
Authorisation of terrestrial mobile networks complementary to 2 GHz Mobile Satellite Service (MSS)

Example 2 GHz Licences

1. Example Network 2 GHz Licence

Any Network 2 GHz Licence granted will be substantially in the form of the example licence appearing below. This licence refers to the entire frequency bands made available to 2 GHz MSS CGC. Each company, however, would only be able to apply for a licence that covers the frequencies it is authorised to use (i.e. Inmarsat could apply for a licence in respect of the frequencies 2170 to 2185 MHz and EchoStar could apply for a licence in respect of in respect of the frequencies 2185 to 2200 MHz).

Office of Communications (Ofcom)
Wireless Telegraphy Act 2006



NETWORK 2 GHz LICENCE

Licence no. **XXXXX**
Date of issue: **XX XXXXX 2017**
Fee Payment Date: **XX XXXX** (annually)

1. The Office of Communications (Ofcom) grants this licence to

Company Name

(Company Reg No: xxxxxx)
("the Licensee")

Address

xxxxxx
xxxxxxxxxxxxxxxx

xxxxxxxx
xxxxxxxx

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

Licence Term

2. This Licence shall continue in force until 13 May 2027 unless earlier 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) if the Licensee fails to pay fees in accordance with paragraph 7 of this Licence;
- d) in accordance with schedule 1 paragraph 8(5) of the Act;
- e) 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;

- f) 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;
- g) for reasons related to the management of the radio spectrum, provided that in such case this power to revoke may only be exercised after at least five (5) year's notice is given in writing to the Licensee;
- h) if UK [Licence number: xxx] is no longer in force

4. Ofcom 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 is not transferable. 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(1) and 30 (3) 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.

Fees

7. The Licensee shall pay to Ofcom the relevant sums as provided under section 12 of the Act and the regulations made thereunder:³

- a) on or before the date of issue of the Licence;
- b) on or before the payment date shown on the Licence for subsequent payments; or such other date or dates as shall be notified in writing to the Licensee, in accordance with those regulations and any relevant terms, provisions and limitations of the Licence.

8. The Licensee shall also pay interest to Ofcom on 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, 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.

¹ These are regulations on spectrum trading.

² https://www.ofcom.org.uk/data/assets/pdf_file/0029/88337/Trading-guidance-doc-jul15v0-1-2.pdf

³ The current regulations relating to fees are the Wireless Telegraphy (Licence Charges) Regulations 2011 (as amended).

9. 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.

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 Schedule(s) of this Licence. Any proposal to amend any detail specified in Schedule(s) of 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.

Access and Inspection

12. 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

13. 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 a term of the Licence has occurred; and/or
- b) the use of the Radio Equipment is causing or contributing to interference to the use of other authorised radio equipment.

14. Ofcom may require any of the wireless telegraphy stations or wireless telegraphy apparatus that comprise 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 is served on the Licensee or a general notice applicable to holders of a named class of Licence is published.

Geographical Boundaries

15. Subject to the requirements of any coordination procedures notified to the Licensee pursuant to 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, this Licence includes the United

Kingdom and 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

16. In this Licence:

- a) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of stations and installation and use of 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 apparatus" and "wireless telegraphy station" shall have the meanings given by section 117 of the Act;
- d) "station" shall mean one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service;
- e) the schedule(s) to this Licence form(s) part of this Licence together with any subsequent schedule(s) which Ofcom may issue as a variation to this Licence at a later date.
- f) the Interpretation Act 1978 shall apply to the Licence as it applies to an Act of Parliament.

Issued by Ofcom

For the Office of Communications

Draft Schedule for 2170-2200 MHz

THIS DRAFT SCHEDULE PROVIDES AN EXAMPLE OF A LICENCE SCHEDULE IN RESPECT OF THE 2170-2200 MHz BAND.

SCHEDULE [1] TO LICENCE NUMBER: **xxxxxxx**

Schedule Date: **xx xxxxx 20xx**

Licence Category: **NETWORK ACCESS [XXXX – XXXX MHz]**

Use of Radio Equipment

1. The Licensee may establish and use Radio Equipment at the location(s) specified in Schedule 2 for the purpose of providing Wireless Telegraphy.

Description of Radio Equipment

2. 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

3. The Radio Equipment shall form part of a mobile satellite system.

Common conditions

4. This Licence is subject to the following common conditions, pursuant to regulation 13 of The Authorisation of Frequency Use for the Provision of Mobile Satellite Services (European Union) Regulations 2010 and Article 8(3) of Decision 626/2008/EC of the European Parliament and of the Council on the selection and authorisation of systems providing mobile satellite services (MSS):

- a) operators shall use the assigned radio spectrum for the provision of complementary ground components of mobile satellite systems;
- b) complementary ground components shall constitute an integral part of a mobile satellite system and shall be controlled by the satellite resource and network management mechanism; they shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of the associated mobile satellite system;
- c) independent operation of complementary ground components in case of failure of the satellite component of the associated mobile satellite system shall not exceed 18 months;
- d) rights of use and authorisations shall be granted for a period of time ending no later than the expiry of the authorisation of the associated mobile satellite system.

Accordingly:

- a) the Licensee may only use the permitted frequency block for the provision of complementary ground components of mobile satellite systems;
- b) the Radio Equipment shall constitute an integral part of a mobile satellite system and shall be controlled by the satellite resource and network management mechanism; it shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of the associated mobile satellite system;
- c) independent operation of the Radio Equipment in the case of failure of the satellite component or the authorised mobile satellite system shall not exceed 18 months;
- d) this Licence shall expire no later than the expiry of [*details of operator's mobile satellite system authorisation*].

Interface Requirements for the Radio Equipment use

5. Use of the Radio Equipment shall be in accordance with IR 2016 – Land mobile satellite systems.

Special Conditions relating to the Operation of the Radio Equipment

6.

- a) 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 base stations:
 - i) postal address (including post code);
 - ii) National Grid Reference, (to 100 metres resolution);
 - iii) antenna height (above ground level) and type, bearing east of true north;
 - iv) radio frequencies which the Radio Equipment is able to use and radio frequencies which the Radio Equipment uses;
 - v) the technical characteristics of the Radio Equipment both in terms of transmission and reception of wireless telegraphy;and the Licensee must produce these records if requested by a person authorised by Ofcom.
- b) The Licensee shall inform Ofcom of the address of the premises at which this Licence and the information detailed at sub-paragraph 6(a) shall be kept.
- c) The Licensee must submit to Ofcom copies of such parts of the records detailed in sub-paragraph 6(a) at such intervals as Ofcom shall notify to the Licensee. Without prejudice to any information which Ofcom is required by law to publish or disclose, Ofcom may, from time to time, publish such extracts of this information as it sees fit, regarding-
 - i) the total number of base stations of the Radio Equipment which are operational;
 - ii) the locations, aggregated by outward postcode, of those base stations;

- iii) the frequencies used by the Radio Equipment.
- d) The Licensee must also submit to Ofcom in such manner and at such times, all information relating to the establishment, installation or use of the Radio Equipment, whether stored in hard copy or electronic form, as reasonably requested for the purposes of verifying compliance with this Licence, for statistical purposes and more generally for the purpose of ensuring that Ofcom can perform its spectrum management functions.
- e) The Licensee must submit to Ofcom an annual compliance report indicating that the use of Radio Equipment is in accordance with the following conditions of its licence:
 - i) the Radio Equipment shall constitute an integral part of a mobile satellite system and shall be controlled by the satellite resource and network management mechanism; it shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of the associated mobile satellite system;
 - ii) independent operation of the Radio Equipment in the case of failure of the satellite component or the authorised mobile satellite system shall not exceed 18 months.

National Co-ordination (e.g. at Frequency and Geographical Boundaries)

7. The Radio Equipment shall be operated in compliance with such co-ordination procedures as may be notified to the Licensee by Ofcom.

International Cross-border Co-ordination

8. The Licensee must 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.

Permitted Frequency Block

9. Subject to the out-of-block emissions permitted under paragraph 10, the Radio Equipment must only transmit in the following frequency band the “permitted frequency block”:

- a) The Radio Equipment shall transmit in the following band [assignment, or subset, given by the Decision No 626/2008/EU process in the 2170-2200MHz band] – Base Transmit “the downlink”;
- b) The Radio Equipment shall receive in the following band [assignment, or subset of, given by the Decision No 626/2008/EC process in 1980-2010 MHz band] – Base Receive “the uplink”.

Maximum Permissible Transmitted Power

10. The maximum mean power transmitted (downlink) in the permitted frequency block shall not exceed:

- 62 dBm/5 MHz

11. The power limits above apply within the frequency range 2170-2200 MHz. Outside of the permitted frequency block the permissible out-of-block emissions requirement will apply (see below).

12. The Licensee shall ensure that the transmissions of mobile earth stations connecting with the Radio Equipment within 1980 – 2010 MHz band (uplink) do not exceed the following maximum mean power limits above ground level:

- 40 dBm EIRP for altitudes at 1000 meters or above
- 24 dBm EIRP for altitudes below 1000 meters

Permissible out-of-block emissions

13. The permissible out-of-block emission limit for the downlink use of frequencies is provided in the Table below:

Offset from relevant block edge	Maximum mean EIRP for out-of-block emissions
-10 to -1.5 MHz (lower block edge)	+3.5 dBm/MHz
-1.5 to -1 MHz (lower block edge)	-9.5 dBm/30 kHz
-1 to -0.2 MHz (lower block edge)	Linear from -9.5 dBm/30 kHz to +2.5 dBm/30 kHz
-0.2 to 0.0 MHz (lower block edge)	+2.5 dBm/30 kHz
0.0 to +0.2 MHz (upper block edge)	+2.5 dBm/30 kHz
+0.2 to +1.0 MHz (upper block edge)	Linear from +2.5 dBm/30 kHz to -9.5 dBm/30 kHz
+1.0 to +1.5 MHz (upper block edge)	-9.5 dBm/30 kHz
+1.5 to +10 MHz (upper block edge)	+3.5 dBm/MHz

Where:

- frequency offset is from the relevant block edge (in MHz);
- the lower block edge is the lower frequency of the permitted frequency block; and
- the upper block edge is the upper frequency of the permitted frequency block.

Application of the Maximum Permissible Transmitted Power to base stations with multiple transmit antennas

14.

- a) In cases where the inputs to different antennas are not correlated, the maximum mean EIRP transmitted in the permitted frequency block is calculated from the sum of the EIRP for each separate antenna;

Note: this applies for MIMO, transmit diversity and “antenna combining” (where different transmitter channels are fed to different branches of a diversity antenna system).

- b) In cases where the inputs to different antennas or antenna elements are correlated, the maximum mean EIRP transmitted in the permitted frequency block above is calculated as follows:

$$\text{EIRP}_{\text{effective}} = \Sigma P_{\text{nom}} \text{ (dBm)} + 10 \log 180/\theta + 10 \log 360/\phi$$

Where:

ΣP_{nom} is the sum of the nominal maximum powers of the transmitter outputs feeding each element, measured at the antenna port;

θ is the -3 dB beamwidth of the antenna array in the vertical plane (if this beamwidth can vary, the minimum value should be used); and

ϕ is the angle in the horizontal plane for which the antenna system is intended to provide service (e.g. for an antenna system that is intended to provide 360° coverage with four arrays, this angle would be 90°).

Note: this applies to adaptive or beam forming antenna arrays where, averaged over time, the power radiated by the antenna system is spread evenly over its angle of operation (where this is not the case the calculation method in (a) above applies).

Interpretation of terms in this Schedule

15. In this Schedule:

- a) "EIRP" means the equivalent isotropic 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);
- b) "dBm" means the power level in decibels (logarithmic scale) referenced against 1milli-Watt (i.e. a value of 0 dBm is 1 milli-Watt);
- c) "out-of-block emissions" means radio frequency emissions generated by the Radio Equipment and radiated into the frequency bands adjacent (in terms of frequency) to the Licensee's permitted frequency block;
- d) "uplink" refers to transmissions from a mobile earth station to a complementary ground component or a space station;
- e) "downlink" refers to transmissions from a complementary ground component or a space station to a mobile earth station;
- f) "mobile satellite systems" shall mean electronic communications networks and associated facilities capable of providing radiocommunications services between a mobile earth station and one or more space stations, or between mobile earth stations by means of one or more space stations, or between a mobile earth station and one or

more complementary ground components used at fixed locations. Such a system shall include at least one space station⁴;

- g) "complementary ground components" of mobile satellite systems shall mean ground based stations used at fixed locations, in order to improve the availability of the mobile satellite service in geographical areas within the footprint of the system's satellite(s), where communications with one or more space stations cannot be ensured with the required quality⁵.

Ofcom

⁴ This is the definition used in Article 2 of Decision No 626/2008/EC of the European Parliament and of the Council of 30 June 2008 on the selection and authorisation of systems providing mobile satellite services (MSS). As noted above, regulation 13 of The Authorisation of Frequency Use for the Provision of Mobile Satellite Services (European Union) Regulations 2010 requires any CGC authorisation to be subject to the common conditions set out at Article 8(3) of this Decision.

⁵ This is the definition used in Article 2 of Decision No 626/2008/EC of the European Parliament and of the Council of 30 June 2008 on the selection and authorisation of systems providing mobile satellite services (MSS). As noted above, regulation 13 of The Authorisation of Frequency Use for the Provision of Mobile Satellite Services (European Union) Regulations 2010 requires any CGC authorisation to be subject to the common conditions set out at Article 8(3) of this Decision.

SCHEDULE [2] TO LICENCE NUMBER: **xxxxxxx**

Schedule Date: **xx xxxxx 20xx**

Licence Category: **NETWORK ACCESS [XXXX – XXXX MHz]**

Licence No.		Licence version date		Payment interval	
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Station details

Station ID	Station NGR	Station Address

Ofcom

2. Example Spectrum Access 2 GHz Licence

Any Spectrum Access 2 GHz Licence granted will be substantially in the form of the example licence appearing below. This licence refers to the entire frequency bands made available to 2 GHz MSS CGC. Each company, however, would only be able to apply for a licence that covers the frequencies it is authorised to use (i.e. Inmarsat could apply for a licence in respect of the frequencies 2170 to 2185 MHz and EchoStar could apply for a licence in respect of the frequencies 2185 to 2200 MHz).

Wireless Telegraphy Act 2006
Office of Communications (Ofcom)



SPECTRUM ACCESS 2 GHz LICENCE

Licence no. **XXXXX**
Date of issue: **xx xxxxx 2017**

1. The Office of Communications (Ofcom) grants this licence to

Company Name

(Company Reg No: xxxxxx)
("the Licensee")

Address

XXXXXX
XXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXX
XXXXXXXXXX
XXXXXXXXXX

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

Licence Term

2. This Licence shall continue in force until 13 May 2027 unless earlier 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 of, or with the consent of, the Licensee;
- b) if there has been a breach of any of the terms of this Licence;
- c) if the Licensee fails to pay fees in accordance with paragraph 7 of this Licence;
- d) in accordance with schedule 1 paragraph 8(5) of the Act;
- e) if it appears to Ofcom to be necessary or expedient to revoke or vary the Licence for the purposes 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.

- f) 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 section 30(3) of the Act;
- g) for reasons related to the management of the radio spectrum, provided that in such case this power to revoke may only be exercised after at least five (5) year's notice is given in writing to the Licensee;
- h) if UK [Licence number: xxx] is no longer in force

4. Ofcom may only revoke or vary this Licence by notification in writing to the Licensee and in accordance with Schedule 1 Paragraphs 6 and 7 of the Act.

Transfer

5. This Licence is not transferable. 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(1) and 30 (3) of the Act⁶.

Changes to Licensee details

6. The Licensee must give prior notice to Ofcom in writing of any proposed change to the Licensee's name and address from that recorded in the Licence.

Fees

7. The Licensee shall pay to Ofcom the relevant sums as provided under section 12 of the Act and the regulations made thereunder:⁷

- a) on or before the date of issue of the Licence;
- b) on or before the payment date shown on the Licence for subsequent payments; or such other date or dates as shall be notified in writing to the Licensee, in accordance with those regulations and any relevant terms, provisions and limitations of the Licence.

8. The Licensee shall also pay interest to Ofcom on 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, 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 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 in accordance with any regulation made under those sections of the Act (as the case may be).

⁶ https://www.ofcom.org.uk/data/assets/pdf_file/0029/88337/Trading-guidance-doc-jul15v0-1-2.pdf

⁷ The current regulations relating to fees are the Wireless Telegraphy (Licence Charges) Regulations 2011 (as amended).

Radio Equipment Use

10. The Licensee must ensure that the Radio Equipment is established, installed and used only in accordance with the provisions specified in Schedule(s) of this Licence. Any proposal to amend any detail specified in Schedule(s) of this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.

11. 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.

Access and Inspection

12. 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

13. A person authorised by Ofcom may require any of the wireless telegraphy stations or wireless telegraphy apparatus that comprise the Radio Equipment 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 a term of the Licence has occurred; and/or
- b) the use of the Radio Equipment is causing or contributing to interference to the use of other authorised radio equipment.

14. Ofcom may require any of the wireless telegraphy stations or wireless telegraphy apparatus that comprise 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 is served on the Licensee or a general notice applicable to holders of a named class of Licence is published.

Geographical Boundaries

15. Subject to the requirements of any coordination procedures notified to the Licensee pursuant to 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, this Licence includes the United Kingdom and 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

16. In this Licence:

- a) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of stations and installation and use of 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 apparatus" and "wireless telegraphy station" shall have the meanings given by section 117 of the Act;
- d) "station" shall mean one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service;
- e) the schedule(s) to this Licence form(s) part of this Licence together with any subsequent schedule(s) which Ofcom may issue as a variation to this Licence at a later date.
- f) the Interpretation Act 1978 shall apply to the Licence as it applies to an Act of Parliament.

Issued by Ofcom

For the Office of Communications

Draft Schedule for 2170-2200 MHz

THIS DRAFT SCHEDULE PROVIDES AN EXAMPLE OF A LICENCE SCHEDULE IN RESPECT OF THE 2170-2200 MHz BAND.

SCHEDULE [] TO LICENCE NUMBER: **xxxxxx**

Schedule Date: **xx xxxxx 2008**

Licence Category: **SPECTRUM ACCESS [XXXX – XXXX MHz]**

Description of Radio Equipment Licensed

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.

Purpose of the Radio Equipment

2. The Radio Equipment shall form part of a mobile satellite system.

Common conditions

3. This Licence is subject to the following common conditions, pursuant to regulation 13 of The Authorisation of Frequency Use for the Provision of Mobile Satellite Services (European Union) Regulations 2010 and Article 8(3) of Decision 626/2008/EC of the European Parliament and of the Council on the selection and authorisation of systems providing mobile satellite services (MSS):

- a) operators shall use the assigned radio spectrum for the provision of complementary ground components of mobile satellite systems;
- b) complementary ground components shall constitute an integral part of a mobile satellite system and shall be controlled by the satellite resource and network management mechanism; they shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of the associated mobile satellite system;
- c) independent operation of complementary ground components in case of failure of the satellite component of the associated mobile satellite system shall not exceed 18 months;
- d) rights of use and authorisations shall be granted for a period of time ending no later than the expiry of the authorisation of the associated mobile satellite system.

Accordingly:

- a) the Licensee may only use the permitted frequency block for the provision of complementary ground components of mobile satellite systems;
- b) the Radio Equipment shall constitute an integral part of a mobile satellite system and shall be controlled by the satellite resource and network management mechanism; it shall use the

same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of the associated mobile satellite system;

- c) independent operation of the Radio Equipment in the case of failure of the satellite component or the authorised mobile satellite system shall not exceed 18 months;
- d) this Licence shall expire no later than the expiry of [*details of operator's mobile satellite system authorisation*].

Interface Requirements for the Radio Equipment use

4. Use of the Radio Equipment shall be in accordance with IR 2016 – Land mobile satellite systems.

Special Conditions relating to the Operation of the Radio Equipment

5.

- a) 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 base stations:
 - i) postal address (including post code);
 - ii) National Grid Reference, (to 100 metres resolution);
 - iii) antenna height (above ground level) and type, bearing east of true north;
 - iv) radio frequencies which the Radio Equipment is able to use and radio frequencies which the Radio Equipment uses;
 - v) the technical characteristics of the Radio Equipment both in terms of transmission and reception of wireless telegraphy;

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

- b) The Licensee shall inform Ofcom of the address of the premises at which this Licence and the information detailed at sub-paragraph 5(a) shall be kept.
- c) The Licensee must submit to Ofcom copies of such parts of the records detailed in sub-paragraph 5(a) at such intervals as Ofcom shall notify to the Licensee. Without prejudice to any information which Ofcom is required by law to publish or disclose, Ofcom may, from time to time, publish such extracts of this information as it sees fit, regarding-
 - i) the total number of base stations of the Radio Equipment which are operational;
 - ii) the locations, aggregated by outward postcode, of those base stations;
 - iii) the frequencies used by the Radio Equipment.
- d) The Licensee must also submit to Ofcom in such manner and at such times, all information relating to the establishment, installation or use of the Radio Equipment,

whether stored in hard copy or electronic form, as reasonably requested for the purposes of verifying compliance with this Licence, for statistical purposes and more generally for the purpose of ensuring that Ofcom can perform its spectrum management functions.

- e) The Licensee must submit to Ofcom an annual compliance report indicating that the use of Radio Equipment is in accordance with the following conditions of its licence:
- i) the Radio Equipment shall constitute an integral part of a mobile satellite system and shall be controlled by the satellite resource and network management mechanism; it shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of the associated mobile satellite system;
 - ii) independent operation of the Radio Equipment in the case of failure of the satellite component or the authorised mobile satellite system shall not exceed 18 months.

National Co-ordination (e.g. at Frequency and Geographical Boundaries)

6. The Radio Equipment shall be operated in compliance with such co-ordination procedures as may be necessary and notified to the Licensee by Ofcom.

International Cross-border Co-ordination

7. The Licensee must 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.

Permitted Frequency Block

8. Subject to the out-of-block emissions permitted under paragraph 9, the Radio Equipment must only transmit in the following frequency band the “permitted frequency block”:

- a) The Radio Equipment shall transmit in the following band [assignment, or subset, given by the Decision No 626/2008/EU process in the 2170-2200MHz band] – Base Transmit “the downlink”;
- b) The Radio Equipment shall receive in the following band [assignment, or subset of, given by the Decision No 626/2008/EC process in 1980-2010 MHz band] – Base Receive “the uplink”.

Maximum Permissible Transmitted Power

9. The maximum mean power transmitted (downlink) in the permitted frequency block shall not exceed the more stringent of:

- 65 dBm/5 MHz EIRP
- 61 dBm/MHz EIRP

10. The power limits above apply within the frequency range 2170-2200 MHz. Outside of the permitted frequency block the permissible out-of-block emissions requirement will apply (see below).

11. The Licensee shall ensure that the transmissions of mobile earth stations connecting with the Radio Equipment within 1980 – 2010 MHz band (uplink) do not exceed the following maximum mean power limits above ground level:

- 40 dBm EIRP for altitudes at 1000 meters or above
- 24 dBm EIRP for altitudes below 1000 meters

12. Where technologies are deployed that actively transmit in bursts then the above limits shall be applied to the active part of the transmission.

Permissible out-of-block emissions

13. The permissible out-of-block emission limit for the downlink use of frequencies is provided in the Table below:

Offset from relevant block edge	Maximum mean EIRP for out-of-block emissions
10 to -1.5 MHz (lower block edge)	+4 dBm/MHz
-1.5 to -1 MHz (lower block edge)	-9 dBm/30 kHz
-1 to -0.2 MHz (lower block edge)	Linear from -9 dBm/30 kHz to +3 dBm/30 kHz
-0.2 to 0.0 MHz (lower block edge)	+3 dBm/30 kHz
0.0 to +0.2 MHz (upper block edge)	+3 dBm/30 kHz
+0.2 to +1.0 MHz (upper block edge)	Linear from +3 dBm/30 kHz to -9 dBm/30 kHz
+1.0 to +1.5 MHz (upper block edge)	-9 dBm/30 kHz
+1.5 to +10 MHz (upper block edge)	+4 dBm/MHz
+10MHz (upper block edge) ⁸	- 38 dBm/MHz

Where:

- frequency offset is from the relevant block edge (in MHz);
- the lower block edge is the lower frequency of the permitted frequency block; and
- the upper block edge is the upper frequency of the permitted frequency block.

⁸ This limit only applies to the block edge at 2200 MHz. +4 dBm/MHz applies for all other block edges.

Application of the Maximum Permissible Transmitted Power to base stations with multiple transmit antennas

14.

- a) In cases where the inputs to different antennas are not correlated, the maximum mean EIRP transmitted in the permitted frequency block above is calculated from the sum of the EIRP for each separate antenna;

Note: this applies for MIMO, transmit diversity and “antenna combining” (where different transmitter channels are fed to different branches of a diversity antenna system).

- b) In cases where the inputs to different antennas or antenna elements are correlated, the maximum mean EIRP transmitted in the permitted frequency block referred to in section 7 above is calculated as follows:

$$\text{EIRP}_{\text{effective}} = \Sigma P_{\text{nom}} \text{ (dBm)} + 10 \log 180/\theta + 10 \log 360/\phi$$

Where:

ΣP_{nom} is the sum of the nominal maximum powers of the transmitter outputs feeding each element, measured at the antenna port;

θ is the -3 dB beamwidth of the antenna array in the vertical plane (if this beamwidth can vary, the minimum value should be used); and

ϕ is the angle in the horizontal plane for which the antenna system is intended to provide service (e.g. for an antenna system that is intended to provide 360° coverage with four arrays, this angle would be 90°).

Note: this applies to adaptive or beam forming antenna arrays where, averaged over time, the power radiated by the antenna system is spread evenly over its angle of operation (where this is not the case the calculation method in (a) above applies).

Interpretation of terms in this Schedule

15. In this Schedule:

- a) "EIRP" means the equivalent isotropic 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);
- b) “dBm” means the power level in decibels (logarithmic scale) referenced against 1 milli-Watt (i.e. a value of 0 dBm is 1 milli-Watt);
- c) “out-of-block emissions” means radio frequency emissions generated by the Radio Equipment and radiated into the frequency bands adjacent (in terms of frequency) to the Licensee’s permitted frequency block;
- d) “uplink” refers to transmissions from mobile earth stations to a complementary ground component or a space station;

- e) “downlink” refers to transmissions from a complementary ground component or a space station to a mobile earth station;
- f) “mobile satellite systems” shall mean electronic communications networks and associated facilities capable of providing radiocommunications services between a mobile earth station and one or more space stations, or between mobile earth stations by means of one or more space stations, or between a mobile earth station and one or more complementary ground components used at fixed locations. Such a system shall include at least one space station⁹;
- g) "complementary ground components" of mobile satellite systems shall mean ground based stations used at fixed locations, in order to improve the availability of the mobile satellite service in geographical areas within the footprint of the system's satellite(s), where communications with one or more space stations cannot be ensured with the required quality.¹⁰

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⁹ This is the definition used in Article 2 of Decision No 626/2008/EC of the European Parliament and of the Council of 30 June 2008 on the selection and authorisation of systems providing mobile satellite services (MSS). As noted above, regulation 13 of The Authorisation of Frequency Use for the Provision of Mobile Satellite Services (European Union) Regulations 2010 requires any CGC authorisation to be subject to the common conditions set out at Article 8(3) of this Decision.

¹⁰ This is the definition used in Article 2 of Decision No 626/2008/EC of the European Parliament and of the Council of 30 June 2008 on the selection and authorisation of systems providing mobile satellite services (MSS). As noted above, regulation 13 of The Authorisation of Frequency Use for the Provision of Mobile Satellite Services (European Union) Regulations 2010 requires any CGC authorisation to be subject to the common conditions set out at Article 8(3) of this Decision.