UK Interface Requirement 2102

Licence-exempt mobile phone repeaters

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1. References

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

1.2 EN 301 908-11: Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 11: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD and E-UTRA FDD) (Repeaters) covering the essential requirements of article 3.2 of the R&TTE Directive

1.3 EN 301 908-15: IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Part 15: Evolved Universal Terrestrial Radio Access (E-UTRA FDD) Repeaters.

2. Foreword

2.1 It is required by the Wireless Telegraphy Act 2006 that no radio equipment is installed or used in the UK except under the authority of a licence granted by or otherwise exempted by regulations made by Ofcom.

2.2 The Wireless Telegraphy (Mobile Repeater) (Exemption) Regulations 2022 (the "2022 Exemption Regulations") exempt certain mobile repeater devices from the requirement for a wireless telegraphy licence in the UK. Specifically, the 2022 Exemption Regulations exempt the following repeaters, provided that they comply with the terms, provisions and limitations set by Ofcom:

a) static provider-specific mobile phone repeaters for indoor use;
b) low gain mobile phone repeaters for in-vehicle use; and
c) static multi-operator mobile phone repeaters for indoor use.

2.3 To benefit from this exemption and therefore be installed and used in the UK without a licence:

a) static provider-specific mobile phone repeaters for indoor use must meet the requirements of Regulations 5 to 12 of the 2022 Exemption Regulations. This UK Interface Requirement (specifically, at IR 2102.1) summarises these technical requirements;
b) low gain mobile phone repeaters for in-vehicle use must meet the minimum requirements specified in Regulation 18 of the 2022 Exemption Regulations and in this UK Interface Requirement (specifically IR 2102.2); and
c) static indoor multi-operator mobile phone repeaters must meet the requirements of Regulations 5 to 8 and 14 to 17. This UK Interface Requirements (specifically, at IR 2102.3) summarises these technical requirements.

2.4 In the event that there is any inconsistency between IR 2102.1 or 2102.3, and the 2022 Exemption Regulations, the 2022 Exemption Regulations shall take precedence.

2.5 Nothing in this UK Radio Interface Requirement or in the 2022 Regulations shall preclude the need for equipment to comply with the Radio Equipment Regulations 2017 (the "RER 2017").

2.6 Nothing in this UK Interface Requirement shall preclude equipment from being placed on the market in the UK that complies with the 'essential requirements' specified in the RER 2017.

2.7 This UK Radio Interface Requirement will be revised as necessary, for example to follow:

a) current technology developments for reasons related to the effective, efficient and appropriate use of the spectrum in particular maximising spectrum utilisation; and
b) changes to the available spectrum allocated for mobile radiocommunication services.

2.8 All UK Radio Interface Requirements will be published and will be made available free of charge on the Ofcom website.

2.9 Further information on this UK Radio Interface Requirement can be obtained from the technical enquiry contact given at the back of this document.

3. Minimum requirements for operation within the UK

3.1 The minimum requirements in this document are made for reasons related to the effective, efficient and appropriate use of the radio spectrum, in particular maximising spectrum utilisation.

3.2 This UK Radio Interface Requirement sets out the terms, provisions and limitations which apply to the installation and use in the UK of low gain mobile phone repeaters for in-vehicle use on a licence-exempt basis. It also summarises the terms, provisions and limitations which apply to the installation and use of static mobile phone repeaters for indoor use (the full detail of these being found in the 2022 Exemption Regulations).

3.3 These requirements, taken together with the 'essential requirements' detailed in the RER 2017, constitute the minimum requirements for the installation and use of mobile phone repeaters within the UK.

3.4 The technical parameters specified in the UK Radio Interface Requirement are applied to achieve the desired level of compatibility within the spectrum used for mobile radiocommunication services and with other radiocommunications services, whilst promoting enterprise, innovation and competition.

3.5 It is not the intention of this UK Radio Interface Requirement to duplicate or impose any additional 'essential requirements' of the RER 2017 on products. Any specified parameters within this document are for the purpose of identifying product options and not as a national de facto product requirement.

IR2102.1: Minimum requirements for the use of: provider specific static mobile phone repeaters for indoor use		
This table provides a summary of the minimum requirements applicable to provider-specific static mobile phone repeaters for indoor use. The full detail of these requirements is contained in the 2022 Exemption Regulations, which shall take precedence in the event of any inconsistency.		
Mandatory (1-10)		
1	Radiocommunication Service	Mobile
2	Application	Provider-specific static mobile phone repeaters for indoor use
3	Frequency bands	**700** 703-733 MHz (Uplink) 758-788 MHz (Downlink)
		800 791-821 MHz (Downlink) 832-862 MHz (Uplink)

		900 880-915 MHz (Uplink) 925-960 MHz (Downlink)
		1800 1710-1785 MHz (Uplink) 1805-1880 MHz (Downlink)
		2100 1920-1980 MHz (Uplink) 2110-2170 MHz (Downlink)
4	Channelling	Not specified
5	Modulation / Occupied bandwidth	Not specified
6	Direction / Separation	Repeater transmit/receive
7	Transmit power/Power density	See Table A1
8	Channel access and occupation rules	**Transmit Gain Control** The uplink and downlink system gain in dB of a repeater, referenced to its input and output ports, shall not exceed BSCL−30, where BSCL (base station coupling loss) is the path loss between the base station and the repeater. Where BSCL cannot be determined, the repeater must not transmit. The uplink and downlink system gain of a repeater shall not exceed 100 dB. The apparatus shall determine the value of BSCL by calculating the difference between the carrier power received at the repeater and the carrier power transmitted from the base station. The carrier power transmitted by the base station may be determined from the system information messages sent by the base station on its control channels.
		Automatic Standby When the repeater is no longer serving an active connection between a mobile device operating on the network of a particular mobile network operator and that mobile network, it must, after no more than 5 minutes, reduce any uplink noise power associated with the frequencies licensed to that mobile network operator to no more than −70 dBm/MHz EIRP.

		Anti-Oscillation Repeaters must detect and stop (i.e. by automatic gain reduction or shut down) any oscillations in uplink and downlink frequency bands. Oscillation detection must occur automatically within: • 0.3 seconds in the uplink band; and • 1 second in the downlink band. In cases where oscillation is detected, the repeater must continue any anti-oscillation technique for at least one minute. After anti-oscillation techniques have been used five times, the repeater must cease transmitting and cannot resume operation until manually reset.
		Provider Specific configuration Where a repeater is only capable of amplifying frequencies licensed to one mobile network operator at a time, the Transmit Power/Power Density and Transmit Gain Control requirements shall be calculated and applied individually for each uplink and downlink frequency band (as defined in Mandatory 3) that is being amplified by that repeater. Where a repeater is capable of amplifying frequencies licensed to more than one mobile network operator at the same time, those requirements shall be calculated and applied individually for each of the uplink and downlink frequency bands licensed to each mobile network operator that is being amplified by that repeater.
		Noise Figure The repeater system noise figure shall not exceed 7 dB.
9	Additional essential requirements	Nil
10	Frequency planning assumptions	Not specified
Informative (11-14)		
11	Planned changes	Nil
12	Reference	EN 303 609 EN 301 908-11 EN 301 908-15
13	Remarks	Nil
14	Notification Number (in respect of Northern Ireland)	2021/7013/XI

Table A1

Band	Technology	Maximum Uplink Power	Maximum Downlink Power (indoor use only)
700 & 800	Technology Neutral	23 dBm EIRP	PSD 10 dBm / 5 MHz EIRP; and Total 17 dBm EIRP
900	GSM	33 dBm EIRP	10 dBm EIRP
1800	GSM	30 dBm EIRP	10 dBm EIRP
900, 1800 & 2100	3G	24 dBm EIRP	PSD 10 dBm / 5 MHz EIRP; and Total 17 dBm EIRP
900 & 1800	Technology Neutral (excluding GSM and 3G)	23 dBm EIRP	PSD 10 dBm / 5 MHz EIRP; and Total 17 dBm EIRP
2100	Technology Neutral (excluding 3G)	24 dBm EIRP	PSD 10 dBm / 5 MHz EIRP; and Total 17 dBm EIRP
Where PSD is power spectral density			

IR2102.2: 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 bands	**700** 703-733 MHz (Uplink) 758-788 MHz (Downlink)
		800 791-821 MHz (Downlink) 832-862 MHz (Uplink)
		900 880-915 MHz (Uplink) 925-960 MHz (Downlink)
		1800 1710-1785 MHz (Uplink) 1805-1880 MHz (Downlink)
		2100 1920-1980 MHz (Uplink) 2110-2170 MHz (Downlink)

		2600 2500-2570 MHz (Uplink) 2620-2690 MHz (Downlink)
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	**Maximum permitted Gain** In both the Uplink and the Downlink the maximum permitted gain1 is • 36 dB in relevant frequency bands above 1 GHz; and • 30 dB in relevant frequency bands below 1 GHz.
		Automatic Standby 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.
9	Authorisation regime	Licence Exempt
10	Additional essential requirements	Nil
11	Frequency planning assumptions	Not specified
Informative (11-14)		
12	Planned changes	Nil
13	Reference	EN 303 609 EN 301 908-11 EN 301 908-15
14	Remarks	Nil
15	Notification Number (in respect of Northern Ireland)	2019/344/UK

Table A2

Band	Technology	Maximum Uplink Power	Maximum Downlink Power (indoor use only)
700 & 800	Technology Neutral	23 dBm EIRP	PSD 10 dBm / 5 MHz EIRP; and Total 17 dBm EIRP
900	GSM	33 dBm EIRP	10 dBm EIRP
1800	GSM	30 dBm EIRP	10 dBm EIRP
900, 1800	3G	24 dBm EIRP	PSD 10 dBm / 5 MHz EIRP; and Total 17 dBm EIRP
900 & 1800	Technology Neutral (excluding GSM and 3G)	23 dBm EIRP	PSD 10 dBm / 5 MHz EIRP; and Total 17 dBm EIRP
2100	Technology Neutral	24 dBm EIRP	PSD 10 dBm / 5 MHz EIRP; and Total 17 dBm EIRP
2600	Technology Neutral	23 dBm EIRP	PSD: 10 dBm / 5 MHz TRP; and Total: 17 dBm TRP
Where PSD is power spectral density			

IR2102.3: Minimum requirements for the use of multi-operator static mobile phone repeaters for indoor use		
This table provides a summary of the minimum requirements applicable to multi-operator static mobile phone repeaters for indoor use. The full detail of these requirements is contained in the 2022 Exemption Regulations, which shall take precedence in the event of any inconsistency.		
Mandatory (1-10)		
1	Radiocommunication Service	Mobile
2	Application	Multi-operator static mobile phone repeaters for indoor use
3	Frequency bands	**700** 703-733 MHz (Uplink) 758-788 MHz (Downlink)
		800 791-821 MHz (Downlink) 832-862 MHz (Uplink)
		900 880-915 MHz (Uplink) 925-960 MHz (Downlink)

		1800 1710-1785 MHz (Uplink) 1805-1880 MHz (Downlink)
		2100 1920-1980 MHz (Uplink) 2110-2170 MHz (Downlink)
4	Channelling	Not specified
5	Modulation / Occupied bandwidth	Not specified
6	Direction / Separation	Repeater transmit/receive
7	Transmit power/Power density	**Maximum Uplink Power for each Frequency Band** 17 dBm / 5 MHz EIRP
		Maximum Downlink Power for each Frequency Band 10 dBm / 5 MHz EIRP (indoor use only)
8	Channel access and occupation rules	**Transmit Gain Control** The uplink and downlink system gain in dB of a repeater, referenced to its input and output ports, shall not exceed 10−RSSI, where RSSI is the downlink composite received signal power in dBm at the repeater donor port, for all base stations in the band of operation. A repeater shall provide the same uplink and downlink system gain. The uplink and downlink system gain of a repeater shall not exceed 100 dB.
		Automatic Standby When the repeater does not serve an active connection between a mobile device and a mobile network it must, after no more than 5 minutes, reduce any uplink noise power to no more than −70 dBm/MHz EIRP.

		Anti-Oscillation Repeaters must detect and stop (i.e. by automatic gain reduction or shut down) any oscillations in uplink and downlink frequency bands. Oscillation detection must occur automatically within: • 0.3 seconds in the uplink band; and • 1 second in the downlink band. In cases where oscillation is detected, the repeater must continue any anti-oscillation technique for at least one minute. After anti-oscillation techniques have been used five times, the repeater must cease transmitting and cannot resume operation until manually reset.
		Noise Figure The repeater system noise figure shall not exceed 7 dB.
		Intermodulation due to signals within the frequency band(s) of operation For each frequency band that is being amplified by the repeater, transmitted intermodulation products due to input signals within that band shall not exceed −19dBm at the donor and coverage ports.
9	Additional essential requirements	Nil
10	Frequency planning assumptions	Not specified
Informative (11-14)		
11	Planned changes	Nil
12	Reference	EN 303 609 EN 301 908-11 EN 301 908-15
13	Remarks	Nil
14	Notification Number (in respect of Northern Ireland)	2021/7013/XI

4. Additional performance parameters

(informative)

4.1 None specified

5. Contact details

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6. Document history

Version	Date	Changes
0.1	12 July 2019	Draft published
1.0	1 November 2019	Document published featuring changes to IR2102.2: Minimum requirements for the use of: low gain mobile phone repeaters for in-vehicle use.
2.0	26 May 2022	Document published featuring: - changes to IR2102.1: Minimum requirements for the use of: provider-specific static mobile phone repeaters for indoor use; and - addition of IR2102.3: Minimum requirements for the use of: multi-operator static mobile phone repeaters for indoor use
3.0	8 February 2024	Document published featuring: - changes to IR2102.1: Removal of requirement for 4G provider-specific repeaters to also amplify 2G and/or 3G signals. - Changes to IR2102.2: Addition of 700 MHz band to licence-exemption frequencies for in-vehicle mobile repeaters; and making associated power limits technology neutral. - changes to IR2102.3: Removal of requirement for multi-operator repeaters to transmit the entirety of the 900, 1800 and 2100 MHz frequency bands.