Non-Confidential

Mobile phone repeaters

A consultation on extending the range of mobile phone repeaters that can be used without a licence and on measures to improve information for consumers

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Executive summary

1. BT[1] recognises the role that licence-exempt mobile repeaters can have in resolving coverage problems in some specific circumstances and acknowledges that there are currently few products that comply with the present UK licence-exemption regulations.
2. BT supports Ofcom's proposal to include information about products that are compliant with the licence-exemption regulations on its website. We also encourage Ofcom to seek inclusion of relevant technical requirements in harmonised European standards used as part of the certification process when placing equipment on the market.
3. BT is not convinced that broadening the scope of the licence-exemption regulations is in the overall interests of consumers. We are particularly concerned that some larger scale deployments, that the proposed broadening of scope could facilitate, may adversely affect the performance of our mobile network and would not be in the overall interests of consumers.
4. BT does not support the extension of the licence-exemption regulations to facilitate deployment of "provider specific" mobile repeaters due to concerns as to how the proliferation of these could impact the performance of our mobile network.
5. BT is particularly concerned with the proposed licence-exemption of "multi-operator" repeaters. Our reservations about the adverse and unpredictable impact of repeaters on our mobile network, and ultimately customer service, are further amplified in the case of this type of repeater as additional interference problems may arise. There are also concerns that such licence-exempt systems would detract from our own efforts and techniques to extend and improve coverage which would not be in the interests of consumers.
6. BT agrees that Ofcom should, for the time being, continue to require that 4G signals are only repeated where 2G and/or 3G signals are being repeated by single operator repeaters (and provider-specific repeaters, if allowed) and that, if allowed, multi-operator repeaters would need to repeat the frequency bands used by MNOs for 2G/3G.
7. BT agrees that it would not be appropriate to allow licence-exempt repeaters in the 2.6GHz band given potential interference with radar systems that Ofcom has identified.
8. Finally, BT does not support the licence-exemption of mobile repeaters covering the 700MHz band. This band was only very recently awarded to mobile operators and is in the process of being deployed, including to improve indoor coverage. The use of the band by repeaters would conflict with this and would raise other technical concerns in relation to the combination of bands needed for 5G service and potential for interference with TV reception.

[1] Including its subsidiary mobile network operator EE Ltd.

1 Introduction

BT welcomes the opportunity to provide its views on Ofcom's consultation proposals[2] to extend the scope of the licence-exemption regulations for mobile repeaters and to highlight compliant products on its website.

In section 2 we provide a summary of BT's views on the evolution of licence-exempt mobile repeaters and in section 3 we address the specific questions that Ofcom has posed.

2 Summary of BT's views

We understand that Ofcom's proposals are intended to facilitate improvements to mobile coverage for consumers and we acknowledge the benefits this would offer. However, this needs to be carefully balanced against the potential adverse effects the proposals could have on mobile networks and other consumers.

Extending the scope of the licence-exemption regulations in the way proposed may give rise to unintended consequences that would be harmful to consumers and would undermine the plans of operators to improve coverage in a more managed way. This is already apparent from the previous regulations, where a desire to allow coverage options for homes and small offices using a typical small repeater single coverage antenna is now expanding to also include solutions with multiple coverage units able to target much larger premises[3]. Such systems can impact the experience of other customers on the mobile network.

BT would typically only deploy a 'hybrid DAS[4]' solution as a last resort, where backhaul is unavailable to the premises to provide a solution with its own capacity. Where it is deployed by necessity, careful planning using a highly directional donor antenna directed towards the preferred donor cell, along with managed capacity uplift is carried out to ensure macro cell performance is not negatively impacted for existing users. BT would be greatly concerned by further unmanaged deployment of this type of solution, likely exacerbated by further relaxation of licence exemption rules.

Ofcom's technical analysis is helpful to examine interference considerations, but we believe there are additional technical aspects that need to be considered, including the impacts unplanned deployments of repeaters can have on other users of the network as well as impacts on network capacity planning.

Each sudden and unexpected introduction of large numbers of additional users, that could be facilitated by licence-exempt repeaters deployed well beyond the scope that Ofcom may have initially envisaged, has the potential to require significant amounts of optimisation work and capacity upgrades (which will be delayed by lack of forewarning). Since third parties are unlikely to be able to correctly plan donor antenna alignment, lacking detailed knowledge of the EE network and in some cases necessary RF planning knowledge, this creates further potential for poor performance for both new users covered by the repeater and existing macro users.

We explain our views in more detail in our responses to the consultation questions in Section 3 below.

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[2] https://www.ofcom.org.uk/__data/assets/pdf_file/0023/219245/mobile-phone-repeaters-condoc-2021.pdf

[3] For example Cel-Fi QUATRA 3G/4G Signal Booster for Enterprises & Large Areas (signalboosters.co.uk)

[4] A hybrid Distributed Antenna Solution (DAS) is a combination of active and passive components to provide coverage within a building.

3 Response to the consultation questions

Question 1: Do you agree that Ofcom should consider working with relevant industry partners to develop a voluntary testing standard, and publishing a list on our website of static indoor mobile phone repeaters that comply with our licence exemption requirements?

BT agrees that this is a measure that would be helpful to give consumers confidence that the products they buy would comply with applicable regulations for licence-exemption.

We note that certification of compliance to Ofcom's specification of requirements for licence-exempt operation and listing on Ofcom's website is proposed to be voluntary. Ofcom should also consider including the UK requirements in ETSI harmonised standards so that these are part of the certification process for placing equipment on the market.

Question 2: Do you agree that we should modify IR 2102.1 to allow for 'provider specific' mobile phone repeaters? If you do not agree, please explain your reasons.

BT notes the logic that if separate single operator repeaters can already be deployed together in the same location on a licence-exempt basis, then allowing these to be in the same box and still be licence-exempt does not really enable any new technical scenario from an interference perspective. However, we are concerned that this would further encourage a proliferation of such devices, which we do not consider to be in the overall interests of consumers for similar reasons as those we set out below in response to Question 3.

It should, however, also be noted that such devices do encourage the use of a single donor antenna for all operators. This, by its nature, is not optimised for any particular operator and may typically be omnidirectional in design and so can result in the amplification of multiple different potential donor cells. Particularly in dense urban areas, with many nearby cells optimised for ground level not rooftop coverage, this can result in significant interference levels and, therefore, at best, inefficient and, at worst, poor or intermittent performance in the repeater coverage area. Again, this performance issue is exacerbated the more users are within the intended repeater coverage area.

Additionally, we appreciate Ofcom's distinction between such 'provider specific' solutions, which from a technical perspective allow for appropriate management of each operators specific incoming RF signal strength, and the broader 'multi-operator' repeater, which adds the additional issue of averaged amplification of all operators signals to the above performance issues.

Question 3: Do you agree that we should make 'multi-operator' mobile phone repeaters complying with the technical requirements outlined above (and set out in the draft UK Radio Interface Requirement IR 2102.3 at Annex A3) licence exempt? If you do not agree, please explain your reasons.

We are concerned that the proposal to allow such devices on a licence-exempt basis may have unintended consequences for consumers and harms the ability of MNOs to properly manage capacity on their networks. We take this view for the reasons set out below.

Ofcom's proposals facilitate large scale indoor coverage solutions that harm the macro network

- The proposal goes far beyond the original intention of fixing isolated coverage issues for consumers. It enables coverage solutions on an industrial scale that can damage the performance of the MNO's macro network in an unpredictable way.

Impact on other customers in a cell caused by use of repeaters

- Dimensioning capacity is not manageable, as unexpected step change in capacity demand will occur where repeaters are deployed, unlike when an MNO provides indoor solutions itself.
- In order to ensure the extra traffic loading on the macro donor cell is within the capacity dimension plan and to maintain the integrity of the macro network, when deploying any indoor repeater solutions MNOs have to assess the quality of the donor. This typically involves examining technical parameters, such as: Receive Quality (RxQual) of 2G; Energy per chip to Interference power ratio (Ec/Io) of 3G; and Reference Signal Received Quality (RSRQ) & Signal-to-Noise Ratio (SNR) of 4G. It also considers the utilisation of radio access resources and backhaul capacity of the donor macro cell and any potential interfering signals from the macro sites at the coverage target area, not just the received donor signal levels at the repeater site. A third party does not have access to this commercially sensitive information of the MNO's macro network.
- We are concerned that the licence-exempt multi-operator repeaters will amplify the degradation of MNOs' macro network and users elsewhere in a cell will see less available capacity (especially in other buildings) where repeaters are deployed.

Mobile repeaters can conflict with other MNO solutions that are now being deployed, e.g. 4G femtos and neutral host networks.

- Network operators have a strong incentive to improve indoor mobile coverage, to compete effectively.
- Facilitation of multi-operator mobile repeaters removes some incentive for operators to improve their network coverage. As such, facilitation of licence-exempt repeaters could actually have a negative impact for consumers.

Which bands are amplified

With the dynamic spectrum sharing (DSS) to be introduced in MNOs' networks for different technologies (LTE/NR) and GSM operating at the same frequency bands, the amplitude and phase linearity performance of the amplifier will play a critical part. The uncontrolled repeater handling multiple technologies/bands/operators with a wide range of donor levels will likely degrade user experience and the macro network performance, and this situation and consequent effects may change over time.

When repeaters are used to support all MNOs, there is increased likelihood of Active and Passive Intermodulation Interference that will result in performance distortion. In this scenario, the repeater may become degraded or useless for some frequency combinations (e.g. two MNOs' carriers in 1800 MHz) and not work for all MNOs equally. The way to resolve this is to limit the supported frequency range, which is then unlikely to achieve repeaters that support all MNOs.

Question 4: Do you agree with our provisional view as set out in paragraph 3.48 above? If you do not agree, please explain why you think the requirement is not necessary.

Yes, BT agrees that Ofcom should for the time being continue to require that 4G signals are only repeated where 2G and/or 3G signals are being repeated by single operator repeaters (and

provider-specific repeaters, if allowed) and that, if allowed, multi-operator repeaters would need to repeat the frequency bands used by MNOs for 2G/3G.

Ofcom's proposal ensures that consumers with older 4G handsets that are not VoLTE capable (still a significant market share) are able to make voice calls while in a repeater coverage area and, most essentially, emergency calls when necessary.

We advise Ofcom not to allow standalone 2100MHz band repeaters since this would likely lead to very poor user experience given the evolution of how that band is used in MNO networks over time.

Question 5: Do you agree that it would not be appropriate to allow the use of licence-exempt repeaters in the 2.6 GHz band? If you do not agree, please explain your reasons.

Yes, BT agrees that it would not be appropriate to allow licence-exempt repeaters in the 2.6GHz band, including for the reasons Ofcom has provided in relation to radar interference.

Question 6: Do you agree that we should allow the use of static indoor mobile phone repeaters (on a licence-exempt basis) in the paired 700 MHz mobile band?

BT does not consider it appropriate to authorise licence-exempt repeaters in the 700MHz band.

The 700MHz spectrum is in the process of being deployed by MNOs and will penetrate well into buildings, likely making the need for mobile repeaters obsolete in time or ineffective where 700MHz is not yet deployed.

We also have a concern as to whether this could lead to increased interference effects to DTT, which would be detrimental to consumers of TV and could potentially lead to increased costs to MNOs who must, according to the licence conditions, fund mitigation measures to solve 700MHz DTT interference problems that arise from mobile network deployments.

It should also be noted that with current non-standalone mode 5G services, a 700MHz repeater would not provide service without also providing coverage on a suitable 4G control layer. Appropriate layers would be operator dependant, with no common frequency band supporting all.

Accordingly, we ask that Ofcom removes the 700MHz (and 800MHz) bands from the draft Radio Interface Requirement as set out in Annex 3 of the consultation.


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