Commission for
Communications Regulation

Consultation Paper

Preparing the Radio Spectrum Management Strategy for 2005 - 2007.

An Examination of the Key Drivers Affecting Spectrum Demand, the Economic Impact of Spectrum Usage and a Review of Radiocommunication Services.

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All responses to this consultation should be clearly marked:- "Reference: Submission re ComReg 05/01" as indicated above, and sent by post, facsimile or e-mail, to arrive on or before 5 pm, 4 March 2005, to:

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Annex A Consultation Questions

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Annex B Review and Strategy for Specific Radio Services

B.1 Introduction

The radio frequency spectrum is available for use for the provision of a variety of communications services and networks. These include radio transmission networks, public access services– such as the mobile telephony and broadband access networks, broadcast networks as well as radio navigation systems, business radio, ships' radio, amateur radio, consumer products and equipment used in industry, medicine and commerce.

In addition, the nature of the spectrum means that certain parts of the spectrum are more suitable for certain purposes than others.

The use of radio equipment in Ireland must be authorised by ComReg. This authorisation may take the form of either a licence, under the Wireless Telegraphy Act 1926, or a licence exemption.

The key strategy for radio services in Ireland is to ensure that there is sufficient useful spectrum to cope with the competing demands of all the different services.
The following sections highlight the different services authorised for use in Ireland and the strategies being proposed by ComReg to ensure the demands for those services continue to be met.

B.2 General Licensing Trends

The majority of spectrum users fall within a licence framework that requires the issue of an annual licence. Table An.B.1 details the total number of licences issued in the period May 2002 to October 2004.

Service Type	Number of Licences Issued
Fixed	2259
Business Radio	950
Aircraft Radio	335
Satellite Services	229
Radio Experimenters	98
Community Repeater	12
Total	5708

Table An.B.1: Licences issued May 2002 to Oct 2004.

Almost 40% of the contribution to licensing volume comes from fixed links, 32% from ships licensing, 17% from the business radio sector and the rest contribute significantly smaller percentages. The following graph indicates the yearly licensing volumes in several different services.

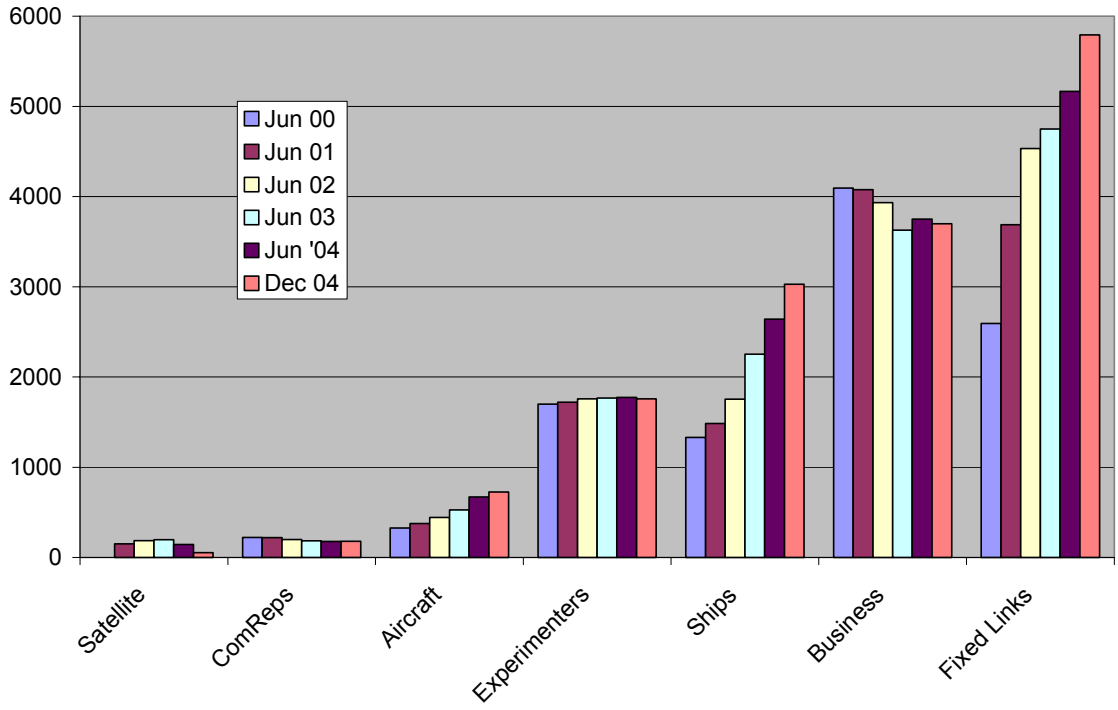

Figure An.B.1: Annual licensing volumes for different radio services.

It is clear from the diagram above that the general trend in licensing volumes is increasing in the aeronautical, maritime and fixed links sectors and is relatively stable for business radio, community repeaters and experimenters.

B.3 Public Mobile Services

B.3.1 Introduction

Mobile communications is one of the fastest growing sectors of telecommunications with mobile phone penetration rates in Ireland now standing at 89%[20]. There are four licensed mobile network operators in Ireland, three of whom are licensed 2nd generation or GSM[21] services namely, Vodafone, O2 and Meteor. GSM systems operate in both the 900 MHz and 1800 MHz frequency bands with enhancements for GSM networks such as GPRS[22] to improve their data handling capability. In 2002 ComReg issued three 3rd generation (3G) or IMT-2000/UMTS[23] licences to

[20] ComReg Quarterly Report September 04.
[21] GSM- Global System for Mobile Communications is a cellular, digital, land-based mobile communications system.
[22] GPRS- General Packet Radio Service is a GSM data technique that transmits and receives data in packets rather than establishing a continuous channel from a portable terminal for the transmission and reception of data. It makes very efficient use of available radio spectrum, and users only pay for the volume of data sent and received.
[23] UMTS is a European standard which is part of the IMT-2000 family. Other IMT-2000 standards may be deployed but at the time of the licence competition the EU required that at least one UMTS-based 3G mobile network must be licensed in each Member State to facilitate roaming (Decision no. 128/1999/EC of the European Parliament and of the Council of 14 December 1998 on the co-ordinated introduction of a third-generation mobile and wireless communications system (UMTS) in the Community refers).

Vodafone, O2 and Hutchison 3G in the 1920 – 1980 MHz, and 2110 – 2170 MHz bands. 3G networks will be capable of supporting data rates of up to 384kbit/s in a mobile environment and up to 2Mbit/s in-building, in comparison to 115kbit/s for GSM networks (unless EDGE[24] or similar technology is deployed). All three of Ireland's 3G licensees have launched limited services but it remains unclear how this market will develop, both in Ireland and elsewhere. For example, the presence of alternatives such as "2.5G" services like GPRS and licence-exempt Wi-Fi may have a bearing on 3G growth.

The three 2G cellular operators each have a total of 2 x 21.6 MHz of assigned spectrum, and the three 3G operators each have 2 x 15 MHz. 59% of the available 2G spectrum[25] and 62% of the available 3G spectrum[26] has been licensed.

Following from its commitment in the previous Spectrum Strategy (document 02/43); ComReg has carried out measurements on the Quality-of-Services offered by GSM operators in Ireland. All operators were found to be in material compliance with their licence Quality-of-services commitments. ComReg is currently conducting a similar survey of licensed 3G operators to ensure compliance with the rollout commitments of their licences.

ComReg is continuing to work with Ofcom, the UK regulator to develop a co-ordination agreement for 3rd generation systems operating in the border region and has recently signed a MoU[27] on frequency channels.

ComReg has continued to actively participate in international fora on mobile systems development to protect and promote Irish mobile cellular end-user interests.

The World Radiocommunication Conference of 2000 designated the bands 2500-2690 MHz for IMT-2000 on an international basis. CEPT ECC is expected to adopt a Decision in 2005 which will designate 2 x 70 MHz of spectrum in this band for FDD IMT-2000/UMTS services. However in Ireland this band is currently used for MMDS services. ComReg, in consultation with the industry, is seeking to develop a coherent strategy which will facilitate the development of 3G services in line with market demand and also seek to accommodate the requirement of MMDS operators and their customers. In line with this aim ComReg hosted a workshop in 2004 to inform interested parties of the work ongoing within CEPT on the detailed spectrum arrangements for UMTS/IMT-2000 in this band and to have an initial exploration of options. It is likely that further workshops and consultations will be carried out over the next 12 to 18 month period as the 3G mobile market develops.

[24] Enhanced Data in a GSM Environment, a 3G mobile standard that is compatible with current 2G GSM spectrum
[25] Assumed to be 2 x 35 MHz available in the GSM900 band and 2 x 75 MHz in the GSM1800 band
[26] Assumed to be 2 x 60 MHz paired plus 25 MHz unpaired (excludes spectrum identified for self-co-ordinated systems)
[27] MoU = Memorandum of Understanding

B.3.2 Key Drivers

The key drivers of demand for public mobile spectrum are likely to be new and faster data applications, for example the delivery of audiovisual content to mobile phones or high speed access to the Internet or corporate intranets. In theory falling voice tariffs could also lead to more substitution of fixed telephony by mobile, further driving demand for spectrum. However, to some extent the effect of this may be offset by technology developments such as Voice over IP or improved codecs, which would enable more voice traffic to be carried in the existing spectrum.

It is unclear yet how much consumer demand exists for value-added content, however the popularity of internet-based music download services and associated portable music players suggests attractively priced mobile downloads could be a major growth area. A recent study carried out by NOP for Nokia indicated European mobile users would be willing to pay 28% more for mobile content than they are currently paying for their mobile services[28]. The study suggested that enhanced content services could generate high interest and that younger consumers (of whom there are proportionately more in Ireland than elsewhere in Europe) were willing to pay an extra €10 monthly for such content.

The implications for spectrum demand in Ireland could be significant. Current 2G networks do not have the capacity to support such services and it is questionable whether 3G networks This could fuel demand for more economic delivery platforms, such as the handheld digital video broadcasting technology (DVB-H) currently under trial in Finland, Germany and the UK. This in turn could lead to pressure to free up some of the analogue TV spectrum to accommodate this technology, especially if the dual-mode phones used in these trials become widely available in the market.

B.3.3 Economic Contribution

GDP and Employment Impacts

The GDP and employment contributions of the public mobile sector comprise the direct contribution from mobile operators, the forward and backward linkages to mobile retailing and software, security, messaging and other suppliers to the mobile sector respectively, and multiplier effects on the rest of the economy.

The top part of Table An.B.2 provides estimates of the GDP and employment associated with public mobile operators, retailers and suppliers for 2002 and 2003. Data for mobile sector suppliers was only available for 2003 and for the purposes of this document it has been assumed that the same values applied in 2002. Data for retailers and operators are shown together because the retailing operations of the operators are consolidated in their annual accounts. The indirect impacts are estimated using a multiplier of 1.1[29].

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[28] Nokia Press Release, 29th April 2004, http://press.nokia.com/PR/200404/943441_5.html

[29] This is a general economic multiplier reported in "The Macro-economy of Ireland", by Leddin and Walsh.

	GDP (€m)		Employment	
	2002	2003	2002	2003
Mobile operators and retailing	267	508	3374	2907
Mobile sector suppliers[30]	250	250[31]	4300	4300
Sub-total	517	758	7774	7207
Multiplier effect	52	76	777	721
Total	569	834	8551	7928

Table An.B.2: GDP and employment associated with public mobile services

(Source: Indepen and Aegis analysis, Forfás[32])

Consumer and Producer Surplus

To estimate consumer surplus one needs an estimate of the demand for mobile services as a function of their price and other factors. Such estimates do not exist for Ireland. The only recent published work found on this issue comprises a study undertaken by Hague Consulting for the UK Radiocommunications Agency in 2000[33]. This study estimated consumer surplus for business users of £47.18/month and for personal users of £16.27/month. There are two issues to be addressed in using these estimates: first they are for the UK and not Ireland and secondly mobile markets have changed since 2000. On the first point, similarities between the UK and Ireland in the services received, income levels and penetration rates would suggest that use of UK data would not be unreasonable. Although it is noted that mobile usage rates are higher in Ireland, perhaps suggesting consumers gain more benefits from use of their mobile phones.

Arguably the market changes since 2000 will have had a greater impact on the data. The impact of these changes on the surplus users enjoy from the service is unclear. Declining prices would increase the surplus, all else being equal. Also, as having a mobile has become an integral part of the way many people socialise and do business its value is likely to have risen. Against this, more marginal users will have taken up the service as penetration has risen, leading to a lower average surplus assuming all else is equal. On balance, we consider that use of the UK data from 2000 is likely to give a conservative estimate of the consumer surplus from use of mobile phones in Ireland. Using the UK estimates given above and Irish penetration data for 2003[34] gives a total consumer surplus of €1390m.

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[30] Data on employment and turnover supplied by Forfás. GDP estimated based on value added to output ratio of 0.571 for the radio, television and communications apparatus sector. "1998 Supply and Use and Input-Output Tables", Central Statistics Office, Prn 3547October 2004.

[31] Estimated based on an assumed cost/employee of €60,000 obtained from Sigma Wireless annual accounts for 2002. This assumes profits are small relative to payments to labour.

[32] Wireless Communications: An Area of Opportunity for Ireland, Forfás, April 2004

[33] Consumer surplus to cellular mobile and pager users, Hague Consulting Group, August 2000.

[34] Irish Communications Market, ComReg, December 2003, 03/144b

As stated earlier in Chapter 5, producer surplus is "supernormal profit". Taking a sector as a whole[35], economic theory suggests that supernormal profit will only be made if the sector is not fully competitive i.e. supernormal profits are not competed away. One way of measuring whether the prices charged reflect efficiently incurred costs, including the cost of capital is the use of the Rate of Return on Capital Employed (ROCE). The rate of return on capital employed is the ratio between profit and total assets + total liabilities and is an indicator of how well a company uses its capital investments to generate revenue. Estimates of mobile returns produced in the context of the mobile access and call origination review[36] indicate that the industry as a whole made returns of 35.5% and 25.9% in 2003 and 2002, respectively. Cullen International, reports that regulators in Europe have estimated the cost of capital for mobile operators to range from 12% to 19.5%. Taking the mid-point of this range (i.e. 15.75%) the producer surplus for the mobile industry is €235m and €95m for 2003 and 2002, respectively.

B.3.4 Approaches to Licensing Public Mobile Spectrum

Public mobile networks require access to exclusive radio spectrum so that the networks can be planned to deliver a specific grade of service in a controlled interference environment. In most parts of the world, public mobile services have been authorised on a national basis and licensees self-manage their block or blocks of available spectrum[37]. Because a limited amount of spectrum is allocated internationally for mobile services, it is therefore necessary to limit the number of rights of use that can be issued and under the terms of the EU Authorisation Directive it is necessary to grant such rights using selection criteria that are objective, transparent, non-discriminatory and proportionate.

The majority of European second generation (2G) cellular licences were awarded using comparative selection procedures with initially only one or two operators having licences. Further competition was introduced at a later date as additional spectrum became available and there was confidence in the business case for more than two operators offering mobile services. In the USA, licences were initially let by lottery and subsequently using auctions, the latter also being adopted in Australasia and elsewhere in the Americas. Some of the later GSM licences awarded in Europe (e.g. in the Netherlands, Austria and Greece) were awarded by auction.

Several European countries chose to adopt auctions for licensing third generation (3G) mobile services, based on experience elsewhere. Others, including Ireland, chose a comparative selection procedure. Some countries explicitly sought to encourage new market entrants through the 3G licensing process, by offering more

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[35] Note that it is not appropriate to look at particular firms within a sector, as even in competitive industries, where normal returns are made on average, particular firms will earn above normal profits because they are more efficient or have some other competitive advantage compared with others.

[36] Market Analysis - Wholesale Mobile Access and Call Origination, ComReg, 04/118.

[37] Notable exceptions include the USA and India, where a very large land area and federal political structure favoured the issue of regional licences. Many of these have since been aggregated to provide national or semi-national coverage.

licences than there were existing 2G operators (as in Ireland) or by reserving a licence for a new entrant (as in the UK), however in some cases not all the available licences were awarded. On some occasions all the licences were let but one or more were subsequently given up by the licensee. The implication is that, depending upon the size, state of the maturity and existing level of competition, there is a limit to the number of national mobile networks that are viable in a given national market at any given time.

A comparison of tariff levels and services offered by European 3G operators does not indicate any significant correlation between the licensing approach adopted and the procedure used for licence award. Both auctions and comparative selection have been effective in terms of awarding licences in a timely manner and to operators who have proceeded to roll out networks and offer competitive data services.

In November 2004, following a consultation, ComReg outlined its position regarding the use of jammers and interceptor base station in Ireland. Based on the consultation ComReg decided to permit mobile network operators to install mobile phone interceptors as part of their licensed network if they wish to do so, subject to conditions detailed in document 04/109. ComReg would also encourage organisations which have, or intend to have, mobile phone interceptors installed on their premises to insert information concerning the use and impact of interceptors into their organisational handbooks and to display notices in public areas to notify users that they are entering a restricted services zone.

B.3.5 Proposed ComReg Strategy for Public Mobile Services

B.3.5.1 Public Mobile Spectrum Availability

Ireland is unusual in a European context in that it has large quantities of unused spectrum in the GSM and 3G bands (see Figure An.B.2 for a detailed spectrum diagram). In the GSM 900 band all of the 2 x 10 MHz E-GSM spectrum is unassigned as is a further 2 x 3.8 MHz in the core GSM 900 band. Similarly in the GSM 1800 band there is 2 x 26.4 MHz of spectrum yet to be assigned. In total Ireland has 2 x 40.2 MHz of available GSM spectrum.

ComReg is participating in European work on the designation of the 900 and 1800 MHz GSM bands for 3G mobile (work on an ECC Decision is expected to commence in 2005) and will consult with all interested parties on the implications of any proposals.

In September 2002 ComReg issued three 3G licences consisting of 2 x 15 MHz of paired spectrum and 5 MHz of unpaired TDD spectrum in the core band. Only two of the licensees took up their unpaired TDD allocation. There remains a 4th licence block of 2 x 15 MHz paired spectrum and 5 MHz of TDD spectrum unassigned as well as the 5 MHz TDD spectrum that the third licensee did not take up. In total Ireland has 2 x 15 MHz of paired spectrum and 25 MHz of unpaired spectrum in the core IMT-2000/UMTS band unassigned.

ERC Decision ERC/DEC(99)25[38] designated the bands 2010 – 2025 MHz for use for UMTS services, with the 2010 – 2020 MHz portion for self provided applications operating in a self-co-ordinating mode. However this band remains unassigned for UMTS TDD services in most European countries. CEPT is currently considering a proposal to review this Decision with the possibility of reassigning the 2010 - 2025 MHz band for other services. Within the European Commission the Radio Spectrum Committee recently conducted a survey of member states on the use of this band. Most member states have a preference to preserve the harmonisation of this band and it may be feasible to make the band available for other non 3G-applications on a harmonised basis.

ECC Decision (02)06 designated the band 2500 – 2690 MHz as the expansion band for IMT-2000/UMTS systems. This spectrum is to be made available by 1 January 2008 subject to market demand and national licensing schemes. A further ECC Decision scheduled for adoption by the ECC in March 2005 designates the entire 2500 -2690 MHz of spectrum for terrestrial IMT-2000/UMTs with 2500 - 2570 MHz paired with 2620 – 2690 MHz for FDD operation. In Ireland this band is currently used for MMDS broadcasting services with operators licensed until 2014. Therefore Ireland is not in a position to implement either of these Decisions. ComReg is currently investigating the possibilities of allowing both MMDS and IMT-2000 services to share this band. It is intended to hold a consultation with industry to develop a coherent strategy to facilitate the development of 3G services in the 2.6 GHz band in line with market demand whilst accommodating any ongoing requirement by MMDS operators and their customers.

[38] ERC/DEC(99)25 on the harmonised utilisation of spectrum for terrestrial Universal Mobile Telecommunications System (UMTS) operating within the bands 1900 – 1980 MHz, 2010 – 2025 MHz and 2110 - 2170 MHz.

860 MHz to 2690 MHz Spectrum Allocations in Ireland

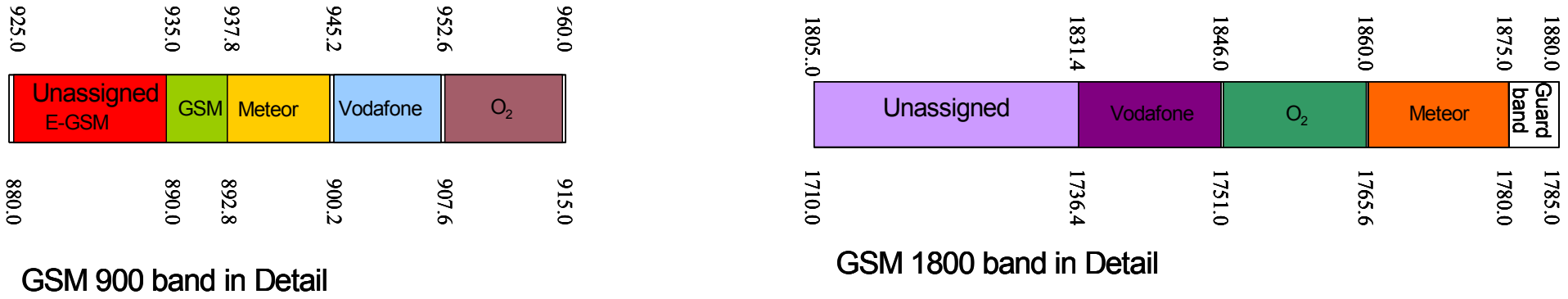

Figure An.B.2: 860 MHz to 2690 MHz spectrum allocations in Ireland

Ireland is experiencing a continuing demand for innovative wireless services, e.g. to provide a return path for interactive broadcast services. The unused GSM and IMT-2000 spectrum is very attractive for the provision of such services because of its propagation characteristics and the ready availability of equipment. ComReg is obligated to ensure the efficient use of the radio spectrum and is therefore investigating all options on how best to accommodate these innovative services. There are several options available to ComReg regarding the unassigned GSM and IMT-2000 spectrum. ComReg has identified the following options for use of currently unassigned GSM and IMT-2000 spectrum:

- Leave the unassigned spectrum as is until required by the current licensed operators;
- Assign part (e.g. half) of the spectrum to the existing licensed operators with the remaining spectrum left for the introduction of innovative services;
- Assign all the spectrum for innovative wireless services;
- Assign rights of use for this spectrum in say 200 kHz blocks of this spectrum via and auction or beauty contest to interested parties with no restrictions, beyond those required to meet international obligations, on the type of services to be introduced;
- Extend similar liberalisation to existing licensees, i.e. extend scope of rights of use whilst maintaining existing obligations.

Interest has been raised in various around using DVB and DAB technology to deliver mobile content such as video clips or broadcast programs. It is not clear at this stage what the most appropriate frequency spectrum is for this application.

B.4 Broadcasting Services

B.4.1 Introduction

Broadcasting is a major user of the radio frequency spectrum. Radio Telefis Éireann (RTÉ), the public service broadcaster established under the Broadcasting Authority Act 1960 as amended provides national radio and television services. The Broadcasting Commission of Ireland (BCI), established under the Broadcasting Act, 2001, is responsible for the authorisation of Irish broadcasting services other than those provided by RTÉ, under the Radio and Television Act, 1988 and the 2001 Act. ComReg is responsible for the allocation, assignment and licensing of the associated radio frequencies under the Broadcasting Acts.

The following table summarises the current use of spectrum for broadcasting or related services in Ireland:

Band	Frequencies	Current / Planned Use
Long Wave	150 – 279 kHz	Analogue sound broadcasting (national)
Medium Wave	530 – 1602 kHz	Analogue sound broadcasting (national) (regional, local not operating at present)
VHF II	87.5 – 108 MHz	Analogue sound broadcasting (national, regional & local)
VHF III	174 – 222 MHz	Analogue TV
	217 – 223 MHz	Additional digital audio broadcasting in WI95 Plan
	223 – 230 MHz	Planned for digital audio broadcasting at WI95
UHF IV/V	470 – 862 MHz	Analogue TV; planned for digital TV
2.6 GHz	2520 – 2670 MHz	MMDS
11 GHz	10.7 – 11.7 GHz	Direct to home Satellite TV (Astra / BSkyB)
12 GHz	11.7 – 12.5 GHz	Direct to home Satellite TV (Astra / BSkyB); Local MMDS services

Table An.B.3: Current use of spectrum for broadcasting or related services

The first session of a two session ITU planning conference took place in May 2004. The second session will take place in May 2006. This Regional Radio Communications Conference (RRC) will re-plan the broadcast bands III, IV and V, currently covered by the Stockholm Agreement. The plan that will be agreed at the RRC will form the basis for VHF/UHF broadcasting for possibly the next 20 to 30 years. ComReg together with the BCI and RTÉ is assisting the Department in the work of this conference.

Co-ordination is completed for a transitional DTT plan. The new ITU plan and agreement may also address the period immediately after RRC-06. ComReg will in the meantime continue preparations for the RRC-06.

ComReg continues to monitor the development of other digital systems. At the Maastricht 2002 planning meeting Ireland obtained allotment frequencies in the 1.5 GHz (1452 MHz to 1479.5 MHz) band for DAB based on county and city allotment areas.

B.4.2 Key Drivers

The drivers of future spectrum demand for broadcasting will be dependent on the manner in which digital TV and digital radio evolves. The DCMNR have stated that they are committed to providing a free-to-air digital service and will set a date for analogue switch over. The eventual rollout of a digital terrestrial platform to complement and eventually replace the existing analogue network is likely to be inevitable in the long term, assuming the rest of Europe migrates (since it is unlikely manufacturers would continue to produce analogue sets for such a small market). But given the timescales agreed at the recent Regional Radio Conference this could be a decade or more away. Demand could also arise for access to UHF spectrum for the delivery of mobile content using technologies such as DVB-H.

There is a more immediate demand for additional FM radio services, particularly in the urban areas and to cater for specialist content. Due to the importance attached to broadcasting from a political, social and cultural perspective broadcasting has been, and no doubt will continue to be, afforded a prominent position in both National and International spectrum allocation policies.

B.4.3 Economic Contribution

GDP and employment impacts

The economic contribution of the broadcasting sector comprises the GDP and employment associated with the operations of RTÉ, independent national terrestrial TV, independent commercial radio, cable/MMDS and satellite pay TV. Given that subscribers to BSkyB services pay VAT at 17.5% it is assumed that the revenues from services supplied to Irish Sky subscribers contribute to UK GDP (with the possible exception of related services such as installation, maintenance etc...) It is also assumed that employment in this area is negligible.

In addition to the broadcasters and pay TV operators there are forward linkages to the advertising industry and wider economic effects. Data from annual reports of the broadcasting operators were used to calculate these effects together with the consultant's estimate of the scale of the advertising industry based on assumptions that agency commission and production costs each comprise 15% of gross advertiser expenditures[39].

In the case of MMDS services, we have assumed that 10% of the GDP and employment of the cable/MMDS operators can be attributed to MMDS, as about 10% of their subscribers receive their service via MMDS. We have only included data for NTL, as the 2002 and 2003 annual accounts for Chorus have not been filed, possibly because the company went bankrupt in this time.

	GDP		**Employment**	
	2002	2003	2002	2003
TV and radio	143	183	3211	3202
Advertising industry	50	53	510	534
Sub-total	193	236	3721	3736
Multiplier effects	19	24	372	374
Total	212	260	4093	4110

Table An.B.4: GDP and employment impacts associated with broadcasting

(Source: Indepen and Aegis analysis, Company annual reports)

[39] These assumptions are based on discussions with the Institute of Advertising Practitioners in Ireland. 15% is the standard agency commission on advertising deals, although discounts may be negotiated for large deals. The industry norm for the ratio of production to media expenditure in Ireland has historically been 20:80, though ratios differ widely depending on the product or service being advertised and there has been a trend to source an increasing amount of production outside Ireland – for cost reasons and as advertising agencies consolidate globally.

Consumer surplus

As stated elsewhere, consumer surplus is the cumulative difference between the willingness to pay for a good or service and the actual price paid. Estimates of Irish households' willingness to pay for RTÉ's services (general interest broadcast services) are reported in Delaney and O'Toole (2004)[40]. These give a mean household willingness to pay for RTÉ's services at the end of 2002, of €252.6 as compared with the current TV licence fee of €152[41], suggesting an average consumer surplus of about €100 per household and an overall aggregate surplus of €129 million. These estimates do not include the value individuals derive from watching or listening to non-RTÉ services and so provide a lower bound on the consumer surplus derived from broadcasting.

In respect of the non-RTÉ services, these mainly consist of TV3, Today FM, independent commercial radio, UK terrestrial TV services and cable/MMDS and satellite services. For comparison, estimates of the value to UK consumers of UK terrestrial TV and BSkyB services that have been derived by the UK Radiocommunications Agency and the BBC are provided. The values for UK terrestrial and satellite services are shown in Table An.B.5. These suggest that UK consumers enjoy considerable consumer surplus from their domestic terrestrial services, but not from Sky services, presumably because the pricing structure for the latter extracts most of the surplus.

One approach, to obtaining a more comprehensive value for Irish viewers would be to up rate the estimates for RTÉ by the relative proportion of time spent watching non-RTÉ services (TV3 and UK terrestrial services) versus RTÉ TV services. Cable and satellite services have not been included as based on the UK estimates, and in the absence of any Irish data on willingness to pay for these services, we are making the assumption that the consumer surplus related to these services is nil, as the companies' pricing structure extracts most of the surplus. It should be noted that this may result in an underestimation of the consumer surplus for broadcasting services in Ireland. The approach taken gives a consumer surplus value of around €290 million.

[40] Irish Public Service Broadcasting: A Contingent Valuation Analysis, L Delaney and F O'Toole, February 2004, Trinity College, University of Dublin.

[41] The Minister for Communications, marine and Natural Resources, Noel Dempsey T.D, announced on the 29 December 2004 that he has decided to increase the cost of a television licence fee by €3 (2%) with effect from 1 April 2005.

	Value/household (€/year)	Consumer surplus/household (€/year)
Radiocommunications Agency (2000)[42]		
Terrestrial TV	271	52
Satellite	278-452	0
BBC (2004)[43]		
TV and radio	325[44]	151

Table An.B.5: UK willingness to pay and consumer surplus estimates

B.4.4 Approaches to Licensing Broadcasting

In this section we consider approaches to licensing broadcasting use of spectrum. Most free to air broadcasting services are required to meet certain public interest obligations in regard to the type of content that should be delivered and their coverage. For terrestrial services, coverage requirements are fulfilled by the licensing of spectrum/transmitters in order to ensure adequate reception in the desired area. Content requirements are usually attached to broadcast service licences and not frequency licences. Broadcast licences and the associated frequency licences are usually assigned together and their assignment is either the responsibility of government or the broadcasting regulator.

In Ireland, the Government is responsible for broadcasting policy and the framework under which decisions concerning the assignment of broadcasting spectrum are taken. Content requirements are contained in primary legislation and also in the "Public Service Broadcasting Charter" (which applies to RTÉ) and BCI contracts (covering independent broadcasters) and not spectrum/transmitter licences. ComReg undertakes the largely technical tasks associated with international co-ordination of the broadcast spectrum and spectrum planning, making spectrum available for use by sound broadcasters on request from the Broadcasting Commission of Ireland. ComReg issues the spectrum /apparatus licences to the BCI and the RTE Authority under broadcasting legislation. There is no mechanism under the Broadcasting Act for ComReg to charge broadcasters a spectrum-rights-of use fee[45].

However, the MMDS operators licensed under the 1926 Act are subject to administrative charges as well as a licence fee and therefore already pay for their use of the spectrum.

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[42] Survey to determine the consumers' surplus accruing to viewers and radio listeners, MVA, in association with Aegis Systems, Radiocommunications Agency, October 2000.

[43] Measuring success at the BBC, James Thickett, June 2004, presentation to British Library conference Demonstrating Value, June 2004.

[44] This is the value to the individuals in the household. When respondents were asked to consider the value to society as a whole values increased by 25%.

[45] This issue is discussed more fully in "Submission re Review of Radio Licensing", ComReg 04/102, 20 September 2004.

B.4.5 Proposed ComReg Strategy for Sound Broadcasting

- monitor the development of digital modulation techniques that have the potential to replace the analogue service with high quality broadcast services in the short wave, medium wave and long wave broadcast bands;

- ensure present operator compliance and protect authorised services from illegal spectrum use;

- prepare positions for ITU Conference RRC-06.

B.4.6 Proposed ComReg Strategy for Television Broadcasting

- ensure present operator compliance and protect authorised services from interference;

- prepare for RRC-06: ComReg is working with the BCI RTÉ and the DCMNR in preparation for the forthcoming 2006 Regional Radio Conference to re-plan the broadcast bands III, IV and V, currently covered by the Stockholm Agreement. The frequency plan(s) to be agreed at the RRC will form the basis for VHF/UHF broadcasting in Europe for possibly the next 20 to 30 years;

- As mentioned in the section under Public Mobile Systems ComReg is keeping an open mind on the issue of MMDS and IMT-2000/UMTS in the 2500 – 2690 MHz band.

B.5 The Terrestrial Fixed Services

B.5.1 Introduction

The Terrestrial Fixed Services can be divided up into two main groups:

- Point-to-Point Links;

- Point-to-Multipoint systems.

And in the case of Point-to-Multipoint systems, further subdivided into:

- Point-to-Multipoint links;

- Wireless Broadband Services (FWA) (see section B.6).

Point to point terrestrial links (fixed links) provide communications between two fixed stations with a clear line of site between them separated by distances typically ranging from a few kilometres up to 50 kilometres. They are used mainly by telecommunications operators, mobile phone operators, broadcasters, utilities, and the emergency services to provide transmission networks which are cheaper to build than fibre based networks. They are used extensively in fixed telecommunications networks both to carry trunk traffic and to provide broadband access networks. As a

result, fixed links play a vital role in the development of a competitive telecommunications industry in Ireland.

There are currently over 4,000 licensed fixed links in Ireland. The majority of fixed links use the frequency bands above 1000 MHz (1 GHz). The frequency bands between 3 - 11 GHz are suitable for the development of long distance, high capacity infrastructure radio networks. Access networks generally occupy the bands above 12 GHz. The pressure on the spectrum allocated to fixed links is expected to continue to increase as the demand for alternatives to copper and fibre infrastructure, particularly in the access network, continues to grow.

Currently point to multipoint links are mainly used for telemetry systems or SCADA applications by public utilities and alarm monitoring companies. In some rural areas they are also used for the provision of basic telephony services.

Radio Links are licensed under the Radio Links Regulations S.I. 319 of 1992.

In 2004, ComReg carried out an internal review of the usage of spectrum for Fixed Services in Ireland. Following on from this ComReg expects to start a programme of compliance audits and investigations in early 2005 aimed at enhancing the use of the fixed service bands.

In relation to electronic licensing, ComReg commenced an online e-payments scheme for licence applications and is working towards the online licence application system which is expected to commence in 2005.

B.5.2 Key Drivers

By European standards, reliance on radio links for infrastructure is relatively high in Ireland, reflecting the hilly terrain, low population, largely rural population and high cost of fibre infrastructure. The comparison in Figure An.B.3 is based on link data supplied to CEPT in 2002, normalised by population.

The success of the cellular (GSM networks) and the development of new transmission networks to support telecommunications services, for example 3G, has meant that the demand for fixed links has continued to grow. Broadcasters (notably RTÉ), public utilities and fixed telecommunications providers also continue to use links for their national or regional transmission networks. The value of fixed link spectrum is therefore highly significant in terms of facilitating the rollout of high value business and consumer services like mobile telephony, access to broadband services and TV broadcasting.

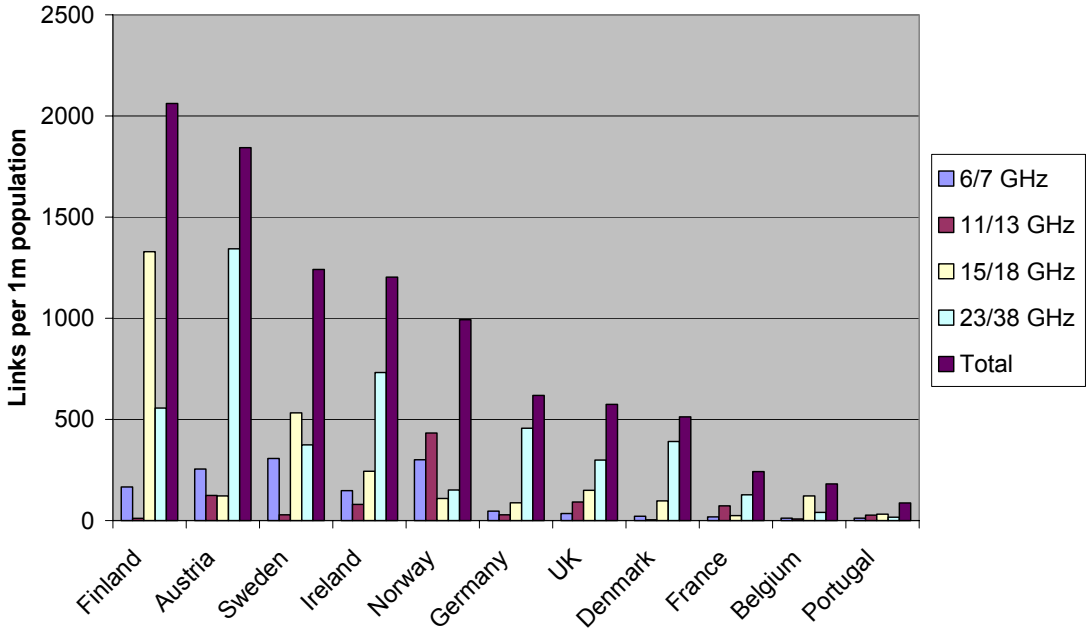

Figure An.B.3: Fixed links relative to population in various European countries

As can be seen in Figure An.B.4, in recent years, demand growth has been concentrated in the higher frequency bands, driven by urban and suburban infrastructure requirements of mobile networks. Demand in lower frequencies has declined as backbone networks have migrated to fibre.

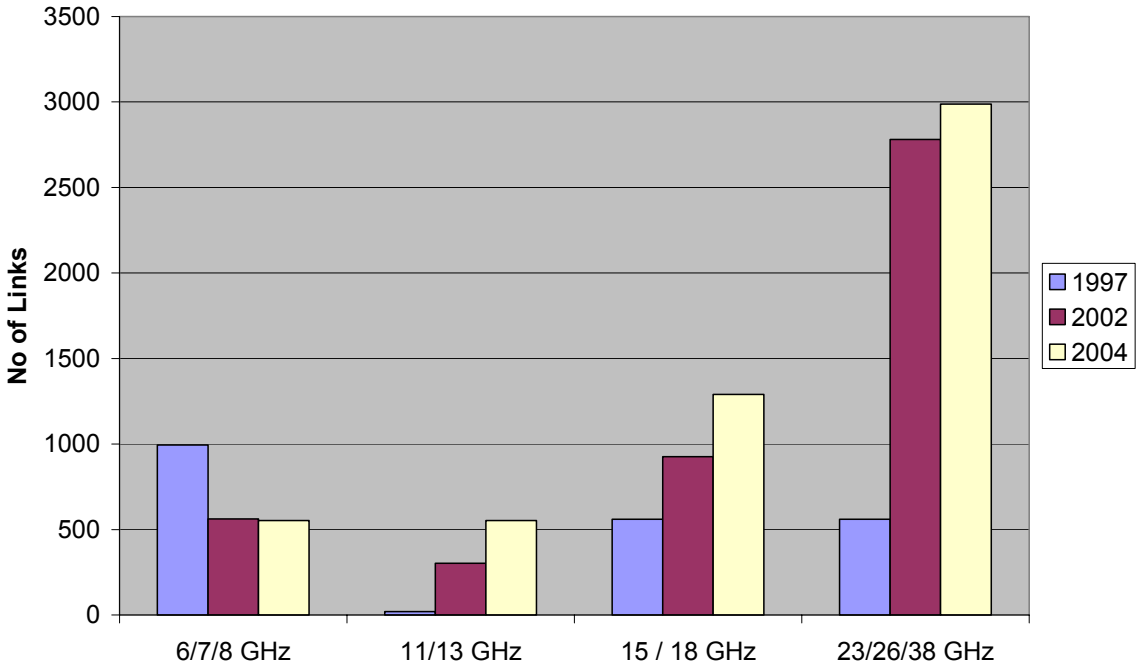

Figure An.B.4: Fixed Link growth in Ireland by frequency, 1997 – 2004

B.5.3 Economic Contribution

GDP and employment impacts

Fixed links are primarily used to support the activities of cellular operators, public utilities, broadcasters and fixed telecoms providers. Estimates have already been made of the economic contribution of cellular operators and broadcasters and these will include the economic activity (GDP and employment) associated with the operation of their fixed link networks. However, so far, the economic benefits from use of fixed links by fixed telecom operators, utilities, the emergency services and private companies has not been counted. Two options for estimating these benefits are to: 1) calculate the value of the activity associated with investment in and maintenance of fixed links or 2) calculate the value of the activity supported by the fixed links. As data was not available on the latter the first approach has been adopted.

If we assume that:

- annual maintenance costs are 12% of the capital cost of the equipment, where this depends on the equipment bandwidth;
- there are 463 links that are not used by mobile operators or broadcasters;
- the average cost of a maintenance engineer is €45,000.

This gives a total economic contribution of about €1m and implies employment of about 20 engineers.

Efficiency benefits

Fixed links are not supplied to final consumers and so consumer surplus is not a relevant measure of benefit. An analogous measure is the efficiency benefit (i.e. cost reductions) that fixed links offer to users, as compared with the use of alternative technologies or services such as leased lines and dark fibre. For fixed links deployed in locations where these services are not available the alternatives would either be a satellite link or laying a new copper or fibre link.

To calculate the efficiency benefit from use of fixed links we have distinguished between links used for access and those used to provide a network backbone. It is assumed that:

- All backbone links are STM-1 and link cities together. The distance between cities is assumed to be 200km on average and that this is equivalent to four 50km fixed links;
- Access links are 10km in length and have an average capacity of 34 Mbit/s;
- In 2002/2003 there were roughly 1000 backbone links and 3000 access links the cost of fixed links is compared with the minimum of the cost of a leased line and new fibre. This gives a total efficiency gain of €644m.

B.5.4 Approaches to Licensing Fixed Services

In Ireland, all fixed link bands are shared between users and the relevant frequency bands are managed by ComReg to minimise interference to neighbouring operators. In order to ensure the most efficient use of the spectrum and to avoid harmful interference, ComReg has also established guidelines for users which detail the application process, the frequency bands, link length policies, and the technical parameters associated with link licensing (ComReg 98/14R3).

ComReg currently has a policy not to assign blocks of radio spectrum for radio point to point systems. This is to ensure optimum use of the radio spectrum for the benefit of the maximum number of users. This is clearly the case if there are a large number of smaller users as only a few would be able to obtain access to spectrum unless some of the bands were managed by a third party. ComReg is considering a review of this strategy to ascertain if there are circumstances where the use of a block of spectrum may lead to improved efficiencies and if so, how and where could we facilitate this use.

B.5.5 Proposed ComReg Strategy for Fixed Services

ComReg considers that in the long term, fibre infrastructure is the most appropriate medium for emerging broadband services, in particular for those networks requiring very high capacity. However, it is recognised that radio links facilitate the early development of infrastructure and competition in the provision of electronic communications services, especially in rural areas. In this regard, ComReg's short to medium term strategy is to encourage the use of fixed links for infrastructure and competition development, for the maximum benefit of all licensees and in particular new market entrants. As networks develop and as congestion in the fixed links bands grow, the strategy will be to encourage established fixed link licensees to migrate to fibre based infrastructure.

Strategy for the next 2-5 years:

- ComReg will review the spectrum usage and requirements of licensees to ensure the continued efficient use of spectrum;

- ComReg will encourage operators to use the latest technology such as CCDP equipment or higher modulation schemes in order to ensure efficient use of the spectrum;

- ComReg will study the introduction of administrative incentive pricing to encourage the use of more bandwidth efficient technologies in congested bands/areas;

- ComReg will study sharing implications between Satellite and Fixed services in the 4 GHz band which is currently unused in Ireland. This band could be used for the provision of further national networks;

- ComReg to review its current licensing strategy to ascertain if there are circumstances where the licensing of a block of spectrum may lead to

improved efficiencies and if so, how and in what spectrum, could we facilitate this type of licensing approach;

- A liberalised approach is being considered in the use of the 4 GHz band to allow market forces to decide the best use of the band e.g. Fixed or FWA;

- ComReg will study the use of the 26 GHz band with a view to developing it for point to multipoint spectrum (see also Wireless Broadband services below);

- ComReg will study the potential and demand for new fixed links bands e.g. 58 GHz;

- ComReg will review the fixed links frequency bands with a view to rationalising the use of these bands where this makes sense and where the disruption to existing licensees is minimal;

- It is the intention to clear all remaining links from the old 1.5 GHz band to allow future introduction of TDAB in this band.

B.6 Wireless Broadband Services

B.6.1 Introduction

Wireless Broadband Services (WBS) refers to the delivery of broadband access services to residential or business users by terrestrial wireless networks (also known as Broadband Wireless Access). WBS provides an alternative to wired solutions such as digital subscriber line (DSL) or cable, providing competition to incumbent operators and extending broadband access in 'the last mile' to areas where wired solutions are technically or economically unviable.

Wireless connectivity is generally supported by a base-station, connected to the operator's core-network, communicating over the air to multiple customer units. This type of network architecture is referred to as 'Point-to-Multipoint' and is the predominant architecture employed in existing networks. However, other architectures such as 'Mesh' configurations or 'Point-to-Point' may be employed to provide similar connectivity.

Wireless Broadband can be used to replicate the existing copper local access, providing traditional voice telephony but also direct access to broadband data networks such as the Internet. Indeed, developments in wireless broadband technologies are becoming predominantly data-centric. Previously a limitation of wireless broadband systems was the requirement to have a direct 'line-of-sight' between the operator's base station and the customer's transceiver. This requirement limited the number of potential customers within the service area of any given base-station and also required an operator 'truck roll' to install an antenna on the eaves or roof of each customer premises. Advancements in digital signal processing have facilitated the commercial development of modulation techniques which, when employed in wireless broadband technology, can facilitate 'non-line-of-sight'

deployments and use of a desktop radio modem instead of eaves mounted antennas, etc.

WBS, were first licensed in Ireland under the ODTR's Fixed Wireless Point-to-Multipoint Access (FWPMA) initiative in 1999. A comparative selection procedure led to the licensing of four national broadband networks in the 26 GHz frequency band, operated by eircom, Esat BT, Formus and Princes Holdings (Chorus). Three narrowband national FWPMA licences were also awarded, two in the 3.5 GHz band (eircom and Chorus) and one in the 2.4 GHz band (Esat BT). However, in common with other European countries, the fixed wireless market failed to develop in line with expectations and a number of these licences subsequently lapsed. Currently two of the 26 GHz networks remain active, operated by eircom and Esat BT. Eircom also continues to operate a national narrow band network in the 3.5 GHz band.

Following a public consultation in 2002, ComReg developed the Fixed Wireless Access Local Area (FWALA) licensing scheme. This scheme introduced a novel approach to licensing wireless broadband services, by licensing on a local area basis, providing opportunities for operators to deploy scalable networks and lowering barriers to entry in this market. Since March 2003 the FWALA licensing scheme has been introduced in the 3.5 GHz, 10.5 GHz and 26 GHz band. In total, to date, 77 (74 in 3.5 GHz and 3 in 10.5 GHz) local area licences have been issued to 9 different operators ranging from those wishing only to provide service in their own locality to those with national roll-out aspirations. For further information relating to the FWALA licensing schemes and the locations of licensed local areas see the ComReg web-site (ref: www.comreg.ie/FWABroadband/FWABroadband.asp). In order to offer further support to FWALA licensees ComReg has established a FWALA licensee forum to facilitate discussion and resolution of the any issues of common interest to the licensees.

Figure An.B.5 on the next page indicates the current (October 2004) licensed Local Areas under the FWALA licensing scheme using the 3.5 GHz and 10.5 GHz bands. The black circles indicate the licensed 'Service Areas', which are the areas within which the licensee can deploy radio equipment under that particular licence. It should be noted that licensees are not obligated to provide service to every part of the service area, therefore the usual health warning applies in terms of service being subject to survey, some systems may require line of sight etc. In addition, some areas (e.g. Dublin and Galway) have up to 4 local licences issued each on a different frequency. For clarity in Figure An.B.5 only one indicative circle is included for a licensed area (i.e. the circle in Galway is representative of the 4 licences for that area).

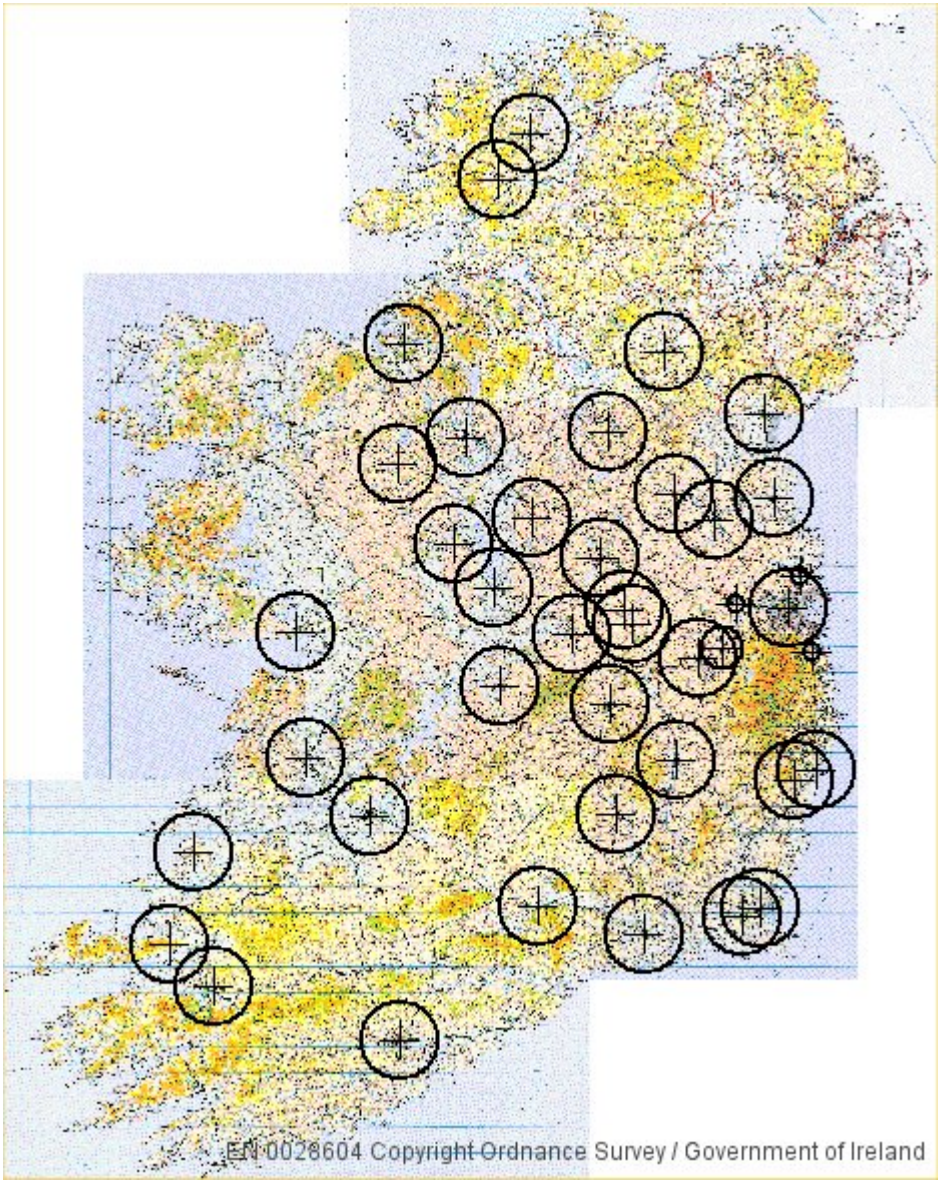

Figure An.B.5: FWALA Licences in Ireland at December 2004.

B.6.2 Key Drivers

The key drivers of the wireless broadband access market are likely to be the same as those for other broadband platforms such as ADSL and cable. Current penetration of broadband services in Ireland is low by European standards (see Figure An.B.6 below), yet there is no reason to suppose that if demand is stimulated that Ireland should not be at the EU average in coming years. The lack of cable broadband provision and the slower roll out of DSL on eircom's legacy copper network have put Ireland behind the EU Average. In such an environment wireless provision has the potential to gain a substantially greater share of the broadband market than in other countries with widespread ADSL and cable availability.

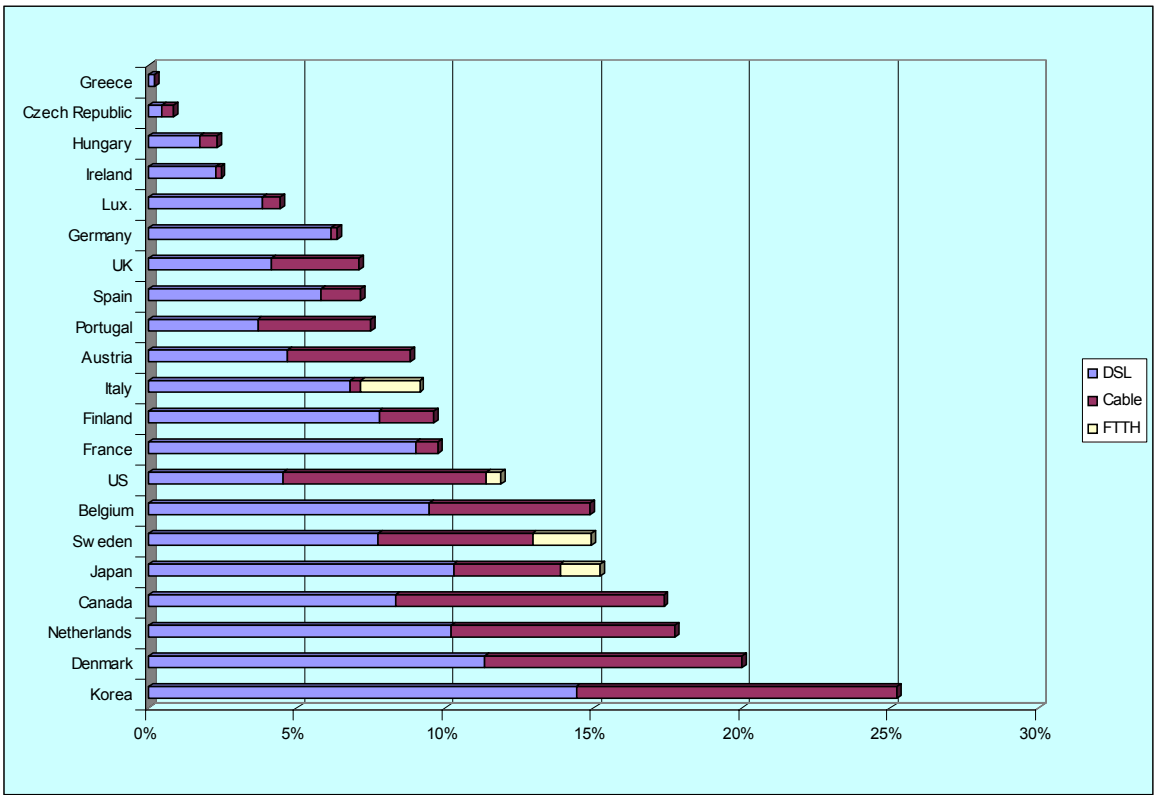

Figure An.B.6: Overall broadband take-up in 21 countries (3rd Qt. 2004)

(Source: Point-Topic, ECTA, Ofcom, Converge, FTTH Council)

Undoubtedly, technology developments and lowering price points (particularly for IP based platforms) are now making wireless solutions far more attractive, not only for access but also back-haul. In addition, a wireless solution allows a rapid network roll out without the obvious costly and time-consuming activities such as road-digs, etc.

Finally, there is renewed interest and confidence in broadband wireless access with the development of WiMAX (World interoperability for Microwave Access). The WiMAX forum is an industry group supporting the IEEE 802.16 standard for broadband wireless access but more importantly promoting worldwide interoperability between vendors. The WiMAX forum will design and conduct interoperability conformance testing to ensure different vendor products will operate seamlessly with one another. For the industry this carries the promise of widespread deployment and bulk chip manufacture, driving down equipment cost, particularly the customer equipment. Many believe that similar to how Wi-Fi capability is now built into laptop computers as standard, soon WiMAX capability will be the next generation laptop standard.

B.6.3 Economic Contribution

Introduction

FWA services have so far failed to make any significant inroads in developed countries. However, the emergence of new technologies that enable the use of low cost indoor terminals make the economic case for FWA potentially much stronger. A recent study by IDC Research[46] addressed FWA in the Australian market and suggested that by 2008, FWA would have a 7% share of the Australian broadband market, generating a total revenue of AU$278 million (up from AU$ 22M in 2004). According to IDC's forecasts, the residential market would dominate, as the following graph shows:

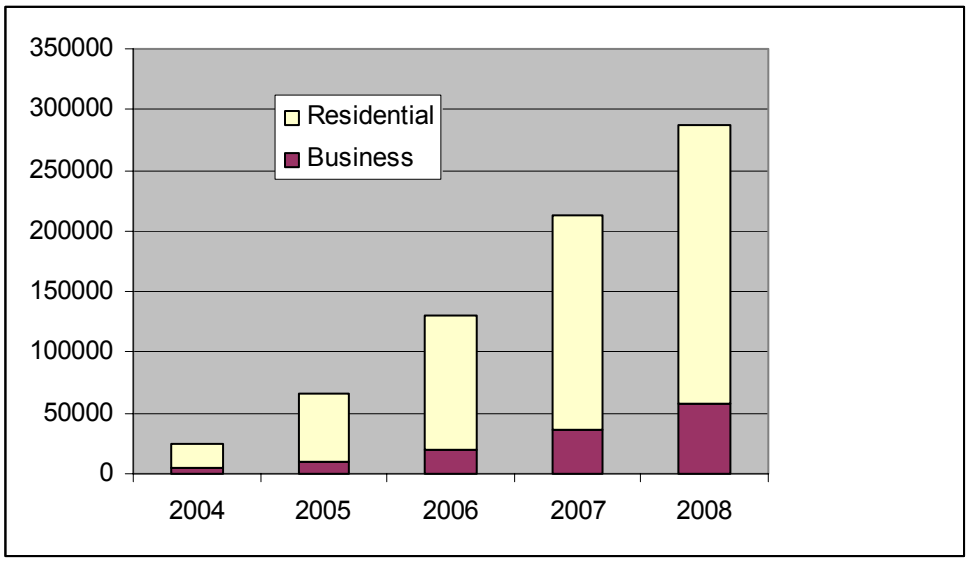

Figure An.B.7: IDC Forecast of Residential Market Domination

It is difficult to quantify the investment so far in wireless broadband networks in Ireland, as much of the investment to date has been by established operators who use multiple platforms. However in December 2003, Irish Broadband announced it was aiming to secure second round financing worth €10 -20M by the end of 2004. The company hoped to become cash-flow positive in 2005. The company has also expressed an interest in entering the UK FWA market.

GDP and Employment Impacts

Based on the information available to ComReg it appears that for the time period under study, namely 2002 and 2003 the economic contribution of FWA services was small because of the limited scope of their operations. As operators will have been investing heavily in 2003, with little if any revenues, the GDP impact was probably negative as most equipment is imported, though there will be a positive employment impact.

[46] Reported in Broadband Markets, October 2004

The potential impact of broadband on GDP in the UK has also been estimated by cebr (2003). They argue that the deployment of broadband could increase GDP in 2015 by between £5 and £21bn because of the positive impact on labour productivity[47]. If impacts of a similar order of magnitude applied in Ireland, scaled by the relative size of the Irish economy, then broadband could contribute €0.75-3bn to the Irish economy by 2015.

Consumer Surplus

Information is not available to measure the consumer surplus from broadband in Ireland, however, the potential benefits, measured in terms of consumer surplus from broadband could be considerable. Crandall and Jackson (2001)[48] have estimated that for the US the NPV of these benefits could range from $50-$300bn assuming ubiquitous penetration by 2025. In the UK, Volterra has estimated that over the period 2001-2003 the gains to consumers were of the order of £300m and these could rise to £2bn a year by 2010, assuming 50% penetration by this time[49].

Again pro-rating these results for Ireland (based on GDP), the benefits could be of the order of €250m/year by 2010.

B.6.4 Approaches to Licensing WBS

European FWA licences have been awarded using a number of different approaches, notably auctions, comparative selection and first-come first-served. Where auctions or comparative selection have been deployed, results have been mixed. Early comparative selection processes, including the first round of FWPMA licences in Ireland, invited applicants to propose coverage and other service-related commitments against which the applications would be judged. However, the subsequent market demand for services proved to be insufficient to justify the investment required to meet these obligations and as a result many operators withdrew from the market. This was largely due to the rapid growth in availability of low cost DSL and cable broadband services in most EU countries. Complex selection criteria and the scale of coverage required (e.g., national) also led to significant costs which were not reflected in the revenue streams that were eventually generated by FWA services.

Auctions were used in the UK for regional FWA licences in the 26 GHz and 3.5 GHz bands. In the former case, the majority of the licences remained unsold as bidders were unwilling to pay the reserve prices that had been set. However the 3.5 GHz licences were successfully auctioned and services are now being rolled out in this band. In Ireland, a simplified comparative selection procedure based on tariff commitments and a performance bond was used for the award of FWALA licences, with any remaining licences being awarded on a first-come first-served basis. This

[47] The economic impact of a competitive market for broadband, A cebr report for the Broadband Industry Group, November 2003.

[48] The $500 billion opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access, Crandall and Jackson, July 2001; Ch 13 of Broadband: Should we regulate high-speed Internet Access, Crandall and Alleman, AEI-Brookings, 2002

[49] Broadband: Estimating the value of the benefits to users, Volterra Consulting, April 2004.

led to the award of 77 licences and services are already being rolled out. A first-come first-served approach has also been successfully used in Finland and Denmark.

Considering the current state of the market for broadband services, the optimum approach to licensing FWA services appears therefore to be to match the scale of the licence requirements to realistic market scenarios. Either an auction or comparative selection procedure can be used in the first instance as appropriate, with any remaining licences being offered on a first come first served basis. If an auction is chosen, a low reserve price should be applied, but it may be appropriate to require a refundable performance bond in addition to the auction payment linked to a commitment to provide service by a certain date, to ensure that bidders are serious. If comparative selection is used, criteria should be simple and transparent to minimise costs and timescales associated with the licensing process. The ability to trade spectrum rights might also be a useful tool given the relative uncertainty of this market.

B.6.5 Licence Exempt FWA Services

A number of initiatives are underway in Europe to develop licence-exempt FWA services. Following a public consultation in 2002 ComReg led Europe with the introduction of licence exempt wireless broadband access in the 5.8 GHz band (5725 - 5875 MHz). Currently ComReg is chairing a CEPT Project Team (SE38) examining sharing scenarios with other services in the 5.8 GHz band in Europe with a view to developing a harmonised approach to 5.8 GHz wireless broadband access across Europe.

In Ireland a number of operators have launched public wireless data services in the 5.8 GHz band. In some cases operators have subsequently acquired FWALA licences, having successfully tested the market in the licence-exempt bands. In general, licensed bands are preferred where an assured grade of service is required, but licence exempt spectrum can be used to extend the reach of licensed services using low cost wireless hot-spots.

For example, France Telecom's R&D Division has launched a pilot FWA network in Brittany using Aperto Networks' 3.5 GHz broadband wireless PacketWave technology. Applications being explored include backhaul to Wi-Fi hotspots, as well as delivery of high-speed Internet access and direct broadband access to customers. In Belgium, plans were recently announced for 4,000 people to test wireless internet in the Belgian cities of Hasselt and Leuven, as part of a pilot project by Concentra Media, Microsoft, Telenet, Siemens, Fujitsu-Siemens and the city of Hasselt. The Flemish government would also take part in the project, known as "I-city", which was due to start in September 2004. Wi-Fi hotspots will be built throughout the cities and depending on the results of the project, the services will be expanded.

The USA has recently announced a proposal to use 50 MHz of spectrum in the 3650 - 3700 MHz band for licence-exempt Wi-Fi type devices. The FCC is proposing the use of this spectrum for higher powered applications than are currently allowed in the 2.4 GHz band and is envisaging the use of cognitive radio technologies to reduce the possibility of interference. The aim is to provide broadband access services to rural area more economically than can be done with existing licensed or licence-exempt options.

B.6.6 Proposed ComReg Strategy for WBS

- ComReg will continue the work of the FWALA Operators Forum, the objectives of which include promoting FWA as a viable & reliable alternative platform for the provision of electronic communications services;

- ComReg will continue to identify appropriate spectrum allocations, both licensed and licence-exempt, for Wireless Broadband Services which are supported, or likely to be supported, by ready availability of choice of equipment;

- ComReg will also carry out a comprehensive review of the 26 GHz band in early 2005 in order to rationalise the use of the band and improve its usefulness to a range of services;

- Promote the Trial Licence scheme[50] as an ideal opportunity to trial new WBS technologies such as mobile versions of WiMAX in Ireland.

B.7 Licence Exempt Services

B.7.1 Short Range Devices

Among the most prevalent radio systems in Ireland are Short Range Devices (SRDs). These are uni-directional (one-way) and bi-directional (two-way) low power radio transmitters that serve a multitude of purposes e.g. car door openers, baby alarms, wireless microphones and wireless local area networks (WLANs). SRDs are deployed in both private and commercial scenarios. Private applications range from medical implants to cordless telephones while commercial applications include public access wireless hotspots. Additionally, SRDs are used for specialised applications such as Road Traffic and Transport Telematics (RTTT) for the management of roads and traffic e.g. automatic road toll collection and traffic information.

SRDs occupy a range of diverse frequencies in the radio spectrum, ranging from kilohertz, through megahertz to gigahertz frequencies. Due to their low power and localised usage, SRDs are regarded as having a low capability of causing interference. Consequently, they have generally been made exempt from the need for individual radio licences in Ireland, subject to certain technical constraints.

Since the last spectrum strategy document was issued in May 2002, new Regulations[51] applicable to SRDs have been brought into force in Ireland. In conjunction with the issuing of these Regulations, ComReg published document 02/71[52] which outlined the requirements for the operation of SRDs in Ireland. The

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[50] See ComReg Document 04/115: Opportunities for Trialling Wireless Services and Technologies in Ireland.

[51] S.I. No. 405 of 2002, Wireless Telegraphy Act, 1926 (Section 3) (Exemption of Short Range Devices) Order, 2002

[52] http://www.comreg.ie/_fileupload/publications/odtr0271.pdf

Regulations provide the legal basis for the exemption from individual licensing of a wide range of SRDs, subject to the criteria laid down in 02/71 being met.

The common position on spectrum allocations for SRDs within CEPT is outlined in ERC Recommendation 70-03 (ERC/REC/70-03). This Recommendation contains the most widely accepted CEPT position with respect to SRDs and provides a useful reference document for Member States. ComReg has participated in and will continue to participate in the CEPT Short range Device Maintenance Group to represent Irish interests on SRD issues.

B.7.1.1 Key Drivers of Short Range Devices

One of the fundamental drivers of the SRD service is the fact that SRDs do not require an individual user licence for operation. This means, that they can be deployed quickly and inexpensively since there is no requirement to wait for a licence to be issued, nor is there any licence cost involved. Additionally, SRDs are produced for the mass market and, as such benefit from harmonised use of spectrum across Europe.

As stated above, although many SRDs are by necessity very low cost devices, they may be deployed in very high volumes and could have a significant impact on the efficiency of certain business processes. For example, RFID devices enable retailers and others involved in distribution chains to keep better control of their stock and are expected to become as ubiquitous as bar codes once their unit cost falls below one cent which is likely to happen within the next decade[53].

Medical implants are increasingly being used as pacemakers, defibrillators and nerve stimulators.

B.7.1.2 Economic Contribution of SRDs

The main economic contribution from SRDs is likely to derive from the efficiency, convenience and flexibility benefits which consumers derive from use of these devices. By their nature we do not know how many SRDs are in use and we are not aware of any estimates of the value consumers derive from such devices. However, even if we simply take the example of remote car immobilisers and assume that all new cars sold since 2000 (more than 800,000)[54] are fitted with these devices; even a relatively small value (say €10) per car would yield a sizeable benefit.

Turning to the GDP and employment contribution, to give three examples of manufacturers of low power radio devices in Ireland; these are Guidant, CEL (Connaught Electronics Ltd.) and Tyco International.

Guidant Corporation designs and develops cardiovascular medical devices. Its facility at Clonmel, Co. Tipperary, manufactures pacemakers and implantable defibrillators. These devices can be monitored and adjusted by doctors using remote

[53] Steven Ashley. August 2004. "Innovations: penny-wise smart labels." Scientific American.

[54] Between 200 and 2003, 679,000 new private cars were licensed. Statistical Yearbook of Ireland 2004.

controls that communicate with the devices using radio. In 2002, Guidant employed 966 people in Ireland and had a turnover of €1.5bn.

Connaught Electronics Limited (CEL) designs, develops and manufactures technologically advanced products for automotive manufacturers and their suppliers, including remote access and security devices. In 2002 it employed 196 people and had a turnover of €32m.

Tyco International operates two facilities in the Cork area. Tyco Sensormatics specialises in the production of RFID devices and Tyco MA/COM specialises in RF and microwave components, employing a team of 45 research and development engineers.

Guidant and Connaught alone had a GDP contribution of €460m and employed 1162 in 2002. As not all the activities of these companies' concern wireless devices and the Guidant data include some of its non-Ireland activities, we have arbitrarily halved these numbers when estimating the overall economic contribution from radio given in Section 5.2.

B.7.1.3 Proposed ComReg Strategy for SRDs

Short range devices are generally exempt from licensing and operate in frequency bands shared with other users and services on a non-interference, non-protected basis. Effectively, this means that they should not cause interference to other spectrum users, nor can they claim protection from interference from other spectrum users.

In Ireland, SRDs are licence exempt subject to meeting certain technical criteria e.g. maximum power levels and reference standards. The technical criteria for the operation of SRDs in Ireland are laid down in ComReg document 02/71. In addition, all SRDs placed on the market are required to comply with the R&TTE Directive.

Concerning SRDs:

- ComReg aims to facilitate new SRD applications by making spectrum available wherever possible for such applications, subject to demand and technical feasibility;
- ComReg has participated in and will continue to actively participate in the relevant CEPT fora where SRD related issues are discussed.

B.7.2 Other Licence Exempt Services

In addition to the SRDs discussed above, there are a number of other licence exempt radio services and applications in Ireland. These include the use of Citizens Band (CB) radio and PMR 446.

B.7.2.1 Key Drivers of Licence Exempt Services

The use of CB radio is likely to remain at current levels as it is mainly used by those who do not want to go down the route of obtaining a radio amateur licence. It is also very much a "cult" application and used, for example, by truck drivers.

In the case of PMR 446 the main advantages are the low cost and easy availability of equipment which lends itself to flexible and occasional use. The main uses are personal (contact with families and friends) as well as light professional (e.g. on a site where workers may need to communicate with each other to facilitate their work). In general the potential for interference is not a concern as it is not intended for professional use. Work is currently ongoing to provide a digital alternative to PMR 446 which will be able to use digital codes to provide a greater degree of protection from interference and also better security.

The use of wireless local area networks is being driven by convergence between home entertainment and computing and the increasing availability of one or more computers in every household. Wireless local area networks are easy to use and install, are low cost and are being heavily promoted in major stores (e.g. PC World). As equipment is becoming available to the IEE 802.11g standard much higher data throughputs have become available that allows video to be streamed throughout the house. It is the use of such devices in the home that will drive the market growth.

The expected exponential growth in the use of Bluetooth devices has not yet materialised. However one area where it should see increasing demand is in the connection of multiple personal devices over short distances. For example Bluetooth devices can be used to easily connect from a computer to a mobile phone, without the need for wired connections, and so provide the down-load of games etc. from the internet onto the mobile. The use of headsets using Bluetooth devices is increasing with the ready availability in retail outlets, reduced costs and the advantages of not needing wired connections that can be damaged when not in use.

B.7.2.2 Economic Contribution of Licence Exempt Services

More than 1.5 million PMR 446 terminals have been sold in the UK since its launch in 1999, according to Ofcom. Assuming similar levels of penetration in Ireland, this would amount to around 100,000 units in Ireland. At a typical cost of €50 and assuming a local retailer's margin of 10%, that implies a contribution of €500,000 over 5 years, or around €100,000 per year. Motorola has forecast that 3.8 million of its PMR 446 terminals will be sold in Europe during 2003.

B.7.2.3 Proposed ComReg Strategy for Licence Exempt Services

- ComReg will facilitate new licence exempt services by making spectrum available wherever possible for such applications, subject to demand and technical feasibility;

- ComReg will continue to exempt services from licensing where this is appropriate in the Irish context;

- ComReg will monitor and contribute to international developments in licence-exempt applications and technologies and ensure these can be accommodated in Ireland.

B.8 Maritime Services

B.8.1 Introduction

Due to the global nature of maritime service, the management of the radio spectrum is largely governed by national and international regulations relating to safety of life at sea. The ITU allocates frequency bands for the operation of maritime services and these permit both long range (in frequency bands below 30 MHz and in Bands allocated to marine satellite services) and shorter range communications. In addition, specific frequency channels are allocated as international distress channels and are required to be kept free from interference at all times. There are also a number of bands allocated to marine communications on a national basis.

In Ireland, the Maritime Radio Affairs Unit (MRAU) of the Department of Communications, Marine and Natural Resources is responsible for marine regulation and for ensuring compliance with legislation requiring certain classes of vessels to install a radio[55] which is to be operated by a properly qualified operator.

Every Irish registered ship that has a radio system installed must carry a Ship Radio Licence issued by ComReg under the WT Act 1926. Radios are not mandatory for owners of recreational craft but many opt to install a radio system on a voluntary basis, in which case they must also obtain a Ship Radio Licence. Licences currently cost €3.81 and must be renewed each year. The number of marine licences has continued to grow steadily over the last five years, with the vast majority of licences being held by owners of recreational craft.

[55] Under the Merchant Shipping (Radio) Rules, 1992, every passenger ship or cargo ship of 300 Gross Tons or above is required to install a radio in compliance with the Global Maritime Distress and Safety System (GMDSS). Similar requirements apply to fishing vessels under the Merchant Shipping Fishing Vessel (Radio Installations) Regulations, 1998.

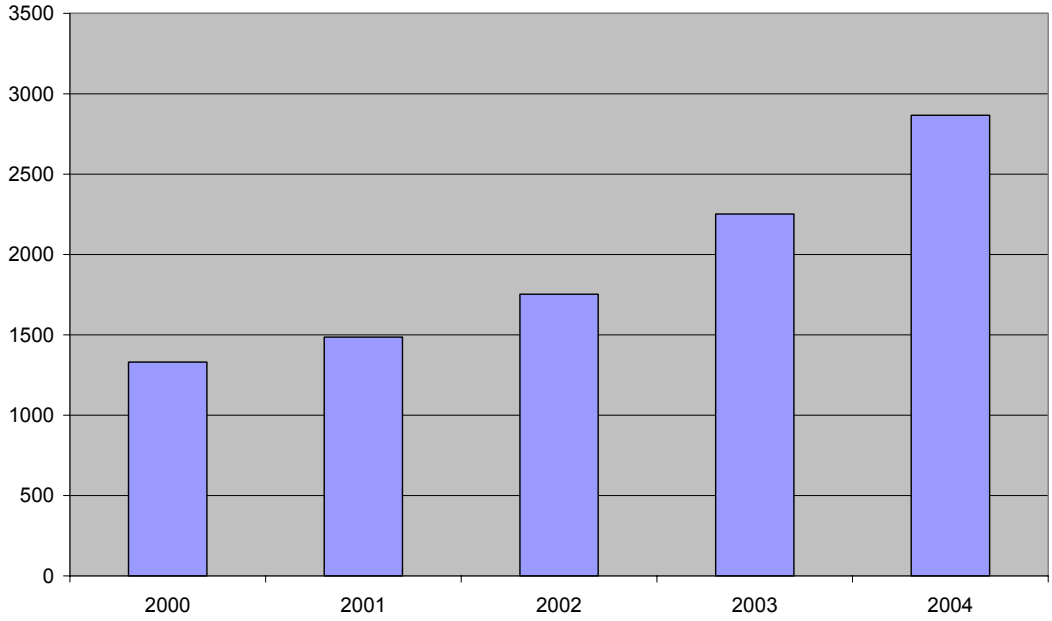

Figure An.B.8: Number of Ships licences (2000-2004)

In addition to bearing the relevant ships radio licence, vessels on which ships radio equipment is installed are required to have a suitably qualified radio operator on board. ComReg is responsible for the issuing of Ships Radio Operator Certificates.

Coastal stations are licensed under the business radio regulations of the WT Act 1926. Land based radar and radionavigation stations also require a licence from ComReg and currently there is no charge for these installations.

B.8.2 Key Drivers

The predominant driver of the maritime radio service in Ireland is the safeguard of life at sea.

Another important driver of the maritime service is compliance with international and European law. The ITU Radio Regulations allocate specific radio frequencies for the maritime services and the European Directives and Decisions lay down specific requirements for the maritime services.

B.8.3 Economic Contribution

Overview

As an island, maritime transportation is vital to the Irish economy and reliable radio communication is essential to the efficient operation of this sector. While Ireland accounts for only 2.2% of the land area of the European Union it has 13% of the marine territory. The Irish seafood industry (fishing, aquaculture, processing and ancillary sectors} employs 16,000 people and sales of Irish seafood are worth

€381m p.a. with exports accounting for 75% of the total[56]. There are 1,400 registered Irish vessels and around 2,500 ships' radio licences in Ireland (many of these are held by leisure craft owners).

The marine sector makes a significant indirect contribution to the Irish economy in terms of improved operational efficiency at ports and marine safety. The combination of long range maritime services with digital technologies and the availability of data services allows more efficient operation of shipping and ferry companies as all necessary paper work can be completed at sea and sent in advance. Although public cellular networks have substituted for maritime mobile services in some inshore applications, these do not have the necessary range to cater for seagoing vessels.

We do not have a direct estimate of the economic contribution of maritime services; however, the data reported below on the scale of shipping and other maritime operations gives an indication of the importance of the efficient operation of ports.

Sector Analysis

Ports and shipping (imports / exports and ferries)
In 2003 the Irish ports handled 46 million tonnes of goods, an increase of 2.8% over the previous year. Goods received increased by 3.3% in comparison with 2002 and goods forwarded by 1.5%. Imports accounted for 72% of the total goods handled and exports accounted for 28%. The number of vessels arriving in 2003 was 17,183, an increase of 1.9%. The total cargo handled has grown steadily since 1997 as shown below:

Year	Approx. cargo handling (Million tonnes)
1997	36
1998	40
1999	43
2000	45
2001	45
2002	45
2003	46

Table An.B.6: Approximate cargo handling per year

According to the Irish Marine Development Office, 99% (by volume) of all Irish trade travels by sea. In monetary terms this represents goods to the value in excess of €130 Billion passing through the Irish maritime transport supply chain in 2003.

In 2003 the ports of Cork, Dublin, Dun Laoghaire and Rosslare handled the following roll-on / roll-off traffic[57]:

[56] Source: Report by Innovation Norway on Irish-Norwegian trade
[57] It should be noted that this traffic is included in the earlier statistics.

Type of traffic	Number
Passenger cars, motorcycles and accompanying trailers / caravans	948,342
Passenger buses	26,223
Trade vehicles (imported or exported)	188,136 (254,000 tonnes)
Freight vehicles / trailers loaded	617,665 (9,543,000 tonnes)
Freight vehicles /trailers empty	104,408

Table An.B.7: Types of traffic handled at Cork, Dublin, Dun Laoghaire and Rosslare in 2003

In a report on the Irish Sea Pilot[58] it was reported that there were 6.665 million sea passengers using the main routes in 2002 and out of this 3.611 million were to ports in Ireland. It was also reported that the ports and shipping sector is a significant employer in the Irish Sea region with in the order of 10,000 – 15,000 people directly employed in the sector. Assuming a similar split in employees to sea passengers there could potentially be in excess of 5,000 people employed. In 1996 it was reported that the four main Irish ports handled just over 4 million passenger movements.

The principal findings of a report into the Economic Impact of Swansea Cork Ferries' service on the Irish Economy in 2000[59] were:

- The total value of the economic activities generated by Swansea Cork Ferries is €34.8 million and 528 full time equivalent jobs. Total traffic carried amounted to 132,000 passengers, 30,000 accompanied vehicles and 3,000 freight units;

- The total contribution of Swansea Cork Ferries' own activities to the Irish economy was €6.13 million and 176 full time equivalent jobs. Direct expenditure was €3.19 million and 94 jobs and indirect €2.95 million and a further 82 jobs.

Over 4,000 people are employed within the Dublin Port estate, 290 of them by Dublin Port Company directly. Export trade through Dublin Port is estimated to be associated with a national employment of 206,000 jobs while import trade for 65,000.

Domestic Boating

The Marine Institute[60] have estimated that domestic boating on the coast and inland waterways generated a €54.6 million contribution to the Irish economy, supporting

[58] The Irish Sea Pilot, undertaken by Posford Haskoning Ltd, report provides combined data for all those geographic areas that are adjacent to the Irish Sea. The report collated statistics on the contribution to the regional economy of the principal sectors which are directly dependent on the Irish Sea.
[59] The report was by Dr. Richard Moloney, Department of Economics, UCC and was for the Swansea Cork ferries and the Port of Cork Company.
[60] This information was provided in a submission by the Marine Institute to the Tourism Policy Review Group.

an estimated 1,600 jobs[61]. A proportion of these sailors will require the use of radio. An estimate of GNP in 1996 for water-based tourism sector is shown below:

Category	Total revenue (£m)	Employees (FTE)	GNP Contribution (£m)
Sailing	15.0	557	11.6
Inland Cruising	26.3	1,022	21.3
General Boating	19.4	688	14.2
Total	60.7	2267	47.1

Table An.B.8: Estimate of GNP in 1996 for the water-based tourism sector

It would probably be reasonable to assume that around 10% of these activities involve the use of radio.

The Marine Institute has also reported from studies that a typically small / medium sized marina (50-80 berths) in a regional location can generate between €380k and €800k and support 20 – 30 full time equivalent jobs. In Ireland there are a large number of marinas[62] and some with in excess of 100 berths such as Dun Laoghaire Marina near Dublin which has 450 berths.

Fisheries

According to a report issued by the Irish Sea Fisheries Board (BIM) in April 2004, the Irish seafood industry (comprising of fishing, aquaculture, processing and ancillary sectors}, employs 16,000 people. In 2003 Irish seafood exports were down by 10.2% to €384 million but the value of seafood sales on the domestic market increased by 3.3% to reach €281 million in 2003, making the total turnover of the sector €665 million. Investment in the industry reached record levels with BIM/EU grant-aided investment of €24.3 million, complemented by a further €60 million in non-grant aided investment in the pelagic sector, making for a total investment of €84 million in 2003.

B.8.4 Proposed ComReg Strategy for Maritime Services

- ComReg will continue to provide support to Ireland at international fora to ensure adequate spectrum is available for maritime services;
- ComReg will continue to prioritise and provide protection from interference to maritime safety of life services;

[61] This information was from a National Marine Leisure Survey undertaken in 1996 by ESRI for the Marine Institute.
[62] In Port Focus there are 17 marinas listed and several more in the Blue Moment cruising directory.

- ComReg will promote the use of spectrum efficient technologies in the maritime bands, thereby maximising the spectrum available for growth and new applications;

- ComReg will ensure spectrum is available for use by new emerging systems, in line with international requirements;

- ComReg is planning to introduce a once-off licensing fee for these services, subject to DCMNR approval. A once-off licence fee of around €500 for new stations is proposed, to cover co-ordination and notification costs;

- ComReg is planning to review the fees associated with these licence types.

B.9 Aeronautical Services

B.9.1 Introduction

Since the bulk of air travel is international in nature, most of the radio spectrum that is used by the aeronautical sector is planned internationally. The ITU Radio Regulations, the International Civil Aviation Organisation (ICAO)[63], Eurocontrol[64] as well as national and European legislation all set down requirements applicable to the aeronautical service. In Ireland, regulation of the aviation industry is the responsibility of the Irish Aviation Authority. ComReg's role in this area is limited to administering the issue of radio licences for on board aircraft, for ground based aeronautical transceivers, radar and radionavigation systems.

Spectrum is allocated internationally for a variety of aeronautical applications, including air-ground voice and data communication, radars and automated landing systems. The safety critical nature of these services and the need to reach high altitudes over great distances means that even distant sources of interference present a major problem hence it is not generally feasible to use aeronautical radio spectrum for other radio services. This in turn means that demand for spectrum is determined internationally and there is little scope for individual countries to deviate from the internally agreed spectrum allocations.

There are currently around 750 aircraft radio licences issued by ComReg.

Aviation traffic is increasing[65] and accordingly so is the demand for radio spectrum for the aeronautical services. The current VHF spectrum allocated to aviation is divided into communications channels, each one 25 kHz wide, with only 760 in total. To cope with the anticipated traffic demand, Europe has decided to increase the number of voice channels and introduced a new system where each existing voice

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[63] http://www.icao.int/

[64] http://www.eurocontrol.int/corporate/public/subsite_homepage/index.html

[65] In September 2004, the average number of flights per days in Ireland was 1,482 in comparison with 1,354 flights per day in September 2001, Source: http://www.eurocontrol.int/statfor/statistics/index.html

channel was divided into 3 new ones, each 8.33 kHz wide. In this way, more voice channels will be available to keep pace with the ever increasing demand. Europe has been implementing 8.33 kHz channel spacing since 1999 for aircraft flying above 24,500 feet and plans to extend this to 19,500 feet from 2006. This effectively means all commercial aircraft will need to migrate to the narrower channels. Nevertheless, Eurocontrol (the European co-ordinator of air traffic control services) predicts that Europe will need further aeronautical mobile channels by 2015[66].

Similarly, data applications which make use of terrestial and satellite networks are being considered to complement normal voice communications. Ireland's geographical position and responsibility for communications in the North Atlantic (Shanwick) control area means that Ireland is a major user of the aeronautical High Frequency (HF) band.

ComReg is committed to providing protection to the safety-related aeronautical service. As such, ComReg will continue to liaise closely with the Irish Aviation Authority in order to ensure that appropriate provisions are in place to safeguard, in particular, the aeronautical services considered to be related to safety. ComReg will also continue to promote the use of spectrum efficient technologies in all of the aeronautical bands and will facilitate the provision of spectrum for use by emerging aeronautical systems.

B.9.2 Key Drivers

Continuing worldwide growth in air traffic and planned enhancement to aeronautical communications (including increased use of data transmission) means that requirements for additional spectrum and/or for alternative uses of existing spectrum are currently under consideration within the international aeronautical community as part of its preparations for the next World Radiocommunication Conference in 2007 (WRC-07). One of the WRC-07 agenda items will consider allocations to the aeronautical radionavigation service in the range 108 MHz to 6 GHz and another will consider possible additional spectrum allocations for aeronautical telecommand and telemetry. Estimates presented within ITU working party 8B have suggested that 60 MHz will be required to cater for aeronautical telemetry in the band 3-30 GHz. to support aircraft development and trials.

B.9.3 Economic Contribution

Traffic growth

Passenger traffic at the three main airports (Dublin, Cork, Shannon) has increased steadily over the last five years, as illustrated in the figure below.

[66] Source: Eurocontrol Newsletter "Skyway 34", August 2004 (http://www.eurocontrol.int/library/skyway/2004/autumn/p04_06.pdf)

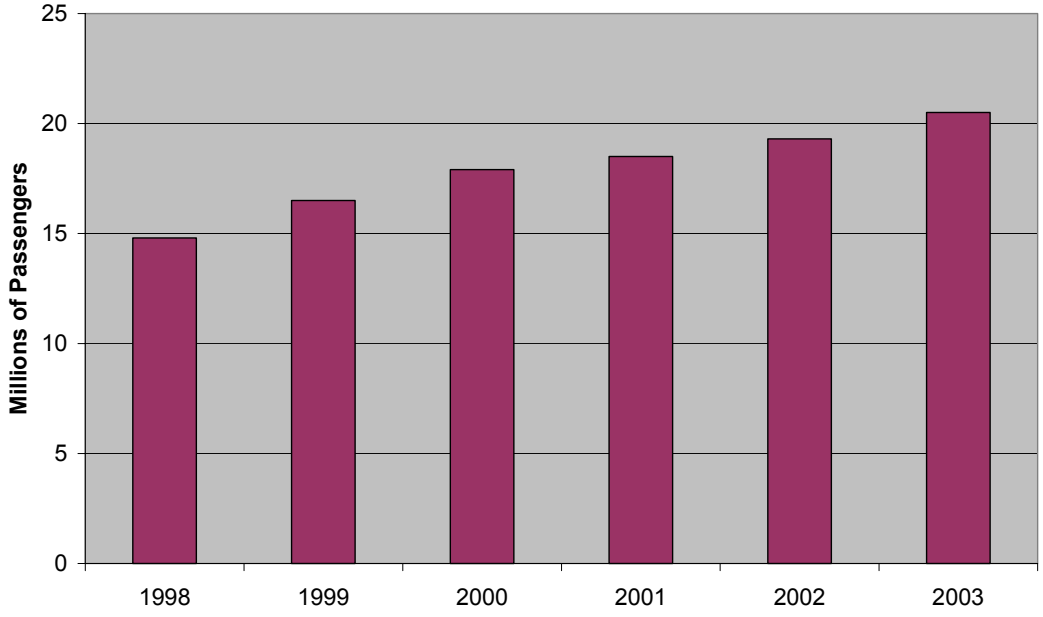

Figure An.B.9: Passenger numbers using Ireland's three main airports
(Source: FAEI)

Domestic and European traffic has also grown sharply in recent years, and the airports operated by Are Riana have expanded to match the growth in traffic and new air traffic facilities have been commissioned. New radio systems have been installed at the airports to support key activities such as baggage handling and aircraft ground movement.

Air Traffic Control (ATC)

Civil air traffic control services in Ireland are provided by the Air Navigation Services Division of the Irish Aviation Authority (IAA), which employs around 300 personnel. 80% of all flights transiting between Europe and North America are controlled by the Shannon ATC centre. Shannon controls these flights as far as 15 degrees west, approximately 400 km off the Irish coast. Beyond here, ATC services are provided by the UK but communication facilities continue to be provided by Ireland, from the Shannon Aeradio facility in Co. Clare. In 2003, the Shannon ATC centre handled over 272,000 air movements and the Dublin centre over 177,000 movements. With the exception of a slight fall in 2002 following the 9/11 incident there has been a steady year on year rise in air traffic controlled by the IAA.

As the most westerly country in Europe, the Irish Aviation Authority (IAA) plays a key role in managing transatlantic air traffic, with over 70% of transatlantic flights being handled by the Shannon control centre. A new air traffic management system and control centre became operational in 2004, processing radar and flight plan information for 500,000 km^2 of Irish airspace. The centre cost €83 million, and the entire project being fully financed by the IAA from its own resources. The system is part of a €115 million investment in buildings and air traffic control systems known collectively as CAIRDE 2000, spread between Shannon and Dublin. ATC facilities include Systems maintained include SMR, SRE and MSSR radars and I.L.S. (GlideSlope, Localiser, IRVR, DVOR, DME, NDB, and Marker Beacons).

Engineers also maintain the Air Ground Communications (both VHF and HF) and the new CAIRDE 2000 Air Traffic Management system.

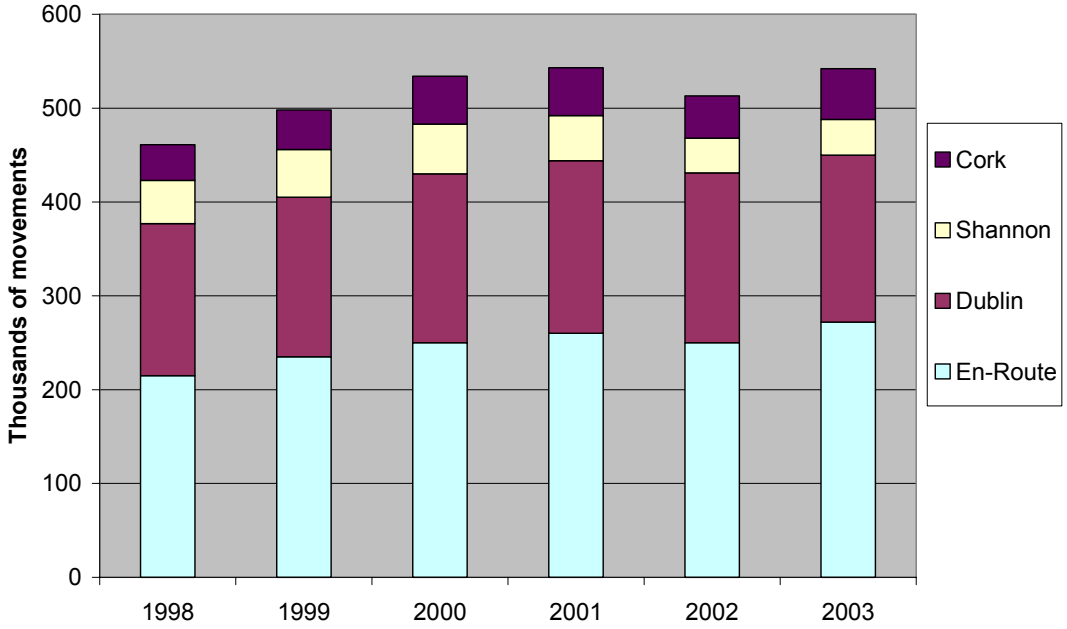

Figure An.B.10: Air Traffic Movements in Ireland, 1998 - 2003
(Source: IAA)

The costs of providing ATC and aeronautical communications services are charged to the airlines and this accounts for over 80% of the IAA's revenue. The current IAA fee for en-route ATC s €31.88 and the en-route communications charge is €37 per contact. An air navigation terminal charge is also applied at the three main airports, at a rate of €1.75 per tonne. With the exception of the Czech Republic and Malta, the ATC fee is the lowest in Europe; by comparison the UK fee is over €80.
Total turnover of the IAA in 2003 was €110.6m, of which en-route ATC and communications accounted for €86.4m. Operating profit before tax was €5.1m.

GDP and Employment Impacts

The aviation and aerospace industries are a major contributor to the Irish economy and a major source of employment. Similar to the maritime services, most of the economic value accruing from aeronautical communications services is indirect. A September 2003 survey by the Federation of Aerospace Enterprises in Ireland (FAEI)[67] estimated that around 15,100 people were employed in this sector, 7,000 of whom were employed by airlines, 2,500 in airports, air traffic control and other infrastructure providers, 4,000 in maintenance, repair and overhaul and the balance in manufacturing and internationally traded services. Employment and GDP for 2002 and 2003 for airlines, Aer Rianta, and the Irish Aviation Authority is estimated directly. The data are shown in Table An.B.9.

[67] see FAEI report "Flight Path to the Future", available at http://www.faei.ie/pressreleases/AeroPagesSK(Mar1).pdf

	GDP (€m)		Employment	
	2002	**2003**	**2002**	**2003**
Airlines	301	339	6777	6683
Aer Rianta	116	159	3431	3387
Irish Aviation Authority	36	47	681	684
Sub-total	453	545	10,889	10.754
Multiplier effects	45	55	1089	1075
Total	498	600	11978	11829

Table An.B.9: GDP and employment impacts associated with aviation

(Source: Indepen and Aegis analysis, company annual reports)

Consumer Surplus

The absence of suitable data means that estimate of consumer surplus associated with aviation in Ireland is not provided. In respect of producer surplus, it is worth noting that the sector is very competitive and as a result does not appear to be earning above normal returns.

B.9.4 Licensing Considerations

In Ireland, aeronautical radio equipment installed on aircraft is required to be licensed under the WT Act, 1926. Such licences are issued by ComReg in liaison with the Irish Aviation Authority (IAA). The technical approval for aircraft station licences is carried out by the IAA. Aircraft licences are subject to a one off fee.

Ground based aeronautical transceivers radar and radionavigation systems are also permitted under the WT Act 1926 and frequencies for such systems are coordinated internationally by ComReg with the technical advice and assistance of the IAA.

In 2004, ComReg issued an exemption order (S.I. 007 of 2004), exempting aeronautical broadband stations, namely Inmarsat and Connexion by Boeing terminals from the requirement of individual radio licensing.

B.9.5 Proposed ComReg Strategy for Aeronautical Services

Aeronautical spectrum is allocated internationally on an exclusive basis and there is little scope for national flexibility. However,

- ComReg will continue to provide support to Ireland at international fora to ensure adequate spectrum is available for aeronautical services;
- ComReg will continue to prioritise and provide protection from interference to aeronautical safety of life services;
- ComReg will promote the use of spectrum efficient technologies in the aeronautical bands, thereby maximising the spectrum available for growth and new applications;

- ComReg will ensure spectrum is available for use by emerging systems, in line with international requirements;

- ComReg is planning to review the current fees attached to aircraft licences[68];

- ComReg proposes to introduce a once-off fee for these services, subject to DCMNR approval. A once-off licence fee of around €500 for the new stations is proposed, to cover co-ordination and notification costs.

B.10 The Satellite Services

B.10.1 Introduction

Satellite radiocommunication networks provide a wide range of applications from mobile and fixed telecommunications, Direct To Home (DTH) multichannel television, broadband services, satellite news gathering (SNG) and outside broadcast (OB) links to meteorological and Earth exploration service applications. Additionally, satellites play a crucial role in aeronautical and maritime safety by providing services such as navigation, radar and the Global Positioning System (GPS).

B.10.2 Broadcasting-Satellite Service (BSS)

The broadcasting satellite service is defined as a radiocommunication service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public. In the broadcasting-satellite service, the term "direct reception" shall encompass both individual reception and community reception[69].

Individual reception by consumers is referred to as Direct-To-Home (DTH) or Direct Broadcasting by Satellite (DBS) and is facilitated by a set-top box (STB) and a small (60-80cm in diameter) dish antenna which receives the signal from the satellite demodulates it for viewing on a standard television. Community reception (Satellite Master Antenna Television, SMATV) uses a larger dish (typically 1.2-2.4m in diameter) for reception, with the signals being distributed to users' homes via a small cable system, for reception by their STB and television.

B.10.3 Fixed-Satellite Service (FSS)

Traditionally the FSS has been used for intercontinental trunk telecommunications, and broadcast contributions, including Satellite News Gathering (SNG) from foreign correspondents. However with the widespread explosion in fibre capacity in the 1990s the telecommunications market is no longer as strategically important as it once was to satellite networks and instead they are used to provide network resilience or telecommunications to countries without a fibre point of presence. Satellite networks quick set up time and resilience have proved to be extremely

[68] see FAEI report "Flight Path to the Future", available at http://www.faei.ie/pressreleases/AeroPagesSK(Mar1).pdf

[69] Definitions from Article 1 of the ITU Radio Regulations, 2001

important after the events of 11/09/2001 where they are the only technology that can be used to re-establish trunk communications in times of emergency. This has lead to a reinvestment by telecommunications companies in specialised transportable earth stations with switching capacity in Europe and the US.

Over the next few years it is expected that we may see the development of indigenous small broadband hubs serving the licence exempt Very Small Aperture Terminal (VSAT), Satellite Interactive Terminal (SIT) and Satellite User Terminal (SUT) markets. These are currently served by hub stations located in continental Europe and the UK.

B.10.4 Mobile-Satellite Service (MSS)

In general the MSS is composed of the land mobile-satellite service, the aeronautical mobile-satellite service and the maritime mobile-satellite service. Terminals are usually mobile or portable and can be located on the person or on vehicles, aircraft and ships. The MSS also supports important safety of life functions including; survival craft stations, emergency position-indicating radiobeacons (EPIRBs) and most importantly in the maritime mobile-satellite service the Global Maritime Distress and Safety Service (GMDSS) which provides communication for the implementation of search and rescue situations.

Voice, video, data, fax and messaging applications are supported by the MSS and in general the MSS can be used as a complement to the terrestrial cellular networks.

B.10.5 Radio Navigation Satellite Service (RNSS)

In 2003 at the World Radiocommunication Conference (WRC-03) in Geneva a set of technical criteria were adopted to allow the development of a European satellite navigation system (Galileo) Alongside the current RNSS systems GPS and GLONASS.

RNSS systems such as Galileo, GPS and GLONASS contribute to improved security for air navigation, more precision in public transport, better traffic management, and also assist in preventing crime by facilitating remote asset tracking. The implementation of the Galileo system will allow for competition in the provision of RNSS within Europe and will place less reliance on the American GPS system which can be dithered or switched off in times of conflict to remove or limit accuracy. It is expected that the competition in the RNSS market will lead to a reduction in terminal prices and allow for the further development of novel services which may be offered to the general public as well as commercial users.
Ireland is a signatory to an MoU establishing a European management committee to oversee the implementation of the Galileo system.

B.10.6 Key Drivers

VSATs, SITs and SUTs are relatively expensive compared to other forms of broadband access and are likely to remain so given the relatively small volumes involved. However, it should be noted that there is a large price differential in the cost of the Consumer Premises Equipment (CPE) in Ireland and Europe compared to

the cost in the US even though exactly the same terminal is supplied in most cases. These terminals typically use a small dish (0.8m) and a plug-and-play modem and install costs are approximately the same as a satellite TV installation (€100).

According to Northern Sky Research[70], the market for enterprise "broadband" satellite services in Western Europe is expected to grow steadily over the next five years. The installed base is forecast to rise from 76,000 units in 2002 to over 420,000 units in 2007. The compound annual growth rate (CAGR) of 40 percent is above the natural build-out of the entire European VSAT market growth (legacy + IP), but should be realized through enhanced focus on SME and SOHO markets. Northern Sky forecasts that the consumer broadband market in Europe would grow from roughly 71,000 subscribers in 2002 to 701,000 subscribers in 2007.

SchoolSat is a trial service providing fast access to the Internet for schools in rural Ireland using leading-edge satellite technology developed by Web-Sat in Dublin and supported by the Telecommunications department of the European Space Agency (ESA)[71]. The service is based on the Digital Video Broadcasting (DVB) standard. The SchoolSat service currently serves the Donegal Education Centre and 9 secondary schools in the county, ranging from the largest secondary school in Ireland, Carndonagh Community School on the Inishowen peninsula serving more than 1300 students, to the small Gaeltacht Vocational School on Aranmore Island with just 46 students. The schools taking part have been equipped with small satellite dishes that allow them to send and receive information at a speed far faster than ISDN.

In Ireland the main economic driver for the FSS would be news and outside broadcast coverage of major events, such as sports events and concerts. SNG trucks and 'Fly-Away' systems are deployed to cover such events for national and international broadcasters. These systems typically use the Ku-band (14 GHz), with the Eutelsat or SES ASTRA satellite networks used to EU countries and Intelsat or PanamSAT to the Americas. Occasionally C-band (3-6 GHz) is used for distribution to the Americas and sub-Saharan Africa.

A product launch by Inmarsat of B-GAN at 1.6 GHz (Lower L-band) is anticipated in the second quarter of 2005 and this may impact on non-broadcast quality and emergency SNG services, due to its light weight small size and unregulated nature.

B.10.7 Economic Contribution

The benefits from SNGs are already counted in broadcasting and so are not separately addressed here.

In respect of VSATs, ComReg is not aware of any VSAT manufacturers in Ireland. The main satellite service providers (e.g. Aramiska, Hughes Network Systems) offer services on a pan-European basis with hubs outside Ireland and so it has not been possible to isolate any contribution to the Irish economy.

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[70] http://www.telecomweb.com/reports/satellite2002-europe/snapshot.htm

[71] ESA press release 16/10/02

Estimates of the efficiency benefits of using VSATs can be made compared to the wired alternative of a leased line assuming that VSAT services offer 2Mbit/s capacity and the closest substitute is a 5km 2Mbit/s leased line. Using leased line costs for eircom and taking the price of Aramiska's 2Mbit business service as an indication of the VSAT costs, and noting that there were 100 VSAT licensees in Ireland in 2002, the efficiency benefits for VSATs come out at around €0.5m. It should also be noted that since 2002 lower powered services have become licence exempt so it is not possible to obtain a more accurate estimate of the actual number of VSAT terminals in use.

B.10.8 Licensing Considerations

ComReg currently has two licensing regimes covering satellite systems. One regime covers FSS Earth Stations in the bands above 3 GHz[72], which includes transmitting VSATs typically used for private data communications, Transportable Earth Stations (TES) such as SNG trucks used for outside broadcasts and Large Earth Stations (LES) such as those used by Broadcasters and Telecommunication Companies. The other regime covers teleport'[73] installations that consist of three or more large 'steerable' co-sited satellite Earth stations which can typically use many different satellites, thus increasing the flexibility offered to the final end user of the satellite communications system in terms of cost and capacity. A review of the licensing schemes is underway with new Regulations expected in 2005. It is expected that while the licensing costs will remain more or less the same the new regulations will pave the way for the cost-effective introduction of Earth stations within High Density Fixed-Satellite systems (HDFSS) in Ireland.

ComReg's general approach to licensing satellite services is dependant on the nature of the spectrum concerned, i.e. whether it is shared with other services, or there is limited or no risk to other services. Where there is low risk of interference to other services, a deregulated approach is appropriate as can be seen from the VSAT, SIT, SUT and AMSS exemptions.

In shared spectrum, where deployment of satellite Earth stations has an impact on other radiocommunication services, the licensing of Earth stations in these bands is carried out on a first-come first-served basis, with a spectrum fee that reflects the level of coordination which may be required.

11/12/14 GHz bands

The 11 GHz (10.7 – 11.7 GHz) band is shared by the FSS with the fixed service. The fixed service designation is for high capacity point-to-point links. This band is in high demand for trunk routes. The reason for this is that a shorter minimum hop length is permitted in this band than in the other fixed service bands below 12 GHz. In terms of the FSS applications, this band is vital for Earth station reception, in particular, for VSAT and television reception. Most VSATs operate in the Ku-Band

[72] Wireless Telegraphy (Fixed Satellite Earth Stations) Regulations, 2000. (S.I. No. 261 of 2000).

[73] Wireless Telegraphy (Teleport Facility) Regulations, 2001, S.I. No. 18 of 2001.

(10.7-11.7 GHz, 12.5-12.75 GHz (space-to-Earth), 14-14.5 GHz (Earth-to-space). In Ireland, the band 14-14.5 GHz is subject to licensing for FSS.

SNG and Electronic News Gathering (ENG) systems are now designated for use in the 11.7-12.5 GHz band. The 12.5-12.75 GHz band is allocated exclusively for the downlink satellite component for VSATs and Transportable Earth Stations (TES). The 13 GHz band (12.75-13.25 GHz) is shared by the FSS (Transportable Earth Stations) by the fixed service and the mobile service. Ireland has fixed links between 12.75 GHz and 13.25 GHz. The direction of transmission in this band is Earth-to-space (the relative downlink allocation is in the 11 GHz band) and therefore the potential for interference here is from the satellite earth station into the terrestrial fixed service receivers. Appendix S30 of the Radio Regulations governs the use of the band by the satellite service.

Above 15 GHz

The ITU has allocated the 18 GHz (18.1-19.3 GHz) band for fixed satellite services. In Ireland the 18.1-19.7 GHz band is allocated for fixed links and Earth station downlinks are allocated to the 18.8-19.7 GHz segment of the band.

Decision (00)07 on 'The shared use of the band 17.7-19.7 GHz by the fixed service and Earth stations of the fixed-satellite (space-to-Earth)' was approved by the ERC (now the ECC). This Decision proposed that stations in the fixed-satellite service (space-to-Earth) that are not coordinated shall not claim protection from stations of the fixed service and that both fixed-satellite services and fixed services must implement mitigation techniques as outlined in the Decision. ComReg is investigating the practicalities of the Decision with a view to implementing the Decision, bearing in mind that there are fixed links in this band in Ireland.

In the 27.5-29.5 GHz band, Decision (00)09 on 'The use of the band 27.5 - 29.5 GHz by the fixed service and uncoordinated Earth stations of the fixed-satellite service (Earth-to-space)' has been adopted by the ECC. This Decision proposes that sections of the band are designated for exclusive use of uncoordinated fixed-satellite service Earth stations, that sections of the band are designated for exclusive use of fixed satellite systems and that a section of the band be shared between both the fixed service and uncoordinated fixed-satellite service with limitations in certain geographical areas. In Ireland, there are fixed services (FWA) in the band which would need to be considered if this band was designated for fixed satellite services. It should be noted that licence exempt SITs and SUTs use the Ka Band for their uplink.

Finally, in terms of representation on an international level, ComReg has and will continue to represent Irish positions with regard to the satellite services in the relevant international fora within the ITU and CEPT.

B.10.9 Proposed ComReg Strategy for Satellite Services

As stated previously ComReg is conducting a review of its current satellite legislation with a view to adapting it to cover future licensable services such as HDFSS. The review will ensure that the spectrum efficiencies offered by HDFSS are reflected in a new fee structure and is proportionate to the existing fee structure. Where possible, ComReg intends to exempt most low interference risk terminals which are typified by operating in harmonised spectrum to harmonised standards.

B.11 Defence Forces Use of Spectrum

B.11.1 Introduction

Defence Forces have actively utilised radiocommunications from the earliest days and the use of radio spectrum is considered critical to national security. The significance of military radio communications is reflected in the ITU Constitution and the Radio Regulations. There are no specific service allocations for defence applications in the Radio Regulations as defence communications are recognised as the prerogative of each Sovereign State.

In Europe there is increasing pressure on all elements of spectrum use including civil and military spectrum and the consequent need for greater sharing between civil and military applications. Additionally the increased involvement of national defence forces in combined international aid operations requires compatibility of communications between units.

The Irish Defence Forces, comprising the army, naval services and air corps, use radio in a variety of ways, most notably in relation to maritime and aeronautical applications.

B.11.2 Licensing Issues

In accordance with the 1926 WT Act, apparatus for wireless telegraphy kept by or in the possession of the Minister for Defence, for the purpose of the Defence Forces, does not require a licence. Accordingly, while ComReg is responsible for the general management of the spectrum and overall allocations, the Defence Forces may operate equipment without a licence.

To date, the Defence Forces have generally used spectrum that is not suitable for commercial purposes. However, internationally, there is a growing trend among military organisations to use radio equipment which is commercially available. This trend may results in denial of spectrum to other users. ComReg consider that the use of such spectrum by the Defence Forces should be subject either to licensing or the payment of an appropriate fee to reflect the opportunity cost of the spectrum so denied. This approach has been adopted in the UK, for example where military use of fixed link or satellite spectrum prevents its use by commercial systems.

B.11.3 Proposed ComReg Strategy for Defence Forces spectrum

ComReg will maintain awareness of international developments, particularly in CEPT through the Civil - Military forum which Ireland chairs. ComReg will continue to liaise with the Defence Forces as required to solve issues of mutual concern.

B.12 Business Radio Services

B.12.1 Introduction

Despite the continued rapid growth of cellular telephony, business radio is still a popular communication system for applications where most traffic is between a control point and one or more mobile terminals, or where groups of mobile terminals need to communicate on a "one to all" basis. Business radio is also attractive where the user requires complete control over network operation and costs. The main uses of business radio are for public safety and security (e.g., the Garda Síochána, fire and ambulance emergency services), public utilities (power, water, transport etc.), industrial and commercial users (taxis, couriers, warehouses etc) as well as various voluntary organisations, all of whom need reliable means of communicating with personnel and more especially groups of personnel on the move.

The business radio market is relatively static currently, as shown in the following charts:

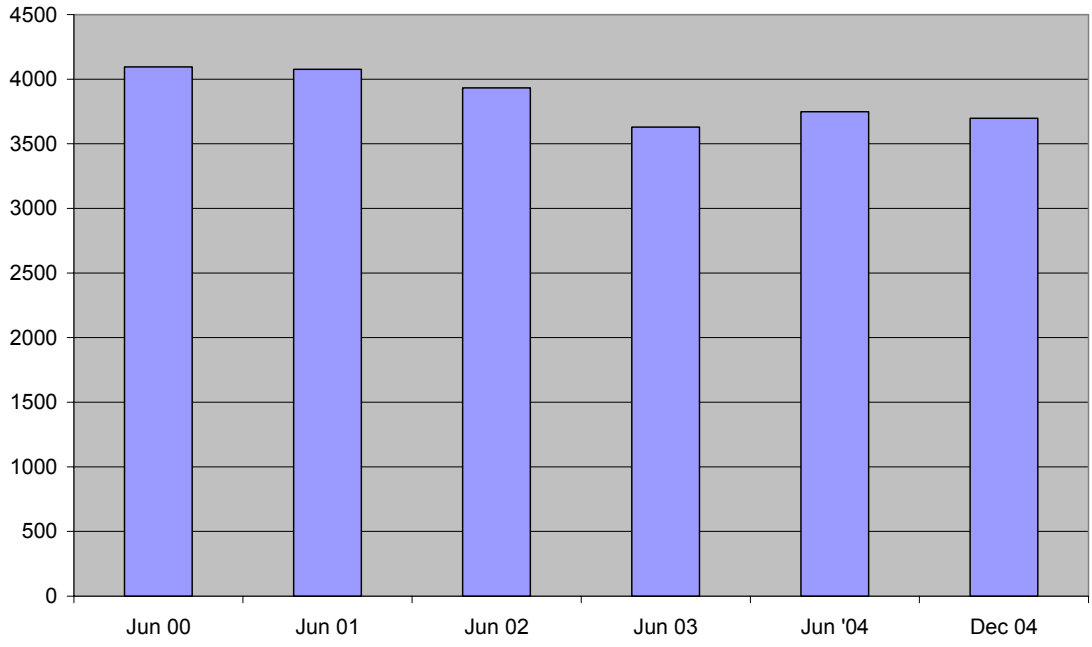

Figure An.B.11: Annual licence statistics for Business Radio

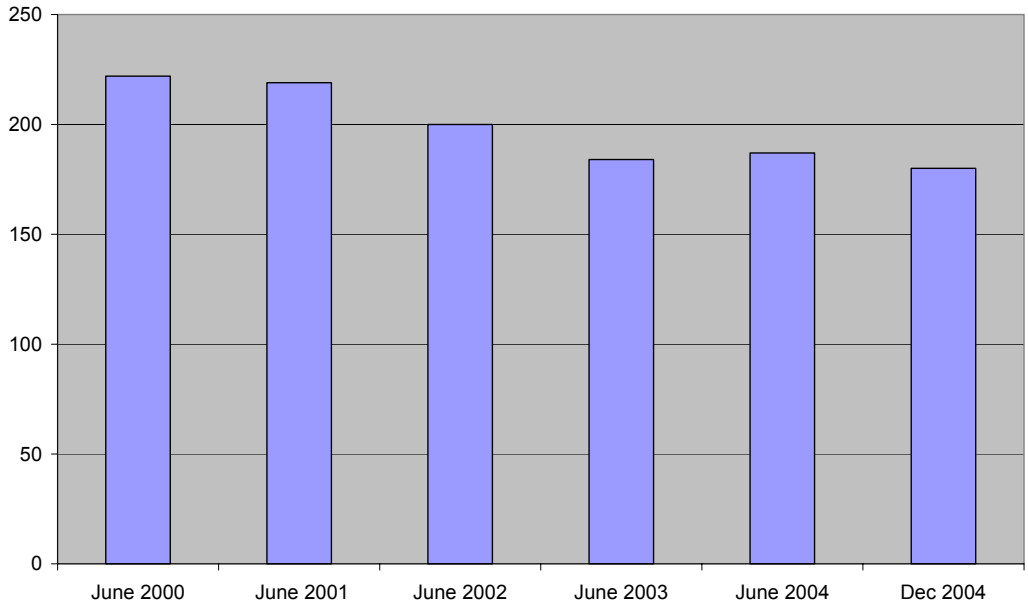

Figure An.B.12: Annual licence statistics for Community Repeaters

B.12.2 Types of Business Radio

The term Business Radio in Ireland includes Private mobile radio (PMR), Community Repeaters, Public Access Mobile Radio (PAMR) and Paging. PMR networks are self-provided, i.e. the licensee operates his own radio networks, whereas Community Repeaters and PAMR Networks provide services to other third party users, typically on a monthly subscription basis. Subscribers to these services may use their own mobile radios or hire them from the networks operator.

The paging systems that are currently allowed in Ireland are mainly private on-site or local area systems. On-site paging is typically used by institutions such as hospitals, while local area paging is typically used for emergency services call-out. There has been a steady decline in paging systems both in Ireland and across Europe following the growth of mobile cellular communications.

Currently it is not necessary to hold a licence if you operate a paging system. It is only necessary to have a permit which does not attract a fee. This has resulted in certain inefficiencies in the use of the spectrum and in the power levels of some systems used. ComReg is mindful of the need to ensure the efficient and effective use of the radio spectrum and therefore is proposing to introduce a licensing regime for paging systems

Recent years have seen a number of developments that have enhanced the reliability and security of PMR and PAMR systems. Trunked systems, whereby users have access to a pool of channels rather than the users each having their own specific channel can increase the effective use of PMR/PAMR spectrum. On-site trunked radio systems have been in operation for a number of years and there are now a small number of wide area trunked PMR and PAMR systems.

Currently all Business Radio services use analogue technology, however a number of digital standards exist or are in development and interest is growing in this option. The main advantages of digital technology are the ability to transmit data at much higher speeds and improved security from eavesdropping. The first European digital standard, TETRA, was aimed primarily at large public safety or PAMR networks and a trial network is currently being operated by the Gardaí in Dublin. While there appears to be little interest in TETRA (Terrestrial Trunked Radio) for commercial applications currently, alternative digital technologies are coming onto the market that are likely to be better suited to smaller users.

The most significant development currently is the emerging European standard for digital mobile radio, ETSI Technical Specification TS 102 361, which supports a comprehensive range of business radio architectures from simple on-site mobile to mobile communications to wide area trunked repeater systems. The standard, which is supported by all the major equipment vendors, is scheduled to be agreed in two stages. Release 1 in March 2005 will cover Voice Calls for individuals and groups; Release 2 in October 2005 will cover data applications.

Business Radio plays a major role in supporting public transport in Ireland. For example, Dublin Bus recently commissioned a new trunked radio network using 20 UHF channels at five transmitter sites around Dublin. Staff can be kept fully informed of traffic problems or other incidents, reducing delays and improving services for passengers. 1,250 radios are deployed on the network. CIE also make extensive use of Business Radio to support rail operations and there is a long term plan to adopt the European GSM-R (GSM for Railways) standard which would provide an advanced communication and signalling facility based on the GSM mobile phone standard. Spectrum has been designated throughout Europe for GSM-R in the 900 MHz band.

B.12.3 Key Drivers

The business radio market is currently static in terms of the volume of licences but there are signs that some users are interested in migrating to more advanced digital systems that can offer higher speed data transmission. Digital Business Radio has the potential to offer operational, cost and safety benefits to users but also faces competition from new developments such as Push to Talk over Cellular networks (POC) and voice over WLANs. Large equipment vendors like Motorola are planning to launch low cost digital business radio kit from 2006, once the new ETSI standard is agreed (see above). This will be targeted at existing users, with the intention of being able to keep the existing analogue frequencies. Motorola has suggested that ease of obtaining digital licences or converting existing licences will be an important factor in the take up of digital services[74].

It seems likely therefore that future demand for digital business radio services will be accommodated in existing spectrum, however if digital services are successful this could stimulate demand for wider bandwidth systems, perhaps using spectrum higher frequency bands than currently used for business radio. ComReg has recently

[74] Presentation to UK "PMR Digital Future 2004" workshop, November 2004, available at http://www.fcs.org.uk/library/other/pmrdf2004.asp

consulted on the use of parts of the 400 and 900 MHz bands for wideband PAMR systems and the response to the consultation will be published shortly.

Two specific drivers will be the need for increased security and functionality by major users such as the Gardaí and railways, which in these instances will involve the use of dedicated spectrum. This should over time lead to the release of existing analogue spectrum that will become available for other users.

B.12.4 Economic Contribution

Business radio is used by a wide mix of businesses to support their internal operations. It offers economic benefits in terms of:

(i) the activity associated with manufacturing and retailing equipment;

(ii) the efficiency gains from using this technology as compared with a public mobile alternative[75]; and

(iii) the consumer surplus associated with the use of business radio.

Most business radio equipment in Ireland is imported. There is some production of antennas in Ireland and this is counted in the contribution of mobile sector suppliers (see Section B3).

The UK regulator has conducted research on users' willingness to pay for business radio services which are likely to be applicable to Ireland given the similar operational scenarios. The inputs to these calculations of the Irish willingness to pay for these services are as follows:

- Annual consumer surplus estimates of €658 for police, fire, regional and national systems; €1,830 for wide area systems; €242 for on site systems[76];

- Numbers of users (defined as either a mobile or a hand portable user) in each category.

Applying these data gives an estimated consumer surplus of around €56m.

In the case of the emergency services, we understand that the Gardaí employ around 50 staff to undertake maintenance, installation and other technical support for their radio based equipment and services, implying a cost of around €1.8m[77]. This excludes any maintenance activities that are outsourced. As with other business radio users Equipment purchased by the Gardaí is manufactured outside Ireland.

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[75] The approach of estimating the economic activity supported by business radio is not usually adopted because it is difficult to argue that these sectors could not operate without business radio – they would just be less efficient.
[76] An exchange rate of GBP1 = €1.6 has been used (current at time research undertaken in 2002)
[77] This assumes a cost per employee of €35,000. Information on police pay scales (excluding allowances and overtime is given at www.garda.ie/angarda/faq.html. We have taken the five year pay point and added around 10% for allowances and overtime.

B.12.5 Approaches to Licensing Business Radio

For conventional wide area business radio systems operating on shared frequency channels, a first come first served approach is appropriate, with fees levied that reflect the costs associated with licensing and managing the spectrum. On-site systems are inherently less susceptible to interference and therefore do not require the level of technical co-ordination applied to wide area systems. It is however useful for enforcement purposes and to facilitate any future change of use of the spectrum concerned to be aware of the location of on-site systems. A notification or registration process is therefore appropriate for such systems.

In the case of national exclusive channels, these may also be made available on a first come first served basis, but where there is a scarcity of these channels a selection process may be necessary. Since the nature of business radio services will vary from user to user, it is unlikely to be possible to apply meaningful selection criteria for comparative selection so either an auction or a lottery approach would be favoured. Although lotteries have been criticised when used for high value licences elsewhere in the past (notably when used for cellular licences in the USA, where many licences were acquired by speculators with no intention of using the spectrum themselves), these considerations are unlikely to apply to relatively small spectrum packages in the business radio bands.

National channels licensed in this way provide the scope for rights holders to lease access to the channels in specific areas, either on a temporary or permanent basis, where the spectrum is not required by the licensee. This could create opportunities for users who would benefit from operating their own business radio system but may currently be deterred by the need for an individual licence. ComReg is currently considering the launch of a national business radio licensing scheme that would include such a provision for third party use.

B.12.6 Proposed ComReg Strategy for Business Radio

- ComReg will encourage the development and use of new technologies.

B.12.6.1 Digital Business Radio

- ComReg will continue to support the requirements of the PMR industry and users to ensure that spectrum is available to accommodate new business radio technologies and that existing licences for analogue systems can be upgraded to digital where required;

- ComReg will review the business radio frequency bands with a view to ensuring that there is adequate spectrum for the introduction of new and emerging digital technologies;

- ComReg will continue to monitor PMR installations to ensure compliance with licence conditions.

B.12.6.2 Wideband PAMR systems

Further to the recent consultation, ComReg will be proceeding with a licensing scheme for wideband systems in the 410 – 430 MHz and 872 – 876 / 917 – 921 MHz bands.

B.12.6.3 Paging

ComReg is proposing to introduce a licensing regime for paging systems. This would mean that all existing and future paging systems are licensed and will be subject to a once licensing administration fee of €50 per base station. Licenses would be renewable annually.

The pan-European paging standard, ERMES (European Messaging Service) has failed to attract significant market interest and CEPT is currently in the process of abrogating the ECC Decision that provided for the coordinated introduction of ERMES. There is also a public consultation in progress on an ECC Decision to implement a new frequency plan for the ERMES band for other services.

B.12.6.4 GSM-R

The ECC Decision (02)05[78] designates the band 876 – 880 MHz paired with 921 – 925 MHz for international and national railway operations (GSM-R). GSM-R systems would provide the radio communications to facilitate the managing and operation of railway traffic and increase its safety. Ireland has yet to adopt this Decision but as these bands are currently unassigned ComReg foresees no difficulty in doing so if there is a request for the provision of GSM-R in Ireland. Prospective licensees should be aware of the need to provide guard bands to prevent interference from services in the adjacent bands. ECC Report 38[79] gives details of work carried out within CEPT into the introduction of CDMA-PAMR services in the lower adjacent band of 870 – 876 MHz. If ComReg were to proceed with the licensing of this spectrum for GSM-R services then it will be necessary to implement ECC Decision (02)10[80] allowing for the exemption from licensing of GSM-R mobile terminals in this band.

ComReg is aware that this GSM-R allocation is adjacent to the GSM 900 MHz spectrum that is assigned to the mobile network operators which has attracted high spectrum access fees. However as the GSM-R spectrum is not intended for the provision of services to the public ComReg considers that rights of use for this spectrum should attract a lower fee. ComReg is in the process of developing its fee structure for this band.

ComReg is currently considering the process by which rights of use to this spectrum would be awarded. If the railway operators were to provide and operate the system themselves for the sole purpose of railway communications then it may not be

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[78] ECC/DEC (02)05 of 5 July 2002 on the designations and availability of frequency bands for railway purposes in the 876 – 880 and 921 – 925 MHz bands. (Available for download from www.ero.dk).
[79] ECC Report 38. The technical impact of introducing CDMA-PAMR on the UIC DMO and GSM-R Radio systems in the 900 MHz band. (Available for download from www.ero.dk).
[80] ECC/DEC (02)10 of 15 November 2002 on exemption from individual licensing of GSM-R mobile terminals operating within the frequency band 876 – 880 MHz and 921 – 9235 MHz for railway purposes.

necessary to hold a competition. If however, the service was to be provided by a third party such as a mobile network operator, or if it is intended to carry third part traffic, then it may be necessary for ComReg to conduct a competition such as a beauty contest or auction.

B.12.6.5 Public Safety Services

ComReg will ensure spectrum is available to meet the future needs of the emergency and law enforcement services and that such spectrum is kept free from interference.

B.13 Radio Experimenters (Amateur Service)[81]

B.13.1 Introduction

The Amateur Service is specifically recognised by the ITU with a formal service definition in the Radio Regulations and specific spectrum allocated to it within the International Table of Frequency Allocations where it is defined as *'A radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest'*. Radio Amateurs in Ireland are referred to as Experimenters and are licensed under the Wireless Telegraphy (Experimenter's Licence) Regulations 2002, S.I. 450 of 2002.

Experimenters have used spectrum since the earliest days of radio communications and experimentation by radio amateurs continues to contribute to the development of radiocommunications service and use of the frequency spectrum. Experimenters continue to contribute to propagation and modulation technique studies either on their own or in conjunction with research establishments. As witnessed in the aftermath of recent natural and other disasters, the willingness and preparedness of the experimenter community to operate emergency communications has proven to be invaluable and ComReg licences two experimenter organisations for this purpose. These are the Amateur Radio Emergency Network (AREN) and Raynet Ireland. Both of which are affiliated to the Irish Radio Transmitters Society (IRTS) which represents the interest of its members and is the member society for Ireland of the International Amateur Radio Union (IARU).

B.13.2 Licensing Trends

While there is an increasing overall trend in the number of Experimenter's licences issued, there has been a slight downturn in the overall number of Experimenter's currently licensed due to the implementation of a stricter credit control policy at ComReg during the last quarter of 2004. It is expected that this will correct itself within the next year and that the trend will continue slowly upwards.

[81] Within this document reference to the Amateur Service should, unless indicated otherwise, be regarded as including the Amateur Satellite Service.

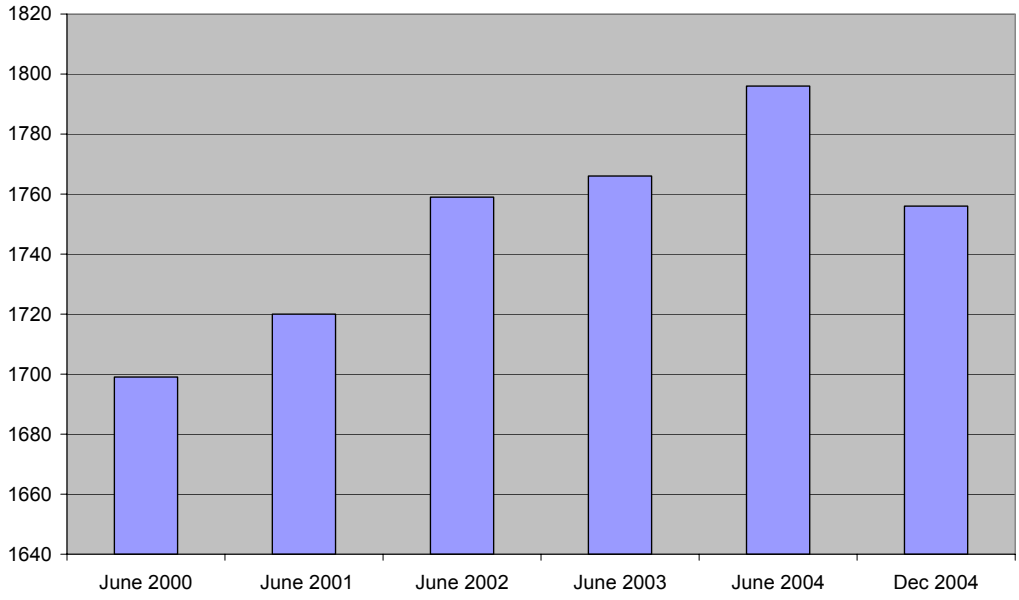

Figure An.B.13: Annual licensing statistics for radio experimenters

B.13.3 Approaches to Licensing Radio Experimenters

Ireland has adopted the CEPT Harmonised Amateur Radio Certificate (HAREC) syllabus Recommendation T/R 61-01 (as revised) for assessing whether a candidate is suitably qualified both of which allow for a simplified reciprocal licensing scheme. It should be noted that UK Intermediate and Novice licences are not recognised by CEPT and therefore these UK licensees may not operate in Ireland.

B.13.4 Technical Considerations

A number of significant changes have occurred since the previous publication of the radio spectrum strategy.

At the World Radiocommunication Conference in 2003 (WRC-03), it was decided internationally that the compulsory requirement of proficiency in Morse code in order to use the HF bands be abrogated. Ireland moved swiftly to implement this provision in our national licensing scheme.

The WRC-03 also allocated a further 100 kHz of spectrum, 7100 -7200 kHz, for use by Radio Amateurs. This allocation is on a secondary basis until 29 March 2009 when sharing with the primary service, broadcasting, ceases. ComReg has allocated this new portion of spectrum on a secondary basis.

In the last spectrum strategy it was proposed to open a number of new bands for use by experimenters in Ireland. These new bands are:

- 135.7 to 137 kHz;
- 50 – 52.0 MHz;
- 47 – 47.2 GHz.

These changes have now been added to the Radio Frequency Plan and the details and conditions of use are in document ComReg 02/77R5.

B.13.5 Proposed ComReg Strategy for Radio Experimenters

ComReg has allocated a number of bands in the Radio Frequency plan and will make these available for use on application. These bands are:

- 76 – 81 GHz;
- 122.25 – 123 GHz;
- 134 – 136 GHz;
- 136 - 141 GHz;
- 241 – 248 GHz;
- 248 - 250 GHz.

B.14 Science Services

B.14.1 Introduction

The science services use the radio spectrum for a range of applications, for example, observations of our natural environment made by sensors that function at frequencies set aside for the purpose. These sensors may be passive or active. Passive sensors take the form of sensitive radiometers which measure the strength of the natural radiation within chosen frequency limits radiating, for example, from the surface of the earth or from within its atmosphere. Active sensors are essentially radar which analyse radiation returned from a target that has been illuminated by transmissions from the sensor.

Many of the activities of the space research, Earth exploration-satellite and the meteorological-satellite services are of this kind, using passive or active sensors carried by satellites in Earth orbit. A special case is the radio astronomy service, which observes emissions of natural origin arriving from beyond the Earth's atmosphere. All radio astronomy allocations are used passively.

There are three other science-related radio services. The meteorological aids service, which is used for links to platforms, airborne or seaborne, which gather meteorological data. The standard frequency and time signal service and the corresponding standard frequency and time signal-satellite service which is used for comparison of time and frequency standards and the dissemination of these standards.

Meteorology/Earth Exploration

Meteorology depends on radio both to collect the data upon which its predictions are based and to disseminate to the public and specialised users the weather information and warnings which results. The dissemination of weather information to the public and specialised users uses the normal communications channels such as broadcasting, telephony or aviation/maritime radio.

It is in the collection of data that meteorology has special requirements. This includes weather satellites, storm tracking, sea surface temperature and wave height measurements etc. In recent years the science of using satellites for remote earth-sensing for environmental and other purposes has developed. Active sensing involves both the transmission and reception of a signal. Its uses are many and varied from measuring the characteristics of sea surface to determining the density of trees in a rain forest.

Radio Astronomy

Radio astronomy is defined in the Radio Regulations as: "*Astronomy based on the reception of radio waves of cosmic origin*". To date, Ireland does not have any radio astronomy installations. However, interest continues in the establishment of a radio astronomy observatory in the State. As radio astronomy is a receive-only service, which attempts to receive very weak signals, it is particularly vulnerable to interference. Throughout the ITU table of allocations certain bands are allocated to radio astronomy and administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. In a number of the bands all emissions by other services are prohibited. However with the demand for spectrum by telecommunications services the spectrum previously available to radio astronomy and the level of protection afforded is constantly coming under threat.

Standard Frequency and Time Signal Service

The Radio Regulations define the standard frequency and time signal service as: 'A radiocommunication service for scientific, technical and other purposes, providing the transmission of specified frequencies, time signals, or both, of stated high precision, intended for general reception.'

While There are no standard frequency and time installations in Ireland there are a number of users of transmissions in the short wave and long wave bands and signals from major installations such as MSF Rugby (in the UK) and Darmstadt (in Germany) operating in the LF band, which are readily received and used in Ireland.

More recently, satellite-based standard frequency and time signals have become available using very high accuracy atomic clocks on board each orbiting satellite that are constantly monitored by a control centre on the ground. The most well known is the Global Positioning System (GPS) operated by the United States Department of Defence. The European Union is developing a satellite radionavigation system called Galileo, Europe's contribution to the next-generation of global navigation satellite services. The project is designed to introduce greater safety in air traffic management and air navigation, as well as better train safety control, road traffic

management and other surface transport applications by developing and deploying up to 30 earth orbit satellites.

B.14.2 Key Drivers

There has been considerable take up of Earth-Exploration Satellite products by private industry. This includes high resolution imagery for land usage evaluation and Synthetic Aperture Radar surveys for mineral exploitation.

This has lead to a number of private companies launching satellites to meet the demand. This in turn has lead to demands for protection of existing passive and active frequency bands used by these services and further demand for new spectrum. These demands are going to be dealt with at the next Word Radiocommunication Conference in 2007 and the preparatory work is underway in preparation for that conference.

B.14.3 Approaches to Licensing Science Services

Most science services operate in internationally allocated bands and as such licence exemption is an appropriate way to deal with these services. Where spectrum is shared with other services and denial of spectrum to those services results, a mechanism should exist to recover the opportunity cost of the denied spectrum from the science service.

B.14.4 Proposed ComReg Strategy for Science Services

In general for the Science Service ComReg will:

- liaise with Met Éireann and other scientific organisations to ensure that current and future spectrum requirements of the Science Services are fully understood and, wherever possible, incorporated into national plans for future spectrum planning conferences;

- remain appraised of possible means of reducing unwanted emissions to protect Radio astronomy, Frequency and Time Services and other passive services.

Regarding the Meteorological Service ComReg will:

- continue to offer a high degree of protection to meteorological services, in view of their use in the safeguarding of human life and property;

- continue to offer a high degree of protection to Earth-exploration services in view of the potential impact of interference on passive and active sensors which could severely disrupt scientific research programmes.

Regarding Radio Astronomy, ComReg has taken an active interest in the establishment of a radio astronomy observatory in Ireland and will endeavour to protect such a site using internationally accepted procedures and techniques to mitigate and prevent interference in the frequency bands of interest.

In common with the proposal for aeronautical and maritime radar, ComReg proposes to introduce a licensing regime for meteorological radars, subject to DCMNR approval. A one-off licence fee of around €500 for new stations will apply, to cover co-ordination and notification costs. Existing meteorological radars will not be charged for licensing.

B.15 Miscellaneous Services

B.15.1 Wireless Public Address Systems

ComReg is proposing to permit Wireless Public Address Systems to use the band 27.6 – 27.99 MHz to meet the needs of religious and other community organisations. There are currently 35 unassigned channels in this band. Wireless Public Address Systems would, in practice consists of short range, inexpensive, off the shelf equipment.

There are members of some religious congregations who are housebound and wish to hear their local religious services but are unable to do so. ComReg is aware that such services have been provided in the past using broadcasting spectrum which resulted in interference to licensed users. The key characteristics which define Wireless Public Address Systems are

- The service will only be available for local community users;
- Spectrum will be allocated on a non-exclusive, non interfering basis.

To enable the provision of such services ComReg is proposing to allocate 35 channels on a non-exclusive, non-interfering basis. To ensure efficient use of the radio spectrum ComReg is proposing that all users register their transmitter equipment which will incur a one off licence processing fee of €25 per application, receiver equipment will be exempt from registration. It will be necessary for ComReg to develop licensing regulations which require approval from the Minister for Communications, Marine and Natural Resources to enable it to proceed with this proposal.

B.15.2 ECC Decision on Temporary Introduction of Automotive Short Range Radar[82](SRR)

This decision forms part of comprehensive package solution for the introduction of SRR in the 24 GHz band including a MoU with the automotive industry, an EC Decision and the R&TTE Directive. The decision temporarily opens the 24 GHz band (24.15 GHz ± 2.5 GHz) for SRR on a non-interference and non-protected basis until the reference date of 1 July 2013 or 7.0% penetration of equipped vehicles in any European national market. In the area of Radio Astronomy sites manual de-activation is permitted until 1 July 2007 and automatic deactivation is mandated

[82] ECC/DEC/(04)10 - ECC Decision of 12 November 2004 on the frequency bands to be designated for the temporary introduction of Automotive Short Range Radars (SRR).

after this date. There is a related Decision ECC/DEC/ (04)03, already adopted, which designates the band 77-81 GHz for SRR use on a long term basis.

The decision on whether to implement or not should be made bearing in mind that an EC decision will follow shortly which establishes the legislative framework within which such devices can be placed on the EU market and the use of the EC Decision in combination with ECC Decision, the R&TTE Directive and the associated Harmonised Standard to then prevent further devices being placed on the same market once either the 'Reference Date' (cut-off date) has been reached or the penetration limit exceeded, whichever comes first. Note that the CEPT decision does not appear to include additional mitigation (included in the draft EC decision) of -61.3 dBm/MHz for protection of the Satellite Broadcast service (s-e) below 22 GHz. In the event that this decision is adopted consideration will need to be given to the monitoring of equipped vehicle penetration onto the Irish market and the monitoring of any harmful interference as a result of SRR.

Annex C: Monitoring and Enforcement

C.1 Introduction

ComReg is obliged under the Communications Act 2002 to maintain the integrity of the radio spectrum. ComReg monitors licensed operators to ensure that they are in compliance with their licence conditions and investigates complaints of interference. ComReg is also obliged to ensure that all radio equipment placed on the market is in compliance with the R&TTE and EMC Directives[83]. ComReg also monitors the radio spectrum to ensure that there are no illegal operators and will take action against anyone operating a radio system without a licence.

C.2 Monitoring

Spectrum monitoring is one of the essential tools of spectrum management. Spectrum monitoring techniques are developed to ensure that technical parameters and standards for radiocommunication systems are adhered to. In addition spectrum monitoring assists in promoting the efficient utilisation of the radio frequency spectrum.

Spectrum monitoring can be defined as a process of observing the radio frequency spectrum and reporting on its use. Normally reporting is done for the benefit of other sections working in the spectrum management system such as frequency management, licensing, and enforcement, and also to external customers.

Spectrum monitoring is necessary in practice because authorised use of the spectrum does not ensure that it is being used as planned. The monitoring system provides a method of verification of the spectrum management process. The purpose of spectrum monitoring is to support the spectrum management process in general and the frequency assignment and planning functions.

Normal budgetary and personnel constraints require the use of fixed monitoring stations spread throughout the country to provide an accurate picture of spectrum use/utilisation, with mobile monitoring stations dealing with interference problems.

C.2.1 Purpose of Spectrum Monitoring

Specifically, the goals of monitoring (not necessarily in priority order) are to:

- assist in the resolution of electromagnetic spectrum interference, whether on a local, regional or global scale, so that radio services and stations may coexist compatibly, reducing and minimizing resources associated with installing and operating these telecommunication services while

[83] Article 3(2) of Directive 1999/5/EC Of The European Parliament and of The Council Of 9 March 1999 On Radio Equipment And Telecommunications Terminal Equipment And The Mutual Recognition Of Their Conformity O.J. 7.4.99 L 91/10 (The R&TTE Directive).
Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility OJ L 139, 23.5.1989, p. 19. Directive as last amended by Directive 93/68/EEC.

providing economic benefit to a country's infrastructure through access to interference-free, accessible telecommunication services;

- assist in ensuring an acceptable quality of radio and television reception by the general public;

- provide valuable monitoring data to an administration's electromagnetic spectrum management process concerning the actual use of frequencies and bands (e.g., channel occupancy and band congestion), verification of proper technical and operational characteristics of transmitted signals, detection and identification of illegal transmitters, and the generation and verification of frequency records; and

- provide valuable monitoring information for programmes organized by the ITU Radio-communication Bureau (Bureau), for example in preparing reports to Radiocommunication Conferences, in seeking special assistance of administrations in eliminating harmful interference, in clearing out-of-band operations, or in assisting the finding of available frequencies.

C.2.2 Relationship between Spectrum Monitoring and Spectrum Management

The functions of spectrum monitoring and spectrum management are closely related.

Monitoring further supports the overall spectrum management effort, by providing general measurement of channel and band usage, including channel availability statistics of a technical and operational nature, thereby giving a measure of spectrum occupancy. Monitoring is also useful for planning, in that it can assist spectrum managers in understanding the level of spectrum use as compared to the assignments that are registered on paper or in data files. A monitoring and measurement system can help in some instances where a solution to a problem requires more than knowledge of authorized or designed characteristics of radio systems. A monitoring and measuring system also obtains information on the operation of individual stations, for regulatory, enforcement, and compliance purposes, and can be used to establish the location and identity of stations causing interference.
In general terms, monitoring gives feedback to spectrum management on whether the practical use of the spectrum matches the national policy. Monitoring can also identify the need for future requirements for spectrum management officials. In this case monitoring gives feed-forward information to spectrum management.

C.3 Compliance and Enforcement

The basis for compliance enforcement, are two pieces of legislation as follows:

R&TTE Directive – S.I. 240 of 2001 also EN 1999/5/EC

This provides that a member state may not prevent the sale (placing on the market) of Apparatus for Wireless Telegraphy or any piece of telecommunications terminal equipment, providing the equipment in question complies with the requirements of the Directive.

From ComReg's point of view this means that we can act against a retailer, wholesaler, distributor, importer or manufacturer if their product is non-compliant and this includes non-compliant documentation, packaging and labelling.

EMC Directive – S.I. 22 of 1998 also EN 89/336 EC

This relates to the EMC compliance of products and covers most items not covered by R&TTE with similar powers.

C.4 Inspection of Radio Installations

The inspection of radio installations is an effective means of regulating and ensuring more efficient use of the spectrum. ComReg has an ongoing program of inspection of existing licensed radio installations. It is planned to move to a position where all new business radio installations are inspected for compliance prior to the issuing of licences.

The basis for radio installation inspection, are three pieces of legislation as follows:

1926 Wireless Telegraphy Act – S.I. 45 of 1926

This is the primary legislation from which most of the secondary working legislation is derived. The fundamental principle is that all Apparatus for Wireless Telegraphy must be licensed unless specifically exempted.

This Act covers all equipment, but in practise the main area affected is Business Radio. Business radio users who use equipment without eh appropriate licence or operate licensed equipment outside the terms of the licence commit offences under the 1926 Act. The R&TTE Directive provides that dealers in radio equipment shall not be subject to the licensing requirements of the 1926 Act, provided their stock complies with the requirements of the R&TTE Directive.

1988 Broadcasting and Wireless Telegraphy Act – S.I. 19 of 1988

This act covers primarily broadcasting and is the act under which the majority of summonses are issued in Unlicensed Broadcasting cases. It also has a section (9) which covers supply of licensable equipment. This prohibits the supply of such equipment to a customer who has not produced a valid licence for same.

Conditional Access Regulations – S.I. 357 of 2000

These regulations prohibit the manufacture, importation, distribution, etc. *for commercial purposes* of equipment (including software) intended to allow the interception of subscription-based TV, Radio and IT services.

Communications Regulation Act 2002 - (S.I. 20 of 2002)

Sections 39 to 46 of this Act provides for increased powers for officers of the Commission who have been designated as authorised officers for the purposes of the 2002 Act. The powers are similar to those granted under the R&TTE Directive and

allow for, among others, the inspection and testing of apparatus and for the copying and seizure of documents without the requirement for a search warrant. Significantly it also introduces the power to instruct an offender to remedy a failing under a range of Acts and to fine them €1,000 without a prosecution on the basis that the Commission has reasonable grounds for believing that an offence has been committed.

C.5 Compliance and Enforcement Actions

In 2003 ComReg initiated 157 compliance and enforcement actions covering a range of services, the breakdown of which is given in Figure An.C.1. The majority of actions have been taken against unlicensed broadcasting and business radio.

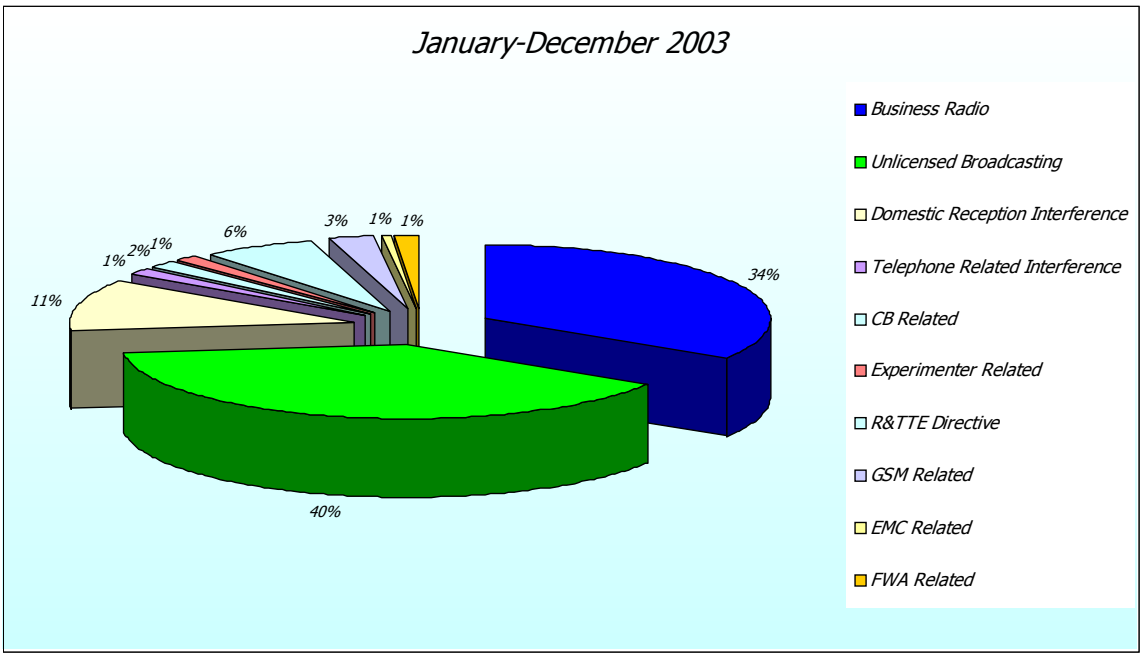

Figure An.C.1: Compliance and enforcement actions undertaken in 2003

To date in 2004 ComReg has initiated 87 compliance and enforcement actions covering a range of services, the breakdown of which is given in Figure An.C.2.

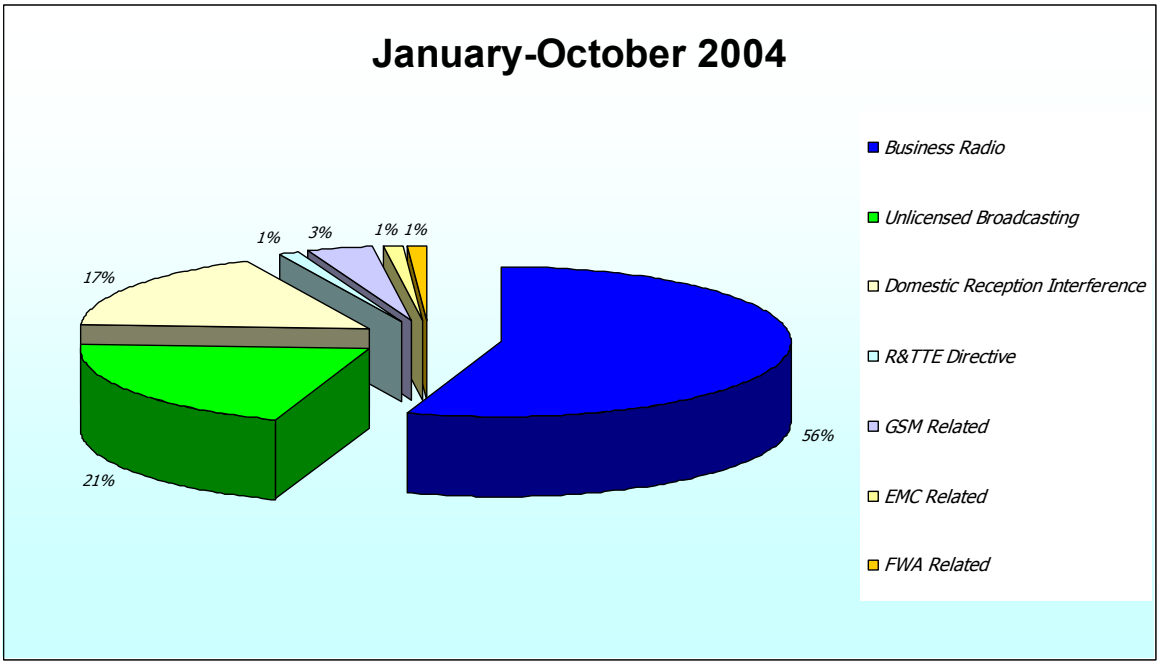

Figure An.C.2: Compliance and enforcement actions undertaken from January to October 2004.

The following graph indicates the number of actions taken from September 2002 to October 2004 against unlicensed broadcasting and business radio complaints. After a number of enforcement actions in 2003 and 2004 against unlicensed broadcasting across Ireland, the number of complaints has reduced significantly. The number of complaints in the business radio sector continues to be fairly constant.

ComReg will continue to take action against unlicensed broadcasting and business radio complaints with priority given to cases of interference to safety of life services.

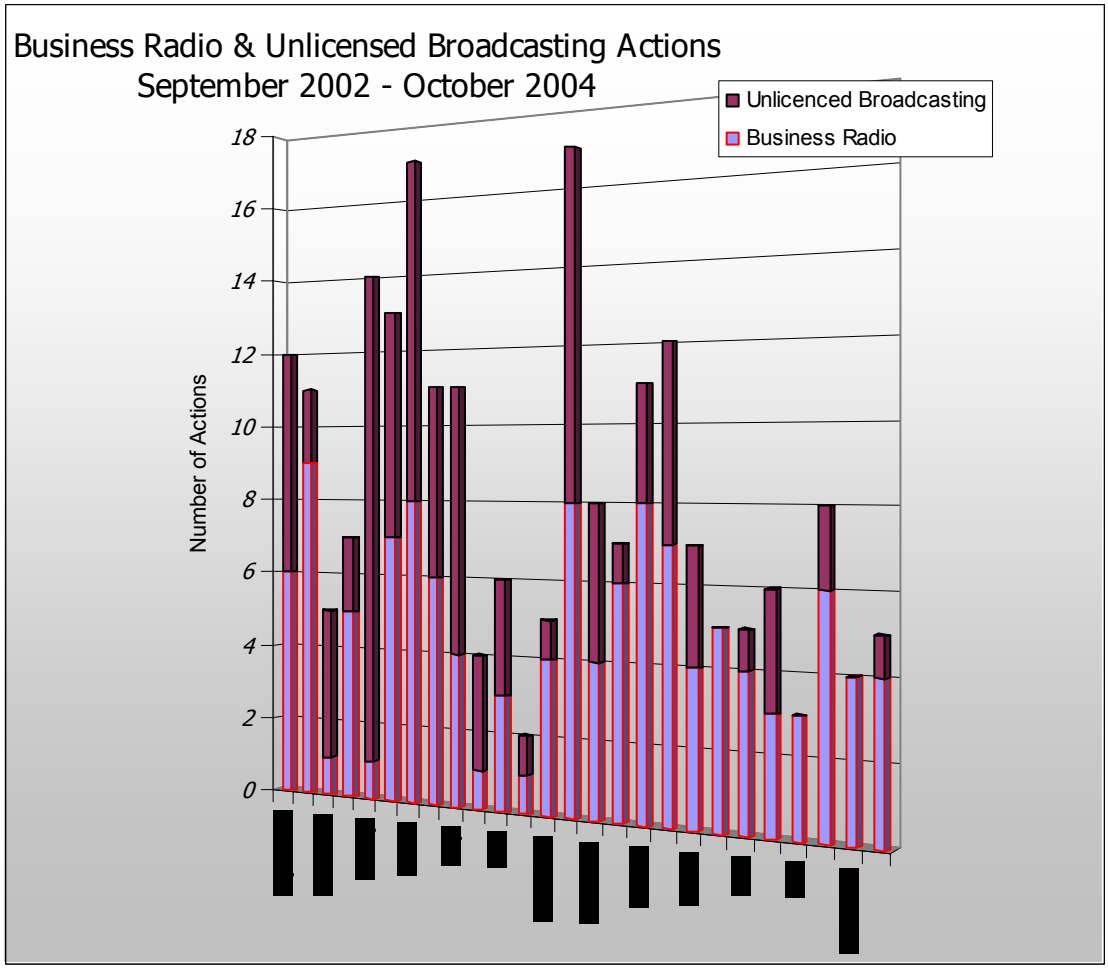

Figure An.C.3: Combined enforcement actions on business radio and unlicensed broadcasting from September 2002 to October 2004.

C.6 NIR Auditing

Non-ionising radiation (NIR) is the term given to electromagnetic radiation which has insufficient energy to cause ionisation (molecular changes) in living matter. It includes static and power frequency fields, radiofrequencies, microwaves, infra-red, visible and ultraviolet radiation.

ComReg's responsibility and capacity to act in this area is solely to ensure that its licensees comply with their licence conditions relating to non-ionising radiation, such that all NIR emissions from their apparatus are within the levels set down by the International Commission on Non-Ionising Radiation Protection (ICNIRP) in 1998.

Licensees must take full account of the ICNIRP limits when designing, constructing, and operating any radio installations. ICNIRP is an independent, scientific organisation established in 1992 under the auspices of the World Health Organisation (WHO) to provide guidance and recommendations on NIR issues globally. ICNIRP operates in co-operation with the Environmental Health Division of the WHO and the United Nations Environment Programme. In 1998 ICNIRP

issued a position paper on the health and safety aspects of NIR, reviewing both the thermal and other effects of NIR. The report's conclusion endorsed the 1988 limits produced by the IRPA.

Until 2001 ComReg arranged for audits of compliance of major licensed operators to be carried out. This was to ensure that the radiation emissions from Telecommunication masts were within the ICNIRP guidelines for NIR emission levels.

In 2003, ComReg arranged for an independent NIR audit of 400 sites countrywide to assess compliance with the current ICNIRP limits. This project was the largest NIR audit ever conducted in Ireland and is now complete. The four interim reports and final report is available on the ComReg website[84], giving the details of each site measurement. All sites measured were found to be well within the ICNIRP levels.

ComReg will continue to monitor licensee compliance to NIR guideline limits in the future. At the time of writing this document, ComReg is in discussions with the Department of Communications Marine and Natural Resources to define a more effective targeted method of assessing NIR compliance in order to build on the results of last year's extensive audit.

[84] www.comreg.ie

Annex D: The Regulatory Framework for Spectrum Management in Ireland

D.1 The National Framework

D.1.1 Role of the NRA

During the liberalisation of the telecommunications sector across Europe in the 1990's many Countries established an independent regulator to deal impartially with the sector. In Ireland, the Commission for Communications Regulation (ComReg) (The Commission) is the National Regulatory Authority responsible for the regulation of the electronic communications sector (telecommunications, radiocommunications and broadcasting transmission) and the postal sector.

Established on the 1 December 2002[85], ComReg was preceded by the Office of the Director of Telecommunications Regulation (The ODTR) which was the original NRA established in June 1997[86].

One of the functions of the Commission is to manage the radio frequency spectrum. In carrying out this role ComReg must:

- take into account any policy directions issued by the Minister for Communications, Marine and Natural Resources;
- in meeting its objective to ensure the efficient management and use of the radio spectrum, ensure that measures taken are proportionate;
- have regard to international developments with regard to the radio frequency spectrum.

The management of the radio frequency spectrum takes place within a framework which encompasses both national law and international obligations. This framework is detailed below.

D.1.2 Role of the Department of Communications, Marine and Natural Resources

The Department of Communications, Marine and Natural Resources (the DCMNR) was established in June 2002 as a result of the restructuring of a number of Government Departments. The Department's economic remit brings together the communications, broadcasting and energy functions with those of marine and natural resources. The Department has responsibility for 19 commercial and 25 non-commercial State bodies and regulatory offices which includes ComReg as well as 14 harbour authorities.

[85] Established under the Communications Regulation Act, 2002 (No. 20 of 2002) and the notice of establishment day was given under S.I. No. 510 of 2002 Communications Regulation Act 2002 (Establishment Day) Order 2002.
[86] Established under the Telecommunications (Miscellaneous Provisions) Act, 1996 (No. 34 of 1996)

The role of the Minister for Communications, Marine and Natural Resources in regard to spectrum management is to develop Primary and Secondary legislation providing a national framework for spectrum management, develop broadcasting policy, issue policy directions to the Commission as he considers appropriate and in accordance with international law and to represent Ireland at international decision making bodies such as the International Telecommunications Union (the ITU), the Conference of European Post and Telecommunication Administrations (CEPT), the European Union and their affiliated bodies.

Within these international bodies ComReg is involved, at the invitation of the Minister, to provide specialist expertise on spectrum management issues.

D.1.3 Legislative Framework relating to Spectrum Management

The legislative framework provides the legal basis for the regulation of the communications sector in Ireland. This framework is composed of primary and secondary legislation and is published in the Irish Statute Book[87]. In recent years there has been a number of European Parliament and Council Directives and Decisions which have been transposed into Irish law, under secondary legislation, and which establish a new framework for the regulation of the electronic communications sector.

Acts of the Oireachtas (Parliament) constitute primary legislation in Ireland. The principal Acts applicable to the development of the spectrum management framework - the Acts which established ComReg and Acts governing the radio and broadcasting sectors in Ireland are detailed below:

Responsibility for the regulation of the telecommunications sector in Ireland, including the management of the radio spectrum, was transferred to an independent regulator in 1997 under the Telecommunications (Miscellaneous Provisions) Act, 1996 (No. 34 of 1996). This Act established the Office of the Director of Telecommunications Regulation, ODTR, transferred functions from the then Minister for Transport, Energy and Communications to the Director, allowed for the imposition of a levy on telecommunications service providers and for the regulation of tariffs for some telecommunications services.

In 2002, the ODTR was replaced by a Commission. The Communications Regulation Act, 2002 (No. 20 of 2002) dissolved the ODTR, established the Commission for Communications Regulation (ComReg), extended the role of the regulatory body and defined its functions.

The main Acts governing the radio sector are the Wireless Telegraphy (WT) Acts of 1926, 1956, 1972 and the Broadcasting and Wireless Telegraphy Act, 1988. The WT Acts provide for the licensing of radio systems in Ireland. Under these Acts, the possession and use of apparatus for wireless telegraphy[88] requires authorisation – either by a licence or licence exemption.

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[87] http://www.irishstatutebook.ie/

[88] Apparatus for wireless telegraphy is defined in the WT Act, 1926 (No. 45 of 1926) as "apparatus for sending and receiving or for sending only or for receiving only messages, spoken words, music, images, pictures, prints,

The primary legislation applicable to the Broadcasting sector comprise the Broadcasting Authority Act 1960 as amended,, the Broadcasting and Wireless Telegraphy Act, 1988, the Broadcasting Act 1990, the Radio and Television Act, 1988 and the Broadcasting Act, 2001. RTE is the national broadcaster in Ireland and is licensed under the 1960 Broadcasting Authority Act. The BCI, which manages the independent radio and television sector, is licensed under the Radio and Television Act, 1988 and it is responsible for issuing sound and television broadcasting contracts to the independent sector.

It should be noted that ComReg is not responsible for the regulation of broadcasting content. This responsibility lies with the Broadcasting Commission of Ireland (BCI) for the independent television and radio sector and with the Radio Telefís Éireann (RTÉ) Authority for RTÉ programme services.

In July 2003, a new EU regulatory framework for electronic communications came into force. This had a significant impact on the manner in which the communications sector is regulated throughout Europe. The framework comprised 5 Directives[89] (Framework, Authorisation, Access, Universal Service and Data Protection) and one Decision (Spectrum Decision) and it aims to promote competition, the interests of the citizen (universal service, consumer protection, privacy, dispute resolution) and the single European market. This framework does not include broadcast content regulation.

In Ireland, the Framework, Authorisation, Access and Universal Service Directives were transposed into law under the following Regulations[90]:

- S.I. 305 of 2003, European Communities (Electronic Communications Networks and Services) (Access) Regulations 2003 ("Access Regulations");
- S.I. 306 of 2003 European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2003 ("Authorisation Regulations");
- S.I. 307 of 2003 European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2003 ("Framework Regulations");
- S.I. 308 of 2003 European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulations 2003 ("Universal Service Regulations").

In terms of the radio spectrum, usage is now subject to individual rights of use for radio frequencies. Such rights of use continue to be referred to as radio licences in

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or other communications, sounds, signs, or signals by wireless telegraphy and includes any part of such apparatus and any article primarily designed for use as part of such apparatus and not capable of being conveniently used for any other purpose".

[89] Available at http://europa.eu.int/information_society/topics/telecoms/regulatory/new_rf/

[90] Available at http://www.dcmnr.gov.ie/files/

Ireland, although certain conditions which applied to radio licences under the WT Acts 1926-1988 no longer apply[91]. Further information on the new regulatory regime may be found at http://comreg.ie/about_us/ .

In the next 2-5 years it is expected that a number of new Acts relating to the regulation of the electronic communications sector will be enacted. These include a new Miscellaneous Provisions Act, a new Radiocommunications Act, which will replace the Wireless Telegraphy Acts 1926-1988, and new Broadcasting legislation. The implications of this new legislation will be included in future strategy documents.

D.1.4 Legislation issued under the WT Acts 1926-1988

In Ireland, the day-to-day aspects of primary legislation are implemented by secondary legislation in the form of Statutory Instruments (S.I.) – either "Regulations" or "Orders". Statutory Instruments are made by the person or body that has been granted the power to legislate on such matters and they can take five forms: by-laws, orders, regulations, rules and schemes. For the electronic communications sector, ComReg is responsible for the development of radio licensing Regulations (subject to the approval of the Minister) and licence exemption Orders, under the WT Acts 1926-1988. Since 2003, these regulations must conform to the requirements of the EU Framework regulations described above.

The Statutory Instruments issued over the period 1922-2002 are published at http://www.irishstatutebook.ie/. Regulations applicable to the communications sector issued over the period 1997-2004 are available at http://comreg.ie/about_us/ .

D.2 The Regional Framework

D.2.1 The European Union

The European Union comprises 25 Member States operating together under a series of international treaties including the Treaty on European Union that established the European Commission which is responsible for implementation of the treaties, managing EU policy and making proposals for new legislation to achieve the objectives of the various treaties. The Commission are able to and have used, legally binding regulatory measures to achieve policy objectives, including objectives related to radio spectrum usage and management. The pace of these regulatory measures is gathering speed as market integration becomes a reality within the EU.

The European Commission policy objectives for radio spectrum usage include:

1 facilitating technological innovation and competition in radiocommunications, mobile telephony and wireless local networks;

[91] See ComReg document 03/84 entitled "Wireless Telegraphy Licences - Future Applicability of Licence Conditions"

2 pursuing Community objectives with regard to the radio spectrum within a predictable and legally certain regulatory framework;

3 ensuring an appropriate balancing of the interests of the individual Member States, of the European Community and of the different user communities; and

4 safeguarding the Community's interests in the international negotiations on the radio spectrum.

Following a review of the whole EU Framework for telecommunications, on 14 February 2002, the European Union adopted a series of new Directives designed to strengthen competition in the EU electronic communications market. These Directives were transposed into Irish law in July 2003 and provide for access to radio spectrum to be primarily driven by policy objectives while recognising that access must be conditioned by technical considerations.

The new regulatory package also includes a Radio Spectrum Decision[92] that is a platform for realising a coherent approach on spectrum strategy across the EU.

To achieve the goals of the Directives and the Decision the EU has established a Radio Spectrum Committee, to implement measures in close cooperation with the CEPT, and a Radio Spectrum Policy Group which gives political advice to the Commission on strategic policy questions. The Commission also work in close cooperation with the CEPT on international negotiations concerning world wide spectrum issues such as the ITU World Radiocommunication Conferences.

The EU has also played a significant role in movement of goods throughout Europe and in the placing of goods on the market throughout the Community. In relation to Radio and electronic communications sector there are two Directives, in particular which need to be discussed, the Electromagnetic Compatibility (EMC) Directive and the Radio and Telecommunications Terminal Equipment (R&TTE) Directive.

D.2.2 EMC Directive

Directive 89/336/EEC relating to Electromagnetic Compatibility (EMC) was transposed into law in Ireland by Statutory Instrument No. 22 of 1998, European Communities (Electromagnetic Compatibility) Regulations. These Regulations apply to apparatus[93] which is liable to cause or be disturbed by electromagnetic disturbance. Under the EMC Regulations, ComReg has the power to withdraw from the market apparatus which is not in compliance with the regulations. Additionally, ComReg has the powers to appoint authorised officers for the purpose of seizing apparatus and documents that may be required to fulfil ComReg's functions or the functions of a competent body or notified body under the Regulations.

[92] Spectrum Decision (766/2002/EC) OJ L 108 of 24.4.2002 p. 1

[93] Apparatus is defined in the Regulations as "all electrical and electronic appliances and equipment (together with equipment and installations) containing either electrical or electronic components or both electrical and electronic components to which these Regulations apply".

D.2.3 R&TTE Directive

All radio and telecommunications terminal equipment placed on the market in Ireland is now required to comply with the Radio and Telecommunications Terminal Equipment (R&TTE) Directive 1999/5/EC. This Directive was transposed into Irish law in 2001 by Statutory Instrument (S.I.) 240 of 2001. The main provisions of the Directive are that radio and telecoms terminal equipment must meet safety and electromagnetic compatibility requirements as well as, for radio equipment, the efficient use of the radio spectrum.

In terms of ComReg's role under the Regulations, ComReg is required under Regulation 5(6) of the S.I. to notify the European Commission of the regulated interfaces in Ireland as well as details of the interfaces offered by public telecommunications network operators in Ireland. In 2000, ComReg submitted information relevant to these aspects to the EC. ComReg is now carrying out a review of these obligations, with a view to submitting updated information to the EC over the coming months. Under the R&TTE Regulations, ComReg has also been designated as the authority responsible for market surveillance.

The R&TTE Directive encompasses the requirements of the Low Voltage Directive (LVD)[94] and the Electromagnetic Compatibility Directive (EMCD)[95] (Directives 73/23/EEC and 89/336/EEC respectively). In testing compliance to the R&TTE Directive, manufacturers have the option of using harmonised standards[96]. Although their use is not mandatory, harmonised standards give a presumption of conformity to the essential requirements of the Directive within their scope. A list of the harmonised standards under the R&TTE Directive is maintained on the European Commission's website[97]. For the most part, harmonised standards under the R&TTE Directive are developed by ETSI. Furthermore, harmonised standards that have been published under the LVD[98] and EMCD[99] give a presumption of conformity to the low voltage and EMC requirements of the R&TTE Directive respectively. Where a manufacturer chooses not to use a harmonised standard to test compliance, he/she must demonstrate how the essential requirements of the R&TTE Directive are met.

Under the R&TTE Directive a number of Commission Decisions have been adopted[100]. One such Decision is Commission Decision 2000/299/EC[101] (6 April 2000) which relates to the initial classification of radio and telecommunications terminal equipment and the application of equipment "identifiers". This Decision stipulates that telecommunications terminal equipment and radio equipment which can be placed on the market and put into service without restrictions are referred to as "Class 1". An Equipment Class Identifier is not assigned for this class of equipment. Radio equipment for which Member States apply restrictions in terms of placing on the market or putting into service is referred to as "Class 2" and a specific

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[94] Transposed into Irish law by Statutory Instrument 62 of 1975
[95] Transposed into Irish law by Statutory Instrument 22 of 1998
[96] http://europa.eu.int/comm/enterprise/rtte/harstand.htm
[97] http://europa.eu.int/comm/enterprise/newapproach/standardization/harmstds/reflist/radiotte.html
[98] http://europa.eu.int/comm/enterprise/newapproach/standardization/harmstds/reflist/lvd.html
[99] http://europa.eu.int/comm/enterprise/newapproach/standardization/harmstds/reflist/emc.html
[100] http://europa.eu.int/comm/enterprise/rtte/decision/present.htm
[101] http://europa.eu.int/comm/enterprise/rtte/decision/classif.htm

equipment identifier is assigned to this class of equipment. More information on the classification of equipment in accordance with the R&TTE Directive is available on the European Radiocommunications Office (ERO) website[102].

ComReg attends TCAM, the standing committee under the R&TTE Directive which assists the European Commission in the implementation of the Directive. TCAM meets approximately three times per year.

D.2.4 CEPT

The European Conference of Postal and Telecommunications Administrations (CEPT) established in 1959 is a body of policy-makers and regulators currently encompassing 46 European countries[103] covering almost the entire geographic area of Europe.

The essential aims of the CEPT are to strengthen relations between member Administrations, to promote their co-operation and to contribute to creating a dynamic market in the field of European posts and telecommunications.

Its functions include:

1 working out common views on the priorities and aims set in the field of posts and telecommunications;

2 examining, in a European context, public policy and regulatory issues regarding posts and telecommunications;

3 promoting the harmonisation of regulations;

4 establishing necessary contacts and co-operation with European organisations and bodies and other institutions dealing with postal and telecommunications matters;

5 providing a forum for the preparation of common positions for congresses and/or conferences of international postal and telecommunications organisations and bodies.

The CEPT, which deals exclusively with sovereign regulatory matters, has established two committees, one on postal matters (CERP) and another dealing with radiocommunications and telecommunications issues: the ECC (Electronic Communications Committee). The committees handle harmonisation activities within their respective fields of responsibility, and adopt recommendations and

[102] http://www.ero.dk/rtte

[103] Administrations from the following 46 countries are members of CEPT: Albania, Andorra, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, San Marino, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Turkey, Ukraine, Vatican.

decisions. Under the ECC there are a number of working groups and project teams which develop and deal with radio spectrum issues for consideration by the ECC plenary meetings. The ECC also adopts Decisions, Recommendations and Reports aimed at efficient spectrum utilisation and harmonisation. While the implementation of the Decisions and Recommendations by national administrations is on a voluntary basis, as the CEPT and ECC have no legislative power, the ECC has played a significant role in harmonising spectrum use in Europe providing, for example, a table of European frequency allocations which is in effect a long term strategic plan for harmonisation and use of the radio spectrum throughout Europe.

Within the available resources, ComReg is actively involved in the most relevant CEPT working groups, project teams and the ECC plenary sessions in order to promote and protect Ireland's interests.

D.2.5 The Linkage between the European Commission and the CEPT

Over the last few years the EC has shown an increased interest in spectrum issues including the work of the CEPT. In this regard, the EC has mandated CEPT to undertake studies on specific spectrum issues and as appropriate, to develop Recommendations and Decisions, for adoption by Member States.

A recent example of EC involvement in CEPT activities concerns the selection of appropriate frequency bands for the introduction of Automotive Short Range Radars (SRR). These SRRs are intended to be used in motor vehicles for collision avoidance purposes. A band had already been identified by CEPT in the 77 GHz region for this type of application but the technology was considered to be insufficiently mature for mass production of devices using that band. Therefore an interim solution was proposed by the automotive industry in the 24 GHz region to facilitate an early introduction of these devices. This part of the spectrum is already used for a range of applications including microwave links supporting mobile telephony infrastructure, passive sensing of the Earth's environment (particularly temperature) by earth-exploration satellites and radio astronomy observatories.

Due to the challenge of sharing between SRR and these services, the EC mandated CEPT to study the issue and a complex package was developed. This package comprises a report from CEPT to the EC which explored the options available, an ECC Decision[104] on the 79 GHz band as the long-term home for automotive SRR applications, an ECC Decision[105] designating the 24 GHz band for automotive SRR under certain conditions, an EC Decision establishing a legislative framework for the use of the 24 GHz band by SRR and an associated Harmonised Standard developed by ETSI.

In the case of the 24 GHz band the ECC and EC Decisions make the band available to SRR applications for a limited time period on a non-interference and unprotected basis, with a limit on the level of penetration by SRRs in the market of any Member

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[104] ECC/DEC/(04)03 - ECC Decision of 19 March 2004 on the frequency band 77-81 GHz to be designated for the use of Automotive Short Range Radars (available at www.ero.dk)

[105] ECC/DEC/(04)10 - ECC Decision of 12 November 2004 on the frequency bands to be designated for the temporary introduction of Automotive Short Range Radars (SRR) (available at www.ero.dk)

State supported by a legislative basis for preventing further devices being placed on the market in the event of interference or penetration levels being exceeded and in any case after a cut-off date.

This example illustrates the complex relationships between CEPT, the EC and individual Member States in developing harmonised solutions for the use of the radio spectrum.

D.2.6 Proposed ComReg Strategy at the Regional Framework Level

The proposed strategy at the Regional Framework level is:

- to work within European frameworks to ensure that the availability of spectrum and regulatory practices are in line with ComReg's objectives, particularly where they bring benefits to consumers in terms of increased choice, more competitive pricing and better quality services;
- to implement, to the maximum extent possible, the CEPT/ECC Table of European Common Frequency Allocations (ECA)[106] in order to support regional harmonisation, noting that implementation of the ECA is currently under review within CEPT;
- where appropriate, to implement ECC Decisions;
- to influence and support the development of harmonised standards;
- to improve co-ordination of frequency assignments with other administrations, through a harmonised European or global approach or by bi-lateral or multi-lateral agreements, as appropriate.

D.3 The Global Framework

D.3.1 The ITU

The effective integration of each nation into the international community of spectrum users is required to ensure availability of interference free-services such as international aeronautical and maritime communications supporting air and sea travel, global mobile communications, satellite communications, international broadcasting and public safety services such as search and rescue. Because radio waves do not respect international boundaries and many systems operate on a world-wide basis, the international community has developed a structure for co-operatively managing interference between services and between nations. International co-operation in the field of telecommunications can be traced back to 1865 with the establishment of the International Telegraph Union as a method of solving interference problems. In 1939, participating nations decided to create a single organisation known as the International Telecommunications Union (ITU), governed

[106] See CEPT ERC Report 25, The European table of frequency allocations and utilisations covering the frequency range 9 kHz – 275 GHz (available at www.ero.dk).

by a single International Telecommunications Convention supplemented by the Radio Regulations.

The ITU uses a number of structures and associated meetings to carry out its activities, including World Radiocommunication Conferences that review and amend the Radio Regulations which contain technical and procedural provisions related to each of the various radio services. The Radio Regulations serve as the primary international agreement covering rules and procedures for operating radio equipment and resolving and preventing interference and contain the international frequency allocation table. While each nation remains sovereign in their use of the radio spectrum the work of the ITU forms the global framework on which regional and national planning is developed.

Ireland operates within a global economy. International markets and competition must therefore be taken into account in the development and introduction of new services. Spectrum allocation issues also have to take the international dimension into account. To maintain an effective and responsive regulatory structure there is an ongoing need for participation in appropriate international fora, to track and influence developments in international regulation, harmonisation of standards and new market opportunities and to monitor developments in technologies and applications.

In the 30 months since the publication of the spectrum strategy in May 2002 ComReg has been a key participant in Irish delegations to International fora including the Conference Preparatory meeting to prepare for the 2003 World Radiocommunication Conference, the World Radiocommunication Conference[107] itself, the first session of a Regional Radiocommunication Conference[108] (RRC) to develop frequency plans for digital broadcasting and a number of preparatory meetings for the second session of the RRC to be held in 2006. Lead by the DCMNR the Irish delegation which includes ComReg staff works to meet objectives and goals established in the national preparatory process.

D.3.2 WTO

The allocation and use of frequencies in the EU is subject to the provisions of the Framework Directive and the Specific Directives[109]. The provisions of these Directives reflect the commitments in the GATS (General Agreement on Trade in

[107] See document ODTR 03/66 Information Notice on the World Radiocommunication Conference and document ODTR 03/79 Second Information notice of the World Radiocommunication Conference – July 2003.
[108] See document ComReg 04/66 Information notice on Regional Radiocommunication Conference (RRC-04)
[109] The new regulatory framework for electronic communications networks and services, comprising of Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, ("the Framework Directive"), OJ 2002 L 108/33, and four other Directives (collectively referred to as "the Specific Directives"), namely: Directive 2002/20/EC of the European Parliament and of the Council on the authorisation of electronic communications networks and services, ("the Authorisation Directive"), OJ 2002 L 108/21; Directive 2002/19/EC of the European Parliament and of the Council on access to, and interconnection of, electronic communications networks and services, ("the Access Directive"), OJ 2002 L 108/7; Directive 2002/22/EC of the European Parliament and of the Council on universal service and users' rights relating to electronic communications networks and services, ("the Universal Service Directive"), OJ 2002 L 108/51; and the Directive 2002/58/EC of the European Parliament and of the Council concerning the processing of personal data and the protection of privacy in the electronic communications sector, ("the Privacy and Electronic Communications Directive"), OJ 2002 L 201/37.

Services) Agreement on Basic Telecommunications Services and in the Technical Barriers to Trade (TBT) Agreement, which are applicable to the EU and its Member States.

D.3.2.1 Background

The General Agreement on Trade in Services (GATS) was concluded in 1994 following the Uruguay Round of GATT negotiations on December 15, 1993. The Agreement on Basic Telecommunications entered into force on January 1, 1998 and constituted part of the GATS commitments. 55 schedules of commitments on telecommunications services, which sought to liberalise the world telecommunications market, representing 69 WTO member governments had been agreed to. The EU committed to one concessions schedule for its (then) 15 Member States. With respect to any measure covered by the Agreement, each Member shall accord unconditionally to services and service suppliers of any other Member, treatment no less favourable than that it accords to like services and service suppliers of any other country. The GATS allows some freedom to allocate and assign frequencies domestically provided that any such provisions do not have the purpose or effect of blocking, or unreasonably limiting market access for operators from other WTO Member countries. Frequency management policies if implemented in accordance with these provisions do not *per se* constitute a market access barrier.

The Agreement on Technical Barriers to Trade (TBT) relates to trade in goods. The first agreement was signed in 1979, at the end of the Tokyo Round of negotiations, by 32 GATT Contracting Parties. The Standards Code, as the Agreement was called, laid down the rules for preparation, adoption and application of technical regulations, standards and conformity assessment procedures. A GATT working group, set up to evaluate the impact of non-tariff barriers in international trade, had concluded that technical barriers were the largest category of non-tariff measures faced by exporters. The new WTO Agreement on Technical Barriers to Trade, or TBT Agreement, has strengthened and clarified the provisions of the Tokyo Round Standards Code. The TBT Agreement, negotiated during the Uruguay Round is an integral part of the WTO Agreement.

The difference between a standard and a technical regulation lies in compliance. While conformity with standards is voluntary, technical regulations are by nature mandatory. They have different implications for international trade. If an imported product does not fulfil the requirements of a technical regulation, it will not be allowed to be put on sale. In the case of standards, non-complying imported products will be allowed on the market, but then their market share may be affected if consumers' prefer products that meet local standards such as quality for textiles and clothing.

D.3.2.2 Community and International Obligations Applicable

The EU's commitments in the GATS agreement are reflected in the above mentioned Directives. Under these Directives, the designation of radio frequencies for specific communications services and licensing must be based on objective criteria and procedures must be transparent and published in an appropriate manner. Where Member States decide to limit licenses to use radio frequencies, in order to

ensure the efficient use and efficient management of frequency spectrum, they must do so having regard to the principle of proportionality and the need to maximise benefits for users and to facilitate the development of competition. Where there is no limitation on the number of licenses, any undertaking which fulfils the conditions decided and published by the Member State is entitled to receive a full licence.

The **Technical Barriers to Trade Agreement (TBT)** tries to ensure that regulations, standards, testing and certification procedures do not create unnecessary obstacles to trade in goods or are used as an excuse for protectionism. The Agreement ensures Members accord to imported products national and non-discriminatory treatment in relation to technical regulations, standards and conformity assessment procedures.

Exclusive reservation of specific frequency bands for a specific standard or system must remain limited to those cases where it is necessary, in particular to ensure the efficient use of spectrum and, as a general rule, reference to product requirements in terms of performance is preferable to reference to design or descriptive characteristics.

The TBT also contains general criteria for determining whether a measure constitutes an unnecessary obstacle to trade, and shall not be more trade-restrictive than to fulfil a legitimate objective, which include *inter alia*, national security requirements, the prevention of deceptive practices, protection of human health or safety, animal or plant life or health, or the environment.

D.3.3 Proposed Strategy at the Global Framework Level

The proposed strategy for the global framework level should continue to include:

- supporting harmonisation of global spectrum allocations where the harmonisation fits in with Ireland's strategic vision;
- ensuring that Irish interests as a whole are promoted;
- participating actively in key ITU activities in so far as available resources permit to support greater efficiency in its operations;
- supporting the development of relevant international standards;
- taking an active role in the work of international meetings in line with ComReg's legislative mandate, when invited by the Minister to contribute through ComReg's specialist spectrum management expertise.

Annex E: List of Recommendations aimed at ComReg from Forfás Report, "Wireless Communications: An Area of Opportunity for Ireland," April 2004

- ComReg to consider promoting the change of use of spectrum by users;
- ComReg to continue to monitor the development of "spectrum commons" models in other markets and consider making bands available for unlicensed use in response to, or ahead of developments in other markets (including important markets beyond Europe such as USA and Japan);
- ComReg to monitor progress in Ultra Wide Band (UWB) licensing in other markets with the aim of moving more rapidly to license UWB than other European markets;
- ComReg to consider establishing zones of relaxed spectrum regulation – for example a UWB zone in an Agency business park;
- ComReg to consider extending the regime of test licences to allow R&D and commercial trial licences.

Glossary

Term	Definition
3G	Third Generation
ADSL	Asymmetric Digital Subscriber Line
AIP	Administrative Incentive Pricing
ATC	Air Traffic Control
BCI	Broadcasting Commission of Ireland
BSS	Broadcast Satellite Service
CAIRDE	Civil Aviation Integrated Radar Display Equipment
CB	Citizens Band
CCDP	Co-channel dual polar, technique for combining horizontal and vertical polarisation to double capacity of a microwave fixed link
CDMA	Code Division Multiple Access, technique for differentiating between different spectrum users on the basis of unique codes rather than time or frequency
CENELEC	European Committee For Electrotechnical Standardization
CEPT	Conference of European Telecommunications and Postal Administrations
Consumer Surplus	The cumulative difference between the willingness to pay for a good and its price, used by economists to measure of the economic and other benefits of a resource such as the radio spectrum to consumers.
DAB	Digital Audio Broadcasting
DCMNR	Department of Communications, Marine and Natural Resources
DME	Distance Measuring Equipment (ILS component
DSL	Digital Subscriber Line
DTT	Digital Terrestrial Television
DVB	Digital Video Broadcasting Standard
DVB-C	Cable DVB standard
DVB-H	Handheld DVB standard, intended for delivery of audiovisual content to mobile terminals
DVB-S	Satellite DVB standard
DVB-T	Terrestrial DVB standard
DVOR	Doppler VHF Omnidirectional Radar (ILS component)
EC	European Commission
ECC	European Communications Committee
ECN	Electronic Communication Network
ECS	Electronic Communication Service
EESS	Earth Exploration Satellite Service
EMC	Electromagnetic Compatibility
ERC	European Radiocommunications Committee (forerunner to ECC)
ETSI	European Telecommunications Standards Institute
FAIE	Federation of Aerospace Enterprises in Ireland
FDD	Frequency Division Duplex, technique where two separate frequencies are used for forward and reverse transmission
FM	Frequency Modulation
FSS	Fixed Satellite Service
FWA	Fixed Wireless Access
FWALA	Fixed Wireless Access, Local Area
FWPMA	Fixed wireless point to multipoint access
Galileo	Planned new European satellite navigation system

Term	Definition
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GMDSS	Global Maritime Distress and Safety System
GPRS	General Packet Data Service: Packet data transmission standard for GSM mobile phone networks
GPS	Global Positioning System
GSM	Global System for Mobile Communications: European 2nd generation mobile phone technology now in use worldwide
GSM-R	GSM for railways, variant of GSM mobile phone standard that provides communication and signalling functionality for railway use
HDFSS	High Density Fixed-Satellite Service
IAA	Irish Aviation Authority
ICAO	International Civil Aviation Organisation
ICNIRP	International Committee on Non-Ionising Radiation Protection
IEEE	Institution of Electrical and Electronics Engineers (US Standards Body)
ILS	Instrument Landing System
IMT-2000	International Mobile Telecommunications 2000 – A family of standards agreed by ITU for 3rd Generation mobile phones
IRPA	International Radiation Protection Association
IRVR	Instrument Runway Visual Range (ILS component)
ITU	International Telecommunications Union
Mbit/s	Megabits per second
Microwave	Generic terms for frequencies in the range 3 GHz to 30 GHz
MMDS	Multipoint Microwave Distribution System (for multi-channel TV)
MRAU	Maritime Radio Affairs Unit
MSS	Mobile Satellite Service
MSSR	Monopulse secondary surveillance radar
NDB	Non-directional Beacon
NIR	Non-Ionising Radiation
NRA	National Regulatory Authority
PAMR	Public Access Mobile Radio, business radio service that provides services to third party subscribers
PC	Personal Computer
PFP	Partnership for Peace, an agreement focussing on practical co-operation between NATO and partner countries
PMR	Private Mobile Radio
PMR 446	Licence exempt two way radio standard
PoC	Push to talk over cellular, technology enabling business radio functionality over GSM networks
Producer Surplus	The cumulative sum of the difference between the price of a good and what a firm is willing to be paid to produce the good, used by economists to measure of the economic and other benefits of a resource such as the radio spectrum to producers.
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
R&TTE	Radio and Telecommunications Terminals
Radar	Radiodetermination system based on the comparison of reference signals reflected, or transmitted from the position to be determined. This encompasses meteorological radars and radionavigation systems.

Term	Definition
Radio-determination	Determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, be means of the propagation properties of radio waves.
RRC-06	2006 ITU Regional Radiocommunication Conference to address re-planning of broadcast bands for introduction of digital broadcasting
RTTT	Road Traffic Telemetry and Telematics
SAB	Services Ancillary to Broadcasting
SAP	Services Ancillary to Programme Making
SCADA	Supervisory, Control and Data Acquisition
SDR	Software Defined Radio
SI	Statutory Instrument
SIT	Satellite Interactive Terminal
SME	Small and Medium Enterprises
SMR	Surface Movement Radar
SNG	Satellite news gathering
SOHO	Small Office / Home Office
SRD	Short Range Device
SRE	Search and Rescue Equipment
SRR	Short Range Radar
SUT	Satellite User Terminal
TBT	Technical Barriers to Trade
TCAM	EU Telecommunications Conformity Assessment and Market Surveillance Committee and Market Surveillance Committee
TDAB	Terrestrial Digital Audio Broadcasting
TDD	Time Division Duplex, technique whereby the same frequency can used for forward and reverse transmission
TES	Transportable Earth Station (satellite service)
TETRA	Terrestrial Trunked Radio, European digital trunked mobile radio standard
UHF	Ultra High Frequency (300 MHz to 3 GHz)
UMTS	Universal Mobile Telecommunications System: European 3rd generation standard, part of IMT-2000 family of standards
UWB	Ultra Wideband
VHF	Very High Frequency (30 MHz to 300 MHz)
VoIP	Voice over Internet Protocol, technique for carrying real-time voice communication over packet data networks such as the internet
VSAT	Very Small Aperture Terminal (satellite earth station)
WBS	Wireless Broadband Services
WHO	World Health Organisation
Wi-Fi	Commercial name for WLAN devices operating in the 2.4 GHz and 5 GHz bands, based on the IEEE 802.11 series of standards
WiMAX	Family of standards under development for broadband wireless access in bands above 3 GHz, also referred to as IEEE 802.16
WLAN	Wireless Local Area Network
WRC	World Radiocommunication Conference
WT Act	Wireless Telegraphy Act
WTO	World Trade Organisation