

Annex 6: Draft licence variation templates

Variation of certain licences held by Vodafone and Telefónica in the 900 MHz, 1800 MHz, 2100 MHz and 2.6 bands

ANNEX:

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A6. Annex overview

- A6.1 This document is Annex 6 to Ofcom's consultation entitled "Ofcom's response to Vodafone's and Telefónica's requests to update the technical conditions of their mobile licences to enable the deployment of newer technologies including 5G".¹
- A6.2 In this Annex we show the changes that we are proposing to make to the following licences using tracked changes:
 - i) Vodafone licence 0249664 (900 MHz and 1800 MHz);
 - ii) Vodafone licence 0207131 (2100 MHz);
 - iii) Vodafone licence 094358 (2.6 GHz); and
 - iv) Telefónica licence 1238565 (2.6 GHz).
- A6.3 To show the proposed changes, these are coloured as follows:
 - Green = proposed changes for introducing Block Edge Masks (BEM) and Active Antenna Systems (AAS) required to deploy the latest technology such as 5G;
 - Teal = proposed changes to make the licence more technology neutral by authorising Licensees to transmit on all of their frequency bands;
 - Blue = proposed administrative changes to correct errors or update terms; and
 - Yellow = proposed changes requested by Telefónica, and agreed with Vodafone, to relax a boundary condition between the licensees in the 2.6 GHz band.
- A6.4 The licences also contain other schedules that licensees must comply with, such as compliance with EMF. As we are not proposing to make any changes to these schedules, we have not included these in this document. Copies of the existing licences can be found on the Ofcom website.²

¹ <u>https://www.ofcom.org.uk/ data/assets/pdf file/0026/237824/vodafone-telefonica-licence-variation.pdf</u>.

² Links to all current licences can be found <u>here</u>.

A7. Proposed changes to Vodafone 900/1800 MHz licence

PUBLIC WIRELESS NETWORK LICENCE

This licence document replaces the version of the Licence issued by Ofcom on 18 May 2020 to Company Limited.

Licence no.	0249664
Date of issue:	[27 July 2021]
Fee payment date:	31 October (annually)

1. The Office of Communications (Ofcom) grants this wireless telegraphy licence ("the Licence") to

Vodafone Limited
(Company registration number 1471587)
("the Licensee")
Vodafone House
The Connection
Newbury
Berkshire
RG14 2FN

to establish, install and use wireless telegraphy stations and/or wireless telegraphy apparatus as described in the schedules to this Licence (together "the Radio Equipment") subject to the terms set out below.

Licence Term

2. This Licence shall continue in force until revoked by Ofcom or surrendered by the Licensee.

Licence Variation and Revocation

- 3. Pursuant to schedule 1 paragraph 8 of the Wireless Telegraphy Act 2006 ("the Act"), Ofcom may not revoke or vary this Licence under schedule 1 paragraph 6 of the Act except:
 - a) at the request, or with the consent, of the Licensee;
 - b) if there has been a breach of any of the terms of this Licence;
 - c) in accordance with schedule 1 paragraph 8(5) of the Act;

- d) if it appears to Ofcom to be necessary or expedient to revoke or vary the licence for the purpose of complying with a direction by the Secretary of State given to Ofcom under Section 5 of the Act or Section 5 of the Communications Act 2003;
- e) if, in connection with the transfer or proposed transfer of rights and obligations arising by virtue of the Licence, there has been a breach of any provision of regulations made by Ofcom under the powers conferred by section 30(1) and 30(3) of the Act3;
- f) for reasons related to the management of the radio spectrum, provided that in such a case the power to revoke may only be exercised after at least five years' notice is given in writing.
- 4. Of com may only revoke or vary this Licence by notification in writing to the Licensee and in accordance with schedule 1 paragraphs 6, 6A and 7 of the Act.

Transfer

5. This Licence may not be transferred. The transfer of rights and obligations arising by virtue of this Licence may however be authorised in accordance with regulations made by Ofcom under powers conferred by section 30 of the Act.⁴

Changes to Licensee details

6. The Licensee must give prior notice to Ofcom in writing of any change in the details of the name and/or address recorded in paragraph 1 of this Licence.

Fees

7. The Licensee shall each year pay to Ofcom the relevant fee(s) as provided in section 12 of the Act and the regulations made thereunder on or before the fee payment date shown above, or on or before such dates as shall be notified in writing to the Licensee.

Radio Equipment Use

- 8. The Licensee shall ensure that the Radio Equipment is established, installed and used only in accordance with the provisions specified in the schedules to this Licence. Any proposal to amend any detail specified in the schedules to this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.
- 9. The Licensee must ensure that the Radio Equipment is operated in compliance with the terms of this Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of this Licence.
- 10. The Licensee must ensure that all Radio Equipment is established, installed, modified and used only in accordance with the provisions specified in schedule 2 (EMF Licence Condition) of this Licence.

³ These are regulations on spectrum trading.

⁴ See Ofcom's website for the latest position on spectrum trading and the types of trade which are permitted.

Access and Inspection

- 11. The Licensee shall permit a person authorised by Ofcom:
 - a) to have access to the Radio Equipment; and
 - b) to inspect this Licence and to inspect, examine and test the Radio Equipment,

at any and all reasonable times or, when in the opinion of that person an urgent situation exists, at any time to ensure the Radio Equipment is being used in accordance with the terms of this Licence.

Modification, Restriction and Closedown

- 12. A person authorised by Ofcom may require the Radio Equipment, or any part thereof, to be modified or restricted in use, or temporarily or permanently closed down immediately if in the opinion of the person authorised by Ofcom:
 - a) a breach of this Licence has occurred; and/or
 - b) the use of the Radio Equipment is causing or contributing to undue interference to the use of other authorised radio equipment.
- 13. Of com may require the Radio Equipment to be modified or restricted in use, or temporarily or permanently closed down either immediately or on the expiry of such period as may be specified in the event of a national or local state of emergency being declared. Of com may exercise this power by a written notice served on the Licensee or by a general notice applicable to holders of this class of Licence.

Geographical Boundaries

14. Subject to the requirements of any coordination procedures notified to the Licensee pursuant to paragraphs 5 and 6 of schedule 1 to this Licence, the Licensee is authorised to establish, install and use the Radio Equipment in the United Kingdom. For the avoidance of doubt, the United Kingdom includes the United Kingdom's territorial sea (measured in accordance with section 1 of the Territorial Sea Act 1987) and does not include the Channel Islands or the Isle of Man.

Interpretation

- 15. In this Licence:
 - a) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of wireless telegraphy stations and installation and use of wireless telegraphy apparatus for wireless telegraphy as specified in section 8(1) of the Act;
 - b) the expression " interference" shall have the meaning given by section 115 of the Act;
 - c) the expressions "wireless telegraphy station" and "wireless telegraphy apparatus" shall have the meanings given by section 117 of the Act;

- d) the schedules form part of this Licence together with any subsequent schedule(s) which Ofcom may issue as a variation to this Licence; and
- e) the Interpretation Act 1978 shall apply to the Licence as it applies to an Act of Parliament.

Issued by Ofcom

SCHEDULE 1 TO LICENCE NUMBER: 0249664

Licence Category: Public Wireless Network

This schedule forms part of licence no xxxxxxx, issued to Company Limited, the Licensee on xx xxxx 2022 and describes the Radio Equipment covered by the Licence and the purpose for which the Radio Equipment may be used.

Description of Radio Equipment Licensed

1. In this Licence, the Radio Equipment means the base transceiver stations or repeater stations forming part of the Network (as defined in paragraph 2 below) References in this schedule to the Radio Equipment are references to any wireless telegraphy station or wireless telegraphy apparatus that is established, installed and/or used under this schedule.

Purpose of the Radio Equipment

2. The Radio Equipment shall form part of a radio telecommunications network ("the Network"), in which User Stations which meet the appropriate technical performance requirements as set out in the relevant Wireless Telegraphy (Exemption) Regulations made by Ofcom communicate by radio with the Radio Equipment to provide a telecommunications service.

Interface Requirements for the Radio Equipment

2. Use of the Radio Equipment shall be in accordance with the following Interface Requirements:

IR 2014 – Public Wireless Networks; and/or

IR 2019 – Third Generation Mobile; and/or

IR 2087 – 900 / 1800 MHz LTE and WiMAX;

IR 2109 - Terrestrial systems capable of providing electronic communications services in the 900 MHz and 1800 MHz bands

or for equipment placed on the market before 8 April 2000, is required to be type approved in accordance with a recognised technical performance standard relating to the service licensed.

Special Conditions relating to the Operation of the Radio Equipment

3.

 a) Subject to paragraph (b) of this schedule, during the period that this Licence remains in force, unless consent has otherwise been given by Ofcom, the Licensee shall compile and maintain accurate written records of the following details relating to the Radio Equipment:

- a) postal address (including post code);
- b) National Grid Reference, to at least 10<mark>0</mark> metre resolution;
- c) antenna height (above ground level) and type, and boresight east of true north (if applicable); and
- d) radio frequencies which the Radio Equipment uses;
- e) Transmitted power expressed in dBm / 200 kHz EIRP for GSM base stations;
- f) Transmitted power expressed in dBm / 200 kHz EIRP per antenna for base stations for narrowband terrestrial ECS; and
- g) Transmitted power expressed in dBm / 5 MHz EIRP per antenna for base stations for broadband terrestrial ECS.

and the Licensee must produce these above records if requested by a person authorised by Ofcom;

- b) The conditions relating to the keeping of records contained in sub-paragraphs 4(a)i),
 4(a)ii) and 4(a)iii), shall not apply in respect of femtocell equipment and
 smart/intelligent low power repeater equipment;
- c) The Licensee shall submit to Ofcom copies of the records detailed in sub- paragraph(a) above at such intervals as Ofcom shall notify to the Licensee.

Co-ordination at Frequency and Geographical Boundaries and Compliance with Other Procedures Relating to Interference

4. The Licensee shall ensure that the Radio Equipment is operated in compliance with such coordination and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

International Cross-Border Coordination

5. The Licensee shall ensure that the Radio Equipment is operated in compliance with such cross-border co-ordination and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

Voice Coverage Obligation

6. The Licensee shall maintain an electronic communications network that is capable of providing mobile voice telecommunications services to an area covering at least 90% of the geographic landmass of the United Kingdom at at least one of the minimum signal strengths set out in Table 1 of this condition. For the avoidance of doubt the Licensee shall be permitted to meet the obligation set out in this condition using any frequencies and technologies available to the Licensee.

Table 1

Technology and Band	Minimum Signal Threshold
GSM 900	-93 dBm

GSM 1800	-93 dBm
UMTS 2100	-103 dBm
LTE 800	-115 dBm

Assessment of compliance with the Voice Coverage Obligation

7. Of com will assess the Licensee's compliance with the Voice Coverage Obligation by reference to the document "*Voice Coverage Obligation Notice of Compliance Methodology*" published by Ofcom.

2020 Coverage Obligations

8. <u>Definitions</u>

- 1. For the purposes of interpreting conditions 9.(2)-(8) below, these terms shall have the following meaning:
 - a) **"2019 Baseline Coverage Level"** means the Licensee's coverage footprint of the Required Service as measured by the Licensee's predictive model on the basis of their September 2019 data as submitted to Ofcom in October 2019;
 - b) "2020 Baseline Coverage Footprint" means the Licensee's coverage footprint of the Required Service as submitted to Ofcom in January 2020 on the basis of: (i) the data submitted to Ofcom in September 2019 for the Connected Nations 2019 report and (ii) the Licensee's forward-looking predictions for any additional site which is expected to be on-air by 30 June 2020, excluding any site which is not on-air by 30 June 2021;
 - c) **"Available"**, for the purposes of condition 9.(4)(a), has the meaning given in the Grant Agreement;
 - d) "EAS Site" means: (i) any of the 292 extended area service sites that the Home Office is intending to build to improve coverage in remote areas and (ii) any alternative or additional extended area service site which is publicly funded in the same way whose location is specified by Government by 31 March 2024, excluding any such site the deployment of which would materially duplicate the coverage from any site in Total Not Spots for which land has already been acquired by the Licensee;
 - e) **"Full Coverage Area"** means a geographical area within the UK falling within all the MNOs' 2020 Baseline Coverage Footprints;
 - f) "Grant Agreement" means the funding agreement entered into by Government and the SRN Entity in March 2020 as amended on 1 March 2021;
 - g) "Initial Coverage Deadline" means 30 June 2024;

- h) "MNO" (Mobile Network Operator) means each of EE Limited,⁵ Hutchison 3G UK Limited,⁶ Telefónica UK Limited⁷ and Vodafone Limited⁸ (collectively, the "MNOs");
- i) **"Partial Not Spot"** means a geographical area within the UK falling within at least one, but not all, the MNOs' 2020 Baseline Coverage Footprints;
- j) "Required Service" means an electronic communications network that provides with a confidence level of more than 95% a mobile telecommunications service to users (i) with a sustained downlink speed of not less than 2 megabits per second, and (ii) on which 90 second voice calls can be made without interruption. This is equivalent to providing an outdoor LTE telecommunications service at a predicted mean signal strength of at least -105dBm;
- k) "Road" means all motorway, A-road, B-road, minor (non-numbered) roads and local roads excluding restricted access, private roads and cul-de-sacs;
- "Subsequent Coverage Deadline" means, in relation to each obligation that falls due on such deadline, 31 January 2027, unless Government suspends funding in response to a "Suspension Event" (as defined in the Grant Agreement), in which case the deadline shall be extended by the number of days included within such suspension;
- m) "SRN Entity" means the joint venture set up by the MNOs to run the SRN Programme;
- n) **"SRN Programme**" means the programme agreed between the MNOs and Government in March 2020 to improve mobile coverage in rural areas;
- o) **"Total Not Spot**" means geographical areas within the UK falling outside all the MNOs' 2020 Baseline Coverage Footprints.

<u>88% coverage</u>

- 2. By the Initial Coverage Deadline the Licensee shall provide, and thereafter maintain, the Required Service to an area covering at least:
 - a) 88% of the geographic landmass of the United Kingdom;
 - b) 92% of the geographic landmass of England;
 - c) 93% of the geographic landmass of Northern Ireland;
 - d) 76% of the geographic landmass of Scotland; and
 - e) 82% of the geographic landmass of Wales.

⁵ **EE Limited**, registered in England under company number 02382161. Registered office address: Trident Place, Mosquito Way, Hatfield, Hertfordshire, AL10 9BW.

⁶ Hutchison 3G UK Limited, registered in England under company number 03885486. Registered office address: Star House, 20 Grenfell Road, Maidenhead, Berkshire, SL6 1EH.

⁷ **Telefónica UK Limited**, registered in England under company number 01743099. Registered office address: 260 Bath Road, Slough, Berkshire, SL1 4DX.

⁸ **Vodafone Limited**, registered in England under company number 01471587. Registered office address: Vodafone House, The Connection, Newbury, Berkshire, RG14 2FN.

In meeting these obligations, the Licensee shall ensure that:

- i. any additional coverage relative to the 2020 Baseline Coverage Footprint is either:
 - (A) provided in Partial Not Spots;
 - (B) gained by deploying on sites located in Partial Not Spots; or
 - (C) gained by deploying on sites located in a Full Coverage Area, provided that any such coverage which is added in Total Not Spots does not exceed 0.3% of the geographic landmass of the United Kingdom; and
- ii. any additional coverage which is provided in Total Not Spots does not limit the Licensee's ability to meet condition 9.(4)(b)(ii) below.

90% coverage

- 3. By the Subsequent Coverage Deadline the Licensee shall provide, and thereafter maintain, the Required Service to an area covering at least:
 - a) 90% of the geographic landmass of the United Kingdom;
 - b) 92% of the geographic landmass of England;
 - c) 93% of the geographic landmass of Northern Ireland;
 - d) 85% of the geographic landmass of Scotland;
 - e) 85% of the geographic landmass of Wales;
 - f) 90,000 premises in the United Kingdom which do not fall within the Licensee's 2019 Baseline Coverage Level. Premises which are built after September 2019 will not count towards satisfaction of this requirement; and
 - g) 8,500 kilometres of Roads in the United Kingdom which do not fall within the Licensee's 2019 Baseline Coverage Level. Roads which are built after September 2019 will not count towards satisfaction of this requirement.

Coverage from the Extended Area Service Sites and in Total Not Spots

- 4. In meeting the obligations set out in condition 9.(3)(a), the Licensee shall ensure that any coverage required to meet such condition which is incremental to the 88% geographic coverage to be met under condition 9.(2)(a):
 - a) includes, as far as possible, coverage from the EAS Sites in so far as these sites are made Available by the Home Office no later than one year before the Subsequent Coverage Deadline and continue to be made Available to the Licensee for the duration of this condition; and
 - b) the remaining additional coverage:
 - is provided in areas that are Total Not Spots and are not provided with the Required Service from either sites located within the 2020 Baseline Coverage Footprint or the EAS Sites, as far as possible by deploying on any other publicly funded sites; and
 - ii. includes, in any case, at least 1 percentage points in such areas.

Proportionate reduction

5. The obligations set out in conditions 9.(3)(a)-(e) and 9.(4) will be removed or proportionately reduced if the conditions described in the document *"2020"*

Coverage Obligations - Notice of compliance verification methodology" published by Ofcom in March 2020 (and updated in July 2021) are met.

Duration

6. The obligations set out in conditions 9.(3) and 9.(4) will remain in force for 14 years from the Subsequent Coverage Deadline.

Technology neutrality

7. For the avoidance of doubt, the Licensee is permitted to meet the obligations set out in this Licence using any frequencies and technologies available to the Licensee.

Assessment of compliance with the 2020 coverage obligations

8. Ofcom will assess the Licensee's compliance with the obligations set out in conditions 9.(2) to 9.(4) after the date at which each obligation is due to have been met by reference to the document "2020 Coverage obligations - Notice of compliance verification methodology" notified by Ofcom to the Licensee in March 2020 (and updated in July 2021). In addition to verifying compliance when these obligations fall due, Ofcom may repeat this assessment from time to time to ensure continued compliance.

Permitted Frequency Blocks

9. Subject to any emission requirements in this schedule, ^Tthe Radio Equipment may only transmit on downlink frequencies within the following frequency bands (the Permitted Frequency Blocks):

Downlink frequencies	Uplink frequencies
925.1 – 930.1 MHz	880.1 – 885.1 MHz
935.1 – 947.5 MHz	890.1 – 902.5 MHz
1810.9 – 1816.7 MHz	1715.9 – 1721.7 MHz

Radio Frequency Carrier Spacing

- 10. In the absence of bilateral or multilateral agreements which have been notified to Ofcom specifying alternative arrangements between the licensee and the licensee(s) of neighbouring networks the licensee must ensure that in respect of the frequencies set out at paragraph [5] of this schedule:
 - a) the centre frequency of any of their GSM carriers is 100 kHz or more inside any edge of their Permitted Frequency Blocks;
 - b) the centre frequency of any of their UMTS carriers is 2.7 MHz or more inside any edge of their permitted frequency blocks where a neighbouring licensee has deployed a GSM carrier or carriers (including GSM-R) in the immediately adjacent spectrum; and
 - c) the centre frequency of any of their UMTS carriers is 2.5 MHz or more inside any other edge of their permitted frequency blocks;
 - the channel edge of any of their LTE carriers is 200 kHz or more inside any edge of their permitted frequency blocks where a neighbouring licensee has deployed a GSM carrier or carriers (including GSM-R) in the immediately adjacent spectrum; and

- e) the channel edge of any of their LTE carriers does not extend beyond their permitted frequency blocks;
- f) the channel edge of any of their WiMAX carriers is 200 kHz or more inside any edge of their permitted frequency blocks where a neighbouring licensee has deployed a GSM carrier or carriers (including GSM-R) in the immediately adjacent spectrum; and
- g) the channel edge of any of their WiMAX carriers does not extend beyond their permitted frequency blocks.
- b) the channel edge of any of their narrowband terrestrial ECS carriers is 200 kHz or more inside any edge of their permitted frequency blocks
- c) the channel edge of any of their wideband terrestrial ECS carriers is 200 kHz or more inside any edge of their permitted frequency blocks where a neighbouring licensee has deployed a GSM carrier or carriers (including GSM-R) in the immediately adjacent spectrum; and
- d) the channel edge of any of their wideband terrestrial ECS carriers does not extend beyond their permitted frequency blocks.

ITU Class of Emission

11.	For GSM:	271KG7W
	For UMTS:	5M00D7W
	For 1.4 MHz LTE:	1M40D7W
	For 3 MHz LTE:	<u> 3M00D7W</u>
	For 5 MHz LTE:	5M00D7W
	For 10 MHz LTE:	10M0D7W
	For 15 MHz LTE:	15M0D7W
	For 20 MHz LTE:	20M0D7W
	For 5 MHz WiMAX:	5M00D7W
	For 10 MHz WiMAX:	10M0D7W

Maximum Permissible Downlink Transmit Power

12. The power transmitted (in e.i.r.p.) in any direction on the downlink frequencies of the Permitted Frequency Blocks by the Radio Equipment shall not exceed:

- Technology	900 MHz spectrum	1800 MHz spectrum
<mark>for GSM</mark>	<mark>62 dBm per carrier</mark>	62 dBm per carrier
<mark>for UMTS</mark>	<mark>65 dBm per carrier</mark>	65 dBm per carrier
<mark>for LTE</mark>	<mark>65 dBm per 5 MHz</mark>	<mark>65 dBm per 5 MHz</mark>
<mark>for WiMAX</mark>	<mark>65 dBm per 5 MHz</mark>	<mark>65 dBm per 5 MHz</mark>

12. Subject to any more restrictive limitations imposed by the coordination requirements notified by Ofcom in accordance with paragraphs [4 and 5] of this schedule, the power transmitted in any direction in the Permitted Frequency Blocks by the Radio Equipment shall not exceed:

a) Downlink Frequencies

Radio Equipment	Maximum mean power
GSM base station	62 dBm EIRP per carrier
non-AAS base station _[a] – narrowband terrestrial ECS	62 dBm / 200 kHz EIRP per antenna
non-AAS base station _[a] – broadband terrestrial ECS	65 dBm / 5 MHz EIRP per antenna

[1] For femtocell base stations, power control must be applied to minimise interference to adjacent channels.

b) Uplink Frequencies⁹

Radio Equipment	Maximum mean power	
GSM terminal station	900 MHz Spectrum	1800 MHz Spectrum
	33 dBm TRP	30 dBm TRP
Terrestrial ECS mobile or nomadic terminal	25 dBm TRP	
station[b][c]		
Terrestrial ECS fixed or installed terminal	25 dBm EIRP	
station[b][c]		

_{Φ]} The maximum mean power relates to the EIRP or TRP of a specific piece of Radio Equipment irrespective to the number of transmit antennas.

[c] It is recognised that a possible tolerance of up to +2 dB is included in this value, to take account of operation under extreme environmental conditions and production spread. This value does not include test tolerance.

Maximum power outside the Permitted Frequency Blocks

For transmissions on the downlink frequencies, the EIRP emanating from the Radio
 Equipment transmissions at any frequency outside the Permitted Frequency Blocks, but
 within 915-970 MHz and 1795-1890 MHz, shall not exceed the higher (least stringent) of (a)
 the baseline requirements and (b) the block specific requirements for that frequency.

a) Baseline Requirements

	Non-AAS mean EIRP limit per	AAS mean TRP limit per cell
Frequency Range	antenna	(1800 MHz Spectrum only)
915-970 MHz	<mark>3 dBm / MHz</mark>	N/A
1795-1890 MHz	<mark>3 dBm / MHz</mark>	–6 dBm / MHz

⁹ Consumer user equipment will be authorised by means of a licence exemption under section 8 of the Wireless Telegraphy Act 2006

b) Block-specific requirements

Frequency range	Non-AAS mean EIRP	AAS mean TRP limit per
	limit per antenna (900	cell (1800 MHz
	MHz & 1800 MHz	Spectrum only)
	<mark>Spectrum)</mark>	
-10 to -5 MHz from lower block edge	12 dBm / 5 MHz	3 dBm / 5 MHz
-5 to -1 MHz from lower block edge	5 dBm / MHz	–4 dBm / MHz
-1 to -0.2 MHz from lower block edge	13.8 dBm / 0.8 MHz	4.7 dBm / 0.8 MHz
-0.2 to 0 MHz from lower block edge	32.4 dBm / 0.2 MHz	17.4 dBm / 0.2 MHz
0 to +0.2 MHz from upper block edge	32.4 dBm / 0.2 MHz	17.4 dBm / 0.2 MHz
+0.2 to +1 MHz from upper block edge	13.8 dBm / 0.8 MHz	4.7 dBm / 0.8 MHz
+1 to +5 MHz from upper block edge	5 dBm / MHz	–4 dBm / MHz
+5 to +10 MHz from upper block edge	12 dBm / 5 MHz	3 dBm / 5 MHz

Interpretation

- 14. In this schedule:
 - a) "900 MHz spectrum" means frequencies in the range 880 MHz to 915 MHz paired with 925 MHz to 960 MHz;
 - b) "1800 MHz spectrum" means frequencies in the range 1710 MHz to 1781.7 MHz paired with 1805 MHz to 1876.7 MHz;
 - c) "dBm" means the power level in decibels (logarithmic scale) referenced against 1 miliwatt (i.e. a value of 0 dBm is 1 milliwatt);
 - d) "e.i.r.p." means the effective isotropically radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);
 - e) "A femtocell" means Radio Equipment transmitting on the downlink frequencies, which operates at a power not exceeding 24 dBm e.i.r.p. per carrier which may be established by customers of the Network but which is or will be used only by and under the control of the Network, following the establishment of a telecommunications link between the femtocell and the Network;
 - f) "GSM system" means an electronic communications network that complies with GSM standards, as published by ETSI, in particular EN 301 502, and EN 301 511, and EN 301 908-18 and "GSM" means pertaining to such a network or its Radio Equipment;
 - g) "GSM-R" means the variant of GSM for railways as specified in IR 2064;

- h) "IR" means a United Kingdom Radio Interface Requirement published by Ofcom in accordance with the Radio Equipment Regulations 2017, as amended by the Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019; means a United Kingdom Radio Interface Requirement published by Ofcom in accordance with Article 4.1 of Directive 1995/5/EC of the European Parliament and of the Council on radio equipment and telecommunications terminal equipment (RTTE) and the mutual recognition of their conformity;
- i) "ITU" means the International Telecommunication Union, and "Class of Emission" shall have the meaning as defined in the ITU Radio Regulations Appendix 1;
- j) "LTE system" means an electronic communications network that complies with the LTE standards as published by ETSI, in particular EN 301 908-1, EN 301 908-13, EN 301 908-14, EN 301 908-15 and EN 301 908-11 and "LTE" means pertaining to such a network or its Radio Equipment;
- k) "Permitted Frequency Blocks" has the same meaning given to it in paragraph 6[9] of this schedule;
- I) "User Station" means any vehicle mounted or hands portable mobile station designed for mobile use and/ or any station designed or adapted to be established and used from static locations which meet the appropriate technical performance requirements as set out in the Wireless Telegraphy (Exemption) Regulations and either complies with the appropriate Interface Regulation listed in paragraph 3, or for equipment placed on the market before 8 April 2000, is type approved in accordance with a recognised technical standard relating to the service licensed;
- m) A "smart/intelligent low power repeater" means a repeater which operates with power not exceeding 24 dBm e.i.r.p. per carrier, which may be established by customers of the Licensee who have written agreements with the Licensee and:
 - The Licensee has ultimate control of the repeater, i.e. each individual repeater can be disabled remotely by the Licensee;
 - The repeater operates only on the Licensee's frequencies and with their valid Public Land Mobile Network Identifier;
 - Must not cause undue interference to other spectrum users; and
 - The repeater only transmits on the Licensee's Base Receive frequencies when actively carrying a call (voice, video or data) or signalling from serviced handsets;
- n) "UMTS system" means an electronic communications network that complies with the UMTS standards as published by ETSI, in particular EN 301 908-2, EN 301 908-3 and EN 301 908-11 and "UMTS" means pertaining to such a network or its Radio Equipment; and

- o) "WiMAX system" means an electronic communications network that complies with the WiMAX standards as published by ETSI, in particular EN 301 908-1, EN 301 908-21 and EN 301 908-22 and "WiMAX" means pertaining to such a network or its Radio Equipment.
- p) "AAS" means active antenna system. An AAS is a base station and antenna system where the amplitude and / or phase between antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. This is not intended to include long term beam shaping such as fixed electrical down tilt. In AAS base stations the antenna system is integrated as part of the base station system or product;
- g) "Broadband terrestrial ECS" means a system that operates in channel bandwidths greater than 200 kHz;
- r) "Downlink" means transmissions from a base station or repeater to a terminal station (handset);
- s) "ECS" means Electronics Communication System;
- t) "Fixed or installed" means used or installed at specific fixed points;
- "Lower block edge" means, in relation to the Permitted Frequency Block, the lowest frequency in that Permitted Frequency Block;
- v) "Mobile or nomadic" means intended to be used while in motion or during halts at unspecified points;
- w) "Narrowband terrestrial ECS" means a system that operates in channel bandwidths of 200 kHz, excluding GSM;
- x) "non-AAS" means a piece of Radio Equipment which is not an AAS;
- Y) "Per antenna" means per radiating unit/component (irrespective of the number of radiating elements that make up that unit/component);
- "TRP" means the total radiated power. This is the integral of the power transmitted in different directions over the entire radiation sphere;
- aa) "Uplink" means transmissions from a terminal station (handset) or repeater to a base station;
- bb) "Upper block edge" means, in relation to the Permitted Frequency Block, the highest frequency in that Permitted Frequency Block;

Ofcom

A8. Proposed changes to Vodafone 2100 MHz licence

SPECTRUM ACCESS 2100 MHz LICENCE

This licence document replaces the version of the licence issued by the Ofcom on 23 March 2015 to Vodafone Limited.

Licence no: 0207131 Date of issue: [18 May 2021] Fee payment date **01 January** (annually) The Office of Communications (Ofcom) grants this wireless telegraphy licence ("the 1. Licence") to **Vodafone Limited** (Company registration number 1471587) ("the Licensee") **Vodafone House The Connection** Newbury **Berkshire**

RG14 2FN

to establish, install and use wireless telegraphy stations and/or wireless telegraphy apparatus as described in the schedules to this Licence (together "the Radio Equipment") subject to the terms set out below.

Licence Term

2. This Licence shall continue in force until revoked by Ofcom or surrendered by the Licensee.

Licence Variation and Revocation

- 3. Pursuant to schedule 1 paragraph 8 of the Wireless Telegraphy Act 2006 ("the Act"), Ofcom may not revoke or vary this Licence under schedule 1 paragraph 6 of the Act except:
 - a) at the request, or with the consent, of the Licensee;
 - b) if there has been a breach of any of the terms of this Licence;
 - c) in accordance with schedule 1 paragraph 8(5) of the Act;

- d) if it appears to Ofcom to be necessary or expedient to revoke the licence for the purpose of complying with a direction by the Secretary of State given to Ofcom under Section 5 of the Act or Section 5 of the Communications Act 2003;
- e) if, in connection with the transfer or proposed transfer of rights and obligations arising by virtue of the Licence, there has been a breach of any provision of regulations made by Ofcom under the powers conferred by section 30(1) and 30(3) of the Act10;
- f) for reasons related to the management of the radio spectrum, provided that in such a case the power to revoke may only be exercised after at least five years' notice is given in writing.
- 4. In the period before 31 December 2021, pursuant to schedule 1 paragraph 8(1) of the 2006 Act, Ofcom may not vary this Licence under schedule 1 paragraph 6 of the 2006 Act save at the request or with the consent of the Licensee except:
 - a) in the circumstances specified in paragraphs (b), (c) and (d) of sub-paragraph (1) of the paragraph; or
 - b) in relation only to paragraphs 7 and 8 of schedule 1, if Ofcom has reasonable grounds for concluding that use of the Radio Equipment in accordance with either or both of these paragraphs is causing, or is likely to cause, undue interference to other authorised radio equipment.
- 5. After 31 December 2021, Ofcom may only vary this Licence by notification in writing to the Licensee and in accordance with schedule 1 paragraphs 6, 6A and 7 of the Act.

Transfer

6. This Licence may not be transferred. The transfer of rights and obligations arising by virtue of this Licence may however be authorised in accordance with regulations made by Ofcom under powers conferred by section 30 of the Act¹¹.

Changes to Licensee details

- 7. The Licensee shall give prior notice to Ofcom in writing of any changes to the Licensee's name and/or address as recorded in paragraph 1 of this Licence.
- 8. If the Licence is surrendered or revoked no refund of the fee which was paid by Company Limited whether in whole or in part will be made except at the absolute discretion of the Secretary of State in accordance with regulation 5 of the Wireless Telegraphy (Third Generation Licences) Regulations 1999.

Fees

9. From 1 January 2022, the Licensee shall each year pay to Ofcom the relevant fee(s) as provided in section 12 of the Act and the regulations made thereunder on or before the fee

¹⁰ These are regulations on spectrum trading.

¹¹ See Ofcom's website for the latest position on spectrum trading and the types of trade which are permitted.

payment date shown above, or on or before such dates as shall be notified in writing to the Licensee.

- 10. The Licensee shall also pay interest to Ofcom on any amount which is due to Ofcom under the terms of this Licence or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act from the date such amount falls due until the date of payment, calculated with reference to the Bank of England base rate from time to time. In accordance with section 15 of the Act any such amount and any such interest is recoverable by Ofcom.
- 11. If the Licence is surrendered or revoked, no refund, whether in whole or in part of any amount which is due under the terms of this Licence or provided for in any Regulations made by Ofcom under sections 12 and 13(2) of the Act will be made, except at the absolute discretion of Ofcom.

Penalty

12. Of com may impose a penalty on the Licensee in accordance with section 43A of the 2006 Act if the Licensee is or has been in contravention of the provisions specified in schedule 1 paragraph 4(b) of this Licence.

Radio Equipment Use

- 13. The Licensee shall ensure that the Radio Equipment is constructed and used only in accordance with the provisions specified in the schedules to this Licence. Any proposal to amend any detail specified in the schedules to this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.
- 14. The Licensee shall ensure that the Radio Equipment is operated in compliance with the terms of this Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of this Licence.
- 15. The Licensee must ensure that all Radio Equipment is established, installed, modified and used only in accordance with the provisions specified in schedule 4 (EMF Licence Condition) of this Licence.

Access and Inspection

- 16. The Licensee shall permit a person authorised by Ofcom:
 - a) to have access to the Radio Equipment; and
 - b) to inspect this Licence and to inspect, examine and test the Radio Equipment,

at any and all reasonable times or, when in the opinion of that person an urgent situation exists, at any time to ensure the Radio Equipment is being used in accordance with the terms of this Licence.

Modification, Restriction and Closedown

17. A person authorised by Ofcom may require the Radio Equipment or any part thereof, to be modified or restricted in use, or temporarily or permanently closed down immediately if in the opinion of the person authorised by Ofcom:

- a) a breach of this Licence has occurred; and/or
- b) the use of the Radio Equipment is, or may be, causing or contributing to undue interference to the use of other authorised radio equipment.
- 18. Of com may require any of the Radio Equipment to be modified or restricted in use, or temporarily closed down either immediately or on the expiry of such period as may be specified in the event of a national or local state of emergency being declared. Of com may only exercise this power after a written notice has been served on the Licensee or by a general notice applicable to holders of this class of Licence has been published.

Geographical Boundaries

19. Subject to the requirements of any coordination procedures notified to the Licensee pursuant to paragraphs 5 and 6 of schedules 1 and 2 and paragraphs 6 and 7 of the schedule(s) 3 to this Licence, the Licensee is authorised to establish, install and use the Radio Equipment in the United Kingdom. For the avoidance of doubt, the United Kingdom includes the United Kingdom's territorial sea (measured in accordance with section 1 of the Territorial Sea Act 1987)and does not include the Channel Islands or the Isle of Man.

Interpretation

- 20. In this Licence:
 - a) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of wireless telegraphy stations and installation and use of wireless telegraphy apparatus for Wireless Telegraphy as specified in section 8(1) of the Act;
 - b) the expression "interference" shall have the meaning given by Section 115 of the Act;
 - c) the expressions "wireless telegraphy station" and "wireless telegraphy apparatus" shall have the meanings given by section 117 of the Act;
 - d) the schedules form part of this Licence together with any subsequent schedule(s) which Ofcom may issue as a variation to this Licence; and
 - e) the Interpretation Act 1978 shall apply to the Licence as it applies to an Act of Parliament.

Issued by Ofcom

SCHEDULE 1 TO LICENCE NUMBER: XXXXXXXX

Schedule date: xx xxxx 2022

Licence Category: Spectrum Access Licence 2100 MHz: (Paired Spectrum)

Description of Radio Equipment Licensed

 In this schedule, the Radio Equipment means the base transceiver stations or repeater stations forming part of the Network (as defined in paragraph 2 below). References in this schedule to the Radio Equipment are references to any wireless telegraphy station or wireless telegraphy apparatus that is established, installed and/or used under this schedule.

Purpose of the Radio Equipment

2. The Radio Equipment shall form part of a radio telecommunications network ("the Network"), in which approved user stations communicate by radio with the Radio Equipment to provide a telecommunications service.

Approved Standards for the Radio Equipment

Interface Requirements for the Radio Equipment

2. Use of the Radio Equipment shall be in accordance with the following Interface Requirements:

IR 2019 - Third Generation Mobile;

IR 2092 – Terrestrial systems capable of providing electronic communications services in the frequency bands 1920 – 1980 MHz and 2110 – 2170 MHz;

or for equipment placed on the market before 8 April 2000, is required to be type approved in accordance with a recognised technical performance standard relating to the service licensed.

Special Conditions relating to the Radio Equipment

3.

- a) The Licensee shall by no later than 30 June 2013 provide and thereafter maintain an electronic communications network that is capable of providing mobile telecommunications services to an area within which at least 90% of the population of the United Kingdom lives and with a 90% probability that users in outdoor locations within that area can receive the service with a sustained downlink speed of not less than 768kbps in a lightly loaded cell. Section 43A of the 2006 Act shall apply to any contravention of this provision.
- b) Subject to paragraph 4(c) of this schedule, during the period that this Licence remains in force, unless consent has otherwise been given by Ofcom, the Licensee shall compile and maintain accurate records of the following details relating to the Radio Equipment:

- i) postal address (including post code);
- ii) National Grid Reference, to at least 10⁰ metre resolution;
- iii) antenna height (above ground level) and type, and boresight east of true north (if applicable);
- iv) radio frequencies which the Radio Equipment uses; and
- v) Transmitted power expressed in dBm / 5 MHz EIRP per antenna for non-AAS Radio Equipment; and
- vi) Transmitted power expressed in dBm / 5 MHz TRP per cell for AAS Radio Equipment.

without prejudice to this paragraph (b), the Licensee shall furnish to Ofcom in such a manner and at such times as reasonably requested, information in the form of documents, accounts, estimates, returns and any other information, which may be reasonably required for the purposes of verifying compliance with this Licence and for statistical purposes.

- c) The conditions relating to the keeping of records contained in sub-paragraphs 4(b)i), 4(b)ii) and 4(b)iii) shall not apply in respect of femtocell equipment and smart/intelligent low power repeater equipment.
- d) The Licensee shall submit to Ofcom copies of the records detailed in sub-paragraph 4(b) above at such intervals as Ofcom shall notify to the Licensee.
- e) The Licensee shall, upon request, supply Ofcom or any person authorised on their behalf with the name and address of any subscribing customers of the Network, or require its agents to provide such information on its behalf.

Co-ordination at Frequency and Geographical Boundaries and Compliance with Other Procedures Relating to Interference

4. The Licensee shall ensure that the Radio Equipment is operated in compliance with such coordination and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

International Cross-Border Coordination

5. The Licensee shall ensure that the Radio Equipment is operated in compliance with such cross-border co-ordination and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

Permitted Frequency Blocks

6. Subject to the any emissions permitted under paragraph 8 of requirements in this schedule, the Radio Equipment may only transmit within the following frequency bands (the "Permitted Frequency Blocks"):

Downlink frequencies	Uplink frequencies
2134.9 – 2149.7 MHz	1944.9 – 1959.7 MHz

Maximum Permissible Transmit Power

7. Subject to any more restrictive limitations imposed by the coordination requirements notified by Ofcom in accordance with paragraphs [4 and 5] of this schedule, the The transmitted in any direction in the Permitted Frequency Blocks by the Radio Equipment shall not exceed:

a) Downlink frequencies

	Maximum mean e.i.r.p.	Measurement bandwidth
Radio Equipment	<mark>65-dBm</mark>	<mark>5 MHz</mark>

b) Uplink Frequencies

	<mark>Maximum mean</mark>
Mobile or nomadic Radio Equipment	<mark>24 dBm TRP</mark>
Fixed or installed Radio Equipment	<mark>24 dBm e.i.r.p.</mark>

Radio Equipment	Maximum mean power
non-AAS base station _[a]	65 dBm / 5 MHz EIRP per antenna
AAS base station _[a]	50 dBm / 5 MHz TRP per cell
Mobile or nomadic terminal station[b]	24 dBm TRP
Fixed or installed terminal station[b]	24 dBm EIRP

[6] For femtocell base stations, power control must be applied to minimise interference to adjacent channels.

In The maximum mean power relates to the EIRP or TRP of a specific piece of Radio Equipment irrespective of the number of transmit antennas.

Maximum Power outside the Permitted Frequency Blocks

- For transmissions on the downlink frequencies, the e.i.r.p. emanating from the Radio Equipment transmissions at any frequency outside the Permitted Frequency Blocks, but within 2110-2170 MHz, shall not exceed the higher (least stringent) of (a) the baseline requirement and (b) the block specific requirements for that frequency;
 - a) Baseline Requirements

Frequency Range	Maximum mean	Measurement
	e.i.r.p	<mark>bandwidth</mark>
	Non-AAS mean	AAS mean TRP
	EIRP limit per	limit per cell[2]
	antenna[1].	
Frequencies spaced more than 10 MHz from the lower	9 dBm <mark>/ 5 MHz</mark>	1 dBm / 5 MHz
or upper block edge		

[1] The non-AAS BEM is defined per antenna and applicable to base station configuration with up to four antennas per sector

[2] In a multi-sector base station, the AAS radiated power limit applies to each one of the individual sectors.

b) Block-specific requirements

Frequency range	Maximum mean e.i.r.p. Non-AAS mean EIRP limit per antenna[1].	Measurement bandwidth AAS mean TRP limit per cell[2]
-10 to -5 MHz from lower block edge	11.0 dBm <mark>/ 5 MHz</mark>	<mark>3 dBm/ 5 MHz</mark>
-5 to 0 MHz from lower block edge	16.3 dBm <mark>/ 5 MHz</mark>	<mark>8 dBm/ 5 MHz</mark>
0 to +5 MHz from upper block edge	16.3 dBm <mark>/ 5 MHz</mark>	<mark>8 dBm/ 5 MHz</mark>
+5 to +10 MHz from upper block edge	11.0 dBm <mark>/ 5 MHz</mark>	<mark>3 dBm/ 5 MHz</mark>

[1] The non-AAS BEM is defined per antenna and applicable to base station configuration with up to four antennas per sector

[2] In a multi-sector base station, the AAS radiated power limit applies to each one of the individual sectors.

The baseline and block-specific requirements are defined per antenna and applicable to configurations with up to four antennas per sector.

Interpretation

- 9. In this schedule:
 - a) "2100 MHz paired spectrum" means frequencies in the range 1920 MHz to 1980 MHz paired with 2110 MHz to 2170 MHz;
 - b) "dBm" means the power level in decibels (logarithmic scale) referenced against 1 milliwatt (i.e. a value of 0 dBm is 1 milliwatt);
 - c) "e.i.r.p." means the equivalent isotropically radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);

- d) A "femtocell" means Radio Equipment transmitting on the downlink frequencies which operates at a power not exceeding 24 dBm e.i.r.p. per carrier which may be established by customers of the Network but which is or will be used only by and under the control of the Network, following the establishment of a telecommunications link between the femtocell and the Network;
- e) "Fixed or installed" means used or installed at specific fixed points;
- f) "IR" means a United Kingdom Radio Interface Requirement published by Ofcom in accordance with the Radio Equipment Regulations 2017, as amended by the Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019Article 4.1 of Directive 1995/5/EC of the European Parliament and of the Council on radio equipment and telecommunications terminal equipment (RTTE) and the mutual recognition of their conformity;
- g) "lower block edge" means, in relation to the Permitted Frequency Block, the lowest frequency in that Permitted Frequency Block;
- measurement bandwidth" means the size of an individual spectrum segment within the specified frequency range that is used to measure compliance with the specified power limit;
- i) "mobile or nomadic" means intended to be used while in motion or during halts at unspecified points;
- j) "Permitted Frequency Blocks" has the same meaning given to it in paragraph 6 of this schedule;
- k) A "smart/intelligent low power repeater" means a repeater which operates with power not exceeding 24 dBm e.i.r.p. per carrier, which may be established by customers of the Network who have written agreements with the Licensee and:
 - The Licensee has ultimate control of the repeater, i.e. each individual repeater can be disabled remotely by the Licensee;
 - The repeater operates only on the Licensee's frequencies and with their valid Public Land Mobile Network Identifier;
 - Must not cause undue interference to other spectrum users; and
 - The repeater only transmits on the uplink frequencies when actively carrying a call (voice, video or data) or signalling from serviced handsets.
- I) "TRP" means the total radiated power. This is the integral of the power transmitted in different directions over the entire radiation sphere;
- m) "upper block edge" means, in relation to the Permitted Frequency Block, the highest frequency in that Permitted Frequency Block; and

- n) "User Station" means any vehicle mounted or hands portable mobile station designed for mobile use and/or any station designed or adapted to be established and used from static locations which meet the appropriate technical performance requirements as set out in the Wireless Telegraphy (Exemption) Regulation in force from time to time and either complies with the appropriate Interface Regulation listed in paragraph 3, or for equipment placed on the market before 8 April 2000, is type approved in accordance with a recognised technical standard relating to the service licensed.
- o) "AAS" means active antenna system. An AAS is a base station and antenna system where the amplitude and / or phase between antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. This is not intended to include long term beam shaping such as fixed electrical down tilt. In AAS base stations the antenna system is integrated as part of the base station system or product;
- p) "Downlink" means transmissions from a base station or repeater to a terminal station (handset);
- q) "non-AAS" means a piece of Radio Equipment which is not an AAS;
- r) "per antenna" means per radiating unit/component (irrespective of the number of radiating elements that make up that unit/component);
- s) "per cell" means per specific piece of Radio Equipment. For a multi-sector base station, per cell refers to each one of the individual sectors irrespective of the number of transmit antennas;
- "Uplink" means transmissions from a terminal station (handset) or repeater to a base station;

Ofcom

A9. Proposed changes to Vodafone 2.6 GHz Licence

SPECTRUM ACCESS 2.6 GHz LICENCE

This licence document replaces the version of the Licence issued by Ofcom on [18 May] 2021 to Vodafone Limited.

Licence no:	094358
Date of issue:	[1 November 2021]
Fee payment date	1 March (annually)

 The Office of Communications (Ofcom) grants this wireless telegraphy licence ("the Licence") to

Vodafone Limited

(Company Registration number: 1471587)

("the Licensee")

Vodafone House

The Connection

Newbury

Berkshire

RG14 2FN

to establish, install and use wireless telegraphy stations and/or wireless telegraphy apparatus as described in the schedule to this Licence (together "the Radio Equipment") subject to the terms set out below.

Licence Term

2. This Licence shall continue in force until revoked by Ofcom or surrendered by the Licensee.

Licence Variation and Revocation

- **3**. Pursuant to schedule 1 paragraph 8 of the Wireless Telegraphy Act 2006 ("the Act"), Ofcom may not revoke this Licence under schedule 1 paragraph 6 of the Act except:
 - a) at the request, or with the consent, of the Licensee;
 - b) if there has been a breach of any of the terms of this Licence;
 - c) in accordance with schedule 1 paragraph 8(5) of the Act;

- d) if it appears to Ofcom to be necessary or expedient to revoke the Licence for the purpose of complying with a direction by the Secretary of State given to Ofcom under section 5 of the Act or section 5 of the Communications Act 2003;
- e) if, in connection with the transfer or proposed transfer of rights and obligations arising by virtue of the Licence, there has been a breach of any provision of regulations made by Ofcom under the powers conferred by section 30 of the Act¹²;
- f) for reasons related to the management of the radio spectrum, provided that in such a case the power to revoke may only be exercised after at least five years' notice is given in writing (such notice must not expire before 28 February 2033);
- g) if the Licensee has been found to the reasonable satisfaction of Ofcom to have been involved in any act, or omission of any act, constituting a breach of the Wireless Telegraphy (Licence Award) Regulations 2012 ("the Regulations").
- 4. Of com may only revoke or vary this Licence by notification in writing to the Licensee and in accordance with schedule 1 paragraphs 6, 6A and 7 of the Act.

Transfer

5. This Licence may not be transferred. The transfer of rights and obligations arising by virtue of this Licence may however be authorised in accordance with regulations made by Ofcom under powers conferred by section 30 of the Act¹³.

Changes to Licensee details

6. The Licensee shall give prior notice to Ofcom in writing of any changes to the Licensee's name and/or address as recorded in paragraph 1 of this Licence.

Fees

- 7. From 1 March 2033, the Licensee shall each year pay to Ofcom the relevant fee(s) as provided in section 12 of the Act and the regulations made thereunder on or before the fee payment date shown above, or on or before such dates as are notified in writing to the Licensee.
- 8. The Licensee shall also pay interest to Ofcom on any amount which is due to Ofcom under the terms of this Licence or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act from the date such amount falls due until the date of payment, calculated with reference to the Bank of England base rate from time to time. In accordance with section 15 of the Act any such amount and any such interest is recoverable by Ofcom
- 9. If the Licence is surrendered, revoked or varied, no refund, whether in whole or in part, of any amount which is due under the terms of this Licence, payable in accordance with the Regulations, or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act will be made, except at the absolute discretion of Ofcom.

¹² These are regulations on spectrum trading.

¹³ See Ofcom's website for the latest position on spectrum trading and the types of trade which are permitted.

Radio Equipment Use

- 10. The Licensee shall ensure that the Radio Equipment is established, installed and used only in accordance with the provisions specified in the schedules to this Licence. Any proposal to amend any detail specified in any of the schedules to this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.
- 11. The Licensee shall ensure that the Radio Equipment is operated in compliance with the terms of this Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of this Licence.
- 12. The Licensee must ensure that all Radio Equipment is established, installed, modified and used only in accordance with the provisions specified in schedule 2 (EMF Licence Condition) of this Licence.

Access and Inspection

- 13. The Licensee shall permit any person authorised by Ofcom:
 - a) to have access to the Radio Equipment; and
 - b) to inspect this Licence and to inspect, examine and test the Radio Equipment,
 - c) at any and all reasonable times or, when in the opinion of that person an urgent situation exists, at any time, to ensure the Radio Equipment is being used in accordance with the terms of this Licence.

Modification, Restriction and Closedown

- 14. Any person authorised by Ofcom may require the Radio Equipment or any part thereof, to be modified or restricted in use, or temporarily or permanently closed down immediately if in the opinion of the person authorised by Ofcom:
 - a) a breach of this Licence has occurred; and/or
 - b) the use of the Radio Equipment is, or may be, causing or contributing to undue interference to the use of other authorised radio equipment.
- 15. Of com may require any of the Radio Equipment to be modified or restricted in use, or temporarily closed down either immediately or on the expiry of such period as may be specified in the event of a national or local state of emergency being declared. Of com may only exercise this power after a written notice has been served on the Licensee or a general notice applicable to holders of a named class of licence has been published.

Geographical Boundaries

16. Subject to the requirements of any coordination procedures notified to the Licensee pursuant to paragraph 4 of the schedule to this Licence, the Licensee is authorised to establish, install and use the Radio Equipment in the United Kingdom. For the avoidance of doubt, the United Kingdom includes the United Kingdom territorial sea (measured in

accordance with section 1 of the Territorial Sea Act 1987) and does not include the Channel Islands or the Isle of Man.

Interpretation

- 17. In this Licence:
 - c) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of wireless telegraphy stations and installation and use of wireless telegraphy apparatus for wireless telegraphy as specified in section 8(1) of the Act;
 - d) the expression "interference" shall have the meaning given by section 115 of the Act;
 - e) the expressions "wireless telegraphy station" and "wireless telegraphy apparatus" shall have the meanings given by section 117 of the Act;
 - f) the schedules form part of this Licence together with any subsequent schedule(s) which Ofcom may issue as a variation to this Licence; and
 - g) the Interpretation Act 1978 shall apply to the Licence as it applies to an Act of Parliament.

Issued by Ofcom

SCHEDULE 2 TO LICENCE NUMBER: 0943538

 Schedule Date:
 [01 November 2021]

 Licence category:
 Spectrum Access Licence

 (2500 MHz – 2690 MHz [paired spectrum])

Description of Radio Equipment

1. References in this schedule to the Radio Equipment are references to any wireless telegraphy station or wireless telegraphy apparatus that is established, installed and/or used under this schedule.

Interface Requirements for the Radio Equipment

2. Use of the Radio Equipment shall be in accordance with the following Interface Requirement:

IR 2072: Terrestrial systems capable of providing electronic communications services in the band 2500 to 2690 MHz

Special conditions relating to the Radio Equipment

- 3.
- a) Subject to paragraph 3(b) of this schedule, during the period that this Licence remains in force, unless consent has otherwise been given by Ofcom, the Licensee shall compile and maintain accurate written records of the following details relating to the Radio Equipment:
 - i) postal address (including post code);
 - ii) National Grid Reference, to at least 10 metre resolution;
 - iii) antenna height (above ground level), type, and boresight bearing east of true north (if applicable);
 - iv) radio frequencies which the Radio Equipment uses;
 - v) transmitted power expressed in dBm/(5 MHz) EIRP per antenna for non AAS Radio Equipment; and
 - vi) transmitted power expressed in dBm/(5 MHz) TRP per cell for AAS Radio Equipment

and the Licensee must produce these records if requested by any person authorised by Ofcom.

b) The conditions relating to the keeping of records contained in sub-paragraphs 3(a)(ii) and (iii) of this schedule shall not apply in respect of femtocell equipment and smart/intelligent low power repeater equipment.

c) The Licensee shall submit to Ofcom copies of the records detailed in sub-paragraph 3(a) above at such intervals as Ofcom may notify to the Licensee.

Co-ordination at frequency and geographical boundaries

4. The Licensee shall ensure that the Radio Equipment is operated in compliance with such coordination procedures as may be notified to the Licensee by Ofcom from time to time.

International cross-border coordination

5. The Licensee shall ensure that the Radio Equipment is operated in compliance with such cross-border co-ordination and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

Permitted Frequency Blocks

6. Subject to any emission requirements in this schedule, the Radio Equipment may only transmit within the following frequency bands (the "Permitted Frequency Blocks"):

Downlink frequencies	Uplink frequencies
2620 – 2640 MHz	2500 – 2520 MHz

Maximum power within the Permitted Frequency Blocks

Subject to any more restrictive limitations imposed by the coordination requirements notified by Ofcom in accordance with paragraphs [4 and 5] of this schedule, the power transmitted in the Permitted Frequency Blocks shall not exceed:

a) Downlink frequencies

	Maximum EIRP
Radio Equipment	61dBm/(5 MHz) EIRP

	Maximum power
Non-AAS Radio Equipment	61dBm/(5 MHz) EIRP per antenna
AAS Radio Equipment	46dBm/(5 MHz) TRP per cell

b) Uplink frequencies¹⁴

¹⁴ Consumer use equipment will be authorised by means of a licence exemption under section 8 of the Wireless Telegraphy Act 2006

Radio Equipment	Maximum mean power
Mobile or nomadic	
Radio Equipment	
Fixed or installed	
Radio Equipment	

Maximum power outside the Permitted Frequency Blocks

- 7. For transmissions on the downlink frequencies, the EIRP emanating from the Radio Equipment transmissions at any frequency outside the Permitted Frequency Blocks shall not exceed the higher (least stringent) of (a) the baseline requirements and (b) the block specific requirements for that frequency.
 - a) Baseline requirements

Frequency range	Maximum mean EIRP	<mark>Measurement</mark> bandwidth
2500 to 2615 MHz	<mark>–45dBm</mark>	<mark>1 MHz</mark>
2615 to 2700 MHz	<mark>4dBm</mark>	<mark>1 MHz</mark>
2700 to 3100 MHz	<mark>–45dBm</mark>	<mark>1 MHz</mark>

Frequency range	Maximum mean EIRP per antenna for non-AAS Radio Equipment	Maximum mean TRP per cell for AAS Radio Equipment	Measurement bandwidth
2500 to 2615 MHz	<mark>–45dBm</mark>	<mark>-52dBm</mark>	<mark>1 MHz</mark>
2615 to 2700 MHz	<mark>4dBm</mark>	<mark>5dBm</mark>	<mark>1 MHz</mark>
2700 to 3100 MHz	<mark>–45dBm</mark>	<mark>-52dBm</mark>	<mark>1 MHz</mark>

b) Block-specific requirements

Frequency range	Maximum mean Measureme EIRP bandwidt					
Start of band (2500 MHz) to -5 MHz from lower block edge	Baseline requirement level					
-5 MHz to -1 MHz from lower block edge	<mark>4dBm</mark>	<mark>1 MHz</mark>				
-1 MHz to -0.2 MHz from lower block edge	<mark>3 + 15(Δ₊+0.2) dBm</mark>	<mark>30 kHz</mark>				
-0.2 MHz to 0 MHz from lower block edge	<mark>3dBm</mark>	<mark>30 kHz</mark>				
0 MHz to 0.2 MHz from upper block edge	<mark>3dBm</mark>	<mark>30 kHz</mark>				
0.2 MHz to 1 MHz from upper block edge	<mark>3 – 15(Δ_F−0.2) dBm</mark>	<mark>30 kHz</mark>				
1 MHz to 5 MHz from upper block edge	4dBm	<mark>1 MHz</mark>				
5 MHz from upper block edge to end of band (2690 MHz)	Baseline requirement level					
Where: $\Delta_{\mathbf{F}}$ is the frequency offset from the relevant	block edge (in MHz)					

Frequency range	Maximum mean EIRP per antenna for non-AAS Radio Equipment	Maximum mean TRP per cell for AAS Radio Equipment	Measurement bandwidth
Start of band (2500 MHz) to −5 MHz from lower block edge	Baseli	ne requirement level	
-5 MHz to 0 MHz from lower block edge	16dBm	<mark>16dBm</mark>	<mark>5 MHz</mark>
0 MHz to 5 MHz from upper block edge	16dBm	<mark>16dBm</mark>	<mark>5 MHz</mark>
5 MHz from upper block edge to end of band (2690 MHz)	Baseli	ne requirement level	

Interpretation of terms in this schedule

In this schedule:

- a) "dBm" means the power level in decibels (logarithmic scale) referenced against 1milliwatt (i.e. a value of 0 dBm is 1 milliwatt);
- b) "EIRP" means the equivalent isotropically radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);
- c) "femtocell" means Radio Equipment transmitting on the downlink frequencies, which operates at a power not exceeding 24 dBm EIRP per carrier, and which is or will be used only by and under the control of the Licensee, following the establishment of a telecommunications link between the femtocell and a network of the Licensee;
- d) "Fixed or installed" means used or installed at specific fixed points;
- e) "IR" means a United Kingdom Radio Interface Requirement published by Ofcom in accordance with the Radio Equipment Regulations 2017, as amended by the Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019;
- f) "lower block edge" means, in relation to each Permitted Frequency Block, the lowest frequency in that Permitted Frequency Block;
- g) "measurement bandwidth" means the size of an individual spectrum segment within the specified frequency range that is used to measure compliance with the specified power limit;
- h) "mobile or nomadic" means intended to be used while in motion or during halts at unspecified points;
- i) "Permitted Frequency Blocks" has the meaning given to it in paragraph 6 of this schedule;

- j) "smart/intelligent low power repeater" means a repeater which operates with power not exceeding 24 dBm EIRP per carrier, which may be established by customers of the Licensee who have written agreements with the Licensee and:
 - The Licensee has ultimate control of the repeater, i.e. each individual repeater can be disabled remotely by the Licensee;
 - The repeater operates only on the Licensee's frequencies and with their valid Public Land Mobile Network Identifier;
 - Must not cause undue interference to other spectrum users; and
 - The repeater only transmits on the uplink frequencies when actively carrying a call (voice, video or data) or signalling from serviced handsets;
- k) "TRP" means the total radiated power. This is the integral of the power transmitted in different directions over the entire radiation sphere; and
- I) "upper block edge" means, in relation to each Permitted Frequency Block, the highest frequency in that Permitted Frequency Block.
- m) "AAS" means active antenna system. An AAS is a base station and antenna system
 where the amplitude and / or phase between antenna elements is continually adjusted
 resulting in an antenna pattern that varies in response to short term changes in the
 radio environment. This is not intended to include long term beam shaping such as
 fixed electrical down tilt. In AAS base stations the antenna system is integrated as part
 of the base station system or product;
- n) "non-AAS" means a piece of Radio Equipment which is not an AAS;
- o) "per antenna" means per radiating unit/component (irrespective of the number of radiating elements that make up that unit/component);
- p) "per cell" means per specific piece of Radio Equipment. For a multi-sector base station, per cell refers to each one of the individual sectors irrespective of the number of transmit antennas;

Ofcom

SCHEDULE 3 TO LICENCE NUMBER: 0943538

 Schedule Date:
 [01 November 2021]

 Licence category:
 Spectrum Access Licence

 (2500 MHz – 2690 MHz [Unpaired Spectrum])

Description of Radio Equipment

1. References in this schedule to the Radio Equipment are references to any wireless telegraphy station or wireless telegraphy apparatus that is established, installed and/or used under this schedule.

Interface Requirements for the Radio Equipment

2. Use of the Radio Equipment shall be in accordance with the following Interface Requirement:

IR 2072: Terrestrial systems capable of providing electronic communications services in the band 2500 to 2690 MHz

Special conditions relating to the Radio Equipment

- 3.
- a) Subject to paragraph 3(b) of this schedule, during the period that this Licence remains in force, unless consent has otherwise been given by Ofcom, the Licensee shall compile and maintain accurate written records of the following details relating to the Radio Equipment:
 - i) postal address (including post code);
 - ii) National Grid Reference, to at least 10 metre resolution;
 - iii) antenna height (above ground level), type, and boresight bearing east of true north (if applicable); and
 - iv) radio frequencies which the Radio Equipment uses;
 - v) transmitted power expressed in dBm/(5 MHz) EIRP per antenna for non-AAS Radio Equipment; and
 - vi) transmitted power expressed in dBm/(5 MHz) TRP per cell for AAS Radio Equipment

and the Licensee must produce these records if requested by any person authorised by Ofcom.

b) The conditions relating to the keeping of records contained in sub-paragraphs 3(a)(ii) and (iii) of this schedule shall not apply in respect of femtocell equipment and smart/intelligent low power repeater equipment;

c) The Licensee shall submit to Ofcom copies of the records detailed in sub-paragraph 3(a) above at such intervals as Ofcom may notify to the Licensee.

Co-ordination at frequency and geographical boundaries

4. The Licensee shall ensure that the Radio Equipment is operated in compliance with such coordination procedures as may be notified to the Licensee by Ofcom from time to time.

International cross-border coordination

5. The Licensee shall ensure that the Radio Equipment is operated in compliance with such cross-border co-ordination and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

Permitted Frequency Blocks

6. Subject to any emission requirements in permitted under paragraph 8 of this schedule, the Radio Equipment may only transmit within the following frequency bands (the "Permitted Frequency Blocks"):

"Unrestricted frequencies" (uplink and downlink):	2575 – 2595 MHz
"Restricted frequencies" (uplink and downlink):	2570 – 2575 MHz

Maximum power within the Permitted Frequency Blocks

7. For downlink transmissions, the power transmitted in the Permitted Frequency Blocks shall not exceed:

	Maximum EIRP
Radio Equipment in unrestricted frequencies	<mark>61dBm/(5 MHz) EIRP</mark>
Radio Equipment in restricted frequencies	<mark>25dBm/(5 MHz) EIRP</mark>

	Maximum EIRP per antenna for non-AAS Radio Equipment	Maximum TRP per cell for AAS Radio Equipment
Unrestricted frequencies	61dBm/(5 MHz)	46dBm/(5 MHz)
Restricted frequencies	25dBm/(5 MHz)	22dBm/(5 MHz)

For uplink transmissions, the power transmitted in the Permitted Frequency Blocks shall not exceed¹⁵:

¹⁵ Consumer user equipment will be authorised by means of a licence exemption under section 8 of the Wireless Telegraphy Act 2006

Radio Equipment	Maximum mean power
Mobile or nomadic Radio Equipment	31dBm/(5 MHz) TRP
Fixed or installed Radio Equipment	35dBm/(5 MHz) EIRP

Maximum power outside the Permitted Frequency Blocks

Unrestricted frequencies

- 8. In the absence of bilateral or multilateral agreements which have been notified to Ofcom specifying alternative arrangements between the Licensee and any other Spectrum Access licensees in the 2570-2620 MHz sub-band, the Licensee must ensure that when transmitting on the unrestricted frequencies set out in this schedule transmissions must fall within the limits of Frame Structure A.
- 9. For downlink transmissions on unrestricted frequencies, the EIRP emanating from the Radio Equipment transmissions at any frequency outside the Permitted Frequency Blocks shall not exceed the higher (least stringent) of (a) the baseline requirements and (b) the block specific requirements.

Frequency range	Maximum mean EIRP <mark>per antenna for</mark> <mark>non-AAS Radio</mark> Equipment	Maximum mean TRP per cell for AAS Radio Equipment	Measurement bandwidth
2500 to <mark>2570</mark> 2615 MHz	–45dBm	<mark>-52dBm</mark>	1 MHz
<mark>2570 2615 to 2700 MHz</mark>	4dBm	<mark>5dBm</mark>	1 MHz
2700 to 3100 MHz	–45dBm	<mark>-52dBm</mark>	1 MHz

a) Baseline requirements

b) Block-specific requirements

Frequency range	<mark>Maximum mean</mark> <mark>EIRP</mark>	<mark>Measurement</mark> bandwidth		
Start of band (2500 MHz) to -5 MHz from lower boundary of unrestricted frequencies	Baseline requirement level			
–5 MHz to –1 MHz from lower boundary of unrestricted frequencies	4dBm	<mark>1 MHz</mark>		
–1 MHz to –0.2 MHz from lower boundary of unrestricted frequencies	3 + 15(Δ_Γ+0.2) dBm	<mark>30 kHz</mark>		
-0.2 MHz to 0 MHz from lower boundary of unrestricted frequencies	<mark>3dBm</mark>	<mark>30 kHz</mark>		
0 MHz to 0.2 MHz from upper boundary of unrestricted frequencies	<mark>3dBm</mark>	<mark>30 kHz</mark>		
0.2 MHz to 1 MHz from upper boundary of unrestricted frequencies	3 – 15(Δ_Γ−0.2) dBm	<mark>30 kHz</mark>		
1 MHz to 5 MHz from upper boundary of unrestricted frequencies	4dBm	<mark>1 MHz</mark>		
5 MHz from upper boundary of unrestricted frequencies to end of band (2690 MHz)	Baseline requirer	nent level		
Where: A _F is the frequency offset from the relevan	nt boundary of unrestricted f	requencies (in MHz)		

Frequency range	Maximum mean EIRP per antenna for non-AAS Radio Equipment	Maximum mean TRP per cell for AAS Radio Equipment	Measurement bandwidth			
Start of band (2500 MHz) to -5 MHz from lower boundary of unrestricted frequencies	Ba	seline requirement le	vel			
-5 MHz to 0 MHz from lower boundary of unrestricted frequencies	16dBm	16dBm	<mark>5 MHz</mark>			
0 MHz to 5 MHz from upper boundary of unrestricted frequencies	16dBm	16dBm	<mark>5 MHz</mark>			
5 MHz from upper boundary of unrestricted frequencies to end of band (2690 MHz)	Baseline requirement level					

10. Frame Structure A means that:

a) transmissions from the Licensee's base stations have a frame structure as shown in
 Figure 1. Timeslots (or subframes) 0, 2 to 5 and 7 to 9 must be allocated to Downlink
 (D) or Uplink (U) transmissions as indicated or may be left with no transmissions;

- b) the Licensee must ensure that the special subframes (S) in timeslots 1 and 6 have a structure that is compatible with TD-LTE special subframe configuration 6, also known as 9:3:2 (DwPTS: GP: UpPTS). For the avoidance of doubt, a special subframe structure is compatible where there are no uplink transmissions within the downlink pilot timeslot (DwPTS) or guard period (GP) and no downlink transmissions within the uplink pilot timeslot (UpPTS) or guard period (GP);
- c) timeslots must have a duration of 1 millisecond;
- d) the Licensee shall ensure that frames start at a common reference time so that all licensees' frames are aligned and transmissions synchronised;

Note: TD-LTE frame configuration 2 (3:1) is compatible with Frame Structure A, as are some 5G NR frame configurations. Other technologies are permitted provided that the requirements of 11(a) to 11(d) are met.

Figure 1: Frame Structure A

DI /III rotio	Subframe number									
DL/UL ratio	0	1	2	3	4	5	6	7	8	9
3:1	D	S	U	D	D	D	S	U	D	D

11. When transmitting on unrestricted frequencies, the Licensee is not required to comply with the frame structure requirements set out in paragraphs 9 and 11 for:

Indoor Domestic Small Cells; or

ii) Indoor Non-domestic Small Cells, except where another licensee demonstrates that they are suffering harmful interference as a result.

12. When transmitting on unrestricted frequencies, if another licensee demonstrates that they are suffering undue interference as a result of an Indoor Non-domestic Small Cell, the Indoor Non-domestic Small Cell must comply with the requirements set out in paragraphs 9 and 11 above.

Restricted frequencies

13. For downlink transmissions on restricted frequencies, the EIRP emanating from the Radio Equipment transmissions at any frequency outside the Permitted Frequency Blocks shall not exceed the higher (least stringent) of (a) the baseline requirements and (if applicable) (b) the alternative block-specific requirements:

Frequency range	Maximum mean EIRP per antenna for non- AAS Radio Equipment Maximum mean EIRP	Maximum mean TRP per cell for AAS Radio Equipment	Measurement bandwidth
2500 to 2615 MHz	−45dBm	<mark>-52dBm</mark>	1 MHz
2615 to 2700 MHz	4dBm	<mark>5dBm</mark>	1 MHz
2700 to 3100 MHz	–45dBm	<mark>-52dBm</mark>	1 MHz

a) Baseline requirements

b) Alternative block-specific requirements

The following block-specific requirements apply to non-AAS base stations with outdoor antennas meeting the conditions in paragraph [9], and to non-AAS base stations with indoor antennas, subject to the "Notice of coordination procedure for the licences covering the 2.6 GHz band – Deployment of mobile electronic communication networks in unpaired restricted blocks and in spectrum adjacent to unpaired restricted blocks" notified by Ofcom to the Licensee:

Frequency range	Maximum mean <mark>EIRP</mark>	<mark>Measurement</mark> bandwidth	
Start of band (2500 MHz) to -5 MHz from lower	-22dBm	<mark>1 MHz</mark>	
edge of restricted frequencies	220011		
-5 MHz to -1 MHz from lower boundary of	-18dBm	<mark>1 MHz</mark>	
restricted frequencies			
-1 MHz to -0.2 MHz from lower boundary of	10 + 10 = 10	20 411-	
restricted frequencies	−19 + 13(∆⊧+0.2) ubiii	ЗU КНZ	
-0.2 MHz to 0 MHz from lower boundary of	-10dPm		
restricted frequencies		30 KH2	
0 MHz to 0.2 MHz from upper boundary of	-10dBm	20 1/117	
restricted frequencies	- <u></u>	JU KHZ	
0.2 MHz to 1 MHz from upper boundary of	$-10 - 15(\Lambda - 0.2) dBm$	<mark>30 kHz</mark>	
restricted frequencies	<u>-13 13(8+ 0.2) abin</u>		
1 MHz to 5 MHz from upper boundary of	-19dPm		
restricted frequencies			
5 MHz from upper boundary of restricted	-22dBm		
frequencies to end of band (2690 MHz)	-22uDin	1 V 2	
Where: Δ _F is the frequency offset from the relevant boundary of restricted frequencies (in MHz)			

Frequency range	Maximum mean EIRP per antenna for non-AAS Radio Equipment	Measurement bandwidth
Start of band (2500 MHz) to –5 MHz from lower boundary of restricted frequencies	<mark>–22dBm</mark>	<mark>1 MHz</mark>
–5 MHz to 0 MHz from lower boundary of restricted frequencies	-6dBm	<mark>5 MHz</mark>
0 MHz to 5 MHz from upper boundary of restricted frequencies	-6dBm	<mark>5 MHz</mark>
5 MHz from upper boundary of restricted frequencies to end of band (2690 MHz)	<mark>–22dBm</mark>	<mark>1 MHz</mark>

If the Licensee wishes to deploy AAS base stations with outdoor antennas meeting the conditions in paragraph 15, or AAS base stations with indoor antennas, the Licensee must demonstrate compliance with the EIRP limits in the table above and will be subject to the "Notice of coordination procedure for the licences covering the 2.6 GHz band – Deployment of mobile electronic communication networks in unpaired restricted blocks and in spectrum adjacent to unpaired restricted blocks" notified by Ofcom to the Licensee.

Antenna height limit for base stations using alternative blockspecific EIRP requirements limits

14. The highest point of outdoor antenna systems of base stations using the alternative blockspecific requirements EIRP limits shall be no more than 12m above ground level.

Interpretation of terms in this schedule

- 15. In this schedule:
 - a) "dBm" means the power level in decibels (logarithmic scale) referenced against 1milliwatt (i.e. a value of 0 dBm is 1 milliwatt);
 - b) "downlink transmission" means transmission from a base station to a terminal station;
 - c) "EIRP" means the equivalent isotropically radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);
 - d) "femtocell" means Radio Equipment transmitting on the downlink frequencies, which operates at a power not exceeding 24 dBm EIRP per carrier, and which is or will be used only by and under the control of the Licensee, following the establishment of a telecommunications link between the femtocell and a network of the Licensee;
 - e) "Fixed or installed" means used or installed at specific fixed points;
 - f) "IR" means a United Kingdom Radio Interface Requirement published by Ofcom in accordance with the Radio Equipment Regulations 2017, as amended by the Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019; in accordance with Article 8 of Directive 2014/53/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available of radio equipment on the market, known as the Radio Equipment Directive;
 - g) "measurement bandwidth" means the size of an individual spectrum segment within the specified frequency range that is used to measure compliance with the specified power limit;
 - h)—"measurement bandwidth" means the size of an individual spectrum segment within the specified frequency range that is used to measure compliance with the specified power limit;
 - "mobile or nomadic" means intended to be used while in motion or during halts at unspecified points;

- j) "Permitted Frequency Blocks" has the meaning given to it in paragraph 6 of this this schedule;
- k) "smart/intelligent low power repeater" means a repeater which operates with power not exceeding 24 dBm EIRP per carrier, which may be established by customers of the Licensee who have written agreements with the Licensee and:
 - The Licensee has ultimate control of the repeater, i.e. each individual repeater can be disabled remotely by the Licensee;
 - The repeater operates only on the Licensee's frequencies and with their valid Public Land Mobile Network Identifier;
 - Must not cause undue interference to other spectrum users; and
 - The repeater only transmits on the uplink frequencies when actively carrying a call (voice, video or data) or signalling from serviced handsets;
- I) "TRP" means the total radiated power. This is the integral of the power transmitted in different directions over the entire radiation sphere; and
- m) "uplink transmission" means transmission from a terminal station to a base station.
- n) "AAS" means active antenna system. An AAS is a base station and antenna system where the amplitude and / or phase between antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. This is not intended to include long term beam shaping such as fixed electrical down tilt. In AAS base stations the antenna system is integrated as part of the base station system or product;
- o) "Indoor" means a location inside a building or place in which the shielding will typically provide the necessary attenuation to protect wireless telegraphy against harmful interference;
- p) "Indoor Domestic Small Cell" means a base station with an EIRP of less than or equal to 24dBm per 20 MHz carrier that is located within a residential property;
- q) "Indoor Non-domestic Small Cell" means a base station with an EIRP of less than or equal to 24dBm per 20 MHz carrier that is located indoors but not within a residential property;
- r) "non-AAS" means a piece of Radio Equipment which is not an AAS;
- s) "per antenna" means per radiating unit/component (irrespective of the number of radiating elements that make up that unit/component);
- t) "per cell" means per specific piece of Radio Equipment. For a multi-sector base station, per cell refers to each one of the individual sectors irrespective of the number of transmit antennas;

Ofcom

A10. Proposed changes to Telefónica 2.6 GHz licence

SPECTRUM ACCESS 2.6 GHz LICENCE

This licence document replaces the version of the Licence issued by Ofcom on [03 November] 2020 to EE Limited.

Licence	no:	1238565
Date of	issue:	[18 May 2021]
Fee pay	rment date	1 March (annually from 1 March 2033)
1.	The Office of Communications (Licence") to	Ofcom) grants this wireless telegraphy licence ("the

Telefónica UK Limited

(Company Registration number: 1238565)

("the Licensee")

260 Bath Road

Slough

Berkshire

SL1 4DX

to establish, install and use wireless telegraphy stations and/or wireless telegraphy apparatus as described in the schedule to this Licence (together "the Radio Equipment") subject to the terms set out below.

Licence Term

2. This Licence shall continue in force until revoked by Ofcom or surrendered by the Licensee.

Licence Variation and Revocation

- **3.** Pursuant to schedule 1 paragraph 8 of the Wireless Telegraphy Act 2006 ("the Act"), Ofcom may not revoke this Licence under schedule 1 paragraph 6 of the Act except:
 - a) at the request, or with the consent, of the Licensee;
 - b) if there has been a breach of any of the terms of this Licence;
 - c) in accordance with schedule 1 paragraph 8(5) of the Act;
 - d) if it appears to Ofcom to be necessary or expedient to revoke the Licence for the purpose of complying with a direction by the Secretary of State given to Ofcom under section 5 of the Act or section 5 of the Communications Act 2003;

- e) if, in connection with the transfer or proposed transfer of rights and obligations arising by virtue of the Licence, there has been a breach of any provision of regulations made by Ofcom under the powers conferred by section 30 of the Act¹⁶;
- f) for reasons related to the management of the radio spectrum, provided that in such a case the power to revoke may only be exercised after at least five years' notice is given in writing (such notice must not expire before 28 February 2033);
- g) if the Licensee has been found to the reasonable satisfaction of Ofcom to have been involved in any act, or omission of any act, constituting a breach of the Wireless Telegraphy (Licence Award) Regulations 2012 ("the Regulations").
- 4. Of com may only revoke or vary this Licence by notification in writing to the Licensee and in accordance with schedule 1 paragraphs 6, 6A and 7 of the Act.

Transfer

5. This Licence may not be transferred. The transfer of rights and obligations arising by virtue of this Licence may however be authorised in accordance with regulations made by Ofcom under powers conferred by section 30 of the Act¹⁷.

Changes to Licensee details

6. The Licensee shall give prior notice to Ofcom in writing of any changes to the Licensee's name and/or address as recorded in paragraph 1 of this Licence.

Fees

- 7. From 1 March 2033, the Licensee shall each year pay to Ofcom the relevant fee(s) as provided in section 12 of the Act and the regulations made thereunder on or before the fee payment date shown above, or on or before such dates as are notified in writing to the Licensee.
- 8. The Licensee shall also pay interest to Ofcom on any amount which is due to Ofcom under the terms of this Licence or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act from the date such amount falls due until the date of payment, calculated with reference to the Bank of England base rate from time to time. In accordance with section 15 of the Act any such amount and any such interest is recoverable by Ofcom.
- 9. If the Licence is surrendered, revoked or varied, no refund, whether in whole or in part, of any amount which is due under the terms of this Licence, payable in accordance with the Regulations, or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act will be made, except at the absolute discretion of Ofcom.

Radio Equipment Use

10. The Licensee shall ensure that the Radio Equipment is established, installed and used only in accordance with the provisions specified in the schedules to this Licence. Any proposal to

¹⁶ These are regulations on spectrum trading.

¹⁷ See Ofcom's website for the latest position on spectrum trading and the types of trade which are permitted.

amend any detail specified in any of the schedules to this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.

- 11. The Licensee shall ensure that the Radio Equipment is operated in compliance with the terms of this Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of this Licence.
- 12. The Licensee must ensure that all Radio Equipment is established, installed, modified and used only in accordance with the provisions specified in schedule 2 (EMF Licence Condition) of this Licence.

Access and Inspection

- 13. The Licensee shall permit any person authorised by Ofcom:
 - a) to have access to the Radio Equipment; and
 - b) to inspect this Licence and to inspect, examine and test the Radio Equipment,

at any and all reasonable times or, when in the opinion of that person an urgent situation exists, at any time, to ensure the Radio Equipment is being used in accordance with the terms of this Licence.

Modification, Restriction and Closedown

- 14. Any person authorised by Ofcom may require the Radio Equipment or any part thereof, to be modified or restricted in use, or temporarily or permanently closed down immediately if in the opinion of the person authorised by Ofcom:
 - a) a breach of this Licence has occurred; and/or
 - b) the use of the Radio Equipment is, or may be, causing or contributing to undue interference to the use of other authorised radio equipment.
- 15. Of com may require any of the Radio Equipment to be modified or restricted in use, or temporarily closed down either immediately or on the expiry of such period as may be specified in the event of a national or local state of emergency being declared. Of com may only exercise this power after a written notice has been served on the Licensee or a general notice applicable to holders of a named class of licence has been published.

Geographical Boundaries

16. Subject to the requirements of any coordination procedures notified to the Licensee pursuant to paragraph 4 of the schedule to this Licence, the Licensee is authorised to establish, install and use the Radio Equipment in the United Kingdom. For the avoidance of doubt, the United Kingdom includes the United Kingdom territorial sea (measured in accordance with section 1 of the Territorial Sea Act 1987) and does not include the Channel Islands or the Isle of Man.

Interpretation

17. In this Licence:

- (a) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of wireless telegraphy stations and installation and use of wireless telegraphy apparatus for wireless telegraphy as specified in section 8(1) of the Act;
- (b) the expression "interference" shall have the meaning given by section 115 of the Act;
- (c) the expressions "wireless telegraphy station" and "wireless telegraphy apparatus" shall have the meanings given by section 117 of the Act;
- (d) the schedules form part of this Licence together with any subsequent schedule(s) which Ofcom may issue as a variation to this Licence; and
- (e) the Interpretation Act 1978 shall apply to the Licence as it applies to an Act of Parliament.

Issued by Ofcom

SCHEDULE 1 TO LICENCE NUMBER: 1238565

 Schedule Date:
 [18 May 2021]

 Licence category:
 Spectrum Access Licence (2500 MHz – 2690 MHz [Unpaired Spectrum])

Description of Radio Equipment

1. References in this schedule to the Radio Equipment are references to any wireless telegraphy station or wireless telegraphy apparatus that is established, installed and/or used under this schedule.

Interface Requirements for the Radio Equipment

2. Use of the Radio Equipment shall be in accordance with the following Interface Requirement:

IR 2072: Terrestrial systems capable of providing electronic communications services in the band 2500 to 2690 MHz

Special conditions relating to the Radio Equipment

- 3.
- a) Subject to paragraph 3(b) of this schedule, during the period that this Licence remains in force, unless consent has otherwise been given by Ofcom, the Licensee shall compile and maintain accurate written records of the following details relating to the Radio Equipment:
 - i) postal address (including post code);
 - ii) National Grid Reference, to at least 10 metre resolution;
 - iii) antenna height (above ground level), type, and boresight bearing east of true north (if applicable); and
 - iv) radio frequencies which the Radio Equipment uses.

and the Licensee must produce these records if requested by any person authorised by Ofcom.

- b) The conditions relating to the keeping of records contained in sub-paragraphs 3(a)(ii) and (iii) of this schedule shall not apply in respect of femtocell equipment and smart/intelligent low power repeater equipment;
- c) The Licensee shall submit to Ofcom copies of the records detailed in sub-paragraph 3(a) above at such intervals as Ofcom may notify to the Licensee.

Co-ordination at frequency and geographical boundaries

4. The Licensee shall ensure that the Radio Equipment is operated in compliance with such coordination procedures as may be notified to the Licensee by Ofcom from time to time.

International cross-border coordination

5. The Licensee shall ensure that the Radio Equipment is operated in compliance with such cross-border co-ordination and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

Permitted Frequency Blocks

6. Subject to any emission requirements in permitted under paragraph 8 of this schedule, the Radio Equipment may only transmit within the following frequency bands (the "Permitted Frequency Blocks"):

"Unrestricted frequencies" (uplink and downlink):	<mark>2600</mark> 2595 – 2615 MHz
"Postricted frequencies" (unlink and downlink):	<mark>2595—2600</mark> MHz
Restricted frequencies (uplink and downlink).	2615 – 2620 MHz

Maximum power within the Permitted Frequency Blocks

7. For downlink transmissions, the power transmitted in the Permitted Frequency Blocks shall not exceed:

	Maximum EIRP
Radio Equipment in unrestricted frequencies	61dBm/(5 MHz) EIRP
Radio Equipment in restricted frequencies	25dBm/(5 MHz) EIRP

For uplink transmissions, the power transmitted in the Permitted Frequency Blocks shall not exceed¹⁸:

Radio Equipment	Maximum mean power
Mobile or nomadic Radio Equipment	31dBm/(5 MHz) TRP
Fixed or installed Radio Equipment	35dBm/(5 MHz) EIRP

Maximum power outside the Permitted Frequency Blocks

Unrestricted frequencies

8. In the absence of bilateral or multilateral agreements which have been notified to Ofcom specifying alternative arrangements between the Licensee and any other Spectrum Access licensees in the 2570-2620 MHz sub-band the Licensee must ensure that when transmitting on the unrestricted frequencies set out in this schedule transmissions must fall within the limits of Frame Structure A.

¹⁸ Consumer user equipment will be authorised by means of a licence exemption under section 8 of the Wireless Telegraphy Act 2006

- 9. For downlink transmissions on unrestricted frequencies, the EIRP emanating from the Radio Equipment transmissions at any frequency outside the Permitted Frequency Blocks shall not exceed the higher (least stringent) of (a) the baseline requirements and (b) the block specific requirements.
 - a) Baseline requirements

Eroquency range	Maximum mean	Measurement
Frequency range	EIRP	bandwidth
2500 to 2615 MHz	–45dBm	1 MHz
2615 to 2700 MHz	4dBm	1 MHz
2700 to 3100 MHz	–45dBm	1 MHz

b) Block-specific requirements

Frequency range	Maximum mean EIRP	Measurement bandwidth
Start of band (2500 MHz) to -5 MHz from lower	Baseline requirement level	
boundary of unrestricted frequencies		
−5 MHz to −1 MHz from lower boundary of	/dBm	1 MHz
unrestricted frequencies	40011	
–1 MHz to –0.2 MHz from lower boundary of	$3 \pm 15(A_{-1}0, 2) dBm$	30 kHz
unrestricted frequencies	5 + 15(Δ _F +0.2) αΒΠ	
–0.2 MHz to 0 MHz from lower boundary of	3dBm	30 kHz
unrestricted frequencies		
0 MHz to 0.2 MHz from upper boundary of	2 dBm	30 kHz
unrestricted frequencies	Subili	
0.2 MHz to 1 MHz from upper boundary of	$2 - 15(\Lambda - 0.2) dBm$	30 kHz
unrestricted frequencies	$5 - 15(\Delta_F - 0.2)$ (Bill	
1 MHz to 5 MHz from upper boundary of	4dBm	1 MHz
unrestricted frequencies	40011	
5 MHz from upper boundary of unrestricted	Baseline requirement level	
frequencies to end of band (2690 MHz)		
Where: $\Delta_{\rm F}$ is the frequency offset from the relevant boundary of unrestricted frequencies (in MHz)		

Restricted frequencies

- 10. For downlink transmissions on restricted frequencies, the EIRP emanating from the Radio Equipment transmissions at any frequency outside the Permitted Frequency Blocks shall not exceed the higher (least stringent) of (a) the baseline requirements and (if applicable) (b) the alternative block-specific requirements:
 - a) Baseline requirements

Frequency range	Maximum mean EIRP	Measurement bandwidth
2500 to 2615 MHz	–45dBm	1 MHz
2615 to 2700 MHz	4dBm	1 MHz
2700 to 3100 MHz	–45dBm	1 MHz

b) Alternative block-specific requirements

The following block-specific requirements apply to base stations with outdoor antennas meeting the conditions in paragraph 9, and to base stations with indoor antennas, subject to the "Notice of coordination procedure for the licences covering the 2.6 GHz band – Deployment of mobile electronic communication networks in unpaired restricted blocks and in spectrum adjacent to unpaired restricted blocks" notified by Ofcom to the Licensee:

Frequency range	Maximum mean	Measurement	
	EIRP	bandwidth	
Start of band (2500 MHz) to –5 MHz from lower	JJdPm		
edge of restricted frequencies	-220011		
–5 MHz to –1 MHz from lower boundary of	19dBm	1 MHz	
restricted frequencies	-1000111		
-1 MHz to -0.2 MHz from lower boundary of	10 · 15(A · 0.2) dDay	30 kHz	
restricted frequencies	$-19 + 15(\Delta_{\rm F}+0.2)$ dBm		
–0.2 MHz to 0 MHz from lower boundary of	-10dPm	30 kHz	
restricted frequencies	-190011		
0 MHz to 0.2 MHz from upper boundary of	-10dBm	30 kHz	
restricted frequencies	-190011		
0.2 MHz to 1 MHz from upper boundary of	$-10 - 15(\Lambda - 0.2) dBm$	30 kHz	
restricted frequencies	$-19 - 15(\Delta_{\rm F} - 0.2)$ ubin		
1 MHz to 5 MHz from upper boundary of	-19dPm	1 MHz	
restricted frequencies	- TOUDIII		
5 MHz from upper boundary of restricted	-22dPm	1 1 1	
frequencies to end of band (2690 MHz)	-2200111		
Where: Δ_F is the frequency offset from the relevant boundary of restricted frequencies (in MHz)			

Antenna height limit for base stations using alternative blockspecific EIRP limits

11. The highest point of outdoor antenna systems of base stations using the alternative blockspecific EIRP limits shall be no more than 12m above ground level.

Interpretation of terms in this schedule

- 12. In this schedule:
 - a) "dBm" means the power level in decibels (logarithmic scale) referenced against 1milliwatt (i.e. a value of 0 dBm is 1 milliwatt);

- b) "downlink transmission" means transmission from a base station to a terminal station;
- c) "EIRP" means the equivalent isotropically radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);
- d) "femtocell" means Radio Equipment transmitting on the downlink frequencies, which operates at a power not exceeding 24 dBm EIRP per carrier, and which is or will be used only by and under the control of the Licensee, following the establishment of a telecommunications link between the femtocell and a network of the Licensee;
- e) "Fixed or installed" means used or installed at specific fixed points;
- f) "IR" means a United Kingdom Radio Interface Requirement published by Ofcom in accordance with the Radio Equipment Regulations 2017, as amended by the Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019; in accordance with Article 8 of Directive 2014/53/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available of radio equipment on the market, known as the Radio Equipment Directive;
- g) "measurement bandwidth" means the size of an individual spectrum segment within the specified frequency range that is used to measure compliance with the specified power limit;
- g)—"measurement bandwidth" means the size of an individual spectrum segment within the specified frequency range that is used to measure compliance with the specified power limit;
- mobile or nomadic" means intended to be used while in motion or during halts at unspecified points;
- i) "Permitted Frequency Blocks" has the meaning given to it in paragraph 6 of this this schedule;
- j) "smart/intelligent low power repeater" means a repeater which operates with power not exceeding 24 dBm EIRP per carrier, which may be established by customers of the Licensee who have written agreements with the Licensee and:
 - The Licensee has ultimate control of the repeater, i.e. each individual repeater can be disabled remotely by the Licensee;
 - The repeater operates only on the Licensee's frequencies and with their valid Public Land Mobile Network Identifier;
 - Must not cause undue interference to other spectrum users; and
 - The repeater only transmits on the uplink frequencies when actively carrying a call (voice, video or data) or signalling from serviced handsets;
- k) "TRP" means the total radiated power. This is the integral of the power transmitted in different directions over the entire radiation sphere; and

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