



Notice of Ofcom's proposal to make regulations in connection with Recognised Spectrum Access (RSA) for radio astronomy

Consultation

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Section 1

Summary

- 1.1 This document provides formal notice of Ofcom's proposals to introduce the RSA regime by making various RSA Regulations in connection with radio astronomy. This is the first application of RSA under the new powers introduced by the Communications Act 2003 (the "Act"). The deadline for responses is the 18th December 2006
- 1.2 One of Ofcom's duties under the Act is to secure the optimal use of the radio spectrum in order to further the interests of citizens and consumers. This has become more challenging in recent years as demand for spectrum has grown. As set out in various publications, Ofcom is making increasing use of market mechanisms as the best means of achieving its spectrum management aims. RSA is a development of this policy.
- 1.3 Ofcom consulted in April 2005 (the "Consultation") on the principles of applying RSA to radio astronomy and sought views on a range of related issues including the fee basis, security of tenure and application of spectrum trading. Ofcom considered the responses to the Consultation and published a policy statement on 17 October 2005 (the "Statement"), setting out its conclusions on these issues as follows:
 - RSA will be an appropriate spectrum management tool for radio astronomy services;
 - RSA will initially only address in-band interference issues, and Ofcom will continue its work to address sharing issues arising from out-of-band issues;
 - holders will acquire RSA for an indefinite terms, with 5 years' minimum notice of variation or revocation of the RSA except in specified circumstances;
 - in bands used for radio astronomy and in which alternative use of the spectrum is permitted by the International Radio Regulations, the RSA fees should be set by Administrative Incentive Pricing (AIP) based on the opportunity cost of denying the spectrum to alternative services;
 - it is desirable in principle for radio astronomy to be tradable to give increased incentives for spectrum efficiency. However, the incentive effect will depend on whether or not the radio astronomy community is allowed to retain the proceeds of trading.
- 1.4 In relation to radio astronomy where RSA has been applied for and granted for particular frequency bands and geographic locations, this means that Ofcom would endeavour to avoid licensing terrestrial services that would block out observations of radio emissions from space in areas where radio astronomy observations are carried out.
- 1.5 This will give radio astronomers greater certainty about the quality of the spectrum they use and allow market mechanisms to be applied to promote optimal use of the radio spectrum in line with the principles set out by the Independent Audit of Spectrum Holdings (the Cave Audit) in December 2005, endorsed and accepted by the Government in its response in March 2006 .

- 1.6 The proposed regulations are intended to give effect to the policies announced in Ofcom's Statement. There are several sets of regulations that Ofcom proposes to make in this connection. This Notice seeks views on
- the main Regulations establishing the circumstances in which Ofcom will grant RSA and the terms and conditions that may be applied to RSA grants (the "RSA Regulations") (see Annex 4);
 - a proposed Limitations Order restricting RSA grants to existing uses of radio astronomy (see Annex 5);
 - an amendment to the Wireless Telegraphy (Register) Regulations 2004 to enable Ofcom to publish details of RSA grants Ofcom may make (see Annex 6); and
 - the proposed RSA Charges Regulations (see Annex 7).
- 1.7 By way of additional background and reference, this document also includes an example of the proposed form that RSA will take in Annex 9, although this will not form part of the regulations.
- 1.8 The proposed regulations define:
- the frequencies and locations where RSA for radio astronomy is to be introduced;
 - the restrictions and conditions to which a grant may be made subject;
 - requirements which must be met before a grant is made;
 - time limits for dealing with applications for a grant of RSA;
 - the details of RSA grants that will be made available on the existing wireless telegraphy register; and
 - charges that may be made in respect to the issue, variation and renewal of charging of RSA grants.
- 1.9 The initial RSA regulations will not allow RSA to be traded or converted to a licence. However, as outlined in the Consultation and Statement, it remains Ofcom's intention to make RSA tradable and convertible in due course.
- 1.10 1.10 This Notification document is structured as follows.
- Section 2 notifies Ofcom's intention to make various Regulations in relation to RSA and includes details of how to make representations to Ofcom with respect to the proposals;
 - Section 3 discusses the general background to radio astronomy and RSA;
 - Section 4 provides an overview of the legal and regulatory framework associated with RSA and restates Ofcom's policy position with respect to RSA;
 - Section 5 discusses the general effect of each of the proposed regulations;
 - Section 6 discusses the proposed RSA grant template document;

- Annexes 1 through 3 explain how to respond to this consultation and Ofcom's consultation principles;
- Annex 4 contains the proposed Regulations setting out the processes that will apply in relation to RSA for radio astronomy;
- Annex 5 sets out the proposed Limitations Order restricting the initial grants of RSA to existing radio astronomy sites and to frequencies already in use for radio astronomy purposes;
- Annex 6 sets out the proposed amending Regulations to incorporate RSA grants on the existing Wireless Telegraphy Register;
- Annex 7 contains the proposed Regulations relating to the charges for RSA;
- Annex 8 contains the Regulatory Impact Assessment for each of the proposed Regulations;
- Annex 9 includes an example of a proposed RSA grant document;
- Annex 10 includes examples of AIP calculations; and
- Annex 11 describes Ofcom's approach to using AIP..

Section 2

Notice of Proposals

- 2.1 Ofcom proposes to make regulations to introduce the RSA regime in spectrum used for radio astronomy. The proposed regulations cover four aspects: (1) RSA Regulations; (2) a Limitations Order applying to grants of RSA; (3) Register Regulations; and (4) RSA Fee Regulations.
- 2.2 An overview of the legislative framework and Ofcom's policy in relation to RSA is set out in section 4. The proposed Regulations are set out in Annexes 4, 5, 6 and 7 respectively.
- 2.3 A Regulatory Impact Assessment (RIA) for each set of proposed Regulations is available in Annex 8. The RIAs set out what Ofcom considers to be the risks, costs and benefits of the various proposals and the effects that the proposals will have on the cost to the business and consumer interest.
- 2.4 The general effect of the proposed regulations is set out in section 5.
- 2.5 Comments or representations with respect to the Proposed Regulations and the proposed template for an RSA grant are invited by **5pm on 18 December 2006**. A one month consultation period reflects statutory requirements and is considered sufficient for consultation on these draft regulations. There has already been full consultation on the underlying policy of applying RSA to radio astronomy.

Comments should be sent to:

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2a Southwark Bridge Road
London SE1 9HA

Email: rsa.radioastronomy@ofcom.org.uk

Telephone: 0207 981 3134
Fax: 0207 981 3208

- 2.6 Following this consultation, Ofcom intends to make the final regulations as soon as practicable.
- 2.7 Further copies of this notice and the proposed Recognised Spectrum Access RSA Regulations, Limitations Order, Register Regulations and RSA Charges Regulations can also be obtained from the above point of contact.
- 2.8 Electronic copies are also available and this notice has been placed on Ofcom's website.

Section 3

Background

What is radio astronomy?

- 3.1 Radio astronomy consists of the observation of radio signals and the background radio 'noise' for research into the properties of stars, the nature of galaxies and the age of the universe. These observations provide an insight into the structure of matter and origins of the universe. Radio astronomy is financed in the UK by Government grants to the Particle Physics and Astronomy Research Council ("PPARC") and there are a number of operational radio astronomy sites in the UK.

Which radio frequencies do astronomers use?

- 3.2 Frequencies of observation are largely, if not completely, governed by the physical characteristics of the extra-terrestrial transmissions and fundamental physical constants. So radio astronomers, unlike many other radio users, have little choice about the frequencies they use, although they have some choice over where to locate radio telescopes and some scope to shield them from unwanted signals.
- 3.3 A significant range of frequencies are currently allocated to radio astronomy as detailed in Annex D of UK Frequency Allocation Table (the "UK FAT"). Some of the allocations are pursuant to international agreements. These frequencies are in the range 13KHz to 275GHz.
- 3.4 The International Telecommunication Union ("ITU") has, through the table of allocations in the Radio Regulations, allocated some 2% of the spectrum below 50 GHz to radio astronomy. About one-third of the frequencies are harmonised globally for passive use and these bands are shared with other passive applications, such as remote sensing and earth observation. The remaining two-thirds of frequency bands are shared with active services including terrestrial fixed and mobile services. These other services can interfere with radio astronomy if positioned too closely to radio astronomy sites; and protecting specific radio astronomy sites can significantly constrain deployment of other services.

Regulation of radio spectrum use in the United Kingdom

- 3.5 The Wireless Telegraphy Act 1949 (the "1949 Act") regulates the use by equipment of the radio spectrum in the United Kingdom.
- 3.6 Under section 1 of that Act, the establishment, installation or use of any station (or apparatus) for wireless telegraphy is prohibited, unless it has been authorised. Authorisation may be granted in two ways: either by way of the grant of a wireless telegraphy licence or by regulations exempting the establishment, installation or use in question from the requirement to be licensed.
- 3.7 Licensing is reserved for equipment that Ofcom considers has the potential to cause harmful interference. In granting licences, Ofcom imposes various technical conditions in order to avoid unacceptable interference between neighbouring users, e.g. power limits or guard bands between the frequencies licensed to adjacent users.

- 3.8 If a service is unlikely to involve any undue interference with wireless telegraphy, Ofcom is required by section 1AA of the 1949 Act and the EU Authorisation Directive 2002/20/EC to exempt it from licensing.

Current authorisation of radio astronomy under the Wireless Telegraphy Act 1949

- 3.9 Radio astronomy in the UK involves reception by radio telescopes located in the UK of faint signals from space. Radio astronomy use therefore does not require a wireless telegraphy licence as radio telescopes used for observations are not designed to transmit and so are inherently incapable of causing harmful interference to other radio users. By virtue of the Wireless Telegraphy Apparatus (Receivers) (Exemption) Regulations 1989 (S.I. 1989/123), they are therefore exempt from the requirement to be licensed.

What is recognised spectrum access?

- 3.10 RSA is a new spectrum management instrument that fills a significant gap in the management of the radio spectrum. The gap arises because there are current and potential users whose spectrum use is not licensable and so cannot be subjected to market mechanisms but which has to be taken into account by Ofcom in planning the spectrum so that other licensed users do not cause it excessive interference. In the absence of a grant of RSA, this use could continue. However, grants of RSA will give holders greater certainty by formally recognising their spectrum use while enabling market mechanisms to be applied thereby contributing to securing optimal use of spectrum resources in line with Ofcom's spectrum management duties under the Act.
- 3.11 The main features of RSA are as follows.
- Grants of RSA can only be made after Ofcom has made the necessary regulations.
 - Ofcom has a duty to take account of the existence of a grant of RSA in the same way as it would in respect of a licence. For example, Ofcom would plan to limit the levels of licensed emissions into spectrum and geographical areas covered by RSA.
 - RSA is not mandatory even in bands in which it has been introduced. It will remain lawful to operate without RSA, although users without RSA forego the benefits that RSA confers.
 - Ofcom is able to charge fees for RSA that reflect the economic value of the spectrum to which it relates. As for wireless telegraphy licences, there are statutory safeguards to ensure that fees are no higher than required for spectrum management purposes.
 - RSA can be made tradable and convertible into licences although, as explained above, this is not proposed to be done at the present time.
 - Similar provisions apply to the issue, variation and revocation of RSA as apply to licences.
 - RSA does not provide an absolute guarantee of protection from interference but offers a higher degree of certainty than would otherwise be the case.

Ofcom's earlier consultation on recognised spectrum access

- 3.12 In 2005 Ofcom consulted on the introduction of RSA to the radio astronomy sector. The consultation document is available at <http://www.ofcom.org.uk/consult/condocs/astronomy>.
- 3.13 Following the consultation, Ofcom considered the responses it received and reached (in summary) the following conclusions, which are set out in full in the Statement.
- Ofcom believes that its objective of securing optimal use of the radio spectrum used for radio astronomy will be best secured in relation to radio astronomy by:
 - making transparent the economic cost of making spectrum available for radio astronomy so as to assist rational and informed decision-making;
 - providing appropriate incentives for radio astronomers to use spectrum efficiently.
 - The application of RSA to radio astronomy will facilitate optimal use of the radio spectrum and so Ofcom should proceed with its proposals modified as described in the Statement.
 - As further explained in section 5.5, the parameters to be included in RSA as applied to radio astronomy or referenced by it should be:
 - location (expressed as latitude and longitude);
 - the frequency range expressed in terms of a starting frequency, an end frequency and bandwidth to which the RSA applies;
 - a 'Restricted Area' expressed in terms of a circle of specified radius and centre within which the use of the spectrum for radio astronomy will be recognised;
 - a spectrum quality bench mark (SQB) at the input to the receiver in the associated bandwidth.
 - An indefinite term with a minimum 5 year notice period is appropriate for RSA for radio astronomy.
 - In bands used for radio astronomy and in which alternative use of the spectrum is permitted by the International Radio Regulations, the RSA charging mechanism should be based on the application of AIP based on the opportunity cost of denying the spectrum to alternative services.
 - It is desirable, in principle, for radio astronomy RSA to be tradable and convertible to give increased incentives for spectrum efficiency. However, the incentive effect will depend on whether or not the radio astronomy community is allowed to retain the proceeds of trading. Ofcom does not intend to introduce trading for radio astronomy RSA at this time and will revisit this issue in the light of the Government's conclusions on treatment of income from public sector spectrum trading and leasing. This is in line with the Government's response to recommendation 2.4 of the Independent Audit of Spectrum Holdings. The Audit and response may be found at <http://www.spectrumbudget.org.uk>.

Section 4

Statutory background

- 4.1 The Communications Act 2003 (the “Act”) enabled the introduction of RSA by making specific provisions in that Act and by making changes to the Wireless Telegraphy Act 1998 (the “1998 Act”). An outline of the framework is set out below.

Legislation on RSA

- 4.2 The Act empowers Ofcom to introduce RSA on a selective basis to manage the radio spectrum more effectively.
- 4.3 Section 159(1) of the Act prescribes the circumstances in which Ofcom can enable RSA. These circumstances are where:
- a) a person is proposing to use or to continue to use a station or apparatus for wireless telegraphy;
 - b) the circumstances of use are circumstances specified for the purposes of this section in regulations made by Ofcom (in relation to the proposed RSA Regulations see Regulation 4 and Schedule 2); and
 - c) that use does not require a wireless telegraphy licence but will involve the emission of electro-magnetic energy with a view to the reception of anything at places in the United Kingdom or in the territorial waters adjacent to the United Kingdom, regardless of whether the emissions are from a place within the United Kingdom or from a place outside the United Kingdom.
- 4.4 Section 159(2) empowers Ofcom to grant RSA. Sections 159(3) to (7), in summary, provide that Ofcom may make grants by reference to such factors as Ofcom thinks fit, that the grant is made to a person by giving that person notification containing the grant and that the grant may be subject to such restrictions and conditions as Ofcom think fit.
- 4.5 Schedule 5 of the Act makes provisions about making, revocation and modification of grants of RSA. Grants of RSA are to be determined in accordance with procedures prescribed in regulations made by Ofcom. Accordingly Ofcom has prepared regulations which establish these procedures and these are the subject of this Notice (See section 5 and Annex 4).
- 4.6 Broadly (in summary) section 160 of the Act provides that Ofcom has a duty to take account of the existence of a grant of RSA to the same extent as it would in respect of a wireless telegraphy licence making equivalent provision for the spectrum use.
- 4.7 Under section 164 of the Act where Ofcom consider it appropriate, for the purpose of securing the efficient use of the electro-magnetic spectrum, to impose limitations on grants of RSA in particular frequencies, Ofcom must make an order which imposes the limitations. The number of grants of RSA will initially be limited only to existing radio astronomy sites. Ofcom has prepared a draft order which is the subject of this Notice (see section 5 and Annex 5).

- 4.8 To assist in providing transparency about the new RSA regime, Ofcom has prepared draft regulations to amend the Wireless Telegraphy Register to include provision to insert grants of RSA on the Register (see section 5 and Annex 6).
- 4.9 Under the 1998 Act Ofcom may make regulations which specify charges which are to be payable in respect of grants of RSA. Accordingly Ofcom has prepared regulations which set out charges in respect of RSA grants. These are considered further at section 5 and a draft of the proposed Regulations is set out in Annex 7.

Statutory duties on Ofcom in relation to radio spectrum (including RSA) functions

- 4.10 Statutory obligations provide Ofcom with a framework of relevant considerations against which decisions are made. These include decisions to make regulations enabling RSA, RSA charges and decisions on individual grants.

General considerations

- 4.11 Under section 3(1) of the Act 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.
- 4.12 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 television 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;
 - f) and to have regard to certain matters which include:
 - o principles of better regulation (section 3(3));
 - o the desirability of promoting competition (section 3(4));
 - o the desirability of encouraging investment and innovation (section 3(4)(d));
 - o the desirability of encouraging availability and use of broadband services throughout the UK (section 3(4)(e));

- the different needs and interests of persons in different parts of the UK (section 3(4)).

4.13 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 Act 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 take account of the desirability 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));
- 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)).

Spectrum specific considerations

4.14 In carrying out its spectrum functions it is the duty of Ofcom (under section 154 of the Act) 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.

4.15 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.

- 4.16 Where it appears to Ofcom that any of its duties in section 154 conflict with one or more of its general duties under sections 3 to 6 of the Act, priority must be given to its duties under those sections.
- 4.17 Section 160 of the Act requires Ofcom to take account of any existing grant of RSA on a comparable basis as it would a licence with terms, provisions or limitations making equivalent provision.

Section 5

General effect of proposed RSA Regulations applying to Radio Astronomy

- 5.1 In order to introduce the RSA regime, the Act requires Ofcom to make regulations to give effect to the processes for granting RSA and its ongoing administration.

Wireless Telegraphy (Recognised Spectrum Access) Regulations 2006

- 5.2 Under section 159(1)(b) and Schedule 5, paragraph 1 of the Act, Ofcom has powers to make regulations prescribing the procedures in accordance with which an application for a grant of RSA must be determined. Such procedures would include provision for (a) the restrictions and conditions to which a grant may be made subject (b) requirements which must be met before a grant is made and (c) time limits for dealing with applications for a grant of RSA.
- 5.3 These regulations are to be made under section 159(1)(b) and Schedule 5, paragraph 1 of the Act. Ofcom has powers to make regulations under these provisions prescribing the procedures in accordance with which an application for a grant of RSA must be determined.
- 5.4 Such procedures would include provision for: (a) the restrictions and conditions to which a grant may be made subject; (b) requirements which must be met before a grant is made; and (c) time limits for dealing with applications for a grant of RSA.
- 5.5 The proposed regulations define:
- the circumstances of use;
 - frequencies and locations of where RSA for radio astronomy is to be introduced;
 - particulars of the restrictions and conditions to which a grant may be made subject;
 - information and requirements which must be met by the applicant before a grant will be made; and
 - time limits for dealing with applications for a grant of RSA.

Extent of application

- 5.6 Regulation 1 of the proposed Regulations will apply to the United Kingdom and will not extend to Guernsey, Jersey and the Isle of Man. Application to the Channel Islands and Isle of Man may be reviewed in the future.

Circumstances of use

- 5.7 Regulation 2 of the proposed Regulations gives effect to section 159(1)(b) and prescribes the circumstances of use for RSA. Ofcom has identified the circumstances of use as being for stations which are inherently incapable of transmission, used for the purposes of radio astronomy and operating at the frequencies and at the

locations set out in the Schedule to the Regulations. In addition, the circumstances of use are where the use requires protection from harmful interference arising from the use of other stations or apparatus in the frequency bands.

- 5.8 These circumstances are intended to incorporate the nature of, and type of, spectrum use that is required in order to successfully carry out radio astronomy observations and for which recognition by way of RSA will be available.

Time limit for dealing with applications for a grant of RSA

- 5.9 In Regulation 3 Ofcom has set a time limit of six weeks for dealing with an application requesting a grant of RSA (Annex 4), which is consistent with the time limit permitted by the 1949 Act for decisions about the granting of wireless telegraphy licences.

Information requirements for applications requesting a grant of RSA

- 5.10 Schedule 5, paragraph 1 of the Act requires Ofcom to specify any requirements that must be met by applicants when applying for a grant of RSA. Regulation 4 of the proposed Regulations includes a list of details that Ofcom will require when assessing applications. A person applying for a grant of RSA must be a person proposing to use or to continue to use a station for wireless telegraphy or apparatus for wireless telegraphy consistent with the circumstances of use set out in the Regulations. The application must include the following information:

- the name and address of the applicant;
- the desired frequency band and range in which the applicant wishes to operate a wireless telegraphy station or wireless telegraphy apparatus;
- the location of the wireless telegraphy station or wireless telegraphy apparatus;
- information relating to the spectrum quality benchmark which is sought for radio astronomy use and the extent to which the applicant is therefore willing to share use of the frequencies with holders of wireless telegraphy licences and other holders of grants of recognised spectrum access.

Restrictions and conditions to which a grant is subject

- 5.11 Schedule 5, paragraph 1 of the Act requires Ofcom to specify any restrictions and conditions to which a grant of RSA may be made subject. In Regulation 5, Ofcom has specified a number of restrictions and conditions for which a grant of RSA may be made subject. These include conditions relating to the duration of the grant, requiring payment of fees, any conditions restricting the exercise by Ofcom of their power to revoke or modify the grant and access or inspection of the relevant station or apparatus.
- 5.12 The other restrictions that Ofcom may impose relate to limitation on the extent of use recognised in the RSA grant, for example, by reference to the location of the station or apparatus, the recognised purpose of use of the electromagnetic spectrum, the frequencies that are recognised and the recognised SQB for that use.
- 5.13 As explained in the Statement, Ofcom considers these parameters to be appropriate to describe and recognise the use of spectrum for radio astronomy. It is necessary for these values to be included in the RSA grant so that Ofcom can fulfil its spectrum management duties, including the duty in section 160(2), which requires Ofcom to

take account of existing (and in force) grants of RSA, along with any restrictions or conditions attaching to the RSA in the same way that Ofcom would take into account the existence of wireless telegraphy licences and any restrictions and conditions associated with such licences, when carrying out its spectrum management functions.

- 5.14 A copy of the proposed RSA Regulations is provided at Annex 4 and a proposed draft RSA grant template is provided at Annex 9

Wireless Telegraphy (Limitations of Number of Grants of Recognised Spectrum Access) Order 2006

- 5.15 Ofcom proposes to use its powers conferred by sections 164(1) to (3) of the Act to make an Order limiting the grants of RSA for radio astronomy.

Limitations on RSA grant applications

- 5.16 The proposed Limitation Order includes criteria that limit grants of RSA to existing radio astronomy stations at specified locations and at the frequency bands listed in the Schedule. Further, the RSA will apply to stations where the station or apparatus is inherently incapable of transmission (that is, receive only) and the station is currently used for radio astronomy
- 5.17 As discussed, RSA is a new statutory instrument to assist Ofcom in its spectrum management functions. Although the power to grant RSA has a wider application than radio astronomy, as discussed in the Statement, Ofcom proposes to limit the initial introduction of RSA to spectrum used for radio astronomy. Other types of spectrum use that could be eligible for RSA raise different issues requiring further consideration. Ofcom proposes to address these separately in future consultations.
- 5.18 The main objective of introducing RSA for radio astronomy is to formalise the present arrangement of the consideration of existing radio astronomy stations. This current consideration cites a number of existing and well-established radio astronomy sites operating in the United Kingdom.
- 5.19 As these sites and associated geographical areas are currently free from conflicting radio services, Ofcom proposes initially to limit RSA grant applications to these geographical areas. The same frequencies used for radio astronomy in those specific geographic areas are used for providing other services elsewhere in the UK. This is the reason for proposing the limitation of RSA to existing radio astronomy sites at this stage. However, Ofcom will keep this limitation under review.

Limitations on available frequency bands for RSA grant applications

General frequency band limitations

- 5.20 Ofcom proposes to limit the upper frequency band available for RSA applications to 50GHz. This is because within the UK, above this frequency band there are no licensed users sharing spectrum with radio astronomy stations and minimal radio astronomy observations take place above this frequency range. Ofcom notes that this may change in the future and will keep this under review.
- 5.21 Ofcom proposes to limit the initial grant of RSA under the draft regulations to frequency bands in which it currently restricts licensing of active services in the interests of sharing with radio astronomy. These are mainly bands in which ITU

Radio Regulations give radio astronomy primary or co-primary status. The reason for this limitation is to maintain the present degree of informal recognition accorded to radio astronomy in the UK in Ofcom's frequency planning and to avoid imposing additional constraints on other services that share frequency bands with radio astronomy. Moreover, Ofcom is not proposing at this time to apply RSA in frequency bands shared with Crown users such as Government departments as Ofcom does not license these.

- 5.22 Ofcom may review this limitation in light of future developments. If it were to plan any changes, it would not introduce them without further consultation.

Extent of application

- 5.23 The regulations will apply to the United Kingdom. They will not extend to Guernsey, Jersey and the Isle of Man as there are no established radio astronomy research establishments in those territories that Ofcom currently takes into account in exercising its spectrum management functions, although this may be reviewed in the future.

- 5.24 A copy of the proposed Limitations Order is provided at Annex 5.

Wireless Telegraphy (Register) (Amendment) Regulations 2006

- 5.25 Under section 170(1) of the Act, Ofcom may, by regulations, make provision for the establishment and maintenance of a wireless telegraphy register (the "Register"). Under section 170(2) of that Act Ofcom may only include relevant information in the Register if it is information of a description prescribed by regulations. These Regulations provide that Ofcom shall establish and maintain a register of relevant information and prescribe the relevant information.
- 5.26 In December 2004 Ofcom issued the Wireless Telegraphy (Register) Regulations 2004, which came into effect on 23 December 2004. Since their inception these Regulations have been amended on several occasions to incorporate more classes of licences to be included on the Register.
- 5.27 Ofcom proposes to make a further amendment to these regulations to expand the Register so that grants of RSA are also included as relevant information (see Regulation 2 of the proposed Regulations). Section 170(3)(b) provides that information is relevant for the purposes of the wireless telegraphy register if it relates to the making, renewal, transfer, modification or revocation of grants of RSA.
- 5.28 The Register will contain basic information about details of RSA grants, such as names, contact details, frequencies and location of the radio station/radio receiver, the class of RSA and any restricted zone around the radio receiver. The table below provides an indication of the data fields and specific information about RSA grants that Ofcom intends to publish in the Register. These fields are currently included in the Register in relation to wireless telegraphy licences. Ofcom will continue to consider what information to make available on the Register.
- 5.29 Ofcom considers that it is important to ensure openness and transparency in relation to recognition of spectrum use through RSA grants. Having this information available on the Register will assist Ofcom to do this. It will also assist Ofcom in carrying out its spectrum management functions, in particular how Ofcom will continue to manage and coordinate the issue of future licences and grants of RSA, by taking into account existing licences and grants of RSA.

5.30 At a later date, including RSA grants on the Register will also facilitate trading.

Table 1: Register of RSA grants

Data field	Description
RSA reference number	Identification number assigned to the individual RSA grant
Name of grantee	Name of the individual or enterprise holding the grant of RSA (as notified to Ofcom)
Contact details	Contact postal address, Email addresses, or Telephone numbers or Agent's contact details
RSA class	Description of the type of spectrum use covered by the RSA, for example, radio astronomy
Frequency boundaries	The radio frequency range specified in terms of channel width, e.g., 100kHz and frequency range, e.g. 415.15 to 415.25MHz
Geographical information relevant to the RSA grant	Description of the geographical characteristics, for example, the location of the radio astronomy site in lat/long and any restricted zone (expressed in radius km) with the radio receiver coordinates located at its centre

5.31 Ofcom will take reasonable steps to ensure the Register contains accurate information and is regularly updated. Ofcom intends to manage the information it includes about RSA grants in a similar way to how it manages information about licences.

Extent of application

5.32 The regulations will apply to the United Kingdom. They will not extend to Guernsey, Jersey and the Isle of Man, although that may be reviewed in the future.

5.33 A draft of the proposed amending Regulations is set out in Annex 6.

Wireless Telegraphy (Recognised Spectrum Access Charges) Regulations 2006

5.34 Section 1 of the Wireless Telegraphy Act 1998 (the "1998 Act") empowers Ofcom to make regulations to prescribe fees payable for the making of a grant of RSA. Under section 2(2) of the 1998 Act, Ofcom may, if it thinks fit in the light (in particular) of the matters to which it is required to have regard under section 154 of the Act, prescribe fees which would be greater than those that would be necessary for the purposes of recovering costs incurred by Ofcom in connection with its functions under the enactments relating to the management of the radio spectrum. In particular, pursuant to section 154, it is Ofcom's duty in relation to the management of radio spectrum to have regard to:

- the availability of electro-magnetic spectrum for use for wireless telegraphy;

- the present and future demand for its use;
- the desirability of promoting its efficient management and use;
- the economic and other benefits that may arise from its use; and
- the development of innovative services and competition in the provision of electronic communications services.

5.35 Ofcom may set fees for RSA grants in excess of management costs incurred in relation to spectrum for the purpose of achieving its above-mentioned spectrum management objectives. This mechanism is known as Administered Incentive Pricing ("AIP"). Examples of AIP as they will apply to RSA grants are provided in Annex 10 to illustrate the methods of calculating the sums payable for RSA grants in relation to frequency bands that are shared with mobile and fixed services, where AIP will apply. In relation to other frequency bands where AIP is not adopted, Ofcom proposes to apply a cost recovery basis for grants of RSA as set out in the proposed fees regulations.

5.36 The general economic approach to AIP is discussed in Annex 11.

5.37 As discussed in the Statement on applying RSA to radio astronomy and endorsed by the Audit and the Government's response, Ofcom considers that it is appropriate to apply AIP to radio astronomy in some frequency bands as outlined below.

The fees for RSA grants

5.38 The proposed charges regulations for RSA bands are detailed in Annex 7 and are based on AIP principles in some frequency bands and on cost recovery in others. The proposed AIP based charges are in line with the findings of the Review of Radio Spectrum Management¹ and the more recent Independent Audit of Spectrum Holdings.

Application of AIP based charges to radio astronomy frequency bands

5.39 The proposed fee structure for radio astronomy frequency bands shared with fixed and mobile services are based on the opportunity cost relating to the sharing of these frequency bands with fixed and mobile services, in other words to the value of the spectrum if used for an alternative application. This is consistent with the approach to AIP adopted for other services.

5.40 Examples of AIP fee calculations for the frequency bands shared with the mobile and fixed services are detailed in Annex 10.

AIP charging in frequency bands shared with the fixed service

5.41 The AIP based charges for RSA grants in frequency bands that share with the fixed service will be directly related to the assessable bandwidth, coordination or restricted zone area², fixed service spectrum tariff unit (**STU**) and an impact factor on the

¹ By Professor Martin Cave for the Department of Trade and Industry and Her Majesty's Treasury and published March 2002. See <http://www.ofcom.org.uk/static/archive/ra/spectrum-review/index.htm>.

² Coordination or restriction zones can be deployed around radio astronomy stations sharing spectrum with fixed services, this is dependent on the requirements of the radio astronomy service in question.

deployment of fixed services. The charges that will apply for grants of RSA in these frequency bands are set out in Regulations 3(1) and 3(2) of the proposed fees Regulations. In either case the fee payable will be the higher of £500, or the sum calculated using the fee algorithm.

- 5.42 The fixed service STU of £0.51 per square km/MHz is derived using revisions of the original findings of the Economic Study to Review Spectrum Pricing³. This report analysed the marginal value of fixed service spectrum using various assumptions about the geographical characteristics of area sterilised by point to point services. The spectrum price developed from the Indepen report concluded a fixed service reference fee of £132 per 2 x 1MHz and £0.76 per square km/MHz as an appropriate price.
- 5.43 In 2004 Ofcom developed its own estimate of an appropriate fixed service spectrum fee of £88 per 2 x 1 MHz by utilising all link data rates and bandwidth possibilities together with more realistic estimates of equipment costs.
- 5.44 Ofcom proposes to use the revised value of £88 per 2 x 1 MHz for spectrum that could be used for fixed services. This equates to £0.51 per square km/MHz.
- 5.45 The impact factor used within the fixed service AIP algorithm is a measure of constraints on deployment of fixed services in the same frequency band and geographical areas as radio astronomy stations. This is calculated by assessing the number of fixed service (point to point) stations that are denied assignments in this band in order to avoid radio astronomy services from being affected by unwanted emissions in excess of the SQB. Ofcom has reviewed the level of denial to fixed services and has found that 5% of assignment proposals are refused on this basis. Ofcom proposes that this figure would be reviewed every 3-5 years (see Regulation 3(2)). However, in cases where a restricted zone operates, then all fixed services assignments will be refused if they fall within the specified geographic area. In this case the impact factor for fixed services will be rated at 100% (as set out in Regulation 3(1)). The frequency bands which are shared with fixed services are listed in Part 1 of the Schedule to the proposed charging regulations.

Proposed fee basis for frequency bands that share with fixed services

- 5.46 For radio astronomy bands that share with the **fixed service** that involve coordination zones being employed within Ofcom's spectrum planning considerations, the AIP charge is proposed to be calculated using following fee algorithm.

$$\text{AIP} = \text{BW} \times (\pi \times r^2) \times \text{STU} \times \text{Impact Factor}$$

- BW = assessable bandwidth in MHz
- $\pi = 3.142$
- r = radius of coordinated zone area as specified within RSA grant schedule in kilometres
- STU = Spectrum tariff unit (£ 0.51 per square km/MHz)

³ An Economic Study To Review Spectrum Pricing, Indepen, Aegis Systems and Warwick Business School, February 2004, P57

- Impact Factor = 5%

5.47 For radio astronomy bands that share with the **fixed service** that involve restricted zones being employed within Ofcom's spectrum planning considerations, the AIP charge is proposed to be calculated using following fee algorithm.

$$\underline{AIP = BW \times (\pi \times r^2) \times STU \times \text{Impact Factor}}$$

- BW = assessable bandwidth in MHz
- $\pi = 3.142$
- r = radius of restricted zone area as specified within RSA grant schedule in kilometres
- STU = Spectrum tariff unit (£ 0.51 per square km/MHz)
- Impact Factor = 100%

AIP charging in frequency bands shared with the mobile service

5.48 The AIP based charges for RSA grants in frequency bands that share with the mobile service will be directly related to the assessable bandwidth, restricted zone area and mobile service STU.

5.49 The mobile service STU is based upon the findings of the Study into Spectrum Pricing⁴ that determined four separate marginal values for PMR, PAMR, cellular and PCN services spectrum. Following this study the Radiocommunications Agency concluded that a common STU of £1.65 per square km/MHz should apply to PMR and PAMR services.

5.50 The impact factor used within the mobile service AIP algorithm is a measure of constraints on deployment of mobile services in the same frequency band and geographical areas as radio astronomy stations. As mobile services can not generally co-exist with radio astronomy stations within the areas of consideration, this results in a restricted zone area for mobile services. Therefore the mobile service impact factor is set to 100% The basis of the fees applying to these frequency bands is set out in Regulation 4 and the frequency bands which are shared with mobile services are listed in Part 2 of the Schedule to the proposed charging regulations. The fee payable will be the higher of £500, or the sum calculated using the fee algorithm.

Proposed fee basis for frequency bands that share with mobile services

5.51 For radio astronomy bands that share with **mobile services**, the AIP charge is calculated using the following fee algorithm.

$$\underline{AIP = BW \times (\pi \times r^2) \times STU \times \text{impact factor}}$$

- BW = assessable bandwidth in MHz
- $\pi = 3.142$

⁴ Smith-NERA Study 1997

- r = radius of restricted zone area as specified within RSA grant schedule in kilometres
- STU = Spectrum tariff unit [(£ 1.65 per square km/MHz)]
- Impact Factor = 100%

Cost recovery based charging structures

- 5.52 There are a number of radio astronomy frequency bands where constraints are placed on the national deployment of active services due to international radio regulations or where they are currently used for the deployment of licence exempt services. The general approach employed by Ofcom within these frequency bands is to assume zero opportunity cost. On this basis Ofcom proposes fixed fee structures based on a cost recovery basis for these bands.

Radio astronomy services operating within frequency bands shared with broadcasting services (Channel 38) (606-614 MHz)

- 5.53 The spectrum either side of channel 38 is currently used for terrestrial UHF5 TV broadcasting, which represents the current alternative use of that channel were it not allocated to radio astronomy. Ofcom therefore intends to set the charge for RSA in channel 38 on a similar basis as is currently used for Wireless Telegraphy Act licence fees for TV broadcasting.
- 5.54 These fees are currently set based on a cost recovery basis, i.e. the fees are calculated to recover the costs to Ofcom of managing the spectrum. Ofcom proposes to adopt a similar approach in setting the RSA fee for radio astronomy in channel 38.
- 5.55 However, Ofcom is currently consulting on the prospective changes to the license fees for terrestrial broadcasting in the UK and that from 2014, AIP based on the full opportunity cost of broadcast use of the spectrum over any other use will be applied. Moreover, the spectrum either side of channel 38 might be released for services other than broadcasting following digital switchover. Ofcom will be consulting on the future management of the analogue TV spectrum later this year in the Digital Dividend Review and will review the fee structure and possibly revise the basis of charging for RSA for radio astronomy in channel 38 in the light of these developments.
- 5.56 Meanwhile, Ofcom proposes a fee of £22,500 a year per radio astronomy station for RSA within this band. This fee reflects the cost to a broadcaster for an equivalent use of a national UHF channel. Regulation 5 of the proposed charges regulations provides for the fees that will apply in relation to these frequency bands. The frequency bands which are shared with broadcasting services are listed in Part 3 of the Schedule to the proposed charging regulations.

Radio astronomy frequency bands that are shared with licence exempt services

- 5.57 There are numerous radio astronomy frequency bands that share with licence exempt services such as mobile satellite services. These services are exempt from

⁵ UHF- Ultra High Frequency

licence fees and therefore these frequency bands have a zero opportunity cost. In these bands, Ofcom proposes to continue to charge on the basis of cost recovery.

- 5.58 Ofcom has assessed the costs of administering a grant for use within frequency bands that have zero opportunity cost and considers that this represents the same costs as administering a permanent earth station licence. Ofcom therefore proposes that the same level of fee be applied, £500 per site per frequency band. Regulation 6 of the proposed charges Regulations provides for the fees that will apply in relation to these frequency bands. The frequency bands which are to be charged on this cost recovery basis are listed in Part 4 of the Schedule to the proposed charges Regulations.

Radio astronomy frequency band 42.5 - 43.5GHz

- 5.59 This frequency band has minimal opportunity cost as indicated within Ofcom's consultation on *Award of available spectrum: 10 GHz, 28 GHz, 32 GHz and 40 GHz*⁶. The consultation found no evidence of commercially available equipment for use within this spectrum and on this basis Ofcom proposes to charge cost recover for RSA grants within this frequency band. However in line with previous Ofcom statements, this position will may be reviewed in the future.

Radio astronomy frequency bands that are allocated on an exclusive basis

- 5.60 There are certain radio astronomy frequency bands that are allocated to the radio astronomy service on an exclusive basis under current international regulations. The current international regulations prevent administrations from assigning frequencies to other transmitting services within these frequency bands. As a consequence, these frequency bands have a zero opportunity cost. In these bands, Ofcom proposes to continue to charge on the basis of cost recovery in line with Cave recommendations, which currently works out to a charge of £500 per site per frequency band.

Extent of application

- 5.61 The regulations will apply to the United Kingdom. They will not extend to Guernsey, Jersey and the Isle of Man, although that may be reviewed in the future. A draft of the proposed regulations is provided in Annex 7.

⁶ See http://www.ofcom.org.uk/consult/condocs/10ghz/spec_condoc.pdf.

Section 6

The RSA grant document

- 6.1 Grants of RSA will be contained in a notification document. Ofcom has prepared a proposed template RSA grant document and this is attached for information in Annex 9. Ofcom would welcome comments on the template. The terms of grants in any individual case may be different from the template as they will have to be tailored to the particular circumstances of the individual grant.

What is recognised by the grant?

- 6.2 The template states that, in making the grant, Ofcom recognises the use of specific frequencies in the electromagnetic spectrum for wireless telegraphy. Features of the recognition include:
- the use of a particular radio astronomy station at a particular location;
 - use of the electromagnetic spectrum for reception at ground level;
 - a maximum level of interference (expressed in dWB/MHz) arising from other licensed users in the frequency band of the recognised frequencies at the input to the receiver of the radio astronomy station. Ofcom refers to this as a "Spectrum Quality Benchmark" (SQB)⁷.

What are the terms of the grant?

- 6.3 The general terms reflect closely those that already exist for wireless telegraphy licences. In summary, they provide for the following:
- the RSA shall commence when issued and continue in force indefinitely unless revoked by Ofcom (paragraph 2);
 - payment of fees (paragraph 8);
 - information about the frequency bands, purpose of use recognised and geographic areas covered by the grant (paragraphs 10 through 12).
- 6.4 Ofcom may only revoke the RSA in particular circumstances, which include:
- at the request of, or with the consent of the grantee (paragraph 3(a));
 - with 5 years notice served on the grantee (paragraph 3(b));
 - immediately (subject to the procedures in the Act) if it appears to Ofcom to be necessary or expedient for the purposes of complying with a direction by the Secretary of State given to Ofcom under section 156 of the Act, or under sections 5 and 132 of the Act (paragraph 3(c));

⁷ Reference – 'Spectrum Liberalisation A consultation on proposals to reduce or remove certain restrictions on spectrum use', Ofcom, 2004

- immediately (subject to the procedures in the Act) in accordance with any international statutory obligations placed on Ofcom under European Community or other agreement which may affect the spectrum recognised (paragraph 3(d));
- if there has been a failure to pay the fee(paragraph 3(e)); and
- if there has been a material breach of any of the terms (paragraph 3(f)).

6.5 Like wireless telegraphy licences, the RSA grant will not be transferable and any changes in the details of the recipient's name and address must be notified to Ofcom (paragraphs 6 and 7).

Spectrum Quality Benchmarks

- 6.6 SQBs are technical parameters that indicate the level of spectrum quality of a particular radio service. SQBs are a measure of the spectrum quality that is needed to ensure that spectrum quality is not degraded to an extent that would be unacceptable for continuation of the wireless telegraphy service in question.
- 6.7 In the application of RSA for radio astronomy, Ofcom will use its best endeavours in planning use of the spectrum to ensure that the SQBs are not exceeded by in-band emissions from other licensed services at the radio astronomy stations for which RSA has been granted.
- 6.8 As mentioned above, it is proposed that the RSA grant will specify the SQB for the recognised spectrum (see paragraph 13 and Table 3). The SQB is the maximum level of interference (expressed in dWB/MHz) which:
- may be received at the input to the receiver of the radio astronomy station;
 - arises from other licensed users of the recognised frequencies in the recognised band; and
 - is compatible with radio astronomy use at the particular station.
- 6.9 The SQB provides guidance for holders of RSA grants about the levels of interference that Ofcom expects are likely to be encountered at the radio astronomy site⁸ from other licensed services in the same band and reflects the technical planning and coordination processes and criteria that Ofcom currently applies in making assignments in certain frequency bands shared between radio astronomy and other services.
- 6.10 The SQB will initially be set to reflect the levels which Ofcom expects to exist under current planning assumptions and criteria which Ofcom applies. These levels are sufficiently low to permit radio astronomy observations to be made at the site.
- 6.11 As discussed below, the SQB will initially reflect the interference that is attributable only to in-band emissions. In granting RSA, Ofcom undertakes to limit spectrum assignments within the band in the surrounding geographical area so as to keep emissions from them below the SQB at the radio astronomy site that is the subject of the grant.

⁸ Measured at the input to the receiver of the station identified in the RSA grant.

- 6.12 In effect, Ofcom commits to limit the assignments it will make within the band used by the radio astronomers in the surrounding geographical area by not licensing transmissions that operate in the recognised frequency bands and transmit from within a prescribed surrounding area around the astronomy site if they would result in a power density at the astronomy station that exceeds the benchmark level (paragraph 14 of the proposed RSA template).
- 6.13 While Ofcom appreciates the importance of certainty about spectrum quality, it is not practicable to guarantee maximum levels of interference that will be experienced in practice. Spectrum quality can differ from the SQB for a variety of reasons outside Ofcom's control as explained in the Spectrum Liberalisation consultation. In addition, some radio astronomy bands are shared with licence exempt devices, the location of which is beyond Ofcom's control. This is reflected in paragraph 16 of the proposed RSA template.
- 6.14 Furthermore, notwithstanding the undertaking in paragraph 14 of the proposed grant document, it might be necessary for spectrum quality to be reduced below the stated SQB for reasons outside Ofcom's control. This is reflected in paragraph 15 of the proposed RSA template.
- 6.15 It is important to note that there is a direct relationship between the level of interference stated in the SQB and the fees payable for grants of RSA. This is because the radius of the area around the radio astronomy receiver and within which constraints are imposed on the licensing of other services sharing the frequency band is an element of the fee calculation. A larger radius constrains other services in the band to a greater extent resulting in lower levels of interference to the service in respect of which RSA is granted. This corresponds to a higher spectrum quality for which a higher fee is charged. The converse also holds, i.e. the smaller the radius, the higher the levels of interference suffered, the lower the spectrum quality and the lower the fee.

Interference from out of band emissions

- 6.16 Radio interference to radio astronomy may be categorised as originating from 'in-band' or out of band emissions⁹ depending on whether it arises from services that are assigned frequencies **within** bands allocated to radio astronomy or from services in **neighbouring** bands.
- 6.17 In line with Ofcom's Statement, RSA for radio astronomy will be confined to in-band sharing and will reflect current planning assumptions and criteria in respect of services sharing a frequency bands with radio astronomy. Ofcom does not at this stage propose that RSA for radio astronomy should extend to consideration of co-existence between radio astronomy and licensed services in neighbouring frequency bands.
- 6.18 Work on some bands is currently underway internationally within the ITU and the findings will be considered at the forthcoming World Radio Conference in 2007. The ITU study relates to out of band interference from existing satellite downlinks that are outside the jurisdiction of individual administrations. Ofcom is actively participating in this work and will consider the findings when conclusions are finalised and published.

⁹ Out-of-band emissions – emissions on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions (ITU Radio Regulations 1.144)

- 6.19 Meanwhile, in line with the Statement, the recognition to be accorded radio astronomy under the proposed RSA regulations will initially only consider in-band sharing and interference scenarios and will not extend to out of band emissions originating from other licensed services in adjacent or neighbouring frequency bands. Although Ofcom is aware that coexistence issues may exist in relation to out-of-band emissions from active services, Ofcom will adopt an approach that aims to avoid undue constraints on the deployment of other services. This reflects the status quo and Ofcom is not currently considering imposing any additional restrictions on other existing services in respect of out-of-band emissions and coexistence with radio astronomy.
- 6.20 Ofcom will consult stakeholders before determining the conditions under which new services (in adjacent or neighbouring bands) and radio astronomy services should co-exist. In so doing, Ofcom will take account of all relevant considerations, including its statutory duties and international obligations.

Annex 1

Responding to this Notification

How to respond

- A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on Monday 18 December 2006**.
- A1.2 Ofcom strongly prefers to receive responses using the online web form at <http://www.ofcom.org.uk/consult/condocs/rsa/howtorespond/form>, 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 (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.
- A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email: rsa.radioastronomy@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.
- A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.
- Mark Rider
Floor 3
Dept: Space Services
Riverside House
2A Southwark Bridge Road
London SE1 9HA
- Fax: 020 7981 3208
- A1.5 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.

Further information

- A1.6 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Mark Rider on 020 7981 3134.

Confidentiality

- A1.7 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 (when respondents confirm on their response coversheet that this is acceptable).
- A1.8 All comments will be treated as non-confidential unless respondents specify that part or all of the response is confidential and should not be disclosed. Please place any confidential parts of a response in a separate annex so that non-confidential parts may be published along with the respondent's identity.

- A1.9 Ofcom reserves its power to disclose any information it receives where this is required to facilitate the carrying out of its statutory functions.
- A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use in order to meet its legal requirements. Ofcom's approach on intellectual property rights is explained further on its website at <http://www.ofcom.org.uk/about/accoun/disclaimer/>

Next steps

- A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in early 2007.
- A1.12 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

- A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.
- A1.14 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.
- A1.15 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:

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 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 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

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 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 version for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will normally allow ten weeks for responses to consultations on issues of general interest.

A2.6 There will be a person within Ofcom who will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organizations interested in the outcome of our decisions. This individual (who we call the consultation champion) will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why. This may be because a particular issue is urgent. If we need to reduce the amount of time we have set aside for a consultation, we will let those concerned know beforehand that this is a 'red flag consultation' which needs their urgent attention.

After the consultation

A2.8 We will look at each response carefully and with an open mind. We will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

- A3.1 In the interests of transparency, we will publish all consultation responses in full on our website, www.ofcom.org.uk, unless a respondent specifies that all or part of their response is confidential. We will also refer to the contents of a response when explaining our decision, without disclosing the specific information that you wish to remain confidential.
- A3.2 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 by allowing you to state very clearly what you don't want to be published. We will keep your completed coversheets confidential.
- A3.3 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.
- A3.4 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/.
- A3.5 Please put any confidential parts of your response in a separate annex to your response, so that they are clearly identified. 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 coversheet 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

What do you want Ofcom to keep confidential?

Nothing

☐

Name/contact details/job title

☐

Whole response

☐

Organisation

☐

Part of the response

☐

If there is no separate annex, which parts?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response. It can be published in full on Ofcom's website, unless otherwise specified on this cover sheet, and I authorise Ofcom to make use of the information in this response to meet its legal requirements. 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 4

Draft Recognised Spectrum Access Regulations

DRAFT STATUTORY INSTRUMENTS

2006 No. XXXX

ELECTRONIC COMMUNICATIONS

The Wireless Telegraphy (Recognised Spectrum Access) Regulations 2006

<i>Made</i>	-	-	-	-	XXXX
<i>Coming into force</i>	-	-			XXXX

The Office of Communications (“OFCOM”) make the following Regulations in exercise of the powers conferred by section 159(1)(b) and Schedule 5, paragraph 1 of the Communications Act 2003⁽¹⁰⁾ (“the Act”).

Before making the Regulations OFCOM have given notice of their proposal to do so in accordance with section 403(4)(a) of the Act, published notice of their proposal in accordance with section 403(4)(b) of the Act and have considered the representations made to them before the time specified in the notice in accordance with section 403(3)(c) of the Act.

Citation, commencement and extent

1.—(1) These Regulations may be cited as the Wireless Telegraphy (Recognised Spectrum Access) Regulations 2006 and shall come into force on [] 2006.

(2) These Regulations shall not extend to the Channel Islands or to the Isle of Man.

Circumstances of use

2.— The circumstances of the use of a station for wireless telegraphy or apparatus for wireless telegraphy, specified for the purpose of section 159, are circumstances where the station or apparatus —

- (a) is inherently incapable of transmission;
- (b) is used only for the purposes of radio astronomy;
- (c) operates within any of the frequency bands listed in the Schedule; and
- (d) operates at a radio astronomy station whose location is listed in the Schedule (expressed in latitude and longitude).

⁽¹⁰⁾ 2993 c. 21

Time limit for dealing with grants of recognised spectrum access

3.— A decision on an application for a grant of recognised spectrum access which is made to OFCOM, will be made, notified to the applicant and published not more than six weeks after the day of the receipt of the application by OFCOM.

Requirements that must be met for a grant of recognised spectrum access

4.—(1) An applicant for a grant of recognised spectrum must —

- (a) be a person proposing to use or to continue to use a station for wireless telegraphy or apparatus for wireless telegraphy in the circumstances specified in regulation 2; and
- (b) provide to OFCOM the information specified in paragraph (2).

(2) The information to be provided is —

- (a) the name and address of the applicant;
- (b) the desired frequency range in which the applicant wishes to operate a wireless telegraphy station or wireless telegraphy apparatus;
- (c) the location of the wireless telegraphy station or wireless telegraphy apparatus; and
- (d) information relating to the maximum level of interference arising from other authorised users (who operate within the desired frequency range) which is required for radio astronomy use at that station.

Particulars of the restrictions and conditions to which a grant is subject

5.— A grant of recognised spectrum access may be subject to—

- (a) a condition providing for the duration of the grant;
- (b) conditions restricting the exercise by OFCOM of their power to revoke or modify the grant;
- (c) a condition requiring payment of fees; and
- (d) conditions describing the limits of the use of the electromagnetic spectrum which is recognised by the grant by reference to—
 - (i) the location of the wireless telegraphy station or apparatus;
 - (ii) the recognised purpose of use of the electromagnetic spectrum;
 - (iii) the recognised frequencies for that use; and
 - (iv) the recognised maximum level of interference arising from other authorised users (who operate within the recognised frequencies) which is required for that use.

Date _____ [_____] *Name*
For and by authority of the Office of Communications

SCHEDULE

Frequency bands

37.75-38.25 MHz
80.5-82.5 MHz
150.05-152 MHz
606.0-614.0 MHz
1.400-1.427 GHz
1.6106-1.6138 GHz
1.6600-1.6605 GHz
1.6605-1.6680 GHz

Notice of Ofcom's proposal to make regulations in connection with Recognised Spectrum Access (RSA) for radio astronomy

1.668-1.670 GHz
 2.69-2.70 GHz
 10.60-10.68 GHz
 10.68-10.70 GHz
 15.35-15.40 GHz
 22.01-22.21 GHz
 22.21-22.50 GHz
 22.81-22.86 GHz
 23.07-23.12GHz
 23.6-24.0 GHz
 31.3-31.5 GHz
 31.5-31.8 GHz
 42.5-43.5 GHz
 48.94-49.04 GHz

(2)

<i>Radio Astronomy Station</i>	<i>Location</i>
Jodrell Bank	02° 18'26" W 53° 14'10" N
Cambridge	00° 02'23" E 52° 10'06"; N
Darnhall	02° 32'46" W 53° 08'38" N
Pickmere	02° 26'42" W 53° 16'44" N
Defford	02° 08'10" W 52° 05'28" N
Knockin	03° 00'40" W 52° 46'41" N

Annex 5

Proposed Recognised Spectrum Access Limitation Order

DRAFT STATUTORY INSTRUMENTS

2006 No.XXXX

ELECTRONIC COMMUNICATIONS

The Wireless Telegraphy (Limitation of Number of Grants of Recognised Spectrum Access) Order 2006

Made - - - - *XXXX 2006*

Coming into force - - *XXXX 2006*

The Office of Communications (“OFCOM”) make the following Order in exercise of the powers conferred by section 164(1) to (3) of the Communications Act 2003⁽¹⁾ (“the Act”).

Before making the Order OFCOM have given notice of their proposal to do so in accordance with section 403(4)(a) of the Act, published notice of their proposal in accordance with section 403(4)(b) of the Act and have considered the representations made to them before the time specified in the notice in accordance with section 403(4)(c) of the Act.

Citation, commencement and extent

1.—(1) This Order may be cited as the Wireless Telegraphy (Limitation of Number of Grants of Recognised Spectrum Access) Order 2006 and shall come into force on ***.

(2) This Order shall not extend to the Channel Islands or to the Isle of Man.

Limitation of grants

2.— (1) OFCOM will make a limited number of grants of recognised spectrum access for radio astronomy use of the frequency bands listed in the Schedule.

(2) In determining the limit on the number of grants of recognised spectrum access and the persons to whom they may be granted OFCOM shall apply the criteria in paragraph (3).

(3) The criteria are that grants shall only be made to a user of a station for wireless telegraphy or apparatus for wireless telegraphy where that station or apparatus —

- (i) is inherently incapable of transmission;
- (ii) is used only for the purposes of radio astronomy; and

⁽¹⁾ 2003 c. 21

- (iii) operates at a radio astronomy station whose location is listed in the Schedule (expressed in longitude and latitude coordinates).

Chief Executive of the Office of Communications
For and by authority of the Office of Communications

SCHEDULE

Frequency bands

37.75-38.25 MHz
80.5-82.5 MHz
150.05-152 MHz
606.0-614.0 MHz
1.400-1.427 GHz
1.6106-1.6138 GHz
1.6600-1.6605 GHz
1.6605-1.6680 GHz
1.668-1.670 GHz
2.69-2.70 GHz
10.60-10.68 GHz
10.68-10.70 GHz
15.35-15.40 GHz
22.01-22.21 GHz
22.21-22.50 GHz
22.81-22.86 GHz
23.07-23.12GHz
23.6-24.0 GHz
31.3-31.5 GHz
31.5-31.8 GHz
42.5-43.5 GHz
48.94-49.04 GHz

(2)

<i>Radio Astronomy Station</i>	<i>Location</i>
Jodrell Bank	02° 18'26" W 53° 14'10" N
Cambridge	00° 02'23" E 52° 10'06"; N
Darnhall	02° 32'46" W 53° 08'38" N
Pickmere	02° 26'42" W 53° 16'44" N
Defford	02° 08'10" W 52° 05'28" N
Knockin	03° 00'40" W 52° 46'41" N

Annex 6

Proposed Wireless Telegraphy (Register) Amending Regulations 2006

DRAFT STATUTORY INSTRUMENTS

2006 No. XXX

ELECTRONIC COMMUNICATIONS

The Wireless Telegraphy (Register) (Amendment) (No. []) Regulations 2006

Made - - - - - ***

Coming into force - - - - - ***

The Office of Communications (“OFCOM”) make the following Regulations in exercise of the powers conferred by section 170(1) and (2) and section 403(7) of the Communications Act 2003⁽¹²⁾ (“the Act”).

Before making the Regulations OFCOM have given notice of their proposal to do so in accordance with section 403(4)(a) of the Act, published notice of their proposal in accordance with section 403(4)(b) of the Act, and have considered the representations made to them before the time specified in the notice in accordance with section 403(4)(c) of the Act.

Citation and commencement

1.— These Regulations may be cited as the Wireless Telegraphy (Register) (Amendment) (No.[]) Regulations 2006 and shall come into force on [] 2006.

Amendment of the Wireless Telegraphy (Register) Regulations 2004

2. —The Wireless Telegraphy (Register) Regulations 2004 are amended as follows:
(1) In Regulation 4, subsection (1), after the words “which relate to the issue”, and before the word “renewal” insert the word “making,”

(2) In Regulation 4, subsection (1) after the words “wireless telegraphy licences”, and before the word “of” insert the words “or a grant of recognised spectrum access”;

(3) In Regulation 4, subsection (2)(a), after the words “wireless telegraphy licence” insert the words “or the holder or concurrent holders of a grant of recognised spectrum access”,

(4) In Regulation 4, subsection (2)(b), after the words “wireless telegraphy licence” insert the words “or grant of recognised spectrum access”,

(5) In Regulation 4, subsection (2)(c), after the words “wireless telegraphy licence” insert the words “or grant of recognised spectrum access”,

⁽¹²⁾ 2003 c. 21

Notice of Ofcom's proposal to make regulations in connection with Recognised Spectrum Access (RSA) for radio astronomy

- (6) In Regulation 4, subsection (2)(c)(i), after the word “assigned” insert the words “or recognised”,
 (7) In Regulation 4, subsection (2)(c)(ii), after the words “the geographical area of”, and before the word “transmission” insert the words “reception or”
 (8) In the Schedule, after Part 7 add the following Part—

"PART 8

<i>Column 1</i>	<i>Column 2</i>
Recognised Spectrum Access class	Frequency bands
Radio Astronomy	37.75-38.25 MHz
	80.5-82.5 MHz
	150.05-152 MHz
	606.0-614.0 MHz
	1.400-1.427 GHz
	1.6106-1.6138 GHz
	1.6600-1.6605 GHz
	1.6605-1.6680 GHz
	1.668-1.670 GHz
	2.69-2.70 GHz
	10.60-10.68 GHz
	10.68-10.70 GHz
	15.35-15.40 GHz
	22.01-22.21 GHz
	22.21-22.50 GHz
	22.81-22.86 GHz
	23.07-23.12GHz
	23.6-24.0 GHz
	31.3-31.5 GHz
	31.5-31.8 GHz
	42.5-43.5 GHz
	48.94-49.04 GHz

“

EXPLANATORY NOTE

(This note is not part of the Regulations)

These Regulations amend the Wireless Telegraphy (Register) Regulations 2004 (S.I. 2004/3155) (the "Principal Regulations").

The Principal Regulations require OFCOM to establish and maintain a public register of relevant information relating to wireless telegraphy licences of certain classes which apply to a station or apparatus operating within certain frequency bands specified in the Schedule to the Principal Regulations. Section 170 of the Communications Act 2003 provides that the making, renewal or transfer of grants of recognised spectrum access is relevant information that may be included on the public register.

Regulation 2 of these Regulations amends the Principal Regulations by adding grants of recognised spectrum access as items in the existing Schedule, which records certain wireless telegraphy classes of licence and the relevant frequency bands for those licence classes.

A full regulatory impact assessment of the effect that these Regulations will have on the costs to business is available to the public from OFCOM at Riverside House, 2a Southwark Bridge Road, London SE1 9HA (Tel: 020 7981 3000) or on the Office of Communications Internet web site at www.ofcom.org.uk. Copies of the report have also been placed in the libraries of both Houses of Parliament

Annex 7

Proposed Recognised Spectrum Access Charging Regulations

DRAFT STATUTORY INSTRUMENTS

2006 No. XXXX

ELECTRONIC COMMUNICATIONS

The Wireless Telegraphy (Recognised Spectrum Access Charges) Regulations 2006

Made - - - -

Date

Coming into force - -

Date

The Office of Communications (“OFCOM”) make the following Regulations in exercise of the powers conferred on OFCOM by sections 1 and 2(2) of the Wireless Telegraphy Act 1998⁽¹³⁾ (“the 1998 Act”) and section 403(7) of the Communications Act 2003⁽¹⁴⁾ (“the 2003 Act”) as applied by section 6(1) of the 1998 Act;

Before making these Regulations OFCOM have given notice of their proposal to do so in accordance with section 403(4)(a) of the 2003 Act as applied by section 6(1) of the 1998 Act, published notice of their proposal in accordance with section 403(4)(b) of the 2003 Act as applied by section 6(1) of the 1998 Act and have considered the representations made to them before the time specified in that notice in accordance with section 403(4)(c) of the 2003 Act as applied by section 6(1) of the 1998 Act.

Citation, commencement and extent

1.—(1) These Regulations may be cited as the Wireless Telegraphy (Recognised Spectrum Access Charges) Regulations 2006 and shall come into force on [] 2006.

(2) These Regulations shall not extend to the Channel Islands or to the Isle of Man.

Time of payment

2.—(1) There shall be paid to OFCOM —

- (a) on the making of a grant of recognised spectrum access; and
- (b) on the last day of each period of twelve months following the grant when the grant remains in force;

the sum specified in these regulations.

⁽¹³⁾ 1998 c.6. Section 3 of the 1998 Act was amended by the Communications Act 2003 (c.21), section 167, section 406, Schedule 17, paragraph 149 and Schedule 19(1).

⁽¹⁴⁾ 2003 c.21.

Charges for grants in respect of Part 1 frequency bands

3.—(1) In the case of a grant of recognised spectrum access in respect of any frequencies within the frequency bands specified in Part 1 of the Schedule and in respect of which Ofcom undertakes not to authorise other users of these frequencies within a restricted zone the sum shall be the higher of—

- (a) £500; and
- (b) an amount equal to £0.51 multiplied by the number of megahertz of radio frequencies in respect of which the grant is made multiplied by the squared radius in kilometres of the restricted area specified in the grant multiplied by π multiplied by 100 per cent.

(2) In the case of any other grant of recognised spectrum access in respect of any frequencies within the frequency bands specified in Part 1 of the Schedule the sum shall be the higher of—

- (a) £500; and
- (b) an amount equal to £0.51 multiplied by the number of megahertz of radio frequencies in respect of which the grant is made multiplied by the squared radius in kilometres of the restricted area specified in the grant multiplied by π multiplied by 5 per cent.

Charges for grants in respect of Part 2 frequency bands

4.— In the case of a grant of recognised spectrum access in respect of any frequencies within the frequency bands specified in Part 2 of the Schedule the sum shall be the higher of—

- (a) £500; and
- (b) an amount equal to £1.65 multiplied by the number of megahertz of radio frequencies in respect of which the grant is made multiplied by the squared radius in kilometres of the restricted area specified in the grant multiplied by π .

Charges for grants in respect of Part 3 frequency bands

5.— In the case of a grant of recognised spectrum access in respect of any frequencies within the frequency bands specified in Part 3 of the Schedule the sum shall be £22,500.

Charges for grants in respect of Part 4 frequency bands

6.—In the case of a grant of recognised spectrum access in respect of any frequencies within the frequency bands specified in Part 4 of the Schedule the sum shall be £500.

Chief Executive of the Office of Communications
For and on the authority of the Office of Communications

[] 2006

SCHEDULE

Regulations 3, 4, 5 and 6

FREQUENCY BANDS

PART 1

FIXED SERVICE BANDS

1.6605 – 1.6680 GHz

1.668 – 1.670 GHz

10.60 – 10.68 GHz

22.01 – 22.21 GHz
22.21 – 22.50 GHz
22.81 – 22.86 GHz
23.07 – 23.12 GHz
31.5 – 31.8 GHz

PART 2
MOBILE SERVICE BANDS

37.75 – 38.25 MHz
80.5 – 82.5 MHz
150.05 – 152.00 MHz

PART 3
BROADCASTING SERVICE BANDS

606 – 614 MHz

PART 4
FIXED FEE BANDS

1.400 – 1.427 GHz
1.6106 – 1.6138 GHz
1.6600 – 1.6605 GHz
2.69 – 2.70 GHz
10.68 – 10.7 GHz
15.35 – 15.4 GHz
23.6 – 24 GHz
31.3 – 31.5 GHz
42.5 – 43.5 GHz
48.94 – 49.04 GHz

EXPLANATORY NOTE

(This note is not part of the Regulations)

These Regulations are made by the Office of Communications (“OFCOM”) under sections 1 and 2(2) of the Wireless Telegraphy Act 1998 (c.6) (“the 1998 Act”) and sections 403(7) of the Communications Act 2003 (c.21) (“the 2003 Act”) as applied by section 6(1) of the 1998 Act.

These Regulations provide for fees to be paid to OFCOM in respect of recognised spectrum access grants made under section 159 of the 2003 Act.

Regulation 1(2) provides that these Regulations do not extend to the Channel Islands or the Isle of Man.

Regulation 2 makes provision for —

- (a) the sum payable to OFCOM as specified in, or determined in accordance with the provisions of these Regulations; and
- (b) when such sums are payable.

Regulation 3(1) makes provision for the sum payable to OFCOM for grants of recognised spectrum access in respect of any frequencies within the frequency bands specified within Part 1 of the Schedule and in respect of which OFCOM undertakes not to authorise other uses of these frequencies within a restricted zone.

Regulation 3(1) makes provision for the sum payable to OFCOM for grants of recognised spectrum access in respect of any frequencies within the frequency bands specified within Part 1 of the Schedule.

Regulation 4 makes provision for the sum payable to OFCOM for grants of recognised spectrum access in respect of any frequencies within the frequency bands specified within Part 2 of the Schedule.

Regulation 5 makes provision for the sum payable to OFCOM for grants of recognised spectrum access in respect of any frequencies within the frequency bands specified within Part 3 of the Schedule.

Regulation 6 makes provision for the sum payable to OFCOM for grants of recognised spectrum access in respect of any frequencies within the frequency bands specified within Part 4 of the Schedule. [].

A full regulatory impact assessment of the effect that these Regulations will have on the costs to business is available to the public from the OFCOM Library at Riverside House, 2a Southwark Bridge Road, London SE1 9HA (Tel: 020 7981 3000) or on OFCOM's website at www.ofcom.org.uk. Copies of this assessment have also been placed in the libraries of both Houses of Parliament.

Annex 8

Regulatory Impact Assessments for the proposed Regulations

- A8.1 The analysis presented in this Section, when read in conjunction with the rest of this document, represents a Regulatory Impact Assessment ("RIA"), as defined by section 7 of the Act. You should send any comments on this RIA to Ofcom by the closing date for this consultation. We will consider all comments before deciding whether to implement our proposals.
- A8.2 RIAs 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 and are commonly used by other regulators. This is reflected in section 7 of the Act, which means that generally we have to carry out RIAs 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. In accordance with section 7 of the Act, in producing the RIA in this document Ofcom has had regard to such general guidance as it considers appropriate, including related Cabinet Office guidance.

Regulatory Impact Assessment - The Wireless Telegraphy ([Radio Receivers] Recognised Spectrum Access) Regulations 2006

- A8.3 Ofcom published a consultation on Recognised Spectrum Access (RSA) as applied to radio astronomy in April 2005. This included an Impact Assessment (IA). Ofcom's conclusions following consideration of responses to the consultation were given in its statement of October 2005 <http://www.ofcom.org.uk/consult/condocs/astronomy>. This RIA considers the principle of introducing RSA for radio astronomy and the framework for introducing it. It reflects closely the relevant sections of the IA included in the April consultation because Ofcom's proposals are unchanged from those put forward in the Consultation, with the exception of the issue of spectrum trading for RSA.
- A8.4 The issue of tradability of public sector spectrum, including spectrum used for radio astronomy and conversion into licences was considered in the Independent Audit of Spectrum Holdings and the Government's response (www.spectrumbaudit.org.uk). As stated in the Government's response, although Ofcom believes that the ability to trade spectrum and convert RSA into licences and vice versa will help secure optimal use of the spectrum¹⁵, it has decided to defer the introduction of spectrum trading for RSA applied to radio astronomy pending clarification by the Government of how income from the trading of public sector spectrum will be treated in order to provide effective and proper incentives to users. This will be discussed between departments and HM Treasury in the context of the 2007 Comprehensive Spending Review, which will commence shortly.

Policy, purpose and intended effect

- A8.5 Ofcom's objective is to exercise its functions in relation to spectrum used for radio astronomy in a way that complies with its international obligations and secures

¹⁵ If, in the future, use of a particular frequency or location became redundant, radio astronomy could potentially benefit from trading the spectrum and society would benefit from more efficient spectrum use.

optimal use of the spectrum in accordance with its statutory duties. It aims to do this by maximising the value created by use of the radio spectrum while recognising the non-commercial benefits of scientific research. The proposals in this document will achieve this by:

- making transparent the economic cost of making spectrum available for radio astronomy and so assisting rational and informed decision-making;
- providing appropriate incentives for radio astronomers while empowering them to choose whether or not to relinquish spectrum;
- ensuring, through funding arrangements that are the responsibility of the government and PPARC, that financial support for radio astronomy will not be reduced as a result of the proposals and could even increase.

A8.6 Ofcom has considered two scenarios: introduction of RSA for radio astronomy and continuation of the status quo without RSA.

Benefits of RSA

A8.7 As discussed in Section 4, Ofcom believes that RSA will be beneficial for radio astronomy as well as helping to secure optimal use of the radio spectrum.

A8.8 RSA will provide radio astronomers enhanced security and incentives to use spectrum more efficiently. Efficiency gains could open up opportunities for alternative uses of spectrum that could promote innovation and competition, benefiting radio-using businesses and consumers.

A8.9 The main benefits of radio astronomy are not economic. Nonetheless, radio astronomy research contributes to the UK economy by training high quality scientist and engineers and therefore increasing UK industrial competitiveness.

A8.10 Radio astronomy also contributes to technology development and has collaborated with industry on development of low noise measurement receiver and antenna technologies.

Costs of RSA

A8.11 The costs of RSA will be the increase in fees compared to the amount currently paid by PPARC to Ofcom. Fees will be no greater than necessary for spectrum management purposes. Ofcom understands that the increase in fees will be factored into the financial support available to radio astronomy so that any impact on the funding available for radio astronomy will be offset. A full assessment of the impact of the specific charges Ofcom is proposing to set is contained in the Regulatory Impact Assessment for the Regulatory Impact Assessment – The Wireless Telegraphy (Recognised Spectrum Access Charges) Regulations 2006.

A8.12 Ofcom has already assessed the burden of the introduction of AIP to various radio astronomy frequency bands and as a result considers that application of RSA to radio astronomy will not place an extra burden on Ofcom.

A8.13 Ofcom proposes to review fees for radio astronomy RSA approximately every 5 years or when PPARC proposes amendments to the RS grant. The methodology for calculating the fee charged will be based on spectrum management considerations.

A8.14 Ofcom believes that it is unlikely that applying RSA to radio astronomy will cause an increase in its own administrative costs. Although Ofcom will have to review fees every five years, much of the work in calculating opportunity costs will have been carried out in setting fees for other spectrum users. Moreover, in between review periods, administrative costs may actually be lower because there will be no need to re-calculate the fees until the next review period, unlike the current system.

Options and assessment

A8.15 The following table analyses the options, the benefits, costs and risks and mitigating measures associated with the proposals discussed in this document.

Option/issue	Benefits	Costs/risks	Mitigation
Introduce RSA	Enhance security for radio astronomy Incentives to share spectrum with commercial users	Radio astronomy bears higher fees. Risks reducing funding for radio astronomy and impacts UK achievements in field	Radio astronomers can decide whether or not to take advantage of RSA. Funding for radio astronomy sufficient to offset the impact of RSA fee.
Technical parameters of RSA	Recognition will provide enhanced assurance as Ofcom will have a statutory duty to take radio astronomy into account in spectrum planning.	If parameters are too demanding, other services will be unduly constrained. If they are too relaxed, radio astronomy will be affected by harmful interference.	Appropriate choice of technical parameters based on international standards. When introduced, trading and conversion will provide a mechanism to adjust boundaries with commercial services.

Conclusion

A8.16 The introduction of RSA for radio astronomy is expected to be beneficial for the economy by promoting efficient use of spectrum. It also offers radio astronomy users additional security. It is not expected to lead to a reduction in radio astronomy activity in the UK as the government has indicated that account will be taken of the long-term nature of radio astronomy research and the need to ensure security of access to spectrum and financial certainty. (ref Cave report paragraph 11.6)¹⁶ Moreover, the costs that industry and Ofcom would incur appear small and likely to be outweighed by the benefits.

¹⁶ The Government Response to the Review of Radio Spectrum Management – October 2002; section 11.6

Regulatory Impact Assessment – the Wireless Telegraphy (Limitation of Number of Grants of Recognised Spectrum Access) Order 2006

Proposal, purpose and intended effect

- A8.17 Following the Consultation and Statement on the Recognised Spectrum Access as applied to Radio Astronomy, Ofcom has decided to apply RSA to radio astronomy.
- A8.18 The draft Limitation Order to which this Impact Assessment relates is intended to allow Ofcom to limit the number of grants of RSA for radio astronomy it makes in the frequency bands specified in the Order. The grant of RSA under these circumstances would be limited to users at existing radio astronomy sites/the sites specified in the Order.

Costs and benefits to radio astronomy users

- A8.19 Ofcom's considers that limiting the grant of RSA for radio astronomy to the frequency bands and sites specified will not impose costs on radio astronomy because these are the only locations where the frequencies radio astronomy requires are available now and for the foreseeable future in the UK. At other feasible locations, users are already very likely to have licenses to transmit in those frequencies.
- A8.20 Ofcom's aim of applying incentives for radio astronomers to use spectrum more efficiently can be met without applying RSA more widely. Before trading and conversion are introduced, there is no advantage in making RSA available more widely. There would be no practical point in granting RSA in areas where there are existing licensees as interference levels would in all probability be too high for successful radio astronomy observations.

Costs to Ofcom

- A8.21 The costs to Ofcom of limiting the grant of RSA for radio astronomy are likely to be negligible. If anything they may be lower than not having this limitation because Ofcom may make fewer grants of RSA.

Sectors affected

- A8.22 The sector affected by this proposal is radio astronomy.
- A8.23 Other business sectors may benefit from opportunities to access more spectrum, as a result of the incentives to promote efficient use of the spectrum allocated to radio astronomy contained in these proposals.

Conclusion

- A8.24 Ofcom has assessed the impact of limiting the grant of RSA for radio astronomy and has concluded that the better option is limitation. This is primarily because radio astronomy users are unlikely to be disadvantaged by this proposition.

The Wireless Telegraphy (Register) (Amendment) (No. [1]) Regulations 2006

Proposal, purpose and intended effect

- A8.25 In order to enhance the general development of a secondary market for the right to use spectrum, Ofcom has established and maintains a register about spectrum licences - the Wireless Telegraphy Register.
- A8.26 The intended effect of this proposal is to enable information about the grants of Recognised Spectrum Access for Radio astronomy to be published in this Wireless Telegraphy Register. In so doing this should facilitate sharing of bands used for radio astronomy, where permitted, by other services. If the trading of grants of RSA is allowed in the future, it should also be facilitated by publishing this information on the Register.

Costs and benefits

- A8.27 Ofcom carried out a regulatory impact assessment for the Wireless Telegraphy (Register) Regulations 2004, (published December 2004), which established the Register. This proposed amendment to those regulations only has the effect of including the specified grants of RSA within the regulations. Ofcom considers that the original RIA is also relevant to the impact assessment for these current regulations.
- A8.28 The RIA for the Wireless Telegraphy (Register) Regulations 2004 concluded that the benefits of a having a register exceeded the costs that would be incurred by Ofcom and business in establishing and maintaining the register, and in publishing information. The costs to Ofcom of updating the Register to add RSA grants will be minimal since it has already been established and would be maintained regardless of the current regulations. Moreover, if grants of RSA are not added to the Register, other spectrum users may incur greater costs in coordinating with radio astronomy.

Business sectors affected

- A8.29 The sector affected by this proposal radio astronomy.
- A8.30 Other business sectors may benefit from opportunities to access more spectrum as a result of the incentives to promote efficient use of the spectrum allocated to radio astronomy contained in these proposals.

Conclusions

- A8.31 Ofcom's assessment is that the benefits of including grants of RSA for radio astronomy within the Wireless Telegraphy Register are likely to outweigh the costs. The costs would be minimal because the register has already been established, and the benefits from lower coordination costs could also be gained.

Regulatory Impact Assessment – The Wireless Telegraphy (Recognised Spectrum Access Charges) Regulations 2006

Proposal, purpose and intended effect

- A8.32 These Regulations have the effect of setting out the way in which the charges for Recognised Spectrum Access as applied to radio astronomy would be calculated for the frequency bands in which RSA would be granted.

A8.33 The charges are based on the opportunity cost of the spectrum in the relevant frequency bands. By setting charges on this basis, Ofcom intends to promote efficient decisions about the use of spectrum for radio astronomy that take into account the cost to the economy of spectrum use, in terms of the value that alternative users could make of the spectrum.

Options and assessment

A8.34 The benefits, costs and mitigating factors relating to Ofcom's proposed charges for RSA applied to radio astronomy are summarised in the table below.

Option/issue	Benefits	Costs/risks	Mitigation
Level of fees	Incentives for Spectrum efficiency. Transparency aids decision-making	Financial impact on radio astronomy and reduction in funds for research	The fees no higher than necessary and based on spectrum management considerations. Any reductions of fees from more efficient use will be retained for science.

Costs to Ofcom

A8.35 The charges for RSA applied to radio astronomy are based on existing calculation of AIP charged to other spectrum users, therefore Ofcom will incur little additional cost in setting these charges.

Sectors affected

A8.36 The sector affected by this proposal is radio astronomy.

A8.37 Other business sectors may benefit from opportunities to access more spectrum, as a result of the incentives to promote efficient use of the spectrum allocated to radio astronomy contained in these proposals.

Conclusion

A8.38 Ofcom considers that the benefits of more efficient spectrum that apply these charges will create are much greater than the costs of the additional fees that will be paid by radio astronomers for RSA compared to the present cost-based amounts they pay to Ofcom. There should be no adverse impact on the level or standard of radio astronomy in the UK as the Government has undertaken to offset the prospective increase in the fees paid.

Annex 9

Illustrative RSA document

OFCOM

Communications Act 2003

Notification of RECOGNISED SPECTRUM ACCESS (RSA) grant by the Office of Communications ("Ofcom") under section 159 of the Communications Act 2003 ("the Act")

RSA no.

Date of grant:

PART 1 - GENERAL

1. In granting this Recognised Spectrum Access ("RSA") the Office of Communications ("Ofcom") recognises the use of frequencies in the electromagnetic spectrum in Table 2 by

[Body] (the "grantee")
of Address
Address
Address
postcode

for wireless telegraphy subject to the conditions and restrictions in the terms below.

RSA Term

2. This grant of RSA shall commence on [day, month, year] (the date of issue) and continue in force unless revoked by Ofcom in accordance with paragraph 3.

Revocation and Variation of RSA

3. Pursuant to Schedule 5 of the Act Ofcom may only revoke this RSA:
 - a. at the request of, or with the consent of the grantee; or
 - b. with 5 years notice served on the grantee; or
 - c. immediately (subject to the procedures in the Act) if it appears to Ofcom to be necessary or expedient to revoke the RSA for the purposes of complying with a direction by the Secretary of State given to Ofcom under section 156 of the Act, or under sections 5 and 132 of the Act; or

- d. immediately (subject to the procedures in the Act) in accordance with any international statutory obligations placed on Ofcom under European Community or other agreement which may affect the spectrum recognised; or
 - e. if there has been a failure to pay the fee prescribed in accordance with paragraph 8; or
 - f. if there has been a material breach of any of the terms of this RSA by the grantee; or
 - g. if, in connection with the transfer or proposed transfer of rights and obligations arising by virtue of this RSA, there has been a breach of any provision of any regulations made by Ofcom under the powers conferred by sections 168 (1) and (3) of the Act.
- 4. The grantee may surrender all or part of this RSA at any time during the term.
- 5. Where Ofcom exercises their power to revoke or vary this RSA in accordance with Schedule 5 of the Act, the grantee shall be notified in writing.

Changes

- 6. This RSA is not transferable.
- 7. The RSA grantee must give immediate notice to Ofcom in writing of any changes in the details of the name and address from that recorded above.

RSA Fees

- 8. The grantee shall pay Ofcom the relevant sums as provided in the fee regulations made from time to time under section 1 of the Wireless Telegraphy Act 1998, payable;
 - a. on or before the date of this RSA; and
 - b. on or before the payment date shown on this RSA for subsequent payments or such other date or dates as shall be notified in writing to the holder (if this RSA Grant is renewable),in accordance with those fee regulations and any relevant terms of this RSA, failing which Ofcom may revoke this grant of RSA.
- 9. If this RSA is surrendered or revoked, no refund, whether in whole or in part of any amount which is due under the terms of this RSA or provided for in any regulations

made by Ofcom under section 1 of the Wireless Telegraphy Act 1998 will be made, except at the absolute discretion of Ofcom and in accordance with those regulations.

PART 2 – RECOGNISED SPECTRUM USE

Recognised location of spectrum use

10. The spectrum use recognised by this RSA is at the location of the wireless telegraphy station which is specified in Table 1.

Recognised purpose of spectrum use

11. This RSA applies in relation to receive-only use of the electromagnetic spectrum for wireless telegraphy at ground level at the location specified in Table 1.

Recognised frequencies

12. The frequency bands of use recognised in this RSA are specified in Table 2.

Recognised interference levels

13. The recognised maximum level of interference (expressed in dWB/MHz), arising from other authorised users (who operate within the recognised frequencies in Table 2), at the input to the receiver of the station identified in Table 1 is set out in Table 3 (the "Spectrum Quality Benchmark Level").
14. In recognising use of the radio spectrum by the grantee, Ofcom undertakes to take the RSA into account when carrying out the functions referred to in section 160(1) of the Act to the same extent as Ofcom would take into account a wireless telegraphy licence with terms, provisions and limitations making equivalent provision and, in that regard, subject to paragraphs 15 and 16, when granting wireless telegraphy licences under section 1 of the Wireless Telegraphy Act 1949 and making grants of recognised spectrum access¹⁷ under the Act, Ofcom will not authorise transmissions -
 - a. which operate using the frequency bands described in Table 2; and
 - b. which transmit from within the restricted zone described in Table 4,

¹⁷ In instances where the spectrum use recognised in the grant of RSA includes transmission.

where the effect of such a grant would be to increase the level of radio emissions received at the input to the receiver of the station whose location is stated in Table 1, above the benchmark level set out in Table 3 below.

15. Notwithstanding paragraph 14, Ofcom will authorise transmissions by grant of a wireless telegraphy licence or by a grant of recognised spectrum access where it appears to Ofcom to be requisite or expedient to do so -
- in the interests of national security, or
 - for the purposes of complying with an Community obligation of the United Kingdom or with any international agreement or arrangement to which the United Kingdom is a party;
 - for the purposes of complying with a direction by the Secretary of state given to Ofcom under section 5 or section 156 of the Communications Act 2003.
16. Nothing in this grant of RSA provides any undertaking in relation to any interference (including harmful interference) which may arise from factors and sources outside Ofcom's control including, without limitation, natural phenomena such as atmospheric pressure and wind direction, unlicensed users¹⁸, users outside the United Kingdom and licence exempt use.

Interpretation

17. In this grant of RSA:
- "wireless telegraphy" has the meaning set out in section 19 of the Wireless Telegraphy Act 1949
 - "dBW/MHz" means decibels relative to one Watt of power per MegaHertz of frequency

Table 1: Recognised location of wireless telegraphy use

The location of the wireless telegraphy station is:	NGR	
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Table 2: Recognised frequencies

Frequency band – from:	MHz	
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¹⁸ Ofcom may take enforcement action against persons Ofcom believes may have transmitted without a wireless telegraphy licence, or transmitted in contravention of a wireless telegraphy licence.

Frequency band – to:	MHz	
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Table 3: Spectrum quality benchmark level

Recognised maximum level of interference measured at the input to the receiver of the station in Table 1	dBW/MHz	
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Table 4: Restricted zone

The restricted zone is an area falling within a circle which has the station with the location (in coordinates) specified in Table 1 as its centre and a radius specified of:	Radius in kilometres	
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Issued by Ofcom

RSA grant reference number	
RSA	«Radio Astronomy»
RSA grant holder	«name»
RSA grant holder address	«address»
Date of granting	«date»
RSA start date	«date»
RSA end date	«date»
Fee payment date	
SQB reference number	

Annex 10

Example AIP fee calculations

Example AIP calculation for frequency bands shared with the fixed service with i) an associated coordination zone, and ii) a restricted zone

A10.1 A grant application is made for a radio astronomy station for 50MHz of spectrum with an associated coordination zone radius of 10km within a frequency band shared with the fixed service (refer to proposed fees Regulation 3(2)). The fee would be calculated as follows:

$$\underline{AIP = BW \times (\pi \times r^2) \times STU \times \text{Impact Factor}}$$

$$\begin{aligned}\text{Therefore the AIP fee} &= \underline{50 \times (\pi \times 10^2) \times 0.51 \times 0.05} \\ &= \text{£}400\end{aligned}$$

A grant application is made for a radio astronomy station for 10MHz of spectrum with an associated restricted zone radius of 5km within a frequency band shared with the fixed service (refer to proposed fees Regulation 3(1)). The fee would be calculated as follows:

$$\underline{AIP = BW \times (\pi \times r^2) \times STU \times \text{Impact Factor}}$$

$$\begin{aligned}\text{Therefore the AIP fee} &= \underline{10 \times (\pi \times 5^2) \times 0.51 \times 1} \\ &= \text{£ } 400\end{aligned}$$

Example AIP calculation for frequency bands shared with the mobile service

A10.2 A grant application is made for a radio astronomy station for 20MHz of spectrum with an associated restricted zone radius of 8km within a frequency band shared with the mobile service (refer to proposed fees Regulation 4). The fee would be calculated as follows:

$$\underline{AIP = BW \times (\pi \times r^2) \times STU}$$

$$\begin{aligned}\text{Therefore the AIP fee} &= \underline{20 \times (\pi \times 8^2) \times 1.65} \\ &= \text{£}6,635\end{aligned}$$

Annex 11

Economic Approach to using AIP

Rationale and objectives of AIP

A11.1 As we explained in the 2005 Consultation on Spectrum Pricing¹⁹, under the Communications Act 2003, Ofcom has a general duty to promote the “efficient use and management of the electro-magnetic spectrum for wireless telegraphy; and for connected purposes”. In exercising its functions in relation to spectrum management (including its power to set licence fees), Ofcom is also required (under section 154) to have regard, inter alia, to:

- a) the extent to which the electro-magnetic spectrum is available for use;
- b) present and future demand for use of that spectrum for wireless telegraphy;
- c) the desirability of promoting:
 - i) efficient use and management of the electro magnetic spectrum;
 - ii) economic and other benefits arising from the use of wireless telegraphy;
 - iii) the development of innovative services; and
 - iv) competition in the provision of electronic communications services.

A11.2 Ofcom is proposing to set administrative charges for the grant of RSA on the basis of opportunity cost. This is the same as the basis on which AIP fees are set. Therefore the following arguments on the economic rationale for AIP should be taken as applying equally to RSA.

A11.3 Ofcom considers that AIP is an important mechanism for promoting efficient spectrum management. This is because AIP signals to the spectrum user the opportunity cost to society of using the resource. The rationale for AIP is to promote the efficient use of spectrum (where it is congested) by allocating it to those who value it most. Those users to whom spectrum is worth more than the AIP fee will keep the spectrum they hold (or buy any that becomes available), and those to whom spectrum is worth less will return spectrum to Ofcom (or sell spectrum) until the value of the spectrum remaining to them is equal to or above AIP.

A11.4 In determining appropriate spectrum prices under AIP, the starting premise is that spectrum is a finite resource with competing demands for its use. Prices should be set to encourage the allocation of spectrum (bearing in mind that the supply is fixed) to competing uses in a way that generates the best outcome for society. The best outcome is reached when transferring one “unit” of spectrum from one use to another does not result in an overall increase in the value generated by the spectrum. This means that the additional value of having one unit of spectrum (the marginal benefit) is the same in both competing uses. If the regulator can set spectrum prices at this level, spectrum users will be encouraged to buy or sell spectrum until the benefit to them of an extra unit of spectrum is equal to the price. This is the economic principle

¹⁹ Spectrum Pricing - A consultation on proposals for setting wireless telegraphy act licence fees
http://www.ofcom.org.uk/consult/condocs/spec_pricing/spec_pricing/spec_pricing.pdf

underpinning administrative pricing. To do this, ideally the “equilibrium point” i.e. where marginal are equal benefits across competing uses, (given the fixed supply of spectrum) should be estimated.

- A11.5 It is difficult to identify this equilibrium point directly, without knowing first what the most efficient allocation of spectrum is (if this could easily be derived, Ofcom could just allocate the spectrum accordingly). In practice, we can estimate the marginal benefit of the spectrum to “representative” users in its existing and alternative uses. AIP could be adjusted towards the equilibrium point over time as follows: initially AIP could be set according to the value of spectrum in its existing use. It could then be adjusted at regular review periods towards the value in the alternative use (re-calculated each time), taking into account information on changes in spectrum usage during the review period.
- A11.6 To estimate the marginal benefit of spectrum, it is necessary to calculate the cost of alternative means for the representative user of achieving the same output. The core purpose of administered pricing is to influence the choices made by spectrum users so that:
- decisions on spectrum use take into account the value of spectrum to alternative users (and potentially alternative uses of the spectrum);
 - users of the spectrum consider alternative means of communication -not necessarily requiring access to the radio spectrum - and seek to avoid use of the most congested frequencies;
 - existing users examine their spectrum needs and shed surplus spectrum; and
 - new entrants and new technologies have a greater chance of gaining access to the spectrum if their use has a higher potential value.

Three types of efficiency

- A11.7 Economic efficiency can be looked at in three different ways relating to consumption, production, and the use of resources over time. The methodology for setting AIP fees will depend on which of these definitions of efficiency we are aiming for. The three definitions of efficiency are:
- **allocative efficiency** – an allocation of inputs that maximises the value of goods and services produced such that no other allocation can increase the well-being of one economic agent without harming that of another;
 - **productive efficiency** – an allocation of inputs in the production of goods and services that produces a given level of output at the lowest possible cost;
 - **dynamic efficiency** – inputs are allocated to the production of goods and services over time so that productive and allocative efficiency are maintained in response to changes in technology or consumer preferences.
- A11.8 Pricing can promote the attainment of allocative efficiency by reflecting what those who value spectrum most highly are willing to pay to use it. Prices set at the appropriate level will ration demand, so that only those who value an additional unit of spectrum more than the price charged for it will demand more spectrum. When the demand for spectrum from all the competing uses matches the supply, the allocation of spectrum should be efficient (externalities may affect this and will be discussed

later). As discussed previously, it would not be possible to increase the total value generated from the spectrum by re-allocating spectrum from one use to another.

A11.9 Pricing can promote productive efficiency by reflecting the opportunity cost to a specific user of using spectrum, at a given level of output. The opportunity cost of spectrum is its value at the margin in terms of the cost of other inputs saved by using the spectrum, while keeping output constant. Setting price equal to the opportunity cost encourages productive efficiency by creating incentives for users to minimise the cost of producing a given level of output. One measure of the marginal benefit of using spectrum (assuming output is held constant) is the cost saved by using one additional unit or channel of spectrum, e.g. not having to install more base stations. If the marginal benefit to the user is less than the opportunity cost of the spectrum, the user will have an incentive to give up spectrum.²⁰

A11.10 Dynamic efficiency can be promoted by adjusting prices regularly - on the basis explained above - to take account of changes in the market. Ofcom has proposed to review AIP levels every 3 to 5 years, depending on the specific licence class. Regularly reviewing AIP levels enables Ofcom to reflect such developments and help ensure dynamic efficiency in the use of spectrum. This also fits in with Ofcom's duty to promote innovation.

Taking social benefits into account

A11.11 Ofcom has the power to set AIP fees to take into account objectives other than promoting efficiency. Ofcom can set AIP levels to promote 'economic and other benefits' e.g. social benefits and costs. Ofcom should consider whether it would be more effective and efficient to address social benefits/costs through AIP or through existing policy tools.

A11.12 Some Ofcom stakeholders have argued that AIP should take into account the social benefits (and costs) associated with the use of spectrum by certain services, most notably the public service aspects of broadcasting, but also social benefits associated with emergency services. Since Ofcom intends that AIP fees will reflect the demand for spectrum from competing uses, it could be argued that if AIP ignores social benefits, the benefits of spectrum to the economy and society may not be maximised.

A11.13 Indepem addressed this issue in their review of spectrum pricing. Following the work of Diamond and Mirrlees²¹ they concluded that it was better to address externalities such as social benefits by focusing on outputs rather than by subsidising the price of inputs such as spectrum. For example, subsidies could be provided to producers or directly to end users to take account of the social value. They noted that other inputs such as electricity were not subsidised to take account of externalities.

²⁰ Productive efficiency is a necessary condition for allocative efficiency. However while productive efficiency concerns how goods and services are produced, allocative efficiency also concerns maximising the value of those goods and services produced to consumers. Therefore productive efficiency is not sufficient by itself to ensure allocative efficiency.

²¹ 'Optimal taxation and public production 1: Production efficiency and 2: Tax rules' American Economic Review, vol. 61, Peter Diamond and James Mirrlees, 1971. This work proved that, in competitive markets, if the prices of inputs are set so that a given level of output is produced at the minimum cost (productive efficiency), then retail prices can be adjusted by subsidies so that social benefits are taken into account in markets for end-user goods and services.

A11.14 Ofcom believes that in general the approach suggested by Indepen is likely to be the better way forward and has proposed this approach in its 2006 Consultation on Future Pricing of Spectrum used for Terrestrial Broadcasting²².

²² <http://www.ofcom.org.uk/consult/condocs/futurepricing/>