By e-mail to firmapost@nkom.no

COMMENTS OF DANIMEX COMMUNICATION A/S, DATAMATIK AS, MOTOROLA SOLUTIONS, INC., NORSK RADIOKOMMUNIKASJON AS (NORAKOM), AND TC CONNECT AS.

We, the undersigned, are filing these joint comments for the Norwegian Communication Authority (Nkom) Consultation on future use of available frequency resources in 410-430 MHz.

We remain at your disposal to provide any further details.

Aage Terp Senior Vice President Global Account Operations Danimex Communication A/S aat@danimex.com	Ove Ruud Managing Director Datamatik AS ove.ruud@datamatik.no	Daniel Hamadeh Regional Director, Gov. Affairs, Spectrum and Regulatory Policy Motorola Solutions danielhamadeh@motorolasolutions.com
Tor Martin Partner/ CEO NORAKOM NORSK RADIOKOMMUNIKASJON AS tmk@norakom.no	Herald Berg CEO TC Connect AS harald.bergby@tcconnect.no	

Summary of Comments of DANIMEX COMMUNICATION A/S, DATAMATIK AS, MOTOROLA SOLUTIONS, INC., NORSK RADIOKOMMUNIKASJON AS (NORAKOM), AND TC CONNECT AS:

We, the undersigned, recall that 400 MHz remains the only UHF band available for narrowband land mobile applications that is not identified for IMT in the ITU Radio Regulations, or for exclusive for public protection and disaster relief (PPDR) or North Atlantic Treaty Organization (NATO) use. As recognized in Electronic Communications Committee (ECC) Report 283, use of the 410 to 430 MHz band is also very complex, both in terms of which services already use the bands, and on the density of usage in each country. Allocating parts of the 410-430 MHz band to additional broadband mobile communications risks causing interference with existing narrowband services, and introducing uncertainty for current users. No additional spectrum is being made available for narrowband mobile users, while demand for Professional Mobile Radio (PMR) continues.

We therefore encourage Nkom to reconsider this proposal, and to maintain current PMR use for at least five years, and ideally for ten years. We support efforts to make spectrum available for private mobile broadband, and encourage Nkom to consider other bands where much wider bandwidth could be realized, and where an ecosystem of devices and infrastructure can be supported. We support Nkom efforts to enable drive broadband applications, and encourage Nkom to consider what other countries are doing – for example Germany, Sweden, UK, and France, where private broadband users can acquire tens of megahertz of spectrum, and can deploy broadband systems based on LTE or 5G technologies for their specific radio-communication needs. Further study is required before additional allocations should be considered, especially since any use of LTE would require band splitting and site engineering, to avoid harmful and unnecessary interference between broadband and narrowband carriers and services.

<u>Comments in response to specific questions</u>

1. **What will such a provision for mobile communication enable of services? Could a smaller bandwidth for mobile communications, such as NB-IoT and 200 kHz channel bandwidths, be appropriate?**

Nkom should note that 410-430 MHz remains the main band suitable for PMR / Public Access Mobile Radio (PAMR) applications based on TETRA & Digital Mobile Radio (DMR) using 25 KHz / 12.5 KHz bandwidth. Business and mission critical voice Push-To-Talk narrowband is in high demand, and vital for users that require instantaneous, reliable communication. TETRA technology in this band is supported by a range of infrastructure and device vendors and TETRA users and operators. The technology is so useful for mission critical applications that some customers have signed contracts extending TETRA operational life beyond 2030. Rather than increasing the risk of interference to these incumbent operations, technologies such as 5G networks, Short Range Devices (SRD) bands, satellite IoT and Wi-Fi 6 can provide IoT functionality in bands that are less crowded and better suited to IoT uses.

Any consideration for licensing LTE carriers in the 410-430 MHz band must first take into account issues outlined below, in particular, measures to reduce interference (offset and filtering) and the result of 3rd order inter-modulation interference on narrowband land mobile from a broadband LTE carrier. These issues must be fully analyzed and resolved before finalizing any LTE-based spectrum award in this band.

The European Conference of Postal and Telecommunications Administrations (CEPT) compatibility study ECC Report 283 reached no conclusion on the impact of LTE 3rd order inter-modulation on victim

narrow band receivers. The potential for this interference is caused by Inter-modulation Distortion (IMD) in PMR receivers (e.g. TETRA) from neighboring broadband signals (e.g. LTE). In many instances around the world, interference has occurred when broadband systems were permitted to operate on bands immediately adjacent to narrowband systems, where appropriate technical restrictions were not implemented. At this stage we do not recommend the use of LTE channel widths in the 410-430 MHz band, given the existing density of usage in the band, and the likely high density deployment of LTE.

We note that a CEPT Spectrum Engineering Task Force has been established to investigate this topic but work in CEPT has not progressed. We can provide Nkom with a methodology to assess interference potential if a broadband channel is introduced in adjacent or co-channel. Interference potential depends on the frequency offset of the LTE carrier from the victim PMR receiver, received power, and inter-modulation performance of the victim PMR receiver.

If radar is used in the 420-430 and 430-440 MHz bands, there are further issues for Nkom to consider:

- ECC Report 283 analyses the impact of introducing broadband systems of land mobile services in the 410-430 MHz band, with a view to protecting radiolocation and radio astronomy services.
- An LTE base station transmitting in the 420-430 MHz band operates on a co-channel basis with radars, and LTE interference has to be managed.
- A 40 dB reduction in out-of-band-emission (OOBE) from the levels used in LTE Band 31, which was used as baseline LTE standard (e.g. by means of LTE BS duplexer filtering), may be needed to avoid desensitization of radiolocation systems operated in the 430-440 MHz band.
- Simulation results indicate that LTE BSs should be excluded within a radius of ~120 km around ground radars in the co-channel scenario, depending on the bandwidth of the LTE system.

The undersigned recommend that Nkom should first consider opportunities in other frequency bands, if it receives interest from providers in using blocks of spectrum in the 410-430 MHz band to deploy LTE. At a minimum, further study of this band is required before allocations can be made. From existing studies, it is clear that any future allocations in the 410-430 MHz band will require that:

- There is a band split, to enable both LTE carrier and narrowband carriers to coexist, and to ensure adequate guard band & RF filtering;
- Appropriate site engineering is established to avoid unnecessary harmful interference between broadband and narrowband carriers.

If it is determined that there are financially sustainable IoT deployment opportunities in this band (which we do not see any evidence for) narrowband (200 kHz) channels are preferable to broadband LTE (1.4 MHz). The division of spectrum in the band must ensure protection to incumbent PMR narrowband services while enabling IoT.

2. **Would it be appropriate to divide the frequency band and regionalize the resources? What distribution (local, regional or national) will be relevant to achieve?**

A regional distribution of the frequency band, at any level, risks repeating the potential interference issues described above on a localized basis. Any proposed regional division would require comprehensive prior study, to identify existing uses of the frequency band at a regional level (including the possibility of overlap with neighboring regions), along with appropriate band splits for any deployment scenario.

3. **Status of equipment availability (ecosystem) and of possible non-availability, when will equipment be commercially interesting and mature?**

As noted in the consultation, the 87 and 88 band designations for LTE were approved only in June 2019. As a result, the equipment market for these bands is in its infancy, as manufacturers will not have started serious development until bands were designated. The latest Global mobile Supplier Association (GSA) Analyser for Mobile Broadband Data (GAMBoD) shows there are no devices of any form factor supporting 3GPP bands band 87 or 88. We assess that these bands will not be a priority for chipset manufacturers and handset manufacturers, who will be focusing on 5G bands that provide the bandwidth, and bands that are used more extensively by MNOs. This point is relevant considering the wider 3GPP band landscape alongside the novelty of these bands being designated by 3GPP. Initial equipment development will be slow, and when deployed, will likely be comparatively expensive, especially compared to established PMR solutions. Given the diversity of business and mission critical communications which rely on existing allocations in this band, it is important that equipment remains price competitive, especially for public safety or security uses.

4. **In the absence of interest and ecosystem at present, when should any new interest consultation occur?**

It is important that all entities involved in this band have a degree of certainty regarding allocations and future plans. Any decisions on allocations should have duration of at least ten years and ideally more.

To conclude, there is strong present and future demand for mission and business critical narrowband services using this band. Many outstanding issues involving potential interference also need to be further considered. Finally, economic challenges to using LTE in this band are unlikely to be resolved in the short-term. We recommend against revising the current band before the end of 2025 at the earliest.

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