



Decision to make Wireless Telegraphy Exemption Regulations 2016

User Terminal Exemptions

Statement

Publication date: 7 November 2016

About this document

This document confirms Ofcom's decision to make two sets of regulations, the Wireless Telegraphy (Mobile Satellite System Equipment) (Exemption) Regulations 2016 and the Wireless Telegraphy (Exemption) (Amendment) (No.2) Regulations 2016.

The decision enables the use of user terminals (e.g. mobile and satellite phones) on a licence exempt basis within the 1980 to 2200 MHz ('2 GHz band'), 2350 to 2390 MHz ('2.3 GHz band') and 3400 to 3800 MHz ('3.4 GHz band') bands and outlines the technical parameters for their use within these bands.

The Regulations will come into force by 1 December 2016

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Section 1

Executive summary

- 1.1 This document sets out our decision to make two regulations that will exempt the use of certain user terminals (e.g. handsets) from the need to hold a licence. This follows our recent Statutory Notice entitled “Notice of proposal to make Wireless Telegraphy Exemption Regulations 2016: User Terminal Exemptions”¹ (the ‘Notice’) which we published on 28 July 2016. Following on from the Notice, we have decided to make:
- the Wireless Telegraphy (Mobile Satellite System Equipment) (Exemption) Regulations 2016 (the ‘2 GHz MSS Regulations’); and
 - the Wireless Telegraphy (Exemption) (Amendment) (No.2) Regulations 2016 (the ‘Amendment Regulations’) that amends the Wireless Telegraphy (Exemption) Regulations 2003 (the ‘2003 Regulations’).
- 1.2 These Regulations will permit, on a licence-exempt basis, the use of the following equipment when connecting to a licensed network:
- i) Mobile Satellite Service (MSS) user terminals (e.g. satellite phones) within the 1980 to 2010 MHz and 2170 to 2200 MHz frequency bands (‘2 GHz band’) that comply with the technical parameters set out in the 2 GHz MSS Regulations;
 - ii) mobile user terminals (e.g. handsets and dongles) in the 2350 to 2390 MHz (‘2.3 GHz band’) that comply with the technical parameters set out in Interface Requirement (IR) 2098²; and
 - iii) mobile user terminals in the 3400 to 3800 MHz (‘3.4 GHz band’) that comply with the technical parameters set out in IR 2097³. This is in line with the technical provision as set out in European Commission (EC) Amending Decision 2014/276/EU⁴ (the ‘Amending Decision’) which amended EC decision 2008/411/EC⁵ (the ‘3.4 GHz Decision’).
- 1.3 Before deciding to make the Regulations, in accordance with the requirements of section 122(4) of the Wireless Telegraphy Act 2006 (the ‘WT Act’), we published the Notice setting out our proposals to make them. The Notice contained a draft of the 2 GHz MSS Regulations and the Amendment Regulations. It also invited comments from stakeholders on the drafting of the proposed Regulations.
- 1.4 We received two non-confidential responses, from EchoStar Mobile Limited⁶ and Inmarsat, and one confidential response to the Notice. The non-confidential responses agreed with parts of our proposals in relation to the 2 GHz MSS Regulations and raised additional comments, but made no comments in relation to the Amendment Regulations. The confidential response agreed with our proposal to make the Amendment Regulations but made objections to our proposals to make the

¹ https://www.ofcom.org.uk/_data/assets/pdf_file/0029/78464/user_terminal_exemption_notice.pdf

² https://www.ofcom.org.uk/_data/assets/pdf_file/0023/85082/ir_2098_2.3_ghz_final.pdf

³ https://www.ofcom.org.uk/_data/assets/pdf_file/0017/85031/ir_2097_2015_final.pdf

⁴ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0276&qid=1414427840029&from=EN>

⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:144:0077:0081:EN:PDF>

⁶ Formerly known as Solaris

2 GHz MSS Regulations. The non-confidential responses are published in full on our website.⁷

- 1.5 In accordance with section 122(4)(c) of the WT Act, we have considered the comments that were raised. After doing so, and for the reasons set out in this document, we have decided to adopt the 2 GHz MSS Regulations as proposed subject to minor editorial amendments and the Amendment Regulations as proposed. This statement confirms that both Regulations will come into force by 1 December 2016. Copies of the Regulations can be obtained through the National Archives.⁸
- 1.6 In order for Ofcom to authorise the use of 2 GHz MSS band equipment on an aircraft, we will extend the existing aeronautical licensing regime via the use of a Notice of Variation (NoV) to an aircraft radio WT Act licence. We consider that it is sensible not to include the technical parameters for the 2 GHz MSS within draft IR2016.10 and draft IR2016.11. These draft IRs were included in the Notice for information purposes. We have decided to include the technical parameters only within the NoV of the aircraft licence.

⁷ <https://www.ofcom.org.uk/consultations-and-statements/category-3/wt-exemption-2016>

⁸ A link to the online version can be found at <http://www.legislation.gov.uk/>

Section 2

Background

Introduction

- 2.1 We are responsible for authorising civil use of the radio spectrum and achieve this by granting wireless telegraphy licences under the Wireless Telegraphy Act 2006 (the 'WT Act') and by making regulations exempting users of particular equipment from the requirement to hold such a licence. Under section 8(1) of the WT Act, it is an offence to establish, install or use equipment to transmit without holding a licence granted by us, unless the use of such equipment is exempted.
- 2.2 Under section 8(4) of the WT Act, we are required to make regulations to exempt the use of wireless telegraphy equipment if the conditions in section 8(5) of the WT Act are met, namely, if its installation or use is not likely to:
- involve undue interference with wireless telegraphy;
 - have an adverse effect on technical quality of service;
 - lead to inefficient use of the part of the electromagnetic spectrum available for wireless telegraphy;
 - endanger safety of life;
 - prejudice the promotion of social, regional or territorial cohesion; or
 - prejudice the promotion of cultural and linguistic diversity and media pluralism.
- 2.3 In accordance with the requirements of section 8(3B) of the WT Act, the terms, provisions and limitations specified in the regulations 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.

The Notice

- 2.4 Under section 122(4) to (6) of the WT Act, we are required to publish a notice of any proposal to make regulations. The notice must state that Ofcom proposes to make the regulations in question, must set out their general effects, specify an address from which a copy of the proposed regulations may be obtained and specify a time of at least one month before which any representations with respect to the proposal must be made to Ofcom.

- 2.5 We published “Notice of proposal to make Wireless Telegraphy Exemption Regulations 2016: User Terminal Exemptions”⁹ (the ‘Notice’), meeting the statutory requirements, on 28 July 2016. The Notice included a draft of the 2 GHz MSS Regulations and the Amendment Regulations. The Notice gave any person or party who wished to do so until 30 August 2016 to make representations.
- 2.6 The Notice contained draft regulations that would licence-exempt the following:
- i) Mobile Satellite Service (MSS) user terminals (e.g. satellite phones) within the 1980 to 2010 MHz and 2170 to 2200 MHz frequency bands (‘2 GHz band’) that comply with the technical parameters set out in the 2 GHz MSS Regulations;
 - ii) mobile user terminals (e.g. handsets and dongles) in the 2350 to 2390 MHz (‘2.3 GHz band’) that comply with the technical parameters set out in IR 2098¹⁰; and
 - iii) mobile user terminals in the 3400 to 3800 MHz (‘3.4 GHz band’) that comply with the technical parameters set out in IR 2097¹¹. This is in line with the technical provision as set out in European Commission (EC) Amending Decision 2014/276/EU¹² (the ‘Amending Decision’) which amended EC decision 2008/411/EC¹³ (the ‘3.4 GHz Decision’).

2 GHz band MSS proposals

- 2.7 In the Notice, we proposed to make the 2 GHz MSS Regulations that would exempt user terminals (e.g. satellite phones) used to access services via a licensed Mobile Satellite Service (MSS) network in the UK in the 2 GHz band.
- 2.8 This was on the basis that the use of the 2 GHz band for MSS was the subject of a pan-European award process by the European Commission (EC). Due to this the following European Union (EU) Decisions, which are legally binding on the UK, apply to services in this band:
- i) Decision 2007/98/EC¹⁴ on the harmonised use of radio spectrum in the 2 GHz frequency bands for systems providing MSS;
 - ii) Decision 626/2008/EC¹⁵ adopted jointly by the European Parliament and Council, provided a process for the selection and authorisation of would-be providers of MSS; and
 - iii) Decision 2009/449/EC¹⁶ completed this process by selecting two operators – Inmarsat Ventures Limited and Solaris Mobile Limited (now EchoStar) (the “MSS operators”) - and assigning frequencies to each for the provision of MSS at 2 GHz.
- 2.9 The award took place in 2009 and two companies – Inmarsat (1980 to 1995 MHz and 2170 to 2185 MHz) and Solaris Mobile, subsequently acquired by EchoStar Mobile Limited, (1995 to 2010 MHz and 2185 to 2200 MHz) were selected.

⁹ https://www.ofcom.org.uk/data/assets/pdf_file/0029/78464/user_terminal_exemption_notice.pdf

¹⁰ https://www.ofcom.org.uk/data/assets/pdf_file/0023/85082/ir_2098_2.3_ghz_final.pdf

¹¹ https://www.ofcom.org.uk/data/assets/pdf_file/0017/85031/ir_2097_2015_final.pdf

¹² <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0276&qid=1414427840029&from=EN>

¹³ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:144:0077:0081:EN:PDF>

¹⁴ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:043:0032:0034:EN:PDF>

¹⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:172:0015:0024:EN:PDF>

¹⁶ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:149:0065:0068:EN:PDF>

- 2.10 The EU Decisions were implemented in the UK by the Authorisation of Frequency Use for the Provision of Mobile Satellite Services (European Union) Regulations 2010¹⁷ as amended, under which Ofcom issued authorisations to Inmarsat Ventures Limited and Solaris Mobile (now EchoStar).
- 2.11 Electronic Communications Committee (ECC) Decision (12)01¹⁸ encourages European Conference of Postal and Telecommunications Administrations (CEPT) countries¹⁹ to use licence exemption as the mechanism of authorisation should that country choose to allow use of apparatus for frequency bands listed in table 1 of the Annex to ECC Decision (12)01. The 1980 to 2010 / 2170 to 2200 MHz bands are listed in table 1 of the ECC Decision therefore; it is appropriate for the UK to authorise equipment through licence exemption.
- 2.12 The 2 GHz MSS systems comprise of a number of elements of equipment; these are the satellite component and the MSS user terminals (both on land and on aircraft). As noted above, the satellite component is already authorised. The Notice consulted on licence exempting MSS user terminals to be used on land. The technical parameters for 2 GHz band MSS user terminals we proposed in the Notice were based on work carried out by CEPT, namely ECC Report 197²⁰ and ECC Report 233²¹. We also included (for information purposes) the limits we planned to implement for 2 GHz band MSS user terminals on aircraft.

2.3 and 3.4 GHz band proposals

- 2.14 As highlighted in the Notice, we are in the process of awarding spectrum in the 2.3 GHz and parts of the 3.4 GHz bands (3410 to 3600 MHz). As part of this process, on 26 October 2015, we published an Information Memorandum on the award of 2.3 and 3.4 GHz spectrum bands²² (the 'Memorandum'). In the Memorandum and supporting consultations²³, we advised that the authorisation of certain user terminals, when connecting to a licensed network, would be on a licence-exempt basis. To do this, we proposed to amend the 2003 Regulations by making the Amendment Regulations. This is in line with our current practice for mobile use in other frequency bands e.g. 900 MHz and 1800 MHz. The Notice proposed to exempt these user terminals in line with the technical limits that Ofcom has previously consulted on.

¹⁷ http://www.legislation.gov.uk/ukxi/2010/672/pdfs/ukxi_20100672_en.pdf

¹⁸ <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1201.PDF>

¹⁹ The UK is a member of CEPT

²⁰ www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP197.PDF

²¹ <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP233.PDF>

²² https://www.ofcom.org.uk/_data/assets/pdf_file/0030/81579/info-memorandum.pdf

²³ https://www.ofcom.org.uk/_data/assets/pdf_file/0027/68337/Public_Sector_Spectrum_Release_statement.pdf

Section 3

Responses to the Notice

Introduction

- 3.1 This section outlines the comments that we received on the Notice²⁴ published on 28 July 2016 and our responses to these.
- 3.2 We received two non-confidential responses from EchoStar and Inmarsat and one confidential response to the Notice. The non-confidential responses agreed with parts of our proposals in relation to the 2 GHz MSS Regulations and raised additional comments but made no comments in relation to the Amendment Regulations. The confidential response agreed with our proposal to make the Amendment Regulations but made objections to our proposals to make the 2 GHz MSS Regulations. The non-confidential responses are published in full on our website²⁵. The comments raised have been addressed below.

Stakeholders' comments on the Notice and Ofcom's response for 2 GHz MSS Bands

EchoStar response

- 3.3 EchoStar supported the proposal to authorise 2 GHz MSS user terminals as licence exempt devices. EchoStar agreed with the proposed technical parameters for 2 GHz MSS terminals, with the understanding that pan-European technical rules for 2 GHz MSS user terminals may be revisited in the future as new technologies are introduced into the market.
- 3.4 EchoStar also supported the adoption of technical parameters for 2 GHz MSS user terminals on aircraft. However, it raised concern about the proposed maximum equivalent isotropic radiated power (e.i.r.p) and power density for MSS terminals on aircraft. It questioned the basis for Ofcom's proposed e.i.r.p power limit; noting that this is 5 dB higher than what was studied in CEPT for ECC Report 233.²⁶ It also noted that the basis of compatibility studies for the e.i.r.p power limits in ECC Report 197 are different to those in ECC Report 233, which studied aeronautical complementary ground component (CGC) systems. EchoStar further pointed out that ECC Report 197 only studied MSS terminals transmitting to a satellite, with an MSS antenna height of 1 or 1.5m.
- 3.5 EchoStar considered that Ofcom should clarify the following:
- that in paragraph 3.15 of the Notice, the 2 GHz MSS user terminals on-board an aircraft would transmit (to the Satellite) in the 1980 to 2010 MHz band (Earth to space) and receive (from the Satellite) in the 2170 to 2200 MHz band (space to Earth); and
 - that the proposed maximum e.i.r.p and power density in Table 2 of the Notice, are not for 2 GHz MSS user terminals on-board an aircraft, transmitting to terrestrial or Aeronautical CGC Ground Stations.

²⁴ https://www.ofcom.org.uk/data/assets/pdf_file/0029/78464/user_terminal_exemption_notice.pdf

²⁵ <https://www.ofcom.org.uk/consultations-and-statements/category-3/wt-exemption-2016>

²⁶ See ECC Report 233, Table 7: Aeronautical terminal parameters, transmitting to the Satellite

- 3.6 Another issue raised by EchoStar in its response was that Inmarsat has not actively engaged in the International Telecommunication Union (ITU) satellite coordination process with regard to EchoStar's MSS system. Therefore, it considered there is no evidence that the proposed e.i.r.p limits for user terminals on aircraft will protect the operations of EchoStar or other adjacent or near-adjacent spectrum users. EchoStar urged Ofcom not to adopt the same e.i.r.p power limit for 2 GHz MSS user terminals on aircraft as those proposed for 2 GHz MSS user terminals until they can be confirmed through the European-wide standards process and/or coordination with the EML MSS satellite system is completed.

Ofcom response

- 3.7 Ofcom is open to revisiting the technical rules as the technology evolves in the future. However, we expect that any necessary sharing studies, technical standards and Harmonised Standards will be driven at a European level through the CEPT and the European Telecommunications Standards Institute (ETSI) in the first instance.
- 3.8 Although not part of the consultation we note EchoStar's concerns about the proposed e.i.r.p for MSS user terminals on aircraft. We also acknowledge that the proposed power is 5 dB higher than the assumptions used for the compatibility studies in ECC report 233²⁷ (table 7). Although 5 dB higher, we do not believe that this will increase the risk of harmful interference. This is because the final EN 301 473 sets absolute levels for the unwanted emission mask, meaning that it is independent of the transmitter power. In the compatibility studies undertaken for ECC Report 233, MSS unwanted emissions were dominant by 16 dB over ECN/CGC base station receiver performance. Therefore, the 5 dB higher e.i.r.p would not have a material effect on receiver blocking / adjacent channel interference. We further note that we also indicated the higher e.i.r.p. limit in the consultation on *"Authorisation of terrestrial mobile networks complementary to 2 GHz Mobile Satellite Service (MSS) - A consultation on the licensing of 2 GHz MSS Complementary Ground Component (CGC) for aeronautical use"*²⁸. We acknowledge that ECC Report 233 studied different MSS usage scenarios than ECC Report 197. However, the e.i.r.p. we are authorising for MSS terminals on aircraft is no higher than what we are authorising for land MSS use, which is based on ECC Report 197.
- 3.9 To answer EchoStar's request for clarification on two points (see paragraph 3.5 above), the intention of the consultation was to only cover the authorisation via licence exemption of the MSS user terminals. We included the technical information for the aircraft NoV to authorise the (Earth-to-space / space-to-Earth) MSS equipment on-board an aircraft for information purposes. The CGC (air-to-ground / ground-to-air) equipment was not within scope of the licence-exemption consultation. Matters relating to the authorisation of CGC networks in the UK are being considered via a separate consultative process.
- 3.10 We do not consider that it is necessary for operators to complete the ITU satellite coordination process before we authorise user equipment in these bands. We consider that regardless of what we authorise, the ITU co-ordination process between satellite networks, as per Article 9 of the Radio Regulations, will address adjacent channel / band interference issues for both EchoStar and Inmarsat satellite networks (i.e. interference to the respective satellite and MSS user terminals). We plan to proceed with authorising equipment regardless of where operators are at in the ITU coordination process but encourage both operators to continue such co-

²⁷ <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP233.PDF>

²⁸ https://www.ofcom.org.uk/_data/assets/pdf_file/0021/77115/2ghz_consultation.pdf

ordination so that the frequency assignments of their filings can be registered in the ITU Master International Frequency Register under the most appropriate provisions.

Inmarsat response

- 3.11 Inmarsat pointed out that the proposed technical requirements do not appear to provide for CGC terminals that communicate with CGC base stations. Inmarsat considered that both MSS terminals communicating with a satellite and CGC terminals communicating with a CGC base station should be provided for and reflected in IR 2016.10 and IR 2016.11.
- 3.12 Inmarsat argued that it is necessary to differentiate between user terminals which transmit to a CGC base station and user terminals which transmit to the satellite. It added that the technical characteristics are different and some of the technical parameters are key to sharing with other services and applications in the adjacent frequency bands.
- 3.13 Inmarsat proposed modifications to the provisions for land terminals to additionally cover the use of land based CGC terminals communicating with CGC base stations as well as some other minor changes. It stated that the maximum e.i.r.p. values proposed by Ofcom for draft IR 2016.10 are applicable for user terminals when transmitting to the satellite and have a maximum value of 47 dBm. It considered that the values proposed are consistent with those in ECC Report 197 for terminals transmitting to the satellite but are significantly higher than the 24 dBm maximum that typically applies to terrestrial user terminals and to the assumptions behind Report 197. It considered that when land terminals are used to communicate with the CGC base station, the e.i.r.p. should be limited to 24 dBm. Consequently, Inmarsat proposes to modify Draft IR 2016.10 to specify that when transmitting to the CGC base station, the e.i.r.p. should not exceed 24 dBm.
- 3.14 Inmarsat considered that the proposed provisions and draft IR2016.11 do not differentiate between the two types of aircraft terminals: (1) a terminal which communicates with the satellite and is located on the top of the aircraft; and (2) a terminal which communicates with the CGC ground stations and is located on the underside of the aircraft. Inmarsat proposed some revisions to the draft IR2016.11 that would provide for CGC terminals on an aircraft communicating with a CGC base station. It also urged Ofcom not to limit its authorisation to only 2 GHz MSS equipment on an aircraft but to extend it, via an NoV, for both types of aircraft terminals. Inmarsat also provided a couple of minor suggested amendments, in particular clarifying the description of radio services (to refer to aeronautical, not land) and provide clarity that the power limits are in e.i.r.p.
- 3.15 Inmarsat also requested Ofcom to consider the need for occasional testing of the communication terminals when the aircraft is on the ground and to adjust relevant regulations to enable such testing.

Ofcom response

- 3.16 We acknowledge Inmarsat's comments and proposed revisions regarding provisions for authorising CGC terminals that communicate with a CGC base station. The intention of the Notice was to focus on the authorisation of MSS terminals communicating with a satellite (Earth-to-space / space-to-Earth). The Notice did not address authorisation of land based CGC terminals or CGC terminals fitted to aircraft intended to communicate with a CGC base station. As we advised in paragraph 3.9 above, matters relating to the authorisation of CGC networks in the UK are being considered via a separate consultative process.

- 3.17 We agree with Inmarsat's proposal on minor amendments to draft IR 2016.11 by providing clarification that the power limits are indeed in e.i.r.p. However, we have decided to include all the technical parameters within an NoV instead of a separate IR2016.11 as in the Notice. For clarification, in Table 2 of section 4 of this document we have included the technical parameters for the NoV we will issue for the aircraft licence.
- 3.18 We also note the point raised concerning the need for occasional testing of the MSS terminal while the aircraft is on the ground. The reports on aeronautical use and our proposals required that the e.i.r.p is reduced below 1000 meters above ground level. In this particular case, use of the MSS terminal on the aircraft is comparable to that of a conventional MSS ground based use terminal. Therefore, we expect that this testing would not present a greater risk of interference. We plan to include a condition in the NoV that will permit occasional testing while the aircraft is on the ground and stationary.

Confidential response

- 3.19 We received a confidential response which did not support the proposal to allow the introduction of licence-exempt user terminal devices in the band 1980 to 2010 MHz ('2 GHz band'). The respondent had concerns about significant and unacceptable degradation in the adjacent band used for Electronic Communications Network (ECN) - mobile transmit / base station receive.
- 3.20 The confidential respondent also stated that ECC Report 197 suggests that significant local and surrounding network interference could be caused by such (Earth-to-space) devices with transmit powers as high as 47dBm/5MHz e.i.r.p. The respondent argued that to justify exempting, Ofcom should have more fully investigated and stated its due diligence in considering the projected numbers of such devices, their characteristics and usage patterns, and the consequent impact on neighbouring ECN operators within the context of the 2170 to 2200 MHz licensing options available.
- 3.21 The respondent considered that studies make no consideration of the impact of these MSS terminals on a Long Term Evolution (LTE) Base Station given the plans to introduce LTE systems into the 2 GHz band. They also noted that that LTE deployments place greater reliance on micro and pico cells and that ECC report 197 has not considered probabilistic studies for these.
- 3.22 The respondent argued that the user terminal licence exemption did not clearly meet the test of not being likely to involve undue interference to other legitimate use of radio spectrum.

Ofcom response

- 3.23 In regards to potential interference from conventional land based MSS terminals to electronic communications networks (ECN), we consider that there will be minimal impact. We note that ECC Report 197 concluded that for a 0.8 dB cell noise rise, no additional mitigations (above the assumptions in the report) are required provided that the 300 kHz guard band is retained. This was based on a statistical analysis for macro cells. In the UK there is a 300 kHz guard band implemented at the 1980 MHz band edge on our Spectrum Access 2100 MHz licences. We further note that interested parties from both regulators and industry had the opportunity to participate in the development and outcomes of ECC Report 197. In addition, our assumption about usage patterns is that MSS use will be low density and generally away from built up areas where ECN systems, including micro and pico cells, are widely deployed.

- 3.24 Taken together, we believe the above points are sufficient to mitigate the risk of harmful interference to ECN systems. We separately note that at this stage, EchoStar who is authorised for upper 15 MHz (1995 - 2010 MHz) of the 1980 – 2010 MHz band are the only 2 GHz MSS operator that has expressed interest in land MSS terminal use. In this scenario it will have 15 MHz of frequency separation from the 1980 MHz band edge, which would further mitigate any risk of harmful interference to ECN systems, including micro and pico cells.
- 3.25 Turning to MSS terminals on aircraft we do not consider these to be an issue for ECN. The potential for interference from MSS terminals on aircraft into this was studied in Scenario 1 of ECC Report 233. This concluded that with three mitigations, the risk of harmful interference could be mitigated. These mitigations were transmitter filtering, e.i.r.p reduction depending on altitude and fuselage attenuation. We consider that these will be implemented through EN 301 473, licence conditions and physical characteristics of the aircraft.
- 3.26 We acknowledge that ECC Report 197 only considers UMTS and not LTE as the potentially affected adjacent system. However, we do not consider that there would be a material difference between the susceptibility of a UMTS base station compared with an LTE base station. In general, co-existence work conducted in the CEPT has assumed that LTE receivers are as robust as UMTS receivers from adjacent interferers. A particular example of this is in Section 9, 9.3 of CEPT Report 40²⁹ While this relates to a specific case we consider that it remains true in the general case:
- “Although the LTE BS narrow band blocking is slightly worse (2.7 dB) than UMTS BS, by considering the difference of interferer signals defined in the UMTS and LTE BS narrow band blocking requirement, it can be shown that LTE BS and UMTS BS have equivalent narrow band blocking performance at 300 kHz frequency separation between the nearest GSM carrier centre frequency and the LTE channel edge. A similar conclusion can be drawn for the UE.”*
- 3.27 Given the conclusions of ECC report 197 we consider that the risk of harmful interference to adjacent ECNs is low. We consider that the likely usage scenarios will further mitigate the risks of degradation. We also highlight that the licence exemption is on a non-interference basis, where under 5 (2); *“The apparatus shall not cause or contribute to any undue interference to any wireless telegraphy”*. Should the usage scenarios for MSS materially change in the future, in a way that will have a significant impact on other spectrum users, we are open to revisit the terms of the exemption at that time.

Stakeholder’s comment on the Notice and Ofcom’s response for 2.3 and 3.4 GHz Bands

- 3.28 We received no comments on the drafting of the regulations for the proposals for the licence exemption of user terminal devices in the 2.3 GHz (2350 to 2390 MHz) and the 3.4 GHz (3400 to 3800 MHz) bands and their inclusion in the Notice.

²⁹ <http://www.ero-docdb.dk/Docs/doc98/official/pdf/CEPTREP040.PDF>

Section 4

Ofcom's decision

4.1 This section set out our decision on making the regulations and provides information on the technical requirements that equipment must adhere to in order to be authorised for use in the UK.

2 GHz band MSS

4.2 We have considered the responses in section 3 and have decided to proceed with making the use of terrestrial MSS user terminals in the 2 GHz band licence-exempt. We have also included information on the authorisation of 2 GHz band equipment on aircraft. The following sections set out the technical requirements that equipment will need to meet.

2 GHz band MSS user terminal technical parameters

4.3 The 2 GHz band MSS user terminals must comply with the technical parameters set out in the 2 GHz MSS Regulations which set out the necessary equipment parameters for the licence exemption of MSS equipment in the 2 GHz band in the UK. Given the work carried out and consulted on by CEPT which forms the basis for compatibility, we consider it appropriate to adopt the limits taken from ECC Report 197.³⁰

4.4 The limits set out in Table 1 are taken from Regulation 5(5) of the 2 GHz MSS Regulations.

Table 1: Technical limitations for satellite user terminals in the 1980 to 2010 MHz band

Maximum e.i.r.p and power density	Narrowband stations with a bandwidth of less than 1 MHz transmitting to a satellite: 45 dBm / 200 kHz Wideband stations with a bandwidth 1 MHz or greater transmitting to a satellite: 47 dBm / 5 MHz:
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2 GHz band equipment on aircraft

4.5 The use of equipment on aircraft is subject to a different authorisation regime. All equipment installed on an aircraft is covered by the aircraft licence class and for the 2 GHz band this will be implemented through an NoV to the aircraft's WT Act licence. The NoV will set out the technical conditions under which terminals on aircraft operating in the 2 GHz band with MSS or terrestrial radio systems are licensed for operation on a UK aircraft.

MSS user terminals on aircraft

4.6 2 GHz MSS terminals on-board an aircraft will transmit in the 1980 to 2010 MHz band (Earth-to-space) and receive in the 2170 to 2200 MHz band (space-to-Earth).

³⁰ "Compatibility Studies – MSS terminals transmitting to a satellite in the band 1980- 2010 and adjacent UMTS services"
www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP197.PDF

Aeronautical 2 GHz MSS terminals, as a result of the improved transmitter filtering, will be able to be operated at or above 1000 metres altitude without any reduction in e.i.r.p. Below 1000 metres altitude, e.i.r.p. reduction is required and initially terminals will automatically determine the altitude and be deactivated below this altitude. In the future, automatic mitigation / power control may be developed to allow operation below 1000 metres altitude. At this stage, we have decided to require a significant reduction in e.i.r.p at altitudes below 1000 meters, to an e.i.r.p. of 24 dBm, which is no greater than what is permitted for ECN User Equipment.³¹

- 4.7 2 GHz MSS terminals on-board an aircraft are required to have a maximum transmit power of 30 dBm and an antenna gain of 15 dBi. The maximum e.i.r.p. will be 45 dBm in a 200 kHz bandwidth. This maximum e.i.r.p. is consistent with ECC Report 197 and our decision in relation to 2 GHz MSS user terminals. The technical parameters are detailed below in Table 2.

Table 2: Technical limitations for satellite user terminals on-board aircraft in the 1800 to 2010 MHz band

Maximum Transmit Power / Power Density	45 dBm / 200 kHz e.i.r.p for altitudes at 1000 meters or above 24 dBm e.i.r.p for altitudes below 1000 meters
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2.3 and 3.4 GHz bands

- 4.8 The mobile user terminals must comply with the technical parameters set in IR2098³² in respect of 2.3 GHz and IR2097³³ in respect of 3.4 GHz band in order to be licence exempt. IR2098 and IR2097 set out the necessary equipment parameters for the authorisation of terrestrial systems capable of providing electronic communications services in the 2.3 GHz and 3.4 GHz bands respectively. Both IRs are available on our website.³⁴

2.3 GHz band technical parameters

- 4.9 In June 2014 an ECC Decision³⁵ set out harmonised technical and regulatory conditions for the 2.3 GHz band. The implementation of the decision is not mandatory. However, in addition the EC issued a mandate to CEPT to carry out work to look into harmonised technical measures.
- 4.10 In March 2015³⁶, CEPT provided a report to the Radio Spectrum Committee (RSC) which aligned with the ECC Decision, providing information on the technical parameters, sharing conditions and views on how a licensed shared access (LSA) approach could be implemented. The CEPT report aligned with the ECC Decision on the harmonised technical and regulatory conditions for the use of the 2.3 GHz band. Discussions on a potential Commission Decision on the harmonisation of the band are still on going.

³¹ IR 2092: https://www.ofcom.org.uk/_data/assets/pdf_file/0026/84671/IR_2092.pdf

³² https://www.ofcom.org.uk/_data/assets/pdf_file/0023/85082/ir_2098_2.3_ghz_final.pdf

³³ https://www.ofcom.org.uk/_data/assets/pdf_file/0017/85031/ir_2097_2015_final.pdf

³⁴ <https://www.ofcom.org.uk/spectrum/information>

³⁵ <http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1402.PDF>

³⁶ <http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP056.PDF>

- 4.11 In the absence of a Commission Decision, we decided to proceed by aligning licence conditions with the ECC Decision. If a subsequent Commission Decision mandates different conditions, we will consider our obligations arising from that Decision, including whether it was necessary to change the licences to comply with European law. Regulation 3 of the Amendment Regulations requires that equipment must meet the technical parameters set out in IR2098, for information these are detailed below in Table 3.

Table 3: Technical limitations for mobile user terminals in the 2350 to 2390 MHz band

Maximum Transmit Power / Power Density	Mobile/ Nomadic terminal station 25 dBm TRP per device * Irrespective of the number of transmit antennas.
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3.4 GHz band technical parameters

- 4.12 On 21 May 2008, the EC adopted the decision on the harmonisation of the 3.4 GHz band for terrestrial systems capable of providing electronic communications services in the Community³⁷ (the '3.4 GHz Decision'). The 3.4 GHz Decision required Member States to designate and make available the band, on a non-exclusive basis, for terrestrial ECN, in compliance with a number of technical parameters set out in the annex to the 3.4 GHz Decision.
- 4.13 The 3.4 GHz Decision was implemented in the UK by way of the 3400-3800 MHz Frequency Band (Management) Regulations 2008³⁸, which required Ofcom to exercise its functions under the WT Act so as to give effect to the obligations of the UK.
- 4.14 On 2 May 2014, the EC adopted Decision 2014/276/EU³⁹ (the 'Amending Decision') which amended the 3.4 GHz Decision, primarily in relation to the technical conditions, set out in the annex. The Amending Decision was implemented in the UK by the 1452-1492 MHz and 3400-3800 MHz Frequency Bands (Management) Regulations 2016.⁴⁰
- 4.15 In line with the Regulation 3 of the Amendment Regulations, we have decided that mobile user terminals will be required to operate within the conditions set out in IR2097 in order to be licence-exempt, for information these are detailed below in Table 4.

Table 4: Technical limitations for mobile user terminals in the 3400 to 3800 MHz band

Maximum Transmit Power / Power Density	Mobile/ Nomadic terminal station 25 dBm TRP per device * Irrespective of the number of transmit antennas.
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³⁷ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:144:0077:0081:EN:PDF>

³⁸ http://www.legislation.gov.uk/ukxi/2008/2794/pdfs/ukxi_20082794_en.pdf

³⁹ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0276&qid=1414427840029&from=EN>

⁴⁰ http://www.legislation.gov.uk/ukxi/2016/495/pdfs/ukxi_20160495_en.pdf

Section 5

Scope of Regulations

- 5.1 As already stated, we received two non-confidential responses as well as one confidential response. Following consideration of the responses as outlined in Section 3, we have decided to proceed with our proposal to make the 2GHz MSS Regulations as proposed subject to minor amendments and the Amendment Regulations as proposed. The Regulations come into force by 1 December 2016. We also outline the final scope of the Regulations below.
- 5.2 We have made editorial changes to the 2 GHz MSS Regulations. These changes have been made to better reflect the type of equipment we are exempting in the Regulations. As part of the amendments, we have changed the title of the 2GHz MSS Regulations from The Wireless Telegraphy (Mobile Satellite Earth Apparatus) (Exemption) Regulations 2016 to the Wireless Telegraphy (Mobile Satellite Systems Equipment) (Exemption) Regulations 2016; we have also replaced the term “apparatus” with “equipment” (which includes apparatus and stations). In regulations 4, we have replaced the term “terrestrial use only” with non-airborne use.

The Legislative Framework

- 5.3 As previously stated, under section 8(1) of the WT Act it is an offence to install or use equipment to transmit without holding a licence granted by Ofcom, unless the installation or use of such equipment is exempted. Ofcom can exempt the establishment, installation and use of wireless telegraphy equipment by making regulations under section 8(3) of the WT Act.

Extent of application

- 5.4 The 2 GHz MSS Regulations and the Amendment Regulations will apply in the United Kingdom, the Channel Islands and Isle of Man

The 2GHz MSS Regulations

- 5.5 Regulation 2 provides an interpretation of the terms used in the 2 GHz MSS Regulations.
- 5.6 Regulation 3 exempts the establishment, installation and use of equipment connecting to a space station which forms part of a MSS, from the need to hold a licence subject to the terms, provisions and limitations set out in Regulations 4.
- 5.7 Regulation 4 sets out the terms, provisions and limitations relating to the establishment, installation and use of equipment connecting to a MSS System subject to the technical provisions contained in paragraphs (a) to (e).

The Amendment Regulations

- 5.8 Regulation 2 amends Schedule 3, Part III, paragraph 3 of the 2003 Regulations in order to licence exempt the use of Long Term Evolution (LTE) and Worldwide Interoperability for Microwave Access (WiMAX) user terminals in the 2350 to 2390 MHz and 3400 to 3800 MHz bands.

5.9 Regulations 3 inserts into the 2003 Regulations reference to the corresponding technical requirements set out in IR2098 and IR2097 that equipment must meet in order to be licence exempt.

Annex 1

List of respondents

EchoStar Mobile Limited

Inmarsat

Confidential response

Annex 2

Glossary of Abbreviations

CEPT	European Conference of Postal and Telecommunications Administrations
dBm	Decibels relative to one Milliwatt (0 dBm is equivalent to one Milliwatt)
EC	European Commission
ECC	Electronic Communications Committee
ECN	Electronic Communication Networks
e.i.r.p	Equivalent isotropic radiated power
ERP	Effective radiated power
ETSI	European Technical Standards Institute
EU	European Union
GHz	Gigahertz (a frequency of one billion Hz)
Hz	Hertz (one complete cycle of a radio signal per second)
IR	Radio Interface Requirement
ITU	International Telecommunication Union
kHz	Kilohertz (a frequency of one thousand Hz)
LTE	Long Term Evolution
MHz	Megahertz (a frequency of one million Hz)
MSS	Mobile Satellite Service
mW	Milliwatt (one thousandth of a watt)
NoV	Notice of Variation
OJEU	Official Journal of the European Union
TRP	Total Radiated Power
UTMS	Universal Mobile Telecommunications System
WiMAX	Worldwide Interoperability for Microwave Access
WT Act	Wireless Telegraphy Act 2006