BBC Response to Ofcom's consultation: *Award of the 700 MHz and 3.6-3.8 GHz spectrum bands*

12 March 2019

Introduction

1. The BBC welcomes the opportunity to comment on Ofcom's proposals regarding the award of licences in the 700 MHz and 3.6-3.8 GHz bands.[1]

2. The BBC is clearing DTT from 700 MHz and will continue to use the adjacent spectrum to deliver television services to 20 million homes across the UK.[2] The BBC also has an ongoing interest in 3.6 to 4.2 GHz which is used by BBC Monitoring to provide access to footage from TV channels around the world for the UK and global news audiences and serve a range of other clients. This spectrum is also used by BBC World Service, as detailed in our response to *Enabling opportunities for innovation.*

3. As an incumbent user of the spectrum to be auctioned as well as a user of the adjacent bands, the BBC is keen to ensure that our uses are protected from interference from mobile.

4. The key points we raise in respect of coexistence are:

    - For 700 MHz, we would suggest that Ofcom assign the widest bandwidth blocks furthest away from DTT in order to limit the spread of the wider out-of-band emissions;
    - We believe Ofcom should incorporate our suggestions for changes to the technical licence conditions which would lower the risk of interference to DTT;
    - For 3.6 to 3.8 GHz, we believe Ofcom underestimates the risk of interference to adjacent services including the BBC's operations above 3.8 GHz and would ask Ofcom to further consider our suggestions for mitigating this risk.

5. We also note that the proposal to auction both 700 MHz and 3.4 GHz spectrum in nationwide packages means that potentially innovative users of spectrum at a local level will be denied the opportunity to access two of the pioneer 5G bands. We note the very different approach taken in Germany, where a substantial block of spectrum in the 3.4-3.8 GHz range has been set aside for local 5G networks, that may be employed by, for example, industrial concerns in factories, or by the entertainment industry in studios and theatres.

6. In addition, the availability of suitable spectrum for new uses will not only be a key driver of success of 5G, but also of the trials and testbeds intended to support the UK becoming a world leader in 5G deployment – for example, the DCMS's "Urban

[1] Some of the responses to this consultation should be read in conjunction with our responses to the parallel Ofcom consultation on "*Enabling Opportunities for Innovation*". Places in our response where such a crossover should be noted will be marked in the text.

[2] http://www.digitaluk.co.uk/operations/about_dtt

Connected Communities[3]" (UCC) programme. Decisive in the success of such trials will be ready availability of commercial user equipment (UEs) and base stations (BSs).

7. We are therefore concerned that the current proposals mean that both 3.6 to 3.8 GHz and 700 MHz spectrum - two of the key "5G pioneer bands" - may be made unavailable for use in 5G testbed trials post-auction. Use of these bands in trials might be coordinated through winning bidders. However, with the auction outcomes uncertain, access to this spectrum cannot be relied upon in the trial planning stage. And while access to the low and medium power networks proposed in "Enabling Opportunities for Innovation", and the remaining 5G pioneer mmWave band are welcome, these bands might be too limiting in scope and application for trials of the scale envisaged in the DCMS UCC paper.

8. Therefore, to aid further testing of new services we urge Ofcom to further consider how parts of both the 700 MHz and 3.4 to 3.6 GHz bands might be made available for local networks and 5G testbeds.[4]

Q1) Do you agree with our proposals on the coverage obligations as set out in this section? Please give reasons supported by evidence for your views.

9. The BBC supports Ofcom's aim to ensure that consumers experience the best possible coverage from mobile networks.

Q4) Do you agree with our proposal to proceed with a conventional assignment stage?

10. Section 6 of the Consultation deals only with the assignment of the 3.6-3.8 GHz band, and not at all with the assignment process in the 700 MHz band. As we have laid out in previous Ofcom consultation responses[5], all other things being equal, coexistence between mobile above 700 MHz and DTT below 700 MHz can be optimised by the assignment of low bandwidth blocks at the lower end of the frequency range, as this limits the spread of the out-of-band emissions.

11. Details of the proposed assignment stage of the auction process in paragraphs 7.215-7.223 indicate that coexistence issues will not be taken into account at the time of the assignment stage.

[3] https://www.gov.uk/government/publications/5g-urban-connected-communities-project
[4] In practice, we recognise that that is more achievable in the 3.6-3.8 GHz band than in the 700 MHz band.
[5] BBC response to Ofcom's consultation "Improving mobile coverage: Proposals for coverage obligations in the award of the 700 MHz spectrum band" and Ofcom's discussion document "Enabling 5G in the UK", paragraph 39, 4 May 2018.

12. Ofcom does not appear to have considered our previous proposal in its work on the auction design, and we urge them to consider it now.

Q5) Do you agree with our proposed approach to coexistence in the 700 MHz band?

Q6) Do you have any comments on the proposed licence obligation and guidance note (annex 19)?

13. We agree with Ofcom that comparison with the experience of managing coexistence at 800 MHz is a useful starting point for managing issues that arise at 700 MHz. We are also, however, mindful of the differences that could arise. One of these is discussed at greater length in our answer to question 13 – namely that higher base station power levels will be permitted from 700 MHz base stations than from those in the 800 MHz band.
14. With that in mind, we explicitly support the replies to these two questions in the Digital UK response, in particular with regard to the scope and management of any mitigation scheme.

Q9) Do you agree with our proposed approach to managing interim protections for registered 3.6-3.8 GHz band users?

15. As a holder of a grant of recognised spectrum access (RSA) in the 3.6-3.8 GHz band, the BBC has a material interest in how Ofcom manages interim protections.
16. We note that during the interim period between assignment of frequencies and end of the RSA protection, Ofcom will calculate interference from and authorise base stations on a case-by-case basis.
17. The process laid out in Annex 15 for how such calculation would be carried out is specifically designed to illustrate the interference impact to a fixed link, and not to a satellite earth station.
18. Clearly, the details of the number and locations of mobile base stations that may cause interference to an earth station will be different to those in the sample analysis, and it is difficult for us to judge the separation distance likely to cause interference to the operation of our earth station.
19. The grant of RSA for the BBC's earth station which will continue operation in the band 3.6-3.8 GHz, only shows allowable single entry interference levels. These would have been calculated based, in part, on the expected number of interferers which for many years has been low in this band. The arrival of dense mobile

networks will increase the expected number of interfering stations and hence aggregate interference.

20. The analysis in A15.7-A15.37 shows that 179 base station antenna sectors in "Area A" may be expected to break the chosen threshold by a median value of c.30 dB. Ofcom judge that a margin of less than about 6 dB might be mitigated by, for example, operation at lower power, while high margins cannot be mitigated by any practical means. Even mitigating power levels for the c.40 sectors shown in Figure A15.3 to have margins of less than 6 dB to reduce the impact for each to 0 dB would increase the overall aggregate interference by 10 $\log_{10}(40)$ = 16 dB over the single-entry interference level. This quick calculation is done on the basis of the fixed-link analysis presented in A15, as no such analysis has been shown for a satellite earth station.

21. Without a worked illustration of the likely impact to a satellite earth station – one that notably is close to major urban areas - we have considerable concerns that Ofcom's proposal would cause a considerable increase in total interfering power above the "single entry" limit specified in the RSA. We would like to work with Ofcom to reach a more detailed understanding of how interim protections will be managed in 3.6 to 3.8 GHz for the BBC and other receive only earth station users.

Q11) Do you agree with our view that we do not need to include any specific conditions in 3.6-3.8 GHz licences to mitigate the risk of adjacent band interference?

22. No. We believe Ofcom has a duty to ensure that interference levels to ongoing receive only earth stations (ROES) operations above 3.8 GHz do not exceed those specified in the grants of RSA.

23. Paragraph 14 of the Notification of Recognised Spectrum Access (RSA) granted by Ofcom under section 18 of the WT Act 2006, states that *"Ofcom will not authorise transmissions … where the effect of such a grant would be to increase the level of radio emissions … above the single entry interference level set out in column 4 of Schedule 1 [of the RSA]."*

24. We believe from the calculations Ofcom sets out that base station operation at close proximity to our ROES sites, are likely to cause interference to our operations above 3.8 GHz. We disagree with Ofcom's conclusion in paragraph 9.56 that there is only a "small theoretical risk" of interference.

25. We would therefore encourage Ofcom to consider mitigations so that our incumbent use is not compromised. For example, Ofcom might authorise, on a case-by-case basis, base station proposed by licensees to be located within 4.1 km of the earth station for non-AAS macro cells and within 7.5 km of the earth station

for AAS macro cells. Given the power levels and operators parameters Ofcom has assumed in its analysis, we assume the risk of interference at these distances would be within the levels allowed for in the grants of RSA.

26. We also note that Ofcom proposes that the insertion of a high-pass waveguide filter would be a suitable mitigation against interference from mobile base stations below 3.8 GHz. This is a mitigation with costs that the BBC as the incumbent would need to bear. In addition, we do not believe it would be entirely effective as a mitigation measure.

27. In Table A15.11, Ofcom shows typical and minimum rejection figures for a range of such filters at a frequency separation of 150 kHz from the lower band edge (or possibly, in some cases, 50 kHz – the table isn't clear). These show some impressive performance with up to 60 dB rejection indicated at 150 kHz separation. However, the rejection at smaller separations – sometimes for operations at band edge, very small separations, will inevitably be smaller than those shown and the mitigations posited by Ofcom will not be achieved.

Q13) Do you agree with the technical licence conditions we propose?

28. We have identified three specific issues in Ofcom's proposed technical licence conditions:

- Ofcom proposes that the maximum BS power for 700 MHz is 64 dBm/(5 MHz) – this is higher than the power level set for 800 MHz which in the UK was set to 61 dBm/(5 MHz) [6]. However, Ofcom states that they do not believe there will be higher levels of interference to DTT reception from 700 MHz band base stations than there were from 800 MHz BSs. We question this conclusion as the higher power levels are more likely to overload masthead amplifiers, and this effect is non-linear. A higher power density would therefore be expected to lead to a larger overall effect. Although a new 700 MHz filter could mitigate more effectively than 800 MHz filters, because of the greater frequency separation, this will not reduce the number of interventions required.
- We note that provision of 700 MHz filters to mitigate the effect of BS interference into DTT receiving systems will also remove any ongoing use of channels 55 and 56 for the interim DTT multiplexes.
- The footnote to Table 11.2, identified by an asterisk, appears to apply to both the in-block power limit and the out-of-band power limit for UEs. However, the

[6] Ref: IR 2090 "UK Interface Requirement 2090 - Terrestrial systems capable of providing electronic communications services in the 800 MHz band", Table 3.1 row 7.

Commission Implementing Decision[7] from which this is drawn only applies the footnote to the in-block power limit. The effect of the Ofcom draft in the consultation document is to allow a tolerance of up to 2 dB on both in-block and out-of-band power limits – this is not the intent of the Implementing Decision, and is contrary to the CEPT Reports from which these figures are drawn. We request that Ofcom reviews its drafting here to be clearer than the 2 dB tolerance only applies to the in-block power limit. In connection with this, we also note that the draft Interface Requirement given in Annex 20 does not specify any out-of-block power limit requirements. These are listed by Ofcom as informative references to EU and ECC Decisions and CEPT Reports – implying that out-of-band emission limits are not mandatory. Our view is that these are mandatory requirements, and should be listed as such in the technical licence conditions.

[7] Commission Implementing Decision (EU) 2016/687