DRAFT PUBLICATION

Strategic Management of the Radio Spectrum in Ireland

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Proposed Foreword

The telecommunications sector that the ODTR regulates, has and continues to transform almost every area of our lives – business, education, public services and leisure – at a pace that would have been unthinkable just five years ago. We are poised to enter the broadband age where wireless systems are expected to have the potential to deliver high capacity services on the move and also potentially provide an alternative medium to wired systems for delivering broadband to the home, adding competition in the last mile and most importantly bringing down prices and offering a diversity of choice to the consumer.

I am constantly aware that the spectrum, the foundation without which these innovations would not be possible, is a finite resource and the pressure on it is constantly growing as demand continues to accelerate. As the information society continues to develop at a breathtaking pace, the task of managing the radio spectrum becomes ever more complex and its importance for the nation ever greater.

My objective is to ensure that spectrum is used in the best possible manner and this strategy document sets out the framework in which spectrum is used, develops a picture of the current use of spectrum in Ireland and how we expect this to develop in the years ahead.

Following on from the consultation paper released in February 2001[1] and the response to the consultation[2] regarding the management of radio spectrum, this document develops the objectives we strive towards, the intended strategy we are under taking to achieve those objectives and outlines key issues for spectrum use going forward. In light of the fact that this is the first time we are publishing the spectrum strategy document, I have decided to publish it in draft form and to invite interested parties to remark on areas of interest to them. This presents an opportunity for spectrum users to submit comment and give input on topics of importance to them.

Openness and transparency is a premise that underlies the activities of my Office and this draft spectrum strategy document reflects our ongoing discourse with the public and our attempt to refine the strategy in consultation with them. I hope therefore, that many of

[1] ODTR Document No. 01/06
[2] ODTR Document No. 01/31

you will take up my invitation to comment on this document. Your views will be considered in developing the final version of the Spectrum Strategy.

Etain Doyle
Director of Telecommunications Regulation.

1 INTRODUCTION

In February 2001, the ODTR issued a consultation paper (ODTR Document No. 01/06) and in May 2001 a response to the consultation (ODTR Document No. 01/31), regarding the management of radio spectrum, which outlines the current spectrum management framework in Ireland and the key issues for spectrum use going forward.

The ODTR seeks to ensure that Ireland has the necessary operational framework in place to maximise economic benefit from radio spectrum while protecting the needs of the wider community. Over the last decade mobile communications, which depends substantially on radio spectrum, has become one of the fastest growing industries. Developments in other spectrum using services and technology such as digital broadcasting and satellite also have the potential to provide significant benefits to industry and consumers. Decisions about spectrum use have long term implications for the spectrum user, for the consumer, and for the Irish economy overall.

There are three issues driving the development of a strategic framework for managing the radio spectrum, these are:

1. The economic impact that the use of the radio spectrum has had in past years and how economically and socially the use of the radio spectrum has aided the development of the Irish economy. The ODTR wants to ensure a continued positive impact from radio spectrum usage on the economy by developing a clear, well-balanced strategy for future radio spectrum usage;

2. The general trend towards convergence, increased mobility and ubiquity of services requires spectrum managers make faster provision and in a more flexible manner than before. This strategy will aid future market development by ensuring flexibility and speed of provision.

3. It became clear during the consultation process mentioned above that there was a demand and need to lay out the future strategy being adopted to provide users with a strategy that:

    - Is informed by and informs spectrum management decisions at a European and International level;

- Takes due account of likely future developments in communications and other spectrum using sectors;
- Takes account of the requirements of Irish users and broader national objectives;
- Provides users with information to make appropriate investment decisions.

2 USING THIS DOCUMENT

This document is comprised of four parts.

Part A will be of particular interest to senior decision makers who want a broad look at the important issues and developments affecting the industry using radio spectrum. This section begins by examining the economic impact of radio spectrum usage and market developments drivers mentioned above. This is followed by the seven broad spectrum management objectives which the ODTR believes are central to a balanced spectrum strategy. Ten strategy guidelines are then determined to align the spectrum management strategy and philosophy. Bearing in mind the intention to implement administrative pricing, a short discussion ensures before looking at developments in some key radiocommunication services.

Part B is useful as an introduction for spectrum users who need to understand the complex arena in which radio spectrum users and mangers operate. This section lays out the Global, European and International framework in which radio spectrum management and users operate. This includes E.U directives, equipment standardisation, frequency usage harmonisation, compliance and enforcement.

Part C will be of particular interest to engineers and other specialists involved in the day to day management of the spectrum used by their specific service. This section concentrates on developments in all radiocommunication services dealt with by the ODTR. This includes specific spectrum management objectives for each radiocommunication service and spectrum strategy issues that have been decided or are under consideration by the ODTR.

Part D consists of two appendixes that provide a glossary of terms and definitions used and sources of useful information including sources of documents and a list of relevant websites.

3 IMPORTANT NOTICE

The information in this document is made available by the Office of the Director of Telecommunications Regulation (the "ODTR") on the understanding that it is for information purposes only. It is not intended to form the basis of any investment decision and should not be considered as a recommendation by the Director, the ODTR or their advisors to participate in any tender for the allocation of radio spectrum.

The ODTR makes no representation or warranty nor accepts any responsibility as to the accuracy or completeness of the information contained in this document and any liability in respect of any such information or any inaccuracy in, or omission from, this document is hereby expressly disclaimed.

Recipients of this document in any format should consult their own professional financial, legal or other advice in order to make an independent assessment of the potential value of any allocation of radio spectrum by whatever means applicable.

The policy of the ODTR is to correct and update the document from time to time as appropriate.

4 EXECUTIVE SUMMARY

The economic impact that the use of the radio spectrum has had in past years, the general trend towards convergence and requests from a previous consultation process are three issues driving the development of a strategic framework for managing the radio spectrum.

Considering the economic impact of radio spectrum use and the need for Radio Spectrum Management, the overall objective of this initiative is to develop a National Spectrum Strategy Framework which will establish guiding principles for managing the radio spectrum resource in Ireland's interest.

Consequently the ***broad spectrum management objectives***, which we believe are central to a balanced Spectrum Strategy are:

- To promote and support the orderly development and efficient operation of radiocommunication systems and services to facilitate the rapid development of a competitive, leading edge telecommunications sector that provides the best in terms of price, choice and quality to the end user, attracts business investment and ensures ongoing social and economic growth.
- To plan and manage the utilisation of the spectrum resource in accordance with both national and international legislation.
- To further improve efficient and optimum use of the spectrum resource, by example, the adoption of advanced spectrum allocation and management techniques based on operational requirements, bearing in mind technical and economic viability.
- To protect national interests when harmonising and co-ordinating spectrum utilisation with other countries, regional and international organisations.
- To ensure flexibility and ease of access to radio spectrum in reaction to technological advances and market factors in order to leverage Ireland's competitive advantage in this area.
- To support and promote innovation, research and development in new radiocommunication techniques, spectrum-based services and applications.
- To co-ordinate and establish national spectrum and radiocommunication policies and plans by widely consulting with all interested parties.

In addition a number of ***strategy guidelines*** have been adopted to align spectrum management strategy and philosophy. These are:

- The radio frequency spectrum, a finite resource, will be planned and allocated to advance the broad-spectrum management objectives adopted in this document.
- The allocation of and access to the spectrum resource will be adapted to provide spectrum that best meets the needs of the user and to facilitate new and innovative services.
- Emphasis also will continue to be placed on efficient spectrum utilisation and conservation techniques as a requirement for existing and new services.
- In order to maximise spectrum usage in critical frequency bands, the ODTR encourages the use of spectrum efficient radio systems and the use of the most appropriate frequency band for the application.
- Noting that a radio licence does not confer ownership nor a continued right to a particular radio frequency, the ODTR will review the current procedures in order to align investment decisions with licence duration.
- The ODTR will endeavour to provide reasonable notice to inform users of any conditions or circumstances which could result in displacement of services or systems to other bands – however it should be recognised that this will not always be possible.
- The ODTR will continue to authorise radiocommunication system trials and new technology experiments in frequency bands appropriate to the intended applications and subject to the availability of suitable spectrum.
- Recognising that standards are necessary for harmonious system operation, efficient spectrum management, spectrum utilisation, compatibility, competitiveness and avoidance of interference; were appropriate the ODTR considers it important to specify compliance with international standards as a requirement for spectrum access.
- In order to encourage efficient use of the spectrum, with the intention of bringing the demand for spectrum into equilibrium with its supply, it is the intention of the ODTR to introduce administrative pricing – subject to the consent of the Minister of Public Enterprise.
- The ODTR will continue to operate its consultation procedures in order to have the benefit of industry views when making decisions.

Administrative Pricing

Currently there are a few frequency bands that are becoming congested, mainly in high population density areas such as Dublin. The aim of administrative pricing is to make the operators use the spectrum more efficiently, with the intention of bringing the demand for spectrum into equilibrium with its supply by encouraging users to move to more spectrally efficient equipment, handing back spectrum they do not need and moving to a less congested part of the spectrum.

Summary of all Spectrum Management Objectives:

For Cellular Services:

- Facilitate increased competition in the mobile market
- Improve the quality offered by regular QoS[3] audits
- To utilise the available IMT-2000 spectrum with optimum efficiency
- Continue to develop co-ordination agreements with neighbouring countries for 3rd generation systems in the same vein as the GSM MoU[4].
- Monitor the evolution and coexistence of different 3G standards.
- Actively participate in international fora on mobile system development.
- Protect and prioritise Irish mobile cellular interests in national and international fora

For the Fixed Service:

- Formulate a policy document for the future management of the Fixed Service spectrum including link transfers and re-assignments by early 2002 and a forecast of the proposed future demand for point-to-point links to facilitate future Fixed Service spectrum allocations.
- Improve the use of the Fixed Service spectrum through a programme of compliance audits and investigations.
- Protect Fixed Service interests in international fora.
- Complete the development of an electronic licensing regime.
- Consider classifying link by usage e.g. Infrastructure links or access links to facilitate more effective spectrum management.

[3] QoS = Quality of Service
[4] MoU = Memorandum of Understanding

For Short Range Devices:

- Permitting the use of SRD in bands allocated to low power applications where ever possible having regard to the general terms of SRD usage.
- Monitor market interest in the development of SRD .
- Contribute to the work of the CEPT, in association with industry, in seeking harmonised bands for low power use.

For Broadcasting

- Complete co-ordination for initial DTT coverage
- Continue planning and co-ordination for further rollout of DTT.
- 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 for the proposed T-DAB planning meeting in 2002.
- Prepare for the Stockholm 1961 replanning exercise, which includes Band III.

For Business Radio:

- Improve the use of the land mobile spectrum through a programme of audits, investigations and targeted monitoring leading to better strategic planning and individual assignments.
- Encourage the introduction and use of spectrally efficient technologies.
- Investigate possibilities to improve spectrum utilisation and where necessary seek new spectrum for PMR use.
- Continued commitment to providing a diverse range of services in the land mobile radio bands.
- Develop methodologies for the identification of congestion on PMR channels including the use of monitoring data.
- Ensure that frequency requirements for current and future Public Access Mobile Radio Network operators are met
- Protect Irish PMR interests in international fora and bilateral discussions.

*For the Satellite Service***:**

- Protect national Fixed Satellite Service (FSS) and Broadcast Satellite Service (BSS) interests in international fora.
- Facilitate electronic licensing through the CEPT One Stop Shopping initiative.
- Develop suitable regulatory regime for emerging new Fixed Satellite Services e.g. Satellite Interactive Terminals (SITs) and Satellite User Terminals (SUTs).

For the Science Services:

- Liase with Met Éireann and other scientific organisations to ensure that current and future Science Services requirements are fully understood and, wherever possible, incorporated into national plans for the future spectrum planning conferences.
- Remain appraised of possible means of reducing unwanted emissions for the protection of the Radioastronomy and other passive services.
- Protect national Science Service interests in national and international fora.

For the Aviation Sector:

- Continue to provide protection for those aeronautical services, which are considered as safety services.
- Continue close co-operation with the Irish Aviation Authority.
- Continue to provide spectrum for use by new emerging Aeronautical systems

For the Marine Sector:

- Continue to provide protection for those maritime services which are considered as safety services.
- Continue to promote the use of spectrum efficient technologies, thereby maximising spectrum available for Maritime use
- Continue to provide spectrum for use by new emerging Maritime systems

For the Meteorological Service:

- The ODTR 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.
- The ODTR will continue to offer a high degree of protection to Earth Exploration services in view of the impact of interference on passive and active sensors, which causes problems, and disruption to scientific research programs.

For Experimenters

- Where not required for other services the ODTR will endeavour to support, where possible, the requirements of the amateur radio sector.

For the Frequency, Time and Radiodetermination Services

- The ODTR will continue to offer a high degree of protection to time and frequency services, in view of their use in the safeguarding of human life and property.
- Protect national radiodetermination service interests in national and international fora.
- Remain appraised of possible means of reducing unwanted emissions for the protection of the radiodetermination services.

Part A:

5 DEVELOPMENT OF A STRATEGIC FRAMEWORK FOR RADIO SPECTRUM MANAGEMENT

5.1 ECONOMIC IMPACT OF RADIO SPECTRUM USE

Use of the radio spectrum contributes economically and socially to the development of the Irish Economy. As a raw material for key infrastructure for the Information and Communication Technology (ICT) Industry it has helped to sustain recent high rates of economic growth. According to the ODTR Quarterly Review, the Irish telecommunications market accounts for 3% of Irish GDP[5]. This estimate does not include the contribution which communications infrastructure makes to the efficient operation of almost all other sectors of the economy.

Radiocommunications are a fundamental element of the telecommunications and broadcasting industries, as well as being crucial to the control and safety of transport systems, operations of a modern defence capability, the provision of emergency services and a wide range of social, scientific research and cultural activities.

Efficient management of the radio spectrum contributes to economic growth by:

- Supporting the development of existing and new innovative services in a timely manner;
- Supporting the development of knowledge based services and attracting foreign investment;
- Promoting competition in communications services (e.g. FWA provides competition in the local loop, mobile services compete with fixed telecoms);
- Promoting the competitive provision of radio based equipment.

In some frequency bands there is considerable demand for spectrum, particularly in densely populated areas such as Dublin where spectrum demand tends to exceed supply. In addition certain bands are more attractive to use than others, which decreases spectrum availability in those frequencies. For example, TV broadcasting and mobile communications are accommodated in a limited spectrum band which is also well suited to use by other non-consumer services such as aeronautical, maritime, scientific and military applications. Because commercial and non-consumer services have different

economic and social aims spectrum managers face a complex task when seeking to accommodate both types of service in constrained frequency bands.

In order to make economically efficient and effective decisions on spectrum management spectrum managers need to articulate reasons for the allocation between the various social and economic uses of spectrum. In addition they need to find ways of ensuring that users are efficiently using their allocated spectrum.

Table 1 presents a summary of the impact of key radio communication services on GDP and employment in 1999. The Radiocommunication Industry is estimated to contributed IR£574m to Ireland's GDP and to employ more than 5000 people. This does not include any of the more intangible benefits we all enjoy from the use of radio, ranging from the enjoyment of a favourite TV program to the convenience of mobile phone use and the safety of air transport services.

	Direct Value Added[6]	**Employment**
Public Mobile	448	1 821
Fixed Services	3	100
RTE TV & Radio	64	2 100
Independent Radio	59	1 112
Total	IR£574m	5 133

Table 1. Summary of Economic Impact in 1999 (in IR£ m)[7]

5.2 MARKET DEVELOPMENT AND THE NEED FOR RADIO SPECTRUM MANAGEMENT

After a period of explosive growth of fixed and mobile telecom markets in the 1990s, there has been much slower growth over the last year in part because of the world-wide economic slowdown. This is evidenced both by the fall in the value of telecom stocks[8] and the loss of around 300,000 jobs in the global telecoms industry since the start of the

[5] The Irish communication Quarterly Review, March 2001 (ODTR 01/14).
[6] Value added is the sum of wages and profit.
[7] Figures compiled from the published Annual Report and Accounts of relevant companies operating in Ireland.
[8] The value of the six main telecom stocks on the London Stock Exchange fell by between 15% and 80% in the first 8 months of 2001. Sunday Times, 12 August 2001.

year.[9] Market uncertainty has meant that new services, such as 3G and broadband access (wired and wireless), are not being rolled out as quickly as anticipated.

A similar situation exists in the Irish communications sector. Since the first quarter of 2001, there has been a decline of 2.5% in the telecommunications employment market[10]. However the country is still growing at a higher pace than the average European countries and therefore creation of new jobs is partially offsetting this trend.
Despite the market slowdown, the general trend towards convergence and providing consumers with increased mobility and ubiquity of services continues. Digitalisation and Internet standards are driving progress toward convergence of the underlying technology for delivering information, communication and entertainment services. At the same time, there is increasing competition between delivery platforms. For example it is proposed that TV clips may be delivered over 3G mobile phones, and e-commerce can take place over interactive digital TV.

The main new wireless services that are starting to be offered to consumers include:

- Digital TV and radio services delivered terrestrially and by satellite.
- Mobile digital TV services will also be possible and in Singapore a DTT service is currently operating, delivering services to local buses.
- Enhanced mobile phone services offering a wide range of data and in time video services.
- 2.5 G services are currently being implemented and the first 3G services are likely to be offered in Japan next year.
- Converged phone and broadcast services. For example integration of a DTT or DAB receiver with a 3G mobile handset permitting digital TV or sound broadcast reception on a mobile phone. Broadband wireless access to fixed telecommunications networks. Wireless local area networks provided in homes, offices and public spaces (e.g. airports, hotels) doing away with the need for internal cabling and a fixed connection to the network.
- Many short range / untethered devices providing wireless connectivity between devices (such as PCs, personal digital assistants, mobile phones, game machines etc), supporting electronic financial transactions (e.g. between a phone and vending machines) and communications between appliances and the owner or third parties (e.g. for communicating status information about the appliance).

[9] Financial Times, 30 July 2001

These services will compete with – or sometimes complement - fixed line broadband options such as ADSL and its successors, cable modems and optical fibre.

Convergence raises the fundamental question of whether current service definitions used by spectrum managers will make any sense by the end of the decade when voice has turned into data and television may be delivered on-demand via a broadband interactive Internet. Convergence will also require changes to existing licensing regulation in order to allow technology neutral licence regimes for new services. Uncertainty about the speed of deployment of new technologies and services, and their adoption by businesses and consumers makes it unclear how much and when additional spectrum will be required for new services. To address this problem, spectrum managers may need to make provision for new services in a more flexible manner than has been the case up to now.

5.3 BROAD SPECTRUM MANAGEMENT OBJECTIVES

For almost a century, radio has made a vital contribution to Ireland's society and economy. From its early years as a specialist tool providing essential communications for the maritime, aeronautical, transport, public safety and radio broadcasting communities, it has evolved to a mass-market medium providing users with information, communications and entertainment. Over the last decade mobile communication, which depends entirely on the use of the radio spectrum, has become one of the world's fastest growing industries. Over half of the Irish population now owns a mobile telephone. The latest developments in technology and applications including fixed wireless access, third generation (3G) mobile communications and short range wireless connectivity devices herald a new era of competitive, broadband communication services for Irish businesses and consumers, while digital broadcasting is set to deliver a multitude of new channels and novel, interactive services.

It is clear therefore that radio has a key role to play in shaping the future delivery of electronic communications in Ireland. However, the radio spectrum itself is finite and due to the limits of technology only a small percentage of the spectrum can currently be used for communications purposes and like other limited natural resources must be managed carefully if the maximum benefit is to be obtained. Recognising the speed of technological change and growth in the use of the radio spectrum, it is important to

[10] The Irish Communications Market Quarterly Review (ODTR 01/72), 6 September 2001.

review arrangements for managing the spectrum to ensure that they are well tuned to the needs of consumers and the industry.

Considering the economic impact of radio spectrum use and the need for Radio Spectrum Management, the overall objective of this initiative is to develop a National Spectrum Strategy Framework which will establish guiding principles for managing the radio spectrum resource in Ireland's interest.

The broad spectrum management objectives, which we believe are central to a balanced Spectrum Strategy are:

- To promote and support the orderly development and efficient operation of radiocommunication systems and services to facilitate the rapid development of a competitive, leading edge telecommunications sector that provides the best in terms of price, choice and quality to the end user, attracts business investment and ensures ongoing social and economic growth.
- To plan and manage the utilisation of the spectrum resource in accordance with both national and international legislation.
- To further improve efficient and optimum use of the spectrum resource, by example, through the adoption of advanced spectrum allocation and management techniques based on operational requirements, bearing in mind technical and economic viability.
- To protect national interests when harmonising and co-ordinating spectrum utilisation with other countries, regional and international organisations.
- To ensure flexibility and ease of access to radio spectrum in reaction to technological advances and market factors in order to leverage Ireland's competitive advantage.
- To support and promote innovation, research and development in new radiocommunication techniques, spectrum-based services and applications.
- To co-ordinate and establish national spectrum and radiocommunication policies and plans by widely consulting with all interested parties.

In addition a number of ***strategy guidelines*** have been adopted to align spectrum management strategy and philosophy. These are:

- The radio frequency spectrum, a finite resource, will be planned and allocated to advance the broad spectrum management objectives adopted in this document.

- The allocation of and access to the spectrum resource will be adapted to provide spectrum that best meets the needs of the user and to facilitate new and innovative services.
- Emphasis also will continue to be placed on efficient spectrum utilisation and conservation techniques as a requirement for existing and new services.
- In order to maximise spectrum usage in critical frequency bands, the ODTR encourages the use of spectrum efficient radio systems and the use of the most appropriate frequency band for the application.
- Noting that a radio licence does not confer ownership nor a continued right to a particular radio frequency, the ODTR will review the current procedures in order to align investment decisions with licence duration.
- The ODTR will endeavour to provide reasonable notice to inform users of any conditions or circumstances which could result in displacement of services or systems to other bands – however it should be recognised that this will not always be possible.
- The ODTR will continue to authorise radiocommunication system trials and new technology experiments in frequency bands appropriate to the intended applications and subject to the availability of suitable spectrum.
- Recognising that standards are necessary for harmonious system operation, efficient spectrum management, spectrum utilisation, compatibility, competitiveness and avoidance of interference; were appropriate the ODTR considers it important to specify compliance with international standards as a requirement for spectrum access.
- In order to encourage efficient use of the spectrum, with the intention of bringing the demand for spectrum into equilibrium with its supply, it is the intention of the ODTR to introduce administrative pricing – subject to the consent of the Minister of Public Enterprise.
- The ODTR will continue to operate its consultation procedures in order to have the benefit of industry views when making decisions.

5.4 ADMINISTRATIVE PRICING

The radio spectrum is a finite but reusable resource that cannot be fully utilised due to limitations in current technology. Use is further constrained by propagation effects and the requirement of some services for specific frequencies. If the spectrum is to be used efficiently and effectively it is essential that it is effectively managed at both the national and international level for the overall benefit of the country, to avoid unwanted interference and ensure equitable access to the spectrum for all existing and potential

users. To achieve this aim it is necessary to control access to the spectrum and this can be achieved by issuing licences to legitimate radio users. The manner in which licenses are issued can vary considerably and methods such has 'first-come-first –served', 'Beauty' contests and auctions have been used for different services with varying levels of success.

Licensing however, is only one aspect of managing the spectrum and it cannot function effectively without the support of other spectrum management activities, for example monitoring and enforcement. Many spectrum management functions are inter-related and each needs to be performed to provide an overall management package for the radio spectrum - although it has to be recognised that the requirements of each administration may be different and the extent to which each function is performed may vary. If these functions are to be performed, then this activity will need to be funded and the administration will require a charging policy, this could be based on national budget financing, spectrum usage fees or other appropriate fees and charges. The aim of administrative pricing is to make the users use the spectrum more efficiently, with the intention of bringing the demand for spectrum into equilibrium with its supply by encouraging users to move to more spectrally efficient equipment, handing back spectrum they do not need and moving to a less congested part of the spectrum.

Administrative pricing is based on the principle that charges in excess of the costs of licence administration and enforcement are only justified if demand for spectrum exceeds supply either now or in the foreseeable future (i.e. spectrum is congested). In these circumstances, charges should be related to what might loosely be described as the "quantity of spectrum occupied". This means relating charges to bandwidth, area over which the user has exclusive use and if use is not exclusive the extent of sharing, and the time period over which the user has exclusive use. (The latter is not usually an issue as there are few circumstances in which spectrum is shared on a time of day/week basis.) The level of charges should be related to the value of the spectrum to the marginal user. This is often proxies by the cost of moving to the next best alternative use – be it another frequency band or another technology.

In particular the increased demand for spectrum and its scarcity have generated a requirement for a more dynamic spectrum management process and its associated procedures. This has led to the development of new approaches to spectrum management including, among other things, the use of economic criteria as part of spectrum management policy as an instrument for calculating licence fee structures. The economic

criteria are used, together with other more traditional spectrum management tools, with the aim of improving spectrum management and allowing the radio spectrum to be managed on a more equitable basis for the benefit of all radio users.

Administrative pricing is increasingly being adopted by administrations in Europe and elsewhere. It has been adopted in the UK and France and is being considered in Finland and Portugal. It is also applied in Australia and New Zealand.

A number of options are open to the Director when dealing with congestion, including:

- Ensuring that spectrum-efficient technology is utilised;
- Closing the affected bands or locations to prohibit further congestion;
- Allocating additional spectrum to the affected services;
- Migrating some users to other bands;
- Implementing administrative pricing to encourage more efficient use of the spectrum, (e.g. by encouraging spectrum users to consider alternative technologies such as fibre optics in appropriate cases).

Congestion is not a serious problem in most geographical areas in Ireland but where it does occur, administrative pricing is likely to provide an effective means of managing it. This would need to take regard of the availability of and demand for spectrum for the service in question and the desirability of promoting spectrum efficiency, economic benefits, innovation and competition. Pricing would also take into account factors such as congestion in specific bands or geographic areas and the degree of exclusivity of spectrum assignments. The Director considers it would be useful to prepare a paper and to seek views before proceeding further, this paper is expected to be issued by Autumn 2002.

5.5 DEVELOPMENTS IN KEY SERVICES

5.5.1 Broadcasting

The broadcasting service is a major user of the radio frequency spectrum. Due to the importance attached to it from a political, social and cultural perspective it has been, and no doubt will continue to be, afforded a prominent position in both international and national spectrum allocation policies.

Digital broadcasting is the next major technological change in the broadcasting area. However as it is not backward compatible with the existing analogue systems, a simulcasting approach will have to be adopted if the disruption to the consumer is to be minimised. Where there is presently a large use of a consumer product, the time required for transition from one technology to the next can be considerable. In relation to Digital TV it can be expected that the digital technology currently being introduced will form the basis of digital television transmission for a considerable time.

Digital Audio Broadcasting (DAB) is heralded as the next significant development for sound broadcasting. Each DAB multiplex can carry typically 5 to 6 programme services. DAB multiplexes can also be used to deliver additional data type services. Unlike television where the ceasing of analogue services –in a 15 to 20 year timescale- is being discussed, it is not expected that the ceasing of analogue sound broadcasting would be as rapid.

Digital Terrestrial Television (DTT) is the next significant development for television broadcasting. Each DTT multiplex can carry a number of programme services although the typical figure is four. DTT multiplex can also be used to deliver additional data type services. Currently Ireland is planning for 6 DTT multiplexes using the UHF broadcast band (Bands IV & V). Currently work is progressing toward a planning conference re-plan the broadcast bands III, IV, V. The plan that is agreed at the proposed conference will form the basis for VHF/UHF broadcasting for possibly the next 20 to 30 years.

Microwave Multichannel Television Distribution Systems. (MMDS) - In Ireland MMDS networks have been deployed using the 2.5 to 2.68 GHz. After 2005 a portion of the band will be reassigned to mobile satellite systems. The band 2.5 GHz to 2.69 GHz has been designated by the ITU for use by IMT-2000 services and has been identified by CEPT as the primary band for expansion of 3rd generation mobile communications services.

Multimedia Wireless Systems (MWS) at 40 GHz are being developed to provide broadband wireless communications that will meet future consumer requirements for bi-directional multimedia applications. Prototype system concepts which emphasise a high degree of spectrum reuse and bandwidth on-demand are being developed and tested. The ODTR has added this frequency band for MWS use in the national table of frequency

allocations but in a recent consultation paper there appeared to be little demand for MWS at 40 GHz.

5.5.2 Fixed Services

In providing transmission capacity, radio instead of cable is often the preferred solution where constraints such as cost, local topography (e.g. mountainous terrain, paths across water) and the need for access to remote rural regions are fundamental considerations. In urban areas the use of cables can be more cost effective due to the larger capacity they can provide. However fixed radio systems also have a role to play as they provide the operator with the ability to roll-out a network rapidly and the capability to install transmission paths as and when required. In addition delays arising from obtaining way-leave rights can be minimised.

This growing demand for access to the radio spectrum resource is likely to place increasing pressure on all frequency bands. While the mobile services are placing considerable pressure on fixed service frequency bands below 3 GHz, the demand by the fixed service will mainly be on bands above 3 GHz. Requirements for fixed and mobile radio links is expected from the Public Telephone Networks, GSM networks, 3rd generation mobile networks, FWA networks and in the future from Multimedia Wireless Systems (MWS). It is anticipated that the support infrastructure for these networks will necessitate very high usage of fixed radio links.

Due to the smaller cell size likely to be employed for 3rd generation mobile networks, the number of radio links required could be significantly higher than current 2nd generation networks, especially where suitable cable infrastructure does not exist. A different approach to the licensing of links in these higher bands may have to be considered. In light of the importance of this spectrum used for Fixed Services it is the intention of the ODTR to run a high level review of the use of this spectrum by early 2002.

5.5.3 Fixed Wireless Access (FWA)

The ODTR recently conducted a consultation of FWA with a view to licensing further FWA spectrum. In the light of the responses received and other considerations the Director has decided to take the following actions:

- to carry out a full review to identify the best basis for future licensing of FWA, prior to licensing any further FWA spectrum;
- to permit the provision of short range public access services in the 2.4 GHz and 5 GHz bands using technologies which are exempt from wireless telegraphy licensing, subject to compliance with relevant European specifications and the holding of either a Basic or General Telecommunication Service licence;
- to proceed with the re-allocation of the 28 GHz band to point-to-point fixed links, which will be subject to the standard ODTR licensing process and spectrum charges for such links.

5.5.4 Short Range Devices

The term "Short Range Device" (SRD) is intended to cover the radio transmitters which provide either uni-directional or bi-directional communication over short distances and which have low capability of causing interference to other radio spectrum users. A wide range of spectrum use has been made exempt from individual licensing, typically because the power and propagation characteristics of these services is so localised that they do not materially interfere with other spectrum users. With advances in radio technology, there is growing commercial interest in developing products that utilise spectrum set aside for short range devices, for example, home /office local area wireless networks and wireless connectivity technology such as 'Bluetooth'.

Some of the SRD services developed can be partial substitutes for and/or complements to licensed spectrum applications, such as mobile phones. The absence of spectrum usage charges may encourage commercial operators to focus their research efforts on using this spectrum. Equally, the lack of protection from interference offered to users of such spectrum may militate against operators providing a commercial service, since they may face difficulties in guaranteeing the quality of transmissions.

5.5.5 Third Generation Services (3G) Mobile Cellular Services

Third generation (3G) mobile represents the latest development in the evolution of mobile communications, combining high bandwidth multimedia performance with wide area mobility. The development is underpinned by global initiatives to set aside dedicated radio spectrum and to develop harmonised equipment standards. The ODTR is currently preparing to offer four 3G mobile licences and further spectrum in the 900 MHz and/or 1800 MHz bands to new market entrants.

In order to encourage market entry at both the service and infrastructure levels, two distinct 3G licence packages, one of which carries incentives to support certain types of MVNOs[11]. One "class A" licence and three " class B" licences, all of which will comprise a minimum of 2 x 15 MHz paired and 5 MHz unpaired 3G mobile spectrum will be offered. The " class A" licence will also include as an evaluation criterion the offering of a voluntary commitment with regard to the access price for MVNOs and where such a commitment is made, additional spectrum comprising up to 2 x 5.2 MHz of spectrum in the 900 MHz band and 5 MHz unpaired 3G mobile spectrum will be made available to the successful applicant, subject to demonstrable need.

Additional spectrum will also be made available, subject to compliance with a pre-defined spectrum efficiency threshold, to successful applicants who do not already have access to 2G spectrum or who are not connected to undertakings[12] which have such access. In the case of a single new market entrant, this spectrum will comprise up to 2 x 7.2 MHz of spectrum in the 900 MHz band, and up to 2 x 6.0 MHz in the 1800 MHz band. In the case of more than one new market entrant, spectrum in the 900 MHz and 1800 MHz bands will be made available as necessary to cater for individual operators' demonstrable needs.

Among the major market trends in recent years have been the growth of broadband services and the interest in communicating information anytime and anywhere. This has led to the concept of "broadband mobility" in which it is expected that 3G will play a key role. This segment of the information and communications technology market looks set to continue to grow over the medium to long term. Given that radio provides the principal means of achieving mobility in communications services, ensuring there is sufficient spectrum in appropriate frequency bands is and will remain a major consideration for spectrum managers in the medium term.

[11] For the purposes of this response document, an MVNO is defined as an organisation operating a physical network infrastructure comprising as a minimum a mobile switching centre, home location register and authentication centre (or 3G mobile equivalents), having its own unique mobile network code with distinct IMSI and E.164 number series (where applicable), and issuing its own branded SIM cards (or 3G mobile equivalent), but without a mobile radio access network. This definition is consistent with the Director's objective to promote competition at both the service and infrastructure level.

[12] A connected undertaking is any entity that has a shareholding link with any existing licensed GSM networks in Ireland.

5.5.6 Business Radio

Despite the rapid growth of cellular telephony, Business Radio is still the preferred communication system for applications where most traffic is between a control point and one or more mobile terminals, or where groups of mobile terminal need to communicate on a "one to all" basis. The main uses of Business radio are for public safety and security (police, fire and ambulance), public utilities (power, water, transport etc.), industrial and commercial users as well as various voluntary organisations, who need a reliable means of communicating with personnel and more especially groups of personnel on the move.

Recent years have seen a number of developments that have enhanced the reliability and security of PMR and PAMR systems. For the most demanding user (security and emergency services) features such as encryption, data and interworking are important.

5.5.7 Satellite Communications

The Fixed Satellite Service forms an important part of telecommunications networks. While initially it was used extensively for intercontinental/ international applications, in more recent years some countries have deployed satellite systems for domestic purposes. With the development of fibre optic cables, with its inherently high capacity, the use of satellite communications for intercontinental international applications has reduced. The fixed satellite service will continue to play an important role in the future delivery of broadband telecommunications services involving direct to home (DTH) delivery. This type of development results in a proliferation of small earth stations/consumer terminals.

In the case of the mobile satellite service it can be divided into Land mobile satellite service, Maritime mobile satellite service and Aeronautical mobile satellite service. In the case of the latter two, in addition to normal communications, the mobile satellite service also provides important safety functions such as the Global Maritime Distress and Safety Service (GMDSS). The mobile satellite service provides a variety of voice, data, fax and messaging services throughout the world that complement the terrestrial cellular networks. The satellite component of 3rd generation mobile is expected to comprise of constellations of non-geostationary satellites using spectrum between 1 and 3 GHz.

Broadcasting by satellite comprises both individual reception , often called direct-to-home (DTH) or direct broadcasting by satellite (DBS) and community reception. It is assumed that individual reception will involve simple receiving installations with small antenna, requiring a strong signal from the satellite and very effective protection against interference. Community reception, serving the public typically through cable distribution systems, is assumed to involve more complex receiving installations with larger antenna which do not require such powerful signals.

5.5.8 Recent Developments in Radiocommunications Technology and Applications

A prominent feature of the telecommunications sector is the extent to which it is subject to rapid technological innovation and changing market conditions. Keeping pace with these developments is one of the most difficult challenges the ODTR faces as it strives to ensure that our regulatory approaches and methods are appropriate and timely.

The ODTR has published briefing notes[13] on Ultrawideband Communications, High Altitude Platform Stations, Broadband VSAT (Very Small Aperture Terminals). More detail on these can be found in part C of this document.

Details on other services such as the Aviation, Maritime, Military, Amateur, Science and Radiodetermination services can also be found in Part C of this document.

[13] See ODTR Document 01/59 – Technology developments in Telecommunications – Briefing note series.

Part B:

6 THE RADIO SPECTRUM MANAGEMENT FRAMEWORK

6.1 THE GLOBAL FRAMEWORK LEVEL

The effective integration of each nation into the international community of spectrum users determines the availability of services such as international air and maritime travel, satellite communications, and search and rescue and limit radio interference across borders. 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 preventing interference. International co-operation can be traced back to 1865 with the establishment of the International Telegraph Union. In 1939, participating nations decided to create a single organisation known as the International Telecommunications Union (ITU), governed 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 is increasingly operating in a global economy. International markets and competition are having to be taken into account in the development and introduction of new services. Allocation issues will have to take international impacts into account. There is an ongoing need for participation in international fora, with stronger emphasis on international opportunities, competitiveness, harmonisation of standards and new market opportunities.

Bearing in mind constraints to success which include differing spectrum allocations, timing of service introductions, standards, trade barriers and cultural differences the ODTR's strategy on the International Level is to:

- support appropriate harmonisation of spectrum allocation world-wide
- ensuring that National interests as a whole are not compromised
- continuing to participate actively in key ITU activities in so far as available resources permit
- support the development of international standards

6.2 THE EUROPEAN FRAMEWORK LEVEL

6.2.1 The European Union

The European Union comprises 15 member States operating together under a series of international Treaties. The Treaty on European Union[14] established the European Commission that is responsible for implementing the Treaties, managing EU policy and making proposals for all new legislation. The EU Council comprises representatives of all member States and decides with the European Parliament on proposals presented by the Commission.

In preparing new legislation the Commission fulfils three main functions. Because of its right of initiative, the Commission is charged with making proposals for all new legislation. It does so on the basis of what it considers best for the Union and its citizens in general rather than on behalf of sectoral interests or individual countries. These activities are laid down in the EC Treaty and range from trade, competition, industry and social policies to agriculture, the environment, energy, regional development and development co-operation. Before it issues an item of draft legislation, the Commission carries out extensive preliminary soundings and discussions with representatives of governments, industry, the trade unions, special interest groups and, where necessary, technical experts. It tries to take account of these often competing interests when it prepares its proposals. As enshrined in the Treaty on European Union, the Commission takes the principle of subsidiarity into account in its proposals, initiating legislation only in areas where the European Union is better placed than individual Member States to take effective action. Once a Commission proposal has been submitted to the Council of Ministers and the European Parliament, the three institutions work together to produce a satisfactory result. The European Parliament shares the power of co-decision with the Council in most areas and has to be consulted in others. When revising its proposals the Commission is required to take Parliament's amendments into consideration.

[14] European Union Consolidated Treaties, Treaty on European Union, Treaty establishing the European Community - ISBN 92-828-1640-0

The European Community has its own set of policy objectives for radio spectrum usage which includes:

- facilitating technological innovation and competition in radiocommunications, mobile telephony and wireless local networks;
- pursuing Community objectives with regard to the radio spectrum within a predictable and legally certain regulatory framework;
- ensuring an appropriate balancing of the interests of the individual Member States, of the European Community and of the different user communities; and
- safeguarding the Community's interests in the international negotiations on the radio spectrum.

These are accomplished through the use of Directives issued by the EU. Of particular relevance to radio spectrum management are the Licensing Directive and other 'new approach' Directives such as the R&TTE and EMC Directives. The general thrust is toward more light-handed regulation facilitating open markets and with these objectives in mind, a further set of Directives is being developed. In July 2000, the European Commission published a package of legislative proposals designed to strengthen competition in the electronic communications markets in the EU. The package is intended to simplify and clarify the existing regulatory framework, by reducing the number of specific legal measures. The proposed revised framework includes:

- Five harmonisation Directives, including a Framework Directive and four specific Directives on authorisation, access and interconnection, universal service and user rights, and data protection in telecommunications services.
- A draft Competition7 Directive.
- A draft Decision on EU Radio Spectrum Policy

The two Directives and the Decision discussed below are still under discussion in the EU. The original proposals are presented bearing in mind that changes can still be made and the information will be updated in the final document, pending progress within the EU.

Proposed Framework Directive

This Directive aims to establish the principles governing the National Regulatory Authorities (NRAs) and Member States. In particular, it defines their duties with regard

to the distribution and granting of radio spectrum and numbering as well as the granting of rights of way.

It also groups together the provisions that are common to the specific Directives and which define:

- the concept of Significant Market Power (SMP) and the market analysis procedure to be used by NRAs to impose specific obligations on certain undertakings;
- the procedures to be adopted to ensure uniform implementation of the new regulatory framework, for resolution of disputes between undertakings and to resolve problems of market access in 3rd countries;

Article 8 of the draft Framework Directive[15] proposes a number of obligations related to allocation and assignment of radio spectrum. In particular, it requires national regulatory authorities (NRAs) to manage spectrum efficiently and proposes to allow NRAs to permit the trading of frequency assignments, subject to certain safeguards. The draft Decision on Radio Spectrum Policy[16] aims to ensure the harmonised availability and efficient use of radio spectrum.

Proposed Authorisation Directive

Following the liberalisation of telecoms markets within the European Union, most Member States continue to require some form of licence or authorisation from companies wishing to offer telecommunications services or operate networks in their territory. Attention at an EU level has focused on developing a common framework for these licences and for the procedures according to which they are granted in order to facilitate the development of a single market in telecoms.

The EU framework envisages two approaches to licensing. Firstly, the use of general authorisations, (e.g. statutory provisions, class licences) and, secondly, the use of a more onerous heavier individual licensing procedure, to be used only in certain prescribed cases.

[15] COM(2000)393, "Proposal for a Directive of the European Parliament and of the Council on a Common Regulatory Framework for Electronic Communications Networks and Services", 12th July 2000

[16] COM(2000)407, "Proposal for a Decision on a Regulatory Framework for Radio Spectrum Policy in the European Community"

The proposed Authorisation Directive:

- provides that there should be no limitation on the number of licences granted for a particular type of service or network. This is intended to build on existing rules.
- contains an exhaustive list of the types of conditions which may be attached to licences in its Annex. These cover a very wide range, from conditions relating to universal service, disabled users, effective use of radio frequency, to conditions to facilitate monitoring and enforcement by National Regulatory Authorities (NRAs).
- provides that fees for general authorisations should be limited to covering the costs of issuing, managing, controlling and enforcing the licence. Coverage of the administrative costs incurred is also the principle for individual licences, but where these licences give access to scarce resources (frequency or numbers), charges may be imposed which "reflect the need to ensure the optimal use of these resources". In this context, the EU framework neither requires nor rules out the use of administrative pricing (pricing which seeks to reflect the economic value of the spectrum) or auctioning as a means of allocating licences for radio spectrum.
- establishes time limits within which authorisation procedures or licensing should be completed .

Proposed Radio Spectrum Policy for Europe[17]

In July 2000, the European Commission submitted to the European Parliament and Council a draft for a new radio Spectrum Policy. Parliament and Council are currently discussing the text of a proposed Decision. The draft Decision on EU radio spectrum policy follows the public consultation on the 1998 Green Paper on Radio Spectrum Policy and builds upon co-operation with the Member States and the CEPT in the area of spectrum management.

In order to meet this aim, this proposed Decision attempts to establish procedures in order to:

(a) facilitate policy-making with regard to the strategic planning and harmonisation of the use of radio spectrum in the Community taking into consideration inter alia economic, safety, health, public policy, freedom of expression, cultural, scientific, social and technical aspects of Community policies as well as the various interests of radio spectrum user communities

[17] COM(2000)407, "Proposal for a Decision on a Regulatory Framework for Radio Spectrum Policy in the European Community" and 10447/01

with the aim of optimising the use of spectrum and of avoiding harmful interference;

(b) ensure the effective implementation of radio spectrum policy in the Community, and in particular establish a general methodology to ensure harmonised conditions for the availability and efficient use of radio spectrum;

(c) ensure the co-ordinated and timely provision of information concerning the allocation, availability and use of radio spectrum in the Community;

(d) ensure the effective co-ordination of Community interests in international negotiations where radio spectrum use affects Community policies.

Under the present Licensing Directive a Licensing Committee has been established, composed of representatives of the Member States and chaired by the Commission, to assist the Commission in executing the various tasks, which the Directive has created. The ODTR takes an active role in the Licensing Committee meetings, along side the Department of Public Enterprise to look after national interests. Furthermore the ODTR strategy at the European Framework Level is:

- To work within European frameworks to ensure that the availability of spectrum, regulatory practices, technology and equipment are in line with the mission of the ODTR.
- implementing, to the maximum extent possible, the table of European common frequency allocations (do we want a date here)
- where appropriate, committing Ireland to ECC Decisions
- support the development of ETSI standards.
- improve co-ordination of frequency assignments with other administrations, through a harmonised European or global approach or by bilateral.

With the exception of radio spectrum availability for mobile and personal communications, in which areas Community legislation exists, the European Community mainly relies on the work undertaken in ITU/WRC and CEPT to achieve the harmonisation of radio spectrum necessary for the pan-European and global provision of services and equipment.

6.2.2 CEPT

The Conference of European Postal and Telecommunications Administrations - CEPT was established in 1959 by 19 countries which expanded to 26 during its first ten years and is a body of policy-makers and regulators currently encompassing 44 European Countries covering almost the entire geographical area of Europe.

The essential aims of CEPT shall be 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 shall include:

- working out common views on the priorities and aims set in the field of posts and telecommunications;
- examining, in a European context, public policy and regulatory issues regarding posts and telecommunications;
- promoting the harmonisation of regulations;
- establishing necessary contacts and co-operation with European organisations and bodies and other institutions dealing with postal and telecommunications matters;
- providing a forum for the preparation of common positions for congresses and/or conferences of international postal and telecommunications organisations and bodies.

CEPT, which deals exclusively with sovereign/regulatory matters, has established two committees, one on postal matters and one dealing with radiocommunications and telecommunications issues: the ECC (European Communication Committee). The committees handle harmonisation activities within their respective fields of responsibility, and adopt recommendations and decisions. Under the ECC are a number of work groups and project teams that will develop and deal with future radio spectrum issues for consideration by the ECC plenary meetings.

The predecessor to the ERC, the European Radiocommunication Committee has played a significant role in harmonising spectrum use in Europe, providing for example a table of European frequency allocations, effectively a long term strategic plan for spectrum use and harmonisation, and many Decisions, Recommendations and Reports aimed at

efficient spectrum utilisation and harmonisation. This work will continue under the new ECC[18].

Within resource constraints the ODTR is actively involved in the working groups and the Committee plenary sessions of the CEPT.

6.3 RADIO EQUIPMENT STANDARDISATION FRAMEWORK

ETSI

ETSI (the European Telecommunications Standards Institute) is a non-profit making organisation whose mission is to produce the telecommunications standards that will be used for decades to come throughout Europe and beyond. ETSI brings together 789 members from 52 countries inside and outside Europe, and represents administrations, network operators, manufacturers, service providers, research bodies and users.

The aim of ETSI is to produce voluntary open standards for radio equipment and systems and promotes the world-wide standardisation process whenever possible. Its Work Programme is based on, and co-ordinated with, the activities of international standardisation bodies, mainly the ITU-T and the ITU-R.
ETSI has links (mainly MoUs) with a range of other organisations and standardisation bodies, such as CEN, CENELEC, EBU, ITU and participates globally in the Global Standards Collaboration (GSC) and Radio Standardisation (RAST). One recent development of significance has been the formation of the Third Generation Partnership Project 3GPP, a global alliance of standardisation bodies which is responsible for generating standards for IMT 2000/UMTS. With the formation of the Third Generation Partnership Project (3GPP), ETSI covers all aspects of cellular narrow-band and broad-band radio communication and is tackling the wider issues of fixed mobile convergence and internet related platforms.

In order to provide a forum for radio co-existence criteria of radio equipment and other systems ETSI brought together EMC and radio spectrum within a single committee called TC-ERM. TC-ERM will be responsible for preparing many of the candidate harmonised standards now required under the R&TTE Directive.

[18] Readers are made aware that in this document, due to the recent change of the ERC to the ECC, references are interchangeable between the two.

The new Radio and Telecommunications Terminal Equipment (R&TTE) Directive adds a new role for ETSI in preparing candidate harmonised standards for radio equipment and systems. This Directive provides for a presumption of conformity for equipment compliant with the notified harmonised standards. The concept of 'type approval' is replaced by a manufacturer's declaration of compliance with the essential requirements of the Directive, from 8 April 2000.

R&TTE

The R&TTE Directive is the newly introduced legal measure in Europe for the marketing, connecting and putting into service of telecommunications terminal equipment. The R&TTE Directive was transposed into Irish law on 5th June 2001 by Statutory Instrument 240 of 2001. The Directive replaces the old approvals systems for telecommunications terminal equipment i.e. it replaces the current terminal equipment Directive (98/13/EC) and the Common technical regulations adopted under that Directive, as well as the existing national type approval regulations. R&TTE incorporates the requirements of the EMC and LVD Directives (Directive 89/336/EEC and Directive 73/23/EEC respectively). Any radio or telecommunications terminal equipment that is placed on the market or put into service in Ireland must now must comply with the essential requirements and all other relevant provisions of R&TTE.

The R&TTE Directive is a response to long-standing pressure from the telecommunications industry and its users for a more deregulated environment, which allows quicker 'one stop' market access for innovative products and services.
The aim of R&TTE is to provide a simple procedure for manufacturers to access the EU market. Manufacturers are given a choice of conformity assessment procedures to follow in order to prove compliance. In addition, except in the case of radio equipment where a harmonised standard[19] is not used, the involvement of third parties in the conformity assessment is not mandatory.

CENELEC

CENELEC is the European Committee for Electrotechnical Standardisation. It was set up in 1973 as a non-profit-making organisation under Belgian Law and has been officially recognised as the European Standards Organisation in its field by the European Commission in Directive 83/189/EEC. Its members have been working together in the

[19] A harmonised standard means a technical specification adopted by a recognised standards body under a mandate from the Commission in conformity with the procedures laid down on Directive 98/13/EC for the purpose of establishing a European requirement, compliance of which is not compulsory.

interests of European harmonisation, developing alongside the European Economic Community. CENELEC works with 35,000 technical experts from 19 European countries to publish standards for the European market.

CEN

CEN is the European Committee for Standardisation and its mission is to promote voluntary technical harmonisation in Europe in conjunction with world-wide bodies and its partners in Europe.

CENELEC, CEN and ETSI are the three European standardisation bodies which prepare European standards in specific sectors of activity. Most standards are prepared at the request of industry or as work "mandated" by the Commission in support of the legislation. If these standards are prepared in the framework of the "New Approach" directives, they are known as "harmonised standards". The products manufactured in accordance with these standards benefit from a presumption of conformity with the essential requirements of a given directive. Although they are precisely defined, the functions of CENELEC, CEN and ETSI inevitably overlap in a number of fields, such as the machinery sector or the sector of information and communications technology (ICT), which is situated at the crossroads between information technology, electronic components and telecommunications networks. Co-ordination of the works is therefore essential.

As noted above, Ireland operates within a complex international framework. The radiocommunications industry is increasingly a global industry and many of the radio services e.g., broadcasting, mobile, satellite communications etc., by their nature traverse national boundaries. Therefore management of the radio spectrum at the national level must be cognisant of the international environment within which we operate.

6.4 NATIONAL LEVEL

6.4.1 The National Spectrum Management Framework

In accordance with international law, the Minister for Public Enterprise is the national representative at international decision making bodies such as the ITU, the EU and their affiliated agencies. The ODTR participates actively in these bodies, providing specialist expertise on spectrum management issues for example, and provides the chairmen for the

CEPT Electronic Communications Committee (ECC) and for the CEPT ECC Project Team on IMT-2000 respectively.

Under the 1996 Act, the ODTR is responsible for the production of the radio frequency plan and management of the radio spectrum, subject to certain legislative constraints. The spectrum is managed by way of licensing schemes that are formed in regulations that require the consent of the Minister for Public Enterprise who may also issue 1) policy directions with regard to allocation and use of the radio spectrum and 2) decisions to enable the state to discharge its obligations as a member of an international organisation or as a party to an international agreement.

The ODTR was established in June 1997 under the Telecommunications Miscellaneous Provision Act 1996 (The 1996 Act). The ODTR (Office of the Director of Telecommunications Regulation) is the National Regulatory Authority for the telecommunications sector in Ireland. The office was set up in 1997 and is responsible for making the liberalised market work in accordance with EU and Irish law. The key objective of regulation is to benefit the user. The development of competition and provision of choice is essential to achieve this aim. The office manages a wide range of regulatory functions in respect of telecommunications services, the management of radio spectrum for many uses including broadcasting and the regulation of television transmission systems. As the National Regulatory Authority (NRA) the ODTR issues approvals under the R&TTE Directive for telecommunications Equipment and the assignment of frequencies to individual licensees in accordance with the Wireless Telegraphy Acts. Under the WT Acts and the 1996 Act, the Director of Telecommunications Regulation is required to provide a frequency plan[20] and is responsible for licensing the use of apparatus for all radio applications, except those used by the military[21]. In practice, this means issuing individual licences to individuals or organisations to permit the installation and operation of radiocommunications apparatus, and the publication of statutory instruments exempting certain apparatus from individual licensing.

The Office also maintains a strong range of international contacts to ensure that the Irish Regulatory System is the best and most effective it can be.

[20] Document ODTR 01/23, "Table of Frequency Allocations, Ireland", available on the ODTR web site at: www.odtr.ie/docs/odtr0123.pdf
[21] Wireless Telegraphy Act 1926, Section 3, paragraph 6

Spectrum Allocation - Spectrum allocation is the process by which parts of the radio spectrum are designated for use by generic types of service, such as Fixed, Mobile or Broadcast. In some cases, notably mobile and broadcast services where the radio signal is distributed over a wide area, spectrum is allocated exclusively by an NRA to one generic service, or even to one application (e.g. television or GSM mobile phones). In other cases it may be possible for spectrum to be shared between two or more services. For example, several frequency bands are allocated to both the terrestrial Fixed Service and the Fixed Satellite Service, on the basis that both deploy fixed, highly directional transmitting and receiving stations that are relatively straightforward to co-ordinate with one another. The generic service categories are defined in the ITU Radio Regulations and in Appendix B of this document.

6.4.2 Legislation Relating to Spectrum Management

Spectrum use and management within Ireland is governed by the Wireless Telegraphy Acts 1926-1988 ("the WT Acts") and the Telecommunications (Miscellaneous Provisions) Act, 1996 ("the 1996 Act"). Regulations covering the licensing of specific services are created under the WT Acts in the form of statutory instruments, which require the consent of the Minister for Public Enterprise.

The ODTR is responsible for issuing two broad types of licences, namely those which relate to the type of service provided (Telecommunications Service Licences) and those which relate to use of the wireless telegraphy apparatus and radio spectrum (Wireless Telegraphy Licences). One of the key pieces of legislation affecting licensing is Statutory Instrument 96 of 1998, as amended[22]. A WT Act licence is required by any user of wireless telegraphy equipment, unless specifically exempted by the definitions in the 1926 Act or a statutory instrument. A wide variety of WT Act licences are issued by the ODTR, the majority of which are renewable on an annual basis. Licensees who operate public telecommunication networks (e.g. fixed wireless access or mobile telephony) are also required, subject to limited exceptions, to have a service licence issued under the Postal and Telecommunications Services Act 1983 as amended, and the Telecommunications (Miscellaneous Provisions) Act 1996 as amended. It is interesting to note that if the Authorisation Directive comes into force, it will largely mean the end to individual licenses.

[22] European Communities (Telecommunications Licenses) Regulation, 1998, being the transposition into Irish law of Inter-alia the Licensing Directive (97/13/EC)

Broadcasting licenses for commercial Radio and TV services are the responsibility of the Broadcasting Commission of Ireland (BCI), who together with RTE have their frequency allocations licensed by the ODTR. Frequency planning for broadcast services is undertaken by the ODTR, liasing with both the BCI and RTE.

Spectrum use by the aeronautical community is licensed with the co-operation of the Irish Aviation Authority (IAA). The IAA provides the technical approval for Aircraft Station licences and the frequency assignment and co-ordination for all ground based aeronautical transceivers that should be licensed with the ODTR holding ultimate responsibility for spectrum use. The IAA also holds some licences itself in relation to the provision of radar and Distance measuring Equipment.

Maritime licences are currently issued by the ODTR with co-operation from the Department of the Marine, however these licensing responsibilities are expected to be transferred entirely to the Marine Radio Survey Office (MRSO) under new legislation planned for 2001.

Military use of the spectrum is outside the Director's remit but use is generally notified to the ODTR for co-ordination purposes.

6.4.3 Compliance and Enforcement

A 'clean' spectrum environment, free from excessive interference, is vital to the successful deployment of radiocommunication services. The licensing process enables the co-ordination of individual radio users use of frequencies so that they do not suffer mutual interference, or in the case of licence-exempt services, ensures that such services operate in such a way that they are unlikely to cause interference to other radio services. Operation of equipment not conforming to the licence conditions, circumvents this co-ordination process and can result in interference to licensed services. Operation of licensed apparatus outside the terms of the licence, for example by operating at excessive power levels or with inadequately suppressed out-of-band emissions can lead to serious interference to other users.

The ODTR has effective enforcement powers to ensure that spectrum is used properly and in conformance with the relevant licence or exemption regulation. The ODTR's remit in this regard includes the enforcement of licence conditions and the taking of action against unlicensed use of radio apparatus. The ODTR is currently establishing a

monitoring facility within the office and is equipping for the purposes of checking that spectrum licensees (such as FWA & GSM operators) are meeting their licence conditions.

Compliance with licence conditions is determined by the nature of the individual licences and varies over the spectrum from PMR users through Broadcasting to the aforementioned GSM & FWA operators. The office works within the limitations imposed by the 1926 Wireless Telegraphy Act as amended and the 1996 Telecommunications Miscellaneous Provisions Act. Activities include the tracing of interference to licensees and safety-of-life services, inspection of licensed installations and the prosecution of offences such as unlicensed operation of mobile radio and particularly broadcast equipment.

6.5 NON IONISING RADIATION AND THE ISSUE OF MAST SITES

Radio is required for a variety of purposes for the benefit of both private individuals and commercial organisations. These purposes include radio and television broadcasting, telecommunications services including fixed telecommunications services, mobile telephony, satellite services, radio navigation systems and equipment used in industry, medicine and commerce. The use of radio in this country has accelerated in recent years and as the economy continues to flourish and technology advances this use will also continue to grow. An example of this growth is evident in the mobile telephony industry where, the market in Ireland has seen unprecedented growth from a penetration level of 22% in 1998 to 70% in 2001.

The future will see further substantial growth in the application of radio as new technologies are developed and utilised. These include digital television, advanced mobile telephony services, and wireless based systems capable of providing advanced telecommunications services in areas of low population density. Inevitably, as consumer demand for radio based services increases, the number of masts required to deliver these services will also increase.

The ODTR includes a requirement in relevant licences to ensure compliance with the international guidelines for general public exposure to electromagnetic fields, i.e. the radiation emissions from telecommunications masts must be within the levels set down by the International Commission on Non-ionising Radiation Protection (ICNIRP).

Licensees must take full account of the Guidelines when designing, constructing, and operating radio installations.

In order to ensure that operators comply with this licence condition the ODTR conducts audits on the telecommunications licensees. To date, two such audits have been conducted, the first in 1998 which lead to the publication of a report in July 1998 (Document ODTR 98/23) and the second in 1999 which lead to the publication of a report in February 2000 (Document ODTR 00/06).

Both audits involved:

- Auditing the procedures put in place by the operators to ensure that their sites are in compliance with the ICNIRP levels
- Verifying that the sites are in compliance with the ICNIRP levels by taking a series of test measurements on a number of sample sites.

On the basis of these audits, the Director is satisfied that the telecommunications operators have adequate procedures in place to ensure compliance with their licence conditions. Both of these audit reports have been published on the website www.odtr.ie. A third audit is underway and is due for completion in October 2001.

It is important to note that the ODTR has no authority in relation to health issues or in relation to the granting of planning permissions for masts. The development of policy regarding health and safety issues is primarily the responsibility of the Department of Health and Children whilst the local planning authorities are responsible for the granting of planning permissions.

Part C:

7 STRATEGIC DEVELOPMENTS IN RADIO SERVICES

7.1 INTRODUCTION

This section deals with each of the radiocommunication services using the radio spectrum in Ireland. After a quick overview of each service, the spectrum management objectives for that service are detailed, followed by the spectrum strategy issues that are under considered by the ODTR.

Each service, while dealt with separately in this document, should not be viewed in isolation, bearing in mind that some bands are shared between different services with different protection status as indicated in the Table of Frequency Allocations for Ireland. In addition, sharing criteria between services in the same band and between services in adjacent bands must be considered when there is a potential for harmful interference between two services.

The general format used for each service is first to give an overview, followed by the current spectrum use by that service, the spectrum management objectives that are applicable and completed with the spectrum management issues that apply to that service. Two documents constantly referred to in this section are the 2001 publication of the National Table of Frequency Allocations[23] and the ERO Report number 25, known as the on the European Common Spectrum Allocations Table[24].

7.2 MOBILE CELLULAR SERVICES

Overview of the Mobile Cellular Services

Mobile communications is one of the most rapidly expanding sectors of telecommunications and this is particularly true of cellular radiotelephones. With the introduction of 2nd generation mobile networks such as GSM[25], mobile radio services have moved from a specialist market to the general consumer market. As a consequence the profile and public awareness of mobile communications has increased significantly.

[23] See ODTR 01/23 – Table of Frequency Allocations for Ireland available on www.odtr.ie

[24] Available on the ERO website, www.ero.dk

[25] GSM – Global System for Mobile Communications is a cellular, digital, land-based mobile communications system.

GSM systems operate in two frequency bands at 900 MHz and 1800 MHz and with enhancements being developed for GSM networks to improve their data handling capacity, both 2nd and 3rd generation networks could coexist and compete in certain sectors for some considerable time. In the longer term, once 3rd generation services are fully established and if there is substantial migration to the 3rd generation networks, the future of the 2nd generation (GSM) networks would need to be reviewed. While the GSM networks meet the requirement for mobility they do not, as currently configured, facilitate fast data transfer. Although 3rd generation mobile is often referred to as the solution for fast data transfer, there will also be a requirement to consider enhanced facilities, such as the General Packet Radio Service (GPRS) and Enhanced Data for GSM Environment (EDGE), being developed for GSM to meet this requirement, which are seen as an evolutionary step toward 3G.

Use of Spectrum by the Mobile Cellular Services in Ireland

Spectrum has been designated for use by digital GSM systems in the in the 900 MHz range, 880-915 MHz and 925 – 960 MHz, and in the 1800 MHz band, 1710-1785 MHz and 1805-1880 MHz.

For 3rd Generation systems spectrum has been made available in the bands 1900-1980 MHz, 2010-2025 MHz and 2110–2170 MHz.

Third Generation Services (3G) in Ireland

Third generation (3G) mobile, sometimes referred to as IMT-2000[26] or UMTS[27], represents the latest development in the evolution of mobile communications, combining high bandwidth multimedia performance with wide area mobility. The development is underpinned by global initiatives to set aside dedicated radio spectrum and to develop harmonised equipment standards. The ODTR is currently preparing to offer four 3G mobile licences and further spectrum in the 900 MHz and/or 1800 MHz bands to new market entrants.

In order to encourage market entry at both the service and infrastructure levels, two distinct 3G licence packages, one of which carries incentives to support certain types of MVNOs[28]. One "class A" licence and three " class B" licences, all of which will

[26] IMT-2000 is the international family of third generation mobile standards approved by the International Telecommunications Union.

[27] UMTS is a European standard which is part of the IMT-2000 family. Other IMT-2000 standards may be deployed but the EU requires that at least one UMTS-based 3G mobile network must be licensed in each Member State to facilitate roaming.

[28] An MVNO is defined here as an organisation operating a physical network infrastructure comprising as a minimum a mobile switching centre, home location register and authentication centre (or 3G mobile equivalents), having its own unique mobile network code with

comprise a minimum of 2 x 15 MHz paired and 5 MHz unpaired 3G mobile spectrum will be offered. The " class A" licence will also include as an evaluation criterion the offering of a voluntary commitment with regard to the access price for MVNOs and where such a commitment is made, additional spectrum comprising up to 2 x 5.2 MHz of spectrum in the 900 MHz band and 5 MHz unpaired 3G mobile spectrum will be made available to the successful applicant, subject to demonstrable need.

Additional spectrum will also be made available, subject to compliance with a pre-defined spectrum efficiency threshold, to successful applicants who do not already have access to 2G spectrum or who are not connected to undertakings[29] which have such access. In the case of a single new market entrant, this spectrum will comprise up to 2 x 7.2 MHz of spectrum in the 900 MHz band, and up to 2 x 6.0 MHz in the 1800 MHz band. In the case of more than one new market entrant, spectrum in the 900 MHz and 1800 MHz bands will be made available as necessary to cater for individual operators' demonstrable needs.

The competition is designed to ensure that licences are awarded according to objective, transparent, non-discriminatory and proportionate selection criteria, giving due weight to the need to facilitate the development of competition and to maximise benefits for users in accordance with the provisions of the European Communities (Telecommunications Licences) Regulations 1998 (SI no. 96 of 1998), which transposed into Irish law the European Parliament and Council Directive 97/13/EC[30].

Work on the development of IMT-2000 and future systems continues at the European and the global level and it is important that Ireland participate in these developments in order to maintain its position. With this objective in mind, the ODTR chairs ECC Project Team 1 on IMT-2000 and Systems Beyond which plays a key role in developing the European position for the next world radio conference (WRC-2003) and is well positioned to monitor international developments in this field.

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distinct IMSI and E.164 number series (where applicable), and issuing its own branded SIM cards (or 3G mobile equivalent), but without a mobile radio access network. This definition is consistent with the Director's objective to promote competition at both the service and infrastructure level.

[29] A connected undertaking is any entity that has a shareholding link with any existing licensed GSM networks in Ireland.

[30] Directive of the European Parliament and Council of 10th April 1997, on a common framework for general authorisations and individual licences in the field of telecommunications services

Cellular Services Spectrum Management Objectives:

- Facilitate increased competition in the mobile market
- Improve the quality offered by regular QoS[31] audits
- To utilise the available IMT-2000 spectrum with optimum efficiency
- Continue to develop co-ordination agreements with neighbouring countries for 3rd generation systems in the same vein as the GSM MoU[7].
- Monitor the evolution and coexistence of different 3G standards.
- Actively participate in international fora on mobile system development.
- Protect and prioritise Irish mobile cellular interests in national and international fora

Spectrum Strategy Issues in the Cellular Services

880-890 / 925-935 The TACS[32] network closed on the 31st July 2001. This opens up the Extended GSM bands, which provides additional spectrum. Some of this additional spectrum has been identified for use by 3G network operators and the remainder could be used for expansion of existing 2G networks if required.

2.5 – 2.6 GHz At present this band is used by MMDS services in Ireland. This band has been identified for 3G and the ODTR intends to develop a long term strategy concerning the future use of this band, taking into account the development of 3G services and the continued need for MMDS.

Fourth Generation Services (4G)

Fourth generation mobile cellular systems, will have to facilitate the development of new wireless multimedia services, by providing transmission rates up to 10 times higher than the current UMTS data rates. This increase in capacity must contend with severe constraints in terms of mobility and service diversity.

Through the chairmanship of ECC Project Team , on IMT-2000 and Systems Beyond, the ODTR and is well positioned to continue monitoring international developments in 4G systems.

[31] QoS = Quality of Service
[32] Also known as the 088 network

Broadband Mobility

Among the major market trends in recent years have been the growth of broadband services and the interest in communicating information anytime and anywhere. This has led to the concept of "broadband mobility". This segment of the information and communications technology market looks set to continue to grow over the medium and long term. Given that radio provides the principal means of achieving mobility in communications services, ensuring there is sufficient spectrum in appropriate frequency bands is, and will remain a major consideration for spectrum managers in the medium term.

In terms of the way the market is developing, broadband mobility can be considered from two standpoints: first, services that develop largely as an extension of mobile telephony; and secondly, services that owe their origins more to the computer industry and the Internet. GPRS, 3G and future information services developed around small handsets such as the mobile phone, are examples of the former. IEEE 802.11 and HIPERLAN based services currently aimed at portable computer users are examples of the latter. In the first case, providing continuous coverage at all locations for people on the move is a key priority in terms of the design of the radio systems, and this to some extent dictates which frequencies are suitable for this type of application. In the second case, it is the ability to provide high data rates suitable for say web searching that is key. Many users of such applications are currently content to have access only at convenient 'hot spot' locations, such as hotels and airport terminals, rather than continuously as they walk along the street for example. In time, we might reasonably expect the two types of broadband mobility to converge, which will pose new challenges for radio systems designers and spectrum managers.

7.3 FIXED SERVICES

In providing transmission capacity, radio instead of cable is often the preferred solution where constraints such as cost, local topography (e.g. mountainous terrain, paths across water) and the need for access to remote rural regions are fundamental considerations. In urban areas the use of cables can be more cost effective due to the larger capacity they can provide. However fixed radio systems also have a role to play as they provide the operator with the ability to roll-out a network rapidly and the capability to install transmission paths as and when required. In addition delays arising from obtaining way-leave rights can be minimised.

This growing demand for access to the radio spectrum resource is likely to increase pressure on all frequency bands. While the demand for spectrum by the mobile services is placing considerable pressure on frequency bands below 3GHz available for use by the fixed services, the demand by the fixed service will mainly be on bands above 3 GHz. Above 3 GHz most of the bands allocated to the fixed service are also allocated on a co-primary basis to other services such as mobile or satellite services. This is creating other pressures for access to the various bands[33] used for fixed services.

The fixed service provides transmission paths for various types of traffic such as voice, data or video. The traffic can be either that associated with a public telecommunications network or a private network.

The Fixed Service can be divided into two main groups namely:

- 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 access in the local loop.
- Multichannel Television Distribution Systems. (e.g. MMDS and MVDS)
- Multimedia Wireless Systems (MWS).
- Multipoint to multipoint links

Point to Point Radio Links

A typical point to point radio link consists of two stations with a clear line of sight between them and separated by distances ranging from a few kilometres up to 40 kilometres or greater. Each station employs a highly directive antenna, for transmission and reception. A chain of such stations can be used to cover greater distances.

Most fixed services operate at frequencies above 1 GHz with trunked network links mainly in bands between 3 and 11 GHz and access links mainly in bands above 12 GHz. Over the last few years the trend in the demand for fixed links has been steadily upwards. This has been particularly noticeable in the bands used for short haul access links, which

[33] For more information consult 'Licensing requirements for radio services –A summary' – (ODTR 00/62)

are normally above 12 GHz[34]. Over the next decade, pressure on the spectrum allocated to the fixed service will continue to increase through the demand for new applications, such as the satellite or mobile services for which radio is the optimum transmission medium.

While the traditional fixed service was mainly regarded as a point to point application there was limited application for point to multipoint use. Furthermore these various applications cannot always be considered as stand-alone applications for spectrum as some form of infrastructure support is often required. Requirements for fixed and mobile radio links is expected from the operators of Telephone Networks, GSM networks, 3rd generation mobile networks, FWA networks and in the future from Multimedia Wireless Systems (MWS) operators. It is anticipated that the support infrastructure for these networks will necessitate very high usage of fixed radio links.

Point to Multi-Point Links

Historically point to multipoint links have been used for the provision of basic telephony to isolated customers. This has provided an adequate solution for serving areas with a low customer base and usually does not offer capacity for services other than basic telephony.

Another application for point to multipoint links would be within a network, such as a private network, linking a number of outstations back to a central station. For the historical reasons, these links have been in frequency bands below 1 GHz. These systems are typically used for telemetry or SCADA (Supervisory, Control and Data Acquisition) applications. The number of systems currently licensed is limited and mainly used by some utilities for remotely accessing their outstations. It is expected that there will be a small but ongoing requirement for Point to Multipoint links for this type of application (i.e. in-area use) though not necessarily limited to frequencies below 1 GHz.

Fixed Wireless Access (FWA)[35]

Traditionally the most difficult component of a telecommunications network to build and the least cost effective to maintain has been the local access network. Most of the local loop connections in place today use cable and copper pairs. Radio systems represent a

[34] Guidelines for applicants for point to point radio link licenses in spectrum above 1 GHz - (ODTR 98/14R)

[35] Also referred to as Fixed Wireless Point to Multipoint Access (FWPMA), Radio in the Local Loop (RLL), or Wireless in the Local Loop (WLL).

small part of these connections and as mentioned above were mainly used for connecting single or small isolated groups of subscribers. New operators entering the market may consider cable for provision of services particularly in urban areas. However the cabling of an area, even an urban area can be expensive and delays can arise with obtaining rights of way. In cabling there is a significant up-front capital costs. In urban areas Wireless access techniques allow an operator to develop presence in the market place and a subscriber base prior to investing in the significant capital cost associated with cabling.

With a wireless system, infrastructure need only be installed initially to provide the geographic coverage of the potential subscriber base and the base stations need only be equipped with the capacity required to serve the initial customer base. In addition a significant proportion of the system cost is in the subscriber terminals. These factors allow for an incremental expenditure as the subscriber base increases and an economic advantage through the closer correlation between capital expenditure, running costs and revenue.

Multimedia Wireless Systems (MWS).

Wireless based telecommunications systems serving the end user have, until recently, been limited in capacity and only provided an alternative to the traditional telephone system. Convergence is envisaged between broadcasting and telecommunications which traditionally have been treated separately. Projects have been initiated at a global/European level that are intended to provide a variety of services to the end users which are far beyond the conventional and traditional broadcasting and telecommunications services currently available. Projects and systems that are being developed by the broadcasting sector include DVB and MMDS, while those that are being developed by the Telecommunications sector include FWA and HAPS.
To cater for this expected convergence between the Fixed Service and the Broadcasting Service the term “Multimedia Wireless Systems (MWS)” has evolved. CEPT is defining “Multimedia Wireless Systems (MWS)” as: ‘Terrestrial multipoint systems which have their origin in telecommunications and/or broadcasting and which provide fixed wireless access direct to the end user for multimedia services’.

These Multimedia Wireless Systems could be either purely distribution systems such as digital MVDS or systems offering different degrees of interactivity. As multimedia is generally understood to be a mixture of voice, data imaging and/or video offered to a customer with some degree of interactivity, CEPT has proposed that MWS can use bands allocated to the Fixed Service and /or the Broadcasting Service.

Broadband services are usually considered to be those offering data rates in excess of 2 Mbit/sec. However this is very much a minimum figure and it can be expected that terrestrial broadband wireless systems should provide for data rates up to 20 to 50 Mbit/s and above to the end user. Studies undertaken within ETSI indicate that the total spectrum requirements for all operators for a specific MWS technology range from 240 MHz for a MWS offering reduced services up to 3.4 GHz for a full service system. The technology used for the ETSI studies would typically provide transport at up to 25 Mbits/sec to the users terminal and be able to compete with or complement broadband wireline access systems using Digital Subscriber Loop (DSL) and other cable modems technologies. The 40 GHz band is one of the few bands available that can offer this amount of unused capacity throughout Europe. Recently CEPT/ERC adopted a decision (ERC Decision (99)15) designating the band for use by "Multimedia Wireless Systems (MWS)".

Fixed Service Spectrum Management Objectives:

- Formulate a policy document for the future management of the Fixed Service spectrum including link transfers and re-assignments by early 2002 and a forecast of the proposed future demand for point-to-point links to facilitate future Fixed Service spectrum allocations.
- Improve the use of the Fixed Service spectrum through a programme of compliance audits and investigations.
- Protect Fixed Service interests in international fora.
- Complete the development of an electronic licensing regime.
- Consider classifying link by usage e.g. Infrastructure links or access links to facilitate more effective spectrum management.

Use of Spectrum for Fixed Services in Ireland

The Irish Fixed Service Allocations are indicated in the National Table of Frequency Allocations[36].

Spectrum Strategy Issues in Fixed Service Bands below 1 GHz

A planned approach to the transferring of links from below 1 GHz to the 1.3/1.4 GHz band is under consideration. This affects for example, narrowband links that have been licensed in the PMR bands, primarily 410-440 MHz and 450-470 MHz, operating in

[36] Currently document ODTR 01/23.

support of PMR systems. Fixed links, other than for SCADA systems will also be phased out.

Spectrum Strategy Issues in Fixed Service Bands between 1 and 3 GHz

The fixed service bands between 1 and 3 GHz are particularly affected by current and emerging changes which see them being re-allocated to other services such as the mobile service and various satellite services that have a mobile/portable reception application. In addition to the WRC changes, the CEPT and ETSI have developed European channel plans and equipment standards for fixed service use of this frequency segment. As a consequence in the mid 90's it was necessary to review how the fixed services were utilising the bands. As a result of this review, over the last few years, a number of the bands have being closed for new link applications and the existing links are being phased out over a period of time. The following table summarises the current and planned use of three fixed service bands between 1 and 3 GHz where changes are being considered.

Band	Current Use	Planned / Future Use
1.3 / 1.4 GHz	Links	Business radio links presently below 1GHz
2.3 / 2.5 GHz	ISM, Short Range Devices, RURTEL System	Alternative uses to be considered
2.5 / 2.68 GHz	MMDS systems	Future MSS systems

Spectrum Strategy Issues in the Fixed Service bands between 3 and 12 GHz

This is an important spectrum segment for the fixed service. The principle use is high capacity trunk routes with hop lengths typically in the order of 15 to 45 kilometres. The fixed service bands in this segment are also allocated to other services and in particularly the satellite service. Equipment for these bands tends to be channel specific and often manufactured to order. As a consequence the time-scale for any re-organisation of the use of any of these bands would need to take equipment availability/delivery into account. The following table summarises the current and planned use of three fixed service bands between 3 and 12 GHz where changes are being considered.

Band	Current Use	Planned / Future Use
4 GHz	Radio Links	Radio Links or FWA or 3G infrastructure Links
L and U 6 GHz	Trunked high capacity, point-to-point, route systems.	Phase out analogue links
10 GHz	Proposed for FWA licence	Review under way.

11 GHz Band, The frequency range of this band is 10.7 to 11.7 GHz. This band designated for high capacity point to point links is shared with the Fixed Satellite Service. It is a very important band in Ireland for trunk routes due to the shorter minimum hop length to that permitted in other bands below 12 GHz. Accordingly it is heavily used. The Fixed Satellite Service also make extensive use this band. It is an important band for earth station reception particularly for VSATs and television reception. As the satellite use is space to earth the potential for interference is from the radio links into the satellite earth station receiver. Due to the proliferation of satellite receive earth stations in this band some European Administrations are no longer licensing point to point links in this band. The ODTR will keep the use of this band under review for possible conflicts arising between the demands of the satellite and terrestrial services.

Spectrum Strategy Issues in the Fixed Service bands between 12 and 40 GHz

The licensing of fixed services in this spectrum segment is a relatively recent occurrence, over the last 10 years or so, with the development of mobile networks. The principle use is for access links. Significant demand for point to point links is envisaged over the next few years. In addition spectrum, particularly above 20 GHz is in demand for point to multipoint applications. The fixed service bands in this segment are also allocated to other services and in particularly the satellite service. The following table summarises two fixed Service bands where changes are being considered.

Band	Current Use	Planned / Future Use
15 GHz	Access links.	Phase out non compliant links
23 GHz	Access links	Examining removal of high capacity links

10.7 – 12.5 GHz, The ERC has approved Decision (00)08 on 'The use of the band 10.7 – 12.5 GHz by the fixed services and earth stations of the broadcasting-satellite and fixed-satellite service (space-to-Earth)' which proposes 1) that in the band 10.7-11.7 GHz that new fixed services be limited to high capacity, above 140 Mbit/s, point to point links used for trunk networks and that uncoordinated fixed-satellite service Earth stations operate on a non-protected basis. 2) that in the band 11.7 – 12.5 GHz, no new fixed service systems are deployed giving the priority to fixed-satellite service and broadcast-satellite service. The ODTR has been approached to license a terrestrial broadcast service in the band 11.7 – 12.5 GHz, which is currently undergoing consultation,[37]

[37] ODTR 01/69 – 'Licensing regional or locally based digital television delivery'

bearing in mind Irelands commitment to European harmonisation and the potential problems of licensing dissimilar systems to neighbouring countries.

13 GHz Band, The frequency range of this band is 12.75 to 13.25 GHz. This band is allocated to the fixed service, the mobile service and the fixed satellite service. As the transmissions are in the Earth to space direction, the potential for interference is from satellite earth station to the radio link receiver. The use of the band (12.75 to 13.25 GHz) by the satellite service is governed by the ITU Allotment plan (RR Appendix S30 B). Ireland has allotments in this plan and accordingly have, to date, refrained from opening it to fixed service use. If Ireland decides not to implement its satellite allotments, the ODTR will consider opening the band up for use by the fixed service.

18 GHz Band, The frequency range of this band is 17.7 to 19.7 GHz. Part of this band (17.7 – 18.1 GHz) also used for BSS feeder links though currently this does not include the Irish feeder link assignments, which are below 17.7 GHz. Part of the band (18.8 – 19.3 GHz) is also allocated to NGSO FSS [38] systems (space to earth). Typical of the satellite application will be planned systems such as "Teledesic" or "Skybridge", which are intended as "direct to home" broadband deliver systems. It is recognised that it will be difficult for the terrestrial fixed service to share spectrum with the NGSO FSS applications as the FSS systems intend to deploy large numbers of user terminals on an uncoordinated basis.

A CEPT ERC Decision[39] is being considered by the ODTR that will establish sharing criteria between the two services which will effectively prohibit uncoordinated fixed satellite services from claiming protection from the fixed services, and require the implementation of interference mitigation techniques by the fixed satellite services. The ODTR welcomes any comments on this issue that will assist the deliberations.

28 GHz Band. The frequency range of this band is 27.5 to 29.5 GHz. Part of the band (28.6 – 29.1 GHz) is also allocated to NGSO FSS systems in the Earth to space direction. Typical of the satellite application will be systems such as "Teledesic" or "Skybridge", which are planned as "direct to home" broadband deliver systems.

[38] NGSO FSS: Non Geostationary satellite orbit, Fixed Satellite Service.

[39] ERC Decision (00)07on the shared use of the band 17.7-19.7 GHz by the fixed satellite service and Earth stations of the fixed-satellite service (space to Earth)

A CEPT ERC Decision[40] that will 1) divide the band and establish exclusivity for the two different services in parts of the band and 2) establish sharing criteria between the two services in shared segments of the band and which will limit the use of uncoordinated fixed satellite services from claiming protection from the fixed services, is being considered by the ODTR. The ODTR welcomes any comments on this matter that will assist the deliberations.

Spectrum Strategy Issues in the Fixed Service Bands above 40 GHz

Little use is currently being made of this segment of spectrum within Ireland and indeed Europe, but greater use is expected in the near future. With the demand for spectrum for short haul applications and facilitated by developments in manufacturing technology, exploitation of the bands up to 70 GHz is envisaged over the next few years. The current limited use of this segment throughout Europe presents a unique opportunity to exploit the use of parts of the spectrum for pan European type applications. The following table summarises six bands used for fixed services above 40 GHz where changes are being considered.

Band	Current Use	Planned / Future Use
40 GHz	Not used	Reserved for MWS
47 GHz	Not used.	Considering potential of HAPS
50, 52, 60, 65 GHz	Proposed for Fixed Links	Monitoring regulatory developments in Europe

7.4 BROADCASTING

The broadcasting service is a major user of the radio frequency spectrum. Due to the importance attached to it from a political, social and cultural perspective it has been, and no doubt will continue to be, afforded a prominent position in both international and national spectrum allocation policies.

Until recently all broadcasting has used analogue modulation techniques. Various enhancements (colour, teletext, dual-sound, etc. for television, stereo sound and RDS, etc. for VHF-FM sound broadcasting) have been introduced over the years. A number of these enhancements have been backward compatible with the basic system so that the introduction could be phased in, in a manner so as not to require the viewer/listener to change their receiving equipment unless they wished to avail of the new enhancements.

[40] ERC Decision (00)09 on the use of the band 27.5-29.5 GHz by the fixed satellite service and uncoordinated Earth stations of the fixed-

Digital broadcasting is the next major technological change in the broadcasting area. However as it is not backward compatible with the existing analogue systems, a simulcasting approach will have to be adopted if the disruption to the consumer is to be minimised. Where there is presently a large use of a consumer product, the time required for transition from one technology to the next can be considerable. In relation to Digital TV it can be expected that the digital technology currently being introduced will form the basis of digital television transmission for a considerable time. However it should not be assumed that this technology will remain static. As occurred with analogue television, it can be expected that additional enhancements to the basic digital transmission technology will evolve over the lifetime of the system. Along with a change in the transmission format there will also be considerable expansion in the services that it will be possible to provide.

Sound Broadcasting in Ireland

The sole Irish Long Wave (LF) assignment is licensed to RTE for use by Atlantic 252. Limited use is made by RTE of the Medium Wave (MF) band for the national services. Ireland does not operate any Short Wave (HF) broadcast stations.

VHF-FM in the band 87.5 – 108 MHz (Also known as Band II) is the dominant sound broadcasting mode in Ireland. This band is used for national networks (four public service networks and one commercial network) as well as for local and community radio. Currently about 70 to 75% of the band is used in Ireland. There is capacity for further expansion, to various degrees, in most parts of the country.

Digital Audio Broadcasting (DAB) is heralded as the next significant development for sound broadcasting. Each DAB multiplex can carry typically 5 to 6 programme services and can also be used to deliver additional data type services.

A CEPT planning meeting was held in Wiesbaden in 1995 in order to provide each European Administration with two DAB allotments. Ireland obtained two national DAB allotments in the VHF band (223 to 230 MHz, part of Band III). In the longer term, with the phasing out of analogue television from band III, it should be possible to increase the amount of spectrum for DAB. To date no plans have been made for local or regional DAB services, although the ODTR is participating with Government and industry to assess how best to implement these services. CEPT intends to hold another planning meeting in June 2002 to plan further the use of the 1.5 GHz (1452 MHz to 1479.5 MHz) band for digital sound broadcasting and it is possible that spectrum in this band would be

satellite service (Earth to space)

used for regional networks. Unlike television where the ceasing of analogue services –in a 15 to 20 year timescale- is being discussed, it is not expected that the ceasing of analogue sound broadcasting would be as rapid.

Satellite Sound Broadcasting in Ireland

Until recently satellite sound broadcasting has mainly consisted of using one of the auxiliary sound carriers available on a satellite television transponder. Sound broadcasting in this manner is not suitable for portable/mobile reception, which is one of the key marketing strengths of sound broadcasting. The emphasis, in Europe, appears to be focused on terrestrial broadcasting (sound).

Spectrum Management Objectives 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 for the proposed T-DAB planning meeting in 2002.
- Prepare for the Stockholm 1961[41] replanning exercise, which includes Band III.

Television Broadcasting in Ireland

There are 4 analogue national networks: RTE 1, Network 2, TV3 and TnaG. RTE 1 and RTE 2 have mature transmission networks. TnaG was established in 1996 and TV3 commenced operation in 1998.

The TV3 and TnaG transmission networks only use the UHF band (bands IV & V)[42] while RTE 1 and Network 2 use a mixture of the VHF and UHF bands (Bands III, IV & V). The last VHF band I transmitter has now been phased out. A number of UHF deflector systems using the UHF Bands (IV &V) have been licensed to cover rural areas.

A decision will not be made to switch off the current analogue television service before three years after the commercial launch of DTT and then only after 98% of the population covered and there is a 85-90% take-up of digital services across all digital platforms.

[41] ITU Stockholm 61 Plan - Plans annexed to the Regional agreement for the European Broadcasting Area concerning the use of frequencies by the broadcasting services in the VHF and UHF bands.
[42] Bands III = 174-230 MHz, Band IV = 470 – 582 MHz, Band V = 582 – 862 MHz

Digital Terrestrial Television (DTT) is the next significant development for television broadcasting. Each DTT multiplex can carry a number of programme services although the typical figure is four. A DTT multiplex can also be used to deliver additional data type services. A CEPT meeting held in 1997[43] laid down the general criteria for planning DTT. However, unlike the DAB planning meeting of 1995, it did not develop an assignment or an allotment plan. It is up to each Administration to develop and co-ordinate its plan within the framework developed at the 1997 meeting. Following on from a consultation[44] and the published response[45] to the consultation, which includes draft license conditions, Ireland is planning for 6 DTT multiplexes using the UHF broadcast band (Bands IV & V).

A ITU planning conference is scheduled for May 2004 and again during 2005 to re-plan the broadcast bands III, IV, V covered by the 1961 Stockholm Agreement. The plan that is agreed at the proposed conference will form the basis for VHF/UHF broadcasting for possibly the next 20 to 30 years. The ODTR is assigning resources to plan for the conference.

Use of Spectrum for Microwave Multichannel Television Distribution Systems. (MMDS)

MMDS are basically point to multipoint systems used to distribute television programmes, developed to bring multichannel television services to remote areas not covered by the standard terrestrial television services and are inherently one-way transmission systems. In Ireland, MMDS networks have been deployed using the 2.5 to 2.68 GHz band and both current operators are licensed for 11 channels. After 2005 a portion of the band will be reassigned to mobile satellite systems. The band 2.5 GHz to 2.69 GHz has been designated by the ITU for use by IMT-2000 services and has been identified by CEPT as the primary band for expansion of 3rd generation mobile communications services.

[43] The Chester 1997 Multilateral Co-ordination Agreement Relating to Technical Criteria, Co-ordination Principles and Procedures for the Introduction of Terrestrial Digital Video Broadcasting (DVB-T)
[44] ODTR 99/57 – Licensing Digital Terrestrial Television
[45] ODTR 01/17 – Response to Consultation on Licensing Digital Terrestrial Television

Multimedia Wireless Systems (MWS) at 40 GHz

Multimedia Wireless Systems[46] are been developed to provide broadband wireless communications that will meet future consumer requirements for bi-directional multimedia applications. Prototype system concepts which emphasise a high degree of spectrum reuse and bandwidth on-demand are being developed and tested. MWS emerged through a combination of developments including subscriber demand for an increased variety of services at lower cost and higher data rates, development of fibre infrastructure which brought broadband transport within the range of a single microwave link hop and deregulation that is promoting competition[47] in the local access.
CEPT has been active in this area and has designated[48] the band 40.5 to 43.5 GHz for the introduction of Multimedia Wireless Systems (MWS), including Multipoint Video Distribution Systems (MVDS). In line with this Decision, the ODTR has added this frequency band for MWS use in the national table of frequency allocations but in a recent consultation paper[49] there appeared to be little demand for MWS at 40 GHz. Other frequency bands are also under consideration and further details are available on the ERO website.

Spectrum Management Objectives for Television Broadcasting

- Complete co-ordination for initial DTT coverage
- Continue planning and co-ordination for further rollout of DTT.
- Ensure present operator compliance and protect authorised services from illegal use
- Prepare for the Stockholm 1961[50] replanning exercise, which includes Band III.

Use of Spectrum by Satellite Television Broadcasting in Ireland

In 1977 the ITU held an international conference to develop a frequency plan for the broadcasting satellite service (television) in the 12 GHz band. Each country obtained 5 (analogue) channels at a specific orbit location. Over the years very few assignments in the plan were implemented. At WRC-97, in addition to some minor changes to the plan, a resolution was passed regarding a review and possible revision of the plan. The main emphasis for the review is to study the possibility of increasing the minimum number of channels for each country and to accommodate the new countries –particularly in Europe- which were not taken into account in the 1977 assignment plan**.**

[46] Also known as Broadband Wireless Access
[47] Referred to in Ireland as local loop unbundling
[48] ERC/DEC/(99)15 on the designation of the harmonised frequency band 40.5 to 43.5 GHz for the introduction of Multimedia Wireless Systems (MWS), including Multipoint Video Distribution Systems (MVDS)
[49] Document ODTR 01/70

10.7 – 12.5 GHz, The ODTR has been approached to license a terrestrial broadcast service in the band 11.7 – 12.5 GHz and is currently running a consultation on this matter [51], bearing in mind Irelands commitment to European harmonisation and the potential problems of licensing dissimilar systems to neighbouring countries. In addition the ERC has approved Decision (00)08 on 'The use of the band 10.7 – 12.5 GHz by the fixed services and earth stations of the broadcasting-satellite and fixed-satellite service (space-to-Earth)' which proposes 1) that in the band 10.7-11.7 GHz that new fixed services be limited to high capacity, above 140 Mbit/s, point to point links used for trunk networks and that uncoordinated fixed-satellite service Earth stations operate on a non-protected basis; 2) that in the band 11.7 – 12.5 GHz, no new fixed service systems are deployed giving the priority to fixed-satellite service and broadcast-satellite service.

Spectrum for Services Ancillary to Broadcasting (SAB) in Ireland

For broadcasting services to function they need temporary access to spectrum for various support facilities. These additional facilities which are now regarded as an integral part of broadcasting/programme making are generally referred to as Services Ancillary to Broadcasting (SAB). The uses that conveniently fall under the heading of services ancillary to broadcasting are not restricted to broadcasters. Independent programme makers, film producers and organisers of special events, can also require them. Typically the facilities required are:

- Outside broadcast links including Electronic News Gathering (ENG).
- Satellite News Gathering (SNG) including radio microphones and radio cameras.
- Various 2 way control circuits (e.g. Talk-back).

SAB is allocated to the broadcasting service subject to conditions. Over the past decade spectrum –particularly in the 1 to 3.6 GHz range- that has traditionally been used for services ancillary to broadcasting has been re-assigned to other uses which were considered to have a higher priority (i.e. MMDS and WLL). With the increasing use of spectrum generally and an increase in activity in the programme/film production sector there is a need to examine whether certain parts of the spectrum should be designated for these types of use, either nationally or regionally and on what basis.

[50] ITU Stockholm 61 Plan - Plans annexed to the Regional agreement for the European Broadcasting Area concerning the use of frequencies by the broadcasting services in the VHF and UHF bands.
[51] Please see Document ODTR 01/69 – 'Licensing regional or locally based digital television delivery'

It is likely that the temporary use of VHF/UHF broadcast bands for radio microphones and other SAP/SAB systems including sound outside broadcasting links can be facilitated on a case by case basis. The ODTR is cognisant of developments on a European level dealing with spectrum requirements for SAB and outside broadcasting.

7.5 BUSINESS RADIO

Overview of Business Radio

Despite the rapid growth of cellular telephony, Business Radio is still the preferred 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. The main uses of Business radio are for public safety and security (police, fire and ambulance), public utilities (power, water, transport etc.), industrial and commercial users as well as various voluntary organisations, who need a reliable means of communicating with personnel and more especially groups of personnel on the move. Business Radio can be Private mobile radio (PMR), Community Repeater or Public Access Mobile Radio (PAMR).

Recent years have seen a number of developments that have enhanced the reliability and security of PMR and PAMR systems. For the most demanding user (security and emergency services) features such as encryption, data and interworking are important. Trunked systems, whereby users have access to a pool of channels rather than the users each having their own specific channel will increase the effective use of PMR/PAMR spectrum. On-site Trunked Radio systems have been in operation for a number of years and it is expected that interest will grow in local area PAMR systems. Some demand is still expected for digital systems that are possibly based on the TETRA (Terrestrial Trunked Radio) system.

Use of Spectrum by Professional Mobile Radio (PMR and PAMR) in Ireland.

The main mobile bands used by PMR and PAMR are listed in the table below:

Frequency Band and Frequency Range	National Mobile Usage
68 to 87.5 MHz (VHF Low Band)	PMR state Services PMR commercial PAMR Community repeaters.
138 to 156 (VHF Mid-Band)	This band has only been recently planned for use in Ireland. It is intended that it will be used for PMR

Frequency Band and Frequency Range	National Mobile Usage
156 to 174 MHz (VHF High-band)	PMR State Services Maritime Mobile Inland Waterway Applications PMR commercial
380.0 to 399.9 MHz	Digital Trunked Radio
410 to 430 MHz	Some Analogue Trunked Radio Systems Digital trunked radio.
446 – 446.1 MHz	PMR 446 – License exempt service[52].
450 to 470 MHz (Main UHF band)	PMR state Services PMR commercial PAMR Community repeaters. Fixed Links supporting PMR
870 to 876 MHz and 915 to 921 MHz	Digital Trunked Radio

Overview of Paging

Paging systems currently allowed in Ireland are mainly private on-site or local area systems. The on-site paging would typically be used by institutions such as hospitals etc. while the local area paging would typically be used for emergency service call-out.

Use of spectrum by Paging in Ireland

The frequency bands used by paging in Ireland are listed in the table below:

Frequency Band	National Paging Usage
86 – 90 kHz	Paging (Commercial Firms)
26.175 - 27.5 MHz	Paging (private, on-site)
27.5 - 28 MHz	Paging (private, on-site)
30.01 - 37.5 MHz	Paging (Hospitals)
153-154 MHz	Paging and alarm systems (National, wide area, local and on-site)
169.4 - 169.8 MHz	ERMES - Subject to review in light of market developments
458.5-459.5 MHz	On-site paging

The ERO have prepared a report[53] on compatibility issues for narrow band return path two way paging systems. The ODTR is monitoring interest within Europe.

The Use of Spectrum by PMR 446 in Ireland.

PMR 446 was implemented as a new concept for short range voice communications where operation is under relaxed licensing conditions on collective frequencies shared by

[52] SI 93 of 1998 exempts SRB in this band from requiring a licence. These devices are limited to 500mW maximum erp.

[53] ERC Report 75 on 'Narrow band return path two way paging compatibility studies in the 406.1 – 410 MHz, 440 - 470 MHz and 862 - 871 MHz bands.

many users on an uncoordinated basis. The equipment uses integral antennas in order to maximise sharing and minimise interference and is intended for voice communications only.

The band 446.000-446.100 MHz was identified as a European-wide harmonised frequency band for such an application and ETSI prepared ETS 300 296 to facilitate standardisation. The use of this service is licence exempt within Ireland.

Spectrum Management Objectives for Business Radio in Ireland:

- Improve the use of the land mobile spectrum through a programme of audits, investigations and targeted monitoring leading to better strategic planning and individual assignments.
- Encourage the introduction and use of spectrally efficient technologies.
- Investigate possibilities to improve spectrum utilisation and where necessary seek new spectrum for PMR use.
- Continued commitment to providing a diverse range of services in the land mobile radio bands.
- Develop methodologies for the identification of congestion on PMR channels including the use of monitoring data.
- Ensure that frequency requirements for current and future Public Access Mobile Radio Network operators are met
- Protect Irish PMR interests in international fora and bilateral discussions.

Spectrum Strategy Issues in Business Radio

410 to 430 MHz, A number of fixed links exist in this band and they need to be phased out to release the band for TETRA services and/or analogue trunked radio systems that appear to still be in demand.

450 to 470 MHz, There is currently an investigation within the UK to align this band with the European Bandplan. At present the Irish and UK UHF base/mobile band segmentation are aligned. However these segments do not align with those used in continental Europe and as a result the UK suffers interference from the continent. To overcome this problem the UK are intending to adopt the band segment configuration presently used in continental Europe. The body responsible for spectrum management in the UK propose to use the period up to 2004 to continue the development of a realistic implementation plan. Unless Ireland makes similar changes then the problem moves from being a UK/Continent interference problem to being an UK/ Ireland problem and in

particular a N.I. / Ireland problem. The ODTR is monitoring the process and if similar changes are to be made in Ireland then implementation plans need to be developed in consultation with the Industry.

138 to 156 MHz, It is intended that this band will be used for both PMR and PAMR services in the future.

7.6 SATELLITE COMMUNICATIONS

Overview of Satellite Communications Sector

Satellite services are classified into applications of a general telecommunications or broadcasting nature, for example Fixed satellite service, Mobile satellite service, Broadcasting satellite service, etc.

Fixed Satellite Service (FSS)

The Fixed Satellite Service forms an important part of telecommunications networks. While initially it was used extensively for intercontinental/ international applications, in more recent years some countries have deployed satellite systems for domestic purposes. With the development of fibre optic cables, with its inherently high capacity, the use of satellite communications for intercontinental international applications has reduced. The fixed satellite service will continue to play an important role in the future delivery of broadband telecommunications services involving direct to home (DTH) delivery. This type of development results in a proliferation of small earth stations/consumer terminals.

Mobile Satellite Service (MSS)

In the case of the mobile satellite service it can be divided into Land mobile satellite service, Maritime mobile satellite service and Aeronautical mobile satellite service. In the case of the latter two, in addition to normal communications, the mobile satellite service also provides important safety functions such as the Global Maritime Distress and Safety Service (GMDSS).

The mobile satellite service provides a variety of voice, data, fax and messaging services throughout the world that complement the terrestrial cellular networks. The initial Mobile satellite systems were implemented primarily for maritime use, however as terminals developed and became smaller, applications on land as well as at sea developed. These earlier systems used a small number of satellites in the geostationary

orbit. More recently networks consisting of a large number of satellites (up to 66) in non-geostationary satellite orbits have been developed. The satellite component of 3rd generation mobile is expected to comprise of constellations of non-geostationary satellites using spectrum between 1 and 3 GHz.

Broadcasting satellite service

Broadcasting by satellite comprises both individual reception , often called direct-to-home (DTH) or direct broadcasting by satellite (DBS) and community reception. It is assumed that individual reception will involve simple receiving installations with small antenna, requiring a strong signal from the satellite and very effective protection against interference. Community reception, serving the public typically through cable distribution systems, is assumed to involve more complex receiving installations with larger antenna which do not require such powerful signals.

FSS bands have been used extensively and are still being used for the distribution of television programmes signals direct to the home. This activity was driven by the availability of surplus satellite transponder capacity and the relative ease in which co-ordination could be accomplished in the FSS bands as opposed to the BSS bands.

Use of Spectrum for Satellite Communications in Ireland

The Irish Allocations for space radiocommunications services are indicated in the National Table of Allocations[54]. They conform to the ITU Allocations for Region 1 and the "European Table of Frequency Allocations and Utilisation". As indicated in the National Table of Allocations, a significant number of the bands allocated to the space radiocommunications services are also allocated to one or more terrestrial services. This is particularly relevant in the case of bands used for telecommunication applications. The specific utilisation for the various bands is subject to particular implementation arrangements, such as the relevant intra / inter-service sharing and co-ordination considerations. These are normally derived from ITU and CEPT/ERC specified criteria.

Spectrum Management Objectives

- Protect national Fixed Satellite Service (FSS) and Broadcast Satellite Service (BSS) interests in international fora.
- Facilitate electronic licensing through the CEPT One Stop Shopping initiative.
- Develop suitable regulatory regime for emerging new Fixed Satellite Services e.g. Satellite Interactive Terminals (SITs) and Satellite User Terminals (SUTs).

[54] Currently document ODTR 01/23.

Broadcasting Satellite Service Spectrum Strategy Issues

BSS band**,** The frequency range of this band is 1.452.7 to 1.492 GHz. This band is allocated to the Fixed Service, the Mobile Service, the Broadcast Service and the Broadcast Satellite Service (BSS). In Ireland the band is closed for the fixed service and is being cleared of its existing use for use for Terrestrial Digital Audio Broadcasting (T-DAB) as per the 1995 Wiesbaden[55] and 1996 Bonn[56] agreements. A further T-DAB planning meeting to allocate 7 additional T-DAB blocks will be held in June 2002 to extend the allotments.

BSS-TV band**,** The frequency range of this band is 21.4 to 22.0 GHz. This band is allocated to the Broadcast Satellite Service (BSS), the Fixed Service and the Mobile Service. In the case of the Broadcast Satellite Service (BSS) the allocation shall come into effect on 1st April 2007. The band is intended for High Definition Television and an ITU conference is envisaged to plan the long-term use of the band.

Mobile Satellite Service Spectrum Strategy Issues

Segments between 1 and 3 GHz. The frequency ranges of these bands are 1525 to 1559 MHz (space to Earth) 1610 to 1660.5 MHz (Earth to space), 1980 to 2010 MHz (Earth to space), 2170 to 2200 MHz (space to Earth), 2483.5 to 2500 MHz (space to Earth), 2500 to 2520 MHz (space to Earth) and 2670 to 2690 MHz (Earth to space).

The following bands have been identified as candidate bands for providing the additional spectrum for the satellite component for IMT 2000:

- 1525 - 1559 MHz (space to Earth) paired with 1626.5 - 1660.5 MHz (Earth to space).
- 1610 – 1626.5 MHz (Earth to space) paired with 2483.5 to 2500 MHz (space to Earth).
- 2500 to 2520 MHz (space to Earth) paired with 2670 to 2690 MHz (Earth to space).

Work is ongoing within Project Team One of the ECC in progressing these issues and the ODTR is taking an active role within this project team.

[55] Finals Acts of the CEPT T-DAB Planning Meeting, Wiesbaden 1995.

Fixed Satellite Service Spectrum Strategy Issues

3.4 GHz band, The frequency range of this band is 3.4 to 3.6 GHz. In the past this band has been regarded as a military band in parts of Europe and consequently there was little commercial use. This band is one of the bands identified by the Working Group on Frequency Management of the ECC as a preferred band for FWA in Europe and Ireland has licensed two FWA operators in part of the band. Sharing between the Fixed Satellite Service and the above mentioned terrestrial service is likely to be difficult.

11 GHz Band, The frequency range of this band is 10.7 to 11.7 GHz. This band is shared with the Fixed service and is designated for high capacity point to point links. It is a very important band in Ireland for trunk routes due to the shorter minimum hop length to that permitted in other bands below 12 GHz. Accordingly it is heavily used. The Fixed Satellite Service extensively uses this band also. It is an important band for earth station reception particularly for VSATs and television reception. As the satellite use is space to earth the potential for interference is from the radio links into the satellite earth station receiver. Due to the proliferation of satellite receive earth stations in this band some European Administrations are no longer licensing point to point links in this band. The ODTR will keep the use of this band under review for possible conflicts arising between the demands of the satellite and terrestrial services.

10.7 – 12.5 GHz, The ERC has approved Decision (00)08 on 'The use of the band 10.7 – 12.5 GHz by the fixed services and earth stations of the broadcasting-satellite and fixed-satellite service (space-to-Earth)' which proposes 1) that in the band 10.7-11.7 GHz that new fixed services be limited to high capacity, above 140 Mbit/s, point to point links used for trunk networks and that uncoordinated fixed-satellite service Earth stations operate on a non-protected basis. 2) that in the band 11.7 – 12.5 GHz, no new fixed service systems are deployed giving the priority to fixed-satellite service and broadcast-satellite service. The ODTR has been approached to license a terrestrial broadcast service in the band 11.7 – 12.5 GHz, which is currently undergoing a consultation[57], bearing in mind Irelands commitment to European harmonisation and the potential problems of licensing dissimilar systems to neighbouring countries.

13 GHz Band, The frequency range of this band is 12.75 to 13.25 GHz. This band is allocated to the fixed service, the mobile service and the fixed satellite service. As the transmissions are in the Earth to space direction, the potential for interference is from

[56] Finals Acts of the T-DAB Planning Meeting, Bonn, 1996

satellite earth station to the radio link receiver. The related downlink allocation (space to Earth) is in the 11 GHz band. The use of the band (12.75 to 13.25 GHz) by the satellite service is governed by the ITU Allotment plan (RR Appendix S30 B). Ireland has allotments in this plan and accordingly we have, to date, refrained from opening it to fixed service use. If Ireland decides not to implement its satellite allotments, the ODTR will consider opening the band up for use by the fixed service.

18 GHz Band, The frequency range of this band is 18.1 to 19.3 GHz. The band is allocated to the space to Earth direction although the segment 18.1 to 18.4 GHz is also allocated to the Earth to space direction. Part of the band (18.8 – 19.3 GHz) is allocated to NGSO FSS [58] systems (space to Earth). Typical satellite applications will be planned systems such as "Teledesic" or "Skybridge", which are intended as "direct to home" broadband delivery systems. It is recognised that it will be difficult for the terrestrial and other space services to share spectrum with the NGSO FSS applications and there has been a strong lobby in the international fora to recover some spectrum in this band from the fixed service in order to facilitate the satellite operators. Accordingly a final decision is needed at a European level on possible segmenting of the band between the fixed service and the space service and we also await the outcome of the CEPT deliberations, on band segmentation, before taking a decision on possible changes in use of this band.

11.7 – 19.7 GHz, The ERC has approved 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)' which proposes 1) that stations in the fixed-satellite service (space-to-Earth) which are not co-ordinated shall not claim protection from stations of the fixed service. 2) that both fixed-satellite services and fixed services must implement mitigation techniques as outlined in the Decision. The ODTR is investigating the practicalities of the Decision with a view to implementing the Decision.

27.5 – 29.5 GHz, The ERC has approved 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)' which proposes 1) that sections of the band are designated for exclusive use of uncoordinated fixed-satellite service Earth stations; 2) that sections of the band are designated for exclusive use of fixed satellite systems; 3) that a section of the band be shared between both the fixed service and uncoordinated fixed-satellite

[57] ODTR 01/69 – 'Licensing regional or locally based digital television delivery'

service with limitations in certain geographical areas. The ODTR is investigating the practicalities of the Decision with a view to implementing the Decision.

47 GHz Band, The frequency range of this band is 47.2 - 50.2 GHz. The band is allocated to the Fixed Service, the Mobile Service and the Fixed Satellite Service (Earth to space direction). Parts of the band (47.2 – 47.5 & 47.9 – 48.2 GHz) are designated by the ITU for use by stratospheric repeaters (High Altitude Platforms HAP's). Accordingly the band will remain closed for the present and we should await the outcome of European considerations on using HAPS for IMT-2000 and other applications.

7.7 SHORT RANGE DEVICES

The term "Short Range Device" (SRD) has been adopted by both the CEPT and ETSI. It is intended to cover the radio transmitters which provide either uni-directional or bi-directional communication over short distances and which have low capability of causing interference to other radio spectrum users.

A wide range of spectrum use has been made exempt from individual licensing, typically because the power and propagation characteristics of these services is so localised that they do not materially interfere with other spectrum users. With advances in radio technology, there is growing commercial interest in developing products that utilise SRD technology. Some of the services developed for permitted short range device spectrum can be partial substitutes for and/or complements to licensed spectrum applications, such as mobile phones. The absence of spectrum usage charges may encourage commercial operators to focus their research efforts on using this spectrum. Equally, the lack of protection from interference offered to users of such spectrum may militate against operators providing a commercial service, since they may face difficulties in guaranteeing the quality of transmissions.

Use of permitted SRD in Ireland is on a non-interference non-protected basis. Users of such spectrum must not cause interference to other authorised spectrum users, nor can they claim protection from interference from such services. With short range propagation and few devices in any given geography, the risk of interference caused by SRD use has been shown in studies to be relatively low. Technology advances offer the prospect of

[58] NGSO FSS: Non Geostationary satellite orbit, Fixed Satellite Service.

increasing the intensity of spectrum use in these bands through the use of systems which are automatically self-protecting and self-regulating in a sense, that is, avoiding interference coming into the band and avoiding transmitting over other signals within the band.

The use of spectrum for SRD poses a number of regulatory challenges including:

- How to regulate growing congestion in spectrum were short range devices are permitted to operate.
- To target regulation where it is needed, to help different spectrum users resolve efficiently their competing demands to use a particular radio frequency, avoiding unnecessary over-regulation

The Use of Spectrum by Short Range Devices (SRD) in Ireland.

A complete list of permitted short range devices permitted in Ireland are contained in Annex 4 to the national table of frequency allocations. Within Ireland, short-range devices may be operated, within the confines of the technical parameters given, without the requirement of an individual license.

The general terms of use are that:

- SRDs in general operate in shared bands and are not permitted to cause harmful interference to other radio services
- in general SRDs cannot claim protection from other radio services
- due to the increasing interest in the use of SRDs for a growing number of applications it is necessary to harmonise frequencies and regulations for these devices
- there is a need to distinguish between different applications
- additional applications and associated annexes will be added as necessary

SRDs use either integral, dedicated or external antennas and all modes of modulation can be permitted subject to relevant standards and SRD cover a large range of different services, including Telecommand and Telecontrol, Telemetry, Alarms and Speech /Video equipment. Also included in as short range devices are cordless telephones, baby monitors, wireless microphones and radio LANs.

In order to harmonise the spectrum used by short range devices in Europe the CEPT has adopted eighteen Decisions[59] concerning the various frequency bands for low power devices, and specific short range devices. The Decisions describe the requirements for SRDs relating to allocated frequency bands, maximum power levels, equipment antenna, channel spacing, duty cycle, licensing, conformity assessment, marking and free circulation requirements. Much of the equipment covered would come within the ambit of the R&TTE Directive. The European Telecommunications Standards Institute (ETSI) has also developed standards for the majority of these devices.

New Developments in SRD

The following proposals are been monitored in the ODTR:

- The development of a European strategic plan for the use of the band 862-870 MHz for Short Range Devices in future.
- A European strategic plan for the use of the frequency spectrum within the band 2400-2483.5 MHz based on the international trends and market development as the band 2400-2483.5 MHz is currently the only world wide harmonised band for SRD applications.

The introduction of new SRD is being monitored through participation in ECC working Groups and the evolution of ERC Recommendation 70-03[60].

Short range Device Spectrum Management Objectives:

- Permitting the use of SRD in bands allocated to low power applications where ever possible having regard to the general terms of SRD usage.
- Monitor market interest in the development of SRD .
- Contribute to the work of the CEPT, in association with industry, in seeking harmonised bands for low power use.
- Consider the implementation of CEPT Decisions[61] on short range devices
- Continually update and expand ERC REC 70-03 on Short Range Devices.

[59] ERC Decisions (01)01 to (01)18
[60] ERC RECOMMENDATION 70-03 (Tromsø 1997 and subsequent amendments relating to the use of short range devices (SRD) as adopted by the Frequency Management, Radio Regulatory and Spectrum Engineering Working Groups
[61] ERC Decisions (01)01 to (01)18

7.8 RECENT DEVELOPMENTS IN RADIOCOMMUNICATIONS TECHNOLOGY AND APPLICATIONS

A prominent feature of the telecommunications sector is the extent to which it is subject to rapid technological innovation and changing market conditions. Keeping pace with these developments is one of the most difficult challenges the ODTR faces as it strives to ensure that our regulatory approaches and methods are appropriate and timely.

Spectrum Management Objectives in regard to recent developments

- Contribute to the work of the CEPT in seeking harmonised bands for new services.
- Anticipate technological and market developments so that we can assess and prepare for regulatory changes that may be required as a consequence.
- Contribute to the ODTR's forward-looking Programme, which aims to monitor trends and developments, including those that occur within the global radiocommunications sector and identify which ones may give rise to new spectrum management issues.

Ultrawideband Communications (UWB)

The term ultrawideband (UWB) communications covers short-range in-building type devices potentially capable of competing with current Wireless LANs and Bluetooth technologies (in the frequency range 1 to 6 GHz) and a new generation of short range radar devices (~ 24 GHz). Radar applications of this type include for example level gauges in industrial process storage tanks and collision detection devices for cars[62].

Claimed advantages of this Technology

- high transmission rates (up to 100Mbit/s) at low power densities
- no need for exclusive or even protected spectrum.

Possible disadvantages of this Technology

- The use of a large amount of spectrum
- The effect of UWB systems on existing radio systems is as yet unknown, and measuring techniques have yet to be developed to successfully demonstrate the impact of UWB systems on other radiocommunication systems.
- There are concerns that the use of a large number of such devices in a location may increase the ambient noise floor to unacceptable levels.

[62] For further details please see ODTR 01/59 – Technology Developments in Telecommunications

Licensing Issues

Due to their low levels of emitted power and expected mass distribution UWB systems could be treated in a similar manner to short range devices in most countries and may therefore be eligible for exemption from licensing requirements. In Ireland, and other countries, possible licensing approaches are currently under consideration. In the case of UWB radar systems, certain restrictions on the usage methods may need to be employed (e.g. a device may only transmit when in contact with the surface being surveyed).

Implications for the Irish market

If UWB is introduced to the Irish market its potential market development impact could be significant, particularly for short range wireless applications (e.g. wireless LAN) and in advanced automobile systems (e.g. short range collision detection and avoidance radar systems). Such applications could be of significant social benefit, by helping to increase safety on our roads. Other applications may emerge in due course. It would appear that UWB will in the future offer a convenient way of overcoming some spectral resource problems. However, at present, not enough is known about its operation and the impact it will have on existing radio systems. The Spectrum Engineering Working Group of the ECC are currently undertaking a study of this technology and the ODTR is actively involved in monitoring this working group.

High Altitude Platform Stations (HAPS)

High Altitude Platform Stations (HAPS)[63] potentially offer a new way of delivering broadband radiocommunications services that could help ease some of the roll out and capacity problems faced by today's telecommunications network operators within the next five years. These systems bypass the need for the roll out of extensive access and back-haul networks. Furthermore, HAPS systems can provide instant coverage once launched and have no need for expensive launch vehicles as in satellite systems[64].

Possible applications

- Mobile – specific spectrum has been identified for HAPS for IMT-2000 (3G) applications
- Fixed Wireless Access – broadband access, up to 155Mbit/s or higher.
- Low cost telecommunications for developing countries
- Broadcast services – metropolitan or region wide coverage.

[63] A high altitude platform station is defined in the ITU Radio Regulations as a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth.

- Disaster Relief – rapid deployment of communications for relief workers where existing telecommunications infrastructure may be insufficient or inoperable.
- Earth sciences – inexpensive environmental studies (e.g. crop densities, radiation detection, road traffic patterns).

Advantages

- Coverage: at an altitude of 21km a HAPS could potentially achieve a coverage area of 19000 square km which represents a circular region of 160km in diameter.
- Direct line of sight from most city streets and from any roof top to the HAPS.
- Network roll-out speed
- Capacity, provisioning of more focused beams which aids frequency re-use.
- Accessible for maintenance and upgrades.

Frequency allocations for HAPS were made at WRC-97 and WRC-2000, and the issue will be raised again at the next World Radiocommunication Conference in 2003, WRC-03. It has also been suggested (by Japan) that HAPS could operate at practically any frequency shared with terrestrial services (fixed and mobile) above 3 GHz and sharing studies are to be carried out. The possibility of interference with amateur services in an adjacent band at 48GHz has also been raised along with possible negative implications to radio astronomy services. Sharing studies are being conducted in these areas.

Irish Implications

For a country the size of Ireland HAPS systems could provide region-wide coverage of broadband access services (say up to 155Mbit/s) once the technology has matured sufficiently. HAPS could also assist with the roll out of FWA and mobile services. The ECC is working toward preparing a common European Proposal on HAPS services for consideration at the next world radio conference.

Broadband VSAT (Very Small Aperture Terminals)

A VSAT (Very Small Aperture Terminal[65]) is a communications terminal that can be easily installed on the roof or side of a user's premises and used to access a wide range of telecommunications services such as video on demand and internet access. VSATs communicate through orbiting satellites, relaying information to and from controlling

[64] For further details please see document ODTR 01/59 – Technology Developments in Telecommunications

[65] The term VSAT stems from the size of the satellite terminal's antenna or dish, which is generally very small relative to traditional satellite earth stations (approx. 2 metres). A VSAT however is defined by more characteristics than just antenna size, such as networking and control details.

gateway stations known as hub stations. VSATs can offer low cost, easy to install solutions for areas with limited telecommunications infrastructure (e.g. rural areas) due to the large coverage areas offered by these satellite systems[66].

Advantages

- Easy Deployment
- Rural Deployment
- Diversity

Disadvantages

- Low Capacity
- Latency issues

Spectrum Issues

Currently most VSAT services operate in the Ku-Band (10.7-11.7GHz, 12.5-12.75GHz Downlink, 14-14.5GHz Uplink). Some sections of these bands are also used for terrestrial fixed microwave links. VSAT services will continue to grow in these bands for the foreseeable future. Other VSAT systems are planned for the Ka Band (17.7 – 22.2GHz downlink, 27.5 - 31GHz uplink). There is more bandwidth available at these higher frequencies which yields greater capacities, and it is expected that high density services such as home internet access will develop. Certain portions of spectrum in these bands are also shared with fixed links and there are European measures that allocate these bands more specifically.

Licensing in Ireland

Currently VSAT terminals are required to hold a Wireless Telegraphy licence for transmissions. The receiving portion is exempt from licensing. Furthermore there is an ERC decision that would allow for the exemption of the transmitting portion, in a certain dedicated VSAT band which covers most of the VSATs that the ODTR currently licences. VSAT systems that provide services to the public may also be subject to telecommunications service licensing.

Next generation VSATs such as SITs (Satellite Interactive Terminals) and SUTs (Satellite User Terminals) operating at higher frequencies in the Ka band are also covered under the current regime, however there are ERC decisions recommending the exemption from licensing of some of these. SITs and SUTs have uses ranging from

[66] For further details please see document ODTR 01/59 – Technology Developments in Telecommunications

interactive TV to broadband internet access. The frequency 29.5 to 30GHz (Ka band) is used for the up-link from both the SIT and the SUT terminals to the orbiting satellite. SIT terminals receive in the band 10.7 to 12.75 GHz (Ku band) where we have already exempted the receiving portion of earth station terminals, of this size, from licensing. SUT terminals receive in the frequency band 19.7 to 20.2 GHz (Ka band).

ERC Decisions (00)03 and (00)04 exempt SITs and SUTs operating at powers of no more than 50dBW from licensing. These ECC decisions are been considered for adoption in Ireland along with along with ERC DEC(00)05 which permits for VSAT terminal exemption.

Impact on Regulation by recent Developments

The innovative and future services discussed in this section bring with them new demands on spectrum management. It has been recognised that as the development of new technology speeds up, driven by increased demand from the market, the process of standardisation and evolving regulation to cope with new technologies must happen faster and faster.

Many of the benefits of new technology can be lost or hampered by a delay on the part of the regulator to implement suitable regulatory framework to deal with licensing of new developments. It is crucial that the regulator be proactive in identifying new technologies and preparing the regulatory structures to implement innovative systems as easily as possible, bearing in mind the need to balance the use of the spectrum in the national interest.

The ODTR's forward-looking programme is dedicated to looking typically two to five years ahead in order to keep abreast of developments in technology, and continues to provide relevant information and discussion on new technology and applications that affect the work of the Office.

New techniques of dynamic frequency assignment and dynamic frequency selection, combined with software defined radio structures, offer the spectrum manger enormous advantages that can be used to good affect in increasing the usage of spectrum in already congested bands. International studies and developments are been monitored in order to keep abreast of the latest developments and how they may apply to the local situation.

7.9 MILITARY USE OF SPECTRUM

Overview of the Military Sector

The military sector has 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 made to the Military in the Radio Regulations as military communications is recognised as the prerogative of each Sovereign State.

While the Act establishing the ODTR[67] requires the Director to *' publish a plan to be known as a "Radio Frequency Plan" comprised of a set of tables indicating frequency allocations in the radio'*, the 1926 WT Act reflects the freedom enjoyed by the military by stating in the section specifying the requirement to hold a WT licence that; *'This section shall not apply to any apparatus for wireless telegraphy kept by or in the possession of the Minister for Defence for the purpose of the defence forces, nor to any ship of war belonging to the Government of Saorstat Eireann or any other country or state'*.

Use of Spectrum by the Military Sector in Ireland

In some cases military and civilian systems share frequency bands, while in other cases there is almost exclusive military use of bands and in these, no equipment types have been manufactured for those frequency ranges. Military communications use the aeronautical, maritime and land mobile bands as well as some of the fixed service and satellite service bands. In addition use is make of various allocations for radiodetermination purposes (i.e. radionavigation and radiolocation).

Spectrum Management Objectives and Spectrum Strategy Issues

As indicated above there is no specific legislative regime for the licensing of military installations.

[67] No. 34/1996: Telecommunications (Miscellaneous Provisions) Act, 1996.

7.10 AVIATION AND MARITIME

The International Radiotelegraph Union was set up in 1906 to regulate the operation of radio services between ships and shore stations. When the ITU was founded in 1932 it took over the this function from the previous body. The maritime sector has actively participated in the radiocommunications field and its requirements for access to spectrum on a global basis has been recognised by the ITU through the inclusion in the table of frequency allocations of specific allocations for maritime purposes. In 1932 the ITU recognised that the aeronautical sector had similar needs and included specific allocations for aeronautical purposes in the table of frequency allocations. These allocations, for both aeronautical and maritime purposes, have been updated on a regular basis over the years.

In addition to making special provisions within the table of frequency allocations[68] the ITU Radio Regulations also includes extensive requirements relating specifically to the maritime service or the aeronautical service or both. The maritime and aeronautical services are the only services with which the ITU has a significant operational involvement.

In examining spectrum for both the maritime and aeronautical sectors it is important to note that in addition to the allocations for communications purposes, allocations for radiodetermination purposes (i.e. radionavigation, and radiolocation)[69] have also been made by the ITU.

Overview of the Aeronautical Sector

The demand for radio spectrum by the aeronautical services is increasing. This is particularly so in the VHF communications band where in parts of Europe, due to congestion, a change in the channel spacing from 25 kHz to 8.33 kHz is being progressively implemented. In addition to the normal voice communications data applications using both terrestrial and satellite are being considered. Ireland is a major user of the aeronautical HF band for communications due to its strategic location and responsibility for communications in the North Atlantic (Shanwick) control area.

Article S43.4 of the ITU Radio Regulations states that ‘Administrations shall not permit public correspondence in the frequency bands allocated exclusively to the aeronautical

[68] Article S5

mobile service or to the aeronautical mobile-satellite service'. If this facility is needed then it must be provided in frequency spectrum set aside for other appropriate services.

Use of spectrum by the aviation sector in Ireland

The various bands available to the maritime and aeronautical services are listed in the national table of frequency allocations.

Spectrum Management Objectives for the aviation sector:

- Continue to provide protection for those aeronautical services, which are considered as safety services.
- Continue close co-operation with the Irish Aviation Authority.
- Continue to provide spectrum for use by new emerging Aeronautical systems

Aviation Spectrum Strategy Issues

As the aeronautical service is global in nature, changes to the spectrum allocations and assignments are often decided at the international level. These allocations and assignments are in turn implemented by the national aviation organisations.

Overview of the Maritime Sector

A large part of the radio spectrum below 150 kHz is allocated to the maritime services and communication over long distances can be achieved in this frequency range. However this use is small and declining. The use of the band between 1.6 and 4 MHz is suitable for many kinds of medium distance narrow-band services due to the propagation characteristics. Despite having to share this spectrum in some sea areas with other services on land, the maritime services make substantial use of this frequency range for distances up to a few hundred kilometres.

A number of frequency bands between 4 and 30 MHz are allocated exclusively world-wide to the maritime services, divided into use for ship stations and coastal stations with an internationally agreed frequency allotment plan. The use of the radio spectrum by the maritime sector, like that for the aeronautical sector, has to be considered at both a national and an international level. Within the maritime sector considerable emphasis is put on safety of life and there are internationally recognised channels used for distress purposes which are to be kept interference free. In this regard frequencies for the Global Maritime Distress and Safety System (GMDSS) are particularly important.

[69] Dealt with under section 2.12

Use of spectrum by the Maritime sector in Ireland

The various bands allocated to the maritime and aeronautical services are listed in the Table of frequency Allocations for Ireland.

Marine Spectrum Management Objectives:

- Continue to provide protection for those maritime services which are considered as safety services.
- Continue to promote the use of spectrum efficient technologies, thereby maximising spectrum available for Maritime use;
- Continue to provide spectrum for use by new emerging Maritime systems;

Marine Spectrum Strategy Issues

As the maritime service is global in nature, changes to the spectrum allocations and assignments are decided at the international level. These plans are in turn are implemented by the Department of the Marine and the Marine Radio Surveyors Office.

7.11 EXPERIMENTERS (AMATEUR RADIO)

Overview of Amateur Radio[70].

The Amateur Radio sector is specifically recognised by the ITU with a formal service definition in the Radio Regulations, specific spectrum allocated to it within the International Table of Frequency Allocations were 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 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. In more recent times the amateur community developed the concept of small low earth orbit satellites with a store and forward operating mode and showed the suitability of small satellites for certain applications. These concepts are now being commercially exploited and the satellites are often referred to as "micro Sats". Amateurs also contribute to propagation studies either on their own or in assisting research establishments. Operating in small

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

groups amateurs have shown the possibilities of propagation over increasing distances using frequencies above 30 GHz.

Use of Spectrum by the Amateur Sector in Ireland

The amateur sector has allocations throughout the radio frequency spectrum. Some of the bands are allocated on a primary basis while other bands are allocated on a secondary basis. Exact frequency allocations can be found in the National Table of Frequency Allocations[71].

Experimenter Spectrum management Objectives

- Where not required for other services the ODTR will endeavour to support, where possible, the requirements of the amateur radio sector.

Experimenter Spectrum Strategy Issues

Summarised in the table below are the experimenter spectrum strategy issues:

Frequency Band	Current Use	Planned/Future Use
135.7 to 137 kHz	Maritime Mobile and Fixed Service	Include amateurs on secondary basis as per ERC REC 62-01 E[72]
50 – 52.0 MHz	Broadcasting in Band I - phased out	Has been added to the NTFA[73]
24.05-24.25 GHz, 47 – 47.2 GHz, 76 – 81 GHz, 122.25 – 123 GHz, 134 – 141 GHz and 241 – 250 GHz:	Not Currently used	Possible assigned in line with the ITU and European Table of Common Allocations.

If there is sufficient interest in the bands above 20GHz, the ODTR will consider assigning these segments to the Amateur Radio Service in line with the European Common Allocation Table.

7.12 MISCELLANEOUS SERVICES

Use of Spectrum by Citizen Band Radio in Ireland.

The regulations relating to CB vary from country to country within Europe where the service is known as "Personal Radio Communications (PR) 27". In general it is a minimally regulated service, intended to provide a two way, short range radio service for

[71] See ODTR 01/23 – Table of Frequency Allocations for Ireland

[72] ERC Recommendation 62-01 E72 (Mainz 1997), recommends that the band 135.7-137.8 kHz may be used with a maximum e.r.p. of 1 Watt on a secondary basis by the Amateur Service in CEPT countries. Available as REC6201E.pdf (Use of the band 135.7-137.8 kHz by the Amateur Service) under documentation section of http://www.ero.dk/.

[73] NTFA = National Table of Frequency Allocations

business and personal use. Depending on the local terrain transmissions can cover distances of up to 20 kilometres and during periods of anomalous propagation PR 27 may be able to communicate over distances of hundreds of kilometres. CEPT and ETSI have undertaken considerable work to develop a European-wide common frequency band and standard. The frequency range for PR 27 is 26.96 to 27.41 MHz and in 1998 the Director exempted CB from licensing (SI No. 436 of 1998).

Use of Spectrum by Industrial, Scientific and Medical (ISM) applications in Ireland

The ITU Radio Regulations define the Industrial, Scientific and Medical service as:

"Operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications."

In addition to radiocommunication services which depend on their functioning on the radiation of radio frequency (RF) energy and its reception at a distance, there are other applications for RF energy that do not involve deliberate radiation outside the limits of the apparatus in which it is used. The most important of these involve industrial, scientific or medical (ISM) apparatus. A considerable amount of RF energy may be radiated unintentionally from such installations, capable of causing severe interference to local receivers. A number of frequency bands have been designated for use by ISM apparatus and details can be found in the national table of frequency allocations. While the same bands have been allocated to other services, devices sharing the band with ISM must tolerate interference from ISM apparatus.

Use of Spectrum by Cordless Telephones in Ireland

Cordless telephones, including phones that meet the TTE9[74], CT2[75] and the DECT[76] standards are permitted in a portion of the HF band and in the 900 MHz band. These devices have been licence exempt for a number of years and freely available. There are moves within Europe to phase out the use of CT1 and CT1+ technology in the 900 MHz band. This is not seen as an issue as Ireland never permitted the use of this technology at 900 MHz. Concerning the phasing out of CT2 technology in the 900 MHz band, the ODTR is carefully considering the draft ERC Decision[77] which intend to complete the

[74] TTE9 is used to reference the frequency bands for an analogue cordless telephone.
[75] CT2 = Cordless Telephone, system 2, a follow on from CT1.
[76] DECT = Digital European Cordless Telephone – a harmonised European specification and frequency.
[77] Draft ERC Decision ERC/DEC/(01)QQ on 'Phasing out digital CT2 applications in the 900 MHz band.

phasing out of these services by 2005 and will consider any notice of interest in the use of CT2 technology.

Spectrum Management Objectives for these Miscellaneous Services:

- Consider a CEPT Draft Decision to phase out cordless telephone services in the 900 MHz band by 2005.

7.13 SCIENCE SERVICES

Overview of Science Services

Use of the radio spectrum by the science services is similar to the communication services, which most other radio services supply. Information at one end of the link is transmitted over the link to another location where it is required. However, in the science services the information to be transmitted has often been gathered directly by observations of nature, 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's 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 time and frequency satellite-service which is used for comparison of time and frequency standards and the dissemination of these standards.

Science Service Spectrum Management Objectives:

- Liase with Met Éireann and other scientific organisations to ensure that current and future Science Services requirements are fully understood and, wherever possible, incorporated into national plans for the future spectrum planning conferences.
- Remain appraised of possible means of reducing unwanted emissions for the protection of the Radioastronomy and other passive services.
- Protect national Science Service interests in national and international fora.

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, use 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 measuring etc. In recent years the science of using satellites for remote earth sensing for environmental and other purposes has evolved. 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.

Meteorological Service Spectrum Strategy Issues

- The ODTR 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.
- The ODTR will continue to offer a high degree of protection to Earth Exploration services in view of the impact of interference on passive and active sensors, which causes problems, and disruption to scientific research programs.

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 has recently been expressed in the establishment of a radio astronomy observatory in the Republic. As radio astronomy is a receive-only service and is attempting 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.

Radio Astronomy Spectrum Strategy Issues

The ODTR 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.

Standard Frequency and Time

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' and the standard frequency and time signal-satellite service as: 'A radiocommunication service using space stations on earth satellites for the same purposes as those of the standard frequency and time signal service'*.

There are no standard frequency and time installations in Ireland. The terrestrial systems mainly use frequencies in the short wave band and signals from the major installations such as MSF Rugby (in the UK) and Darmstadt (in Germany) operating in the LF band, are readily received and used in Ireland. The standard time signal is used in synchronising time dependent functions. In recent times the interconnecting of telecommunication networks is dependent on the networks being synchronised to a very high degree and the standard time signal provides an accurate reference signal for this purpose. The standard frequency signal is also used in checking and calibrating electronic equipment.

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 ground. The most well known is the Global Positioning System (GPS) operated by the American Department of Defence.

Frequency and Time Spectrum Strategy Issues

The ODTR will continue to offer a high degree of protection to time and frequency services, in view of their use in the safeguarding of human life and property.

7.14 RADIODETERMINATION

Overview of Radiodetermination Services

The Radio Regulations define the Radiodetermination service as: '*the determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves'*.

Radiodetermination comprises both radionavigation and radiolocation systems that are used for the navigation of ships, aircraft and vehicles. These systems provide safety services that, by definition, involve the safeguarding of human life and property and are therefore given a high degree of protection from interference. In addition to the terrestrial radionavigation services, which are subdivided between the maritime and aeronautical radionavigation services, there is the radionavigation-satellite and radiolocation- satellite services. The radionavigation satellite-services is further divided into maritime and aeronautical services.

Ireland, under the auspicious of the Commissioner of Irish Lights, run a number of maritime radionavigation aids including differential GPS stations on a trial public basis and Racons (Radar Beacons) at both X and P band.

Ireland, under the auspicious of the Irish Aviation Authority, run a number of aeronautical radionavigation aids including Non Directional Radio Beacons and Distance Measuring Equipment.

Radiodetermination Service Spectrum Management Objectives:

- Protect national radiodetermination service interests in national and international fora.
- Remain appraised of possible means of reducing unwanted emissions for the protection of the radiodetermination services.

Spectrum Strategy Issues

The ODTR will continue to offer a high degree of protection to all radiodetermination services, in view of their use in the safeguarding of human life and property.

8 SUBMITTING COMMENTS

All comments are welcome, but it would make the task of analysing responses easier if comments were referenced to the relevant question numbers from this document.

The period for submitting comments will run from ***2 October 2001*** to ***3 December 2001*** during which the Director welcomes written comments on any of the issues raised in this paper. Having analysed and considered the comments received, the ODTR will then publish the final spectrum strategy document. In order to promote further openness and transparency the ODTR will publish the names of all respondents and make available for inspection, all responses to the consultation, at her Offices.

The Director appreciates that some of the issues raised in this paper may require respondents to provide confidential information if their comments are to be meaningful. Respondents are requested to clearly identify confidential material and if possible to include it in a separate annex to the response. Such information will be treated as strictly confidential.

"All responses to this consultation should be clearly marked "Reference: Submission re ODTR 01/81" and sent by post, facsimile or e-mail to:

Ms. Sinéad Devey
Office of the Director of Telecommunications Regulation
Irish Life Centre
Abbey Street
Dublin 1
Ireland

Ph: +353-1-804 9621 Fax: +353-1-804 9671 Email: deveys@odtr.ie

to arrive on or before ***16H00, 3 December 2001***.

Office of the Director of Telecommunications Regulation
03 October 2001

Part D:

APPENDIX A - ODTR Contact Points

Queries relating to Spectrum Management should in the first instance be addressed to:

Mr. J. Connolly
Senior Manger
Spectrum Management – Competitions & International Strategy
The Office of the Director of Telecommunications Regulation,
Abbey Court,
Irish Life Centre,
Lower Abbey Street,
Dublin 1.

General queries regarding radio or licensing matters can be directed to:

The Office of the Director of Telecommunications Regulation,
Abbey Court,
Irish Life Centre,
Lower Abbey Street,
Dublin 1.

Tel: 01 804 9600
Fax: 01 804 9680

Email: info@odtr.ie

Internet Site

The ODTR maintains a comprehensive and regularly updated Web Site at: http://www.odtr.ie

Publications

This document is available in electronic format from the ODTR web site at: http://www.odtr.ie

The National Table of Frequency Allocations document is available electronically from the ODTR web site at: http://www.odtr.ie or as paperware by writing to Mr. Samuel Ritchie, The ODTR, Abbey Court, Irish life Centre, Lower Abbey Street, Dublin 1.he contact points mentioned above.

Sources of Further Information

The International Telecommunications Union

This organisation is responsible for the publication of the Radio Regulations which includes the International Table of Frequency Allocations. The Radio Regulations also detail the footnotes, appendices and describe the different categories of service referred to in the Table of Frequency Allocations, Ireland.

Publications of the International Telecommunications Union (ITU) can be obtained from:

Sales and Marketing Service,
International Telecommunications Union,
Place Des Nations,Ch-1211,
Geneva 20,
Switzerland.

Tel: +41 22 730 61 41
Fax: +41 22 730 51 94
Email: sales@itu.ch
Web Site: http://www.itu.int

CEPT Documentation, including ERC Decisions, Recommendations, Reports and Publications of the European Radiocommunications Office (ERO) can be obtained from:

The European Radiocommunications Office,
Midtermolen 1,
DK 2100 Copenhagen,
Denmark.

Tel: +45 35 25 03 00
Fax: +45 35 25 03 30
E-mail: ero@ero.dk
Web Site: http://www.ero.dk

Publications of the European Telecommunications Standards Institute (ETSI) can be obtained from:

The Sales Office,
ETSI,
Sofia Antipolis,
Nice,
France
Tel: +33 92 94 42 41
Fax: +33 93 95 81 33
Email: secretariat@etsi.fr
Web Site: http://www.etsi.fr/

Irish Equipment Standards (Including ETSI transposed standards) can be obtained from the National Standards Authority of Ireland at the address below:

Sales Office,
NSAI,Glasnevin,
Dublin 9,

Tel: 01 807 3877 / 3878
Fax: 01 807 3841

Irish Government Publications, including Statutory Instruments, can be obtained from:

The Government Publications Office,
4/5 Harcourt Road,
Dublin 2.

Tel: 01 661 3111
Fax: 01 475 2760

EC Directives and other European Community publications can be obtained from:

The European Commission Representation in Ireland,
European Union House,
18 Dawson Street,
Dublin 2.

Tel: 01 662 5113
Fax: 01 662 5118

APPENDIX B - Glossary of Terms and Definitions Used

Key to Abbreviations

ASDL	Asynchronous Services Digital Line
AIS	Universal Shipborne Automatic Identification System
AM	Amplitude Modulation
Appendix 16	Appendix 16 of the Radio Regulations: Channelling of the maritime mobile radiotelephone bands between 4000 kHz and 23 000 kHz.
Appendix 18	Appendix 18 of the Radio Regulations: Table of Transmitting frequencies in the band 156-174 MHz for stations in the maritime mobile service.
Appendix 27 aer2	Appendix 27 aer2 of the Radio Regulations: Frequency allotment plan for the aeronautical mobile (R) service and related information between 2850 kHz and 22 000 kHz.
Appendix 30	Appendix 30 of the Radio Regulations: Provisions for all services and associated plans for the broadcast-satellite service in frequency bands 11.7-12.2 GHz (in Region 3), 11.7-12.5 GHz (in Region 1), and 12.2-12.7 GHz (in Region 2).
Appendix 30A	Appendix 30A of the Radio Regulations: Provisions and associated plans for feeder links for the broadcasting-satellite services.
APT	Automatic Picture Transmission
AVI	Automatic Vehicle Identification.
BCI	Broadcasting Commission Ireland.
CEN	European Committee for Standardisation
CENELEC	European Committee for Electro-technical Standardisation
CEPT	European Conference of Postal and Telecommunications Administrations.
CT2	European Analogue cordless telephone system (second generation) (I-ETS 300 131)
DAB	Digital Audio Broadcasting.
DCS1800	Digital Communications System, 1800 MHz band.
DECCA	A Radionavigation system (of the DECCA company) – discontinued 31 March 2000.
DECT	Digital European Cordless Telecommunications a pan-European standard for short-range cordless telephones.
DGPS	Differential Global Positioning System.
DSI	Detailed Spectrum Investigation (as conducted by CEPT/ERO)
DTT	Digital Terrestrial Television
DVB	Digital Video Broadcasting
Earth - space	Earth to space direction of transmission.
EBU	European Broadcasting Union
ECC	Electronic Communications Committee

EESS	Earth Exploration Satellite Service.
EGSM	Extended Global System for Mobile Communications (see GSM)
EMC	Electromagnetic Compatibility
ENG/OB	Electronic News Gathering/Outside Broadcast.
EPIRB	Emergency Position-Indicating Radio Beacon.
ERC	European Radiocommunications Committee - A committee of CEPT responsible for radio matters.
ERC/DEC/	ERC Decision.
ERC/REC/	ERC Recommendation
ERO	European Radiocommunications Office - A permanent office within CEPT dealing with radio matters.
ERMES	Enhanced Radio Message Service.
e.r.p.	Equivalent radiated power.
e.i.r.p.	Equivalent isotropically radiated power.
ETACS	Extended Total Access Communications System.
ETS	European Telecommunication Standard.
ETSI	European Telecommunication Standards Institute.
EU	European Union
EUTELSAT	European Telecommunications Satellite Organisation.
FDDA	Field Disturbance and Doppler Apparatus (Motion Detectors)
FM	Frequency Modulation.
FSS	Fixed Satellite Service.
FSTV	Fast Scan Television
FWA	Fixed Wireless Access
FWPMA	Fixed Wireless Point to Multipoint Access
GDP	Gross Domestic Product
GHz	Gigahertz - 1,000,000,000 Hertz.
GLONASS	Global Satellite Navigation System (Russian Federation)
GMDSS	Global Maritime Distress and Safety System.
GPS	Global Positioning System.
GSM	Global System for Mobile Communications (Public mobile cellular system in the 900 MHz band.)
GSO	Geostationary Orbit.
HAPS	High Altitude Platform Station
HDFS	High Definitions Fixed Service

HDFSS	High Definitions Fixed Satellite Service
HDTV	High Definition Television.
HF	High Frequency
Hz	Hertz, The unit of frequency measurement, (1 kHz = 1000 Hz, 1 MHz = 1000,000 Hz, 1GHz = 1000,000,000 Hertz)
HIPERLAN	HIgh PErformance Radio Local Area Network.
HRPT	High Resolution Picture Transmission
IAA	Irish Aviation Aiuthority
IMT-2000	International Mobile Telecommunications – 3rd generation Mobile Systems.
INTELSAT	International Telecommunications Satellite Organisation.
INMARSAT	International Maritime Satellite Organisation.
ISM	Industrial, Scientific and Medical applications
ITU	International Telecommunications Union.
ITU-R	Radiocommunication Sector of the ITU.
ITU-T	Telecommunication Sector of the ITU.
ITU Geneva 75 Plan	Plan for the assignment of frequencies to broadcasting stations in the medium frequency. bands in Regions 1 and 3 and in the low frequency bands in Region 1.
ITU Geneva 84 Plan	Frequency assignment plan for FM sound broadcasting stations in Region 1 and part of Region 3 in the band 87.5-108 MHz.
ITU Geneva 85 Plan	Frequency assignment plan (Region 1) for stations of the maritime mobile service in the bands 85 415-495 kHz 505-kHz 1606.5-1625 kHz 1635-1800 kHz 2045 - 2160 kHz. Frequency assignment plan (Region 1) for stations of the aeronautical radionavigation service (radiobeacons) in the band 415-435 kHz and 510-526.5kHz Frequency assignment plan for stations of the radionavigation service (radiobeacons) for the European Maritime Area in the band 283.5-315 kHz.
ITU Stockholm 61 Plan	Plans annexed to the Regional agreement for the European Broadcasting Area concerning the use of frequencies by the broadcasting services in the VHF and UHF bands.
kHz	Kilohertz - 1000 Hertz.
LAN	Local Area Network.
LEO	Low Earth Orbit
LORAN C	Radionavigation System.
LPD	Low Power Device (Low power radio transmitters used for general data telemetry and telecommand).
LVD	Low Voltage Device
MEO	Medium Earth Orbit
MHz	Megahertz - 1,000,000 Hertz.
MLS	Microwave Landing System.
MMDS	Microwave Multimedia Distribution System
MRSO	Marine Radio Surveyors Office

MSS	Mobile Satellite Service.
MVDS	Microwave (or Multi-point) Video Distribution System.
MWS	Multimedia Wireless System.
N-GSO	Non-Geostationary Orbit.
NRA	National Regulatory Authority
PC	Personal Computer
Primary	Where a band is indicated as allocated to more than one service and the name of the service is printed in “Capitals” (e.g. MOBILE) these are called “primary” services. Within a band, Primary services shall have prior choice of frequencies. (also see secondary services). Where a band is indicated in a footnote of the Table as allocated to a service “on a primary basis” in an area smaller than a region or in a particular country, this is a primary service in that country.
PMR Band	Private Mobile Radio Band (Frequency band mainly used for business radio purposes)
RACON	Radar Beacon.
RDS	Radio Data System.
RLAN	Radio Local Area Network.
RTTT	Road Transport & Traffic Telematics.
R&TTE	Radio and Telecommunications Terminal Equipment.
SAB	Services Ancillary to Brooadcasting.
SAR	Search and Rescue.
SCADA	Supervisory, Control and Data Acquisition.
S-DAB	Satellite Digital Audio Broadcasting.
SMP	Significant Market Power.
SNG	Satellite News Gathering.
S-PCS	Satellite Personal Communications System.
space - Earth	space to Earth direction of transmission.
SHF	Super High Frequency
S.I.	Statutory Instrument (National Legislation)
SRD	Short Range Devices
STL	Studio to Transmitter Link.
SYLEDIS	A Position Fixing System.
T-DAB	Terrestrial Digital Audio Broadcasting.
TACS	Total Access Communications System (Analogue)
TETRA	Terrestrial Trunked Radio (Digital)
TFTS	Terrestrial Flight Telephone System.
TV	Television
UHF	Ultra High Frequency

UIC	Union International Chemin de Fer (International railways Organisation)
UMTS	Universal Mobile Telecommunications Systems.
UWB	Ultra Wide Band
VHF	Very High Frequency
VHF-FM	Very High Frequency – Frequency Modulated
VSAT	Very Small Aperture Terminal.
WARC	World Administrative Radio Conference.
WRC	World Radiocommunication Conference

Terms and Definitions:

Allocation:
Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned.

Aeronautical Mobile Service:
A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radiobeacon stations may also participate in this service on designated distress and emergency frequencies.

Aeronautical Fixed Service:
A radiocommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular efficient and economical operation of air transport.

Aeronautical Mobile - Satellite Service:
A mobile satellite service in which mobile earth stations are located on board aircraft; survival craft stations and emergency position indicating radiobeacon stations may also participate in this service.

Amateur Service:
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.

Amateur - Satellite Service:
A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service.

Broadcasting Service:
A radiocommunication service in which the transmissions are intended for direct reception by the general public. This service may include sound transmissions, television transmissions or other types of transmission.

Broadcasting - Satellite Service:
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.

Deep Space:
Space at a distance from the Earth approximately equal to, or greater than, the distance between the earth and the moon.

Earth Exploration - Satellite Service:
A radiocommunication service between earth stations and one or more space stations which may include links between space stations, in which:

- information relating to the characteristics of the earth and its natural phenomena is obtained from active sensors or passive sensors on earth satellites;
- similar information is collected from airborne or earth based platforms;

- such information may be distributed to earth stations within the system concerned;
- platform interrogation may be included.

This service may also include feeder links necessary for its operation.

Emergency Position - Indicating Radiobeacon Station:
A station in the mobile service the emissions of which are intended to facilitate search and rescue operations.

Fixed Service:
A radiocommunication service between specified fixed points.

Fixed - Satellite Service:
A radiocommunication service between earth stations at specified fixed points when one or more satellites are used; in some cases this service includes satellite-to-satellite links, which may also be effected in the inter-satellite service; the fixed-satellite service may also include feeder links for other space radiocommunication services.

Galileo:
A proposed Euroepan global satellite navigation system.

Inductive Loop Systems:
Systems which operate by producing a controlled magnetic field within which a predetermined recognisable signal is formed.

Industrial, Scientific and Medical (ISM) applications (of radio frequency energy):
Operation of equipment or appliances designed to generate and use locally, radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications.

Instrument Landing System (ILS):
A radionavigation system which provides aircraft with horizontal and vertical guidance just before and during landing and, at certain fixed points, indicates the distance to the reference point of landing.

Inter - Satellite Service:
A radiocommunication service providing links between artificial earth satellites.

Meteorological Aids Service:
A radiocommunication service used for meteorological, including hydrological, observations and exploration.

Meteorological - Satellite Service:
An earth exploration satellite service for meteorological purposes.

Land Mobile Service:
A mobile radiocommunications service between base stations and land mobile stations or between land mobile stations.

Mobile - Satellite Service:
A radiocommunication service between mobile earth stations and one or more space stations, or between space stations used by this service or between mobile earth stations by means of one or more space stations. This service may also include feeder links necessary for its operation.

Maritime Mobile Service:
A mobile service between coast stations and ship stations, or between ship stations, or between associated on board communication stations; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service.

Maritime Mobile - Satellite Service:
A mobile satellite service in which mobile earth stations are located on board ships; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service.

Radar:
A radiodetermination system based on the comparison of reference signals with radio signals reflected, or retransmitted, from the position to be determined.

Radar Beacon (Racon):
A transmitter-receiver associated with a fixed navigational mark which, when triggered by a radar, automatically returns a distinctive signal which can appear on the display of the triggering radar, providing range, bearing and identification information.

Radio Astronomy:
Astronomy based on the reception of radio waves of cosmic origin.

Radio Astronomy Service:
A service involving the use of radio astronomy.

Radiocommunications Service:
A service involving the transmission, emission and/or reception of radio waves for specific telecommunications purposes.

Radiodetermination:
The determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves.

Radionavigation:
Radiodetermination used for the purposes of radionavigation, including obstruction warning.

Radiolocation:
Radiodetermination used for purposes other than radionavigation.

Radiosonde:
An automatic radio transmitter in the meteorological aids service usually carried on an aircraft, free balloon, kite or parachute, and which transmits meteorological data.

Safety Service:
Any radiocommunication service used permanently or temporarily for the safeguarding of human life and property.

Secondary Where a band is indicated as allocated to more than one service and the name of the service is printed in normal characters (e.g. Mobile) these are called secondary services. Stations of a secondary service:

- shall not cause harmful interference to stations of primary services to which the frequencies are already assigned or to which stations may be assigned at a later date
- cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date;
- can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.

Where a band is indicated in a footnote of the Table as allocated to a service “on a secondary basis” in an area smaller than a region or in a particular country, this is a secondary service.

Space Research Service:
A radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes.

Standard frequency and Time Signal Service:
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.

Standard Frequency and Time Signal - Satellite Service:
A radiocommunication service using space stations on earth satellites for the same purpose as those of the standard frequency and time signal service.

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