



ECC Decision (16)02

Harmonised technical conditions and frequency bands for the implementation of Broadband Public Protection and Disaster Relief (BB-PPDR) systems

Approved 17 June 2016

Amended 8 March 2019

EXPLANATORY MEMORANDUM

1 INTRODUCTION

This ECC Decision addresses the harmonised Least Restrictive Technical Conditions (LRTC) for the implementation of Broadband Public Protection and Disaster Relief (BB-PPDR) radio systems, within the 400 MHz and 700 MHz frequency ranges. It also addresses the regulation on free circulation and use of BB-PPDR user equipment operating in the frequency bands indicated.

These two frequency ranges 400 MHz and 700 MHz have been investigated for spectrum compatibility for BB PPDR in ECC Report 240 [1], ECC Report 283 [23] and ECC Report 239 [2].

The 700 MHz range can provide the core spectrum requirements for the terrestrial networks and be considered as a stand-alone solution for the BB-PPDR requirements as calculated in ECC Report 199 [3]. The 400 MHz range does not provide enough available spectrum to provide a stand-alone solution as calculated in ECC Report 199, even though it can offer national flexibility, e.g. in the context of additional spectrum beside the 700 MHz range. In addition, the 400 MHz range has the advantage of very good propagation characteristics, potentially reducing the number of base station sites needed to provide the necessary coverage (rural areas).

Resolution 646 (Rev.WRC-15) [4] defines the purpose of a PPDR radio system. Such a system includes two different uses. The first one is for Public Protection (PP) which covers radiocommunications used by responsible agencies and organisations dealing with maintenance of law and order, protection of life and property, and emergency situations. The second one is for Disaster Relief (DR) which covers radiocommunications used by agencies and organisations dealing with a serious disruption of the functioning of society, posing a significant, widespread threat to human life, health, property or the environment, whether caused by accident, nature or human activity, and whether developing suddenly or as a result of complex, long-term processes (the precise definitions are also included and explained in ECC Report 102 [5]).

BB-PPDR services can be provided by means of three infrastructure models; through mobile broadband networks dedicated to providing service to BB-PPDR users to meet their specific requirements, through commercial mobile networks providing both PPDR and commercial service or through hybrid solutions with partly dedicated and partly commercial network infrastructure.

ECC Report 218 [8] also covers the band 410-430 MHz which is added to this ECC Decision by the amendment of this Decision in 2019, following the studies set out in ECC Report 283.

2 BACKGROUND

The ECC identified in its strategic plan in 2015 PPDR as a major topic for the next five years: "The spectrum needs for Public Protection and Disaster Relief have been raised during the last few years and ECC is investigating various solutions to meet such requirements. In particular, the safety and security community needs access to wideband and broadband services such as video, and has specific requirements in terms of priority, availability or security. Adequate levels of harmonisation will require a long term effort from the ECC and relevant CEPT administrations at national level. The ECC shall seek an appropriate response to spectrum requirement and harmonisation needs for PPDR".

The growing needs for voluminous high-speed data such as live video feeds and images in PPDR scenarios drive the development of Broadband PPDR radio systems. The PPDR user community has stated that BB-PPDR, from a technical standard point of view, wants to be part of the global LTE ecosystem because of several advantages including for example, a wider choice of terminals, potentially lower costs for chipsets and duplex filters, benefits derived from economies of scale achieved in commercial networks and the commitment to develop mission critical capabilities into the standard. In addition, it will benefit from roaming over commercial networks, whereby end user radio terminal equipment can obtain mobile communication services under the coverage of another radio communication network (the "visited network"). ETSI TR 102

022 [6] anticipates that LTE technology and its further evolutions will be able to address the needs of BB-PPDR.

The PPDR user community also put forward the notion that given the magnitude or geographical localisation of certain events, cross-border operations are bound to become an important part of PPDR mission, stressing the need for efficient cross-border cooperation and interoperability of BB-PPDR systems. CEPT countries are increasingly experiencing the need to give and receive PPDR assistance within areas such as international crime and trafficking, near-border accidents, natural disasters, terror attacks etc.

The required level of interoperability is to be realised through the availability of multiple band PPDR user equipment, the adoption of common technical standards (i.e. LTE and its evolutions), and also by standard conformance and interoperability specifications. The visiting BB-PPDR equipment will operate as defined by its host base station. CEPT administrations in cooperation with their national relevant PPDR organisations should foster the aim of interoperability. It has to be assumed that this requires a common technical standard.

CEPT administrations should also allow free circulation and use of BB-PPDR user equipment operating in the frequency bands indicated.

A concept of “flexible harmonisation” is described in ECC Report 218 [8] to enable an efficient implementation of BB-PPDR within CEPT. This includes three major elements:

- a common technical standard (i.e. LTE and its evolutions);
- national flexibility to decide how much spectrum and which specific frequency ranges should be designated for BB-PPDR networks within harmonised tuning range(s), according to national needs;
- national choice of the most suitable implementation model (either dedicated, commercial or hybrid BB-PPDR network solution).

Different national choices of implementation models for BB-PPDR within CEPT will require - within an implementable tuning range - multiple bands BB-PPDR user equipment. Such equipment can be used in either dedicated, commercial or hybrid networks.

Work on developing the LTE technology to support BB-PPDR specific functionalities is ongoing in international standardisation organisations (for more information, see ECC Report 218 and Report ITU-R M.2291 [7]).

In addition, mission-critical voice as specified in ECC Report 199 [3] is not covered. The assumption is that mission critical voice (and narrowband data) will continue to operate in most CEPT countries by the existing dedicated TETRA, Tetrapol, Project 25, and DMR networks until 2025 to 2030. The spectrum for these networks have been designated in the ECC/DEC/(08)05 [10].

Further investigations may also be needed on some aspects for cross-border coordination for BB-PPDR applications.

3 REQUIREMENT FOR AN ECC DECISION

This ECC Decision covers in particular the possible tuning ranges for BB-PPDR wide area networks within the 400 MHz and within the 700 MHz for the following reasons:

- It is in line with the ECC approach for narrow band and wide band PPDR systems which are already covered by an ECC Decision (ECC/DEC/(08)05 [10]);
- It must include the 400 MHz and 700 MHz ranges in order to offer a single ECC Decision for all CEPT administrations to implement a BB-PPDR solution. Administrations requiring 2x10 MHz for BB-PPDR and authorising the full 2x30 MHz (703-733 MHz / 758-788 MHz) for commercial MFCN networks can no longer identify 2x10 MHz for dedicated BB-PPDR networks within the 700 MHz band. These administrations may therefore need to use the remaining part of the 700 MHz (698-703 MHz / 753-758 MHz and 733-736 MHz / 788-791 MHz) range and the 400 MHz ranges;

- It will provide the necessary level of harmonisation to answer the needs related to interoperability and cross-border operations.

ECC recognises that for BB-PPDR to continue to develop successfully, industry stakeholders and PPDR operators must be given the confidence and certainty to make the necessary investment. The ECC believes that the continued development of BB-PPDR services will be facilitated by the introduction of the flexible harmonisation concept for the implementation of BB-PPDR systems across CEPT countries.

ECC also recognises that administrations need flexibility to adapt their use in the bands 410-430 MHz, 450-470 MHz and 694-791 MHz to national circumstances.

The harmonisation on a European basis would support the aims of Directive 2014/53/EU [11] 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.

A commitment by CEPT administrations to implement an ECC Decision will provide a clear indication that the required frequency bands will be made available on time within the harmonised framework of the Least Restrictive Technical Conditions (LRTC).

ECC DECISION (16)02 OF 17 JUNE 2016 ON HARMONISED TECHNICAL CONDITIONS AND FREQUENCY BANDS FOR THE IMPLEMENTATION OF BROADBAND PUBLIC PROTECTION AND DISASTER RELIEF (BB-PPDR) SYSTEMS, AMENDED ON 8 MARCH 2019

“The European Conference of Postal and Telecommunications Administrations,

considering

- a) that for the purposes of this Decision, public protection and disaster relief radio communications means radio communication services for public safety and security services used by national authorities or relevant operators;
- b) that operational use such as critical voice communications over the BB-PPDR wide area network, direct terminal-to-terminal communications (off-network working), air-ground-air, or ad-hoc networks, is not covered by this Decision;
- c) that the definitions for BB-PPDR are also included in ECC Report 199 [3] and ECC Report 102 [5];
- d) that the introduction of new BB-PPDR systems will enhance broadband communications over wide territories in the CEPT, making them available through national choice of the most suitable implementation model (either dedicated, commercial or hybrid), as described in ECC Report 218 [8];
- e) that PPDR is a sovereign national matter and that each CEPT administration shall decide how to organise and use their radio spectrum for public order and public security purposes;
- f) that ECC Report 218 proposes the concept of “flexible harmonisation” to enable national flexibility to decide how much spectrum and which specific frequency ranges should be designated for BB-PPDR;
- g) that fully commercial network implementation options will not require any BB-PPDR specific spectrum, but spectrum for the dedicated network option and many of the hybrid network models would be required on a national level;
- h) that Resolution 646 [4] (Rev. WRC-15) on “Public Protection and Disaster Relief” recommends to use harmonised frequency ranges for BB-PPDR radio systems to the maximum extent possible, taking into account the national and regional requirements and also having regard to any needed consultation and cooperation with other concerned countries/regions;
- i) that BB-PPDR services could also be provided by MFCN operators using their own frequency bands including those not listed in the “decides” section of this Decision on the basis of a commercial agreement between MFCN operators and the users of BB-PPDR services;
- j) that the Council of the European Union adopted a Council Recommendation on improving radio communication between operational units in border areas on 20 May 2009;
- k) that the Decision 243/2012/EU [12] of the European Parliament and of the Council establishing a multi-annual Radio Spectrum Policy Programme (RSPP) specifically addresses in its article 8.3 the need for interoperable solutions for public safety and disaster relief;
- l) that there is a need for interoperability between BB-PPDR responsible agencies and organisations, both nationally and for cross-border operations;
- m) that different national choices within CEPT will require, within an implementable tuning range, multi-band BB-PPDR user equipment;
- n) that the required level of interoperability is to be realised on multiple layers through the availability of multi-band PPDR user equipment (UE), the adoption of common technical standards (i.e. LTE and its evolutions), utilising different PPDR network implementation models (dedicated, commercial or hybrid networks), and also by standard conformance and interoperability specifications;

- o) that since only the 700 MHz range can be considered as a stand-alone solution for the BB-PPDR requirements as calculated in ECC Report 199 [3], it is considered as the core frequency range for enabling interoperability;
- p) that the 400 MHz range does not provide enough available spectrum to provide a stand-alone solution in CEPT countries requiring 2x10 MHz for BB-PPDR as calculated in ECC Report 199, however the 400 MHz range can offer national flexibility, e.g. in the context of additional spectrum beside the 700 MHz range;
- q) that the frequency band 410-430 MHz is allocated in the European Common Allocation Table (ERC Report 25) [13] to the mobile service except aeronautical mobile service on a primary basis;
- r) that the radio astronomy service in the band 406.1-410 MHz, and radiolocation systems in the band 420-430 MHz which are deployed and protected at a national level, may require protection zones in some countries, if the band 410-430 MHz is used by BB-PPDR;
- s) that the frequency band 450-470 MHz is allocated in the European Common Allocation Table (ERC Report 25) and in the ITU Radio Regulations to the mobile service on a primary basis. In addition, through footnote 5.286AA [14] in the Radio Regulations, the band is also identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. Recommendation ITU-R M.1036 [21] gives the recommended frequency arrangements for implementation of IMT in the band 450-470 MHz;
- t) that the frequency bands 410-420 MHz / 420-430 MHz and 450-460 MHz / 460-470 MHz are identified in the Annex 2 of the Recommendation T/R 25-08 [18] as paired arrangement for use by land mobile systems;
- u) that the frequency band 694-790 MHz is allocated in Region 1 to the mobile, except aeronautical mobile, service on a primary basis and is identified for IMT;
- v) that the frequency range 452.5-457.5 MHz / 462.5-467.5 MHz (band 31) and the frequency range 451-456 MHz / 461-466 MHz (band 72) are listed as E-UTRA operating bands in ETSI TS 136 101 [20];
- w) that the frequency band 694-790 MHz is also allocated in Region 1 to the broadcasting service on a primary basis and that the GE-06 agreement [22] applies for this band and the bands above and below;
- x) that the PPDR user community has stated that BB-PPDR, from a technical standard point of view, wants to be part of the global LTE ecosystem because of several advantages including for example, a wider choice of terminals, potentially lower costs for chipsets and duplex filters, benefits derived from economies of scale achieved in commercial networks and the commitment to develop mission critical capabilities into the standard. Other benefits include possible roaming over commercial networks and further evolutions of LTE;
- y) that the work on developing the LTE technology to support the BB-PPDR specific functionalities is ongoing in 3GPP, ETSI and other international organisations with wide support from the mobile industry and involvement of the PPDR stakeholders;
- z) that the system reference document ETSI TR 102 628 [15] for BB-PPDR has been developed and provided by ETSI;
- aa) that ECC Report 199 [3] describes user requirements and spectrum needs for future European broadband PPDR systems (wide area networks), approved in May 2013;
- bb) that conclusions on spectrum compatibility of the options for BB-PPDR are derived from ECC Reports 239 [2] and 240 [1] and are summarised in ECC Report 218 [8];

- cc) that BB-PPDR usage could be anywhere within the harmonised MFCN band plan (703-733 MHz / 758-788 MHz) in ECC/DEC/(15)01 [16] on harmonised technical conditions for mobile/fixed communications networks (MFCN) in the band 694-790 MHz provided that the implementation is in line with the assumptions made for MFCN networks (including the protection requirements);
- dd) that CEPT Report 53 [9] and CEPT Report 60 [19] consider BB-PPDR as one of the national options for the use of the duplex gap and guard bands of the MFCN FDD 2x30 MHz set out in ECC/DEC/(15)01 and using the same duplex spacing of 55 MHz;
- ee) that the risk of interference between BB-PPDR and DTT above 470 MHz can be reduced by a set of technical measures including a guard band between DTT and BB-PPDR base stations and an appropriate limit of the corresponding BB-PPDR base station out-of-band emissions;
- ff) that the Recommendation T/R 25-08 [18] provides guidance for planning criteria and cross-border co-ordination of frequencies for land mobile systems in the range 29.7-470 MHz that can be used by BB-PPDR systems operating in 410-430 MHz or 450-470 MHz;
- gg) that studies in ECC Report 239 [2] look at the compatibility between BB-PPDR networks using MFCN LTE-based technologies in the 700 MHz range and DTT below 694 MHz;
- hh) that the studies in ECC Report 239 have shown that the most critical compatibility analysis with DTT networks is for BB-PPDR UE use in the 698-703 MHz band. These studies also looked at a number of different scenarios with different assumptions looking at BB-PPDR UEs operating within the 698-703 MHz band and the technical feasibility of PPDR UEs implementing appropriate filtering to meet the proposed unwanted emission levels;
- ii) that for BB-PPDR systems with base station receive immediately above 698 MHz, operating in areas where DTT channel 48 is used, interference may occur and may need to be resolved through mitigation techniques which may include careful network planning, down tilting the BB-PPDR antenna, fine tuning antenna orientation and implementing link budget margins by increasing the BB-PPDR network density;
- jj) that ECC Report 239 sets out that compatibility between BB-PPDR UL and MFCN including MFCN SDL (MFCN Supplemental Downlink) is feasible and depends on the scenario which is targeted;
- kk) that with regard to the compatibility between MFCN and BB-PPDR networks, BB-PPDR UE radio modules should provide sufficient receiver performance including sufficient rejection of intermodulation products and receiver selectivity performance which would ensure operation in a sparse BB-PPDR network when adjacent in frequency to a dense commercial network;
- ll) that the implementation of the 700 MHz frequency arrangements by national administrations will require coordination with any other administration whose broadcasting service and/or other primary terrestrial services are considered to be affected. For broadcasting, the coordination procedure will take into account the framework GE-06 agreement [22];
- mm) that ECC/REC/(16)03 [17] provides guidance for cross-border coordination for BB-PPDR systems in the frequency band from 698 MHz to 791 MHz;
- nn) that ECC Report 283 [23] analyses the impact of the introduction of BB-PPDR in the band 410-430 MHz with a view to give protection to radiolocation and radio astronomy services;
- oo) that in Article 5 of the Radio Regulations (RR), the allocation in ITU Region 1 to the radiolocation service is secondary in the band 420-430 MHz and primary in the band 430-440 MHz. Therefore, the base station transmitting in the band 420-430 MHz operates under a co-channel basis with radars within this band whereas it operates under adjacent band basis when the radar operates above 430 MHz. Given the allocation in the RR, the protection of radiolocation systems is mandatory only for the band 430-440 MHz, although minimisation of interference within the band 420-430 MHz is also desirable;

- pp) that LTE channel arrangements could be entirely placed in the tuning range of 410-417.5/420-427.5 MHz applying a 100 kHz channel spacing. In addition, a 40 dB of out-of-band-emission (OOBE) reduction from the band 31 standard (e.g. by means of LTE BS duplexer filtering) may be needed to avoid desensitisation of radiolocation systems operated in 430-440 MHz;
- qq) that ECC Report 283 [23] also includes some considerations which can be applied for the crossborder-coordination of BB-PPDR with stations of the radio astronomy service between two countries;
- rr) that ECC Report 240 [1] concludes that if the DTT transmission is vertically polarised, DTT reception is more exposed to possible interference in 400 MHz, than for horizontal polarisation. If a country is in such a situation, the operator of a BB-PPDR network has the possibility on a cell-by-cell basis to limit the maximum mean in-block power of PPDR-UEs for the protection of DTT. In this situation maximum mean in-block power, as referred to in ECC Report 240, may be reduced to 31 dBm outside the coverage areas of DTT channel 21 and channel 22, further reduced to 23 dBm inside the coverage areas of DTT channel 21 and channel 22;
- ss) that in EU/EFTA countries the radio equipment that is under the scope of this Decision shall comply with the RE Directive. Conformity with the essential requirements of the RE Directive may be demonstrated by compliance with the applicable harmonised European standard(s) or by using the other conformity assessment procedures set out in the RE Directive.

DECIDES

1. that the **purpose of this ECC Decision** is to identify the frequency ranges for BB-PPDR wide area network, and provide CEPT administrations with the associated relevant Least Restrictive Technical Conditions (LRTC) for BB-PPDR intended to ensure coexistence with other services;
2. that CEPT administrations wishing to introduce BB-PPDR in parts of the 700 MHz range **shall apply** the LRTC within the following paired frequency arrangements:
 - a) 698-703 MHz (uplink) / 753-758 MHz (downlink) those specified in Annex 1;
 - b) 703-733 MHz (uplink) / 758-788 MHz (downlink) those specified in ECC/DEC/(15)01 [16];
 - c) 733-736 MHz (uplink) / 788-791 MHz (downlink) those specified in Annex 1;
3. that CEPT administrations wishing to introduce additional spectrum for BB-PPDR in parts of the 400 MHz range **shall apply** LRTC with channelling arrangements 1.4 MHz, 3 MHz or 5 MHz within the following paired frequency ranges:
 - a) 450.5-456.0 MHz (uplink) / 460.5-466.0 MHz (downlink) those specified in Annex 2;
 - b) 452.0-457.5 MHz (uplink) / 462.0-467.5 MHz (downlink) those specified in Annex 2;
 - c) 410.0-415.0 MHz (uplink) / 420.0-425.0 MHz (downlink) those specified in Annex 3;
 - d) 411.0-416.0 MHz (uplink) / 421.0-426.0 MHz (downlink) those specified in Annex 3;
 - e) 412.0-417.0 MHz (uplink) / 422.0-427.0 MHz (downlink) those specified in Annex 3;
4. that CEPT **administrations shall** allow free circulation and use of compliant BB-PPDR user equipment which operate under the control of a network;
5. that this Decision **enters into force** on 8 March 2019;
6. that CEPT administrations shall inform the Office, which precise frequency arrangements are used for BB-PPDR operations within their territory;

7. 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://www.ecodocdb.dk> for the up to date position on the implementation of this and other ECC Decisions.

ANNEX 1: LEAST RESTRICTIVE TECHNICAL CONDITIONS (LRTC) FOR BB-PPDR IN THE PAIRED FREQUENCY ARRANGEMENTS 698-703 MHz / 753-758 MHz AND 733-736 MHz / 788-791 MHz

A1.1 INTRODUCTION

BB-PPDR can be accommodated within the 700 MHz range by either designating spectrum for dedicated BB-PPDR, use of commercial MFCN or a combination of the two (hybrid) as necessary to fulfil national BB-PPDR requirements. Therefore, the 700 MHz range can be considered as a stand-alone solution for the BB-PPDR requirements as calculated in ECC Report 199 [3].

Harmonised technical requirements for the use of MFCN in the 700 MHz range (703-733 MHz and 758-788 MHz) are already developed in ECC/DEC/(15)01 [16]. This annex includes the LRTC for BB-PPDR in the paired frequency arrangements 698-703 MHz / 753-758 MHz and 733-736 MHz / 788-791 MHz. These options are based on a duplex spacing of 55 MHz.

Cross-border co-ordination needs to be addressed for the 700 MHz range BB-PPDR options, also with regard to the possible implementation of other usage scenarios (MFCN and non-MFCN) in neighbouring countries.

A1.2 LRTC FOR BB-PPDR

For the BB-PPDR DL block 788-791 MHz, the LRTC as described in ECC/DEC/(15)01 ANNEX 2 apply, extending the applicability of ECC/DEC/(15)01 ANNEX 2 Table 4 to the frequency range 733-821 MHz, and with the exception of ECC/DEC/(15)01 ANNEX 2 Table 5 which is not applicable for this band.

For the BB-PPDR DL block 753-758 MHz, the LRTC in ECC/DEC/(15)01 ANNEX 2 apply.

For CEPT administrations deploying BB-PPDR radio systems in the 753-758 MHz block and within 788-791 MHz, the BS unwanted emissions level shall be in accordance with ECC/DEC/(15)01.

For the BB-PPDR UL block 733-736 MHz, the LRTC in ECC/DEC/(15)01 ANNEX 2 apply, with the exception of the out of block emission limits in the 733-738 MHz band as described in ECC/DEC/(15)01 ANNEX 2 Table 11, which is not applicable for this band.

For the BB-PPDR UL block 698-703 MHz, the LRTC in ECC/DEC/(15)01 ANNEX 2 apply with the exception of ECC/DEC/(15)01 ANNEX 2 Table 10 and ECC/DEC/(15)01 ANNEX 2 Table 12 which is replaced by Table 1 and the note below. The BB-PPDR UE unwanted emission levels in Table 1 and the note below are identified in ECC Report 218 [8] and ECC Report 239 [2].

Table 1: BB-PPDR UE unwanted emission level below 694 MHz under normal environmental conditions

Maximum unwanted emissions level
-42 dBm/8MHz

Note: A different level can be considered for such BB-PPDR UE operating in the 698-703 MHz block in extreme environmental conditions (i.e. outside normal environmental conditions) for equipment conformance tests but shall not exceed -30dBm/8MHz.

ANNEX 2: LEAST RESTRICTIVE TECHNICAL CONDITIONS (LRTC) FOR BB-PPDR IN THE PAIRED FREQUENCY ARRANGEMENT 450-460 MHz / 460-470 MHz

A2.1 INTRODUCTION

The 450-460 MHz / 460-470 MHz frequency range does not allow for enough available spectrum to provide for a stand-alone solution in CEPT countries requiring 2x10 MHz for BB-PPDR as calculated in ECC Report 199 [3].

The range can offer national flexibility, e.g. in the context of additional spectrum beside the 700 MHz range. 1.4 MHz, 3 MHz, and 5 MHz LTE FDD channelling arrangements could be implemented in the paired frequency arrangements in 450.5-456.0 MHz / 460.5-466.0 MHz and 452.0-457.5 MHz / 462.0-467.5 MHz. These options are based on a set duplex spacing of 10 MHz.

The risk of interference between BB-PPDR and DTT can be reduced by a set of technical measures including a guard band between DTT and BB-PPDR BSs and an appropriate limit of the corresponding PPDR BS out-of-band emissions.

The LRTC set out in this annex are derived from ECC Report 218 [8] and ECC Report 240 [1].

A2.2 BB-PPDR USER EQUIPMENT (UE)

Table 2: BB-PPDR UE transmitter characteristics

Parameter	Value
Channel bandwidth	1.4, 3 or 5 MHz
Maximum mean in-block power	37 dBm (see Note)
Note: The maximum mean in-block power of PPDR-UEs for the protection of the broadcasting service may be limited on a cell-by-cell basis. More information can be found in section 8.1.1.4 of ECC Report 218	

Table 3: BB-PPDR UE maximum unwanted emission levels

Frequency offset from channel edge (MHz)	Channel width			Measurement bandwidth
	1.4 MHz	3 MHz	5 MHz	
± 0-1	-7 dBm	-7 dBm	-9 dBm	30 kHz
± 1-1.8	-7 dBm	-7 dBm	-7 dBm	1 MHz
± 1.8-2.5	-10 dBm	-7 dBm	-7 dBm	1 MHz
± 2.5-2.8	-25 dBm	-10 dBm	-10 dBm	1 MHz
± 2.8-5		-10 dBm	-10 dBm	1 MHz
± 5-6		-25 dBm	-13 dBm	1 MHz
± 6-10			-25 dBm	1 MHz

In addition to the BB-PPDR UE mask in Table 3, BB-PPDR UE shall meet the unwanted emission levels specified in Table 4 for the protection of DTT.

Table 4: BB-PPDR UE unwanted emission level above 470 MHz

Equipment	Maximum unwanted emissions level
PPDR UE	-42 dBm/8 MHz

A2.3 BB-PPDR BASE STATION (BS)

Table 5: PPDR BS unwanted emission levels

Frequency range	Condition on Base station in-block e.i.r.p, P (dBm/cell)	Maximum mean out-of-block e.i.r.p (dBm/cell)	Measurement bandwidth
UL band 450-460 MHz		- 43	100 kHz
1 MHz offset from BB-PPDR BS transmit band edge		- 43	100 kHz
For DTT frequencies above 470 MHz where broadcasting is protected	$P \geq 60$	-7	8 MHz
	$P < 60$	($P - 67$)	8 MHz

ANNEX 3: LEAST RESTRICTIVE TECHNICAL CONDITIONS (LRTC) FOR BB-PPDR IN THE PAIRED FREQUENCY ARRANGEMENT 410-420 MHz / 420-430 MHz

A3.1 INTRODUCTION

The 410-420 MHz / 420-430 MHz frequency range does not allow for enough available spectrum to provide for a stand-alone solution in CEPT countries requiring 2x10 MHz for BB-PPDR as calculated in ECC Report 199 [3].

The range can offer national flexibility, e.g. in the context of additional spectrum beside the 700 MHz range. 1.4 MHz, 3 MHz and 5 MHz LTE FDD channelling arrangements could be implemented in the paired frequency arrangements in 410.0-415.0 MHz / 420.0-425.0 MHz, 411.0-416.0 MHz / 421.0-426.0 MHz and 412.0-417.0 MHz / 422.0-427.0 MHz.

The LRTC set out in this annex are derived from ECC Report 283 [23].

A3.2 BB-PPDR USER EQUIPMENT (UE)

Table 6: BB-PPDR UE transmitter characteristics

Parameter	Value
Channel bandwidth	1.4, 3 or 5 MHz
Maximum mean in-block power	23 dBm (see Note)
Note: Administrations may use higher UE maximum mean in-block power up to 31 dBm for special deployment scenarios, provided that protection of other services, networks and applications is not compromised. Vice-versa, the maximum mean in-block power of PPDR-UE for the protection of other services may be limited on a cell-by-cell basis.	

Table 7: BB-PPDR UE maximum unwanted emission levels

Frequency offset from channel edge (MHz)	Channel width			Measurement bandwidth
	1.4 MHz	3 MHz	5 MHz	
± 0-1	-10 dBm	-13 dBm	-15 dBm	30 kHz
± 1-2.5	-10 dBm	-10 dBm	-10 dBm	1 MHz
± 2.5-2.8	-25 dBm	-10 dBm	-10 dBm	1 MHz
± 2.8-5		-10 dBm	-10 dBm	1 MHz
± 5-6		-25 dBm	-13 dBm	1 MHz
± 6-10			-25 dBm	1 MHz

A3.3 BB-PPDR BASE STATION (BS)

Table 8: PPDR BS unwanted emission levels

Channel width	Delta F _c (MHz) from centre frequency	Out-of-band emissions (transmitter output power)	Measurement bandwidth
1.4 MHz	0.7 to 2.1	-1 dBm -10/1.4 * (Delta F _c - 0.7) dB	100 kHz
	2.1 to 3.5	-11 dBm	100 kHz
	3.5 to 9.95	-16 dBm	100 kHz
3 MHz	1.5 to 4.5	-5 dBm -10/3* (Delta F _c - 1.5) dB	100 kHz
	4.5 to 7.5	-15 dBm	100 kHz
	7.5 to 9.995	-16 dBm	100 kHz
5 MHz	2.5 to 7.5	-7 dBm -7/5* (Delta F _c - 2.5) dB	100 kHz
	7.5 to 9.95	-14 dBm	100 kHz

Note 1: for the maximum mean out-of-block e.i.r.p. the antenna gain and cable losses of the land mobile system have to be considered.

Note 2: additional out-of-band emission reduction may be necessary for the protection of other land mobile systems in the adjacent bands (see ECC Report 283). For the protection of the uplink frequencies of land mobile systems within 410-420 MHz, a maximum mean out-of-block e.i.r.p. of -43 dBm/100 kHz may be needed.

Note 3: additional 40 dB of out-of-block emission reduction may be needed for the protection of radiolocation services.

ANNEX 4: LIST OF REFERENCES

This annex contains the list of relevant reference documents.

- [1] ECC Report 240: "Compatibility studies regarding Broadband PPDR and other radio applications in 410-430 and 450-470 MHz and adjacent bands"
- [2] ECC Report 239: "Compatibility and sharing studies for BB PPDR systems operating in the 700 MHz range"
- [3] ECC Report 199: "User requirements and spectrum needs for future European broadband PPDR systems (Wide Area Networks)"
- [4] Resolution 646 (Rev. WRC-15): "Public Protection and Disaster Relief" recommends to use regionally harmonised bands for BB-PPDR radio systems to the maximum extent possible, taking into account the national and regional requirements and also having regard to any needed consultation and cooperation with other concerned countries/regions
- [5] ECC Report 102: "Public Protection and Disaster Relief Spectrum Requirements"
- [6] ETSI TR 102 022: "Requirements Specification Mission Critical Broadband Communications"
- [7] Report ITU-R M.2291: "The use of International Mobile Telecommunications for broadband public protection and disaster relief applications"
- [8] ECC Report 218: "Harmonised conditions and spectrum bands for the implementation of future European Broadband Public Protection and Disaster Relief (BB-PPDR) systems"
- [9] CEPT Report 53: "Report A from CEPT to the European Commission in response to the Mandate "to develop harmonised technical conditions for the 694 -790 MHz ('700 MHz') frequency band in the EU for the provision of wireless broadband and other uses in support of EU spectrum policy objectives""
- [10] ECC Decision (08)05: "The harmonisation of frequency bands for the implementation of digital Public Protection and Disaster Relief (PPDR) radio applications in bands within the 380-470 MHz range"
- [11] Directive 2014/53/EU 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
- [12] Decision 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multi-annual Radio Spectrum Policy Programme (RSPP)
- [13] ERC Report 25: "The European table of frequency allocations and applications in the frequency range 8.3 kHz to 3000 GHz"
- [14] Footnote 5.286AA: "The frequency band 450-470 MHz is identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). See Resolution 224 (Rev.WRC-15). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. (WRC-15)"
- [15] ETSI TR 102 628: "Additional spectrum requirements for future Public Safety and Security (PSS) wireless communication systems in the UHF frequency range"
- [16] ECC Decision (15)01: "Harmonised technical conditions for mobile/fixed communications networks (MFCN) in the band 694-790 MHz including a paired frequency arrangement (Frequency Division Duplex 2x30 MHz) and an optional unpaired frequency arrangement (Supplemental Downlink)"
- [17] ECC Recommendation (16)03: "Cross-border coordination for Broadband Public Protection and Disaster Relief (BB-PPDR) systems in the frequency band from 698 MHz to 791 MHz"
- [18] Recommendation T/R 25-08: "Planning criteria and cross-border coordination of frequencies for land mobile systems in the range 29.7-470 MHz"
- [19] CEPT Report 60: "Report B from CEPT to the European Commission in response to the Mandate "to develop harmonised technical conditions for the 694 -790 MHz ('700 MHz') frequency band in the EU for the provision of wireless broadband and other uses in support of EU spectrum policy objectives""
- [20] ETSI TS 136 101: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception;"
- [21] Recommendation ITU-R M.1036: "Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations;"
- [22] GE-06 Agreement: "Plans for VHF/UHF analogue and digital broadcasting in parts of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz, Geneva 2006 (GE06)"
- [23] ECC Report 283: "Compatibility and sharing studies related to the introduction of broadband and narrowband systems in the bands 410-430 MHz and 450-470 MHz"