Commission for
Communications Regulation

Consultation Paper

Future Spectrum Availability For Programme Making & Special Events

Wireless Microphones/IEMs & Wireless Cameras

Document No:	**10/37**
Date:	**27 April 2010**

All responses to this consultation should be clearly marked:- "Reference: Submission re ComReg 10/37" as indicated above, and sent by post, facsimile, e-mail or on-line at www.comreg.ie (current consultations), to arrive on or before 5pm on 10th June 2010 , to:

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

Contents

1 Foreword

This consultation details the current and possible future outlook on spectrum allocation for Programme Making and Special Events (PMSE). ComReg recognises that the PMSE sector plays an essential role in enabling the state-of-the-art coverage of some of the highest-profile public events that take place in Ireland.

Spectrum allocations for PMSE tend to be secondary in nature and on a temporary basis. As such, there is no spectrum specifically set aside for this purpose. ComReg is mindful of the need and demand for PMSE spectrum and needs to balance this against the demand by alternative users to access these bands.

Over the coming years, ComReg intends to make available spectrum in the TV band (470-862 MHz) and in the 2.3 GHz band for use by new electronic communications services. This will impact the availability of spectrum for PMSE use. The aim of this consultation is to identify alternative spectrum which could be made available for PMSE in the future. ComReg is aware that the Irish market of itself has limited scale to justify equipment manufacturers making bespoke equipment. ComReg must therefore take into account equipment availability in neighbouring and other European markets. Accordingly, this document examines the current allocations of spectrum for PMSE in Ireland and elsewhere in Europe.

ComReg looks forward to engaging with the PMSE sector and all other stakeholders in identifying and securing spectrum for PMSE users in the future.

John Doherty,
Commissioner

2 Introduction

This consultation considers the current and possible future availability of radio spectrum for "Programme Making and Special Events" (PMSE). In this document, the term PMSE spectrum refers to radio spectrum that is used in the course of audio/video and broadcasting content production.

PMSE spectrum is typically assigned on a temporary basis for wireless transmission of camera, microphone and private mobile radio signals over short distances. These signals are very often generated as part of content production and distribution at live and recorded entertainment, sporting and cultural events.

This document discusses spectrum changes that will affect Wireless Cameras and Wireless Microphones/In-Ear Monitor Systems. Related radio applications including Private Mobile Radio (PMR) and Satellite News Gathering (SNG) are beyond the scope of this document.

2.1 Outlook for PMSE Spectrum Assignments in Ireland

The future deployment of electronic communications services such as digital TV and wireless broadband in Ireland will impact on the availability of spectrum in the TV (470 – 862 MHz) and 2 GHz frequency bands. Both of these bands are currently used for PMSE.

The preferred band for wireless camera transmission is **2.2 – 2.4 GHz**. Most applications are assigned channels of between 8 – 20 MHz in this band. ComReg proposed in **Consultation 09/49**[1] to release spectrum in the 2.3 GHz band for other Electronic Communication Services (ECS). ComReg will consult once more on the release of spectrum in the 2.3 GHz band. Should the auction of spectrum in the 2.3 GHz band proceed along these lines, then this band will no longer be available for wireless camera applications[2].

Wireless microphone and in-ear monitor transmissions are licensed in the **TV band (470 – 862 MHz)**. The 2007 World Radiocommunication Conference allocated 790 – 862 MHz to Mobile services on a co-primary basis in Region 1 (including Europe) as from 17th June 2015. Following CEPT reports 30[3] & 31[4] on the issue, the CEPT Electronics Communications Committee decided to harmonise 790 – 862 MHz for mobile services Europe-wide[5]. In Ireland, a timescale for Analogue TV switch-off and a channel plan for Digital Terrestrial TV (DTT) in 470 – 790 MHz remain to be

[1] "Release of Spectrum in the 2300 – 2400 MHz band"- http://www.comreg.ie/_fileupload/publications/ComReg0949.pdf

[2] PMSE operators could of course bid for the spectrum, however the PMSE sector is mainly comprised of relatively small, independent production companies and in most cases it would not be financially or economically viable for them to secure the spectrum permanently.

[3] http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP030.PDF

[4] http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP031.PDF

[5] http://www.erodocdb.dk/Docs/doc98/Official/Pdf/ECCDec0903.pdf

decided. However, regardless of when it occurs, the switchover to digital TV will notably reduce available spectrum for microphones, in-ear monitoring and other PMSE content in the TV band.

2.2 ComReg's Statutory Obligations

ComReg has the statutory function, under section 10 of the Communications Regulation Act 2002, to manage the radio frequency spectrum. In doing so, ComReg's statutory objective, under section 12, is to ensure the efficient management and use of the spectrum.

2.3 Document Format

- Section 3 gives an overview of PMSE and discusses its cultural and social importance to Ireland.
- Section 4 provides details of current spectrum allocation for Wireless Cameras, Wireless Microphones and In-ear Monitors in Ireland.
- Section 5 discusses spectrum allocation changes which will impact upon Wireless Microphones and In-ear Monitor transmission in Ireland and elsewhere in Europe and proceeds to offer some potential solutions in that regard.
- Section 6 discusses spectrum changes which will impact upon Wireless Camera transmission in Ireland and further presents some potential solutions.
- Section 7 describes the procedure for submitting responses to this consultation.

3 Overview of PMSE

3.1 Cultural and Social importance of the PMSE sector to Ireland

Spectrum assigned for PMSE is used to cover a wide range of live and pre-recorded events of social and community importance. The PMSE sector is typified by small, independent production companies without the resources to secure full-time access to the spectrum they need. It also includes broadcasters, ranging from local to regional to national.

PMSE plays a key role in enabling state-of-the-art media coverage of some of the highest-profile public events held in Ireland. Recent examples include sporting events such as the Ryder Cup, the Tour of Ireland cycle race, the Irish Open and the Volvo Ocean Race. PMSE spectrum is also essential for live music events such as the Oxygen Festival, concerts at Slane Castle and pre-recorded theatre events. Such events raise Ireland's international profile and contribute to the local and national economy.

The provision of sufficient spectrum for PMSE is therefore of key importance. Developments in technology and applications are driving changes in uses of the radio spectrum throughout the European Union. In dealing with these changes and planning for the future, it is important that the spectrum needs of the PMSE sector are not ignored.

3.2 PMSE Spectrum Assignments in Ireland

In Ireland, PMSE is licensed by ComReg under the "Temporary Business Radio" licensing scheme on the basis that such use should neither cause interference to other services nor seek protection from interference by other users of the radio spectrum (this is often referred to as licensing on a "non-interference, non-protection" basis). These temporary licences have a maximum duration of six months but are usually issued only for the duration of the specific event.

Applications for PMSE spectrum are broadly classified into four categories:

1. **Private Mobile Radio (PMR)**

   VHF or UHF two-way radio systems ("Walkie-Talkies") used for event co-ordination and stewarding.

2. **Data / Telemetry**

   Radio links used for the remote control of cameras and other programme making equipment and for signalling.

3. **Wireless Cameras**

Cameras integrated with wireless transmitters; there are several types of wireless camera setup, including:

Temporary Point-to-Point Video links:

Video links between the programme transmission site (location of the event) and the reception site (usually a studio or OB vehicle);

Portable and Mobile Video links:

Portable (carried by a person) or mobile (airborne & vehicular) links carrying video content;

4. **Wireless Microphones/In-Ear Monitors**

A wireless microphone is handheld or body-worn with an integrated or body–worn transmitter. A wireless microphone consists of two components – the transmitter and the receiver. An in-ear monitor is a body-worn miniature receiver with an earpiece for personal monitoring of single or dual channel sound. As with Wireless Cameras, there are several types of audio link setup, including:

Temporary Point-Point Audio links

Portable and Mobile Audio links

In Ireland (as in many other countries), there is no dedicated spectrum set aside for PMSE. Instead, PMSE is typically assigned frequencies in secondary spectrum allocations with assignments being made between existing services or in bands allocated to other services but not yet assigned. PMSE may also share some frequency bands with low power, short-range devices which also typically operate on a non-interference, non-protection basis. PMSE is therefore licensed at frequencies and in geographical areas where there is little likelihood of interference to protected licensed services.

For each of the four application categories listed above, the spectrum bands typically used are shown in Table 1.

PMSE Application	**Spectrum Band in which PMSE Frequencies Assigned**
Private Mobile Radio (PMR)	VHF and Lower UHF bands
Data/Telemetry	VHF and Lower UHF bands
Wireless Cameras	2.2-2.4 GHz & 10 GHz bands
Wireless Microphones & In-ear Monitors	TV Band (470 – 862 MHz)

Table 1: PMSE spectrum bands

The general spectrum map for PMSE is shown in Figure 1 below.

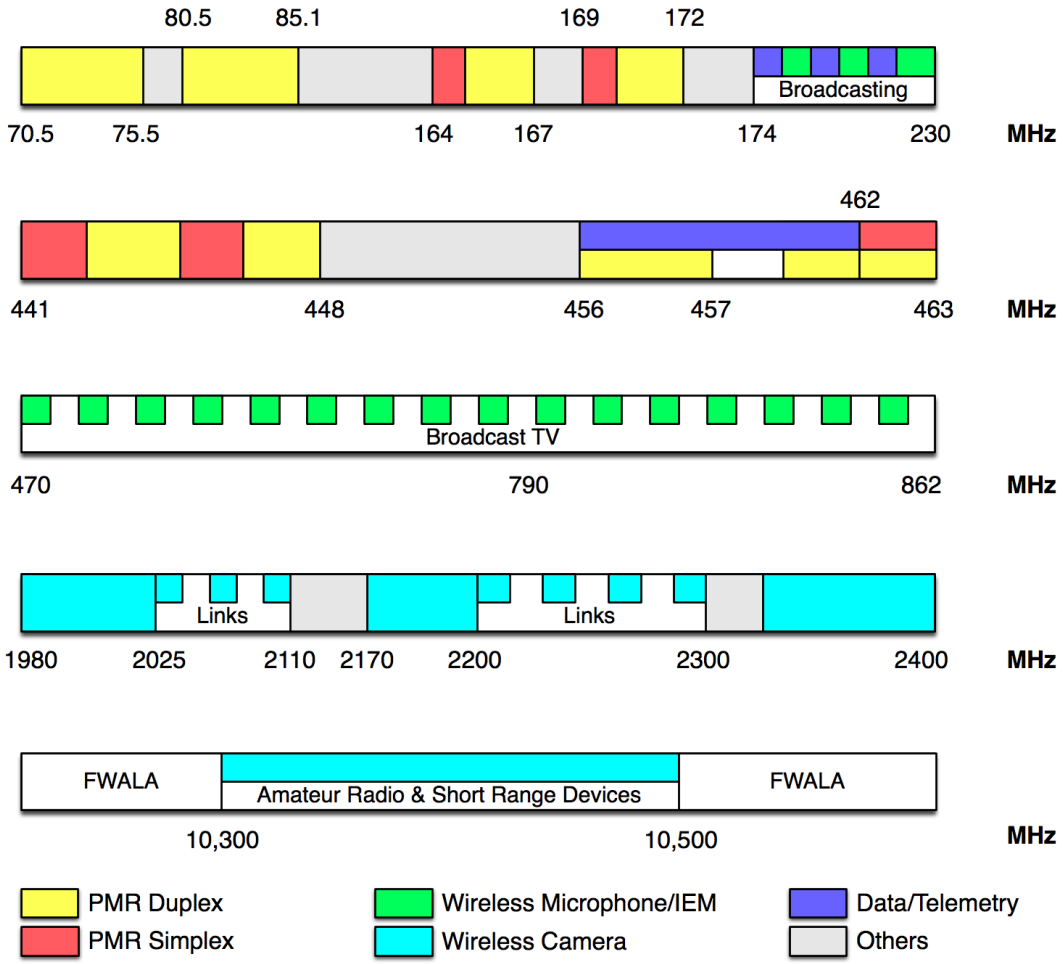


Figure 1: General Spectrum Map for PMSE in Ireland

As shown in Figure 1, it is clear that most of the PMSE bands are shared with other services. For example, Wireless Microphones/IEMs in the 470 – 862 MHz band share spectrum with broadcasting services while Wireless Cameras share spectrum in 2025 – 2110 MHz & 2200-2300 MHz with fixed links. Full spectrum allocation details can be found in Ireland's National Table of Frequency Allocations[6].

[6] http://www.comreg.ie/_fileupload/publications/Comreg0890R1.pdf

4 Current Spectrum Usage

4.1 Current Band Plan for Wireless Microphones/IEMs

Wireless Microphones and In-Ear Monitor systems share frequency bands with Television Broadcasting (470 – 862 MHz) and Digital Audio Broadcasting (174 – 230 MHz), which are the primary services in those bands. Licensed Wireless Microphones and In-Ear Monitor systems, as secondary services, are licensed at locations where they will not cause interference to reception of television and digital radio from local transmitters. Wireless Microphones and In-Ear systems transmit at very low power with a channel spacing of 200 kHz and a maximum ERP of typically 10-50 mW.

Figure 2 below plots the total number of individual frequency channels assigned for Wireless Microphones/IEMs since 2002:

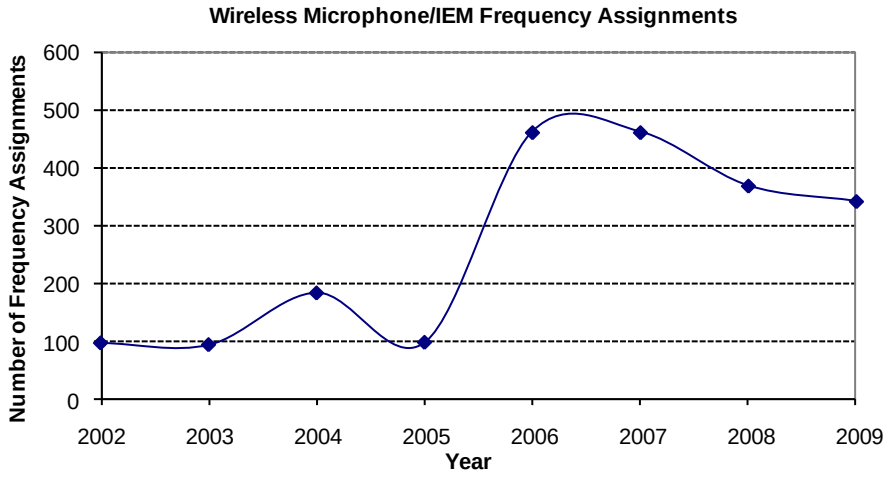
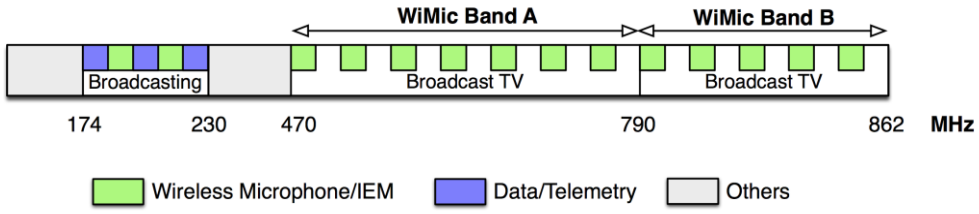


Figure 2: Wireless Microphone/IEM Frequency Assignments 2002 - 2009

In this document, we adopt the following terms to refer to spectrum in the 470 - 862 MHz band:

- WiMic Band A: 470 – 790 MHz
- WiMic Band B: 790 – 862 MHz



4.2 Current Band Plan for Wireless Cameras

Due to their flexibility, simple installation and ability to capture fast action, wireless cameras are now widely used by professional programme makers and broadcasters. The transmission bandwidth of modern digital camera systems is typically in the range 8 to 10 MHz, or, in the case of older analogue systems, up to 20 MHz. The total amount of spectrum required for wireless cameras at any time depends upon the size of the event. For example, an average sporting event requires about 48 MHz of spectrum while larger events (such as the Tour of Ireland cycle race) require closer to double this amount. Occasional high profile international events (such as the 2006 Ryder Cup) can require more than 200 MHz of spectrum, allocated to a mix of broadcast and CCTV camera links.

In CEPT Recommendation ERC/REC 25-10[7], the European Communications Committee (ECC) proposes 2025 – 2110 MHz and 2200 – 2500 MHz as "recommended tuning ranges" for Wireless Cameras within the 2 GHz band. This recognises the difficulty of finding frequency bands which can be made available on a fully harmonised basis across Europe. Instead the solution is to recommend common frequency ranges within which frequencies can be made available, but varying from country to country and location to location. It is essential therefore that wireless camera equipment is capable of being tuned to operate anywhere within those frequency ranges. This also gives the industry a degree of certainty in designing and procuring suitable products.

Figure 3 below plots the total number of frequency assignments made for Wireless Cameras since 2002:

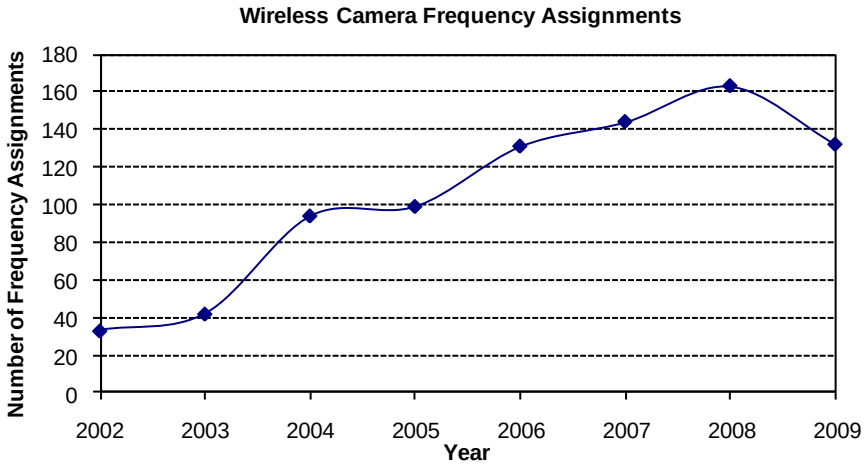
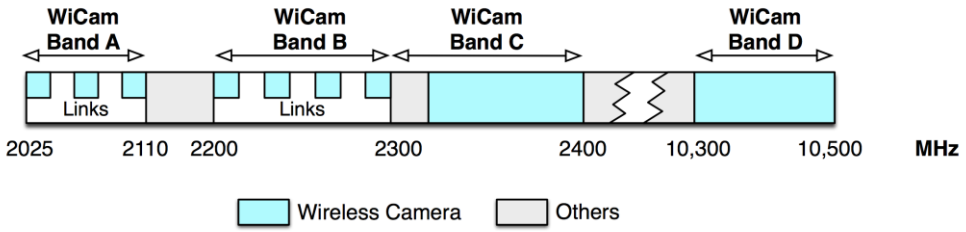


Figure 3: Wireless Camera Frequency Assignments 2002 - 2009

In this document, we adopt the following terms to refer to spectrum in the 2 GHz and 10 GHz bands

[7] Frequency Ranges for the use of temporary terrestrial audio and video SAP/SAB links (INCL. Eng/OB) - http://www.erodocdb.dk/Docs/doc98/official/pdf/REC2510E.PDF

- WiCam Band A:2025 – 2110 MHz
- WiCam Band B:2200 – 2300 MHz
- WiCam Band C: 2300 – 2400 MHz
- WiCam Band D:10.3 – 10.5 GHz



- **2025 – 2110 & 2200 – 2300 MHz**

  In Ireland and in Europe these two bands are allocated on a co-primary basis to fixed links. Other co-primary services to which the bands are allocated include the Mobile, Space Research, Space Operation and Earth Exploration-Satellite services in the case of the lower band and allocations to the Mobile service, with the exception of the aeronautical mobile service, and to the Space Research service in the upper band. The two frequency bands form a duplex arrangement whereby one end of a fixed link transmits in the sub-band 2025 – 2110 MHz, while the corresponding end transmits in the sub-band 2200 – 2300 MHz. Assignments can also be made in the bands on a secondary basis to Wireless Cameras based on geographic availabilities and the avoidance of harmful interference to the primary services.

- **2300 - 2400 MHz**

  This is the main band used by Wireless Camera applications. A total of 74 MHz of spectrum in the frequency range 2326 – 2400 MHz is available nationally in Ireland, accommodating a maximum of about 7 camera channels.

  The band 2307 – 2326 MHz is currently occupied by RurTel (in the west of Ireland) and Dáil TV (in Dublin). Nevertheless it is possible to make frequency assignments in the band for Wireless Cameras avoiding interference with RurTel and Dáil TV.

- **10.3 – 10.5 GHz**

10.15 – 10.3 and 10.5 – 10.65 GHz are used by Fixed Wireless Access Local Area (FWALA) services under a primary allocation to the fixed service. The spectrum between 10.3 and 10.5 GHz is used on a secondary basis for Wireless Cameras, Short Range Devices[8] and Amateur services. The band 10-10.5 GHz is also allocated on a co-primary basis in Europe to the Radiolocation service and the bands 10-10.3 GHz and 10.45 to 10.6 GHz are also allocated to the Mobile service, with the upper 50 MHz being allocated to the Mobile (except aeronautical) service.

Rarely Used Bands:

In the case of occasional very large events, additional spectrum in the 2 GHz band has been used for Wireless Camera transmissions. Examples of such events have included the 2006 Ryder Cup, the 2007 X-Fighters motorcycle event at Slane and the 2007 Smurfit European Open at the K-Club.

- **1980 – 2010 & 2170 – 2200 MHz**

  In accordance with EC Decision 2007/98/EC[9], these bands have been designated for use by Mobile Satellite Station (MSS) services with a Complementary Ground Component. Following a selection process in 2009 the European Commission selected two MSS operators[10], each of which was assigned 2 x 15 MHz of spectrum as follows: Inmarsat – 1980 – 1995 MHz (transmitting in the Earth to space direction), 2170 – 2185 MHz (transmitting in the space to Earth direction); Solaris – 1995 – 2010 MHz (Earth to space) and 2185 – 2200 MHz (space to Earth). Both operators are required to provide MSS services on a pan-European basis.

- **2010 – 2025 MHz**

  This band has been designated for use by UMTS (3G) services[11]. However, currently there are no assignments in the band.

Typical spectrum usage for a range of different types of event is outlined in Table 2 below. The events are categorised by size as small, medium, large and very large.

[8] See ComReg Document 02/71 R

[9] EC Decision 2007/98/EC - on the harmonised use of radio spectrum in the 2 GHz frequency bands for the implementation of systems providing mobile satellite services - http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:043:0032:0034:EN:PDF

[10] See EC Decision 2009/449/EC

[11] ERC Decision ERC/DEC(00)01 – Extending ERC/DEC/(97)07 on the frequency bands for the introduction of terrestrial UMTS- http://www.erodocdb.dk/Docs/doc98/official/pdf/DEC0001.PDF

Typical Events	Number of Wireless Cameras	Bandwidth per Camera (MHz)	Total Camera Bandwidth (MHz)	Number of Wireless Mics/IEMs	Bandwidth per Mic/IEM (kHz)	Total Mic/IEM Bandwidth (MHz)
Small						
Newsgathering	1	10	**10**	1	200	**0.2**
Medium						
St Patrick's Day Parade (in Dublin)	3	12	**36**	12	200	**2.4**
Football Match (e.g., at Croke Park)	4	12	**48**	15	200	**3.0**
Large						
Tour of Ireland (cycle race)	10	8 -12	**96**	3	200	**0.6**
Oxygen Festival (outdoor music event)	7	25	**175**	85	200	**17**
Very Large						
Ryder Cup (golf tournament)	17	8-25	**200**	102	200	**20.4**

Table 2: Typical Spectrum Usage for a range of events

It can be seen that the total bandwidth requirements for wireless cameras can range from 10 MHz for a small event up 200 MHz for a large-scale event, and from 200 kHz up to 20.4 MHz for wireless microphones/in-ear monitors for similar scale events.

5 Future Spectrum Availability for Wireless Microphones

The transition from analogue to digital TV is taking place worldwide. Digital terrestrial television (DTT) systems require less spectrum per TV channel than their analogue counterparts. The spectrum vacated in the transition to DTT is referred to as the **Digital Dividend.** Due to the desirable propagation characteristics of the UHF band, this vacated spectrum is very valuable and is in huge demand.

The current "WiMic" Band B has been identified as part of the Digital Dividend in most European countries. At the World Radiocommunication Conference 2007, it was decided that vacated spectrum in this band would be allocated on a co-primary basis to new Mobile/Fixed Communication Network (MFCN) services such as LTE in Europe by 2015.

European Commission policy on radio spectrum issues such as the Digital Dividend is informed by the **Radio Spectrum Policy Group** (RSPG)[12]. The RSPG has published Opinion Paper RSPG07-161[13] on the EU spectrum policy implications of the Digital Dividend. The latest update to the RSPG's position is published in Opinion Paper RSPG09-291[14]. These documents provide guidance to the European Commission (EC) in defining a digital dividend roadmap for the EU.

CEPT Reports 30[3] & 31[4] investigated the technical conditions facilitating the use of WiMic Band B for other MFCN services on a co-primary basis. Following the publication of these reports, ECC Decision ECC/DEC/(09)03[5] designated the use of this band for MFCN across the EU. This decision was produced to provide a clear signal to regulators and to manufacturers developing equipment for this band. It also allows operators to prepare for investment.

Where Frequency-Division Duplexing (FDD) is applied, ECC Decision (09)03 stipulates that use of WiMic Band B (790-862 MHz) for MFCN should be based on division of the band into a pair of 30 MHz uplink and downlink channels with an 11 MHz "duplex gap" in between, as illustrated in Figure 4 below.

790-791	791-796	796-801	801-806	806-811	811-816	816-821	821-832	832-837	837-842	842-847	847-852	852-857	857-862
Guard band	Downlink						Duplex gap	Uplink					
1 MHz	30 MHz (6 blocks of 5 MHz)						11 MHz	30 MHz (6 blocks of 5 MHz)					

Figure 4: Proposed FDD Channel Plan for MFCN in WiMic Band B

Where FDD cannot be used as outlined in Figure 4, the report suggests partial implementation of FDD and/or the introduction of Time-Division Duplexing (TDD).

[12] The RSPG is a high-level advisory group established under European Commission Decision 2002/622/EC

[13] http://rspg.groups.eu.int/_documents/documents/opinions/rspg07_161_final_op_digdiv.pdf

[14] http://rspg.groups.eu.int/_documents/documents/opinions/rspg09_291_digitaldividend.pdf

In the TDD case, the use of WiMic Band B is partitioned into 5 MHz blocks starting at 797 MHz, with a guard band of 7 MHz starting at 790 MHz. This arrangement is shown in Figure 5 below.

790-797	797-802	802-807	807-812	812-817	817-822	822-827	827-832	832-837	837-842	842-847	847-852	852-857	857-862
Guard band	Unpaired												
7 MHz	65 MHz (13 blocks of 5 MHz)												

Figure 5: Proposed TDD Channel Plan for MFCN in WiMic Band B

Decision 5 of ECC Decision (09)03 states that administrations wishing to implement PMSE in the FDD centre gap (Figure 4) or in the TDD guard band (Figure 5) should adopt the block-edge mask requirements specified in Annex 3, Section 3.1 of that document.

5.1 Impact of ECC Decision (09)03 on Ireland

A date for analogue TV switch-off in Ireland has not yet been fixed. However, the EU Commission Recommendation[15] of 28.10.2009 recommends that Member States complete both their digital TV switchover and analogue switch-off by 1st Jan 2012, although the Commission has since recognised that this may not be feasible in some Member States.

Under the current arrangements in Ireland, WiMic Bands A and B are assigned on a secondary basis for Wireless Microphones and IEMs. These arrangements will continue to apply until analogue TV switch-off occurs. However, these arrangements must be considered strictly temporary.

The frequencies of the TV Channels which make up WiMic Bands A & B are listed in Table 3 below. Figure 5 shows the total number of frequency assignments made in each channel for the period 2002 – 2009.

Channels with a total number of assignments greater than 15 are highlighted in Table 3 and shown in Figure 5.

[15] http://www.ero.dk/01B962D6-4069-40E1-BB32-0B23E872A7CC?frames=no&

Channel	Frequency (MHz)
21	470-478
22	478-486
23	486-494
24	494-502
25	502-510
26	510-518
27	518-526
28	526-534
29	534-542
30	542-550
31	550-558
32	558-566

Channel	Frequency (MHz)
33	566-574
34	574-582
35	582-590
36	590-598
37	598-606
38	606-614
39	614-622
40	622-630
41	630-638
42	638-646
43	646-654
44	654-662

Channel	Frequency (MHz)
45	662-670
46	670-678
47	678-686
48	686-694
49	694-702
50	702-710
51	710-718
52	718-726
53	726-734
54	734-742
55	742-750
56	750-758

Channel	Frequency (MHz)
57	758-766
58	766-774
59	774-782
60	782-790
61	790-798
62	798-806
63	806-814
64	814-822
65	822-830
66	830-838
67	838-846
68	846-854
69	854-862

Table 3: Wireless Microphone/IEM Channel frequencies

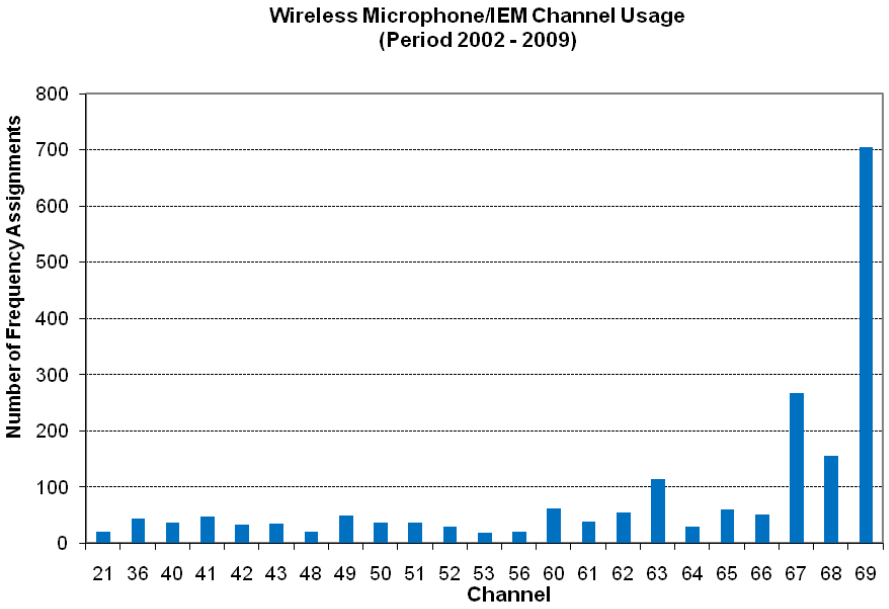


Figure 5: Wireless Mics/IEMs Channel Usage Statistics (2002 - 2009)

Clearly, most assignments were made in channels 61 - 69 (WiMic Band B). The reasons for this include:

- Demand was higher for these channels
- availability of microphone and IEM equipment capable of operating in WiMic Band A (470 - 790 MHz) is limited
- consistency with other European countries

The implementation of ECC Decision (09)03 will greatly restrict the available spectrum in WiMic Band B for Wireless Microphones/IEMs. In addition, contention

for spectrum in WiMic Band A is set to increase as digital broadcast transmitters make more efficient use of the spectrum leaving fewer gaps than the current analogue transmitters.

As a result of these factors, it will become more difficult to find alternative spectrum for PMSE applications with sufficiently low risk of interference. Any such interference would reduce the audio quality of Wireless Microphone/IEM transmissions and affect the integrity of primary services in the band.

5.2 Impact of ECC Decision (09)03 on other European Countries

In Ireland and across Europe, Wireless Microphones and IEMs are assigned spectrum in WiMic Bands A and B. Timelines for analogue TV switch-off and the implementation of ECC Decision (09)03 varies from country to country, but the resulting scarcity of spectrum for PMSE will affect all countries.

After the digital switchover, limited interleaved spectrum will be available in WiMic Band A for PMSE on a secondary and temporary basis all over Europe as a possible alternative to WiMic Band B. Recent developments include:

1. In June 2009, the UK Communications Regulator (Ofcom) confirmed Channel 38 (606 – 614 MHz) in WiMic Band A as a replacement for Channel 69 (854 – 862 MHz).

2. In June 2008, the Finnish Communications Regulator FICORA opened WiMic Band B for MFCN. WiMic Band B will still be available for PMSE on a secondary basis until sufficient replacement spectrum becomes available elsewhere. Also in December 2009, FICORA decided to open WiMic Band A for Cognitive Radio systems on a co-secondary basis with Wireless Microphones.

3. Sweden has vacated WiMic Band B in advance of the analogue TV switch-off in that jurisdiction

In all other European countries, WiMic Band B will remain available on a secondary, non-interference basis until at least 2012 and in some countries (such as Germany) until 2015.

5.3 After Analogue Switch-off

Task Group 4 (TG4) of the ECC has investigated the suitability of the FDD duplex gap and TDD guard band for PMSE and has published their findings in CEPT Report 32[16].

[16] http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP032.PDF

The report makes the following recommendations with respect to Wireless Microphones and IEMs:

> *WiMic Band A (470-790 MHz) should be maintained for PMSE on a temporary basis where broadcasting is not used (i.e. vacant channels)*
>
> *Two kinds of bands could be made available in addition to 470 - 790 MHz*
>
> - *for less critical uses or for cases where 470-790 MHz cannot be used for equipment reasons, additional frequency bands should be identified without a "controlled" access to the spectrum*
> - *Where interleaved channels are insufficient for "critical" PMSE uses in the band 470-790 MHz to satisfy peak demand, new frequency bands need to be identified and controlled access provided*

The report identifies several bands as possible "additional" spectrum for PMSE:

1. **TV VHF Band** (216-223 MHz)

   According to ERC/REC 70-03[17] and ERC/REC 25-10[18], the band 174-216MHz is available for PMSE and is intensively used within CEPT for analogue TV broadcasting. As in the UHF band, the introduction of digital systems in this band may result in fewer white spaces available for PMSE.

2. **MFCN (FDD) 11 MHz Duplex Gap** (821-832 MHz)

   See the discussion at the beginning of the Section 5.

3. **The "L" band** (1452-1559 MHz)

   A study is being carried out by CEPT on the suitability of this band for Wireless Microphones/IEMs.

   To provide the same coverage range as in the UHF band (470-862 MHz), PMSE in the "L" band would require more output power. In addition, this spectrum is not available for PMSE use in all CEPT countries.

4. **1800-1805 MHz** in conjunction with **1785-1800 MHz**

[17] http://www.erodocdb.dk/Docs/doc98/official/pdf/REC7003E.PDF

[18] http://www.erodocdb.dk/Docs/doc98/official/pdf/REC2510E.PDF

According to Annex 10 to ERC/REC 70-03[17] and ERC/REC 25-10[18], the 1785 – 1800 MHz band may be available for PMSE.

The propagation characteristics of this band are inferior to those of the VHF / UHF band. In addition, the band is occupied in some countries by military or government applications.

The ECC FM working group is currently investigating the addition of the 1800 – 1805 MHz band into Annex 10 of ERC/REC 70-03 for Wireless Microphones/IEMs.

Q. 1. Which (if any) of bands 1-4 listed above should ComReg consider for wireless microphone/IEM applications in the future? Please set out the reasons for your answer. Is the necessary equipment currently available or about to become available?

5.4 Future Spectrum for Wireless Microphones/IEMs in Ireland

The Digital Switchover will mean that Channel 69 will no longer be available for Wireless Microphone/IEM assignments. In its Consultation Document on the "Digital Dividend in Ireland" (Doc 09/15)[19], ComReg identified Channels 36 (590 – 598 MHz) and 38 (606 – 614 MHz) as potentially forming part of the digital dividend. Both of these 8 MHz channels are currently unused and either of them could serve as a replacement for Channel 69 in Ireland (subject to agreement with neighbouring administrations).

As mentioned in Section 5.2 of this chapter, the United Kingdom has confirmed Channel 38 will be used to replace Channel 69 in that jurisdiction. Because much of the demand for PMSE spectrum in Ireland arises from UK-based companies operating here, Channel 38 may offer a practical solution to the loss of spectrum in Channel 69. This was an approach suggested by certain respondents to Consultation Document 09/15[20].

[19] http://comreg.ie/_fileupload/publications/ComReg0915.pdf

[20] See ComReg Response to Consultation Document 09/81

Q. 2. In your view, should ComReg allocate Channel 38 exclusively to PMSE (as in the UK)? Please give reasons for your answer.

Q. 3. Would this Channel be sufficient to satisfy demand? Please give reasons for your answer.

The interleaved spectrum resulting from the DTT plan was also considered[20] as a possible replacement for lost spectrum in WiMic Band B. At this stage, ComReg cannot be certain how much interleaved spectrum will be available after the digital switchover. However, licensing of Wireless Microphones/IEMs will continue in both WiMic Band A and WiMic Band B until the Digital switchover occurs.

Q. 4. In your opinion, would access to the interleaved spectrum in the DTT band plan on a non-interference, non-protected basis be useful for Wireless Microphone/IEM applications? If so, why?

863 – 865 MHz is designated for use by Short Range Devices (SRD) all across Europe[21], including Ireland. This band is 2 MHz wide and could be suitable for small-scale or indoor events. (There is a limit of 10mW ERP on all Wireless Microphone/IEM transmissions in this band.)

As the use of SRD applications in the band is licence-exempt, ComReg cannot directly assess how heavily it is utilised.

Q. 5. Is the sub-band 863 – 865 MHz suitable for PMSE? Are there any difficulties or issues with this band, such as interference or lack of available equipment?

[21] See Annex 1 & 13 of ERC/REC 70 -03

6 Future Spectrum Availability for Wireless Cameras

Figure 6 below illustrates the number of frequency assignments to Wireless Cameras by band for the period 2002 – 2009:

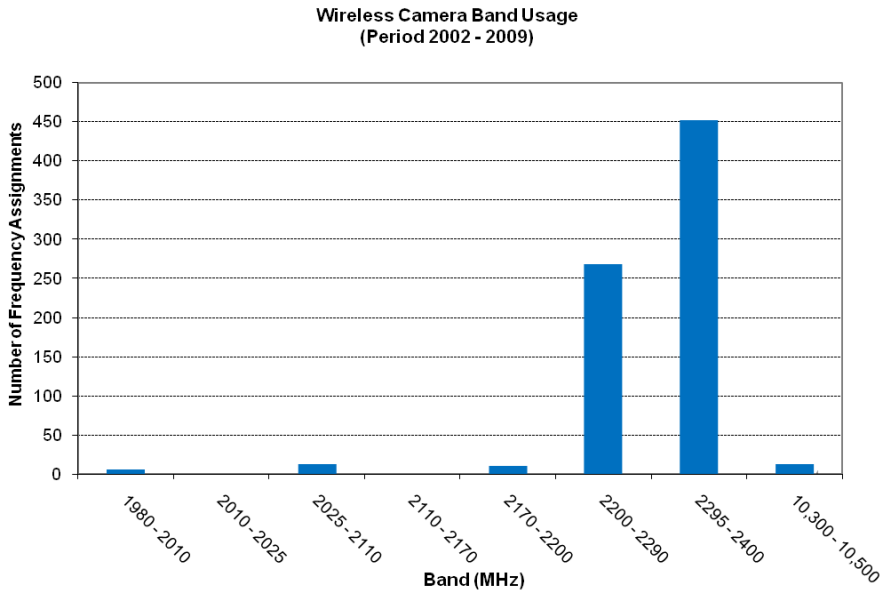


Figure 6: Wireless Cameras Channel Usage Statistics (2002 - 2009)

As discussed in Section 4 ("Current Spectrum Usage"), in Ireland Wireless Cameras are mainly assigned spectrum in WiCam Band C (2.3-2.4 GHz). On the basis of experience the spectrum in WiCam Band C would appear to be sufficient to accommodate most small to medium-sized events.

In Consultation Document 09/49[22], ComReg announced its intention to make the 2.3-2.4 GHz band (corresponding to WiCam Band C) available for new wireless broadband services. This is likely to notably reduce the amount of spectrum available in the band in Ireland for Wireless Cameras.

6.1 Situation in other European Countries

Agenda Item 1.5 of the upcoming World Radiocommunications Conference (WRC) 2012[23] will examine the future spectrum requirements of PMSE. At the moment, WiCam Band C is not standardised across Europe. Potential uses identified for WiCam Band C include aeronautical telemetry (on a national basis), PMSE, mobile applications and Amateur Radio. In addition, some countries have identified this band as suitable for sharing between civil and military spectrum users. PMSE and

[22] http://comreg.ie/_fileupload/publications/ComReg0949.pdf

[23] http://www.ero.dk/CAA48508-28BD-4B51-8803-100E2CBF8ACB?frames=no&

aeronautical telemetry usage in WiCam Band C are continuously increasing all over Europe.

Some countries use additional tuning ranges for Wireless Cameras[24], including 2500 – 2690 MHz. This band will soon be made available[25] for new IMT/UMTS services in countries throughout Europe. In these countries, WiCam Band C is considered a replacement option for spectrum lost in 2500 – 2690 MHz. It is not yet clear whether this will satisfy spectrum demand for future large scale events. As part of Agenda Item 1.5 at WRC-2012, other viable tuning ranges may also be considered. CEPT preparatory group (CPG) Project Team D (PT-D) are responsible for developing European proposals on the matter.

In summary, almost all other European countries propose to continue licensing Wireless Cameras in the 2.2-2.4 GHz band due to existing demand, until an alternative solution is found at European level.

6.2 Future Spectrum for Wireless Cameras in Ireland

As discussed, the proposed auction of 2.3 GHz spectrum ("WiCam Band C") for wireless broadband will reduce available spectrum for future Wireless Camera applications.

ComReg would like to assess the level of interest in maintaining some 2.3 GHz spectrum for use by the PMSE sector in the future.

Q. 6. In your view, is it important to maintain some spectrum in WiCam Band C (2.3 – 2.4 GHz) for future Wireless Camera applications? How much might be reasonably required? Please give reasons for your answer.

Assuming spectrum in WiCam Band C is released for other services as planned, the following bands will remain for Wireless Camera applications:

WiCam Band A (2025 – 2110 MHz) & WiCam Band B (2200 – 2300 MHz)

There are currently only a handful of short-distance Fixed Links in the Greater Dublin area which occupy these bands. If these links could be moved, WiCam Bands A and B could be made available exclusively for Wireless Cameras within that area. While the bands would remain assigned to Fixed Links in other areas, Wireless Camera assignments could possibly continue on a secondary, non-interference basis.

[24] In accordance with ERC/REC 25 – 10

[25] In accordance with ECC Decision ECC/DEC/(02)06 and EC Decision 2008/477/EC[http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:163:0037:0041:EN:PDF]

Q. 7. In your view, should ComReg consider making WiCam Bands A and B available exclusively for Wireless Cameras in the greater Dublin area? Please give reasons for your answer. (The bands could possibly continue to be available on a secondary, non-interference, non-protected basis for Wireless Camera assignments elsewhere in Ireland.)

WiCam Band D (10.3 – 10.5 GHz)

According to the guidelines for Temporary Business Radio published in ComReg Document 08/08[26], there are 16 channels of 10 MHz bandwidth available in this band. Despite the large amount of available spectrum however, demand for Wireless Camera frequency assignments in this band has historically been low (as illustrated in Figure 6).

Q. 8. What, in your opinion, are the reasons for the low demand for Wireless Camera frequency assignments in WiCam Band D? Are there (for example) interference, propagation characteristic or equipment availability problems which affect this band?

Q. 9. Is there anything that could be done to increase the usage of this band?

U6 (6.425 GHz – 7.125 GHz) & L7 (7.125 – 7.425 GHz)

These bands are in use by microwave point-to point Fixed Links. It might be possible to permit Wireless Camera applications in the band interleaved with fixed links as is currently done in WiCam Bands A and B. However, great care would have to be taken to ensure that interference was not caused to any fixed links which might require quite strict technical constraints on the wireless camera equipment.

[26] http://www.comreg.ie/_fileupload/publications/ComReg0808.pdf

Q. 10. **Is there equipment available for use in the U6 and L7 bands for Wireless Camera applications? If so, should ComReg open these bands for such applications on a secondary, non-interference non-protected basis?**

Q. 11. **Apart from equipment availability concerns, do you foresee any other issues which may affect the operation of Wireless Cameras in interleaved spectrum within the U6 or L7 bands?**

Summary

Figure 7 below shows the spectrum available for future Wireless Camera assignments after the proposed auction of spectrum in the 2.3 GHz band.

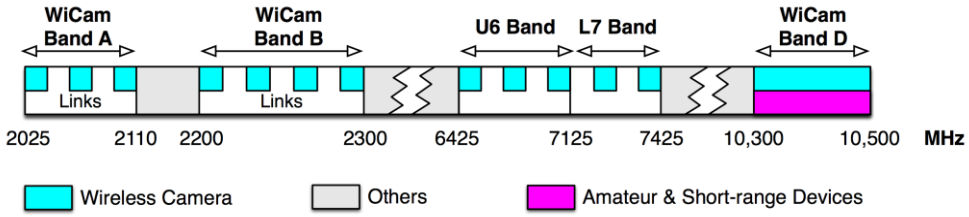


Figure 7: Spectrum potentially available for Wireless Camera after 2.3 GHz auction

Q. 12. **In your opinion apart from those listed above, are there any other bands which ComReg should consider for Wireless Camera applications in future? If so, please indicate what bands should be considered giving reasons for your answer.**

7 Submitting Comments

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

The consultation period will run until 10th June 2010 during which ComReg welcomes written comments on any of the issues raised in this paper.

Having analysed and considered the comments received, ComReg envisages publishing a report on the consultation which will, inter alia, summarise the responses to the consultation subject to the provisions of ComReg's *Guidelines on the Treatment of Confidential Information* – ComReg Document 05/24. -be unprotected so that they can be appended into the ComReg submissions document for publishing electronically.

Confidential material

ComReg will publish all responses to this consultation on its website, subject to the provisions of its *Guidelines on the treatment of confidential information* (ComReg 05/24). ComReg appreciates that many of the issues raised in this paper may require respondents to provide confidential information if their comments are to be meaningful.

As all responses will be published and made available for inspection generally, respondents should clearly identify confidential material and place confidential material in a separate annex to their response.

Annex A – Regulatory Framework

ComReg's main statutory functions, and its objectives in exercising those functions, are set out in sections 10 and 12 of the Communications Regulation Act, 2002, respectively. The full text of sections 10 and 12 is set out below – please note that this text below reflects certain amendments made to section 10 under the Communications Regulation (Amendment) Act, 2007. The main changes were the insertion of three new sub-sections - 10(1)(ca), 10(1)(d), and 10(1)(da) – and the replacement of the original sub-section 10(2).

Functions of Commission

10.—*(1) The functions of the Commission shall be —*

(a) to ensure compliance by undertakings with obligations in relation to the supply of and access to electronic communications services, electronic communications networks and associated facilities and the transmission of such services on such networks,

(b) to manage the radio frequency spectrum and the national numbering resource, in accordance with a direction under section 13,

(c) to ensure compliance by providers of postal services with obligations in relation to the provision of postal services

(ca) to monitor the quality and efficiency of the emergency call answering service established under Part 6,

(d) to carry out investigations into matters relating to the supply of, and access to, electronic communications services, electronic communications networks and associated facilities and the transmission of such services on such networks,

(da) for the purpose of contributing to an open and competitive market and also for statistical purposes, to collect, compile, extract, disseminate and publish information from undertakings relating to the provision of electronic communications services, electronic communications networks and associated facilities and the transmission of such services on those networks, and";

(e) to ensure compliance, as appropriate, by persons in relation to the placing on the market of communications equipment and the placing on the market and putting into service of radio equipment.

(2) The Commission may carry out an investigation referred to in subsection (1) either on its own initiative or as a result of a complaint made by an end user or an undertaking.

(3) The Commission shall have all such powers as are necessary for or incidental to the performance of its functions under this or any other Act

(4) The Commission shall be the national regulatory authority for the purposes of Regulation No. 2887/2000 of 18 December 2000 (O.J. No. L336, 30.12.2000) of the European Parliament and of the Council on unbundled access to the local loop.

Independence of Commission

11.*—Subject to this Act, the Commission shall be independent in the exercise of its functions.*

Objectives of Commission

12.*—(1) The objectives of the Commission in exercising its functions shall be as follows—*

(a) in relation to the provision of electronic communications networks, electronic communications services and associated facilities—

(i) to promote competition,
(ii) to contribute to the development of the internal market, and
(iii) to promote the interests of users within the Community,

(b) to ensure the efficient management and use of the radio frequency spectrum and numbers from the national numbering scheme in the State in accordance with a direction under section 13, and

(c) to promote the development of the postal sector and in particular the availability of a universal postal service within, to and from the State at an affordable price for the benefit of all users.

(2) In relation to the objectives referred to in subsection (1)(a), the Commission shall take all reasonable measures which are aimed at achieving those objectives, including—

(a) in so far as the promotion of competition is concerned—

(i) ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality,
(ii) ensuring that there is no distortion or restriction of competition in the electronic communications sector,
(iii) encouraging efficient investment in infrastructure and promoting innovation, and
(iv) encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources,

(b) in so far as contributing to the development of the internal market is concerned—

(i) removing remaining obstacles to the provision of electronic communications networks, electronic communications services and associated facilities at Community level,
(ii) encouraging the establishment and development of trans-European networks and the interoperability of transnational services and end-to-end connectivity,
(iii) ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services and associated facilities, and
(iv) cooperating with electronic communications national regulatory authorities in other Member States of the Community and with the Commission of the Community in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of Community law in this field, and

(c) in so far as promotion of the interests of users within the Community is concerned—

(i) ensuring that all users have access to a universal service,
(ii) ensuring a high level of protection for consumers in their dealings with suppliers, in particular by ensuring the availability of simple and inexpensive dispute resolution procedures carried out by a body that is independent of the parties involved,
(iii) contributing to ensuring a high level of protection of personal data and privacy,
(iv) promoting the provision of clear information, in particular requiring transparency of tariffs and conditions for using publicly available electronic communications services,
(v) encouraging access to the internet at reasonable cost to users,
(vi) addressing the needs of specific social groups, in particular disabled users, and
(vii) ensuring that the integrity and security of public communications networks are maintained.

(3) In carrying out its functions, the Commission shall seek to ensure that measures taken by it are proportionate having regard to the objectives set out in this section.

(4) In carrying out its functions, the Commission shall, without prejudice to subsections (1), (2) and (3), have regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to the Commission, in relation to the economic and social development of the State.

(5) In carrying out its functions, the Commission shall have regard to international developments with regard to electronic communications networks and electronic communications services, associated facilities, postal services, the radio frequency spectrum and numbering.

(6) The Commission shall take the utmost account of the desirability that the exercise of its functions aimed at achieving the objectives referred to in subsection (1)(a)

does not result in discrimination in favour of or against particular types of technology for the transmission of electronic communications services.

(7) In this section, "national numbering scheme" means the scheme administered by the Commission which sets out the sequence of numbers or other characters used to route telephony traffic to specific locations.

Annex B – Glossary of terms

Term	Explanation
CCTV	Closed-Circuit TV
CEPT	European Conference of Postal and Telecommunications
CPGPT-D	CEPT Preparatory Group Project Team- D
DTT	Digital Terrestrial Television
EC	European Commission
ECC	Electronic Communications Committee
ECS	Electronic Communication Services
ERP	Effective Radiated Power
ETSI	European Telecommunications Standard Institute
FDD	Frequency-Division Duplexing
FICORA	Finnish Communications Regulatory Authority
FWALA	Fixed Wireless Access Local Area
IEM	In-Ear Monitor
IMT	International Mobile Telecommunications
LTE	Long Term Evolution
MFCN	Mobile/Fixed Communication Networks
MSS	Mobile Satellite Services
OB	Outside Broadcast
Ofcom	The Office of Communications (UK Communications Regulator)
PMR	Private Mobile Radio
PMSE	Programme Making & Special Events
RSPG	Radio Spectrum Policy Group
SNG	Satellite Newsgathering
TDD	Time-division Duplexing
ECC TG4	ECC Task Group 4 “digital dividend”
UHF	Ultra High Frequency
UK	United Kingdom
UMTS	Universal Mobile Telecommunications System
VHF	Very High Frequency
WRC	World Radio Communication Conference

Annex C – Consultation Questions

List of Questions