

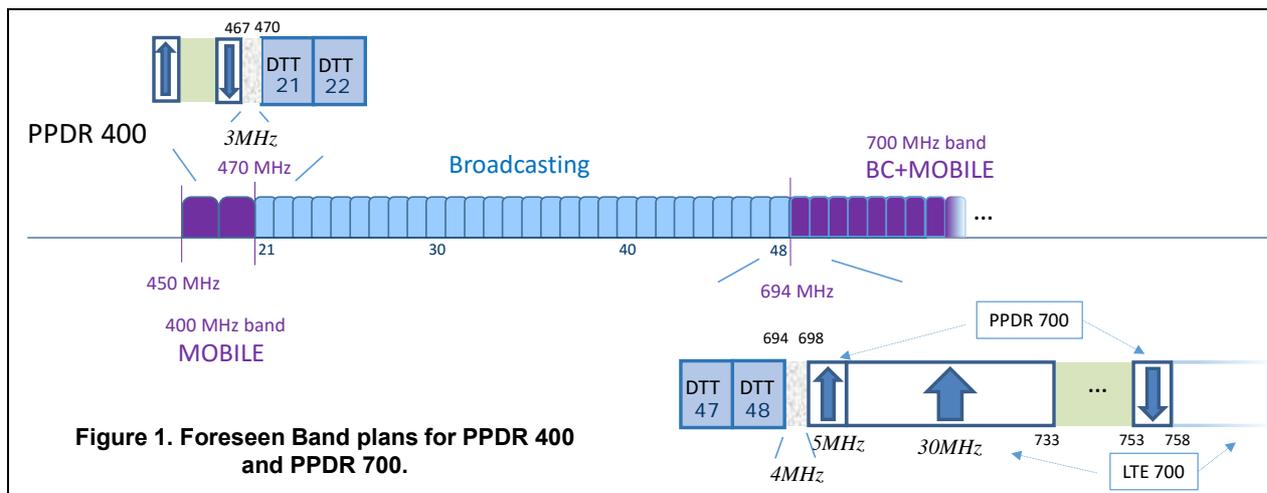
PPDR IN ADJACENT BANDS TO DTT

PPDR (Public Protection and Disaster Relief) equipment manufacturers and users want to use part of the 700 MHz band to deploy dedicated PPDR networks in order to benefit from the LTE technology developed in the same band. They also want to use the 450 - 470 MHz band for PPDR as an additional spectrum resource suitable for large area coverage. The two contemplated bands being immediately adjacent to DTT, this creates compatibility issues. This fact sheet describes these issues and the conditions set up to deal with them in Europe.

BACKGROUND

CEPT has carried out studies on PPDR in the bands 450 - 470 MHz (400 MHz band) and 694 - 790 MHz (700 MHz band) and in autumn 2015 approved three related ECC reports: Report 240 (PPDR 400), Report 239 (PPDR 700) and Report 218 (BB-PPDR).

In the 700 MHz band, some European Administrations intend to use commercial LTE 700 networks for PPDR purposes while others want to deploy dedicated PPDR 700 networks. In the 400 MHz band, some Administrations expressed interest in using this band for PPDR, in particular for rural and sub-urban area coverage. Figure 1 shows the detailed spectrum configurations at each edge of the UHF broadcasting band.

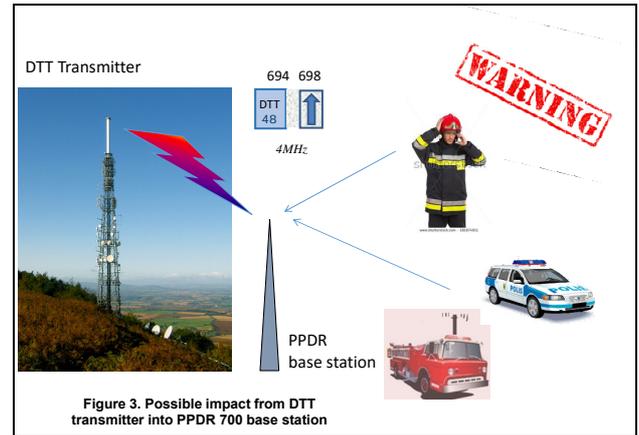
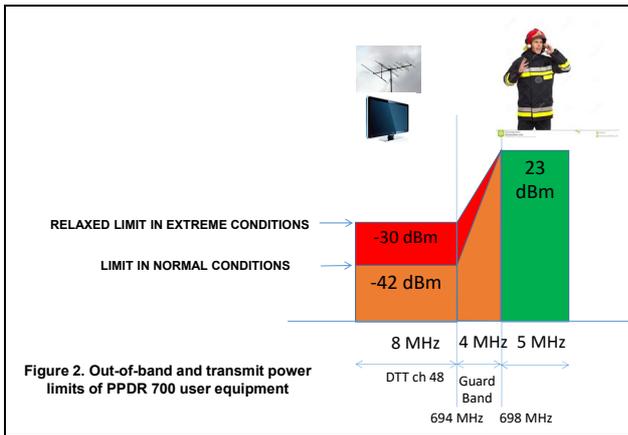


Based on these studies, ECC Decision (16)02 "Harmonised technical conditions and frequency bands for the implementation of Broadband Public Protection and Disaster Relief (BB-PPDR) systems" was approved on 17 June 2016. It defines the technical specifications of PPDR equipment, both for base stations and user terminals, in each band.

MAIN FEATURES OF ECC DECISION (16)02 FOR PPDR IN THE 700 MHz BAND

For PPDR 700 user equipment, which uses an uplink block located 4 MHz away from DTT channel 48 (see Figure 1), the out-of-band emission limit was set to -42 dBm / 8 MHz, similar to the limit set for the commercial LTE 700 user equipment that uses a band located 9 MHz away from channel 48 (see ECC Decision (15)01 "Harmonised technical conditions for MFCN in the band 694 - 790 MHz). However, due to manufacturing constraints and with the assumptions that user density of PPDR would be considerably lower than that of commercial LTE, this limit was relaxed to -30 dBm / 8 MHz in extreme temperature conditions (See Figure 2). The transmit power of PPDR 700 user equipment was limited to 23 dBm, like for LTE 700.

For the PPDR 700 base station, which uses a downlink block located 59 MHz away from DTT channel 48, the out-of-band emission limit in DTT frequencies below 694 MHz where broadcasting is protected was set to -23 dBm / 8 MHz. Due to the large frequency separation in this case, the impact on DTT below 694 MHz is expected to be very low.



POSSIBLE IMPACT FROM DTT TRANSMITTERS TO PPDR 700 BASE STATIONS

Due to the narrow guard band (4 MHz) between the upper DTT UHF channel (channel 48) and the PPDR uplink channel (698 - 703 MHz) the out-of-band emission of the DTT transmitter using channel 48 may in some conditions harmfully desensitise the PPDR 700 base station uplink receiver at some distance from the DTT transmitter (See Figure 3).

The main solution for this is to improve the filtering of the out-of-band emissions of the DTT transmitter that uses channel 48 in the case of impact on a nearby PPDR base station. Other solutions could be envisaged, also on a case by case basis, for example optimizing the location and the antenna characteristics (polarization and directivity) of the PPDR base station to minimize the received level of out-of-band emission from the concerned DTT transmitter.

MAIN FEATURES OF ECC DECISION (16)02 FOR PPDR IN THE 450 - 470 MHz BAND

For PPDR 400 user equipment, the out-of-band emission limit in DTT frequencies above 470 MHz, where broadcasting is protected, was set to -42 dBm / 8 MHz. However, the actual emission is expected to be lower due to the need to protect reception of its own PPDR downlink signal in the same terminal. Measurements made by TDF on a prototype PPDR 400 user terminal showed actual out-of-band emission levels ranging from -76 dBm / 8 MHz to -50 dBm / 8 MHz.

The transmit power of the PPDR 400 user terminal specified in the Decision can be as high as 37 dBm, which is considerably higher than for LTE and PPDR user equipment in the 700 MHz band. This high transmit power is intended for terminals installed in PPDR vehicles with external antennas (Fire Trucks or Ambulances for example). However, the decision includes a note indicating that this maximum mean in-block power of PPDR-UEs may be reduced (to 31 or 23 dBm as described in section 8.1.1.4 of ECC Report 218) on a cell-by-cell basis for protection of DTT fixed roof top reception. For handheld PPDR UE it is expected that the transmit power will be considerably lower than 37 dBm.

For the PPDR 400 base station, the out-of-band emission level was limited to -7 dBm / 8MHz in DTT frequencies above 470 MHz where broadcasting is to be protected. The configuration of the PPDR 400 downlink frequency with regard to channel 21 is similar to the LTE 800 downlink frequency with regard to channel 60, except that the guard band is larger (3 MHz instead of 1 MHz). It is therefore required to apply similar mitigation measures to protect DTT reception in the adjacent band as was done for the deployment of LTE 800. These measures include identifying the DTT receiving installations, located around the PPDR 400 base stations, that are subject to interference and using appropriate mitigation measures, including installation of filters at the DTT receiving places.

THE EBU ROLE

The EBU and EBU Members' engineers have actively contributed to the CEPT work carried out in the relevant groups (SE7 and FM49) to define acceptable specifications of PPDR equipment.

EBU Members are invited to monitor their Administrations' decisions and the development of PPDR equipment as well as the envisaged deployment scenarios in their respective countries. The aim should be to engage with the concerned stakeholders as early as possible in the process in order to minimise possible disturbance to delivery of DTT services in the UHF band.

FIND OUT MORE

EBU SDB (Sharing with Digital Broadcasting) group

<https://tech.ebu.ch/groups/ssdb>

ECC Reports 239, 240, 218 - ECC Decision (16)02 - ECC Decision (15)01

<http://www.ecodocdb.dk/>

EBU fact sheet "Protection of DTT from LTE 700"

https://tech.ebu.ch/publications/ebu_fs_protection-of-NTT-from-LTE-700