May 4th, 2020

Hellenic Telecommunications and Post Commission (EETT)
60 Kifissias Avenue
151 25 Maroussi
Athens
Greece

COMMENTS OF MOTOROLA SOLUTIONS INC.

Motorola Solutions Inc (MSI) is filing these comments for the EETT consultation about the granting of Rights Use of Radio Frequency in the band 410-430 MHz.

MSI is a global leader in mission-critical communications. Our platforms in communications, command center software, video security and analytics and managed and support services make cities safer and help communities and businesses thrive. We serve more than 100,000 customers in more than 100 countries, with 17,000 employees and an install base of more than 13,000 systems around the world, based on industry-leading innovation and a deep portfolio of products and services. We have been a leader in the field of radiocommunication for over 90 years.

We remain at your disposal to provide any further details.

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No of Pages: 4 including cover letter

Comments to Public Consultation Questions

1. You are directly interested in acquiring rights to use radio frequencies at band in the 410-430 MHz band; If so, what is the total spectrum (in MHz) which do you wish to be granted?

MSI does not have any direct interest in acquiring spectrum in this band at this stage.

2. How you intend to use the rights granted to you in this zone;

Not applicable to MSI.

3. Do you agree to the technical terms and conditions of network development, which does EETT recommend for bandwidth rights in the 410-430 MHz band?

We believe there are several technical issues that require further study. A CEPT compatibility study reached no conclusion on impact of LTE 3rd order inter-modulation on victim narrow band receivers. This interference is caused by Inter-modulation Distortion (IMD) in PMR receivers (eg TETRA) from neighboring broadband signals (eg LTE). In many instances around the world, this interference occurred when broadband systems were permitted to operate on bands immediately adjacent to narrowband systems and appropriate technical restrictions were not implemented. CEPT has set up a task force to look at this but work has not progressed. MSI can provide a methodology to assess interference potential if a broadband channel is introduced in adjacent or co-channel as proposed by the Commission. This 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.

ECC Reports 240 & 292 show that, based on the 3GPP Base Station (BS) spectrum emission mask minimum requirements, LTE400 would cause interference with existing systems. Co-existence is possible with additional filtering for 3GPP protection of own UL minimum requirement (UE) duplexers, to limit interference to an acceptable level. Such duplexers are needed both to fulfill the 3GPP minimum requirements, and to ensure correct performance of the LTE400 system itself, especially with higher power UE.

Another issue is related to whether radars are used in Greece in the 420-430 MHz and 430-440 MHz bands. If they are being used, we suggest the following issues should be further evaluated:

- 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.

We understand there is a Radio Astronomy Service (RAS) in Thermopiles (38°49'00'' N, 22°41'00" E) that needs to be protected from any new mobile system. Generic compatibility calculations in ECC Report 292 for LTE systems in the 410-430 MHz band, and radio astronomy in the 406.1-410 MHz band, show that compatibility may be achievable by implementing emission-free zones around RAS stations: "using MATLAB with Recommendation ITU-R P.452-16 for outdoor UE, and a 1 MHz guard band, separation distances for single emitter and aggregate cases should be 78 km and 326 km".

If there is demand for licensing of LTE carriers in the 410-430 MHz band, we recommend that the Commission studies the issues above, in particular the required measures (offset & filtering) and the result of 3rd order inter-modulation interference on narrowband land mobile from a broadband LTE carrier, before a final decision is made on band plan and spectrum award.

4. You agree with EETT's proposals regarding the procedure for their allocation bandwidth rights in the 410-430 MHz band;

We encourage EETT to extend for at least ten years the rights of current holders in the 410-430 MHz band - in particular 413.75-415.75 & 423.75-425.75 MHz that expire in July 2020 - to operate and deploy narrowband technology and provide business critical services. Business and mission critical voice Push-To-Talk is in high demand, and vital for users that require instantaneous and reliable communication. 410-430 MHz remains the main band suitable for PMR/PAMR applications based on TETRA & DMR. LTE in this band is still far from being realized or economically affordable.

5. In documenting your answer, what do you consider to be a reasonable starting price for a 2x2 MHz bandwidth for a period of fifteen (15) years;

We recommend against using 450-470 MHz spectrum auctions/pricing as a baseline to calculate or set a price for the 410-430 MHz band, for the following reasons:

- The 450-470 MHz band enjoys a different regulatory status in ITU Radio Regulations and in active LTE networks in several countries. The 410-430MHz band has no IMT identification, and has only recently (2019) been approved to support wider channel plans suitable for LTE carriers.

- The 450-470 MHz band is supported by a NB-IoT/LTE-M/LTE ecosystem, and is used to provide PAMR or BB-PPDR applications. It has benefited from reuse of RF filtering components.

- The Global Suppliers Association (GSA) reported 13 active operations and 125 devices available by Q3 2019 supporting 450 MHz (Band 31), but no devices so far in the 410-430 MHz band.

- Despite having similar bandwidth and propagation conditions, the 450-470MHz band offers a higher economic value than 410-430 MHz, so comparing the value of the bands would be unfair.

6. If there is no market interest in the immediate acquisition of spectrum in this zone, what is your opinion on the EETT's review of the extension of existing rights for up to 3 years?

We encourage EETT to extend the licenses of current users for at least ten years, to give stability for them to continue investing in infrastructure to serve the Greek market. TETRA technology in

this band is supported by many infrastructure and device vendors, and TETRA users and operators. Some of our customers have signed contracts extending TETRA operational life beyond 2030.

If there is interest in acquiring blocks of spectrum to deploy LTE, we propose that the Commission follow a band split, to enable both LTE carrier and narrowband carriers to coexist, and to ensure adequate guard band & RF filtering, and that appropriate site engineering is established to avoid unnecessary harmful interference between broadband and narrowband carriers.

7. If there is no market interest in directly acquiring spectrum in this band with the existing design but there is interest in obtaining spectrum with different design, do you agree to temporarily renew the existing entitlement until the 2x5MHz range liberalization process is completed and if so, what time period do you consider reasonable?

As for Question 6, we recommend that at least ten years be given to current spectrum holders, to avoid unnecessary costs for repurposing the band. Most TETRA devices operate across a wide frequency range and should not be impacted by relocation within the existing block. However, some hardware including RF filters are typically of limited frequency tuning range. Any shift in the current block beyond the filter range would therefore require physical replacement of filters or base stations, re-planning of the network, and hence bring more cost and service disruption.

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