

SPECTRUM ACCESS 2100 MHz LICENCE

This Licence document replaces the version of the licence issued by the Office of Communications (Ofcom) on 23 March 2015 to EE Limited.

Licence no: **0207128**

Date of issue: **10 January 2017**

Fee payment date
(from 1 January 2022) **1 January** (annually)

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

EE Limited
(Company registration number 02382161)
("the Licensee")
Trident Place
Mosquito Way
Hatfield
Hertfordshire
AL10 9BW

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. (1) 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 Act¹;
 - (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 not to be given before 31 December 2016).
- (2) 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 subparagraph (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.
4. 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

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 Act².

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.
7. If the Licence is surrendered or revoked no refund of the fee which was paid by One2One Personal Communications Limited and Orange 3G 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

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

¹ These are regulations on spectrum trading.

² See Ofcom's website for the latest position on spectrum trading and the types of trade which are permitted.

9. 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.
10. 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

11. Ofcom 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

12. 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.
13. 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.

Access and Inspection

14. 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

15. 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.

16. Ofcom 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. Ofcom 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

17. 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 Schedule 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

18. 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

Office of Communications

SCHEDULE 1 TO LICENCE NUMBER: **0207128**

Schedule date: **10 January 2017**

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

Description of Radio Equipment Licensed

1. 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).

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

3. 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

4.
 - (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

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 subparagraphs 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 subparagraph 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

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

International Cross-Border Coordination

- 6. 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

- 7. Subject to the emissions permitted under paragraph 8 of this Schedule, the Radio Equipment may only transmit within the following frequency bands (the “Permitted Frequency Blocks”):

Downlink frequencies	Uplink frequencies
2149.7 – 2169.7 MHz	1959.7 – 1979.7 MHz

Maximum Permissible Transmit Power

- 8. The power 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	65 dBm	5 MHz

- (b) Uplink Frequencies

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

Maximum Power outside the Permitted Frequency Blocks

9. 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 shall not exceed the higher (least stringent) of (a) the baseline requirement and (b) the block specific requirements for that frequency;

- (a) Baseline Requirements

	Maximum mean e.i.r.p.	Measurement bandwidth
Frequencies spaced more than 10 MHz from the lower or upper block edge	9 dBm	5 MHz

- (b) Block-specific requirements

Frequency range	Maximum mean e.i.r.p.	Measurement bandwidth
-10 to -5 MHz from lower block edge	11.0 dBm	5 MHz
-5 to 0 MHz from lower block edge	16.3 dBm	5 MHz
0 to +5 MHz from upper block edge	16.3 dBm	5 MHz
+5 to +10 MHz from upper block edge	11.0 dBm	5 MHz

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

Interpretation

10. In this Schedule:
- “2100 MHz paired spectrum” means frequencies in the range 1920 MHz to 1980 MHz paired with 2110 MHz to 2170 MHz;
 - “dBm” means the power level in decibels (logarithmic scale) referenced against 1 milliwatt (i.e. a value of 0 dBm is 1 milliwatt);
 - “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);
 - 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;
 - “Fixed or installed” means used or installed at specific fixed points;
 - “IR” 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;

- (g) “lower block edge” means, in relation to the Permitted Frequency Block, the lowest frequency in that Permitted Frequency Block;
- (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;
- (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.
- (l) “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.

SCHEDULE 2 TO LICENCE NUMBER: **0207128**

Schedule date: **10 January 2017**

Licence Category: **Spectrum Access Licence 2100 MHz: (Unpaired Spectrum)**

Description of Radio Equipment Licensed

1. 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).

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

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

IR 2019 – Third Generation Mobile;

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

4. (a) Subject to paragraph 4(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 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

without prejudice to this paragraph (a), 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.

- (b) The conditions relating to the keeping of records contained in subparagraphs 4(a)i), 4(a)ii) and 4(c)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 subparagraph 4(a) above at such intervals as Ofcom shall notify to the Licensee.
- (d) 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

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

International Cross-Border Coordination

- 6. 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 Block

- 7. Subject to the emissions permitted under paragraph 8 of this Schedule, the Radio Equipment may only transmit within the following frequency band (the “Permitted Frequency Block”):

1899.9 – 1909.9 MHz

Maximum Permissible e.i.r.p.

- 8. For downlink transmissions, the power transmitted (in e.i.r.p.) in any direction in the Permitted Frequency Block by the Radio Equipment shall not exceed:

Maximum e.i.r.p. per carrier	Maximum e.i.r.p. per MHz
62 dBm	58 dBm/MHz

ITU Class of Emission Code

- 9. 5M00G7W

Maximum Power outside the Permitted Frequency Blocks

- 10. 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 shall not exceed the following;

Offset from edge of block	Maximum permitted level	Measurement bandwidth
0 to 5 MHz	-23 dBm	1.0 MHz
Beyond 5 MHz	-30 dBm	1.0 MHz

Interpretation

11. In this Schedule:

- (a) “2100 MHz Unpaired spectrum” means frequencies in the range 1900 MHz to 1920 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) “IR” means a U 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;
- (f) “Maximum e.i.r.p. per carrier”. The maximum e.i.r.p. in any direction from the base-station should be below this limit for any transmitted carrier. Power for this limit is defined as the mean modulated carrier power time averaged over any suitable time period in which the transmitter is continuously transmitting at its maximum operational power level;
- (g) “Maximum e.i.r.p. per MHz”. The e.i.r.p. per MHz means the sum of the e.i.r.p. radiated by all transmitted carriers in any given direction within any contiguous 5 MHz block within an operator’s spectrum allocation, divided by 5;
- (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;
- (i) “Permitted Frequency Blocks” has the same meaning given to it in paragraph 7 of this Schedule;

- (j) 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.
- (k) “TRP” means the total radiated power. This is the integral of the power transmitted in different directions over the entire radiation sphere;
- (l) “upper block edge” means, in relation to the Permitted Frequency Block, the highest frequency in that Permitted Frequency Block; and
- (m) “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.

Ofcom

SCHEDULE 3 TO LICENCE NUMBER: **0207128**

Schedule date: **10 January 2017**

Licence Category: **Spectrum Access Licence 2100 MHz:
(TD-LTE Unpaired Spectrum)**

Description of Radio Equipment Licensed

1. In addition to the uses authorised under Schedules 1 and 2 of this Licence, the Licensee may also establish, install and/or use Radio Equipment under this Schedule, including Emergency Services Gateway equipment. Radio Equipment, including Emergency Services Gateway equipment, means the base transceiver stations or repeater stations forming part of the Network (as defined in paragraph 2 below).

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.

Interface Requirements for the Radio Equipment

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

IR 2100 - Terrestrial systems capable of providing electronic communications services in the frequency band 1899.9-1920.0 MHz.

Special Conditions relating to the Radio Equipment

4.
 - a. Subject to paragraphs 4(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 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

without prejudice to this paragraph (a), 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.

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

Special Conditions relating to Emergency Services Gateway Equipment

5. Emergency Services Gateway equipment established under this Schedule is:
 - a. only to be used as a temporary base station for occasional use in connection with user stations used by the emergency services; and
 - b. not to be used when it is in motion if mounted in a vehicle.

Co-ordination at Frequency and Geographical Boundaries

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

International Cross-Border Coordination

7. 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 Block

8. Subject to the emissions permitted under paragraph 10 of this Schedule, the Radio Equipment may only transmit within the following frequency band (the “Permitted Frequency Block”):

1899.9 – 1909.9 MHz

Cooperation between Licensees

9. In addition to complying with the specific transmission terms, conditions and limitations set out in this Licence, the Licensee must liaise and co-operate with other holders of licences in the 1899.9 MHz – 1919.9 MHz band (if necessary adjusting transmission power and other technical parameters of transmission) in such a way that harmful interference is not caused by one TD-LTE (or equivalent) network deployment to another TD-LTE (or equivalent) network of another Licensee within the band. This clause shall not apply in respect of Emergency Services Gateway equipment.

Maximum power within the Permitted Frequency Blocks

10. For downlink transmissions, the power transmitted in the Permitted Frequency Block shall not exceed:

Frequency Block	Maximum mean power
1899.9 – 1904.9 MHz	43 dBm/(5 MHz) e.i.r.p.
1904.9 – 1909.9 MHz	30 dBm/(5 MHz) e.i.r.p.

Note 1: For femtocell equipment and Emergency Services Gateway equipment, power control must be applied to minimise interference to adjacent channels.

For uplink transmissions, the power transmitted in the Permitted Frequency Block shall not exceed:

	Maximum mean power
Mobile or nomadic Radio Equipment	24 dBm TRP
Fixed or installed Radio Equipment	24 dBm e.i.r.p.

Note 2: Consumer user equipment will be authorised by means of a licence exemption under section 8 of the Wireless Telegraphy Act 2006.

Maximum Power outside the Permitted Frequency Blocks

11. 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 shall not exceed the following;

Frequency range	Maximum mean e.i.r.p.	Measurement bandwidth
1876.6 to 1880 MHz	-47 dBm	100 kHz
1880 MHz to 1891.296 MHz	-30 dBm	1 MHz
1891.296 to 1898.208 MHz	-16 dBm	1 MHz
1898.208 to 1899.9 MHz	9.3 dBm	1 MHz
1909.9 to 1914.9 MHz	16.3 dBm	5 MHz
1914.9 to 1919.9 MHz	11.0 dBm	5 MHz
1919.9 – 1980 MHz	-50 dBm	5 MHz

Frame Structure

12. When transmitting, the Licensee must transmit within the limits of the following frame structure:
- 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;
 - The Licensee must ensure that the special subframe (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;
- e. TD-LTE frame configuration 2 (3:1) is compatible with this frame structure. Other technologies are permitted provided that the requirements of 10(a) to 10(d) are met.

Figure 1: Frame Structure

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

Interpretation

13. In this Schedule:
- a. “2100 MHz – TD-LTE Unpaired Spectrum” means frequencies in the range 1899.90 MHz to 1919.9 MHz;
 - b. “downlink” means transmissions from a base station to a terminal station (handset);
 - c. “dBm” means the power level in decibels (logarithmic scale) referenced against 1 milliwatt (i.e. a value of 0 dBm is 1 milliwatt);
 - d. “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);
 - e. “Emergency Services Gateway equipment” means temporary occasional use base stations which are established under this Schedule for use in connection with user stations used by the emergency services;
 - f. “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;
 - g. “fixed or installed” means used or installed at specific fixed points;
 - h. "IR" 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. “maximum mean power” is the maximum mean e.i.r.p. or TRP radiated in any direction from the Radio Equipment for any transmitted carrier and determined irrespective of the number of antennas. Power for this limit is defined as the mean modulated carrier power time averaged over any suitable time period in which the transmitter is continuously transmitting at its maximum operational power level;
- j. “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;
- k. “mobile or nomadic” means intended to be used while in motion or during halts at unspecified points;
- l. “Permitted Frequency Blocks” has the same meaning given to it in paragraph 7 of this Schedule;
- 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 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.
- n. “TD-LTE means the TDD variant of LTE (Long Term Evolution or 4G technology);
- o. “TRP” means the total radiated power. This is the integral of the power transmitted in different directions over the entire radiation sphere; and
- p. “uplink” means transmissions from a terminal station (handset) to a base station;
- q. “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.