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22 January, 2018

Regulatory Authority – RÚ
Office for Regulation of Electronic Communications and Postal Services
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Ref.: Public Consultation on the frequency band 450 – 470 MHz “Verejná konzultácia o budúcom využívaní frekvencií vo frekvenčnom pásme 450 MHz”

Motorola Solutions would like to thank The Regulatory Authority – RÚ in Slovakia for the opportunity to provide its comments to some questions raised in the public consultation referenced above.

I remain at your disposal to provide you any further clarification.

Yours sincerely,

On behalf of Motorola Solutions,

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No of Pages: 6 including cover letter

Attachments: 2 Motorola inputs to SE7

- *SE7(17)003_Interference from LTE network on narrowband PMR cell*
- *SE7(17)023R1_Interference model including intermodulation*



Motorola Solutions (MSI) Comments to selected questions from Section V "Questionnaire":

Question no. 4.1: *What kind of selection procedure do you prefer? Selection procedure in form electronic auction or no auction? Provide reasons why.*

Comment:

- Motorola Solutions (MSI) normally do not comment on national methodology to grant spectrum access. We find this entirely a national matter.
- However, we believe that the 450-470MHz continues to be widely used for a variety of PMR/PAMR applications including both for public safety/public protection and disaster relief radiocommunications (PPDR).
- In particular, we emphasize ECC PPDR related decisions ECC/DEC/(08)05 & ECC/DEC/(16)02 & ITU R Resolution 646(WRR-15) and ITU-R M.2015 (finalized in 2017; document [5/82](#)).
- Since the amount of spectrum available for award is only 2x5MHz at best, our view is that that it might not be as attractive to traditional electronic communications services as other bands offer multiple carriers and wider channel bandwidth per carrier and carrier aggregation scenarios. When considering the demand and growth forecasted for massive machine-to-machine communications and broadband channel bandwidth capabilities in IMT-2020, our view is that this band continues to be a niche and is more suitable for PPDR and other industrial applications / PMR.
- Considering the fact that the band 450-470MHz could be well suited for verticals use and that existing users can as well be looking for expanding their existing use of narrowband systems and introducing broadband carriers for their vertical needs, we believe it might well be suitable to consider that as an option vs. awarding it to existing carriers with an outcome likely to produce a single winner with a single 2x5MHz block rights nationwide.
- If the decision is to award this band for commercial electronic communications, we encourage an award procedure that is based on apparatus licensing regime that includes site engineering and encourages collocation of PMR and LTE sites to provide protection against interference to existing PMR assignments.

Question no. 5.1: *The Office intends to extend the updated Annex to the Plan (Annex 1) current channel width of 200 kHz and 1.25 MHz to 1.40 MHz, 3.00 MHz and 5.00 MHz. How is he your opinion on this intention of the Office? If you prefer a different channel width, specify what your own answer the reason.*

Ans.

Detailed simulations and simulation methods have been submitted by Motorola Solutions to CEPT FM & SE meetings highlighting effects of OOB and Intermodulation Distortion (IMD) between broadband and narrow-band indicated that adopting different channel



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bandwidth within the 5MHz block (1.4 x 3 MHz or 1.4 + 3MHz or 5 MHz). Studies suggested that different levels of interference to neighboring blocks exist and some are significant even with much bigger than the 200KHz suggested as guard-band. TX BS OOB of 25dB is recommended, in addition to site engineering to reduce a higher probability of interference to the adjacent blocks proposed to be maintained for narrowband PMR application with channel width of 12.5 kHz, 20 & 25KHz.

As per Table 14 of ECC Report 240 (p 23) specifies the same transmitter power be used regardless of the LTE bandwidth. If three 1.4MHz channels are used, the amount of power is multiplied and the inter-modulation effect adds to the interference on the existing/planned narrowband PMR in the remaining blocks.

The preferred bandwidth option for LTE would be a single 5MHz paired channel. The BS LTE transmitter will require a duplexer to reduce the OOB by a minimum of 25dB hence this needs to be reflected in Annex no. 1. Also we suggest site engineering and co-locating LMR and LTE sites to reduce impact of such interference cases.

When taking into account the additional interference due to Inter-Modulation of LTE signals, we note the larger number of LTE sites could result in a large number of “holes” in coverage across the existing PMR coverage areas, which will greatly reduce the dependability of the PMR systems and result in complaints and mitigation costs for the LTE operator.

The UE is bound to cause problems as well, but we have not simulated that. Again, co-locating sites should reduce the effect of UE OOB levels. Simulation of UE to MS has not been considered but might require further TX power control.

Question no. 6.1: *The Authority intends to carry out a call for tenders to allocate frequencies 451.50 MHz - 456.50 MHz / 461.50 MHz - 466.50 MHz even if it fails agree with the holders of currently valid individual permits for early termination use of the frequencies concerned. In that case, the frequencies concerned would be provided that they are available only after expiry individual permits. Give your opinion on this intention of the Office.*

Ans.

The 450MHz band has been identified for Mobile IMT applications in WRC-2007, and continues to be used for land mobile, PMR/PAMR/PPDR applications. ITU R M 1036 list a number of frequency arrangements for IMT for the band but only one band has been commercialized. 3GPP has developed recently specifications for a new band, Band 72, yet to be commercialized. Note that the start and end frequency fall outside the proposed block of both bands.

We believe that it could be more beneficial if the ecosystem development is given priority first to realize the full potential of the band and to avoid costly compensation for existing users for early termination.



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Our proposal is to re-assess the possible future use of the band taking into account needs of PPDR, including possible allocation in 700MHz as a priority band for LTE PPDR and the 450MHz if the 700MHz is not available taking into account Commission Implementing Decision (EU) 2016/687 of 28 April 2016, ECC Decision (16)02, ECC Decision (08)05, ECC Report 240, ECC report 199 and the draft new report on LTE in 450MHz currently in draft by CEPT SE7. Our proposal is to give priority for the 700MHz and 450MHz as priority bands that could better serve the future needs of PPDR in Slovakia.

Question no. 6.2: *Do you think that by such an arrangement the given frequency range will be effectively used for public electronic communications service? If you prefer a different kind of service specify what.*

Ans.:

The CEPT is currently developing studies in WG SE, which on the longer term may provide the means for developing a harmonized PMR/PAMR market in the entire 450 – 470 MHz for narrowband as well as for broadband. This study is under development by SE7, and deals with the elaboration of a new ECC Report focusing (in 450 – 470 MHz) on the coexistence between legacy NarrowBand PMR/PAMR systems and Broadband systems that are operating spectrally adjacent and un-coordinated with the band. In particular, the interference from Intermodulation components (IM) excited by Broadband Carriers overlapping Narrow Band Carriers is studied and assessed. Motorola is available to provide more details and have included two relevant contributions that provide relevance of the assumptions and simulation parameters.

While we expect that CEPT continues its work in early 2018, we suggest not introducing regulatory changes on the 450-470MHz until administrations can take guidance from this advisory ECC Report.

As for the proposed arrangement, two bands have been specified in the range 450-470MHz Band 31 & more recently Band 72. The LTE band that covers the majority of the proposed band (4.5MHz of 5Hz) have been recently subject to a work item by the 3GPP RAN team driven for PPDR applications in Europe. On Jan 18 2018, the 3GPP TS 36.101 V15.1.0 specs have been updated to reflect the new LTE band driven by European PPDR.

The band known as band LTE #72 has a start frequency at 451.0MHz and not 451.5MHz and ends at 456.0 and not 456.5 as per the proposed band under consultation. This band has not been commercialized yet in any country and we are not aware of any device or chipset currently supporting LTE Band 72.



E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex Mode
	F _{UL_low} – F _{UL_high}	F _{DL_low} – F _{DL_high}	
72	451 MHz – 456 MHz	461 MHz – 466 MHz	FDD
31	452.5 MHz – 457.5 MHz	462.5 MHz – 467.5 MHz	FDD

Source : 3GPP TS 36.101

The commercial availability of equipment and ecosystem supporting LTE band 72 is yet to be determined. Commercialization and ecosystem development will depend if commercial viable deployments demand it.

Based on the above, we propose that you take note of the above when finalizing the decision on the future of 450-470MHz and in particular, consider whether Broadband PPDR in Slovakia in the future will be served in the 700MHz (694-791MHz) or in the 450-470MHz band.

Question no. 7.1: You prefer to extend the section currently designated for public radiotelephone service on a 2 × 5,00 MHz block? Please explain your answer.

Ans.:

Compatibility and sharing studies related to the introduction of broadband and narrowband systems in the band 450-470 MHz have been tasked to CEPT Spectrum Engineering SE7 with target date of public consultation by May 2018.. In addition ECC Report 240 addresses some elements of sharing and compatibility between existing systems and new system with channel bandwidth up to 5MHz. In particular, the interference from Inter-modulation components (IM) excited by Broadband Carriers overlapping Narrow Band Carriers is studied and assessed in the current draft. Motorola offers to provide further guideline to explain the co-existence challenges between both arrangements.

The 451.5-456.5 MHz/461.5-466.5 MHz band overlaps with the two LTE arrangements listed earlier. If the intention is to offer a complete 2x5MHz block, as a start, we suggest aligning the blocks and shifting the arrangement to be consistent with LTE band specified in 3GPP. The alternative would leave some resource blocks unused or disabled.

As other types of applications, including for PPDR (public protection and disaster relief) & PMR continue to look for spectrum for growing needs of applications, our view is that this band continues to offer a good band for PMR and verticals. Our view is that it offers this band has been the least demanded (historically by commercial carriers) for commercial IMT deployment and offers the smallest single block of spectrum available for an LTE carrier across all MFCN bands.

Question no. 7.2: Do you think the 200 kHz proposed protection band (GB) is sufficient to ensure the undisturbed operation of networks of neighboring workers frequencies? Please explain your answer.



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Ans.:

Our simulations indicate that a 200 kHz guard band does not seem to provide protection from harmful interference especially within the first 500m coverage radius of a PMR station operating in the upper or lower blocks of the band. It does not guarantee interference free operation and does not present adequate offset for the duplex filter performance given temperature and manufacturing variations. Even when 25dB OOBE for is introduced, the 200kHz is not enough to protect PMR from inference. When considering IMD In particular if the deployment is on non coordinated basis. Co-sitting LMR and LTE base stations helps reducing interference. Kindly refer to the attached study submitted by Motorola to CEPT SE7 Doc. SE7(17)003 & Doc. SE7(17)023R1 as examples.

Question no. 7.3: Do you think that the office should be successful in allocating frequencies participant in the selection procedure to set development criteria in order to promote it effectively using frequencies? If yes, please specify what.

COMMENT:

No Comments

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