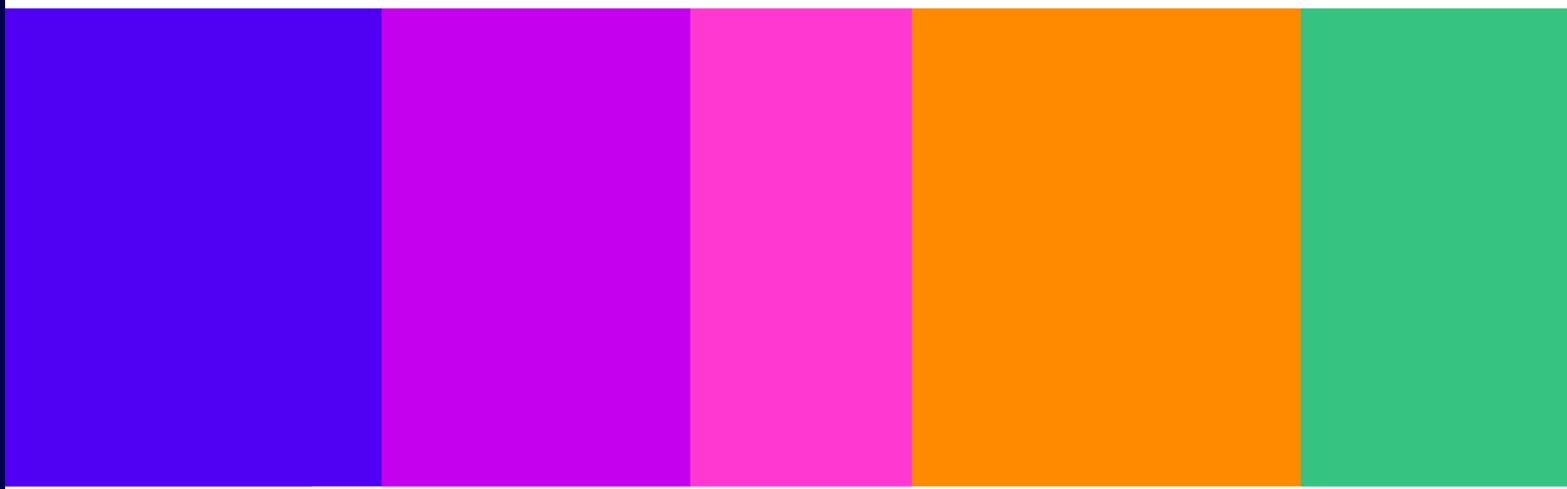


Enabling mmWave spectrum for new uses

Final decisions on the design of the auction

Statement

Published: 16 April 2024



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1. Overview

- 1.1 We are making a large amount of spectrum in the 26 GHz and 40 GHz bands (together, “**mmWave spectrum**”) available for new services, including 5G.¹ In the major towns and cities in which we expect the highest volume of mmWave deployment (“**high density areas**”), we are making 2.4 GHz of spectrum in the 26 GHz band (25.1-27.5 GHz), and 3 GHz of spectrum in the 40 GHz band (40.5-43.5 GHz), available by auction.
- 1.2 In November 2023, we published a consultation and statement (the “[November 2023 Statement and Consultation](#)”) in which we set out our decisions on most aspects of the auction design, including the structure of the auction and of lots, reserve prices, the principal stage, some features of the assignment stage, and deposits.
- 1.3 In that document, we also sought stakeholders’ comments on our provisional decisions:
 - not to include in the assignment stage of the auction a negotiation period which would give winners of spectrum in a band an opportunity to agree that their respective allocations of spectrum will be adjacent;
 - to adopt the assignment stage rules initially proposed in the March 2023 Statement and Consultation; and
 - not to include any assignment stage rules governing the location of any unsold spectrum in the 40 GHz band, other than to require it is treated as a single contiguous block.

What we have decided – in brief

Having considered stakeholders’ comments, we have decided not to include a negotiation period in the assignment stage of the auction. However, to facilitate post auction spectrum trading, we will enable bidders to start negotiating in the period immediately after notifying the assignment stage results to bidders and before the auction licences have been granted.

We have decided to adopt the assignment stage rules initially proposed in the March 2023 Statement and Consultation (including the clarifications provided in November 2023) and not to include rules governing the location of any unsold spectrum in the 40 GHz band in the assignment stage of the auction, other than to require that any unsold 40 GHz lots are treated as a single, contiguous block.

We are minded to increase the initial deposit that applicants will be required to submit to £1m.

Consultation responses

- 1.4 We received responses from BT/EE, Vodafone, VMO2 and a confidential respondent.² In summary, BT/EE, Vodafone and VMO2 expressed mixed views about the inclusion of a negotiation period, while they all agreed with our proposed rules for the assignment stage

¹ Ofcom’s 27 September 2023 Statement “[Enabling mmWave spectrum for new uses](#)”.

² A confidential respondent sought assurances that the frequencies within the 26 GHz and 40 GHz bands will not endanger human and animal health. As set out in our [13 March 2023 statement](#) (paragraphs. 13.44-13.47) and our [27 September 2023 statement](#) (paragraph 7.38), the new mmWave licences will include our standard licence condition requiring licensees to comply with the ICNIRP general public limits.

of the auction, including in relation to the location of any unsold spectrum in the 40 GHz band. We consider these comments in Section 2 and 3.

- 1.5 Vodafone reiterated that it is concerned about the risk of “bidders breaching budget caps set by investors”. However, we do not consider that any of Vodafone’s comments on this point provide a basis for revisiting our decision on the design of the principal stage of the auction, since Vodafone has not raised any new material issue which we had not already considered in the November 2023 Statement and Consultation.

Impact assessment

- 1.6 In reaching the decisions set out in this statement, we have considered the impact of our decisions on relevant stakeholders, including citizens and consumers. In particular, in Sections 2 and 3 we discuss stakeholders’ comments on the impact of our provisional decisions and explain how we have taken them into account in reaching our final decisions. We do not consider that our decisions have equality implications under the 2010 Act or the 1998 Act.

Auction regulations

- 1.7 We will shortly consult on draft legislation setting out the detailed procedures for implementing the design of the auction (the “**Auction Regulations**”). Rules on the drafting of legislation may require us at that time to make changes and adjustments to the procedures for implementing the design.
- 1.8 The overview section in this document is a simplified high-level summary only. The decisions we have taken, and our reasoning are set out in the full document.

2. Negotiation period and assignment stage rules

Summary

- 2.1 In the [November 2023 Statement and Consultation](#), we set out our decisions and provisional decisions on the design of the mmWave auction. Some of our decisions on the assignment stage of the auction were provisional because we were open to considering additional evidence on whether to include a negotiation period, following requests from both VMO2 and Vodafone. In particular, we provisionally decided that we would adopt the assignment stage rules that we proposed in the March 2023 Statement and Consultation.³
- 2.2 A negotiation period would allow winners of spectrum in a band to agree that their holdings will be adjacent in frequency, which could help reduce the costs of sharing radio equipment. In the November 2023 Statement and Consultation,⁴ we said that we had provisionally decided not to include a negotiation period in the auction, because we considered that the likely benefits did not justify the additional complexity and costs which a negotiation period would entail.
- 2.3 Having considered stakeholders' responses to the November 2023 Statement and Consultation, we remain of this view. However, to facilitate post auction spectrum trading, we have decided to enable bidders to start engaging in negotiations in the period immediately after we notify the assignment stage results to bidders, and before the auction licences have been granted. We also do not expect to conduct any further competition assessment in relation to any trades which relate only to spectrum in the 26 GHz and 40 GHz bands, and will as far as possible expedite processing of any trading applications.
- 2.4 We understand from stakeholders that enabling bidders to start negotiating before the auction completion may make trading easier. This is because key personnel at bidders' organisations would likely be available until completion of the auction but may have less availability thereafter. We also note that many of the benefits of a negotiation period could be delivered by post auction trading, and that enabling earlier negotiations would not impose any constraints on bidders who are not interested in trading spectrum.
- 2.5 As we have decided not to include a negotiation period, we have also decided to adopt the assignment stage rules proposed in March 2023, including the clarifications set out in November 2023.⁵ Illustrative examples of how the auction process will work for the assignment stage are shown at Annex 7 of our November 2023 Statement and Consultation.

Ofcom's consultation proposals

- 2.6 In response to the March 2023 Statement and Consultation, VMO2 and Vodafone commented on the importance of enabling bidders to obtain blocks of spectrum adjacent to specific other bidders. Contiguity would be important for bidders who are part of, or expect

³ November 2023 Statement and Consultation, paragraph 6.44.

⁴ November 2023 Statement and Consultation, paragraphs 6.3, 6.30-6.36 and Annex 8.

⁵ November 2023 Statement and Consultation, paragraphs 6.46-6.48.

to be part of, the same network sharing agreement. To help ensure contiguity, they suggested the inclusion of a negotiation period similar to the one we included in the award of the 700 MHz and 3.6-3.8 GHz (“**2021 Auction**”).⁶ They proposed to include the negotiation period in both the longer-term assignment of the 26 GHz band and the single assignment of the 40 GHz band.

- 2.7 In the [November 2023 Statement and Consultation](#) (paragraphs 6.33-6.36 and Annex 8), we set out our understanding of the potential advantages and downsides of including a negotiation period within the assignment stage of the auction.
- 2.8 A negotiation period would enable two (or more) principal stage winners of spectrum in the same band to agree that their spectrum holdings in that band will be adjacent in frequency. In summary, we said that this could benefit operators interested in sharing radio equipment, as adjacency could give operators more choice of mmWave radio equipment, potentially giving rise to lower costs of deployment. This, in turn, could result in greater mmWave deployment.
- 2.9 However, we said that the likelihood and extent of any potential benefits were unclear, because:
- a) it was unclear whether operators would actually engage in network sharing agreements,
 - b) the costs savings that adjacency would enable were unclear, and
 - c) it may be possible for operators to deploy shared networks even without adjacent spectrum holdings.⁷
- 2.10 We also expressed concerns about the some of the downsides that a negotiation period could carry⁸:
- a) It could require one or more bidders to change frequencies after the 26 GHz clearance deadline, even though, in the absence of an adjacency agreement by others, they would have won contiguous holdings in the 26 GHz band without the need for any frequency rearrangement.
 - b) It would lead to increased complexity of the auction rules.
 - c) It would require extending the duration of the auction process by two to three weeks.
- 2.11 Taking into account the potential downsides of a negotiation period, and the uncertainty around its benefits, we said that our provisional view was that the evidence did not support including a negotiation period in the auction. Nevertheless, we invited further relevant evidence from stakeholders and comments on our reasoning and on how the assignment stage would work if we were to include a negotiation period.

Alternative routes to adjacent spectrum assignments

- 2.12 We also noted that there were other mechanisms which could help interested operators to achieve adjacent frequencies. In particular, we said that post auction trading would enable auction winners to attempt to trade their spectrum to secure adjacency.⁹

⁶ Ofcom’s 13 March 2020 Statement “[Award of the 700 MHz and 3.6-3.8 GHz spectrum bands](#)”, paragraph 6.123 to 6.126.

⁷ November 2023 Statement and Consultation, paragraphs 6.33-6.35.

⁸ November 2023 Statement and Consultation, paragraph 6.34.

⁹ Ofcom’s 8 November 2023 Statement and consultation “[Enabling mmWave spectrum for new uses](#)”, paragraphs A8.19 to A8.25.

Assignment stage rules

- 2.13 Since we were still consulting on the potential inclusion of a negotiation period, we invited stakeholders to comment on our provisional decision to adopt the assignment stage rules proposed in March 2023 (Question 1(i) of the November 2023 Statement and Consultation).

Summary of consultation responses

- 2.14 BT/EE, VMO2 and Vodafone commented on our proposal not to include a negotiation period. In summary:
- a) BT/EE agreed with our proposal.¹⁰ It was not in favour of a negotiation period and believes post auction trading would be sufficient to enable operators to achieve adjacency.
 - b) VMO2 disagreed with our proposal.¹¹ It was strongly in favour of including a negotiation period. It provided information on the potential benefits of a negotiation period and commented on the negotiation period rules provided by Ofcom.
 - c) Vodafone¹² said that spectrum adjacency could be important, and that we had not sufficiently demonstrated that we should not address the need for it. Vodafone did not object to the negotiation mechanism we proposed, but thought we should also look at further options for achieving adjacency.
- 2.15 Below, we summarise the following elements of MNOs' responses in more detail:
- a) Merits of including a negotiation period:
 - evidence of costs and benefits of network sharing partnerships; and
 - likelihood of MNOs entering a network sharing partnership.
 - b) Mechanics of a negotiation period:
 - comments on the negotiation period rules proposed by Ofcom; and
 - comments on the alternative routes to adjacent spectrum assignments we suggested.
- 2.16 In each case, we also provide our view of stakeholders' responses.

Merits of including a negotiation period

Evidence of costs and benefits of network sharing partnerships

- 2.17 BT/EE agreed that the benefits of a network sharing partnership are uncertain and might not materialise.¹³ On the other hand, VMO2¹⁴ said it could see significant benefits in enabling network sharing partners to secure adjacent frequencies, and Vodafone¹⁵ said that adjacency could be important, and that we should address the need for it.

¹⁰ BT/EE non confidential response to the November 2023 Statement and Consultation, pp. 3-4.

¹¹ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 1.

¹² Vodafone non confidential response to the November 2023 Statement and Consultation, pp. 3-4.

¹³ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 4.

¹⁴ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 1.

¹⁵ Vodafone non confidential response to the November 2023 Statement and Consultation, p. 3.

2.18 In detail:

- a) BT/EE¹⁶ agreed with our analysis. It considered the benefits of including a negotiation period to be uncertain, and that there are “significant potential downsides”. Operators may be forced to move frequencies after 5 years in the 26 GHz band, and the inclusion of a negotiation period would increase the length and complexity of the auction.
- b) VMO2 strongly advocated for the inclusion of a negotiation period. VMO2 said that “it is important that Ofcom fully considers its statutory duty to secure optimal use of spectrum” and that adjacency is essential to reach efficiency. According to VMO2, “Network sharing is an important tool which enables MNOs to improve their capability to fund rollout to extend coverage, and increase capacity through densification, by sharing costs”.¹⁷ VMO2 argued that without a network sharing agreement, mmWave spectrum rollout may be delayed by higher deployment costs and limited choice of vendors (as at least one vendor does not provide equipment which spans the entire 26 GHz band).¹⁸ Additionally, to support its argument, VMO2 quantified the cost savings to MNOs resulting from the negotiation period. We summarise this in the section below.
- c) Vodafone¹⁹ thought that “Ofcom should be concerned if there is any realistic prospect of successful bidders wishing to share RAN equipment, and a realistic prospect that RAN equipment will have a tuning range that could not support sharing of the frequencies awarded in the auction.” Vodafone also did not agree that “post auction trading provides a ready avenue to achieving contiguity”.

VMO2’s analysis of cost savings brought by the negotiation period

- 2.19 VMO2²⁰ estimated the costs to deploy mmWave spectrum using small cells on an active sharing basis (using a single radio unit per cell, enabled by adjacent spectrum), compared to the estimated costs to deploy on a limited sharing basis (using two radio units per cell, due to non-adjacent spectrum and instantaneous bandwidth (IBW) limitations of the chosen vendor’s equipment). According to VMO2’s estimates, the cost of shared deployment of one mmWave small cell with a single radio unit enabled by adjacent spectrum would be [CONFIDENTIAL ✂] while for shared deployment with two radio units due to non-adjacent spectrum and equipment with limited IBW the cost would be higher at [CONFIDENTIAL ✂], with a difference of £10,000 per small cell.²¹
- 2.20 Thus, according to VMO2’s analysis of the two scenarios it considered, the cost savings of deploying with a single radio per cell relative to deploying with two radios per cell were estimated as £20m if 2,000 mmWave small cells were deployed and £300m to £500m if 30,000 to 50,000 mmWave small cells were deployed.²²

¹⁶ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 4.

¹⁷ VMO2 non confidential response to the November 2023 Statement and Consultation, pp. 2-3.

¹⁸ VMO2 non confidential response to the November 2023 Statement and Consultation, pp. 1 and 6.

¹⁹ Vodafone non confidential response to the November 2023 Statement and Consultation, pp. 3-4

²⁰ VMO2 non confidential response to the November 2023 Statement and Consultation, pp. 7-8.

²¹ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 8.

²² VMO2 noted that “these cost estimates and cost saving are for Capital Expenditure only. It is worth noting that we would also expect Operational Expenditure costs to be lower, and therefore additional cost savings to accrue, in an active sharing scenario, compared to that of a limited sharing scenario in which there is likely to be increased costs for rental and power consumption”. VMO2 non confidential response to the November 2023 Statement and Consultation, p. 7.

- 2.21 Furthermore, VMO2 said that, as some street furniture may not be able to support two sets of radio units, shared deployment with two radio units per cell may be further impaired and carry even higher costs.

Likelihood of mmWave network sharing partnerships

- 2.22 BT/EE, VMO2, and Vodafone all commented on the likelihood of MNOs entering network sharing partnerships:
- a) BT/EE²³ said that it does not see “any material benefits of a negotiation period to BT/EE in this case and share Ofcom’s scepticism as to the benefits this might have to other parties that might want to share network equipment or gain access to additional spectrum as part of a club arrangement.”
 - b) VMO2²⁴ said that “network sharing is an important tool which enables MNOs to improve their capability to fund rollout to extend coverage, and increase capacity through densification, by sharing costs.” VMO2 noted that its network sharing agreement with Vodafone “has delivered substantial benefits and underpinned significant levels of network investment”. VMO2 also said that “The importance of such agreements will continue to grow as a key enabler of our network evolution and as a tool to deliver increased capacity to meet growth in demand, whilst also minimising impact on the built environment and helping to meet our Net Zero targets.”
 - c) Vodafone agreed that there is “considerable uncertainty about whether successful bidders will wish to share RAN equipment, and even then, whether there are equipment limitations that would make contiguous or proximate spectrum desirable”.²⁵

Ofcom’s view of the merits of a negotiation period

Potential benefits

- 2.23 Having considered stakeholders’ responses, our view is that a negotiation period could give rise to some potential benefits in terms of (i) cost savings, and (ii) choice of equipment vendor.
- 2.24 **Cost savings:** As there is equipment that spans the auctioned spectrum, a negotiation period would either not affect costs or would reduce costs in a limited set of scenarios and by a modest amount.
- 2.25 VMO2 estimated that network sharing partners with adjacent spectrum holdings could save approximately £10,000 when deploying each mmWave small cell²⁶. However, VMO2 based its analysis on operators requiring two distinct radio units when deploying in non-adjacent frequencies, whereas we set out in the November 2023 Statement and Consultation²⁷ that at least one vendor supplies equipment spanning the entire band. Therefore, network sharing partners should be able to buy equipment capable of working across the auctioned spectrum in 26 GHz, even if the spectrum they win in the 26 GHz band is not adjacent. The equipment that spans the auctioned spectrum could be either cheaper, similarly priced, or more expensive than equipment that does not. Even in the case of more expensive

²³ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 4.

²⁴ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 3.

²⁵ Vodafone non confidential response to the November 2023 Statement and Consultation, p. 3.

²⁶ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 8.

²⁷ Ofcom’s 8 November 2023 Statement and consultation “[Enabling mmWave spectrum for new uses](#)”, paras A8.6 to A8.7.

equipment, it would likely be substantially lower cost than VMO2's estimates based on needing two sets of radio equipment per cell.

- 2.26 **Vendor choice:** Adjacent spectrum may enable operators to choose from a wider range of base station equipment from different vendors. This could offer: (i) cost savings through cheaper equipment, (ii) better performance on other metrics, such as operating bandwidth, and/or (iii) better integration with existing equipment.²⁸
- 2.27 We have also considered Vodafone's submission that while there is currently uncertainty about the importance of adjacent spectrum holdings, we should consider further options to "address the need for contiguity" in case there is "any realistic prospect" of it turning out to be important. We do not agree with Vodafone. Even if more substantial benefits did materialise in the future, we consider that operators who place value on adjacency would have a route to securing it, even if less certain, through post auction trading of spectrum. Even where operators are unable to secure adjacency through post auction trading, they should be able to share equipment if they use equipment with IBW that spans all their combined holdings in the band. We explain why we have reached this view in greater detail below.

Potential downsides

- 2.28 We also continue to consider that including a negotiation period comes with the potential downsides we highlighted in the November 2023 Statement and Consultation, which BT/EE²⁹ described as "significant potential downsides". Specifically, a negotiation period:
- a) could require one or more bidders to change frequencies after the 26 GHz clearance deadline, even though in the absence of an adjacency agreement they would have won contiguous holdings in the 26 GHz band without the need for any frequency rearrangement;
 - b) would lead to increased complexity of the auction rules; and
 - c) would extend the duration of the auction process.³⁰
- 2.29 In addition, it remains uncertain whether MNOs would want to enter a mmWave network sharing partnership. Vodafone thought that "Ofcom should be concerned if there is any realistic prospect of successful bidders wishing to share RAN equipment [...]"³¹. However, of the four MNOs, only VMO2 expressed clear interest in a negotiation period. Vodafone said that "there is considerable uncertainty about whether successful bidders will wish to share RAN equipment", BT/EE did "not see any material benefits of a negotiation period", and H3G did not respond to the consultation.

Ofcom's conclusions

- 2.30 We remain of the view that the likelihood and extent of any reduction in costs that a negotiation period could deliver, and hence of any potential benefits, are currently unclear, while there are likely downsides to including a negotiation period.
- 2.31 If we included a negotiation period and the benefits resulting from a network sharing partnership did not materialise, some bidders would have had to unnecessarily incur the

²⁸ Ofcom's 8 November 2023 Statement and consultation "[Enabling mmWave spectrum for new uses](#)", para A8.8.

²⁹ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 4.

³⁰ Ofcom's 8 November 2023 Statement and consultation "[Enabling mmWave spectrum for new uses](#)", para 6.34.

³¹ Vodafone non confidential response to the November 2023 Statement and Consultation, pp. 3-4.

delay and complications caused by having to move frequencies. On the other hand, if we did not include a negotiation period and bidders who had not secured adjacent spectrum wanted to enter into network sharing agreements, we consider that they could either use equipment that spans their combined spectrum holdings in the 26 GHz band or agree post auction trades to secure adjacent holdings. Below, we consider post auction trades in more detail.

Post-auction trades as an alternative route to adjacent spectrum assignments

Ofcom's initial view

2.32 In the November 2023 Statement and Consultation,³² we noted that licensees could achieve adjacency through post auction trading, which would allow the costs of changing frequencies to be taken into account. However, we also acknowledged that post-auction trading would provide a less certain route to achieve adjacency than a negotiation period in the assignment stage of the auction.

Stakeholders' comments

2.33 BT/EE was not in favour of a negotiation period and would support post auction trading instead.³³ According to BT/EE, spectrum trading would be more appropriate for this award, as operators could secure adjacency without the risk that bidders not seeking adjacency would have to move frequencies after the 26 GHz clearance deadline. BT/EE also noted that spectrum trading could “provide a route to implementing the final 26 GHz assignment plan, or a modified version of it, immediately rather than waiting for 5 years if that suited the parties concerned.”

2.34 However, Vodafone and VMO2 did not support relying on post-auction trading:

- a) Vodafone argued that spectrum trading post auction would fail to achieve adjacency while giving the power to bidders not party to the agreement to extract ransom prices.³⁴ Alternatively, Vodafone suggested Ofcom explore a number of alternative possibilities, which it outlined at a high level. We summarise these and set out our views on each in the sub-section below.³⁵
- b) Similarly, VMO2 thought that a negotiation period during the auction would be superior to post-auction trading as: “(i) spectrum is, as yet, unused, so there are no opportunity costs for the parties to any negotiated agreement; (ii) the prices paid for the spectrum are known, but the licences have yet to be issued and form part of the company balance sheet; (iii) all parties are focused on maximising the value they obtain from that auction; (iv) relevant company resources are on hand for quick decision making”.^{36,37}

³² November 2023 Statement and Consultation, Annex 8, paragraphs A8.20-A8.24.

³³ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 4.

³⁴ Vodafone non confidential response to the November 2023 Statement and Consultation, pp. 4-5.

³⁵ Vodafone noted that as the award has been delayed, we could use the extra time available “to explore options rather than dismissing the issue as too complex.”

³⁶ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 10.

³⁷ We note that we have had an email exchange with VMO2 clarifying points (ii), (iii) and (iv), as well as their proposed mechanics for the negotiation period.

Ofcom's conclusions

Summary of Ofcom's view

- 2.35 In summary, having considered stakeholders' responses, we remain of the view that post-auction spectrum trading would enable auction winners to secure adjacency, where it is valuable to them. We also think there are several benefits to post-auction trading, which are not necessarily available to bidders in a negotiation period:
- a) Post-auction trading would allow licensees to reflect in negotiations any cost to them of changing frequencies, meaning no bidder would be required to change frequencies as a result of competitors entering an agreement.
 - b) As trading would take place after completion of the assignment stage, it would not add time or complexity to the auction process, and any bidders not interested in adjacency would not need to participate in the process.
 - c) As noted by BT/EE,³⁸ post-auction trading may allow bidders to implement their final 26 GHz assignment plan immediately after the auction, rather than waiting for the 26 GHz clearance deadline.
- 2.36 To facilitate post-auction spectrum trading, we have decided to enable bidders to start engaging in negotiations immediately after notifying the assignment stage results to bidders, and before the auction licences have been granted.
- 2.37 Below, we explain our response to the points raised by Vodafone and VMO2 in more detail.

Ofcom's response to Vodafone's concerns about post-auction trades

- 2.38 We have considered Vodafone's concern that post-auction spectrum trading may fail to secure adjacency and carry a risk of ransom pricing. As set out in the November 2023 Statement and consultation (paragraphs A8.23-A8.24), we recognise that some licensees may have a strategic incentive not to trade or expect a high price for any trade that would benefit their competitors. For these reasons, post-auction trades may not always secure adjacency. However, we consider that these risks are outweighed by the advantages of post-auction trading in this case, particularly given the likelihood and extent of any potential benefits of a negotiation period are unclear.

Ofcom's response to VMO2's concerns about post-auction trades

- 2.39 We have considered also the potential advantages of a negotiation period listed by VMO2, which we set out in paragraph 2.31b) above, and repeat below for reference.
- i) "Spectrum is, as yet, unused, so there are no opportunity costs for the parties to any negotiated agreement;
 - ii) The prices paid for the spectrum are known, but the licences have yet to be issued and form part of the company balance sheet;
 - iii) All parties are focussed on maximising the value they obtain from that auction; and
 - iv) Relevant company resources are on hand for quick decision making."
- 2.40 We do not consider these points are likely to give rise to any significant benefit over and above what could be achieved by post-auction trades. This is because:

³⁸ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 4.

- i) It is likely that spectrum will still be unused immediately after the auction, as bidders would need some time to deploy. We consider that bidders can use this period to negotiate any trades.
 - ii) While there could be some accounting complexities, even if they do arise, we believe they should be manageable for VMO2 and other winners interested in securing adjacency.
 - iii) Incentives to maximise value to bidders should be similar during and after the auction.
- 2.41 However, we do recognise that during the auction all relevant parties would be available to negotiate trades, but that resources (particularly key senior employees) may disperse after the auction, and that initiating negotiations thereafter may be more difficult. In view of this, we have decided to allow bidders to communicate with each other as soon as the assignment stage results are notified to them, rather than waiting until after Ofcom has granted the licences. We consider this would facilitate trading, as it should be possible for bidders to ensure that key personnel remain available after the assignment stage.

Alternative options suggested by stakeholders

Ofcom's proposed negotiation period design

- 2.42 In the November 2023 Statement and consultation (Annex 9), we explained how the assignment stage would work if we were to include a negotiation period, and asked stakeholders whether they agreed with our proposed design for the negotiation period (Question 3).
- 2.43 In summary, we received the following comments from stakeholders:
- a) Vodafone said that they did not object to the mechanics we proposed³⁹, but suggested we explore a number of alternatives to a negotiation period;
 - b) VMO2⁴⁰ proposed modifications to the negotiation period we suggested. In particular, VMO2 thought that bidders not party to an agreement should not be forced to move frequencies. Rather, VMO2 said that if it were necessary for a bidder to switch frequencies to allow network sharing partners to be adjacent, this bidder should be compensated, and it would be their decision whether to enter the negotiation;
 - c) BT/EE was not in favour of a negotiation period, and so did not comment on our proposed mechanics.⁴¹
- 2.44 We consider the alternative suggestions made by Vodafone and VMO2 below.

Alternatives suggested by Vodafone

- 2.45 Vodafone suggested Ofcom explore the following alternatives to a negotiation period:
- a) Adjacency could be agreed before the auction. In particular, Vodafone said that "a negotiation in the mm-wave auction would simply consist of prospective RAN share partners agreeing whether there was any benefit in asking for adjacency. This could be achieved very quickly, indeed if Ofcom were to permit/set parameters for such a

³⁹ Vodafone non confidential response to the November 2023 Statement and Consultation, p. 4.

⁴⁰ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 10.

⁴¹ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 4.

discussion, it could actually be agreed as an input to the award process rather than interrupting the flow of the auction."⁴²

- b) Ofcom could “conditionally allow adjacency agreements”. Specifically, Vodafone said that Ofcom should allow adjacency agreements, “to the extent that it was possible without resulting in [another bidder’s] holdings being fragmented”.⁴³
- c) Ofcom could devise a bidding mechanism that would enable participants “to express a monetary value for being adjacent to another bidder. So, if [two network sharing partners]’s desire to be adjacent was such that they were prepared to pay a premium that outstripped what [another bidder] placed on contiguity [...], then this consideration would prevail.”⁴⁴

2.46 We believe that these alternatives would come with risks to the integrity of the award, increased likelihood of inefficient outcomes, and additional costs and complications, without bringing further benefit compared to the negotiation period we proposed. We comment on each alternative below:

- a) We consider that Vodafone’s option (a) would give rise to the same potential benefits as our negotiation period. Those bidders that want adjacency could secure it either through this option, or through our proposed negotiation period. However, allowing bidders to agree adjacency before the auction could impact the competitiveness of bidding and the integrity of the award, as bidders may need to exchange confidential information before the auction to decide whether they want adjacency.
- b) We understand Vodafone’s option (b) to entail allowing adjacency agreements only where they would not cause other bidders to have fragmented spectrum. This appears to us to come with similar advantages and disadvantages as the negotiation period we proposed. Both would ensure that bidders in adjacency agreements would win adjacent holdings, without causing other bidders to have fragmented spectrum in the final allocation of the 26 GHz band⁴⁵ or the 40 GHz band. However, both versions also give rise to the downsides we identified above.
- c) We are also not in favour of Vodafone’s option (c), in which bidders would be able to express their values for both particular frequencies and adjacency. Our understanding is that this option could result in an outcome where a bidder’s spectrum is fragmented, while we consider optimal use of this spectrum would involve operators holding contiguous blocks of spectrum. In addition, this option is likely to unduly complicate the design of the assignment stage of the award.

2.47 We do not plan to further explore the alternatives suggested by Vodafone, given the uncertainty around any potential benefits of adjacency and the potential to achieve the same benefits through post-auction trading.

2.48 In addition to the options discussed above, Vodafone said that “[a]s the award has been delayed pending the regulatory clearance of the potential Vodafone UK / 3UK merger, (...) Ofcom now has the time to explore options”.⁴⁶ We do not agree with this suggestion. Having considered stakeholders’ comments on the potential benefits and downsides of a

⁴² Vodafone non confidential response to the November 2023 Statement and Consultation, p. 4.

⁴³ Vodafone non confidential response to the November 2023 Statement and Consultation, p. 4.

⁴⁴ Vodafone non confidential response to the November 2023 Statement and Consultation, p. 4.

⁴⁵ Our negotiation mechanism did not implement adjacency agreements in the initial period for the 26 GHz band, when fixed links would still be present in the auctioned spectrum.

⁴⁶ Vodafone non confidential response to the November 2023 Statement and Consultation, p. 4.

negotiation period, and reached the view that the likely benefits do not justify the additional complexity and costs which a negotiation period would entail, we now consider it appropriate to use our resources for delivering other administrative priorities.

Alternatives suggested by VMO2

- 2.49 We have also considered VMO2's alternative suggestion, whereby bidders would not be forced to move frequencies to accommodate negotiation agreements reached by network sharing partners. Our understanding is that this would mean allowing bidders to bid during the assignment stage of the award, then allowing them to agree location changes, which would be reflected when licences are granted. We would then only accept agreed location changes in the following cases: (i) where those agreements do not affect other bidders not party to the agreement or (ii) where those agreements do affect other bidders not party to the agreement, but such bidders are willing to move frequencies. Our view is that this mechanism essentially amounts to trading of the rights and obligations that would arise from the award licences (once granted) which would take place during the auction, rather than afterwards.
- 2.50 We do not consider it appropriate to allow this form of trading to occur during the assignment stage because it would add complexity and potential delay. However, as set out above (and explained in more detail below), to facilitate post-auction trading we have decided to enable bidders to communicate immediately after the notification of assignment stage results to bidders.

Assignment stage rules

- 2.51 We have decided to adopt the assignment stage rules proposed in March 2023 (including the clarifications provided in November 2023⁴⁷), noting that BT/EE,⁴⁸ Vodafone⁴⁹ and VMO2⁵⁰ agreed with them.

Ofcom's decisions

- 2.52 We have considered the potential benefits and downsides associated with including a negotiation period in the assignment stage of the mmWave auction, as well as the likelihood that bidders will want to enter into network sharing agreements relating to mmWave spectrum.
- 2.53 As set out in more detail above, the likelihood and extent of any reduction in costs that a negotiation period could deliver, and hence of any potential benefits, are unclear, while there are likely downsides to including a negotiation period. Where bidders who have not secured adjacent spectrum through the auction process do want to enter into network sharing agreements, we consider that they can either: (i) use equipment that spans the entire auctioned 26 GHz spectrum, or (ii) agree post-auction trades to secure adjacent holdings.

⁴⁷ November 2023 Statement and Consultation, paragraphs 6.44 and 6.46-6.48.

⁴⁸ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 3.

⁴⁹ Vodafone non confidential response to the November 2023 Statement and Consultation, p. 3.

⁵⁰ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 10.

- 2.54 We have therefore decided not to include a negotiation period. As a result, we have decided to implement the assignment stage rules proposed in March 2023.
- 2.55 Nevertheless, we see merit in facilitating post auction spectrum trading, and we explain below how we intend to do this.

Confidential information and exclusion rules after completion of the assignment stage

- 2.56 To facilitate spectrum trading in the 26 GHz and 40 GHz bands, we are minded to provide that certain rules regarding the exchange of confidential information between bidders would not apply between notification of all the assignment stage results and completion of the award process. This means that auction winners would be able to start negotiating trades of their award licences a few days before we grant such licences, meaning they would be ready to submit a trading application to Ofcom as soon as the award process is completed.
- 2.57 Ofcom is not able to pre-determine whether bidders' actions during any negotiation following completion of the assignment stage would constitute collusion or other grounds for exclusion under the auction regulations. We also note that all bidding, including any such negotiations, must be compliant with competition law. However, we do not expect that participating in negotiations following notification of the assignment stage results would, in and of itself, constitute grounds for exclusion. This is because any information exchanged between bidders following notification of the assignment stage results would take place after, and therefore could not affect, the submission of principal stage bids and assignment stage bids.
- 2.58 We will provide further detail about the implementation of this approach when we consult on the Auction Regulations.

Applications for spectrum trading in the mmWave bands

- 2.59 As set out in the [March 2023 Statement](#) (Section 5), we intend to make the award licences tradable under the [Wireless Telegraphy \(Mobile Spectrum Trading\) Regulations 2011](#) (the "**Mobile Trading Regulations**")⁵¹, and to do so we are currently consulting on proposed changes to these regulations. Consequently, any post-auction trades would be subject to the procedures set out in the Mobile Trading Regulations, and the auction winners would therefore need to submit a trading application to Ofcom after the auction.⁵²
- 2.60 Given the analysis set out in Section 8 of the [March 2023 Statement \(Section 8\)](#), we do not expect to conduct any further competition assessment in relation to any trades which relate only to spectrum in the 26 GHz and 40 GHz bands, and will as far as possible expedite such processing of trading applications.

⁵¹ S.I. [2011/1507](#), amended by S.I. [2013/646](#), S.I. [2015/1339](#) and S.I. [2019/951](#).

⁵² The [Trading Guidance Notes](#) provide further detail on this transfer process.

3. Unsold spectrum in the 40 GHz band

Summary

- 3.1 We have decided not to include any rules governing the location of unsold spectrum in the 40 GHz band beside requiring that any unsold 40 GHz lots are treated as a single contiguous block, noting that all respondents agreed with this proposal.

Ofcom's consultation proposals

- 3.2 In the November 2023 Statement and Consultation, we proposed not to include any assignment stage rules on the location of unsold spectrum in the 40 GHz band, other than requiring unsold spectrum to be treated as a single, contiguous block.⁵³
- 3.3 We explained that we had identified the following potential differences in value in the 40 GHz spectrum we are awarding:
- a) The frequency blocks currently licensed to MBNL (40.50-40.75 GHz and 42.00-42.25 GHz) are the most intensively used parts of the 40 GHz band and the new users will have to coordinate around MBNL's fixed links until revocation of these links takes effect. Therefore, until the 40 GHz band is cleared of existing links in/around high density areas, new users' ability to deploy in the 40 GHz band is likely to be more constrained in these spectrum blocks.⁵⁴
 - b) The restriction on antenna elevation that we have decided to include in the award licences (which could restrict licensees' ability to use the spectrum for integrated access and backhaul) will apply only in relation to outdoor base stations transmitting in the top 1 GHz of the 40 GHz band (42.5-43.5 GHz). Those transmitting in the bottom 2 GHz (40.5-42.5) will not be subject to this restriction.⁵⁵
 - c) Deployments in the 40 GHz band within 50km of the radio astronomy site at Cambridge will need to be coordinated.⁵⁶ The practical impact is that deploying medium power base stations in the Cambridge high density area is likely to be more challenging in the 42.5-43.5 GHz range than in the 40.5-42.5 GHz range.⁵⁷ However, also in 40.5-42.5 GHz the challenge is likely to remain substantial because medium power base stations using

⁵³ 8 November 2023 Statement and consultation "[Enabling mmWave spectrum for new uses](#)", paragraphs 6.49 to 6.51.

⁵⁴ 27 September 2023 Statement "[Enabling mmWave spectrum for new uses](#)", paragraphs. 4.67—4.69. As noted in paragraph 4.68 (footnote 131) of the 27 September 2023 Statement, we have offered to allow MBNL to continue to operate up to 500 fixed links until 1 January 2030, subject to a number of conditions. Should MBNL take up this option, we will continue to coordinate deployments around the relevant links until January 2030.

⁵⁵ 27 September 2023 Statement "[Enabling mmWave spectrum for new uses](#)", paragraphs. 4.71—4.84 and paragraphs. 7.28-7.35; and the technical licence condition set out in paragraph 8 of Schedule 1 to the "Sample Award licence" in [Annex 4](#) (Sample Shared Access licence).

⁵⁶ 27 September 2023 Statement "[Enabling mmWave spectrum for new uses](#)", paragraph 4.82.

⁵⁷ 27 September 2023 Statement "[Enabling mmWave spectrum for new uses](#)", paragraph 4.78.

these frequencies could require additional mitigations, which could include height reduction or additional out-of-block filtering.⁵⁸

- 3.4 However, we considered that assignment stage bidding would already enable operators to express their preferences in terms of frequencies. Thus, we said that our provisional view was that additional rules around the location of unsold 40 GHz spectrum were not required.

Summary of consultation responses

- 3.5 BT/EE⁵⁹, VMO2⁶⁰, and Vodafone⁶¹ all agreed that Ofcom should not include any additional assignment stage rules governing the location of unsold 40 GHz spectrum.

Ofcom's decision

- 3.6 We remain of the view that assignment stage bidding mechanism should enable bidders to indicate their preferred locations within the 40 GHz band, which should mean any unsold spectrum ends up in the frequencies that are least favoured by bidders.
- 3.7 All respondents agreed with this proposal and as a result we have decided not to include any assignment stage rules governing the location of unsold spectrum in the 40 GHz band, other than requiring unsold spectrum to be treated as a single, contiguous block.

⁵⁸ 27 September 2023 Statement "[Enabling mmWave spectrum for new uses](#)", paragraphs. 4.79 and 4.80. As noted in the 27 September 2023 Statement (paragraph 4.80), this assessment is subject to the uncertainties over the out-of-block emissions performance of real equipment.

⁵⁹ BT/EE non confidential response to the November 2023 Statement and Consultation, p. 3.

⁶⁰ VMO2 non confidential response to the November 2023 Statement and Consultation, p. 10.

⁶¹ Vodafone non confidential response to the November 2023 Statement and Consultation, p. 3.

4. Deposits in the principal stage

- 4.1 In November 2023,⁶² we decided that applicants will be required to submit an initial monetary deposit and that qualified bidders will need to provide an additional deposit before the first round of the auction. In the illustrative procedures (for the principal stage) annexed to the November 2023 statement and consultation,⁶³ we indicated that the initial monetary deposit would amount to £100,000 and that the additional deposit before the first round of the auction would be at least £900,000.
- 4.2 To deter frivolous applications and mitigate the risk of disruption to the auction process, we are minded to increase the initial monetary deposit to £1m, in line with the reserve price for a 40 GHz lot. This would remove the need to set any minimum threshold for the additional deposit before the first round of the auction. The total amount on deposit from the bidder at that point would be used to determine that bidder's eligibility points.
- 4.3 We note that we did not receive any comment on the specific amounts (i.e. £100,000 and £900,000) set out in the illustrative auction procedures and that, in line with the approach taken in previous spectrum auctions,⁶⁴ we would expect to write the amount of the initial deposit into the Auction Regulations. Therefore, stakeholders will have a further opportunity to comment on such amount when we consult on the Auction Regulations.

⁶² November 2023 Statement and Consultation, paragraphs 5.53-5.56.

⁶³ November 2023 Statement and Consultation, paragraphs A6.5-A6.9.

⁶⁴ For example, see [regulation 4\(3\)\(b\)](#) and [regulation 15\(1\)](#) of The Wireless Telegraphy (Licence Award) Regulations 2020.