
Satellite Earth Station Network licences

Proposals to enable NGSO maritime services and adopt new conditions on coexistence

CONSULTATION:

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1. Overview

Space based connectivity is increasingly important for UK consumers and businesses, with an ever-growing number of satellite operators offering a range of services. Delivery of these services relies on radio spectrum. This consultation document sets out proposals for updating the licence we issue to authorise access to spectrum used by satellite Earth Station Networks.

Every network operator delivering Fixed Satellite Services (broadband) to UK based satellite terminals must hold an Earth Station Network licence.¹ For Non-geostationary Orbiting (NGSO) systems, this must be the satellite operator.

Our proposals reflect an overall aim to ensure all providers of UK satellite services - both Geostationary Orbiting (GSO) and NGSO - can access the spectrum in a similar manner, including in the provision of maritime connectivity. We also want to ensure different services can coexist, by mitigating the risk of undue or harmful interference.²

Our proposals would give us additional options to intervene should any licence holder cause disruption to another system or service. This means we can ensure consumers and businesses continue to have access to reliable services, and that accurate radio astronomy data can be collected for scientific research.

What we are proposing – in brief

We are proposing the following changes to the satellite Earth Station Network licence:

- a) Authorisation of NGSO maritime earth stations, to clarify that these services are permitted in the territorial seas of the UK, Isle of Man and Channel Islands and so ensure all NGSO services operate under the same licence conditions;
- b) New licence conditions to support the protection of GSO satellite services, radio astronomy and fixed links from harmful interference caused by NGSO systems;
- c) The addition of a definition of the geographical boundaries of the licence.

- 1.1 Satellite services are able to deliver communications services to places that are difficult to serve by other means. They are ideal for connecting premises and businesses in remote geographic locations as well as to vehicles, ships and aeroplanes operating in locations where terrestrial services cannot reach.
- 1.2 The launch and operation of next generation satellite constellations (referred to here as 'NGSO systems') - such as the Starlink/SpaceX and OneWeb systems - represents a new way of delivering Fixed Satellite Services (FSS).
- 1.3 These NGSO systems have the potential to offer higher capacity and lower latency broadband services, which can serve larger numbers of customers at higher speeds. We

¹ In this document we use "user earth station" and "terminal" interchangeably. This is the equipment enabling a user to connect (via satellite) to the internet or a private network. Examples of such equipment could be a parabolic dish (Very Small Aperture Terminal) or flat panel antenna.

² Interference is referred to as "harmful" in ITU Radio Regulations and as "undue" in UK Wireless Telegraphy Act UK 2006

Updates to satellite Earth Station Network licence

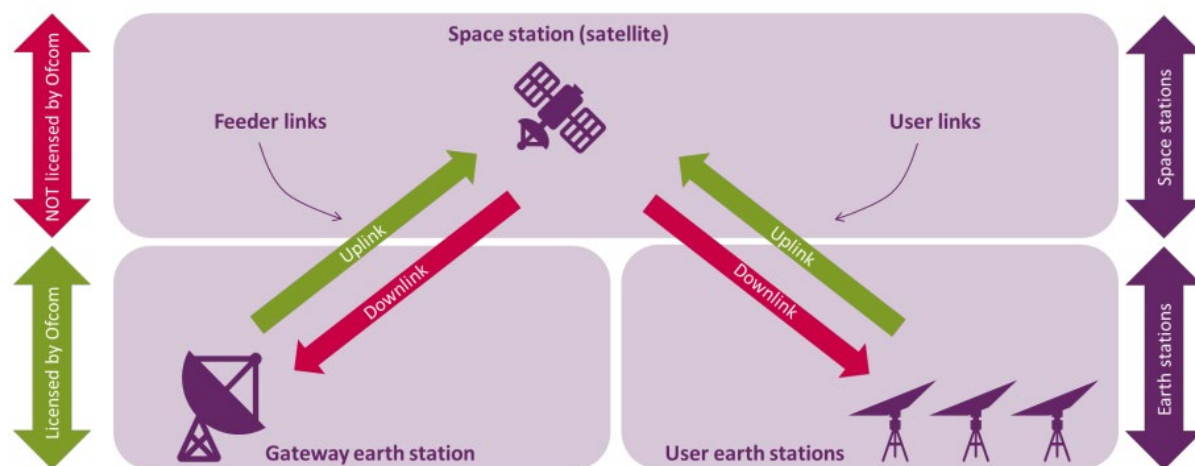
want to encourage as many of these NGSO services as possible for the benefit of UK consumers and businesses.

- 1.4 One way of doing this is by allowing NGSO services to access the radio spectrum in the same way as existing GSO services. Accordingly, in this consultation, we propose to authorise NGSO terminals operating on ships under the Earth Station Network licence in the same way as we authorise terminals connecting to GSO networks.
- 1.5 Our consultation recognises that NGSO services are evolving and there is the potential for these new services to cause harmful interference to existing services and operations. We are therefore also proposing additional licence provisions aimed at ensuring the coexistence of NGSO and other services, specifically: GSO, radio astronomy and fixed links.
- 1.6 We invite stakeholders with an interest in the topics addressed in this consultation to comment on our proposals. The consultation will remain open until **7 July 2023**. Once the consultation is closed, we will review all the responses we receive, and take decisions on whether to proceed with our proposals.

2. Introduction and background

- 2.1 Satellites transmit across national borders and over multiple individual states, so their use of radio spectrum is administered globally. The process is managed through a system of 'satellite filings' overseen by the International Telecommunication Union (ITU), a specialised agency of the United Nations. A filing confers international recognition of spectrum and orbital resources.
- 2.2 Although Ofcom does not issue licences authorising the operation of satellites themselves, we do issue licences authorising the use of spectrum by UK-based earth stations that are connected to satellite systems. In practice, this means we authorise the uplink to satellite systems but not the downlink from the satellite to UK earth stations (see Fig 1 below).

Fig 1: Domestic and international regulation of space services



- 2.3 There are two types of satellite licences available to authorise a satellite network in the UK.
 - a) **A Permanent Earth Station or NGSO Earth Station (Gateway) licence** - these licences authorise access to spectrum for gateway earth stations which connect the user (via satellites) to the internet or a private network.
 - b) **An Earth Station Network licence** - this licence authorises access to spectrum for user terminals to communicate with satellites to deliver broadband on aircraft or ships, as well as to ground-based terminals delivering services such as residential and business broadband; private corporate networks; and remote monitoring for the utilities industries.
- 2.4 This consultation concerns the Earth Station Network licence.
- 2.5 Noting the increased potential for interference between different NGSO satellite systems, we said in our [Statement on the Updates to NGSO licensing](#), that an Earth Station Network licence holder must have control over the whole satellite network (satellites, gateways and user terminals).
- 2.6 In the event of harmful interference to another UK authorised NGSO service, under the terms of the Earth Station Network licence, we can direct the licence holder to cease or

change the use of its equipment or radio frequencies. This applies to any part of the satellite system.

- 2.7 Our proposals extend this approach to ensure other services are not disrupted by new NGSO services.

Our Space Spectrum Strategy

- 2.8 The proposals set out in this consultation follow the publication of our refreshed [Space Spectrum Strategy](#) in November 2022. The strategy provides a framework for our administration of the radio spectrum needed to enable space services in the UK, and identifies our priority work areas over the next few years.
- 2.9 The work we identified for priority has a particular focus on new NGSO satellite communication systems. These systems typically operate around constellations of multiple small and medium sized satellites in low and medium-earth orbit.
- 2.10 The Space Spectrum Strategy stated that we want to encourage as many NGSO communications systems as possible because they provide opportunities for the development of new and innovative services to users, including consumers in hard-to-reach areas; passengers on aircraft and ships; and the public sector.
- 2.11 Our consultation proposals - which are set out in full in section 3 - seek to ensure all providers of UK satellite services (NGSO and GSO) can access the spectrum in a similar manner for maritime connectivity, and can coexist with other users of the spectrum without causing harmful interference.
- 2.12 We focus specifically on changes to the Earth Station Network licence to address the coexistence of NGSO services with radio astronomy, GSO satellite operators and fixed wireless services.

Maritime and aeronautical connectivity services

- 2.13 This consultation sets out proposals to enable broadly equivalent access to spectrum by both NGSO and GSO systems under the Earth Station Network licence for **maritime Earth Stations in Motion (ESIMs)** in Ku band (14.0-14.5 GHz) and Ka band (27.5–27.8185 GHz, 28.4545–28.8265 GHz, and 29.5–30 GHz).³
- 2.14 International regulations governing the use of additional Ku band spectrum (12.75-13.25GHz) for all FSS satellite networks and for NGSO terminals operating across the full Ka band (27.5-30GHz) for aeronautical and maritime ESIMs will be considered at this year’s World Radiocommunication Conference (WRC-23)⁴. Pending the outcome of WRC-23

³ In this document “Ku band” covers the frequencies: 10.7-11.7 GHz and 12.5-12.75 GHz (space-to-Earth – or downlink) and 14.0-14.5GHz (Earth-to space – or uplink); “Ka band” covers the frequencies 17.7-19.7GHz (space- to-Earth) and 27.5–27.8185 GHz, 28.4545–28.8265 GHz, and 29.5–30 GHz (Earth-to-space).

⁴ The proposed Ka band regulations build on [Resolution 169](#) agreed at WRC-19 and Resolution 156 agreed at WRC-15, which together enable aeronautical and maritime ESIMS connecting to GSO satellite networks to operate across the full Ka band (27.5-30GHz).

deliberations, we plan to consider expanding our authorisations for terminals connecting to both GSO and NGSO systems to include these frequencies next year (2024).

Coexistence with other spectrum users

- 2.15 Although NGSO constellations can provide a wide range of benefits to consumers and businesses, they also have the potential to present coexistence issues for other new and existing services.
- 2.16 In line with the approach outlined in the Space Spectrum Strategy, we are proposing to introduce terms and conditions to include specific requirements which would protect existing users from undue harmful interference from NGSO systems in downlink frequencies as well as uplink frequencies.
- 2.17 Our proposals would also give us additional options to intervene should an NGSO system cause disruption to another service, thereby ensuring consumers and businesses continue to have access to reliable services, and that accurate radio astronomy data can be collected for scientific research.

Ofcom's duties

- 2.18 Ofcom's statutory powers and duties in relation to spectrum management are set out primarily in the Communications Act 2003 (the "**2003 Act**") and the Wireless Telegraphy Act ("**WT Act**").

Communications Act 2003

- 2.19 Our principal duties under the 2003 Act are to further the interests of citizens and consumers in respect to communications matter, where appropriate by promoting competition. In doing so, we are also required (among other things) to secure the optimal use of spectrum and the availability throughout the United Kingdom of a wide range of electronic communications services.
- 2.20 Our spectrum management duties require us to have regard to:
- i) the desirability of promoting competition in relevant markets;
 - ii) the desirability of encouraging investment and innovation in relevant markets;
 - iii) the different needs and interests, so far as the use of the electro-magnetic spectrum for wireless telegraphy is concerned, of all persons who may wish to make use of it; and
 - iv) the different interests of persons in the different parts of the United Kingdom, of the different ethnic communities within the United Kingdom and of persons living in rural and in urban areas.

Wireless Telegraphy Act

- 2.21 We permit the use of the radio spectrum by granting wireless telegraphy licences under the WT Act. It is unlawful and an offence to install or use wireless telegraphy apparatus

without holding a licence granted by Ofcom, unless the use of such equipment is exempted.

2.22 In carrying out our spectrum functions we have a duty under section 3 of the Act to have regard in particular to:

- i) the extent to which the spectrum is available for use, or further use, for wireless telegraphy;
- ii) the demand for use of that spectrum for wireless telegraphy; and
- iii) the demand that is likely to arise in future for such use.

2.23 We also have a duty to have regard to the desirability of promoting:

- i) the efficient management and use of the spectrum for wireless telegraphy;
- ii) the economic and other benefits that may arise from the use of wireless telegraphy;
- iii) the development of innovative services; and
- iv) competition in the provision of electronic communications services.

2.24 Section 8(3B) of the WT Act says the terms, provisions and limitations specified in the licences must be:

- objectively justifiable in relation to the wireless telegraphy stations or wireless telegraphy apparatus to which they relate;
- not such as to discriminate unduly against particular persons or against a particular description of persons;
- proportionate to what they are intended to achieve; and
- transparent in relation to what they are intended to achieve.

3. Our proposals

- 3.1 We are consulting on proposals to make specific updates to Earth Station Network licences, which are addressed in turn below:
- Explicit authorisation for NGSO maritime earth stations to clarify that these services are permitted in the territorial seas of the UK, Isle of Man and Channel Islands and to ensure all NGSO services operate under the same licence conditions;
 - New licence conditions to support the protection of GSO satellite services, radio astronomy and fixed links from harmful interference caused by NGSO systems; and
 - A definition of the geographic boundaries of the licence.
- 3.2 The changes we propose mean some other wording in the licence will need to be adapted, and some footnotes added. The proposed updated licence is attached at annex 5, with our proposed text changes highlighted in yellow.
- 3.3 As a consequence of these proposals, we are also proposing a new question for inclusion in our NGSO licensing process. This question should allow applicants to address up front some of the more common concerns we receive during our commenting periods.

NGSO satellite terminals on ships

- 3.4 In the Space Spectrum Strategy statement, we said that in the limited number of cases where spectrum access is currently available for GSO - but not for NGSO satellite systems - we would consider whether NGSO systems could access the same spectrum (and in the same way) as GSO systems.
- 3.5 One particular area we identified was access to Ka and Ku band frequencies by NGSO satellite terminals on ships. Maritime services are increasingly reliant on satellites for applications such as broadband for cruise liners; welfare connectivity for crew on shipping vessels; and connectivity for fishermen, enabling them to better track shoals and sell their catches more rapidly.
- 3.6 Until recently, our Earth Station Network licences have enabled
- a) NGSO land stations in Ku band (14.0-14.5 GHz) and Ka band (27.5–27.8185 GHz, 28.4545–28.8265 GHz, and 29.5–30 GHz); as well as
 - b) NGSO aeronautical stations in Ku band (14.0-14.47 GHz).
- 3.7 However, as set out in our [2016 NGSO Statement](#), NGSO maritime stations on ships are authorised directly through the Ship Radio licence instead.⁵

⁵ The UK Ship Radio Licence covers the use of radio equipment on UK registered ships within the United Kingdom, Channel Islands or the Isle of Man territorial seas and in international seas. In seas governed by other administrations, use is also permitted so long as it is in accordance with the relevant regulations and authorisations of that administration. Ships registered by overseas administrations must conform to the conditions set by their own licensing authority. According to the Wireless Telegraphy Visiting Ships and Aircraft Regulations (1998), ships may operate their wireless equipment in UK territorial seas on the condition that that they do not cause interference to wireless services based in the UK.

- 3.8 More recently, we said in our [Statement on the Updates to NGSO licensing \(2021\)](#) that an NGSO Earth Station Network licence holder must have control over the whole satellite network (satellites, gateways and user terminals). We also decided that in the event of harmful interference to another UK authorised NGSO service, we could direct the licence holder to cease or change the use of their equipment or radio frequencies. This applies to any part of the satellite system.
- 3.9 It is important that all NGSO satellite operators providing UK services hold an Earth Station Network licence. This is to ensure that the conditions in the licences apply equally to all - particularly those conditions regarding cooperation with other NGSO operators and mitigation of interference.
- 3.10 In line with this approach, our proposals would amend the Earth Station Network licence to authorise NGSO terminals on maritime vessels and off-shore facilities to use Ku and Ka band frequencies within the territorial seas of the UK and Crown Dependencies (subject to the conditions set out in the Earth Station Network licence and notices).
- 3.11 For ship connectivity, the Earth Station Network licence (covering the terms and conditions for NGSO systems) would operate alongside individual Ship Radio licences.⁶ This is the same as our approach for authorising terminals operating to GSO satellites in UK waters.
- 3.12 Specifically, this approach requires satellite operators to ensure that terminals on visiting ships do not cause interference to UK services. It also enables us to take quicker action to address any issues related to non-UK registered ships.
- 3.13 We propose a change of wording within the NGSO section of the current licence so that it now includes maritime services as follows:

3.2. Land station(s) (including stations on vehicles and trains), station(s) on offshore installations and maritime station(s) operating with non-geostationary satellites shall:

- d) transmit within one or more of the following frequency ranges: 14.0-14.5 GHz, 27.5-27.8185 GHz, 28.4545-28.8265 GHz, 29.5-30 GHz;
- e) transmit only to the satellite network specified in Schedule 2;

Interim licence variation for existing NGSO Earth Station Network licences

- 3.14 All four current NGSO licence holders plan to offer maritime services internationally, with OneWeb and SpaceX planning to roll out maritime terminals this year (2023).
- 3.15 Recognising the above; the growing demand for improved maritime broadband services; and planned deployment of maritime NGSO terminals in Ku band frequencies, we have varied the licences of existing NGSO Earth Station Network licensees 'by consent' on an

⁶ The Ship Radio Licence authorises the installation and use of maritime radio and associated equipment, as well as non-maritime radio equipment (such as a mobile phone picocell) on a named ship, subject to applicable licence conditions. The ship must be registered in the UK or one of the Crown Dependencies. The licence applies to the ship no matter where in the world it might be.

interim basis to clear up any immediate ambiguity regarding the provision of these services within the territorial seas of the UK and Crown Dependencies.⁷

- 3.16 The proposals outlined above would extend this approach as standard for future NGSO Earth Station Network licence holders.

Protection of other services from interference

- 3.17 In the Space Spectrum Strategy statement we said we would examine whether conditions should be placed on NGSO satellite downlinks to protect GSO satellite operators and radio astronomy from potential interference.
- 3.18 In principle, the international regulatory framework should protect against such instances of harmful interference occurring. However, we consider that by introducing new provisions on the NGSO satellite downlink into our licence we would be able to take swifter, more direct action should harmful interference arise from NGSO downlinks.
- 3.19 Given that we want the powers to be able to respond to any cases of suspected undue interference arising from NGSO downlinks quickly, we have also examined other co-frequency or adjacent band services to check whether there would be a case for introducing any other similar provision.
- 3.20 Fixed Satellite Services currently downlink in the following spectrum bands in the UK:
- i) For Ku band: 10.7-11.7 GHz, 12.5-12.75 GHz
 - ii) For Ka band: 17.7-19.7 GHz
- 3.21 The UK Frequency Allocation table also lists fixed wireless links (FS), mobile, Earth Exploration Satellite Services (EESS), radio location and Space Research Services (SRS) operating in or adjacent to these frequencies.
- 3.22 Of these services, we consider that EESS and SRS would be covered by the new conditions we are proposing on the protection of radio astronomy; radio location services are secondary services so do not need protecting from primary services; and there are no mobile services authorised in these frequencies.
- 3.23 We are, however, proposing to add a new condition to protect fixed wireless links in the 17.7-19.7 GHz band based on Article 21 of the ITU Radio Regulations. This is because these links support backhaul for mobile services. We assess that harmful interference to these fixed links has the potential to have a noticeable and immediate impact for UK citizens and consumers.
- 3.24 In the following sub-sections we deal in turn with proposed new licence conditions related to the protection of **GSO services**; protection **of radio astronomy**; and protection of **fixed links**.

⁷ We have published these updated licences. See [NGSO licensing webpage](#).

Protection of GSO services from NGSO interference

- 3.25 In the Space Spectrum Strategy statement we said we would examine whether conditions should be placed on NGSO satellite downlinks to protect GSO satellite operators from potential interference.
- 3.26 The way NGSO systems and GSO networks coexist is primarily managed through the ITU Radio Regulations, which are part of an international treaty that is binding on ITU Member States. For most of Ku and Ka band, the Radio Regulations define a set of interference limits, called equivalent power-flux density (EPFD) limits, that NGSO systems must respect in order to avoid interference to GSO networks.
- 3.27 It is reasonable for us to expect that NGSO satellite operators will comply with the Radio Regulations and protect GSO networks according to the relevant provisions. The administration which holds the filing(s) for a specific NGSO system is ultimately responsible for ensuring compliance, and Article 15 of the regulations sets out the process for resolving cases of harmful interference between member states.
- 3.28 However, as noted in the Space Spectrum Strategy, the process for resolving harmful interference can be slow, and outcomes can be uncertain if the NGSO system causing interference is operated under a non-UK filing. These issues are likely to be compounded as more and more NGSO constellations are deployed.
- 3.29 We already have a condition in Earth Station Network licences applying to transmissions (uplinks) from earth stations located in the UK. This requires compliance with the equivalent power flux-density limitations specified in Article 22 of the ITU Radio Regulations, which are intended to protect GSO satellites.
- 3.30 We now propose to add into the licence a new condition in respect of the NGSO satellite downlinks to gateways and terminals in the UK.
- 3.31 The proposed new condition is based on existing limits in Article 22 of the ITU Radio Regulations, with which operators are already expected to comply. We therefore propose the addition of a new sub-section (3.7) as follows:

3.7 Protection of geostationary satellites and earth stations communicating with geostationary satellites

- p) Non-geostationary satellites and earth stations communicating with non-geostationary satellite(s) shall ensure compliance with the relevant equivalent power flux-density limitations specified in Article 22 of the ITU Radio Regulations in both the Earth-to-space and space-to-Earth direction.

Protection of radio astronomy from NGSO interference

- 3.32 We said in the Space Spectrum Strategy statement that we would seek to ensure appropriate protections for radio astronomy⁸ from potential interference caused by space-to-Earth downlinks of NGSO (as well as GSO) systems operating in frequencies adjacent to those allocated for radio astronomy use.
- 3.33 We said it was possible that large NGSO constellations visible to radio astronomy sites could present an increased risk of interference compared to GSO.
- 3.34 We said we would consider whether licence conditions should therefore be placed on NGSO satellite downlinks to protect radio astronomy in the 10.6-10.7 GHz band. This is a band adjacent to the downlink bands used by Ku band satellites. This new condition would be in addition to the existing provisions in relation to NGSO satellite uplinks to protect two radio astronomy sites in the 14.47-14.5 GHz band.
- 3.35 Although satellite services are already subject to international thresholds which protect radio astronomy in this band, enforcement through international bodies can be a lengthy process. A specific UK licence condition would provide us with the ability to take direct enforcement action in any cases of harmful interference from NGSO constellations and remove interference more quickly than relying on international processes.
- 3.36 The 10.6-10.7 GHz band covers two radio astronomy allocations. The lower end contains a primary allocation to radio astronomy in 10.60-10.68 GHz, while the 10.68-10.7 GHz band is a passive band subject to Radio Regulations footnote No. 5.340, where all emissions are prohibited in a number of bands, including 10.68-10.7 GHz.
- 3.37 We propose changes to the current Earth Station Network licence conditions relating to protection of radio astronomy, including the addition of a new sub-section (numbered 3.6 in the proposed draft licence) to require specific protection of radio astronomy in the 10.6-10.7 GHz band as follows:

⁸ Radio astronomy is the study of radio and microwave spectrum to develop understanding of the universe. Different elements and compounds can be detected at particular frequencies so by studying the spectrum, scientists can tell the chemical make-up of stars, galaxies and the interstellar medium (the space between space objects).

3.5 Protection of radio astronomy and fixed links in the 14.25-14.5 GHz band

- l) To protect radio astronomy, a land or maritime station shall not transmit in the frequency range 14.47-14.5 GHz when located within a 175 km radius of either of the national grid references below¹²:
- Jodrell Bank – focus point of circle is NGR SJ5739392556;
 - Cambridge – focus point of circle is NGR TL5439992385.
- m) Licensees shall protect fixed links at 14.25-14.5 GHz in accordance with any Notice issued by Ofcom.

3.6 Protection of radio astronomy stations operating in the 10.6-10.7 GHz band

- n) For protection of the following six UK radio astronomy stations:
- Jodrell Bank - NGR (Easting) 379817, (Northing) 370806
 - Cambridge - NGR (Easting) 539423, (Northing) 254028
 - Darnhall - NGR (Easting) 364278, (Northing) 362263
 - Defford - NGR (Easting) 390201, (Northing) 244700
 - Knockin - NGR (Easting) 332854, (Northing) 321877
 - Pickmere - NGR (Easting) 370407, (Northing) 376953
- o) Licensees shall manage interference by limiting unwanted emissions¹³. For non-geostationary orbit systems this includes the suppression of satellite transmissions in the channel immediately adjacent to 10.7 GHz or taking other measures.¹⁴

Footnotes:

¹²Due to UK terrain, the interference areas are not symmetrical around each of the radio astronomy sites. By offsetting the centre of the interference area (away from the site) we can more closely match the interference area which has the overall result of reducing the size of the protection area.

¹³Interference from any one network should not exceed the thresholds given in Recommendation ITU-R RA.769 by causing more than 2% data loss in radio astronomy measurements as stated in ITU-R Recommendation RA.1513.

¹⁴ See ECC report 271

Conditions to protect fixed links in 17.7-19.7 GHz from NGSO interference

- 3.38 There are roughly 3,700 fixed wireless links⁹ currently operating in the 17.7-19.7 GHz frequencies in the UK, mainly supporting back haul for mobile operations.¹⁰

⁹ Fixed wireless links are terrestrial based wireless systems that operate between two or more fixed points.

¹⁰ As set out above, we also examined EESS, SRS, mobile and radiolocation services in Ku band (10.7-11.7 GHz and 12.5-12.75 GHz) and Ka and (17.3-19.7 GHz). These services can either be protected via the proposals we are already making or have secondary allocations.

- 3.39 We note that, in principle, interference into these links should not arise. This is because Article 21 of the ITU's Radio Regulations sets out PFD limits at the earth's surface to facilitate sharing with terrestrial services such as fixed wireless links.
- 3.40 Compliance with these limits is checked by the ITU's Satellite Bureau prior to accepting an application for a satellite filing. However, by including this condition in the licence, we will ease enforcement and ensure consistency with all our existing co-frequency/adjacent band spectrum users.
- 3.41 We propose therefore to include two new conditions in paragraph 3.8 to require all operators to protect these fixed links. These will be based on compliance with Article 21 as follows:

3.8 Protection of fixed links in the 17.7-19.7 GHz band

- q) For non-geostationary systems, licencees shall ensure compliance with the relevant power flux-density limitations in Article 21 of the Radio Regulations in the space-to-Earth direction.
- r) In any case, NGSO satellites operating in the space-to-Earth direction shall not cause undue (or harmful) interference to fixed links, and compliance with the relevant power flux-density limitations referred to in 3.8.q does not release licensees from this obligation.

Geographic boundaries of the licence

- 3.42 The growth of offshore industries and the rapid development of new ESIM services on ships and planes means it is now important to clarify where the licence applies, noting that UK ships and planes travel beyond UK territory into geographies governed by other administrations.
- 3.43 We therefore propose to add the following definition of geographic boundaries to the licence schedule:

2. Geographical extent of the licence

2.1 This licence authorises earth stations:

- a) on land (within the UK, Channel Islands or Isle of Man);
- b) on offshore installations (which are inside UK territorial sea or outside UK territorial sea but in waters which are to be treated as if they were situated in such part of the United Kingdom under section 120(2) of the Wireless Telegraphy Act 2006); and
- c) on any vessel or aircraft (within or above the territory of the UK or within or above the territorial seas of the UK, the Channel Islands and the Isle of Man).¹

Footnote: Stations on an aircraft or vessel which is registered in the United Kingdom, Channel Islands and Isle of Man and which is outside those territories and outside their territorial seas are not authorised under this licence but may be separately authorised under wireless telegraphy licences for that individual vessel or aircraft.

Other proposed text changes

- 3.44 In addition to the proposed changes to the Earth Station Network licence already outlined, there are consequent small changes to some of the wording. We also propose the addition of a small number of footnotes to clarify references.
- 3.45 All the proposed changes are highlighted in yellow in the proposed updated licence set out at annex 5.

Applications for new NGSO operators

- 3.46 Recognising the new conditions in the Earth Station Network licence, we propose to update the application form for the licence to include a new question:
- “Please provide evidence that your service can protect other services operating in co-frequency or adjacent bands”*
- 3.47 By asking that operators submit this information up front, we reduce the risk that we will need to ask applicants for further information after the initial consultation. This has occurred on a number of occasions already, and tends to lengthen the application process.
- 3.48 We also propose to update our guidance to reflect this change.

Investigations and compliance

- 3.49 At the same time as developing a new licence condition covering the downlink, we are planning further development of our ability to investigate and verify any complaints of harmful interference to GSO stations.
- 3.50 For any suspected cases of interference arising from a single NGSO satellite, we will seek evidence of measurements conducted at the ‘victim’ earth stations (i.e. at the user or operator’s site). For the investigation of any suspected cases of aggregate interference, we will use our satellite monitoring facility at Baldock in Hertfordshire.
- 3.51 We have also initiated work to promote a globally harmonised approach on the handling of NGSO to GSO and NGSO to NGSO interference through our engagement with the ISRMM (International Space Radio Monitoring Meeting) and relevant ITU groups.
- 3.52 We note that in cases of potentially harmful interference from NGSO Earth stations to GSO satellite receivers, measurements cannot be taken on the ground. We will therefore make use of evidence provided by the ‘victim’ satellite operator.

Provision of information on satellite interference

- 3.53 The WT Act gives us power to request information on interference and other data from licensees on a case-by-case basis. However, considering the new complex sharing environment we are seeing for satellites, it is clear that the real time and automated reporting of interference data could play a vital role in speedy resolution of satellite interference cases, and also benefit our understanding of sharing environment conditions.

Updates to satellite Earth Station Network licence

- 3.54 While we are not proposing to add specific conditions to the licence at this stage, we welcome and encourage engagement with operators willing to provide access to this information.
- 3.55 This is in line with our decision to progress with the development of a proof-of-concept interference reporting API (application programming interface) to allow spectrum users to log interference events automatically - in real time - as set out in our [Spectrum Roadmap](#) published in November 2022.
- 3.56 We will consider the options for obtaining the information on real time interference data from satellite operators in the future, including potential further amendment of Earth Station Network licence conditions.

Summary of proposals

- 3.57 We believe the proposals set out in this document will fulfil our aim of ensuring all providers of UK satellite services - NGSO and GSO - can access broadly similar radio frequencies. They should also ensure different services can coexist, thereby mitigating the risk of harmful interference.
- 3.58 Our proposed updates to the Earth Station Network licence would give us additional options to intervene swiftly should a licence holder cause disruption to another service, thereby ensuring consumers and businesses continue to have access to reliable services and assuring the integrity of scientific research in the UK.
- 3.59 In summary, our main proposals are to update the Earth Station Network licence to:
- Explicitly allow NGSO satellite terminals on ships to use Ku and Ka band radio frequencies in the territorial seas of the UK and Crown Dependencies;
 - Introduce new conditions to support the protection of GSO satellite services, radio astronomy and other services from NGSO systems; and
 - Define the geographic boundaries of the licence.
- 3.60 As part of our considerations regarding these proposals we have carried out an impact and equality assessment (see paragraphs 3.63-3.80 below) and consider the proposals to be:
- objectively justified in that they are likely to meet our aim of ensuring an effective, efficient and even-handed licensing regime for satellite earth stations, for the benefit of consumers and businesses;
 - not unduly discriminatory against particular persons or against a particular description of persons in that the in that the new provisions would apply to all potential NGSO operators, and the benefits would apply to all potential users of the services;
 - proportionate to what they are intended to achieve, in that our proposed updated licence conditions aim to ensure the continuing coexistence of different services and align with already defined international obligations; and
 - transparent in relation to what they are intended to achieve, in that they are clearly described and explained in this consultation document.

Impact Assessment

- 3.61 Impact assessments provide a valuable way of assessing different options for regulation. They form part of best practice policy making. In preparing this document, we have considered the citizen and consumer interests relating to authorising equipment. We have also considered the impact of making the proposed changes to the Earth Station Network licence on other users of the radio spectrum and on the licence holders themselves.
- 3.62 As set out in the Space Spectrum Strategy, it is our objective to encourage as many NGSO communications systems as possible because they provide new and innovative broadband services to a variety of users, including consumers in hard-to-reach areas; passengers on aircraft and ships; and the public sector.

Impact on Consumers

- 3.63 We consider there are beneficial impacts for UK consumers and businesses arising from enabling NGSO services in the territorial seas of the UK and Crown Dependencies through a combination of the Earth Station Network licence and Ship Radio licence.
- 3.64 We also consider that UK consumers and businesses would benefit from our being able to take more direct and swift action in the event of suspected interference to other services from a NGSO system, as detailed below.

Impact on other users

- 3.65 We set out in the Space Spectrum Strategy that we would examine the risk that NGSO systems might affect existing GSO services and radio astronomy in downlink frequencies. These issues were also raised by stakeholders in our consultation on NGSO Licensing Updates. We have examined these and other services operating co-frequency and in adjacent bands. We have assessed that it would be beneficial to also introduce protections for fixed wireless links in order to protect back haul for mobile services.
- 3.66 Our Earth Station Network licence already contains protections for these services in the uplink frequencies. Our proposals to introduce additional protections for GSO services, radio astronomy and fixed links are designed to mitigate potential interference from NGSO services in the down link frequencies and to improve speed of enforcement in the event of disruption to these services. They should therefore have a beneficial impact on these services.
- 3.67 Finally, our new approach to licensing NGSO maritime services, which no longer simply relies on individual Ship Radio licences, should ensure that all user terminals on ships are operated in a way that protects UK spectrum users while in UK territorial seas.

Impact on NGSO operators

- 3.68 The new approach to authorising maritime services is similar to our approach to authorising GSO terminals. It will ensure that all NGSO satellite operators will have similar licence obligations when providing connectivity in the territorial seas of the UK and the Crown Dependencies.

- 3.69 We have varied the licences of existing NGSO Earth Station Network licence holders in order to ensure that they are not held up in the deployment of their services. This is in line with our policy to encourage innovative new satellite services and seek to support competition through an equitable approach to authorisations and the efficient use of spectrum.
- 3.70 In relation to our proposals to add specific licence conditions relating to NGSO downlinks, the measures we propose should already be followed by satellite operators in compliance with international regulations. Compliance with the additional protection measures should not place an additional burden on operators or have a negative impact on their operations.
- 3.71 Overall, we assess that our proposals should have a beneficial impact on NGSO operators.

Impact on other Earth Station Network licence holders

- 3.72 We assess that there will be no negative impact from any of these proposed changes to terminals operating to GSO services operating under the Earth Station Network licence as the proposed conditions will not place additional obligations on them.
- 3.73 At present, we are proposing to introduce new conditions relating to the downlink for NGSO systems only. This proposed approach takes account of the fact that GSO services have been operating for decades without causing interference to radio astronomy and fixed wireless links in the UK, and that the nature of GSO services means there is a reduced likelihood of harmful interference arising.
- 3.74 We have a duty to ensure our regulations are proportionate to the aim we are trying to achieve. This does not, of course, remove any obligation for GSO satellite operators to comply with Recommendation 769 or Article 21 of the ITU Radio Regulations.
- 3.75 In addition, where GSO systems are being used for connectivity, Earth Station Network licences can be held by both GSO satellite operators and network operators (resellers using terminals operating to GSO networks) who do not control the GSO satellite.
- 3.76 Finally, the conditions designed to protect GSO networks from potential interference from NGSO operators should give Earth Station Network licence holders operating terminals connecting to GSO networks greater certainty that their (existing) services will be protected in the frequencies where Article 22 of the ITU Radio Regulations applies. This will be a positive impact.

Commenting on the impact assessment

- 3.77 Any comments about our assessment of the impact of our proposals should be sent to us under responses to question 5 by the closing date for this consultation.
- 3.78 We will consider all comments before deciding whether to implement our proposals. For further information about our approach to impact assessments, see the guidelines '[Better policy making: Ofcom's approach to impact assessments](#)' on our website.

Equality Impact Assessment

- 3.79 Ofcom is separately required by statute to assess the potential impact of all our functions, policies, projects and practices on the following equality groups: age, disability, gender, gender reassignment, pregnancy and maternity, race, religion or belief, and sexual orientation.
- 3.80 Equality impact assessments also assist us in making sure that we are meeting our principal duty of furthering the interests of citizens and consumers regardless of their background or identity.
- 3.81 We consider that our proposals would not be detrimental to any of these equality groups.
- 3.82 We have not carried out separate equality impact assessments in relation to the additional equality groups in Northern Ireland: religious belief, political opinion and dependants. This is because we anticipate that our proposals would not have a differential impact in Northern Ireland compared to consumers in general. We welcome any stakeholder views on this assessment.

Consultation questions

- 3.83 We invite interested parties to respond to this consultation by answering the following questions:

Question 1: Do you agree with our proposal to update the Earth Station Network Licence to include a new provision authorising NGSO maritime services in the territorial seas of the UK and the Crown Dependencies? If you do not agree, please explain your reasons.

Question 2: Do you agree with our proposal to introduce a licence condition in relation to NGSO downlinks to protect GSO satellites, and earth stations communicating with GSO satellites? If you do not agree, please explain your reasons.

Question 3: Do you agree with our proposal to introduce a licence condition setting out requirements for the protection of radio astronomy from harmful interference in relation to NGSO downlinks? If you do not agree, please explain your reasons.

Question 4: Do you agree with our proposal to introduce licence conditions setting out requirements for the protection of fixed links from harmful interference in relation to NGSO downlinks? If you do not agree, please explain your reasons.

Question 5: Do you have any additional comments regarding any of our proposals?

4. Next steps

- 4.1 We now await the responses of stakeholders to our proposals. The consultation will remain open until 7 July 2023.
- 4.2 Once the consultation is closed we will review all the responses we receive and take decisions on whether to proceed with our proposals.

Future evolution of Earth Station Network licences

- 4.3 We expect to consult on making further changes to the Earth Station Network licences in future to reflect developments in UK and international regulation.
- 4.4 For example, we will consider expanding the authorisations within the Earth Station Network licence to Ka band terminals on aircraft and maritime vessels for GSO next year (2024). This would implement decisions made during WRC-19 (allowing aeronautical and maritime services to operate across the full ka band 27.5-30 GHz band - subject to conditions to protect fixed wireless links).
- 4.5 International regulations governing the use of Ka band frequencies for non-GSO satellite systems will be considered at this year's World Radiocommunications Conference (WRC-23). Pending the outcome of WRC-23 deliberations, we will also consider enabling air and maritime services operating to GSO and NGSO in Ku band (13 GHz) and operating to NGSO services using Ka band terminals (27.5-30 GHz).

A1. Responding to this consultation

How to respond

- A1.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 7 July 2023.
- A1.2 You can download a response form from <https://www.ofcom.org.uk/consultations-and-statements/category-2/satellite-earth-station-network-licences>. You can return this by email or post to the address provided in the response form.
- A1.3 If your response is a large file, or has supporting charts, tables or other data, please email it to NGSO.Licensing.Consultation@ofcom.org.uk as an attachment in Microsoft Word format, together with the [cover sheet](#).
- A1.4 Responses may alternatively be posted to the address below, marked with the title of the consultation:
- NGSO Consultation
Spectrum Group
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA
- A1.5 We welcome responses in formats other than print, for example an audio recording or a British Sign Language video. To respond in BSL:
- send us a recording of you signing your response. This should be no longer than 5 minutes. Suitable file formats are DVDs, wmv or QuickTime files; or
 - upload a video of you signing your response directly to YouTube (or another hosting site) and send us the link.
- A1.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)
- A1.7 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt of a response submitted to us by email.
- A1.8 You do not have to answer all the questions in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.
- A1.9 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed at Annex 4. It would also help if you could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.
- A1.10 If you want to discuss the issues and questions raised in this consultation, please contact us by email at NGSO.Licensing.Consultation@ofcom.org.uk.

Confidentiality

- A1.11 Consultations are more effective if we publish the responses before the consultation period closes. In particular, this can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish responses on [the Ofcom website](#) at regular intervals during and after the consultation period.
- A1.12 If you think your response should be kept confidential, please specify which part(s) this applies to, and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.
- A1.13 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.14 To fulfil our pre-disclosure duty, we may share a copy of your response with the relevant government department before we publish it on our website. These are the Department for Science, Innovation and Technology, and the Department for Digital, Culture, Media and Sport.
- A1.15 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further in our [Terms of Use](#).

Next steps

- A1.16 Following this consultation period, Ofcom plans to publish a statement.
- A1.17 If you wish, you can [register to receive mail updates](#) alerting you to new Ofcom publications.

Ofcom's consultation processes

- A1.18 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex 2.
- A1.19 If you have any comments or suggestions on how we manage our consultations, please email us at consult@ofcom.org.uk. We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.
- A1.20 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:

Corporation Secretary
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Email: corporationsecretary@ofcom.org.uk

A2. Ofcom's consultation principles

Ofcom has seven principles that it follows for every public written consultation:

Before the consultation

- A2.1 Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

During the consultation

- A2.2 We will be clear about whom we are consulting, why, on what questions and for how long.
- A2.3 We will make the consultation document as short and simple as possible, with an overview of no more than two pages. We will try to make it as easy as possible for people to give us a written response.
- A2.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.
- A2.5 A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.
- A2.6 If we are not able to follow any of these seven principles, we will explain why.

After the consultation

- A2.7 We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish the responses on our website at regular intervals during and after the consultation period. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

A3. Consultation coversheet

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing

Name/contact details/job title

Whole response

Organisation

Part of the response

If there is no separate annex, which parts? _____

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom aims to publish responses at regular intervals during and after the consultation period. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

A4. Consultation questions

Question 1: Do you agree with our proposal to update the Earth Station Network Licence to include a new provision authorising NGSO maritime services in the territorial seas of the UK and the Crown Dependencies? If you do not agree, please explain your reasons.

Question 2: Do you agree with our proposal to introduce a licence condition in relation to NGSO downlinks to protect GSO satellites, and earth stations communicating with GSO satellites? If you do not agree, please explain your reasons.

Question 3: Do you agree with our proposal to introduce a licence condition setting out requirements for the protection of radio astronomy from harmful interference in relation to NGSO downlinks? If you do not agree, please explain your reasons.

Question 4: Do you agree with our proposal to introduce licence conditions setting out requirements for the protection of fixed links from harmful interference in relation to NGSO downlinks? If you do not agree, please explain your reasons.

Question 5: Do you have any additional comments regarding any of our proposals?

A5. Proposed updated Earth Station Network licence

A5.1 Our proposed updated Earth Station Network licence is set out here, with the changes we are proposing to make to the current licence template marked in yellow.

Wireless Telegraphy Act 2006

Satellite (Earth Station Network)

Sector/class/product	<Product>
Licence number	<Lic_No>
Licensee	<Lic_Name>
Licensee address	<Address>
Licence first issue date	<Issue_Date>
Licence version date	<Date>
Payment interval	<Year>

1. This Licence is issued by the Office of Communications (“Ofcom”) on <Date> and replaces any previous authority granted in respect of the service subject to this Licence by Ofcom or by the Secretary of State.
2. This Licence authorises <Lic Name> (“the Licensee”) to establish, install and/or use radio transmitting and/or receiving stations and/or radio apparatus as described in the schedule(s) (hereinafter together called “the radio equipment”) subject to the terms set out below and subject to the terms of the General Licence Conditions booklet (Version OfW597).

ISSUED BY OFCOM

Satellite (Earth Station Network) Licence SCHEDULE 1 TO LICENCE NUMBER <Lic_No> TERMS, PROVISIONS AND LIMITATIONS COVERED BY THIS LICENCE

This schedule forms part of Licence <Lic_No>, issued to <Lic_Name>, the Licensee on <Issue_Date>, and describes the terms and equipment specifications covered by this Licence.

1. **The Licensee may establish and use:**

- 1.1. Permanent, transportable or mobile sending and receiving network earth station(s) ("the station(s)") for the purpose of providing wireless telegraphy links between the station(s) and geostationary or non-geostationary satellite(s).

2. Geographical extent of the licence

2.1 This licence authorises earth stations:

- a) on land (within the UK, Channel Islands or Isle of Man);
- b) on offshore installations (which are inside UK territorial sea or outside UK territorial sea but in waters which are to be treated as if they were situated in such part of the United Kingdom under section 120(2) of the Wireless Telegraphy Act 2006); and
- c) on any vessel or aircraft (within or above the territory of the UK or within or above the territorial seas of the UK, the Channel Islands and the Isle of Man).¹¹

3. Limitations on use

3.1. The station(s) operating with geostationary satellites shall:

- a) transmit within one or more of the following frequency ranges: 14.0-14.5 GHz, 27.5-27.8185 GHz, 28.4545-28.8265 GHz, 29.4625-30 GHz;
- b) for aeronautical stations, not transmit within the frequency range 14.47-14.5 GHz;
- c) transmit only to the satellite and its associated orbital longitude specified in Schedule 2;

3.2. Land station(s) (including stations on vehicles and trains), station(s) on offshore installations and maritime station(s) operating with non-geostationary satellites shall:

- d) transmit within one or more of the following frequency ranges: 14.0-14.5 GHz, 27.5-27.8185 GHz, 28.4545-28.8265 GHz, 29.5-30 GHz;
- e) transmit only to the satellite network specified in Schedule 2;

3.3. Aeronautical station(s) operating with non-geostationary satellites shall:

- f) transmit within the frequency range 14.0-14.47 GHz;
- g) transmit only to the satellite network specified in Schedule 2;

3.4. Additionally:

- h) station(s) that transmit with e.i.r.p. greater than 55 dBW shall operate only with prior consent from Ofcom and registration of the station(s) against the Licence;
- i) station(s) that transmit within the frequency range 14.0-14.5 GHz inclusive shall not operate at any location that is less than or equal to 5 km from the two

¹¹Stations on an aircraft or vessel which is registered in the United Kingdom, Channel Islands and Isle of Man and which is outside those territories and outside their territorial seas are not authorised under this licence but may be separately authorised under wireless telegraphy licences for that individual vessel or aircraft.

- geographical locations specified in Schedule 3 without prior consent from Ofcom and registration of the station(s) against the Licence;
- j) station(s) that transmit with e.i.r.p. greater than 50 dBW and less than 55 dBW (50 dBW < e.i.r.p. < 55 dBW) in the frequency range 14.0-14.5 GHz inclusive shall not operate at any location that is greater than 5 km and less than or equal to 7 km from the two geographical locations specified in Schedule 3 without prior consent from Ofcom and registration of the station(s) against the Licence; and
 - k) station(s) shall not operate within the perimeter fence of any of the aerodromes specified in Schedule 4 without prior consent from the Civil Aviation Authority or stated Airport Authority.

3.5 Protection of radio astronomy and fixed links in the 14.25-14.5 GHz band

- l) To protect radio astronomy ~~operating between 14.47-14.5 GHz~~, a land or maritime station shall not transmit ~~from a location in the frequency range 14.47-14.5 GHz~~ when located within a 175 km radius of either of the national grid references below¹²:
 - Jodrell Bank – focus point of circle is NGR SJ5739392556;
 - Cambridge – focus point of circle is NGR TL5439992385.
- m) Licensees shall protect fixed links at 14.25-14.5 GHz in accordance with any Notice issued by Ofcom.

3.6 Protection of radio astronomy stations operating in the 10.6-10.7 GHz band

- n) For protection of the following six UK radio astronomy stations:
 - Jodrell Bank - NGR (Easting) 379817, (Northing) 370806
 - Cambridge - NGR (Easting) 539423, (Northing) 254028
 - Darnhall - NGR (Easting) 364278, (Northing) 362263
 - Defford - NGR (Easting) 390201, (Northing) 244700
 - Knockin - NGR (Easting) 332854, (Northing) 321877
 - Pickmere - NGR (Easting) 370407, (Northing) 376953
- o) Licensees shall manage interference by limiting unwanted emissions¹³. For non-geostationary orbit systems this includes the suppression of satellite transmissions in the channel immediately adjacent to 10.7 GHz or taking other measures.¹⁴

¹² Due to UK terrain, the interference areas are not symmetrical around each of the radio astronomy sites. By offsetting the centre of the interference area (away from the site) we can more closely match the interference area which has the overall result of reducing the size of the protection area.

¹³ Interference from any one network should not exceed the thresholds given in Recommendation [ITU-R RA.769](#) by causing more than 2% data loss in radio astronomy measurements as stated in ITU-R Recommendation [RA.1513](#).

¹⁴ See [ECC report 271](#)

3.7 Protection of geostationary satellites and earth stations communicating with geostationary satellites

- p) Non-geostationary satellites and earth stations communicating with non-geostationary satellite(s) shall ensure compliance with the relevant equivalent power flux-density limitations specified in Article 22 of the ITU Radio Regulations in both the Earth-to-space and space-to-Earth directions.

3.8 Protection of fixed links in the 17.7-19.7 GHz band

- q) For non-geostationary systems, licensees shall ensure compliance with the relevant power flux-density limitations in Article 21 of the Radio Regulations in the space-to-Earth direction.
- r) In any case, NGSO satellites operating in the space-to-Earth direction shall not cause undue (or harmful) interference to fixed links, and compliance with the relevant power flux-density limitations referred to in 3.8.q does not release licensees from this obligation.

4. Apparatus

4.1. The Licensee shall ensure that:

- a) The wireless telegraphy apparatus comprised in the station(s) ("the apparatus") is so designed, constructed, maintained and operated, that its use does not cause any undue interference to other users of the spectrum;
- b) The apparatus complies with (and is maintained in accordance with) the relevant performance specification(s) published by the operator(s) of the geostationary or non-geostationary satellite(s);
- c) ~~The earth stations operating with non-geostationary satellite(s) shall ensure compliance with the equivalent power flux density limitations specified in Article 22 of the ITU Radio Regulations;~~ and
- d) The apparatus used for transmission complies with the Radio Equipment Directive and UK Interface Requirement 2077.

5. Additional conditions for mobile operation

- a) The radio equipment shall be established or installed so that transmissions from the radio equipment may only be made when the radio equipment's operation is enabled by the crew of the vehicle, aircraft, vessel or train upon which it is mounted, and under the operational control of the network control facility. The radio equipment shall provide the crew with a means to terminate transmissions immediately;
- b) Where an aircraft or vessel is registered in the United Kingdom, Channel Islands or the Isle of Man, the Licensee shall ensure that all radio equipment on board

that aircraft or vessel is endorsed by either a separate licence or exemption under the Wireless Telegraphy Act 2006;

- c) Transmissions from the radio equipment shall automatically be terminated on loss or significant degradation of the downlink signal from the relevant satellite;
- d) For operation with geostationary satellites, the radio equipment shall employ a stabilised platform with the ability to maintain a pointing accuracy ± 0.2 degrees towards relevant satellites throughout transmission; and
- e) For operation with geostationary satellites, the maximum EIRP at angles greater than or equal to 2.5 degrees from the antenna main beam axis shall not exceed 20 dBW/40 kHz from any individual station.

6. National and international obligations

- a) The relevant satellite data shall have been submitted to ITU in accordance with established ITU procedures; and
- b) All transmissions from the radio equipment must be terminated prior to any change of location; unless the apparatus used for transmission is designed for mobile operation and incorporates a stabilised platform or is operating under a specific exemption authorised by Ofcom.

7. Requirements specific to Satellite (Earth Station Network) Licences

- a) The Licensee shall keep a record of the operational characteristics of all terminals in the network, including the locations of fixed installations or, for mobile operation, details of the vehicles, aircraft, vessels or trains on which the terminals are installed and the associated route or defined area of operation, which Ofcom may wish to have access to for enforcement purposes;
- b) The radio equipment shall implement independent local control and monitoring functions at the terminal, and be authorised, supervised and administered by a network control and monitoring centre;
- c) The Licensee shall have the facility to disable individual terminal transmission; and
- d) For satellite networks in MESH configuration, the network operator must nominate and notify Ofcom of those earth station(s) located in the UK which have independent centralised control and monitoring functionality and possess the capability to suppress transmissions from any earth station within the network. Earth stations that are capable of dynamic assignment as point-to-multipoint and point-to-point configuration may only be licensed as permanent earth stations.

8. Additional conditions for operation with non-geostationary satellites

- 8.1. The radio frequencies authorised by this Licence must be used in common with other non-geostationary satellite systems authorised under wireless telegraphy licences granted by Ofcom. The names of these licensees shall be notified by Ofcom to the

Licensee from time to time, and together with the Licensee are described as the “NGSO Licensees”.

8.2. The Licensee shall cooperate with all NGSO Licensees such that each satellite system (comprising the satellites, gateway earth stations and user terminals) can co-exist and operate within the United Kingdom without causing harmful radio interference to each other, such that network services can be provided to end users.

8.3. In the event that -

- a) one (or more than one) of the NGSO Licensees suffers a material and recurring (or ongoing) degradation of services to its users at a specific region or location in the United Kingdom; and
- b) the degradation of services is resulting from radio transmissions from the earth stations, the satellite or any other part of the satellite system operated by any of the NGSO Licensees, including the Licensee;

Ofcom may by notice instruct the Licensee to cease or change the use of particular equipment or particular radio frequencies which are authorised under a wireless telegraphy licence (including but not limited to radio frequencies authorised under this Licence) and are used by any part of the satellite system.

8.4 Any such cessation or change must be for the purposes of ensuring that such interference is avoided and the degradation of services to users at the particular regions or locations is resolved.

8.5 Following receipt of such notice, for such period of time as may be specified in the notice, the Licensee may only operate in accordance with the terms and conditions of the notice.

9. Interpretation

9.1. In this and subsequent schedule(s):

- a) “earth station” means a radio transmitter located on the surface of the earth or mounted on a vehicle, aircraft, vessel or train and intended for communication with one or more satellites;
- b) “geostationary satellite” means a satellite in geostationary orbit which remains approximately in a fixed position relative to a position on the surface of the earth;
- c) “non-geostationary satellite” means a satellite that does not remain fixed relative to a position on the surface of the earth; and
- d) “IR” means the United Kingdom Radio Interface Requirement published by Ofcom in accordance with Article 8 of the Radio Equipment Directive (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)).

Notes

1. This Licence does not remove any other obligations that the Licensee may have in relation to satellite filings made under the ITU Radio Regulations.

2. This Licence does not affect the requirement, when necessary, to obtain licences or authorisations under other Acts, such as the Communications Act (2003).
3. Some terminal installations may require local authority planning approval.
4. The Licensee must apply for a variation of the Licence from Ofcom before making any changes which may contravene the conditions of the Licence.
5. Technical terms used in clause 2 shall have the meanings assigned to them in the ITU Radio Regulations.
6. For radio equipment installed on aircraft, licensees are advised that they must comply with Civil Aviation Authority (CAA) airworthiness requirements and regulations.
7. Further information, in respect of airworthiness requirements and certification requirements before installation, can be obtained by contacting the Civil Aviation Authority:

Civil Aviation Authority

Tel: 0330 022 1500

<http://www.caa.co.uk>

SCHEDULE 2

Licence No	<Lic No>	Licence version date	<Date>	Payment Interval	<1 Year>
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Earth Station Network Name	Emergency Telephone Number (24 Hours)
<Network_name>	<Emergency_telephone>

Network Type	Satellite Type	Satellite / Satellite Network Name	Geostationary Orbital Longitude (degrees)
<Network_type>	<Geostationary/NonGeostationary>	<Sat_name>	<Orbit_long>

Frequency band
14.0 – 14.5 GHz 27.5 – 27.8185 GHz 28.4545 – 28.8265 GHz 29.4625 – 30 GHz (GSO) 29.5 – 30 GHz (NGSO)

Operations are subject to the provision of Article 4.4 of the ITU Radio Regulations (non-interference basis to users of this spectrum) prior to international coordination.

SCHEDULE 3

Restrictions on equipment to be located within 7 km of the following National Grid References apply - see Schedule 1, Sections 2 i) and j) for further details.

SE 20900 56100

SS 20500 12600

SCHEDULE 4

Permission to operate equipment subject to this Licence from any location within the perimeter fence of the aerodromes listed below must be obtained from either the CAA or the Airport Authority.

CAA Contact: 0207 453 6531

Aerodrome name	Address	Postcode	Telephone	UK/CI/NI	Easting	Northing	Aerodrome POC
Aberdeen / Dyce	Aberdeen Airport	AB21 7DU	01224 723714	UK	387997	812609	Duty Officer
Alderney	Alderney Airport	GY9 3AJ	01481 822851	CI	556723	5506468	Senior Air Traffic Controller
Belfast Aldergrove	Belfast International Airport	BT29 4AB	028 9448 4281	NI	315195	380283	Duty Air Traffic Engineer
Belfast City	Belfast City Airport	BT3 9JH	028 9045 4871	NI	337483	376510	ATC Supervisor
Benbecula	Benbecula Aerodrome	HS7 5LA	01870 602051	UK	78483	855733	Senior Air Traffic Controller
Biggin Hill	Biggin Hill Airport	TN16 3BN	01959 574677	UK	541691	161064	ATS Manager
Birmingham	Birmingham International Airport	B26 3QJ	0121 780 0922	UK	417220	284022	Duty Engineering Officer
Blackpool	Blackpool Airport	FY4 2QY	01253 343434	UK	332307	431071	Senior Telecommunications Officer
Bournemouth	Bournemouth International Airport	BH23 6SE	01202 364150	UK	411201	97844	ATS Manager
Bristol	Bristol Airport	BS48 3DY	08701 212747	UK	350055	165098	Air Traffic Engineering Manager

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Cambridge	Cambridge Airport	CB5 8RX	01223 293737	UK	548723	258544	Senior Air Traffic Controller
Cardiff	Cardiff International Airport	CF62 3BD	01446 712562	UK	306643	167265	Duty Engineering Officer
Carlisle	Carlisle Airport	CA6 4NW	01228 573629	UK	348265	560609	Senior Telecommunications Officer
Coventry	Coventry Airport	CV8 3AZ	02476 308638	UK	435519	274761	Senior Air Traffic Engineer
Cranfield	Cranfield Aerodrome	MK43 0AL	01234 754761	UK	494909	242446	Manager ATS
Dundee	Dundee Airport	DD2 1UH	01382 643242	UK	336868	729382	Senior Air Traffic Controller
Doncaster / Sheffield	Robin Hood Airport	DN9 3RH	01302 624870	UK	46603	39807	ATC Manager
East Midlands	East Midlands Airport	DE74 2SA	01332 852910	UK	445367	326168	Duty Engineering Officer
Edinburgh	Edinburgh Airport	EH12 9DN	0131 317 7638	UK	314389	673842	Duty Air Traffic Engineer
Exeter	Exeter Airport	EX5 2BD	01392 367433	UK	300326	93702	Senior Air Traffic Controller
Farnborough	Farnborough Airport	GU14 6XA	01252 526015	UK	485452	153678	Senior Air Traffic Controller
Filton	Filton Aerodrome	BS99 7AR	0117 969 9094	UK	359103	180229	Senior Air Traffic Controller
Glasgow	NATS, Control Tower	PA3 2SG	0141 840 8029	UK	247869	666993	Manager Engineering
Gloucestershire	Gloucestershire Aerodrome	GL51 6SR	01452 857700	UK	388598	221747	Duty Aerodrome Controller
Guernsey	Guernsey Airport	GY8 0DJ	01481 237766	CI	528960	5476102	Senior Air Traffic Controller
Hawarden	Hawarden Airport	CH4 0DR	01244 522012	UK	334748	364998	Senior Air Traffic Controller
Humberside	Humberside Airport	DN39 6YH	01652 682022	UK	509295	409914	Air Traffic Manager
Inverness	Inverness Airport	IV2 7JB	01667 464293	UK	277380	851836	ATC Inverness
Isle of Man	Isle of Man Airport	IM9 2AS	01624 821600	UK	228463	468452	Senior Air Traffic Engineer
Jersey	Jersey Airport	JE1 1BW	01534 492226	CI	558699	5451100	Senior Air Traffic Controller
Kirkwall	Kirkwall Airport	KW15 1TH	01856 886205	UK	348020	1008196	Senior Air Traffic Controller
Land's End / St Just	Land's End Aerodrome	TR19 7RL	01736 788944	UK	137630	28983	Senior Air Traffic Controller
Leeds Bradford	Leeds Bradford International Airport	LS19 7TU	0113 391 3277	UK	422418	441129	Duty Air Traffic Engineer
Liverpool	Liverpool Airport Plc	L24 1YD	0151 288 4300	UK	343507	382196	Senior Air Traffic Controller
London City	London City Airport	E16 2PX	020 7646 0205	UK	542674	180487	Duty Air Traffic Engineer

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London Gatwick	London (Gatwick) Airport	RH6 0NP	01293 601060	UK	526676	140318	Duty Air Traffic Engineer
London Luton	London Luton Airport	LU2 9LY	01582 395029	UK	512422	220804	Duty Air Traffic Engineer
London Stansted	London Stansted Airport	CM24 1QW	01279 669316	UK	553916	223081	Duty Air Traffic Engineer
Londonderry / Eglinton	City of Derry Airport	BT47 3PY	028 7181 1099	NI	253681	422039	Senior Air Traffic Engineer
Manchester	Manchester Airport	M90 1QX	0161 499 5025	UK	381796	384132	Duty Air Traffic Engineer
Manchester Woodford	Manchester Woodford	SK7 1QR	0161 439 3383	UK	390174	382355	Senior Air Traffic Controller
Manston	Kent International Airport	CT12 5BP	01843 825063	UK	633140	165662	Senior Air Traffic Controller
Newcastle	Newcastle Airport	NE13 8BZ	0191 214 3244	UK	419802	571483	Senior Air Traffic Controller
Northolt	RAF Northolt	HA4 6NG	020 8833 8228	UK	509755	184987	Air Traffic Supervisor
Norwich	Norwich Airport	NR6 6JA	01603 420645	UK	622014	313753	Tels/Engineering
Oxford/ Kidlington	Oxford Airport	OX5 1RA	01865 844272	UK	446949	215594	Senior Air Traffic Controller
Pembrey	Pembrey Airport	SA16 0HZ	01554 891534	UK	240360	204220	Senior Air Traffic Controller
Plymouth	Plymouth City Airport	PL6 8BW	01752 515341	UK	250511	60229	Senior Air Traffic Controller
Prestwick	Glasgow Prestwick International Airport	KA9 2PL	01292 511107	UK	236746	626815	Senior Air Traffic Controller
Redhill	Terminal Building	RH1 5YP	01737 823377	UK	530105	147698	Senior Air Traffic Controller
Scatsta	Scatsta Aerodrome	ZE2 9QP	01806 242791	UK	438844	1172284	Senior Air Traffic Controller
Scilly Isles / St Mary's	St Mary's Airport	TR21 0NG	01720 422677	UK	92020	10300	Senior Air Traffic Controller
Shoreham	Shoreham Airport	BN4 5FJ	01273 467377	UK	519999	105406	Senior Air Traffic Controller
Southampton	Southampton Airport	SO18 2NL	023 8062 7113	UK	445278	116962	Duty Air Traffic Engineer
Southend	London Southend Airport	SS2 6YF	01702 608120	UK	586898	189290	Senior Air Traffic Controller
Stornoway	Stornoway Aerodrome	HS2 0BN	01851 707415	UK	145851	933141	Senior Air Traffic Controller
Sumburgh	Sumburgh Airport	ZE3 9JP	01950 460173	UK	439533	1110613	Senior Air Traffic Controller
Swansea	Swansea Aerodrome	SA2 7JU	01792 204063	UK	256904	191635	Senior Air Traffic Controller
Teesside	Teesside International Airport	DL2 1LU	01325 332811	UK	437041	512801	Senior Air Traffic Controller
Warton	British Aerospace	PR4 1AX	01772 852374	UK	341805	427980	Senior Air Traffic Controller
Wick	Wick Aerodrome	KW1 4QP	01955 602215	UK	336317	952799	Senior Air Traffic Controller

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Wolverhampton	Wolverhampton Aerodrome	DY7 5DY	01384 221378	UK	382473	291103	Senior Air Traffic Controller
Wycombe Air Park / Booker	Wycombe Air Park	SL7 3DP	01494 529261	UK	482630	190993	Senior Air Traffic Controller
Yeovil / Westland	Yeovil Aerodrome	BA20 2YB	01935 475222	UK	353823	115831	Senior Air Traffic Controller