
Notice of proposal to make the Wireless Telegraphy (Mobile Repeater) (Exemption) (Amendment) Regulations 2019

Technical changes for in-vehicle mobile phone
repeaters

CONSULTATION:

Publication date: 12 July 2019

Closing date for responses: 5 September 2019

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1. Overview

Ofcom is responsible for authorising use of the radio spectrum. We permit the use of the radio spectrum either by granting wireless telegraphy licences under the Wireless Telegraphy Act 2006 (the “WT Act”) or by making statutory regulations exempting users of particular equipment from the requirement to hold such a licence.

What we are proposing – in brief

Ofcom proposes to make a slight change to the technical parameters allowed for licence exempt in-vehicle low gain mobile phone repeaters and to amend the Wireless Telegraphy (Mobile Repeater) (Exemption) Regulations 2018 to implement the change.

Accessing the mobile network from a vehicle can be troublesome for some consumers, particularly where they are travelling at the edge of mobile network coverage. The signal penetration losses through the glass and bodywork of some modern vehicles can mean that, where the mobile phone signal is weak outdoors, it falls below a usable level once inside the vehicle. In-vehicle mobile phone repeaters, also known as signal boosters and signal enhancers, can help to mitigate the loss of the mobile signal through the car’s bodywork

The amendment has been requested by an equipment supplier of low gain mobile phone repeaters which are used in the manufacture of European cars. Having undertaken our own technical analysis, Ofcom considers it appropriate to consult on changes to increase the scope of the current exemption. The proposed changes would:

- Include the 2.6 GHz Frequency-division duplex (FDD) band (2500-2570 MHz uplink, 2620-2690 MHz downlink) in the list of licence exempt frequency bands;
- Increase the maximum permitted gain:
 - a) to 36 dB in relevant frequency bands above 1 GHz from the existing 21 dB; and
 - b) to 30 dB in relevant frequency bands below 1 GHz from the existing 15 dB.

The changes also work to clarify the way we measure the maximum permitted gain by expressly including any external antenna gains

Our objective is to help improve mobile reception in vehicles, without giving rise to undue interference or other adverse impacts on technical quality of service of mobile operators’ networks, other mobile users and other users of the radio spectrum.

The details of our technical analysis are set out in Annex A3 to this document. The analysis shows that undue interference or other adverse impacts on technical quality of service are unlikely and therefore the technical parameters can be changed.

We invite any comments on the proposed regulations and technical changes in IR 2102 by **5pm on Friday, 6 September 2019**.

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

2. Background

- 2.1 This Notice sets out Ofcom’s proposal to revise certain technical parameters and amend the Wireless Telegraphy (Mobile Repeater) (Exemption) Regulations 2018 (the “Principal Regulations”) by making the Wireless Telegraphy (Mobile Repeater) (Exemption) (Amendment) Regulations 2019 (the “Proposed Regulations”) statutory instrument. The Notice is given in accordance with sections 122(4) and (5) of the WT Act.
- 2.2 The Principal Regulations currently exempt (amongst other things) the in-vehicle use of mobile repeater devices, where their use complies with the technical conditions set out in the UK Interface Requirements 2102.2 (“**IR 2102.2**”), which are contained in the UK Interface Requirements 2102 (“**IR 2102**”).¹
- 2.3 We are proposing to change certain technical parameters set out in IR 2102.2 and update the Principal Regulations by referring to the revised version of such interface requirements.
- 2.4 Accessing the mobile network from a vehicle can be troublesome for some consumers, particularly where they are travelling at the edge of mobile network coverage. The signal penetration losses through the glass and bodywork of some modern vehicles can mean that, where the mobile phone signal is weak outdoors, it falls below a usable level once inside the vehicle.
- 2.5 In 2017 and 2018, we consulted on a set of technical requirements for in-vehicle mobile phone repeaters to allow them to be used on a licence-exempt basis. This was part of several different initiatives Ofcom has undertaken to support improved mobile coverage in general.
- 2.6 The decision to exempt in-vehicle mobile phone repeaters was explained in our statement of 24 October 2017, “Licence Exempt Mobile Phone Repeaters Indoor and In-vehicle”² (the “October 2017 statement”). During this consultation, Ofcom flagged the possible future inclusion of the 2.6GHz band in the licence exemption.
- 2.7 In October 2018, Ofcom was approached by an equipment supplier of low gain mobile phone repeaters used in the manufacture of European cars. They formally requested Ofcom to consider making changes to the technical conditions contained in IR 2102.2 and provided technical evidence supporting the request.³
- 2.8 Having undertaken our own technical analysis, Ofcom considers it appropriate to consult on proposals intended to increase the scope of the current licence exemption for operating low-gain mobile phone repeaters in vehicles. Ofcom’s technical analysis considers whether

¹ “UK Interface Requirements IR 2102 – Licence exempt static indoor and low gain mobile phone repeaters”

https://www.ofcom.org.uk/_data/assets/pdf_file/0016/112291/IR_2102.pdf

The interface requirements for indoor use (IR 2102.1) and in-vehicle use (IR 2101.2) form part of a single document (IR 2102).

² https://www.ofcom.org.uk/_data/assets/pdf_file/0019/107254/Repeaters-Statement-2017.pdf at page 30-32

³ IR 2102.2 provides the current minimum technical requirements for the use of low gain mobile phone repeaters for in-vehicle use and was published by Ofcom on 22 March 2018.

the changes to the technical conditions for in-vehicle repeaters could cause undue interference with wireless telegraphy, namely interference with base stations, other phones or radar operating in neighboring frequency bands. In addition, we look at the specific limits to protect against oscillation and to reduce the adverse effects on the technical quality of service of the mobile operators' networks.

What are low gain mobile phone repeaters for in-vehicle use?

2.9 The technical conditions set out in IR 2012.2 apply to the use of “a low gain mobile phone repeater for in-vehicle use”. As defined in the Principal Regulations, such devices include a wireless telegraphy station or apparatus which amplifies the radio signal carried over a GSM⁴, LTE⁵, UMTS⁶ or WiMax⁷ system. A device would fall within this definition if, for instance, it consisted of the following:

- i) An external antenna that receives downlink signals from the base station and transmits the repeated uplink signals from the mobile handset;
- ii) A two-way amplifier – specifically, a smart amplifier which identifies the frequency channels in use and compensates for the signal loss through the system for these identified frequency channels, in both the uplink and downlink direction, whilst limiting emissions with a potential negative impact to such a level that harmful interference is avoided (e.g. in adjacent channels); and
- iii) A near-field coupler, also known as a cradle, that couples with the mobile handset to receive the handset's uplink signals and transmit the repeated downlink signals from the base station to the handset.

Document structure

2.10 This document is structured as follows:

- i) Section 3 contains the Notice of Proposals.
- ii) Section 4 sets out the general effects of the Proposed Regulations.
- iii) Annex A1 contains a draft of the Proposed Regulations.
- iv) Annex A2 contains a draft of the Proposed IR 2102.2.
- v) Annex A3 contains the technical analysis of the proposed changes.
- vi) Annexes A4 to A7 contain details of Ofcom's consultation processes.

⁴ Global System for Mobile Communications.

⁵ Long Term Evolution telecommunications system.

⁶ Universal Mobile Telecommunications system.

⁷ Worldwide Interoperability for Microwave Access telecommunications system.

3. Notice of proposals

Notice of proposals

- 3.1 This Notice is given in accordance with sections 122(4) and (5) of the WT Act and covers a proposal to amend the Principal Regulations.
- 3.2 This section sets out the legal framework for making the Proposed Regulations, summarises the technical changes currently proposed and provides a provisional assessment that implementing the proposals would be consistent with the requirements of the WT Act.

The legal framework

- 3.3 Ofcom's statutory powers and duties in relation to spectrum management are set out primarily in the Communications Act 2003 (the "2003 Act") and the WT Act. Amongst our functions are the making available of frequencies for use for particular purposes and the granting of rights of use of spectrum through wireless telegraphy licences and licence exemptions.
- 3.4 Our principal duties under the 2003 Act, when carrying out our functions and exercising our powers, are to further the interests of citizens and consumers, where appropriate by promoting competition. In doing so, we are also required (among other things) to secure the optimal use of spectrum and the availability throughout the United Kingdom of a wide range of electronic communications services.
- 3.5 We must also have regard to: (i) the desirability of promoting competition in relevant markets; (ii) the desirability of encouraging investment and innovation in relevant markets; (iii) the different needs and interests, so far as the use of the electro-magnetic spectrum for wireless telegraphy is concerned, of all persons who may wish to make use of it; and (iv) the different interests of persons in the different parts of the United Kingdom, of the different ethnic communities within the United Kingdom and of persons living in rural and in urban areas.
- 3.6 Additionally, in carrying out our spectrum functions we have a duty under section 3 of the WT Act to have regard in particular to: (i) the extent to which the spectrum is available for use, or further use, for wireless telegraphy; (ii) the demand for use of that spectrum for wireless telegraphy; and (iii) the demand that is likely to arise in future for such use.
- 3.7 We also have a duty to have regard to the desirability of promoting: (i) the efficient management and use of the spectrum for wireless telegraphy; (ii) the economic and other benefits that may arise from the use of wireless telegraphy; (iii) the development of innovative services; and (iv) competition in the provision of electronic communications services.

- 3.8 Under section 8(1) of the WT Act, it is unlawful to establish or use a wireless telegraphy station or install or use wireless telegraphy apparatus except under and in accordance with a wireless telegraphy licence granted under the WT Act.
- 3.9 Under sections 8(3) - 8(3B) of the WT Act, Ofcom may make regulations exempting from the licensing requirements under section 8(1) the establishment, installation or use of wireless telegraphy stations or wireless telegraphy apparatus of such classes or description as may be specified in the regulations, either absolutely or subject to such terms, provisions and limitations as may be specified.
- 3.10 Under sections 8(4) and 8(5) of the WT Act, we must make regulations to exempt stations and apparatus from the requirement to be licensed if their establishment, installation or use is not likely to:
- a) involve undue interference with wireless telegraphy;
 - b) have an adverse effect on technical quality of service;
 - c) lead to inefficient use of the part of the electromagnetic spectrum available for wireless telegraphy;
 - d) endanger safety of life;
 - e) prejudice the promotion of social, regional or territorial cohesion; or
 - f) prejudice the promotion of cultural and linguistic diversity and media pluralism.
- 3.11 In accordance with the requirements of section 8(3B) of the WT Act, the terms, provisions and limitations specified in the regulations must be:
- a) objectively justifiable in relation to the wireless telegraphy stations or wireless telegraphy apparatus to which they relate;
 - b) not such as to discriminate unduly against particular persons or against a particular description of persons;
 - c) proportionate to what they are intended to achieve; and
 - d) transparent in relation to what they are intended to achieve.
- 3.12 Before making any exemption regulations, we are required by section 122(4) of the WT Act to give statutory notice of our proposal to do so. Under section 122(5), such notice must state that we propose to make the regulations in question, set out their general effect, specify an address from which a copy of the proposed regulations or order may be obtained, and specify a time period of at least one month during which any representations with respect to the proposal must be made to us.
- 3.13 In order to update IR 2102.2 as proposed, the proposed new requirements will need to be notified to the European Commission in accordance with the Radio Equipment Directive

(“RED”)⁸ and the Technical Standards and Regulations Directive⁹. The Commission and Member States have three months in which to comment on the draft technical standard before it may be adopted. We will therefore need to wait until this process is complete before we can determine whether or not it is appropriate to update IR 2102.2 as proposed and implement this change by making the Proposed Regulations.

Proposed changes

- 3.14 In summary, we are proposing to update the interface requirements set out in IR 2102.2 with respect to the low gain mobile phone repeaters for in-vehicle use by:
- Increasing the maximum gain limits for in-vehicle mobile repeaters from 21 dB to 36 dB in relevant frequency bands above 1 GHz;
 - Increasing the maximum gain limits for in-vehicle mobile repeaters from 15 dB to 30 dB in relevant frequency bands below 1 GHz; and
 - Including the 2.6 GHz FDD band in the list of licence-exempt frequency bands.
- 3.15 As part of the technical analysis conducted in support of the changes, we have also clarified the way we measure the maximum permitted gain. This is measured by including any external antenna gains and is reflected in the amendments that we are proposing to make to IR 2102.2.
- 3.16 By updating the interface requirements for the in-vehicle use of mobile repeaters as set out above, newer in-vehicle mobile repeater products will be able to operate on a licence-exempt basis in the UK.

Increasing the maximum gain limits

- 3.17 The October 2017 statement set maximum gain limits to avoid the risk of undue interference with wireless telegraphy or adverse effects on the technical quality of services. Those limits were intended to overcome the coupling loss between the cradle of an in-vehicle repeater and the relevant mobile phone handset.
- 3.18 Accounting for the new way we will measure the maximum permitted gain, we are proposing to change the maximum permitted gain of low gain mobile phone repeaters for in-vehicle use:
- a) to increase from 21 dB to 36 dB in relevant frequency bands above 1 GHz; and
 - b) to increase from 15 dB to 30 dB in relevant frequency bands below 1 GHz.
- 3.19 Our technical analysis has considered the potential risk of causing undue interference or other adverse impacts on mobile operators’ networks, other mobile users or other users of the radio spectrum. In particular, Ofcom’s analysis (set out in detail in Annex A3) showed

⁸ Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC. See, in particular, Article 8.

⁹ Directive (EU) 2015/1535 of the European Parliament and of the Council, laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services, 9 September 2015. See in particular, Articles 5 and 6.

that the proposed increases of the maximum permitted gain are unlikely to cause undue interference or other adverse impacts on mobile networks and users of radio spectrum because:

- a) Irrespective of the maximum permitted gain or frequency band in use, the maximum uplink power requirement means the maximum uplink signals from low gain mobile phone repeaters for in-vehicle use cannot exceed the maximum uplink signals from mobile phones. However, it is well understood that the amplifier will also amplify any underlying noise (such as noise from the mobile phone), and hence a maximum permitted gain must be enforced to mitigate the risk of causing interference from amplifying this noise. The proposed maximum permitted gain limits are sufficient to overcome the coupling loss of an efficient near-field coupler, so applying the particular limit prevents less efficient near-field couplers being used with higher gain amplifiers which could lead to an unacceptable increase in noise. Accordingly, the uplink transmissions will not exceed those of a mobile phone, the use of which is already accepted;
- b) The proposed maximum permitted gain limits ensure that once the repeated downlink signal propagates beyond the vehicle it will be at a power that is at least 6 dB lower than the downlink signal received directly from the base station at the same location. Accordingly, the repeated signal is unlikely to cause undue interference with the mobile operators' networks, other mobile users or other users of the radio spectrum;
- c) The proposed maximum permitted gain limit ensures that the loss between the internal transmitter/receiver and the roof-top antenna exceeds the maximum gain. This means that the repeater cannot experience a positive gain loop and therefore protecting against oscillations, thus ensuring that it is unlikely to cause adverse effects on the technical quality of service of the mobile operators' networks.¹⁰

Including the 2.6 GHz FDD band

- 3.20 When the Principal Regulations were made, the relevant interface requirements did not include technical requirements for in-vehicle repeaters operating in the 2.6 GHz FDD band. We are proposing to now include the 2.6 GHz band in the updated version of IR 2102.2 so that products incorporating this frequency band could operate legally within the UK on a licence-exempt basis.
- 3.21 The 2.6 GHz FDD band was not originally included because of concerns raised that the inclusion of the band may cause interference into the adjacent frequency band used for Aeronautical Radars.
- 3.22 Our technical analysis examines the potential risk of undue interference from the "in-vehicle use" of mobile repeaters to Aeronautical Radar in the adjacent frequency band as well as mobile users and other users of the radio spectrum. The analysis (set out in detail in

¹⁰ See Annex A3.

Annex A3) shows that the inclusion of the 2.6 GHz band is extremely unlikely to cause undue interference because:

- a) An in-vehicle repeater will only transmit in the 2.6 GHz uplink band from locations where it is receiving a downlink signal from a 2.6 GHz base station (coordinated with radar operation above 2.7 GHz), and in locations where the 2.6 GHz uplink from mobile phones is already accepted.
- b) Due to the automatic standby requirement, it is extremely unlikely that an in-vehicle mobile phone repeater system would be activated in the uplink by a 2.7-3.1 GHz radar signal's out-of-band power being received at the near-field coupler.
- c) To conform with the essential requirements set out in the Radio Equipment Directive (Directive 2014/53/EU), the amplifier must be designed to amplify signals of the frequency band in use, while limiting emissions with a potential negative impact to such a level that harmful interference is avoided (e.g. in adjacent channels). This conformance means that when the system is activated, it will only amplify signals in:
 - i) the mobile uplink band, whilst avoiding harmful interference to the 2.7-3.1 GHz radar signal from the rooftop antenna; and
 - ii) the mobile downlink band, whilst avoiding harmful interference to the 2.7-3.1 GHz radar signal at the near-field coupler.
- d) The addition of the 2.6 GHz FDD band is extremely unlikely to cause undue interference as:
 - i) In the uplink, the in-vehicle repeater transmissions will not exceed those of a mobile phone, which are already accepted in the 2.6 GHz FDD band.
 - ii) In the downlink, the coordination with 2.6 GHz will be unaffected by the repeated downlink signal from the in-vehicle repeater because the signal level received at any location beyond the vehicle will not increase.¹¹

Our provisional assessment

3.23 For the reasons set out in this Notice, our provisional assessment is that our proposals are consistent with our statutory duties and the proposed terms, provisions and limitations would meet the requirements of section 8(4) of the WT Act.

3.24 In our view, the proposals set out in this document are:

- a) **objectively justified** in that they address the risks of undue interference that might otherwise arise from the use of in-vehicle mobile repeaters;
- b) **not unduly discriminatory** against particular persons or against a particular description of persons in that they would apply to all users of relevant repeaters (and, indirectly, to all manufacturers and sellers);

¹¹ See Annex A3.

- c) **proportionate to what they are intended to achieve**, in that they would be necessary to ensure that use of the relevant in-vehicle repeaters would not be likely to cause undue interference or to have an adverse effect on technical quality of the mobile networks, mobile users or other users of the radio spectrum; and
- d) **transparent** in relation to what they are intended to achieve, in that they would be clear on the face of the revised interface requirements and the amended Principal Regulations, in addition to being described and explained in this Notice.

4. General effect

4.1 In this section, we set out the general effects of the Proposed Regulations as required by section 122(5) of the WT Act.

Extent of application

4.2 The Proposed Regulations would apply in the United Kingdom, the Channel Islands and the Isle of Man, subject to formal agreement of the Crown Dependencies.

Proposed Regulations

Overall general effect

Definition of “IR 2102.2” (interface requirements for in-vehicle use)

4.3 The Proposed Regulations would implement Ofcom’s proposal to update the technical requirements for the in-vehicle use of certain mobile phone repeaters by amending the definition of “IR 2102.2” in regulation 2(f) of the Principal Regulations. This would update the publication date of the current version of IR 2102.2 from 22 March 2018 to a new date, following any amendments which are made to those interface requirements as a result of this consultation.

4.4 If regulation 2(f) for the Principal Regulations are amended as proposed, this would have the effect of changing the scope of the current licence exemption to:

- include the 2.6 GHz Frequency-division duplex (FDD) band (2500-2570 MHz uplink, 2620-2690 MHz downlink) in the list of licence-exempt frequency bands;
- increase the maximum permitted gain to:
 - 36 dB in all relevant frequency bands above 1 GHz; and
 - 30 dB in all relevant frequency bands below 1 GHz; and
- measure the maximum permitted gain including any external antenna gain.

4.5 In-vehicle devices that do not meet the revised interface requirements would not fall within the licence exemption. As such, their establishment, installation and use without a licence would be a criminal offence.

Definition of “IR 2102.1” (interface requirements for indoor use)

4.6 As we are proposing to publish an updated version of IR 2101, the Proposed Regulations would also amend the definition of “IR 2102.1” in regulation 2(e) of the Principal Regulations. This is because the interface requirements for indoor use (IR 2102.1) and in-vehicle use (IR 2101.2) form part of a single document (IR 2102). Therefore, references to both parts of such document (rather than just the part entitled “IR 2102.2”) would be amended to show the date of making and publication of the revised IR 2102 document.

Since we are not proposing to make any substantive change to the interface requirements for indoor use (IR 2102.1), the indoor use of mobile repeaters would remain subject to the current technical conditions in this part of the interface requirements.

Definition of “uplink frequencies”

- 4.7 The Proposed Regulations would omit the definition of “uplink frequencies” from the Principal Regulations. This minor change would have the effect of simplifying the Principal Regulations as the definition of “uplink frequencies” is redundant.

Notifying the European Commission

- 4.8 As stated above, in order to implement the Proposed IR 2102.2 as intended, we will first need to notify these amendments to the European Commission in accordance with the RED and the Technical Standards Directive. The Commission and Member States have three months in which to comment on the draft technical standard before it may be adopted. We will therefore need to wait until this process is complete before we will be in a position to determine whether or not it is appropriate to update IR 2120 as proposed and implement this change by making the Proposed Regulations. This means that the earliest we anticipate that the amendments to IR 2120 may be implemented is October 2019.

Comments and representations

- 4.9 The Proposed Regulations that would amend the Principal Regulations are set out in Annex A1.
- 4.10 The proposed amendments to IR 2102.2, setting out new technical conditions to include the 2.6 GHz FDD band and the revised maximum permitted gains, are set out in Annex A2.
- 4.11 This Notice, including the proposed amendments to IR 2102.2 and the Proposed Regulations, is available on Ofcom’s website (www.ofcom.org.uk). A paper copy may be obtained from Elizabeth Press, Ofcom, Riverside House, 2a Southwark Bridge Road, London SE1 9HA.
- 4.12 We invite stakeholders to provide comments on our proposals. In particular, we invite them to respond to the questions set out in Annex A7.
- 4.13 For the avoidance of doubt, we are not inviting comments on the substance of Ofcom’s original decision set out in the October 2017 statement (which was the subject of previous consultation in 2017).
- 4.14 A regulatory impact assessment for the Proposed Regulations will be made when the regulations are made.
- 4.15 Comments on the Proposed Regulations and Proposed IR 2102 are invited **by 5pm on Friday 6 September 2019**. Subject to our consideration of responses, we intend to bring the Proposed IR 2120.2 and the Proposed Regulations into force in October 2019.

A1. Proposed Regulations

STATUTORY INSTRUMENTS

2019 No. [***]

ELECTRONIC COMMUNICATIONS

The Wireless Telegraphy (Mobile Repeater) (Exemption) (Amendment) Regulations 2019

Made - - - - - ***

Coming into force - - - - - ***

The Office of Communications (“OFCOM”) make the following Regulations in exercise of the powers conferred by sections 8(3) and 122(7) of the Wireless Telegraphy Act 2006^(a) (the “Act”) and in exercise of those sections of the Act^(b) as extended to the Bailiwick of Guernsey, the Bailiwick of Jersey and the Isle of Man.

Before making these Regulations, OFCOM have given notice of their proposal to do so in accordance with section 122(4)(a) of the Act, published notice of their proposal in accordance with section 122(4)(b) of the Act, and considered the representations made to them before the time specified in the notice in accordance with section 122(4)(c) of the Act.

Citation and commencement

1. These Regulations may be cited as the Wireless Telegraphy (Mobile Repeater) (Exemption) (Amendment) Regulations 2019 and shall come into force on [***].

Amendments of the Wireless Telegraphy (Mobile Repeater) (Exemption) Regulations 2018

2. The Wireless Telegraphy (Mobile Repeater) (Exemption) Regulations 2018^(c) are amended in accordance with regulation 3.

3. In regulation 2 (interpretation)—

(a) for paragraph (e), substitute the following paragraph—

“(e) “IR2102.1” means section “2102.1: Minimum requirements for the use of: static mobile phone repeaters for indoor use” contained within the document entitled “UK Interface

^(a) 2006 c. 36.

^(b) Sections 8(3) and 122(7) of the Act were extended to the Bailiwick of Guernsey by article 2 of the Wireless Telegraphy (Guernsey) Order 2006 (S.I. 2006/3325); to the Bailiwick of Jersey by article 2 of the Wireless Telegraphy (Jersey) Order 2006 (S.I. 2006/3324); and to the Isle of Man by article 2 of the Wireless Telegraphy (Isle of Man) Order 2007 (S.I. 2007/278).

^(c) S.I. 2018/399.

Requirements IR2102 – Licence exempt static indoor and low gain mobile phone repeaters” published by OFCOM on [***];”;

(b) for paragraph (f), substitute the following paragraph —

“(f) “IR2102.2” means section “2102.2: Minimum requirements for the use of: low gain mobile phone repeaters for in-vehicle use” contained within the document entitled “UK Interface Requirements IR2102 – Licence exempt static indoor and low gain mobile phone repeaters” published by OFCOM on [***];”;

(c) at the end of paragraph (k), insert “and”; and

(d) omit paragraph (l).

[Date]

[Name]
Group Director Spectrum Group
For and by the authority of OFCOM

A2. Proposed changes to IR 2102

A2.1 This Annex shows the changes that we are proposing to make to **IR 2102** using tracked changes. We have taken the following approach to show the changes that we are proposing to make:

(a) the words in red (and in bold font) are those that we have decided to insert (e.g. “**example**”);

(b) the words struck through are those that we have decided to delete (e.g. “~~example~~”).

| IR 2102.2: Minimum requirements for the use of: low gain mobile phone repeaters for in-vehicle use | | |
|--|-------------------------------------|--|
| Mandatory (1-11) | | |
| 1 | Radiocommunication Service | Mobile |
| 2 | Application | Low gain mobile phone repeaters for in-vehicle use; no fixed installations |
| 3 | Frequency band | <p>800 791-721 MHz (Downlink) 832-862 MHz (Uplink)</p> <p>900 880-915 MHz (Uplink) 925-960 MHz (Downlink)</p> <p>1800 1710-1785 MHz (Uplink) 1805-1880 MHz (Downlink)</p> <p>2100 1920-1980 MHz (Uplink) 2110-2170 MHz (Downlink)</p> <p>2600 2500-2570 MHz (Uplink) 2620-2690 MHz (Downlink)</p> |
| 4 | Channelling | Not specified |
| 5 | Modulation/Occupied bandwidth | Not specified |
| 6 | Direction/Separation | Repeater transmit/receive |
| 7 | Transmit power/Power density | See Table A2 |
| 8 | Channel access and occupation rules | <p>Maximum permitted gain</p> <p>In both the Uplink and the Downlink the maximum permitted system gain, referenced between the external antenna and the input port to the cradle, is:</p> |

| | | |
|----------------------------|-----------------------------------|---|
| | | <ul style="list-style-type: none"> • 21 dB in relevant frequency bands above 1 GHz; and • 15 dB in relevant frequency bands below 1 GHz. <p>In both the Uplink and the Downlink the maximum permitted gain¹⁵ is</p> <ul style="list-style-type: none"> • 36 dB in relevant frequency bands above 1 GHz; and • 30 dB in relevant frequency bands below 1 GHz. |
| | | <p>Automatic Standby</p> <p>When the repeater is no longer serving an active device connection it must, after no more than 5 minutes, reduce any uplink noise power to no more than -70 dBm/MHz TRP.</p> |
| 9 | Authorisation regime | Licence Exempt |
| 10 | Additional essential requirements | Nil |
| 11 | Frequency planning assumptions | Not specified |
| Informative (12-15) | | |
| 12 | Planned changes | |
| 13 | Reference | EN 303 609 EN 301 908-11 EN 301 908-15 |
| 14 | Remarks | |
| 15 | Notification Number | 2017/509/UK (TBA) |

Table A2

| Band | Technology | Maximum Uplink Power | Maximum Downlink power (in-vehicle use only) |
|------------------|--------------------|----------------------|--|
| 800 | Technology Neutral | 23 dBm TRP | PSD 10 dBm / 5 MHz TRP; and Total 17 dBm TRP |
| 900 | GSM | 33 dBm TRP | 10 dBm TRP |
| 1800 | GSM | 30 dBm TRP | 10 dBm TRP |
| 900, 1800 & 2100 | 3G | 24 dBm TRP | PSD: 10 dBm / 5 MHz TRP; and Total: 17 dBm TRP |

¹⁵ Including any external antenna gain.

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| | | | |
|-------------------------------------|---------------------------|-------------------|---|
| 900 & 1800 | LTE & WiMAX | 23 dBm TRP | PSD: 10 dBm / 5 MHz TRP; and Total: 17 dBm TRP |
| 2100 | Technology Neutral | 24 dBm TRP | PSD: 10 dBm / 5 MHz TRP; and Total: 17 dBm TRP |
| 2600 | Technology Neutral | 23 dBm TRP | PSD: 10 dBm / 5 MHz TRP; and Total: 17 dBm TRP |
| Where PSD is power spectral density | | | |

A3. Technical analysis

Background

- A3.1 In Ofcom's October 2017 statement, the maximum permitted gain limit imposed was based on the gain of systems installed by European car manufacturers at the time of consultation. The limits were also below the maximum permitted gain imposed by the Federal Communications Commission (FCC) in the USA for in-vehicle repeaters which use direct contact coupling (i.e. "cradle-type" repeaters). To date, no cases of interference caused by these in-vehicle repeaters have been reported to Ofcom.
- A3.2 Ofcom did not include technical requirements for in-vehicle repeaters operating in the 2.6 GHz FDD band in the October 2017 statement because of concerns raised that licence-exempt repeaters could not be coordinated with radar operations above 2.7 GHz as they would be installed by consumers.
- A3.3 We believe that this concern was most likely relevant to the use of static mobile phone repeaters for indoor use, rather than the use of low gain mobile phone repeaters for in-vehicle use. At the time of publishing the October 2017 statement, Ofcom had not conducted any specific analysis on whether there was a material risk of interference from low gain in-vehicle repeaters.
- A3.4 In this Technical Annex, Ofcom investigates the impact of the proposed changes, to:
- a) increase the maximum permitted gain of low gain mobile phone repeaters for in-vehicle use to:
 - i) 36 dB in relevant frequency bands above 1 GHz, and;
 - ii) 30 dB in relevant frequency bands below 1 GHz; and,
 - b) include the 2.6 GHz FDD band in the list of license exempt frequency bands for low gain mobile phone repeaters for in-vehicle use.
- A3.5 We have considered whether the changes to the technical conditions for in-vehicle repeaters could cause undue interference with wireless telegraphy, namely interference with base stations, other phones or radar operating in neighboring bands. In addition, we have proposed specific limits to protect against oscillation and to reduce the adverse effects on the technical quality of service of the mobile operators' networks.
- A3.6 On the basis of our assessment, we consider that the proposed changes ensure that low gain mobile phone repeaters for in-vehicle use remain extremely unlikely to cause undue interference or other adverse impacts on mobile operators' networks, other mobile users or other users of the radio spectrum.

Assumptions

- A3.7 Based on the in-vehicle repeaters currently available on the market, and realistic installation locations, it is assumed that the internal transmitter/receiver will be located in

the centre console of the vehicle. This means it will be at least 75 cm from the edge of the vehicle body¹⁶, and hence always 75 cm away from any spectrum users outside of the vehicle.

Downlink analysis

Impact of increasing the maximum permitted gain

- A3.8 The maximum permitted gain is in place to ensure that mobile operators' networks, other mobile users or other users of the radio spectrum remain protected from interference. Specifically:
- a) co-channel mobile phone users outside of the vehicle must receive their signal directly from the base station with a C/I of at least 6 dB, ensuring that the signal from the in-vehicle repeater is received as an acceptable level of interference; and,
 - b) the coverage outside the vehicle must not increase, protecting nearby co-channel base stations from inter-site interference and protecting adjacent spectrum users from any noticeable increase in interference from the mobile downlink band.
- A3.9 Therefore, the maximum permitted gain must be set at a level which guarantees that this is true for all frequency bands.
- A3.10 Free-space path loss from the internal transmitter/receiver to the edge of the vehicle body (at least 75 cm) would result in at least 28 dB of attenuation in relevant frequency bands below 1 GHz (based on LTE 800), and at least 34 dB of attenuation in relevant frequency bands above 1 GHz (based on LTE 1800). Therefore, it can be guaranteed that the signal propagating from the internal transmitter/receiver is going to be attenuated by at least this amount before reaching any users outside the vehicle.
- A3.11 It is unlikely that any of the users requiring protection will be only 75 cm from the internal transmitter/receiver fitted in the centre of a vehicle – this would only happen if a device was touching the outside of the vehicle. To account for the low likelihood of this scenario, it is assumed that the separation is instead 150 cm. This assumption results in the protected user being 75 cm away from the vehicle body. This separation will occur for nearly all interference scenarios and will result in 6 dB more attenuation compared to those values given above.
- A3.12 Additional attenuation will also occur due to the surrounding clutter, increasing the overall attenuation of the signal from the cradle to the victim receiver. The amount of additional attenuation will depend on many factors, including the materials that the vehicle is made of and whether the vehicle windows are closed.

¹⁶ City cars (the smallest category of cars) are approximately 150 cm wide. The high-end cars that these systems are currently installed in are significantly larger.

- A3.13 In this analysis, an additional attenuation of 3 dB is assumed. This is to account for the vehicle penetration loss (the loss caused from the mobile signal propagating from inside to directly outside the vehicle). This 3 dB value is chosen based on a study commissioned by Ofcom¹⁷ which found a median loss from vehicle penetration of 8 dB and ITU-R P.679-4¹⁸ which found a median loss from vehicle penetration of 3–8 dB. Additional clutter loss will occur from the internal transmitter/receiver to users at a distance from the vehicle due to the surrounding environmental clutter. This additional clutter loss is not accounted for in this analysis. Therefore, additional attenuation of 3 dB will occur for nearly all interference scenarios.
- A3.14 Although it is possible for a protected user to be closer than 150 cm from the internal transmitter/receiver while outside of the vehicle, or the additional attenuation caused by the surrounding clutter to be less than 3 dB, the risk of these scenarios is low. Accordingly, the risk of both these scenarios occurring at once is extremely low. In any case, the mobility of the in-vehicle repeater makes any interference scenarios transient, further reducing the probability of these interference scenarios. Therefore, the likelihood of the signal propagating from the internal transmitter/receiver being attenuated by less than 37 dB (28 dB + 3 dB + 6 dB) for relevant frequency bands below 1 GHz and 43 dB (34 dB + 3 dB + 6 dB) for relevant frequency bands above 1 GHz before reaching any users outside the vehicle is insignificant.
- A3.15 To ensure that a co-channel mobile phone user outside of the vehicle receives the signal directly from the base station with a C/I of at least 6 dB, the repeated signal must be received at a power that is 6 dB less than the signal propagating directly from the base station. For this to be true, the following equation must hold:

$$\begin{aligned} \text{Signal from BS} - \frac{C}{I} \\ > \text{Signal from BS} + \text{Repeater Gain (Including Antenna Gain)} \\ - \text{Attenuation from Internal Transmitter/Receiver to Protected User} \end{aligned}$$

where,

$$\begin{aligned} \text{Attenuation from Internal Transmitter/Receiver to Protected User} \\ > 37 \text{ dB for relevant frequency bands below 1 GHz} \end{aligned}$$

$$\begin{aligned} \text{Attenuation from Internal Transmitter/Receiver to Protected User} \\ > 43 \text{ dB for relevant frequency bands above 1 GHz} \end{aligned}$$

$$C/I = 6 \text{ dB}$$

- A3.16 This equation holds when the repeater gain is less than or equal to 31 dB for relevant frequency bands below 1 GHz and 37 dB for relevant frequency bands above 1 GHz.
- A3.17 Ensuring the coverage outside of the vehicle does not increase, protecting nearby co-channel base station from inter-site interference and protecting adjacent spectrum users

¹⁷ <https://www.ofcom.org.uk/research-and-data/technology/general/in-car-attenuation>

¹⁸ https://www.itu.int/dms_pubrec/itu-r/rec/p/R-REC-P.679-4-201507-1!!PDF-E.pdf

from any noticeable increase in interference from the mobile downlink band, is a less stringent requirement which is met with $C/I = 0$.

- A3.18 Ofcom has not assessed the impact of the low gain repeater on other mobile phones inside of the vehicle because this is a matter under the control of the owner of the vehicle. If other phones are already receiving adequate signal inside the vehicle, there would seem to be no need for the in-vehicle repeater to be operating, while if there is no adequate signal then the in-vehicle repeater is not designed to improve the signal received by these other mobile phones.

Impact of including the 2.6 GHz band

- A3.19 During the consultation preceding the October 2017 statement, a stakeholder raised concerns about allowing repeaters to use the 2.6 GHz band, due to the possible impact on aeronautical radars above 2.7 GHz. No specific details or evidence was submitted.
- A3.20 As shown above, the repeated base station signal generated by the low gain mobile phone repeaters for in-vehicle use will be received at a level at least 6 dB lower than the signal directly from the base station (when outside the vehicle), and even lower in the case of LTE 2600 due to the increased path loss of higher frequencies. This means that the adjacent users are unlikely to receive any noticeable increase in interference from the mobile downlink band.
- A3.21 Furthermore, as low-gain repeaters for in-vehicle use do not increase the coverage of base stations, and the 2.6 GHz base stations' coverage is already coordinated with the aeronautical radar use above 2.7 GHz to protect against harmful interference, there will not be any harmful interference from base station signals repeated by low gain mobile phone repeaters for in-vehicle use.

Uplink analysis

Impact of increasing the maximum permitted gain

- A3.22 Increasing the maximum permitted gain to 31 dB for relevant frequency bands below 1 GHz and 37 dB for relevant frequency bands above 1 GHz does not cause any additional impact in the uplink:
- a) there is already a requirement in the uplink that the power from the repeater cannot exceed the maximum power of a mobile phone;
 - b) the relatively low gain limit ensures the underlying noise is not amplified to a harmful level. The proposed gain limit of 31 dB for relevant frequency bands below 1 GHz and 37 dB for relevant frequency bands above 1 GHz is sufficient to overcome the coupling loss of an efficient near-field coupler, so applying this limit prevents less efficient near-field couplers being used with higher gain amplifiers which could lead to an unacceptable increase in noise; and

- c) the system must conform with the essential requirements set out in the Radio Equipment Directive (Directive 2014/53/EU).¹⁹

A3.23 The above-mentioned points mean that the impact from an in-vehicle repeater can be no more than that of a licence exempt mobile phone in the same location. Therefore, the uplink of an in-vehicle repeater can be licence exempt in the same way as a mobile phone.

Impact of including the 2.6 GHz band

A3.24 A mobile phone will only transmit in the 2.6 GHz uplink band when receiving a downlink signal from a base station in the 2.6 GHz downlink band, and the same is true when the mobile phone is connected via an in-vehicle repeater.

A3.25 Therefore, an in-vehicle repeater will only transmit in the 2.6 GHz uplink band from locations where it is receiving a downlink signal from a 2.6 GHz base station (that has been coordinated with radar operation above 2.7 GHz), and hence in locations where 2.6 GHz uplink from mobile phones is already accepted.

A3.26 As described above, the uplink from the in-vehicle repeater in the 2.6 GHz FDD band will be indistinguishable from the uplink from a mobile phone in the 2.6 GHz FDD band, and hence it will appear to other users as a use that is already accepted.

Preventing oscillations

Limiting the maximum permitted gain

A3.27 Due to the low RF isolation between the internal transmitter/receiver and the roof-top antenna, and the lack of anti-oscillation measures, increasing the gain increases the risk of the repeater experiencing a positive gain loop and going into oscillation, causing an adverse effect on a mobile network.

A3.28 Therefore, the maximum permitted gain must be limited to a level which guarantees oscillations do not occur in any frequency bands.

A3.29 Free-space path loss from the internal transmitter/receiver to the roof-top antenna (at least 75 cm) would result in at least 28 dB of attenuation in relevant frequency bands below 1 GHz (based on LTE 800), and at least 34 dB of attenuation in relevant frequency bands above 1 GHz (based on LTE 1800).

A3.30 As described previously, additional attenuation will also occur from vehicle penetration loss. This vehicle penetration loss will result in 3 dB additional attenuation.

A3.31 Therefore, the loss between the internal transmitter/receiver and the roof-top antenna will be at least 31 dB (28 dB + 3 dB) for relevant frequency bands below 1 GHz and 37 dB (34 dB + 3 dB) for relevant frequency bands above 1 GHz.

¹⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0053&from=EN>

A3.32 To ensure that oscillations do not occur, the loss between the internal transmitter/receiver and the roof-top antenna must exceed the repeater gain (including antenna gain). For assurance, we ensure that the loss exceeds the repeater gain by at least 1 dB. For this to be true, the following equation must hold:

$$\text{Loss between the Internal Transmitter/Receiver and the Rooftop Antenna} \\ - \text{Repeater Gain (Including Antenna Gain)} > 1\text{dB}$$

where,

$$\text{Loss between the Internal Transmitter/Receiver and the Rooftop Antenna} \\ > 31 \text{ dB for relevant frequency bands below 1 GHz}$$

$$\text{Loss between the Internal Transmitter/Receiver and the Rooftop Antenna} \\ > 37 \text{ dB for relevant frequency bands above 1 GHz}$$

A3.33 This equation holds when the repeater gain is less than or equal to 30 dB for relevant frequency bands below 1 GHz and 36 dB for relevant frequency bands above 1 GHz.

A3.34 Therefore, it is proposed that the maximum permitted gain be increased to:

- a) 36 dB for relevant frequency bands above 1 GHz; and,
- b) 30 dB for relevant frequency bands below 1 GHz.

Additional analysis

Risk of repeating radar signals in the 2.7-3.1 GHz band

A3.35 The risk of the system repeating a radar signal above 2.7 GHz, using either its uplink or downlink amplifier, and causing interference to these systems needs to be understood.

Uplink

A3.36 The mobile uplink band is 130 MHz away from the radar band. Due to the automatic standby requirement, it is extremely unlikely that the system would be activated in the uplink by a 2.7-3.1 GHz radar signal's out-of-band power being received at the near-field coupler.

A3.37 In any case, to conform with the essential requirements set out in the Radio Equipment Directive (Directive 2014/53/EU), the amplifier must be designed to limit emissions with a potential negative impact to such a level that harmful interference is avoided (e.g. in adjacent channels). This conformance means that when the system is activated, it will only amplify signals in the mobile uplink band, whilst avoiding harmful interference in the 2.7-3.1 GHz radar signal before transmission from the rooftop antenna.

A3.38 Therefore, in the extremely unlikely event that the system is activated in the uplink by a 2.7-3.1 GHz radar signal, the output from the external antenna will be attenuated down to a negligible level, especially when compared to the 2.7-3.1 GHz radar signal outside of the vehicle.

Downlink

- A3.39 The risk of repeating 2.7-3.1 GHz radar signals could theoretically be higher in the downlink because of the design (receiving using an antenna rather than a coupler) as well as because of smaller frequency separation.
- A3.40 However, again due to the conformance with the Radio Equipment Directive (Directive 2014/53/EU) essential requirements, the system will amplify signals in the mobile downlink band, whilst avoiding harmful interference in the 2.7-3.1 GHz radar signal before transmission at the near-field coupler.
- A3.41 Additionally, any radar signals that are transmitted in the downlink will suffer significant propagation losses. Free space path loss over 150 cm results in at least 44 dB attenuation in the radar band, which is significantly more than the maximum in-band gain of the system (which due to conformance with the Radio Equipment Directive (Directive 2014/53/EU) won't be applied in the radar band), even before accounting for any additional propagation losses.
- A3.42 Therefore, the output in the downlink is likely to be attenuated down to a negligible level, and propagation losses to locations outside the vehicle will ensure that this is the case.

Summary

- A3.43 Increasing the maximum permitted gain to no more than 30 dB for relevant frequency bands below 1 GHz and 36 dB for relevant frequency bands above 1 GHz ensures that once the repeated downlink signal propagates beyond the vehicle it is unlikely to cause undue interference or other adverse impacts on mobile operators' networks, other mobile users or other users of the radio spectrum. This is because the repeated downlink signal will be at a power that is at least 6 dB less than the downlink signal received directly from the base station. Additionally, it has been confirmed that increasing the maximum permitted gain to 30 dB for relevant frequency bands below 1 GHz and 36 dB for relevant frequency bands above 1 GHz will ensure protection against oscillations. This is because the loss between the internal transmitter/receiver and the rooftop antenna will always exceed the maximum permitted gain. Our provisional view is that the proposed amendments are unlikely to cause undue interference or to have an adverse effect on technical quality of service in the downlink.
- A3.44 Irrespective of the maximum permitted gain or frequency band in use, the maximum uplink power requirement means the maximum uplink signals from low gain mobile phone repeaters for in-vehicle use cannot exceed the maximum uplink signals from mobile phones. However, it is well understood that the amplifier will also amplify any underlying noise, and hence a maximum permitted gain must be enforced to mitigate the risk of causing interference from amplifying this noise. The proposed gain limit of 30 dB for relevant frequency bands below 1 GHz and 36 dB for relevant frequency bands above 1 GHz is sufficient to overcome the coupling loss of an efficient near-field coupler, so applying this limit prevents less efficient near-field couplers being used with higher gain amplifiers which could lead to an unacceptable increase in noise. Therefore, the

amendments should not cause any undue interference in the uplink because transmissions will not exceed those of a mobile phone, the use of which is already accepted.

- A3.45 The addition of the 2.6 GHz FDD band is unlikely to cause undue interference for those reasons outlined in the points above. In the uplink, the in-vehicle repeater transmissions will not exceed those of a mobile phone, which are already accepted in the 2.6 GHz FDD band. In the downlink, the coordination with 2.6 GHz will be unaffected by the repeated downlink signal from the in-vehicle repeater because the coverage beyond the vehicle will not increase. Finally, conforming with the essential requirements set out in the Radio Equipment Directive (Directive 2014/53/EU) means the amplifier must be designed to amplify signals of the frequency band currently in use, whilst limiting emissions with a potential negative impact to such a level that harmful interference is avoided (e.g. in adjacent channels), so radar signals in 2.7-3.1 GHz will be protected from interference and will not be repeated.

A4. Responding to this consultation

How to respond

- A4.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 6 September 2019.
- A4.2 You can download a response form from <https://www.ofcom.org.uk/consultations-and-statements/category-1/proposal-wireless-telegraphy-regulations>. You can return this by email or post to the address provided in the response form.
- A4.3 If your response is a large file, or has supporting charts, tables or other data, please email it to Elizabeth.Press@ofcom.org.uk, as an attachment in Microsoft Word format, together with the cover sheet (<https://www.ofcom.org.uk/consultations-and-statements/consultation-response-coversheet>).
- A4.4 Responses may alternatively be posted to the address below, marked with the title of the consultation:
- Elizabeth Press
Spectrum Management and Authorisation
Spectrum Group
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA
- A4.5 We welcome responses in formats other than print, for example an audio recording or a British Sign Language video. To respond in BSL:
- Send us a recording of you signing your response. This should be no longer than 5 minutes. Suitable file formats are DVDs, wmv or QuickTime files. Or
 - Upload a video of you signing your response directly to YouTube (or another hosting site) and send us the link.
- A4.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)
- A4.7 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt if your response is submitted via the online web form, but not otherwise.
- A4.8 You do not have to answer all the questions in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.
- A4.9 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed at Annex 7. It would also help if you

could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.

- A4.10 If you want to discuss the issues and questions raised in this consultation, please contact Elizabeth Press on 020 76206814, or by email to elizabeth.press@ofcom.org.uk.

Confidentiality

- A4.11 Consultations are more effective if we publish the responses before the consultation period closes. In particular, this can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish all responses on our website, www.ofcom.org.uk, as soon as we receive them.
- A4.12 If you think your response should be kept confidential, please specify which part(s) this applies to, and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.
- A4.13 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A4.14 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further at <https://www.ofcom.org.uk/about-ofcom/website/terms-of-use>.

Next steps

- A4.15 Following this consultation period, Ofcom plans to publish a statement in October 2019.
- A4.16 If you wish, you can register to receive mail updates alerting you to new Ofcom publications; for more details please see <https://www.ofcom.org.uk/about-ofcom/latest/email-updates>

Ofcom's consultation processes

- A4.17 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex 5.
- A4.18 If you have any comments or suggestions on how we manage our consultations, please email us at consult@ofcom.org.uk. We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.
- A4.19 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:

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

A5. Ofcom's consultation principles

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

Before the consultation

- A5.1 Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

During the consultation

- A5.2 We will be clear about whom we are consulting, why, on what questions and for how long.
- A5.3 We will make the consultation document as short and simple as possible, with a summary of no more than two pages. We will try to make it as easy as possible for people to give us a written response. If the consultation is complicated, we may provide a short Plain English / Cymraeg Clir guide, to help smaller organisations or individuals who would not otherwise be able to spare the time to share their views.
- A5.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.
- A5.5 A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.
- A5.6 If we are not able to follow any of these seven principles, we will explain why.

After the consultation

- A5.7 We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish all the responses on our website as soon as we receive them. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

A6. Consultation coversheet

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

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

Nothing

Name/contact details/job title

Whole response

Organisation

Part of the response

If there is no separate annex, which parts? _____

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)

A7. Consultation questions

Question 1: Do you agree with Ofcom's proposals to amend the technical parameters for low gain in-vehicle repeaters? If you disagree, could you please provide evidence indicating where, in your view, Ofcom's technical analysis was incorrect.

Question 2: Do the Proposed Regulations and Proposed IR 2102.2 correctly implement the policy proposals set out in this document?