Mobile Coverage Enhancers and their use in licensed spectrum

Call for input

Publication date:	07 May 2014
Closing Date for Responses:	06 Aug 2014

About this document

Improving mobile coverage is an important area of work for Ofcom, as highlighted in our 2014/15 Annual Plan. So, too, is ensuring that apparatus is used in accordance with the law.

As part of this work, Ofcom wants to develop a better understanding of the role end-user mobile coverage enhancers could play in improving indoor mobile coverage. Such solutions could sit alongside others such as femtocells and smart repeaters.

Ofcom is seeking to establish whether end-user repeaters having certain characteristics or used in certain circumstances might provide enhanced coverage solutions for consumers. This would have to be achieved without causing interference or other relevant adverse effects to mobile networks and/or other mobile users.

Ofcom intends to use the responses to this call for inputs to inform its future approach towards any use of self-installed mobile repeaters. This includes whether Ofcom should consider making changes that would permit the use of such repeaters under a licence exemption, and any conditions that should be attached.

Introduction

1.1 Consumers are making increasing use of mobile services, resulting in a growing demand for reliable access to these services in outdoor and indoor locations. Mobile coverage is an important priority area for Ofcom, and it appears as a major work area in our 2014/15 Annual Plan[1].

1.2 Recent initiatives in this area include:

1.2.1 **Ofcom making additional sub 1 GHz spectrum available for mobile services:** this spectrum has good propagation characteristics enabling it to achieve good outdoor and indoor mobile coverage. Additional spectrum was recently made available in this frequency range in the 800 MHz band following the completion of digital television switchover. In addition, we are currently exploring a potential future change of use of the 700 MHz band from TV to mobile broadband use.

1.2.2 **Ofcom introducing mobile licence coverage obligations:** Ofcom has included more extensive coverage obligations in some mobile licences. For example, one of the 4G licences awarded last year (in the 800 MHz band) included a requirement to provide 98% indoor coverage.

1.2.3 **The Mobile Infrastructure Project (MIP):** This programme, led by DCMS, aims to extend 2G mobile coverage in particular in rural areas. Ofcom is supporting this work with expert technical advice.

These three initiatives reflect, amongst other things, Ofcom's duties in relation to citizens and consumers in section 3 of the Communications Act 2003. This includes a requirement to secure the availability throughout the United Kingdom of a wide range of electronic communications services.

1.3 We also recognise the important role that consumer/operator-initiated approaches can play in improving coverage. This includes femtocells and WiFi offload that can both improve indoor mobile coverage. The importance of these solutions is increasing as a result of:

1.3.1 the wider use of new metallic building insulation materials which can make it harder for mobile signals to penetrate buildings; and

1.3.2 the demand for higher mobile data connection speeds

1.4 Ofcom commissioned and recently published a report[2] on the range of different technical approaches that could be used to improve indoor coverage including:

- Wi-Fi-based solutions;
- mobile repeaters;
- femtocells and picocells;

[1] http://www.ofcom.org.uk/about/annual-reports-and-plans/annual-plans/annual-plan-201415/

[2] http://stakeholders.ofcom.org.uk/market-data-research/other/telecoms-research/improving-building-coverage/

- Distributed Antenna Systems (DAS); and

- Ongoing improvements to the wide area mobile cellular network, such as Co-ordinated Multi Point (CoMP) which make use of interconnected base stations and the use of multiple (MIMO) antennae[3].

1.5 This report highlighted the range of benefits that these different approaches are capable of providing in terms of (i) cost, (ii) the level of coverage improvement provided, (iii) any need for access to an in-building broadband connection and (iv) their ability to operate with different mobile network providers' networks.

1.6 The alternative solutions place different demands on spectrum. Most can be implemented in some form today, either by mobile operators using their licensed spectrum or by end users making use of licence-exempt Wi-Fi spectrum.

1.7 However, this is not necessarily so for end-user-installed mobile repeater solutions.

1.8 Mobile repeaters amplify and retransmit mobile signals locally to improve coverage. They may provide benefits for some end-users where network coverage is otherwise limited. However, they may also have adverse effects on mobile networks, and for other end-users of those networks.

1.9 Accordingly, alongside other solutions for improving coverage, Ofcom is interested in whether, and in what circumstances, repeaters may form part of the solution in improving coverage without having such adverse effects. That is a key purpose of this CFI.

Repeaters and use in licensed spectrum

1.10 In the UK, the use of a transmitting radio device, such as a repeater, must be either licensed by Ofcom, or specifically exempted from such licensing under section 8 of the Wireless Telegraphy Act 2006 (WT Act 2006). The use of any such device other than under and in accordance with a licence is liable to be a criminal offence, unless an exemption applies (and the use complies with the terms of any exemption).

1.11 Mobile network operators hold spectrum licences that allow them to use certain frequencies to deliver services over their networks. The licences permit the use of these frequencies at mobile base stations as well as at repeater sites which operate under the operator's control. Mobile operators use repeaters as part of their networks to amplify and retransmit mobile signals to improve coverage in locations such as tunnels, deep indoor areas, shopping malls, car parks and sports stadia.

1.12 Ofcom has varied the licences held by mobile network operators (in, and since, 2008) to facilitate the use by end-users of femtocells and smart repeaters[4] to improve the coverage of their networks. Both of these approaches use spectrum which is under the control of the mobile network provider using a broadband connection. This means that mobile operators have the ability to switch off femtocells and smart repeaters if, for example, they are found to be detrimental to the performance of their or other operators' networks.

[3] http://stakeholders.ofcom.org.uk/market-data-research/other/telecoms-research/improving-building-coverage/

[4] A smart repeater is an example of a device for instance under operator control that can be remotely controlled, configured and turned on or off

1.13 The position in relation to the use of mobile cellular repeaters (also sometimes called boosters and/or coverage enhancers) by, and under the control of, end users, rather than under the direct control of the mobile operator, is different. These end-user devices simply receive, amplify and re-transmit the signals from mobile base stations. Their purpose, in broad terms, is to enhance mobile signals in areas where they are weak, such as in indoor locations.

1.14 This approach relies on the repeater devices making low power use of the spectrum licensed to mobile operators. Ofcom has not issued any licences for the use of such devices by consumers and other end users,[5] nor made any exemption from the need for a licence.

1.15 Sections 8(4) and 8(5) of the WT Act 2006 set out conditions under which exemptions from the need for a licence are to be made. The relevant conditions include that the use of the device is not likely to:

1. involve undue interference with wireless telegraphy;

2. have an adverse effect on technical quality of service;

3. lead to inefficient use of the part of the electromagnetic spectrum available for wireless telegraphy; or

4. endanger safety of life.

1.16 We want to understand whether there are repeater devices (already available or which could be devised), which would meet these conditions and could therefore be made licence-exempt.

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1.17 Ofcom is, therefore, currently seeking to develop a better understanding of the role end-user repeaters could play in improving indoor coverage alongside other solutions such as femtocells and smart repeaters.

1.18 We are seeking to develop a better understanding of whether end-user repeaters having certain characteristics or used in certain circumstances might provide enhanced coverage solutions for consumers without causing interference or other relevant adverse effects to mobile networks and/or other mobile users[6].

1.19 Accordingly, Ofcom is requesting information and evidence in relation to the following:

- **Consumer demand:** the consumer demand for improved indoor coverage solutions, especially repeaters, and the circumstances and locations under which they can provide the greatest net benefit;

- **Operation:** the ways in which different types of repeater devices operate and the technical and other effects they have on networks and other mobile users, especially in light of the distinction the High Court drew between (1) undue

[5] Other than use by and under the control of the network operators as part of their networks.
[6] Our monitoring, compliance and enforcement team is aware of over 240 occasions over the past three years where unlicensed repeater devices have caused disruption of service to other mobile users.

interference and (2) network congestion, in the case of *Recall Support Services Ltd and others v Secretary of State for Culture, Media and Sport*;[7]

- **Technology evolution:** the current operation and likely evolution of different types of repeater and other coverage enhancing devices such as multi operator open femtocells. One of the drawbacks for consumers of current femtocells is that they typically only enhance the coverage of a single MNO's network so a household buying services from more than one MNO would need multiple femtocells;

- **Consumer utility and benefits:** the potential utility of end-user deployed repeaters compared to alternative approaches for enhancing mobile coverage, such as multi-operator pico or femtocells, and the benefits that different types of indoor coverage enhancement solutions, and repeaters in particular, can provide to consumers (including equipment costs, their effectiveness in improving coverage, compatibility with different mobile operators' networks, the need for a broadband connection to be available in the building etc.);

- **Impact on networks and other mobile users:** the impact of different types of indoor coverage enhancement solutions, particularly repeaters, on networks and other mobile users, and especially the risks that end user installed repeaters will have adverse effects outside the premises in which they are deployed (we are seeking evidence and/or simulations of these impacts);

- **Solutions that could minimise any impacts on networks and other mobile users:** the potential for technical solutions or practical installation steps, again in relation to repeaters in particular, that could be used to minimise any detrimental impacts on other mobile users;

- **Spectrum management impacts:** the impact of repeater deployment on spectrum management, including spectrum re-farming and where macro enhancement techniques such as MIMO[8] are in use, and means by which any such impact may be reduced; and

- **International developments:** the scope for international co-ordination, perhaps through CEPT[9] or at an EC level, on the development of a common European Union-wide framework for the authorisation of end user installed repeater solutions. In addition, we are interested in evidence of the impact of international developments, including repeater use in Australia, US and across the EU. This will include evidence of the impact of international harmonisation by service providers on consumer equipment, and economies of scale and prices.

1.20 We are seeking views from stakeholders on all the areas set out above and any other issues you think we should consider in relation to any future use of self-installed indoor repeaters.

1.21 We are keen to develop hypotheses to test, as to the technical characteristics and circumstances of use that might be suitable for self-installation of repeater devices by consumers and other end-users under a licence exemption. In particular, we would

[7] *[2013] EWHC 3091 (Ch)*. The High Court distinguished between unwanted signals that cause undue interference and the use of networks in accordance with the way they are meant to be used (which may amount to mere use or congestion of the network).
[8] Multiple Input, Multiple Output makes use of more than one antenna for transmit and/or receive
[9] Conference of European Post and Telecommunication, European Commission

like to identify the characteristics and circumstances in which such repeaters might be unlikely to cause harmful interference and/or to cause adverse effects on the technical quality of service.

1.22 We would therefore welcome submissions on those technical characteristics and circumstances. These might include such factors as operating modes, receiver sensitivity, transmit power levels, frequency ranges, stability, and demonstration and mitigation of impacts to other licensed spectrum holders. Any hypotheses as to the conditions under which repeaters having particular characteristics may be exempted from the need for a licence would also be valuable.

Next steps

1.23 Ofcom intends to use the responses to this CFI to inform its future approach towards any use of self-installed mobile repeaters. In particular, to help inform whether Ofcom should consider making changes that would permit the use of user installed mobile repeaters under a licence exemption, and if so the conditions that should be attached to any such use. It does not necessarily mean any exemption will be made. It may not be possible to identify repeaters and circumstances of use meeting the relevant conditions. In addition, any approach we ultimately take will need to balance the benefits against the risks (of, for example, adverse effects on networks and other users).[10]

1.24 In addition to responding to this CFI we would also welcome meetings with stakeholders on this issue.

1.25 This CFI does not mean Ofcom may not continue to take enforcement action in respect of unlicensed use of repeaters during the period of this CFI or any subsequent consultation on possible exemption(s). For example, Ofcom may investigate and take appropriate action in cases where the evidence suggests unlicensed use has caused undue interference and/or adverse effects on the technical quality of service such that the repeater(s) could not be the subject of an exemption.

How to make submissions

1.26 Ofcom invites written submissions to be made by 5pm on Wednesday 6 August 2014. We are seeking responses that provide views, supported by evidence, on the areas discussed above, or on other considerations stakeholders consider relevant.

1.27 Please make representations via:

- The online web form at https://stakeholders.ofcom.org.uk/consultations/enhancers/howtorespond/form
- By email - especially for larger submissions - particularly those with supporting charts, tables or other data – to enhancers@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet (see next page).

[10] The authorisation, whether ultimately through mobile network operator-led solutions, licensing or exemption of such devices might also aid Ofcom in carrying out its enforcement activities. This may occur, for example, by facilitating the removal from the market of those devices that are unlicensed and outside the terms of any exemption, and which may have the potential to degrade the service for other users of the mobile cellular network.

1.28 Responses may alternatively be posted or faxed to the address below, marked with 'Call for input on mobile coverage enhancers and their use in licensed spectrum'.

Robindhra Mangtani
Ofcom, SITE, 3rd Floor
Riverside House
2A Southwark Bridge Road
London SE1 9HA
Fax: 020 7981 3333

robindhra.mangtani@ofcom.org.uk

1.29 We do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.

1.30 Ofcom may publish responses to this CFI. Ofcom is subject to restrictions on the way we disclose and use information (see, for example, section 111 of the WT Act 2006). These seek to strike a balance between Ofcom's proper performance of our functions and protecting the confidentiality of stakeholders' information. They are relevant to material supplied in response to this call for input.

1.31 Ofcom will comply with our obligations and the restrictions in this regard. If your submission includes material which you consider is confidential, please indicate what that material is and why it is confidential. It is not helpful to make blanket claims of confidentiality for all submitted material. Please also provide a non-confidential version of your response (with confidential information omitted).

1.32 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach to intellectual property rights is explained further on its website at http://www.ofcom.org.uk/about/accou/disclaimer.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title: Mobile Coverage Enhancers and their use in licensed spectrum

To (Ofcom contact): Robindhra Mangtani

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

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

Nothing ☐

Whole response ☐

Part of the response ☐

Name/contact details/job title ☐

Organisation ☐

If there is no separate annex, which parts?

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

DECLARATION

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

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

Name

Signed (if hard copy)