ECC Decision (06)13

Harmonised technical conditions for mobile/fixed communications networks (MFCN) including terrestrial IMT systems, other than GSM and EC-GSM IoT, in the bands 880-915/925-960 MHz and 1710-1785/1805-1880 MHz[1]

approved 01 December 2006

latest amended 4 March 2022

[1] Comparable technical specifications to those given in this ECC Decision are given in Commission Implementing Decision (EU) 2022/173 [22]. EU Member States and, if so approved by the EEA Joint Committee, Iceland, Liechtenstein and Norway are obliged to implement the EC Decision.

EXPLANATORY MEMORANDUM

1 INTRODUCTION

Since 1997 CEPT has adopted a series of Decisions and Reports regarding the implementation of Mobile/Fixed Communications Networks (MFCN). These CEPT deliverables include:

- ERC Report 060 on global circulation of IMT-2000 terminals [1];
- ECC Report 82 on the compatibility study for UMTS operating within the GSM 900 and GSM 1800 frequency bands [2];
- ECC Report 96 on the compatibility between UMTS 900/1800 and systems operating in adjacent bands [3];
- CEPT Report 42 on compatibility between UMTS and existing and planned aeronautical systems above 960 MHz [4].

The 900 MHz (880-915 MHz/925-960 MHz) and 1800 MHz (1710-1785 MHz/1805-1880 MHz) bands have been subject to several harmonisation measures taken at EU level or by the ECC:

- Council Directive 87/372/EEC [5] and the related Council Recommendation 87/371/EEC [6], which came into force in 1987;
- ERC Decision (94)01 on the frequency bands to be designated for the coordinated introduction of the GSM digital pan-European communications system [7];
- ERC Decision (95)03 on the frequency bands to be designated for the introduction of DCS 1800 [8];
- ERC Decision (97)02 on the extended frequency bands to be used for the GSM Digital Pan-European Communication System [9].

In 2009, Directive 2009/114/EC [10] of the European Parliament and of the Council amending Council Directive 87/372/EEC [5] was approved opening the 880-915 MHz and 925-960 MHz frequency bands (the 900 MHz band) to the Universal Mobile Telecommunications System (UMTS) and to other terrestrial systems capable of providing electronic communications services that can co-exist with the Global System for Mobile communications (GSM).

During 2009, the European Commission issued a mandate to CEPT on the technical conditions for allowing LTE and possibly other technologies within the bands 880-915 MHz/925-960 MHz and 1710-1785 MHz/1805-1880 MHz (900 MHz and 1800 MHz bands). It was verified that WiMAX is another technology besides LTE showing interest for the 900 MHz and 1800 MHz bands. Compatibility studies were done and the technical conditions under which LTE and WiMAX technologies can be deployed in the 900/1800 MHz bands are identified in the following CEPT Reports approved by the ECC in 2010:

- CEPT Report 40 on compatibility study for LTE and WiMAX operating within the bands 880-915 MHz/925-960 MHz and 1710-1785 MHz/1805-1880 MHz (900 MHz and 1800 MHz bands) [11];
- CEPT Report 41 on compatibility between LTE and WiMAX operating within the bands 880-915 MHz/925-960 MHz and 1710-1785 MHz/1805-1880 MHz (900 MHz and 1800 MHz bands) and systems operating in adjacent bands [12].

Based on the above CEPT Reports, the European Commission updated the EU regulatory framework accordingly to address also LTE and WiMAX with Decision 2011/251/EU [13].

In 2017, ECC assessed the suitability of the current ECC regulatory framework for the usage of Wideband and Narrowband M2M in the frequency bands 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 2.6 GHz and published the ECC Report 266 [14] accordingly.

ECC proposed relevant amendments of the harmonised technical conditions accordingly and ensuring both backward compatibility with existing use in 900/1800 MHz frequency band, and suitability for IoT applications. ECC developed its analysis in CEPT Report 66 [15] on the basis of the ECC Report 266. Based on CEPT Report 66, the European Commission updated the EU regulatory framework accordingly to address also IoT cellular with Decision 2018/637/EU [16].

In 2018, ECC assessed in ECC Report 297 [17] the suitability of the current harmonised ECC regulatory framework for the deployment of 5G based on New Radio ("5G New Radio" is abbreviated as "NR" in this Decision) with non-AAS BS in 880-915 MHz and 925-960 MHz frequency bands (i.e. "900 MHz band") and NR with non-AAS BS, NR AAS BS and LTE AAS BS in the 1710-1785 MHz and 1805-1880 MHz frequency bands (i.e. "1800 MHz band").

In 2019, ECC developed CEPT Report 72 (Report A) [18] to *"review the harmonised technical conditions for certain EU-harmonised frequency bands and to develop least restrictive harmonised technical conditions suitable for next-generation (5G) terrestrial wireless systems"* and in particular *"Review of technical conditions in the paired terrestrial 2 GHz and the 2.6 GHz frequency bands, and the usage feasibility of the 900 MHz and 1800 MHz frequency bands".*

In 2021, ECC developed CEPT Report 80 (Report B) [19] to "*develop channelling arrangements and common and minimal (least restrictive) technical conditions, for the 900MHz and 1800MHz, suitable for 5G terrestrial wireless systems in compliance with the principles of technology and service neutrality".*

Non-AAS (non-active antenna systems) refers to MFCN base stations that provide one or more antenna connectors, which are connected to one or more separately designed passive antenna elements to radiate radio waves. The amplitude and phase of the signals to the antenna elements is not continually adjusted in response to short term changes in the radio environment.

AAS (active antenna systems) refers to MFCN base stations and antenna systems where the amplitude and/or phase of the signals from the various antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. This is intended to exclude long term beam shaping such as fixed electrical down tilt.

ECC also assessed the suitability of the current ECC regulatory framework for the deployment of NR Supplemental Uplink (SUL) operation in frequency bands 880-915 MHz and 1710-1785 MHz i.e. NR uplink operation without paired downlink NR channel in the same band, on the basis of the current FDD usage of the band plan.

ECC noted that the current EU framework Decision 2009/766/EC [20] (as amended in 2011/251/EU [21] and 2018/637/EU [16]) allows in 900/1800 MHz use of other systems, which are not listed in the annex of this EU framework, under the condition of ensuring coexistence with the GSM system and the systems: UMTS, LTE, WiMAX and IoT cellular. In consequence, this updated ECC harmonised framework facilitates compliance with this current EU 900/1800 MHz framework in order to accommodate LTE AAS and New Radio (Non-AAS and AAS) providing relevant harmonised technical conditions allowing the use in 900/1800 MHz of these new systems while ensuring coexistence with the technologies listed in the previous version of this Decision. The EU framework has been updated in 2022 in Commission Implementing Decision (EU) 2022/173 [22] on the basis of CEPT Report 80 in order to implement a technology neutral approach (BEM).

2 BACKGROUND

In line with CEPT proposals, WRC-07 identified for IMT the spectrum that was already used on a large scale for GSM systems having in mind that IMT would be implemented in the longer term in these frequency bands as part of the migration from 2G to 3G, 4G and 5G networks.

In the meantime, the licensing process for IMT has taken place starting in the "core" (2.1 GHz) band, followed by other frequency bands (e.g. 800 MHz, 1800 MHz or 2.6 GHz). IMT networks have been deployed over Europe in these frequency bands and are rapidly growing.

IMT is defined in Resolution ITU-R 56 (on Naming for International Mobile Telecommunications) [23] and detailed specifications of IMT radio interfaces can be found in several Recommendations e.g. Recommendation ITU-R M.1457 [24], Recommendation ITU-R M.2012 [25] and Recommendation ITU-R M.2150 [26];

CEPT Reports 40 [11], 41 [12] and 66 [15] concluded that LTE, WiMAX and IoT cellular systems can be introduced in the 900 MHz and 1800 MHz bands using appropriate values for the separation between the channel edges of the respective carriers. It is also recognised that there is a wide range of licensing situations

for GSM, UMTS and LTE networks which have to be addressed on a national level to enable the progressive transition from GSM networks to UMTS, LTE, NR, WiMAX and IoT cellular networks.

In the foreseen usage of these bands for M2M systems standardised by 3GPP and ETSI, ECC Report 266 [14] analyses the suitability of the current ECC framework for the usage of Machine-to-Machine (M2M) applications according to the following technologies: Extended Coverage GSM IoT (EC-GSM-IoT), LTE Machine Type Communication (LTE-MTC), evolved MTC (LTE-eMTC)[2] and Narrowband IoT (NB-IoT). It describes the various deployment models for the technologies. Deployment models refer to how Mobile Network Operators (MNO) can deploy M2M/IoT technologies, taking into account that these are narrowband technologies, while MNOs' networks are often based on wideband technologies. The deployment models are as follows:

- as a fully independent deployment (standalone (SA) deployment);
- by pre-empting some of the resources of an existing carrier (in-band deployment);
- by being deployed on the side of an existing carrier (guard band deployment).

ECC analysed in ECC Report 297 [17] the characteristics of the NR non-AAS BS systems including Supplemental Uplink (SUL) operation as developed by standardisation bodies compared to LTE non-AAS BS and concluded that they are generally equivalent for the purpose of co-existence studies.

ECC also analysed the characteristics of the NR AAS BS and LTE AAS BS systems and concluded that they are generally aligned and are also equivalent for the purpose of co-existence studies to those of LTE non-AAS BS system with the same functionality:

- ECC noted that AAS is not implemented in User Equipment at 900/1800 MHz frequency bands;
- ECC analysed and confirmed that the conclusions of the adjacent bands compatibility studies from CEPT Report 41 [12] and CEPT Report 42 [4] applicable to LTE non-AAS in 900/1800 MHz frequency bands are also applicable to both NR non-AAS 900/1800 MHz and LTE/NR AAS 1800 MHz;
- ECC analysed and confirmed that the conclusions of the in-band compatibility studies applicable to LTE non-AAS in 900/1800 MHz bands from CEPT Report 40 are also applicable to NR AAS, NR non-AAS and LTE AAS in 1800 MHz band and to NR non-AAS in 900 MHz band.

Further to the EC Mandate requiring implementation of the technology neutral principle in the 900/1800 MHz bands, CEPT has analysed in CEPT Report 80 [19] how to transpose the current harmonised technical conditions, based on a list of technologies identified by the previous EC regulatory framework: UMTS, LTE, WiMAX, NR and NB-IoT, to a common set of least restrictive technical conditions (LRTCs) which are compliant with the principles of technology neutrality.

CEPT considered the following definitions for NB and WB systems respectively:

- NB systems as systems operating in 200 kHz channels, excluding GSM and EC-GSM-IoT;
- WB systems as systems operating in channels larger than 200 kHz.

Therefore, the LRTCs include various common components of a Block Edge Mask (BEM) applicable for both WB and NB systems and, when appropriate, relevant frequency separation to be applied at the edge of the assigned block.

CEPT agreed to derive a single BEM for non-AAS BS based on non-AAS MSR BS unwanted emissions supporting UMTS, LTE (1.4 MHz, 3 MHz and5 MHz), NR, NB-IoT-SA.

CEPT agreed to derive a single BEM for AAS BS based on AAS MSR BS unwanted emissions supporting UMTS, LTE (1.4 MHz, 3 MHz and 5 MHz), NR.

CEPT confirmed in CEPT Report 80 that GSM (including EC-GSM-IoT) protection from systems complying with the harmonised LRTCs (non-AAS or AAS) is ensured, with relevant frequency separation as appropriate.

[2] In 3GPP terms, LTE-MTC corresponds to LTE Cat-1 or LTE Cat-0 and LTE-eMTC corresponds to LTE Cat-M1.

Based on CEPT Report 80, CEPT updated in 2021 the ECC framework on 900 and 1800 MHz giving flexibility for usage of various MFCN technologies according to the national situation.

3 REQUIREMENT FOR AN ECC DECISION

The ECC recognises that a harmonised implementation of cellular technologies will be of greatest benefit to operators, manufacturers as well as users and will facilitate the successful deployment of for example LTE, NR and IoT cellular technologies. Furthermore, the ECC recognises the demand for the introduction of IoT cellular technologies, i.e. LTE-MTC/eMTC (LTE evolved Machine Type Communication), EC-GSM-IoT (Extended Coverage GSM IoT) and NB-IoT (Narrowband IoT).

The ECC recognises that the introduction of NR in the bands 880-915 MHz, 925-960 MHz, 1710-1785 MHz and 1805-1880 MHz provides opportunity for better coverage and, ultimately, more capacity. These frequency bands are already widely harmonised in Europe for GSM, UMTS, LTE and, IoT cellular networks.

The ECC recognises that NR systems have been developed to meet a new demand for enhanced mobile broadband (eMBB), massive machine type communications (mMTC), and ultra-reliable and low latency communications (URLLC).

CEPT has analysed how to transpose the current harmonised technical conditions, based on a list of technologies identified by the previous ECC regulatory framework: UMTS, WiMAX, NR, NB-IoT and LTE, to a common set of LRTCs which are compliant with the principle of technology neutrality.

CEPT confirmed the need to replace the current technical framework based on references to ETSI harmonised standards for both bands in order to implement the LRTCs approach suitable for long term development of various mobile systems (NB/WB, non-AAS, AAS) in the 900/1800 MHz bands.

Furthermore, it ensures coexistence with the GSM system in the 900/1800 MHz frequency bands, pursuant to the GSM Directive (Council Directive 87/372/EEC [5] as amended by Directive 2009/114/EC of the European Parliament and of the Council [10]), while delivering a solution, which ensures availability and efficient use of the spectrum for next-generation terrestrial wireless systems in line with the Union's spectrum policy priorities. EC-GSM-IoT is protected as GSM with the proposed technology neutral LRTCs. CEPT developed an analysis for GSM in CEPT Report 80, which is also valid for EC-GSM-IoT.

The 900 MHz and 1800 MHz bands are intensively used. This ECC Decision will enable flexibility and increased spectrum efficiency in these bands.

This ECC Decision provides the necessary provisions for the designation of the bands 880-915 MHz, 925-960 MHz, 1710-1785 MHz and 1805-1880 MHz, for Narrowband (NB) systems and Wideband (WB) systems and their implementation is subject to market demand and national licensing schemes.

Decisions that "designate" a frequency band for a harmonised application are intended to foster the deployment of an application to meet a market demand in a harmonised manner throughout CEPT. Members implementing the Decision commit themselves to make spectrum available for this harmonised application which includes assessing when and where there is a demand for the harmonised service/application and deciding whether that demand is great enough to exclude other services and applications from the harmonised band. Such Decisions shall not inhibit radiocommunication equipment meeting different standards from operating in an identified frequency band provided it offers the same spectrum use and application as specified in a Decision for the band and is placed on the market in conformity with the essential requirements i.e. it makes effective use of the spectrum allocated to terrestrial/space radiocommunications so as to avoid harmful interference[3].

[3] This paragraph is Article 12.1.2 of the ECC Rules of Procedure, edition 13, Vilnius, 2 November 2012.

ECC DECISION OF 1 DECEMBER 2006 ON THE HARMONISED TECHNICAL CONDITIONS FOR MOBILE/FIXED COMMUNICATIONS NETWORKS (MFCN) INCLUDING TERRESTRIAL IMT SYSTEMS, OTHER THAN GSM AND EC-GSM-IOT, IN THE BANDS 880-915/925-960 MHZ AND 1710-1785/1805-1880 MHZ (ECC/DEC/(06)13), AMENDED 21 JUNE 2013, 2 MARCH 2018, 8 MARCH 2019 AND 4 MARCH 2022

"The European Conference of Postal and Telecommunications Administrations,

considering

a) that MFCN for the purpose of this Decision includes terrestrial IMT (excluding GSM and EC-GSM-IoT) and other communications networks in the mobile and fixed services;

b) that GSM is referenced based on ERC Decision (94)01 [7], ERC Decision (95)03 [8], ERC Decision (97)02 [9] and reference to relevant ETSI harmonised standards EN 301 502 [28], EN 301 511 [29] and EN 301 908-18 [30];

c) that EC-GSM-IoT is included under the umbrella term GSM, due to being defined under the same ETSI harmonised standard as those given for GSM in considering b);

d) that non-AAS (non-Active Antenna Systems) refers to MFCN base stations that provide one or more antenna connectors, which are connected to one or more separately designed passive antenna elements to radiate radio waves. The amplitude and phase of the signals to the antenna elements is not continually adjusted in response to short term changes in the radio environment;

e) that AAS (Active Antenna Systems) refers to MFCN base stations and antenna systems 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 is intended to exclude long-term beam shaping such as fixed electrical down tilt;

f) ERC Decision (94)01 on the frequency bands to be designated for the coordinated introduction of the GSM digital pan-European communications system [7];

g) ERC Decision (95)03 on the frequency bands to be designated for the introduction of DCS 1800 [8];

h) ERC Decision (97)02 on the extended frequency bands to be used for the GSM Digital Pan-European Communications System [9];

i) that Member States of the European Union have implemented Council Directive 87/372/EEC [5] amended by Council Directive 2009/114/EC [10] and the related Council Recommendation 87/371/EEC [6] which came into force in 1987;

j) the importance of facilitating the deployment of mobile broadband networks in rural areas and improving indoor coverage;

k) that the introduction of a technology neutral framework for MFCN Narrow Band (NB) systems and Wide Band (WB) systems leads to future proof regulation in the 900 MHz and 1800 MHz bands;

l) that GSM/UMTS networks may progressively migrate to more recent cellular network technologies compatible with the MFCN NB and WB LRTCs included in this ECC Decision, and the migration schedule and process will depend on market demand and conditions, national regulatory conditions and licensing schemes;

m) that CEPT reused existing ECC/CEPT deliverables to avoid new additional studies in order to derive the LRTCs, including the coexistence with all adjacent services;

n) that CEPT Report 80 [19] provides analysis, harmonised technical conditions and a toolbox on the national implementation of technology neutral LRTCs in the 900 MHz and 1800 MHz frequency bands, and information and recommendations on how to mitigate interference between MFCN in the 900 MHz and 1800 MHz frequency bands and services in the adjacent bands;

o) that ECC Report 229 [31] proposes guidelines to help national coordination/cooperation between RMR and MFCN systems;

p) that the technical conditions for MFCN base stations have been developed under the assumption that only non-AAS BS may be used in the 900 MHz frequency band and either non-AAS BS or AAS BS may be used in the 1800 MHz frequency band;

q) that the technical conditions for MFCN base stations have been developed under the assumption that only non-AAS BS may be used by NB systems and either non-AAS BS or AAS BS may be used by WB systems;

r) that AAS does not apply to user terminals in the 900 MHz and 1800 MHz frequency bands;

s) that AAS MFCN systems should not claim more protection than provided to non-AAS MFCN systems;

t) that the spurious emission domain for the base station in these frequency bands start 10 MHz from the band edge and the corresponding limits are defined in current ERC Recommendation 74-01 [32];

u) that some WB systems (such as 5G NR) are standardised on the basis of 5 MHz blocks or multiples thereof, and these systems therefore require a minimum assigned block size of 5 MHz;

v) that, to avoid blocking by a narrowband system adjacent in frequency, a 200 kHz frequency separation may be required including between RMR and MFCN and this issue can be addressed at national level;

w) that, without bilateral coordination between MFCN networks, there may be a need for 200 kHz frequency separation to be managed at a national level. Different approaches could be implemented, depending on the spectrum edges noting that CEPT Report 80 includes a toolbox supporting this implementation as appropriate according to national situations (efficient use of spectrum, competition, coverage policy, etc;).

x) that MFCN authorisations may have been granted for the 900 MHz and 1800 MHz bands based on the technical conditions as contained in the previous versions of this ECC Decision including the version of 8 March 2019 ;

y) that CEPT agreed to derive the technology neutral LRTCs in Annex 1 (BEM for non-AAS and AAS base stations) based on ETSI Core requirements specifications;

z) that CEPT assumes that ETSI will continue using conformance requirements when developing ETSI Harmonised Standards in the future (including necessary test tolerance);

aa) that assignment of contiguous spectrum offers more flexibility to mobile operators to manage various NB and WB technology migration;

bb) that the proposed technology neutral LRTCs for AAS and non-AAS (including implementation of required frequency separation) as described in CEPT Report 80 will ensure that GSM (including EC-GSM-IoT) will remain protected;

cc) that in EU/EFTA countries the radio equipment that is under the scope of this Decision shall comply with the RE Directive [33]. Conformity with the essential requirements of the RE Directive may be demonstrated by compliance with the applicable harmonised European standard(s), cited in the Official Journal of the European Union (OJ), or by using the other conformity assessment procedures set out in the RE Directive;

DECIDES

1. that this decision designates[4] the frequency bands 880-915 MHz, 925-960 MHz, 1710-1785 MHz and 1805-1880 MHz, for MFCN Narrowband (NB) systems which are operating in 200 kHz channels (excluding GSM and EC-GSM-IoT) and MFCN Wideband (WB) systems which are operating in channels larger than 200 kHz, subject to market demand and national licensing schemes;
2. that administrations wishing to implement MFCN systems in the 880-915/925-960 MHz and 1710-1785/1805-1880 MHz bands should follow the frequency arrangement and the least restrictive technical conditions suitable for MFCN, given in Annex 1;
3. that administrations shall take all necessary measures to ensure the protection of the continued operation of GSM including EC-GSM-IoT systems in the 900 MHz and 1800 MHz bands;
4. that this Decision shall enter into force on date: 4 March 2022;
5. that the preferred date for implementation of this Decision shall be: 4 September2022;

[4] See section 3 of the Explanatory Memorandum.

6. that CEPT administrations shall communicate the national measures implementing this Decision to the ECC Chairman and the Office when the Decision is nationally implemented."

Note:

Please check the Office documentation database https://docdb.cept.org/ for the up to date position on the implementation of this and other ECC Decisions.

ANNEX 1: HARMONISED CHANNELLING ARRANGEMENT AND LEAST RESTRICTIVE TECHNICAL CONDITIONS

A1.1 DEFINITIONS

The following definitions for MFCN narrowband (NB) and MFCN wideband (WB) systems respectively apply in this Annex:

- MFCN NB systems are systems operating in 200 kHz channels, excluding GSM and EC-GSM-IoT;
- MFCN WB systems are systems operating in channels larger than 200 kHz.

The following definitions for RMR narrowband (NB) and RMR wideband (WB) systems respective apply in this Annex:

- RMR NB systems are RMR systems operating in 200 kHz channels;
- RMR WB systems are RMR systems operating in channels larger than 200 kHz.

A1.2 MFCN HARMONISED BAND PLAN

1 The 900 MHz band follows an FDD band plan. The duplex direction for the carriers in 880-915 MHz/925-960 MHz[5] frequency bands is mobile transmit within the lower band and base station transmit within the upper band.

2 The 1800 MHz band follows an FDD band plan. The duplex direction for the carriers in 1710-1785 MHz/1805-1880 MHz[6] frequency bands is mobile transmit within the lower band and base station transmit within the upper band.

3 The 900 MHz national band plan should generally provide the opportunity to access at least 5 MHz of contiguous spectrum; if smaller block sizes are assigned they should be in multiples of 200 kHz.

4 The 1800 MHz national band plan should generally provide the opportunity to access at least 5 MHz of contiguous spectrum; if smaller block sizes are assigned they should be in multiples of 200 kHz.

5 The MFCN band plans for the 900 MHz and 1800 MHz bands are depicted in Figure 1.

[5] The 880-915 MHz range or portions thereof can be used for uplink-only operation without paired spectrum within the 925-960 MHz range;
the 925-960 MHz range or portions thereof, can be used for downlink-only operation without paired spectrum within the 880-915 MHz range.

[6] The 1710-1785 MHz range or portions thereof, can be used for uplink-only operation without paired spectrum within the 1805-1880 MHz range;
the 1805-1880 MHz range or portions thereof, can be used for downlink-only operation without paired spectrum within the 1710-1785 MHz range.

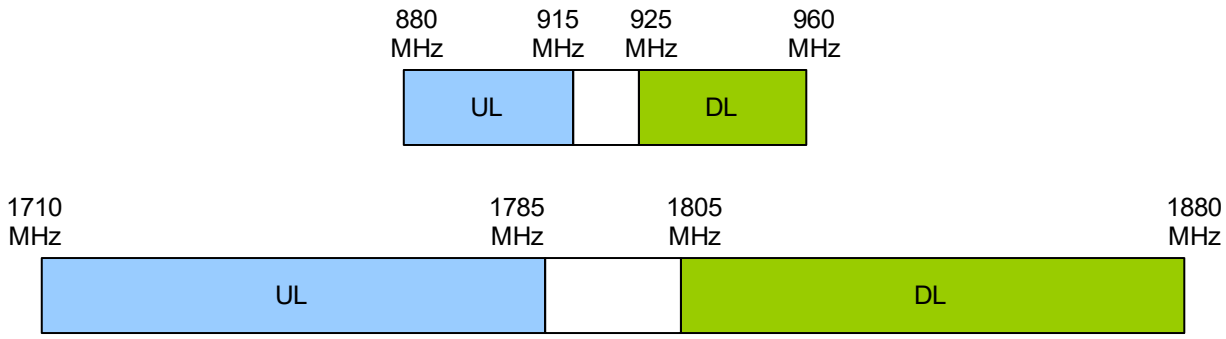

Figure 1: Harmonised band plan

A1.3 FREQUENCY SEPARATION BETWEEN ADJACENT MFCN SYSTEMS

When deployed in an uncoordinated approach, it is necessary to implement a 200 kHz frequency separation between the nominal channel edges of:

- An MFCN NB system complying with the BEM and an MFCN WB system complying with the BEM;
- Different MFCN NB systems both complying with the BEM; and,
- GSM (including EC-GSM-IoT) and either an MFCN NB system or MFCN WB system complying with the BEM.

Implementation of such frequency separation refers to a national context.

For an MFCN NB system operating in a guard band mode of a relevant MFCN WB system, a frequency separation of 200 kHz or more is necessary between the channel edge of this MFCN NB system and the edge of the operator's block, taking into account existing guard bands between operators' block edges or the edge of the operating band (adjacent to other services). Such MFCN NB systems operate only in channel bandwidths of 10 MHz or higher.

The above frequency separations are required to ensure coexistence in the absence of bilateral or multilateral agreements between neighbouring networks, without precluding less stringent technical parameters if agreed among the operators of such networks.

Where needed, the implementation of this 200 kHz frequency separation needs to be addressed on a national basis in order to maintain spectrum efficiency. Various approaches could be implemented either separately or simultaneously depending on the spectrum edges of adjacent MFCN networks.

Depending on the national context and relevant deployment of MFCN NB or WB and RMR (encompasses GSM-R and its successor(s), including FRMCS), there may also be a need for a 200 kHz frequency separation between channel edges of networks adjacent in frequency at 925 MHz in the following cases: RMR NB vs. MFCN WB, RMR WB vs. MFCN NB and, when the MFCN NB and RMR NB systems are different, RMR NB vs. MFCN NB. This frequency separation should be addressed by regulatory measures at a national level in order to maintain spectrum efficiency.

A1.4 LEAST RESTRICTIVE TECHNICAL CONDITIONS

A Block Edge Mask (BEM) is an essential component of conditions necessary to ensure co-existence 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 technical conditions presented in this Annex, which apply to all systems except GSM/EC-GSM-IoT, are in the form of a Block Edge Mask (BEM) for base stations and an in-band power limit for terminal stations. BEMs

are related to authorisation of spectrum rights of use and the avoidance of interference between users which benefit from such authorisation.

A1.4.1 Technical conditions for base stations – Block Edge Mask

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

The additional baseline power limit is an out-of-band power limit which is used for the protection of systems above and below the band edge, where needed.

Power limits are provided separately for non-AAS and AAS base stations. Non-AAS base stations may be used in the 900 MHz and 1800 MHz frequency bands, hence the non-AAS base station power limits apply to both bands. For non-AAS base stations, the power limits are expressed as mean equivalent isotropically radiated power (e.i.r.p.). AAS base stations may only be used in the 1800 MHz frequency band, hence the AAS base station power limits only apply to this band. For AAS base stations, the power limits are expressed as mean total radiated power (TRP). TRP is defined as the integral of the power radiated by an antenna array system in different directions over the entire radiation sphere. TRP is equal to the total conducted power input into the antenna array system, less any losses in the antenna array system. The mean e.i.r.p. or mean TRP are measured by averaging over a time interval and over a measurement frequency bandwidth. In the time domain, the mean e.i.r.p. 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 e.i.r.p. or mean TRP is determined over the measurement frequency bandwidth as given in Table 2, Table 3, Table 4 and Table 5 below.

The BEM power limits for AAS base stations are specified per cell and for non-AAS base stations are specified per antenna.

Table 1: MFCN Base Station Block Edge Mask elements

BEM element	Definition
In-block	Applies to a block assigned to an operator
Baseline	Applies in spectrum used for MFCN, except from the operator block in question and corresponding transitional regions
Transitional regions	Applies in regions adjacent to the operator block in question
Additional baseline	Applies in adjacent bands (out-of-band) where specific limits for protection of other services are necessary

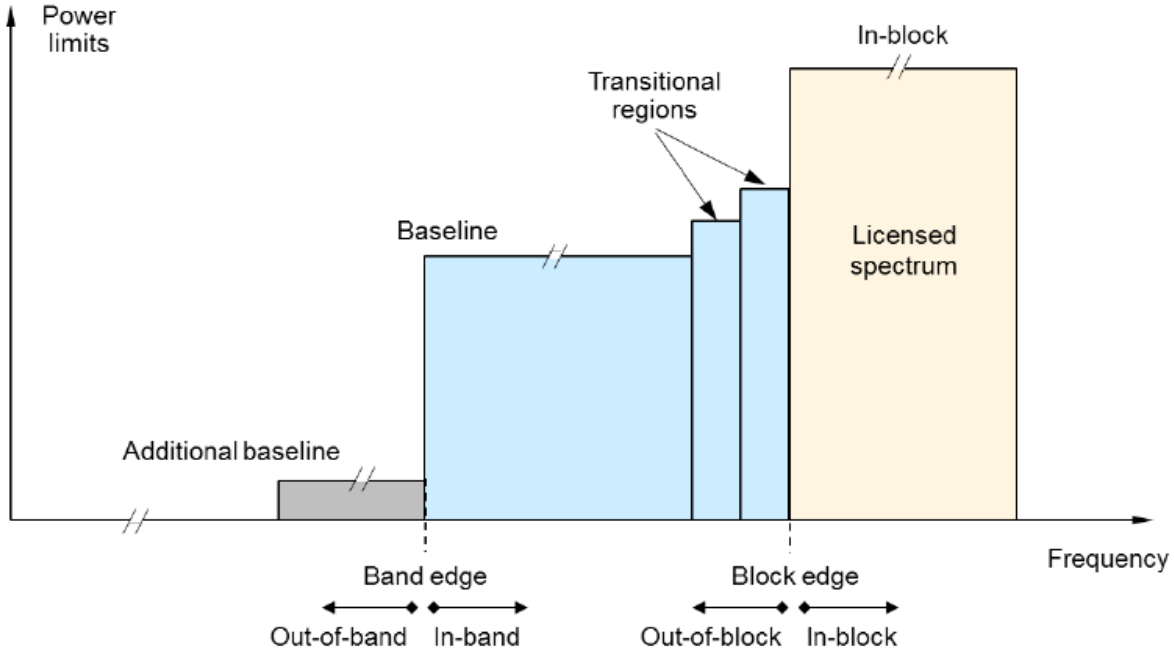

Figure 2: Block edge mask elements

A1.4.1.1 In-band power limits

In-band power limits for base stations are provided in Table 2, Table 3 and Table 4.

Table 2: Base station in-block power limit for non-AAS and AAS

BEM element	Non-AAS maximum mean e.i.r.p. per antenna (for 900 MHz and 1800 MHz band)	AAS maximum mean TRP per cell (for 1800 MHz band)
In-block	Not obligatory. In case an upper bound is desired by an administration, a value of 63-67 dBm/(5 MHz) may be applied for wideband systems and a value of 60-69 dBm/(200 kHz) may be applied for narrowband systems.	Not obligatory. In case an upper bound is desired by an administration, a value of 58 dBm/(5 MHz) (Note 1) may be applied.
Note: For locations where coordination procedure with adjacent services applies an upper bound on output power can be set by administrations. Note 1: In a multi-sector base station, the radiated power limit applies to each one of the individual sectors.		

Table 3: Base Station Baseline out-of-block power limit for non-AAS and AAS

BEM element	Frequency range	Non-AAS maximum mean e.i.r.p. per antenna (for 900 MHz and 1800 MHz band)	AAS maximum mean TRP per cell (Note 1) (for 1800 MHz band)
Baseline	FDD DL blocks	3 dBm/MHz	-6 dBm/MHz
Note 1: In a multi-sector base station, the radiated power limit applies to each one of the individual sectors.			

Table 4: Base Station Transitional out-of-block power limits for non-AAS and AAS

BEM element	Frequency range	Non-AAS maximum mean e.i.r.p. per antenna (for 900 MHz and 1800 MHz band) (Note 1)	AAS maximum mean TRP per cell (Note 2) (for 1800 MHz band)
Transitional region	0 to 0.2 MHz offset from block edge	32.4 dBm/(0.2 MHz)	17.4 dBm/(0.2 MHz)
	0.2 to 1 MHz offset from block edge	13.8 dBm/(0.8 MHz)	4.7 dBm/(0.8 MHz)
	1 to 5 MHz offset from block edge	5 dBm/MHz	-4 dBm/MHz
	5 to 10 MHz offset from block edge	12 dBm/(5 MHz)	3 dBm/(5 MHz)
Note 1: The non-AAS e.i.r.p. limits could be relaxed at national level, either if agreed among all affected operators of such networks or in accordance with national implementation already in place. Note 2: In a multi-sector base station, the radiated power limit applies to each one of the individual sectors.			

A1.4.1.2 Out-of-band power limits

To protect the adjacent services, the additional baseline region limits for non-AAS BS provided in the below table are defined. Table 5 applies only to the out-of-band domain in line with Figure 2 and Table 1. This implies that the applicable frequency range entirely falls within the out-of-band domain.

Table 5: Base Station Additional baseline region power limits for non-AAS

Applicable frequency range	Non-AAS maximum mean e.i.r.p. per antenna (for 900 MHz and 1800 MHz band) (Note 1 and Note 2)
0 to 0.2 MHz offset from block edge	32.4 dBm/(0.2 MHz)
0.2 to 1 MHz offset from block edge	13.8 dBm/(0.8 MHz)
1 to 5 MHz offset from block edge	5 dBm/MHz
5 to 10 MHz offset from block edge	12 dBm/(5 MHz)
>10 MHz offset from block edge (Note 3)	3 dBm/MHz

Note 1: Provided that adjacent services, applications or networks remain protected above 960 MHz, below 1805 MHz and above 1880 MHz: On case-by-case basis, at national level, higher e.i.r.p. limits may be applied for non-AAS BS:

- e.i.r.p. limits up to 6 dB higher are allowed in the 0-200 kHz range from the band edge to support higher MFCN NB in-band block conducted power than 49 dBm/(200 kHz) i.e. up to 55 dBm/(200 kHz);
- e.i.r.p. limits up to 11 dB higher is allowed in the 0-10 MHz range from the band edge to support higher antenna gain than 18 dBi (up to 29 dBi).

Note 2: Provided that adjacent services, applications or networks remain protected below 925 MHz: On case-by-case basis, at national level, higher e.i.r.p. limits may be applied for non-AAS BS.

Note 3: The spurious value in A1.4.1.3 applies for a frequency spacing of more than 10 MHz from the band edge.

For AAS BS, the out-of-block limits given in Tables 3 and 4 also apply to the out-of-band domain in the range of 0 to 10 MHz from the band edge, as appropriate, considering the position of the assigned block.

A1.4.1.3 Other conditions

The spurious emission domain for the base station in these frequency bands start 10 MHz from the band edge and the corresponding limits are defined in current ERC Recommendation 74-01 [31].

In addition, MFCN networks making use of AAS systems shall not be granted more protection from systems in adjacent and neighbouring bands than experienced with non-AAS systems.

A1.4.2 Technical conditions for terminal stations

In-block power limits for terminal stations are provided in Table 6.

Table 6: In-block power limits for Terminal Stations

BEM element	Maximum mean power (Note 1)
In-block	25 dBm (Note 2)

Note 1: The recommended power limit for mobile terminal stations is specified as TRP. The in-block radiated power limit for fixed/nomadic terminal stations may be agreed on a national basis provided that protection of other services, networks and applications is not compromised and cross-border obligations are fulfilled.

Note 2: It is recognised that this value includes a possible tolerance of up to +2 dB, to take account of operation under extreme environmental conditions and production spread. This value does not include test tolerance..

ANNEX 2: LIST OF REFERENCES

This annex contains the list of relevant reference documents.

Note: where version numbers of harmonised standards are not stated, the latest published version applies.

[1] ERC Report 060:"Global circulation of IMT-2000 terminals", approved September 1998

[2] ECC Report 82: "Compatibility study for UMTS operating within the GSM 900 and GSM 1800 frequency bands", approved May 2006

[3] ECC Report 96: "Compatibility between UMTS 900/1800 and systems operating in adjacent bands", approved April 2007

[4] CEPT Report 42: "Compatibility between UMTS and existing and planned aeronautical systems above 960 MHz", approved November 2010

[5] Council Directive 87/372/EEC of 25 June 1987 on the frequency bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community

[6] Council Recommendation 87/371/EEC of 25 June 1987 on the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community

[7] ERC Decision (94)01: "The frequency bands to be designated for the coordinated introduction of the GSM digital pan-European communications system", approved October 1994

[8] ERC Decision (95)03: "The frequency bands to be designated for the introduction of DCS 1800", approved December 1995

[9] ERC Decision (97)02: "The extended frequency bands to be used for the GSM Digital Pan-European Communication System", approved March 1997

[10] Directive 2009/114/EC of the European Parliament and of the Council amending Council Directive 87/372/EEC on the frequency bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community

[11] CEPT Report 40 : "Compatibility study for LTE and WiMAX operating within the bands 880-915 MHz / 925-960 MHz and 1710-1785 MHz / 1805-1880 MHz (900/1800 MHz bands)", approved November 2010

[12] CEPT Report 41: "Compatibility between LTE and WiMAX operating within the bands 880-915 MHz / 925-960 MHz and 1710-1785 MHz / 1805-1880 MHz (900/1800 MHz bands) and systems operating in adjacent bands", approved November 2010

[13] EC Decision 2011/251/EU amending Decision 2009/766/EC on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community

[14] ECC Report 266: "The suitability of the current ECC regulatory framework for the usage of Wideband and Narrowband M2M in the frequency bands 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 2.6 GHz", approved June 2017

[15] CEPT Report 66: Report from CEPT to the European Commission in response to the Mandate "to review the harmonised technical conditions for use of the 900 MHz and 1800 MHz frequency bands for terrestrial wireless broadband electronic communications services in support of the Internet of Things in the Union", approved March 2018

[16] EC Decision 2018/637/EU - amending Decision 2009/766/EC on the harmonisation of the 900 MHz and 1 800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community as regards relevant technical conditions for the Internet of Things

[17] ECC Report 297: "Analysis of the suitability and update of the regulatory technical conditions for 5G MFCN and AAS operation in the 900 MHz and 1800 MHz bands", approved March 2019

[18] CEPT Report 72: Report from CEPT to the European Commission in response to the Mandate "to review the harmonised technical conditions for certain EU-harmonised frequency bands and to develop least restrictive harmonised technical conditions suitable for next-generation (5G) terrestrial wireless systems" Report A: Review of technical conditions in the paired terrestrial 2 GHz and the 2.6 GHz frequency bands, and the usage feasibility of the 900 MHz and 1800 MHz frequency bands", approved July 2016

[19] CEPT Report 80: “Report from CEPT to the European Commission in response to the Mandate “to review the harmonised technical conditions for certain EU-harmonised frequency bands and to develop least restrictive harmonised technical conditions suitable for next-generation (5G) terrestrial wireless systems” Report B: Channelling arrangements and least restrictive technical conditions suitable for ECS including 5G terrestrial wireless systems in the 900 MHz and 1800 MHz frequency bands, in compliance with the principles of technology and service neutrality”, approved July 2021

[20] EC Decision 2009/766/EC: Commission Decision of 16 October 2009 on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community

[21] EC Decision 2011/251/EU: Commission Implementing Decision of 18 April 2011 amending Decision 2009/766/EC on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community

[22] EC Decision (EU) 2022/173: Commission Implementing Decision (EU) 2022/173 of 7 February 2022 on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing electronic communications services in the Union and repealing Decision 2009/766/EC

[23] Resolution ITU-R 56: “Naming for International Mobile Telecommunications”

[24] Recommendation ITU-R M.1457-13: “Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)”

[25] Recommendation ITU-R M.2012-3: “Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced)”

[26] Recommendation ITU-R M.2150: “Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2020 (IMT-2020)”

[27] ETSI EN 301 908-1 V11.1.1: “IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Introduction and common requirements”

[28] ETSI EN 301 502 V12.5.2: “Global System for Mobile communications (GSM); Harmonized EN for Base Station Equipment covering the essential requirements of article 3.2 of the R&TTE Directive”

[29] ETSI EN 301 511 V 12.5.1: “Global System for Mobile communications (GSM); Mobile Stations (MS) equipment; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU”

[30] ETSI EN 301 908-18: “IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the Radio Equipment Directive 2014/53/EU; Part 18: E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Station (BS)”

[31] ECC Report 229: “Guidance for improving coexistence between GSM-R and MFCN in the 900 MHz band”, approved May 2015

[32] ERC Recommendation 74-01 : “Unwanted emissions in the spurious domain”, approved 1998, amended May 2019, updated October 2021

[33] 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