BT's response to:

Public Sector Spectrum Release (PSSR)

Award of the 2.3GHz and 3.4GHz bands

(Issued on 7 November 2014)

Submitted to Ofcom on 23 January 2015

EXECUTIVE SUMMARY

1. BT welcomes these consultation proposals on release of this valuable 2.3GHz and 3.4GHz mobile spectrum. We appreciate the efforts that Ofcom has made to address some of the issues that BT made in the earlier call for inputs, notably the desirability of keeping the process as simple as possible while ensuring an efficient auction outcome is achievable.
2. BT agrees that the SMRA auction format is preferable in this instance, but we have a number of suggestions as to how the design may be further developed or enhanced in order to maximise the likelihood of the most efficient outcome. We suggest that a 10MHz lot size may further simplify the process. We also suggest that Ofcom considers an additional auction round to deal with any unsold lots, which would also reduce the liability of bidders to pay for unsold spectrum that they do not win despite genuine bidding that involves switching between lot categories; this is a particularly important issue if Ofcom proceeds with the very restrictive information policy for the award.
3. BT supports the concept of a minimum spectrum requirement, but we have some concerns around the details of this and also concerns in relation to the eligibility point ratios and a number of other detailed auction design matters, including the imposition of linear prices.
4. If Ofcom were to change its plans and move to a CCA format auction, we would have a number of significant concerns with the proposals and we believe Ofcom would need to re-consult in order to arrive at an acceptable design.
5. The competition assessment in relation to the award is important and, while BT agrees with the broad approach, we have a concern around the total spectrum cap. We do not consider that any cap is absolutely necessary, but if Ofcom does adopt one then, for reasons explained in this response, we consider that this should be slightly increased from the 310MHz figure and should be no less than 315MHz. Furthermore, we believe there is a strong argument that the 3.6-3.8GHz band should also be included in the calculation, which would tend to support an even higher cap value.
6. BT agrees with the proposals to include the 1.4, 2.3 and 3.4GHz bands in the mobile trading regulations just before the auction. It is sufficient that 1.4GHz trading is in the meantime adequately covered by the general trading regulations.
7. In relation to the technical licence conditions BT understands the desire to ensure efficient spectrum use, but considers the present proposals to not be sufficiently technology neutral, which may inhibit innovation, possibly affecting introduction of future 5G mobile. This concern could be readily addressed with some changes to the technical proposals.

1. INTRODUCTION

BT is pleased to contribute its views on how this very valuable new mobile spectrum at 2.3GHz and 3.4GHz should be awarded, taking into account the need to promote competition and innovation and the efficient use of this spectrum.

The deployment of networks using unpaired (TDD) spectrum is gaining momentum in the world's largest markets and is increasingly supported in popular mobile devices. The availability of this spectrum in late 2015 or early 2016 in the UK is very timely for delivering capability for additional 4G capacity as well as providing an opportunity to provide larger blocks of spectrum that may be needed to support future 5G requirements.

A summary of our overall position is provided in section 2 and our responses to the consultation questions are provided in section 3 below.

2. SUMMARY OF BT'S VIEWS

BT broadly supports and welcomes the approach that Ofcom is taking to this award. In particular we appreciate the efforts Ofcom has made to keep the auction process as simple and predictable as possible, which should assist in achieving an efficient outcome and minimise the overheads on Ofcom and bidders. In BT's view the SMRA as proposed by Ofcom is preferable to the CCA proposal for this particular award. We suggest some minor improvements in terms of lot sizes, reserve prices and other detailed matters within the auction rules which we urge Ofcom to fully consider before it finalises the plans.

We welcome Ofcom's competition assessment, which was one of the recommendations of the National Audit Office after the last auction, and are content with the conclusion that if any measure is required at all it is only a safeguard of a total spectrum cap. We even question whether a cap is needed, but if one is included, we suggest a slight adjustment to the value that Ofcom has proposed. We also question whether, in addition to the bands that Ofcom proposes for inclusion, it would make sense to also include the 3.6-3.8GHz band in view of the pace of standardisation and harmonisation for 4G and its use by UK Broadband.

On the technical aspects we appreciate the efforts Ofcom has made in terms of promoting efficient use of the spectrum but consider that there is a risk that the proposals are not sufficiently technology neutral and may impede future innovations including potential 5G developments. It should be possible to address these concerns, perhaps in the course of further informal or formal consultation.

3. RESPONSES TO THE QUESTIONS

Question 4.1: Do you agree with our proposals for categories and lot sizes in the auction? If you disagree please provide evidence for your position.

We would prefer that Ofcom awards the spectrum in a larger block size than 5MHz. We propose that Ofcom uses a minimum block size of 10MHz as this would be more relevant for high speed broadband application requirements. This view is reinforced by the fact that the option to mandate a 5MHz internal guard band at one edge of each operator block, as an alternative to requiring synchronisation between operators, which could be a reason to offer 5MHz increments, is not included within the proposals.

A 10MHz block size would simplify the award process by reducing the opportunity for strategic bidding for combinations that are unlikely to be required but could unnecessarily complicate the bidding process. This is a particular concern in relation to the 2.3 GHz band.

Question 4.2: Do you have any other comments or views relating to the overview of the spectrum?

Ofcom mentions that low power shared licences were previously offered in the 2.6GHz auction and notes that there was only limited and insufficient demand for these to be allocated. We consider that the lack of demand was at least in part a result of the auction design which allowed a "free rider" opportunity in relation to the low power licences which deterred serious bids.

Question 5.1: Do you agree with our proposals for achieving contiguity, and if not please provide further explanation.

Yes, we agree with Ofcom's proposals in relation to UK Broadband and promoting contiguity of spectrum allocations.

Question 6.1: Do you agree with our recommendation for an SMRA? If not, please explain why.

Of the two detailed designs that Ofcom has put forward, BT agrees that the SMRA auction format proposed is preferable to the CCA format proposed. This is for all of the reasons that Ofcom has considered and explained, in particular the benefit of simplicity and transparency which may reduce possibilities for gaming and enable a process that is easier to explain and which has greater certainty as to the outcome and costs compared to the CCA alternative.

Question 6.2: Do you agree with our proposals for the SMRA (including withdrawals, minimum requirements and waivers)? Do you have any other comments or views on this proposal?

BT broadly agrees with Ofcom's proposal for the SMRA, but has a number of comments on specific

aspects of the proposed design as follows.

Liability for unsold lots

BT's primary concern is with the details of the proposed withdrawal rule, in particular the penalty to be imposed if standing high bids are withdrawn and the lots concerned then go unsold. Our concern is that the potential penalty may be so harsh as to discourage bidders from making legitimate use of this essential facility, leading to distorted bidding behaviour and potentially an inefficient auction outcome[1]. Ofcom's proposed information policy makes this a particular risk as it will make it harder for bidders to estimate whether the auction is a long way from completion – in which case a withdrawal may be relatively safe – or close to completion – in which case a withdrawal may be very risky.

One response to this concern might be to change the information policy; to give bidders more information about demand in each round of the auction and hence give them a better idea about the risk they would be taking if they were to withdraw standing high bids. We recognise however that this might facilitate strategic bidding, as it would equally provide those bidders that wished to engage in strategic bidding the opportunity to do so at reduced risk.

Another potential response, which we would urge Ofcom to consider, would be to hold a single additional (second-price?) sealed-bids round for any lots that were unsold at the end of the final round of the standard SMRA (to be held immediately after the standard SMRA and before the assignment stage)[2], with any withdrawal penalty being reduced to the difference between the amount of the withdrawn standing high bid and the amount of any new winning bid for the previously unsold lots. We envisage that there would need to be rules governing the bids that could be made in such a round to prevent strategic behaviour; perhaps for example prohibiting any bidder that was liable to pay a withdrawal penalty from bidding for the relevant lots, or perhaps, alternatively, allowing them to do so up to some limit, provided that this was not incompatible with other restrictions (such as spectrum caps).

Minimum spectrum requirement

BT agrees with the inclusion of this feature and that the maximum amount of the minimum spectrum requirement should be 20MHz. We consider that less may not be enough to be viable, whilst more is not necessary and could be used strategically.

Standing high bids below minimum requirement

BT would also urge Ofcom to reconsider its (implicit) proposal that bidders be required to hold standing high bids on lots in a band even if those lots amount to less than the bidder's minimum

[1] We also note that Ofcom's proposal regarding the penalty to be paid by each bidder in the case where multiple bidders have withdrawn standing high bids in a category is not currently clear, merely stating that all bidders may be liable to pay.

[2] We note that any lots left unsold as a result of being less than the standing high bidder's minimum spectrum requirement could also be offered for award through this additional round.

spectrum requirement in the band (which can arise if the bidder is the marginal winning bidder in a round and is provisionally allocated fewer lots than it bid for in the round). Ofcom proposes not to require such bidders to buy these lots if this situation persists in the final round, nor otherwise to penalise any bidder left in this situation at the end of the auction. We would argue therefore that these are not real standing high bids at all.

Such faux standing high bids give no benefit to the bidder that holds them, since they can never become winning bids, but at the same time have the potential to constrain the bidder's subsequent bidding behaviour in ways that could be problematic. In particular the bidder will have eligibility tied up in the faux standing high bids that it will not be able to use to bid for lots in other categories without withdrawing the faux standing high bids. But if the bidder does withdraw the faux standing high bids then it puts itself at risk of paying a withdrawal penalty (even though it would not have to buy the lots even if it was still the standing high bidder on those lots at the end of the auction), which may discourage the bidder from withdrawing the faux standing high bids and consequently limit the number of lots in other categories that it can bid for.

We would therefore strongly urge Ofcom to consider either: (a) changing its proposals as regards the identification of standing high bids such that no bidder is required to hold standing high bids on fewer lots than its minimum spectrum requirement in a band (even if that means some lots do not have standing high bids on them); or (b) allowing the penalty-free withdrawal by a bidder of all their standing high bids in a category if the number of lots provisionally held is less than the bidder's minimum spectrum requirement in the band.

Eligibility points

BT also has some concerns about Ofcom's proposal to assign an equal number of eligibility points per MHz to lots in both the 2.3 and 3.4 GHz bands. Our concern is that in reality it seems likely that the price per MHz of spectrum in these two bands will not be equal, or even approximately equal. Ofcom's own proposals for reserve prices suggest a per MHz price ratio of between 2.5:1 and 5:1 for 2.3 GHz spectrum as compared with 3.4 GHz spectrum. The use of equal eligibility points in such circumstances creates two potential concerns for us.

Firstly some bidders may use the equality of eligibility points to hide their demand for the more expensive spectrum, by bidding for an equal amount of the less expensive spectrum in the early stages of the auction.

Secondly, and more concerning for us, the use of equal eligibility points may mean that bidders that see 2.3 and 3.4 GHz spectrum as being partial substitutes for each other, but not on an equal value per MHz basis, may have to bid for more spectrum than they really need at certain price points, in order to maintain sufficient eligibility to switch their demand into the less valuable (per MHz) spectrum if prices subsequently change in favour of such less valuable spectrum.

{*Confidential paragraph redacted}*

We note that Ofcom's CCA proposals include the use of a relaxed activity rule, which goes some

way to mitigating this problem in that case. Might it be possible to use a relaxed activity rule in the SMRA case too? If not, we would strongly urge Ofcom to reconsider its proposed assignment of eligibility points to lots, to bring them more into line with expected prices.

Information policy

BT agrees with the strict information policy to reduce the risk of strategic bidding only on condition that the above concern about liability for unsold lots is resolved. With a solution to this concern along the lines we have proposed we would be able to support the proposed limited information policy.

Linear pricing

We note that Ofcom seems to be particularly concerned to reduce the likelihood of strategic demand reduction in this auction. We note however that whilst Ofcom has taken steps to make it harder for bidders to engage successfully in strategic demand reduction, there appears to be no discussion in Ofcom's consultation document of options that might reduce the incentive to engage in strategic demand reduction – that incentive deriving largely if not entirely from the use of linear pricing (the price to a bidder of *n* lots being *n* times the price of a single lot).

To be clear, we are definitely not proposing the use of a second price rule as per the proposed CCA. Rather, we are suggesting that consideration be given to changing certain specific aspects of the proposed SRMA auction design such that prices need not necessarily be linear. For example the Ofcom proposed rule that (it appears to us) most directly enforces price linearity, is the rule that requires a standing high bidder that wishes to bid for more lots in the same category to make a new bid at the current round price, not only for the additional lots that they wish to bid for but also for the lots on which they are already the standing high bidder ('cancelling' their existing standing high bids). Why is this rule necessary? What would be the implications of modifying it to allow such bidders to maintain their existing standing high bids and only bid at the new round price for any additional lots that they would like to win?[3] We note that this would be the standard rule in an SMRA with specific lots.

We appreciate that all of this would be a fruitless exercise if bidders were able simply to switch their demand across the various individual lots that make up a category and consequently increase the price of all of them until they were uniform, and hence the price of multiple lots was linear. Indeed this is often the experience in SMRAs with specific lots that are in practice close if not perfect substitutes. But in this case Ofcom is proposing the use of generic lots, with specific rules as to the order in which standing high bids are superseded by new bids. In this context it seems to us entirely plausible that a set of rules could be devised that would allow non-linear prices, more closely reflecting the true structure of demand and consequently being more likely to lead to an efficient outcome, in particular reducing the incentive for strategic demand reduction. We would urge Ofcom to give due consideration to such options.

[3] We recognise that other rules would likely need to be amended as well to achieve our overall objective.

Question 6.3: Do you agree with our proposals for the CCA? Do you have any other comments or views on this proposal?

BT has a number of concerns with the specific version of the CCA proposed by Ofcom, which we would want to see addressed if Ofcom were to change its mind and decide to use a CCA instead of an SMRA for this award.

Our principal concern relates to the potential for bidders to make what have sometimes been called 'spiteful' bids in the supplementary bids round – that is to say bids that are made with the intent of increasing the price other winning bidders will have to pay, with little or no chance of the bids actually winning. Ofcom expressly decided not to use a final price cap in the 800 MHz and 2.6 GHz auction in order to prevent bidders from being able to make bids in the supplementary bids round that could not win but could raise the prices that other bidders would have to pay[4]. Ofcom again acknowledges the potential for such behaviour in this latest consultation[5], but on this occasion has (provisionally) decided that the benefits from greater certainty for bidders going into the supplementary bids round outweigh the risks of price driving behaviour. Ofcom provides no substantive evidence to support this change of view[6].

A secondary concern relates to the complexity of the CCA design that Ofcom has put forward. We note for example that Ofcom has proposed a relaxed activity rule with the potential need for bidders to submit 'chain bids', but provides no analysis of the necessity for such chain bids[7].

Finally we note that Ofcom's proposed information policy during the primary bid rounds of the CCA is completely the opposite of that used in, for example, Canada, where aggregate demand information was made available to bidders at the end of each primary bid round **except** the last (as compared with Ofcom's proposal to make aggregate demand information available to bidders **only** after the final primary bid round).

[4] See paragraph 7.6 onwards of Ofcom's statement *Assessment of future mobile competition and award of 800 MHz and 2.6 GHz, 24 July 2012*

[5] See paragraph 6.73

[6] Some of the arguments that Ofcom does make in this regard are also flawed. For example in paragraph 6.74 of its consultation Ofcom notes that it believes that prices may only rise above the prices prevailing at the end of the final clock round if there are provisionally unsold lots at the end of the clock rounds. This may well be true factually, but in our view it considers the wrong price benchmark. The correct benchmark is the opportunity cost of each winning package (or combination of winning packages), not the prices prevailing at the end of the final clock round. Ofcom presents no analysis of the potential for spiteful bids to increase prices above opportunity cost, nor of the potential impact on the behaviour of (other) bidders that the potential for such spiteful bidding might create.

[7] By way of example, the Canadian 700 MHz auction cited in paragraph 6.63 of Ofcom's consultation used a relaxed activity rule, but did not require bidders to make chain bids.

In summary therefore, if Ofcom were to change its mind and decide that it would be better to use a CCA rather than an SMRA for the award of this spectrum, BT would urge Ofcom to reconsider the details of the proposed CCA, and re-consult, before proceeding with the drafting of auction regulations.

Question 6.4: Do you agree with our proposals for the assignment stage? Do you have any additional views or comments?

Yes, we agree with the assignment round proposals.

Question 6.5: Do you have any other comments on auction design?

BT has no further comments.

Question 6.6: Do you agree with our proposals for the reserve prices? If so, where in the range we propose should the reserve price for the 2.3 GHz band be? Do you have any other views or comments?

We would recommend that Ofcom sets reserve prices at a level that does not unnecessarily deter participation in the auction (except frivolous bidders) and we do not see a need to set the reserve prices in relation to Ofcom's prediction as to what the market value might be. However, so long as the reserve prices are a small fraction of what Ofcom thinks that the market value may be we would have no concerns about the precise figure. We are however concerned with how Ofcom may use the initial reserve prices to set the subsequent round prices as it may be more efficient if the market clearing price of the two lot categories is reached at approximately the same time. It would be helpful if Ofcom could give some indication of how the auctioneer would intend to decide on round by round price increments.

On the basis that reserve prices need not reflect market values or the ratio of market values but simply should be low amounts to encourage participation in the auction, we suggest the following value on the basis that there is some limited justification from the last auction.

We propose a reserve price of **£100k per 5MHz for 3.4GHz** as this was the reserve price used by Ofcom in previous auctions where the aim was primarily to deter frivolous bidders.

The 3.4GHz spectrum may be expected to sell for a lower price than 2.3GHz given that there is a less developed ecosystem and there is also much more spectrum, hence more operators are likely to be able to be accommodated within it and it may be less heavily contended. Thus it is not unreasonable to have a somewhat higher reserve price for 2.3GHz spectrum reflecting this anticipated price differential.

Question 7.1: Do you agree with our approach to considering what spectrum is relevant to this competition assessment? Please give reasons for your views.

Ofcom proposes to include spectrum that is or will be available for use in the short to medium term. BT agrees with this approach.

Question 7.2: Do you agree with our view that spectrum at 800 MHz, 900 MHz, 1.4 GHz, 1.8 GHz, 2.1 GHz (paired only), 2.3 GHz, 2.6 GHz and 3.4 GHz is relevant for this competition assessment? Please give reasons for your views.

BT agrees with Ofcom's assessment that the 1.4GHz, 2.3GHz and 3.4GHz spectrum bands are all relevant to the competition assessment since they are likely to be available within the timeframe of the auction. These bands have all been harmonised for mobile broadband within Europe and binding EC Decisions on designating and subsequently making available these bands already exist or are in the process of being finalised. They are each therefore part of the pool of mobile broadband spectrum that is being addressed within 3GPP standards and for which consumer devices can be expected to become widely available in the next few years.

The 700MHz spectrum is also likely to be awarded within 5 years of the PSSR auction but we agree that that could be considered to be beyond the timescales that are relevant to Ofcom's present competition assessment.

Given that Ofcom is considering bands that will be useable in the short to medium term we propose that the 3.6-3.8GHz band is added to the list of bands that are relevant to the competition assessment. This band is already substantially assigned to UK Broadband and is available for their 4G/LTE wireless broadband service. It is harmonised for mobile use in the EU in accordance with an EC Decision and is included in the 3GPP standards for LTE. Europe has also drafted a proposal to the ITU World Radiocommunication Conference 2015 to upgrade this band to Primary Mobile status for ITU Region 1 and to identify it for International Mobile Telecommunications (IMT) within the Radio Regulations. Thus, there is a good prospect of use for mobile in the medium term. Ofcom's argument that it is not relevant because it is not available in some geographies due to sharing with satellite Earth stations does not seem compelling because these tend to be remote areas where there is no shortage of spectrum, and hence where the amount of available spectrum does not significantly affect competition.

Question 7.3: Do you agree that very asymmetric spectrum holdings could give rise to competition concerns? Please give reasons for your views.

Very asymmetric spectrum holdings are not a primary concern as it is the quality of the spectrum that is also relevant (large amounts of high frequency spectrum are much less useful than the same amount of sub 1GHz spectrum). Furthermore the spectrum has a cost associated with acquiring or maintaining it. There is a clear trade-off between bearing the higher costs of a larger amount of spectrum and the higher costs of more infrastructure (but lower costs of using less spectrum). This is a choice that operators can and have made in the UK.

Ofcom has continued to place emphasis on the desirability of having four UK national wholesalers and additional retailers. In this context Ofcom may be concerned to ensure that they have the opportunity to acquire sufficient spectrum and has indicated that 10-15% is a minimum share that may be necessary in this context.

Considering all factors and given that Ofcom is not minded to reserve spectrum for new or weaker players, we do not see any particular need for an overall spectrum cap to address competition concerns. We consider that with multiple operators likely to be vying for spectrum and with a large amount of additional spectrum becoming available, it should be possible for those with the greatest need for more spectrum to be able to acquire it, without capping some parties to limit demand and enable those parties that need the spectrum to get it cheaper.

Question 7.4: Do you agree with our proposal to impose an overall spectrum cap in the auction equivalent to the overall spectrum cap in the 2013 auction? If our assessment of what spectrum is relevant is correct, do you agree with the proposal for an overall spectrum cap at 310 MHz? Please give reasons for your views.

We are unconvinced of the need for an overall spectrum cap but if one is applied, and only the bands Ofcom has currently proposed are included, then the figure should be no less than 315MHz.

{*Confidential paragraph redacted}*

If Ofcom were to include the possibility for an internal guard band to be used to enable greater flexibility in the choice of technology, this would be a further reason to increase the value of any cap to reflect that in this circumstance 5/10MHz might not be fully used.

If Ofcom includes the 3.6 - 3.8GHz band as BT proposes then the overall spectrum cap should be accordingly higher given the 37% total spectrum share criterion that has been discussed.

Question 7.5: Do you agree with our proposals to amend the Mobile Trading Regulations shortly before the PSSR award so as to include relevant spectrum at 1.4 GHz, 2.3 GHz and 3.4 GHz? Please give reasons for your views.

Yes, it makes sense that all mobile spectrum is treated on a similar basis in terms of spectrum

trading rules and the completion of the auction is a sensible point to secure this alignment given Ofcom's view that any trade of the 1.4GHz spectrum ahead of the auction is unlikely to raise competition concerns.

Question 7.6: Do you have any other comments on our assessment of competition effects from the award?

BT has no further comments.

Question 8.1: Do you have any comments on the proposals relating to the duration of the initial licence period, our rights to revoke the licence during this period, the charging of licence fees after the end of the initial period and our additional revocation powers following the initial period?

Ofcom's proposals for the non-technical licence conditions are in line with the measures attached to other recently awarded licences and we agree that they are appropriate.

Question 8.2: Do you have any comments on our proposals relating to the territorial extent in the award licences?

No comments.

Question 8.3: Do you have any views on the merits of the proposed approach to information provision; in particular concerning the type of information that may be helpful and any impacts that publication of information might have both on licence holders and the wider spectrum market?

Other than the point below, BT does not in principle have any concerns with the record keeping requirements that Ofcom has set out in the draft licences. We do however have concerns over the required frequency of updating this information in terms of the burden this may place on licensees (depending on the frequency and timescales of requests) and its publication (which could have adverse competitive implications).

On a point of detail, we suggest that Ofcom reviews the 20dBm power threshold for which less onerous record keeping requirements for femtocells applies. A figure of 24dBm would be more appropriate to cover all in-building cells for which precise height and more detailed grid reference details may not be readily available nor would be necessary for Ofcom's purposes. A 24dBm power level threshold for record keeping would also have the advantage of being consistent with the 24dBm power limit proposed by Ofcom in the context of unsynchronised indoor small cells.

In the case of in-building cells within end customer premises we would suggest that access and

inspection rights that go beyond the basic requirements of the Wireless Telegraphy Act may not be necessary for inclusion in licences, or could be waived for indoor femtocells. These are in many respects similar to WiFi, for which the licence-exemption regulations do not include access and inspection provisions.

Question 8.4: Do you have any comments on other proposed non-technical licence conditions and the draft licences at Annexes 8 and 9?

No additional comments.

Question 9.1: Of our two possible options to encourage or mandate synchronisation do you prefer Option 1 or Option 2? Please explain your preference for the option and let us know if you have other comments or suggestions.

Whilst in general BT supports the approach of encouraging synchronisation between operators in this spectrum in view of the benefits in spectrum efficiency and the ability to use equipment with less stringent filtering, we are concerned that the proposals as written preclude the possibility to use different technology to other operators that may have a different transmission frame length (e.g. 5G technology that may differ from LTE).

The proposals do not appear to allow an operator even to use some of his own spectrum as an internal guard band and then not synchronise with his neighbours. This is a serious limitation that could inhibit innovation and early deployment of new technologies.

It is important that Ofcom takes the utmost account of the desirability of making regulations technologically neutral as required by the EU regulatory framework for electronic communications. In particular the licences should not limit the use of the spectrum to the current 4G/LTE TDD mode but should include more flexibility including possible supplementary downlink (SDL) mode and future 5G technologies. We therefore request Ofcom to review its proposals on mandatory frame synchronisation to address this concern, for example to allow operators the option to use an internal guard band where synchronisation with its neighbours is not feasible.

Whilst neither of the two options offered by Ofcom is satisfactory to BT for the reason explained above, of the two options the first is preferable to the second as it at least gives flexibility to use different frame structures, albeit with the requirement to synchronise the start of each frame.

Question 9.2: Do you agree with our proposed frame structure of LTE configuration 2 or equivalent?

BT cannot at this point sign up to a 3:1 downlink/uplink LTE frame structure as our business case work and technical evaluations of these spectrum bands is incomplete.

We also note that LTE configuration 2 is not the most efficient, because there are two special sub-

frames per frame rather than one.

It may be better as a first step to indicate a range of envisaged uplink/downlink ratios and leave the final decision to be taken by Ofcom after the licensees have been identified and had the possibility to discuss the issue between them.

Ofcom refers in para 2.5 to a further technical consultation and, whilst we are not aware of what that is intended to address, we wonder whether this matter could be finalized as part of that exercise, as well as addressing our above concerns around the technology neutrality of the current proposals.

Question 9.3: Do you agree with our proposal that indoor small cells, with power levels up to 24 dBm, do not need to synchronise?

Yes, BT agrees with this proposal. However, we suggest Ofcom looks in to whether this could be extended to also apply to *outdoor* small cells. This would be logical because the unsynchronised indoor cells could have outdoor mobiles and these would have a similar potential to interfere with adjacent TDD systems as an unsynchronised outdoor base station of the same maximum power as a mobile.

Question 9.4: Do you agree with our approach in the Inter-operator Synchronisation Procedure?

As noted in our response to Q9.1 we believe the synchronisation options need further consideration, in particular the need to include an option to not require any synchronisation and hence not require adherence to a procedure. We also cannot at this stage agree to adopt TD-LTE configuration 2. Notwithstanding these points, the proposed approach of using an Inter-Operator Synchronisation Procedure where this is applicable makes sense. The flexibility to update the procedure in light of developments is an important element.

Question 9.5: Do the parameters to be provided in the Inter-operator Synchronisation Procedure give you sufficient certainty at the time of the award for your future deployments? If not can you provide further information on what extra detail information would need to be covered?

The parameters that Ofcom has identified appear to be the most relevant ones, although the values of these (e.g. the TD-LTE frame configuration) may need further consideration. At this stage we have no additional suggestions as to what needs to be included to enable services to be launched.

Question 9.6: Would any of the potential changes to the procedure that we have considered made within the first 12 months following the award have a significant impact to a network that has been deployed in the interim? If so please explain any concerns.

It is not entirely clear to us which elements of the procedure Ofcom considers are the ones that are subject to potential change and which are not. Perhaps even all elements could be changed or items added? That said we think the flexibility to adapt the procedure in the light of developments or experience is a good one and we have no specific concerns about that possibility at this stage.

Question 9.7: Do you agree with our approach for power control for femto cells?

In general we do consider that downlink power control is important in femtocell deployments in the 2.3GHz and 3.4GHz bands, to limit interference between cell coverage areas and potentially to limit interference levels to other systems operating in adjacent channels.

The power control can be done through the management system or through a SON mechanism, and we would like to retain the flexibility of being able to use either method. In LTE, downlink power control enables management of the pilot pollution that otherwise would limit the edge of cell performance and / or cause a high number of handovers of mobile UEs.

We note that the ECC Decision for the 2300 - 2400MHz band requires femtocells to use power control and that the EC Decision for the 3400 – 3800 MHz band mentions a minimum ATPC requirement. However, the details of power control are best left to standardisation bodies.

Question 9.8: Do you agree with our position to adopt the new power limits above 2403 MHz?

Yes we consider that protection of WiFi is an important consideration and we support any necessary power limits above 2403 MHz that are intended to address the issue of out of band interference from LTE base stations in to WiFi.

More generally we have noted Ofcom's further investigation of potential for interference from LTE to WiFi and the available mitigations to this issue. We remain concerned about the potential impact on some consumers and find the conclusions to be unsatisfactory in terms of what risks are considered acceptable and the absence of measures to avoid or compensate for problems occurring.

Question 9.9: Do you agree with our position with regard to the out of block levels applicable in UK Broadband's spectrum holding of 3605 – 3689 MHz?

Yes, we agree with Ofcom's position.

Question 9.10: Do you have any other comments on the proposed technical licence conditions and the draft licences attached at annexes 8 and 9?

BT has no further comments.

END