

Spectrum Framework Review: Implementation Plan – Interim Statement

Issued: 28 July 2005

Contents

Section	Page
Executive summary	- 3 -
Introduction	- 6 -
Policy on awarding spectrum	- 7 -
Spectrum awards programme	- 21 -
Annex A	- 35 -
Summary of responses	- 35 -
Annex B	- 55 -
Glossary	- 55 -

Section 1

Executive summary

Spectrum is a key resource

- 1.1 Radio spectrum is a vital input to electronic communication services and networks and a major asset to the UK. One of Ofcom's primary statutory duties is to ensure the optimal use of the radio spectrum in the interests of citizens and consumers. It is essential that the regulatory regime for spectrum is able to respond to changes in the demand for and use of spectrum in the UK.

The way we manage spectrum is changing

- 1.2 Ofcom published its statement on the Spectrum Framework Review (SFR) in June 2005.
- 1.3 Ofcom's vision for spectrum management, as set out in the SFR, is for market forces to play an increasingly important role in determining how spectrum is used. Ofcom believes that this will encourage efficiency in spectrum use, by increasing the likelihood that spectrum will be held by those who can make best use of it, and by creating more freedom for spectrum to be used for more valuable applications.

Key areas of implementation

- 1.4 In January 2005, Ofcom published the Spectrum Framework Review: Implementation Plan ("SFR:IP") which discussed two key areas of implementation of the SFR:
 - The release of newly available spectrum into the market over the next 2-3 years.
 - The transition to spectrum trading and liberalisation in relation to mobile services.
- 1.5 Ofcom received 68 responses to the SFRIP from a wide range of stakeholders.
- 1.6 The main purpose of this document is to provide stakeholders with an update on how Ofcom plans to take forward the issues it discussed in the SFRIP, in particular in relation to the release of newly available spectrum. Ofcom is also publishing today detailed proposals for a particular set of spectrum awards, relating to spectrum at 1781.7-1785 MHz paired with 1876.7-1880 MHz, previously known as the DECT Guard bands. This document sets those particular proposals in context and provides an overview of next steps for the rest of the award programme.
- 1.7 This document does not discuss the substance of the policy issues relating to the extension of spectrum trading and liberalisation in existing mobile spectrum, in particular the issue of the future of the spectrum held by the 2G licensees. Ofcom is still considering the responses on those complex issues. Its current expectation is that it will issue a further consultation document on those issues by the end of this year.

Newly available spectrum

Next steps on the spectrum awards

1.8 The SFR:IP identified the spectrum which Ofcom expects to be able to make available to the market over the next few years. This document confirms that this spectrum is likely to be made available, although the timing is clearer in some cases than in others. The document sets out in as much detail as it can at this stage Ofcom's plans for each of the bands.

1.9 Figure 1 below summarises the next steps and timing for each band.

Figure 1. next steps and timing

Bands	Key Next Steps & Timing
410-415 MHz/420-425 MHz	Consultation on detailed proposals for an award – Autumn 2005, possible award at end of 2005/06 or early 2006/07
872-876 MHz/917-921 MHz	Consultation on detailed proposals for an award – by end of 2005/06, possible award during 2006/07
1452 -1492 MHz (L Band)	Consultation on detailed proposals for an award – by end of 2005/06, possible award during 2006/07
1781-1785 MHz/1876-1880 MHz (GSM/DECT guard bands)	Consultation on detailed proposals for an award – July 2005, possible award by end of 2005/06
1785 – 1805 MHz (NI)	Consultation on detailed proposals for an award – by end of 2005, possible award in 2006/07
1790-1798 MHz (GB)	Consultation on the feasibility of an award, probably in 2006/07
2010-2025 MHz	Further work at the European level to amend the existing harmonisation measure during 2005 /06
2290-2302 MHz	Reassess options, when European position on 2010 – 2025 MHz is clearer (since Ofcom continues to favour linking the two awards)
2302 – 2310 MHz	Consultation on the feasibility of an award, probably in 2006/07
2500-2690 MHz	Further work at the European level in relation to the Commission's proposal to make a binding EU decision. Ofcom will be submitting a response to the Commission's current consultation on whether band should be exclusively reserved for IMT-2000 technologies arguing for technology and application neutrality.
3.6 – 4.2 GHz	Further work exploring the scope for further terrestrial services to share the band with satellite services.
10 GHz, 28 GHz, 32 GHz and 40 GHz	A market study covering all 4 bands to be followed by a consultation on detailed proposal for the awards – by end of 2005/06, possible awards during 2006/07.

1.10 As stressed in the SFR:IP, it is important to note that these timings are indicative only. Ofcom's plans may change following further consultations. Ofcom also faces important external constraints in a number of bands, either because satisfactory arrangements may need to be agreed with public sector users (including the Civil Aviation Authority (CAA) and Ministry of Defence (MoD), or because decisions are needed at European level.

1.11 Two other bands were discussed in the SFR:IP and are covered by this document but in each case no new proposals are made. In the case of Band III

Ofcom is currently considering responses to its consultation on the Radio Review and will set out its plans in the next publication on the Radio Review. In the case of spectrum that might be released by the switchover of television to digital broadcasting (within 470-854 MHz), this document confirms Ofcom's position that it does not expect to make policy decisions until after the Regional Radio Conference in 2006.

- 1.12 Meeting this award programme will be challenging for Ofcom and for stakeholders. However Ofcom believes that it is important that spectrum is released to the market as soon as possible to allow operators to determine efficient uses of the spectrum and so bring benefits to consumers and citizens.
- 1.13 As in the case of the SFR:IP this document discusses the spectrum that Ofcom is able to identify at this stage as available for assignment. Other spectrum may also become available in future. In particular, a review of public sector spectrum holdings is currently being undertaken at the Government's request by Professor Martin Cave. Ofcom is actively supporting this review.

General award policy issues

- 1.14 The SFRIP set out for consultation proposals on a number of general questions relating to releasing spectrum to the market. Ofcom has considered the comments it received on these issues and building upon the analysis set out in the SFR, this document sets out a number of general policy conclusions.
 - Where demand for the spectrum is likely to exceed supply new licence awards are likely to be made using a competitive process. This will usually be an auction as in most cases this is the process most likely to allocate spectrum to the users who have the highest valuation and so most likely to use the spectrum efficiently.
 - Auction design will be tailored to the particular circumstances of an award and Ofcom will seek to ensure so far as possible that particular design and rules chosen reflect the objectives of the auction, and create a fair environment for all bidders.
 - New licences awarded by an auction will generally have an indefinite duration but contain a minimum term during which Ofcom's scope to revoke the licence will be limited. On the expiry of the minimum term licences will be subject to the possibility of revocation on 5 years' notice for spectrum management reasons. This approach will increase the options open to licensees for making use of the spectrum, and reduce the requirement for regulatory intervention in spectrum management.
 - New licence awards will, subject to international constraints, generally be made on a technology and application neutral basis, although the spectrum will be packaged in a way which takes account of the most likely use. This approach should enable the market, rather than the regulator, to determine the optimal use of a particular piece of spectrum.

Section 2

Introduction

- 2.1 In January 2005 Ofcom published the Spectrum Framework Review: Implementation Plan consultation document (“SFR:IP”). It received 68 responses from a wide range of stakeholders commenting on its proposals.
- 2.2 In June 2005 Ofcom published a revised Spectrum Framework Review (“SFR”) following the consultation during the end of last year and early this year. In taking the issues raised in the SFR:IP forward, Ofcom intends to follow, so far as possible, the broad approach to spectrum management set out in the SFR.
- 2.3 Ofcom has completed its consideration of the issues raised in the SFR:IP in relation to a number of general policy questions relating to the award of spectrum and the particular spectrum award of the DECT guard bands. It is publishing its detailed proposals for that award alongside this document. Its consideration of the other awards and issues is ongoing.
- 2.4 This document is designed to set out Ofcom’s proposed approach on a number of common issues. The document should provide a context for the detailed proposals on the DECT guard bands and other individual awards in the future. The document also sets out, so far as it can at this stage, Ofcom’s overall plan and timing for taking forward the programme of work set out in the SFR:IP in the light of comments received. It describes Ofcom’s revised spectrum awards programme giving an indication of the high level timing and next steps for the various bands. The timetable is not comprehensive as there are number of issues where Ofcom’s consideration of responses to the SFR:IP is not sufficiently complete to allow it to set out firm plans.
- 2.5 In addition to the potential spectrum awards the SFR:IP discussed a number of policy issues relating to the extension of trading and liberalisation to existing mobile spectrum. This document does not address those issues. Ofcom received a number of long and detailed responses which raise many legal and policy issues. Ofcom believes that the issues are very complex and important and require further detailed careful consideration before they can be progressed. We currently expect to issue a further document for consultation by the end of this year explaining how Ofcom plans to progress those issues.
- 2.6 The remainder of this document is structured into 2 Sections:
 - Section 3 – discusses a number of wide-ranging issues relating to awarding spectrum and sets out Ofcom’s general policy position
 - Section 4 – set out a revised spectrum awards programme, including details of next steps for a number of awards

Section 3

Policy on awarding spectrum

3.1 The SFR:IP raised a number of general policy issues relating to the award of spectrum and invited comments. This Section sets out Ofcom's general position on issues in light of the responses to the SFR:IP. Further detail on the responses and Ofcom's comments is set out in annex A. It should be noted that for each particular award Ofcom will consider the appropriateness of its general policy in the light of the individual circumstances of that award and that Ofcom may consequently deviate from its general policy where it is appropriate. The particular issues discussed in this Section are:

- choice of assignment process
- auction design
- ensuring bidders are well informed
- licence term and licence fees
- technology and application neutral awards

3.2 Issues related to the timing and particular plans for the individual awards which form part of Ofcom's spectrum awards programme are discussed in the following Section.

Choice of assignment process

3.3 In the SFR:IP Ofcom discussed 3 possible assignment processes it may use where it is appropriate to limit the number of licences on offer:

- a "first-come first served" basis;
- comparative selection (also referred to as "beauty contest"); and
- auction.

3.4 The key considerations identified in the SFR:IP in each case are set out Figure 2 below.

Figure 2. Assignment Mechanisms

First come first served	Under a first come first served approach, licences are assigned to applicants in the order of their application. This mechanism is appropriate where demand for spectrum does not exceed supply. Where spectrum is scarce assigning it in this way is unlikely to lead to the spectrum ending up in the hands of those best able to use it to the maximum economic advantage.
Comparative	In a comparative selection, licences are assigned to the applicants that, in the regulator's judgement, best satisfy

selection	<p>the selection criteria that it has set. This approach is appropriate in cases where, for example on public policy grounds, spectrum is being assigned for a specific end use. However it is unlikely to be appropriate for cases where the key objective is to maximise the chance of the spectrum being obtained by those best able to use it to maximum economic advantage.</p> <p>This approach needs the regulator to set very clear criteria on which selection between bidders is made. Even so, with an element of judgement involved in selecting successful bidders there is a risk that the selection procedure will not be sufficiently as objective, non-discriminatory and transparent. While any mechanism is open to legal challenge, experience with this approach (for example, in the US) suggests that it might be more susceptible to such challenges, which create delays in the award of licences.</p>
Auction	<p>In auctions, a bidding process is used to award licences to those bidders prepared to pay most for them. Auctions are therefore likely to lead to the spectrum being assigned to users that value it most highly. However, to maximise efficient use of spectrum it is important that auctions are carefully designed and managed, and that they have the participation of well-informed bidders.</p> <p>A well-managed auction ought to be an objective selection process that meets the requirements for openness, non-discrimination and transparent processes. The outcomes should therefore be more robust.</p>

- 3.5 There was general agreement amongst most respondents to the use of auctions to award licences where there is a restricted number of licences available and demand is likely to exceed supply. Those opposing the use of auctions did so for three main reasons: (i) the financial benefits from auctions are transferred to the Government and not to the players, customers or the industrial sector; (ii) auctions, and especially more complex ones, can disadvantage financially weaker bidders and therefore hinder more spectrally efficient or more innovative applications; (iii) auctions will only lead to efficient outcomes if the willingness to pay for spectrum reflects the social value of spectrum's intended use and therefore where there are social externalities (eg Public Service Broadcasting (PSB) services) other mechanisms are likely to be more appropriate (see Annex A for more detail on the responses on these issues).
- 3.6 On the second point about financially weaker bidders, Ofcom does not believe that these concerns prevent the use of auctions per se. However, instead it believes that encouraging the active participation of both 'strong' and 'weak' bidders is an important consideration that should be taken into account in the auction design. As discussed further below, Ofcom intends to aim for simplicity in auction design so far as possible and for processes that do not place

excessive burdens on bidders. In any particular auction design process it will also consider the potential for differences between potential bidders to distort the efficiency of the assignment process (taking into account also the scope for spectrum trading post-auction).

- 3.7 On the third point, at a general level, as indicated in the SFR and in SFR:IP, Ofcom recognises that there are exceptions to its general preference for a reliance on market mechanisms to manage spectrum – for example the assignment of frequencies for radio broadcasting. This is also true of its proposal to use auctions.
- 3.8 In the light of the responses, Ofcom continues to believe that in general, auctions are the best mechanism for awarding licences where the nature of the spectrum available indicates that demand for licences is likely to exceed supply. However, before any particular spectrum award it will consider what is the most appropriate mechanism for assigning the spectrum in the particular circumstances.

Auction design

- 3.9 There are many auction formats, each of which may be tailored to particular circumstances. An observation often made is that ‘one size does not fit all’. Ofcom’s approach will be to look at the circumstances of each particular award and ensure that the particular auction design chosen is the most appropriate. It is likely that different awards will have different designs. Ofcom will make that assessment in the light of the applicable circumstances and the objectives for the award. At a general level the objective of an auction will be to promote the optimal use of the radio spectrum, and in particular of the relevant frequency bands which are the subject of the auction, and in securing that objective Ofcom will have regard, in particular, to:
- the availability and demand for the spectrum and to the desirability of promoting:
 - the efficient management and use of the spectrum;
 - the economic and other benefits that may arise from use of the spectrum;
 - the development of innovative services; and
 - competition in the provision of electronic communications services.
- 3.10 However, there are likely to be different issues relating to these objectives in different awards and the relative importance of the objectives may vary.
- 3.11 Ofcom has set out its proposal for a single round sealed bid auction format for the award of spectrum at 1781.7-1785/1877.7-1880 MHz. For the reasons explained in relation to that award, Ofcom has chosen relatively simple processes. However in other cases, a simultaneous multiple round auction may be more suitable. Also where there are varying requirements between bidders for licence packages, in terms of spectrum or geography, a combinatorial auction could be used, which would allow the bidding process to determine the most efficient combinations of packages.
- 3.12 It is likely that Ofcom will employ a number of designs in its programme of spectrum awards. Ofcom will engage specialist advisers as needed to assist in developing these. In each particular case Ofcom will consult on the proposed detailed design before it is adopted.

Implications of asymmetry between bidders

- 3.13 As explained above, the purpose of an auction is to promote the optimal use of the spectrum. This will typically be achieved by assigning the spectrum to the person who is willing to pay the most for it. A wide range of matters need to be taken into consideration when designing an auction to ensure that the actual result deviates from this aim as little as possible. One particular matter, raised in the SFR:IP, was the existence of asymmetries between likely bidders.
- 3.14 A particularly extreme form of asymmetry would be if one (or more) of the likely bidders in the auction were to have Significant Market Power (SMP) in a downstream market, entry into which was highly dependant on having access to spectrum similar to that being auctioned. In such circumstances Ofcom would have to consider very carefully the likely impact on downstream competition of different auction designs, and perhaps take specific steps to ensure that such an auction did not give rise to a strengthening of an already dominant position in a dependant downstream market.
- 3.15 However, even when the extent of asymmetry is less extreme, or has a different source, auction theory alerts us to the risk that asymmetries between bidders can give rise to inefficient auction outcomes if an inappropriate auction design is used. Less extreme asymmetries can for example arise from differences in the information available to bidders, differences in access to capital and financial resources, and from the advantages typically enjoyed by existing operators as compared to potential new entrants.
- 3.16 Of particular concern is the risk that the presence of bidders that are perceived to be “strong” may deter entry into the auction by other potential bidders that perceive themselves by comparison to be “weak”. The problem is that such apparently “weaker” bidders may in fact be the most efficient users of the spectrum. They may, for example, have the most innovative approach to use of the spectrum, and their entry into downstream markets may bring gains to productive, dynamic and allocative efficiency.
- 3.17 Ofcom will therefore consider carefully the degree of asymmetry between likely bidders in each auction, and where appropriate will select an auction design that ensures that “weaker” bidders are less likely to be deterred from participating by the presence of “stronger” bidders. Other considerations will also need to be taken into account, such as the extent of common value uncertainty among bidders and the risk that this may lead to inefficient decisions. Ofcom will take these factors into account in making choices - for example, as between use of a sealed bid process or of an open auction format. Ofcom’s aim in general will be to encourage a competitive auction, with wide participation where possible, and thus to help ensure that the spectrum is acquired by those who can make the most efficient use of it.
- 3.18 One particular respondent to the SFR:IP, O2, raised three concerns regarding Ofcom’s comments on these issues in the SFR:IP, namely:
- it suggested that discriminating between potential bidders on the grounds of market power was not justified since Ofcom had a number of other powers to deal with competition problems relating to market power;
 - it did not consider that there was a market for spectrum in general in relation to which companies could be said to have market power;

- if there are markets for spectrum, as it understood Ofcom to be suggesting, then it suggested that Ofcom would need to conduct a market review in accordance with the European regulatory framework for regulation of electronic communications networks and services and such a review would have to be concluded before commencing auctions.
- 3.19 In relation to the first point, as explained above it is possible that if there were one or more firm(s) which were potential bidders for some spectrum and had market power in a tightly-linked downstream market, this may raise concerns regarding the efficiency of the auction unless the existence of such market power was taken into account in the auction design. While it is true that Ofcom has other powers to address competition issues, it does not believe that it is likely to be consistent with its statutory duties, in particular to ensure optimal use of the radio spectrum and to promote competition, to disregard the existence of market power of this nature in designing the auction.
- 3.20 In relation to the second point, Ofcom believes that there is no reason in principle why economic markets may not exist in relation to spectrum. However, in relation to the third point, Ofcom does not believe that there is any requirement under its statutory framework which means that prior to holding an auction it is necessary to carry out market reviews of potential spectrum markets or other markets. Rather, in deciding to hold an auction and in designing an auction Ofcom must take account of its relevant statutory duties, in particular securing the optimal use of the radio spectrum, promoting competition, and ensuring the award process is open, transparent and non-discriminatory. Ofcom believes that it is consistent with those duties to consider the different ways in which asymmetries may exist between potential bidders and the implications these may have for the efficiency of the auction process.

Auctions in a liberalised and tradable spectrum market

- 3.21 In the SFR:IP Ofcom discussed the scope for making auctions simpler than those run in the past because of the existence of spectrum trading, and also in the case of awards of spectrum which was likely to be of a lower value. The existence of a secondary market means that following the award of licences the market can re-allocate the rights to transmit under the licences, so that spectrum should eventually be transferred to its highest value use.
- 3.22 To date in the UK there have been three spectrum auctions: for 3G licences (in 2000), 28 GHz Broadband Fixed Wireless Access licences (in 2000) and 3.4 GHz Public Fixed Wireless Access licences (in 2003). In each case the auction used a simultaneous multiple round auction design (SMRA). Indeed, this is the most commonly used format throughout the world for spectrum auctions.
- 3.23 Respondents to the SFR:IP generally favoured an approach that tailored auction design to match the circumstances of each spectrum award. There was some preference for open auctions to sealed bids and for the use of simultaneous multiple round auctions in some circumstances. It was also suggested by some respondents that auctions should be designed to allow regional licences and small spectrum blocks. Some also suggested that reserving licences for new entrants would not be appropriate. Annex A sets out further detail on the responses on these issues.
- 3.24 On auction design, Ofcom has not closed its mind to any of the options suggested by respondents and will seek to use a design that is most appropriate to the circumstances and objectives of each award. The packaging

of spectrum to be auctioned for each auction will take account of such factors as the nature of the spectrum on offer and the services that might be provided. Combinatorial auctions may be used where potential bidders have varying requirements. As licences will be tradable, it should be possible to look to the secondary market in many cases to meet demand for regional or small spectrum blocks. On reserving licences for new entrants, Ofcom does not believe, in general, that auction objectives should include the determination of the most appropriate market structure and accordingly there would need to be particular reasons to justify reserving licences for new entrants, which are likely to be related to existing or potential competition concerns in the relevant downstream markets.

- 3.25 In conclusion, Ofcom's approach will be to seek to ensure that the auction results in an assignment of licences that is most likely to achieve the optimal use of the spectrum through a process that does not call for excessive resources or impose disproportionate burdens on bidders. Auction designs will be no more complex than required to meet these objectives.

Well-informed bidders

- 3.26 The SFR:IP set out Ofcom's view that an important factor in making for a successful auction is to have well-informed bidders. It is ultimately for bidders and potential bidders to take responsibility for deciding whether to enter an auction and how to develop bidding strategies but Ofcom will aim to provide information to allow potential bidders to make well-informed decisions. Some key aspects of this will be:
- Raising awareness – Ofcom will publicise details of forthcoming award processes, with the aim of stimulating awareness of the process and thus encouraging entry to the auction. The information in this document represents the first stage in this process. More detailed information will be provided as Ofcom develops more fully its plans for each award.
 - Information memorandum – The information memorandum for an auction is designed to give bidders as much information as possible for them to decide whether to enter the auction and how they would prepare for participation.
 - Auction website – the information memorandum may be modified or complemented by the publication of updates and answers to specific questions. Such information will be posted on a dedicated part of the Ofcom website. The website will also contain full information on the progress of each auction.
 - Preparing bidders is a key activity in the immediate run up to an auction. Training may involve a seminar covering auction procedures and software familiarisation. Unless the auction design is straightforward, mock auctions may be needed to familiarise the bidders with the auction and, if necessary, to test the bidding system and communications with the bidders.
- 3.27 There were many and varied suggestions from respondents on how Ofcom might ensure that bidders are well-prepared and well-informed (see annex A for a more detailed discussion). They covered the early release of information, the scope of information (comprehensive technical information, current users of the spectrum, and future awards) and methods of dissemination. All of the suggestions were helpful and Ofcom will take them into account in its preparations for the awards. In providing information one of its objectives will

be to ensure, as far as possible, that all interested parties have equal access to the information relevant to their participation in an award. Ofcom will aim to give as much information as possible, as early as possible, in its subsequent documents setting out firm proposals for each award. In the information memorandum for each award, it will aim to set out the relevant information to allow potential bidders to make well-informed decisions. This will include a timetable for the award process and also details of the spectrum on offer - including any constraints there may be on its use, such as emission limits, channel plans, co-ordination requirements and details of any incumbent users. It will also include details of similar spectrum that is available or likely to become available, including the timing of future awards, so far as that is known at the time. Ofcom will disseminate information primarily via the Ofcom website. For each award it will consider what is necessary in the context of that award. This might include for example holding stakeholder events to explain and explore key issues and workshops, with mock auctions, to inform and instruct potential bidders on the administration of the auction and their participation in it.

Licence term and licence fees for auctioned licences

Licence term

- 3.28 Following Ofcom's consultations on the introduction of spectrum trading, it is in the process of varying wireless telegraphy licences, starting with those that have been made tradable in 2004, to give them an indefinite term, with a five year minimum notice period for revocation on the basis of spectrum management reasons.
- 3.29 Ofcom has powers (under Section 1(4) of Wireless Telegraphy Act 1949) to revoke wireless telegraphy licences. This may be done in situations where it is necessary to do so for overriding reasons of spectrum management. Such reasons might be to ensure that the development of a wide swathe of spectrum was not impeded by a minority user; or that spectrum did not remain unused for an excessive period. Ofcom would only revoke or change licences for spectrum management reasons where there was a pressing need to do so, and only after careful consideration and consultation with the stakeholders affected. These reasons are in addition to Ofcom's powers and duties (under section 4(5) of the Wireless Telegraphy Act 1998 and section 5 or section 156 of the Communications Act 2003) to intervene in spectrum management where national security, international obligations or a direction from Government are involved.
- 3.30 In the SFR:IP, Ofcom discussed three possible approaches to the licence term for new licences to be awarded:
- a fixed term
 - an indefinite term (with no minimum period)
 - an indefinite term (with a minimum period)¹

¹ This option was described in the SFR:IP as minimum term followed by a rolling period. However, this description has caused some confusion and we believe that it is more accurately described as indefinite term with minimum period.

- 3.31 Ofcom proposed that new licences awarded by auction should in general have an indefinite term with a minimum period. During the minimum period the grounds for revocation would be restricted and would not include a general right to revoke for spectrum management reasons. However, Ofcom could potentially revoke the licence for spectrum management reasons at any point after the minimum term, provided that 5 years' notice was given. Such notice could be given so that the licence ended the day after the expiry of the minimum term.
- 3.32 Ofcom did not make any proposals for amending the term of licences that have already been awarded by auction, namely the 3G licences (which have a term lasting nearly 21 years); 28 GHz fixed wireless access licences (which have a 15 year term); and, 3.4 GHz fixed wireless access licences (which have a potential 15 year term (an initial five year term, extendable for a further five years on each of the fifth and tenth anniversaries of the award). These terms were set prior to each of these auctions in order to give certainty to bidders at the time of the auction, and to give licensees security of tenure for a period so that they would have an opportunity to recoup the costs of establishing their networks.
- 3.33 Annex A sets out a detailed discussion of the responses on this issue. In summary most respondents agreed with the proposal for auctioned licences to be indefinite with a minimum term. Although there were some differences over the length of the minimum term. Another issue, raised by some, was that roll-out or use it or lose it (UIOLI) conditions should be imposed.
- 3.34 Ofcom believes that the proposal for an indefinite term with a minimum initial period should provide sufficient security of tenure to bidders to promote efficient use of the spectrum. Ofcom expects the length of the initial term to be set on a basis that gives licensees a reasonable opportunity of recovering their investment. This period may vary between different auctioned bands, and will be set taking into account any other relevant considerations. The consultation document on 1781.7-1785/1876.7-1880MHz sets out Ofcom's view that an appropriate minimum period for those awards is 10 years. In general, in relation to the spectrum awards discussed in this document, Ofcom considers that roll-out or UIOLI conditions are unlikely to be required to meet the objective of ensuring that the spectrum is used efficiently. This is because spectrum trading and liberalisation and AIP provide or enhance market-based incentives to use spectrum efficiently. Furthermore, Ofcom has indicated in the Spectrum Trading statement that concerns regarding spectrum hoarding, which sometimes underlie proposals for UIOLI conditions, may be addressed ex post, for example through competition law.
- 3.35 Some respondents suggested that, if the approach set out above is taken for new licence awards, licences that have already been auctioned should be varied so that their licence term is also indefinite. Certain of these respondents also argued that if roll-out or UIOLI obligations are not included in new licences, they should be removed from existing licences.
- 3.36 Ofcom does not believe that there is an automatic linkage between the approach generally proposed for the award of new licences, and the appropriate treatment of licences that have already been auctioned. Different considerations are likely to apply to licences which have already been awarded which may mean that a different approach is appropriate. For example, where an auction has already been held, there may be concerns relating to fairness

and non-discrimination in relation to unsuccessful bidders, which would need to be assessed carefully. This is because the behaviour of other bidders, and the outcome of the auction, might have been different if they had known that the licence term would be varied. It is also the case that the holders of licences that have already been auctioned have acquired them in the knowledge that they contained roll-out obligations, and that to the extent such obligations have financial costs, these should have been reflected in the bids made for them. As a general matter, it is important for Ofcom to have regard to the integrity of the spectrum auction process in considering the case for changes to a licence after an auction, while also taking into account other considerations such as any effects on the incentives for efficient spectrum use and Ofcom's objectives for the promotion of competition.

3.37 Ofcom therefore intends to consider case-by-case the merits of any change to the terms of licences that have already been auctioned. The facts of each case should be considered carefully, taking into account all relevant factors at the time.

3.38 Therefore, in conclusion Ofcom's generally preferred approach (which might of course require modification in particular cases) in relation to its new spectrum awards where licences are auctioned will be to specify licence terms as follows:

- The licence will have an indefinite duration
- The licence will have a minimum term
- The licence could be revoked before the expiry of the minimum term on a limited number of the grounds set out below in paragraph 3.40
- The licence could be revoked from any point after the expiry of the minimum term on the grounds set out in paragraph 3.40, and also for spectrum management reasons, subject to giving 5 years' notice which may be issued during the minimum term

3.39 During the minimum term the licence may only be revoked for the following reasons:

- With the consent of the licensee.
- For non-payment or late payment of the relevant licence fee.
- If there has been a breach of any of the terms of the licence.
- If the licensee has not complied with any requirement of any relevant trading regulations
- If the licensee has not complied with the auction regulations under which the licence was awarded
- In accordance with section 4(5) of the Wireless Telegraphy Act 1998. (That section provides that notwithstanding any terms or provisions in a WT Act licence which restrict the exercise by Ofcom of its power to revoke licences, Ofcom may at any time, by notice in writing, revoke or vary licence terms if it appears to be requisite or necessary or expedient to do so in the interests of national security, or for the purposes of complying with a Community obligation of the UK or with any international agreement or arrangements to which the UK is party.)

- If it appears requisite or necessary or expedient to do so for the purpose of complying with a direction by the Secretary of State to Ofcom under section 5 or section 156 of the Communications Act 2003.
- 3.40 Ofcom considers that there are a number of reasons why this approach is likely to promote optimal use of the radio spectrum and other relevant objectives, including the promotion of competition.
- 3.41 In particular, the award of licences with an indefinite duration (subject to the powers of revocation set out above) reduces the need for regulatory intervention to reassign spectrum at the end of the licence term. One disadvantage of fixed term licences is that at the end of the licence term the licence expires and so the rights to use it must be returned to the regulator. The regulator must then go through a process to reassign those rights. The alternative of licences with an indefinite duration removes the requirement for return to the regulator, and creates additional opportunities for the market to secure the efficient use of the spectrum, particularly in the presence of spectrum trading.
- 3.42 Ofcom considers that, as a matter of principle, it is preferable to look to market mechanisms to promote the efficient use of resources rather than regulatory intervention, unless the case for such intervention is clear. Ofcom has not identified a general need for the regulator to recover spectrum at the end of the minimum term in relation to its future programme of spectrum awards, though it will continue to judge the right approach for individual awards in light of the circumstances of each case. Ofcom considers that there are likely to be a number of other advantages to adopting the general approach proposed above. In particular, reassignment by the regulator typically takes significant time and resource. The spectrum may also lie idle for a period as the regulator prepares for reassignment. While it may be possible to reduce this problem through the use of overlay auctions, the approach of an indefinite term together with spectrum trading seem likely to offer a simpler and less costly way of ensuring the spectrum is used efficiently.
- 3.43 Ofcom therefore generally continues to favour offering licences with an indefinite duration for auction in future. The retention of powers to revoke on spectrum management grounds provides a mechanism allowing regulatory intervention if this is justified in particular cases
- 3.44 The inclusion of a minimum term in the licence is required in order to give sufficient certainty to investors to incur the necessary costs to put the spectrum into use. Without a minimum period there is a risk that this may not occur and so the spectrum would not be used efficiently.
- 3.45 Ofcom also notes that this approach to setting licence term will help to promote greater consistency between different classes of wireless telegraphy licence. This should have various benefits, including greater simplicity in the regulatory regime.

Licences fees – Administrative Incentive Pricing (AIP)

- 3.46 In the SFR:IP Ofcom proposed that, if licences are auctioned with a minimum term followed by an indefinite term, there was a case for imposing AIP once the minimum term has finished. This issue has not arisen in the past because licences were auctioned with fixed terms only and the fee paid at auction reflected the value of the licence during this fixed term. However, if auctioned

licences are indefinite in duration, it is important to consider whether AIP should be payable. In the SFR:IP Ofcom proposed that AIP should be payable after the end of the minimum term. Ofcom noted that it was desirable for licences held after the minimum term to be on similar economic terms to other licences with indefinite terms (such as licences awarded by means such as first come, first served and beauty contest). Given that AIP typically applies to such licences Ofcom suggested that AIP should be imposed after the minimum term of newly auctioned licences as well.

- 3.47 This suggestion drew a wide range of responses. See Annex A for a full discussion. Some argued that AIP distorted the trading market and should be avoided. Others pointed out some potential difficulties in using AIP for auctioned licences: some pointed to the difficulty of calculating AIP some years hence, others that it would create uncertainty if it were not made clear at the time of the award what the AIP would be. Some suggested that instead of AIP fees should be on a cost recovery basis. There was also the suggestion that royalty payments should be used where spectrum is to be used for innovative services.
- 3.48 Ofcom has set out elsewhere its view that AIP should continue to apply after the introduction of spectrum trading and liberalisation (see Spectrum Pricing documents at http://www.ofcom.org.uk/consult/condocs/spec_pricing/ and Trading Statement at www.ofcom.org.uk/consult/condocs/spec_trad/s) in order to encourage optimal use of the spectrum. This is not the issue under consideration here. Rather, the issue is whether Ofcom should keep open the option to charge fees, including AIP, after the end of the minimum term for licence awarded by way of auction in the future.
- 3.49 Ofcom will make decisions on the terms for each licence prior to each award in light of all relevant circumstances at the time. However, as a general matter, Ofcom considers that it is likely to be appropriate to include a licence condition giving Ofcom the option of charging fees after the end of the minimum term if it is justified to do so in order to promote efficient use of the spectrum. The rationale for Ofcom retaining this option is closely related to the rationale for Ofcom retaining the power to revoke licences for spectrum management reasons after the minimum term.
- 3.50 During the minimum term, Ofcom has a high degree of confidence that the auction, including the payment of the auction fee, will secure efficient use of the spectrum. However, it is less clear that this objective will be met after the minimum term, or indeed for the entire indefinite duration of the licence. The longer the period over which the regulator is required to look forward, the greater the uncertainty that exists. At present, the ability to revoke licences on spectrum management grounds, and the ability to charge fees are important mechanisms in the regulator's tool kit for promoting optimal use of the spectrum. Ofcom considers that it would be unwise to assume that the need for such mechanisms in the future will abate to such an extent that the regulator should be precluded from using them after the end of the minimum term. Rather, Ofcom considers that the regulator should retain the option to use these mechanisms, where it is justified to do so.
- 3.51 The ability to charge fees also extends to fees that recover an appropriate proportion of Ofcom's administrative costs. Fees may therefore be set for this purpose or to promote efficient use of the spectrum. Ofcom considers that in

either case it is desirable for the regulator to have the option to set such fees after the end of the minimum term.

- 3.52 Ofcom has therefore concluded that in general it is likely to be proportionate and objectively justifiable to include provisions in new licences allowing fees to be charged to licensees after the end of the minimum term. It is important to note that Ofcom would expect to give prior notice to use such provisions and consult as appropriate.

Spectrum rights to be awarded – technology neutrality

- 3.53 In the SFR Ofcom has set out that its general approach to spectrum management is to apply market forces to a greater extent than has been done in the past. A key element of that approach is that users' rights should be defined in a way which is as far as possible technology and application neutral. The first element of the Ofcom Spectrum vision is:

*Spectrum should be free of technology and usage constraints as far as possible.
Policy constraints should only be used where they can be justified;*

- 3.54 In the SFR:IP, Ofcom consulted on the issue of whether an exception should be made to this general approach in relation to the award of some new licences such that a restriction was included in the licences against the provision of mobile services, both 3G services and services other than 3G.
- 3.55 Ofcom proposed not to impose restrictions in future licences that would prevent use in relation to the provision of mobile services other than 3G. It noted that the avoidance of such restrictions should increase the opportunities for the market to determine the optimum use of the spectrum, thereby improving the efficiency of spectrum use, and helping to promote competition in relevant markets.
- 3.56 In relation to the provision of 3G mobile services Ofcom distinguished between awards of spectrum which had already been identified internationally for 3G services, namely the 2010 – 2025 MHz and 2500 -2690 MHz awards, and other awards. Ofcom considered that, in relation to the first category, the issue was not whether the bands should be used to offer 3G services but whether other technologies or services should be allowed as well. This issue is discussed below in Section 4 in relation to the 2500 MHz award.
- 3.57 In relation to the second category of awards, Ofcom considered in the SFR:IP whether there should be a restriction on offering 3G services. This issue was considered alongside a wider discussion of the removal of restrictions that prevent the use of spectrum that has already been assigned for 3G services. Ofcom consulted on a number of options. It identified two in particular as meriting consideration:
- Option 1 – do not impose any restrictions on the terms of new licence awards that prevent use of spectrum for 3G services (subject to other constraints mentioned in the SFR:IP); adopt this approach with effect from conclusion of this consultation, in relation to all spectrum licences awarded under a competitive process;
 - Option 2 - impose restrictions on the terms of new licence awards that prevent use of spectrum for 3G services, but these restrictions should only

have a temporary life (subject to certain other constraints), and would last only to 2007.

- 3.58 Stakeholders expressed different views on these issues. The overwhelming majority of respondents favoured a technology neutral approach and hence not including restrictions in licences for new spectrum which prohibited mobile use of any type. However, the 5 mobile network operators (MNOs) to differing degrees all opposed the suggestion that spectrum should be awarded which could be used to offer mobile services on the timing indicated in the SFR:IP and argued that, if awards did proceed, restrictions on the ability to offer mobile services should be imposed.
- 3.59 A number of points were raised by the MNOs. There were differences of emphasis in their responses. However, broadly they raised the following particular concerns about the award of technology and use-neutral licences as part of the spectrum awards programme:
- The awards would be unduly discriminatory as the new licences would not contain the same obligations as the existing licences held by the MNOs and would also grant more rights;
 - The awards could undermine investment in 3G services and prevent or hamper the recovery of investment in 3G services;
 - The proposals constituted a significant change in the regulatory framework in existence at the time of the 3G auction. This was premature and contrary to expectations and was likely to harm investment in 3G;
 - The approach was unnecessary as there was no demand at present for 3G spectrum.
- 3.60 This document does not attempt to provide a comprehensive consideration of these arguments in relation to each element of the proposed spectrum award programme. Ofcom considers that the nature of the licences offered in each award should be considered when proposals are brought forward for that award, in light of all the relevant considerations at the time.
- 3.61 However, Ofcom considers that it is unlikely to be justified to adopt a general policy of restricting the use of spectrum made available via new licence awards, to prevent particular technologies or types of use. On reflection, Ofcom does not consider that the choice between adopting such a restriction, and not doing so, is likely to be finely balanced. A technology neutral approach is likely to be beneficial in terms of promoting optimal use of the spectrum, and such an approach is in general likely to be pro-competitive, as it will reduce unnecessary barriers to entry. It will also allow the market and not the regulator to decide what particular frequencies should be used, thereby reducing the scope of regulatory intervention. It will also be better aligned with the general requirement for technology neutrality included in the European and statutory frameworks for regulation.
- 3.62 Ofcom also considers that the arguments for leaving spectrum unused in its hands awaiting “proof of demand” are weak. This is unlikely to be the most appropriate way to secure optimal use of the spectrum. It will artificially reduce the supply of a scarce resource, and reduce the opportunities for the increased availability of spectrum to have beneficial effects on competition and innovation.

- 3.63 Ofcom's preference therefore remains to proceed in a timely way with the new award programme and to do so on a technology and use neutral basis. Ofcom will consider the right approach for each particular award taking account of this general policy, as well as other all considerations relevant to a particular award, such as any international harmonisation measures. The issue of harmonisation and technology neutrality in relation to the 2500 MHz award is discussed in Section 4.
- 3.64 Two additional points might be noted in the context of this discussion. The first is that, as recognised in the SFR, even under a technology and use neutral approach, there is a requirement to specify the technical characteristics of the licences available in an auction. For example, spectrum is typically auctioned in packages with each package having a lower and upper frequency boundary, and hence a bandwidth.
- 3.65 It is important that likely uses of the spectrum are taken into account in specifying any technical parameters to the usage rights. However, this can be done without requiring that the uses considered are the uses that must be made of the spectrum. Ofcom therefore expects to consider likely uses of the spectrum to be awarded and to design the auction and packaging in a manner that takes these into account. The licences should however retain as much flexibility as possible, so that the market has the opportunity to move to a different use of the spectrum if that proves to be optimal. The details of the award set in this manner will normally include the channel plan and maximum emission characteristics included in the licences. This is the approach that Ofcom has followed in the case of the proposed 1781.7-1785/1876.7-1880MHz awards.
- 3.66 The second point relates to work that Ofcom has under way in relation to the scope for specifying spectrum usage rights in alternative ways in the future. In particular, as set out in the SFR, Ofcom is undertaking further work on the options for moving to a description of usage rights in terms of "specific" and "restrictive" rights. In time, this work may have implications for the general approach to specifying wireless telegraphy licences, including both those that have already been issued and those that may be issued in future. The work is still in its early stages. Ofcom has made no proposals for changes to licence conditions.
- 3.67 Given the generic nature of the work, Ofcom does not consider that it is necessary or appropriate to delay proceeding with the programme of spectrum awards on this account.

Section 4

Spectrum Awards Programme

- 4.1 This Section sets out Ofcom's revised plans for its spectrum awards programme in the light of the responses to the SFR:IP. Annex A contains more detailed comments on the responses on timing issues. As explained further below it is not possible to be definitive about the timing of some awards as there are significant external constraints (including European processes), and in some cases Ofcom is still considering issues raised by the responses. However, Ofcom believes that, in addition to publishing detailed proposals for individual awards, it would be helpful to stakeholders to provide as much clarity as possible regarding the plans for the whole programme.

High level timing and next steps for the programme

- 4.2 This Section provides an update on the proposed timing and Ofcom's plans for each of the spectrum awards identified in the SFR:IP. There are some awards where the timing is still uncertain and this is explained further below.
- 4.3 It is important to stress that the timing discussed below is indicative only at this stage and Ofcom's plans may change following the completion of further work including further consultations with stakeholders on detailed proposals for each award. Also, as explained in the SFR:IP, Ofcom faces important external constraints in a number of bands, either because satisfactory arrangements may need to be agreed with public sector users (including the Civil Aviation Authority (CAA) and Ministry of Defence (MoD), or because decisions are needed at European level.
- 4.4 In revising the timing of its programme since the SFR:IP Ofcom has taken into account the comments it received on both the considerations which should be taken into account in devising the programme and on the appropriateness of the proposed programme. Ofcom will consider the comments that relate to individual bands further when it determines the timing for particular awards. Ofcom may also review the overall timing for the programme from time to time. A summary of the responses on timing and related issues and Ofcom's comments is set out in annex A.

Band III

- 4.5 In the SFR:IP Ofcom indicated that additional capacity might become available in Band III sub-band 3 (209 – 215 MHz). The Radio Review, published in December 2004 discussed how this capacity might be assigned, making proposals to award three blocks for digital sound broadcasting to complete the pattern of local DAB multiplexes started by the Radio Authority; and one or two blocks (depending on the outcome of international negotiations) for new national multiplexes. The Radio Review also discussed the potential for awarding some of these multiplexes solely under WT Act licences rather than with Broadcasting Act licences as well.
- 4.6 Ofcom plans to publish a further document later in 2005 setting out its conclusions on these matters in the light of responses received to the Radio Review. This document will also consider the likely timing of awards in Band III.

- 4.7 The availability of this capacity for UK use is subject to the outcome of the Regional Radio Conference, which is re-planning spectrum use for broadcasting in Bands III, IV and V across Europe. The RRC is expected to conclude in mid-2006

410 – 425 MHz

- 4.8 In the SFR:IP Ofcom set out its provisional view to award 2 x 4 MHz in this band as single UK licence and to do so during 2005/06. It also identified the possibility of a band manager model developing in the band and it flagged up the possibility that the emergency services may need spectrum from the band.

Market Study

- 4.9 Ofcom also explained that it had engaged independent advisers to complete a market study for the band assessing the different technologies and services that might be employed. These advisers, DotEcon and Analysys Mason Group (“the consultants”), reported in February 2005². The main findings and recommendations were as follows.
- 4.10 The consultants interviewed a range of companies and institutions, a number of whom expressed interest in acquiring usage rights for this spectrum. All of them envisaged deploying technologies compatible with PMR/PAMR, and their requirements were geographically fragmented.
- 4.11 They also considered the question of whether to release the spectrum under a single, national, technology-neutral licence or release it in a number of smaller awards, split by frequency and location. They found that, on balance, a national licence, which would also allow for commercial management of frequencies and transmitter use, would be preferable, providing some practical issues could be addressed. In particular, they recommended that Ofcom should develop a clear framework for how a band manager might operate.
- 4.12 They noted that uncertainty as to how interference with the existing MoD radar use would be limited and managed was a cause of concern among potential bidders.

Emergency services use

- 4.13 Since the SFR:IP Ofcom has held a number of discussions with the Government and the emergency services in relation to this band.
- 4.14 There is a long-standing Government policy of guaranteeing access to spectrum needed for the emergency services’ operational requirements by administrative assignment. In future, as market mechanisms develop, Ofcom considers that it should be possible for public services, including the emergency services, to look to the market as the principal means for acquiring spectrum, just as happens in most circumstances with other inputs that they require (such as land, buildings, equipment and personnel).
- 4.15 However, Ofcom has considered very carefully, with the relevant Government departments, whether it would be justified to assign some spectrum within this

² DotEcon and Analysys Mason Group *Allocation options for selected bands, 410-415 MHz and 420-425 MHz, et al.* The report can be found here:
<http://www.ofcom.org.uk/consult/condocs/sfrip/band/?a=87101>

band to the emergency services in present circumstances. The relevant considerations here include the fact that market mechanisms are still at an early stage of development, and the fact that the emergency services have identified an urgent operational need to enhance the capability of their radio systems. After a careful review of the emergency services' requirement, Ofcom has concluded that spectrum should be assigned within this band for emergency services and that, in the light of an independent assessment, a pair of 2 MHz bands should be sufficient for their needs.

- 4.16 Accordingly 2 x 2 MHz has been identified for emergency services use. This leaves Ofcom with 2 x 2 MHz which it can make available in this band for other use.
- 4.17 The wider question of how public services should access spectrum in the future is being considered by Professor Cave's Independent Audit of Spectrum Holdings.

Next Steps

- 4.18 It is still Ofcom's plan to award the remaining spectrum, probably by means of an auction. The consultants report identified two key things Ofcom need to do before this could be done, namely provide clarification regarding the development of band manager model for this band and implications of the MoD use in the band. Ofcom is continuing to work on these issues and plans to set out detailed proposals for consultation in the Autumn. Subject to the outcome of the consultation, Ofcom anticipates making an award in late 2005/06 or early 2006 /07.

470 – 854 MHz

- 4.19 In the SFR:IP Ofcom set out its view that it would decide its approach to the award of this band after the RRC in 2006.
- 4.20 Amongst respondents to the SFR:IP there was general agreement with this approach. However, a minority of respondents advocated a more immediate consideration of options for the award of this spectrum. This view was mainly based on a support for broadcasting use (although there was not unanimous agreement for the associated licensing process). It was also based on the view that resolution in generic terms of the likely outcome of a licence award process would better inform the UK's negotiation position at the RRC-06 conference. Further comments on the responses on this award are set out in annex A.
- 4.21 Ofcom is considering the likely candidates for using capacity in these bands, and the implications these may have on the form in which the UK's requirements are cast and negotiated within the RRC 06 process. There is a wide range of uses to which this spectrum released by switchover may be put, and Ofcom will be as facilitative as possible in supporting any of these. Nevertheless, the RRC 06 process is based on the creation of a common European plan of high power TV broadcasting stations, and this therefore has to be the starting point for the expression of UK's requirements, even though a range of possible uses is envisaged.
- 4.22 Ofcom is still intending make this spectrum available by market process. as there is a clearly a variety of competing users and uses for the spectrum.

However it remains of the view that it will only make policy decisions on this award after the RRC when the international constraints are clearer.

870 – 921 MHz

- 4.23 In the SFR:IP Ofcom proposed to auction one national licence for this spectrum on a technology neutral basis, subject to the outcome of a market study it had commissioned and responses to the SFR:IP.
- 4.24 Subsequently in February 2005, Ofcom published a market study by DotEcon and Analysys Mason Group which recommended that one national licence should be auctioned, but before doing so Ofcom should consider evaluating demand under current market conditions. This proviso was prompted by the likelihood that co-ordination would be required with the neighbouring GSM band that might undermine the viability of deploying a national CDMA 2000 network in the band.
- 4.25 Also in February Ofcom published a note that summarised work it had completed, since publication of the SFR:IP, on the potential technical characteristics of this band, and in particular the constraints that might be appropriate to avoid interference to existing GSM networks in adjacent bands (see www.ofcom.org.uk/consult/condocs/sfrip/constraints/?a=87101). The constraints are set out in Annex A to the paper. They would provide a high degree of certainty for adjacent users of the band but there might be a small residual requirement for co-ordination with O2: a transmit power restricted to 32 dBm would mean that only those O2 base stations within 20 metres of the transmitter would suffer blocking. Any technology might be used that complied with a spectrum mask designed to protect adjacent users.
- 4.26 Ofcom received a number of responses both to the SFR:IP and the supplementary documents. There was a wide divergence of views among these respondents. Some agreed with the proposal but a significant number suggested alternative approaches, in the main either facilitating a variety of technologies or holding back the spectrum until there was evidence of demand. There was particularly strong disagreement by two respondents with the technical analysis, and concern regarding the impact that the proposed constraints would have on business propositions for the band.
- 4.27 Ofcom is evaluating these responses. It plans to issue a further consultation document with detailed discussion of the technical issues raised by the band and its proposals towards the end of 2005/06 to allow release of the spectrum in 2006/07.

1452 – 1492 MHz (L – Band)

- 4.28 The spectrum from 1452 MHz-1492 MHz will become available from 2007 (when the incumbent use is due to end). The SFR:IP set out Ofcom's intention to allocate all 40 MHz of spectrum on a technology and application neutral basis. It did not propose any particular way of packaging the spectrum, but mentioned the possibility of having one licence, or recognised spectrum access (RSA) right, for the 12 MHz currently identified for satellite broadcasting, and one or more licences for the remaining spectrum. The SFR:IP indicated that the spectrum could be auctioned in 2006-07.
- 4.29 Most respondents did not comment on the proposed timing for this award. Two respondents specifically encouraged Ofcom to keep to an early timetable.

However, a minority of respondents suggested delaying the award for a variety of reasons, including to allow continued use by ambulance services, to allow Ofcom to reserve the spectrum for Digital Satellite Broadcasting, and to allow the DAB digital radio market to develop further before decisions are taken.

- 4.30 Ofcom will address the points made by respondents in detail in due course. However, in general, Ofcom continues to favour of technology and use neutral licensing in this band, as in others, consistent with the reasoning set out in the SFR, the consultation and statement on Spectrum Liberalisation and other documents.
- 4.31 Ofcom considers that it is now appropriate to consider the different options for releasing the spectrum in detail, and that this work should be taken forward as a priority. Accordingly, Ofcom plans to issue a detailed consultation document discussing the different options for the band by the end of 2005/06 with a view to an award in the following year. This consultation document will consider in detail the responses received to the SFR:IP that are relevant to this band.

DECT guard bands (1781.7 – 1785 MHz paired with 1876.7 – 1880 MHz)

- 4.32 In the SFR:IP Ofcom set out its plan to award a small number of low power concurrent licences for this band and to do so in 2005/06. Ofcom's revised plans are set out in full in a further consultation document published at the same time as this statement. This proposes the award should be by means of a sealed bid auction of between 5 and 10 low power concurrent licences (exact number to be determined by the auction) which will be technology and application neutral. It is proposed to make the award by end of 2005/06.

1785 – 1805 MHz (Northern Ireland)

- 4.33 In the SFR:IP Ofcom explained that it was exploring the possibility of awarding at the same time as ComReg, licences to use spectrum in the band 1790 - 1798 MHz for use in the Republic of Ireland and Northern Ireland.
- 4.34 Ofcom is continuing its consideration of this option with ComReg. Through the discussions the bands 1785 – 1790 MHz, 1798 -1800 MHz and 1800 – 1805 MHz have also been identified as un-used in both Northern Ireland and the Irish Republic. The difficulties created by the emergency service and MoD use in the 1790-1798 MHz band in Great Britain (see paragraphs 4.39 – 4.42 below) do not apply in Northern Ireland. There is therefore the potential for a simultaneous award of 20 MHz of un-paired spectrum in Northern Ireland and the Republic of Ireland.
- 4.35 Ofcom's initial assessment is that that simultaneous awards north and south of the border would be legally and practically feasible and likely to be beneficial to consumers in Northern Ireland and the Republic of Ireland for the following reasons.
- It is likely to lead to an earlier release of spectrum than if Ofcom takes a UK-wide approach to releasing spectrum at 1790-1798 MHz. This is because, as discussed further below, in Great Britain there are complex issues connected with emergency service and MoD use of the 1790-1798 MHz band. At present it is not clear whether and when these can be resolved but, in any event, it is unlikely that the spectrum would be available in Great Britain before 2007/8 as indicated in the SFR:IP.

- Holding an award in Northern Ireland, separately from Great Britain, would allow significantly more spectrum to be released. In the rest of the UK the bands 1785 – 1790 MHz and 1798-1805 MHz are unavailable for release due to MoD use.
- There is a technical and economic case for encouraging or enabling the development of a coordinated release of spectrum in NI and the Republic of Ireland. From the technical perspective, coordinated release of the spectrum should help services to be planned more efficiently by the operator(s), facilitating the provision of services in border areas to the largest number of consumers.
- The co-ordinated release of spectrum in Northern Ireland and the Republic of Ireland should also facilitate commercial arrangements that span the border. For example, there will be an opportunity for the same operator to acquire a licence in each jurisdiction and a reduction of transaction costs for that operator. A more attractive structure for licensing could bring benefits to consumers by facilitating additional competition or innovation in the provision of telecommunications services.

4.36 Ofcom is still considering the issue of the appropriate licensing structure for this spectrum in Northern Ireland as well as Great Britain. Ofcom is planning to carry out a market study, jointly with ComReg. Following this study if Ofcom continues to judge that a separate award of Northern Ireland is likely to be the most appropriate way forward, it will issue a consultation document setting out further information, including detailed proposals for the award of the spectrum. This may be issued by the end of 2005.

1790 – 1798 MHz (Great Britain)

- 4.37 In the SFR:IP Ofcom set out its proposals to seek to resolve the issues relating to this band to allow, if possible, an award to be held during 2007/8.
- 4.38 The responses to the SFR:IP (see annex A for a detailed discussion) identify three main issues for Ofcom: timing for the release of spectrum, regional availability of spectrum, and whether more spectrum (e.g. more than 8 MHz) could be made available.
- 4.39 On the question of timing, Ofcom believes that its assessment of the priority for the release of this band is still correct. It recognises that there are enthusiastic proponents of new technologies seeking access to spectrum for broadband mobile services. However, before any award can take place there are a number of complex issues which need to be resolved. These relate to the existing use of the band by the emergency services and the MoD and also the possible future use by digital radio microphones (the band is identified for this use across Europe). At present it is not clear exactly whether all these issues can be resolved and therefore it is very unlikely that, if the spectrum can be awarded, this could occur earlier than the timescale indicated in the SFR:IP, ie 2007/08.
- 4.40 Ofcom will, however, continue to work to resolve the issues which represent pre-conditions to allowing commercial use of the band. In particular, it will seek to establish an appropriate migration plan for the emergency services. However, the co-ordination issues with existing MoD use in the band will not

diminish over time. Ofcom currently anticipates that it may be possible to issue a detailed consultation document on the possibilities for the band during 2006/07.

- 4.41 Some respondents suggested that the band could be made available earlier on a regional basis. Ofcom recognises that the issue of emergency service use does not impact on all areas of Great Britain to the same degree. However, Ofcom does not accept that a regional approach to the release of spectrum and regional geographic protection of legacy links is likely to be the appropriate means of balancing the promotion of spectrum efficiency with the need to protect incumbent uses of this band, especially for the safety of life services. Ofcom's judgement is that, given the spectrum would be shared by a number of users, a regional approach could lead to an un-necessarily complex and burdensome management regime. Given the wide range of other spectrum awards that Ofcom needs to progress, and the significant complications with use of this band in Great Britain, Ofcom remains minded to proceed with the release of other bands as a higher priority.
- 4.42 Some respondents also suggested that additional spectrum should be made available. Ofcom continues to believe that this 8 MHz of spectrum is the most that could be made available in Great Britain since the other adjacent bands are currently used by the MoD, and even this 8 MHz could be constrained by MoD use. As discussed above the position is different in Northern Ireland.

2010 – 2025 MHz

- 4.43 In the SFR:IP Ofcom set out its intention, assuming the European harmonisation measures relating to this band were amended appropriately, to award one or more UK licences in the band on a technology and application neutral basis. It also identified the possibility of linking the award of this band with that of 2290 – 2302 MHz to allow users to create their own paired spectrum.
- 4.44 Since the publication of the SFR:IP there have been a number of discussions of this band in Europe. Ofcom has been working within the relevant CEPT and EU committees to ensure that any revised European harmonisation measures meet the UK's objectives.
- 4.45 Ofcom has brought proposals to CEPT to allow national administrations a greater degree of flexibility to allow frequency division duplex (FDD) in addition to time division duplex (TDD) use in the band 2010 – 2025 MHz. The relevant CEPT project team (ECC PT1) has adopted a new work item to conclude on a revision to the existing Decision ERC/DEC/(99)25 to allow such flexibility by the end of 2005. Proposals to pair the band 2010 – 2025 MHz with the currently unpaired centre portion of the band 2500 – 2690 MHz are currently under consideration. Tied in with this, ECC PT1 is also considering additional proposals to allow a similar FDD pairing between the band 1900 – 1920 MHz (currently licensed in the UK for TDD use by four of the 3G operators) and the unpaired centre portion of the band 2500 – 2690 MHz.
- 4.46 The consideration of these issues is ongoing but to date the harmonisation measures designating this band for licence exempt IMT – 2000 TDD systems have not been amended or removed. Ofcom will continue to seek changes to these measures to allow more flexible use of this band.

- 4.47 Amongst the responses to the SFR:IP in relation to this band, Ofcom has received representations from the MNOs that its award should not be pursued on the timescales suggested. One of the reasons given was that the awards were linked to the resolution of the policy issues concerned with the extension of spectrum liberalisation to the mobile sector. Certain MNOs also argued that the award of the band could be unlawful unless it occurred on terms that they outlined, for example as to resolving the future of the existing 2G spectrum and the imposition of roll-out obligations. Other respondents to the consultation argued in favour of releasing the band to the timetable identified, and supported Ofcom's approach to removing unnecessary constraints on its use. They argued that release of this band, in the manner Ofcom had suggested, would promote efficient use of the spectrum, competition and innovation.
- 4.48 The continuing discussions at European level in relation to the amendment of the existing harmonisation measures mean that Ofcom is not presently in a position to set out the likely timing for award of this band. When the European discussion have been concluded, or are significantly further advanced, Ofcom will set out detailed proposals for the release of this spectrum. These will take account of all representations received, and will include proposals for the form of any licences and the award process.
- 4.49 Ofcom regards the release of this band as a priority, and it will continue to work towards making awards as soon as possible, consistent with its general approach towards spectrum awards, and taking account of the fact that (owing in part to the existing regulatory constraints) the spectrum is presently un-used.

2290 – 2302 MHz

- 4.50 In the SFR:IP Ofcom set out its view that this band should be awarded on a technology neutral basis but suggested the value of the band to potential users was likely to be increased by linking its award with 2010 – 2025 MHz as it would facilitate users creating their own paired spectrum.
- 4.51 Considerable interest was expressed by the respondents to the SFR:IP in the possibility of linking the award of this band with that of 2010 – 2025 MHz. Accordingly, Ofcom's current plan is to progress this award on a similar timescale to 2010 – 2025 MHz. Ofcom will keep this policy under review, and may reconsider if it becomes apparent that this would lead to undue delay in the award of 2290 – 2302 MHz.

2302 – 2310 MHz

- 4.52 In the SFR:IP, Ofcom explained that this band was potentially available for award but it required resolution of the same issues as in 1790 – 1798 MHz in Great Britain.
- 4.53 Responses to the SFR:IP indicated limited interest in the band. Only two respondents mentioned the band 2302 – 2310 MHz, supporting the release of this band but only after the migration of emergency services was complete.
- 4.54 Ofcom does not consider that the release of this spectrum is a priority. However, it will work to resolve the issues associated with the existing users in the same way as for 1790-1798 MHz.

2500 – 2690 MHz

4.55 In the SFR:IP Ofcom set out its proposal to award this band in 2006/07 on a technology neutral basis but respecting the IMT-2000 spectrum mask developed for this band. However, it made clear that this was subject to any binding EU harmonisation measures.

EU harmonisation measures

4.56 Since publication of the SFR:IP there have been a number of developments regarding the possible EU harmonisation measures relating to this band. In March 2005, the CEPT adopted a new decision, ECC/DEC/(05)05, on harmonised spectrum arrangements for the band 2500 – 2690 MHz. As expected, this identified the band for terrestrial IMT-2000/UMTS use and adopted the channelling arrangements detailed in Figure 2 of the SFR:IP. According to this Decision, the band should be made available (for IMT-2000/UMTS use) by 1 January 2008.

4.57 At the ECC meeting in March where Decision ECC/DEC/(05)05 was adopted, the UK was unable to indicate its intention to commit to the Decision. The reason was that, whilst it supported the detailed channelling arrangements as the basis for European harmonisation of the band, it did not support the proposal to reserve the band exclusively for IMT-2000/UMTS. Ofcom considers that national administrations should have the flexibility to allow other technologies and applications to operate in the band.

4.58 Following the March ECC meeting, the EU's Radio Spectrum Committee (RSC) met in early June and discussed future use of the band 2500 – 2690 MHz. There was common agreement in the RSC that ECC/DEC/(05)05 fulfils the last element of the Commission's Mandate 5 to CEPT on IMT-2000/UMTS. However, even though the Commission considered that CEPT had fulfilled Mandate 5 by delivering channelling arrangements that cater for technical coexistence in the band, the Commission also considered that the issue of non-discriminatory access by technologies other than IMT-2000/UMTS still needed to be clarified, and that ECC/DEC/(05)05 did not offer a final solution. The Commission concluded that a Commission Decision would be needed to ensure a consistent approach to implementation across Europe, in compliance with the European legal framework.

4.59 The RSC has now issued a working document (RSCOM05-18) in relation to this band. This sets out the Commission's view that:

“the harmonisation of this frequency must not be extended to establishing an exclusive usage right for IMT-2000 technologies. The regulatory framework, including competition rules, would allow exclusive use only when duly justified. There does not seem to be any valid justification, since IMT-2000 is already on the market and as harmonised frequencies already exist in the so-called core band at 2GHz. New technologies, including particularly those which were developed after the identification of IMT-2000 technologies in 1999, should not be excluded, provided they do not cause interference and are compatible with the channelling plan developed based on IMT-2000. “

4.60 Before submitting a draft Commission Decision to the RSC, the Commission is now consulting Member States and other constituencies regarding the impact of the impact of a Decision that clearly opens the band 2500 – 2690 MHz for IMT-2000 and other compatible technologies. In late June, the Commission

issued an “Invitation for Comment” on the issues taking into account RSCOM05-18.

- 4.61 The deadline for comments in response to this consultation is 22 August 2005. Ofcom expects to reply indicating its support for the Commission’s position as set out in RSCOM05-18.

SFR:IP responses – technology neutrality

- 4.62 The SFR:IP consulted on the issue of whether the award of this band should be made on a technology neutral basis. Ofcom proposed to take a technology neutral approach, but to base the spectrum mask for the band on the IMT-2000 spectrum mask.
- 4.63 Ofcom will not make a final decision on this issue until it makes detailed final proposals for the award, which will not occur until the position regarding European harmonisation measures is resolved. However, in the interests of transparency, Ofcom sets out below its current thinking on the issue. A more detailed consideration of the issues raised by respondents on this issue is set out in annex A.
- 4.64 Of the 26 respondents who commented specifically on this issue only 6 were specific in opposing Ofcom’s proposal.
- 4.65 It is important to be clear about what is the relevant question in relation to the issue of whether this band should be exclusively reserved for IMT-2000 technologies. The position is that there is already spectrum, namely the so-called core IMT-2000 bands (1920–1980 MHz paired with 2110-2170 MHz plus 1900–1920 MHz) which has to date been reserved exclusively for IMT–2000. Therefore the relevant question for purposes of responding to the Commission’s consultation relates to the incremental benefits and costs from reserving the 2.6GHz band exclusively for IMT–2000 in addition to other spectrum.
- 4.66 Ofcom believes that the incremental benefits, if any, are likely to be small while the costs could be significant. Ofcom will set out further details on this when it publishes its response to the Commission’s consultation discussed above.
- 4.67 Respondents to the SFR:IP who opposed Ofcom’s proposal identified the following as the key benefits of exclusive access. They suggested that regulatory harmonisation with exclusive access for IMT-2000 would:
- allow economies of scale in equipment manufacture to be realised, leading to lower prices for consumers;
 - secure international roaming for consumers;
 - minimise the potential for interference; and
 - provide certainty as to the spectrum which will be available for IMT-2000, leading to more investment in IMT-2000.
- 4.68 Underlying all of these suggested benefits of exclusive access is the argument that a technology neutral approach will result in “fragmentation” of demand which will have a negative effect on the benefits generated from use of this spectrum band. Adopting a technology neutral approach may result in “fragmentation” in the 2.6GHz band in the sense that the spectrum use may involve other technologies as well as IMT-2000. It may also arise in the relevant

downstream markets in the sense that there may be more competing technologies and applications. However, it is Ofcom's view that if "fragmentation" is the result of the market identifying that alternative technologies and applications generate higher values than IMT-2000 this would be expected to have a positive rather than negative impact on the overall benefits generated from use of the spectrum in this band. Additional competition from alternative technologies would generally be expected to be beneficial to consumers (welfare enhancing).

- 4.69 Detailed consideration of each of the issues raised by respondents is provided in Annex A below. Based on this analysis Ofcom's current view is that the expected costs of reserving the band exclusively for IMT-2000 technologies are likely to exceed the expected benefits.
- 4.70 As explained above, Ofcom has not yet reached a decision on this issue and will only do so when the European position is clear and nearer to the time when the award would be made. However, currently its preferred view remains that set out in the SFR:IP and in this document, and Ofcom will be responding to the Commission's consultation accordingly.

Next Steps

- 4.71 Amongst the responses to the SFR:IP in relation to this band Ofcom has received representations from the MNOs that its award should not be pursued on the timescales suggested. One of the reasons given was that the awards were linked to the resolution of the policy issues concerned with the extension of spectrum liberalisation to the mobile sector. The four 2G MNOs also argued that, unless certain conditions they outlined were met, the award of the band before resolution of the 2G liberalisation issue would be inappropriate and unlawful.
- 4.72 Many other respondents argued strongly in favour of releasing the spectrum in the manner proposed by Ofcom, and argued that this would promote optimal use of the spectrum, competition and innovation in electronic communication services.
- 4.73 The continuing discussions at European level in relation to possible harmonisation measures mean that Ofcom is not presently in a position to set out the likely timing for award of this band. When the European discussion have been concluded, or are significantly further advanced, Ofcom will prepare detailed proposals for the release of this spectrum. These will take account of all representations received, and will include final proposals for the form of licences and the award process.
- 4.74 Ofcom will continue to work towards awarding the band in a timely way, consistent with its general approach to spectrum awards, and taking account of the fact that spectrum will be unoccupied in the UK from 1 January 2007.

3.6 – 4.2 GHz

- 4.75 In the SFR:IP Ofcom set out a description of the current position of licensed services within these bands. Existing fixed services (fixed links) and fixed satellite services (earth stations) are licensed throughout this band and Ofcom requires that fixed wireless access services coordinate installations to manage the interference environment. While this band could possibly be used for (among other applications) new Broadband Wireless Access technologies

(including IEEE 802.16 and 802.20), it is also co-ordinated internationally for satellite use.

- 4.76 In the SFR:IP, Ofcom proposed to do further work on the possibilities for licensing additional terrestrial services in these bands, while taking account of the interests of current users. Key to this is clarifying and regularising the current use in the bands which is part of a wider programme of work and involves discussion with users from all relevant industry sectors. As well as licensing, Recognised Spectrum Access is also available as a possible mechanism for the Fixed Satellite service to consolidate its position in the bands.
- 4.77 A number of responses to the SFR:IP noted that the ITU WRC-07 agenda will consider work for future mobile systems beyond IMT-2000 and suggested that any further release should be delayed to take account of preparations for future conferences. It was also noted that 3.6-3.8 GHz could be considered for FWA / WiMax as it is within the tuning range of some current equipment.
- 4.78 Ofcom plans to continue exploratory work on sharing with satellite services in discussion with the various industry sectors to see if it is possible to license further terrestrial services in the band. If this is possible, Ofcom would expect to do so on a technology neutral basis in line with its general approach.

10 GHz

- 4.79 In the SFR:IP Ofcom set out its plan to award a single national licence for the spectrum available in 10 GHz band (2 x 100MHz) and to do so in 2006/07.
- 4.80 Responses to the SFR:IP were broadly supportive of releasing the spectrum but in relation to the proposed timing, a number of respondents suggested that the band should not be treated as a high priority for award and its award should not be pursued on the proposed timing if it compromised other awards.
- 4.81 Ofcom agrees with respondents that this band is not a high priority for award but it believes that there is some scope to pursue this award without compromising other award processes. There are also coordination issues with the MoD which will need to be resolved ahead of any award. Ofcom plans to continue to work towards an award of this band probably during 2006/7. In order to facilitate this it plans to undertake a market study of this band together with 28 GHz, 32 GHz and 40 GHz. The conclusions of this will be used to develop detailed proposals for these awards. Ofcom expects to issue a consultation document on this by the end of 2005/06.

28 GHz

- 4.82 In this band 27 regional licences are available for award, having remained unsold in the November 2000 auction that the Radiocommunications Agency ran and in a subsequent modified procedure. In the SFR:IP Ofcom proposed that these licences, with the original geographical borders and spectrum packages, should be made available via an open-ended process that would allow interested companies to submit bids at a time that suited their business requirements. Competitive bidding would occur only where two or more bidders expressed an interest within a certain timeframe in the same regional licences. Reserve prices would be lower than in the 2000 auction.

- 4.83 There was general agreement to the proposals among the 14 respondents who commented on them. A number pointed out that metropolitan regions, where licences had been sold, were the most attractive or that the licences should give national UK coverage. Some commented on the need for a flexible and attractive award process. Two commented that the spectrum should be made available for the amateur service.
- 4.84 In the SFR:IP Ofcom pointed out that the ECC Decision (ERC/DEC(00)09) that made allocations in the 28 GHz band for Fixed and Fixed Satellite Services was in the course of revision. The ECC agreed a new Decision in March (ECC/DEC(05)01). This identifies additional harmonised spectrum for terrestrial and satellite services with a clearer definition between the two (the original decision had a three part service partition). Additional terrestrial spectrum is available that could be used nationally, i.e. a pair of 112 MHz channels and an unpaired 112 MHz channel.
- 4.85 Ofcom believes that it should take account of the availability of additional spectrum in assessing the options for this band. It has decided that instead of pressing ahead immediately with the award of the remaining regional licences it should commission a market study of potential opportunities created by the new spectrum, the appropriate award process and the implications for the award of regional licences. Ofcom expects to run the market study (which will also cover 10 GHz, 32 GHz and 40 GHz) and issue a further detailed consultation on proposals when the study is completed, probably by the end of 2005/06. Ofcom therefore now expects to launch the award process for this band in 2006/07.

32 GHz

- 4.86 In this band 2x500 MHz is available and Ofcom proposed in the SFR:IP to award the spectrum in an auction process on similar lines to that proposed for the 28 GHz regional licences. We sought views on whether the spectrum should be awarded as a single national licence or as two licences each of 2x250 MHz.
- 4.87 There was general agreement to the proposals among the 14 respondents who commented on the proposal. There were some differences on the number of licences that should be awarded and a suggestion that this could be decided in a combinatorial auction. Two commented that the spectrum should be made available for the amateur service.
- 4.88 Ofcom believes that, not least given the divergence of opinion on the number of licences in this band, it should carry out a market study to review likely demand for the spectrum and to consider the appropriate spectrum packaging and award design. It expects to run the market study (which will also cover 10 GHz, 32 GHz and 40 GHz) and issue a further detailed consultation on proposals when the study is completed probably by the end of 2005/06. Accordingly, it now expects to launch the award process for this band in 2006/07.

40 GHz

- 4.89 In relation to 40 GHz, in the SFR:IP Ofcom proposed to release the spectrum through a non-exclusive licensing mechanism. It proposed that a total of 2 x 250MHz should be released for full commercial trial licensing which would commence in 2005/06. This will be in a part of the 40.5 – 43.5 GHz band which

is outside the band shared with Radio Astronomy Service (42.5 – 43.5 GHz) and will contain a high level co-ordination method.

- 4.90 On the timing of release, respondents commented that the band was of low priority and that the process of release should not delay the award of other bands. Ofcom believes it can make some progress on releasing this band without diverting resources away from the award of other bands. In view of the uncertain demand for licences in the band it plans to undertake a market study of this band, together with 10 GHz, 28 GHz and 32 GHz. The conclusions of this will be used to developed detailed proposals for the release of spectrum in the band and Ofcom expects to issue a consultation document on this by end of 2005/06.

Conclusion

- 4.91 Ofcom expects to keep the timing of the award programme under review as it takes the work forward and to provide periodic updates on the timing of the individual awards.

Annex A

Summary of responses

- A.1 This annex sets out a summary of responses made to the SFR:IP in relation to following questions: 4.1- 4.6, 5.4, 5.9 and 5.16.
- A.2 Many other comments were made in the consultation in relation to the licensing of particular bands, including in response to other questions in Section 5 of the SFR:IP, and to certain questions in Sections 6 and 8. Ofcom has commented on many of these points in Sections 3 and 4 of this Interim Statement.
- A.3 Ofcom also expects to publish a detailed consultation before each spectrum award. This will set out detailed proposals for the licences to be awarded, the assignment process, and any other relevant issues. These consultations will consider the comments made by respondents to the SFR:IP that are relevant to the licensing of particular bands. In the case of some major spectrum awards (such as the 2500-2690 MHz band) there may be a need for a wider consultation process extending beyond a single document.

Question 4.1 Do you see scope for using simpler auction formats in the future than used in the UK in the past?

- A.4 The table below sets out the comments, where they differed from Ofcom's view, made by respondents in relation to this question and Ofcom's response. Further discussion of the issues is set out in Section 3 above.

Issue raised	Comments	Ofcom's response
Open auctions preferred to sealed bid	TETRA MOU Association pointed out that sealed bid auctions could lead to winner's curse and that multiple round auctions would favour small bidders. T-Mobile considered that sealed bid auctions might give inefficient outcomes.	We shall use the auction design most appropriate for meeting the objectives of each award. In some cases this may be a sealed bid auction in others an open auction. Sealed bid auctions have advantages in some circumstances, and open auctions in others.
Simultaneous multiple round auctions (SMRA) may be appropriate in some cases.	Orange considered that SMRA design may be needed in some cases. Vodafone considered SMRA as likely to be preferable to sealed bid auctions.	Where we judge that SMRA is the most suitable process for an award we shall use it. However, this will depend on judgements that reflects the circumstances of the individual awards, including the objectives of the process and the significance of issues such as bidder asymmetry and strategic behaviour.
Concern about handling potential entrants with market power	Kingston considered that companies with SMP should be excluded. O2 were concerned about an apparent intention to design auctions that favoured those without market power.	As explained more fully in Section 3, the purpose of an auction is to promote the optimal use of the spectrum. This will typically be achieved by assigning the spectrum to the person who is willing to pay

		<p>most for it. However, it is possible that asymmetries between bidders, whether caused by one likely bidder having SMP or for some other reason, could undermine the achievement of this objective if not taken into account when designing an auction. They may for example lead to other bidders not participating, or otherwise adversely affect the efficiency of the assignment process. Accordingly, Ofcom will take the existence of significant market power and other reasons for asymmetries between bidders into account when designing auctions. It is possible in principle for market power to exist in spectrum markets and/or in relevant downstream markets.</p>
Design should allow for regional and small spectrum blocks	TAUWI suggested this.	<p>The packaging of spectrum to be auctioned will be determined for each auction taking account of such factors as the nature of the spectrum on offer and the services that might be provided. Combinatorial auctions may be used where potential bidders have varying requirements. A primary award structure that involves small or regional blocks involves extra complexity and a potential loss of flexibility for the market. These may impair the development of viable services and an efficient assignment process. As licences will be tradable, in some cases the secondary market may be relied upon to meet demand for regional or small spectrum blocks.</p>
Licences should not be reserved for new entrants	Orange considered that with the market approach to spectrum management there was less need to reserve licences for new entrants. Another respondent suggested that Ofcom should avoid setting the size and number of licences and reserving for a new entrant.	<p>Ofcom does not believe, in general, that auction objectives are likely to extend to determination of the most appropriate market structure. There would need to be particular reasons to justify reserving licences for new entrants, which are likely to be related to existing or potential competition concerns in the relevant downstream markets.</p>

Question 4.2 Do you agree future auctioned licences be for a minimum fixed term with a rolling extension?

A.5 The table below sets out the comments, where they differed from Ofcom’s view, made by respondents in relation to this question and Ofcom’s response. Further discussion of the issues is set out in Section 3 above.

Issue raised	Comments	Ofcom's response
Licence terms should be indefinite	BT were concerned about rolling terms and thought that Ofcom should look at indefinite term. T-Mobile considered that security of tenure was critical and that perpetual licences should be considered.	We consider that the phrase "rolling term" is unhelpful, and now use the term "indefinite duration" instead. The purport is the same. We consider that an indefinite term with a minimum term should provide sufficient security of tenure for licensees.
Treatment of previously auctioned licences	O2 suggested that existing auctioned licences should be brought into line with the proposal. Vodafone similarly suggested that all licences should be brought into line. The FCS suggested that auctioned licences should be treated as existing licences. Another respondent agreed that existing licensees should be offered a rolling extension.	As explained in Section 3, Ofcom does not believe there is an automatic linkage between the approach generally proposed for new awards and the treatment of licences already auctioned. It proposes to consider case by case the merits of any change to the terms of licences already auctioned.
Length of minimum term	ip.access suggested a minimum term of five years. Others suggested it should be short without specifying the length. TAUWI suggested the minimum term should allow the recovery of investment.	The length of the minimum period will be designed to allow sufficient time to give bidders a reasonable opportunity to recover their investments and be appropriate for the type of service likely to be deployed. The minimum period may therefore vary between awards.
Include roll-out or use it or lose it (UIOLI) conditions to ensure spectrum is used to deliver services	A number of respondents suggested under-use of spectrum needed to be addressed. Oak Global suggested UIOLI to address legacy technologies. Stratex thought UIOLI was desirable. TCI believed it was needed. The Wales BSG thought UIOLI should be more widely used.	While Ofcom will consider each case on its merits, in general it believes that roll-out or UIOLI conditions are unlikely to be justified to promote optimal use of the spectrum, as this is better achieved through other mechanisms such as competitive award processes, spectrum trading, liberalisation and spectrum pricing.

Question 4.3 If licences with minimum fixed terms followed by rolling terms are introduced, do you agree that AIP should be payable during the rolling term of a licence?

A.6 The table below sets out the comments, where they differed from Ofcom's view, made by respondents in relation to this question and Ofcom's response. Further discussion of the issues is set out in Section 3 above.

Issue raised	Comments	Ofcom's response
Avoid use of AIP	Broadband Access Strategies considered payments should be visible as part of the auction price. BT suggested AIP be avoided. Crown Castle would like to see the	Ofcom has set out elsewhere its view that AIP should continue to apply notwithstanding the introduction of spectrum trading (see Spectrum Pricing documents and Spectrum

	case made for AIP. A number of respondents opposed AIP. O2 believed that AIP is a distortion in a traded market. Orange agreed with this. T-Mobile believed AIP should be discontinued. Vodafone considered that AIP should not exist alongside spectrum trading.	Trading Statement) in order to encourage optimal use of the spectrum. The issue here is not whether AIP should be maintained but whether Ofcom should retain the option to charge fees (which may include AIP). For the reasons set out in Section 3 Ofcom believes that it would be appropriate for Ofcom to retain this option.
Clarity regarding AIP	Orange considered that calculating AIP before an auction would be difficult and calculating it later would cause uncertainty. ip.access said that information on AIP would be needed before an auction. The Wales BSG considered that payments should be visible as part of the auction process. The WiMAX Forum believed clarity was needed before an auction. Zynetix said that AIP should be set at the outset.	Ofcom does not expect to set the level before the auction, since it does not believe that it is necessary or appropriate to do so. Rather, it is retaining the option to charge AIP. If it were to charge fees it would expect to give licensees reasonable notice before doing so.
Cost recovery fees	Orange argued that fees should be set on a cost recovery basis.	Ofcom will determine any relevant licence fees in the future in line with its general policy at that time, and in light of the relevant justification for charging fees. Fees may be set on the basis of AIP, or to recover an appropriate share of regulatory costs.
Royalty payments	Intellect suggested looking at royalty payments.	We will set payment terms that are appropriate to the objectives of each auction. We do not favour royalty payments, which can discourage the optimal development of services.

Question 4.4 What should Ofcom do to ensure that bidders are well informed and well prepared to participate in an auction?

A.7 The table below sets out the comments, where they differed from Ofcom's view, made by respondents in relation to this question and Ofcom's responses. Further discussion of the issues is set out in Section 3 above.

Issue raised	Comments	Ofcom's response
Timely publication of information	Broadband Access Strategies suggested information should be available a minimum of four months from the start of the auction process. BT said that information should include firm award dates. The Wales BSG suggested information be available a minimum of three months ahead of the process.	We aim to give as much information as possible, as early as possible, in our statements setting out firm proposals for each award. In the information memorandum for each award we will aim to set out the essential information to allow potential bidders to make well informed decisions. It will include a timetable for the award process.
Comprehensive technical information	FCS said that details of co-ordination limitations were needed. Intellect said that absolute clarity on	For each award the information memorandum will include technical details of the spectrum on offer –

	<p>technical conditions was needed. ip.access said that technical information should be included. TETRA MOU Association said that technical constraints and sharing requirements should be explained. Vodafone said it was essential to know all aspects of permitted use, the protection required by neighbouring users and co-existence problems between adjacent blocks. The Wales BSG said technical information and assumptions were needed.</p>	<p>including what constraints there may be on its use, and any co-ordination requirements.</p>
Market and technology information	<p>Network Rail said that bidders needed to be aware of incumbents. Oak Global said that Ofcom needed to be informed by bidders of innovative technologies and markets.</p>	<p>For each award the information memorandum will include details of the spectrum on offer, including details of any incumbent users.</p>
Asymmetry of information	<p>O2 pointed out the danger of asymmetry of information between bidders. TETRA MOU Association said that sufficient information to aid inexperienced bidders should be released early.</p>	<p>Ofcom's aim for each auction will be to make available as much information as it can to allow all potential bidders to make fully informed decisions on judging the opportunity presented by the spectrum award and to determine their strategies should they wish to enter an auction.</p>
Spectrum availability and future awards	<p>O2 said that bidders needed to know what substitutable spectrum will become available and the utility of the assets of their competitors subsequent to an auction. Pipex said that as much information as possible should be given to bidders, especially on licence conditions and future awards. The WiMAX Forum wanted as much information as possible, including the timing of awards. The Wales BSG said knowing the sequence of later awards was important.</p>	<p>For each award the information memorandum will include details of similar spectrum that is available or likely to become available, including the potential timing of future awards.</p>
Consultation	<p>Orange suggested that industry consultation was needed prior to an auction. T-Mobile suggested the establishment of consultation groups.</p>	<p>There will be full consultation on all aspects of Ofcom's proposals for each award. Ofcom expects to organise a number of events for stakeholders that will allow full exchange of information and views relating to particular awards.</p>
Information media	<p>Kingston Communications suggested that key dates should be announced via Ofcom updates. TAUWI suggested using the internet, trade journals and workshops. Zynetix suggested e-mail guidance on decision making criteria and dummy runs.</p>	<p>We will disseminate information primarily via the Ofcom website. For each auction, where necessary, workshops, with mock auctions, will be run to inform and instruct potential bidders on the administration of the auction and their participation in it.</p>

Question 4.5 Do you agree these are relevant considerations which Ofcom should take into account in devising its programme of spectrum awards?

A.8 The table below sets out the comments, where they differed from Ofcom's view, made by respondents in relation to this question and Ofcom's response. Further discussion of the issues is set out in Section 3 above.

Issue raised	Comments	Ofcom's response
Resourcing considerations	Crown Castle suggested that the award of bands should not be delayed for resource reasons. Kingston Communications suggested that the cost of the award programme to Ofcom should not influence the timetable. Oak Global commented that Ofcom needed to have resources to avoid delays.	Ofcom will seek so far as it is able, given it is required to meet a wide range of duties which extend beyond spectrum management, to avoid circumstances where a lack of its resources delays the award of spectrum.
	02, Orange suggested that bidders resources should also be considered.	Ofcom recognises the need to consider the call on potential bidders' resources where they may be interested in the award of a number of different bands and will consider the need to stagger auctions on a case by case basis as the programme progresses.
International considerations	BT expressed the concern that waiting for other countries could delay awards.	Ofcom recognises this concern but believes that it has to be balanced against the need to take account of existing or forthcoming international measures which might impact on (or contain mandatory requirements relating to) the spectrum to be awarded. To proceed too early in the process risks an inefficient assignment because there may be too much uncertainty regarding possible use of the spectrum.
	Many respondents including Network Rail, 02, Oak Global. TETRA MOU Association, T-Mobile emphasised the importance of EC harmonisation and the need to comply with international decisions.	See comments on harmonisation below in relation to questions 4.6 and 5.16.
Economic value considerations	BT expressed concern that it was difficult to assess the economic value of innovative ideas. TETRA MOU Association expressed a similar concern.	Ofcom agrees with these comments up to a point but it believes that it should be possible to distinguish at a broad level between bands which are likely to bring greater economic benefits than others, for example by reference to the amount of spectrum available, whether it is also available in other countries, its technical characteristics and the availability of

		equipment.
Level of interest	BT suggested if there was little interest then Ofcom should consider other award procedures.	Ofcom agrees that auctions are relevant where it is likely that demand will exceed supply. If this is not the case then other assignment mechanisms may be preferable. Ofcom has made proposals for using a simplified 'shop window' process in cases where demand may be low.
Other considerations which should be included by Ofcom	One respondent suggested that Ofcom should take into account social factors in devising the programme as these could distort the ability of some participants to compete against rival bidders in auctions whose services contained no such social element.	As set out in the SFR Ofcom accepts that there may be exceptions to its general preference to rely on market mechanisms. One example of this might be where there was a compelling case on public safety grounds for ensuring spectrum is available for emergency services. However, as indicated in the SFR, policy interventions of this kind will need to be clearly justified. Prof Cave is looking at the wider issue of access to spectrum for public services in his independent audit.
	IEEE 802, ip.access, and another respondent suggested that Ofcom should take into account incentives to develop new technologies and so encourage innovation.	Ofcom will take this consideration into account and it believes that it forms part of the broader consideration which it identified in the SFR:IP to consider likely economic benefits which an award would bring.
	Network Rail commented that Ofcom should take into account issues of national strategic importance.	It is not clear from the response what specifically is meant by "issues of national strategic importance". However, if it relates to the use by Network Rail of particular bands adjacent to bands due for award then these issues will be considered in the relevant awards.
Other points	Orange suggested there was a need for consultation on the assessment of the criteria and commented that it did not believe that the criteria were consistent with releasing spectrum as soon as possible.	In the SFR:IP Ofcom set out the considerations which it believed impacted on the timing of awards for consultation. Ofcom considers that the efficient use of the spectrum is unlikely to be promoted if it sits with the regulator, unavailable for use. Release of the spectrum as early as possible to the market will enlarge the opportunities for use to be made of it.
	Telecommunications association of the UK water industry (TAUWI) suggested there was a need to prepare detailed information on spectrum to be auctioned, covering what changes are likely to be made to that spectrum or adjacent spectrum during the life of licence.	Before any particular award Ofcom will publish a document known as the Information Memorandum which will set out the type of information identified.
	O2 commented that it would expect Ofcom to provide clarity of the overall future supply side conditions	Ofcom expects to set out in the information memorandum for each award the information available to it

that licensees could expect before auctioning spectrum.

at that point in time regarding the availability of potentially substitutable spectrum.

Question 4.6 Do you believe that the proposed award programme is appropriate?

A.9 The table below sets out the comments, where they differed from Ofcom's view, made by respondents in relation to this question and Ofcom's response. Comments on the timing of particular bands are dealt with other parts of this Annex or in Section 4.

Issue raised	Comments	Ofcom's response
Level of interest should be key	BT, Intellect, ip.access and WiMax forum suggested the bands where there is significant interest should be awarded first.	Ofcom agrees that this is a very important consideration to take into account when deciding on the timing of particular spectrum awards and all other things being equal it would suggest doing those awards first. However, in practice there are other considerations such as the existence of incumbent users, EU processes or unresolved policy issues which may mean that even though a band has a high level of interest its award may need to follow other bands with a lower level of interest.
Accelerate the programme	CMA, Crown Castle, and another respondent, suggested the process should be accelerated	Ofcom does not believe that it is possible given its available resources and also external consideration to accelerate the programme. It also notes that this view was only expressed by three of the many stakeholders who commented on this question.
Programme too ambitious / too fast	Orange, T-Mobile, O2, Vodafone, and another respondent all commented that the proposed programme if implemented would not be appropriate as it would lead to the assignment of additional spectrum which could be used for 3G services, in particular through the 2500 MHz and 2010-2025 MHz bands, and that this would occur too soon.	Ofcom remains of the general view that holding back spectrum from the market is unlikely to be consistent with its duties to secure efficient use. More information is available to the market (taking all different potential uses and users into account) than to the regulator about the most efficient use of the spectrum over time, and the optimum timing for deployment of networks and services. If the regulator delays making spectrum available, the opportunities for putting the spectrum to productive use will also be reduced.
	Vodafone commented that spectrum which could be used to provide 2G services could only be awarded when existing 2G licences had the same terms.	Ofcom considers that a technology and use neutral approach is most likely to promote efficient use of the spectrum and competition. Ofcom will make decisions on the form of each licence made available for award as part of the relevant award process.
	T-Mobile, O2 commented the	Ofcom recognises that more rather

<p>proposed programme should be not be pursued until clarity was provided on the availability of 470-854 MHz spectrum.</p>	<p>than less certainty regarding the availability of all types of spectrum is desirable. However, decisions on the future use of the spectrum released by digital switchover cannot be taken until after the Regional Radio Conference ("RRC") in 2006. Ofcom does not consider that it is necessary or appropriate to delay the spectrum awards programme until the RRC has concluded. When the RRC has concluded, work on the future assignment process for this spectrum will be taken forward alongside other potential spectrum awards.</p>
<p>T-Mobile, Orange, O2, and Vodafone commented the proposed programme should be not be pursued until clarity was provided on the liberalisation of 2G spectrum.</p>	<p>Ofcom recognises that liberalisation of the 2G spectrum is an important issue which it is still considering. However, Ofcom does not agree that the existence of this issue requires the spectrum award programme to be postponed pending resolution. Spectrum is a scarce resource and Ofcom considers that it desirable to increase its supply to the market. Ofcom expects to publish a consultation document in relation to each award setting out Ofcom's proposals in detail. This will address the relationship to 2G liberalisation where Ofcom considers this relevant.</p>
<p>T-Mobile commented the proposed programme should be not be pursued until clarity was provided on the availability of spectrum held by the public sector currently the subject of review by Professor Cave.</p>	<p>Ofcom notes this suggestion for further delay. However, Ofcom does not believe it would appropriate to delay any awards until this review is finished as it would be likely to lead to considerable delay, and the delay may bring no benefits. Before each award Ofcom will seek to make available as much information as it can on the availability of substitutable spectrum, including any which might be released by Government.</p>
<p>T-Mobile, Orange both commented that the award programme should be delayed to allow certainty and clarity to be created in relation to the definition of property rights and the approach to managing spectrum interference. Vodafone raised a similar issue regarding how the rights of neighbours would be protected in forthcoming auctions.</p>	<p>Ofcom believes that within the existing legal framework it is possible to define adequately the rights in relation to frequencies to be awarded so that an efficient process can be run. Before each award it will consult on how this will be done and this will give any neighbouring users the opportunity to raise concerns if they have any. For an example of how Ofcom plans to proceed see consultation document published in parallel with this document on the award of spectrum formerly known as the DECT Guard Band.</p> <p>In the longer term, Ofcom is</p>

		<p>undertaking work on the scope for redefining spectrum usage rights in a more far-reaching way, in terms of “specific” and “restrictive” rights. However, this work is at an early stage of research, and has not yet led to any particular policy proposals. If it does lead to proposals these are likely to be generic in their application. Ofcom does not consider that it is necessary or appropriate to wait on the results of this research before proceeding with the programme of spectrum awards.</p>
	<p>T-Mobile , Orange and H3G commented that proposed programmed failed to take account of the benefits from European harmonisation, especially in relation to the 2010 MHz and 2500 MHz awards.</p>	<p>Ofcom recognises the importance of taking into account the plans in the rest of Europe for particular bands. Indeed for some particular awards, for example 2010 – 2025 MHz and 2500 – 2690 MHz, its proposals in the SFR:IP were made expressly subject to particular outcomes at an EU level. In relation to the issue of harmonisation more generally, as Ofcom has set out in the SFR its long-term objective is that harmonisation is predominantly performed by the market with minimal regulatory intervention and is non-binding. However, Ofcom recognises that this will not be achieved immediately and it will continue to participate in international harmonisation activities but it will seek to ensure that regulation is clearly justified and that the benefits exceed the costs. Ofcom does not consider that conferring exclusive access on a particular technology or application is likely to be justified. See comments in Section 4 and in the table below on Question 5.16 for more comments on this issue.</p>
	<p>T-Mobile commented the proposed programme should be changed to take into account the manner in which UWB will be introduced as it is likely to impact on the bands in question and increase costs of their use.</p>	<p>Ofcom regularly provides information relating to the regulation of UWB, and it will continue to do so. Ofcom considers that bidders should be able to assess the impact of UWB for themselves.</p>
	<p>Pipex suggested there was a need to evaluate impact on the market before spectrum was released</p>	<p>As indicated in the SFR and in Section 3 Ofcom’s general approach before awarding spectrum will be to assess likely use, for example through a market study. It will also as part of detailed proposals for an award carry out an impact assessment. Ofcom believes that as a general matter making available</p>

		additional spectrum is likely to have a positive impact, as it is likely to promote rather than restrict competition, and to increase consumer benefits compared to not awarding the band.
	TAUWI timescale may not give sufficient time for development of business cases and should be published well in advance	The publication of the programme in this document and in subsequent documents should give potential bidders sufficient notice to assess the opportunities well in advance of the auctions. Ofcom also intends to publish detailed proposals for a particular award for comment before proceeding to the auction itself, as in the case of the parallel document published today on the spectrum formerly known as the DECT guard band.
	TETRA MOU Assoc suggested starting the programme more slowly and not try to award 4 bands in first year	As set out in Section 4, Ofcom is no longer planning on completing 4 awards in 2005/06.
Make the process more open	CMA suggested Ofcom needed to be more open in justifying its programme Orange suggested consultations on each band before the programme was finalised	The rationale for the timing of each award was discussed in Sections 5 and 6 of the SFR:IP and an update is set out in Section 4 of this Statement. Ofcom envisages that it will consult on each award before finalising the proposals for that award including timing, see for example the parallel document on the spectrum formerly known as the DECT Guard Band.
Other specific issues	Another respondent suggested that the proposals could lead to PMSE being displaced from many bands and this need an urgent review.	Ofcom recognises that the proposals in the SFR:IP may affect PMSE users, for example in Band III, in the 2.5 GHz band and in the spectrum to be released by digital switchover. Ofcom has initiated a detailed study of the present and forecast spectrum requirements of PMSE users and the bands which would be appropriate for their applications. Ofcom is also considering the possibility for band management to create a route for larger organisations to acquire spectrum in the market and provide it for PMSE users as required. Ofcom will consult stakeholders on its plans in due course.

470 – 854 MHz Broadcast Dividend - Question 5.4 Do you believe it is appropriate wait until after the RRC in 2006 before developing policy proposals?

A.10 The table below sets out the comments, where they differed from Ofcom's view, made by respondents in relation to this question and Ofcom's response.

Issue raised	Comments	Ofcom's response
Policy decision now in favour of broadcasting	The DTG, BBC, Philips, Intellect advocated this, with HDTV seen by some as a principal driver. NTL also on grounds of cost saving if broadcast the eventual outcome anyway.	Ofcom has noted that there are divergent views on this issue with a number of competing uses and users identified. Ofcom considers that this divergence of views tends to support Ofcom's general approach, in favour of market-based mechanisms. Ofcom does not expect to make any decision until after RRC-06.
Decide policy sooner, in order to inform RRC-06 negotiations	Crown Castle (to assist business planning); Tetra MOU Association and Wales Broadband Stakeholder Group. Microsoft recommended early competition to allow for implementation as switchover progresses rather than when it is complete.	Ofcom believes that any competition now to determine use would be subject to too much uncertainty this far in advance of the frequency's availability, not least because of the RRC-06 itself. Ofcom is however undertaking a research project into potential alternative uses with a view to informing the approach taken in RRC-06.

1790 – 1798 MHz Question 5.9 Do you believe the release of this band is a priority?

A.11 The table below sets out the comments, where they differed from Ofcom's view, made by respondents in relation to this question and Ofcom's response.

Issue raised	Comments	Ofcom's response
Great Britain Timing and priority for release of the spectrum	<p>Support for an early release of band before 2007/08 from BAS, CMA, Intellect, Stratex, Oak Global, UKSPA, the WBSG and another respondent.</p> <p>BT, Kingston Communications, Pipex, Siemens, T-Mobile and Vodafone did not think an early release appropriate.</p> <p>Proposals for migration of incumbent users made by Oak Global and Stratex. By contrast BT, CSS-Water Industry, O2 and PITO suggested either that the migratory plan for the emergency services needed to be concluded first or that there should be no undue pressure on emergency services to migrate.</p> <p>Resolution of complex spectrum issues as a priority before release was mentioned by Kingston Communications and CSS-Water Industry, Pipex and Vodafone. The</p>	<p>On the question of timing Ofcom believes that its assessment of the priority for the release of this band is still correct. It recognises that there are enthusiastic proponents of new technologies seeking access to spectrum for broadband mobile services. However, before any award can take place there are a number of complex issues which need to be resolved. These relate to the existing use of the band by the emergency services and MoD, and also to the possible future use by digital radio microphone users (the band is identified for this use across Europe). At present it is not clear whether and when all these issues can be resolved and therefore it is very unlikely that, if the spectrum can be awarded, this could occur earlier than the timescale indicated in the SFR:IP ie 2007/08.</p> <p>Ofcom will, however, continue to work to resolve the issues which</p>

	<p>BBC would like to see the band opened up for digital and analogue radio microphones and the Digital TV Group believe the spectrum might be suitable for DVB-H channels associated with 3G services.</p>	<p>represent pre-conditions to allowing commercial use of the band. In particular it will seek to establish an appropriate migration plan for the emergency services. However, the co-ordination issues with existing military earth stations in the band will not diminish over time. It may be possible to issue a detailed consultation document on the possibilities for the band during 2006/07.</p>
Regional availability of spectrum	<p>CSS-Water Industry identified consideration of complex regional issues as important as did the Wales Broadband Stakeholder Group, the WBSG suggesting a regional case and devolved licences. Oak Global commented that MoD use of the band can be tolerated, welcoming an all-Ireland initiative and suggesting that licensing of large regional areas was feasible</p>	<p>Ofcom recognises that the issue of emergency service use does not and will not impact on all areas of GB to the same degree. However, it does not accept that a regional approach to the release of spectrum and regional geographic protection of legacy links is likely to be the appropriate way to balance the promotion of spectrum efficiency with need to protect incumbent uses of this band, especially for the safety of life services. When spectrum is shared by a number of users, a regional approach can lead to an unnecessarily complex and burdensome management regime.</p>
Additional contiguous spectrum	<p>Oak Global and the Wales Broadband Stakeholder Group identified a requirement to increase the available spectrum from 8 MHz to 15 or 20 MHz (e.g. increase from 1790 – 1798 MHz to 1785 – 1800 MHz or 1785 – 1805 MHz) and the UMTS Forum commented that the band was too restricted for UMTS mass market interest. However, Vodafone commented on the potential for adjacent band interference problems.</p>	<p>Ofcom continues to believe that 8 MHz of spectrum is all that could be made available in Great Britain since the other adjacent bands are currently used by the MoD. As discussed elsewhere, the position is different in Northern Ireland.</p>
<p>Northern Ireland</p> <p>Priority to release spectrum early with access for all of Ireland and open more contiguous</p>	<p>Release of band before 2007/08 with all-Ireland licences and an increase in spectrum from 8 MHz to 15 or 20 MHz (e.g. increase from 1790 – 1798 MHz to 1785 – 1800 MHz or 1785 – 1805 MHz)</p>	<p>Ofcom's initial assessment is that a simultaneous award of 20 MHz of unpaired spectrum in Northern Ireland and the Republic of Ireland is legally and practically feasible and is likely to be beneficial to consumers in Northern Ireland and the Republic of Ireland.</p>

spectrum	Support for an early (all-island) award from BT, Bytel, CMA, Oak Global and the Wales Broadband Stakeholder Group. Oak Global identified the difference between the constraints in Great Britain and Northern Ireland and CMA wanted to see encouragement for the creation of widest possible (e.g. all-island) markets. O2 would like to see more information about the legal and regulatory issues for an all-island award.	Ofcom is planning to carry out a market study, jointly with ComReg, which will amongst other things explore the issue of whether a separate award for NI is appropriate. Assuming following this study Ofcom continues to believe that a separate NI award is likely to be the most appropriate way forward, then it plans to issue a consultation document setting out the case for this approach and detailed proposals for the award of the spectrum by the end of the year.
Release of the band 2302 – 2310 MHz	Two respondents mentioned the band 2302 – 2310 MHz, supporting the release of this band but only after the migration of emergency services was complete.	Ofcom does not consider that the release of this spectrum is a priority. However, it will work to resolve the issues associated with the existing users in the same way as for 1790-98 MHz.

2500 – 2690 MHz Question 5.16 Is a technology neutral award the right approach for the award of 2500 – 2690 MHz?

A.12 The table below sets out the comments, where they differed from Ofcom’s view, made by respondents in relation to this question and a summary of Ofcom’s response. Further discussion of the issues is set out in below the table and Section 4 above.

A.13 However, it should be noted that the final decision regarding harmonisation parameters will be taken by the EU Commission Radio Spectrum Committee and that the UK will be bound by the forthcoming EU Commission decision when it enters into force.

Issue raised	Comments	Ofcom’s response
Lost harmonisation benefits	H3G, Orange, T Mobile, and UMTS forum suggested that adopting a technology neutral approach to the award of this band (in place of exclusive access) will result in lost harmonisation benefits such as international roaming. H3G, Siemens Communications Mobile, and UMTS forum also suggested that there would a loss of economies of scale.	Taking into account other relevant considerations (including the availability of spectrum at 2GHz for IMT-2000) Ofcom does not consider that a technology neutral approach to this band would result in lost harmonisation benefits, such as economies of scale and international roaming. The reasons for this are set out in the paragraphs under this table.
Minimise interference	H3G, Orange, and Siemens Communications suggested that adopting a technology neutral approach could increase interference. If alternative technologies are allowed the interference management approach must be designed to ensure use by IMT-2000 is not compromised.	In relation to the issue of interference, since Ofcom’s proposals is that any non-IMT-2000 technology would have to respect a spectrum mask designed in relation to IMT-2000 technology use, Ofcom does not believe that reserving the band for exclusive IMT-2000 use would realise any additional benefit in terms of reduced interference.

Efficiency of use	Orange stated that the most efficient use of this spectrum is IMT-2000.	Ofcom does not consider this to be a reason not to award this band on a technology neutral basis which would permit other technologies. Should firms in the market determine that they would wish to employ a different technology to IMT-2000 Ofcom would not wish to prevent that from occurring. Licences for the 2.6GHz band would be auctioned and licences are likely to be made tradable. Therefore, the market will be able to determine the most efficient use or uses of this spectrum at the time of the award and in the future. If there are significant efficiency benefits to be generated by using only IMT-2000 technologies in this band this is likely to be reflected in the auction outcome and in any subsequent secondary trading.
Expansion of IMT-2000 family	Orange suggested that technology neutrality should be achieved through extension of the IMT-2000 family of technologies rather than by taking a technology neutral approach to the award.	Ofcom welcomes moves in international forums to extend the range of the IMT-2000 family. However Ofcom considers that there is no objective justification for the regulator to preclude the use of alternative technologies which can meet the technical limitations designed to avoid interference.
Investment and innovation incentives	H3G suggested that adopting a technology neutral approach would increase uncertainty and, in this market, may impact upon the investment plans of existing IMT-2000 operators.	Among other considerations, it is important to take account of the incremental nature of this band. Further details are provided in the paragraphs under this table. Given the spectrum already available for IMT-2000 at 2GHz, Ofcom does not consider that a technology neutral award would have a negative impact upon investment and innovation in IMT-2000 technologies.

A.14 The SFR:IP consulted on the issue of whether the award of this band should be made on a technology neutral basis. Ofcom will make a final decision on this issue when it brings forward detailed proposals for the award and when the position regarding the European harmonisation measures is resolved. However, in the interests of transparency, Ofcom sets out its current thinking on the issue below.

A.15 Of the 26 respondents who commented specifically on this issue only 6 specifically opposed Ofcom's proposal to adopt a technology neutral approach. Most others supported the approach as likely to facilitate entry, promote competition, promote optimal spectrum use, reduce regulation, and promote innovation.

A.16 It is important to be clear about what is the relevant question in relation to the issue of whether this band should be exclusively reserved for IMT-2000

technologies. The position is that there is already spectrum, namely the so-called core IMT-2000 bands (1920–1980 MHz paired with 2110-2170 MHz plus 1900–1920 MHz) which has to date been reserved exclusively for IMT–2000. Therefore the relevant question for purposes of analysis relates to the incremental benefits and costs from reserving the 2.6GHz band exclusively for IMT–2000 in addition to other spectrum..

- A.17 Ofcom believes that the incremental benefits if there are any are likely to be small while the costs could be significant. It will set out further details on this when it publishes its response to the Commission’s consultation discussed above. Respondents to the SFR:IP who opposed Ofcom’s proposal have identified the following as key benefits of exclusive access. They suggested that regulatory harmonisation with exclusive access would:
- allow economies of scale in equipment manufacture to be realised leading to lower prices for consumers;
 - secure international roaming for consumers;
 - minimise the potential for interference; and
 - provide certainty as to the spectrum which will be available for IMT-2000, leading to more investment in IMT-2000
- A.18 Underlying all of these suggested benefits of exclusive access is the argument that a technology neutral approach would result in “fragmentation” of demand which will have a negative effect on the benefits generated from use of this spectrum band. Adopting a technology neutral approach may result in “fragmentation” in the 2.6GHz band in the sense that the spectrum use may involve other technologies as well as IMT–2000. It may also arise in the relevant downstream markets in the sense that there may be more competing technologies and applications. However, it is Ofcom’s view that if “fragmentation” is the result of the market identifying that alternative technologies and applications generate higher values than IMT-2000 this would be expected to have a positive rather than negative impact on the overall benefits generated from use of the spectrum in this band. Additional competition from alternative technologies would generally be expected to be beneficial to consumers (welfare enhancing).
- A.19 In responding to the concerns raised by some stakeholders, Ofcom has taken the following approach. Firstly, it sets out its understanding of the situations in which the benefits of harmonisation identified by respondents could be put at risk if a technology neutral approach is adopted. Secondly, if such situations are identified, it assesses whether these benefits could be lost due to market failures (resulting in lower overall benefits) rather than because a higher value alternative use had been identified by the market (resulting in higher overall benefits).

Economies of scale

- A.20 The argument put forward by respondents in favour of exclusive access bringing additional economies of scale is that exclusive access would generate additional volumes for IMT-2000 equipment and that these additional volumes would contribute significantly to lower unit costs, such as in handsets.
- A.21 If there is “fragmentation” of demand in the 2.6GHz band this does not imply that all economies of scale will be lost. Even if only, for example, half of the 38

available 5MHz blocks were used for IMT-2000 throughout Europe this would still be expected to generate significant economies of scale. This would mean that 19 5MHz blocks were used for IMT-2000 at 2.6GHz compared to the 24 5MHz blocks available in the core 2GHz band. In addition, economies of scale are not only dependent upon the volumes generated in any particular band. A proportion of the fixed costs of developing and manufacturing equipment are independent of the frequency in which the equipment operates, hence are shared over the (global) equipment volumes in all bands.

- A.22 Therefore, in the situation in which IMT-2000 was found to be the highest value use for the majority of the 2.6GHz band throughout Europe, there do not appear to be strong arguments to suggest the exclusive access is required for economies of scale to be achieved. The incremental volumes generated by exclusive access in this case would be unlikely to be significant and the contribution of these incremental volumes to economies of scale would be likely to be small.
- A.23 In the situation in which IMT-2000 is not identified as the highest value use for much of the 2.6GHz band, imposing exclusive access for IMT-2000 would generate significant incremental volumes. However, this may not increase overall benefits as these benefits would be at the cost of the additional benefits which would have been generated by alternative (higher value) technologies, which may be benefiting from economies of scale themselves.
- A.24 However, if a technology neutral approach were adopted operators would not be able to rely on any particular level of economies of scale being achieved when identifying the value of spectrum in the 2.6GHz band, as the level of economies of scale will be dependent upon the actions of other operators. Therefore, operators may face additional uncertainty as to the equipment costs they will incur if they were to win the spectrum at auction. However, this would not only affect IMT-2000 operators, it would also affect operators planning to deploy alternative technologies. Therefore, it is not clear that this would result in IMT-2000 not being identified as the highest private value use of this spectrum when it should have been. Given that IMT-2000 technologies already benefit from those economies of scale which are generated by IMT-2000 being offered in other bands worldwide, IMT-2000 operators may be less affected by this than operators planning to deploy alternative technologies.
- A.25 In addition, providing information during the auction process as to the technologies which different operators are intending to deploy, and the spectrum lots they are currently bidding on, could facilitate co-ordination between bidders as to the technologies it is most beneficial to offer, if this were seen to be desirable.
- A.26 Despite this, it is conceivable that a technology neutral approach could result in some reduction in benefits associated with economies of scale for equipment manufacturing. In competitive markets the lower equipment prices which result from economies of scale would be expected to be largely passed on to consumers. Therefore, consumers may pay more for the services they consume than they would have done if fewer technologies had been used in the band. Given the externalities which exist between operators in achieving economies of scale, operators may not take full account of these benefits when assessing their private valuation for spectrum. Hence, the lost economies of scale benefits could result in lower overall benefits being generated from the

use of this band. However, there are a number of reasons why these lost benefits may be either small and/or unlikely to occur.

- Consumers value choice, therefore, any lost consumer benefits due to higher prices would need to be assessed against the additional benefits which consumers derive from the additional choice of technologies on offer.
- If consumers identify that they prefer one, or a group of, technologies to the choice provided by the full range of technologies this would provide operators with the incentive to unite around these technologies. Hence generating increasing economies of scale.
- Operators would have incentives in the secondary market to unite around technologies and/or re-locate in groups if this brings significant additional cost savings.
- Fragmentation of demand does not imply that all economies of scale are lost. If the band were shared between a relatively small number of different technologies we would still expect significant economies of scale to be achieved. This would appear to be a more likely scenario than the band being shared by a large number of technologies given the amount of spectrum which may be required by each operator in order to provide both coverage and capacity (as consumer demand increases).

A.27 Therefore, whilst it is conceivable that there could be some reduction in benefits associated with lost economies of scale, compared to imposing exclusive access, this does not appear to be likely and there are factors which suggest that the magnitude of these lost benefits is unlikely to be significant.

International roaming

A.28 In relation to international roaming, it is difficult to see how reserving the 2.6 GHz band exclusively for IMT-2000 is necessary to realise these benefits. It is clear that spectrum is already going to be used for IMT-2000 in the so called core bands throughout the EU. Hence consumers will be able to roam without exclusive access in the 2.6GHz band as international roaming in the EU can occur in the core bands. International roaming generates significant benefits for both producers and consumers and it is likely that there will therefore be benefits to operators in providing handsets with this functionality, even if the 2.6GHz band is not assigned exclusively to IMT-2000 in the EU,. Therefore, Ofcom does not expect that technology neutrality would result in the loss of these benefits.

Potential interference

A.29 In relation to the issue of interference, since Ofcom's proposal is that any non-IMT-2000 technology would have to respect a spectrum mask designed in relation to IMT-2000 technology use, Ofcom does not believe that reserving the band for exclusive IMT-2000 use would realise any additional benefit in terms of reducing the interference faced by IMT-2000 operators. Therefore, Ofcom does not consider that exclusive access in the 2.6GHz band would reduce the level of interference faced by IMT-2000 operators or by any other person.

Uncertainty effects

- A.30 Finally, it is useful to comment on any certainty effects associated with exclusive access and any additional investment in IMT-2000 which may result from this. Given the use of IMT-2000 technologies in the core 2GHz bands, it seems unlikely that spectrum at 2.6GHz would be used to provide coverage, hence it is the effect on investment in capacity expansion or content services which would be more likely to be relevant. The effect which additional certainty on spectrum availability would have upon this investment is unclear.
- A.31 Imposing exclusive access would not fully remove uncertainty. Uncertainty would remain over which of the family of IMT-2000 technologies is offered in this band and over whether new entrants would enter the market. Hence, exclusive access would not guarantee no more competition in downstream markets.
- A.32 Whilst imposing exclusive access would remove some of the uncertainty for both IMT-2000 operators and manufacturers, and operators and manufacturers of alternative technologies, this may not result in an overall increase in investment.
- A.33 In the situation in which IMT-2000 was the highest value use for all of this band it is not clear that the additional certainty provided by exclusive access would have any impact on investment levels. In addition, in the situation in which IMT-2000 was the highest value use for some but not all of the 2.6GHz band there are two factors which suggest that imposing exclusive access would not be expected to increase overall investment levels. Firstly, whilst imposing exclusive access would reduce the uncertainty faced in acquiring this spectrum this would be at the cost of excluding investment in alternative technologies. Absent regulatory intervention all operators wishing to acquire spectrum would face common uncertainty. Therefore, if alternative technologies are identified by the market as higher value uses of this spectrum, under the presence of this common uncertainty, any additional investment in IMT-2000 which is lost would be expected to be outweighed by investment in the alternative technologies. Secondly, when IMT-2000 is not identified as the highest value use for some of the band this suggests that the incremental value which could be generated by offering more IMT-2000 services in this band, in addition to that already offered in the core 2GHz band, is relatively small. In which case, the value which could be generated from IMT-2000 technologies in this additional spectrum may not be enough to warrant additional investment even under the certainty provided by exclusive access
- A.34 For any spectrum for which IMT-2000 was not the highest value use, whilst imposing exclusive access would reduce the uncertainty faced in acquiring for this spectrum, it is not clear that this would increase overall investment, as imposing exclusive access would be at the cost of excluding investment in alternative technologies. All operators wishing to acquire spectrum would face common uncertainty. Therefore, if alternative technologies are identified by the market as higher value uses of this spectrum, under the presence of this common uncertainty, any additional investment in IMT-2000 which is lost would be expected to be outweighed by investment in the alternative technologies.

Costs of imposing exclusive access

- A.35 Therefore, Ofcom does not consider that the uncertainty which may be introduced by a technology neutral approach is likely to reduce overall levels of investment. Hence Ofcom does not find this a compelling argument for imposing exclusive access.
- A.36 Any additional benefits which may be generated by exclusive access would need to be assessed against the costs which exclusive access may impose. If IMT-2000 technologies were not the highest value use for all of this spectrum band throughout the EU, imposing exclusive access would result in allocative inefficiencies in spectrum use. These could take two forms:
- Firstly, by imposing exclusive access there is a risk that this may result in some of this spectrum remaining unused. Given the existence of “core” bands for IMT-2000 technologies, and the possibility of liberalisation of some GSM spectrum in the future, this risk cannot be ruled out.
 - Secondly, whilst some or all the spectrum may be used for IMT-2000 some higher value uses may be precluded. This is relevant not least given the amount of spectrum available at 2.6GHz and the spectrum capacity already available for IMT-2000.
- A.37 In addition to allocative inefficiencies, imposing exclusive access could result in dynamic inefficiencies and act as a barrier to innovation. There is no evidence to suggest that the pace of technological development is slowing. Hence there are reasons to expect that, in the future, there may be alternative uses of the 2.6GHz spectrum which may generate higher value than IMT-2000. If exclusive access were imposed the introduction of these new services could be delayed, which could impose significant costs on consumers. In addition, this delay could act as a barrier to innovation as developers would be uncertain that they would be able to obtain spectrum for higher value uses in the short to medium term. Further to this, by preventing new, potentially higher value uses, from being launched this is limiting the possibility for inter-technology competition which may generate benefits for consumers, such as by allowing the market to trial and identify higher value uses.
- A.38 Accordingly, Ofcom’s current view is that the expected costs of reserving the band exclusively for IMT-2000 technologies are likely to substantially exceed the expected benefits. Ofcom will therefore be responding to the Commission’s current consultation in line with the position taken in the SFR:IP and in this Interim Statement.

Annex B

Glossary

2G

“Two G”: Second generation of mobile telephony systems using digital encoding. 2G networks support voice and limited data communications.

2.5G

“Two and a half G”: term used to describe the enhanced data facilities within 2G digital networks, GPRS and including EDGE

3G

The third generation cellular phone system, currently being deployed, which offers higher data rates than previous systems allowing services such as videophones.

AIP

Administrative incentive pricing. A fee charged to users of the spectrum to encourage them to make economically efficient use of their spectrum.

Airwave Service

Airwave is the commercial name for the company deploying the TETRA service for the UK police and associated emergency services. See TETRA.

Allocation

The process of identifying specific frequency ranges for specific applications; or a frequency band entered in a table of frequency allocations, for use by a particular category of service.

Analogue

When used in the radio context is the descriptive term for information when relayed directly by radio, with no form of processing.

Assignment

Authorisation given by a licensing authority for a radio station to use a specific radio frequency or channel under specified conditions.

Band

A defined range of frequencies that may be allocated for a particular radio service, or shared between radio services.

Band III

Band “Three” is a range of frequencies generally extending from 170 up to 230 MHz.

Band III Sub Band 1

Ranges from 174 191 MHz

Band III Sub Band 2

Ranges from 193 to 207 MHz

Band III Sub Band 3

Ranges from 209 to 225 MHz

Base Station

A radio transmitter with or without a receiver installed to provide a communications service, typically used in mobile or broadcasting radio systems.

BFWA

Broadband Fixed Wireless Access: similar to Fixed Wireless Access, but generally with data speeds higher than that used by Fixed Wireless Access. See FWA.

CDMA

Code Division Multiple Access: A radio transmission method where individual traffic transmissions use the same frequency, but where users' traffic is separated by means of different codes.

cdma2000

cdma2000 - a 3G mobile phone standard built on the CDMA technology. One of the IMT-2000 family of standards. See CDMA.

Cell Radius

Term used to describe the geographical limit of reliable transmissions from a particular focused transmission beam at a mobile cellular base station or point to multi-point radio system.

CEPT

Conference of European Postal and Telecommunications administrations, comprising over 40 European administrations.

CAA

Civil Aviation Authority: A public corporation established by Parliament in 1972 as an independent specialist aviation regulator and provider of air traffic services.

Cave Review

Review of Radio Spectrum Management, by Professor Martin Cave, published March 2002, available at:

<http://www.ofcom.org.uk/static/archive/ra/spectrum-review/index.htm>

cdmaOne™

cdmaOne™ is the commercial name a 2G mobile phone systems based on CDMA (Code Division Multiple Access) access technology defined by a number of equipment manufactures as an alternative to GSM technology.

Common Base Station (CBS)

A base station for PBR shared by users (also known as a community repeater); or a PBR installation giving wide area coverage under the control of one or more operators offering mobile communications on a commercial basis to a number of independent (usually business) users.

Communications Act

Communications Act 2003, which came into force in 2003.

Coordination

This term refers to the process under which a new user seeks the agreement of existing users to share access to a particular range of frequencies while avoiding harmful interference.

DAB

Digital Audio Broadcasting. A standard for digital radio.

dBW

Decibels above one Watt: A logarithmic representation of radio frequency power with respect to one Watt.

DCS 1800

Digital Cellular System: term used to describe GSM implementation in frequencies around 1800 MHz. GSM was initially implemented in the 900 MHz band. DCS 1800 is now more commonly known as GSM 1800. See GSM.

DEC

In the context of CEPT, an agreed harmonisation measure to which administrations may commit themselves.

DECT

Digital Enhanced Cordless Telecommunications: An access

technology used in private cordless telephone equipment.

GSM/DECT – Guard band

The guard band between the GSM 1800 radio service and the DECT cordless phone product. See DCS 1800, DECT, and Guard Band.

Digital PAMR

A fully digital implementation of PAMR in both management and traffic relayed. See PAMR.

DSL

Digital Subscriber Line: a method of sending data over existing copper telephone cables that increases the data capacity above that of traditional dial-up data rates.

EC

European Commission: is one of the five institutions that look after the running of the European Union (EU). It is the main body that handles the day-to-day running of the EU in areas such as Transport and Telecommunications.

ECC

Electronic Communications Committee: a committee that reports to CEPT.

EDGE

Enhanced Data Rates for Global Evolution: an access technology that delivers broadband-like data speeds to mobile devices at data speeds faster than is possible with GSM/GPRS.

EIRP

Equivalent Isotropically Radiated Power is a theoretical measure of the power radiated by a transmitter/antenna - defined as the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

EN

European Norm: a prefix attached to ETSI equipment standards that indicates its European position.

ENG

Electronic News Gathering: the production of news programming who use radio in the course of their work, see also PMSE and OB.

ERC

European Radio Communications Committee: a previous committee of CEPT, the functions of which have been taken over by ECC. See ECC..

ERP

Effective Radiated Power is a theoretical measure of the power radiated by a transmitter/antenna - defined as the product of the power supplied to the antenna and its gain relative to a halfwave dipole in a given direction.

ETSI

European Telecommunications Standards Institute: a European based industry group that addresses equipment standards for telecommunications equipment.

EU

European Union: Collective of European Member States.

FDD

Frequency Division Duplex: A transmission method where the downlink/downstream path and the uplink/upstream path are separated by frequency.

Fixed Links

Communications links between fixed points. Such links may be unidirectional or bi-directional.

Fixed Point to Point Links (P-P)

Radio service which links two fixed specific locations.

FS

Fixed Services: radio service where all ground based transmissions are to and from fixed, non mobile, stations.

FSS

Fixed Satellite Services: A satellite system, where the ground or earth station is fixed during transmission and/or reception.

FWA

Fixed Wireless Access: radio link to the home or the office from a base station to give access to telecommunications services.

Guard Band

Frequency range deliberately kept vacant between assignments to give a level of protection to users on either side from interference from each other.

GHz

Gigahertz: a unit of frequency equal to 1000 million (1×10^9) Hz or cycles per second.

GPRS

General Packet Radio Service: a method to increase the data capacity of 2G or voice based digital networks to enable real time data services such as internet browsing, e-mail, visual communications etc.

GSM

Global System for Mobile communications: a 2G mobile phone technology. This is the technology behind the vast majority of 2G mobile phones used across Europe and is used by approximately 80% of 2G operators worldwide. Also sometimes referred to under its original meaning of "Groupe Spécial Mobile".

GSM 900

GSM 900: term used to describe GSM used in the 900 MHz frequency band. See GSM.

GSM 1800

GSM 1800: term used to describe GSM used in the 1800 MHz frequency band. Sometimes also known as DCS 1800. See GSM and DCS 1800.

GSM – R

This is a variant of the GSM standard developed specifically for use by the railways.

HSDPA

High-Speed Downlink Packet Access: an add-on access component used to enhance the data speed to the end user on 3G/UMTS networks.

IEEE

Institute of Electrical and Electronics Engineers: A US based standardisation organisation that produces equipment standards for, amongst other things, radio access systems.

IMT-2000

International Mobile Telephony 2000: a family of global standards for mobile phone networks proposed by the ITU Also referred to as 3G.

Interference

The effect of unwanted signals upon the reception of a wanted signal in a radio system, resulting in degradation of performance, misinterpretation or loss of information compared with that which would have been received in the absence of the unwanted signal.

ITU

International Telecommunication Union: is an international organization within the United Nations System where governments and the private sector coordinate, discuss and agree

the logistics of global telecom networks and services.

JFMG

JFMG Ltd undertakes licensing of programme-making and special events spectrum (see PMSE, OB and ENG) on behalf of Ofcom, administering licences and collecting licence fees.

kHz

Kilohertz: a unit of frequency, equal to 1000 (1×10^3) Hz or of cycles per second.

L Band

A range of radio frequencies around 1.5 GHz.

Liberalisation

Allowing licence holders to change the use to which they put their spectrum, within constraints to prevent interference.

Licence Class

Type of licence issued by Ofcom, for example PAMR. Volume classes refer to those licence classes for which there are significant numbers of licensees, for example on site PBR with 26,000 licensees.

Licence Exempt

Allowing anyone to use the spectrum for any application under certain specified restrictions, but typically with maximum power levels. The current regulations are the Wireless Telegraphy (Exemption) Regulations 2003 (SI 2003 No. 74), available at:

<http://www.legislation.hmso.gov.uk/si/si2003/20030074.htm>

MHz

Megahertz: a unit of frequency equal to 1,000,000 (1×10^6) Hz or cycles per second.

Mobile Broadband

The use of broadband data access at speed (i.e. faster than walking pace).

Mobile Satellite (MSS)

A service between mobile earth stations and one or more space stations.

MoD

Ministry of Defence:

MWS

Multimedia Wireless Systems: term created within the CEPT Project Teams to describe a converged wireless platform that would supply two data services, video on demand and broadcasting.

National Autonomy Study

A study commissioned by the Radiocommunications Agency towards the end of 2003 and concluded under Ofcom. The objective of the study was to look at the possibilities for the UK to use spectrum in a different way to our continental neighbours and what technical constraints we would need to apply to avoid interference and meet international obligations.

OB

Outside Broadcast: the use of radio in the production of film, television programming, but are not necessarily involved in news programming, see ENG.

Ofcom

Office of Communications. Ofcom took over the RA's responsibility for spectrum management in the UK in December 2003.

Oftel

Office of Telecommunications, which was the telecommunications regulator, until its functions transferred to Ofcom in December 2003.

Paired spectrum

Used by FDD systems where two frequency bands are used together, one for transmission in the forward or downlink direction (e.g. base station to handset) and another for transmission in the reverse or uplink direction (e.g. handset to base station).

PAMR

Public Access Mobile Radio. A mobile radio service where a number of different organisations have access to a common radio system.

Partial Transfer

In a spectrum trading market, licence holders may transfer only a part of the rights and obligations associated with their spectrum licence - whereby the licence can be divided (e.g. partitioned) by geography, frequency and by time.

PBR

Private Business Radio (previously known as Private Mobile Radio (PMR)). A private radio service installed and operated by businesses and public sector organisations to provide mobile communications for their own workforce.

PBR – On Site

As PBR but with a range limited to within 3 or 6 kms of a nominated location.

PBR – Wide Area

As PBR but range extension is permitted beyond the regulated limit (if technically possible).

PDC

Personal Digital Communication: an alternative 2G mobile phone technology which is used in Japan.

Point-to-Multipoint

Fixed radio system that transmits from a central point to multiple users and/or multiple sites.

PMR

Private Mobile Radio. See PBR.

PMSE

Programme Making & Special Events: A collective term used to describe the provision of News, Film, Television, Stage, Concert and Sports programming through the use of radio.

Primary

This is a term used to indicate that a frequency allocation for a particular service has priority over other services in the same band. It is quite frequent to have several services that are 'co-primary' (e.g. fixed and mobile) where both services have equal priority. See paragraphs 5.23 to 5.33 of the ITU Radio Regulations.

Primary Assignment

The initial allocation of spectrum by the regulator.

Propagation

The transmission of radio waves. Propagation characteristics depend on frequency and are affected by the environmental conditions, such as terrain and atmospheric conditions, encountered on the path.

RA

The Radiocommunications Agency: a former executive agency of the Department of Trade and Industry, which was responsible for the management of most non-military spectrum in the UK and for representing the UK in relevant international bodies. The RA's functions transferred to Ofcom in December 2003.

Radio Spectrum

A section of frequencies of electromagnetic radiation in the range of approximately 10 kHz to 3000 GHz.

RIA

Regulatory Impact Assessment: A process undertaken by policy makers

to show why a particular decision was made.

RSA

Recognised Spectrum Access: A method of recognising the use of radio spectrum by an operator which is not covered by a Wireless Telegraphy Act Licence or a Licence Exemption.

RR

Radio Regulations: an international treaty produced by the ITU that sets out at a global level how spectrum should be used by countries. The Radio Regulations are developed and maintained by WRCs. See WRC.

RRC

Regional Radio Conference: an ITU conference established to produce a regional agreement on the use of the spectrum for a specific purpose such as broadcasting.

Safety of Life Services

Services provided by organisations who use radio spectrum to protect the lives of individuals, such as the emergency services.

Scanning Telemetry

Radio Frequencies that are licensed to the water, electricity and gas companies for the purposes of data collection and telecommand.

Secondary

This term is defined in paragraphs 5.28 to 5.31 of the ITU Radio Regulations. Stations of a secondary service shall not cause harmful interference to primary services or

claim protection from harmful interference from primary services. See 'Primary'.

Spectrum Framework Review (SFR)

Ofcom consultation on how spectrum will be managed in the future published in November 2004.

Spectrum Mask

A way of specifying the amount of power that a transmitter is allowed to transmit into neighbouring frequency channels.

Spectrum Tariff Unit

An average tariff per MHz of spectrum used.

Spectrum Trading

Process through which spectrum licence holders are able to transfer some or all of their rights to a third party.

TACS

Total Access Communication System: An analogue cellular mobile telephone standard originally used in the UK on the first cellular telephony system. TACS operated in the 900MHz frequency band.

T-DAB

Terrestrial version of DAB, see Terrestrial and DAB.

TDD

Time Division Duplex: A transmission method where the downlink/downstream path and the uplink/upstream path are separated by time.

Terrestrial

Terrestrial radio service: any radio service other than a space service or radio astronomy.

TETRA

Terrestrial enhanced Trunked Radio Access: An ETSI standard for digital mobile radio utilised by fleets of vehicles such as emergency services, courier companies etc.

Trading Regulations

The Statutory Regulations that facilitate Spectrum Trading.

UHF

Ultra High Frequency: Term used to describe frequencies in the range 300 MHz to 3 GHz.

UHF I

UHF frequency band from 410 – 450 MHz.

UHF II

UHF frequency band from 450 – 470 MHz.

UIC

Union Internationale des Chemins de Fer (International Union of Railways) - the role of the UIC is to promote cooperation between railways at the

world level and to carry out activities to develop international transport by rail.

UMTS

Universal Mobile Telecommunications System – a 3G mobile phone standard built on W-CDMA technology. See W-CDMA. One of the IMT-2000 family of standards. This is the standard being deployed by the vast majority of European mobile phone operators to offer 3G services.

Undue Interference

Interference with any wireless telegraphy that is harmful, as provided by section 183 Communications Act 2003. This includes interference that creates dangers or risks of dangers to the functioning of any radiocommunications service designed for the purposes of navigation or safety services, or if the interference degrades, obstructs or repeatedly interrupts authorised broadcasting or other wireless telegraphy.

Un-paired spectrum

Used by TDD systems where only one frequency band is used for transmitting in both the forward or downlink direction (e.g. basestation to handset) and the reverse or uplink direction (e.g. handset to basestation).

UTRA

UMTS Terrestrial Radio Access. This term specifically refers to the radio interface standard of UMTS.

UTRA TDD

UTRA FDD: a variant of the UMTS radio interface standard which uses paired spectrum in FDD mode, see FDD.

UTRA TDD

UTRA TDD: a variant of the UMTS radio interface standard which uses unpaired spectrum in TDD mode, see TDD.

UWB

Ultra wide band. A technology that spreads a low-power signal over a wide range of frequencies.

VHF

Very High Frequency: term used to describe frequencies in the range 30 to 300 MHz.

WARC

World Administrative Radio Conference. The name previously given to WRCs. The last WARC was held in 1992, since then they have been referred to as WRCs see WRC.

WRC

World Radiocommunications Conference: an ITU convened conference, held approximately every two or three years, which updates the International Radio Regulations.

W-CDMA

Wideband – CDMA, a version of CDMA that has a bandwidth wider than that defined in the original CDMA consideration. See CDMA. The term W-CDMA is often used as an alternative to UMTS

Wi-Fi™

WiFi™ is a short-range wireless broadband technology that allows

Internet users to access at so-called hot spots in coffee shops, railway stations and airports and which is used as the basis for most home wireless networking. WiFi™ is built on the IEEE802.11 (Wireless Local Area Network) Standard.

Wi-Fi™ Alliance

The Wi-Fi™ Alliance is a not for profit industry organisation that certifies interoperability of WiFi™ radio equipment that meets parts of the IEEE802. standard.

WiMAX™

WiMAX™ is a new technology that is similar to WiFi™. However, unlike WiFi's 150-foot range, WiMAX™ has a reach of several miles, offering a way to bring broadband data and the Internet to both domestic and business customers. WiMAX™ is built on the IEEE802.16 and ETSI HiperMAN (Metropolitan Area Network) standards.

WiMAX™ Forum

The WiMAX™ Forum is a not for profit industry organisation that certifies interoperability of WiMAX™ radio equipment meeting parts of the IEEE802.16 and ETSI HiperMAN standards.

Wireless Telegraphy

The means of sending information without the use of a wired system.

WT Acts

Wireless Telegraphy Act 1949 (as amended by the Wireless Telegraphy Act 1967) and Wireless Telegraphy Act 1998. These Acts are further amended by the Communications Act 2003. WT Acts regulate the use of civil radio spectrum in the UK.

WT Act licences

Licences issued under the Wireless Telegraphy Act 1949 (as amended).