Issue 1

BT's response to:

2.3 and 3.4 GHz spectrum award

Consultation on a 3.4 GHz band plan, varying UK Broadband Limited's licence and a call for inputs on other aspects of the award

Issued by Ofcom on 16 October 2013

Executive Summary

1. BT agrees with Ofcom's proposal that the 3.4 GHz band (and 2.3 GHz band) should be awarded as unpaired spectrum compatible with TDD technologies, such as LTE.

2. BT does not agree that UK Broadband Ltd (UKB)'s existing authorisation to use the 3480–3500 MHz and 3580–3600 MHz bands (which expires in 2018) should be changed to cover a single block of frequencies at 3560 – 3600 MHz. The new frequencies that Ofcom proposes to give to UK broadband are of particular interest to BT, and potentially to other parties, and we believe they must instead be awarded by a competitive process. Ofcom should include these frequencies in the auction, for availability in 2018 (or earlier if traded to a new buyer).

3. BT encourages Ofcom to design the auction to be as simple and transparent as possible for bidders, with a view to minimising complexity and the costs to bidders in preparing to participate, as well as minimise opportunities for gaming that could lead to an inefficient outcome. Our preliminary view is that a form of simultaneous multiple round auction may be preferable to a combinatorial clock auction. Bidding for specific rather than abstract blocks would avoid an assignment round, although details such as guard bands between operators or ability to repack the spectrum if the outcome is fragmented are items that require more detailed study.

4. The spectrum should be packaged in sufficiently large usable blocks (e.g. 20MHz). We also encourage Ofcom to consider reserving a very large package suitable for a "neutral host" operator, rather than relying on the auction to enable this outcome via aggregation of blocks. In this context we believe a wholesale obligation is needed to ensure provision of a neutral host platform. If Ofcom chooses not to require neutral host obligations then a large block shouldn't be included as it would be susceptible to foreclosure bidding. Market mechanisms alone will not deliver a neutral host wholesaler: they will deliver neither aggregated lots in the auction nor commercial agreements after the auction.

5. Measures to promote competition and innovation are important considerations and should be included in the auction design. Spectrum caps are one possible approach and these should be set to ensure that there will be more than four winners of the spectrum, in order to avoid large existing players with large existing spectrum holdings excluding new competition.

6. BT is potentially interested in both bands and foresees a diverse range of applications, including wholesaling capacity. Use of the spectrum for small cells may be of interest and we see advantage in considering assignment of a large proportion of the available spectrum to licensees who will commit to building a neutral host network. We would be interested in a neutral host opportunity, but only if sufficient spectrum is reserved (e.g. 120MHz). We would be very interested in the top of the 3.4GHz band in view of its proximity to UKB and global developments.

7. BT has a clear preference that both bands are awarded at the same time. We recognise that there is much to be done to prepare for the award, both by Ofcom and potential bidders, and we consider the target date of 2015/16 to be ambitious and sooner than the spectrum is needed.

8. We continue to evaluate the various options as to how the spectrum can be awarded and will contribute to the development of further detailed consultations as Ofcom's plans progress. We encourage further study of the adjacent band compatibility issues and would be interested in visibility of these results and details of any geographic constraints that may be applied to use of these spectrum bands.

1. Introduction

BT is pleased to contribute its views on the arrangements for awarding the 2.3GHz and 3.4GHz spectrum that is to be released by MoD. Interest in these bands is growing internationally and the early deployments and trials of TD-LTE in these bands in Asia are encouraging steps towards their widespread commercialisation for mass market mobile. The 3.4GHz band is receiving a lot of attention in the USA at present where the FCC is developing suitable plans for the 3.4GHz band with industry. Within the UK and Europe availability of these additional bands for mobile broadband will become important over the next few years as the volumes of mobile data continue to grow and existing spectrum and network architectures, even with new 4G technology and the option of WiFi off-load, are unable to satisfy demand.

In this response we have set out our preliminary views on the award arrangements and have responded to the specific questions that Ofcom has posed. Given the rather short timescale of this call for input we have not fully analysed all the issues and would appreciate further opportunity to contribute our views to Ofcom ahead of launch of formal consultation proposals.

2. Summary of BT views

BT welcomes early debate on how the MoD spectrum is to be awarded. We encourage Ofcom to look forward to the how the mobile market is evolving and to consider alternative options to the past approach of auctioning available spectrum in small lots to multiple bidders who would build duplicative infrastructure. This spectrum needs to be available in large blocks, potentially to support 5G mobile services in future. Our preliminary analysis also suggests that there would be advantage to the UK if a neutral host network, available to all operators, were deployed using a large proportion of the new spectrum, providing a single low cost infrastructure, such as indoor small cells, with appropriate wholesale access obligations. This would avoid expensive duplicative future new mobile network infrastructure by all operators and could deliver massive mobile broadband capacity at lower cost than is possible today. We therefore set out some initial ideas as to how that could be supported in the auction arrangements.

BT does not agree that UKB's existing authorisation to use the 3480–3500 MHz and 3580–3600 MHz bands (which expires in 2018) should be changed to cover a single block of frequencies at 3560 – 3600 MHz. The new frequencies that Ofcom proposes to give to UKB, which coincide with spectrum being harmonised for shared use and small cells in the USA, are of particular interest to BT, and potentially to other parties. We believe they should be awarded using selection criteria and procedures that promote competition, investment and the efficient use of spectrum, and not be assigned to UKB. It would be improper to award spectrum to a party without proper process. Ofcom should include these UKB frequencies in the auction, for availability in 2018 (or earlier if traded to a new buyer). In any case we are unclear why Ofcom is consulting on changing the UKB frequencies without addressing the obvious question of what happens to them when the licence expires in 2018. We see no value in delaying that discussion and if the intention is to re-auction those later, as a separate exercise to the main 3.5GHz auction, that does not seem efficient or optimal. If the intention is to propose to extend the licence then BT would be opposed to this as we do not believe that this will promote optimal use of the spectrum.

We agree that the 2.3GHz and 3.4GHz spectrum should be awarded as unpaired spectrum suitable for TDD technology. We would prefer the auction design to be kept as simple as possible, with spectrum awarded in packages of 20MHz and a large block available (at least 120MHz) specifically for a neutral host operator, with wholesale obligations.

Competition measures such as spectrum caps on existing national MNOs with large spectrum holdings should be included as a means of promoting competition and innovation. We believe that Ofcom should devise caps that will ensure that there will be more than four winners of spectrum in this auction, this will ensure that the existing four national mobile network operators cannot acquire all of the spectrum to foreclose competition and will encourage other existing or new players to participate to promote further competition and innovation.

We are concerned that the question of guard bands between TDD operators needs to be addressed because this can affect the amount of spectrum that an operator requires. It might be worth Ofcom facilitating an industry discussion to determine whether agreement could be reached on synchronisation of TDD deployments so that guard bands are not required.

The timing of the award must allow sufficient time for preparations and ensuring the spectrum is available within required timescales. Our view is that a date of 2015/16 is quite an ambitious target and is sooner than the spectrum is likely to be needed.

3. Our responses to the consultation questions

Question 1: Do you agree with our proposal to award the 3.4 GHz band in a way that is consistent with an unpaired (TDD-compatible) band plan only, and to make this decision sooner rather than later? If not, please set out your reasons and any evidence for your view.

Yes, we agree that the 3.4GHz spectrum should be awarded as unpaired spectrum. This would support asymmetric mobile data requirements and would be consistent with the global trends that indicate that the major use of this spectrum band will be for LTE-TD technology.

Question 2: Do you agree with our proposal to vary UK Broadband's licence so that it encompasses the frequencies 3560-3600 MHz instead of 3480-3500 and 3580-3600 MHz?

No, BT does not agree with this proposal. Since the UKB's licence expires in 2018, just two years after the earliest date Ofcom anticipates auctioning the rest of the band, Ofcom and/or MoD should first indicate what will happen to the spectrum after the licence expires. Awarding new frequencies to UKB in the way proposed might simplify the auction arrangements for the remainder of the band and will confer substantial advantage to them (e.g. less complex equipment if all channels are in one sub-band). However, this is not the only consideration needed. BT is interested in the frequencies that are assigned to UKB that expire in 2018 and we are also particularly interested in the new frequencies that Ofcom is proposing to assign to UKB without a competitive process (for reasons see our response the Q3).

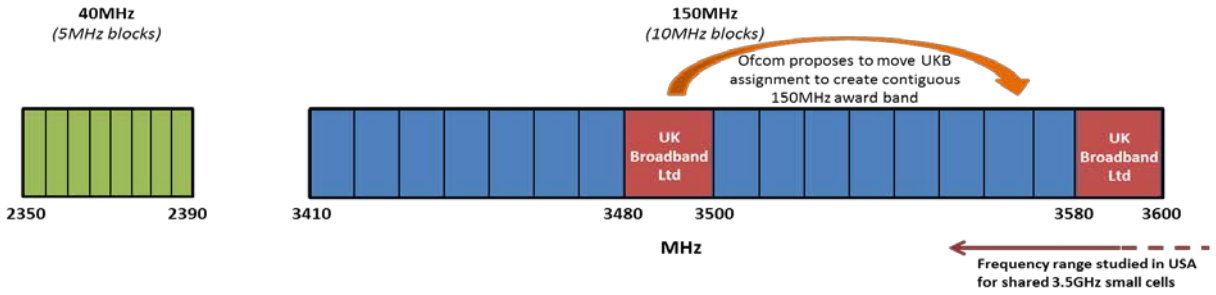
Question 3: Do you have any specific interest in the 3560-3580 MHz block in preference to any other 20 MHz block within the available 150MHz? If so please give your reasons and any supporting evidence.

BT would be interested in acquiring the frequencies immediately below the 3580-3600MHz allocation that Ofcom proposes to give to UKB. This would be convenient to us in view of the possibility to later acquire additional contiguous frequencies, if needed, from the existing UKB assignment in the event that they would trade their spectrum or wholesale their network to BT, or if BT could buy that spectrum if it is re-auctioned and use it after their licence expires. Furthermore, the US FCC has proposed[1] to make 3550-3650MHz

[1] See http://transition.fcc.gov/Daily_Releases/Daily_Business/2013/db1104/FCC-13-144A1.pdf

available for small cells and so the top part of the 3.5GHz band may have low cost equipment available and hence is of particular interest to BT and possibly to other companies. The location of the band under consideration by the US FCC and the UK award bands is illustrated in Figure 1 below.

Figure 1



Ofcom has not indicated in the consultation document the deadline by which existing equipment deployed in the 3480-3500MHz will be cleared under Ofcom's proposal to replace this assignment. If use is light then this would be an additional argument to re-auction the existing UKB frequencies for the period after the existing licence expires. This would improve the likelihood that it is placed in the hands of those that value it most and so are likely to derive maximum value from its use.

Question 4: Do you have any specific interest in acquiring a licence to use frequencies in either or both of the bands to be awarded?

Yes we are interested in acquiring a licence in one or both of these bands.

Question 5: How much spectrum would you be interested in acquiring? (What is the minimum and maximum amount of spectrum of interest to you?).

We would be interested in obtaining multiples of 20MHz channels; however, our exact requirements have not yet been decided and would, in any event, be commercially confidential.

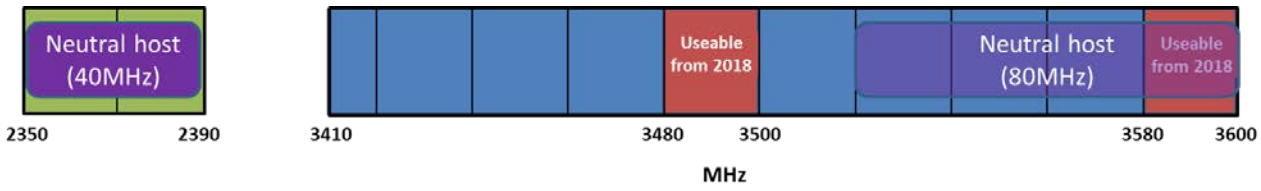
We urge Ofcom to also consider alternative approaches to the traditional approach of auctioning the spectrum in small packages (e.g. 5MHz lots) and to instead consider making available large blocks of spectrum that could be of interest to a "neutral host" operator supporting multiple service providers, for example to provide a small cells capacity solution in buildings, in outdoor hot-spots or in rural broadband scenarios. Such a solution based on network and spectrum sharing by multiple operators could result in lower costs/Mbit for delivery of very high volumes of mobile data to UK consumers. This could for example involve the entire 40MHz of spectrum at 2.3GHz and 80MHz of the 3.4GHz spectrum, enabling the neutral host operator to support devices capable of accessing either band. Alternatively the neutral host operator could be accommodated in just the 3.4GHz band with a single 120MHz assignment. BT would be interested in such an opportunity if the amount of spectrum set aside is sufficiently large (e.g. 120MHz).

Spectrum caps could be relaxed in the case of operators committing to provide regulated wholesale access to such a neutral host network. It is important that the neutral host operator block is sufficiently large that multiple operators can be supported. Examples of how the spectrum could be packaged to include provision for a neutral host operator are set out below, assuming that the UKB spectrum is included in the auction.

Scenario 1 – dual band neutral host network

Award blocks totalling **120 MHz** (40MHz @ 2.3GHz + 80MHz @ 3.4 GHz) for a neutral host operator with regulated wholesale access obligations. This would allow devices in two bands to be supported including earlier 2.3GHz ecosystem.

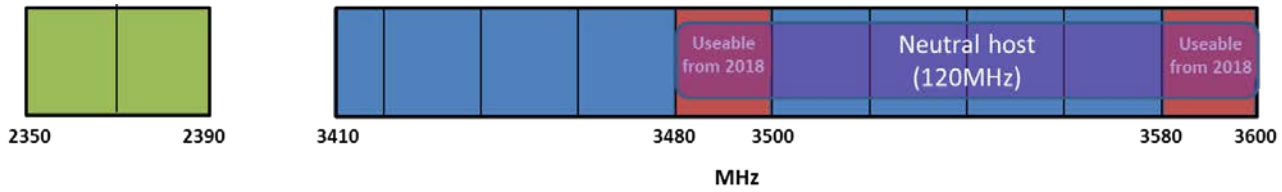
Figure 2



Scenario 2 – single band neutral host network

Award large block of **120 MHz** for a neutral host operator with regulated wholesale access obligation (120MHz @ 3.4 GHz).

Figure 3



Question 6: Which of the two bands would you be interested in: 2.3 GHz, 3.4 GHz or both?

BT is interested in both available bands.

Question 7: Are there specific parts of the bands you are interested in and if so what are they?

BT is particularly interested in parts of the 3.4-3.6GHz band adjacent to existing UKB assignments and the top of the this band. We would need to further analyse the adjacent band compatibility issues and understand the characteristics of adjacent band services before concluding on this matter. These aspects are likely to be commercially confidential in view of the fact that they may affect bidding if the spectrum is auctioned.

Question 8: What do you envisage using the spectrum for (e.g. 4G services or other applications)?

BT is exploring a range of applications that extend existing propositions in development in other bands as well as new innovative propositions that are in development. We are likely to be interested in using standard 4G TD-LTE technology (and its evolutions).

Question 9: Where would you expect to use the spectrum (Great Britain-wide or in specific geographical areas)?

The spectrum would be of interest for use by BT nationwide.

Question 10: What types of device would you want to use the spectrum for, and when would they be available?

We would expect to use the spectrum for a range of fixed and mobile devices. These are standardised technologies available now, but in the next 2-3 years will be available in greater volumes and much cheaper than today.

Question 11: When would you expect to make use of the spectrum?

Different potential applications have different timescales. Some limited use would be envisaged within a year of the award (assuming it is made in 2015/16 in line with current proposed timing), but the more intensive use of the new spectrum by industry would in our view more likely start c. 4-5 years from now when we predict that growth in mobile data will outstrip existing spectrum and mobile network architectures.

Question 12: Do you have any comments on the method of award, such as combinatorial clock auction?

BT encourages Ofcom to design the auction to be as simple and transparent as possible for bidders, with a view to minimising complexity and the costs to bidders in preparing to participate, as well as minimising opportunities for gaming that could lead to an inefficient outcome. Our preliminary view is that a form of simultaneous multiple round auction may be preferable to a combinatorial clock auction. Bidding for specific rather than abstract blocks would avoid an assignment round, although details such as guard bands between operators or ability to repack the spectrum if the outcome is fragmented are items that require more detailed study.

Both bands should be awarded at the same time given that they are to some extent substitutes and it would be more efficient to enable operators to choose between the bands knowing the prices in each at the same time. If Ofcom is prepared to include options of large spectrum blocks for a neutral host network, the design of the award could even be adapted further, for example taking some of the ideas used in the French mobile auction held in 2010 where additional weighting was given to financial bids where wholesale access obligations apply.

The idea of allocating large blocks of spectrum for a national wholesale mobile network is also being considered elsewhere in the world: the Mexican regulator recently announced that the 700MHz spectrum (2x45 MHz) will be awarded to a single national wholesaler.

At this stage, and within the short timescales of this call for inputs, we do not have specific solutions but would wish to engage with Ofcom further before formal consultation proposals are issued.

Question 13: Do you have any comments on whether a cap on the amount of spectrum that could be acquired through this award would be appropriate?

Yes, given the very asymmetric holdings of established UK national mobile network operators on the one hand and BT and others as new entrants on the other, we consider that strict measures to ensure adequate levels of competition are important in this award to ensure that the spectrum does not all simply end up in the hands of the four national network operators who have an interest in ensuring smaller players cannot

obtain sufficient spectrum to compete. This would also reflect the requirements of the EU regulatory framework which is designed to avoid excessive accumulation of rights of use of spectrum. Spectrum caps, such as those imposed in the recent 4G spectrum auction, are probably the simplest approach but if they are to reflect existing asymmetries they would need to address existing as well as new holdings, in which case different caps may be appropriate for different players. Ofcom should devise spectrum caps to ensure that more than four players will win spectrum in this auction.

Question 14: Do you have any preference for spectrum packaging, for example block size?

A unit block size of 20MHz could be appropriate (and an odd one of 10MHz in the 3.4GHz band). However, rather than trusting that large blocks can be won by a neutral host operator by winning and aggregating multiple lots, it is important to instead directly include large packages for a neutral host operator within the auction. If spectrum is not reserved for a neutral host network, there is a risk that an auction may lead to an inefficient outcome. This is because the value of the spectrum to a neutral host network only reflects part of the value to society; it is based on the provision of wholesale services and excludes the value of retail services. On the other hand, the value of the spectrum to vertically integrated MNOs depends on both wholesale and retail services. Hence, the potential users would not be bidding on the same basis with regard to the overall efficiency of the spectrum.

As illustrated above, to facilitate a neutral host operator, for example the entire 2.3GHz band and a large proportion of the 3.4GHz band (e.g. 80MHz) could be awarded as a single lot, or a single lot of 120MHz from the 3.4GHz band could be identified.

Question 15: Do you have any views on the non-technical licence conditions discussed in this document, including coverage and roll-out and "use it or lose it"?

The spectrum is most suited to capacity solutions and we don't think a coverage obligation is needed. If the spectrum is tradable and because it may take time for the ecosystems in these bands to fully mature we do not think a "use it or lose it" obligation is appropriate.

Question 16: What do you consider would be the optimal timing for the award?

BT has a clear preference that both bands are awarded at the same time. We recognise that there is much to be done in preparation for the award, both by Ofcom and potential bidders, and we consider the target date of 2015/16 as ambitious and is sooner than the spectrum is needed.

Question 17: Are there any reasons why these bands should be assigned for low-power use? Would such uses be appropriate even if purchasing a licence for low-power use would cost the same as for high- power use?

We believe that lower power use for capacity solutions, especially indoors, will be of particular interest for this spectrum and would be a very efficient use of this spectrum. Assignment for low power use would make sense if several operators were to share the spectrum in an uncoordinated manner. We propose that the neutral host operator concept could better facilitate the sharing of the spectrum but with a single network with the power levels set appropriately for the particular scenario at the discretion of the operator (e.g. fixed broadband, indoor small cells etc).

Question 18: Will you use this spectrum for backhaul? If so, please state the minimum contiguous block you would require.

Backhaul is one option that we are considering and a minimum of 20MHz is needed.

4. Other points

We would be interested in details of adjacent band compatibility issues and any geographic constraints on use of any of the available frequencies. For example, the compatibility of 2.3GHz mobile systems and adjacent 2.4GHz WiFi systems is an issue that requires careful analysis and development of suitable technical conditions.

The issue of guard band requirements and possible requirements for network synchronisation between operators to avoid these has not been addressed. It may be worth Ofcom facilitating an industry discussion around this point before finalising the auction design including packaging arrangements and technical licence conditions.

Our own analysis of the auction design options is work in progress and we would welcome the opportunity to further discuss these issues with Ofcom ahead of the publication of further consultation documents.