BBC response to Ofcom's consultation: *'Coexistence of new services in the 700 MHz band with digital terrestrial television'*

18 July 2017

Overview

1. The BBC welcomes the opportunity to respond to this consultation on 'Coexistence of new services in the 700 MHz band with digital terrestrial television.' [1]

2. It acknowledges Ofcom's extensive work on field measurements to quantify the degree of interference from mobile handsets to DTT receivers.

3. With regard to mobile handsets operating in channels adjacent to DTT, although we broadly agree with many of the points made in this consultation it is noted that the companion document to the consultation '700MHz Coexistence - Study of mobile uplink effects on DTT Reception' identifies two possible characteristics for the Adjacent Channel Leakage of mobile handsets, -42 dBm/8MHz (for bandwidths of 10 MHz or less) and -25 dBm/8MHz (for bandwidths greater than 10 MHz). The results of Ofcom's measurements lead only to the conclusion of minimal interference, based on the value of -42dBm/8MHz. As the auction process is as yet undefined, it may not be safe to assume that the band will be channelled into lots of 10 MHz or less. Should parts of the band be auctioned in channels of more than 10 MHz, the consequential adoption of -25dBm/8MHz OOBE limit will result in increased interference and will also eliminate the further reduction of interference that Ofcom suggests will come about by improvement of DTT receiver adjacent channel selectivity, ACS.

4. Furthermore, the consultation cites the Paris experience as confirmation of Ofcom's conclusions of minimal interference. However we understand that French LTE is licenced as a 5MHz block from 703 MHz to 708 MHz and consequently 3rd order intermodulation products from this block do not extend below 698 MHz and do not therefore overlap with Channel 48. It is our understanding that such an arrangement effectively limits interference into Channel 48 to -57 dBm/8MHz, some 15 dB better than the CEPT value of -42 dBm/8 MHz. This should be borne in mind as Ofcom develop the channelling arrangement for the auction process.

5. The consultation notes that the new Radio Equipment Directive (RED 2014/EU/53) will mean that, over time, receiving equipment being sold within the EU will be less prone to interference. This is articulated by stating that households with current equipment might experience a picture interruption every 10 hours for SD services and every 100 hours for HD services, with the impact reducing to a picture interruption every 100 hours for SD services and every 10,000 hours for HD services by 2020. This is based on the expectation that users replace receiving equipment every 7 to 8 years – an assumption that is not borne out in practice, where old equipment is relocated throughout a household as new equipment is purchased.

6. As the expectation of interference is based on an assumed receiver replacement cycle, the quoted number of hours between picture interruptions can only be interpreted as averages across all households. They will therefore underestimate the interference experienced by those who have not yet replaced their receivers. For those that have not replaced their receivers, the interval between picture interruptions will not increase – indeed, it is likely to decrease as

[1] This response should be read in conjunction with that provided by Digital UK. In this response the BBC have provided further detail on the technical aspects of the questions Ofcom have asked.

mobile network loading increases. The BBC believes that all television viewers should be protected against interference over which they have little or no control.

Answers to questions in Ofcom's consultation

Question 1: Do you have any comments on our conclusions that a) the risk of interference from mobile handsets to DTT will be minimal and b) the risk of interference from mobile base stations in 700 MHz to DTT will be broadly similar to the risk for 800 MHz, with some tens of thousands of households potentially affected

7. The measurements of coupled power between mobile handsets and DTT receivers broadly agree with coupling gain measurements carried out by the BBC and Arqiva as part of the White Space Consultation. Considering this, along with the intermittent nature of mobile handset emissions, leads us to agree that the risk of interference to DTT is likely to be low. Nevertheless for the potentially small number of households that do suffer interference, positive identification of the cause and thus effective mitigation will be somewhat problematic. This needs to be addressed in future discussions on how any mitigation solutions should be delivered.

8. The BBC broadly agrees with the assessment of the risk of interference from base stations in the 700MHz band. If infrastructure for 800 MHz is reused for 700 MHz, then already installed 800 MHz filters may need to be replaced with 700 MHz filters (but see the first paragraph of our answer to Q3).

Question 2: Do you have any comments on our analysis of coexistence risks related to set-top aerials, direct signal ingress to receivers, impact of DTT on mobile services and interference to cable TV?

9. It is well known that a significant number of DTT viewers make use of set-top aerials, and although Ofcom has always maintained that such opportunistic reception was not 'protected', the broadcasters were reassured that, whilst the primary LTE-800 interferer was the base-station, consideration of interference into roof-top reception tended also to 'protect' set-top reception. LTE-700 has a reversal of the relative frequency bands for base-station and mobile handset and consequently mobile handsets become the predominant interferer. Clearly this is a worse-case situation for set-top DTT reception, as the primary interferer may be a handset located within a few metres of the DTT receiving aerial. Consequently mitigation of interference to set-top reception may need to be included in discussions about how any mitigation solutions and associated communications to the public should be delivered.

10. We agree that direct signal ingress can be mitigated by replacement of wall plates and/or fly-leads.

11. We agree that co-existence of ETSI RED compliant DTT transmitters and LTE BS receivers requires a very significant improvement in the ACS of the BS.

12. We agree that interference to cable TV is unlikely to be a problem and if so can be mitigated by replacement of wall plates and/or fly-leads.

Question 3: Do you agree with our conclusions that DTT receiver filters will be the most effective mitigation technique for the 700 MHz band and that group K aerials will also help to mitigate against 700 MHz coexistence issues?

13. In order to accelerate the 700 MHz clearance programme, COM7 and 8 (the interim multiplexes) have been relocated to Channels 55 and 56 in the duplex-gap between the LTE-700 uplink and downlink. Channels 55 and 56 will operate as a UK-wide single frequency network until at least 2Q 2020 and possibly, with special agreement from Ofcom and the mobile operators, beyond that date. This means that part of the UK DTT platform, carrying some Public Service programming will be in a frequency range potentially rejected by 700 MHz DTT receiver filters. Until COM 7 and 8 have vacated Channels 55 and 56 we do not agree with prescriptive use of filters to mitigate LTE-700 interference. DMSL have reported that many cases of LTE-800 interference can be mitigated by improving the domestic reception equipment, so avoiding the use of any filters.

14. At a time when COM7 and COM8 have vacated Channels 55 and 56 and considering interference from base-stations to DTT receivers, we agree that DTT receiver filters will be the most effective mitigation technique. Given that records of households where LTE filters were fitted during LTE-800 roll-out seem to exist, direct replacement of these filters with a single 700 MHz filter may be the optimum strategy. We do note that currently suitable commercially available 700MHz filters are few and far between and that this will need to be address by Ofcom. For interference from mobile handsets to DTT reception, we note that the choice of -42 dBm/8MHz was a compromise, chosen such that the two mechanisms for interference, leakage from the mobile handset (ACLR) and the selectivity of the DTT receiver (ACS), were equally damaging. LTE filters have the effect of improving the DTT receiver selectivity, but improvements greater than just 3 dB provide no overall value as beyond that, the mobile handset adjacent channel leakage predominates. To achieve a better overall improvement, the handset leakage and DTT receiver selectivity need to improve together but as the mobile handset leakage is fixed by specification there is currently there is no indication that this is likely or indeed possible.

15. Given that there is a fundamental limit in the reduction of overall interference of 3 dB by improving DTT receiver ACS (either by an external filter of by improved receiver performance) it is difficult to understand how Ofcom expects the introduction of new receiver designs to give a reduction in the instances of a single transient picture interruption from 1 per 10 hour for standard definition (DVB-T) and 1 per 100 hours for HD (DVB-T2), to1 per 1000 hours for SD and virtually eliminated for HD.

16. The question regarding a recommendation of Group K domestic receiving aerials follows, with respect to COM 7 and 8 on Channels 55 and 56, a similar argument to that for 700 filters. It is expected that the 700 clearance roll-out will result in the need for a large number of domestic aerials to be changed. Certainly until 2020 and possibly beyond, in order to continue to receive COM 7 and 8, these should be Group T rather than Group K. By the time all DTT is below Channel 48, and the use of Group K is possible, most of the required new aerials will have been

purchased and fitted. We see limited benefits and the possibility of greater viewer confusion, from the widespread promotion of Group K aerials at an early stage in the process.

ENDS.