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RADIO SPECTRUM COMMITTEE

Working Document

Subject: Outline of a draft Commission Implementing Decision amending Decision 2012/688/EU as regards an update of relevant technical conditions applicable to the frequency bands 1920-1980 MHz and 2110-2170 MHz

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1 INTRODUCTION

5G should provide enhanced mobile broadband (eMBB) in support of the gigabit connectivity targets of the Union and boost massive machine-type communications (mMTC) as well as ultra-reliable and low latency communications (URLLC).

The great variety and the wide spread of wireless 5G services depends on spectrum availability in a mix of spectrum bands in different frequency ranges. In this regard, mid frequency bands (i.e. between 1 and 6 GHz), including the paired terrestrial 2 GHz band, are essential to provide wide coverage and reasonable capacity to serve different 5G services such as connected driving, remote healthcare or broadband access on the move.

In fulfilment of the 5G Action Plan (5GAP), the Radio Spectrum Policy Group (RSPG) recommended in its Opinions of November 2016 (RSPG16-032 FINAL) and January 2019 (third suplementary opinion, RSPG19-007 FINAL) that it is necessary to ensure that technical and regulatory conditions for all bands already harmonised for mobile networks are fit for 5G use. The paired terrestrial 2 GHz band is one such band widely used currently mainly with 3G technology (UMTS)[1] in the EU.

In this context, in July 2018, the Commission issued a mandate to CEPT (RSCOM18-19rev1) to review the harmonised technical conditions for certain EU-harmonised frequency bands, including the paired terrestrial 2 GHz band, and to develop technical conditions suitable for next-generation (5G) terrestrial wireless systems. The CEPT Report 72 in response to this mandate, which is expected to be adopted by the CEPT in July 2019 in time for this RSC meeting, provides the technical input for an amendment of the technical conditions for use of the paired terrestrial 2 GHz band with 5G systems.

2 OBJECTIVES AND SCOPE

The Commission plans to adopt in Q1/2020 a Decision, amending Decision 2012/688/EU as regards the harmonised technical conditions for the use of the paired terrestrial 2 GHz band for terrestrial systems capable of providing electronic communications services, in order to make these suitable for 5G while preserving the principle of technology and service neutrality. This is in line with the overall policy objective of efficient spectrum use in accordance with Articles 45 and 51 of the European Electronic Communications Code.

The amending Decision should facilitate market developments towards the most efficient technology in line with the principles of service and technological neutrality. This is in accordance with Article 6(3) of the Radio Spectrum Policy Programme[2]. The paired terrestrial 2 GHz band would be suitable for initial (as of 2020) or later commercial deployments of terrestrial 5G systems with wide coverage in the Union.

The amending Decision should keep pace with 5G deployment by making an additional 120 MHz of spectrum '5G ready'. A Commission study (SMART 2014/008) estimates that the successful EU-wide deployment of 5G could bring benefits of about €113 billion Euro per annum to Europe. In addition, 5G success in Europe is a key condition to keep highly qualified jobs in the ICT sector as it contributes to the creation of new digital ecosystems. There is a potential of creating over 2 million jobs in the EU.

[1] Universal Mobile Telecommunications System (UMTS) is a third generation mobile cellular system for networks based on EN 301908.

[2] Decision No 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme (OJ L 81, 21.3.2012, p. 7).

The proposed amendment of the technical conditions for the paired terrestrial 2GHz band reflects the major elements in line with the (draft) CEPT Report 72 in the following way:

1. The existing FDD mode of operation is preserved. Moreover, the frequency band 1920-1980 MHz may be used for uplink-only operation (such as SUL), and the frequency band 2110-2170 MHz may be used for downlink-only operation (such as SDL).

2. The sub-bands 1920-1980 MHz and 2110-2170 MHz should be divided into twelve paired assigned blocks, with a block size of 5 MHz. This new frequency arrangement (or band plan) should facilitate the use of the band for the next generation mobile technology (5G). It should be possible within this band plan that Member States apply a smaller block size of no less than 4.8 MHz as long as this fits in the band plan. The existing 300 kHz guard bands (Annex A(2) of Decision 2012/688/EU) at the lower and upper band edges should be removed.

3. The Decision should establish a stable harmonised framework for spectrum use which facilitates economies of scale and cross-border coordination while observing the principles of technology and service neutrality. In this regard, network operators should be allowed flexibility to adapt their existing frequency arrangement to the new technical conditions band plan and Member States should provide such flexibility in their authorisation, in accordance with Article 53(2) of the Code[3].

The envisaged update of the technical annex of Commission Decision 2012/688/EU is presented in the Annex of this document.

3 NEXT STEPS

The Commission will present an initial version of the draft Implementing Decision for the RSC#69 meeting in December 2019.

Member States are invited to comment on the proposed approach and the technical annex.

[3] Article 53(2) of the Code: ***"Where harmonised conditions have been set by technical implementing measures in accordance with Decision No 676/2002/EC in order to enable the radio spectrum use for wireless broadband networks and services, Member States shall allow the use of that radio spectrum, as soon as possible and at the latest 30 months after the adoption of that measure, or as soon as possible after the lifting of any decision to allow alternative use on an exceptional basis pursuant to Article 45(3) of this Directive. This is without prejudice to Decision (EU) 2017/899 and to the Commission's right of initiative to propose legislative acts".***

ANNEX

Parameters referred to in Article 2(1)[4]

A. DEFINITIONS

Active antenna systems (AAS) means a base station and an antenna system where the amplitude and/or phase between antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. This excludes long-term beam shaping such as fixed electrical down tilt. In AAS base stations the antenna system is integrated as part of the base station system or product.

Total radiated power (TRP) is a measure of how much power a composite antenna radiates. It equals the total conducted power input into the antenna array system less any losses in the antenna array system. TRP means the integral of the power transmitted in different directions over the entire radiation sphere as shown in the formula:

$$TRP \stackrel{\text{def}}{=} \frac{1}{4\pi}\int_0^{2\pi}\int_0^{\pi} P(\theta,\varphi)\sin(\theta)d\theta d\varphi$$

where P(θ,φ) is the power radiated by an antenna array system in direction (θ,φ) given by the formula:

$$P(\theta,\varphi) = P_{Tx}g(\theta,\varphi)$$

where P_{Tx} denotes the conducted power (measured in Watts), which is input to the array system, and g(θ,φ) denotes the array systems directional gain along the (θ, φ) direction.

B. GENERAL PARAMETERS

Within the paired terrestrial 2 GHz band, the frequency arrangement shall be as follows:

1. The duplex mode of operation is Frequency Division Duplex (FDD). The duplex spacing shall be 190 MHz with terminal station transmission (FDD uplink) located in the lower part of the band starting at 1 920 MHz and finishing at 1 980 MHz (‘lower band') and base station transmission (FDD downlink) located in the upper part of the band starting at 2 110 MHz and finishing at 2 170 MHz (‘upper band’).
2. The lower band of 1920-1980 MHz or portions thereof, can be used for uplink-only operation[5] without paired spectrum within the upper band of 2110-2170 MHz.
3. The upper band of 2110-2170 MHz or portions thereof, can be used for downlink-only operation[6] without paired spectrum within the lower band of 1920-1980 MHz.

[4] It might be amended
[5] Such as supplmental uplink (SUL) according to 3GPP standardisation
[6] Such as supplmental downlink (SDL) according to 3GPP standardisation

4. The assigned block size shall be in multiples of 5 MHz. The lower frequency lmit of an assigned block in the lower band of 1920-1980 MHz shall be aligned with or spaced at multiples of 5 MHz from its lower edge of 1920 MHz. The lower frequency limit of an assigned block in the upper band of 2110-2170 MHz shall be aligned with or spaced at multiples of 5 MHz from its lower edge of 2110 MHz.
5. Base station and terminal station transmission shall be in compliance with the technical conditions specified in Part C and Part D, respectively.

C. TECHNICAL CONDITIONS FOR BASE STATIONS – BLOCK EDGE MASK

The following technical parameters for base stations called block edge mask (BEM) are an essential component of conditions necessary to ensure coexistence between neighbouring networks, in the absence of bilateral or multilateral agreements between operators of such neighbouring networks. Less stringent technical parameters, if agreed among all affected operators of such networks, may also be used provided that these operators continue to comply with the technical conditions applicable for the protection of other services, applications or networks and with obligations resulting from cross-border coordination.

The BEM consists of several elements given in Table 1. The in-block power limit is applied to a block owned by an operator. The baseline power limit, designed to protect the spectrum of other operators, and the transitional region power limit, enabling filter roll-off from the in-block to the baseline power limit represent out-of-block elements.

Power limits are provided separately for for non-AAS and AAS. Power limits for non-AAS on the mean equivalent isotropically radiated power (EIRP) and power limits for AAS on the mean total radiated power (TRP)[7] apply over an averaging time interval, and over a measurement frequency bandwidth. In the time domain, the mean EIRP or mean TRP is averaged over the active portions of signal bursts and corresponds to a single power control setting. In the frequency domain, the mean EIRP or mean TRP is determined over the measurement frequency bandwidth as given in Tables 3 and 4 below[8]. In general, and unless stated otherwise, the BEM levels correspond to the aggregate power radiated by the relevant device including all transmit antennas, except in the case of baseline and transition requirements for base stations, which are specified per antenna.

Equipment operating in this band may also make use of power limits other than those set out below provided that appropriate mitigation techniques are applied which comply with Directive 2014/53/EU[9] and which offer at least an equivalent level of protection to that provided by these technical parameters.

Tables 2 to 4 contain the power limits for the different BEM elements for FDD networks providing wireless broadband (WBB) electronic communications services (ECS).

Table 1: Definition of BEM elements

[7] TRP is a measure of how much power the antenna actually radiates. EIRP and TRP are equivalent for isotropic antennas

[8] The actual measurement bandwidth of the measurement equipment used for purposes of compliance testing may be smaller than the measurement bandwidth provided in those tables.

[9] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC

BEM element	Definition
In-block	Refers to a block for which the BEM is derived.
Baseline	Spectrum within the FDD downlink frequency band used for WBB ECS, with the exception of block assigned to the operator and the corresponding transitional regions.
Transitional region	Spectrum within the FDD downlink within 0 to 10 MHz below and 0 to 10 MHz above the block assigned to the operator. The transitional regions do not apply below 2110 MHz or above 2170 MHz.

Table 2: In-block power limit for non-AAS ands AAS base stations

BEM element	**Frequency range**	**Non-AAS EIRP limit**	**AAS TRP limit**
In-block	Block assigned to the operator	Not obligatory. In case an upper bound is desired by a Member State, a value of 65 dBm/(5 MHz) per antenna may be applied.	Not obligatory. In case an upper bound is desired by a Member State, a value of 57 dBm/(5 MHz) per cell(1) may be applied.
(1) In a multi-sector base station, the radiated power limit applies to each one of the individual sectors.			

Explanatory note to Table 2:

The corresponding in-block TRP limit is determined following guidelines given in 3GPP TS 38.104 and assuming a 17 dBi antenna gain and a total of eight beam forming antenna elements (scaling factor of 9 dB):

65 dBm/(5 MHz) - 17 dBi + 9 dB = 57 dBm/(5 MHz).

Table 3: Baseline power limits for non-AAS and AAS base stations

BEM element	**Frequency range (out-of-block) of FDD downlink**	**Non-AAS EIRP limit per antenna(1)**	**AAS TRP limit per cell(2)**	**Measurement bandwidth**
Baseline	Frequencies spaced more than 10 MHz from the lower or upper block edge	9 dBm	1 dBm	5 MHz
(1) The non-AAS BEM level is defined per antenna and applicable to base station configuration with up to four antennas per sector. (2) In a multi-sector base station, the AAS radiated power limit applies to each one of the individual sectors.				

Table 4: Transitional region power limits for non-AAS and AAS base stations

BEM element	**Frequency range (out-of-block) of FDD downlink**	**Non-AAS EIRP limit per antenna(1)**	**AAS TRP limit per cell(2)**	**Measurement bandwidth**
Transitional	–10 to –5 MHz from lower block edge	11 dBm	3 dBm	5 MHz

region	–5 to 0 MHz from lower block edge	16,3 dBm	8 dBm	5 MHz
	0 to +5 MHz from upper block edge	16,3 dBm	8 dBm	5 MHz
	+5 to +10 MHz from upper block edge	11 dBm	3 dBm	5 MHz
(1) The non-AAS BEM level is defined per antenna and applicable to base station configuration with up to four antennas per sector (2) In a multi-sector base station, the AAS radiated power limit applies to each one of the individual sectors.				

Explanatory note to Table 3 and 4:

In alignment with the specification of unwanted emission conducted power (TRP) for AAS base stations in 3GPP TS 38.104 and the analysis made in ECC Report 281, the out-of-block TRP limits are set to a value that correspond to a total of eight beam forming antenna elements.

D. TECHNICAL CONDITIONS FOR TERMINAL STATIONS

Table 5: In-block requirement – terminal station BEM in-block power limit

Maximum in-block power (1)	24 dBm(2)
(1) This power limit is specified as EIRP for terminal stations designed to be fixed or installed and as TRP for terminal stations designed to be mobile or nomadic. EIRP and TRP are equivalent for isotropic antennas. It is recognised that this value may be subject to a tolerance defined in the harmonised standards to take account of operation under extreme environmental conditions and production spread. (2) For the determination of out of band emissions of terminals in CEPT Report 39 the maximum conducted transmit power of 23 dBm has been used as a reference.	

Explanatory note to Table 5:

Member States may relax this limit for specific deployments, e.g. fixed terminal stations in rural areas provided that protection of other services, networks and applications is not compromised and cross-border obligations are fulfilled.