

A Statement on the licensing of 2 GHz MSS Complementary Ground Components (CGC)

Statement

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Section 1

Executive Summary

- 1.1 This Statement concludes on the terms and conditions for the spectrum access licence for terrestrial mobile networks (Complementary Ground Components "CGC") that complement 2 GHz mobile satellite systems ("MSS") operating in the frequency bands 1980 2010 MHz and 2170 2200 MHz ("the 2 GHz spectrum").
- 1.2 The European Commission announced¹ the results of the EC administered selection and authorisation process ("the EU process") provided for by Decision No. 626/2008/EC² ("the EU Decision") on 14 May 2009. Inmarsat Ventures Ltd and Solaris Mobile Ltd were selected under this process. Decision No. 2009/449/EC ("the EC Selection Decision") of 13 May 2009 confirmed the selection of both operators and identified the specific frequency bands awarded to each operator.
- 1.3 The formal Selection Decision was published in the Official Journal ("the OJ") of the European Union on 12 June 2009³. In conjunction with the EU Decision, the EC Selection Decision requires that Member States grant the selected MSS operators an authorisation for CGC for their territory, with the terms and conditions of such authorisations to be determined by national and community law as well as the EU Decision.
- 1.4 In this Statement we have concluded that we will proceed on the detailed terms and conditions for licensing CGC broadly in line with the proposals we made in our joint Statement and consultation document⁴ published on 3rd November 2008.
- 1.5 On the issue of whether to base the CGC technical transmission rights on SUR or a spectrum mask approach, we have concluded that we will proceed on the basis of spectrum masks. We have also concluded that we will use the technical limits proposed in our consultation, with the addition of two further limits:
 - An in-band limit of 58 dBm/MHz EIRP, which will allow for carriers having a bandwidth of less than 5 MHz; and
 - An out of band limit of -38 dBm/MHz, above 2210 MHz, to facilitate use of PMSE above 2210 MHz.
- 1.6 The full set of terms and conditions that will apply to the CGC Licences are provided as Annex 5.
- 1.7 On the issue of the level of the CGC Licence fee we have concluded that we will proceed on the basis of a fee level of £554,000 per 2 x 1 MHz nationwide and that we will only authorise the specific frequencies requested by the MSS operators for use by the CGC. Therefore the CGC Licence fee will be calculated on the basis of the amount of spectrum used by the CGC and not to the full frequency assignment at the satellite level.

http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/770&format=HTML&aged=0&language=EN&guiLanguage=en http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:172:0015:0024:EN:PDF

³ http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:149:0065:0068:EN:PDF

⁴ http://www.ofcom.org.uk/consult/condocs/cgcs2/

- 1.8 We recognise that there may well be a need to review the AIP fee rate for these CGC licences in due course as the passage of time reveals more information in relation to those factors which are currently subject to considerable uncertainty. However, we need to balance this potential need for review against the desirability of providing the MSS / CGC operators with a reasonable period of certainty over the fee rates that they will face. Accordingly, we do not intend to carry out a review of the CGC licence fee rate before 5 years from the date of this Statement, with one exception, so as to provide an appropriate degree of stability for MSS/ CGC operators. The exception is that we will consider reviewing the rate downwards before this 5 year period has elapsed if, once the European regulatory position and associated market developments have become a little clearer, we are presented with clear and compelling evidence that the rate of £554,000 per 2 x 1 MHz is preventing this spectrum from being brought into efficient use.
- 1.9 On a related issue, we confirm our understanding of the EU Decision's requirement for the CGC to remain integral with the MSS. In particular, it is necessary for the frequency assignment to the CGC and satellite components to be managed by the MSS, in order to manage the risk of interference between the CGC and the satellite. However, in our view, it is not necessary to restrict the CGC to provide the same service, application or content as the satellite component.

Next Steps

- 1.10 To enable us to issue CGC licences, it will be necessary for Ofcom to make changes to a number of Statutory Instruments. We will publish a notice to consult on these changes shortly.
- 1.11 In addition, we are examining, with the Department for Business Innovation and Skills ("BIS"), the need for any actions arising from Article 7 of the EU Decision in relation to authorisation of the selected MSS satellite operators. Any such authorisation is likely to be based on a Statutory Instrument adopted by BIS under the European Communities Act 1972.

Section 2

Introduction

- 2.1 This document sets out our policy decisions on the level of the CGC Licence fee and the on the detailed terms and conditions for licensing of terrestrial mobile networks complementary to 2 GHz mobile satellite systems ("MSS") i.e. terrestrial mobile networks (Complementary Ground Component, "CGC") that complement 2 GHz MSS operating in the frequency bands 1980-2010 MHz and 2170 2200 MHz ("the 2 GHz spectrum"). CGCs are a way for terrestrial networks to use spectrum assigned to mobile satellite systems by interleaving with the satellite components pattern of frequency re-use thereby improving the efficiency of use of the MSS spectrum.
- 2.2 We have published two documents on the authorisation of CGC:
 - The first⁵ was a consultation, published on 15 January 2008, that addressed the high level policy issues, including the CGC fee (the "first consultation"); and
 - The second⁴ was a combined document, published on 3 November 2008, that included:
 - A Statement (the "first Statement") that set out our decisions on the issues raised in the first consultation, with the exception of the level of fee to be charged; and
 - A further consultation (the "second consultation") that addressed the detailed terms and conditions of the CGC Licence.
- 2.3 The first Statement on the authorisation of CGC concluded, amongst other issues, that the CGC fees should be based on Administered Incentive Pricing (AIP).⁶ However, our first Statement did not conclude on the fee rate to be charged which we had proposed, in our first consultation, to be set at £554,000 per 2 x 1 MHz for a UK-wide authorisation. The questions from our first consultation which relate to the level of the fee are:

Question 10: Do you agree that the licence fees should be set at around \pm 554,000 per 2 x 1MHz?

Question 11: If you believe that setting fees at this level would result in CGC systems not being deployed, please provide your reasons and full supporting evidence including a detailed business case.

⁵ <u>http://www.ofcom.org.uk/consult/condocs/cgcs/</u>

⁶ AIP is the term we use when licence fees are set above a contribution to the recovery of the administrative costs of our spectrum management functions, to achieve Ofcom's objectives including: the efficient management and use of the part of the electro-magnetic spectrum available for wireless telegraphy; the economic and other benefits that may arise from the use of wireless telegraphy; the development of innovative services; and competition in the provision of electronic communications services.

- 2.4 We have considered responses to these questions in reaching the decisions in this document. Responses to all other questions from our first consultation were addressed in our first Statement on the authorisation of CGC in November 2008.
- 2.5 Our second consultation document posed the following nine questions on which it sought specific responses from stakeholders. The responses to these questions have been considered in reaching the decisions set out in this document.

Question 1: Do you agree with our proposals for the detailed terms and conditions of the CGC Licence set out in this document or have any other comments on the issues raised in this document?

Question 2: Do you agree with our proposed approach for including the conditions imposed by Decision No 626/2008/EC in the CGC Licence?

Question 3: Do you believe that the technical parameters used to define transmission rights should be based on spectrum usage rights or spectrum masks?

Question 4: Do you agree with our proposed SUR parameters for CGC?

Question 5: Do you agree with the spectrum masks parameters proposed?

Question 6: Do you agree with the proposed changes to the other standard technical licence terms and conditions?

Question 7: We have assumed that the CGC base station and user terminal characteristics will be similar to those for equivalent 3GPP equipment. Specifically, we have assumed a maximum transmitted power of 31 dBm/5 MHz for CGC handsets, and a maximum transmitted power of 61 dBm/5 MHz for the CGC base stations. Do you agree these are reasonable assumptions?

Question 8: We have based our analysis of compatibility between CGC and other radio systems on studies of analogous scenarios conducted for the 2.6 GHz award – do you agree with this assumption?

Question 9: Do you have any comments on the assumptions of the deployed network modelled for the SUR parameters?

Stakeholder responses

- 2.6 Ofcom received 18 responses to the first and 13 to the second consultation from a range of interested parties. These included stakeholders who are satellite and mobile network operators, a public service broadcaster as well as a band manager and a variety of trade and industry associations. These also included responses from the two successful applicants to the EU process.
- 2.7 The full text of the non-confidential responses to the first consultation is available at <u>http://www.ofcom.org.uk/consult/condocs/cgcs/responses</u>.
- 2.8 The full text of the non-confidential responses to the second consultation is available at <u>http://www.ofcom.org.uk/consult/condocs/cgcs2/responses/</u>.
- 2.9 Two respondents to the first consultation and three respondents to the second consultation requested that their responses be kept confidential. In addition, two

responses to the first consultation requested that parts of their response be kept confidential.

2.10 The responses to the specific questions addressed in this Statement and raised in the two consultations are summarised in Annex 1 and the list of respondents to the second consultation is provided as Annex 3.

Next Steps

- 2.11 To enable us to issue CGC licences, it will be necessary for us to amend a number of regulations. We will therefore publish a notice to consult on changes to a number of regulations shortly. These regulations are:
 - Wireless Telegraphy (Licence charges) regulations;
 - Wireless Telegraphy (Exemption) regulations;
 - Wireless Telegraphy (Limitation of Number of Spectrum Access Licences) regulations;
 - Wireless Telegraphy (Trading) regulations;
 - Wireless Telegraphy (Register) regulations.
- 2.12 In addition, we are examining, with the Department for Business Innovation and Skills ("BIS") the need for any actions arising from the EU Selection Decision, in particular its Article 7, in relation to authorisation of the selected MSS satellite operators. Any such authorisation is likely to be based on a Statutory Instrument adopted by BIS under the European Communities Act 1972.

Structure of this document

- 2.13 This remainder of this document is structured as follows:
 - Section 3 Background to 2 GHz MSS CGC
 - Section 4 Inclusion of Conditions required by Decision 626/2008/EC (question 2 of our second consultation)
 - Section 5 CGC Licence Fees (questions 10 and 11 of our first consultation)
 - Section 6 Technical & Other Licence conditions, (questions 1 and question 3 to 9 of our second consultation)
 - Annex 1 Summary of responses to second consultation
 - Annex 2 Summary of responses to the first consultation in relation to CGC Fees
 - Annex 3 List of respondents to the second consultation
 - Annex 4 Impact Assessment
 - Annex 5 Example Licence
 - Annex 6 Glossary

Section 3

Background to 2 GHz MSS CGC

2 GHz MSS and CGC

- 3.1 MSS systems incorporate small user terminals with low discrimination antennas, which are required to support mobile operation. This means that it is necessary for exclusive assignments of frequencies to any particular MSS with no sharing possible with other MSS or terrestrial based radio service, as is the case for terrestrial mobile networks. Studies carried out in the ITU have concluded, however, that sharing between terrestrial mobile services and MSS is possible when both are under the control of the same frequency management system that ensures, through its frequency reuse pattern, that the CGC and the satellite network do not use the same frequencies, in the same location, at the same time.
- 3.2 Some MSS operators have, over recent years, petitioned regulators, particularly in the US, to allow them to deploy such terrestrial networks utilising the same frequency bands as assigned to the MSS operator. This was agreed in principle by the Federal Communications Commission (FCC) in the US in 2001, where such terrestrial networks are termed Ancillary Terrestrial Communications (ATC).
- 3.3 In Europe, similar representations have resulted in the adoption of two Decisions by the European Commission and the European Parliament and Council. The first, an RSC Decision, harmonised use of radio spectrum in the 2 GHz frequency bands for the implementation of systems providing MSS (the "RSC Decision")⁷ and includes harmonisation provisions for the 2 GHz spectrum for terrestrial mobile networks known as Complementary Ground Components (CGC).
- 3.4 This RSC Decision was followed by Decision 626/2008/EC² a Decision adopted jointly by the European Parliament and the Council on the selection and authorisation of systems providing MSS ("the EU Decision") that sets out details of an EC administered selection and authorisation process ("the EU process") further details of which are provided in paragraphs 3.13 to 3.19.
- 3.5 These CGCs will enable MSS operators to increase the efficiency of their use of spectrum by increasing their frequency re-use throughout Europe. Another rationale for introducing CGC in the EU is that they can typically be used to improve MSS availability in areas that are hard to serve by satellite, including built-up urban environments, and also to provide in-building coverage. It is also our understanding that CGC operators may wish to offer services and applications distinct from those carried by the satellite component.
- 3.6 In addition to the European activity related to the 2 GHz spectrum, work is also underway within the Frequency Management Working Group of the ECC to examine the regulatory feasibility of CGC operation in the MSS allocations at 1.5 /1.6 GHz and 1.6 /2.4 GHz.

⁷ EC Decision 2007/98/EC on the harmonised use of radio spectrum in the 2 GHz frequency bands for the implementation of systems providing mobile satellite services <u>http://eur-lex.europa.eu/LexUriServ/site/en/oj/2007/I_043/I_04320070215en00320034.pdf</u>

3.7 Services that have been proposed by the successful applicants to the EU selection and authorisation process include maintenance of essential communications in the event of disruption or overload of terrestrial mobile systems, often referred to as Public Protection and Disaster Relief (PPDR) and mobile TV using a combination of satellite and terrestrial delivery.

CGC base stations and user terminals

- 3.8 Under the EU Decision², in Europe CGC base stations are required to be an integral part of a mobile satellite system, in our view, primarily to avoid interference from the CGC to the satellite network. As a consequence, it will be necessary for frequencies used by the CGC network to be managed by the same system that is used to control the use of frequencies in the associated MSS system.
- 3.9 CGC base stations need to operate within the same block of spectrum assigned to the associated MSS system. However, in any single geographic area it is possible that this spectrum will be segmented on a semi-permanent basis between satellite use and terrestrial use.
- 3.10 A CGC system will likely resemble a 2 GHz terrestrial mobile system utilising a number of base stations to provide connectivity within major urban areas as well as areas with lower population density. For example, it may be possible to modify existing 3G mobile service base stations to accommodate the CGC application without major cost implications.
- 3.11 Delivery of services to the CGC base stations and connection between the CGC base stations and other public networks, if required, could be provided through the MSS satellite, other satellites operating in different frequency bands or via terrestrial networks including fixed links.
- 3.12 MSS terminals are anticipated to be similar to those used in existing MSS systems and therefore similar to typical terrestrial mobile terminals. CGC user terminals are, in general, anticipated to be able to work interchangeably between the MSS satellite and the CGC base stations, although there is no regulatory requirement for them to do so. Ofcom also understands from the successful MSS operators that they may also plan for the CGC terminals to be dual-mode with terrestrial 3G services.

Development of European legal framework and the EU Decision

- 3.13 In October 2005, EU Member States recognised the need for a robust legal framework for the selection and authorisation of MSS operators wishing to access the 2 GHz spectrum (1980 to 2010 MHz (Earth-to-space) and 2170 to 2200 MHz (space-to- Earth)) identified by the ITU for use by MSS. The justification for which was that a fragmented approach to the selection of such systems would create regulatory uncertainty and risk for the MSS operators interested in developing pan-European MSS, which might result in a delay, or failure to use the 2 GHz spectrum.
- 3.14 The EU Radio Spectrum Committee (RSC) and Communications Committee (COCOM) therefore established an ad hoc expert group on 2 GHz MSS regulatory issues to oversee the development of this selection and authorisation process. This group began by preparing the RSC Decision designating this spectrum for MSS, including CGC that was adopted on 14 February 2007⁷.

- 3.15 In parallel with the development of the RSC Decision, the ad hoc group, recognising that spectrum scarcity was highly possible based on a survey by CEPT⁸, in which 13 systems were identified with an intention to operate in the 2 GHz MSS spectrum, started development of the necessary legal framework to support the proposed selection and authorisation process. Responsibility for this task was subsequently formally transferred to the Communications Committee (COCOM) and in particular to the Working Group on Authorisation and Rights of Use.
- 3.16 On 30 June 2008, the European Parliament and the Council adopted the EU Decision² on the selection and authorisation process for 2 GHz MSS systems. The purpose of the Decision was to create a Community procedure for the common selection of operators of mobile satellite systems (to be administered by the European Commission) as well as to lay down provisions for the coordinated authorisation by Member States of the selected operators to use spectrum for the operation of MSS. The EU Decision is addressed to all Member States and is therefore binding on the UK.
- 3.17 Following publication of the EU Decision in the Official Journal ("OJ") of the European Union and subsequent entry into force, COCOM initiated action which led to the publication of a call for applications from potential candidate MSS operators in the OJ, on 7 August 2008.
- 3.18 On 11 December 2008, the EC adopted a Decision confirming that the four received applications had been accepted as admissible: ICO Satellite Limited, Inmarsat Ventures Limited, Solaris Mobile Limited, and TerreStar Europe Limited¹.
- 3.19 On 14 May 2009, the EC published a statement indicating the outcome of the selection process, which is formally captured in an EC Decision made on 13 May 2009. The decision is that Inmarsat Ventures Ltd and Solaris Mobile Ltd have been selected as the successful applicants. This Decision³ ("the EC Selection Decision") confirmed the selection decision and identified the specific frequency bands awarded to each operator. The Selection Decision was also made conditional:

"upon no information in writing being provided, within 30 working days of the publication of the list of selected applicants by the Commission, by the relevant selected applicant to the effect that the applicant intends not to use the radio frequencies identified"

- 3.20 The formal Selection Decision, No. 2009/449/EC, was published in the OJ on 12 June 2009. In conjunction with the EU Decision, the EC Selection Decision requires that Member States grant the selected MSS operators an authorisation for CGC for their territory, with the terms and conditions of such authorisations to be determined by national and community law as well as the EU Decision.
- 3.21 It should also be noted that in September 2008, ICO Services Limited brought an action⁹ to the Court of First Instance ("CFI") of the European Communities seeking annulment of the EU Decision. More recently TerreStar Europe Limited announced that it has brought an action to the CFI, seeking the annulment of the EC Selection Decision. On 10 July 2009, the President of the CFI stated that he had decided not to grant interim measures to Terrestar but to hear the case under an expedited procedure. We will continue with the authorisation of 2 GHz MSS and CGC as

⁸ Minutes of the 14th meeting of the ECC document (06)097 Annex 14, reflecting the situation as of July 2006

⁹ <u>http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:006:0033:0034:EN:PDF</u>

required by the EU Decision and the EC Selection Decision but will, of course, take due account of any future judgment by the CFI.

Section 4

Non-Technical Conditions

Introduction

- 4.1 In this section we address the approach for including the non-technical conditions of the CGC licence, excluding fees which are the subject of Section 5, including the common conditions imposed by the EU Decision. We also consider the responses to Question 2 of our second consultation.
- 4.2 In particular, we address:
 - The requirement for CGC to constitute an integral part of MSS;
 - Interpretations in the Licence; and
 - Monitoring and enforcement of Decision No 626/EC/2008.
- 4.3 Respondents agreed with the our proposals for all of the above conditions except for concerns raised by responses on:
 - The requirement for CGC to constitute an integral part of MSS; and
 - The need for a separate and individual authorisation of the MSS satellite.
- 4.4 These concerns are discussed in turn in the following sub-sections. In addition, we state our decision in relation to those conditions where respondents did not raise any concerns, at the end of this section.

The requirement for CGC to constitute an integral part of MSS

- 4.5 Four responses, primarily from the terrestrial mobile operators, commented on the relationship between the CGC and the MSS satellite.
- 4.6 Three commented that the EU Decision requires a stronger relationship between the MSS satellite and the CGC and one agreed with Ofcom's interpretation. In particular:
 - Two responses raised concerns on Ofcom's understanding that the EU Decision does not restrict the CGC to carry the same services or applications as the MSS components and stated that the definition of the CGC (as given in the EU Decision and Ofcom's draft licence) includes the phrase "in order to improve the availability of the mobile satellite service". This, they believed, makes it necessary to restrict the CGC to provide only the same services, and, indeed, possibly to act as only a repeater of the satellite signal;
 - One response went on to state that the satellite element of the mobile satellite system should not be a simple "flag of convenience" for the CGC, to allow the CGC to be deployed for largely or wholly terrestrial usage and that CGC licensing should not permit:
 - the bulk of the awarded spectrum to be used for a service or technology unrelated to that provided over the satellite; nor

- the purchaser of a concurrent traded licence to operate a terrestrial system and service completely unrelated to the satellite licensee's systems and service.
- This response further argued that this interpretation could result in market distortions relating to spectrum already or planned to be awarded which is itself recognised as prime terrestrial spectrum;
- Another response went on to state that the EU Decision requires Ofcom to request technical information indicating "how particular ground components would improve the availability of the proposed MSS in geographical areas where communication with one or more space stations cannot be ensured with the required quality" and this should be part of the application process for CGC licensing;
- Another response stated that the proposed CGC base station power limit is high, in its view, given that CGC is only intended for in-building coverage and city areas where line of sight cannot be guaranteed and that there should be no need for macro cells as wide area coverage is provided by the satellite component (see also paragraph 6.41);
- A further response was fully supportive of Ofcom's understanding that the requirement for the CGC to be an integral part of the MSS derives from the need to prevent interference by the CGC into the satellite component.
- 4.7 We note, however, that the three responses that commented that a greater level of constraint should be placed on CGC operation, in terms of the services and content it should be permitted to carry, also argued that the spectrum should be charged at a rate which reflected the opportunity cost of mobile services operating in the region of 1800 MHz.

Ofcom position

Introduction

- 4.8 In considering our approach with regard to the requirement for CGC to form an integral part of the MSS, we have considered:
 - The requirements of the EU and RSC Decisions;
 - Our duties in relation to our spectrum management functions;
 - The practical consideration of CGC operation as it relates to the MSS satellite component.

Requirements of the EU and RSC Decisions

4.9 The EU Decision recognises that the authorisation of CGC relies mainly on conditions related to local circumstances and should, therefore, be granted on a national level¹⁰. The intention of the EU Decision was to base the process to select the MSS satellite operators on the capability of the satellite service alone; and the

¹⁰ EU Decision 626/EC/2008 recital (18): "The authorisation of such complementary ground components will therefore mainly rely on conditions related to local circumstances. They should therefore be selected and authorised at national level, subject to conditions set by Community Law."

Decision, whilst providing for a small number of necessary common conditions is intended to leave Member States flexibility in how to define the CGC licensing terms, subject to applicable national and European law.

- 4.10 In the development of the EU Decision there was some discussion on including an additional restriction to the CGC, limiting its use to act as simply a repeater of the satellite signal. This suggestion received support from some Member States, however, the majority of Member States argued that such additional restrictions could be inefficient and wasteful of spectrum and therefore these restrictions were not included in the final RSC or EU Decisions. Indeed, the intention of Member States not to restrict the use of the CGC to a mere repeater of the satellite signal manifests itself in recital (18)¹¹ of the EU Decision. There, the word "typically" and not "exclusively" is used to describe the use of CGC to enhance the availability of the satellite signal in a variety of areas where connection with the satellite could be problematic. Had the Community legislator intended to restrict the use of CGCs to a mere repeater function it would have expressed this intention in recital (18) by explicitly stressing that the use of CGCs was "exclusively" dedicated to the enhancement of the satellite signal.
- 4.11 It should also be noted that although the definition of CGC in the EU and RSC Decisions includes the phrase "in order to improve the availability of MSS", the definition of MSS¹² in these Decisions is that MSS is the combination of the satellite component and the CGC and not limited to the satellite component. Accordingly, any service carried over the CGC whatever content or application it carries, would by definition improve the availability of MSS under this definition.
- 4.12 We believe, therefore, that there is no inconsistency between allowing flexibility in the use of CGC and the requirements of the EU and RSC Decisions.

Our duties in relation to our spectrum functions

- 4.13 In this section we consider whether allowing flexibility in the use of CGC is appropriate given our duties in relation to our spectrum functions.
- 4.14 Given the requirement to authorise CGC in accordance with European and national law we need to consider our general duties under UK law in relation to our spectrum functions when authorising CGCs as well as our obligations under the European Framework.
- 4.15 Under UK law we are required to secure optimal use of the radio spectrum in the interests of citizens and consumers having regard in particular to the desirability of promoting:
 - a) efficient management and use of the spectrum for wireless telegraphy;
 - b) economic and other benefits that may arise from the use of wireless telegraphy;

¹¹ Recital (18) of the EU Decision states that "Complementary ground components are an integral part of a mobile satellite system and are used, typically, to enhance the services offered via the satellite in areas where it may not be possible to retain a continuous line of sight with the satellite due to obstructions in the skyline caused by buildings and terrain."

¹² "systems capable of providing radiocommunications services between a mobile earth station and one or more space stations, or between mobile earth stations by means of one or more space stations, or between a mobile earth station **and one or more complementary ground based stations used at fixed locations**" (emphasis added)

- c) development of innovative services; and
- d) competition in the provision of electronic communications services.
- 4.16 Similarly, Section 4 of the 2003 Act implements Article 8 (policy objectives and regulatory principles) of Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services (the "Framework Directive")¹³. This sets out the objectives that national regulatory authorities must take all reasonable steps to achieve. These include the promotion of competition in the provision of electronic communications networks and services by, among other things, encouraging efficient investment in infrastructure and promoting innovation, and encouraging efficient use of radio frequencies; and contributing to the development of the internal market by, among other things, removing obstacles to the provision of electronic communications networks and services at a European level, encouraging the interoperability of pan-European services and ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services.
- 4.17 Article 8 of the Framework Directive also requires EU Member States to ensure that, in carrying out their regulatory tasks, national regulatory authorities take the utmost account of the desirability of making regulations technologically neutral.
- 4.18 If we were to restrict the use of CGC to merely repeating the satellite signal or carrying the same services and applications, this would unnecessarily restrict the range of services and applications available to citizens and consumers and forego the greater economic and other benefits that would otherwise have arisen from any services of higher value for the duration of the CGC licence. It would also represent an inefficient use of the spectrum as we would be unnecessarily restricting the ways in which the spectrum could be employed in service delivery.
- 4.19 Further, given that the lifetime of a satellite is typically 15 years, limiting the CGC to provide the same services as the satellite could also hold back any innovation in the development of CGC services, which would be denied access to spectrum and prevent the introduction to the market of competing CGC services. For example, this would prevent the CGC offering services targeted at the particular market in which the CGC is located, unlike the satellite service that will likely provide services across wider geographic areas and therefore would need to provide services of broader appeal.
- 4.20 One stakeholder has argued that Ofcom's interpretation of the term integral could result in market distortions to spectrum already or planned to be awarded. By permitting a wider range of services and applications to be carried on the CGC, rather than imposing any additional limitation on its permitted use, the set of potential competitors to the CGC networks is increased. Hence, our decision has the potential to increase competition in a larger number of existing markets than would otherwise have been the case. While an increase in competition can have a negative impact on existing competitors, this generally should be more than offset by the positive impact of greater competition on consumers and citizens. Provided our decision does not unduly favour some competitors does not suggest that we should prevent more flexible use. Indeed, a failure to do so on this basis could be considered inconsistent without duty to promote competition in relevant markets.

¹³ http://eur-

lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:108:0033:0050:EN:PDF.

Practical considerations

- 4.21 We now consider the practical considerations which underlie the need for the CGC component to be an integral part of MSS.
- 4.22 MSS systems incorporate small user terminals with low discrimination antennas in order to support mobile operation, which results in the need for exclusive assignments of frequencies to a single MSS with no sharing possible with other MSS or terrestrial based radio services. Studies carried out in the ITU have concluded, however, that sharing between terrestrial mobile services and MSS is possible when both are under the control of the same frequency management system that ensures, through its frequency reuse pattern, that the CGC and the satellite do not use the same frequencies, in the same location, at the same time.
- 4.23 It is desirable and probable that MSS satellites will improve their spectrum efficiency through frequency reuse and deploy spatially separated spot beams in order to achieve this. Spot beams using the same frequencies must therefore be geographically separated and at any particular location on the ground some of the assigned MSS frequencies will be unused by the satellite and would be available for the CGC.
- 4.24 The amount of spectrum available to the CGC and the exact frequencies available in any particular location are dependent of the frequency reuse pattern employed by an MSS satellite component and the size of the satellite spot beams. Sharing of the MSS spectrum is only possible therefore with very close co-ordination between the CGC and satellite component. Any changes in the location of the MSS satellite spot beams or its frequency reuse pattern, as a result for example of changing demand, could result in the need to change the CGC spectrum usage and therefore needs to be managed by the same resource that manages the MSS satellite component.
- 4.25 This is why CGC needs to be an integral part of the MSS and is the basis of our interpretation of the definition of CGC in the RSC and EU Decisions and in the common condition b) of Article 8 (3) of the EU Decision and was a key subject of discussion at the working groups that developed the RSC and EU Decisions.
- 4.26 Indeed, minutes of the 2 GHz MSS expert Group of November 2006 record that the group concluded that¹⁴:

"Even if the operators for the satellite and CGC networks are different, the CGCs shall have to be controlled by the satellite resource and network management system to avoid harmful interference".

- 4.27 Hence, there is no inconsistency between allowing flexibility and ensuring the practical requirements of integral use are met. Provided the CGC and MSS operators coordinate their spectrum use the services provided by these two components can be different.
- 4.28 Therefore, in summary we do not believe that stakeholders have raised, nor have we identified, any balancing benefits that imposing such a restriction on CGC operation would bring to UK citizens and consumers.

¹⁴ <u>http://circa.europa.eu/Public/irc/infso/radiospectrum/library?l=/public_documents_2006&vm=detailed&sb=Title</u>

4.29 We therefore conclude that it would be in the best interests of UK citizens and consumers and help secure optimal use of the radio spectrum as required by our statutory duties not to restrict the range of CGC services or applications to those carried by the satellite component.

Other issues related to the understanding of the term integral

- 4.30 On the specific issue of the potential requests for technical information on "how particular ground components would improve the availability of the proposed MSS in geographical areas where communication with one or more space stations cannot be ensured with the required quality", one respondent alleged that we were under an obligation to request this type of information. However, we note that there is nothing in the operational part of the EU Decision that imposes any such obligation on us to do this. Only the recitals of the EU Decision mention specific requests that could be made by competent authorities with regard to the provision of technical information. The relevant recital (18) states that the selection and authorisation of CGC is "without prejudice to specific requests made by competent national authorities" requesting such technical information. Recital (18) therefore indicates that Member States may, if they desire, request such technical information but it does not indicate that it is a requirement to do so.
- 4.31 On the issue of the possibility of the MSS satellite being used as 'a flag of convenience' (see paragraph 4.6, second bullet), we note that the EU process requires that the MSS operators make a range of commitments in terms of the services they will provide over the satellite, including coverage conditions and, we believe, this will ensure a strong satellite component of the MSS. The delivery of these mandated services will necessarily impact the availability of spectrum for use in CGC. We do not believe that there is any need, nor objective justification for us to include any specific limitation on the spectrum used by the CGC to avoid this eventuality.
- 4.32 In relation to base station power limits (see also paragraph 6.41) as outlined in detail above, Ofcom does not agree that CGC is intended solely for improving coverage inside buildings and in city areas and could potentially be used for a wide range of applications and services. We therefore consider that the suggested restriction would not be likely to secure optimal use of the spectrum in the interests of UK citizens and consumers, and would therefore be inconsistent with Ofcom's duties and functions.

Conclusion

- 4.33 We have, therefore, concluded that we should authorise the CGC licensee without additional constraints such as a restriction to provide the same service and application as the satellite component, recognising that if they chose to, MSS operators would be able to limit their use of CGC in such a way. An example of the rights and obligations included in the licence can be found in Annex 5.
- 4.34 In line with our principal conclusion that CGC licensees should be permitted to provide any service or application, we further conclude the CGC component should be allowed to:
 - Operate on a pre-determined sub-set of frequencies assigned to the MSS operator under the EU process;
 - Provide a different set of services and applications to the satellite component; and

- Operate to a different air interface standard to the satellite component.
- 4.35 The operator of the CGC must, however, have the formal and legal right to use these frequencies by virtue of:
 - being the selected MSS operator; or
 - as a CGC party to a trade with an MSS operator.
- 4.36 The MSS operator must also retain the rights and obligations of the CGC licence post-trade, as we concluded in our first Statement, through a concurrent trade.

The need for a separate and individual authorisation of the MSS satellite

- 4.37 Two respondents raised questions about the need for a separate and individual authorisation of the MSS satellite. In particular:
 - Solaris Mobile stated its belief that it would be more efficient for us to include the common conditions required by the EU Decision in the licence exemption for the end user handsets;
 - Inmarsat requested that the MSS satellite be authorised under a general authorisation aimed at the selected MSS operators rather than an individual licence.

Ofcom position

- 4.38 On the issue of an approach based on us issuing a general authorisation rather than an individual authorisation, it is not possible under the Authorisation Directive to issue a general authorisation addressed to a specific entity, as by its nature it is addressed to anyone meeting the technical requirements contained in the general authorisation. In particular, general authorisations for spectrum use in the UK are implemented through licence exemption. It is however, possible to include, as a provision of the licence exemption, that the terminal be used only to connect to an authorised network. Therefore if MSS satellites were authorised it would be possible to limit the use of licence-exempt equipment for use to only the authorised MSS or CGC network.
- 4.39 It is also not possible for us to adopt the approach, suggested by one response, of incorporating the required common conditions of the EU Decision into the licence exemption of the user handset, as this would place an obligation on consumers that they would have no ability to meet. For example, the requirement to launch the MSS satellite within 24 months of the selection of the MSS operators.
- 4.40 In addition, if we were to adopt such an approach the UK would be unable to carryout the monitoring and enforcement obligations imposed on it by the EU Decision. In particular, we would be unable to:
 - Require the MSS operator to provide us with an annual report and would have to rely solely on its willingness to comply; and
 - Enforce conditions on the MSS operator, as required by the EU Decision, through remedies which would be effective, dissuasive and proportionate. In particular, we would not be able to impose any fines on the MSS operator and would have only one remedy open to us in the event of a breach of the licence conditions,

which would be the removal of the exemption regulations for the handsets, thereby criminalising any consumers who continued to use these handsets.

- 4.41 Ofcom considers this to be an unacceptable approach to the implementation of the EU Decision as it would not meet the UK's obligations under this Decision.
- 4.42 As previously discussed in our second consultation document, Article 7 of the EU Decision stipulates a number of common conditions that Member States are required to ensure are reflected in the authorisation of the successful MSS applicants. We have therefore concluded that these conditions need to be attached to a separate and new authorisation of the satellite component. In part, this is because the common conditions in Article 7 relate primarily to the satellite component. In addition, there is no requirement for a successful applicant to deploy CGC in the UK; accordingly, we could not be sure of meeting our obligation to impose these common conditions if we sought to implement them via the licensing arrangements for authorisation of CGC.
- 4.43 We therefore are examining, with BIS, the need for any actions arising from Article 7 of the EU Selection Decision in relation to authorisation of the selected MSS satellite operators. Any such authorisation is likely to be based on a Statutory Instrument adopted by BIS under the European Communities Act 1972.

Decision on other non-technical conditions

4.44 In addition, as respondents did not raise concerns with the following non-technical conditions, we have concluded that we will proceed as we proposed in our second consultation.

Interpretation of the licence

- 4.45 We conclude that we will, as set out in our second consultation, make a number of additions to the interpretation of terms in the CGC Licence, in particular:
 - A definition of a "mobile satellite component" for which we propose: "all elements required to provide a mobile satellite service and shall include the space station or stations and gateway earth stations";
 - A definition of a "space station" for which we propose: "a station located on an object which is beyond, is intended to go beyond or has been beyond, the major portion of the earth's atmosphere";
 - A definition of a "station" for which we propose: "one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service".

Monitoring and enforcement of Decision No 626/EC/2008

4.46 We conclude that we will, as set out in our second consultation, include an additional reporting requirement on the CGC licensee at condition 5 (e) under the "special conditions relating to the Operation of the Radio Equipment" in the CGC Licence schedule. This will require the CGC licensee to provide us with an annual statement of compliance against the relevant CGC common conditions.

Section 5

CGC Licence Fees

Introduction

- 5.1 In our initial consultation⁵ we identified AIP fee rates for spectrum bands which have similar technical characteristics to the 2 GHz CGC spectrum. Based on this information we proposed that the most appropriate AIP reference point for CGC fees would be the use of spectrum at or around 1800 MHz. We therefore proposed a CGC fee rate of £554,000 per 2 x 1 MHz for a UK-wide authorisation and we noted that these charges would be subject to review, as are all AIP charges.
- 5.2 We concluded in our first Statement⁴ that the CGC Licence will be subject to AIP and will be tradable, although we also concluded that trading will be limited to concurrent trades to ensure that the obligation for CGC to remain integral to the MSS is retained. In this context the term "integral" addresses the need for CGC to co-ordinate its frequency use closely with the MSS satellite component as discussed in more detail in paragraphs 4.8 to 4.36. We do not however believe that it is necessary to restrict the CGC to carry the same content, services or applications as the MSS satellite component.
- 5.3 In light of this conclusion, we have now reviewed the responses and evidence received from stakeholders which includes:
 - responses to our initial consultation, which closed on 25 March 2008,
 - responses to a subsequent request for further information,
 - additional representations we have received subsequent to the closure of this first consultation, and
 - further comment received as part of responses to our second consultation (although we did not at this time consult further on fees).

Summary of responses

Responses to the first consultation

- 5.4 Of the 18 responses received to the first consultation:
 - Three responses supported the use of an AIP fee level similar to that of GSM 1800. However, of these:
 - two responses felt that this was the lowest fee rate that should be set for CGC Licences;
 - one response, whilst agreeing with the proposed fee level, proposed a more formal linkage to the terms and conditions associated with the current GSM 1800 licences, including not permitting trading of the CGC Licence.
 - Nine suggested that the reference point should be zero given the constraints on use of the spectrum due to the RSC and EU Decisions and eight of these argued

that even if this view was not accepted by Ofcom then a lower rate than we proposed should be charged;

- Two argued for a higher rate given that the 2 GHz spectrum is more akin to 3G than 2G spectrum. One further commented that CGC would be competing directly with 3G services and that the 3G operators paid £22.5 billion for these licences by auction. Setting the CGC fee at the level of the GSM 1800 would, in its view, be completely inappropriate and would distort competition.
- 5.5 Of those responses arguing for a lower rate, key points made were that:
 - The constraints on the use of the spectrum for anything other than MSS are so stringent that the opportunity cost of the spectrum will be very low or close to zero;
 - In addition to the constraints on use imposed by the EU process, the adjacent spectrum is under-utilised and the respondent detected little market interest in additional spectrum for 3G outside of the UHF (digital dividend spectrum);
 - As a result of the EU process, Ofcom should authorise the CGC through a general authorisation and that therefore under the Authorisation Directive we must limit the fee to (administrative) cost recovery only;
 - There are cases where Ofcom has not set the licence fee based on the opportunity cost for terrestrial cellular networks. For example, WiFi networks are licence exempt and the fee for the 3.4 GHz BWA operator is equivalent to an annual charge of £69,550 per 2 x 1 MHz;
 - That we should consider the costs of the overall infrastructure of MSS networks including CGC. This response argued that such costs should be taken to include the manufacture, launch and operation of the satellite in addition to the CGC network. In addition, it was also argued that the extremely high upfront MSS costs, the lengthy lag between the time capital is required to develop the satellite network and the time when commercial revenues can be expected to recover the investment, all generate significant incentives to make the most efficient use of the spectrum;
 - Ofcom should not directly compare terrestrial mobile networks such as 2G with CGC as at any particular time some of the licensed CGC spectrum would be in use by the satellite and therefore the CGC would not have the same capacity;
 - The fee level should instead be £140,000 per 2 x 1 MHz;
 - Setting a fee at the level proposed would materially affect the viability of CGC deployment in the UK, or even rule out UK deployment completely.
- 5.6 Respondents who argued this last point made the following specific points:
 - The proposed fee level would add to the constraints imposed by the EU in significantly affecting the return on investment of the MSS/CGC business;
 - Any fee level charged should not inhibit service rollout in the UK or other European Member States;

- As Ofcom was party to the EU Decision that designated the 2 GHz bands to MSS, with or without CGC, it should not introduce regulations that prevent CGC systems from being deployed by setting fees at too high a level.
- 5.7 Several responses offered their assessment of what the spectrum cost implications would be if all Member States priced their CGC spectrum on a similar basis to the fee proposed for the UK spectrum. These assessments were, variously, £183m per annum; £225m per annum; £233m per annum; and €3365m over a 15 year period.
- 5.8 In our consultation document, we asked a particular question of respondents that if they believed that setting fees at the proposed level would result in CGC systems not being deployed, for them to provide their reasons and full supporting evidence including a detailed business case.
- 5.9 Whilst a number of respondents replied to this question, the level of detail contained in these responses was not sufficient for us to make a reasonable assessment of the impact of the proposed fee level on the MSS or CGC business case (see Annex 4 for further details).

Responses received to our request for information

- 5.10 Given these responses, we made, in addition to the question contained in the first consultation and discussed above, a further request for information (RFI) to all respondents to the consultation, as it this was in advance of the deadline for applications to the EU process and we did not therefore know who the prospective MSS operators were. In this RFI we sought information on the business plans from prospective applicants to the EU process in order to collect evidence to test the arguments made that the level of CGC fee was so high that it would hinder or prevent the deployment of CGC in UK. For instance, MSS operators were asked to provide forecasts of demand, prices, costs and revenues in relation to potential CGC services.
- 5.11 We received a small number of responses to this request, none of which provided a sufficient level of detail to make any better assessment of the impact of the proposed fee level on CGC deployment in UK. Further none provided any compelling evidence that this was a significant risk.

Inputs received subsequent to our consultation on fees

- 5.12 We also received a number of inputs on the issue of fees following the closure of both the consultation period of the first consultation and the deadline given in the RFI. The paragraphs below summarise inputs that provided substantively different arguments to those listed above.
- 5.13 Inmarsat argued that the fee level should be lower than we had proposed in our consultation based on the fact that the spectrum is not unencumbered and that the CGC offerings are complementary to the associated satellite services.
- 5.14 Inmarsat's contribution also suggested that the closest indicator should be the value of 1452-1492 MHz spectrum which was the subject of an auction in April 2008. Inmarsat felt that this spectrum has a higher value than 2 GHz CGC because it is not subject to the same operational constraints and is a closer benchmark for a combined satellite and terrestrial application including mobile TV. Based on this approach, Inmarsat proposed a fee of around £13,900 per 2 x 1 MHz per annum.

- 5.15 Inmarsat also proposed that any CGC licence fee should be introduced over time, taking into account the roll-out of the CGC business. They referred to the gradual increase in spectrum licence fees for the 1800 MHz 2G systems from their introduction in 1996 compared to the current rate.
- 5.16 One stakeholder, Solaris Mobile, challenged the principle of applying AIP to the CGC spectrum. It argued that, due to the constraints in the EU Decision, trading of the CGC spectrum could only take place among four or fewer MSS operators. This small number of operators, it said, means that the Coase Theorem (see explanation given in footnote 15) is more likely to hold and trading can be relied upon to achieve efficiency, without the need for AIP.
- 5.17 Solaris Mobile also argued that, because the proposed AIP fee rate for the 2 GHz MSS award reflects costs of an outdated technology that will not be used with the CGC spectrum, the proposed level of AIP fees will not be appropriate.
- 5.18 Solaris Mobile further argued that setting an AIP rate for 2 GHz CGC spectrum in the UK will have distortionary effects where other European jurisdictions do not charge fees to reflect the opportunity costs of the spectrum concerned.

Ofcom Position

- 5.19 We have previously concluded in our first Statement⁴ that we will charge fees for CGC based on AIP. In this Statement we address the issue of the level of the fee.
- 5.20 In the following sub-section we address the following issues in turn:
 - The case for charging AIP for tradable licences. We explain why we think it is appropriate to apply AIP given that 2 GHz CGC spectrum is tradable (paragraphs 5.22-5.27);
 - The appropriateness of the proposed AIP fee level. We set out the considerations that are relevant to setting an appropriate AIP fee rate, including the appropriateness of phasing in the fees (paragraphs 5.28- 5.41);
 - A discussion of the wider impact of our decision on the EU market (paragraphs 5.43 -5.64); and
- 5.21 We then set out our conclusions on the fee rate to be charged for CGC Licences at the end of the section (see paragraphs 5.65 5.75).

The need for pricing where licences are tradable

5.22 One stakeholder, Solaris Mobile, challenged the application of AIP on the CGC spectrum. It argued that, due to the constraints in the EU Decision, trading of the CGC spectrum could only take place among four or fewer MSS operators. This small number of operators, it said, means that the Coase Theorem¹⁵ is more likely to hold and that trading can be relied upon to achieve efficiency, with no need for AIP.

¹⁵ The Coase Theorem states that, once well-defined rights are assigned and tradable, in an abstract world with zero transaction costs, bargaining would lead to an efficient allocation regardless of how the rights are initially assigned. Coase defined transaction costs as the costs of using the price mechanism, including search and information, bargaining and decision, and policing and enforcement costs. In the real world, he emphasised, positive transaction costs may prevent an efficient allocation

- 5.23 As noted in our conclusion in paragraph 4.35, the MSS operators may not in practice be the only parties to the trades in CGC spectrum as Solaris Mobile had assumed. However, more generally, the question of whether transaction costs are smaller with fewer traders depends on the facts of each case. On the one hand, as noted by Solaris Mobile, with a smaller number of entities fewer transactions may be required to achieve an efficient outcome.¹⁶
- 5.24 On the other hand, fewer potential entities may lessen the competitiveness of the market and increase the scope for bargaining between traders. This can make agreements harder to reach, as bargaining between traders is required to identify an appropriate price. Moreover, if fewer parties results in fewer transactions, the resulting market may be 'thin' and provide little or no information about prices or value. Therefore, where there are fewer potential entities, agreements will reflect the negotiating skill of each party gains from trade can be split in several ways, bargaining costs will be incurred and in some cases these costs may be significant. By contrast, when there are a large number of traders and trades, the scope for bargaining over prices is much lower, traders tend to take prices as given, and therefore the costs of transacting will be reduced.
- 5.25 Ofcom's current view on applying AIP where licences are tradable¹⁷ is that in the early stages of development, spectrum markets may be less than fully effective at promoting efficiency, due to the presence of transaction costs, asymmetric information, and the lack of good price information. In a less than fully effective market, we believe therefore that AIP may promote economic efficiency over and above spectrum trading. Importantly, provided AIP is set appropriately conservatively, AIP should not have any harmful effects on the efficient use of the spectrum. Our current policy, therefore, is to charge AIP for tradable licences.
- 5.26 Going forward, we are reviewing our approach to spectrum pricing more generally as part of the Strategic Review of Spectrum Pricing (SRSP). As part of this review we will be revisiting Ofcom's spectrum pricing policy, including our general approach to setting AIP where the licences concerned are tradable and or liberalised, later this year. The conclusions of this general review will apply to all specific fee rate reviews undertaken subsequently.
- 5.27 We therefore conclude that it remains appropriate at this point to charge AIP for 2 GHz CGC Licences as for other tradable licences.

Appropriateness of the AIP rate

5.28 We now turn to the issue of the choice of AIP fee level and the associated opportunity cost of the 2 GHz spectrum. As context for our consideration of the issues raised in responses, we note that the AIP fee rates we charge are informed by our assessment of the opportunity cost of spectrum use and that a key input to this assessment is the range of alternative uses that could be made of the spectrum. As a statement of general principle, there can be limitations on making efficient changes to the current use of some spectrum and these limitations can arise from national or

¹⁶ For instance, in the example provided by Coase if noise resulting from the operation of a confectioner's machinery disturbs only one neighbour, the costs involved in reaching an agreement, such as to compensate the neighbour for the noise, would likely be lower than if the noise affects an entire neighbourhood.

of rights. Whether they do so in practice depends on the facts of each particular case. Coase, R. *The Firm, the Market and the Law*; The University of Chicago Press (1988), pages 6, 15, 178.

⁷ http://www.ofcom.org.uk/consult/condocs/spec_pricing/statement/statement.pdf

international constraints. In consequence, there are two distinct opportunity costs that may need to be considered in coming to a conclusion:

- Short to medium term opportunity cost which takes account of any existing constraints on the use of the spectrum: and
- Long term opportunity cost which considers a wider range of alternative uses where these are presently excluded due to the constraints currently imposed.
- 5.29 However, this distinction between the assessments of short term and long term opportunity costs is unlikely to be material in the current context because we consider that there will be few constraints on the potential use of the 2 GHz spectrum that is licensed to CGC.
- 5.30 In our first consultation document we proposed a fee level based on a reference point of the1800 MHz AIP fee rate of £554,000 per 2 x 1 MHz. In that document we proposed that the 1800 MHz AIP rate was a reasonable reference point because it lies within a range of existing AIP fee rates paid by users of spectrum with similar propagation characteristics.¹⁸ We noted that the 1800 MHz rate is therefore representative of a range of potential uses and underlying opportunity costs. Accordingly, we considered that in the context of setting a single fee rate for 2 GHz CGC spectrum, where potential future uses remain uncertain, the 1800 MHz rate, which sits in the lower half of the range of AIP rates identified in our first consultation of £473,000 to £792,000, represents a reasonable reference point to consider when setting fees for 2 GHz CGC.
- 5.31 As noted above, a number of responses (largely from the satellite community) argued that the AIP should be set lower than this proposed level, whilst a number of others (mainly from Mobile Network Operators ("MNOs")) argued that the proposed level was appropriate, or should be set higher. In considering the points raised we have paid attention to a number of factors which could influence the opportunity cost associated with this spectrum. Some factors do indeed argue for a lower AIP rate whereas others argue for a higher AIP rate. As we make clear below, the nature of the way in which this spectrum might be used means that there is, inevitably, a significant degree of uncertainty over the opportunity cost and this needs to be recognised in coming to a balanced view on the most appropriate way forward.
- 5.32 Some responses argued that the requirement for CGC to be integral to the MSS should imply a zero opportunity cost. One response specifically quoted the Cave Review of March 2002¹⁹ in support of this position; namely that "for some spectrum uses, though, the opportunity cost will be zero. This will occur where use of a particular band in the UK has been exclusively defined through international agreements and incumbents have no scope to change their spectrum use²⁰".
- 5.33 However, for the reasons discussed in section 4, we consider that the requirement for CGC to be integral to the MSS places only a limited constraint on CGC use, namely that it must co-ordinate its use of the MSS frequency assignment with the MSS satellite component. Further, the definition of "mobile satellite systems" given in

¹⁸ In Ofcom's initial consultation, we identified spectrum bands with similar propagation characteristics to 2 GHz CGC, including similar spectrum bands used for business radio, public wireless mobile radio, and MOD spectrum.

¹⁹ We also note that the Government did not comment on this issue in its response to the Cave Review.

²⁰ Review of Radio Spectrum Management, March 2002, paragraph 66.

the EU Decision²¹ makes it clear that the MSS can be used to provide any radiocommunication service, and is not limited to the ITU Radio Regulations definition of mobile satellite services.

- 5.34 Therefore, we do not consider that there will be a constraint on service provision using spectrum for CGC once this has been co-ordinated with the frequency assignment of the satellite component. The constraint on the service that can be provided by CGC and the limited scope for change perceived by some stakeholders, and used by them to argue for a zero opportunity cost, does not, in our view, exist. However, even was such a constraint to exist, for the reasons set out in pages 22-24 of our first Statement we would still consider it appropriate to charge on the basis of AIP, although we would have to consider the specifics of the case in determining what level of AIP would be appropriate.
- 5.35 The respondents that argued for a lower AIP rate drew attention to a number of other spectrum bands which they felt would provide more appropriate reference rates than the 1800 MHz spectrum. These included the auctioned spectrum at 1452 1492 MHz (the "L-Band award") and the auction for the Broadband Wireless Access (BWA) licence at 3.4 GHz spectrum, which resulted in staged payments every five years.
- 5.36 We have considered the price of spectrum revealed through auctions as an input to our assessment. However, a great deal of care is required when interpreting their relevance because of the specific circumstances surrounding each case. In the case of the UK L-Band award we note that its use is not harmonised, either by regulation or by industry across Europe or elsewhere. Hence the price paid for in the L-Band award is unlikely to be indicative of the opportunity cost in other bands which have been harmonised or might expect to be (e.g. 1800 MHz and 2 GHz spectrum). In particular, since the 2 GHz spectrum that will be licensed for CGC use is available at the same time across the whole of the EU the scope of potential harmonisation benefits that could be exploited would appear to be significantly greater in the case of the 2 GHz MSS CGC spectrum than in the case of the L-Band award.
- 5.37 In the case of 3.4 GHz, some characteristics of this spectrum are different to those at 2 GHz, for example there are differences in the radio propagation between the two bands. In addition, the 3.4 GHz spectrum was the subject of an auction at a time when mobile use was not anticipated and there was little prospect of harmonised use across Europe."
- 5.38 Another possible comparator auction, not mentioned by those respondents arguing for a lower AIP but raised by another respondent arguing that the AIP for CGC should be set higher, is the 3G auction held in 2000. Indeed, it could be argued that this auction of the 2.1 GHz (3G) licences might be more relevant since the CGC spectrum at 2 GHz is immediately adjacent to the existing 2.1 GHz licences used for 3G and has similar technical licence conditions. However, the prices paid for the 3G licences in 2000 reflected the specific market circumstances at that time. Moreover, there is a question over the extent to which the 2 GHz CGC spectrum will be able to exploit the benefits of European wide harmonisation to the same extent as has been possible for existing 3G use (see further discussion of this issue below).

²¹ "mobile satellite system" shall mean electronic communications networks and associated facilities capable of providing radiocommunications services between a mobile earth station and one or more space stations, or between a mobile earth station and one or more complementary ground components used at fixed locations. Such a system shall include at least one space station.

- 5.39 One respondent noted that there are specific cases where we have not charged AIP. In particular, this respondent quoted the case of WiFi, which is licence exempt. However, the decision to exempt WiFi use from licensing was taken by us in line with our obligations, under the Authorisation Directive and under s166 of the Communications Act 2003, to exempt uses which are not likely to involve any undue interference with other spectrum use. In the case of CGC base stations this is clearly not the case and therefore we cannot licence exempt CGC use.
- 5.40 Turning to other points raised in favour of a lower AIP rate:
 - We have no evidence that supports the assertion that the adjacent spectrum at 2.1 GHz is likely to be "under-utilised" now and in the short to medium term. Indeed, the use of this spectrum for mobile broadband has expanded very rapidly in the last year or so;
 - On the suggestion that we should issue a general authorisation rather than an individual authorisation for CGC and therefore should not charge a fee under the Authorisation Directive, as already discussed in paragraph 4.38, it is not possible to limit a general authorisation to individual companies and therefore this is not an approach that we can take;
 - We decided in our first Statement that fees would only be payable in respect of spectrum that is licensed to the CGC component. Hence, it should not be the case that a CGC operator would incur fees in respect of spectrum used by the satellite where the MSS operator segments its use of spectrum as between the CGC and satellite components in advance.
- 5.41 It was also suggested that the existence of high up-front costs of MSS and CGC implementation should sufficiently incentivise MSS operators to exploit the spectrum without the need to apply AIP. We do not agree with these suggestions.
- 5.42 We agree that all businesses have an incentive to get the maximum return for their overall investment, including the up-front costs, and this will be true for any CGC licensee. However we do not consider that this incentive on its own, with no price reflecting the value of the spectrum would ensure fully efficient decisions about all inputs including spectrum. That is, if there is no price attached to spectrum that reflects its value to society, a user may take the available amount of spectrum as a given, and then deploy other inputs to make the most use of it, taking the costs of those inputs into account and trading them off against one another. The introduction of a price for spectrum that reflects its value is more likely to encourage the user to take that cost into account on an equal basis with the costs of other inputs. For example, a user may decide to spend slightly more at the margin on equipment if a reduction in the spectrum requirement, and hence a saving in spectrum costs, justifies it. Conversely, if there is a price for the spectrum that reflects its value, and the user decides in light of that to use all of the available spectrum, that decision is more likely to have been taken on the basis that all of the spectrum use, and attendant spectrum cost, is justified by the expected benefits, whether savings in other input costs or increases in services that can be delivered.
- 5.43 A further suggestion from respondents arguing for a lower AIP rate was that the proposed AIP fees would have the effect of preventing commercial use of the CGC spectrum, thereby leaving it unused. We recognised the potential for this to happen and, for this reason we requested relevant information from stakeholders in order to allow us to assess the risk. However, the responses received did not provide meaningful evidence in support of such assertions (see paragraphs 5.9 5.11, and

A4.34 - A4.52). Nevertheless, as discussed further below, this is an issue which we intend to keep subject to review.

- 5.44 One respondent arguing for a lower fee noted that the 1800 MHz fee rate was inaccurate because it is based on out-dated technology and should not, therefore, be used to set AIP for CGC Licences. We recognise that the AIP rate for the 1800 MHz frequency band set in 1998 (and reviewed in 2005) was based on the estimated marginal valuation of the spectrum concerned based on GSM technology and that since then, costs of networks that may be deployed to use this and other relevant spectrum may have changed as new terrestrial network technologies have developed, implying potentially different marginal valuations for spectrum at 1800 MHz.
- 5.45 However, as noted in our consultation on the application of spectrum liberalisation and trading to the mobile sector, the opportunity cost of 1800 MHz spectrum is likely to have risen since the current conservative AIP rates were set²². Therefore this consideration would, taken in isolation from other factors, would argue for a higher AIP rate and not a lower one.
- 5.46 Turning to those respondents that argued for a higher AIP rate, they raised two interrelated issues, namely that:
 - The technical conditions in the CGC licence imply fewer constraints than apply to the 1800 MHz licences; and
 - A reference point based on 3G usage would be more appropriate.
- 5.47 Some respondents argued that the opportunity cost of the CGC spectrum should, all else being equal, be higher than that of the 1800 MHz spectrum since it will be subject to fewer constraints as compared to the 1800 MHz spectrum (which is currently constrained in terms of the technology that can be operated and is not tradable).
- 5.48 In this context, one stakeholder proposed that there should be a more formal link with the conditions of the 1800 MHz Licence (including not permitting trading of CGC Licences). While we accept that the differences between the CGC and 1800 MHz Licence conditions will affect the relative opportunity cost of the two spectrum bands, as discussed in our first Statement⁴ we see no benefit to UK citizens and consumers in restricting the CGC Licence by not permitting trading or restricting its use.
- 5.49 The argument that a reference point based on the auction outcome for 3G would be more appropriate is based on the observation that the CGC licence conditions would, at face value, allow the CGC spectrum to be used for very similar services and applications as the existing 3G spectrum at 2.1 GHz. We understand this argument and recognise that setting the AIP fee for 2 GHz MSS at the 1800 MHz reference rate, which reflects 2G technology, could understate the opportunity costs of the 2 GHz CGC spectrum in 3G-type uses. However, this observation needs to be tempered with the counter points, discussed further below, that:
 - The value of spectrum will depend on the extent to which it becomes possible over time to access the benefits of harmonisation; and

²² ibid section 8.31

- The nature of risks that might attach to differences in the licence conditions as between the 3G Licences at 2.1 GHz and the CGC Licences.
- 5.50 A significant driver of the value of spectrum used for mobile communications and broadcasting in the EU arises from the scope for harmonised use throughout the European (and sometimes global) market. This is a feature of key mobile communications bands such as 900 MHz, 1800 MHz and 2100 MHz, as it enables the deployment of handsets in a given market to benefit from scope and scale economies, and facilitates international roaming.
- 5.51 However, there are a number of uncertainties over the timing and extent of harmonisation benefits that CGC deployments will be able to exploit. On the one hand, the RSC and EU Decisions harmonise and make available the 2 GHz spectrum at the same time in all countries across the EU; and the EU Decision has now assigned this spectrum to two operators, each of whom can exploit this spectrum across the EU. These circumstances create the opportunity to access and exploit the advantages of harmonisation on this scale.
- 5.52 On the other hand, as we have noted in paragraphs 4.8 4.12, the implementation of the RSC and EU Decisions in respect of the permitted uses of spectrum for CGCs may vary by administration. This has been underlined by our own consultation responses, where different views have been expressed on the appropriate scope of licensing in the UK. In Europe, most Member States have yet to set out their authorisation regime in respect of CGC spectrum. To the extent that some countries adopt a different, and more restrictive, approach to CGC authorisation, then this could reduce the scale of harmonisation benefits and the size of a future EU market in 2 GHz user equipment.
- 5.53 The ability of the operators to exploit the harmonisation benefits will depend, in part, on the response of the vendors in the relevant equipment and device manufacturing markets. It is unlikely that manufacturers will commit to production until the scale of potential CGC roll-out across multiple EU countries is clearer (although the fact that this band is immediately adjacent to the existing 3G bands may help in this regard). Accordingly, this market is unlikely to develop until the uncertainties surrounding the authorisation regimes in at least some Member States are removed.
- 5.54 The degree to which the existing mobile spectrum bands can be taken as a comparable reference point for the 2 GHz spectrum relates to the risks created by differences in the licence conditions. On the one hand, the technical licence conditions in the CGC licences are very similar to the current 3G licences. On the other hand, there are a number of non-technical licence conditions that, by definition, could expose the CGC operators to risks which are not relevant in the case of the 3G licensees.
- 5.55 In particular, the need for the CGC to remain integral to the MSS satellite component will have the effect of exposing the CGC licensee to some specific risks relating to the performance of the satellite component. The licence requires the CGC operator to terminate operation after 18 months following the failure of the MSS satellite if a replacement satellite has not at that point been deployed.
- 5.56 The scale of this regulatory risk is difficult to estimate, although we note that the risk of MSS satellite failure in orbit is relatively low and, like launch failure can be insured against. We also note that a failure of the MSS satellite, dependent on the degree of failure, might also be felt Europe-wide and might lead to a review of the existing constraints, although the way that this situation might be addressed at the time is

hard to anticipate now. However, it is likely to be the case that the existence of this regulatory risk would reduce its value of a CGC licence relative to a licence which does not carry this risk.

- 5.57 We turn finally to the question of phasing in AIP rates. It has been put to us, by one response, that there is a case for phasing in the AIP rate, noting that this approach was adopted for an initial period of the 2G licences. We have considered whether it would be appropriate to phase in the AIP rate over a number of initial years. However, we have decided that this would not be appropriate in this case because:
 - The MSS / CGC operators can delay their decision to obtain a CGC licence, and so avoid the liability to pay fees, until they are ready to deploy equipment, whilst still being secure of their future access to the spectrum because of the legal rights established by the EU Decision. This situation contrasts with the more general case where a company has to pay for the spectrum rights (through auction payment or via an AIP fee attaching to an assigned licence) from the point at which they secure these rights. In addition, the deployment of services using CGC will involve long term investments and the adoption of an initial phase-in period will have a limited impact on lifetime costs;
 - The circumstances where the case for phase-in is strongest is where a substantial change is being made to existing fee rates and where this change could have a material impact on existing users (recognising that these users will have made investments on the basis of the existing fee rates); clearly, this does not apply in the case of CGC where no investments have yet been made.
- 5.58 We have therefore concluded not to phase in the AIP fee rate.

Impact of our decision on the EU market

- 5.59 A number of stakeholders argued that Ofcom should consider the impact of the UK decision on CGC fees on the wider EU market.
- 5.60 A part of this concern related to the principle of our charging fees based on opportunity cost whilst other European administrations do not. We note that in making our decision on the appropriate fee level we must assess the overall implications for UK citizens and consumers. Our general policy is to reflect positive opportunity costs in AIP-based licence fees (other than the initial term of spectrum licences awarded by auction) and failure to apply this policy consistently would have the potential to distort investment decisions in spectrum bands which may be close or even partial substitutes in the UK. For instance, spectrum licensed at 1800 MHz attracts AIP, which is taken into account in licensees' decisions to optimise the mix of spectrum and other inputs in delivering services for citizens and consumers in the UK. If we were not to price the 2 GHz CGC spectrum on a comparable basis, productive efficiency in the supply of services could be lowered, resulting in welfare costs to society and detriment to UK citizens and consumers.
- 5.61 We recognise that MSS businesses operate on a pan-European basis and that, to the extent there is a risk that investment decisions in one jurisdiction have some will impact on investment decisions elsewhere, however, there could be a further risk that setting different fees in the UK could affect efficient CGC network deployment at the European level.
- 5.62 However, if this argument is taken to its extreme, it would imply that all UK spectrum management decisions should be dependent on the policies of other jurisdictions

across a wide range of activities where spectrum is a key input, including where investment decisions across jurisdictions may be linked to varying degrees (e.g. in relation to wireless network operators' use of spectrum at 1800 MHz). In practice, different market circumstances and specific industry structures exist in different jurisdictions, and regulatory policy must reflect this. We do not consider that the circumstances in the 2 GHz MSS award are significantly different to other policy areas (e.g. AIP for 1800 MHz) to warrant any change in our policy to charge fees based on AIP. Failure to apply AIP policy consistently within the UK would, in our view, be detrimental to the interests of UK citizens and consumers.

- 5.63 Regarding the impact on MSS operators if all Member States were to charge on a similar basis to the UK, it is not Ofcom's role to comment on the policies adopted by other European administrations. In addition, we specifically asked, both in the first consultation and in the subsequent RFI, for specific evidence that the proposed CGC fee levels would prevent the deployment of CGC and have received little evidence in support of this argument and certainly no compelling evidence that this would be so.
- 5.64 We would further note that we are dealing here with the fee rate for licensing CGC in the UK only. The EU Decision makes clear that licensing of CGC is a national issue. Moreover, it is possible to deploy CGC in one country and not another and there are many other reasons, aside from spectrum pricing, why an MSS / CGC operator may choose to do so (for example, the MSS operator could trade the CGC spectrum to another party that has an interest in only one country).

Conclusion on fee rate for CGC Licences

- 5.65 As is clear from the above discussion, there are a number of factors which are relevant to this decision on AIP rates which are, inevitably, subject to a significant degree of uncertainty. In respect of some factors, such as the extent of harmonisation benefits that might become available for CGC operators to exploit, a fuller appreciation of their implications for spectrum value will only become possible in the light of developments over the next few years. However, we need to make a decision now on the AIP fee rate that will apply to the CGC licence in order to meet our obligation under EU law to be able to issue CGC licences to the selected 2 GHz MSS operators when requested by them to do so.
- 5.66 Under these circumstances, it makes sense to consider in the round the issues relating to: the choice of AIP fee level that will apply when we first issue a CGC licence, the approach to reviewing this AIP level in due course. In particular, the nature of the current uncertainty means that we may need to review the level of CGC AIP in due course when the passage of time has shed more light on the way that this market develops. The potential for review can therefore mitigate, to some degree, the risk of setting an AIP rate at the outset which comes to be seen as either too high or too low in light of subsequent developments.
- 5.67 We consider first the choice of AIP fee level that will apply when we first issue a CGC licence. As explained in the previous section, our judgement on the relevant opportunity cost needs to reflect the position that:
 - The CGC licence places few restrictions on the types of service and application that can be provided (once the CGC frequency use has been coordinated with the assignment of spectrum to the satellite component);
 - The MSS operator need only apply for a licence in respect of the frequency range over which it intends to install and operate CGC equipment (i.e. the MSS

operator will not incur fees in respect of the spectrum assigned to its satellite component) and the CGC fees will only apply from the time at which the MSS operator is issued a CGC licence following their application (and not from the time at which this spectrum is, in effect, reserved for their use).

- 5.68 Under these circumstances, we consider it appropriate to base the AIP rate on the potential for terrestrial mobile type applications. However, we recognise that the choice of the particular level of AIP is subject to a number of competing considerations. The rate of £554,000 per 2 x 1 MHz that we proposed in our initial consultation has the advantage of being a tangible reference point which reflects the AIP rate paid being by mobile operators at present, albeit for the provision of services using 2G technologies. In terms of its appropriateness to the use of the 2 GHz spectrum for CGC, there are a number of factors which point in opposing directions.
- 5.69 On the one hand, there are a number of factors that might argue that this reference rate would be too low:
 - the rate of £554,000 per 2 x 1 MHz is a conservative figure in the range of estimates of the opportunity cost for mobile spectrum;
 - we have indicated that the AIP rate for 2G mobile spectrum might be increased following review; and
 - CGC licence conditions do not restrict the types of mobile services and applications that could be provided and, for example, do not prevent the provision of 3G type services.
- 5.70 On the other hand, there are a number of factors that might argue that this reference rate would be too high:
 - there is an inevitable uncertainty over the extent of harmonisation benefits that will be achievable, where this uncertainty is linked in part to the manner in which other countries choose to authorise CGC and in part on the way that the market for exploitation of CGC spectrum develops;
 - We are required to include specific licence conditions in the CGC licences, linked to the satellite authorisation, which add some measure of regulatory risk (linked to failure of the satellite) that is not present in the case of the licences held by the MNOs at 900 MHz, 1800 MHz and 2.1 GHz.
- 5.71 On balance, and when considering the opposing implications of the above factors in the round, we do not consider that there is a compelling reason to choose a rate which is different from the rate of £554,000 per 2 x 1 MHz that we proposed in our initial consultation. Our judgement is that the use of this rate strikes a reasonable balance by being a conservative number within the range of mobile AIP rates applied to existing licences.
- 5.72 The nature of this conclusion makes it clear that the choice of the initial AIP fee rate needs to be viewed alongside the question of it future review. We recognise that there may well be a need to review the AIP fee rate for these CGC licences in due course as the passage of time reveals more information in relation to those factors which are currently subject to considerable uncertainty as discussed above. However, we need to balance this case for review against the desirability of providing the MSS / CGC operators with a reasonable period of certainty over the fee rates that they will face. Accordingly, we do not intend to carry out a review of the CGC licence

fee rate before 5 years from the date of this Statement, with one exception, so as to provide an appropriate degree of stability for MSS/ CGC operators. The exception is that we will consider reviewing the rate downwards before this 5 year period has elapsed if, once the European regulatory position and associated market developments have become a little clearer, we are presented with clear and compelling evidence that the rate of £554,000 per 2 x 1 MHz is preventing this spectrum from being brought into efficient use.

- 5.73 We consider that this approach reflects an appropriate bias towards conservatism in that there is greater scope for adverse impact when AIP rates are set too high rather than when they are set too low.
- 5.74 We also consider that this approach carries a low risk of distorting competition by licensing spectrum which can be used for terrestrial mobile applications at a rate which is "too low" with reference to other spectrum used to provide mobile service (a concern raised by some respondents to the consultation). This view reflects, in part, the fact that it would take some time before a competing mobile service with any scale could be deployed and, in part, the potential to review the AIP rate in due course if it appeared that there was a material risk of distortions to competition arising.
- 5.75 Finally, we should deal with the question of whether, in view of the uncertainty that we have described, it is actually necessary to make a decision now on the AIP fee rate (as opposed to deferring the decision for some time in order to await and observe regulatory and market developments around Europe or, indeed, to await our own review of AIP rates for mobile spectrum at 900 MHz and 1800 MHz). We do not consider that delaying this decision would be appropriate for two main reasons:
 - We will be obliged to authorise CGC use by the successful 2 GHz MSS operators following their application to us. This means that we have to be ready to issue a CGC licence at any point, now that the EU selection decision has been made; and, in order to be able to issue a CGC licence, we need to have decided the associated fee rate;
 - We consider it important to signal the fee level even though decisions on its level have had to be made despite the existence of significant uncertainties, so as to give interested parties the relevant information on which to develop more detailed business plans and in order to facilitate appropriate investment.

Section 6

Technical & Other CGC Licence conditions

Introduction

- 6.1 This section covers the issues raised in question 1 and questions 3 to 9 of our second consultation and refers to the technical licence conditions of the CGC spectrum access licence. We received a range of responses to these questions and in this section we consider each of the issues raised in turn, namely:
 - Whether the technical parameters used to define transmission rights should be based on spectrum usage rights (SUR) or spectrum masks (question 3);
 - Our proposed SUR parameters for CGC (question 4);
 - Our proposed spectrum masks parameters (question 5);
 - Our proposed changes to other standard technical licence terms and conditions (question 6);
 - Our assumptions on the CGC base station and user terminal characteristics (question 7);
 - Our decision to base our analysis of compatibility between CGC and other radio systems on studies of analogous scenarios conducted for the 2.6 GHz award (question 8); and
 - Our assumptions on the deployed network modelled for the SUR parameters (question 9).
- 6.2 We also consider additional issues raised by responses that are not directly related to any of our other questions, but were raised in response to the general request for comments included in our second consultation as question 1.
- 6.3 At the end of this section we provide additional information that will be of interest to some stakeholders relating to a formal request we have received from Vodafone to vary their 3G Licence terms and conditions to increase the permitted 3G base station power limits from 62 dBm per carrier to 65 dBm per carrier and the relevance this has to CGC Licences.

Technical parameters based on SUR or spectrum mask approach

- 6.4 There was a general agreement amongst responses that the spectrum mask approach was preferred. Of those who responded to this question:
 - Eight were firmly in support of spectrum masks. This included responses from users in adjacent bands and two applicants to the EU process;
 - Solaris acknowledged the possible benefits of the SUR approach but felt unable to decide on a preferred approach without more information on the CGC

deployment, channel plan and before the adoption of the ETSI standard for CGC base stations. Solaris had no objection to the spectrum mask approach;

- Solaris also stated that any approach to the technical transmission rights should be in line with any ECC or ETSI technical standards for CGC base stations.
- 6.5 The main reasons given for stakeholders' preference for the spectrum mask approach were that:
 - The spectrum mask approach simplifies transmitter compliance testing and allows interference levels to be calculated easily given the transmitter locations;,
 - Spectrum transmitter masks provide for similar networks and technologies to be deployed in adjacent bands and thereby minimises the risk of interference;,
 - There is regulatory uncertainty in the resolution of disputes with the SUR approach;,
 - Ofcom has yet to undertake a proof of concept of SUR modelling; and
 - Ofcom has over-stated the pace of change as a prime reason for the use of SUR.

Ofcom position

- 6.6 Stakeholders almost unanimously indicated their preference for the spectrum mask approach, including those who acknowledged the potential advantages the SUR approach might bring.
- 6.7 Whilst it remains our view that the SUR approach could be developed further with respect to the 2 GHz MSS band, it is apparent that stakeholders still have concerns that our SUR proposals need refinement, including a proof of the SUR modelling concept, and that the added benefit of greater certainty of interference limits into adjacent bands is not perceived by stakeholders to be significant.
- 6.8 There is also insufficient certainty over the time it would take to resolve these outstanding issues for Ofcom to be confident that we will be able meet our obligations under the EU Decision, namely to be in a position to authorise the CGC network(s) shortly after the Selection Decision has been published in the OJ.
- 6.9 We have therefore concluded that we will base the technical transmission rights of the CGC spectrum access licence on the spectrum mask approach.

SUR parameters

- 6.10 Reponses made a number of comments about the specific approach we took to calculating the SUR parameters for CGC networks. In particular:
 - BBC and SPMF stated that the technical characteristics and network deployment of CGC networks are unknown and so in-band SUR parameters cannot be reliably calculated;
 - BBC and SPMF provided a calculation of the out-of-band SUR parameters needed to protect PMSE reception and requested they be reflected in the CGC SUR parameters
- BBC and SPMF also stated that the PMSE receiver sensitivity degradation that would result from the proposed SUR limit would typically be 27 dB;
- Orange stated reservations with regard to the use of ITU-R Rec.P.1546 -3 for propagation modelling of compliance, as they have previously commented to Ofcom;
- Solaris stated that they would prefer to wait until the deployment of CGC networks are known and the ETSI standards are adopted before commenting on the SUR parameters proposed;
- Inmarsat, Intellect and Terrestar reiterated their opposition to SUR for the specific case of CGC; and
- Two responses, Intellect and one confidential, stated that if Ofcom is to proceed on the basis SUR they would wish greater time to review the proposed SUR parameters than was given in the consultation.

Ofcom position

- 6.11 As indicated in the previous sub-section, we have concluded on the use of spectrum masks to define the transmission rights of the 2 GHz MSS CGC and therefore we do not intend responding to the detailed comments on the SUR parameters proposed in our consultation.
- 6.12 We acknowledged in our consultation document that there was a strong likelihood that PMSE would be restricted in the use of the channel 2200 2210 MHz due to the increased likelihood of adjacent channel interference. This is a result of the requirement resulting from the EU Decision to provide CGC operators use of the full 30 MHz from 2170 to 2200 MHz. As we have concluded on the use of spectrum masks, we respond in the following sub-section with details of why it is not possible for us to fully protect this PMSE channel, including the implication on CGC operation if we were to do so.
- 6.13 On the issue of awaiting the adoption of ETSI standards for CGC base station we confirm that our intention is to authorise the 2 GHz MSS CGC licence on a technology and service neutral basis. We will not base the downlink spectrum mask for CGC on any specific technical standard and believe that our proposals, based as they are on the CEPT Report 19 developed under the WAPECS mandate for the European Commission, provide sufficient flexibility to CGC operators to implement their networks.
- 6.14 In any event, we are required by the EU Decision to grant the authorisation necessary for the provision of the CGC network(s) after the Selection Decision has been published in the OJ. The current status of the ETSI CGC standards is such that these standards are unlikely to be adopted before August 2010 and the EC is in discussion with Member States to identify an acceptable way forward on this matter.
- 6.15 Finally, whilst we understand the concerns expressed by some stakeholders that this consultation period was shorter than they might have wished to consider the implication of SUR, we needed to balance the requirement to complete the process of authorisation of 2 GHz MSS CGC in good time for the conclusion of the EU process, against the need to give stakeholders more time to respond to our proposals.

Spectrum mask parameters

- 6.16 The PMSE community expressed considerable concern about the impact of the proposed spectrum masks on the use of the PMSE channel 2200 2210 MHz as they felt that our proposals would make this channel unusable. They also asked for clarification on the CGC out-of-band emission limits above 2210 MHz and the potential impact on other PMSE channels as no limits above 2210 MHz were included in the proposed CGC spectrum mask.
- 6.17 The PMSE community also indicated that they would prefer Ofcom to include a similar spectrum mask to that developed as part of the 2.6 GHz award to protect PMSE above 2200 MHz.
- 6.18 Inmarsat and Intellect proposed that the in-band power limit be 58 dBm/MHz as included in the terrestrial 3G. They further proposed an additional limit of 65 dBm/10 MHz to allow use of multiple wideband carriers.
- 6.19 Terrestar proposed to increase the CGC base station power limit to 65 dBm/5 MHz.
- 6.20 Terrestar also stated a preference for an additional limit for wide band carrier operation, but proposed a higher limit than Inmarsat and Intellect of 68 dBm/10 MHz to maintain the same energy per symbol for all channel bandwidths stating that otherwise operators that use wider channels would be penalised in terms of spectral efficiency per unit bandwidth.
- 6.21 One confidential response agreed that the proposed spectrum mask is likely to be suitable for a technology neutral terrestrial mobile authorisation, but indicated its belief that to support mobile multimedia services, higher in-band power limits may be useful to allow a lower site density of base stations than is normal for cellular services and proposed to increase the in-band power spectral density to 69 dBm/5 MHz.
- 6.22 One confidential response stated that the proposed in-band power limit appeared high given CGC is only intended to be used for in-building coverage and city areas where buildings prevent line-of-sight with the satellite and stated its belief that there should be no need for macro cells, as wide area coverage would be provided by the MSS satellite.
- 6.23 Solaris stated that until the ETSI standard(s) for CGC base stations are approved it would be unable to agree fully to any proposed spectrum mask.
- 6.24 Orange, a user in an adjacent band, stated that the permitted Block Edge Mask (BEM) figures should be clearly defined as EIRP BEMs.

Ofcom position

- 6.25 We recognise the concerns expressed by the PMSE community and in the course of developing the consultation document we explored a number of technical approaches to the transmission rights of CGC in order to accommodate the continued use of the adjacent band for PMSE.
- 6.26 We first considered the technical conditions that were included in the 2.6 GHz award to protect PMSE and concluded that adjacent band-sharing scenario at 2200 MHz is different to that at 2025 MHz. In particular, there is a 5 MHz offset at the 2025 MHz

band edge (unused by PMSE) that effectively acts as a guard band and thus helps to protect the first PMSE channel.

- 6.27 Therefore, if we were to apply to CGC the same spectrum mask for the 2010 MHz lot included in the 2.6 GHz, absent this 5 MHz offset, (+4dBm / MHz from 2200 2205 MHz), the PMSE channel would still have a high risk of interference when PMSE receivers are in close proximity to CGC base station transmitters.
- 6.28 If Ofcom did apply an out-of-band limit of -38 dBm/MHz from 2200 MHz, as requested by the PMSE community, then to meet this limit the additional transmit filtering in one or both CGC channels at 2190-2195 MHz and 2195-2200 MHz it would be necessary to reduce significantly the maximum CGC power in one or both of these channels. The extent of this reduction would reduce significantly the utility of these channels.
- 6.29 During the development of both the RSC and EU Decisions it had always been anticipated that the full 2 x 30 MHz of the 2 GHz spectrum would be made available to the MSS operators for CGC.
- 6.30 We have therefore concluded that it is not possible to protect fully PMSE use in band 2200 2210 MHz by the use of filtering at the CGC and allow CGC operation at anything approaching normal transmission power levels. Also, restricting CGC operation to such low power limits cannot be considered consistent with our obligation under the EU Decision to make the full 2 x 30 MHz available for CGC operation.
- 6.31 It should be noted however that the discussion above assumes a worst case scenario whereby the MSS operator chooses to operate the CGC at the top end of its assignment, as they are entitled to do under the EU Decision. Depending on the actual assignment of spectrum between the satellite and CGC, it may be possible for PMSE to continue operation in the channel 2200 2210 MHz.
- 6.32 We have reviewed the conditions we could impose beyond 2210 MHz in order to allow the continued operation of the second PMSE channel. We have concluded that by imposing an additional out-of-band e.i.r.p limit of -38 dBm/MHz above 2210 MHz it should be possible for continued PMSE use of this channel, without imposing an unreasonable burden on the operation of CGC.
- 6.33 Information obtained by Ofcom from a number of filter manufacturers during studies for other similar bands, in particular the 2.6 GHz award, suggested that stop-band attenuations of the order of 60 dB are readily achievable by 5 MHz off-set from the pass-band edge. As the -38 dBm/ MHz limit is more than 10 MHz offset, it should be possible to manufacture RF transmit filters to meet this limit; with their performance based on commercially available conventional resonator filters.
- 6.34 On the various issues of parity with the spectrum mask for the adjacent 3G operations, we agree with the aim of symmetric operation of similar services in adjacent bands, such as already exists between the 3G operators. This has proven to be a very effective method of managing adjacent band interference and this is our approach for CGC licensing. In adopting this approach in aiming for symmetrical requirements for 3G licences there are two relevant EIRP limits:
 - 62 dBm per carrier, where the carrier is a WCDMA signal with a data rate of 3.84 Mcps; and

- 58 dBm/MHz.
- 6.35 The second of these limits is an additional power spectral density limit that must be met and is not an upper limit in itself. It does not permit 65 dBm/5MHz²³, as suggested by some stakeholders; the more stringent of the two limits must be met.
- 6.36 We do accept that the additional limit of 58 dBm/MHz included in 3G Licences will also be needed for CGC operation for carrier bandwidths of less than 5 MHz and therefore we conclude that this additional limit should be added to the CGC technical licence conditions.
- 6.37 On the issue of whether 61 or 62 dBm/5MHz would provide parity with the adjacent band use, we note that the work carried out by CEPT under the WAPECS mandate for the European Commission concluded with RSC Decision 2008/477/EC²⁴ that imposed a block edge mask for the 2.6 GHz bands which included an in-band EIRP limit of 61 dBm/5 MHz and that the 3G limit of 62 dBm/carrier is equivalent to 61 dBm/5 MHz²⁵. We have concluded therefore that this is a matter of how the limit is expressed technically and not a difference in the actual limit applied. We prefer to remain consistent with the work carried out by CEPT, in Report 19, and with the EC WAPECS initiative and so we will express this limit as 61 dBm/5 MHz EIRP in the CGC Licence.
- 6.38 On the issue of a desire for a higher in-band EIRP of up to 69 dBm/5MHz for multimedia mobile services, we note that this is significantly above the existing limits of 3G operations in adjacent bands and, as such, could cause difficulties of asymmetric co-ordination with adjacent users and therefore we are unable to agree with this proposal at this time. In the event that similar high power operation was requested by the 3G operators in the adjacent bands, we would of course consider these requests together.
- 6.39 On the issue of EIRP limits for wideband carriers, including 10 MHz carriers, we do not intend to impose a 5 MHz channel plan on CGC operation. The block edge mask need only be met at the band edge and if an operator wishes to implement a 10 MHz channel it can do so as long as the 61 dBm/5MHz limit is not breached, i.e. it can operate up to 64 dBm/10 MHz, so long as the block edge mask is met.
- 6.40 Some stakeholders have however requested higher EIRP limits for wideband carriers of up to 68 dBm /10 MHz. These limits we believe may be based on the assumption that the 58 dBm/MHz limit of the 3G operators is a stand-alone limit and not an additional limit (see paragraphs 6.34 6.35). An increase, as suggested, to 68 dBm/10 MHz would lead to similar asymmetric coordination problems as previously discussed in paragraph 6.38 and therefore we cannot, at this point, agree to the request.
- 6.41 In response to the comment that CGCs are intended to be used only in city areas and that there should be no need for macro cells in a CGC network, we would reiterate our understanding that the CGC can be used to provide services other than those provided over the satellite (see paragraph 4.8–4.31 for further details) and that

²³ 58 + (10(log (5(MHz))) = 65 dBm/5 MHz.

²⁴ <u>http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:163:0037:0041:EN:PDF</u>

²⁵ The measurement of the mean power of a 3G signal with carrier of 62 dBm and a raised root cosine signal shaping (roll-off 0.22) is equivalent to a flat spectral density of 62 dBm/3.84MHz. In 5MHz this corresponds to a spectral density of [62 - 10*log(5/3.84)] dBm/5MHz, or 61 dBm/5MHz.

therefore CGC networks can be deployed outside city areas and may well include macro cellular usage.

- 6.42 On the issue of awaiting the adoption of ETSI standards for CGC base station we note that our intention is to award the 2 GHz MSS CGC licence on a technology and service neutral basis and as such we will not base the downlink block edge mask for CGC on any specific technical standard. We do however believe that the block edge mask we intend to impose on CGC allows sufficient flexibility to CGC operators to deploy their networks, whilst ensuring compatibility with the majority of the users of the adjacent bands, whose operations are constrained by very similar block edge masks.
- 6.43 In any event, as previously indicated we are required by the EU Decision to grant the authorisation necessary for the provision of the CGC following the Selection Decision is published in the OJ. The current status of the ETSI CGC standards is such that these are very unlikely to be adopted in a reasonable timescale following the publication of the EC Selection Decision and therefore it is probable that we will need to proceed with the licensing of CGC absent such standards.
- 6.44 We therefore conclude that we will proceed on the basis of the block edge mask proposed in our consultation document, which is the permissible out-of-block emission limit for the downlink use of frequencies provided below:

Offset from relevant block edge	Maximum mean EIRP for out-of-block emissions
-1.5 to -10 MHz (lower block edge)	+4 dBm/MHz
-1 to -1.5 MHz (lower block edge)	-9 dBm/30 kHz
-1 to -0.2 MHz (lower block edge)	Linear from -9 dBm/30 kHz to +3 dBm/30 kHz
-0.2 to 0.0 MHz (lower block edge)	+3 dBm/30 kHz
0.0 to +0.2 MHz (upper block edge)	+3 dBm/30 kHz
+0.2 to +1.0 MHz (upper block edge)	Linear from +3 dBm/30 kHz to -9 dBm/30 kHz
+1.0 to +1.5 MHz (upper block edge)	-9 dBm/30 kHz
+1.5 to +10 MHz (upper block edge)	+4 dBm/MHz
+10MHz (upper block edge) ²⁶	+4 dBm/MHz

Where:

- frequency offset is from the relevant block edge (in MHz);
- the lower block edge is the lower frequency of the "permitted assigned frequency block"; and
- the upper block edge is the upper frequency of the "permitted assigned frequency block".
- 6.45 We have however also concluded that we should include:

²⁶ - 38 dBm/MHz applies to the block edge at 2200 MHz.

- A limit of -38 dBm/MHz above 2210 MHz in order to provide additional protection to PMSE operation in this channel,
- Maximum in-band levels of 58 dBm/MHz and 61 dBm/5 MHz on CGC basestation EIRP. Both of these limits will need to be met. and
- We confirm that the permitted BEM figures are EIRP BEMs.

Other standard technical licence terms and conditions

- 6.46 No other comments were received on the other proposals for the standard technical terms and conditions of the CGC Licence. However subsequent to the consultation an issue has been raised within the ECC relating to possible interference into Earth Exploration Satellite Service (EESS), Space Research Service (SRS) and Space operations operating above 2200 MHz from CGC base stations. We understand, however, that no facility in UK operates below 2225 MHz and that these are therefore unlikely to suffer interference from CGC base stations.
- 6.47 We have therefore concluded that we will proceed on the basis of the previous proposals, which are reflected in the CGC Licence provided as Annex 5.

Assumed CGC base station and user terminal characteristics

- 6.48 Most responses agreed with assumptions we made for the CGC base station and user terminal handsets for the purposes of compatibility analysis with adjacent band use. However a small number of comments were received relating to proposed BEM for user terminals, in particular:
 - Inmarsat, Terrestar and Intellect, whilst agreeing that the assumptions made by Ofcom were reasonable, noted the draft ETSI standard for CGC handsets (EN 302 574-2) allows for 39 dBm ± 2.7 dB and stated that they would like this limit included as the maximum power limit in the handset exemption regulations, rather than the limit assumed in our analysis;
 - Orange also proposed that a formal definition of the uplink BEM EIRP be included and that this definition be based on the relevant 3GPP user device standard; and
 - A number of other comments were received on how the limits for the uplink BEM for the terminals should be defined in the exemption regulations.

Ofcom position

- 6.49 The majority of responses to this question agreed that our assumptions were reasonable, but were keen that these assumptions should not be the basis for the uplink BEM for the terminals in the exemption regulation. We have previously indicated that we intend that the mobile handsets will be licence exempt and that once the appropriate harmonised standards are available we will consult on the licence exemption for this equipment in our normal way. This will include an assessment of the likely impact the use of any higher terminal powers may have on adjacent bands.
- 6.50 We do not therefore intend, at this point, to respond further on the comments made on the uplink EIRP but will use these to inform our subsequent consultation.

Basis of analysis of compatibility between CGC and other radio systems

- 6.51 Terrestar and Solaris agreed with our basing our compatibility analysis on the studies of analogous scenarios conducted for the 2.6 GHz award.
- 6.52 Aside from the PMSE issue (discussed above) we received no other responses to this issue.

Assumptions used to develop SUR parameters

6.53 Most responses referred back to their earlier stated preference for the spectrum mask approach and their concerns regarding the use of SUR, the lack of agreed ETSI standards for CGC base stations and handset and the uncertainty in the CGC network deployment.

Ofcom position

6.54 As we have concluded that we will proceed with the licensing of CGC base stations based on the block edge mask approach and we do not intend to provide a detailed response on the potential merits of an SUR approach in licensing CGC base stations.

Other Issues raised by responses

- 6.55 Question 1 asked if stakeholders agreed with our proposals for the detailed terms and conditions of the CGC Licence and whether they had any other comments on the issues raised by the consultation. Orange, a user in an adjacent band, made two observations:
 - It expressed surprise at Ofcom's decision to leave CGC international coordination to the MSS satellite operators and commented that it is unclear if other administrations have been consulted and/or agreed to this approach; and
 - It expressed a concern that no analysis of the potential interference from the satellite component was included in the consultation.

Ofcom position

- 6.56 On the issue of international co-ordination of the CGC networks, we agree that it will be necessary for us to agree our proposed licensing approach with neighbouring administrations. However, it is appropriate for us to consult with stakeholders on the approach we intend to propose to these administrations in advance of initiating discussions. As we have received no objections to our proposals we will initiate discussions on this basis.
- 6.57 On the issue of interference from the satellite into adjacent bands, we note that our consultation is concerned with the authorisation of the terrestrial CGC components only and so did not address the satellite transmissions.
- 6.58 However, as this issue has been raised, we would draw stakeholders' attention to the conclusions of a 1999 CEPT ERC Report²⁷ for the 2 GHz MSS bands, which concludes that terrestrial systems need no guard band protection from adjacent band satellite transmissions. We would also add that there are similar conclusions in ITU-R

²⁷ ERC Report 65 on Adjacent Band Compatibility Between UMTS and other Services In The 2 GHz Band

Report M.204: "Sharing and adjacent band compatibility in the 2.5 GHz band between the terrestrial and satellite components of IMT-2000".

Request to vary 3G Licence terms and conditions

- 6.59 We have received a formal request from Vodafone to vary its 3G Licence terms and conditions to increase the permitted 3G base station power limits we intend to consult on this issue shortly.
- 6.60 We intend to issue the CGC Licences based on the technical terms and conditions included in this Statement, but if MSS or CGC operators were, subsequently, to formally request a similar variation of their licences, this consultation will be relevant to our consideration of their request.

Annex 1

Summary of the responses to the second consultation on 2 GHz CGC

A1.1 The following provides a summary of the response comments to the second consultation on 2 GHz CGC.

A1.2 Question 1:

Q -1 Do you agree with our proposals for the detailed terms and conditions of the	
CGC Licence set out in this document or h	ave any other comments on the issues
raised in this document?	
Response comments	Ofcom position
PMSE receivers that would be permitted under the proposed technical conditions.	channel 2200 – 2210 MHz without severely restricting the use of the top 10 MHz of CGC, to the extent that this 10 MHz cannot be considered to be made
industry to revisit the technical licence conditions applied to CGC out-of-band emissions.	available to the MSS operator, as required by the EU Decision
	analogous to the situation for 2 GHz MSS CGC:
	 The technical conditions for the 2.6 GHz award were solely a UK Decision; and An effective 5 MHz guard band
	exists at the band edge before the first PMSE channel that provides additional protection for PMSE.
Surprised by Ofcom's decision to leave CGC international co-ordination with satellite operators and it is unclear if other administrations have been consulted and/or agreed to this approach.	We acknowledge that it will be necessary for us to agree our proposed approach with other neighbouring administrations. We felt however that we should consult with stakeholders on the approach we intend to propose to these administrations in advance of initiating discussions. As we have had no objections to our proposals we will initiate discussions on this basis.
The satellite element should not be a simple "flag of convenience" for the CGC, to allow the CGC to be deployed for largely or wholly terrestrial usage.	From our understanding of the negotiations that led to the adoption of the EU Decision, we have concluded that the CGC is required to be an integral part of the MSS in order to manage potential
CGC licensing should not permit:	interference between the satellite and CGC components.

-		
(i) (ii)	the bulk of the awarded spectrum to be used for a service or technology unrelated to that provided over the satellite; nor the purchaser of a concurrent traded licence to operate a terrestrial system and service completely unrelated to the satellite licensee's systems and service.	We have therefore concluded that the CGC component should be allowed to operate on a pre-determined sub-set of frequencies assigned to the MSS operator under the EU process; provide a different set of services and applications to the satellite component; and can operate to a different air interface standard than the satellite component.
CGC s same satellit	should be limited to providing the service or application as the te component.	
The E reques "how p would propos where space the reo part of licensi	U Decision requires Ofcom to st technical information indicating particular ground components improve the availability of the sed MSS in geographical areas communication with one or more stations cannot be ensured with quired quality" and this should be f the application process for CGC ing.	The EU Decision does not require UK to request technical information nor does the recital quoted (recital (18) indicate that it is desirable for us to request this information as it is included "without prejudice". The UK sees no benefit to consumers and citizens in requesting such information and in limiting the use of the CGC to improving the availability of the satellite signal.
Prefer standa comm are de	to await the conclusion of the ards development at ETSI before enting on how transmission rights fined.	Our intention is to authorise the 2 GHz MSS CGC licence on a technology and service neutral basis and as such we will not base the downlink spectrum mask for CGC on any specific technical standard.
An app addres studies CGC s	propriate mandate should be ssed to CEPT for compatibility s on UMTS and MSS satellite and services in adjacent bands.	We would draw stakeholders' attention to the conclusions of ECC Report 45 on 2500 MHz "Sharing and adjacent band compatibility Between UMTS/IMT-2000 in the band 2500-2690 MHz and other Services", which considers very similar sharing arrangements albeit at slightly higher frequencies.
Disapp one m to this Staten As the legitim spectr UK.	pointed that there has only been onth in which to make responses consultation, particularly as the nent was issued simultaneously. adjacent operator, we have a nate interest in how the MSS um is allocated and used in the	Ofcom recognises the concerns of users in adjacent bands. However, this consultation dealt with a small number of detailed technical issues which in accordance with our consultation principles called for a consultation period of 1 month.
We ne be any the ad	eed to be assured that there will not adverse interference to UMTS in jacent band as a result of the	We have undertaken compatibility analyses of the proposed CGC technical limits with services in adjacent bands and

authorisation for use within this spectrum.	consulted on these. We have received no comments on this analysis that would lead us to conclude that this analysis is flawed.
Broadly agree with the detailed terms and conditions of the CGC Licence, but regrets Ofcom has not taken the opportunity to provide clarity on licence fees.	We have been considering very careful the comments we continue to receive, from stakeholders on the important issue of fees to be charged for CGC Licences. We recognise that this is an issue that is of particular concern to all stakeholders and we wish to give this issue the due consideration it deserves. We did not consult again on this issue and therefore do not intend to comment further on this subject at this time.

A1.3 Question 2:

Q -2 Do you agree with our proposed approach for including the conditions imposed by Decision No 626/2008/EC in the CGC Licence?	
Response comments	Ofcom position
As Ofcom does have authority to permit local variation from the EC Decision to the technical licence conditions, propose alternative technical conditions based on those included in the 2.6 GHz award to protect PMSE use.	It is not possible to protect the PMSE channel 2200 – 2210 MHz without severely restricting the use of the top 10 MHz of CGC, to the extent that this 10 MHz cannot be considered to be made available to the MSS operator, as required by the EU Decision.
As the EU Decision does not mandate specific technical band edge conditions, Ofcom can set technical conditions to take account of their impact on PMSE use in the adjacent band. It may be difficult to make the full 30 MHz available to MSS and CGC operators whilst completely satisfying the needs of the PMSE industry but Ofcom should try to achieve the best outcome for both parties.	 The case of the 2.6 GHz award is not analogous to the situation for 2 GHz MSS CGC: The technical conditions for the 2.6 GHz award were solely a UK Decision; and An effective 5 MHz guard band exists at the band edge before the first PMSE channel that provides additional protection for PMSE.
	We have, however, concluded that we will include an additional constraint on CGC out-of-band transmissions in order to provide additional protection to PMSE channels above 2210 MHz.
Any satellite authorisation should be a general authorisation, addressed to the selected MSS operators, rather than individual authorisations.	Attaching the satellite common conditions to the licence exemption of the handsets would limit our enforcement options to revocation of the licence exemption and the potential criminalisation of consumers, possibly

	European roamers, who continued to use the terminals in UK.
The EU Decision does not require Ofcom to authorise the MSS satellite. The common conditions required to be attached to the satellite authorisation could more efficiently be attached to the licence exemption of user handset instead removing the need for an SI and a further consultation.	Ofcom has concluded that the EU Decision requires the UK to authorise the 2 GHz MSS satellite in order for us to meet our obligations on monitoring and enforcement and to allow us to attach the common conditions to this authorisation, as required by Decision 626/2008/EC.
The volume and portions of spectrum used by a CGC operator may vary over time and therefore it would be better not to refer to specific frequency bands for CGC operation in the licence.	If a CGC operator wishes to have the flexibility to use any portion of the frequencies assigned to the MSS under the EU process then it should apply for the full set of frequencies. This will however have implications on the level of fee that will be charged for the CGC Licence.
If Ofcom wishes to propose SUR in other bands in the future, a much longer period of time than was made available during this consultation would be necessary.	This consultation considered only a small number of detailed technical terms and conditions to be included in the CGC Licence, the main policy issues having already been consulted on. In line with our consultation policy principles therefore the consultation period was 4 weeks. Given that we have previously consulted extensively on SUR principles and application we had anticipated stakeholders would be fully conversant with these.
We support Ofcom's understanding that the common condition b) of Decision No 626/2008/EC2 is that the requirement for CGC to constitute an integral part of the satellite network derives from the need to prevent the CGC component causing interference to the satellite component and therefore it is necessary that the assignment of frequencies between satellite and CGC are coordinated by the MSS operator.	Noted.
Regret that Ofcom has not taken the opportunity to clarify that CGC terminals will be licence exempt.	We have indicated in both consultation documents for authorising CGC that we anticipate that the CGC terminals will be licence exempt and that we will consult further on this.

A1.4 Question 3:

Q -3 Do you believe that the technical para	meters used to define transmission rights
should be based on spectrum usage rights	or spectrum masks?
Response comments	Ofcom position
Favour spectrum mask approach as it simplifies transmitter compliance testing and allows interference levels to be calculated easily given the transmitter locations.	Given the almost unanimous preference expressed by responses for the spectrum mask approach, we have concluded that we will proceed on this basis.
Where SURs are used there is concern regarding regulatory uncertainty of the dispute resolution mechanism.	
Proof of concept through applying SUR modelling concept to a real network has yet to be done, although promised by Ofcom.	
Transmitter masks are easy to check for compliance and if similar networks and technologies are used in adjacent bands the risk of interference is low.	
Ofcom has over-stated the pace of change as a prime reason for the use of SURs. The pace of technology change is constrained by the need to have a fair return on capital investments and a large customer base that will have a natural inertia to change that can take many years to influence.	
Can comply with both approaches but prefer the use of spectrum masks	
Any approach should be in line with any ECC or ETSI technical standards for CGC base stations.	Noted and agreed.
No objection in principle to the use of SUR and recognise potential advantages this approach offers. However, without knowledge of the number of licensees, the precise channel plan and the adoption of the ETSI standards for CGC base stations it is not appropriate to make at a final conclusion on SUR limits.	
The interference impact of the satellite component is unclear in this consultation and should be consulted on.	We would draw stakeholders' attention to the conclusions of a 1999 CEPT ERC Report for the 2 GHz MSS Bands, which concludes that terrestrial systems need no guard band protection from adjacent

	band satellite transmissions, (ERC Report 65 "Adjacent Band Compatibility Between UMTS and other Services In The 2 GHz Band"). We would also add that there are similar conclusions in ITU- R report M.204: "Sharing and adjacent band compatibility in the 2.5 GHz band between the terrestrial and satellite components of IMT-2000".
Ofcom should also fully specify the uplink mask for the award and further consult with stakeholders.	As we have previously stated, it is our intention to licence exempt the CGC and satellite handsets in our normal way. However in this particular case we may need to consult on this issue on the basis of draft ETSI standards.

A1.5 Question 4:

Q -4 Do you agree with our proposed SUR	parameters for CGC?
Response comments	Ofcom position
Network parameters for CGC deployment are unknown and so in-band SUR parameters cannot be reliably calculated (although out-of-band SUR parameters needed to protect PMSE reception can be calculated). The testing requirements imposed by the SUR approach are complicated and add uncertainty to the process.	As explained in A1.4, given the almost unanimous preference expressed by responses for the spectrum mask approach, we have concluded that we will proceed on this basis and therefore do not intend to address the specific points raised on the proposed SUR parameters.
Would prefer to wait until the number of licensees, the precise channel plan and the adoption of the ETSI standards for CGC base stations are know before commenting on these values.	
Reservations with regard to the efficiency of the use of ITU-R Rec. P. 1546 -3 for propagation modelling of compliance.	
Concerns about the SUR approach, especially as regards the complexity of the testing requirements.	

A1.6 Question 5:

Q -5 Do you agree with the spectrum mask	s parameters proposed?
Response comments	Ofcom position

Use of the proposed spectrum masks will result in severe interference into PMSE in 2200 – 2210 MHz making the channel unusable. The proposed spectrum masks do not give out-of-band emission limits above 2210 MHz and the impact on PMSE remains unclear. The spectrum masks included in the 2.6 GHz award to protect PMSE at 2025 – 2110 MHz are preferred.	It is not possible to protect the PMSE channel 2200 – 2210 MHz without severely restricting the use of the top 10 MHz of CGC, to the extent that this 10 MHz cannot be considered to be made available to the MSS operator, as required by the EU Decision The case of the 2.6 GHz award is not analogous to the situation for 2 GHz MSS CGC: • The technical conditions for the 2.6 GHz award were solely a UK Decision; and • An effective 5 MHz guard band exists at the band edge before the first PMSE channel that provides additional protection for PMSE. We have however included an additional constraint on CGC out-of-band transmissions, of -38 dBm/MHz above 2210 MHz in order to allow PMSE operation above 2210 MHz.
The permitted BEM figures should be clearly defined as EIRP BEMs.	Noted and agreed.
To support mobile multimedia higher in- band power limits may be useful to allow a lower site density of base station than is normal for cellular services. Propose to increase the in-band power spectral	We have also included an additional limit of 58dBm / MHz for the in-band power spectral density to allow for carriers with bandwidths smaller than 5 MHz
density to 69 dBm/5 MHz.	The most stringent limit of 61dBm/5 MHz or 58dBm/ MHz applies.
	We are unable however to agree to increasing the in-band spectral density to 69 dBm/5 MHz given the problems that this would cause from the asymmetrical co-ordination with adjacent users.
The maximum in-band power spectral density for CGC user handsets should ideally be increased to 33 dBm/5 MHz,	We will be consulting on the licence exemption of CGC terminals and the

noting that if the CGC uses bandwidths	uplink BEM shortly and will address the
less than 5 MHz the mobile station power	comments raised on this at that time.
need not be reduced below the limit for 5	
MHz bandwidth.	

A1.7 Question 6 :

Q -6 Do you agree with the proposed changes to the other standard technical licence terms and conditions?	
Response comments	Ofcom position
In-band power limits should be in line with the terrestrial 3G limits (UK IR 2019).	The in-band limits proposed by Ofcom are in line with the terrestrial 3G limits but are expressed technically in a slightly different way.
Propose an additional limit of 65 dBm/10 MHz to allow possible use of multiple wideband carriers.	Ofcom does not intend to impose a 5 MHz channel plan on CGC operation. The spectrum mask need only be met at the band edge and if an operator wishes to implement a 10 MHz channel it can do so as long as the 61 dBm/5MHz limit is not breached, i.e. it can operate up to 64 dBm/10 MHz, so long as the block edge spectrum mask is met.
Agreement with the 58 dBm/MHz EIRP but would prefer an additional limit of 68 dBm/10MHz to maintain the same energy per symbol for all channel bandwidths.	Although we did not propose the 58dBm/MHz limit in our consultation document, we have concluded that we will add this condition to the CGC Licence to allow for carrier bandwidths smaller than 5 MHz.
	This limit, however, is in addition to the 61 dBm/5 MHz and is not a limit of itself. We cannot agree to an increase in the in- band spectral density to 68 dBm/10 MHz as this will create co-ordination problems with the adjacent 3G services due to the asymmetry of operation that would result.

A1.8 Question 7:

Q -7 We have assumed that the CGC base station and user terminal characteristics will be similar to those for equivalent 3GPP equipment. Specifically, we have assumed a maximum transmitted power of 31 dBm/5 MHz for CGC handsets, and a maximum transmitted power of 61 dBm/5 MHz for the CGC base stations. Do you agree these are reasonable assumptions?		
Response comments	Ofcom position	
The assumptions may not be appropriate for CGC services, in which case the derived SUR will be incorrect.	As previously discussed, we do not propose proceeding on the basis of SL	

Note the draft ETSI standard EN 302 574-2 allows for 39 dBm± 2.7 dB. The value of 31 dBm/5 MHz assumed should not be viewed as a limit for CGC handsets. 3GPP WCDMA/HSPA standard allows for 33 +1/-2 dBm/5 MHz Transmit power at the antenna connector and at the very minimum that should be allowed as Transmit power and 3GPP has not yet defined Power Classes 1 and 4, which may be higher than that for WCDMA/HSPA.	We have previously indicated that we intend for the mobile handsets to be licence exempt and that once the appropriate harmonised standards are available we will consult on the licence exemption of this equipment in our normal way. We do not intend to comment here on the proposed uplink EIRP but will use these comments to inform our subsequent consultation.
CGC base station limits should be 65 dBm/5MHz. The proposed in-band power limit is high given CGC is only intended to be used for in-building coverage and city areas	As previously discussed, we see no benefit to consumers and citizens in limiting the use of CGC to provide the same application and/or service as the
where buildings prevent line-of-sight with the satellite. There should be no need for macro cells as wide area coverage is provided by the satellite.	MSS satellite component and do not intend to include such constraints in the CGC Licence.

A1.9 Question 8:

Q -8 We have based our analysis of compatibility between CGC and other radio		
systems on studies of analogous scenarios conducted for the 2.6 GHz award – do		
you agree with this assumption?		
Response comments	Ofcom position	
Concern that the decisions made in the 2.6 GHz award have not been applied to the CGC technical licence conditions.	It is not possible to protect the PMSE channel 2200 – 2210 MHz without severely restricting the use of the top 10 MHz of CGC, to the extent that this 10 MHz cannot be considered to be made available to the MSS operator, as required by the EU Decision The case of the 2.6 GHz award is not analogous to the situation for 2 GHz MSS CGC: • The technical conditions for the 2.6 GHz award were solely a UK Decision; and • An effective 5 MHz guard band exists at the band edge before the first PMSE channel that provides additional protection for PMSE.	

We have however included an additional constraint on CGC out-of-band transmissions, of -38 dBm/ MHz above
2210 MHz in order to allow PMSE
operation above 2210 MHz.

A1.10 Question 9:

Q -9 Do you have any comments on the assumptions of the deployed network modelled for the SUR parameters?	
Response comments	Ofcom position
None received.	

Annex 2

Summary of the responses related to fees for 2 GHz CGC

- A2.1 The following provides a summary of the response comments relating to questions on fees in the first consultation on 2 GHz CGC.
- A2.2 Question 10:

Q -10 Do you agree that the licence fees should be set at around £554,000 per 2 x		
1MHz?		
Response comments	Ofcom position	
A fee level at £554,000 is totally inappropriate, and will completely undermine the many benefits that the UK and the EU envisioned for integrated MSS and CGC systems. An alternative feel level of £140,000 per	Our response to comments on the level of fee that should be charged can be found in Section 5 of the main body of this Statement. The issues raised by stakeholders are complex and we would not do justice to these arguments if we were to attempt to summarise our	
2x 1 MHz per year would be appropriate. In accordance with the Authorisation Directive, the licence fee should be set at a level to recover administrative costs only.	response here.	
Adjacent spectrum is underutilised.		
Ofcom should set a fee based on the number of CGC base stations deployed.	Unlike other European administrations it is not Ofcom's policy to charge for spectrum based on the number of installed base stations as proposed by one response. No arguments have been made that lead us to conclude that we should charge for CGC Licences in such a substantially different way than other existing mobile licences.	

A2.3 Question 11:

Q -11 If you believe that setting fees at this level would result in CGC systems not being deployed, please provide your reasons and full supporting evidence including a detailed business case.		
Response comments	Ofcom position	
Proposed fee level would have significant impact on MSS/CGC return on investment.	Our response to comments on the level of fee that should be charged can be found in Section 5 of the main body of	
If similar fee levels were introduced by half of the EU Member States this would	this Statement. The issues raised by stakeholders are complex and we would not do justice to these arguments if we	

cost MSS operators £183 million annually and this would likely render any 2 GHz MSS/CGC business plan infeasible.	were to attempt to summarise our response here.
If there is a business case for CGC systems they should be able to afford the proposed licence fee.	
The proposed licence fees could have a significant impact at an EU level and these have not been considered in the consultation document.	

Annex 3

List of respondents to the second consultation

BBC

Inmarsat

Intellect

JFMG

Orange

SAP Reg

Solaris

SPMF

T-Mobile

Terrestar Europe

Three confidential responses

Electronic copies of the non-confidential responses to this consultation can be found on Ofcom's website: <u>http://www.ofcom.org.uk/consult/condocs/cgcs2/responses/</u>.

Annex 4

Impact Assessment

Introduction

- A4.1 The analysis presented in this Annex represents an impact assessment, as defined in section 7 of the Communications Act 2003 (the Act).
- A4.2 Impact assessments provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making. This is reflected in section 7 of the Act, which means that generally we have to carry out impact assessments where our proposals would be likely to have a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. However, as a matter of policy Ofcom is committed to carrying out and publishing impact assessments in relation to the great majority of our policy decisions. For further information about our approach to impact assessment, which are on our website: http://www.ofcom.org.uk/consult/policy_making/guidelines.pdf

The citizen and/or consumer interest

- A4.3 This Statement concludes on the terms and conditions that will apply to CGC Licences in the UK. In so doing it sets out the regulatory approach to authorising CGC networks that will allow CGC services to be provided in UK.
- A4.4 CGC services complement MSS services carried over the satellite. CGC services may be provided across wide rural areas and in urban as well as sub-urban areas. The deployment of CGC services will benefit consumers and citizens in the following ways:
 - CGC networks might be used to improve coverage of the satellite services, particularly in urban areas where high rise buildings may block or shadow the satellite signal;
 - CGC networks might also be used to extend coverage into buildings, thus
 extending the coverage of these services to consumers in areas not traditionally
 served by satellite networks;
 - In addition, CGC networks may provide services and applications that are distinct from those carried on the satellite and thereby could provide new and innovative services including mobile TV, additional mobile broadband services, or provide increased public security through Public Protection and Disaster Relief (PPDR) services.

Ofcom's policy objective

- A4.5 Ofcom's policy objective for these bands is to allow the 2 GHz spectrum to be put into use in UK shortly after the EC Selection Decision is published in the OJ.
- A4.6 In addition, it is Ofcom's objective to incorporate into the CGC Licence the UK's relevant obligations arising from Decision No 626/2008/EC, so as to ensure

compliance with the CGC common conditions detailed within Article 8 of that Decision.

Equality Impact of the detailed terms and conditions of the CGC Licence

- A4.7 Following an initial assessment of its policy Ofcom considers that it is reasonable to assume that any impacts on consumers and citizens arising from the detailed terms and conditions of the CGC Licence, including setting AIP for 2 GHz CGC spectrum, would not differ significantly between groups or classes of UK consumers and citizens, all of whom would have access to these services, potentially at end-user prices reflective of all general input costs, including opportunity costs of spectrum used.
- A4.8 In addition, Ofcom notes that there is no available evidence to suggest the decision to apply AIP in this Statement would have a significantly greater direct financial impact on groups including based on gender, race or disability or for consumers in Northern Ireland relative to consumers in general. While Ofcom does not know with certainty the types of CGC services that will be provided, Ofcom does not consider that there is evidence to suggest that costs of providing any UK wide CGC service, including AIP fees paid in relation to bandwidth used by the CGC operator, would differ significantly by these aforementioned groups of consumers and citizens relative to consumers in general. This is because one would not expect the impact of AIP on the cost of supplying these consumers and citizens to differ significantly between these groups and consumers in general. Nor would cost reflective enduser prices therefore be expected to impact significantly differently on these groups as a result of charging AIP.
- A4.9 Ofcom has not carried out a full Equality Impact Assessment in relation to race equality or equality schemes under the Northern Ireland and disability equality schemes at this stage. This is because we are not aware that the proposals being considered here are intended (or would, in practice) have a significant differential impact on different gender or racial groups, on consumers in Northern Ireland or on disabled consumers compared to consumers in general

Analysis of Issues

- A4.10 This Statement focuses on the detailed licence conditions to be included in the CGC Licence, including the level of fee that will apply. This impact assessment considers issues that arise as a result of our Statement which have a significant impact on MSS operators and other stakeholders.
- A4.11 The issues considered are:
 - Permitting CGC networks to support services and applications that may differ in form and content from those carried by the satellite service;
 - The level of CGC fees level;
 - The impact of the specified technical licence conditions on PMSE operation above 2200 MHz.

Services permitted to be carried on CGC

Introduction

- A4.12 As discussed in further detail in paragraphs 4.5 to 4.36 of the main document, some responses to our consultation proposed that we should restrict the use of the CGC to provide the same services and applications as the satellite component in order to ensure that CGC is an integral part of the MSS. We consider below the impact that our decision to not restrict the use of the CGC network in this way will have on the key parties affected. The impacts are considered relative to a scenario in which we include the following additional constraints on the use of CGC networks, as envisaged by some stakeholders, namely:
 - The CGC network is restricted to carrying the same service as the MSS satellite component; or
 - The CGC network is restricted to carrying the same signal and content as the MSS satellite component i.e. is a simple repeater of the satellite signal.
- A4.13 In reaching a conclusion on the nature of the requirement for CGC to form an integral part of the MSS, we considered:
 - The requirements of the EU Decision, in relation to which we are of the view that imposing no additional restrictions than those strictly required by the EU Decision on the services and applications that can be provided by CGC networks is consistent with the EU and RSC Decisions;
 - Our duties in relation to our spectrum functions in relation to which we conclude that allowing services other than those provided by the MSS satellite component would be in the best interests of UK citizens and consumers and help secure optimal use of the radio spectrum, as required by our statutory duties;
 - The practical considerations of CGC operation, as it relates to the MSS satellite component, in relation to which we conclude that whilst it would be possible in theory to restrict the CGC to repeating the satellite signal, or to providing the same service or application, this is not required in order to allow the CGC to share spectrum with the MSS. Moreover that it would be an inefficient use of the spectrum used by the CGC as otherwise it could provide additional or complementary services. For example, services targeted at the specific market in which the CGC is located, unlike the satellite service that will likely provide services of broader appeal.
- A4.14 The impact of this decision is likely to be felt by:
 - MSS operators;
 - CGC operators, where the CGC licence has been traded;
 - Competitors to CGC operators; and
 - UK citizens and consumers.
- A4.15 Each of these impacts is discussed in turn in the following sub-sections.

Impact on MSS operators

- A4.16 MSS operators will be able to use the CGC to provide a greater range of services, applications and content to their customers than would be possible if service provision was restricted further than required by the EU and RSC Decisions.
- A4.17 There is therefore no likely detrimental impact on MSS operators, rather a greater opportunity for the MSS operators to provide additional services and profit. These benefits should therefore also encourage roll-out of CGC in the UK, compared to a situation where the services permitted to be carried on the CGC were more restricted.

Impact on CGC operators

- A4.18 Similarly where the CGC operator is different to the MSS operator, the CGC operators will be able to use the CGC to provide a greater range of services, applications and content to their customers than would be possible if service provision was restricted further than required by the EU Decisions.
- A4.19 There is therefore no likely detrimental impact on CGC operators, rather a greater opportunity for the CGC operators to generate additional revenue and profit. Again this should therefore encourage roll-out of CGC in UK, compared to a situation where the services permitted to be carried on the CGC were more restricted.

Impact on CGC competitors

- A4.20 The identity of competitors to CGC will depend upon the services that the different CGC networks offer. As such, by permitting a wider range of services and applications to be carried on the CGC, rather than imposing an additional limitation on its permitted use, the set of potential competitors to the CGC networks is increased. This approach has the potential to increase competition for these services by removing restrictions on the provision of additional innovative service offerings.
- A4.21 When deciding on whether to limit the services which can be offered, Ofcom has a statutory duty to promote competition in relevant markets. In addition, it is important for us to consider the impact on competitors as in some cases it may be possible for our decisions to unduly distort competition. However, in this particular case, we do not consider that our proposals would unduly distort competition by unreasonably favouring CGC competitors over others. This assumes that the price paid by the CGC operator does not allow them to enter on more favourable terms (see paragraph 5.74). We discuss this issue in our assessment of the impact of our proposed fee level. This will be particularly relevant where our policy might impact on incentives to enter or exit markets.

Impact on citizens and consumers

- A4.22 Given that MSS and/or CGC operators will be able to provide a wider range of services, compared to the situation where a more restricted set of services is provided, citizens and consumers will benefit from our decision.
- A4.23 The additional services permitted may be ones that might otherwise not have been provided e.g. PPDR services, or may be in competition with other existing services (see previous section). Therefore consumers and citizens will likely benefit from

new and unique service offerings and/or additional competition and therefore potentially lower prices, or higher quality for existing services.

A4.24 We have identified no detrimental impacts for citizens and consumers from permitting a wider range of services and applications to be provided over the CGC.

Level of CGC fees

Introduction

- A4.25 The options open to Ofcom in relation to the fees charged for WT Act licences generally fall into the following categories:
 - i) to charge the full rate of AIP;
 - ii) to charge cost recovery prices for WT licences; and
 - iii) not to charge for WT Act licences.
- A4.26 As we outlined in detail in our first Statement we believe that fees based on recovery of administrative costs or those that are zero rated AIP would not encourage optimal use of the 2 GHz spectrum.
- A4.27 In particular, there is substitutable spectrum available which could be used to provide services similar to CGC. For instance, mobile TV could potentially be provided within the UHF digital dividend spectrum, at L band (1452-1492 MHz) or at 2.6 GHz all of which have been or will be the subject of auctions. If the 2 GHz CGC spectrum were not subject to AIP, there is a risk that users would face disincentives to use these alternative bands, even if the benefit they might be able to provide from using those bands were higher than could be achieved at 2 GHz. It could therefore incentivise them to use a satellite/CGC based platform for the delivery of their services even if this is not the most efficient means of delivering them.
- A4.28 A decision to grant licences free of charge, or to charge a fee based only on our administrative costs, could lead to a socially sub-optimal level of services and would therefore lead to lower benefits for UK citizens and consumers. We believe that the potential disadvantages of not providing incentives for efficient use of this spectrum are such that we do not propose this option.
- A4.29 This would be inconsistent with our duty to promote the optimal use of the spectrum, and would risk failing to maximise the benefits available to society, to citizens and consumers, from the use of spectrum.
- A4.30 We have discussed in some detail, in section 5 of the main document, the issues of whether:
 - the case for charging AIP for tradable licences;
 - the appropriateness of the proposed AIP fee level; and
 - the wider implications of our decision on the EU market,

and concluded that:

- it remains appropriate to apply the principle of AIP to CGC licence fees, regardless of the fact that they are tradable,
- there is not a compelling reason to choose a rate which is different from the rate of £554,000 per 2 x 1 MHz that we proposed in our initial consultation. Our judgement is that the use of this rate strikes a reasonable balance by being a conservative number within the range of mobile AIP rates applied to existing licences,
- the wider implications of our decisions on the EU market do not out-weigh the potential damage to the efficient allocation of spectrum in UK to warrant us revising our conclusion.
- A4.31 We have concluded therefore, on balance, to set the AIP fee for CGC at the £554,000 per 2 x 1 MHz level. We have also discussed and concluded, in section 5, that we will not review this fee before 5 years, except where we are provided clear and compelling evidence that the level of fee is likely to prevent this spectrum being brought into efficient use in which case we would consider reviewing the rate downwards. As discussed in paragraphs 5.72 5.74 this approach will:
 - provide MSS/CGC operators with a reasonable period of certainty over the fee rates that they will face, but also
 - recognise the need to review the AIP rate in due course as more information becomes available thereby minimising the risk of fee levels being too high or too low.
- A4.32 The CGC fee level will potentially impact a range of stakeholders, in particular the:
 - MSS operators,
 - CGC only operators,
 - Competitors in CGC markets, and
 - Consumers of CGC services.
- A4.33 The impact on each of these stakeholders is assessed in the following sub-sections.

Impact of CGC fee level on MSS operators

- A4.34 In determining the impact of CGC fees on the MSS operators we need first to recognise that these fees are only payable by the MSS operator following their request for a CGC Licence and are therefore discretionary²⁸.
- A4.35 In addition the level of the CGC Licence fee is directly related to the amount of spectrum that the MSS operator requests and can therefore be controlled to some extent by the operators based on the expected CGC traffic requirements and therefore revenue potential of the CGC service.
- A4.36 The financial impact on MSS operators will depend upon a number of uncertain factors including:

²⁸ Equally no fees will be applied to the use of the spectrum by the MSS satellite component in any event.

- how much spectrum they request;
- any commercial negotiations with third-party CGC operators; and
- the extent to which costs are passed through to consumers.
- A4.37 Similarly, depending on the extent of the competition in the downstream markets and the mix of input costs that other competitors face, some or all of these costs could be passed through to the consumer (see paragraphs A4.56 -A4.57).
- A4.38 It is therefore difficult to calculate the final financial impact, if any, of the CGC fees that an MSS operator may have to bear.
- A4.39 The points set out above suggest that the final financial impact of CGC fees on MSS operators could lie significantly below the level implied by the initial legal incidence or allocation of CGC bandwidth to an MSS operator through the CGC licence.
- A4.40 For the purposes of illustration, we have estimated a maximum financial impact for an MSS operator in the case where an MSS operator applies for a CGC licence in 2009/10 and was not able to pass through any of the CGC fees to either a CGC operator (e.g. through a concurrent trade) or the consumer. The maximum possible fee is given in Table 1, based on an annual AIP fee level of £554,000 per 2 x 1 MHz for two scenarios of CGC bandwidth: 2 x 5 MHz and 2 x 10 MHz.

CGC Bandwidth	Fee
2 X 5 MHz	£2,770,000
2 X 10 MHz	£5,540,000

Table 1: Maximum annual impact of CGC fees on MSS operators

- A4.41 We considered whether to explicitly model the impacts of AIP fees relative to a representative MSS business model. For instance, we considered whether to model the relative impacts of AIP fees against a Mobile TV business for a MSS operator.²⁹ We have, however, chosen not to undertake a quantitative impact analysis for the following reasons:
 - First, to undertake a reliable impact analysis of fees relative to a MSS business model (e.g. Mobile TV) we would require information such as forecasts of demand, prices, costs and revenues. Ofcom has sought this information from prospective MSS licensees. However, prospective MSS operators were unable to provide Ofcom with sufficient information that would allow us to draw meaningful conclusions.
 - We also note that there is limited published information on the market planned for satellite and CGC based mobile TV services and ATC/MSS type services more generally that would enable us to draw meaningful conclusions. Where Ofcom has access to published third party reports³⁰ we do not consider that the

²⁹ Ofcom met with the four MSS bidders to the EU award during the course of this consultation, and Mobile TV was raised by at least one prospective MSS operator as a possible business model. ³⁰ NSR, Mobile TV via Satellite: Assessing S- Band and Channel Distribution / Backhaul opportunities, April 2007; TMF Associates, ATC, satellite radio and other hybrid MSS networks: business cases and spectrum valuations

forecasts are sufficiently robust to develop a quantitative assessment of the impacts of differing levels of AIP on the selected MSS operators with confidence (e.g. due to concerns over the assumptions made in these reports and an insufficient UK service model focus) particularly in the absence of reliable, complementary information provided by the selected MSS operators.

- In addition, the range of services that a CGC operator might provide are very wide and there is a large degree of uncertainty over what services and what mix of services MSS operators intend to provide. It would therefore be necessary for us to carry out multiple impact analyses for various possible business plans without any certainty as to which, if any, of the business models might be implemented by the CGC operators.
- Second, although as part of its DDR consultation³¹, Ofcom has undertaken modelling to assess the value of alternative uses of the DDR spectrum³², we believe it would be inappropriate for us to use this model to undertake an assessment of the financial impact of our AIP proposals on potential CGC operators. This is because this model:
 - was not constructed to provide a reliable estimate of the impact of individual costs on the business case of a mobile TV operator. Rather the key purpose of the model was to illustrate the potential magnitude of the value to society of the DDR spectrum. As a result, the level of detail in which it was necessary to model the business case of potential operators is less than would be required to produce a reliable estimate of the impact of differing levels of AIP; and
 - is based on the particular circumstances of the deployment of Mobile TV in the DDR spectrum, and accordingly some of the underlying modelling assumptions are unlikely to be relevant to the business case for deploying these services in the 2 GHz MSS and CGC spectrum.
- A4.42 There are however, qualitative reasons which suggest that the proposed fees are unlikely to have a detrimental impact on MSS operators.
- A4.43 This is firstly because there are several features of our proposals that reduce the potential for the proposed fees to have a detrimental impact on the provision of MSS services:
 - For instance, the regulatory risk of setting fees incorrectly (including setting fees too high) to the detriment of the MSS business has been considered by Ofcom and balanced against the interests of providing certainty to MSS/CGC operators regarding the fee rate that will apply. We consider that a review of fees no sooner than 5years from the date of this Statement will provide a balanced approach to mitigating risk of setting fees too high against the need to provide regulatory certainty. As part of striking this balance, Ofcom may consider reviewing the rate downwards before 5 years (as an exception to the approach above) where Ofcom is presented with clear and compelling evidence that the proposed rate is preventing spectrum from being brought into efficient use (see paragraphs 5.72-5.74).

³¹ http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf

³². For example, the DDR consultation assesses the value of Mobile TV services under a range of market conditions and scenarios (albeit at lower spectrum frequencies than 2 GHz)

- A4.44 Second, Ofcom notes that the AIP fees are discretionary and can therefore be avoided by the MSS operator, including by:
 - negotiating with a CGC operator to pay for a smaller proportion of the AIP fee³³;
 - passing fees through to intermediate and end consumers; and
 - scaling back the MSS business operation.³⁴

Impact of CGC fee level on CGC operators

- A4.45 A third party CGC operator, not the MSS operator, would need to have bought a concurrent trade of the CGC licence that would have required commercial negotiations. We would expect that such negotiations would include the extent to which each party would be liable to pay the CGC AIP fee.
- A4.46 The CGC operator, depending on the extent of the competition in the downstream markets and the mix of input costs that other competitors face, might be able to pass through some or all of these costs to the consumer.
- A4.47 It is therefore difficult to predict the final financial impact, if any, of the CGC fees that a CGC operator may have to bear.
- A4.48 We can however estimate a maximum financial impact for a CGC operator based on the following assumptions. Using a similar approach as set out above for the MSS operator, in the case where a third party CGC operator agreed to pay the full AIP and was not able to pass through any of the CGC fees to the consumer then a maximum possible fee is given in Table 1, based on an annual AIP fee level of £554,000 per 2 x 1 MHz and for the two scenarios of CGC bandwidth: 2 x 5 MHz or 2 x 10 MHz. The annual fees estimated are the same as those estimated for the MSS operator in Table 1.
- A4.49 The fees proposed are based on the AIP currently charged for similar spectrum. There is no evidence to suggest that these fees are having a significant detrimental impact upon the delivery of services using similar spectrum.
- A4.50 In addition, as discussed above in relation to the MSS operators, there are qualitative reasons which suggest that the proposed fees are unlikely to have a detrimental impact on CGC operators.
- A4.51 Firstly, Ofcom notes that the regulatory risk of setting fees too high to the detriment of the CGC business is mitigated by the possibility for future review of fee levels (see paragraphs **Error! Reference source not found.** and 5.72-5.74).

³³ In some cases the MSS operator may not pay any fees. For example, an MSS business operating, say, a Mobile TV service may decide to undertake a concurrent trade of the CGC Licence, such that all bandwidth used under the CGC Licence relates to other terrestrial based network services. Ofcom considers that AIP fees paid in respect of bandwidth used under CGC licences may therefore not affect profitability in the MSS licensed use over the lifetime of the licence (i.e. where the CGC Licence Licensee pays the AIP fee in respect of all bandwidth used under the CGC Licence).

³⁴ Ofcom also notes that MSS operators could, in an extreme scenario, hand back the CGC licence in whole or part to Ofcom in the unlikely event the business is no longer deemed profitable. However, we consider this outcome is neither likely nor desirable (as it would reduce welfare outcomes for consumer/citizens).

- A4.52 Secondly, Ofcom notes that the AIP fees are discretionary and can therefore be avoided by the CGC operator, including by:
 - passing fees through to intermediate and end consumers; and
 - scaling back the CGC business operation.³⁵

Impact of CGC fees on competitors to CGC services

- A4.53 We consider that the proposed reference rate strikes a reasonable balance by being appropriately biased towards conservatism in that there is greater scope for adverse impact when AIP rates are set too high rather than when they are set too low.
- A4.54 We also consider that this approach carries a low risk of distorting competition by licensing spectrum which can be used for terrestrial mobile applications at a rate which is "too low" with reference to other spectrum used to provide mobile service (a concern raised by some respondents to the consultation). This view reflects, in part, the fact that it would take some time before a competing mobile service with any scale could be deployed and, in part, because we would expect to review the AIP rate in due course if mobile use of this spectrum emerged and it appeared that there was a material risk of distortions to competition arising.
- A4.55 Any distortions from setting fees too low are uncertain and are unlikely to persist into the long term for the reasons given above, Hence, we do not believe the additional competition will unduly distort competition for competing services at the proposed fee level.

Impact of CGC fees on consumers of CGC services

- A4.56 At present, there is a significant degree of uncertainty regarding the types of services that may develop in downstream markets in response to the award of 2 GHz spectrum for both of the successful MSS and CGC licensees. While Ofcom is aware of some of the potential MSS applications (including mobile TV and satellite radio) and CGC applications (including 2G and 3G services) there will be other applications, and these cannot be known with any certainty. Accordingly, it is not possible to reliably estimate the financial impacts on end consumers.
- A4.57 Ofcom notes that although higher end-user prices may represent one possible outcome of applying AIP, Ofcom considers that if there are opportunity costs underlying spectrum use then it is appropriate for producers, consumers or both to bear these costs. In this way society benefits through resources being valued optimally, resulting in greater overall efficiency. Prices reflecting the opportunity cost of spectrum, while encouraging more efficient use of the spectrum, will potentially lead to a different mix of services provided in the market from that which would be likely if this input is not priced and which will benefit producers and consumers in aggregate.

³⁵ Ofcom also notes that MSS operators could, in an extreme scenario, hand back the CGC licence in whole or part to Ofcom in the unlikely event the business is no longer deemed profitable. However, Ofcom considers this outcome is neither likely nor desirable (as it would reduce welfare outcomes for consumer/citizens).

Impact on PMSE operation above 2200 MHz

- A4.58 As we have previously discussed, in paragraphs 6.25 6.33, whilst we recognise the concerns expressed by the PMSE community all of our technical analysis has led to our conclusion that it is not possible to protect fully PMSE use in band 2200 – 2210 MHz. Our analysis shows that the use of filtering at the CGC and imposing restrictions on the power levels of CGC operation to the level that would be needed to allow PMSE use of 2200 – 2210 MHZ would not be consistent with our obligation under the EU Decision to make any part of the full 2 x 30 MHz available for CGC operation.
- A4.59 It should be noted however that all of the discussion on this assessment assumes the case whereby the MSS operator chooses to operate the CGC at the top end of their assignment. Depending on the actual assignment of spectrum between the satellite and CGC, the actual impact on PMSE may be lower than anticipated, and hence it may be possible for PMSE to continue operation in the channel 2200 2210 MHz.
- A4.60 In addition we have reviewed the conditions we could impose beyond 2210 MHz in order to protect the second PMSE channel. We have concluded that by imposing an additional out-of-band e.i.r.p limit of -38 dBm /MHz above 2210 MHz it should be possible for continued PMSE use of this channel, without imposing an unreasonable burden on the operation of CGC given that:
 - information obtained by Ofcom from a number of filter manufacturers during studies for other similar bands, in particular the 2.6 GHz award, suggested that it is possible to reduce power levels out-of-band by the 60 dB required within 5 MHz of the band edge; and
 - as the -38 dBm/ MHz limit, we have imposed, is more than 10 MHz offset, it should be possible to manufacture RF transmit filters to meet this limit using commercially available conventional resonator filters at no significant additional cost.

Annex 5

Example CGC Licence

A5.1 This Annex provides an example of the CGC Licence we have concluded we will issue for the installation and operation of the 2 GHz MSS CGC networks in UK.

Wireless telegraphy Act 2006

Office of Communications (Ofcom)

SPECTRUM ACCESS LICENCE XXXX MHz - XXXX MHz

Licence no. xxxxx

Date of issue: xx xxxx 2009

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

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

Licence Term

2. This Licence shall continue in force until [Date: This date will be 18 years from the date of EU Selection Decision] unless earlier revoked by Ofcom in accordance with paragraph 3 of this Licence or surrendered by the Licensee.

Licence Variation and Revocation

- **3.** Pursuant to Schedule 1, paragraph 8 of the Wireless Telegraphy Act 2006 ("the Act") Ofcom may not revoke or vary this Licence under Schedule 1, paragraph 6 of the Act except:
 - (a) at the request of, or with the consent of, the Licensee;
 - (b) in accordance with paragraph 8 of this Licence;
 - (c) if there has been a breach of any of the terms of this Licence;
 - (d) if, in connection with the transfer or proposed transfer of rights and obligations arising by virtue of the Licence, there has been a breach of any provision of regulations made by Ofcom under the powers conferred by section 30(1) and section 30(3) of the Act³⁶;

- (e) if UK [Licence number: xxx] is no longer in force
- (f) if it appears to Ofcom to be necessary or expedient to revoke or vary the Licence for the purposes of complying with a direction by the Secretary of State given to Ofcom under section 5 of the Act or section 5 of the Communications Act 2003.
- **4.** Of com may only revoke or vary this Licence by notification in writing to the Licensee and in accordance with Schedule 1 Paragraphs 6 and 7 of the Act.

Failure of Mobile Satellite Component

5. In the event of failure of the Mobile Satellite Component, independent operation of the Radio Equipment shall not exceed 18 months before the Mobile Satellite Component is restored.

Changes

- **6.** This Licence is not transferable. The transfer of rights and obligations arising by virtue of this Licence may however be authorised in accordance with regulations made by Ofcom under powers conferred by section 30(1) and 30 (3) of the Act³⁷.
- 7. The Licensee must give prior notice to Ofcom in writing of any proposed change to the Licensee's name and address from that recorded in the Licence.

Fees

- 8. The Licence Fee in respect of this Licence is [£xxxxxxx] per annum which for the avoidance of doubt is exclusive of any VAT which may ultimately be payable, failing which Ofcom may revoke this licence
- **9.** The Licensee shall also pay interest to Ofcom on any amount which is due under the terms of this Licence or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act, from the date such amount falls due until the date of payment, calculated with reference to the Bank of England base rate from time to time. In accordance with section 15 of the Act any such amount and any such interest is recoverable by Ofcom.
- **10.** If the Licence is surrendered or revoked, no refund, whether in whole or in part of any amount which is due under the terms of this Licence or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act will be made, except at the absolute discretion of Ofcom in accordance with any regulation made under those sections of the Act (as the case may be).

³⁷ http://www.ofcom.org.uk/radiocomms/ifi/trading/

Radio Equipment Use

- **11.** The Licensee must ensure that the Radio Equipment is established, installed and used only in accordance with the provisions specified in Schedule(s) of this Licence. Any proposal to amend any detail specified in Schedule(s) of this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.
- **12.** The Licensee must ensure that the Radio Equipment is operated in compliance with the terms of this Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of this Licence.

Access and Inspection

- **13.** The Licensee shall permit a person authorised by Ofcom:
 - (a) to have access to the Radio Equipment; and
 - (b) to inspect this Licence and to inspect, examine and test the Radio Equipment,

at any and all reasonable times or, when in the opinion of that person an urgent situation exists, at any time to ensure the Radio Equipment is being used in accordance with the terms of this Licence.

Modification, Restriction and Closedown

- **14.** A person authorised by Ofcom may require any of the wireless telegraphy stations or wireless telegraphy apparatus that comprise the Radio Equipment to be modified or restricted in use, or temporarily or permanently closed down immediately if in the opinion of the person authorised by Ofcom:
 - (a) a breach of a term of the Licence has occurred; and/or
 - (b) the use of the Radio Equipment is causing or contributing to interference to the use of other authorised radio equipment.
- **15.** Ofcom may require any of the wireless telegraphy stations or wireless telegraphy apparatus that comprise the Radio Equipment to be modified or restricted in use, or temporarily closed down either immediately or on the expiry of such period as may be specified in the event of a national or local state of emergency being declared. Ofcom may only exercise this power after a written notice is served on the Licensee or a general notice applicable to holders of a named class of Licence is published.

Geographical Boundaries

16. This Licence authorises the Licensee to establish, install and use the Radio Equipment only in the United Kingdom, Isle of Man, Guernsey and Jersey.
Interpretation

- **17.** In this Licence:
 - (a) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of stations and installation and use of apparatus for wireless telegraphy as specified in section 8(1) of the Act;
 - (b) the expression "interference" shall have the meaning given by section 115 of the Act;
 - (c) the expressions "wireless telegraphy apparatus" and "wireless telegraphy station" shall have the meanings given by section 117 of the Act;
 - (d) "mobile satellite component" shall mean all elements required to provide a mobile satellite service and shall included the space station or stations required to provide the mobile satellite service and any gateway earth stations required for the delivery of mobile satellite services;
 - (e) "space station" shall mean a station located on an object which is beyond, is intended to go beyond or has been beyond, the major portion of the earth's atmosphere;
 - (f) "station" shall mean one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service";
- **18.** The schedule(s) to this Licence form(s) part of this Licence together with any subsequent schedule(s) which Ofcom may issue as a variation to this Licence at a later date.
- **19.** The Interpretation Act 1978 shall apply to the Licence as it applies to an Act of Parliament.

Issued by Ofcom

Signed by

For the Office of Communications

Draft Schedule for 2170-2200 MHz

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

SCHEDULE [] TO LICENCE NUMBER: xxxxxx

Schedule Date: xx xxxx 2008 Licence Category: SPECTRUM ACCESS [XXXX – XXXX MHz]

1. Description of Radio Equipment Licensed

In this Licence, the Radio Equipment means the base stations (base transceiver stations or repeater stations) forming part of the Network (as defined in paragraph 2 below) that transmit in accordance with the requirements of paragraphs 7 - 11 of this schedule.

2. Purpose of the Radio Equipment

The Radio Equipment shall form part of a radio telecommunications network ("the Network"), in which Mobile Earth Stations or User Stations which meet the appropriate technical performance requirements as set out in the relevant Wireless Telegraphy (Exemption) Regulations made by Ofcom communicate by radio with the Radio Equipment to provide services as part of a mobile satellite system.

The Network shall constitute an integral part of a mobile satellite system; it shall be controlled by that satellite's radio spectrum management resource and Network management mechanism.

3. Interface Requirements for the Radio Equipment use

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

IRxxxx "Spectrum Access xxxxxxxxxx"

4. Special Conditions relating to the Operation of the Radio Equipment

a) During the period that this Licence remains in force, unless consent has otherwise been given by Ofcom, the Licensee shall compile and maintain accurate written records of:

- (i) the following details relating to the base stations:
 - a) postal address (including post code);
 - b) National Grid Reference, (to 100 metres resolution);
 - c) antenna height (above ground level) and type, bearing east of true north;
 - d) radio frequencies which the Radio Equipment is able to use and radio frequencies which the Radio Equipment uses;

e) the technical characteristics of the Radio Equipment both in terms of transmission and reception of wireless telegraphy;

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

- b) The Licensee shall inform Ofcom of the address of the premises at which this Licence and the information detailed at sub-paragraph 4(c) shall be kept.
- c) The Licensee must submit to Ofcom copies of such parts of the records detailed in sub-paragraph 4(c) at such intervals as Ofcom shall notify to the Licensee. Without prejudice to any information which Ofcom is required by law to publish or disclose, Ofcom may, from time to time, publish such extracts of this information as it sees fit, regarding-
 - (i) the total number of base stations of the Radio Equipment which are operational;
 - (ii) the locations, aggregated by outward postcode, of those base stations;
 - (ii) the frequencies used by the Radio Equipment.
- d) The Licensee must also submit to Ofcom in such manner and at such times, all information relating to the establishment, installation or use of the Radio Equipment, whether stored in hard copy or electronic form, as reasonably requested for the purposes of verifying compliance with this Licence, for statistical purposes and more generally for the purpose of ensuring that Ofcom can perform its spectrum management functions.
- e) The Licensee must submit to Ofcom an annual compliance report indicating that the use of Radio Equipment is in accordance with the following conditions of its licence:
 - the Radio Equipment constitutes an integral part of a mobile satellite system and is controlled by the satellite resource and network management mechanism; it uses the same direction of transmission and the same portions of frequency bands as the associated mobile satellite component;
 - (ii) independent operation of the Radio Equipment, in case of failure of the mobile satellite component associated with the Radio Equipment has not exceeded 18 months.

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

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

CGC base stations are not permitted to operate within 8km of the following sites:

- a) Oakhanger (SU 776 357);
- b) Colerne (ST 808 717);
- c) Menwith Hill (SE 209 561).

6. International Cross-border Co-ordination

The Licensee must ensure that the Radio Equipment is operated in compliance with such cross-border co-ordination and sharing procedures as may be notified to the Licensee by Ofcom.

7. Permitted Frequencies

Subject to the out-of-block emissions permitted under paragraph 9, the Radio Equipment must only transmit in the following frequency band the "permitted assigned frequency block":

(*i*) The Radio Equipment shall transmit in the following band [assignment, or subset, given by the Decision No 626/2008/EU process in the 2170-2200MHz band] – Base Transmit "the downlink";

(ii) The Radio Equipment shall receive in the following band [assignment, or subset of, given by the Decision No 626/2008/ECprocess in 1980-2010 MHz band] – Base Receive "the uplink".

8. Maximum Permissible Transmitted Power

The maximum mean power transmitted in the permitted assigned frequency block shall not exceed the more stringent of:

- 61 dBm/5 MHz EIRP
- 58 dBm/MHz EIRP

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

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

9. Permissible out-of-block emissions

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

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

Where:

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

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

 In cases where the inputs to different antennas are not correlated, the maximum mean EIRP transmitted in the Permitted Frequency assignment band referred to in section 7 above is calculated from the sum of the EIRP for each separate antenna;

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

(b) In cases where the inputs to different antennas or antenna elements are correlated, the maximum mean EIRP transmitted in the Permitted Frequency Blocks referred to in section 7 above is calculated as follows:

EIRP_{effective} =
$$\Sigma P_{nom}$$
 (dBm) + 10 log 180/ θ + 10 log 360/ ϕ

Where:

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

³⁸ A limit of -38 dBm/MHz applies to the block edge at 2200 MHz.

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

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

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

11. Interpretation of terms in this Schedule

In this Schedule:

- (a) "EIRP" means the equivalent isotropically radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);
- (b) "dBm" means the power level in decibels (logarithmic scale) referenced against 1 milli-Watt (i.e. a value of 0 dBm is 1 milli-Watt);
- (c) "out-of-block emissions" means radio frequency emissions generated by the Radio Equipment and radiated into the frequency bands adjacent (in terms of frequency) to the licensee's Permitted Frequency Assignment;
- (d) "uplink" refers to transmissions from Mobile Earth stations or User stations to a base station or space station;
- (e) "downlink" refers to transmissions from a base station or space station to a Mobile Earth Station or User station;
- (f) "The expression "mobile satellite systems" shall mean electronic communications networks and associated facilities capable of providing radiocommunication services between a mobile earth station and one or more space stations, or between mobile earth stations by means of one or more space stations, or between a mobile earth station and one or more complementary ground components used at fixed locations. Such a system shall include at least one space station;
- (g) "complementary ground components" of mobile satellite systems shall mean ground based stations used at fixed locations, in order to improve the availability of the mobile satellite service in geographical areas within the footprint of the system's satellite(s), where communications with one or more space stations cannot be ensured with the required quality;

- (h) "base station", means any station that is providing communications services to associated Mobile Earth Stations or User stations and forms part of an electronic communications network;
- (i) "mobile earth station" shall mean an earth station in the mobile satellite service intended to be used while in motion or during halts at unspecified points"
- (j) "space station" shall mean a station located on an object which is beyond, is intended to go beyond or has been beyond, the major portion of the earth's atmosphere;
- (k) "station" shall mean one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service";
- (I) "mobile satellite component" shall mean the space station or stations required and any earth stations required to support services provided over the mobile satellite system;
- (m) "earth station" shall mean a station located either on the Earth's surface or within the major portion of the Earth's atmosphere and intended for communication.
- (n) "a satellite resource and network management mechanism" means a facility which assigns frequencies to terminals within the mobile satellite system.

Annex 6

Glossary

Administration	Any governmental department or service responsible for discharging the obligations undertaken in the Constitution of the ITU, in the Convention of the ITU and in the Administrative Regulations.
AIP	Administered incentive pricing – setting charges for spectrum holdings to reflect the value of the spectrum in order to promote efficient use of the spectrum.
Allocation	Use of a frequency band. Entry in the table of frequency allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radio communications services or the radio astronomy service under specified conditions. This term is also applied to the frequency band concerned.
Assignment	Use of a radio frequency or radio frequency channel. Authorisation given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions.
BIS	Department for Business Innovation and Skills
CEPT	European Conference of Postal and Telecommunications Administrations. A body of national policy-makers and regulators in the telecoms and postal sectors which co-operate on regulatory and technical standardisation issues, including harmonisation within their field of responsibility.
CFI	Court of First Instance of the European Communities
CGC	Complementary Ground Component. A terrestrial network which forms as integral part of a MSS system and uses the same frequencies, in the same direction as the satellite and which does not increase the spectrum demands of the MSS system.
COCOM	Communication Committee of the European Commission. Its members are EU Member States and it assists the Commission in carrying out its executive powers at the top level. It provides a platform for an exchange of information on market developments and regulatory activities.
Concurrent	(Of spectrum trading) a transaction in which rights and obligations are transferred while continuing to be rights and obligations of the transferor.
EC	European Commission. The executive body of the European Union.
ECC EC Selection Decision	Electronic Communications Committee. One of two committees at the highest level of CEPT which deals with all matters relating to electronic communications. Decision No. 2009/449/EC – Commission Decision of 13 May 2009 on the selection of operators of pan-European systems providing mobile satellite services (MSS)

ERC	European Radiocommunications Committee, a previous committee within CEPT, the responsibilities of which are now undertaken by the ECC.
EU Decision	Decision No. 626/2008/EC of the European Parliament and of the Council of 30 June 2008 on the selection and authorisation of systems providing mobile satellite services (MSS)
EU process	The EC administered selection and authorisation process provided for by the EU Decision.
Exemption	Exemption regulations made by Ofcom allow anyone to use specified radio equipment without the need to have a WT Act licence.
Framework Directive	Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services.
Frequency Band	A defined range of frequencies that may be allocated for a particular radio service, or shared between radio services.
FSS	Fixed Satellite Service. Satellite service which provides communications between fixed earth stations.
Geo-synchronous orbit	An orbit around the earth that is at a distance which results in it orbiting at the same speed and direction as the earth spins on its axis.
GHz	Gigahertz – unit of frequency equal to one thousand MHz.
GSO	Geostationary satellite orbit. A geo-synchronous orbit of the earth, directly above the equator, in which the satellite appears to be stationary when viewed from earth.
Harmonisation	The identification of common frequency bands throughout a region (e.g. Europe) for a particular application and, in some cases, technology.
Hz	Basic unit of frequency – one hertz is equivalent to one cycle per second.
Interference	Unwanted disturbance caused in a radio receiver or other electrical circuit by electromagnetic radiation emitted from an external source.
ITU	International Telecommunication Union - the United Nations agency for information and communication technology responsible for developing and publishing the International Radio Regulations.
JPT	Joint Project Team.
Market mechanisms	Approach to managing spectrum where key decisions, e.g. on acquiring or disposing of spectrum and what service to provide are made by spectrum users rather than by the regulator.
MNO	Mobile Network operator
MSS	An RSC Decision definition of 'systems providing mobile satellite services': systems capable of providing Radiocommunications services between a mobile earth station and one or more space stations, or between mobile earth stations by means of one or more space stations, or between a mobile earth station and one

	or more complementary ground based stations used at fixed locations.
MSS	An ITU definition of a Mobile Satellite Service: a Radiocommunications service between mobile earth stations and one or more space stations or between space stations used by this service; or between mobile earth stations by means of one or more space stations. This service may also include Feeder links necessary for its operation.
Mcps	Mega chips per second.
MHz	Megahertz – unit of frequency equal to one million Hz.
Ofcom	Office of Communications. Ofcom is the regulator for the UK communications industries, with responsibilities across television, radio, telecommunications and wireless communications services.
Opportunity cost	The cost of a decision or choice in terms of the benefits which would have been received from the most valuable of the alternatives that was foregone.
Outright	(Of spectrum trading) a transaction in which the transferred rights and obligations pass to the transferee and no longer appertain to the transferor.
Partial	(of spectrum trading) a transaction in which some of the rights and obligations are transferred while others are not.
PMSE	Programme Making and Special Events – a class of radio application that supports a wide range of activities in entertainment, broadcasting, news gathering and community events.
Radio Regulations	International Radio Regulations made by the ITU, which have the status and force of a treaty, allocate frequencies globally to various applications and deal with cross-border interference.
Radio spectrum	The portion of the electromagnetic spectrum below 3000 GHz that is used for radiocommunications.
RSC	Radio Spectrum Committee of the EC, made up of EU administrations and which assists the EC in the adoption of technical implementing measures in support of Community policies.
RSC Decision	EC Decision 2007/98/EC on the harmonised use of radio spectrum in the 2 GHz frequency bands for the implementation of systems providing mobile satellite services.
Satellite	An object which is located in an orbit around a celestial body. In Radiocommunications, a man-made electronic device which receives and transmits signals to and from earth stations on the earth's surface.
Spectrum	The range of electromagnetic radio frequencies from LF frequencies to x-rays and gamma rays.
Spectrum liberalisation	Removal of restrictions from WT licences and RSA to allow holders greater flexibility to change how they use spectrum.

Spectrum trading	Ability of spectrum users to transfer rights and obligations under WT licences to another person in accordance with regulations made by Ofcom. Trades may be total, partial, outright or concurrent.
Total	(Of spectrum trading) a transaction in which all the rights and obligations are transferred to the transferee.
UKFAT	UK Frequency Allocation Table. This identifies responsibilities for the management of frequency bands or services showing whether they are managed by Ofcom, the MOD or another Government department or Agency. It also includes the ITU Table of Frequency Allocations contained in the current Radio Regulations. It is published by Ofcom on behalf of the National Frequency Planning Group, a sub-committee of the UKSSC.
UKSSC	Cabinet Office committee that discusses matters relating to the use of the radio spectrum, including by government departments and other public sector bodies.
WRC	A World Radiocommunication Conference, one of the principal activities of the ITU Radiocommunication Sector (ITU-R), is convened normally every three to four years to consider specific radiocommunication matters. A World Radiocommunication Conference deals with those items which are included in its agenda, including the partial or, exceptionally, complete revision of the Radio Regulations.
WT Act	The Wireless Telegraphy Act 2006, which sets out the statutory framework for management of the radio spectrum consolidating a number of older Acts dating back to 1949.
WT licence	Licence granted by Ofcom to authorise installation or use of radio equipment as required by section 8(1) of the WT Act.