ECC Decision (YY)XX

Harmonised technical conditions for Mobile/Fixed Communications Networks (MFCN) in the band 40.5‑43.5 GHz

**Approved DD Month YYYY**

**[Amended: DD Month YYYY [date of the latest update]]**

**NOTE: This is a working document. All texts will be further reviewed and discussed in upcoming correspondence group meetings until the next ECC PT1 meeting.**

# explanatory memorandum

## INTRODUCTION

This ECC Decision on harmonised technical conditions for mobile/fixed communications networks (MFCN) in the 40 GHz (40.5-43.5 GHz) band reflects the objective of CEPT to harmonise the 40.5-43.5 GHz band for Europe for 5G.

Studies have taken into account the compatibility with and protection of all existing services, including their future deployments, in the same and adjacent frequency bands.

## BACKGROUND

CEPT recognises the importance of a harmonised frequency arrangement for MFCN and the need of common and minimal Least Restrictive Technical Conditions (LRTC) for MFCN in the band 40.5-43.5 GHz, including to ensure protection of other services and applications.

The following principles have been considered to define the MFCN frequency arrangement:

* Facilitating roaming and cross-border coordination to achieve global economies of scale for equipment;
* Use of a 200 MHz block size approach which is in line with the mobile systems foreseen to be used in the 40.5-43.5 GHz band;
* Spectrum efficiency and high level of flexibility in order to adapt to national circumstances as well as to meet the changing need and demand for capacity in time and geography.

The implementation of this ECC Decision will encompass different stages at the national level (e.g. national consultation processes and update of existing authorisations as required) with a varying complexity depending on the legal and regulatory framework of each country. The harmonised technical conditions for MFCN set out in this decision have been developed assuming an authorisation regime where the base station locations are known. Additional considerations may be needed on a national basis for an authorisation regime where the location of base stations are not known to ensure that the harmonised technical conditions in this Decision are met.

WRC-19 identified the frequency band 40.5-43.5 GHz for IMT on a global basis. In March 2020, CEPT decided to develop a new ECC Decision to harmonise the frequency bands 40.5-43.5 GHz for MFCN. The harmonisation measures comprise a band plan and technical conditions suitable for 5G, taking into account the radio applications according to ERC Report 25 (ECA table).

In the 40.5-43.5 GHz band, MFCN will support mainly urban and suburban hotspot areas. The deployment of MFCN is expected to target only cells with a small range. Due to the characteristics of this frequency band, there is no expectation that it will be used for contiguous wide/nationwide coverage of MFCN networks areas. There may be a need for a limited number of hotspots in rural areas. MFCN networks at 40 GHz could be deployed indoor and outdoor.

Based on the harmonised technical conditions included in this ECC decision, coexistence with the FSS, the FS and RAS in the same band is feasible when considering assumed technical and operational characteristics for terrestrial MFCN and should be managed at national level. Additional national measures which do not impact LRTC are needed.

CEPT develop[ing /ed] [a] ECC Recommendation [(21)XX] on “Guidelines to support the introduction of 5G while ensuring, in a proportionate way, the use of FSS receiving earth stations in the frequency band 40.5-42.5 GHz and the use of FSS transmitting earth stations in the frequency band 42.5-43.5GHz and the possibility for future deployment of these earth stations”

In a number of CEPT countries, fixed point-to-point and point-to-multipoint links are in operation in the 40.5-43.5 GHz band. The band is also heavily used in many countries to deploy fixed point-to-point backhaul links for cellular networks and governmental usage. Coexistence issues between fixed links and MFCN in the 40.5-43.5 GHz frequency band will be managed at national level or through bilateral agreements for cross-border coordination and do not impact the harmonised technical conditions as defined in this Decision.

The protection of Radio Astronomy Service (RAS) observations in the 42.5-43.5 GHz band from in-band MFCN transmissions and from unwanted emissions of MFCN in the band 40.5-42.5 GHz will require the implementation of suitable coordination zones around RAS stations on a case-by-case basis.

A regular assessment of the evolution of MFCN system characteristics, including network deployments, in a timeline consistent with the 5 years review process of the Decision, or sooner if necessary, will provide additional confidence that these LRTC ensure adequate protection of other services, in particular space services

## REQUIREMENT FOR AN ECC DECISION

The ECC recognises that implementation of MFCN including IMT-2020/5G systems in CEPT countries providing high data rate applications in the band 40.5-43.5 GHz based on a harmonised frequency arrangement and least restrictive technical conditions will reduce development and implementation costs of manufacturing equipment and will secure future long term investments by providing economies of scale. A harmonised frequency arrangement will reduce complexity in cross-border coordination. The opportunity to utilise larger channel bandwidths will assist the provision of high data rates.

The ECC recognises that for the continuation of the successful development of MFCN including IMT­2020/5G, the regulatory framework needs to provide the confidence and certainty for industry to make the necessary investment. ECC recognises that administrations need flexibility to adapt their use of the band 40.5-43.5 GHz to national circumstances due to the current fixed links usage. Furthermore, administrations need to maintain the possibility of existing and future FSS earth stations to operate.

The ECC also recognises the need to include relevant technical conditions for MFCN including IMT-2020/5G to ensure protection of the FSS (s-e) in the frequency band 40.5-42.5 GHz, FSS (e-s) in the frequency band 42.5-43.5 GHz. and RAS (42.5-43.5 GHz). Additionality the implementation of suitable coordination zones (separation distances) between RAS stations / FSS earth stations and MFCN transmitters will be needed on a case-by-case basis.

# ECC Decision of dd month yyyy on HARMONISED TECHNICAL CONDITIONS FOR MOBILE/FIXED COMMUNICATIONS NETWORKS (MFCN) IN THE BAND 40.5-43.5 GHZ (ECC DECISION (YY)XX)

“The European Conference of Postal and Telecommunications Administrations,

*considering*

1. that MFCN for the purpose of this Decision includes International Mobile Telecommunications for 2020 (IMT-2020/5G) and other mobile and fixed communications networks;
2. that harmonised technical conditions (including a harmonised frequency arrangement) will support the implementation of MFCN in this band and facilitate global roaming, economies of scale and reduce the cost of equipment;
3. 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;
4. that the use of contiguous blocks of spectrum for MFCN reduces equipment complexity, provides a more efficient use of spectrum and facilitates spectrum access compared to the use of fragmented, non-contiguous blocks of spectrum;
5. that for a single MFCN network a contiguous block of 800-1000 MHz is desirable to enable the full capabilities of IMT-2020/5G systems;
6. that differences in the market demand for spectrum for MFCN and different authorisations regimes across CEPT countries is likely to lead to different timescales concerning the introduction of MFCN in the band 40.5-43.5 GHz;
7. that some administrations may wish to implement MFCN in parts of this frequency band on a progressive basis depending on national market demand;
8. that sharing with active services above 40 GHz may be easier than systems operating at lower frequencies since high transmitting directivity can be achieved with antennas of practical size, the atmospheric attenuation is higher and the scattering of signals by the troposphere decreases [1];
9. that the block edge mask (BEM) concept has been developed by CEPT to facilitate implementation of spectrum rights of use which are as technology neutral as possible;
10. that the technical conditions related to coexistence with other services attached to this Decision have been developed on the assumption of an authorisation regime where the base station location are known. Additional considerations may be needed on a national basis for an authorisation regime where the location of base stations are not known to ensure that the harmonised technical conditions in this Decision are met.;
11. that it is beneficial to synchronise MFCN networks operating in the same location (avoid simultaneous uplink and downlink transmissions) since this would increase the efficient usage of spectrum;
12. that the 40.5-43.5 GHz band will mainly be used for urban and suburban hotspot areas; however there may be a need for a limited number of hotspots in rural areas; it is not expected that the band will be used for contiguous wide/nationwide coverage of MFCN;
13. that a regular assessment of the evolution of MFCN system characteristics, including network deployments, in a timeline consistent with the 5 years review process of the Decision, or sooner if necessary, will provide additional confidence that these LRTC ensure adequate protection of other services, in particular space services;
14. that [CEPT is developing a] ECC Recommendation [(21)XX] “Guidelines to support the introduction of 5G while ensuring, in a proportionate way, the use of FSS receiving earth stations in the frequency band 40.5-42.5 GHz and the use of FSS transmitting earth stations in the frequency band 42.5-43.5GHz and the possibility for future deployment of these earth stations”. This address transmitting earth stations in the frequency band 42.5-43.5GHz and receiving earth stations in the frequency band 40.5-42.5GHz, for GSO and non-GSO satellite systems.
15. that most sharing studies have shown that Fixed-Satellite Service (FSS) space stations in the frequency band 42.5-43.5 GHz would be protected with a margin of more than 16 dB for GSO and 24.3 dB for NGSO, based on agreed assumptions, and it will be necessary to ensure that these services remain protected[(see considering n))];
16. that for outdoor base stations operating in 42.5-43.5 GHz the pointing elevation of the main beam should normally be below the horizon, and also the mechanical pointing needs to be at or below the horizion;
17. that very limited number of MFCN base stations will be communicating with a positive elevation angle towards MFCN indoor mobile stations;
18. that coexistence issues between fixed links and MFCN in the 40.5 – 43.5 GHz frequency band will be managed at national level or through bilateral agreements for cross-border coordination;
19. that the protection of RAS will require the implementation of suitable co-ordination zones around RAS stations on a case-by-case basis;
20. that the coverage of outdoor hotspot has been assumed in sharing studies to be achieved with the deployment of base stations communicating with terminals on the ground and a very limited number of indoor terminals with positive elevation, resulting in an elevation of the main beam of outdoor base stations normally below the horizon, thus with high discrimination towards the satellites;
21. ;

*DECIDES*

1. that CEPT administrations shall designate the frequency band 40.5-43.5 GHz for MFCN on a non-exclusive basis to Mobile/Fixed Communications Networks (MFCN) taking into account considerings o)), p)) … and q));
2. [that CEPT administrations shall make available by the end of 202X at least 1 GHz for MFCN in this band, subject to market demand;]
3. that CEPT administrations wishing to introduce MFCN in the band 40.5-43.5 GHz shall apply the frequency arrangement and technical conditions according to decides X, X and ... X;
4. that the MFCN frequency arrangement in the band 40.5 – 43.5 GHz is an unpaired Time Division Duplex (TDD) frequency arrangement as provided in Annex 1;
5. that the Least Restrictive Technical Conditions (LRTC) specified in Annex 2 shall apply to the MFCN systems;
6. that this Decision does not preclude the use of the band by other services to which the band is allocated;
7. that this Decision **enters into force** on X Month 202X;
8. that the preferred **date for implementation** of this Decision shall be X Month 202X;
9. that CEPT administrations shall communicate the **national measures** implementing this Decision to the ECC Chairman and the Office when this ECC Decision is nationally implemented.”

*Note:*

*Please check the Office documentation database http://www.ecodocdb.dk for the up to date position on the implementation of this and other ECC Decisions.*

1. harmonised frequency arrangement for the band 40.5–43.5 GHz
* The frequency arrangement is a TDD arrangement with a block size of 200 MHz;
* This block size could be adjusted to narrower blocks (multiples of 50 MHz) adjacent to other users, to allow full use of spectrum, if required
1. Example of possible frequency arrangements for MFCN in the 40.5-43.5 GHz band

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|   |  |  |  |  |  |  |   |
|   | 200 MHz | … | 200 MHz | 200 MHz | … | 200 MHz |   |
| 40500 |  |  |  |  |  |  | 43500 |
|   |  |  |  |  |  |  |   |

1. least restrictive technical conditions (LRTC) for the MFCN SYSTEMS

The technical conditions presented in this annex have been developed assuming an authorisation regime where the base station locations of transmitters and receivers are known. Additional considerations may be needed on a national basis for an authorisation regime where the location of base stations are not known to ensure that the harmonised technical conditions in this Decision are met. These conditions include provisions related to the coexistence between MFCN systems in the form of block edge masks (BEMs), i.e. related to spectrum licensing and the avoidance of interference between users of spectrum.

A BEM is an emission mask that is defined, as a function of frequency, relative to the edge of a block of spectrum that is licensed to an operator. It consists of components which specify the permitted emission levels in adjacent blocks (transitional region 0-50 MHz below or above operator block) and non-adjacent blocks in the band.

The technical conditions derived below for the frequency range 40.5 – 43.5 GHz are optimised for, but not limited to, fixed/mobile communications networks (two-way). Therefore, they are derived both for base stations (BS) and terminal stations (TS). The BEMs have been developed to ensure coexistence with other MFCN blocks, as well as other services and applications in adjacent bands. Additional measures may be required at a national level to achieve coexistence with other services and applications.

* 1. Base station

The MFCN Base Station (BS) BEM consists of a baseline level, designed to protect the spectrum of other MFCN operators as well as emission limits to protect adjacent services (additional baseline level(s)), and transitional levels for coexistence between MFCN networks in adjacent blocks.

Table 1 contains the different elements of the BS BEM, and Table 2 to Table 4 contain the power limits for the different BEM elements.

To obtain a BS BEM for a specific block the BEM elements that are defined in Table 1 are used as follows:

* Transitional regions are determined, and corresponding power limits are used;
* For remaining spectrum assigned to MFCN, baseline power limits are used;
* For protection of services in adjacent bands, additional baseline is used.

For MFCN base stations, baseline requirements and requirements for transitional regions in Table 2 and Table 3 assume synchronised operation. Operators of mobile/fixed communications networks (MFCN) in the 40.5 -43.5 GHz band may agree, on a bilateral or multilateral basis, less stringent technical parameters provided that they continue to comply with the technical conditions applicable for the protection of other services, applications or networks and with their cross-border obligations. Administrations should ensure that these less stringent technical parameters can be used, if agreed among all affected parties.

1. Table 1: MFCN BS BEM elements

| **BEM element** | **Definition** |
| --- | --- |
| Baseline | Applies in spectrum used for MFCN, except from the operator block in question and corresponding transitional regions. |
| Transitional region | These are the regions adjacent to an operator block. |

1. Table 2: MFCN BS transitional region requirements for coexistence
between MFCN networks in adjacent blocks (assuming synchronised operation, see note 1)

| **Frequency range**  | **Maximum Total Radiated Power (TRP)**  | **Measurement Bandwidth** |
| --- | --- | --- |
| 0-50 MHz below or above operator block  | [12 dBm] | 50 MHz |
| Note 1: Administrations may define appropriate mitigation measures to be applied in case of unsynchronised or semi-synchronised operations |

1. Table 3: MFCN BS baseline requirements for coexistence with MFCN networks in other (non-adjacent) blocks in the band (assuming synchronised operation, see note 1)

| **Frequency range**  | **Protected frequency range** | **Maximum Total Radiated Power (TRP)** | **Measurement bandwidth** |
| --- | --- | --- | --- |
| In-band baseline | 40.5-43.5 GHz | [4 dBm] | 50 MHz |
| Note 1: Administrations may define appropriate mitigation measures to be applied in case of unsynchronised or semi-synchronised operations,  |

1. Table 5: Conditions applying to the pointing of the main beam of 5G AAS outdoor base stations in 42.5 -43.5 GHz

| **Requirement on pointing of the main beam of 5G AAS outdoor base stations** |
| --- |
| When deploying outdoor base stations, it shall be ensured that each antenna is normally transmitting only with main beam pointing below the horizon and in addition the antenna shall have mechanical pointing below the horizon except when the base station is only receiving |

This requirement refers to the elevation of the main beam of 5G AAS outdoor base stations to ensure coexistence with space station receivers.

1. List of reference

This annex contains the list of relevant reference documents.

1. ITU, [Handbook on Radio Astronomy](https://www.itu.int/pub/R-HDB-22-2013), 2013.
2. etc.
3. etc.