



An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Consultation on Permitting the General Use of Mobile Phone Repeaters

Consultation

Reference: ComReg 17/103

Date: 08/12/2017

An Coimisiún um Rialáil Cumarsáide
Commission for Communications Regulation

1 Lárcheantar na nDugaí, Sráid na nGildeanna, BÁC 1, Éire, D01 E4X0.
One Dockland Central, Guild Street, Dublin 1, Ireland, D01 E4X0.
Teil | Tel +353 1 804 9600 Suíomh | Web www.comreg.ie

Legal Disclaimer

This Consultation is not a binding legal document and also does not contain legal, commercial, financial, technical or other advice. The Commission for Communications Regulation is not bound by it, nor does it necessarily set out the Commission's final or definitive position on particular matters. To the extent that there might be any inconsistency between the contents of this document and the due exercise by it of its functions and powers, and the carrying out by it of its duties and the achievement of relevant objectives under law, such contents are without prejudice to the legal position of the Commission for Communications Regulation. Inappropriate reliance ought not therefore to be placed on the contents of this document.

Content

Section	Page
1 Introduction	6
2 Background Information	8
2.1 Introduction	8
2.2 Boosters and Repeaters	8
2.3 Current Prevalence of Repeaters and Boosters.....	9
2.4 Indoor Reception Issues	10
2.5 International Developments.....	11
2.6 ETSI/ITU Standards	12
3 Draft Regulatory Impact Assessment	13
3.1 RIA Framework	13
3.2 Structure of a RIA.....	13
3.3 Identification of stakeholders.....	13
3.4 Identify the policy issues and identify the objectives (Step 1)	15
3.5 Identify and describe the regulatory options (Step 2)	18
3.6 Impact on industry stakeholders (Step 3).....	19
3.7 Impact on competition (Step 4)	22
3.8 ComReg's Preferred Option (step 5).....	26
4 Proposed Conditions of Use	28
5 Draft Decision.....	32
6 Submitting Views & Next Steps	33
6.1 Submitting Views.....	33
6.2 Next Steps.....	34

Annex

Section	Page
Annex: 1 Glossary	35
Annex: 2 Legal Basis	37
Annex: 3 Draft Exemption Order	38

Table of Figures

Section	Page
Table 1 - Proposed Specifications.....	31

1 Introduction

- 1 The Commission for Communications Regulation (ComReg) is the statutory body responsible for the regulation of the electronic communications telecommunications, radio communication and broadcasting networks, postal, and premium rate sectors in Ireland in accordance with European Union (EU) and Irish law and manages the national numbering resource, among other responsibilities.
- 2 One of ComReg's core statutory functions is to manage the radio frequency spectrum ("radio spectrum" or "spectrum"). Radio spectrum is a valuable, finite national resource underpinning many important economic and social activities.
- 3 In its Radio Spectrum Management Strategy 2016 to 2018 (Doc 16/50¹), ComReg observed that the use of mobile phone repeaters is one potential solution to the issue of indoor coverage² and in a more general sense, a way of improving mobile user experience.
- 4 Furthermore, the Report³ of the Government Mobile Phone and Broadband Taskforce ("the Taskforce") highlighted putting in place a scheme which allows the use of mobile phone repeaters as one of its "key messages". The Taskforce identified this as an important early issue to address and recommended that ComReg explore introducing a regime that would permit the "*orderly installation of mobile phone repeaters which would go some way to addressing the problem of indoor coverage*". It was highlighted that such devices would be of particular use to households and businesses in rural areas.
- 5 The purpose of this consultation document is to set out ComReg's proposals on the introduction of a licence exemption scheme for mobile phone repeaters. Currently, the use of mobile phone repeaters is only authorised to mobile network operators provided they are directly controlled and operated under their Wireless Telegraphy Licence. Any other use or possession of a domestic mobile phone repeater by consumers is currently illegal⁴ in Ireland.
- 6 Mobile phone repeaters constitute apparatus for wireless telegraphy as defined in the Wireless Telegraphy Acts 1926 to 2009. Under the same act it is illegal to possess apparatus for wireless telegraphy for which a licence is not in force. The proposed exemption would permit the general use of mobile phone repeaters provided all conditions of the exemption are met.

¹ <https://www.comreg.ie/media/2016/03/Radio-Spectrum-Management-Strategy-2016-2018.pdf>

² Another solution identified is Native Wi-Fi calling. Native Wi-Fi calling is a service for Android and iOS smartphones providing the ability to make and receive phone calls over a Wi-Fi connection. This however is entirely at the discretion of the Mobile Network Operators to introduce. Currently eir are the only network that offers such a facility to its customers. See Chapter 3 – RIA

³ <http://www.chg.gov.ie/app/uploads/2016/12/taskforce-report.pdf>

⁴ <https://www.comreg.ie/industry/radio-spectrum/spectrum-compliance/enforcement/>

- 7 While the terms “booster” and “repeater” are sometimes used interchangeably, there are important technical differences between the two. For the avoidance of doubt the key differences of both types of devices are set out below:
- A booster is a device that simply amplifies a signal it receives and re-transmits it. There is typically no filtering or interference mitigation in the device. Such devices are usually sourced at low cost through on-line markets. Boosters do not meet the required European Standards⁵ and as such cannot carry the CE mark⁶.
 - A repeater also re-transmits signals it receives, however such devices include filtering and interference mitigation which provide better coexistence with other spectrum users. This is explained further in Chapter 4. Furthermore, such devices meet the applicable standards, or relevant parts thereof, and carry the CE mark.
- 8 Consequently, repeaters are the only devices addressed by this consultation, and for which draft regulations for licence exemption are proposed. As it is highly unlikely that it would possible to operate a booster without causing some level of disruption to mobile networks in the area, and boosters cannot carry the CE mark, ComReg is not consulting on the use of such devices. The legal status and treatment of boosters will thus remain unchanged. This consultation is structured as follows:
- Chapter 1 - Introduction
 - Chapter 2 – Background Information
 - Chapter 3 - Regulatory Impact Assessment
 - Chapter 4 - Technical Details & Proposed Conditions of Use
 - Chapter 5 - Draft Decision
 - Chapter 6 - Submitting Views & Next Steps
 - Annex 1: Glossary
 - Annex 2: Overview of the legal basis governing apparatus for wireless telegraphy
 - Annex 3: Draft exemption order

⁵ Boosters by design cannot meet ETSI standards for Radiated Spurious Emissions, Intermodulation attenuation and out of band gain.

⁶ The CE mark is a certification mark that indicates conformity with health, safety, and environmental protection standards for products sold within the European Economic Area (EEA).

2 Background Information

2.1 Introduction

- 9 This Chapter explores the key differences between mobile phone boosters and repeaters, and the likelihood of either causing interference to a mobile base station, or other spectrum users in the area. It also considers indoor reception issues in modern Ireland as the demand for mobile services increases⁷.
- 10 An overview of how other regulators have approached the issue is provided and European standards for harmonisation of GSM and LTE systems.

2.2 Boosters and Repeaters

- 11 A mobile phone booster is simply an amplifier and as such is highly susceptible to the following:
- Intermodulation – mixing of signals at different frequencies producing one or more new signals;
 - Compression/Nonlinearity/Clipping - the input level of the signal exceeds the design parameters of the amplifier, distorting the signal;
 - Overload – where signals of a relatively high amplitude at the input of the device cause the amplifier to go into compression;
 - Oscillation – the most common cause of oscillation in boosters is when a signal from the output of the device is received on the input of the same device which in effect sets up a feedback loop; and
 - Amplifier Noise – boosters, due to their low cost manufacture and non-conformity with relevant standards, are inherently noisy and such wideband emissions often result in significant disruption to other users.
- 12 One of the features of boosters that often results in interference to other spectrum users is a lack of gain control. Gain control limits the output power of a device typically based on an external factor, e.g. received power. As a result, a booster amplifies signals to the same extent regardless of its proximity to a base station; this often results in significant disruption to a base station.

⁷ <https://www.comreg.ie/publication/quarterly-key-data-report-q2-2017/>

- 13 Unlike boosters, a repeater has gain control. A repeater will reduce the amplitude of the emitted signals proportionally to the power of the received signals thus reducing the chance of causing interference. Should the input level of a signal exceed a predetermined threshold the device should cease all transmission.
- 14 Also unlike boosters, repeaters must have built in oscillation detection. If such emissions are detected the repeater should power down. This is an important feature as a significant number of cases of interference involving boosters have been caused by oscillation within the device.
- 15 An issue with boosters that often causes disruption to other spectrum users is that the noise from the amplifier is omnipresent. Repeaters on the other hand detect when there is no signal at its input and switch into a low power state significantly reducing the risk of interference.
- 16 It is ComReg's view that there are clear differences between the two types of devices and as such it is appropriate to treat both separately. Furthermore, ComReg does not believe that it would be appropriate to consult on the use of boosters given the high likelihood of interference to other mobile networks and other spectrum users. Conversely, ComReg considers it reasonable and appropriate to consult on the use of repeaters as, on its face, it seems that such devices can coexist with existing services and spectrum users.

2.3 Current Prevalence of Repeaters and Boosters

- 17 Over the last 3 years ComReg received on average 58 complaints per annum from MNO's of external radio interference to base stations. While the interference can be caused by a number of different devices, it is common to find mobile phone signal boosters at the root of the issue. In rural areas of already limited coverage one or several boosters have been found to cause major deterioration to mobile reception.
- 18 It is noteworthy that while ComReg has removed a significant number of boosters during the course of its interference investigation activities no repeaters, as defined in this document, have been encountered.
- 19 With the foregoing in mind, it could be concluded that a demand for products such as repeaters exist. However, the market that currently exists for consumers to independently purchase such devices is unregulated and as such there are no controls on the types or classes of devices that end up in service other than to:
 - remove devices that are found to be in use and causing interference; and,
 - attempt to prevent such devices entering service through proactive market surveillance.

- 20 ComReg is of the view that should a legal alternative to the status quo exist it would allow for the controlled and orderly distribution and use of repeaters and significantly reduce the risk of interference to mobile networks and other users from current levels.
- 21 Currently in Ireland only MNO's are legally allowed to install mobile phone repeaters. These repeaters must meet certain standards and carry a CE mark. There are many of these devices operating throughout Ireland coexisting with other users and operators.

2.4 Indoor Reception Issues

- 22 The issue of indoor coverage is one that has taken on a new importance in recent years. This is primarily due to the use of more energy efficient building materials and the changing habits and usage patterns of consumers as discussed in section 3.
- 23 People are more reliant on mobile devices than ever before for their personal communications. With this increased reliance has come greater expectations of users' experience.
- 24 Modern building materials, especially foil backed thermal insulation, can have a significant impact on radio signals as they penetrate a building; the signals can be reduced by up to 40 dB⁸ in some circumstances. The core problem is that heat and radio signals are both electromagnetic energy, just at different frequencies, therefore material that is effective at keeping heat in the building is also effective at keeping the radio signals out.
- 25 ComReg has identified two solutions⁹ to overcome the problems outlined above, native Wi-Fi calling and the use of mobile phone repeaters.
- 26 Currently only eir supports native Wi-Fi Calling and not all phones support this feature yet. Wi-Fi calling also requires an internet connection with sufficient download speeds and latency which may not be currently readily available in all parts of the country.

⁸ BoR(17) 185 Section 1.1 indoor coverage

http://berec.europa.eu/eng/news_and_publications/whats_new/4618-berec-rspg-joint-report-on-facilitating-mobile-connectivity-in-challenge-areas-berec-and-rspg-see-your-views-ends-28-november-2017

⁹ Femtocells provide a further option. Femtocells are a device that communicates with the mobile phone by acting like a base station within the home and then converts the voice calls into VoIP. This is then transmitted over a broadband connection to the mobile operator's servers. In Ireland the use of Femtocells is at the discretion of the mobile operator and are beyond the scope of this consultation.

2.5 International Developments

27 The UK Regulator, OFCOM, has made a decision to put in place a licence exempt scheme for mobile repeaters. These repeaters will have to comply with the Radio Equipment Directive (“RED”)¹⁰; such devices also must meet OFCOM’s conditions¹¹. These conditions include:

- Limits on the amount of frequency bands the repeater operates in; limited to a single operator
- Limits on the uplink and downlink power; limited to 10 dBm (0.01 Watts) in the downlink. Uplink is limited to that maximum permitted power for a handset.
- Transmit gain control; Base station coupling loss (BSCL) should not exceed -30 dB. The uplink and downlink gain in dB of a single operator repeater, reference to its input and output ports shall not exceed 100 dB.
- Automatic standby mode;- when the repeater is idle for more than 5 minutes the uplink power will reduce to no more than -70 dBm/MHz.
- Anti-Oscillation detection and shutdown;- Repeaters must be able to detect and mitigate oscillations automatically within 0.3 seconds in the uplink band and 1 second in the downlink band. Repeaters are to mitigate by either automatic gain reduction or shut down. The repeater must continue this mitigation for at least one minute before restarting. After 5 such restarts the device must shut down and require a manual restart.
- Devices are to be configured in such a way as to only use the channels assigned to a single operator at any given time; this is something that can be reconfigured to a different operator at any given time.

28 In the Netherlands three MNO’s have a combined policy for providing indoor repeater systems that operate on their mutual frequencies.¹² Large public space buildings, for example hospitals, represent a positive business case for installing and operating these systems.

¹⁰ Radio Equipment Directive transposed into Irish legislation as [<http://www.irishstatutebook.ie/eli/2017/si/248/made/en/print>]

¹¹ OFCOM’s technical requirements

https://www.ofcom.org.uk/_data/assets/pdf_file/0019/107254/Repeaters-Statement-2017.pdf

¹² Section 1.3.2 of BEREC report BoR(17) 185

2.6 ETSI/ITU Standards

- 29 The European Telecommunications Standards Institute (ETSI) ¹³ produces globally-applicable standards for information and communications technologies, including fixed, mobile, radio, converged, broadcast and Internet technologies. ETSI is a recognised European Standards Organisation.
- 30 The International Telecommunication Union (ITU) is the United Nations specialised agency for information and communication technologies. The ITU allocate global radio spectrum and satellite orbits, develop the technical standards that ensure networks and technologies seamlessly interconnect.
- 31 Both the ITU and ETSI have set standards for harmonisation of GSM and LTE systems. These standards set limits on power levels on spurious emissions, out of band gain and intermodulation attenuation. The scope of these standards include mobile repeaters.
- 32 ComReg has used these standards in creating the proposed technical conditions as set out in section 3.7 below.

¹³ <http://www.etsi.org>

3 Draft Regulatory Impact Assessment

3.1 RIA Framework

33 In general terms, a RIA is an analysis of the likely effect of a proposed new regulation or regulatory change, and, indeed, of whether regulation is necessary at all. A RIA should help identify the most effective and least burdensome regulatory option and should seek to establish whether a proposed regulation or regulatory change is likely to achieve the desired objectives, having considered relevant alternatives and the impacts on stakeholders. In conducting a RIA, the aim is to ensure that all proposed measures are appropriate, effective, proportionate and justified.

3.2 Structure of a RIA

34 As set out in ComReg's RIA Guidelines,¹⁴ there are five steps in a RIA. These are:

- Step 1: Identify the policy issues and identify the objectives.
- Step 2: Identify and describe the regulatory options.
- Step 3: Determine the impacts on stakeholders.
- Step 4: Determine the impact on competition.
- Step 5: Assess the impacts and choose the best option.

35 In the following sections ComReg identifies the relevant stakeholder groups, specific policy issues to be addressed and relevant objectives (i.e. Step 1 of the RIA process). This is followed by the identification of fundamental policy issues.

36 ComReg then considers these policy issues in accordance with the four remaining steps of ComReg's RIA process.

3.3 Identification of stakeholders

37 The focus of Step 3 is to assess the impact of the proposed regulatory options available to ComReg on stakeholders. A precursor to the subsequent steps in the RIA, therefore, is to identify the relevant stakeholders. Stakeholders consist of two main groups:

- consumers; and

¹⁴ See Document 07/56a - Guidelines on ComReg's approach to Regulatory Impact Assessment - August 2007.

- Industry stakeholders.

38 The main industry stakeholders in relation to the matters considered in this chapter are Mobile Operators, which consist of:

- Mobile Network Operators (MNOs); and
- Mobile Virtual Network Operators (MVNOs).

39 Separately, repeater manufacturers/suppliers may also have views on the preferred option.

40 Prior to receiving submissions on ComReg's various proposals contained in this consultation, ComReg has, in the following analysis, taken a reasonable and pragmatic approach to considering the likely impact of each option on the various stakeholders without, in some cases, being in a position to reference particular views expressed by those stakeholders, but having regard to its experience and expertise and views previously submitted on related matters.

41 The focus of Step 4 is to assess the impact on competition of the proposed regulatory options available to ComReg. In that regard, ComReg notes that it has various statutory objectives, regulatory principles and duties which are relevant to the issue of competition.

42 Of themselves, the various RIA guidelines provide little guidance on how much weight should be given to the positions and views of each stakeholder group (Step 3), or the impact on competition (Step 4). Accordingly, ComReg has been guided by its statutory objectives, which it is obliged to pursue when exercising its functions. ComReg's statutory objectives in managing the radio frequency spectrum, include, include:

- the promotion of competition;
- contributing to the development of the internal market; and
- to promote the interest of users within the Community.

43 In this document, ComReg has adopted the following structure in relation to Step 3 and Step 4 – the impact on industry stakeholders is considered first, followed by the impact on competition, followed by the impact on consumers. The order of this assessment does not reflect any assessment of the relative importance of these issues but rather reflects a logical progression. For example, a measure which safeguards and promotes competition should also, in turn, impact positively on consumers. In that regard, the assessment of the impact on consumers draws substantially upon the assessment carried out in respect of the impact on competition.

3.4 Identify the policy issues and identify the objectives (Step 1)

Policy Issues

44 In its Spectrum Strategy Statement (Document 17/31), ComReg noted that despite the improvements in mobile networks and consumer satisfaction there is a public perception that the mobile retail consumer experience has deteriorated. ComReg recognised that there may be various factors contributing to this perception, including:

- the signal may deteriorate indoors (compared to outdoors) depending on the technology (2G or 3G) and the network operator; and
- the use of better building insulation materials (e.g. foil backed insulation, windows with metallic components and coatings, etc.) and the consequent reduction in indoor signal penetration.

45 In that regard, in order to increase its understanding of the issues experienced by consumers, ComReg commissioned Behaviour and Attitudes (Document 17/100a) to survey residential consumers in Ireland to provide ComReg with an insight into the usage, perceptions and experiences of mobile phones users.

46 This survey highlighted a number of key issues and concerns with regard to mobile connectivity. In particular:

- consumer satisfaction with respondent's mobile phone networks coverage at the home is relatively high with only 11% of users dissatisfied ¹⁵, rising to 19% in more rural areas.¹⁶
- inside the home is the location most used by consumers to use their mobile phone for voice and data. For example:
 - nearly 70% use their mobile phone for voice or text in the house every day, falling to 60% in more rural areas¹⁷.
 - 74% (45% every day) use their mobile phone for data usage at some point inside the home, rising to 82% (48% every day) for more rural areas.¹⁸

¹⁵ Respondents were asked to rate their mobile phone network coverage at the home out of ten. Respondents that rated 4 or lower are classified as dissatisfied.

¹⁶ Slide 62, Document 17/100a

¹⁷ Slide 43, Document 17/100a

¹⁸ Slide 46, Document 17/100a.

- Nearly 30% of all respondents experienced various service issues for call/text and data usage during the past month in the home, the highest of all locations assessed¹⁹.
- Incidence of experiencing service issues in the house or part thereof for calls/text and data (c. 30%) is higher than the same service issues that occur outside the home (c.18%)²⁰.
- Rural consumers have higher rates of experiencing services issues regardless of location with higher levels of service issues arising in the home or part thereof (i.e. indoor).²¹

47 In light of the above, ComReg is of the preliminary view that while consumers can experience issues regardless of their location, those issues occur more frequently at indoor locations and in more rural parts of the country.

48 ComReg's Spectrum Strategy Statement also noted that there may be various ways of addressing indoor reception issues affecting the mobile retail consumer experience. In particular:

- the ability to use fixed broadband connections (e.g. Native Wi-Fi calling) for the provision of mobile services (both voice and data) to address indoor reception issues; and
- the use of mobile repeaters to address indoor reception issues, noting that such repeaters would have to be CE-certified and be authorised (via a licence or a licence-emption) to use the radio frequencies.

Wi-Fi enabled calling (“Native Wi-Fi”)

49 Native Wi-Fi is not the focus of this consultation. However, ComReg observes that the ability to use Native Wi-Fi is likely to be the most effective mechanism to improve indoor reception issues, in most instances, in the long run. Native Wi-Fi is a service that can be provided by operators that makes it possible for consumers to make/receive phone calls and text messages from their Native Wi-Fi enabled mobile phone, where mobile coverage is not sufficient, by using an existing Wi-Fi network. Native Wi-Fi consumers can use their enabled phones and existing mobile phone number to connect via the Wi-Fi in their users homes to the operator provided voice service to provide voice with data for a higher-quality calling.

50 In that regard, ComReg notes that Eir²² is the first and currently the only operator offering Native Wi-Fi calling and all eir Mobile plans currently being sold can avail

¹⁹ Slide 51, Document 17/100a.

²⁰ Slide 51, Document 17/100a.

²¹ Slides 54 and 56, Document 17/100a.

²² <https://www.eir.ie/wificalling/>

of Wi-Fi Calling.²³ Vodafone has indicated that it plans to launch a voice over Wi-Fi (VoWiFi) service in early 2018²⁴. Notwithstanding, there are likely to be consumers that are currently unable to benefit from Native Wi-Fi for a number of reasons including:

- Not all Mobile Operators currently offer Native Wi-Fi as part of their mobile service offering;
- Certain consumers, regardless of mobile operator, do not have a Native Wi-Fi enabled phone. For example, 22% of all mobile phones are 3 years old or more, rising to 34% in more rural areas.²⁵ Such phones are unlikely to be Native Wi-Fi enabled. In addition, certain models on the Apple or Android platforms are not Wi-Fi calling enabled. For example, to use Wi-Fi Calling using the Apple platform an iPhone 5c or later is required on a supported Mobile Operator.²⁶
- Certain consumers, particularly rural consumers, may not have an internet connection sufficient to benefit from Wi-Fi calling regardless of operator or handset availability; and
- Certain consumers may not have access to the internet at all. For example, 10% of households do not have internet access²⁷

51 These reasons are likely to become less relevant over time although certain households may never chose to have internet access²⁸. In particular, the National Broadband Plan (“NBP”) is a Government wide initiative to deliver high speed broadband services to all businesses and households in Ireland at a minimum speed of 30Mbps download and 6Mbps upload by 2020.²⁹ Further, other Mobile Operators are likely to offer Native Wi-Fi services in the period up to 2020 which will allow consumers to take advantage of improved broadband connectivity indoors. Over the same period, the natural replacement cycle of phones should allow most consumers to be able to benefit from Native Wi-Fi. However, in the meantime the use of repeaters is likely to be of benefit to those consumers who face mobile connectivity issues indoors.

²³ <https://www.eir.ie/wificalling> “All eir Mobile plans currently being sold can avail of WiFi Calling”

²⁴ <https://www.siliconrepublic.com/comms/vodafone-voice-lte-wifi>

²⁵ Slide 34, Document 17/100a

²⁶ <https://support.apple.com/en-ie/HT203032>

²⁷ CSO Information Society Statistics – Households 2017.

²⁸ CSO Information Society Statistics – Households 2017. For example, 45% of those without access claim “not to need internet”.

²⁹ <https://www.dccae.gov.ie/en-ie/communications/topics/Broadband/national-broadband-plan/high-speed-broadband-map/Pages/Interactive-Map.aspx>

52 Therefore, ComReg is of the view that the primary policy issue to be considered in this draft RIA is whether to make the use of certain mobile phone repeaters that comply with the technical standards set out in Chapter 3 available on a licence exempt basis.

Objectives

53 The focus of this draft RIA is to assess the impact of the proposed measure(s) (see regulatory options below) on industry stakeholders, competition and consumers. ComReg can then identify and take the most appropriate and effective course of action that considers the interests of all sets of stakeholders, while also protecting and promoting competition.

54 In this regard, ComReg would highlight:

- its objectives as set out in section 12 of the 2002 Act and Regulation 16(1) of the of the European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (“Framework Regulations”) including:
 - to promote competition; and
 - to ensure the efficient management and use of the radio frequency spectrum in accordance with Ministerial Policy Directions issued under section 13 of the 2002 Act;
- the regulatory principles which it is obliged to apply in pursuit of the objectives set out in Regulation 16(2) of the Framework Regulations, including:
 - safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure based competition; and
 - promoting efficient investment and innovation in new and enhanced infrastructures;
- its obligation to ensure that radio frequencies are efficiently and effectively used having regard to Section 12(2)(a) of the 2002 Act and Regulations 16(1) and 17(1) of the Framework Regulations (Regulation 9(1) of the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (“Authorisation Regulations”).

3.5 Identify and describe the regulatory options (Step 2)

55 ComReg considers that the three regulatory options now available to it are:

Option 1: Status Quo – the use of mobile repeaters remains unlawful for consumers.

56 Option 1 is to leave the current licensing regime unchanged and for ComReg to take no regulatory action i.e. Mobile phone repeaters that are not directly controlled by MNO's would continue to be classed as unlicensed apparatus for wireless telegraphy as defined in the Wireless Telegraphy Acts 1926 to 2009, and remain illegal to possess.

Option 2 – Permit the licence exempt use of repeaters for consumers on a single Mobile Operator network only ('Single-operator Repeaters')

57 Option 2 considers making specific mobile phone repeaters licence exempt on a single mobile network operator only. Mobile phone repeaters would be required to meet the technical standards and specifications as set out by ComReg in Chapter 3 in order to warrant exemption from the Wireless Telegraphy Acts 1926 to 2009. Repeaters that meet these requirements would be available for consumers to purchase and install.

58 This option would include a requirement that the repeaters operate only over the frequency bands of any single Mobile Operator at a given time. The repeater would only amplify the signal of one operator designated for the relevant premises.

Option 3 – Permit the licence exempt use of repeaters for consumers on all Mobile Operators' networks ('Multi-operator Repeaters')

59 Option 3 is the same as Option 2 except this option would allow the repeater used on a premises to amplify the signal from all mobile phones regardless of the mobile network operator.

3.6 Impact on industry stakeholders (Step 3)

Option 1

60 As noted above, connectivity is a particular problem for consumers when trying to access services (voice, text, data) over their mobile phone using their mobile network (as opposed to a Wi-Fi connection). Currently, under Option 1, repeaters can be deployed by MNOs as part of managing their ongoing network. This is similar to Option 2 except, the cost is typically borne by the Mobile Operator. However, under Option 1, certain consumers purchase boosters³⁰ without authorisation in order to improve indoor mobile connectivity from that location. This typically occurs in rural or remote locations, or to address in-building penetration where outdoor connectivity is satisfactory. While the consumer-purchased booster may benefit the end-user's connectivity at that location, it is illegal and it can also disrupt or interfere

³⁰ See section 2.2 on the difference between repeaters and boosters.

with other consumer's connectivity across the same area.

- 61 In that regard, ComReg notes that there are typically around 60 complaints from MNOs each year on issues related to interference with many associated with the use of boosters. Such unauthorised apparatus are primarily, poorly designed, mass market equipment and more often than not are likely to increase the risk of harmful interference, especially due to malfunctions of the boosters and inadequate technical standards.
- 62 In that regard, Option 1 the unauthorised use of boosters has a number of negative impacts on Mobile Operators, including:
- they are likely to cause network interference and damage subscribers' mobile consumer experience.
 - they are likely to damage the reputation of Mobile Operators³¹ where that reputation does not relate to underlying performance of their network but rather the unauthorised use of boosters.
 - they disproportionality affect Mobile Operators that have:
 - more subscribers in the particular area where the booster is causing interference; and
 - better underlying coverage in those areas, as the connectivity problems experienced by a consumer in the first instance may be related to a networks with poorer connectivity;
 - they reduce the return earned on efficient investments made by MNOs to improve quality of service and extend coverage in specific areas; and
 - they create additional operational costs for MNOs in order to manage related customer complaints, identify interference and report, where relevant, to ComReg.
- 63 Therefore for the reasons stated above, ComReg is of the preliminary view that Mobile Operators are unlikely to prefer Option 1.
- 64 Alternatively, the apparatus authorised under Options 2 and 3 includes filtering and interference mitigation mechanisms which substantially the risk of disruption to other spectrum users. While certain consumers may continue to purchase unauthorised apparatus, the availability of authorised licence-exempt apparatus should, over time, reduce the extent to which network interference issues occur due to the use of unauthorised equipment. For example, Option 2 and 3 would

³¹ Consumers are likely to be unaware the issues associated with connectivity arise from the use by boosters.

encourage the development of a retail market for authorised mobile phone repeaters. Therefore, suppliers of mobile phone repeaters are likely to prefer Options 2 or 3. This would reduce the likelihood that consumers continue to purchase unauthorised apparatus. Continued enforcement and confiscation of existing devices by ComReg will assist in this process. Therefore, MNOs will likely see a fall in the level of interference on their networks due to unauthorised equipment as users switch to the legal repeaters under Options 2 and 3.

65 Therefore, ComReg is of the preliminary view that Mobile Operators are likely to prefer Options 2 & 3 over Option 1.

Option 2 v Option 3

66 In considering coverage improvements in a particular area MNOs are likely to assess the costs of such improvements against the benefits of the same. In particular, to fix a coverage problem affecting only a small area within a cell, an operator could have to enhance the network's coverage and/or capacity over the entire cell, including places where outdoor coverage may already be good. Therefore, to the extent that coverage is a particular problem for certain households MNOs may not have the investment incentives to extend coverage in certain areas, particularly where the investment that would arise may be more efficiently allocated in more populated areas where a return can be generated.

67 In relation to Options 2 and 3, Mobile Operators are likely to prefer the Option that provides the greatest potential benefit to their subscribers as it reduces the level of complaints associated with coverage for that particular premises and improves user satisfaction. This is particularly the case in this consultation where the cost associated with improving coverage is borne by consumers and the operator does not need to consider the usual trade-off between any efficient investment it would have to make, and the returns it might earn.

68 Further, Mobile Operators are likely to prefer the Option that increases the extent to which unauthorised repeaters are replaced by compliant apparatus. There is also an increased risk of interference, from Option 2 over Option 3, if a premises were to install multiple devices to cover bands used by different Operators. (i.e. oscillation increases significantly). Adopting Option 3 and permitting the general usage of wideband repeaters offers better protection to MNOs and existing spectrum users.

69 Therefore, ComReg is of the preliminary view that Mobile Operators would likely prefer Option 3 over Option 2 as it:

- a) is an investment neutral option that provides the greatest overall benefit to consumers (Impact on Consumers below);

- b) would likely see the use of more compliant repeaters at the expense of current unauthorised apparatus, i.e. the cost and benefits are spread across more users making the decision to purchase an authorised repeater more likely under Option 3; and
- c) would provide greater interference protection where multiple repeaters were used on a premises.

3.7 Impact on competition (Step 4)

Option 1

70 As discussed above, under Option 1 the use of boosters remains unlawful for consumers and would likely result in interference to MNOs networks. This can harm competition as boosters amplify the signal across multiple frequencies assigned to different Mobile Operators. This can cause interference across multiple operators, including the Mobile Operator targeted by the booster. In this way, the booster can eliminate any differentiation on outdoor coverage that existed between operators prior to installation of the repeater. For example, an operator that could have competed on coverage (outdoor) as a result of investments made in a particular area may be unable to do so after the installation of the booster.

71 Further, interference caused by boosters may affect some networks to a greater extent than others reducing the competitive offering associated with those networks. For example, the premises using a booster under Option 1, will disproportionately affect the network whose base stations are situated closer to the premises with the installed booster. Such issues could be ongoing for a significant period of time as other users may not raise concerns until connectivity falls below a certain threshold of acceptability. As such, the affected Mobile Operator may not be aware that their network is not performing efficiently and delivering full benefit to consumers in line with efficient investments already made. This results in consumers forming views on coverage that may not be related to the underlying performance of the networks but rather the interference issues caused by the booster.

72 Therefore, ComReg is of the preliminary view that Option 1 is likely to have a negative impact on competition.

Option 2 v Option 3

73 Options 2 and 3 and the use of technically compliant repeaters would not create undue interference on mobile networks allowing Mobile Operators to continue to differentiate on coverage. Under Option 2, the repeater could likely be reconfigured to a different operator at any given time. Therefore, such consumers would not be locked in and would be free to switch to an alternative operator in response to a

price rise or deterioration in service. However, under Option 2, only one network can be served per premises at any given time; this is true even if there are multiple devices operating on multiple networks.

- 74 As noted below (Impact on Consumers) there is likely to be more than one person per premises and these persons may be on different networks. Those members that do not benefit from the increased connectivity provided by the repeater will likely have incentives to switch to the network served by the repeater. However, these incentives are not related to the factors which other operators could reasonably compete with and would normally do so in the absence of the repeater. Such consumers may switch to an alternative provider when, absent the repeater, another operator may have been preferred on the basis of product and service differentiation. In this way, the restriction of the repeater to one Mobile Operator corrupts the competitive process and does not deliver the best available option to consumers.
- 75 Therefore, ComReg is of the preliminary view that Option 3 is the most beneficial in terms of the impact on competition.

Impact on Consumers

Option 1

- 76 As outlined in Policy Issues above indoor coverage can be a particular problem for consumers. Currently, under Option 1 consumers may be unaware of the restrictions on the operation and possession of boosters, and unwittingly be committing an offence under the Wireless Telegraphy Act–1926 as amended.
- 77 Such unauthorised apparatus can cause undue interference and, in some instances, block certain sectors of the mobile base station creating adverse effects to mobile services for other consumers. Therefore, every consumer served by the associated base station(s), could experience negative mobile connectivity issues, including:
- lower quality voice calls;
 - an increase in the number of dropped calls;
 - lower mobile data speeds; or
 - disconnection from the network entirely.
- 78 The average mobile base station serves³² over 2,000 persons³³ therefore

³² This typically depends on the location of the base station. See section 3.2.4 (Distribution of Traffic in the network - Document 15/62a

³³ Population 4,757,976 (Census 2016) and assuming national network of 2000 – 2,200 base stations.

depending on a user's position relative to the base station, the number of impacted consumers has the potential to be considerable. Further, the multiple use of such unauthorised boosters in an area increases the extent to which negative connectivity issues arise for other users.

- 79 Even for the user that installed the booster it may not remedy the connectivity experience to any significant degree. Boosters, being inherently 'noisy' devices are likely to raise the apparent noise floor which typically results in a degraded experience for other users in its vicinity, and in some cases even disabling the sector of the base station. In such cases this degradation is not typically represented by a reduction in the signal displayed on the handset; the user may have a stable downlink and an unstable uplink which often results in a poor mobile experience.³⁴
- 80 There is obvious demand for mobile repeaters, as shown by the existing market for illegal booster/repeaters and indoor service issues identified in the Mobile Consumer Experience Survey³⁵. Options 2 and 3 would allow for the use of apparatus that is not likely to cause harmful interference or have adverse effects on the quality of service for voice and data. Options 2 and 3 would also provide the users of repeaters with better connectivity than under Option 1 as the noise level is significantly reduced and the user's phone can connect to the network without unduly reducing the quality of the call.
- 81 Therefore, ComReg is of the preliminary view that consumers are unlikely to prefer Option 1 and are likely to have a preference for Options 2 or 3.

Option 2 v Option 3

- 82 Firstly, it can be assumed that what is good for competition, and what promotes investment in infrastructure, is, in general, good for consumers. This is because increased competition between Mobile Operators brings benefits to their customers in terms of price, choice, and quality of services. As such, consumers are likely to prefer Option 3 because of the positive impacts on competition associated with this Option as described above.
- 83 Further, under Option 2 a repeater can only serve one network per premises. Repeaters are likely to be primarily used in the household. In that regard, ComReg observes that a household may contain:
- a) more than one person.
 - b) more than one person with a phone; and

³⁴ (2014) Report of the 6th Joint Cross-Border R&TTE Market Surveillance Campaign. Group of Administrative Co-operation under the R&TTE Directive.

³⁵ Document 17/100a.

c) more than one operator serving those phones.

- 84 In relation to (a) ComReg notes that over 75% of all private households contain more than one person. For example, nearly 50% of all private households consist of 3 persons or more and 30% consist of 4 persons or more.³⁶
- 85 In relation to (b) 98% of the population aged 15+ now own a mobile phone.³⁷ As such, almost all persons (excluding aged <15) in a household will own a phone.
- 86 In relation to (c) members of the same household could historically have been part of the same network as the selection of that network would have reduced calling costs.³⁸ However, the advent of bundling in mobile phone plans and the availability of alternative voice and text communications through increased data usage means the incentives to be on the same network as other household members has largely fallen away. For example, ComReg notes that in 2011 being on the same network as family and friends was the main reason (40% of all users) for switching to a network³⁹. In 2015, this had fallen to just 9%⁴⁰. Therefore, certain households with multiple members are likely to have different networks serving those members.
- 87 Under Option 2, the main decision maker will configure the repeater so as to only use the channels assigned to the Mobile Operator providing its service. While any other members of the same household using that same Mobile Operator will benefit, those that are using a different Mobile Operator, and have similar mobile connectivity issues will not. These consumers will either (a) purchase their own repeater in which case a household will have multiple repeaters or (b) switch to the operator associated with the repeater (which as noted above distorts competition). Alternatively, under Option 3 the main decision maker is no worse off and more members of the household are facilitated by better connectivity at less cost.
- 88 Furthermore, a household is far more likely to justify the upfront cost (€200 - €500)⁴¹ of a repeater if the resulting benefit is spread across multiple members of that household. Depending on the household, the upfront cost of a repeater may be a more efficient allocation of resources if the alternative was to upgrade to a number of Wi-Fi calling enabled phones. Finally, it is worth noting that Option 2 would likely increase the cost to the consumer in two ways:
- Firstly, band specific devices would likely be more expensive to manufacture with the additional cost most likely passed onto the

³⁶ Census 2016, Households and Families.

³⁷ See Slide 15, Document 17/100a.

³⁸ See Section 5.1.4 of Hutchison 3G UK/Telefonica Ireland (Case No COMP/M.6992) and in particular *"In the past, and prior to reductions enforced by regulation, high termination rates and associated off-network call charges provided strong incentives for subscribers to join and remain on the same network as their friends and family and discouraged switching between networks."*

³⁹ Slide 55, Document 12/46a.

⁴⁰ Slide 68, Document 15/123a

⁴¹ <https://www.mobilerepeater.co.uk/>

consumer; and,

- To cover multiple bands in a premises a consumer would have to purchase multiple devices would add significant cost to a consumer.

89 Therefore, ComReg is of the preliminary view that consumers would likely prefer Option 3.⁴²

3.8 ComReg's Preferred Option (step 5)

90 The above assessment has considered the impact of the various options from the perspective of industry stakeholders, as well as the impact on competition and consumers. For the reasons identified above, ComReg considers that, on balance, Option 3 would be the more appropriate regulatory option to adopt in the context of the RIA analytical framework.

91 In particular, ComReg is of the preliminary view that Option 3 would be justified, reasonable and proportionate, because, amongst other things Option 3:

- provides households/premises with a mobile connectivity solution that benefits the greatest number of consumers by authorising repeaters across all networks, and is more efficient for consumers as there is no need to buy more than one device per household; ;
- protects Mobile Operators existing and future efficient investments by mitigating the risks of interference associated with the use of unauthorised repeaters/boosters and also positively impacts on user perceptions of the MNO networks by eliminating issues that had been previously and erroneously associated with them;
- would accord with ComReg's statutory objective of encouraging the efficient use and ensuring the effective management of spectrum by allowing the radio spectrum to be used in a manner that provides connectivity solutions to consumers while protecting against undue interference;
- would protect all operators from network interference and provides equal benefits in terms of improved connectivity for consumers;

⁴² Business customers may also use repeaters to address connectivity issues associated with their premises. In that regard, such users are likely to prefer Option 3 as it would cater for users across all networks.

- would accord with the principle of safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure based competition; and
- would appear to be least onerous means by which the policy issues and objectives as stated could be achieved.

4 Proposed Conditions of Use

92 This section sets out the technical conditions that ComReg proposes to use in granting licence exemption for a mobile phone repeater. Table 1 below sets the specifications that a mobile phone repeater must meet to warrant exemption.

93 The proposed technical requirements set out in Table 1 above reflect the following considerations:

- **Automatic Standby/Shutoff** – ComReg proposes that repeaters must have an automatic standby and/or shutoff mode to reduce the risk of interference to other users as much as possible. This would ensure that when not in use the repeater should not contribute any unwanted emissions or electromagnetic noise in the uplink bands being used by base stations.
- **Anti-Oscillation** – As highlighted earlier, a common source of interference encountered by ComReg involves boosters in oscillation; to differentiate it from a generic booster the repeater must be able to detect and mitigate oscillations.

To minimise risk of interference ComReg proposes that detection and mitigation should take no longer than 0.5 second in the uplink band and 1 second in the downlink band. Interference in the uplink band tends to be more detrimental to the network as a whole and as such has been prioritised. In addition, any interference on the downlink is not likely to impact on users other than those in the building with the repeater. As such the cut off times above are considered sufficient to protect all users in the bands in question.

Accordingly, the device should either power off, restart, or reduce its output power until oscillations are no longer detected. If mitigations fail the device must power off completely.

- **Frequency Band** – the repeater must only repeat signals within bands assigned for mobile use (listed in table 1 above). ComReg proposes no restrictions on the number of operators the device may amplify as this is unlikely to add any protection to existing users above and beyond that already provided by other conditions of use. Additionally, to impose such a condition would likely not benefit consumers and only serve to restrict choice.

- **Power** – As a guiding principle, from the perspective of the mobile network it should be almost impossible to differentiate between a repeater in use and a handset being used outdoors. As such ComReg proposes that the maximum output power in the uplink band be limited to that of a mobile handset. This, in conjunction with the other conditions set out here, and the essential requirements of the Radio Equipment Directive, should ensure that this principle is met.

Furthermore, ComReg proposes that the maximum downlink power be 17 dBm, similar to the power levels of a typical domestic Wi-Fi router⁴³. ComReg believes this should be sufficient to allow coverage within a typical domestic home, while making interference to other users in the locality unlikely. This is due to the fact that the building entrance loss mentioned above works in both directions, signals that emanate from within a building are likely to be significantly attenuated as they exit the building, sometimes by as much as 40dB or more.

- **Gain** – ComReg proposes that the maximum gain of the repeater be 70 dB. ComReg believes that this level represents an appropriate balance between protecting existing users and enabling devices to be as efficient as possible.

Should too high a gain be permitted it is likely that the risk of disruption and interference to existing users, especially the base stations on a mobile network would be unacceptable.

At the same time, the device must be capable of offering sufficient gain to allow consumers in weak signal areas and at the fringes of coverage areas to benefit as much as possible.

- **Gain Control** – Any repeater used must have automatic gain control to fall within the proposed framework. This is primarily to limit the amplitude of signals received and protect base stations from unnecessary interference and disruption.

The gain of the repeater would be limited based on the level of the downlink signal detected at the repeater's external antenna. Simply put, the device can effectively work out its relative distance from the base station serving it based on free space loss being constant. Accordingly, should a signal of greater than -40 dBm be present at the repeater's external antenna it should be prevented from powering on.

It is ComReg's belief that a received level of -40 dBm from a base station is sufficient for a user to still be able to make a call with a building entry loss of up to 60 dB.

⁴³ Typical power of a WiFi router is 20 dBm

- Intermodulation Attenuation** – The transmitted intermodulation products of the repeater at its uplink and downlink ports shall not exceed the power levels of -36 dBm in the frequency band below 1 GHz and -30 dBm above 1 GHz. These values are obtained from ETSI standard 303 609⁴⁴. ComReg is of the view that such limits are sufficient to prevent unnecessary interference to other users of the spectrum.
- Radiated Spurious Emissions & Out of Band Gain** – to reduce risk of external interference to mobile base stations and other mobile users the repeater must adhere to the limitations set out in Table 1 above. These values are obtained from ETSI Standards 303 609, 136 101⁴⁵, 125 106⁴⁶, 300 220-1⁴⁷ and ITU-R SM.329-12⁴⁸. ComReg is of the view that such limits are sufficient to prevent unnecessary interference to other users of the spectrum.

Limit Type	Specification
Automatic Standby/Shutoff	When not in use for 1 minute the device would reduce its output power to no more than -70 dBm/MHz
Protection against Oscillation	The repeater must be able to detect and mitigate any oscillations in the uplink or downlink bands. Detection and mitigation must occur within 0.3 seconds in the uplink band and 1 second in the downlink.
Frequency Band	<p>The amplified frequencies are limited to those that are currently used in the Republic of Ireland for mobile phone services:</p> <p>800 Band: 791-821 MHz DL 832-862 MHz UL</p> <p>900 Band: 880-915 MHz UL 925-960 MHz DL</p> <p>1800 Band: 1710-1785 MHz UL 1805-1880 MHz DL</p> <p>2100 Band: 1920-1980 MHz UL 2110-2170 MHz DL</p> <p>No restriction on MNO services the device may amplify</p>

⁴⁴ ETSI EN 303 609: Global System for Mobile Communications (GSM); GSM Repeaters; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

⁴⁵ ETSI 136 101: LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception

⁴⁶ ETSI TS 125 106: UMTS; UTRA repeater radio transmission and reception

⁴⁷ ETSI EN 300 220-1: Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz

⁴⁸ ITU-R SM.329-12: Unwanted emissions in the spurious domain

Power	The transmit power is limited to the maximum permitted power of a mobile handset in the uplink and 17 dBm (0.05 Watts) in the downlink
Gain	The maximum gain of the repeater is limited to 70 dB
Gain Control	The repeater must have automatic gain control to protect against excessive input signals that would produce output power emissions that would cause interference to a mobile base station The repeater must power off if the receive level from the base station is -40 dBm or greater.
Intermodulation attenuation	The maximum level of intermodulation product shall not be greater than: -36 dBm in the frequency band less than 1 GHz -30 dBm in the frequency band more than 1 GHz
Radiated Spurious Emissions	The effective radiated power shall not exceed: -36 dBm in the frequency band less than 1 GHz -30 dBm in the frequency band more than 1 GHz
Out of Band Gain	The following limits will apply to out of band gain: 50 dB at 400 kHz offset and greater 40 dB at 600 kHz offset and greater 35 dB at 1 MHz offset and greater 25 dB at 5 MHz offset and greater

Table 1 - Proposed Specifications

- Q. 1 Do you agree with ComReg’s proposal for the license exemption of mobile phone repeaters?
- Q. 2 Do you agree with ComReg’s proposed technical conditions set out in Table 1? If not please provide reasons and supporting evidence for your answer.

5 Draft Decision

94 The Commission for Communications Regulation, in exercise of the powers conferred on it by section 3(6)(a) of the Wireless Telegraphy Act 1926 (No. 45 of 1926), (inserted by section 11(c) of the Wireless Telegraphy Act 1972 (No. 5 of 1972)), transferred to the Commission for Communications Regulation by section 4(2) of the Communications Regulation (Amendment) Act 2007 (No. 22 of 2007), hereby decides to make the order attached in draft form in Annex 3 to this consultation.

6 Submitting Views & Next Steps

6.1 Submitting Views

- 95 All input and comments to this consultation are welcome. However, it would make the task of analysing the responses easier if comments were referenced to the relevant section/paragraph number in each chapter and annex in this document.
- 96 Please also set out your reasoning and all supporting information for any views expressed.
- 97 The consultation period will run until 17:00 on Friday 19th January 2018 during which time ComReg welcomes written comments on any of the issues raised in this document.
- 98 Responses must be submitted in written form (post or email) to the following recipient, clearly marked – Submissions to ComReg 17/103:

Mr. Karl Craine

Commission for Communications Regulation,

One Dockland Central,

Guild Street,

Dublin 1

Ireland

D01 E4X0

Email: marketframeworkconsult@comreg.ie

- 99 We request that all electronic submissions be submitted in an unprotected format so that they can be included in the ComReg submissions document for electronic publication.

100 ComReg appreciates that respondents may wish to provide confidential information if their comments are to be meaningful. In order to promote openness and transparency, ComReg will publish all respondent's submissions to this consultation as well as all substantive correspondence on matters relating to this document, subject to the provisions of ComReg's guidelines on the treatment of confidential information. In that regard, respondents are requested to provide both a confidential and non-confidential version of their submission to the consultation, providing supporting reasoning as to why they consider material to be confidential. Alternatively, respondents are requested to place confidential material in a separate annex to their response again providing supporting reasoning in that annex as to why such material confidential.

6.2 Next Steps

101 When it has concluded its review of all submissions received and other relevant material, ComReg intends to publish a response to consultation and draft decision as appropriate.

Annex: 1 Glossary

A 1.1 The definitions in this glossary shall apply to this document as a whole.

A 1.2 Where a term in this glossary is defined by reference to a definition in a section or paragraph and an explanation of that term is provided in this glossary, the latter explanation is for convenience only and reference should be made to the appropriate part of the document for the definitive meaning of that term in its appropriate context.

A 1.3 Any reference to any provision of any legislation shall include any modification re-enactment or extension thereof.

A 1.4 Terms defined in this consultation paper shall, unless the context otherwise requires or admits, have the meaning set out below:

MNO	Mobile Network Operator
Uplink	Frequency used to talk to a mobile base station from a mobile handset
Downlink	Frequency used to talk to a mobile handset from a base station
800 MHz band	The frequency range 790 - 862 MHz
900 MHz band	The frequency range 880 – 960 MHz
1800 MHz band	The frequency range 1710 - 1880 MHz
2100 MHz band	The frequency range 1920 - 2170 MHz
NRA	National Regulatory Authority
RIA	Regulatory Impact Assessment. An analysis of the likely effect of, and necessity of, a proposed new regulation or regulatory change.
dB	Decibel is a logarithmic expression of the ratio between two signal power
dBm	A unit measure of power in decibels referenced to one milliwatt (mW)

dBi	dB isotropic is the forward gain of an antenna compared with the hypothetical isotropic antenna, which uniformly distributes energy in all directions.
mW	Miliwatt, a unit of power equal to one thousandth of a watt
MHz	megahertz (1 million Hertz)
Intermodulation	Intermodulation is the undesired combining of several signals in a nonlinear device, producing new, unwanted frequencies
Oscillation	An undesirable variation in output voltage or current in an electronic device, usually an amplifier. It is often caused by feedback in the amplifier
Gain	The increase in power from the input to the output of a device, usually an amplifier or antenna
Spurious Emissions	Spurious Emission are emission which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products
AGC	Automatic Gain Control is the ability to automatic adjust the gain of an amplifier through intelligent software.
Attenuation	The reduction in signal strength
ETSI	European Telecommunications Standards Institute.
BEREC	Body of European Regulators for Electronic Communications

Annex: 2 Legal Basis

The Communications Regulation Acts 2002-2011 (the “2002 Act”), the Common Regulatory Framework (including the Framework and Authorisation Directives as transposed into Irish law by the corresponding Framework and Authorisation Regulations), and the Wireless Telegraphy Acts 1926 to 2009 (“the 1926 Act”) set out, amongst other things, powers, functions, duties and objectives of ComReg that are relevant to the management of the radio frequency spectrum in Ireland.

Apart from licensing and making regulations in relation to licences, ComReg’s functions include the management of Ireland’s radio frequency spectrum in accordance with ministerial Policy Directions under section 13 of the 2002 Act, having regard to its objectives under section 12 of the 2002 Act, Regulation 16 of the Framework Regulations and the provisions of Article 8a of the Framework Directive. ComReg is to carry out its functions effectively, and in a manner serving to ensure that the allocation and assignment of radio frequencies is based on objective, transparent, non-discriminatory and proportionate criteria.

Section 3(1) of the 1926 Act sets out the general prohibition on possession of unauthorised wireless telegraphy apparatus, but under section 3(6)(a), ComReg can declare, in an exemption order, that a certain class or description of wireless telegraphy is exempt from section 3.

It is considered that mobile phone repeaters are capable of coming within the definition of “apparatus for wireless telegraphy” for the purposes of the 1926 Act, namely: “apparatus capable of emitting and receiving, or emitting only or receiving only, over paths which are not provided by any material substance constructed or arranged for that purpose, electric, magnetic or electro-magnetic energy, of a frequency not exceeding 3 million megahertz, whether or not such energy serves the conveying (whether they are actually received or not) of communications, sounds, signs, visual images or signals, or the actuation or control of machinery or apparatus, and includes any part of such apparatus, or any article capable of being used as part of such apparatus, and also includes any other apparatus which is associated with, or electrically coupled to, apparatus capable of so emitting such energy.

Annex: 3 Draft Exemption Order

Wireless Telegraphy Act 1926 (section 3) (Draft Exemption of Mobile Phone Repeaters) Order 2017

Notice of the making of this Statutory Instrument was published in

“Iris Oifigiúil” of [-].

The Commission for Communications Regulation, in exercise of the powers conferred on it by section 3(6)(a) of the Wireless Telegraphy Act 1926 (No. 45 of 1926), (inserted by section 11(c) of the Wireless Telegraphy Act 1972 (No. 5 of 1972)), transferred to the Commission for Communications Regulation by section 4(2) of the Communications Regulation (Amendment) Act 2007 (No. 22 of 2007), hereby makes the following Order:

Citation

1. This Order may be cited as the Wireless Telegraphy Act 1926 (section 3) (Exemption of Mobile Phone Repeaters) Order 2017.

Interpretation

2. In this Order—

“Mobile Phone Repeater” means apparatus for wireless telegraphy, which is used specifically to amplify signals between a mobile phone and a network operator’s base station, either indoors or in-vehicle;

“Apparatus for Wireless Telegraphy” has the same definition herein as in the Wireless Telegraphy Act 1926 (No. 45 of 1926);

“dB” means a unit of transmission giving the ratio of two powers: if P1 and P2 represent two values of power and n the number of decibels representing their ratio then $n=10 \log_{10} P1/P2$. If the two powers are dissipated in equal resistive impedances their ratio in decibels may be expressed by $n=20 \log_{10} V1/V2$ where V1 and V2 are the voltages across the two resistive impedances;

“dBm” means decibels of power referenced to one milliWatt;

“GHz” means gigahertz (1,000,000,000 Hertz);

“Hertz” means Unit of Frequency;

“kHz” means kilohertz (1,000 Hertz);

“MHz” means megahertz (1,000,000 Hertz);

“Mobile Base Station” means Apparatus for Wireless Telegraphy connected to a backhaul network, which provides a Radiocommunication Service to Terminal Stations;

“Radio Equipment Directive” means 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 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity;

“Radio Equipment Regulations” means the European Union (Radio Equipment) Regulations 2017 (S.I. No. 248 of 2017).

Limitation

3. This Order only applies within the jurisdiction of the State and only applies to Mobile Phone Repeaters which are in conformance with the Radio Equipment Directive and the Radio Equipment Regulations.

Applicability

4. Section 3 of the Wireless Telegraphy Act 1926 (No. 45 of 1926) does not apply to classes of Mobile Phone Repeaters described as, and fulfilling the requirements set out in, this Order.

Conditions

5. Mobile Phone Repeaters to which this Order applies shall comply with the following conditions:

(a) When the Mobile Phone Repeater is no longer serving an active device connection, it must, after no longer than 1 minute, reduce its power to no more than -70 dBm/MHz;

(b) The Mobile Phone Repeater must detect and mitigate (by automatic gain reduction or shutdown) any oscillations in uplink and downlink bands, and such detection and mitigation must occur within 0.5 seconds in the uplink band, and 1 second in the downlink;

(c) ComReg reserves the right to inspect the Mobile Phone Repeater at the licensee’s own expense prior to and during operation if necessary;

(d) The amplified frequencies which the Mobile Phone Repeater is capable of using shall be limited to those amplified frequencies that are used in the State for mobile phone services, namely:

800 MHz - 791-821 MHz (Downlink) 832-862 MHz (Uplink);
900 MHz - 880-915 MHz (Uplink) 925-960 MHz (Downlink);
1800 MHz - 1710-1785 MHz (Uplink) 1805-1880 MHz (Downlink); and
2100 MHz - 1920-1980 MHz (Uplink) 2110-2170 MHz (Downlink);

(e) The transmit power of the Mobile Phone Repeater is limited to the maximum permitted power of a mobile handset in the uplink and 17 dBm (0.05 Watts) in the downlink;

(f) The maximum gain of the Mobile Phone Repeater is limited to 70 dB;

(g) The Mobile Phone Repeater must have automatic gain control to protect against excessive input signals that would produce output power emissions that would cause interference to a Mobile Base Station;

(h) The Mobile Phone Repeater must cease transmitting and shut off automatically if external signal strength of -40dBm or greater is detected;

(i) The maximum level of intermodulation product of the Mobile Phone Repeater shall not be greater than:

(i) -36 dBm in the frequency band less than 1 GHz, or

(ii) -30 dBm in the frequency band more than 1 GHz;

(j) The effective radiated power of the Mobile Phone Repeater shall not exceed:

(i) -36 dBm in the frequency band less than 1 GHz, or

(ii) -30 dBm in the frequency band more than 1 GHz; and

(k) The out of band gain produced by the Mobile Phone Repeater will be subject to the following limits:

(i) 50 dB at 400 kHz offset and greater,

(ii) 40 dB at 600 kHz offset and greater,

(iii) 35 dB at 1 MHz offset and greater, or

(iv) 25 dB at 5 MHz offset and greater.



GIVEN under the official seal of the Commission for Communications Regulation,
[-] 2017.

GERRY FAHY,

For and on Behalf of the Commission for Communications Regulation.

EXPLANATORY NOTE

(This note is not part of the Instrument and does not purport to be a legal interpretation.)

This Order provides for the exemption of certain wireless telegraphy apparatus, namely mobile phone repeaters, which meet certain conditions stated in the face of the order, from the requirement to be licensed under the Wireless Telegraphy Act 1926.

Questions

Section

Page

Q. 1 Do you agree with ComReg’s proposal for the license exemption of mobile phone repeaters? 31

Q. 2 Do you agree with ComReg’s proposed technical conditions set out in Table 1? If not please provide reasons and supporting evidence for your answer..... 31