Commission for
Communications Regulation

Consultation Paper

The Introduction of a Licensing Framework for VHF and UHF Telemetry Systems, Changes to Current Frequency Assignments and Spectrum Release Proposals.

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All responses to this consultation should be clearly marked:- "Reference: Submission re ComReg 11/94" as indicated above, and sent by post, facsimile or e-mail to arrive on or before 5pm, 27 January 2012 to:

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Please note ComReg will publish all respondents submissions with the Response to this Consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24

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1 Executive Summary

The Commission for Communications Regulation ("ComReg") is consulting on a range of proposals to establish a new licensing framework for scanning telemetry and telecontrol systems in the VHF and UHF spectrum bands.

A telemetry and telecontrol system ("telemetry") is a wireless telegraphy system by which automated measurements are made and other data collected at remote or inaccessible locations, and transmitted to receiving stations for monitoring, recording or remote control purposes.

Demand for spectrum by telemetry users has increased in recent years, mainly from utility operators (electricity, gas, water supply etc.) and also from the manufacturing and food and beverage production industries.

ComReg currently licences telemetry under its Business Radio licensing framework, which is intended to facilitate mobile services. With the increasing demand for telemetry, which is a fixed wireless service, it has become difficult to provide interference free channels for this purpose. Furthermore, the incompatibility of fixed and mobile users requires that significant tranches of spectrum are left unused to serve as guard-bands between these two user groups.

ComReg considers that a licensing framework specifically for telemetry is required in order to meet the demand for spectrum and to ensure ongoing coexistence with other services.

This consultation proposes four new licence types that are aimed at meeting the needs of different telemetry users, ranging from systems spanning a single premises to regional and nationwide networks. The new licences will also include a revised fee structure and licence conditions appropriate to telemetry use.

In order to give effect to the new licensing framework, ComReg also proposes to re-allocate up to 2 x 1.2625 MHz of paired spectrum and 1 x 25 kHz of unpaired spectrum in the 163 – 174 MHz and 450 – 470 MHz bands, specifically for telemetry use. This will require the relocation of some existing licensed users.

Two Community Repeaters are currently licensed in the proposed telemetry spectrum. These repeaters provide Business Radio services to third parties in the Dublin area, and ComReg plans to relocate them into alternative spectrum. Furthermore, ComReg plans to relocate telemetry users who are currently licensed on other frequencies in the VHF and UHF bands, so that all telemetry licensees operate in the proposed telemetry bands. These telemetry users include, but are not limited to, utility companies (e.g. ESB), local authorities (predominantly to control the provision of water services) and the manufacturing, food and beverage industries (for plant monitoring and control).

ComReg invites all interested parties to submit written comments on the proposals set out in this consultation document. The period during which interested parties may respond is open until Friday 27 January 2012.

2 Introduction

This section introduces ComReg's role in managing the radio frequency spectrum and the concept of telemetry systems.

2.1 ComReg's Role in Managing and Licensing Radio Spectrum

The Communications Regulation Acts 2002-2011[1] ("2002 Act"), the EU common regulatory framework (including the Framework Directive[2], transposed into Irish law by the Framework Regulations 2011[3], and the Authorisation Directive[4] transposed into Irish law by the Authorisation Regulations[5]), and the Wireless Telegraphy Acts 1926-2009 set out the powers, functions, and objectives of ComReg that are relevant to the subject of this consultation and ComReg's implementation of the proposals contained in it.

ComReg's statutory functions, set out in Section 10 of the Communications Regulation Act 2002, as amended, include the following:

> *(a) to ensure compliance by undertakings with obligations in relation to the supply of and access to electronic communication services, electronic communications networks and associated facilities and the transmission of such services on such networks,*
>
> *(b) to manage the radio frequency spectrum and the national numbering resource, in accordance with a direction under section 13,*
>
> *(d) to carry out investigations into matters relating to—*
>
> > *(i) the supply of, and access to, electronic communications services, electronic communications networks and associated facilities and the transmissions of such services on such networks, and*
> >
> > *(ii) the provision, content and promotion of premium rate services,*
>
> *(e) to ensure compliance, as appropriate, by persons in relation to the placing on the market of communications equipment and the placing on the market and putting into service of radio equipment.*

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[1] *Communications Regulation Act 2002, as amended by the Communications Regulation*

[2] *Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services (Framework Directive), as amended by Directive 2009/140/EC.*

[3] *European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. 333 of 2011).*

[4] *Directive 2002/20/EC on the authorisation of electronic communications networks and services (Authorisation Directive) as amended by Directive 2009/140/EC.*

[5] *European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (S.I. 335 of 2011).*

Section 12(1) of the Communications Regulation Act, 2002 sets out ComReg's primary objectives, to be met in the performance of the above functions, and those objectives include the following:

> *12. (1) The objectives of the Commission in exercising its functions shall be as follows:*
>
> *(a) in relation to the provision of electronic communications networks, electronic communications services and associated facilities—*
>
> *(i) to promote competition,*
> *(ii) to contribute to the development of the internal market, and*
> *(iii) to promote the interests of users within the Community,*
>
> *(b) to ensure the efficient management and use of the radio frequency spectrum and numbers from the national numbering scheme in the State in accordance with a direction under section 13.*

In addition, all radio frequency spectrum in the State is released through licences granted by ComReg pursuant to the Wireless Telegraphy Acts, 1926-2009, which permit the licensee to possess and use "apparatus for wireless telegraphy".

2.2 Overview of Typical Telemetry Systems and Networks

A telemetry system uses apparatus for wireless telegraphy to transmit control information or data from outstations in remote locations. Examples of the data that may be transmitted over telemetry systems include control commands, measurement readings such as temperature, electrical current or liquid flow rates, or the status of equipment activity, etc.

Telemetry systems are used by organisations such as utility and industrial companies, where continuous monitoring of operations and control of equipment at multiple locations is necessary in order to ensure the proper function of processes and equipment. These systems are used to provide "electronic communications networks" (ECN), importantly, they do not constitute "electronic communications services" (ECS) as defined in the Framework Regulations[6], as they are not intended for third party use for remuneration[7].

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[6] *Regulation 2 of the European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. 333 of 2011):*

"electronic communications network" means transmission systems and, where applicable, switching or routing equipment and other resources, including network elements which are not active, which permit the conveyance of signals by wire, by radio, by optical or by other electromagnetic means, including satellite networks, fixed (circuit- and packet-switched, including Internet) and mobile terrestrial networks, electricity cable systems, to the extent that they are used for the purpose of transmitting signals, networks used for radio and television broadcasting, and cable television networks, irrespective of the type of information conveyed;

"electronic communications service" means a service normally provided for remuneration which consists wholly or mainly in the conveyance of signals on electronic communications networks, including telecommunications services and transmission services in networks used for broadcasting, but excludes—

Telemetry systems vary greatly in terms of their complexity and the size of the geographic areas that they span. The data may be transmitted bi-directionally (duplex) or in one direction only (simplex). A point-to-point telemetry system consists of a base station and a remote outstation. Larger networks (known as point-to-multipoint systems) may comprise multiple remote outstations communicating with one or more base stations.

Telemetry networks broadly fall into three size categories. These are:

1. *Small - On-site Telemetry Networks*

On-site systems can be found particularly in the pharmaceutical and manufacturing industries, where all of the equipment requiring monitoring and control is located within a single premises or complex, typically within a radius of one kilometre. Due to the relatively short distances covered by such systems, the transmit power level required for communication is low and antenna heights are restricted to that required to achieve reliable communications within the premises. Due to the relatively low transmit power level, this configuration allows greater frequency re-use than the two systems described below.

2. *Medium - Local Area and Wide Area Telemetry Networks*

Examples of operators of medium sized systems, spanning several kilometres, are local authorities and smaller utility companies with monitoring requirements at remote or geographically dispersed sites. Higher transmit power levels are required to communicate over these distances and antennas are sited in higher locations to achieve reliable communications over wider areas. This configuration limits frequency reuse.

3. *Large - National Telemetry Networks*

An example of operators of nationwide telemetry systems is utility companies (i.e. gas, electricity and water) with sites distributed across the State, who wish to control and monitor their network infrastructure. Such national networks also require higher power levels and often include repeater stations which are required to overcome terrain, buildings and other obstacles that may obstruct links to remote sites.

(a) services providing, or exercising editorial control over, content transmitted using electronic communications networks and services, and

(b) information society services, as defined in Article 1 of Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998, which do not consist wholly or mainly in the conveyance of signals on electronic communications networks.

[7] *A separate licensing scheme is in place to provide Third Party Business Radio services for remuneration, including telemetry services.*

3 The Current Framework Used for Licensing of Telemetry Systems

To date ComReg has licensed telemetry systems under the Business Radio Regulations[8], however, in recent years, the demand for telemetry systems has increased, prompting a review by ComReg of its licensing framework.

3.1 Existing Band-plans and Telemetry Spectrum Use

Telemetry systems are currently licensed in the VHF and UHF bands[9] in non-exclusive, non-contiguous channels. Currently the total amount of spectrum used by telemetry systems is approximately 2 x 887.5 kHz. The channels assigned to telemetry users are highlighted in red in the frequency bands shown in Figure 1 below.

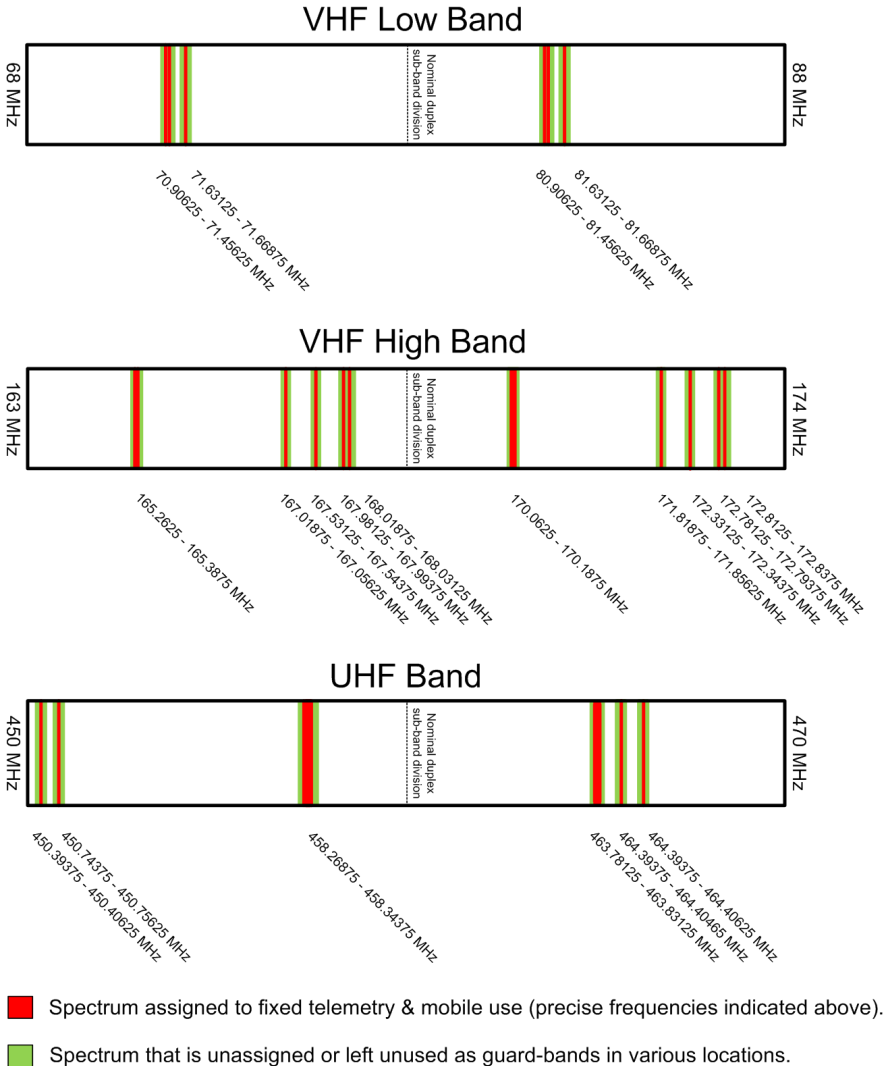

Figure 1: Current telemetry use and guard-bands in the VHF-High and UHF bands.

[8] *Wireless Telegraphy (Business Radio Licence) Regulations, 1949 (S.I. 320 of 1949).*

[9] *VHF Low Band (68 – 88 MHz), VHF High Band (163 – 174 MHz) and UHF Band (450 – 470 MHz).*

3.2 Limitations of the Business Radio Framework for Telemetry Licensing

The current Business Radio Regulations date back to 1949. ComReg has outlined its proposals to modernise the Business Radio framework in its Spectrum Strategy Statement[10]. However, a number of factors, unique to telemetry, make the Business Radio licensing framework unsuitable for future telemetry licensing. These are discussed below.

1. *Mixed Fixed and Mobile Use in the Same Bands*

Telemetry is predominantly a fixed wireless service whereas the Business Radio licensing framework is intended to facilitate mobile use. As telemetry systems often operate over large geographic areas, channels are typically assigned on an exclusive basis in any given area. This is not the case for mobile Business Radio users who can share[11] the same channel assignment in the same geographic area as other mobile Business Radio users.

A large number of Business Radio users operate various mobile electronic communications systems throughout the State, using the same spectrum. As a result, it is becoming increasingly difficult to mitigate co-channel and adjacent channel interference between mobile Business Radio users and users of fixed telemetry systems. In these circumstances, ComReg has had to leave 12.5 kHz-wide channels unused to serve as guard-bands between users. This reduces the number of channels available for assignment and results in inefficient use of spectrum. This situation does not sit comfortably with ComReg's statutory objective *"to ensure the efficient management and use of the radio frequency spectrum"*.

If there was no mobile use it would be possible to assign spectrum for fixed telemetry use in a more efficient manner, and *vice versa*. Effective frequency coordination and denser frequency re-use between fixed licensees would permit more efficient use of the spectrum resource.

2. *Administrative Burden on Stakeholders*

As noted earlier, some telemetry networks span large geographic areas, including nationwide networks. These networks comprise many stations. The existing Business Radio licensing framework does not facilitate regional or national licensing of spectrum and therefore a separate, individual licence must be obtained for each station in a national network. Licensing thus places a significant administrative burden on operators of larger telemetry networks and also on ComReg as the licensing authority.

[10] ComReg 11/89 - *Strategy for Managing the Radio Spectrum: 2011 – 2013.*

[11] *Sharing of a channel is possible through the use of mitigation techniques such as Continuous Tone Coded Squelch Suppression (CTCSS), however, at any given time only one user may make use of the channel.*

3. Fragmented Spectrum Holdings

Congestion in the Business Radio bands and the requirement to separate fixed use from mobile use leads to the spectrum holdings of larger telemetry operators becoming fragmented as their networks grow in size. This results in a patchwork of different channels being used by the same licensee in different geographic areas. Fragmented spectrum incurs additional costs for telemetry users, reduces the efficient use of the relevant spectrum bands and increases the risk of interference between different services.

4. Structure of Fees

ComReg maximises Business Radio use of radio spectrum by ensuring that each channel is shared by a number of licensees, taking into account their geographic coverage, channel loading and the number of users in each case. For this reason, the fees paid by Business Radio users increase by €22 for each item of equipment listed in its licence.

Spectrum is typically assigned to telemetry users on an exclusive basis due to co-existence issues between different technologies and users. As the current licence fee paid by telemetry users is based on the number of items of equipment licensed, rather than the amount of spectrum used, there may be less incentive for a telemetry licensee to maximise its use of a given channel. This may encourage applications for more channels than are actually required for the efficient operation of a telemetry system.

5. Duration of Licences

Business Radio licences have a duration of one year, subject to renewal upon payment of the appropriate fee, though ComReg may determine that a particular licence or category of licences cannot be renewed on spectrum management grounds[12]. A one-year licence duration may not provide licensees with sufficient certainty to plan investment in substantial telemetry networks, particularly where they provide regional or nationwide coverage.

3.3 ComReg's View on the Current Framework for Licensing Telemetry

For the reasons set out above, ComReg considers that the existing Business Radio licensing framework is no longer suited to the licensing of fixed telemetry systems. ComReg proposes to introduce a new licensing framework for telemetry and to set aside spectrum for fixed telemetry use, so that telemetry licences may be segregated into separate frequency bands from mobile users.

[12] *Spectrum management grounds for non-renewal of licence(s) may arise for a number of reasons, including changes in spectrum allocations in accordance with international treaties, regionally negotiated agreements, EU legislation or in order to meet national requirements in line with ComReg's functions and statutory objectives. In the interests of the efficient use of the radio spectrum it is the policy of ComReg to review the use of the spectrum on an ongoing basis in order to reflect the changes outlined above and changes in the market place.*

The proposed new licensing framework and changes to the frequency arrangements are discussed in Sections 4 and 5 respectively.

4 Proposed Future Telemetry Licensing Framework

This section describes the new licensing framework which ComReg proposes to establish in order to replace the Business Radio framework as the mechanism for future licensing[13] of telemetry systems. These proposals would not affect those low-power telemetry systems operating under the short range device (SRD) regulations detailed in ComReg 02/71R5[14].

ComReg proposes to introduce four categories of fixed telemetry licence:

- On-site Telemetry Licence;
- Local Area Telemetry Licence;
- Wide Area Telemetry Licence; and
- National Telemetry Licence.

Each licence category is described below along with a short summary of the proposed licence conditions that would apply in each case. A more detailed discussion of licence conditions is provided in Section 7.

4.1 On-site Telemetry Licence

On-site telemetry licences would facilitate systems contained within a single premises or a small campus. The main features of such a licence would include:

- Telemetry stations permitted within an area of up to 1 kilometre radius from the central nominated location[15];
- a maximum transmit power level of 1 Watt ERP;
- a channel bandwidth of 2 x 12.5 kHz;
- a maximum permitted antenna height of 10 metres above ground level for all stations;
- the use of repeater stations would not be permitted; and
- a licence duration of five years, non-renewable[16]. Licensees would be required to reapply for licences upon expiry.

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[13] *ComReg proposes to replace the Business Radio framework as the mechanism for future licensing of telemetry services. The future licensing of other services currently authorised under the Business Radio framework are outside the scope of this consultation. ComReg will begin a general review of the use of Business Radio spectrum in the VHF and UHF bands and this will include a public consultation process.*

[14] *ComReg 02/71R5 - Permitted Short Range Devices.*

[15] *The central nominated location is typically the site of a base station, but any location may be nominated so long as all stations are located no further than 1 kilometre from it.*

A licensee could hold multiple on-site licences in different geographic areas. Sites separated by more than 1 kilometre could not be linked by means of telemetry equipment licensed under those on-site licences. To do so would require the equipment to transmit at a higher power level and this may cause interference to neighbouring users. However, on-site licensees may also hold local-area, wide-area or national telemetry licences if appropriate or they could link multiple on-site licences via alternative means[17].

4.2 Local Area and Wide Area Telemetry Systems

Local Area and Wide Area telemetry licences are intended to facilitate more extensive networks spanning multiple sites with ranges of up to 12.5 kilometres and 25 kilometres respectively from the central nominated location. The main features of such licences are set out in Table 1 below:

Licence Type:	Local Area Licences	Wide Area Licences
Coverage area:	Coverage area up to **12.5 kilometre radius** from the central nominated location.	Coverage area up to **25 kilometre radius** from the central nominated location.
Maximum power level:	Maximum transmit power level of 25 Watts ERP.	Maximum transmit power level of 25 Watts ERP.
Channel bandwidth:	2 x 12.5 kHz.	2 x 12.5 kHz.
Maximum antenna height applicable to all stations:	Maximum permitted antenna height of 25 meters above ground level.	Maximum permitted antenna height of 25 meters above ground level.
Repeater stations within maximum coverage area:	**Not permitted**.	**Permitted**.
Licence duration:	Five years.	Five years.

Table 1: Main attributes of local area and wide area telemetry licences.

[16] *ComReg proposes to issue all future telemetry licences with a finite duration. This is consistent with ComReg's position on licence duration for ECS and ECN as set out in Section 4.3 of its Strategy for Managing the Radio Spectrum: 2011 – 2013 ComReg 11/89.*

[17] *Alternative means may include linking by cable, optical fibre or by a licensed point to point radio link.*

4.3 National Telemetry Licence

National telemetry licences would facilitate nationwide telemetry networks with stations dispersed throughout the State.

ComReg anticipates that the demand for these licences will primarily come from the utility sector. ComReg proposes to make four[18] licences available initially, and may eventually grant up to six licences depending on the level of demand evident. Each national licence would consist of twelve duplex channels and the channel arrangements would be based on a national telemetry cellular frequency plan[19]. The frequency plan has been developed in order to minimise interference between national licensees and to reduce the need for coordination with the UK regulator (Ofcom).

ComReg also notes that the electricity, gas and water sectors in Northern Ireland operate telemetry systems within a similar licensing framework and ComReg's national telemetry proposals could facilitate interconnection of systems in both jurisdictions.

The main features of a national telemetry licence are as follows:

- nationwide coverage;
- twelve duplex channels (channel bandwidth of 2 x 12.5 kHz) assigned with each national licence. However the use of only one duplex channel would be permitted in any geographic location, in line with the national telemetry cellular frequency plan;
- a maximum transmit power level of 25 Watts ERP; and
- a licence duration of ten years, non-renewable. Licensees would be required to reapply for licences upon expiry;

Regulation 11 of the Authorisation Regulations 2011 provides that where ComReg considers that the number of "rights of use" (i.e. licences) to be granted for radio frequencies should be limited then ComReg shall (*a*) give due weight to the need to maximise benefits for users and to facilitate the development of competition, and (*b*) give all interested parties the opportunity to express their views. Regulation 11(2) provides that ComReg may decide that the number of licences ought to be limited and, where it so decides, it shall grant such licences on the basis of selection criteria which are objective, transparent, non-discriminatory and proportionate and which give due weight to its statutory objectives.

[18] *National licence Blocks 1, 2, 3 and 4 (as set out in Table 7 of Annex A) would be made available first. Blocks 5 and 6 are currently encumbered by existing licensed services. Blocks 5 and 6 may be made available for telemetry at a later date, pending demand and the migration of existing licensed users. See Section 6 for further information on legacy issues.*

[19] *The cellular frequency plan is discussed in Section 5 and further details are available in Annexes A and B.*

In light of the limited amount of spectrum for national licences that may be made available (initially only four and up to a maximum of six), ComReg also proposes that:

- to ensure the efficient use of national telemetry services spectrum, no licensee would be granted rights of use to more than two national blocks of spectrum; and
- in light of the need to ensure efficient use of this limited spectrum, there would be a requirement for applicants for more than one national licence to satisfactorily demonstrate to ComReg the need for the additional spectrum requested. ComReg would envisage the provision by applicants of a detailed network plan outlining, amongst other things, network loading and ComReg also reserves the right to obtain independent advice relating to such material and to consult as appropriate to determine the veracity of said material.

This restriction would not apply to other telemetry licence types. Holders of national licenses could apply for additional on-site, local area and wide area telemetry licences should the need arise to meet specific geographically limited demands.

Q. 1. Do you agree that the four proposed licence types (on-site, wide area, local area and national) and their proposed features are sufficient to cater for all ECN telemetry system requirements? Please give reasons in your response.

Q. 2. Do you agree with ComReg's proposal to limit the number of national telemetry licences that may be held by a single licensee to a maximum of two? Please give reasons in your response.

5 Proposed Frequency Arrangements for Future Telemetry Licensing

As stated in Section 3, the current frequency arrangements for licensed telemetry systems are inefficient because a large degree of geographical and frequency separation is required to mitigate the potential interference between fixed and mobile users. It also leads to fragmented spectrum assignments resulting in additional costs to users.

ComReg considers that the segregation of fixed telemetry and mobile use into separate frequency bands would facilitate defragmentation of current assignments. It would also allow fixed telemetry systems to reuse frequencies in closer proximity, without an increased risk of harmful interference. ComReg therefore proposes to reallocate spectrum in the VHF and UHF bands, to be made available specifically for use by fixed telemetry licensees, so that such licences will no longer operate in the same spectrum as mobile Business Radio licensees. This approach would also have the advantage of freeing[20] up spectrum for mobile Business Radio services, which would be especially advantageous in currently congested areas.

ComReg proposes to reallocate up to a maximum[21] of 2 x 1.2625 MHz of paired spectrum and 25 kHz of unpaired[22] spectrum within the VHF High and UHF bands for telemetry use. The proposed new telemetry bands are shown in Figure 2.

Mobile Business Radio users would remain in the parts of the spectrum bands shown in white in Figure 2. Currently these users are predominantly using the spectrum for Private Mobile Radio (PMR) services, such as the analogue mobile telephony equipment used by taxi, security, courier and utility companies, as well as paging services. Additional services may be introduced into the Business Radio sections of the bands in the future. In the next spectrum strategy period (2011 to 2013), ComReg is seeking to review[23] the current and future use of the VHF and UHF bands.

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[20] *ComReg's forthcoming review of the use of the VHF and UHF bands will, amongst other issues, consider the future use of any spectrum released through more efficient assignments such as the separation of fixed telemetry and mobile use. The review may also consider the potential refarming of spectrum for new applications and services that are not currently licensed in those bands.*

[21] *In addition to its other statutory objectives, ComReg will also have regard to the balance of demand for spectrum between fixed telemetry and other Business Radio users when reallocating spectrum, i.e. ComReg may ultimately reallocate less than the proposed 2 x 1.2625 MHz of spectrum if the future demand for telemetry is low, in the face of growing demand from other users.*

[22] *It is proposed to make this 1 x 25 kHz of unpaired spectrum available for simplex use only. Use of the corresponding channels in the paired spectrum band (i.e. the channels centred at 458.48125 MHz and 458.49375 MHz) is not possible due to the need to coexist with Short Range Devices (SRDs) operating in spectrum above 458.4875 MHz, further details of which are available in ComReg 02/71R5.*

[23] *For further details see Section 6.9.1 of its Strategy for Managing the Radio Spectrum: 2011 – 2013 ComReg 11/89.*

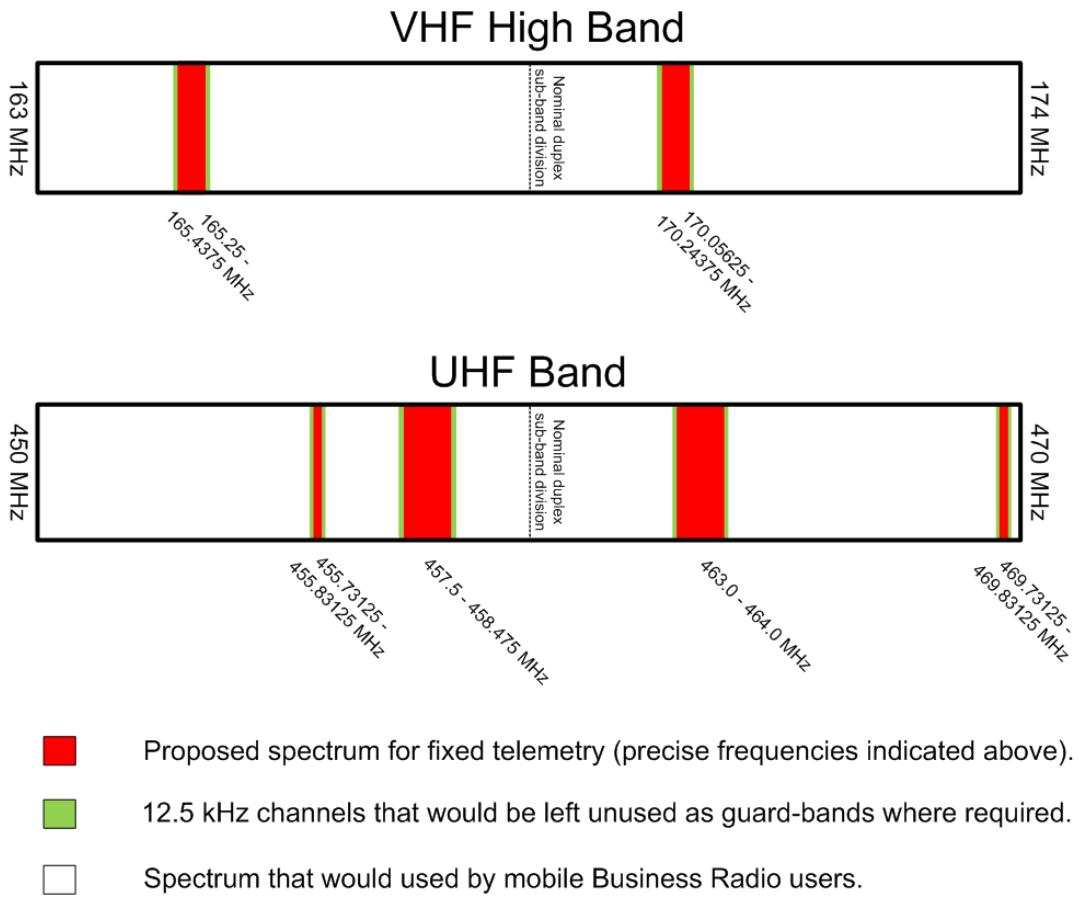

Figure 2: Proposed future VHF and UHF telemetry bands.

Table 2 below shows the duplex arrangements and number of channels available in each of the spectrum tranches ComReg proposes to reallocate. Annex B provides further details of the specific channel frequencies that ComReg proposes to assign under the four licence categories detailed in Section 4.

Spectrum Proposed for On-site, Local area and Wide Area Telemetry Systems		
Spectrum	**Number of channels**	**Frequency range**
VHF paired spectrum	15 channels each of 2 x 12.5 kHz (totalling 2 x 187.5 kHz of spectrum)	Comprised of 165.25 – 165.4375 MHz paired with 170.05625 – 170.24375 MHz
UHF paired spectrum	78 channels each of 2 x 12.5 kHz (totalling 2 x 975 kHz of spectrum)	Comprised of 457.5 – 458.475 MHz paired with 463.0 – 463.975 MHz
	8 channels each of 2 x 12.5 kHz (totalling 2 x 100 kHz of spectrum)	Comprised of 455.73125 – 455.83125 MHz paired with 469.73125 – 469.83125 MHz
UHF unpaired spectrum	2 channels each of 1 x 12.5 kHz (totalling 1 x 25 kHz of spectrum)	Comprised of 463.975 – 464.0 MHz

Table 2: VHF and UHF channel arrangements.

The precise spectrum tranches that ComReg proposes to allocate for telemetry use, as shown in Figure 2 and Table 2, have been selected in order to:

- minimise the need to relocate[24] existing licensed services and any resulting disruption to them;
- ensure that spectrum released by the migration of the Emergency Services from the legacy analogue mobile network to the Emergency Services Digital Radio[25] network is put to productive use; and
- simplify coexistence and interconnection with similar telemetry systems in the United Kingdom and Northern Ireland, by harmonising telemetry spectrum use with the United Kingdom.

The VHF and UHF bands are allocated to the Fixed and Mobile Services at an international level and both services have co-primary allocations in the Radio

[24] *The relocation of existing users of this spectrum are discussed further in Section 6.*

[25] *Emergency Services Digital Radio refers to a licence type issued by ComReg to allow the provision and operation of digital radio systems by the emergency services. "Emergency service" means An Garda Síochána, the Fire Brigade services, the Ambulance services, boat and coastal rescue services (including the rescue services provided by the Air Corps) and the mountain and cave rescue services.*

Regulations of the International Telecommunication Union (ITU). Furthermore, there are currently no plans at a European level, to harmonise or refarm the specific tranches of spectrum that ComReg proposes to reallocate to telemetry.

Accordingly, ComReg is of the view that there is no alternative use of the spectrum which could not be accommodated elsewhere in the VHF and UHF bands, and that its proposals in this regard will not impair innovation or the efficient future use of spectrum.

Q. 3. Do you agree with ComReg's proposal to reallocate spectrum for use specifically by fixed telemetry services? Please give reasons with your answer.

Q. 4. Are there any alternative uses of the spectrum bands listed in Table 2, which could not be accommodated elsewhere in the 163 – 174 MHz and 450 – 470 MHz bands? Please give reasons with your answer.

Q. 5. In addition to those already listed, are there any other factors that ComReg should consider when deciding on the amount of spectrum to reallocate for use by fixed telemetry services? Please give reasons with your answer.

5.1 The National Cellular Plan for Frequency Reuse

ComReg proposes to make up to 72 duplex channels available for licensing national telemetry networks. These 72 channels will be sub-divided into six national spectrum blocks, each comprising twelve 2 x 12.5 kHz duplex channels. A full listing of the national channel arrangements is provided in Table 7 in Annex B.

Each national telemetry licensee would be assigned a block of channels and the twelve channels within that block shall be used in line with the cellular reuse pattern detailed in Annex A. An indicative sample area based on the cellular reuse pattern is provided in Figure 3 below. It depicts a 12 channel cluster shown in black, surrounded by the cells of the neighbouring channel clusters shown in red.

This pattern of frequency reuse minimises co-channel interference between cells, as the centres of cells using the same frequency are separated by a distance of 150 kilometres. The cellular arrangement would be applied throughout the State, as described[26] in Annex A.

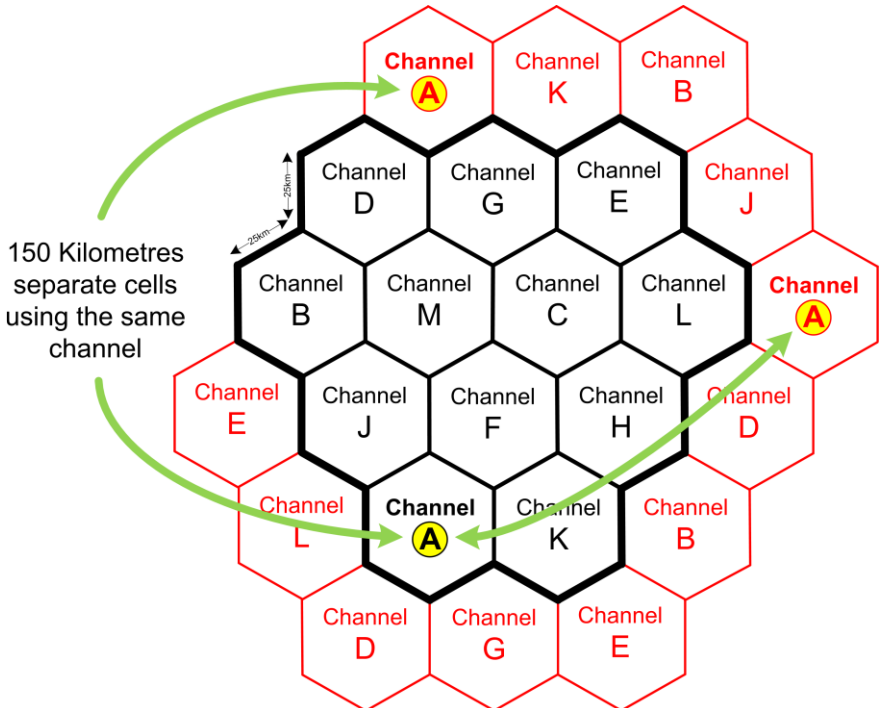

Figure 3: An indicative example of the cellular frequency reuse pattern.

Q. 6. Do you agree with the proposed national cellular plan for frequency reuse? Please give reasons with your answer.

[26] *Figure 4 (in conjunction with Table 6) lists the centre of each cell and Figure 5 (in conjunction with Table 7) indicates the channels for use in each cell.*

6 Legacy Issues Arising from Current Spectrum Use

Two licensees operate Community Repeaters[27] (a non-telemetry service) in the spectrum bands which ComReg proposes to reallocate for telemetry use. The two affected licensees are EMR Radio & Telemetry Ltd. and Universal Radio and Data Communication Ltd.

Furthermore, a number of Business Radio licensees operate telemetry services in non-contiguous frequency allocations throughout the VHF and UHF bands. Licensees operating telemetry services under a Business Radio licence include, but are not limited to, utility companies (e.g. ESB), local authorities (predominantly to control the provision of water services) and the manufacturing, food and beverage industries (for plant monitoring and control).

In order to give effect to the proposed telemetry licensing framework and to make the telemetry bands available, ComReg proposes to relocate some of these existing spectrum users.

This section discusses the implications of relocating existing telemetry users into the proposed telemetry bands and the implications of relocating existing licensed providers of other services (i.e. Community Repeaters) out of the proposed telemetry bands.

6.1 Migration of Community Repeaters

Two licensed Community Repeaters currently operate on frequencies within two[28] of the six proposed national licence spectrum blocks. Both of these repeaters are located on Three Rock Mountain in South Dublin and the two affected licensees are EMR Radio & Telemetry Ltd. and Universal Radio and Data Communication Ltd. These Community Repeaters provide Business Radio services to third parties in the Dublin area.

ComReg proposes to relocate these two Community Repeater licensees into alternative spectrum in order to make these two blocks available for telemetry use. ComReg proposes to afford the two licensees a period of up to three years to relocate to alternative spectrum. However, should there be significant demand for national telemetry licences, this period may need to be shortened so that blocks 5 and 6 may be assigned to national telemetry licensees with minimal delay.

[27] *Community Repeater licences are issued to licensees offering geographical limited third party services eliminating the requirement for end users to hold individual radio licences. All Community Repeater systems are governed by the Wireless Telegraphy (Community Repeater Licence) Regulations, which came into effect on May 15, 1988 (S.I. 83 of 1988).*

[28] *National Licence Frequency Blocks 5 and 6 as listed in Annex B.*

Q. 7. Are there any other factors that ComReg should consider with regard to the migration of existing telemetry systems or existing Community Repeaters as detailed above? Please give reasons in your response.

6.2 Migration of Existing Telemetry Systems

Currently fixed telemetry systems currently share the same spectrum as mobile Business Radio systems. As discussed in Section 3 this constrains ComReg's ability to employ denser frequency reuse amongst licensees. ComReg considers that segregating fixed telemetry and mobile Business Radio systems into separate frequency bands would facilitate more efficient use of the radio spectrum bands at issue.

Notwithstanding the perceived benefits of this approach, ComReg is aware that existing operators of telemetry systems may be at differing stages of their business cycles, and is therefore cognisant that an immediate migration of existing licensees to new spectrum assignments may present difficulties for them. Accordingly, ComReg makes the following proposals:

- to licence all new applications for telemetry systems in the proposed telemetry bands[29];
- upon request, to consider replacing current licences (issued under the Business Radio scheme) with licences issued under the new regime, so that the operators may relocate their existing telemetry systems into the new telemetry bands; and
- to replace any remaining Business Radio licences issued to telemetry users with new telemetry licences within a period not exceeding five years[30]. The new telemetry licences would include new frequency assignments, so that all[31] telemetry systems would be located in the designated telemetry bands and would not share spectrum with mobile users.

When issuing new on-site, local-area and wide-area licences to existing telemetry users, ComReg will upon request, endeavour to assign channels in the same bands as those within which they were previously licensed (i.e. new VHF channels would be assigned to systems formerly licensed in the VHF band and likewise for systems

[29] *If these proposals outlined herein are implemented, the telemetry bands referred to will be those listed in Table 2 of Section 5.*

[30] *A period of five years (from publication of ComReg's Decision on the introduction of the telemetry licensing regime) is considered adequate to allow existing licensees to depreciate current investments, as national Third Party Business Radio services are provided under five-year licences.*

[31] *This will not apply to any telemetry operating under third party Business Radio licences. However stakeholders should not draw any inferences regarding the availability or award of third party Business Radio licences beyond the 31st December 2016.*

in the UHF band). This would simplify the migration and minimise disruption to existing services.

Q. 8. Do you agree with ComReg's proposals regarding the migration of existing ECN telemetry systems? Please give reasons in your response.

6.3 Regulatory Impact Assessment

The proposed new licensing framework and the above changes to existing frequency arrangements will affect some existing licensees. ComReg invites the views of interested parties on its draft Regulatory Impact Assessment (RIA)[32] in Annex D, which analyses the implications for the various stakeholders involved.

Q. 9. Do you agree with ComReg's draft Regulatory Impact Assessment? Please give reasons in your response.

Q. 10. Are there any other factors that ComReg should consider when compiling a Regulatory Impact Assessment on the migration of existing users? Please give reasons in your response.

[32] *This RIA has been prepared in accordance with ComReg's guidelines. See ComReg 07/56a – "Guidelines on ComReg's approach to Regulatory Impact Assessment".*

7 Proposed Licence Conditions for Telemetry

This section discusses the conditions that would apply to the four categories of telemetry licence described in Section 4. Section 7.1 describes the proposed conditions that are specific to each of the four categories of telemetry licence. The proposed duration of licences is discussed in Section 7.2 and the conditions that would be common to all four categories are described in Sections 7.3 and 7.4.

7.1 Technical Licence Conditions

The proposed technical conditions specific to each licence type are shown in Table 3 below**:**

Licence Type	On-site	Local Area	Wide Area	National
Number of channels assigned in a licence:	1 channel	1 channel	1 channel	12 channels
Max coverage radius from licensed location:	1 km	12.5 km	25 km	Nationwide
Multi-site coverage:	No	Yes	Yes	Yes
Maximum Transmit power level[33]:	1 Watt	25 Watts	25 Watts	25 Watts
Maximum antenna height above ground level[33]:	10 metres	25 metres	25 metres	Subject only to international cross-border coordination agreements.
Repeaters permitted:	No	No	Yes	Yes

Table 3: Technical licence conditions applicable to each of the four telemetry licence types.

Telemetry licences will include technical conditions in order to mitigate interference with neighbouring users. In the case of on-site, local area and wide area licences, ComReg will decide on the technical conditions to be included in each licence.

[33] *ComReg may assign licences with lower power level or antenna height conditions in order to mitigate interference or to comply with the terms of international agreements.*

Applicants may state a preference for particular channels, or antenna characteristics[34] and ComReg will have regard to these preferences. However ComReg's decision will be based primarily on mitigating interference and the efficient use of spectrum.

National telemetry licences will comprise a national frequency assignment and the licensee will be expected to plan their own networks and individual station characteristics, but frequency assignments must be used in accordance with the frequency reuse plan set out in Annex A.

All licensees would have to operate in accordance with future frequency coordination agreements with the UK. These agreements may oblige national licensees to notify ComReg of any planned stations requiring coordination with Northern Ireland before they are put into service. In such cases, ComReg may stipulate additional mitigation measures to minimise cross-border interference. Without prejudice to this requirement, national licensees may otherwise select station characteristics on a site by site basis.

All licensees would have to ensure that all antennas and masts associated with the operation of a licensed telemetry system conform to all requirements prescribed by law or to a lawful direction of a competent authority. Particular attention is drawn to requirements relating to planning permission, installations in the proximity of airports, and precautions to be taken against possible damage to overhead cables and power lines.

Practical constraints may limit the antenna options in some telemetry installations, such as indoor sites. Where possible, ComReg would encourage telemetry licensees to use antennas with the greatest directivity that is achievable and practical. However, the antenna directivity of all outdoor stations must, at a minimum, meet the conditions set out in Table 4 below and in Figures 5 and 6 in Annex C.

Antenna	Type	Antenna Radiation Pattern Envelope Limits
Base Station	Omni-directional	The radiation pattern when measured in azimuth shall not vary by more than ± 1.5 dB for horizontally polarised antennas.
Base Station	Sector coverage	See Figure 5 in Annex C.
Outstation	Directional	See Figure 6 in Annex C.

Table 4: Antenna radiation pattern envelope requirements.

The antenna polarisation shall be either vertical or horizontal and the recommended level of cross-polarisation discrimination is at least -20 dB.

[34] *These characteristics include antenna polarisation and maximum antenna height. In order to mitigate potential interference, ComReg may also stipulate outdoor antenna directivity conditions more stringent than those shown in Table 4 later in this Section or Figures 5 & 6 of Annex C.*

7.2 Duration of Proposed Telemetry Licences

Most Business Radio licences have a duration of one year subject to renewal. The short licence term reflects the short-term nature of many of the operations which such licences facilitate. A notable exception is the Third Party Business Radio scheme (TPBR) which permits licensees to offer services to third parties on a nationwide basis. TPBR licences have a duration of five years.

Other categories of wireless telegraphy licence are of longer duration. Examples include the Emergency Services Digital Radio licences (ten years), GSM licences (fifteen years), and 3G licences (twenty years). In these cases, the longer licence duration reflects factors including the minimum geographic coverage conditions that must be met and the level of investment required to meet more extensive coverage conditions. A longer period is required to make a return on investment.

ComReg is of the view that a one-year licence would not suit telemetry systems, as it would not provide sufficient time for licensees to make a return on investment. ComReg is also of the view that a licence duration of fifteen years or more is unwarranted, as while it would provide sufficient time to make a return on investment, ComReg needs to ensure the ongoing efficient use, through periodic re-release of spectrum[35].

ComReg is therefore minded to issue on-site, local-area and wide-area telemetry licences with a duration of five years and national telemetry licences with a duration of ten years. This reflects the differing levels of investment certainty required by prospective licensees.

It should be noted that upon the natural expiry of any telemetry licence, the licence would not be subject to any form of renewal or extension, but would expire altogether, and all spectrum rights of use conferred under that licence would cease. The spectrum rights of use would then be re-released through an appropriate, open award mechanism the details of which would be determined closer to that date. This may involve a competitive award process.

Q. 11. Do you agree with ComReg's proposal to set the duration of on-site, local area and wide-area telemetry licences to five years and national telemetry licences to ten years? Please give reasons in your response.

7.3 Cross Border Coordination Requirements

In order to provide interference protection to telemetry systems, ComReg is seeking to develop a Memorandum of Understanding (MoU) with the UK regulator, Ofcom, with defined technical conditions to facilitate operation of telemetry systems close to the border with Northern Ireland and along the Eastern

[35] *For further details see Section 4.3 of its Strategy for Managing the Radio Spectrum: 2011 – 2013 ComReg 11/89.*

coast. Applications for telemetry licences that do not meet the technical conditions set out in a future MoU will be coordinated with Ofcom on a case by case basis. Typically, this coordination process should not exceed six weeks.

It is envisaged that national licensees will operate a significant number of stations close to the border with Northern Ireland. The proposed national telemetry cellular plan, which is set out in Annex A, is designed to facilitate the operation of such stations without the need to seek international coordination.

7.4 Compliance with ICNIRP and Other Licence Conditions

ComReg proposes to include the following conditions in all telemetry licences:

- The licensee will ensure that non-ionising radiation emissions from each radio installation operated under its licence(s) are within the limits specified by the guidelines published by the International Commission for Non-ionising Radiation Protection (ICNIRP) or its successors. Stations will also comply with any revised radiation emission standards adopted and published from time to time by ICNIRP, any standards of the European Committee for Electro-technical Standards and any standards which may from time to time be specified by the European Union. Wireless telegraphy apparatus operated under the licence shall not be installed or operated at a location, or in a manner, such as to be the cause of the aggregate non-ionising radiation emissions exceeding these limits.

- The licensee shall not, without the consent of ComReg, assign the licence or any of the powers, duties or functions conferred by it or otherwise transfer any of the rights or obligations conferred by it;

- The licensee shall comply with obligations under relevant international agreements, including the R&TTE Directive[36], to the use of apparatus or the frequencies to which they are assigned; and

- If the address of the licensee or the person to whom the licence has been assigned changes then the licensee shall, as soon as possible, notify ComReg in writing of the change.

Q. 12. Are there any other factors that ComReg should consider when deciding on the licence conditions that apply to future telemetry licences? Please give reasons in your response.

[36] *The European Communities (Radio Equipment and Telecommunications Terminal Equipment) Regulations, 2001. (S.I. 240 of 2001)*

8 Proposed Licence Fees for Telemetry

This section discusses the fees that would apply to the four categories of telemetry licence described in Section 4.

8.1 Principles for Setting Telemetry Fees

The fees for telemetry should be structured so as to incentivise licence applicants to only apply for the amount of spectrum necessary to efficiently meet their needs.

In 2005, ComReg consulted[37] on the setting of fees for the use of radio spectrum, including those appropriate to use of the VHF and UHF bands. In December 2005 ComReg published its decision on the setting of fees in Document 05/89[38].That document sets out the level of fees which should be paid by holders of VHF and UHF licences assigned on an on-site, local area, wide area and nationwide basis. In each case, the fees also reflect the degree to which the licence holder utilises a channel, thereby denying its use to others.

Channels are typically assigned to telemetry licensees on an exclusive basis. ComReg is minded to reflect this factor in setting the telemetry licence fees by applying the highest usage level applicable in each case.

The proposed fees for the four categories of telemetry licence are shown in Table 5 below. These fees are based on those set out in ComReg 05/89 but also reflect changes[39] in the consumer price index (CPI) since December 2005. ComReg also proposes to apply future changes in the CPI to the annual fees during the term of telemetry licences.

As stated earlier, ComReg plans to review the use of the VHF and UHF bands and the scope of the review may include the fees charged for telemetry systems. Any changes to the fees resulting from this review, if any, would apply to active telemetry licences from their next renewal.

Q. 13. Is ComReg's proposal to adjust the level of fees by the Consumer Price Index (CPI) adequate to ensure the ongoing efficient use of spectrum? Please give reasons in your response.

[37] *ComReg 05/58 - Consultation on Review of fees applicable to Rights of Use for Radio Frequencies.*

[38] *ComReg 05/89 - Review of fees applicable to Rights of Use for Radio Frequencies: Response to Consultation.*

[39] *CPI has increased by 9% in the period since December 2005.*

8.2 Table of Proposed Fees for Telemetry Licences

The proposed fees that would apply to the four categories of telemetry licences are set out in Table 5 below. The figure shown in each case is the fee that must be paid each year by the licence holder.

Telemetry Licence Type	Number of 2 x 12.5 kHz Channels[40] Assigned in a Licence	Annual Licence Fee
On-site	1	€109
Local-area	1	€436
Wide-area	1	€872
National	12	€39,240

Table 5: Proposed Fees for Telemetry Licences.

Q. 14. Are there any other factors that ComReg should consider when setting fees for telemetry licences to ensure that its Statutory Objectives are met? Please explain your response in detail.

[40] *The fees are based on a duplex 12.5 kHz channel (2 x 12.5 kHz). If a 2 x 25 kHz channel is required then two adjacent 12.5 kHz channels may be aggregated. In such cases the fee charged will be as if two separate 12.5 kHz channels were assigned.*

9 Proposed Licence Award Mechanism

This section discusses the award mechanism that ComReg proposes to use for the assignment of the four categories of telemetry licences described in Section 4.

9.1 Selection of an Appropriate Award Mechanism

In coming to a view on the appropriate mechanism for the award of these licences ComReg has considered the following facts:

- The equivalent licensing regime in the UK, which also has provision for six national blocks is equally divided between the three major utility operators, that is gas, electricity and water each have access to two national blocks. In the decade that this licence regime has been in force two national blocks have proven to be sufficient for each utility operator;
- There are a similar number of utility providers in Ireland, operating networks of significantly less scale than those in the UK;
- The proposed licences are for the provision of Electronic Communications Networks (see Section 2.2) by end users;
- Increasing demand for spectrum by telemetry users is primarily from utility operators requiring national networks (for which there are a limited number of possible licensees) and to a less degree for wide area, local area and on-site licences; and
- There does not appear to be any idiosyncratic valuation of specific frequency allocations in the proposed spectrum bands.

Based on these factors ComReg is of the view that it should be able to accommodate all prospective licensees and considers that a "*first-come first-served*" licence award mechanism is appropriate for all four proposed licence types.

Applicants may state a preference for a specific block or frequency in their applications. If multiple applications are received by ComReg on the same day they will be treated equally. If multiple applications (received on the same day) are for the same specific blocks or frequencies[41], then ComReg would draw lots to determine which applicant the licences will be assigned to, subject to spectrum efficiency considerations.

Notwithstanding ComReg's preliminary view that a *first-come first-served* award process is appropriate, ComReg may decide, on foot of this consultation or other factors that emerge, to award telemetry licences through an alternative award mechanism, having regard to Regulation 11 of the Authorisation Regulations 2011. Therefore, ComReg reserves the right to adopt a market based assignment mechanism such as an auction, should such a requirement arise.

[41] *This would apply to any frequencies that may not be coordinated to mitigate interference due to geographic proximity of the stations in the respective licence applications.*

Q. 15. Do you agree with ComReg's view that a *first-come first-served* award process is the most efficient mechanism for assigning on-site, local-area, wide-area and national telemetry licences? Please give reasons in your response.

10 Submitting Comments

The consultation period will run from 2 December 2011 to 27 January 2012 during which ComReg welcomes written comments on any of the issues raised in this paper.

Comments should be submitted to marketframeworkconsult@comreg.ie. Having analysed and considered the comments received, ComReg will review its proposals and publish a report on the consultation which will, inter alia, summarise the responses to the consultation.

In order to promote further openness and transparency ComReg will publish all respondents' submissions to this consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information - ComReg 05/24[42].

We request that you reference the relevant question numbers in this document, in submitting your comments. We also request that electronic submissions be submitted in an unprotected format so that they can be appended into the ComReg submissions document for publishing electronically.

Please note

ComReg appreciates that some of the issues raised in this paper may require respondents to provide confidential information if their comments are to be meaningful.

As it is ComReg's policy to make all responses available on its web-site and for inspection generally, respondents to consultations are requested to clearly identify confidential material and place confidential material in a separate annex to their response.

Such information will be treated subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24.

[42] *ComReg 05/24 Response to Consultation - Guidelines on the treatment of confidential information - March 2005.*

Annex A - Proposed National Telemetry Cellular Frequency Plan

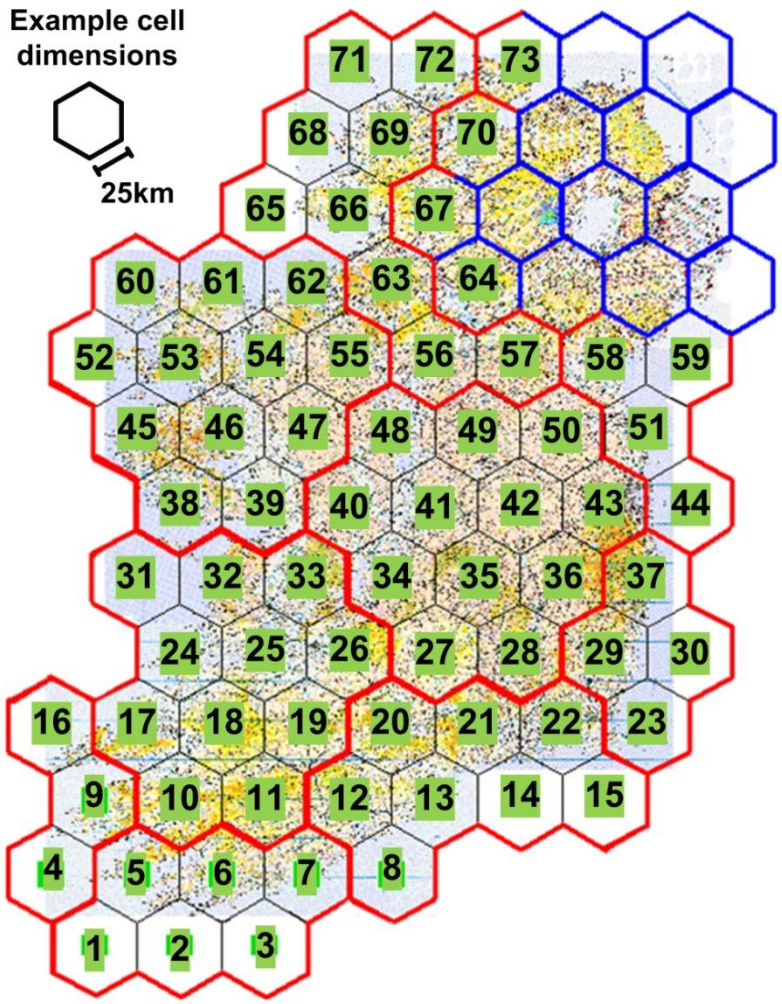

Figure 4: The national licence cellular plan indicating cell numbers. The Irish Grid coordinates for the centre of each cell are shown in Table 6 of Annex B.

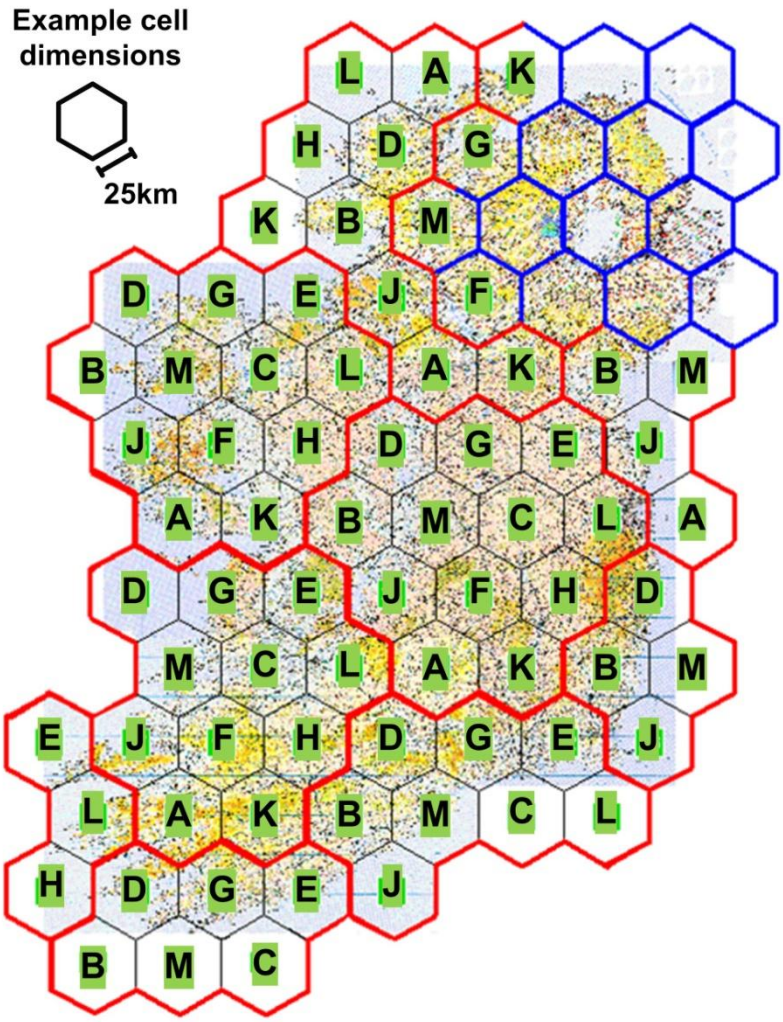

Figure 5: The national licence cellular frequency plan, indicating which national channels may be used in each cell. The proposed channel frequencies (corresponding to the letters[43] A to K) are shown in Table 7 in Annex B.

[43] *By convention the letter "I" is typically not used in order to avoid potential confusion with the number "1".*

Annex B - Proposed Channel Frequencies and Cell Coordinates

Cell Centre in Irish Grid Coordinates.					
cell number	Coordinates			cell number	Coordinates	
	Easting	Northing			Easting	Northing
1	45000	4600		**38**	88400	229600
2	88400	4600		**39**	131800	229600
3	131800	4600		**40**	175200	229600
4	23300	42100		**41**	218600	229600
5	66700	42100		**42**	262000	229600
6	110100	42100		**43**	305400	229600
7	153500	42100		**44**	348800	229600
8	196900	42100		**45**	66700	267100
9	45000	79600		**46**	110100	267100
10	88400	79600		**47**	153500	267100
11	131800	79600		**48**	196900	267100
12	175200	79600		**49**	240300	267100
13	218600	79600		**50**	283700	267100
14	262000	79600		**51**	327100	267100
15	305400	79600		**52**	45000	304600
16	23300	117100		**53**	88400	304600
17	66700	117100		**54**	131800	304600
18	110100	117100		**55**	175200	304600
19	153500	117100		**56**	218600	304600
20	196900	117100		**57**	262000	304600
21	240300	117100		**58**	305400	304600
22	283700	117100		**59**	348800	304600
23	327100	117100		**60**	66700	342100
24	88400	154600		**61**	110100	342100
25	131800	154600		**62**	153500	342100
26	175200	154600		**63**	196900	342100
27	218600	154600		**64**	240300	342100
28	262000	154600		**65**	131800	379600
29	305400	154600		**66**	175200	379600
30	348800	154600		**67**	218600	379600
31	66700	192100		**68**	153500	417100
32	110100	192100		**69**	196900	417100
33	153500	192100		**70**	240300	417100
34	196900	192100		**71**	175200	454600
35	240300	192100		**72**	218600	454600
36	283700	192100		**73**	262000	454600
37	327100	192100				

Table 6: National Cell Coordinates and Numbers.

National ST Block Frequency Assignments												
National Spectrum Block	Block 1		Block 2		Block 3		Block 4		Block 5		Block 6	
	MHz Base	MHz Outstation	MHz Base	MHz Outstation	MHz Base	MHz Outstation	MHz Base	MHz Outstation	MHz Base	MHz Outstation	MHz Base	MHz Outstation
12 Cell Frequencies												
A	458.20625	463.70625	458.23125	463.73125	457.53125	463.03125	457.64375	463.14375	458.04375	463.54375	458.08125	463.58125
B	458.35625	463.85625	458.30625	463.80625	457.89375	463.39375	457.56875	463.06875	457.75625	463.25625	457.94375	463.44375
C	458.09375	463.59375	458.11875	463.61875	457.85625	463.35625	457.99375	463.49375	457.88125	463.38125	458.19375	463.69375
D	458.10625	463.60625	458.13125	463.63125	457.65625	463.15625	457.79375	463.29375	457.66875	463.16875	457.69375	463.19375
E	458.29375	463.79375	458.31875	463.81875	457.83125	463.33125	457.58125	463.08125	457.86875	463.36875	457.95625	463.45625
F	458.24375	463.74375	458.26875	463.76875	458.00625	463.50625	457.80625	463.30625	457.93125	463.43125	458.05625	463.55625
G	458.36875	463.86875	458.39375	463.89375	457.61875	463.11875	457.63125	463.13125	457.73125	463.23125	457.70625	463.20625
H	458.25625	463.75625	458.28125	463.78125	457.60625	463.10625	457.91875	463.41875	457.96875	463.46875	458.06875	463.56875
J	458.14375	463.64375	458.16875	463.66875	457.78125	463.28125	457.84375	463.34375	457.55625	463.05625	457.68125	463.18125
K	458.33125	463.83125	458.21875	463.71875	457.51875	463.01875	457.90625	463.40625	457.50625	463.00625	457.98125	463.48125
L	458.34375	463.84375	458.38125	463.88125	457.59375	463.09375	457.81875	463.31875	457.74375	463.24375	458.03125	463.53125
M	458.15625	463.65625	458.18125	463.68125	457.54375	463.04375	458.01875	4643.51875	457.71875	463.21875	457.76875	463.26875

Table 7: National Telemetry Cell Frequencies.

Channel number (UHF)	Sub-channel centre frequency (MHz)	Sub-channel centre frequency (MHz)	Channel type
1	455.7375	469.7375	2 x 12.5 kHz (Duplex)
2	455.75	469.75	2 x 12.5 kHz (Duplex)
3	455.7625	469.7625	2 x 12.5 kHz (Duplex)
4	455.775	469.775	2 x 12.5 kHz (Duplex)
5	455.7875	469.7875	2 x 12.5 kHz (Duplex)
6	455.800	469.800	2 x 12.5 kHz (Duplex)
7	455.8125	469.8125	2 x 12.5 kHz (Duplex)
8	455.825	469.825	2 x 12.5 kHz (Duplex)
9	458.40625	463.90625	2 x 12.5 kHz (Duplex)
10	458.41875	463.91875	2 x 12.5 kHz (Duplex)
11	458.43125	463.93125	2 x 12.5 kHz (Duplex)
12	458.44375	463.94375	2 x 12.5 kHz (Duplex)
13	458.45625	463.95625	2 x 12.5 kHz (Duplex)
14	458.46875	463.96875	2 x 12.5 kHz (Duplex)
15	-	463.98125	1 x 12.5 kHz (Simplex)
16	-	463.99375	1 x 12.5 kHz (Simplex)

Table 8: UHF On-site, Local Area and Wide-Area Telemetry Channel Assignments.

Channel number (VHF)	Sub-channel centre frequency (MHz)	Sub-channel centre frequency (MHz)	Channel type
1	165.25625	170.0625	2 x 12.5 kHz (Duplex)
2	165.26875	170.075	2 x 12.5 kHz (Duplex)
3	165.28125	170.0875	2 x 12.5 kHz (Duplex)
4	165.29375	170.1	2 x 12.5 kHz (Duplex)
5	165.30625	170.1125	2 x 12.5 kHz (Duplex)
6	165.31875	170.125	2 x 12.5 kHz (Duplex)
7	165.33125	170.1375	2 x 12.5 kHz (Duplex)
8	165.34375	170.15	2 x 12.5 kHz (Duplex)
9	165.35625	170.1625	2 x 12.5 kHz (Duplex)
10	165.36875	170.175	2 x 12.5 kHz (Duplex)
11	165.38125	170.1875	2 x 12.5 kHz (Duplex)
12	165.39375	170.2	2 x 12.5 kHz (Duplex)
13	165.40625	170.2125	2 x 12.5 kHz (Duplex)
14	165.41875	170.225	2 x 12.5 kHz (Duplex)
15	165.43125	170.2375	2 x 12.5 kHz (Duplex)

Table 9: VHF On-site, Local Area and Wide-Area Telemetry Channel Assignments.

Annex C - Antenna Radiation Pattern Envelopes for Outdoor Stations

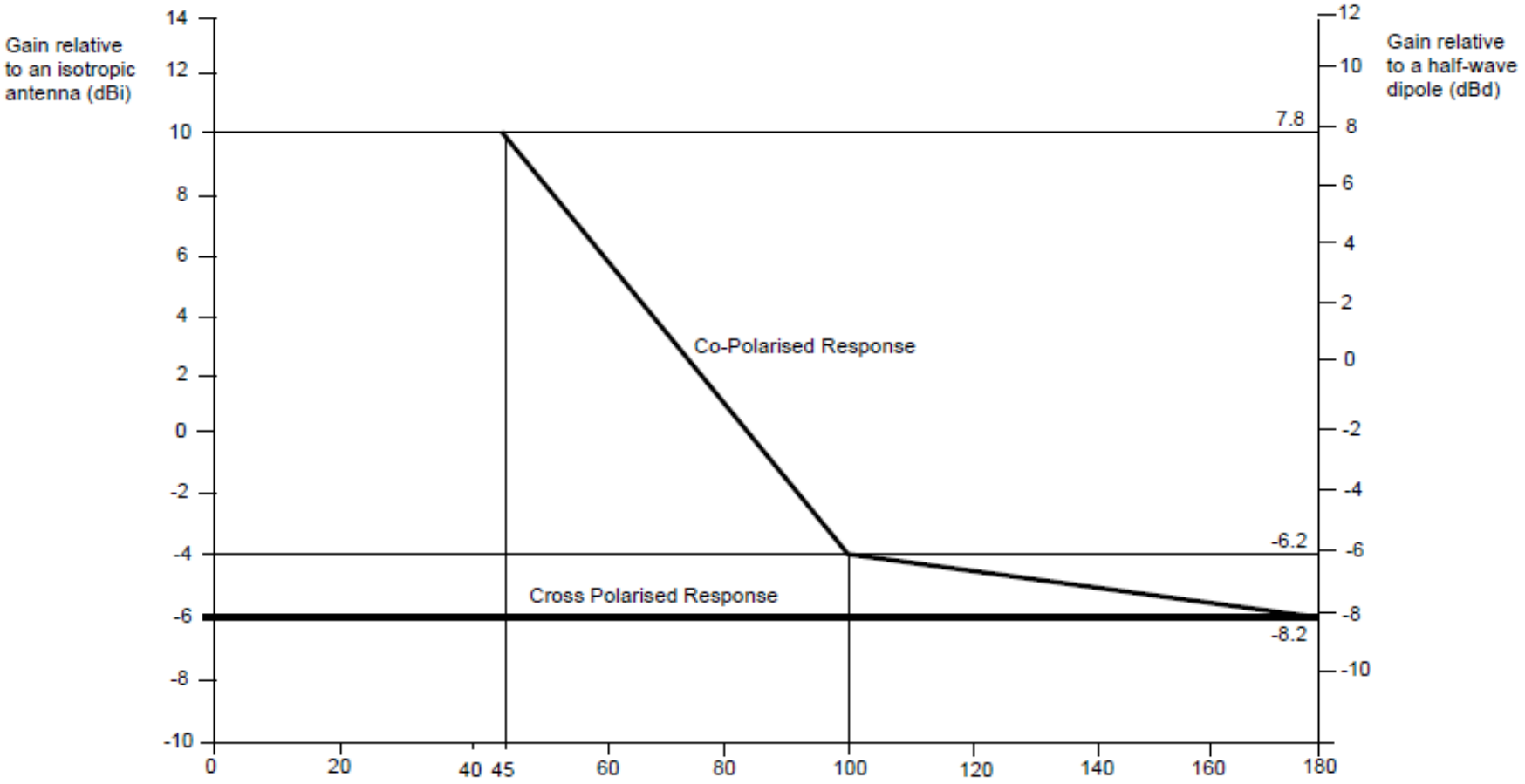

Figure 5: Sector Antenna Radiation Pattern Envelope for Base Stations.

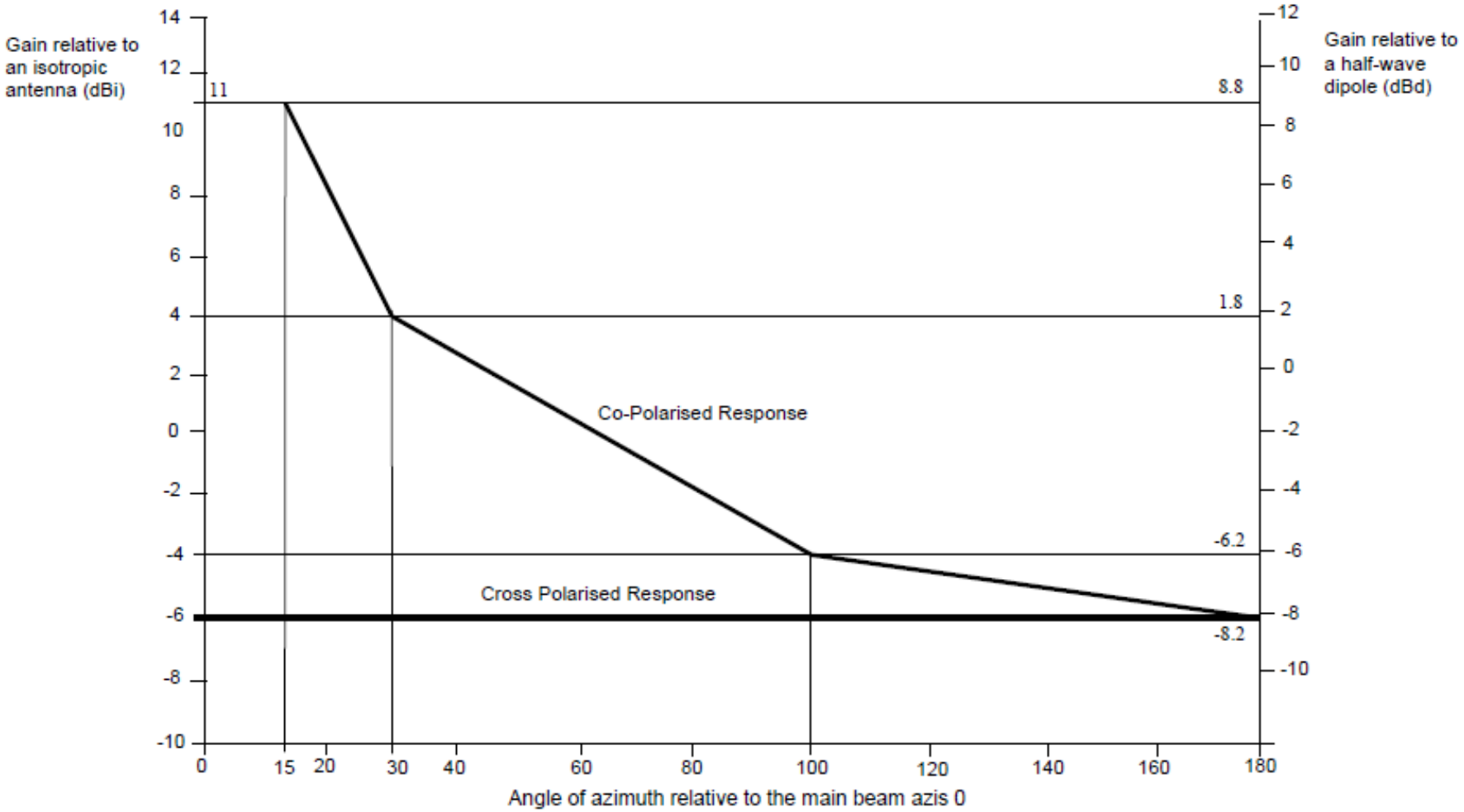

Figure 6: Antenna Radiation Pattern Envelope for Outstations.

Annex D - Draft Regulatory Impact Assessment (RIA)

This Annex sets out ComReg's draft RIA on its proposals and is prepared in accordance with ComReg's RIA Guidelines (as set out in ComReg Document 07/56a) ("ComReg's RIA Guidelines") and having regard to the RIA Guidelines issued by the Department of An Taoiseach in June 2009 ("the Department's RIA Guidelines").

In August 2007 ComReg issued guidelines on its approach to conducting a RIA. The guidelines set out, amongst other things, the circumstances in which ComReg considers that a RIA is appropriate. In summary, ComReg indicated that it would generally conduct a RIA in any process that might result in the imposition of a regulatory obligation, or the amendment of an existing regulatory obligation to a significant degree, or which might otherwise significantly impact on any relevant market or on any stakeholders or consumers.

In the interests of continuing to ensure openness and transparency, and alongside comments on other matters addressed in this document, ComReg invites interested parties to review this draft RIA and to submit any comments or information in relation to it that they believe ComReg should consider in finalising its decision.

The draft RIA follows the structure described in ComReg's RIA Guidelines and consists of the following five steps:

- Step 1: Identify the policy issue and identify the objectives;
- Step 2: Identify and describe the regulatory options;
- Step 3: Determine the impacts on stakeholders;
- Step 4: Determine the impacts on competition; and
- Step 5: Assess the impacts and choose the best option.

Step 1 - Identify the policy issue and identify the objectives:

ComReg's relevant statutory functions are listed in Section 2.1 of this document. These functions, amongst other things, require ComReg to:

- *promote competition;*
- *promote the interests of users within the Community; and*
- *ensure the efficient management and use of the radio frequency spectrum.*

ComReg licences telemetry under the Business Radio licensing framework, which is intended to facilitate mobile services. This means that fixed telemetry users share the same spectrum as mobile users and it has become increasingly difficult to ensure that these two groups do not interfere with one another. Significant tranches of spectrum have been left unused in order to serve as guard-bands for this purpose, which creates artificial scarcity of spectrum. These factors undermine certainty regarding the future availability of spectrum for licensing new telemetry and Business Radio users.

The policy issues that must therefore be addressed are:

- to create certainty for stakeholders regarding the future availability of spectrum for licensing both telemetry and Business Radio;

- to ensure the efficient management and use of spectrum by:

    - defragmenting existing telemetry spectrum assignments;
    - introducing new fees that better reflect the opportunity cost of spectrum use;
    - harmonising spectrum use with the UK and Northern Ireland; and
    - segregating incompatible users (fixed and mobile) into separate spectrum bands.

- to reduce the administrative burden on users when licensing multi-site telemetry networks.

Step 2 - Identify and describe the regulatory options:

ComReg considers that there is a need for two important changes to the current way in which telemetry is licensed, by:

- introducing a separate licensing framework which would be more suited to the needs of telemetry users: and
- changing the current frequency arrangements to ensure efficient spectrum use and ongoing coexistence between telemetry and Business Radio users.

ComReg is of the view that there are two regulatory options which may be adopted in order to address the policy issues outlined above, in line with its statutory functions. These options are as follows:

- **Option 1:** To introduce a new licensing framework, under which four different categories of telemetry licence could be awarded. This framework would be aimed at meeting the needs of a range of telemetry users, from those operating telemetry within a single premises to those operating regional and nationwide telemetry networks. To give effect to this framework, ComReg would also have to amend the current spectrum allocations, in the 163 – 174 MHz (VHF) and 450 – 470 MHz (UHF) bands, specifically for telemetry use (by re-allocating up to 2 x 1.2625 MHz of paired spectrum and 1 x 25 kHz of unpaired spectrum).

  Both aspects of Option 1 are described in detail in Sections 4 and 5 of this document.

- **Option 2:** To make no change to ComReg's current practice for licensing telemetry and to leave the existing frequency arrangements unchanged.

Step 3 - Determine the impacts on stakeholders:

The stakeholders likely to be affected by the options outlined above are;

- telemetry users,
- Business Radio users, in particular a limited number of Community Repeaters.

Telemetry users:

Option 1 would reduce congestion in the VHF and UHF spectrum bands. This would increase the quantity of spectrum available for new telemetry licences.

Option 1 would also involve the introduction of national and wide-area licence categories. This could benefit telemetry users with larger networks in the following ways:

- it would reduce the administrative burden on these operators, as fewer licence applications and renewals would be required; and

- operators of nationwide telemetry networks would hold a single national licence, indicating the channels to be used in each region of the State. It would no longer be necessary for these operators to wait for an individual licence for each site in their network, before they know the precise frequencies of operation. This would provide greater certainty and would be beneficial when ordering telemetry equipment.

A potential drawback of Option 1 from the perspective of existing telemetry licensees would be the need to relocate from the channels they are currently assigned, into the proposed telemetry bands, within a period of five years. This may lead to retuning costs and some temporary disruption of existing telemetry services.

Under Option 2, there would be no relocation and consequently no retuning costs or disruption for existing telemetry users.

However, licensing of telemetry would remain under the existing Business Radio framework and operators of larger networks would still have to apply for individual licences for every site in their network, with the associated administrative burden. Similarly, if no changes are made to the existing frequency arrangements the fragmented spectrum holdings of existing telemetry licensees would persist, requiring licensees to hold a larger inventory of replacement spare parts in case of equipment failure.

Overall, for these reasons, ComReg is of the view that telemetry users are likely to favour Option 1 over Option 2.

Business Radio users (including Community Repeater users)

Option 1 would reduce congestion in the VHF and UHF spectrum bands. This would increase the quantity of spectrum available for new Business Radio licences. The more efficient assignment of spectrum would also mitigate the risk of interference to Business Radio users from fixed telemetry.

There are two Community Repeaters that currently operate on frequencies within the proposed national telemetry spectrum band. Under Option 1, this may involve retuning costs for these licensees, and may lead to some temporary Community Repeaters service disruption. ComReg is of the view, that in the majority of cases, it would be possible to retune the equipment used to provide these services without incurring significant expense. Moreover, it is also proposed that the effected licensees would have a period of three years to smoothly transition existing Community Repeater services with minimal disruption.

Under Option 2 there would be no relocation or retuning costs for the two Community Repeaters concerned and no disruption to their services.

Overall, ComReg is of the view that Business Radio users are likely to favour Option 1, as it reduces the uncertainty associated with interference and the future availability of Business Radio licences. A limited number of Community Repeater users may be concerned about the relocation required under Option 1 and may therefore favour Option 2. However as stated above, ComReg is of the view that the incurred costs on these users would be low.

Step 4 - Determine the impacts on competition:

Telemetry users come from a range of diverse sectors, the majority of which are not in direct competition. Nonetheless these users all require access to radio spectrum as a key input to their business. Radio spectrum is a finite resource and the right to use it is conferred by ComReg, in accordance with its statutory functions. This may mean that insufficient spectrum is available to award to all parties who desire it, and they must compete with each other to secure access to it. ComReg has a statutory function to "*ensure the efficient management and use of the radio frequency spectrum*" as a means of promoting competition. The inefficient use of spectrum would have a detrimental impact on competition.

Under Option 1, the segregation of fixed telemetry and mobile users into separate spectrum bands would have a positive effect on competition as it would facilitate denser and more efficient reuse of frequencies. This would allow more users to operate in a given area without increasing the risk of interference.

Segregation of these services would also allow assignments in the VHF and UHF spectrum bands to be de-fragmented, so that future assignments could be more efficiently structured. The benefit of this is that fewer channels would be required to serve as unused guard-bands. These channels could then be put to productive use by assigning them to licensees.

A negative impact of Option 1 is that the spectrum that ComReg proposes to reserve for telemetry use would no longer be available to other Business Radio users. However, ComReg is of the view that the spectrum in question does not offer any unique advantages to Business Radio users, who may be suitably accommodated elsewhere in the VHF and UHF bands. Indeed, the more efficient spectrum assignment that would be possible under Option 1 may assist in making VHF and UHF spectrum available for alternative applications in the future.

Option 2 could have a negative impact on competition because spectrum assignments in the VHF and UHF bands would remain fragmented and reservation of unused guard-bands would still be needed to mitigate interference. This could lead to artificial spectrum

scarcity which could reduce the amount of spectrum available for current and future potential users.

Overall, Option 1 is likely to have a greater positive impact on competition, by ensuring more efficient management and use of the radio frequency spectrum.

Step 5 - Assess the impacts and choose the best option:

The stakeholder impacts set out above indicated that Option 1 is likely to be the preferred option for both telemetry users and Business Radio users, and the benefits of Option 1 are likely to outweigh the costs which relate to the short-term disruption to existing telemetry and Community Repeater services, that may occur during its implementation.

Whilst these costs would not arise under Option 2 there are some potentially significant disadvantages associated with Option 2 for stakeholders. Option 2 could jeopardise the future efficient management and use of the VHF and UHF spectrum bands. If demand for telemetry licences continues to grow, Option 2 may also hamper the future productivity of industry, the utility sector and the Business Radio community, by reducing the quantity of spectrum available to grant new licences to these users.

With regard to the factors discussed above, ComReg is of the view that Option 1 is likely to better address the policy issues set out above, in line with its statutory functions.

Annex E - Definitions and Interpretation

"Base Station" refers to a station located at a fixed location which communicates with fixed outstations.

"Repeater" refers to a base station that receives a weak signal and re-broadcasts this signal on the same frequency at a higher power in order to extend coverage without degradation and also to enable communications around certain topographies where it would otherwise have been unable with standard base station.

"Community Repeater" refers to a base station that re-transmits what it receives using multiple codes to separate users. This allows multiple users to share repeaters' resources. The Community Repeater Licensee may establish a base station on a high mountain or other high site which offers customers the advantage of extended radio coverage without the requirement to hold a radio licence. All radio stations on the system are covered by the operator's licence, i.e. the user does not have to hold a licence for controlling the base station (by means of a trigger station) or for the operation of his mobiles. Community Repeaters come under the following regulations (S.I. 83 of 1988).

"dB" or "Decibel" is a measure of the ratio between two signal levels. Frequently used to express gain (or loss) in a system.

"**ERP**" refers to Effective Radiated Power.

"PMR" refers to Private Mobile Radio are VHF or UHF two-way radio systems that are operated by the police, ambulance, taxi companies, construction companies etc... PMR also includes data systems operating in the VHF and UHF spectrum.

"Point-To-Multipoint system" refers to that there are several remote stations/outstations that have data to be exchanged with a single fixed base station. Signalling is bi-directional and the data can only be exchanged between base and all remote stations.

"**R&TTE**" refers to Radio Equipment and Telecommunications Terminal Equipment. (see S.I. 240 of 2001 For further details).

"SRD" refers to Short Range Device (see ComReg 02/71R5 for further details).

"TPBR" refers to Third Party Business Radio.

"UHF" refers to Ultra High Frequency and refers to frequencies in the range 300 MHz – 3 000 MHz.

"VHF" refers to Very High Frequency and refers to frequencies in the range 30 MHz - 300 MHz.

Annex F - Consultation Questions

List of Questions