Commission for
Communications Regulation

Report

Programme of Measurement of Non-Ionising Radiation emissions

Second Interim Report

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1 Foreword

The use of radio technology has played and will continue to play a significant role in the development and growth of this country. Advances in mobile radio technology with the convenience it can bring to business and consumers alike are well documented. Today in Ireland over 3.17m people own mobile phone for instance. The use of SMS messages, once the domain of the young is increasingly utilised by all ages and the latest technologies such as GPRS and now 3G with their range of new and interesting applications indicate that further growth can be anticipated in this sector.

This growth and development have raised the awareness of the public of the positive benefits mobile radio technology can bring to individuals, industry and commerce. This can be particularly important in an increasingly knowledge based economy like Ireland's where access to information and the tools to support and enhance competitiveness are key to our future progress and prosperity. To maintain this level of progress will however require continuing investment in the maintenance and upgrading of existing networks as well as the roll out of new infrastructure.

Recognising the need for this ongoing investment in infrastructure, ComReg has required that in their respective licences that all operators are compliant with the international guidelines for general exposure to electromagnetic fields. In addition to this the Commission has over the past three years published three audit reports on their compliance with emission limits for non-ionising radiation. Each audit has focused on compliance with the general exposure limits specified in the guidelines published by the International Commission on Non Ionising Radiation Protection (ICNIRP). On the basis of the work carried out in each of the audits it has been possible to confirm that all of the companies audited have procedures and processes in place to ensure compliance with these international general exposure limits.

In 2003 an extensive programme was been put in place to measure non-ionising radiation levels at up to 400 antenna sites around the country. Undertaking this programme involves measuring the highest emission level associated with each site. This work is undertaken by Mason Communications and Radio Frequency Investigations on ComReg's behalf. This data is then published as part of a process to seek to better inform the public about the

compliance of radio installations with international guidelines for public exposure limits to non-ionising radiation.

This report on the second 100 sites concludes that on the basis of the audit undertaken all of the sites are significantly below the ICNIRP guideline levels. Audits continue on the remaining sites with the final report on all 400 sites due in July 2004.

Commission for Communications Regulation

2 Executive Summary

This report is the second of three interim reports which outline the programme to measure Non-Ionising Radiation at 400 sites nationwide and covers the results of the second 100 sites measured under that programme. Both reports are available on the comReg website[1]. The programme has been implemented by ComReg as a result of co-operation with the Department of Communications, Marine and Natural Resources, and the Department of the Environment, Heritage and Local Government. It involves measurement of emission levels at the point of highest emission associated with antenna sites and is fully operated and funded by ComReg.

In May of 2003, following a competitive tender process, Mason Communications in conjunction with Radio Frequency Investigations were contracted by ComReg to carry out Non-Ionising Radiation emission measurements at 400 sites throughout the country. On the basis of this work, Mason have concluded that the NIR emissions from all of the 100 sites measured are significantly below the ICNIRP guideline limits[2].

[1] www.comreg.ie Document ComReg 03/132 – 04/NN
[2] See Annex 1

3 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 of radio spectrum, today, include the transmission of a wide range of services, including 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 communications sites must be within the levels set down in the latest international guidelines.

This report represents the results of Non-Ionising Radiation measurements at the second 100 sites chosen as part of the Programme of Measurement of Non-Ionising Radiation emissions. The full programme consists of the measurement of Non-Ionising Radiation emissions at 400 sites throughout the country. The programme is being carried out by Mason Communications in conjunction with Radio Frequency Investigations on behalf of ComReg.

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 where the general public has access.

This report is arranged as follows:

The first section outlines the role of the ComReg in the area of NIR. It outlines Mason Communications appointment in the programme.

The second section is Mason Communications' report on the measurement programme. It contains the summary results for each of the sites. Each site report[3] contains a conclusion by Mason Communications on the extent of its compliance of each site with the general public exposure limits of the ICNIRP Guidelines 1998.

The third section contains the overall conclusions.

The Annex section contains two elements which are as follows:

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

[3] See individual reports on www.comreg.ie

4 Background

4.1 What is NIR?

Non-ionising radiation is that part of the electromagnetic spectrum below 2420 million MHz. Radio waves, infrared radiation and visible light are examples of NIR.

4.2 Role of the Commission for Communications Regulation

In 2003/2004 measurements of Non-Ionising Radiation emissions are being taken at 400 sites throughout the country in a programme agreed with the Minister for Communications, Marine and Natural Resources, and the Minister for the Environment, Heritage and Local Government. The programme is being carried out by Mason Communications in conjunction with Radio Frequency Investigations (RFI) on behalf of ComReg.

The aim of the programme is to ensure that emissions from communications sites comply with the general public exposure limits set down by the International Commission for Non-Ionising Radiation Protection (ICNIRP). Some sites have been nominated by the public and the other sites are chosen by Mason/RFI, based on population coverage. Currently, radiation emissions from communications sites must be within the levels set down in the ICNIRP guidelines.

4.3 The Role of Mason Communications Ltd.

Following a competitive tender process held in early 2003, Mason Communications in conjunction with Radio Frequency Investigations Ltd. were chosen to carry out the site measurements. Mason Communications Ireland Ltd. is a wholly owned subsidiary of Mason Group Ltd. Mason advises many of the leading organisations in the Republic of Ireland on converging markets and converging technologies. The management of this programme by Mason Communications involved the services of Radio Frequency Investigations (RFI) Ltd. RFI has been performing Non-Ionising Radiation site surveys since its formation in 1987. RFI is accredited to ISO 17025, which ensures independence from other bodies that may be involved directly or indirectly in this programme.

5 Mason Communications summary report on the site measurement programme

5.1 Introduction

ComReg has commissioned Mason Communications, as an independent consultancy service to conduct a survey of 400 sites. Mason Communications and their measuring sub-contractor "Radio Frequency Investigation (RFI) Ltd" will work on the programme throughout 2003 and 2004.

Mason/RFI engineers measure the power density of transmissions in the various radio bands to be surveyed[4] .The results, derived from electric field voltage measurements, are referenced to and presented alongside the relevant International Commission on Non-Ionising Radiation Protection (ICNIRP) recommended public maximum exposure levels.

A full site report for each site is available in the Non-Ionising Radiation section of the ComReg website.

[4] See Annex 2 for the site measurement methodology

5.2 Summary of site report results[5]

5.2.1 County Clare

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Broadford	300MHz – 1GHz	3.79891×10^{-4}	4.746
	GSM 900	3.95056×10^{-4}	4.73745
	GSM 1800	1.00383×10^{-8}	9.275
	1GHz – 2GHz	2.45843×10^{-8}	5.84

[5] See each individual site report for the full set of measurement results

5.2.2 County Cork

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Kilbrogan	300MHz – 1GHz	23.6406 x10^{-5}	4.72
	GSM 900	18.9086x10^{-5}	4.69725
	GSM 1800	1.06576x10^{-07}	9.235
	1GHz – 2GHz	3.82524x10^{-05}	9.27
Carrigfroca	300MHz – 1GHz	3.82524 x10^{-5}	4.8075
	GSM 900	3.80766 x10^{-5}	4.77075
	GSM 1800	1.04872 x10^{-7}	9.16
	1GHz – 2GHz	9.76469x10^{-7}	9.175
Aherla	300MHz – 1GHz	1.40494x10^{-4}	4.755
	GSM 900	1.68523 x10^{-4}	4.73795
	GSM 1800	2.03544x10^{-7}	9.365
	1GHz – 2GHz	5.92459x10^{-7}	9.5
Knockonna	300MHz – 1GHz	1.1263118x10^{-2}	4.755
	GSM 900	1.152547 x10^{-2}	4.74485
	GSM 1800	9.92336x10^{-9}	9.055
	1GHz – 2GHz	1.02721x10^{-8}	9.915

5.2.3 County Cork - Cork City

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Sullivans Quay	300MHz – 1GHz	0.001895216	4.825
	GSM 900	0.001752503	4.7999
	GSM 1800	0.000008292	9.295
	1GHz – 2GHz	0.000005843	9.34
Morrisons Island	300MHz – 1GHz	1.4114×10^{-5}	4.7635
	GSM 900	1.5764×10^{-5}	4.73655
	GSM 1800	6.9929×10^{-5}	9.305
	1GHz – 2GHz	1.04390×10^{-4}	9.34
Lapps Quay	300MHz – 1GHz	2.90174×10^{-4}	4.7635
	GSM 900	2.91513×10^{-4}	4.7333
	GSM 1800	1.99369×10^{-4}	9.195
	1GHz – 2GHz	2.67091×10^{-4}	9.225
Anglesea Street	300MHz – 1GHz	6.40706×10^{-4}	4.7985
	GSM 900	9.21847×10^{-4}	4.7911
	GSM 1800	6.36295×10^{-4}	9.24
	1GHz – 2GHz	6.14694×10^{-4}	9.275
Oliver Plunkett Street (2)	300MHz – 1GHz	0.001873521	4.7635
	GSM 900	0.002166001	4.73375
	GSM 1800	0.000409882	9.245
	1GHz – 2GHz	0.000568406	9.34

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Oliver Plunkett Street (1)	300MHz – 1GHz	0.003816442	4.825
	GSM 900	0.002670906	4.79435
	GSM 1800	0.004483928	9.23
	1GHz – 2GHz	0.029968061	9.275
Grande Parade	300MHz – 1GHz	0.004567291	4.755
	GSM 900	0.005256040	4.73515
	GSM 1800	0.002758409	9.185
	1GHz – 2GHz	0.003293507	9.215
Dennehys Cross	300MHz – 1GHz	0.001646867	4.7635
	GSM 900	0.001613090	4.72775
	GSM 1800	6.204×10^{-6}	9.205
	1GHz – 2GHz	8.254×10^{-6}	9.225
Bishopstown	300MHz – 1GHz	0.000125216	4.816
	GSM 900	0.000101078	4.7953
	GSM 1800	0.002166001	9.35
	1GHz – 2GHz	0.002146143	9.39

5.2.4 County Dublin - Dublin City

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Finglas Road, Dublin	300MHz – 1GHz	9.83238×10^{-4}	4.7985
	GSM 900	9.63072×10^{-4}	4.76755
	GSM 1800	.002758409	9.24
	1GHz – 2GHz	.002842226	9.275
Navan Road, Dublin	300MHz – 1GHz	.002054275	4.781
	GSM 900	.001756542	4.7356
	GSM 1800	2.72056×10^{-4}	9.16
	1GHz – 2GHz	3.43288×10^{-4}	9.24
Ballymun Lane	300MHz – 1GHz	0.002855345	4.816
	GSM 900	0.003211136	4.7666
	GSM 1800	0.001522855	9.24
	1GHz – 2GHz	0.001890857	9.275
Glasnevin, Dublin	300MHz – 1GHz	3.53719×10^{-4}	4.7725
	GSM 900	3.53719×10^{-4}	4.74165
	GSM 1800	2.02609×10^{-4}	9.225
	1GHz – 2GHz	3.17438×10^{-4}	9.265
Dublin Industrial Estate (Glasnevin)	300MHz – 1GHz	9.80977×10^{-4}	4.755
	GSM 900	.0011149896	4.73145
	GSM 1800	.001008460	9.21
	1GHz – 2GHz	.001165893	9.25

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Ballymun Industrial Estate	300MHz – 1GHz	0.004588372	4.8075
	GSM 900	0.008987909	4.79065
	GSM 1800	0.002156049	9.235
	1GHz – 2GHz	0.001934901	9.275
Clonshaugh Industrial Estate	300MHz – 1GHz	0.005644931	4.7725
	GSM 900	0.004463326	4.75735
	GSM 1800	0.001744450	9.16
	1GHz – 2GHz	0.001411428	9.19
Artane	300MHz – 1GHz	6.34832×10^{-4}	4.781
	GSM 900	6.30462×10^{-4}	4.7518
	GSM 1800	5.54190×10^{-4}	9.215
	1GHz – 2GHz	5.11280×10^{-4}	9.25
Whitehall	300MHz – 1GHz	0.008563645	4.8075
	GSM 900	0.008783319	4.79715
	GSM 1800	0.000506592	9.23
	1GHz – 2GHz	0.000513640	9.275
Inchicore	300MHz – 1GHz	0.002040134	4.79
	GSM 900	0.002369511	4.762
	GSM 1800	0.003851755	9.185
	1GHz – 2GHz	0.002969331	9.225

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Kimmage Road	300MHz – 1GHz	0.002481182	4.781
	GSM 900	0.002040134	4.76845
	GSM 1800	0.000554190	9.22
	1GHz – 2GHz	0.000541575	9.34
Walkinstown	300MHz – 1GHz	0.005723460	4.816
	GSM 900	0.007955338	4.77585
	GSM 1800	0.005736654	9.17
	1GHz – 2GHz	0.004577819	9.2
Harolds Cross	300MHz – 1GHz	0.000938985	4.755
	GSM 900	0.001240677	4.73005
	GSM 1800	0.002452780	9.22
	1GHz – 2GHz	0.002689420	9.215
Terenure Road East	300MHz – 1GHz	0.001272503	4.825
	GSM 900	0.000683374	4.79715
	GSM 1800	0.000321114	9.37
	1GHz – 2GHz	0.000382524	9.39
Cowper Drive	300MHz – 1GHz	0.000187352	4.7635
	GSM 900	0.000179746	4.73425
	GSM 1800	0.000095865	9.185
	1GHz – 2GHz	0.000103910	9.225

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Ballsbridge	300MHz – 1GHz	0.001048718	4.7985
	GSM 900	0.000928237	4.7768
	GSM 1800	0.000874296	9.23
	1GHz – 2GHz	0.000768526	9.265
Ranelagh	300MHz – 1GHz	0.000943319	4.79
	GSM 900	0.000848513	4.7578
	GSM 1800	0.001198557	9.375
	1GHz – 2GHz	0.000637762	9.415
Donnybrook	300MHz – 1GHz	0.000609058	4.7285
	GSM 900	0.000606260	4.69955
	GSM 1800	0.000072054	9.355
	1GHz – 2GHz	0.000070252	9.34
Sundrive	300MHz – 1GHz	0.001366654	4.816
	GSM 900	0.000819707	4.7911
	GSM 1800	0.001305145	9.235
	1GHz – 2GHz	0.001123721	9.315
Ballyfermot	300MHz – 1GHz	0.002458435	4.781
	GSM 900	0.002452780	4.7592
	GSM 1800	0.002310248	9.22
	1GHz – 2GHz	0.003017579	9.25

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Ballyfermot Garda Station	300MHz – 1GHz	8.96724 x10^{-4}	4.8075
	GSM 900	0.001450971	4.77075
	GSM 1800	0.000406124	9.29
	1GHz – 2GHz	0.000469525	9.29
Dominic St Upper	300MHz – 1GHz	0.003569921	4.79
	GSM 900	0.003045500	4.7569
	GSM 1800	0.001843566	9.17
	1GHz – 2GHz	0.002146143	9.2
Raheny	300MHz – 1GHz	6.72448 x10^{-4}	4.72
	GSM 900	0.000577642	4.6954
	GSM 1800	4.3 x10^{-8}	9.18
	1GHz – 2GHz	4.5 x10^{-8}	9.2
Killester	300MHz – 1GHz	0.001299148	4.7985
	GSM 900	0.000819707	4.72915
	GSM 1800	0.001100674	9.29
	1GHz – 2GHz	0.000934671	9.29
Northern Cross Industrial Park	300MHz – 1GHz	0.002942108	4.7285
	GSM 900	0.002809692	4.70045
	GSM 1800	0.000395056	9.24
	1GHz – 2GHz	0.000412723	9.3

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Kilmore	300MHz – 1GHz	0.001039103	4.816
	GSM 900	0.000892604	4.6963
	GSM 1800	0.000814064	9.305
	1GHz – 2GHz	0.000559318	9.34
Clontarf	300MHz – 1GHz	0.002598117	4.781
	GSM 900	0.003255807	4.7393
	GSM 1800	3.8164×10^{-5}	9.36
	1GHz – 2GHz	2.3370×10^{-5}	9.39
Clontarf Garda Station	300MHz – 1GHz	0.001226475	4.825
	GSM 900	0.001354125	4.76615
	GSM 1800	0.000779217	9.24
	1GHz – 2GHz	0.000710655	9.275
Marino	300MHz – 1GHz	0.014950601	4.816
	GSM 900	0.015475997	4.76705
	GSM 1800	0.003627928	9.24
	1GHz – 2GHz	0.008905507	9.275
Whitehall	300MHz – 1GHz	0.002646419	4.8075
	GSM 900	0.002822661	4.7842
	GSM 1800	0.001209647	9.245
	1GHz – 2GHz	0.001080584	9.275

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Naas Road Red Cow Hotel	300MHz – 1GHz	0.005160106	4.7985
	GSM 900	0.003746784	4.76705
	GSM 1800	0.000419429	9.25
	1GHz – 2GHz	0.000431180	9.29

5.2.5 County Dublin - Fingal

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Coolock Garda Station	300MHz – 1GHz	8.54394×10^{-3}	4.4835
	GSM 900	1.21243×10^{-3}	4.77865
	GSM 1800	9.02939×10^{-5}	9.285
	1GHz – 2GHz	2.35319×10^{-4}	8.825
Blanchardstown Centre	300MHz – 1GHz	0.001201320	4.755
	GSM 900	0.001110858	4.7435
	GSM 1800	0.000673998	9.175
	1GHz – 2GHz	0.000588381	9.215
Baldoyle	300MHz – 1GHz	0.003781453	4.816
	GSM 900	0.003301100	4.79205
	GSM 1800	0.000640706	9.23
	1GHz – 2GHz	0.000768526	9.315

5.2.6 County Dublin - Dun Laoghaire - Rathdown

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Sandyford Industrial Estate	300MHz – 1GHz	0.000621811	4.7725
	GSM 900	0.000430188	4.73285
	GSM 1800	0.000184782	9.31
	1GHz – 2GHz	0.000162427	9.2
Sandyford Avenue	300MHz – 1GHz	0.0006786670	4.755
	GSM 900	0.000623245	4.74535
	GSM 1800	0.000102721	9.265
	1GHz – 2GHz	6.4812×10^{-5}	9.3
Kill O' Grange	300MHz – 1GHz	0.001590958	4.79
	GSM 900	0.001457668	4.79665
	GSM 1800	0.001098142	9.27
	1GHz – 2GHz	0.001681352	9.3
Monkstown Avenue	300MHz – 1GHz	6.556×10^{-6}	2.69
	GSM 900	6.39×10^{-7}	4.7791
	GSM 1800	7.8643×10^{-5}	9.345
	1GHz – 2GHz	5.0426×10^{-5}	9.375
Stepaside	300MHz – 1GHz	0.001223654	4.816
	GSM 900	0.001388861	4.78975
	GSM 1800	0.001554743	9.265
	1GHz – 2GHz	0.001760592	9.265

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Carrickmines	300MHz – 1GHz	0.001344803	4.79
	GSM 900	0.001398488	4.7592
	GSM 1800	1.33555 x10^{-4}	9.175
	1GHz – 2GHz	9.3467 x10^{-5}	9.215
Kilmashogue	300MHz – 1GHz	2.04484 x10^{-4}	4.755
	GSM 900	0.000244151	4.72915
	GSM 1800	0.000111856	9.17
	1GHz – 2GHz	0.000197997	9.2
Rathfarnham Village	300MHz – 1GHz	0.002664763	4.781
	GSM 900	0.002803229	4.7398
	GSM 1800	0.000487145	9.31
	1GHz – 2GHz	0.000649619	9.215
Grange Road	300MHz – 1GHz	0.000506592	4.816
	GSM 900	0.000836871	4.70555
	GSM 1800	0.000838800	9.36
	1GHz – 2GHz	0.000447362	9.35
Cabinteely	300MHz – 1GHz	0.001716559	4.7985
	GSM 900	0.001793324	4.76475
	GSM 1800	0.001085572	9.295
	1GHz – 2GHz	0.000840734	9.3

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Shankill	300MHz – 1GHz	0.001934901	4.79
	GSM 900	0.001744450	4.76245
	GSM 1800	0.000043217	9.225
	1GHz – 2GHz	0.000022012	9.2
Dalkey	300MHz – 1GHz	0.002901741	4.7285
	GSM 900	0.002976176	4.70045
	GSM 1800	0.000344873	9.18
	1GHz – 2GHz	0.000173244	9.265
Blackrock	300MHz – 1GHz	0.049278633	4.7985
	GSM 900	0.034566758	4.7962
	GSM 1800	0.037727554	9.24
	1GHz – 2GHz	0.031743781	9.275
Dun Laoghaire	300MHz – 1GHz	0.011552039	4.816
	GSM 900	0.012666559	4.7902
	GSM 1800	0.014745471	9.26
	1GHz – 2GHz	0.012264749	9.315
Ballinteer	300MHz – 1GHz	0.026464193	4.7985
	GSM 900	0.022680815	4.7879
	GSM 1800	7.51×10^{-7}	9.21
	1GHz – 2GHz	9.72×10^{-7}	9.45

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Dundrum Business Park	300MHz – 1GHz	0.002175999	4.746
	GSM 900	0.002435895	4.7185
	GSM 1800	0.000739024	9.18
	1GHz – 2GHz	0.001024846	9.215
Dundrum Garda Station	300MHz – 1GHz	0.004146280	4.7985
	GSM 900	0.004341688	4.7763
	GSM 1800	0.002035442	9.24
	1GHz – 2GHz	0.001551167	9.315
Foxrock	300MHz – 1GHz	0.004136744	4.79
	GSM 900	0.002875138	4.7555
	GSM 1800	0.001565520	9.175
	1GHz – 2GHz	0.001551167	9.215

5.2.7 County Dublin – South Dublin

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Liffey Valley	300MHz – 1GHz	0.000744147	4.746
	GSM 900	0.000775637	4.71665
	GSM 1800	0.000170082	9.36
	1GHz – 2GHz	0.000200751	9.4
Lucan Garda Station	300MHz – 1GHz	0.000945494	4.816
	GSM 900	0.000913395	4.7666
	GSM 1800	0.000730565	9.265
	1GHz – 2GHz	0.000492786	9.29
Newlands Cross	300MHz – 1GHz	0.003636291	4.7285
	GSM 900	0.003932409	4.70095
	GSM 1800	0.001793324	9.195
	1GHz – 2GHz	0.001696909	9.225
Templeogue	300MHz – 1GHz	0.002568376	4.7725
	GSM 900	0.003790170	4.74905
	GSM 1800	0.000759729	9.18
	1GHz – 2GHz	0.000917611	9.275
Ballyboden	300MHz – 1GHz	0.000444282	4.7635
	GSM 900	0.000723867	4.74485
	GSM 1800	0.000369538	9.225
	1GHz – 2GHz	0.000336247	9.265

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Tallaght (Airton Road)	300MHz – 1GHz	0.001255043	4.72
	GSM 900	0.000976469	4.69355
	GSM 1800	0.001769592	9.25
	1GHz – 2GHz	0.001515858	9.29
Saggart City West Hotel	300MHz – 1GHz	0.000864288	4.7285
	GSM 900	0.000782814	4.69675
	GSM 1800	0.000256247	9.25
	1GHz – 2GHz	0.000218604	9.29
Clondalkin	300MHz – 1GHz	0.000249838	4.755
	GSM 900	0.000255658	4.7287
	GSM 1800	0.000757982	9.21
	1GHz – 2GHz	0.000700904	8.84
Tallaght Business Park	300MHz – 1GHz	0.001843566	4.816
	GSM 900	0.002146143	4.78465
	GSM 1800	0.001165893	9.245
	1GHz – 2GHz	0.001467772	9.3
Tempelogue ESB	300MHz – 1GHz	0.004223365	4.7725
	GSM 900	0.005316902	4.7384
	GSM 1800	0.000403328	9.165
	1GHz – 2GHz	0.000556748	9.2

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Cookstown Industrial Estate	300MHz – 1GHz	0.000331634	4.781
	GSM 900	0.000369538	4.7467
	GSM 1800	0.000026894	9.165
	1GHz – 2GHz	0.000038606	9.225

5.2.8 County Galway

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Clifden	300MHz – 1GHz	5.93825×10^{-4}	4.816
	GSM 900	4.18465×10^{-4}	4.7981
	GSM 1800	9.19726E-09	9.29
	1GHz – 2GHz	4.46333E-08	9.5
Oughterard	300MHz – 1GHz	0.000459895	4.781
	GSM 900	0.000424286	4.7393
	GSM 1800	8.98791E-09	9.185
	1GHz – 2GHz	7.47582E-08	9.475

5.2.9 County Kildare

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Dunmurray Hill	300MHz – 1GHz	2.90843×10^{-5}	3.25
	GSM 900	1.92601×10^{-5}	4.7282
	GSM 1800	9.09198×10^{-5}	9.2
	1GHz – 2GHz	6.91287×10^{-5}	9.225

5.2.10 County Meath

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Dunshaughlin	300MHz – 1GHz	7.40727×10^{-5}	4.72
	GSM 900	9.69747×10^{-5}	4.7162
	GSM 1800	2.02608×10^{-5}	9.3
	1GHz – 2GHz	3.47263×10^{-5}	9.265

5.2.11 County Offaly

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Edenderry	300MHz – 1GHz	1.37296×10^{-4}	4.7985
	GSM 900	7.4758×10^{-5}	4.7939
	GSM 1800	6.73998×10^{-8}	9.16
	1GHz – 2GHz	4.0519×10^{-8}	9.25

5.2.12 County Tipperary

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Roscrea	300MHz – 1GHz	0.001027209	4.711
	GSM 900	0.000773853	4.6949
	GSM 1800	0.000643663	9.23
	1GHz – 2GHz	0.000487145	9.25
Templemore	300MHz – 1GHz	0.009992143	4.7725
	GSM 900	0.009764694	4.75875
	GSM 1800	0.000000010	9.155
	1GHz – 2GHz	0.000000051	9.49

5.2.13 County Waterford – Waterford City

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Ballybricken	300MHz – 1GHz	1.3793×10^{-3}	4.7985
	GSM 900	1.155204×10^{-3}	4.7763
	GSM 1800	6.77109×10^{-4}	9.23
	1GHz – 2GHz	8.42672×10^{-4}	9.265

5.2.14 County Wicklow

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Laragh	300MHz – 1GHz	0.002486902	4.545
	GSM 900	0.002299634	4.74855
	GSM 1800	2.27331×10^{-8}	9.26
	1GHz – 2GHz	2.11183×10^{-8}	9.94
Newtown	300MHz – 1GHz	0.001215230	4.755
	GSM 900	0.001017791	4.76245
	GSM 1800	1.1×10^{-8}	9.39
	1GHz – 2GHz	1.0×10^{-8}	9.99
Rathnew	300MHz – 1GHz	0.002868525	4.8075
	GSM 900	0.003010639	4.7726
	GSM 1800	3.42×10^{-7}	9.23
	1GHz – 2GHz	2.95×10^{-7}	9.265
Wicklow (Garda Station)	300MHz – 1GHz	0.000188651	4.816
	GSM 900	0.000169691	4.76705
	GSM 1800	1.0131×10^{-5}	9.185
	1GHz – 2GHz	1.0881×10^{-5}	9.225

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Ballinclough	300MHz – 1GHz	8.2920×10^{-5}	4.816
	GSM 900	8.9055×10^{-5}	4.78465
	GSM 1800	1.31×10^{-7}	9.16
	1GHz – 2GHz	8.6×10^{-8}	9.2

5.2.15 County Wexford

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Rosslare	300MHz – 1GHz	0.000341711	4.825
	GSM 900	0.000301758	4.799
	GSM 1800	1.0 x10^{-8}	9.19
	1GHz – 2GHz	1.0 x10^{-8}	9.615
Wexford	300MHz – 1GHz	0.001382479	4.746
	GSM 900	0.000751932	4.72915
	GSM 1800	0.001930450	9.22
	1GHz – 2GHz	0.001650664	9.25
New Ross	300MHz – 1GHz	0.000100383	4.816
	GSM 900	0.000096307	4.7962
	GSM 1800	0.000003843	9.17
	1GHz – 2GHz	0.000003394	9.2
Enniscorthy	300MHz – 1GHz	0.000511280	4.7285
	GSM 900	0.000559318	4.768
	GSM 1800	0.000009390	9.19
	1GHz – 2GHz	0.000011032	9.215
Ferns	300MHz – 1GHz	0.000356171	4.781
	GSM 900	2.08285 x10^{-4}	4.78835
	GSM 1800	9.45 x10^{-7}	9.16
	1GHz – 2GHz	8.91 x10^{-7}	9.19

Site	Frequency Range	Highest reading W/m^2	ICNIRP guideline Limit W/m^2
Campile	300MHz – 1GHz	0.001001518	4.7985
	GSM 900	0.000990053	4.79295
	GSM 1800	0.000000012	9.18
	1GHz – 2GHz	0.000000079	9.525
Carricklawn	300MHz – 1GHz	0.000633372	4.781
	GSM 900	0.000436173	4.75505
	GSM 1800	0.000027968	9.19
	1GHz – 2GHz	4.0894×10^{-5}	9.215
Kilmore Quay	300MHz – 1GHz	0.000963072	4.79
	GSM 900	0.000923972	4.7629
	GSM 1800	1.9×10^{-8}	9.2
	1GHz – 2GHz	8.70×10^{-7}	9.49
Gorey	300MHz – 1GHz	0.000275841	4.816
	GSM 900	0.000240247	4.7939
	GSM 1800	1.7485×10^{-5}	9.225
	1GHz – 2GHz	1.0463×10^{-5}	9.225
Clonroche	300MHz – 1GHz	0.000248690	4.7635
	GSM 900	0.000234779	4.73885
	GSM 1800	1.60×10^{-8}	9.195
	1GHz – 2GHz	3.000×10^{-8}	5.35

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 the some cases the levels are in fact less than one ten-thousandth of the ICNIRP limits.

Annex 1

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

Definition

Non-ionising radiation is that part of the electromagnetic spectrum below 2420 million MHz. Radio waves, infrared radiation and visible light are examples of NIR. Electromagnetic waves at frequencies above 2420 million MHz (2.4THz) are known as ionising radiation and this includes X-rays and Gamma rays.

Standards for emissions limits for non-ionising radiation

The International Commission for Non-Ionising 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).

This programme required 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 1. It should be noted that in 1999 the European Commission issued a recommendation[6] which proposed to limit exposure of the general public to electromagnetic fields 0Hz - 300GHz based on a set of basic restrictions and reference levels developed internationally under the advice of the International Commission on Non-Ionising Radiation Protection. In relation

[6] Recommendation of the European Council 1999/519/EC of July 12, 1999

to emissions within the radio spectrum, these limits are equivalent to the ICNIRP guideline limits used by ComReg.

ICNIRP limits

In 1998 ICNIRP produced "Guideline 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 "Guideline 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).However, only power density in air, outside the body, can be readily measured in 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 ICNIRP Guidelines: 1998 reference levels appropriate to the frequency range 100 kHz to 40GHz, covered by this report are given in the table on the following page.

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	$1.375f^{1/2}$	$0.0037f^{1/2}$	f/2000	UHF Television Broadcasting and Mobile Telephony Systems
2000 - 300000	61	0.16	1	Microwave Links, and MMDS

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. For the purposes of this programme, measurements were carried out at GSM sites and Mixed Use sites.

Cellular/GSM sites

Cellular/GSM 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.

Mixed use site

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 Ireland.

Methodology

An initial survey of the area was conducted to determine the location(s) of highest non-ionising radiation emissions. At the GSM only site this was done by using a broadband probe and an engineering mobile phone, in conjunction with the appropriate software, to identify the position of maximum field strength. The engineering mobile phone provides an indication of the field strength levels from the GSM channels in use in the vicinity of the site.

Once the locations of the highest field strength emissions were identified, a series of narrowband measurements were taken at these locations. These measurements were taken using a spectrum analyser and associated antennas.

At GSM only sites, measurements were performed over the following frequency range from 300MHz – 2GHz. This range includes both the GSM900 and GSM1800 bands.

For mixed use sites, measurements were performed over the following frequency ranges 30MHz – 40GHz. These measurements included all radio services which are present at these sites. These services include, GSM, Broadcasting, fixed links, MMDS, FWA. Point to Point links, amongst others.

At both GSM only sites and Mixed Use sites, electric field strength measurements conducted in the frequency bands of interest, are recorded and converted to power density levels for direct comparison with the ICNIRP guideline levels. These power density levels are tabulated alongside the relevant ICNIRP limits. The tables present the highest emission level readings recorded within a band.