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# Defragmentation of spectrum holdings in the 3.4-3.8 GHz band

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**CONSULTATION:**

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# 1. Overview

The 3.4-3.8 GHz band has been harmonised for mobile services and identified as the primary band for introducing 5G in Europe. There is general consensus that optimal deployment of 5G would be best achieved through large contiguous blocks. However, in the UK, the current holdings in the band mean that, without trading of blocks, holdings after our forthcoming award are likely to be fragmented.

In December 2018 we consulted on proposals for the award by auction of the 700 MHz and 3.6-3.8 GHz bands. Having considered responses in relation to fragmentation of the 3.4-3.8 GHz band, we set out in this document revised proposals for part of the award process, with the aim of facilitating defragmentation.

## What we are proposing – in brief

In order to facilitate defragmentation of the 3.4-3.8 GHz band, we are minded to impose a **restriction** on winners of less than 20 MHz of 3.6-3.8 GHz spectrum to bidding only for the top or bottom of the 3.6-3.8 GHz band in the assignment stage of the auction. In addition, we are also minded to include a **negotiation phase**, within the assignment stage of the auction, during which winners of 3.6-3.8 GHz spectrum would have the opportunity to agree the assignment of frequencies in the 3.6-3.8 GHz band between themselves.

This document sets out our revised proposals and two possible sub-options of the negotiation phase. One sub-option, which we considered in the December 2018 consultation, would require unanimous agreement among the winning bidders of 3.6-3.8 GHz spectrum. The other sub-option, which we have set out in this document in light of stakeholders' comments, would allow for partial agreement in the absence of unanimous agreement. We are interested in stakeholders' views on these possible sub-options.

**This overview is a simplified high-level summary only. The proposals we are consulting on and our reasoning are set out in the full document.**

## 2. Our revised proposals for defragmentation

### Introduction

- 2.1 In December 2018, we published a consultation (the “**December 2018 consultation**”) on our proposals for the award of spectrum in the 700 MHz and 3.6-3.8 GHz bands.<sup>1</sup> Section 6 of that consultation set out our initial views on how we might use the award to facilitate defragmentation of the 3.4-3.8 GHz band. Having considered stakeholders’ responses to the December 2018 consultation, we now consider that it may be appropriate for Ofcom to include measures in the upcoming auction which could facilitate defragmentation of the band.
- 2.2 This document sets out the measures we are minded to include in the auction, which are:
- a) a restriction on winners of less than 20 MHz of 3.6-3.8 GHz spectrum to bidding for either the top or the bottom of the band in the assignment stage of the auction; and
  - b) a negotiation phase within the assignment stage of the auction, during which winners of 3.6-3.8 GHz spectrum would have an opportunity to agree the assignment of frequencies in the 3.6-3.8 GHz band.

We are seeking stakeholders’ views on two different potential sub-options for this negotiation phase.

### Our December 2018 proposals

- 2.3 In the December 2018 consultation, we acknowledged the general consensus – including among mobile network operators (MNOs) and European regulatory bodies – that optimal deployment of 5G will be best achieved through large contiguous spectrum blocks.
- 2.4 We recognised that defragmentation of the 3.4-3.8 GHz band may well be desirable given the benefits that contiguity of spectrum holdings could bring.
- 2.5 We said that in the absence of contiguous spectrum, an operator may benefit from having its separate blocks of 3.4-3.8 GHz spectrum sufficiently close to each other. This may allow it to avoid higher costs of equipment e.g. it may avoid the requirement to deploy more than one antenna to service frequency bands that are wide apart.
- 2.6 We referred to this issue as the ‘proximity’ of an operator’s spectrum blocks. We considered there were advantages in proximity, although contiguity was likely to be a better outcome.
- 2.7 We set out our expectation that the limitations associated with non-contiguous holdings, inherent to the early stage of the new technology, would reduce in the future as the technology develops and matures. Our understanding was that dual connectivity would

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<sup>1</sup> [https://www.ofcom.org.uk/data/assets/pdf\\_file/0019/130726/Award-of-the-700-MHz-and-3.6-3.8-GHz-spectrum-bands.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0019/130726/Award-of-the-700-MHz-and-3.6-3.8-GHz-spectrum-bands.pdf)

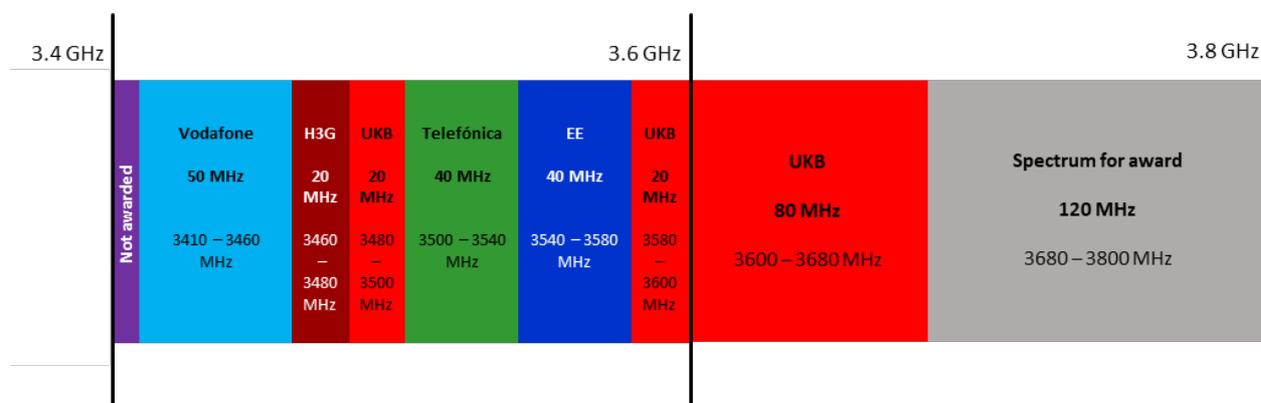
## Defragmentation of spectrum holdings in the 3.4-3.8 GHz band

allow for inter-band carrier aggregation between 4G and 5G carriers that could allow for higher peak speeds.

2.8 The arrangement of spectrum holdings ahead of the auction is illustrated in Figure 1 below. H3G, which owns UK Broadband, holds a total of 140 MHz of spectrum in the 3.4-3.8 GHz band, including a contiguous holding of 100 MHz (3580-3680 MHz). However, with only 120 MHz of new spectrum being awarded, only one other operator could achieve a contiguous holding of 80 MHz or more solely by bidding in the auction.

2.9 We therefore considered whether there were steps we could take to facilitate defragmentation of the wider 3.4-3.8 GHz band, so that all or most operators were able to have contiguous holdings – or, at least, holdings in which blocks allocated to each operator were in close proximity to each other.

**Figure 1 – The 3.4-3.8 GHz band**



2.10 We said defragmentation could be achieved if operators included their existing spectrum holdings in an overall assignment of the 3.4-3.8 GHz band. We considered options for compelling MNOs (H3G, in particular) to participate in such a process, and alternative options for voluntary participation.

2.11 Our initial view was that, even if making H3G’s participation in the award conditional on it including some (or all) of its existing spectrum holdings in the assignment stage could be justified, there would be no certainty that H3G would enter the award on these terms. We also said that, without H3G’s participation, it is not clear that all or any of the remaining MNOs would necessarily choose to take part in a full band assignment stage.<sup>2</sup>

2.12 We therefore considered whether defragmentation could be achieved through spectrum trading. This would be possible if all relevant licensees in the 3.4-3.8 GHz band perceived an advantage in engaging in such trades.

2.13 We noted that defragmentation could be delivered for all MNOs through relatively simple bilateral trades. For example, we considered that it would require only two separate

<sup>2</sup> December 2018 consultation, paragraphs 6.22-6.24.

- bilateral trades to achieve defragmentation in a number of reasonably likely outcomes to the principal stage of the 3.6-3.8 GHz auction.
- 2.14 Our provisional view was that the most effective approach was to allow the market to determine the best allocation of spectrum - first through the 700 MHz and 3.6-3.8 GHz auction and then through spectrum trading.
- 2.15 We also considered three particular options for the assignment stage that might help to facilitate post-auction trades:
- a) Option 1: Restricting the assignment of any bidder winning a small amount of spectrum to either the top or bottom of the band;
  - b) Option 2: Allowing bidders to agree their assignments between themselves on a commercial basis as an alternative to an assignment stage; and
  - c) Option 3: Allowing contingent bidding in the assignment stage i.e. making a bid valid depending on which other operator wins adjacent spectrum.
- 2.16 We recognised some potential downsides to all these options, such as restricting possible assignment stage outcomes; adding complexity to the process; causing a delay to the outcome of the auction; and increasing the scope for strategic bidding in the assignment stage. In light of these potential downsides, we proposed to proceed with a conventional assignment stage for the auction without any of the options above. However, we welcomed feedback from stakeholders on the options we outlined to inform our view on the potential demand for these options.

## Stakeholders' responses

- 2.17 H3G supported the view that the defragmentation of the 3.4-3.8 GHz band should be left to the market. More specifically, H3G stated that there were opportunities for trades to occur pre and post auction in order to further reduce or eliminate fragmentation of the band.<sup>3</sup>
- 2.18 Dense Air Ltd noted that defragmentation of the 3.4-3.8 GHz band would be critical to any 5G nationwide deployment. They also believed that spectrum holders should work together without Ofcom involvement.<sup>4</sup>
- 2.19 A number of other respondents, including Vodafone, BT/EE, and O2, argued that Ofcom should do more to facilitate defragmentation of the 3.4-3.8 GHz band through the auction. O2 considered there to be large downsides in having fragmented spectrum across the 3.4-3.8 GHz band.<sup>5</sup> BT/EE considered that contiguous spectrum assignments would have

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<sup>3</sup> H3G non-confidential response to the December 2018 consultation, sections 5.1 and 5.2 (pages 46 and 47).

<sup>4</sup> Dense Air Ltd non-confidential response to the December 2018 consultation, pages 3 and 4.

<sup>5</sup> O2 non-confidential response to the December 2018 consultation, pages 32-34. Firstly, O2 claimed that there will be reduced performance of 5G networks, which would result in lower speeds for the average customer and delays to 5G use cases, such as Industry 4.0. Secondly, it thought there would be higher costs of deployment in the band, which may reduce the total number of sites that the spectrum will be deployed on in the UK.

significant benefits over fragmented assignments in terms of technical efficiency and costs.<sup>6</sup> In addition, it cited the draft EC Decision for the 3.4-3.8 GHz band, which states that *“Member States should aim at ensuring a defragmentation of the 3 400-3 800 MHz frequency band so as to provide opportunities to access large portions of contiguous spectrum in line with the goal of gigabit connectivity. This includes facilitating trading and/or leasing of existing rights of use.”*<sup>7</sup>

- 2.20 Vodafone considered that, in light of the new European Electronic Communications Code (in particular, Art. 54), *“Ofcom will likely have a duty to ensure that large contiguous blocks are made available for operator usage”*.<sup>8</sup> In its view, all three options that Ofcom outlined in the December 2018 consultation should be implemented to maximise the chances of defragmenting the 3.4-3.8 GHz band. Vodafone noted that these options are not mutually exclusive and that the worst-case outcome is that the auction is delayed by a week or two. On option 2 (‘the negotiation option’), Vodafone suggested that Ofcom should facilitate the negotiations.
- 2.21 BT/EE considered that the most promising approach to achieving defragmentation would be a variant of our option 2.<sup>9</sup> It included in its response examples of other countries that have assignment negotiations in their spectrum auctions, such as Germany and Belgium.
- 2.22 BT/EE’s proposed modification to the negotiation option would allow for bi-lateral trades to be confirmed during the negotiation phase, and in turn allow for partial defragmentation of the 3.4-3.8 GHz band. BT/EE’s proposal would allow a subset of two winning bidders of 3.6-3.8 GHz to agree bi-lateral trades, by trading spectrum that they have in the 3.4-3.6 GHz band, during the negotiation phase, without the involvement of other bidders. If all winning bidders of 3.6-3.8 GHz spectrum are not able to agree the band plan for 3.6-3.8 GHz, these two bidders would still be able to ensure that they have contiguous spectrum across the 3.4-3.8 GHz band – either in the 3.4-3.6 GHz band, or as a

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<sup>6</sup> BT/EE non-confidential response to the December 2018 consultation, paragraphs 4.1.

<sup>7</sup> BT/EE non-confidential response to the December 2018 consultation, paragraphs 4.4.

<sup>8</sup> Vodafone non-confidential response to the December 2018 consultation, pages 42-43.

<sup>9</sup> BT/EE non-confidential response to the December 2018 consultation, paragraph 4.10.

single contiguous block in the 3.6-3.8 GHz band assignment stage.<sup>10 11</sup> We note that, unlike BT/EE's suggestion, the negotiation outlined in the December 2018 consultation would require *all* winning bidders of 3.6-3.8 GHz spectrum to agree the assignments in 3.6-3.8 GHz, for the outcome of the negotiation phase to replace assignment stage bidding.

- 2.23 BT/EE suggested that Ofcom could alternatively announce before the start of bidding in the principal stage (or possibly later) the order in which new frequencies will be assigned to bidders.<sup>12</sup> BT/EE gave an example of this in which Ofcom could announce before the start of the principal stage that any new frequencies to be assigned to Operator A would be assigned from the bottom of the new frequency range, any new frequencies to be assigned to Operator B would be assigned immediately above those, and so on, listing all bidders qualified to bid in the auction in turn.
- 2.24 BT/EE also suggested that Ofcom could incentivise H3G to participate in defragmentation through the annual licence fees (ALFs). As an example, it suggested that Ofcom could commit to reviewing H3G's ALFs after the auction if trading had occurred. It claimed this would incentivise H3G to trade if the 3.6-3.8 GHz auction prices end up lower than the 3.4-3.6 GHz auction prices. We note that, as set out in our recent statement on ALF for this spectrum, we always retain the ability to revise fees in the future in appropriate circumstances, including after the forthcoming auction of 700 MHz and 3.6-3.8 GHz spectrum, if we consider there is evidence to suggest a revision to fees is warranted.<sup>13</sup> However, we also consider that there is benefit for licensees in a period of certainty on fees and we intend to retain the fees as set unless there is strong evidence that a material misalignment has arisen between the level of the fees and the value of the spectrum.

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<sup>10</sup> Here we set up a hypothetical example to aid the explanation of BT/EE's modification to the negotiation phase. This is our own example and not BT/EE's. Bidder A and B already own licences that are adjacent in the 3.4-3.6 GHz band. Bidder A owns a licence for 5 MHz, while bidder B owns a licence for 10 MHz. Both of these bidders participate in the 700 MHz and 3.6-3.8 GHz auction. In the principal stage, both bidders win 5 MHz. They both submit bids for the assignment stage of the 3.6-3.8 GHz band independently, and afterwards the auction enters the negotiation phase. These two bidders decide to trade bi-laterally, where bidder A agrees to trade its 5 MHz licence in 3.4-3.6 GHz for bidder B's 5 MHz Principal stage winnings in 3.6-3.8 GHz. Bidder B will therefore have 15 MHz of contiguous spectrum in the 3.4-3.6 GHz band, while bidder A will now have 10 MHz in the 3.6-3.8 GHz band, where the exact frequency location will be determined by previous assignment stage bidding.

In the assignment stage, Bidder B's bids are now removed. Bidder A's assignment stage bid remains unchanged on its original 5 MHz block, and there is an additional restriction that Bidder A must receive the whole 10 MHz in a contiguous assignment (i.e. it can only be assigned frequencies that would have been adjacent with bidder B's bids, had these bids not been removed). Assuming that there are no other trades and that the winners of the 3.6-3.8 GHz spectrum do not agree the precise frequency arrangements in the rest of the negotiation phase, Ofcom would process the assignment stage bids (with the modifications described above).

<sup>11</sup> BT/EE non-confidential response to the December 2018 consultation, Chapter 4. The modified negotiation phase is described in paragraphs 4.8 to 4.14.

<sup>12</sup> To align terminology, we have replaced BT/EE's use of 'primary stage' with 'principal stage'. For more information on the BT/EE's suggestion, see BT/EE non-confidential response to the December 2018 consultation, paragraphs 4.15 to 4.18.

<sup>13</sup> Annual Licence Fees for UK Broadband's 3.4 GHz and 3.6 GHz spectrum, [https://www.ofcom.org.uk/data/assets/pdf\\_file/0013/151231/statement-annual-licence-fees-uk-3.4-ghz-and-3.6-ghz-spectrum.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0013/151231/statement-annual-licence-fees-uk-3.4-ghz-and-3.6-ghz-spectrum.pdf).

## Defragmentation of spectrum holdings in the 3.4-3.8 GHz band

- 2.25 O2 said that defragmentation would be best achieved by an assignment round that includes all 3.4-3.8 GHz holdings, or industry consensus on a series of trades that would give all operators contiguous holdings.<sup>14</sup>
- 2.26 O2 also considered that we should adopt specific measures with respect to the assignment stage to make defragmentation more likely. O2 supported the option of restricting bidders who win small amounts of spectrum to the top or bottom of the band. In addition to this, O2 suggested that new entrants to the 3.4-3.8 GHz band should be placed at the top of the band, while H3G should be placed at the bottom of the 3.6-3.8 GHz band, adjacent to its current holdings.
- 2.27 O2 supported a negotiation phase for bidders to agree their assignments in the 3.6-3.8 GHz band. O2 believed that a negotiation window of two weeks would be sufficient to reach an agreed outcome. O2 thought that there could be scenarios where some, but not all, of the principal stage winners would want to negotiate. It therefore proposed that the negotiation phase should allow for two winning bidders to agree to have their spectrum considered as a single block in the assignment round. As an example of how this could work, NERA (on behalf of O2) suggested that in a scenario with only three bidders where two agree to be treated contiguously, the third bidder would have first choice of their frequency position in the 3.6-3.8 GHz band.<sup>15 16</sup>
- 2.28 O2 considered that operators may place a high value on having certainty about the holders of adjacent spectrum, so as to facilitate trades. O2 therefore thought that the option of bidding contingent on neighbours in the assignment stage was worth exploring further, but was cautious about this option given the novelty and strategic bidding possibilities.
- 2.29 The Communications Consumer Panel supported the option of having a negotiation phase for operators to agree the assignment of the 3.6-3.8 GHz band. The Panel also stated that Ofcom should set a clear expectation of how long the negotiation window should be, and that, at this stage, Ofcom should not rule out the possibility of intervention should market forces not be sufficient for defragmentation to occur.<sup>17</sup>
- 2.30 Telint Ltd considered that defragmentation would be more complex to achieve than expected. In its view, the MNOs should be given more of an opportunity to work out how this complex task will be delivered.<sup>18</sup>

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<sup>14</sup> O2 non-confidential response to the December 2018 consultation, paragraph 166.

<sup>15</sup> O2 non-confidential response to the December 2018 consultation, paragraph 176, 2<sup>nd</sup> bullet point; and NERA non-confidential report on behalf of O2, paragraph 4, page 46.

<sup>16</sup> This is a simplification of NERA's suggestion. NERA suggested that H3G should be assigned the lowest assignment stage location, while new entrants should be placed at the top of the band. This would necessarily only leave three potential bidders (BT/EE, O2 and Vodafone) without a designated location. Were BT/EE, O2 and Vodafone to win 3.6-3.8 GHz spectrum and two out of the three agree to be treated contiguously, NERA suggested that the third bidder should be given have first choice of its frequency position in the 3.6-3.8 GHz band.

<sup>17</sup> Communication Consumer Panel non-confidential response to the December 2018 consultation, page 2.

<sup>18</sup> Telint Ltd non-confidential response to the December 2018 consultation, page 2.

## Our revised proposals on defragmentation

- 2.31 As in the December 2018 consultation, we recognise that there are likely to be benefits associated with defragmentation of the wider 3.4-3.8 GHz band and consider trades to be the best mechanism to defragment the wider 3.4-3.8 GHz band.<sup>19</sup>
- 2.32 In the December 2018 consultation, we presented options to facilitate post-auction trading to defragment the band but said we were not minded to take them up given uncertainty of interest from potential bidders and the potential downsides to each of these options. However, stakeholders expressed significant interest in options which could facilitate successful post-auction trades to achieve defragmentation. Having considered stakeholders' arguments, we are now minded to amend our approach to the assignment stage for spectrum in the 3.6-3.8 GHz band as described below.

### We are minded to restrict the assignment of any bidder who wins less than 20 MHz to either the top or the bottom of the band

- 2.33 We are minded to adopt 'option 1', which is to restrict bidders that win less than 20 MHz to bidding for (and winning) only the top or the bottom portion of the 3.6-3.8 GHz band in the award. This would be to limit the risk of further fragmentation of the wider 3.4-3.8 GHz band resulting from strategic bidding.
- 2.34 We note that O2 and Vodafone supported this option, while no other respondents commented on it. The purpose of this option is to enable winners of large blocks of spectrum to be assigned adjacent blocks of spectrum, which would facilitate trading between them. This option would also remove the possibility of a bidder winning a small amount of spectrum and bidding for the middle of the band purely for strategic reasons. This could be either to stop defragmentation trades occurring or to extract value from bidders that wish to trade by being placed between them.
- 2.35 We recognise that a potential downside of this option is that it may not allow a bidder that has won a small amount of spectrum to bid for its preferred location, if it has a genuine intrinsic value for the middle of the band. We also acknowledge the restriction on winners of large blocks, who might fail to win their preferred locations at the top or bottom of the band (due to the need to place any winner(s) of less than 20 MHz in these locations). However, we note the absence of objections to this option in consultation responses and the support from two MNOs. Overall, we believe the potential disadvantages are outweighed by the benefits of increasing the chances of successful post-auction trades and realising the wider benefits to society of defragmentation.

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<sup>19</sup> For the reasons set out in the December 2018 consultation (paragraphs 6.15-6.20), we do not consider mandatory reassignment to be a feasible route to defragmentation of the 3.4-3.8 GHz band.

## We are minded to include an optional negotiation phase

- 2.36 We are also minded to adopt a negotiation phase after assignment stage bidding. During this negotiation phase, bidders would have an opportunity to agree the frequency assignments in 3.6-3.8 GHz as an alternative to bidding determining the outcome of the assignment stage (as is our usual practice). As well as their assignments in the 3.6-3.8 GHz band, winning principal stage bidders may also provisionally agree any post-auction trades on a commercial basis without Ofcom's involvement during this phase.
- 2.37 BT/EE, O2, Vodafone and the Communications Consumer Panel supported the option of having a negotiation phase, while no respondent objected to this option.
- 2.38 As set out in the December 2018 consultation, we consider that this negotiation phase should occur after bidders have submitted their assignment stage bids, but before the assignment stage results are processed. Bidders would therefore not know the outcome of assignment stage bidding in advance of the negotiations. We have considered whether it may be appropriate to release the outcome of assignment stage bidding in advance of the negotiations, noting that certainty of the assignment stage bidding outcome may help to inform negotiations. However, these negotiations would then be conceptually similar to the discussions required for post-auction trades without any negotiation phase, which may weaken the distinctive benefits of allowing for a negotiation phase in the auction in the first place. There is also a risk that knowing the outcome in advance of negotiations could disincentivise some bidders from participating in good faith in the negotiations. On balance, we therefore consider that the negotiation phase is more likely to be beneficial if we do not release the results of assignment stage bidding ahead of the negotiation phase.
- 2.39 We have considered Vodafone's suggestion that Ofcom should facilitate negotiations, however, we do not currently think it would be appropriate for us to facilitate commercial discussions between bidders. Commercial negotiations are inherently a matter for industry, and our involvement as a potential facilitator does not seem to us compatible with our statutory role in assessing trades under the relevant legislation.<sup>20</sup> However, this does not preclude bidders from appointing an independent third-party as a facilitator, if they decided this would be appropriate and consistent with the Auction Regulations.
- 2.40 Below, we discuss two sub-options for the negotiation phase: (1) "unanimous agreement", as outlined in the December 2018 consultation, where all winning bidders of 3.6-3.8 GHz spectrum would have to consent to negotiations and agree the outcome, or (2) "partial agreement", where we would allow a subset of bidders to agree adjacent assignments which would then be reflected in the outcome. As a minimum, we are minded to adopt the unanimous agreement negotiation phase.
- 2.41 We explain below how each of these sub-options would work, were we to adopt them.

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<sup>20</sup> The Wireless Telegraphy (Mobile Spectrum Trading) Regulations 2011 (S.I. 2011/1507, amended by S.I.s 2013/646, 2015/1339 and 2019/951).

### Unanimous agreement negotiation

- 2.42 Under the unanimous agreement sub-option, the assignment of frequencies in the 3.6-3.8 GHz band after the principal stage would run as follows:
- a) There would be conventional assignment stage bidding in which winning bidders of 3.6-3.8 GHz spectrum could bid their valuations for assignments in different parts of the band. Bidders may submit bids for multiple different frequency locations, only one of which could win. Bidders who won less than 20 MHz in the principal stage would be restricted to bidding for the top or bottom of the 3.6-3.8 GHz band. For the avoidance of doubt, there would be a conventional, single round, sealed bid assignment stage for 700 MHz FDD and SDL spectrum.
  - b) After the assignment stage bidding has occurred, all winning bidders of 3.6-3.8 GHz spectrum would be required to specify whether they wished to participate in a negotiation phase. If all bidders wish to do so, Ofcom would pause the auction for two weeks (10 working days). During those two weeks, winning bidders of 3.6-3.8 GHz spectrum would attempt unanimously to agree the assignment of the 3.6-3.8 GHz band frequencies. If such agreement was successfully reached, Ofcom would assign the 3.6-3.8 GHz frequencies according to that plan, and Ofcom would not process or publish the assignment stage bids that had been made.
  - c) If the negotiation phase is either not activated by all bidders or is unsuccessful, Ofcom would process the assignment stage bids and assign the 3.6-3.8 GHz frequencies in accordance with those bids.
- 2.43 To avoid any unnecessary delay, this option would only be triggered if all bidders of 3.6-3.8 GHz spectrum agreed to participate in the negotiation period, following the release of the principal stage results.
- 2.44 A downside of this option is that it would require all bidders to sign up to the negotiation phase and agree to a band assignment. This would include bidders who have won less than 20 MHz in the principal stage, who may have less incentive to participate in negotiations to defragment the wider 3.4-3.8 GHz band. For the avoidance of doubt, winners of less than 20 MHz would be able to negotiate placement anywhere in the band during the negotiation phase. We note that it would be possible to amend the unanimous agreement sub-option to eliminate the possibility that a principal stage winner of less than 20 MHz prevents the negotiation process. This would involve building in elements of the partial agreement sub-option, which is described below.<sup>21</sup>

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<sup>21</sup> This amendment to the negotiation phase would not require bidders that have won 15 MHz or less to consent to negotiations or reach an agreement with the other winning bidders, provided that at least all bidders that have won 20 MHz or more agree to negotiate and are able to reach a unanimous agreement on their ordering. A winner of 15 MHz or less could also participate in these negotiations, but would not be allowed to prevent the other bidders from negotiating with each other. The subset of the bidders who have successfully negotiated, which may include one or more winners of 15 MHz or less, would then be treated in the same manner as in the partial agreement sub-option (i.e. they would be treated as a single contiguous block with a bid value of zero). For avoidance of doubt, any winners of 15 MHz or less who have **not**

2.45 In the December 2018 consultation we set out our initial view that the negotiation phase should be of short duration, for example no longer than two weeks, to avoid causing a material delay to the outcome of the auction and award of the licences. O2 agreed that two weeks was a sufficient amount of time and the Communications Consumer Panel suggested that “Ofcom should set a clear expectation for how long that negotiation window should be”.<sup>22 23</sup> No other respondent directly commented on this. We are therefore minded to proceed with a two week (10 working days) negotiation phase under the unanimous negotiation sub-option.

### Partial agreement negotiation

2.46 As set out above, BT/EE and O2 suggested modifications to the negotiation phase that would allow a subset of winners in the principal stage to agree to trades. There are differences of detail between these suggestions, but we think they are similar in that they seek to allow for partial defragmentation of the band as part of the negotiations.

2.47 BT/EE’s suggestion would involve Ofcom allowing trades of the rights and obligations arising from both the MNOs’ existing licences and the licences to be awarded in the auction during the negotiation phase.<sup>24</sup> We cannot consent to any trade before the underlying licence has been granted.<sup>25</sup> Therefore, we would not be able to consent to trades of the 3.6-3.8 GHz licences during the negotiation phase. We could potentially consent to trades concerning the licences that already exist (including the 3.4-3.6 GHz licences), but we do not consider it appropriate to include this process within the negotiation phase as it would delay the auction. However, as we said in the December 2018 consultation, we would expect to look favourably on any trades which support defragmentation of the band, provided they do not give rise to competition concerns.<sup>26</sup>

2.48 O2 suggested that the negotiation phase could be amended so that two winners of 3.6-3.8 GHz spectrum could bi-laterally agree to have adjacent assignments, through their spectrum being treated as a single contiguous block for the purpose of the assignment stage. However, these two bidders would not be able to influence the specific frequency assignment of the single block.

2.49 Having considered strong stakeholder demand that we do more to facilitate defragmentation, and BT/EE’s and O2’s specific concerns, our view is that it may be beneficial to allow a subset of winning bidders of 3.6-3.8 GHz spectrum to agree to adjacent assignments in the 3.6-3.8 GHz band. In the absence of unanimous agreement

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participated in successful negotiations would also be treated the same as in the partial agreement sub-option, and would still be restricted to only receiving assignments at either the top or bottom of the band.

<sup>22</sup> O2 non-confidential response to the December 2018 consultation, paragraph 176, 3<sup>rd</sup> bullet point.

<sup>23</sup> Communication Consumer Panel non-confidential response to the December 2018 consultation, page 2.

<sup>24</sup> BT/EE suggested that Ofcom should allow “the new spectrum packages won in the principal stage of the auction to be traded ahead of the assignment stage” (BT/EE non-confidential response to the December 2018 consultation, paragraph 4.11).

<sup>25</sup> The Wireless Telegraphy (Mobile Spectrum Trading) Regulations 2011 (S.I. 2011/1507, as amended by SIs 2013/646, 2015/1339 and 2019/951), allow the holders of any 3.6-3.8 GHz licence to trade the rights and obligations “*arising by virtue of that wireless telegraphy licence*”.

<sup>26</sup> December 2018 consultation, paragraphs 6.39-6.40.

from the negotiations, this may increase the likelihood of a subset of winning bidders of 3.6-3.8 GHz spectrum agreeing post auction trades. In turn, this may increase the number of holders of 3.4-3.8 GHz spectrum who have contiguous or proximate holdings. Another advantage of this option is that winners of 3.6-3.8 GHz spectrum that are not interested in negotiating would be unable to prevent others negotiating. We explain below from paragraph 2.54 how we propose this 'partial agreement option' would work, and have set out illustrative worked examples in Annex A1.

- 2.50 We have also considered potential drawbacks to this sub-option.
- a) One drawback is that there may be a restricted set of assignment options for winning bidders of 3.6-3.8 GHz spectrum that are not party to the partial agreement (as explained below and illustrated in Annex A1). On the other hand, such a bidder would still have the opportunity during the negotiation phase to achieve a desired 3.6-3.8 GHz location that it might not obtain through assignment stage bidding.
  - b) We also note that allowing subsets of bidders to reach an agreement could potentially, under some circumstances, weaken incentives to reach a unanimous agreement.
  - c) There would also be some additional complexity associated with the partial agreement sub-option compared to unanimous agreement. However, this complexity would fall largely on Ofcom, which we consider would be manageable and justified by the potential benefits associated with facilitating greater defragmentation of the wider 3.4-3.8 GHz band.
- 2.51 We consider that this option may require a longer period for negotiations, as we expect that negotiations would include both attempts to reach a unanimous agreement, and attempts by various subsets of bidders to reach a partial agreement if unanimity is not achieved. If we were to grant a longer period for this option, we believe any additional time beyond the maximum two weeks proposed for the unanimous agreement option should be short, so as to not unduly delay the outcome of the award. We propose that a maximum negotiation period of three weeks in total should be appropriate for the partial agreement option.
- 2.52 We propose that bidders should still have a deadline of two weeks after the start of this negotiation period to attempt to reach a unanimous agreement, and a further week to negotiate any partial agreements between subsets of bidders if it is not possible to reach unanimous agreement. This is because we consider unanimous agreement between all winning bidders to be most likely to achieve the best outcome for post-auction defragmentation trades. We therefore would encourage all winning bidders of 3.6-3.8 GHz spectrum to first try to reach a consensus during this negotiation, and treat sub-set negotiations as a fall back.
- 2.53 As for the unanimous agreement option, there would be a conventional, single round, sealed bid assignment stage for the 700 MHz FDD and SDL spectrum.
- 2.54 Under this sub-option, the assignment stage process for 3.6-3.8 GHz spectrum would follow these steps (see also Annex A1 for illustrative worked examples):

- a) The winning bidders in the 3.6-3.8 GHz band would enter the assignment stage for the 3.6-3.8 GHz band. These bidders would submit independent bids for specific locations of the band as they would in a conventional assignment stage. Bidders may submit bids for multiple different frequency locations, only one of which could win. Bidders who have won less than 20 MHz in the principal stage would be restricted to bidding for the top and bottom of the 3.6-3.8 GHz band.
- b) All winning bidders would be required to specify whether they wish to participate in a negotiation phase. If **at least two bidders** wish to enter the negotiation phase, Ofcom would not process the assignment stage bids and the auction would enter a negotiation phase for up to 15 working days.
- c) If all winning bidders of 3.6-3.8 GHz spectrum were to agree to participate in the negotiation phase, and unanimously agreed to a 3.6-3.8 GHz band assignment within 10 working days, then Ofcom would award licences in accordance with the agreed band plan and would not process the assignment stage bids.
- d) If either:
  - i) only a subset of winning bidders of 3.6-3.8 GHz spectrum were to enter the negotiation phase, or
  - ii) all winning bidders of 3.6-3.8 GHz spectrum were to enter the negotiation phase but are unable unanimously to agree a 3.6-3.8 GHz band plan,then it would be open to a subset of winning bidders of 3.6-3.8 GHz spectrum to agree to be assigned adjacent blocks of spectrum within 15 working days of the start of the negotiation phase. At the end of the three-week period, this subset of bidders would have the opportunity to inform Ofcom that they wish their spectrum to be treated as a single contiguous block for the purpose of the assignment stage.<sup>27</sup>
- e) Where a subset of bidders wishes for their spectrum to be treated as one contiguous block, Ofcom would eliminate all possible assignment stage outcomes where this subset of bidders are not assigned adjacent blocks of spectrum. This would reduce the number of possible combinations possible in the assignment stage.<sup>28</sup>
- f) For the remaining assignment stage options, the previous assignment stage bids of the subset of bidders would be reduced to zero, and they would not be able to re-submit bids for their one contiguous block. The assignment stage bids of other bidders (i.e. bidders not included in the negotiated subset) for the remaining assignment stage options would remain valid for the purposes of winner determination. Therefore, among the remaining assignment stage combinations, the final assignments (and any

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<sup>27</sup> They would also inform Ofcom of the precise ordering of principal stage bidders within this block, regardless of precise frequency location.

<sup>28</sup> This may eliminate certain bids placed by other bidders in the assignment stage. For example, if there are 3 winning bidders in 3.6-3.8 GHz band and only two of these negotiate to be a contiguous block, then the third bidder would no longer have the option of being placed in the middle of the band between the two negotiated bidders.

assignment stage prices) would be determined only by the assignment stage bids made by bidders who have *not* agreed to be treated as a single contiguous block.

- g) Ofcom would then process the assignment stage bids (after the modifications described above), which would follow the usual convention of running the winner determination. The outcome would be the assignment stage option that has the highest bid value.<sup>29</sup> All bidders would then be assigned frequencies based on this result.

2.55 We propose that under the partial agreement sub-option, winners of less than 20 MHz who are party to any successful negotiations would not need to be placed at the bottom or top of the band. However, we propose that the restriction set out at paragraphs 2.33-2.35 would still apply to winners of 20 MHz or less who are not party to successful negotiations.

### Ofcom assessment of trades

2.56 We note that any trades will be subject to Ofcom's process for assessing mobile spectrum trades, which it will carry out in accordance with the Wireless Telegraphy (Mobile Spectrum Trading) Regulations 2011, as amended.<sup>30</sup> As set out above, we would expect to look favourably on any trades which support defragmentation of the band, provided they do not give rise to competition concerns. We generally consider that swaps and trades of 3.4-3.8 GHz spectrum to defragment the band would be unlikely to give rise to such competition concerns.

### We are minded not to implement contingent bidding in the assignment stage

2.57 Vodafone was in favour of option 3 (contingent bidding), while O2 was more cautious and thought it was worth exploring the option further. Our view is that, although there may be some benefits in allowing bidders to specify a preference as to who their neighbours are, there are considerable downsides to this option. We set these out in the December 2018 consultation, and below:

- contingent bidding would make bidder choices more complex in the assignment stage. Bidders would have more options to consider, and potentially a large number of options if they were interested in trading with different bidders;
- bidders may not have the same view on who their preferred 'neighbour' would be, and so may end up bidding against each other;
- there would be more scope to submit strategic bids that disadvantage competitors; and
- the winner determination and pricing algorithm would be more complex, making it more difficult for bidders to develop bidding strategies.

2.58 Given the material risks associated with contingent bidding, we are minded not to adopt this option. However, we note that a number of the potential benefits of contingent bidding may materialise through the negotiation phase, which we explain above.

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<sup>29</sup> This will not include any valuations from the subset of negotiated bidders, as their bids will have been reduced to zero.

<sup>30</sup> <http://www.legislation.gov.uk/ukxi/2011/1507/contents/made>

## We are minded not to implement alternative suggestions from stakeholders

- 2.59 We have considered whether it would be appropriate to automatically assign the bottom of the 3.6-3.8 GHz band to the holder of the top of the 3.4-3.6 GHz band (if this holder were to win spectrum in the 3.6-3.8 GHz band in the principal stage of this auction). This option was proposed by O2 and one confidential respondent, but was opposed by another confidential respondent. It would ensure contiguity to the holder of the top of the 3.4-3.6 GHz band, and potentially ensure more efficient use of the spectrum. However, we recognise that other potential bidders with 3.4-3.6 GHz holdings may also wish to be placed at the bottom of the 3.6-3.8 GHz band to reduce the gap between their existing holdings in 3.4-3.6 GHz and their newly won 3.6-3.8 GHz spectrum. Our view is therefore that it would not be appropriate to deny other bidders the opportunity to bid to be located at the bottom of the 3.6-3.8 GHz band for this reason.
- 2.60 O2 and one confidential respondent proposed that any principal stage winners that do not already have holdings in the 3.4-3.6 GHz band (“new entrants”) should be placed at the top of the 3.6-3.8 GHz band. We can see merit in this suggestion, as it would allow all the MNOs to be assigned adjacent blocks of spectrum across the 3.4-3.8 GHz band, which may facilitate post-auction trades. However, we are already proposing measures to facilitate post-auction trades (a negotiation phase and restricting the assignments of bidders that win less than 20 MHz). In addition, the proposal would deny new entrants the opportunity to bid for other locations, which they may prefer to the top of the band. We are therefore not minded to adopt this measure and are instead minded to allow assignment stage bidding (or the negotiation phase) to determine new entrants’ locations.
- 2.61 BT/EE suggested that Ofcom could in advance determine the assignment ordering of bidders in the 3.6-3.8 GHz band. We believe that the market bidding (or a negotiation phase) will determine a more efficient outcome than Ofcom pre-determining the ordering of locations in the band. We therefore are not minded to implement this option.

## Summary of our revised proposals

- 2.62 In summary, in light of the benefits associated with defragmentation of the 3.4-3.8 GHz band, and stakeholders’ responses to the December 2018 consultation, we are minded to amend the proposed rules which relate to the assignment of spectrum in the 3.6-3.8 GHz band, in order to facilitate defragmentation of the band through post auction trades.
- 2.63 In the assignment stage, which would consist of a single round of sealed bids, we are minded to impose **a restriction on winners of less than 20 MHz of 3.6-3.8 GHz spectrum to bidding only for (and winning) the top or bottom of the 3.6–3.8 GHz band in the assignment stage.**
- 2.64 We are also minded to include **a negotiation phase** in which winning bidders of 3.6-3.8 GHz spectrum would have the opportunity to agree the assignment of frequencies in the 3.6–3.8 GHz band. This negotiation phase would take place after the assignment stage

bidding, but before the assignment stage bids are processed by Ofcom. We are consulting on two different sub-options for this negotiation phase:

- a) **Unanimous agreement** which would require all winning bidders to agree the 3.6-3.8 GHz band plan during the negotiations. If all bidders are able to agree during the negotiation phase, Ofcom would award licences in accordance with this agreed band plan, and would not process the assignment stage bids. If winning bidders are unable to unanimously agree a 3.6-3.8 GHz band plan, or do not all consent to participating in the negotiation phase, Ofcom would process the assignment stage bids, and assign the 3.6-3.8 GHz frequencies in accordance with those bids.
- b) **Partial agreement** which would allow either all winning bidders of 3.6-3.8 GHz spectrum or a subset of these bidders to reach an agreement during the negotiation phase, such that they are guaranteed assignments of adjacent blocks of spectrum. Ofcom would reflect the agreement of this subset of bidders when processing (modified) bids to determine the assignment stage results. If neither all nor a subset of winning bidders are able to reach agreement during the negotiations, Ofcom would process the assignment stage bids (without modification), and assign the 3.6-3.8 GHz frequencies in accordance with those bids.

2.65 As a minimum, we are minded to adopt the unanimous agreement negotiation phase.

## Consultation questions

**Question 1:** Do you have any comments on the two sub-options for the negotiation phase set out above, including your preference between the two? Please give reasons for your views.

**Question 2:** Do you agree with our intention to restrict winners of less than 20 MHz to bidding for the top or bottom of the band?

**Question 3:** Do you have any other comments on our proposals to include measures in the auction to help defragment the 3.4–3.8 GHz band?

## Next steps

2.66 We invite responses to this consultation by 10 July 2019, so that we can take these into account before reaching a final decision. We are currently planning to publish a final decision on the upcoming award of 700 MHz and 3.6-3.8 GHz spectrum later this year.

## A1. Worked examples of the partial agreement negotiation period

A1.1 In order to give a better understanding of how the partial agreement negotiation option would work, we have set up two hypothetical examples. We first give an example where there are 3 principal stage winners in the 3.6 – 3.8 GHz band and then an example where there are 4 principal stage winners. In both examples, for simplicity we assume that each bidder has won the same amount of spectrum.

### Example 1 – three winning principal stage bidders in the 3.6 – 3.8 GHz band

#### Step 1: Assignment stage bids

A1.2 In example 1, there are 3 principal stage winning bidders (called A, B and C) in the 3.6-3.8 GHz band. They have all won the same amount of spectrum in the band (40 MHz). In the assignment stage they all place bids for specific frequencies in the band. Here we examine bidder A's bids.

**Figure A1: Bidder A's bids in the assignment stage of 3.6-3.8 GHz**

3680 - 3720 MHz	3720 - 3760 MHz	3760 - 3800 MHz
100	50	0

A1.3 Bidder A submits its highest bid of 100 for the bottom of the band, which is its preferred frequency location. Its next preference is to be in the middle of the band and therefore it submits a bid of 50 for this location. The bidder does not wish to be at the top of the band and therefore submits a bid of 0 (or equivalently, makes no bid) for this location.

A1.4 Bidders B and C also submit bids for the assignment stage, but we do not need to detail these for this example.

#### Step 2: Notification to participate in the negotiation

A1.5 All winning bidders notify Ofcom that they wish to enter the negotiation phase. Ofcom therefore announces that there will be a three-week negotiation phase.<sup>31</sup>

#### Step 3: Outcome of unanimous agreement negotiation phase

A1.6 All bidders negotiate but they are unable to reach unanimous agreement (within the two-week period allowed for achieving unanimity).

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<sup>31</sup> There would also be a three-week negotiation phase if two of the three winning bidders notified Ofcom. However, in that case, unanimous agreement and Step 3 would not be relevant.

#### Step 4: Outcome of partial agreement negotiation phase

A1.7 By the end of the three-week period, bidders B and C decide that they wish their spectrum to be considered as one contiguous block for the assignment stage, with bidder B being assigned the lowest frequencies of the contiguous block.

#### Step 5: Eliminating assignment stage outcomes that are no longer relevant

A1.8 Ofcom therefore eliminates all possible assignment stage outcomes where bidders B and C are not assigned adjacent blocks of spectrum, and considers these two bidders as one contiguous block. The possible assignment stage options are therefore reduced to the two shown in Figure A2 below. As can be seen, bidder A can no longer be placed in the middle of the band. Eliminating assignment stage options that are no longer relevant therefore has the effect of eliminating some bids from all bidders, including bidder A’s bid of 50 for the middle of the band.

**Figure A2: Remaining assignment stage possibilities**

	3680 - 3720 MHz	3720 - 3760 MHz	3760 - 3800 MHz
Assignment 1	A	B	C
Assignment 2	B	C	A

A1.9 For completeness, the assignment stage options that are eliminated are shown in Figure A3 and A4. Figure A3 shows the assignment stage options that are eliminated due to bidders B and C deciding that they wish their spectrum to be considered as one contiguous block.

**Figure A3: Assignments that are no longer possible as B and C are not adjacent**

	3680 - 3720 MHz	3720 - 3760 MHz	3760 - 3800 MHz
Assignment 3	B	A	C
Assignment 4	C	A	B

**Figure A4: Assignments that are no longer possible as the negotiated parties have decided that B should have the lower frequency**

	3680 - 3720 MHz	3720 - 3760 MHz	3760 - 3800 MHz
Assignment 5	A	C	B
	3680 - 3720 MHz	3720 - 3760 MHz	3760 - 3800 MHz
Assignment 6	C	B	A

### Step 6: Bids for the remaining assignment stage options

A1.10 For the remaining assignment stage options in Figure A2, Ofcom reduces bidders B and C's assignment stage bids to zero. The bids (after this modification) for each of bidder A and the combination of bidders B & C are shown in brackets in Figure A5 below.

**Figure A5: Remaining assignment stage possibilities after bidders B and C are treated as a contiguous block**

	3680 - 3720 MHz	3720 - 3800 MHz
Assignment 1	A (100)	B & C (0)
	3680 - 3760 MHz	3760 - 3800 MHz
Assignment 2	B & C (0)	A (0)

### Step 7: Determining the band plan outcome

A1.11 Ofcom now processes the assignment stage bids. Given that only two combinations are possible, and that setting the bids of bidders B & C to zero means that they are treated as if they state no preference for the location of their one contiguous block, bidder A receives its preferred location. Assignment 1 is the winning combination as this has a total bid value of 100, as opposed to assignment 2 which has a total bid value of 0. Due to the second price rule, none of the bidders pays any amount in the assignment stage in this scenario. The band plan that is the outcome of the assignment stage is shown in Figure A6.

**Figure A6: Final 3.6 GHz band plan**

3680 - 3720 MHz	3720 - 3760 MHz	3760 - 3800 MHz
A	B	C

## Example 2 – four winning principal stage bidders in the 3.6 – 3.8 GHz band

### Step 1: Assignment stage bids

A1.12 In example 2, there are 4 principal stage winning bidders (called D, E, F and G) in the 3.6-3.8 GHz band. They have all won the same amount of spectrum in the band (30 MHz). In the assignment stage they all place bids for specific frequencies in the band. Here we examine bidder D and E’s bids.

**Figure A7: Bidder D’s bids in the assignment stage of 3.6-3.8 GHz**

3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
100	50	0	0

**Figure A8: Bidder E’s bids in the assignment stage of 3.6-3.8 GHz**

3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
40	10	0	0

A1.13 Bidder D submits its highest bid of 100 for the bottom of the band which is its preferred frequency location. Its next preference is to be second from the bottom in the band and therefore submits a bid of 50 for this location. The bidder does not wish to be in the top half of the band and therefore submits bids of 0 for the top two locations. Bidder E has similar preferences, although at lower valuations. It therefore submits bids of 40 for the bottom location, 10 for the assignment 3710 – 3740 MHz, and zero for the other locations.

A1.14 Bidders F and G also submit bids for the assignment stage, but we do not need to detail these for this example.

### Step 2: Notification to participate in the negotiation

A1.15 All winning bidders notify Ofcom that they wish to enter the negotiation phase. Ofcom therefore announces that there will be a three-week negotiation phase.

### Step 3: Outcome of unanimous agreement negotiation phase

A1.16 All bidders negotiate but they are unable to reach unanimous agreement (within the two-week period allowed for achieving unanimity).

### Step 4: Outcome of partial agreement negotiation phase

A1.17 By the end of the three-week period, bidders F and G decide that they wish their spectrum to be considered as one contiguous block, with bidder G being assigned the lowest frequencies of the contiguous block.

### Step 5: Eliminating assignment stage outcomes that are no longer relevant

A1.18 Ofcom therefore eliminates all possible assignment stage outcomes where bidders F and G are not assigned adjacent blocks of spectrum, and considers these two bidders as one contiguous block. The possible assignment stage options are therefore reduced to the six shown in Figure A9 below. In this example, the remaining options include all of bidders D and E (who are not party to the partial agreement) zero and non-zero bids. The elimination of assignment stage outcomes has not lead to the elimination of any of bidder D or E’s bids in this example.

**Figure A9: Remaining assignment stage possibilities**

Assignment 1	3680 - 3710 MHz D	3710 - 3740 MHz E	3740 - 3770 MHz G	3770 - 3800 MHz F
Assignment 2	3680 - 3710 MHz E	3710 - 3740 MHz D	3740 - 3770 MHz G	3770 - 3800 MHz F
Assignment 3	3680 - 3710 MHz D	3710 - 3740 MHz G	3740 - 3770 MHz F	3770 - 3800 MHz E
Assignment 4	3680 - 3710 MHz E	3710 - 3740 MHz G	3740 - 3770 MHz F	3770 - 3800 MHz D
Assignment 5	3680 - 3710 MHz G	3710 - 3740 MHz F	3740 - 3770 MHz D	3770 - 3800 MHz E
Assignment 6	3680 - 3710 MHz G	3710 - 3740 MHz F	3740 - 3770 MHz E	3770 - 3800 MHz D

A1.19 Figure A10 shows the assignment stage options that are eliminated due to bidders F and G deciding that they wish their spectrum to be considered as one contiguous block.

**Figure A10: Assignments that are no longer possible as F and G are not adjacent**

	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 7	D	G	E	F
Assignment 8	D	F	E	G
Assignment 9	E	G	D	F
Assignment 10	E	F	D	G
Assignment 11	F	E	D	G
Assignment 12	F	E	G	D
Assignment 13	F	D	E	G
Assignment 14	F	D	G	E
Assignment 15	G	E	F	D
Assignment 16	G	E	D	F
Assignment 17	G	D	F	E
Assignment 18	G	D	E	F

A1.20 Figure A11 shows the assignment stage options that are eliminated due to bidders F and G deciding that bidder G should be assigned the lowest frequencies of the contiguous block.

**Figure A11: Assignments that are no longer possible as the negotiated parties have decided that G should have the lower frequency**

	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 19	D	F	G	E

	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 20	E	D	F	G

	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 21	E	F	G	D

	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 22	F	G	D	E

	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 23	F	G	E	D

	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 24	D	E	F	G

### Step 6: Bids for the remaining assignment stage options

A1.21 For the remaining assignment stage options, Ofcom also reduces bidders F and G's assignment stage bids to zero. The bids (after this modification) for each of bidders D, E and the combination of bidders F & G are shown in brackets in Figure A12 below.

**Figure A12: Remaining assignment stage possibilities after bidders F and G are treated as a contiguous block**

	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3800 MHz
Assignment 1	D (100)	E (10)	G & F (0)
	3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3800 MHz
Assignment 2	E (40)	D (50)	G & F (0)
	3680 - 3710 MHz	3710 - 3770 MHz	3770 - 3800 MHz
Assignment 3	D (100)	G & F (0)	E (0)
	3680 - 3710 MHz	3710 - 3770 MHz	3770 - 3800 MHz
Assignment 4	E (40)	G & F (0)	D (0)
	3680 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 5	G & F (0)	D (0)	E (0)
	3680 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
Assignment 6	G & F (0)	E (0)	D (0)

### Step 7: Determining the band plan outcome

A1.22 Ofcom now processes the assignment stage bids. Assignment 1 is the winning combination as this has the highest total bid value of 110. Due to the second price rule, only bidder D is required to pay for its location, due to outbidding bidder E for the bottom location. Bidder D is therefore required to pay 30 for this location, which is the difference between E’s value of 40 to be at the bottom location and E’s value of 10 to be at location 3710 – 3740 MHz. The band plan that is the outcome of the assignment stage is shown in Figure A13.

**Figure A13: Final 3.6 GHz band plan**

3680 - 3710 MHz	3710 - 3740 MHz	3740 - 3770 MHz	3770 - 3800 MHz
D	E	G	F

## A2. Responding to this consultation

### How to respond

- A2.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 10 July.
- A2.2 You can download a response form from <https://www.ofcom.org.uk/consultations-and-statements/category-3/defragmentation-spectrum-holdings>. You can return this by email or post to the address provided in the response form.
- A2.3 If your response is a large file, or has supporting charts, tables or other data, please email it to [RadioSpectrum.Award@ofcom.org.uk](mailto:RadioSpectrum.Award@ofcom.org.uk), as an attachment in Microsoft Word format, together with the cover sheet (<https://www.ofcom.org.uk/consultations-and-statements/consultation-response-coversheet>). This email address is for this consultation only.
- A2.4 Responses may alternatively be posted to the address below, marked with the title of the consultation:
- 700 MHz and 3.6-3.8 GHz award  
Ofcom  
Riverside House  
2A Southwark Bridge Road  
London SE1 9HA
- A2.5 We welcome responses in formats other than print, for example an audio recording or a British Sign Language video. To respond in BSL:
- Send us a recording of you signing your response. This should be no longer than 5 minutes. Suitable file formats are DVDs, wmv or QuickTime files. Or
  - Upload a video of you signing your response directly to YouTube (or another hosting site) and send us the link.
- A2.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)
- A2.7 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt if your response is submitted via the online web form, but not otherwise.
- A2.8 You do not have to answer all the questions in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.
- A2.9 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed at Annex A5. It would also help if you could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.

- A2.10 If you want to discuss the issues and questions raised in this consultation, please contact John Glover on 020 7981 3000, or by email to [RadioSpectrum.Award@ofcom.org.uk](mailto:RadioSpectrum.Award@ofcom.org.uk).

## Confidentiality

- A2.11 Consultations are more effective if we publish the responses before the consultation period closes. In particular, this can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish all responses on our website, [www.ofcom.org.uk](http://www.ofcom.org.uk), as soon as we receive them.
- A2.12 If you think your response should be kept confidential, please specify which part(s) this applies to, and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.
- A2.13 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A2.14 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further at <https://www.ofcom.org.uk/about-ofcom/website/terms-of-use>.

## Next steps

- A2.15 Following this consultation period, Ofcom plans to publish a statement later this year.
- A2.16 If you wish, you can register to receive mail updates alerting you to new Ofcom publications; for more details please see <https://www.ofcom.org.uk/about-ofcom/latest/email-updates>

## Ofcom's consultation processes

- A2.17 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex A3.
- A2.18 If you have any comments or suggestions on how we manage our consultations, please email us at [consult@ofcom.org.uk](mailto:consult@ofcom.org.uk). We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.
- A2.19 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:

Corporation Secretary  
Ofcom  
Riverside House  
2a Southwark Bridge Road  
London SE1 9HA  
Email: [corporationsecretary@ofcom.org.uk](mailto:corporationsecretary@ofcom.org.uk)

## A3. Ofcom's consultation principles

### Ofcom has seven principles that it follows for every public written consultation:

#### Before the consultation

- A3.1 Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

#### During the consultation

- A3.2 We will be clear about whom we are consulting, why, on what questions and for how long.
- A3.3 We will make the consultation document as short and simple as possible, with a summary of no more than two pages. We will try to make it as easy as possible for people to give us a written response. If the consultation is complicated, we may provide a short Plain English / Cymraeg Clir guide, to help smaller organisations or individuals who would not otherwise be able to spare the time to share their views.
- A3.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.
- A3.5 A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.
- A3.6 If we are not able to follow any of these seven principles, we will explain why.

#### After the consultation

- A3.7 We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish all the responses on our website as soon as we receive them. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

## A4. Consultation coversheet

### BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

### CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing

Name/contact details/job title

Whole response

Organisation

Part of the response

If there is no separate annex, which parts? \_\_\_\_\_

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If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

### DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

## A5. Consultation questions

**Question 1:** Do you have any comments on the two sub-options for the negotiation phase set out above, including your preference between the two? Please give reasons for your views.

**Question 2:** Do you agree with our intention to restrict winners of less than 20 MHz to bidding for the top or bottom of the band?

**Question 3:** Do you have any other comments on our proposals to include measures in the auction to help defragment the 3.4–3.8 GHz band?