



Authorisation of terrestrial mobile networks complementary to 2 GHz mobile satellite systems

A statement and second consultation on proposals for
authorisation of 2 GHz MSS Complementary Ground
Components (CGC)

Statement &
Second consultation

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Section 1

Executive Summary

- 1.1 This document addresses the arrangements for authorising the use of spectrum in the UK for terrestrial mobile networks (Complementary Ground Component, “CGC”) that complement 2 GHz mobile satellite systems (MSS) operating in the frequency bands 1980-2010 MHz and 2170 – 2200 MHz (“the 2 GHz MSS bands”). It comprises:
- A Statement on the policy issues raised in our first consultation on this subject¹; and
 - A further consultation on the detailed terms and conditions of such authorisations.
- 1.2 The award of the 2GHz spectrum to MSS operators will take place in 2009 under a European selection and authorisation process provided for by Decision No 626/2008/EC², made under Article 95 of the European Treaty that was adopted jointly by the European Parliament and Council and published in July 2008.

Statement

- 1.3 The Statement in section 5 sets out Ofcom’s decisions in respect of the high level policy issues raised in the first consultation on the authorisation of CGC. In particular, we have concluded that the CGC authorisation will:
- be in the form of a spectrum access licence using standard terms and conditions, but with the addition of the specific conditions imposed by Decision No 626/2008/EC;
 - be awarded, on application, to the MSS operators that are selected under the EU selection & authorisation process;
 - be available for a fixed term which will be 18 years from the publication date of the EU selection decision;
 - be service and technology neutral, to the extent possible within the constraints of the RSC Decision³ and Decision No 626/2008/EC²;
 - authorise only the set of frequencies that the applicant applies to use for CGC in the UK;
 - be tradable, using the form of a concurrent trade in which the MSS operator has to retain a concurrent licence itself;
 - be available to the selected MSS operators from the date of the EU selection decision and in advance of the commercial launch of the satellite component (which could be up to 24 months after the decision);

¹ <http://www.ofcom.org.uk/consult/condocs/cgcs/>

² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:201:0004:0027:EN:PDF>

³ **2007/98/EC**, Commission Decision of 14 February 2007 on the harmonised use of radio spectrum in the 2 GHz frequency bands for the implementation of systems providing mobile satellite services

- incur a licence fee based on the principle of AIP, although we have still to decide on the level of AIP, which we will do as part of a future Statement.

Second consultation

- 1.4 Sections 6 and 7 of this document address the two remaining areas on which we need to consult on the authorisation of CGC in the UK:
- The approach for reflecting in the CGC Licence the specific conditions that are required by Decision No 626/2008/EC; and
 - The technical conditions that should attach to the CGC licence.
- 1.5 Decision No 626/2008/EC sets out a number of common conditions that must be applied to the successful MSS applicants as part of their authorisation. In order for the UK to fulfil this obligation, we expect to be given a new power to authorise the 2GHz MSS satellite service by the Department for Business Enterprise and Regulatory Reform (BERR) through a Statutory Instrument under the European Communities Act 1972. We anticipate a separate consultation on this issue later in the year. It is expected that the resulting satellite authorisation will support the UK's monitoring and enforcement obligations under Decision No 626/2008/EC, and will require the MSS operator to report against the milestones achieved and commitments made under the selection and authorisation process.
- 1.6 Decision No 626/2008/EC also includes a number of common conditions that must be applied to the CGC authorisation itself. Section 6 of this document therefore consults on the manner in which we propose to do this. For the most part, this can be achieved by the straightforward addition of the Decision requirements to the terms of the CGC licence. We propose to include a condition enabling us to revoke or vary the CGC licence if the associated MSS satellite authorisation is no longer in place. We also propose some additional reporting requirements on the CGC operator in order to support our monitoring obligation. In addition, we consider that it would be beneficial, and in keeping with our duties to promote efficient use of spectrum, for the CGC licences to be awarded on a nation-wide basis.
- 1.7 Section 7 consults on the technical conditions that should attach to the CGC licence. It sets out two options for the approach to defining the technical conditions included in the CGC licence:
- One option based on Spectrum Usage Rights (SUR) that provides hard limits for the aggregate PFD (Power Flux Density) for operation both in-band and out-of band; and
 - A second option based on block edge masks and maximum transmitter power for the individual base stations.
- 1.8 The proposed technical conditions for the CGC Licence are based on the assumption that the technical characteristics of the base station and handset equipment likely to be deployed in the CGC bands are similar to those used in the adjacent terrestrial mobile bands, as borne out by the current draft block edge masks in the draft CGC standards⁴ currently under development in ETSI. In the case of the spectrum mask option for defining the transmission rights of the CGC licensee, we have also drawn

⁴ http://webapp.etsi.org/WorkProgram/Report_WorkItem.asp?WKI_ID=24294

heavily on the compatibility studies carried out for the 2.6 GHz award⁵ which analysed interference scenarios between adjacent services with very similar technical characteristics to those envisaged for 2 GHz.

Next Steps

- 1.9 Given the relatively narrow scope of this second consultation, we are providing for a consultation period of four weeks in line with our consultation guidelines⁶. The closing date for this consultation is 1 December 2008.
- 1.10 Following consideration of the responses to this consultation, we plan to publish a Statement around the end of this year setting out our decisions on the detailed terms and conditions of the CGC Licences. We will also issue a statement concerning the level of AIP fees either as part of the same statement or subsequently in the form of a separate statement.
- 1.11 We will separately consult on changes to a number of regulations which will be required to implement these decisions and make the CGC licences available.
- 1.12 We will also consult on the licence exemption of the satellite and CGC handsets once harmonised standards for these terminals are available.
- 1.13 As noted above, we anticipate that a separate consultation will take place on the arrangements for authorisation in the UK of the satellite systems of the successful MSS operators.

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?

⁵ <http://www.ofcom.org.uk/consult/condocs/2ghzawards/2ghzawards.pdf>

⁶ http://ofcom.org.uk/consult/consult_method/ofcom_consult_guide

Section 2

Introduction

- 2.1 This document takes forward the preparatory work for authorisation of terrestrial mobile networks complementary to 2 GHz mobile satellite system i.e. terrestrial mobile networks (Complementary Ground Component, “CGC”) that complement 2 GHz mobile satellite systems (MSS) operating in the frequency bands 1980-2010 MHz and 2170 – 2200 MHz (“the 2 GHz MSS bands”). CGCs are a way for terrestrial networks to use spectrum assigned to mobile satellite systems to improve the availability of mobile satellite services. They do this, as explained later in this document, by interleaving with the satellite components pattern of frequency re-use.
- 2.2 The document serves two main purposes:
- It provides a Statement in section 5 setting out our decisions in respect of the high level issues on which we consulted earlier in 2008; and
 - It initiates a second consultation, in sections 6 and 7, on the implementation of the Decision No 626/2008/EC requirements and on the technical conditions that attach to the CGC licence.
- 2.3 Sections 3 and 4 first provide context. Section 3 summarises the background to the 2 GHz mobile satellite service and explains the context within which we are addressing the authorisation of CGC in the UK. Section 4 provides the legal context, covering both the general duties on Ofcom that flow from the UK Statutory framework and the development of the European legal framework and Decision No 626/2008/EC.
- 2.4 Section 8 provides a summary of other regulatory and legal considerations, aside from the satellite and CGC authorisations, that prospective MSS operators might need to address when providing services in the UK.

Statement on the first consultation

- 2.5 Ofcom published a consultation document¹ on 15th January 2008, outlining the options for authorising the successful operators of the EU selection and authorisation process. We received 18 responses from a range of interested parties. These included stakeholders who are satellite and mobile network operators, public service broadcasters as well as a variety of trade and industry associations and a number of potential 2 GHz MSS candidate operators.
- 2.6 The full text of the non-confidential responses is available at <http://www.ofcom.org.uk/consult/condocs/cgcs/responses/>. Two respondents requested that their responses be kept confidential. In addition, two respondents requested that parts of their responses be kept confidential.
- 2.7 The responses to the specific questions raised in the consultation are summarised in Annex 1.
- 2.8 Following the close of the consultation we also issued a questionnaire intended to help potential CGC operators illustrate the effect of CGC fees on their business plans.

2.9 Section 5 of this document now provides our decisions in respect of the high level policy issues raised in the consultation.

Second Consultation

2.10 Sections 6 and 7 of this document present our proposals for the detailed terms and conditions for licences to be awarded for CGC networks, including:

- How the specific CGC common conditions, required by Decision No 626/2008/EC, should be included in the CGC Licence;
- Specific details on the two approaches to the technical definition of the rights of transmission we could include in the CGC Licence, one based on Spectrum Usage Rights and one based on spectrum masks;

2.11 The two corresponding versions of the proposed Draft Licence, one based on Spectrum Usage Rights and one based on spectrum masks, are included at annex 13 and 14 respectively.

Section 3

Background to 2 GHz Mobile Satellite Services incorporating CGC

Introduction to satellite services

3.1 Satellite systems have been used for more than forty years to provide various forms of one-way and two-way communications services across wide areas. The majority of these systems operate with satellites in the geostationary satellite orbit (GSO) where each satellite is positioned approximately 36000 km above the equator at a longitude that best provides the desired coverage and connectivity.

Mobile satellite systems

3.2 Mobile satellite systems have been deployed for commercial applications since the mid 1970's with some systems designed for global coverage and others focussing on a single geographic region. Global coverage systems using geostationary orbit (GSO) satellites typically use three or four orbital locations to provide complete coverage of the Earth up to latitudes of around 75 degrees.

3.3 Existing mobile satellite systems using GSO provide a range of low to medium rate digital services including voice, video and data services. Applications are very diverse and include:

- two way voice and data communications to ships, aircraft and remote and rural areas;
- mobile and transportable contribution links for broadcasters;
- supervisory, control and data acquisition (SCADA) systems for use by industries such as oil and gas as well as for pollution monitoring and disaster mitigation;
- backup and emergency communications in the event of a disaster.

3.4 Mobile satellite systems are interconnected to public networks via one or more earth stations, often referred to as gateway stations. These stations typically operate in the frequency bands allocated to the fixed satellite service.

MSS and Complementary Ground Components

3.5 MSS systems normally support small user terminals with low discrimination antennas. As a consequence, it is difficult if not impossible, for one MSS system to share the same frequencies in the same geographic area either with another MSS system or with another radio service. Studies carried out in the ITU have concluded that sharing between terrestrial mobile services and mobile satellite services is not possible unless both are under the control of the same frequency management system which 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.

3.6 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).

- 3.7 In Europe, similar representations have resulted in the adoption of an EC RSC Decision (see section 4) that harmonises the designation of the 2 GHz band to MSS including for terrestrial overlay applications known as Complementary Ground Components (CGC).
- 3.8 These CGCs will enable MSS operators to increase the efficiency of their use of spectrum and improve their service availability particularly in areas which are hard to serve by satellite, including built-up urban environments, but also to provide in-building coverage.
- 3.9 Services that have been proposed to take advantage of the use of CGC to extend the coverage of MSS systems 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).
- 3.10 In addition, the 2 GHz MSS spectrum has been identified as a candidate band for mobile TV using a combination of satellite and terrestrial delivery.

Complementary Ground Component base stations

- 3.11 Under Decision No 626/2008/EC, in Europe CGC base stations are required to be an integral part of a mobile satellite system, 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.
- 3.12 CGC base stations will need to operate within the same block of spectrum assigned to the associated MSS system. However in any single geographic area it is probable that this spectrum will be segmented between satellite use and terrestrial use.
- 3.13 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. Indeed, it may be possible to modify existing 3G mobile service base stations to accommodate the CGC application without major cost implications.
- 3.14 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. CGC base stations are not limited to repeating the MSS satellite signals.

MSS and CGC user terminals

- 3.15 MSS terminals are anticipated to be similar to those used in existing MSS systems and therefore similar to typical terrestrial terminals. CGC terminals are, in general, anticipated to be able to work interchangeably between the MSS satellite and the CGC base stations, possibly roaming to the strongest signal in a similar way to a standard cellular mobile network. Ofcom also understands from prospective MSS operators that some intend for the CGC terminals to be dual-mode with terrestrial 3G services.

- 3.16 Depending on the services and applications that a MSS operator provides they may also develop specialist terminals and accessories which are designed for some specific niche services e.g. ruggedised terminals for use by government personnel or cradles for installation on boats or cars.

Section 4

Legal background to 2 GHz MSS CGC

Introduction

- 4.1 This section describes the legal background and framework of the UK and European Union as it affects the implementation of UK CGC networks. At the end of this section we summarise the development of the specific RSC and Article 95 Decisions which apply to the authorisation of CGC in the UK.

Radio spectrum is a valuable and finite resource

- 4.2 Radio spectrum is a limited resource of considerable economic and social importance. Access to spectrum is key to innovation and competition in the fast-growing information and communications technology sector as well as to a wide range of other commercial and non-commercial applications, including defence, safety-of-life and emergency services and science.
- 4.3 Demand for spectrum below about 3 GHz is growing and it is critical for innovation and growth that it is used as efficiently as possible while providing sufficient bandwidth for broadband services over sufficient distances to make it commercially feasible to roll out national networks.

Ofcom's duties and functions

- 4.4 This section provides a brief overview of the main UK and European legislative provisions relevant to wireless telegraphy licensing and to the proposed award process. It does not provide a comprehensive statement of all legal provisions which may be relevant to Ofcom's functions and to the award of a wireless telegraphy licence.

Ofcom's general duties

- 4.5 Under section 3(1) of the Communications Act 2003 it is the principal duty of Ofcom in carrying out its functions:
- a) To further the interests of citizens in relation to communications matters; and
 - b) To further the interests of consumers in relevant markets, where appropriate by promoting competition.
- 4.6 In doing so, Ofcom is required to secure (under section 3(2)):
- a) The optimal use for wireless telegraphy of the electro-magnetic spectrum;
 - b) The availability throughout the UK of a wide range of services;
 - c) The availability throughout the UK of a wide range of TV and radio services which (taken as a whole) are both of high quality and calculated to appeal to a variety of tastes and interests;
 - d) The maintenance of a sufficient plurality of providers of different television and radio services;

- e) The application in the case of all television and radio services of standards that provide adequate protection to members of the public from the inclusion of offensive and harmful material, unfair treatment in programmes and unwarranted infringement of privacy;
- 4.7 and to have regard to certain matters which include:
- a) Principles of better regulation (section 3(3));
 - b) The desirability of promoting competition (section 3(4));
 - c) The desirability of encouraging investment and innovation (section 3(4)(d));
 - d) The desirability of encouraging availability and use of broadband services throughout the UK (section 3(4)(e));
 - e) The different needs and interests of persons in different parts of the UK (section 3(4)).
- 4.8 As the management of the UK radio spectrum is governed by the European Communications Directives, which aim to harmonise the regulation of electronic communications networks and services throughout the European Union, section 4 of the Communications Act 2003 requires Ofcom, when carrying out its spectrum functions, to act in accordance with the “six community requirements” set out in that section when managing the wireless spectrum in the UK. Of relevance are the following:
- a) The requirement to promote competition (section 4(3));
 - b) The requirement to secure that Ofcom’s activities contribute to the development of the European internal market (section 4(4));
 - c) The requirement to promote the interests of all persons who are citizens of the European Union (section 4(5));
 - d) The requirement to act in a technology neutral way (section 4(6));
 - e) The requirement to encourage to such extent as appropriate the provision of network access and service interoperability (section 4(7)); and
 - f) The requirement to encourage such compliance with international standards as is necessary for (a) facilitating service interoperability; and (b) securing freedom of choice for the customers of communications providers (sections 4(9) and (10)).

Ofcom’s duties when carrying out spectrum functions

- 4.9 In carrying out its spectrum functions, it is the duty of Ofcom (under section 3 of the Wireless Telegraphy Act 2006) to have regard in particular to:
- a) The extent to which the spectrum is available for use or further use, for wireless telegraphy;
 - b) The demand for use of that spectrum for wireless telegraphy; and
 - c) The demand that is likely to arise in future for the use of that spectrum for wireless telegraphy.

- 4.10 It is also the duty of Ofcom to have regard, in particular, to the desirability of promoting:
- a) The efficient management and use of the spectrum for wireless telegraphy;
 - b) The economic and other benefits that may arise from the use of wireless telegraphy;
 - c) The development of innovative services; and
 - d) Competition in the provision of electronic communications services.
- 4.11 Where it appears to Ofcom that any of its duties in section 3 of the Wireless Telegraphy Act 2006 conflict with one or more of its duties under sections 3 to 6 of the Communications Act 2003, priority must be given to its duties under sections 3 to 6 of the Communications Act 2003.

Granting wireless telegraphy licences

- 4.12 Ofcom's legal power to grant wireless telegraphy licences is set out in section 8(1) of the Wireless Telegraphy Act 2006. Section 8(1) makes it an offence for any person to establish or use any station for wireless telegraphy or to install or use any apparatus for wireless telegraphy except under and in accordance with a licence granted by Ofcom under that section (a wireless telegraphy licence).
- 4.13 Section 9(1) of the Wireless Telegraphy Act 2006 gives Ofcom the power to grant wireless telegraphy licences subject to such terms as Ofcom thinks fit.
- 4.14 However, Ofcom's broad discretion in relation to the terms that can be imposed in a wireless telegraphy licence is subject to the rule that Ofcom must impose only those terms that it is satisfied are objectively justifiable in relation to the networks and services to which they relate, not unduly discriminatory, and proportionate and transparent as to what they are intended to achieve (section 9(7)).
- 4.15 This obligation mirrors obligations imposed by Article 9 of the Directive 2002/21/EC (the "Framework Directive") which provides that the allocation and assignment of radio frequencies by national regulatory authorities must be based on objective, transparent, non-discriminatory and proportionate criteria.
- 4.16 Under Article 5(2) of the Directive on the authorisation of electronic communications networks and services 2002/20/EC (the "Authorisation Directive"), when granting rights of use of radio frequencies (wireless telegraphy licences in the UK context), Member States must do so through open, transparent and non-discriminatory procedures.
- 4.17 Under Article 7(2) of the Authorisation Directive⁷ where the number of rights of use of radio frequencies needs to be limited, Member States' selection criteria must be objective, transparent, non-discriminatory and proportionate. (Section 29 of the Wireless Telegraphy Act 2006 requires Ofcom to make an order setting out the criteria).

⁷ 2002/20/EC

Development of European legal framework and Decision No 626/2008/EC

- 4.18 In October 2005, EU Member States recognised the need for a robust legal framework for the selection and authorisation of mobile satellite systems' (MSS) operators wishing to access the spectrum at 2 GHz (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 such an EU harmonised approach to the use of this spectrum was that a fragmented approach would negate the potential benefits of MSS systems intended to provide pan European coverage and would make the use of the available spectrum ineffective.
- 4.19 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 a draft RSC Decision designating this spectrum for MSS, including complementary ground components (CGC) and this was approved by the RSC at its meeting in December 2006 and subsequently adopted³ on 14 February 2007.
- 4.20 Complementary ground components (CGC) are required by this Decision to:
- “constitute an integral part of the mobile satellite system and shall be controlled by the satellite resource and network management system. It shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirements of its associated mobile satellite system.”
- 4.21 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 band, started development of the necessary legal framework to support the proposed selection and authorisation process. Responsibility for this task was formally transferred to the Communications Committee (COCOM) and in particular to the Working Group on Authorisation and Rights of Use.
- 4.22 The ad hoc group proposed a comparative selection procedure (beauty contest) between candidates pre-selected through a milestone review process (MRP) as the process by which to select candidate systems. It was also proposed in this consultation that a Decision under Article 95 of the European Treaty would be required in order to provide the level of legal and regulatory certainty to potential operators to make the required investments. Such a Decision would require formal adoption by the European Council and the European Parliament.
- 4.23 On 30 June 2008, the European Parliament and Council adopted a joint Decision² on the selection and authorisation process for 2 GHz MSS systems. The purpose of the Decision is to create a Community procedure for the common selection of operators of mobile satellite systems 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.

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

4.24 Under Article 249 of the EC Treaty:

“A decision shall be binding in its entirety upon those to whom it is addressed.”

4.25 Decision No 626/2008/EC was published in July 2008, is addressed to all Member States and is therefore binding on the UK.

4.26 Following publication of the Decision in the Official Journal of the European Union and subsequent entry into force, the EC Communications Committee initiated action which led to the publication of a call for applications from potential candidate MSS operators in the Official Journal, on 7th August 2008². Applications had to be submitted to the EC by 7 October 2008. It is expected that the conclusion of this process will result in MSS operators being assigned spectrum in the first half of 2009 at which point they may apply for national CGC authorisations in all EU member states.

Section 5

Statement on the first consultation

Purpose of this section

- 5.1 This section provides our policy decisions on high level policy issues raised in our first consultation document¹ outlining the options for authorising CGC operation by the successful operators of the EU selection and authorisation process. This consultation posed 11 questions on which it sought specific responses from stakeholders, these were:

Question 1: Do you agree that the CGC licence should be in the form of a spectrum access licence with standard terms and conditions?

Question 2: Do you agree that such licences should be awarded on a UK-wide basis?

Question 3: Do you agree that the CGC licence should authorise the complete set of frequencies assigned under the EC process?

Question 4: Do you agree that the initial grant of the CGC licence should made be to the MSS operator only?

Question 5: Subject to certain safeguards, would it be appropriate to license the CGC in advance of the satellite service coming into operation and if so, what criteria should be applied to determine whether the satellite component of the MSS network is operational and what period of time do you consider would be appropriate?

Question 6: Do you agree that the CGC licence should not include a coverage obligation?

Question 7: Do you agree that the CGC licence should be provided on a service and technology neutral basis?

Question 8: Do you agree that it CGC licences should be tradable and, if so, that they should be both totally or partially tradable and both outright or concurrently tradable, that Ofcom's consent should be required for transfers and that the grounds on which Ofcom may withhold consent should be limited as proposed?

Question 9: Do you agree that AIP should be applied to CGC licences at a level that reflects the associated opportunity cost?

Question 10: Do you agree that the licence fees should be set at around £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.

Stakeholder responses

- 5.2 Ofcom received 18 responses from a range of interested parties. These included stakeholders who are satellite and mobile network operators, public service broadcasters as well as a variety of trade and industry associations and a number of potential 2 GHz MSS candidate operators.
- 5.3 The full text of the non-confidential responses is available at <http://www.ofcom.org.uk/consult/condocs/cgcs/responses/>.
- 5.4 Two respondents requested that their responses be kept confidential. In addition, two respondents requested that parts of their responses be kept confidential.
- 5.5 The responses to the specific questions raised in the consultation are summarised in Annex 1. The list of respondents to this consultation is included at Annex 2.

Structure of this section

- 5.6 This remainder of this section is structured as follows:
- Paragraphs 5.8 to 5.23 - Form of licence, scope and coverage conditions (covering issues raised in consultation questions 1, 2, 3, 6 and 7);
 - Paragraphs 5.24 to 5.37 - Initial award of licence and trading (covering issues raised in consultation questions 4 and 8),
 - Paragraphs 5.38 to 5.56 - Timing of authorisation and term of CGC licence (covering issues raised in consultation questions 5)
 - Paragraphs 5.57 to 5.69 - CGC licence fees and the application of AIP (covering issues raised in consultation question 9)
 - Paragraphs 5.70 to 5.86 – The level of licence fee for CGC (covering issues raised in consultation question 10 and 11),
 - Paragraphs 5.87 to 5.96 - Other issues raised by stakeholders,
- 5.7 The section concludes with a summary, in paragraphs 5.97 to 5.102 of our decisions in respect of the above matters.

Form of licence, scope and coverage conditions

- 5.8 Twelve responses agreed that the CGC licence should be in the form of a spectrum access licence with standard terms and conditions. A number of responses commented on the need to make the relationship of the CGC to the MSS network explicit in the licence conditions. This issue is addressed within Decision No 626/2008/EC and is addressed further in our second consultation, provided as Section 6 to Section 8 of this document.
- 5.9 All responses which commented on the issue agreed that the CGC licence should be national and most felt that it should cover the full set of frequencies authorised through the EU selection and authorisation process. However, one confidential response questioned whether a condition should be included in the licence, which allowed use of only a portion of the band at any particular time, in order to reflect the complementary nature of the CGC to the MSS network.

- 5.10 Nine responses agreed that the licence should be service and technology neutral. Six responses agreed with the principle of technology and service neutrality but commented that Decision No 626/2008/EC constrained the use of CGC to mobile satellite services as defined by the RSC Decision and argued that whilst the licence could be technology neutral it could not be truly service neutral.
- 5.11 Twelve responses also agreed that the CGC licence should not include any coverage requirements.
- 5.12 In contrast, one response stated that the licence conditions for CGC should avoid discriminating against 'conventional' terrestrial operators who have been subject to coverage obligations for both GSM and UMTS spectrum. Therefore, Ofcom should include a coverage obligation in the CGC licence for the combined satellite and terrestrial components of the system within the UK. This obligation should be set at a level at least as high as the 2.1 GHz award i.e. 80% of the population of UK. The response noted that this obligation should be easier for the MSS CGC system to achieve than the terrestrial services, given the nature of satellite services.
- 5.13 One response stated that if broadcasting services are provided over CGC then the same coverage obligations should apply to CGC as for broadcast services.

Ofcom position on form of licence, scope and coverage conditions

- 5.14 We agree with the majority of responses that a spectrum access licence would be the most appropriate form of licence for the CGC and that, as far as consistent with Decision No 626/2008/EC, it should include the standard terms and conditions.
- 5.15 Whilst we agree with the majority of the responses that the CGC licence should be a nationwide licence, we discuss how this could be implemented as part of our second consultation in paragraphs 6.14 to 6.21.
- 5.16 We have, however, reconsidered whether it should cover the full set of frequencies authorised under the EU selection and authorisation process and have concluded that the maximum flexibility can be provided to the MSS operators if we allow them to choose the set of frequencies they wish to have authorised and in use in the CGC. We have therefore concluded that we will authorise only the frequencies requested for CGC use in the MSS operators' applications for CGC licences (or in subsequent licence variation requests). We note that this will mean that the licence fees for CGC use will apply only to those frequencies authorised for use by CGC (and not to the full set of frequencies authorised through the EU selection and authorisation process).
- 5.17 We do not consider that there would be any benefit in the CGC licence containing the type of condition suggested by the confidential response requiring a portion of the spectrum to be available to the satellite at any specific time. This does not seem necessary or appropriate for spectrum management (or other) reasons, particularly now that the CGC licence will cover only those frequencies for which the MSS operator applies and will not automatically cover the full MSS spectrum allocation as we had previously suggested. Meanwhile, the way in which the MSS operator uses its spectrum allocation for satellite use will be governed by the commitments it makes in its application to the EU selection and authorisation process.
- 5.18 We also agree with the majority of responses that the licence should be as service and technology neutral as possible within the constraints of the EC and EU Decisions. It can not be entirely technology neutral because, for example, the use of the spectrum to provide TDD services is not permitted by these Decisions as they

require that the CGC use the same direction of transmission and the same portions of frequency bands as the satellite.

- 5.19 We agree, however, with the comments of a number of responses that the licence has to be consistent with the definition of mobile satellite services as defined within the RSC Decision. In this context, we note that the definition of MSS in the RSC Decision differs from that provided in the ITU Radio Regulations in that it incorporates the concept of CGC. We also consider that there is no requirement for the CGC component to provide the same service or application as the satellite component.
- 5.20 We also agree that the technical conditions of the CGC licence need to be clearly defined and are now consulting on specific proposals in Section 7 of this document.
- 5.21 We also agree with the majority of responses that there should be no coverage obligations for CGC. We have set out previously our general policy that roll-out obligations are unlikely to meet the objective of ensuring that spectrum is used efficiently⁹ and that spectrum trading and Administered Incentive Pricing provide or enhance the incentives to use spectrum efficiently with the relevant degree of flexibility for licensees to conduct their business. Moreover, in this particular case, the geographic and population coverage of the satellite element of the MSS network forms a specific requirement of the EU selection and authorisation process, and is also a specific criterion of the second phase of the EU selection and authorisation process (if required). Coverage considerations will therefore have already been addressed as part of the EU selection and award process and Article 7 of Decision 626/2008/EC requires that the successful applicants honour the commitments they give as part of their in their applications.
- 5.22 Therefore we do not believe that there will be any benefits which would be afforded to UK consumers and citizens by the inclusion of additional coverage requirements of the CGC licence. Indeed, we believe that the inclusion of a roll-out obligation in a CGC licence could discourage application for a licence and so jeopardise deployment of CGC in UK.
- 5.23 On the specific issue of extending the coverage obligations for broadcast services to the CGC licences, these coverage obligations apply only to the existing DTT multiplex services. Ofcom set these obligations under the provisions of the Communications Act 2003 and in the context of planning for Digital Switchover (DSO)¹⁰. In the case of any new terrestrial broadcasting applications, either CGC or other applications, these provisions do not apply; nor would the coverage of these new services be linked in any way to the DSO process.

Initial award of licence and trading

- 5.24 Whilst there was strong agreement with our proposal to award the CGC licence initially only to those successful MSS operators, there appeared to be considerable confusion as to our intentions to allow trading of CGC licences.
- 5.25 Fifteen responses agreed with our proposal to award the initial CGC licence to the selected MSS operator under the EU selection and authorisation process set out in

⁹ See the Spectrum Framework Review: Implementation Plan, Interim Statement <http://www.ofcom.org.uk/consult/condocs/sfrip/statement/statement.pdf>

¹⁰ *Planning Options for Digital Switchover: a consultation*, 9 February 2005, and subsequent statement, 1 June 2005: <http://www.ofcom.org.uk/consult/condocs/pods1/main/>

Decision No 626/2008/EC. Three responses agreed that we could award the CGC licence to the successful MSS operator, but argued that we could also award the licence to an operator having an exclusive agreement with the selected MSS operator.

- 5.26 None of the responses disagreed with our proposal to award the initial CGC licence to the selected MSS operator under the EU selection and authorisation process set out in Decision No 626/2008/EC.
- 5.27 Eight responses agreed with our proposal that CGC licences should be tradable. One of these responses agreed to trading, provided the MSS operator retains operational control over the use of frequencies.
- 5.28 Two responses highlighted the need, in the event of a trade, for all conditions of the original CGC licence to be incorporated into the new licence and four responses highlighted that in the event of a trade a change of use should not be permitted.
- 5.29 Seven responses questioned how trading of CGC licences would be possible within the constraints of Decision No 626/2008/EC. Two of these responses argued that it would only be feasible to trade CGC licences through a simple change of ownership of the MSS.
- 5.30 Two responses argued that a change of use of spectrum harmonised through a community measure (as in this case) was not allowable under the Framework Directive, and therefore trading of CGC licences should not be permitted.
- 5.31 One response commented that whilst trading would not be possible, it might be possible to 'transfer the rights' of the CGC in some way.

Ofcom position on initial award of licence and trading

- 5.32 We have concluded that Decision No 626/2008/EC requires us to award, in the first instance, the CGC licence to those MSS operators selected under the EU selection and authorisation process.
- 5.33 We agree that having the capability to transfer the CGC licence would be desirable, particularly to facilitate the variety of commercial models that MSS operators might adopt. Transfers of the rights and obligations of spectrum licences are effected by carrying out a trade of the licence. We have therefore decided to permit trading of the CGC licence, subject to the restrictions discussed below.
- 5.34 We recognise that there are a number of conditions of the CGC licence which we are required to include in this CGC licence as a result of Decision No 626/2008/EC and which we will therefore need to ensure are transferred as the result of any trade.
- 5.35 In particular, we agree that it is not possible to change the use of the spectrum from MSS to any other use and that, as such, the relationship between the CGC and the MSS network must be retained following any trade.
- 5.36 A number of responses questioned whether any form of trade is possible given the constraints of Decision No 626/2008/EC. We agree that all conditions of the CGC licence must transfer to the new licensee following any trade and that the relationship between the MSS and CGC networks must be retained. In order to ensure that the CGC remains an integral part of the MSS network, as required under the EC

Decision and Decision No 626/2008/EC, we intend therefore to permit trades only in the form of concurrent trades.

- 5.37 In a concurrent trade, the rights and obligations being transferred extend to both the purchaser and the vendor simultaneously so that the parties have the flexibility to share the rights between themselves as they see fit without the need to undertake further transfers under the trading regulations. The rights and obligation that are traded in a concurrent trade may be total, incorporating all of the licence rights and obligations, or partial. Partial trades may, for example, be divided by frequency, geography or time.

Timing of authorisation and term of CGC licence

- 5.38 All of the responses that addressed this issue agreed that the CGC should not be authorised before the completion of the EU selection and authorisation process.
- 5.39 Eight responses agreed that the CGC network should be authorised and allowed to be operational for a period in advance of the operation of the satellite. Of these:
- Three responses indicated that an operational period of two years in advance of the satellite would be appropriate;
 - Five responses did not indicate a maximum period for operation of the CGC in advance of the commercial launch of the satellite.
- 5.40 In addition, one confidential response, whilst agreeing to early operation of the CGC, indicated that they would be keen to have a clear indication of the consequences of failing to deploy the satellite and a further response felt that there was a need to consult further on the exact period of such operation.
- 5.41 In contrast, four responses agreed to us licensing the CGC network and it being built prior to the commercial operations of the satellite, but argued that there should be no commercial operation of the CGC ahead of the satellite operation.
- 5.42 One response stated that Ofcom had not demonstrated that there was any justification for issuing CGC licences ahead of the commercial availability of the satellite and indeed, licensing the CGC ahead of the commercial availability of the MSS system could lead to consumer harm if the MSS failed to deploy.
- 5.43 A further response stated that the period for any terrestrial use should be sufficiently short that in the event that revocation of the licence was necessary this would have a minimal impact on consumers and the market.
- 5.44 One response indicated that whilst it may be appropriate to allow the CGC base stations to be brought into service in advance of the full operation of the satellite, Ofcom should consult again on the timing, as we had not proposed a specific period and had not provided the justification behind the proposal.
- 5.45 On the issue of what criteria we should apply to determine whether or not the mobile satellite system is operational, two responses indicated that they believed that this would be addressed at the European level and that national authorities should not develop their own criteria. One response further stated that this would risk a patchwork approach to this determination across Europe, at odds with the intent of Decision No 626/2008/EC.

- 5.46 A further response encouraged us to define criteria to encompass meaningful commercial services, including availability of terminals, distribution chain, paying customer and support services. A further response, whilst agreeing broadly with Ofcom's proposed criteria, encouraged Ofcom to take a pragmatic approach to the availability of terminals
- 5.47 Turning to the question of licence term, four responses stated that it should be possible to extend the term of the CGC licence, upon the request of the CGC operator, beyond the fixed term of the MSS authorisation.

Ofcom position on timing of authorisation and term of CGC licence

- 5.48 Article 8.2 of Decision No 626/2008/EC explicitly states that Member States should not authorise CGC in advance of the completion of the EU selection process.
- 5.49 Moreover, Ofcom agrees that we should only license terrestrial networks in the 2GHz band following the completion of the EU selection and authorisation process. To license a terrestrial system in advance of this would potentially result in us being required to revoke a licence for this terrestrial system if the relevant operator was not successful, or did not apply, to the EU selection and authorisation process. This would be to the detriment of those UK consumers who would have only recently purchased this service. We aim to have a suitable application process in place so that applications for CGC authorisation can be received by Ofcom shortly following official confirmation of the results of the EU selection process.
- 5.50 We do, however, believe that there are clear benefits to UK consumers and citizens in the availability of services provided by CGC in advance of the launch of the satellite service. Given that satellites, by their nature, have long procurement and manufacturing cycles, we anticipate that some of these systems may not provide services in the UK before 2010/11. By allowing CGC operation in advance of this, given sufficient guarantees of the satellite's subsequent operation, UK citizens and consumers could benefit from these services earlier than would otherwise be the case.
- 5.51 However, we recognise that the EU authorisation process requires the satellite to be launched within a prescribed timescale and believe that the Milestone Review Process, incorporated in the process set out in Decision No 626/2008/EC, provides a sufficient guarantee of the commitment of MSS operators to the launch of the satellite services. Therefore, any failure is liable to come about as a result of circumstances unplanned by the successful applicants e.g. satellite launch failure. In any event, as indicated in 5.91, we will include any conditions required of us by Decision No 626/2008/EC in the CGC and satellite authorisations in relation to monitoring and enforcement (see section 6).
- 5.52 We also note that, in the event of a satellite failure, the EU process does envisage independent operation of CGC for a limited period of 18 months, specifically allowed for in Decision No 626/2008/EC. We also note that Decision No 626/2008/EC requires the satellite to be operational within 24 months of the conclusion of the selection and authorisation process.
- 5.53 We have therefore concluded that we will license CGC for operation in advance of the launch of the commercial satellite service and that we will licence CGC from the point at which the selection and authorisation decision is made. The period when CGC could operate without the satellite being in commercial service would therefore be limited to 24 months. This will enable us to align the date by which the MSS

satellite must be operational to meet the requirements of the overarching EU authorisation process with that required by our national process, minimising the regulatory burden on ourselves and the licensee in terms of monitoring of this requirement.

- 5.54 On the issue of which criteria we should take into account for the purposes of determining whether the satellite component of the MSS is in commercial use, Decision No 626/2008/EC explicitly requires that Member States be responsible for the monitoring of compliance with the common conditions of the CGC licence. We therefore need to determine, at a national level, against what criteria we will judge this compliance. We have concluded that the definition of the MSS being in commercial use should be based on operational availability of the satellite network, gateway station(s) and user equipment as proposed in the application to the EU selection and authorisation process, as only with all of these aspects in place can UK and European consumers benefit from the MSS services provided.
- 5.55 We note that Decision No 626/2008/EC includes a term of 18 years from the date of the selection and authorisation for the MSS. Accordingly, we intend to reflect this licence term in the CGC licence.
- 5.56 On the issue of renewing the CGC licence beyond the fixed term of the MSS authorisation, our understanding is that any extension of the CGC authorisation beyond the initial 18 year period will be a matter for decision by individual Member States. However, we consider that it would be appropriate to gain experience of how this initial authorisation works before making any decisions on this issue. It is not necessary to address this issue before granting the CGC licence as any extension to the licence term could be dealt with through a licence variation request at an appropriate time, following consultation.

CGC licence fees and the application of AIP to CGC licences

- 5.57 Ten of the responses, including a number of Mobile Network Operators, agreed with the principle of applying Administered Incentive Pricing (AIP) to spectrum fees in general. Of these, seven also agreed to the principle of AIP being applied to the licence fees for CGC, although the other three argued against the use of AIP in this specific case.
- 5.58 Of those who disagreed with the application of AIP to CGC licence fees, including all of those in the satellite sector:
- Eight responses stated that the fee should be purely an administrative fee, based on cost recovery, or be set very low, given that the RSC Decision³ places such heavy constraints on any alternative use that there is no practical alternative use, and argued therefore that the opportunity cost was zero;
 - One response quoted the Cave Review of March 2002¹¹ “for some spectrum uses, 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 use” and questioned why we were deviating from this view;

¹¹ http://www.ofcom.org.uk/static/archive/ra/spectrum-review/2002review/1_whole_job.pdf

- One response stated an opposition to AIP for broadcasting on principle and if CGC were therefore used for broadcasting, the fee should either not be based on AIP or should be set very low;
- One disagreed on a matter of principle with AIP applied to licences which are tradable.

Ofcom position on the application of AIP to CGC licence fees

- 5.59 We have considered carefully all of the responses regarding the applicability of AIP to the licence fees for CGC.
- 5.60 We note that in following our duty to promote the optimal use of the spectrum we are seeking to maximise the benefits available to society, to citizens and consumers, from the use of spectrum. The opportunity cost to society of a user holding spectrum is the highest value alternative use that could otherwise have been made of it.
- 5.61 An important question in defining opportunity cost concerns which alternative use is the relevant one for us to consider, either that which:
- Takes account of the effect of constraints introduced by regulatory policy (e.g. the fact that the spectrum is allocated on an exclusive basis) and thus considers only those alternative uses that can be accommodated within these constraints; or
 - Does not take account of these constraints, but considers all alternative uses that are technically feasible, ignoring constraints imposed by regulatory policy or international agreement.
- 5.62 In making this decision it is important to recognise that an understanding of the opportunity cost, or value, of spectrum is important for a wide range of Ofcom's spectrum management activities, not simply, or even most importantly, in setting fees. Understanding the potential value in different bands of spectrum informs our decisions on:
- prioritising bands for release by auction;
 - prioritising bands for liberalisation and trading;
 - working with Government on policy decisions, including in international fora, that may reserve spectrum exclusively for particular uses (or change or remove an existing exclusive designation);
 - assessing whether spectrum in certain bands is not in the most efficient use and considering whether we should take specific steps, beyond enabling liberalisation and trading, to secure the most efficient use.
- 5.63 In taking these decisions, we (and Government as appropriate) need to understand the full economic potential of each band that is the best use it might be put to if current restrictions were changed or lifted.
- 5.64 In the context of the above, we note that:
- The cost to society of the loss of the service excluded from the spectrum is not reduced by virtue of the way the alternative service was excluded. Whether the alternative service is excluded simply because the existing user paid more for the

spectrum at auction, or because there are laws or other undertakings preventing alternative uses of spectrum, the net effect for citizens and consumers is the same;

- International constraints, like any other policy constraint, can be changed. They are not completely fixed and spectrum users, Ofcom and other policy makers including government should understand the impact of these decisions in order to understand the true cost of policy decisions, and to assess the potential benefits of changing these decisions;
- There is a concern that if we were to take account of these constraints in defining the opportunity cost and setting fee levels we would create an undesirable incentive for spectrum users to lobby international fora for exclusive allocations, with potential costs to society from the loss of excluded services, to gain access to spectrum at a lower rate than would apply otherwise;
- If different spectrum bands having similar technical characteristics are charged in radically different ways simply because some were allocated by decisions in international fora, users' choices between these spectrum bands could be distorted leading to inefficient and sub-optimal use of spectrum.

- 5.65 It is also useful to consider what the implications of providing this spectrum free of charge, or for an administrative fee only, would be. In particular, this might distort users' choice of spectrum based on the 'price' they need to pay for spectrum. Ofcom is currently offering spectrum to the market, through award by auction, in a number frequency bands which are similar in technical characteristics to that at 2 GHz for CGC. If, therefore, the licence fees for 2 GHz CGC were set at an administrative charge or available free of charge, some users may choose to utilise this spectrum rather than a more appropriate choice of spectrum purely on this basis alone, distorting the market for spectrum in UK and leading to the inefficient use of spectrum. These incentive benefits of pricing this spectrum, of informing choices about which spectrum to use, and how much to use, are unlikely to be reduced by the constraints discussed above.
- 5.66 It is important to understand in this context that Ofcom's aim is not to achieve any specific short-term change in the use of spectrum. Rather, Ofcom's aim is to ensure that holders of spectrum fully recognise the costs that their use imposes on society. Ofcom appreciates that many holders of spectrum are not in a position to make rapid changes to their use of spectrum in response to the application of AIP. However, we observe that even where international and other constraints limit the alternative use of spectrum, even in the long term, there are usually opportunities for the users of such spectrum to influence changes to this use and, further, that without an appropriate price signal to such users, a change of use of such spectrum is unlikely ever to occur.
- 5.67 On the issue of the principle that tradable licences should not be subject to AIP, Ofcom has previously consulted on this specific issue and concluded in its statement on Spectrum Trading¹² that AIP should continue to apply for tradable spectrum. Ofcom reached this conclusion as it is concerned that spectrum trading alone, while an important aid to more optimal use of the spectrum, may not be fully effective at promoting efficiency. Ofcom considers therefore that for the foreseeable future the benefits of maintaining AIP should exceed the costs.

¹² A Statement on Spectrum Trading: Implementation in 2004 and beyond, 6th August 2004, http://ofcom.org.uk/consult/condocs/spec_trad/statement/

- 5.68 In relation to spectrum used for broadcasting, we consulted in 2006 on proposals to extend AIP to spectrum used for digital terrestrial television and radio broadcasting. In our Statement in July 2007, we confirmed our expectation to apply AIP in both cases from 2014. In that document, we also confirmed that AIP should apply immediately to any spectrum used for any new terrestrial broadcast service, unless such spectrum is acquired through an auction.
- 5.69 In particular, we conclude that in the specific case of CGC licences we have identified no benefits to consumers and citizens in our providing the CGC spectrum free, or for an administrative charge. Further if we were to deviate from our principle of applying AIP to the licence fees in the specific instance of CGC, there is a real risk that users' choices of spectrum could be distorted as a result and therefore we conclude that we will apply the principle of AIP to CGC licence fees.

The level of licence fee for CGC

- 5.70 The most contentious issue in the consultation was the AIP reference point. We proposed that the most suitable reference point is the spectrum at around 1800 MHz. From consideration of a variety of Equivalent AIP rates around 1800 MHz we proposed a rate of £554,000 per 2 x 1 MHz for a UK-wide authorisation.
- 5.71 Three responses supported the use of an AIP fee level similar to that of GSM 1800. However, of these, two responses felt that this rate was the lowest fee 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 should be included. This included fees being subject to regular reviews and the licences not being tradable.
- 5.72 Nine responses suggested that the reference point should be zero given the constraints on use of the spectrum due to the EC and EU Decisions^{3,2} and eight of these argued for a lower rate.
- 5.73 One response argued for a higher rate, commenting that CGC would be competing directly with 3G services and that the 3G operators paid £22.5 billion for these licences through an auction process. Setting the CGC fee at the level of the GSM 1800 would therefore be completely inappropriate and would distort competition. This response had serious reservations both on the reference point we proposed for CGC licences and on the fee levels we have set for other terrestrial networks, which the response felt were significantly too low.
- 5.74 Of those responses arguing for a lower rate, key points made were that:
- in addition to the constraints on use imposed by the EU process, the adjacent spectrum is underutilised and that the respondent detected little market interest in additional spectrum for 3G outside of the UHF (digital dividend spectrum);
 - 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;
 - it was necessary to consider the costs of the overall infrastructure of network based on MSS with 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;

- 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;
- MSS operators already have significant incentives to make the most efficient use of spectrum due to the extremely high upfront costs and 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;
- Ofcom should instead set a fee based on the number of CGC base stations deployed;
- 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.

5.75 Respondents who argued this last point made the following specific points that:

- 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 state;
- as Ofcom is party to the EU Decision that will have 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.

5.76 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; €3365m over a 15-year period.

5.77 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.

5.78 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 with CGC” business case.

Ofcom position on the level of licence fee for CGC

5.79 We have considered carefully the many and varied comments which were raised on the issue of exactly how the level of the fee for CGC should be set.

5.80 The opportunity cost of spectrum is only one input, albeit a key input, into our decision on the level of the fee. As indicated previously we will also always consider the specifics of each case when setting the level of licence fees.

5.81 While international or other constraints do not affect the full opportunity cost of the spectrum, they do directly affect the circumstances of the users who may use it. We therefore recognise that for any band, there are factors which mean that setting fees

at full opportunity cost, regardless of regulatory constraints, may not lead to us securing the optimal use of the spectrum. Even if an alternative use was more economically viable in the longer term, leaving the spectrum idle for the short or medium term could represent an inefficient use of spectrum and therefore not be compatible with Ofcom's duty to promote efficient use of spectrum. We therefore need in each case to assess the balance of the benefits of setting fees at opportunity cost in the longer term against the potential for this leading to a less optimal use of the spectrum in the short or medium term.

- 5.82 In taking the decision on fees in relation to this spectrum, we are mindful of the potential risk that setting a fee at the full opportunity cost level might, of itself, discourage or even prevent CGC networks being deployed in the UK. This could lead to the spectrum being under-used, which is unlikely to be an efficient outcome for citizens and consumers.
- 5.83 Whilst we are concerned, as set out above, not to set a fee which might lead to the under-use or non-use of the spectrum, none of the respondents arguing that the proposed fee level would have this effect provided a documented business plan that was sufficient for us to conclude that was the case. Therefore, the question of whether these fees are supportable by the MSS and CGC business remains unanswered.
- 5.84 Following the consultation, we therefore issued a detailed request for information to all respondents to our consultation, which included a clear definition of the specific detail and format of data required. A small number of stakeholders responded to this questionnaire, including some of those who have now made formal applications to the EU selection and award process. We are considering these responses as part of our further deliberations on this matter.
- 5.85 We also note the arguments made by a number of mobile network operators (MNOs) that to charge anything other than the level of the opportunity cost of the CGC spectrum for the CGC licence has the potential to distort the market.
- 5.86 We therefore at this stage, do not intend to discuss all of the comments and issues raised in the consultation responses. We will address these issues and make a decision on the level of fees, in a future Statement.

Other issues raised by stakeholders

- 5.87 A large number of responses raised issues related to our intentions for implementing Decision No 626/2008/EC and in particular, implementing conditions that we might be obliged to include in the CGC licence, arising from this Decision.
- 5.88 A number of responses commented on the need to ensure that the CGC licence clearly states the relationship between the CGC and the MSS, as required by the RSC Decision and Decision No 626/2008/EC. In particular, respondents commented that the CGC licence should state that the CGC:
- must be an integral part of the MSS i.e. be controlled by the satellite resource and network management mechanism (6 responses);
 - must be within the 'footprint/service area' of the MSS satellite (2 responses);
 - should be authorised for no longer than the EU authorisation of the associated MSS (3 responses);

- would be subject to revocation procedures if the MSS satellite ceases to provide service for longer than a 18 month grace period (1 response);
 - would be subject to revocation procedures if the satellite is not launched within 22 months of the end of the selection process (1 response).
- 5.89 A number of responses also requested additional clarification on our enforcement procedures for the CGC licence conditions.
- 5.90 The responses raised a variety of other points:
- some commented that our consultation document did not address the technical conditions that would apply to the CGC licence, for example, spectrum user rights and issues of adjacent band protection for other services;
 - if the EU process failed to conclude with an award of an MSS authorisation then Ofcom should consult further on the use of the spectrum;
 - in common with other terrestrial mobile networks, frequency co-ordination agreements need to be agreed with the UK's near neighbours for CGC networks;
 - there was a need to ensure that selected MSS operators have the right to interconnect to the PSTN; and
 - clarification was requested on the status of previously licence-exempted terminals operating in this frequency band.

Ofcom position on other issues raised by stakeholders

- 5.91 The issues relating to the implementation of Decision No 626/2008/EC, including the common conditions which must be reflected in any national authorisation of CGC networks and the requirements for monitoring and enforcement, are addressed in section 6 as part of our second consultation.
- 5.92 The definition of the technical conditions applied to CGC use are addressed in section 7 as part of our second consultation.
- 5.93 On the issue of what actions we might take if the EU process failed to conclude with an award of MSS authorisations, the Commission would need to address this first at the European level. However, any alternative to the arrangements set out here for authorisation of this spectrum in the UK would need to be subject to further consultation.
- 5.94 With regards to any international coordination requirements, we note that the MSS frequency assignments will be authorised on a harmonised pan-European basis to a single MSS operator, who may then deploy CGC across EU member states. Given this, we do not anticipate the need for any formal frequency co-ordination to be required between the different implementations of the same MSS system's CGC in each member state.
- 5.95 On the issue of connection to the PSTN, as previously indicated in the consultation document, Ofcom operates a general authorisation regime for telecommunications networks. This replaces the licensing regime, which was previously in place prior to 25 July 2003, which required all providers of telecommunications to apply for and hold a Telecommunications Act licence. This general authorisation regime includes

General Conditions of Entitlement (that is, conditions which apply to all) and specific conditions (that is, conditions which apply to individuals). See further details in section 8.

- 5.96 On the issue of existing licence exemption of terminals in the band, we will need to review the status of any currently exempted equipment following the completion of the EU selection and authorisation process. We also note that at our next regular update to the exemption regulations we intend to remove reference to specific satellite systems and replace these with references to ETSI standards.

Summary of Decisions

- 5.97 This Statement sets out Ofcom's policy decisions in respect of the policy issues highlighted within the first consultation.

- 5.98 We have decided to proceed with the following aspects of the proposals for which there was broad stakeholder support:

- Authorisation will be in the form of a spectrum access licence with standard terms and conditions with the addition of conditions imposed by Decision No 626/2008/EC;
- The licence will be awarded, on application, to the selected MSS operators under the EU selection & authorisation process following the completion of this process;
- The licence will be awarded for a fixed period that ends 18 years after the date of publication of the EU selection Decision.
- The licence will be service and technology neutral, to the extent possible within the constraints of the RSC Decision¹³ and Decision No 626/2008/EC² We have concluded that it would be more appropriate to authorise only the set of frequencies that the applicant applies to use for CGC in the UK. This will provide the MSS operator with the flexibility to apply for the full set of frequencies, or a smaller subset of frequencies, dependent on their planned usage.

- 5.99 On the issue of trading, we have concluded that we will permit trading of CGC licences as:

- Decision No 626/2008/EC does not preclude trading of CGC licences;
- There are a number of benefits to MSS operators, in terms of the flexibility that trading will afford them in developing their commercial business models; and
- There are a number of benefits, in terms of the efficiency of regulating and enforcing the terms and conditions of the CGC licence, if the operator of the CGC network (which may not be the same organisation as the MSS operator depending on commercial arrangements) is also a licence holder.

- 5.100 However, we have decided to allow concurrent trades only (i.e. no outright trade will be allowed). This will allow us to have the level of confidence that the relationship between the CGC and the MSS network can be assured as required under Decision No 626/2008/EC.

¹³ **2007/98/EC**, Commission Decision of 14 February 2007 on the harmonised use of radio spectrum in the 2 GHz frequency bands for the implementation of systems providing mobile satellite services

- 5.101 On the issue of licensing, and permitting the commercial operation of, the CGC in advance of the operational satellite, we have concluded that there are benefits to UK citizens and consumers in permitting the earlier CGC commercial operation. We have therefore decided to licence CGC from the date of the selection decision, which could be up to 24 months before the commercial launch of the satellite component.
- 5.102 On the issue of CGC Licence fees we have concluded that these will be set on the basis of AIP. We will conclude on the level of fees in a future Statement.

Section 6

Implementation of Decision No 626/2008/EC for CGC

Purpose of this consultation

- 6.1 Sections 6 and 7 (and their associated annexes) form part of a second consultation on our proposals for the detailed terms and conditions that will be included in licences awarded for terrestrial mobile networks (Complementary Ground Component, “CGC”) that complement 2 GHz mobile satellite systems (MSS) operating in the frequency bands 1980-2010 MHz and 2170 – 2200 MHz (“the 2 GHz MSS bands”).
- 6.2 Section 6 focuses on the way in which we propose to implement the requirements of Decision No 626/2008/EC that relate to the authorisation of CGC in the UK, setting out proposals for specific additions to our standard licence terms and conditions.
- 6.3 Section 7 addresses the technical terms and conditions of the CGC Licence which will be included in the schedule(s) attached to the CGC Licence.

Requirements of Decision No 626/2008/EC

- 6.4 Title III of Decision No 626/2008/EC sets out a number of requirements on Member States that relate to:
- The authorisation of the selected MSS applicants (Article 7);
 - The authorisation of CGC in Member States (Article 8); and
 - Monitoring and enforcement (Article 9).
- 6.5 We consider these in turn below, identifying where these requirements are reflected in the draft CGC Licence which is included at Annexes 13 and 14.

Authorisation of selected applicants

- 6.6 Article 7 of Decision No 626/2008/EC stipulates a number of common conditions that Member States need to ensure are reflected in the authorisation of the successful MSS applicants. We have concluded that these conditions need to be attached to a separate 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.
- 6.7 In the UK we have no existing mechanism for authorisation of transmissions from satellites. Instead, we rely on the ITU satellite filing process to manage any frequency co-ordination required to protect other satellites and have managed interference arising from the mobile terminals through licensing, or license exemption, of these user terminals. However, we expect that we will be provided with the power to licence

the 2 GHz MSS satellite(s) through a Statutory Instrument implemented by BERR under the European Communities Act 1972 and we anticipate a separate and short consultation on this issue later in the year.

- 6.8 We expect such a MSS satellite authorisation to include all of the terms and conditions which Decision No 626/2008/EC requires to be imposed on the operation of the satellite, including the obligation to inform us in the event of a failure of the satellite. In particular we expect this authorisation to include the following common conditions set out in Article 7:
- a) Details of the frequency range assigned to the successful MSS applicant;
 - b) The requirement to fulfil the Milestone Review Process (MRP) within 24 months of the Selection Decision;
 - c) The requirement to honour other commitments made in the successful MSS Operator's application to the EU selection and authorisation process;
 - d) The requirement to provide an annual report outlining their progress against the MRP and the other commitments made in the application to the EC administered selection and authorisation process; and
 - e) The duration of the authorisation, which will be eighteen years from the date of the EU selection decision.
- 6.9 We do not anticipate charging a fee for this authorisation.

Implementation of Decision No 626/2008/EC common conditions relating to CGC

- 6.10 The CGC Licence will provide the licensee with the right to establish, install and use radio transmitting and receiving stations and/or radio apparatus described in the Licence, subject to a number of terms and conditions. These will, for the most part, reflect the standard licence terms and conditions used in WT Act licences.
- 6.11 However, Article 7 of Decision No 626/2008/EC² requires Member States to include a number of common conditions in the national authorisation of CGC. The common conditions, and the way that we propose to incorporate them in the CGC licence (drafts of which are included at Annexes 13 and 14) are as follows:
- a) Operators shall use the assigned radio spectrum for the provision of complementary ground components of mobile satellite systems. This requirement is reflected in the standard condition on "Permitted Frequency Block", at paragraph 2 of the draft CGC Licence Schedule.
 - b) Complementary ground components shall constitute an integral part of a mobile satellite system and shall be controlled by the satellite resource and network management mechanism; they shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of the associated mobile satellite system. This condition is reflected in the standard condition on "Purpose of radio equipment licensed" at paragraph 4 of the CGC Licence Schedule. There is no need, however, to include a separate reference to the requirement to "not increase the spectrum requirement of the associated mobile satellite system" as

- condition a) ensures that there will be no increase in the spectrum requirement of the associated mobile satellite system.
- c) Independent operation of complementary ground components in case of failure of the satellite component of the associated mobile satellite system shall not exceed 18 months. This requirement is reflected as a new condition, paragraph 5 in the licence, entitled "Failure of Mobile Satellite Component".
- d) Rights of use and authorisations shall be granted for a period of time ending no later than the expiry of the authorisation of the associated mobile satellite system. This requirement is reflected in paragraph 2 on "licence term" in the CGC Licence.

Requirement for CGC to constitute an integral part of MSS

- 6.12 Our understanding of 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. Accordingly, it is necessary that the assignment of frequencies between satellite and CGC are coordinated by the MSS operator. However, we do not consider that there is a requirement for the CGC component to provide the same service or application as the satellite component, although the MSS operator may of course choose to do so. The CGC component may also operate to a different air interface standard compared to the satellite component.

Geographic Coverage

- 6.13 Decision No 626/2008/EC authorises the grant of spectrum rights within the service area to which the successful applicants commit themselves. Member States are permitted to grant rights of use outside this area provided that this grant of use is on a non-interference, non-protected basis (Article 7, paragraph 3). We have therefore considered the most appropriate way to deal with the geographic coverage of the CGC licence, taking due account of our statutory duties, including the duty to promote the efficient use of spectrum.
- 6.14 We propose to award 2 GHz CGC licence(s) on a UK wide basis which includes both the rights authorised under the EU selection and authorisation process itself and, to the extent that the satellite footprint does not cover the whole of the UK, the non-interference, non-protection rights for use of spectrum that falls outside the satellite footprint.
- 6.15 This proposal reflects an expectation that a large part of the UK, and possibly the whole of the UK, is likely to be included in the satellite footprint as a result of the EU process. To the extent that there is any part of the UK that is not included in the footprint, it would be unlikely to benefit UK citizens and consumers to set up a separate authorisation process for "out-of-footprint" spectrum for the reasons given below.
- 6.16 There would be practical difficulties in defining a geographical limit to the satellite footprint within the CGC Licence. For example, defining an absolute geographic limit to the footprint could prove difficult as the local propagation conditions may allow services to be used outside of this area on occasion and there would be no consumer benefit in restricting such use. Indeed, given our intention to licence exempt the user equipment, consistent with the Authorisation Directive, it would be very difficult in practice to restrict the use, or attempted use, of such equipment

outside the satellite footprint, which would then pose an interference risk to any service operating in the spectrum outside the satellite footprint.

- 6.17 Further, whilst the footprint might indicate the area where service was possible, the area over which interference could be caused to the MSS will be much wider, reducing the utility of the spectrum outside the footprint.
- 6.18 We are also aware that for some potential MSS operators their satellite footprint is likely to increase over time. Indeed this is specifically provided for in Decision No 626/2008/EC, which includes two distinct geographic coverage requirements at year one and year seven. The exact size of the satellite footprint will also be dependent on the specific service being offered by the MSS operator and this could change over time. Therefore, if we were to define the satellite footprint within the CGC Licence this would not preclude the MSS operator subsequently increasing its satellite footprint, either by launching an additional satellite within the 18 year term, or by changing the service it offered (e.g. by introducing a vehicle-based service). Indeed, given the early stage of development of MSS CGC services and the uncertainties in the market, significant changes to the services provided over the 18 year term of the Licence would be expected.
- 6.19 Any separate authorisation of spectrum outside the satellite footprint would therefore need to include conditions which would allow for a later reduction in the geographical scope of the licence and therefore reduce the utility of such spectrum further.
- 6.20 A number of other considerations also support the case for CGC Licences to be awarded on a UK wide basis:
- i) any use outside of the footprint would have to operate on a non-interference / non-protection basis which would significantly limit its use in the same frequencies as used by the satellite (as transmissions outside of the footprint would still cause interference into the satellite);
 - ii) where an “out-of-footprint” operator was different to the CGC operator there would be a need for coordination across geographic boundaries between different systems, which could lead to less efficient spectrum usage;
 - iii) the cost and complexity of setting up a separate award process would not be proportionate in light of i) and ii); and
 - iv) to the extent that other, more valuable uses of the “out-of-footprint” spectrum emerged over time then these uses could be enabled by the CGC licensee trading the spectrum on a geographic basis.
- 6.21 This assessment is based on the expectation that the MSS footprints will cover a large part of the UK, even if they do not cover the whole of the UK. If, in the event, it turned out that the MSS footprint covered only a small part of the UK then the balance of the above assessment might change. We will give appropriate consideration to this issue before we issue a CGC Licence following the conclusion of the EU selection process.
- 6.22 On the basis that we issue a UK-wide CGC licence, we do not consider that is necessary to identify separately in the licence any spectrum usage rights that are out-of-footprint. This is because the non-interference, non-protection requirement will be met automatically by the requirement for CGC use to be controlled by the satellite resource and network management system.

- 6.23 Having consulted the relevant authorities we also propose to extend the authorisation to include the Isle of Man, Jersey and Guernsey.

Licence variation and revocation

- 6.24 We propose to create a direct link between the authorisation of CGC and the authorisation of the MSS satellite by inserting an additional clause (e) in condition 3 of the draft CGC licence by which the CGC Licence may be varied or revoked as follows:

- If [the UK licence authorisation of the associated MSS satellite] is no longer in force.

- 6.25 In this way, any breach of the conditions included in the satellite authorisation, including failure to launch within the 24 months provided for by Decision No 626/2008/EC, could result in the revocation in the first instance of the satellite authorisation, which would then lead directly to a breach of the CGC licence conditions and the possible variation or revocation of the CGC licence.

Interpretations in Licence

- 6.26 We propose to make a number of additions to the standard 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 626/2008/EC conditions

- 6.27 Article 9 of Decision 626/2008/EC requires Member States to:

- i) monitor the compliance with the common conditions for the satellite and CGC Components and take appropriate measures to address non-compliance; and
- ii) provide the Commission with an annual report indicating the progress of the MSS operators against the MRP and other commitments made by successful MSS operators to the EC administered selection and authorisation process.

- 6.28 As explained above, we expect there to be a separate authorisation for the satellite component. We expect this separate authorisation to include conditions that will support our monitoring and enforcement obligations. In particular, we anticipate that it will include a requirement for the authorised satellite operator to inform us of any failure of the MSS satellite component. We would therefore expect, in the event of such a failure, to write to the CGC Licensee(s) to remind them of their obligation (under the proposed condition 5 of the CGC Licence on “Failure of Mobile Satellite

Component”) to have the satellite restored within 18 months of such a failure, or risk a variation or revocation of their CGC Licence.

- 6.29 In order to support our monitoring obligation in respect of the CGC component, we propose to 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.

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

Section 7

Technical CGC Licence conditions

Introduction

- 7.1 The spectrum access Licence will provide licensees with the right to establish, install and use radio transmitting and receiving stations and/or radio apparatus described in the Licence subject to a number of terms and conditions, both technical and non-technical.
- 7.2 This section of the consultation addresses the specific technical and other conditions to be included in the Schedule of the CGC Licence.
- 7.3 Two versions of the draft CGC Licence are provided that differ in the way that transmission rights are defined the Licence Schedule:
- One using Spectrum Usage Rights (SUR) the draft Licence for which is provided as Annex 14; and
 - One using spectrum masks, the draft Licence for which is provided as Annex 15.
- 7.4 The Schedules of these draft Licences include the standard technical terms and conditions that are included in comparable spectrum access licences with a small number of amendments and additions to reflect the specifics of the CGC Licence. In particular, they include:
- Description of the Radio Equipment Licensed;
 - Purpose of the Radio Equipment;
 - Interface requirements for the Radio Equipment Use;
 - Special conditions relating to the Operation of the Radio Equipment;
 - Site Clearance Requirements;
 - National Co-ordination;
 - International Cross-border co-ordination;
 - Permitted Frequency Bands;
 - Maximum aggregate in-band PFD limit for the SUR approach (or Maximum permissible transmitted power for the spectrum mask approach);
 - Permissible Out-of-Block Emissions;
 - Interpretations.

Approach to transmission rights included in the CGC licence

- 7.5 This section of the consultation is concerned with the CGC base station transmission rights for the downlink band 2170 – 2200 MHz (the 1980 – 2010 MHz band is the

uplink band in which base station transmissions will not be permitted). It is intended that the authorisation of the uplink band will be through the licence exemption of the user handsets.

- 7.6 We have based these transmission rights on the framework set out by RSC Decision 2007/98/EC and the EU's Decision No 626/2008/EC. Neither Decision includes any provisions relating to technical band edge conditions. However, the discussions on RSC Decision were based on the assumption that the full 30 MHz uplink band (1980 – 2010 MHz) would be available for CGC use. Subsequent work on Decision No 626/2008/EC and the EU selection and award process has proceeded on the basis that the full 2x30 MHz is available for award to a number of competing satellite operators. As a result, we have not imposed constraints on CGC use at the boundaries in order to protect services operating in adjacent bands. If we were to do so, then it would not be possible for the EU to make the full 30 MHz available to MSS operators as part of its selection and award process. This does not have any significant implications for terrestrial mobile use immediately below the 2170 MHz boundary since this is the existing 3G downlink band which has equivalent technical conditions to protect adjacent downlink channels from interference. However, it could impact on the PMSE applications immediately above the 2010 MHz boundary if the frequencies immediately below 2010 MHz are used for CGC.
- 7.7 Our analysis of technical conditions below also reflects the requirement for geographic exclusion zones for three small areas in the UK in order to protect MoD space operation (passive) receivers.
- 7.8 Within this framework, the main issue for this consultation concerns the form of the technical parameters. We set out our proposals for two options in this section. The first approach is based on Spectrum Usage rights (SUR) which has been developed over the last few years and used for the "L-band" award at 1479.5 – 1492 MHz. The second option is based on transmitter spectrum masks, which is how technical licence conditions have traditionally been specified.
- 7.9 While both spectrum masks and SUR parameters aim to protect neighbouring (geographical and in terms of frequency) users from harmful interference, the specific licensing terms will differ between the two approaches and therefore they are not directly comparable.
- 7.10 The SUR approach offers some advantages:
- By directly specifying the parameter which needs to be controlled, all unnecessary restrictions are removed from the licence, providing maximum flexibility to licensees;
 - Specification of maximum aggregate interference levels allows neighbours to plan their networks more accurately, with less uncertainty or margin for error, because they have a better idea of the interference levels to expect;
 - Clearly setting out the "harm" that one user of spectrum can cause another simplifies the process of negotiating between users such that they can determine the optimal interference levels that they can cause each other.
- 7.11 In the specific case of 2 GHz CGC Licences, the SUR approach to limiting possible interference between CGC licence holders as well as into services in adjacent bands offers potential benefits over a spectrum mask approach. In particular, it better provides the flexibility to support the wide variety of service which the 2 GHz MSS

band can be used to provide, including mobile TV, voice and data as part of a traditional MSS service, or voice and data as part of a Public Protection and Disaster Relief (PPDR) service, whilst ensuring that CGC operators do not suffer harmful interference from each other. It allows the CGC operators to maximise the flexibility of use of the band and also allows us to quantify the maximum level of interference they can cause to neighbours.

- 7.12 The next part of this section describes our approach and proposals for how SUR is applied to the CGC Licence.

Spectrum Usage Rights

- 7.13 In December 2007 we published a statement on Spectrum Usage Rights (SUR) which sets out our approach to Spectrum usage rights including how we might define the SUR parameters. We have since consulted and concluded on further details on our approach to SUR.

- 7.14 Licence conditions defined by SUR parameters directly specify the aggregate emissions that a licence holder may radiate in neighbouring locations and frequency bands. When implemented in all Licences this will give licensees more clarity over the interference they can expect to receive and more flexibility in terms of their own use of spectrum. In particular, SUR parameters account for the density of deployment of transmitters by a licensee.

- 7.15 Licensing terms based on SUR consist of the following parameters:

- In-band aggregate power flux density (in-band PFD);
- Out-of-band aggregate power flux density (out-of-band PFD); and
- Geographical interference based on the aggregate power flux density at a boundary.

- 7.16 In line with our Statement on SUR, the in-band PFD and out-of-band PFD would be defined as follows:

- The aggregate out-of-band PFD at a height H m above ground level should not exceed $X1 \text{ dBW/m}^2/\text{MHz}$ at more than $Z\%$ of locations in a test area;
- The aggregate in-band PFD at a height H m above ground level should not exceed $X2 \text{ dBW/m}^2/\text{MHz}$ at more than $Z\%$ of locations in a test area.

- 7.17 Aggregate PFD values are calculated at a height H corresponding to the antenna height of receivers into which they could cause interference. These receivers are those operating in the neighbouring band or geographical area. In this case the neighbouring service below 2170 MHz is UMTS FDD downlink for which the appropriate height is 1.5 metres. Above 2200 MHz the neighbouring service is Programme Making and Special Events (PMSE) with a receiver height of 2 metres. For simplicity we will consider a height H of 1.5 metres.

- 7.18 We propose for the CGC Licence that Z is set at 95%. The SUR parameters have therefore been calculated based on an aggregate PFD level which should not be exceeded at more than 95% of locations.

- 7.19 In addition, we propose that the test area is defined as a square area including at least ten transmitters. Its location is defined by the (4-figure) National Grid Reference of the bottom left corner. The appropriate test area is the smallest of the following areas, 1 km², 4 km², 25 km², 100 km², 400 km², 2500 km² or 10000 km², which includes at least ten transmitters. All test points that occur above a water feature (e.g. sea, lake or river) will be ignored. PFD levels at these points will not contribute to establishing compliance.
- 7.20 The specific SUR parameters proposed are provided in the next sub-section. They have been developed on an individual channel basis, assuming a CGC channel bandwidth of 5 MHz.
- 7.21 The assumptions used to develop these SUR parameters are given in Annex 9; the approach used to develop the SUR parameters is given in Annex 10; while Annex 11 provides the options that we propose be used in the propagation model when assessing the compliance against the chosen SUR parameters.

Proposed SUR parameters for 2170 - 2200 MHz

- 7.22 For the 2170 - 2200 MHz, downlink band, SUR parameters we propose the in-band and out-of band aggregate PFD values as provided in Table 1.

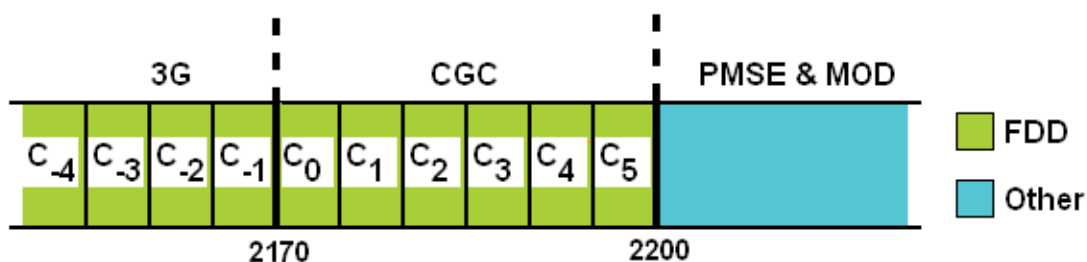
Table 1: In-band and out-of-band PFD for CGC DL channels (Δ_F is the frequency offset from the relevant channel edge) for 95% of locations in a test area

Scenario	Offset from relevant channel edge [MHz]	PFD at 1.5m [dBW/m ² /MHz]	PFD at 10m [dBW/m ² /MHz]
In-band PFD	NA	-67.6	-45.0
Out-of-band PFD	-5.0 < Δ_F ≤ -0.0 (lower edge) +5.0 > Δ_F ≥ +0.0 (upper edge)	-112.6	-90.0
Out-of-band PFD	-10.0 < Δ_F ≤ -5.0 (lower edge) +10.0 > Δ_F ≥ +5.0 (upper edge)	-117.6	-95.0

Out of band aggregate PFD emissions into CGC channels

- 7.23 It is useful for potential CGC operators to understand the potential aggregate interference PFD from adjacent channels and other services into a CGC channel. We have therefore made an estimate of this aggregate PFD based on a channel plan based on 5 MHz CGC channels as discussed in Annex 10 and shown in Figure 1. It should be noted that this channel plan is only illustrative and will not be known until after the EU selection and authorisation process.

Figure 1: 2 GHz illustrative channel plan



- 7.24 At the 2170 MHz band edge, the adjacent service is downlink for 3G FDD. The interfering aggregate PFD into CGC channels C0 – C3 will therefore be the aggregation of the out-of-band PFD¹⁴ from the two FDD DL channels on each side of the CGC channel i.e. four channels contribute to this aggregate PFD level. However, since the 3G services are not licensed on the basis of SUR the estimated aggregate PFD given below cannot be assured and therefore the values presented should be treated with caution.
- 7.25 The values for the aggregate interfering PFD into the CGC FDD DL channels C0 to C3 are therefore as given in the Table 2 below. This assumes the 3G FDD DL channels C₋₁ and C₋₂ below 2170 MHz and the CGC channels C₀ to C₅ are UMTS FDD downlink with similar characteristics (spectrum masks etc. and that the networks also generate identical out of band PFDs). However, this will only be true if the 3G network employs similar network topology (base station density, transmit power etc) to the CGC network.

Table 2: Estimated aggregate Interfering PFD in CGC FDD DL channels C0 – C3

	H [m]	Aggregate pfd [dBW/m ² / MHz]
C0 –C3	1.5m	-108.4

- 7.26 At the 2200 MHz boundary, the adjacent services are MoD mobile (tactical radio relay), MOD space operations and PMSE.
- 7.27 The MoD space operations, as a passive service will not contribute to the interference into CGC channels. As we do not have details of the MoD tactical radio relay or its deployment characteristics we can not assess the likely interference into the CGC channels; noting that tactical radio relay may operate throughout the UK. .
- 7.28 PMSE services are also not licensed in terms of SUR. Therefore to understand the potential aggregate OOB PFD of these services into CGC channels, we have modelled their use in a similar way to that by which we develop SUR parameters, using the assumptions and approach given in Annex 12, which is based on published information on PMSE use.
- 7.29 From this modelling, we believe the typical OOB PFD level from PMSE, are -126.7 dBW/m²/MHz at 1.5metres height. Our assessment is that the PMSE values will contribute little OOB PFD into the CGC channels C4 and C5, See Annex 12 for further detail. Therefore we assume no interfering contribution from PMSE into these channels.
- 7.30 The aggregate interfering PFD into the CGC channels C4 and C5 is therefore as given in Table 3 assuming no contribution from PMSE or tactical radio relay.

¹⁴ Note that for C₀ and C₁ some of the interference is from 3G channels not licensed using SUR. As discussed, the values should therefore be treated with caution as different 3G network deployment topologies can cause different aggregate PFD values.

Table 3: Estimated aggregate Interfering PFD in CGC FDD DL channels C4 and C5

Channel	H [m]	PFD PMSE [dBW/m²/ MHz]
C4	1.5	-109.0
C5	1.5	-111.4

SUR analysis of interference to adjacent services

- 7.31 Whilst we have indicated that CGC operation will not be constrained in order to protect services operating in the adjacent bands, the exception to this is use by the MoD which can be defined as for national security.
- 7.32 To protect the MoD space operations use in an adjacent band it will be necessary to incorporate exclusion zones of 8km radius around the three locations:
- Oakhanger (SU 776 357);
 - Colerne (ST 808 717); and
 - Menwith Hill (SE 209 561).
- 7.33 We have no information on the MoD use of tactical radio relay systems (TRR) or its deployment; therefore we have proposed no specific protection for TRR against CGC operation, nor can we indicate whether CGC operation could suffer interference from MoD's tactical relay use.
- 7.34 The aggregate out-of-band PFD contributions of C4 and C5 into PMSE above 2200 MHz can also be calculated, as given in Table 4.

Table 4: Contribution to aggregate PFD into PMSE from CGC use

Offset from channel C5 edge [MHz]	Out of Band PFD into PMSE at 1.5m [dBW/m²/ MHz]	Out of Band PFD into PMSE at 10m [dBW/m²/ MHz]
+5.0 > $\Delta_F \geq +0.0$ (upper edge)	-111.4	-88.8
+10.0 > $\Delta_F \geq +5.0$ (upper edge)	-117.6	-95.0

- 7.35 This we believe will severely restrict the use of the band 2200 – 2210 MHz by PMSE.
- 7.36 For the PMSE channel 2200-2210 MHz, the calculated aggregate value of the OOB PFDs from CGC will be -103.5 dBW/m² across a 10 MHz PMSE receiver at a height of 1.5 metres and it will be -80.9 dBW/m² across a 10 MHz a PMSE receiver at height of 10 metres.
- 7.37 If we assume a PMSE radio camera with a zero dB gain antenna, operating at 1.5 metres height, then we estimate that the aggregated OOB CGC PFD at the camera would result in a received input power of -101.8 dBm. This exceeds the assumed PMSE wireless camera receiver interference threshold limit of -107 dBm¹⁵. For PMSE operating at heights of more than 1.5 metre the potential interference will be greater.

¹⁵ www.ofcom.org.uk/consult/condocs/2ghzawards

- 7.38 We recognise that this will cause some concern to the PMSE sector. However, as previously indicated, this is as a direct result of the requirements of Decision No 626/2008/EC and therefore we have no discretion to impose additional constraints on CGC use to protect continued PMSE use.

Verifying compliance with the SUR option

- 7.39 In December 2007 we published a statement on Spectrum Usage Rights (SUR) which set out modelling as our proposed approach to verify licensees' compliance with SUR licence terms. In that statement we provided an example of how such verification might work but indicated that other cases would need further consideration. In January 2008 we published a consultation setting out the additional cases needed along with proposed approaches. In our 15th May 2008 Statement we concluded on the general approach to be adopted to verify compliance with Spectrum Usage Rights terms¹⁶.
- 7.40 We anticipate that in each particular case where SUR are adopted, that more specific details will be provided, for example including the propagation model to be adopted and precise details on the parameters and process to be used. To aid in that process we have also produced an SUR guide¹⁷.
- 7.41 The 15th May statement also sets out our preference for compliance to be verified by modelling because of its simplicity, repeatability and low cost. This approach was included in the recent "L-band" award.
- 7.42 In Annex 11 we provide the specific details of the propagation model and other parameters we propose be used in any compliance modelling for terrestrial networks complementing 2 GHz mobile satellite systems.
- 7.43 In the following sections, where the use of spectrum masks would result in different technical conditions we have indicated this under the relevant licence condition.
- 7.44 In the next sub-section we outline our proposals for the spectrum mask approach.

Spectrum mask approach

- 7.45 The assumptions on which we have based our proposals for the option based on a spectrum mask approach, along with a consideration of the potential impact on services operating in adjacent bands, are provided as Annex 8.
- 7.46 We propose that the maximum mean permissible transmitted power within the assigned 2 GHz frequency blocks would be:
- 61 dBm/5 MHz EIRP.
- 7.47 This limit would also be subject to permissible out-of-block EIRP limits.
- 7.48 We propose the permissible Out-of-Block EIRP limits provided in Table 5 below:

¹⁶ www.ofcom.org.uk/consult/condocs/surs/statement/sur.pdf

¹⁷ <http://www.ofcom.org.uk/radiocomms/isu/sursguide/>

Table 5: CGC Base Station out-of-block EIRP limit

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*

7.49 As a result of not imposing additional constraints on CGC use, at the band edge 2200 MHz, we note that our assessment of the interference scenario with PMSE operations in the band 2200-2210 MHz, could lead to a significant impairment, if not the loss of this band for PMSE use, due to anticipated interference from CGC Base stations. Further details are provided in Annex 8 of this document.

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?

7.50 In the remainder of this section we outline our proposals for the amendments to the other standard conditions included in the CGC Licence Schedule.

Purpose of the Radio Equipment

7.51 As discussed in paragraph 6.11, we propose to include an additional condition that the radio equipment must be used to provide services as part of a mobile satellite system and that the CGC must constitute an integral part of a mobile satellite system, controlled by the satellite resource and network management mechanism. We recognise that the MSS and CGC components will not necessarily offer the same services or applications and may operate to different interface standards.

Special conditions relating to the Operation of the Radio Equipment

7.52 As discussed in paragraph 6.11, we also propose adding a further condition that the licensee submits an annual compliance report to us indicating its continuing compliance with two key CGC common conditions:

- 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 satellite components;
- 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.

- 7.53 We do not believe that it is necessary for the licensee to report on the remaining CGC common conditions, namely operating in the permitted frequencies and the term of the CGC Licence.

National co-ordination (e.g. at frequency and geographic boundaries)

- 7.54 To protect adjacent band services, the Ministry of Defence requires that CGC operators avoid base station operation within 8 km of their sites at Oakhanger, Colerne and Menwith Hill. We propose therefore to include these as exclusion zones in the CGC Licence and to include the NGRs (National Grid References) of these sites.
- 7.55 Whilst we propose to include the standard requirement for CGC licensees to comply with any national co-ordination procedures as may be notified by us, as discussed in Annex 8, we do not envisage any need for us to impose any national co-ordination procedures for CGC, beyond the exclusion zones required by MoD, and discussed above.

International Cross-border co-ordination

- 7.56 We propose to include the standard requirement for CGC licensees to comply with any procedures as may be notified by us. However, given that the frequencies used by national CGC networks will be assigned by the MSS network management system and operated as an integrated MSS network, we do not believe there is any reason why any formal International Cross border co-ordination would be required.

Permitted Frequencies of Operation

- 7.57 As discussed in paragraph 6.11, we will include in the CGC Licence Schedule the set of frequencies applied for by the MSS operator, so long as these are equal to or a subset of the frequencies assigned to the associated MSS satellite in the EU selection and authorisation process.
- 7.58 We will also indicate within the Licence which of the permitted frequency bands will be the uplink and which will be the downlink.
- 7.59 These permitted frequencies will, as normal, be subject to Out-of-Block emissions included in the Licence Schedule, regardless of how these emissions are defined i.e. maximum out-of-block e.i.r.p. or maximum aggregate out-of-block PFD.

Interpretations in Licence Schedule

- 7.60 As a result of these additions and amendments we propose including the following additional definitions:
- A definition of the mobile satellite system for which we propose to include that contained in Decision No 626/2008/EC, namely: “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”;

- A definition of the complementary ground component of MSS for which we propose to include that included in Decision No 626/2008/EC, namely: "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";
- A definition of the "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 the "mobile earth station" for which we propose "an earth station in the mobile satellite service intended to be used while in motion or during halts at unspecified points";
- A definition of the "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";
- A definition of an "earth station" for which we propose "a station located either on the Earth's surface or within the major portion of the Earth's atmosphere and intended for communication";
- A definition of "a satellite resource and network management mechanism" for which we propose "a facility which assigns frequencies to terminals within the mobile satellite system".

7.61 For the SUR option we also propose including definitions for:

- PFD for which we propose "a measure of the power received per unit area per frequency. For the purposes of this licence it is expressed in the following units dBW/m²/MHz;
- Aggregate PFD for which we propose "the combined PFD caused by all transmitters authorised by this licence within the test area defined in Schedule 1.

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

Section 8

Other Regulatory and Legal Considerations

Introduction

8.1 There are a number of other legal requirements with which CGC operators might need to comply, depending on the nature of the services that they wish to provide. This includes:

- R&TT E Directive,
- Electronic Communications Code,
- Other regulations on the provision of electronic communications services and networks,
- Authorisation of broadcast content,
- General conditions of entitlement.

8.2 Each of these is discussed in the remainder of this document.

R&TTE directive

8.3 The R&TTE Directive requires manufacturers to make declarations that their radio and telecommunications terminal equipment conforms to the essential requirements of the Directive; all products within the scope of the R&TTE Directive and the Low Voltage Directive which are placed on the UK market must show "CE" marks. The European Commission's "Blue Guide" (Guide to the Implementation of Directives Based on the New Approach and Global Approach) lists other Directives which require CE marking of products and equipment. It is available from the Commission's website¹⁸.

Sitefinder

8.4 Sitefinder¹⁹ is the Government's public access database of base stations. It is operated by Ofcom on behalf of the Government, and is developed in co-operation with industry. The database provides information on operational base stations in England, Scotland, Wales and Northern Ireland, and was established following the recommendations of the Stewart Report. All holders of licences using technologies Global systems for Mobile communications (GSM), International Mobile Telecommunications (IMT) or Terrestrial Trunked Radio (TETRA) and similar technologies, will be requested and expected to provide the information specified in the Sitefinder database in relation to their networks, on a voluntary basis.

¹⁸ <http://ec.europa.eu/enterprise/newapproach/legislation/guide/index.htm>

¹⁹ <http://www.sitefinder.ofcom.org.uk>

Electronic Communications Code

- 8.5 The Electronic Communications Code (the "Code") is set out at schedule 2 to the Telecommunications Act 1984 as amended by schedule 3 to the Communications Act 2003. The Code sets out various rights of Code operators and these include the ability to install their infrastructure on public highways without needing a specific licence to do so under the New Road and Street Works Act 1991 (Local Authorities will be permitted to establish permit schemes to better manage access to public highways under Part 3 of the Traffic Management Act 2004 and the Traffic Management Permit Schemes (England) Regulations 2007; the latter which come into force on 1 April 2008) and it also exempts them from certain aspects of the Town and Country Planning regime in the form of Permitted Development.
- 8.6 Ofcom is permitted to grant Code powers under section 106 of the Communications Act 2003 to any applicant for the purposes of the provision by them of an electronic communications network or for the purposes of the provision by them of a system of conduits which would be made available for use by providers of electronic communications networks. Applicants seeking Code powers are required to provide Ofcom with details in relation to their application and these are set out in the statement entitled: "The Granting of the Electronic Communications Code" (see http://www.ofcom.org.uk/telecoms/ioi/e_c_c/ecc.pdf).

Other regulation on the provision of electronic communications services and networks

- 8.7 It is the responsibility of interested parties who are considering using the Bands to provide electronic communications services to familiarise themselves with any relevant regulation. The same is also true of all other aspects of regulation, such as broadcasting regulation and competition law. It should be noted that all aspects of regulation are subject to change from time to time, including (without limitation) the relevant legislative framework, and the nature of regulation within any given legislative framework. In particular and by way of example, interested parties should note:
- That there are General Conditions of Entitlement with which they may need to comply with as described in more detail below;
 - The existence of regulation in relation to the provision of voice call termination on each network operated by a mobile network operator²⁰; and
 - That if Licensees wish to purchase access and interconnection from operators of existing networks for services in markets where those operators do not have Significant Market Power, our expectation is that these services should be negotiated commercially.

Authorisation of broadcast content

- 8.8 Where the CGC operator intends to provide TV content over the CGC and/or satellite it will further need to ascertain any obligation it might have to apply for a Television Licensable Content Service (TLCS) licence.

²⁰ See for example http://www.ofcom.org.uk/consult/condocs/mobile_call_term/

- 8.9 General guidance notes for applicants of Television Licensable Content Service (TLCS) licences are available on Ofcom's web-site:
http://ofcom.org.uk/tv/ifi/tvlicensing/guidance_notes_and_apps/tlcs/
- 8.10 These guidance notes provide an overview of the licensing process, the licensing requirements and the conditions that licensees are subject to, but do not purport to explain all the relevant provisions of the legislation, or give an exhaustive account of the licensing requirements or licence conditions. Applicants should seek their own legal advice for this purpose.

General conditions of entitlement

- 8.11 All providers of Electronic Communications Services (ECS) and Electronic Communications Networks (ECN) in the UK are covered by the General Conditions of Entitlement. Out of 22 conditions, some apply to particular categories of ECS or ECN providers, mainly depending on whether they provide public services or networks and whether they provide publicly available telephone services or public telephone networks.
- 8.12 It is the responsibility of any undertaking involved in the provision of ECS or ECN to identify which conditions apply to them and to ensure that it complies with them. Further information can be found at http://www.ofcom.org.uk/telecoms/ioi/g_a_regime/qce/qcoe/ and a copy of the consolidated General Conditions can be found at: http://www.ofcom.org.uk/telecoms/ioi/g_a_regime/qce/. This is usually updated quarterly.
- 8.13 It should be noted that from time to time Ofcom consults on changing the General Conditions of Entitlement and such proposals can usually be found on the Ofcom Website. Recent consultations concerning General Conditions include:
- Consumer protection test for telephone number allocation²¹;
 - Metering and Billing²².
- 8.14 We have also published recent statements setting out policies which we will implement in the following areas:
- Telephone numbering,²³
 - NTS,²⁴
 - Arrangements for porting numbers when customers switch supplier,²⁵
 - Regulation of VoIP services.²⁶
- 8.15 In addition, the Ofcom Annual Plan²⁷ and the updated programme of work contains details of work that we are carrying out, or are planning to undertake that relates to

²¹ <http://www.ofcom.org.uk/consult/condocs/numberingcpt/>

²² http://www.ofcom.org.uk/consult/condocs/metering_billing/

²³ <http://www.ofcom.org.uk/consult/condocs/numberingreview/statement/> and <http://www.ofcom.org.uk/consult/condocs/numbering03/statement/>

²⁴ http://www.ofcom.org.uk/consult/condocs/nts_forward/statement/

²⁵ http://www.ofcom.org.uk/consult/condocs/gc18review/statement

²⁶ http://www.ofcom.org.uk/consult/condocs/voip

this area and the European Commission is carrying out a review of the Directives that may also affect the General Conditions²⁸.

²⁷ http://www.ofcom.org.uk/about/accoun/reports_plans/annual_plan0809/
²⁸ http://ec.europa.eu/information_society/policy/ecomm/tomorrow/index_en.htm

Annex 1

Summary of the responses to the 2 GHz CGC consultation

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

A1.2 Question 1:

<i>Q -1 Do you agree that the CGC licence should be in the form of a spectrum access licence with standard terms and conditions?</i>	
Response comments	Ofcom position
<p>CGC licences should be based on a spectrum access licence with standard terms and conditions and should be awarded on a national basis.</p> <p>Conditions should include specific limitations arising from the definition of CGC arising from Decision No 626/2008/EC including in particular that CGC is an integral part of an MSS system and that CGC should only be deployed within the coverage area of the MSS.</p> <p>Conditions must also identify requirement to protect services operating in adjacent frequency bands.</p> <p>The CGC licence term should have the same duration as for the MSS authorisation, but it should be possible to extend the licence beyond the initial term.</p> <p>Terms and conditions associated with current 2G licences including the fact that fees are subject to regular review.</p>	<p>We agree with the consensus view that the CGC licence should be based on the spectrum access licence and should include normal terms and conditions.</p> <p>These terms and conditions should also include those arising from the EC and EU Decisions.</p> <p>We have therefore included a draft licence in the second consultation on detailed elements of the CGC licence terms & conditions, which forms the second half of this document, indicating how we propose to include these conditions.</p>

A1.3 Question 2:

<i>Q -2 Do you agree that such licences should be awarded on a UK-wide basis?</i>	
Response comments	Ofcom position
<p>CGC licences should be awarded on a national basis.</p> <p>CGC should only be authorised for operation within the coverage area of the satellite.</p> <p>CGC operators should be allowed to decide where to roll out CGC.</p> <p>The CGC licence should indicate the number of CGC base stations deployed.</p>	<p>Whilst we agree with the consensus view that the CGC licence should be a national licence we are consulting further on exactly how this should be implemented.</p>

A1.4 Question 3:

<i>Q -3 Do you agree that the CGC licence should authorise the complete set of frequencies assigned under the EU process?</i>	
Response comments	Ofcom position
<p>The CGC licence should include the full set of frequencies authorised to the MSS operator under the EU selection and authorisation process.</p>	<p>We have reconsidered whether to authorise the full set of frequencies assigned to each MSS operator under the EU selection process and have concluded that the maximum flexibility can be provided to the MSS operators if we allow them to choose the set of frequencies they wish to have authorised and in use in the CGC. We have therefore concluded that we will authorise only the frequencies requested for CGC use in the MSS operators' applications.</p>

A1.5 Question 4:

<i>Q -4 Do you agree that the initial grant of the CGC licence should made be to the MSS operator only?</i>	
Response comments	Ofcom position
<p>Initial CGC licence grant should be limited to the MSS operator.</p> <p>Decision No 626/2008/EC requires that the CGC licence should only be awarded to the MSS operator.</p> <p>CGC licence could be granted to an operator with an exclusive agreement</p>	<p>We agree that initial grant of CGC licences should be limited to the MSS operators authorised under the EU selection process and that it is only necessary for the applicant to have a presence in the EU, not necessarily in the UK.</p>

<p>with an MSS operator authorised under the EU selection process.</p> <p>CGC licences should be transferable after initial grant to the MSS operator selected under the EU selection process.</p> <p>The CGC licence applicant must have an EU presence but not necessarily established in the UK.</p>	
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A1.6 Question 5:

<i>Q -5 Subject to certain safeguards, would it be appropriate to license the CGC in advance of the satellite service coming into operation and if so, what criteria should be applied to determine whether the satellite component of the MSS network is operational and what period of time do you consider would be appropriate?</i>	
Response comments	Ofcom position
<p>CGC licences should not be awarded before completion of the EU selection process.</p> <p>CGC could be authorised:</p> <p>a) to operate before operation of the associated MSS satellite</p> <p>b) CGC could be authorised up to two years before operation of the MSS satellite, but after completion of the EU selection process.</p> <p>Authorisation of CGC must be in conformity with Decision No 626/2008/EC.</p> <p>There is no justification for issuing CGC licences ahead of the commercial availability of the MSS system.</p> <p>Identification that an MSS system is operational should be confirmed as availability of terminals, distribution chain, paying customers and all necessary support systems such as customer care, billing, network maintenance.</p> <p>Criteria to demonstrate that the MSS network is operational are contained within the EU Decision.</p> <p>Operation of CGC in advance of full operation of MSS should be permitted but further consultation required on</p>	<p>We agree that CGC licences should not be granted before completion of the EU selection process.</p> <p>We intend to have a suitable application process in place so that applications can be received by Ofcom shortly following official confirmation of the results of the EU selection process.</p> <p>We believe that it would be appropriate to authorise use of a CGC network for a period of up to 24 months before the corresponding MSS satellite component is brought into operation in order to align the date with that required in the overarching EU administered authorisation process for the MSS satellite.</p> <p>We agree that the definition of the MSS being in commercial use should be based on operational availability of the satellite network, gateway station(s) and user equipment as proposed in the application to the EU selection process.</p> <p>This definition will be included in the satellite authorisation terms and conditions and we anticipate a further short consultation on the approach to this satellite authorisation.</p>

<p>actual period.</p> <p>Operation of the CGC up to 24 months before the satellite system is brought into service should be permitted.</p> <p>CGC may be deployed before the MSS satellite network is operational but the CGC should not be switched on.</p>	
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A1.7 Question 6:

<i>Q -6 Do you agree that the CGC licence should not include a coverage obligation?</i>	
Response comments	Ofcom position
<p>CGC licence should:</p> <ul style="list-style-type: none"> a) not include any geographic coverage requirements b) should only extend to the footprint of the satellite. <p>If broadcasting services are provided, the same coverage obligations should apply for broadcast content.</p> <p>The CGC licence should include a coverage requirement on the combined coverage of the satellite and CGC system.</p>	<p>We agree with the wide view that geographic coverage requirements should not be included in the CGC licence as this is our policy for new awards and no argument has been put forward which suggests we should differ from this policy in this instance.</p> <p>We do not concur with the view that CGCs providing broadcast type content should be subject to coverage obligations.</p>

A1.8 Question 7:

<i>Q -7 Do you agree that the CGC licence should be provided on a service and technology neutral basis?</i>	
Response comments	Ofcom position
<p>CGC licences should be service and technology neutral –</p> <ul style="list-style-type: none"> a) to the extent that this is consistent with Decision EC 2007/98 and Decision No 626/2008/EC b) but there are concerns over the associated spectrum user rights and potential impact on adjacent band use c) but consideration should be given to efficient use of spectrum. <p>Since CGC is part of MSS, it is not</p>	<p>We concur with the view general that CGC licences should be provided on a service and technology neutral basis. However, we agree that service flexibility will be constrained by the EC Decisions, such as by the requirement to use the same frequencies in the same direction as the satellite component.</p> <p>Services provided could include fixed, mobile and transportable applications for one-way and two way voice and data communications as well as multicasting.</p> <p>We have therefore included a draft licence in the second consultation on detailed elements of the CGC licence</p>

<p>service neutral. Also, the CGC must use technology that is compatible with the MSS.</p> <p>CGC licences should be on a technology neutral basis but that it would not be appropriate for them to be service neutral due since the EC Decision has determined the service as being MSS.</p>	<p>terms & conditions, which forms the second half of this document, indicating how we propose to include this restriction to MSS services.</p>
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A1.9 Question 8:

<p><i>Q -8 Do you agree that it CGC licences should be tradable and, if so, that they should be both totally or partially tradable and both outright or concurrently tradable, that Ofcom's consent should be required for transfers and that the grounds on which Ofcom may withhold consent should be limited as proposed?</i></p>	
<p>Response comments</p>	<p>Ofcom position</p>
<p>CGC licences should be totally or partially tradable.</p> <p>Trading of CGC licences should be permitted but any change of use would need to ensure compatibility with other systems.</p> <p>Do not see how the CGC licences can be tradable if CGC must be part of an MSS system.</p> <p>Trading from one CGC operator to another should be permitted with the agreement of MSS operator but not change of use.</p> <p>Trading of CGC licences should not be allowed but transfer at the request of the original licensee should be permitted.</p> <p>CGC licences should not be tradable as this would appear to be in conflict with the Framework Directive which says that transfer of rights must not result in a change of use for spectrum that has been harmonised through community measures.</p> <p>Trading should be permitted provided it does not involve change of use. Simple transfer of the CGC licence should be permitted provided that MSS operator retains operational control over the use of frequencies.</p> <p>Decision No 626/2008/EC will only allow</p>	<p>We believe that, in principle, CGC licences should be tradable but subject to specific constraints arising from the EU selection process and limited to concurrent trades only.</p> <p>In particular, it will be necessary to ensure that in any trade, the conditions under which the MSS operator was granted the authorisation continue to apply following a trade. This would include issues such as continuation of the MSS satellite part of the systems and compliance with the criteria against which the original MSS award was granted.</p> <p>We therefore intend to allow the transfer of a CGC licence through concurrent trades only, which will ensure that the relationship between the MSS satellite and the CGC is maintained, as required under Decision No 626/2008/EC.</p>

<p>Ofcom to grant CGC licences to the selected MSS operators; May not be feasible to trade CGC except through a simple change of ownership arrangement.</p> <p>Do not agree that spectrum should be tradable. If the spectrum is not to be used in the manner it was authorised then it should be handed back to Ofcom for reallocation</p>	
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A1.10 Question 9:

<i>Q -9 Do you agree that AIP should be applied to CGC licences at a level that reflects the associated opportunity cost?</i>	
Response comments	Ofcom position
<p>Support principle of AIP for CGC licences but feasibility of alternative use is heavily constrained by EU Decisions.</p> <p>Opportunity cost should be defined with reference to the best alternative use of the spectrum as MSS.</p> <p>International agreement limits scope for alternative uses; If AIP is imposed, the fee levels should be set very low.</p> <p>AIP should be used to set licence fee to encourage efficient use of spectrum.</p> <p>Setting the CGC AIP at the level for GSM 1800 would not be appropriate and would distort competition. AIP level should be set at the marginal opportunity cost for a 3G service.</p> <p>Ofcom is not competent to speculate that EC decisions may change in the future.</p> <p>CGC licence fees should be based on AIP but that further consultation should take place on the actual fee level.</p> <p>Since the spectrum must accommodate both MSS and CGC, the actual amount of spectrum available for CGC will be less than the total assigned.</p>	<p>We agree with the wide view that AIP is, in principle, an appropriate mechanism to establish the fee level for use by CGC operators.</p> <p>We note the range of views that has been expressed regarding the scope for alternative uses of the 2 GHz spectrum, particularly in light of the EU and other constraints that might be considered to apply to its use.</p> <p>We remain of the view that AIP is the appropriate mechanism to establish fee levels for licences but believe that it would be worthwhile to carry out additional work to understand any potential impact of the fee on the likely deployment of CGC network in UK. We therefore issued a specific request for additional information from respondents on their business plans for a CGC business in UK, where relevant, responses to which we have now received. We intend to conclude on the subject of the level of the fees in a future statement.</p>

A1.11 Question 10:

<i>Q -10 Do you agree that the licence fees should be set at around £554,000 per 2 x 1MHz?</i>	
Response comments	Ofcom position
<p>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.</p> <p>An alternative fee level of £140,000 per 2x 1 MHz per year would be appropriate.</p> <p>In accordance with the Authorisation Directive, the licence fee should be set at a level to recover administrative costs only.</p> <p>Adjacent spectrum is underutilised.</p>	<p>As indicated above, we believe it would be appropriate to carry out additional work to understand any potential impact of the fee on the likely deployment of CGC network in UK. We have therefore issued a specific request for additional information from respondents on their business plans for a CGC business in UK, where relevant, responses to which we have now received. We intend to conclude on the subject of the level of the fees in a future statement.</p>

A1.12 Question 11:

<i>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.</i>	
Response comments	Ofcom position
<p>Proposed fee level would have significant impact on MSS/CGC return on investment.</p> <p>If similar fee levels were introduced by half of the EU member states this would cost MSS operators £183 million annually and this would likely render any 2 GHz MSS/CGC business plan infeasible.</p> <p>If there is a business case for CGC systems they should be able to afford the proposed licence fee.</p> <p>The proposed licence fees could have a significant impact at an EU level and these have not been considered in the consultation document.</p>	<p>We have issued a detailed request for information to all respondents of the consultation, responses to which we have now received. We intend to conclude on the subject of the level of the fees in a future statement.</p>

Annex 2

List of respondents to the consultation

Alcatel Lucent

Arqiva

BBC

ESA

ESOA and SAP Reg

H3G

Inmarsat

Intellect

O₂

Ondas

Orange

SIA

Solaris

T-Mobile

Terrestar

Vodafone

Two confidential responses

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

Annex 3

Responding to this consultation

How to respond

- A3.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 1 December 2008**.
- A3.2 Ofcom strongly prefers to receive responses using the online web form located within the consultation response area of <http://www.ofcom.org.uk/consult/condocs> against this particular item, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 5), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.
- A3.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email bob.phillips@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.
- A3.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.
- Bob Phillips
Floor 3
Space Services Unit
Riverside House
2A Southwark Bridge Road
London SE1 9HA
- Fax: 020 7981 3208
- A3.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.
- A3.6 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex 6. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

- A3.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Bob Phillips on 020 7981 3119.

Confidentiality

- A3.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether

all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

- A3.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A3.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at <http://www.ofcom.org.uk/about/accoun/disclaimer/>

Next steps

- A3.11 Following the end of the consultation period, Ofcom intends to publish a statement around the end of this year.
- A3.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

- A3.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 4.
- A3.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.
- A3.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Vicki Nash, Director Scotland, who is Ofcom's consultation champion:

- A3.16 Vicki Nash
Ofcom
Sutherland House
149 St. Vincent Street
Glasgow G2 5NW
- Tel: 0141 229 7401
Fax: 0141 229 7433
- Email vicki.nash@ofcom.org.uk

Annex 4

Ofcom's consultation principles

A4.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A4.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A4.3 We will be clear about who we are consulting, why, on what questions and for how long.

A4.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A4.5 We will consult for up to 10 weeks depending on the potential impact of our proposals.

A4.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.

A4.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A4.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 5

Consultation response cover sheet

- A5.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.
- A5.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.
- A5.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.
- A5.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.
- A5.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

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

Nothing	<input type="checkbox"/>	Name/contact details/job title	<input type="checkbox"/>
Whole response	<input type="checkbox"/>	Organisation	<input type="checkbox"/>
Part of the response	<input type="checkbox"/>	If there is no separate annex, which parts?	

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

DECLARATION

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

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

Annex 6

Consultation questions

CGC implementation

A6.1 This Annex provides a list of the questions included in this consultation 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?

Annex 7

Impact Assessment

Introduction

- A7.1 The analysis presented in this Annex represents an impact assessment, as defined in section 7 of the Communications Act 2003 (the Act).
- A7.2 You should send any comments on this impact assessment to us by the closing date for this consultation. We will consider all comments before deciding whether to implement our proposals.
- A7.3 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 assessments, see the guidelines, Better policy-making: Ofcom's 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

- A7.4 Radio spectrum is made available to the consumer and citizen for a variety of uses. Ofcom's usual approach is to allow the user which most values the spectrum to maximise the benefits which goes to consumers and to apply a technology and service neutral approach. However, for the 2 GHz bands, the European Union has determined that a specific approach should be followed and has adopted these bands specifically for integrated mobile satellite services and complementary ground component networks.
- A7.5 These integrated MSS services will allow coverage across wide rural areas and in urban, sub-urban areas. The CGC networks will provide improved coverage of the satellite services, particularly to urban areas where high rise buildings may block or shadow the satellite signal. CGC networks will also enable services to be delivered in-building, thus extending the coverage area of these services to consumers in areas not traditionally served by satellite networks. In addition CGC networks, depending on what services they provide, will either provide competition to existing networks or provide increased public security through Public Protection and Disaster Relief services.

Ofcom's policy objective

- A7.6 Ofcom's policy objective for these bands is to bring into operation UK services as soon as possible after the European Union has selected and authorised the associated mobile satellite operators. Ofcom expects the selection and authorisation to be completed by around April 2009.

A7.7 In addition, it is Ofcom's objective to incorporate into the CGC Licence its 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.

Issues relating to the statement

A7.8 In the statement we believe there are only two issues that require an impact assessment:

- Permitting spectrum trading, and
- Service and technology neutrality of the CGC Licence.

A7.9 On the issue of spectrum trading, it is Ofcom's established policy is to facilitate trading of spectrum licences on the basis that this is likely to generate benefits for UK citizens and consumers and we believe that this principle is valid for the case of 2 GHz CGC.

A7.10 We have identified two alternative approaches to trading of CGC licences, namely outright trades and concurrent trades.

A7.11 In the case of the outright trade, all of the rights and obligations associated with the licence would be transferred to the new licence holder and this would be our normal approach. Article 8.1 of Decision No 626/2008/EC requires that administrations grant CGC authorisations to the selected MSS applicants and this is what we propose to do. In addition we are proposing that the MSS operator may trade the CGC licence to another entity wishing to operate the CGC. However, the Decision also requires that we impose conditions on the CGC operator, including the requirement that the MSS satellite must continue in operation. Clearly, such a requirement may be beyond the direct influence of the CGC operator and we therefore believe it would not be appropriate to include such a condition in the CGC licence.

A7.12 A concurrent trade of the licence would require that the original CGC licensee and the new licence holder have joint responsibilities, including those relating to continuity of operation of the MSS satellite component.

A7.13 The only costs imposed on the licence holder would be voluntary as the licence holder can choose not to trade.

A7.14 We therefore conclude that concurrent trading of the CGC licence should deliver the desired benefits of trading of CGC licences while enabling us to comply with our obligations to ensure that the CGC is not authorised to operate if the satellite component does not continue in operation.

A7.15 On the issue of service and technology neutrality, our policy is that in general spectrum awards should be made on a service and technology neutral basis and we believe that this approach should be followed in the case of CGC licences. This will permit the greatest flexibility of use of the spectrum and therefore offer the greatest potential benefits to citizens and consumers.

A7.16 Decision No 626/2008/EC recognises that mobile satellite service systems constitute an innovative alternative platform for various types of pan-European telecommunications and broadcasting services. However, the Decision requires that the CGC must operate in the same direction of transmission as the MSS satellite

i.e. 1980-2010 MHz up link and 2170-2200 MHz downlink. The purpose of this limitation is to minimise the probability of interference between the CGC and the satellite network which could result in significant detriment to citizens and consumers. One impact of this condition is that there are some limitations on the type of technology that might be used. For example, it would not be permissible to operate Time Division Duplex as this would require both the up link and down link to operate in the same band.

Analysis of Issues

A7.17 This consultation focuses on elements associated with the development of the UK draft Licence for CGC. This impact assessment therefore considers areas of the licence where we are making new proposals or where elements affect other services. The issues considered are: -

- Ofcom shall have access to accurate written records details relating to the base stations, central stations or broadcasting stations;
- Ofcom will not be involved in co-ordination between different MSS operators to minimise interference between UK licenced CGC networks or other adjacent terrestrial mobile networks;
- Impact on PMSE use above 2200 MHz due to the proposed CGC transmission rights;
- Ofcom does not intend to develop cross-border agreements concerning CGC network implementations that use the same permitted assigned frequency band;
- Draft harmonised transmitter and receiver standards used to develop band edge masks and consequent constraints on the CGC licence conditions developed from those.

Ofcom requirement for information

A7.18 Ofcom considered whether or not we should request information on deployment of the CGC network, noting that the licence does not include any roll-out obligations.

A7.19 Ofcom, without a formal requirement to provide the requested information, would not be able monitor or meet its spectrum management function or determine whether the CGC deployment is in contravention or breach of the licence conditions.

A7.20 With a requirement to provide such information on request, rather than at defined periods, the burden and cost to industry is reduced, while maintaining the ability for Ofcom to fulfil its regulatory function.

A7.21 Ofcom has therefore reduced the regulatory burden on licensees to the extent that it is able to, whilst maintaining its ability to carry-out its spectrum management functions.

Co-ordination between CGC network operators or adjacent terrestrial mobile operators

A7.22 Ofcom has considered whether or not it should impose a formal network co-ordination process on the CGC licensees for co-ordinations between different CGC

networks or CGC networks and adjacent band terrestrial networks. The alternative option is to allow bilateral agreements between CGC licensees and other affected licensees.

- A7.23 However, we note that mitigation techniques to limit the impact of dead zones require a high level of operator cooperation and this detailed co-ordination will be driven largely by the specific commercial concerns of the CGC and other terrestrial networks. We therefore see no significant benefit of our imposing a formal co-ordination process on CGC licensees. The bilateral approach proposed minimises the regulatory burden on licensees with the costs borne by industry being a necessary outcome of the use made of the frequencies. This approach will also minimise the regulatory burden on Ofcom.

Cross border co-ordination

- A7.24 Ofcom has also considered whether or not it should develop cross border co-ordination agreements for CGC networks in bordering Member States. The alternative is for Ofcom to leave it to the associated MSS operator to manage co-ordination of its CGC networks.
- A7.25 However, given that both of the CGC networks will be integrated into one MSS system and their use of frequencies will be managed by the satellite network management system, any required co-ordination will need to be undertaken by the associated MSS operator.
- A7.26 This proposal therefore minimises the regulatory burden on both the CGC licensee, which will include the MSS operator and Ofcom.

2200 MHz band edge impact

- A7.27 Ofcom has a duty to promote the efficient management and use of the spectrum, under the Wireless Telegraphy Act. It also is required to implement Decision No 626/2008/EC on MSS. Although the EU Decision does not include any provisions relating to technical band edge conditions, the discussions on this Decision were based on the assumption that the full 30 MHz uplink band (1980 – 2010 MHz) would be available for CGC use. Subsequent work on Decision No 626/2008/EC and the EU selection and award process has proceeded on the basis that the full 2x30 MHz is available for award to a number of competing satellite operators.
- A7.28 We therefore propose not to place any specific constraints on the CGC base station spectrum emission masks to take account of PMSE operations above 2200 MHz. This will mean that in the 10 MHz above 2200 MHz PMSE use could be significantly impaired.
- A7.29 To improve compatibility, PMSE users may have to apply interference mitigation techniques such as positioning a PMSE receiver closer to camera and away from sources of interference, or improve the receive antenna (directional antenna, antenna diversity) or the addition of channel filters or an offset in the carrier frequency of the channel adjacent to 2200 MHz, and in any event will need to improve the adjacent channel selectivity of PMSE equipment. In practice it may mean that this 10 MHz is no longer available for PMSE use, in some instances.
- A7.30 However, given the need to implement Decision No 626/2008/EC, we do not believe that we have any option but to proceed as proposed.

Impact of CGC on the adjacency of 2170 MHz

- A7.31 Within the UK, the band below 2170 MHz is licensed to 3G operators. The operator assigned the frequencies immediately below 2170 MHz has been operating under conditions where on one side the radio spectrum above 2170 MHz has essentially been unused. The adjacency situation is base station transmit to adjacent terminal receive.
- A7.32 Ofcom has considered in this consultation that the current 3G specifications with an antenna gain of 17 dB, and the 3GPP mask provides and out of band mask limits of +4 dB/MHz. Ofcom has also considered that the 3G network co-ordination to 3G co-ordination process, using the current 3G licence conditions has worked successfully. Therefore, the impact on existing businesses should be low as the licence conditions below 2170 MHz have the same equivalent out of band mask to CGC if a maximum antenna gain of 17 dB is assumed. Therefore, any limitation in terms of required out of band mask should have been implemented by 3G existing network operators.
- A7.33 A comparison of 3G terminal characteristics to the draft CGC user terminal ETSI standard indicates that CGC user terminals should have better performance against 3G base stations.
- A7.34 Ofcom has therefore concluded that CGC use above 2170 MHz will impose no greater burden on the operator below 2170 MHz than that which is imposed by 3G operation at its lower band edge. No user of spectrum can assume that the use of spectrum in adjacent bands will remain constant and in particular cannot expect that under utilised spectrum, such as the 2 GHz MSS spectrum will remain under utilised. We conclude therefore that whilst the operator above 2170 MHz will experience the burden of additional co-ordination compared to the current situation, this burden is one that other 3G operators already bear and as such is a reasonable burden for the operator to expect to bear.

Annex 8

Spectrum mask approach

Services within the 2 GHz MSS bands

A8.1 In the UK, there are a small number of existing licensed operations in the 2 GHz MSS bands, all of which are under notice to cease operation in the band by June 2009. These services are:

- A troposcatter fixed link in the North of Scotland; and
- Six other fixed links.

Services in bands adjacent to the 2 GHz MSS bands

A8.2 Terrestrial mobile services using UMTS technology and 3GPP standards operate or plan to operate in three of the four bands adjacent to MSS CGC (below 1980 MHz, above 2010MHz and below 2170 MHz).

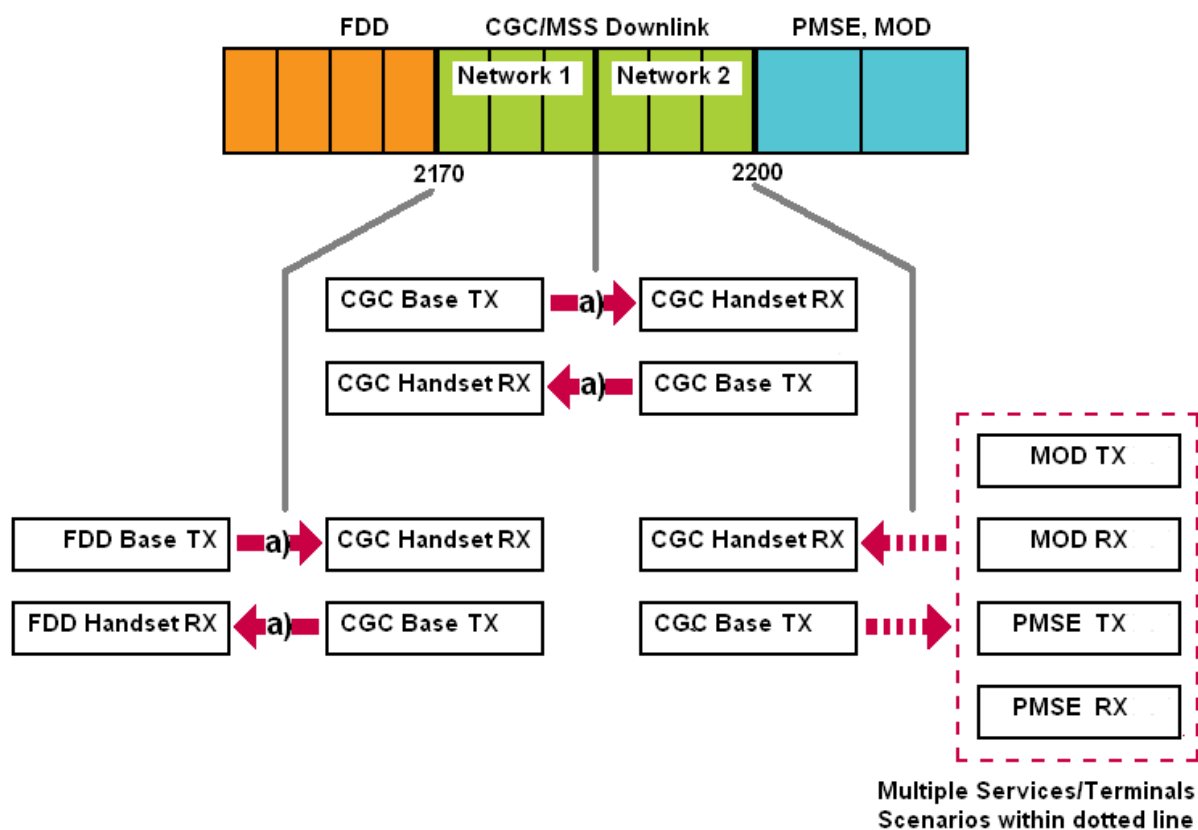
A8.3 The mobile services below 1980 MHz and below 2170 MHz are existing FDD 3G mobile networks.

A8.4 The band 2010-2025 MHz is the subject of an upcoming Ofcom award. We intend as part of the award to permit the band 2010-2025 MHz to be used for both FDD and TDD services. For the purposes of the following interference analysis we have assumed the worst case of TDD services operating in this band.

A8.5 The fourth adjacent band, above 2200 MHz, is primarily managed by the Ministry of Defence and is used for space operations and MoD mobile services. In addition, there are PMSE uses immediately above 2200 MHz, which are managed by a band manager on behalf of Ofcom but which operate on a non-interference, non-protection basis with MoD services.

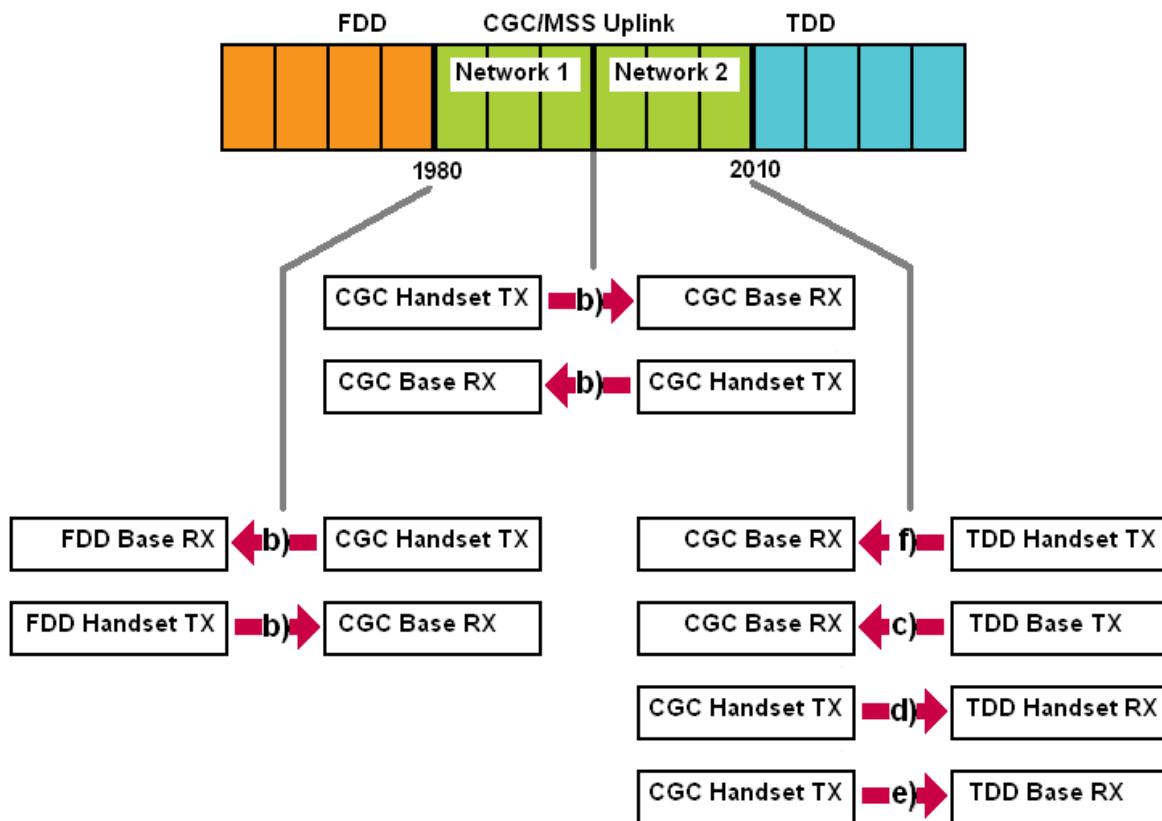
A8.6 The potential inter-system interference scenarios are shown in Figure 2 for the CGC uplink and for the CGC downlink.

Figure 2 Interference Scenarios CGC downlink and adjacent services



A8.7 It should be noted that the channel plan indicated above is only illustrative and will not be known until after the EU selection process.

Figure 3 Interference Scenarios CGC uplink and adjacent services



- A8.8 It should be noted that the channel plan indicated above is only illustrative and will not be known until after the EU selection process.
- A8.9 From these two diagrams we can summarise the inter-system band edge and block edge adjacent channel interference scenarios into six types, excluding the 2200 MHz band edge:
- CGC and FDD base station to CGC and FDD handset interference (Within MSS 2 GHz band and at band edge 2170 MHz);
 - CGC and FDD handset to CGC and FDD base station interference (Within MSS 2 GHz band at band edge 1980 MHz);
 - TDD base station to CGC base station (band edge 2010 MHz);
 - CGC handset to TDD handset interference (band edge 2010 MHz);
 - CGC handset to TDD base station interference (band edge 2010 MHz);
 - TDD handset to CGC base station (band edge 2010 MHz).
- A8.10 The interference scenario at the 2200 MHz band edge involve a variety of services both MoD and PMSE and also include a variety of different terminal types, particularly for PMSE. We consider the 2200 MHz band edge scenarios separately below.
- A8.11 In the recent 2.6 GHz award documentation Ofcom undertook a number of studies that assessed the range of likely interference scenarios between adjacent FDD and TDD services. The FDD networks in this analysis were assumed to meet the 3GPP

spectrum emission masks. We have drawn heavily on this work where appropriate, as the draft ETSI spectrum emission masks for CGC are consistent with those of 3GPP. We assume that the draft CGC standards²⁹, currently under development, are representative of those which will ultimately be employed in CGC networks. Therefore in the following discussion of the interference scenarios we have been reliant on the study work of the 2.6 GHz. We also assume that:

- For the CGC handsets, a maximum transmitted power of 31 dBm/5 MHz; and
- For the CGC base stations a maximum transmitted power of 61 dBm/5 MHz.

A8.12 The above permissible power limits were chosen on the basis that:

- the assumed maximum total radiated power of the CGC handset is consistent within the power classes proposed in the draft ETSI specifications and it also matches that of the terminal stations in the harmonised EC decision for the band 2500-2690 MHz. It is also the power assumed for mobile user terminals in other terrestrial network consultations carried out by Ofcom. It is also consistent with the maximum permissible power level we concluded for the 2.6 GHz award in our Statement, 4th April 2008.
- the figure assumed for the CGC base station matches the maximum power included in the EU Decision in the band 2500- 2690 MHz. In addition, the power matches within 1 dB that of the existing terrestrial 3G networks. It is also consistent with the maximum permissible power level we concluded for the 2.6 GHz award in our Statement, 4th April 2008. Ofcom assumed in that document a maximum antenna gain of 17 dBi for the base station for the compatibility assessment. We note that the draft ETSI specifications for CGC base stations²⁹ do not have any upper limit on the transmitter power, other than at transmit powers of greater than +43 dBm, the required out of band filter requirements will increase as a result of the absolute out of band emission limits. The value of +61 dBm/5MHz is assumed to provide sufficient flexibility for CGC network operation, whilst minimising the risk of receiver blocking to adjacent band operations.

A8.13 The maximum permissible power level for CGC base stations are reflected in the Technical Licence conditions of the draft alternative Licence given as Annex 14. The maximum permissible power level for the CGC handsets will be included in the licence exemption for these terminals on which we will consult later in the year.

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?

A8.14 Each of the interference scenarios identified above and any implications for the CGC Licence conditions are discussed in the following sections.

²⁹ http://webapp.etsi.org/WorkProgram/Report_WorkItem.asp?WKI_ID=24294

Interference Scenarios at 2170 MHz and 1980 MHz boundaries

A8.15 The scenarios considered here are:

- CGC and FDD base station to CGC and FDD handset interference (Within MSS 2 GHz band and at band edge 2170 MHz); and
- CGC and FDD handset to CGC and FDD base station interference (Within MSS 2 GHz band at band edge 1980 MHz).

A8.16 These interference scenarios are directly analogous to the situation which occurs between separate adjacent FDD cellular systems, where the transmissions of adjacent systems are in the same direction (for example existing 3G networks) and similar types of intra-system interference occurs at the channel boundaries within any type of cellular networks.

A8.17 A worst case analysis for base stations (both CGC and 3G) operating at maximum power would show a need for additional margin with the other network mobile terminals in both transmit and receive directions, where so called dead zones would occur. These dead zones are characterised by coverage areas where strong adjacent channel interference maybe received and which can result in an increased probability of call blocking and call dropping.

A8.18 A research report commissioned by Ofcom and conducted by MAC³⁰, Multiple Access Communications Limited, considered the impact of dead zones and network co-ordination for 3G networks and concluded:

- For downlink transmissions the mobile handsets that are in the vicinity of another network's base stations may experience sufficient adjacent channel interference from these base station transmissions that the mobiles are prevented from communicating to their serving base stations;
- For uplink transmission, the situation is more complex. In this case mobile handsets in one 3G network may generate sufficient adjacent channel interference at the base station receivers in another 3G network that the noise floor of these base station receivers increases, resulting in the mobiles in the boundary areas of their cells suffering an increase in the call blocking and dropping probabilities;
- Mitigation techniques to limit the impact of dead zones require a high level of operator cooperation and we anticipate the same will be true of CGC to 3G co-ordination.

A8.19 Therefore dead zones are inevitable in the implementation of FDD terrestrial mobile networks and the only effective method of minimising the interference effects between CGC networks and the adjacent 3G network will be a high degree of operator cooperation, in a similar way to that which is undertaken at present between the 3G operators. We do not propose to include any additional technical constraints in the CGC licence conditions as result of these interference scenarios.

A8.20 We therefore propose that co-ordination of CGC networks with other adjacent terrestrial mobile networks, including other CGC networks should be carried out through informal cooperation between the network operators.

³⁰ <http://www.macltd.com/publications.php>, January 2004

Interference Scenario at 2010 MHz boundary for TDD base station to CGC base station

- A8.21 For interference scenario c) there is the potential for TDD licences to be awarded in the band 2010-2025 MHz adjacent to CGC. Therefore there is the potential for TDD base station transmissions to be directly adjacent to CGC base station receivers.
- A8.22 Ofcom in its earlier Statement³¹ for the 2.6 GHz award noted that work within CEPT on least restrictive technical conditions for WAPECS implementation has resulted in the development of CEPT Report 19. Whilst covering use of the band 2010 – 2025 MHz, Report 19 does not consider the implications of CGC use in the bands below 2010 MHz. However, the conclusions drawn from the analysis of FDD/TDD adjacencies in the 2.6 GHz band appear to us to be directly comparable since a CGC base station operating immediately below 2010 MHz would be very similar to a base station operating in the FDD uplink portion of the 2.6 GHz band. On the basis of this analogy, it is reasonable to deduce that there will be a need for a 5 MHz restricted block between any CGC use below 2010 MHz and base station transmissions above 2010 MHz.
- A8.23 It would be possible technically to accommodate the need for a restricted block between full power use of base stations in the 2010 MHz band and CGC base stations below the 2010 MHz boundary in a number of ways. The impact of the restriction could fall entirely on the 2010-2015 MHz band, entirely on the use of CGC below 2010 MHz or some combination of these. However, the EC Decision requires that all of the 1980 – 2010 MHz band must be made available for use by CGC. Accordingly, we concluded in our Statement that any restriction must fall on the 2010-2025 MHz band. As such, Base station downlink transmissions within the 2010 – 2025 MHz band are required to comply with maximum unwanted emissions limits within the 1980 – 2010 MHz band. The technical licence conditions set out in our Statement reflect this requirement.
- A8.24 CGC operators may need to take account of services operating above 2010 MHz and they might need to co-ordinate with operators of these services.

Interference Scenario at 2010 MHz boundary for CGC handset to TDD handset

- A8.25 A potential interference scenario between CGC and TDD handsets operating near to the 2010 MHz boundary exists. A TDD handset above 2010 MHz might be operating at the edge of coverage of its cell, while nearby a CGC handset below 2010 MHz might be transmitting and causing blocking effects to reception of the TDD signals. The CGC handset will operate in a FDD mode.
- A8.26 A similar scenario of adjacent FDD and TDD handsets was studied for the 2.6 GHz awards. On that issue we concluded in our Statement³² that there is little risk of 1st adjacent-block interference from TDD terminal stations towards FDD terminal stations when the former are served by pico-cellular base stations and that, the impact of terminal-to-terminal interference from the 2nd adjacent-block or beyond (i.e., greater frequency offsets) is shown to be insignificant, even when the TDD terminal stations are served by macro-cellular base stations. The situation for CGC towards TDD is analogous and we consider that broadly similar results will apply. Therefore, we do not consider there is a need to provide any additional regulatory or other coordination provisions against CGC handsets.

³¹ <http://www.ofcom.org.uk/consult/condocs/2ghzrules/statementim/statement/statement.pdf>

³² <http://www.ofcom.org.uk/consult/condocs/2ghzregsnotice/tech.pdf>

A8.27 Ofcom notes that the handsets have limited capability for additional filtering

Interference Scenarios at 2010 MHz boundary for CGC handset to TDD base station

A8.28 TDD base station receivers operating above 2010 MHz will be adjacent to CGC handsets operating below 2010 MHz. This scenario is analogous to CGC handsets operating on adjacent frequencies to FDD base stations within the band 1920 - 1980 MHz.

A8.29 For the band 2010-2025 MHz Ofcom decided there is no need to provide any additional regulatory provisions for TDD handsets and therefore Ofcom do not consider there is a need to provide any regulatory or co-ordination provisions against CGC handsets for this scenario.

Interference Scenarios at 2010 MHz boundary for TDD handset to CGC base station

A8.30 CGC base station receivers below 2010 MHz are adjacent to TDD mobiles operating above 2010 MHz. This scenario is the same as CGC handset adjacent channel interference into CGC base stations in the band 1980 - 2010 MHz, which is part of a CGC network operator's implementation decisions. This scenario is directly analogous to the potential of CGC handset interference to TDD base station receivers operating within 2010 – 2025 MHz. It is also analogous to unsynchronised TDD handsets operating on adjacent frequencies to TDD base stations within the band 2010-2025 MHz, though as the 2010-2025 MHz award is linked to one assignee, this latter situation is unlikely to occur.

A8.31 Due to the low risk of interference, Ofcom has concluded there is no need to provide any additional regulatory provisions for TDD handsets. Therefore, Ofcom does not consider that there is a need to provide any further regulatory or co-ordination provisions on TDD mobiles against CGC base station receivers.

Interference Scenarios above 2200 MHz

A8.32 At 2200 MHz, CGC base station transmitters are adjacent to Ministry of Defence space operations and mobile services and PMSE services.

Compatibility with PMSE operations

A8.33 Various types and configuration of PMSE radio equipment links operate above 2200 MHz within bands managed by MoD. The PMSE services operate within the band through frequency assignments co-ordinated by the PMSE frequency manager, currently JFMG Ltd. JFMG is contracted on behalf of Ofcom to provide PMSE WT Act licenses. PMSE services work on non-interference and no protection basis to MoD operations and in some instances are excluded from certain geographic areas or are required in other areas to co-ordinate with MoD for spectrum access. This co-ordination is done through JFMG.

A8.34 Ofcom has been particularly mindful of the impact of CGC base stations on PMSE users in the adjacent spectrum at 2200 MHz. This spectrum is currently used by wireless camera users for electronic news gathering, events and sports purposes. Ofcom is aware of the importance that these users attach to their continuing use of this spectrum and acknowledge that the PMSE sector as a whole provide services which contribute towards the cultural and social well-being of the UK.

- A8.35 The circumstances of the CGC developments are unlike those of the 2.6 GHz award where we took measures to protect PMSE use in adjacent channels by restricting out of band emissions. In the case of CGC, Ofcom considers that this option is not open to it because it has an obligation to implement Decision No 626/2008/EC as proposed. Full flexibility of implementation of CGC transmitter base stations is a necessary condition of meeting the EU Decision No 626/2008/EC conditions. As a result of this, Ofcom's analysis indicates regrettably that there is likely to be interference into wireless cameras in the channel between 2200-2210 MHz.
- A8.36 The proposed CGC base station transmitter masks and maximum in-band radiated powers are included within the draft licence attached to this document. PMSE operators may therefore need to take account of services operating below 2200 MHz.

Compatibility with MoD services

- A8.37 MoD operates both Space Operations and mobile services in the band above 2200 MHz. In order to protect the space operations services it will be necessary to include in the CGC licence conditions a requirement for:
- Exclusion zones of 8 km around three sites:
 - Oakhanger (SU 776 357),
 - Colerne (ST 808 717) and
 - Menwith Hill (SE 209 561).
- A8.38 For their mobile services MoD has informed us that they use 2200-2245 MHz for transportable terrestrial radio relay throughout the UK.

Annex 9

Assumptions and inputs used to model the SUR

Introduction

- A9.1 The modelling described in Annex 10 is based on the use of Transfinite Visualyse professional tool and is underpinned by the chosen system parameters for CGC use as well as the deployment assumptions and the propagation model used.
- A9.2 In this Annex, the information used in the modelling by Visualyse for CGC FDD DL, 3G FDD DL and PMSE use is specified.

FDD DL

- A9.3 The parameters used to derive the CGC FDD DL PFD mask are given in Table 6.

Table 6: WCDMA FDD DL parameters

Field	Value	Comments
Frequency	2.2 GHz	Consistent with proposed channel plan
Bandwidth	5 MHz	WCDMA channel
Base station maximum power	38 dBm	Typical transmit power for Pedestrian Micro FDD scenario from ECC Report 45.
Base station typical power	35 dBm	Typical transmit power for Pedestrian Micro FDD scenario from ECC Report 45. Includes 3 dB power control factor.
Adjacent channel leakage power ratio (ACLR)	45 dB and 50 dB at a 5 MHz and 10 MHz offset from carrier frequency respectively	From 3GPP TS 25.104. and Draft CGC specification given in ETSI 302 574-1
Base station peak gain	5 dBi	From ECC Report 45. Hence EIRP = 40 dBm
Base station height	10 m	Standard height
Cell shape	Hexagon	
Cell radius	0.315 km	Based upon ERC Report 45

- A9.4 Modelling area and parameters for CGC FDD DL are given by:

- Modelling area: 1 hexagonal cell;

- Number of test points in modelling area used to assess the aggregate PFD: 350 (These were uniformly deployed across the hexagonal central cell).

A9.5 We used ITU propagation model ITU-R Recommendation P.1546-3 for our calculation of SUR parameters. The choice of propagation model, whilst an important element in SUR development, is most critical in any subsequent modelling of compliance with the SUR parameters. Annex 11 provides our proposals for the specific details of the definition of the appropriate test area, test points and the propagation model options to be included for the ITU-R propagation model P.1546-3.

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

Annex 10

SUR modelling approach

Introduction

- A10.1 This section details the approach used by Ofcom to derive the SUR parameters.
- A10.2 The Transfinite Visualyse Professional tool was used to generate the expected in-band PFD for the various services of interest.
- A10.3 Visualyse is a tool that can model radio communication systems (terrestrial and satellite) across a frequency range of 100 MHz to 100 GHz. Hence it is well suited to model the services that are of relevance to this spectrum award.

Modelling methodology

- A10.4 The methodology used to generate the SUR PFD parameters for the licence was underpinned by the chosen system parameters, the deployment assumptions and the propagation model. These are provided in Annex 9.

Selection of parameters

- A10.5 The accuracy of simulation techniques depends upon the selection of input parameters. In order to calculate PFD levels in computer models, it is necessary to have all relevant parameters well defined. The assumptions made can have a significant impact on the results and care is needed in their selection. A number of principles were applied as shown below:
- Parameters and modelling methods should be based upon documents that are in the public domain;
 - These documents should have been subject to a process such as peer review that gives confidence in their use;
 - Selection of parameters and modelling methodology should take account of how the PFD masks would be used – in particular as a regulatory tool for compliance.
- A10.6 A number of alternative scenarios can be defined depending upon whether the modelled network is in urban, suburban or rural areas.
- A10.7 It is generally accepted that field strengths in high density urban areas are higher than for rural areas and that rural cells are coverage limited whereas urban areas are noise limited due to the aggregation of large numbers of users. Hence a PFD mask that is defined for urban areas is expected in general to be higher than the equivalent for rural areas.
- A10.8 Therefore it was assumed that if the regulatory regime defines a single mask it can be derived for high density urban areas and applied to all conditions.
- A10.9 The parameters selected for the high density urban scenario are described in detail in Annex 9. Some simplifying assumptions were made – for example use of isotropic gain patterns rather than detailed shaped ones. However test runs comparing the results with isotropic vs. another gain pattern (based upon ITU-R

Recommendation F.1336) showed only minor differences in the resulting PFD mask.

A10.10 The simulations took into account variations due to power control by taking the typical EIRP rather than maximum EIRP: however both numbers are given in the parameter tables in Annex 9 and there should be a linear impact on the resulting PFD mask.

Deployment assumptions

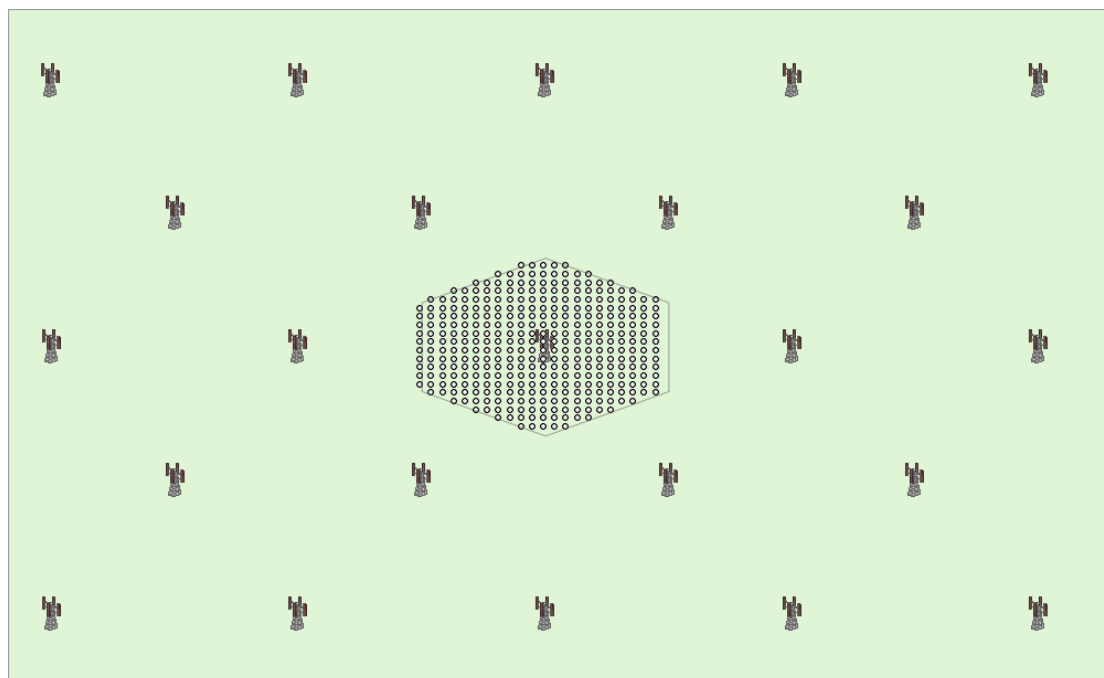
A10.11 In order to calculate PFD levels it is necessary to know the locations of transmitters and receivers and predict how the radio waves propagate from one to the other. In general there are two possible approaches that could be used:

- Model a specific location in depth – for example taking into account the impact of terrain and buildings;
- Model a generic location using a statistical approach – for example one that averages the results from many specific locations.

A10.12 There would be a danger in taking the first approach in that the results might be atypical due to unusual characteristics of the site selected. Hence the second approach was chosen, though attention was made to assessing the variations that could be expected for particular locations.

A10.13 Hence it was considered appropriate to use a geometric “ideal” deployment of base stations in a hexagonal cellular structure as in Figure 4 below.

Figure 4: Location of base stations and users in test deployment



A10.14 The propagation model used was Recommendation ITU-R Rec. P.1546-3 using the options specified in Annex 11, except for path profile extraction and terrain clearance angle correction. These elements were not appropriate during the SUR parameter development because these would be related to a specific location.

- A10.15 The PFD measure is defined as an aggregate from all possible transmitters – in theory this could require the inclusion of all co-frequency transmitters nationwide. As this is computationally infeasible it is typically necessary to limit simulations to a manageable set. The modelled area required that at least ten transmitters be present – in the above figure there are 23 base stations.
- A10.16 Furthermore it is noted that receivers at the centre are likely to experience a greater degree of power aggregation than those at the outskirts – the so-called “edge effect”. In order to remove this bias the test points in the modelled area assumed for measurement of the PFD were across the central cell, shown in the hexagon in Figure 4 with the test points arranged in a grid.

Modelling outputs

- A10.17 Note that two pairs of PFD masks were generated for both the in-band and out-of-band cases. One pair of masks was generated assuming measurements are to be made at 1.5 m above local terrain and another pair for a height of 10m. Hence each scenario involved four PFD masks in total.
- A10.18 All PFD masks were calculated assuming a reference bandwidth of 1 MHz and uniform WCDMA spectral density across the 5 MHz.

Annex 11

SUR Compliance

Introduction

A11.1 In our 15th May 2008 statement we describe generic approaches to SUR compliance verification; the particular parameters presented here are those applicable to this specific SUR licence verification.

Terrain data

A11.2 We propose to use Ordnance Survey “Panorama DTM” 50 m resolution digital terrain map data.

Clutter data

A11.3 We propose to use the 50 m resolution clutter database produced by Infoterra.

A11.4 This database identifies 10 different clutter categories. For the purposes of incorporation into ITU-R Rec. P.1546-3 these categories are mapped to the categories noted in ITU-R Rec. P.1546-3, namely: urban, dense urban, suburban, sea, open. The mapping that will be used is shown in Table A1.

SUR test area and test point definition

A11.5 This section outlines the options to be used when measuring compliance against the SUR parameters and the definitions applicable to the test points and test area.

Test area and test points

A11.6 It should be noted that the test points used for compliance are not the same as those Ofcom used in deriving the SUR PFD parameters. The compliance test points are location specific.

A11.7 In line with the proposals made by Ofcom in its statement³³ on Spectrum Usage Rights, we propose that the following definitions will apply when confirming compliance with the CGC SUR :

- **Test area.** The test area is a square area including at least ten transmitters. Its location is defined by the (4-figure) National Grid Reference of the bottom left corner. The appropriate test area is the smallest of the following areas, 1 km², 4 km², 25 km², 100 km², 400 km², 2500 km² or 10000 km², which includes at least ten transmitters. All test points that occur above a water feature (e.g. sea, lake or river) will be ignored. PFD levels at these points will not contribute to establishing compliance;
- **Pixel Size.** The test area defined will be divided into square pixels of size 50 m by 50 m. Each pixel is a test point;
- **Summation of signals from transmitters.** The aggregate field strength at a pixel will be defined to be the summation of the predicted field strengths for each

³³ <http://www.ofcom.org.uk/consult/condocs/surfurtherinfo/statement/statement.pdf>

outdoor transmitter (expressed in linear units) on an r.m.s. basis (linear addition of power density);

- **Excluded pixels.** Aggregate field strength will not be calculated for pixels which contain a transmitter. Pixels containing a transmitter will not be considered in determining compliance. Pixels which are of ITU-R Rec. P.1546-3 clutter type 'Sea' will not be considered in determining compliance;
- **The term "adjacent to sea"** as described in ITU-R Rec. P.1546-3, Annex 5, Section 9 is interpreted as "located over the sea". These pixels will therefore not be considered in determining compliance.

A11.8 Propagation model options

A11.9 To confirm compliance, the propagation model used shall be ITU- R Rec. P.1546-3. The options used in ITU- R Rec. P.1546-3 shall be as follows:

- **P.1546-3 location variability.** Field strengths will be predicted for a 50% location variability;
- **P.1546-3 time variability.** Field strengths will be predicted for a 50% time Variability;
- **P.1546-3 field-strength predictions for distances less than 1 km.** For path lengths of less than 1 km, the method described in P.1546-3, Annex 5, Section 14 will be used;
- **P.1546-3 correction for receiving/mobile antenna height.** Equation 27a of P.1546-3 shall be used to determine the correction for receiving/mobile antenna height. Assuming a local clutter height of 10metres;
- **P.1546-3 Correction for short urban/suburban paths.** (P.1546-3, Annex 5, Section 10,). No correction for short urban/suburban paths will be applied
- **P.1546-3 Land paths shorter than 15 km.** For paths less than 15 km in length, as described in P.1546-3, Appendix 5, Section 3.1, equation 6 of P.1546-3, Annex 5 will be used to determine h_1 in all cases. In using this equation the actual value of path length d will be used, including cases when d is less than 1 km;
- **Transmit antenna gain.** The transmit EIRP assumed will be that in the direction of the reference receiver at the clutter height;
- **Terrain Clearance Angle.** Terrain Clearance Angle correction as described in P.1546-3, Annex 5, Section 11 will be used;
- **Path profile extraction.** Both terrain height and clutter height will be assumed to be constant over the area of a pixel. No interpolation of heights will be undertaken. The path profile will be extracted using the Bresenham algorithm. Ofcom will publish an example of modelling compliance for a reference network against which licence holders can verify their own compliance modelling software.

Annex 12

PMSE Out of Band PFD derivation

Parameters assumed in modelling

A12.1 Wireless cameras are assumed to be the major PMSE usage scenario in the band 2200 MHz adjacent to the CGC downlink band. The in-band and out-of-band PFD obtained for PMSE is based on this assumption.

A12.2 The assumed system parameters for wireless cameras are listed in Table 7.

Table 7: Wireless camera system parameters

Field	Value	Comments
Bandwidth	8 MHz	DVB-T standard channel width
Centre frequency	2205 MHz	
EIRP	0 dBW	Note that ERC Report 38 suggested an EIRP of 6 dBW: however this was for analogue systems with a bandwidth of 20 MHz.
Antenna pattern	Isotropic	From ERC Report 38
Antenna height	2 m	Assumed value ERC Report 38 suggested the antenna is typically higher than average mobile height in order to improve probability of a line of sight path to the receiver.
Separation distance	10 km	Assumed value consistent with link budget analysis below

A12.3 A worst case interference link budget is given in Table 8.

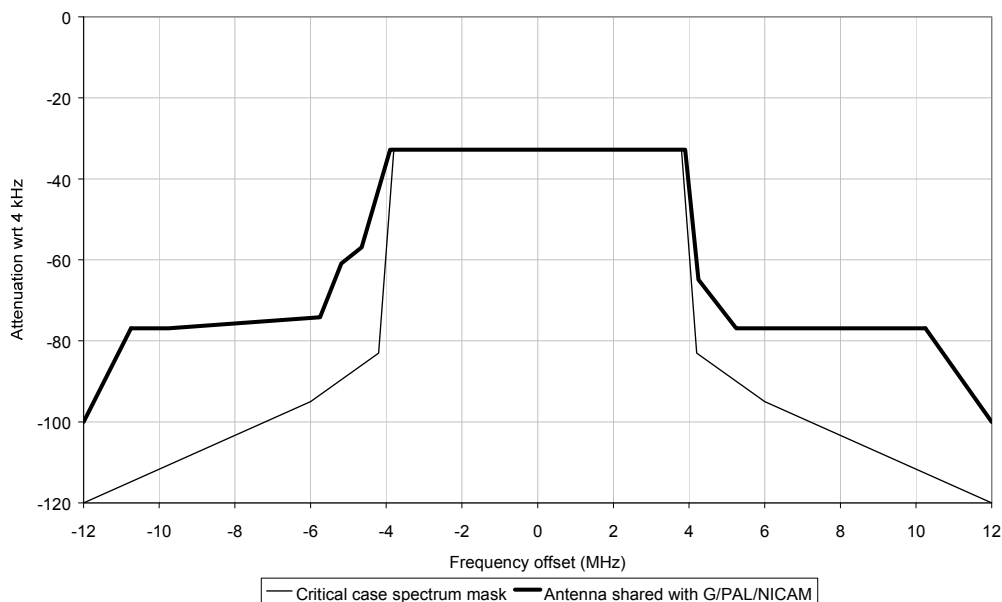
Table 8: Example of interfering signal link budget

Frequency (MHz)	2,200.0
Bandwidth (MHz)	8.0
EIRP (dBW)	0.0
Path distance (km)	10.0
Free space path loss (dB)	119.4
Smooth earth diffraction loss (dB)	19.2
RX peak gain (dBi)	6.0
RX relative gain (dB)	0.0
RX Noise temp (K)	1,585.0
RX signal (dBW)	-132.6
RX noise (dBW)	-127.6
I/N (dB)	-5.0

A12.4 10 km was considered as a suitable separation distance to use in simulations, as it can be seen that there is a worst case I/N = -5 dB at this distance even assuming direct alignment and no other losses such as clutter..

A12.5 A number of OOB masks are defined in ETSI EN 300 744, (baseline parameters for digital video broadcasting), in particular there is the case of a transmitter co-sited with analogue TV channels and another for critical cases where adjacent to other services (low power or receiver only). Figure 5 below shows an example of the former together with the latter.

Figure 5: DVB-T masks from ETSI EN 300 744.



A12.6 The out-of-band PFD of PMSE towards a 5 MHz CGC, could be taken from the above shared antenna mask of ETSI EN300 574. We have however assumed that the worst case adjacent channel PMSE ACLR value is -36 dB taken from ETSI EN 302 064-1, for wireless video links.

A12.7 A relative attenuation with respect to the in-band power is calculated for the 5 MHz CGC channel. The out-of-band PFD is obtained from the in-band and the relative ACLR attenuation.

PMSE modelling approach

A12.8 The measurement area and parameters for PMSE SUR OOB PFD evaluation are :-

- The scenario was modelled assuming a grid of wireless cameras transmitting co-frequency every 10 km over the measurement area. With at least 10 wireless camera transmitters;
- 380 measurement points uniformly distributed across a square cell of 10km by 10 km located at the centre of the grid of wireless cameras and containing one camera.

A12.9 The selected propagation model used for PMSE OOB PFD modelling was ITU-R Rec. P.452-12 using smooth Earth diffraction i.e. no terrain. With the PMSE camera at 2 metres height and the CGC receivers at 1.5 metres, this model was selected as it is valid for the frequency bands and path lengths under consideration and is able to handle the low height paths involved.

A12.10 ITU-R Rec. P.1546-3 is not suitable in this case because it is not valid in situations where the transmitting antenna is below the height of local clutter. ITU-R Rec. P.452 allowed Ofcom to estimate the PMSE OOB PFD towards CGC.

PMSE OOB PFD estimates

A12.11 For PMSE we have assumed that mobile wireless camera links are the major PMSE use.

A12.12 The in-band and out-of-band PFD towards CGC mobile terminals has been calculated at 1.5 m, while the wireless cameras (PMSE equipment) have been assumed to operate at a height of 2 m. For simplicity, it is assumed that the OOB PFD from PMSE equipment at 2 m is the same as the OOB PFD at 1.5 m.

Standard PMSE channel

A12.13 We note that for the low height paths considered here and 10 km grid separation distance that there is likely to be only one wireless camera at the centre of the grid of measurement points.

A12.14 A standard PMSE channel is defined as one whose in-band and out-of-band PFD are obtained as described above the results are shown in Table 9. A standard PMSE channel provides a level of interference protection to adjacent channels based on the spectrum mask described above.

Table 9: In-band and out-of-band PFD for a standard PMSE channel (*): It is assumed that the PFD at 2 m is the same as the PFD measured at 1.5 m.

Scenario	Offset from 2200 MHz edge	PFD at 1.5 m (*) [dBW/m²/ MHz]	PFD at 10 m [dBW/m²/ MHz]
In-band PFD	NA	-86 (95% locations)	-81(95% locations)
Out-of-band PFD	0 to ± 5.0	- 126.7(95% locations)	-117 (95% locations)

Annex 13

Draft Licence (SUR)

A13.1 The following draft licence provides our proposals for a CGC licence based on the SUR option to control interference between licensees.

Wireless telegraphy Act 2006

Office of Communications (Ofcom)

SPECTRUM ACCESS LICENCE XXXX MHz - XXXXMHz

Licence no. **xxxxxx**

Date of issue: **xx xxxxx 2009**

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

Company Name
Company Reg No: xxxxxx
("the Licensee")
Address
xxxxxx
xxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxx
xxxxxxxx
xxxxxxxx

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

Licence Term

2. This Licence shall continue in force until [Date: This date will be 18 years from the date of EU selection and authorisation 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 Act³⁴;
 - (e) If UK [satellite licence number: xxx] is no longer in force;

³⁴ These are regulations on spectrum trading.

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

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 Act³⁵.
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 [£xxxxxxxx] 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).

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 Schedules 1 and 2 of this Licence. Any proposal to amend any detail specified in Schedules 1 and 2 of this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.

³⁵ <http://www.ofcom.org.uk/radiocomms/ifi/trading/>

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 the space station or stations required to provide the mobile satellite service as well as any gateway earth stations required for the delivery of services provided over the mobile satellite system;
 - (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 schedules to this Licence form part of this Licence together with any subsequent schedules 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 1 TO LICENCE NUMBER: xxxxxx

Schedule Date: **xx xxxxx 2009**

Licence Category: **SPECTRUM ACCESS [XXXX MHz – 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 the mobile satellite system and shall be controlled by that satellite's 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 xxxxxxxxxxxx"

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;
- (ii)

- 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;
 - (iii) the frequencies used by the Radio Equipment.
 - d) The Licensee must also submit to Ofcom in such manner and at such times, all information relating to the establishment, installation or use of the Radio Equipment, whether stored in hard copy or electronic form, as reasonably requested for the purposes of verifying compliance with this Licence, for statistical purposes and more generally for the purpose of ensuring that Ofcom can perform its spectrum management functions.
 - e) The Licensee must submit to Ofcom an annual compliance report indicating that the use of Radio Equipment is in accordance with the following conditions of its licence:
 - (i) the Radio Equipment 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 satellite components;
 - (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 permissible out-of-block aggregate PFD limits 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 a subset of, given by the Decision No 626/2008/EC 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/EC process in 1980-2010 MHz band]* – Base Receive “the uplink”.

8. Maximum permissible aggregate in-band PFD Limits

The maximum permissible aggregate PFD inside the Permitted Frequencies specified in Paragraph 7 (i) shall not exceed:

Scenario	Offset from relevant channel edge [MHz]	PFD at 1.5 m [dBW/m ² / MHz]	PFD at 10 m [dBW/m ² / MHz]
In-band PFD	NA	-67.6	-45.0

In-band aggregate PFD limits for CGC DL channels (Δ_F is the frequency offset from the relevant channel edge) for 95% of locations in a test area

9. Maximum permissible aggregate out-of-band PFD Limits

The maximum permissible aggregate PFD outside the Permitted Frequencies specified in Paragraph 7 (i) shall not exceed:

Scenario	Offset from relevant channel edge [MHz]	PFD at 1.5 m [dBW/m ² / MHz]	PFD at 10 m [dBW/m ² / MHz]
Out-of-band PFD	$-5.0 < \Delta_F \leq -0.0$ (lower edge)	-112.6	-90.0
	$+5.0 > \Delta_F \geq +0.0$ (upper edge)		
Out-of-band PFD	$-10.0 < \Delta_F \leq -5.0$ (lower edge)	-117.6	-95.0
	$+10.0 > \Delta_F \geq +5.0$ (upper edge)		

Out-of-band aggregate PFD limits for CGC DL channels (Δ_F is the frequency offset from the relevant channel edge) for 95% of locations in a test area

10. Compliance with aggregate PFD limits

For the purposes of establishing compliance with the PFD conditions set out in Paragraph 9 a methodology based on radio-frequency propagation modelling shall be used. This methodology is set out in Schedule 2 of this licence.

11. Definition of test area

The test area is a square including at least ten transmitters. Its location is defined by the (4-figure) National Grid Reference of the bottom left corner. The appropriate test area is the smallest of the following areas, 1 km², 4 km², 25 km², 100 km², 400 km², 2500 km² or 10000 km² which includes at least ten transmitters.

All test points that occur above a water feature (e.g. sea, lake or river) will be ignored. PFD levels at these points will not contribute to establishing compliance.

12. Interpretation of terms in this Schedule

In this Schedule:

- (a) "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;
- (b) "uplink" refers to transmissions from Mobile Earth stations or User stations to a base station or space station;
- (c) "downlink" refers to transmissions from a base station or space station to a Mobile Earth Station or User station;
- (d) "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;
- (e) "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;
- (f) "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;
- (g) "mobile earth station" means any station that, in relation to an electronic communications network, provides services directly to the user;

- (h) “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;
- (i) “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”;
- (j) “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.
- (k) “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;
- (l) “PFD” means power-flux density and is a measure of the power received per unit area, per frequency. For the purposes of this licence it is expressed in the following units dBW/m²/MHz;
- (m) “aggregate PFD” means the combined PFD caused by all transmitters authorised by this licence within the test area defined in Schedule 1;
- (n) “a satellite resource and network management mechanism” means a facility which assigns frequencies to terminals within the mobile satellite system.

SCHEDULE 2 TO LICENCE NUMBER: **XXXXXX**

Schedule Date: xx xx xx

Licence Category: **Spectrum Access Licence [XXXX – XXXX MHz]**

1. Radio-frequency propagation model

For the purpose of radio-frequency propagation modelling ITU-R Rec. P.1546-3 (P.1546) shall be used.

2. Terrain data

Ordnance Survey “Panorama DTM” 50 m resolution digital terrain map data shall be used.

3. Clutter data

The 50 m resolution clutter database produced by Infoterra shall be used.

This database identifies 10 different clutter categories. For the purposes of incorporation into P.1546 these categories are mapped to the categories noted in P.1546, namely: urban, dense urban, suburban, sea, open. The mapping that will be used is shown in Table A1.

Code	Clutter Database Category	P.1546 category	Reference Antenna Height (m)
1	Dense urban	Dense Urban	30
2	Urban	Urban	20
3	Industrial	Suburban	10
4	Suburban	Suburban	10
5	Village	Suburban	10
6	Parks/recreation	Open	10
7	Open	Open	10
8	Open in urban	Urban	20
9	Forest	Open	10
10	Water	Sea	10

Table A1. Mapping of clutter categories

4. Calculation methodology

To verify compliance, field strength values will be calculated using any suitable radio-frequency software planning tool implementing the radio-frequency propagation model and terrain and clutter data sets described in Paragraphs 1, 2 and 3.

Compliance to the licence terms is established if the aggregate field strength values predicted by the radio-frequency software planning tool are no greater than those given in Schedule(s), Paragraphs 9 and 10 for the specified percentage of locations (pixels) within the test area.

Detailed specification of the methodology is given below:

- a) **Pixel Size.** The test area defined in Schedule(s), Paragraph 12 will be divided into square pixels of size 50 m by 50 m;
- b) **Summation of signals from transmitters.** The aggregate field strength at a pixel will be defined to be the summation of the predicted field strengths for each outdoor transmitter (expressed in linear units) on an r.m.s. basis (linear addition of power density);
- c) **Excluded pixels.** Aggregate field strength will not be calculated for pixels which contain a transmitter. Pixels containing a transmitter will not be considered in determining compliance. Pixels which are of P.1546 clutter type 'Sea' will not be considered in determining compliance;

The term "adjacent to sea" as described in P.1546, Annex 5, Section 9 is interpreted as "located over the sea". These pixels will therefore not be considered in determining compliance;

- d) **Path profile extraction.** Both terrain height and clutter height will be assumed to be constant over the area of a pixel. No interpolation of heights will be undertaken. The path profile will be extracted using the Bresenham algorithm. Ofcom will publish an example of modelling compliance for a reference network against which licence holders can verify their own compliance modelling software;
- e) **P.1546 location variability.** Field strengths will be predicted for a 50% location variability;
- f) **P.1546 time variability.** Field strengths will be predicted for a 50% time variability;
- g) **P.1546 field-strength predictions for distances less than 1 km.** For path lengths of less than 1 km, the method described in P.1546, Annex 5, Section 14 will be used;
- h) **Receiving/mobile antenna height.** Field strengths will be calculated at the height specified in Schedule 1 Paragraphs 8 and 9;
- i) **P.1546 correction for receiving/mobile antenna height.** For pixels which are classified as P.1546 categories "dense urban", "urban" or "suburban environment", equation 27a of P.1546 shall be used to determine the correction for receiving/mobile antenna height. For pixels which are classified as P.1546 categories "open" or "sea", equation 27b shall be used to determine the correction for receiving/mobile height;
- j) **Terrain Clearance Angle.** Terrain Clearance Angle correction as described in P.1546, Annex 5, Section 11 will be used;

- k) **P.1546 Correction for short urban/suburban paths.** (P.1546, Annex 5, Section 10,). No correction for short urban/suburban paths will be applied;
- l) **P.1546 Land paths shorter than 15 km.** For paths less than 15 km in length, as described in P.1546, Appendix 5, Section 3.1, equation 6 of P.1546, Annex 5 will be used to determine $h1$ in all cases. In using this equation the actual value of path length d will be used, including cases when d is less than 1 km;
- m) **Transmit antenna gain.** The transmit e.i.r.p. assumed will be that in the direction of the reference receiver at the clutter height.

5. **Operational details of transmitting stations**

The operational details of all transmitting stations within the area for which compliance is to be established will be entered into the radio-frequency software planning tool, excluding indoor transmitting stations with an e.i.r.p. not greater than 2 Watts per 1.7 MHz. These details may include:

- (a) the National Grid Reference to ten (10) metres resolution of each transmitting site;
- (b) the height above ground level of each transmitting antenna to an accuracy of 1 metre;
- (c) the azimuth of each transmitting antenna on each site;
- (d) the horizontal and vertical profile of each transmitting antenna on each site (without taking into account any down-tilt);
- (e) the down-tilt (physical and electrical) of each transmitting antenna;
- (f) Class of Emission of the radiated signal;
- (g) the mean operational e.i.r.p. per MHz over the permitted frequency(s) given in Schedule 1 Paragraph 7, averaged over a specified 3 minute interval; and
- (h) the out of block emission profile in e.i.r.p. per MHz to a maximum of 4 MHz either side of the permitted frequency(s) given in Schedule1 Paragraph 7 of each transmitting antenna.

Annex 14

Draft Licence (spectrum mask)

A14.1 The following draft CGC licence provides an alternative approach to control interference between licensees based on a spectrum mask approach.

Wireless telegraphy Act 2006

Office of Communications (Ofcom)

SPECTRUM ACCESS LICENCE XXXX MHz - XXXX MHz

Licence no. **xxxxxx**

Date of issue: **xx xxxxx 2009**

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

Company Name
Company Reg No: xxxxxx
("the Licensee")
Address
xxxxxx
xxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxx
xxxxxxxx
xxxxxxxx

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

Licence Term

2. This Licence shall continue in force until [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;

³⁶ These are regulations on spectrum trading.

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

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 [£xxxxxxxx] 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 include 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 xxxxx 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 xxxxxxxxxxxx"

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:
 - (i) 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/EC 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/EC process 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:

For downlink use of frequencies	61 dBm/(5 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*

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

- (a) 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:

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

Where:

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

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

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

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

11. Interpretation of terms in this Schedule

In this Schedule:

- (a) "EIRP" means the equivalent isotropic radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);
- (b) "dBm" means the power level in decibels (logarithmic scale) referenced against 1milli-Watt (i.e. a value of 0 dBm is 1 milli-Watt);
- (c) "out-of-block emissions" means radio frequency emissions generated by the Radio Equipment and radiated into the frequency bands adjacent (in terms of frequency) to the licensee's Permitted Frequency 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 radiocommunications services between a mobile earth station and one or more space stations, or between mobile earth stations by means of one or more space stations, or between a mobile earth station and one or more complementary ground components used at fixed locations. Such a system shall include at least one space 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”;
- (l) “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 15

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.
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.
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	Electronic Communications Committee. One of two committees at the highest level of CEPT which deals with all matters relating to electronic communications.
ERC	European Radiocommunications Committee, a previous committee within CEPT, the responsibilities of which are now undertaken by the ECC.

Exemption	Exemption regulations made by Ofcom allow anyone to use specified radio equipment without the need to have a WT Act licence.
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.
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.
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.
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 earths 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.