Commission for
Communications Regulation

Ofcom
OFFICE OF COMMUNICATIONS

Award of available spectrum: 1785 - 1805 MHz

This document sets out ComReg's and Ofcom's decisions for the award of wireless telegraphy licences for use of this spectrum band. The Information Memorandum for this award is published separately.

Statement

Publication date: 14 December 2006

Contents

Section 1

Foreword

1.1 The co-ordinated award of spectrum at 1785 – 1805 MHz in Ireland and Northern Ireland marks a new milestone in co-operation between the Commission for Communications Regulation (ComReg) and the Office of Communications (Ofcom) in considering the development of spectrum across the island of Ireland and the opportunity for new wireless services to emerge in both administrations.

1.2 As Member States of the European Union, Ireland and the UK share the same EU regulatory framework for electronic communications. The award of licences in Ireland and Northern Ireland will mark the creation of an innovative approach to securing optimal use of the radio spectrum for the benefit of citizens and consumers across the island of Ireland.

1.3 We wish to thank all those who took the time to respond to the consultation and to express our appreciation for the thoroughness of submissions.

Mike Byrne

Chairperson
Commission for Communications Regulation

Ed Richards

Chief Executive
Office of Communications

Section 2

Executive Summary

2.1 On 15 December 2005 the Commission for Communications Regulation (ComReg) and the Office of Communications (Ofcom) published a joint consultation entitled "Award of available spectrum: 1785 – 1805 MHz" (the "**Consultation Document**"). Seminars to discuss the award were held in Dublin and Belfast in February 2006. Since then, Ofcom has undertaken further technical studies to help gain information about the implications of the 1785-1805 MHz award in Northern Ireland for licensees in neighbouring bands. A further seminar to discuss the conclusions to these technical studies was held in Belfast on 8 November 2006. This document summarises the comments received and sets out the decisions taken for the separate, but co-ordinated, competitions (the "**Award Processes**") to use the spectrum at 1785 - 1805 MHz (the "**Spectrum Band**").

The spectrum and the process for the awards

2.2 Having carefully considered the responses received to the Consultation Document and the issues raised at the public seminars ComReg and Ofcom have concluded that substantive change to the plans and proposals set out in the Consultation Document is not needed except in respect of the technical terms and conditions for the Spectrum Band. This joint statement (the "**Statement**") sets out ComReg's and Ofcom's conclusions and decisions on the wide range of matters raised in response to the Consultation Document including:

- the bidding process, auction rules and auction design (see section 6)
- the jurisdictional basis for the awards (see Section 4)
- spectrum packaging and spectrum harmonisation (see Section 4)
- spectrum co-ordination issues. (see Section 5)

2.3 In summary, the licences to be awarded in each jurisdiction will be for the single lot of 20MHz of spectrum, between 1785MHz and 1805MHz, by sequential sealed bid auctions, first in Ireland and then Northern Ireland.

2.4 ComReg and Ofcom are publishing, at the same time as the Statement, the following documents that are relevant to the Award Processes:

- A joint information memorandum (the "**Information Memorandum**"), which sets out information that interested parties should take into account when considering their possible participation in the Award Processes. It includes a description of the spectrum packaging and the auction format and rules and provides further clarification of the issues raised during the consultation process; and
- Regulations needed for the awards. ComReg will publish its draft regulations in relation to the licence for Ireland (the "**Ireland Licence**").
- Ofcom will publish a notice (the "**Notice**") of Ofcom's proposal to make statutory instruments in relation to the Award Process for the licence for Northern Ireland (the "**NI Licence**"). These statutory instruments are the auction regulations, regulations extending spectrum trading to the Spectrum Band and regulations to allow for the publication of the identity and terms of the Licence and an order limiting the number of licences in the Spectrum Band.

2.5 ComReg and Ofcom have published the independent review of the technical licence conditions undertaken for Ofcom by Red-M, Total Airspace Management (the "**Red-M Report**"), which can be found on Ofcom's web site at: http://www.ofcom.org.uk/radiocomms/spectrumawards/awardspending/award_1785/finalreport.pdf and on ComReg's web site at: http://www.comreg.ie/search/display.asp?STID=2&search=ofcom&Match=near&ydate=&submit=Publications+Search

2.6 Because the awards are co-ordinated ComReg and Ofcom have made every attempt to keep the Award Processes and licence conditions as similar as possible, but differences do exist and interested parties are advised to familiarise themselves with the auction rules, format and regulations for Ireland and Northern Ireland.

Section 3

Introduction

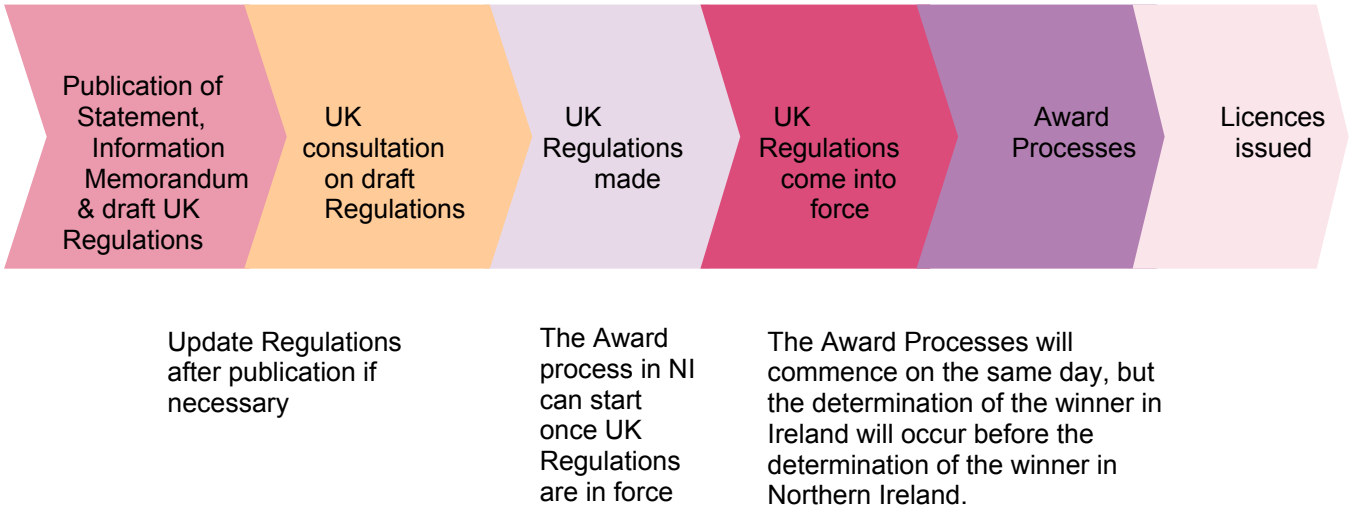
3.1 The Statement sets out ComReg's and Ofcom's conclusions and decisions on various matters relating to the award by auctions of wireless telegraphy licences for the use of the Spectrum Band, one in Ireland and one in Northern Ireland. These decisions and conclusions have been made following careful consideration of the responses to the Consultation Document. These decisions and conclusions take into account the feedback received at the seminars held on 6 and 8 January 2006 at which ComReg and Ofcom presented the proposals for the Award Processes and the feedback received at a further seminar to discuss the conclusions on technical terms and conditions which was held in Belfast on 8 November 2006.

3.2 Further details of the plans for the awards, including application instructions, are given in documents published alongside the Statement, specifically the Information Memorandum, and the proposed regulations in Ireland and the UK. Precedence shall be given to each of the following in the order set out below (from first to last):

- The Regulations:
  - (by ComReg) the provisions of the Wireless Telegraphy Regulations for the Spectrum Band in Ireland;
  - (by Ofcom) the provisions of the Notice to make auction regulations;
- the Information Memorandum; and
- the provisions of the Statement.

3.3 The Award process starts with the publication of the Statement, the Information Memorandum and the draft regulations. An outline of the sequence for the awards is given in figure 3.1 below.

Figure 3.1 An outline of the sequence for the awards



Overview of responses to the December 2005 Consultation

3.4 The December 2005 Consultation closed on 2 March 2006. Ten responses were received and these have been, according to the principle set out in the Consultation Document, considered jointly by ComReg and Ofcom. All non-confidential responses to the December 2005 Consultation have been published. A summary of the responses is given at Annex 1 and can be obtained from Ofcom's web site at: http://www.ofcom.org.uk/consult/condocs/availspec/responses/ and on ComReg's web site at: http://www.comreg.ie/search/display.asp?STID=2&search=ofcom&Match=near&ydate=&submit=Publications+Search.

3.5 There was a good measure of support for the co-operative approach to the development of spectrum use in both parts of the island of Ireland, one response going as far as to suggest that all jurisdictional constraints should be removed so that awards do not need to be legally separate. Just one response proposed a UK-wide award (separate from Ireland) arguing that this would improve spectrum efficiency and help realise economies of scale.

3.6 There was a general measure of support for the proposal to remove the spectrum allocation to short range, licence exempt, devices though there was support too for the concept of a mechanism for access to spectrum for professional radio microphone users. Two responses mentioned the on-going review of the band 1800 - 1805 MHz by the Electronic Communications Committee (ECC) in Europe.

3.7 A number of alternative packaging arrangements for the Spectrum Band were suggested either to address competition concerns or to improve economic benefits. Comments on auction design concerned the perceived risk of an inefficient auction outcome where the benefits arising from the synergies of co-ordinated awards would not be realised or concerns regarding transparency and incentives for participation and bidding strategies, which might favour existing service providers.

3.8 Further consideration of the spectrum usage rights associated with the awards was also suggested. This included a request that the emission limits proposed should be re-evaluated. Although there was some support for the emission limits proposed by ComReg and Ofcom serious concerns were raised regarding the protection of GSM 1800 stations. One response requested that a more comprehensive technical analysis should be carried out.

Associated documents to be published

3.9 Alongside the Statement, Comreg and Ofcom are publishing the following documents:

- An Information Memorandum. This sets out relevant information that interested parties should take into account when considering their participation in the awards. It will include the draft regulations in relation to the licence award in Ireland.
- A Notice of Ofcom's proposal to make four statutory instruments in relation to the award process for Northern Ireland. These statutory instruments are the Northern Ireland auction regulations, regulations extending spectrum trading to the Spectrum Band, regulations to allow for publication of the identity of licensees and terms of the licences in the Spectrum Band and an order limiting the number

of licences in the Spectrum Band. The statutory consultation period for these instruments expires on 19 January 2007.

The UK Interface Requirement document (draft IR 2046) "Spectrum Access 1785 – 1805 MHz, Devices" will be published in due course. ComReg will not publish a separate Interface Requirement, but will amend the existing Interface Requirement (ComReg 00/61). ComReg and Ofcom have published the independent review of the technical licence conditions undertaken for Ofcom by Red-M, Total Airspace Management, which can be found on Ofcom's web site at: http://www.ofcom.org.uk/radiocomms/spectrumawards/awardspending/award_1785/finalreport.pdf and on ComReg's web site at: http://www.comreg.ie/search/display.asp?STID=2&search=ofcom&Match=near&ydate=&submit=Publications+Search

Document structure

3.10 In addition to the Foreword (section 1), the Executive Summary (section 2) and this Introduction (section 3), the Statement comprises conclusions and decisions relating to:

- Section 4 – spectrum policy issues and spectrum packaging;
- Section 5 – technical issues and licence conditions;
- Section 6 – the auction format and rules; and
- Section 7 – the next steps for the Award Processes.

3.11 There is one annexe to the Statement:

- Annex 1 - summarises the main points made in the responses to the December 2005 Consultation.

Section 4

Spectrum Policy Issues and Spectrum Packaging

Introduction

4.1 ComReg's and Ofcom's proposals in the Consultation Document were to award a single lot of 20MHz of spectrum, between 1785MHz and 1805MHz. This would be awarded by two sequential sealed bid auctions, first in Ireland and then in Northern Ireland. After careful consideration of the responses ComReg and Ofcom have determined that the proposals should be confirmed as the basis for the awards. A summary of the points made by respondents and the reasons for deciding on them are set out in the following paragraphs. Responses and decisions on the technical parameters of the awards are discussed in section 5.

Jurisdictional issues

4.2 A number of respondents commented on the legal structure of the proposed Award Process. O2 proposed that Ofcom and ComReg should have considered altering the legal framework in order to allow the running of a combined award for both Ireland and Northern Ireland. Ireland and the UK are separate States operating under distinct legal frameworks. It is therefore not feasible for either administration to award licences that have extra-territorial effect or to run a joint competition for a radio spectrum licence covering both Ireland and Northern Ireland (see Section 3, paragraph 3.3 of the Consultation Document). Altering the regulatory frameworks of both countries would substantially delay the Award Processes. O2 asserts that the costs of delaying the Award Processes would be low because the value of this spectrum is uncertain. We disagree because the interest shown by parties who have attended workshops and responded to the consultation suggests that there is demand for this spectrum now and that there could be significant costs in delaying the auction (see Section 5 of the Consultation Document). The uncertainty that exists relates more to the identity of the uses and users that would maximise the value of the spectrum. This can be assessed by what users might be willing to pay, which is what the auction is designed to reveal.

4.3 One respondent questioned whether a UK-wide award would lead to higher economic benefit than award of a licence in Northern Ireland alongside Ireland. There is clearly a trade-off between:

- a co-ordinated award of spectrum in Ireland and Northern Ireland where the spectrum is awarded with the minimum delay and the exploitation of synergies between Ireland and Northern Ireland is facilitated; and
- awarding the spectrum on a UK-wide basis to allow synergies between Great Britain and Northern Ireland to be captured, this would involve delay for several years because this Spectrum Band is not presently available in Great Britain.

4.4 The economic analysis conducted by ComReg and Ofcom was not conclusive, partly because of the difficulties in measuring potential synergies and the uncertainties over what services may be offered in this spectrum in the future. It did however show that there were potential synergies between using the spectrum in Ireland and Northern Ireland (see Section 5 of the Consultation Document). It is also relevant that the

spectrum awarded in Northern Ireland will be tradable from the outset. Therefore if the Award Processes proceed as planned and subsequently it turns out that the Spectrum Band in Northern Ireland would be worth more to another user proposing a UK wide service, trading will allow an efficient reallocation of the Spectrum Band (provided transaction costs are not high). ComReg and Ofcom therefore do not propose to change the plan for co-ordinated Award processes in Ireland and Northern Ireland.

Possible EU Measure

4.5 One respondent argued that the Award Processes should be delayed until the outcome of the review of the band 1800 – 1805 MHz by the Electronic Communications Committee (the "**ECC**") and the Conference of Posts and Telecommunication Administrations (the "**CEPT**") had been completed as this approach would allow the loss of benefits from harmonisation of the band to be considered.

4.6 This matter is dealt with in Section 4 (paragraphs 4.4 to 4.6) of the Consultation Document. Section 3 of the Information Memorandum provides an update on the progress of the review by the ECC of the CEPT.

4.7 Harmonisation is a broad term which can encompass a wide variety of different international regulatory measures. One type of harmonisation involves reserving spectrum exclusively for a specific application (and even a specific technology). ComReg and Ofcom believe that harmonisation of this kind is not a pre-requisite for common services to develop. If spectrum is available on a flexible basis across Europe, market forces (including spectrum trading) can generate strong incentives for harmonisation where there are clear benefits to be gained. The use of market forces also allows greater flexibility in cases where there may not be strong benefits from harmonisation. It also avoids the losses in welfare which may arise because regulators generally are less efficient than markets (absent market failure) in identifying the most valuable uses of spectrum.

4.8 ComReg and Ofcom have stated that issuing one licence in each country is preferable to issuing multiple licences because this will enable the Award Processes to proceed with maximum flexibility and technology and service neutrality (see Section 6 of the Consultation Document). Ofcom's impact assessment and research presented in Section 5 of the Consultation Document has shown a high degree of uncertainty over which technologies and services will deliver the optimal value of the spectrum, therefore technology and service neutrality are particularly important in this award.

4.9 As a consequence of the review by the ECC, the European Commission (the "**Commission**") has concluded[1] that the band 1800 – 1805 MHz would be considered as a candidate band for the so-called WAPECS[2] concept. CEPT has been tasked[3] to consider this band in the context of the European Commission Mandate on WAPECS, with the expectation by Member States that the harmonised nature of this band would be maintained, but allowing its flexible use at the same time. The term WAPECS is used to signal a move away from the traditional method

[1] Document RSCOM06-73, Brussels 21 September 2006.
[2] Wireless Access Policy for Electronic Communications Services.
[3] "Mandate to CEPT to develop least restrictive technical conditions in frequency bands addressed in the context of WAPECS", submitted to CEPT on 5 July 2006.

of identifying spectrum for specific technologies and/or services in favour of an approach that is, so far as possible, neutral between different technologies and services. However, this is subject to technical co-existence requirements which are tailored to the spectrum band and those adjacent to it.

4.10 Following discussions at a European level it is evident[4] that there is more support for a flexible approach to use of this band. As a consequence, the Commission urged Member States to ensure that any use of this band is in line with WAPECS principles. This desire to investigate flexible use of the band 1800 -1805 MHz is reflected by its inclusion in the recent European Commission Mandate[5] to CEPT on WAPECS.

4.11 Although this leaves open the possibility of a future binding Commission Decision covering the band. The present assessment of ComReg and Ofcom is that it seems likely that such a Decision (if it is pursued) would be in line with the approach to flexibility set out in the WAPECS framework, which is broadly consistent with the approach that ComReg and Ofcom have adopted. However, this assessment is subject to change. In the event of a future Commission Decision covering the band 1800 – 1805 MHz or any other spectrum band where changes are necessitated by EU legislation, ComReg and Ofcom may be required to change the terms and conditions of the Ireland and NI Licences and these changes may impose restrictions on services and technologies.

Licences and packaging

4.12 Some respondents argued that the spectrum packaging should be changed - for example to four separate lots each of 5 MHz. If the spectrum was of similar quality and subject to similar technical constraints, there would be merit in comparing the economic benefits of packaging into smaller units. However, technical constraints on the Spectrum Band (see Section 5 below) will restrict the way in which the Spectrum Band can be used in order to afford protection to other spectrum users. ComReg and Ofcom have reviewed the range of potential services that could be offered in the Spectrum Band and concluded that (for the most likely services) the minimum spectrum requirements would not permit more than one licensee to operate in each country. If sub-division of the Spectrum Band is subsequently required, spectrum trading in Northern Ireland will allow this to occur. Currently spectrum trading is not permitted under legislation in Ireland.

Other issues

4.13 Some Mobile Network Operators (MNOs) commented in some detail on matters of competition and undue discrimination, referring to previous Ofcom consultations (e.g. Ofcom's Spectrum Framework Review: Implementation Plan).

4.14 ComReg and Ofcom have considered these comments carefully and concluded that there would be no undue discrimination against existing MNOs (or any other persons) in proceeding with the Award Processes as proposed. These issues were addressed in the joint Consultation Document (see Annex D, sections D.45 to D.60 and Table D.1). In summary, ComReg and Ofcom note that there is evidence of demand for the spectrum and that the Spectrum Band is presently unused in Ireland

[4] DG INFSO/B4, **RSCOM06-73** Brussels, 21 September 2006 and Ofcom, Note of the Seventeenth Radio Spectrum Committee meeting held in Brussels on 4-5 October 2006.

[5] Document RSCOM06-42, Brussels, 23 June 2006, DG INFSO/B4

and Northern Ireland. It may be of substantial value if the Spectrum Band is brought to productive use sooner rather than delay the awards. The terms and conditions envisaged for the Ireland and NI Licences and other aspects of the Award Processes are in the view of ComReg and Ofcom objectively justified, proportionate and transparent as to what they seek to achieve. To delay or postpone the Award Processes further is inappropriate and inconsistent with ComReg's and Ofcom's statutory duties.

4.15 Undue discrimination can only arise, as stated in the Consultation Document (see Annex D), where different treatment is given to persons in similar circumstances, or where the same treatment is given to persons in different circumstances and there is a lack of objective justification for the treatment given. We do not consider that the Ireland and NI licences for the Spectrum Band unduly discriminate against the holders of 2G and 3G licences, or any other existing licence holder. This is because there are a number of differences between the Ireland and NI Licences and existing licences in Ireland and the United Kingdom, with rights that are different from and in some material respects inferior to the existing 2G and 3G licences. These differences include the quantity of spectrum available, its status in relation to international harmonisation measures, the geographical scope of the Ireland and NI Licences, and the circumstances under which these will be awarded.

4.16 Further, neither ComReg nor Ofcom is proposing to place any restrictions on the holders of 2G or 3G licences (or for that matter any other person) from participating in the Award processes and competing to acquire the Ireland and NI Licences. ComReg and Ofcom consider that there can therefore be no undue discrimination against existing 2G or 3G licensees.

Radio microphones

4.17 Audio Ltd commented that a fair system of access for professional radio microphone users is needed with a fair pricing policy. The Ireland and NI Licences for the Spectrum Band will be technology and application neutral. This will allow radio microphone and other short range device users to compete for the Ireland and NI Licences or subsequently acquire access to the Spectrum Band in Northern Ireland through spectrum trading.

Section 5

Technical Issues and Licence Conditions

5.1 A number of comments were made about the technical parameters of the licences. After careful consideration and further research, ComReg and Ofcom have decided to vary the terms and conditions proposed in the Consultation Document. The revised technical conditions of the Ireland and NI Licences resulting from this review are given in paragraphs 5.10 – 5.18 below.

5.2 ComReg and Ofcom have published the independent review of the technical licence conditions undertaken for Ofcom by Red-M, Total Airspace Management, which can be found on Ofcom's web site at: http://www.ofcom.org.uk/radiocomms/spectrumawards/awardspending/award_1785/finalreport.pdf and on ComReg's web site at: http://www.comreg.ie/search/display.asp?STID=2&search=ofcom&Match=near&ydate=&submit=Publications+Search

GSM 1800 networks

5.3 The responses to the December 2005 Consultation included concerns about the protection of a GSM 1800 network in Northern Ireland and indicated that the technical conditions given in Annex C (sections C.1 – C.24) of the Consultation Document required further clarification in order that the rights of licensees are made clear. In a response to Ofcom, one respondent asserted that a 2km exclusion zone[6] based on a minimum coupling loss calculation should be specified in the NI Licence conditions in order to protect GSM 1800 base station receivers of a particular network or the Award Processes halted. The same respondent suggested that in the absence of additional filtering for GSM Base stations the NI Licence conditions should restrict the eirp density to a limit not greater than 5dBm/MHz for any transmitter which is not permanently fixed.

5.4 ComReg and Ofcom have re-examined in detail the claim made for a 2km exclusion zone, the specification of limits for power spectral density, the real-world filtering characteristics and deployment of band filters used in GSM 1800 networks and the design and specification of GSM base and mobile equipment.

Summary of conclusions

5.5 ComReg and Ofcom have concluded that the spectrum usage rights of existing licensees have been fully dealt with by the review as set out in the Consultation Document (see Annex D, sections D.45 to D.60 and Table D.1).

5.6 The spectrum usage rights proposed in the December 2005 Consultation for the Spectrum Band were based on the application of probabilistic methods for the assessment of interference to adjacent band services and a theoretical performance value for the filters used in GSM base stations receivers, which in turn are based on accepted criteria published in European studies[7]. ComReg and Ofcom have

[6] The basis for the 2km exclusion zone being the protection afforded to GSM 1800 BTS receivers by the parameters specified by the European standard for GSM equipment (ETSI TS05.05).
[7] The Conference of European Posts and Telecommunications Administrations (CEPT). See for example Report 100.

concluded that the minimum coupling loss (MCL) method should also be used as the MCL method gives clear descriptions of the scenarios and associated separation distances of victim receivers from unwanted interferers, which can be readily understood in this instance. Having reviewed the analyses undertaken in support of the proposals made in the December 2005 Consultation, ComReg and Ofcom have concluded that in this case spectrum masks, power limits and coordination separation distances should reflect the real-world band filtering performance and technological improvements that could impact future performance levels of GSM equipment, its installation and design.

5.7 Following an extensive review of the proposals made by ComReg and Ofcom in the December 2005 Consultation and taking full account of the responses received, ComReg and Ofcom have concluded that the limiting scenarios for an un-coordinated use of the Spectrum Band are GSM base station receiver blocking, GSM mobile station receiver blocking and GSM base station receiver intermodulation interference. Different spectrum masks are required for stations that are operated from a fixed location (base stations) and those stations that are mobile. Frequency co-ordination arrangements will also be necessary. These co-ordination arrangements should give as much flexibility as possible to the Licensees of the Spectrum Band (the "**Licensees**") and the current GSM licence holder in Northern Ireland in the band 1751.7 - 1781.5 MHz.

5.8 Details of the revised spectrum masks and the co-ordination arrangements are given in paragraphs 5.10 to 5.18 below.

5.9 ComReg and Ofcom also note that intermodulation interference will still be a potential problem for uncoordinated deployments in the Spectrum Band.

The spectrum masks

5.10 There are four spectrum masks for stations that are installed and operated at a fixed location (base stations) within the Spectrum Band. The Licensees must use the spectrum mask that is relevant to the distance separating a station that is installed and operated at a fixed location within the Spectrum Band and pre-existing GSM 1800 base stations operating in the band 1751.7 - 1781.5 MHz.

Fixed (base) station spectrum masks

5.11 For stations that are installed and operated at a fixed location clarification of the spectrum mask and power limits for the Spectrum Band is given in Figure 5.1 below. If the Licensees wish, ComReg and Ofcom will consider varying the licences to allow other spectrum masks, but these should be within the range of masks given in Figure 5.1 below.

5.12 These four spectrum masks are shown in Figure 5.1 below. The corresponding power limits are given in tables 5.1 to 5.4 below and these will be applied as follows:

- when a station is installed and operated at a fixed location that is 200 metres from a pre-existing GSM 1800 base station operating in the band 1751.7 - 1781.5 MHz the power limits shown in table 5.1 will apply;
- when a station is installed and operated at a fixed location that is between 200 and 300 metres from a pre-existing GSM 1800 base station operating in the band 1751.7 - 1781.5 MHz the power limits shown in table 5.1 will apply;

- when a station is installed and operated at a fixed location that is between 300 and 500 metres from a pre-existing GSM 1800 base station operating in the band 1751.7 - 1781.5 MHz the power limits shown in table 5.2 will apply;
- when a station is installed and operated at a fixed location that is between 500 and 750 metres from a pre-existing GSM 1800 base station operating in the band 1751.7 - 1781.5 MHz the power limits shown in table 5.3 will apply.
- When a station is installed and operated at a fixed location that is at a distance greater than 750 metres from a pre-existing GSM 1800 base station operating in the band 1751.7 - 1781.5 MHz the power limits shown in table 5.4 will apply.

Figure 5.1 Fixed (base) station spectrum masks and coordination separation distances

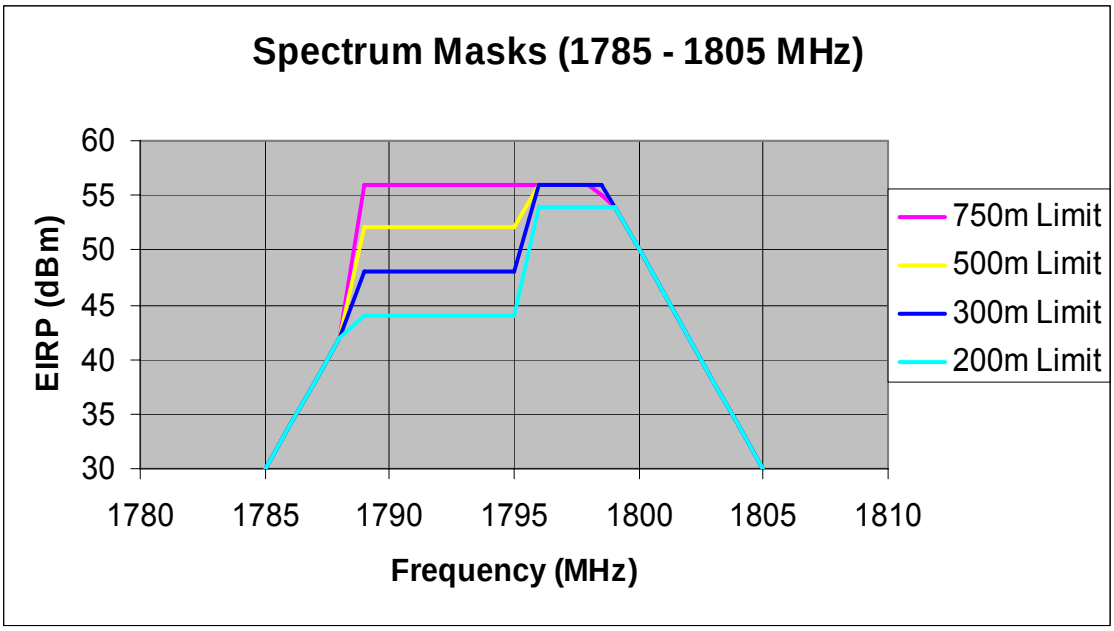


Table 5.1 Maximum EIRP for stations installed and operated at fixed locations at a separation distance of 200m

Frequency (MHz)	Maximum EIRP (dBm)
Below 1785	Unwanted Emission Level
1785	30
1785 – 1788	30 + (4*ΔF1) Note 1
1788 – 1789	42 + (2*ΔF2) Note 2
1789 – 1795	44
1795 – 1796	44 + (10*ΔF3) Note 3
1796 – 1799	54
1799 – 1805	54 – (4*ΔF4) Note 4
1805	30
Above 1805	Unwanted Emission Level

Note 1: ΔF1 is the positive offset in MHz to a maximum of 3MHz
Note 2: ΔF2 is the positive offset in MHz to a maximum of 1MHz
Note 3: ΔF3 is the positive offset in MHz to a maximum of 1MHz
Note 4: ΔF4 is the positive offset in MHz to a maximum of 6MHz

Table 5.2 Maximum EIRP for stations installed and operated at fixed locations at a separation distance of 300m

Frequency (MHz)	Maximum EIRP (dBm)
Below 1785	Unwanted Emission Level
1785	30
1785 – 1788	30 + (4*ΔF1) Note 1
1788 – 1789	42 + (6*ΔF2) Note 2
1789 – 1795	48
1795 – 1796	48 + (8*ΔF3) Note 3
1796 – 1798.5	56
1798.5 – 1799	56 – (4*ΔF4) Note 4
1799 – 1805	54 – (4*ΔF5) Note 5
1805	30
Above 1805	Unwanted Emission Level

Note 1: ΔF1 is the positive offset in MHz to a maximum of 3MHz
Note 2: ΔF2 is the positive offset in MHz to a maximum of 1MHz
Note 3: ΔF3 is the positive offset in MHz to a maximum of 1MHz
Note 4: ΔF4 is the positive offset in MHz to a maximum of 0.5MHz
Note 5: ΔF5 is the positive offset in MHz to a maximum of 6MHz

Table 5.3 Maximum EIRP for stations installed and operated at fixed locations at a separation distance of 500m

Frequency (MHz)	EIRP (dBm)
Below 1785	Unwanted Emission Level
1785	30
1785 - 1788	30 + (4*ΔF1) Note 1
1788 - 1789	42 + (10*ΔF2) Note 2
1789 - 1795	52
1795 - 1796	52 + (8*ΔF3) Note 3
1796 – 1798.5	56
1798.5 – 1799	56 – (4*ΔF4) Note 4
1799 - 1805	54 – (4*ΔF5) Note 5
1805	30
Above 1805	Unwanted Emission Level

Note 1: ΔF1 is the positive offset in MHz to a maximum of 3MHz
Note 2: ΔF2 is the positive offset in MHz to a maximum of 1MHz
Note 3: ΔF3 is the positive offset in MHz to a maximum of 1MHz
Note 4: ΔF4 is the positive offset in MHz to a maximum of 0.5MHz
Note 5: ΔF5 is the positive offset in MHz to a maximum of 6MHz

Table 5.4 maximum EIRP for stations installed and operated at fixed locations at a separation distance of 750m

Frequency (MHz)	Maximum EIRP (dBm)
Below 1785	Unwanted Emission Level
1785	30
1785 – 1788	30 + (4*ΔF1) Note 1
1788 – 1789	42 + (14*ΔF2) Note 2
1789 – 1798	56
1798 – 1799	56 – ΔF3 Note 3
1799 – 1805	54 – (4*Δf) Note 4
1805	30
Above 1805	Unwanted Emission Level

Note 1: ΔF1 is the positive offset in MHz to a maximum of 3MHz
Note 2: ΔF2 is the positive offset in MHz to a maximum of 1MHz
Note 3: ΔF3 is the positive offset in MHz to a maximum of 1MHz
Note 4: ΔF5 is the positive offset in MHz to a maximum of 6MHz

New mobile station spectrum mask

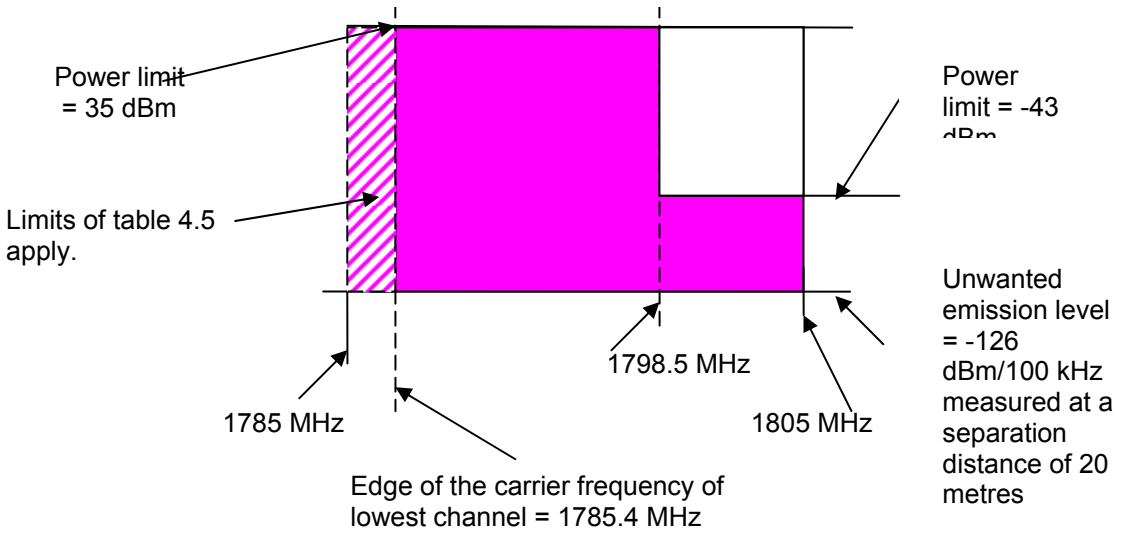
5.13 Further consideration has also been given to the protection of GSM mobile stations, which receive above 1805 MHz. ComReg and Ofcom have concluded that the dominant interference mechanism is GSM mobile station receiver blocking and that the mobile station spectrum mask given at figure 5.2 below will be effective in limiting the interference to GSM mobile terminals to a figure comparable to existing GSM design limits.

Table 5.5 Power limit on emissions from mobile terminals

Frequency offset in kHz from the carrier (Note 1)	Upper EIRP limit (35dBm) (Notes 2 & 3)	Measurement Bandwidth (kHz)
100	+0.5	30
200	-30	30
250	-33	30
400	-60	30
600 - <1200	-62	-65
1200 - <1800	-65	-67
1800 - <6000	-67	100
6000	-80	100

Note 1: The lowest carrier centre frequency will be 1784.5MHz
Note 2: An in band power limit of -43dBm is assumed inside the spectrum band 1798.5 to 1805 MHz.
Note 3 The unwanted emission limit is -126 dBm/100kHz measured at a separation distance of 20 metres

Figure 5.2 Spectrum mask and power limits (mobile stations)



5.14 The Licensees will not be permitted to operate a fixed station that is closer than 200 metres to a pre-existing GSM base station operated in the band 1751.7 - 1781.5 MHz by the current GSM licence holder in Northern Ireland unless it is successfully co-ordinated. For co-ordination to be successful, the parties concerned will need to exchange any and all relevant information. ComReg and Ofcom expect the costs resulting from co-ordination of stations in the Spectrum Band with pre-existing GSM base stations operated in the band 1751.7 - 1781.5 MHz by the current GSM licence holder in Northern Ireland to be borne by the relevant Licensee (either the Licensee in Ireland or the Licensee in Northern Ireland, whichever is appropriate).

5.15 The current GSM licence holder in Northern Ireland is able to deploy new stations and modify pre-existing GSM base stations under the terms of its licence. The obligations on the Licensee to co-ordinate with the GSM licence holder in Northern Ireland if the former does not respect the spectrum masks set out in tables 5.1 to 5.4 exists only in relation to GSM base stations that exist before the deployment of any given fixed station by the Licensee. It is therefore a matter for the GSM licence holder to seek co-ordination with the Licensee in relation to new or modified GSM base stations. ComReg's and Ofcom's preference is that the parties concerned find a satisfactory framework for managing any co-ordination of this kind that is required, and the costs that arise from this.

5.16 In general, licensees are required to operate radio equipment in compliance with such co-ordination and sharing procedures as may be considered necessary and notified by ComReg or Ofcom.

International frequency co-ordination

5.17 ComReg and Ofcom have agreed in principle to a memorandum of understanding for the Spectrum Band (the "**MoU**"), which will come into effect in the event that international co-ordination is required for the efficient use of the Spectrum Band. The draft MoU and procedure for coordination is set out in Annex 8 of the Information Memorandum.

5.18 Details of the arrangements for international co-ordination are given in the Information Memorandum, Annex 8.

Section 6

Auction Format and Rules

Introduction

6.1 In the December Consultation, it was proposed that the award of spectrum take place along the following lines. The spectrum should be auctioned sequentially, first in Ireland and then in Northern Ireland. ComReg and Ofcom proposed that the auctions should be a sealed bid format, and that a second price rule should be used to determine how much the winning bidders should pay. ComReg and Ofcom received a number of comments on these aspects of the auction format and these are addressed in the sub-section below. ComReg and Ofcom also received comments on speculators and on the objectives of the award an these are also dealt with in the following sub-section. The second sub-section presents ComReg's and Ofcom's decisions on the other auction rules and procedures for the auctions such as deposits and bidder association rules.

Auction Format

Use of sequential sealed bid processes

6.2 One respondent suggested that auctioning licences sequentially in Ireland and Northern Ireland would create a disincentive for bidders wanting to participate in both auctions to do so because the risk of being stranded with one licence (the exposure problem) is not entirely eliminated. The respondent argues that bidders wanting only one licence will have a slight advantage which will be sufficient to deter those wanting two licences from entering the auction. Although Comreg and Ofcom recognise that bidders wanting both licences may face some degree of aggregation risk, we do not agree that that this effect is sufficiently strong to deter such bidders from entering the auction.

6.3 The same respondent argues from a different standpoint that if a bidder wanting both licences does enter the auction, and wins the first licence, it will have a "toehold" in the second that will make it bound to win that auction. We agree that a bidder that wins the licence in the first auction may have an advantage in the second auction (because it will be the only bidder able to exploit the synergies associated with holding both licences), but we do not consider this advantage to be sufficiently strong that the auction outcome will be a foregone conclusion. As discussed above, it is possible that there will be a variety of bidders with very different business cases bidding for this spectrum, so it does not necessarily follow that the winner of the licence in the first auction will value the licence in the second auction, together with any synergies, above the value of another bidder.

6.4 One disadvantage of a sequential process is that the winner of the first auction still runs the risk of not winning the second licence and ending up having overpaid for the first licence. This could affect bidding strategies and lead to inefficient outcomes, in particular synergies may not be fully realised even when they turn out to be the most efficient outcome. If there is a significant difference in the size of the two potential markets, holding the first auction in the jurisdiction which has the larger potential market may limit the potential impact of aggregation risks. This is because the synergies will have less of an impact on the viability of services in the jurisdiction with the larger potential market.

6.5 In summary, ComReg and Ofcom believe that holding sequential auctions facilitates the realisation of synergies to some degree. Bidders can set their strategy for the second auction contingent on the outcome of the first auction. By holding the first auction for the licence in the jurisdiction which has the larger potential market (i.e. Ireland), aggregation risks can be reduced. Given the constraint that it is not possible to hold a single auction for both licences (without a change in the law, which would cause undesirable delay to the award process), we believe that this approach should produce the most efficient outcome.

Complexity and common values

6.6 ComReg and Ofcom believe that some clarification of their position on the complexity of an ascending auction is needed to address the argument that an ascending auction would be too complex and could deter bidders. We do not believe that this is true generally for an ascending auction. ComReg and Ofcom did state that holding simultaneous ascending auctions in Ireland and Northern Ireland could lead to some practical complexities because of the complementary nature of holding coordinated awards in both countries and the need to address aggregation risks. In particular the auction rules needed to deal with this and to promote an efficient outcome over both jurisdictions turned out to be complex as discussed in the Consultation Document (see section 8, paragraphs 8.19 to 8.20).

6.7 T-Mobile was correct in pointing out that where bidders' valuations are strongly affiliated either because a substantial part of the value is common to many bidders or their valuations are in some way correlated, ascending formats have advantages. Equally, where bidders' values are private and independent from each other, second price sealed bid formats give bidders strong incentives to bid their true value, thus they are simpler for bidders. Second price sealed bid auctions in this context are also cheaper to participate in and are cheaper to run.

6.8 As part of its argument that there could be a large degree of common value, T-Mobile also argues that it is unclear whether potential bidders are likely to want to use the spectrum to provide different services. However, representatives of companies operating in a number of different markets or niches have attended workshops or responded to the consultation. This together with the service neutral nature of the auctions leads us to expect that bidders will indeed want to use this spectrum to provide different services.

6.9 T-Mobile also suggests that common values could arise from uncertainties in the quality of the spectrum. We do not accept that there will be significant uncertainty in the quality of the spectrum in relation to interference issues. ComReg and Ofcom have carefully reviewed the technical issues relating to the award of this spectrum band, and has held workshops with stakeholders to discuss the technical work that underpins award.

6.10 In summary, although ComReg and Ofcom acknowledge that some bidders may have a degree of common value uncertainty, our judgement is that this effect is not strong enough to justify the greater complexity of using an ascending bid process rather than a second price, sealed bid for the two auctions. Moreover, as there will be just one lot in each auction, the potential benefit in terms of alleviating common value uncertainty from having an ascending bid process would be modest, as bidders would only be able to observe competitors dropping out at a single price point. Thus, the benefits from running an ascending bid process are much less than for an award where there are multiple lots, and bidders can switch demand between them and/or buy more than one lot.

Pricing rule

6.11 T-Mobile referred to experimental studies of second price auctions that find evidence of overbidding (i.e. bidding more than your true value). A study "Behaviour in Second Price Auctions by Highly Experienced eBay Buyers and Sellers (Garratt, Walker and Wooders, 2004)" is quoted in support of the view that second price sealed bid auctions lead to overbidding. However, this is only part of what the Garratt, Walker and Wooders study found. In their experimental study of second price auctions underbidding was as frequent as overbidding. One conclusion from this work is that further research is necessary to gain a greater understanding of the drivers of behaviour in experimental auctions and their implications for real world auctions. We note that some surveys of experimental work have suggested that the lack of any real penalty for overbidding in an experimental auction could equally be the cause of such irrational behaviour.

6.12 Harstad (2000) finds that prior auction experience can reduce the level of overbidding observed in experimental second-price auctions. Critical to whether participants overbid in second price auction experiments appears to be the extent to which they are aware of, or learn through the course of the experiments, that overbidding can lead to losses which in a real life situation would carry a penalty.

6.13 ComReg and Ofcom have concluded that while experimental evidence can offer interesting insights into bidder's behaviour, there is no strong evidence to suggest that a second price auction approach should not produce a reasonably efficient outcome in the context of this spectrum award, especially given the scope for bidders to seek advice on bidding strategy (i.e. to have a certain level of experience). ComReg and Ofcom are confident that the proposed auction format is an efficient means of assigning the authorisation to develop services in the Spectrum Band.

Speculators

6.14 Two respondents argue that a second-price sealed bid auction could encourage speculators because of the uncertainty over valuations of the spectrum and the possibility that the spectrum could be traded. These speculators might, it is suggested, overpay for spectrum because of the purported lack of information available to bidders in a sealed bid process.

6.15 ComReg and Ofcom do not agree with this view. Speculation would appear to be a risky strategy, particularly if there is a strong risk that speculators misjudge what others are prepared to pay for the spectrum. More importantly, the returns to speculators in a second price sealed bid auction do not appear likely to be high, particularly the more that bidders' valuations are independent. If bidders have incentives to bid their true values, then if a speculator were to win the auction it pays the highest amount that a "real" user would be willing to pay. It follows that the speculator would not be able to earn any margin on selling the spectrum unless and until perceived market conditions improved.

6.16 Another deterrent for speculation is the risk that another speculator enters the auction with an aggressive bidding strategy. In this case both speculators could end up bidding much more than the spectrum is worth and therefore the winner would have little prospect of being able to recoup fully the amount it would pay in the auction.

Efficiency and revenue maximisation

6.17 One respondent said that the statement that an objective of the auction was to maximise efficiency and not raise revenue was irrelevant and questioned the consistency of this statement. The respondent argued that auctions maximised efficiency by maximising revenue raised (reflecting willingness to pay). However, ComReg and Ofcom maintain their original position. The revenue raising and efficiency properties of auction designs are not the same things, and depend upon the underlying conditions in the auction such as the degree to which valuations are independent, asymmetries between bidders and the potential for collusion.

Other rules and auction procedures

Deposits and reserve prices

6.18 Interested parties are urged to acquaint themselves with the rules for deposits for the awards. The rules for deposits for the award in Ireland are given in Annex 1 of the Information Memorandum. The rules for deposits for the award in Northern Ireland are given in Annex 4 of the Information Memorandum.

6.19 Deposits are upfront payments that will be forfeit if a bidder breaks specific auction rules or a winning bidder defaults on its payment. They help to deter frivolous bidders - similarly to reserve prices - and to reduce strategic incentives for default. When considering the impact of withdrawal or default on the auctions in Ireland and Northern Ireland, ComReg and Ofcom now believe that it might be possible for bidders to default as part of a collusive strategy to reduce the amount due to be paid by the person who wins the spectrum after default, and increase their joint payoff.

6.20 ComReg and Ofcom have decided that a change to the deposit rules is needed and will require, in each jurisdiction, bidders to submit a cash deposit equal to 50% of the reserve price with their application. In Northern Ireland bidders must submit 100% of their bid price at the qualification stage less the Initial deposit paid at the application stage. There will be no change to the reserve prices which remain at €150k and £50k for Ireland and Northern Ireland respectively.

6.21 If a bidder defaults on the payment for a licence it will forfeit its full deposit and remain liable for the outstanding balance and of course it will not be granted a licence. Also if default occurs then that licence will be offered to unsuccessful bidders for that option in rank order of their bids, at the price that was due to be paid by the bidder who defaulted.

Withdrawal rules

6.22 Taking into account the sequential nature of the awards, ComReg and Ofcom have concluded that the withdrawal rules will allow for a simple 'no bid' as a means of withdrawing from the award process. The Information Memorandum (see Annex 1) and the Wireless Telegraphy (Licence Award) Regulations 2006 clarify the withdrawal rules.

Bidding locations

6.23 Ofcom has decided that it will allow for bids to be handed in either at Ofcom's Belfast office or at Ofcom's HQ, London. Full details are given in Annex 4 of the Information Memorandum. ComReg will only allow for bids to be handed in at the ComReg offices in Dublin.

Bidder association rules

6.24 The Information Memorandum (see Annex 1, Annex 3) and the Wireless Telegraphy (Licence Award) Regulations 2006 clarify the bidder association rules. The assessment of bidder groups for association will be applied differently by ComReg and Ofcom. For this reason interested parties should ensure they have familiarised themselves with the association rules.

Conclusions

6.25 ComReg and Ofcom have considered the points raised by respondents very carefully. They have concluded that the proposals made in the Consultation Document are the most appropriate to achieve the objectives of the award. In summary, the auction format and rules will be:

- A single round sealed bid auction format will be used for both Award Processes;
- The Award Processes will commence on the same day. The auction in Ireland will be concluded first. The auction in Northern Ireland will follow;
- In each jurisdiction, the winning bid for each Licence will be the highest bid in that auction. In each auction, a tie between bidders shall be settled by a method of random selection;
- In each jurisdiction the winning bidder will pay the ***second highest price*** bid for that Licence in the relevant Award Process;
- There will be separate registration processes in Ireland and Northern Ireland. Participation in the auctions, and the identities of all those registered in both auctions will be made public on ComReg's and Ofcom's websites;
- ComReg and Ofcom will publish the identities of the winning bidders; and
- There are specific rules listed in this Memorandum to prohibit collusion.

Section 7

Next Steps

7.1 ComReg and Ofcom intend to hold the awards as soon as possible. The key next step in the Award Processes is for ComReg and Ofcom to make the statutory instruments which set out the licence conditions for Ireland and Northern Ireland and the auction rules for Northern Ireland. A draft of these regulations is one of the documents published alongside the Statement. It is subject to a statutory consultation period of at least one month. After the closing date for responses to this statutory consultation, Ofcom will consider responses and assess whether it should amend the proposed regulations. It will then make the regulations and they will come into force on the date specified in them, which is likely to be about one month after the date they are made.

7.2 The timing cannot be finalised before the statutory consultations have closed and Ofcom has considered responses. Subject to this, Ofcom expects the auction regulations for Northern Ireland to be in force by a date that would allow the Northern Ireland Auction Processes to start.

7.3 The auction process in Ireland will commence once the necessary licensing regulations are approved by the Minister for Communications Marine and Natural Resources. Auction regulations are not required in Ireland.

7.4 An indicative time line for both the award processes from their respective application dates is set out in Section 5 of the Information Memorandum. This may be updated nearer the time.

Further seminars

7.5 ComReg and Ofcom may hold further seminars with interested parties prior to the commencement of the auctions. If a decision is taken to hold further seminars ComReg and Ofcom will publish the details in advance on their websites. ComReg and Ofcom do plan to publish Questions and Answers regarding the auction rules where this is helpful. The timing for Question and Answers is dealt with in the Information Memorandum.

Annex 1

Summary of Responses to the December 2005 Consultation

A1.1 ComReg and Ofcom received 10 responses to the December 2005 joint consultation. The responses provided detailed comments on:

- the bidding process, auction rules and auction design
- the jurisdictional basis for the Award Processes
- spectrum packaging and spectrum harmonisation
- spectrum co-ordination issues.

A1.2 This Annex sets out a summary of the responses and ComReg's and Ofcom's view on the main points raised. Some of the issues are discussed in detail in the main body of this statement.

Issues raised	Comments	ComReg's & Ofcom's comments
Competition and discrimination	Audio Ltd commented that there should be a fair system of access to spectrum for professional radio microphone users with a fair pricing policy. T-Mobile commented on discrimination against the holders of 2G/3G licences and argued for a level playing field for competing operators where the most efficient end up supplying services. It Cited distortions as: - 3G service provision will be possible - no costly roll out obligations in the licences available in this award - tradable licences in this award - indefinite term of licence - spectrum licences will be relatively inexpensive (to 3G).	The Ireland and NI Licences will be technology and application neutral. In Northern Ireland this will allow radio microphone and other short range device users to compete for the NI Licence or subsequently acquire access to the spectrum (for example through spectrum trading). Spectrum trading is not permitted in Ireland. ComReg and Ofcom have concluded that discrimination issues are fully dealt with in the Consultation Document of 15 December 2005 (see Annex D, sections D.45 to D.60 and Table D.1).ComReg and Ofcom do not consider that Ireland and NI Licences unduly discriminate against the holders of 2G and 3G licences, or any other existing licence holder. There are a number of

		differences between the Ireland and NI Licences and existing licences in Ireland and the United Kingdom including the existing 2G and 3G licences. These differences include the quantity of spectrum available, its status in relation to international harmonisation measures the circumstances under which the licences were or will be awarded, and the geographical scope of the licences. Further, neither ComReg nor Ofcom is proposing to place any restrictions on the holders of 2G or 3G licences (or for that matter any other person) from participating in and competing to acquire the Ireland and NI Licences. ComReg and Ofcom consider that there is no undue discrimination against existing 2G or 3G licensees.
Technology neutrality	Another respondent re-iterated a view expressed in response to other Ofcom consultations that spectrum awards of this type should restrict the use of 3G in such bands and should not therefore be application and technology neutral.	ComReg and Ofcom reject the suggestion that there should be a licence condition prohibiting the use of a particular technology (such as 3G technology) in this Spectrum Band. ComReg and Ofcom do not see any objective justification for such an intrusive restriction, which would also be inconsistent with the emphasis on technology neutrality in the European regulatory framework. ComReg and Ofcom consider that giving the Ireland and NI Licensees freedom to select the technology which meets their objectives should enhance the Licensees' ability to use the Spectrum Band efficiently. To the extent that there may be an effect on

		other spectrum licensees, ComReg and Ofcom would expect this to be an enhancement of competition and the opportunities for innovation, which should be in the interests of citizens and consumers.
Spectrum usage rights	Audio Ltd said that the power limits would not be compatible with radio microphone use of the spectrum. Vodafone Ireland said that the power limit proposed are not sufficient to protect GSM users and called for a more comprehensive analysis. Mobile200 said that the limits proposed are appropriate, but need to be enforced to protect adjacent 1781.7-1785 MHz band. Orange said that there is a need for substantial guard bands and that the emission limits must provide protection to GSM users in adjacent bands. Spurious emission limits must be sufficient to ensure protection to quality of service requirements for GSM/UMTS base stations. Orange suggests that unconstrained spectrum for new services will therefore be limited. T-Mobile commented that property rights in spectrum need to be adequately defined. They said that the draft licence was unclear and should contain legal title to spectrum, that dispute resolution mechanisms remain unclear and that flexibility to negotiate higher power limits would be an advantage. They also commented that spectrum rights should be clear in relation to interference to	Regarding the protection of other spectrum users, ComReg and Ofcom have set out their conclusions regarding revised technical terms and conditions of the Ireland and NI Licences in section 5 of the Statement. ComReg and Ofcom have concluded that the spectrum usage rights of existing licensees have been fully dealt with by the review as set out in the Consultation Document (see Annex D, sections D.45 to D.60 and Table D.1).

	adjacent bands. Personal Broadband UK Ltd commented that the emission limits are appropriate and still leave scope for a useful service. Meteor Mobile Communications Ltd said that the limits proposed will not impede the design and operation of a commercial network and by Motorola Ltd who commented that the power limit is adequate to accomplish reception in small handheld terminals with integral antennas.	
Auction design	Personal Broadband UK Ltd commented that the award process is unlikely to result in outcome where one licensee holds both licences and suggested a hybrid (beauty contest auction) to prevent strategic bidding by incumbents with market power and argues for roll out (Use It Or Lose It) obligations to counter 'spectrum blocking'. They argue that harmonisation locks in 'dominant' technologies and disadvantages innovation.	ComReg and Ofcom have concluded that speculation would appear to be a risky strategy, particularly if there is a strong risk that speculators misjudge what others are prepared to pay for the spectrum. More importantly, the returns to speculators in a second price sealed bid auction do not appear likely to be high, particularly the more that bidders' valuations are independent. If bidders have incentives to bid their true values, then if a speculator were to win the auction it pays the highest amount that a "real" user would be willing to pay. It follows that the speculator would not be able to earn any margin on selling the spectrum. Another deterrent for speculation is the risk that another speculator enters the auction with an aggressive bidding strategy. In this case both speculators could end up bidding much more than the spectrum is worth and therefore the winner would never be able to recoup fully the amount it

		would pay in the auction. ComReg and Ofcom believe that harmonisation is not a pre-requisite for common services to develop. If spectrum is available on a flexible basis across Europe, market forces (including spectrum trading) can generate strong incentives for harmonisation where there are clear benefits to be gained. The use of market forces also allows greater flexibility in cases where there may not be strong benefits from harmonisation. It also avoids the losses in welfare which may arise because regulators generally are less efficient than markets (absent market failure) in allocating spectrum to its most valuable uses.
	T-Mobile does not agree with the proposal for a sequential sealed bid process with two second price auctions. T-Mobile argues that two sequential simultaneous multi-round ascending price auctions would be the most appropriate auction format because of transparency and information gained during process. T-Mobile argues that two sequential sealed bid auctions risk efficiency and distortion. Separate analysis of auction design issues was provided that deals with incentives for participation and simplicity, efficiency of outcome and the alternative of Multi-Round Ascending Auction. Risk of 'winners curse' is also identified by T-Mobile as an issue arising from two Sealed Bid Auctions. Another respondent suggested that auctioning	T-Mobile was correct in pointing out that where bidders' valuations are strongly affiliated either because a substantial part of the value is common to many bidders or their valuations are in some way correlated, ascending formats have advantages. Equally, where bidders values are private and independent from each other, second price sealed bid formats give bidders strong incentives to bid their true value, thus they are simpler for bidders. Second price sealed bid auctions in this context are also cheaper to participate in and are cheaper to run. ComReg and Ofcom do not accept that there will be significant uncertainty in the quality of the spectrum in relation to interference

	licences sequentially in Ireland and Northern Ireland would create a disincentive for bidders wanting to participate in both auctions to do so because the risk of being stranded with one licence (the exposure problem) is not entirely eliminated. The same respondent argues from a different standpoint that if a bidder wanting both licences does enter the auction, and wins the first licence, it will have a "toehold" in the second that will make it bound to win that auction. The respondent also said that an objective of the auction was to maximise efficiency and not raise revenue was irrelevant and questioned the consistency of this statement.	issues. This issue is therefore not relevant to the choice of auction design. ComReg and Ofcom agree that a bidder who wins the licence in the first auction may have an advantage in the second auction (it will be the only bidder able to exploit the synergies associated with holding both licences), but we do not consider this advantage to be sufficiently strong that the auction outcome will be a foregone conclusion. It is possible that there will be a variety of bidders with very different business cases bidding for this spectrum, so it does not necessarily follow that the winner of the licence in the first auction will value the licence in the second auction, together with any synergies, above the value of another bidder. The revenue raising and efficiency properties of auction designs depend upon the underlying conditions in the auction such as the degree to which valuations are independent, asymmetries between bidders and the potential for collusion. Auction theory in fact shows that the auction design which leads to the most efficient allocation of resources (given the underlying conditions) is not always the one which raises the most revenue.
	Vodafone Ireland supports a market based mechanism for access to spectrum, but would like smaller lots (i.e. 4x5MHz)	

	Meteor Mobile Communications and Motorola are supportive of the proposals.	
Licensing and packaging	Audio Ltd said that new licensees should be obliged to offer access to Short Range Devices users. Orange was supportive of the proposals and said that there was spectrum sufficient to support only one licence as was Personal Broadband UK Ltd who said that a single licence in each administration is appropriate if a single 'all-island' licence cannot be awarded. T-Mobile make reference to Ofcom's SFR:IP response, but would prefer spectrum to be split into smaller portions and use combinatorial approach to award. But recognise that this might mean little spectrum is left when guard bands are taken into account. Supportive of proposal. Meteor Mobile Communications argues that dividing spectrum would compromise advantages that could be gained by one licensee. Motorola is supportive of the packaging proposals and commented that at least two national licences and provide options for an 8MHz multiplexer (MUX) allowing one operator to transmit up to 50 parallel streams. However, they note a requirement for protection of licence rights by geographic separation. Vodafone Ireland commented that there was no readily apparent candidate technology. They would like to see 4x5 MHz packaging, claiming this would permit the value of	The Ireland and NI Licences will be technology and application neutral. In Northern Ireland this will allow radio microphone and other short range device users to compete for the licence or subsequently acquire access to the spectrum (for example through spectrum trading).Spectrum trading is not permitted in Ireland. If the spectrum was of similar quality and subject to similar technical constraints, there would be merit in comparing the economic benefits of packaging into smaller units. However, technical constraints in the Licences will restrict the way in which the spectrum can be used in order to afford protection to other spectrum users. For example, the effective (full power) bandwidth will be 7 MHz. ComReg and Ofcom have reviewed the range of potential services that could be offered in the Spectrum Band and concluded that (for the most likely services) the minimum spectrum requirements would not permit more than one licensee to operate in each country.

	different potential uses to be compared directly.	
Jurisdictional issues	T-Mobile stated a preference for UK wide solution not NI and GB separately arguing spectrum efficiency and economies of scale as reasons for this. They also sought clarity over timescales for usable GB spectrum. Vodafone Ireland commented that no reason is given why the band should be offered for all-island services. Motorola supports a collaborative approach to awards. Rationale is that it safeguards larger markets	The economic analysis conducted by ComReg and Ofcom was not conclusive, partly because of the difficulties in measuring potential synergies and the uncertainties over what services may be offered in this spectrum in the future. It did however show that there were potential synergies between using the spectrum in Ireland and Northern Ireland. It is also relevant that the spectrum awarded in Northern Ireland will be tradable from the outset and the Ireland licence will be tradable once the appropriate legislation is in place. Therefore if the awards proceed as planned and subsequently it turns out that the spectrum in Northern Ireland would be worth more to another user proposing a UK wide service, trading will allow an efficient reallocation of the spectrum (provided transaction costs are not high). ComReg and Ofcom therefore do not propose to change the decision for a co-ordinated award of spectrum in Ireland and Northern Ireland.
Other issues **Short Range Devices**	Audio Ltd support removal of licence exempt use of the spectrum band and mention that they have invested heavily in a digital radio microphone system for this band. Mobile200 support the proposal to discontinue Short Range Devices (SRDs) because SRDs use of the band is uneconomic and Personal Broadband say it is appropriate to discontinue use of band for SRDs. Vodafone Ireland say that it is appropriate to facilitate	The Ireland and NI Licences will be technology and application neutral. In Northern Ireland this will allow radio microphone and other short range device users to compete for the NI Licence or subsequently acquire access to the spectrum (for example through spectrum trading). Spectrum trading is not permitted in Ireland.

	sub-allocation as means of access to the spectrum as a band manager. Rationale applied is that granting exclusive rights and protection from interference by other spectrum users is inconsistent with permitting other spectrum users to use spectrum. Meteor Mobile Communications also supports proposal to discontinue SRD allocation. Rationale is that it allows for a better use of spectrum. Motorola is also supportive of proposal to discontinue allocation and argues that the proposal might be of substantial benefit to society when replaced by much higher value services (e.g. mobile broadcasting).	
1800 – 1805 MHz	T-Mobile commented that the CEPT review process for this band creates uncertainty. One respondent commented that the potential benefits of harmonisation would not be achieved by awarding the band on a flexible basis prior to any indication of the outcome of CEPT discussions. Vodafone Ireland commented that the 1800-1805 MHz band was readily available and harmonised throughout Europe for airborne (backhaul from aircraft) services and argued that this application should not be precluded as an option 'by technology and service neutral approach'. Instead they propose to delay an award until after harmonisation is in place.	ComReg and Ofcom believe that a further harmonisation measure is not a pre-requisite for common services to develop. If spectrum is available on a flexible basis across Europe, market forces (including spectrum trading) can generate strong incentives for harmonisation where there are clear benefits to be gained. The use of market forces also allows greater flexibility in cases where there may not be strong benefits from harmonisation. It also avoids the losses in welfare which may arise because regulators generally are less efficient than markets (absent market failure) in allocating spectrum to its most valuable uses. Harmonisation means harmonisation of use, i.e. for a specific application (and even specific technology).
Other uses	Personal Broadband UK commented that the award should deal with issue of	ComReg and Ofcom have stated that issuing one licence in each country is

	incompatible technologies and address/avoid border area co-ordination where possible.	preferable to issuing multiple licences because this will enable the licence awards to proceed with maximum flexibility and technology and service neutrality. In the event that the Licences in Ireland and Northern Ireland are held by different Licensees, the Licensees of the Spectrum Band will be required to co-ordinate all stations to be deployed in within 2km of the border between Ireland and Northern Ireland. Details of the arrangements for international co-ordination are given in the Information Memorandum, Annex 7.
	Motorola recognised the difficulty finding nationwide spectrum in broadcasting bands IV/V and commented that the band is suited to Digital Video Broadcasting (DVB-H) for the streaming of content to handheld devices and suggests that the band be used for a downlink-only Digital Terrestrial Television (DTT) service aimed at portable/handheld TV and multimedia terminals.	The proposals for the award envisage that the Spectrum Band will be technology and application neutral. ComReg and Ofcom stated in the Consultation Document (see Annex C, paragraphs C.17 to C.20) that a guard band could be required to protect GSM 1800 base station receivers. ComReg and Ofcom also stated that this will have the effect of reducing the usable spectrum within the Spectrum Band (the ‘effective bandwidth’) for new services.