



Commission for
Communications Regulation

Report

2007 Programme of Measurement of Non-Ionising Radiation Emissions

Second Interim Report

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1 Executive Summary

This report is the second of four interim reports which outline the programme to measure Non-Ionising Radiation (NIR) at 130 sites nationwide during 2007 and covers the results of the second set of sites (30 in total) measured under that programme. Abbreviated versions of the individual site reports are available on the ComReg website¹ as well as on Siteviewer², an on-line facility provided by ComReg, which allows the public to view details of GSM and 3G mobile telephony base stations throughout Ireland. Copies of the full site reports are available on request.

The programme involves measurement of emission levels at the point of highest emission associated with antenna sites and is fully coordinated and funded by ComReg.

In April 2007, following a competitive tender process, Compliance Engineering Ireland Ltd (CEI) were contracted by ComReg to assist it with its programme of measurements by carrying out Non-Ionising Radiation emission measurements at 120 sites throughout the country.

ComReg arranged for NIR measurements to be conducted at 30 sites in May and June 2007. All of the site surveys were conducted by CEI engineers. On the basis of this work, both CEI have concluded that the NIR emissions measured at all of the 30 sites were below the ICNIRP guideline limits³. The measurements taken at all the sites are summarised in this report.

¹ www.comreg.ie

² www.siteviewer.ie

³ See Annex 1

2 Introduction

The Commission for Communications Regulation (ComReg) is the licensing authority for the use of the radio frequency spectrum in Ireland. The frequency spectrum is a valuable National resource which has been used for communications purposes for over 100 years. Applications which make use of the radio spectrum include a wide range of services such as radio and television broadcasting, mobile telephony and other telecommunications services such as internet connection.

As the licensing authority for radiocommunications in Ireland, ComReg is responsible for ensuring that communications operators comply with their licence condition relating to non-ionising radiation. The radiation emissions from licensed radiocommunications sites must be within the levels set down in the latest guidelines issued by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

This report represents the results of Non-Ionising Radiation measurements taken at the second 30 sites chosen as part of the current Programme of Measurement of Non-Ionising Radiation emissions. The full programme consists of the measurement of Non-Ionising Radiation emissions at 130 sites throughout the country during 2007. The major part of the programme is being carried out by Compliance Engineering Ireland Ltd on behalf of ComReg.

Sites are being surveyed during four periods as follows:

Period	Dates	No. of Sites
First	April 2007	25
Second	May & June 2007	30
Third	July, August & September 2007	40
Fourth	October, November & December 2007	35

For each site, ComReg requires that the measured levels of non-ionising radiation emissions should not exceed the ICNIRP limits in any part of the site or surrounding area to which the general public has access.

The remainder of this report is arranged as follows:

Section 3 outlines the role of the ComReg in the area of NIR. It outlines the appointment of Compliance Engineering Ireland Ltd in the programme.

Section 4 contains summaries of the results for each site surveyed as part of the measurement programme. Each site report contains a conclusion on the extent of the compliance of each site with the general public exposure limits of the ICNIRP Guidelines 1998. Abbreviated versions of the individual site reports are to be found on the ComReg website⁴. Copies of the full site reports are available on request.

Section 5 contains the overall conclusions.

Annexes: The Annex section contains two elements which are as follows:

1. An explanation of Non-Ionising Radiation and an explanation of the International Commission on Non-Ionizing Radiation Protection and the guideline limits associated with that body.
2. A guide to the methodology used in the site measurements.

⁴ www.comreg.ie

3 Background

3.1 What is NIR?

Non-ionising radiation is that part of the electromagnetic spectrum below 3×10^{15} Hz (3000 million MHz). Radio waves, infrared radiation and visible light are examples of NIR.

3.2 Role of the Commission for Communications Regulation

In 2007 measurements are being taken at 130 sites throughout the country as part of ComReg's Programme of Measurement of Non-Ionising Radiation emissions. The programme is carried out by for the most part by Compliance Engineering Ireland Ltd on behalf of ComReg.

The aim of the programme is to ensure that emissions from radiocommunications sites comply with the general public exposure limits set down by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). A sample of sites is chosen by ComReg, based on population coverage. Some sites nominated by the public have been included if the location is consistent with population coverage. Currently, radiation emissions from communications sites must be within the levels set down in the ICNIRP guidelines.

3.3 Role of Compliance Engineering Ireland Ltd

Following a competitive tender process held in March 2007, Compliance Engineering Ireland Ltd (CEI) was chosen to assist ComReg in carrying out the site measurements. CEI is an Irish registered company which operates an electrical test laboratory in Co. Meath and offers a range of certification services and compliance testing, as well as services such as the monitoring of NIR emissions. CEI will be surveying 120 of the 130 sites in total which are being selected as part of the programme.

4 Summary of reports on the site measurement programme

4.1 Introduction

ComReg has arranged for measurements of Non-Ionising Radiation (NIR) to be taken at 130 sites nationwide during 2007.

At each site engineers measure the field strength (electric field voltage) of transmissions in the various radio bands to be surveyed⁵. The results are referenced and presented alongside the relevant International Commission on Non-Ionizing Radiation Protection (ICNIRP) recommended public maximum exposure levels.

Abbreviated versions of the reports for each site are available in the Non-Ionising Radiation section of the ComReg website as well as on the Siteviewer website, mentioned above. The full versions of the reports are available on request.

⁵ See Annex 2 for the site measurement methodology

4.2 Summary of site report results⁶

The tables which follow over the next several pages show the highest readings measured in the relevant radio frequency bands at each site surveyed. The sites are presented in order by county.

For each site the tables show the highest electric field strength measured in each frequency band (such as GSM 900, 3G etc) along with the ICNIRP limit which applies to the particular frequency at which the measurement was taken.

It should be noted that the ICNIRP guideline limits vary according to frequency. For example, for a GSM mobile signal on a frequency of 940.050 MHz the relevant limit is 42.158 V/m, while for a 3G mobile signal on a frequency of 2147.2 MHz the relevant limit is 61 V/m.

⁶ See each individual site report for the full set of measurement results

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Bandon Co. Cork <i>Garda Station</i>	30 to 300 MHz	0.0006	28.00
	300 to 1000 MHz	0.1899	42.20
	GSM 900 (925 to 960 MHz)	0.1641	42.10
	1000 – 3000 MHz	0.0895	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0493	59.10
	3G (2110 – 2170 MHz)	0.1281	61.00
Dunmanway Co. Cork <i>Garda Station</i>	30 to 300 MHz	0.0013	28.00
	300 to 1000 MHz	0.3735	42.60
	GSM 900 (925 to 960 MHz)	0.1906	42.50
	1000 – 3000 MHz	No appreciable signal	
	GSM 1800 (1805 to 1880 MHz)	No appreciable signal	
	3G (2110 – 2170 MHz)	No appreciable signal	
Macrooom Co. Cork <i>Eircom Building</i>	30 to 300 MHz	0.0045	28.00
	300 to 1000 MHz	0.3517	42.40
	GSM 900 (925 to 960 MHz)	0.1953	42.40
	1000 – 3000 MHz	No appreciable signal	
	GSM 1800 (1805 to 1880 MHz)	No appreciable signal	
	3G (2110 – 2170 MHz)	No appreciable signal	

Programme of Measurement of Non-Ionising Radiation emissions

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Mallow Co. Cork <i>near Hibernian Hotel</i>	30 to 300 MHz	0.0017	28.00
	300 to 1000 MHz	0.2258	42.60
	GSM 900 (925 to 960 MHz)	0.1643	42.50
	1000 – 3000 MHz	0.1246	59.20
	GSM 1800 (1805 to 1880 MHz)	0.1206	59.20
	3G (2110 – 2170 MHz)	0.2136	61.00
Killaloe Co. Clare <i>Garda Station</i>	30 to 300 MHz	0.0118	28.00
	300 to 1000 MHz	0.5868	42.40
	GSM 900 (925 to 960 MHz)	5.1683	42.30
	1000 – 3000 MHz	9.8345	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0030	58.80
	3G (2110 – 2170 MHz)	5.5744	61.00
Ballyjamesduff Co. Cavan <i>Waterworks</i>	30 to 300 MHz	0.0021	28.00
	300 to 1000 MHz	0.0461	34.30
	GSM 900 (925 to 960 MHz)	0.0259	42.30
	1000 – 3000 MHz	0.0166	61.00
	GSM 1800 (1805 to 1880 MHz)	No appreciable signal	
	3G (2110 – 2170 MHz)	0.1567	61.00

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Tullow Co. Carlow <i>Garda Station</i>	30 to 300 MHz	0.0130	28.00
	300 to 1000 MHz	0.0866	42.60
	GSM 900 (925 to 960 MHz)	0.1370	42.50
	1000 – 3000 MHz	0.0304	61.00
	GSM 1800 (1805 to 1880 MHz)	No appreciable signal	
	3G (2110 – 2170 MHz)	0.1345	61.00
Frosses Co. Donegal <i>Tullinlough</i>	30 to 300 MHz	0.0135	28.00
	300 to 1000 MHz	0.9372	42.50
	GSM 900 (925 to 960 MHz)	0.3801	42.50
	1000 – 3000 MHz	0.0010	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0006	59.40
	3G (2110 – 2170 MHz)	0.0031	61.00
Ballinteer Dublin 16 <i>Ballinteer Avenue</i>	30 to 300 MHz	0.0280	28.00
	300 to 1000 MHz	1.1228	42.60
	GSM 900 (925 to 960 MHz)	0.8100	42.60
	1000 – 3000 MHz	0.1882	58.90
	GSM 1800 (1805 to 1880 MHz)	0.1983	58.90
	3G (2110 – 2170 MHz)	0.1958	61.00

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Blanchardstown Dublin 15 <i>Main Street</i>	30 to 300 MHz	0.0044	28.00
	300 to 1000 MHz	0.0392	42.60
	GSM 900 (925 to 960 MHz)	0.0317	42.40
	1000 – 3000 MHz	1.3077	58.90
	GSM 1800 (1805 to 1880 MHz)	1.6419	59.30
	3G (2110 – 2170 MHz)	1.7662	61.00
Dalkey Co. Dublin <i>Garda Station</i>	30 to 300 MHz	0.0044	28.00
	300 to 1000 MHz	0.6176	42.40
	GSM 900 (925 to 960 MHz)	5.5017	42.40
	1000 – 3000 MHz	0.1683	59.10
	GSM 1800 (1805 to 1880 MHz)	0.2157	59.10
	3G (2110 – 2170 MHz)	0.0086	61.00
Firhouse Dublin 24 <i>Community Centre</i>	30 to 300 MHz	0.0031	28.00
	300 to 1000 MHz	0.0887	33.20
	GSM 900 (925 to 960 MHz)	0.0232	42.40
	1000 – 3000 MHz	0.5105	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0086	59.00
	3G (2110 – 2170 MHz)	1.6455	61.00
	FWALA (3535 - 3580 MHz)	0.0238	61.00

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Malahide Co. Dublin <i>Grand Hotel</i>	30 to 300 MHz	0.0010	28.00
	300 to 1000 MHz	0.3457	42.20
	GSM 900 (925 to 960 MHz)	0.2805	42.20
	1000 – 3000 MHz	0.0745	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0438	59.00
	3G (2110 – 2170 MHz)	0.1730	61.00
Rathcoole Co. Dublin <i>Poitín Still</i>	30 to 300 MHz	0.0288	28.00
	300 to 1000 MHz	0.8155	42.50
	GSM 900 (925 to 960 MHz)	5.0974	42.60
	1000 – 3000 MHz	0.0152	58.90
	GSM 1800 (1805 to 1880 MHz)	0.0147	59.00
	3G (2110 – 2170 MHz)	0.0179	61.00
St. John's Estate Sydney Parade Dublin 4	30 to 300 MHz	0.0055	28.00
	300 to 1000 MHz	0.0599	42.10
	GSM 900 (925 to 960 MHz)	0.0590	42.10
	1000 – 3000 MHz	0.6196	59.20
	GSM 1800 (1805 to 1880 MHz)	0.4022	59.20
	3G (2110 – 2170 MHz)	0.4199	61.00

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Athenry Co. Galway <i>Eircom Building</i> <i>Corner of Clarke St & McDonald's Lane</i>	30 to 300 MHz	0.0041	28.00
	300 to 1000 MHz	0.4826	42.40
	GSM 900 (925 to 960 MHz)	0.3201	42.40
	1000 – 3000 MHz	0.2492	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0007	59.70
	3G (2110 – 2170 MHz)	0.3179	61.00
Glenina Galway City <i>Flannery's Hotel</i>	30 to 300 MHz	0.0127	28.00
	300 to 1000 MHz	0.7337	42.10
	GSM 900 (925 to 960 MHz)	0.3872	42.50
	1000 – 3000 MHz	0.2811	59.10
	GSM 1800 (1805 to 1880 MHz)	0.2861	59.20
	3G (2110 – 2170 MHz)	0.3139	61.00
Menlo Park Hotel Galway City	30 to 300 MHz	0.0091	28.00
	300 to 1000 MHz	0.9720	42.30
	GSM 900 (925 to 960 MHz)	0.3203	42.20
	1000 – 3000 MHz	0.3975	59.40
	GSM 1800 (1805 to 1880 MHz)	0.3925	59.40
	3G (2110 – 2170 MHz)	0.3496	61.00

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Ormonde St. Kilkenny City <i>Multi-Story Car Park</i>	30 to 300 MHz	0.0091	28.00
	300 to 1000 MHz	15.3860	42.30
	GSM 900 (925 to 960 MHz)	4.9894	42.20
	1000 – 3000 MHz	7.4869	59.40
	GSM 1800 (1805 to 1880 MHz)	7.8316	59.40
	3G (2110 – 2170 MHz)	7.2971	61.00
Killorglin Co. Kerry <i>Iveragh Park Estate</i> <i>Community Centre</i>	30 to 300 MHz	0.0024	28.00
	300 to 1000 MHz	0.3360	42.40
	GSM 900 (925 to 960 MHz)	0.2157	42.40
	1000 – 3000 MHz	0.0251	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0191	58.90
	3G (2110 – 2170 MHz)	0.1291	61.00
Ardee Co. Louth <i>ESB</i>	30 to 300 MHz	0.0008	28.00
	300 to 1000 MHz	0.1068	42.20
	GSM 900 (925 to 960 MHz)	0.3220	42.20
	1000 – 3000 MHz	0.0116	59.00
	GSM 1800 (1805 to 1880 MHz)	0.0044	59.90
	3G (2110 – 2170 MHz)	0.0061	61.00

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Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Kilmallock Co. Limerick <i>Garda Station</i>	30 to 300 MHz	0.0043	28.00
	300 to 1000 MHz	0.1570	42.50
	GSM 900 (925 to 960 MHz)	0.2479	42.50
	1000 – 3000 MHz	0.0103	60.20
	GSM 1800 (1805 to 1880 MHz)	0.0005	59.70
	3G (2110 – 2170 MHz)	0.0025	61.00
Trim Co. Meath <i>ESB Site</i>	30 to 300 MHz	0.0180	28.00
	300 to 1000 MHz	0.4805	42.20
	GSM 900 (925 to 960 MHz)	3.3128	42.50
	1000 – 3000 MHz	0.1372	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0054	59.30
	3G (2110 – 2170 MHz)	0.5474	61.00
Carrickmacross Co. Monaghan <i>Car Park off Main St</i>	30 to 300 MHz	0.0025	28.00
	300 to 1000 MHz	0.0718	42.50
	GSM 900 (925 to 960 MHz)	0.0989	42.50
	1000 – 3000 MHz	0.0288	59.20
	GSM 1800 (1805 to 1880 MHz)	0.0423	59.20
	3G (2110 – 2170 MHz)	0.0472	61.00

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Dooncarton Co. Mayo	30 to 300 MHz	0.0471	28.00
	300 to 1000 MHz	0.0950	42.20
	UHF TV (470 to 588 MHz)	0.0066	29.80
	GSM 900 (925 to 960 MHz)	0.0933	42.20
	1000 – 3000 MHz	No appreciable signal	
	GSM 1800 (1805 to 1880 MHz)	No appreciable signal	
	3G (2110 – 2170 MHz)	No appreciable signal	
Boyle Co. Roscommon <i>Garda Station</i>	30 to 300 MHz	0.1405	28.00
	300 to 1000 MHz	0.2206	42.20
	GSM 900 (925 to 960 MHz)	0.2584	42.10
	1000 – 3000 MHz	0.1186	61.00
	GSM 1800 (1805 to 1880 MHz)	No appreciable signal	
	3G (2110 – 2170 MHz)	0.2179	61.00
Tobercurry Co. Sligo <i>Humbert Street</i>	30 to 300 MHz	0.0010	28.00
	300 to 1000 MHz	0.2874	42.30
	GSM 900 (925 to 960 MHz)	0.1694	42.30
	1000 – 3000 MHz	0.2578	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0079	59.80
	3G (2110 – 2170 MHz)	0.2023	61.00

Site	Frequency Range	Highest reading V/m	ICNIRP guideline Limit V/m
Tipperary Town Co. Tipperary <i>Excel Centre</i>	30 to 300 MHz	0.0870	28.00
	300 to 1000 MHz	0.1878	42.60
	GSM 900 (925 to 960 MHz)	0.1135	42.60
	1000 – 3000 MHz	0.1362	61.00
	GSM 1800 (1805 to 1880 MHz)	0.0505	58.90
	3G (2110 – 2170 MHz)	0.1788	61.00
Arklow Co. Wicklow <i>Garda Station</i>	30 to 300 MHz	0.0110	28.00
	300 to 1000 MHz	0.3437	42.50
	GSM 900 (925 to 960 MHz)	0.3220	42.20
	1000 – 3000 MHz	0.1699	59.10
	GSM 1800 (1805 to 1880 MHz)	0.1512	59.20
	3G (2110 – 2170 MHz)	0.2572	61.00
Fethard-on-Sea Co. Wexford <i>GAA Grounds Ramstown</i>	30 to 300 MHz	0.0105	28.00
	300 to 1000 MHz	0.7651	42.50
	GSM 900 (925 to 960 MHz)	5.5005	42.60
	1000 – 3000 MHz	0.0006	60.10
	GSM 1800 (1805 to 1880 MHz)	0.0005	58.80
	3G (2110 – 2170 MHz)	No appreciable signal	

5 Conclusion

The conclusion of the site measurements undertaken is that emission levels at all the sites measured fall significantly below the international ICNIRP general exposure levels. In some cases the levels are in fact less than one thousandth of the ICNIRP limits.

Annex 1

Non-Ionising Radiation (NIR) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP)

Definition

Non-ionising radiation is that part of the electromagnetic spectrum below 3000 million MHz (3×10^{15} Hz). Non-ionising radiation includes all radiations and fields of the electromagnetic spectrum that do not normally have sufficient energy to produce ionisation in matter and is characterised by energy per photon of less than about 12 eV and wavelengths greater than 100 nm. Radio waves, infrared radiation and visible light are examples of NIR. Electromagnetic waves at frequencies above 3000 million MHz are known as ionising radiation and this includes X-rays and Gamma rays.

Standards for emissions limits for non-ionising radiation

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an independent, scientific organisation established in 1992. The ICNIRP was established for the purpose of advancing Non-Ionising Radiation Protection for the benefit of people and the environment and in particular to provide guidance and recommendations on protection from NIR exposure. ICNIRP operates in co-operation with the Environmental Health Division of the World Health Organisation and the United Nations Environment Programme. In 1998 ICNIRP issued a position paper on the health and safety aspects of NIR. This reviewed both thermal and athermal effects and its conclusion endorsed the 1988 guidelines produced by the International Radiation Protection Association (IRPA).

ComReg's current programme of NIR measurements requires sites to be in compliance with the ICNIRP (1998) guidelines. A summary of the maximum public exposure levels in the ICNIRP Guidelines for the radio systems in this audit are shown in Table 1⁷. It should be noted that in 1999 the Council of the European Union issued a recommendation⁸ to limit exposure of the general public to electromagnetic fields 0Hz - 300GHz

⁷ See page 20

⁸ Recommendation of the European Council 1999/519/EC of July 12, 1999

based on a set of basic restrictions and reference levels developed internationally under the advice of the International Commission on Non-Ionizing Radiation Protection. In relation to emissions within the radio spectrum, these limits are equivalent to the ICNIRP guideline limits used by ComReg.

ICNIRP limits

In 1998 ICNIRP published “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz)”. ComReg and a large number of international regulators have adopted the 1998 ICNIRP document as the reference for ensuring that NIR levels do not cause an adverse health effect.

The main purpose of the “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz)” is to provide guidelines for limiting Electromagnetic Field (EMF) exposure that will provide protection against known adverse health effects. An adverse health effect causes detectable impairment of the health of the exposed individual or his or her offspring.

Two classes of guidance are presented:

- Basic Restrictions
- Reference Levels

Basic Restrictions

Restrictions on exposure to time-varying electric, magnetic and electromagnetic fields that are based on health effects are termed “basic restrictions”. Depending upon the frequency of the field, the physical quantities used to specify these restrictions are current density (J), Specific Absorption Rate (SAR), and power density (S). Of these, only power density can be readily measured. Measurement of power density is performed in air, outside the human body, rather than within the living tissue of exposed individuals.

Reference Levels

These levels are provided for practical exposure assessment purposes to determine whether the basic restrictions are likely to be exceeded. Some reference levels are derived from basic restrictions using measurement and/or computational techniques, and some address perception and adverse indirect effects of exposure to EMF.

Compliance with the reference levels will ensure compliance with the relevant basic restriction. If the measured or calculated value exceeds the reference level, it does not necessarily follow that the basic restriction will be exceeded. However, when a reference level is exceeded, it is necessary to test compliance with the relevant basic restriction and to determine whether additional protective measures are necessary.

The reference levels, taken from the ICNIRP Guidelines⁹, appropriate to the frequency range 100 kHz to 40GHz, covered by this report are given in *Table 1* on the following page.

⁹ International Commission on Non-Ionizing Radiation Protection, “*Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)*”, Health Physics, vol 74, no. 4, April 1998
Available on the Web at www.icnirp.de

Table 1: GUIDELINE LIMITS OF NIR FOR MEMBERS OF THE GENERAL PUBLIC

Frequency f (MHz)	Unperturbed RMS Electric Field Strength E(V/m)	Unperturbed RMS Magnetic Field Strength H(A/m)	Equivalent Plane Wave Power Density (mW/cm ²)	Radio Service
0.003-0.15	87	5	-	
0.15-1	87	0.73/f	-	LW and MW Radio Broadcasting
1-10	$87/f^{1/2}$	0.73/f	-	
10-400	28	0.073	0.2	VHF Radio and Television Broadcasting
400-2000	$1375f^{1/2}$	$0.0037f^{1/2}$	f/2000	UHF Television Broadcasting and Mobile Telephony Systems
2000-300000	61	0.16	1	Microwave Links, and MMDS

Note: f denotes frequency in MHz

The guideline levels are lowest in the 10 MHz to 400 MHz frequency range as at these wavelengths resonance in parts or all of the body may occur resulting in optimum coupling of the radio frequency energy.

The ICNIRP guidelines require that in instances of simultaneous exposure to multiple sources, the sum of the exposure levels should be considered. In the case of the frequency range 30 MHz to 40 GHz, covered by the narrowband equipment used to generate this report, both the electric field strength and the magnetic field strength at each frequency should be expressed as a fraction of the limit at that frequency and both the sum of the

electric field strength fractions squared and the sum of the magnetic field strength fractions squared should not exceed unity.

Annex 2

Methodology and measurements

Introduction

Measurements of the non-ionising radiation emissions from each site were conducted in accordance with ECC Recommendation (02) 04. Some departure from this prescribed methodology was taken, but only in order to take into account the particular signal characteristics of certain services (e.g. UMTS and GSM signals having different bandwidths require different measurement bandwidths to be employed in each case)¹⁰. This is in order to provide a more accurate picture of the signal levels present.

For the purposes of this programme, measurements were carried out at Cellular (Third Generation and GSM Mobile Telephony sites), as well as at Mixed Use sites.

Cellular sites

Cellular sites are sites and locations in Ireland at which electronic communications network transmission facilities and/or infrastructure are located, the primary purpose or sole use of such facilities/infrastructure being to facilitate the provision of mobile telephony services in Ireland. Measurements at these sites were conducted in both the GSM900 and GSM1800 bands as well as the 2110-2200 MHz band currently in use for Third Generation Mobile Telephony.

Mixed use sites

Mixed use sites are sites and locations in Ireland at which electronic communications network transmission facilities and/or infrastructure are located and where such facilities and or infrastructure is not primarily or solely used to facilitate the provision of mobile telephone services in

¹⁰ For example: ECC REC (02)04 recommends a measurement bandwidth of 100 kHz for both GSM and UMTS. However, measurement bandwidths more appropriate to the actual signal bandwidths of 200 kHz and 5 MHz respectively have been employed.

Ireland. The measurements conducted at these sites included all radio services which are present at these sites. These services include, GSM, 3G Mobile, Broadcasting, fixed links, MMDS, FWA and Point to Point links, among others.

Methodology

An initial survey of the area was conducted to determine the location(s) of highest non-ionising radiation emissions. This was done by using a broadband probe attached to a field strength meter to identify the position of maximum field strength. The probe used for this initial investigation measured and summed the contributions of all signals in the frequency range 100 kHz to 3 GHz.

Once the locations of the highest field strength emissions were identified the field strength meter and broadband probe were mounted on a non-conductive tripod and the field strength in Volts per meter was recorded for a period exceeding six minutes.

A narrowband survey was then carried out at the same location using a spectrum analyser and a range of antennas matched to the frequencies being measured. The spectrum analyser was set to sweep a frequency range continuously for a period of six minutes and the results were stored in the spectrum analyser.

This procedure was repeated at different frequency ranges until the electromagnetic fields at all relevant frequencies were recorded. The results were later transferred to a computer for analysis and comparison to the ICNIRP general public guideline levels.