



Statement on Authorisation
regime for GNSS repeaters
1164-1215 MHz, 1215-1300 MHz & 1559-1610 MHz

Statement

Publication date:

20 June 2012

Contents

Section		Page
1	Executive Summary	2
2	Introduction	4
3	Summary of responses	7
4	Ofcom Decision and approach to GNSS repeater licensing	25
Annex		Page
1	List of Respondents	26
2	Example GNSS repeater Licence	27
3	Glossary	32

Section 1

Executive Summary

- 1.1 In this statement we set out our conclusions on the proposal to implement a light licence regime to authorise the use of Global Navigation Satellite System (GNSS) repeaters in the UK. Our proposals apply only to GNSS repeater systems operating in any of the following RNSS¹ frequency bands; 1164-1215 MHz, 1215-1300 MHz and 1559-1610 MHz. This statement does not relate to other technologies, including (but not limited to) GSM, UMTS, WiMAX and LTE, where the use of repeater equipment (other than by the licensed network operators), may cause harmful interference effects and such use is a criminal offence under the Wireless Telegraphy Act 2006 (as amended)².
- 1.2 Having considered the responses to our consultation published in March 2012, we have concluded that we will proceed with the implementation of a light licence approach in line with the proposals we outlined in our consultation. Consequently we will:
- License GNSS repeaters and record (and hold) all active and archived locations (no prior or post coordination required from aviation bodies);
 - Set an indefinite licence term and ensure we have an archive database of all sites that are or have been licensed;
 - Set a licence fee of £75;
 - Allow licences to be traded on an outright or concurrent basis (partial trades split geographically or by frequency will not be permitted);
 - License in any of the three frequency bands; 1164-1215 MHz, 1215-1300 MHz, 1559-1610 MHz;
 - Permit the inclusion of multiple installations for GNSS repeater radiating elements at one address provided they are set out on the licence;
 - Allow GNSS repeater installations in defined fixed locations only (mobile use will not be authorised);
 - Only permit GNSS repeater use indoors (as defined in the licence);
 - Use the ETSI standard as the compliance assessment baseline for GNSS repeater devices manufactured or assembled from component parts.

Timing

- 1.3 We expect to be able to issue licences from the end of July once the relevant Interface Document (Draft IR2089) is finalised and licensing documentation is finalised. In order to permit trading, we need to first make the Wireless Telegraphy

¹Radio Navigation Satellite Service (RNSS). All GNSS systems, such as GPS and Galileo operate within these radio spectrum allocations.

²[Repeaters other than GNSS](#)

(Spectrum Trading) Regulations 2012. We anticipate that this Statutory Instrument will come into force in mid August 2012.

Section 2

Introduction

- 2.1 On 8 March 2012 we published a consultation detailing proposals to authorise, by licence, the use of GNSS repeaters in the RNSS³ frequency bands 1164-1215 MHz, 1215-1300 MHz and 1559-1610 MHz.
- 2.2 This statement describes the responses to that consultation and sets out our decision to proceed with a licensing approach as proposed.

GNSS repeaters

- 2.3 GNSS repeaters receive, amplify and transmit signals from a Global Navigation Satellite System (GNSS) in order to provide coverage within a building where the GNSS signals do not reach. These GNSS repeaters use a simple set of radio equipment, i.e. a receive antenna, an amplifier and a transmit antenna. The receive antenna is placed at a fixed position outside a building, in view of the GNSS satellites, and the transmit antenna is placed inside the building where the GNSS signal is desired.
- 2.4 Many consumer and industry products contain GNSS receivers used for positioning and timing applications. GNSS receivers are found in the majority of mobile smart phones and a range of transport, including aircraft and ships. Location reports from GNSS receivers can be used for managing vehicle and personnel resources. They are also used by the emergency services, in the military, in agriculture, and civil engineering.
- 2.5 Within Europe, GNSS repeaters have been available for a number of years. Some European countries, including the UK, identified concerns about the availability of devices with no defined radio parameters and which lacked conformance testing to limit and regulate any potential interference to GPS applications. The unregulated use of poorly installed and illegal GNSS repeaters that exceed radio parameters that are now embodied in the ETSI standard, have caused interference events in Germany, USA and Canada. In the German incident, a GNSS repeater at an airport hangar caused false alerts to aircraft taxiing and landing at the adjacent runway. For this reason, Ofcom has thus far prohibited the use of GNSS repeaters in the UK.
- 2.6 Over recent years, and at the UK's and other countries instigation, CEPT⁴ has considered the technical compatibility of GNSS repeaters, and the methods by which countries might authorise these devices. The CEPT reports consider in detail various operating scenarios for GNSS repeaters and the effect that these may have on other systems. The potential for a GNSS repeater to cause interference (including multipath reception of GNSS signals) is related to its' maximum amplifier gain and saturation power. Unlike unregulated and illegal installations, the operational range from a GNSS repeater compliant to the ETSI standard is around 2 metres (to a GNSS receiver with a signal sensitivity of approximately -160dBW). At distances beyond 10 metres, the CEPT reports state that there should be little interference to GNSS receivers. The related CEPT ECC Recommendation also highlights the importance of

³Radio Navigation Satellite Service (RNSS). All GNSS systems, such as GPS and Galileo operate within these radio spectrum allocations.

⁴European Conference of Postal and Telecommunications Administrations

correct installation. The publication of the technical ETSI standard EN 302 645 followed the completion of the CEPT Reports.

- 2.7 In our consultation, we highlighted that GNSS signals (and therefore GNSS repeaters) share frequency bands with other systems. The 1164-1215MHz band is shared with aeronautical Distance Measuring Equipment (DME). The 1215-1300 MHz band is shared with two general sorts of radar; long range civil aviation air traffic control radar and also the military equivalent, and a special type of radar called Wind profiler, which samples and detects the velocity of low altitude wind speeds
- 2.8 Both the existence of illegal GNSS repeaters operating at higher powers than the ETSI standard and requests by industry to use this technology prompted Ofcom to consider, carefully, the authorisation of these devices in the UK. In our view, an authorisation regime that legalises the use of ETSI compliant devices should encourage manufacturers to develop compliant equipment. From the results predicted in the CEPT studies, Ofcom considers that GNSS repeaters compliant with the ETSI standard are unlikely to cause harmful interference effects.

Consultation

- 2.9 In our consultation, we covered several topics concerning GNSS repeaters and set out our proposed authorisation approach including:
- A simple site licence for a specific location with the ability to have one or more GNSS repeater station per site licence (this was based on a simple site Business Radio licence product);
 - £75 licence fee (the same as the Business Radio simple site);
 - A Lifetime and tradable licence;
 - GNSS repeater operation in one or more of the three GNSS bands 1164-1215 MHz, 1215-1300 MHz and 1559-1610 MHz, on a non-interference basis (to other user's reception of GNSS signals outside of the repeater coverage area); and
 - No prior or post coordination approval of an installation from aviation bodies or CAA. However, we may provide, on an occasional basis, a set of GNSS site locations records to the CAA.

Stakeholder responses to the consultation

- 2.10 We have provided a summary of points made in response to our consultation in section 3 along with our response to those comments.

Implementation

- 2.11 We expect to be able to issue licences from late July once the relevant Interface Requirement and necessary licensing documentation are finalised. Trading will not be permitted until new Wireless Telegraphy Trading Regulations have been made. We anticipate that this Statutory Instrument will come into force in Mid August 2012 from which point trades will be possible.

Structure of this document

2.12 The remainder of this document is structured as follows:

- Section 3 – Summary of responses and Ofcom’s assessment
- Annex 1 List of respondents
- Annex 2 Example licence
- Annex 3 Glossary

Section 3

Summary of responses

Overview

- 3.1 Ofcom received nineteen responses from a variety of interested parties. They ranged from Government departments and agencies, the European Commission's Satellite Navigation Programme Office, the International Civil Aviation Organisation (ICAO), the UK Civil Aviation Authority (CAA), several electronics companies dealing (producing and testing) with GNSS receivers, members of the public, a radio amateur, a satellite system operator, a satellite manufacturer, a company supplying aeronautical navigation services and an industry association.
- 3.2 The full text of the non-confidential responses is available on our website⁵.
- 3.3 Seven respondents requested that their names and e-mail addresses remain confidential. Of these, two respondents requested that Ofcom keep their company association and response completely confidential, but that Ofcom could use summaries of these responses in the statement.
- 3.4 Our consultation posed three questions:
- 3.4.1 Question 1: Do you agree with our proposal to authorise GNSS repeaters on the basis of the ETSI standard?
 - 3.4.2 Question 2: Do you agree with our proposal to use a licence approach to authorise GNSS repeaters?
 - 3.4.3 Question 3: Do you have any comments on the proposals for the licence terms and conditions?
- 3.5 Many respondents broadly supported our approach; these were the CAA, NATS, Rogers-GPS, Ministry of Defence (MoD), several companies that embed GNSS receivers in their products and ICAO.
- 3.6 The MoD, in addition, has asked Ofcom to engage with them when this licence is reviewed in the future. In any future review of our approach, Ofcom would seek to engage with all relevant parties (including the MoD) before we consulted.
- 3.7 We note the CAA response which welcomed the opportunity to comment on the proposals made in the consultation. The CAA commented that the consultation considerations supported the traceability of repeaters and that this would promote an environment which would allow both interference free use of GNSS repeaters, and provide protection for safety of life operations such as those used by the aeronautical community.

1.1 ⁵ <http://stakeholders.ofcom.org.uk/consultations/gnss-repeaters/?showResponses=true>

- 3.8 From ICAO we note their comment that the Ofcom authorisation regime is broadly in line with their ICAO position EB 2011/56 AN 7/5 21 November 2011, their reference document is included in the response section of the website.
- 3.9 NATS supported the Ofcom approach as one that will produce a better managed environment for GNSS safety of life operations for the aeronautical community
- 3.10 Roger-GPS Ltd noted that the consultation provides self explanatory terms and is easy to use for the GNSS licence applicants and it allows Ofcom tools to control misuse.
- 3.11 Several electronic companies made positive general responses such that the consultation proposals would allow them to bring testing of equipment containing GNSS receivers into the UK and for a repair company of GPS systems, the reception internally in a workshop would be of great benefit. They agreed to the proposal to authorise GNSS repeaters based on the ETSI EN 302 645 standard and they believed a licence approach would be appropriate and necessary.
- 3.12 The DLR German Space Centre noted that Germany has had two incidents of GNSS repeater interference from installations that were non-compliant with the ETSI standard, and they noted our conservative approach. They commented that Germany has authorised GNSS for landing approaches at some locations. Ofcom were aware of the reports of cases of illegal usage of high gain GNSS repeater systems in Germany. In our consultation we wished to enable a proper authorisation regime for low gain GNSS repeaters as we were aware that these types of GNSS repeater devices had been found useful for testing GNSS receiver products (e.g. on aircraft or other vehicles). Ofcom emphasises that it is not proposing to authorise GNSS repeaters with high gain not compliant to the ETSI standard.
- 3.13 The GPS Industry Council (GPSIC) suggested Ofcom should follow the US FCC and NTIA rules for GNSS repeater licensing. Their members sell and distribute GNSS receivers worldwide. Their members were very concerned with the potential of a widespread deployment of GNSS repeaters and particularly, if these were not properly installed or maintained, that they may interfere with GNSS receivers. They strongly urged Ofcom to reconsider the potential ramifications of its proposed "light licensing" and instead limit use of GNSS repeaters to a very narrow class of operators, for limited purposes and under operational and licensing conditions that ensure against interference to GNSS receivers. We set out our view on the GPSIC responses below. However, we note that the UK has a different legal framework to that of the US.

Summary of responses

- 3.14 The following provides a summary of the responses to the three questions posed by our consultation, as well as to a number of additional but related comments.

March 2012 Question 1: Do you agree with our proposal to authorise GNSS repeaters on the basis of the ETSI standard?

- 3.15 Most respondents agreed with the application of the current ETSI standard, including the CAA, UK Space Agency, NATS, Newcastle University, Rogers-GPS, Ministry of Defence, several confidential responses, UK Met Office, EU Satellite Navigation Programme Office (for Galileo), ICAO, ST Microelectronics and Iridium. The GPS IC

stated that the standard provides an adequate basis for a limited authorization of a GNSS repeater though they made the following additional comments:

- the summary of the ETSI standard provided in the Ofcom consultation is not completely accurate. For example, the ETSI standard does not limit amplified defined Global Navigation Satellite Service ("GNSS") signals to -60dBm as stated in the Ofcom consultation paragraph 3.3, first bullet;
- that the GNSS repeater rules (*National Telecommunications and Information Administration (NTIA) manual "the Manual"*) for special authorised use in the US, operate pursuant to technical limits that are more restrictive than allowed under the ETSI standard;
- noted that the United States has adopted a strict policy of prohibiting the sale, manufacture or use of GNSS repeaters except for the conditions set forth by NTIA.
- that Ofcom should view GNSS repeater systems with at least as much concern of interference and operational conflict as Ofcom views GSM, UMTS, WiMAX and LTE and possibly consider imposing sanctions available through the Telegraphy Act of 2006.

- 3.16 The CAA reviewed the limits contained in the ETSI standard and confirmed their opinion that these limits should ensure protection of aeronautical interests and therefore the proposal to authorise GNSS repeaters on the basis of the ETSI standard is acceptable.
- 3.17 NATS supported the view that the ETSI standard parameters for a GNSS repeater licence are unlikely to cause interference problems from an aeronautical perspective.
- 3.18 Newcastle University supported GNSS repeaters as a step forward for geo-location for many applications, such as lone working and personal security.
- 3.19 ICAO informed Ofcom that the ETSI standard is appropriate for the use intended.
- 3.20 The European Commission Galileo Satellite Navigation Programme Office and Rogers-GPS a GNSS repeater manufacturer supported the ETSI parameters and the use of the ETSI standard.
- 3.21 Iridium Satellite LLC, operating in bands adjacent to 1559-1610MHz, agreed that the ETSI standard was a reasonable basis for authorisation based on the proposed light licence.
- 3.22 The UK Space Agency agreed with our approach and that compliance to appropriate standards was important to make sure interference does not occur.
- 3.23 The Meteorological Office broadly agreed with the Ofcom proposal, based on the validity of the assumption that the ETSI standard for indoor (only) GNSS repeaters ensures compatibility with meteorological Doppler radar wind profilers and other instruments operating in the band 1270-1300 MHz. They commented that licensing based on the ETSI standard should severely limit the spatial influence of a GNSS repeater's output power on wind profiler radar.

- 3.24 One respondent supported a change to the ETSI standard for more complex installations. They suggested that the ETSI standard could be changed to increase the expected operational range in order to enable more complex installations without harmful interference to other systems. The company would like to initiate a discussion at ETSI on the possibility of amending the ETSI harmonised standard, while still ensuring non-interference to other systems.
- 3.25 ST Microelectronics support GNSS repeaters built in conformance to the parameters described in the ETSI standard. They note that GNSS repeaters may not necessarily be CE marked, but they could meet the standards through other procedures that show this compliance.

Ofcom response

- 3.26 In our consultation document, on the ETSI standard we said that “the GNSS repeater maximum system gain will be limited to 45 dB and the e.i.r.p of amplified GNSS defined signals will be limited to -60 dBm”. Ofcom recognises the GPSIC comment, that -60dBm is not in the ETSI standard. However, the standard does explicitly state the 45dB gain and from this, we have the maximum likely output and limit of the GNSS related signals. Ofcom should have added into the consultation document the words “therefore” and “effective” before e.i.r.p. So that the phrase was: “the GNSS repeater maximum system gain will be limited to 45 dB and therefore the effective e.i.r.p of amplified GNSS defined signals is limited to -60 dBm”.
- 3.27 There is no change to the intent of the text provided in the Ofcom consultation as the 45dB gain requirement limits the radiated power of the GNSS signals to the -60dBm figure. This is further explained in the CEPT reports 129 and 145 (which were referenced in our consultation), where it is explained that the level of one satellite signal would be limited to about -77 dBm (taken from an expected typical GNSS received signal level of -155 dBW (-125 dBm) and a maximum GNSS repeater gain of +45 dB. For more than one GNSS satellite in a constellation, we have to increase the total GNSS related output power accordingly. In this case, we assume a maximum of 11 out of the 30 satellites are in view and around 4 constellations are spread across any one of the relevant bands. The estimated maximum level of all GNSS signals will rise from that of a single transmission of -77dBm, by a factor 44 (+16.5 dB) to -60.5dBm.
- 3.28 Ofcom observe that “The Manual’s test limit is 30 metres away from the building. This means that the actual maximum possible gain of any GNSS repeater installation is undefined”. The GNSS repeater in the building may be at any distance from the inside wall of the building and therefore the true separation distance is undefined. However, the ETSI standard does define the maximum gain (45-48dB (depending on the installed cable losses). The development and studies towards the ETSI standard assumed the same protection limit as the NTIA Manual, this being -140dBm/m²/24MHz (or -170dBW/m²/24 MHz). However, for the ETSI standard the test point is 10 metres distance away from the device rather than the Manual’s distance of at least 30 metres from a building. For the ETSI standard this is a minimum factor of three times improvement (or 9.4dB) and reduction in the potential for harmful interference compared to the Manual. Our observations are that the GPSIC comparison is incorrect as the US restrictions come more from whom and what sites may install GNSS repeaters than the ETSI standard and because the bands have a “restricted Government” tag associated with them in those regulations.

- 3.29 Ofcom notes that the NTIA rules do not restrict the international sale of these devices by a US company. The UK and other European countries have detected and found illegal use of exported high gain GNSS repeater devices. We believe the ETSI standard is more onerous in its limits and therefore places better restrictions on the actual devices.
- 3.30 Ofcom note the comment from GPSIC. Ofcom added paragraph 4.15 to the consultation specifically to avoid confusion between these proposals on GNSS repeaters and repeaters for other systems; they are a separate issue from GNSS repeaters, the subject of our consultation.
- 3.31 Ofcom supports the current ETSI standard, the detail of which came from the detailed studies conducted by European countries. These studies sought to ensure that the technical proposals for GNSS repeaters were such that it does not cause harmful interference to other services in the same bands. Ofcom does not support changing the ETSI standard to increase the allowable gain that can be used in the system. The ETSI GNSS repeater parameters were developed so that they should not potentially lead to harmful interference situations. An increase in gain would undermine that cautious approach.
- 3.32 The European R&TTE directive covers the above question on CE marking. The Ofcom website⁶ provides further information on this. One way to address this is by constructing and testing the radio equipment to meet specifications known as 'Harmonised Standards.' However the use of 'Harmonised Standards' for CE marking under the R&TTE Directive is not a mandatory process. There are other ways to do this, such as a Declaration of Conformity for the relevant radio equipment; a set of Technical Documentation must be retained; and the responsible person must supply the Technical Documentation to Ofcom when required to do so (we usually require production within 10 days). In this way, radio equipment combined from several different radio products, might not be CE marked, but it will meet the Essential Requirements under the R&TTE Directive.

March 2012 Question 2: Do you agree with our proposal to use a licence approach to authorise GNSS repeaters?

- 3.33 Our consultation identified specific reasons for using a light licence approach for GNSS repeaters, including:
- the operational parameters under which the equipment should be operated can be made clear to the licensee;
 - Ofcom can record all GNSS repeater locations and the CAA could be informed of the location of any these GNSS repeaters; and
 - For any cases of interference to aeronautical use of GNSS systems Ofcom can trace local licensees, identify whether they were the cause of the interference and quickly take relevant remedial action.
- 3.34 The majority of respondents agreed with our view that we should use a licence approach for GNSS repeaters.

⁶ [R&TTE FAQ on Ofcom website](#)

- 3.35 The UK Space Agency, CAA, ICAO, NATS, Rogers-GPS, ST Microelectronics, a confidential respondent who makes GNSS receivers, EADS, the Ministry of Defence, the EU Galileo programme Office and Iridium Satellite LLC agreed with our light licence approach and supported the licensing need. Otherwise identifying interference would be more difficult. Some noted that a full licence approach would be more burdensome for Ofcom and users and that a light licensing approach allows additional relevant licence information to be recorded.
- 3.36 Newcastle University also consider that such a GNSS repeater licence approach will assist development of location based services.
- 3.37 The UK Meteorological Office strongly endorsed the view that a licensing approach by site should be taken to ensure sufficient protection to existing users of the band (radiolocation and other GNSS receivers).
- 3.38 A GNSS receiver company supported a licence approach because of the control required on the transmissions within the GNSS bands.
- 3.39 The European Commission Satellite Navigation Programme Office supported a GNSS repeater licensing approach. They noted that the UK is supportive of the Galileo GNSS programme and that it is important that non-compliant hardware does not undermine that deployment.
- 3.40 A member of the Radio Amateur community did not agree with our proposal to authorise GNSS repeaters, they commented that there are already many high powered transmitters in the band 1240-1320 MHz, which may cause interference all around. The respondent hoped these systems would not cause interference to Radio Amateurs who have responsibly used the band 1240-1320 MHz for many years and asked why Ofcom agreed to the use of GNSS systems in these bands anyway.
- 3.41 Confidential respondents expressed a view that they considered a formal application and licence approach as unworkable and a voluntary registration scheme is more workable than a licence process.
- 3.42 The GPSIC commented that since repeaters only provide the position of the repeater receive antenna, their utility may be limited to "hot start" garaged emergency vehicles. They also noted it is rare for governments to authorize individuals and businesses to transmit energy on an occupied broadcast frequency band of general use.
- 3.43 A company producing GNSS receiver related electronics suggested the recording of the active antennas latitude and longitudinal co-ordinates on the licence database rather than a National Grid Reference code.

Ofcom response

- 3.44 We welcome the support for our licence approach expressed in the majority of stakeholder responses.
- 3.45 The Radionavigation Satellite Service (RNSS) allocations in 1215-1300 MHz were the subject of international World Radio Conference decisions. GNSS systems, such as Galileo and the Chinese COMPASS system use these RNSS allocations and these are operating today. The United Kingdom supports the international radio spectrum regulatory framework. Ofcom discussed authorising GNSS repeaters with the CAA prior to the publication of the consultation document and took account of their views

in developing our proposal. GNSS repeaters compliant to ETSI standard are to be used indoor and have very low power transmitters with a limited interfering range.

- 3.46 Ofcom does have a licence product that allows licensees to self-register additional base stations. However, this is a facility available only to users who are already licensed. We consider that a voluntary registration scheme would not suit our objectives enabling us to monitor legal use. Once we had determined that a general authorisation (licence exemption) would not meet our aims, a light licence approach is the next least burdensome process which we believe strikes a balance of supporting our necessarily cautious approach, and being as simple as possible for users.
- 3.47 “Hot start” of garaged vehicles is just one application, it is not the only GNSS repeater application; we outlined this in the consultation. Our experience is that Governments do allow sharing of bands where they determine that, for policy reasons, sharing should occur where that harmful interference between services is minimised or will not occur. Ofcom does not support the view expressed by GPSIC in this comment.
- 3.48 Ofcom includes in the licence an information field that defines the location of the GNSS repeater’s receive antenna, as this is the source of the re-transmitted data. We see no reason to change our view that we record the GNSS repeater Tx antenna in a NGR format.
- 3.49 Below we set out and address some additional comments on:
- The need for a database of GNSS repeaters.
 - The risk that people or organisations will use a GNSS repeater, without first applying for a licence.
 - Whether licensing should be limited to government operators and government supported GNSS device manufacturers.
 - Consultation with European aviation organisations.

GNSS repeater database

- 3.50 A confidential respondent suggested that a database of GNSS repeaters might not be required as Ofcom already have powers to investigate interference issues. However, they noted that a database would enable Ofcom to identify more quickly the likely interference source, it may be a licence holder and that a self certifying database updates for any authorised and licensed location could keep the database information "fresh".
- 3.51 Given the importance of the continued operations of its radio sites to meteorological products and services, the Met Office wished to be included as an authority to receive an extract from the GNSS repeater licence database on request, like the CAA and MoD.
- 3.52 A company producing GNSS receiver related electronics felt that GNSS repeater installers should have access to any uploaded licence installation data including details such as installation live date, health and location as new installations are created and monitored. They would offer a service to retain and manage this data, as part of Ofcom’s licensing regime, and the technical characteristics of all equipment in the system and calculations/diagrams relating to component and system gain.

Ofcom response

- 3.53 Our view is that licence database information should assist a quicker resolution of interference cases. In our pre-consultation discussions with the Civil Aviation Authority they considered it necessary for the UK to operate a licensing regime for GNSS repeaters; we have therefore an automatic licence database. Ofcom supports the need for a GNSS repeater licence to assist any future investigation, enforcement and resolution of interference cases.
- 3.54 The Met Office have requested to have occasional access to an extract of the GNSS repeater licence database, as the Meteorological Office Wind profiler share the band 1215-1300 MHz and they also use this band and the other bands for GNSS receiver measurements. Ofcom sees no problem in allowing the Met Office, on an ad-hoc and occasional basis, access to the database's licence output; this is the same access as already proposed for the CAA and MoD.
- 3.55 We do not support or see a need for general public access to the licensing database, Our publicly accessible Wireless Telegraphy Register will hold all licensed locations

People/organisations will not apply for a licence

- 3.56 A confidential respondent commented that a licence approach will mean that people/organisations will use GNSS repeaters, but not apply for a licence. We assume this response to mean that people will not apply for a licence because they want to avoid the paperwork and fees attached to such a licence product.

Ofcom response

- 3.57 Ofcom currently prohibits the use of GNSS repeaters and organisations which have installed these devices are therefore operating illegally. We wish to allow legal use of these devices under the licence and under certain terms and conditions. If organisations now wish to license and operate their installations legally, our proposals allow them to do so. Those who do not apply and ignore the licence opportunity or cause interference are open to enforcement action. The GNSS repeater licence allows Ofcom to offer a route away from the risk of enforcement due to the current prohibition.

Limit licensing for government supported purposes

- 3.58 The US GPS Industry Council (GPSIC) was strongly against Ofcom's proposals and commented that the UK should limit its' licensing to government operators and government supported GNSS device manufacturers only.

Ofcom response

- 3.59 We did look at the information available and published by the United States Federal Communications Commission (the FCC) and the National Telecommunications Information Administration (the NTIA). These two entities respectively manage the civil and government radio spectrum policy in the USA. However, within the UK, we operate under a different legal framework, as set outlined in the Communications Act

2003⁷ and the Wireless Telegraphy Act 2006 (the WT Act)⁸. These Acts set out our duties, functions and powers.

- 3.60 Crown bodies generally use radio spectrum without needing to obtain a licence from Ofcom. The Crown cannot trade radio spectrum holdings unless Ofcom provides a grant of Recognised Spectrum Access. Some Government related agencies are not classified as Crown and therefore are required to obtain a licence issued by Ofcom.
- 3.61 We are required to secure the optimal use for wireless telegraphy of the electro-magnetic spectrum, and the availability throughout the UK of a wide range of electronic communications services. As a result, we do not support the GPSIC view.

Consultation with European aviation organisations

- 3.62 DLR German Space Centre commented that Ofcom seemed not to have involved Eurocontrol and European Aviation Safety Agency (EASA) in preparing the consultation.

Ofcom response

- 3.63 Although we did not contact the above mentioned organisations directly, when considering our proposals we were cautious and waited for the CEPT and ETSI to complete its reports, recommendations and standards on GNSS repeaters. In addition, before the consultation we were actively discussing the issue of GNSS repeaters over an extensive period with the UK Civil Aviation Authority. There has been extensive discussion on the general GNSS repeater topic within CEPT and ETSI, where aviation related organisation could have input and commented on the CEPT reports and the ETSI standards.
- 3.64 Ofcom kept the UK CAA, NATS, MoD and other related UK organisations informed during the development of the CEPT reports and ETSI standard. EUROCONTROL and EASA have access to CEPT and ETSI documents and could have commented at any time.
- 3.65 We would like to note that we have received responses from the UK CAA, NATS and the ICAO who have all supported the use of the ETSI standard and the use of a licensing approach for GNSS repeaters.

March 2012 Question 3: Do you have any comments on the proposals for the licence terms and conditions?

- 3.66 The Ofcom consultation highlighted and made specific comments and proposals on:
- Relevant standards and its conditions;
 - interference management and consideration of licence technical coordination;
 - the form of the licence;
 - frequency bands;

⁷ [Communications Act 2003](#)

⁸ [WT Act 2006](#)

- licence fees;
- licence duration;
- trading; and
- mobility.

3.67 The responses to the consultation did in the majority support the main proposals in our consultation. However, there were various other observations and requests for clarifications, which we also address here including:

- Installation accreditation and maintenance;
- Resolution of interference and enforcement;
- Licence duration and trading;
- Mobile use;
- Definition of “indoors”;
- Who can apply for a GNSS repeater licence; and
- Flexibility in use of GNSS frequencies.

Installation, accreditation and maintenance

3.68 The GPSIC noted that once a GNSS repeater is in use, even if its location is known, it is very easy for it to malfunction and/or to cause even unintended interference to nearby GNSS receivers, particularly if persons install and operate equipment, when that person is not properly trained or skilled in this service.

3.69 A confidential respondent commented that the licence process should involve a suitably accredited company to fit or check the GNSS repeater installations. In addition, they comment GNSS repeater installation characteristics can change over time so they proposed that we should require annual inspections of any installations.

3.70 Another confidential response suggested that a licence-based regime should be on an installation by installation basis, rather than on a site basis. It suggested that if there is a site licence, the licensee might assume that they can install any number of GNSS repeater stations, some of which may be non-compliant. The company commented that although Ofcom intends to cover multiple installations at one address with one licence, Ofcom will need to make clear that installing another repeater requires its location to be licensed, perhaps by registering the location at time of purchase - like television receiver equipment.

3.71 A confidential respondent pointed to the consultation’s section 4.7, which indicated that for MOD locations and operational areas, the MoD would control the installation and monitoring of these devices themselves. They asked us to give some thought as to how we believe the MOD achieved this.

3.72 EADS Astrium commented that they manufacture satellites, some of which have GPS receivers for providing location information in low Earth orbit. They therefore have a

need to test the GPS receiver in a satellite assembly hall, which is largely screened from the GPS constellation signals and is windowless and owing to the size of their satellite assembly hall, the transmit antenna may be moved to be close to the satellite under test. This move may be of the order of twenty or thirty metres and vary in height and orientation. They may have up to four or five satellites in the hall at any one time, and moving a satellite to the antenna is impractical, too risky and relatively expensive.

Ofcom response

- 3.73 We have developed our licence conditions based on a light licence approach, and we specifically comment on this matter in paragraphs 5.8 to 5.13 of our consultation. Also as explained in the consultation, we consulted the UK CAA on this matter before the consultation was published. Hence, we are of the view that no such pre-coordination is necessary.
- 3.74 Our view is that there is no need to restrict or accredit installers of GNSS repeaters and that this shall not be a requirement or pre-condition of a licence. As we explained in our consultation this would be an unnecessary additional burden to the process on the licensee.
- 3.75 If changes to an installation do occur over time resulting in interference (to a nearby GNSS user) we would be able to take necessary enforcement action under the WT Act to resolve the situation. The requirement for annual inspections to keep a licence valid would be an increase in the regulatory burden and we consider that this would be disproportionate. The licence database (and archive of old locations) combined with investigation/enforcement is a good mitigation for such occurrences.
- 3.76 Our position does not support the view that once there is a licence at a site, the applicant can assume that it can install any number of GNSS repeaters, without reference back to Ofcom. As we indicate in our example licence, a licence for a site address, will allow the applicant to identify more than one GNSS repeater station for the licence schedules. There is no excuse for not reporting the different GNSS repeater sites, thus if an applicant installed a station but it was not on the licence schedule, it would be an illegal installation. Ofcom does not support such a general principle as the proposed reporting of sales of GNSS repeaters like UK TV receiver licence regulations. It would massively increase the regulatory burden on consumers and is a disproportionate requirement.
- 3.77 As we explained in our consultation, the MoD operates their GNSS repeaters under a Crown Exemption status. The MoD is responsible for maintaining and installing their own GNSS repeaters to avoid harmful interference effects. If a MoD GNSS repeater use caused interference to other non-MoD users, Ofcom would manage this in collaboration with the MOD.
- 3.78 A licensee requiring a more complex location needing more than one GNSS repeater radiating element can define these so that they have the required coverage for any particular set of tests. To achieve this, Ofcom includes in the example GNSS repeater licence at Annex 2 of this statement, the flexibility for multiple GNSS repeater stations on one site. There is the ability to have identified one licensed site address and in schedule 2, to define where there might be a number of GNSS repeater radiating elements at that site.

- 3.79 Ofcom, does however note that the licensee would have to separate the different GNSS repeater radiating elements by at least the expected distance at which a repeated signal is 10dB below the expected nominal GNSS signal receive level, to reduce the interaction on any GNSS receiver of any two radiating GNSS repeater. Alternatively, if the test is limited to one location at a time, the user would switch off the unused GNSS repeater location. Ofcom believe that the example licence schedule in Annex 2 is suitably flexible to allow the licensing of multiple locations, at one site address. A licensee would have to amend any installation if it caused harmful interference.

Resolution of interference and enforcement

- 3.80 The Meteorological Office were concerned that licensing of GNSS repeaters should operate on a non-interference basis only and a licence should confer no primary, secondary or other status upon the licensed device.
- 3.81 Several respondents (the Met Office, a confidential response and EADS Astrium) were concerned that if interference with other services be found from indoor and licensed GNSS repeaters, Ofcom enforcement teams would still take action.
- 3.82 The same confidential respondent also commented as to whether Ofcom had considered how to approach retrospective licensing for systems installed before the licensing scheme was proposed, that are currently operating outside of Ofcom regulations.
- 3.83 The European Commission Galileo Satellite Navigation Programme Office asked Ofcom what enforcement measures it would take to make sure that people keep GNSS repeaters at the fixed defined location.
- 3.84 EADS Astrium commented on the consultation's paragraphs 5.7 & 5.26 that unlicensed equipment might be the cause of interference. They commented that any interference detected by an Ofcom enforcement team must not be assumed to be automatically that of a nearby licensed GNSS repeater
- 3.85 An individual input from a member of the Radio Amateur community noted that GNSS repeater licensees would have to accept other users on the frequencies used by GNSS repeaters and accept that these other users may cause GNSS repeater system malfunctions at times. The concern was to the effect on Radio Amateur reception operation to/from these devices in the band 1240-1320MHz, they asked whether this was going to be a repetition of similar problems in other bands with other services (car locks ISM band usage etc.)?
- 3.86 The GPSIC commented that the potential for cumulative interference is too great and the need to licence is too small.
- 3.87 The European Commission Satellite Navigation Programme Office, made a comment that an installer should place a local warning notice near to the GNSS repeater, informing local users that the position reported to them by their GNSS receiver is that of the GNSS repeater's receive antenna that is located on the roof.

Ofcom response

- 3.88 In our view, the GNSS repeater equipment which is based on the ETSI standard should not cause harmful interference to GNSS receivers (operating at the standard

receive levels) beyond the 10 metres distance of the indoor transmit antenna of the GNSS repeater. If interference was reported to us, we may take enforcement action, and remove the interference, by either closing down the installation, or suggest methods to amend the installation to stop the external radiation of the GNSS signal that caused harmful interference.

- 3.89 If interference continues, even after investigation and an amendment to an installation, then as the GNSS repeater licence is on a non-interference basis Ofcom would seek to revoke the licence and if apparatus is used thereafter it would be a criminal offence (Section 8 WTA).
- 3.90 Ofcom would expect users of existing installations to apply to Ofcom for a licence. Those installations are already operating illegally and they now have the option to ensure legal operation.
- 3.91 Ofcom do not plan to check that people keep the GNSS repeater at the defined fixed location as this is a burdensome and disproportionate process. We discounted this in our discussions on prior or post installation accreditation with the CAA. Ofcom assume that the licensees will actively check devices and update any necessary changes to the licensed locations. The GNSS repeater location will be defined to a four figure NGR i.e. GH 1234 9876, an accuracy of 10 metres.
- 3.92 Ofcom have confidence that our enforcement teams would react to complaints of interference and take steps to detect the source. Having a database of local licensees is beneficial in being able to eliminate those as a source of the interference and to focus on the direction of the real culprit.
- 3.93 We believe it unlikely that a situation of a radio amateur causing a GNSS repeater to overload and have a complete loss of signal will occur. If the situation did arise, then we would deal with this on a case by case basis. However, we note that the GNSS repeater will be operating on a non-interference basis as a condition of its licence. For interference to the Radio Amateur, any repeated signal would occur inside a building and not generally transmitted outside, the CEPT studies for other services in the same band did not show any particular issues and Ofcom do not expect effects on Radio Amateurs.
- 3.94 In our consultation, we provided our view on potential aggregate interference to a single GNSS receiver that was in view to multiple GNSS repeaters. The CEPT work indicated that such an interference situation should not arise and we agreed with the work based of CEPT on this point. The GPSIC comment may instead refer to a single interference event occurring at different locations. As commented in our consultation, we do not expect mass market use of these devices. Therefore, with the limited range of the specified device, its use indoors and an expected limited number of licence applications, Ofcom are not persuaded by the cumulative argument of GPSIC. However, if the GPSIC prediction were to occur, the Ofcom enforcement teams would begin to see many such events (they may enforce against a breach of the licensing conditions and gather any installation information) and they would begin to correlate these. In that instance, Ofcom would review the information gathered for any regulatory actions. After a suitable period of providing authorisations for GNSS repeater licences and GNSS repeater operation, we may consider undertaking a review of a sample of recorded licensed installations to determine if it was necessary to update its installation guidance notes or licensing conditions.

- 3.95 We intend to incorporate the suggestion that a local warning notice should be placed, as a note in the guidance material we plan to provide with the GNSS repeater licence application form and any issued licence.

Licence Duration and Trading

- 3.96 The UK Space Agency was not supportive of the Ofcom trading approach; they commented that a low fee did not make trading seem necessary.
- 3.97 GPSIC strongly opposed the Ofcom proposal to make licences tradable and to have licences of perpetual duration.
- 3.98 The CAA supported the proposed licensing terms although they did question the need to make the licence tradable, as it seemed rather strange to even think about trading a cheap licence, an assumed requirement from Ofcom licensing, but they had no objection.
- 3.99 European Commission Galileo Programme Office, support licences of a limited duration (they suggest that building works could mean that installations are moved). They suggest each device shall have a contact label, so that if the device is planned to be moved, there is a warning notice to re-licence and also that nearby to the device there is a notice to state that the location fixes received are the repeater receive antenna location only.
- 3.100 A confidential respondent suggested the inclusion of a licence renewal date as part of essential on-going installation checking and monitoring, test conducted to allowing a licence renewal extension. This to ensure the installation still complies with the terms of the licence and they proposed that experienced and accredited organisations conduct annual inspections of any installation given a licence to ensure the installation remains compliant.
- 3.101 Several responses made the case for a limited duration licence, as this will force a licensee to check whether they still require a licence, and they will need to check that installation

Ofcom response

- 3.102 On the trading of licences, we see no real opposition or reasons to avoid the possibility of trading these licences, though we understand the points raised in relation to whether trading is actually needed in this instance. Our general policy is to make licences tradable. Although we do not expect many trades to occur, as others can also apply for a licence, it is worth noting that where a company changes hands, the WT licence does not automatically pass to the new corporate entity. Trading can simplify the licensing process following a change of ownership by providing a process to transfer the licence without charge. In the absence of trading, this process would involve the new owner having to submit a new licence application and fee.
- 3.103 We believe that placing a renewal or revalidation requirement on these licences, adds to the regulatory burden. Renewing a licence does not force licensees to check their installation. If we conducted a renewal cycle, and had no answer, the licence location would then disappear from Ofcom's active GNSS repeater database, thus Ofcom's database would be less accurate, with potential implications for the investigation of any future interference. On balance, Ofcom believe that offering the long duration licence is of benefit.

Mobile use

- 3.104 The UK Space Agency and ICAO commented on the question of mobility of GNSS repeaters. The UK Space Agency agreed with our proposals to not make GNSS repeaters licensable on mobile platforms, and ICAO noted their specific position was that GNSS repeaters should not be authorised on mobile platforms.
- 3.105 We received an additional confidential response that concerned the licensing of GNSS repeaters placed on survey vessels, when stationary in port. These could have a GNSS repeaters installed within their back deck areas, to assist in the operational testing of devices used for oceanic surveys that have embedded GNSS receivers.

Ofcom response

- 3.106 Ofcom continues to hold its view as expressed in the consultation, supported by the UKSA and ICAO, that GNSS repeaters should not be placed on mobile platforms (e.g. automobiles, ships, aircraft), as it would undermine the whole basis of our consultation to legalise these equipment. Having GNSS repeaters on mobile platforms will undermine our ability to localise the devices and thus the actions needed to solve any interference case or conduct enforcement actions.
- 3.107 Before Ofcom can answer the ship/vessel GNSS repeater licensing question above, we need to outline some background on ship radio licensing.
- The radio apparatus of a ship must be licensed. One of the reasons for this is so that, when inspected overseas, surveyors can relate the installed apparatus with the vessel's radio licence. The UK ship radio licence therefore enables us to ensure that only *bona fide* maritime apparatus, complying with the correct standards is fitted and used. It also allows us to ensure that the radio on a ship is operated only by those who are suitably qualified. We can occasionally authorise non-maritime radio under a ship radio licence by varying that licence. We do this in the case on on-board GSM base stations, for example. However, to authorise GNSS repeaters in this manner would be to permit mobile operation. As we have said above, we are not prepared to authorise mobile operation of GNSS repeaters and we shall not, therefore consider variation of the ship radio licence as a means of authorising the use of GNSS repeaters on UK ships.
 - If a UK registered ship is in the territorial waters of another country, it must comply with their national rules. In the situation that a UK ship with transmitting equipment installed on board not covered for use in that countries territory, or not on the ship radio licence, might be subject to fines, seizure of the kit, or even detention of the vessel by the enforcement authorities in the subject Administration.
 - If a foreign flagged ship in UK waters had a GNSS repeater installed and it caused interference, we would seek to take remedial action based on the Visiting Ships and Aircraft Regulations 1998*, though the Maritime Coastguard Agency may have powers to deal with them under more general maritime safety legislation.1998⁹.
- 3.108 To answer the question posed above we believe a licence applicant could specify a location for a GNSS repeater in a dock/harbour, within 10 metres of the dockside. As the licence allows a 10 metre NGR accuracy for the location of the repeater, the

⁹ SI 1998/2970¹⁰ "[Indoors](#)" defined in Ultra Wide Band – S.I 2009 No. 2517.

licence could authorise the use of a GNSS repeater installed on a ship (for example installed in a covered deck) within that radius. Any use must be with the licensee's agreement and must comply with all of the terms and conditions of the licence. However, the captain of a ship is legally responsible for the use of any radio on his ship and any use must therefore be at the discretion of the captain.

- 3.109 We do not endorse or permit mobile use of GNSS repeaters. We shall not be offering a notice of variation to a UK Ship Radio Licence to authorise the installation or use of a GNSS repeater. To do so could imply that the equipment was authorised to operate on a mobile basis. The ship's owner/operator and captain must be aware that if a GNSS repeater were used other than in accordance with the licence as described above (particularly on a vessel in motion), the repeater would not be authorised and may result in enforcement action.

Definition of "indoor"

- 3.110 The Meteorological Office and two confidential respondents commented that it would be useful if Ofcom could provide a definition of "indoor" in any licence, such that clear guidelines are available for enforcement should interference issues subsequently occur. They suggested that the licence should state the devices are not to be sited outside and they should have instructions as to the unit locations being within a building.
- 3.111 European Commission Galileo Satellite Navigation Programme Office clearly supported the need for an indoor definition by their stated view that these are for indoor operation only.
- 3.112 Iridium Satellite LLC commented that their system operates within parts of the MSS band (1610-1626.5 MHz) adjacent to the GNSS band 1559-1610 MHz. They also proposed that the licence includes an additional indoor definition. They noted that indoor use was the intent of these systems, that it should not affect their operation and would minimise the potential for interference.

Ofcom response

- 3.113 Ofcom supports the general idea for an "indoor" definition. We have identified that there are very few radio regulatory texts providing such a definition. However, one that we have identified, for ultra wideband equipment¹⁰, seems appropriate to the licensing of GNSS repeaters, this is given below, and we have included this within the licence:
- "indoors" means inside a building or a place in which the shielding will typically provide the necessary attenuation to protect wireless telegraphy against harmful interference.
- 3.114 In our consultation, we identified that the operational range of the GNSS indoor radiating element is likely to be around 2 metres. If such a radiating antenna were close to a building aperture (e.g. window or door) or other place, the beneficial propagation loss of building attenuation would be small. Therefore, Ofcom would recommend that the licensee places the radiating element at least 2 metres away from any external wall/roof of the building, or wall/roof of the place, where the GNSS repeater radiating element is installed. We would include such a recommendation in

¹⁰ "Indoors" defined in Ultra Wide Band – S.I 2009 No. 2517.

guidance notes provided by Ofcom in its GNSS repeater application forms and with any licence guidance, but not include this in the “indoors” definition above, which would be added into the licence terms and conditions.

Who can apply for a GNSS repeater licence

- 3.115 The response from the GPS Industry Council (GPSIC) indicated that the United States of America prohibit GNSS repeaters from operating, except for U.S. Government agencies and departments who may seek a special authorization. They severely restrict who they allow to use them and authorizations for the use of GNSS repeaters should only proceed on a very limited basis, for “clearly circumscribed applications”, and on narrow terms and condition. They further comment that this is to ensure the reliability and efficacy of GNSS signals received from spacecraft, to avoid unintentional interference, and as importantly, to reduce the possibility of “spoofing” of GNSS signals by unfriendly sources
- 3.116 The second comment from GPSIC is the suggestion “to avoid unintentional interference and to reduce the possibility of the “spoofing” of GNSS signals by unfriendly sources”.
- 3.117 We have explained our view on who can apply for a licence earlier in this section and that we do not have the same legal framework as the USA.
- 3.118 Ofcom is aware that illegal GNSS repeaters are on sale on the internet and we have taken actions to have these removed from sale. Ofcom’s intention is to legalise the use of equipment compliant to ETSI standard and therefore reducing any proliferation and sale of illegal GNSS repeaters. Ofcom would continue to take enforcement action, if we found GNSS repeaters for sale that did not meet the required standards.
- 3.119 We explained in our consultation, that we believe the limitations in the ETSI standard’s radio parameters, the licence conditions we are proposing and guidance notes we plan to provide with a licence that this will reduce the potential for any unintentional or harmful interference. We note that neither Ofcom nor the US FCC can avoid persons who deliberately ignore regulations or orders and use illegal devices, so we take “unintentional” in this case to mean installations that can be detected and the interference situation resolved.

Flexibility in use of GNSS frequencies

- 3.120 EADS Astrium noted that their satellite radio equipment may use different radio frequencies, and asked us whether the GNSS repeater licence enables use depending on the installed receiver unit on a particular satellite.

Ofcom response

- 3.121 In the licence schedule, we will show that a GNSS repeater can use any or all of the three defined frequency bands, 1164-1215,1215-1300,1559-1610 MHz, therefore, a licence applicant should define in his application whether they wish to use all or just one of these bands.

Licence fee

- 3.122 The Meteorological Office asked us whether the £75 fee is intended solely to cover the administrative costs of Ofcom licensing, or whether there will be a contribution within that fee towards Administered Incentive Pricing (AIP) costs for a given band. This would potentially offset the existing AIP cost to incumbent users, notably given the potentially increased risk of interference to said incumbent users.
- 3.123 One confidential respondent commented that they did not agree to our licence approach as they consider that they are paying a licence fee for absolutely nothing.

Ofcom response

- 3.124 The licence fee as described in the consultation document is to cover administrative licensing costs only. There is no cost element for Administered Incentive Pricing (AIP) included in this figure and therefore there is no offset to the incumbent users. Ofcom believe that there is little potential risk of interference to incumbent users as the studies expect GNSS repeater devices built to the ETSI standard and installed in a reasonable way will avoid radiation outside the building where they are installed and will not cause harmful interference.
- 3.125 We have set out our reasons for implementing a light licence approach, the associated fee supports the administrative cost of providing and maintaining this approach.

Section 4

Ofcom Decision and approach to GNSS repeater licensing

Introduction

- 4.1 In considering our final approach to licensing GNSS repeaters, we have thus considered the responses to questions 1, 2 and 3 and the general points raised.
- 4.2 Ofcom has decided that:
- It will licence GNSS repeaters and record (and hold) all active and archived locations.
 - The licence term will be indefinite, to ensure we have an archive database of all sites that are or have been licensed.
 - The fee will be £75.
 - The licences will be tradable on an outright or concurrent basis. However, they cannot be split geographically or by frequency.
 - All three frequency bands can be used, 1164-1215 MHz, 1215-1300 MHz, 1559-1610 MHz.
 - Multiple installations for GNSS repeater radiating elements may be included at one address on one licence.
 - GNSS repeaters installations shall be for defined fixed locations only (mobile use will not be authorised).
 - GNSS repeaters shall be for indoor use only. We provide a definition.
 - The ETSI standard provides the compliance assessment baseline for GNSS repeater devices manufactured or assembled from component parts.
- 4.3 In view of the above, Ofcom in Annex 2 provides the proposed GNSS repeater licence.

Annex 1

List of Respondents

Non-confidential respondents

UK Space Agency

UK Civil Aviation Authority

NATS

Newcastle University

Roger-GPS Ltd

UK Ministry of Defence

US GPS Industry Council

UK Meteorological Office

International Civil Aviation Organisation

DLR German Space Centre

ST Microelectronics

European Commission

Iridium Satellite LLC

Annex 2

Example GNSS repeater Licence

A2.1 This annex provides an example of the GNSS repeater licence that we will issue for the installation and operation of GNSS repeaters.

Wireless Telegraphy Act 2006

GNSS Repeater

Sector/class/product	
Licence number	
Licensee	
Licensee address	
Licence first issue date	
Licence version date	

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 «customer_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 OF195.1).

ISSUED BY OFCOM

GNSS Repeater 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 «customer_name», the Licensee on «date», and describes the terms and equipment specifications covered by this licence.

1. Description of the Radio Equipment licensed:

In this Licence, the Radio Equipment means a receiving and sending Earth Station ("the Station") for the purpose of providing Wireless Telegraphy links between the Station and Global Navigation Satellite System receivers "GNSS Receivers".

2. Purpose of the Radio Equipment

Subject to the administrative and technical requirements set out in this and the subsequent schedule(s) to this Licence, the Licensee and any person authorised to act on the Licensee's behalf is hereby authorised to:

(a) Receive and send signals of Global Navigation Satellite systems between the GNSS repeater and a GNSS receiver.

3. Interface Requirements for the Radio Equipment use

(a) Use of the radio equipment shall be in accordance with the following Interface Requirement:

UK Interface Requirement 2089 dated [] for Global Navigation Satellite Systems Repeaters

4. Special conditions relating to the activities of the Licensee

- a) The station will provide a 24 hour contact telephone number, as listed in Schedule 2.
- b) The Radio Equipment comprised in the Station(s) is so designed, constructed, maintained and operated, that its use does not cause any undue interference to other users of the spectrum.
- c) The Radio Equipment shall be established or installed so that transmissions from the Radio Equipment may only be made when the licensee enables operation.
- d) The Licensee shall have the facility to disable individual GNSS repeater transmissions.

5. Technical conditions

The Station shall:

- e) transmit within the frequency ranges, as listed in Schedule 2.

- f) only transmit Indoors and towards GNSS receivers located inside the same building ;

6. Interpretation

In this and subsequent schedule(s):

- a) “Station” means a radio transmitter located on the surface of the earth intended for communication with one or more GNSS receivers.
- b) “Global Navigation Satellite System” GNSS includes satellites operating in non-geostationary or geostationary orbits and providing Radionavigation Satellite Service signals.
- c) “Radionavigation Satellite Service” is as defined by the International Telecommunications Union -ITU.
- d) “IR” or “Interface Requirement” means the United Kingdom Interface requirements published by Ofcom in accordance with the R&TTE Directive 1999/5/EC of the European Parliament and of the Council on radio equipment and telecommunications equipment (R&TTE) and mutual recognition of conformity. The Directive implemented in the UK, by the Radio Equipment and Telecommunications Terminals Equipments Regulations (S.I 2000/730 and amendments).
- e) “Indoors” means inside a building or a place in which the shielding will typically provide the necessary attenuation to protect wireless telegraphy against harmful interference.

Notes

1. This Licence does not affect the requirement, when necessary, to obtain licences or authorisations under other Acts, such as the Broadcasting Act.
2. The licensee must apply for a variation of the licence from Ofcom before making any changes, which may contravene the conditions of the licence.
3. Technical terms used in clause 2 shall have the meanings assigned to them in the Radio Regulations.

SCHEDULE 2

Licence No	<LIC_NO>	Licence version date	«Date»
-------------------	----------	-----------------------------	--------

<i>GNSS repeater Transmit Antenna Location</i>	TQ 1234 5678 <station1>
<i>Site address</i>	<Site Address Details>

GNSS Repeater <Caretaker Contact Telephone Number (24 Hours)>	Frequency bands of operation <station1>		
“SID_CS_NAME_DUMMY “	“EFL_FREQ_DUMMY1” – “EFL_FREQ_TO_DUMMY1”	EFL_FREQ_DUMMY2” – “EFL_FREQ_TO_DUMMY2”	EFL_FREQ_DUMMY3” – “EFL_FREQ_TO_DUMMY3”

<i>Additional Information</i>	
<i>GNSS Repeater Receive Antenna location</i> <station1> <i>(WGS 84 GPS Co-ordinates - Latitude Longitude)</i>	“ TCS_COMMENT FIELD”

Operations are subject to non-interference basis to users of this spectrum).

Licence No	<LIC_NO>	Licence version date	«Date»
-------------------	----------	-----------------------------	--------

<i>GNSS repeater Transmit Antenna Location</i>	TQ 1236 5680 <station2>
<i>Site address</i>	<Site Address Details>

GNSS Repeater Caretaker Contact <station2> Telephone Number (24 Hours)	Frequency bands of operation <station2>		
“SID_CS_NAME_DUMMY “	“EFL_FREQ_DUMMY1” – “EFL_FREQ_TO_DUMMY1”	EFL_FREQ_DUMMY2” – “EFL_FREQ_TO_DUMMY2”	EFL_FREQ_DUMMY3” – “EFL_FREQ_TO_DUMMY3”

<i>Additional Information</i>	
<i>GNSS Repeater Receive Antenna location <station2></i> <i>(WGS 84 GPS Co-ordinates - Latitude Longitude)</i>	“ TCS_COMMENT FIELD”

Operations are subject to non-interference basis to users of this spectrum).

Annex 3

Glossary

CAA	Civil Aviation Authority
CEPT	Conference European Post and Telecommunications
COMPASS	Chinese GNSS system
DME	Distance Measuring Equipment
ECC	European Communications Committee
EMC	Electro-Magnetic Compatibility
e.i.r.p.	Effective isotropic radiated power
ETSI	European Telecommunications Standards Institute
Galileo	European GNSS system
GLONASS	Russian GNSS system
GNSS	Global Navigation Satellite System
GPS	Global Positioning System - a USA GNSS system
MoD	Ministry of Defence