

# World Radiocommunication Conference 2019 (WRC-19)

## Provisional Final Acts



**ITUWRC**  
SHARM EL-SHEIKH2019

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## ARTICLE 5

**Frequency allocations****Section IV – Table of Frequency Allocations**  
(See No. 2.1)**MOD**

**AI 8** **5.67** *Additional allocation:* in Kyrgyzstan and Turkmenistan, the frequency band 130-148.5 kHz is also allocated to the radionavigation service on a secondary basis. Within and between these countries this service shall have an equal right to operate. (WRC-19)

**MOD**

**AI 8** **5.67B** The use of the frequency band 135.7-137.8 kHz in Algeria, Egypt, Iraq, Lebanon, Syrian Arab Republic, Sudan, South Sudan and Tunisia is limited to the fixed and maritime mobile services. The amateur service shall not be used in the above-mentioned countries in the frequency band 135.7-137.8 kHz, and this should be taken into account by the countries authorizing such use. (WRC-19)

**MOD**

**AI 9.2** **5.70** *Alternative allocation:* in Angola, Botswana, Burundi, the Central African Rep., Congo (Rep. of the), Eswatini, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Nigeria, Oman, the Dem. Rep. of the Congo, South Africa, Tanzania, Chad, Zambia and Zimbabwe, the frequency band 200-283.5 kHz is allocated to the aeronautical radionavigation service on a primary basis. (WRC-19)

**MOD****200-415 kHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>255-283.5</b> BROADCASTING AERONAUTICAL RADIONAVIGATION 5.70	<b>200-275</b> AERONAUTICAL RADIONAVIGATION Aeronautical mobile	<b>200-285</b> AERONAUTICAL RADIONAVIGATION Aeronautical mobile
	<b>275-285</b> AERONAUTICAL RADIONAVIGATION Aeronautical mobile Maritime radionavigation (radiobeacons)	
<b>283.5-315</b> AERONAUTICAL RADIONAVIGATION MARITIME RADIONAVIGATION (radiobeacons) 5.73 5.74	<b>285-315</b> AERONAUTICAL RADIONAVIGATION MARITIME RADIONAVIGATION (radiobeacons) 5.73	

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**SUP**  
**5.71**

AI 8

**MOD**

**5.77** *Different category of service:* in Australia, China, the French overseas communities of Region 3, Korea (Rep. of), India, Iran (Islamic Republic of), Japan, Pakistan, Papua New Guinea, the Dem. People's Rep. of Korea and Sri Lanka, the allocation of the frequency band 415-495 kHz to the aeronautical radionavigation service is on a primary basis. In Armenia, Azerbaijan, Belarus, the Russian Federation, Kazakhstan, Latvia, Uzbekistan and Kyrgyzstan, the allocation of the frequency band 435-495 kHz to the aeronautical radionavigation service is on a primary basis. Administrations in all the aforementioned countries shall take all practical steps necessary to ensure that aeronautical radionavigation stations in the frequency band 435-495 kHz do not cause interference to reception by coast stations of transmissions from ship stations on frequencies designated for ship stations on a worldwide basis. (WRC-19)

AI 8

**MOD**

**5.79** In the maritime mobile service, the frequency bands 415-495 kHz and 505-526.5 kHz are limited to radiotelegraphy and may also be used for the NAVDAT system in accordance with the most recent version of Recommendation ITU-R M.2010, subject to agreement between interested and affected administrations. NAVDAT transmitting stations are limited to coast stations. (WRC-19)

AI 1.8  
Issue A

**MOD**

**495-1 800 kHz**

Allocation to services		
Region 1	Region 2	Region 3
495-505	MARITIME MOBILE	ADD 5.A18

AI 1.8  
Issue A

**ADD**

**5.A18** The frequency band 495-505 kHz is used for the international NAVDAT system as described in the most recent version of Recommendation ITU-R M.2010. NAVDAT transmitting stations are limited to coast stations. (WRC-19)

AI 1.8  
Issue A

**MOD**

**5.87** *Additional allocation:* in Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia and Niger, the frequency band 526.5-535 kHz is also allocated to the mobile service on a secondary basis. (WRC-19)

AI 9.2



**MOD**

**AI 9.2** **5.107** *Additional allocation:* in Saudi Arabia, Eritrea, Eswatini, Ethiopia, Iraq, Libya and Somalia, the frequency band 2 160-2 170 kHz is also allocated to the fixed and mobile, except aeronautical mobile (R), services on a primary basis. The mean power of stations in these services shall not exceed 50 W. (WRC-19)

**MOD**

**AI 8** **5.112** *Alternative allocation:* in Sri Lanka, the frequency band 2 194-2 300 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.114** *Alternative allocation:* in Iraq, the frequency band 2 502-2 625 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.117** *Alternative allocation:* in Côte d'Ivoire, Egypt, Liberia, Sri Lanka and Togo, the frequency band 3 155-3 200 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.118** *Additional allocation:* in the United States, Mexico and Peru, the frequency band 3 230-3 400 kHz is also allocated to the radiolocation service on a secondary basis. (WRC-19)

**MOD**

**AI 9.2** **5.123** *Additional allocation:* in Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe, the frequency band 3 900-3 950 kHz is also allocated to the broadcasting service on a primary basis, subject to agreement obtained under No. 9.21. (WRC-19)

**MOD**

**AI 8** **5.128** Frequencies in the bands 4 063-4 123 kHz and 4 130-4 438 kHz may be used exceptionally by stations in the fixed service, communicating only within the boundary of the country in which they are located, with a mean power not exceeding 50 W, on condition that harmful interference is not caused to the maritime mobile service. In addition, in Afghanistan, Argentina, Armenia, Belarus, Botswana, Burkina Faso, the Central African Rep., China, the Russian Federation, Georgia, India, Kazakhstan, Mali, Niger, Pakistan, Kyrgyzstan, Tajikistan, Chad, Turkmenistan and Ukraine, in the frequency bands 4 063-4 123 kHz, 4 130-4 133 kHz and 4 408-4 438 kHz, stations in the fixed service, with a mean power not exceeding 1 kW, can be operated on condition that they are situated at least 600 km from the coast and that harmful interference is not caused to the maritime mobile service. (WRC-19)



**MOD**

**AI 8** **5.132B** *Alternative allocation:* in Armenia, Belarus, Moldova and Kyrgyzstan, the frequency band 4 438-4 488 kHz is allocated to the fixed and mobile, except aeronautical mobile (R), services on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.133A** *Alternative allocation:* in Armenia, Belarus, Moldova and Kyrgyzstan, the frequency bands 5 250-5 275 kHz and 26 200-26 350 kHz are allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-19)

**MOD**

**AI 9.2** **5.133B** Stations in the amateur service using the frequency band 5 351.5-5 366.5 kHz shall not exceed a maximum radiated power of 15 W (e.i.r.p.). However, in Region 2 in Mexico, stations in the amateur service using the frequency band 5 351.5-5 366.5 kHz shall not exceed a maximum radiated power of 20 W (e.i.r.p.). In the following Region 2 countries: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Dominica, El Salvador, Ecuador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela, as well as the overseas countries and territories within the Kingdom of the Netherlands in Region 2, stations in the amateur service using the frequency band 5 351.5-5 366.5 kHz shall not exceed a maximum radiated power of 25 W (e.i.r.p.). (WRC-19)

**MOD**

**AI 4** **5.134** The use of the frequency bands 5 900-5 950 kHz, 7 300-7 350 kHz, 9 400-9 500 kHz, 11 600-11 650 kHz, 12 050-12 100 kHz, 13 570-13 600 kHz, 13 800-13 870 kHz, 15 600-15 800 kHz, 17 480-17 550 kHz and 18 900-19 020 kHz by the broadcasting service is subject to the application of the procedure of Article 12. Administrations are encouraged to use these frequency bands to facilitate the introduction of digitally modulated emissions in accordance with the provisions of Resolution 517 (Rev.WRC-19). (WRC-19)

**MOD**

**AI 8** **5.141B** *Additional allocation:* in Algeria, Saudi Arabia, Australia, Bahrain, Botswana, Brunei Darussalam, China, Comoros, Korea (Rep. of), Diego Garcia, Djibouti, Egypt, United Arab Emirates, Eritrea, Guinea, Indonesia, Iran (Islamic Republic of), Japan, Jordan, Kuwait, Libya, Mali, Morocco, Mauritania, Niger, New Zealand, Oman, Papua New Guinea, Qatar, the Syrian Arab Republic, the Dem. People's Rep. of Korea, Singapore, Sudan, South Sudan, Tunisia, Viet Nam and Yemen, the frequency band 7 100-7 200 kHz is also allocated to the fixed and the mobile, except aeronautical mobile (R), services on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.145B** *Alternative allocation:* in Armenia, Belarus, Moldova and Kyrgyzstan, the frequency bands 9 305-9 355 kHz and 16 100-16 200 kHz are allocated to the fixed service on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.149A** *Alternative allocation:* in Armenia, Belarus, Moldova and Kyrgyzstan, the frequency band 13 450-13 550 kHz is allocated to the fixed service on a primary basis and to the mobile, except aeronautical mobile (R), service on a secondary basis. (WRC-19)

**MOD**

**AI 8** **5.158** *Alternative allocation:* in Armenia, Belarus, Moldova and Kyrgyzstan, the frequency band 24 450-24 600 kHz is allocated to the fixed and land mobile services on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.159** *Alternative allocation:* in Armenia, Belarus, Moldova and Kyrgyzstan, the frequency band 39-39.5 MHz is allocated to the fixed and mobile services on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.161A** *Additional allocation:* in Korea (Rep. of), the United States and Mexico, the frequency bands 41.015-41.665 MHz and 43.35-44 MHz are also allocated to the radiolocation service on a primary basis. Stations in the radiolocation service shall not cause harmful interference to, or claim protection from, stations operating in the fixed or mobile services. Applications of the radiolocation service are limited to oceanographic radars operating in accordance with Resolution **612 (Rev.WRC-12)**. (WRC-19)

**MOD**

**AI 9.2** **5.161B** *Alternative allocation:* in Albania, Germany, Armenia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Cyprus, Vatican, Croatia, Denmark, Spain, Estonia, Finland, France, Greece, Hungary, Ireland, Iceland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, North Macedonia, Malta, Moldova, Monaco, Montenegro, Norway, Uzbekistan, Netherlands, Portugal, Kyrgyzstan, Slovakia, Czech Rep., Romania, United Kingdom, San Marino, Slovenia, Sweden, Switzerland, Turkey and Ukraine, the frequency band 42-42.5 MHz is allocated to the fixed and mobile services on a primary basis. (WRC-19)



**MOD**

**5.162A** *Additional allocation:* in Germany, Austria, Belgium, Bosnia and Herzegovina, China, Vatican, Denmark, Spain, Estonia, the Russian Federation, Finland, France, Ireland, Iceland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, North Macedonia, Monaco, Montenegro, Norway, the Netherlands, Poland, Portugal, the Czech Rep., the United Kingdom, Serbia, Slovenia, Sweden and Switzerland the frequency band 46-68 MHz is also allocated to the radiolocation service on a secondary basis. This use is limited to the operation of wind profiler radars in accordance with Resolution **217 (WRC-97)**. (WRC-19)

**MOD****47-75.2 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>47-50</b> BROADCASTING  5.162A 5.163 5.164 5.165	<b>47-50</b> FIXED MOBILE	<b>47-50</b> FIXED MOBILE BROADCASTING  5.162A
<b>50-52</b> BROADCASTING Amateur <b>ADD 5.A11 ADD 5.B11</b> <b>ADD 5.E11</b> 5.162A 5.164 5.165 <b>MOD 5.169 ADD 5.C11 ADD</b> <b>5.D11 ADD 5.169bis ADD</b> <b>5.A11bis</b>	<b>50-54</b> AMATEUR  5.162A 5.167 5.167A 5.168 5.170	
<b>52-68</b> BROADCASTING  5.162A 5.163 5.164 5.165 <b>MOD 5.169 5.171 ADD 5.169bis</b> <b>ADD 5.A11bis</b>	<b>54-68</b> BROADCASTING Fixed Mobile  5.172	<b>54-68</b> FIXED MOBILE BROADCASTING  5.162A

**ADD**

**5.A11** In Region 1, stations in the amateur service operating on a secondary basis shall not cause harmful interference to, or claim protection from, stations of the broadcasting service. The field strength generated by an amateur station in Region 1 in the frequency band 50-52 MHz shall not exceed a calculated value of +6 dB( $\mu$ V/m) at a height of 10 m above ground for more than 10% of time along the border of a country with operational analogue broadcasting stations in Region 1 and of neighbouring countries with broadcasting stations in Region 3 listed in Nos. **5.167** and **5.168**. (WRC-19)

**ADD**

**AI 1.1** **5.B11** In Region 1, stations in the amateur service in the frequency band 50-52 MHz, with the exception of those countries listed in No. **5.169**, shall not cause harmful interference to, or claim protection from, wind profiler radars operating in the radiolocation service under No. **5.162A**. (WRC-19)

**ADD**

**AI 1.1** **5.E11** In the Russian Federation, only the frequency band 50.080-50.280 MHz is allocated to the amateur service on a secondary basis. The protection criteria for the other services in the countries not listed in this provision are specified in Nos. **5.A11** and **5.A11bis**. (WRC-19)

**ADD**

**AI 1.1** **5.C11** *Different category of service:* in Lebanon, the frequency band 50-52 MHz is allocated to the amateur service on a primary basis. Stations in the amateur service in Lebanon shall not cause harmful interference to, or claim protection from, stations of the broadcasting, fixed and mobile services operating in accordance with the Radio Regulations in the frequency band 50-52 MHz in the countries not listed in this provision. (WRC-19)

**ADD**

**AI 1.1** **5.D11** *Different category of service:* in Austria, Cyprus, the Vatican, Croatia, Denmark, Spain, Finland, Hungary, Latvia, the Netherlands, the Czech Republic, the United Kingdom, Slovakia and Slovenia, the frequency band 50.0-50.5 MHz is allocated to the amateur service on a primary basis. Stations in the amateur service in these countries shall not cause harmful interference to, or claim protection from, stations of the broadcasting, fixed and mobile services operating in accordance with the Radio Regulations in the frequency band 50.0-50.5 MHz in the countries not listed in this provision. For a station of these services, the protection criteria in No. **5.A11bis** shall also apply. In Region 1, with the exception of those countries listed in No. **5.169**, wind profiler radars operating in the radiolocation service under No. **5.162A** are authorized to operate on the basis of equality with stations in the amateur service in the frequency band 50.0-50.5 MHz. (WRC-19)



**ADD**

**5.169bis** *Alternative allocation:* in the following countries in Region 1: Angola, Saudi Arabia, Bahrain, Burkina Faso, Burundi, the United Arab Emirates, Gambia, Jordan, Kenya, Kuwait, Mauritius, Mozambique, Oman, Uganda, Qatar, South Sudan and Tanzania, the frequency band 50-54 MHz is allocated to the amateur service on a primary basis. In Guinea-Bissau, the frequency band 50.0-50.5 MHz is allocated to the amateur service on a primary basis. In Djibouti, the frequency band 50-52 MHz is allocated to the amateur service on a primary basis. With the exception of those countries listed in No. **5.169**, stations in the amateur service operating in Region 1 under this footnote, in all or part of the frequency band 50-54 MHz, shall not cause harmful interference to, or claim protection from, stations of other services operating in accordance with the Radio Regulations in Algeria, Egypt, Iran (Islamic Republic of), Iraq, Israel, Libya, Palestine\*, the Syrian Arab Republic, the Dem. People's Republic of Korea, Sudan and Tunisia. The field strength generated by an amateur station in the frequency band 50-54 MHz shall not exceed a value of +6 dB( $\mu$ V/m) at a height of 10 m above ground for more than 10% of time along the borders of listed countries requiring protection. (WRC-19)

AI 1.1

**ADD**

**5.A11bis** Except countries listed under No. **5.169**, stations in the amateur service used in Region 1, in all or part of the 50-54 MHz frequency band, shall not cause harmful interference to, or claim protection from, stations of other services used in accordance with the Radio Regulations in Algeria, Armenia, Azerbaijan, Belarus, Egypt, Russian Federation, Iran (Islamic Republic of), Iraq, Kazakhstan, Kyrgyzstan, Libya, Uzbekistan, Palestine\*, the Syrian Arab Republic, Sudan, Tunisia and Ukraine. The field strength generated by an amateur station in the frequency band 50-54 MHz shall not exceed a value of +6 dB( $\mu$ V/m) at a height of 10 m above ground for more than 10% of time along the borders of the countries listed in this provision. (WRC-19)

AI 1.1

**MOD**

**5.163** *Additional allocation:* in Armenia, Belarus, the Russian Federation, Georgia, Kazakhstan, Latvia, Moldova, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the frequency bands 47-48.5 MHz and 56.5-58 MHz are also allocated to the fixed and land mobile services on a secondary basis. (WRC-19)

AI 8

\* Pursuant to Resolution 99 (Rev. Dubai, 2018) and taking into account the Israeli-Palestinian Interim Agreement of 28 September 1995.

\* Pursuant to Resolution 99 (Rev. Dubai, 2018) and taking into account the Israeli-Palestinian Interim Agreement of 28 September 1995.

**MOD**

**5.164** *Additional allocation:* in Albania, Algeria, Germany, Austria, Belgium, Bosnia and Herzegovina, Botswana, Bulgaria, Côte d'Ivoire, Croatia, Denmark, Spain, Estonia, Eswatini, Finland, France, Gabon, Greece, Hungary, Ireland, Israel, Italy, Jordan, Lebanon, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Malta, Morocco, Mauritania, Monaco, Montenegro, Nigeria, Norway, the Netherlands, Poland, Syrian Arab Republic, Slovakia, Czech Rep., Romania, the United Kingdom, Serbia, Slovenia, Sweden, Switzerland, Chad, Togo, Tunisia and Turkey, the frequency band 47-68 MHz, in South Africa the frequency band 47-50 MHz, and in Latvia the frequency bands 48.5-56.5 MHz and 58-68 MHz, are also allocated to the land mobile service on a primary basis. However, stations of the land mobile service in the countries mentioned in connection with each frequency band referred to in this footnote shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations of countries other than those mentioned in connection with the frequency band. (WRC-19)

**MOD**

**5.165** *Additional allocation:* in Angola, Cameroon, Congo (Rep. of the), Egypt, Madagascar, Mozambique, Niger, Somalia, Sudan, South Sudan, Tanzania and Chad, the frequency band 47-68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-19)

**MOD**

**5.169** *Alternative allocation:* in Botswana, Eswatini, Lesotho, Malawi, Namibia, , Rwanda, South Africa, Zambia and Zimbabwe, the frequency band 50-54 MHz is allocated to the amateur service on a primary basis. In Senegal, the frequency band 50-51 MHz is allocated to the amateur service on a primary basis. (WRC-19)

**MOD**

**5.171** *Additional allocation:* in Botswana, Eswatini, Lesotho, Malawi, Mali, Namibia, Dem. Rep. of the Congo, Rwanda, South Africa, Zambia and Zimbabwe, the frequency band 54-68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-19)



**MOD****75.2-137.175 MHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
...		
<b>137-137.025</b>	SPACE OPERATION (space-to-Earth) <b>ADD 5.A17</b> METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208	
<b>137.025-137.175</b>	SPACE OPERATION (space-to-Earth) <b>ADD 5.A17</b> METEOROLOGICAL-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) Mobile-satellite (space-to-Earth) 5.208A 5.208B 5.209 5.204 5.205 5.206 5.207 5.208	

**ADD**

**5.A17** The use of the space operation service (space-to-Earth) with non-geostationary satellite short-duration mission systems in the frequency band 137-138 MHz is subject to Resolution **COM5/9 (WRC-19)**. Resolution **COM5/5 (WRC-19)** applies. These systems shall not cause harmful interference to, or claim protection from, the existing services to which the frequency band is allocated on a primary basis. (WRC-19)

**MOD**

**5.194** *Additional allocation:* in Kyrgyzstan, Somalia and Turkmenistan, the frequency band 104-108 MHz is also allocated to the mobile, except aeronautical mobile (R), service on a secondary basis. (WRC-19)

**MOD**

**5.201** *Additional allocation:* in Armenia, Azerbaijan, Belarus, Bulgaria, Estonia, the Russian Federation, Georgia, Hungary, Iran (Islamic Republic of), Iraq (Republic of), Japan, Kazakhstan, Mali, Mongolia, Mozambique, Uzbekistan, Papua New Guinea, Poland, Kyrgyzstan, Romania, Senegal, Tajikistan, Turkmenistan and Ukraine, the frequency band 132-136 MHz is also allocated to the aeronautical mobile (OR) service on a primary basis. In assigning frequencies to stations of the aeronautical mobile (OR) service, the administration shall take account of the frequencies assigned to stations in the aeronautical mobile (R) service. (WRC-19)

**MOD**

**5.202** *Additional allocation:* in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, Bulgaria, the United Arab Emirates, the Russian Federation, Georgia, Iran (Islamic Republic of), Jordan, Mali, Oman, Uzbekistan, Poland, the Syrian Arab Republic, Kyrgyzstan, Romania, Senegal, Tajikistan, Turkmenistan and Ukraine, the frequency band 136-137 MHz is also allocated to the aeronautical mobile (OR) service on a primary basis. In assigning frequencies to stations of the aeronautical mobile (OR) service, the administration shall take account of the frequencies assigned to stations in the aeronautical mobile (R) service. (WRC-19)

AI 8

**MOD**

**5.204** *Different category of service:* in Afghanistan, Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, China, Cuba, the United Arab Emirates, India, Indonesia, Iran (Islamic Republic of), Iraq, Kuwait, Montenegro, Oman, Pakistan, the Philippines, Qatar, Singapore, Thailand and Yemen, the frequency band 137-138 MHz is allocated to the fixed and mobile, except aeronautical mobile (R), services on a primary basis (see No. **5.33**). (WRC-19)

AI 8

**MOD**

**5.208A** In making assignments to space stations in the mobile-satellite service in the frequency bands 137-138 MHz, 387-390 MHz and 400.15-401 MHz and in the maritime mobile-satellite service (space-to-Earth) in the frequency bands 157.1875-157.3375 MHz and 161.7875-161.9375 MHz, administrations shall take all practicable steps to protect the radio astronomy service in the frequency bands 150.05-153 MHz, 322-328.6 MHz, 406.1-410 MHz and 608-614 MHz from harmful interference from unwanted emissions as shown in the most recent version of Recommendation ITU-R RA.769. (WRC-19)

AI 1.9.1

**MOD**

**5.208B\*** In the frequency bands:

137-138 MHz,  
 157.1875-157.3375 MHz,  
 161.7875-161.9375 MHz,  
 387-390 MHz,  
 400.15-401 MHz,  
 1 452-1 492 MHz,  
 1 525-1 610 MHz,  
 1 613.8-1 626.5 MHz,  
 2 655-2 690 MHz,  
 21.4-22 GHz,

Resolution **739 (Rev.WRC-19)** applies. (WRC-19)

AI 1.9.1

\* This provision was previously numbered as No. **5.347A**. It was renumbered to preserve the sequential order.

**MOD****137.175-148 MHz**

Allocation to services		
Region 1	Region 2	Region 3
...		
<b>137.175-137.825</b>	SPACE OPERATION (space-to-Earth) <b>ADD 5.A17 ADD 5.AA17</b> METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208	
<b>137.825-138</b>	SPACE OPERATION (space-to-Earth) <b>ADD 5.A17</b> METEOROLOGICAL-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) Mobile-satellite (space-to-Earth) 5.208A 5.208B 5.209 5.204 5.205 5.206 5.207 5.208	

**ADD**

**5.AA17** The use of the frequency band 137.175-137.825 MHz by non-geostationary satellite systems in the space operation service identified as short-duration mission in accordance with Appendix 4 is not subject to No. **9.11A**. (WRC-19)

**MOD**

**5.211** *Additional allocation:* in Germany, Saudi Arabia, Austria, Bahrain, Belgium, Denmark, the United Arab Emirates, Spain, Finland, Greece, Guinea, Ireland, Israel, Kenya, Kuwait, Lebanon, Liechtenstein, Luxembourg, North Macedonia, Mali, Malta, Montenegro, Norway, the Netherlands, Qatar, Slovakia, the United Kingdom, Serbia, Slovenia, Somalia, Sweden, Switzerland, Tanzania, Tunisia and Turkey, the frequency band 138-144 MHz is also allocated to the maritime mobile and land mobile services on a primary basis. (WRC-19)

**MOD**

**5.212** *Alternative allocation:* in Angola, Botswana, Cameroon, the Central African Rep., Congo (Rep. of the), Eswatini, Gabon, Gambia, Ghana, Guinea, Iraq, Jordan, Lesotho, Liberia, Libya, Malawi, Mozambique, Namibia, Niger, Oman, Uganda, Syrian Arab Republic, the Dem. Rep. of the Congo, Rwanda, Sierra Leone, South Africa, Chad, Togo, Zambia and Zimbabwe, the frequency band 138-144 MHz is allocated to the fixed and mobile services on a primary basis. (WRC-19)



**MOD**

**5.214** *Additional allocation:* in Eritrea, Ethiopia, Kenya, North Macedonia, Montenegro, Serbia, Somalia, Sudan, South Sudan and Tanzania, the frequency band 138-144 MHz is also allocated to the fixed service on a primary basis. (WRC-19)

**MOD****148-161.9375 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>148-149.9</b> FIXED MOBILE except aeronautical mobile (R) MOBILE-SATELLITE (Earth-to-space) 5.209 5.218 <b>MOD 5.219</b> 5.221 <b>ADD 5BB17</b>	<b>148-149.9</b> FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.209  5.218 <b>MOD 5.219</b> 5.221 <b>ADD 5BB17</b>	
...		

**ADD**

**5BB17** The frequency band 148-149.9 MHz in the space operation service (Earth-to-space) may be used by non-geostationary satellite systems with short-duration missions. Non-geostationary satellite systems in the space operation service used for a short-duration mission in accordance with Resolution **COM5/5 (WRC-19)** of the Radio Regulations are not subject to agreement under No. **9.21**. At the stage of coordination, the provisions of Nos. **9.17** and **9.18** also apply. In the frequency band 148-149.9 MHz, non-geostationary satellite systems with short-duration missions shall not cause unacceptable interference to, or claim protection from, existing primary services within this frequency band, or impose additional constraints on the space operation and mobile-satellite services. In addition, earth stations in non-geostationary satellite systems in the space operation service with short-duration missions in the frequency band 148-149.9 MHz shall ensure that the power flux-density does not exceed  $-149 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$  for more than 1% of time at the border of the territory of the following countries: Armenia, Azerbaijan, Belarus, China, Korea (Rep. of), Cuba, Russian Federation, India, Iran (Islamic Republic of), Japan, Kazakhstan, Malaysia, Uzbekistan, Kyrgyzstan, Thailand and Viet Nam. In case this power flux-density limit is exceeded, agreement under No. **9.21** is required to be obtained from countries mentioned in this footnote. (WRC-19)

**MOD****148-161.9375 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>156.8375-157.1875</b> FIXED MOBILE except aeronautical mobile 5.226	<b>156.8375-157.1875</b> FIXED MOBILE 5.226	
<b>157.1875-157.3375</b> FIXED MOBILE except aeronautical mobile Maritime mobile-satellite ADD 5.A192 MOD 5.208A MOD 5.208B ADD 5.B192 5.226	<b>157.1875-157.3375</b> FIXED MOBILE Maritime mobile-satellite ADD 5.A192 MOD 5.208A MOD 5.208B ADD 5.B192 5.226	
<b>157.3375-161.7875</b> FIXED MOBILE except aeronautical mobile 5.226	<b>157.3375-161.7875</b> FIXED MOBILE 5.226	
<b>161.7875-161.9375</b> FIXED MOBILE except aeronautical mobile Maritime mobile-satellite ADD 5.A192 MOD 5.208A MOD 5.208B ADD 5.B192 5.226	<b>161.7875-161.9375</b> FIXED MOBILE Maritime mobile-satellite ADD 5.A192 MOD 5.208A MOD 5.208B ADD 5.B192 5.226	

**ADD**

**AI 1.9.2** **5.A192** The use of the frequency bands 157.1875-157.3375 MHz and 161.7875-161.9375 MHz by the maritime mobile-satellite service (Earth-to-space) is limited to non-GSO satellite systems operating in accordance with Appendix **18**. (WRC-19)

**ADD**

**AI 1.9.2** **5.B192** The use of the frequency bands 157.1875-157.3375 MHz and 161.7875-161.9375 MHz by the maritime mobile-satellite service (space-to-Earth) is limited to non-GSO satellite systems operating in accordance with Appendix **18**. Such use is subject to agreement obtained under No. **9.21** with respect to the terrestrial services in Azerbaijan, Belarus, China, Korea (Rep. of), Cuba, the Russian Federation, the Syrian Arab Republic, the Dem. People's Rep. of Korea, South Africa and Viet Nam. (WRC-19)

**MOD**

**5.219** The use of the frequency band 148-149.9 MHz by the mobile-satellite service is subject to coordination under No. **9.11A**. The mobile-satellite service shall not constrain the development and use of the fixed, mobile and space operation services in the frequency band 148-149.9 MHz. The use of the frequency band 148-149.9 MHz by non-geostationary-satellite systems in the space operation service identified as short-duration mission is not subject to No. **9.11A**. (WRC-19)

AI 1.7

**MOD**

**5.221** Stations of the mobile-satellite service in the frequency band 148-149.9 MHz shall not cause harmful interference to, or claim protection from, stations of the fixed or mobile services operating in accordance with the Table of Frequency Allocations in the following countries: Albania, Algeria, Germany, Saudi Arabia, Australia, Austria, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Benin, Bosnia and Herzegovina, Botswana, Brunei Darussalam, Bulgaria, Cameroon, China, Cyprus, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Croatia, Cuba, Denmark, Djibouti, Egypt, the United Arab Emirates, Eritrea, Spain, Estonia, Eswatini, Ethiopia, the Russian Federation, Finland, France, Gabon, Georgia, Ghana, Greece, Guinea, Guinea Bissau, Hungary, India, Iran (Islamic Republic of), Ireland, Iceland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Lesotho, Latvia, Lebanon, Libya, Liechtenstein, Lithuania, Luxembourg, North Macedonia, Malaysia, Mali, Malta, Mauritania, Moldova, Mongolia, Montenegro, Mozambique, Namibia, Norway, New Zealand, Oman, Uganda, Uzbekistan, Pakistan, Panama, Papua New Guinea, Paraguay, the Netherlands, the Philippines, Poland, Portugal, Qatar, the Syrian Arab Republic, Kyrgyzstan, Dem. People's Rep. of Korea, Slovakia, Romania, the United Kingdom, Senegal, Serbia, Sierra Leone, Singapore, Slovenia, Sudan, Sri Lanka, South Africa, Sweden, Switzerland, Tanzania, Chad, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Ukraine, Viet Nam, Yemen, Zambia and Zimbabwe. (WRC-19)

AI 9.2

**MOD**

**5.242** *Additional allocation:* in Canada and Mexico, the frequency band 216-220 MHz is also allocated to the land mobile service on a primary basis. (WRC-19)

AI 8

**MOD**

**5.252** *Alternative allocation:* in Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe, the frequency bands 230-238 MHz and 246-254 MHz are allocated to the broadcasting service on a primary basis, subject to agreement obtained under No. **9.21**. (WRC-19)

AI 9.2



**MOD****335.4-410 MHz**

Allocation to services		
Region 1	Region 2	Region 3
...		
<b>399.9-400.05</b>	MOBILE-SATELLITE (Earth-to-space) 5.209 5.220 <b>ADD 5.B12</b>	<b>ADD 5.A12</b>
...		

**ADD**

**5.A12** In the frequency band 399.9-400.05 MHz, the maximum e.i.r.p. of any emission of earth stations in the mobile-satellite service shall not exceed 5 dBW in any 4 kHz band and the maximum e.i.r.p. of each earth station in the mobile-satellite service shall not exceed 5 dBW in the whole 399.9-400.05 MHz frequency band. Until 22 November 2022, this limit shall not apply to satellite systems for which complete notification information has been received by the Radiocommunication Bureau by 22 November 2019 and that have been brought into use by that date. After 22 November 2022, these limits shall apply to all systems within the mobile-satellite service operating in this frequency band.

In the frequency band 399.99-400.02 MHz, the e.i.r.p. limits as specified above shall apply after 22 November 2022 to all systems within the mobile-satellite service. Administrations are requested that their mobile-satellite service satellite links in the 399.99-400.02 MHz frequency band comply with the e.i.r.p. limits as specified above, after 22 November 2019. (WRC-19)

**ADD**

**5.B12** In the frequency band 400.02-400.05 MHz, the provisions of No. **5.A12** are not applicable for telecommand uplinks within the mobile-satellite service. (WRC-19)

**MOD****335.4-410 MHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
...		
<b>401-402</b>	METEOROLOGICAL AIDS SPACE OPERATION (space-to-Earth) EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Fixed Mobile except aeronautical mobile <b>ADD 5.C12 ADD 5.D12</b>	
<b>402-403</b>	METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Fixed Mobile except aeronautical mobile <b>ADD 5.C12 ADD 5.D12</b>	
...		

**ADD**

**5.C12** In the frequency band 401-403 MHz, the maximum e.i.r.p. of any emission of each earth station in the meteorological-satellite service and the Earth exploration-satellite service shall not exceed 22 dBW in any 4 kHz band for geostationary systems and non-geostationary systems with an orbit of apogee equal or greater than 35 786 km.

The maximum e.i.r.p. of any emission of each earth station in the meteorological-satellite service and the Earth exploration-satellite service shall not exceed 7 dBW in any 4 kHz band for non-geostationary systems with an orbit of apogee lower than 35 786 km.

The maximum e.i.r.p. of each earth station in the meteorological-satellite service and the Earth exploration-satellite service shall not exceed 22 dBW for geostationary systems and non-geostationary systems with an orbit of apogee equal or greater than 35 786 km in the whole 401-403 MHz frequency band. The maximum e.i.r.p. of each earth station in the meteorological-satellite service and the Earth exploration-satellite service shall not exceed 7 dBW for non-geostationary systems with an orbit of apogee lower than 35 786 km in the whole 401-403 MHz frequency band.

Until 22 November 2029, these limits shall not apply to satellite systems for which complete notification information has been received by the Radiocommunication Bureau by 22 November 2019 and that have been brought into use by that date. After 22 November 2029, these limits shall apply to all systems within the meteorological-satellite service and the Earth exploration-satellite service operating in this frequency band. (WRC-19)

**ADD**

**5.D12** Non-geostationary satellite systems in the meteorological-satellite service and the Earth exploration-satellite service for which complete notification information has been received by the Radiocommunication Bureau before 28 April 2007 are exempt from provisions of No. **5.C12** and may continue to operate in the frequency band 401.898-402.522 MHz on a primary basis without exceeding a maximum e.i.r.p. level of 12 dBW. (WRC-19)



**MOD**

**5.265** In the frequency band 403-410 MHz, **Resolution 205 (Rev.WRC-19)** applies. (WRC-19)

**MOD**

**5.275** *Additional allocation:* in Croatia, Estonia, Finland, Libya, North Macedonia, Montenegro and Serbia, the frequency bands 430-432 MHz and 438-440 MHz are also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-19)

**MOD**

**5.277** *Additional allocation:* in Angola, Armenia, Azerbaijan, Belarus, Cameroon, Congo (Rep. of the), Djibouti, the Russian Federation, Georgia, Hungary, Israel, Kazakhstan, Mali, Uzbekistan, Poland, the Dem. Rep. of the Congo, Kyrgyzstan, Slovakia, Romania, Rwanda, Tajikistan, Chad, Turkmenistan and Ukraine, the frequency band 430-440 MHz is also allocated to the fixed service on a primary basis. (WRC-19)

**MOD**

**5.278** *Different category of service:* in Argentina, Brazil, Colombia, Costa Rica, Cuba, Guyana, Honduras, Panama, Paraguay, Uruguay and Venezuela, the allocation of the frequency band 430-440 MHz to the amateur service is on a primary basis (see No. **5.33**). (WRC-19)

**MOD**

**5.279** *Additional allocation:* in Mexico, the frequency bands 430-435 MHz and 438-440 MHz are also allocated on a primary basis to the mobile, except aeronautical mobile, service, and on a secondary basis to the fixed service, subject to agreement obtained under No. **9.21**. (WRC-19)

**MOD**

**5.279A** The use of the frequency band 432-438 MHz by sensors in the Earth exploration-satellite service (active) shall be in accordance with Recommendation ITU-R RS.1260-2. Additionally, the Earth exploration-satellite service (active) in the frequency band 432-438 MHz shall not cause harmful interference to the aeronautical radionavigation service in China. The provisions of this footnote in no way diminish the obligation of the Earth exploration-satellite service (active) to operate as a secondary service in accordance with Nos. **5.29** and **5.30**. (WRC-19)

**MOD**

**5.280** In Germany, Austria, Bosnia and Herzegovina, Croatia, Liechtenstein, North Macedonia, Montenegro, Portugal, Serbia, Slovenia and Switzerland, the frequency band 433.05-434.79 MHz (centre frequency 433.92 MHz) is designated for industrial, scientific and medical (ISM) applications. Radiocommunication services of these countries operating within this frequency band must accept harmful interference which may be caused by these applications. ISM equipment operating in this frequency band is subject to the provisions of No. **15.13**. (WRC-19)

**MOD**

**5.286AA** The frequency band 450-470 MHz is identified for use by administrations wishing to implement International Mobile Telecommunications (IMT) - see **Resolution 224 (Rev.WRC-19)**. This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. (WRC-19)

**MOD**

**5.287** Use of the frequency bands 457.5125-457.5875 MHz and 467.5125-467.5875 MHz by the maritime mobile service is limited to on-board communication stations. The characteristics of the equipment and the channelling arrangement shall be in accordance with Recommendation ITU-R M.1174-4. The use of these frequency bands in territorial waters is subject to the national regulations of the administration concerned. (WRC-19)

**MOD**

**5.288** In the territorial waters of the United States and the Philippines, the preferred frequencies for use by on-board communication stations shall be 457.525 MHz, 457.550 MHz, 457.575 MHz and 457.600 MHz paired, respectively, with 467.750 MHz, 467.775 MHz, 467.800 MHz and 467.825 MHz. The characteristics of the equipment used shall conform to those specified in Recommendation ITU-R M.1174-4. (WRC-19)



AI 9.2

AI 4

AI 2

AI 2

**MOD****460-890 MHz**

Allocation to services			
Region 1	Region 2	Region 3	
...			
<b>470-694</b> BROADCASTING  5.149 5.291A 5.294 5.296 5.300 5.304 5.306 5.312	<b>470-512</b> BROADCASTING Fixed Mobile 5.292 5.293 5.295	<b>470-585</b> FIXED MOBILE 5.296A BROADCASTING  5.291 5.298	
	<b>512-608</b> BROADCASTING 5.295 5.297		<b>585-610</b> FIXED MOBILE 5.296A BROADCASTING RADIONAVIGATION 5.149 5.305 5.306 5.307
	<b>608-614</b> RADIO ASTRONOMY Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)	<b>610-890</b> FIXED MOBILE 5.296A 5.313A 5.317A BROADCASTING  5.149 5.305 5.306 5.307 5.320	
	<b>614-698</b> BROADCASTING Fixed Mobile 5.293 5.308 5.308A 5.309		
	<b>694-790</b> MOBILE except aeronautical mobile 5.312A 5.317A BROADCASTING 5.300 5.312		<b>698-806</b> MOBILE 5.317A BROADCASTING Fixed  5.293 5.309
	<b>790-862</b> FIXED MOBILE except aeronautical mobile 5.316B 5.317A BROADCASTING 5.312 5.319		<b>806-890</b> FIXED MOBILE 5.317A BROADCASTING
<b>862-890</b> FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322  5.319 5.323	5.317 5.318		

**MOD**

**5.295** In the Bahamas, Barbados, Canada, the United States and Mexico, the frequency band 470-608 MHz, or portions thereof, is identified for International Mobile Telecommunications (IMT) – see **Resolution 224 (Rev.WRC-19)**. This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. Mobile service stations of the IMT system within the frequency band are subject to agreement obtained under No. **9.21** and shall not cause harmful



AI 9.2

AI 4

interference to, or claim protection from, the broadcasting service of neighbouring countries. Nos. **5.43** and **5.43A** apply. (WRC-19)

## MOD

**5.296** *Additional allocation:* in Albania, Germany, Angola, Saudi Arabia, Austria, Bahrain, Belgium, Benin, Bosnia and Herzegovina, Botswana, Bulgaria, Burkina Faso, Burundi, Cameroon, Vatican, Congo (Rep. of the), Côte d'Ivoire, Croatia, Denmark, Djibouti, Egypt, United Arab Emirates, Spain, Estonia, Eswatini, Finland, France, Gabon, Georgia, Ghana, Hungary, Iraq, Ireland, Iceland, Israel, Italy, Jordan, Kenya, Kuwait, Lesotho, Latvia, Lebanon, Libya, Liechtenstein, Lithuania, Luxembourg, North Macedonia, Malawi, Mali, Malta, Morocco, Mauritius, Mauritania, Moldova, Monaco, Mozambique, Namibia, Niger, Nigeria, Norway, Oman, Uganda, the Netherlands, Poland, Portugal, Qatar, the Syrian Arab Republic, Slovakia, the Czech Republic, Romania, the United Kingdom, Rwanda, San Marino, Serbia, Sudan, South Africa, Sweden, Switzerland, Tanzania, Chad, Togo, Tunisia, Turkey, Ukraine, Zambia and Zimbabwe, the frequency band 470-694 MHz is also allocated on a secondary basis to the land mobile service, intended for applications ancillary to broadcasting and programme-making. Stations of the land mobile service in the countries listed in this footnote shall not cause harmful interference to existing or planned stations operating in accordance with the Table in countries other than those listed in this footnote. (WRC-19)



## MOD

**5.296A** In Micronesia, the Solomon Islands, Tuvalu and Vanuatu, the frequency band 470-698 MHz, or portions thereof, and in Bangladesh, Maldives and New Zealand, the frequency band 610-698 MHz, or portions thereof, are identified for use by these administrations wishing to implement International Mobile Telecommunications (IMT) – see **Resolution 224 (Rev.WRC-19)**. This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. The mobile allocation in this frequency band shall not be used for IMT systems unless subject to agreement obtained under No. **9.21** and shall not cause harmful interference to, or claim protection from, the broadcasting service of neighbouring countries. Nos. **5.43** and **5.43A** apply. (WRC-19)



**MOD**

**5.297** *Additional allocation:* in Canada, Costa Rica, Cuba, El Salvador, the United States, Guatemala, Guyana and Jamaica, the frequency band 512-608 MHz is also allocated to the fixed and mobile services on a primary basis, subject to agreement obtained under No. **9.21**. In the Bahamas, Barbados and Mexico, the frequency band 512-608 MHz is also allocated to the mobile service on a primary basis, subject to agreement obtained under No. **9.21**. In Mexico, the frequency band 512-608 MHz is also allocated on a secondary basis to the fixed service (see No. **5.32**). (WRC-19)

AI 8

**MOD**

**5.308** *Additional allocation:* in Belize, Colombia and Guatemala, the frequency band 614-698 MHz is also allocated to the mobile service on a primary basis. Stations of the mobile service within the frequency band are subject to agreement obtained under No. **9.21**. (WRC-19)

AI 8

**MOD**

**5.308A** In the Bahamas, Barbados, Belize, Canada, Colombia, the United States, Guatemala and Mexico, the frequency band 614-698 MHz, or portions thereof, is identified for International Mobile Telecommunications (IMT) – see **Resolution 224 (Rev.WRC-19)**. This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. Mobile service stations of the IMT system within the frequency band are subject to agreement obtained under No. **9.21** and shall not cause harmful interference to, or claim protection from, the broadcasting service of neighbouring countries. Nos. **5.43** and **5.43A** apply. (WRC-19)

AI 9.2

AI 4

**SUP****5.311A**

AI 4

**MOD**

**5.312** *Additional allocation:* in Armenia, Azerbaijan, Belarus, the Russian Federation, Georgia, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the frequency band 645-862 MHz, and in Bulgaria the frequency bands 646-686 MHz, 726-753 MHz, 778-811 MHz and 822-852 MHz, are also allocated to the aeronautical radionavigation service on a primary basis. (WRC-19)

AI 8

**MOD**

**5.312A** In Region 1, the use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service is subject to the provisions of **Resolution 760 (Rev.WRC-19)**. See also **Resolution 224 (Rev.WRC-19)**. (WRC-19)

AI 4



**MOD**

**5.313A** The frequency band, or portions of the frequency band 698-790 MHz, in Australia, Bangladesh, Brunei Darussalam, Cambodia, China, Korea (Rep. of), Fiji, India, Indonesia, Japan, Kiribati, Lao P.D.R., Malaysia, Myanmar (Union of), New Zealand, Pakistan, Papua New Guinea, the Philippines, the Dem. People's Rep. of Korea, Solomon Islands, Samoa, Singapore, Thailand, Tonga, Tuvalu, Vanuatu and Viet Nam, are identified for use by these administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-19)

AI 9.2

**MOD**

**5.316B** In Region 1, the allocation to the mobile, except aeronautical mobile, service in the frequency band 790-862 MHz is subject to agreement obtained under No. 9.21 with respect to the aeronautical radionavigation service in countries mentioned in No. 5.312. For countries party to the GE06 Agreement, the use of stations of the mobile service is also subject to the successful application of the procedures of that Agreement. Resolutions 224 (Rev.WRC-19) and 749 (Rev.WRC-19) shall apply, as appropriate. (WRC-19)

AI 4

**MOD**

**5.317A** The parts of the frequency band 698-960 MHz in Region 2 and the frequency bands 694-790 MHz in Region 1 and 790-960 MHz in Regions 1 and 3 which are allocated to the mobile service on a primary basis are identified for use by administrations wishing to implement International Mobile Telecommunications (IMT) – see Resolutions 224 (Rev.WRC-19), 760 (Rev.WRC-19) and 749 (Rev.WRC-19), where applicable. This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-19)

AI 4

**MOD**

**5.323** *Additional allocation:* in Armenia, Azerbaijan, Belarus, the Russian Federation, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan and Ukraine, the frequency band 862-960 MHz, in Bulgaria the frequency bands 862-880 MHz and 915-925 MHz, and in Romania the frequency bands 862-880 MHz and 915-925 MHz, are also allocated to the aeronautical radionavigation service on a primary basis. Such use is subject to agreement obtained under No. 9.21 with administrations concerned and limited to ground-based radiobeacons in operation on 27 October 1997 until the end of their lifetime. (WRC-19)

AI 8

**MOD**

**5.325A** *Different category of service:* in Argentina, Brazil, Costa Rica, Cuba, Dominican Republic, El Salvador, Ecuador, the French overseas departments and communities in Region 2, Guatemala, Paraguay, Uruguay and Venezuela, the frequency band 902-928 MHz is allocated to the land mobile service on a primary basis. In Mexico, the frequency band 902-928 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis. In Colombia, the frequency band 902-905 MHz is allocated to the land mobile service on a primary basis. (WRC-19)

AI 8

**MOD**

**5.328AA** The frequency band 1 087.7-1 092.3 MHz is also allocated to the aeronautical mobile-satellite (R) service (Earth-to-space) on a primary basis, limited to the space station reception of Automatic Dependent Surveillance-Broadcast (ADS-B) emissions from aircraft transmitters that operate in accordance with recognized international aeronautical standards. Stations operating in the aeronautical mobile-satellite (R) service shall not claim protection from stations operating in the aeronautical radionavigation service. **Resolution 425 (Rev.WRC-19)** shall apply. (WRC-19)

AI 4

**MOD**

**5.329** Use of the radionavigation-satellite service in the frequency band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to, and no protection is claimed from, the radionavigation service authorized under No. **5.331**. Furthermore, the use of the radionavigation-satellite service in the frequency band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to the radiolocation service. No. **5.43** shall not apply in respect of the radiolocation service. **Resolution 608 (Rev.WRC-19)** shall apply. (WRC-19)

AI 4

**MOD**

**5.331** *Additional allocation:* in Algeria, Germany, Saudi Arabia, Australia, Austria, Bahrain, Belarus, Belgium, Benin, Bosnia and Herzegovina, Brazil, Burkina Faso, Burundi, Cameroon, China, Korea (Rep. of), Croatia, Denmark, Egypt, the United Arab Emirates, Estonia, the Russian Federation, Finland, France, Ghana, Greece, Guinea, Equatorial Guinea, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Jordan, Kenya, Kuwait, Lesotho, Latvia, Lebanon, Liechtenstein, Lithuania, Luxembourg, North Macedonia, Madagascar, Mali, Mauritania, Montenegro, Nigeria, Norway, Oman, Pakistan, the Kingdom of the Netherlands, Poland, Portugal, Qatar, the Syrian Arab Republic, Dem. People's Rep. of Korea, Slovakia, the United Kingdom, Serbia, Slovenia, Somalia, Sudan, South Sudan, Sri Lanka, South Africa, Sweden, Switzerland, Thailand, Togo, Turkey, Venezuela and Viet Nam, the frequency band 1 215-1 300 MHz is also allocated to the radionavigation service on a primary basis. In Canada and the United States, the frequency band 1 240-1 300 MHz is also allocated to the radionavigation service, and use of the radionavigation service shall be limited to the aeronautical radionavigation service. (WRC-19)

AI 9.2

**MOD****1 300-1 525 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>1 452-1 492</b> FIXED MOBILE except aeronautical mobile <b>MOD 5.346</b> BROADCASTING BROADCASTING-SATELLITE 5.208B  5.341 5.342 5.345	<b>1 452-1 492</b> FIXED MOBILE 5.341B 5.343 <b>MOD 5.346A</b> BROADCASTING BROADCASTING-SATELLITE 5.208B  5.341 5.344 5.345	

AI 9.1.2

**AI 9.1.9 MOD**

**AI 1.13 5.338A** In the frequency bands 1 350-1 400 MHz, 1 427-1 452 MHz, 22.55-23.55 GHz, 24.25-27.5 GHz, 30-31.3 GHz, 49.7-50.2 GHz, 50.4-50.9 GHz, 51.4-52.6 GHz, 81-86 GHz and 92-94 GHz, Resolution **750 (Rev.WRC-19)** applies. (WRC-19)

**AI 1.6****MOD**

**AI 4 5.345** Use of the **frequency** band 1 452-1 492 MHz by the broadcasting-satellite service, and by the broadcasting service, is limited to digital audio broadcasting and is subject to the provisions of **Resolution 528 (Rev.WRC-19)**. (WRC-19)

**MOD**

**AI 9.1.2 5.346** In Algeria, Angola, Saudi Arabia, Bahrain, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Congo (Rep. of the), Côte d'Ivoire, Djibouti, Egypt, United Arab Emirates, Eswatini, Gabon, Gambia, Ghana, Guinea, Iraq, Jordan, Kenya, Kuwait, Lesotho, Lebanon, Liberia, Madagascar, Malawi, Mali, Morocco, Mauritius, Mauritania, Mozambique, Namibia, Niger, Nigeria, Oman, Uganda, Palestine\*\*, Qatar, Dem. Rep. of the Congo, Rwanda, Senegal, Seychelles, Sudan, South Sudan, South Africa, Tanzania, Chad, Togo, Tunisia, Zambia, and Zimbabwe, the frequency band 1 452-1 492 MHz is identified for use by administrations listed above wishing to implement International Mobile Telecommunications (IMT) in accordance with Resolution **223 (Rev.WRC-15)**. This identification does not preclude the use of this frequency band by any other application of the services to which it is allocated and does not establish priority in the Radio Regulations. The use of this frequency band for the implementation of IMT is subject to agreement obtained under No. **9.21** with respect to the aeronautical mobile service used for aeronautical telemetry in accordance with No. **5.342**. See also Resolution **761 (WRC-19)**. (WRC-19)

**AI 9.2****MOD**

**AI 9.1.2 5.346A** The frequency band 1 452-1 492 MHz is identified for use by administrations in Region 3 wishing to implement International Mobile Telecommunications (IMT) in accordance with Resolution **223 (Rev.WRC-19)** and Resolution **761 (Rev.WRC-19)**. The use of this frequency band by the above administrations for the implementation of IMT is subject to agreement obtained under No. **9.21** from countries using stations of the aeronautical mobile service. This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. (WRC-19)

**MOD**

**AI 9.2 5.349** *Different category of service:* in Saudi Arabia, Azerbaijan, Bahrain, Cameroon, Egypt, Iran (Islamic Republic of), Iraq, Israel, Kazakhstan, Kuwait, Lebanon, North Macedonia, Morocco, Qatar, Syrian Arab Republic, Kyrgyzstan, Turkmenistan and Yemen, the allocation of the frequency band 1 525-1 530 MHz to the mobile, except aeronautical mobile, service is on a primary basis (see No. **5.33**). (WRC-19)



\*\* The use by Palestine of the allocation to the mobile service in the frequency band 1 452-1 492 MHz identified for IMT is noted, pursuant to Resolution 99 (Rev. Busan, 2014) and taking into account the Israeli-Palestinian Interim Agreement of 28 September 1995.

**MOD**

**AI 8** **5.350** *Additional allocation:* in Kyrgyzstan and Turkmenistan, the frequency band 1 525-1 530 MHz is also allocated to the aeronautical mobile service on a primary basis. (WRC-19)

**MOD**

**AI 8** **5.352A** In the frequency band 1 525-1 530 MHz, stations in the mobile-satellite service, except stations in the maritime mobile-satellite service, shall not cause harmful interference to, or claim protection from, stations of the fixed service in Algeria, Saudi Arabia, Egypt, Guinea, India, Israel, Italy, Jordan, Kuwait, Mali, Morocco, Mauritania, Nigeria, Oman, Pakistan, the Philippines, Qatar, Syrian Arab Republic, Viet Nam and Yemen notified prior to 1 April 1998. (WRC-19)

**MOD**

**AI 8** **5.359** *Additional allocation:* in Germany, Saudi Arabia, Armenia, Azerbaijan, Belarus, Cameroon, the Russian Federation, Georgia, Guinea, Guinea-Bissau, Jordan, Kazakhstan, Kuwait, Lithuania, Mauritania, Uganda, Uzbekistan, Pakistan, Poland, the Syrian Arab Republic, Kyrgyzstan, the Dem. People's Rep. of Korea, Romania, Tajikistan, Tunisia, Turkmenistan and Ukraine, the frequency bands 1 550-1 559 MHz, 1 610-1 645.5 MHz and 1 646.5-1 660 MHz are also allocated to the fixed service on a primary basis. Administrations are urged to make all practicable efforts to avoid the implementation of new fixed-service stations in these frequency bands. (WRC-19)



**MOD****1 610-1 660 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>1 613.8-1 621.35</b> MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) 5.208B  5.341 5.355 5.359 5.364 5.365 5.366 5.367 MOD 5.368 5.369 5.371 MOD 5.372	<b>1 613.8-1 621.35</b> MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION- SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) 5.208B  5.341 5.364 5.365 5.366 5.367 MOD 5.368 5.370 MOD 5.372	<b>1 613.8-1 621.35</b> MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) 5.208B Radiodetermination-satellite (Earth-to-space)  5.341 5.355 5.359 5.364 5.365 5.366 5.367 MOD 5.368 5.369 MOD 5.372
<b>1 621.35-1 626.5</b> MARITIME MOBILE- SATELLITE (space-to-Earth) ADD 5.ADJBAND ADD 5.INBAND MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) except maritime mobile satellite (space-to-Earth)  5.208B 5.341 5.355 5.359 5.364 5.365 5.366 5.367 MOD 5.368 5.369 5.371 MOD 5.372	<b>1 621.35-1 626.5</b> MARITIME MOBILE- SATELLITE (space-to-Earth) ADD 5.ADJBAND ADD 5.INBAND MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION- SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) except maritime mobile satellite (space-to-Earth)  5.208B 5.341 5.364 5.365 5.366 5.367 MOD 5.368 5.370 MOD 5.372	<b>1 621.35-1 626.5</b> MARITIME MOBILE- SATELLITE (space-to- Earth)ADD 5.ADJBAND ADD 5.INBAND MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) except maritime mobile satellite (space-to-Earth) Radiodetermination-satellite (Earth-to-space)  5.208B 5.341 5.355 5.359 5.364 5.365 5.366 5.367 MOD 5.368 5.369 MOD 5.372

**ADD**

**5.ADJBAND** Maritime mobile earth stations receiving in the frequency band 1 621.35-1 626.5 MHz shall not impose additional constraints on earth stations operating in the maritime mobile-satellite service or maritime earth stations of the radiodetermination-satellite service operating in accordance with the Radio Regulations in the frequency band 1 610-1 621.35 MHz or on earth stations operating in the maritime mobile-satellite service operating in accordance with the Radio Regulations in the frequency band 1 626.5-1 660.5 MHz, unless otherwise agreed between the notifying administrations. (WRC-19)

AI 1.8  
Issue BAI 1.8  
Issue B

**ADD**AI 1.8  
Issue B

**5.INBAND** Maritime mobile earth stations receiving in the frequency band 1 621.35-1 626.5 MHz shall not impose constraints on the assignments of earth stations of the mobile-satellite service (Earth-to-space) and the radiodetermination-satellite service (Earth-to-space) in the frequency band 1 621.35-1 626.5 MHz in networks for which complete coordination information has been received by the Radiocommunication Bureau before 28 October 2019. (WRC-19)

**MOD**AI 1.8  
Issue B

**5.368** The provisions of No. **4.10** do not apply with respect to the radiodetermination-satellite and mobile-satellite services in the frequency band 1 610-1 626.5 MHz. However, No. **4.10** applies in the frequency band 1 610-1 626.5 MHz with respect to the aeronautical radionavigation-satellite service when operating in accordance with No. **5.366**, the aeronautical mobile satellite (R) service when operating in accordance with No. **5.367**, and in the frequency band 1 621.35-1 626.5 MHz with respect to the maritime mobile-satellite service when used for GMDSS. (WRC-19)

**MOD**AI 1.8  
Issue B

**5.372** Harmful interference shall not be caused to stations of the radio astronomy service using the frequency band 1 610.6-1 613.8 MHz by stations of the radiodetermination-satellite and mobile-satellite services (No. **29.13** applies). The equivalent power flux-density (epfd) produced in the frequency band 1 610.6-1 613.8 MHz by all space stations of a non-geostationary-satellite system in the mobile-satellite service (space-to-Earth) operating in frequency band 1 613.8-1 626.5 MHz shall be in compliance with the protection criteria provided in Recommendations ITU-R RA.769-2 and ITU-R RA.1513-2, using the methodology given in Recommendation ITU-R M.1583-1, and the radio astronomy antenna pattern described in Recommendation ITU-R RA.1631-0. (WRC-19)

**MOD**

AI 9.2

**5.382** *Different category of service:* in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, Congo (Rep. of the), Egypt, the United Arab Emirates, Eritrea, Ethiopia, the Russian Federation, Guinea, Iraq, Israel, Jordan, Kazakhstan, Kuwait, Lebanon, North Macedonia, Mauritania, Moldova, Mongolia, Oman, Uzbekistan, Poland, Qatar, the Syrian Arab Republic, Kyrgyzstan, Somalia, Tajikistan, Turkmenistan, Ukraine and Yemen, the allocation of the frequency band 1 690-1 700 MHz to the fixed and mobile, except aeronautical mobile, services is on a primary basis (see No. **5.33**), and in the Dem. People's Rep. of Korea, the allocation of the frequency band 1 690-1 700 MHz to the fixed service is on a primary basis (see No. **5.33**) and to the mobile, except aeronautical mobile, service on a secondary basis. (WRC-19)

**MOD****1 710-2 170 MHz**

AI 9.1.1

Allocation to services		
Region 1	Region 2	Region 3
<b>1 980-2 010</b>	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.388 5.389A <b>MOD 5.389B</b> 5.389F	

**MOD**

**AI 8** **5.388B** In Algeria, Saudi Arabia, Bahrain, Benin, Burkina Faso, Cameroon, Comoros, Côte d'Ivoire, China, Cuba, Djibouti, Egypt, United Arab Emirates, Eritrea, Ethiopia, Gabon, Ghana, India, Iran (Islamic Republic of), Israel, Jordan, Kenya, Kuwait, Lebanon, Libya, Mali, Morocco, Mauritania, Nigeria, Oman, Uganda, Pakistan, Qatar, the Syrian Arab Republic, Senegal, Singapore, Sudan, South Sudan, Tanzania, Chad, Togo, Tunisia, Yemen, Zambia and Zimbabwe, for the purpose of protecting fixed and mobile services, including IMT mobile stations, in their territories from co-channel interference, a high altitude platform station (HAPS) operating as an IMT base station in neighbouring countries, in the frequency bands referred to in No. **5.388A**, shall not exceed a co-channel power flux-density of  $-127 \text{ dB(W/(m}^2 \cdot \text{MHz))}$  at the Earth's surface outside a country's borders unless explicit agreement of the affected administration is provided at the time of the notification of HAPS. (WRC-19)

**MOD**

**AI 9.1.1** **5.389B** The use of the frequency band 1 980-1 990 MHz by the mobile-satellite service shall not cause harmful interference to or constrain the development of the fixed and mobile services in Argentina, Brazil, Canada, Chile, Ecuador, the United States, Honduras, Jamaica, Mexico, Paraguay, Peru, Suriname, Trinidad and Tobago, Uruguay and Venezuela. (WRC-19)

**MOD**

**AI 8** **5.389F** In Algeria, Cape Verde, Egypt, Iran (Islamic Republic of), Mali, Syrian Arab Republic and Tunisia, the use of the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz by the mobile-satellite service shall neither cause harmful interference to the fixed and mobile services, nor hamper the development of those services prior to 1 January 2005, nor shall the former service request protection from the latter services. (WRC-19)

**MOD**

**AI 4** **5.393** *Additional allocation:* in Canada, the United States and India, the frequency band 2 310-2 360 MHz is also allocated to the broadcasting-satellite service (sound) and complementary terrestrial sound broadcasting service on a primary basis. Such use is limited to digital audio broadcasting and is subject to the provisions of **Resolution 528 (Rev.WRC-19)**, with the exception of *resolves 3* in regard to the limitation on broadcasting-satellite systems in the upper 25 MHz. **Complementary terrestrial sound broadcasting stations shall be subject to bilateral coordination with neighbouring countries prior to their bringing into use.** (WRC-19)

**SUP**

**AI 4** **5.396**



**MOD**

**5.401** In Angola, Australia, Bangladesh, China, Eritrea, Eswatini, Ethiopia, India, Lebanon, Liberia, Libya, Madagascar, Mali, Pakistan, Papua New Guinea, Syrian Arab Republic, Dem. Rep. of the Congo, Sudan, Togo and Zambia, the frequency band 2 483.5-2 500 MHz was already allocated on a primary basis to the radiodetermination-satellite service before WRC-12, subject to agreement obtained under No. **9.21** from countries not listed in this provision. Systems in the radiodetermination-satellite service for which complete coordination information has been received by the Radiocommunication Bureau before 18 February 2012 will retain their regulatory status, as of the date of receipt of the coordination request information. (WRC-19)

AI 4

**MOD**

**5.418** *Additional allocation:* in India, the frequency band 2 535-2 655 MHz is also allocated to the broadcasting-satellite service (sound) and complementary terrestrial broadcasting service on a primary basis. Such use is limited to digital audio broadcasting and is subject to the provisions of **Resolution 528 (Rev.WRC-19)**. The provisions of No. **5.416** and Table **21-4** of Article **21** do not apply to this additional allocation. Use of non-geostationary-satellite systems in the broadcasting-satellite service (sound) is subject to **Resolution 539 (Rev.WRC-19)**. Geostationary broadcasting-satellite service (sound) systems for which complete Appendix **4** coordination information has been received after 1 June 2005 are limited to systems intended for national coverage. The power flux-density at the Earth's surface produced by emissions from a geostationary broadcasting-satellite service (sound) space station operating in the frequency band 2 630-2 655 MHz, and for which complete Appendix **4** coordination information has been received after 1 June 2005, shall not exceed the following limits, for all conditions and for all methods of modulation:

AI 4

-130 dB(W/(m <sup>2</sup> · MHz))	for 0° ≤ θ ≤ 5°
-130 + 0.4 (θ - 5) dB(W/(m <sup>2</sup> · MHz))	for 5° < θ ≤ 25°
-122 dB(W/(m <sup>2</sup> · MHz))	for 25° < θ ≤ 90°

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees. These limits may be exceeded on the territory of any country whose administration has so agreed. As an exception to the limits above, the pfd value of -122 dB(W/(m<sup>2</sup> · MHz)) shall be used as a threshold for coordination under No. **9.11** in an area of 1 500 km around the territory of the administration notifying the broadcasting-satellite service (sound) system.

In addition, an administration listed in this provision shall not have simultaneously two overlapping frequency assignments, one under this provision and the other under No. **5.416** for systems for which complete Appendix **4** coordination information has been received after 1 June 2005. (WRC-19)

**MOD**

**5.428** *Additional allocation:* in Kyrgyzstan and Turkmenistan, the frequency band 3 100-3 300 MHz is also allocated to the radionavigation service on a primary basis. (WRC-19)

AI 8

**MOD**

**5.429** *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Benin, Brunei Darussalam, Cambodia, Cameroon, China, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Egypt, the United Arab Emirates, India, Indonesia, Iran (Islamic Republic of), Iraq, Japan, Jordan, Kenya, Kuwait, Lebanon, Libya, Malaysia, New Zealand, Oman, Uganda, Pakistan, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, the Dem. People's Rep. of Korea, Sudan and Yemen, the frequency band 3 300-3 400 MHz is also allocated to the fixed and mobile services on a primary basis. New Zealand and the countries bordering the Mediterranean shall not claim protection for their fixed and mobile services from the radiolocation service. (WRC-19)

AI 8

**MOD**

**5.429A** *Additional allocation:* in Angola, Benin, Botswana, Burkina Faso, Burundi, Djibouti, Eswatini, Ghana, Guinea, Guinea-Bissau, Lesotho, Liberia, Malawi, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sudan, South Sudan, South Africa, Tanzania, Chad, Togo, Zambia and Zimbabwe, the frequency band 3 300-3 400 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis. Stations in the mobile service operating in the frequency band 3 300-3 400 MHz shall not cause harmful interference to, or claim protection from, stations operating in the radiolocation service. (WRC-19)

AI 9.2

**MOD**

**5.429B** In the following countries of Region 1 south of 30° parallel north: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Congo (Rep. of the), Côte d'Ivoire, Egypt, Eswatini, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Malawi, Mauritania, Mozambique, Namibia, Niger, Nigeria, Uganda, the Dem. Rep. of the Congo, Rwanda, Sudan, South Sudan, South Africa, Tanzania, Chad, Togo, Zambia and Zimbabwe, the frequency band 3 300-3 400 MHz is identified for the implementation of International Mobile Telecommunications (IMT). The use of this frequency band shall be in accordance with Resolution **223 (Rev.WRC-15)**. The use of the frequency band 3 300-3 400 MHz by IMT stations in the mobile service shall not cause harmful interference to, or claim protection from, systems in the radiolocation service, and administrations wishing to implement IMT shall obtain the agreement of neighbouring countries to protect operations within the radiolocation service. This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. (WRC-19)

AI 9.2

**MOD**

**5.429C** *Different category of service:* in Argentina, Belize, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, El Salvador, Ecuador, Guatemala, Mexico, Paraguay and Uruguay, the frequency band 3 300-3 400 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis. In Argentina, Brazil, the Dominican Republic, Guatemala, Mexico, Paraguay and Uruguay, the frequency band 3 300-3 400 MHz is also allocated to the fixed service on a primary basis. Stations in the fixed and mobile services operating in the frequency band 3 300-3 400 MHz shall not cause harmful interference to, or claim protection from, stations operating in the radiolocation service. (WRC-19)

AI 8

**MOD**

**5.429D** In the following countries in Region 2: Argentina, Belize, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, El Salvador, Ecuador, Guatemala, Mexico, Paraguay and Uruguay, the use of the frequency band 3 300-3 400 MHz is identified for the implementation of International Mobile Telecommunications (IMT). Such use shall be in accordance with Resolution **223 (Rev.WRC-15)**. This use in Argentina, Paraguay and Uruguay is subject to the application of No. **9.21**. The use of the frequency band 3 300-3 400 MHz by IMT stations in the mobile service shall not cause harmful interference to, or claim protection from, systems in the radiolocation service, and administrations wishing to implement IMT shall obtain the agreement of neighbouring countries to protect operations within the radiolocation service. This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. (WRC-19)

AI 8

**MOD**

**5.429F** In the following countries in Region 3: Cambodia, India, Indonesia, Lao P.D.R., Pakistan, the Philippines and Viet Nam, the use of the frequency band 3 300-3 400 MHz is identified for the implementation of International Mobile Telecommunications (IMT). Such use shall be in accordance with Resolution **223 (Rev.WRC-15)**. The use of the frequency band 3 300-3 400 MHz by IMT stations in the mobile service shall not cause harmful interference to, or claim protection from, systems in the radiolocation service. Before an administration brings into use a base or mobile station of an IMT system in this frequency band, it shall seek agreement under No. **9.21** with neighbouring countries to protect the radiolocation service. This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. (WRC-19)

AI 8

**MOD**

**5.430** *Additional allocation:* in Kyrgyzstan and Turkmenistan, the frequency band 3 300-3 400 MHz is also allocated to the radionavigation service on a primary basis. (WRC-19)

AI 8

**MOD**

**5.431** *Additional allocation:* in Germany, the frequency band 3 400-3 475 MHz is also allocated to the amateur service on a secondary basis. (WRC-19)

AI 8

**MOD**

**5.432** *Different category of service:* in Korea (Rep. of), Japan, Pakistan and the Dem. People's Rep. of Korea, the allocation of the frequency band 3 400-3 500 MHz to the mobile, except aeronautical mobile, service is on a primary basis (see No. **5.33**). (WRC-19)

AI 8

**MOD**

**5.432A** In Korea (Rep. of), Japan, Pakistan and the Dem. People's Rep. of Korea, the frequency band 3 400-3 500 MHz is identified for International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. At the stage of coordination the provisions of Nos. **9.17** and **9.18** also apply. Before an administration brings into use a (base or mobile) station of the mobile service in this frequency band it shall ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed  $-154.5 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$  for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile service in the frequency band 3 400-3 500 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations (Edition of 2004). (WRC-19)

**MOD**

**5.432B** *Different category of service:* in Australia, Bangladesh, Brunei Darussalam, China, French overseas communities of Region 3, India, Indonesia, Iran (Islamic Republic of), Malaysia, New Zealand, the Philippines, Singapore and Thailand, the frequency band 3 400-3 500 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis, subject to agreement obtained under No. **9.21** with other administrations and is identified for International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. At the stage of coordination the provisions of Nos. **9.17** and **9.18** also apply. Before an administration brings into use a (base or mobile) station of the mobile service in this frequency band it shall ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed  $-154.5 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$  for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile service in the frequency band 3 400-3 500 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations (Edition of 2004). (WRC-19)

**MOD**

**5.433A** In Australia, Bangladesh, Brunei Darussalam, China, French overseas communities of Region 3, Korea (Rep. of), India, Indonesia, Iran (Islamic Republic of), Japan, New Zealand, Pakistan, the Philippines and the Dem. People's Rep. of Korea, the frequency band 3 500-3 600 MHz is identified for International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. At the stage of coordination the provisions of Nos. **9.17** and **9.18** also apply. Before an administration brings into use a (base or mobile) station of the mobile service in this frequency band it shall ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed  $-154.5 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$  for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile service in the frequency band 3 500-3 600 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations (Edition of 2004). (WRC-19)

**MOD**

**5.434** In Canada, Chile, Colombia, Costa Rica, El Salvador, the United States and Paraguay, the frequency band 3 600-3 700 MHz, or portions thereof, is identified for use by these administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. At the stage of coordination the provisions of Nos. **9.17** and **9.18** also apply. Before an administration brings into use a base or mobile station of an IMT system, it shall seek agreement under No. **9.21** with other administrations and ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed  $-154.5 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$  for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile service, including IMT systems, in the frequency band 3 600-3 700 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations (Edition of 2004). (WRC-19)

**MOD****4 800-5 250 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>4 800-4 990</b>	FIXED MOBILE 5.440A 5.441A <b>MOD 5.441B</b> 5.442 Radio astronomy 5.149 5.339 5.443	
...		

AI 9.1

**MOD****4 800-5 250 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>5 150-5 250</b>	FIXED-SATELLITE (Earth-to-space) 5.447A MOBILE except aeronautical mobile <b>MOD 5.446A</b> 5.446B AERONAUTICAL RADIONAVIGATION 5.446 <b>MOD 5.446C MOD 5.447</b> 5.447B 5.447C <b>ADD 5.A116</b>	

AI 1.16

**ADD**

**5.A116** *Additional allocation:* in Brazil, the band 5 150-5 250 MHz is also allocated to the aeronautical mobile service on a primary basis, limited to aeronautical telemetry transmissions from aircraft stations (see No. **1.83**), in accordance with Resolution **418 (Rev.WRC-12)\***. (WRC-19)

AI 1.16

**MOD**

**5.441A** In Brazil, Paraguay and Uruguay, the frequency band 4 800-4 900 MHz, or portions thereof, is identified for the implementation of International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. The use of this frequency band for the implementation of IMT is subject to agreement obtained with neighbouring countries, and IMT stations shall not claim protection from stations of other applications of the mobile service. Such use shall be in accordance with Resolution **223 (Rev.WRC-19)**. (WRC-19)

AI 8

**MOD**

**5.441B** In Angola, Armenia, Azerbaijan, Benin, Botswana, Brazil, Burkina Faso, Burundi, Cambodia, Cameroon, China, Côte d'Ivoire, Djibouti, Eswatini, Russian Federation, Gambia, Guinea, Iran (Islamic Republic of), Kazakhstan, Kenya, Lao P.D.R., Lesotho, Liberia, Malawi, Mauritius, , Mongolia, Mozambique, Nigeria, Uganda, Uzbekistan, the Dem. Rep. of the Congo, Kyrgyzstan, the Dem. People's Rep. of Korea, Sudan, South Africa, Tanzania, Togo, Viet Nam, Zambia and Zimbabwe, the frequency band 4 800-4 990 MHz, or portions thereof, is identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. The use of **IMT stations** is subject to agreement obtained under No. **9.21** with concerned administrations, and IMT stations shall not claim protection from stations of other applications of the mobile service. In addition, before an administration brings into use an IMT station in the mobile service, it shall ensure that the power flux-density (pfd) produced by this station does not exceed  $-155 \text{ dB(W/(m}^2 \cdot 1 \text{ MHz))}$  produced up to 19 km above sea level at 20 km from the coast, defined as the low-water mark, as officially recognized by the coastal State. This **pfd** criterion is subject to review at **WRC-23**. Resolution **223 (Rev.WRC-19)** applies. This identification shall be effective after WRC-19. (WRC-19)

**MOD**

**5.444B** The use of the frequency band 5 091-5 150 MHz by the aeronautical mobile service is limited to:

- systems operating in the aeronautical mobile (R) service and in accordance with international aeronautical standards, limited to surface applications at airports. Such use shall be in accordance with Resolution **748 (Rev.WRC-19)**;
- aeronautical telemetry transmissions from aircraft stations (see No. **1.83**) in accordance with Resolution **418 (Rev.WRC-19)**. (WRC-19)

**MOD**

**5.446A** The use of the bands 5 150-5 350 MHz and 5 470-5 725 MHz by the stations in the mobile, except aeronautical mobile, service shall be in accordance with Resolution **229 (Rev.WRC-19)**. (WRC-19)

**MOD**

**5.446C** *Additional allocation:* in Region 1 (except in Algeria, Saudi Arabia, Bahrain, Egypt, United Arab Emirates, Iraq, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Syrian Arab Republic, Sudan, South Sudan and Tunisia), the frequency band 5 150-5 250 MHz is also allocated to the aeronautical mobile service on a primary basis, limited to aeronautical telemetry transmissions from aircraft stations (see No. **1.83**), in accordance with Resolution **418 (Rev.WRC-19)**. These stations shall not claim protection from other stations operating in accordance with Article 5. No. **5.43A** does not apply. (WRC-19)



**MOD**

**5.447** *Additional allocation:* in Côte d'Ivoire, Egypt, Lebanon, the Syrian Arab Republic and Tunisia, the frequency band 5 150-5 250 MHz is also allocated to the mobile service, on a primary basis, subject to agreement obtained under No. **9.21**. In this case, the provisions of Resolution **229 (Rev.WRC-19)** do not apply. (WRC-19)

**MOD**

**5.447F** In the frequency band 5 250-5 350 MHz, stations in the mobile service shall not claim protection from the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active). The radiolocation service, the Earth exploration-satellite service (active) and the space research service (active) shall not impose more stringent conditions upon the mobile service than those stipulated in Resolution **229 (Rev.WRC-19)**. (WRC-19)

**MOD**

**5.448** *Additional allocation:* in Kyrgyzstan, Romania and Turkmenistan, the frequency band 5 250-5 350 MHz is also allocated to the radionavigation service on a primary basis. (WRC-19)

**MOD**

**5.450A** In the frequency band 5 470-5 725 MHz, stations in the mobile service shall not claim protection from radiodetermination services.-The radiodetermination services shall not impose more stringent conditions upon the mobile service than those stipulated in Resolution **229 (Rev.WRC-19)**. (WRC-19)


**MOD**

**5.453** *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Cameroon, China, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Djibouti, Egypt, the United Arab Emirates, Eswatini, Gabon, Guinea, Equatorial Guinea, India, Indonesia, Iran (Islamic Republic of), Iraq, Japan, Jordan, Kenya, Kuwait, Lebanon, Libya, Madagascar, Malaysia, Niger, Nigeria, Oman, Uganda, Pakistan, the Philippines, Qatar, the Syrian Arab Republic, the Dem. People's Rep. of Korea, Singapore, Sri Lanka, Tanzania, Chad, Thailand, Togo, Viet Nam and Yemen, the band 5 650-5 850 MHz is also allocated to the fixed and mobile services on a primary basis. In this case, the provisions of Resolution **229 (Rev.WRC-12)** do not apply. In addition, in Afghanistan, Angola, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Dem. Rep. of the Congo, Fiji, Ghana, Kiribati, Lesotho, Malawi, Maldives, Mauritius, Micronesia, Mongolia, Mozambique, Myanmar, Namibia, Nauru, New Zealand, Papua New Guinea, Rwanda, Solomon Islands, South Sudan, South Africa, Tonga, Vanuatu, Zambia and Zimbabwe, the band 5 725-5 850 MHz is allocated to the fixed service on a primary basis, and stations operating in the fixed service shall not cause harmful interference to and shall not claim protection from other primary services in the frequency band. (WRC-19)

**MOD**

**5.455** *Additional allocation:* in Armenia, Azerbaijan, Belarus, Cuba, the Russian Federation, Georgia, Hungary, Kazakhstan, Moldova, Uzbekistan, Kyrgyzstan, Romania, Tajikistan, Turkmenistan and Ukraine, the frequency band 5 670-5 850 MHz is also allocated to the fixed service on a primary basis. (WRC-19)

**MOD****8 500-10 000 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>9 300-9 500</b>	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION <b>5.475</b>  SPACE RESEARCH (active) 5.427 5.474 5.475A 5.475B 5.476A	

**MOD**

**5.468** *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Burundi, Cameroon, China, Congo (Rep. of the), Djibouti, Egypt, the United Arab Emirates, Eswatini, Gabon, Guyana, Indonesia, Iran (Islamic Republic of), Iraq, Jamaica, Jordan, Kenya, Kuwait, Lebanon, Libya, Malaysia, Mali, Morocco, Mauritania, Nepal, Nigeria, Oman, Uganda, Pakistan, Qatar, Syrian Arab Republic, the Dem. People's Rep. of Korea, Senegal, Singapore, Somalia, Sudan, Chad, Togo, Tunisia and Yemen, the frequency band 8 500-8 750 MHz is also allocated to the fixed and mobile services on a primary basis. (WRC-19)

**MOD**

**5.473** *Additional allocation:* in Armenia, Austria, Azerbaijan, Belarus, Cuba, the Russian Federation, Georgia, Hungary, Uzbekistan, Poland, Kyrgyzstan, Romania, Tajikistan, Turkmenistan and Ukraine, the frequency bands 8 850-9 000 MHz and 9 200-9 300 MHz are also allocated to the radionavigation service on a primary basis. (WRC-19)

**MOD**

**5.478** *Additional allocation:* in Azerbaijan, Kyrgyzstan, Romania, Turkmenistan and Ukraine, the frequency band 9 800-10 000 MHz is also allocated to the radionavigation service on a primary basis. (WRC-19)

**MOD**

**5.480** *Additional allocation:* in Argentina, Brazil, Chile, Cuba, El Salvador, Ecuador, Guatemala, Honduras, Paraguay, the overseas countries and territories within the Kingdom of the Netherlands in Region 2, Peru and Uruguay, the frequency band 10-10.45 GHz is also allocated to the fixed and mobile services on a primary basis. In Colombia, Costa Rica, Mexico and Venezuela, the frequency band 10-10.45 GHz is also allocated to the fixed service on a primary basis. (WRC-19)

**MOD**

**5.481** *Additional allocation:* in Algeria, Germany, Angola, Brazil, China, Côte d'Ivoire, Egypt, El Salvador, Ecuador, Spain, Guatemala, Hungary, Japan, Kenya, Morocco, Nigeria, Oman, Uzbekistan, Pakistan, Paraguay, Peru, the Dem. People's Rep. of Korea, Romania, Tunisia and Uruguay, the frequency band 10.45-10.5 GHz is also allocated to the fixed and mobile services on a primary basis. In Costa Rica, the frequency band 10.45-10.5 GHz is also allocated to the fixed service on a primary basis. (WRC-19)

AI 8

**MOD**

**5.483** *Additional allocation:* in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, China, Colombia, Korea (Rep. of), Egypt, the United Arab Emirates, Georgia, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kazakhstan, Kuwait, Lebanon, Mongolia, Qatar, Kyrgyzstan, the Dem. People's Rep. of Korea, Tajikistan, Turkmenistan and Yemen, the frequency band 10.68-10.7 GHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. Such use is limited to equipment in operation by 1 January 1985. (WRC-19)


AI 8

**MOD**

**5.495** *Additional allocation:* in Greece, Monaco, Montenegro, Uganda and Tunisia, the frequency band 12.5-12.75 GHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a secondary basis. (WRC-19)

AI 8

**MOD****13.4-14 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>13.4-13.65</b> EARTH EXPLORATION-SATELLITE (active) FIXED-SATELLITE (space-to-Earth) 5.499A 5.499B RADIOLOCATION SPACE RESEARCH 5.499C 5.499D Standard frequency and time signal-satellite (Earth-to-space)  5.499E 5.500 5.501 5.501B	<b>13.4-13.65</b> EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.499C 5.499D Standard frequency and time signal-satellite (Earth-to-space)	
	5.499 5.500 5.501 5.501B	

AI 9.2

**MOD**

**5.505** *Additional allocation:* in Algeria, Saudi Arabia, Bahrain, Botswana, Brunei Darussalam, Cameroon, China, Congo (Rep. of the), Korea (Rep. of), Djibouti, Egypt, the United Arab Emirates, Eswatini, Gabon, Guinea, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kuwait, Lebanon, Malaysia, Mali, Morocco, Mauritania, Oman, the Philippines, Qatar, the Syrian Arab Republic, the Dem. People's Rep. of Korea, Singapore, Somalia, Sudan, South Sudan, Chad, Viet Nam and Yemen, the frequency band 14-14.3 GHz is also allocated to the fixed service on a primary basis. (WRC-19)

**MOD**

**5.508** *Additional allocation:* in Germany, France, Italy, Libya, North Macedonia and the United Kingdom, the frequency band 14.25-14.3 GHz is also allocated to the fixed service on a primary basis. (WRC-19)

**MOD****15.4-18.4 GHz**

Allocation to services		
Region 1	Region 2	Region 3
...		
<b>17.7-18.1</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.484A <b>ADD 5.A15</b> (Earth-to-space) 5.516 MOBILE	<b>17.7-17.8</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.517 <b>ADD 5.A15</b> (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.515 <b>17.8-18.1</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.484A <b>ADD 5.A15</b> (Earth-to-space) 5.516 MOBILE 5.519	<b>17.7-18.1</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.484A <b>ADD 5.A15</b> (Earth-to-space) 5.516 MOBILE
<b>18.1-18.4</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B <b>ADD 5.A15</b> (Earth-to-space) 5.520 MOBILE 5.519 5.521	

**ADD**

**5.A15** The operation of earth stations in motion communicating with geostationary fixed-satellite service space stations within the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) shall be subject to the application of Resolution **COM5/6** (WRC-19). (WRC-19)

**MOD****5.516B**

...

This identification does not preclude the use of these frequency bands by other fixed-satellite service applications or by other services to which these frequency bands are allocated on a co-primary basis and does not establish priority in these Radio Regulations among users of the frequency bands. Administrations should take this into account when considering regulatory provisions in relation to these frequency bands. See Resolution 143 (Rev.WRC-19). (WRC-19)

AI 4

**MOD****18.4-22 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>21.4-22</b> FIXED MOBILE BROADCASTING-SATELLITE 5.208B 5.530A 5.530B 5.530D	<b>21.4-22</b> FIXED <b>ADD 5.B114</b> MOBILE  5.530A	<b>21.4-22</b> FIXED MOBILE BROADCASTING-SATELLITE 5.208B 5.530A 5.530B 5.530D 5.531

AI 1.14

**ADD**

**5.B114** The allocation to the fixed service in the frequency band 21.4-22 GHz is identified for use in Region 2 by high-altitude platform stations (HAPS). This identification does not preclude the use of this frequency band by other fixed-service applications or by other services to which it is allocated on a co-primary basis, and does not establish priority in the Radio Regulations. Such use of the fixed-service allocation by HAPS is limited to the HAPS-to-ground direction, and shall be in accordance with the provisions of Resolution COM4/3 (WRC-19). (WRC-19)

AI 1.14

## MOD



## 18.4-22 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>18.4-18.6</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B <b>ADD 5.A15</b> MOBILE	
<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B <b>ADD 5.A15</b> MOBILE except aeronautical mobile Space research (passive) 5.522A 5.522C	<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B <b>ADD 5.A15</b> MOBILE except aeronautical mobile SPACE RESEARCH (passive) 5.522A	<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B <b>ADD 5.A15</b> MOBILE except aeronautical mobile Space research (passive) 5.522A
<b>18.8-19.3</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A <b>ADD 5.A15</b> MOBILE	
<b>19.3-19.7</b>	FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E <b>ADD 5.A15</b> MOBILE	
...		

AI 1.5

## MOD

## 18.4-22 GHz

Allocation to services		
Region 1	Region 2	Region 3
...		
<b>21.4-22</b> FIXED MOBILE BROADCASTING-SATELLITE 5.208B 5.530A 5.530B 	<b>21.4-22</b> FIXED MOBILE 5.530A	<b>21.4-22</b> FIXED MOBILE BROADCASTING-SATELLITE 5.208B 5.530A 5.530B 5.531 

AI 4

## SUP

5.530D

AI 4



**MOD****22-24.75 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>24.25-24.45</b> FIXED	<b>24.25-24.45</b> <u>FIXED</u> <b>ADD 5.C114</b> RADIONAVIGATION	<b>24.25-24.45</b> FIXED MOBILE RADIONAVIGATION
<b>24.45-24.65</b> FIXED INTER-SATELLITE	<b>24.45-24.65</b> FIXED <b>ADD 5.C114</b> INTER-SATELLITE RADIONAVIGATION  5.533	<b>24.45-24.65</b> FIXED INTER-SATELLITE MOBILE RADIONAVIGATION  5.533
<b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE	<b>24.65-24.75</b> <u>FIXED</u> <b>ADD 5.C114</b> INTER-SATELLITE RADIOLOCATION- SATELLITE (Earth-to-space)	<b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE  5.533

**ADD**

**5.C114** The allocation to the fixed service in the frequency band 24.25-25.25 GHz is identified for use in Region 2 by high-altitude platform stations (HAPS). This identification does not preclude the use of this frequency band by other fixed-service applications or by other services to which this frequency band is allocated on a co-primary basis, and does not establish priority in the Radio Regulations. Such use of the fixed-service allocation by HAPS is limited to the HAPS-to-ground direction and shall be in accordance with the provisions of Resolution **COM4/4 (WRC-19)**. (WRC-19)



**MOD****22-24.75 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>24.25-24.45</b> FIXED MOBILE except aeronautical mobile <b>ADD 5.A113</b> <b>MOD 5.338A</b>	<b>24.25-24.45</b> MOBILE except aeronautical mobile <b>ADD 5.A113</b> <b>MOD 5.338A</b> RADIONAVIGATION	<b>24.25-24.45</b> FIXED MOBILE <b>ADD 5.A113</b> <b>MOD 5.338A</b> RADIONAVIGATION
<b>24.45-24.65</b> FIXED INTER-SATELLITE MOBILE except aeronautical mobile <b>ADD 5.A113</b> <b>MOD 5.338A</b>	<b>24.45-24.65</b> INTER-SATELLITE MOBILE except aeronautical mobile <b>ADD 5.A113</b> <b>MOD 5.338A</b> RADIONAVIGATION 5.533	<b>24.45-24.65</b> FIXED INTER-SATELLITE MOBILE <b>ADD 5.A113</b> <b>MOD 5.338A</b> RADIONAVIGATION 5.533
<b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE except aeronautical mobile <b>ADD 5.A113</b> <b>MOD 5.338A</b>	<b>24.65-24.75</b> INTER-SATELLITE MOBILE except aeronautical mobile <b>ADD 5.A113</b> <b>MOD 5.338A</b> RADIOLOCATION- SATELLITE (Earth-to-space)	<b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE <b>ADD 5.A113</b> <b>MOD 5.338A</b> 5.533


AI 1.13

**ADD**

**5.A113** The frequency band 24.25-27.5 GHz is identified for use by administrations wishing to implement the terrestrial component of International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. Resolution **COM4/8 (WRC-19)** applies. (WRC-19)

AI 1.13

**MOD****22-24.75 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE	<b>24.65-24.75</b> INTER-SATELLITE RADIOLOCATION- SATELLITE (Earth-to-space)	<b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE 

AI 9.2

**MOD****24.75-29.9 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>AI 1.14</b> <b>24.75-25.25</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B	<b>24.75-25.25</b> FIXED <b>ADD 5.C114</b> FIXED-SATELLITE (Earth-to-space) 5.535	<b>24.75-25.25</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE

**MOD****24.75-29.9 GHz**

Allocation to services		
Region 1	Region 2	Region 3
	FIXED <b>ADD 5.D114</b> INTER-SATELLITE 5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)	
	EARTH EXPLORATION-SATELLITE (space-to Earth) 5.536B FIXED <b>ADD 5.D114</b> INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH (space-to-Earth) 5.536C Standard frequency and time signal-satellite (Earth-to-space) 5.536A	
<b>27-27.5</b> FIXED INTER-SATELLITE 5.536 MOBILE	<b>27-27.5</b> FIXED <b>ADD 5.D114</b> FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE	
5.540 5.542	5.525 5.526 5.527 5.529 5.540	5.540 5.542

**ADD**

**AI 1.14** **5.D114** The allocation to the fixed service in the frequency band 25.25-27.5 GHz is identified in Region 2 for use by high-altitude platform stations (HAPS) in accordance with the provisions of Resolution **COM4/4 (WRC-19)**. Such use of the fixed-service allocation by HAPS shall be limited to the ground-to-HAPS direction in the frequency band 25.25-27.0 GHz and to the HAPS-to-ground direction in the frequency band 27.0-27.5 GHz. Furthermore, the use of the frequency band 25.5-27.0 GHz by HAPS shall be limited to gateway links. This identification does not preclude the use of this frequency band by other fixed-service applications or by other services to which this band is allocated on a co-primary basis, and does not establish priority in the Radio Regulations. (WRC-19)

**MOD****24.75-29.9 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>24.75-25.25</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B MOBILE except aeronautical mobile <b>ADD 5.A113</b> <b>MOD 5.338A</b>	<b>24.75-25.25</b> FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE except aeronautical mobile <b>ADD 5.A113</b> <b>MOD 5.338A</b>	<b>24.75-25.25</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE <b>ADD 5.A113</b> <b>MOD 5.338A</b>
<b>25.25-25.5</b>	FIXED INTER-SATELLITE 5.536 MOBILE <b>ADD 5.A113 MOD 5.338A</b> Standard frequency and time signal-satellite (Earth-to-space)	
<b>25.5-27</b>	EARTH EXPLORATION-SATELLITE (space-to Earth) MOD 5.536B FIXED INTER-SATELLITE 5.536 MOBILE <b>ADD 5.A113 MOD 5.338A</b> SPACE RESEARCH (space-to-Earth) 5.536C Standard frequency and time signal-satellite (Earth-to-space) <b>MOD 5.536A</b>	
<b>27-27.5</b> FIXED INTER-SATELLITE 5.536 MOBILE <b>ADD 5.A113</b> <b>MOD 5.338A</b>	<b>27-27.5</b> FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE <b>ADD 5.A113 MOD 5.338A</b>	

AI 1.13

**MOD****24.75-29.9 GHz**

Allocation to services		
Region 1	Region 2	Region 3
...		
27.5-28.5	FIXED 5.537A FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE 5.538 5.540	ADD 5.A15
AI 1.5 28.5-29.1	FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 ADD 5.A15 MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540	
29.1-29.5	FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A 5.539 5.541A ADD 5.A15 MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540	
...		

**MOD**

AI 1.13  
**5.536A** Administrations operating earth stations in the Earth exploration-satellite service or the space research service shall not claim protection from stations in the fixed and mobile services operated by other administrations. In addition, earth stations in the Earth exploration-satellite service or in the space research service should be operated taking into account the most recent version of Recommendation ITU-R SA.1862. Resolution **COM4/8 (WRC-19)** applies. (WRC-19)


**MOD**

AI 1.13  
**5.536B** In Algeria, Saudi Arabia, Austria, Bahrain, Belgium, Brazil, China, Korea (Rep. of), Denmark, Egypt, United Arab Emirates, Estonia, Finland, Hungary, India, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jordan, Kenya, Kuwait, Lebanon, Libya, Lithuania, Moldova, Norway, Oman, Uganda, Pakistan, the Philippines, Poland, Portugal, Qatar, the Syrian Arab Republic, Dem. People's Rep. of Korea, Slovakia, the Czech Rep., Romania, the United Kingdom, Singapore, Slovenia, Sudan, Sweden, Tanzania, Turkey, Viet Nam and Zimbabwe, earth stations operating in the Earth exploration-satellite service in the frequency band 25.5-27 GHz shall not claim protection from, or constrain the use and deployment of, stations of the fixed and mobile services. Resolution **COM4/8 (WRC-19)** applies. (WRC-19)

**MOD**

**5.537A** In Bhutan, Cameroon, China, Korea (Rep. of), the Russian Federation, India, Indonesia, Iran (Islamic Republic of), Iraq, Japan, Kazakhstan, Malaysia, Maldives, Mongolia, Myanmar, Uzbekistan, Pakistan, the Philippines, Kyrgyzstan, the Dem. People's Rep. of Korea, Sudan, Sri Lanka, Thailand and Viet Nam, the allocation to the fixed service in the band 27.9-28.2 GHz may also be used by high altitude platform stations (HAPS) within the territory of these countries. Such use of 300 MHz of the fixed-service allocation by HAPS in the above countries is further limited to operation in the HAPS-to-ground direction and shall not cause harmful interference to, nor claim protection from, other types of fixed-service systems or other co-primary services. Furthermore, the development of these other services shall not be constrained by HAPS. See Resolution **145 (Rev.WRC-19)**. (WRC-19)

**MOD****29.9-34.2 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>31-31.3</b>	FIXED 5.338A <b>ADD 5.F114</b> MOBILE Standard frequency and time signal-satellite (space-to-Earth) Space research 5.544 5.545 5.149	

**ADD**

**5.F114** The allocation to the fixed service in the frequency band 31-31.3 GHz is identified for worldwide use by high-altitude platform stations (HAPS). This identification does not preclude the use of this frequency band by other fixed-service applications or by other services to which this frequency band is allocated on a co-primary basis, and does not establish priority in the Radio Regulations. Such use of the fixed-service allocation by HAPS shall be in accordance with the provisions of Resolution **COM4/5 (WRC-19)**. (WRC-19)

**SUP****5.543A****MOD**

**5.546** *Different category of service:* in Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, Egypt, the United Arab Emirates, Spain, Estonia, the Russian Federation, Georgia, Hungary, Iran (Islamic Republic of), Israel, Jordan, Lebanon, Moldova, Mongolia, Oman, Uzbekistan, Poland, the Syrian Arab Republic, Kyrgyzstan, Romania, the United Kingdom, South Africa, Tajikistan, Turkmenistan and Turkey, the allocation of the frequency band 31.5-31.8 GHz to the fixed and mobile, except aeronautical mobile, services is on a primary basis (see No. **5.33**). (WRC-19)

**MOD****34.2-40 GHz**

Allocation to services		
Region 1	Region 2	Region 3
AI 1.14 38-39.5	FIXED <b>ADD 5.G114</b> FIXED-SATELLITE (space-to-Earth) MOBILE Earth exploration-satellite (space-to-Earth) 5.547	

**MOD****34.2-40 GHz**

Allocation to services		
Region 1	Region 2	Region 3
AI 1.6 37.5-38	FIXED FIXED-SATELLITE (space-to-Earth) <b>ADD 5.A16</b> MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	
AI 1.6 38-39.5	FIXED FIXED-SATELLITE (space-to-Earth) <b>ADD 5.A16</b> MOBILE Earth exploration-satellite (space-to-Earth) 5.547	
AI 1.6 39.5-40	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B <b>ADD 5.A16</b> MOBILE MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547 <b>ADD 5.B16</b>	

**ADD**

**5.G114** The allocation to the fixed service in the frequency band 38-39.5 GHz is identified for worldwide use by administrations wishing to implement high-altitude platform stations (HAPS). In the HAPS-to-ground direction, the HAPS ground station shall not claim protection from stations in the fixed, mobile and fixed-satellite services; and No. **5.43A** does not apply. This identification does not preclude the use of this frequency band by other fixed-service applications or by other services to which this frequency band is allocated on a co-primary basis and does not establish priority in the Radio Regulations. Furthermore, the development of the fixed-satellite, fixed and mobile services shall not be unduly constrained by HAPS. Such use of the fixed-service allocation by HAPS shall be in accordance with the provisions of Resolution **COM4/6 (WRC-19)**. (WRC-19)

AI 1.14

**ADD**

**5.A16** The use of the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by a non-geostationary-satellite systems in the fixed-satellite service is subject to the application of the provisions of No. **9.12** for coordination with other non-geostationary-satellite systems in the fixed-satellite service but not with non-geostationary systems in other services. Resolution **COM5/11 (WRC-19)** shall also apply, and No. **22.2** shall continue to apply. (WRC-19)

AI 1.6

**ADD**

**5.B16** The use of the frequency bands 39.5-40 GHz and 40-40.5 GHz by non-geostationary-satellite systems in the mobile-satellite service (space-to-Earth) and by non-geostationary-satellite systems in the fixed-satellite service (space-to-Earth) is subject to the application of the provisions of No. **9.12** for coordination with other non-geostationary satellite systems in the fixed-satellite and mobile-satellite services but not with non-geostationary satellite systems in other services. No. **22.2** shall continue to apply for non-geostationary-satellite systems. (WRC-19)

AI 1.6

**MOD****34.2-40 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>37-37.5</b>	FIXED MOBILE except aeronautical mobile <b>ADD 5.BCD113</b> SPACE RESEARCH (space-to-Earth) 5.547	
<b>37.5-38</b>	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile <b>ADD 5.BCD113</b> SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	
<b>38-39.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE <b>ADD 5.BCD113</b> Earth exploration-satellite (space-to-Earth) 5.547	
<b>39.5-40</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE <b>ADD 5.BCD113</b> MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	

AI 1.13



**ADD**

**5.BCD113** The frequency band 37-43.5 GHz, or portions thereof, is identified for use by administrations wishing to implement the terrestrial component of International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. Because of the potential deployment of FSS earth stations within the frequency range 37.5-42.5 GHz and high-density applications in the fixed-satellite service in the bands 39.5-40 GHz in Region 1, 40-40.5 GHz in all Regions and 40.5-42 GHz in Region 2 (see No. **5.516B**), administrations should further take into account potential constraints to IMT in these bands, as appropriate. Resolution **COM4/9 (WRC-19)** applies. (WRC-19)

**MOD****40-47.5 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>40-40.5</b>	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE ADD <b>5.BCD113</b> MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)	
<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) LAND MOBILE ADD <b>5.BCD113</b> BROADCASTING BROADCASTING-SATELLITE Aeronautical mobile Maritime mobile  5.547	40.5-41 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B LAND MOBILE ADD <b>5.BCD113</b> BROADCASTING BROADCASTING-SATELLITE Aeronautical mobile Maritime mobile Mobile-satellite (space-to-Earth) 5.547	40.5-41 FIXED FIXED-SATELLITE (space-to-Earth) LAND MOBILE ADD <b>5.BCD113</b> BROADCASTING BROADCASTING-SATELLITE Aeronautical mobile Maritime mobile  5.547
<b>41-42.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B LAND MOBILE ADD <b>5. BCD113</b> BROADCASTING BROADCASTING-SATELLITE  Aeronautical mobile Maritime mobile 5.547 5.551F 5.551H 5.551I	
<b>42.5-43.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except aeronautical mobile ADD <b>5.BCD113</b> RADIO ASTRONOMY 5.149 5.547	

**MOD****40-47.5 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>40-40.5</b>	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B <b>ADD 5.A16</b> MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth) ADD 5.B16	
<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) <b>ADD 5.A16</b> BROADCASTING BROADCASTING-SATELLITE Mobile  5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.516B <b>ADD 5.A16</b> BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) <b>ADD 5.A16</b> BROADCASTING BROADCASTING-SATELLITE Mobile  5.547
<b>41-42.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B <b>ADD 5.A16</b> BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I	
<b>47.2-47.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 <b>ADD 5.A16</b> MOBILE 5.552A	

AI 1.6

**MOD****40-47.5 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>40-40.5</b>	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)	
<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547
<b>41-42.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I	
<b>42.5-43.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149 5.547	
<b>43.5-47</b>	MOBILE 5.553 <b>ADD 5.F113</b> MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	
<b>47-47.2</b>	AMATEUR AMATEUR-SATELLITE	
<b>47.2-47.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A	

AI 1.13

**MOD****40-47.5 GHz**

Allocation to services		
Region 1	Region 2	Region 3
47.2-47.5	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE <b>ADD 5.H113</b> 5.552A	

**ADD**

**5.F113** In Algeria, Angola, Bahrain, Belarus, Benin, Botswana, Brazil, Burkina Faso, Cabo Verde, Korea (Rep. of), Côte d'Ivoire, Croatia, United Arab Emirates, Estonia, Eswatini, Gabon, Gambia, Ghana, Greece, Guinea, Guinea-Bissau, Hungary, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lesotho, Latvia, Liberia, Lithuania, Madagascar, Malawi, Mali, Morocco, Mauritius, Mauritania, Mozambique, Namibia, Niger, Nigeria, Oman, Qatar, Senegal, Seychelles, Sierra Leone, Slovenia, Sudan, South Africa, Sweden, Togo, Tunisia, Zambia and Zimbabwe, the frequency band 45.5-47 GHz is identified for use by administrations wishing to implement the terrestrial component of International Mobile Telecommunications (IMT), taking into account No. **5.553**. With respect to the aeronautical mobile service and radionavigation service, the use of this frequency band for the implementation of IMT is subject to agreement obtained under No. **9.21** with concerned administrations and shall not cause harmful interference to, or claim protection from these services. This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. Resolution **COM4/10 (WRC-19)** applies. (WRC-19)

**ADD**

**5.H113** In Region 2 and Algeria, Angola, Saudi Arabia, Australia, Bahrain, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Rep., Comoros, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Djibouti, Egypt, United Arab Emirates, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Equatorial Guinea, India, Iran (Islamic Republic of), Iraq, Japan, Jordan, Kenya, Kuwait, Lesotho, Liberia, Libya, Lithuania, Madagascar, Malaysia, Malawi, Mali, Morocco, Mauritius, Mauritania, Mozambique, Namibia, Niger, Nigeria, Oman, Uganda, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Singapore, Slovenia, Somalia, Sudan, South Africa, Sweden, Tanzania, Chad, Togo, Tunisia, Zambia and Zimbabwe, the frequency band 47.2-48.2 GHz is identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated, and does not establish any priority in the Radio Regulations. Resolution **COM4/9 (WRC-19)** applies. (WRC-19)

**MOD****40-47.5 GHz**

Allocation to services		
Region 1	Region 2	Region 3
47.2-47.5	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE MOD 5.552A	

AI 1.14

**MOD**

**5.552A** The allocation to the fixed service in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz is identified for use by high-altitude platform stations (HAPS). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated on a co-primary basis, and does not establish priority in the Radio Regulations. Such use of the fixed-service allocation in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz by HAPS shall be in accordance with the provisions of Resolution **122 (Rev.WRC-19)**. (WRC-19)

AI 1.14

**MOD****47.5-51.4 GHz**

Allocation to services		
Region 1	Region 2	Region 3
47.9-48.2	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE MOD 5.552A	

AI 1.14

**MOD****47.5-51.4 GHz**


<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>47.5-47.9</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 <b>ADD 5.A16</b> (space-to-Earth) 5.516B 5.554A MOBILE	<b>47.5-47.9</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 <b>ADD 5.A16</b> MOBILE	
<b>47.9-48.2</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 <b>ADD 5.A16</b> MOBILE 5.552A	
<b>48.2-48.54</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 <b>ADD 5.A16</b> (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	<b>48.2-50.2</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.516B <b>MOD 5.338A</b> 5.552 <b>ADD 5.A16</b> MOBILE	
<b>48.54-49.44</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 <b>ADD 5.A16</b> MOBILE 5.149 5.340 5.555		
<b>49.44-50.2</b> FIXED FIXED-SATELLITE (Earth-to-space) <b>MOD 5.338A</b> 5.552 <b>ADD 5.A16</b> (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	5.149 5.340 5.555	
<b>50.2-50.4</b>	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340	
<b>50.4-51.4</b>	FIXED FIXED-SATELLITE (Earth-to-space) <b>MOD 5.338A</b> <b>ADD 5.A16</b> MOBILE Mobile-satellite (Earth-to-space)	

AI 1.6

**MOD****47.5-51.4 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>AI 1.13</b> <b>47.5-47.9</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 (space-to-Earth) 5.516B 5.554A MOBILE <b>ADD 5.H113</b>	<b>47.5-47.9</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE <b>ADD 5.H113</b>	
	<b>47.9-48.2</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE <b>ADD 5.H113</b> 5.552A	

**MOD****51.4-55.78 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>AI 9.1.9</b> <b>51.4-52.4</b>	FIXED <b>FIXED-SATELLITE (Earth-to-space) ADD 5.A919</b> MOBILE 5.547 5.556 <b>MOD 5.338A</b>	
<b>52.4-52.6</b>	FIXED <b>MOD 5.338A</b> MOBILE 5.547 5.556	

**ADD**

**AI 9.1.9** **5.A919** The use of the frequency band 51.4-52.4 GHz by the fixed-satellite service (Earth-to-space) is limited to geostationary-satellite networks. The earth stations shall be limited to gateway earth stations with a minimum antenna diameter of 2.4 metres. (WRC-19)

**MOD****66-81 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>AI 1.13</b> <b>66-71</b>	INTER-SATELLITE MOBILE 5.553 5.558 <b>ADD 5.J113</b> MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	

**ADD**

**AI 1.13** **5.J113** In Regions 1 and 3, and Brazil, and Region 2 the frequency band 66-71 GHz is identified for use by administrations wishing to implement the terrestrial component of International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. Resolution **COM4/7 (WRC-19)** applies. (WRC-19)

**MOD**

**AI 9.2** **5.562B** In the bands 105-109.5 GHz, 111.8-114.25 GHz and 217-226 GHz, the use of this allocation is limited to space-based radio astronomy only. (WRC-19)

**MOD****151.5-158.5 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>151.5-155.5</b>	FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	
<b>155.5-158.5</b>	FIXED MOBILE RADIO ASTRONOMY 5.149	

**SUP****5.562F****SUP****5.562G****MOD****248-3 000 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>275-3 000</b>	(Not allocated) 5.565	<b>ADD 5.X115</b>

**MOD**



**ADD**

**5.X115** For the operation of fixed and land mobile service applications in frequency bands in the range 275-450 GHz:

The frequency bands 275-296 GHz, 306-313 GHz, 318-333 GHz and 356-450 GHz are identified for use by administrations for the implementation of land mobile and fixed service applications, where no specific conditions are necessary to protect Earth exploration-satellite service (passive) applications.

AI 1.15

The frequency bands 296-306 GHz, 313-318 GHz and 333-356 GHz may only be used by fixed and land mobile service applications when specific conditions to ensure the protection of Earth exploration-satellite service (passive) applications are determined in accordance with Resolution **731 (Rev.WRC-19)**.

In those portions of the frequency range 275-450 GHz where radio astronomy applications are used, specific conditions (e.g. minimum separation distances and/or avoidance angles) may be necessary to ensure protection of radio astronomy sites from land mobile and/or fixed service applications, on a case-by-case basis in accordance with Resolution **731 (Rev.WRC-19)**.

The use of the above-mentioned frequency bands by land mobile and fixed service applications does not preclude use by, and does not establish priority over, any other applications of radio services in the range of 275-450 GHz. (WRC-19)

**MOD**

AI 4

AI 1.6

AI 7(D)

AI 7(I)

AI 9.2


**ARTICLE 9**

**Procedure for effecting coordination with or obtaining agreement of other administrations**<sup>1, 2, 3, MOD 4, 5, 6, 7, 9</sup> (WRC-19)

**MOD**


AI 4

AI 7(I)

<sup>4</sup> **A.9.4** Resolution **49 (Rev.WRC-19)**, Resolution **552 (Rev.WRC-19)** or Resolution **COM5/5 (WRC-19)**, as appropriate, shall also be applied with respect to those satellite networks and satellite systems that are subject to it. (WRC-19) 

AI 4

**MOD**

<sup>8</sup> **A.9.7** (SUP – WRC-19) 

## Section I – Advance publication of information on satellite networks or satellite systems

### *General*

#### MOD

**9.1** Before initiating any action under Article **11** in respect of frequency assignments for a satellite network or system not subject to the coordination procedure described in Section II of Article **9** below, an administration, or one<sup>10</sup> acting on behalf of a group of named administrations, shall send to the Bureau a general description of the network or system for advance publication in the International Frequency Information Circular (BR IFIC) not earlier than seven years and preferably not later than two years before the planned date of bringing into use of the network or system (see also No. **11.44**). The characteristics to be provided for this purpose are listed in Appendix **4**. The notification information may also be communicated to the Bureau at the same time, but shall be considered as having been received by the Bureau not earlier than **four** months after the date of publication of the advance publication information. (WRC-19)



#### MOD

**9.1A** Upon receipt of the complete information sent under No. **9.30**, the Bureau shall **make available**, using the basic characteristics of the coordination request, a general description of the network or system for advance publication in a Special Section. The characteristics to be **made available** for this purpose are listed in Appendix **4**. (WRC-19)

#### MOD

**9.2** Amendments to the information sent in accordance with the provisions of No. **9.1** shall also be sent to the Bureau as soon as they become available. The use of an additional frequency band, or modification of the orbital location for a space station using the geostationary-satellite orbit, the modification of the reference body or the modification of the direction of transmission for a space station using a non-geostationary-satellite orbit, as well as the use of inter-satellite links of a geostationary space station communicating with a non-geostationary space station which are not subject to the coordination procedure under Section II of Article **9**, will require the application of the advance publication procedure<sup>A</sup>. (WRC-19)

#### ADD

**A 9.2.1** For geostationary-satellite networks using inter-satellite links of a geostationary space station communicating with a non-geostationary space station which are not subject to the coordination procedure under Section II of Article **9**, the Appendix **4** characteristics to be provided for advance publication in the BR IFIC shall be the same as those listed for the coordination of a geostationary-satellite network. (WRC-19)

**MOD**

**9.2B** On receipt of the complete information sent under Nos. **9.1** and **9.2**, the Bureau shall publish<sup>11</sup> it in a Special Section of its BR IFIC within **two** months. When the Bureau is not in a position to comply with the time-limit referred to above, it shall periodically so inform the administrations, giving the reasons therefor. (WRC-19)



**Sub-Section IA – Advance publication of information on satellite networks or satellite systems that are not subject to coordination procedure under Section II**

**MOD**

**9.3** If, upon receipt of the BR IFIC containing information published under No. **9.2B**, any administration believes that interference which may be unacceptable may be caused to its existing or planned satellite networks or systems, it shall within four months of the date of publication of the BR IFIC communicate to the publishing administration its comments **ADD XX** on the particulars of the anticipated interference to its existing or planned systems. A copy of these comments shall also be sent to the Bureau. Thereafter, both administrations shall endeavour to cooperate in joint efforts to resolve any difficulties, with the assistance of the Bureau, if so requested by either of the parties, and shall exchange any additional relevant information that may be available. If no such comments are received from an administration within the aforementioned period, it may be assumed that the administration concerned has no objections to the planned satellite network(s) of the system on which details have been published. (WRC-19)

**ADD**

**XX 9.3.1** Upon receipt of the International Frequency Information Circular (BR IFIC) containing information published under No. **9.2B** for frequency assignments to non-GSO satellite systems subject to Resolution **COM5/5 (WRC-19)**, any administration which believes that unacceptable interference may be caused to its existing or planned satellite networks or systems shall, as soon as possible and within a period of four months, communicate to the notifying administration, with a copy to the Bureau, these comments on the particulars of the potential interference to its existing or planned systems. The Bureau shall promptly make these comments available “as received”, on the ITU website. (WRC-19)

**MOD**

**9.4** In the case of difficulties, the administration responsible for the planned satellite network shall explore all possible means to resolve the difficulties without considering the possibility of adjustment to networks of other administrations. If no such means can be found, it may request the other administrations to explore all possible means to meet its requirements. The administrations concerned shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks. An administration on behalf of which details of planned satellite networks have been published in accordance with the provisions of No. **9.2B** **may**, after the period of four months, inform the Bureau of the progress made in resolving any difficulties. (WRC-19)



## Section II – Procedure for effecting coordination<sup>12, 13</sup>

### Sub-Section IIA – Requirement and request for coordination

#### MOD

**AI 1.6** **9.35** a) examine that information with respect to its conformity with No. **11.31**<sup>MOD 19;</sup> (WRC-19)

#### MOD

**AI 1.6** <sup>19</sup> **9.35.1** The Bureau shall include the detailed results of its examination under No. **11.31** of compliance with the limits in Tables **22-1** to **22-3** or the single-entry limits in No. **22.5L** of Article **22**, as applicable, in the publication under No. **9.38**. (WRC-19)

#### MOD

**AI 7(D)** **9.36** b) identify in accordance with No. **9.27** any administration with which coordination may need to be effected<sup>MOD 20, 21;</sup> (WRC-19)

#### MOD

**AI 7(D)** <sup>20</sup> **9.36.1** In the case of coordination under Nos. **9.12**, **9.12A** and **9.13**, the Bureau shall also identify the satellite networks or systems with which coordination may need to be effected. The list of administrations identified by the Bureau under Nos. **9.11** to **9.14** and **9.21** and the list of satellite networks or systems identified by the Bureau under Nos. **9.12**, **9.12A** and **9.13** are only for information purposes, to help administrations comply with this procedure. (WRC-19)

### Sub-Section IIC – Action upon a request for coordination

#### MOD

**AI 7(D)** **9.52C** For coordination requests under Nos. **9.11** to **9.14** and **9.21**, an administration not responding under No. **9.52** within the same four-month period shall be regarded as unaffected and, in the cases of Nos. **9.11** to **9.14**, the provisions of Nos. **9.48** and **9.49** shall apply. Furthermore, for coordination under Nos. **9.12**, **9.12A** and **9.13**, any satellite networks or systems identified under No. **9.36.1** but not confirmed in the response provided by the administration under No. **9.52** within the same four-month period shall be regarded as unaffected and the provisions of Nos. **9.48** and **9.49** shall also apply. (WRC-19)

**MOD**

**9.53A** Upon expiry of the deadline for comments in respect of a coordination request under Nos. **9.11** to **9.14** and **9.21**, the Bureau shall, according to its records, publish a Special Section, indicating the list of administrations having submitted their disagreement and the list of satellite networks or systems upon which this disagreement is based, as appropriate, or other comments within the regulatory deadline. (WRC-19)

**MOD**

AI 7(D) AI 7(A) AI 1.14 AI 7(C) AI 7(I)

AI 9.2 AI 4

**ARTICLE 11**

**Notification and recording of frequency assignments**<sup>1, MOD 2, 3, 4, 5, 7, 8</sup> (WRC-19)

**MOD**

<sup>2</sup> **A.11.2** Resolution **49 (Rev.WRC-19)**, Resolution **552 (Rev.WRC-19)** or Resolution **COM5/5 (WRC-19)**, as appropriate, shall also be applied with respect to those satellite networks and satellite systems that are subject to it. (WRC-19)

**MOD**

<sup>6</sup> **A.11.5** (SUP – WRC-19)

**Section I – Notification****MOD**

**11.9** Similar notification shall be made for a frequency assignment to a receiving earth station or space station, or to a receiving high-altitude platform station in the fixed service using the frequency bands mentioned in Nos. **5.457**, **5.D114**, **5.F114**, **5.G114** and **5.552A** or to a land station for reception from mobile stations, when: (WRC-19)

**MOD**

**11.13** Assignments involving specific frequencies which are prescribed by these Regulations for common use by terrestrial stations of a given service shall not be notified. They shall be entered in the Master Register and a consolidated table shall also be published in the Preface to the International Frequency **Information Circular (BR IFIC)**. (WRC-19)

**MOD**

**AI 1.14** **11.26** Notices relating to assignments for high-altitude platform stations in the fixed service in the frequency bands identified in Nos. **5.457**, **5.537A**, **5.B114**, **5.C114**, **5.D114**, **5.F114**, **5.G114** and **5.552A** shall reach the Bureau not earlier than five years before the assignments are brought into use. (WRC-19)

## Section II – Examination of notices and recording of frequency assignments in the Master Register

**MOD**

**AI 4** <sup>21</sup> **11.37.2** When a frequency assignment to a space station in the broadcasting-satellite service in a non-planned band other than the frequency band 21.4-22 GHz is recorded in the Master Register, a note shall be entered in the remarks column indicating that such recording does not prejudice in any way the decisions to be included in the agreements and associated plans referred to in Resolution **507 (Rev.WRC-19)**. (WRC-19)

**MOD**

**AI 7(A)** **11.44** The notified date<sup>24</sup>, **MOD 25, MOD 26** of bringing into use of any frequency assignment to a space station of a satellite network **or system** shall be not later than seven years following the date of receipt by the Bureau of the relevant complete information under No. **9.1** or **9.2** in the case of satellite networks or systems not subject to Section II of Article **9** or under No. **9.1A** in the case of satellite networks or systems subject to Section II of Article **9**. Any frequency assignment not brought into use within the required period shall be cancelled by the Bureau after having informed the administration at least three months before the expiry of this period. (WRC-19)

**MOD**

**AI 4** <sup>24</sup> **11.44.1** In the case of space station frequency assignments that are brought into use prior to the completion of the coordination process, and for which the Resolution **49 (Rev.WRC-19)** or Resolution **552 (Rev.WRC-19)** data, as appropriate, have been submitted to the Bureau, the assignment shall continue to be taken into consideration for a maximum period of seven years from the date of receipt of the relevant information under No. **9.1A**. If the first notice for recording of the assignments in question under No. **11.15** related to No. **9.1** or No. **9.1A** has not been received by the Bureau by the end of this seven-year period, the assignments shall be cancelled by the Bureau after having informed the notifying administration of its pending actions six months in advance. (WRC-19)

**MOD**

**AI 7(A)** <sup>25</sup> **11.44.2** The notified date of bringing into use of a frequency assignment to a space station of a satellite network or system shall be the date of the commencement of the continuous period defined in No. **11.44B** or No. **11.44C**, or the date of deployment as defined in Nos. **11.44D** or **11.44E**, as applicable. (WRC-19)

**MOD**

**AI 7(A)** <sup>26</sup> **11.44.3, 11.44B.1, 11.44C.2, 11.44D.2 and 11.44E.1** Upon receipt of this information and whenever it appears from reliable information available that a notified frequency assignment has not been brought into use in accordance with No. **11.44**, No. **11.44B**, No. **11.44C**, No. **11.44D** or No. **11.44E**, as the case may be, the consultation procedures and subsequent applicable course of action prescribed in No. **13.6** shall apply, as appropriate. (WRC-19)

**MOD**

**AI 4** **11.44B** A frequency assignment to a space station in the geostationary-satellite orbit shall be considered as having been brought into use when a space station in the geostationary-satellite orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained at the notified orbital position for a continuous period of 90 days. The notifying administration shall so inform the Bureau within 30 days from the end of the 90-day period<sup>26, 27</sup>. On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC. Resolution **40 (Rev.WRC-19)** shall apply. (WRC-19)

**MOD**

**AI 7(A)** **11.44C** A frequency assignment to a space station in a non-geostationary-satellite orbit network or system in the fixed-satellite service, the mobile-satellite service or the broadcasting-satellite service shall be considered as having been brought into use when a space station with the capability of transmitting or receiving that frequency assignment has been deployed and maintained on one of the notified orbital plane(s)<sup>ADD AA</sup> of the non-geostationary satellite network or system for a continuous period of 90 days, irrespective of the notified number of orbital planes and satellites per orbital plane in the network or system. The notifying administration shall so inform the Bureau within 30 days from the end of the 90-day period<sup>MOD 26, ADD BB, ADD CC</sup>. On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC subsequently. (WRC-19)

**ADD**

**AI 7(A)** <sup>AA</sup> **11.44C.1 and 11.44D.1** For the purposes of No. **11.44C** or No. **11.44D**, the term “notified orbital plane” means an orbital plane of the non-GSO system, as provided to the Bureau in the most recent notification information for the system’s frequency assignments, that corresponds to Items A.4.b.4.a, A.4.b.4.d, A.4.b.4.e and A.4.b.5.c (only for orbits whose altitudes of the apogee and perigee are different) in Table A of Annex 2 to Appendix 4. (WRC-19)

**ADD**

**BB 11.44C.3** A frequency assignment to a space station in a non-geostationary-satellite orbit with a notified date of bringing into use more than 120 days prior to the date of receipt of the notification information shall also be considered as having been brought into use if the notifying administration confirms, when submitting the notification information for this assignment, that a space station in a non-geostationary orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained on one of the notified orbital planes as provided for in No. **11.44C** for a continuous period of time from the notified date of bringing into use until the date of receipt of the notification information for this frequency assignment. (WRC-19)

AI 7(A)

**ADD**

**CC 11.44C.4** For the purposes of No. **11.44C** and **11.44D**, when the notifying administration informs the Bureau of the bringing into use, it shall identify the orbital plane number as in the latest notification information received by the Bureau that corresponds to the orbital plane in which the space station has been deployed to bring into use the frequency assignments. (WRC-19)

AI 7(A)

**MOD**

**11.44D** A frequency assignment to a space station in a non-geostationary satellite orbit network or system with “Earth” as the reference body, other than a frequency assignment to which No. **11.44C** applies, shall be considered as having been brought into use when a space station with the capability of transmitting or receiving that frequency assignment has been deployed on one of the notified orbital plane(s)<sup>ADD AA</sup> of the non-geostationary satellite network or system, irrespective of the notified number of orbital planes and satellites per orbital plane in the network or system. The notifying administration shall so inform the Bureau as soon as possible, but not later than 30 days after the end of the period referred to in No. **11.44**.<sup>MOD 26, ADD CC</sup> On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC subsequently. (WRC-19)

AI 7(A)

**MOD**

**11.44E** A frequency assignment to a space station with a reference body that is not “Earth” shall be considered as having been brought into use when the notifying administration informs the Bureau that a space station with the capability of transmitting or receiving that frequency assignment has been deployed in accordance with the notification information. The notifying administration shall so inform the Bureau as soon as possible, but not later than 30 days after the end of the period referred to in No. **11.44**.<sup>MOD 26</sup> On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC subsequently. (WRC-19)

AI 7(A)



**MOD**

**11.46** In applying the provisions of this Article, any resubmitted notice which is received by the Bureau more than six months after the date on which the original notice was returned by the Bureau shall be considered to be a new notification with a new date of receipt<sup>ADD x</sup>. For frequency assignments to a space station, should the new date of receipt of such a notice not comply with the period specified in No. **11.44.1** or No. **11.43A**, as appropriate, the notice shall be returned to the notifying administration in the case of No. **11.44.1**, and the notice shall be examined as a new notice of a change in the characteristics of an assignment already recorded with a new date of receipt in the case of No. **11.43A**. The Bureau shall appropriately reflect the resubmission on the ITU website within 30 days of receipt. (WRC-19)

**ADD**

<sup>x</sup> **11.46.1** If the resubmitted notice is not received by the Bureau within four months from the date on which the original notice was returned by the Bureau, the Bureau shall promptly send a reminder to the notifying administration. (WRC-19)

**MOD**

**11.48** If, after the expiry of the period of seven years from the date of receipt of the relevant complete information referred to in No. **9.1** or **9.2** in the case of satellite networks or systems not subject to Section II of Article **9** or in No. **9.1A** in the case of satellite networks or systems subject to Section II of Article **9**, the administration responsible for the satellite network has not brought the frequency assignments to stations of the network into use, or has not submitted the first notice for recording of the frequency assignments under No. **11.15**, or, where required, has not provided the due diligence information pursuant to Resolution **49 (Rev.WRC-19)**, as appropriate, the corresponding information published under Nos. **9.1A**, **9.2B** and **9.38**, as appropriate, shall be cancelled, but only after the administration concerned has been informed at least six months before the expiry date referred to in Nos. **11.44** and **11.44.1** and, where required, § 10 of Annex 1 of Resolution **49 (Rev.WRC-19)**<sup>27bis</sup>. (WRC-19)

**ADD**

<sup>27bis</sup> **11.48.1** If the information pursuant to Resolution **552 (Rev.WRC-15)** has not been provided, the corresponding information published under No. **9.38** shall be cancelled 30 days after the end of the seven-year period following the date of receipt by the Bureau of the relevant complete information under No. **9.1A**. (WRC-19)

**MOD**

**11.49** Wherever the use of a recorded frequency assignment to a space station of a satellite network or to all space stations of a non-geostationary satellite system is suspended for a period exceeding six months, the notifying administration shall inform the Bureau of the date on which such use was suspended. When the recorded assignment is brought back into use, the notifying administration shall, subject to the provisions of Nos. **11.49.1**, **11.49.2**, **11.49.3** or **11.49.4**, as applicable, so inform the Bureau, as soon as possible. On receipt of the information sent under this provision, the Bureau shall make that information available as soon as possible on the ITU website and shall publish it in the BR IFIC. The date on which the recorded assignment is brought back into use<sup>28</sup> **ADD DD, ADD EE, ADD FF, ADD GG** shall be not later than three years from the date on which the use of the frequency assignment was suspended, provided that the notifying administration informs the Bureau of the suspension within six months from the date on which the use was suspended. If the notifying administration informs the Bureau of the suspension more than six months after the date on which the use of the frequency assignment was suspended, this three-year time period shall be reduced. In this case, the amount by which the three-year period shall be reduced shall be equal to the amount of time that has elapsed between the end of the six-month period and the date that the Bureau is informed of the suspension. If the notifying administration informs the Bureau of the suspension more than 21 months after the date on which the use of the frequency assignment was suspended, the frequency assignment shall be cancelled. **Ninety days** before the end of the period of suspension, the Bureau shall send a reminder to the notifying administration. If the Bureau does not receive the declaration of the commencement of the bringing back into use period within thirty days following the limit date of the period of suspension established in accordance with this provision, it shall cancel the entry in the Master Register. The Bureau shall, however, inform the administration concerned before taking such action. (WRC-19)

AI 7(A)

AI 9.2

**ADD**

**DD 11.49.2** The date of bringing back into use of a frequency assignment to a space station in a non-geostationary-satellite orbit network or system in the fixed-satellite service, the mobile-satellite service or the broadcasting-satellite service shall be the date of the commencement of the 90-day period defined below. A frequency assignment to such a space station shall be considered as having been brought back into use when a space station with the capability of transmitting or receiving that frequency assignment has been deployed and maintained on one of the notified orbital plane(s) (see No. **11.49.5**) of the non-geostationary-satellite network or system for a continuous period of 90 days, irrespective of the notified number of orbital planes and satellites per orbital plane in the network or system. The notifying administration shall so inform the Bureau within 30 days from the end of the 90-day period. When the notifying administration informs the Bureau of the bringing back into use, it shall identify the orbital plane number as in the latest notification information received by the Bureau that corresponds to the orbital plane in which the space station has been deployed to bring back into use the frequency assignments. (WRC-19)

AI 7(A)

**ADD**

**EE 11.49.3** A frequency assignment to a space station in a non-geostationary-satellite orbit network or system with “Earth” as the reference body, other than a frequency assignment to which No. 11.49.2 applies, shall be considered as having been brought back into use when a space station with the capability of transmitting or receiving that frequency assignment has been deployed on one of the notified orbital plane(s) (see No. 11.49.5) of the non-geostationary-satellite network or system, irrespective of the notified number of orbital planes and satellites per orbital plane in the network or system. The notifying administration shall so inform the Bureau not later than 30 days after the end of the suspension period referred to in No. 11.49. When the notifying administration informs the Bureau of the bringing back into use, it shall identify the orbital plane number as in the latest notification information received by the Bureau that corresponds to the orbital plane in which the space station has been deployed to bring back into use the frequency assignments. (WRC-19)

AI 7(A)

**ADD**

**FF 11.49.4** A frequency assignment to a space station with a reference body that is not “Earth” shall be considered as having been brought back into use when the notifying administration informs the Bureau that a space station with the capability of transmitting or receiving that frequency assignment has been deployed and operated in accordance with the notification information. The notifying administration shall so inform the Bureau not later than 30 days after the end of the suspension period referred to in No. 11.49. (WRC-19)

AI 7(A)

**ADD**

**GG 11.49.5** For purposes of Nos. 11.49.2 and 11.49.3, the term “notified orbital plane” means an orbital plane of the non-GSO system, as provided to the Bureau in the most recent notification information for the system’s frequency assignments, that corresponds to Items A.4.b.4.a, A.4.b.4.d, A.4.b.4.e and A.4.b.5.c (only for orbits whose altitudes of the apogee and perigee are different) in Table A of Annex 2 to Appendix 4. (WRC-19)

AI 7(A)

**MOD**

<sup>28</sup> **11.49.1** The date of bringing back into use of a frequency assignment to a space station in the geostationary-satellite orbit shall be the date of the commencement of the 90-day period defined below. A frequency assignment to a space station in the geostationary-satellite orbit shall be considered as having been brought back into use when a space station in the geostationary-satellite orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained at the notified orbital position for a continuous period of 90 days. The notifying administration shall so inform the Bureau within 30 days from the end of the 90-day period. Resolution 40 (Rev.WRC-19) shall apply. (WRC-19)

AI 4

**ADD**

**AI 7(A)** **Section III – Maintenance of the recording of frequency assignments to non-GSO satellite systems in the Master Register** (WRC-19)

**ADD**

**AI 7(A)** **11.51** For frequency assignments to some non-GSO satellite systems in specific frequency bands and services, Resolution **COM5/7 (WRC-19)** shall apply. (WRC-19)

## ARTICLE 13

**AI 7(A)** **AI 9.2**

### Instructions to the Bureau

#### Section II – Maintenance of the Master Register and of World Plans by the Bureau

**MOD**

**AI 7(A)** **13.6** *b)* whenever it appears from reliable information available that a recorded assignment has not been brought into use, or is no longer in use, or continues to be in use but not in accordance with the notified required characteristics<sup>**ADD 1**</sup> as specified in Appendix 4, the Bureau shall consult the notifying administration and request clarification as to whether the assignment was brought into use in accordance with the notified characteristics or continues to be in use in accordance with the notified characteristics. Such a request shall include the reason for the query. In the event of a response and subject to the agreement of the notifying administration the Bureau shall cancel, suitably modify, or retain the basic characteristics of the entry. If the notifying administration does not respond within three months, the Bureau shall issue a reminder. In the event the notifying administration does not respond within one month of the first reminder, the Bureau shall issue a second reminder. In the event the notifying administration does not respond within one month of the second reminder, action taken by the Bureau to cancel the entry shall be subject to a decision of the Board. In the event of non-response or disagreement by the notifying administration, the entry will continue to be taken into account by the Bureau when conducting its examinations until the decision to cancel or modify the entry is made by the Board. In the event of a response, the Bureau shall inform the notifying administration of the conclusion reached by the Bureau within three months of the administration's response. When the Bureau is not in a position to comply with the three-month deadline referred to above, the Bureau shall so inform the notifying administration together with the reasons therefor. In case of disagreement between the notifying administration and the Bureau, the matter shall be carefully investigated by the Board, including taking into account submissions of additional supporting materials from administrations through the Bureau within the deadlines as established by the Board. The application of this provision shall not preclude the application of other provisions of the Radio Regulations. (WRC-19)

**ADD**

AI 7(A)

**13.6.1** See also No. **11.51**, frequency assignments to non-geostationary satellite systems recorded in the Master Register. (WRC-19)

**MOD**

AI 9.2

**13.7** c) enter in the Master Register and publish in the Preface to the International Frequency **Information Circular (BR IFIC)** all frequencies prescribed by these Regulations for common use;

**MOD**

AI 9.2

**13.9** e) maintain and periodically update the Preface to the **BR IFIC**.

**MOD**

AI 9.2

**13.10** The Bureau shall also compile, for publication by the Secretary-General in the form of the **BR IFIC**, comprehensive listings of entries extracted from the Master Register and such other extracts as may periodically be required.

AI 9.2

**ARTICLE 19****Identification of stations****Section II – Allocation of international series and assignment of call signs****MOD**

AI 9.2

**19.36** § 17 Each administration has been allocated one or more maritime identification digit (MID) for its use. A second or subsequent MID should not be requested<sup>2</sup> unless the previously allocated MID is more than 80% **exhausted and** the rate of assignments is such that 90% exhaustion is foreseen. (WRC-19)

**Section VI – Identities in the maritime mobile service** (WRC-12)**19.98***A – General***MOD**

AI 2

**19.99** § 39 When a station<sup>6</sup> operating in the maritime mobile service or the maritime mobile-satellite service is required to use maritime mobile service identities, the responsible administration shall assign the identity to the station in accordance with the provisions described in Annex 1 of Recommendation ITU-R M.585-8. In accordance with No. **20.16**, administrations shall notify the Radiocommunication Bureau immediately when assigning maritime mobile service identities. (WRC-19)



**MOD**

AI 2

**19.102** 3) The types of maritime mobile service identities shall be as described in Annex 1 of Recommendation ITU-R M.585-8. (WRC-19)

**19.110***C – Maritime mobile service identities* (WRC-07)**MOD**

AI 2

**19.111** § 43 1) Administrations shall follow Annex 1 of Recommendation ITU-R M.585-8 concerning the assignment and use of maritime mobile service identities. (WRC-19)

**SUP**

AI 9.2

**19.114**

## ARTICLE 20

### Service publications and online information systems (WRC-07)

#### Section I – Titles and contents of service publications (WRC-07)

**MOD**

AI 9.2

**20.2**

§ 2 **BR IFIC** – *The International Frequency Information Circular.*

**MOD**

AI 9.2

**20.3**

The **BR IFIC** shall contain:

AI 9.1.9 AI 9.2 AI 4

## ARTICLE 21

**Terrestrial and space services sharing frequency bands above 1 GHz****Section II – Power limits for terrestrial stations**

MOD

TABLE 21-2 (Rev.WRC-19)

Frequency band	Service	Limit as specified in Nos.
...	...	...
10.7-11.7 GHz <sup>5</sup> (Region 1) 12.5-12.75 GHz <sup>5</sup> (Nos. 5.494 and 5.496) 12.7-12.75 GHz <sup>5</sup> (Region 2) 12.75-13.25 GHz 13.75-14 GHz (Nos. 5.499 and 5.500) 14.0-14.25 GHz (No. 5.505) 14.25-14.3 GHz (Nos. 5.505 and 5.508) 14.3-14.4 GHz <sup>5</sup> (Regions 1 and 3) 14.4-14.5 GHz 14.5-14.8 GHz 51.4-52.4 GHz	Fixed-satellite	21.2, 21.3 and 21.5
...	...	...

**Section III – Power limits for earth stations**

MOD

TABLE 21-3 (Rev.WRC-19)

Frequency band	Services
...	...
14.3-14.4 GHz <sup>6</sup> (for Regions 1 and 3) 14.4-14.8 GHz 17.7-18.1 GHz 22.55-23.15 GHz 27.0-27.5 GHz <sup>6</sup> (for Regions 2 and 3) 27.5-29.5 GHz 31.0-31.3 GHz (for the countries listed in No. 5.545) 34.2-35.2 GHz (for the countries listed in No. 5.550 with respect to the countries listed in No. 5.549) 51.4-52.4 GHz	Fixed-satellite Earth exploration-satellite Mobile-satellite Space research Fixed-satellite

## Section V – Limits of power flux-density from space stations

### MOD

AI 9.2

TABLE 21-4 (continued) (Rev.WRC-19)

Frequency band	Service*	Limit in dB(W/m <sup>2</sup> ) for angles of arrival ( $\delta$ ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
...					
40-40.5 GHz	Fixed-satellite Mobile-satellite	-115	$-115 + 0.5(\delta - 5)$	-105	1 MHz
...					

### MOD

AI 4

<sup>10</sup> 21.16.3A Resolution 903 (Rev.WRC-19) shall apply. (WRC-19)

## ARTICLE 22

AI 1.6

AI 9.2

### Space services<sup>1</sup>

#### Section II – Control of interference to geostationary-satellite systems

### MOD

AI 4

22.5CA 2) The limits given in Tables 22-1A to 22-1E may be exceeded on the territory of any country whose administration has so agreed (see also Resolution 140 Rev.WRC-15)). (WRC-19)

### MOD

AI 9.2

22.5H 5) The limits specified in Nos. 22.5C (except for Table 22-1E) to 22.5D (except for Table 22-2 for the frequency band 5 925-6 725 MHz) and 22.5F apply to non-geostationary-satellite systems in the fixed-satellite service for which complete coordination or notification information, as appropriate, has been received by the Bureau after 22 November 1997. The limits specified in Table 22-1E and those specified in Table 22-2 for the frequency band 5 925-6 725 MHz apply to non-geostationary-satellite systems in the fixed-satellite service for which complete notification information has been received by the Bureau after 5 July 2003. The limits in Tables 22-4A, 22-4A1 and 22-4B not apply to non-geostationary-satellite systems in the fixed-satellite service for which complete coordination or notification information, as appropriate, has been received by the Bureau before 22 November 1997. (WRC-19)



**MOD**

**22.5I** 6) An administration operating a non-geostationary-satellite system in the fixed-satellite service which is in compliance with the limits in Nos. **22.5C**, **22.5D** and **22.5F** shall be considered as having fulfilled its obligations under No. **22.2** with respect to any geostationary-satellite network, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite system and the geostationary-satellite network, provided that the  $\text{epfd}\downarrow$  radiated by the non-geostationary-satellite system in the fixed-satellite service into any operating geostationary fixed-satellite service earth station does not exceed the operational and additional operational limits given in Tables **22-4A**, **22-4A1** and **22-4B**, when the diameter of the earth station antenna is equal to the values given in Table **22-4A** or **22-4A1**, or the gain of the earth station is equal to or greater than the values given in Table **22-4B** for the corresponding orbital inclination of the geostationary fixed-satellite service satellite. Except as otherwise agreed between concerned administrations, an administration operating a non-geostationary-satellite system in the fixed-satellite service that is subject to the limits in Nos. **22.5C**, **22.5D** and **22.5F** and which radiates  $\text{epfd}\downarrow$  into any operating geostationary fixed-satellite service earth station at levels in excess of the operational or additional operational limits given in Tables **22-4A**, **22-4A1** and **22-4B**, when the diameter of the earth station antenna is equal to the values given in Tables **22-4A** or **22-4A1**, or the gain of the earth station is equal to or greater than the values given in Table **22-4B** for the corresponding orbital inclination of the geostationary fixed-satellite service satellite, shall be considered to be in violation of its obligations under No. **22.2**, and the provisions of Article **15** (Section V) apply. In addition, administrations are encouraged to use the relevant ITU-R Recommendations to determine whether such a violation has occurred. (WRC-19)

**SUP**TABLE **22-4C** (WRC-2000)

**Operational limits to the  $\text{epfd}\downarrow$  radiated by non-geostationary-satellite systems in the fixed-satellite service in certain frequency bands<sup>26</sup>**

**SUP**

<sup>26</sup> **22.5H.6**

**ADD**

**22.5L** 9) A non-geostationary-satellite system in the fixed-satellite service in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) shall not exceed:

- a single-entry increase of 3 per cent of the time allowance for the  $C/N$  value associated with the shortest percentage of time specified in the short-term performance objective of the generic<sup>ADD 1</sup> GSO reference links; and
- a single-entry permissible allowance of at most 3 per cent reduction in time-weighted average spectral efficiency calculated on an annual basis for the generic GSO reference links using adaptive coding and modulation. (WRC-19)

**ADD**

AI 1.6

1 **22.5L.1** Generic GSO reference links are comprised of parametric link budget parameters and are used for the purpose of determining the compliance of a non-GSO system with respect to No. **22.5L**. The generic GSO reference link parameters are found in Table 1 of Annex 1 to Resolution **COM5/11 (WRC-19)**.

The procedures and methodologies specified in Resolution **COM5/11 (WRC-19)** shall be used for the calculations. The equivalent-power flux density levels from the non-GSO FSS system should be derived using the most recent version of Recommendation ITU-R S.1503. (WRC-19)

**ADD**

AI 1.6

**22.5M** 10) Administrations operating or planning to operate non-geostationary-satellite systems in the fixed-satellite service in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space), and 50.4-51.4 GHz (Earth-to-space) shall ensure that the aggregate interference to GSO FSS, MSS, and BSS networks caused by all non-GSO FSS systems operating in these frequency bands does not exceed:

- an increase of 10 per cent of the time allowance for the  $C/N$  value associated with the shortest percentage of time specified in the short-term performance objective of the generic GSO reference links; and
- a reduction of at most 8 per cent in a calculated annual time-weighted average spectral efficiency for the generic GSO reference links using adaptive coding and modulation, taking into account that the methodology ensures that the degradation of time-weighted average spectral efficiency on each link is lower than the maximum permissible reduction,

for each generic GSO reference link in Annex 1 of Resolution **COM5/11 (WRC-19)**.

And:

- an increase of 10 per cent of the time allowance for the  $C/N$  values associated with the short-term performance objectives of the supplemental GSO links; and
- a reduction of at most 8 per cent in a calculated annual time-weighted average spectral efficiency for the supplemental GSO links associated with notified and brought into use frequency assignments using adaptive coding and modulation, taking into account that the methodology ensures that the degradation of time-weighted average spectral efficiency on each link is lower than the maximum permissible reduction,

Resolution **COM5/10 (WRC-19)** shall also apply. (WRC-19)

**MOD**

**22.5K** 8) Administrations operating or planning to operate non-geostationary-satellite systems in the fixed-satellite service in the frequency bands listed in Tables **22-1A** to **22-1D** of No. **22.5C** will apply the provisions of Resolution **76 (Rev.WRC-15)** to ensure that the actual aggregate interference into geostationary fixed-satellite service and geostationary broadcasting-satellite service networks caused by such systems operating co-frequency in these frequency bands does not exceed the aggregate power levels shown in Tables **1A** to **1D** of Resolution **76 (Rev.WRC-15)**. In the event that an administration operating a geostationary-satellite network in conformity with the Radio Regulations identifies equivalent power flux-density levels from non-geostationary-satellite systems in the fixed-satellite service which may be in excess of the aggregate limits contained in Tables **1A** to **1D** of Resolution **76 (Rev.WRC-15)**, the administrations responsible for the non-geostationary-satellite systems in the fixed-satellite service will apply the provisions contained in *resolves 2* of Resolution **76 (Rev.WRC-15)**. (WRC-19)

**ARTICLE 32****Operational procedures for distress communications in the global maritime distress and safety system (GMDSS)** (WRC-07)**Section II – Distress alerting and distress calling** (WRC-07)**32.8***A – General***MOD**

**32.10A** § 7A 1) A distress alert is false if it was transmitted without any indication that a mobile unit or person was in distress and required immediate assistance (see No. 32.9). Administrations receiving a false distress alert shall report this infringement in accordance with Section V of Article 15, if that alert:

- a) was transmitted intentionally;
- b) was not cancelled in accordance with No. **32.53A** and **Resolution 349 (Rev.WRC-19)**;
- c) could not be verified as a result of either the ship's failure to keep watch on appropriate frequencies in accordance with Nos. **31.16** to **31.20**, or its failure to respond to calls from an authorized rescue authority;
- d) was repeated; or
- e) was transmitted using a false identity.

Administrations receiving such a report shall take appropriate steps to ensure that the infringement does not recur. No action should normally be taken against any ship or mariner for reporting and cancelling a false distress alert. (WRC-19)



AI 4

AI 4

## ARTICLE 33

**Operational procedures for urgency and safety communications in the global maritime distress and safety system (GMDSS)**

**Section V – Transmission of maritime safety information<sup>2</sup>**

**33.49** *E – Maritime safety information via satellite*

**MOD**

**33.50** § 26 Maritime safety information may be transmitted via satellite in the maritime mobile-satellite service using the frequency bands 1 530-1 545 MHz and 1 621.35-1 626.5 MHz (see Appendix 15). (WRC-19)

**Section VII – Use of other frequencies for safety** (WRC-07)

**MOD**

**33.53** § 28 Radiocommunications for safety purposes concerning ship reporting communications, communications relating to the navigation, movements and needs of ships and weather observation messages may be conducted on any appropriate communications frequency, including those used for public correspondence. In terrestrial systems, the frequency bands 415-535 kHz (see Article 52), 1 606.5-4 000 kHz (see Article 52), 4 000-27 500 kHz (see Appendix 17), and 156-174 MHz (see Appendix 18) are used for this function. In the maritime mobile-satellite service, frequencies in the bands 1 530-1 544 MHz, 1 621.35-1 626.5 MHz and 1 626.5-1 645.5 MHz are used for this function as well as for distress alerting purposes (see No. 32.2). (WRC-19)

## ARTICLE 59

**Entry into force and provisional application of the Radio Regulations** (WRC-12)

**MOD**

**59.1** These Regulations, which complement the provisions of the Constitution and Convention of the International Telecommunication Union, and as revised and contained in the Final Acts of WRC-95, WRC-97, WRC-2000, WRC-03, WRC-07, WRC-12, WRC-15 and WRC-19, shall be applied, pursuant to Article 54 of the Constitution, on the following basis. (WRC-19)

**MOD**

**59.14** – the revised provisions for which other effective dates of application are stipulated in Resolutions:

**31 (WRC-15)\*\*\*\*\*** and **99 (WRC-15)\*\*\*\*\*** (WRC-19)

**ADD**

**59.15** The other provisions of these Regulations, as revised by WRC-19, shall enter into force on 1 January 2021, with the following exceptions: (WRC-19)

**ADD**

**59.16** – the revised provisions for which other effective dates of application are stipulated in Resolution:

**99 (Rev.WRC-19)** (WRC-19)

**MOD**

4.1.13 The agreement of the administrations affected may also be obtained in accordance with this Article, for a specified period. When this specific period of agreement expires for an assignment in the List, the assignment in question shall be maintained in the List until the end of the period referred to in § 4.1.3 above. After that date this assignment shall lapse unless the agreement of the administrations affected is renewed<sup>a</sup>. (WRC-19)

## APPENDIX 1 (REV.WRC-12)

AI 2

**Classification of emissions and necessary bandwidths****MOD**

§ 1 1) Emissions shall be designated according to their necessary bandwidth and their classification as explained in this Appendix.

2) Formulae and examples of emissions designated in accordance with this Appendix are given in Recommendation ITU-R SM.1138-3. Further examples may be provided in other ITU-R Recommendations. These examples may also be published in the **Preface to the International Frequency Information Circular (BR IFIC)**. (WRC-19)

\*\*\*\*\* *Note by the Secretariat:* This Resolution was abrogated by WRC-19.

\*\*\*\*\* *Note by the Secretariat:* This Resolution was revised by WRC-19.

<sup>a</sup> Unless the Bureau has been informed by the notifying administration of the renewal of the agreement, it shall, no later than six months before the end of the specified period, send a reminder to the notifying administration. (WRC-19)

AI 2

## Section I – Necessary bandwidth

### MOD

§ 2 1) The necessary bandwidth, as defined in No. **1.152** and determined in accordance with the formulae and examples, shall be expressed by three numerals and one letter. The letter occupies the position of the decimal point and represents the unit of bandwidth. The first character shall be neither zero nor K, M or G.

2) Necessary bandwidths<sup>1</sup>:

between 0.001 and 999 Hz shall be expressed in Hz (letter H);

between 1.00 and 999 kHz shall be expressed in kHz (letter K);

between 1.00 and 999 MHz shall be expressed in MHz (letter M);

between 1.00 and 999 GHz shall be expressed in GHz (letter G).

3) For the full designation of an emission, the necessary bandwidth, indicated in four characters, shall be added just before the classification symbols. When used, the necessary bandwidth shall be determined by one of the following methods:

- 3.1) use of the formulae and examples of necessary bandwidths and designation of corresponding emissions given in Recommendation **ITU-R SM.1138-3**; (WRC-19)
- 3.2) computation, in accordance with other ITU-R Recommendations;
- 3.3) measurement, in cases not covered by § 3.1) or 3.2) above.



AI 1.14

AI 1.8  
Issue B

AI 1.5

## APPENDIX 4 (REV.WRC-15)

AI 1.6

### Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

AI 7(A)

AI 7(I)

AI 7(C)

AI 9.1.9

AI 7(H)

AI 9.2

## ANNEX 1

### Characteristics of stations in the terrestrial services<sup>1</sup>

<sup>1</sup> Examples:

0.002 Hz = H002	6 kHz = 6K00	1.25 MHz = 1M25
0.1 Hz = H100	12.5 kHz = 12K5	2 MHz = 2M00
25.3 Hz = 25H3	180.4 kHz = 180K	10 MHz = 10M0
400 Hz = 400H	180.5 kHz = 181K	202 MHz = 202M
2.4 kHz = 2K40	180.7 kHz = 181K	5.65 GHz = 5G65

<sup>1</sup> The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the BR IFIC (Terrestrial Services).

## Footnotes to Tables 1 and 2

### MOD

<sup>1</sup> The most recent version of Recommendation ITU-R SF.675 should be used to the extent applicable in calculating the maximum power density per Hz.

TABLE 2  
**Characteristics for high altitude platform stations (HAPS) frequency assignments  
 in the terrestrial services**

Item identifier	<i>1 - GENERAL CHARACTERISTICS OF THE HAPS</i>	Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2	Receiving station in the bands listed in No. 5.388A for the application of No. 11.9	Transmitting station in the bands listed in Nos. 5.457, 5.537A, 5.B114, 5.C114, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.2	Receiving station in the bands listed in Nos. 5.457, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.9	Item identifier
	<b>GENERAL INFORMATION</b>					
1.B	the symbol of the notifying administration (see the Preface)	X	X	X	X	1.B
1.D	the provision code of the Radio Regulations under which the notice has been submitted	X	X	X	X	1.D
1.ID1	the unique identifier given by the administration to the station	X	X	X	X	1.ID1
	<b>LOCATION OF THE STATION</b>					
1.4.a	the name by which the station is known	X	X	X	X	1.4.a
1.4.b	the code of the geographical area, above which the station is located (see the Preface)	X	X	X	X	1.4.b
1.4.c	the nominal geographical coordinates of the station Latitude and longitude are provided in degrees, minutes and seconds	X	X	X	X	1.4.c
1.4.h	the nominal altitude of the station above mean sea level, in metres	X	X	X	X	1.4.h
1.4.t	<b>Station location tolerances:</b>					1.4.t
1.4.t.1.a	the planned latitudinal tolerance northerly limit, using d.m.s units	X	X	X	X	1.4.t.1.a
1.4.t.1.b	the planned latitudinal tolerance southerly limit, using d.m.s units	X	X	X	X	1.4.t.1.b
1.4.t.2.a	the planned longitudinal tolerance easterly limit, using d.m.s units	X	X	X	X	1.4.t.2.a
1.4.t.2.b	the planned longitudinal tolerance westerly limit, using d.m.s units	X	X	X	X	1.4.t.2.b
1.4.t.3	the planned altitudinal tolerance, in metres	X	X	X	X	1.4.t.3
	<b>COMPLIANCE WITH TECHNICAL OR OPERATIONAL LIMITS</b>					
1.14.b	a commitment that the HAPS does not exceed an out-of-band pfd of $-165 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$ at the Earth's surface in the bands 2 160-2 200 MHz in Region 2 and 2 170-2 200 MHz in Regions 1 and 3 (see Resolution 221 (Rev.WRC-07))	X				1.14.b
1.14.c	a commitment that the HAPS does not exceed the out-of-band pfd limits of $-165 \text{ dB(W/(m}^2 \cdot \text{MHz))}$ for angles of arrival ( $\theta$ ) less than $5^\circ$ above the horizontal plane, $-165 + 1.75 (\theta - 5) \text{ dB(W/(m}^2 \cdot \text{MHz))}$ for angles of arrival	X				1.14.c

Item identifier	<i>1 - GENERAL CHARACTERISTICS OF THE HAPS</i>	Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2	Receiving station in the bands listed in No. 5.388A for the application of No. 11.9	Transmitting station in the bands listed in Nos. 5.457, 5.537A, 5.B114, 5.C114, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.2	Receiving station in the bands listed in Nos. 5.457, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.9	Item identifier
	between 5° and 25° and -130 dB(W/(m <sup>2</sup> · MHz)) for angles of arrival between 25° and 90° (see Resolution 221 (Rev.WRC-07))					
1.14.d	a commitment that the antenna pattern complies with the reference antenna pattern defined in <i>resolves</i> 1 of Resolution 150 (WRC-12) Required in the band 6 560-6 640 MHz				+	1.14.d
1.14.e	a commitment that the aggregate power flux-density (pfd) of HAPS uplinks is limited to a maximum of -183.9 dB(W/(m <sup>2</sup> · 4 kHz)) at any point in the geostationary arc. To meet this aggregate power flux-density (pfd) criterion, the maximum e.i.r.p. density value of a single HAPS gateway link towards the geostationary arc shall not exceed -59.9 dB(W/4 kHz) in any direction within ±5 degrees of the geostationary arc (see Resolution 150 (WRC-12)) Required in the band 6 560-6 640 MHz				+	1.14.e
1.14.f	a commitment that the e.i.r.p. density per HAPS in the bands 21.2-21.4 GHz and 22.21-22.5 GHz does not exceed -0.76 θ - 9.5 dB(W/100 MHz) for angles of arrival between -4.53° and 35.5° and -36.5 dB(W/100MHz) for angles of arrival between 35.5° and 90° (see Resolution COM4/3 (WRC-19)) Required in the band 21.4-22 GHz			+		1.14.f
1.14.g	a commitment that the unwanted emission power flux-density produced by the HAPS does not exceed -176 dB(W/(m <sup>2</sup> · 290 MHz)) for continuum observations, and -192 dB(W/(m <sup>2</sup> · 250 kHz)) for spectral line observations in the band 22.21-22.5 GHz at an RAS station location at a height of 50 m (see Resolution COM4/3 (WRC-19)) Required in the band 21.4-22 GHz			+		1.14.g
1.14.h	a commitment that, for the purpose of protecting the aeronautical mobile service operating in the band 21.2-21.5 GHz, the e.i.r.p. density per HAPS in the bands 21.4-21.5 GHz does not exceed 17.5 dB(W/100 MHz) (see Resolution COM4/3 (WRC-19)) Required in the band 21.4-22 GHz			+		1.14.h
1.14.i	a commitment that the e.i.r.p. density per HAPS in the band 23.6-24GHz does not exceed -0.7714 θ -16.5 dB(W/200 MHz) for angles of arrival between -4.53° and 35° and -43.5 dB(W/200 MHz) for angles of arrival between 35° and 90° (see Resolution COM4/4 (WRC-19)) Required in the band 24.25-25.25 GHz			+		1.14.i
1.14.j	a commitment that the power flux-density produced by unwanted emissions from the HAPS does not exceed -177 dB(W/(m <sup>2</sup> · 400 MHz)) for continuum observations and -191 dB(W/(m <sup>2</sup> · 250 kHz)) for spectral line observations in the band 23.6-24 GHz at an RAS station location at the height of 50 m (see Resolution COM4/4 (WRC-19))			+		1.14.j



Item identifier	<i>1 - GENERAL CHARACTERISTICS OF THE HAPS</i>	Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2	Receiving station in the bands listed in No. 5.388A for the application of No. 11.9	Transmitting station in the bands listed in Nos. 5.457, 5.537A, 5.B114, 5.C114, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.2	Receiving station in the bands listed in Nos. 5.457, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.9	Item identifier
	Required in the band 24.25-25.25 GHz					
1.14.k	a commitment that the level of unwanted power density into the HAPS ground station antenna in the band 31.3-31.8 GHz does not exceed $-83$ dB(W/200 MHz) under clear-sky conditions and may be increased under rainy conditions to mitigate fading due to rain, provided that the effective impact on the passive satellite does not exceed the impact under clear-sky conditions (see Resolution COM4/5 (WRC-19)) Required in the band 31-31.3 GHz			+		1.14.k
1.14.l	a commitment that the e.i.r.p. density per HAPS in the band 31.3-31.8 GHz does not exceed $-0 - 13.1$ dB(W/200 MHz) for angles of arrival between $-4.53^\circ$ and $22^\circ$ and $-35.1$ dB(W/200 MHz) for angles of arrival between $22^\circ$ and $90^\circ$ (see Resolution COM4/5 (WRC-19)) Required in the band 31-31.3 GHz			+		1.14.l
1.14.m	a commitment that the power flux-density produced by unwanted emissions from the HAPS ground station does not exceed $-141$ dB(W/(m <sup>2</sup> · 500 MHz)) in the band 31.3-31.8 GHz at an RAS station location at the height of 50 m (see Resolution COM4/5 (WRC-19)) Required in the band 31-31.3 GHz				+	1.14.m
1.14.n	a commitment that the power flux-density produced by unwanted emissions from the HAPS does not exceed $-171$ dB(W/(m <sup>2</sup> · 500 MHz)) in the band 31.3-31.8 GHz at an RAS station location at the height of 50 m. (see Resolution COM4/5 (WRC-19)) Required in the band 31-31.3 GHz			+		1.14.n
1.14.o	a commitment that the space research service (space-to-Earth) protection level of $-217$ dB(W/Hz) at the input of SRS receiver in the 37.0-38.0 GHz band with 0.001% exceedance due to atmospheric and precipitation effects, as referred to in the relevant ITU-R Recommendations, is not exceeded. (see Resolution COM4/6 (WRC-19)) Required in the band 38-39.5 GHz			+	+	1.14.o
1.14.p	A commitment that the HAPS operation shall be in conformity with the Radio Regulations, including this Resolution. (see Resolution COM4/6 (WRC-19)) Required in the band 38-39.5 GHz			+	+	1.14.p
1.14.q	a commitment that, upon receiving an unacceptable interference report with relevant justification on the exceedance of the limits set in this Resolution, the notifying administration for the HAPS system shall take the required action to eliminate the interference or reduce it an acceptable level. (see Resolution COM4/6 (WRC-19)) Required in the band 38-39.5 GHz			+	+	1.14.q
1.14.r	a commitment that the separation distance between the nadir of the HAPS and a radio astronomy station operating in the band 48.94-49.04 GHz within the territory of another administration shall exceed 50 km (see Resolution 122 (Rev.WRC-19)) Required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz			+		1.14.r

Item identifier	<i>1 - GENERAL CHARACTERISTICS OF THE HAPS</i>	Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2	Receiving station in the bands listed in No. 5.388A for the application of No. 11.9	Transmitting station in the bands listed in Nos. 5.457, 5.537A, 5.B114, 5.C114, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.2	Receiving station in the bands listed in Nos. 5.457, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.9	Item identifier
<b>COORDINATION AND AGREEMENT</b>						
1.11.a	the symbol of each administration with which coordination has been successfully effected, including where the agreement is to exceed the limits prescribed in the Radio Regulations  Required if coordination is necessary and has been obtained pursuant to the relevant provisions of the Radio Regulations	+	+	+	+	1.11.a
<b>OPERATING ADMINISTRATION OR AGENCY</b>						
1.12.a	the symbol for the operating agency	O	O	O	O	1.12.a
1.12.b	the symbol for the address of the administration responsible for the station and to which communication should be sent on urgent matters regarding interference, quality of emissions and questions referring to the technical operation of the circuit (see Article 15)	X	X	X	X	1.12.b
<b>REMARKS</b>						
1.13.c	Remarks for assisting the Bureau in processing the notice	O	O	O	O	1.13.c

Item identifier	2 - CHARACTERISTICS TO BE PROVIDED FOR EACH INDIVIDUAL OR COMPOSITE HAPS ANTENNA BEAM	Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2	Receiving station in the bands listed in No. 5.388A for the application of No. 11.9	Transmitting station in the bands listed in Nos. 5.457, 5.537A, 5.B114, 5.C114, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.2	Receiving station in the bands listed in Nos. 5.457, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.9	Item identifier
	<b>IDENTIFICATION AND DIRECTION OF THE HAPS ANTENNA BEAM</b>					
2.1.a	the identification of the HAPS antenna beam	X	X	X	X	2.1.a
2.1.b	an indicator showing whether the antenna beam, under 2.1.a, is fixed or whether it is steerable and/or reconfigurable	X	X	X	X	2.1.b
2.1.c	an indicator showing whether the HAPS antenna tracks the service area	X		X		2.1.c
2.1.d	an indicator showing whether the antenna beam is individual or composite beam	X	X	X	X	2.1.d
	<b>ANTENNA CHARACTERISTICS</b>					
2.9.e	the height of the antenna above ground level, in metres, in the case of a HAPS transmitting ground station Required for an assignment in the bands shared with space services (space-to-Earth)				+	2.9.e
2.9.f	antenna diameter, in metres, in the case of a HAPS transmitting ground station Required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz				+	2.9.f
2.9.g	the maximum co-polar isotropic gain	X	X	X	X	2.9.g
2.9.j	the measured radiation pattern of the antenna, the reference radiation pattern or the symbols in standard references to be used for coordination	X	X	X	X	2.9.j
2.9.gp	the co-polar antenna gain contours plotted on a map of the Earth's surface, preferably in a radial projection from the HAPS onto a plane perpendicular to the axis from the centre of the Earth to the HAPS  The HAPS antenna gain contours shall be drawn as isolines of the isotropic gain, relative to the maximum antenna gain, when any of these contours is located either totally or partially outside the territory of the notifying administration  The antenna gain contours shall include the effects of the planned longitudinal and latitudinal tolerance, planned altitudinal tolerance and the pointing accuracy of the antenna, taking into consideration the movement of the HAPS antenna boresight around the effective boresight area	X	X	X	X	2.9.gp

Item identifier	3 – CHARACTERISTICS TO BE PROVIDED FOR EACH FREQUENCY ASSIGNMENT FOR EACH INDIVIDUAL OR COMPOSITE HAPS ANTENNA BEAM	Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2	Receiving station in the bands listed in No. 5.388A for the application of No. 11.9	Transmitting station in the bands listed in Nos. 5.457, 5.537A, 5.B114, 5.C114, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.2	Receiving station in the bands listed in Nos. 5.457, 5.D114, 5.F114, 5.G114B and 5.552A for the application of No. 11.9	Item identifier
	<b>ASSIGNED FREQUENCY</b>					
3.1.a	the assigned frequency, as defined in No. 1.148	X	X	X	X	3.1.a
3.1.b	the reference frequency, as defined in Article 1 Required if the modulation envelope is asymmetric	+	+	+	+	3.1.b
	<b>DATE OF OPERATION</b>					
3.2.c	the date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into use	X	X	X	X	3.2.c
	<b>LOCATION OF THE ASSOCIATED ANTENNA(S)</b>					
3.5.c	the geographical coordinates of the ground station(s) in the fixed service Required in the bands 6 560-6 640 MHz and 25.25-27 GHz, 31-31.3 GHz, and 38-39.5 GHz; Required in the other bands, if neither the geographical coordinates of a given zone (3.c.a) nor a geographical area (3.5.d) nor a circular area (3.5.e and 3.5.f) are provided			+	+	3.5.c
	<b>For an area in which associated transmitting/receiving ground station(s) operate:</b>					
3.5.c.a	the geographical coordinates of a given zone A minimum of six geographical coordinates are required, in degrees, minutes and seconds <i>Note</i> – For the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz the geographical coordinates are provided for each of the UAC, SAC and if applicable RAC (see the most recent version of Recommendation ITU-R F.1500) Required if neither a circular area (3.5.e and 3.5.f) nor a geographical area (3.5.d) are provided	+	+	+	+	3.5.c.a
3.5.d	the code of the geographical area (see the Preface) <i>Note</i> – For the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz separate geographical areas are provided for each of the UAC, SAC and if applicable RAC (see the most recent version of Recommendation ITU-R F.1500) Required if neither a circular area (3.5.e and 3.5.f) nor the geographical coordinates of a given zone (3.5.c.a) are provided	+	+	+	+	3.5.d
3.5.e	the geographical coordinates of the centre of the circular area in which the associated ground station(s) are operating The latitude and longitude are provided in degrees, minutes and seconds <i>Note</i> – For the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz different centres of the circular area may be provided for the UAC, SAC and if applicable RAC (see the most recent version of Recommendation ITU-R F.1500) Required if neither a geographical area (3.5.d) or geographical coordinates of a given zone (3.5.c.a) are provided	+	+	+	+	3.5.e

Item identifier	3 - CHARACTERISTICS TO BE PROVIDED FOR EACH FREQUENCY ASSIGNMENT FOR EACH INDIVIDUAL OR COMPOSITE HAPS ANTENNA BEAM	Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2	Receiving station in the bands listed in No. 5.388A for the application of No. 11.9	Transmitting station in the bands listed in Nos. 5.457, 5.537A, 5.B114, 5.C114, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.2	Receiving station in the bands listed in Nos. 5.457, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.9	Item identifier
3.5.f	<p>the radius, in km, of the circular area</p> <p><i>Note</i> – For the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz, a separate radius is provided for each of the UAC, SAC and if applicable RAC (see the most recent version of Recommendation ITU-R F.1500)</p> <p>Required if neither a geographical area (3.5.d) nor geographical coordinates of a given zone (3.5.c.a) are provided</p>	+	+	+	+	3.5.f
<b>CLASS OF STATION AND NATURE OF SERVICE</b>						
3.6.a	the class of station, using the symbols from the Preface	X	X	X	X	3.6.a
3.6.b	the nature of service, using the symbols from the Preface	X	X	X	X	3.6.b
<b>CLASS OF EMISSION AND NECESSARY BANDWIDTH</b> <i>(in accordance with Article 2 and Appendix 1)</i>						
3.7.a	the class of emission	X	X	X	X	3.7.a
3.7.b	the necessary bandwidth	X	X	X	X	3.7.b
<b>POWER CHARACTERISTICS OF THE TRANSMISSION</b>						
3.8	the symbol (X, Y or Z, as appropriate) describing the type of power (see Article 1) corresponding to the class of emission	X	X	X	X	3.8.
3.8.aa	<p>the power delivered to the antenna, in dBW, excluding the level of power control in 3.8.BA under clear-sky conditions</p> <p><i>Note</i> – For a receiving HAPS, the power delivered to the antenna refers to the associated transmitting ground station(s)</p>	X		X	X	3.8.aa
3.8.AB	the power density <sup>1</sup> averaged over the worst 1 MHz band delivered to the antenna under clear-sky conditions	X		X		3.8.AB
3.8.BA	<p>the range of power control, in dB</p> <p><i>Note</i> – For a receiving HAPS, the power control refers to its use by the associated transmitting ground station(s)</p> <p>In the case of a transmitting HAPS, required in the bands, 21.4-22 GHz, 24.25-25.25 GHz, 27-27.5 GHz, 31-31.3 GHz, 38-39.5 GHz, 47.2-47.5 GHz and 47.9-48.2 GHz</p> <p>In the case of a receiving HAPS, required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz</p>	X		+	+	3.8.BA
<b>POLARIZATION AND RECEIVING SYSTEM NOISE TEMPERATURE</b>						
3.9.d	the code indicating the type of polarization (see the Preface)	X	X	X	X	3.9.d
3.9.j	<p>the reference radiation pattern of the associated ground station(s)</p> <p>Required in the bands 47.2-47.5 GHz and 47.9-48.2 GHz</p>			+	+	3.9.j
3.9.k	the lowest total receiving system noise temperature, in kelvins, referred to the output of the receiving antenna		X		X	3.9.k

Item identifier	3 - CHARACTERISTICS TO BE PROVIDED FOR EACH FREQUENCY ASSIGNMENT FOR EACH INDIVIDUAL OR COMPOSITE HAPS ANTENNA BEAM	Transmitting station in the bands listed in No. 5.388A for the application of No. 11.2	Receiving station in the bands listed in No. 5.388A for the application of No. 11.9	Transmitting station in the bands listed in Nos. 5.457, 5.537A, 5.B114, 5.C114, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.2	Receiving station in the bands listed in Nos. 5.457, 5.D114, 5.F114, 5.G114 and 5.552A for the application of No. 11.9	Item identifier
3.10.b	<b>HOURS OF OPERATION</b> the regular hours of operation (in hours and minutes from ... to ...) of the frequency assignment, in UTC	X	X	X	X	3.10.b

## ANNEX 2

**Characteristics of satellite networks, earth stations  
 or radio astronomy stations<sup>2</sup>** (Rev.WRC-12)

AI 1.8  
Issue B

AI 7(A)

AI 7(I)

AI 1.5

AI 9.1.9

AI 1.6

AI 7(C)

AI 9.2

Footnotes to Tables A, B, C and D

MOD

TABLE A

AI 9.2

**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,  
EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK OR SYSTEM, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network or system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network or system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network or system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.1	<b>IDENTITY OF THE SATELLITE NETWORK OR SYSTEM, EARTH STATION OR RADIOASTRONOMY STATION</b>										A.1	
...												
A.1.f.2	if the notice is submitted by the notifying administration in association with other administrations, the symbols of each of the administrations(see the Preface)	+	+	+	+	+		+	+	+	A.1.f.2	
...												

MOD

AI 1.6

**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,**  
**EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...												
A.4.b.6	For space stations operating in a frequency band subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L, the data elements to characterize properly the orbital operation of the non-geostationary-satellite system:										A.4.b.6	
...												
A.4.b.7	For space stations operating in a frequency band subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L, the data elements to characterize properly the performance of the non-geostationary-satellite system:										A.4.b.7	
...												
A.14	FOR STATIONS OPERATING IN A FREQUENCY BAND SUBJECT TO Nos. 22.5C, 22.5D, 22.5F OR 22.5L: SPECTRUM MASKS										A.14	
...												



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AI 9.2

**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,**  
**EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...	...	...	...	...	...	...	...	...	...	...	...	...
<b>A.5</b>	<b>COORDINATIONS</b>										<b>A.5</b>	
A.5.a.1	the symbol of any administration (see the Preface) with which coordination has been successfully effected Required only in the case of notification				+	+	+ <sup>1</sup>				A.5.a.1	
A.5.a.1.a	the name of satellite network or system with which coordination has been successfully effected for all notified assignments				0						A.5.a.1.a	
A.5.a.2	the symbol of any intergovernmental organization (see the Preface) with which coordination has been successfully effected Required only in the case of notification				+	+	+ <sup>1</sup>				A.5.a.2	
A.5.a.2.a	the name of satellite network or system with which coordination has been successfully effected for all notified assignments				0						A.5.a.2.a	
A.5.b.1	the symbol of any administration (see the Preface) with which coordination has been sought but not completed				0	0	0				A.5.b.1	
A.5.b.2	the symbol of any intergovernmental organization (see the Preface) with which coordination has been sought but not completed				0	0					A.5.b.2	

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.5.c	the related provision code (see the Preface) under which coordination has been sought or completed if either A.5.a.1 (and A.5.a.2) or A.5.b.1 (and A.5.b.2) has been supplied				+	+	+1				A.5.c	
<b>A.6</b>	<b>AGREEMENTS</b>										<b>A.6</b>	
A.6.a	if appropriate, the symbol of any administration or administration representing a group of administrations (see the Preface) with which agreement has been reached, including where the agreement is to exceed the limits prescribed in these Regulations				+	+	+1	+	+	+	A.6.a	
<b>A.6.a.1</b>	<b>the name of satellite network or system with which agreement has been reached for all notified assignments</b>				<b>O</b>						<b>A.6.a.1</b>	
A.6.b	if appropriate, the symbol of any intergovernmental organization (see the Preface) with which agreement has been reached, including where the agreement is to exceed the limits prescribed in these Regulations				+	+	+1	+	+	+	A.6.b	
<b>A.6.b.1</b>	<b>the name of satellite network or system with which agreement has been reached for all notified assignments</b>				<b>O</b>						<b>A.6.b.1</b>	
A.6.c	if agreement has been reached, the related provision code (see the Preface)				+	+	+1	+	+	+	A.6.c	
...	...	...	...	...	...	...	...	...	...	...	...	...

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AI 1.8  
Issue B

**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,**  
**EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...												
A.17	<b>COMPLIANCE WITH POWER FLUX-DENSITY, pfd, LIMITS</b>										A.17	
...												
A.17.XX	the equivalent power flux-density (epfd) produced at the site of a radio astronomy station in the frequency band 1 610.6-1 613.8 MHz, as defined in No. 5.372 Required only for non-geostationary-satellite systems operating in the mobile-satellite service (space-to-Earth) in the frequency band 1 613.8-1 626.5 MHz					+					A.17.XX	
...												

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TABLE A

**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,  
EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

AI 7(A)

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...												
A.18	<b>COMPLIANCE WITH NOTIFICATION OF AIRCRAFT EARTH STATION(S)</b>										A.18	
A.18.a	a commitment that the characteristics of the aircraft earth station (AES) in the aeronautical mobile-satellite service are within the characteristics of the specific and/or typical earth station published by the Bureau for the space station to which the AES is associated Required only for the band 14-14.5 GHz, when an aircraft earth station in the aeronautical mobile-satellite service communicates with a space station in the fixed-satellite service				+	+					A.18.a	
A.19	<b>COMPLIANCE WITH § 6.26 OF ARTICLE 6 OF APPENDIX 30B</b>										A.19	
A.19.a	a commitment that the use of the assignment shall not cause unacceptable interference to, nor claim protection from, those assignments for which agreement still needs to be obtained Required if the notice is submitted under § 6.25 of Article 6 of Appendix 30B								+		A.19.a	
A.20	<b>COMPLIANCE WITH RESOLUTION COM5/7 (WRC-19)</b>										A.20	

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.20.a	a commitment stating that the characteristics as modified will not cause more interference or require more protection than the characteristics provided in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary-satellite system					O					A.20.a	

MOD

AI 7(A)

**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,**  
**EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.1	<b>IDENTITY OF THE SATELLITE NETWORK, EARTH STATION OR RADIOASTRONOMY STATION</b>										A.1	
...												
A.2	<b>DATE OF BRINGING INTO USE</b>										A.2	
A.2.a	the date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into use For a frequency assignment to a GSO space station, including frequency assignments in Appendices 30, 30A and 30B, the date of bringing into use is as defined in Nos. 11.44B and 11.44.2 For a frequency assignment to a non-GSO space station, the date of bringing into use is as defined in Nos. 11.44C, 11.44D, 11.44E and 11.44.2, as applicable Whenever the assignment is changed in any of its basic characteristics (except in the case of a change under A.1.a, the date to be given shall be that of the latest change (actual or foreseen, as appropriate) Required only for notification				+	+	+	+	+	+	A.2.a	
A.2.b	for a space station, the period of validity of the frequency assignments (see Resolution 4 (Rev.WRC-03))			X	X	X					A.2.b	
A.2.c	the date (actual or foreseen, as appropriate) on which reception of the frequency band begins or on which any of the basic characteristics are modified										A.2.c	X
A.3	<b>OPERATING ADMINISTRATION OR AGENCY</b>										A.3	
...												

MOD

AI 7(H)

**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,**  
**EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...												
A.4.b	<b>For space station(s) onboard non-geostationary satellite(s):</b>										A.4.b	
A.4.b.1	the number of orbital planes			X		X					A.4.b.1	
A.4.b.1.a	<p>indicator of whether the non-geostationary-satellite system represents a “constellation”, where the term “constellation” describes a satellite system, for which the relative distribution of the orbital planes and satellites is defined</p> <p><i>Note</i> – Non-geostationary-satellite systems in frequency bands subject to the provisions of Nos. 9.12, 9.12A, 22.5C, 22.5D, 22.F or 22.5L are always considered as “constellations”</p>			X		X					A.4.b.1.a	
A.4.b.1.b	<p>indicator of whether all the orbital planes identified under A.4.b.1 describe a) a single configuration where all frequency assignments to the satellite system will be in use or b) multiple configurations that are mutually exclusive where a sub-set of the frequency assignments to the satellite system will be in use on one of the sub-sets of orbital parameters to be determined at the notification and recording stage of the satellite system</p> <p>Required only for the:</p> <ol style="list-style-type: none"> <li>1) advance publication information for a non-geostationary-satellite system representing a constellation (A.4.b.1.a), and</li> <li>2) coordination request for non-geostationary-satellite systems</li> </ol>			+		+					A.4.b.1.b	

Items in Appendix	<p style="text-align: center;"><i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i></p>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.1.c	<p>if the orbital planes identified under A.4.b.1 describe multiple mutually exclusive configurations, identification of the number of sub-sets of orbital characteristics that are mutually exclusive</p> <p>Required only for the:</p> <ol style="list-style-type: none"> <li>1) advance publication information for a non-geostationary-satellite system representing a constellation (A.4.b.1.a), and</li> <li>2) coordination request for non-geostationary-satellite systems</li> </ol>			+		+					A.4.b.1.c	
A.4.b.1.d	<p>if the orbital planes identified under A.4.b.1.b describe multiple mutually exclusive configurations, identification of the orbital planes' id numbers that are associated with each of the mutually exclusive configurations</p> <p>Required only for the:</p> <ol style="list-style-type: none"> <li>1) advance publication information for a non-geostationary-satellite system representing a constellation (A.4.b.1.a), and</li> <li>2) coordination request for non-geostationary-satellite systems</li> </ol>			+		+					A.4.b.1.d	
...												
A.4.b.3	<p><b>For space stations of a non-geostationary fixed-satellite service system operating in the frequency band 3 400-4 200 MHz:</b></p>										A.4.b.3	
...												
A.4.b.4.g	<p>the right ascension of the ascending node (<math>\Omega_j</math>) for the <math>j</math>-th orbital plane, measured counter-clockwise in the equatorial plane from the direction of the vernal equinox to the point where the satellite makes its South-to-North crossing of the equatorial plane (<math>0^\circ \leq \Omega_j &lt; 360^\circ</math>), determined at the reference time indicated in A.4.b.4.k and A.4.b.4.l</p> <p>Required only for space stations operating in a frequency band subject to the provisions of Nos. 9.12 or 9.12A</p> <p><i>Note</i> – All satellites in all orbital planes must use the same reference time. If no reference time is provided in A.4.b.4.k and A.4.b.4.l, it is assumed to be <math>t = 0</math></p>					+					A.4.b.4.g	



Items in Appendix	<p style="text-align: center;"><b>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</b></p>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.4.h	<p>the initial phase angle (<math>\omega_i</math>) of the <math>i</math>-th satellite in its orbital plane at reference time <math>t = 0</math>, measured from the point of the ascending node (<math>0^\circ \leq \omega_i &lt; 360^\circ</math>)</p> <p>Required only in the case of a non-geostationary-satellite system representing a “constellation” (A.4.b.1.a), and to be specified in:</p> <ol style="list-style-type: none"> <li>1) the advance publication information, for any frequency assignment not subject to the provisions of Section II of Article 9</li> <li>2) the coordination request, for any frequency assignment subject to the provisions of Nos. 9.12, 9.12A, 22.5C, 22.5D, 22.5F or 22.5L</li> <li>3) the notification, in all cases</li> </ol> <p>Note – The initial phase angle is the argument of perigee plus the true anomaly</p>			+		+					A.4.b.4.h	
A.4.b.4.i	<p>the argument of perigee (<math>\omega_p</math>), measured in the orbital plane, in the direction of motion, from the ascending node to the perigee (<math>0^\circ \leq \omega_p &lt; 360^\circ</math>)</p> <p>Required only for orbits of a “constellation” (A.4.b.1.a) where the altitudes of apogee and perigee (A.4.b.4.d and A.4.b.4.e) are different, and to be specified in:</p> <ol style="list-style-type: none"> <li>1) the advanced publication information, for any frequency assignment not subject to the provisions of Section II of Article 9</li> <li>2) the coordination request, for any frequency assignment subject to the provisions of Nos. 9.12, 9.12A, 22.5C, 22.5D, 22.5F or 22.5L</li> <li>3) the notification, in all cases</li> </ol>			+		+					A.4.b.4.i	

Items in Appendix	<p style="text-align: center;"><i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i></p>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.4.j	<p>the longitude of the ascending node (<math>\theta_j</math>) for the <math>j</math>-th orbital plane, measured counter-clockwise in the equatorial plane from the Greenwich meridian to the point where the satellite orbit makes its South-to-North crossing of the equatorial plane (<math>0^\circ \leq \theta_j &lt; 360^\circ</math>)</p> <p>Required only for orbits of a “constellation” (A.4.b.1.a), and to be specified in:</p> <ol style="list-style-type: none"> <li>1) the advance publication information, for any frequency assignment not subject to the provisions of Section II of Article 9</li> <li>2) the coordination request, for any frequency assignment subject to the provisions of Nos. 9.12, 9.12A, 22.5C, 22.5D, 22.5F or 22.5L</li> <li>3) the notification, in all cases</li> </ol> <p>Note – All satellites in all orbital planes must use the same reference time. If no reference time is provided in A.4.b.4.k and A.4.b.4.l, it is assumed to be <math>t = 0</math></p>			+		+					A.4.b.4.j	
A.4.b.4.k	the date (day:month:year) at which the satellite is at the location defined by the longitude of the ascending node ( $\theta_j$ ) (see Note under A.4.b.4.j)			O		O					A.4.b.4.k	
A.4.b.4.l	the time (hours:minutes) at which the satellite is at the location defined by the longitude of the ascending node ( $\theta_j$ ) (see Note under A.4.b.4.j)			O		O					A.4.b.4.l	
A.4.b.4.m	<p>indicator of whether the space station uses sun-synchronous orbit or not</p> <p>Required only in frequency bands not subject to the provisions of Nos 9.12 or 9.12A</p>			+		+					A.4.b.4.m	
A.4.b.4.n	if the space station uses sun-synchronous orbit (A.4.b.4.m), indicator of whether the space station references the local time of the ascending node (solar local time when the space station is crossing the equatorial plane in the South-North direction in hours:minutes format) or the descending node (solar local time when the space station is crossing the equatorial plane in the North-South direction in hours:minutes format)			O		O					A.4.b.4.n	
A.4.b.4.o	if the space station uses sun-synchronous orbit (A.4.b.4.m), the local time of the ascending (or descending, per A.4.b.4.n) node (solar local time when the space station is crossing the equatorial plane in the South-North (or North-South) direction in hours:minutes format)			O		O					A.4.b.4.o	
A.4.b.5	Not used										A.4.b.5	

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.6	<b>For space stations operating in a frequency band subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L, additional data elements to characterize properly the orbital operation of the non-geostationary-satellite system:</b>										A.4.b.6	
A.4.b.6bis	an indicator showing whether the set of operating parameters is provided in A.14.d (extended set of operating parameters) or provided in A.4.b.6.a and A.4.b.7 (limited set of operating parameters)					X					A.4.b.6bis	
A.4.b.6.a	<b>For each range of latitudes:</b> the limited set of operating parameters										A.4.b.6.a	
A.4.b.6.a.1	the maximum number of non-geostationary satellites transmitting with overlapping frequencies to a given location					+					A.4.b.6.a.1	
A.4.b.6.a.2	the associated start of the latitude range					+					A.4.b.6.a.2	
A.4.b.6.a.3	the associated end of the latitude range					+					A.4.b.6.a.3	
...												
A.4.b.6.g	Not used										A.4.b.6.g	
A.4.b.6.h	Not used										A.4.b.6.h	
A.4.b.6.i	Not used										A.4.b.6.i	
A.4.b.6.j	the longitudinal tolerance of the longitude of the ascending node					X					A.4.b.6.j	
A.4.b.7	<b>For space stations operating in a frequency band subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L, the data elements to characterize properly the performance of the non-geostationary-satellite system:</b> to be provided, if A.4.b.6bis indicates the limited set of operating parameters										A.4.b.7	
A.4.b.7.a	the maximum number of non-geostationary satellites receiving simultaneously with overlapping frequencies from the associated earth stations within a given cell					+					A.4.b.7.a	
A.4.b.7.b	the average number of associated earth stations with overlapping frequencies per square kilometre within a cell					+					A.4.b.7.b	

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A.4.b.7.c	the average distance, in kilometres, between co-frequency cells					+					A.4.b.7.c	
A.4.b.7.cbis	the minimum elevation angle at which any associated earth station can transmit to or receive from a non-geostationary satellite					+					A.4.b.7.cbis	
A.4.b.7.d	<b>For the exclusion zone about the geostationary-satellite orbit:</b>										A.4.b.7.d	
A.4.b.7.d.1	the type of zone (based on topocentric angle or satellite-based angle for establishing the exclusion zone)					+					A.4.b.7.d.1	
A.4.b.7.d.2	if the zone is based on a topocentric angle or a satellite-based angle, the width of the zone, in degrees					+					A.4.b.7.d.2	
A.4.b.7.d.3	<b>Not used</b>										A.4.b.7.d.3	
...												
A.14.a.4	the mask pattern defined in terms of the power in the reference bandwidth for a series of angles measured at the non-geostationary space station between the line to the sub-satellite point and the line to a point on the geostationary arc, together with the bandwidth used					X					A.14.a.4	
A.14.a.5	the reference bandwidth used for the mask pattern of A.14.a.4					X					A.14.a.5	
A.14.b	<b>For each associated earth station e.i.r.p. mask:</b>										A.14.b	
A.14.b.1	the mask identification code					X					A.14.b.1	
A.14.b.2	the lowest frequency for which the mask is valid					X					A.14.b.2	
A.14.b.3	the highest frequency for which the mask is valid					X					A.14.b.3	
A.14.b.4	<b>Not used</b>										A.14.b.4	
A.14.b.5	<b>Not used</b>										A.14.b.5	
A.14.b.6	the mask pattern defined in terms of the power in the reference bandwidth as a function of latitude and the off-axis angle between the non-geostationary earth station boresight line and the line from the non-geostationary earth station to a point on the GSO arc					X					A.14.b.6	
A.14.b.7	the reference bandwidth used for the mask pattern of A.14.b.6					X					A.14.b.7	

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...												
A.14.c.4	the type of mask, among one of the following types: (Earth-based exclusion zone angle, difference in longitude, latitude), (satellite-based exclusion zone angle, difference in longitude, latitude) or (satellite azimuth, satellite elevation, latitude)					X					A.14.c.4	
A.14.c.5	the mask pattern of the power flux-density defined in three dimensions					X					A.14.c.5	
A.14.c.6	the reference bandwidth used for the mask pattern of A.14.c.5					X					A.14.c.6	
A.14.d	<b>For each set of non-geostationary-satellite system operating parameters</b> to be provided, if A.4.b.6bis indicates the use of an extended set of operating parameters <i>Note</i> – There could be different sets of parameters at different frequency bands, but only one set of operating parameters for any frequency band used by the non-geostationary system										A.14.d	
A.14.d.1	the parameter set identification code					+					A.14.d.1	
A.14.d.2	the lowest frequency for which the mask is valid					+					A.14.d.2	
A.14.d.3	the highest frequency for which the mask is valid					+					A.14.d.3	
A.14.d.4	minimum limit of the latitude range of non-geostationary earth station locations in degrees North					+					A.14.d.4	
A.14.d.5	maximum limit of the latitude range of non-geostationary earth station locations in degrees North					+					A.14.d.5	
A.14.d.6	the average number of associated earth stations, per km <sup>2</sup> , active at the same time					+					A.14.d.6	
A.14.d.7	the average distance, in kilometres, between co-frequency cell or beam footprint centre					+					A.14.d.7	
A.14.d.8	the minimum duration, in seconds, during which an earth station will track a non-geostationary satellite without handover for different ranges of latitude					+					A.14.d.8	
A.14.d.9	the maximum number of co-frequency tracked non-geostationary satellites for different ranges of latitude					+					A.14.d.9	

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A.14.d.10	<p>the exclusion zone angle (degrees), i.e. the minimum angle to the geostationary arc at the non-geostationary earth station at which it will operate, defined at the earth station's given latitude range</p> <p><i>Note</i> – The exclusion zone angle could vary between non-geostationary system orbit planes. If the identification code of the orbital plane is not defined then it applies to all orbital planes</p>					+					A.14.d.10	
A.14.d.11	<p>the minimum elevation angle (degrees) of the non-geostationary earth station when it is receiving or transmitting within a given latitude (degrees North) and azimuth (degrees from North) range</p>					+					A.14.d.11	



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A.4.b.3	For space stations of a non-geostationary fixed-satellite service system operating in the frequency band 3 400-4 200 MHz:										A.4.b.3	
A.5.a.1	the symbol of any administration (see the Preface) with which coordination has been successfully effected Required only for notification				+	+	+1				A.5.a.1	
A.5.a.2	the symbol of any intergovernmental organization (see the Preface) with which coordination has been successfully effected Required only for notification				+	+	+1				A.5.a.2	
...											...	
A.5.c	if either A.5.a.1 (and A.5.a.2) or A.5.b.1 (and A.5.b.2) has been supplied, the related provision code (see the Preface) under which coordination has been sought or completed				+	+	+1				A.5.c	
...											...	
A.7.a	horizon elevation angle and distance										A.7.a	
...											...	
A.7.b	minimum/maximum antenna main beam elevation										A.7.b	
A.7.b.1	the planned minimum angle of elevation of the antenna's main beam axis, in degrees, from the horizontal plane For determining the minimum elevation angle of an earth station, due regard should be given to possible inclined-orbit operation of the associated geostationary space station Required only for earth stations operating with geostationary satellite						+1				A.7.b.1	X
A.7.b.2	the planned maximum angle of elevation of the antenna's main beam axis, in degrees, from the horizontal plane Required only for earth stations operating with geostationary satellite										A.7.b.2	X
A.7.c	operating azimuths of antenna main beam										A.7.c	
A.7.c.1	the start azimuth for the planned range of operating azimuthal angles for the antenna's main beam axis, in degrees, clockwise from True North For determining the start azimuth of an earth station, due regard should be given to possible inclined-orbit operation of the associated geostationary space station Required only for earth stations operating with geostationary satellite						+1				A.7.c.1	X
A.7.c.2	the end azimuth for the planned range of operating azimuthal angles for the antenna's main beam axis, in degrees, clockwise from True North For determining the end azimuth of an earth station, due regard should be given to possible inclined-orbit operation of the associated geostationary space station Required only for earth stations operating with geostationary satellite						+1				A.7.c.2	X
...											...	
A.7.e	the minimum angle of elevation of the antenna's main beam axis, in degrees, from the horizontal plane for each azimuth around the earth station Required only for earth stations operating with non-geostationary space stations						+				A.7.e	
...											...	
A.13.b	the reference and number of the coordination request in accordance with No. 9.6 For the notification of an earth station, the reference to the Special Section of the associated satellite network or system has to be provided For the notification of an earth station coordinated under No. 9.7A, the coordination Special Section number of this earth station has to be provided				X	X	X				A.13.b	
...											...	



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A.15.a	a commitment that the filed for system will meet the additional operational efd <sub>i</sub> limits that are specified in Table 22-4A1 under No. 22.51 Required only for non-geostationary-satellite systems operating in the fixed-satellite service in the frequency bands 10.7-11.7 GHz (in all Regions), 11.7-12.2 GHz (Region 2), 12.2-12.5 GHz (Region 3), and 12.5-12.75 GHz (Regions 1 and 3)									A.15.a		
<b>A.16</b>	<b>COMMITMENT REGARDING COMPLIANCE WITH OFF-AXIS POWER LIMITATIONS, POWER FLUX-DENSITY (pfd) LIMITS OR SEPARATION DISTANCE</b>										<b>A.16</b>	
A.16.a	a commitment that the associated earth stations operating with a geostationary-satellite network in the fixed-satellite service meet the off-axis power limitations given in Nos. 22.26 to 22.28 or 22.32 (as appropriate) under the conditions specified in Nos. 22.30, 22.31 and 22.34 to 22.39 Required only for earth stations that are subject to those power limitations									A.16.a		
A.16.b	a commitment by administrations that the filed system will meet the single entry power flux-density limits that are specified in No. 5.502 Required only for specific earth station antennas less than 4.5 m in diameter operating with geostationary space stations in the frequency band 13.75-14 GHz									A.16.b		
A.16.c	a commitment by administrations that the earth station associated with the filed system will meet the separation distance as specified in No. 5.509E and the power flux-density limits that are specified in No. 5.509D Required only for earth stations of geostationary-satellite networks operating in the fixed-satellite service in the frequency band 14.5-14.8 GHz except feeder links for the broadcasting satellite service									A.16.c		
<b>A.17</b>	<b>COMPLIANCE WITH POWER FLUX-DENSITY (pfd) LIMITS</b>										<b>A.17</b>	
A.17.a	a commitment of compliance with per-satellite power flux-density level produced at the Earth's surface of -129 dB(W/(m <sup>2</sup> · MHz)) in any 1 MHz band under free space propagation conditions Required only for satellite systems operating in the radionavigation-satellite service in the frequency band 1 164-1 215 MHz									A.17.a		
A.17.b.1	the calculated aggregate power flux-density produced at the Earth's surface by any geostationary radionavigation-satellite system in the frequency band 4 990-5 000 MHz in a 10 MHz bandwidth, as defined in <i>resolves</i> 1 of Resolution 741 (Rev.WRC-15) Required only for geostationary-satellite systems operating in the radionavigation-satellite service in the frequency band 5 010-5 030 MHz									A.17.b.1		
A.17.b.2	the calculated aggregate power flux-density produced at the Earth's surface by all space stations within any radionavigation-satellite service system in the frequency band 5 030-5 150 MHz in a 150 kHz bandwidth, as defined in No. 5.443B Required only for satellite systems operating in the radionavigation-satellite service in the frequency band 5 010-5 030 MHz									A.17.b.2		
...											...	
A.17.e.1	the calculated equivalent power flux-density produced at the site of a radio astronomy station in the frequency band 42.5-43.5 GHz, as defined in No. 5.551H Required only for non-geostationary-satellite systems operating in the fixed-satellite service and broadcasting-satellite service in the frequency band 42-42.5 GHz									A.17.e.1		
A.17.e.2	the calculated power flux-density produced at the site of a radio astronomy station in the frequency band 42.5-43.5 GHz, as defined in No. 5.551I Required only for geostationary-satellite systems operating in the fixed-satellite service and broadcasting-satellite service in the frequency band 42-42.5 GHz									A.17.e.2		

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A.18	<b>COMPLIANCE WITH NOTIFICATION OF AIRCRAFT EARTH STATION(S)</b>										A.18	
A.18.a	a commitment that the characteristics of the aircraft earth station (AES) in the aeronautical mobile-satellite service are within the characteristics of the specific and/or typical earth station published by the Bureau for the space station to which the AES is associated Required only for the frequency band 14-14.5 GHz, when an aircraft earth station in the aeronautical mobile-satellite service communicates with a space station in the fixed-satellite service				+	+					A.18.a	
A.19	<b>COMPLIANCE WITH § 6.26 OF ARTICLE 6 OF APPENDIX 30B OR WITH OTHER PROVISIONS REFERENCED BY ARTICLE 5</b>										A.19	
A.19.a	a commitment that the use of the assignment shall not cause unacceptable interference to, nor claim protection from, those assignments for which agreement still needs to be obtained Required only if the notice is submitted under § 6.25 of Article 6 of Appendix 30B									+	A.19.a	
A.19.b	a commitment in accordance with <i>resolves</i> 1.5 of Resolution 156 (WRC-15) that the administration responsible for the use of the assignment shall implement <i>resolves</i> 1.4 of Resolution 156 (WRC-15) Required only for geostationary-satellite networks operating in the fixed-satellite service in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz communicating with transmitting earth stations in motion				+						A.19.b	

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**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,**  
**EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

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...												
<b>A.20</b>	<b>COMPLIANCE WITH <i>resolves</i> 1.1.4 OF RESOLUTION COM5/6 (WRC-19)</b>										<b>A.20</b>	
A.20.a	a commitment that the ESIM operation would be in conformity with the Radio Regulations and Resolution <b>COM5/6 (WRC-19)</b> Required only for the notification of earth stations in motion submitted in accordance with Resolution <b>COM5/6 (WRC-19)</b>				+						A.20.a	
<b>A.21</b>	<b>COMPLIANCE WITH <i>resolves</i> 1.2.6 OF RESOLUTION COM5/6 (WRC-19)</b>										<b>A.21</b>	
A.21.a	a commitment that, upon receiving a report of unacceptable interference, the notifying administration for the GSO FSS network with which ESIMs communicate shall follow the procedures in <i>resolves</i> 4 of Resolution <b>COM5/6 (WRC-19)</b> Required only for the notification of earth stations in motion submitted in accordance with Resolution <b>COM5/6 (WRC-19)</b>				+						A.21.a	
<b>A.22</b>	<b>COMPLIANCE WITH <i>resolves</i> 8 OF RESOLUTION COM5/6 (WRC-19)</b>										<b>A.22</b>	

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A.22.a	<p>a commitment that aeronautical ESIMs would be in conformity with the pfd limits on the Earth's surface specified in Part II of Annex 2 to Resolution COM5/6 (WRC-19)</p> <p>Required only for the notification of earth stations in motion submitted in accordance with Resolution COM5/6 (WRC-19)</p>				+						A.22.a	
...												

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**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,**  
**EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

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...												
A.1.g	indicator showing that the non-GSO satellite system is planned to be operated in accordance with Resolution COM5/5 (WRC-19) Required for advance publication and notification			X		+					A.1.g	A.1.g
...												
A.2	DATE OF BRINGING INTO USE										A.2	

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.2.a	<p>the date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into use</p> <p>For a frequency assignment to a GSO space station, including frequency assignments in Appendices 30, 30A and 30B, the date of bringing into use is as defined in Nos. 11.44B and 11.44.2</p> <p>For a frequency assignment to a non-GSO satellite system with a short-duration mission, the date of bringing into use is as defined in Resolution COM5/5 (WRC-19)</p> <p>Whenever the assignment is changed in any of its basic characteristics (except in the case of a change under A.1.a, the date to be given shall be that of the latest change (actual or foreseen, as appropriate)</p> <p>Required only for notification</p>				+	+	+	+	+	+	A.2.a	
A.2.b	<p>for a space station, the period of validity of the frequency assignments (see Resolution 4 (Rev.WRC-03) and Resolution COM5/5 (WRC-19), as appropriate)</p>			X	X	X					A.2.b	
...												
<b>A.20</b>	<b>COMPLIANCE WITH NOTIFICATION OF A NON-GSO SHORT DURATION MISSION</b>										<b>A.20</b>	
A.20.A	<p>a commitment by the administration that, in the case that unacceptable interference caused by a non-GSO satellite network or system identified as short-duration mission in accordance with Resolution COM5/5 (WRC-19) is not resolved, the administration shall undertake steps to eliminate the interference or reduce it to an acceptable level</p> <p>Required only for notification</p>					+					A.20A	

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**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,**  
**EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	...	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	...
...					
<b>A.2</b>	<b>DATE OF BRINGING INTO USE</b>				
A.2.a	<p>the date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into use</p> <p>For a frequency assignment to a GSO space station, including frequency assignments in Appendices 30, 30A and 30B, the date of bringing into use is as defined in Nos. 11.44B and 11.44.2</p> <p>Whenever the assignment is changed in any of its basic characteristics (except in the case of a change under A.1.a, the date to be given shall be that of the latest change (actual or foreseen, as appropriate)</p> <p>Required only for notification and, in the case of Appendices 30 and 30A, also for simultaneous submissions for modifications to the Region 2 Plan or entry into the Regions 1 and 3 List under Article 4 and notification under Article 5</p>	+	+		
...					

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**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,  
EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

Items in Appendix	<p style="text-align: center;"><i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i></p>	...	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)
<b>A.2</b>	<b>DATE OF BRINGING INTO USE</b>		
A.2.a	the date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into use For a frequency assignment to a GSO space station, including frequency assignments in Appendices <b>30</b> , <b>30A</b> and <b>30B</b> , the date of bringing into use is as defined in Nos. <b>11.44B</b> and <b>11.44.2</b> Whenever the assignment is changed in any of its basic characteristics (except in the case of a change under A.1.a, the date to be given shall be that of the latest change (actual or foreseen, as appropriate) Required only for notification and, in the case of Appendix <b>30B</b> , also for simultaneous submissions for entry into the List under § 6.17 and notification under § 8.1		+
...			
<b>A.3</b>	<b>OPERATING ADMINISTRATION OR AGENCY</b>		
A.3.a	 the symbol for the operating administration or agency (see the Preface) that is in operational control of the space station, earth station or radio astronomy station		<b>X</b>
A.3.b	 the symbol for the address of the administration (see the Preface) to which communication should be sent on urgent matters regarding interference, quality of emissions and questions referring to the technical operation of the network or station (see Article 15)		<b>X</b>
...			



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**TABLE B**  
**CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA** (Rev.WRC-19)

Items in Appendix	B - CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network or system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network or system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network or system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...												
B.4.b	For a space station submitted in accordance with Nos. 9.11A, 9.12 or 9.12A:										B.4.b	
...												
B.4.b.3	Not used										B.4.b.3	
...												

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**TABLE B**  
**CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA** (Rev.WRC-19)

Items in Appendix	B - CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...												
B.2bis.a	an indicator specifying whether the space station only transmits when visible from the notified service area In the case of advance publication, required only for frequency assignments of a non-geostationary satellite transmitting beam In the case of notification or coordination of a non-geostationary-satellite network, required only for frequency assignments of a non-geostationary satellite transmitting beam of a satellite network not subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L			+		+					B.2bis.a	

Items in Appendix	<p><i>B - CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA</i></p>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
B.2bis.b	<p>in case of non-continuous transmission in item B.2bis.a, the minimum elevation angle above which transmissions occur when the space station is visible from the notified service area In the case of notification or coordination of a non-geostationary-satellite network, only for frequency assignments of a non-geostationary satellite transmitting beam of a satellite network not subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L</p>			<b>O</b>		<b>O</b>					B.2bis.b	
...												

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TABLE B

CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA (Rev.WRC-19)

Items in Appendix	B - CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...											...	
B.1.c	if the beam is part of a multiple-beam network, the multiple beam identification code									+	B.1.c	
B.1.d	<b>For sensor operation</b>										B.1.d	
B.1.d.1	an indicator showing whether the beam is for an active or passive sensor			X	X	X					B.1.d.1	
B.2	<b>TRANSMISSION / RECEPTION INDICATOR FOR THE BEAM OF THE SPACE STATION OR THE ASSOCIATED SPACE STATION</b>			X	X	X	+ <sup>1</sup>			X	B.2	
B.2bis	Not used										B.2bis	
B.2bis.a	Not used										B.2bis.a	
B.2bis.b	Not used										B.2bis.b	
B.2.a	<b>For the space station transmitting beam, continuous/non-continuous transmission indicators</b>										B.2.a	
B.2.a.1	an indicator specifying whether the space station only transmits when visible from the notified service area In the case of non-geostationary-satellite systems, required only for frequency assignments not subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L			X			+				B.2.a.1	

Items in Appendix	<i>B - CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
B.2.a.2	if the non-geostationary satellite beam's transmissions are non-continuous, the minimum elevation angle above which transmissions occur when the space station is visible from the notified service area Not required for coordination and notification of frequency assignments subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L			O		O					B.2.a.2	
...										...		

B.3.b.1	<p>the co-polar antenna gain contours plotted on a map of the Earth's surface, preferably in a radial projection from the satellite onto a plane perpendicular to the axis from the centre of the Earth to the satellite</p> <p>The space station antenna gain contours shall be drawn as isolines of the isotropic gain, at least for -2, -4, -6, -10 and -20 dB and at 10 dB intervals thereafter, as necessary, relative to the maximum antenna gain, when any of these contours is located either totally or partially anywhere within the limit of visibility of the Earth from the given geostationary satellite</p> <p>Whenever possible, the gain contours of the space station antenna should also be provided in a numerical format (e.g. equation or table)</p> <p>Where a steerable beam (see No. 1.191) is used, if the effective boresight area (see No. 1.175) is less than the global service area, the contours are the result of moving the boresight of the steerable beam around the limit defined by the effective boresight area and are to be provided as described above but shall also include the 0 dB relative gain isoline. In addition, for a steerable transmitting beam, except for the case of Appendix 30B, see also No. 21.16 (and its associated Rules of Procedure)</p> <p>The antenna gain contours shall include the effects of the planned inclination excursion, longitudinal tolerance and the planned pointing accuracy of the antenna</p> <p><i>Note</i> – Taking due account of applicable technical restrictions and allowing some reasonable degree of flexibility for satellite operations, administrations should, to the extent practicable, align the areas the satellite steerable beams could cover with the service area of their networks or systems with due regard to their service objectives.</p> <p>In the case of Appendix 30, 30A or 30B, required only for non-elliptical beams</p>				X		+	+	+	B.3.b.1
...										...
B.3.c.1	<p>the co-polar antenna radiation pattern</p> <p>In the case of geostationary space stations required only for an antenna radiation beam that is directed towards another satellite</p> <p>In the case of Appendix 30, 30A or 30B, required only for elliptical antenna beams</p>		X	+	X		+	+	+	B.3.c.1
...										...
B.3.e	<p>if the space station is operating in a frequency band allocated in the Earth-to-space direction and in the space-to-Earth direction, the gain of the antenna in the direction of those parts of the geostationary-satellite orbit which are not obstructed by the Earth.</p>				+		+	+		B.3.e

Items in Appendix	<p><b>B – CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA</b></p>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
	In the case of Appendix 30, required only for the frequency band 12.5-12.7 GHz											
...											...	
B.4.a.3	<b>For a space station submitted in accordance with Nos. 9.11A, 9.12, 9.12A or for active or passive sensors on board a non-geostationary-satellite system not subject to coordination under Section II of Article 9:</b>										B.4.a.3	
...											...	
B.4.a.3.a.1	the orientation angle alpha, in degrees (see the most recent version of Recommendation ITU-R SM.1413)			X		X					B.4.a.3.a.1	
B.4.a.3.a.2	the orientation angle beta, in degrees (see the most recent version of Recommendation ITU-R SM.1413)			X		X					B.4.a.3.a.2	
...											...	
B.4.b.4	<b>For each transmitting beam:</b>										B.4.b.4	
...											...	
B.4.b.5	the calculated peak value of power flux-density produced within $\pm 5^\circ$ inclination of the geostationary-satellite orbit Required only for the fixed-satellite service (space-to-Earth) in the frequency band 6 700-7 075 MHz					+					B.4.b.5	
...											...	
B.5.d	antenna dimension aligned with the geostationary arc ( $D_{GSO}$ ), in metres (see the most recent version of Recommendation ITU-R S.1855) Except for Appendix 30 or 30A						O				B.5.d	
...											...	

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TABLE C  
CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS  
FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR  
RADIO ASTRONOMY ANTENNA (Rev.WRC-19)

Items in Appendix	C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...												
C.9.d	For stations operating in a frequency band subject to Nos. 22.5C, 22.5D, 22.5F or 22.5L:										C.9.d	
...												

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**TABLE C**  
**CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS**  
**FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR**  
**RADIO ASTRONOMY ANTENNA (Rev.WRC-19)**

Items in Appendix	<i>C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...											...	
C.2.a.1	<p>the assigned frequency (frequencies), as defined in No. <b>1.148</b></p> <ul style="list-style-type: none"> <li>– in kHz up to 28 000 kHz inclusive</li> <li>– in MHz above 28 000 kHz to 10 500 MHz inclusive</li> <li>– in GHz above 10 500 MHz</li> </ul> <p>If the basic characteristics are identical, with the exception of the assigned frequency, a list of frequency assignments may be provided</p> <ul style="list-style-type: none"> <li>In the case of advance publication, required only for active sensors</li> <li>In the case of geostationary and non-geostationary satellite networks <b>or systems</b>, required for all space applications except passive sensors</li> <li>In the case of Appendix <b>30B</b>, required only for notification under Article 8</li> </ul>			+	+	+	X	X	X	+	C.2.a.1	



Items in Appendix	<i>C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
...											...	
C.2.b	the centre of the frequency band observed – in kHz up to 28 000 kHz inclusive – in MHz above 28 000 kHz to 10 500 MHz inclusive – in GHz above 10 500 MHz In the case of satellite networks or systems, required only for passive sensors			+	+	+					C.2.b	X
...											...	
C.3.a	the bandwidth of the assigned frequency band, in kHz (see No. 1.147) In the case of advance publication, required only for active sensors In the case of geostationary and non-geostationary satellite networks or systems, required for all space applications except passive sensors In the case of Appendix 30B, required only for notification under Article 8			+	+	+	X	X	X	+	C.3.a	
C.3.b	the bandwidth of the frequency band, in kHz, observed by the station In the case of satellite networks or systems, required only for passive sensors			+	+	+					C.3.b	X
...											...	

Items in Appendix	<p align="center"><b>C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA</b></p>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
C.5.a	the lowest total receiving system noise temperature, in kelvins, referred to the output of the receiving antenna of the space station In the case of satellite networks or systems, required for all space applications except for active or passive sensors			+	+	+			X	X	C.5.a	
...											...	
C.6.a	the type of polarization (see the Preface) For circular polarization, this includes the sense of polarization (see Nos. 1.154 and 1.155) In the case of a space station submitted in accordance with Appendix 30 or 30A, see § 3.2 of Annex 5 to Appendix 30			X	X	X	+ <sup>1</sup>	X	X		C.6.a	
...											...	
C.7	<p><b>NECESSARY BANDWIDTH AND CLASS OF EMISSION</b>  <i>(in accordance with Article 2 and Appendix I)</i></p> For advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9, changes to this information within the limits specified under C.1 shall not affect consideration of notification under Article 11 <i>Not required for active or passive sensors</i>										C.7	
...											...	

Items in Appendix	<i>C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
C.8.a.2	the maximum power density, in dB(W/Hz), supplied to the input of the antenna for each carrier type <sup>2</sup> <b>In the case of satellite networks or systems, required if neither C.8.b.2 nor C.8.b.3.b is provided</b> In the case of Appendix <b>30B</b> , required only for notification under Article 8			+	+	+	O			+	C.8.a.2	
...											...	
C.8.b.1	the total peak envelope power, in dBW, supplied to the input of the antenna For coordination or notification of an Appendix <b>30A</b> earth station the values shall include the maximum range of power control <b>In the case of satellite networks or systems, required if neither C.8.a.1 nor C.8.b.3.a is provided</b>			+	+	+	+ <sup>1</sup>	X	X		C.8.b.1	
C.8.b.2	the maximum power density, in dB(W/Hz), supplied to the input of the antenna <sup>2</sup> For coordination or notification of an Appendix <b>30A</b> earth station the values shall include the maximum range of power control <b>In the case of satellite networks or systems, required if neither C.8.a.2 nor C.8.b.3.b is provided</b> In the case of Appendix <b>30B</b> , required only for submission under Article 6			+	+	+	+ <sup>1</sup>	X	X	+	C.8.b.2	
C.8.b.3	<b>For the case of active sensors:</b>										C.8.b.3	
C.8.b.3.a	the mean peak envelope power, in dBW, supplied to the input of the antenna <b>Required if neither C.8.a.1 nor C.8.b.1 is provided</b>			+	+	+					C.8.b.3.a	

Items in Appendix	C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
C.8.b.3.b	the mean power density, in dB(W/Hz), supplied to the input of the antenna Required if neither C.8.a.2 nor C.8.b.2 is provided			+	+	+				C.8.b.3.b		
...										...		
C.8.d.2	if the contiguous satellite bandwidth is different from the bandwidth of the assigned frequency band (C.3.a), each contiguous satellite bandwidth For the maximum saturated peak envelope power of the satellite transponder, this corresponds to the bandwidth of each transponder Required only for a space-to-Earth or space-to-space link			O	+	+				C.8.d.2		

Items in Appendix	C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
C.8.e.1	for space-to-Earth, Earth-to-space or space-to-space links. for each carrier type, the greater of either the carrier-to-noise ratio, in dB, required to meet the performance of the link under clear-sky conditions or the carrier-to-noise ratio, in dB, required to meet the short-time objectives of the link, inclusive of necessary margins If not provided, the reason for absence under C.8.e.2			+	+	+	+1				C.8.e.1	
...											...	
C.9.a.7	if other forms of modulation than frequency modulation are being used, the type of energy dispersal			O	C	C		+	+		C.9.a.7	
...											...	
C.10	<b>TYPE AND IDENTITY OF THE ASSOCIATED STATION(S)</b> (the associated station may be another space station, a typical earth station of the network or system or a specific earth station) <i>For all space applications except active or passive sensors</i>										C.10	
...											...	
C.10.d.7	the antenna diameter, in metres In cases other than Appendix 30A, required only for fixed-satellite service networks or systems operating in the frequency bands 13.75-14 GHz, 14.5-14.75 GHz (in countries listed in Resolution 163 (WRC-15) not for feeder links for the broadcasting-satellite service), 14.5-14.8 GHz (in countries listed in Resolution 164 (WRC-15) not for feeder links for the broadcasting-satellite service), 24.65-25.25 GHz (Region 1) and 24.65-24.75 GHz (Region 3) and for maritime mobile-satellite service networks or systems operating in the frequency band 14-14.5 GHz				+	+			X		C.10.d.7	
...											...	

Items in Appendix	C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
C.10.d.9	antenna dimension aligned with the geostationary arc ( $D_{GSO}$ ), in metres (see the most recent version of Recommendation ITU-R S.1855) Except for Appendix 30 or 30A				O					O	C.10.d.9	
...											...	
C.11.b	the appropriate information required to calculate the affected region (as defined in Recommendation ITU-R M.1187-1) Required only for a non-geostationary space station in the mobile-satellite service submitted in accordance with No. 9.11A in frequency bands between 1 and 3 GHz					+					C.11.b	
...												
C.12.a	if the aggregate carrier-to-interference ratio is less than 21 dB, the minimum acceptable aggregate carrier-to-interference ratio The carrier-to-interference ratio is to be expressed in terms of the power averaged over the necessary bandwidth of the modulated wanted and interfering signals, assuming both the desired carrier and interfering signals have equivalent bandwidths and modulation types									+	C.12.a	
...											...	

MOD

AI 7(C)

**TABLE C**  
**CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS**  
**FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR**  
**RADIO ASTRONOMY ANTENNA (Rev.WRC-19)**

Items in Appendix	<i>C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA</i>		Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)
...			
<b>C.7</b>	<p><b>NECESSARY BANDWIDTH AND CLASS OF EMISSION</b> <i>(in accordance with Article 2 and Appendix 1)</i></p> <p>For advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9, changes to this information within the limits specified under C.1 shall not affect consideration of notification under Article 11</p> <p>Not required for active or passive sensors</p>		
C.7.a	<p>the necessary bandwidth and the class of emission: for each carrier</p> <p>In the case of Appendix 30B, required only for notification under Article 8 (including simultaneous submissions for entry into the List under § 6.17 and notification under § 8.1)</p> <p>NOTE – For simultaneous submissions, the Bureau will use predefined values for the necessary bandwidth when examining the notice under § 6.17 of Article 6 of Appendix 30B</p>		+
..			
C.8.a.2	<p>the maximum power density, in dB(W/Hz), supplied to the input of the antenna for each carrier type<sup>2</sup></p> <p>In the case of Appendix 30B, required only for notification under Article 8, or simultaneous submissions for entry into the List under § 6.17 and notification under § 8.1</p> <p>Required if neither C.8.b.2 nor C.8.b.3.b is provided</p>		+





AI 9.1.2 AI 7(B) AI 9.2

APPENDIX 5 (REV.WRC-15)

**Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9**

MOD

AI 9.1.2

TABLE 5-1 (Rev.WRC-19)

**Technical conditions for coordination**  
(see Article 9)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
...	...	...	...	...	...
No. 9.11 GSO, non-GSO/ terrestrial	A space station in the BSS in any band shared on an equal primary basis with terrestrial services and where the BSS is not subject to a Plan, in respect of terrestrial services	620-790 MHz (see Resolution 549 (WRC-07)) 1 452-1 492 MHz 2 310-2 360 MHz (No. 5.393) 2 535-2 655 MHz (Nos. 5.417A and 5.418) 17.7-17.8 GHz (Region 2) 74-76 GHz	Bandwidths overlap: The detailed conditions for the application of No. 9.11 in the bands 2 630-2 655 MHz and 2 605-2 630 MHz are provided in Resolution 539 (Rev.WRC-03) for non-GSO BSS (sound) systems pursuant to Nos. 5.417A and 5.418, and in Nos. 5.417A and 5.418 for GSO BSS (sound) networks pursuant to those provisions. The detailed conditions for the application of No. 9.11 in the frequency band 1 452-1 492 MHz are provided in Resolution 761 (Rev.WRC-19) for Regions 1 and 3.	Check by using the assigned frequencies and bandwidths	
...	...	...	...	...	...

**MOD**

AI 9.2

TABLE 5-1 (continued) (Rev.WRC-19)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. 9.7 GSO/GSO (cont.)		9) All frequency bands, other than those in 1), 2), 2 <i>bis</i> ), 3), 4), 5), 6), 6 <i>bis</i> ), 7) and 8), allocated to a space service, and the bands in 1), 2), 2 <i>bis</i> ), 3), 4), 5), 6), 6 <i>bis</i> ), 7) and 8) where the radio service of the proposed network or affected networks is other than the space services listed in the threshold/condition column, or in the case of coordination of space stations operating in the opposite direction of transmission	i) Bandwidth overlap, and ii) Value of $\Delta T/T$ exceeds 6%	Appendix 8	In application of Article 2A of Appendix 30 for the space operation functions using the guardbands defined in § 3.9 of Annex 5 of Appendix 30, the threshold/condition specified for the FSS in the bands in 2) applies. In application of Article 2A of Appendix 30A for the space operation functions using the guardbands defined in § 3.1 and 4.1 of Annex 3 of Appendix 30A, the threshold/condition specified for the FSS in the bands in 2) and 7) apply, as appropriate
...					

**MOD**

TABLE 5-1 (Rev.WRC-19)

**Technical conditions for coordination**  
(see Article 9)

...

TABLE 5-1 (continued) (Rev.WRC19)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. <b>9.11</b> GSO, non-GSO/ terrestrial	A space station in the BSS in any band shared on an equal primary basis with terrestrial services and where the BSS is not subject to a Plan, in respect of terrestrial services	1 452-1 492 MHz 2 310-2 360 MHz (No. <b>5.393</b> ) 2 535-2 655 MHz (Nos. <b>5.417A</b> and <b>5.418</b> ) 17.7-17.8 GHz (Region 2) 74-76 GHz	Bandwidths overlap: The detailed conditions for the application of No. <b>9.11</b> in the bands 2 630-2 655 MHz and 2 605-2 630 MHz are provided in Resolution <b>539 (Rev.WRC-19)</b> for non-GSO BSS (sound) systems pursuant to Nos. <b>5.417A</b> and <b>5.418</b> , and in Nos. <b>5.417A</b> and <b>5.418</b> for GSO BSS (sound) networks pursuant to those provisions.	Check by using the assigned frequencies and bandwidths	

TABLE 5-1 (continued) (Rev.WRC-19)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. <b>9.19</b> Terrestrial, GSO, non-GSO/ GSO, non-GSO	Any transmitting station of a terrestrial service or a transmitting earth station in the FSS (Earth-to-space) in a frequency band shared on an equal primary basis with the BSS, with respect to typical earth stations included in the service area of a space station in the BSS	1 452-1 492 MHz 2 310-2 360 MHz (terrestrial services in all three Regions in respect of BSS allocation in No. <b>5.393</b> ) 2 520-2 670 MHz (see No. <b>5.416</b> ) 11.7-12.7 GHz (see Article 6 of Appendix <b>30</b> ) 12.5-12.7 GHz (terrestrial services in Nos. <b>5.494</b> and <b>5.496</b> as well as in Regions 2 and 3, or transmitting earth station in the FSS (Earth-to-space) in Region 1, in respect of BSS allocation in Region 3) 12.7-12.75 GHz (terrestrial services in Nos. <b>5.494</b> and <b>5.496</b> as well as in Regions 2 and 3, or transmitting earth station in the FSS (Earth-to-space) in Regions 1 and 2, in respect of BSS allocation in Region 3) 17.7-17.8 GHz (terrestrial services in all three Regions in respect of BSS allocation in Region 2)	i) Necessary bandwidths overlap; and ii) the power flux-density (pfd) of the interfering station at the edge of the BSS service area exceeds the permissible level	Check by using the assigned frequencies and bandwidths	See also Article 6 of Appendix <b>30</b>

MOD

AI 7(B)

TABLE 5-1 (Rev.WRC-19)

**Technical conditions for coordination**  
(see Article 9)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. 9.7 GSO/GSO	A station in a satellite network using the geostationary-satellite orbit (GSO), in any space radiocommunication service, in a frequency band and in a Region where this service is not subject to a Plan, in respect of any other satellite network using that orbit, in any space radiocommunication service in a frequency band and in a Region where this service is not subject to a Plan, with the exception of the coordination between earth stations operating in the opposite direction of transmission	1) 3 400-4 200 MHz 5 725-5 850 MHz (Region 1) and 5 850-6 725 MHz 7 025-7 075 MHz  2) 10.95-11.2 GHz 11.45-11.7 GHz 11.7-12.2 GHz (Region 2) 12.2-12.5 GHz (Region 3) 12.5-12.75 GHz (Regions 1 and 3) 12.7-12.75 GHz (Region 2) and 13.75-14.8 GHz	i) Bandwidth overlap, and ii) any network in the fixed-satellite service (FSS) and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of $\pm 7^\circ$ of the nominal orbital position of a proposed network in the FSS  i) Bandwidth overlap, and ii) any network in the FSS or broadcasting-satellite service (BSS), not subject to a Plan, and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of $\pm 6^\circ$ of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan iii) in the frequency band 14.5-14.8 GHz any network in the space research service (SRS) or FSS not subject to a Plan and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of $\pm 6^\circ$ of the nominal orbital position of a proposed network in the SRS or FSS not subject to a Plan		With respect to the space services listed in the threshold/condition column in the frequency bands in 1), 2), 2bis), 3), 3bis), 4), 5), 6), 7) and 8), an administration may request, pursuant to No. 9.41, to be included in requests for coordination, indicating the networks for which the value of $\Delta T/T$ calculated by the method in § 2.2.1.2 and 3.2 of Appendix 8 exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. 9.42, the calculation method given in § 2.2.1.2 and 3.2 of Appendix 8 shall be used

AI 7(B)

TABLE 5-1 (continued) (Rev.WRC-19)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. 9.7 GSO/GSO (cont.)		<p>2bis) 13.4-13.65 GHz (Region 1)</p> <p>3) 17.7-19.7 GHz, (Regions 2 and 3), 17.3-19.7 GHz (Region 1) and 27.5-29.5 GHz</p> <p>3bis) 19.7-20.2 GHz and 29.5-30 GHz</p> <p>4) 17.3-17.7 GHz (Regions 1 and 2)</p>	<p>i) Bandwidth overlap, and ii) any network in the space research service (SRS) or any network in the FSS and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of <math>\pm 6^\circ</math> of the nominal orbital position of a proposed network in the FSS or SRS</p> <p>i) Bandwidth overlap, and ii) any network in the FSS and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of <math>\pm 8^\circ</math> of the nominal orbital position of a proposed network in the FSS</p> <p>i) Bandwidth overlap, and ii) any network in the FSS or in the mobile-satellite service (MSS) and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of <math>\pm 8^\circ</math> of the nominal orbital position of a proposed network in the FSS or in the MSS.</p> <p>i) Bandwidth overlap, and ii) a) any network in the FSS and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of <math>\pm 8^\circ</math> of the nominal orbital position of a proposed network in the BSS, or</p>		





TABLE 5-1 (continued) (Rev.WRC-19)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. 9.7 GSO/GSO (cont.)		<p>6bis) 21.4-22 GHz (Regions 1 and 3)</p> <p>7) Bands above 17.3 GHz, except those defined in 3), 3bis) and 6)</p> <p>8) Bands above 17.3 GHz except those defined in 4), 5) and 6bis)</p>	<p>i) Bandwidth overlap; and</p> <p>ii) any network in the BSS and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of <math>\pm 12^\circ</math> of the nominal orbital position of a proposed network in the BSS (see also Resolutions 554 (WRC-12) and 553 (WRC-12)).</p> <p>i) Bandwidth overlap, and</p> <p>ii) any network in the FSS and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of <math>\pm 8^\circ</math> of the nominal orbital position of a proposed network in the FSS (see also Resolution 901 (Rev.WRC-07))</p> <p>i) Bandwidth overlap, and</p> <p>ii) any network in the FSS or BSS, not subject to a Plan, and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of <math>\pm 16^\circ</math> of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan, except in the case of a network in the FSS with respect to a network in the FSS (see also Resolution 901 (Rev.WRC-07))</p>		No. 9.41 does not apply.

AI 7(B)

TABLE 5-1 (continued) (Rev.WRC-19)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. 9.7 GSO/GSO (cont.)		9) All frequency bands, other than those in 1), 2), 2 <i>bis</i> ), 3), 3 <i>bis</i> ), 4), 5), 6), 6 <i>bis</i> ), 7) and 8), allocated to a space service, and the frequency bands in 1), 2), 2 <i>bis</i> ), 3), 3 <i>bis</i> ), 4), 5), 6), 6 <i>bis</i> ), 7) and 8) where the radio service of the proposed network or affected networks is other than the space services listed in the threshold/condition column, or in the case of coordination of space stations operating in the opposite direction of transmission	i) Bandwidth overlap, and ii) Value of $\Delta T/T$ exceeds 6%	Appendix 8	In application of Article 2A of Appendix 30 for the space operation functions using the guardbands defined in § 3.9 of Annex 5 of Appendix 30, the threshold/condition specified for the FSS in the frequency bands in 2) applies. In application of Article 2A of Appendix 30A for the space operation functions using the guardbands defined in § 3.1 and 4.1 of Annex 3 of Appendix 30A, the threshold/condition specified for the FSS in the frequency bands in 7) applies

AI 9.2

## ANNEX 1

- 1 Coordination thresholds for sharing between MSS (space-to-Earth) and terrestrial services in the same frequency bands and between non-GSO MSS feeder links (space-to-Earth) and terrestrial services in the same frequency bands and between RDSS (space-to-Earth) and terrestrial services in the same frequency bands** (WRC-12)
- 1.2 Between 1 and 3 GHz**
- 1.2.3 Determination of the need for coordination between MSS and RDSS space stations (space-to-Earth) and terrestrial stations** (WRC-12)
- 1.2.3.1 Method for the determination of the need for coordination between MSS and RDSS space stations (space-to-Earth) and other terrestrial services sharing the same frequency band in the 1 to 3 GHz range**

### MOD

TABLE 5-2 (*end*) (Rev.WRC-19)

...

AI 9.2

NOTE 9 – Instead of the values in the Table, the pfd coordination thresholds of  $-142.5$  dB(W/m<sup>2</sup>) in 4 kHz and  $-124.5$  dB(W/m<sup>2</sup>) in 1 MHz for the MSS and  $-152$  dB(W/m<sup>2</sup>) in 4 kHz and  $-128$  dB(W/m<sup>2</sup>) in 1 MHz for the RDSS shall apply in Albania, Germany, Andorra, Antigua and Barbuda, Argentina, Australia, Austria, Bahamas, Barbados, Belgium, Belize, Bolivia (Plurinational State of), Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Chile, Cyprus, Vatican, Colombia, Congo (Rep. of the), Costa Rica, Croatia, Denmark, Dominican Rep., Dominica, El Salvador, Ecuador, Spain, Estonia, United States, Finland, France, Greece, Grenada, Guatemala, Guyana, Haiti, Honduras, Hungary, Ireland, Iceland, Israel, Italy, Jamaica, Latvia, Liechtenstein, Lithuania, Luxembourg, North Macedonia, Malta, Mexico, Monaco, Montenegro, Nicaragua, Nigeria, Norway, Panama, Paraguay, Netherlands, Peru, Poland, Portugal, Slovakia, Czech Rep., Romania, United Kingdom, Saint Lucia, Saint Kitts and Nevis, San Marino, Saint Vincent and the Grenadines, Serbia, Slovenia, Sweden, Switzerland, Suriname, Trinidad and Tobago, Turkey, Uruguay and Venezuela. (WRC-19)



...

## APPENDIX 7 (REV.WRC-15)

### Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz

#### MOD

#### 1 Introduction

This Appendix addresses the determination of the coordination area (see No. 1.171) around a transmitting or receiving earth station that is sharing spectrum in frequency bands between 100 MHz and 105 GHz with terrestrial radiocommunication services or with earth stations operating in the opposite direction of transmission.

The coordination area represents the area surrounding an earth station sharing the same frequency band with terrestrial stations, or the area surrounding a transmitting earth station that is sharing the same bidirectionally allocated frequency band with receiving earth stations, within which the permissible level of interference may be exceeded and hence coordination is required. The coordination area is determined on the basis of known characteristics for the coordinating earth station and on conservative assumptions for the propagation path and for the system parameters for the unknown terrestrial stations (see Tables 7 and 8), or the unknown receiving earth stations (see Table 9), that are sharing the same frequency band.

NOTE – Throughout this Appendix, the word “unknown”, when applied to terrestrial stations or earth stations, refers to such stations that are potentially located in the coordination area.

#### 2 Determination of the earth station coordination area with respect to terrestrial stations

##### 2.1 Earth stations operating with geostationary space stations

#### MOD

##### 2.1.2 Determination of the coordinating earth station’s propagation mode (2) contour

The required distance for hydrometeor scatter is that distance that will result in a propagation mode (2) predicted path loss equal to the propagation mode (2) minimum required loss  $L(p)$ , as defined in equation (3). This propagation mode (2) required distance is determined using the guidance in § 5, and the detailed methods in Annex 2.

For an earth station operating with a geostationary space station having a slightly inclined orbit, the rain-scatter contours for each of the satellite’s two most extreme orbit positions are determined individually, using the relevant elevation angles and their associated azimuths to the satellite. The rain scatter area is the total area contained within the two resulting overlapping contours.

### 3 Determination of the coordination area between earth stations operating in bidirectionally allocated frequency bands

MOD

AI 9.2

TABLE 2

Coordination contours required for each bidirectional scenario

Coordinating earth station operating to a space station in the	Unknown receiving earth station operating with a space station in the	Section containing the method to determine $G_t$ and $G_r$	Contours required	
			No.	Details
Geostationary orbit	Geostationary orbit	§ 3.1	1	A coordination contour comprising both propagation mode (1) and propagation mode (2) contours
	Non-geostationary orbit	§ 3.2.1	1	A propagation mode (1) coordination contour
	Geostationary or non-geostationary orbits <sup>1</sup>	§ 3.1 and 3.2.1	2	Two separate coordination contours, one for the geostationary orbit (propagation mode (1) and mode (2) contours) and one for the non-geostationary orbit (propagation mode (1) contour)
Non-geostationary orbit	Geostationary orbit	§ 3.2.2	1	A propagation mode (1) coordination contour
	Non-geostationary orbit	§ 3.2.3	1	A propagation mode (1) coordination contour
	Geostationary or non-geostationary orbits <sup>1</sup>	§ 3.2.2 and 3.2.3	2	Two separate propagation mode (1) coordination contours, one for the geostationary orbit and one for the non-geostationary orbit

<sup>1</sup> In this case, the bidirectional frequency band may contain allocations in the space-to-Earth direction for space stations in both the geostationary orbit and non-geostationary orbits. Hence, the coordinating administration will not know whether the unknown receiving earth stations are operating with space stations in the geostationary orbit or non-geostationary orbit.

MOD

#### 3.1 Coordination of known and unknown earth stations operating with geostationary space stations

AI 9.2

When both the known and the unknown earth stations operate with space stations in the geostationary orbit, it is necessary to develop a coordination contour comprising both propagation mode (1) and propagation mode (2) contours, using the procedures described in § 3.1.1 and 3.1.2, respectively.

**MOD**

**3.1.1 Determination of the coordinating earth station’s propagation mode (1) contour**

AI 9.2

The procedure for the determination of the propagation mode (1) contour in this case differs from that described in § 2.1.1 in two ways. First, the parameters to be used for the unknown receiving earth station are those in Table 9. Second, and more significantly, the knowledge that the unknown earth stations operate with geostationary satellites can be used to calculate the worst-case value of the horizon antenna gain of the receiving earth station towards the transmitting earth station for each azimuth at the transmitting earth station. The propagation mode (1) required distance is that distance which will result in a value of propagation mode (1) predicted path loss which is equal to the propagation mode (1) minimum required loss,  $L_b(p)$  (dB), as defined in § 1.3, and repeated here for convenience.

$$L_b(p) = P_t + G_t + G_r - P_r(p) \quad \text{dB} \quad (6)$$

where:

$P_t$  and  $P_r(p)$ : as defined in § 1.3

$G_t$ : gain of the coordinating (transmitting) earth station antenna (dBi) towards the horizon at the horizon elevation angle and the azimuth under consideration

$G_r$ : the horizon antenna gain of the unknown receiving earth station towards the transmitting earth station on the specific azimuth from the coordinating earth station. Values are determined by the procedure in § 2.1 of Annex 5, based on parameters from Table 9.

To facilitate the determination of the values of  $G_r$  to be used at an azimuth from the transmitting earth station, several simplifying approximations must be made:

- that the horizon elevation of the receiving earth station is zero degrees on all azimuths;
- that the receiving earth station operates with a space station that has zero degrees orbital inclination and may be located anywhere on the geostationary orbit that is above the minimum elevation angle, given in Table 9, for the location of the receiving earth station;
- that the latitude of the receiving earth station is the same as that of the transmitting earth station;
- that plane geometry can be used to interrelate the azimuth angles at the respective earth stations, rather than using the great circle path.

The first three assumptions provide the basis for determining the horizon antenna gain of the receiving earth station on any azimuth. The assumption of 0° horizon elevation angle is conservative since the increase in horizon antenna gain due to a raised horizon would, in practice, be more than offset by any real site shielding<sup>7</sup>. The last two assumptions in the list simplify the calculation of the sum of  $G_t$  and  $G_r$  along any azimuth. Since the propagation mode (1) required distances are small, in global geometric terms these approximations may introduce a small error in the determination of the horizon antenna gain of the receiving earth station antenna that, in any case, will not exceed 2 dB. Because of the assumption of plane geometry, for a given azimuth at the transmitting earth station the appropriate value of the horizon antenna gain of the receiving earth station is the value on the reciprocal (i.e. ±180°, see § 2.1 of Annex 5) azimuth at the receiving earth station.

The propagation mode (1) required distance is then determined using the procedures described in § 4, and the detailed methods in Annex 1. Specific guidance relevant to the application of the propagation calculations is provided in § 4.4.

AI 9.2

## ANNEX 5

### **Determination of the coordination area for a transmitting earth station with respect to receiving earth stations operating with geostationary space stations in bidirectionally allocated frequency bands**

MOD

#### **1 Introduction**

AI 9.2 The propagation mode (1) **contour** of a transmitting earth station with respect to unknown receiving earth stations operating with geostationary space stations requires the determination of the horizon gain of the antenna of the receiving earth station at each azimuth of the transmitting earth station. Different methods then need to be applied to determine the coordination area of the coordinating earth station, depending on whether it operates with geostationary or non-geostationary space stations. When both the coordinating earth station and the unknown receiving earth stations operate with geostationary space stations, it is also necessary to determine a propagation mode (2) **contour**.

The coordination area of a transmitting earth station, with respect to unknown receiving earth stations that operate to non-geostationary space stations, can be determined by minor modifications to the methods applicable to the determination of coordination area of transmitting earth stations with respect to terrestrial stations. (See § 3.2.1 and § 3.2.3 of the main body of the Appendix.)

MOD

#### **2 Determination of the bidirectional **contour** for propagation mode (1)**

AI 9.2 For a transmitting earth station operating in a frequency band that is also allocated for bidirectional use by receiving earth stations operating with geostationary space stations, further development of the procedures in Annex 3 is needed. It is necessary to determine the horizon gain of the unknown receiving earth station, the horizon gain to be used at each azimuth at the coordinating (transmitting) earth station, for the determination of the bidirectional **contour**.

AI 1.14

AI 9.1.9

AI 9.2

## ANNEX 7

### **System parameters and predetermined coordination distances for determination of the coordination area around an earth station**

#### **3 Horizon antenna gain for a receiving earth station with respect to a transmitting earth station**

## MOD

TABLE 7c (Rev.WRC-19)

## Parameters required for the determination of coordination distance for a transmitting earth station

Transmitting space radiocommunication service designation		Fixed-satellite	Fixed-satellite	Fixed-satellite <sup>2</sup>	Fixed-satellite <sup>3</sup>	Space research	Earth exploration-satellite, space research	Fixed-satellite, mobile-satellite, radionavigation-satellite	Fixed-satellite <sup>2</sup>
Frequency bands (GHz)		24.65-25.25 27.0-29.5	24.65-25.25 27-27.5	28.6-29.1	29.1-29.5	34.2-34.7	40.0-40.5	42.5-47 47.2-50.2 50.4-51.4	47.2-50.2
Receiving terrestrial service designations		Fixed (except HAPS), mobile	Fixed (HAPS ground station)	Fixed, mobile	Fixed, mobile	Fixed, mobile, radiolocation	Fixed, mobile	Fixed, mobile, radionavigation	Fixed, mobile
Method to be used		§ 2.1	§ 2.1	§ 2.2	§ 2.2		§ 2.1, § 2.2	§ 2.1, § 2.2	§ 2.2
Modulation at terrestrial station <sup>1</sup>		N	N	N	N		N	N	N
Terrestrial station interference parameters and criteria	$p_0$ (%)	0.005	0.01	0.005	0.005		0.005	0.005	0.001
	$n$	1	1	2	1		1	1	1
	$p$ (%)	0.005	0.005	0.0025	0.005		0.005	0.005	0.001
	$N_L$ (dB)	0	0	0	0		0	0	0
	$M_s$ (dB)	25	10	25	25		25	25	25
Terrestrial station parameters	$G_x$ (dBi) <sup>4</sup>	50	0 <sup>5</sup>	50	50		42	42	46
	$T_e$ (K)	2 000	350	2 000	2 000		2 600	2 600	2 000
Reference bandwidth	$B$ (Hz)	$10^6$	$10^6$	$10^6$	$10^6$		$10^6$	$10^6$	$10^6$
Permissible interference power	$P_r(p)$ (dBW) in $B$	-111	-134	-111	-111		-110	-110	-111

<sup>1</sup> A: analogue modulation; N: digital modulation.<sup>2</sup> Non-geostationary satellites in the fixed-satellite service.<sup>3</sup> Feeder links to non-geostationary-satellite systems in the mobile-satellite service.<sup>4</sup> Feeder losses are not included.<sup>5</sup> Maximum HAPS ground station antenna gain toward the horizon.



MOD

AI 9.2

TABLE 7c (Rev.WRC-19)

**Parameters required for the determination of coordination distance for a transmitting earth station**

Transmitting space radiocommunication service designation		Fixed-satellite	Fixed-satellite <sup>2</sup>	Fixed-satellite	Space research	Earth exploration-satellite, space research	Fixed-satellite, mobile-satellite, radionavigation-satellite	Fixed-satellite <sup>2</sup>
Frequency bands (GHz)		24.65-25.25 27.0-29.5	28.6-29.1	27.5-28.6 29.1-29.5 <sup>3</sup>	34.2-34.7	40.0-40.5	42.5-47 47.2-50.2 50.4-51.4	47.2-50.2
Receiving terrestrial service designations		Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile, radiolocation	Fixed, mobile	Fixed, mobile, radionavigation	Fixed, mobile
Method to be used		§ 2.1	§ 2.2	§ 2.2		§ 2.1, § 2.2	§ 2.1, § 2.2	§ 2.2
Modulation at terrestrial station <sup>1</sup>		N	N	N		N	N	N
Terrestrial station interference parameters and criteria	$p_0$ (%)	0.005	0.005	0.005		0.005	0.005	0.001
	$n$	1	2	1		1	1	1
	$p$ (%)	0.005	0.0025	0.005		0.005	0.005	0.001
	$N_L$ (dB)	0	0	0		0	0	0
	$M_S$ (dB)	25	25	25		25	25	25
Terrestrial station parameters	$W$ (dB)	0	0	0		0	0	0
	$G_x$ (dBi) <sup>4</sup>	50	50	50		42	42	46
Reference bandwidth	$T_e$ (K)	2 000	2 000	2 000		2 600	2 600	2 000
	$B$ (Hz)	$10^6$	$10^6$	$10^6$		$10^6$	$10^6$	$10^6$
Permissible interference power	$P_f(p)$ (dBW) in $B$	-111	-111	-111		-110	-110	-111

<sup>1</sup> A: analogue modulation; N: digital modulation.

<sup>2</sup> Non-geostationary satellites in the fixed-satellite service.

<sup>3</sup> Feeder links to non-geostationary-satellite systems in the mobile-satellite service.

<sup>4</sup> Feeder losses are not included.

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AI 9.1.9

TABLE 7c (Rev.WRC-19)

**Parameters required for the determination of coordination distance for a transmitting earth station**

Transmitting space radiocommunication service designation		Fixed-satellite	Fixed-satellite <sup>2</sup>	Fixed-satellite <sup>3</sup>	Space research	Earth exploration-satellite, space research	Fixed-satellite, mobile-satellite, radionavigation-satellite	Fixed-satellite	Fixed-satellite <sup>2</sup>
Frequency bands (GHz)		24.65-25.25 27.0-29.5	28.6-29.1	29.1-29.5	34.2-34.7	40.0-40.5	42.5-47 47.2-50.2 50.4-51.4	51.4-52.4	47.2-50.2
Receiving terrestrial service designations		Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile, radiolocation	Fixed, mobile	Fixed, mobile, radionavigation	Fixed, mobile	Fixed, mobile
Method to be used		§ 2.1	§ 2.2	§ 2.2		§ 2.1, § 2.2	§ 2.1, § 2.2	§ 2.1	§ 2.2
Modulation at terrestrial station <sup>1</sup>		N	N	N		N	N	N	N
Terrestrial station interference parameters and criteria	$p_0$ (%)	0.005	0.005	0.005		0.005	0.005	0.005	0.001
	$n$	1	2	1		1	1	1	1
	$p$ (%)	0.005	0.0025	0.005		0.005	0.005	0.005	0.001
	$N_L$ (dB)	0	0	0		0	0	0	0
	$M_s$ (dB)	25	25	25		25	25	25	25
	$W$ (dB)	0	0	0		0	0	0	0
Terrestrial station parameters	$G_x$ (dBi) <sup>4</sup>	50	50	50		42	42	42	46
	$T_e$ (K)	2 000	2 000	2 000		2 600	2 600	2 600	2 000
Reference bandwidth	$B$ (Hz)	$10^6$	$10^6$	$10^6$		$10^6$	$10^6$	$10^6$	$10^6$
Permissible interference power	$P_r(p)$ (dBW) in $B$	-111	-111	-111		-110	-110	-110	-111

<sup>1</sup> A: analogue modulation; N: digital modulation.

<sup>2</sup> Non-geostationary satellites in the fixed-satellite service.

<sup>3</sup> Feeder links to non-geostationary-satellite systems in the mobile-satellite service.

<sup>4</sup> Feeder losses are not included.

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AI 9.2

TABLE 8d (Rev.WRC-19)

Parameters required for the determination of coordination distance for a receiving earth station

Receiving space radiocommunication service designation	Meteorological-satellite	Fixed-satellite	Fixed-satellite <sup>3</sup>	Broadcasting-satellite	Earth exploration-satellite <sup>4</sup>	Earth exploration-satellite <sup>5</sup>	Space research (deep space)	Space research		Fixed-satellite <sup>6</sup>	Fixed-satellite <sup>5</sup>	Mobile-satellite	Broadcasting-satellite, fixed-satellite	Mobile-satellite	Radio-navigation-satellite
								Unmanned	Manned						
Frequency bands (GHz)	18.0-18.4	17.8-18.6 <sup>4</sup> 18.8-19.3	19.3-19.7	21.4-22.0	25.5-27.0	25.5-27.0	31.8-32.3	37.0-38.0		37.5-40.5	37.5-40.5	39.5-40.5	40.5-42.5	43.5-47.0	43.5-47.0
Transmitting terrestrial service designations	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, radio-navigation	Fixed, mobile		Fixed, mobile	Fixed, mobile	Fixed, mobile	Broadcasting, fixed	Mobile	Mobile
Method to be used	§ 2.1	§ 2.1, § 2.2	§ 2.2	§ 1.4.5	§ 2.2	§ 2.1	§ 2.1, § 2.2	§ 2.1, § 2.2		§ 2.2	§ 2.1	§ 1.4.6	§ 1.4.5, § 2.1	§ 1.4.6	–
Modulation at earth station <sup>1</sup>	N	N	N		N	N	N	N		N	N	N	–	N	
Earth station interference parameters and criteria	$p_0$ (%)	0.05	0.003	0.01		0.25	0.25	0.001	0.1	0.001	0.02	0.003			
	$n$	2	2	1		2	2	1	1	1		2			
	$p$ (%)	0.025	0.0015	0.01		0.125	0.125	0.001	0.1	0.001		0.0015			
	$N_L$ (dB)	0	0	0		0	0	0	0		1	1			
	$M_S$ (dB)	18.8	5	5		11.4	14	1	1	1	6.8	6			
$W$ (dB)	0	0	0		0	0	0	0		0	0				
Terrestrial station parameters	$E$ (dBW) in $B^2$	A	–	–		–	–	–	–	–	–	–	–	–	–
		N	40	40	40	40	42	42	–28	–28	35	35	35	44	40
	$P_t$ (dBW) in $B$	A	–	–	–	–	–	–	–	–	–	–	–	–	–
		N	–7	–7	–7	–7	–3	–3	–81	–73	–10	–10	–10	–1	–7
$G_x$ (dBi)	47	47	47	47	45	45	53	45	45	45	45	45	45	47	47
Reference bandwidth <sup>7</sup>	$B$ (Hz)	$10^7$	$10^6$	$10^6$		$10^7$	$10^7$	1	1	$10^6$	$10^6$	$10^6$	$10^6$		
Permissible interference power	$P_r(p)$ (dBW) in $B$	–115	–140	–137		–120	–116	–216	–217	–140					

<sup>1</sup> A: analogue modulation; N: digital modulation.

<sup>2</sup>  $E$  is defined as the equivalent isotropically radiated power of the interfering terrestrial station in the reference bandwidth.

<sup>3</sup> Non-geostationary mobile-satellite service feeder links.

<sup>4</sup> Non-geostationary-satellite systems.

<sup>5</sup> Geostationary-satellite systems.

<sup>6</sup> Non-geostationary fixed-satellite service systems.

<sup>7</sup> In certain systems in the fixed-satellite service it may be desirable to choose a greater reference bandwidth  $B$ . However, a greater bandwidth will result in smaller coordination distances, and a later decision to reduce the reference bandwidth may require recoordination of the earth station.

**MOD**

AI 9.2

TABLE 9a (Rev.WRC-19)

**Parameters required for the determination of coordination distance for a transmitting earth station  
in bands shared bidirectionally with receiving earth stations**

Space service designation in which the transmitting earth station operates	Mobile-satellite	Earth exploration-satellite, meteorological-satellite	Mobile-satellite		Fixed-satellite, mobile-satellite	Aeronautical mobile-satellite (R) service		Fixed-satellite <sup>3</sup>		Fixed-satellite	Fixed-satellite, meteorological-satellite	Fixed-satellite	
	0.272-0.273		0.401-0.402	1.670-1.675		2.655-2.690	5.030-5.091	5.150-5.216					6.700-7.075
Space service designation in which the receiving earth station operates	Space operation	Space operation	Meteorological-satellite		Fixed-satellite, broadcasting-satellite	Aeronautical mobile-satellite (R) service		Fixed-satellite	Radiodetermination-satellite	Fixed-satellite	Earth exploration-satellite	Earth exploration-satellite	
Orbit <sup>6</sup>	Non-GSO	Non-GSO	Non-GSO	GSO		Non-GSO	GSO	Non-GSO		Non-GSO	Non-GSO	GSO	
Modulation at receiving earth station <sup>1</sup>	N	N	N	N						N	N	N	
Receiving earth station interference parameters and criteria	$p_0$ (%)	1.0	0.1	0.006	0.011					0.005	0.011	0.083	
	$n$	1	2	3	2					3	2	2	
	$p$ (%)	1.0	0.05	0.002	0.0055					0.0017	0.0055	0.0415	
	$N_L$ (dB)	0	0	0	0					1	0	1	
	$M_S$ (dB)	1	1	2.8	0.9	2			2	2	2	4.7	2
	$W$ (dB)	0	0	0	0					0	0	0	
Receiving earth station parameters	$G_m$ (dBi) <sup>2</sup>	20	20	30	45		45	45	48.5		50.7		
	$G_r$ (dBi) <sup>4</sup>	19	19	19 <sup>9</sup>	8		8	8	10		10	8	
	$\epsilon_{min}$ <sup>5</sup>	10°	10°	5°	3°	3°	10°	10°	3°	3°	3°	5°	3°
	$T_e$ (K) <sup>7</sup>	500	500	370	118	75	340	340	75	75	75		
Reference bandwidth	$B$ (Hz)	10 <sup>3</sup>	1	10 <sup>6</sup>	4 × 10 <sup>3</sup>		37.5 × 10 <sup>3</sup>	37.5 × 10 <sup>3</sup>			10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>
Permissible interference power	$P_{p(p)}$ (dBW) in $B$	-177	-208	-145	-178		-163.5	-163.5			-151	-142	-154

*Notes to Table 9a:*

- <sup>1</sup> A: analogue modulation; N: digital modulation.
- <sup>2</sup> On-axis gain of the receive earth station antenna.
- <sup>3</sup> Feeder links of non-geostationary-satellite systems in the mobile-satellite service.
- <sup>4</sup> Horizon antenna gain for the receive earth station (refer to § 3 of the main body of this Appendix and to § 3 of this Annex).
- <sup>5</sup> Minimum elevation angle of operation in degrees (non-geostationary or geostationary).
- <sup>6</sup> Orbit of the space service in which the receiving earth station operates (non-geostationary or geostationary).
- <sup>7</sup> The thermal noise temperature of the receiving system at the terminal of the receiving antenna (under clear-sky conditions). Refer to § 2.1 of this Annex for missing values.
- <sup>8</sup> Horizon antenna gain is calculated using the procedure of Annex 5. Where no value of  $G_m$  is specified, a value of 42 dBi is to be used.
- <sup>9</sup> Non-geostationary horizon antenna gain,  $G_e = G_{min} + 20$  dB (see § 2.2), with  $G_{min} = 10 - 10 \log(D/\lambda)$ ,  $D/\lambda = 13$  (refer to Annex 3 for definition of symbols).



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AI 9.2

TABLE 9b (Rev.WRC-19)

**Parameters required for the determination of coordination distance for a transmitting earth station  
in bands shared bidirectionally with receiving earth stations**

Space service designation in which the transmitting earth station operates	Fixed-satellite			Fixed-satellite			Fixed-satellite	Fixed-satellite	Fixed- satellite <sup>3</sup>	Fixed- satellite <sup>3</sup>	Earth exploration- satellite, space research	
	10.7-11.7			12.5-12.75			17.3-17.8	17.7-18.4	19.3-19.6	19.3-19.6	40.0-40.5	
Space service designation in which the receiving earth station operates	Fixed-satellite			Fixed-satellite			Broadcasting- satellite	Fixed-satellite, meteorological- satellite	Fixed-satellite <sup>3</sup>	Fixed-satellite <sup>4</sup>	Fixed-satellite, mobile-satellite	
Orbit <sup>7</sup>	GSO		Non-GSO	GSO		Non-GSO		GSO	Non-GSO	GSO	GSO	Non-GSO
Modulation at receiving earth station <sup>1</sup>	A	N	N	A	N			N	N			
Receiving earth station interference parameters and criteria	$p_0$ (%)	0.03	0.003	0.03	0.003			0.003	0.01	0.003	0.003	
	$N$	2	2	2	2			2	1	2	2	
	$p$ (%)	0.015	0.0015	0.015	0.0015			0.0015	0.01	0.0015	0.0015	
	$N_L$ (dB)	1	1	1	1			1	0	1	1	
	$M_S$ (dB)	7	4	7	4			6	5	6	6	
	$W$ (dB)	4	0	4	0			0	0	0	0	
Receiving earth station parameters	$G_m$ (dBi) <sup>2</sup>		51.9		31.2			58.6	53.2	49.5	50.8	54.4
	$G_r$ (dBi) <sup>5</sup>	9	9	10	9	9	11 <sup>11</sup>	9	10	10	9	7 <sup>12</sup>
	$\epsilon_{min}$ <sup>6</sup>	5°	5°	6°	5°	5°	10°	5°	5°	10°	10°	10°
	$T_e$ (K) <sup>8</sup>	150	150	150	150	150		300	300	300	300	
Reference bandwidth	$B$ (Hz)	10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>			10 <sup>6</sup>	10 <sup>6</sup>			
Permissible interference power	$P_f(p)$ (dBW) in $B$	-144	-144	-144	-144	-144	-144	-138	-141			

Notes to Table 9b:

- <sup>1</sup> A: analogue modulation; N: digital modulation.
- <sup>2</sup> On-axis gain of the receive earth station antenna.
- <sup>3</sup> Feeder links of non-geostationary satellite systems in the mobile-satellite service.
- <sup>4</sup> Geostationary-satellite systems.
- <sup>5</sup> Horizon antenna gain for the receive earth station (refer to § 3 of the main body of the Appendix and to § 3 of this Annex).

- 6 Minimum elevation angle of operation in degrees (non-GSO or GSO).
- 7 Orbit of the space service in which the receiving earth station operates (GSO or non-GSO).
- 8 The thermal noise temperature of the receiving system at the terminal of the receiving antenna (under clear-sky conditions). Refer to § 2.1 of this Annex for missing values.
- 9 Horizon antenna gain is calculated using the procedure of Annex 5. Where no value of  $G_m$  is specified, a value of 42 dBi is to be used.
- 10 Horizon antenna gain is calculated using the procedure of Annex 5, except that the following antenna pattern may be used in place of that given in § 3 of Annex 3:  $G = 32 - 25 \log \varphi$  for  $1^\circ \leq \varphi < 48^\circ$ ; and  $G = -10$  for  $48^\circ \leq \varphi < 180^\circ$  (refer to Annex 3 for definition of symbols).
- 11 Non-geostationary horizon antenna gain.  $G_e = G_{max}$  (see § 2.2 of the main body of this Appendix) with the antenna pattern modelled by the equation  $G = 36 - 25 \log (\varphi)$  (refer to Annex 3 for definition of symbols).
- 12 Non-geostationary horizon antenna gain.  $G_e = G_{max}$  (see § 2.2 of the main body of this Appendix) with the antenna pattern modelled by the equation  $G = 32 - 25 \log (\varphi)$  (refer to Annex 3 for definition of symbols).

**MOD**

**AI 9.2**

TABLE 10 (Rev.WRC-19)

**Predetermined coordination distances**

Frequency sharing situation		Coordination distance (in sharing situations involving services allocated with equal rights) (km)
Type of earth station	Type of terrestrial station	
Ground-based in the bands below 1 GHz to which No. 9.11A applies. Ground-based mobile in the bands within the range 1-3 GHz to which No. 9.11A applies	Mobile (aircraft)	500
Aircraft (all bands)	Ground-based	500
Aircraft (all bands)	Mobile (aircraft)	1 000
Ground-based in the bands: 400.15-401 MHz 1 668.4-1 675 MHz	Station in the meteorological aids service (radiosonde)	580
Aircraft in the bands: 400.15-401 MHz 1 668.4-1 675 MHz	Station in the meteorological aids service (radiosonde)	1 080
Ground-based in the radiodetermination-satellite service (RDSS) in the bands: 1 610-1 626.5 MHz 2 483.5-2 500 MHz 2 500-2 516.5 MHz	Ground-based	100
Airborne earth station in the radiodetermination-satellite service (RDSS) in the bands: 1 610-1 626.5 MHz 2 483.5-2 500 MHz 2 500-2 516.5 MHz	Ground-based	400
Receiving earth stations in the meteorological-satellite service	Station in the meteorological aids service	The coordination distance is considered to be the visibility distance as a function of the earth station horizon elevation angle for a radiosonde at an altitude of 20 km above mean sea level, assuming 4/3 Earth radius (see Note 1)
Non-GSO MSS feeder-link earth stations (all bands)	Mobile (aircraft)	500
Non-GSO MSS feeder-link earth stations in the band 5 091-5 150 MHz	Station in the aeronautical radionavigation service	Note 2
Receiving earth stations in the space research service in the band: 2 200-2 290 MHz	Mobile (aircraft)	880
Ground-based in the bands in which the frequency sharing situation is not covered in the rows above	Mobile (aircraft)	500



Notes to Table 10:

NOTE 1 – The coordination distance,  $d$  (km), for fixed earth stations in the meteorological-satellite service vis-à-vis stations in the meteorological aids service assumes a radiosonde altitude of 20 km and is determined as a function of the physical horizon elevation angle  $\epsilon_h$  (degrees) for each azimuth, as follows:

$$\begin{array}{ll}
 d = 100 & \text{for } \epsilon_h \geq 11^\circ \\
 d = 582 \left( \sqrt{1 + (0.254 \epsilon_h)^2} - 0.254 \epsilon_h \right) & \text{for } 0^\circ < \epsilon_h < 11^\circ \\
 d = 582 & \text{for } \epsilon_h \leq 0^\circ
 \end{array}$$

The minimum and maximum coordination distances are 100 km and 582 km, and correspond to physical horizon angles greater than  $11^\circ$  and less than  $0^\circ$ . (WRC-2000)

NOTE 2 – For the coordination distance in the frequency band 5 091-5 150 MHz vis-à-vis stations in the aeronautical radionavigation service, see No. **5.444A**. (WRC-15)

## APPENDIX 11 (REV.WRC-03)

### System specifications for double-sideband (DSB), single-sideband (SSB) and digitally modulated emissions in the HF broadcasting service

#### PART B – Single-sideband (SSB) system

##### 1 System parameters

###### MOD

##### 1.1 Channel spacing

In a mixed DSB, SSB and digital environment (see **Resolution 517 (Rev.WRC-19)**), the channel spacing shall be 10 kHz. In the interest of spectrum conservation, it is also permissible to interleave SSB emissions midway between two adjacent DSB channels, i.e., with 5 kHz separation between carrier frequencies, provided that the interleaved emission is not to the same geographical area as either of the emissions between which it is interleaved.

In an all-inclusive SSB environment, the channel spacing and carrier frequency separation shall be 5 kHz. (WRC-19)

###### MOD

#### PART C – Digital system (WRC-03)

##### 1 System parameters

##### 1.1 Channel spacing

The initial spacing for digitally modulated emissions shall be 10 kHz. However, interleaved channels with a separation of 5 kHz may be used in accordance with the appropriate protection



criteria appearing in Resolution 543 (Rev.WRC-19), provided that the interleaved emission is not to the same geographical area as either of the emissions between which it is interleaved. (WRC-19)

...

## 2 Emission characteristics

...

### 2.5 RF protection ratio values

The protection ratio values for analogue and digital emissions for co-channel and adjacent channel conditions shall be in accordance with Resolution 543 (Rev.WRC-19) as provisional RF protection ratio values subject to revision or confirmation by a future competent conference. (WRC-19)



AI 4

## MOD

### APPENDIX 15 (REV.WRC-19)

#### Frequencies for distress and safety communications for the Global Maritime Distress and Safety System

(See Article 31)

The frequencies for distress and safety communications for the GMDSS are given in Tables 15-1 and 15-2 for frequencies below and above 30 MHz, respectively.

TABLE 15-2 (WRC-19)

Frequencies above 30 MHz (VHF/UHF)

Frequency (MHz)	Description of usage	Notes
...	...	...
1 621.35-1 626.5	SAT-COM	In addition to its availability for routine non-safety purposes, the frequency band 1 621.35-1 626.5 MHz is used for distress and safety purposes in the Earth-to-space and space-to-Earth directions in the maritime mobile-satellite service. GMDSS distress, urgency and safety communications have priority in this band over non-safety communications within the same satellite system. (WRC-19)
...	...	...

AI 1.8  
Issue B

**MOD**

AI 1.8  
Issue A

**APPENDIX 17 (REV.WRC-19)**

**Frequencies and channelling arrangements in the  
high-frequency bands for the maritime mobile service**

(See Article 52)

**SUP**

AI 1.8  
Issue A

**ANNEX 1\*** (WRC-15)

**Frequencies and channelling arrangements in the high-frequency  
bands for the maritime mobile service, in force  
until 31 December 2016** (WRC-12)

**SUP**

AI 1.8  
Issue A

**ANNEX 2** (WRC-15)

**Frequency and channelling arrangements in the high-frequency  
bands for the maritime mobile service, which  
enter into force on 1 January 2017** (WRC-12)

**MOD**

AI 1.8  
Issue A

**PART A – Table of subdivided bands** (WRC-19)

...

**Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (end)**

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Limits (kHz)	4 221	6 332.5	8 438	12 658.5	16 904.5	19 705	22 445.5	26 122.5
Frequencies assignable for wide-band systems, facsimile, special and data transmission systems and direct-printing telegraphy systems <i>m) p) s) pp)</i>								
Limits (kHz)	4 351	6 501	8 707	13 077	17 242	19 755	22 696	26 145

...

*pp)* The bands 4 221-4 231 kHz, 6 332.5-6 342.5 kHz, 8 438-8 448 kHz, 12 658.5-12 668.5 kHz, 16 904.5-16 914.5 kHz and 22 445.5-22 455.5 kHz may also be used by the NAVDAT system, on condition that the use of NAVDAT system transmitting stations is limited to coast stations operating in accordance with the most recent version of Recommendation ITU-R M.2058. (WRC-19)

...

**MOD**

AI 1.8  
Issue A

**PART A – Table of subdivided bands** (WRC-19)

...

**Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (end)**

Band (MHz)	4	6	8	12	16	18/19	22	25/26
...								
Limits (kHz)	4 351	6 501	8 707	13 077	17 242	19 755	22 696	26 145
Frequencies assignable to coast stations for telephony, duplex operation <i>a) t)</i>	4 352.4 to 4 436.4	6 502.4 to 6 523.4	8 708.4 to 8 813.4	13 078.4 to 13 198.4	17 243.4 to 17 408.4	19 756.4 to 19 798.4	22 697.4 to 22 853.4	26 146.4 to 26 173.4
	29.f. 3 kHz	8.f. 3 kHz	36.f. 3 kHz	41.f. 3 kHz	56.f. 3 kHz	15.f. 3 kHz	53.f. 3 kHz	10.f. 3 kHz
Limits (kHz)	4 438	6 525	8 815	13 200	17 410	19 800	22 855	26 175

...



...

MOD

AI 1.9.2

APPENDIX 18 (REV.WRC-19)



**Table of transmitting frequencies in the VHF maritime mobile band**

(See Article 52)

NOTE A – For assistance in understanding the Table, see Notes *a)* to *zz)* below. (WRC-15)

NOTE B – The Table below defines the channel numbering for maritime VHF communications based on 25 kHz channel spacing and use of several duplex channels. The channel numbering and the conversion of two-frequency channels for single-frequency operation shall be in accordance with Recommendation ITU-R M.1084-5 Annex 4, Tables 1 and 3. The Table below also describes the harmonized channels where the digital technologies defined in the most recent version of Recommendation ITU-R M.1842 could be deployed. (WRC-15)

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public correspondence
		From ship stations	From coast stations		Single frequency	Two frequency	
60	<i>m)</i>	156.025	160.625		x	x	x
01	<i>m)</i>	156.050	160.650		x	x	x
61	<i>m)</i>	156.075	160.675		x	x	x
02	<i>m)</i>	156.100	160.700		x	x	x
62	<i>m)</i>	156.125	160.725		x	x	x
03	<i>m)</i>	156.150	160.750		x	x	x
63	<i>m)</i>	156.175	160.775		x	x	x
04	<i>m)</i>	156.200	160.800		x	x	x
64	<i>m)</i>	156.225	160.825		x	x	x
05	<i>m)</i>	156.250	160.850		x	x	x
65	<i>m)</i>	156.275	160.875		x	x	x
06	<i>f)</i>	156.300		x			
2006	<i>r)</i>	160.900	160.900				
66	<i>m)</i>	156.325	160.925		x	x	x
07	<i>m)</i>	156.350	160.950		x	x	x
67	<i>h)</i>	156.375	156.375	x	x		
08		156.400		x			
68		156.425	156.425		x		
09	<i>i)</i>	156.450	156.450	x	x		
69		156.475	156.475	x	x		
10	<i>h), q)</i>	156.500	156.500	x	x		
70	<i>f), j)</i>	156.525	156.525	Digital selective calling for distress, safety and calling			
11	<i>q)</i>	156.550	156.550		x		
71		156.575	156.575		x		
12		156.600	156.600		x		
72	<i>i)</i>	156.625		x			
13	<i>k)</i>	156.650	156.650	x	x		
73	<i>h), i)</i>	156.675	156.675	x	x		
14		156.700	156.700		x		

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public correspondence
		From ship stations	From coast stations		Single frequency	Two frequency	
74		156.725	156.725		x		
15	g)	156.750	156.750	x	x		
75	n), s)	156.775	156.775		x		
16	f)	156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	n), s)	156.825	156.825		x		
17	g)	156.850	156.850	x	x		
77		156.875		x			
18	m)	156.900	161.500		x	x	x
78	m)	156.925	161.525		x	x	x
1078		156.925	156.925		x		
2078	mm)		161.525		x		
19	m)	156.950	161.550		x	x	x
1019		156.950	156.950		x		
2019	mm)		161.550		x		
79	m)	156.975	161.575		x	x	x
1079		156.975	156.975		x		
2079	mm)		161.575		x		
20	m)	157.000	161.600		x	x	x
1020		157.000	157.000		x		
2020	mm)		161.600		x		
80	y), wa)	157.025	161.625		x	x	x
21	y), wa)	157.050	161.650		x	x	x
81	y), wa)	157.075	161.675		x	x	x
22	y), wa)	157.100	161.700		x	x	x
82	x), y), wa)	157.125	161.725		x	x	x
23	x), y), wa)	157.150	161.750		x	x	x
83	x), y), wa)	157.175	161.775		x	x	x
24	w), x)	157.200	161.800		x	x	x
1024	w)	157.200	157.200	x (digital only)	x (digital only)		
2024	w)	161.800	161.800	x (digital only)	x (digital only)		
84	w), x)	157.225	161.825		x	x	x
1084	w)	157.225	157.225	x (digital only)	x (digital only)		
2084	w)	161.825	161.825	x (digital only)	x (digital only)		
25	w), x)	157.250	161.850		x	x	x
1025	w)	157.250	157.250	x (digital only)	x (digital only)		
2025	w)	161.850	161.850	x (digital only)	x (digital only)		
85	w), x)	157.275	161.875		x	x	x
1085	w)	157.275	157.275	x (digital only)	x (digital only)		
2085	w)	161.875	161.875	x (digital only)	x (digital only)		

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public correspondence
		From ship stations	From coast stations		Single frequency	Two frequency	
26	w), x)	157.300	161.900		x	x	x
1026	w)	157.300					
2026	w)		161.900				
86	w), x)	157.325	161.925		x	x	x
1086	w)	157.325					
2086	w)		161.925				
1027	zz)	157.350	157.350		x		
ASM 1	z)	161.950	161.950				
87	zz)	157.375	157.375		x		
1028	zz)	157.400	157.400		x		
ASM 2	z)	162.000	162.000				
88	zz)	157.425	157.425		x		
AIS 1	f), l), p)	161.975	161.975				
AIS 2	f), l), p)	162.025	162.025				

#### Notes referring to the Table

##### General notes

...

- m) These channels may be operated as single frequency channels, subject to coordination with affected administrations. The following conditions apply for single frequency usage:
- The lower frequency portion of these channels may be operated as single frequency channels by ship and coast stations.
  - Transmission using the upper frequency portion of these channels is limited to coast stations.
  - If permitted by administrations and specified by national regulations, the upper frequency portion of these channels may be used by ship stations for transmission. All precautions should be taken to avoid harmful interference to channels AIS 1, AIS 2, ASM 1 and ASM 2. (WRC-19)
- mm) Transmission on these channels is limited to coast stations. If permitted by administrations and specified by national regulations, these channels may be used by ship stations for transmission. All precautions should be taken to avoid harmful interference to channels AIS 1, AIS 2, ASM 1 and ASM 2. (WRC-19)

...

w)

The frequency bands 157.1875-157.3375 MHz and 161.7875-161.9375 MHz (corresponding to channels: 24, 84, 25, 85, 26, 86, 1024, 1084, 1025, 1085, 1026, 1086, 2024, 2084, 2025, 2085, 2026 and 2086) are identified for the utilization of the VHF Data Exchange System (VDES). The VDES terrestrial and satellite components are described in the most recent version of Recommendation ITU-R M.2092. These channels shall not be used for feeder links. The channels may be merged using multiple 25 kHz contiguous channels to form channel bandwidths of 50, 100 or 150 kHz. The channel usage is shown below:

- The channels 1024, 1084, 1025 and 1085 are identified for ship-to-shore, shore-to-ship and ship-to-ship communications, but ship-to-satellite and satellite-to-ship communications may be possible without imposing constraints on ship-to-shore, shore-to-ship and ship-to-ship communications.
- The channels 2024, 2084, 2025 and 2085 are identified for shore-to-ship and ship-to-ship communications, but ship-to-satellite and satellite-to-ship communications may be possible without imposing constraints on shore-to-ship and ship-to-ship communications.
- The channels 1026, 1086, 2026 and 2086 are identified for ship-to-satellite and satellite-to-ship communications and are not used by the terrestrial component of VDES.

– The channels 24, 84, 25 and 85 are identified for ship-to-shore and shore-to-ship communications.

The Earth-to-space component of the VDES shall not cause harmful interference to, nor claim protection from, nor restrict future development of, terrestrial systems operating in the same frequency bands.

Until 1 January 2030, the channels 24, 84, 25, 85, 26 and 86 may also be used for analogue modulation described in the most recent version of Recommendation ITU-R M.1084 by an administration that wishes to do so, subject to not causing harmful interference to, or claiming protection from other stations in the maritime mobile service using digitally modulated emissions and subject to coordination with affected administrations. (WRC-19)

wa) In Regions 1 and 3:

The frequency bands 157.0125-157.1125 MHz and 161.6125-161.7125 MHz (corresponding to channels: 80, 21, 81 and 22) are identified for utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842 using multiple 25 kHz contiguous channels.

The frequency bands 157.1375-157.1875 MHz and 161.7375-161.7875 MHz (corresponding to channels: 23 and 83) are identified for utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842 using two 25 kHz contiguous channels. The frequencies 157.125 MHz and 161.725 MHz (corresponding to channel: 82) are identified for the utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842.

The frequency bands 157.0125-157.1875 MHz and 161.6125-161.7875 MHz (corresponding to channels: 80, 21, 81, 22, 82, 23 and 83) can also be used for analogue modulation described in the most recent version of Recommendation ITU-R M.1084 by an administration that wishes to do so, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions and subject to coordination with affected administrations. (WRC-19)

x) In Angola, Botswana, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Democratic Republic of the Congo, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe, the frequency bands 157.1125-157.3375 and 161.7125-161.9375 MHz (corresponding to channels: 82, 23, 83, 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions.

In China, the frequency bands 157.1375-157.3375 and 161.7375-161.9375 MHz (corresponding to channels: 23, 83, 24, 84, 25, 85, 26 and 86) are designated for digitally modulated emissions. (WRC-19)

y) These channels may be operated as single or duplex frequency channels, subject to coordination with affected administrations. (WRC-12)

z) Channels ASM 1 and ASM 2 are used for application specific messages (ASM) as described in the most recent version of Recommendation ITU-R M.2092. (WRC-19)

zz) Channels 1027, 1028, 87 and 88 are used as single-frequency analogue channels for port operation and ship movement. (WRC-19)



**MOD**

AI 1.9.1

APPENDIX 18 (REV.WRC-19)

**Table of transmitting frequencies in the  
VHF maritime mobile band**

(See Article 52)

...

**Notes referring to the Table**

*General notes*

...

*Specific notes*

...

- f) The frequencies 156.300 MHz (channel 06), 156.525 MHz (channel 70), 156.800 MHz (channel 16), 161.975 MHz (AIS 1) and 162.025 MHz (AIS 2) may also be used by aircraft stations for the purpose of search and rescue operations and other safety-related communication. The frequencies 156.525 MHz (channel 70), 161.975 MHz (AIS 1) and 162.025 MHz (AIS 2) may also be used by autonomous maritime radio devices Group A that enhance the safety of navigation, using digital selective calling and/or AIS technology. Such use should be in accordance with the most recent version of Recommendation ITU-R M.2135. (WRC-19)

...

**MOD**

AI 1.9.1

APPENDIX 18 (REV.WRC-19)

**Table of transmitting frequencies in the  
VHF maritime mobile band**

(See Article 52)

...

**Notes referring to the Table**

*General notes*

...

*Specific notes*

...

- r) In the maritime mobile service, the frequency 160.9 MHz (channel 2006) is designated for autonomous maritime radio devices Group B that do not enhance the safety of navigation, using AIS technology, in accordance with the most recent version of Recommendation ITU-R M.2135. Autonomous maritime radio devices Group B are limited to a transmitter e.i.r.p. of 100 mW and an antenna height not exceeding 1 m above the surface of the sea.

In the maritime mobile service, this frequency may also be used for experimental use for future applications or systems (e.g. new AIS applications, man over board systems, etc.). If authorized by administrations for experimental use, the operation shall not cause harmful interference to, or claim protection from, stations operating in the fixed and mobile services, including the use of autonomous maritime radio devices Group B. (WRC-19)

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AI 9.2

## APPENDIX 26 (REV.WRC-15)\*

### **Provisions and associated Frequency Allotment Plan for the aeronautical mobile (OR) service in the bands allocated exclusively to that service between 3 025 kHz and 18 030 kHz**

#### **PART III – Arrangement for the allotment of frequencies for the aeronautical mobile (OR) service in the exclusive bands between 3 025 and 18 030 kHz**

##### **MOD**

26/5.2 Whenever the allotment area is followed by another administration's code, indicated in parentheses, the notifications are receivable from the latter administration on the basis of an agreement in accordance with Resolution 1 (Rev.WRC-97).

NOTE a): The allotment area is designated by the symbol of the country or the geographical area, the meaning of which is given in the Preface to the **International Frequency Information Circular (BR IFIC)**. The meaning of the following symbol, which does not appear in the Preface to the **BR IFIC**, is given below:

...

##### **MOD**

AI 9.2

## APPENDIX 27 (REV.WRC-19)\*

### **Frequency allotment Plan for the aeronautical mobile (R) service and related information**

#### **PART II – Plan for the allotment of frequencies for the aeronautical mobile (R) service in the exclusive bands between 2 850 and 22 000 kHz**

##### **Section I – Description of the boundaries of the areas and sub-areas**

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\* This revision contains an up-to-date version of Part III, reflecting all amendments to Part III resulting from the application of the procedures of Part V, up to and including 10 May 2016, as well as those amendments, which resulted from geopolitical changes that occurred up to and including that date.

\* *Note by the Secretariat:* This edition of Appendix 27 incorporates editorial amendments to the Appendix 27 Aer2 as adopted by the WARC-Aer2.

The references in Appendix 27 now conform to the new numbering scheme of the Radio Regulations. In addition, the text of Appendix 27 contains updated definitions of the relevant aeronautical areas conforming with the new geographical situation reflecting the political changes since 1979. It also contains updated references to the classes of emissions in accordance with Article 2. (WRC-03)

## ARTICLE 2

### Description of the boundaries of the regional and domestic air route areas (RDARAs)

#### MOD

##### 27/114 *Regional arid Domestic Air Route Area – 4 (RDARA-4)*

From the point 30° N 39° W, and through the points 10° N 20° W, 05° S 20° W, to the point 05° S 12° E. Thence along the border between the Rep. of the Congo and Angola, then along the northern border of the Dem. Rep. of the Congo, and the borders of the Rep. of the Congo, of the Central African Republic and South Sudan. Thence north along the western borders of South Sudan and the Sudan. Along the western border of Egypt, northwards to the Mediterranean and along the Mediterranean and Atlantic coasts of North Africa to the point 30° N 10° W. West along the 30° N parallel to close the area at 30° N 39° W.

AI 9.2

#### MOD

##### 27/116 *Sub-Area 4B*

From the point 21° N 31° W, through the points 10° N 20° W, 05° S 20° W to 05° S 12° E. Thence along the southern border of the Rep. of the Congo and the Central African Republic to the junction between the Dem. Rep. of the Congo, South Sudan and the Central African Republic. Along the western border of South Sudan and the Sudan to the point 12° N 22° E. Thence along the N'Djamena parallel to the Nigerian border. Then westward along this border to the point 13° 12' N 10° 45' E, through Zinder and Gao, to the point 21° N 31° W.

AI 9.2

#### MOD

##### 27/117 *Regional and Domestic Air Route Area – 5 (RDARA-5)*

From the point 41° N 40° E to the point 37° N 40° E. Then along the border between Turkey and Syrian Arab Republic to the Mediterranean coast. Thence to the common border of Libya and Egypt on the North African coast excluding Cyprus. Southward along the western border of Egypt, the Sudan and South Sudan to the border of Kenya. Thence east along the northern border of Kenya, then south along the border between Kenya and Somalia and to the East African coast at 02° S 41° E. Then through the point 02° S 73° E to 37° N 73° E. Then east along the border between Afghanistan and Pakistan, and west along the northern borders of Afghanistan and the Islamic Republic of Iran to the Caspian Sea. Then along the northern border of the Islamic Republic of Iran and Turkey to close the area at 41° N 40° E.

AI 9.2

#### MOD

##### 27/121 *Sub-Area 5D*

From the junction of Egypt, Libya and the Sudan southward along the western border of the Sudan and South Sudan to the border of Kenya. Thence along the northern border of Kenya. Then south along the border between Kenya and Somalia to the east African coast, at the point 02° S 42° E. Then through the points 02° S 54° E, 13° N 54° E, 13° N 52° E to the point 12° N 44° E. Thence

AI 9.2

northwest along the middle of the Red Sea to 24° N 37° E. Thence along the southern border of Egypt to close the sub-area.

**MOD**

**27/130**     *Regional and Domestic Air Route Area – 7 (RDARA-7)*

From the South Pole along the 20° W meridian to 05° S. Then along the 05° S parallel to 12° E. Thence along the border between the Rep. of the Congo and Angola, then along the northern border of the Dem. Rep. of the Congo, along the border between Uganda and South Sudan, and the borders between Kenya and South Sudan, Ethiopia and Somalia, to the point 02° S 42° E. Then to 02° S 60° E and along the 60° E meridian to 11° S, then through the points 11° S 65° E, 40° S 65° E, 40° S 60° E to the South Pole.

AI 9.2

**MOD**

**27/132**     *Sub-Area 7B*

From the point 05° S 10° E to 05° S 12° E. Thence along the border between the Rep. of the Congo and Angola, then along the northern border of the Dem. Rep. of the Congo, to the junction of the borders of Uganda, the Dem. Rep. of the Congo and South Sudan. Thence along the eastern borders of the Dem. Rep. of the Congo, Rwanda, Burundi, and the Dem. Rep. of the Congo. Thence along the southern borders of the Dem. Rep. of the Congo and Angola to the coast of the South Atlantic. Thence to the point 17° S 10° E, and then to the point 05° S 10° E.

AI 9.2

**MOD**

**27/133**     *Sub-Area 7C*

From the junction of the borders of Uganda, the Dem. Rep. of the Congo and South Sudan along the western borders of Uganda and Tanzania, and then along the southern border of Tanzania to the coast. Thence through the points 11° S 41° E, 11° S 60° E, 02° S 60° E, to 02° S 41° E and thence to the east coast of Africa. Then north along the eastern border of Kenya, then west along the northern borders of Kenya and Uganda to close the sub-area at the junction of the borders of the Dem. Rep. of the Congo, South Sudan and Uganda.

AI 9.2

AI 4 AI 1.4

AI 7(C) AI 7(G)

AI 7(K) AI 9.2

AI 9.1

## APPENDIX 30 (REV.WRC-15)\*

### Provisions for all services and associated Plans and List<sup>1</sup> for the broadcasting-satellite service in the frequency bands 11.7-12.2 GHz (in Region 3), 11.7-12.5 GHz (in Region 1) and 12.2-12.7 GHz (in Region 2) (WRC-03)

MOD

#### ARTICLE 2A (REV.WRC-19)

#### Use of the guardbands<sup>2</sup>

#### ARTICLE 4 (REV.WRC-15)

#### Procedures for modifications to the Region 2 Plan or for additional uses in Regions 1 and 3<sup>3</sup>

##### 4.1 Provisions applicable to Regions 1 and 3

MOD

AI 7(K) 4.1.12<sup>XX</sup> If agreement has been reached with the administrations identified in the publication referred to under § 4.1.5 above, the administration proposing the new or modified assignment may continue with the appropriate procedure in Article 5, and shall so inform the Bureau, indicating the

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\* The expression “frequency assignment to a space station”, wherever it appears in this Appendix, shall be understood to refer to a frequency assignment associated with a given orbital position. See also Annex 7 for the orbital limitations. (WRC-2000)

<sup>1</sup> The Regions 1 and 3 List of additional uses is annexed to the Master International Frequency Register (see Resolution **542 (WRC-2000)**<sup>\*\*</sup>). (WRC-03)

<sup>\*\*</sup> *Note by the Secretariat:* This Resolution was abrogated by WRC-03.

*Note by the Secretariat:* Reference to an Article with the number in roman is referring to an Article in this Appendix.

<sup>2</sup> The provisions of Resolution **49 (Rev.WRC-15)** do not apply. (WRC-19)

<sup>3</sup> The provisions of Resolution **49 (Rev.WRC-15)** apply. (WRC-15)

AI 7(K) <sup>XX</sup> For any remaining affected networks whose assignments were entered in the List before the notice received under § 4.1.12, the Bureau shall use the method in Annex 1 to further examine if the remaining corresponding assignments in the List are still considered as being affected. The examination in respect of those remaining affected networks is conducted independently using the Appendices **30** and **30A** master database corresponding to the Part B Special Section that was published under § 4.1.15. Resolution **548 (Rev.WRC-12)** applies. (WRC-19)

final characteristics of the frequency assignment together with the names of the administrations with which agreement has been reached. (WRC-19)

## MOD

AI 7(C) 4.1.12*bis* In application of § 4.1.12, an administration may indicate the changes to the information communicated to the Bureau under § 4.1.3 and published under § 4.1.5. In submitting such information, noting the requirements of § 5.1.2, the administration may also request the Bureau to examine the submission in respect of notification under § 5.1.1. (WRC-19)

## MOD

AI 9.2 4.1.16 In case of disagreement on the part of an administration whose agreement has been sought, the requesting administration shall first endeavour to solve the problem by exploring all possible means of meeting its requirement. If the problem still cannot be solved by such means, the administration whose agreement has been sought should endeavour to overcome the difficulties as far as possible, and shall state the technical reasons for any disagreement if the administration seeking the agreement requests it to do so. (WRC-19)

## MOD

AI 7(G) 4.1.18*bis* When requesting the application of § 4.1.18, the notifying administration shall undertake to meet the requirements of § 4.1.20 and provide to the administration in respect of which § 4.1.18 is applied, with a copy to the Bureau, a description of the steps by which it undertakes to meet these requirements. Once an assignment is entered in the List provisionally under the provisions of § 4.1.18, the calculation of the equivalent protection margin (EPM)<sup>9</sup> of an assignment in the Regions 1 and 3 List or for which the procedure of Article 4 has been initiated and which was the basis for the disagreement shall not take into account the interference produced by the assignment for which the provisions of § 4.1.18 have been applied. When the recording of an assignment entered into the List is changed from provisional to definitive in accordance with § 4.1.18, but there is still continuing disagreement between the administrations, the Bureau shall consult with the administration responsible for the assignments which were the basis for the disagreement in determining the appropriate course of action as regards any update to the EPM for the assignments which were the basis for the disagreement. (WRC-19)

## MOD

AI 9.2 4.1.24 No assignment in the List shall have a period of operation exceeding 15 years, counted from the date of bringing into use, or 2 June 2000, whichever is later. Upon request by the responsible administration received by the Bureau at the latest three years before the expiry of this period, this period may be extended by up to 15 years, on condition that all the characteristics of the assignment remain unchanged<sup>b</sup>. (WRC-19)

AI 9.2 <sup>b</sup> Unless the request has been received by the Bureau, it shall, no later than 90 days before the deadline of such a request, send a reminder to the notifying administration. (WRC-19)

## 4.2 Provisions applicable to Region 2

### MOD

4.2.3 An administration proposing a modification to the characteristics of a frequency assignment in conformity with the Region 2 Plan, or the inclusion of a new frequency assignment in that Plan, shall seek the agreement of those administrations:

...

- f) having a frequency assignment to a space station in the broadcasting-satellite service in the frequency band 12.5-12.7 GHz in Region 3 with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment, and:
- which is recorded in the Master Register; *or*
  - for which complete coordination information has been received by the Bureau for coordination under No. 9.7 or under § 7.1 of Article 7;

...

### MOD

4.2.16<sup>XX1</sup> If no comments have been received on the expiry of the periods specified in § 4.2.14, or if agreement has been reached with the administrations which have made comments and with which agreement is necessary, the administration proposing the modification may continue with the appropriate procedure in Article 5, and shall so inform the Bureau, indicating the final characteristics of the frequency assignment together with the names of the administrations with which agreement has been reached. (WRC-19)

AI 7(K)

### MOD

4.2.16<sup>bis</sup> In application of § 4.2.16, an administration may indicate the changes to the information communicated to the Bureau under § 4.2.6 and published under § 4.2.8. In submitting such information, noting the requirements of § 5.1.2, the administration may also request the Bureau to examine the submission in respect of notification under § 5.1.1. (WRC-19)

AI 7(C)

### MOD

4.2.17 The agreement of the administrations affected may also be obtained in accordance with this Article, for a specified period. When this specific period of agreement expires for an assignment in the Plan, the assignment in question shall be maintained in the Plan until the end of

AI 9.2

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<sup>12</sup> (SUP – WRC-19)

<sup>XX1</sup> For any remaining affected networks whose assignments were entered in the Plan before the notice received under § 4.2.16, the Bureau shall use the method in Annex 1 to further examine if the remaining corresponding assignments in the Plan are still considered as being affected. The examination in respect of those remaining affected networks is conducted independently using the Appendices 30 and 30A master database corresponding to the Part B Special Section that was published under § 4.2.19. (WRC-19)

AI 7(K)

**AI 9.2** the period referred to in § 4.2.6 above. After that date this assignment in the Plan shall lapse unless the agreement of the administrations affected is renewed<sup>c</sup>. (WRC-19)

## **MOD**

**AI 9.2** 4.2.20 When an administration proposing to modify the characteristics of a frequency assignment or to make a new frequency assignment receives notice of disagreement on the part of an administration whose agreement it has sought, it shall first endeavour to solve the problem by exploring all possible means of meeting its requirement. If the problem still cannot be solved by such means, the administration whose agreement has been sought should endeavour to overcome the difficulties as far as possible, and shall state the technical reasons for any disagreement if the administration seeking the agreement requests it to do so. (WRC-19)

**AI 4**

## **ARTICLE 5 (REV.WRC-15)**

### **Notification, examination and recording in the Master International Frequency Register of frequency assignments to space stations in the broadcasting-satellite service<sup>18</sup> (WRC-07)**

#### **5.1 Notification**

## **MOD**

5.1.3 Each notice must reach the Bureau not earlier than three years before the date on which the frequency assignment is to be brought into use. In any case, the notice must reach the Bureau not later than three months before that date<sup>20</sup>. (WRC-19)

**AI 9.2** <sup>c</sup> Unless the Bureau has been informed by the notifying administration of the renewal of the agreement, it shall, no later than 6 months before the end of the specified period, send a reminder to the notifying administration. (WRC-19)

<sup>18</sup> If the payments are not received in accordance with the provisions of Council Decision 482, as amended, on the implementation of cost recovery for satellite network filings, the Bureau shall cancel the publication specified in § 5.1.6 and the corresponding entries in the Master Register under § 5.2.2, 5.2.2.1, 5.2.2.2 or 5.2.6, as appropriate, and the corresponding entries included in the Plan on and after 3 June 2000 or in the List, as appropriate, after informing the administration concerned. The Bureau shall inform all administrations of such action. The Bureau shall send a reminder to the notifying administration not later than two months prior to the deadline for the payment in accordance with the above-mentioned Council Decision 482 unless the payment has already been received. See also Resolution **905 (WRC-07)**\*. (WRC-07)

\* *Note by the Secretariat:* This Resolution was abrogated by WRC-12.

<sup>20</sup> Where appropriate, the notifying administration shall initiate the procedure for modifying the Plan concerned or for including assignments in the Regions 1 and 3 List in sufficient time to ensure that this limit is observed. For Region 2, see also Resolution **42 (Rev.WRC-19)** and § B of Annex 7. (WRC-19)



## 5.2 Examination and recording

### MOD

#### 5.2.1 The Bureau shall examine each notice:

- a) with respect to its conformity with the Constitution, the Convention and the relevant provisions of the Radio Regulations (with the exception of those relating to § *b*), *c*), *d*) and *e*) below);
- b) with respect to its conformity with the appropriate Regional Plan or the Regions 1 and 3 List, as appropriate; *or*
- c) with respect to the coordination requirements specified in the Remarks column of Article 10 or Article 11; *or*
- d) with respect to its conformity with the appropriate Regional Plan or the Regions 1 and 3 List, however, having characteristics differing from those in the appropriate Regional Plan or in the Regions 1 and 3 List, in one or more of the following aspects:
  - use of a reduced e.i.r.p.,
  - use of a reduced coverage area entirely situated within the coverage area appearing in the appropriate Regional Plan or in the Regions 1 and 3 List,
  - use of other modulating signals in accordance with the provisions of § 3.1.3 of Annex 5,
  - use of the assignment for transmission in the fixed-satellite service in accordance with No. **5.492**,
  - in the case of Region 2, use of an orbital position under the conditions specified in § B of Annex 7,
  - in the case of the notification of Plan assignments, use of an e.i.r.p. which produces a pfd that exceeds the limit of  $-103.6 \text{ dB(W/(m}^2 \cdot 27 \text{ MHz))}$  given in Section 1 of Annex 1 to Appendix 30 on the territory of the notifying administration under the condition that the calculated pfd at test points of any Plan assignment, List assignment or proposed assignment submitted under Article 4 are equal to or below that of the original Plan assignments in the same channel of the administration applying this section; *or*
- e) with respect to its conformity with the provisions of Resolution **42 (Rev.WRC-19)**. (WRC-19)

### MOD

5.2.2.2 In the case of Region 2, where the Bureau reaches a favourable finding with respect to § 5.2.1 *a*) and 5.2.1 *c*), but an unfavourable finding with respect to § 5.2.1 *b*) and 5.2.1 *d*), it shall examine the notice with respect to the successful application of the provisions of Resolution **42 (Rev.WRC-19)**. A frequency assignment for which the provisions of Resolution **42 (Rev.WRC-19)** have been successfully applied shall be recorded in the Master Register with an appropriate symbol to indicate its interim status. The date of receipt of the notice by the Bureau shall be entered in the Master Register. In relations between administrations all frequency assignments brought into use following the successful application of the provisions of Resolution **42 (Rev.WRC-19)** and recorded in the Master Register shall be considered to have the same status irrespective of the dates of receipt entered in the Master Register for such frequency assignments. (WRC-19)

**MOD**



5.2.10 Wherever the use of a frequency assignment to a space station recorded in the Master Register and emanating from the Regions 1 and 3 List is suspended for a period exceeding six months, the notifying administration shall inform the Bureau of the date on which such use was suspended. When the recorded assignment is brought back into use, the notifying administration shall so inform the Bureau, as soon as possible. On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC. The date on which the recorded assignment is brought back into use<sup>20bis</sup> shall be no later than three years from the date on which the use of the frequency assignment was suspended, provided that the notifying administration informs the Bureau of the suspension within six months from the date on which the use was suspended. If the notifying administration informs the Bureau of the suspension more than six months after the date on which the use of the frequency assignment was suspended, this three-year time period shall be reduced. In this case, the amount by which the three-year period shall be reduced shall be equal to the amount of time that has elapsed between the end of the six-month period and the date that the Bureau is informed of the suspension. If the notifying administration informs the Bureau of the suspension more than 21 months after the date on which the use of the frequency assignment was suspended, the frequency assignment shall be cancelled. (WRC-15)

AI 4

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<sup>20bis</sup> The date of bringing back into use of a frequency assignment to a space station in the geostationary-satellite orbit shall be the commencement of the 90-day period defined below. A frequency assignment to a space station in the geostationary-satellite orbit shall be considered as having been brought back into use when a space station in the geostationary-satellite orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained at the notified orbital position for a continuous period of 90 days. The notifying administration shall inform the Bureau within 30 days from the end of the 90-day period. **Resolution 40 (Rev. WRC-19)** shall apply. (WRC-19)

ARTICLE 7 (REV.WRC-03)

**Coordination, notification and recording in the Master International Frequency Register of frequency assignments to stations in the fixed-satellite service (space-to-Earth) in the bands 11.7-12.2 GHz (in Region 2), 12.2-12.7 GHz (in Region 3) and 12.5-12.7 GHz (in Region 1), and to stations in the broadcasting-satellite service in the band 12.5-12.7 GHz (in Region 3) when frequency assignments to broadcasting-satellite stations in the bands 11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3 are involved<sup>22</sup>**

**MOD**

7.1 The provisions of No. 9.7 and the associated provisions under Articles 9 and 11 are applicable in respect of frequency assignments to broadcasting-satellite stations in the frequency bands 11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3:

- a) to transmitting space stations in the fixed-satellite service in the frequency bands 11.7-12.2 GHz (in Region 2), 12.2-12.7 GHz (in Region 3) and 12.5-12.7 GHz (in Region 1); and
- b) to transmitting space stations in the broadcasting-satellite service in the frequency band 12.5-12.7 GHz (in Region 3). (WRC-19)

**MOD**

ARTICLE 10 (REV.WRC-19)

**The Plan for the broadcasting-satellite service in the frequency band 12.2-12.7 GHz in Region 2**

...

9/GR . . . This assignment is part of a group, the number of which follows the symbol. The group consists of the beams and has the number of channels assigned to it as indicated in Table 1 below.

- a) The overall equivalent protection margin to be used for the application of Article 4 and Resolution 42 (Rev.WRC-19) shall be calculated on the following basis:

...

---

<sup>22</sup> These provisions do not replace the procedures prescribed in Articles 9 and 11 when stations other than those in the broadcasting-satellite service subject to a Plan are involved. (WRC-03)

<sup>23</sup> (SUP – WRC-19)

**MOD**

AI 9.2 10.1 COLUMN HEADINGS OF THE PLAN

Col. 1 *Beam identification* (Column 1 contains the symbol designating the country or the geographical area taken from Table B1 of the Preface to the International Frequency Information Circular (BR IFIC) followed by the symbol designating the service area).

...

**MOD**

AI 9.2 *Country symbols*

1 For the explanation of symbols designating countries or geographical areas in Region 2, see the Preface to the BR IFIC.

...

AI 9.2 ARTICLE 11 (REV.WRC-15)

**Plan for the broadcasting-satellite service in the frequency bands  
11.7-12.2 GHz in Region 3 and 11.7-12.5 GHz in Region 1**

**MOD**

AI 9.2 11.1 COLUMN HEADINGS OF THE PLAN

Col. 1 *Notifying administration symbol.*

Col. 2 *Beam identification* (Column 2, normally, contains the symbol designating the administration or the geographical area taken from Table B1 of the Preface to the International Frequency Information Circular (BR IFIC), followed by the symbol designating the service area).

...

**MOD**

AI 9.1

TABLE 2 (WRC-19)

**Affected administrations and corresponding networks/beams identified based on Note 5 in § 11.2 of Article 11**

Beam name	Channels	Ref. Table 1	Affected administrations*	Affected networks/beams*
...	...	...	...	...
RUS-4	28, 29, 33, 37	c	KOR	KOREASAT-1, KOREASAT-2
...	...	...	...	...



\* Administrations and corresponding networks/beams whose assignment(s) may receive interference from the beam shown in the left-hand column.

**MOD**

AI 9.1

TABLE 6A (WRC-19)

**Basic characteristics of the Regions 1 and 3 Plan (sorted by administration)**

1	2	3	4		5			6	7	8		9		10		11	12	13	14	15	16
			Long.	Lat.	Major axis	Minor axis	Ori-entation			Space station antenna code	Shaped beam	Co-polar	Cross-polar	Code	Gain						
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
E	HISPASA4	-30.00	-4.00	39.00					COP	39.80	5.50	MODRES	38.43	CL		57.6	27MOG7W	HISPASAT-1	01	PE	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
J	000BS-3N	109.85	134.50	31.50	3.52	3.30	68.00	R13TSS		33.80		MODRES	35.50	CR		*	27MOG7W	BS-3N	02	PE	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
J	J 1110E	110.00	134.50	31.50	3.52	3.30	68.00	R13TSS		33.80		MODRES	35.50	CR		*	27MOG7W	BS-3M	02	PE	

\* Channel 1: 58.2 dBW, channels 3, 5, 7: 59.2 dBW, channels 9, 11, 13: 59.3 dBW, other channels: 59.4 dBW.



**MOD**

COLUMN HEADINGS IN TABLE 6B

- AI 9.2**
- Col. 1 *Nominal orbital position*, in degrees and hundredths of a degree from the Greenwich meridian (negative values indicate longitudes which are west of the Greenwich meridian; positive values indicate longitudes which are east of the Greenwich meridian).
- Col. 2 *Notifying administration symbol*.
- Col. 3 *Beam identification* (Column 2, normally, contains the symbol designating the administration or the geographical area taken from Table B1 of the Preface to the International Frequency **Information Circular (BR IFIC)**, followed by the symbol designating the service area).
- ...

**MOD**

ARTICLE 12 (REV.WRC-19)

**Relationship to Resolution 507 (Rev.WRC-19)**

**MOD**

12.1 The provisions and associated Plans for the broadcasting-satellite service in Regions 1 and 3 and in Region 2, of this Appendix, shall be regarded as including a world agreement and associated Plans for Regions 1, 2 and 3 in accordance with *resolves* 1 of Resolution **507 (Rev.WRC-19)**, which requires the stations in the broadcasting-satellite service to be established and operated in accordance with such agreements and associated Plans.

## ANNEX 1 (REV.WRC-15)

**Limits for determining whether a service of an administration is affected by a proposed modification to the Region 2 Plan or by a proposed new or modified assignment in the Regions 1 and 3 List or when it is necessary under this Appendix to seek the agreement of any other administration<sup>25</sup>**

**MOD**

**4 Limits to the power flux-density to protect the terrestrial services of other administrations<sup>29, 30, 31</sup>**

...

With respect to § 4.1.1 *d*) or § 4.2.3 *d*) of Article 4, an administration in Region 1, 2 or 3 is considered as being affected if the proposed new assignment in the Regions 1 and 3 List, or if the proposed new frequency assignment in the Region 2 Plan, would result in exceeding a power flux-density, for any angle of arrival, at any point on its territory, of:

$$\begin{array}{ll} -148 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))} & \text{for } 0^\circ \leq \theta \leq 5^\circ \\ -148 + 0.5 (\theta - 5) \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))} & \text{for } 5^\circ < \theta \leq 25^\circ \\ -138 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))} & \text{for } 25^\circ < \theta \leq 90^\circ \end{array}$$

where  $\theta$  represents the angle of arrival. (WRC-19)

**MOD**

**6 Limits to the change in the power flux-density of assignments in the Regions 1 and 3 Plan or List to protect the fixed-satellite service (space-to-Earth) in the frequency band 11.7-12.2 GHz<sup>32</sup> in Region 2 or in the frequency band 12.2-12.5 GHz in Region 3, and of assignments in the Region 2 Plan to protect the fixed-satellite service (space-to-Earth) in the frequency band 12.5-12.7 GHz in Region 1 and in the frequency band 12.2-12.7 GHz in Region 3**

With respect to § 4.1.1 *e*) of Article 4, an administration is considered as being affected if the proposed new or modified assignment in the Regions 1 and 3 List would result in an increase in the power flux-density over any portion of the service area of its overlapping frequency assignments in

<sup>25</sup> With respect to this Annex, except for Section 2, the limits relate to the power flux-density which would be obtained assuming free-space propagation conditions.

With respect to Section 2 of this Annex, the limit specified relates to the overall equivalent protection margin calculated in accordance with § 2.2.4 of Annex 5.

<sup>31</sup> See Resolution 34 (Rev.WRC-19).



the fixed-satellite service in Region 2 or Region 3 by **more than** 0.25 dB above that resulting from the frequency assignments in the Plan or List for Regions 1 and 3 as established by WRC-2000.

With respect to § 4.2.3 e), an administration is considered as being affected if the proposed modification to the Region 2 Plan would result in an increase in the power flux-density over any portion of the service area of its overlapping frequency assignments in the fixed-satellite service in Region 1 or 3 **by more than** 0.25 dB above that resulting from the frequency assignments in the Region 2 Plan at the time of entry into force of the Final Acts of the 1985 Conference.

With respect to § 4.1.1 e) or 4.2.3 e) of Article 4, with the exception of cases covered by Note 1 below, an administration is considered as not being affected if the proposed new or modified assignment in the Regions 1 and 3 List, or if a proposed modification to the Region 2 Plan, gives a power flux-density anywhere over any portion of the service area of its overlapping frequency assignments in the fixed-satellite service in Region 1, 2 or 3 of less than **or equal to:**

$$\begin{array}{ll}
 -186.5 \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 0^\circ \leq \theta < 0.054^\circ \\
 -164.0 + 17.74 \log \theta \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 0.054^\circ \leq \theta < 2.0^\circ \\
 -165.0 + 1.66 \theta^2 \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 2.0^\circ \leq \theta < 3.59^\circ \\
 -157.5 + 25 \log \theta \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 3.59^\circ \leq \theta < 10.57^\circ \\
 -131.9 \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 10.57^\circ \leq \theta
 \end{array}$$

where  $\theta$  is the minimum geocentric orbital separation in degrees between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies.

NOTE 1 – With respect to § 4.1.1 e) of Article 4, an administration in Region 3 is considered as not being affected if the proposed new or modified assignment in the Regions 1 and 3 List in the orbital arc 105° E-129° E gives a power flux-density anywhere over any portion of the territory of the notifying administration within the service area of its overlapping frequency assignments in the fixed-satellite service in the orbital arc 110° E-124° E of less than **or equal to:**

$$\begin{array}{ll}
 -186.5 \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 0^\circ \leq \theta < 0.054^\circ \\
 -164.0 + 17.74 \log \theta \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 0.054^\circ \leq \theta < 1.8^\circ \\
 -162.3 + 0.89 \theta^2 \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 1.8^\circ \leq \theta < 5.0^\circ \\
 -157.5 + 25 \log \theta \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 5.0^\circ \leq \theta < 10.57^\circ \\
 -131.9 \text{ dB(W/(m}^2 \cdot 40 \text{ kHz))} & \text{for } 10.57^\circ \leq \theta
 \end{array}$$

where  $\theta$  is the minimum geocentric orbital separation in degrees between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies.

The above set of formulas is only applied to networks:

- for which Appendix 4 information for coordination had been received by the Bureau prior to 30 March 2002; *and*
- which had been brought into use prior to 30 March 2002 and for which the date of bringing into use had been confirmed to the Bureau; *and*
- for which the complete due diligence information, in accordance with Annex 2 to Resolution 49 (Rev.WRC-15), had been received by the Bureau prior to 30 March 2002. (WRC-19)

MOD

AI 9.2

ANNEX 4 (REV.WRC-19)

**Need for coordination of a transmitting space station in the fixed-satellite service or in the broadcasting-satellite service where this service is not subject to a Plan: in Region 2 (11.7-12.2 GHz) with respect to the Plan, the List or proposed new or modified assignments in the List for Regions 1 and 3; in Region 1 (12.5-12.7 GHz) and in Region 3 (12.2-12.7 GHz) with respect to the Plan or proposed modifications to the Plan in Region 2; in Region 3 (12.2-12.5 GHz) with respect to the Plan, List or proposed new or modified assignments in the List for Region 1**

(See Article 7)

...

In the case of an administration in Region 3 that has notified and brought into use its BSS Plan assignments before 9 June 2003, and whose notified assignments have been recorded in the Master Register with a favourable finding and for which the date of bringing into use has been confirmed to the Bureau, with respect to § 7.2.1 a) of Article 7, the conditions contained above are replaced by the following conditions:

- under assumed free-space propagation conditions, the power flux-density at any test point within the service area of the overlapping frequency assignments in the Plan



**exceeds** the following values: (WRC-19)

$-147 \text{ dB(W/(m}^2 \cdot 27 \text{ MHz))}$	for $0^\circ \leq \theta < 0.23^\circ$
$-135.7 + 17.74 \log \theta \text{ dB(W/(m}^2 \cdot 27 \text{ MHz))}$	for $0.23^\circ \leq \theta < 1.8^\circ$
$-134.0 + 0.89 \theta^2 \text{ dB(W/(m}^2 \cdot 27 \text{ MHz))}$	for $1.8^\circ \leq \theta < 5.0^\circ$
$-129.2 + 25 \log \theta \text{ dB(W/(m}^2 \cdot 27 \text{ MHz))}$	for $5.0^\circ \leq \theta < 10.57^\circ$
$-103.6 \text{ dB(W/(m}^2 \cdot 27 \text{ MHz))}$	for $10.57^\circ \leq \theta$

...

MOD

ANNEX 7 (REV.WRC-19)

Orbital position limitations<sup>ADD YY, ADD ZZ</sup>

MOD

- AI 1.4 1) No broadcasting satellite serving an area in Region 1 and using a frequency in the frequency band 11.7-12.2 GHz shall occupy a nominal orbital position further east than 146° E.



MOD

- AI 1.4 2) No broadcasting satellite serving an area in Region 2 and using a frequency in the frequency band 12.2-12.7 GHz that involves an orbital position different from that contained in the Region 2 Plan shall occupy a nominal orbital position further west than 175.2° W.

However, modifications necessary to resolve possible incompatibilities during the incorporation of the Regions 1 and 3 feeder-link Plan into the Radio Regulations shall be permitted.



SUP

- AI 1.4 3)



SUP

TABLE 1

AI 1.4 Allowable portions of the orbital arc between 37.2° W and 10° E for new or modified assignments in the Regions 1 and 3 Plan and List

YY See Resolution COM5/2 (WRC-19).

ZZ Resolution COM5/4 (WRC-19) applies to broadcasting satellites serving areas in Region 1 in the frequency band 11.7-12.2 GHz from nominal orbital positions further west than 37.2° W and broadcasting satellites serving areas in Region 2 in the frequency band 12.5-12.7 GHz from nominal orbital positions further east than 54° W and not within its clusters in the Region 2 Plan of Appendix 30.

SUP

AI 1.4

TABLE 2

Nominal positions in the orbital arc between 37.2° W and 10° E at which the e.i.r.p. may exceed the limit of 56 dBW

AI 7(K)

APPENDIX 30A (REV.WRC-15)\*

AI 4

AI 7(C)

AI 7(G)

AI 9.2 **Provisions and associated Plans and List<sup>1</sup> for feeder links for the broadcasting-satellite service (11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3) in the frequency bands 14.5-14.8 GHz<sup>2</sup> and 17.3-18.1 GHz in Regions 1 and 3, and 17.3-17.8 GHz in Region 2** (WRC-03)

AI 9.1

MOD

ARTICLE 2A (REV.WRC-19)

**Use of the guardbands<sup>4</sup>**

ARTICLE 3 (REV.WRC-03)

**Execution of the provisions and associated Plans**

MOD

3.3 The procedures for the use of interim systems in Region 2 for feeder links in the fixed-satellite service for the frequency bands covered by this Appendix are given in Resolution **42 (Rev.WRC-19)**. (WRC-19)

---

\* The expression “frequency assignment to a space station”, wherever it appears in this Appendix, shall be understood to refer to a frequency assignment associated with a given orbital position. (WRC-03)

<sup>1</sup> The Regions 1 and 3 feeder-link List of additional uses is annexed to the Master International Frequency Register (see Resolution **542 (WRC-2000)\*\***). (WRC-03)

\*\* *Note by the Secretariat:* This Resolution was abrogated by WRC-03.

<sup>2</sup> This use of the band 14.5-14.8 GHz is reserved for countries outside Europe.

*Note by the Secretariat:* Reference to an Article with the number in roman is referring to an Article in this Appendix.

<sup>4</sup> The provisions of Resolution **49 (Rev.WRC-15)** do not apply. (WRC-19)

ARTICLE 4 (REV.WRC-15)

**Procedures for modifications to the Region 2 feeder-link Plan  
or for additional uses in Regions 1 and 3**

**4.1 Provisions applicable to Regions 1 and 3**

**MOD**

4.1.1 An administration proposing to include a new or modified assignment in the feeder-link List shall seek the agreement of those administrations whose services are considered to be affected, i.e. administrations<sup>4, 5</sup>:

- AI 9.2**
- a) of Regions 1 and 3 having a feeder-link frequency assignment in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service which is included in the Regions 1 and 3 feeder-link Plan with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment; *or*
  - b) of Regions 1 and 3 having a feeder-link frequency assignment included in the feeder-link List or for which complete Appendix 4 information has been received by the Radiocommunication Bureau in accordance with the provisions of § 4.1.3, and any portion of which falls within the necessary bandwidth of the proposed assignment; *or*
  - c) of Region 2 having a feeder-link frequency assignment in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service which is in conformity with the Region 2 feeder-link Plan, or in respect of which proposed modifications to that Plan have already been received by the Bureau in accordance with the provisions of § 4.2.6 with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment; *or*
  - d) having a feeder-link frequency assignment in the frequency bands 14.5-14.8 GHz or 17.8-18.1 GHz in Region 2 in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service, or a frequency assignment in the frequency band 14.5-14.75 GHz in countries listed in Resolution 163 (WRC-15) and in the frequency band 14.5-14.8 GHz in countries listed in Resolution 164 (WRC-15), in the fixed-satellite service (Earth-to-space) not subject to a Plan, which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of No. 9.7, or under § 7.1 of Article 7, with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment. (WRC-19)

**MOD**

AI 7(K) 4.1.12<sup>XX</sup> If agreement has been reached with the administrations identified in the publication referred to under § 4.1.5 above, the administration proposing the new or modified assignment may continue with the appropriate procedure in Article 5 and shall inform the Bureau, indicating the final characteristics of the frequency assignment together with the names of the administrations with which agreement has been reached. (WRC-19)

**MOD**

AI 7(C) 4.1.12<sup>bis</sup> In application of § 4.1.12, an administration may indicate the changes to the information communicated to the Bureau under § 4.1.3 and published under § 4.1.5. In submitting such information, noting the requirements of § 5.1.6, the administration may also request the Bureau to examine the submission in respect of notification under § 5.1.2. (WRC-19)

**MOD**

AI 9.2 4.1.13 The agreement of the administrations affected may also be obtained in accordance with this Article, for a specified period. When this specific period of agreement expires for an assignment in the List, the assignment in question shall be maintained in the List until the end of the period referred to in § 4.1.3 above. After that date this assignment shall lapse unless the agreement of the administrations affected is renewed<sup>a</sup>. (WRC-19)

**MOD**

AI 9.2 4.1.16 In case of disagreement on the part of an administration whose agreement has been sought, the requesting administration shall first endeavour to solve the problem by exploring all possible means of meeting its requirement. If the problem still cannot be solved by such means, the administration whose agreement has been sought should endeavour to overcome the difficulties as far as possible, and shall state the technical reasons for any disagreement if the administration seeking the agreement requests it to do so. (WRC-19)

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AI 7(K) <sup>XX</sup> For any remaining affected networks whose assignments were entered in the List before the notice received under § 4.1.12, the Bureau shall use the method in Annex 1 to further examine if the remaining corresponding assignments in the List are still considered as being affected. The examination in respect of those remaining affected networks is conducted independently using the Appendices 30 and 30A master database corresponding to the Part B Special Section that was published under § 4.1.15. Resolution 548 (Rev.WRC-12) applies. (WRC-19)

AI 9.2 <sup>a</sup> Unless the Bureau has been informed by the notifying administration of the renewal of the agreement, it shall, no later than six months before the end of the specified period, send a reminder to the notifying administration. (WRC-19)

## MOD

AI 7(G) 4.1.18bis When requesting the application of § 4.1.18, the notifying administration shall undertake to meet the requirements of § 4.1.20 and provide to the administration in respect of which § 4.1.18 is applied, with a copy to the Bureau, a description of the steps by which it undertakes to meet these requirements. Once an assignment is entered in the feeder-link List provisionally under the provisions of § 4.1.18, the calculation of the equivalent protection margin (EPM)<sup>11</sup> of an assignment in the Regions 1 and 3 feeder-link List or for which the procedure of Article 4 has been initiated and which was the basis for the disagreement shall not take into account interference produced by the assignment for which the provisions of § 4.1.18 have been applied. When the recording of an assignment entered into the List is changed from provisional to definitive in accordance with § 4.1.18, but there is still continuing disagreement between the administrations, the Bureau shall consult with the administration responsible for the assignments which were the basis for the disagreement in determining the appropriate course of action as regards any update to the EPM for the assignments which were the basis for the disagreement. (WRC-19)

## MOD

AI 9.2 4.1.24 No assignment in the feeder-link List shall have a period of operation exceeding 15 years, counted from the date of bringing into use, or 2 June 2000, whichever is later. Upon request by the responsible administration received by the Bureau at the latest three years before the expiry of this period, this period may be extended by up to 15 years, on condition that all the characteristics of the assignment remain unchanged<sup>b</sup>. (WRC-19)

## 4.2 Provisions applicable to Region 2

### MOD

4.2.1 When an administration intends to make a modification to the Region 2 feeder-link Plan, i.e.:

- a) to modify the characteristics of any of its frequency assignments in the fixed-satellite service which are shown in the Region 2 feeder-link Plan, or for which the procedure in this Article has been successfully applied, whether or not the station has been brought into use; *or*
- b) to include in the Region 2 feeder-link Plan a new frequency assignment in the fixed-satellite service; *or*
- c) to cancel a frequency assignment in the fixed-satellite service,

the following procedure shall be applied before any notification of the frequency assignment is made to the Bureau (see Article 5 and Resolution 42 (Rev.WRC-19)). (WRC-19)

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AI 9.2 <sup>b</sup> Unless the request has been received by the Bureau, it shall, no later than 90 days before the deadline of such a request, send a reminder to the notifying administration. (WRC-19)

**MOD**

4.2.16<sup>XX1</sup> If no comments have been received on the expiry of the periods specified in § 4.2.14, or if agreement has been reached with the administrations which have made comments and with which agreement is necessary, the administration proposing the modification may continue with the appropriate procedure in Article 5, and shall so inform the Bureau, indicating the final characteristics of the frequency assignment together with the names of the administrations with which agreement has been reached. (WRC-19)

AI 7(K)

**MOD**

4.2.16<sup>bis</sup> In application of § 4.2.16, an administration may indicate the changes to the information communicated to the Bureau under § 4.2.6 and published under § 4.2.8. In submitting such information, noting the requirements of § 5.1.6, the administration may also request the Bureau to examine the submission in respect of notification under § 5.1.2. (WRC-19)

AI 7(C)

**MOD**

4.2.17 The agreement of the administrations affected may also be obtained in accordance with this Article, for a specified period. When this specific period of agreement expires for an assignment in the Plan, the assignment in question shall be maintained in the Plan until the end of the period referred to in § 4.2.6 above. After that date this assignment in the Plan shall lapse unless the agreement of the administrations affected is renewed<sup>c</sup>. (WRC-03)

AI 9.2

**MOD**

4.2.20 When an administration proposing to modify the characteristics of a frequency assignment or to make a new frequency assignment receives notice of disagreement on the part of an administration whose agreement it has sought, it shall first endeavour to solve the problem by exploring all possible means of meeting its requirement. If the problem still cannot be solved by such means, the administration whose agreement has been sought should endeavour to overcome the difficulties as far as possible, and shall state the technical reasons for any disagreement if the administration seeking the agreement requests it to do so. (WRC-19)

AI 9.2

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<sup>XX1</sup> For any remaining affected networks whose assignments were entered in the Plan before the notice received under § 4.2.16, the Bureau shall use the method in Annex 1 to further examine if the remaining corresponding assignments in the Plan are still considered as being affected. The examination in respect of those remaining affected networks is conducted independently using the Appendices 30 and 30A master database corresponding to the Part B Special Section that was published under § 4.2.19. (WRC-19)

AI 7(K)

<sup>c</sup> Unless the Bureau has been informed by the notifying administration of the renewal of the agreement, it shall, no later than six months before the end of the specified period, send a reminder to the notifying administration. (WRC-19)

AI 9.2



MOD

AI 4 AI 7(C)

ARTICLE 5 (REV.WRC-19)

**Coordination, notification, examination and recording in the Master International Frequency Register of frequency assignments to feeder-link transmitting earth stations and receiving space stations in the fixed-satellite service<sup>21</sup>, MOD 22 (WRC-19)**

**5.2 Examination and recording**

MOD

5.2.1 The Bureau shall examine each notice:

- a) with respect to its conformity with the Convention and the relevant provisions of the Radio Regulations (with the exception of those relating to § *b*), *c*), *d*), *e*) and *f*) below);  
*and*
- b) with respect to its conformity with the appropriate Regional feeder-link Plan or the Regions 1 and 3 feeder-link List, as appropriate; *or* (WRC-03)
- c) with respect to the coordination requirements specified in the Remarks column of Article 9 or Article 9A; *or*
- d) with respect to its conformity with the appropriate Regional feeder-link Plan or the Regions 1 and 3 feeder-link List, however, having characteristics differing from those in this Plan or in the Regions 1 and 3 feeder-link List in one or more of the following aspects:
  - use of a reduced e.i.r.p.,
  - use of a reduced coverage area entirely situated within the coverage area appearing in the Plan or in the Regions 1 and 3 feeder-link List,
  - use of other modulating signals in accordance with the provisions of § 3.1.3 to Annex 5 of Appendix 30,
  - in the case of Region 2, use of an orbital position under the conditions specified in § B of Annex 7 to Appendix 30,

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<sup>22</sup> If the payments are not received in accordance with the provisions of Council Decision 482, as amended, on the implementation of cost recovery for satellite network filings, the Bureau shall cancel the publication specified in § 5.1.10 and the corresponding entries in the Master Register under § 5.2.2, § 5.2.2.1, § 5.2.2.2 or § 5.2.6, as appropriate, and the corresponding entries included in the Plan on and after 3 June 2000 or in the List, as appropriate, after informing the administration concerned. The Bureau shall inform all administrations of such action. The Bureau shall send a reminder to the notifying administration not later than two months prior to the deadline for the payment in accordance with the above-mentioned Council Decision 482 unless the payment has already been received. (WRC-19)



AI 7(C)

- in the case of Regions 1 and 3, use of the assignment for transmissions in the fixed-satellite service (Earth-to-space) other than for feeder links to the broadcasting-satellite service provided that such transmissions do not cause more interference, or require more protection from interference, than the feeder-link transmissions operating in conformity with the Plan or the List, as appropriate; (WRC-03)
- e) for Region 2, with respect to its conformity with the provisions of Resolution **42 (Rev.WRC-19)**; (WRC-19)
- f) for Regions 1 and 3, with respect to its conformity with the provisions of § 5.1.3 and also its conformity with § 5.1.4 or 5.1.5 relating to coordination.

## MOD

5.2.2.2 In the case of Region 2, when the Bureau reaches a favourable finding with respect to § 5.2.1 a) and 5.2.1 c) but an unfavourable finding with respect to § 5.2.1 b) and 5.2.1 d), it shall examine the notice with respect to the successful application of the provisions of Resolution **42 (Rev.WRC-19)**. A frequency assignment for which the provisions of Resolution **42 (Rev.WRC-19)** have been successfully applied shall be recorded in the Master Register with an appropriate symbol to indicate its interim status. The date of receipt of the notice by the Bureau shall be entered in the Master Register. In relations between administrations all frequency assignments brought into use following the successful application of the provisions of Resolution **42 (Rev.WRC-19)** and recorded in the Master Register shall be considered to have the same status irrespective of the dates of receipt entered in the Master Register for such frequency assignments. If the finding with respect to § 5.2.1 e), where applicable, is unfavourable, the notice shall be returned immediately by airmail to the notifying administration. (WRC-19)

## MOD

5.2.6 If the notifying administration resubmits the notice without modification and insists on its reconsideration, and if the Bureau's finding with respect to § 5.2.1 remains unfavourable, the notice is returned to the notifying administration in accordance with § 5.2.4. In this case, the notifying administration undertakes not to bring into use the frequency assignment until the condition specified in § 5.2.5 is fulfilled. For Regions 1, 2 and 3, in the event that the Bureau has been informed of agreement to new or modified frequency assignments in the Plan for a specified period of time in accordance with Article 4, the frequency assignment shall be recorded in the Master Register with a note indicating that the frequency assignment is valid only for the period specified. The notifying administration using the frequency assignment over a specified period shall not subsequently invoke this fact to justify the continued use of the frequency beyond the period specified unless it obtains the agreement of the administration(s) concerned. (WRC-19)

AI 7(C)

## MOD

5.2.10 Wherever the use of a frequency assignment to a space station recorded in the Master Register and emanating from the Regions 1 and 3 List is suspended for a period exceeding six months, the notifying administration shall inform the Bureau of the date on which such use was suspended. When the recorded assignment is brought back into use, the notifying administration shall so inform the Bureau, as soon as possible. On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC. The date on which the recorded assignment is brought back into use<sup>24bis</sup> shall be no later than three years from the date on which the use of the frequency assignment was suspended, provided that the notifying administration informs the Bureau of the suspension within six months from the date on which the use was suspended. If the notifying administration informs the Bureau of the suspension more than six months after the date on which the use of the frequency assignment was suspended, this three-year time period shall be reduced. In this case, the amount by which the three-year period shall be reduced shall be equal to the amount of time that has elapsed between the end of the six-month period and the date that the Bureau is informed of the suspension. If the notifying administration informs the Bureau of the suspension more than 21 months after the date on which the use of the frequency assignment was suspended, the frequency assignment shall be cancelled. (WRC-15)

AI 4



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<sup>24bis</sup> The date of bringing back into use of a frequency assignment to a space station in the geostationary-satellite orbit shall be the commencement of the 90-day period defined below. A frequency assignment to a space station in the geostationary-satellite orbit shall be considered as having been brought back into use when a space station in the geostationary-satellite orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained at the notified orbital position for a continuous period of 90 days. The notifying administration shall inform the Bureau within 30 days from the end of the 90-day period. Resolution **40 (Rev.WRC-19)** shall apply. (WRC-19)

MOD

ARTICLE 7 (REV.WRC-19)

**Coordination, notification and recording in the Master International Frequency Register of frequency assignments to stations in the fixed-satellite service (space-to-Earth) in Region 1 in the frequency band 17.3-18.1 GHz and in Regions 2 and 3 in the frequency band 17.7-18.1 GHz, to stations in the fixed-satellite service (Earth-to-space) in Region 2 in the frequency bands 14.5-14.8 GHz and 17.8-18.1 GHz, to stations in the fixed-satellite service (Earth-to-space) in countries listed in Resolution 163 (WRC-15) in the frequency band 14.5-14.75 GHz and in countries listed in Resolution 164 (WRC-15) in the frequency band 14.5-14.8 GHz where those stations are not for feeder links for the broadcasting-satellite service, and to stations in the broadcasting-satellite service in Region 2 in the frequency band 17.3-17.8 GHz when frequency assignments to feeder links for broadcasting-satellite stations in the frequency bands 14.5-14.8 GHz and 17.3-18.1 GHz in Regions 1 and 3 or in the band 17.3-17.8 GHz in Region 2 are involved<sup>28</sup> (REV.WRC-19)**

**Section I – Coordination of transmitting space or earth stations in the fixed-satellite service or transmitting space stations in the broadcasting-satellite service with assignments to broadcasting-satellite service feeder links**

MOD

7.1 The provisions of No. 9.7 and the associated provisions under Articles 9 and 11 are applicable to transmitting space stations in the fixed-satellite service in Region 1 in the frequency band 17.3-18.1 GHz, to transmitting space stations in the fixed-satellite service in Regions 2 and 3 in the frequency band 17.7-18.1 GHz, to transmitting earth stations in the fixed-satellite service in Region 2 in the frequency bands 14.5-14.8 GHz and 17.8-18.1 GHz, to transmitting earth stations in the fixed-satellite service in countries listed in Resolution 163 (WRC-15) in the frequency band 14.5-14.75 GHz and in countries listed in Resolution 164 (WRC-15) in the frequency band 14.5-14.8 GHz where those stations are not for feeder links for the broadcasting-satellite service, and to transmitting space stations in the broadcasting-satellite service in Region 2 in the frequency band 17.3-17.8 GHz. (WRC-19)

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<sup>29</sup> (SUP – WRC-19)

**MOD**

ARTICLE 9 (REV.WRC-19)

**Plan for feeder links for the broadcasting-satellite service in  
the fixed-satellite service in the frequency band  
17.3-17.8 GHz in Region 2**

...

9/GR . . . This assignment is part of a group, the number of which follows the symbol. The group consists of the beams and has the number of channels assigned to it as indicated in Table 1.

a) The overall equivalent protection margin to be used for the application of Article 4 and Resolution 42 (Rev.WRC-19) shall be calculated on the following basis:

...

**MOD**

AI 9.2 9.1 COLUMN HEADINGS OF THE PLAN

Col. 1 *Beam identification* (column 1 contains the symbol designating the country or the geographical area taken from Table B1 of the Preface to the International Frequency Information Circular (BR IFIC) followed by the symbol designating the service area).

...

**MOD**

AI 9.2 *Country symbols*

1 For the explanation of symbols designating countries or geographical areas in Region 2, see the Preface to the BR IFIC.

...

AI 9.2

ARTICLE 9A (REV.WRC-15)

**Plan for feeder links for the broadcasting-satellite service in  
the fixed-satellite service in the frequency bands  
14.5-14.8 GHz and 17.3-18.1 GHz in Regions 1 and 3**

**MOD**

AI 9.2 9A.1 COLUMN HEADINGS OF THE PLAN

Col. 1 *Notifying administration symbol.*

Col. 2 *Beam identification* (Column 2, normally, contains the symbol designating the administration or the geographical area taken from Table B1 of the Preface to the International Frequency **Information Circular (BR IFIC)**, followed by the symbol designating the service area).

...

**MOD**

AI 9.2

9A.2 TEXT FOR NOTES IN THE REMARKS COLUMN OF THE  
REGIONS 1 AND 3 FEEDER-LINK PLAN (WRC-19)

MOD

AI 9.1

TABLE 3A1 (WRC-19)

Basic characteristics of the Regions 1 and 3 feeder-link Plan in the frequency band 14.5-14.8 GHz (sorted by administration)

1	2	3	4		5			6	7	8		9		10		11	12	13	14	15	16	17
			Boresight	Space station antenna characteristics	Space station antenna code	Shaped beam	Space station antenna gain			Earth station antenna	Polarization	Long.	Lat.	Major axis	Minor axis							
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
KOR	KOR11201	116.00	127.50	36.00	1.24	1.02	168.00	R13RSS		43.40		R13TES	57.30	CL		82.0		27M0G7W	KOREASAT-1	03	PE	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

MOD

AI 9.1

TABLE 3A2 (WRC-19)

Basic characteristics of the Regions 1 and 3 feeder-link Plan in the frequency band 17.3-18.1 GHz (sorted by administration)

1	2	3	4		5			6	7	8		9		10		11	12	13	14	15	16	17
			Boresight	Space station antenna characteristics	Space station antenna code	Shaped beam	Space station antenna gain			Earth station antenna	Polarization	Long.	Lat.	Major axis	Minor axis							
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
E	HISPASA4	-30.00	-3.10	39.90					ECO	43.00	18.70	R13TES	55.00	CR		82.5		27M0G7W	HISPASAT-1	01	PE	
E	HISPASA6	-30.00	-3.10	39.90					ECO	43.00	18.70	R13TES	58.50	CR		83.5		27M0G7W	HISPASAT-1	01	PE	
J	000BS-3N	109.85	134.50	31.50	3.52	3.30	68.00	MODRSS		33.80		MODTES	57.00	CR		87.0		27M0G7W	BS-3N	02	PE	
J	J 1110E	110.00	134.50	31.50	3.52	3.30	68.00	MODRSS		33.80		MODTES	57.00	CR		87.0		27M0G7W	BS-3M	02	PE	
RUS	RSTREA11	36.00	38.00	53.00					COP	38.40	8.40	MODTES	57.00	CR		84.0		27M0G7W	RST-1	05	PE	
RUS	RSTREA12	36.00	38.00	53.00					COP	38.40	8.40	MODTES	57.00	CL		84.0		27M0G7W	RST-1	05	PE	





**MOD**

COLUMN HEADINGS OF TABLES 3B1 AND 3B2

- AI 9.2** Col. 1 *Nominal orbital position*, in degrees and hundredths of a degree from the Greenwich meridian (negative values indicate longitudes which are west of the Greenwich meridian; positive values indicate longitudes which are east of the Greenwich meridian).
- Col. 2 *Notifying administration symbol*.
- Col. 3 *Beam identification* (Column 2, normally, contains the symbol designating the administration or the geographical area taken from Table B1 of the Preface to the International Frequency **Information Circular (BR IFIC)**, followed by the symbol designating the service area).
- ...

ANNEX 1

**Limits for determining whether a service of an administration is considered to be affected by a proposed modification to the Region 2 feeder-link Plan or by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List or when it is necessary under this Appendix to seek the agreement of any other administration** (Rev.WRC-03)

**MOD**

**3 Limits to the change in the overall equivalent protection margin with respect to frequency assignments in conformity with the Region 2 feeder-link Plan<sup>33</sup>** (WRC-19)

With respect to the modification to the Region 2 feeder-link Plan and when it is necessary under this Appendix to seek the agreement of any other administration of Region 2, except in cases covered by Resolution **42 (Rev.WRC-19)**, an administration is considered as being affected if the overall equivalent protection margin<sup>34</sup> corresponding to a test point of its entry in that Plan, including the cumulative effect of any previous modification to that Plan or any previous agreement, falls more than 0.25 dB below 0 dB, or, if already negative, more than 0.25 dB below the value resulting from:

- the feeder-link Plan as established by the 1983 Conference; *or*
- a modification of the assignment in accordance with this Appendix; *or*
- a new entry in the feeder-link Plan under Article 4; *or*
- any agreement reached in accordance with this Appendix except for Resolution **42 (Rev.WRC-19)**. (WRC-19)

**MOD**

**5 Limits applicable to protect a frequency assignment in the bands 17.3-18.1 GHz (Regions 1 and 3) and 17.3-17.8 GHz (Region 2) to a receiving space station in the fixed-satellite service (Earth-to-space)**

An administration in Region 1 or 3 is considered as being affected by a proposed modification in Region 2, with respect to § 4.2.2 *a*) or 4.2.2 *b*) of Article 4, or an administration in Region 2 is considered as being affected by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List, with respect to § 4.1.1 *c*) of Article 4, when the power flux-density arriving at the receiving space station of a broadcasting-satellite feeder-link would cause an increase in the noise temperature of the feeder-link space station which exceeds the threshold value of  $\Delta T/T$  corresponding to 6%, where  $\Delta T/T$  is calculated in accordance with the method given in Appendix 8, except that the maximum power densities per hertz averaged over the worst 1 MHz are replaced by power densities per hertz averaged over the necessary bandwidth of the feeder-link carriers. (WRC-03)

Interim systems of Region 2 in accordance with Resolution 42 (Rev.WRC-19) shall not be taken into consideration when applying the above paragraph to proposed new or modified assignments in the Regions 1 and 3 feeder-link List. However, the above paragraph shall be applied to Region 2 interim systems with respect to Regions 1 and 3 administrations, referred to in § 5.2 *b*) of Resolution 42 (Rev.WRC-19). (WRC-19)

**MOD**

**6 Limits applicable to protect a frequency assignment in the frequency bands 14.5-14.8 GHz and 17.8-18.1 GHz (Region 2) to a receiving feeder-link space station in the fixed-satellite service (Earth-to-space) or a frequency assignment in the frequency bands 14.5-14.75 GHz (in countries listed in Resolution 163 (WRC-15)) and 14.5-14.8 GHz (in countries listed in Resolution 164 (WRC-15)) to a receiving space station in the fixed-satellite service (Earth-to-space) not subject to a Plan** (WRC-19)

With respect to § 4.1.1 *d*) of Article 4, an administration is considered affected by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List when the power flux-density arriving at the receiving space station of a broadcasting-satellite feeder link in Region 2 or the receiving space station of the fixed-satellite service uplinks not subject to a Plan in all Regions of that administration would cause an increase in the noise temperature of the receiving uplink space station which exceeds the threshold value of  $\Delta T/T$  corresponding to 6%, where  $\Delta T/T$  is calculated in accordance with the method given in Appendix 8, except that the maximum power densities per hertz averaged over the worst 1 MHz are replaced by power densities per hertz averaged over the necessary bandwidth of the feeder-link carriers. (WRC-15)

AI 9.2

ANNEX 4 (REV.WRC-15)

**Criteria for sharing between services**

MOD

- 2** **Threshold values for determining when coordination is required between transmitting feeder-link earth stations in the fixed-satellite service in Region 2 and a receiving space station in the Regions 1 and 3 feeder-link Plan or List or a proposed new or modified receiving space station in the List, in the frequency bands 14.5-14.8 GHz and 17.8-18.1 GHz** (WRC-19)

AI 9.2

With respect to § 7.1, Article 7, coordination of a transmitting feeder-link earth station in the fixed-satellite service with a receiving space station in a broadcasting-satellite feeder link in the Regions 1 and 3 feeder-link Plan or List, or a proposed new or modified receiving space station in the List, is required when the power flux density arriving at the receiving space station of a broadcasting-satellite service feeder link of another administration would cause an increase in the noise temperature of the feeder-link space station which exceeds a threshold value of  $\Delta T/T$  corresponding to 6%, where  $\Delta T/T$  is calculated in accordance with the method given in Appendix 8. (WRC-19)



AI 4 AI 7(C) AI 7(E)

APPENDIX 30B (REV.WRC-15)

AI 7(F) AI 7(K)

AI 9.2

**Provisions and associated Plan for the fixed-satellite service in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz**

MOD

ARTICLE 6 (REV.WRC-19)

**Procedures for the conversion of an allotment into an assignment, for the introduction of an additional system or for the modification of an assignment in the List<sup>1, 2, 2bis</sup>** (WRC-19)

AI 7(E)

AI 7(E)

<sup>2bis</sup>

Resolution COM5/8 (WRC-19) applies.

**MOD**

AI 9.2 6.1 When an administration intends to convert an allotment into an assignment or when an administration, or one acting on behalf of a group of named administrations<sup>3</sup>, intends to introduce an additional system or modify the characteristics of assignments in the List that have been brought into use, it shall, not earlier than eight years and preferably not later than two years before the planned date of bringing the assignment into use, send to the Bureau the information specified in Appendix 4<sup>4, 5</sup>. (WRC-19)

**ADD**

AI 7(C) 6.1bis Administrations, in submitting an additional use under § 6.1 of Appendix 30B, may submit the information specified in Appendix 4 for both sub-bands each of 250 MHz (10.7-10.95 GHz and 11.2-11.45 GHz for downlink and 12.75-13.0 GHz and 13.0-13.25 GHz for uplink) and notify and bring into use under Article 8 only one of the two sub-bands each of 250 MHz (10.7-10.95 GHz or 11.2-11.45 GHz for downlink and 12.75-13.0 GHz or 13.0-13.25 GHz for uplink) or submit under § 6.1 either of the two sub-bands each of 250 MHz (10.7-10.95 GHz or 11.2-11.45 GHz for downlink and 12.75-13.0 GHz or 13.0-13.25 GHz for uplink) and notify and bring into use that sub-band under Article 8. The Bureau shall process that sub-band as it has been submitted under Article 6 and shall apply Article 8 for the sub-band notified and brought into use and cancel the other sub-band from its database. (WRC-19)

**ADD**

AI 7(C) 6.15bis The course of action described in §§ 6.13 to 6.15 do not apply to the agreement requested under § 6.6. (WRC-19)

**ADD**

AI 7(C) 6.15ter The agreement of the administrations affected may also be obtained in accordance with this Article for a specified period. When this specific period of agreement expires for an assignment in the List, the assignment in question shall be maintained in the List until the end of the period referred to in § 6.1 above. After that date this assignment in the List shall lapse unless the agreement of the administrations affected is renewed. (WRC-19)

**MOD**

6.16 An administration may at any time during or after the above-mentioned four-month period inform the Bureau about its objection to being included in the service area of any assignment, even if this assignment has been entered in the List. The Bureau shall then inform the administration responsible for the assignment and exclude the territory and test points<sup>7</sup> that are within the territory of the objecting administration from the service area. The Bureau shall update the reference situation without reviewing the previous examinations. (WRC-19)

AI 9.2

**MOD**

6.17 If agreements have been reached with administrations published in accordance with § 6.7, the administration proposing the new or modified assignment may request the Bureau to have the assignment entered into the List, indicating the final characteristics of the assignment together with the names of the administrations with which agreement has been reached. For this purpose, it shall send to the Bureau the information specified in Appendix 4. In submitting this notice, the administration may request the Bureau to examine the notice under §§ 6.19, 6.21 and 6.22 (entry into the List) and then under Article 8 of this Appendix (notification)<sup>xx</sup>. (WRC-19)

AI 7(C)



**ADD**

6.17bis An administration that has submitted the notice for an additional use under § 6.1 may request the Bureau to enter into the List only one sub-band of 250 MHz (10.7-10.95 GHz or 11.2-11.45 GHz for downlink and 12.75-13.0 GHz or 13.0-13.25 GHz for uplink). (WRC-19)

AI 7(C)

**MOD**

6.19 Upon receipt of a complete notice under § 6.17, the Bureau shall examine each assignment in the notice:

AI 9.2

a) with respect to the requirement for the notifying administration to seek the agreement of those administrations whose territories are included in the service area; (WRC-19);

...

AI 9.2

<sup>7</sup> The administration responsible for the assignment may request to relocate the downlink test points from the excluded territory to a new location within the remaining part of its service area. (WRC-19)

<sup>xx</sup> A single notice containing the information specified in Appendix 4 under Article 8 of Appendix 30B (notification) shall be submitted. When examining the notice under §§ 6.19, 6.21 and 6.22 of Article 6 of Appendix 30B, the Bureau shall use the values of the maximum power density per frequency group contained in the submitted notice as well as predefined values for the assigned frequency (10.825 GHz for 10.7-10.95 GHz, 11.325 GHz for 11.20-11.45 GHz, 12.875 GHz for 12.75-13 GHz, 13.125 GHz for 13-13.25 GHz, 4 650 MHz for 4 500-4 800 MHz and 6 875 MHz for 6 725-7 025 MHz) and the necessary bandwidth (250 MHz for 13/11 GHz or 300 MHz for 6/4 GHz).

AI 7(C)

**MOD**

6.21 When the examination with respect to § 6.19 of an assignment received under § 6.17 leads to a favourable finding, the Bureau shall use the method of Annex 4 to examine if there is any administration and the corresponding:

- a) allotment in the Plan;
- b) assignment which appears in the List at the date of receipt of the examined notice submitted under § 6.1;
- c) assignment for which the Bureau has previously received complete information in accordance with § 6.1 and has conducted the examination under § 6.5 of this Article at the date of receipt of the examined notice submitted under § 6.1;

considered as being affected and whose agreement has not been provided under § 6.17.

**MOD**

**ARTICLE 8** (REV.WRC-19)

**Procedure for notification and recording in the Master Register  
of assignments in the planned bands for the  
fixed-satellite service**<sup>MOD 11, 12</sup> (WRC-19)

**MOD**

8.5 Complete notices shall be marked by the Bureau with their date of receipt and shall be examined in the date order of their receipt. Following receipt of a complete notice the Bureau shall, as soon as possible after the date of entry of the corresponding assignment into the List, or within not more than two months if the corresponding assignment has already been entered into the List, publish its contents, with any diagrams and maps and the date of receipt, in the BR IFIC, which shall constitute the acknowledgement to the notifying administration of receipt of its notice. When the Bureau is not in a position to comply with the time-limit referred to above, it shall periodically so inform the administrations, giving the reasons thereof. (WRC-19)

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<sup>11</sup> If the payments are not received in accordance with the provisions of Council Decision 482, as amended, on the implementation of cost recovery for satellite network filings, the Bureau shall cancel the publication specified in §§ 8.5 and 8.12 and the corresponding entries in the Master Register under § 8.11 or § 8.16bis, as appropriate, after informing the administration concerned. The Bureau shall inform all administrations of such action and that any resubmitted notice shall be considered to be a new notice. The Bureau shall send a reminder to the notifying administration not later than two months prior to the deadline for the payment in accordance with the above-mentioned Council Decision 482, unless the payment has already been received. (WRC-19)

## MOD

8.13 A notice of a change in the characteristics of an assignment already recorded, as specified in Appendix 4, shall be examined by the Bureau under § 8.8 and § 8.9, as appropriate. Any changes to the characteristics of an assignment that has been recorded and confirmed as having been brought into use shall be brought into use within eight years from the date of the notification of the modification. Any changes to the characteristics of an assignment that has been recorded but not yet brought into use shall be brought into use within the period provided for in §§ 6.1, 6.31 or 6.31bis of Article 6. (WRC-19)

## ADD

8.16bis In the event that the Bureau has been informed of agreement to new or modified frequency assignments in the List for a specified period of time in accordance with Article 6, the frequency assignment shall be recorded in the Master Register with a note indicating that the frequency assignment is valid only for the period specified<sup>a</sup>. The notifying administration using the frequency assignment over a specified period shall not subsequently invoke this fact to justify the continued use of the frequency beyond the period specified unless it obtains the agreement of the administration(s) concerned. (WRC-19)

## MOD

8.17 Wherever the use of a recorded frequency assignment to a space station is suspended for a period exceeding six months, the notifying administration shall inform the Bureau of the date on which such use was suspended. When the recorded assignment is brought back into use, the notifying administration shall so inform the Bureau, as soon as possible. On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC. The date on which the assignment is brought back into use<sup>14bis</sup> shall be no later than three years from the date on which the use of the frequency assignment was suspended, provided that the notifying administration informs the Bureau of the suspension within six months from the date on which the use was suspended. If the notifying administration informs the Bureau of the suspension more than six months after the date on which the use of the frequency assignment was suspended, this three-year time period shall be reduced. In this case, the amount by which the three-year period shall be reduced shall be equal to the amount of time that has elapsed between the end of the six-month period and the date that the Bureau is informed of the suspension. If the notifying administration informs the Bureau of the suspension

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<sup>a</sup> Unless the Bureau has been informed by the notifying administration of the renewal of the agreement, it shall, no later than six months before the end of the specified period, send a reminder to the notifying administration. (WRC-19)

<sup>14bis</sup> The date of bringing back into use of a frequency assignment to a space station in the geostationary-satellite orbit shall be the date of the commencement of the 90-day period defined below. A frequency assignment to a space station in the geostationary-satellite orbit shall be considered as having been brought back into use when a space station in the geostationary-satellite orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained at the notified orbital position for a continuous period of 90 days. The notifying administration shall inform the Bureau within 30 days from the end of the 90-day period. Resolution 40 (Rev.WRC-19) shall apply. (WRC-19)


more than 21 months after the date on which the use of the frequency assignment was suspended, the frequency assignment shall be cancelled from the Master Register and the Bureau shall apply the provisions of § 6.33. (WRC-15)

ARTICLE 10 (REV.WRC-15)

**Plan for the fixed-satellite service in the frequency bands  
4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz,  
11.20-11.45 GHz and 12.75-13.25 GHz**

**MOD**


4 500-4 800 MHz, 6 725-7 025 MHz

1	2	3	4	5	6	7	8	9	10
...									
B 00001	-65.00								1
B 00002	-56.50								1
...									
BUL00000	56.02								1
...									
SDN00001	23.55	29.30	10.30	3.00	1.90	131.00	-9.3	-39.0	*/MB15
SDN00002	23.55	29.40	16.70	2.60	2.40	171.00	-9.6	-39.3	*/MB15
...									
USA00000	-101.30	-93.90	36.80	8.20	3.60	172.00	-0.9	-38.3	*/MB16
USAVIPRT	-101.30	-64.50	17.80	1.60	1.60	90.00	-9.6	-41.4	*/MB16
...									

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**MOD**

10.70-10.95 GHz, 11.20-11.45 GHz, 12.75-13.25 GHz

1	2	3	4	5	6	7	8	9	10
...									
B 00001	-65.00								1
B 00002	-56.50								1
...									
BUL00000	56.02								1
...									
SDN00001	23.55	29.30	10.30	3.00	1.90	131.00	5.3	-24.0	*/MB15
SDN00002	23.55	29.40	16.70	2.60	2.40	171.00	1.1	-27.4	*/MB15
...									
USA00000	-101.30								1
USAVIPRT	-101.30								1
...									

AI 9.2





**MOD**

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**ANNEX 3** (REV.WRC-19)

**Limits applicable to submissions received under Article 6 or Article 7<sup>MOD 15</sup>**

Under assumed free-space propagation conditions, the power flux-density (space-to-Earth) of a proposed new allotment or assignment produced on any portion of the surface of the Earth shall not exceed:

-  -131.4 dB(W/(m<sup>2</sup> · MHz)) in the frequency band 4 500-4 800 MHz; and
-  -118.4 dB(W/(m<sup>2</sup> · MHz)) in the frequency bands 10.70-10.95 GHz and 11.20-11.45 GHz.

Under assumed free-space propagation conditions, the power flux-density (Earth-to-space) of a proposed new allotment or assignment shall not exceed:

-  -140.0 dB(W/(m<sup>2</sup> · MHz)) towards any location in the geostationary-satellite orbit located more than 7° from the proposed orbital position in the frequency band 6 725-7 025 MHz, and
-  -133.0 dB(W/(m<sup>2</sup> · MHz)) towards any location in the geostationary-satellite orbit located more than 6° from the proposed orbital position in the frequency band 12.75-13.25 GHz.


**MOD**

**ANNEX 4** (REV.WRC-19)

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**Criteria for determining whether an allotment or an assignment is considered to be affected<sup>X1</sup>**

An allotment or an assignment is considered as being affected by a proposed new allotment or assignment:

- 1 if the orbital spacing between its orbital position and the orbital position of the proposed new allotment or assignment is equal to or less than:
  - 1.1  7° in the frequency bands 4 500-4 800 MHz (space-to-Earth) and 6 725-7 025 MHz (Earth-to-space);


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<sup>15</sup> These limits shall not apply to assignments submitted in accordance with Article 6 or recorded in the List before 23 November 2019. For assignments submitted under § 6.17 after 22 November 2019, related to assignments submitted under § 6.1 before 23 November 2019, the limits specified in Annex 3 (Rev.WRC-07) apply. (WRC-19)


<sup>X1</sup> For frequency assignments recorded in the List and brought into use before 23 November 2019, the criteria of § 2.2 of this Annex are not applicable. (WRC-19)

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1.2  6° in the frequency bands 10.70-10.95 GHz (space-to-Earth), 11.20-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space).

AI 7(F) 2 However, an allotment or an assignment is considered as not being affected if at least one of the following conditions is satisfied:

2.1  the calculated<sup>16</sup> Earth-to-space single-entry carrier-to-interference  $(C/I)_u$  value at each test point associated with the allotment or assignment under consideration is greater than or equal to a reference value that is 30 dB, or  $(C/N)_u + 9$  dB<sup>17, X2</sup>, whichever is the lowest, and the calculated<sup>16</sup> space-to-Earth single-entry  $(C/I)_d$  value everywhere within the service area of the allotment or assignment under consideration is greater than or equal to a reference value<sup>19</sup> that is 26.65 dB, or  $(C/N)_d + 11.65$  dB<sup>20, X3</sup>, whichever is the lowest, and the calculated<sup>16</sup> overall aggregate  $(C/I)_{agg}$  value at each test point associated with the allotment or assignment under consideration is greater than or equal to a reference value that is 21 dB, or  $(C/N)_t + 7$  dB<sup>21</sup>, or any already accepted overall aggregate  $(C/I)_{agg}$  value, whichever is the lowest, with a tolerance of 0.25 dB<sup>22</sup> in the case of assignments not stemming from the conversion of an allotment into an assignment without modification, or when the modification is within the envelope characteristics of the initial allotment;

2.2 in the frequency band 6 725-7 025 MHz (Earth-to-space), the pfd produced at the location in the geostationary-satellite orbit of the allotment or assignment under consideration under assumed free-space propagation conditions does not exceed  $-204.0 - G_{Rx}$  dB(W/(m<sup>2</sup> · Hz)), where  $G_{Rx}$  (dB) is the relative space station uplink receive antenna gain of the potentially affected assignment at the location of the interfering earth station;

<sup>16</sup> Including a computational precision of 0.05 dB.

<sup>17</sup>  $(C/N)_u$  is calculated as in Appendix 2 to this Annex.

AI 7(F) X2 Any already accepted Earth-to-space single-entry  $(C/I)_u$  value, excluding values accepted in accordance with § 6.15 of Article 6, could be used by administrations during coordination of their respective networks. The Bureau shall continue to make available any already accepted Earth-to-space single-entry  $(C/I)_u$  value. (WRC-19)

<sup>19</sup> The reference values within the service area are interpolated from the reference values on the test points.

<sup>20</sup>  $(C/N)_d$  is calculated as in Appendix 2 to this Annex.

AI 7(F) X3 Any already accepted space-to-Earth single-entry  $(C/I)_d$  value could be used by administrations during coordination of their respective networks. The Bureau shall continue to make available any already accepted space-to-Earth single-entry  $(C/I)_d$  value. (WRC-19)

<sup>21</sup>  $(C/N)_t$  is calculated as in Appendix 2 to this Annex.

<sup>22</sup> Inclusive of the 0.05 dB computational precision.

in the frequency band 4 500-4 800 MHz (space-to-Earth), the pfd produced under assumed free-space propagation conditions does not exceed the threshold values shown below, anywhere within the service area of the allotment or assignment under consideration:

$0^\circ \leq \theta \leq 0.09^\circ$	-243.5	dB(W/(m <sup>2</sup> · Hz))
$0.09^\circ < \theta \leq 3^\circ$	$-243.5 + 20\log(\theta/0.09)$	dB(W/(m <sup>2</sup> · Hz))
$3^\circ < \theta \leq 5.5^\circ$	$-219.79 + 0.75 \cdot \theta^2$	dB(W/(m <sup>2</sup> · Hz))
$5.5^\circ < \theta \leq 7^\circ$	$-197.1 + 25\log(\theta/5.5)$	dB(W/(m <sup>2</sup> · Hz))

where  $\theta$  denotes nominal geocentric separation (degrees) between interfering and interfered-with satellite networks;

in the frequency band 12.75-13.25 GHz (Earth-to-space), the pfd produced at the location in the geostationary-satellite orbit of the allotment or assignment under consideration under assumed free-space propagation conditions does not exceed  $-208.0 - G_{Rx}$  dB(W/(m<sup>2</sup> · Hz)), where  $G_{Rx}$  (dB) is the relative space station uplink receive antenna gain of the potentially affected assignment at the location of the interfering earth station;

in the frequency bands 10.7-10.95 GHz and 11.2-11.45 GHz (space-to-Earth), the pfd produced under assumed free-space propagation conditions does not exceed the threshold values shown below, anywhere within the service area of the allotment or assignment under consideration:

$0^\circ \leq \theta \leq 0.05^\circ$	-238.0	dB(W/(m <sup>2</sup> · Hz))
$0.05^\circ < \theta \leq 3^\circ$	$-238.0 + 20\log(\theta/0.05)$	dB(W/(m <sup>2</sup> · Hz))
$3^\circ < \theta \leq 5^\circ$	$-210.98 + 0.95 \cdot \theta^2$	dB(W/(m <sup>2</sup> · Hz))
$5^\circ < \theta \leq 6^\circ$	$-187.23 + 25\log(\theta/5)$	dB(W/(m <sup>2</sup> · Hz))

where  $\theta$  denotes nominal geocentric separation (degrees) between interfering and interfered-with satellite networks.

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APPENDIX 42 (REV.WRC-19)

**Table of allocation of international call sign series**

(See Article 19)

...

Call sign series	Allocated to	
...	...	
PAA-PIZ PJA-PJZ	Netherlands (Kingdom of the) Netherlands (Kingdom of the) – Curaçao, Sint Maarten (Dutch part), and the Netherlands Caribbean	(WRC-19)
...	...	
P4A-P4Z	Netherlands (Kingdom of the) – Aruba	

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Call sign series	Allocated to	
ZQA-ZQZ	United Kingdom of Great Britain and Northern Ireland	
ZRA-ZUZ	South Africa (Republic of)	
ZVA-ZZZ	Brazil (Federative Republic of)	
Z2A-Z2Z	Zimbabwe (Republic of)	
Z3A-Z3Z	North Macedonia	(WRC-19)
Z8A-Z8Z	South Sudan (Republic of)	(WRC-15)
2AA-2ZZ	United Kingdom of Great Britain and Northern Ireland	
3AA-3AZ	Monaco (Principality of)	
3BA-3BZ	Mauritius (Republic of)	
3CA-3CZ	Equatorial Guinea (Republic of)	
3DA-3DM	Eswatini (Kingdom of)	(WRC-19)
3DN-3DZ	Fiji (Republic of)	
3EA-3FZ	Panama (Republic of)	
3GA-3GZ	Chile	
3HA-3UZ	China (People's Republic of)	
3VA-3VZ	Tunisia	
3WA-3WZ	Viet Nam (Socialist Republic of)	
3XA-3XZ	Guinea (Republic of)	
3YA-3YZ	Norway	
3ZA-3ZZ	Poland (Republic of)	
4AA-4CZ	Mexico	
4DA-4IZ	Philippines (Republic of the)	
4JA-4KZ	Azerbaijani Republic	
4LA-4LZ	Georgia	
4MA-4MZ	Venezuela (Bolivarian Republic of)	
4OA-4OZ	Montenegro	(WRC-07)
4PA-4SZ	Sri Lanka (Democratic Socialist Republic of)	
4TA-4TZ	Peru	
*4UA-4UZ	United Nations	
4VA-4VZ	Haiti (Republic of)	
4WA-4WZ	Timor-Leste (Democratic Republic of)	(WRC-03)
4XA-4XZ	Israel (State of)	
*4YA-4YZ	International Civil Aviation Organization	
4ZA-4ZZ	Israel (State of)	
5AA-5AZ	Libya	
5BA-5BZ	Cyprus (Republic of)	
5CA-5GZ	Morocco (Kingdom of)	
5HA-5IZ	Tanzania (United Republic of)	
5JA-5KZ	Colombia (Republic of)	
5LA-5MZ	Liberia (Republic of)	
5NA-5OZ	Nigeria (Federal Republic of)	
5PA-5QZ	Denmark	
5RA-5SZ	Madagascar (Republic of)	
5TA-5TZ	Mauritania (Islamic Republic of)	
5UA-5UZ	Niger (Republic of the)	
5VA-5VZ	Togolese Republic	
5WA-5WZ	Samoa (Independent State of)	
5XA-5XZ	Uganda (Republic of)	
5YA-5ZZ	Kenya (Republic of)	

MOD



## RESOLUTION 7 (REV.WRC-19)

**Development of national radio-frequency management**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the Radio Regulations contain, *inter alia*, procedures for the coordination, notification and registration of frequencies which specify the rights and obligations of Member States;
- b) that the application of the above-mentioned procedures necessitates an appropriate radio-frequency management unit in each Member State;
- c) that the existence of such a unit helps Member States to safeguard their rights and to discharge their obligations under the Radio Regulations;
- d) that the application of the Radio Regulations through the agency of such units is in the interest of the international community as a whole,

*noting*

that such a unit requires an adequate number of suitably qualified staff,

*noting further*

that the administrations of many developing countries need to create or to strengthen such a unit, appropriate to their administrative structure, with responsibility for the application of the Radio Regulations at the national and international levels,

*resolves*

- 1 that meetings shall be organized between representatives of the Radiocommunication Bureau and the personnel involved in frequency management matters from administrations of developing and developed countries;
- 2 that such meetings shall be aimed at designing standard structures suitable for administrations of developing countries and include discussions concerning the establishment and operation of radio-frequency management units;
- 3 that such meetings should also identify the particular needs of developing countries in establishing such units, and the means required to meet those needs,

*recommends*

that developing countries, when planning the use of funds, particularly those received from international sources, make provision for participation in these meetings as well as **taking appropriate action** for the introduction and development of such units,

*invites the Council*

to take the necessary measures for the organization of such meetings,

*instructs the Secretary-General*

- 1 to circulate this Resolution to all Member States, drawing their attention to its importance;
- 2 to circulate the results of such meetings, particularly to the developing countries;
- 3 to inform the developing countries of the types of assistance the ITU can provide in setting up the desired structure,

*instructs the Director of the Radiocommunication Bureau*

to include this activity in the Operational Plan, within existing budgetary resources of the Sector,

*draws the attention of the next Plenipotentiary Conference to*

- 1 the particular problems identified in this Resolution;
- 2 the need for prompt and effective action to resolve them;
- 3 the need to take all practicable measures to ensure that resources are made available for this purpose.

**MOD**

**RESOLUTION 12 (REV.WRC-19)**

**Assistance and support to Palestine**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*recalling*

- a)* the Charter of the United Nations and the Universal Declaration of Human Rights;
- b)* the terms of Resolution 67/19 of the United Nations General Assembly (UNGA), which decides to accord to Palestine non-member observer State status in the United Nations;
- c)* Resolution 72/240 of the United Nations General Assembly, which recognizes the Palestinian people's right to permanent sovereignty over their natural resources, specifically land, water, energy and other natural resources, in the occupied Palestinian territory, including East Jerusalem;
- d)* Resolution 32 (Kyoto, 1994) of the ITU Plenipotentiary Conference, on technical assistance to Palestine for the development of telecommunications;
- e)* Resolution 125 (Rev. Dubai, 2018), Resolution 125 (Rev. Busan, 2014), Resolution 125 (Rev. Guadalajara, 2010), Resolution 125 (Rev. Antalya, 2006) and Resolution 125 (Marrakesh, 2002) of the Plenipotentiary Conference, on assistance and support to Palestine for rebuilding its telecommunication networks;
- f)* Resolution 99 (Rev. Dubai, 2018), Resolution 99 (Rev. Busan, 2014) and Resolution 99 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference, on the Status of Palestine in ITU;
- g)* Resolution 18 (Rev. Buenos Aires, 2017), Resolution 18 (Rev. Dubai, 2014) and Resolution 18 (Rev. Hyderabad, 2010) of the World Telecommunication Development Conference, on Special Technical Assistance to Palestine;
- h)* Resolution 9 (Rev. Buenos Aires, 2017) and Resolution 9 (Rev. Dubai, 2014) of the World Telecommunication Development Conference, which recognizes that it is the sovereign right of every State to manage spectrum use within its territories;
- i)* Nos. 6 and 7 of the ITU Constitution indicating among the purposes of the Union "to promote the extension of the benefits of the new telecommunication technologies to all the world's inhabitants" and "to promote the use of telecommunication services with the objective of facilitating peaceful relations",

*considering*

- a)* that the ITU Constitution and Convention are designed to strengthen peace and security in the world for the development of international cooperation and better understanding among the peoples concerned;
- b)* Resolution 125 (Rev. Dubai, 2018) of the Plenipotentiary Conference, which recognizes that ITU's policy of assistance to Palestine for the development of its telecommunication sector has been efficient but has not yet fulfilled its goals due to the prevailing situation,

*considering further*

- a) the need to continue assisting Palestine to manage, similar to ITU administrations, its radio spectrum resources required to advance the economic and social development of Palestine;
- b) that the frequency assignments and frequency spectrum management requirements of Palestine must be respected and safeguarded in accordance with the provisions and resolutions of the ITU and international law in this regard;
- c) the right of Palestine to manage and plan its own spectrum resources in accordance with the Interim Agreement and the provisions of the Radio Regulations and the various resolutions adopted by global and regional radiocommunication assemblies and conferences,

*mindful*

of the fundamental principles contained in the ITU Constitution,

*noting with concern*

the restrictions and difficulties related to the current situation in Palestine that are preventing access to telecommunication means, services, and applications and which constitute a continuing obstacle to telecommunications in Palestine,

*welcomes*

a) the bilateral agreement elaborated through the Joint Technical Committee (JTC) by concerned parties on 24 October 2019, which included:

1 establishing a subcommittee dedicated to reviewing and assessing the present and future needs of Palestine for the next five years, which will establish a work plan containing an outline of future steps towards addressing the requirements presented by the Palestinians, including, after 6 months, steps with respect to the identification, designation and allocation of adequate frequencies for the operation of 4G and 5G networks;

2 identifying, designating and allocating adequate frequencies for the operation of 3G, 4G and 5G networks and for microwave links in Palestine for the existing Palestinian operators and another new potential operator, based on the Palestinian requirements as submitted to the last JTC meeting held on 24 October 2019;

3 to support the timely implementation in Palestine of new technologies in accordance with the agreed outcomes of the meeting of 24 October 2019 elaborated through the JTC;

b) the commitment of concerned parties to advance efforts to facilitate the entry of necessary equipment for the construction and operation of telecommunication networks for the use by Palestinian operators;

c) the continued support of the ITU, including its Secretary-General, in achieving the goals of this resolution,

*urges Member States*

including concerned parties, to make every effort with a view to facilitating the acquisition and deployment of the equipment needed by Palestine for the establishment of their networks,

*resolves*

1 to continue to provide assistance to Palestine, through ITU-R and in collaboration with ITU-D, pursuant to the relevant ITU resolutions and decisions, in particular in the areas of capacity building, spectrum management and frequency assignment, with the view to enabling Palestine to manage and exploit its radio spectrum;



2 to enable Palestine to continue implementing 3G technology in Gaza through support and technical assistance, consistent with the bilateral agreement signed on 19 November 2015;

3 to enable Palestine to modernize its telecommunication networks, including building and operating 4G and 5G networks, through support and technical assistance,

*resolves to urge*

concerned parties to facilitate the import and deployment of equipment and, in the next JTC meeting (expected either December 2019 or January 2020), to start establishing a clear and reasonable time-frame for allocation of adequate frequencies of 4G and 5G for the Palestinian operators,

*instructs the Director of the Radiocommunication Bureau*

1 to take appropriate measures within the mandate of the Radiocommunication Bureau (BR) in order to assist in the implementation of this resolution;

2 to report to the next World Radiocommunication Conference on progress achieved in the implementation of this resolution,

*instructs the Secretary General*

to ensure that this resolution is implemented.

**MOD****RESOLUTION 26 (REV.WRC-19)****Footnotes to the Table of Frequency Allocations in Article 5 of the Radio Regulations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that footnotes are an integral part of the Table of Frequency Allocations in the Radio Regulations and, as such, form part of an international treaty text;
- b) that footnotes to the Table of Frequency Allocations should be clear, concise and easy to understand;
- c) that footnotes should relate directly to matters of frequency allocation;
- d) that, in order to ensure that footnotes allow modification of the Table of Frequency Allocations without introducing unnecessary complications, principles relating to the use of footnotes are needed;
- e) that, currently, footnotes are adopted by competent world radiocommunication conferences (WRCs) and any addition, modification or deletion of a footnote is considered and adopted by the competent conference;
- f) that some problems concerning country footnotes may be resolved through the application of a special agreement envisaged by Article 6;
- g) that, in certain cases, administrations are confronted with major difficulties due to inconsistencies or omissions in footnotes;
- h) that, in order to keep the footnotes to the Table of Frequency Allocations up to date, there should be clear and effective guidelines for additions, modifications and deletions of footnotes,

*noting*

- a) that some footnotes have been developed and revised under relevant agenda items of WRCs; while footnotes which are not related to those agenda items were considered by previous WRCs, as described in Annex 1 to this Resolution, under the standing agenda item referred to in *further resolves 2*;
- b) that, under certain circumstances and on a purely exceptional basis, previous WRCs considered proposals for the addition of country names to existing footnotes which were not related to the case mentioned in *further resolves 1*;
- c) that previous conferences also received proposals for the addition of new country footnotes not related to any agenda items, and that these proposals were not accepted;
- d) that administrations need sufficient time to examine the potential consequences of changes to footnotes to the Table of Frequency Allocations;

e) the importance of coordination between countries before WRC to agree on changes related to country footnotes,

*resolves*

1 that, wherever possible, footnotes to the Table of Frequency Allocations should be confined to altering, limiting or otherwise changing the relevant allocations rather than dealing with the operation of stations, assignment of frequencies or other matters;

2 that the Table of Frequency Allocations should include only those footnotes which have international implications for the use of the radio-frequency spectrum;

3 that new footnotes to the Table of Frequency Allocations should only be adopted in order to:

a) achieve flexibility in the Table of Frequency Allocations;

b) protect the relevant allocations in the body of the Table and in other footnotes in accordance with Section II of Article 5;

c) introduce either transitional or permanent restrictions on a new service to achieve compatibility; or

d) meet the specific requirements of a country or area when it is impracticable to satisfy such needs otherwise within the Table of Frequency Allocations;

4 that footnotes serving a common purpose should be in a common format, and, where possible, be grouped into a single footnote with appropriate references to the relevant frequency bands,

*further resolves*

1 that any addition of a new footnote or modification of an existing footnote should be considered by a WRC only when:

a) the agenda of that WRC explicitly includes the frequency band to which the proposed additional or modified footnote relates; or

b) the frequency bands to which the desired additions or modifications of the footnote belong are considered during WRC and WRC decides to make a change in those bands; or

c) the addition or modification of footnotes is specifically included in the agenda of WRC as a result of the consideration of proposals submitted by one or more interested administration(s);

2 that recommended agendas for future WRCs should include a standing agenda item which would allow for the consideration of proposals by administrations for deletion of country footnotes, or country names in footnotes, if no longer required;

3 that in cases not covered by *further resolves* 1 and 2, proposals for new footnotes or modification of existing footnotes could exceptionally be considered by a WRC if they concern corrections of obvious omissions, inconsistencies, ambiguities or editorial errors and have been submitted to ITU as stipulated in No. 40 of the General Rules of conferences, assemblies and meetings of the Union (Antalya, 2006),

*urges administrations*

- 1 to review footnotes periodically and to propose the deletion of their country footnotes or of their country names from footnotes, as appropriate;
- 2 to take account of the *further resolves* above in making proposals to WRCs in relation with footnotes or country names in footnotes.

**ANNEX 1 TO RESOLUTION 26 (REV.WRC-19)**

Previous WRCs have recognized that the scope of the standing agenda item is only related to requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required. However, previous WRCs have also received proposals on the addition of country names to existing footnotes and on the addition of new country footnotes.

It is recognized that it is not the intention of WRCs to encourage the addition of country names to existing footnotes.

Taking into account the decisions of WRC-12, WRC-15 and WRC-19 on the same subject, it is suggested that future WRCs may apply a similar approach to previous WRCs.

Future WRCs may consider the following guidance derived from the above-mentioned decisions.

- A) The work of WRC on proposals submitted under the standing agenda item described in *further resolves 2* may be based on the following:
- i) Under certain circumstances, on a purely exceptional basis and if justified, proposals for the addition of country names to existing footnotes may be considered by WRCs, but their acceptance is subject to the express condition that there are no objections from affected countries.
  - ii) Should a WRC decide to accept submissions of additional proposals for the addition of country names to existing footnotes based on the proposals received, it may establish a deadline for such further contributions to WRC.
  - iii) A deadline may also be established for proposals on the deletion of country names, if appropriate, taking into account that administrations require sufficient time to analyse the proposals.
  - iv) Proposals for the addition of new country footnotes which are not related to agenda items of a WRC or cases described in *further resolves 1* should not be considered.
- B) The proposals on additions of country names to existing footnotes or new country footnotes in the cases addressed by the *further resolves 1* of Resolution **26 (Rev.WRC-19)** are to be treated in the committees responsible under the relevant agenda items, as appropriate.

Administrations are invited to submit their proposals under relevant agenda items.

Proposals for additions which do not fall within the categories referred to in *further resolves 1* of Resolution **26 (Rev.WRC-19)** may be considered by the WRC committee responsible for proposals submitted under the standing agenda item described in *further resolves 2* and are subject to the principles mentioned in A) above.

**MOD****RESOLUTION 27 (REV.WRC-19)****Use of incorporation by reference in the Radio Regulations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the Voluntary Group of Experts (VGE) on simplification of the Radio Regulations proposed the transfer of certain texts of the Radio Regulations to other documents, especially to ITU-R Recommendations, using the incorporation by reference procedure;
- b) that the principles of incorporation by reference were adopted by WRC-95 and revised by subsequent conferences;
- c) that, in some cases, there are provisions in the Radio Regulations containing references which fail to distinguish adequately whether the status of the referenced text is mandatory or non-mandatory;
- d) that all texts of ITU-R Recommendations incorporated by reference are published in a volume of the Radio Regulations;
- e) that, taking into account the rapid evolution of technology, ITU-R may revise the ITU-R Recommendations containing text incorporated by reference at short intervals;
- f) that, following revision of an ITU-R Recommendation containing text incorporated by reference, the reference in the Radio Regulations shall continue to apply to the earlier version until such time as a competent world radiocommunication conference (WRC) agrees to incorporate the new version;
- g) that it would be desirable that texts incorporated by reference reflect the most recent technical developments,

*noting*

- a) that references to Resolutions or Recommendations of a WRC require no special procedures, and are acceptable for consideration, since such texts will have been agreed by a WRC;
- b) that administrations need sufficient time to examine the potential consequences of changes to ITU-R Recommendations containing text incorporated by reference and would therefore benefit greatly from being advised, as early as possible, of which ITU-R Recommendations have been revised and approved during the elapsed study period or at the radiocommunication assembly preceding the WRC,

*resolves*

- 1 that for the purposes of the Radio Regulations, the term “incorporation by reference” shall only apply to those references intended to be mandatory;
- 2 that the text incorporated by reference shall have the same treaty status as the Radio Regulations themselves;
- 3 that the reference shall be explicit, specifying the specific part of the text (if appropriate) and the version or issue number;

4 that, where a mandatory reference to an ITU-R Recommendation, or parts thereof, is included in the *resolves* of a WRC Resolution, which is itself cited in a provision or footnote of the Radio Regulations using mandatory language (i.e. “shall”), the ITU-R Recommendation or parts thereof shall also be considered as incorporated by reference;

5 that texts which are of a non-mandatory nature or which refer to other texts of a non-mandatory nature shall not be considered for incorporation by reference;

6 that when considering the introduction of new cases of incorporation by reference, such incorporation shall be kept to a minimum and made by applying the following criteria:

6.1 only texts which are relevant to a specific WRC agenda item may be considered;

6.2 where the relevant texts are brief, the referenced material should be placed in the body of the Radio Regulations rather than using incorporation by reference;

6.3 the guidance contained in Annex 1 to this Resolution shall be applied in order to ensure that the correct method of reference for the intended purpose is employed;

7 that the text to be incorporated by reference shall be submitted for adoption by a competent WRC and the procedure described in Annex 2 to this Resolution shall be applied for approving the incorporation by reference of ITU-R Recommendations or parts thereof;

8 that existing references to ITU-R Recommendations shall be reviewed to clarify whether the reference is mandatory or non-mandatory in accordance with Annex 1 to this Resolution;

9 that ITU-R Recommendations, or parts thereof, incorporated by reference at the conclusion of each WRC, and a cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating such ITU-R Recommendations by reference, shall be collated and published in a volume of the Radio Regulations (see Annex 2 to this Resolution);

10 that if, between WRCs, a text incorporated by reference (e.g. an ITU-R Recommendation) is updated, the reference in the Radio Regulations shall continue to apply to the earlier version incorporated by reference until such time as a competent WRC agrees to incorporate the new version; the mechanism for considering such a step is given in the *further resolves* part of this Resolution,

*further resolves*

1 that each radiocommunication assembly shall communicate to the next WRC a list of the ITU-R Recommendations containing text incorporated by reference in the Radio Regulations which have been revised and approved during the elapsed study period;

2 that, on this basis, WRC is invited to examine those revised ITU-R Recommendations, and decide whether or not to update the corresponding references in the Radio Regulations;

3 that, if WRC decides not to update the corresponding references, the currently referenced version shall be maintained in the Radio Regulations;

4 to invite future WRCs to include a standing agenda item on examination of the revised ITU-R Recommendations in accordance with *further resolves* 1 and 2 of this Resolution,

*instructs the Director of the Radiocommunication Bureau*

1 to bring this Resolution to the attention of the Radiocommunication Assembly and the ITU-R study groups;

- 2 to identify the provisions and footnotes of the Radio Regulations containing references to ITU-R Recommendations and make suggestions on any further action to the second session of the Conference Preparatory Meeting (CPM) for its consideration and inclusion in the CPM Report;
- 3 to identify the provisions and footnotes of the Radio Regulations containing references to WRC Resolutions that contain references to ITU-R Recommendations, and make suggestions on any further action to the second session of CPM for its consideration and inclusion in the CPM Report;
- 4 to provide the second session of CPM with a list, for inclusion in the CPM Report, of those ITU-R Recommendations containing texts incorporated by reference that have been revised or approved since the previous WRC, or that may be revised in time for the next WRC,

*invites administrations*

- 1 to submit proposals to future conferences, taking into account the CPM Report, in order to clarify the status of references, where ambiguities remain regarding the mandatory or non-mandatory status of the references in question, with a view to amending those references:
- i) that appear to be of a mandatory nature, identifying such references as being incorporated by reference by using clear linking language in accordance with Annex 1;
  - ii) that are of a non-mandatory character, so as to refer to “the most recent version” of the Recommendations;
- 2 to participate actively in the work of the radiocommunication study groups and the Radiocommunication Assembly on revision of those Recommendations to which mandatory references are made in the Radio Regulations;
- 3 to examine any indicated revisions of ITU-R Recommendations containing text incorporated by reference and to prepare proposals on possible updating of relevant references in the Radio Regulations.

## ANNEX 1 TO RESOLUTION 27 (REV.WRC-19)

### **Application of incorporation by reference**

When introducing new cases of incorporation by reference in the provisions of the Radio Regulations or reviewing existing cases of incorporation by reference, administrations and ITU-R should address the following factors in order to ensure that the correct method of reference is employed for the intended purpose, according to whether each reference is mandatory (i.e. incorporated by reference), or non-mandatory:

#### **Mandatory references**

- 1 mandatory references shall use clear linking language, i.e. “shall”;
- 2 mandatory references shall be explicitly and specifically identified, e.g. ”Recommendation ITU-R M.541-8”;
- 3 if the intended reference material is, as a whole, unsuitable as treaty-status text, the reference shall be limited to just those portions of the material in question which are of a suitable nature, e.g. ”Annex A to Recommendation ITU-R Z.123-4”.

**Non-mandatory references**

4 Non-mandatory references or ambiguous references that are determined to be of a non-mandatory character (i.e. not incorporated by reference) shall use appropriate language, such as “should” or “may”. This appropriate language may refer to “the most recent version” of a Recommendation. Any appropriate language may be changed at any future WRC.

**ANNEX 2 TO RESOLUTION 27 (REV.WRC-19)****Procedures applicable by WRC for approving the incorporation  
by reference of ITU-R Recommendations or parts thereof**

During the course of each WRC, a list of the ITU-R Recommendations incorporated by reference, and a cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating such ITU-R Recommendations by reference, shall be developed and maintained by the committees. These lists shall be published as a conference document in line with developments during the conference.

Following the end of each WRC, the Bureau and General Secretariat will update the volume of the Radio Regulations which serves as the repository of ITU-R Recommendations incorporated by reference in line with developments at the conference as recorded in the above-mentioned document.



**MOD**

**RESOLUTION 34 (REV.WRC-19)**

**Establishment of the broadcasting-satellite service in Region 3  
in the 12.5-12.75 GHz frequency band and sharing with space and  
terrestrial services in Regions 1, 2 and 3**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

that the World Administrative Radio Conference (Geneva, 1979) allocated the frequency band 12.5-12.75 GHz to the broadcasting-satellite service for community reception in Region 3,

*recognizing*

that under Resolution **507 (Rev.WRC-19)** the ITU Council may wish to empower a future competent radiocommunication conference to establish a plan for the broadcasting-satellite service in the frequency band 12.5-12.75 GHz in Region 3,

*resolves*

1 that, until such time as a plan may be established for the broadcasting-satellite service in the frequency band 12.5-12.75 GHz in Region 3, the relevant provisions of Article **9** shall continue to apply to the coordination between stations in the broadcasting-satellite service in Region 3 and:

- a) space stations in the broadcasting-satellite and fixed-satellite services in Regions 1, 2 and 3;
- b) terrestrial stations in Regions 1, 2 and 3;

2 that the ITU-R shall study urgently the technical provisions which may be appropriate for the sharing between stations in the broadcasting-satellite service in Region 3 and:

- a) space stations in the broadcasting-satellite and fixed-satellite services in Regions 1 and 2;
- b) terrestrial stations in Regions 1 and 2;

3 that, until such time as technical provisions are developed by the ITU-R and accepted by administrations concerned under Resolution **703 (Rev.WRC-07)** the sharing between space stations in the broadcasting-satellite service in Region 3 and terrestrial services in Regions 1, 2 and 3 shall be based on the following criteria as appropriate:

- a) the power flux-density at the Earth's surface, produced by emissions from a space station in the broadcasting-satellite service in Region 3 for all conditions and for all methods of modulation shall not exceed the limits given in Annex 5 of Appendix **30**;
- b) in addition to *resolves 3 a)* above, the provisions of Article **21** (Table **21-4**) shall apply in the countries mentioned in Nos. **5.494** and **5.496**;
- c) the limits given in *resolves 3 a)* and *b)* above may be exceeded on the territory of any country provided the administration of that country has so agreed.

**MOD****RESOLUTION 40 (REV.WRC-19)****Use of one space station to bring frequency assignments to geostationary-satellite networks at different orbital locations into use within a short period of time**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the use of the same space station to bring frequency assignments to geostationary-satellite networks located at different orbital locations into use within a short period of time could lead to inefficient use of spectrum/orbit resources;
- b) that there are legitimate reasons why a notifying administration may need to move a space station from one orbital position to a new orbital position, and this should not be constrained,

*noting*

- a) that WRC-12 recognized that the issue of using one space station to bring frequency assignments at different orbital locations into use within a short period of time was not the intent for its adoption of Nos. **11.44**, **11.44.1**, **11.44B** and **11.49**;
- b) that, with respect to cases where an administration brings into use frequency assignments at a given orbital location using an already in-orbit satellite, and pending completion of ITU Radiocommunication Sector studies, WRC-12 requested the Radiocommunication Bureau to make an enquiry to that administration as to the last previous orbital location/frequency assignments brought into use with that satellite and make such information available;
- c) that the procedures of Article **14** are available to administrations in cases where information required under *resolves* below may not be available to the notifying administration,

*recognizing*

- a) that administrations may bring into use or bring back into use a frequency assignment to a geostationary-satellite network using one of its own space stations or a space station under the responsibility of another administration;
- b) that the absence of a geostationary space station capable of transmitting and receiving the frequency assignments at a notified orbital position, due to the relocation of an in-orbit satellite to a new orbital position, can lead to either the suspension or the cancellation of those frequency assignments in some cases,

*resolves*

- 1 that, when informing the Bureau of the bringing into use, or bringing back into use after suspension, of a frequency assignment to a space station in a geostationary-satellite network, the notifying administration shall indicate to the Bureau whether or not this action has been accomplished with a space station that has previously been used to bring into use, or resume the use of, frequency assignments at a different orbital location within the three years prior to the date of submission of this information;

2 that, in cases where a notifying administration informs the Bureau, pursuant to *resolves* 1 above, that it has brought into use, or resumed the use after suspension of, a frequency assignment to a space station in a geostationary-satellite network with a space station that has previously been used to bring into use, or resume the use of, frequency assignments at a different orbital location within three years prior to the date of submission of this information, the notifying administration shall also indicate, for that same three-year period:

- i) the last orbital location where the space station was used to bring into use, or resume the use of, frequency assignments;
- ii) the satellite network(s) with which the frequency assignments in 2i) above were associated;
- iii) the date on which the space station was no longer maintained at the orbital location in 2i) above;

3 that, if the information is not provided by the notifying administration under *resolves* 1 and 2 above, as appropriate, the Bureau shall consult the notifying administration requesting the missing information;

4 that, if the notifying administration fails to provide the missing information within 30 days from the Bureau's request under *resolves* 3 above, the Bureau shall immediately send a reminder requesting the missing information;

5 that, from 1 January 2018, if the notifying administration fails to provide the missing information within 15 days after the Bureau's reminder under *resolves* 4 above, the Bureau shall consider that the frequency assignments to the geostationary-satellite network have not been brought into use, or brought back into use, and shall so inform the notifying administration,

*instructs the Radiocommunication Bureau*

to make available the information provided in *resolves* 1 and 2 on the ITU website<sup>1</sup> within 30 days of its receipt.

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<sup>1</sup> [https://www.itu.int/net/ITU-R/space/snl/sat\\_relocation/index.asp](https://www.itu.int/net/ITU-R/space/snl/sat_relocation/index.asp).

**MOD**

**RESOLUTION 42 (REV.WRC-19)**

**Use of interim systems in Region 2 in the broadcasting-satellite and fixed-satellite (feeder-link) services in Region 2 for the frequency bands covered by Appendices 30 and 30A**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the Regional Administrative Conference for the Planning of the Broadcasting-Satellite Service in Region 2, Geneva, 1983, prepared a Plan for the broadcasting-satellite service in the frequency band 12.2-12.7 GHz and a Plan for the associated feeder links in the frequency band 17.3-17.8 GHz with provisions for implementing interim systems in accordance with Resolution 2 (Sat-R2);
- b)* that in the implementation of their assignments in the Plans, administrations of Region 2 may find it more appropriate to adopt a phased approach and initially use characteristics different from those appearing in the appropriate Region 2 Plan;
- c)* that some administrations of Region 2 may cooperate in the joint development of a space system with a view to covering two or more service areas from the same orbital position or to using a beam which would encompass two or more service areas;
- d)* that some administrations of Region 2 may cooperate in the joint development of a space system with a view to covering two or more feeder-link service areas from the same orbital position or to using a beam which encompasses two or more feeder-link service areas;
- e)* that interim systems shall not adversely affect the Plans nor hamper the implementation and evolution of the Plans;
- f)* that the number of assignments to be used in an interim system shall not in any case exceed the number of assignments appearing in the Region 2 Plan which are to be suspended;
- g)* that the interim systems shall not in any case use orbital positions that are not in the Region 2 Plan;
- h)* that an interim system shall not be introduced without the agreement of all administrations whose space and terrestrial services are considered to be affected;
- i)* that WRC-2000 revised Regions 1 and 3 downlink and feeder-link Plans and established Lists together with regulatory procedures, protection criteria and calculation methods for sharing between services in the frequency bands of Appendices **30** and **30A**;
- j)* that WRC-03 modified the regulatory procedures, protection criteria and calculation methods for sharing between services in the frequency bands of Appendices **30** and **30A**,

*resolves*

that administrations and the Radiocommunication Bureau shall apply the procedure contained in the Annex to this Resolution, so long as Appendices **30** and **30A** remain in force.

## ANNEX TO RESOLUTION 42 (REV.WRC-19)

1 An administration or a group of administrations in Region 2 may, after successful application of the procedure contained in this Annex and with the agreement of the affected administrations, use an interim system during a specified period not exceeding ten years in order:

### **1.1 For an interim system in the broadcasting-satellite service**

- a) to use an increased e.i.r.p. in any direction relative to that appearing in the Region 2 Plan provided that the power flux-density does not exceed the limits given in Annex 5 to Appendix 30;
- b) to use modulation characteristics<sup>1</sup> different from those appearing in the Annexes to the Region 2 Plan and resulting in an increased probability of harmful interference or in a wider assigned bandwidth;
- c) to change the coverage area by displacing boresight, or by increasing the major or minor axis, or by rotating them from an orbital position which shall be one of the corresponding orbital positions appearing in the Region 2 Plan;
- d) to use a coverage area appearing in the Region 2 Plan or a coverage area encompassing two or more coverage areas appearing in the Region 2 Plan from an orbital position which shall be one of the corresponding positions appearing in the Region 2 Plan;
- e) to use a polarization different from that in the Region 2 Plan.

### **1.2 For an interim feeder-link system**

- a) to use an increased e.i.r.p. in any direction relative to that appearing in the Region 2 feeder-link Plan;
- b) to use modulation characteristics<sup>1</sup> different from those appearing in the Annexes to the Plan and resulting in an increased probability of harmful interference or in a wider assigned bandwidth;
- c) to change the feeder-link beam area by displacing the boresight, or by increasing the major or minor axis, or by rotating them in relation to an orbital position which shall be one of the corresponding orbital positions appearing in the Region 2 feeder-link Plan;
- d) to use a feeder-link beam area appearing in the Region 2 feeder-link Plan or a feeder-link beam area encompassing two or more feeder-link beam areas appearing in the Region 2 feeder-link Plan in relation to an orbital position which shall be one of the corresponding orbital positions appearing in the Region 2 feeder-link Plan;
- e) to use a polarization different from that in the Region 2 feeder-link Plan.

2 In all cases, an interim system shall correspond to assignments in the appropriate Region 2 Plan; the number of assignments to be used in an interim system shall not in any case exceed the number of assignments appearing in the Region 2 Plan which are to be suspended. During the use of an interim system, the use of the corresponding assignments in the Region 2 Plan is suspended; they shall not be brought into use before the cessation of the use of the interim system. However, the suspended assignments, but not the interim system's assignments, of an administration shall be taken into account when other administrations apply the procedure of

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<sup>1</sup> For example, modulation with sound channels frequency-multiplexed within the bandwidth of a television channel, digital modulation of sound and television signals, or other pre-emphasis characteristics.

Article 4 of Appendix **30** or of Article 4 of Appendix **30A**, as appropriate, in order to modify the Region 2 Plan or to include new or modified assignments in the Regions 1 and 3 List, or the procedure of this Annex in order to bring an interim system into use. The assignments of interim systems shall not be taken into account in applying the procedure of Article 6 or Article 7 of Appendix **30** and the procedure of Article 6 or Article 7 of Appendix **30A**.

3 As a specific consequence of § 2 above, Region 2 interim system assignments shall not obtain protection from, or cause harmful interference to, new or modified assignments appearing in the Regions 1 and 3 List following the successful application of the procedure of Article 4 of Appendix **30** or of Article 4 of Appendix **30A**, as appropriate, even if the assignment modification procedure is concluded and the assignments become operational within the time-limits specified in § 4 a).

4 When an administration proposes to use an assignment in accordance with § 1, it shall communicate to the Bureau the information listed in Appendix **4** not earlier than eight years but, preferably, not later than two years before the date of bringing into use. An assignment shall lapse if it is not brought into use by that date. The administration shall also indicate:

- a) the maximum specified period during which the interim assignment is intended to remain in use;
- b) the assignments in the Region 2 Plans the use of which will remain suspended for the duration of the use of the corresponding interim assignment;
- c) the names of the administrations with which an agreement for the use of the interim assignment has been reached, together with any comment relating to the period of use so agreed and the names of administrations with which an agreement may be required but has not yet been reached.

## **5 Administrations are considered to be affected as follows:**

### **5.1 For an interim system in the broadcasting-satellite service**

- a) an administration of Region 2 is considered to be affected if any overall equivalent protection margin of one of its assignments in the Region 2 Plan, calculated in accordance with Annex 5 to Appendix **30** including the cumulative effect of all interim uses during the maximum specified period of use of the interim system, but excluding the corresponding suspended assignments (§ 4 b)), becomes negative or a former negative value is made more negative;
- b) an administration of Region 1 or 3 is considered to be affected if it has an assignment which is in conformity with the Regions 1 and 3 Plan contained in Appendix **30** or with the List or in respect of which proposed new or modified assignments have been received by the Bureau in accordance with the provisions of Article 4 of that Appendix with a necessary bandwidth which falls within the necessary bandwidth of the proposed interim assignment and the appropriate limits of § 3 of Annex 1 to Appendix **30** are exceeded;
- c) an administration of Region 1 or 3 is considered to be affected if it has a frequency assignment in the fixed-satellite service which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of No. **9.7** or under Article 7 of Appendix **30** or which has been published in accordance with No. **9.2B** and the appropriate limits of § 6 of Annex 1 to Appendix **30** are exceeded;
- d) an administration of Region 1 or 3 is considered to be affected if, although having no frequency assignment in the appropriate Regions 1 and 3 Plan or List in the channel

concerned, it nevertheless would receive on its territory a power flux-density value which exceeds the limits given in § 4 of Annex 1 to Appendix 30 as a result of the proposed interim assignment, or if it has such an assignment for which its associated service area does not cover the whole of the territory of the administration, and in its territory outside that service area the power flux-density from the interim system space station exceeds the above-mentioned limits;

- e) an administration of Region 2 is considered to be affected if, although having no frequency assignment in the appropriate Region 2 Plan in the channel concerned, it nevertheless would receive on its territory a power flux-density value which exceeds the limits given in § 4 of Annex 1 to Appendix 30 as a result of the proposed interim assignment, or if it has such an assignment for which its associated service area does not cover the whole of the territory of the administration, and in its territory outside that service area the power flux-density from the interim system space station exceeds the above-mentioned limits;
- f) an administration of Region 3 is considered to be affected if it has a frequency assignment to a space station in the broadcasting-satellite service in the frequency band 12.5-12.7 GHz with a necessary bandwidth any portion of which falls within the necessary bandwidth of the proposed assignment, and which:
- is recorded in the Master Register; *or*
  - has been coordinated or is being coordinated under the provisions of Articles 9 to 14; *or*
  - appears in a Region 3 Plan to be adopted at a future radiocommunication conference, taking account of modifications which may be introduced subsequently in accordance with the Final Acts of that conference,
- and the limits of § 3, Annex 1 to Appendix 30 are exceeded.

## 5.2 For interim feeder-link systems

- a) an administration of Region 2 is considered to be affected if any overall equivalent protection margin of one of its assignments in the Plan, calculated in accordance with Annex 3 to Appendix 30A including the cumulative effect of all interim uses during the maximum specified period of use of the interim system, but excluding the corresponding suspended assignment(s) (§ 4 b)), becomes negative or a former negative value is made more negative;
- b) an administration in Region 1 or 3 is considered to be affected if it has an assignment for feeder links in the fixed-satellite service (Earth-to-space), any portion of the necessary bandwidth of which falls within the necessary bandwidth of the proposed assignment, which is in conformity with the feeder-link Plan or List for Regions 1 and 3, or in respect of which proposed new or modified assignments in the List have already been received by the Bureau in accordance with the provisions of Article 4 of Appendix 30A and for which the limits set out in § 5 of Annex 1 to Appendix 30A are exceeded.

6 The Bureau shall publish in a Special Section of its International Frequency Information Circular (BR IFIC) the information received under § 4, together with the names of the administrations which the Bureau has identified in applying § 5.

7 When the Bureau finds that the suspended assignment of an administration having an interim system is not affected, it shall examine the projected interim system with respect to the interim system of that administration and if there is an incompatibility, it shall request the two

administrations concerned to adopt any measures that may enable the new interim system to be operated.

8 The Bureau shall send a telegram to the administrations listed in the Special Section of the BR IFIC, drawing their attention to the information it contains and shall send them the results of its calculations.

9 Any administration not listed in the special section which considers that its planned interim assignment may be affected shall so inform the administration responsible for the interim system and the Bureau, and the two administrations shall endeavour to resolve the difficulty before the proposed date of bringing the interim assignment into use.

10 An administration which has not sent its comments either to the administration seeking agreement or to the Bureau within a period of four months following the date of the BR IFIC referred to in § 6 shall be understood as having agreed to the proposed interim use.

11 On the expiry of four months following the date of publication of the BR IFIC referred to in § 6, the Bureau shall review the matter, and, depending on the results obtained, shall inform the administration proposing the interim assignment that:

- a) it may notify its proposed use under Article 5 of Appendix **30** or Article 5 of Appendix **30A**, as appropriate, if no agreement is required or the required agreement has been obtained from the administrations concerned. In this case the Bureau shall update the Interim List;
- b) it may not bring into use its interim system before having obtained the agreement of the administrations affected, either directly or by applying the procedure described in Article 4 of Appendix **30** or Article 4 of Appendix **30A**, as appropriate, as a means of obtaining that agreement.

12 The Bureau shall include all the interim assignments in an Interim List in two parts, one each for the broadcasting-satellite service and the feeder-link assignments, and shall update it in accordance with this Annex. The Interim List shall be published together with the Region 2 Plans but does not constitute part of them.

13 One year prior to the expiry of the interim period, the Bureau shall draw the attention of the administration concerned to this fact and request it to notify in due time the deletion of the assignment from the Master Register and the Interim List.

14 If, notwithstanding the reminders by the Bureau, an administration does not reply to its request sent in application of § 13, the Bureau shall, at the termination of the interim period:

- a) enter a symbol in the Remarks Column of the Master Register to indicate the lack of response and that the entry is for information only;
- b) not take that assignment into account in the Interim List;
- c) inform the administrations concerned and affected of its action.

15 When an administration confirms the termination of the use of the interim assignment, the Bureau shall delete the assignment concerned from the Interim List and the Master Register. Any corresponding assignment in the Plan(s), suspended earlier, may then be brought into use.

16 An administration which considers that its interim system may continue to be used after the expiry of the interim period may extend it by not more than four years and to this effect shall apply the procedure described in this Annex.

17 When an administration applies the procedure in accordance with § 16, but is unable to obtain the agreement of one or more affected administrations, the Bureau shall indicate this



situation by inserting an appropriate symbol in the Master Register. Upon receipt of a complaint of harmful interference, the administration shall immediately cease operation of the interim assignment.

18           When an administration, having been informed of a complaint of harmful interference, does not cease transmission within a period of thirty days after the receipt of complaint, the Bureau shall apply the provisions of § 14.

**MOD****RESOLUTION 49<sup>1</sup> (REV.WRC-19)****Administrative due diligence applicable to some  
satellite radiocommunication services**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that Resolution 18 of the Plenipotentiary Conference (Kyoto, 1994) instructed the Director of the Radiocommunication Bureau to initiate a review of some important issues concerning international satellite network coordination and to make a preliminary report to WRC-95 and a final report to WRC-97;
- b)* that the Director of the Bureau provided a comprehensive report to WRC-97, including a number of recommendations for action as soon as possible and for identifying areas requiring further study;
- c)* that one of the recommendations in the Director's report to WRC-97 was that administrative due diligence should be adopted as a means of addressing the problem of reservation of orbit and spectrum capacity without actual use;
- d)* that experience may need to be gained in the application of the administrative due diligence procedures adopted by WRC-97, and that several years may be needed to see whether administrative due diligence measures produce satisfactory results;
- e)* that new regulatory approaches may need to be carefully considered in order to avoid adverse effects on networks already going through the different phases of the procedures;
- f)* that Article 44 of the Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries,

*considering further*

- a)* that WRC-97 decided to reduce the regulatory time-frame for bringing a satellite network into use;
- b)* that WRC-2000 has considered the results of the implementation of the administrative due diligence procedures and prepared a report to the 2002 Plenipotentiary Conference in response to Resolution 85 (Minneapolis, 1998),

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<sup>1</sup> This Resolution does not apply to satellite networks or satellite systems of the broadcasting-satellite service in the frequency band 21.4-22 GHz in Regions 1 and 3.

*resolves*

that the administrative due diligence procedure contained in Annex 1 to this Resolution shall be applied for a satellite network or satellite system of the fixed-satellite service, mobile-satellite service or broadcasting-satellite service for which the advance publication information under Nos. **9.1A** or **9.2B**, or for which the request for modifications of the Region 2 Plan under Article 4, § 4.2.1 *b*) of Appendices **30** and **30A** that involve the addition of new frequencies or orbit positions, or for which the request for modifications of the Region 2 Plan under Article 4, § 4.2.1 *a*) of Appendices **30** and **30A** that extend the service area to another country or countries in addition to the existing service area, or for which the request for additional uses in Regions 1 and 3 under § 4.1 of Article 4 of Appendices **30** and **30A**, or for which the submission under Appendix **30B** is received, with the exception of submissions of new Member States seeking the acquisition of their respective national allotments<sup>2</sup> for inclusion in the Appendix **30B** Plan,

*further resolves*

that the procedures in this Resolution are in addition to the provisions under Article **9** or **11** of the Radio Regulations or Appendices **30**, **30A** or **30B**, as applicable, and, in particular, do not affect the requirement to coordinate under those provisions (Appendices **30**, **30A**) in respect of extending the service area to another country or countries in addition to the existing service area,

*instructs the Director of the Radiocommunication Bureau*

to report to future competent world radiocommunication conferences on the results of the implementation of the administrative due diligence procedure.

## ANNEX 1 TO RESOLUTION 49 (REV.WRC-19)

1 Any satellite network or satellite system of the fixed-satellite service, mobile-satellite service or broadcasting-satellite service with frequency assignments that are subject to coordination under Nos. **9.7**, **9.11**, **9.12**, **9.12A** and **9.13** and Resolution **33 (Rev.WRC-03)**<sup>\*</sup> shall be subject to these procedures.

2 Any request for modifications of the Region 2 Plan under the relevant provisions of Article 4 of Appendices **30** and **30A** that involve the addition of new frequencies or orbit positions or for modifications of the Region 2 Plan under the relevant provisions of Article 4 of Appendices **30** and **30A** that extend the service area to another country or countries in addition to the existing service area or request for additional uses in Regions 1 and 3 under the relevant provisions of Article 4 of Appendices **30** and **30A** shall be subject to these procedures.

3 Any submission of information under Article 6 of Appendix **30B (Rev.WRC-07)**, with the exception of submissions of new Member States seeking the acquisition of their respective national allotments<sup>3</sup> for inclusion in the Appendix **30B** Plan, shall be subject to these procedures.

4 For any satellite network subject to § 1 above, administrations shall send to the Bureau no later than 30 days following the end of the period established as a limit to bringing into use in No. **11.44**, the due diligence information relating to the identity of the satellite network, the spacecraft manufacturer and the launch service provider specified in Annex 2 to this Resolution.

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<sup>2</sup> See § 2.3 of Appendix **30B (Rev.WRC-07)**.

<sup>\*</sup> *Note by the Secretariat:* This Resolution was revised by WRC-15.

<sup>3</sup> See § 2.3 of Appendix **30B (Rev.WRC-07)**.

5 An administration requesting a modification of the Region 2 Plan or additional uses in Regions 1 and 3 under Appendices **30** and **30A** under § 2 above shall send to the Bureau no later than 30 days following the end of the period established as a limit to bringing into use in accordance with the relevant provisions of Article 4 of Appendix **30** and the relevant provisions of Article 4 of Appendix **30A**, the due diligence information relating to the identity of the satellite network, the spacecraft manufacturer and the launch service provider specified in Annex 2 to this Resolution.

6 An administration applying Article 6 of Appendix **30B (Rev.WRC-07)** under § 3 above shall send to the Bureau no later than 30 days following the end of the period established as a limit to bringing into use in § 6.1 of that Article, the due diligence information relating to the identity of the satellite network, the spacecraft manufacturer and the launch service provider specified in Annex 2 to this Resolution.

7 The information to be submitted in accordance with § 4, 5 or 6 above shall be signed by an authorized official of the notifying administration or of an administration that is acting on behalf of a group of named administrations.

8 On receipt of the due diligence information under § 4, 5 or 6 above, the Bureau shall promptly examine that information for completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within 30 days.

9 If the information is found to be incomplete, the Bureau shall immediately request the administration to submit the missing information. In all cases, the complete due diligence information shall be received by the Bureau within the appropriate time period specified in § 4, 5 or 6 above.

10 Six months before expiry of the period specified in § 4, 5 or 6 above and if the administration responsible for the satellite network has not submitted the due diligence information under § 4, 5 or 6 above, the Bureau shall send a reminder to the responsible administration.

11 If the complete due diligence information is not received by the Bureau within the time limits specified in § 4, 5 or 6, as appropriate, the networks covered by § 1, 2 or 3 above shall be cancelled by the Bureau. The provisional recording in the MIFR shall be deleted by the Bureau after it has informed the concerned administration. The Bureau shall publish this information in the BR IFIC.

With respect to the request for modification of the Region 2 Plan or for additional uses in Regions 1 and 3 under Appendices **30** and **30A** under § 2 above, the modification shall lapse if the complete due diligence information is not submitted in accordance with § 5.

With respect to the request for application of Article 6 of Appendix **30B (Rev.WRC-07)** under § 3 above, the network shall also be deleted from the Appendix **30B** List if the complete due diligence information is not submitted in accordance with § 6. When an allotment under Appendix **30B** is converted into an assignment, the assignment shall be reinstated in the Plan in accordance with § 6.33 *c*) of Article 6 of Appendix **30B (Rev.WRC-07)**.

12 When an administration has completely fulfilled the due diligence procedure but has not completed coordination, this does not preclude the application of No. **11.41** by that administration.

## ANNEX 2 TO RESOLUTION 49 (REV.WRC-15)

**A Identity of the satellite network**

- a)* Identity of the satellite network
- b)* Name of the administration
- c)* Country symbol
- d)* Reference to the advance publication information or to the request for modification of the Region 2 Plan or for additional uses in Regions 1 and 3 under Appendices **30** and **30A**; or reference to the information processed under Article 6 of Appendix **30B (Rev.WRC-07)**
- e)* Reference to the request for coordination (not applicable for Appendices **30, 30A** and **30B**)
- f)* Frequency band(s)
- g)* Name of the operator
- h)* Name of the satellite
- i)* Orbital characteristics.

**B Spacecraft manufacturer\***

- a)* Name of the spacecraft manufacturer
- b)* Date of execution of the contract
- c)* Contractual “delivery window”
- d)* Number of satellites procured.

**C Launch services provider**

- a)* Name of the launch vehicle provider
- b)* Date of execution of the contract
- c)* Launch or in-orbit delivery window
- d)* Name of the launch vehicle
- e)* Name and location of the launch facility.

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\* NOTE – In cases where a contract for satellite procurement covers more than one satellite, the relevant information shall be submitted for each satellite.

**MOD****RESOLUTION 55 (REV.WRC-19)****Electronic submission of notice forms for satellite networks,  
earth stations and radio astronomy stations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

that submission of notices for all satellite networks, earth stations and radio astronomy stations in electronic format would further facilitate the tasks of the Radiocommunication Bureau and of administrations, and would accelerate the processing of these notices,

*recognizing*

that, should the processing delays related to the coordination and notification procedures extend beyond the periods specified in Articles **9** and **11** as well as in Appendices **30**, **30A** and **30B**, administrations may be faced with a shortened time window in which to effect coordination,

*resolves*

1 that, as from 3 June 2000, all notices (AP4/II and AP4/III), radio astronomy notices (AP4/IV) and API (AP4/V and AP4/VI) and due diligence information (Resolution **49 (Rev.WRC-15)**) for satellite networks and earth stations submitted to the Radiocommunication Bureau pursuant to Articles **9** and **11** shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCap);

2 that, as from 17 November 2007, all notices for satellite networks, earth stations and radio astronomy stations submitted to the Radiocommunication Bureau pursuant to Articles **9** and **11**, as well as Appendices **30** and **30A** and Resolution **49 (Rev.WRC-15)**, shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCap and SpaceCom);

3 that, as from 1 June 2008, all notices for satellite networks and earth stations submitted to the Radiocommunication Bureau pursuant to Appendix **30B** shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCap);

4 that, as from 1 July 2009, comments/objections submitted to the Bureau in accordance with Nos. **9.3** and **9.52** with respect to Nos. **9.11** to **9.14** and **9.21** of Article **9**, or in accordance with § 4.1.7, 4.1.9, 4.1.10, 4.2.10, 4.2.13 or 4.2.14 of Appendices **30** and **30A** with respect to modification to the Region 2 Plan or to additional uses in Regions 1 and 3 under Article 4 and use of the guardbands under Article 2A of those Appendices, shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCom);

5 that, as from 18 February 2012, all requests for inclusion or exclusion submitted to the Bureau under No. **9.41** of Article **9** shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCom);

6 that, since 3 June 2000, all graphical data associated with the submissions addressed in *resolves* 1, 2 and 3 should be submitted in graphics data format compatible with the Bureau's data capture software (graphical interference management system (GIMS)),

*instructs the Radiocommunication Bureau*

- 1 to make available coordination requests and notifications referred to in *resolves* 1 “as received” within 30 days of receipt on its website;
- 2 to provide administrations with the latest versions of the capture and validation software and any necessary technical means, training and manuals, along with any assistance requested by administrations to enable them to comply with *resolves* 1 to 4 above;
- 3 to integrate the validation software with the capture software to the extent practicable.

**MOD**

## RESOLUTION 72 (REV.WRC-19)

### **World and regional preparations for world radiocommunication conferences**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the regional telecommunication organizations continue to coordinate their preparations for world radiocommunication conferences (WRCs);
- b) that many common proposals have been submitted to previous WRCs from administrations participating in the preparations of regional telecommunication organizations;
- c) that this consolidation of views at regional level, together with the opportunity for interregional discussions prior to WRCs, has eased the task of reaching a common understanding and saved time during past WRCs;
- d) that the burden of preparation for future WRCs is likely to increase;
- e) that there is consequently great benefit to the Member States of coordination of preparations at world level and at regional level;
- f) that the success of future WRCs will depend on greater efficiency of regional coordination and interaction at interregional level prior to future WRCs, including possible face-to-face meetings between regional telecommunication organizations;
- g) that there is a need for overall coordination of the interregional consultations,

*recognizing*

- a) *resolves* 2 of Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference;
- b) *resolves* 3 of Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference: “to encourage both formal and informal collaboration in the interval between conferences with a view to resolving differences on items already on the agenda of a conference or new items”,

*noting*

that the plenipotentiary conferences have resolved that the Union should continue to develop stronger relations with regional telecommunication organizations,

*resolves to invite the regional telecommunication organizations*

- 1 to continue their preparations for WRCs, including the possible convening of joint meetings of regional telecommunication organizations formally and informally;
- 2 to provide the Radiocommunication Bureau with a document containing the latest version of their views, positions and/or proposals under the agendas of WRCs at the earliest stage after each regional meeting in order to be published on the website of the related WRC,

*invites administrations*

to participate actively in the preparations of their regional telecommunication organizations for WRCs and join, to the extent possible, the regional common proposals,



*instructs the Director of the Radiocommunication Bureau*

1 to publish the documents mentioned in *resolves to invite the regional telecommunication organizations* 2 on the website of each WRC immediately after receiving such documents;

2 to continue consulting the regional telecommunication organizations on the means by which assistance can be given to their preparations for future WRCs in the following areas:

- organization of regional preparatory meetings;
- organization of information sessions, preferably before and after the second session of the Conference Preparatory Meeting (CPM), including presentation of the chapters of the CPM Report;
- identification of major issues to be resolved by the forthcoming WRC;
- facilitation of regional and interregional formal and informal meetings, with the objective of reaching a possible convergence of interregional views on major issues;

3 to submit a report on the results of such consultations to each WRC,

*invites the Director of the Telecommunication Development Bureau*

to collaborate with the Director of the Radiocommunication Bureau in implementing this Resolution.

**MOD**

**RESOLUTION 95 (REV.WRC-19)**

**General review of the Resolutions and Recommendations of world administrative radio conferences and world radiocommunication conferences**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considers*

- a) that it is important to keep the Resolutions and Recommendations of past world administrative radio conferences and world radiocommunication conferences under constant review, in order to keep them up to date;
- b) that the reports of the Director of the Radiocommunication Bureau submitted to previous conferences provided a useful basis for a general review of the Resolutions and Recommendations of past conferences;
- c) that some principles and guidelines are necessary for future conferences to treat the Resolutions and Recommendations of previous conferences which are not explicitly related to the agenda of the conference,

*resolves*

that recommended agendas for future world radiocommunication conferences should include a standing agenda item to review the Resolutions and Recommendations of previous conferences that are not related to any other agenda item of the conference with a view to:

- abrogating those Resolutions and Recommendations that have served their purpose or have become no longer necessary;
- reviewing the need for those Resolutions and Recommendations, or parts thereof, requesting ITU-R studies on which no progress has been made during the last two periods between conferences;
- updating and modifying Resolutions and Recommendations, or parts thereof, that have become out of date, and to correct obvious omissions, inconsistencies, ambiguities or editorial errors and effect any necessary alignment,

*invites future competent world radiocommunication conferences*

1 to review the Resolutions and Recommendations of previous conferences that are related to the agenda items of the conference, other than the standing agenda item mentioned in *resolves*, under those specific agenda items, with a view to their possible revision, replacement or abrogation, and to take appropriate action;

2 at the beginning of the conference, to determine which committee within the conference has the primary responsibility to review each of the Resolutions and Recommendations of previous conferences,

*instructs the Director of the Radiocommunication Bureau*

1 to conduct a general review of the Resolutions and Recommendations of previous conferences and, after consultation with the Radiocommunication Advisory Group and the Chairmen and Vice-Chairmen of the radiocommunication study groups, submit a report to the second session of the Conference Preparatory Meeting (CPM) in respect of *resolves* and *invites future competent world radiocommunication conferences* 1, including an indication of any associated agenda items;

2 to include in the above report, with the cooperation of the chairmen of the radiocommunication study groups, the progress reports of ITU-R studies on the issues which have been requested by the Resolutions and Recommendations of previous conferences, but which are not placed on the agendas of the forthcoming two conferences,

*invites administrations*

to submit contributions on the implementation of this Resolution to the second session of CPM and the conference,

*invites the Conference Preparatory Meeting*

to include, in its Report, the results of the general review of the Resolutions and Recommendations of previous conferences, based on the contributions by administrations to the second session of CPM and the above-mentioned Report of the Director, in order to facilitate the follow-up by the conference.

**MOD**

**RESOLUTION 99 (REV.WRC-19)**

**Provisional application of certain provisions of the Radio Regulations  
as revised by the 2019 World Radiocommunication Conference  
and abrogation of certain Resolutions and Recommendations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that this conference has, in accordance with its terms of reference, adopted a partial revision to the Radio Regulations (RR), which will enter into force on 1 January 2021;
- b)* that some of the provisions, as amended by this conference, need to apply provisionally before that date;
- c)* that, as a general rule, new and revised Resolutions and Recommendations enter into force at the time of the signing of the Final Acts of a conference;
- d)* that, as a general rule, Resolutions and Recommendations which a world radiocommunication conference has decided to suppress are abrogated at the time of the signing of the Final Acts of a conference,

*resolves*

1 that, as of 23 November 2019, the following provisions of the RR, as revised or established by this conference, shall provisionally apply: Table of Frequency Allocations 1 621.35-1 626.5 MHz, Nos. **5.ADJBAND**, **5.INBAND**, **5.368**, **5.372**, **5.A12**, **5.A16**, **5.B12**, **5.B16**, **5.C12**, **5.D12**, **5.441B**, **9.35**, **9.35.1**, **22.5L**, **22.5L.1**, **22.5M**, **33.50**, **33.53**, Table **21-4** (frequency band 40-40.5 GHz) as well as all provisions of Appendices **4**, **5**, **15**, **30**, **30A** and **30B**;

2 that, as of 1 July 2020, the following provisions of the RR, as revised or established by this conference, shall provisionally apply: No. **5.A15**,

*further resolves*

to abrogate the following Resolutions as of 23 November 2019:

Resolution **28 (Rev.WRC-15)**

Resolution **31 (WRC-15)**

Resolution **33 (Rev.WRC-15)**

Resolution **157 (WRC-15)**

Resolution **158 (WRC-15)**

Resolution **159 (WRC-15)**

Resolution **162 (WRC-15)**

Resolution **236 (WRC-15)**

Resolution **237 (WRC-15)**

Resolution **238 (WRC-15)**

Resolution **239 (WRC-15)**

Resolution **359 (WRC-15)**

Resolution **360 (Rev.WRC-15)**

Resolution **362 (WRC-15)**

Resolution **549 (WRC-07)**

Resolution **555 (Rev.WRC-15)**

Resolution **556 (WRC-15)**

Resolution **557 (WRC-15)**

Resolution **641 (Rev.HFBC-87)**

Resolution **658 (WRC-15)**

Resolution **659 (WRC-15)**

Resolution **764 (WRC-15)**

Resolution **765 (WRC-15)**

Resolution **766 (WRC-15)**

Resolution **767 (WRC-15)**

Resolution **809 (WRC-15)**

Resolution **810 (WRC-15)**

Resolution **958 (WRC-15)**

**MOD****RESOLUTION 122 (REV.WRC-19)****Use of the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz by high-altitude platform stations in the fixed service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the frequency band 47.2-50.2 GHz is allocated to the fixed, mobile and fixed-satellite services on a co-primary basis;
- b) that WRC-97 made provision for the operation of high-altitude platform stations (HAPS), also known as stratospheric repeaters, within the fixed service in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz;
- c) that establishing a stable technical and regulatory environment will promote the use of all co-primary services in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz;
- d) that Recommendation ITU-R F.1500 contains the characteristics of systems in the fixed service using HAPS in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz;
- e) that, while the decision to deploy HAPS can be taken on a national basis, such deployment may affect the territory of other administrations and operators of co-primary services;
- f) that ITU-R has completed studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz;
- g) that ITU-R has conducted studies dealing with compatibility between systems using HAPS and existing services in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz, leading to Report ITU-R F.2476;
- h) that No. **5.552** urges administrations to take all practicable steps to reserve fixed-satellite service (FSS) use of the frequency band 47.2-49.2 GHz for feeder links for the broadcasting-satellite service (BSS) operating in the frequency band 40.5-42.5 GHz, and that ITU-R studies indicate that HAPS in the fixed service may share with such feeder links;
- i) that the technical characteristics of expected BSS feeder links and FSS gateway-type stations are similar;
- j) that ITU-R has updated studies on sharing between HAPS ground stations in the fixed service and the FSS, noting the negligible contribution to interference from HAPS stations to FSS space receivers,

*recognizing*

- a) that Recommendation ITU-R SF.1843 provides information on the feasibility of HAPS systems in the fixed service sharing with the FSS;
- b) that ITU-R studies have established specific power flux-density values to be met at international borders to facilitate sharing conditions for HAPS with other types of fixed-service systems in a neighbouring country;

c) that FSS satellite networks and systems with earth station antenna diameters of 2.5 metres or larger operating as a gateway-type station are capable of sharing with HAPS ground stations;

d) that during periods of rain, the e.i.r.p. of the beam of the HAPS system suffering rain fade may be increased by a level commensurate with the level of rain fade, by up to 20 dB above the e.i.r.p. under clear-sky conditions indicated in Appendix 4,

*resolves*

1 that to facilitate sharing with the FSS (Earth-to-space), the maximum transmit e.i.r.p. density of a HAPS ground station shall not exceed the following levels under clear-sky conditions:

6.4	dB(W/MHz)	for	$30^\circ < \theta \leq 90^\circ$
22.57	dB(W/MHz)	for	$15^\circ < \theta \leq 30^\circ$
28	dB(W/MHz)	for	$5^\circ < \theta \leq 15^\circ$

where  $\theta$  is the HAPS ground station elevation angle in degrees (angle of arrival above the horizontal plane);

2 that the ground station antenna patterns of HAPS operating in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz shall meet the following antenna beam patterns:

$$G(\varphi) = G_{max} - 2.5 \times 10^{-3} \left( \frac{D}{\lambda} \varphi \right)^2 \quad \text{for} \quad 0^\circ < \varphi < \varphi_m$$

$$G(\varphi) = 39 - 5 \log(D/\lambda) - 25 \log \varphi \quad \text{for} \quad \varphi_m \leq \varphi < 48^\circ$$

$$G(\varphi) = -3 - 5 \log(D/\lambda) \quad \text{for} \quad 48^\circ \leq \varphi \leq 180^\circ$$

where:

$G_{max}$ : maximum antenna gain (dBi)

$G(\varphi)$ : gain (dBi) relative to an isotropic antenna

$\varphi$ : off-axis angle (degrees)

$D$ : antenna diameter } expressed in the same units  
 $\lambda$ : wavelength }

$$\varphi_m = \frac{20 \lambda}{D} \sqrt{G_{max} - G_1} \text{ degrees}$$

$G_1$ : gain of the first side lobe

$$= 2 + 15 \log(D/\lambda) \text{ (dBi);}$$

3 that, for the purpose of protecting fixed-service systems in the territory of other administrations in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz, the power flux-density (pfd) level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of the notification of HAPS:

-141	dB(W/(m <sup>2</sup> · MHz))	for	0° ≤ θ < 3°
-141 + 2(θ - 3)	dB(W/(m <sup>2</sup> · MHz))	for	3° ≤ θ ≤ 13°
-121	dB(W/(m <sup>2</sup> · MHz))	for	13° < θ ≤ 90°

where θ is the angle of the arrival of the incident wave above the horizontal plane, in degrees;

4 that, for the purpose of protecting mobile-service systems in the territory of other administrations in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz, the pfd level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of the notification of HAPS:

-106	dB(W/(m <sup>2</sup> · MHz))	for	0° ≤ θ ≤ 4°
-106 + 1.2 (θ - 4)	dB(W/(m <sup>2</sup> · MHz))	for	4° < θ ≤ 11.5°
-97	dB(W/(m <sup>2</sup> · MHz))	for	11.5° < θ ≤ 90°

where θ is the angle of arrival of the incident wave above the horizontal plane in degrees.

The limits above take into account the 3 dB aggregate loss due to polarization mismatch, and body loss was not taken into account;

5 that, to protect radio astronomy stations operating in the frequency band 48.94-49.04 GHz from unwanted emissions of HAPS operating in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz, the separation distance between the radio astronomy station and the nadir of a HAPS platform shall exceed 50 km;

6 that administrations planning to implement a HAPS system in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz shall notify the frequency assignments by submitting all mandatory elements of Appendix 4 to the Bureau for the examination of compliance with respect to this Resolution with a view to their registration in the Master International Frequency Register,

*instructs the Director of the Radiocommunication Bureau*

to take all necessary measures to implement this Resolution.



**MOD****RESOLUTION 143 (REV.WRC-19)****Guidelines for the implementation of high-density applications in the fixed-satellite service in frequency bands identified for these applications**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that demand has been increasing steadily for global broadband communication services throughout the world, such as those provided by high-density applications in the fixed-satellite service (HDFSS);
- b) that HDFSS systems are characterized by flexible, rapid and ubiquitous deployment of large numbers of cost-optimized earth stations employing small antennas and having common technical characteristics;
- c) that HDFSS is an advanced broadband communication application concept that will provide access to a wide range of broadband telecommunication applications supported by fixed telecommunication networks (including the Internet), and thus will complement other telecommunication systems;
- d) that, as with other FSS systems, HDFSS offers great potential to establish telecommunication infrastructure rapidly;
- e) that HDFSS applications can be provided by satellites of any orbital type;
- f) that interference mitigation techniques have been and continue to be studied in ITU-R to facilitate sharing between HDFSS earth stations and terrestrial services;
- g) that to date, studies have not concluded on the practicability of implementation of interference mitigation techniques for all HDFSS earth stations,

*noting*

- a) that No. **5.516B** identifies bands for HDFSS;
- b) that, in some of these bands, the FSS allocations are co-primary with fixed and mobile service allocations as well as other services;
- c) that this identification does not preclude the use of these bands by other services or by other FSS applications, and does not establish priority in these Radio Regulations among users of the bands;
- d) that, in the band 18.6-18.8 GHz, the FSS allocation is co-primary with the Earth exploration-satellite service (EESS) (passive) with the restrictions of Nos. **5.522A** and **5.522B**;
- e) that radio astronomy observations are carried out in the 48.94-49.04 GHz band, and that such observations require protection at notified radio astronomy stations;
- f) that co-frequency sharing between transmitting HDFSS earth stations and terrestrial services is difficult in the same geographical area;
- g) that co-frequency sharing between receiving HDFSS earth stations and terrestrial stations in the same geographical area may be facilitated through the implementation of interference mitigation techniques, if practicable;

*h)* that many FSS systems with other types of earth stations and characteristics have already been brought into use or are planned to be brought into use in some of the frequency bands identified for HDFSS in No. **5.516B**;

*i)* that HDFSS stations in these bands are expected to be deployed in large numbers over urban, suburban and rural areas of large geographical extent;

*j)* that the 50.2-50.4 GHz band, adjacent to the band 48.2-50.2 GHz (Earth-to-space) identified for HDFSS in Region 2, is allocated to the EESS (passive),

*recognizing*

*a)* that in cases where FSS earth stations use bands that are shared on a co-primary basis with terrestrial services, the Radio Regulations stipulate that earth stations of the FSS shall be individually notified to the Bureau when their coordination contours extend into the territory of another administration;

*b)* that, as a consequence of their general characteristics, it is expected that the coordination of HDFSS earth stations with fixed service stations on an individual site-by-site basis between administrations will be a difficult and long process;

*c)* that, to minimize the burden for administrations, simplified coordination procedures and provisions can be agreed by administrations for large numbers of similar HDFSS earth stations associated with a given satellite system;

*d)* that harmonized worldwide bands for HDFSS would facilitate the implementation of HDFSS, thereby helping to maximize global access and economies of scale,

*recognizing further*

that HDFSS applications implemented on FSS networks and systems are subject to all provisions of the Radio Regulations applicable to the FSS, such as coordination and notification pursuant to Articles **9** and **11**, including any requirements to coordinate with terrestrial services of other countries, and the provisions of Articles **21** and **22**,

*resolves*

that administrations which implement HDFSS should consider the following guidelines:

*a)* making some or all of the frequency bands identified in No. **5.516B** available for HDFSS applications;

*b)* in making frequency bands available under *resolves a)*, take into account:

– that HDFSS deployment will be simplified in bands that are not shared with terrestrial services;

– in bands shared with terrestrial services, the impact that the further deployment of terrestrial stations would have on the existing and future development of HDFSS, and the further deployment of HDFSS earth stations would have on the existing and future development of terrestrial services;

*c)* take into account the relevant technical characteristics applicable to HDFSS, as identified by ITU-R Recommendations (e.g. **the most recent versions of Recommendations ITU-R S.524**, ITU-R S.1594 and ITU-R S.1783);

*d)* take into account other existing and planned FSS systems, having different characteristics, in frequency bands where HDFSS is implemented in accordance with *resolves a)* above and the conditions specified in No. **5.516B**,

*invites administrations*

- 1 to give due consideration to the benefits of harmonized utilization of the spectrum for HDFSS on a global basis, taking into account the use and planned use of these bands by all other services to which these bands are allocated, as well as other types of FSS applications;
- 2 to consider implementing simplified procedures and provisions that facilitate the deployment of HDFSS systems in some or all of the bands identified in No. **5.516B**;
- 3 when considering the deployment of HDFSS systems in the upper portion of the band 48.2-50.2 GHz, to take into account as appropriate the potential impact such deployment may have on the satellite passive services in the adjacent band 50.2-50.4 GHz, and to participate in ITU-R studies on the compatibility between these services, taking into account No. **5.340**;
- 4 to consider, given *invites administrations* 3 above, and where practicable, starting the deployment of HDFSS earth stations in the lower part of the band 48.2-50.2 GHz.

## MOD

## RESOLUTION 145 (REV.WRC-19)

**Use of the frequency band 27.9-28.2 GHz by  
high-altitude platform stations in the fixed service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WRC-97 made provision for the operation of high-altitude platform stations (HAPS), also known as stratospheric repeaters, within a  $2 \times 300$  MHz portion of the fixed-service allocation in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz;
- b) that No. **4.23** specifies that transmissions to or from HAPS shall be limited to the frequency bands specifically identified in Article 5;
- c) that, at WRC-2000, several countries in Region 3 and one country in Region 1 expressed a need for a lower frequency band for HAPS due to the excessive rain attenuation that occurs at 47 GHz in these countries;
- d) that some countries in Region 2 have also expressed an interest in using a frequency range lower than those referred to in *considering a*);
- e) that, in order to accommodate the need expressed by the countries referred to in *considering c*), WRC-2000 adopted Nos. **5.537A** and **5.543A**, which were modified at WRC-03 and then again at WRC-07 to permit the use of HAPS in the fixed service in the frequency band 27.9-28.2 GHz and in the frequency band 31-31.3 GHz in certain Region 1 and 3 countries on a non-harmful interference, non-protection basis;
- f) that the frequency band 27.9-28.2 GHz is already heavily used or planned to be used by a number of different services and a number of other types of applications in the fixed service;
- g) that while the decision to deploy HAPS can be taken on a national basis, such deployment may affect neighbouring administrations, particularly in small countries;
- h) that ITU-R has conducted studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the frequency band 27.9-28.2 GHz, leading to Recommendation ITU-R F.1609;
- i) that results of some ITU-R studies indicate that, in the frequency band 27.9-28.2 GHz, sharing between fixed-service systems using HAPS and other conventional fixed-service systems in the same area will require appropriate interference mitigation techniques to be developed and implemented;
- j) that ITU-R has produced Recommendation ITU-R SF.1601 containing methodologies for evaluating interference from fixed-service systems using HAPS into GSO FSS systems in the frequency band 27.9-28.2 GHz;
- k) that HAPS technical issues could continue to be studied in order to determine appropriate measures for protecting the fixed service and other co-primary services in the frequency band 27.9-28.2 GHz,

*resolves*

- 1 that, notwithstanding No. **4.23**, in Region 2 the use of HAPS within the fixed-service allocations within the frequency band 27.9-28.2 GHz shall not cause harmful interference to, or claim protection from, other stations of services operating in accordance with the Table of Frequency Allocations of Article **5**, and, further, that the development of these other services shall proceed without constraints by HAPS operating pursuant to this Resolution;
- 2 that any use by HAPS of the fixed-service allocation at 27.9-28.2 GHz pursuant to *resolves* 1 above shall be limited to operation in the HAPS-to-ground direction;
- 3 that the administrations listed in No. **5.537A** which intend to implement systems using HAPS in the fixed service in the frequency band 27.9-28.2 GHz shall seek explicit agreement of concerned administrations with regard to their stations of primary services to ensure that the conditions in No. **5.537A** are met, and those administrations in Region 2 which intend to implement systems using HAPS in the fixed service in these frequency bands shall seek explicit agreement of concerned administrations with regard to their stations of services operating in accordance with the Table of Frequency Allocations of Article **5** to ensure that the conditions in *resolves* 1 are met;
- 4 that administrations planning to implement a HAPS system pursuant to *resolves* 1 above shall notify the frequency assignment(s) by submitting all mandatory elements of Appendix **4** to the Radiocommunication Bureau for the examination of compliance with *resolves* 3 above,

*invites ITU-R*

- 1 to continue to carry out studies on the appropriate interference mitigation techniques for the situations referred to in *considering i*);
- 2 to develop protection criteria for the mobile service having primary allocations in the frequency band 27.9-28.2 GHz from HAPS in the fixed service and include the result of these studies in existing or new ITU-R reports/recommendations, as appropriate.

## MOD

## RESOLUTION 155 (REV.WRC-19)

**Regulatory provisions related to earth stations on board unmanned aircraft which operate with geostationary-satellite networks in the fixed-satellite service in certain frequency bands not subject to a Plan of Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces\***

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the operation of unmanned aircraft systems (UAS) requires reliable control and non-payload communication (CNPC) links, in particular to relay air traffic control communications and for the remote pilot to control the flight;
- b) that satellite networks may be used to provide CNPC links of UAS beyond the line-of-sight, as shown in Annex 1;
- c) that CNPC links between space stations and stations on board unmanned aircraft (UA) are proposed to be operated under this Resolution in the primary fixed-satellite service (FSS) in frequency bands shared with other primary services, including terrestrial services, however that would not preclude the use of other available allocations to accommodate this application,

*considering further*

that UAS CNPC links relate to the safe operation of UAS and have to comply with certain technical, operational and regulatory requirements,

*noting*

- a) that this conference has adopted Resolution **156** on the use of earth stations in motion communicating with geostationary FSS space stations in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz;
- b) that Report ITU-R M.2171 provides information on characteristics of UAS and spectrum requirements to support their safe operation in non-segregated airspace,

*recognizing*

- a) that the UAS CNPC links will operate in accordance with international standards and recommended practices and procedures established in accordance with the Convention on International Civil Aviation;
- b) that, in this Resolution, conditions are provided for operations of CNPC links without prejudging whether the International Civil Aviation Organization (ICAO) would be able to develop standards and recommended practices to ensure safe operation of UAS under these conditions,

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\* May also be used consistent with international standards and practices approved by the responsible civil aviation authority.

*resolves*

- 1 that assignments to stations of geostationary FSS satellite networks operating in the frequency bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.5 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Regions 1 and 3 and 19.7-20.2 GHz (space-to-Earth), and in the frequency bands 14-14.47 GHz (Earth-to-space) and 29.5-30.0 GHz (Earth-to-space), may be used for UAS CNPC links in non-segregated airspace\*, provided that the conditions specified in *resolves* below are met;
- 2 that earth stations in motion on board UA may communicate with the space station of a geostationary FSS satellite network operating in the frequency bands listed in *resolves* 1 above, provided that the class of the earth station in motion on board UA is matched with the class of the space station and that other conditions of this Resolution are met (see also *instructs the Director of the Radiocommunication Bureau* 3 below);
- 3 that the frequency bands specified in *resolves* 1 shall not be used for the UAS CNPC links before the adoption of the relevant international aeronautical standards and recommended practices (SARPs) consistent with Article 37 of the Convention on International Civil Aviation, taking into account *instructs the Director of the Radiocommunication Bureau* 4;
- 4 that administrations responsible for an FSS network providing UA CNPC links shall apply the relevant provisions of Articles **9** (necessary provisions need to be identified or developed) and **11** for the relevant assignments, including, as appropriate, assignments to the corresponding space station, specific and typical earth station and earth station in motion on board UA, including the request for publication in BR IFIC of items referred to in *resolves* 2 and the course of actions identified in that *resolves* in order to obtain international rights and recognition as specified in Article **8**;
- 5 that earth stations of UAS CNPC links shall operate within the notified and recorded technical parameters of the associated satellite network, including specific or typical earth stations of the geostationary FSS satellite network(s) as published by the Radiocommunication Bureau;
- 6 that earth stations of UAS CNPC links shall not cause more interference to, or claim more protection from, other satellite networks and systems than specific or typical earth stations as indicated in *resolves* 5 as published by the Bureau;
- 7 that, in order to apply *resolves* 6 above, administrations responsible for the FSS network to be used for UAS CNPC links shall provide the level of interference for the reference assignments of the network used for CNPC links upon request by an administration authorizing the use of UAS CNPC links within its territory;
- 8 that earth stations of UAS CNPC links of a particular FSS network shall not cause more interference to, or claim more protection from, stations of terrestrial services than specific or typical earth stations of that FSS network as indicated in *resolves* 5 that have been previously coordinated and/or notified under relevant provisions of Articles **9** and **11**;
- 9 that the use of assignments of a FSS satellite network for UAS CNPC links shall not constrain other FSS satellite networks during the application of the provisions of Articles **9** and **11**;
- 10 that the introduction of UAS CNPC links shall not result in additional coordination constraints on terrestrial services under Articles **9** and **11**;

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\* May also be used consistent with international standards and practices approved by the responsible civil aviation authority.



11 that earth stations on board UA shall be designed and operated so as to be able to accept the interference caused by terrestrial services operating in conformity with the Radio Regulations in the frequency bands listed in *resolves* 1 without complaints under Article 15;

12 that earth stations on board UA shall be designed and operated so as to be able to operate with interference caused by other satellite networks resulting from application of Articles 9 and 11;

13 that, in order to ensure safety-of-flight operation of UAS, administrations responsible for operating UAS CNPC links shall:

- ensure that the use of UAS CNPC links be in accordance with the international standards and recommended practices (SARPs) consistent with Article 37 of the Convention on International Civil Aviation;
- take the required measures, consistent with No. 4.10, to ensure freedom from harmful interference to earth stations on board UA operated in accordance with this Resolution;
- act immediately when their attention is drawn to any such harmful interference, as freedom from harmful interference to UAS CNPC links is imperative to ensure their safe operation, taking into account *resolves* 11;
- use assignments associated with the FSS networks for UAS CNPC links (see Figure 1 in Annex 1), including assignments to space stations, specific or typical earth stations and earth stations on board UA (see *resolves* 2), that have been successfully coordinated under Article 9 (including provisions identified in *resolves* 4) and recorded in the Master International Frequency Register (MIFR) with a favourable finding under Article 11, including Nos. 11.31, 11.32 or 11.32A where applicable, and except those assignments that have not successfully completed coordination procedures under No. 11.32 by applying Appendix 5 § 6.d.i;
- ensure that real-time interference monitoring, estimation and prediction of interference risks and planning solutions for potential interference scenarios are addressed by FSS operators and UAS operators with guidance from aviation authorities;

14 that, unless otherwise agreed between the administrations concerned, UA CNPC earth stations shall not cause harmful interference to terrestrial services of other administrations (see also Annex 2);

15 that, in order to implement *resolves* 14 above, power flux-density hard limits need to be developed for UAS CNPC links; possible examples of such provisional limits to protect the fixed service are provided in Annex 2; subject to agreement between the administrations concerned, that annex may be used for the implementation of this Resolution;

16 that the power flux-density hard limits provided in Annex 2 shall be reviewed and, if necessary, revised by WRC-23<sup>1</sup>;

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<sup>1</sup> WRC-19 received a proposal from one regional organization regarding protection of the fixed service using a revised pfd mask as contained in Annex 2 section b). ITU-R is invited, in continuing its study on the implementation of this Resolution, to consider this mask and take necessary action as appropriate.



17 that, in order to protect the radio astronomy service in the frequency band 14.47-14.5 GHz, administrations operating UAS in accordance with this Resolution in the frequency band 14-14.47 GHz within line-of-sight of radio astronomy stations are urged to take all practicable steps to ensure that the emissions from the UA in the frequency band 14.47-14.5 GHz do not exceed the levels and percentage of data loss given in the most recent versions of Recommendations ITU-R RA.769 and ITU-R RA.1513;

18 to consider the progress obtained by ICAO in the process of preparation of SARPs for UAS CNPC links, to review this Resolution at WRC-23, taking into account the results of the implementation of Resolution **156 (WRC-15)**, and to take necessary actions as appropriate;

19 that ITU Radiocommunication Sector (ITU-R) studies on technical, operational and regulatory aspects in relation to the implementation of this Resolution shall be completed, together with the adoption of relevant ITU-R Recommendations defining the technical characteristics of CNPC links and conditions of sharing with other services,

*resolves to encourage administrations*

1 to provide the relevant information where available in order to facilitate the application of *resolves* 6;

2 to participate actively in the studies referred to in *invites ITU-R* by submitting contributions to ITU-R,

*resolves further to invite the 2023 World Radiocommunication Conference*

to consider the results of the above studies referred to in this Resolution with a view to reviewing and, if necessary, revising this Resolution, and take necessary actions, as appropriate,

*invites ITU-R*

to conduct, as a matter of urgency, relevant studies of technical, operational and regulatory aspects in relation to the implementation of this Resolution<sup>1</sup>,

*instructs the Director of the Radiocommunication Bureau*

1 to examine the relevant part of this Resolution requiring actions to be taken by administrations to implement this Resolution, with a view to sending it to administrations and posting it on the ITU website;

2 to present to subsequent WRCs a progress report relating to the implementation of this Resolution;

3 to define a new class of station in order to be able to process satellite network filings submitted by administrations for earth stations providing UA CNPC links, after the Resolution is implemented, in accordance with this Resolution, and publish the information as referred in *resolves* 4;

4 not to process satellite network filing submissions by administrations with a new class of a station for earth stations providing UA CNPC links before *resolves* 1-12 and 14-19 of this Resolution are implemented;

5 to report to subsequent WRCs on the progress made by ICAO on the development of SARPs for UAS CNPC links,

*instructs the Secretary-General*

to bring this Resolution to the attention of the Secretary-General of ICAO,

*invites the International Civil Aviation Organization*

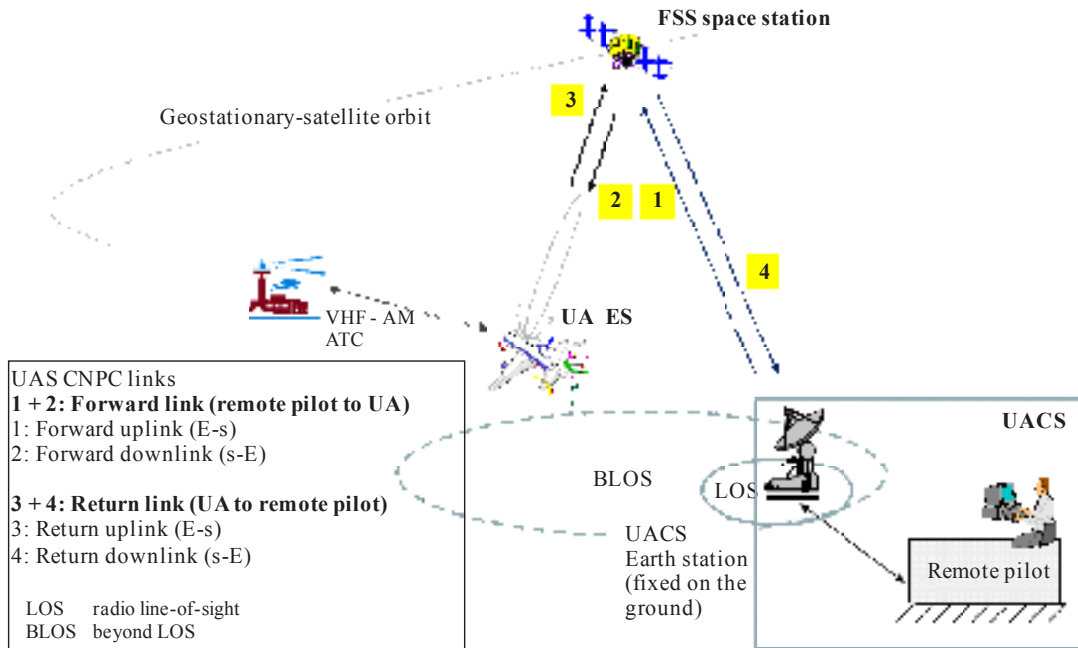
to provide to the Director of the Radiocommunication Bureau, in time for WRC-19 and WRC-23, information on ICAO efforts regarding implementation of UAS CNPC links, including the information related to the development of SARPs for UAS CNPC links.

ANNEX 1 TO RESOLUTION 155 (REV.WRC-19)

UAS CNPC links

FIGURE 1

Elements of UAS architecture using the FSS



Ann1-resol\_155-01

ANNEX 2 TO RESOLUTION 155 (REV.WRC-19)

Protection of the fixed service from UAS CNPC emissions

a) Example provided to WRC-15

The fixed service is allocated by table entries and footnotes in several countries with co-primary status with FSS. Conditions of UA using CNPC shall be such that the fixed service is protected from any harmful interference as follows:

An earth station on board UA in the frequency band 14.0-14.47 GHz shall comply with provisional power flux-density (pfd) limits described below:

$$\begin{array}{lll}
 -132 + 0.5 \cdot \theta & \text{dB(W/(m}^2 \cdot \text{MHz))} & \text{for } 0^\circ \leq \theta \leq 40^\circ \\
 -112 & \text{dB(W/(m}^2 \cdot \text{MHz))} & \text{for } 40^\circ < \theta \leq 90^\circ
 \end{array}$$

where  $\theta$  is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

NOTE – The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.

**b) Example provided to WRC-19**

An earth station on board UA in the frequency band 14.0-14.3 GHz shall comply with the power flux-density (pfd) limits described below, on the territory of countries listed in No. 5.505:

$$15 \log_{10}(\theta + 0.9) - 124 \text{ dB} \left( \text{W} / \left( \text{m}^2 \cdot \text{MHz} \right) \right) \quad \text{for } 0^\circ \leq \theta \leq 90^\circ$$

where  $\theta$  is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

An earth station on board UA:

- in the frequency band 14.25-14.3 GHz on the territory of countries listed in No. 5.508;
- in the frequency band 14.3-14.4 GHz in Regions 1 and 3;
- in the frequency band 14.4-14.47 GHz worldwide,

shall comply with the pfd limits described below:

$$15 \log_{10}(\theta + 0.9) - 133.5 \text{ dB} \left( \text{W} / \left( \text{m}^2 \cdot \text{MHz} \right) \right) \quad \text{for } 0^\circ \leq \theta \leq 90^\circ$$

where  $\theta$  is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

NOTE – The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.

**MOD****RESOLUTION 205 (REV.WRC-19)****Protection of the systems operating in the mobile-satellite service in the frequency band 406-406.1 MHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WARC-79 allocated the frequency band 406-406.1 MHz to the mobile-satellite service (MSS) in the Earth-to-space direction;
- b) that No. **5.266** limits the use of the frequency band 406-406.1 MHz to low-power satellite emergency position-indicating radiobeacons (EPIRBs);
- c) that WARC Mob-83 made provision in the Radio Regulations for the introduction and development of a global distress and safety system;
- d) that the use of satellite EPIRBs is an essential element of this system;
- e) that, like any frequency band reserved for a distress and safety system, the frequency band 406-406.1 MHz is entitled to full protection against all harmful interference;
- f) that Nos. **5.267** and **4.22** and Appendix **15** (Table **15-2**) require the protection of the MSS within the frequency band 406-406.1 MHz from all emissions of systems, including systems operating in the lower and upper adjacent frequency bands;
- g) that Recommendation ITU-R M.1478 provides protection requirements for the various types of instruments mounted on board operational satellites receiving EPIRB signals in the frequency band 406-406.1 MHz against both broadband out-of-band emissions and narrowband spurious emissions;
- h) that Report ITU-R M.2359 provides the results of studies covering various scenarios between the MSS and other relevant active services operating in the frequency bands 390-406 MHz and 406.1-420 MHz or in separate parts of these frequency bands;
- i) that unwanted emissions from services outside the frequency band 406-406.1 MHz have the potential to cause interference to MSS receivers within 406-406.1 MHz;
- j) that long-term protection against harmful interference of the Cospas-Sarsat satellite system operating in the MSS in the frequency band 406-406.1 MHz is vital to the response times of emergency services;
- k) that, in most cases, the frequency bands adjacent or near to those used by Cospas-Sarsat will continue to be used for various applications in the services to which they are allocated,

*considering further*

- a) that some administrations have initially developed and implemented an operational low-altitude, near-polar orbiting satellite system (Cospas-Sarsat) operating in the frequency band 406-406.1 MHz to provide alerting and to aid in the locating of distress incidents;
- b) that thousands of human lives have been saved through the use of spaceborne distress-beacon detection instruments, initially on 121.5 MHz and 243 MHz, and subsequently in the frequency band 406-406.1 MHz;

- c) that the 406 MHz distress transmissions are relayed through many instruments mounted on geostationary, low-Earth and medium-Earth satellite orbits;
- d) that the digital processing of these emissions provides accurate, timely and reliable distress alert and location data to help search and rescue authorities assist persons in distress;
- e) that the International Maritime Organization (IMO) has decided that satellite EPIRBs operating in the Cospas-Sarsat system form part of the Global Maritime Distress and Safety System (GMDSS);
- f) that observations of the use of frequencies in the frequency band 406-406.1 MHz show that they are being used by stations other than those authorized by No. 5.266, and that these stations have caused harmful interference to the MSS, and particularly to the reception of satellite EPIRB signals by the Cospas-Sarsat system;
- g) that the results of spectrum monitoring and ITU-R studies contained in Report ITU-R M.2359 indicate that emissions from stations operating in the frequency bands 405.9-406 MHz and 406.1-406.2 MHz have the potential to severely impact the performance of MSS systems in the frequency band 406-406.1 MHz;
- h) that the results of ITU-R studies indicate that increased deployment of land mobile systems operating in the vicinity of the 406-406.1 MHz frequency band may degrade the receiver performance of mobile-satellite systems operating in the frequency band 406-406.1 MHz;
- i) that the maximum permissible level of interference to the MSS in the 406-406.1 MHz frequency band may be exceeded due to frequency drift of the radiosondes operating above 405 MHz,

*recognizing*

- a) that it is essential for the protection of human life and property that frequency bands allocated exclusively to a service for distress and safety purposes be kept free from harmful interference;
- b) that the deployment of mobile systems near the frequency band 406-406.1 MHz is ongoing and more such systems are envisaged;
- c) that this increased deployment raises significant concerns on the reliability of future distress and safety communications due to the increases in the noise level measured in many areas of the world for the frequency band 406-406.1 MHz;
- d) that it is essential to preserve the MSS frequency band 406-406.1 MHz free from out-of-band emissions that would degrade the operation of the 406 MHz satellite transponders and receivers, with the risk that satellite EPIRB signals would go undetected,

*noting*

- a) that the 406 MHz search and rescue system will be enhanced by placing 406-406.1 MHz transponders on global navigation satellite systems such as Galileo, GLONASS and GPS, relaying search and rescue emissions at 406 MHz, in addition to already-operational and future low-Earth orbiting and geostationary satellites, thus providing a large constellation of satellites relaying search and rescue messages;
- b) that this enhanced constellation of spaceborne search and rescue instruments was designed to improve geographic coverage and reduce distress-alert transmission delays by means of larger uplink footprints, an increased number of satellites and improvement in the accuracy of the location of the distress signal;

c) that the characteristics of these spacecraft with larger footprints, and the low power available from satellite EPIRB transmitters, means that aggregate levels of electromagnetic noise, including noise from transmissions in adjacent frequency bands, may present a risk of satellite EPIRB transmissions being undetected, or delayed in reception, or lead to reduced accuracy of the calculated locations, thereby putting lives at risk;

d) that Report ITU-R SM.1051 provides a methodology to monitor the electromagnetic environment in the adjacent frequency bands 405.9-406 MHz and 406.1-406.2 MHz,

*noting further*

a) that the MSS systems contributing to the emergency location system “Cospas-Sarsat” provide a worldwide emergency location system to the benefit of all countries, even if those mobile-satellite systems are not operated by their country;

b) that many Cospas-Sarsat satellites implement efficient out-of-band filtering, which would be further improved in upcoming satellites,

*resolves*

1 to request administrations not to make new frequency assignments within the frequency bands 405.9-406.0 MHz and 406.1-406.2 MHz under the mobile and fixed services;

2 that administrations take into account frequency drift characteristics of radiosondes when selecting their operating frequencies above 405 MHz to avoid transmitting in the 406-406.1 MHz frequency band and take all practical steps to avoid frequency drifting close to 406 MHz,

*instructs the Director of the Radiocommunication Bureau*

1 to continue to organize monitoring programmes in the frequency band 406-406.1 MHz in order to identify the source of any unauthorized emission in that frequency band;

2 to organize monitoring programmes on the impact of unwanted emissions from systems operating in the frequency bands 405.9-406 MHz and 406.1-406.2 MHz on MSS reception in the frequency band 406-406.1 MHz in order to assess the effectiveness of this Resolution, and to report to subsequent world radiocommunication conferences,

*encourages administrations*

to take measures such as authorizing new assignments to stations in the fixed and mobile services with priority given to selecting channels with greater frequency separation from the 406 to 406.1 MHz frequency band and ensuring that the e.i.r.p. of new fixed and mobile systems at all but low elevation angles is kept to the minimum required level,

*urges administrations*

1 to take part in monitoring programmes referred to in *instructs the Director of the Radiocommunication Bureau* above;

2 to ensure that stations other than those operated under No. **5.266** abstain from using frequencies in the frequency band 406-406.1 MHz;

3 to take the appropriate measures to eliminate harmful interference caused to the distress and safety system;

- 4 when designing Cospas-Sarsat satellite receiver payloads in the 406-406.1 MHz frequency band, to improve, to the extent possible, out-of-band filtering of such receivers, in order to reduce constraints on adjacent services while preserving the ability of the Cospas-Sarsat system to detect all kinds of emergency beacons and to maintain an acceptable rate of detection, which is vital to search and rescue missions;
- 5 to take all practical steps to limit the levels of unwanted emissions of stations operating within the 403-406 MHz and 406.1-410 MHz frequency ranges in order not to cause harmful interference to mobile-satellite systems operating in the 406-406.1 MHz frequency band;
- 6 to actively cooperate with the administrations participating in the monitoring programme and the Bureau to resolve reported cases of interference to the Cospas-Sarsat system.



**MOD****RESOLUTION 212 (REV.WRC-19)****Implementation of International Mobile Telecommunications in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that Resolution ITU-R 56 defines the naming for International Mobile Telecommunications (IMT);
- b) that the ITU Radiocommunication Sector (ITU-R), for WRC-97, recommended approximately 230 MHz for use by the terrestrial and satellite components of IMT;
- c) that ITU-R studies forecast that additional spectrum may be required to support the future services of IMT and to accommodate future user requirements and network deployments;
- d) that ITU-R has recognized that the satellite component is an integral part of IMT;
- e) that, in No. 5.388, WARC-92 identified frequency bands to accommodate certain mobile applications defined as IMT,

*noting*

- a) that both the terrestrial and satellite components of IMT have already been deployed or are being considered for deployment within the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz;
- b) that the availability of the satellite component of IMT in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz simultaneously with the terrestrial component of IMT in the frequency bands identified in No. 5.388 would improve the overall use of IMT,

*noting further*

- a) that co-coverage, co-frequency deployment of independent satellite and terrestrial IMT components is not feasible unless techniques, such as the use of an appropriate guardband or other mitigation techniques, are applied to ensure coexistence and compatibility between the terrestrial and satellite components of IMT, but that co-coverage, co-frequency deployment of terrestrial and satellite components of IMT could be feasible if deployed as integrated networks supported by a system providing the management of frequency utilization by both components;
- b) that, when the satellite and terrestrial components of IMT are deployed in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz, technical or operational measures may need to be implemented to avoid harmful interference,

*resolves*

- 1 that administrations which implement IMT:
  - a) should make the necessary frequencies available for system development;
  - b) should use those frequencies when IMT is implemented;
  - c) should use the relevant international technical characteristics, as identified by ITU-R and ITU-T Recommendations;

2 that administrations should take the technical and operational measures such as those found in the Annex to this Resolution, to facilitate coexistence and compatibility between the terrestrial and satellite components of IMT in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz;

3 that in the event of harmful interference, the concerned administrations should investigate and take technical and operational measures, as appropriate, to reduce interference to an acceptable level,

*invites ITU-R*

to study possible technical and operational measures to improve co-existence and compatibility between the terrestrial and satellite components of IMT in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz where those frequency bands are shared by the mobile service and the mobile-satellite service in different countries, in particular for the deployment of independent satellite and terrestrial components of IMT and to facilitate development of both the satellite and terrestrial components of IMT,

*invites administrations*

1 to give due consideration to the accommodation of other services currently operating in these frequency bands when implementing IMT;

2 to facilitate coexistence of the satellite component of IMT with the terrestrial component of IMT in the frequency band 1 980-2 010 MHz, by the concerned administrations, as appropriate, considering the following:

a) to apply an uplink direction from user equipment to IMT base stations as provided in the latest version of Recommendation ITU-R M.1036, for the user equipment belonging to the terrestrial component of IMT in the frequency band 1 980-2 010 MHz (see the Annex to this Resolution);

b) that in the event of harmful interference to the satellite component of the IMT space station, the concerned administrations may take additional steps to facilitate the reduction of harmful interference to an acceptable level;

3 to facilitate the coexistence of the terrestrial component of IMT stations with the satellite component of IMT in the frequency band 2 170-2 200 MHz, by the concerned administrations, as appropriate, considering the following:

a) to apply an appropriate pfd value to the IMT space stations in the frequency band 2 170-2 200 MHz (see the Annex to this Resolution);

b) that in the event of harmful interference to the terrestrial component of IMT, the concerned administrations may take additional steps to facilitate the reduction of harmful interference to an acceptable level.

## ANNEX TO RESOLUTION 212 (REV.WRC-19)

**Guidance on the implementation of technical and operational measures to facilitate coexistence between terrestrial and satellite components of IMT in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz**

This Annex provides guidance to concerned administrations on the following technical, operational and other applicable measures in the deployment of terrestrial and satellite components of IMT for reducing the potential of harmful interference between the terrestrial and satellite components of IMT in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz for the interference scenarios indicated in the table below, noting the applicability of any relevant Article 9 coordination procedures for scenarios A2, B1 and B2. The identified measures may be applicable for some scenarios and may not be applicable to other scenarios, and may or may not be implementable in satellite and terrestrial IMT system designs.

Interference scenarios

Scenario	From	To
A1	Terrestrial IMT base station or mobile station	Satellite IMT space station
A2	Terrestrial IMT base station	Satellite IMT mobile earth station
B1	Satellite IMT mobile earth station	Terrestrial IMT base station or user equipment
B2	Satellite IMT space station	Terrestrial IMT user equipment

- 1) Measures for the terrestrial component of IMT:
  - a) Use of base station antennas with improved sidelobe performance as shown in relevant ITU-R Recommendations and Reports (e.g. improved antenna patterns compared with those contained in Recommendation ITU-R F.1336).
  - b) Consider the orientation in elevation and/or in azimuth of the IMT base station antenna pointing in the coexistence analysis with a view to reducing the interference level from the IMT base station above the horizon.
  - c) Consider the impact of the actual deployment scenario, including the activity factor values of the terrestrial component of IMT, on the coexistence.
  - d) Consideration of attenuation from terrain and clutter taking into account the deployment environments and propagation effects in the coexistence analysis.
  - e) Consider reducing the e.i.r.p. in the frequency band 1 980-2 010 MHz to a level sufficient for coexistence, for example, nominally to 20 dBm/5 MHz<sup>1</sup>.
  - f) Set the transmission direction for the use of the frequency band 1 980-2 010 MHz with regard to the IMT base station to operate in receive mode as found in relevant ITU-R Recommendations.
  - g) Implementing other applicable interference mitigation techniques.

<sup>1</sup> See user terminal characteristics in Report ITU-R M.2292.

- 2) Measures for the satellite component of IMT:
- a) Use narrower spot beams and steeper roll-off from the boresight of the satellite antenna (i.e. not only reducing the interference level from the antenna sidelobe but also increasing frequency reuse and resilience to interference).
  - b) Antenna steering, where such capability exists in the satellite design.
  - c) Beam forming and/or beam nulling of the satellite antenna (e.g. digital processing of multi-element beamforming technique, which has the capability to suppress received interference from regions on the Earth).
  - d) Dynamic frequency management paired with geographical separation (e.g. monitoring interference in real time and dynamically assigning channels and/or beams).
  - e) Consider reducing the power flux-density (pfd) to a level sufficient for coexistence, for example to nominally  $-122$  dBW/m<sup>2</sup> for 1 MHz<sup>2</sup> for the protection of some base stations or nominally  $-108.8$  dBW/m<sup>2</sup> for 1 MHz for the protection of some user equipment on the Earth's surface on the territories of other administrations using this band for the terrestrial IMT component.
  - f) Consider an appropriate elevation angle model of an earth station and handover method by a satellite control system in the coexistence analysis.
  - g) Consideration of actual activity factor values, which may result in a reduction of interference.
  - h) Applying a polarization of the satellite antenna different from that of the terrestrial station receiver (for example, use of linear polarization by the terrestrial station receivers and circular polarization by the satellite may provide some benefit).
  - i) Implementing other applicable interference mitigation techniques.

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<sup>2</sup> See Resolution **539 (Rev.WRC-15)** for the frequency band 2 605-2 655 MHz.

**MOD****RESOLUTION 223 (REV.WRC-19)****Additional frequency bands identified for International Mobile Telecommunications**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that International Mobile Telecommunications (IMT), including IMT-2000, IMT-Advanced and IMT-2020, is the ITU vision of global mobile access;
- b) that IMT systems provide telecommunication services on a worldwide scale regardless of location, network or terminal used;
- c) that IMT provides access to a wide range of telecommunication services supported by fixed telecommunication networks (e.g. PSTN/ISDN, high bit rate Internet access), and to other services which are specific to mobile users;
- d) that the technical characteristics of IMT are specified in ITU Radiocommunication Sector (ITU-R) and ITU Telecommunication Standardization Sector (ITU-T) Recommendations, including Recommendations ITU-R M.1457 and ITU-R M.2012, which contain the detailed specifications of the terrestrial radio interfaces of IMT;
- e) that the evolution of IMT is being studied within ITU-R;
- f) that the review of IMT-2000 spectrum requirements at WRC-2000 concentrated on the frequency bands below 3 GHz;
- g) that at WARC-92, 230 MHz of spectrum was identified for IMT-2000 in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz, including the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz for the satellite component of IMT-2000, in No. 5.388 and under the provisions of Resolution 212 (Rev.WRC-19);
- h) that since WARC-92 there has been a tremendous growth in mobile communications including an increasing demand for broadband multimedia capability;
- i) that the frequency bands identified for IMT are currently used by mobile systems or applications of other radiocommunication services;
- j) that Recommendation ITU-R M.1308 addresses the evolution of existing mobile communication systems to IMT-2000, and that Recommendation ITU-R M.1645 addresses the evolution of the IMT systems and maps out their future development;
- k) that harmonized worldwide bands for IMT are desirable in order to achieve global roaming and the benefits of economies of scale;
- l) that the frequency bands 1 710-1 885 MHz, 2 500-2 690 MHz and 3 300-3 400 MHz are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations;

- m)* that the frequency band 2 300-2 400 MHz is allocated to the mobile service on a co-primary basis in the three ITU Regions;
- n)* that the frequency band 2 300-2 400 MHz, or portions thereof, is used extensively in a number of administrations by other services including the aeronautical mobile service for telemetry in accordance with the relevant provisions in the Radio Regulations;
- o)* that IMT has already been deployed or is being considered for deployment in some countries in the frequency bands 1 710-1 885 MHz, 2 300-2 400 MHz and 2 500-2 690 MHz and equipment is readily available;
- p)* that the frequency bands 1 710-1 885 MHz, 2 300-2 400 MHz and 2 500-2 690 MHz, or parts thereof, are identified for use by administrations wishing to implement IMT;
- q)* that technological advancement and user needs will promote innovation and accelerate the delivery of advanced communication applications to consumers;
- r)* that changes in technology may lead to the further development of communication applications, including IMT;
- s)* that timely availability of spectrum is important to support future applications;
- t)* that IMT systems are envisaged to provide increased peak data rates and capacity that may require a larger bandwidth;
- u)* that ITU-R studies forecasted that additional spectrum may be required to support the future services of IMT and to accommodate future user requirements and network deployments;
- v)* that the frequency band 1 427-1 429 MHz is allocated to the mobile, except aeronautical mobile, service in all three Regions on a primary basis;
- w)* that the frequency band 1 429-1 525 MHz is allocated to the mobile service in Regions 2 and 3 and to the mobile, except aeronautical mobile, service in Region 1 on a primary basis;
- x)* that the frequency band 1 518-1 559 MHz is allocated in all three Regions to the mobile-satellite service (MSS) on a primary basis<sup>1</sup>;
- y)* that WRC-15 identified the frequency band 1 427-1 518 MHz for use by administrations wishing to implement terrestrial IMT systems;
- z)* that there is a need to ensure the continued operations of the MSS in the frequency band 1 518-1 525 MHz;
- aa)* that appropriate technical measures to facilitate adjacent band compatibility between MSS in the frequency band 1 518-1 525 MHz and IMT in the frequency band 1 492-1 518 MHz need to be studied;
- ab)* Report ITU-R RA.2332, on compatibility and sharing studies between the radio astronomy service and IMT systems in the frequency bands 608-614 MHz, 1 330-1 400 MHz, 1 400-1 427 MHz, 1 610.6-1 613.8 MHz, 1 660-1 670 MHz, 2 690-2 700 MHz, 4 800-4 990 MHz and 4 990-5 000 MHz;
- ac)* that WRC-15 and this conference identified the frequency band 3 300-3 400 MHz for use by administrations wishing to implement terrestrial IMT systems in Nos. **5.429B**, **5.429D** and **5.429F**;


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<sup>1</sup> See Table **21-4** for applicable pfd limits.

*ad)* that the frequency band 3 300-3 400 MHz is allocated worldwide on a primary basis to the radiolocation service;

*ae)* that a number of administrations use the frequency band 3 300-3 400 MHz, or portions thereof, which is allocated to the fixed and mobile services on a primary basis in No. 5.429;

*af)* that the frequency band 4 800-4 990 MHz is allocated worldwide to the mobile and fixed services on a primary basis;

*ag)* that WRC-15 and this conference identified the frequency band 4 800-4 990 MHz for use by administrations wishing to implement terrestrial IMT systems in countries listed in Nos. 5.441A and 5.441B; 

*ah)* that appropriate technical measures may be considered by administrations at a national level to facilitate adjacent band compatibility between radio astronomy receivers in the frequency band 4 990-5 000 MHz and IMT systems in the frequency band 4 800-4 990 MHz,

*emphasizing*

*a)* that flexibility must be afforded to administrations:

- to determine, at a national level, how much spectrum to make available for IMT from within the identified frequency bands;
- to develop their own transition plans, if necessary, tailored to meet their specific deployment of existing systems;
- to have the ability for the identified frequency bands to be used by all services having allocations in those frequency bands;
- to determine the timing of availability and use of the frequency bands identified for IMT, in order to meet particular user demand and other national considerations;

*b)* that the particular needs of developing countries must be met;

*c)* that Recommendation ITU-R M.819 describes the objectives to be met by IMT-2000 in order to meet the needs of developing countries,

*noting*

*a)* Resolutions 224 (Rev.WRC-19) and 225 (Rev.WRC-12), which also relate to IMT;

*b)* that the sharing implications between services sharing the frequency bands identified for IMT in No. 5.384A, as relevant, will need further study in ITU-R;

*c)* that studies regarding the availability of the frequency band 2 300-2 400 MHz for IMT are being conducted in many countries, the results of which could have implications for the use of those frequency bands in those countries;

*d)* that, due to differing requirements, not all administrations may need all of the IMT frequency bands identified at WRC-07, or, due to the usage by and investment in existing services, may not be able to implement IMT in all of those frequency bands;

*e)* that the spectrum for IMT identified by WRC-07 may not completely satisfy the expected requirements of some administrations;

*f)* that currently operating mobile communication systems may evolve to IMT in their existing frequency bands;

*g)* that services such as fixed, mobile (second-generation systems), space operations, space research and aeronautical mobile are in operation or planned in the frequency band 1 710-1 885 MHz, or portions thereof;



- h)* that in the frequency band 2 300-2 400 MHz, or portions thereof, there are services such as fixed, mobile, amateur and radiolocation which are currently in operation or planned to be in operation in the future;
- i)* that services such as broadcasting-satellite, broadcasting-satellite (sound), mobile-satellite (in Region 3) and fixed (including multipoint distribution/communication systems) are in operation or planned in the frequency band 2 500-2 690 MHz, or portions thereof;
- j)* that the identification of several frequency bands for IMT allows administrations to choose the best frequency band or parts thereof for their circumstances;
- k)* that further study of the technical and operational measures regarding adjacent band compatibility between IMT systems operating below 3 400 MHz and fixed-satellite service earth stations operating above 3 400 MHz may be required;
- l)* that ITU-R has identified additional work to address further developments in IMT;
- m)* that the IMT terrestrial radio interfaces as defined in Recommendations ITU-R M.1457 and ITU-R M.2012 are expected to evolve within the framework of ITU-R beyond those initially specified, to provide enhanced services and services beyond those envisaged in the initial implementation;
- n)* that the identification of a frequency band for IMT does not establish priority in the Radio Regulations and does not preclude the use of the frequency band for any application of the services to which it is allocated;
- o)* that the provisions of Nos. **5.317A**, **5.384A**, **5.388**, **5.429B**, **5.429D**, **5.429F**, **5.441A** and **5.441B** do not prevent administrations from having the choice to implement other technologies in the frequency bands identified for IMT, based on national requirements,

*recognizing*

that for some administrations the only way of implementing IMT would be spectrum refarming, requiring significant financial investment,

*resolves*

- 1 to invite administrations planning to implement IMT to make available, based on user demand and other national considerations, additional frequency bands or portions of the frequency bands above 1 GHz identified in Nos. **5.341B**, **5.384A**, **5.429B**, **5.429D**, **5.429F**, **5.441A** and **5.441B** for the terrestrial component of IMT; due consideration should be given to the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT, taking into account the services to which the frequency band is currently allocated;
- 2 to acknowledge that the differences in the texts of Nos. **5.341B**, **5.384A** and **5.388** do not confer differences in regulatory status;
- 3 that in the frequency bands 4 800-4 825 MHz and 4 835-4 950 MHz, in order to identify potentially affected administrations when applying the procedure for seeking agreement under No. **9.21** by IMT stations in relation to aircraft stations, a coordination distance from an IMT station to the border of another country equal to 300 km (for land path)/450 km (for sea path) applies;
- 4 that in the frequency band 4 800-4 990 MHz, in order to identify potentially affected administrations when applying the procedure for seeking agreement under No. **9.21** by IMT stations in relation to fixed-service stations or other ground-based stations of the mobile service, a coordination distance from an IMT station to the border of another country equal to 70 km applies;



5 that the power flux-density (pfd) limits in No. **5.441B**, which is subject to review at WRC-23, shall not apply to the following countries: Armenia, Brazil, Cambodia, China, Russian Federation, Kazakhstan, Lao P.D.R., Uzbekistan, South Africa, Viet Nam and Zimbabwe,

*invites the ITU Radiocommunication Sector*

1 to conduct compatibility studies in order to provide technical measures to ensure coexistence between MSS in the frequency band 1 518-1 525 MHz and IMT in the frequency band 1 492-1 518 MHz, including guidance on the implementation of frequency arrangements for IMT deployment in the frequency band 1 427-1 518 MHz, taking into account the results of these studies;

2 to study the technical and regulatory conditions for the protection of stations of the aeronautical and maritime mobile services located in international airspace or waters (i.e. outside national territories) and operated in the frequency band 4 800-4 990 MHz;

3 to continue providing guidance to ensure that IMT can meet the telecommunication needs of developing countries and rural areas;

4 to include the results of the studies mentioned in *invites the ITU Radiocommunication Sector* above in one or more ITU-R Recommendations and Reports, as appropriate,

*invites the 2023 world radiocommunication conference*

to consider, based on the results of the studies referred to in *invites the ITU Radiocommunication Sector* above, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the aeronautical and maritime mobile services located in international airspace and waters from other stations located within national territories and to review the pfd criteria in No. **5.441B**.



**MOD****RESOLUTION 224 (REV.WRC-19)****Frequency bands for the terrestrial component of International Mobile Telecommunications below 1 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that International Mobile Telecommunications (IMT) is the root name that encompasses IMT-2000, IMT-Advanced and IMT-2020 collectively (see Resolution ITU-R 56);
- b) that IMT systems are intended to provide telecommunication services on a worldwide scale, regardless of location, network or terminal used;
- c) that parts of the frequency band 790-960 MHz are extensively used in the three Regions by mobile systems;
- d) that IMT systems have already been deployed in the frequency band 694/698-960 MHz in some countries of the three Regions;
- e) that some administrations of Regions 2 and 3 are planning to use the frequency band 470-694/698 MHz, or part of that frequency band, for IMT;
- f) that the frequency band 450-470 MHz is allocated to the mobile service on a primary basis in the three Regions and that IMT systems have already been deployed in some countries of the three Regions;
- g) that results of the sharing studies for the frequency band 450-470 MHz are contained in Report ITU-R M.2110;
- h) that cellular-mobile systems in the three Regions in the frequency bands below 1 GHz operate using various frequency arrangements;
- i) that, where cost considerations warrant the installation of fewer base stations, such as in rural and/or sparsely populated areas, frequency bands below 1 GHz are generally suitable for implementing mobile systems, including IMT;
- j) that frequency bands below 1 GHz are important, especially for some developing countries and countries with large areas where economic solutions for low population density areas are necessary;
- k) that Recommendation ITU-R M.819 describes the objectives to be met by IMT-2000 in order to meet the needs of developing countries, and in order to assist them to “bridge the gap” between their communication capabilities and those of developed countries;
- l) that Recommendation ITU-R M.1645 also describes the coverage objectives of IMT,

*recognizing*

- a) that the evolution of cellular-based mobile networks to IMT can be facilitated if they are permitted to evolve within their current frequency bands;

- b)* that some of the frequency bands or parts of the frequency bands, identified for IMT below 1 GHz are used extensively in many countries by various other terrestrial mobile systems and applications, including public protection and disaster relief radiocommunications (see **Resolution 646 (Rev. WRC-19)**);
- c)* that there is a need, in many developing countries and countries with large areas of low population density, for the cost-effective implementation of IMT, and that the propagation characteristics of frequency bands below 1 GHz identified in Nos. **5.286AA**, **5.295**, **5.308A** and **5.317A** result in larger cells;
- d)* that the frequency band 450-470 MHz, or parts thereof, is also allocated to services other than the mobile service;
- e)* that the frequency band 460-470 MHz is also allocated to the meteorological-satellite service in accordance with No. **5.290**;
- f)* that the frequency band 470-890 MHz, except the frequency band 608-614 MHz in Region 2, is allocated to the broadcasting service on a primary basis in all three Regions as contained in Article 5 of the Radio Regulations, and parts of this frequency band are used predominantly by this service;
- g)* that, in the frequency band 470-862 MHz, the GE06 Agreement applies in all Region 1 countries, except Mongolia, and in the Islamic Republic of Iran, and that this Agreement contains provisions for the terrestrial broadcasting service and other primary terrestrial services, a Plan for digital television, and a list of stations of other primary terrestrial services;
- h)* that the transition from analogue to digital television is expected to result in situations where the frequency band 470-806/862 MHz will be used extensively for both analogue and digital terrestrial transmission, and the demand for spectrum during the transition period may be even greater than the standalone usage of analogue broadcasting systems;
- i)* that the time-frame and transition period for analogue to digital television switchover may not be the same for all countries;
- j)* that, after analogue to digital television switchover, some administrations may decide to use all or parts of the frequency band 470-806/862 MHz for other services to which the frequency band is allocated on a primary basis, in particular the mobile service for the implementation of IMT, while in other countries the broadcasting service will continue to operate in that frequency band;
- k)* that in the frequency band 470-890 MHz, or parts thereof, there is an allocation on a primary basis for the fixed service;
- l)* that, in some countries, the frequency band 470-862 MHz, or parts thereof, for Regions 2 and 3 and the frequency band 694-862 MHz in Region 1 are allocated to the mobile service on a primary basis;
- m)* that the frequency band 645-862 MHz is allocated on a primary basis to the aeronautical radionavigation service in the countries listed in No. **5.312**;
- n)* that Recommendation ITU-R M.1036 provides frequency arrangements for implementation of the terrestrial component of IMT in the frequency bands identified for IMT in the Radio Regulations;
- o)* that Reports ITU-R M.2241, ITU-R BT.2215, ITU-R BT.2247, ITU-R BT.2248, ITU-R BT.2265, ITU-R BT.2301, ITU-R BT.2337 and ITU-R BT.2339 contain material relevant to compatibility studies between IMT and other services;

p) that Report ITU-R BT.2338 describes the implications of a co-primary allocation to the mobile service in the frequency band 694-790 MHz in Region 1 for the use of that frequency band by applications ancillary to broadcasting and programme-making,

*emphasizing*

a) that in all administrations terrestrial broadcasting is a vital part of the communication and information infrastructure;

b) that flexibility must be afforded to administrations:

- to determine, at a national level, how much spectrum to make available for IMT from within the identified frequency bands, taking into account current uses of the spectrum and the needs of other applications;
- to develop their own transition plans, if necessary, tailored to meet their specific deployment of existing systems;
- to have the ability for the identified frequency bands to be used by all services having allocations in those frequency bands;
- to determine the timing of availability and use of the frequency bands identified for IMT, in order to meet particular market demand and other national considerations;

c) that the particular needs and national conditions and circumstances of developing countries, including least-developed countries, highly-indebted poor countries with economies in transition, and countries with large territories and territories with a low-subscriber density, must be met;

d) that due consideration should be given to the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT, taking into account the current and planned use of these frequency bands by all services to which these frequency bands are allocated;

e) that the use of frequency bands below 1 GHz for IMT also helps to “bridge the gap” between sparsely-populated areas and densely-populated areas in various countries;

f) that the identification of a frequency band for IMT does not preclude the use of this frequency band by other services or applications to which it is allocated;

g) that the use of the frequency band 470-862 MHz by the broadcasting service and other primary services is also covered by the GE06 Agreement;

h) that the requirements of the different services to which the frequency band is allocated, including the mobile and broadcasting services, need to be taken into account,

*resolves*

1 that administrations which are implementing or planning to implement IMT consider the use of frequency bands identified for IMT below 1 GHz and the possibility of cellular-based mobile network evolution to IMT, in the frequency band identified in Nos. **5.286AA**, **5.317A**, and in some countries of Regions 2 and 3, the frequency band(s) identified in Nos. **5.295**, **5.296A** and **5.308A**, based on user demand and other considerations;

2 to encourage administrations to take into account results of the existing relevant ITU-R studies, when implementing IMT applications/systems in the frequency bands 694-862 MHz in Region 1, in the frequency band 470-806 MHz in Region 2, in the frequency band 790-862 MHz in Region 3, in the frequency band 470-698 MHz, or portions thereof, for those administrations mentioned in No. **5.296A** and in the frequency band 698-790 MHz, or portions thereof, for those administrations mentioned in No. **5.313A**;

3 that administrations should take into account the need to protect the existing and future broadcasting stations, both analogue and digital, except analogue in the GE06 planning area, in the frequency band 470-806/862 MHz, as well as other primary terrestrial services;

4 that administrations planning to implement IMT in the bands mentioned in *resolves 2* shall effect coordination, as required, with all neighbouring administrations prior to implementation;

5 that in Region 1 (excluding Mongolia) and in the Islamic Republic of Iran, the implementation of stations in the mobile service shall be subject to the applications of procedures contained in the GE06 Agreement; in so doing:

- a) administrations which deploy stations in the mobile service for which coordination was not required, or without having obtained the prior consent of those administrations that may be affected, shall not cause unacceptable interference to, nor claim protection from, stations of the broadcasting service of administrations operating in conformity with the GE06 Agreement. This should include a signed commitment as required under § 5.2.6 of the GE06 Agreement;
- b) administrations which deploy stations in the mobile service for which coordination was not required, or without having obtained the prior consent of those administrations that may be affected, shall not object nor prevent the entry into the GE06 plan or recording in the MIFR of additional future broadcasting allotments or assignments of any other administration in the GE06 Plan with reference to those stations;

6 that, in Region 2, implementation of IMT shall be subject to the decision of each administration on the transition from analogue to digital television,

*invites the Director of the Telecommunication Development Bureau*

to draw the attention of the ITU Telecommunication Development Sector to this Resolution.

**MOD****RESOLUTION 229 (REV.WRC-19)****Use of the frequency bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz by the mobile service for the implementation of wireless access systems including radio local area networks**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WRC-03 allocated the frequency bands 5 150-5 350 MHz and 5 470-5 725 MHz on a primary basis to the mobile service for the implementation of wireless access systems (WAS), including radio local area networks (RLANs);
- b) that WRC-03 decided to make an additional primary allocation for the Earth exploration-satellite service (EESS) (active) in the frequency band 5 460-5 570 MHz and space research service (SRS) (active) in the frequency band 5 350-5 570 MHz;
- c) that WRC-03 decided to upgrade the radiolocation service to a primary status in the frequency band 5 350-5 650 MHz;
- d) that the frequency band 5 150-5 250 MHz is allocated worldwide on a primary basis to the fixed-satellite service (FSS) (Earth-to-space), this allocation being limited to feeder links of non-geostationary-satellite systems in the mobile-satellite service (No. **5.447A**);
- e) that the frequency band 5 150-5 250 MHz is also allocated to the mobile service, on a primary basis, in some countries (No. **5.447**) subject to agreement obtained under No. **9.21**;
- f) that the frequency band 5 250-5 460 MHz is allocated to the EESS (active) and the frequency band 5 250-5 350 MHz to the SRS (active) on a primary basis;
- g) that the frequency band 5 250-5 725 MHz is allocated on a primary basis to the radiodetermination service;
- h) that there is a need to protect the existing primary services in the frequency bands 5 150-5 350 MHz and 5 470-5 725 MHz;
- i) that results of studies in ITU-R indicate that sharing in the frequency band 5 150-5 250 MHz between WAS, including RLANs, and the FSS is feasible under specified conditions;
- j) that studies have shown that sharing between the radiodetermination and mobile services in the frequency bands 5 250-5 350 MHz and 5 470-5 725 MHz is only possible with the application of mitigation techniques such as dynamic frequency selection;
- k) that there is a need to specify an appropriate e.i.r.p. limit and, where necessary, operational restrictions for WAS, including RLANs, in the mobile service in the frequency bands 5 250-5 350 MHz and 5 470-5 570 MHz in order to protect systems in the EESS (active) and SRS (active);
- l) that the deployment density of WAS, including RLANs, will depend on a number of factors including intrasystem interference and the availability of other competing technologies and services;
- m) that the means to measure or calculate the aggregate pfd level at FSS satellite receivers specified in Recommendation ITU-R S.1426 are currently under study;

n) that certain parameters contained in Recommendation ITU-R M.1454 related to the calculation of the number of RLANs tolerable by FSS satellite receivers operating in the frequency band 5 150-5 250 MHz require further study;

o) that an aggregate pfd level has been developed in Recommendation ITU-R S.1426 for the protection of FSS satellite receivers in the frequency band 5 150-5 250 MHz;

p) that the attenuation offered by the car and train hulls, when WAS including RLANs are located inside automobiles and trains, could facilitate a level of protection to incumbent services from WAS including RLANs,

*further considering*

a) that the interference from a single WAS, including RLANs, complying with the operational restrictions under *resolves* 2 will not on its own cause any unacceptable interference to FSS receivers on board satellites in the frequency band 5 150-5 250 MHz;

b) that such FSS satellite receivers may experience an unacceptable effect due to the aggregate interference from these WAS, including RLANs, especially in the case of a prolific growth in the number of these systems;

c) that the aggregate effect on FSS satellite receivers will be due to the global deployment of WAS, including RLANs, and it may not be possible for administrations to determine the location of the source of the interference and the number of WAS, including RLANs, in operation simultaneously,

*noting*

a) that, prior to WRC-03, a number of administrations have developed regulations to permit indoor and outdoor WAS, including RLANs, to operate in the various bands under consideration in this Resolution;

b) that, in response to Resolution **229 (WRC-03)\***, ITU-R developed Report ITU-R M.2115, which provides testing procedures for implementation of dynamic frequency selection,

*recognizing*

a) that in the frequency band 5 600-5 650 MHz, ground-based meteorological radars are extensively deployed and support critical national weather services, according to footnote No. **5.452**;

b) that the performance and interference criteria of spaceborne active sensors in the EESS (active) are given in Recommendation ITU-R RS.1166;

c) that a mitigation technique to protect radiodetermination systems is given in Recommendation ITU-R M.1652;

d) that Recommendation ITU-R RS.1632 identifies a suitable set of constraints for WAS, including RLANs, in order to protect the EESS (active) in the frequency band 5 250-5 350 MHz;

e) that Recommendation ITU-R M.1653 identifies the conditions for sharing between WAS, including RLANs, and the EESS (active) in the frequency band 5 470-5 570 MHz;

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\* *Note by the Secretariat:* This Resolution was revised by WRC-12.



- f) that the stations in the mobile service should also be designed to provide, on average, a near-uniform spread of the loading of the spectrum used by stations across the band or bands in use to improve sharing with satellite services;
- g) that WAS, including RLANs, provide effective broadband solutions;
- h) that the demand for WAS/RLAN including outdoor services has increased since WRC-03;
- i) that there is a need for administrations to ensure that WAS, including RLANs, meet the required mitigation techniques, for example, through equipment or standards compliance procedures;
- j) that some sharing studies submitted to ITU-R between WAS/RLAN and FSS for non-GSO MSS feeder uplinks, in the frequency band 5 150-5 250 MHz, have shown that WAS/RLAN outdoor relaxation up to 3 per cent of the total number of WAS/RLAN can be feasible;
- k) that measures to control the number of outdoor WAS/RLAN, in the frequency band 5 150-5 250 MHz, can include: authorization approach, registration procedures, domestic notification, limited application, limitation to fixed WAS/RLAN access points, etc.,

*resolves*

- 1 that the use of these bands by the mobile service is for the implementation of WAS, including RLANs, as described in the most recent version of Recommendation ITU-R M.1450;
- 2 that in the band 5 150-5 250 MHz, stations in the mobile service shall be restricted to indoor use, including inside trains, with a maximum mean e.i.r.p.<sup>1</sup> of 200 mW and a maximum mean e.i.r.p. density of 10 mW/MHz in any 1 MHz band or equivalently 0.25 mW/25 kHz in any 25 kHz band. Mobile stations inside automobiles shall operate with a maximum e.i.r.p. of 40 mW;
- 3 that in the frequency band 5 150-5 250 MHz, administrations may exercise some flexibility by taking appropriate measures that would allow controlled and/or limited outdoor usage with a maximum mean e.i.r.p.<sup>1</sup> of 200 mW. Administrations have a further option to permit stations in the mobile service, for indoor or controlled outdoor use, to operate up to a maximum mean e.i.r.p. of 30 dBm. In the case of indoor or controlled outdoor use, administrations are requested to either ensure that the maximum e.i.r.p. at any elevation angle above 5 degrees as measured from the horizon shall not exceed 200 mW (23 dBm), or to ensure that the maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon shall not exceed 125 mW (21 dBm) or to apply the emission mask described in *resolves* 5 below to maintain protection to the incumbent services. In that case, administrations shall, take all appropriate measures, such as those described in *recognizing k)* to control the number of these higher power outdoor WAS/RLANs stations up to 2 per cent of the estimated total amount of WAS/RLAN stations. If the maximum e.i.r.p. is raised above 200 mW, unwanted emissions<sup>1</sup> shall not increase above the existing levels already authorized within administrations for the existing systems that operate with an in-band e.i.r.p. of not greater than 200 mW. In all cases administrations are requested to maintain protection to the other primary services;

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<sup>1</sup> In the context of this Resolution, “mean e.i.r.p.” refers to the e.i.r.p. during the transmission burst which corresponds to the highest power, if power control is implemented.



4 that administrations may monitor whether the aggregate pfd levels given in Recommendation ITU-R S.1426<sup>2</sup> are exceeded as a consequence of a prolific growth in the number of WAS/RLAN;

5 that in the frequency band 5 250-5 350 MHz, stations in the mobile service shall be limited to a maximum mean e.i.r.p. of 200 mW and a maximum mean e.i.r.p. density of 10 mW/MHz in any 1 MHz band. Administrations are requested to take appropriate measures that will result in the predominant number of stations in the mobile service being operated in an indoor environment. Furthermore, stations in the mobile service that are permitted to be used either indoors or outdoors may operate up to a maximum mean e.i.r.p. of 1 W and a maximum mean e.i.r.p. density of 50 mW/MHz in any 1 MHz band, and, when operating above a mean e.i.r.p. of 200 mW, these stations shall comply with the following e.i.r.p. elevation angle mask where  $\theta$  is the angle above the local horizontal plane (of the Earth):

-13 dB(W/MHz)	for $0^\circ \leq \theta < 8^\circ$
$-13 - 0.716(\theta - 8)$ dB(W/MHz)	for $8^\circ \leq \theta < 40^\circ$
$-35.9 - 1.22(\theta - 40)$ dB(W/MHz)	for $40^\circ \leq \theta \leq 45^\circ$
-42 dB(W/MHz)	for $45^\circ < \theta$ ;

6 that administrations may exercise some flexibility in adopting other mitigation techniques, provided that they develop national regulations to meet their obligations to achieve an equivalent level of protection to the EESS (active) and the SRS (active) based on their system characteristics and interference criteria as stated in Recommendation ITU-R RS.1632;

7 that in the frequency band 5 470-5 725 MHz, stations in the mobile service shall be restricted to a maximum transmitter power of 250 mW<sup>3</sup> with a maximum mean e.i.r.p. of 1 W and a maximum mean e.i.r.p. density of 50 mW/MHz in any 1 MHz band;

8 that in the frequency bands 5 250-5 350 MHz and 5 470-5 725 MHz, systems in the mobile service shall either employ transmitter power control to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems, or, if transmitter power control is not in use, then the maximum mean e.i.r.p. shall be reduced by 3 dB;

9 that, in the frequency bands 5 250-5 350 MHz and 5 470-5 725 MHz, the mitigation measures for systems in the mobile service found in Annex 1 to Recommendation ITU-R M.1652-1 as well as the characteristics and interference criteria for systems in the radiolocation service stated in Annex 5 to Recommendation ITU-R M.1652-1 shall be used by systems in the mobile service to ensure compatible operation with radiodetermination systems,

*invites administrations*

1 to consider appropriate measures when allowing the operation of stations in the mobile service using the e.i.r.p. elevation angle mask referred in *resolves* 5 above, to ensure the equipment is operated in compliance with this mask;

<sup>2</sup>  $-124 - 20 \log_{10} (h_{SAT}/1\ 414)$  dB(W/(m<sup>2</sup> · 1 MHz)), or equivalently,  $-140 - 20 \log_{10} (h_{SAT}/1\ 414)$  dB(W/(m<sup>2</sup> · 25 kHz)), at the FSS satellite orbit, where  $h_{SAT}$  is the altitude of the satellite (km).

<sup>3</sup> Administrations with existing regulations prior to WRC-03 may exercise some flexibility in determining transmitter power limits.

2 to take appropriate measures, such as those examples in *recognizing k*), to control the number of outdoor stations in the frequency band 5 150-5 250 MHz, if implementing *resolves 3* above, in order to ensure the protection of incumbent services,

*invites ITU-R*


1 to continue studies on mitigation techniques to provide protection of EESS from stations in the mobile service;

2 to continue studies on suitable test methods and procedures for the implementation of dynamic frequency selection, taking into account practical experience.

**MOD****RESOLUTION 344 (REV.WRC-19)****Management of the maritime identity numbering resource**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*noting*

- a) that the installation of digital selective calling equipment and some Inmarsat ship earth station equipment on ships participating in the Global Maritime Distress and Safety System (GMDSS) on a mandatory or voluntary basis requires the assignment of a unique nine-digit maritime mobile service identity (MMSI);
- b) that such equipment offers the possibility to connect with public telecommunication networks;
- c) that only mobile-satellite systems have been able to resolve the various billing, routing, charging and signalling requirements needed to provide full two-way automatic connectivity between ships and the international public correspondence service; 
- d) that the automatic identification system (AIS) and its related systems require MMSI or other maritime identities;
- e) that radios capable of digital selective calling and intended to be used on non-SOLAS ships, require maritime identities;
- f) that the first three digits of a ship station MMSI form the maritime identification digits (MID), which denote the ship's administration,

*considering*

- a) that digital selective calling distress alerts require valid identities recognizable by search and rescue authorities in order to ensure a timely response;
- b) that AIS and its related systems require valid identities recognizable by other ships and authorities for safety of navigation and search and rescue operations;
- c) that Recommendation ITU-R M.585 contains guidance for the assignment and use of maritime identities, such as MMSIs and other maritime identities,

*recognizing*

- a) that even domestic ships which install the present generation of ship earth stations will require the assignment of MMSI numbers from those numbers originally intended for ships communicating worldwide, further depleting the resource;
- b) that mobile-satellite systems offering access to public telecommunication networks and participating in the GMDSS employ a free-form numbering system that need not include any part of the MMSI;
- c) that future growth of AIS and its related systems will require further resources of MMSI and other maritime identities,

*noting further*

- a) that ITU-R is solely responsible for managing the MMSI and MID numbering resources;
- b) that ITU-R can monitor the status of the MMSI resource, through regular reviews of the spare capacity available within the MIDs already in use, and the availability of spare MIDs, taking account of regional variations;
- c) that ITU-R, as a part of the review of MMSI numbering resources, adopted a revision of Recommendation ITU-R M.585 in 2019, removing a provision within the MMSI numbering scheme that set aside three trailing zeros for some categories of mobile-satellite service systems participating in the GMDSS to facilitate the shore-to-ship routing of calls; the provision is no longer necessary and its removal has allowed for the release of reserved MMSI numbering resources,

*resolves to instruct the Director of the Radiocommunication Bureau*

1 to manage the allotment and distribution of the MID resource within the MMSI and other maritime identity numbering formats, taking into account:

- Sections II, V and VI of Article 19;
- regional variations in MMSI use;
- spare capacity within the MID resource; and
- the assignment, management and conservation of maritime identities contained in the most recent version of Recommendation ITU-R M.585, in particular as regards the reuse of MMSIs;

2 to report to each world radiocommunication conference on the use and status of the MMSI resource, noting in particular the anticipated reserve capacity and any indications of rapid exhaustion of the resource,

*invites ITU-R*

to keep under review the Recommendations for assigning MMSIs and other maritime identities, with a view to:

- improving the management of the MID, MMSI and other maritime identity resources; and
- identifying alternative resources if there is an indication of rapid exhaustion of these resources,

*instructs the Secretary-General*

to communicate this Resolution to the International Maritime Organization.

**MOD****RESOLUTION 349 (REV.WRC-19)****Operational procedures for cancelling false distress alerts in  
the Global Maritime Distress and Safety System**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the 1974 International Convention for the Safety of Life at Sea (SOLAS), as amended, prescribes that ships subject to that Convention shall be fitted with Global Maritime Distress and Safety System (GMDSS) equipment as appropriate;
- b) that non-SOLAS vessels are also being equipped with GMDSS equipment;
- c) that the transmission and relay of false distress alerts is a significant problem within the GMDSS,

*noting*

that the International Maritime Organization (IMO) has developed similar operational procedures to cancel false distress alerts,

*resolves*

- 1 to urge administrations to take all necessary measures to avoid false distress alerts and to minimize the unnecessary burden on rescue organizations which occurs;
- 2 to urge administrations to encourage the correct use of GMDSS equipment, with particular attention to appropriate training;
- 3 to urge administrations to implement the operational procedures contained in the Annex to this Resolution;
- 4 that administrations should take any consequential appropriate action in this respect,

*instructs the Secretary-General*

to bring this Resolution to the attention of IMO.

## ANNEX TO RESOLUTION 349 (REV.WRC-19)

**Cancelling of false distress alerts**

If a distress alert is inadvertently transmitted, the following steps shall be taken to cancel the distress alert.

**1 VHF digital selective calling**

- 1) Reset the equipment immediately;
- 2) If the DSC equipment is capable of cancellation, cancel the alert in accordance with the most recent version of Recommendation ITU-R M.493;
- 3) Set to channel 16; and
- 4) Transmit a broadcast message to “All Stations” giving the ship’s name, call sign and maritime mobile service identity (MMSI), and cancel the false distress alert.

**2 MF digital selective calling**

- 1) Reset the equipment immediately;
- 2) If the DSC equipment is capable of cancellation, cancel the alert in accordance with the most recent version of Recommendation ITU-R M.493;
- 3) Tune for radiotelephony transmission on 2 182 kHz; and
- 4) Transmit a broadcast message to “All Stations” giving the ship’s name, call sign and MMSI, and cancel the false alert.

**3 HF digital selective calling**

- 1) Reset the equipment immediately;
- 2) If the DSC equipment is capable of cancellation, cancel the alert in accordance with the most recent version of Recommendation ITU-R M.493;
- 3) Tune for radiotelephony on the distress and safety frequency in each band in which a false distress alert was transmitted (see Appendix 15); and
- 4) Transmit a broadcast message to “All Stations” giving the ship’s name, call sign and MMSI, and cancel the false alert on the distress and safety frequency in each band in which the false distress alert was transmitted.

**4 Ship earth station**

Notify the appropriate rescue coordination centre that the alert is cancelled by sending a distress priority message. Provide ship name, call sign and ship earth station identity with the cancelled alert message.

**5 Emergency position indicating radiobeacon (EPIRB)**

If for any reason an EPIRB is activated inadvertently, immediately stop the inadvertent transmission and contact the appropriate rescue coordination centre through a coast station or land earth station and cancel the distress alert.

## **6 General**

Notwithstanding the above, ships may use additional appropriate means available to them to inform the appropriate authorities that a false distress alert has been transmitted and should be cancelled.

**MOD****RESOLUTION 356 (REV.WRC-19)****ITU maritime service information registration**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*noting*

- a)* that the provisions of No. **20.16** of Article **20** require administrations to notify the Radiocommunication Bureau of operational information contained in the List of Coast Stations and Special Service Stations (List IV) and List of Ship Stations and Maritime Mobile Service Identity Assignments (List V);
- b)* that this Conference has modified Article **19** to provide for the assignment of a maritime mobile service identity (MMSI) to search and rescue aircraft, automatic identification system (AIS) aids to navigation, and craft associated with a parent ship;
- c)* that the provisions of No. **20.15**, however, give the Radiocommunication Bureau authority to change the content and form of this information in consultation with administrations;
- d)* that the International Maritime Organization (IMO) has already identified, in Resolution A.887(21) adopted on 25 November 1999, information to be included in search and rescue databases, including:
- vessel identification number (IMO number or national registration number);
  - Maritime mobile service identity (MMSI);
  - radio call sign;
  - name, address and telephone number and, if applicable, telefax number of emergency contact person ashore;
  - alternative 24-hour emergency telephone number;
  - capacity for persons on board (passengers and crew),

*resolves to instruct the Director of the Radiocommunication Bureau*

to maintain online information systems to allow rescue coordination centres to have immediate access to this information on a 24-hour per day, 7-day per week basis,

*invites ITU-R*



**to consult with administrations,** IMO, the International Civil Aviation Organization (ICAO), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), and the International Hydrographic Organization (IHO) to identify elements for incorporation in ITU online information systems,

*instructs the Secretary-General*

to communicate this Resolution to IMO, ICAO, IALA, and IHO.



**MOD**

**RESOLUTION 361 (REV.WRC-19)**

**Consideration of possible regulatory actions to support the modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that there is a continuing need in the Global Maritime Distress and Safety System (GMDSS), on a global basis, for improved communications to enhance maritime capabilities;
- b)* that the International Maritime Organization (IMO) is considering GMDSS modernization;
- c)* that advanced maritime MF/HF/VHF data systems and satellite communication systems may be used to deliver Maritime Safety Information (MSI) and other GMDSS communications;
- d)* that IMO is considering additional global and regional GMDSS satellite service providers;
- e)* that WRC-19 has commenced regulatory actions in regard to modernization of the GMDSS;
- f)* that IMO is in the process of implementing e-navigation, defined as the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth-to-berth navigation and related services for safety and security at sea and protection of the marine environment;
- g)* that GMDSS may be influenced by the development of e-navigation in the future,

*noting*

- a)* that WRC-12 reviewed Appendix **17** and Appendix **18** to improve efficiency and introduce frequency bands for new digital technology;
- b)* that WRC-12 has reviewed the regulatory provisions and spectrum allocations for use by maritime safety systems for ships and ports;
- c)* that IMO may evaluate new applications to recognize satellite systems as new GMDSS satellite providers during the WRC-23 study cycle and that this may also need to be addressed, as appropriate,

*further noting*

that WRC-12, WRC-15 and this conference have reviewed Appendix **18** to improve efficiency and introduce frequency bands for new digital technology for data communications,

*recognizing*

- a)* that advanced maritime communication systems may support the implementation of GMDSS modernization and e-navigation;
- b)* that IMO efforts to implement GMDSS modernization and e-navigation may require a review of the Radio Regulations to accommodate advanced maritime communication systems;

- c) that, due to the importance of these radio links in ensuring the safe operation of shipping and commerce and safety at sea, they must be resilient to interference;
- d) that IMO is evaluating an application to recognize the existing GSO satellite system operating on 1 610-1 626.5 MHz (Earth-to-space) and 2 483.5-2 500 MHz (space-to-Earth), as a new GMDSS satellite provider,

*resolves to invite the 2023 world radiocommunication conference*

- 1 to consider possible regulatory actions, based on the ITU Radiocommunication Sector (ITU-R) studies, taking into consideration the activities of IMO, as well as information and requirements provided by IMO, to support GMDSS modernization;
- 2 to consider possible regulatory actions, including spectrum allocations based on the ITU Radiocommunication Sector (ITU-R) studies, for the maritime mobile service, supporting e-navigation;
- 3 to consider regulatory provisions, if any, based on the results of ITU-R studies, referred to in *invites ITU-R* below, to support the introduction of additional satellite systems into the GMDSS,

*invites ITU-R*

to conduct studies taking into consideration the activities of IMO and other relevant international organizations, in order to determine spectrum needs and regulatory actions to support GMDSS modernization and the implementation of e-navigation, including the introduction of additional satellite systems into the GMDSS,

*instructs the Secretary-General*

to bring this Resolution to the attention of IMO and other international and regional organizations concerned.

**MOD****RESOLUTION 418 (REV.WRC-19)****Use of the frequency band 5 091-5 250 MHz by the aeronautical mobile service for telemetry applications**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that there is a need to provide global spectrum to the mobile service for wideband aeronautical telemetry systems;
- b) that the operation of aircraft stations is subject to national and international rules and regulations;
- c) that the frequency band 5 030-5 150 MHz is allocated to the aeronautical radionavigation service on a primary basis;
- d) that the allocation of the frequency band 5 091-5 250 MHz to the fixed-satellite service (Earth-to-space) is limited to feeder links of non-geostationary satellite systems in the mobile-satellite service;
- e) that the frequency band 5 091-5 150 MHz is also allocated to the aeronautical mobile-satellite (R) service on a primary basis, subject to agreement obtained under No. **9.21**;
- f) that WRC-07 allocated the frequency band 5 091-5 150 MHz to the aeronautical mobile service on a primary basis subject to No. **5.444B**;
- g) that the frequency band 5 150-5 250 MHz is also allocated to the mobile, except aeronautical mobile, service on a primary basis;
- h) that WRC-07 additionally allocated the frequency band 5 150-5 250 MHz to the aeronautical mobile service on a primary basis, subject to No. **5.446C**;
- i) that aeronautical mobile telemetry (AMT) in the aeronautical mobile service is not considered an application of a safety service as defined in No. **1.59**,

*noting*

- a) that results of studies show the feasibility of using the frequency band 5 091-5 250 MHz for the aeronautical mobile service on a primary basis, limited to transmissions of telemetry for flight testing, under certain conditions and arrangements **as provided in Recommendation ITU-R M.2122**;
- b) that the identification by ITU-R of technical and operational requirements for aircraft stations operating in the frequency band 5 091-5 250 MHz should prevent unacceptable interference to other services;
- c) that the frequency band 5 091-5 150 MHz is to be used for the operation of the international standard microwave landing system (MLS) for precision approach and landing;
- d) that MLS can be protected through the implementation of an adequate separation distance between an aeronautical mobile service transmitter to support telemetry and MLS receivers;

- e) that ITU-R studies have generated methods, described in Report ITU-R M.2118, for ensuring compatibility and sharing between the aeronautical mobile service and the fixed-satellite service operating in the frequency band 5 091-5 250 MHz, which result in interference of no more than  $1\% \Delta T_{\text{satellite}}/T_{\text{satellite}}$  from AMT aircraft station transmissions to fixed-satellite service spacecraft receivers;
- f) that a method to facilitate sharing between MLS and aeronautical mobile service is contained in Recommendation ITU-R M.1829;
- g) that Recommendation ITU-R M.1828 provides the technical and operational requirements for aircraft stations of the aeronautical mobile service, limited to transmissions of telemetry for flight testing;
- h) that ITU-R compatibility studies have been performed for AMT, limited to flight testing; such application is for the testing of aircraft during non-commercial flights for the purpose of development, evaluation and/or certification of aircraft in airspace designated by administrations for this purpose,
- recognizing*
- a) that priority is to be given to MLS in accordance with No. **5.444** in the frequency band 5 030-5 091 MHz;
- b) that studies have been performed within ITU-R concerning the sharing and compatibility of AMT for flight testing with other services in the frequency band 5 091-5 250 MHz;
- c) that **Resolution 748 (Rev.WRC-19)** also provides guidance on the use of the frequency band 5 091-5 150 MHz by the aeronautical mobile service,

*resolves*

- 1 that administrations choosing to implement AMT shall limit AMT applications to those identified in *noting h)* in the frequency band 5 091-5 250 MHz, and shall utilize the criteria set forth in Annex 1 to this Resolution;
- 2 that the pfd limits in § 3 and 4 of Annex 1 to this Resolution which protect terrestrial services may be exceeded on the territory of any country whose administration has so agreed,



## ANNEX 1 TO RESOLUTION 418 (REV.WRC-15)

- 1 In implementing aeronautical mobile telemetry (AMT), administrations shall utilize the following criteria:
- limit transmissions to those from aircraft stations only (see No. **1.83**);
  - the operation of aeronautical telemetry systems within the frequency band 5 091-5 150 MHz shall be coordinated with administrations operating microwave landing systems (MLS) and whose territory is located within a distance  $D$  of the AMT flight area, where  $D$  is determined by the following equation:

$$D = 43 + 10^{(127.55 - 20 \log(f) + E)/20}$$

where:

- $D$  : separation distance (km) triggering the coordination
- $f$  : minimum frequency (MHz) used by the AMT system
- $E$  : peak equivalent isotropically radiated power density (dBW in 150 kHz) of the aircraft transmitter.

2 For the protection of the fixed-satellite service (FSS), a telemetry aircraft station in the frequency band 5 091-5 250 MHz shall be operated in such a manner that one aircraft station transmitter power flux-density be limited to  $-198.9 \text{ dB(W/(m}^2 \cdot \text{Hz))}$  at the FSS satellite orbit for spacecraft using Earth coverage receive antennas. Such pfd limit per aircraft transmitter has been derived under the assumptions that the FSS satellite orbit is at 1 414 km altitude and that a total of 21 co-frequency AMT transmitters operate concurrently within the field of view of the FSS satellite. In case of fewer than 21 AMT co-frequency transmitters operating simultaneously in view of the satellite, the transmitter power can be adjusted so as not to exceed an aggregate pfd at the satellite of  $-185.7 \text{ dB(W/(m}^2 \cdot \text{Hz))}$ , which corresponds to a  $\Delta T_{\text{satellite}}/T_{\text{satellite}}$  of 1%.

3 For the protection of the mobile service in the frequency band 5 150-5 250 MHz, the maximum pfd produced at the surface of the Earth by emissions from an aircraft station of an aeronautical mobile service system, limited to transmissions of telemetry for flight testing, shall not exceed:  $-79.4 \text{ dB(W/(m}^2 \cdot 20 \text{ MHz))} - G_r(\theta)$ .

$G_r(\theta)$  represents the mobile service receiver antenna gain versus elevation angle  $\theta$  and is defined as follows:

**Wireless access system elevation antenna pattern**

Elevation angle, $\theta$ (degrees)	Gain $G_r(\theta)$ (dBi)
$45 < \theta \leq 90$	-4
$35 < \theta \leq 45$	-3
$0 < \theta \leq 35$	0
$-15 < \theta \leq 0$	-1
$-30 < \theta \leq -15$	-4
$-60 < \theta \leq -30$	-6
$-90 < \theta \leq -60$	-5

4 For the protection of the aeronautical mobile (R) service (AM(R)S) in the frequency band 5 091-5 150 MHz, the maximum pfd produced at the surface of the Earth, where AM(R)S may be deployed in accordance with No. **5.444B**, by emissions from an aircraft station of an aeronautical mobile service system, limited to transmissions of telemetry for flight testing, shall not exceed:  $-89.4 \text{ dB(W/(m}^2 \cdot 20 \text{ MHz))} - G_r(\theta)$ .

$G_r(\theta)$  represents the mobile service receiver antenna gain versus elevation angle  $\theta$  and is defined as follows:

$$G_r(\theta) = \max [G_1(\theta), G_2(\theta)]$$

$$G_1(\theta) = 6 - 12 \left( \frac{\theta}{27} \right)^2$$

$$G_2(\theta) = -6 + 10 \log \left[ \left( \max \left\{ \frac{|\theta|}{27}, 1 \right\} \right)^{-1.5} + 0.7 \right]$$

where:

$G(\theta)$  : gain relative to an isotropic antenna (dBi)

$(\theta)$  : absolute value of the elevation angle relative to the angle of maximum gain (degrees).

**MOD****RESOLUTION 425 (REV.WRC-19)****Use of the frequency band 1 087.7-1 092.3 MHz by the aeronautical mobile-satellite (R) service (Earth-to-space) to facilitate global flight tracking for civil aviation**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that Resolution 185 (Busan, 2014) of the Plenipotentiary Conference instructed WRC-15, pursuant to No. 119 of the ITU Convention, to include in its agenda, as a matter of urgency, the consideration of global flight tracking, including, if appropriate, and consistent with ITU practices, various aspects of the matter, taking into account ITU-R studies;
- b) that the frequency band 960-1 164 MHz is allocated to the aeronautical radionavigation service (ARNS) and the aeronautical mobile (R) service (AM(R)S);
- c) that the frequency band 960-1 164 MHz is used by International Civil Aviation Organization (ICAO) standardized and non-ICAO systems, thus creating a complex interference environment;
- d) that Automatic Dependent Surveillance-Broadcast (ADS-B) is defined by ICAO, and involves aircraft transmission of data such as identification and position;
- e) that the frequency band 1 087.7-1 092.3 MHz is currently utilized for terrestrial transmission and reception of ADS-B signals in accordance with ICAO standards, involving transmissions from aircraft to terrestrial stations on the ground within line-of-sight;
- f) that WRC-15 allocated the frequency band 1 087.7-1 092.3 MHz to the aeronautical mobile-satellite (R) service (AMS(R)S) in the Earth-to-space direction, limited to the space station reception of ADS-B emissions from aircraft transmitters that operate in accordance with recognized international aeronautical standards;
- g) that the allocation of the frequency band 1 087.7-1 092.3 MHz to AMS(R)S is to extend reception of currently transmitted ADS-B signals beyond terrestrial line-of-sight, to facilitate reporting the position of ADS-B equipped aircraft located anywhere in the world;
- h) that, taking into account *considering c)*, use of the frequency band 1 087.7-1 092.3 MHz requires some administrations to control all users to ensure proper operation of all terrestrial systems,

*recognizing*

- a) that ICAO develops Standards and Recommended Practices (SARPs) for systems enabling position determination and tracking of aircraft;
- b) that Annex 10 to the Convention on International Civil Aviation contains SARPs for terrestrial ADS-B usage of the frequency band 1 087.7-1 092.3 MHz,

*noting*

a) that the development of performance criteria for space station reception of ADS-B operating under the provisions of No. **5.328AA**, including whether such criteria would require modifications to ICAO standard ADS-B equipment, is the responsibility of ICAO;

b) that Report ITU-R M.2396 provides information on use of mobile-satellite systems for flight tracking, including through reception of ADS-B in the frequency band 1 087.7-1 092.3 MHz,

*resolves*

1 that the use of the frequency band 1 087.7-1 092.3 MHz by AMS(R)S systems shall be in accordance with recognized international aeronautical standards;

2 that AMS(R)S systems (Earth-to-space) in the frequency band 1 087.7-1 092.3 MHz shall be designed so that they can operate in the interference environment as described in *considering c*);

3 that, taking into account *resolves 2*, AMS(R)S use of the frequency band 1 087.7-1 092.3 MHz shall not constrain administrations which have responsibilities as referred to in *considering h*),

*instructs the Secretary-General*



to bring this Resolution to the attention of ICAO.



**MOD**

**RESOLUTION 507 (REV.WRC-19)**

**Establishment of agreements and associated plans for  
the broadcasting-satellite service<sup>1</sup>**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that it is important to make the best possible use of the geostationary-satellite orbit and of the frequency bands allocated to the broadcasting-satellite service;
- b)* that the great number of receiving installations using such directional antennas as could be set up for a broadcasting-satellite service may be an obstacle to changing the location of space stations in that service on the geostationary-satellite orbit, as of the date of their being brought into use;
- c)* that satellite broadcasts may create harmful interference over a large area of the Earth's surface;
- d)* that the other services with allocations in the same frequency band need to use the frequency band before the broadcasting-satellite service is set up,

*resolves*

1 that stations in the broadcasting-satellite service shall be established and operated in accordance with agreements and associated plans adopted by world or regional radiocommunication conferences, as the case may be, in which all the administrations concerned and the administrations whose services are liable to be affected may participate;

2 that during the period before the entry into force of such agreements and associated plans the administrations and the Radiocommunication Bureau shall apply the procedure contained in Articles 9 to 14,

*invites the Council*

to keep under review the question of world radiocommunication conferences, and/or regional radiocommunication conferences, as required, with a view to fixing suitable dates, places and agenda.

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<sup>1</sup> This Resolution does not apply to the frequency band 21.4-22 GHz.

**MOD****RESOLUTION 517 (REV.WRC-19)****Introduction of digitally modulated emissions in the high-frequency bands between 3 200 kHz and 26 100 kHz allocated to the broadcasting service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that digital techniques are being introduced into many existing services;
- b) that digital techniques allow more effective utilization of the frequency spectrum than double-sideband (DSB) techniques;
- c) that digital techniques enable reception quality to be improved;
- d) the relevant parts of Appendix 11 concerning the digital system specification in the HF broadcasting services;
- e) that ITU-R, in its Recommendation ITU-R BS.1514, has recommended system characteristics for digital sound broadcasts in the broadcast bands below 30 MHz;
- f) that digital modulation techniques are expected to provide the means to achieve the optimum balance between sound quality, circuit reliability and bandwidth;
- g) that digitally modulated emissions can, in general, provide more efficient coverage than amplitude-modulated transmissions by using fewer simultaneous frequencies and less power;
- h) that it may be economically attractive, using current technology, to convert modern conventional DSB broadcasting systems to digital operation in accordance with *considering d)*;
- i) that some DSB transmitters have been used with digital modulation techniques without transmitter modifications;
- j) that ITU-R is carrying out further studies on the development of broadcasting using digitally modulated emissions in the frequency bands allocated to the broadcasting service below 30 MHz;
- k) that a long period could be needed for the introduction of digital broadcasting, taking into account the cost impact of replacement of transmitters and receivers,

*resolves*

- 1 that the early introduction of digitally modulated emissions as recommended by ITU-R in the HF bands between 3 200 kHz and 26 100 kHz allocated to the broadcasting service is to be encouraged;
- 2 that digitally modulated emissions shall comply with the characteristics specified in the relevant parts of Appendix 11;
- 3 that whenever an administration replaces a DSB emission by an emission using digital modulation techniques, it shall ensure that the level of interference is not greater than that caused by the original DSB emission, and shall use the RF protection values specified in Resolution 543 (Rev.WRC-19);

4 that the continued use of DSB emissions may be reviewed by a future competent world radiocommunication conference based on administrations' experience with the introduction of digital HF broadcasting services,

*instructs the Director of the Radiocommunication Bureau*

to compile and provide to the future competent world radiocommunication conference referred to in *resolves 4* the latest available complete statistics on the worldwide distribution of digital HF broadcasting receivers and transmitters,

*invites ITU-R*

to continue its studies on digital techniques in HF broadcasting with a view to assisting in the development of this technology for future use,

*invites administrations*

to encourage the inclusion in all new HF broadcasting transmitters put into service after 1 January 2004 of the capability to offer digital modulation,

*further invites administrations*

1 to assist the Director of the Radiocommunication Bureau by providing the relevant statistical data and to participate in ITU-R studies on matters relating to the development and introduction of digitally modulated emissions in the HF bands between 3 200 kHz and 26 100 kHz allocated to the broadcasting service;

2 to bring to the notice of transmitter and receiver manufacturers the recent results of relevant ITU-R studies on spectrum-efficient modulation techniques suitable for use at HF as well as the information referred to in *considering d)* and *e)*, and encourage the availability of affordable low-cost digital receivers.

**MOD****RESOLUTION 528 (REV.WRC-19)****Introduction of the broadcasting-satellite service (sound) systems and complementary terrestrial broadcasting in the frequency bands allocated to these services within the range 1-3 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WARC-92 has made frequency allocations to the broadcasting-satellite service (sound) and complementary terrestrial broadcasting;
- b) that it is necessary to ensure that the introduction of the broadcasting-satellite service (sound) and complementary terrestrial broadcasting proceeds in a flexible and equitable manner;
- c) that efficient use of the spectrum will be enhanced by a worldwide allocation;
- d) that a worldwide allocation may cause difficulties to some countries in relation to their existing services;
- e) that future planning may limit the effect on other services,

*resolves*

- 1 that a competent conference should be convened for the planning of the broadcasting-satellite service (sound) in the frequency bands allocated to this service in the range 1-3 GHz; and the development of procedures for the coordinated use of complementary terrestrial broadcasting;
- 2 that this conference should review criteria for sharing with other services;
- 3 that in the interim period, broadcasting-satellite systems may only be introduced within the upper 25 MHz of the appropriate frequency band in accordance with the procedures contained in Articles **9** to **14**, as appropriate. The complementary terrestrial service may be introduced during this interim period subject to coordination with administrations whose services may be affected;
- 4 that the calculation methods and the interference criteria to be employed in evaluating the interference should be based upon relevant ITU-R Recommendations agreed by the administrations concerned as a result of Resolution **703 (Rev.WRC-07)** or otherwise,

*invites the ITU-R*

to conduct the necessary studies prior to the conference,

*instructs the Secretary-General*

to bring this Resolution to the attention of the Council to consider including in the agenda of a radiocommunication conference the matters addressed above.



**MOD**

**RESOLUTION 535 (REV.WRC-19)**

**Information needed for the application of Article 12 of the Radio Regulations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

a) that WRC-97 adopted Article 12 as a simple and flexible seasonal planning procedure for high-frequency broadcasting (HFBC) based on coordination;

b) that, for the purpose of application of Article 12, the Radiocommunication Bureau developed the software of which administrations were informed through circular letters,

*instructs the Director of the Radiocommunication Bureau*

to consider improvements to the established arrangements for the preparation, publication and dissemination of the information relating to the application of Article 12, in consultation with administrations and regional coordination groups,

*invites administrations*

to submit their schedules in a common electronic format,

*instructs the Secretary-General*

to consider provision of the necessary funding to enable developing countries to participate fully in the application of Article 12 and relevant radiocommunications seminars.

**ANNEX TO RESOLUTION 535 (REV.WRC-19)**

This Annex responds to the need for information in the application of Article 12; the flowchart in Description 2 provides an overview of the Procedure.

**Software modules**

**Data capture of requirements**

A new module will be required that permits the capture of all data elements detailed in Description 3. This module should also contain validation routines that prevent inconsistent data being captured and sent to the Bureau for processing.

**Propagation calculation**

This new module should calculate the field strength and other necessary data at all relevant test points as described in Descriptions 1 and 4.

It should also include an option that allows administrations to select the optimum frequency bands for their requirements.

The output format of the data and the medium should be such as to allow easy publication and distribution of the results to all administrations.

The results of these calculations should be displayable in a graphical format.

### **Compatibility analysis**

This module should use the output of the propagation calculation to provide a technical analysis of a requirement both alone and in the presence of other requirements as in Description 4. This analysis would be used in the coordination process.

The values for the parameters given in Description 4 should be user selectable, but in the absence of other values the recommended default values should be used.

The results of this analysis should be capable of being displayed in a graphical format for a defined service area as in Description 4.

### **Data query**

This module should enable the user to perform typical data query functions.

## **DESCRIPTION 1**

### **Selection of suitable frequency band(s)**

#### **General**

In order to assist broadcasters and administrations in the preparation of their HF broadcasting requirements, the Bureau will prepare and distribute suitable computer software. This should be easy to use and the output should be easy to understand.

#### **User input data**

The user should be able to enter:

- the name of the transmitting station (for reference purposes);
- the geographic coordinates of the transmitting station;
- the transmitter power;
- the frequency bands which are available for use;
- hours of transmission;
- sunspot number;
- months during which a service is required;
- the available antenna types, together with the relevant directions of maximum radiation;
- the required coverage area specified as a set of CIRAF zones and quadrants (or by means of relevant geographic information).

It is desirable that the software should be able to store the above information, once it has been entered correctly, and provide the user with an easy means of recalling any previously entered information.

#### **Methodology and data**

The software should use:

- Recommendation ITU-R BS.705 for the calculation of antenna patterns;
- Recommendation ITU-R P.533 for the prediction of wanted field-strength values;
- Recommendation ITU-R P.842 for the calculation of reliability values.

The set of 911 test points (agreed at WARC HFBC-87) should be used, supplemented where necessary with test points based on a geographic grid.

The software should calculate the field-strength values and the fading margins at each test point inside the required service area for each of the frequency bands declared to be available, taking account of the relevant transmitting antenna characteristics for each frequency band. The desired RF signal-to-noise ratio should be user selectable with a default value of 34 dB in the case of double sideband (DSB) or as provided in the most recent version of Recommendation ITU-R BS.1615, as appropriate, in the case of digital emissions.

The dates for which calculations are made should be user selectable, the default values being:

- 0.5 month after the start of the season;
- mid-point of the season;
- 0.5 month before the end of the season.

The times for which calculations are made should be user selectable, the default values being:

- 30 min past the hour in which the requirement starts;
- 30 min past each successive hour until the hour in which the requirement stops.

### **Software output data**

For rapid assessment of suitable frequency bands, the software should calculate:

- the basic service reliability for each available frequency band and for the relevant test points from the set of 911 test points;
- the basic area reliability for each available frequency band and for the relevant test points from the set of 911 test points.

In order to provide information about the geographic distribution of wanted signal values within the required service area, additional results should be available from the software:

- a listing should be available giving, for each of the available frequency bands, the basic circuit reliability (BCR) for each of the test points (from the set of 911 test points) inside the required service area.

In some cases, a graphical display of the BCR values throughout the required service area may be desirable. These values should be calculated at test points at 2° intervals of latitude and longitude throughout the required service area.

The BCR values should be displayed graphically as a set of coloured or hatched “pixels” scaled in steps of 10%. It should be noted that:

- reliability values relate to the use of a single frequency band;
- reliability values are a function of the desired RF signal-to-noise ratio (user selectable);
- the field-strength values should be calculated by the supplied software on the user’s own computer hardware. The software supplied should calculate the relevant reliability values based on these field-strength values and the user-supplied desired RF signal-to-noise values.

## DESCRIPTION 2

### Time sequence for the Procedure

In the sequence outlined below, the start date for a given schedule period is defined as D and the end date for the same schedule period is defined as E.

Date	Action
D – 4 months	Closing date for administrations to send their schedules <sup>1</sup> to the Radiocommunication Bureau (Bureau), preferably by electronic means. Schedule data will be made available via TIES as soon as it has been processed.
D – 2 months	Bureau to send to administrations a consolidated schedule (the first Tentative Schedule) together with a complete compatibility analysis <sup>2</sup> .
D – 6 weeks	Closing date for receipt of amendments from administrations to correct errors and other changes resulting from the coordination process to ensure that this information appears in the second Tentative Schedule for D – 1 month.
D – 1 month	Bureau to send to administrations a consolidated schedule (the second Tentative Schedule) together with a complete compatibility analysis <sup>2</sup> .
D – 2 weeks	Closing date for receipt of amendments from administrations to correct errors and other changes resulting from the coordination process to ensure that this information appears in the Schedule for date D.
D	Bureau to issue the High Frequency Broadcasting Schedule and compatibility analysis.
D to E – 3 months	Administrations to correct errors and coordinate in-season changes of requirements, sending information to the Bureau as it becomes available. Bureau to issue updates of the Schedule and compatibility analysis at intervals of two months.
E	Closing date for receipt of final operational schedules from administrations to Bureau. No input is needed if there have been no changes to the information previously sent.
E + 1 month	Bureau to send to administrations the final consolidated schedule (the Final Schedule) together with a compatibility analysis.

Figure 1 shows, in flow chart form, the time sequence for the Procedure.

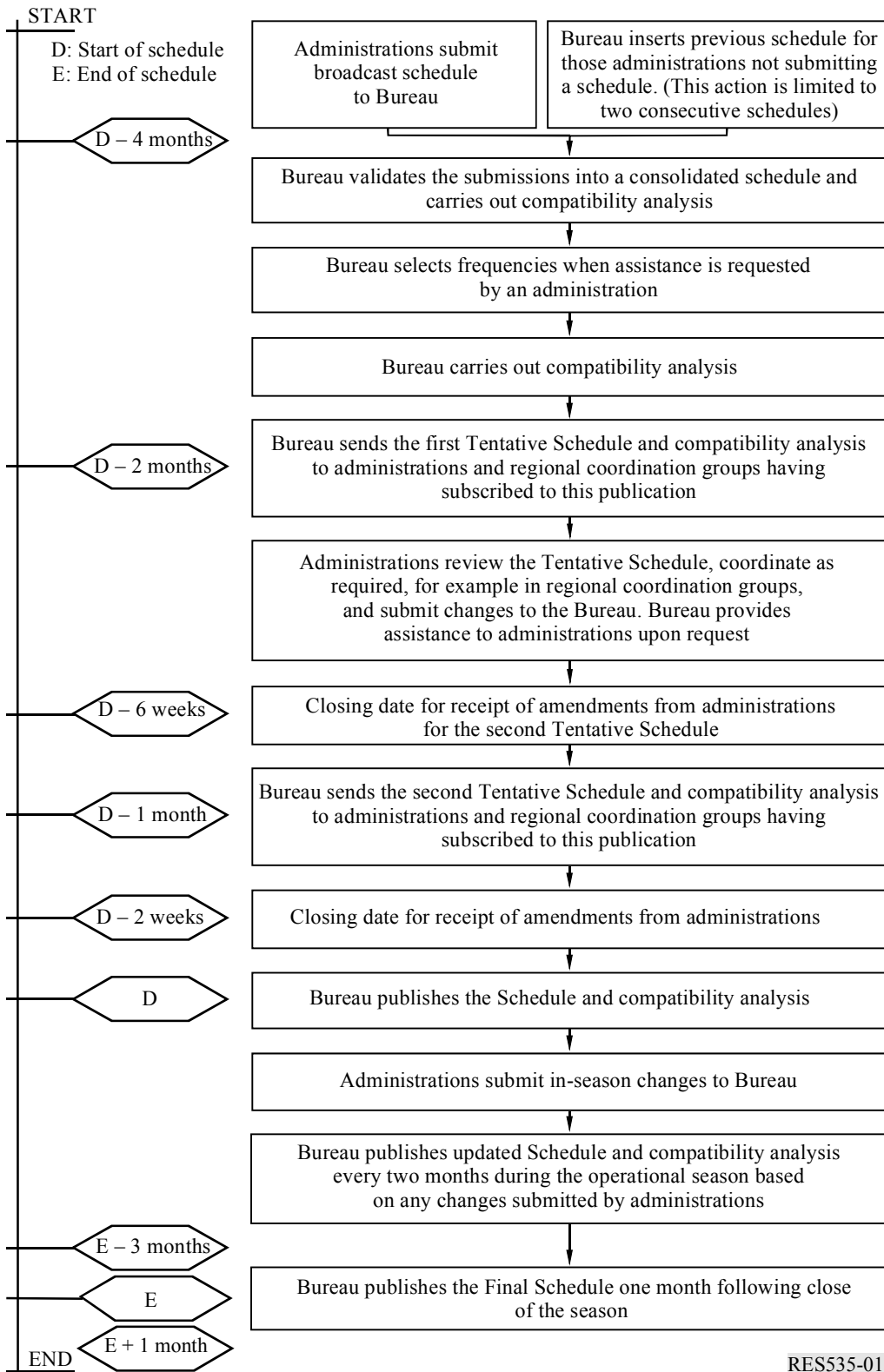
<sup>1</sup> See Description 3.

<sup>2</sup> See Description 4. The schedules and the results of the analyses should be available on CD-ROM and in TIES.



FIGURE 1

**Time sequence for the Procedure**



## DESCRIPTION 3

### **Specification of input data for a requirement**

The fields needed for a given requirement and their specifications are:

- frequency in kHz, up to 5-digit integer;
- start time, as 4-digit integer;
- stop time, as 4-digit integer;
- target service area, as a set of up to 12 CIRAF zones and quadrants up to a maximum of 30 characters;
- site code, a 3-character code from a list of codes, or a site name and its geographic coordinates;
- power in kW, up to 4-digit integer;
- azimuth of maximum radiation;
- slew angle, up to 2-digit integer representing the difference between the azimuth of maximum radiation and the direction of unslewed radiation;
- antenna code, up to 3-digit integer from a list of values, or a full antenna description, as given in Recommendation ITU-R BS.705;
- days of operation;
- start date, in the case that the requirement starts after the start of the schedule;
- stop date, in the case that the requirement stops before the end of the schedule;
- modulation choice, to specify if the requirement is to use DSB, single-side band (SSB) (see Recommendation ITU-R BS.640) or digital emission (see Recommendation ITU-R BS.1514). This field may be used to identify any other type of modulation when this has been defined for use by HFBC in an ITU-R Recommendation;
- administration code;
- broadcasting organization code;
- identification number;
- identification of synchronization with other requirements.

## DESCRIPTION 4

### **Compatibility analysis**

#### **General**

In order to assess the performance of each requirement in the presence of noise and of the potential interference from other requirements using the same or adjacent channels, it is necessary to calculate the relevant reliability values. To this end, the Bureau will prepare suitable software, taking account of user requirements in terms of desired signal-to-noise and signal-to-interference ratios.

#### **Input data**

The schedule for a given season – this may be either an initial consolidated schedule (to permit assessment of those requirements which need coordination) or the High Frequency Broadcasting

Schedule (to permit assessment of the likely performance of requirements during the relevant season).

### **Methodology and data**

The software should use:

- Recommendation ITU-R BS.705 for the calculation of antenna patterns;
- Recommendation ITU-R P.533 for the prediction of the wanted field-strength values at each test point for each wanted requirement;
- Recommendation ITU-R P.533 for the prediction of the potentially interfering field-strength values from all other co-channel or adjacent channel requirements at each test point for each wanted requirement;
- Recommendation ITU-R BS.560 for adjacent channel RF protection ratios;
- Recommendation ITU-R P.842 for the calculation of reliability values.

The set of 911 test points (agreed at WARC HFBC-87) should be used, supplemented where necessary with test points based on a geographic grid.

The software should calculate the wanted and unwanted field-strength values and the fading margins at each test point inside the required service area.

The desired RF signal-to-noise and RF protection ratios should be user selectable, the default values being 34 dB and 17 dB (DSB-to-DSB co-channel case), respectively. In the case of digital emissions, the desired RF signal-to-noise ratios are as provided in the most recent version of Recommendation ITU-R BS.1615. The default values of RF protection ratio to be used by the Bureau for its compatibility analyses are given in Section 1 of the Annex to Resolution **543 (Rev.WRC-19)**.

The dates for which a compatibility analysis is made should be user selectable, the default values being:

- 0.5 month after the start of the season;
- mid-point of the season;
- 0.5 month before the end of the season.

These default values should be used by the Bureau for its compatibility analyses.

The times for which a compatibility analysis is made should be user selectable, the default values being:

- 30 min past the hour in which the requirement starts;
- 30 min past each successive hour until the hour in which the requirement ends.

These default values should be used by the Bureau for its compatibility analyses.

### **Software output data**

For rapid assessment of the performance of a requirement, the software should calculate:

- the overall service reliability for the relevant test points from the set of 911 test points;
- the overall area reliability for the relevant test points from the set of 911 test points.

In order to provide information about the geographic distribution of wanted and unwanted signal values for a given requirement, additional results should be available from the software:

- a listing should be available giving the overall circuit reliability for each of the relevant test points from the set of 911 test points.

In some cases, a graphical display of the coverage achieved throughout a required service area may be desirable. These values will need to be calculated by the user (with the supplied software and on the user's own computer hardware) at test points at 2° intervals of latitude and longitude throughout the required service area. The values should be displayed graphically as a set of coloured or hatched pixels in steps of 10%. It should be noted that:

- reliability values relate to the use of a single frequency;
- reliability values are a function of the desired RF signal-to-noise and RF protection ratios (both user selectable);
- the field-strength values for the test points (from the set of 911 test points) inside the required service area should be calculated by the Bureau. The software supplied should calculate the relevant reliability values based on these pre-calculated field-strength values and the user-supplied desired signal-to-noise and signal-to-interference values;
- the field-strength values for the test points at 2° intervals should be calculated using the supplied software on the user's own computer hardware. The software supplied should calculate the relevant reliability values based on these field-strength values and the user-supplied desired signal-to-noise and signal-to-interference values.

## MOD

## RESOLUTION 539 (REV.WRC-19)

**Use of the frequency band 2 605-2 655 MHz in certain Region 3 countries  
by non-geostationary satellite systems in the  
broadcasting-satellite service (sound)**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the frequency band 2 535-2 655 MHz is allocated under No. **5.418** to the broadcasting-satellite service (BSS) (sound) in certain Region 3 countries;
- b) that the provisions of **Resolution 528 (Rev.WRC-19)** currently limit the use of this frequency band by systems in the BSS (sound) to the upper 25 MHz of the frequency band;
- c) that, prior to WRC-2000, there were no coordination procedures applicable to non-geostationary (non-GSO) BSS (sound) systems in this frequency band in relation to other non-GSO or GSO satellite networks;
- d) that satellite technology has now advanced to the stage where non-GSO systems in the BSS (sound) are technically and economically feasible when operated with high elevation angles and that there are practical designs available to ensure that the radiation of the non-GSO satellite in the BSS (sound) outside the main beam is kept at low levels;
- e) that satellite systems in the BSS as described in *considering d)* can be used for the delivery of high-quality, spectrally efficient BSS (sound) to portable and mobile terminals;
- f) that non-GSO systems in the BSS (sound) in the frequency band 2 630-2 655 MHz in Region 3 have been notified to ITU and are expected to be brought into use in the near future;
- g) that, prior to WRC-2000, the protection of existing terrestrial services was addressed through the coordination procedures of No. **9.11**;
- h) that the provision cited in *considering g)* may be inadequate to ensure the future deployment of terrestrial services in this frequency band;
- i) that a regulatory procedure is required in order to meet the dual objectives of providing adequate long-term protection to existing and planned terrestrial services while not placing undue constraints on the development and implementation of the non-GSO BSS (sound) system;
- j) that there are non-GSO systems being planned for operation in the BSS (sound) in the frequency band 2 605-2 655 MHz in Region 3 that have highly elliptical orbits;
- k) that ITU-R has undertaken studies of the likely aggregate interference from a number of co-frequency broadcasting-satellite systems sharing with the terrestrial services on a co-primary basis;
- l) that ITU-R has undertaken studies that assumed there is only one satellite active at any time in a non-GSO system operating in a highly elliptical orbit,

*invites*

1 administrations planning to operate non-GSO BSS (sound) systems in accordance with this Resolution, to take measures to design the system to minimize interference to terrestrial services outside the non-GSO BSS (sound) service area, for example as in *considering d)* above;

2 administrations, whose territory is geographically close to the territory of an administration planning to operate a non-GSO BSS (sound) system in accordance with this Resolution, and for which there is a correspondingly high elevation angle to the active satellite, to take measures to facilitate the operation of non-GSO BSS (sound) systems,

*resolves*

1 that any BSS (sound) system using non-geostationary orbits brought into operation in the frequency band 2 605-2 655 MHz in Region 3 shall be operated such that the minimum elevation angle over the service area is not less than 55°, for the purposes of sharing with terrestrial services;

2 that, before an administration notifies to the Radiocommunication Bureau or brings into use a frequency assignment for a BSS (sound) system using non-GSO satellites in the frequency band 2 630-2 655 MHz, for which complete Appendix 4 coordination information or notification information has been received after 2 June 2000, and in the frequency band 2 605-2 630 MHz for which complete Appendix 4 coordination information or notification information has been received after 4 July 2003, the following regulatory arrangements shall apply.

The following mask of power flux-density values at the Earth's surface produced by emissions from a space station for all conditions and for all methods of modulation shall be used as the basis of the regulatory procedures of this Resolution:

-130	dB(W/(m <sup>2</sup> · MHz))	for 0° ≤ θ ≤ 5°
-130 + 0.4 (θ - 5)	dB(W/(m <sup>2</sup> · MHz))	for 5° < θ ≤ 25°
-122	dB(W/(m <sup>2</sup> · MHz))	for 25° < θ ≤ 45°
-122 + 0.2 (θ - 45)	dB(W/(m <sup>2</sup> · MHz))	for 45° < θ ≤ 65°
-118 + 0.09 (θ - 65)	dB(W/(m <sup>2</sup> · MHz))	for 65° < θ ≤ 76°
-117	dB(W/(m <sup>2</sup> · MHz))	for 76° < θ ≤ 90°

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees.

These values relate to the power flux-density and angles of arrival which would be obtained under free-space propagation conditions.

Furthermore:

- for angles of arrival less than 76° in the power flux-density mask above, if the limits are exceeded, the notifying administration shall obtain the explicit agreement from any administration identified by the Bureau in its examination below;
- for angles of arrival from 76° to 90° in the power flux-density mask above, the coordination procedure with respect to those administrations identified by the Bureau in its examination below will be that of No. 9.11;

3 that systems in the BSS (sound) using non-GSO satellites shall be limited to national services unless agreement has been reached to include the territories of other administrations in the service area;

4 that, within the context of this Resolution, an administration listed in No. **5.418** shall not have simultaneously two overlapping frequency assignments, one under that provision, and the other one under provision No. **5.416**;

5 that, as from 5 July 2003, the Bureau and administrations shall apply the provisions of Articles **9** and **11** taking into account Nos. **5.418**, **5.418A**, **5.418B**, **5.418C** and this Resolution, as revised by WRC-03,

*instructs the Radiocommunication Bureau*

- 1 when applying *resolves* 2, to use the power flux-density mask in *resolves* 2; and
- for angles of arrival less than 76°, identify the affected administrations which have a primary allocation to terrestrial services in the same frequency band and on whose territory the power flux-density is exceeded and inform both the notifying and the affected administrations. At the notification stage the lack of any necessary agreement is considered as non-conformity with No. **11.31**;
  - for angles of arrival from 76° to 90°, identify the affected administrations which have a primary allocation to terrestrial services in the same frequency band and on whose territory the power flux-density is exceeded and inform both the notifying and the affected administrations. At the notification stage each notice shall be examined in the application of No. **11.32** and, if appropriate, under No. **11.32A** with respect to the probability of harmful interference that may be caused to assignments for which coordination could not be successfully completed;
- 2 as from 5 July 2003, to apply *resolves* 5 in its examination of requests for coordination and notifications for any BSS (sound) systems using non-GSO satellites in the frequency band 2 630-2 655 MHz for which complete Appendix **4** coordination information or notification information has been received after 2 June 2000.

**MOD****RESOLUTION 543 (REV.WRC-19)****Provisional RF protection ratio values for analogue and digitally modulated emissions in the HF broadcasting service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that this Conference has resolved to encourage the introduction of digitally modulated emissions in the high frequency broadcast bands allocated to the broadcasting service and has revised Resolution **517** accordingly;
- b) that the current use of the spectrum is based on the use of double-sideband (DSB) emissions;
- c) that Appendix **11** gives details of the system parameters and the emission characteristics of the digitally modulated emissions;
- d) that ITU-R is carrying out further studies on the development of HF broadcasting using digitally modulated emissions in the bands allocated to the broadcasting service below 30 MHz;
- e) that RF co-channel and adjacent channel protection ratios are among the fundamental parameters when determining compatibility;
- f) that the currently available values of RF protection ratios may need to be updated in the light of future ITU-R studies;
- g) that Annex 1 to Recommendation ITU-R BS.1514 describes a digital system suitable for broadcasting in the bands below 30 MHz;
- h) that there is a need to compile and maintain statistics on administrations' capability to introduce digital modulation systems for their HF broadcasting services,

*resolves*

- 1 that digital modulation in accordance with **Resolution 517 (Rev.WRC-19)** may be used in any of the HF bands allocated to the broadcasting service; this accommodation has to be made with the appropriate amounts of protection given to both analogue and digital emissions as described in the Annex to this Resolution;
- 2 that the protection ratio values described in the Annex be used in the coordination process under Article **12** on a provisional basis;
- 3 to invite a future competent conference to revise these provisional protection ratio values, as appropriate,

*invites ITU-R*

to continue studies on digital techniques in HF broadcasting with the purpose to revise the RF protection ratio values for analogue and digitally modulated emissions in the HF broadcasting service as described in the Annex to this Resolution.



## ANNEX TO RESOLUTION 543 (REV.WRC-19)

### Section 1 – Standard RF protection ratio values

RF protection ratio values to be used for seasonal planning under the provisions of Article 12 are contained in Table 1 in this Section.

The values are consistent with those in Recommendation ITU-R BS.1615.

The characteristics of the digital emission are based on the 64-QAM modulation system, protection level No. 1, robustness mode B, spectrum occupancy type 3 (as contained in Recommendation ITU-R BS.1514), which will be used extensively for HF sky-wave broadcasting in 10 kHz channels.

The characteristics of the analogue emission are based on double-sideband modulation as summarized in Part A of Appendix 11, with 53% modulation depth.

TABLE 1

**Relative RF protection ratios (dB) associated with digitally modulated emissions in the HF bands allocated to the broadcasting service**

Wanted signal	Unwanted signal	Frequency separation $f_{unwanted} - f_{wanted}$ (kHz)								
		-20	-15	-10	-5	0	5	10	15	20
Amplitude modulation	Digital	-47	-42	-32	3	6	3	-32	-42	-47
Digital	Amplitude modulation	-54	-48	-40	-3	0	-3	-40	-48	-54
Digital	Digital	-53	-47	-38	-3	0	-3	-38	-47	-53

In the case of an amplitude modulation (AM) signal interfered with by a digital signal, the protection ratios are determined by adding 17 dB (audio-frequency protection ratio) to the relative RF protection ratios in Table 1.

In the case of a digital signal interfered with by an AM signal, the protection ratios are determined by adding 7 dB (signal-to-interference ratio for a bit error ratio (BER) of  $10^{-4}$ ) to the relative RF protection ratios in Table 1.

In the case of a digital signal interfered with by a digital signal, the protection ratios are determined by adding 16 dB (signal-to-interference ratio for a BER of  $10^{-4}$ ) to the RF relative protection ratios in Table 1.

### Section 2 – Correction values of RF protection ratios

Correction values of RF protection ratios for different wanted signal conditions such as AM modulation depths, AM quality grades and digital modulation modes are provided in this Section.

#### 1 AM modulation depth

RF protection ratios for a wanted AM signal interfered with by a digital signal depend on the AM modulation depth. A modulation depth of 53% is used as a default value in this Annex. If a different modulation depth is used, a correction value for RF protection ratio is required. Table 2 provides correction values for typical modulation depths.

TABLE 2

**Correction values (dB) to be used for other AM modulation depths in respect of wanted AM signal**

Modulation depth (%)	30	38	53	<i>m</i>
Correction value (dB)	5	3	0	$20 \log (53/m)$

## 2 AM audio quality

RF protection ratios for a wanted AM signal interfered with by a digital signal depend on the required audio quality grade. If another quality grade is used, correction values of RF protection ratios as in Table 3 shall be added.

TABLE 3

**Correction values (dB) to be used for other audio quality grades in respect of wanted AM signal**

Audio quality grade	3	3.5	4
Correction value (dB)	0	7	12

## 3 Digital modulation scheme, protection level number and robustness mode

RF protection ratios for a wanted digital signal interfered with by an analogue or digital signal depend on the digital modulation scheme and mode. If any combination different from the default value in Section 1 is used, correction values of RF protection ratios as in Table 4 shall be added.

TABLE 4

**Correction values (dB) to be used for other combinations of digital modulation scheme, protection level number and robustness mode in respect of wanted digital signal**

Modulation scheme	Protection level number	Robustness mode		
		B	C	D
16-QAM	0	-7	-6	-6
	1	-5	-4	-4
64-QAM	0	-1	-1	0
	1	0	0	1

NOTE – 10 kHz nominal bandwidth.

Protection levels Nos. 2 and 3 and robustness mode A are not recommended for use in HF and are therefore not described here.

### Section 3 – Explanatory examples

- a) In Table 1, first row <AM interfered with by Digital>: with the AF protection ratio = 17 dB, all values of relative protection ratios entered in that row of the Table must be increased by 17 dB in order to determine the absolute value of the RF protection ratio (RF PR). As examples:

- For co-channel interference (0 kHz separation) the RF PR would be  $6 + 17 = 23$  dB.
- For adjacent channel interference ( $\pm 10$  kHz separation) the RF PR would be  $-32 + 17 = -15$  dB.
- For the case of modulation depth = 38% and audio quality grade = 4, a correction factor of 15 dB ( $= 3 + 12$ ) is added to the RF PR values described above.

*b)* In Table 1, second row <Digital interfered with by AM>: all values of relative protection ratios entered in that row of the Table must be increased by 7 dB in order to determine the absolute value of the RF PR. As examples:

- For co-channel interference (0 kHz separation) the RF PR would be  $0 + 7 = 7$  dB.
- For adjacent channel interference ( $\pm 10$  kHz separation) the RF PR would be  $-40 + 7 = -33$  dB.

*c)* In Table 1, third row <Digital interfered with by Digital>: all values of relative protection ratios entered in that row of the Table must be increased by 16 dB in order to determine the absolute value of the RF protection ratio. As examples:

- For co-channel interference (0 kHz separation) the RF PR would be  $0 + 16 = 16$  dB.
- For adjacent channel interference ( $\pm 10$  kHz separation) the RF PR would be  $-38 + 16 = -22$  dB.

**MOD**

**RESOLUTION 550 (REV.WRC-19)**

**Information relating to the high-frequency broadcasting service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that this Conference reviewed the case for relieving congestion in certain of the HF bands allocated to the broadcasting service;
- b)* that this Conference decided to maintain the present Table of Frequency Allocations in the HF bands, in view of the rapid development and use of the bands by all services;
- c)* that, as part of a general transition away from analogue transmission systems, digital modulation is being introduced into the HF broadcasting bands;
- d)* that, in common with the other services using the HF bands, the broadcasting service has an ongoing need to review the effectiveness of its use of spectrum,

*noting*

that Resolution **517 (Rev.WRC-19)** deals with the introduction of digitally modulated emissions in the HF bands allocated to the broadcasting service,

*noting further*

that ITU-R has prepared a wide-ranging report, namely Report ITU-R BS.2105 “Information relating to the HF broadcasting service”,

*resolves to invite ITU-R*

to continue studies on HF broadcasting taking into account:

- technical and operational factors,
- digital transmissions, including how the introduction of these emissions will affect HF broadcasting requirements and operations,

*invites administrations and Sector Members*

to participate actively in the aforementioned studies by submitting contributions to ITU-R.

**MOD**

**RESOLUTION 552 (REV.WRC-19)**

**Long-term access to and development in the frequency band  
21.4-22 GHz in Regions 1 and 3**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WARC-92 allocated the frequency band 21.4-22 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;
- b) that the use of the frequency band since 1992 was subject to an interim procedure in accordance with Resolution **525 (WARC-92, Rev.WRC-03 and Rev.WRC-07)\***;
- c) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries;
- d) that a due diligence process was first adopted by WRC-97 with a view to providing, as early as possible, information on the industrial project behind a satellite network submitted to ITU;
- e) that providing information required under this due diligence process was a prerequisite to qualifying for a two-year extension of the regulatory period to bring into use a satellite network in non-planned bands;
- f) that WRC-03 decided to remove the two-year extension by setting the regulatory period to bring into use a satellite network in non-planned bands to seven years;
- g) that data concerning the manufacturer, launch service provider and launch date of a satellite will be more accurate and useful if submitted after the launch of the satellite,

*resolves*

- 1 that this Resolution applies to geostationary-satellite networks in the BSS in the frequency band 21.4-22 GHz;
- 2 that for frequency assignments to satellite networks as described in *resolves* 1 for which confirmation of the date of bringing into use under the provisions of Article **11** was not received by the Bureau before 18 February 2012 or which were suspended under No. **11.49** at that date, the procedure contained in Annex 1 to this Resolution shall be applied at the time of first bringing into use or when resuming use after a suspension, as appropriate;
- 3 that for frequency assignments to satellite networks as described in *resolves* 1 for which the confirmation of the date of bringing into use under the provisions of Article **11** was received by the Bureau before 18 February 2012, the provisions of §§ 5 to 8 of Annex 1 to this Resolution shall be applied, as appropriate,

*further resolves*

that the procedures in this Resolution are in addition to the provisions under Articles **9** and **11** of the Radio Regulations,

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\* *Note by the Secretariat:* This Resolution was abrogated by WRC-12.

*instructs the Director of the Radiocommunication Bureau*

to include in his report to future competent world radiocommunication conferences the results of the implementation of this Resolution.

## ANNEX 1 TO RESOLUTION 552 (REV.WRC-19)

- 1 Within 30 days after the actual commencement, or resumption, of use of the frequency assignments to a satellite network subject to these procedures, the notifying administration shall send to the Bureau the information specified in Annex 2 to this Resolution.
- 2 The information to be submitted in accordance with § 1 above shall be signed by an authorized official of the notifying administration.
- 3 If the spacecraft is used for the first time under this Resolution, the due diligence information to be submitted in accordance with § 1 above could be supplemented by a copy of the contract with the launch services provider.
- 4 On receipt of the information under § 1 above, the Bureau shall promptly examine its completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within two months. If the information is found to be incomplete, the Bureau shall request the notifying administration to submit the missing information within 30 days.
- 5 The information submitted in accordance with § 1 above shall be updated and resubmitted to the Bureau by the notifying administration not later than 30 days after the end of life or the relocation of the spacecraft associated with the submission under § 1 above. In case of end of life of a spacecraft, the corresponding ITU ID number associated to such a spacecraft shall no longer be used.
- 6 On receipt of the information under § 5 above, the Bureau shall promptly examine its completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within two months. If the information is found to be incomplete, the Bureau shall request the notifying administration to submit the missing information within 30 days.
- 7 If the complete information specified in § 1 and 5 above is not received by the Bureau within the time-limits specified in § 1, 4, 5 and 6 above, the Bureau shall immediately inform the notifying administration and take appropriate measures under § 8, if required.
- 8 Within 30 days after the end of the seven-year period following the date of receipt by the Bureau of the relevant complete information under Nos. **9.1A** or **9.2C**, as appropriate, and after the end of the three-year period following the date of suspension under No. **11.49**, if the complete information under this Resolution is not yet received by the Bureau, the corresponding frequency assignments shall be cancelled by the Bureau, which subsequently informs the administration accordingly.

## ANNEX 2 TO RESOLUTION 552 (REV.WRC-19)

### Information to be submitted

- 1 Identity of the satellite network
  - a) Identity of the satellite network
  - b) Name of the notifying administration
  - c) Orbital characteristics
  - d) Reference to the advance publication information
  - e) Reference to the request for coordination
  - f) Reference to the notification, when available
  - g) Frequency band(s) included in the relevant special sections of the satellite network
  - h) First date of bringing into use<sup>1</sup>
  - i) Regulatory status
    - Satellite network under operation (only data listed in § 2 shall be provided), or
    - Satellite network suspended (only data listed in § 3 shall be provided)
- 2 Identity of the spacecraft<sup>2</sup> (if satellite network filing is under operation)
  - a) ITU ID number, or
  - b) Spacecraft manufacturer
    - Name of the spacecraft manufacturer
    - Date of execution of the contract
    - Delivery date
  - c) Launch services provider
    - Name of the launch vehicle provider
    - Date of execution of the contract
    - Name of the launch vehicle
    - Name and location of the launch facility
    - Launch date
  - d) Frequency band(s) present on board the spacecraft (i.e. frequency bands for each transponder that are able to be transmitted by a transponder located on board the spacecraft within the frequency band 21.4-22 GHz)

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<sup>1</sup> This information has already been provided by the administration under the provisions of Article 11 and will be inserted by the Bureau.

<sup>2</sup> If data about the spacecraft are submitted for the first time under this Resolution, items “Spacecraft manufacturer”, “Launch services provider” and “Frequency band(s) present on board the spacecraft” shall be provided. Otherwise, if data about the spacecraft were already submitted under this Resolution, the ID number (based on the ITU filing number) given by the Bureau to this spacecraft at that time shall be indicated.

- 3 Suspension information (if satellite network filing is suspended)
- a)* Date of suspension<sup>3</sup>
- b)* Reason of suspension:
- Spacecraft moved to another orbital position, or
  - In-orbit failure of the spacecraft, or
  - Spacecraft de-orbited,
  - Other reasons (to be specified).

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<sup>3</sup> This information has already been provided by the administration under the provisions of Article **11** and will be inserted by the Bureau.



MOD



## RESOLUTION 608 (REV.WRC-19)

**Use of the frequency band 1 215-1 300 MHz by systems of the radionavigation-satellite service (space-to-Earth)**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that WRC-2000 introduced a new allocation for the radionavigation-satellite service (RNSS) in the frequency band 1 260-1 300 MHz;
- b)* that the frequency bands 1 215-1 240 MHz and 1 240-1 260 MHz were already allocated to the RNSS;
- c)* that, in the frequency band 1 215-1 260 MHz, RNSS (space-to-Earth) systems have been successfully operating for more than 20 years without any reports of interference to the radars which operate in this frequency band;
- d)* the importance of the continuing need for protection for the radiodetermination systems operating in the frequency band 1 215-1 300 MHz,

*noting*

- a)* Recommendation ITU-R M.1902 “Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the frequency band 1 215-1 300 MHz”;
- b)* Report ITU-R M.2284 “Compatibility of radionavigation-satellite service (space-to-Earth) systems and radars operating in the frequency band 1 215-1 300 MHz”,

*further noting*

that the provisions of No. **5.329** as adopted by WRC-03, will provide for the operation of the RNSS (space-to-Earth) in the frequency band 1 215-1 300 MHz and will protect the radiolocation systems operating in that frequency band, in addition to the protection already provided to radionavigation service systems operating in the countries listed in No. **5.331**,

*recognizing*

- a)* that ITU-R carried out studies related to the protection of the radiodetermination systems operating in the frequency band 1 215-1 300 MHz and that these studies should continue pursuant to relevant ITU-R Questions, such as Questions ITU-R 62/5 and ITU-R 217/4, so as to prepare, as appropriate, ITU-R Recommendations;

b) that up to the end of WRC-2000, use of the RNSS in the frequency band 1 215-1 260 MHz was subject only to the constraint that no harmful interference was caused to the radionavigation service in Algeria, Germany, Austria, Bahrain, Belgium, Benin, Bosnia and Herzegovina, Burundi, Cameroon, China, Croatia, Denmark, United Arab Emirates, France, Greece, India, Iran (Islamic Republic of), Iraq, Kenya, Liechtenstein, Luxembourg, North Macedonia, Mali, Mauritania, Norway, Oman, Pakistan, Netherlands, Portugal, Qatar, Serbia and Montenegro\*, Senegal, Slovenia, Somalia, Sudan\*\*, Sri Lanka, Sweden, Switzerland and Turkey, furthermore, that No. 5.43 was applied,

*resolves*

that no constraints in addition to those in place prior to WRC-2000 (see *recognizing b*)) shall be placed on the use of RNSS (space-to-Earth) frequency assignments in the frequency band 1 215-1 260 MHz brought into use until 2 June 2000,

*instructs the Secretary-General*

to communicate the contents of this Resolution to the International Civil Aviation Organization (ICAO) for such actions as it may consider appropriate, and to invite ICAO to participate actively in the study activity identified under *recognizing a*).

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\* *Note by the Secretariat:* Serbia and Montenegro became independent States in 2006.

\*\* *Note by the Secretariat:* Sudan was partitioned into two independent States in 2011 (Sudan and South Sudan).

**MOD**

**RESOLUTION 610 (REV.WRC-19)**

**Coordination and bilateral resolution of technical compatibility issues for  
radionavigation-satellite service networks and systems in the bands  
1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that WRC-2000 decided to allocate the bands 1 164-1 215 MHz, 1 260-1 300 MHz and 5 010-5 030 MHz to the radionavigation-satellite service (RNSS) (space-to-Earth) (space-to-space) in addition to the bands 1 215-1 260 MHz and 1 559-1 610 MHz that have already been allocated to the RNSS;
- b)* that this Conference established conditions for the protection of the aeronautical radionavigation service from RNSS systems in the 1 164-1 215 MHz band, for the protection of radiodetermination services from RNSS systems in the 1 215-1 300 MHz band, and for the protection of the radio astronomy service in the band 4 990-5 000 MHz from RNSS systems in the 5 010-5 030 MHz band;
- c)* that to date, RNSS systems have been able to resolve intersystem technical compatibility issues on a bilateral basis under Section I of Article 9, without the need for imposition of the coordination procedures of Section II of Article 9, however, in recent years, there has been an increase in the number of RNSS systems and networks filed with the Radiocommunication Bureau;
- d)* that this Conference has decided to apply, in the bands mentioned in *considering a)*, the coordination provisions of Nos. 9.12, 9.12A and 9.13 to RNSS systems and networks for which complete coordination or notification information, as appropriate, is received by the Radiocommunication Bureau after 1 January 2005, and the provisions of No. 9.7 already apply to geostationary-satellite networks in the RNSS;
- e)* that it is necessary to have a basis for administrations with RNSS systems that are not subject to Nos. 9.12, 9.12A and 9.13 to engage in bilateral coordinations to resolve intersystem technical compatibility issues within the RNSS;
- f)* that it is desirable, in order to reduce burdens on administrations operating or planning RNSS systems or networks, to conduct bilateral coordinations between RNSS systems and networks that are either in operation or that are actually in the process of being implemented,

*resolves*

- 1 that for administrations planning to operate RNSS systems subject to coordination under Nos. 9.7, 9.12, 9.12A and/or 9.13 in the bands mentioned in *considering a)*, if an administration with which coordination is requested responds to the request under No. 9.52, the requesting administration shall, during the process of coordination and upon request by the responding administration, inform the responding administration (with a copy to the Bureau) whether it has met the criteria listed in the Annex to this Resolution with respect to the subject network or system;

2 that administrations responding under No. **9.52** to a request for coordination under Nos. **9.7**, **9.12**, **9.12A** and/or **9.13** in the bands mentioned in *considering a)*, shall, during the process of coordination mentioned in *resolves 1* and upon request by the requesting administration, inform the requesting administration (with a copy to the Bureau) whether it has met the criteria listed in the Annex to this Resolution with respect to the subject network or system;

3 that administrations operating or planning to operate RNSS systems in the bands mentioned in *considering a)*, which systems are not subject to coordination under Section II of Article **9**, shall take all practicable steps to resolve issues of intersystem compatibility on a bilateral basis;

4 that in undertaking the obligations under *resolves 3* above, administrations operating or planning to operate RNSS systems or networks should first address intersystem compatibility between RNSS systems or networks that are actually in operation or are in the process of being implemented;

5 that for application of *resolves 4* above, an RNSS system or network that has satisfied the criteria listed in the Annex to this Resolution with respect to the subject network or system would be considered to be actually in the process of being implemented;

6 that when notifying the Bureau under No. **11.47** that a frequency assignment to station(s) in the RNSS in the bands mentioned in *considering a)* has been brought into use, the notifying administration, if it has not already done so, shall inform the Bureau whether it has met the criteria listed in the Annex to this Resolution;

7 that implementation of this Resolution shall be conducted in such a way as to promote the principle of equality and fairness in ensuring access for RNSS operators and planned RNSS systems in the above-referenced bands,

*instructs the Radiocommunication Bureau*

to provide, on request, assistance to administrations operating or planning to operate RNSS systems in the bands mentioned in *considering a)* above, which systems are not subject to coordination under Section II of Article **9**, in securing bilateral agreements with other RNSS systems as early as possible.

## ANNEX TO RESOLUTION 610 (REV.WRC-19)

### **Criteria for application of Resolution 610 (Rev.WRC-19)**

1 Submission of appropriate Coordination Request information.

2 Entry into satellite manufacturing or procurement agreement, and entry into satellite launch agreement.

The RNSS system or network operator should possess:

- i) clear evidence of a binding agreement for the manufacture or procurement of its satellites; and
- ii) clear evidence of a binding agreement to launch its satellites.

The manufacturing or procurement agreement should identify the contract milestones leading to the completion of manufacture or procurement of satellites required for the service provision, and the launch agreement should identify the launch date, launch site and launch service provider. The notifying administration is responsible for authenticating the evidence of agreement.

The information required under this criterion may be submitted in the form of a written commitment by the responsible administration.

3 As an alternative to satellite manufacturing or procurement and launch agreements, clear evidence of guaranteed funding arrangements for the implementation of the project would be accepted. The notifying administration is responsible for authenticating the evidence of these arrangements.

**MOD****RESOLUTION 646 (REV.WRC-19)****Public protection and disaster relief**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the term “public protection radiocommunication” refers to radiocommunications used by agencies and organizations responsible for the maintenance of law and order, protection of life and property and emergency situations;
- b)* that the term “disaster relief radiocommunication” refers to radiocommunications used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant widespread threat to human life, health, property or the environment, whether caused by accident, natural phenomena or human activity, and whether developing suddenly or as a result of complex, long-term processes;
- c)* the growing telecommunication and radiocommunication needs of public protection agencies and organizations, including those dealing with emergency situations and disaster relief, that are vital to the maintenance of law and order, protection of life and property, disaster relief and emergency response;
- d)* that many administrations wish to promote interoperability and interworking between systems used for public protection and disaster relief (PPDR), both nationally and for cross-border operations in emergency situations and for disaster relief;
- e)* that existing systems for PPDR applications mainly support narrowband/wideband voice and data applications;
- f)* that, although narrowband and wideband systems will continue to be used to meet PPDR requirements, there is a growing need for broadband applications to support improved data and multimedia capabilities, which require higher data rates and higher capacity, and appropriate spectrum may need to be made available on a national basis to meet these growing needs;
- g)* that new technologies for broadband PPDR applications are being developed in various standards organizations, e.g. International Mobile Telecommunications (IMT) technologies that support higher data rates and higher capacity for PPDR applications, and these technologies are also being used to meet the needs of PPDR agencies and organizations;
- h)* that continuing development of new technologies and systems, such as IMT and Intelligent Transportation Systems (ITS), may be able to further support or supplement advanced PPDR applications;
- i)* that some commercial terrestrial and satellite systems are complementing the dedicated systems in support of PPDR, and that the use of commercial solutions will be in response to technology development and market demands;
- j)* that administrations may have different operational needs and spectrum requirements for PPDR applications depending on the circumstances;

k) that an approach based on global and/or regional frequency ranges<sup>1</sup> may enable administrations to benefit from harmonization while continuing to meet national planning requirements,

*recognizing*

a) the benefits of spectrum harmonization such as:

- increased potential for interoperability;
- clear guidance for standardization;
- increased volume of equipment resulting in economies of scale, more cost-efficient equipment and expanded equipment availability;
- improved spectrum management and planning;
- more effective international aid during disasters and major events; and
- enhanced cross-border coordination and circulation of equipment;

b) that the organizational distinction between public protection activities and disaster relief activities are matters for administrations to determine at the national level;

c) that national spectrum planning for PPDR needs to have regard to cooperation and bilateral consultation with other concerned administrations, which should be facilitated by greater levels of spectrum harmonization;

d) that the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations (Tampere, 1998), an international treaty deposited with the United Nations Secretary-General and related United Nations General Assembly resolutions and reports are also relevant in this regard;

e) that Resolution 36 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference urges Member States Parties to the Tampere Convention to take all practical steps for the application of the Tampere Convention and to work closely with the operational coordinator as provided for therein;

f) that Recommendation ITU-R M.1637 offers guidance to facilitate the global cross-border circulation of radiocommunication equipment in emergency and disaster relief situations;

g) that Recommendation ITU R M.2009 identifies radio interface standards applicable to PPDR operations;

h) that Report ITU-R M.2291 provides details of the capabilities of IMT technologies to meet the requirements of applications supporting broadband PPDR operations;

i) that Report ITU-R M.2377 provides details of systems and applications supporting PPDR operations in narrowband, wideband and broadband use;

j) that PPDR agencies and organizations have an initial set of requirements, including but not limited to interoperability, secure and reliable communications, sufficient capacity to respond to emergencies, priority access in the use of non-dedicated systems, fast response times, ability to handle multiple group calls and the ability to cover large areas, as described in Reports ITU-R M.2377 and ITU-R M.2291;

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<sup>1</sup> In the context of this Resolution, the term “frequency range” means a range of frequencies over which radio equipment is envisaged to be capable of operating but limited to specific frequency band(s) according to national conditions and requirements.

- k) that Report ITU-R BT.2299 provides a compilation of supporting evidence to the effect that terrestrial broadcasting plays an important role in disseminating information to the public in times of emergencies;
- l) that Recommendation ITU-R M.2015 contains regionally harmonized PPDR frequency arrangements, as well as frequency arrangements of individual administrations<sup>2</sup>;
- m) that in times of disasters, if most terrestrial-based networks are destroyed or impaired, amateur, satellite and other non-ground-based networks may be available to provide communication services to assist in PPDR efforts;
- n) that the amount of spectrum needed for public protection on a daily basis differs significantly between countries, and that certain amounts of spectrum are already in use in various countries for PPDR applications;
- o) that in response to a disaster or emergency, access to additional spectrum on a temporary basis may be required for PPDR operations;
- p) that not all frequencies within an identified common frequency range will be available for PPDR use within each country;
- q) that the identification of common frequency ranges within which equipment could operate may ease interoperability and/or interworking, with mutual cooperation and consultation, especially in national, regional and cross-border emergency situations and disaster relief operations;
- r) that when a disaster occurs, the PPDR agencies and organizations are usually the first responders on the scene using their day-to-day communication systems and, additionally, other agencies and organizations may also become involved in disaster relief operations;
- s) that some countries in Region 1 have identified certain parts of the frequency range 694-791 MHz for broadband PPDR deployment;
- t) that some countries in Region 1 have identified certain parts of the frequency range 790-862 MHz for broadband PPDR deployment;
- u) the provisions contained in Nos. 5.266 and 5.267, and **Resolution 205 (Rev.WRC-19)**;
- v) that Metajds and MetSat services operate on a globally harmonized basis in the frequency band 400.15-406 MHz;
- w) that the radio astronomy service operates on a primary basis in the frequency band 406.1-410 MHz and there may be PPDR operations adjacent to that frequency band,

*noting*

- a) that many administrations will continue to use different frequency bands below 1 GHz for narrowband systems and applications supporting PPDR and may decide to use the same range for future PPDR systems;
- b) that some administrations also use certain frequency bands above 1 GHz for broadband PPDR applications;

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<sup>2</sup> For example, **as of November 2015** some countries in Region 3 **had** adopted parts of the frequency ranges 138-174 MHz, 351-370 MHz and 380-400 MHz for narrowband PPDR applications and the frequency ranges 174-205 MHz and 1 447-1 467 MHz for broadband PPDR applications.



- c) that applications requiring large coverage areas and providing good signal availability would generally be accommodated in lower frequency bands;
- d) that many administrations have made significant investments in PPDR systems;
- e) that flexibility allows disaster relief agencies and organizations to use current and future radiocommunications, so as to facilitate their humanitarian operations;
- f) that disasters and emergency events require response not only from PPDR agencies and organizations but also from humanitarian agencies and organizations;
- g) that broadband PPDR can be realized and deployed in the frequency bands identified for IMT;
- h) the benefits of cooperation between countries for the provision of effective and appropriate humanitarian assistance in case of disasters, particularly in view of the special operational requirements of such activities involving multinational response;
- i) the needs of countries, particularly the developing countries<sup>3</sup>, for cost-efficient communication equipment;
- j) that the use of technologies based on Internet protocols is well established,  
*emphasizing*
- a) that the frequency ranges that are covered by the *resolves* part of this Resolution are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations and are currently used intensively by the fixed, mobile, mobile-satellite and broadcasting services;
- b) that PPDR applications in the ranges listed in *resolves* 2 and 3 are intended to operate in the mobile service allocated on a primary basis according to the provisions of the Radio Regulations;
- c) that flexibility must be afforded to administrations to determine:
- how much spectrum to make available at a national level for PPDR from the ranges in the *resolves* part of this Resolution in order to meet their particular national requirements;
  - the need and timing of availability as well as the conditions of usage of the bands used for PPDR, including those covered in this Resolution and Recommendation ITU-R M.2015, in order to meet specific regional or national situations<sup>4</sup>;
- d) that the provisions of Nos. **1.59** and **4.10** of the Radio Regulations do not apply to PPDR;
- e) that administrations can adopt their frequency arrangements for the terrestrial component of IMT, from those detailed in Recommendation ITU-R M.1036,

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<sup>3</sup> Taking into account, for example, the latest version of the ITU-D Handbook on disaster relief.

<sup>4</sup> For example, some countries in Region 1 have identified certain parts of the frequency range 694-862 MHz for broadband PPDR applications.

*resolves*

- 1 to encourage administrations to use harmonized frequency ranges for PPDR to the maximum extent possible, taking into account the national and regional requirements and also having regard to any needed consultation and cooperation with other concerned countries;
- 2 to encourage administrations to consider parts of the frequency range 694-894 MHz, as described in the most recent version of Recommendation ITU-R M.2015, when undertaking their national planning for their PPDR applications, in particular broadband, in order to achieve harmonization, taking into account *emphasizing c) and e)* above;
- 3 to further encourage administrations to also consider parts of the following regionally harmonized frequency ranges, for their PPDR applications:
  - in Region 1: 380-470 MHz;
  - in Region 3: 406.1-430 MHz, 440-470 MHz and 4 940-4 990 MHz;
- 4 that PPDR frequency arrangements within the frequency ranges specified in *resolves 2 and 3*, as well as countries' frequency arrangements for PPDR, should be included in Recommendation ITU-R M.2015;
- 5 that the use of the frequency ranges for PPDR in *resolves 2 and 3* above, as well as the use of the countries' frequency arrangements for PPDR, as described in the most recent version of Recommendation ITU-R M.2015, must not cause unacceptable interference, nor constrain the use of these frequency ranges by applications of the services to which these ranges are allocated in the Radio Regulations;
- 6 to encourage administrations, in emergency and disaster relief situations, to satisfy temporary needs for frequencies in addition to what may be normally provided for in agreements with the concerned administrations;
- 7 to encourage administrations to facilitate cross-border circulation of radiocommunication equipment intended for use in emergency and disaster relief situations through mutual cooperation and consultation without hindering national legislation;
- 8 that administrations encourage PPDR agencies and organizations to utilize relevant ITU-R Recommendations in planning spectrum use and implementing technology and systems supporting PPDR;
- 9 to encourage administrations to continue to work closely with their PPDR community to further refine the operational requirements for PPDR activities,

*invites the ITU Radiocommunication Sector*

- 1 to continue its technical studies and to make recommendations concerning technical and operational implementation, as necessary, to meet the needs of PPDR radiocommunication applications, taking into account the capabilities, evolution and any resulting transition requirements of the existing systems, particularly those of many developing countries, for national and international operations;

**MOD**

**RESOLUTION 647 (REV.WRC-19)**

**Radiocommunication aspects, including spectrum management guidelines,  
for early warning, disaster prediction, detection, mitigation and  
relief operations relating to emergencies and disasters**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that natural disasters have underscored the importance of utilizing effective measures to mitigate their effects, including prediction, detection and alerting through the coordinated and effective use of radio-frequency spectrum;
- b)* ITU's comprehensive role in emergency communications, not only in the field of radiocommunications, but also in the area of technical standards to facilitate interconnection and interoperability of networks for monitoring and management at the onset of and during emergency and disaster situations, and as an integral part of the telecommunication development agenda through the Hyderabad Action Plan;
- c)* that administrations have been urged to take all practical steps to facilitate the rapid deployment and effective use of telecommunication resources for early warning, emergency, disaster mitigation and relief operations by reducing and, where possible, removing regulatory barriers and strengthening global, regional and transborder cooperation between States;
- d)* that effective use of telecommunications/information and communication technologies (ICTs), at the onset of and during critical emergencies, is essential for disaster forecasting and prediction, timely detection, early warning, mitigation, management, relief strategies and operations, and plays a vital role in the safety and security of relief workers in the field;
- e)* the particular needs of developing countries and the special requirements of the inhabitants of high-risk areas exposed to disasters, as well as those living in remote areas;
- f)* the work carried out by the ITU Telecommunication Standardization Sector in standardizing the common alerting protocol (CAP), through the approval of the relevant CAP Recommendation,

*recognizing*

- a)* that the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations (Tampere, 1998)<sup>1</sup>, an international treaty deposited with the United Nations Secretary-General, calls on the States Parties, when possible, and in conformity with their national law, to develop and implement measures to facilitate the availability of telecommunication resources for such operations;
- b)* Article 40 of the ITU Constitution, on priority of telecommunications concerning safety of life;
- c)* Article 46 of the Constitution, on distress calls and messages;

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<sup>1</sup> However, a number of countries have not ratified the Tampere Convention.

- d) Resolution 34 (Rev. Dubai, 2014) of the World Telecommunication Development Conference, on the role of telecommunications/ICTs in disaster preparedness, early warning, rescue, mitigation, relief and response, as well as ITU Telecommunication Development Sector Question 5/2 “Utilization of telecommunications/ICTs for disaster preparedness, mitigation and response”;
- e) Resolution 36 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference, on telecommunications/ICTs in the service of humanitarian assistance;
- f) Resolution 136 (Rev. Busan, 2014) of the Plenipotentiary Conference, on the use of telecommunications/ICTs for monitoring and management in emergency and disaster situations for early warning, prevention, mitigation and relief;
- g) Resolution ITU-R 55, on the ITU Radiocommunication Sector (ITU-R) studies of disaster prediction, detection, mitigation and relief;
- h) that Resolution **646 (Rev.WRC-19)** addresses the broader category of public protection and disaster relief (PPDR), as well as the harmonization of frequency bands/ranges for PPDR solutions<sup>2</sup>;
- i) that some administrations may have different operational needs and spectrum requirements for emergency and disaster-relief applications, depending on their circumstances;
- j) that the immediate availability of spectrum to support emergency radiocommunication equipment and administration contact information on disaster relief issues are important for successful telecommunications in the very early stages of humanitarian assistance intervention for disaster relief,

*aware*

of the progress made in regional organizations around the world, and in particular in regional telecommunication organizations, on matters related to emergency communications planning and response,

*recognizing further*

that ITU-R has developed a Handbook on Emergency and Disaster Relief as well as various Reports and Recommendations relating to emergency and disaster relief operations and radiocommunication resources<sup>3</sup>,

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<sup>2</sup> Resolution **646 (Rev.WRC-19)** includes *considering* paragraphs to the effect that the term “public protection radiocommunication” refers to radiocommunications used by agencies and organizations responsible for the maintenance of law and order, protection of life and property and emergency situations, and that the term “disaster relief radiocommunication” refers to radiocommunications used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant widespread threat to human life, health, property or the environment, whether caused by accident, natural phenomena or human activity, and whether developing suddenly or as a result of complex, long-term processes.

<sup>3</sup> <http://itu.int/go/ITU-R/emergency>

*noting*

- a) the close relation of this Resolution with Resolution **646 (Rev.WRC-19)**, on PPDR;
- b) that when a disaster occurs, the disaster relief agencies are usually the first on the scene using their day-to-day communication systems, but that in most cases other agencies and organizations may also be involved in disaster relief operations;
- c) that there is a critical requirement to perform immediate spectrum management actions, including frequency coordination, sharing and spectrum reuse, within a disaster area;
- d) that national spectrum planning for emergency and disaster relief should take into account the need for cooperation and bilateral consultation with other concerned administrations, which can be facilitated by spectrum harmonization, as well as agreed spectrum management guidelines pertaining to disaster relief and emergency planning;
- e) that in times of disasters, radiocommunication facilities may be destroyed or impaired and the national regulatory authorities may not be able to provide the necessary spectrum management services for the deployment of radio systems for relief operations;
- f) that availability of information, such as the identification of administration disaster-relief contact information, frequency availability within individual administrations within which equipment could operate, and any relevant instructions or procedures may ease the interoperability and/or interworking, with mutual cooperation and consultation, especially in national, regional and cross-border emergency situations and disaster relief activities,

*noting further*

- a) that flexibility must be afforded to disaster relief agencies and organizations to use current and future radiocommunications, so as to facilitate their humanitarian operations;
- b) that it is in the interest of administrations and disaster relief agencies and organizations to have access to updated information on national spectrum planning for emergency and disaster relief,

*taking into account*

that the Radiocommunication Bureau (BR) has established and maintains a database<sup>3</sup> containing administration contact information, available frequencies/frequency bands for use by terrestrial and space services, and any additional information or instructions relevant to emergency situations within these administrations,

*resolves*

- 1 that ITU-R continue through its study groups to study those aspects of radiocommunication/ICTs that are relevant to early warning, disaster prediction, detection, mitigation and relief operations taking into account Resolution ITU-R 55;
- 2 to encourage administrations to communicate to BR the relevant up-to-date administration contact information and, where available, the frequencies or frequency bands for use in emergency and disaster relief operations;
- 3 to reiterate to administrations the importance of having up-to-date information referred to in *resolves* 2 above available for use in the very early stages of humanitarian assistance intervention for disaster relief,

*instructs the Director of the Radiocommunication Bureau*

- 1 to support administrations in their work towards the implementation of Resolution 136 (Rev. Dubai, 2018), as well as the Tampere Convention;
- 2 to coordinate activities between this Resolution and Resolution **646 (Rev.WRC-19)** in order to minimize possible overlap;
- 3 to continue to assist Member States with their emergency communication preparedness activities by maintaining the database<sup>3</sup> of information from administrations for use in emergency situations, which includes contact information and optionally includes available frequencies;
- 4 to facilitate online access to the database by administrations, national regulatory authorities, disaster relief agencies and organizations, in particular the United Nations Emergency Relief Coordinator, in accordance with the operating procedures developed for disaster situations;
- 5 to collaborate with the United Nations Office for the Coordination of Humanitarian Affairs and other organizations, as appropriate, in the development and dissemination of standard operating procedures and relevant spectrum management practices for use in the event of a disaster situation;
- 6 to collaborate, as appropriate, with the United Nations Working Group on Emergency Telecommunications (WGET) and the radio frequency and radio standards group under the UN Emergency Telecommunications Cluster (ETC) for which the World Food Programme (WFP) is the cluster lead;
- 7 to take into consideration, and collaborate in, as appropriate, all relevant activities in ITU's other two Sectors and General Secretariat;
- 8 to report on the progress on this Resolution to subsequent world radiocommunication conferences,

*invites the ITU Radiocommunication Sector*

to continue conducting studies as necessary, in accordance with *resolves* 1 and in support of developing and maintaining appropriate spectrum management guidelines applicable in emergency and disaster relief operations,

*invites the Director of the Telecommunication Standardization Bureau and the Director of the Telecommunication Development Bureau*

to collaborate closely with the Director of BR to ensure that a consistent and coherent approach is adopted in the development of strategies in response to emergency and disaster situations,

*urges administrations*

to participate in the emergency communication preparedness activities described above and to provide to BR their information and, in particular, up-to-date contact information related to emergency and disaster relief radiocommunications for inclusion in the database, taking into account Resolution ITU-R 55.

**MOD**

**RESOLUTION 656 (REV.WRC-19)**

**Possible secondary allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders in the range of frequencies around 45 MHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that spaceborne active radio-frequency sensors can provide unique information on physical properties of the Earth and other planets;
- b) that spaceborne active remote sensing requires specific frequency ranges depending on the physical phenomena to be observed;
- c) that there is an interest in using active spaceborne sensors in the vicinity of the 40-50 MHz frequency range for measurements of the Earth's subsurface to provide radar maps of subsurface scattering layers with the intent to locate water/ice/deposits;
- d) that worldwide, periodic measurements of subsurface water deposits require the use of spaceborne active sensors;
- e) that the 40-50 MHz frequency range is preferable to satisfy all requirements for spaceborne radar sounders;
- f) that spaceborne radars are intended to be operated only in either uninhabited or sparsely populated areas of the globe, with particular focus on deserts and polar ice fields, and only at night-time from 3 a.m. to 6 a.m. locally,

*recognizing*

- a) that the 40-50 MHz range is allocated to the fixed, mobile and broadcasting services on a primary basis;
- b) that the frequency range 40.98 to 41.015 MHz is used by the space research service on a secondary basis;
- c) that country footnotes in the Table of Frequency Allocations for the 40-50 MHz frequency range provide primary allocations for the aeronautical radionavigation and radiolocation services in certain parts of the world;
- d) that Recommendation ITU-R RS.2042-1 provides typical technical and operating characteristics for spaceborne radar sounder systems using the 40-50 MHz frequency range that should be used for interference and compatibility studies;
- e) that Report ITU-R RS.2455-0 provides preliminary results of sharing studies between a 45 MHz radar sounder and incumbent fixed, mobile, broadcasting and space research services operating in the 40-50 MHz frequency range,

*resolves to invite the 2023 world radiocommunication conference*

to consider the results of studies on spectrum needs for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, and take appropriate action,

*invites ITU-R*

to conduct studies on spectrum needs and sharing studies between the Earth exploration-satellite (active) service and the radiolocation, fixed, mobile, broadcasting, amateur and space research services in the 40-50 MHz frequency range and in adjacent bands,

*invites administrations*

to participate actively in the studies by submitting contributions to the ITU Radiocommunication Sector,

*instructs the Secretary-General*

to bring this Resolution to the attention of international and regional organizations concerned.



**MOD**

**RESOLUTION 657 (REV.WRC-19)**

**Protection of radio spectrum-reliant space weather sensors used for global prediction and warnings**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that space weather observations are important for detecting solar activity events that impact services critical to the economy, safety and security of administrations and their population;
- b) that these observations are made from ground-based and space-based systems;
- c) that some of the sensors operate by receiving signals of opportunity, including, but not limited to, low-level natural emissions of the Sun, Earth's atmosphere, and other celestial bodies, and therefore may suffer harmful interference at levels which could be tolerated by other radio systems;
- d) that spectrum-reliant space weather sensor technology has been developed and operational systems have been deployed without much regard for domestic or international spectrum regulations, or for the potential need for protection from interference;
- e) that a wide variety of spectrum-reliant space weather sensors currently operate relatively free of harmful interference; however, the radio interference environment could change as a result of changes made to the Radio Regulations;
- f) that spectrum-reliant space weather sensors may be vulnerable to interference from both terrestrial and spaceborne systems;
- g) that, while all spectrum-reliant space weather observation systems are important, the most critical need for radio regulatory protection is for those systems that are used operationally in the production of forecasts and warnings of space weather events that can cause harm to important sectors of national economies, human welfare and national security;
- h) that frequency use is not consistent across the limited number of operational systems,

*recognizing*

- a) that no frequency bands have been documented in any manner in the Radio Regulations for space weather sensor applications;
- b) that Report ITU-R RS.2456-0 – Space weather sensor systems using radio spectrum contains a summary of spectrum-reliant space weather sensors and identifies the most critical operational systems (hereafter referred to as operational systems);
- c) that the systems used for operational space weather monitoring, prediction and warnings, documented in Report ITU-R RS.2456-0 are deployed globally;
- d) that while the number of systems is currently limited, the interest in and the importance of data from space weather monitoring systems is growing with time;
- e) that certain, receive-only space weather applications may operate in a manner consistent with the definition of the meteorological aids (Met aids) service, but for scientific reasons observations cannot be conducted in frequency bands currently allocated to the Met aids service;

f) that the ITU Radiocommunication Sector (ITU-R) has a Study Question ITU-R 256/7 to study the technical and operational characteristics, frequency requirements and appropriate radio service designation for space weather sensors,

*noting*

- a) that any regulatory action associated with space weather sensor applications should take into account incumbent services that are already operating in the frequency bands of interest;
- b) that ITU-R studies may show that protection of some systems to be strictly a national matter rather than requiring WRC action;
- c) that while data products are used for forecast and warnings related to public safety, among other purposes, the provisions of Nos. **1.59** and **4.10** of the Radio Regulations do not apply to spectrum-reliant space weather sensors,

*resolves to invite ITU-R*

1 to identify, in time for WRC-23, and based on existing and possible further ITU-R studies on the technical and operational characteristics, specific space weather sensors which need to be protected by appropriate regulation, including:

- to determine if receive-only space weather sensors shall be designated as applications of the Metajds service;
- to determine the appropriate radiocommunication service, if any, for cases where it is determined that receive-only space weather sensors do not fall under the Metajds service;

2 to conduct, in time for WRC-23, any necessary sharing studies with incumbent systems operating in frequency bands used by space weather sensors with the objective of determining potential regulatory provisions that can be provided to receive-only operational space weather sensors for their appropriate recognition in the Radio Regulations, while not placing additional constraints on incumbent services;

3 to develop potential solutions to describe in the Radio Regulations in Articles **1** and **4**, and/or as a WRC resolution, if deemed appropriate, for consideration by WRC-23, space weather sensor systems and their corresponding usage, as well as protection requirements for receive-only space weather sensors;

4 to conduct studies, in time for WRC-23, on the technical and operational characteristics of active space weather sensors and conduct necessary sharing studies with incumbent systems operating in frequency bands used by active space weather sensors, with the objective of determining the appropriate radiocommunication service for those sensors,

*instructs the Director of the Radiocommunication Bureau*

to report on the results of the ITU-R studies to WRC-23,

*invites administrations*

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to ITU-R,

*instructs the Secretary-General*

to bring this Resolution to the attention of the World Meteorological Organization (WMO) and other international and regional organizations concerned.

**MOD****RESOLUTION 731 (REV.WRC-19)****Consideration of sharing and adjacent-band compatibility  
between passive and active services above 71 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the changes made to the Table of Frequency Allocations by the World Radiocommunication Conference (Istanbul, 2000) in bands above 71 GHz were based on the requirements known at the time of that Conference;
- b)* that the passive service spectrum requirements above 71 GHz are based on physical phenomena and therefore are well known, and are reflected in the changes made to the Table of Frequency Allocations by that Conference;
- c)* that several bands above 71 GHz are already used by Earth exploration-satellite service (passive) and space research service (passive) because they are unique bands for the measurement of specific atmospheric parameters;
- d)* that frequency bands in the range 275-1 000 GHz are identified for use by administrations for passive service applications in No. **5.565**, without precluding the use of this range by active service applications, and urging administrations to take all practicable steps to protect the passive service applications from harmful interference;
- e)* that there is currently only limited knowledge of requirements and implementation plans for the active services that will operate in bands above 71 GHz;
- f)* that, in the past, technological developments have led to viable communication systems operating at increasingly higher frequencies, and that this can be expected to continue so as to make communication technology available in the future in the frequency bands above 71 GHz;
- g)* that, in the future, alternative spectrum needs for the active and passive services should be accommodated when the new technologies become available;
- h)* that, following the revisions to the Table of Frequency Allocations by the World Radiocommunication Conference (Istanbul, 2000), sharing studies may still be required for services in some bands above 71 GHz;
- i)* that interference criteria for passive sensors have been developed and are given in Recommendation ITU-R RS.2017;
- j)* that protection criteria for radio astronomy have been developed and are given in Recommendations ITU-R RA.769 and ITU-R RA.1513 and Report ITU-R RA.2189;
- k)* that several satellite downlink allocations have been made in bands adjacent to those allocated to the radio astronomy service;
- l)* that, sharing criteria for active and passive services in bands above 71 GHz have not yet been fully developed within ITU-R,

*recognizing*

that, to the extent practicable, the burden of sharing among active and passive services should be equitably distributed among the services to which allocations are made,

*resolves*

to invite a future competent world radiocommunication conference to consider the results of ITU-R studies referred to in *invites ITU-R* below with a view to taking the necessary action, as appropriate, in order to accommodate the emerging requirements of active services, taking into account the requirements of the passive services, in bands above 71 GHz,

*urges administrations*

to note the possibility of changes to Article 5 to accommodate emerging requirements for active services, as indicated in this Resolution, and to take this into account in the development of national policies and regulations,

*invites ITU-R*

1 to continue its studies to determine if and under what conditions sharing is possible between active and passive services in the bands above 71 GHz, such as, but not limited to, 100-102 GHz, 116-122.25 GHz, 148.5-151.5 GHz, 174.8-191.8 GHz, 226-231.5 GHz and 235-238 GHz;

2 to conduct studies to determine the specific conditions to be applied to the land mobile and fixed service applications to ensure the protection of Earth exploration-satellite service (passive) applications in the frequency bands 296-306 GHz, 313-318 GHz and 333-356 GHz;

3 to study means of avoiding adjacent-band interference from space services (downlinks) into radio astronomy bands above 71 GHz;

4 to take into account the principles of burden-sharing to the extent practicable in their studies;

5 to complete the necessary studies when the technical characteristics of the active services in these bands are known;

6 to develop Recommendations specifying sharing criteria for those bands where sharing is feasible,

*instructs the Secretary-General*

to bring this Resolution to the attention of the international and regional organizations concerned.

**MOD**

**RESOLUTION 739 (REV.WRC-19)**

**Compatibility between the radio astronomy service and the active space services in certain adjacent and nearby frequency bands**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that adjacent or nearby primary service allocations have been made to the radio astronomy service, and to various space services, such as the fixed-satellite service (FSS), radionavigation-satellite service (RNSS), mobile-satellite service (MSS) and broadcasting-satellite service (BSS), hereafter referred to as “active space services”;
- b)* that, in many cases, the frequencies used by the radio astronomy service (RAS) are chosen to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, so shifting frequency to avoid or mitigate interference problems may not be possible;
- c)* that Report ITU-R SM.2091 provides a methodology for conducting, and a framework for documenting the results of, compatibility studies between active space service and the radio astronomy service band-pairs;
- d)* that Report ITU-R SM.2091 also provides the results of compatibility studies between the radio astronomy service and an active space service in certain adjacent and nearby frequency bands;
- e)* that appropriate consultation between administrations has the potential to lead to the development of innovative solutions and to the rapid deployment of systems;
- f)* that, for technical or operational reasons, more stringent spurious emission limits than the general limits in Appendix 3 may be required to protect the RAS from active services in specific frequency bands,

*noting*

- a)* that the additional burden of undertaking any technical examination should not be placed on the Radiocommunication Bureau;
- b)* that a consultation procedure, as contained in this Resolution, would not place an additional burden on the Bureau;
- c)* that Recommendation ITU-R M.1583 provides a methodology based on the equivalent power flux-density (epfd) concept for calculation of interference resulting from unwanted emissions from non-geostationary (non-GSO) satellite systems of the MSS or RNSS into radio astronomy stations;
- d)* that Recommendation ITU-R S.1586 provides a methodology based on the epfd concept for calculation of interference resulting from unwanted emissions from non-GSO systems of the FSS into radio astronomy stations;
- e)* that the methodology described in these Recommendations may also be used to study the case of non-GSO systems in the BSS;

- f) that Recommendation ITU-R RA.1631 provides antenna patterns to be used for compatibility analyses between non-GSO systems and RAS stations, based on the epfd concept;
- g) that Recommendation ITU-R RA.1513 provides acceptable levels of data loss to radio astronomy observations, stating in particular that the percentage of data loss caused by any system should be lower than 2%;
- h) that some of the results documented in Report ITU-R SM.2091 may be used as threshold levels to initiate the consultation procedure;
- i) that the results of successful consultation between concerned administrations would ensure that the interests of both the active and radio astronomy services are considered;
- j) that measures taken by active space services to protect radio astronomy stations from interference may result in increased costs and/or reduced capabilities for those services;
- k) that conversely, not taking such measures may result in additional operating costs and reduced operational effectiveness for the radio astronomy stations concerned;
- l) that the implementation of additional interference mitigation measures at the radio astronomy station may increase operating costs and reduce observational effectiveness;
- m) that conversely, not implementing such measures may impose upon the active space services an additional cost burden and reduction in service capability,

*recognizing*

- a) that unwanted emissions produced by stations of the active space services may cause unacceptable interference to stations of the RAS;
- b) that, although some unwanted emissions from transmitters on space stations can be controlled through careful design methods and appropriate testing procedures, other unwanted emissions, such as narrow-band spurious emissions, generated by uncontrollable and/or unpredictable physical mechanisms, may only be detected after the spacecraft is launched;
- c) that there is an uncertainty in the pre-launch assessment of the levels of unwanted emissions;
- d) that it is necessary to ensure an equitable sharing of burden for achieving compatibility between the active space services and the RAS;
- e) that for those cases where difficulties are encountered in meeting the values in Annex 1, a consultation procedure could be used to resolve the difficulties,

*resolves*

- 1 that an administration takes all reasonable steps to ensure that any space station or satellite system being designed and constructed to operate in the frequency bands in Annex 1 meets the values given therein at any radio astronomy station operating in the corresponding frequency bands identified in this Annex;
- 2 that in the event that during construction and prior to launch it is determined that, after having considered all reasonable means, the unwanted emissions from the space station or satellite system cannot meet the values given in Annex 1, the administration that notified the space station or satellite system contacts, as soon as possible, the administration operating the radio astronomy station to confirm that *resolves* 1 has been fulfilled, and the concerned administrations enter into a consultation process in order to achieve a mutually acceptable solution;

3 that in the event, following the space station launch, an administration operating a radio astronomy station determines that, due to unexpected circumstances, a space station or satellite system does not meet the values for unwanted emissions given in Annex 1 at that radio astronomy station, it contacts the administration that notified the space station or satellite system so that the administration that notified the space station or satellite system confirms that *resolves* 1 has been fulfilled, and the concerned administrations enter into a consultation process in order to identify further steps with a view to achieving a mutually acceptable solution;

4 that the radio astronomy stations to be taken into account in applying *resolves* 1, 2 and 3 are those which are operating in the frequency band(s) identified in Annex 1 and which are notified before the date of reception of the advance publication information of the space station or satellite system to which this Resolution applies;

5 that the space stations or satellite systems to be considered in the application of *resolves* 1 to 4 above are those designed to operate in the space service frequency bands listed in the tables of Annex 1 for which advance publication information (API) is received by the Bureau following the entry into force of the Final Acts of the appropriate conference, as specified in these tables;

6 that the objective of the consultation process in *resolves* 1, 2 and 3 is to achieve a mutually acceptable solution, using as guidance Report ITU-R SM.2091 and any other ITU-R Recommendations deemed relevant by the concerned administrations;

7 that the Bureau shall make no examination or finding with respect to this Resolution under either Article 9 or 11,

*invites administrations*

1 to take all appropriate and practicable steps, from the design phase onward, to ensure that unwanted emissions are minimized from space stations that are planned to operate in one or more space service allocations, in order to avoid exceeding the threshold levels of unwanted emissions identified in Annex 1 at any radio astronomy station;

2 to take all practicable steps, from the design phase onward, to minimize the sensitivity of radio astronomy stations to interference and to take into account the need to implement interference mitigation measures.

**MOD**

**ANNEX 1 TO RESOLUTION 739 (REV.WRC-19)**

**Unwanted emission threshold levels**

The unwanted emission threshold levels applicable to geostationary space stations are given in Table 1-1 in terms of power flux-density (pfd) in a reference bandwidth produced at a radio astronomy station.

In Table 1-1 the unwanted emission threshold levels given in the fourth, sixth and eighth columns (associated with the reference bandwidth contained in the adjacent columns) should be met by any geostationary space station operating in the frequency bands indicated in the second column at the radio astronomy station operating in the frequency band mentioned in the third column.

The unwanted emission threshold levels applicable to space stations of a non-geostationary system are given in Table 1-2 in terms of the equivalent power flux-density (epfd), produced at a radio astronomy station in a reference bandwidth by all the space stations in a non-geostationary satellite system that are visible to the radio astronomy station considered, not to be exceeded during a given percentage of time, over the whole sky.

In Table 1-2 the epfd value given in the fourth, sixth and eighth columns (associated with the reference bandwidths contained in the adjacent column) should be met by all the space stations of a non-geostationary satellite system operating in the frequency bands indicated in the second column at the radio astronomy station operating in the frequency band mentioned in the third column. The epfd value at a given radio astronomy station shall be evaluated by using the antenna pattern and the RAS maximum antenna gain given in Recommendation ITU-R RA.1631-0. Guidance on the calculation of epfd can be found in Recommendations ITU-R S.1586 and ITU-R M.1583. The elevation angles of the radio astronomy stations to be taken into account in the epfd calculation are those higher than the minimum elevation angle  $\theta_{min}$  of the radio telescope. In the absence of such information a value of  $5^\circ$  shall be taken. The percentage of time during which the epfd level shall not be exceeded is mentioned in Note <sup>(1)</sup> of Table 1-2.

Some sections of Report ITU-R SM.2091 indicate levels of unwanted emissions in radio astronomy bands that certain satellite systems, by design, do not exceed.



TABLE 1-1  
pfd thresholds for unwanted emissions from any geostationary space station  
at a radio astronomy station

Space service	Space service frequency band	Radio astronomy frequency band	Single dish, continuum observations		Single dish, spectral line observations		VLBI		Condition of application: the API is received by the Bureau following the entry into force of the Final Acts of:
			pfd <sup>(1)</sup>	Reference bandwidth	pfd <sup>(1)</sup>	Reference bandwidth	pfd <sup>(1)</sup>	Reference bandwidth	
			(MHz)	(MHz)	(dB(W/m <sup>2</sup> ))	(MHz)	(dB(W/m <sup>2</sup> ))	(kHz)	
MSS (space-to-Earth)	387-390	322-328.6	-189	6.6	-204	10	-177	10	WRC-07
BSS MSS (space-to-Earth)	1 452-1 492 1 525-1 559	1 400-1 427	-180	27	-196	20	-166	20	WRC-03
MSS (space-to-Earth) MSS (space-to-Earth)	1 525-1 559 1 613.8-1 626.5	1 610.6-1 613.8	NA	NA	-194	20	-166	20	WRC-03
RNSS (space-to-Earth)	1 559-1 610	1 610.6-1 613.8	NA	NA	-194	20	-166	20	WRC-07
BSS FSS (space-to-Earth)	2 655-2 670	2 690-2 700	-177	10	NA	NA	-161	20	WRC-03
FSS (space-to-Earth)	2 670-2 690	2 690-2 700 (in Regions 1 and 3)	-177	10	NA	NA	-161	20	WRC-03
	<b>(GHz)</b>	<b>(GHz)</b>	-	-	-	-	-	-	
BSS	21.4-22.0	22.21-22.5	-146	290	-162	250	-128	250	WRC-03 for VLBI, and WRC-07 for other types of observation

NA: Not applicable, measurements of this type are not made in this frequency band.

<sup>(1)</sup> Integrated over the reference bandwidth with an integration time of 2 000 s.

TABLE 1-2

**epfd thresholds<sup>(1)</sup> for unwanted emissions from all space stations of a non-GSO satellite system at a radio astronomy station**

Space service	Space service band	Radio astronomy band	Single dish, continuum observations		Single dish, spectral line observations		VLBI		Condition of application: the API is received by the Bureau following the entry into force of the Final Acts of:
			epfd <sup>(2)</sup>	Reference bandwidth	epfd <sup>(2)</sup>	Reference bandwidth	epfd <sup>(2)</sup>	Reference bandwidth	
	(MHz)	(MHz)	(dB(W/m <sup>2</sup> ))	(MHz)	(dB(W/m <sup>2</sup> ))	(kHz)	(dB(W/m <sup>2</sup> ))	(kHz)	
MSS (space-to-Earth)	137-138	150.05-153	-238	2.95	NA	NA	NA	NA	WRC-07
MMSS (space-to-Earth)	157.1875-157.3375 161.7875-161.9375	150.05-153	-238	2.95	NA	NA	NA	NA	WRC-19
MMSS (space-to-Earth)	157.1875-157.3375 161.7875-161.9375	322-328.6	-240	6.6	-255	10	-228	10	WRC-19
MSS (space-to-Earth)	387-390	322-328.6	-240	6.6	-255	10	-228	10	WRC-07
MSS (space-to-Earth)	400.15-401	406.1-410	-242	3.9	NA	NA	NA	NA	WRC-07
MSS (space-to-Earth)	1 525-1 559	1 400-1 427	-243	27	-259	20	-229	20	WRC-07
RNSS (space-to-Earth) <sup>(3)</sup>	1 559-1 610	1 610.6-1 613.8	NA	NA	-258	20	-230	20	WRC-07
MSS (space-to-Earth)	1 525-1 559	1 610.6-1 613.8	NA	NA	-258	20	-230	20	WRC-07



NA: Not applicable, measurements of this type are not made in this frequency band.

<sup>(1)</sup> These epfd thresholds should not be exceeded for more than 2% of time.

<sup>(2)</sup> Integrated over the reference bandwidth with an integration time of 2 000 s.

<sup>(3)</sup> This Resolution does not apply to current and future assignments of the radionavigation-satellite system GLONASS/GLONASS-M in the frequency band 1 559-1 610 MHz, irrespective of the date of reception of the related coordination or notification information, as appropriate. The protection of the radio astronomy service in the frequency band 1 610.6-1 613.8 MHz is ensured and will continue to be in accordance with the bilateral agreement between the Russian Federation, the notifying administration of the GLONASS/GLONASS-M system, and IUCAF, and subsequent bilateral agreements with other administrations.

**MOD****RESOLUTION 748 (REV.WRC-19)****Compatibility between the aeronautical mobile (R) service and the fixed-satellite service (Earth-to-space) in the frequency band 5 091-5 150 MHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the allocation of the frequency band 5 091-5 150 MHz to the fixed-satellite service (FSS) (Earth-to-space) is limited to feeder links of non-geostationary-satellite (non-GSO) systems in the mobile-satellite service (MSS);
- b) that the frequency band 5 000-5 150 MHz is currently allocated to the aeronautical mobile-satellite (R) service (AMS(R)S), subject to agreement obtained under No. **9.21**, and to the aeronautical radionavigation service (ARNS);
- c) that WRC-07 allocated the frequency band 5 091-5 150 MHz to the aeronautical mobile service (AMS) on a primary basis subject to No. **5.444B**;
- d) that the International Civil Aviation Organization (ICAO) is in the process of identifying the technical and operating characteristics of new systems operating in the AM(R)S in the frequency band 5 091-5 150 MHz;
- e) that the compatibility of one AM(R)S system, to be used by aircraft operating on the airport surface, and the FSS has been demonstrated in the frequency band 5 091-5 150 MHz;
- f) that ITU-R studies have examined potential sharing among the separate AMS applications and the FSS in the frequency band 5 091-5 150 MHz;
- g) that the frequency band 117.975-137 MHz currently allocated to the AM(R)S is reaching saturation in certain areas of the world, and therefore that frequency band would not be available to support additional surface applications at airports;
- h) that this new allocation is intended to support the introduction of applications and concepts in air traffic management which are data intensive, and which will support data links that carry safety-critical aeronautical data,

*recognizing*

- a) that in the frequency band 5 030-5 091 MHz priority is to be given to the microwave landing system (MLS) in accordance with No. **5.444**;
- b) that ICAO publishes recognized international aeronautical standards for AM(R)S systems;
- c) that Resolution **114 (Rev.WRC-15)** applies to the sharing conditions between the FSS and ARNS in the frequency band 5 091-5 150 MHz,

*noting*

- a) that the number of FSS transmitting earth stations required may be limited;
- b) that the use of the frequency band 5 091-5 150 MHz by the AM(R)S needs to ensure protection of the current or planned use of this frequency band by the FSS (Earth-to-space);

c) that ITU-R studies describe methods for ensuring compatibility between the AM(R)S and FSS operating in the frequency band 5 091-5 150 MHz, and compatibility has been demonstrated for the AM(R)S system referred to in *considering e*),

*resolves*

1 that any AM(R)S systems operating in the frequency band 5 091-5 150 MHz shall not cause harmful interference to, nor claim protection from, systems operating in the ARNS;

2 that any AM(R)S systems operating in the frequency band 5 091-5 150 MHz shall meet the SARPs requirements published in Annex 10 of the ICAO Convention on International Civil Aviation and the requirements of Recommendation ITU-R M.1827-1, to ensure compatibility with FSS systems operating in that frequency band;

3 that, in part to meet the provisions of No. **4.10**, the coordination distance with respect to stations in the FSS operating in the frequency band 5 091-5 150 MHz shall be based on ensuring that the signal received at the AM(R)S station from the FSS transmitter does not exceed  $-143$  dB(W/MHz), where the required basic transmission loss shall be determined using the methods described in Recommendations **ITU-R P.525-4 and ITU-R P.526-15,**



*invites*

1 administrations to supply technical and operational criteria necessary for sharing studies for the AM(R)S, and to participate actively in such studies;

2 ICAO and other organizations to actively participate in such studies,

*instructs the Secretary-General*

to bring this Resolution to the attention of ICAO.

**MOD****RESOLUTION 749 (REV.WRC-19)****Use of the frequency band 790-862 MHz in countries of Region 1 and the Islamic Republic of Iran by mobile applications and by other services**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the favourable propagation characteristics of the frequency band 470-862 MHz are beneficial to provide cost-effective solutions for coverage, including large areas of low population density;
- b) that the operation of broadcasting stations and base stations of the mobile service in the same geographical area may create incompatibility issues;
- c) that many communities are particularly underserved compared to urban centres;
- d) that applications ancillary to broadcasting are sharing the frequency band 470-862 MHz with the broadcasting service in all three Regions, and are expected to continue their operations in this frequency band;
- e) that it is necessary to adequately protect, *inter alia*, terrestrial television broadcasting and other systems in this frequency band,

*recognizing*

- a) that, in Article 5 of the Radio Regulations, the frequency band 790-862 MHz, or parts of that frequency band, is allocated, and is used on a primary basis, for various services including broadcasting;
- b) that the GE06 Agreement applies in all Region 1 countries except Mongolia and in Iran (Islamic Republic of) in the frequency bands 174-230/470-862 MHz;
- c) that the transition from analogue to digital television is expected to result in situations where the frequency band 790-862 MHz will be used for both analogue and digital terrestrial transmission; and the demand for spectrum during the transition period may be even greater than the stand-alone usage of analogue broadcasting systems;
- d) that the switch-over to digital may result in spectrum opportunities for new applications;
- e) that the timing of the switch-over to digital is likely to vary from country to country;
- f) that the use of spectrum for different services should take into account the need for sharing studies;
- g) that the Radio Regulations provide that the identification of a given frequency band for IMT does not preclude the use of that frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations;
- h) that the GE06 Agreement contains provisions for the terrestrial broadcasting service and other terrestrial services, a Plan for digital TV, and the List of other primary terrestrial services;

- i)* that the GE06 Agreement established, for the frequency band 470-862 MHz, 16 June 2015 as the date when the transition period ended, meaning that the assignments that were in the analogue Plan are no longer protected and shall not cause unacceptable interference in countries which are Contracting Members to the Agreement;
- j)* that the studies carried out by ITU-R pursuant to Resolution **749 (WRC-07)**\* showed that the potential impact of the cumulative effect of interference from base stations, which individually did not trigger the need for coordination with broadcasting, could be significant; on the other hand, the potential impact of cumulative interference might be less significant in practice;
- k)* that ITU-R initiated studies, with a view to developing and completing comprehensive Recommendations and Reports, in accordance with **Resolution 224 (Rev.WRC-19)**, which need to take into account the cumulative effect of interference,

*further recognizing*

- a)* that the frequency band 790-862 MHz, as part of a wider frequency band, has been allocated to the mobile service in Region 3 (including Iran (Islamic Republic of)) since 1971 (prior to WRC-07);
- b)* that the GE06 Agreement, in its relevant Annexes, establishes the relation between digital terrestrial broadcasting, on the one hand, and other primary terrestrial services, including the aeronautical radionavigation service in the countries mentioned in No. **5.312**, on the other hand;
- c)* that WRC-07, under No. **5.316B**, allocated the frequency band 790-862 MHz in Region 1 to the mobile, except aeronautical mobile, service on a primary basis, and that this allocation shall come into effect as of 17 June 2015 and shall be subject to agreement obtained under No. **9.21** with respect to the aeronautical radionavigation service in countries mentioned in No. **5.312**;
- d)* that the frequency band 790-862 MHz in Region 1 and the frequency band 790-806 MHz in Region 3 were identified by WRC-07 for use by administrations wishing to implement International Mobile Telecommunications (IMT), whereas the frequency band 806-960 MHz in Region 3 was identified for IMT in WRC-2000;
- e)* that for Contracting Members to the GE06 Agreement, the use of stations of the mobile service in relation to the broadcasting service is also subject to the successful application of the procedures of the GE06 Agreement;
- f)* that the coordination between terrestrial services (fixed, mobile and broadcasting) in the frequency band 790-862 MHz between Iran (Islamic Republic of), on the one hand, and the other countries of Region 3, on the other hand, is a matter to be left to the administrations concerned, based on bilateral or multilateral negotiations, if it is mutually agreed by those administrations,

*noting*

- a)* that Resolution ITU-R 57 provides principles for the process of development of IMT-Advanced and that this process had already started after WRC-07;
- b)* that in the frequency band 790-862 MHz, **Resolution 224 (Rev.WRC-19)** applies,
- emphasizing*
- a)* that the use of the frequency band 470-862 MHz by broadcasting and other primary services is also covered by the GE06 Agreement;

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\* *Note by the Secretariat:* This Resolution was revised by **WRC-12, WRC-15 and WRC-19.**

b) that the requirements of the different services to which the frequency band is allocated, including the mobile, aeronautical radionavigation (in accordance with No. **5.312**), fixed and broadcasting services, shall be taken into account,

*taking into account*

that the results of the studies carried out by ITU-R pursuant to Resolution **749 (WRC-07)\*** indicate that there is a need to protect other primary terrestrial services from the mobile service in Region 1,

*resolves*

1 that in Region 1:

in accordance with No. **5.316B**, and based on the criteria contained in Annex 1 to this Resolution, administrations implementing the mobile service in Region 1 shall seek agreement under No. **9.21** with respect to the aeronautical radionavigation service in the countries mentioned in No. **5.312** of the Radio Regulations;

2 that for Region 1 and Iran (Islamic Republic of):

2.1 when coordination between administrations is being effected, the protection ratios applicable to the generic case NB contained in the GE06 Agreement for the protection of the broadcasting service shall be used only for mobile systems with a bandwidth of 25 kHz. If another bandwidth is used, the relevant protection ratios are to be found in Recommendations ITU-R BT.1368 and ITU-R BT.2033;

2.2 to invite administrations to take into account, *inter alia*, the results of the sharing studies conducted by ITU-R in response to Resolution **749 (WRC-07)\***;

3 that with respect to adjacent channel interference within the frequency band 790-862 MHz:

3.1 adjacent channel interference within a given country is a national matter and needs to be dealt with by each administration as a national matter;

3.2 adjacent channel interference should be treated among administrations concerned, using mutually agreed criteria or those contained in relevant ITU-R Recommendations (see also the most recent versions of Recommendations ITU-R BT.1368, ITU-R BT.1895 and ITU-R BT.2033 when sharing with the broadcasting service is concerned), as appropriate,

*invites administrations*

to contribute further to the studies conducted by ITU-R in accordance with *recognizing k)* above,

*instructs the Director of the Radiocommunication Bureau*

to implement this Resolution and to take appropriate actions.

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\* *Note by the Secretariat:* This Resolution was revised by WRC-15.

## ANNEX 1 TO RESOLUTION 749 (REV.WRC-19)

**The criteria for identifying potentially affected administrations with respect to the aeronautical radionavigation service in countries listed in No. 5.312**

To identify potentially affected administrations when applying the procedure for seeking agreement under No. 9.21 by the mobile service with respect to the aeronautical radionavigation service (ARNS) operating in countries mentioned in No. 5.312, as stipulated in No. 5.316B, the coordination distances (between a base station in the mobile service and a potentially affected ARNS station) indicated below should be used.

When applying No. 5.316B, notifying administrations may indicate in the notice sent to BR the list of administrations with which bilateral agreement has already been reached. BR shall take this into account in determining the administrations with which coordination under No. 9.21 is required.

**1 Case where the mobile service is operated according to the frequency arrangement where the base stations transmit only in the frequency band 791-821 MHz and receive only in the frequency band 832-862 MHz**

ARNS station	System type code	Coordination distances for receiving base stations of MS (km)	Coordination distances for transmitting base stations of MS (km)
RSBN (ground receiver)	AA8	–	70/125/175**
RLS 2 (Type 2) (aircraft receiver)	BC	70/150*	–
RLS 1 (Types 1 and 2) (ground receiver)	AB	70/125/175**	–

\* The first value should be used when the notifying administration indicates in the notice form that aggregate e.i.r.p. value of all user equipment operating simultaneously with the notified base station is assumed not to exceed 21 dBm in 1 MHz. The second value should be used in other cases.

\*\* 90% ≤ land path ≤ 100% / 50% ≤ land path < 90% / 0% ≤ land path < 50%.



**2 Other cases**

<b>ARNS station</b>	<b>System type code</b>	<b>Coordination distances for MS receiving base stations (km)</b>	<b>Coordination distances for MS transmitting base stations (km)</b>
RSBN	AA8	50	125/175*
RLS 2 (Type 1) (aircraft receiver)	BD	410	432
RLS 2 (Type 1) (ground receiver)	BA	50	250/275*
RLS 2 (Type 2) (aircraft receiver)	BC	150	432
RLS 2 (Type 2) (ground receiver)	AA2	50/75*	300/325*
RLS 1 (Types 1 and 2) (ground receiver)	AB	125/175*	400/450*
Other types of ARNS terrestrial station	Not applicable	125/175*	400/450*
Other types of ARNS airborne station	Not applicable	410	432

\*  $50\% \leq \text{land path} \leq 100\%$  /  $0\% \leq \text{land path} < 50\%$ .

**MOD****RESOLUTION 750 (REV.WRC-19)****Compatibility between the Earth exploration-satellite service (passive) and relevant active services**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that primary allocations have been made to various space services such as the fixed-satellite service (Earth-to-space), the space operation service (Earth-to-space) and the inter-satellite service and/or to terrestrial services such as the fixed service, the mobile service and the radiolocation service, hereinafter referred to as “active services”, in frequency bands adjacent or nearby to frequency bands allocated to the Earth exploration-satellite service (EESS) (passive) subject to No. **5.340**;
- b) that unwanted emissions from active services have the potential to cause unacceptable interference to EESS (passive) sensors;
- c) that, for technical or operational reasons, the general limits in Appendix 3 may be insufficient in protecting the EESS (passive) in specific frequency bands;
- d) that, in many cases, the frequencies used by EESS (passive) sensors are chosen to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems is not possible;
- e) that the frequency band 1 400-1 427 MHz is used for measuring soil moisture, and also for measuring sea-surface salinity and vegetation biomass;
- f) that long-term protection of the EESS in the frequency bands 23.6-24 GHz, 31.3-31.5 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz and 86-92 GHz is vital to weather prediction and disaster management, and measurements at several frequencies must be made simultaneously in order to isolate and retrieve each individual contribution;
- g) that, in many cases, the frequency bands adjacent or nearby to passive service frequency bands are used and will continue to be used for various active service applications;
- h) that it is necessary to ensure equitable burden sharing for achieving compatibility between active and passive services operating in adjacent or nearby frequency bands,

*noting*

- a) that **some of** the compatibility studies between relevant active and passive services operating in adjacent and nearby frequency bands are documented in Report ITU-R SM.2092 **and in Report ITU-R S.2463**;
- b) that the compatibility studies between IMT systems in the frequency bands 1 375-1 400 MHz and 1 427-1 452 MHz and EESS (passive) systems in the frequency band 1 400-1 427 MHz are documented in Report ITU-R RS.2336;

c) that Report ITU-R F.2239 provides the results of studies covering various scenarios between the fixed service, operating in the frequency band 81-86 GHz and/or 92-94 GHz, and the Earth exploration-satellite service (passive), operating in the frequency band 86-92 GHz;

d) that Recommendation ITU-R RS.2017 provides the interference criteria for satellite passive remote sensing,

*noting further*

that, for the purpose of this Resolution:

- point-to-point communication is defined as radiocommunication provided by a link, for example a radio-relay link, between two stations located at specified fixed points;
- point-to-multipoint communication is defined as radiocommunication provided by links between a single station located at a specified fixed point (also called “hub station”) and a number of stations located at specified fixed points (also called “customer stations”),

*recognizing*

a) that studies documented in Report ITU-R SM.2092 do not consider point-to-multipoint communication links in the fixed service in the frequency bands 1 350-1 400 MHz and 1 427-1 452 MHz;

b) that, in the frequency band 1 427-1 452 MHz, mitigation measures, such as channel arrangements, improved filters and/or guardbands, may be necessary in order to meet the limits of unwanted emission for IMT stations in the mobile service specified in Table 1-1 of this Resolution;

c) that, in the frequency band 1 427-1 452 MHz, IMT mobile stations typically perform better than the equipment specifications as stated by relevant standards organizations, which may be taken into account in meeting the limits specified in Table 1-1 (see also sections 4 and 5 of Report ITU-R RS.2336),

*resolves*

1 that unwanted emissions of stations brought into use in the frequency bands and services listed in Table 1-1 below shall not exceed the corresponding limits in that table, subject to the specified conditions;

2 to urge administrations to take all reasonable steps to ensure that unwanted emissions of active service stations in the frequency bands and services listed in Table 1-2 below do not exceed the recommended maximum levels contained in that table, noting that EESS (passive) sensors provide worldwide measurements that benefit all countries, even if these sensors are not operated by their country;

3 that the Radiocommunication Bureau shall not make any examination or finding with respect to compliance with this Resolution under either Article 9 or 11.

TABLE 1-1

EESS (passive) band	Active service band	Active service	Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band <sup>1</sup>
1 400-1 427 MHz	1 427-1 452 MHz	Mobile	-72 dBW in the 27 MHz of the EESS (passive) band for IMT base stations -62 dBW in the 27 MHz of the EESS (passive) band for IMT mobile stations <sup>2, 3</sup>
23.6-24.0 GHz	22.55-23.55 GHz	Inter-satellite	-36 dBW in any 200 MHz of the EESS (passive) band for non-geostationary (non-GSO) inter-satellite service (ISS) systems for which complete advance publication information is received by the Bureau before 1 January 2020, and -46 dBW in any 200 MHz of the EESS (passive) band for non-GSO ISS systems for which complete advance publication information is received by the Bureau on or after 1 January 2020
	24.25-27.5 GHz	Mobile	-33 dBW <sup>a</sup> in any 200 MHz of the EESS (passive) band for IMT base stations <sup>5</sup> -29 dBW <sup>b</sup> in any 200 MHz of the EESS (passive) band for IMT mobile stations <sup>5</sup>
31.3-31.5 GHz	31-31.3 GHz	Fixed (excluding HAPS)	For stations brought into use after 1 January 2012: -38 dBW in any 100 MHz of the EESS (passive) band. This limit does not apply to stations that have been authorized prior to 1 January 2012
50.2-50.4 GHz	49.7-50.2 GHz	Fixed-satellite (E-to-s) <sup>4</sup>	For GSO earth stations brought into use after the date of entry into force of the Final Acts of WRC-07 and prior to 1 January 2024: -10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi -20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi For GSO earth stations with antenna gain greater than or equal to 57 dBi brought into use on or after 1 January 2024: -25 dBW into the 200 MHz of the EESS (passive) band for earth stations having an elevation angle below 80°; -45 dBW into the 200 MHz of the EESS (passive) band for earth stations having an elevation angle equal or above 80°; For GSO earth stations with antenna gain less than 57 dBi brought into use on or after 1 January 2024: -30 dBW into the 200 MHz of the EESS (passive) band for earth stations having an elevation angle below 80°; -45 dBW into the 200 MHz of the EESS (passive) band for earth stations having an elevation angle equal or above 80°; For non-GSO earth stations brought into use after the date of entry into force of the Final Acts of WRC-07 and before the date of entry into force of the Final Acts of WRC-19: -10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi

EESS (passive) band	Active service band	Active service	Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band <sup>1</sup>
			<p>–20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi</p> <p>For non-GSO earth stations brought into use after the date of entry into force of the Final Acts of WRC-19<sup>6</sup>:</p> <p>–42 dBW into the 200 MHz of the EESS (passive) band for earth stations not employing uplink power control;</p> <p>–42 dBW into the 200 MHz of the EESS (passive) band at zenith increasing to a maximum level of –35 dBW into the 200 MHz of the EESS (passive) band at a minimum elevation angle of 15° for earth stations employing uplink power control</p>
50.2-50.4 GHz	50.4-50.9 GHz	Fixed-satellite (E-to-s) <sup>4</sup>	<p>For GSO earth stations brought into use after the date of entry into force of the Final Acts of WRC-07 and prior to 1 January 2024:</p> <p>–10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi</p> <p>–20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi;</p> <p>For GSO earth stations with antenna gain greater than or equal to 57 dBi brought into use on or after 1 January 2024:</p> <p>–25 dBW into the 200 MHz of the EESS (passive) band for earth stations having an elevation angle below 80°;</p> <p>–45 dBW into the 200 MHz of the EESS (passive) band for earth stations having an elevation angle equal or above 80°;</p> <p>For GSO earth stations with antenna gain less than 57 dBi brought into use on or after 1 January 2024:</p> <p>–30 dBW into the 200 MHz of the EESS (passive) band for earth stations having an elevation angle below 80°;</p> <p>–45 dBW into the 200 MHz of the EESS (passive) band for earth stations having an elevation angle equal or above 80°;</p> <p>For non-GSO earth stations brought into use after the date of entry into force of the Final Acts of WRC-07 and before the date of entry into force of the Final Acts of WRC-19:</p> <p>–10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi</p> <p>–20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi</p> <p>For non-GSO earth stations brought into use after the date of entry into force of the Final Acts of WRC-19<sup>6</sup>:</p> <p>–42 dBW into the 200 MHz of the EESS (passive) band for earth stations not employing uplink power control;</p> <p>–42 dBW into the 200 MHz of the EESS (passive) band at zenith increasing to a maximum level of –35 dBW into the 200 MHz of the EESS (passive) band at a minimum</p>

EESS (passive) band	Active service band	Active service	Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band <sup>1</sup>
			elevation angle of 15° for earth stations employing uplink power control
52.6-54.25 GHz	51.4-52.4 GHz	Fixed-satellite (E-to-s) <sup>4</sup>	<p>For earth stations operating in GSO FSS networks, in order to protect non-GSO EESS (passive) space stations:</p> <p>–37 dBW in any 100 MHz of the EESS (passive) band for FSS earth stations with elevation angles lower than 75°</p> <p>–52 dBW in any 100 MHz of the EESS (passive) band for FSS earth stations with elevation angles equal to or higher than 75°</p> <p>For earth stations operating with a GSO FSS space station whose nominal geocentric orbital separation <math>\Delta</math> is equal to or smaller than 2.5° from any GSO EESS (passive) space station from the time of its notification in accordance with No. 11.44 with nominal orbital positions: 0°, 9.5° E, 76° E, 79° E, 99.5° E, 105° E, 123.5° E, 133° E, 165.8° E, 14.5° W and 137.2° W:</p> <p>–84 + 200 <math>\Delta</math> dBW for 0° ≤ <math>\Delta</math> &lt; 0.1°</p> <p>–67 + 22.8 <math>\Delta</math> dBW for 0.1° ≤ <math>\Delta</math> &lt; 0.5°</p> <p>–61 + 11.3 <math>\Delta</math> dBW for 0.5° ≤ <math>\Delta</math> &lt; 1.9°</p> <p>–47 + 4 <math>\Delta</math> dBW for 1.9° ≤ <math>\Delta</math> ≤ 2.5°</p> <p>in any 100 MHz of the EESS (passive) band</p>
52.6-54.25 GHz	51.4-52.6 GHz	Fixed	<p>For stations brought into use after the date of entry into force of the Final Acts of WRC-07:</p> <p>–33 dBW in any 100 MHz of the EESS (passive) band</p>

<sup>1</sup> The unwanted emission power level is to be understood here as the level measured at the antenna port, unless it is specified in terms of total radiated power (TRP).

<sup>2</sup> This limit does not apply to mobile stations in the IMT systems for which the notification information has been received by the Radiocommunication Bureau by 28 November 2015. For those systems, –60 dBW/27 MHz applies as the recommended value.

<sup>3</sup> The unwanted emission power level is to be understood here as the level measured with the mobile station transmitting at an average output power of 15 dBm.

<sup>4</sup> The limits apply under clear-sky conditions. During fading conditions, the limits may be exceeded by earth stations when using uplink power control.

<sup>5</sup> The unwanted emission power level is considered in terms of TRP. The TRP is to be understood here as the integral of the power transmitted from all antenna elements in different directions over the entire radiation sphere.

<sup>a</sup> A limit of –39 dB(W/200 MHz) will apply to IMT base stations brought into use after 1 September 2027. This limit will not apply to IMT base stations which have been brought into use prior to this date. For those IMT base stations, the limit of –33 dB(W/200 MHz) will continue to apply after this date.

<sup>b</sup> A limit of –35 dB(W/200 MHz) will apply to IMT mobile stations brought into use after 1 September 2027. This limit will not apply to IMT mobile stations which have been brought into use prior to this date. For those IMT mobile stations, the limit of –29 dB(W/200 MHz) will continue to apply after this date.

<sup>6</sup> Compliance with these limits may include the consideration of additional mitigation techniques, which require further studies by ITU-R.

TABLE 1-2

EESS (passive) band	Active service band	Active service	Recommended maximum level of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band <sup>1</sup>
1 400-1 427 MHz	1 350-1 400 MHz	Radiolocation <sup>2</sup>	-29 dBW in the 27 MHz of the EESS (passive) band
		Fixed	-45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
		Mobile	-60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except transportable radio-relay stations -45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations
	1 427-1 429 MHz	Space operation (E-to-s)	-36 dBW in the 27 MHz of the EESS (passive) band
	1 427-1 429 MHz	Mobile except aeronautical mobile	-60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except IMT stations and transportable radio-relay stations <sup>3</sup> -45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations
		Fixed	-45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
	1 429-1 452 MHz	Mobile	-60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except IMT stations, transportable radio-relay stations and aeronautical telemetry stations -45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations -28 dBW in the 27 MHz of the EESS (passive) band for aeronautical telemetry stations <sup>3</sup>
		Fixed	-45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
31.3-31.5 GHz	30.0-31.0 GHz	Fixed-satellite (E-to-s) <sup>4</sup>	-9 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 56 dBi -20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 56 dBi
86-92 GHz <sup>5</sup>	81-86 GHz	Fixed	-41 - 14( $f$ - 86) dBW/100 MHz for 86.05 ≤ $f$ ≤ 87 GHz -55 dBW/100 MHz for 87 ≤ $f$ ≤ 91.95 GHz where $f$ is the centre frequency of the 100 MHz reference bandwidth expressed in GHz
	92-94 GHz	Fixed	-41 - 14(92 - $f$ ) dBW/100 MHz for 91 ≤ $f$ ≤ 91.95 GHz -55 dBW/100 MHz for 86.05 ≤ $f$ ≤ 91 GHz where $f$ is the centre frequency of the 100 MHz reference bandwidth expressed in GHz

*Notes to Table 1-2:*

- <sup>1</sup> The unwanted emission power level is to be understood here as the level measured at the antenna port.
- <sup>2</sup> The mean power is to be understood here as the total power measured at the antenna port (or an equivalent thereof) in the frequency band 1 400-1 427 MHz, averaged over a period of the order of 5 s.
- <sup>3</sup> The frequency band 1 429-1 435 MHz is also allocated to the aeronautical mobile service in eight Region 1 administrations on a primary basis exclusively for the purposes of aeronautical telemetry within their national territory (No. **5.342**).
- <sup>4</sup> The recommended maximum levels apply under clear-sky conditions. During fading conditions, these levels may be exceeded by earth stations when using uplink power control.
- <sup>5</sup> Other maximum unwanted emission levels may be developed based on different scenarios provided in Report ITU-R F.2239 for the frequency band 86-92 GHz.



**MOD****RESOLUTION 760 (REV.WRC-19)****Provisions relating to the use of the frequency band 694-790 MHz in Region 1 by the mobile, except aeronautical mobile, service and by other services**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the favourable propagation characteristics of the frequency band 694-790 MHz are beneficial in providing cost-effective solutions for coverage;
- b) that the ITU Radiocommunication Sector (ITU-R) carried out studies, in accordance with Resolution **232 (WRC-12)\***, on the compatibility between the mobile service and other services currently allocated in the frequency band 694-790 MHz;
- c) that it is necessary to adequately protect all primary services in the frequency band 694-790 MHz and in adjacent frequency bands;
- d) that Report ITU-R BT.2339 provides elements on co-channel sharing and compatibility between digital terrestrial television broadcasting and International Mobile Telecommunications (IMT) in the frequency band 694-790 MHz in the GE06 planning area which administrations can use in the development of their bilateral agreements;
- e) that the frequency band 645-862 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS) in the countries listed in No. **5.312**;
- f) that, in some countries, applications ancillary to broadcasting and programme-making are operating in the frequency band 470-862 MHz or in parts of that band and are expected to continue such operations;
- g) that, in some countries, the implementation of IMT in the frequency band 694-790 MHz may affect the availability of frequencies for applications ancillary to broadcasting and programme-making,

*recognizing*

- a) that, in Article **5** of the Radio Regulations, the frequency band 694-790 MHz, or parts of that band, is allocated, and is used on a primary basis, for various services;
- b) that the GE06 Agreement applies in all Region 1 countries except Mongolia and in Iran (Islamic Republic of) in the frequency bands 174-230/470-862 MHz;
- c) that, in the frequency band 694-790 MHz, **Resolution 224 (Rev.WRC-19)** applies;
- d) that WRC-12, through Resolution **232 (WRC-12)\***, allocated the frequency band 694-790 MHz in Region 1 to the mobile, except aeronautical mobile, service on a primary basis, subject to agreement obtained under No. **9.21** with respect to the ARNS in countries listed in No. **5.312**, and requested this conference to specify technical and regulatory conditions applicable to the mobile service allocation, as appropriate, taking into account the ITU-R studies;

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\* *Note by the Secretariat:* This Resolution was abrogated by WRC-15.

- e) that the identification of a given frequency band for IMT in the Radio Regulations does not preclude the use of that band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations;
- f) that interference generated and received within a given country is a national matter and needs to be dealt with by each administration as a national matter;
- g) that adjacent channel interference generated in one country and affecting a neighbouring country needs to be mutually considered;
- h) that Recommendation ITU-R M.2090 provides specific unwanted emission limits of IMT mobile stations operating in the frequency band 694-790 MHz in order to facilitate protection of existing services in the frequency band 470-694 MHz in Region 1;
- i) that Recommendation ITU-R M.1036 provides frequency arrangements for implementation of the terrestrial component of IMT in the frequency bands identified for IMT in the Radio Regulations, and provides frequency arrangements in the frequency band 694-960 MHz;
- j) that the studies carried out by ITU-R pursuant to Resolution **232 (WRC-12)**\* showed that the potential impact of the cumulative effect of interference from base stations, which individually did not trigger the need for coordination with broadcasting, could be significant; on the other hand, the potential impact of cumulative interference might be less significant in practice;
- k) that bilateral coordination agreements have already been reached and will be used by administrations as an agreement obtained under No. **9.21** with respect to ARNS in countries listed in No. **5.312**;
- l) that in Region 1, a number of countries have deployments of applications ancillary to broadcasting and programme-making which provide tools for daily content production for the broadcasting service,
- noting*
- a) that while some administrations may decide to use all or part of the frequency band 694-790 MHz for IMT, other countries may continue to operate other services to which the band is also allocated;
- b) that the timing of the deployment of IMT in the frequency band 694-790 MHz is likely to vary from country to country;
- c) that parts of Region 1 have successfully completed or committed to completing modification of the GE06 Digital Plan in the frequency band 470-790 MHz in order to harmonize the use of the frequency band 694-790 MHz for IMT, while other parts of Region 1 have not started;
- d) that a digital entry in the GE06 Plan may also be used for transmissions in the mobile service under the conditions set out in § 5.1.3 of the GE06 Agreement;
- e) that, in some countries, applications ancillary to broadcasting and programme-making may be operated in parts of the frequency band 694-790 MHz;

f) that ITU-R studies regarding possible solutions for global/regional harmonization of frequency bands and tuning ranges for electronic news gathering (ENG)<sup>1</sup> are needed and Resolution ITU-R 59 provides the framework for such studies,

*resolves*

1 that use of the frequency band 694-790 MHz in Region 1 by the mobile, except aeronautical mobile, service is subject to agreement obtained under No. **9.21** with respect to ARNS in countries listed in No. **5.312**, in which regard the criteria for identifying affected administrations under No. **9.21** for the mobile service with respect to the ARNS in the frequency band 694-790 MHz are set out in the Annex to this Resolution;

2 that, for Region 1 and Iran (Islamic Republic of):

2.1 when coordination between administrations is being effected, the protection ratios applicable to the generic case NB contained in the GE06 Regional Agreement for the protection of the broadcasting service shall be used only for mobile systems with a bandwidth of 25 kHz; if another bandwidth is used, the relevant protection ratios are to be found in Recommendations ITU-R BT.1368 and ITU R BT.2033;

2.2 to invite administrations to take into account, *inter alia*, the results of the sharing studies conducted by ITU-R in response to Resolution **232 (WRC-12)**\*;

3 that, with respect to adjacent channel interference between the mobile service in the frequency band 694-790 MHz and the broadcasting service in the frequency band 470-694 MHz:

3.1 adjacent channel interference within a given country is a national matter and needs to be dealt with by each administration as a national matter;

3.2 adjacent channel interference should be treated among administrations concerned, using mutually agreed criteria or those contained in relevant ITU-R Recommendations (see also the most recent versions of Recommendations ITU-R BT.1368, ITU-R BT.1895 and ITU-R BT.2033, as well as ITU-R M.2090 when sharing with the broadcasting service is concerned), as appropriate,

*invites the ITU Radiocommunication Sector*

1 to consider the information received about the implementation of IMT in the frequency band 694-790 MHz and develop ITU-R Reports, as appropriate;

2 to pursue studies on the implementation of applications ancillary to broadcasting and programme-making on the basis of Resolution ITU-R 59,

*invites the Director of the Radiocommunication Bureau*

to work, in cooperation with the Director of the Telecommunication Development Bureau, to bring assistance to developing countries wishing to implement the new mobile allocation in order to help these administrations to determine the modifications of the GE06 entries according to their needs,

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<sup>1</sup> ENG within Resolution ITU-R 59 represents all applications ancillary to broadcasting, such as terrestrial electronic news gathering, electronic field production, TV outside broadcast, wireless radio microphones and radio outside production and broadcast.

\* *Note by the Secretariat:* This Resolution was abrogated by WRC-15.

*invites administrations*

- 1 to provide information to ITU-R about the implementation of IMT in the frequency band 694-790 MHz, including, for example, implementation of measures for interference mitigation;
- 2 to communicate on a bilateral basis in order to eliminate possible cumulative interference, as appropriate;
- 3 to consider the use of applications ancillary to broadcasting and programme-making in those parts of the frequency band 694-790 MHz that are not used for other applications in the mobile service or other primary services,

*instructs the Director of the Radiocommunication Bureau*

to implement this Resolution and to take appropriate actions.

## ANNEX TO RESOLUTION 760 (REV.WRC-19)

### **Criteria for identifying potentially affected administrations in the frequency band 694-790 MHz with respect to the aeronautical radionavigation service for countries listed in No. 5.312**

To identify affected administrations when applying the procedure for seeking agreement under No. 9.21 by the mobile service (MS) with respect to the aeronautical radionavigation service (ARNS) operating in countries mentioned in No. 5.312, the coordination distances (between a base station in the MS and a potentially affected ARNS station) indicated below should be used.

Notifying administrations may indicate in the notice sent to the Radiocommunication Bureau (BR) the list of administrations with which bilateral agreement has already been reached. BR shall take this into account in determining the administrations with which coordination under No. 9.21 is required.

#### **1 Case of mobile service usage under the frequency allocation plans when base stations transmit only in the frequency band 758-788 MHz and receive signals only in the frequency band 703-733 MHz**

TABLE 1

ARNS station	System type code	Coordination distances for the receiving MS base stations (km)	Coordination distances for the transmitting MS base stations (km)
RSBN (ground receiver)	AA8	-	70/125/175*

\* 90% ≤ land path ≤ 100% / 50% ≤ land path < 90% / 0% ≤ land path < 50%.

## 2 Other cases

TABLE 2

ARNS station	System type code	Coordination distances for the receiving MS base stations (km)**	Coordination distances for the transmitting MS base stations (km)
RSBN	AA8	50	125/175*
RLS 2 (type 1) (airborne receiver)	BD	410	432
RLS 2 (type 1) (ground receiver)	BA	50	250/275*
RLS 2 (type 2) (airborne receiver)	BC	150	432
RLS 2 (type 2) (ground receiver)	AA2	50/75*	300/325*
RLS 1 (types 1 and 2) (ground receiver)	AB	125/175*	400/450*
Other ARNS ground stations	Not applied	125/175*	400/450*
Other ARNS airborne stations	Not applied	410	432

\*  $50\% \leq \text{land path} \leq 100\%$  /  $0\% \leq \text{land path} < 50\%$ .

\*\* Coordination distances for the receiving MS base stations are based on protection of ARNS stations from the stations in the mobile service and do not ensure protection for receiving base stations of MS from ARNS stations.

## MOD

## RESOLUTION 761 (REV.WRC-19)

**Coexistence of International Mobile Telecommunications and  
broadcasting-satellite service (sound) in the frequency band  
1 452-1 492 MHz in Regions 1 and 3**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*noting*

a) Recommendation ITU-R M.1459, on protection criteria for telemetry systems in the aeronautical mobile service and mitigation techniques to facilitate sharing with geostationary broadcasting-satellite and mobile-satellite services in the frequency bands 1 452-1 525 MHz and 2 310-2 360 MHz;

b) that ITU Radiocommunication Sector (ITU-R) studies provide useful information on the power flux-density (pfd) level to protect broadcasting-satellite service (BSS) earth stations that could be used for coordination purposes,

*recognizing*

a) that the frequency band 1 452-1 492 MHz is allocated to BSS (sound) and the mobile service (MS) on a primary basis;

b) that both the MS and the BSS (sound) have already been deployed or are being considered for deployment within the frequency band 1 452-1 492 MHz in Regions 1 and 3,

*resolves*

taking into account Nos. **5.346** and **5.346A**

1 that the pfd at the Earth's surface produced by emissions from a geostationary space station in the BSS (sound) in the frequency band 1 452-1 492 MHz shall not exceed  $-107$  dB(W/(m<sup>2</sup> · MHz)) on the territory of any other country in Regions 1 and 3 (except for the territories of the countries listed in No. **5.342**);

2 that the limit in *resolves* 1 may be exceeded on the territory of any country in Region 1 or 3 whose administration has so agreed;

3 that the pfd limit defined in *resolves* 1 does not apply to frequency assignments to the BSS (sound) in the frequency band 1 452-1 492 MHz for which complete Appendix 4 coordination or notification information was received prior to 28 October 2019 and for which the bringing into use or bringing back into use date is prior to 1 January 2024 or the regulatory time-limit as specified in Nos. **11.44** and **11.49**, as appropriate, whichever comes earlier;

4 that in the territories of countries listed in No. **5.342**, the pfd limit defined in *resolves* 1 and pfd coordination threshold in *resolves* 5 do not apply and the BSS (sound) is subject to coordination under No. **9.11**;

5 that, as an exception to No. **9.6.3**, No. **9.11** shall apply, in addition to the pfd limit set forth in *resolves* 1, with respect to the territories of those countries of Region 3 and to those listed in Nos. **5.346** which use frequency assignments with the nature of service “IM”, and the following pfd coordination threshold values shall be used:

–131.3 dB(W/m<sup>2</sup>) in 1 MHz for angles of arrival ( $0^\circ \leq \delta \leq 5^\circ$ ) above the horizontal plane,

–131.3 + 16/20( $\delta - 5$ ) dB(W/m<sup>2</sup>) in 1 MHz for angles of arrival ( $5^\circ \leq \delta \leq 25^\circ$ ) above the horizontal plane,

–115.3 dB(W/m<sup>2</sup>) in 1 MHz for angles of arrival ( $25^\circ \leq \delta \leq 90^\circ$ ) above the horizontal plane;

6 that the Bureau shall apply the coordination threshold identified in *resolves* 5 above in the application of No. **9.11** to identify potentially affected administrations for frequency assignments to stations in the BSS in the frequency band 1 452-1 492 MHz in Regions 1 and 3 for which complete Appendix 4 coordination information is considered as having been received after 23 November 2019;

7 that before an administration in Region 1 or 3 brings into use an International Mobile Telecommunications (IMT) system in the frequency band 1 452-1 492 MHz, the administration shall ensure that the pfd produced by any IMT transmitting station which uses frequency assignments with the nature of service “IM” at 3 m above the ground for any point at the border of the territory of the notifying administration of a BSS (sound) network in this frequency band does not exceed –154 dB(W/(m<sup>2</sup> · 4 kHz)) for more than 20 per cent of time, unless otherwise agreed between the administrations, No. **9.19** also applies;

8 that for the territories of the countries listed in No. **5.342**, the pfd limit defined in *resolves* 7 does not apply and the frequency assignments with the nature of service “IM” are subject to coordination under No. **9.21**,

*instructs the Director of the Radiocommunication Bureau*

1 not to examine the pfd limit set forth in *resolves* 1 under No. **9.35** and issue a qualified favourable finding with respect to No. **9.35**, but to perform the full regulatory examination under No. **11.31**, including the review of any qualified favourable findings;

2 in applying *resolves* 5 at the coordination stage, to check conformity with the pfd value contained herein during the examination under No. **9.36**:

- if the value is met on the territory of countries which use frequency assignments with the nature of service “IM”, the Bureau shall not identify such administrations with which coordination may need to be effected,
- if the value is exceeded, the Bureau shall identify such administrations with which coordination may need to be effected and in such cases publish the administrations with an additional remark “IM” under No. **9.11**;

3 to assist the administrations notifying frequency assignments to the BSS (sound) by informing each administration where coordination is required and to inform them that coordination is requested under No. **9.11** and that No. **9.52C** applies in the application of *resolves* 5;

4 to investigate under No. **13.6** the technical characteristics and operational parameters of assignments to the BSS (sound) in the frequency band 1 452-1 492 MHz for which the notification information has been submitted before 23 November 2019 and which were brought into use by that date;

5 to investigate under No. **13.6** the technical characteristics and operational parameters of assignments to base stations in the frequency band 1 452-1 492 MHz identified for IMT in the country submitting the notice with the nature of service “IM” in Regions 1 and 3 for which the notification information has been submitted and which were brought into use before 23 November 2019.



**MOD**

**RESOLUTION 804 (REV.WRC-19)**

**Principles for establishing agendas for world radiocommunication conferences**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that, in accordance with No. 118 of the ITU Convention, the general scope of the agendas for world radiocommunication conferences (WRCs) should be established four to six years in advance;
- b)* Article 13 of the ITU Constitution relating to the competence and scheduling of WRCs and Article 7 of the Convention relating to their agendas;
- c)* that No. 92 of the Constitution and Nos. 488 and 489 of the Convention require conferences to be fiscally responsible;
- d)* that in Resolution 71 (Rev. Marrakesh, 2002), concerning the strategic plan of the Union, the Plenipotentiary Conference noted the increasingly complex and lengthy agendas for world radiocommunication conferences;
- e)* that Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference and Resolution **72 (Rev.WRC-19)** recognize the positive contribution of regional telecommunication organizations and informal groups and the need for improved efficiency and fiscal prudence;
- f)* the relevant Resolutions of previous WRCs;
- g)* that Resolution ITU-R 2-8 describes the principles of the organization of the work of the Conference Preparatory Meeting (CPM), including the reporting of contributions concerning future agenda items for information,

*noting*

- a)* that the number of issues addressed in agendas for WRCs has been growing, and that some issues could not be resolved adequately in the time allotted to the Conference, including conference preparations;
- b)* that some agenda items may have a greater impact on the future of radiocommunications than others;
- c)* that the human and financial resources of ITU are limited;
- d)* that there is a need to limit the agenda of conferences, taking account of the needs of developing countries, in a manner that allows the major issues to be dealt with equitably and efficiently;
- e)* that, in accordance with No. 90 of the Constitution, the interval between WRCs should normally be three to four years, to ensure that changes in technology and requirements of Member States are adequately reflected in conference agendas;
- f)* that administrations and regional telecommunication organizations need sufficient time to evaluate and examine the potential consequences of proposed new items for inclusion in the agendas of future WRCs,

*resolves*

- 1 that recommended agendas for future WRCs shall include a standing agenda item for the establishment of preliminary agendas for subsequent WRCs;
- 2 that the principles in Annex 1 to this Resolution should be used when developing future WRC agendas;
- 3 to encourage administrations and regional telecommunication organizations to submit, to the extent practicable, information on possible items/topics for the agenda of future WRCs under the WRC standing agenda item mentioned in *resolves* 1 to the second session of the CPM,

*resolves to invite administrations*

- 1 to use the template in Annex 2 to this Resolution in proposing agenda items for WRCs;
- 2 to participate in regional activities for the preparation of future WRC agendas.

## ANNEX 1 TO RESOLUTION 804 (REV.WRC-19)

### **Principles for establishing agendas for WRCs**

- 1 A conference agenda shall include:
  - 1.1 items assigned to it by the ITU Plenipotentiary Conference;
  - 1.2 items on which the Director of the Radiocommunication Bureau has been requested to report;
  - 1.3 items concerning instructions to the Radio Regulations Board and the Radiocommunication Bureau regarding their activities and concerning the review of those activities.
- 2 In general, a conference may include on a future conference agenda an item proposed by a group of administrations or an administration, if all the following conditions are met:
  - 2.1 it addresses issues of a worldwide or regional character;
  - 2.2 it is expected that changes in the Radio Regulations, including WRC Resolutions and Recommendations, may be necessary;
  - 2.3 it is expected that required studies can be completed (e.g. that appropriate ITU-R Recommendations will be approved) prior to that conference;
  - 2.4 resources associated with the subject are kept within a range which is manageable for Member States and Sector Members, the Radiocommunication Bureau and ITU-R study groups and the Conference Preparatory Meeting (CPM).
- 3 Items that meet the requirements specified in section 2 of this Annex shall be included in the future WRC agenda as standalone items, and shall not be included as separate issues under the agenda item on which the Director of the Radiocommunication Bureau reports on the activities of the Radiocommunication Sector since the last WRC.
- 4 To the extent possible, agenda items arising from previous conferences, normally reflected in Resolutions, and which have been considered by two successive conferences, should not be considered, unless justified.
- 5 In addition, where possible, issues that could be addressed through actions undertaken by a Radiocommunication Assembly, particularly those not involving amendments to the Radio Regulations, should not be included in the agenda.

- 6 In developing the conference agenda, efforts should be made to:
- a)* encourage regional and interregional coordination on the subjects to be considered in the preparatory process for the WRC, in accordance with Resolution **72 (Rev.WRC-19)** and Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, with a view to addressing potentially difficult issues well before a WRC;
  - b)* include, to the extent possible, agenda items that are prepared within regional telecommunication organizations, taking into account the equal right of individual administrations to submit proposals for agenda items;
  - c)* ensure that proposals are submitted with an indication of priority;
  - d)* include in proposals an assessment of their financial and other resource implications (with the assistance of the Radiocommunication Bureau) to ensure that they are within the agreed budgetary limits for ITU-R;
  - e)* ensure that the objectives and scope of proposed agenda items are complete and unambiguous;
  - f)* take into account the status of the ITU-R studies related to the potential agenda items before considering them as possible candidates for future agendas;
  - g)* distinguish between items intended to result in changes to the Radio Regulations and those dealing solely with the progress of studies;
  - h)* arrange items on the agenda by subject to the extent possible.

ANNEX 2 TO RESOLUTION 804 (REV.WRC-19)

**Template for the submission of proposals for agenda items**

**Subject:**

**Origin:**

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***Proposal:***

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***Background/reason:***

---

***Radiocommunication services concerned:***

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***Indication of possible difficulties:***

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***Previous/ongoing studies on the issue:***

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***Studies to be carried out by:***

***with the participation of:***

---

***ITU-R Study Groups concerned:***

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***ITU resource implications, including financial implications (refer to CV126):***

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***Common regional proposal:*** Yes/No

***Multicountry proposal:*** Yes/No

***Number of countries:***

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***Remarks***

**MOD**

**RESOLUTION 903 (REV.WRC-19)**

**Transitional measures for certain broadcasting-satellite/fixed-satellite service systems in the frequency band 2 500-2 690 MHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WRC-07 revised the limits of power flux-density from space stations in Article **21**, Table **21-4** for the frequency band 2 500-2 690 MHz;
- b) that use of the frequency bands 2 500-2 690 MHz in Region 2 and 2 500-2 535 MHz and 2 655-2 690 MHz in Region 3 by the fixed-satellite service (FSS) is limited to national and regional systems, subject to agreement obtained under No. **9.21** (see No. **5.415** and No. **5.2.1**);
- c) that in the frequency band 2 520-2 670 MHz, the broadcasting-satellite service (BSS) is limited to national and regional systems, subject to agreement obtained under No. **9.21** (see No. **5.416** and No. **5.2.1**);
- d) that, in No. **5.384A**, the frequency band 2 500-2 690 MHz is identified as one of the frequency bands for use by administrations wishing to implement International Mobile Telecommunications (IMT) in accordance with Resolution **223 (Rev.WRC-19)**;
- e) that, due to the specific national and regional allocation status applied to the space services mentioned above, and the identification for use by administrations wishing to implement IMT, it is advantageous to apply the revised Article **21**, Table **21-4** limits in the frequency band 2 500-2 690 MHz at an early date;
- f) that agenda item 1.9 of WRC-07 mentioned a requirement to not place undue constraints on the services to which the frequency band is allocated,

*resolves*

1 that in the frequency band 2 500-2 690 MHz space stations of satellite networks listed in the Annex to this Resolution shall not exceed the following pfd values:

-152 dB(W/m <sup>2</sup> )	for	$\delta < 5^\circ$
-152 + 0.75 ( $\delta - 5$ ) dB(W/m <sup>2</sup> )	for	$5^\circ \leq \delta \leq 25^\circ$
-137 dB(W/m <sup>2</sup> )	for	$\delta > 25^\circ$

in any 4 kHz band, where  $\delta$  is the angle of arrival above the horizontal plane. The limits in Table **21-4** do not apply;

2 that, for systems other than those addressed in *resolves* 1, No. **5.418** and Resolution **539 (Rev.WRC-19)**, the Bureau shall examine any coordination and notification information with respect to the provisions Nos. **9.35** and **11.31** (respectively) for frequency assignments in the FSS or BSS received by the Bureau after 14 November 2007 using the pfd limits for the frequency band 2 500-2 690 MHz in Table **21-4** of Article **21**,

*instructs the Bureau*

to implement *resolves* 1 and *resolves* 2.

ANNEX TO RESOLUTION 903 (REV.WRC-19)

<b>Notifying administration</b>	<b>Name of space station</b>	<b>Orbital position</b>	<b>Coordination request Special Section</b>	<b>Date of receipt of Advance Publication Information</b>
IND	INSAT-2(74)	74.00 E	CR/C/1311 and CR/C/1311 M1	07.08.85
IND	INSAT-2(83)	83.00 E	CR/C/1312 and CR/C/1312 M1	07.08.85
IND	INSAT-2(93.5)	93.50 E	CR/C/1313 and CR/C/1313 M1	07.08.85

**ADD****RESOLUTION COM4/1 (WRC-19)****Updating provisions related to aeronautical services in the Radio Regulations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that provisions contained in the Radio Regulations should be continually assessed and reviewed to reflect the current utilization of various radio applications;
- b) that some modes of operation of aeronautical radio applications employed in the past are no longer in use, due to the introduction of new aviation technologies;
- c) that some provisions of the Radio Regulations refer to outdated types of equipment,

*recognizing*

that the Radio Regulations may not fully reflect current aeronautical operational practices as defined by the International Civil Aviation Organization (ICAO),

*resolves to invite ITU-R*

to study the Articles, limited to Chapters IV, V, VI and VIII of Volume I of the Radio Regulations and their associated Appendices, as appropriate, in order to identify outdated aeronautical provisions with respect to ICAO standards and recommended practices and to develop examples of regulatory texts for updating these provisions, while ensuring that potential changes to such provisions will not impact any other systems or services operating in accordance with the Radio Regulations,

*invites administrations and Sector Members*

to participate actively in the studies by submitting contributions to ITU-R,

*instructs the Director of the Radiocommunication Bureau*

to include in the Report of the Director to WRC-23 the progress on the ITU-R studies referred to in  
*resolves to invite ITU-R,*

*instructs the Secretary-General*

to bring this Resolution to the attention of ICAO.

ADD

## RESOLUTION COM4/2 (WRC-19)

**Spectrum harmonization for railway radiocommunication systems between train and trackside within the existing mobile service allocations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that railway transportation contributes to global economic and social development, especially for developing countries;
- b) that the term “railway radiocommunication systems between train and trackside” (RSTT) refers to radiocommunication systems providing improved railway traffic control, passenger safety and improved security for train operations;
- c) that the main categories of RSTT applications are train radio, train positioning information, train remote and train surveillance;
- d) that spectrum harmonization of the train radio application of RSTT may have priority among the four categories of RSTT applications, because the train radio application provides for train dispatching, train control and other important railway services which are used to ensure the safety of passengers and train operations and require high reliability and high quality of services;
- e) that there may be a need to integrate different technologies across multiple bands in order to facilitate various functions, for instance dispatching commands, operating control and data transmission, into railway train and trackside systems to also meet the needs of a high-speed railway environment;
- f) that the technologies for RSTT are evolving, and international or regional organizations, such as the 3rd Generation Partnership Project (3GPP), the International Union of Railways (UIC), the European Telecommunications Standards Institute (ETSI), the European Union Agency for Railways (ERA), etc., are developing specifications for technologies and new functions to evolve RSTT;
- g) that the implementation of evolving RSTT needs to take account of the development of the railway industry;
- h) that some administrations wish to facilitate RSTT interoperability, in particular for cross-border operations, to ensure spectrum resources are used effectively and to minimize the risk of interference;
- i) that deployment of RSTT requires significant long-term investment and a stable radio regulatory environment;
- j) that international standards and harmonized spectrum could facilitate deployment of RSTT and provide economies of scale for the railway industry;
- k) that the harmonization of frequency bands for RSTT does not preclude the use of these bands by any other application of services to which they are allocated,

*recognizing*

- a) that Report ITU-R M.2418 provides the generic architecture, main applications, current technologies and generic operating scenarios of RSTT;



- b) that Report ITU-R M.2442 provides detailed technical and operational characteristics of RSTT and also provides spectrum usage of current and planned RSTT in some countries;
- c) that devices used for the train positioning information application of RSTT may be based on short-range devices (SRDs), using some frequency bands contained in the most recent version of Recommendation ITU-R SM.1896;
- d) that, as indicated in Report ITU-R M.2442, most of the current radiocommunication systems for train radio and train remote applications are widely deployed in the frequency bands below 1 GHz, and higher frequency bands such as millimetric bands are used for train radio and train surveillance applications of RSTT in some countries;
- e) that ITU-R is developing an ITU-R Recommendation to facilitate the spectrum harmonization of current and evolving RSTT within the existing mobile-service allocations,

*noting*

- a) that Report ITU-R M.2442 indicates that several particular frequency bands are in common use for train radio applications of RSTT by some administrations;
- b) that administrations have flexibility to determine how much spectrum to make available for RSTT as well as the conditions for usage at the national level in order to meet their particular national and/or regional requirements,

*resolves*

to encourage administrations, when planning for their RSTT, to consider the study results as per *invites ITU-R 1*, as well as other relevant ITU-R Recommendations/Reports, with a view to facilitating spectrum harmonization for RSTT, in particular for train radio applications,

*invites ITU-R*

- 1 to continue the development of the ITU-R Recommendation referred in *recognizing e)* addressing spectrum harmonization for RSTT in a timely manner;
- 2 to further develop and update ITU-R Recommendations/Reports concerning the technical and operational implementation of RSTT, as appropriate,

*instructs the Director of the Radiocommunication Bureau*

to support administrations in their work towards the harmonization of spectrum for RSTT pursuant to *resolves* above,

*invites administrations*

to encourage railway agencies and organizations to utilize relevant ITU-R publications in implementing technologies and systems supporting RSTT,

*invites Member States, Sector Members, Associates and Academia*

to participate actively in the study by submitting contributions to ITU-R,

*instructs the Secretary-General*

to bring this Resolution to the attention of UIC, 3GPP and other relevant international and regional organizations.

ADD

## RESOLUTION COM4/3 (WRC-19)

**Use of the frequency band 21.4-22 GHz by high-altitude platform stations in the fixed service in Region 2**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that there is a need for greater broadband connectivity in underserved communities and in rural and remote areas;
- b) that WRC-15 invited ITU-R to study additional spectrum needs for fixed high-altitude platform station (HAPS) links to provide broadband connectivity and to facilitate the use of HAPS links on a global or regional basis, recognizing that the existing HAPS identifications were established without reference to today's broadband capabilities;
- c) that HAPS can provide broadband connectivity with minimal ground network infrastructure;
- d) that ITU-R has conducted studies dealing with compatibility between systems using HAPS and existing services in the frequency band 21.4-22 GHz in Region 2, leading to Report ITU-R F.2471,

*considering further*

that current technologies can be used to deliver broadband applications by HAPS, which can provide broadband connectivity and disaster-recovery communications with minimal ground network infrastructure,

*recognizing*

- a) that a HAPS is defined in No. **1.66A** of the Radio Regulations as a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth, and is subject to No. **4.23**;
- b) that the aeronautical mobile service within the mobile service operates in the frequency range 21.2-21.5 GHz on a primary basis within Region 2,

*noting*

- a) that limits to be met at the border by HAPS transmitters may not be appropriate for frameworks for the introduction of HAPS nationally;
- b) that Reports ITU-R F.2438 and ITU-R F.2439 provide information relevant to the development of a framework for the introduction of HAPS by administrations,

*resolves*

1 that, for the purpose of protecting fixed-service systems in the territory of other administrations in the frequency band 21.4-22 GHz, the power flux-density (pfd) level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

$0.7 \theta - 135$	dB(W/(m <sup>2</sup> · MHz))	for	$0^\circ \leq \theta < 10^\circ$
$2.4 \theta - 152$	dB(W/(m <sup>2</sup> · MHz))	for	$10^\circ \leq \theta < 20^\circ$
$0.45 \theta - 113$	dB(W/(m <sup>2</sup> · MHz))	for	$20^\circ \leq \theta < 60^\circ$
-86	dB(W/(m <sup>2</sup> · MHz))	for	$60^\circ \leq \theta \leq 90^\circ$

where  $\theta$  is the angle of arrival of the incident wave above the horizontal plane, in degrees.

During periods of rain, the e.i.r.p. of the beam suffering rain fade may be increased by a level commensurate with the level of rain fade, by up to 20 dB above the e.i.r.p. associated with the above pfd mask at the surface of the Earth;

2 that, for the purpose of protecting the Earth exploration-satellite (passive) service in the frequency bands 21.2-21.4 GHz and 22.21-22.5 GHz, the e.i.r.p. density in the bands 21.2-21.4 GHz and 22.21-22.5 GHz per HAPS operating in the frequency band 21.4-22 GHz shall not exceed:

$-0.76 \theta - 9.5$	dB(W/100 MHz)	for	$-4.53^\circ \leq \theta < 35.5^\circ$
-36.5	dB(W/100 MHz)	for	$35.5^\circ \leq \theta \leq 90^\circ$

where  $\theta$  is the elevation angle (°) at the platform height;

3 that in order to ensure the protection of the radio astronomy service (RAS), the pfd level produced by unwanted emissions from HAPS downlink transmissions in the frequency band 21.4-22 GHz shall not exceed  $-176$  dB(W/(m<sup>2</sup> · 290 MHz)) for continuum observations, and  $-192$  dB(W/(m<sup>2</sup> · 250 kHz)) for spectral line observations in the frequency band 22.21-22.5 GHz at an RAS station location at a height of 50 m; this limit relates to the pfd which would be obtained using a time percentage of 2% in the relevant propagation model.

To verify the compliance, the following formula shall be used:

$$pfd = e.i.r.p. \cdot nominal \ clear \ sky (Az, \theta) + Att_{618, p=2\%} + 10 * \log_{10} \left( \frac{1}{4\pi d^2} \right) - GasAtt(\theta)$$

where:

*e.i.r.p.nominal clear sky*: is the nominal unwanted emission e.i.r.p. density towards the RAS station at which the HAPS operates under clear-sky conditions in dB(W/290 MHz) for continuum observations and in dB(W/250 kHz) for spectral line observations in the frequency band 22.21-22.5 GHz;

*Az*: is the azimuth from the HAPS towards the RAS station;

$\theta$ : is the elevation angle at the HAPS towards the RAS station;

*Att<sub>618p=2%</sub>*: is the attenuation from Recommendation ITU-R P.618 corresponding to  $p = 2\%$  of the time at the radio astronomy location;

*d*: is the separation distance in metres between the HAPS platform and the RAS station;

*GasAtt*( $\theta$ ): is gaseous attenuation for elevation  $\theta$  (Recommendation ITU-R SF.1395);

4 that *resolves 3* applies at any radio astronomy station that was in operation prior to 22 November 2019 and has been notified to the Bureau in the frequency band 22.21-22.5 GHz before 22 May 2020, or at any radio astronomy station that was notified before the date of receipt of the complete Appendix 4 information for notification, for the HAPS system to which *resolves 3* applies; radio astronomy stations notified after this date may seek an agreement with administrations that have authorized HAPS;

5 that, for the purpose of protecting the aeronautical mobile service operating in the frequency band 21.2-21.5 GHz, the e.i.r.p. per HAPS shall not exceed 17.5 dB(W/100 MHz) in the frequency range 21.4-21.5 GHz;

6 that administrations planning to implement a HAPS system in the frequency band 21.4-22 GHz shall notify the frequency assignments by submitting all mandatory elements of Appendix 4 to the Bureau for the examination of compliance with respect to this Resolution with a view to their registration in the Master International Frequency Register,

*instructs the Director of the Radiocommunication Bureau*

to take all necessary measures to implement this Resolution.

**ADD****RESOLUTION COM4/4 (WRC-19)****Use of the frequency band 24.25-27.5 GHz by high-altitude platform stations in the fixed service in Region 2**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that there is a need for greater broadband connectivity in underserved communities and in rural and remote areas;
- b) that WRC-15 invited ITU-R to study additional spectrum needs for fixed high-altitude platform station (HAPS) links to provide broadband connectivity and to facilitate the use of HAPS links on a global or regional basis, recognizing that the existing HAPS identifications were established without reference to today's broadband capabilities;
- c) that HAPS can provide broadband connectivity with minimal ground network infrastructure;
- d) that ITU-R has conducted studies dealing with compatibility between HAPS systems and systems in existing services in the frequency band 24.25-27.5 GHz and in the adjacent band in Region 2, leading to Report ITU-R F.2472-0,

*considering further*

that current technologies can be used to deliver broadband applications by HAPS, which can provide broadband connectivity and disaster-recovery communications with minimal ground network infrastructure,

*recognizing*

that, in the frequency bands 24.75-25.25 GHz and 27.0-27.5 GHz with respect to earth stations in the fixed-satellite service (Earth-to-space) and HAPS ground station receivers which operate in the fixed service, No. **9.17** applies,

*resolves*

1 that, for the purpose of protecting fixed-service systems in the territory of other administrations in the frequency band 27-27.5 GHz, the power flux-density (pfd) level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

$0.39 \theta - 132.12$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$0^\circ \leq \theta < 13^\circ$
$2.715 \theta - 162.3$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$13^\circ \leq \theta < 20^\circ$
$0.45 \theta - 117$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$20^\circ \leq \theta < 60^\circ$
$-90$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$60^\circ \leq \theta \leq 90^\circ$

where  $\theta$  is the angle of arrival of the incident wave above the horizontal plane, in degrees.

During periods of rain, the e.i.r.p. of the beam suffering rain fade may be increased by a level commensurate with the level of rain fade, by up to 20 dB above the e.i.r.p. associated with the above pfd mask at the surface of the Earth;

2 that, for the purpose of protecting the mobile-service systems in the territory of other administrations in the frequency band 24.25-25.25 GHz, the pfd level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

$-110.3$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$0^\circ \leq \theta \leq 4^\circ$
$-110.3 + 1.2 (\theta - 4)$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$4^\circ < \theta \leq 9^\circ$
$-104.3$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$9^\circ < \theta \leq 90^\circ$

where  $\theta$  is the angle of arrival of the incident wave above the horizontal plane, in degrees.

The limits above do take into account the 3 dB aggregate loss due to polarization mismatch, and body loss was not taken into account.

During periods of rain, the e.i.r.p. of the beam suffering rain fade may be increased by a level commensurate with the level of rain fade, by up to 20 dB above the e.i.r.p. associated with the above pfd mask at the surface of the Earth;

3 that, for the purpose of protecting the mobile-service systems in the territory of other administrations in the frequency band 27-27.5 GHz, the pfd level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

$0.95 \theta - 114$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$0^\circ \leq \theta < 5.7^\circ$
$0.6 \theta - 112$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$5.7^\circ \leq \theta < 20^\circ$
$-100$	$\text{dB}(W/(\text{m}^2 \cdot \text{MHz}))$	for	$20^\circ \leq \theta \leq 90^\circ$

where  $\theta$  is the angle of arrival of the incident wave above the horizontal plane, in degrees.

The limits above take into account the 3 dB aggregate loss due to polarization mismatch, and body loss was not taken into account.

During periods of rain, the e.i.r.p. of the beam suffering rain fade may be increased by a level commensurate with the level of rain fade, by up to 20 dB above the e.i.r.p. associated with the above pfd mask at the surface of the Earth;

4 that, for the purpose of protecting mobile-service systems operating in the frequency band 25.25-27 GHz in neighbouring administrations, coordination of a transmitting HAPS ground station is required when the pfd in  $\text{dB(W/(m}^2 \cdot \text{MHz))}$  at the border of a neighbouring administration exceeds a pfd limit of  $-110.3 \text{ dB(W/(m}^2 \cdot \text{MHz))}$ , and the pfd values shall be verified considering a percentage of time of 1% using the most recent version of Recommendation ITU-R P.452 and a mobile-station antenna height of 20 m;

5 that, for the purpose of protecting the inter-satellite service and fixed-satellite service, the e.i.r.p. density per HAPS in the frequency band 27-27.5 GHz shall not exceed  $-10.7 \text{ dB(W/MHz)}$  for off-nadir angles higher than  $85.5^\circ$ ;

6 that, for the purpose of protecting the inter-satellite service, the e.i.r.p. density per HAPS in the frequency band 24.45-24.75 GHz shall not exceed  $-19.9 \text{ dB(W/MHz)}$  for off-nadir angles higher than  $85.5^\circ$ ;

7 that, for the purpose of protecting non-GSO space stations of the inter-satellite service, the e.i.r.p. density per HAPS ground station in the frequency band 25.25-27 GHz shall not exceed  $12.3 \text{ dB(W/MHz)}$  under clear-sky conditions;

In addition, for the purpose of protecting GSO space stations of the inter-satellite service, the maximum e.i.r.p. density in the frequency band 25.25-27 GHz of HAPS ground stations shall not exceed  $0.5 \text{ dB(W/MHz)}$  in the direction of geostationary arc under clear-sky conditions. It is also needed to take into account a possible orbit inclination of GSO space stations of between  $-5^\circ$  and  $5^\circ$ .

Automatic power control may be used to increase the e.i.r.p. density only to the level to compensate rain fade and up to 20 dB;

8 that, for the purpose of protecting the fixed-satellite service, the e.i.r.p. density per HAPS in the frequency band 24.75-25.25 GHz shall not exceed  $-9.1 \text{ dB(W/MHz)}$  for off-nadir angles higher than  $85.5^\circ$ ;

9 that, for the purpose of protecting the Earth exploration-satellite service (EESS) (passive) in the frequency band 23.6-24 GHz, the e.i.r.p. density in the frequency band 23.6-24 GHz per HAPS operating in the frequency band 24.25-25.25 GHz shall not exceed:

$$\begin{array}{llll} -0.7714 \theta - 16.5 & \text{dB(W/200 MHz)} & \text{for} & -4.53^\circ \leq \theta < 35^\circ \\ -43.5 & \text{dB(W/200 MHz)} & \text{for} & 35^\circ \leq \theta \leq 90^\circ \end{array}$$

where  $\theta$  is the elevation angle ( $^\circ$ ) at the platform height;

10 that, in order to ensure the protection of in-band space research service (SRS)/EESS in the territory of other administrations from the HAPS gateway in the frequency band 25.5-27.0 GHz, the pfd shall not exceed the threshold values given below at the SRS/EESS earth stations at a height of 20 m above the ground level. If the pfd threshold values below are exceeded, then HAPS shall coordinate in accordance with No. 9.18, taking into account the parameters of the relevant systems. These limits relate to the pfd which would be obtained under assumed propagation conditions predicted by Recommendation ITU-R P.452 using the following time percentages: 0.001% for SRS, 0.005% for EESS non-GSO and 20% for EESS GSO:

SRS: pfd = -121 dB(W/(m<sup>2</sup> · MHz))

EESS non-GSO: pfd = -97 dB(W/(m<sup>2</sup> · MHz))

EESS GSO: pfd = -129 dB(W/(m<sup>2</sup> · MHz));

11 that, in order to ensure the protection of the radio astronomy service, the pfd level produced by unwanted emissions from HAPS downlink transmissions in the frequency band 24.25-25.25 GHz shall not exceed -177 dB(W/(m<sup>2</sup> · 400 MHz)) for continuum observations and -191 dB(W/(m<sup>2</sup> · 250 kHz)) for spectral line observations in the frequency band 23.6-24 GHz at an RAS station location at a height of 50 m; this limit relates to the pfd which would be obtained using a time percentage of 2% in the relevant propagation model.

To verify the compliance the following formula shall be used:

$$pfd = e.i.r.p._{nominal\ clear\ sky}(Az, \theta) + Att_{618, p=2\%} + 10 * \log_{10} \left( \frac{1}{4\pi d^2} \right) - GasAtt(\theta)$$

where:

*e.i.r.p.\_nominal clear sky*: is the nominal unwanted emission e.i.r.p. density towards the RAS station at which the HAPS operates under clear-sky conditions in dB(W/400 MHz) for continuum observations and in dB(W/250 kHz) for spectral line observations in the frequency band 23.6-24 GHz;

*Az*: is the azimuth in degrees from the HAPS towards the RAS station;

*θ*: is the elevation angle in degrees at the HAPS towards the RAS station;

*Att<sub>618p=2%</sub>*: is the attenuation in dB from Recommendation ITU-R P.618 corresponding to *p* = 2% of the time at the radio astronomy location;

*d*: is the separation distance in metres between the HAPS and the RAS station;

*pfd*: pfd at the Earth's surface per HAPS in dB(W/(m<sup>2</sup> · 400 MHz)) for continuum observations and in dB(W/(m<sup>2</sup> · 250 kHz)) for spectral line observations in the frequency band 23.6-24 GHz;

*GasAtt(θ)*: is gaseous attenuation for elevation *θ* (Recommendation ITU-R SF.1395);

12 that *resolves* 11 applies at any radio astronomy station that was in operation prior to 22 November 2019 and has been notified to the Bureau in the frequency band 23.6-24 GHz before 22 May 2020, or at any radio astronomy station that was notified before the date of receipt of the complete Appendix 4 information for notification, for the HAPS system to which *resolves* 11 applies; radio astronomy stations notified after this date may seek an agreement with administrations that have authorized HAPS;



13 that administrations planning to implement a HAPS system in the frequency band 24.25-27.5 GHz shall notify the frequency assignments by submitting all mandatory elements of Appendix 4 to the Bureau for the examination of compliance with respect to this Resolution with a view to their registration in the Master International Frequency Register,

*instructs the Director of the Radiocommunication Bureau*  
to take all necessary measures to implement this Resolution.

**ADD****RESOLUTION COM4/5 (WRC-19)****Use of the frequency band 31-31.3 GHz by high-altitude platform stations in the fixed service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that there is a need for greater broadband connectivity in underserved communities and in rural and remote areas;
- b) that WRC-15 invited the ITU Radiocommunication Sector (ITU-R) to study additional spectrum needs for fixed high-altitude platform station (HAPS) links to provide broadband connectivity and to facilitate the use of HAPS links on a global or regional basis, recognizing that the existing HAPS identifications were established without reference to today's broadband capabilities;
- c) that ITU-R has conducted studies dealing with compatibility between systems using HAPS and the passive services in the frequency band 31.3-31.8 GHz, leading to Report ITU-R F.2473;
- d) that Report ITU-R F.2439 provides deployment and technical characteristics of broadband HAPS systems;
- e) that Report ITU-R F.2438 contains worldwide spectrum needs of HAPS systems;
- f) that ITU-R has conducted studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the frequency band 31-31.3 GHz, leading to Report ITU-R F.2473,

*considering further*

that current technologies, such as HAPS, can be used to deliver broadband applications for broadband connectivity and disaster-recovery communications with minimal ground network infrastructure,

*recognizing*

that, during periods of rain, the e.i.r.p. of the HAPS beam suffering rain fade may be increased by a level commensurate with the level of rain fade, by up to 20 dB above the e.i.r.p. under clear-sky conditions indicated in Appendix 4,

*noting*

- a) that WRC-2000 adopted No. **5.543A**, which was modified at WRC-03 and then again at WRC-07 to permit the use of HAPS in the fixed service in the frequency band 31-31.3 GHz in certain Region 1 and 3 countries on a non-harmful interference, non-protection basis;
- b) that the frequency band 31-31.3 GHz is widely used or planned to be used by a number of different services and a number of other types of applications in the fixed service;
- c) that, while the decision to deploy HAPS can be taken on a national basis, such deployment may affect neighbouring administrations, particularly in small countries;
- d) that results of some ITU-R studies indicate that, in the frequency band 31-31.3 GHz, sharing between fixed-service systems using HAPS and other conventional fixed-service systems in the same area is subject to appropriate interference mitigation techniques to be developed and implemented,

*resolves*

1 that, for the purpose of protecting fixed-service systems in the territory of other administrations in the frequency band 31-31.3 GHz, the power flux-density (pfd) level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

0.875 $\theta$ – 143	dB(W/(m <sup>2</sup> · MHz))	for	0° ≤ $\theta$ < 8°
2.58 $\theta$ – 156.6	dB(W/(m <sup>2</sup> · MHz))	for	8° ≤ $\theta$ < 20°
0.375 $\theta$ – 112.5	dB(W/(m <sup>2</sup> · MHz))	for	20° ≤ $\theta$ < 60°
–90	dB(W/(m <sup>2</sup> · MHz))	for	60° ≤ $\theta$ ≤ 90°

where  $\theta$  is the angle of arrival of the incident wave above the horizontal plane, in degrees;

2 that, with regard to the protection of fixed-service stations with pointing elevation beyond 5°, an administration believing that unacceptable interference may still be caused shall, within four months of the date of publication of the relevant BR IFIC, provide its comments with the relevant justification to the notifying administration;

3 that, in order to ensure the protection of the Earth-exploration satellite service (EESS) (passive), the level of unwanted power density in the frequency band 31.3-31.8 GHz into the antenna of a HAPS ground station operating in the frequency band 31-31.3 GHz shall be limited to –83 dB(W/200 MHz) under clear-sky conditions, and may be increased under rainy conditions to mitigate fading due to rain, provided that the effective impact on the passive satellite does not exceed the impact under clear-sky conditions;

4 that, in order to ensure the protection of the EESS (passive), the level of unwanted emission e.i.r.p. density per HAPS transmitter operating in the frequency band 31-31.3 GHz into the frequency band 31.3-31.8 GHz shall be limited to:

$$\begin{array}{llll} -\theta - 13.1 & \text{dB(W/200 MHz)} & \text{for} & -4.53^\circ \leq \theta < 22^\circ \\ -35.1 & \text{dB(W/200 MHz)} & \text{for} & 22^\circ \leq \theta < 90^\circ \end{array}$$

where  $\theta$  is the elevation angle ( $^\circ$ ) at the platform height;

5 that, in order to ensure the protection of the radio astronomy service (RAS), the pfd level produced by any HAPS ground station operating in the frequency band 31-31.3 GHz at RAS station locations at a height of 50 m shall not exceed  $-141 \text{ dB(W/(m}^2 \cdot 500 \text{ MHz))}$  in the frequency band 31.3-31.8 GHz; this limit relates to the pfd which would be obtained under assumed propagation conditions predicted by the most recent version of Recommendation ITU-R P.452 using a time percentage of 2%;

6 that, in order to ensure the protection of the RAS, the pfd level produced by unwanted emissions from HAPS downlink transmissions in the frequency band 31-31.3 GHz shall not exceed  $-171 \text{ dB(W/(m}^2 \cdot 500 \text{ MHz))}$  for continuum observations in the frequency band 31.3-31.8 GHz at an RAS station location at a height of 50 m; this limit relates to the pfd which would be obtained using a time percentage of 2% in the relevant propagation model;

To verify compliance the following formula shall be used:

$$pfd(\theta) = e.i.r.p._{nominal \ clear \ sky}(Az, \theta) + Att_{618p=2\%} - 10 \log_{10}(4\pi d^2) - G_{ass}Att(\theta)$$

where:

*e.i.r.p.\_nominal clear sky*: nominal unwanted emission e.i.r.p. density towards the RAS station at which the HAPS operates under clear-sky conditions in dB(W/500 MHz) in the RAS band;

*Az*: azimuth from the HAPS towards the RAS station;

$\theta$ : elevation angle at the HAPS towards the RAS station;

*Att<sub>618p=2%</sub>*: attenuation from Recommendation ITU-R P.618 corresponding to  $p = 2\%$  of the time at the radio astronomy location;

*d*: separation distance in metres between the HAPS and the RAS station;

*pfd*( $\theta$ ): pfd at the Earth's surface per HAPS station in dB(W/(m<sup>2</sup> · 500 MHz));

*GasAtt*( $\theta$ ): gaseous attenuation for elevation angle of  $\theta$  (Recommendation ITU-R SF.1395-0);

7 that *resolves* 5 and 6 apply at any radio astronomy station that was in operation prior to 22 November 2019 and has been notified to the Bureau in the frequency band 31.3-31.8 GHz before 22 May 2020, or at any radio astronomy station that was notified before the date of receipt of the complete Appendix 4 information for notification, for the HAPS system to which *resolves* 5 and 6 apply; radio astronomy stations notified after this date may seek an agreement with administrations that have authorized HAPS;

8 that administrations planning to implement a HAPS system in the frequency band 31-31.3 GHz shall notify the frequency assignments by submitting all mandatory elements under Appendix 4 to the Bureau for the examination of compliance with respect to this Resolution with a view to their registration in the Master International Frequency Register,

*instructs the Director of the Radiocommunication Bureau*  
to take all necessary measures to implement this Resolution.

ADD

## RESOLUTION COM4/6 (WRC-19)

**Use of the frequency band 38-39.5 GHz by high altitude platform stations in the fixed service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that there is a need for greater broadband connectivity in underserved communities and in rural and remote areas;
- b) that WRC-15 invited ITU-R to study additional spectrum needs for fixed HAPS links to provide broadband connectivity and to facilitate the use of HAPS links on a global or regional basis, recognizing that the existing HAPS identifications were established without reference to today's broadband capabilities;
- c) that Report ITU-R F.2439 contains updated deployment and technical characteristics of broadband HAPS systems;
- d) that Report ITU-R F.2438 contains worldwide spectrum needs of HAPS systems;
- e) that ITU-R has conducted studies dealing with compatibility between systems using HAPS and existing services in the frequency band 38-39.5 GHz, leading to Report ITU-R F.2475,

*considering further*

that current technologies, such as high-altitude platform stations (HAPS), can be used to deliver broadband applications for broadband connectivity and disaster-recovery communications with minimal ground network infrastructure,

*recognizing*

- a) that, during periods of rain, the e.i.r.p. of the HAPS beam suffering rain fade may be increased by a level commensurate with the level of rain fade, by up to 20 dB above the e.i.r.p. under clear-sky conditions indicated in Appendix 4;
- b) that existing services shall be protected from HAPS operations, and no undue constraints shall be imposed on the future development of existing services by HAPS,

*resolves*

1 that, for the purpose of protecting fixed-service systems in the territory of other administrations in the frequency band 38-39.5 GHz, the power flux-density (pfd) level per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

-137	dB(W/(m <sup>2</sup> · MHz))	for	0° ≤ θ ≤ 13°
-137 + 3.125 (θ - 13)	dB(W/(m <sup>2</sup> · MHz))	for	13° < θ ≤ 25°
-99.5 + 0.5 (θ - 25)	dB(W/(m <sup>2</sup> · MHz))	for	25° < θ ≤ 50°
-87	dB(W/(m <sup>2</sup> · MHz))	for	50° < θ ≤ 90°

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees;

2 that, with regard to the protection of fixed-service stations with pointing elevation beyond 15°, an administration believing that unacceptable interference may still be caused shall, within four months of the date of publication of the relevant BR IFIC, provide its comments with relevant justification to the notifying administration;

3 that, for the purpose of protecting mobile-service systems in the territory of other administrations in the frequency band 38-39.5 GHz, the power flux-density level (pfd) per HAPS produced at the surface of the Earth in the territory of other administrations shall not exceed the following limits, developed for clear-sky conditions, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

-107.8	dB(W/(m <sup>2</sup> · MHz))	for	0° ≤ θ ≤ 4°
-107.8 + 1.5 (θ - 4)	dB(W/(m <sup>2</sup> · MHz))	for	4° < θ ≤ 10°
-98.8	dB(W/(m <sup>2</sup> · MHz))	for	10° < θ ≤ 90°

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees.

The limits above take into account 3 dB aggregate loss due to polarization mismatch, and body loss was not taken into account;

4 that, for the purpose of protecting mobile-service systems operating in the frequency band 38-39.5 GHz in neighbouring administrations, coordination of a transmitting HAPS ground station is required when the power flux-density in dB(W/m<sup>2</sup>/MHz) at the border of a neighbouring administration exceeds a pfd limit of -110.8 dB(W/m<sup>2</sup>/MHz) and the pfd values shall be verified considering a percentage of time of 1% in the relevant propagation model of the most recent version of Recommendation ITU-R P.452 and a mobile station antenna height of 20 m;

5 that, for the purpose of protecting FSS GSO earth stations in the fixed-satellite service (space-to-Earth) in the territory of other administrations, the power flux-density in the territory of other neighbouring administrations shall not exceed the following values, unless the explicit agreement of the affected administration is provided at the time of notification of HAPS:

-169.9 + 1954 α <sup>2</sup>	dB(W/(m <sup>2</sup> · MHz))	for	0° ≤ α < 0.136°
-133.9	dB(W/(m <sup>2</sup> · MHz))	for	0.136° ≤ α < 1°
-133.9 + 25 log α	dB(W/(m <sup>2</sup> · MHz))	for	1° ≤ α < 47.9°
-91.9	dB(W/(m <sup>2</sup> · MHz))	for	47.9° ≤ α ≤ 180°

where α is the minimum angle between the line to the HAPS (taking into account the HAPS location tolerance) and the lines to the GSO arc in degrees at any point on the territory of other administrations.

To calculate the pfd produced by a HAPS platform, the following equation shall be used:

$$pfd = e.i.r.p. - 10 \log_{10} (4\pi d^2) - Att_{gaz}$$

where:

- d*: distance between the HAPS and the GSO FSS earth station (m);
- Att<sub>gaz</sub>*: attenuation due to atmospheric gases on the HAPS-to-GSO FSS earth station path in dB (Recommendation ITU-R P.676);
- e.i.r.p.*: maximum HAPS e.i.r.p. spectral density in the direction of the GSO FSS earth station in dB(W/MHz);

6 that, for the purpose of protecting FSS non-GSO systems in the fixed-satellite service (space-to-Earth) in the territory of other administrations from HAPS interference, administrations implementing HAPS shall seek explicit agreement with any other administration when the distance between the HAPS nadir point and any point on such other administration's border is less than the distance calculated by the following formula, where the minimum earth station elevation angle is 10 degrees; this does not preclude lower elevation angles being used for the operation of earth stations; this distance can be decreased by explicit agreement of affected administrations on a case-by-case basis;

$$d = \frac{\pi R}{180} \left( 90 - \theta - \arcsin \left( \frac{R}{R+h} \cos \theta \right) \right)$$

where:

- R* is the Earth's radius (6 371 km)
- θ* is the minimum elevation angle at the non-GSO FSS earth station (10°)
- h* is the HAPS altitude (km)

7 that, in making assignments to HAPS systems (HAPS ground stations and HAPS) in the fixed service in the frequency band 38-39.5 GHz, administrations shall protect the space research service (SRS) (space-to-Earth) in the frequency band 37-38 GHz from harmful interference by unwanted emissions, taking into account the space research service (space-to-Earth) protection level of -217 dB(W/Hz) at the input of the SRS receiver with 0.001% exceedance due to atmospheric and precipitation effects, as referred to in the relevant ITU-R Recommendations;

8 that, for the purpose of protecting FSS GSO and non-GSO earth stations in the fixed-satellite service (space to-Earth) in neighbouring administrations, coordination of a transmitting HAPS ground station is required when the power flux-density in dB(W/m<sup>2</sup>/MHz) at the border of a neighbouring administration exceeds a pfd limit of -111.3 dB(W/m<sup>2</sup>/MHz) for non-GSO operations and -108.9 dB(W/m<sup>2</sup>/MHz) for GSO operations, and the pfd values shall be verified considering a percentage of time of 20% in the relevant propagation model of the most recent version of Recommendation ITU-R P.452 and an FSS earth station antenna height of 10 m;

9 that the notifying administration for the HAPS system shall send to the Bureau a commitment that the HAPS operation shall be in conformity with the Radio Regulations, including this Resolution;

10 that administrations planning to implement a HAPS system in the frequency band 38-39.5 GHz shall notify the frequency assignments by submitting all mandatory elements of Appendix 4 to the Bureau for the examination of compliance with respect to this Resolution with a view to their registration in the Master International Frequency Register;



11 that the notifying administration for the HAPS system shall send to the Bureau a commitment that, upon receiving an unacceptable interference report with relevant justification on the exceedance of the limits set in this Resolution, the notifying administration for the HAPS system shall take the required action to eliminate or reduce interference to an acceptable level,

*resolves further*

that, should an administration operating HAPS agree, with its neighbouring administrations, to levels higher than the limits contained in this Resolution, such agreement shall not affect other administrations that are not party to that agreement,

*instructs the Director of the Radiocommunication Bureau*

to take all necessary measures to implement this Resolution,

*invites ITU-R*

to develop a Recommendation to provide technical guidance to facilitate the implementation of HAPS operations while ensuring the protection of non-GSO FSS earth stations.

ADD

## RESOLUTION COM4/7 (WRC-19)

**Use of the frequency band 66-71 GHz for International Mobile Telecommunications (IMT) and coexistence with other applications of the mobile service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that International Mobile Telecommunications (IMT), including IMT-2000, IMT-Advanced and IMT-2020, and other wireless access systems are intended to provide telecommunication services on a worldwide scale regardless of location and type of network or terminal;
- b) that the evolution of IMT is being studied within ITU-R;
- c) that harmonized worldwide bands and harmonized frequency arrangements are highly desirable in order to achieve global roaming and the benefits of economies of scale;
- d) that adequate and timely availability of spectrum for IMT and supporting regulatory provisions are essential to realize the objectives in Recommendation ITU-R M.2083;
- e) that IMT systems are envisaged to provide increased peak data rates and capacity that may require a larger bandwidth;
- f) that there is a need to protect existing services and to allow for their continued development,

*noting*

- a) Recommendation ITU-R M.2083, “IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond”;
- b) Recommendation ITU-R M.2003, “Multiple Gigabit Wireless Systems in frequencies around 60 GHz”;
- c) Report ITU-R M.2227, “Use of Multiple Gigabit Wireless Systems in frequencies around 60 GHz”;

*recognizing*

Resolutions 176 (Rev. Dubai, 2018) and 203 (Rev. Dubai, 2018) of the Plenipotentiary Conference,

*resolves*

- 1 that administrations wishing to implement IMT make available the frequency band 66-71 GHz identified in No. **5.J113** for use by the terrestrial component of IMT;
- 2 that administrations wishing to implement IMT in the frequency band 66-71 GHz, identified for IMT under the provisions in No. **5.J113**, which are also wishing to implement other applications of the mobile service, including other wireless access systems in the same frequency band, consider coexistence between IMT and these applications,

*invites ITU-R*

- 1 to develop harmonized frequency arrangements for the implementation of the terrestrial component of IMT in the frequency band 66-71 GHz;
- 2 to develop ITU-R Recommendations and/or Reports, as appropriate, to assist administrations in ensuring the efficient use of the frequency band through coexistence mechanisms between IMT and other applications of the mobile service, including other wireless access systems, as well as between the mobile service and other services;
- 3 to regularly review, as appropriate, the impact of evolving technical and operational characteristics of IMT systems (including base-station density) and those of systems of space services on sharing and compatibility, and to take into account the results of these reviews in the development and/or revision of ITU-R Recommendations/Reports addressing, *inter alia*, if necessary, applicable measures to mitigate the risk of interference into space receivers,

*instructs the Director of the Radiocommunication Bureau*

to bring this Resolution to the attention of relevant international organizations.

**ADD****RESOLUTION COM4/8 (WRC-19)****Terrestrial component of International Mobile Telecommunications in the frequency band 24.25-27.5 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that International Mobile Telecommunications (IMT), including IMT-2000, IMT-Advanced and IMT-2020, is the ITU vision of global mobile access, and is intended to provide telecommunication services on a worldwide scale, regardless of location and type of network or terminal;
- b)* that the evolution of IMT is being studied within ITU-R;
- c)* that harmonized worldwide bands for IMT are desirable in order to achieve global roaming and the benefits of economies of scale;
- d)* that IMT systems are now being evolved to support diverse usage scenarios such as enhanced mobile broadband, massive machine-type communications and ultra-reliable and low-latency communications;
- e)* that ultra-low latency and very high bit-rate applications of IMT will require larger contiguous blocks of spectrum than those available in frequency bands that are currently identified for use by administrations wishing to implement IMT;
- f)* that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems including multiple input, multiple output (MIMO) and beam-forming techniques in supporting enhanced broadband;
- g)* that identification of frequency bands allocated to the mobile service for IMT may change the sharing situation regarding applications of services to which the frequency band is already allocated, and may require regulatory actions;
- h)* that there is a need to protect existing services and to allow for their continued development;
- i)* that ITU-R has studied, in preparation for WRC-19, sharing and compatibility with services allocated in the frequency band 24.25-27.5 GHz and its adjacent band, based on characteristics available at that time, and results may change if these characteristics change;
- j)* it is assumed that a very limited number of IMT base stations will be communicating with positive elevation angle towards IMT indoor mobile stations;
- k)* that the allocations of frequency bands to the Earth exploration-satellite service (EESS) (passive) are defined solely by the fundamental properties of the Earth and its atmosphere, and related measurements are beneficial and used globally and extensively in meteorology, climatology and other scientific purposes for the protection of human life and natural resources; although EESS (passive) satellites and sensors are operated by few countries, they benefit of the whole international community and are hence to be protected on a worldwide basis;
- l)* that sharing studies were conducted considering applications in the land mobile service,

*noting*

Recommendation ITU-R M.2083, which provides “IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond”,

*recognizing*

- a) that the identification of a frequency band for IMT does not establish priority in the Radio Regulations and does not preclude the use of the frequency band by any application of the services to which it is allocated;
- b) Resolutions 176 (Rev. Dubai, 2018) and 203 (Rev. Dubai, 2018) of the Plenipotentiary Conference;
- c) that Resolution **750 (Rev.WRC-19)** establishes limits on unwanted emissions in the frequency band 23.6-24 GHz from IMT base stations and IMT mobile stations within the 24.25-27.5 GHz frequency band;
- d) that spurious emission limits of Recommendation ITU-R SM.329 Category B (−60 dB(W/MHz)) are sufficient to protect the EESS (passive) in the bands 50.2-50.4 GHz and 52.6-54.25 GHz from the second harmonic of IMT base station emissions in the 24.25-27.5 GHz frequency band;
- e) that ITU-R has conducted sharing studies between IMT and the ISS/FSS (Earth-to-space) in the frequency band 24.25-27.5 GHz based on a number of baseline assumptions, (e.g. e.i.r.p. of 18 dB(W/200 MHz), base station densities of 1 200 per 10 000 km<sup>2</sup> and other deployment scenarios), as well as sensitivity analysis for some of them, and these baseline assumptions, as well as other assumptions, influence the sharing study results;
- f) that the frequency bands immediately below the passive frequency band 23.6-24 GHz are not intended to be used for high-density mobile applications,

*resolves*

- 1 that administrations wishing to implement IMT consider the use of frequency band 24.25-27.5 GHz identified for IMT in No. **5.A113**, and the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT taking into account the latest relevant ITU-R Recommendations;
- 2 that administrations shall apply the following conditions for the frequency band 24.25-27.5 GHz;
  - 2.1 take practical measures to ensure the transmitting antennas of outdoor base stations are normally pointing below the horizon, when deploying IMT base stations within the frequency band 24.25-27.5 GHz. The mechanical pointing needs to be at or below the horizon;
  - 2.2 as far as practicable, sites for IMT base stations within the frequency band 24.45-27.5 GHz employing values of equivalent isotropically radiated power (e.i.r.p.) per beam exceeding 30 dB(W/200 MHz) should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit, within the line-of-sight of the IMT base station, by  $\pm 7.5$  degrees;
- 3 that protection of EESS/SRS earth stations in the 25.5-27 GHz frequency band and RAS stations in the 23.6-24 GHz frequency band and coexistence between FSS earth stations in the 24.65-25.25 GHz and 27-27.5 GHz frequency bands and IMT stations should be facilitated through bilateral agreements for cross-border coordination as necessary;

4 the operation of IMT within the frequency band 24.25-27.5 GHz shall protect the existing and future EESS (passive) systems in the frequency bands 23.6-24 GHz;

5 that IMT stations within the frequency range 24.25-27.5 GHz are used for applications of the land mobile service,

*encourages administrations*

1 to ensure that provisions for the implementation of IMT allow for the continued use of EESS, SRS, FSS earth stations and their future development;

2 to keep the IMT base stations antenna pattern within the limits of approximation envelope according to Recommendation ITU-R M.2101;

3 to apply spurious emission limits of Recommendation ITU-R SM.329 Category B for the bands 50.2-50.4 GHz and 52.6-54.25 GHz when making the 24.25-27.5 GHz frequency band available for IMT;

4 that for the future development of EESS (passive) in the frequency band 23.6-24 GHz, administrations should consider additional mitigation techniques (e.g. guardbands) beyond the limits specified in Resolution **750 (Rev.WRC-19)**, as appropriate,

*invites ITU-R*

1 to develop harmonized frequency arrangements to facilitate IMT deployment in the frequency band 24.25-27.5 GHz, taking into account the results of sharing and compatibility studies conducted in preparation for WRC-19;

2 to develop an ITU-R Recommendation on methodologies for calculating coordination zones around EESS/SRS earth stations in order to avoid harmful interference from IMT systems in the frequency band 25.5-27 GHz;

3 to develop ITU-R Recommendation(s) to assist administrations to mitigate interference from FSS earth stations into IMT stations operating in the frequency bands 24.65-25.25 GHz and 27-27.5 GHz;

4 to update existing ITU-R Recommendations or develop a new ITU-R Recommendation, as appropriate, to provide information and assistance to the concerned administrations on possible coordination and protection measures for the radio astronomy service in the frequency band 23.6-24 GHz from IMT deployment;

5 to regularly review, as appropriate, the impact of evolving technical and operational characteristics of IMT systems (including base-station density) and those of systems of space services on sharing and compatibility, and to take into account the results of these reviews in the development and/or revision of ITU-R Recommendations/Reports addressing, *inter alia*, if necessary, applicable measures to mitigate the risk of interference into space receivers,

*instructs the Director of the Radiocommunication Bureau*

to bring this Resolution to the attention of relevant international organizations.

**ADD**

**RESOLUTION COM4/9 (WRC-19)**

**Terrestrial component of International Mobile Telecommunications within the frequency bands 37-43.5 GHz and 47.2-48.2 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that International Mobile Telecommunications (IMT), including IMT-2000, IMT-Advanced and IMT-2020, is intended to provide telecommunication services on a worldwide scale, regardless of location and type of network or terminal;
- b)* that adequate and timely availability of spectrum and supporting regulatory provisions is essential to realize the objectives in Recommendation ITU-R M.2083;
- c)* that there is a need to continually take advantage of technological developments in order to increase the efficient use of spectrum and facilitate spectrum access;
- d)* that IMT systems are now being evolved to provide diverse usage scenarios and applications such as enhanced mobile broadband, massive machine-type communications and ultra-reliable and low-latency communications;
- e)* that ultra-low latency and very high bit-rate applications of IMT will require larger contiguous blocks of spectrum than those available in frequency bands that are currently identified for use by administrations wishing to implement IMT;
- f)* that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems including multiple-input and multiple-output (MIMO) and beam-forming techniques in supporting enhanced broadband;
- g)* that harmonized worldwide frequency bands for IMT are desirable in order to achieve global roaming and the benefits of economies of scale;
- h)* that ITU-R has studied, in preparation for WRC-19, sharing and compatibility with services allocated in the frequency ranges 37-43.5 GHz and 47.2-48.2 GHz and their adjacent frequency bands, based on the characteristics available at that time, and the results may change if these characteristics change;
- i)* that identification of frequency bands allocated to the mobile service for IMT may change the sharing situation regarding applications of services to which the frequency band is already allocated, and may require regulatory actions;
- j)* that there is a need to protect existing services and to allow for their continued development;
- k)* that it is assumed that a very limited number of IMT base stations will be communicating with a positive elevation angle towards IMT indoor mobile stations;
- l)* that the use of this frequency band by the mobile service for IMT is intended for the land mobile service use and sharing studies were conducted based on that assumption,

*noting*

- a) that Recommendation ITU-R M.2083 provides “IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond”;
- b) that Report ITU-R M.2320 addresses future technology trends of terrestrial IMT systems;
- c) that Report ITU-R M.2370 addresses trends impacting future IMT traffic growth beyond the year 2020 and estimates global traffic demands for the period 2020 to 2030;
- d) that Resolution **143 (Rev.WRC-07)** establishes the “Guidelines for the implementation of high-density applications in the fixed-satellite service in frequency bands identified for these applications”;

*recognizing*

- a) that timely availability of wide and contiguous blocks of spectrum is important to support the development of IMT;
- b) Resolutions 176 (Rev. Dubai, 2018) and 203 (Rev. Dubai, 2018) of the Plenipotentiary Conference;
- c) the identification of high-density applications in the fixed-satellite service (HDFSS) in the space-to-Earth direction in the frequency band 39.5-40 GHz in Region 1, 40-40.5 GHz in all Regions, 40.5-42 GHz in Region 2 and 47.5-47.9 GHz in Region 1 (see No. **5.516B**);
- d) that No. **5.149** applies for the purpose of protecting the radio astronomy service (RAS) in the frequency band 42.5-43.5 GHz, which is allocated on a primary basis;
- e) that the frequency band 47.2-48.2 GHz is allocated to the fixed, mobile and fixed-satellite service including planned non-GSO uplinks,

*resolves*

- 1 that administrations wishing to implement IMT consider the use of the frequency band 37-43.5 GHz, or portions thereof, and the frequency band 47.2-48.2 GHz identified for IMT in No. **5.BDE113** and No. **5.H113** and the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT taking into account the latest relevant ITU-R Recommendation;
- 2 that, in order to ensure the coexistence between IMT in the frequency bands 37-43.5 GHz and 47.2-48.2 GHz as identified by WRC-19 in Article 5 of the Radio Regulations and other services to which the frequency band is allocated including the protection of these other services, administrations shall apply the following condition(s);
  - 2.1 that, in order to protect the EESS (passive) in the frequency band 36-37 GHz, the following unwanted emissions of IMT stations operating in the frequency band 37-40.5 GHz apply as specified in Table 1 below;



TABLE 1

Frequency band for the EESS (passive)	Frequency band for IMT stations	Unwanted emission mean power for IMT stations <sup>1</sup>	Recommended limits for IMT stations <sup>1</sup>
36-37 GHz	37-40.5 GHz	-43 dB(W/MHz) and -23 dB(W/GHz) within the 36-37 GHz frequency band	-30 dB(W/GHz)

<sup>1</sup> The unwanted emission power level is considered in terms of total radiated power (TRP). The TRP is to be understood here as the integral of the power transmitted from all antenna elements in different directions over the entire radiation sphere.

2.2 that protection of space research service (SRS) earth stations in the 37-38 GHz frequency band and RAS stations in the 42.5-43.5 GHz frequency band from IMT stations should be facilitated through bilateral agreements for cross-border coordination as necessary;

2.3 that protection of and coexistence with FSS earth stations within the frequency ranges 37.5-43.5 GHz and 47.2-48.2 GHz should be facilitated through bilateral agreements for cross-border coordination as necessary;

2.4 take practical measures to ensure the transmitting antennas of outdoor base stations are normally pointing below the horizon, when deploying IMT base stations within the frequency bands 42.5-43.5 GHz and 47.2-48.2 GHz. The mechanical pointing needs to be at or below the horizon;

2.5 as far as practicable, sites for IMT base stations in the frequency bands 42.5-43.5 GHz and 47.2-48.2 GHz employing values of equivalent isotropically radiated power (e.i.r.p.) per beam exceeding 30 dB(W/200 MHz) should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit, within the line-of-sight of the IMT base station, by  $\pm 7.5$  degrees;

3 that IMT stations within the frequency ranges 37-43.5 GHz and 47.2-48.2 GHz are used for applications of the land mobile service,

*invites administrations*

to ensure that, when considering the spectrum to be used for IMT, due attention is paid to the need for spectrum for ubiquitous earth stations at unspecified points, as well as those used for gateways, taking into account spectrum identified in the frequency bands 39.5-40 GHz in Region 1, 40-40.5 GHz in all Regions, 40.5-42 GHz in Region 2 and 47.5-47.9 GHz in Region 1 for the HDFSS as per No. **5.516B**,

*encourages administrations*

1 to ensure that provisions for the implementation of IMT allow for the continued development of EESS, SRS, FSS, BSS earth stations and RAS stations and their future development;

2 to keep the IMT base stations antenna pattern within the limits of approximation envelope according to Recommendation ITU-R M.2101,

*to encourage administrations of Region 1*

to consider implementing IMT in the frequency band 40.5-43.5 GHz in order to better accommodate the need of other services below 40.5 GHz, taking into account the protection of FSS within 37.5-40.5 GHz in Region 1,

*invites ITU-R*

- 1 to develop harmonized frequency arrangements to facilitate IMT deployment in the frequency bands 37-43.5 GHz and 47.2-48.2 GHz , taking into account the results of sharing and compatibility studies conducted in preparation for WRC-19;
- 2 to continue providing guidance to ensure that IMT can meet the telecommunication needs of the developing countries;
- 3 to develop an ITU-R Recommendation on methodologies for calculating coordination zones around SRS earth stations in order to avoid harmful interference from IMT systems in the frequency band 37-38 GHz;
- 4 to develop ITU-R Reports and Recommendations, as appropriate, to assist administrations in ensuring coexistence between IMT and BSS, FSS, including HDFSS as per No. **5.516B** within the frequency range 37-43.5 GHz and 47.2-48.2 GHz as appropriate;
- 5 to develop a new ITU-R Recommendation, as appropriate, to provide information and assistance to the concerned administrations on possible coordination and protection measures for the radio astronomy service in the frequency band 42.5-43.5 GHz from IMT deployment;
- 6 to regularly review, as appropriate, the impact of evolving technical and operational characteristics of IMT systems (including base-station density) and those of systems of space services on sharing and compatibility, and to take into account the results of these reviews in the development and/or revision of ITU-R Recommendations/Reports addressing, *inter alia*, if necessary, applicable measures to mitigate the risk of interference into space receivers,

*instructs the Director of the Radiocommunication Bureau*

to bring this Resolution to the attention of relevant international organizations.

**ADD****RESOLUTION COM4/10 (WRC-19)****International Mobile Telecommunications in the frequency band 45.5-47 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that International Mobile Telecommunications (IMT), including IMT-2000, IMT-Advanced and IMT-2020, is intended to provide telecommunication services on a worldwide scale, regardless of location and type of network or terminal;
- b) that the evolution of IMT is being studied within ITU-R;
- c) that adequate and timely availability of spectrum and supporting regulatory provisions is essential to realize the objectives in Recommendation ITU-R M.2083;
- d) that there is a need to continually take advantage of technological developments in order to increase the efficient use of spectrum and facilitate spectrum access;
- e) that IMT systems are now being evolved to provide diverse usage scenarios and applications such as enhanced mobile broadband, massive machine-type communications and ultra-reliable and low-latency communications;
- f) that ultra-low latency and very high bit-rate applications of IMT will require larger contiguous blocks of spectrum than those available in frequency bands that are currently identified for use by administrations wishing to implement IMT;
- g) that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems including MIMO and beam-forming techniques in supporting enhanced broadband;
- h) that harmonized worldwide bands for IMT are desirable in order to achieve global roaming and the benefits of economies of scale,

*noting*

Recommendation ITU-R M.2083 “IMT Vision –Framework and overall objectives of the future development of IMT for 2020 and beyond”,

*recognizing*

that the identification of a frequency band for IMT does not establish priority in the Radio Regulations and does not preclude the use of the frequency band by any application of the services to which it is allocated,

*resolves*

that administrations wishing to implement IMT consider the use of frequency band 45.5-47 GHz, identified for IMT in No. **5.F113** and the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT taking into account the latest relevant ITU-R Recommendation,

*invites ITU-R*

- 1 to develop harmonized frequency arrangements to facilitate IMT deployment in the frequency band 45.5-47 GHz;
- 2 to continue providing guidance to ensure that IMT can meet the telecommunication needs of the developing countries in the context of the studies referred to above.

**ADD****RESOLUTION COM5/1 (WRC-19)****Measures to limit unauthorized uplink transmissions  
from earth stations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

a) that, in accordance with Resolution **958 (WRC-15)** and Resolution ITU-R 64 (RA-15), the following issues were studied:

- whether there is a need for possible additional measures in order to limit uplink transmissions of terminals to those authorized terminals in accordance with No. **18.1**;
- the possible methods that will assist administrations in managing the unauthorized operation of earth station terminals deployed within their territory, as a tool to guide their national spectrum-management programme;

b) that demand has been increasing for global satellite broadband communication services throughout the world,

*recognizing*

a) that training and monitoring capabilities, along with ITU reports and handbooks, may assist national administrations in inhibiting the unauthorized uplink transmissions of earth stations and can facilitate the location and termination of unauthorized earth station transmissions which do not comply with the provisions of Article **18** of the Radio Regulations;

b) that Article **18** specifies the requirements for licensing the operation of stations within any given territory;

c) that administrations involved in the provision of satellite services, including notifying administrations of satellite networks or systems, are subject to Article **18**;

d) that successful coordination of a satellite network or system does not imply licensing/authorization to provide a service within the territory of a Member State,

*noting*

a) that the ITU Constitution recognizes the sovereign right of each Member State to regulate its telecommunications;

b) that multiple administrations are involved in the provision of satellite services, including notifying administrations of satellite networks or systems,

*resolves*

1 that the operation of transmitting earth stations within the territory of an administration shall be carried out only if authorized by that administration;

2 that the notifying administration for a satellite network or system shall, to the extent practicable, limit the operation of transmitting earth stations on the territory of an administration on which they are located and operated to only those licensed or authorized by that administration;

3 that, when an administration identifies the presence of unauthorized transmitting earth station transmissions in its territories:

- i) it should take all appropriate actions at its disposal to the extent of its ability to stop such unauthorized transmissions; and
- ii) if the matter is not resolved, this administration may report the details of such unauthorized transmissions, if available, to the notifying administrations of the satellite networks or systems that may be associated with these unauthorized transmissions, and the notifying administrations of these satellite networks or systems shall cooperate with the reporting administration, to the maximum extent possible, in order to resolve the matter in a satisfactory and timely manner,

*invites administrations*

1 to take all appropriate actions to make publicly and readily available the procedures for licensing/authorizing the operation of earth stations in their territories;

2 that have identified unauthorized operation of earth stations within their territories to provide relevant information to the Radiocommunication Bureau to report such cases;

3 when requested by the Radiocommunication Bureau or another administration, to cooperate to the maximum extent practicable, with assistance in identifying unauthorized earth stations, with monitoring or geolocation services,

*instructs the Director of the Radiocommunication Bureau*

1 upon receipt of information from an administration detecting an unauthorized uplink transmission from its territory, to immediately inform Member States and satellite operating agencies of the matter by appropriate means and work with the administrations involved to resolve the matter;

2 to inform the administrations on the type of assistance ITU can provide on this issue,

*instructs the Secretary-General*

to stress the importance and ensure the circulation of this Resolution to all Member States.

ADD

## RESOLUTION COM5/2 (WRC-19)

**Protection of implemented broadcasting-satellite service networks in the orbital arc of the geostationary-satellite orbit between 37.2° W and 10° E in the frequency band 11.7-12.2 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the provisions applying to the broadcasting-satellite service (BSS) in the frequency bands 11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3 are contained in Appendix **30**;
- b) that systems in the fixed-satellite service (FSS) and the BSS share the frequency band 11.7-12.2 GHz;
- c) that this conference suppressed the limitation in Section 3 of Annex 7 to Appendix **30 (Rev.WRC-15)** which determined allowable portions of the orbital arc between 37.2° W and 10° E for new or modified assignments in the frequency band 11.7-12.2 GHz in the Regions 1 and 3 List;
- d) that Section 1 of Annex 1 to Appendix **30** provides criteria used for determining coordination requirements for frequency assignments of the Regions 1 and 3 Plan and List;
- e) that pfd mask values in Section 1 of Annex 1 to Appendix **30** are based on the parameters adopted by WRC-2000 based on a minimum earth station receiving antenna diameter of 60 cm;
- f) that the use of this frequency band by the BSS is subject to the coordination procedure of Article 4 of Appendix **30**,

*noting*

- a) that the ITU Radiocommunication Sector (ITU-R) has carried out a significant amount of studies in preparation for conferences on BSS planning, and has developed a number of Reports and Recommendations;
- b) that, within the orbital arc of the geostationary-satellite orbit between 37.2° W and 10° E, before WRC-19 there were limitations on the use of some orbital positions for any proposed new or modified assignment in the Regions 1 and 3 List of additional uses in the frequency band 11.7-12.2 GHz;
- c) that some networks with an earth station receiving antenna diameter smaller than 60 cm were successfully implemented within the orbital arc mentioned in *noting b)*, in view of protection due to the presence of limitations on the use of orbital positions in this orbital arc;
- d) that with the deletion of orbital position limitations, the protection of satellite assignments mentioned in *noting c)* shall be ensured;
- e) that the geostationary-satellite orbit between 37.2° W and 10° E is widely used by Region 1 BSS and Region 2 FSS networks;
- f) that equitable access to and efficient use of the 12 GHz frequency range should be encouraged,

*resolves*

1 that this Resolution is applicable only to implemented<sup>1</sup> networks with an earth station receiving antenna diameter smaller than 60 cm (40 cm and 45 cm) as outlined in Annex 1 of this Resolution;

2 that frequency assignments associated with an earth station receiving antenna diameter of 40 cm or 45 cm in the networks mentioned in *resolves* 1 above are considered by the Bureau as being affected by a proposed new or modified assignment in the List filed at the GSO orbital positions mentioned in Annex 1 to this Resolution, only if the following conditions specified in Annex 1 of Appendix **30** are met:

- the minimum orbital spacing between the wanted and interfering space stations, under worst-case station-keeping conditions, is less than 9°;
- the reference equivalent downlink protection margin corresponding to at least one of the test points of that wanted assignment, including the cumulative effect of any previous modification to the List or any previous agreement, falls more than 0.45 dB below 0 dB, or, if already negative, more than 0.45 dB below that reference equivalent protection margin value;

3 that for cases when a proposed new assignment in the List is filed within the geostationary orbital arc between 37.2° W and 10° E in orbital arc segments that differ from those in Annex 1 to this Resolution, appropriate provisions of Annex 1 of Appendix **30** to determine the need for coordination continue to be applied with respect to relevant frequency assignments of satellite networks mentioned in *resolves* 1.

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<sup>1</sup> For the avoidance of doubt, the “implemented” networks referred to are related to Regions 1 and 3 BSS networks in the orbital arc 37.2° W and 10° E:

- for which complete Appendix 4 information had been received by the Bureau under § 4.1.3 of Appendix **30 (Rev.WRC-15)** prior to 28 November 2015, and
- for which complete Appendix 4 information had been received by the Bureau under § 4.1.12 of Appendix **30 (Rev.WRC-15)** prior to 23 November 2019, and
- for which the complete due diligence information, in accordance with Annex 2 to Resolution **49 (Rev.WRC-15)**, had been received by the Bureau prior to 23 November 2019, and
- for which complete Appendix 4 information had been received by the Bureau under § 5.1.2 of Appendix **30 (Rev.WRC-15)** prior to 23 November 2019, and
- brought into use, and for which the date of bringing into use has been confirmed to the Bureau before 23 November 2019.



## ANNEX 1 TO RESOLUTION COM5/2 (WRC-19)

**Satellite networks in the frequency band 11.7-12.2 GHz and orbital arc segments for which this Resolution is applicable**

Satellite networks for which this Resolution applies					Orbital arc segments where the conditions specified in <i>resolves 2</i> of this Resolution apply
Orbital position	Earth station antenna diameter, cm	Satellite network	Date of receipt of part A submission	Notice Id Part II	
30.0° W	45	HISPASAT-1	08.02.2000	99500256	34.92° W ≤ θ < 33.5° W; 32.5° W < θ ≤ 31.78° W; 28.22° W ≤ θ < 26.0° W.
		HISPASAT-37A	19.11.2014	117560019	
4.8° E	40	SIRIUS-N-BSS	17.11.2014	118560003	0° < θ ≤ 2.93° E; 6.67° E ≤ θ < 9.0° E; 9° E < θ ≤ 10° E.

Where θ is the orbital position within the orbital segment defined in the table above.

ADD

## RESOLUTION COM5/3 (WRC-19)

**Additional temporary regulatory measures following the deletion of part of Annex 7 to Appendix 30 (Rev.WRC-15) by WRC-19**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that some national assignments, especially those of developing countries in the Regions 1 and 3 Plan, have equivalent downlink protection margin values in Appendix 30 (Rev.WRC-15) equal to or below  $-10$  dB;
- b) that implementation of a national assignment in the Regions 1 and 3 Plan with an equivalent downlink protection margin equal to or below  $-10$  dB would be difficult;
- c) that any modification of orbital position and other parameters of a national assignment in the Appendix 30 Plan would require a corresponding modification of the orbital position and other parameters in the Appendix 30A feeder-link Plan,

*recognizing*

- a) that Article 44 of the ITU Constitution stipulates that: *“In using frequency bands for radio services, Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies taking account the special needs of the developing countries and the geographical situation of particular countries”*;
- b) that Resolution 71 (Rev. Dubai, 2018) of the ITU Plenipotentiary Conference includes the ITU strategic plan for 2020-2023, which contains, as one of the strategic objectives of ITU-R: *“Meet, in a rational, equitable, efficient, economical and timely way, the ITU membership’s requirements for radio-frequency spectrum and satellite-orbit resources, while avoiding harmful interference”*,

*resolves*

- 1 that as of 23 March 2020 and for a period until 21 May 2020, the special procedure outlined in the Attachment to this Resolution shall be applied in respect of submissions of Regions 1 and 3 administrations under § 4.1.3 of Appendices 30 and 30A in Regions 1 and 3 meeting the specified requirements in § 1 of the Attachment to this Resolution at an orbital position of orbital arcs for which the Annex 7 to Appendix 30 (Rev.WRC-15) limitations were suppressed by WRC-19; and those submissions sent before 23 March 2020 shall be returned to the administration;
- 2 that submissions received by the Bureau in accordance with *resolves* 1 shall be considered as received by the Bureau on 21 May 2020;

3 that as of 23 November 2019 and for a period until 21 May 2020, all submissions under § 4.1.3 of Appendices **30** and **30A** in Regions 1 and 3 not meeting the specified requirements in § 1 of the Attachment to this Resolution at an orbital position within orbital arcs for which the Annex 7 to Appendix **30 (Rev.WRC-15)** limitations were suppressed by WRC-19 shall be considered as received by the Bureau on 22 May 2020,

*instructs the Director of the Radiocommunication Bureau*

1 to identify the administrations that meet the conditions of § 1 of the Attachment to this Resolution and inform these administrations accordingly;

2 at the request of administrations identified in *instructs the Director of the Radiocommunication Bureau* 1 which have the intention to apply the procedure indicated in this Resolution, to assist and advise them to comply with the conditions described in the Attachment to this Resolution, including the identification of appropriate new orbital positions and frequency channels.

## ATTACHMENT TO RESOLUTION COM5/3 (WRC-19)

### **Additional temporary regulatory measures following the deletion of part of Annex 7 to Appendix 30 (Rev.WRC-15) by WRC-19**

1 The special procedure described in this Attachment can only be applied once by an administration with:

- a) no frequency assignments submitted on its own behalf and either included in the List or for which complete Appendix **4** information has been received by the Bureau in accordance with the provisions of § 4.1.3 of Appendix **30**; and
- b) an assignment in the Regions 1 and 3 Plan of Appendix **30** when the equivalent downlink protection margin (EPM) value corresponding to a test point of its national assignment in the Regions 1 and 3 Plan is equal to or below  $-10$  dB for at least 50% of the total number of EPM values of the assignment in the Regions 1 and 3 Plan in Appendix **30**.

2 Administrations seeking to apply this special procedure shall submit their request to the Bureau, with the information specified in § 4.1.3 of Appendices **30** and **30A**, which shall include, in particular:

- a) in the cover letter to the Bureau, the information that the administration requests the use of this special procedure together with the name of the Plan assignments for which the conditions defined in § 1 above are met;
- b) a service area limited to the national territory as defined in the relevant Bureau software application;
- c) a set of a maximum of 20 test points inside the national territory;
- d) a minimal ellipse determined by the set of test points submitted in c) above using the relevant Bureau software application. An administration may request the Bureau to create such a diagram;

- e)<sup>1</sup> a maximum ten<sup>2</sup> consecutive odd or even channels with standard Appendix **30** assigned frequencies in the same polarization for a Region 1 administration or twelve consecutive odd or even channels with standard Appendix **30** assigned frequencies in the same polarization for a Region 3 administration with a bandwidth of 27 MHz;
- f) a corresponding submission for the Appendix **30A** feeder-link Plan in compliance with the principles defined in items b), c), d) and e) above.
- 3 Upon receipt of the complete information from an administration sent under § 2 above, the Bureau shall process the submissions in date order in accordance with Article 4 of Appendices **30** and **30A**.
- 4 The notifying administration shall request subsequent WRCs to consider the inclusion of these assignments in the Appendices **30** and **30A** Plans as a replacement of its national assignments appearing in the Plans, pursuant to § 4.1.27 of Article 4 of Appendices **30** and **30A**. Under this Resolution, footnotes 10 and 12 associated with § 4.1.27 of Article 4 of Appendices **30** and **30A**, respectively, are not applicable.

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<sup>1</sup> In case of submission for the Appendix **30A** feeder-link Plan in the 14 GHz band, the maximum of ten<sup>2</sup> channels for a Region 1 administration or twelve<sup>2</sup> channels for a Region 3 administration with a bandwidth of 27 MHz could be in different polarization.

<sup>2</sup> This maximum number of channels shall not be greater than the number of channels contained in the assignment referred in § 1 of the Attachment to this Resolution.

ADD

## RESOLUTION COM5/4 (WRC-19)

**Need for coordination of Region 2 fixed-satellite service networks in the frequency band 11.7-12.2 GHz with respect to the Region 1 broadcasting-satellite service assignments located further west than 37.2° W and of Region 1 fixed-satellite service networks in the frequency band 12.5-12.7 GHz with respect to the Region 2 broadcasting-satellite service assignments located further east than 54° W**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WRC-15 decided to conduct studies on, review, and identify possible revisions to, if necessary, the limitations mentioned in Annex 7 to Appendix 30 (Rev.WRC-15), while ensuring the protection of, and without imposing additional constraints on, assignments in the Plan and in the List and the future of broadcasting-satellite service (BSS) networks and existing fixed-satellite service (FSS) networks;
- b) that the provisions applying to the frequency assignments of the BSS in the frequency bands 11.7-12.5 GHz in Region 1 and 12.2-12.7 GHz in Region 2 are contained in Appendix 30;
- c) that the FSS has primary allocations in the frequency bands 12.5-12.75 GHz in Region 1 and 11.7-12.2 GHz in Region 2;
- d) that the BSS has primary allocations in the frequency bands 11.7-12.5 GHz in Region 1 and 12.2-12.7 GHz in Region 2;
- e) that this conference has suppressed the limitation in Annex 7 to Appendix 30 (Rev.WRC-15) that prevented broadcasting satellites serving an area in Region 1 and using frequency assignments in the frequency band 11.7-12.2 GHz at orbital positions further west than 37.2° W;
- f) that this conference has suppressed the limitation in Annex 7 to Appendix 30 (Rev.WRC-15) that prevented broadcasting satellites serving an area in Region 2 and using frequency assignments in the frequency band 12.5-12.7 GHz at orbital positions further east than 54° W;
- g) that the result of those suppressions shall ensure the protection of, and cannot impose additional constraints on, assignments in the Plan and the List and the future development of the BSS within the Plan, and existing and planned FSS networks,

*recognizing*

- a) that existing FSS networks operating in the frequency bands mentioned in *considering c)* and BSS frequency assignments in the Plan and List implemented in accordance with the provisions of Annex 7 to Appendix 30 (Rev.WRC-15) prior to WRC-19 shall continue to be protected;

b) that the frequency bands 11.7-12.5 GHz in Region 1 and 12.2-12.7 GHz in Region 2 are widely used by BSS networks, subject to the provisions of Annex 7 to Appendix **30 (Rev.WRC-15)** prior to WRC-19;

c) that the frequency bands 12.5-12.75 GHz in Region 1 and 11.7-12.2 GHz in Region 2 are widely used by FSS networks,

*resolves*

1 that, in the frequency band 11.7-12.2 GHz, with respect to §§ 7.1 a), 7.2.1 a), 7.2.1 b) and 7.2.1 c) of Article 7 of Appendix **30**, the need for coordination of a transmitting space station in the FSS in Region 2 with a transmitting space station in the BSS in Region 1 at an orbital position further west than 37.2° W and with minimum geocentric orbital separation of less than 4.2 degrees between the FSS and BSS space stations, the conditions in Annex 1 to this Resolution apply instead of those contained in Annex 4 to Appendix **30**;

2 that, in the frequency band 12.5-12.7 GHz, with respect to §§ 7.1 a), 7.2.1 a) and 7.2.1 c) of Article 7 of Appendix **30**, the need for coordination of a transmitting space station in the FSS in Region 1 with a transmitting space station in the BSS in Region 2 at an orbital position further east than 54° W and not within its clusters in the Region 2 Plan of Appendix **30**, and with a minimum geocentric orbital separation less than 4.2 degrees between FSS and BSS space stations, the conditions in Annex 2 to this Resolution apply instead of those contained in Annex 4 to Appendix **30**;

3 that, except the cases specified in *resolves* 1 and 2, the conditions in Annex 4 to Appendix **30** continue to apply.

#### ANNEX 1 TO RESOLUTION COM5/4 (WRC-19)

With respect to §§ 7.1 a), 7.2.1 a), 7.2.1 b) and 7.2.1 c) of Article 7 of Appendix **30**, coordination of a transmitting space station in the fixed-satellite service (FSS) (space-to-Earth) in Region 2 is required with a broadcasting-satellite station serving an area in Region 1 and using a frequency assignment in the frequency band 11.7-12.2 GHz with a nominal orbital position further west than 37.2° W when, under assumed free-space propagation conditions, the power flux-density at any test point within the service area of the overlapping frequency assignments in the BSS exceeds the following values:

-147	dB(W/(m <sup>2</sup> · 27 MHz))	for	0° ≤ θ < 0.23°
-135.7 + 17.74 log θ	dB(W/(m <sup>2</sup> · 27 MHz))	for	0.23° ≤ θ < 2.0°
-136.7 + 1.66 θ <sup>2</sup>	dB(W/(m <sup>2</sup> · 27 MHz))	for	2.0° ≤ θ < 3.59°
-129.2 + 25 log θ	dB(W/(m <sup>2</sup> · 27 MHz))	for	3.59° ≤ θ < 4.2°

where θ is the minimum geocentric orbital separation in degrees between the wanted and interfering space stations, taking into account the respective east-west station-keeping accuracies.

#### ANNEX 2 TO RESOLUTION COM5/4 (WRC-19)

With respect to §§ 7.1 a), 7.2.1 a) and 7.2.1 c) of Article 7 of Appendix **30**, coordination of a transmitting space station in the fixed-satellite service (FSS) (space-to-Earth) in Region 1 is required with a broadcasting-satellite station serving an area in Region 2 and using a frequency assignment in the frequency band 12.5-12.7 GHz with a nominal orbital position further east than

54° W and not within its clusters in the Region 2 Plan of Appendix **30** when, under assumed free-space propagation conditions, the power flux-density at any test point within the service area of the overlapping frequency assignments in the BSS exceeds the following values:

$$-147 \quad \text{dB(W/(m}^2 \cdot 27 \text{ MHz))} \quad \text{for} \quad 0^\circ \leq \theta < 0.23^\circ$$

$$-135.7 + 17.74 \log \theta \quad \text{dB(W/(m}^2 \cdot 27 \text{ MHz))} \quad \text{for} \quad 0.23^\circ \leq \theta < 1.8^\circ$$

$$-134.0 + 0.89 \theta^2 \quad \text{dB(W/(m}^2 \cdot 27 \text{ MHz))} \quad \text{for} \quad 1.8^\circ \leq \theta < 4.2^\circ$$

where  $\theta$  is the minimum geocentric orbital separation in degrees between the wanted and interfering space stations, taking into account the respective east-west station-keeping accuracies.

**ADD****RESOLUTION COM5/5 (WRC-19)****Regulatory procedures for frequency assignments to non-geostationary-satellite networks or systems identified as short-duration mission not subject to the application of Section II of Article 9**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that some non-geostationary (non-GSO) satellites with short-duration missions to date have been operating for their entire mission duration without being notified or recorded;
- b) that successful and timely development and operation of non-GSO satellite networks or systems with short-duration missions may require regulatory procedures which take account of the short development cycle, the short lifetimes and the typical missions of such satellites, and therefore the application of certain provisions of Articles 9 and 11 of the Radio Regulations may need to be adapted to take account of the nature of these satellites;
- c) that these satellites typically have a short (one to two years) development time and are low cost, often using off-the-shelf components;
- d) that the operational lifetime of these satellites generally ranges from several weeks up to not more than three years;
- e) that non-GSO satellites with short-duration missions utilize low-Earth orbits;
- f) that non-GSO satellites with short-duration missions are being used for a wide variety of applications, including remote sensing, space weather research, upper atmosphere research, astronomy, communications, technology demonstration and education, and therefore may operate under various radiocommunication services;
- g) that advances in the field of satellite technology have resulted in non-GSO satellites with short-duration missions becoming a means for developing countries to become involved in space activities,

*considering further*

- a) that the application of provisions of Articles 9 and 11 to frequency assignments to non-GSO satellite networks or systems identified as short-duration mission as prescribed in this Resolution should not adversely or otherwise affect the regulatory treatment of other systems;
- b) that the application of any modified regulatory procedure should not change the sharing status with respect to networks and systems not applying the modified regulatory procedure, both terrestrial and space, in frequency bands which may be used by non-GSO satellite systems with short-duration missions,

*recognizing*

- a) that Resolution ITU-R 68 seeks to improve awareness and increase knowledge on existing regulatory procedures for small satellites;



b) that non-GSO satellite networks or systems operating in frequency bands not subject to Section II of Article 9 are, irrespective of the period of validity of their associated frequency assignments, subject to Nos. 9.3 and 9.4;

c) that non-GSO satellite systems with short-duration missions are not to be used for safety-of-life services,

*noting*

a) Report ITU-R SA.2312, on characteristics, definitions and spectrum requirements of nanosatellites and picosatellites, as well as systems composed of such satellites;

b) that No. 22.1 states that “Space stations shall be fitted with devices to ensure immediate cessation of their radio emissions by telecommand, whenever such cessation is required under the provisions of these Regulations” (see also Appendix 4 data element A.20.A),

*resolves*

1 that this Resolution shall apply only to non-GSO networks or systems identified by the notifying administration as effecting short-duration missions and corresponding to the following criteria:

1.1 the network or system shall operate under any space radiocommunication service on frequency assignments that are not subject to the application of Section II of Article 9;

1.2 the maximum period of operation and validity of frequency assignments of a non-GSO satellite network or system identified as short-duration mission shall not exceed three years from the date of bringing into use of the frequency assignments (see the Annex to this Resolution for the definition of date of bringing into use for such networks or systems), without any possibility of extension, after which the recorded assignments shall be cancelled;

1.3 the total number of satellites in a non-GSO satellite network or system identified as short-duration mission shall not exceed 10 satellites<sup>1</sup>;

2 that non-GSO satellite networks or systems corresponding to *resolves* 1 of this Resolution shall comply with the conditions for use of the frequency band that is allocated to the service within which they operate;

3 that non-GSO satellite networks or systems identified as short-duration mission using spectrum allocated to the amateur-satellite service shall operate in accordance with the definition of the amateur-satellite service as contained in Article 25;

4 that non-GSO satellite networks or systems with short-duration missions shall have the capability to cease transmitting immediately in order to eliminate harmful interference;

5 that for the purpose of this Resolution, a non-GSO satellite network or system identified as short-duration mission shall have a single launch date associated with the first launch (in the case of systems with multiple launches) and that launch date shall be defined as the date on which the first satellite of the non-GSO satellite network or system with a short-duration mission is placed into its notified orbital plane,

*instructs the Director of the Radiocommunication Bureau*

1 to expedite the online publication of notices “as received” for such networks or systems, in addition to the normal publication of notices;

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<sup>1</sup> The typical mass of each satellite should not normally exceed 100 kg.

2 to provide the necessary assistance to administrations in the implementation of this Resolution;

3 to report to WRC-23 on the implementation of this Resolution,  
*invites administrations*

1 to avoid heavily used frequency bands when assigning frequencies to a non-GSO satellite network or system with a short-duration mission;

2 to exchange information associated with non-GSO satellite networks or systems identified as short-duration mission and to make every possible effort to resolve interference that may be unacceptable to existing or planned satellite networks or systems, including those with short-duration missions;

3 to provide their comments on the application of No. **9.3**, upon receipt of the International Frequency Information Circular (BR IFIC) containing information published under No. **9.2B**, as soon as possible within a period of four months from the date of publication of the BR IFIC and to communicate to the notifying administration, with copy to the Bureau, these comments on the particulars of the potential interference to its existing or planned systems.

## ANNEX TO RESOLUTION COM5/5 (WRC-19)

### **Application of the provisions of Articles 9 and 11 for non-geostationary-satellite networks and systems identified as short-duration mission**

1 The general provisions of the Radio Regulations shall apply to non-GSO satellite networks or systems identified as short-duration mission with the following exceptions/additions/amendments.

2 When submitting advance publication information under No. **9.1**, administrations shall submit the orbital characteristics (Appendix 4 data item A.4.b.4) planned at the early development stage of the satellite project.

3 In the application of No. **9.1**, the notification information cannot be communicated to the Bureau at the same time, and can only be submitted after the launch of a satellite in the case of a network or of the first satellite in the case of a system with multiple launches.

4 Notices relating to non-GSO satellite networks or systems identified as short-duration mission shall be communicated to the Bureau only after the launch of a satellite in the case of a satellite network or of the first satellite in the case of a system requiring multiple launches, and not later than two months after the date of bringing into use. This provision applies instead of No. **11.25** for frequency assignments to non-GSO satellite networks or systems with short-duration missions. Irrespective of the date of receipt of the notified characteristics of the non-GSO satellite network or system with a short-duration mission under this Resolution, the maximum period of validity of frequency assignments of this system shall not exceed the time-limit in *resolves* 1.2 of this Resolution. At the expiry date of period of validity, as described in *resolves* 1.2 of this Resolution, the Bureau shall publish a suppression of the related Special Section.

5 In addition to the application of No. **11.36**, the Bureau shall publish the characteristics of the system together with the findings under No. **11.31** in the BR IFIC and on its website within no more than four months from the date of receipt of complete information under No. **11.28**. When the Bureau is not in a position to comply with the time-limit referred to above, it shall periodically so inform the notifying administration, giving the reasons therefor.

6 In the application of No. **11.44**, the date of bringing into use of a non-GSO satellite network or system identified as short-duration mission shall be defined as the launch date of a satellite in the case of a non-GSO satellite network or of the first satellite in the case of a non-GSO satellite system requiring multiple launches (see *resolves* 5 of this Resolution).

7 Nos. **11.43A**, **11.43B** and **11.49** shall not apply to frequency assignments to non-GSO satellite networks or systems identified as short-duration mission.

**ADD****RESOLUTION COM5/6 (WRC-19)****Use of the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that there is a need for global broadband mobile-satellite communications, and that some of this need could be met by allowing earth stations in motion (ESIMs) to communicate with space stations of the geostationary-satellite orbit (GSO) fixed-satellite service (FSS) operating in the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space);
- b)* that appropriate regulatory and interference-management mechanisms are necessary for the operation of ESIMs;
- c)* that the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) are also allocated to terrestrial and space services used by a variety of different systems, and these existing services and their future development need to be protected, without the imposition of undue constraints, from the operation of ESIMs;
- d)* that ITU-R studied whether aeronautical ESIMs are capable of protecting non-GSO mobile-satellite service (MSS) feeder-link satellite receivers in the frequency band 29.1-29.5 GHz,

*recognizing*

- a)* that the administration authorizing ESIMs on territory under its jurisdiction has the right to require that the ESIMs referred to above only use those assignments associated with GSO FSS networks which have been successfully coordinated, notified, brought into use and recorded in the Master International Frequency Register with a favourable finding under Article **11**, including Nos. **11.31**, **11.32** or **11.32A**, where applicable;
- b)* that for cases of incomplete coordination under No. **9.7** of the GSO FSS network with assignments to be used by ESIMs, the operation of ESIMs on those assignments in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz needs to be in accordance with the provisions of No. **11.42** with respect to any recorded frequency assignment which was the basis of the unfavourable finding under No. **11.38**;
- c)* that any course of action taken under this Resolution has no impact on the original date of receipt of the frequency assignments of the GSO FSS satellite network with which ESIMs communicate or on the coordination requirements of that satellite network;
- d)* that successful compliance with this Resolution does not oblige any administration to authorize/license any ESIM to operate within the territory under its jurisdiction,

*resolves*

1 that for any ESIM communicating with a GSO FSS space station within the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz, or parts thereof, the following conditions shall apply:

1.1 with respect to space services in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz, ESIMs shall comply with the following conditions:

1.1.1 with respect to satellite networks or systems of other administrations, the ESIM characteristics shall remain within the envelope characteristics of typical earth stations associated with the satellite network with which these ESIMs communicate;

1.1.2 the use of ESIMs shall not cause more interference and shall not claim more protection than for typical earth stations in this GSO FSS network;

1.1.3 that the notifying administration of the GSO FSS network with which ESIMs communicate shall ensure that the operation of ESIMs complies with the coordination agreements for the frequency assignments of the typical earth station of this GSO FSS network obtained under the relevant provisions of the Radio Regulations, taking into account *recognizing b)* above;

1.1.4 for the implementation of *resolves* 1.1.1 above, the notifying administration for the GSO FSS network with which ESIMs communicate shall, in accordance with this Resolution, send to the Bureau the relevant Appendix 4 notification information related to the characteristics of the ESIMs intended to communicate with that GSO FSS network, together with the commitment that the ESIM operation shall be in conformity with the Radio Regulations, including this Resolution;

1.1.4bis upon receipt of the notification information referred to in *resolves* 1.1.4 above, the Bureau shall examine it with respect to the provisions referred to in *resolves* 1.1.1 above and publish the result of such examination in the International Frequency Information Circular (BR IFIC);

1.1.5 for the protection of non-GSO FSS systems operating in the frequency band 27.5-28.6 GHz, ESIMs communicating with GSO FSS networks shall comply with the provisions contained in Annex 1 to this Resolution;

1.1.6 for the protection of non-GSO MSS feeder links of non-GSO systems for which complete coordination information was received before, and for which feeder-link earth stations were in service as of, 28 October 2019 in the frequency band 29.1-29.5 GHz, ESIMs communicating with GSO FSS networks should consider Annex 1bis to this Resolution;

1.1.7 ESIMs shall not claim protection from non-GSO FSS systems operating in the frequency band 17.8-18.6 GHz in accordance with the Radio Regulations, including No. **22.5C**;

1.1.8 ESIMs shall not claim protection from broadcasting-satellite service feeder-link earth stations operating in the frequency band 17.7-18.4 GHz in accordance with the Radio Regulations;

1.2 with respect to the protection of terrestrial services to which the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz are allocated and operating in accordance with the Radio Regulations, ESIMs shall comply with the following conditions:

1.2.1 receiving ESIMs in the frequency band 17.7-19.7 GHz shall not claim protection from terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations;

1.2.2 transmitting aeronautical and maritime ESIMs in the frequency band 27.5-29.5 GHz shall not cause unacceptable interference to terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations and Annex 2 to this Resolution shall apply;

- 1.2.3 transmitting land ESIMs in the frequency band 27.5-29.5 GHz shall not cause unacceptable interference to terrestrial services in neighbouring countries to which the frequency band is allocated and operating in accordance with the Radio Regulations (see *resolves* 3);
- 1.2.4 the provisions in this Resolution, including Annex 2, set the conditions for the purpose of protecting terrestrial services from unacceptable interference from aeronautical and maritime ESIMs in neighbouring countries in the frequency band 27.5-29.5 GHz; however, the requirement not to cause unacceptable interference to, or claim protection from, terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations remains valid (see *resolves* 4);
- 1.2.5 for the application of Part II of Annex 2 as referred to in *resolves* 1.2.2 and 1.2.4 above, the Bureau shall examine the characteristics of aeronautical ESIMs with respect to the conformity with the power flux-density (pfd) limits on the Earth's surface specified in Part II of Annex 2 and publish the results of such examination in the BR IFIC;
- 1.2.6 the notifying administration for the GSO FSS network with which the ESIMs communicate shall send to the Bureau a commitment that, upon receiving a report of unacceptable interference, the notifying administration for the GSO FSS network with which the ESIMs communicate shall follow the procedures in *resolves* 4;
- 2 that ESIMs shall not be used or relied upon for safety-of-life applications;
- 3 that the operation of ESIMs within the territory, including territorial waters and territorial airspace, of an administration shall be carried out only if authorized by that administration;
- 4 that in case of unacceptable interference caused by any type of ESIM:
- 4.1 the administration of the country in which the ESIM is authorized shall cooperate with an investigation on the matter and provide, to the extent of its ability, any required information on the operation of the ESIM and a point of contact to provide such information;
- 4.2 the administration of the country in which the ESIM is authorized and the notifying administration of the GSO FSS network with which the ESIM communicates shall, jointly or individually, as the case may be, upon receipt of a report of unacceptable interference take required action to eliminate or reduce interference to an acceptable level;
- 5 that the administration responsible for the GSO FSS satellite network with which ESIMs communicate shall ensure that:
- 5.1 for the operation of ESIMs, techniques to maintain pointing accuracy with the associated GSO FSS satellite, without inadvertently tracking adjacent GSO satellites, are employed;
- 5.2 all necessary measures are taken so that ESIMs are subject to permanent monitoring and control by a Network Control and Monitoring Centre (NCCMC) or equivalent facility in order to comply with provisions in this Resolution, and are capable of receiving and acting upon at least "enable transmission" and "disable transmission" commands from the NCCMC or equivalent facility;
- 5.3 measures, when required, are taken to limit the operation of ESIMs in the territory, including territorial waters and territorial airspace, under the jurisdiction of the administrations authorizing ESIMs;
- 5.4 a permanent point of contact is provided for the purpose of tracing any suspected cases of unacceptable interference from ESIMs and to immediately respond to requests from the focal point of the authorizing administration;

6 that the application of this Resolution does not provide regulatory status to ESIMs different from that derived from the GSO FSS network with which they communicate taking into account the provisions referred to in this Resolution (see *recognizing b*) above);

7 that, if the Bureau is unable to examine, in accordance with *resolves* 1.2.5 above, aeronautical ESIMs with respect to conformity with the pfd limits on the Earth's surface specified in Part II of Annex 2, the notifying administration shall send to the Bureau a commitment that the aeronautical ESIMs comply with those limits;

8 that the Bureau shall formulate a qualified favourable finding under No. **11.31** with respect to the limits contained in Part II of Annex 2, if *resolves* 7 is applied successfully, otherwise it shall formulate an unfavourable finding,

*resolves further*

that, should an administration authorizing ESIMs agree to pfd levels higher than the limits contained in Part II of Annex 2 within the territory under its jurisdiction, such agreement shall not affect other countries that are not party to that agreement,

*instructs the Director of the Radiocommunication Bureau*

1 to take all necessary actions to facilitate the implementation of this Resolution, together with providing any assistance for the resolution of interference, when required;

2 to report to future WRCs any difficulties or inconsistencies encountered in the implementation of this Resolution, including whether or not the responsibilities relating to the operation of ESIMs have been properly addressed;

3 to review, if necessary, once the methodology to examine the characteristics of aeronautical ESIMs with respect to conformity with the pfd limits on the Earth's surface specified in Part II of Annex 2 is available, its findings made in accordance with No. **11.31**,

*invites administrations*

to collaborate for the implementation of this Resolution, in particular for resolving interference, if any,

*resolves to invite ITU-R*

to conduct, as a matter of urgency, relevant studies to determine a methodology with respect to the examination referred to in *resolves* 1.2.5 above,

*instructs the Secretary-General*

to bring this Resolution to the attention of the Secretary-General of the International Maritime Organization and of the Secretary General of the International Civil Aviation Organization.



## ANNEX 1 TO RESOLUTION COM5/6 (WRC-19)

**Provisions for earth stations in motion to protect non-geostationary fixed-satellite service systems in the frequency band 27.5-28.6 GHz**

1 In order to protect those non-GSO FSS systems referred to in *resolves* 1.1.5 of this Resolution in the frequency band 27.5-28.6 GHz, ESIMs shall comply with the following provisions:

- a) the level of equivalent isotropically radiated power (e.i.r.p.) density emitted by an ESIM in a geostationary-satellite network in the frequency band 27.5-28.6 GHz shall not exceed the following values for any off-axis angle  $\varphi$  which is  $3^\circ$  or more off the main-lobe axis of an ESIM antenna and outside  $3^\circ$  of the GSO arc:

<i>Off-axis angle</i>	<i>Maximum e.i.r.p. density</i>
$3^\circ \leq \varphi \leq 7^\circ$	$28 - 25 \log_{10}\varphi$ dB(W/40 kHz)
$7^\circ < \varphi \leq 9.2^\circ$	7 dB(W/40 kHz)
$9.2^\circ < \varphi \leq 48^\circ$	$31 - 25 \log_{10}\varphi$ dB(W/40 kHz)
$48^\circ < \varphi \leq 180^\circ$	-1 dB(W/40 kHz)

- b) for any ESIM operating in the frequency band 27.5-28.6 GHz that does not meet condition a) above, outside of  $3^\circ$  of the GSO arc, the maximum ESIM on-axis e.i.r.p. shall not exceed 55 dBW for emission bandwidths up to and including 100 MHz. For emission bandwidths larger than 100 MHz, the maximum ESIM on-axis e.i.r.p. may be increased proportionately.



## ANNEX 1BIS TO RESOLUTION COM5/6 (WRC-19)

**Protection of non-geostationary mobile-satellite service feeder links in the frequency band 29.1-29.5 GHz from earth stations in motion**

With regard to non-GSO MSS feeder links referred to in *resolves* 1.1.6 of this Resolution, administrations should consider the provisions in Part A, Part B or Part C, below, as appropriate:

A. If an ESIM communicating with a GSO FSS network complies with each of the parameters or operating conditions listed in Table 1 below, coordination may be used to ensure compatibility between the affected non-GSO MSS feeder-link systems in the frequency band 29.1-29.5 GHz and the GSO FSS network with which the ESIM is associated.

TABLE 1

**ESIM operational characteristics and parameters**

E.i.r.p. density per carrier (single per ESIM)	$\leq 35.5$ dBW/MHz
Off-axis e.i.r.p. density	per No. <b>22.32</b>
Average carrier burst duty cycle	$\leq 10\%$ (averaged over 30 seconds)
Number of transmitting ESIMs in a single satellite beam in a 15 MHz channel	$\leq 6$

B. If an ESIM communicating with a GSO FSS network does not comply with each of the parameters or operating conditions listed in Table 1 above, but complies with each of the parameters or operating conditions listed in Table 2 below, coordination may be used to ensure compatibility between the affected non-GSO MSS feeder-link systems in the frequency band 29.1-29.5 GHz and the GSO FSS network with which the ESIM is associated. However, depending on the values of these parameters and characteristics in combination, there may need to be an exclusion zone or other constraint(s) on ESIMs developed by the parties and included in the agreement. Until such time as an agreement on coordination is reached, it may be appropriate for administrations to restrict ESIMs from operating within 500 km of a non-GSO MSS feeder-link earth station in any portion of the frequency band 29.1-29.5 GHz used by non-GSO MSS feeder-link earth stations, and require that ESIMs operate subject to the condition that they do not cause harmful interference.

TABLE 2

**ESIM operational characteristics and parameters**

E.i.r.p. density per carrier (single per ESIM)	$\leq 50$ dBW/MHz
Off-axis e.i.r.p. density	per No. <b>22.32</b>
Average carrier burst duty cycle	100% (averaged over 4 hours)
Number of transmitting ESIMs in a single satellite beam in a 15 MHz channel	$\leq 12$

C. If an ESIM communicating with a GSO FSS network does not comply with each of the parameters or operating conditions listed in Table 1 or Table 2 above, it may be appropriate for administrations to restrict ESIMs from operating within 725 km of the non-GSO MSS feeder-link earth station in any portion of the frequency band 29.1-29.5 GHz used by non-GSO MSS feeder-link earth stations, and to require that any ESIM operations between 725 and 1 450 km of a non-GSO MSS feeder-link earth station in any portion of the frequency band 29.1-29.5 GHz used by non-GSO MSS feeder-link earth stations be subject to the condition that the ESIMs do not cause harmful interference.

## ANNEX 2 TO RESOLUTION COM5/6 (WRC-19)

### **Provisions for maritime and aeronautical earth stations in motion to protect terrestrial services in the frequency band 27.5-29.5 GHz**

1 The parts below contain provisions to ensure that maritime and aeronautical ESIMs do not cause unacceptable interference in neighbouring countries to terrestrial service operations when ESIMs operate in frequencies overlapping with those used by terrestrial services at any time, to which the frequency band 27.5-29.5 GHz is allocated and operating in accordance with the Radio Regulations (see also *resolves* 3).

#### **Part I: Maritime ESIMs**

2 The notifying administration of the GSO FSS network with which a maritime ESIM communicates shall ensure compliance of the maritime ESIM operating within the frequency band 27.5-29.5 GHz, or parts thereof, with both of the following conditions for the protection of terrestrial services to which the frequency band is allocated within a coastal State:

2.1 The minimum distance from the low-water mark as officially recognized by the coastal State beyond which maritime ESIMs can operate without the prior agreement of any administration is 70 km in the frequency band 27.5-29.5 GHz. Any transmissions from maritime ESIMs within the minimum distance shall be subject to the prior agreement of the concerned coastal State;

2.2 the maximum maritime ESIM e.i.r.p. spectral density towards the horizon shall be limited to 24.44 dB(W/14 MHz). Transmissions from maritime ESIMs with higher e.i.r.p. spectral density levels towards the territory of any coastal State shall be subject to the prior agreement of the concerned coastal State.

**Part II: Aeronautical ESIMs**

3 The notifying administration of the GSO FSS satellite network with which an aeronautical ESIM communicates shall ensure compliance of the aeronautical ESIM operating within the frequency band 27.5-29.5 GHz, or parts thereof, with all of the following conditions for the protection of terrestrial services to which the frequency band is allocated:

3.1 when within line-of-sight of the territory of an administration, and above an altitude of 3 km, the maximum pfd produced at the surface of the Earth on the territory of an administration by emissions from a single aeronautical ESIM shall not exceed:

$$\begin{aligned} \text{pfd}(\theta) &= -124.7 && (\text{dB(W/(m}^2 \cdot 14 \text{ MHz)))} && \text{for } 0^\circ \leq \theta \leq 0.01^\circ \\ \text{pfd}(\theta) &= -120.9 + 1.9 \cdot \log_{10}\theta && (\text{dB(W/(m}^2 \cdot 14 \text{ MHz)))} && \text{for } 0.01^\circ < \theta \leq 0.3^\circ \\ \text{pfd}(\theta) &= -116.2 + 11 \cdot \log_{10}\theta && (\text{dB(W/(m}^2 \cdot 14 \text{ MHz)))} && \text{for } 0.3^\circ < \theta \leq 1^\circ \\ \text{pfd}(\theta) &= -116.2 + 18 \cdot \log_{10}\theta && (\text{dB(W/(m}^2 \cdot 14 \text{ MHz)))} && \text{for } 1^\circ < \theta \leq 2^\circ \\ \text{pfd}(\theta) &= -117.9 + 23.7 \cdot \log_{10}\theta && (\text{dB(W/(m}^2 \cdot 14 \text{ MHz)))} && \text{for } 2^\circ < \theta \leq 8^\circ \\ \text{pfd}(\theta) &= -96.5 && (\text{dB(W/(m}^2 \cdot 14 \text{ MHz)))} && \text{for } 8^\circ < \theta \leq 90.0^\circ \end{aligned}$$

where  $\theta$  is the angle of arrival of the radio-frequency wave (degrees above the horizon);

3.2 when within line-of-sight of the territory of an administration, and up to an altitude of 3 km, the maximum pfd produced at the surface of the Earth on the territory of an administration by emissions from a single aeronautical ESIM shall not exceed:

$$\begin{aligned} \text{pfd}(\theta) &= -136.2 && (\text{dB(W/(m}^2 \cdot 1 \text{ MHz)))} && \text{for } 0^\circ \leq \theta \leq 0.01^\circ \\ \text{pfd}(\theta) &= -132.4 + 1.9 \cdot \log_{10}\theta && (\text{dB(W/(m}^2 \cdot 1 \text{ MHz)))} && \text{for } 0.01^\circ < \theta \leq 0.3^\circ \\ \text{pfd}(\theta) &= -127.7 + 11 \cdot \log_{10}\theta && (\text{dB(W/(m}^2 \cdot 1 \text{ MHz)))} && \text{for } 0.3^\circ < \theta \leq 1^\circ \\ \text{pfd}(\theta) &= -127.7 + 18 \cdot \log_{10}\theta && (\text{dB(W/(m}^2 \cdot 1 \text{ MHz)))} && \text{for } 1^\circ < \theta \leq 12.4^\circ \\ \text{pfd}(\theta) &= -108 && (\text{dB(W/(m}^2 \cdot 1 \text{ MHz)))} && \text{for } 12.4^\circ < \theta \leq 90^\circ \end{aligned}$$

where  $\theta$  is the angle of arrival of the radio-frequency wave (degrees above the horizon).

3.3 an aeronautical ESIM operating within the territory of an administration that has authorized fixed service and/or mobile service operation in the same frequency bands shall not transmit in these bands without prior agreement of that administration (see also *resolves* 3);

4 the maximum power in the out-of-band domain should be attenuated below the maximum output power of the aeronautical ESIM transmitter as described in Recommendation ITU-R SM.1541;

5 higher pfd levels than those provided in 3.1 and 3.2 above produced by aeronautical ESIMs on the surface of the Earth within an administration shall be subject to the prior agreement of that administration (see also *resolves further* in this Resolution).

ADD

## RESOLUTION COM5/7 (WRC-19)

**A milestone-based approach for the implementation of frequency assignments to space stations in a non-geostationary-orbit satellite system in specific frequency bands and services**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that filings for frequency assignments to non-geostationary orbit (non-GSO) satellite systems composed of hundreds to thousands of non-GSO satellites have been received by ITU since 2011, in particular in frequency bands allocated to the fixed-satellite service (FSS) or the mobile-satellite service (MSS);
- b) that design considerations, availability of launch vehicles to support multiple satellite launches, and other factors mean that notifying administrations may require longer than the regulatory period stipulated in No. **11.44** to complete implementation of non-GSO systems referred to in *considering a*);
- c) that any discrepancies between the deployed number of orbital planes/satellites per orbital plane of a non-GSO system and the Master International Frequency Register (Master Register) have, to date, not significantly impinged upon the efficient use of the orbital/spectrum resource in any frequency band used by non-GSO systems;
- d) that the bringing into use and recording in the Master Register of frequency assignments to space stations in non-GSO systems by the end of the seven-year regulatory period referred to in No. **11.44** do not require the confirmation by the notifying administration of the deployment of all the satellites associated with these frequency assignments;
- e) that ITU-R studies on the issue have shown that the adoption of a milestone-based approach will provide a regulatory mechanism to help ensure that the Master Register reasonably reflects the actual deployment of such non-GSO satellite systems in certain frequency bands and services, and improve the efficient use of the orbital/spectrum resource in those frequency bands and services;
- f) that, in defining the timeline and objective criteria for the milestone-based approach, there is a need to seek a balance between the prevention of spectrum warehousing, the proper functioning of coordination mechanisms, and the operational requirements related to the deployment of a non-geostationary satellite system;
- g) that adherence to fixed milestone periods is desirable, as this creates certainty with respect to the deployment of non-GSO systems,

*recognizing*

- a) that the bringing into use of frequency assignments to non-GSO satellite systems is addressed in Article **11**;
- b) that any regulatory mechanism for management of frequency assignments to non-GSO systems in the Master Register should not impose an unnecessary burden;

- c)* that the number of orbital planes in a non-GSO system (item A.4.b.1) and the number of satellites in each orbital plane (item A.4.b.4.b) are among the notified required characteristics as specified in Appendix 4;
- d)* that No. 13.6 is applicable to non-GSO systems with frequency assignments that were confirmed to have been brought into use prior to 1 January 2021 in the frequency bands and services to which this Resolution applies;
- e)* that, for frequency assignments to non-GSO systems brought into use and having reached the end of the period referred to in No. 11.44 prior to 1 January 2021 in the frequency bands and services to which this Resolution applies, affected notifying administrations should be given the opportunity to either confirm the completion of the deployment of satellites in accordance with the Appendix 4 characteristics of their recorded frequency assignments, or be given sufficient time to complete deployment in accordance with this Resolution;
- f)* that No. 11.49 addresses the suspension of recorded frequency assignments to a space station of a satellite network or to space stations of a non-geostationary satellite system,

*recognizing further*

that this Resolution relates to those aspects of non-GSO systems to which *resolves* 1 applies with regard to the notified required characteristics as specified in Appendix 4; the conformity of the notified required characteristics of the non-GSO systems, other than those referred to in *recognizing c)* above, is outside the scope of this Resolution,

*noting*

that for the purpose of this Resolution:

- the term “frequency assignments” is understood to refer to frequency assignments to a space station of a non-GSO system;
- the term “notified orbital plane” means an orbital plane of the non-GSO system, as provided to the Bureau in the most recent notification information for the system’s frequency assignments, that possesses the general characteristics of items:
  - A.4.b.4.a, the inclination of the orbital plane of the space station;
  - A.4.b.4.d, the altitude of the apogee of the space station;
  - A.4.b.4.e, the altitude of the perigee of the space station; and
  - A.4.b.5.c, the argument of the perigee of the orbit of the space station (only for orbits whose altitudes of the apogee and perigee are different)
 in Table A of Annex 2 to Appendix 4;
- the term “total number of satellites” is understood to mean the sum of the various values of Appendix 4 data item A.4.b.4.b associated with the notified orbital planes in the most recent notification information submitted to the Bureau,

*resolves*

1 that this Resolution applies to frequency assignments to non-GSO satellite systems brought into use in accordance with Nos. 11.44 or 11.44C, in the frequency bands and for services listed in the Table below:

TABLE

**Frequency bands and services for application of the milestone-based approach**

Bands (GHz)	Space radiocommunication services		
	Region 1	Region 2	Region 3
10.70-11.70	FIXED-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space)	FIXED-SATELLITE (space-to-Earth)	
11.70-12.50	FIXED-SATELLITE (space-to-Earth)		
12.50-12.70	FIXED-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space)	FIXED-SATELLITE (space-to-Earth)	BROADCASTING-SATELLITE FIXED-SATELLITE (space-to-Earth)
12.70-12.75	FIXED-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space)	FIXED-SATELLITE (Earth-to-space)	BROADCASTING-SATELLITE FIXED-SATELLITE (space-to-Earth)
12.75-13.25	FIXED-SATELLITE (Earth-to-space)		
13.75-14.50	FIXED-SATELLITE (Earth-to-space)		
17.30-17.70	FIXED-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space)	None	FIXED-SATELLITE (Earth-to-space)
17.70-17.80	FIXED-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space)	FIXED-SATELLITE (space-to-Earth)	FIXED-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space)
17.80-18.10	FIXED-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space)		
18.10-19.30	FIXED-SATELLITE (space-to-Earth)		
19.30-19.60	FIXED-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space)		
19.60-19.70	FIXED-SATELLITE (space-to-Earth) (Earth-to-space)		
19.70-20.10	FIXED-SATELLITE (space-to-Earth)	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)	FIXED-SATELLITE (space-to-Earth)
20.10-20.20	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)		
27.00-27.50		FIXED-SATELLITE (Earth-to-space)	
27.50-29.50	FIXED-SATELLITE (Earth-to-space)		
29.50-29.90	FIXED-SATELLITE (Earth-to-space)	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space)	FIXED-SATELLITE (Earth-to-space)
29.90-30.00	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space)		
37.50-38.00	FIXED-SATELLITE (space-to-Earth)		
38.00-39.50	FIXED-SATELLITE (space-to-Earth)		

Bands (GHz)	Space radiocommunication services		
	Region 1	Region 2	Region 3
39.50-40.50	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)		
40.50-42.50	FIXED-SATELLITE (space-to-Earth) BROADCASTING-SATELLITE		
47.20-50.20	FIXED-SATELLITE (Earth-to-space)		
50.40-51.40	FIXED-SATELLITE (Earth-to-space)		

2 that for frequency assignments to which *resolves* 1 applies, and for which the end of the seven-year regulatory period specified in No. **11.44** is on or after 1 January 2021, the notifying administration shall communicate to the Bureau the required deployment information in accordance with Annex 1 to this Resolution no later than 30 days after the end of the regulatory period specified in No. **11.44** or 30 days after the end of the bringing into use period in No. **11.44C**, whichever comes later;

3 that, for frequency assignments to which *resolves* 1 applies, and for which the end of the seven-year regulatory period specified in No. **11.44** has expired prior to 1 January 2021, the notifying administration shall communicate to the Bureau the required deployment information in accordance with Annex 1 to this Resolution no later than 1 February 2021;

*3bis* that, for the purposes of this Resolution, all references to 100% of the total number of satellites indicated in the latest notification information shall mean either 100% of the filed satellites (counting the number of satellites in each notified orbital plane), or 100% of the filed satellites minus one (1) satellite;

4 that, upon receipt of the required deployment information submitted in accordance with *resolves* 2 or 3 above, the Bureau shall:

- a) promptly make this information available “as received” on the ITU website;
- b) add a remark to the Master Register entry, if available, or to the latest notification information, as appropriate, stating that the assignments are subject to the application of *resolves* 6 to 17 of this Resolution if the number of satellites communicated to the Bureau under *resolves* 2 or 3 above is less than 100% of the total number of satellites indicated in the latest notification information published in the BR IFIC (Part I-S) or in latest notification information received by the Bureau, as appropriate, for the frequency assignments; and
- c) publish the results of action taken pursuant to *resolves* 4b) above in the BR IFIC and on the ITU website;



5 that, if the number of satellites communicated to the Bureau under *resolves* 2 or 3 above is 100% of the total number of satellites indicated in the Master Register in Part II-S of the BR IFIC, if available, or the latest notification information published in the BR IFIC (Part I-S) for the frequency assignments, *resolves* 6 to 17 of this Resolution are not applicable;

6 that, for the frequency assignments to which *resolves* 2 applies, the notifying administration shall communicate to the Bureau the required deployment information in accordance with Annex 1 to this Resolution as of the expiry of the milestone periods mentioned in subsections *a)* through *c)* below (see also *resolves* 8):

- a)* no later than 30 days after the expiry of the two-year period after the end of the seven-year regulatory period referred to in No. **11.44**;
- b)* no later than 30 days after the expiry of the five-year period after the end of the seven-year regulatory period referred to in No. **11.44**;
- c)* no later than 30 days after the expiry of the seven-year period after the end of the seven-year regulatory period referred to in No. **11.44**;

7 that, for frequency assignments to which *resolves* 3 applies, the notifying administration shall communicate to the Bureau the complete deployment information in accordance with Annex 1 to this Resolution as of 1 January of the years mentioned in subsections *a)* through *c)* below (see also *resolves* 8):

- a)* no later than 1 February 2023 (corresponding to 30 days after the expiry of the two-year period after 1 January 2021);
- b)* no later than 1 February 2026 (corresponding to 30 days after the expiry of the five-year period after 1 January 2021);
- c)* no later than 1 February 2028 (corresponding to 30 days after the expiry of the seven-year period after 1 January 2021);

8 that, for purposes of *resolves* 6 and 7:

- a)* the Bureau shall process the deployment information required to be submitted under *resolves* 6*a)/7a)* or 6*b)/7b)*, as appropriate, at any point during the relevant period, if the notifying administration reports that the total number of satellites required to be deployed as of the end of that milestone period has been achieved;
- b)* the Bureau shall process, at any time, a report from the notifying administration stating that the total number of satellites deployed as a part of the system is 100% of the total number of satellites indicated in the Master Register in Part II-S of the BR IFIC, if available, or the latest notification information published in the BR IFIC (Part I-S) for the frequency assignments;
- c)* if the total number of satellites deployed as part of the system during any relevant milestone period is greater than the number of satellites that remain deployed as part of the system as of the expiry of the relevant milestone period, the Bureau shall take into account the total number of satellites deployed during the period that has been reported by the notifying administration if:
  - i)* the notifying administration includes a detailed explanation of the circumstances which led to having the reduced number of satellites deployed as of the expiry of that milestone period with the complete deployment information in accordance with Annex 1 to this Resolution; and



- ii) the notifying administration provides an indication of whether any of the satellites no longer counted as of the expiry of the relevant milestone period have been or will be used to satisfy milestone obligations associated with frequency assignment(s) of any other non-geostationary satellite system(s) subject to this Resolution and, if so, how many satellites and the identity of the non-GSO satellite system(s) in question;
- d) the notifying administration shall provide with its reporting under *resolves* 6 or 7, as appropriate, an indication of whether any of the satellites counted as of the expiry of the relevant milestone period have been used to satisfy milestone obligations associated with frequency assignment(s) of any other non-GSO satellite system(s) subject to this Resolution and, if so, how many satellites and the identity of the non-GSO satellite system(s) in question;
- 9 that, upon receipt of the required deployment information submitted in accordance with *resolves* 6 or 7, the Bureau shall:
- a) promptly make this information available “*as received*” on the ITU website;
  - b) conduct an examination of the information provided for compliance with the minimum number of satellites to be deployed as prescribed for each period in *resolves* 10a), 10b) or 10c), as appropriate;
  - c) modify the Master Register entry if available or latest notification information, as appropriate, for the frequency assignments to the system to remove the remark added according to *resolves* 4b) stating that the assignments are subject to the application of this Resolution if the number communicated to the Bureau under *resolves* 6 or *resolves* 7 is 100% of the total number of satellites indicated in the Master Register entry for the non-geostationary-satellite system;
  - d) publish this information and its findings in the BR IFIC and shall make that information available on the ITU website as soon as possible;
- 10 that, the notifying administration shall also submit to the Bureau, no later than 90 days after the expiry of each of the milestone periods referred to in *resolves* 6 or *resolves* 7, as appropriate, the modifications to the characteristics of the notified or recorded frequency assignments if the number of space stations declared as deployed:
- a) under *resolves* 6a) or 7a), as appropriate, is less than 10% of the total number of satellites (rounded down to the lower integer) indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments; in this case, the modified total number of satellites shall not be greater than ten (10) times the number of space stations declared as deployed under *resolves* 6a) or 7a);
  - b) under *resolves* 6b) or 7b), as appropriate, is less than 50% of the total number of satellites (rounded down to the lower integer) indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments; in this case, the modified total number of satellites shall not be greater than two (2) times the number of space stations declared as deployed under *resolves* 6b) or 7b);

c) under *resolves 6c*) or *7c*), as appropriate, is less than 100% of the total number of satellites indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments; in this case, the modified total number of satellites shall not be greater than the number of space stations deployed under *resolves 6c*) or *7c*);

11 that *resolves 10a*) shall not apply for frequency assignments for which the end of the seven-year regulatory period in No. **11.44** is before 28 November 2022, provided that the notifying administration submits the complete information listed in Annex 2 to the Bureau by 1 March 2023, and a favourable determination is made by the RRB or WRC-23, as described below:

a) upon receipt of this complete information, the Bureau shall report it to the RRB as soon as possible, but no later than 1 April 2023, in order to enable comments from administrations and consideration by the RRB at its second meeting in 2023, at the latest;

b) the RRB shall consider the information provided under this *resolves* and provide a report with its conclusions or recommendations to WRC-23, including any cases where RRB is not in a position to conclude favourably;

12 that the Bureau shall, no later than forty-five (45) days before any deadline for submission by a notifying administration under *resolves 2*, *resolves 3*, *resolves 6a*), *b*) or *c*) and *resolves 7a*), *b*) or *c*), send a reminder to the notifying administration to provide the information required;

13 that, upon receipt of the modifications to the characteristics of the notified or recorded frequency assignments as referred to in *resolves 10*:

a) the Bureau shall promptly make this information available “as received” on the ITU website;

b) the Bureau shall conduct an examination for compliance with the maximum number of satellites as per *resolves 10a*), *b*) or *c*) and Nos. **11.43A/11.43B**, as appropriate;

c) the Bureau, for the purpose of No. **11.43B**, shall retain the original dates of entry of the frequency assignments in the Master Register if:

i) the Bureau reaches a favourable finding under No. **11.31**; and

ii) the modifications are limited to the reduction of the number of orbital planes (Appendix 4 data item A.4.b.1); modifications to the right ascension of the ascending node of each plane (Appendix 4 data item A.4.b.5.a/A.4.b.4.g), the longitude of the ascending node (Appendix 4 data item A.4.b.6.g) and its date and time (Appendix 4 data items A.4.b.6.h and A.4.b.6.i.a) associated with the remaining orbital planes or the reduction of the number of space stations per plane (Appendix 4 data item A.4.b.4.b) and the modifications of the initial phase of the space stations (Appendix 4 data item A.4.b.5.b/h) within planes; and

iii) the notifying administration provides a commitment stating that the characteristics as modified will not cause more interference or require more protection than the characteristics provided in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments (see Appendix 4 data item A.20);

- d) the Bureau shall ensure the remark stating that the assignments are subject to the application of this Resolution as defined in *resolves* 6 or 7 is retained until the milestone process in *resolves* 6 to 17 of this Resolution is complete;
- e) the Bureau shall publish the information provided and its findings in the BR IFIC;
- 14 that, if a notifying administration fails to communicate the information required under *resolves* 2, *resolves* 3, *resolves* 6a), b) or c), *resolves* 7a), b) or c) or *resolves* 10a), b) or c), as appropriate, the Bureau shall promptly send to the notifying administration a reminder asking the administration to provide the required information within thirty (30) days from the date of this reminder from the Bureau;
- 15 that, if a notifying administration fails to provide information after the reminder sent under *resolves* 14, the Bureau shall send to the notifying administration a second reminder asking it to provide the required information within fifteen (15) days from the date of the second reminder;
- 16 that if a notifying administration fails to provide the required information:
- a) under *resolves* 2 or 3, as appropriate, following the reminders under *resolves* 14 and 15, the Bureau shall continue to take the entry in the Master Register into account when conducting its examinations until the decision is made by the Board to cancel the entry;
- b) under *resolves* 6a), b) or c), *resolves* 7a), b) or c), or *resolves* 10a), b) or c), as appropriate, following the reminders under *resolves* 14 and 15, the Bureau shall:
- i) modify the entry by suppressing the notified orbital parameters of all satellites not listed in the last complete deployment information submitted under *resolves* 2, 3, 6 or 7, as appropriate; and
  - ii) no longer consider the frequency assignments under subsequent examinations under Nos. **9.36**, **11.32** or **11.32A**, and inform administrations having frequency assignments subject to subsection IA of Article **9** that those assignments shall not cause harmful interference to, nor claim protection from, other frequency assignments recorded in the Master Register with a favourable finding under No. **11.31**;
- 17 that the suspension of the use of frequency assignments in accordance with No. **11.49** at any point prior to the end of a milestone period as specified in *resolves* 6a), b) or c) or *resolves* 7a), b) or c) of this Resolution, as applicable, shall not alter or reduce the requirements associated with any of the remaining milestones as derived from *resolves* 6a), b) or c) or *resolves* 7a), b) or c), as appropriate;
- 18 that, for a non-GSO system that has completed the milestone process described in this Resolution, including application of *resolves* 9c) by the Bureau, and for systems to which *resolves* 5 applies, if the number of satellites capable of transmitting or receiving the frequency assignments deployed in that system subsequently falls below 95% (rounded down to the lower integer) of the total number of satellites indicated in the Master Register entry minus one satellite for six continuous months, the notifying administration shall inform the Bureau of the date when this event began, for information purposes only, as soon as possible thereafter. If appropriate and applicable, the notifying administration should also inform the Bureau, as soon as possible thereafter, of the date on which the deployment of the total number of satellites was resumed. The Bureau shall make information received under this *resolves* available on its website,

*instructs the Radiocommunication Bureau*

- 1 to take the necessary actions to implement this Resolution;
- 2 to report any difficulties it encounters in the implementation of this Resolution to WRC-23;
- 3 to continue to identify and report on specific frequency bands in specific services for which there may be a problem similar to that which resulted in the creation of this Resolution, as early as possible but not later than the penultimate meeting of the responsible group prior to the second session of the CPM,

*instructs the Radio Regulations Board*

to provide a report to WRC-23 as called for in *resolves 11b*),

*invites WRC-23*

to consider the RRB report submitted in response to *resolves 11b*) and take necessary action, as appropriate.

## ANNEX 1 TO RESOLUTION COM5/7 (WRC-19)

### **Information to be submitted about the deployed space stations**

#### **A Satellite system information**

- 1) Name of the satellite system
- 2) Name of the notifying administration
- 3) Country symbol
- 4) Reference to the advance publication information or the request for coordination, or the notification information, if available
- 5) Total number of space stations deployed into each notified orbital plane of the satellite system with the capability of transmitting or receiving the frequency assignments
- 6) Orbital plane number indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments into which each space station is deployed.

#### **B Launch information to be provided for each deployed space station**

- 1) Name of the launch vehicle provider
- 2) Name of the launch vehicle
- 3) Name and location of the launch facility
- 4) Launch date.

**C Space station characteristics for each space station deployed**

- 1) Frequency bands from the notification information that the space station can transmit or receive
- 2) Orbital characteristics of the space station (altitude of the apogee and perigee, inclination, and argument of the perigee)
- 3) Name of the space station.

**ANNEX 2 TO RESOLUTION COM5/7 (WRC-19)****Information to be provided by notifying administration pursuant to *resolves 11***

- 1 Reference to Notification Information already submitted.
- 2 Current deployment and operational information.
- 3 Report indicating efforts made and detailing status of coordination with systems or networks.
- 4 Clear evidence of a binding agreement for the manufacture or procurement of a sufficient number of satellites to meet the milestone obligation in *resolves 6b) or 7b)*, as appropriate.
- 5 Clear evidence of a binding agreement to launch a sufficient number of satellites to meet the milestone obligation in *resolves 6b) or 7b)*, as appropriate.

NOTE: The manufacturing or procurement agreement should identify the contract milestones leading to the completion of manufacture or procurement of satellites required, and the launch agreement should identify the launch window, launch site and launch service provider.

The information required under this Annex shall be submitted in the form of a written commitment by the responsible administration, including manufacturer or launch provider letters or declarations, and evidence of guaranteed funding arrangements for the implementation of the project, where possible.

The notifying administration is responsible for authenticating the evidence of agreement.

ADD

## RESOLUTION COM5/8 (WRC-19)

**Additional measures for satellite networks in the fixed-satellite service in frequency bands subject to Appendix 30B for the enhancement of equitable access to these frequency bands**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WARC Orb-88 created an allotment Plan for the use of the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz;
- b) that WRC-07 revised the regulatory regime governing the use of the frequency bands mentioned in *considering a)* above,

*considering further*

- a) the additional regulatory measures for the enhancement of equitable access included in Resolution **553 (WRC-15)**;
- b) that the Rule of Procedure on No. **9.6** of the Radio Regulations states that “the intent of Nos. **9.6 (9.7 to 9.21)**, **9.27** and Appendix **5** is to identify to which administrations a request for coordination is to be addressed, and not to state an order of priorities for rights to a particular orbital position”,

*recognizing*

- a) that Article 44 of the ITU Constitution lays down the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries;
- b) that the “first-come first-served” concept can restrict and sometimes prevent access to and use of certain frequency bands and orbit positions;
- c) the relative disadvantage for developing countries in coordination negotiations for various reasons such as a lack of resources and expertise;
- d) that Resolution **2 (Rev.WRC-03)** resolves that “the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems by other countries”,

*recognizing further*

- a) that information provided by the Bureau in ITU-R studies indicates that a very significant number of Appendix **30B** submissions have been received by the Bureau in the time period 1 January 2009 to 22 November 2019, and that the table below summarizes the data provided by the Bureau into those studies (see also Attachment 2 to this Resolution) and shows the variations for the number of networks at the various stages;

	Request for conversion without change of initial allotment (national service area)	Request for conversion with changes within the envelope of initial allotment (national service area)	Request for conversion with changes outside the envelope of initial allotment (national service area)	Request for conversion with changes outside the envelope of initial allotment (supra national service area)	Request for additional use (national service area)	Request for additional use (supra national service area and global coverage **)	Suppression
2009 Q1 + Q2	0	0	0	1	3	11	0
2009 Q3 + Q4	0	0	0	0	0	6	15
2010 Q1 + Q2	1	0	0	0	1	14	2
2010 Q3 + Q4	0	0	0	0	1	19	1
2011 Q1 + Q2	1	0	0	0	2	18	1
2011 Q3 + Q4	1	0	0	0	2	20	23
2012 Q1 + Q2	0	0	0	0	3	20	1
2012 Q3 + Q4	1	0	2	0	2	23	4
2013 Q1 + Q2	1	0	0	0	4	27	7
2013 Q3 + Q4	1	0	0	0	0	17	12
2014 Q1 + Q2	1	0	0	0	2	30	42
2014 Q3 + Q4	0	0	0	0	7	20	0
2015 Q1 + Q2	0	0	1	0	1	30	11
2015 Q3 + Q4	0	0	0	0	0	26	7
2016 Q1 + Q2	0	1	0	0	0	23	8
2016 Q3 + Q4	0	0	0	0	1	24	4
2017 Q1 + Q2	0	0	0	0	4	34	1
2017 Q3 + Q4	0	1	0	0	0	25	7
2018 Q1 + Q2	0	0	0	0	6	20	9
2018 Q3 + Q4	0	0	0	0	0	10	15
2019 Q1 + Q2	1	1	0	0	0	4	17
2019 Q3	0	0	0	0	1	3	6

\*\* Notices for additional use with service area and coverage beyond the national territory of notifying administration.

- b) that the number of Appendix **30B** submissions made by some administrations is large, which may not be realistic;
- c) that the use of certain combinations of technical parameters in submissions (e.g. high-gain receiving space station antennas) can make systems/submissions overly sensitive to interference, in such a way that subsequent submissions for conversion from allotment into assignments with changes would cause interference to those systems,

*taking into account*

that the majority of submissions under § 6.1 of Appendix **30B** have a global coverage and service area, which is typically changed from limited service area to a considerably wider coverage area at the time of submission under § 6.17, notwithstanding the Note to Appendix **4** data item B.3.b.1, which states “Taking due account of applicable technical restrictions and allowing some reasonable degree of flexibility for satellite operations, administrations should, to the extent practicable, align the areas the satellite steerable beams could cover with the service area of their networks with due regard to their service objectives”, and this is complicating coordination for administrations attempting to convert their national allotments into assignments or introducing an additional system for national use in a technically and economically viable manner, or for administrations acting on behalf of a group of named administrations introducing an additional system for their national use in a technically and economically viable manner,

*resolves*

that, as of 23 November 2019, the special procedure described in Attachment 1 to this Resolution shall be applied for processing of submissions received by the Bureau under Article 6 of Appendix **30B** for conversion of the allotment of an administration into an assignment with modifications outside the envelope of the initial allotment while restricted to providing service to its national territory, designated by test points as contained in the corresponding allotment, submission by an administration of an additional system the service area of which is limited to its national territory, designated by test points as contained in the allotment, or submission by an administration acting on behalf of a group of named administrations of an additional system the service area of which is limited to the national territories of the group of named administrations, designated by test points as contained in the allotments, in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz, if requested by an administration or one acting on behalf of a group of named administrations in respect of its submission, as specified in Attachment 1 to this Resolution,



*further resolves*

that, when coordinating networks submitted under these additional measures, administrations, in particular those having satellite networks in process or included in the List with global coverage, exercise the utmost goodwill, and endeavour to overcome any difficulties encountered by the incoming network, in order to accommodate the incoming submission while respecting the underlying principles of No. 9.6 and its associated Rule of Procedure<sup>1</sup> which would apply by analogy to Article 6 of Appendix 30B; in addressing, in particular, difficulties encountered in coordination due to the issue of potential Earth-to-space harmful interference caused by an incoming network which originates outside the service area of other potentially affected networks, administrations having potentially affected networks with global coverage shall implement, to the maximum extent possible, means to accommodate the incoming network, taking into account actual operating characteristics of the potentially affected networks,

*instructs the Director of the Radiocommunication Bureau*

to provide assistance, if requested by an administration, in the generation of a minimum ellipse as called for in § 3 c) of Attachment 1 to this Resolution.

## ATTACHMENT 1 TO RESOLUTION COM5/8 (WRC-19)

### **Additional measures for satellite networks in the fixed-satellite service in frequency bands subject to Appendix 30B for the enhancement of equitable access to these frequency bands**

1 The special procedure described in this Attachment can only be applied once by an administration, or one acting on behalf of a group of named administrations<sup>2</sup>, having no assignment in the List of Appendix 30B or assignment submitted under § 6.1 of Appendix 30B.

2 With regard to the latter case, in order to benefit from application of the special procedure, the submitting administration may either withdraw or modify its submission previously sent to the Bureau under § 6.1 of Appendix 30B or submit its submission under § 6.17 of Appendix 30B to meet the criteria of this special procedure. Whenever an administration acts on behalf of a group of named administrations, all members of that group shall withdraw their submissions, if any, previously sent to the Bureau under § 6.1 of Appendix 30B.

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<sup>1</sup> “in the application of Article 9 no administration obtains any particular priority as a result of being the first to start either the advance publication phase (Section I of Article 9) or the request for coordination procedure (Section II of Article 9).”

<sup>2</sup> Whenever, under this Resolution, an administration acts on behalf of a group of named administrations, all members of that group can no longer apply this procedure or take part in another group of named administrations that requests to apply this procedure. Furthermore, all members of that group shall have no assignment in the List of Appendix 30B or assignment submitted under § 6.1 of Appendix 30B.

- 3 Administrations, or ones acting on behalf of a group of named administrations, seeking to apply this special procedure shall submit their request to the Bureau, with the information specified in § 6.1 of Appendix **30B**. Specifically, this information shall contain:
- a) in the cover letter to the Bureau, the information that the administration, or one acting on behalf of a group of named administrations, requests the use of this special procedure;
  - b) for an administration acting on its own behalf, a service area limited to the territory as contained in its national allotment, or as submitted in the case that a new Member State of the Union does not have an allotment in the Plan and has not submitted a request under § 7.2 of Article 7 of Appendix **30B**, or, in the case of submission of an additional system by an administration acting on behalf of a group of named administrations, a service area limited to the national territories of the named administrations;
  - c) a minimum ellipse for an administration acting on its own behalf, or a beam formed by combining all individual minimum ellipses for a group of named administrations, determined by the same set of test points contained in the Appendix **30B** Plan from each administration, using the relevant Bureau software application. An administration, or one acting on behalf of a group of named administrations, may request the Bureau to create such a diagram. See the *resolves* section of this Resolution.
- 4 If the information submitted under § 3 above is found to be incomplete, the Bureau shall immediately seek from the administration concerned any clarification required and information not provided.
- 5 An administration, or one acting on behalf of a group of named administrations, using this special procedure shall effect coordination with other administrations as required in § 6 below before:
- i) submitting a request under § 6.17\* of Appendix **30B** to have the satellite network entered into the Appendix **30B** List; and
  - ii) bringing into use a frequency assignment.
- 6 Following the successful application of §§ 1 to 4 above, the Bureau shall, ahead of submissions not yet processed under § 6.3 of Appendix **30B**, promptly:
- a) examine the information with respect to its conformity with § 6.3 of Appendix **30B**;

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\* During the coordination with an administration identified as affected, the notifying administration may change the beam to a shaped beam. Therefore, the Bureau shall accept submissions of satellite networks applying this Resolution and containing a shaped beam under § 6.17 of Appendix **30B**, if the characteristics of the submission under § 6.17 of Appendix **30B** are within the envelope of the characteristics of submission under § 6.1 of Appendix **30B**.

- b) identify, in accordance with Appendix 1 to this Attachment, any administration with which coordination may need to be effected<sup>3, 4</sup>;
- c) include their names in the publication under d) below;
- d) publish<sup>5</sup>, as appropriate, the complete information in the International Frequency Information Circular (BR IFIC) within the time-limit as specified in Appendix **30B**;
- e) inform the administrations concerned of its actions and communicate the results of its calculations, drawing attention to the relevant BR IFIC.

7 In applying §§ 6.5, 6.12, 6.14, 6.21 and 6.22 of Appendix **30B**, the criteria in Annex 4 to Appendix **30B** shall be replaced by those given in Appendix 1 to this Attachment.

8 Administrations identified under § 6 b) above, especially with a global coverage in uplink and limited service area, are required to apply all practical measures to overcome coordination difficulties encountered by the incoming network, in accordance with *further resolves* above.

9 If there is still continuing disagreement, the notifying administration may seek the assistance of the Bureau.

10 If there is still continuing disagreement, the notifying administration can resubmit the notice under § 6.25 of Appendix **30B** and insist upon its reconsideration; the Bureau, on the condition of a favourable finding under § 6.21 and § 6.22 of Appendix **30B** with respect to allotments in the Plan, shall enter the assignment provisionally in the List.

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<sup>3</sup> The Bureau shall also identify the specific satellite networks with which coordination needs to be effected.

<sup>4</sup> Whenever an administration acts on behalf of a group of named administrations, all members of that group retain the right to respond in respect of their own allotments or assignments.

<sup>5</sup> If the payments are not received in accordance with the provisions of ITU Council Decision 482, as amended, on the implementation of cost recovery for satellite network filings, the Bureau shall cancel the publication, after informing the administration concerned. The Bureau shall inform all administrations of such action and that the network specified in the publication in question no longer has to be taken into consideration by the Bureau and other administrations. The Bureau shall send a reminder to the notifying administration not later than two months prior to the deadline for the payment in accordance with above-mentioned Council Decision 482 unless the payment has already been received.

11 The administration responsible for the assignment which was the basis of the provisional entry under § 6.25 of Appendix **30B** shall be deemed to have agreed to the proposed assignment if the Bureau is informed that the new assignment in the List has been in use, together with the assignment which was the basis for the disagreement, for at least four months without any complaint of harmful interference being made, and § 6.29 does not apply\*\*.

12 The start of the four-month period referred to in § 11 above and the conditions for the operation to verify no harmful interference during this period shall be agreed by both administrations. If there is no agreement between administrations, any administration may seek the assistance of the Bureau.

13 If there is no reply under § 8 or § 12 above from the notifying administration of the existing network to the request for collaboration of the notifying administration of the incoming network, or if there are problems in communication between the two administrations, the notifying administration of the incoming network may seek the assistance of the Bureau. In this event, the Bureau shall forthwith send a telefax to the notifying administration of the existing network which has failed to reply, requesting an immediate beginning of collaboration with the notifying administration of the incoming network.

14 If there is no acknowledgement of receipt within 30 days after the Bureau's action under § 13 above, the Bureau shall immediately send a reminder providing an additional 15-day period for response. In the absence of such an acknowledgement within 15 days, it shall be deemed that the notifying administration of the existing network which has failed to acknowledge receipt has undertaken that no complaint will be made in respect of any harmful interference affecting its own assignments which may be caused by the assignment of the notifying administration of the incoming network for which coordination was requested.

15 The calculation of the reference situation (*C/I*) of an assignment with which agreement has been deemed to have been obtained under § 11 above shall not take into account the interference produced by the assignment for which the provisions of § 6.25 of Appendix **30B** have been applied until an explicit agreement has been reached.

16 The provisions in this Attachment are supplementary to the provisions of Article 6 of Appendix **30B**.

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\*\* Should harmful interference be caused at any later time by an assignment submitted under the provisions of this Resolution and for which § 14 has not been applied and which is entered into the List under § 6.25 of Appendix **30B** to any assignment in the List in respect of which § 6.25 of Appendix **30B** was applied, the administrations shall exercise the utmost goodwill and efforts to overcome any difficulties encountered by the incoming network, and the interfered-with administration shall identify appropriate remedial measures to be implemented, taking into account actual operations and cooperation with the incoming network.

APPENDIX 1 TO ATTACHMENT 1 TO  
RESOLUTION COM5/8 (WRC-19)

**Criteria for determining whether an assignment is considered to be affected by  
networks submitted to Appendix 30B under this Resolution**

The criteria as contained in Annex 4 to Appendix **30B** continue to apply in order to determine if a proposed new assignment applying the procedures of this Attachment affects:

- a) national allotments in the Plan;
- b) an assignment stemming from the conversion of an allotment into an assignment without modification or with modification within the envelope of the allotment;
- c) an allotment requested under Article 7 of Appendix **30B** by a new Member State of the Union which has received unfavourable findings under Article 7 and has been subsequently treated as a submission under § 6.1 of Appendix **30B**;
- d) assignments stemming from the application of § 6.35 of Appendix **30B**;
- e) assignments for which the procedures of this Resolution have been previously applied;
- f) assignments recorded in the List until 22 November 2019 with a service area limited to the national territories.

An assignment which appears in the List with a service area beyond national territories or which the Bureau has previously examined after receiving complete information and published under § 6.7 of Appendix **30B**, which does not fall into any of the above categories and which is not applying the procedures of this Attachment, is considered as being affected by a proposed new assignment that is applying the procedures of this Attachment:

- 1) if the orbital spacing between its orbital position and the orbital position of the proposed new assignment is equal to or less than:
  - 1.1) 7° in the frequency bands 4 500-4 800 MHz (space-to-Earth) and 6 725-7 025 MHz (Earth-to-space);
  - 1.2) 6° in the frequency bands 10.70-10.95 GHz (space-to-Earth), 11.20-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space);

2) however, an administration is considered as not being affected by a proposed new assignment that is applying the procedures of this Attachment if the conditions listed in 2.1 or 2.2 are satisfied:

- 2.1) the calculated<sup>6</sup> Earth-to-space single-entry carrier-to-interference  $(C/I)_u$  value at each test point associated with the assignment under consideration is greater than or equal to a reference value of 27 dB, or  $(C/N)_u + 6$  dB<sup>7</sup>, or any already accepted Earth-to-space single entry  $(C/I)$ , whichever is the lowest, and the calculated<sup>6</sup> space-to-Earth single-entry  $(C/I)_d$  value everywhere within the service area of the assignment under consideration is greater than or equal to a reference value<sup>8</sup> of 23.65 dB, or  $(C/N)_d + 8.65$  dB<sup>9</sup>, or any already accepted value whichever is the lowest, and the calculated<sup>6</sup> overall aggregate  $(C/I)_{agg}$  value at each test point associated with the assignment under consideration is greater than or equal to a reference value of 21 dB, or  $(C/N)_t + 7$  dB<sup>10</sup>, or any already accepted overall aggregate  $(C/I)_{agg}$  value, whichever is the lowest, with a tolerance of 0.45 dB<sup>11</sup> in the case of assignments not stemming from the conversion of an allotment into an assignment without modification, or when the modification is within the envelope characteristics of the initial allotment;
- 2.2) in the frequency band 4 500-4 800 MHz (space-to-Earth), the power flux-density (pfd) produced under assumed free-space propagation conditions does not exceed the threshold values shown below, anywhere within the service area of the potentially affected assignment:

$0 \leq \theta \leq 0.09$	-240.5	dB(W/(m <sup>2</sup> · Hz))
$0.09 < \theta \leq 3$	$-240.5 + 20\log(\theta/0.09)$	dB(W/(m <sup>2</sup> · Hz))
$3 < \theta \leq 5.5$	$-216.79 + 0.75 \cdot \theta^2$	dB(W/(m <sup>2</sup> · Hz))
$5.5 < \theta \leq 7$	$-194.1 + 25\log(\theta/5.5)$	dB(W/(m <sup>2</sup> · Hz))

where  $\theta$  denotes nominal geocentric separation (degrees) between interfering and interfered with satellite networks;

<sup>6</sup> Including a computational precision of 0.05 dB.

<sup>7</sup>  $(C/N)_u$  is calculated as in Appendix 2 to Annex 4 to Appendix **30B**.

<sup>8</sup> The reference values within the service area are interpolated from the reference values at the test points.

<sup>9</sup>  $(C/N)_d$  is calculated as in Appendix 2 to Annex 4 to Appendix **30B**.

<sup>10</sup>  $(C/N)_t$  is calculated as in Appendix 2 of Annex 4 to Appendix **30B**.

<sup>11</sup> Inclusive of the 0.05 dB computational precision.

in the frequency band 6 725-7 025 MHz (Earth-to-space), the pfd produced at the location in the geostationary-satellite orbit of the potentially affected assignment under assumed free-space propagation conditions does not exceed  $-201.0 - G_{Rx}$  dB(W/(m<sup>2</sup> · Hz)), where  $G_{Rx}$  is the relative space station uplink receive antenna gain of the potentially affected assignment at the location of the interfering earth station;

in the frequency bands 10.7-10.95 and 11.2-11.45 GHz (space-to-Earth), the pfd produced under assumed free-space propagation conditions does not exceed the threshold values shown below, anywhere within the service area of the potentially affected assignment:

$0 \leq \theta \leq 0.05$	$-235.0$	dB(W/(m <sup>2</sup> · Hz))
$0.05 < \theta \leq 3$	$-235.0 + 20\log(\theta/0.05)$	dB(W/(m <sup>2</sup> · Hz))
$3 < \theta \leq 5$	$-207.98 + 0.95 \cdot \theta^2$	dB(W/(m <sup>2</sup> · Hz))
$5 < \theta \leq 6$	$-184.23 + 25\log(\theta/5)$	dB(W/(m <sup>2</sup> · Hz))

where  $\theta$  denotes nominal geocentric separation (degrees) between interfering and interfered with satellite networks;

in the frequency band 12.75-13.25 GHz (Earth-to-space), the pfd produced at the location in the geostationary-satellite orbit of the potentially affected assignment under assumed free-space propagation conditions does not exceed  $-205.0 - G_{Rx}$  dB(W/(m<sup>2</sup> · Hz)), where  $G_{Rx}$  is the relative space station uplink receive antenna gain of the potentially affected assignment at the location of the interfering earth station.

In addition to the above, and as a consequence of the reduced coordination arc in 1) above as compared to that in Annex 3 to Appendix **30B**, the following limits shall be applied, instead of the limits contained in Annex 3 to Appendix **30B**, for submissions made under this Resolution.

Under assumed free-space propagation conditions, the pfd (space-to-Earth) of a proposed new allotment or assignment produced on any portion of the surface of the Earth shall not exceed:

- $-131.4$  dB(W/(m<sup>2</sup> · MHz)) in the frequency band 4 500-4 800 MHz; and
- $-118.4$  dB(W/(m<sup>2</sup> · MHz)) in the frequency bands 10.70-10.95 GHz and 11.20-11.45 GHz.

Under assumed free-space propagation conditions, the pfd (Earth-to-space) of a proposed new allotment or assignment shall not exceed:

- $-140.0$  dB(W/(m<sup>2</sup> · MHz)) towards any location in the geostationary-satellite orbit located more than 7° from the proposed orbital position in the frequency band 6 725-7 025 MHz; and
- $-133.0$  dB(W/(m<sup>2</sup> · MHz)) towards any location in the geostationary-satellite orbit located more than 6° from the proposed orbital position in the frequency band 12.75-13.25 GHz.

**APPENDIX 2 TO ATTACHMENT 1 TO  
RESOLUTION COM5/8 (WRC-19)**

**Protection criteria for new incoming network**

<b>Incoming network</b>	<b>Allotments or assignments to be protected</b>	<b>Protection criteria</b>
Assignment applying the special procedure	Allotment in the Plan	Annex 4
	Assignment converted from allotment without modification	Annex 4
	Assignment converted from allotment with modification within the envelope of the allotment	Annex 4
	Assignment converted from allotment with modification outside the envelope of the allotment and the special procedure applied	Annex 4
	Assignment converted from allotment with modification outside the envelope of the allotment and the special procedure NOT applied	New criteria
	Former existing system	Annex 4
	Additional system for which the special procedure applied	Annex 4
	Additional system with frequency assignments recorded in the List until 22 November 2019 with service area limited to national territories for which the special procedure NOT applied	Annex 4
	Additional system with frequency assignments submitted under item 6.1 of Appendix <b>30B</b> with service area limited to national territories for which the special procedure NOT applied	New criteria
	Additional system with frequency assignments with service area beyond national territories for which the special procedure NOT applied	New criteria
	Request under Article 7 but transferred to Article 6	Annex 4
	New allotment through the application of § 6.35	Annex 4
Conversion of allotment or new additional system for which the special procedure NOT applied	All	Annex 4



## ATTACHMENT 2 TO RESOLUTION COM5/8 (WRC-19)

**Number of Appendix 30B submissions that have been received by the Bureau****Number of new submissions**

	Request for conversion without change of initial allotment (national service area)	Request for conversion with changes within the envelope of initial allotment (national service area)	Request for conversion with changes outside the envelope of initial allotment (national service area)	Request for conversion with changes outside the envelope of initial allotment (supra national service area)	Request for additional use (national service area)	Request for additional use (with supra national service area and global coverage)	Total
F						103	103
HOL						33	33
RUS/IK						29	29
E						28	28
PNG						28	28
IND					12	14	26
CHN					8	15	23
G						21	21
UAE						19	19
ISR						17	17
RUS					9	7	16
QAT						12	12
ARS/ARB						10	10
LUX						10	10
S						8	8
B			2		2	3	7
D						6	6
INS					3	3	6
J						6	6
USA				1		5	6
BLR	1					4	5
CYP						5	5
BGD	1					3	4
IRN		1				3	4
MCO						4	4
MEX	1				3		4
MLA					1	3	4
TUR						4	4
CAN			1			2	3
KAZ						3	3
BUL	1					1	2
HNG						2	2
LAO						2	2
NCG						2	2

	Request for conversion without change of initial allotment (national service area)	Request for conversion with changes within the envelope of initial allotment (national service area)	Request for conversion with changes outside the envelope of initial allotment (national service area)	Request for conversion with changes outside the envelope of initial allotment (supra national service area)	Request for additional use (national service area)	Request for additional use (with supra national service area and global coverage)	Total
NPL		1			1		2
VTN					1	1	2
ALG						1	1
ARM						1	1
BOL		1					1
CBG						1	1
ETH						1	1
GRC						1	1
IRQ						1	1
MNE	1						1
MNG	1						1
NOR						1	1
PAK						1	1
ROU	1						1
SDN	1						1
<b>Total:</b>	<b>8</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>40</b>	<b>424</b>	<b>479</b>

**Number of suppressions**

	2009-2019	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019*
ARS/ARB	11						3	1	1	1	2	3
BLR	1										1	
BUL	1					1						
CAN	2						1	1				
CHN	16						15					1
E	1											1
F	14						2	1			6	5
F/EUT	38	15	3	16	2	1			1			
G	9				1			6		1		1
HOL	5								3			2
IND	8			1				6	1			
ISR	4										2	2
KOR	10					10						
LBY	1			1								
LUX	26			1		4	13		2	5	1	
MCO	1					1						
MLA	1								1			
NOR	2						1	1				

	2009-2019	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019*
PNG	6			3						1	1	1
RUS	12			2	1	1	5	1	2			
RUS/K	9										6	3
S	4						2		1		1	
SDN	1											1
TUR	2										2	
UAE	4										1	3
USA	2					1		1				
VTN	2				1						1	
<b>Total</b>	193	15	3	24	5	19	42	18	12	8	24	23

\* In 2019, the statistics stop at 30 September.

**ADD****RESOLUTION COM5/9 (WRC-19)****Use of the frequency band 137-138 MHz by non-geostationary satellites with short-duration missions in the space operation service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the term “short-duration mission” is used in accordance with Resolution **COM5/5 (WRC-19)**;
- b) that non-geostationary-satellite systems identified as short-duration missions are constrained in terms of low on-board power and low antenna gain;
- c) that studies in Report ITU-R SA.2427 have indicated that the frequency bands 150.05-174 MHz and 400.15-420 MHz are not suitable for non-geostationary-satellite systems in the space operation service with short-duration missions;
- d) that the overall occupied bandwidth of any emission should be maintained completely within the frequency band allocated to the application identified in the space operation service with short-duration missions, including any offsets such as Doppler shift or frequency tolerances;
- e) that, due to operational restrictions, only one non-geostationary short-duration satellite is transmitting per channel at a given time on the same geographic area;
- f) that Report ITU-R SA.2425 provides studies related to the spectrum requirements for telemetry, tracking and command in the space operation service for non-geostationary-satellite systems with short-duration missions,

*recognizing*

- a) that the frequency range 108-137 MHz is allocated to the aeronautical mobile (route) service and is used for safety-of-life critical air-ground communications to ensure the safe operation of aircraft;
- b) that the technical characteristics for telemetry, tracking and command in the space operation service below 1 GHz for non-geostationary-satellite systems with short-duration missions are found in Report ITU-R SA.2426,

*resolves*

- 1 that the use of the space operation service (space-to-Earth) for non-geostationary-satellite systems with short-duration missions in the frequency range 137-138 MHz shall be limited to the frequency band 137.025-138 MHz;
- 2 that, in the frequency band 137.025-138 MHz, the power flux-density at any point on the Earth’s surface produced by a space station of non-geostationary-satellite systems in the space operation service used for short-duration missions in accordance with Appendix 4 of the Radio Regulations shall not exceed  $-140 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$ ;
- 3 that administrations wishing to implement the space operation service (space-to-Earth) in the frequency band 137.025-138 MHz by non-geostationary-satellites systems for short-duration missions shall ensure compliance with *considering d)*,

*invites the ITU Radiocommunication Sector*

to conduct, as a matter of urgency, relevant studies of technical, operational and regulatory aspects in relation to the implementation of this Resolution,

*instructs the Director of the Radiocommunication Bureau*

to present to the next world radiocommunication conference the progress report relating to the implementation of this Resolution.

ADD

## RESOLUTION COM5/10 (WRC-19)

**Protection of geostationary fixed-satellite service, broadcasting-satellite service, and mobile-satellite service networks from the aggregate interference produced by multiple non-GSO FSS systems in the frequency bands 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) are allocated, *inter alia*, on a primary basis to the fixed-satellite service (FSS);
- b) that the frequency bands 40.5-41 GHz and 41-42.5 GHz are allocated on a primary basis to the broadcasting-satellite service (BSS);
- c) that the frequency bands 39.5-40 GHz (space-to-Earth) and 40-40.5 GHz (space-to-Earth) are allocated, on a primary basis to the mobile-satellite service (MSS);
- d) that Article **22** contains regulatory and technical provisions on sharing between geostationary-satellite orbit (GSO) and non-geostationary-satellite orbit (non-GSO) FSS systems in these bands in *considering a*);
- e) that, in accordance with No. **22.2**, non-GSO systems shall not cause unacceptable interference to GSO FSS and GSO BSS networks and, unless otherwise specified in the Radio Regulations, shall not claim protection from GSO FSS and GSO BSS satellite networks;
- f) that administrations planning to operate non-GSO FSS systems require quantification of technical regulatory measures required for protection of GSO FSS, GSO MSS and GSO BSS satellite networks operating in the bands referred to in *considering a*), *b*) and *c*) above;
- g) that the operating parameters and orbital characteristics of non-GSO FSS systems are usually inhomogeneous;
- h) that, the time allowance for the *C/N* value specified in the short-term performance objective associated with the shortest percentage of time (lowest *C/N*) or decrease of the long-term throughput (spectral efficiency) caused to reference GSO FSS, GSO MSS and GSO BSS links by non-GSO FSS systems is likely to vary according to the parameters of such systems;
- i) that, the aggregate interference from multiple non-GSO FSS systems will be related to the actual number of systems sharing a frequency band based on the single-entry operational use of each system;
- j) that to protect GSO FSS, GSO MSS and GSO BSS networks in the frequency bands listed in *considering a*), *b*) and *c*) from unacceptable interference, the aggregate impact of interference caused by all co-frequency non-GSO FSS systems shall not exceed the aggregate impact limit specified in No. **22.5M** of the Radio Regulations;

*k)* that the aggregate levels are likely to be the summation of worst-case single-entry levels of interference caused by non-GSO FSS systems,

*noting*

*a)* that Resolution **COM5/11 (WRC-19)** contains the methodology for determining conformity to the single-entry limits to protect the GSO networks;

*b)* that Recommendation ITU-R S.1503 provides guidance on how to compute the epfd levels from a non-GSO system into GSO earth stations and satellites;

*c)* that Resolution **COM5/11 (WRC-19)** contains GSO satellite system characteristics to be used in non-GSO/GSO frequency sharing analyses in the frequency bands 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz,

*recognizing*

*a)* that non-GSO FSS systems may need to implement interference mitigation techniques, such as avoidance angles, Earth station site diversity, and GSO arc avoidance to facilitate sharing frequencies among non-GSO FSS systems and to protect GSO FSS, GSO MSS and GSO BSS networks;

*b)* that administrations operating or planning to operate non-GSO FSS systems will need to agree cooperatively through consultation meetings to share the aggregate interference allowance for all non-GSO FSS systems sharing the frequency bands listed in *considering a)* in order to achieve the desired level of protection for GSO FSS, MSS and BSS networks that is stated in No. **22.5M** of the Radio Regulations;

*c)* that administrations operating or planning to operate GSO FSS, MSS or BSS networks are invited to participate and be involved in the consultation meetings mentioned in *recognizing b)* above, especially as the aggregate interference level approaches the limits specified in No. **22.5M**;

*d)* that, taking into account the single-entry allowance in No. **22.5L**, the aggregated worst-case impact of all non-GSO FSS systems can be computed without the need for specialized software tools based on the results of the assessment of single-entry levels of interference caused by each system;

*e)* that in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), signals experience high levels of attenuation due to atmospheric effects such as rain, cloud cover and gaseous absorption;

*f)* that given these expected high levels of fading, it is desirable for GSO networks and non-GSO FSS systems to implement fade counter measures such as automatic level control, power control and adaptive coding and modulation,

*resolves*

1 that administrations operating or planning to operate non-geostationary FSS systems in the frequency bands referred to in *considering a)* above, shall jointly, take all necessary steps, including, if necessary, appropriate modifications to the operational characteristics of their systems or networks, to ensure that the aggregate interference impact to geostationary FSS, MSS and BSS satellite networks caused by such systems operating co-frequency in these frequency bands does not exceed the aggregate limits specified in No. **22.5M**;

- 2 that to carry out the obligations in *resolves* 1 above, administrations operating or planning to operate non-geostationary FSS systems shall agree cooperatively through regular consultation discussions referred to in *recognizing b)* to ensure that operations of all non-GSO FSS networks do not exceed the aggregate level of protection for geostationary satellite networks;
- 3 that, taking into account *resolves* 2, failure by a responsible administration operating or planning to operate non-GSO FSS systems to participate in the consultation process does not relieve that administration of obligations under *resolves* 1 above, nor does it remove their systems from consideration in any aggregate calculations by the consultation group;
- 4 that *resolves* 2 and 3 above begin to apply when a second non-geostationary FSS systems with frequency assignments in the frequency bands referred to in *considering a)* meets the criteria listed in Annex 2 to this Resolution;
- 5 that to carry out the obligations of *resolves* 1 above, administrations shall use the generic GSO reference links listed in Resolution **COM5/11 (WRC-19)** and validated supplemental GSO links associated with notified and brought into use frequency assignments submitted to the Bureau by administrations to determine the results of the aggregate impact to GSO networks;
- 6 that administrations (including representatives of administrations operating GSO FSS, MSS and BSS networks) participating in a consultation meeting are allowed to use their own software in conjunction with any software tools used by the BR for the calculation and verification of the aggregate limits, subject to the agreement of the consultation meeting;
- 7 that administrations, in carrying out their obligations under *resolves* 1 above, shall take into account only those non-geostationary FSS systems with frequency assignments in the frequency bands referred to in *considering a)* above that have met the criteria listed in Annex 2 to this Resolution through appropriate information provided in the course of consultation discussions referred to in *resolves* 2;
- 8 that administrations, in developing agreements to carry out their obligations under *resolves* 1, shall establish mechanisms to ensure that all notifying administrations and operators that are planning to operate FSS, BSS, MSS systems and networks are given full visibility of, and the opportunity to participate in, the consultation process, either in person or remotely, regardless of the stage of development and deployment of these systems and networks;
- 9 that, taking into account *resolves* 2, a responsible administration operating or planning to operate non-GSO FSS systems that is unable to participate in the consultation process, either in person or remotely, is still responsible for meeting its obligations under *resolves* 1 above and for providing information on its systems so that they may be included in the aggregate calculations by the consultation group;
- 10 that each administration, in the absence of an agreement reached at consultation meetings referred to in *resolves* 2, shall ensure that each of its non-GSO FSS systems subject to this Resolution are operated in accordance with reduced single-entry interference impact allowances, calculated by an amount proportional to their single entry contribution to the aggregate so as to ensure that the aggregate allowance in No. **22.5M** is not exceeded;



11 that the administrations participating at the consultation discussion referred to in *resolves* 2 shall designate one convener to be responsible for communicating to the Bureau the results of the aggregate non-GSO system operational calculation and sharing determinations made in application of *resolves* 1, 3 and 9 above, without regard to whether such determinations result in any modifications to the published characteristics of their respective systems, providing a draft record of each consultation meeting, and providing the Bureau the approved record, as specified in Annex 1 to this Resolution,

*invites administrations*

to submit to the Bureau, as necessary, supplemental GSO reference links in a format consistent with the generic links in Annex 1 to Resolution **COM5/11 (WRC-19)** and in the frequency bands listed in *considering a)*, that are associated with GSO satellite networks,

*invites the Radiocommunication Bureau*

to participate in the consultation meetings in *resolves* 2 as an observer,

*invites the ITU Radiocommunication Sector*

1 to carry out studies and develop, as a matter of urgency, a suitable methodology, considering a range of input values and assumptions, including both best and worst case, for calculating the aggregate interference produced by all non-GSO FSS and as appropriate non-GSO MSS systems operating or planning to operate in the frequency bands referred to above co-frequency with GSO FSS, GSO MSS and GSO BSS networks, which may be used to determine whether the systems are in compliance with the aggregate limits specified in No. **22.5M**;

2 to carry out studies and develop, as a matter of urgency a methodology to validate supplemental links;

3 to study the selection and the use of *C/N* objectives, and the necessity of specifying one or more *C/N* objective points at associated percentages of time, with regards to the GSO link performance;

4 to report back to a future WRC, as appropriate, under Resolution **86**,

*instructs the Radiocommunication Bureau*

1 to collect and, once a methodology is available, evaluate for validation purposes and provide for information the supplemental links submitted by administrations for frequency assignments associated with GSO satellite networks;

2 to provide the consultation meeting, for use in the aggregate calculations, with the validated supplemental links associated with networks brought into use;

3 to make available on the ITU website within one month from the closing date of any consultation meeting all information, such as that in Annex 2 referred to in *resolves* 11;

4 to exclude the aggregate calculations given in No. **22.5M** as part of a satellite network examination under No. **11.31**.

## ANNEX 1 TO RESOLUTION COM5/10 (WRC-19)

**List of geostationary networks characteristics and format of the result of the aggregate calculation to be provided to BR for publication for information****I GSO FSS and BSS network characteristics to be used in the calculation of aggregate emissions from non-GSO FSS systems****I-1 GSO FSS, MSS and BSS network characteristics**

The GSO network characteristics to be considered in the aggregate calculation are the:

- generic links contained in Annex 1 to Resolution **COM5/11 (WRC-19)**.

**I-2 Non-GSO FSS satellite system constellation parameters**

For each non-GSO satellite system, the following parameters should be provided to BR for publication in the aggregate calculation:

- notifying administration;
- number of space stations used in aggregate calculations;
- single-entry contribution to the aggregate of each non-GSO FSS system.

**II Results of the aggregate epdf calculation**

- The summary record of the meeting;
- single-entry contribution of each non-GSO FSS system;
- detailed description of methodology used to calculate the aggregate interference;
- the aggregate assessment of the non-GSO systems on the generic and validated supplemental GSO links, if any;
- all input materials submitted to the meeting; and
- studies conducted prior to or at the meeting as well as any other materials deemed necessary for demonstrating compliance with No. **22.5M**.

## ANNEX 2 TO RESOLUTION COM5/10 (WRC-19)

**List of criteria for the application of *resolves 7***

- 1 Submission of appropriate coordination and/or notification information for non-GSO FSS systems.
- 2 Entry into satellite manufacturing or procurement agreement, and entry into satellite launch agreement.

The non-geostationary FSS system operator should possess:

- i) evidence of a binding agreement for the manufacture or procurement of its satellites;  
and
- ii) evidence of a binding agreement to launch its satellites.

The manufacturing or procurement agreement should identify the contract milestones leading to the completion of manufacture or procurement of satellites required for the service provision, and the launch agreement should identify the launch date, launch site and launch service provider. The notifying administration is responsible for authenticating the evidence of an agreement.

The information required under this criterion may be submitted in the form of a written commitment by the responsible administration.

3 As an alternative to satellite manufacturing or procurement and launch agreements, evidence of guaranteed funding arrangements for the implementation of the project would be accepted. The notifying administration is responsible for authenticating the evidence of these arrangements and for providing such evidence to other interested administrations in furtherance of its obligations under this Resolution.

ADD

## RESOLUTION COM5/11 (WRC-19)

**Application of Article 22 of the Radio Regulations to the protection of geostationary fixed-satellite service and broadcasting-satellite service networks from non-geostationary fixed-satellite service systems in the frequency bands 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

a) that geostationary (GSO) and non-geostationary (non-GSO) fixed-satellite service (FSS) networks may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space);

b) that this conference adopted Nos. **22.5L** and **22.5M**, which contain single-entry and aggregate limits for non-GSO FSS systems in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) to protect GSO networks operating in the same frequency bands;

c) that ITU-R has developed a methodology contained in Recommendation ITU-R S.1503 that results in the equivalent power flux-density (epfd) generated by any one non-GSO FSS system considered and a GSO location that corresponds to the worst-case geometry that generates the highest levels of epfd into potentially affected GSO earth stations and satellites,

*recognizing*

a) that, in accordance with calculations utilizing Recommendation ITU-R S.1503, the verification of the worldwide epfd interference of any one non-GSO system can be carried out by a set of generic GSO reference link budgets having characteristics that encompass global GSO network deployments that are independent of any specific geographic locations;

b) that Resolution **COM5/10 (WRC-19)** addresses the protection of GSO satellite networks from aggregate emissions from non-GSO systems,

*resolves*

1 that during the examination under Nos. **9.35** and **11.31**, as applicable, of a non-GSO FSS satellite system with frequency assignments in the 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) frequency bands, the technical characteristics of generic GSO reference links contained in Annex 1 shall be used in conjunction with the methodology in Annex 2 to determine compliance with No. **22.5L**;

2 that frequency assignments to non-GSO FSS systems referred to in *resolves 1*) shall receive a favourable finding with respect to the single-entry provision given in No. **22.5L**, if compliance with No. **22.5L** is established under *resolves 1*, otherwise the assignments shall receive an unfavourable finding;

3 that if the Bureau is unable to examine non-GSO FSS systems subject to the single-entry provision given in No. **22.5L** due to a lack of available software, the notifying administration shall provide all necessary information sufficient to demonstrate compliance with No. **22.5L** and send the Bureau a commitment that the non-GSO FSS system complies with the limits given in No. **22.5L**;

4 that frequency assignments to non-GSO FSS systems that cannot be assessed under *resolves* 1 shall receive a qualified favourable finding under No. **9.35** with respect to No. **22.5L** if *resolves* 3 is satisfied, otherwise the assignments shall receive an unfavourable finding;

5 that if an administration believes that a non-GSO FSS system, for which the commitment referred to in *resolves* 3 was sent, has the potential to exceed the limits given in No. **22.5L**, it may request additional information from the notifying administration with regard to the compliance with these limits and No. **22.2**. Both administrations shall cooperate to resolve any difficulties, with the assistance of the Bureau, if so requested by either of the parties;

6 that *resolves* 3, 4 and 5 shall no longer be applied after the Bureau has communicated to all administrations via a Circular Letter that validation software is available and the Bureau is able to verify compliance with the limits in No. **22.5L**,

*invites the ITU Radiocommunication Sector*

1 to study and, as appropriate, develop a functional description that could be used to develop software for the procedures outlined in *resolves* 1 above;

2 to review and, as appropriate, provide updates to the generic GSO reference links in Annex 1 to this Resolution under Resolution **86**,

*instructs the Director of the Radiocommunication Bureau*

to review, once the validation software as described in *resolves* 3 is available, its findings made in accordance with Nos. **9.35** and **11.31**.

## ANNEX 1 TO RESOLUTION COM5/11 (WRC-19)

### **Generic GSO reference links for evaluation of compliance with single-entry requirements for non-GSO systems**

The data in Annex 1 are to be regarded as a generic range of representative technical characteristics of GSO networks deployments that are independent of any specific geographic location, to be used only for establishing the interference impact of a non-GSO system into GSO satellite networks and not as a basis for coordination between satellite networks.

TABLE 1

**Generic parameters of GSO links to be used in examination of the downlink (space-to-Earth) impact from any one non-GSO system**

1	Generic GSO reference link parameters = service					Parameters
	Link type	User #1	User #2	User #3	Gateway	
1.1	e.i.r.p. density (dBW/MHz)	44	44	40	36	$eirp$
1.2	Equivalent antenna diameter (m)	0.45	0.6	2	9	$D_m$
1.3	Bandwidth (MHz)	1	1	1	1	$B_{MHz}$
1.4	ES antenna gain pattern	S.1428	S.1428	S.1428	S.1428	
1.5	Additional link losses (dB) This field includes non-precipitation impairments	3	3	3	3	$L_o$
1.6	Additional noise contribution including margin for inter system interference (dB)	2	2	2	2	$M_{0inter}$
1.7	Additional noise contribution including margin for intra-system interference (dB) and non-time varying sources	1	1	1	1	$M_{0intra}$

2	Generic GSO reference link parameters - parametric analysis	Parametric cases for evaluation						
2.1	e.i.r.p. density variation	-3, 0, +3 dB from value in 1.1						$\epsilon$
2.2	Elevation angle (deg)	20		55		90	$\Delta eirp$	
2.3	Rain height (m) for specified latitude in item 2.4	5 000	3 950	1 650	5 000	3 950	5 000	$h_{rain}$
2.4	Latitude* (deg. N)	0	$\pm 30$	$\pm 61.8$	0	$\pm 30$	0	Lat
2.5	ES noise temperature (K)	340						$T$
2.6	0.01% rain rate (mm/hr)	10, 50, 100						$R_{0.01}$
2.7	Height of ES above mean sea level (m)	0, 500, 1 000						$h_{ES}$
2.8	Threshold $C/N$ (dB)	-2.5, 2.5, 5, 10						$\left(\frac{C}{N}\right)_{Thr.i}$

Note: For items 2.2, 2.3 and 2.4, these three groups of data are to be considered as unique sets of data to be used in the larger, overall set of total possible permutations. For example, 20 degrees of elevation angle will consider three different latitudes of 0, 30 and 61.8 degrees while 90 degrees of elevation will only consider a latitude of 0 degrees and one possible rain height 5 km. The above parameters are chosen as representative propagation parameters for purposes of calculations of precipitation fade statistics. These precipitation fades are representative of other geographic locations.

\* Latitude is evaluated as single value representing the absolute value of the latitude

TABLE 2

**Parameters of generic GSO reference links to be used in examination of the uplink (Earth-to-space) impact from any one non-GSO system**

1	Generic link parameters = service					
	Link type	Link #1	Link #2	Link #3	Gateway	
1.1	ES e.i.r.p. density (dBW/MHz)	49	49	49	60	$eirp$
1.2	Bandwidth (MHz)	1	1	1	1	$B_{MHz}$
1.3	Half-power beamwidth (deg)	0.2	0.3	1.5	0.3	
1.4	ITU-R S.672 sidelobe level (dB)	-25	-25	-25	-25	
1.5	Satellite antenna peak gain (dBi)	58.5	54.9	38.5	54.9	$G_{max}$
1.6	Additional link losses (dB) This field includes non-precipitation impairments	4.5	4.5	4.5	4.5	$L_o$
1.7	Additional noise contribution including margin for inter system interference (dB)	2	2	2	2	$M_{0inter}$
1.8	Additional noise contribution including margin for intra-system interference (dB) and non-time varying sources	1	1	1	1	$M_{0intra}$

2	Generic link parameters -parametric analysis	Parametric cases for evaluation						
2.1	e.i.r.p. density variation	-6, 0, +6 dB from value in 1.1						$\Delta eirp$
2.2	Elevation angle (deg)	20		55		90	$\epsilon$	
2.3	Rain height (m) for specified latitude in item 2.4	5 000	3 950	1 650	5 000	3 950	5 000	$h_{rain}$
2.4	Latitude* (deg. $N$ )	0	$\pm 30$	$\pm 61.8$	0	$\pm 30$	0	Lat
2.5	0.01% rain rate (mm/hr)	10, 50, 100						$R_{0.01}$
2.6	Height of ES above mean sea level (m)	0, 500, 1 000						$h_{ES}$
2.7	Satellite noise temperature (K)	500, 1 600						$T$
2.8	Threshold $C/N$ (dB)	-2.5, 2.5, 5, 10						$\left(\frac{C}{N}\right)_{Thr,i}$

Note: For items 2.2, 2.3 and 2.4, these three groups of data are be considered as unique sets of data to be used in the larger, overall set of total possible permutations. For example, 20 degrees of elevation angle will consider three different latitudes of 0, 30 and 61.8 degrees while 90 degrees of elevation will only consider a latitude of 0 degrees and one possible rain height 5 km. The above parameters are chosen as representative propagation parameters for purposes of calculations of precipitation fade statistics. These precipitation fades are representative of other geographic locations.

\*Latitude is evaluated as single value representing the absolute value of the latitude

## ANNEX 2 TO RESOLUTION COM5/11 (WRC-19)

**Description of parameters and procedures for the evaluation of interference from any one non-GSO system into global set of generic GSO reference links**

This Annex provides an overview of the process to validate compliance with the single-entry permissible interference of a non-GSO system into GSO networks using the generic GSO reference link parameters in Annex 1 and the interference impact using the latest version of Recommendation ITU-R S.1503. The procedure to determine the compliance with the single-entry permissible interference relies on the following principles.

*Principle 1:* The two time-varying sources of link performance degradation considered in the verification are link fading (from rain) using the characteristics of the generic GSO reference link and interference from a non-GSO system. The total  $C/N$  in the reference bandwidth for a given carrier is:

$$C/N = C / (N_T + I) \quad (1)$$

where:

- $C$ : wanted signal power (W) in the reference bandwidth, which varies as a function of fades and also as a function of transmission configuration;
- $N_T$ : total system noise power (W) in the reference bandwidth;
- $I$ : time-varying interference power (W) in the reference bandwidth generated by other networks.

*Principle 2:* The calculation of spectral efficiency is focused on satellite systems utilizing adaptive coding and modulation (ACM) by calculating the throughput degradation as a function of  $C/N$ , which varies depending on the propagation and interference impacts on the satellite link over the long term.

*Principle 3:* During a fading event in the downlink direction the interfering carrier is attenuated by the same amount as the wanted carrier. This principle results in slight underestimation of the impact of the downlink interference.

**Implementation of verification algorithm**

The generic GSO reference link parameters described in Annex 1 should be used as described in the following algorithm to determine if a non-GSO FSS network is compliant with No. **22.5L**.

Within the parametric analysis there are a range of values for each of the following parameters in Section 2 of Tables 1 and 2:

- e.i.r.p. density variation
- elevation angle (deg)
- rain height (m)
- latitude (deg)
- 0.01% rain rate (mm/hr)
- height of ES (m)
- ES noise temperature (K) or satellite noise temperature (K), as appropriate.



A set of generic GSO reference links should be created using one per service case identified in Section 1 of Tables 1 and 2 and one value from each of the parametric analysis parameters in Section 2 of Tables 1 and 2. Then with this set of generic GSO reference links, the following process should be undertaken:

*Determine the frequency that should be used in the analysis,  $f_{GHE}$ , by applying the methodology in Recommendation ITU-R S.1503 to the non-GSO system filed frequencies and the frequency bands for which No. 22.5L applies*

*For each of the generic GSO reference links*

{

*Step 0: Determine if this generic GSO reference link is valid and select the appropriate threshold*

*If the generic GSO reference link is valid, then*

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*Step 1: Derive the probability density function (PDF) of the rain fade to use in the convolution*

*Step 2: Recommendation ITU-R S.1503 should be used to derive the PDF of the EPFD from the non-GSO FSS system*

*Step 3: Perform a modified convolution (space-to-Earth) or convolution (Earth-to-space) with the PDF of the rain fade and the PDF of the EPFD. This convolution yields a PDF of C/N and C/(N+I)*

*Step 4: Use the C/N and C/(N+I) PDFs to determine compliance with No. 22.5L*

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}

*If the non-GSO system under examination is found to comply with No. 22.5L with respect to all generic GSO reference links, then the result of the evaluation is pass otherwise it is an unfavourable finding.*

Each of these steps are described further in Appendices 1 and 2 to this Annex for the space-to-Earth and Earth-to-space procedures, respectively.

## APPENDIX 1 TO ANNEX 1 OF RESOLUTION COM5/11 (WRC-19)

### **Algorithm steps to be applied in the space-to-Earth direction to determine compliance with No. 22.5L**

By applying the following steps, the single-entry interference impact from a non-GSO system on the availability and spectral efficiency of a generic GSO reference link is determined. The generic GSO reference link parameters of Annex 1 to this Resolution are used, considering all possible parametric permutations, in conjunction with the worst-case geometry (“WCG”) epfd output of the latest version of Recommendation ITU-R S.1503. The output of Recommendation ITU-R S.1503 is a set of interference statistics that a non-GSO system creates. These interference statistics are then used to determine the effect of the interference into each generic GSO reference link.

**Step 0: Verification of the generic GSO reference link and selection of C/N threshold**

The following steps should be used to determine if the generic GSO reference link is valid and if so, which of the thresholds  $\left(\frac{C}{N}\right)_{Thr,i}$  should be used. It is assumed that  $R_s = 6\,378.137$  km,

$R_{geo} = 42\,164$  km and  $k_{dB} = -228.6$  dB(J/K). Note that the term “cumulative distribution function” is meant to include the concept of the complementary cumulative distribution function depending upon context.

- 1) Calculate the peak gain of the ES in dBi using:  
for  $20 \leq D/\lambda \leq 100$

$$G_{max} = 20 \log \left( \frac{D}{\lambda} \right) + 7.7 \quad \text{dBi}$$

for  $D/\lambda > 100$

$$G_{max} = 20 \log \left( \frac{D}{\lambda} \right) + 8.4 \quad \text{dBi}$$

- 2) Calculate the slant distance in km using:

$$d_{km} = R_s \left( \sqrt{\frac{R_{geo}^2}{R_s^2} - \cos^2(\epsilon)} - \sin(\epsilon) \right)$$

- 3) Calculate the free-space path loss in dB using:

$$L_{fs} = 92.45 + 20 \log_{10}(f_{GHz}) + 20 \log_{10}(d_{km})$$

- 4) Calculate the wanted signal power in the reference bandwidth in dBW accounting for additional link losses:

$$C = eirp + \Delta eirp - L_{fs} + G_{max} - L_o$$

- 5) Calculate the total noise power in the reference bandwidth in dBW/MHz using:

$$N_T = 10 \log_{10}(T \cdot B_{MHz} \cdot 10^6) + k_{dB} + M_{ointra} + M_{ointer}$$

- 6) For each threshold  $(C/N)_{Thr,i}$ , derive the margin available for precipitation for that case in dB:

$$A_{rain,i} = C - N_T - \left( \frac{C}{N} \right)_{Thr,i}$$

- 7) If for each threshold  $(C/N)_{Thr,i}$  the  $A_{rain,i} \leq A_{min}$ , then this generic GSO reference link is not valid.
- 8) For each of the thresholds  $(C/N)_{Thr,i}$  for which the  $A_{rain,i} > A_{min}$ , undertake step 9:
- 9) Using the precipitation model in Recommendation ITU-R P.618 together with the selected rain rate, ES height, rain height, ES latitude, elevation angle, frequency, calculated rain fade margin and an assumed polarization of vertical, calculate the associated percentage of time,  $p_{rain,i}$ .

- 10) If for each threshold  $(C/N)_{Thr,i}$  the associated percentage of time is not within the range:
- $$0.001\% \leq p_{rain,i} \leq 10\%$$
- then this generic GSO reference link is not valid.
11. If at least one threshold meets the criteria in steps 7 and 10, then the lowest threshold,  $(C/N)_{Thr}$ , that meets these criteria is used in the analysis.

NOTE:  $A_{min}$  is 3 dB.

### Step 1: Generation of precipitation fade PDF

The precipitation fade PDF should be generated using Recommendation ITU-R P.618 from the selected rain rate, ES height, ES latitude, rain height, elevation angle, frequency and an assumed polarization of vertical as follows:

- 1) Calculate the maximum fade depth  $A_{max}$  using  $p = 0.001\%$
- 2) Create a set of 0.1 dB bins of precipitation fade  $A_{rain}$  between 0 dB and  $A_{max}$
- 3) For each of the bins, determine the associate probability  $p$  to create a cumulative distribution function (CDF) of  $A_{rain}$
- 4) For each of the bins, convert this CDF into a PDF of  $A_{rain}$

When using Recommendation ITU-R P.618, the precipitation attenuation should be 0 dB for time percentages above  $p_{max}$  where  $p_{max}$  is the minimum value of a) 10% and b) the probability of rain attenuation on a slant path calculated. (See Section 2.2.1.2. in Recommendation ITU-R P.618-13.)

A bin size of 0.1 dB should be used to ensure consistency with the output from Recommendation ITU-R S.1503. Each bin of the CDF contains the probability that the precipitation fade is at least  $A_{rain}$  dB. Each bin of the PDF contains the probability that the precipitation fade is between  $A_{rain}$  and  $A_{rain} + 0.1$  dB. During implementation, the array of bins can be capped at the minimum of  $A_{max}$  and the fade for which the resulting  $C/N$  would lead to the link being unavailable or have zero throughput.

### Step 2: Generation of EPFD PDF

Recommendation ITU-R S.1503 should be used to determine the EPFD CDF from the non-GSO FSS parameters and the frequency, dish size and ES gain pattern. The EPFD CDF will be calculated at the worst-case geometry from Recommendation ITU-R S.1503.

The EPFD CDF should then be converted into a PDF.

### Step 3: Creation of $C/N$ and $C/(N+I)$ CDFs by modified convolution of precipitation fade PDF with EPFD PDF

For the selected generic GSO reference link, the  $C/N$  and  $C/(N+I)$  PDFs should be generated using the following steps to undertake the modified discrete convolution:

*Initialize the  $C/N$  and  $C/(N+I)$  distributions with bin size of 0.1 dB*

*Calculate the effective area of an isotropic antenna at wavelength  $\lambda$  using:*

$$A_{ISO} = 10 \log_{10} \left( \frac{\lambda^2}{4\pi} \right)$$

*Calculate the wanted signal power accounting for additional link losses and gain at edge of coverage:*

$$C = eirp + \Delta eirp - L_{fs} + G_{max} - L_o$$

Calculate the system noise power using:

$$N_T = 10 \log_{10}(T \cdot B_{MHz} \cdot 10^6) + k_{dB} + M_{ointra}$$

For each value  $A_{rain}$  in the precipitation fade PDF

{

Calculate the faded wanted signal power using:

$$C_f = C - A_{rain}$$

Calculate the C/N using:

$$\frac{C}{N} = C_f - N_T$$

Update the C/N distribution with this C/N and the probability associated with this  $A_{rain}$

For each value EPFD in the EPFD PDF

{

Calculate the interference from the EPFD taking into account the precipitation fading using:

$$I = EPFD + G_{peak} + A_{iso} - A_{rain}$$

Calculate the noise plus interference using:

$$(N_T + I) = 10 \log_{10} \left( 10^{N_T/10} + 10^{I/10} \right)$$

Calculate the C/(N+I) using:

$$\frac{C}{N+I} = C_f - (N_T + I)$$

Identify the relevant C/(N+I) bin for this C/(N+I) value

Increment this bin's probability with the product of the probabilities of this precipitation fade and EPFD

}

}

#### Step 4: Use of C/N and C/(N+I) distributions with criteria in No. 22.5L

The C/N and C/(N+I) distributions should then be used to check against the availability and spectral efficiency criteria in No. 22.5L as follows:

Step 4A: Check on unavailability increase

Using the selected threshold  $\left(\frac{C}{N}\right)_{Thr}$  for the generic GSO reference link, determine the following:

$$U_R = \text{Sum of the probabilities from all bins for which } C/N < \left(\frac{C}{N}\right)_{Thr}$$

$$U_{RI} = \text{Sum of the probabilities from all bins for which } C/(N+I) < \left(\frac{C}{N}\right)_{Thr}$$

Then the condition to be verified for compliance is:

$$U_{RI} \leq 1.03 \times U_R$$

*Step 4B: Check on the time-weighted average spectral efficiency decrease*

Determine the long-term time-weighted average spectral efficiency,  $SE_R$ , assuming precipitation only by:

*Set  $SE_R = 0$*

*For all bins in the C/N PDF above the threshold  $\left(\frac{C}{N}\right)_{Thr}$*

*{*

*Equation 3 of Recommendation ITU-R S.2131-0 should be used to convert the C/N to a spectral efficiency*

*Increment  $SE_R$  by the spectral efficiency multiplied by the probability associated with this C/N*

*}*

Determine the long-term time-weighted average spectral efficiency,  $SE_{RI}$ , assuming precipitation and interference by:

*Set  $SE_{RI} = 0$*

*For all bins in the C/(N+I) PDF above the threshold  $\left(\frac{C}{N}\right)_{Thr}$*

*{*

*Equation 3 of Recommendation ITU-R S.2131-0 should be used to convert the C/(N+I) to a spectral efficiency*

*Increment  $SE_{RI}$  by the spectral efficiency multiplied by the probability associated with this C/(N+I)*

*}*

Then the condition to be verified for compliance is:

$$SE_{RI} \geq SE_R * (1 - 0.03)$$

## APPENDIX 2 TO ANNEX 1 OF RESOLUTION COM5/11 (WRC-19)

**Algorithm steps to be applied in the Earth-to-space direction to determine compliance with No. 22.5L**

By applying the following steps, the single-entry interference impact from a non-GSO system on the availability and spectral efficiency of a generic GSO reference link is determined. The generic GSO reference link parameters of Annex 1 to this Resolution are used, considering all possible parametric permutations, in conjunction with the worst-case geometry (“WCG”) epfd output of the latest version of Recommendation ITU-R S.1503. The output of Recommendation ITU-R S.1503 is a set of interference statistics that a non-GSO system creates. These interference statistics are then used to determine the effect of the interference into each generic GSO reference link.

**Step 0: Verification of the generic GSO reference link and selection of C/N threshold**

The following steps should be used to determine if the generic GSO reference link is valid and if so, which of the thresholds  $\left(\frac{C}{N}\right)_{Thr,i}$  should be used. It is assumed that  $R_s = 6\,378.137$  km,

$R_{geo} = 42\,164$  km and  $k_{dB} = -228.6$  dB(J/K). Note that the term cumulative distribution function is meant to include the concept of the complementary cumulative distribution function depending upon context.

- 1) Calculate the slant distance in km using:

$$d_{km} = R_s \left( \sqrt{\frac{R_{geo}^2}{R_s^2} - \cos^2(\epsilon)} - \sin(\epsilon) \right)$$

- 2) Calculate the free-space path loss in dB using:

$$L_{fs} = 92.45 + 20\log_{10}(f_{GHz}) + 20\log_{10}(d_{km})$$

- 3) Calculate the wanted signal power in the reference bandwidth in dBW accounting for additional link losses and gain at edge of coverage:

$$C = eirp + \Delta eirp - L_{fs} + G_{max} - L_o + G_{rel}$$

- 4) Calculate the total noise power in the reference bandwidth in dBW/MHz using:

$$N_T = 10\log_{10}(T \cdot B_{MHz} \cdot 10^6) + k_{dB} + M_{ointra} + M_{ointer}$$

- 5) For each threshold  $(C/N)_{Thr,i}$ , derive the precipitation margin for that case in dB:

$$A_{rain,i} = C - N_T - \left(\frac{C}{N}\right)_{Thr,i}$$

- 6) If for each threshold  $(C/N)_{Thr,i}$  the  $A_{rain,i} \leq A_{min}$ , then this generic GSO reference link is not valid.

- 7) For each of the thresholds  $(C/N)_{Thr,i}$  for which the  $A_{rain,i} > A_{min}$ , undertake step 8:

- 8) Using the precipitation model in Recommendation ITU-R P.618 together with the selected rain rate, ES height, rain height, ES latitude, elevation angle, frequency, calculated precipitation fade margin and an assumed polarization of vertical, calculated the associated percentage of time,  $p_{rain,i}$ .

- 9) If for each threshold  $(C/N)_{Thr,i}$  the associated percentage of time is not within the range:

$$0.001\% \leq p_{rain,i} \leq 10\%$$

then this generic GSO reference link is not valid.

- 10) If at least one thresholds meets the criteria in steps 6 and 9, then the lowest threshold,  $(C/N)_{Thr}$ , that meets these criteria should be used in the analysis.

NOTE:  $A_{min}$  is 3 dB and the gain relative to peak towards the ES,  $G_{rel} = -3$  dB.

### Step 1: Generation of precipitation fade PDF

The precipitation fade PDF should be generated using Recommendation ITU-R P.618 from the selected rain rate, ES height, ES latitude, rain height, elevation angle, frequency and an assumed polarization of vertical as follows:

- 1) Calculate the maximum fade depth  $A_{max}$  using  $p = 0.001\%$
- 2) Create a set of 0.1 dB bins between 0 dB and  $A_{max}$
- 3) For each of the bins, determine the associate probability  $p$  to create a cumulative distribution function (CDF) of  $A_{rain}$
- 4) For each of the bins, convert this CDF into a PDF of  $A_{rain}$

When using Recommendation ITU-R P.618, the precipitation attenuation should be 0 dB for time percentages above  $p_{max}$  where  $p_{max}$  is the minimum value of a) 10% and b) the probability of rain attenuation on a slant path calculated from Section 2.2.1.2.

A bin size of 0.1 dB should be used to ensure consistency with the output from Recommendation ITU-R S.1503. Each bin of the CDF contains the probability that the precipitation fade is at least  $A_{rain}$  dB. Each bin of the PDF contains the probability that the precipitation fade is between  $A_{rain}$  and  $A_{rain} + 0.1$  dB. During implementation, the array of bins can be capped at the minimum of  $A_{max}$  and the fade for which the resulting  $C/N$  would lead to the link being unavailable or have zero throughput.

### Step 2: Generation of EPFD PDF

Recommendation ITU-R S.1503 should be used to determine the EPFD CDF from the non-GSO FSS parameters and the frequency, dish size and ES gain pattern. The EPFD CDF will be calculated at the worst-case geometry from Recommendation ITU-R S.1503.

The EPFD CDF should then be converted into a PDF.

### Step 3: Creation of $C/N$ and $C/(N+I)$ CDFs by convolution of precipitation fade PDF with EPFD PDF

For the selected generic GSO reference link, the  $C/N$  and  $C/(N+I)$  PDFs should be generated using the following steps to undertake the discrete convolution:

*Initialize the  $C/N$  and  $C/(N+I)$  distributions with bin size of 0.1 dB*

*Calculate the effective area of an isotropic antenna at wavelength  $\lambda$  using:*

$$A_{ISO} = 10 \log_{10} \left( \frac{\lambda^2}{4\pi} \right)$$

*Calculate the wanted signal power accounting for additional link losses and gain at edge of coverage:*

$$C = eirp + \Delta eirp - L_{fs} + G_{max} - L_o + G_{rel}$$

*Calculate the system noise power using:*

$$N_T = 10 \log_{10}(T \cdot B_{MHz} \cdot 10^6) + k_{dB} + M_{ointra}$$

For each value  $A_{rain}$  in the precipitation fade PDF

{

Calculate the faded wanted signal power using:

$$C_f = C - A_{rain}$$

Calculate the  $C/N$  using:

$$\frac{C}{N} = C_f - N_T$$

Update the  $C/N$  distribution with this  $C/N$  and the probability associated with this  $A_{rain}$

For each value EPFD in the EPFD PDF

{

Calculate the interference from the EPFD:

$$I = EPFD + G_{peak} + A_{iso}$$

Calculate the noise plus interference using:

$$(N_T + I) = 10 \log_{10} \left( 10^{N_T/10} + 10^{I/10} \right)$$

Calculate the  $C/(N+I)$  using:

$$\frac{C}{N+I} = C_f - (N_T + I)$$

Identify the relevant  $C/(N+I)$  bin for this  $C/(N+I)$  value

Increment this bin's probability with the product of the probabilities of this precipitation fade and EPFD

}

}

Step 4: Use of  $C/N$  and  $C/(N+I)$  distributions with criteria in No. 22.5L

The  $C/N$  and  $C/(N+I)$  distributions should then be used to check against the availability and spectral efficiency criteria in No. **22.5L** as follows:

*Step 4A: Check on unavailability increase*

Using the selected threshold  $\left(\frac{C}{N}\right)_{Thr}$  for the generic GSO reference link, determine the following:

$$U_R = \text{Sum of the probabilities from all bins for which } C/N < \left(\frac{C}{N}\right)_{Thr}$$

$$U_{RI} = \text{Sum of the probabilities from all bins for which } C/(N+I) < \left(\frac{C}{N}\right)_{Thr}$$

Then the conditions to be verified for compliance are:

$$U_{RI} \leq 1.03 \times U_R$$



*Step 4B: Check on the time-weighted average spectral efficiency decrease*

Determine the long-term time-weighted average spectral efficiency,  $SE_R$ , assuming precipitation only by:

*Set  $SE_R = 0$*

*For all bins in the C/N PDF above the threshold  $\left(\frac{C}{N}\right)_{Thr}$*

*{*

*Equation 3 of Recommendation ITU-R S.2131-0 should be used to convert the C/N to a spectral efficiency*

*Increment  $SE_R$  by the spectral efficiency multiplied by the probability associated with this C/N*

*}*

Determine the long-term time-weighted average spectral efficiency,  $SE_{RI}$ , assuming precipitation and interference by:

*Set  $SE_{RI} = 0$*

*For all bins in the C/(N+I) PDF above the threshold  $\left(\frac{C}{N}\right)_{Thr}$*

*{*

*Equation 3 of Recommendation ITU-R S.2131-0 should be used to convert the C/(N+I) to a spectral efficiency*

*Increment  $SE_{RI}$  by the spectral efficiency multiplied by the probability associated with this C/(N+I)*

*}*

Then the conditions to be verified for compliance are:

$$SE_{RI} \geq SE_R * (1 - 0.03)$$

ADD

## RESOLUTION COM5/12 (WRC-19)

**Use of the frequency bands 37.5-42.5 GHz (space-to-Earth) and 47.2-48.9 GHz, 48.9-50.2 GHz and 50.4-51.4 GHz (Earth-to-space) by non-geostationary satellite systems in the fixed-satellite service and 39.5-40.5 GHz (space-to-Earth) by non-geostationary satellite systems in the mobile-satellite service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that this conference has adopted regulatory provisions for the operation of non-GSO satellite FSS systems in the frequency bands 37.5-42.5 GHz (space-to-Earth) and 47.2-48.9 GHz, 48.9-50.2 GHz and 50.4-51.4 GHz (Earth-to-space) and non-GSO satellite MSS systems in the frequency bands 39.5-40.5 GHz (space-to-Earth);
- b) that WRC-19 has introduced new coordination procedure associated with the use of these frequency bands by these space services;
- c) that there are already several frequency assignments to non-GSO FSS/MSS satellites systems have been notified or recorded in the Master International Frequency Register prior to 23 November 2019,

*resolves*

- 1 that frequency assignments to non-geostationary satellite networks or systems for which the complete notification information has been received by the Bureau before 23 November 2019 shall be brought into use before 23 November 2022 or the end of the regulatory period set forth in No. **11.44**, whatever date comes earlier;
- 2 that frequency assignments to which *resolves* 1 applies and that are not brought into use before 23 November 2022 or the end of the regulatory period set forth in No. **11.44**, whatever date comes earlier, shall be suppressed,

*instructs the Radiocommunication Bureau*

to take the necessary actions to implement this Resolution.

**ADD**

## RESOLUTION COM6/1 (WRC-19)

### **Agenda for the 2023 world radiocommunication conference**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for a world radiocommunication conference should be established four to six years in advance and that a final agenda shall be established by the ITU Council two years before the conference;
- b)* Article 13 of the ITU Constitution relating to the competence and scheduling of world radiocommunication conferences and Article 7 of the Convention relating to their agendas;
- c)* the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and world radiocommunication conferences (WRCs),

*recognizing*

- a)* that this conference has identified a number of urgent issues requiring further examination by WRC-23;
- b)* that, in preparing this agenda, some items proposed by administrations could not be included and have had to be deferred to future conference agendas,

*resolves*

to recommend to the Council that a world radiocommunication conference be held in 2023 for a maximum period of four weeks, with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC-19 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the frequency bands under consideration, to consider and take appropriate action in respect of the following items:

1.1 to consider, based on the results of the ITU-R studies, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the aeronautical and maritime mobile services located in international airspace and waters from other stations located within national territories, and to review the pfd criteria in No. **5.441B** in accordance with Resolution **223 (Rev.WRC-19)**;

1.2 to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **COM6/2 (WRC-19)**;

- 1.3 to consider primary allocation of the band 3 600-3 800 MHz to mobile service within Region 1 and take appropriate regulatory actions, in accordance with **Resolution COM6/3 (WRC-19)**;
- 1.4 to consider, in accordance with **Resolution COM6/4 (WRC-19)**, the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level;
- 1.5 to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with **Resolution 235 (WRC-15)**;
- 1.6 to consider, in accordance with **Resolution COM6/5 (WRC-19)**, regulatory provisions to facilitate radiocommunications for sub-orbital vehicles;
- 1.7 to consider a new aeronautical mobile-satellite (R) service (AMS(R)S) allocation in accordance with **Resolution COM6/6 (WRC-19)** for both the Earth-to-space and space-to-Earth directions of aeronautical VHF communications in all or part of the frequency band 117.975-137 MHz, while preventing any undue constraints on existing VHF systems operating in the AM(R)S, the ARNS, and in adjacent frequency bands;
- 1.8 to consider, on the basis of ITU-R studies in accordance with **Resolution COM6/7 (WRC-19)**, appropriate regulatory actions, with a view to reviewing and, if necessary, revising **Resolution 155 (Rev.WRC-19)** and No. **5.484B** to accommodate the use of fixed-satellite service (FSS) networks by control and non-payload communications of unmanned aircraft systems;
- 1.9 to review **Appendix 27** of the Radio Regulations and consider appropriate regulatory actions and updates based on ITU-R studies, in order to accommodate digital technologies for commercial aviation safety-of-life applications in existing HF bands allocated to the aeronautical mobile (route) service and ensure coexistence of current HF systems alongside modernized HF systems, in accordance with **Resolution COM6/8 (WRC-19)**;
- 1.10 to conduct studies on spectrum needs, coexistence with radiocommunication services and regulatory measures for possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications, in accordance with **Resolution COM6/9 (WRC-19)**;
- 1.11 to consider possible regulatory actions to support the modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation, in accordance with **Resolution 361 (Rev.WRC-19)**;
- 1.12 to conduct, and complete in time for WRC-23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with **Resolution 656 (Rev.WRC-19)**;

- 1.13 to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with Resolution **COM6/10 (WRC-19)**;
- 1.14 to review and consider possible adjustments of the existing or possible new primary frequency allocations to EESS (passive) in the frequency range 231.5-252 GHz, to ensure alignment with more up-to-date remote-sensing observation requirements, in accordance with Resolution **COM6/11 (WRC-19)**;
- 1.15 to harmonize the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service globally, in accordance with Resolution **COM6/12 (WRC-19)**;
- 1.16 to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by non-GSO FSS earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution **COM6/13 (WRC-19)**;
- 1.17 to determine and carry out, on the basis of the ITU-R studies in accordance with Resolution **COM6/14 (WRC-19)**, the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate;
- 1.18 to consider studies relating to spectrum needs and potential new allocations to the mobile-satellite service for future development of narrowband mobile-satellite systems, in accordance with Resolution **COM6/15 (WRC-19)**;
- 1.19 to consider a new primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2, while protecting existing primary services in the band, in accordance with Resolution **COM6/16 (WRC-19)**;
- 2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with *further resolves* of Resolution **27 (Rev.WRC-19)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in *resolves* of that Resolution;
- 3 to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the conference;
- 4 in accordance with Resolution **95 (Rev.WRC-19)**, to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation;
- 5 to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;

- 6 to identify those items requiring urgent action by the radiocommunication study groups in preparation for the next world radiocommunication conference;
- 7 to consider possible changes, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;
- 8 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26 (Rev.WRC-19)**;
- 9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention;
- 9.1 on the activities of the Radiocommunication Sector since WRC-19:
- In accordance with Resolution **657 (Rev.WRC-19)**, review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;
  - Review of the amateur service and the amateur-satellite service allocations in the frequency band 1 240-1 300 MHz to determine if additional measures are required to ensure protection of the radionavigation-satellite (space-to-Earth) service operating in the same band in accordance with Resolution **COM6/17 (WRC-19)**;
  - Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution **COM6/18 (WRC-19)**;
- 9.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and<sup>1</sup>
- 9.3 on action in response to Resolution **80 (Rev.WRC-07)**;
- 10 to recommend to the Council items for inclusion in the agenda for the next WRC, and items for the preliminary agenda of future conferences, in accordance with Article 7 of the Convention and Resolution **804 (Rev.WRC-19)**,

*invites the ITU Council*

to finalize the agenda and arrange for the convening of WRC-23, and to initiate as soon as possible the necessary consultations with Member States,

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<sup>1</sup> This agenda sub-item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations. Administrations are invited to inform the Director of the Radiocommunication Bureau of any difficulties or inconsistencies encountered in the Radio Regulations.

*instructs the Director of the Radiocommunication Bureau*

1 to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting and to prepare a report to WRC-23;

2 to submit a draft report on any difficulties or inconsistencies encountered in the application of the Radio Regulations referred in agenda item 9.2 to the second session of the CPM and to submit the final report at least five months before the next WRC,

*instructs the Secretary-General*

to communicate this Resolution to international and regional organizations concerned.

**ADD**

**RESOLUTION COM6/2 (WRC-19)**

**Studies on frequency-related matters for the terrestrial component of  
International Mobile Telecommunications identification in the frequency bands  
3 300-3 400 MHz, 3 600-3 800 MHz,  
6 425-7 025 MHz, 7 025-7 125 MHz, and 10.0-10.5 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that International Mobile Telecommunications (IMT) is intended to provide telecommunication services on a worldwide scale, regardless of location and type of network or terminal;
- b)* that IMT systems have contributed to global economic and social development;
- c)* that IMT systems are now being evolved to provide diverse usage scenarios such as enhanced mobile broadband, massive machine-type communications and ultra-reliable and low-latency communications, and applications including fixed broadband;
- d)* that ultra-low latency and very high bit rate applications of IMT will require contiguous blocks of spectrum for use by administrations wishing to implement IMT;
- e)* that compared with the low and high frequency bands, the mid-band spectrum can provide better balance for meeting needs for both coverage and capacity;
- f)* that there is a need to continually take advantage of technological developments in order to increase the efficient use of spectrum and facilitate spectrum access;
- g)* that the properties of high frequency bands, such as short wavelength, would better enable the use of advanced antenna systems including MIMO and beam-forming techniques in supporting enhanced broadband;
- h)* that ITU-T has been working on the network standardization for IMT-2020 and beyond;
- i)* that adequate and timely availability of spectrum and corresponding regulatory provisions are essential to support the future development of IMT;
- j)* that harmonized worldwide bands and harmonized frequency arrangements for IMT are highly desirable in order to achieve global roaming and the benefits of economies of scale;



*k)* that identification of frequency bands as of *considering e)* for IMT may change the sharing situation regarding applications of all services to which the frequency band is already allocated, and may require additional regulatory actions;

*l)* the need to protect existing services and to allow for their continued development when considering frequency bands for possible additional allocations to any service,

*noting*

*a)* that Resolution ITU-R 65 addresses the principles for the process of development of IMT for 2020 and beyond;

*b)* that IMT encompasses IMT-2000, IMT-Advanced, and IMT-2020 collectively, as described in Resolution ITU-R 56-2;

*c)* that Question ITU-R 77-8/5 considers the needs of developing countries in the development and implementation of IMT;

*d)* that Question ITU-R 229/5 seeks to address the further development of IMT;

*e)* that Question ITU-R 262/5 addresses the study of usage of IMT systems for specific applications;

*f)* Recommendation ITU-R M.2083, on the framework and objectives of the future development of IMT for 2020 and beyond;

*g)* Recommendation ITU-R M.2101, on modelling and simulation of IMT networks and systems for use in sharing and compatibility studies;

*h)* Recommendation ITU-R P.2108, on prediction of clutter loss;

*i)* that Report ITU-R M.2320 addresses future technology trends of terrestrial IMT systems;

*j)* that Report ITU-R M.2370 analyses trends impacting future IMT traffic growth beyond the year 2020 and estimates global traffic demands for the period 2020 to 2030;

*k)* Report ITU-R M.2376, on technical feasibility of IMT in the frequency bands above 6 GHz;

*l)* Report ITU-R M.2410, on minimum requirements related to technical performance for IMT-2020 radio interface(s);

*m)* Report ITU-R M.2481 on the in-band and adjacent band coexistence and compatibility studies between IMT systems in 3 300-3 400 MHz and radiolocation systems in 3 100-3 400 MHz,

*recognizing*

*a)* that there is a lead time between the allocation of frequency bands by world radiocommunication conferences and the deployment of systems in those bands, and that timely availability of wide and contiguous blocks of spectrum is therefore important to support the development of IMT;

b) that in order to ensure the future development of IMT it is important to ensure the timely identification of additional spectrum;

c) that any identification of frequency bands for IMT should take into account the use of the bands by other services and the evolving needs of these services,

*resolves to invite ITU-R*

1 to conduct and complete in time for WRC-23 the appropriate studies of technical, operational and regulatory issues pertaining to the possible use of the terrestrial component of IMT in the frequency bands in *resolves to invite ITU-R 2*, taking into account:

- evolving needs to meet emerging demands for IMT;
- technical and operational characteristics of terrestrial IMT systems that would operate in these specific frequency bands, including the evolution of IMT through advances in technology and spectrally efficient techniques;
- the deployment scenarios envisaged for IMT systems and the related requirements of balanced coverage and capacity;
- the needs of developing countries;
- the time-frame in which spectrum would be needed;

2 to conduct and complete in time for WRC-23 the sharing and compatibility studies<sup>1</sup>, with a view to ensuring the protection of services to which the frequency band is allocated on a primary basis, without imposing additional regulatory or technical constraints on those services, and also, as appropriate, on services in adjacent bands, for the frequency bands:

- 3 600-3 800 MHz and 3 300-3 400 MHz (Region 2);
- 3 300-3 400 MHz (amend footnote in Region 1);
- 7 025-7 125 MHz (globally);
- 6 425-7 025 MHz (Region 1);
- 10 000-10 500 MHz (Region 2),

*resolves*

1 to invite CPM23-1 to define the date by which technical and operational characteristics needed for sharing and compatibility studies are to be available, to ensure that studies referred to in *resolves to invite ITU-R* can be completed in time for consideration at WRC-23;

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<sup>1</sup> Including studies with respect to services in adjacent bands, as appropriate.

2 to invite WRC-23 to consider, based on the results of the above studies, additional spectrum allocations to the mobile service on a primary basis and to consider identification of frequency bands for the terrestrial component of IMT; the frequency bands to be considered being limited to part or all of the bands listed in *resolves to invite ITU-R 2*,

*invites administrations*

to participate actively in these studies by submitting contributions to ITU-R.

**ADD**

**RESOLUTION COM6/3 (WRC-19)**

**Studies to consider possible allocation of the frequency band 3 600-3 800 MHz to the mobile, except aeronautical mobile, service on a primary basis within Region 1**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the frequency band 3 600-3 800 MHz is allocated to the fixed and fixed satellite services on a primary basis in all three Regions and is also allocated to mobile, except aeronautical mobile, service on a primary basis within Regions 2 and 3;
- b)* that the frequency band 3 600-3 800 MHz is allocated to the mobile service on a secondary basis within Region 1;
- c)* that systems of terrestrial mobile service are intended to provide telecommunication services on a worldwide scale, regardless of location;
- d)* that some administrations in Region 1 are currently using the band 3 600-3 800 MHz, or part of that band, for mobile service (for example IMT implementation);
- e)* the need to protect existing services when considering possible additional allocation to any service in any frequency band;
- f)* the systems operating in the new allocation should not impose constraints on the existing systems of primary services, including in adjacent bands,

*recognizing*

- a)* that there is a need in many countries to identify additional harmonized spectrum resources for cost-effective implementation of mobile systems;
- b)* that ITU-R performed studies in the band 3 400-4 200 MHz between FSS and IMT during previous study cycles (for example Reports ITU-R S.2368 and ITU-R M.2109);
- c)* that for African countries especially those in the tropical areas, the operations of FSS systems are more reliable to be used in the C-band frequency (3 400-4 200 MHz), rather than the higher frequency bands,

*resolves to invite ITU-R*

to conduct sharing and compatibility studies in time for WRC-23 between the mobile service and other services allocated on a primary basis within the frequency band 3 600-3 800 MHz and adjacent bands in Region 1, as appropriate, to ensure protection of those services to which the frequency band is allocated on a primary basis, and not impose undue constraints on the existing services and their future development,

*resolves to invite WRC-23*

based on the results of studies in *resolves to invite ITU-R*, to consider possible upgrade of the allocation of the frequency band 3 600-3 800 MHz to the mobile, except aeronautical mobile, service on a primary basis within Region 1, and to take appropriate regulatory actions,

*invites administrations*

to participate in these studies in the process of preparation for WRC-23.

**ADD**

**RESOLUTION COM6/4 (WRC-19)**

**Facilitating mobile connectivity in certain frequency bands below 2.7 GHz using high-altitude platform stations as International Mobile Telecommunications base stations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that there is growing demand for access to mobile broadband, requiring more flexibility in the approaches to expand the capacity and coverage provided by IMT systems;
- b) that high-altitude platform stations as IMT base stations (HIBS) would be used as part of terrestrial IMT networks, and may use the same frequency bands with ground-based IMT base stations in order to provide mobile broadband connectivity to underserved communities, and in rural and remote areas;
- c) that IMT systems have evolved significantly in terms of spectrum identification, network deployment, and radio access technology, with the standardization of IMT-Advanced and IMT-2020;
- d) that studies of new IMT network topologies may provide increased spectrum efficiency for the bands already identified for IMT;
- e) that high altitude platform stations as IMT base stations may be used as a part of terrestrial IMT networks to provide mobile connectivity to underserved communities and in rural and remote areas with the ability to utilize a large footprint at low latency;
- f) that recent technological advances in battery and solar-panel technologies provide further support for the deployment of high altitude platform stations as IMT base stations;
- g) that the user equipment to be served, whether by the high-altitude or the ground-based IMT base stations, are the same, and currently support a variety of the frequency bands identified for IMT;
- h) that mobile connectivity is becoming widespread, connecting not only people but also objects (e.g. IoT: Internet of Things, IoE: Internet of Everything) based on IMT technologies (e.g. eMTC: enhanced Machine-Type Communication, NB-IoT: Narrow-Band IoT), which are expected to be used widely including in unpopulated areas;
- i) that the use of high altitude platform stations as IMT base stations within the terrestrial component of IMT should not have any priority, and shall not cause any undue constraints which result in regulatory changes to the existing IMT identifications in the Radio Regulations;
- j) that studies must be performed to demonstrate that sharing with existing services in the band, including other IMT uses is feasible, and that those existing services are protected with no new regulatory constraints on those existing uses and planned development;
- k) that any potential new regulatory procedural considerations resulting from potential identifications of high altitude platform stations as IMT base stations should not apply to existing IMT identifications in the RR;

- l) that studies should be limited to sharing and compatibility between the high altitude platform stations as IMT base stations and other existing services and applications;
- m) that the bands identified for IMT below 2.7 GHz are used extensively to provide mobile broadband services using ground-based IMT systems,

*noting*

that Recommendations ITU-R M.1456 and ITU-R M.1641 provide technical characteristics and operational conditions, as well as methodology for the studies between high altitude platform stations as IMT base stations and ground-based IMT system in certain bands around 1.9/2.1 GHz,

*recognizing*

- a) that high altitude platform station is defined in No. **1.66A** of the Radio Regulations as a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth;
- b) that the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3, and the bands 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2, are included in No. **5.388A** for the use of high altitude platform stations as IMT base stations, in accordance with the provisions of Resolution **221 (Rev.WRC-07)**;
- c) that Nos. **5.388A** and **5.388B** and Resolution **221 (Rev.WRC-07)** stipulate technical conditions for high altitude IMT necessary for the protection of ground-based IMT stations in neighbouring countries and other services based on the sharing and compatibility studies with IMT-2000;
- d) that some frequency bands below 2.7 GHz are globally or regionally identified for IMT in accordance with Nos. **5.286AA**, **5.317A**, **5.341A**, **5.341B**, **5.341C**, **5.346**, **5.346A**, **5.384A** and **5.388**;
- e) that ITU-R is conducting co-channel sharing analysis involving IMT-Advanced systems using high altitude platform stations as IMT base stations;
- f) that some GSO MSS satellite networks in Region 3 have reported harmful interference affecting their uplinks in the frequency band 2 655-2 690 MHz from terrestrial IMT stations operating in some countries in Region 3 and Region 1, and ITU-R is conducting sharing and coexistence studies between the mobile-satellite service and terrestrial IMT systems in the 2 655-2 690 MHz frequency band;
- g) that the frequency band 2 520-2 670 MHz and 2 700-2 900 MHz is allocated on a primary basis to the BSS and aeronautical radionavigation service respectively,

*resolves to invite ITU-R*

- 1 to study spectrum needs, as appropriate, for high-altitude platform stations as IMT base stations to provide mobile connectivity in the mobile service taking into account:
- the existing identification in *recognizing b)*;
  - the usage and deployment scenario envisioned for high-altitude platform stations as IMT base stations as complementary for terrestrial IMT networks;
  - the technical and operational characteristics and requirements of high-altitude platform stations as IMT base stations;

2 to conduct and complete in time for WRC-23, taking into account the results of studies already performed and those in progress within ITU-R, sharing and compatibility studies to ensure the protection of services, without imposing any additional technical or regulatory constraints in their deployment, to which the frequency band is allocated on a primary basis, including other IMT uses, existing systems and the planned development of primary allocated services, and adjacent services, as appropriate, for certain frequency bands below 2.7 GHz, or portions thereof, globally or regionally harmonized for IMT, i.e.:

- 694-960 MHz;
- 1 710-1 885 MHz (1 710-1 815 MHz to be used for uplink only in Region 3);
- 2 500-2 690 MHz (2 500-2 535 MHz to be used for uplink only in Region 3, except 2 655-2 690 MHz in Region 3);

3 to study appropriate modifications to the existing footnote and associated resolution in the identification in *recognizing b)* in order to facilitate the use of high-altitude platform stations as IMT base stations with the latest radio interface technologies of IMT;

4 to study the definition of high-altitude platform stations as IMT base stations (HIBS) including possible modifications to the provisions of the Radio Regulations, as appropriate;

5 to develop ITU-R Recommendations and Reports, as appropriate, taking into account *resolves to invite ITU-R 1, 2, 3, and 4 above,*

*further resolves to invite WRC-23*

to consider, based on the results of the above studies, the use of high altitude platform stations as IMT base stations in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level, and take necessary regulatory actions, as appropriate, taking into account that changes to the footnotes in the *recognizing d)* are outside the scope and there should be no additional regulatory or technical constraints imposed on the deployment of ground-based IMT systems in the frequency bands referred to in those footnotes,

*invites administrations*

to participate actively in these studies by submitting contributions to ITU-R.



**ADD**

**RESOLUTION COM6/5 (WRC-19)**

**Consideration of regulatory provisions to facilitate  
the introduction of sub-orbital vehicles**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that sub-orbital vehicles are being developed which are intended to operate at altitudes higher than conventional aircraft with a sub-orbital trajectory;
- b) that sub-orbital vehicles are being also developed to fly through the lower levels of the atmosphere, where they are expected to operate in the same airspace as conventional aircraft;
- c) that sub-orbital vehicles may perform various missions (e.g. conducting scientific research or providing transportation) and then return to the Earth's surface without completing a full orbital flight around the Earth;
- d) that stations on board sub-orbital vehicles have a need for voice/data communications, navigation, surveillance, telemetry and tracking and command (TT&C);
- e) that sub-orbital vehicles must safely be accommodated into airspaces used by conventional aircrafts during certain phases of flight;
- f) that there is a need to ensure that equipment installed on such vehicles can communicate with air traffic management systems and relevant ground control facilities;
- g) that vehicles operating at the boundary of space and the atmosphere or re-entering the atmosphere may generate a plasma sheath that may envelop all or most of the vehicle;
- h) that the plasma sheath attenuation does not allow for radiocommunications directly to either ground or space stations,

*recognizing*

- a) that there is no internationally agreed legal demarcation between the Earth's atmosphere and the space domain;
- b) that there is no formal definition of sub-orbital flight, although it has been assumed in Report ITU-R M.2477 to be an intentional flight of a vehicle expected to reach the upper atmosphere with a portion of its flight path that may occur in space without completing a full orbit around the Earth before returning back to the surface of the Earth;
- c) that stations on board sub-orbital vehicles may use systems operating under the space and/or terrestrial services;
- d) that the current regulatory provisions and procedures for terrestrial and space services may not be adequate for international use of relevant frequency assignments by stations on board sub-orbital vehicles;
- e) that Annex 10 to the Convention on International Civil Aviation contains Standards and Recommended Practices for aeronautical radionavigation and radiocommunication systems used by international civil aviation;

- f) that the studies on spectrum requirements for voice/data communications, navigation, surveillance and TT&C on stations on board sub-orbital vehicles have not been completed;
- g) that some space launcher systems may include components or items not reaching orbital trajectories, and that some of these components or items may be developed as reusable items operating on sub-orbital trajectories;
- h) that conventional space launcher systems currently have a radiocommunication regulatory framework that may differ from the future radiocommunication framework of sub-orbital vehicles,

*noting*

- a) Question ITU-R 259/5, on “Operational and radio regulatory aspects for planes operating in the upper level of the atmosphere”;
- b) that Report ITU-R M.2477 provides information on the current understanding of radiocommunications for sub-orbital vehicles including a description of the flight trajectory, categories of sub-orbital vehicles, technical studies related to possible avionics systems used by sub-orbital vehicles, and service allocations of those systems;
- c) that the provisions of No. **4.10** may apply to certain aspects of these operations;
- d) that the development of compatibility criteria between International Civil Aviation Organization (ICAO) standardized aeronautical systems is the responsibility of ICAO;
- e) that the definitions and future applicable radiocommunication services for sub-orbital vehicles should be clarified by ITU-R, with necessary coordination with ICAO,

*resolves to invite ITU-R*

1 to study spectrum needs for communications between stations on board sub-orbital vehicles and terrestrial/space stations providing functions such as, *inter alia*, voice/data communications, navigation, surveillance and TT&C;

2 to study appropriate modification, if any, to the Radio Regulations, excluding any new allocations or changes to the existing allocations in Article 5, to accommodate stations on board sub-orbital vehicles, whilst avoiding any impact on conventional space launch systems with the following objectives:

- to determine the status of stations on sub-orbital vehicles, and study corresponding regulatory provisions to determine which existing radiocommunication services can be used by stations on sub-orbital vehicles, if necessary;
- to determine the technical and regulatory conditions to allow some stations on board sub-orbital vehicles to operate under the aeronautical regulation and to be considered as earth stations or terrestrial stations even if a part of the flight occurs in space;
- to facilitate radiocommunications that support aviation to safely integrate sub-orbital vehicles into the airspace and be interoperable with international civil aviation;
- to define the relevant technical characteristics and protection criteria relevant for the studies to be undertaken in accordance with the bullet point below;
- to conduct sharing and compatibility studies with incumbent services that are allocated on a primary basis in the same and adjacent frequency bands in order to avoid harmful interference to other radiocommunication services and to existing applications of the same service in which stations on board sub-orbital vehicles operate, having regard to the sub-orbital flight application scenarios;

3 to identify, as a result of the studies above, whether there is a need for access to additional spectrum that should be addressed after WRC-23 by a future competent conference,

*invites ICAO*

to participate in the studies and provide to ITU the relevant technical characteristics required for the studies called for in *resolves to invite ITU-R*,

*invites the 2023 world radiocommunication conference*

to consider the results of the studies above and take the appropriate action,

*instructs the Director of the Radiocommunication Bureau*

to bring this Resolution to the attention of the relevant ITU-R study groups,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R,

*instructs the Secretary-General*

to bring this Resolution to the attention of the United Nations Committee on the Peaceful Uses of Outer Space and ICAO and other international and regional organizations concerned.

**ADD**

**RESOLUTION COM6/6 (WRC-19)**

**Studies on a possible new allocation to the aeronautical mobile satellite (R) service within the frequency band 117.975-137 MHz in order to support aeronautical VHF communications in the Earth-to-space and space-to-Earth directions**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the optimization of air traffic management over oceanic and remote areas necessitates appropriate aeronautical surveillance and communication means, in order to meet the required communication performance for reduced separation minima, without modification to aircraft equipment;
- b)* that the availability of appropriate communication means is still an issue over oceanic and remote areas, where there is currently no suitable solution to provide aeronautical VHF services;
- c)* that in order to meet the evolving requirements of modern civil aviation, satellite systems may be used for the relay of VHF communications compliant with ICAO standards operating under AM(R)S in order to complement terrestrial communication infrastructures when aircraft are operating in oceanic and remote areas;
- d)* that the VHF channels have become congested in some areas and the new AMS(R)S system would need to operate in a manner to not constrain existing systems;
- e)* that the frequency band 1 087.7-1 092.3 MHz was allocated to AMS(R)S (Earth-to-space) on a primary basis in order to extend reception of Automatic Dependent Surveillance-Broadcast (ADS-B) signals beyond terrestrial line-of-sight, thereby facilitating the availability of surveillance means anywhere in the world;
- f)* that aeronautical VHF communications, when available in geographically remote and oceanic areas, may be used in combination with satellite ADS-B to support radar-like separation of aircraft, thus greatly improving airspace capacity, efficiency and safety,

*recognizing*

- a)* that the frequency band 108-117.975 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS), and to the aeronautical mobile (R) service (AM(R)S) in accordance with Resolution **413 (Rev.WRC-12)**;
- b)* that the frequency band 117.975-137 MHz is allocated on a primary basis to the AM(R)S and is used by air-ground, air-air, and ground-air systems operated in accordance with ICAO standards and recommended practices (SARPs), providing critical voice and data communications for Air Traffic Management (ATM) on a global basis;
- c)* that under No. **5.201** and No. **5.202** of the Radio Regulations, the frequency bands 132-136 MHz and 136-137 MHz are also allocated in several countries to the aeronautical mobile (OR) service on a primary basis;

d) that the AM(R)S VHF frequency band (117.975-137 MHz) is currently used by air traffic communication and airline operational communication;

e) that the frequency band 117.975-137 MHz is only used by systems that operate in accordance with recognized international aeronautical standards,

*noting*

a) that Annex 10 to the International Civil Aviation Organization (ICAO) Convention on International Civil Aviation contains Standards and Recommended Practices (SARPs) for safety aeronautical radionavigation and radiocommunication systems used by international civil aviation;

b) that the development of compatibility criteria between new AMS(R)S systems proposed for operations in the frequency band 117.975-137 MHz and ICAO-standardized aeronautical systems in this frequency band is the responsibility of ICAO;

c) that there are SARPs developed by ICAO detailing frequency assignment planning criteria for VHF air-ground communication systems;

d) that feeder links of AMS(R)S systems may be accommodated in the fixed-satellite service,

*resolves to invite ITU-R*

1 to define the relevant technical characteristics and to study, taking into account *considering c)* and taking into account No. **5.200**, compatibility between potential new AMS(R)S systems that operate within the frequency band 117.975-137 MHz in the Earth-to-space and space-to-Earth directions and existing primary services in band and in adjacent frequency bands, while ensuring protection of systems using existing primary services in those frequency bands and not constraining planned usage of those systems;

2 to take into account the results of the studies, to provide technical and regulatory recommendations relative to a possible new allocation to AMS(R)S within the frequency band 117.975-137 MHz, taking into consideration the responsibility of ICAO in *noting b)*,

*invites the 2023 world radiocommunication conference*

to consider the results of the studies and take appropriate actions, including possible primary allocation to AMS(R)S within the frequency band 117.975-137 MHz,

*invites Member States and Sector Members*

to participate actively in the studies and to submit characteristics of any current and planned systems to be studied, as appropriate,

*invites the International Civil Aviation Organization*

to participate in the studies by providing aeronautical operational requirements and relevant available technical characteristics to be taken into account in ITU-R studies and to take into account the sharing and compatibility conclusions at ITU-R in the SARPs to be developed for AMS(R)S,

*instructs the Secretary-General*

to bring this Resolution to the attention of ICAO.

**ADD**

**RESOLUTION COM6/7 (WRC-19)**

**Review and possible revision of Resolution 155 (Rev.WRC-19) and No. 5.484B in the frequency bands to which they apply**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the operation of unmanned aircraft systems (UAS) requires reliable control and non-payload communication (CNPC) links, in particular to relay air traffic control communications and for the remote pilot to control the flight, and that satellite networks may be used to provide these CNPC links beyond the line of sight;
- b)* that UAS CNPC links relate to the safe operation of UAS and have to comply with certain technical, regulatory requirements, and will operate in accordance with international standards and recommended practices (SARPs) and procedures established in accordance with the Convention on International Civil Aviation;
- c)* that ICAO is developing the Standards and Recommended Practices to ensure the technical aspects of using FSS satellites to support safe and reliable UAS CNPC links;
- d)* that there is urgency to conclude the feasibility of the use of the FSS frequency bands identified by Resolution **155 (Rev.WRC-19)** to support the safe implementation of UAS CNPC links in non-segregated airspace;
- e)* that ITU-R has made substantive progress on studies of technical, operational and regulatory aspects in relation to the implementation of Resolution **155 (Rev.WRC-19)**,

*recognizing*

- a)* that *resolves to invite the 2023 World Radiocommunication Conference* in Resolution **155 (Rev.WRC-19)** requests the 2023 World Radiocommunications Conference to consider the results of ITU-R studies referred to in Resolution **155 (Rev.WRC-19)** with a view to reviewing and, if necessary, revising Resolution **155 (Rev.WRC-19)**, and take necessary actions, as appropriate;
- b)* that, under No. **5.484B** adopted at WRC-15, reference is made to Resolution **155 (Rev.WRC-19)** in the Table of Frequency Allocations;
- c)* that the technical, operational and coordination conditions and processes to operating within FSS networks are to be maintained in any modifications of Resolution **155 (Rev.WRC-19)**;
- d)* that ICAO is responsible for defining the appropriate criteria and mitigation techniques, taking into account the safety-of-life aspects of the CNPC links, in order to operate UA under FSS in non-segregated airspace,

*resolves to invite ITU-R*

- 1 to continue and complete in time for WRC-23 relevant studies of the technical, operational and regulatory aspects, based on the frequency bands mentioned in *resolves* 1 of Resolution **155 (Rev.WRC-19)**, in relation to the implementation of Resolution **155 (Rev.WRC-19)**, taking into account the progress obtained by ICAO in the completion of SARPs on the use of FSS for the UAS CNPC links;

2 to review No. **5.484B** and Resolution **155 (Rev.WRC-19)** taking into account the results of the above studies,

*resolves to invite WRC-23*

to revise, if necessary, No. **5.484B** and Resolution **155 (Rev.WRC-19)** and take other necessary actions, as appropriate, on the basis of the studies conducted under Resolution **155 (Rev.WRC-19)** and *resolves to invite ITU-R* above,

*instructs the Secretary-General*

to bring this Resolution to the attention of the Secretary-General of ICAO.

**ADD**

## RESOLUTION COM6/8 (WRC-19)

### **Consideration of regulatory provisions for updating Appendix 27 of the Radio Regulations in support of aeronautical HF modernization**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that for the purpose of this Resolution, the term “wideband” in HF communications may refer to a combination of multiple 3 kHz channels to provide improved data rates;
- b)* that with the availability of advanced digital technologies and demonstrated capabilities of aeronautical wideband high frequency (HF) including contiguous or non-contiguous channel aggregation, faster data rates and better voice communications are possible;
- c)* that digital aeronautical HF must coexist with existing aeronautical analogue voice and data HF systems;
- d)* that desirable properties of HF propagation enable global coverage for aircraft;
- e)* that aeronautical analogue voice and narrowband digital HF systems are the primary means for international and domestic aviation to communicate with aircraft in remote and oceanic areas;
- f)* that there is an operational need for the modernization of data link services in the HF band for messages related to the safety and regularity of flight for use by international civil aviation;
- g)* that current aeronautical HF systems are limited by the available technology, and are insufficient to meet many modern aircraft information requirements without being augmented by aeronautical safety satellite communications;
- h)* that the use of the frequencies in the frequency bands allocated to the aeronautical mobile (route) service (AM(R)S) in the bands between 2 850-22 000 kHz is governed by the provisions of Appendix 27,

*recognizing*

- a)* the need for improving aeronautical HF performance in support of internationally recognized aviation performance standards as defined by ICAO;
- b)* that Annex 10 Volume III to the Convention on International Civil Aviation is a part of International Standards and Recommended Practices (SARPs) for the current aeronautical narrowband HF communication systems used by international civil aviation;
- c)* that the modernization of aeronautical HF communications will not require any changes to Article 5 of the Radio Regulations;
- d)* that 3 023 kHz and 5 680 kHz are designated for search and rescue in Appendix 15 of the Radio Regulations;
- e)* that any channel aggregation needs to be performed in a manner that protects other primary services operating in band and in adjacent bands,



*noting*

- a) the special arrangements clause in Appendix 27 for classes of emissions other than J3E or H2B;
- b) the existing regional frequency allotments are detailed in Appendix 27 for aeronautical HF in the AM(R)S service;
- c) that Appendix 27 provides international and regional allotments for HF channels within the AM(R)S;
- d) the current aeronautical HF narrowband digital communications are detailed in Recommendation ITU-R M.1458;
- e) that inter-system compatibility between internationally standardized aeronautical equipment is the responsibility of ICAO;
- f) that new HF contiguous or non-contiguous channel aggregation technology allows for variable bandwidths greater than 3 kHz,

*resolves to invite ITU-R*

- 1 to identify any necessary modifications to Appendix 27 for the aeronautical mobile (route) service between 2 850 and 22 000 kHz noting *recognizing c)*;
- 2 to identify any necessary transition arrangements for the introduction of new digital aeronautical wideband HF systems and any consequential changes to Appendix 27;
- 3 to recommend how new digital aeronautical wideband HF systems can be introduced while ensuring compliance with safety requirements and *recognizing e)*;
- 4 to define the relevant technical characteristics and to conduct any necessary sharing and compatibility studies, taking account *noting e)*, with incumbent services that are allocated on a primary basis in the same or adjacent frequency bands to avoid harmful interference in accordance with *recognizing e)*;
- 5 to complete studies in time for WRC-23,

*resolves to invite WRC-23*

to consider necessary changes to Appendix 27, on the basis of the studies conducted under *resolves to invite ITU-R* above,

*instructs the Secretary-General*

to bring this Resolution to the attention of the International Civil Aviation Organization,

*invites the International Civil Aviation Organization*

to participate actively by providing aeronautical operational requirements and relevant available technical characteristics to be taken into account in ITU-R studies.

**ADD**

**RESOLUTION COM6/9 (WRC-19)**

**Studies on frequency-related matters, including possible additional allocations, for the possible introduction of new non-safety aeronautical mobile applications**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the number of aircraft equipped with sensors has grown significantly in the past 20 years;
- b) that the need for bidirectional low to high data rate communications between aeronautical stations and aircraft stations, or between aircraft stations is consequently increasing;
- c) that the frequency bands to be considered should be preferably chosen close to bands already used by aeronautical communication systems to enable extended tuning ranges for such new aeronautical communication systems;
- d) that these new aeronautical communications are not related to safety of flights;
- e) that there is no clear identification of those frequency bands in which these new aeronautical communication systems may be developed with a sufficient level of confidence for long-term investment by industry;
- f) that the decisions of previous conferences have introduced some restrictions to the use and have imposed constraints on the development of these communication systems within several existing mobile allocations traditionally used by the aeronautical mobile applications;
- g) that the existing mobile allocations which can be used by these communication systems have some limitations due to coexistence with other services in the band;
- h) that in Region 1 there are allocations to the mobile except aeronautical mobile service in some frequency bands which are allocated to the mobile service in Regions 2 and 3;
- i) that harmonized worldwide allocation would facilitate the implementation of these new aeronautical communication systems;
- j) that an adaptation of the regulatory framework for further visibility, protection and development of non-safety aeronautical mobile applications may be required,

*recognizing*

- a) that the use of innovative sharing methods may be considered to ensure the protection of existing services while offering the possibility to have access to new frequency bands;
- b) that the introduction of the new aeronautical mobile systems in the possible new allocations should not impose constraints on existing and planned systems of primary services,

*noting*

- a) that the frequency band 15.4-15.7 GHz is allocated to the radiolocation, aeronautical radionavigation and, part of, to the fixed-satellite (Earth-to-space) service on a primary basis;
- b) that the frequency band 22-22.21 GHz is allocated on a primary basis to the mobile except aeronautical mobile service;

- c) that the frequency band 15.4-15.7 GHz is adjacent to the frequency band 15.35-15.4 GHz which is allocated to the radio astronomy service on a primary basis;
- d) that frequency band 22.01-22.21 GHz is adjacent to the frequency band 22.21-22.5 GHz which is allocated to radio astronomy service, EESS and SRS passive service on a primary basis;
- e) that the frequency bands 22.01-22.21 GHz and 22.21-22.5 GHz are covered by No. **5.149**,

*resolves to invite ITU-R*

to conduct, and complete in time for WRC-23:

- 1 studies on spectrum needs for new non-safety aeronautical mobile applications for air-to-air, ground-to-air and air-to-ground communications of aircraft systems;
- 2 sharing and compatibility studies in the frequency band 22-22.21 GHz, already allocated on a primary basis to the mobile, except aeronautical mobile, service, in order to evaluate the possible revision or deletion of the “except aeronautical mobile” restriction while ensuring the protection of primary services in the considered frequency bands and, as appropriate, in adjacent frequency bands;
- 3 sharing and compatibility studies on possible new primary allocations to the aeronautical mobile service for non-safety aeronautical applications in the frequency band 15.4-15.7 GHz, while ensuring the protection of primary services in the considered frequency bands and, as appropriate, adjacent frequency bands;
- 4 definition of appropriate protection for passive services and radio astronomy allocated in adjacent bands from unwanted emission of AMS,

*invites the 2023 world radiocommunication conference*

to review the results of the ITU-R studies and take appropriate actions,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R.

**ADD**

## RESOLUTION COM6/10 (WRC-19)

### **Examination of a possible upgrade to primary status of the secondary allocation to the space research service in the frequency band 14.8-15.35 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the frequency band 14.8-15.35 GHz is currently allocated to the fixed and mobile services on a primary basis;
- b) that the frequency band 14.8-15.35 GHz is currently allocated to the space research service (SRS) on a secondary basis;
- c) that the frequency band 15.2-15.35 GHz is currently allocated to the Earth exploration-satellite service (EESS) (passive) and SRS (passive) on a secondary basis;
- d) that the frequency band 15.35-15.4 GHz is currently allocated to the EESS (passive), the radio astronomy service and the SRS (passive) on a primary basis;
- e) that there is a need for broadband communication downlinks in the SRS for the purpose of transmitting future scientific data at high data transmission speeds;
- f) that a number of space agencies are already considering the possibility of using this band for next-generation SRS satellites;
- g) that, due to the small number of expected SRS earth stations that will be deployed worldwide (10-40 stations), coordination between systems in the fixed and land mobile communication systems and SRS stations will not impose excessive restrictions on any of the services;
- h) that modern modulation methods together with the use of filters in high-speed data transmission links allow a significant reduction in out-of-band emissions, thereby minimizing possible interference for passive services in adjacent bands;
- i) that SRS operators must have stable regulatory certainty in order to be able to ensure long-term operation of systems in this service of public interest, and that operating on the basis of a secondary allocation conflicts with this objective;
- j) that these space programmes represent long-term effort and investment that span across decades, from the time when the programme is officially decided, through the development period and the launch phase to the time when the corresponding satellites are in operation;
- k) that space agencies are investing resources in the continuation of these programmes, providing subsequent satellites and payloads,

*recognizing*

- a) that the frequency band 14.8-15.35 GHz is currently used by data relay satellites in inter-satellite links, which permits the establishment of communications with satellites in non-geostationary orbits (non-GSO), including manned flights in the SRS;
- b) that the frequency band 14.8-15.35 GHz is also used by existing high-speed data links from non-GSO satellites within the SRS and is planned for use in future systems;

- c) that these satellites are needed for the operation of telescopes and/or other passive instruments used for measuring such phenomena as the Earth's magnetosphere and solar flares;
- d) that upgrading to primary status the allocation of the frequency band 14.8-15.35 GHz for the SRS will provide certainty for administrations and space agencies participating in satellite space programmes;
- e) that upgrading to primary status the allocation of the frequency band 14.8-15.35 GHz for the SRS should not impose constraints on existing systems of primary services in 14.8-15.35 GHz;
- f) that allocation to passive services mentioned in *considering c)* should be taken into account for protection,

*noting*

- a) that Recommendations ITU-R M.2068 and ITU-R M.2089 contain characteristics of and protection criteria for systems operating in the land and aeronautical mobile services respectively, in the frequency range 14.5-15.35 GHz;
- b) that Recommendation ITU-R SA.1626 sets out the conditions for frequency sharing between the SRS (space-to-Earth) and the fixed and mobile services in the band 14.8-15.35 GHz, including pfd limits for the SRS;
- c) that Recommendation ITU-R SA.510 sets out the conditions for frequency sharing between data relay systems operating in the SRS (space-to-space) and the fixed and mobile services in the frequency band 14.8-15.35 GHz, including pfd limits for the SRS,

*resolves to invite ITU-R*

- 1 to investigate and identify all relevant scenarios mentioned in *recognizing a) to c)* that need to be considered in compatibility and sharing studies, taking into account the latest relevant ITU-R Recommendations;
- 2 to conduct and complete in time for WRC-23 sharing and compatibility studies in order to determine the feasibility of upgrading the SRS allocation to primary status in the frequency band 14.8-15.35 GHz, with a view to ensuring protection of the primary service in *considering a) and d)* and taking into account *recognizing e)*;
- 3 to determine the technical and regulatory conditions according to the results of studies mentioned in *resolves to invite ITU-R 2*,

*resolves to invite administrations*

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to ITU-R,

*invites the 2023 world radiocommunication conference*

to examine, on the basis of the results of studies by the ITU Radiocommunication Sector, the possibility of upgrading the secondary status of the allocation to the SRS to primary status in the frequency band 14.8-15.35 GHz, taking into account studies in *resolves to invite ITU-R 2* and the considerations in *resolves to invite ITU-R 3*.

**ADD**

**RESOLUTION COM6/11 (WRC-19)**

**Review of frequency allocations for EESS (passive) in the frequency range 231.5-252 GHz and consider possible adjustment according to observation requirements of passive microwave sensors**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that, within the frequency range 231.5-252 GHz, the frequency bands 235-238 GHz and 250-252 GHz are allocated to the Earth observation-satellite service (EESS) (passive) for the use of passive microwave remote sensing systems;
- b) that these allocations were agreed at WRC-2000, under agenda item 1.16, Resolution **723 (WRC-97)**;
- c) that scientific and technology developments for passive microwave sensor measurements have evolved over the last 20 years;
- d) that it is appropriate to ensure that the frequency allocations to EESS (passive) agreed in 2000 correspond to the up-to-date observation requirements for passive microwave sensing,

*recognizing*

- a) that some passive sensor systems under development plan to operate some channel(s) in the frequency range 239-248 GHz, given the specific characteristics of this frequency band for ice-cloud analysis;
- b) that, as a result, it may be necessary to consider some adjustment/extension of the EESS (passive) allocations within the frequency range 231.5-252 GHz;
- c) that the effect on the other primary services in the frequency range 231.5-252 GHz would have to be studied and the EESS (passive) allocations possibly adjusted,

*resolves to invite ITU-R*

- 1 to review the existing primary allocations to the EESS (passive) in the frequency range 231.5-252 GHz in order to analyse if these allocations are aligned with observation requirements of passive microwave sensors;
- 2 to study the impact that any change to the EESS (passive) allocations in the frequency range 231.5-252 GHz might have on the other primary services in these frequency bands;
- 3 to study, as appropriate, possible adjustments to the EESS (passive) allocations in the frequency range 231.5-252 GHz, taking into account the results under *resolves to invite ITU-R 1* above,

*invites the 2023 world radiocommunication conference*

to review the results of these studies with a view to adjusting existing allocations or adding possible new allocations, as appropriate, to EESS (passive) in the frequency range 231.5-252 GHz without unduly constraining the other primary services currently allocated in this frequency range,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R,

*instructs the Secretary-General*

to bring this Resolution to the attention of the international and regional organizations concerned.

**ADD**

**RESOLUTION COM6/12 (WRC-19)**

**Operation of earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service in the frequency band 12.75-13.25 GHz (Earth-to-space)**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WARC Orb-88 created an allotment Plan for the use of the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz;
- b) that WRC-07 revised the regulatory regime governing the use of the frequency bands mentioned in *considering a)* above;
- c) that the frequency band 12.75-13.25 GHz is currently allocated on a primary basis to the fixed (FS), fixed-satellite (FSS) (Earth-to-space) and mobile (MS) services, and on a secondary basis to the space research (deep space) (space-to-Earth) services globally;
- d) that the frequency band 12.75-13.25 GHz is used by the geostationary (GSO) FSS in accordance with the provisions of Appendix **30B** (No. **5.441**) and there are many existing GSO FSS satellite networks operating in this frequency band;
- e) that the corresponding frequency band in the space-to-Earth direction of the frequency band in *considering d)* are the frequency bands 10.7-10.95 GHz and 11.2-11.45 GHz and may be used by earth stations on aircraft and vessels subject to not claiming protection from other applications of the FSS, as well as other radiocommunication services allocated to the band;
- f) that the frequency band 10.6-10.7 GHz is allocated to EESS (passive);
- g) that the availability of the band 12.75-13.25 GHz (Earth-to-space) for earth stations on aircraft and vessels could provide administrations with more flexibility to use their allotments in the Appendix **30B** Plan, restricted to national territory;
- h) that there is an increased need for in-flight and maritime connectivity which can be partially satisfied by allowing earth stations on aircraft and vessels to communicate with GSO space stations in the FSS including in the frequency bands 12.75-13.25 GHz (Earth-to-space);
- i) that advances in technology, including the use of tracking techniques, allow earth stations on aircraft and vessels to operate within the characteristics of fixed earth stations of the FSS;
- j) that the use of the band 12.75-13.25 GHz (Earth-to-space) for links of earth stations on aircraft and vessels operating to GSO FSS satellite networks could contribute as an additional use of the spectrum and enhance broadband communications for passengers and not to be used or relied upon for safety-of-life applications,

*considering further*

- a) that there is no methodology on how to protect the neighboring space stations of Appendix **30B** from the earth stations on aircraft and vessels communicating with a GSO FSS space station;



- b) that there is no information on the coordination agreement reached among administrations regarding GSO FSS satellite network;
- c) that there is no established and agreed interference management procedure to address the potential interference arising from the use of earth stations on aircraft and vessels in this Resolution and the responsibility of the entities involved in this operation is not defined,

*noting*

- a) that Resolution **156 (WRC-15)** addresses the use of earth stations in motion communicating with GSO space stations in the FSS in the 19.7-20.2 GHz and 29.5-30.0 GHz frequency bands;
- b) that Resolution **158 (WRC-15)** calls for studies for the use of earth stations in motion communicating with GSO space stations in the FSS in the 17.7-19.7 GHz and 27.5-29.5 GHz frequency bands;
- c) that WRC-19 adopted Resolution **COM5/6 (WRC-19)** that contains the regulatory conditions regarding ESIM communicating with GSO FSS networks in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz under conditions contained in that Resolution;
- d) that WRC-19 adopted Resolution **COM5/8 (WRC-19)** that provides the procedure to ensure equitable access to frequency bands under Appendix **30B** by developing countries,

*recognizing*

- a) that the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels shall not result in any changes or restrictions to the existing Plan allotments and List assignments made under the Appendix **30B**;
- b) that the technical characteristics of earth stations on aircraft and vessels communicating with a GSO space station in the FSS shall comply with the envelope defined in Appendix **30B** and/or with the coordination agreements reached between administrations;
- c) that the current usage and future development of the allocated services in the band 12.75-13.25 GHz (Earth-to-space) shall be protected without imposing additional constraints on them;
- d) that in the frequency bands mentioned in *considering e)* used by earth stations on aircraft and vessels would be receiving and therefore not causing interference;
- e) that for the bands in *considering e)* earth stations on aircraft and vessels shall not impose constraints to other allocated services nor claim protection from allocated services operating in accordance with the Radio Regulations;
- f) that the transmitting GSO space station communicating with earth stations on aircraft and vessels should protect the adjacent EESS (passive) operations referred to in *considering f)* in accordance with No. **5.340**;
- g) that administrations intending to operate earth stations on aircraft and vessels in Appendix **30B** frequency bands shall submit a commitment to the ITU to undertake to immediately eliminate unacceptable interference level or reduce it to acceptable level should such interference is cause to terrestrial services;
- h) that a worldwide harmonized approach for earth stations on aircraft and vessels would benefit the administrations as well as industries;

- i) that Appendix **30B** requires the notifying administration to obtain specific agreement of other administrations via Article 6 (§§ 6.6 and 6.16) regarding the inclusion of their territory in the service area of the satellite network;
- j) that there are established criteria in Annex 4 to Appendix **30B** comprising single entry and aggregate value to protect Appendix **30B** assignments;
- k) that Article 44 of the ITU Constitution lays down the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries;
- l) that the “first-come first-served” concept can restrict and sometimes prevent access to and use of certain frequency bands and orbit positions;
- m) that Resolution **2 (Rev.WRC-03)** resolves that “the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems by other countries”,

*recognizing further*

that information provided by the Bureau in ITU-R studies indicates that a very significant number of Appendix **30B** submissions have been received by the Bureau in the time period 1 January 2013 until 22 November 2019 and that the table below summarizes the data provided by the Bureau into those studies and shows the variations for the number of networks at the various stages,

*resolves to invite ITU-R*

- 1 to study the technical and operational characteristics and user requirements of earth stations on aircraft and vessels that communicate or plan to communicate with GSO space stations in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space) under the envelope of Appendix **30B** Article 6 recorded in the List or MIFR with favourable finding only and examination of related existing regulatory provisions, subject to *recognizing a)*;
- 2 to study the sharing and compatibility issues between earth stations on aircraft and vessels communicating with GSO space stations in the FSS and current and planned stations of existing services in *considering a)* as well as services in bands adjacent to those, to ensure protection of, and not impose undue constraints on, those services and their future development, taking into account the provisions of Appendix **30B**;
- 3 to study the responsibility of the entities involved in the operation of the earth stations on aircraft and vessels in this Resolution;
- 3bis* to develop the criteria to ensure that earth stations on aircraft and vessels as a new application of FSS in this frequency band shall not claim more protection or cause more interference than filed earth stations in Appendix **30B**;
- 4 to develop the technical conditions and regulatory provisions for the harmonized operation of earth stations on aircraft and vessels communicating with GSO space stations in the FSS operating in the frequency band 12.75-13.25 GHz (Earth-to-space), considering the results of the studies outlined in *resolves to invite ITU-R* 1 and 2, and in particular without affecting the Appendix **30B** Plan;
- 5 to ensure that the operation of earth stations on aircraft and vessels in the frequency band 12.75-13.25 GHz under Appendix **30B** shall not adversely affect the criteria in *recognizing j)*, including the cumulative effect of multiple earth stations on aircraft and vessels;

6 to ensure that the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels shall not limit the access of other administrations to their national resources in Appendix **30B** as well as implementation of Resolution **COM5/8 (WRC-19)**;

7 to ensure that the use of earth stations on aircraft and vessels in this Resolution would not result in any additional status than the GSO network with which these stations communicate;

8 to ensure that the results of ITU-R studies are agreed by Member States by consensus;

9 to complete studies in time for WRC-23,

*further resolves*

that earth stations on aircraft and vessels addressed by this Resolution:

a) shall not be used or relied upon for safety-of-life applications;

b) shall not result in changes or restrictions to the existing Plan allotments and List assignments made under the Appendix **30B**, and their future development,

*resolves to invite WRC-23*

to consider the results of the above studies in *resolves to invite ITU-R* and take necessary actions, as appropriate,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R.

**ADD**

**RESOLUTION COM6/13 (WRC-19)**

**Use of the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by earth stations in motion communicating with non-geostationary space stations in the fixed-satellite service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) are globally allocated on a co-primary basis to the fixed-satellite service (FSS), and that there are a number of non-geostationary satellite systems operating or planned to operate in these frequency bands;
- b)* that the fixed and mobile services are allocated on a primary basis in the frequency bands 17.7-17.8 GHz, 18.1-19.7 GHz and 27.5-29.5 GHz on a global basis and the fixed service is also allocated on a primary basis in the frequency band 17.8-18.1 GHz on a global basis;
- c)* that the frequency band 28.5-30 GHz (Earth-to-space) is allocated to the Earth exploration-satellite service (EESS) on a secondary basis, and no additional constraints should be imposed on the EESS;
- d)* that the frequency band 29.95-30 GHz may be used for space-to-space links in the Earth exploration-satellite service on a secondary basis, and no additional constraints should be imposed on the EESS;
- e)* that there are existing and planned non-geostationary orbit (non-GSO) satellite constellations in the 17.7-20.2 GHz (space-to-Earth) and 27.5-30 GHz (Earth-to-space) and that these constellations are designed to serve the growing need for access to broadband connectivity, regardless of location;
- f)* that existing regulatory and technical procedures apply in the segments of the frequency bands listed in *considering a)* between FSS geostationary networks and FSS non-geostationary systems;
- g)* that the frequency bands listed in *considering a)* are also allocated to several other services on a primary basis, that those services are used by a variety of different systems in many administrations and that these existing services and their future development should be protected without undue constraints;
- h)* that, in accordance with the relevant provisions of Articles 9 and 11 of the Radio Regulations, non-geostationary FSS networks intending to operate in the frequency bands detailed in *considering a)* should be coordinated and notified;
- i)* that there is a need for mobile satellite communications, including global satellite broadband, and that part of this need can be met by allowing earth stations in motion (ESIM) to communicate with space stations of the fixed-satellite service operating in the frequency bands detailed in *considering a)*;

*j)* that a consistent approach to the deployment of these earth stations in motion will support important and growing global communication requirements and provide adequate protection to other services in the frequency bands;

*k)* that, currently, there is no specific regulatory procedure for the coordination of earth stations in motion relative to terrestrial stations for these services,

*considering further*

*a)* that there is no methodology on how to protect the GSO FSS space stations from ESIM communicating with non-GSO FSS systems;

*b)* that there is no information on the coordination agreement reached among administrations between GSO FSS satellite networks and non-GSO FSS systems in those bands where No. **5.523A** applies;

*c)* that there is no established and agreed interference management procedure to address the potential interference arising from the use of ESIM communicating with non-GSO FSS systems in this Resolution and the responsibility of the entities involved in this operation is not defined;

*d)* that ESIM communicating with non-GSO FSS systems should be operated within the envelope of the characteristics and envelope of coordination of specific and/or typical earth stations of the non-GSO FSS systems initially published and included in the BR IFIC;

*e)* that there is no established methodology to calculate the efd from the use of multiple non-GSO FSS systems in the frequency bands detailed in *considering a)*,

*noting*

*a)* that Resolution **156 (WRC-15)** addresses the use of ESIM communicating with GSO space stations in the FSS in the 19.7-20.2 GHz and 29.5-30.0 GHz frequency bands;

*b)* that Resolution **158 (WRC-15)** calls for studies for the use of ESIM communicating with GSO space stations in the FSS in the 17.7-19.7 GHz and 27.5-29.5 GHz frequency bands;

*c)* that WRC-19 adopted Resolution **COM5/6 (WRC-19)** that contains the technical, operational and regulatory provisions for ESIM communicating with GSO FSS networks in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz, under the conditions contained in that Resolution,

*recognizing*

*a)* that technical and operational requirements for ESIM, which were referred to as earth stations on mobile platforms (“ESOMPs” prior to WRC-15) operating with non-GSO in the fixed-satellite service systems in the frequency bands detailed in *considering a)* above have been discussed in ITU-R and are reflected in the Report ITU-R S.2261;

*b)* that Article **21** determines power flux-density limits applicable to systems of the non-geostationary fixed-satellite service to protect fixed and mobile land stations;

*c)* that Article **22** contains equivalent power flux-density (epfd) limits for non-geostationary satellite systems in the fixed-satellite service in the 17.8-18.6 GHz, 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30 GHz (Earth-to-space) and 17.8-18.4 GHz (inter-satellite) frequency bands;

*d)* that the use of the frequency band 19.3-19.6 GHz (Earth-to-space) by the fixed-satellite service is limited to geostationary-satellite systems and feeder links to non-geostationary satellite systems in the mobile-satellite service, in accordance with No. **5.523D**;

- e) that the use of the frequency band 29.1-29.5 GHz (Earth-to-space) by the fixed-satellite service is limited to geostationary-satellite systems and feeder links to non-geostationary satellite systems in the mobile-satellite service, in accordance with No. **5.535A**;
- f) that WRC-15 adopted footnote No. **5.527A** and Resolution **156 (WRC-15)** related to earth stations in motion that communicate with geostationary satellites;
- g) that advances in technology, including the use of tracing techniques, allow earth stations in motion to operate according to the characteristics of typical FSS earth stations;
- h) that these earth stations are not be used or relied upon for safety-of-life applications;
- i) that the frequency band 18.6-18.8 GHz is allocated to the Earth exploration-satellite service (passive) and space research passive,
- recognizing further*
- a) that segments of the frequency band 17.7-18.1 GHz are used by feeder links for the broadcasting-satellite service, subject to Appendix **30A** (No. **5.516**);
- b) that frequency bands 18.3-19.3 GHz (Region 2), 19.7-20.2 GHz (all regions), 27.5-27.82 GHz (Region 1), 28.35-28.45 GHz (Region 2), 28.45-28.94 GHz (all regions), 28.94-29.1 GHz (Regions 2 and 3), 29.25-29.46 GHz (Region 2), 29.465-30.0 GHz (all regions), have been identified for use in high-density applications in the fixed-satellite service (No. **5.516B**);
- c) that the use of the frequency band 18.1-18.4 GHz by the fixed-satellite service (Earth-to-space) is limited to the feeder links of geostationary satellite systems in the broadcasting-satellite service (No. **5.520**);
- d) that the use of the frequency bands 17.8-18.6 GHz, 19.7-20.2 GHz, 27.5-28.6 GHz and 29.5-30.0 GHz for non-geostationary fixed-satellite service systems is subject to the applicable provisions of Nos. **5.484A**, **22.5C** and **22.5I**;
- e) that the use of the frequency bands 18.8-19.3 GHz and 28.6-29.1 GHz by geostationary and non-geostationary fixed-satellite service networks is subject to the applicable provisions of No. **9.11A**, while No. **22.2** does not apply (No. **5.523A**);
- f) that the use of the frequency band 19.3-19.7 GHz by geostationary fixed-satellite service systems and feeder links of non-geostationary satellite systems in the mobile-satellite service is subject to the applicable provisions of No. **9.11A**, but not to the provisions of No. **22.2**. In addition, the use of this frequency band by other non-geostationary fixed-satellite service systems or for the cases indicated in numbers Nos. **5.523C** and **5.523E** is not subject to the provisions of No. **9.11A**, and shall continue to be subject to the procedures of Article **9** (except No. **9.11A**) and Article **11** of the RR, and to the provisions of No. **22.2** (No. **5.523D**);
- g) that the frequency band 27.5-29.1 GHz, and 29.5-30.0 GHz may be used by the fixed-satellite service (Earth-to-space) to provide feeder links in the broadcasting-satellite service (No. **5.539**);
- h) that all allocated services in the frequency bands in *considering a)* to *e)* should be taken into account when conducting sharing and compatibility studies;
- i) that the notifying administrations of those non-GSO FSS systems with which ESIM in the frequency bands detailed in *considering a)* above are intended to operate should submit a commitment to ITU to undertake to immediately eliminate unacceptable interference or reduce it to an acceptable level should such interference be caused to terrestrial services;

*j)* that Resolution 2 (**Rev.WRC-03**) resolves that “the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems by other countries”,

*resolves to invite ITU-R*

1 to study the technical and operational characteristics and user requirements of the different types of earth stations in motion that plan to operate within non-GSO FSS systems in the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space), or parts thereof;

2 to study sharing and compatibility between earth stations in motion operating with non-GSO FSS systems and current and planned stations of primary services allocated in the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space), or parts thereof, to ensure protection of, and not impose additional constraints on, GSO systems and other services, including terrestrial services, in those frequency bands and in adjacent bands, including passive services;

3 to develop the technical and regulatory provisions for the operation of aeronautical and maritime earth stations in motion with non-GSO FSS systems, taking into account the results of studies under *resolves to invite ITU-R* 1 and 2;

4 to ensure that the technical and operational measures and the possible regulatory changes established in accordance with this Resolution shall not affect the relevant provisions related to the protection of GSO networks from non-GSO FSS systems;

5 to ensure that the results of ITU-R studies are agreed by Member States taking into account the required consensus on this matter;

6 to complete studies in time for WRC-23,

*resolves to invite WRC-23*

to review the results of these studies and take appropriate action.

**ADD**

**RESOLUTION COM6/14 (WRC-19)**

**Study of technical and operational issues, and regulatory provisions for satellite-to-satellite links in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz**

The World Radiocommunication Conference (Sharm-el-Sheikh, 2019),

*considering*

- a)* that the definition of fixed-satellite service (FSS) in No. **1.21** of the Radio Regulations includes the possibility, in some cases, of satellite-to-satellite links, which may also be operated in the inter-satellite service;
- b)* that the definition of inter-satellite service (ISS) in No. **1.22** of the Radio Regulations includes only links between space stations and that the term *inter-satellite link* (ISL) in this resolution is taken to mean a radiocommunication service link between artificial satellites;
- c)* that frequency bands allocated to the fixed-satellite service are used for links between earth stations and space stations, and that such links may not be operated in the inter-satellite service;
- d)* that using some frequency bands allocated to the FSS for transmissions between space stations may increase spectral efficiency in those frequency bands;
- e)* that there is growing interest for utilizing satellite-to-satellite links for a variety of applications and that there have been expressions of interest by some administrations of using the FSS frequency bands 27.5-30 GHz (Earth-to-space) and 11.7-12.7 GHz, 18.1-18.6 GHz and 18.8-20.2 GHz (space-to-Earth) for links between space stations;
- f)* that all allocations to the fixed-satellite service include a space-to-Earth or Earth-to-space direction indicator;
- g)* that ITU-R has begun preliminary studies on the technical and operational issues associated with the use of non-GSO satellites transmitting toward the GSO in the 27.5-30 GHz FSS frequency band, and that such studies are expected to continue in this frequency band and other frequency bands after WRC-19,

*recognizing*

- a)* that it is necessary to study the compatibility of satellite-to-satellite transmissions to other primary services in the frequency bands taking into account applicable footnotes, and the need to protect the primary services in the frequency bands of *considering e)*;
- b)* that the use of the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, and 18.8-20.2 GHz (space-to-Earth) and 27.5-30 GHz (Earth-to-space) for transmissions between space stations should ensure compatibility with and impose no additional regulatory or technical constraints on services to which the band is currently allocated on a primary basis, and the services using adjacent bands allocated on a primary basis;



- c) that it is necessary to study whether space-to-Earth direction transmissions from space stations in higher orbital altitudes, including GSO satellites, can be successfully received by lower orbital altitude non-GSO satellites, without imposing any additional constraints on all allocated services in these bands;
- d) that the sharing scenarios are likely to differ as the orbital characteristics of the non-GSO satellites vary;
- e) that out-of-band emissions, signals due to antenna pattern sidelobes, reflections from receiving space stations, and in-band unintentional radiation due to Doppler shifts may impact services operating in the same and adjacent bands;
- f) that some administrations have authorized these satellite-to-satellite transmissions links under Article 4, No. 4.4 of the Radio Regulations, without recognition and on a non-harmful interference/non-protected basis, is being made today,

*recognizing further*

- a) that precedent for satellite-to-satellite links sharing with Earth-to-space and space-to-Earth exists for space operation, Earth exploration-satellite and space research in the frequency bands 2 025-2 110 MHz, and 2 200-2 290 MHz through the inclusion of a space-to-space allocation;
- b) that the use of the frequency bands 27.5-28.6 GHz and 29.5-30 GHz by the non-GSO FSS is subject to the application of the provisions of Nos. **5.484A**, **22.5D** and **22.5I**;
- c) that the use of the frequency bands 17.8-18.6 GHz and 19.7-20.2 GHz by the non-GSO FSS is subject to the application of the provisions of Nos. **5.484A**, **22.5C** and **22.5I**;
- d) that use of the frequency band 28.6-29.1 GHz by geostationary and non-geostationary fixed-satellite service networks is subject to the application of the provisions of No. **9.11A**, and No. **22.2** does not apply (see No. **5.523A**);
- e) that No. **22.2** applies to the 19.7-20.2 GHz and 29.5-30 GHz bands, in which the mobile-satellite service (MSS) has a co-primary allocation in Region 2 and in the 20.1-20.2 GHz and 29.9-30 GHz portions of the bands in Regions 1 and 3;
- f) that use of the frequency band 29.1-29.5 GHz (Earth-to-space) by the fixed-satellite service is limited to geostationary-satellite systems and feeder links to non-geostationary satellite systems in the mobile-satellite service, and that such use is subject to the application of the provisions of No. **9.11A**, but not subject to the provisions of No. **22.2**, except as indicated in Nos. **5.523C** and **5.523E**, where such use is not subject to the provisions of No. **9.11A** and shall continue to be subject to Articles **9** (except No. **9.11A**) and **11** procedures, and to the provisions of No. **22.2** (see No. **5.535A**);
- g) that the frequency band 27.5-30 GHz may be used by the fixed-satellite service (Earth-to-space) for the provision of feeder links for the broadcasting-satellite service (see No. **5.539**);
- h) that feeder links of non-geostationary networks in the mobile-satellite service and geostationary networks in the fixed-satellite service operating in the frequency band 29.1-29.5 GHz (Earth-to-space) shall employ uplink adaptive power control or other methods of fade compensation, such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between both networks (see No. **5.541A**);

- i)* that the fixed and mobile services are allocated on a primary basis in the frequency bands 10.7-11.7 GHz, 17.7-17.8 GHz, 18.1-19.7 GHz and 27.5-29.5 GHz frequency bands on a global basis, 17.7-17.8 GHz in Regions 1 and 3, 12.2-12.7 GHz in Regions 2 and 3, 11.7-12.5 GHz in Regions 1 and 3, and fixed service is also primary within 17.8-18.1 GHz globally and 11.7-12.1 GHz in Region 2;
- j)* that the frequency band 28.5-29.5 GHz (Earth-to-space) is also allocated to the Earth exploration-satellite service on a secondary basis, and no additional constraints should be imposed on the EESS and the conditions of fixed-satellite service operation are described in Resolution **750 (Rev.WRC-15)**;
- k)* that the allotments of the Appendix **30B** Plan, assignments in the Plans and the List subject to Appendix **30** and **30A** and assignments in the Appendix **30B** List must be protected;
- l)* that the frequency band 29.5-30 GHz (Earth-to-space) is also allocated to the mobile-satellite service on a primary basis in 29.5-30 GHz in Region 2, on a primary basis in 29.9-30 GHz in Regions 1 and 3, and on a secondary basis in Regions 1 and 3 in 29.5-29.9 GHz;
- m)* that use of the frequency band 18.1-18.4 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links of geostationary-satellite systems in the broadcasting-satellite service (No. **5.520**);
- n)* that the use of the frequency band 17.8-18.4 GHz is subject to the application of No. **22.5F** and equivalent power flux-density  $epfd_{is}$  limits,

*resolves to invite ITU-R*

- 1 to develop the technical and operational characteristics of different types of space stations that plan satellite-to-satellite transmissions in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, taking into account *considering e)* above;
- 2 to study the technical and operational characteristics, including spectrum requirements, off-axis e.i.r.p. values and out-of-band emission limits, for transmissions between space stations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz;
- 3 to study sharing and compatibility between satellite-to-satellite links, intending to operate between space stations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, and current and planned stations of the FSS and other existing services allocated in same frequency bands and adjacent bands, including passive services, with a view to ensuring protection of the primary services in *recognizing further i)*;
- 4 to develop, for different types of space stations, the technical conditions and regulatory provisions for satellite-to-satellite operations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, or portions thereof, including new ISS allocations, as appropriate, taking into account the results of the studies above,

*invites administrations*

to participate in the studies and to provide input contributions,

*resolves to invite the 2023 world radiocommunication conference*

to consider the results of the above studies and take necessary regulatory actions, as appropriate.

**ADD**

**RESOLUTION COM6/15 (WRC-19)**

**Studies relating to spectrum needs and potential new allocations to the mobile-satellite service in the frequency bands 1 695-1 710 MHz, 2 010-2 025 MHz, 3 300-3 315 MHz and 3 385-3 400 MHz for future development of narrowband mobile-satellite systems**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that a preliminary assessment of the spectrum requirements would suggest a pairing of no more than 5 MHz in uplink and 5 MHz in the downlink, may suffice for the applications of low-data rate systems for the collection of data from, and management of terrestrial devices, in the MSS;
- b)* that the frequency bands under consideration 1 695-1 710 MHz, 2 010-2 025 MHz, 3 300-3 315 MHz, 3 385-3 400 MHz are allocated on a primary and secondary basis to the mobile service (MS), fixed service (FS), fixed-satellite service (FSS), radiolocation and meteorological services;
- c)* that previous studies only addressed spectrum requirements for the satellite component of IMT-2000 and system beyond IMT-2000 (Report ITU-R M.2077) and spectrum requirements for new broadband mobile satellite service (MSS) applications in the 4-16 GHz range (Reports ITU-R M.2218 and ITU-R M.2221);
- d)* that Report ITU-R M.2218 suggests that the operational characteristics of incumbent MSS systems may constrain and effectively hamper the sharing of existing MSS spectrum, resulting in the requirement of additional spectrum for new applications;
- e)* that Report ITU-R SA.2312 suggests that MSS bands already allocated above 5 GHz are outside of the inherent size, weight, and power restrictions of small satellites (usually having a mass of less than 100 kg);
- f)* that earth and space stations used for the applications of the systems in *considering b)* may include a combination of low power and intermittent transmissions to facilitate spectrum sharing and spectrum requirements,

*noting*

- a)* the existing MSS allocation and current use of the frequency band 2 010-2 025 MHz, in particular in Region 2;
- b)* that the number of mobile satellite systems using small satellites for the systems described in *considering b)* is growing and the spectrum demand for suitable MSS allocations is increasing;
- c)* the examples, technical characteristics and benefits of such satellites given in Report ITU-R SA.2312;
- d)* the contribution of the applications described in *considering a)*, delivering actionable information, to the promotion of human welfare;

e) the insufficient spectrum opportunities for new applications described in *considering a)* to operate in MSS bands below 5 GHz;

f) that Recommendation ITU-R SA.1158-3 summarized that narrow-band short duration type of data transmissions in the mobile-satellite service (Earth-to-space) may feasibly share the frequency band 1 670-1 710 MHz with the meteorological-satellite service (space-to-Earth),

*recognizing*

a) that the existing primary allocated services, in the bands considered and adjacent to, shall be protected;

b) the need for regulatory certainty regarding the available spectrum for both satellite and earth station design and planning purposes;

c) that the studies, envisaged in the *resolves* part of this Resolution, are to be limited to those systems with space stations that have a maximum e.i.r.p. of 27 dBW or less, with a beamwidth of no more than 120 degrees, and earth stations that individually communicate no more than once every 15 minutes, for no more than 4 seconds at a time, with a maximum e.i.r.p. of 7 dBW;

d) that some of the frequency bands listed in *resolves b)* are identified for IMT in accordance with Nos. **5.429D**, **5.430A**, **5.431B**, **5.441A** and **5.441B**;

e) that the introduction of the applications of the possible new MSS allocation should not impose constraints to other existing allocated primary services in the bands under consideration and adjacent to, operating in accordance with the Radio Regulations,

*resolves to invite ITU-R*

1 to conduct studies on spectrum and operational requirements as well as system characteristics of low-data rate systems for the collection of data from, and management of, terrestrial devices in the MSS as described in *considering a)* and limited to the basic characteristics in *recognizing c)*;

2 to conduct sharing and compatibility studies with existing primary services to determine the suitability of new allocations to the MSS, with a view to protecting the primary services, in the following frequency bands and adjacent frequency bands:

1 695-1 710 MHz in Region 2,

2 010-2 025 MHz in Region 1,

3 300-3 315 MHz, 3 385-3 400 MHz in Region 2;

3 to consider possible new primary or secondary allocations, with the necessary technical limitations, taking into account the characteristics described in *recognizing c)*, to the MSS for non-GSO satellites operating low-data rate systems for the collection of data from, and management of, terrestrial devices based on the result of sharing and compatibility studies, while ensuring the protection of existing primary services in those frequency bands, and adjacent bands, without causing undue constraints on their further development,

*resolves to invite WRC-23*

to determine, on the basis of the studies conducted under the *resolves to invite ITU-R* above, appropriate regulatory actions,

*invites administrations*

to participate in the studies by submitting contributions to ITU-R.

**ADD**

**RESOLUTION COM6/16 (WRC-19)**

**Primary allocation to the fixed-satellite service in the space-to-Earth direction  
in the frequency band 17.3-17.7 GHz in Region 2**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) the need to encourage the development and implementation of new technologies in the fixed-satellite service (FSS) for broadband applications;
- b) that FSS systems based on the use of new technologies associated with geostationary (GSO) satellite systems are capable of providing high-capacity and low-cost means of broadband communication even to the most isolated regions of the world;
- c) that the Radio Regulations should enable the introduction of new applications of radiocommunication technology to ensure the operation of as many systems as possible in order to ensure efficient use of the spectrum;
- d) that the frequency band 17.3-17.7 GHz is allocated in Region 2 on a primary basis to the broadcasting-satellite service (space-to-Earth) and to the fixed-satellite service (Earth-to-space), subject to the application of No. **5.516**,

*recognizing*

the need to preserve and protect frequencies subject to the application of Appendix **30A**,

*noting*

- a) that technology has been developed to provide more efficient use of the spectrum;
- b) that sharing of fixed-satellite service (Earth-to-space) and fixed-satellite service (space-to-Earth), is already considered in Region 1 for the frequency band 17.3-17.7 GHz;
- c) that there is no other primary service in the frequency band 17.3-17.7 GHz apart from the fixed-satellite service and the broadcasting-satellite service,

*resolves*

that the studies referred in *invites ITU-R* below shall protect radiocommunication services to which the band is allocated on primary basis, in particular assignments contained in Appendix **30A** of the Radio Regulations,

*invites ITU-R*

to conduct, and complete in time for WRC-23, sharing and compatibility studies between the fixed-satellite service (space-to-Earth) and the broadcasting-satellite service (space-to-Earth) and between the fixed-satellite service (space-to-Earth) and the fixed-satellite service (Earth-to-space), in order to consider possible new primary allocation to the fixed-satellite service (space-to-Earth) in the frequency band 17.3-17.7 GHz for Region 2, while ensuring the protection of existing primary allocations in the same and adjacent bands, as appropriate, and without imposing any additional constraints on existing allocations to the broadcasting-satellite service (space-to-Earth) and the fixed-satellite service (Earth-to-space),

*invites WRC-23*

to consider the results of the above studies and take necessary actions, as appropriate,

*invites administrations*

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to ITU-R.

**ADD**

**RESOLUTION COM6/17 (WRC-19)**

**Studies on technical and operational measures to be applied in the frequency band 1 240-1 300 MHz to ensure the protection of the radionavigation-satellite service (space-to-Earth)**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the frequency band 1 240-1 300 MHz is allocated worldwide to the amateur service on a secondary basis;
- b)* that the amateur-satellite service (Earth-to-space) may operate in the band 1 260-1 270 MHz under No. **5.282** of the Radio Regulations;
- c)* that the frequency band 1 240-1 300 MHz is important for the amateur community and has been used for many years for a range of applications;
- d)* that the frequency band 1 240-1 300 MHz is also allocated worldwide to the radionavigation-satellite service (RNSS) in the space-to-Earth direction on a primary basis;
- e)* that RNSS systems using the band 1 240-1 300 MHz are operational, or becoming operational, in various parts of the world, with the aim of supporting a wide range of new satellite positioning services, for example enhanced accuracy and position authentication,

*noting*

- a)* that Recommendation ITU-R M.1732 contains the characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies;
- b)* that Recommendation ITU-R M.1044 should be used as a guide in studies of the compatibility between systems operating in the amateur and amateur-satellite services and systems operating in other services;
- c)* that Recommendation ITU-R M.1787 contains the description of RNSS systems and the technical characteristics of space stations operating in the frequency band 1 240-1 300 MHz;
- d)* that Recommendation ITU-R M.1902 contains the characteristics and protection criteria for RNSS (space-to-Earth) receivers operating in the frequency band 1 240-1 300 MHz,

*recognizing*

- a)* that some cases of harmful interference caused by emissions in the amateur service into RNSS (space-to-Earth) receivers have occurred, and resulted in investigations and in instructions to the operator of the interfering station to cease transmissions;
- b)* that the number of RNSS receivers in the band 1 240-1 300 MHz is currently limited in certain regions, but will increase dramatically in the near future with the ubiquitous deployment of receivers used in mass-market applications;

- c) that according to No. **5.29** of the Radio Regulations, stations of a secondary service shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
- d) that administrations will benefit from the availability of studies and guidelines about the protection of the RNSS (space-to-Earth) by the amateur and amateur-satellite services in the frequency band 1 240-1 300 MHz;
- e) that some RNSS receivers in the band 1 240-1 300 MHz may be equipped with pulse-blanking, which may facilitate sharing with certain amateur service applications;
- f) that the amateur service in the band 1 240-1 300 MHz is currently used for amateur voice, data and image transmission in several countries in Europe and around the globe and may transmit a variety of emission types including wideband, continuous and/or high e.i.r.p. transmissions,

*resolves to invite ITU-R*

1 to perform the detailed review of the different systems and applications used in the amateur service and amateur-satellite service allocations within the frequency band 1 240-1 300 MHz;

2 taking into account the results of the above review, to study possible technical and operational measures to ensure the protection of RNSS (space-to-Earth) receivers from the amateur and amateur-satellite services within the frequency band 1 240-1 300 MHz, without considering the removal of these amateur and amateur-satellite services allocations,

*instructs the Director of the Radiocommunication Bureau*

to include the results of these studies in his Report to WRC-23 for the purpose of considering appropriate actions in response to *resolves to invite ITU-R* above.



**ADD**

**RESOLUTION COM6/18 (WRC-19)**

**Use of International Mobile Telecommunication systems for fixed wireless broadband in the frequency bands allocated to the fixed service on primary basis**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the usage of harmonized bands for international mobile telecommunication systems are desirable in order to achieve the benefits of economies of scale on a worldwide scale;
- b) that use of international mobile telecommunication systems for fixed broadband can assist achieving the global demands to bridge the digital divide, support broadband agenda in developing countries and provide cost-effective broadband services to rural and under-served areas,

*recognizing*

- a) that Resolution 139 (Rev. Dubai, 2018) of the Plenipotentiary Conference calls for bridging the digital divide worldwide through the Use of telecommunications/information and communication technologies to bridge the digital divide and build an inclusive information society;
- b) that Resolution 37 (Rev. Buenos Aires, 2017) of the World Telecommunication Development Conference calls for bridging the digital divide;
- c) that the ITU-R Handbook on “Fixed Wireless Access” addressed the use of International Mobile Telecommunication (IMT) systems for Fixed Wireless Access, and Recommendation ITU-R M.819 contains specific requirements pertaining to fixed wireless access,

*resolves to invite ITU-R*

to conduct any necessary studies on the use of International Mobile Telecommunication systems for fixed wireless broadband in the frequency bands allocated to the fixed service on primary basis, taking into account the relevant ITU-R studies, Handbooks, Recommendations and Reports,

*instructs the Director of the Radiocommunication Bureau*

to report to WRC-23 on the results of these studies,

*invites administrations*

to participate in these studies in the process of preparation for WRC-23.

**ADD**

## RESOLUTION COM6/19 (WRC-19)

### **Preliminary agenda for the 2027 world radiocommunication conference\***

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for WRC-27 should be established four to six years in advance;
- b) Article 13 of the ITU Constitution relating to the competence and scheduling of world radiocommunication conferences and Article 7 of the Convention relating to their agendas;
- c) the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and world radiocommunication conferences (WRCs),

*resolves to give the view*

that the following items should be included in the preliminary agenda for WRC-27:

- 1 to take appropriate action in respect of those urgent issues that were specifically requested by WRC-23;
- 2 on the basis of proposals from administrations and the Report of the Conference Preparatory Meeting, and taking account of the results of WRC-23, to consider and take appropriate action in respect of the following items:
  - 2.1 to consider, in accordance with Resolution **COM6/20 (WRC-19)**, additional spectrum allocations to the radiolocation service on a co-primary basis in the frequency band 231.5-275 GHz and identification for radiolocation applications in frequency bands in the range 275-700 GHz for millimetre and sub-millimetre wave imaging systems;
  - 2.2 study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 37.5-39.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by aeronautical and maritime earth stations in motion communicating with geostationary space stations in the fixed-satellite service, in accordance with Resolution **COM6/21 (WRC-19)**;
  - 2.3 to consider the allocation of all or part of the frequency band [43.5-45.5 GHz] to the fixed-satellite service, in accordance with Resolution **COM6/22 (WRC-19)**;
  - 2.4 the introduction of pfd and e.i.r.p. limits in Article **21** for the frequency bands 71-76 GHz and 81-86 GHz in accordance with Resolution **COM6/23 (WRC-19)**;
  - 2.5 the conditions for the use of the 71-76 GHz and 81-86 GHz frequency bands by stations in the satellite services to ensure compatibility with passive services in accordance with Resolution **COM6/24 (WRC-19)**;

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\* The appearance of square brackets around certain frequency bands in this Resolution is understood to mean that WRC-23 will consider and review the inclusion of these frequency bands with square brackets and decide, as appropriate.

- 2.6 to consider regulatory provisions for appropriate recognition of space weather sensors and their protection in the Radio Regulations, taking into account the results of ITU-R studies reported to WRC-23 under agenda item 9.1 and its corresponding Resolution **657 (Rev.WRC-19)**;
- 2.7 to consider the development of regulatory provisions for non-geostationary fixed-satellite system feeder links in the frequency bands 71-76 GHz (space-to-Earth and proposed new Earth-to-space) and 81-86 GHz (Earth-to-space), in accordance with Resolution **COM6/25 (WRC-19)**;
- 2.8 to study the technical and operational matters, and regulatory provisions, for space-to-space links in the frequency bands [1 525-1 544 MHz], [1 545-1 559 MHz], [1 610-1 645.5 MHz], [1 646.5-1 660.5 MHz] and [2 483.5-2 500 MHz] among non-geostationary and geostationary satellites operating in the mobile-satellite service, in accordance with Resolution **COM6/26 (WRC-19)**;
- 2.9 to consider possible additional spectrum allocations to the mobile service in the frequency band 1 300-1 350 MHz to facilitate the future development of mobile-service applications, in accordance with Resolution **COM6/27 (WRC-19)**;
- 2.10 to consider improving the utilization of the VHF maritime frequencies in Appendix **18**, in accordance with Resolution **COM6/28 (WRC-19)**;
- 2.11 to consider a new EESS (Earth-to-space) allocation in the frequency band 22.55-23.15 GHz, in accordance with Resolution **COM6/29 (WRC-19)**;
- 2.12 to consider the use of existing IMT identifications in the frequency range 694-960 MHz by consideration of the possible removal of the limitation regarding aeronautical mobile in the IMT for the use of IMT user equipment by non-safety applications, where appropriate, in accordance with Resolution **COM6/30 (WRC-19)**;
- 2.13 to consider a possible worldwide allocation to the mobile satellite service for the future development of narrowband mobile-satellite systems in frequency bands between the range [1.5-5 GHz, in accordance with Resolution **COM6/15 (WRC-19)**.
- 3 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with *further resolves* of Resolution **27 (Rev.WRC-19)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in *resolves* of that Resolution;
- 4 to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the Conference;
- 5 in accordance with Resolution **95 (Rev.WRC-19)**, to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation;
- 6 to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;
- 7 to identify those items requiring urgent action by the radiocommunication study groups;

8 to consider possible changes, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

9 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, Resolution **26 (Rev.WRC-19)**;

10 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention;

10.1 on the activities of the Radiocommunication Sector since WRC-23;

10.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and<sup>1</sup>

10.3 on action in response to Resolution **80 (Rev.WRC-07)**;

11 to recommend to the ITU Council items for inclusion in the agenda for the next WRC, and items for the preliminary agenda of future conferences, in accordance with Article 7 of the Convention and Resolution **804 (Rev.WRC-19)**,

*invites the ITU Council*

to finalize the agenda and arrange for the convening of WRC-27, and to initiate as soon as possible the necessary consultations with Member States,

*instructs the Director of the Radiocommunication Bureau*

1 to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting and to prepare a report to WRC-27;

2 to submit a draft Report on any difficulties or inconsistencies encountered in the application of the Radio Regulations referred in agenda item 9.2 to the second session of CPM and to submit the final Report at least five months before the next WRC,

*instructs the Secretary-General*

to communicate this Resolution to international and regional organizations concerned.

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<sup>1</sup> This agenda sub-item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations. Administrations are invited to inform the Director of the Radiocommunication Bureau of any difficulties or inconsistencies encountered in the Radio Regulations.

**ADD**

**RESOLUTION COM6/20 (WRC-19)**

**New allocations for the radiolocation service in the frequency band 231.5-275 GHz, and new identification for radiolocation service applications of frequency bands in the range 275-700 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that millimetre and sub-millimetre wave frequencies have been recognized by scientific communities and governmental organizations as well suited for stand-off detection of concealed objects;
- b)* that millimetre and sub-millimetre wave imaging systems will provide a significant contribution to public safety, counter-terrorism and the security of high-risk/high-value assets or areas;
- c)* that millimetre and sub-millimetre wave imaging systems are typically designed in two main configurations: active (radars) and receive-only (radiometers);
- d)* that active millimetre and sub-millimetre wave imaging systems require a frequency bandwidth wider than 30 GHz to achieve range resolutions in the order of one centimetre;
- e)* that receive-only millimetre and sub-millimetre wave imaging systems detect the extremely weak power that is naturally radiated by objects and require much wider frequency bandwidth than active systems to collect enough power for detection;
- f)* that globally harmonized spectrum for the millimetre and sub-millimetre wave imaging systems is required;
- g)* that the optimal frequency range for the operation of the active millimetre and sub-millimetre wave imaging systems is between 231.5 GHz and 320 GHz, where the atmospheric absorption is relatively low;
- h)* that there are some narrower existing allocations to the radiolocation service in the frequency range 217-275 GHz in the three ITU Regions which however do not support the bandwidth required for these systems;
- i)* that, for the receive-only millimetre and sub-millimetre wave imagers, an identification in the range 275-700 GHz is envisaged;
- j)* that the frequency bands 235-238 GHz and 250-252 GHz are allocated to the Earth exploration-satellite service (passive) on a primary basis;
- k)* that the frequency bands 241-248 GHz and 250-275 GHz are allocated to the radio astronomy service on a primary basis;
- l)* that a number of frequency bands in the range 275-1 000 GHz are identified for use by passive services, such as the radio astronomy service, the Earth exploration-satellite service (passive) and the space research service (passive);
- m)* that No. **5.565** states that the use of the frequency range 275-1 000 GHz by the passive services does not preclude use of this frequency range by active services;

n) that administrations wishing to make frequencies available in the frequency range 275-1 000 GHz for active service applications are urged to take all practicable steps to protect these passive services from harmful interference until the date when the Table of Frequency Allocations is established for the relevant frequencies,

*noting*

a) that active millimetre and sub-millimetre wave imaging systems operate at very low transmit power (a few milliwatts typically) and short ranges (up to 300 m);

b) that millimetre and sub-millimetre wave imaging systems may be severely affected by other power sources operating in the same frequency band;

c) that the technical and operational characteristics for millimetre and sub-millimetre wave imaging systems need to be defined, including protection criteria in particular for receive-only systems,

*resolves to invite ITU-R*

1 to study the future requirements for globally harmonized spectrum for the radiolocation service, in particular for millimetre and sub-millimetre wave imaging applications above 231.5 GHz, as referred to in *considering a) and b)*;

2 to define technical and operational characteristics including required protection criteria for millimetre and sub-millimetre wave imaging systems;

3 to study sharing and compatibility of active millimetre and sub-millimetre wave imaging applications with other systems in the frequency range between 231.5 GHz and 275 GHz while ensuring that the Earth exploration-satellite service (passive), space research (passive) and radio astronomy service allocated in this frequency range are protected;

4 to conduct sharing and compatibility studies between the radiolocation and Earth exploration-satellite service (passive), space research (passive) and radio astronomy service applications operating in the frequency range 275-700 GHz, while maintaining protection of the passive service applications identified in No. **5.565**;

5 to study sharing and compatibility of receive-only millimetre and sub-millimetre wave imaging applications with other systems in the frequency range between 275 GHz and 700 GHz;

6 to study possible new allocations to the radiolocation service on a co-primary basis in the frequency range between 231.5 GHz and 275 GHz, while ensuring the protection of existing services in the considered frequency bands and, as appropriate, adjacent frequency bands;

7 to study a possible identification of frequency bands in the range 275-700 GHz for use by radiolocation service applications;

8 to review studies under *resolves to invite ITU-R 1 to 7* and elaborate regulatory measures for the possible introduction of millimetre and sub-millimetre wave imaging systems;

9 to complete studies in time for WRC-27,

*invites the 2027 world radiocommunication conference*

to review the results of these studies and take appropriate actions,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R.

**ADD**

**RESOLUTION COM6/21 (WRC-19)**

**Use of the frequency bands 37.5-39.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by aeronautical and maritime earth stations in motion communicating with geostationary space stations in the fixed-satellite service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) are globally allocated on a primary basis to the fixed-satellite service (FSS);
- b)* that there is an increasing need for mobile communications, including global broadband satellite services, and that some of this need can be met by allowing aeronautical and maritime earth stations in motion (ESIM) to communicate with space stations of the FSS operating in the frequency bands 37.5-40.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space);
- c)* that in the FSS, there are GSO satellite networks operating and/or planned for near-term operation in the frequency band allocated to the FSS in the range 37.5-51.4 GHz;
- d)* that some administrations have already deployed, and plan to expand their use of, ESIM with operational and future geostationary FSS networks;
- e)* that geostationary FSS networks in the frequency bands 37.5-39.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) are required to be coordinated and notified in accordance with the provisions of Articles **9** and **11** of the Radio Regulations;
- f)* that the frequency bands 37.5-39.5 GHz, 40.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz are also allocated to several other services on a primary basis, the allocated services are used by a variety of different systems in many administrations, and these existing services and their future development should be protected without undue constraints;
- g)* the need to encourage the development and implementation of new technologies in the FSS at frequencies above 30 GHz,

*recognizing*

- a)* that Article **21** contains power flux-density (pfd) limits for geostationary fixed-satellite services;
- b)* that advances in technology, including the use of tracking techniques, allow ESIM to operate within the characteristics of fixed earth stations of the FSS;
- c)* that WRC-15 has adopted footnote No. **5.527A** and Resolution **156 (WRC-15)** related to ESIM;
- d)* that ESIM addressed by this Resolution are not to be used for safety-of-life applications;

- e) that the frequency bands 40.5-42 GHz (space-to-Earth) in Region 2, 47.5-47.9 GHz (space-to-Earth) in Region 1, 48.2-48.54 GHz (space-to-Earth) in Region 1, 49.44-50.2 GHz (space-to-Earth) in Region 1, 48.2-50.2 GHz (Earth-to-space) in Region 2 are identified for use by high-density applications in the fixed-satellite service (No. **5.516B**);
- f) that the frequency bands 37-40 GHz, 40.5-43.5 GHz are available for high-density applications in the fixed service. (No. **5.547**);
- g) that the power flux-density in the band 42.5-43.5 GHz produced by any geostationary space station in the fixed-satellite service (space-to-Earth), or the broadcasting-satellite service operating in the 42-42.5 GHz band, shall not exceed, at the site of any radio astronomy station, the values listed in No. **5.551I**;
- h) that the allocation of the spectrum for the fixed-satellite service in the bands 42.5-43.5 GHz and 47.2-50.2 GHz for Earth-to-space transmission is greater than that in the band 37.5-39.5 GHz for space-to-Earth transmission in order to accommodate feeder links to broadcasting satellites. Administrations are urged to take all practicable steps to reserve the band 47.2-49.2 GHz for feeder links for the broadcasting-satellite service operating in the band 40.5-42.5 GHz (No. **5.552**);
- i) that the allocation to the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz is designated for use by high altitude platform stations. The use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz is subject to the provisions of Resolution **122 (Rev.WRC-19)** (No. **5.552A**);
- j) that the use of the bands 47.5-47.9 GHz, 48.2-48.54 GHz and 49.44-50.2 GHz by the fixed-satellite service (space-to-Earth) is limited to geostationary satellites (No. **5.554A**);
- k) that the power flux-density in the band 48.94-49.04 GHz produced by any geostationary space station in the fixed-satellite service (space-to-Earth) operating in the bands 48.2-48.54 GHz and 49.44-50.2 GHz shall not exceed  $-151.8$  dB(W/m<sup>2</sup>) in any 500 kHz band at the site of any radio astronomy station (No. **5.555B**);
- l) that in the frequency bands 49.7-50.2 GHz, 50.4-50.9 GHz and 51.4-52.6 GHz, Resolution **750 (Rev.WRC-19)** applies. Nos. **5.338A**, **5.340** and **5.340.1** apply among other Radio Regulations;
- m) that the fixed and mobile services are allocated on a primary basis in the frequency bands 37.5-42.5 GHz and 47.2-50.2 GHz on a global basis;
- n) that the frequency band 37.5-38 GHz is allocated to the space research service (deep space) in the space-to-Earth direction and the frequency band 40.0-40.5 GHz is allocated to the space research service and the Earth exploration-satellite service in the Earth-to-space direction on a primary basis;
- o) that the frequency bands 37.5-40.5 GHz and 38-39.5 GHz are also allocated to the Earth exploration-satellite service in the space-to-Earth direction on a secondary basis;
- p) that the frequency band 50.2-50.4 GHz is allocated on a primary basis to the EESS (passive) and space research (passive) services, which needs to be adequately protected;
- q) that all allocated services in these frequency bands should be taken into account,

*resolves to invite ITU-R*

- 1 to study the technical and operational characteristics of aeronautical and maritime ESIM that plan to operate within geostationary FSS allocations in the frequency bands 37.5-39.5 GHz, 40.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz;



2 to study sharing and compatibility between aeronautical and maritime ESIM operating with geostationary FSS networks in the frequency bands 37.5-39.5 GHz, 40.5-42.5 GHz, 47.2-50.2\* GHz and 50.4-51.4\* GHz and current and planned stations of existing services allocated to these bands and, where appropriate, to adjacent bands in order to ensure protection of, and not impose undue constraints on, those services;

3 to develop, for different types of ESIM, technical conditions and regulatory provisions for their operation, taking into account the results of the studies above,

*resolves to further invite the 2027 world radiocommunication conference*

to consider the results of the above studies and take necessary actions, as appropriate, provided that the results of the studies referred to in *resolves to invite ITU-R* are complete and agreed by ITU-R study groups.

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\* For the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz, sharing and compatibility studies for aeronautical ESIM should take into account all necessary steps to protect the terrestrial services to which the frequency band is allocated to.

**ADD**

**RESOLUTION COM6/22 (WRC-19)**

**Studies relating to spectrum needs and possible allocation of the frequency band 43.5-45.5 GHz to the fixed-satellite service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that satellite systems are increasingly being used to deliver broadband services and can help enable universal broadband access;
- b) that next-generation fixed-satellite service technologies for broadband will increase speeds (45 Mbps is already available), with faster rates expected in the near future;
- c) that technological developments such as advances in spot-beam technologies and frequency reuse are used by the fixed-satellite service (FSS) in spectrum above 30 GHz to increase the efficient use of spectrum;
- d) that fixed-satellite applications in spectrum above 30 GHz, such as gateways, should be easier to share with other radiocommunication services than high-density fixed-satellite service (HDFSS) applications;
- e) that FSS systems based on the use of new technologies above 30 GHz and associated with both geostationary (GSO) and non-geostationary (non-GSO) satellite constellations are capable of providing high-capacity and economically feasible communications even to the most isolated regions of the world,

*noting*

that the frequency band 43.5-45.5 GHz is allocated to the mobile, mobile-satellite, radionavigation, and radionavigation-satellite services on a primary basis,

*recognizing*

the need to protect existing services when considering frequency bands for possible additional allocations to any service,

*resolves to invite ITU-R*

to conduct, and complete in time for WRC-27:

- 1 studies considering additional spectrum needs for development of the fixed-satellite service, taking into account the frequency bands currently allocated to FSS, the technical conditions of their use and the possibility of optimizing the use of these frequency bands with a view to increasing spectrum efficiency;
- 2 sharing and compatibility studies with existing services, on a primary basis, to determine the suitability of new primary allocations to the FSS in the frequency band 43.5-45.5 GHz,

*further resolves*

to invite WRC-27 to consider the results of studies in *resolves to invite ITU-R 1* above and take appropriate actions, if necessary,

*invites administrations*

to participate actively in these studies by submitting contributions to ITU-R.

**ADD**

**RESOLUTION COM6/23 (WRC-19)**

**Sharing between stations in the fixed service and satellite services  
in the frequency bands 71-76 GHz and 81-86 GHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that WRC-2000 made a number of different allocation changes to the frequency bands 71-76 GHz and 81-86 GHz based on the requirements known at the time;
- b)* that the frequency bands 71-76 GHz and 81-86 GHz are allocated on a primary basis, amongst other services, to the fixed service globally;
- c)* that the frequency band 71-76 GHz is also allocated to the fixed-satellite service (space-to-Earth) and mobile-satellite service (space-to-Earth) and the frequency band 74-76 GHz is allocated to the broadcasting-satellite service;
- d)* that the frequency band 81-86 GHz is also allocated to the fixed-satellite service and mobile-satellite service (Earth-to-space);
- e)* that sharing conditions between fixed service and satellite services in the frequency bands 71-76 GHz and 81-86 GHz could not be fully developed at WRC-2000 due to lack of available information on these services at the time;
- f)* that now, nearly 20 years on, there have been a number of significant technology advances and network change requirements in the fixed service and the 71-76 GHz and 81-86 GHz frequency bands have become strategically important frequency bands for high capacity fixed service links including backhaul for future mobile networks;
- g)* that WRC-12 already addressed sharing and compatibility issues between fixed service and passive services in the frequency bands 71-76 GHz and 81-86 GHz and relevant adjacent frequency bands,

*recognizing*

- a)* that there is now much more information available in ITU-R on the characteristics and deployment of fixed service systems;
- b)* that there is an increasing number of satellite filings in the 71-76 GHz and 81-86 GHz frequency bands;
- c)* that Article **21** and other provisions of the Radio Regulations currently do not have the necessary technical and regulatory provisions to protect the fixed service use in the 71-76 GHz and 81-86 GHz frequency bands;
- d)* that Resolution **750 (Rev.WRC-19)** already contains necessary provisions to protect passive services in and adjacent frequency bands from emissions of the fixed service in the frequency bands 71-76 GHz and 81-86 GHz and there is no intention to change these provisions;
- e)* that there is no intention to change the existing allocations or status of those allocations in Article **5** of the Radio Regulations for the 71-76 GHz and 81-86 GHz frequency bands,

*resolves to invite ITU-R*

to conduct, as a matter of urgency and in time for WRC-27, the appropriate studies to determine power flux-density (pfd) and equivalent isotropically radiated power (e.i.r.p.) limits in Article **21** for satellite services to protect the fixed service in the frequency bands 71-76 GHz and 81-86 GHz without unduly constraining satellite systems,

*invites the 2027 world radiocommunication conference*

to consider the results of studies and take necessary action,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R.

**ADD**

**RESOLUTION COM6/24 (WRC-19)**

**Conditions for the use of the frequency bands 71-76 GHz and 81-86 GHz by stations in the satellite services to ensure compatibility with passive services**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that WRC-2000 made a number of different allocation changes to the frequency bands 71-76 GHz and 81-86 GHz based on the requirements known at the time;
- b) that the frequency band 71-76 GHz is also allocated to the fixed-satellite service (space-to-Earth) and mobile-satellite service (space-to-Earth) and 74-76 GHz is allocated to the broadcasting-satellite service;
- c) that the frequency band 81-86 GHz is also allocated to the fixed-satellite service and mobile-satellite service (Earth-to-space);
- d) that the frequency bands 76-77.5 GHz, 79-81 GHz and 81-86 GHz are allocated to the radio astronomy service on a primary basis;
- e) that the frequency band 86-92 GHz is allocated to the Earth exploration-satellite (passive), the space research (passive) and the radio astronomy services and that No. **5.340** applies in this frequency band;
- f) that compatibility conditions between satellite services in the frequency bands 71-76 GHz and 81-86 GHz and passive services in the bands and in adjacent bands could not be fully developed at WRC-2000 due to lack of available information on satellite services at the time;
- g) that WRC-12 already addressed sharing and compatibility issues between fixed service and passive services in the frequency bands 71-76 GHz and 81-86 GHz and relevant adjacent frequency bands;
- h) that Resolution **750 (Rev.WRC-19)** contains no provisions to protect the Earth exploration-satellite service (passive) in the 86-92 GHz frequency band from emissions of the space services in the 81-86 GHz frequency band;
- i) that Resolution **739 (Rev.WRC-19)** contains no provisions to protect the radio astronomy service in adjacent frequency bands from emissions of the space services in 71-76 GHz and 81-86 GHz,

*recognizing*

- a) that there is an increasing number of satellite filings in the 71-76 GHz and 81-86 GHz frequency bands;
- b) that Resolution **731 (Rev.WRC-19)** calls for consideration of sharing and adjacent-band compatibility between passive and active services above 71 GHz;
- c) that Resolution **750 (Rev.WRC-19)** already contains necessary provisions to protect passive services in and adjacent frequency bands from emissions of the fixed service in 71-76 GHz and 81-86 GHz and there is no intention to change these provisions;

*d)* that there is no intention to change the existing allocations or status of those allocations in Article 5 of the Radio Regulations for the 71-76 GHz and 81-86 GHz frequency bands,

*resolves to invite ITU-R*

to conduct the appropriate studies to determine the technical conditions for satellite services in the frequency band 81-86 GHz in order to protect the Earth exploration-satellite (passive) and the space research (passive) services in the frequency band 86-92 GHz and the radio astronomy service in the frequency bands mentioned in *considering d)* and *e)* without unduly constraining satellite systems,

*invites the 2027 world radiocommunication conference*

to consider the results of studies and take necessary action,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R.

**ADD**

**RESOLUTION COM6/25 (WRC-19)**

**Studies of technical, operational issues and regulatory provisions for non-geostationary fixed-satellite service satellite system feeder links in the frequency bands 71-76 GHz (space-to-Earth and proposed new Earth-to-space) and 81-86 GHz (Earth-to-space)**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that satellite systems are increasingly being used to deliver broadband services and are part of the solutions to enable broadband access;
- b)* that next-generation fixed-satellite service technologies are required to deliver multi-terabit speeds to support real-time demanding applications, which can be delivered by large constellation non-geostationary satellite operations (non-GSO) FSS systems;
- c)* that the particular characteristics of such high-capacity feeder links for large constellation non-GSO FSS systems involve highly directional antennas on both the satellites and the earth stations and, as such, may be conducive to frequency-sharing arrangements including, but not limited to, consideration of reverse-band operation in certain situations, and a consideration of whether No. 22.2 can be replaced by another sharing mechanism between GSO and non-GSO systems in some or all of the 71-76 GHz and 81-86 GHz bands;
- d)* that GSO networks are operating or planned to operate in these frequency bands and that some administrations are considering deploying high-density fixed-service links in these bands;
- e)* that studies are required in order to ascertain the feasibility of, and conditions for, non-GSO FSS satellite systems sharing the frequency bands 71-76 GHz (space-to-Earth) and 81-86 GHz (Earth-to-space) for feeder links, with GSO links and with other non-GSO FSS satellite systems;
- f)* that studies are required to ascertain the feasibility of, and conditions for, a possible new allocation to FSS (Earth-to-space), for reverse-band feeder links for non-GSO FSS satellite systems in the frequency band 71-76 GHz;
- g)* that the frequency bands 71-76 GHz and 81-86 GHz are allocated to various services,

*considering further*

- a)* that Recommendations ITU-R S.1323, ITU-R S.1325, ITU-R S.1328, ITU-R S.1526 and ITU-R S.1529 provide information on non-GSO and GSO FSS system characteristics, operational requirements and protection criteria that may be used in sharing studies;
- b)* that Recommendation ITU-R F.2006 provides information on radio-frequency channel and block arrangements for fixed wireless systems operating in the 71-76 GHz and 81-86 GHz bands;
- c)* that Recommendation ITU-R M.2057 provides information on systems characteristics of automotive radars operating in the frequency band 76-81 GHz for intelligent transport systems applications;



d) that the ITU-R expert group is currently developing FSS characteristics in 71-76 GHz and 81-86 GHz to provide additional system characteristics of planned high millimetre-wave FSS networks and systems,

*noting*

a) that filing information for GSO and non-GSO FSS satellite networks in the frequency bands 71-76 GHz (space-to-Earth) and 81-86 GHz (Earth-to-space) have recently been communicated to the Radiocommunication Bureau;

b) that the frequency band 71-76 GHz is also allocated to the fixed and mobile services on a primary basis and is extensively used for applications in fixed service;

c) that the frequency band 74-76 GHz is also allocated to the broadcasting and broadcasting-satellite services on a primary basis, as well as the space research service in the space-to-Earth direction on a secondary basis;

d) that, in the band 74-76 GHz, the fixed, mobile and broadcasting services shall not cause harmful interference to stations of the fixed-satellite service in accordance with provision No. **5.561**;

e) that the frequency band 81-86 GHz is also allocated to the fixed, mobile and radio astronomy services on a primary basis, as well as the space research service in the space-to-Earth direction on a secondary basis;

f) that Resolution **750 (Rev.WRC-19)** applies in the frequency band 81-86 GHz in accordance with provision No. **5.338A**;

g) that the frequency band 81-84 GHz is also allocated to the mobile-satellite service in the Earth-to-space direction on a primary basis;

h) that the frequency band 81-81.5 GHz is also allocated to the amateur and amateur-satellite services on a secondary basis;

i) that the frequency band 76-81 GHz is also allocated to the radiolocation service on a primary basis,

*recognizing*

a) that No. **21.16** does not contain power flux-density limits applicable to FSS satellites to protect fixed and mobile services with allocations in the frequency band 71-76 GHz;

b) that the frequency band 86-92 GHz is allocated on a primary basis to the EESS (passive), radio astronomy, and space research (passive) services, which must be protected, and according to No. **5.340** all emissions are prohibited in the frequency band;

c) that No. **5.149** indicates that radio astronomy observations are carried out in the frequency band 76-86 GHz and that mitigation measures may have to be defined in this regard,

*resolves to invite ITU-R*

to conduct, and complete in time for WRC-27:

1 studies considering additional spectrum needs for development of non-GSO satellite systems in the fixed-satellite service in the frequency bands 71-76 GHz and 81-86 GHz, the technical conditions of their use, and the possibility of optimizing the use of these frequency bands with a view to increasing spectrum efficiency;

2 studies of technical and operational issues for the operation of feeder links for non-GSO FSS satellite systems in the frequency bands 71-76 GHz (space-to-Earth and the feasibility of a possible new allocation for reverse-band feeder operation in the Earth-to-space direction) and 81-86 GHz (Earth-to-space) as well as consideration of regulatory provisions in some or all of these frequency bands for non-GSO systems coordinating and sharing with both GSO and other non-GSO systems in the FSS, MSS and BSS, and their specific earth stations, taking into account the future growth of these uses and the need to ensure their protection;

3 sharing and compatibility studies between non-GSO FSS satellite system feeder links in the frequency bands 71-76 GHz (space-to-Earth and a possible new allocation for non-GSO FSS in the Earth-to-space direction) and 81-86 GHz (Earth-to-space), with other existing co-primary services, including fixed and mobile services in those frequency bands, and in adjacent frequency bands, taking into account the need to ensure the protection of these services;

4 studies of possible necessary provisions of the Radio Regulations to ensure the protection of the EESS (passive) and space research (passive) in the frequency bands 86-92 GHz from non-GSO FSS transmissions, including study of aggregate FSS interference;

5 studies towards ensuring protection of the radio astronomy service operating in the frequency bands 76-86 GHz and 86-92 GHz from non-GSO FSS transmissions, taking into account *recognizing b)* above, including study of aggregate FSS interference effects from networks and systems operating or planned to operate in the frequency bands described in *resolves to invite ITU-R 2* above,

*resolves*

to invite WRC-27 to consider the results of the above studies and take appropriate action,

*invites administrations*

to participate in the studies by submitting contributions to ITU-R.

ADD

RESOLUTION COM6/26 (WRC-19)

**Study of technical and operational matters, and regulatory provisions, for space-to-space transmissions in the Earth-to-space direction in the frequency bands [1 610-1 645.5 and 1 646.5-1 660.5 MHz] and space-to-Earth direction in the frequency bands [1 525-1 544 MHz], [1 545-1 559 MHz], [1 613.8-1 626.5 MHz] and [2 483.5-2 500 MHz] among non-geostationary and geostationary satellites operating in the mobile-satellite service\***

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the definition of mobile-satellite service (MSS) in No. **1.25** of the Radio Regulations includes communication between space stations;
- b) that the definition of inter-satellite service (ISS) in No. **1.22** of the Radio Regulations includes only links between space stations, and that the term *inter-satellite link* (ISL) in this resolution is taken to mean a radiocommunication service link between artificial satellites;
- c) that many non-GSO satellites operate with limited and non-real-time connectivity to earth stations;
- d) that space-to-space communication between such non-GSO satellites and geostationary (GSO) MSS satellites would enhance the security and efficiency of operations;
- e) that MSS satellites operating in the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660.5 MHz and 2 483.5-2 500 MHz can support these types of operation;
- f) that using the 1 610-1 645.5 MHz and 1 646.5-1 660.5 MHz frequency bands allocated to the MSS (Earth-to-space) for transmissions in the Earth-to-space direction from non-geostationary orbit (non-GSO) MSS space stations toward MSS space stations operating in higher orbital altitudes including geostationary orbit (GSO) may increase spectral efficiency in these frequency bands;
- g) that using the 1 525-1 544 MHz, 1 545-1 559 MHz, 1 613.8-1 626.5 MHz and 2 483.5-2 500 MHz frequency bands allocated to the MSS (space-to-Earth) for transmissions in the space-to-Earth direction from MSS space stations operating in higher orbital altitudes, including the GSO, toward non-GSO MSS satellites, may increase spectral efficiency in these frequency bands;
- h) that all allocations to the mobile-satellite service in the above frequency bands include a space-to-Earth or Earth-to-space direction indicator, but do not include a space-to-space direction indicator;

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\* The appearance of square brackets around certain frequency bands in this Resolution is understood to mean that WRC-23 will consider and review the inclusion of these frequency bands with square brackets and decide, as appropriate.

- i)* that the ITU-R has begun preliminary studies on the technical and operational issues associated with the operation of space-to-space links between MSS non-GSO satellites and GSO MSS satellites in the above frequency bands, and no studies has been conducted on the technical and operational issues associated with the operation of space-to-space links between non-GSO MSS satellites and non-GSO MSS satellites in the above frequency bands;
- j)* that it is technically feasible for a lower orbital altitude non-GSO space station to transmit data to and receive data from a higher orbital altitude non-GSO or GSO space station when passing within the satellite antenna coverage beam that is directed toward the Earth;
- k)* that several satellite systems have been relying on satellite-to-satellite communication in existing satellite bands under No. 4.4 and such reliance on No. 4.4 does not provide a sound basis for continued development of such systems nor the confidence in commercial viability and availability of the service to the end users;
- l)* that there is growing interest for utilizing space-to-space satellite links for a variety of applications;
- m)* that precedent for space-to-space links sharing with Earth-to-space and space-to-Earth exists for space operation, Earth exploration-satellite and space research in the frequency bands 2 025-2 110 MHz, and 2 200-2 290 MHz through the inclusion of a space-to-space allocation,
- recognizing*
- a)* that it is necessary to study the impact to other services, as well as Earth-to-space and space-to-Earth operation within the MSS, from the operation of intersatellite links in the above frequency bands, taking into account applicable footnotes, to ensure compatibility with all primary allocated services in these bands and the adjacent bands and avoid harmful interference;
- b)* that there should be no additional regulatory or technical constraints imposed on primary services to which the band and the adjacent bands is currently allocated;
- c)* that it is necessary to study whether space-to-Earth direction transmissions from space stations in higher orbital altitudes, including GSO space stations, can be successfully received by lower orbital altitude non-GSO satellites, without imposing any additional constraints on all allocated services in these bands;
- d)* that the sharing scenarios may vary widely because of the wide variety of orbital characteristics of the non-GSO MSS space stations;
- e)* that out-of-band emissions, signals due to antenna pattern sidelobes, reflections from receiving space stations, and in-band unintentional radiation due to Doppler shifts, may impact services operating in the same and adjacent or nearby frequency bands;
- f)* that currently the only option for MSS space stations in the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646-1 660.5 MHz and 2 483.5-2 500 MHz needing to communicate with other orbital space stations is to operate under No. 4.4 of the Radio Regulations, without recognition and on a non-harmful interference/non-protected basis in frequency bands allocated to another space service,
- recognizing further*
- a)* that use of bands by the mobile-satellite service in the frequency range 1-3 GHz are subject to existing Resolutions, coordination requirements and country footnotes taking into account, in particular, the protection of safety services and aeronautical mobile-satellite (R) services, and of the Global Maritime Distress and Safety System;

b) that the fixed and mobile services are allocated on a primary basis in the frequency band 2 483.5-2 500 MHz on a global basis and that the fixed service is also allocated on a primary basis in 1 525-1 530 MHz in Regions 1 and 3;

c) that the radionavigation-satellite service is allocated on a primary basis in the frequency band 1 559-1 610 MHz for both space-to-Earth and space-to-space use,

*noting*

a) that section 3.1.3.2 of the Director's Report to WRC-19 highlights that the Bureau has received an increased number of Advance Publication Information (API) for non-geostationary satellite networks in frequency bands which are not allocated by Article 5 of the Radio Regulations for the type of foreseen service, including satellite network filings for inter-satellite applications in bands allocated only in the Earth-to-space or space-to-Earth directions;

b) that the same Director's Report concludes that in view of recent technical developments and the increasing number of submissions of inter-satellite links in frequency bands not allocated to the inter-satellite service or to a space service in the space-to-space direction, the WRC-19 may wish to consider means to give recognition to these uses based on the conditions derived from studies by ITU-R Working Parties 4A and 4C in order to avoid interfering with existing systems operating in the same frequency bands,

*resolves to invite ITU-R*

1 to study the technical and operational characteristics of different types of non-GSO MSS space stations that operate or plan to operate space-to-space links with GSO MSS networks in the following frequency bands:

a) Earth-to-space direction in the frequency bands [1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz]; and

b) space-to-Earth direction in the frequency bands [1 525-1 544 MHz and 1 545-1 559 MHz];

2 to study the technical and operational characteristics of different types of non-GSO MSS space stations that operate or plan to operate space-to-space links with non-GSO and GSO MSS networks in the following frequency bands:

a) Earth-to-space direction in the frequency band [1 610-1 626.5 MHz]; and

b) space-to-Earth direction in the frequency bands [1 613.8-1 626.5 MHz and 2 483.5-2 500 MHz];

3 to study sharing and compatibility between space-to-space links in the cases described in *resolves* 1 and 2; and

– current and planned stations of the MSS;

– other existing services allocated in the same frequency bands; and

– other existing services allocated in adjacent frequency bands,

to ensure protection of, and not impose undue constraints on, other MSS operations and other services allocated in those frequency bands and in adjacent frequency bands, taking into account *recognizing further a) to c)*;

4 to develop technical conditions and regulatory provisions for operation of space-to-space links in these bands, including new or revised MSS allocations or the addition of inter-satellite service allocations, on a secondary basis, while ensuring the protection of, and without imposing additional constraints on, other MSS operations or services allocated in those and adjacent frequency bands, taking into account the results of the studies called for in *resolves to invite ITU-R 1, 2, and 3* above;

5 to complete these studies by the 2027 world radiocommunication conference,  
*invites administrations*

to participate in the studies by submitting contributions to ITU-R,

*invites the 2027 world radiocommunication conference*

to consider the results of the above studies and take necessary regulatory actions, as appropriate.

**ADD**

**RESOLUTION COM6/27 (WRC-19)**

**Studies on possible allocations to the land mobile service (excluding IMT) in the frequency band 1 300-1 350 MHz for use by administrations for the future development of terrestrial mobile-service applications**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that mobile connectivity contributes to global economic and social development;
- b) that demand has been increasing steadily for mobile communication services throughout the world;
- c) that mobile services plays a large and increasing role in connecting users to the Internet;
- d) that technological advancement and user needs will promote innovation and accelerate the further development of communication applications;
- e) that timely availability of spectrum is important to support future applications;
- f) that all studies leading up to WRC-15 between radars and International Mobile Telecommunication (IMT) in this frequency range concluded, based on the parameters provided at that time, that within the same geographical area co-frequency operation of mobile broadband systems and radar was not feasible;
- g) that there is widespread usage of this frequency range in some countries for radar;
- h) that WRC-15 noted that in countries where the band is not fully used by these systems, studies were undertaken in ITU-R that showed sharing may be feasible in those countries subject to various mitigation and coordination measures, however no conclusions were drawn to their applicability, complexity, practicability or achievability;
- i) some administrations are considering the feasibility of spectrum re-farming/relocating some services operating in portions of the frequency band 1 300-1 350 MHz for land mobile service, which requires a significant investment;
- j) advanced spectrum sharing techniques are under development that could facilitate additional utilization of spectrum by a number of different services of operation;
- k) the need to protect existing services when considering frequency bands for possible additional allocations to any service,

*recognizing*

- a) the frequency band 1 300-1 350 MHz is allocated to the radiolocation, aeronautical radionavigation and radionavigation satellite service on a primary basis;
- b) that the radionavigation satellite service (space-to-Earth) (space-to-space) is allocated, among others, on a primary basis in the adjacent frequency band 1 240-1 300 MHz;
- c) that No. **5.149** calls for administrations to take all practicable steps to protect the radio astronomy service from harmful interference in the frequency band 1 330-1 400 MHz, which includes spectral lines of importance for current astronomical investigations,

*resolves to invite ITU-R*

- 1 to develop technical and operational characteristics of land mobile service systems in the frequency band 1 300-1 350 MHz;
- 2 to conduct sharing and compatibility studies to ensure protection of those services to which the frequency band is allocated on a primary basis, and adjacent bands as appropriate, taking into account *considering f*), for the frequency band 1 300-1 350 MHz;
- 3 to complete these studies by the 2027 world radiocommunication conference,

*resolves to invite WRC-27*

to consider, on the basis of the studies conducted under *resolves to invite ITU-R* above, possible allocations to the land mobile service.



**ADD**

## RESOLUTION COM6/28 (WRC-19)

### **Considerations to improve the utilization of the VHF maritime frequencies in Appendix 18**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that Appendix **18** identifies frequencies to be used for distress and safety communications and other maritime communications on an international basis;
- b)* that congestion on Appendix **18** frequencies requires consideration of efficient new technologies;
- c)* that ITU-R is conducting ongoing studies on improving efficiency in the use of Appendix **18**;
- d)* that the use of digital technologies will make it possible to respond to the emerging demand for new uses and ease congestion;
- e)* that use of existing maritime mobile service allocations, where practicable, for ship and port security and enhanced maritime safety would be preferable, particularly where international interoperability is required;
- f)* that changes made in Appendix **18** should not prejudice the future use of these frequencies or the capabilities of systems or new applications required for use by the maritime mobile service;
- g)* that IMO has initiated a regulatory scoping exercise for the use of Maritime Autonomous Surface Ships (MASS);
- h)* that the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) is developing Ranging Mode (R-Mode), which is a radionavigation system that is intended to provide a contingency system in case of temporary global navigation satellite system (GNSS) disruption, to support e-navigation,

*recognizing*

- a)* that it is desirable to enhance maritime safety, ship and port security via spectrum-dependent systems;
- b)* that ITU and relevant international organizations have initiated related studies on the use of digital technologies for maritime safety, ship and port security;
- c)* that studies will be required to provide a basis for considering possible regulatory provisions to improve maritime safety, ship and port security, which may need access to spectrum for experimental use;
- d)* that in order to provide worldwide interoperability of equipment on ships, there should be harmonized technologies, or interoperable technologies, implemented under Appendix **18**;

e) that administrations' and some relevant international organizations' efforts to continue the development of R-Mode to support the implementation of e navigation may require a review of the Radio Regulations,

*noting*

a) that WRC-12, WRC-15 and WRC-19 have reviewed Appendix **18** to improve use and efficiency for data communication using digital systems;

b) that maritime on-board communication systems have implemented digital technologies for voice communication as described in Recommendation ITU-R M.1174 to improve the efficient use of the 450-470 MHz frequency band;

c) that digital systems have been implemented in the land mobile service,

*further noting*

that WRC-12, WRC-15 and this conference have reviewed Appendix **18** to improve efficiency and introduce frequency bands for new digital technology for data communications, e.g. for the introduction of the VHF data exchange system (VDES),

*resolves to invite WRC-27*

1 to consider possible changes to Appendix **18** in order to enable use in the maritime mobile service for a future implementation of new technologies, for the improvement of the efficient use of the maritime frequency bands;

2 to consider possible changes to the Radio Regulations for an implementation of R-Mode as a new maritime radionavigation service,

*invites relevant international organizations*

to actively participate in the studies by providing requirements and information that should be taken into account in ITU-R studies,

*invites ITU-R*

to conduct studies to determine the necessary regulatory provisions and spectrum needs according to *resolves to invite WRC-27*,

*instructs the Secretary-General*

to bring this Resolution to the attention of IMO and other international and regional organizations concerned.

**ADD**

**RESOLUTION COM6/29 (WRC-19)**

**Use of the frequency band 22.55-23.15 GHz by the Earth exploration-satellite service (Earth-to-space)**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the frequency band 25.5-27 GHz is allocated worldwide on a primary basis to the Earth exploration-satellite (EESS) (space-to-Earth);
- b) that an EESS (Earth-to-space) allocation in the 22.55-23.15 GHz frequency range would allow its use for satellite tracking, telemetry and control (TT&C) in combination with the existing EESS (space-to-Earth) allocation referred to in *considering a)*;
- c) that an EESS (Earth-to-space) allocation in the 23 GHz frequency range would allow for uplinks and downlinks on the same transponder, increasing efficiency and reducing satellite complexity,

*recognizing*

- a) that the frequency band 22.55-23.55 GHz is allocated to the fixed, inter-satellite and mobile services;
- b) that the frequency band 22.55-23.15 GHz is also allocated to the space research service (Earth-to-space);
- c) that the space research (Earth-to-space) allocation in the 22.55-23.15 GHz frequency band is paired with the space research (space-to-Earth) allocation in the 25.5-27 GHz frequency band;
- d) that the possible development of EESS (Earth-to-space) in the 22.55-23.15 GHz frequency band should not constrain the use and development of the space research service (Earth-to-space) in this frequency band,

*resolves to invite ITU-R*

- 1 to conduct sharing and compatibility studies between EESS (Earth-to-space) systems and the existing services mentioned in *recognizing a)* and *b)*, while ensuring the protection of, and not imposing undue constraints on, all services and future developments of existing services, in the frequency band 22.55-23.15 GHz;
- 2 to complete the studies, taking into account the present use of the allocated frequency band, with a view to presenting, at the appropriate time, the technical basis for the work of WRC-27,

*invites the 2027 world radiocommunication conference*

to review the results of these studies with a view to providing a worldwide primary allocation to EESS (Earth-to-space) in the frequency band 22.55-23.15 GHz,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R,

*invites the Secretary-General*

to bring this Resolution to the attention of the international and regional organizations concerned.

**ADD**

**RESOLUTION COM6/30 (WRC-19)**

**Removal of the limitation regarding aeronautical mobile in the frequency range  
694-960 MHz for user equipment non-safety International Mobile  
Telecommunications applications**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that there is a need for greater connectivity of aeronautical vehicles to address existing demand and future requirements from the aeronautical community;
- b)* that current and future International Mobile Telecommunications (IMT) networks can provide connectivity services to helicopters, small aircraft and Unmanned Aircraft Systems (UAS);
- c)* that current and future IMT networks may provide communication functions for the beyond visual line-of-sight operation of UAS;
- d)* that future IMT networks may support direct air to ground connectivity services to commercial airplanes with specific equipment on board airplanes;
- e)* that the IMT capacities identified in the considering above have been demonstrated feasible by several studies and are currently being developed by standards development organizations,

*noting*

- a)* that ITU-R sharing and compatibility studies supporting the identification of specific frequency bands to IMT did not consider the use cases described in *considering b) to e)*;
- b)* that the 694-960 MHz frequency band is allocated on a primary basis to the mobile except aeronautical mobile service in Region 1;
- c)* that the 890-902 MHz and 928-942 MHz frequency bands are allocated on a primary basis to the mobile except aeronautical mobile service in Region 2 and that the 902-928 MHz frequency band is allocated on a secondary basis to the mobile except aeronautical mobile service in Region 2;
- d)* that Nos. **5.312** and **5.323** allocate the 645-960 MHz frequency band or parts thereof to the aeronautical radionavigation service on a primary basis in several countries of Region 1;
- e)* that the 694-960 MHz frequency band is allocated on a primary basis to the broadcasting service in Region 1;
- f)* that Resolution **224 (Rev.WRC-19)** addresses frequency bands for the terrestrial component of IMT below 1 GHz;
- g)* that Resolution **749 (Rev.WRC-19)** addresses the use of the frequency band 790-862 MHz in countries of Region 1 and the Islamic Republic of Iran by mobile applications and by other services;
- h)* that Resolution **760 (Rev.WRC-19)** addresses provisions relating to the use of the frequency band 694-790 MHz in Region 1 by the mobile, except aeronautical mobile, service and by other services,

*recognizing*

that the removal of the limitation regarding aeronautical mobile in the proposed bands would enable the unified use of the IMT identifications by aeronautical user equipment throughout the Regions;

*resolves to invite ITU-R*

- 1 to assess relevant aeronautical mobile service scenarios for air to ground and ground to air connectivity for airborne UE in IMT networks to be addressed in compatibility and sharing studies;
- 2 to identify relevant technical parameters associated with the aeronautical mobile systems;
- 3 to conduct sharing and compatibility studies with existing services, including in adjacent frequency bands;
- 4 to determine the possibility to remove the exception of the aeronautical mobile service or other suitable regulatory measures in the frequency range 694-960 MHz in Region 1 and 890-942 MHz in Region 2 based on the results of studies,

*invites the 2027 World Radiocommunication Conference*

to consider the results of the above studies and take appropriate actions.

**MOD****RECOMMENDATION 16 (REV.WRC-19)****Interference management for stations that may operate under more than one terrestrial radiocommunication service**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that radiocommunication services and spectrum allocation aim at achieving international uniformity in spectrum usage in order to simplify interference management rules and promote equitable spectrum access;
- b)* that the principles behind radiocommunication services and spectrum allocation have been adopted since the first Radio Telegraph Conference of Berlin in 1906, where frequency bands were allocated to the maritime service;
- c)* that technological, market and regulatory developments are resulting in significant changes to the radiocommunication environment, especially in bands below 6 GHz;
- d)* that these changes to the radiocommunication environment, and in particular the convergence of services, will make the classification of certain radio stations under existing radiocommunication services increasingly difficult;
- e)* that the issues raised by the convergence of services may not always be addressed through the redefinition of radiocommunication services;
- f)* that previous world radiocommunication conferences (WRCs) have considered the possibility of enhancing the international spectrum regulatory framework in the light of the changing radiocommunication environment;
- g)* that ITU-R studies to enhance the international spectrum management framework have so far been carried out under the traditional framework of radiocommunication services and spectrum allocation only;
- h)* that administrations have adopted, or are in the process of adopting, approaches to spectrum management on a national basis that are not based on the above traditional framework, with a view to improving flexibility and to catering for the changing radiocommunication environment;
- i)* that in order to obtain the required degree of flexibility at national level while not causing harmful interference at international level, these administrations may use No. 4.4 of the Radio Regulations;
- j)* that through the application of No. 4.4, administrations having adopted national spectrum management that is not based on the above traditional framework and that is in derogation of the Table of Frequency Allocations and of the provisions of the Radio Regulations cannot claim protection for their radio stations from cross-border harmful interference, or cause harmful interference to stations operated in conformance with the Radio Regulations by other administrations,

*recognizing*

- a) that improvement of the international spectrum management framework is a continuous process;
- b) that Article 42 of the Constitution provides that administrations reserve for themselves the right to make special arrangements on telecommunications matters which do not concern Member States in general, so far as this is not in conflict with the provisions of the Constitution, the Convention or the Administrative Regulations, so far as concerns harmful interference which their operation might cause to the radio operations of other Member States,

*recommends*

that ITU-R study all aspects of interference management resulting from the impact of technical convergence on the radio regulatory environment, involving stations that may operate under more than one terrestrial radiocommunication service, particularly cross-border interference cases, to ensure harmful interference is not caused to stations of other Member States,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R.



**MOD****RECOMMENDATION 36 (REV.WRC-19)****Role of international monitoring in reducing apparent congestion in the use of orbit and spectrum resources**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that the geostationary-satellite orbit and the radio-frequency spectrum are limited natural resources and are being increasingly utilized by space services;
- b) the desirability of achieving a more effective use of the geostationary-satellite orbit and radio-frequency spectrum in order to assist administrations in satisfying their requirements and, to that end, the desirability of taking steps to make the **Master International Frequency Register** reflect more accurately the actual use being made of these resources;
- c) that monitoring information should assist ITU-R in discharging this function;
- d) that facilities for monitoring of emissions originating from space stations are expensive,

*recognizing*

that an international monitoring system cannot be fully effective unless it covers all areas of the world,

*invites ITU-R*

to study and make recommendations concerning the facilities required to provide adequate coverage of the world with a view to ensuring efficient use of resources,

*invites administrations*

- 1 to make every effort to provide monitoring facilities as envisaged in Article **16**;
- 2 to inform ITU-R of the extent to which they are prepared to cooperate in such monitoring programmes as may be requested by ITU-R;
- 3 to consider the various aspects of monitoring emissions originating from space stations to enable the provisions of Articles **21** and **22** to be applied.

**MOD****RECOMMENDATION 63 (REV.WRC-19)****Relating to the provision of formulae and examples for  
the calculation of necessary bandwidths**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that Appendix 1, Section I requires that the necessary bandwidth be part of the full designation of emissions;
- b) that Recommendation ITU-R SM.1138, gives a partial list of examples and formulae for the calculation of the necessary bandwidth of some typical emissions;
- c) that sufficient information is not available for the determination of the  $K$ -factors used throughout the table of examples of the necessary bandwidth in Recommendation ITU-R SM.1138;
- d) that, especially with regard to the efficient utilization of the radio-frequency spectrum, monitoring and the notification of emissions, it is required that necessary bandwidths for the individual classes of emission be known;
- e) that for reasons of simplification and international uniformity it is desirable that measurements for determining the necessary bandwidth be made as seldom as possible,

*recommends that ITU-R*

1 provide, from time to time, additional formulae for the determination of necessary bandwidth for common classes of emission, as well as examples to supplement those given in Recommendation ITU-R SM.1138;

2 study and provide values of supplementary  $K$ -factors required for the calculation of the necessary bandwidth for common classes of emission,

*invites the Radiocommunication Bureau*

to publish examples of such calculations in the Preface to the International Frequency **Information Circular (BR IFIC)**.

**MOD**

RECOMMENDATION 206 (REV.WRC-19)

**Studies on the possible use of integrated mobile-satellite service and ground component systems in the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) that mobile-satellite service (MSS) systems may provide service to a wide area;
- b) that integrated MSS systems employ a satellite component and a ground component where the ground component is complementary to the satellite component and operates as, and is, an integral part of the MSS system. In such systems, the ground component is controlled by the satellite resource and network management system. Further, the ground component uses the same portions of MSS frequency bands as the associated operational mobile-satellite system;
- c) that MSS systems have a limited capacity for providing reliable radiocommunication services in urban areas on account of natural or man-made obstacles and that the ground component of an integrated MSS system can mitigate blockage areas, as well as allow for indoor service coverage;
- d) that MSS systems can improve coverage of rural areas, thus being one element that can bridge the digital divide in terms of geography;
- e) that MSS systems are suitable for public protection and disaster relief communications, as stated in Resolution **646 (Rev.WRC-19)**;
- f) that the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz are allocated on a primary basis to the mobile-satellite service and to other services but that none of these bands are allocated to the mobile service on a primary basis except by country footnote;
- g) that within their territories in some of the bands identified in *considering f)*, some administrations have authorized or plan to authorize integrated MSS systems;
- h) that ITU-R has performed frequency sharing studies and has determined that the coexistence between independent systems in the MSS and systems in the mobile services in the same spectrum without harmful interference is not feasible in the same or adjacent geographical area,

*recognizing*

- a) that ITU-R has not performed studies on sharing, technical or regulatory issues with regard to integrated MSS systems, but that some administrations have performed such studies;
- b) that the radionavigation-satellite service in the 1 559-1 610 MHz band and the radio astronomy service in the bands 1 610.6-1 613.8 MHz and 1 660-1 670 MHz need to be protected from harmful interference;
- c) that the MSS in the 1 525-1 559 MHz and 1 626.5-1 660.5 MHz bands needs to be protected from harmful interference that may be caused due to co-channel and/or adjacent channel operation of the ground component of integrated MSS systems;

*d)* that Nos. **5.353A** and **5.357A** are applicable to MSS systems in different portions of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz with respect to the spectrum requirements and prioritization of communications for the Global Maritime Distress and Safety System and the aeronautical mobile-satellite (R) service;

*e)* that, subject to satisfactory measures being taken to protect RNSS systems, integrated MSS systems may be deployed in the 1 980-2 010 MHz, 2 170-2 200 MHz, 2 483.5-2 500 MHz bands in all three Regions and also in the 2 010-2 025 MHz band in Region 2, all of which bands are allocated both to the MSS and MS services, without the need for ITU-R studies,

*noting*

*a)* that the combined wide-area and urban coverage capabilities of integrated MSS systems may contribute to meeting the particular needs of developing countries such as is noted in Resolution **212 (Rev.WRC-07)\***;

*b)* that some administrations that are planning to implement or are implementing integrated systems within their national territories have imposed limitations, in rules and authorization actions, on the e.i.r.p. density that the ground component of such systems may produce into bands allocated to the radionavigation-satellite service;

*c)* that there are a limited number of frequency bands allocated to the MSS, that these bands are already congested, and that the introduction of integrated ground components may in some instances make spectrum access for other MSS systems more difficult;

*d)* that administrations implementing integrated MSS systems may provide, in bilateral consultations of administrations, information on system characteristics of the ground component,

*recommends*

to invite ITU-R to conduct studies on the possible use of integrated MSS systems in the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz, as appropriate, taking into account the need to protect existing and planned systems, as well as the above *considering, recognizing and noting*, and in particular *recognizing a), b) and c)*,

*invites administrations*

to participate as necessary in the ITU-R studies taking into account *recognizing a)*.

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\* *Note by the Secretariat:* This Resolution was revised by WRC-15.

**MOD****RECOMMENDATION 207 (REV.WRC-19)****Future IMT systems**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that the future development of IMT is being studied by ITU-R in accordance with Recommendations ITU-R M.1645 and ITU-R M.2083, and further Recommendations are to be developed for IMT;
- b)* that the future development of IMT for 2020 and beyond is foreseen to address the need for higher data rates, corresponding to user needs, as appropriate, than those of currently deployed IMT systems;
- c)* the need to define the requirements associated with ongoing enhancement of future IMT systems,

*noting*

- a)* the ongoing relevant studies by ITU-R on **IMT-2020**, in particular the outputs from Question ITU-R 229/5;
- b)* the need to take into consideration requirements of applications of other services,

*recommends*

to invite ITU-R to study as necessary technical, operational and spectrum related issues to meet the objectives of future development of IMT systems.

**MOD**

**RECOMMENDATION 316 (REV.WRC-19)**

**Use of ship earth stations within harbours and other waters  
under national jurisdiction**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*recognizing*

that permitting the use of ship earth stations within harbours and other waters under national jurisdiction belongs to the sovereign right of countries concerned,

*recalling*

that a number of frequency bands have been allocated to the mobile-satellite service and maritime mobile-satellite service and can be used for maritime-related communications via ship earth stations,

*considering*

- a)* that the maritime mobile-satellite service, which is at present in operation worldwide, has improved maritime communications greatly and has contributed much to the safety and efficiency of ship navigation, and that fostering and developing the use of that service in future will contribute further to their improvement;
- b)* that the maritime mobile-satellite service plays an important role in the Global Maritime Distress and Safety System (GMDSS),

*recommends*

that all administrations should permit, to the extent possible, ship earth stations to operate within harbours and other waters under national jurisdiction, in the frequency bands used for the GMDSS.

**MOD****RECOMMENDATION 503 (REV.WRC-19)****High-frequency broadcasting**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a) the congestion in the HF broadcasting bands;
- b) the extent of co-channel and adjacent-channel interference;
- c) that AM reception quality is relatively poor compared with FM broadcast or CD quality;
- d) that new digital techniques have enabled significant improvements in reception quality to be obtained in other broadcasting bands;
- e) that the introduction of digital modulation systems in the broadcasting bands below 30 MHz has been shown to be feasible using low bit-rate coding;
- f) that Resolution **517 (Rev.WRC-19)** invites ITU-R to continue its studies on digital techniques in HF broadcasting, **with a view to assisting the development of this technology for future use;**
- g) **that studies on this subject are currently being carried out by ITU-R, with a view to issuing a relevant Recommendation,**

*recognizing*

- a) that the implementation of an ITU-recommended worldwide system for digital sound in the HF bands would be extremely beneficial, particularly for developing countries, since it allows for:
  - mass-scale production resulting in receivers as economical as possible;
  - more economical analogue-to-digital conversion of existing transmitting infrastructures;
- b) that the above system would result in digital receivers having a number of advanced features such as assisted tuning, improved audio quality and robustness to co-channel and adjacent-channel interference, which would greatly contribute to a better spectrum utilization,

*recommends administrations*

- 1 to draw the attention of manufacturers to this matter, in order to ensure that future digital receivers take full advantage of the advanced technology while maintaining low cost;
- 2 to encourage manufacturers to monitor closely the development of the studies carried out by ITU-R, with a view to starting mass production of new low-cost digital receivers as soon as possible after the approval of relevant ITU-R Recommendation(s).

**ADD****RECOMMENDATION COM4/1 (WRC-19)****Harmonization of frequency bands for evolving Intelligent Transport Systems applications under mobile-service allocations**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*considering*

- a)* that information and communication technologies are integrated in a vehicle system to provide evolving Intelligent Transport Systems (ITS) communication applications for the purpose of improving traffic management and assisting safer driving;
- b)* that there is a need for consideration of spectrum harmonization for evolving ITS applications, which are being used globally or regionally;
- c)* that there is a need to integrate various technologies, including radiocommunications, into land transportation systems;
- d)* that many new connected vehicles use intelligent technologies in the vehicles' combined advanced traffic-management, advanced traveller-information, advanced public transportation-management and/or advanced fleet-management systems to improve traffic management;
- e)* that future vehicular radiocommunication technologies and ITS broadcast systems are emerging;
- f)* that some frequency bands harmonized for ITS are also allocated to the fixed-satellite service (FSS) (Earth-to-space), which under certain circumstances may cause potential interference to ITS stations while in close proximity,

*recognizing*

- a)* that harmonized spectrum and international standards facilitate worldwide deployment of evolving ITS radiocommunications and provide for economies of scale in bringing evolving ITS equipment and services to the public;
- b)* that the use of frequency bands harmonized for evolving ITS, or parts thereof, does not preclude the use of these bands/frequencies by any other application of the services to which they are allocated and does not establish priority in the Radio Regulations;
- c)* that in those harmonized frequency bands or parts thereof for evolving ITS, there are existing services whose protection needs to be ensured;
- d)* that evolving ITS also becomes important in helping to reduce road traffic problems such as congestion and accidents;
- e)* that ITU-R studies on evolving ITS technologies are meant to address road safety and efficiency-related matters,

*noting*

- a)* that the ITU-R Recommendations on ITS are Recommendations ITU-R M.1452, M.1453, M.1890, M.2057, M.2084 and M.2121;



b) that the ITU-R Reports on ITS are Reports ITU-R M.2228, M.2322, M.2444 and M.2445;

c) that some administrations have deployed or are considering deployment of radiocommunication local area networks in some frequency bands recommended for evolving ITS,

*recommends*

1 that administrations consider using globally or regionally harmonized frequency bands, or parts thereof, as described in the most recent versions of Recommendations (e.g. ITU-R M.2121), when planning and deploying evolving ITS applications, taking into account *recognizing b)* above;

2 that administrations take into account, if necessary, coexistence issues between ITS stations and stations of existing services (e.g. FSS earth stations), taking into account *considering f)*,

*invites Member States and Sector Members*

to participate actively in and to contribute to ITU-R studies on aspects of ITS and evolving ITS (e.g. connected vehicles, autonomous vehicles, adaptive driver assistance systems), through the ITU-R study groups,

*instructs the Secretary-General*

to bring this Recommendation to the attention of relevant international and regional organizations, in particular standards development organizations, dealing with ITS.

SUP

RESOLUTION 28 (REV.WRC-15)

**Revision of references to the text of ITU-R Recommendations  
incorporated by reference in the Radio Regulations**

SUP

RESOLUTION 31 (WRC-15)

**Transitional measures for the elimination of advance publication filings  
by administrations for frequency assignments to satellite networks  
and systems subject to Section II of Article 9**

SUP

RESOLUTION 33 (REV.WRC-15)

**Bringing into use of space stations in the broadcasting-satellite service,  
prior to the entry into force of agreements and associated plans for the  
broadcasting-satellite service**

SUP

RESOLUTION 157 (WRC-15)

**Study of technical and operational issues and regulatory provisions for new  
non-geostationary-satellite orbit systems in the 3 700-4 200 MHz,  
4 500-4 800 MHz, 5 925-6 425 MHz and 6 725-7 025 MHz  
frequency bands allocated to the fixed-satellite service**

SUP

AI 1.5

**RESOLUTION 158 (WRC-15)**

**Use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service**

SUP

**RESOLUTION 159 (WRC-15)**

**Studies of technical, operational issues and regulatory provisions for non-geostationary fixed-satellite services satellite systems in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space)**

AI 1.6

SUP

AI 9.1.9

**RESOLUTION 162 (WRC-15)**

**Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)**

SUP

AI 1.11

**RESOLUTION 236 (WRC-15)**

**Railway radiocommunication systems between train and trackside**

SUP

AI 1.12

**RESOLUTION 237 (WRC-15)**

**Intelligent Transport Systems applications**

SUP

RESOLUTION 238 (WRC-15)

AI 1.13

**Studies on frequency-related matters for International Mobile Telecommunications identification including possible additional allocations to the mobile services on a primary basis in portion(s) of the frequency range between 24.25 and 86 GHz for the future development of International Mobile Telecommunications for 2020 and beyond**

SUP

RESOLUTION 239 (WRC-15)

AI 1.16

**Studies concerning Wireless Access Systems including radio local area networks in the frequency bands between 5 150 MHz and 5 925 MHz**

SUP

AI 1.8

RESOLUTION 359 (REV.WRC-15)

**Consideration of regulatory provisions for updating and modernization of the Global Maritime Distress and Safety System**

SUP

AI 1.9.2

RESOLUTION 360 (REV.WRC-15)

**Consideration of regulatory provisions and spectrum allocations to the maritime mobile-satellite service to enable the satellite component of the VHF Data Exchange System and enhanced maritime radiocommunication**

SUP

RESOLUTION 362 (WRC-15)

AI 1.9.1

**Autonomous maritime radio devices operating in the frequency band  
156-162.05 MHz**

SUP

RESOLUTION 549 (WRC-07)

AI 4

**Use of the frequency band 620-790 MHz for existing assignments  
to stations of the broadcasting-satellite service**

SUP

RESOLUTION 555 (REV.WRC-15)

AI 4

**Additional regulatory provisions for broadcasting-satellite service  
networks in the frequency band 21.4-22 GHz in Regions 1 and 3 for  
the enhancement of equitable access to this frequency band**

SUP

RESOLUTION 556 (WRC-15)

**Conversion of all analogue assignments in the Appendices 30 and 30A  
Regions 1 and 3 Plan and List into digital assignments**

SUP

RESOLUTION 557 (WRC-15)

AI 1.4

**Consideration of possible revision of Annex 7 to  
Appendix 30 of the Radio Regulations**

SUP

RESOLUTION 641 (REV.HFBC-87)

**Use of the frequency band 7 000-7 100 kHz**

SUP

AI 1.1

RESOLUTION 658 (WRC-15)

**Allocation of the frequency band 50-54 MHz to the amateur service in Region 1**

SUP

RESOLUTION 659 (WRC-15)

AI 1.7

**Studies to accommodate requirements in the space operation service for non-geostationary satellites with short duration missions**

SUP

RESOLUTION 764 (WRC-15)

AI 9.1.5

**Consideration of the technical and regulatory impacts of referencing Recommendations ITU-R M.1638-1 and ITU-R M.1849-1 in Nos. 5.447F and 5.450A of the Radio Regulations**

SUP

RESOLUTION 765 (WRC-15)

AI 1.2

**Establishment of in-band power limits for earth stations operating in mobile-satellite service, the meteorological-satellite service and the Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz**

SUP

RESOLUTION 766 (WRC-15)

**AI 1.2** Consideration of possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz

SUP

RESOLUTION 767 (WRC-15)

**AI 1.15** Studies towards an identification for use by administrations for land-mobile and fixed services applications operating in the frequency range 275-450 GHz

SUP

RESOLUTION 809 (WRC-15)

**Agenda for the 2019 World Radiocommunication Conference**

SUP

RESOLUTION 810 (WRC-15)

**Preliminary agenda for the 2023 World Radiocommunication Conference**

SUP

RESOLUTION 958 (WRC-15)

**AI 9.1.6** Urgent studies required in preparation for the 2019 World Radiocommunication Conference

## **Declaration on Promoting Gender Equality, Equity and Parity in the ITU Radiocommunication Sector**

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

*recognizing*

- a)* that while radiocommunication plays an important role in globalization and the effective development of information and communication technologies (ICT), statistically very few women participate in international radiocommunications processes;
- b)* that the work of the ITU Radiocommunication Sector (ITU-R) can be advanced most effectively through the active inclusion and participation of women;
- c)* that there is a need to ensure that women participate actively and meaningfully in all ITU-R activities;
- d)* that the Radiocommunication Bureau (BR) has established the ITU Network of Women, launched at the 2016 World Radiocommunication Seminar, which is dedicated to promoting women in radiocommunications, telecommunications/ICT and related fields;
- e)* that ITU has adopted a Gender Equality and Mainstreaming (GEM) Policy, with the aim of becoming a model organization for gender equality that leverages the power of telecommunications/ICT to empower both women and men;
- f)* the progress made by ITU in raising awareness on gender issues, specifically over the last decade, in increasing women's participation in and contribution to international forums, in studies, projects and training, and in the establishment of an internal Gender Task Force, as well as the successful establishment by ITU of an international "Girls in ICT" day to be held every year on the fourth Thursday of April;
- g)* Resolution 70 (Rev. Dubai 2018) of the Plenipotentiary Conference, on gender mainstreaming in the ITU and promotion of gender equality and the empowerment of women through ICT;
- h)* Resolution 48 (Rev. Dubai, 2018) of the Plenipotentiary Conference on human resources management and development and, in particular, its Annex 2 "Facilitating the recruitment of women at ITU";
- i)* the United Nations Secretary-General's System-wide Strategy on Gender Parity;
- j)* Resolution 55 (Rev. Buenos Aires, 2017) of the World Telecommunication Development Conference, which encourages mainstreaming a gender perspective for an inclusive and egalitarian information society;
- k)* Resolution 55 (Rev. Hammamet, 2016) of the of the World Telecommunication Standardization Assembly, which encourages mainstreaming a gender perspective in the activities of the ITU Telecommunication Standardization Sector (ITU-T);
- l)* that the ITU's strategic plan references gender issues with a view to debating and exchanging ideas to define, throughout the organization, a concrete action plan with deadlines and goals;
- m)* the EQUALS Global Partnership, of which ITU is a founding member, which is made up of other United Nations agencies, governments, the private sector, academia and civil society organizations, and which aims to reduce the gender digital divide in the world;



n) the recommendation in the 2016 United Nations' Joint Inspection Unit report that the "Secretary-General present to the Council for endorsement at its 2017 session an action plan to complement the Gender Equality and Mainstreaming Policy, with specific targets, indicative timelines and monitoring measures to improve gender balance, especially at senior management levels, within each component of the Union, and report annually to the Council on its implementation",

*bearing in mind*

a) that a fundamental principle of the United Nations Charter adopted by world leaders in 1945 is "equal rights of men and women";

b) United Nations Economic and Social Council (ECOSOC) Resolution E/2012/L.8, on mainstreaming a gender perspective into all policies and programmes in the United Nations system, which welcomed the development of the UN System-Wide Action Plan on Gender Equality and the Empowerment of Women (UNSWAP 2.0), and the 60th session of the UN Commission on the Status of Women (March, 2016), which stressed the need to ensure women's full, equal and effective participation in all fields, and leadership at all levels of decision-making in the public and private sectors, and public, social, economic and political life;

c) the United Nations HeForShe initiative (2014) to involve men and boys in the promotion of gender equality;

d) that society as a whole, particularly in the context of the information and knowledge society, will benefit from equal participation of women and men in policy-making and decision-making and from equal access to communication services for both women and men;

e) that the outcome document of the overall review of the World Summit on the Information Society (WSIS) acknowledged that a gender digital divide exists, called for immediate measures to achieve gender equality in Internet users by 2020, especially by significantly enhancing women's and girls' education and participation in ICT, as users, content creators, employees, entrepreneurs, innovators and leaders, and reaffirmed a commitment to ensure women's full participation in decision-making processes related to ICT;

f) that women continue to be under-represented in the fields of science, technology, engineering and mathematics (STEM), particularly those fields related to the development of ICT, both in academia and in the professional ranks;

g) that enhancing women's and girls' education and their participation in ICT also contributes to the achievement of Sustainable Development Goal 5: Achieve gender equity and empower all women and girls;

h) the 2013 report of the Working Group on Broadband and Gender of the Broadband Commission for Sustainable Development: Doubling Digital Opportunities – Enhancing the inclusion of women and girls in the information society,

*declares*

1 that ITU-R should accelerate efforts to ensure that all its policies, work programmes, information dissemination activities, publications, study groups, seminars, courses, assemblies and conferences reflect the commitment to gender equality, and promote gender balance:

i) by according high priority to gender mainstreaming in the management, staffing and operation of ITU-R;

ii) through the equitable selection of women:

- a) for posts, including those at the Professional and higher levels in BR, in addition to other relevant considerations including geographical distribution;
  - b) for roles that build expertise and expand opportunity, such as delegates, including Heads and Deputy Heads of Delegation, and counsellors in the preparation towards and at World Radiocommunication Conferences;
  - c) for the chairmen, vice-chairmen and rapporteurs of the ITU-R study groups, including CPM, and of RAG;
- iii) by encouraging Member States, Regional Organizations and Sector Members to support the inclusion of women in all aspects of ITU-R activities including both domestic and international processes;
- iv) by the Director of the BR:
- a) continuing to implement the ITU GEM Policy, including supporting the implementation of recommendations from the Joint Inspection Unit relevant to gender mainstreaming, supporting the Gender Focal Points for ITU-R, and encouraging BR staff to undertake relevant training;
  - b) continuing to integrate a gender perspective in the work of the BR in accordance with the principles already applied in ITU;
  - c) including in all circular letters the statement, “The membership is encouraged to include both women and men on their delegations”;
- v) by supporting the ongoing work of the Network of Women to ensure that all women have an opportunity to develop as ITU-R leaders;
- vi) by supporting the ITU Secretary-General to participate in the Planet 50/50 initiative sponsored by UN Women to tackle invisible gender bias as a Geneva Gender Champion on behalf of ITU-R;
- vii) by improving the gender balance in candidatures for chairman and vice-chairman posts so as to support the active involvement of women as well as men in radiocommunications groups and activities;
- viii) by promoting the use of ICT for the economic and social empowerment of women and girls;

2 that the Director of the BR should conduct and publish an annual review on progress made in the Sector in advancing gender mainstreaming, including by collecting and reviewing statistics on ITU-R activities by gender, including geographical distribution, publishing current information on a public-facing web portal, and sharing findings with the Radiocommunication Assembly and the next World Radiocommunication Conference;

3 that Member States should consider and adopt a Resolution at the 2023 Radiocommunication Assembly on gender equality, equity and parity in the ITU-R,

*further declares*

1 that ITU Member States and Sector Members should encourage the adoption of proven measures to increase globally the number of women pursuing academic degrees at all levels in STEM fields, particularly those related to the ICT;

2 that ITU Member States should urgently undertake active measures to increase the number of girls receiving primary and secondary education in mathematics and science that is sufficient to prepare them for undergraduate degrees in STEM fields, particularly in electrical engineering and computer science, which are critical for the development of ICT;

3 that Member States and Sector Members should substantially increase the number of scholarships and fellowships provided to women pursuing academic degrees at all levels in STEM fields, particularly in electrical engineering and computer science;

4 that, by 2023, Member States and Sector Members should substantially increase the number of internships, training opportunities and summer jobs available for women pursuing academic degrees in fields related to the development of ICT;

5 that the Member States, Sector Members and the BR should encourage and actively support ICT education for girls and women, and support all measures that will help prepare them for a professional career in ICT.

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