

PROTECTION OF DTT FROM LTE 700

The European Conference of Postal and Telecommunications Administrations (CEPT) has developed and published CEPT Report 53 on the "*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*". The EBU participated in the technical studies which lead to this specification.

BACKGROUND

At the 2012 World Radio Conference (WRC-12) it was decided to allocate, on a co-primary basis, the 700 MHz frequency band (694-790 MHz) to the Mobile Service in Region 1 (which includes Europe, Africa, the Middle-East and parts of Asia). Based on this decision, CEPT was mandated by the European Commission to develop the related harmonized technical conditions. The specifications of the LTE user equipment (UE) were of particular importance as this latter uses the lower part of the 700 MHz band, i.e. closest to the upper edge of the remaining useable broadcasting band. Figure 1 below shows the expected frequency arrangement.

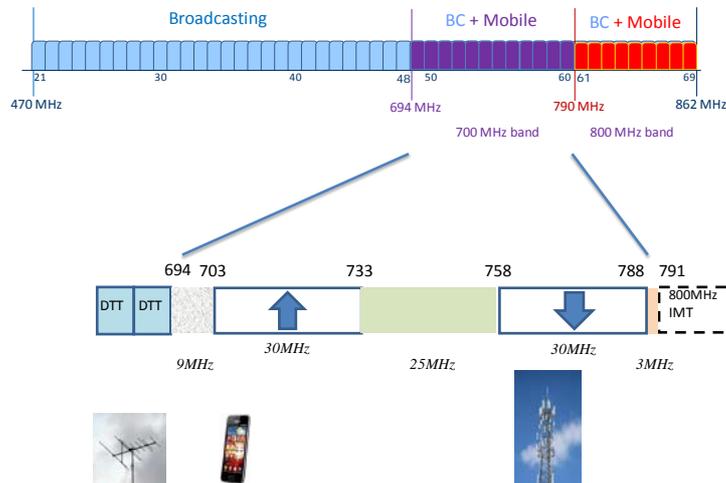


Figure 1: Frequency arrangement of the 700 MHz band showing the proximity between the frequencies used by the LTE user equipment and the DTT frequencies.

IMPLICATIONS FOR THE PROTECTION OF DTT BELOW 694 MHz

The out-of-band emission (OOBE) level of the LTE user equipment (UE) is of particular importance for European broadcasters. The limits specified in Asia and included in the global 3GPP specifications for this band are considerably relaxed compared to those required to maintain broadcasters' existing protection levels. Calculations, simulations and technical characteristics were provided by the EBU/SDB group to the CEPT activity on this subject. Figure 2 illustrates the different considered limits.

CEPT agreed in Report 53 on a compromise limit of -42 dBm/8 MHz for an LTE700 UE using 10 MHz bandwidth for the protection of Digital Terrestrial Television (DTT) fixed rooftop reception. It takes into account the technical feasibility and the targeted global harmonization of the UE characteristics. This limit will have to be met by all the LTE User Equipments that operate in Europe, once included in the related European standards. It is proposed that this requirement should be included in the 3GPP specifications as well. This level is associated with a maximum in-block transmit power of 23 dBm for the UE and a guard band of 9 MHz between the DTT and the UE channel edges, as shown in Figure 2.

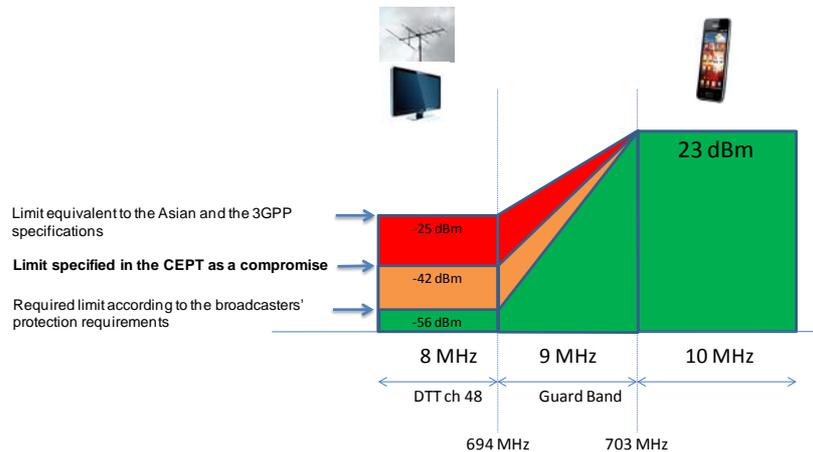


Figure 2: The different OBE limits considered in the CEPT studies including the finally agreed level

CEPT specifications also indicate that LTE700 UEs using larger bandwidth than 10 MHz, e.g. 20 MHz, may not be able to meet the agreed limit. In this case, a preventive measure by a National Regulator would be to implement the greater bandwidth starting at a frequency higher than 703 MHz so that the required limit of unwanted emission power is still met. Conversely, LTE700 UE using narrower bandwidth than 10 MHz, e.g. 5 MHz, would more easily meet the specifications and would actually generate lower OBE levels.

The above specified technical conditions help to reduce the risk of interference into DTT below 694 MHz. Nevertheless, interference may still occur to DTT reception in certain cases. These cases include:

- 1) Portable reception of DTT using top band channels (e.g. channel 48).
- 2) Fixed roof top reception of DTT using top band channels (e.g. channel 48) at low received signal level (e.g. at the edge of coverage areas).
- 3) Fixed roof top reception of DTT using top band channels (e.g. channel 48) in close proximity of a mobile service hot spot (bus stops, meeting points outdoors, etc.).
- 4) DTT receiving installation using active components (mast head amplifiers or active antennas).

In these cases, if interference is identified as being caused by the LTE700 UE emissions, the main mitigation technique on the DTT receiving side is to install a rejection filter between the receiving antenna and the tuner of the DTT receiver, but only when feasible. This filter should sufficiently attenuate the signals received in the frequencies above 694 MHz. However, such a filter doesn't have any effect on the out-of-band emissions of the LTE700 UE, which fall inside the received DTT channel.

If this solution does not work or if the number of interference cases due to LTE700 UE is significantly high in some areas, the installation of filters becomes impractical and a general reduction of the UE transmit power for all the terminals in these areas would be required. This assumes the intervention of the Regulator and the concerned Mobile Network Operator.

In summary, National Regulators should consider allocating 5 MHz blocks for LTE700 uplink at 703 MHz, implementing power limits to LTE700 UE in areas of DTT channel 48 use and setting up suitable mechanisms to provide the affected DTT viewers with rejection filters when needed. Accordingly, National Broadcasters and Broadcast Network Operators should make sure that their National Regulators are taking the adequate decisions in this respect before licensing and implementing the LTE700 mobile networks.

WHAT IS THE EBU DOING?

The EBU Technology & Innovation team, precisely the project group SMR/SDB, contributes to the relevant CEPT and ITU technical groups dealing with interference, compatibility and sharing with DTT. It also provides the EBU members with information and advice on the actions to take on a national level. The SMR/EIC group monitors and contributes to the standardization activities, in CENELEC and ETSI for example, which helps improve the protection of broadcasting reception.

FIND OUT MORE

EBU Spectrum Management and Regulation (SMR) group tech.ebu.ch/groups/smr
 Sharing with Digital Broadcasting (SDB) group tech.ebu.ch/groups/sdb
 Electromagnetic Interference and Compatibility (EIC) group tech.ebu.ch/groups/eic
 CEPT Report 53 www.erodocdb.dk/Docs/doc98/official/Word/CEPTREP053.DOCX