



Commission for
Communications Regulation

Report

2008 Programme of Measurement of Non-Ionising Radiation Emissions

Second Interim Report

Document No:	08/61
Date:	28 th July 2008

Contents

1.	Executive Summary	3
2.	Introduction.....	4
3.	Measurement Results.....	6
3.1	EXPLANATORY NOTE	6
3.2	MEASUREMENT RESULTS BY SITE	10
3.2.1	Cavan: Killeshandra – Main Street	10
3.2.2	Clare: Milltown Malbay - Ballard Road	11
3.2.3	Cork: Blarney – Woollen Mills.....	12
3.2.4	Cork City: Kennedy Quay - R&H Hall Building	13
3.2.5	Cork City: Lancaster Quay - WiFi Hotspot (Payphone)	14
3.2.6	Donegal: Ballybofey – Main Street.....	15
3.2.7	Dublin 2: Chatham Street – WiFi Hotspot (Payphone).....	16
3.2.8	Dublin 4: Ringsend – Whitebank Road	17
3.2.9	Dublin: Lucan - Garda Station	18
3.2.10	Dublin: The Naul - MMDS Transmitter	19
3.2.11	Dublin: Three Rock Mountain - Broadcasting Transmitter Site	20
3.2.12	Galway: Casla (Costelloe) – RTE Site.....	22
3.2.13	Galway City: Monivea Road - WiFi Hotspot (Payphone)	23
3.2.14	Kerry: Tarbert – Main Street.....	24
3.2.15	Kildare: Leixlip – Main Street	25
3.2.16	Kildare: Maynooth - Parson Street WiFi Hotspot (Payphone).....	26
3.2.17	Kilkenny City: Ormonde St. Multi-story Carpark	27
3.2.18	Laois: Mountmellick - Bay Road Business Park	28
3.2.19	Limerick City: Clarion Hotel	29
3.2.20	Louth: Clermont Carn - Broadcasting Transmitter Site	30
3.2.21	Mayo: Swinford – Garda Station	31
3.2.22	Meath: Summerhill - Longwave Radio Transmitter	32
3.2.23	Roscommon: Ballaghaderreen – Station Road.....	33
3.2.24	Tipperary: Knockgraffon	34
3.2.25	Waterford City: Rathfadden - MMDS Transmitter Site.....	35
3.2.26	Westmeath: Castlepollard	36
3.2.27	Wicklow: Rathdrum Business Park	37
4.	Conclusion.....	38
	Annex 1 - NIR and Emissions Standards	39
	Annex 2 – The ICNIRP Guidelines	41
	Annex 3 – Survey Methodology	45
	Annex 4 – Measurement of Electromagnetic Fields.....	47
	Annex 5 – Derivation of Adjusted Levels.....	49
	Annex 6 – Glossary.....	53

1. Executive Summary

The Commission for Communications Regulation (ComReg) currently arranges for Non-Ionising Radiation (NIR) surveys to be conducted near a sample number of licensed transmitter sites nationwide. Each survey involves measurement of NIR emission levels at the point of highest emissions (in a public area), associated with the transmitter. Sites are surveyed in order to assess compliance on the part of transmitter operators with their licence conditions relating to NIR emissions.

This report forms part of an ongoing series of interim reports which outline ComReg's programme of measurements and presents the results of the second set of 27 site surveys undertaken in 2008.

ComReg arranged for NIR measurements to be conducted at the 27 sites during May, June and early July 2008. All of the site surveys were conducted by engineers of Compliance Engineering Ireland Ltd (CEI), which was contracted by ComReg to assist it with the programme.

On the basis of this work, ComReg has concluded that the NIR emissions measured from all of the 27 sites were below the relevant ICNIRP guideline limits for general public exposure¹. The results of the measurements taken at all the sites are presented in this report.

¹ See Annex 2

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.

It is a condition of various licences² issued by ComReg that licensees must ensure that non-ionising radiation³ (NIR) emissions from each transmitter operated under the licence must be within the limits set down in the guidelines published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP)⁴. Levels of NIR emissions from a licensed transmitter must not exceed the ICNIRP limits in any part of the site or surrounding area to which the general public has access.

In order to assess compliance on the part of transmitter operators with their licence conditions relating to NIR, ComReg currently arranges for NIR surveys to be conducted near a sample number of licensed transmitter sites nationwide. Each survey involves measurement of NIR emission levels at the point of highest emissions (in a public area), associated with the transmitter.

This report presents the results of measurements taken at the second set of 27 sites chosen as part of the 2008 Programme of Measurement of Non-Ionising Radiation emissions. All 27 site surveys were conducted by engineers of Compliance Engineering Ireland Ltd (CEI), which was contracted by ComReg to assist it with the programme.

² Issued pursuant to the Wireless Telegraphy Act, 1926 (No. 45 of 1926) e.g. for services such as GSM & UMTS Mobile Telephony, Radio & TV Broadcasting, MMDS, Wireless Broadband etc.

³ 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. (see Annex 1)

⁴ See Annexes 1 & 2 for further details.

Abbreviated versions of the individual site survey reports are available on the ComReg website⁵ as well as on Siteviewer⁶, 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.

⁵ www.comreg.ie

⁶ www.siteviewer.ie

3. Measurement Results

3.1 Explanatory Note

At the point of highest emissions⁷ associated with each site, the engineers measured the electric field strength (or electric field voltage)⁸ of emissions in the relevant radio frequency bands.

The tables which follow in the next sub-section present the levels measured at each site. The sites are listed in order by county.

The tables show the measured levels alongside the relevant ICNIRP limits for general public exposure. They include levels measured in respect of emissions from the transmitter site, along with the levels for emissions from nearby sites, if particularly high at the location.

The tables present the measurements for each site under the following headings:

1. Frequency
2. Measured Level V/m
3. Adjusted Level V/m
4. ICNIRP guideline limit
5. Total Exposure Quotient

A brief explanation of each of the headings follows:-

⁷ See Annex 3 for an outline of the site survey methodology.

⁸ See Annex 4 for an outline of how electromagnetic fields are measured.

Frequency (MHz)

Various radio services are transmitted in predefined frequency ranges. For example 3G (or UMTS) mobile telephony base stations transmit signals on a frequency somewhere in the range 2110 – 2170 MHz. At each site transmitting a 3G signal, measurements were taken in that frequency range and the results of those measurements are presented in the tables. Other services such as GSM 900, GSM 1800, TETRA, Television etc. are presented in similar manner in the tables, if applicable. The frequencies of emissions associated with some services (e.g. emergency services) are not shown in the interests of confidentiality and security.

Measured Level V/m

The tables show the electric field strength levels measured for each emission (signal) type from the designated site, along with the levels for emissions from nearby sites, if particularly high. In many instances more than one measured level is shown for each emission type. This is due to the fact that different mobile operators often transmit signals from the same site on different frequency channels.

Adjusted Level V/m

For some emission types an adjusted level has been calculated from the measured level for any or all of the following reasons:

- to compensate for the limited measurement resolution of the spectrum analyser⁹. For example, a measurement of a digital television signal performed with at a resolution of 5 MHz needs to be adjusted upwards using a correction factor in order to account for the energy present within the full 7.6 MHz bandwidth of the signal.
- to extrapolate to an estimate of the level under maximum traffic from the transmitter. For example, the base stations of mobile telephone networks produce emissions which vary according to the changing volume of calls

⁹ Spectrum analysers are used to measure individual emissions at specific frequencies (see Annex 4).

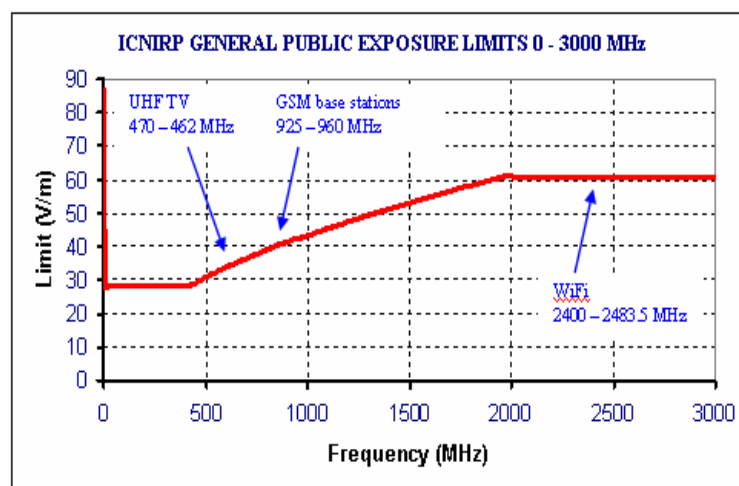
or data traffic over the course of the day. The levels measured for the always-on pilot channels of the base stations can be used to extrapolate to a level which would be expected if all voice and data channels were in operation.

- to account for the characteristics of certain complex signal types (e.g. analogue PAL TV).

For further details concerning the calculation of Adjusted Levels, please refer to Annex 5.

ICNIRP guideline limit

For each site the table shows the measured and adjusted electric field strength levels in Volts per metre (V/m) alongside the relevant ICNIRP general public guideline limits. It should be noted that the ICNIRP guideline limits vary according to frequency as illustrated:



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. Thus the limits for the different measurements presented in the tables will vary as the measurements have been performed at different frequencies.

For further details concerning the ICNIRP Limits, please refer to Annex 2.

Total Exposure Quotient

For each site, Total Exposure Quotients are calculated, in accordance with mathematical formulas specified in the ICNIRP Guidelines in order to assess the cumulative effect of emissions from multiple transmitters. The quotients in this report are calculated from the Adjusted Levels rather than from the Measured Levels, in order to account for total potential public exposure under maximum traffic conditions.

In order to satisfy the criteria of the ICNIRP Guidelines, the Quotients must be less than or equal to 1.

The two quotients are as follows:

Quotient for Electrical Stimulation Effects (1 Hz to 10 MHz)

This quotient is calculated only in a small number of cases where strong emissions in the frequency range between 1 Hz and 10 MHz are present at the survey location (e.g. near a long wave radio transmitter site).

Quotient for Thermal Effects (100 kHz and above)

The measurements of any emissions above 100 kHz are used to calculate a Quotient to assess any thermal (heat) effects.

Please refer to Annex 2 for further information concerning the calculation of the Quotients.

3.2 Measurement Results by Site

3.2.1 Cavan: Killeshandra – Main Street

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	94.741	0.008	0.008	28.000	3687.121
PMR VHF	170.088	0.012	0.012	28.000	2422.145
GSM900	947.350	0.049	0.099	42.321	428.179
GSM900	957.076	0.013	0.025	42.538	1684.002
GSM900	938.688	0.003	0.005	42.127	7684.652

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00000610	1

3.2.2 Clare: Milltown Malbay - Ballard Road

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	91.149	0.006	0.006	28.000	4723.347
VHF TV	181.740	0.012	0.009	28.000	3109.529
VHF TV	185.010	0.012	0.009	28.000	3147.058
GSM900	954.576	0.570	1.139	42.482	37.291
GSM900	946.961	0.008	0.015	42.313	2772.409
GSM900	937.766	0.004	0.009	42.107	4783.751
UMTS	2147.840	0.439	1.388	61.000	43.950

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00124	1

3.2.3 Cork: Blarney – Woollen Mills

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	96.359	0.023	0.023	28.000	1224.311
FM Radio	102.581	0.015	0.015	28.000	1809.955
TV UHF	567.370	0.014	0.010	32.752	3146.739
TV UHF	487.540	0.014	0.010	30.360	2925.598
GSM900	938.792	0.241	0.482	42.130	87.442
GSM900	954.020	0.122	0.243	42.470	174.773
GSM900	941.969	0.108	0.216	42.201	195.013
GSM900	949.563	0.051	0.102	42.371	417.362
GSM1800	1881.769	0.009	0.018	59.647	3359.616
GSM1800	1838.980	0.005	0.010	58.965	6183.366
UMTS	2112.570	0.367	1.160	61.000	52.604
UMTS	2167.360	0.269	0.850	61.000	71.736
UMTS	2147.810	0.099	0.312	61.000	195.458
WiFi	2425.870	0.026	0.052	61.000	1164.567

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00078	1

3.2.4 Cork City: Kennedy Quay - R&H Hall Building

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	89.694	0.023	0.023	28.000	1214.751
FM Radio	91.998	0.022	0.022	28.000	1265.823
FM Radio	102.598	0.021	0.021	28.000	1316.408
PMR VHF	153.000	0.010	0.010	28.000	2871.206
PMR VHF	153.830	0.010	0.010	28.000	2894.356
PMR VHF	not disclosed	0.023	0.023	28.000	1236.749
PMR VHF	not disclosed	0.020	0.020	28.000	1391.650
PMR UHF	456.270	0.013	0.013	29.371	2211.646
PMR UHF	458.530	0.002	0.002	29.443	12324.252
TV UHF	695.300	0.106	0.082	36.257	445.112
TV UHF	671.110	0.098	0.075	35.620	473.118
GSM900	954.755	0.092	0.184	42.486	230.528
GSM900	953.173	0.090	0.181	42.451	234.848
GSM900	946.770	0.039	0.078	42.308	545.490
GSM900	938.413	0.015	0.030	42.121	1409.675
GSM1800	1848.260	0.109	0.217	59.113	272.160
GSM1800	1866.460	0.087	0.174	59.404	341.832
GSM1800	1855.410	0.083	0.166	59.227	357.093
GSM1800	1839.570	0.059	0.118	58.974	500.204
UMTS	2167.510	0.956	3.023	61.000	20.182
UMTS	2147.490	0.130	0.410	61.000	148.726
UMTS	2112.470	0.037	0.116	61.000	526.467
FWALA	3578.400	0.053	0.106	61.000	577.652

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00260	1

3.2.5 Cork City: Lancaster Quay - WiFi Hotspot (Payphone)

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	91.419	0.012	0.012	28.000	2259.887
FM Radio	89.700	0.012	0.012	28.000	2274.574
FM Radio	91.976	0.012	0.012	28.000	2341.137
PMR VHF	153.000	0.017	0.017	28.000	1665.675
PMR VHF	153.830	0.014	0.014	28.000	1953.943
PMR VHF	165.500	0.041	0.041	28.000	679.942
PMR VHF	158.964	0.030	0.030	28.000	937.395
TV UHF	671.310	0.018	0.014	35.626	2557.720
GSM900	951.772	0.169	0.338	42.420	125.577
GSM900	958.537	0.111	0.221	42.570	192.452
GSM900	950.047	0.107	0.213	42.381	198.787
GSM900	938.031	0.034	0.069	42.113	614.602
GSM1800	1834.990	0.187	0.374	58.901	157.488
GSM1800	1842.380	0.141	0.283	59.019	208.695
GSM1800	1865.980	0.113	0.226	59.396	263.280
GSM1800	1854.400	0.067	0.133	59.211	443.863
UMTS	2148.060	0.162	0.511	61.000	119.293
UMTS	2113.850	0.111	0.349	61.000	174.568
UMTS	2167.250	0.068	0.216	61.000	282.427
WiFi	2427.080	1.852	3.704	61.000	16.469

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00401	1

3.2.6 Donegal: Ballybofey – Main Street

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	99.277	0.080	0.080	28.000	348.562
FM Radio	94.083	0.065	0.065	28.000	432.232
FM Radio	89.700	0.064	0.064	28.000	435.188
TV VHF	197.160	0.015	0.012	28.000	2381.335
TV UHF	767.410	0.103	0.079	38.090	482.620
TV UHF	735.230	0.073	0.056	37.283	662.793
TV UHF	815.470	0.071	0.055	39.265	717.492
GSM900	956.066	0.054	0.108	42.515	394.685
GSM900	952.238	0.043	0.086	42.430	490.636
GSM900	945.367	0.042	0.083	42.277	508.869
GSM900	949.621	0.032	0.064	42.372	657.132
GSM1800	1832.600	1.002	2.004	58.862	29.372
GSM1800	1854.410	0.032	0.063	59.211	937.186
UMTS	2146.710	1.302	4.117	61.000	14.815
UMTS	2167.470	0.109	0.346	61.000	176.485
UMTS	2112.160	0.087	0.275	61.000	222.104

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.005812	1

3.2.7 Dublin 2: Chatham Street – WiFi Hotspot (Payphone)

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
PMR	75.973	0.017	0.017	28.000	1667.000
FM Radio	104.398	0.010	0.023	28.000	1198.117
FM Radio	103.810	0.007	0.016	28.000	1698.823
PMR	168.134	0.013	0.013	28.000	2153.846
PMR	165.486	0.008	0.008	28.000	3672.131
VHF TV	183.187	0.007	0.048	28.000	579.790
VHF TV	207.292	0.006	0.042	28.000	662.502
Tetra	399.797	0.003	0.004	28.000	7919.596
Tetra	not disclosed	0.002	0.004	28.000	7936.086
PMR	458.625	0.010	0.010	29.446	3099.616
PMR	452.182	0.003	0.003	29.239	9746.262
UHF TV	743.281	0.018	0.095	37.487	394.582
UHF TV	535.213	0.001	0.006	31.810	5078.252
GSM900	940.000	0.108	0.216	42.157	195.532
GSM900	941.626	0.080	0.160	42.193	263.378
GSM900	938.646	0.036	0.072	42.126	583.467
GSM900	955.026	0.003	0.006	42.492	6639.423
GSM1800	1860.830	0.043	0.085	59.314	696.172
GSM1800	1872.180	0.036	0.071	59.494	837.950
GSM1800	1833.440	0.030	0.060	58.876	987.847
GSM1800	1846.540	0.029	0.058	59.086	1022.243
UMTS	2113.210	0.109	0.346	61.000	176.323
UMTS	2166.580	0.023	0.074	61.000	827.887
UMTS	2147.370	0.022	0.070	61.000	876.807
UMTS	2127.850	0.014	0.043	61.000	1428.871
WiFi	2435.370	0.416	0.832	61.000	73.317

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00028	1

3.2.8 Dublin 4: Ringsend – Whitebank Road

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	98.080	0.016	0.016	28.000	1750.000
FM Radio	106.778	0.014	0.014	28.000	2027.516
FM Radio	105.982	0.013	0.013	28.000	2080.238
PMR VHF	162.253	0.008	0.008	28.000	3416.301
PMR VHF	162.031	0.008	0.008	28.000	3705.174
TV VHF	224.230	0.020	0.015	28.000	1856.860
Tetra	Not disclosed	0.447	0.775	28.000	36.141
Tetra	Not disclosed	0.439	0.761	28.000	36.816
Tetra	Not disclosed	0.432	0.748	28.000	37.438
PMR UHF	456.020	0.041	0.041	29.363	711.821
PMR UHF	466.970	0.010	0.010	29.713	3040.942
TV UHF	772.050	0.068	0.052	38.205	735.117
TV UHF	583.220	0.044	0.034	33.206	981.047
TV UHF	516.300	0.039	0.030	31.243	1052.561
TV UHF	820.790	0.038	0.029	39.393	1337.495
GSM900	946.181	0.010	0.021	42.295	2015.971
GSM900	938.175	0.008	0.016	42.116	2660.502
GSM900	951.162	0.007	0.015	42.406	2831.614
GSM1800	1845.190	0.211	0.421	59.064	140.161
GSM1800	1865.610	0.159	0.318	59.390	186.761
GSM1800	1836.550	0.142	0.283	58.926	208.071
GSM1800	1862.600	0.128	0.255	59.342	232.349
UMTS	2168.010	0.668	2.113	61.000	28.868
UMTS	2113.570	0.260	0.823	61.000	74.077
UMTS	2127.820	0.230	0.728	61.000	83.759
UMTS	2146.210	0.127	0.403	61.000	151.530

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.003916	1

3.2.9 Dublin: Lucan - Garda Station

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	93.468	0.007	0.007	28.000	3834.566
FM Radio	100.882	0.007	0.007	28.000	4012.611
FM Radio	91.306	0.007	0.007	28.000	4199.160
TV VHF	207.330	0.017	0.013	28.000	2134.846
Tetra	Not disclosed	0.181	0.314	28.000	89.314
PMR UHF	452.610	0.002	0.002	29.253	13772.420
PMR UHF	462.000	0.002	0.002	29.555	18896.742
GSM900	955.436	0.998	1.995	42.501	21.300
GSM900	940.590	0.299	0.598	42.170	70.542
GSM900	954.033	0.190	0.380	42.470	111.881
GSM900	951.250	0.013	0.026	42.408	1642.456
GSM1800	1855.626	0.300	0.601	59.231	98.587
GSM1800	1839.206	0.211	0.421	58.968	140.000
GSM1800	1832.197	0.204	0.409	58.856	144.042
GSM1800	1834.582	0.007	0.014	58.894	4186.382
UMTS	2112.990	0.383	1.211	61.000	50.391
UMTS	2167.790	0.156	0.494	61.000	123.573
UMTS	2147.060	0.015	0.048	61.000	1280.860

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.0032737	1

3.2.10 Dublin: The Naul - MMDS Transmitter

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	105.475	0.028	0.028	28.000	993.612
FM Radio	102.684	0.027	0.027	28.000	1046.338
FM Radio	95.180	0.020	0.020	28.000	1394.422
Tetra	Not disclosed	0.010	0.017	28.000	1633.075
PMR UHF	456.450	0.005	0.005	29.376	6446.445
PMR UHF	456.200	0.004	0.004	29.368	6623.456
PMR UHF	463.800	0.004	0.004	29.612	8193.697
TV UHF	831.220	0.094	0.072	39.642	548.034
TV UHF	719.290	0.094	0.072	36.877	512.083
TV UHF	751.310	0.048	0.037	37.689	1032.310
GSM900	946.246	0.068	0.136	42.297	310.137
GSM900	950.184	0.064	0.128	42.384	330.612
GSM900	938.018	0.041	0.083	42.112	508.971
GSM900	955.696	0.033	0.066	42.507	645.614
GSM1800	1855.220	0.010	0.020	59.224	2977.595
GSM1800	1846.350	0.009	0.017	59.083	3425.476
UMTS	2168.830	0.038	0.120	61.000	510.446
UMTS	2147.300	0.031	0.099	61.000	615.303
UMTS	2112.940	0.028	0.089	61.000	684.034
MMDS	2663.610	0.456	0.552	61.000	110.531
MMDS	2613.600	0.443	0.536	61.000	113.902
MMDS	2584.440	0.435	0.527	61.000	115.839
MMDS	2648.900	0.385	0.465	61.000	131.114
MMDS	2631.860	0.373	0.451	61.000	135.156
MMDS	2551.260	0.371	0.449	61.000	135.848
MMDS	2599.240	0.368	0.445	61.000	137.030
MMDS	2536.680	0.337	0.408	61.000	149.639
MMDS	2568.910	0.330	0.399	61.000	152.767

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.000587	1

3.2.11 Dublin: Three Rock Mountain - Broadcasting Transmitter Site Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	98.088	1.966	1.966	28.000	14.242
FM Radio	106.377	1.652	1.652	28.000	16.949
FM Radio	103.773	1.591	1.591	28.000	17.599
FM Radio	102.176	1.383	1.383	28.000	20.246
FM Radio	105.975	1.196	1.196	28.000	23.411
FM Radio	104.382	1.014	1.014	28.000	27.613
FM Radio	106.784	0.947	0.947	28.000	29.561
FM Radio	105.188	0.792	0.792	28.000	35.362
FM Radio	103.192	0.710	0.710	28.000	39.453
PMR VHF	153.000	0.107	0.107	28.000	262.664
PMR VHF	153.820	0.104	0.104	28.000	270.531
PMR VHF	166.499	0.124	0.124	28.000	225.806
PMR VHF	167.987	0.108	0.108	28.000	259.259
PMR VHF	168.488	0.098	0.098	28.000	285.714
T-DAB	224.050	1.654	1.654	28.000	16.929
Tetra	Not disclosed	0.512	0.885	28.000	31.636
PMR UHF	457.210	0.349	0.349	29.401	84.316
PMR UHF	453.820	0.342	0.342	29.292	85.749
PMR UHF	451.270	0.275	0.275	29.209	106.100
PMR UHF	451.110	0.205	0.205	29.204	142.390
PAL TV	583.210	0.107	0.082	33.206	404.988
PAL TV	535.140	0.061	0.047	31.808	675.198
PAL TV	567.120	0.053	0.041	32.745	800.822
PAL TV	743.250	0.134	0.103	37.486	365.821
Digital	793.130	0.413	0.643	38.724	60.219
Digital	816.810	0.371	0.578	39.297	68.030
Digital	739.780	0.257	0.400	37.398	93.461
Digital	768.470	0.160	0.249	38.117	153.293
Digital	515.000	0.122	0.191	31.204	163.733
GSM900	954.815	0.047	0.093	42.488	456.856
GSM900	938.025	0.043	0.087	42.112	486.849
GSM900	947.846	0.035	0.070	42.332	601.482
GSM900	958.911	0.024	0.048	42.579	895.638
GSM1800	1855.200	0.014	0.027	59.224	2163.040
GSM1800	1863.220	0.011	0.021	59.352	2791.718
GSM1800	1831.780	0.009	0.018	58.849	3287.656
GSM1800	1874.800	0.006	0.012	59.536	4874.412
UMTS	2147.530	0.057	0.179	61.000	340.327
UMTS	2112.880	0.042	0.132	61.000	460.706
UMTS	2166.950	0.030	0.095	61.000	643.421
UMTS	2127.250	0.019	0.061	61.000	993.805
Dáil TV	2308.860	0.018	0.155	66.070	427.323

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.025521	1

3.2.12 Galway: Casla (Costelloe) – RTE Site

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	99.277	1.989	1.989	28.000	14.077
FM Radio	94.083	1.698	1.698	28.000	16.490
FM Radio	89.700	0.735	0.735	28.000	38.116
FM Radio	92.782	0.722	0.722	28.000	38.781
TV UHF	639.330	1.485	1.139	34.767	30.524
TV UHF	615.320	0.604	0.464	34.108	73.576
TV UHF	695.290	0.584	0.448	36.256	80.984
GSM900	940.222	0.196	0.391	42.162	107.830
GSM900	946.419	0.184	0.369	42.300	114.697
GSM900	951.943	0.183	0.367	42.424	115.659
GSM900	950.197	0.070	0.141	42.385	301.199

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.011737	1

3.2.13 Galway City: Monivea Road - WiFi Hotspot (Payphone)

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	93.143	0.010	0.010	28.00	2772.277
FM Radio	90.985	0.010	0.010	28.00	2860.646
FM Radio	98.380	0.010	0.010	28.00	2889.577
PMR VHF	153.830	0.179	0.179	28.00	156.863
PMR VHF	153.000	0.105	0.105	28.00	265.907
PMR VHF	165.274	0.032	0.032	28.00	864.998
PMR UHF	463.950	0.012	0.012	29.62	2443.631
GSM900	955.450	0.194	0.388	42.50	109.597
GSM900	939.585	0.094	0.189	42.15	223.475
GSM900	946.617	0.024	0.048	42.31	873.345
GSM1800	1855.800	0.187	0.374	59.23	158.548
GSM1800	1863.730	0.130	0.261	59.36	227.608
GSM1800	1847.180	0.092	0.183	59.10	322.611
GSM1800	1872.350	0.032	0.064	59.50	926.170
UMTS	2112.720	0.184	0.582	61.00	104.779
UMTS	2147.440	0.040	0.126	61.00	484.302
UMTS	2166.710	0.032	0.102	61.00	599.247
WiFi	2437.400	0.091	0.182	61.00	334.466

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.0003385	1

3.2.14 Kerry: Tarbert – Main Street

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
GSM900	954.377	0.066	0.132	42.478	321.802
GSM900	938.599	0.047	0.095	42.125	444.359
GSM900	941.653	0.031	0.062	42.194	676.182
GSM1800	1834.185	0.626	1.252	58.888	47.035
UMTS	2147.790	0.303	0.957	61.000	63.768
UMTS	2167.710	0.015	0.047	61.000	1304.243

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00072	1

3.2.15 Kildare: Leixlip – Main Street

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	91.305	0.012	0.012	28.000	2306.425
FM Radio	93.510	0.011	0.011	28.000	2599.814
FM Radio	89.067	0.010	0.010	28.000	2846.686
GSM900	941.218	0.903	1.806	42.184	23.360
GSM900	946.994	0.227	0.453	42.313	93.407
GSM900	952.216	0.186	0.373	42.430	113.814
GSM900	955.017	0.037	0.074	42.492	575.774
GSM1800	1841.581	0.140	0.280	59.006	210.887
GSM1800	1836.719	0.090	0.181	58.928	326.400
GSM1800	1855.747	0.020	0.039	59.233	1501.084
GSM1800	1847.575	0.011	0.021	59.102	2761.786
UMTS	2147.970	0.255	0.807	61.000	75.557
UMTS	2112.120	0.230	0.727	61.000	83.869
UMTS	2167.320	0.020	0.063	61.000	969.335

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.002379	1

3.2.16 Kildare: Maynooth - Parson Street WiFi Hotspot (Payphone)

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
TV VHF	181.640	0.016	0.012	28.000	2294.523
PMR UHF	456.450	0.002	0.002	29.376	17019.959
TV UHF	774.410	0.009	0.007	38.264	5851.234
TV UHF	799.510	0.008	0.006	38.879	6026.590
TV UHF	584.450	0.008	0.006	33.241	5289.140
GSM900	955.602	0.130	0.260	42.505	163.607
GSM900	953.807	0.042	0.083	42.465	511.629
GSM900	937.816	0.027	0.055	42.108	766.710
GSM900	941.355	0.027	0.053	42.187	789.724
GSM1800	1855.944	0.077	0.155	59.236	383.255
GSM1800	1851.776	0.060	0.120	59.169	493.489
GSM1800	1864.389	0.025	0.050	59.371	1190.745
GSM1800	1843.337	0.024	0.048	59.034	1236.581
UMTS	2113.600	0.209	0.662	61.000	92.119
UMTS	2148.330	0.046	0.145	61.000	422.003
UMTS	2167.420	0.027	0.086	61.000	713.115
WiFi	2427.300	0.484	0.969	61.000	62.964

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.000435	1

3.2.17 Kilkenny City: Ormonde St. Multi-story Carpark

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	96.589	0.017	0.017	28.000	1603.666
FM Radio	89.593	0.012	0.012	28.000	2358.888
FM Radio	91.819	0.009	0.009	28.000	3069.502
PMR VHF	158.701	0.039	0.039	28.000	724.638
PMR VHF	163.199	0.011	0.011	28.000	2529.359
TV VHF	215.292	0.024	0.177	28.000	157.798
TV VHF	191.293	0.019	0.142	28.000	197.452
TV VHF	221.291	0.010	0.074	28.000	378.124
PMR UHF	458.925	0.011	0.011	29.456	2634.704
PMR UHF	456.404	0.003	0.003	29.375	11164.945
TV UHF	511.239	0.046	0.131	31.090	236.997
TV UHF	487.273	0.042	0.118	30.352	256.807
GSM900	954.412	8.408	16.816	42.479	2.526
GSM900	939.978	0.921	1.842	42.156	22.891
GSM900	949.789	0.865	1.731	42.376	24.486
GSM900	946.968	0.669	1.338	42.313	31.624
GSM1800	1851.033	5.671	11.342	59.157	5.216
GSM1800	1857.595	5.526	11.052	59.262	5.362
GSM1800	1843.566	0.919	1.838	59.038	32.124
GSM1800	1872.753	0.806	1.612	59.504	36.917
UMTS	2112.710	4.281	13.538	61.000	4.506
UMTS	2167.430	1.569	4.962	61.000	12.294
UMTS	2147.100	0.296	0.936	61.000	65.168

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.29075	1

3.2.18 Laois: Mountmellick - Bay Road Business Park

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	105.795	0.007	0.007	28.000	3786.342
FM Radio	88.827	0.005	0.005	28.000	5815.161
PMR VHF	153.830	0.003	0.003	28.000	8671.415
TV VHF	207.291	0.004	0.027	28.000	1051.267
TV VHF	183.215	0.003	0.024	28.000	1149.823
PMR UHF	458.649	0.004	0.004	29.447	7124.876
TV UHF	799.240	0.013	0.068	38.872	571.647
TV UHF	775.200	0.012	0.063	38.283	611.834
GSM900	940.623	0.744	1.488	42.171	28.344
GSM900	939.186	0.033	0.066	42.138	641.963
GSM900	952.201	0.008	0.016	42.429	2617.806
GSM900	954.235	0.006	0.011	42.475	3723.891

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.001261	1

3.2.19 Limerick City: Clarion Hotel

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	89.375	0.012	0.012	28.000	2276.423
FM Radio	94.976	0.012	0.012	28.000	2370.872
FM Radio	101.187	0.010	0.010	28.000	2753.196
PMR VHF	153.820	0.027	0.027	28.000	1028.278
PMR VHF	153.000	0.023	0.023	28.000	1227.532
PMR VHF	166.864	0.005	0.005	28.000	5979.073
TV VHF	227.660	0.080	0.061	28.000	456.952
PMR UHF	459.250	0.003	0.003	29.466	9744.184
PMR UHF	458.420	0.003	0.003	29.440	11517.909
TV UHF	663.330	0.019	0.015	35.413	2408.519
TV UHF	615.010	0.016	0.012	34.099	2785.579
TV UHF	695.330	0.014	0.011	36.258	3291.913
GSM900	939.424	0.126	0.253	42.144	166.840
GSM900	940.196	0.077	0.154	42.161	273.347
GSM900	955.051	0.025	0.050	42.493	846.134
GSM900	948.966	0.018	0.036	42.357	1182.504
GSM1800	1832.130	0.190	0.379	58.855	155.126
GSM1800	1866.970	0.151	0.302	59.412	196.597
GSM1800	1834.950	0.112	0.223	58.900	264.125
GSM1800	1843.390	0.095	0.191	59.035	309.117
UMTS	2147.410	0.269	0.850	61.000	71.736
UMTS	2112.810	0.033	0.104	61.000	584.007
UMTS	2166.080	0.015	0.046	61.000	1322.122

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00035	1

3.2.20 Louth: Clermont Carn - Broadcasting Transmitter Site

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
PMR VHF	Not disclosed	0.110	0.110	28.000	255.708
PMR VHF	Not disclosed	0.037	0.037	28.000	747.264
FM Radio	105.470	11.000	11.000	28.000	2.545
FM Radio	102.680	8.321	8.321	28.000	3.365
FM Radio	87.800	4.586	4.586	28.000	6.106
FM Radio	97.010	2.510	2.510	28.000	11.155
PMR VHF	162.025	0.075	0.075	28.000	371.501
T-DAB	224.430	6.069	6.069	28.000	4.614
Tetra	Not disclosed	0.005	0.009	28.000	3269.031
Tetra	Not disclosed	0.005	0.008	28.000	3376.317
PAL TV	831.260	4.267	3.273	39.643	12.113
PAL TV	847.280	3.016	2.313	40.024	17.302
PAL TV	719.240	0.971	0.745	36.876	49.529
PAL TV	752.000	0.172	0.132	37.042	285.820
Digital TV	786.640	1.401	2.181	38.565	17.679
Digital TV	811.780	0.943	1.468	39.176	26.685
Digital TV	762.960	0.752	1.171	37.980	32.437
Digital TV	728.830	0.371	0.577	37.121	64.314
GSM900	957.131	0.478	0.956	42.539	44.478
GSM900	946.156	0.300	0.600	42.295	70.467
GSM900	950.170	0.297	0.594	42.384	71.378
GSM900	937.993	0.209	0.417	42.112	100.987
GSM1800	1864.680	0.017	0.034	59.375	1729.038
GSM1800	1847.870	0.013	0.026	59.107	2271.596
GSM1800	1806.460	0.011	0.022	58.441	2673.417
GSM1800	1827.160	0.010	0.019	58.775	3050.700
UMTS	2112.700	0.198	0.626	61.000	97.472

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.3419971	1

3.2.21 Mayo: Swinford – Garda Station

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
PMR VHF	165.337	0.091	0.091	28.000	309.051
GSM900	946.808	0.467	0.935	42.309	45.270
GSM900	954.259	0.434	0.869	42.475	48.890
GSM900	951.945	0.392	0.783	42.424	54.181
GSM900	945.156	0.099	0.198	42.272	213.928
UMTS	2146.570	0.185	0.585	61.000	104.269
UMTS	2168.130	0.144	0.457	61.000	133.586

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.001428	1

3.2.22 Meath: Summerhill - Longwave Radio Transmitter

Note re Longwave Measurements

As the point of measurement lay within the reactive near-field region (i.e. within less than one wavelength, here 1.19 km) of the longwave transmitter on 252 kHz, the magnetic component (H-Field) of the emission was measured in addition to the electric component (E-Field)¹⁰.

E-Field (Electric) Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
Longwave Radio	0.252	8.000	8.000	87.000	10.875
FM Radio	100.867	0.007	0.007	28.000	3830.893
FM Radio	91.276	0.007	0.007	28.000	4090.577
FM Radio	93.487	0.007	0.007	28.000	4140.174
TV VHF	207.380	0.015	0.011	28.000	2507.271
TV VHF	191.050	0.012	0.009	28.000	2989.833
TV UHF	799.620	0.011	0.009	38.882	4546.470
TV UHF	775.110	0.009	0.007	38.281	5417.951
GSM900	937.817	0.201	0.402	42.108	104.850
GSM900	943.218	0.190	0.380	42.229	111.128
GSM900	956.667	0.023	0.047	42.529	906.411
GSM900	946.586	0.023	0.046	42.304	924.074

H-Field (Magnetic) Measurements¹¹

Signal Type	Frequency (MHz)	Measured Level (A/m)	ICNIRP Limit (A/m)	Times below limit
Longwave Radio	0.252	0.061	2.897	47.214

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects (E-Field)	1 Hz to 10 MHz	0.091954	1
Electrical Stimulation Effects (H-Field)	1 Hz to 10 MHz	0.012200	1
Thermal Effects (E-Field)	100 kHz and above	0.002306	1
Thermal Effects (H-Field)	100 kHz and above	0.021058	1

¹⁰ See Annex 4 for further explanation of reactive near field measurements.

¹¹ The H-Field is measured in Amperes per meter (A/m).

3.2.23 Roscommon: Ballaghaderreen – Station Road

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
PMR VHF	165.500	0.105	0.105	28.000	265.655
GSM900	938.618	1.136	2.272	42.126	18.541
GSM900	949.174	0.941	1.882	42.362	22.504
GSM900	963.172	0.644	1.288	42.673	33.121
UMTS	2112.470	0.992	3.135	61.000	19.455
UMTS	2147.360	0.189	0.598	61.000	102.008
UMTS	2167.340	0.131	0.416	61.000	146.802

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.00859	1

3.2.24 Tipperary: Knockgraffon

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	102.400	0.004	0.004	28.000	6545.115
FM Radio	97.110	0.004	0.004	28.000	6669.843
TV VHF	191.290	0.005	0.040	28.000	700.331
TV VHF	215.291	0.004	0.031	28.000	913.708
TV UHF	511.249	0.006	0.032	31.090	966.712
TV UHF	487.278	0.004	0.021	30.352	1443.906
GSM900	938.385	0.603	1.205	42.120	34.955
GSM900	943.699	0.390	0.780	42.240	54.126
GSM900	945.615	0.016	0.033	42.282	1292.250
GSM900	951.771	0.005	0.010	42.420	4457.738
UMTS	2112.310	0.445	1.408	61.000	43.338

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.001698	1

3.2.25 Waterford City: Rathfadden - MMDS Transmitter Site

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
PMR VHF	Not disclosed	0.008	0.008	28.000	3487.358
FM Radio	88.304	0.765	0.765	28.000	36.582
FM Radio	100.081	0.690	0.690	28.000	40.609
FM Radio	90.492	0.675	0.675	28.000	41.488
FM Radio	92.683	0.576	0.576	28.000	48.611
FM Radio	97.877	0.487	0.487	28.000	57.459
PMR VHF	153.820	0.657	0.657	28.000	42.650
PMR VHF	153.000	0.544	0.544	28.000	51.518
PMR VHF	165.288	0.009	0.009	28.000	3144.301
PMR VHF	167.262	0.007	0.007	28.000	4144.464
TV VHF	191.430	0.022	0.017	28.000	1660.867
TV VHF	175.370	0.015	0.012	28.000	2381.335
TV VHF	214.740	0.014	0.011	28.000	2524.610
PMR UHF	456.350	0.002	0.002	29.373	19261.135
GSM900	947.012	0.033	0.066	42.314	644.632
GSM900	937.813	0.018	0.037	42.108	1143.608
GSM900	943.080	0.014	0.027	42.226	1541.084
GSM900	954.633	0.011	0.022	42.484	1903.386
GSM1800	1834.187	0.236	0.471	58.888	125.027
GSM1800	1842.577	0.221	0.442	59.022	133.414
GSM1800	1836.388	0.104	0.208	58.923	282.740
GSM1800	1860.960	0.015	0.030	59.316	1977.197
UMTS	2147.690	0.112	0.354	61.000	172.538
UMTS	2166.570	0.017	0.055	61.000	1109.244
UMTS	2113.070	0.016	0.051	61.000	1185.603
UMTS	2130.270	0.010	0.032	61.000	1913.666
MMDS	2624.970	0.114	0.137	61.000	443.778
MMDS	2655.570	0.110	0.133	61.000	458.302
MMDS	2576.690	0.106	0.128	61.000	477.398
MMDS	2639.870	0.100	0.121	61.000	505.801
MMDS	2608.000	0.094	0.113	61.000	538.373
MMDS	2591.890	0.090	0.109	61.000	561.520
MMDS	2561.960	0.089	0.107	61.000	568.741

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.0037895	1

3.2.26 Westmeath: Castlepollard

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	96.100	0.004	0.004	28.000	7476.636
PMR VHF	170.074	0.039	0.039	28.000	716.846
PMR VHF	Not disclosed	0.005	0.005	28.000	5641.749
TV UHF	647.236	0.014	0.073	34.981	478.328
TV UHF	671.285	0.013	0.068	35.625	521.370
TV UHF	623.284	0.013	0.067	34.328	512.565
TV UHF	703.237	0.009	0.050	36.463	735.446
GSM900	954.818	0.993	1.986	42.488	21.394
GSM900	946.813	0.444	0.888	42.309	47.645
GSM900	938.972	0.363	0.726	42.134	58.035
GSM900	942.684	0.197	0.393	42.217	107.422
UMTS	2112.320	0.387	1.224	61.000	49.844
UMTS	2147.500	0.251	0.794	61.000	76.821
UMTS	2167.660	0.178	0.563	61.000	108.369

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.003682	1

3.2.27 Wicklow: Rathdrum Business Park

Measurements

Signal Type	Frequency (MHz)	Measured Level (V/m)	Adjusted Level (V/m)	ICNIRP Limit (V/m)	Times below limit (of Adjusted Level)
FM Radio	102.890	0.006	0.015	28.000	1821.721
GSM900	940.189	2.195	4.390	42.161	9.604
GSM900	938.031	0.123	0.245	42.113	171.608
GSM900	946.961	0.110	0.221	42.313	191.633
GSM900	950.170	0.015	0.029	42.384	1453.502
GSM1800	1880.353	0.002	0.005	59.624	12359.904
UMTS	2113.270	0.289	0.915	61.000	66.677
UMTS	2147.050	0.030	0.094	61.000	651.241

Total Exposure Quotients (calculated from Adjusted Levels)

Quotient	Frequency Range	Calculated Quotient Value	Limit
Electrical Stimulation Effects	1 Hz to 10 MHz	n/a	1
Thermal Effects	100 kHz and above	0.01113	1

4. Conclusion

The conclusion of this report is that at all 27 licensed transmitter sites surveyed by Compliance Engineering Ireland Ltd on behalf of ComReg during May, June and early July 2008:

- (1) Measurements undertaken of non-ionising radiation emission levels on individual frequencies were found to fall below the international ICNIRP reference levels for general public exposure.

- (2) The levels measured were not found to cause the aggregate of non-ionising radiation emissions to exceed the criteria for simultaneous exposure to multiple frequency fields specified in the guidelines published by ICNIRP.

Annex 1 - NIR and Emissions Standards

Definition

Non-ionising radiation (NIR) 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 as well as some Ultraviolet radiation.

Standards for limiting exposure to 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 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 published guidelines¹² for limiting exposure to NIR (up to 300 GHz). Many countries have adopted the 1998 ICNIRP document as the reference for setting emissions limits. It should be noted that in 1999 the Council of the European Union issued a recommendation¹³ to limit exposure of the general public to electromagnetic fields 0Hz - 300GHz

¹² "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.

¹³ 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. An outline of the ICNIRP Guidelines is presented in Annex 2.

Non-ionising radiation licence conditions

It is a condition of various licences¹⁴ issued by ComReg pursuant to the Wireless Telegraphy Act, 1926 (No. 45 of 1926) that licensees must ensure that NIR emissions from each radio installation operated thereunder must be within the limits specified in the guidelines published by ICNIRP.

¹⁴ e.g. GSM, 3G Mobile, Radio and TV Broadcasting, MMDS, FWA (Wireless Broadband), among others.

Annex 2 – The ICNIRP Guidelines

SUMMARY OF THE ICNIRP GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC, MAGNETIC, AND ELECTROMAGNETIC FIELDS (UP TO 300 GHz)

In 1974, the International Radiation Protection Association (IRPA) formed a working group on non-ionising radiation (NIR), which examined the problems arising in the field of protection against the various types of NIR. In 1977, this working group became the International Non-Ionizing Radiation Committee (INIRC).

In cooperation with the Environmental Health Division of the World Health Organization (WHO), the IRPA/INIRC developed a number of health criteria documents on NIR as part of WHO's Environmental Health Criteria Program, sponsored by the United Nations Environment Program (UNEP). Each document includes an overview of the physical characteristics, measurement and instrumentation, sources, and applications of NIR, a thorough review of the literature on biological effects, and an evaluation of the health risks of exposure to NIR. These health criteria have provided the scientific database for the subsequent development of exposure limits and codes of practice relating to NIR.

At the Eighth International Congress of the IRPA, a new, independent scientific organization—the International Commission on Non-Ionizing Radiation Protection (ICNIRP)—was established as a successor to the IRPA/INIRC. The functions of the Commission are to investigate the hazards that may be associated with the different forms of NIR, develop international guidelines on NIR exposure limits, and deal with all aspects of NIR protection.

ICNIRP has defined two guideline exposure limits, one for members of the general public and one for people classified as occupational (e.g. telecommunication engineers). The occupationally exposed population consists of adults who are generally exposed under known conditions and are trained to be aware of potential risk and to take appropriate precautions. By contrast, the general public comprises individuals of all ages and of varying health status, and may include particularly susceptible groups or individuals. In many cases, members of the public are unaware of their exposure to EMF. Moreover, individual members of the public cannot reasonably be expected to take precautions to minimize or avoid exposure. It is these considerations that underlie the adoption of more stringent exposure restrictions for the public than for the occupationally exposed population.

ICNIRP has defined basic restrictions and reference levels. Depending on frequency, the physical quantities used to specify the basic restrictions on exposure to electromagnetic fields (EMF) are current density, specific absorption rate (SAR), and power density. SAR is not easily measurable in living people therefore reference levels have been obtained from the basic restrictions by mathematical modelling and by extrapolation from the results of laboratory investigations at specific frequencies.

The reference levels are provided for comparison with measured values of physical quantities; compliance with all reference levels given in these guidelines will ensure

compliance with basic restrictions. If measured values are higher than reference levels, it does not necessarily follow that the basic restrictions have been exceeded, but a more detailed analysis is necessary to assess compliance with the basic restrictions.

Frequency Range	E – Field Strength (Vm^{-1})	H – Field (Am^{-1})	B – Field (μT)	Equivalent plane wave power S (Wm^{-2})
up to 1 Hz	-	1.63×10^5	2×10^5	-
1 – 8 Hz	20,000	$1.63 \times 10^5/f^2$	$2.5 \times 10^5/f^2$	-
8 – 25 Hz	20,000	$1.63 \times 10^5/f$	$2.5 \times 10^4/f$	-
0.025 – 0.82 kHz	$500/f$	$20/f$	$25/f$	-
0.82 – 65 kHz	610	24.4	30.7	-
0.065 – 1 MHz	610	$1.6/f$	$2.0/f$	-
1 – 10 MHz	$610/f$	$1.6/f$	$2.0/f$	-
10 – 400 MHz	61	0.16	0.2	10
400 – 2000 MHz	$3f^{1/2}$	$0.008f^{1/2}$	$0.01f^{1/2}$	$f/40$
2 – 300 GHz	137	0.36	0.45	50

Table 1: Reference levels for occupational exposure to time-varying electric and magnetic fields (unperturbed rms values). f in units as indicated in the Frequency Range column.

Frequency Range	E – Field Strength (Vm^{-1})	H – Field (Am^{-1})	B – Field (μT)	Equivalent plane wave power S (Wm^{-2})
up to 1 Hz	-	3.2×10^4	4×10^4	-
1 – 8 Hz	10,000	$3.2 \times 10^4/f^2$	$4 \times 10^4/f^2$	-
8 – 25 Hz	10,000	$4,000/f$	$5000/f$	-
0.025 – 0.8 kHz	$250/f$	$4/f$	$5/f$	-
0.8 – 3 kHz	$250/f$	5	6.25	-
3 – 150 kHz	87	5	6.25	-
0.15 - 1 MHz	87	$0.73/f$	$0.092/f$	-
1 – 10 MHz	$87/f^2$	$0.73/f$	$0.092/f$	-
10 – 400 MHz	28	0.16	0.092	2
400 – 2000 MHz	$1.375f^{1/2}$	$0.0037f^{1/2}$	$0.0046f^{1/2}$	$f/200$
2 – 300 GHz	61	0.16	0.20	10

Table 2: Reference levels for general public exposure to time-varying electric and magnetic fields (unperturbed rms values). f in units as indicated in the Frequency Range column.

Simultaneous Exposure to Multiple Frequency Fields (Total Exposure Quotients)

ICNIRP has specified a means of assessing additivity of exposures in situations of simultaneous exposure to fields of different frequencies. Additivity is examined separately for the effects of electrical and thermal stimulation, and ICNIRP has set out basic restrictions which should be met for both considerations.

For practical application of the basic restrictions, ICNIRP has advised that the following criteria¹⁵ regarding reference levels of field strengths should be applied:

Induced Current Density and Electrical Stimulation

For induced current density and electrical stimulation effects, relevant up to 10 MHz, the following two requirements should be applied to the field levels:

$$\sum_{i=1 \text{ Hz}}^{1 \text{ MHz}} \frac{E_i}{E_{L,i}} + \sum_{i>1 \text{ MHz}}^{10 \text{ MHz}} \frac{E_i}{a} \leq 1,$$

and

$$\sum_{j=1 \text{ Hz}}^{65 \text{ kHz}} \frac{H_j}{H_{L,j}} + \sum_{j>65 \text{ kHz}}^{10 \text{ MHz}} \frac{H_j}{b} \leq 1,$$

where

E_i = the electric field strength at frequency i ;

$E_{L,i}$ = the electric field reference level from Tables 1 and 2;

H_j = the magnetic field strength at frequency j ;

$H_{L,j}$ = the magnetic field reference level from Tables 1 and 2;

a = 610 V m⁻¹ for occupational exposure and 87 V m⁻¹ for general public exposure; and

b = 24.4 A m⁻¹ (30.7 μT) for occupational exposure and 5 A m⁻¹ (6.25 μT) for general public exposure.

¹⁵ The calculated values are referred to as '**Total Exposure Quotients**' elsewhere in this report.

Thermal Considerations

For thermal considerations, relevant above 100 kHz, the following two requirements should be applied to the field levels:

$$\sum_{i=100 \text{ kHz}}^{1 \text{ MHz}} \left(\frac{E_i}{c} \right)^2 + \sum_{i>1 \text{ MHz}}^{300 \text{ GHz}} \left(\frac{E_i}{E_{L,i}} \right)^2 \leq 1,$$

and

$$\sum_{j=100 \text{ kHz}}^{1 \text{ MHz}} \left(\frac{H_j}{d} \right)^2 + \sum_{j>1 \text{ MHz}}^{300 \text{ GHz}} \left(\frac{H_j}{H_{L,j}} \right)^2 \leq 1,$$

where

E_i = the electric field strength at frequency i ;

$E_{L,i}$ = the electric field reference level from Tables 1 and 2;

H_j = the magnetic field strength at frequency j ;

$H_{L,j}$ = the magnetic field reference level from Tables 1 and 2;

c = $610/f \text{ V m}^{-1}$ (f in MHz) for occupational exposure and $87/f^{1/2} \text{ V m}^{-1}$ for general public exposure; and

d = $1.6/f \text{ A m}^{-1}$ (f in MHz) for occupational exposure and $0.73/f$ for general public exposure.

Annex 3 – Survey Methodology

The purpose of the surveys was to quantify the electromagnetic field (EMF) present at each area and to identify the frequency and intensity (or level) of the principal emissions contributing to the field. The locations of the survey were chosen by ComReg.

Some of the typical emission types encountered when measuring EMF are AM and FM broadcast radio, broadcast television signals, wireless CCTV, mobile radio, emergency services radios, pager base station radios, taxi base station radios, mobile phone base station signals and wireless broadband signals.

Measurements were carried out broadly in accordance with ECC Recommendation (02)04¹⁶. Some departure from this prescribed methodology was taken, but only in order to take into account the particular signal characteristics of certain emission types (e.g. UMTS and GSM signals having different bandwidths require different measurement bandwidths to be employed in each case)¹⁷. This is in order to provide a more accurate picture of the level of emissions present.

Surveys were, in most cases, conducted in three stages as follows:

1 Initial Site Survey

At all sites surveyed, initial investigations were carried out using a field strength meter and a broadband probe to find the position of the maximum field strength. The probe used for the initial investigation measured and summed all emissions present in a broad frequency range (typically 100 kHz to 3 GHz).

¹⁶ ECC REC (02)04 (revised Bratislava 2003, Helsinki 2007), “MEASURING NON-IONISING ELECTROMAGNETIC RADIATION (9 kHz – 300 GHz)”, published by the European Communications Committee on www.ero.dk

¹⁷ *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.

2 Broadband Measurements

Once the location was identified, the field strength meter and broadband probe were mounted on a non-conductive tripod and the aggregate field strength in Volts per meter was recorded over a period exceeding six minutes.

3 Frequency Selective Measurements

Measurements of emissions at specific frequencies were 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 up to 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 with the ICNIRP general public guideline levels.

Annex 4 – Measurement of Electromagnetic Fields

Electromagnetic fields can be sub-divided into two components:

(1) Electric field **E** [measured in Volts per metre or V/m]

(2) Magnetic field **H** [measured in Amperes per metre or A/m]

The E-field and the H-field are mathematically interdependent¹⁸ in the **far-field** which is the region¹⁹ where the distance from the radiating antenna exceeds the wavelength of the radiated electromagnetic field. The measurement locations for most transmitter installations lie well within the far-field, as the wavelengths of the transmitted signals are relatively short and the antennas are typically located many metres from any public area. The following table shows wavelengths for commonly transmitted signals:

Transmitter Type	Frequency	Wavelength
PMR Low Band VHF	68 MHz	4.41 m
UHF TV	470 MHz	0.64 m
GSM 900 (mobile phone base)	925 MHz	0.32 m
GSM 1800 (mobile phone base)	1805 MHz	0.17 m
UMTS (mobile phone base)	2110 MHz	0.14 m

In the far-field only one component needs to be measured, as the other component can be easily derived from it. Normally it is only the electric field which is measured in this region.

In the case of transmitters of very long wavelength signals, such as long wave radio (1.19 km wavelength), the H-field and E-field must be measured separately as the point of measurement will most likely lie within the **reactive near-field** region. This is the region located less than one wavelength from the radiating antenna. Here, the

¹⁸ $E = H \times Z_0$ where Z_0 (characteristic impedance of free space) $\approx 377 \Omega$




¹⁹ Beyond a distance of $\lambda + 2D^2/\lambda$ where λ is the wavelength and D is the antenna's largest dimension

relationship between E and H becomes very complex and there is no direct correlation between both components of the electromagnetic field.

Measurement Equipment

The measurement of electromagnetic fields is a complex process which involves the use of various meters, spectrum analysers, probes and antennas, which are appropriate to the frequencies of the emissions being measured.

The table below shows examples of equipment typically used to measure electromagnetic fields in non-ionising radiation surveys.

Initial Site Survey and Broadband Measurements	Frequency Selective Measurements	
 <p data-bbox="272 1496 630 1675">Used to measure the overall electric or magnetic field present over a range of frequencies. (e.g. 100kHz to 3GHz)</p>	<p data-bbox="651 947 1007 1025">SPECTRUM ANALYSER WITH TRIPOD MOUNTED ANTENNA CONNECTED</p>  <p data-bbox="651 1496 1050 1742">Spectrum analysers are used to measure individual emissions at specific frequencies. The individual emissions contribute to the overall electromagnetic field. Examples of individual emissions are a TV signal and a mobile phone signal for a particular mobile operator. There may be a number of emissions from different transmitters contributing to the overall electromagnetic field at a particular location.</p>	<p data-bbox="1090 947 1425 1025">PORTABLE SPECTRUM ANALYSER WITH ANTENNA DIRECTLY CONNECTED</p> 

Annex 5 – Derivation of Adjusted Levels

In the case of some services an adjusted level is calculated from the measured electric field level and is presented in the relevant frequency selective measurement table for comparison with the applicable emission limit. For a particular measurement, the adjustment may be performed for any or all of the following reasons

- (1) to compensate for the limited measurement resolution of the spectrum analyser used;
- (2) to extrapolate to an estimate of the level of emissions from a transmitter under maximum traffic conditions (e.g. when a mobile phone base station is serving its maximum number of calls and data clients);
- (3) to account for the characteristics of certain signal types.

Compensating for the limited measurement resolution of the spectrum analyser.

In many cases it is necessary to compensate for the limited measurement resolution of the spectrum analyser, as the bandwidth of the signal measured may be greater than the resolution bandwidth (RBW) of the analyser. For example, a measurement of a digital television signal performed with at an RBW setting of 5 MHz needs to be adjusted upwards by multiplying it by a correction factor in order to account for the energy present within the full 7.6 MHz bandwidth of the signal.

The correction factor is derived as follows:

Correction Factor: $K = 10 \times \log_{10} (B_{\text{Signal}} / B_{\text{N}})$

(for a Gaussian Filter: $B_{\text{N}} = 1.1 \times B_{3\text{dB}}$)

Example:

IF

$$\text{RBW (i.e. } B_{3\text{dB}}) = 1 \text{ MHz}$$

$$B_{\text{Signal}} = 4.6 \text{ MHz}$$

THEN

$$B_{\text{N}} = 1.1 \times 1$$

AND

$$K = 10 \times \log_{10} (4.6 / 1.1) = 6.2 \text{ dB}$$

Extrapolation to Max Traffic Signal Level

In the case of some networks it is necessary to extrapolate to an estimate of the level under maximum traffic from the transmitter. For example, the base stations of mobile telephone networks produce emissions which vary according to the changing volume of calls or data traffic over the course of the day.

In the cases of GSM, TETRA and UMTS (3G), the estimated electric field levels for maximum traffic conditions are extrapolated from the constant pilot channels (BCCH for GSM and TETRA and P-CPICH for UMTS) as follows:

GSM and TETRA:

V/m Calculation	dB Calculation
$E_{MAX} = \text{Signal Level (BCCH)} \times \sqrt{\text{no. channels per sector or}^* \text{)}}$	$E_{MAX} = \text{Signal Level (BCCH)} + 10\text{Log}(\text{no. channels per sector}^*)$
<p>* number of channels per sector, if not known, is taken as: 4 for GSM 3 for TETRA (Emergency) 2 for TETRA (Civil)</p>	

UMTS:

V/m Calculation	dB Calculation
$E_{MAX} = \text{Signal Level (P-CPICH)} \times \text{Extrapolation Factor (=3.1623)}$	$E_{MAX} = \text{Signal Level (C-PCICH estimate)} + \text{Extrapolation Factor (=10 dB)}$
<p>The P-CPICH transmits with a constant power typically 10 dB below P_{MAX}. The signal level measured is taken as an estimate of the P-CPICH level if the measurement receiver is unable to identify and measure any P-CPICH channels present.</p>	

If necessary, as in the case of GSM and TETRA, the frequencies of the pilot channels present have been identified prior to recording the standard frequency selective scan of the band.

Accounting for characteristics of certain signal types:

In the case of some signals with a complex structure, such as analogue PAL television, it is necessary to apply a correction factor for reasons such as the following:

- to take into account characteristics of the signal shape, which make it difficult to measure an RMS level directly, which is indicative of worst case exposure.
- to derive a level more indicative of the aggregate of emissions attributable to the individual signal components.

Analogue PAL TV

- The peak field strength caused by the synch pulses of the picture carrier is measured.
- The field strength from the picture signal is at its highest when a black picture is being transmitted.
- It is assumed that 100% black picture is transmitted permanently for worst case exposure evaluation.
- The mean (RMS) level is then calculated from the synch pulse level by applying a correction factor.
- The value of this **correction factor** is **-2.3 dB**.
- The small contributions of the FM and NICAM sound signals have already been taken into consideration in this factor.

Annex 6 – Glossary

Antenna: - A conductive structure specifically designed to couple or to radiate electromagnetic energy.

BCCH: - Broadcast control channel. BCCH is a constant carrier on GSM base stations. Essentially it is the ‘always on’ pilot channel. The constant signal level of the BCCH allows for extrapolation to a maximum traffic signal level for a base station.

Broadband Measurement: - A measurement carried out using a meter and probe combination that simultaneously measures and sums all received signals within the frequency range of the probe. Generally this meter and probe combination is not as sensitive as the equipment used for narrowband measurements but is useful for getting an overall picture of the level of electromagnetic fields present at a site.

ComReg: - The Commission for Communications Regulation. ComReg is the statutory body responsible for the regulation of the electronic communications sector (telecommunications, radiocommunications and broadcasting transmission) and the postal sector in Ireland.

Electric Field Strength: - Electric field strength is a quantitative expression of the intensity of an electric field at a particular location. The standard unit is the Volt per meter (V/m). A field strength of 1 V/m represents a potential difference of one volt between points separated by one meter.

Electromagnetic Field (EMF): - Combined electric and magnetic fields, in this case radiating from an antenna.

Electromagnetic Spectrum: - The complete range of the wavelengths of electromagnetic radiation, beginning with the radio waves and extending through microwaves and visible light (a very small part of the spectrum) all the way to the extremely short gamma rays that are a product of radioactive atoms. The electromagnetic spectrum contains both non-ionizing and ionizing radiation

Frequency: - The number of cycles completed in one second by an electromagnetic wave. It is expressed in Hertz (Hz) or a multiple of Hertz, e.g. kHz (kilohertz, 1,000 Hertz), MHz (MegaHertz, 1,000,000 Hertz) and GHz (GigaHertz, 1,000,000,000 Hertz).

Frequency Range: - A group of frequencies between a selected start and stop frequency. E.g. the frequency range of the FM broadcast band includes all frequencies between 88 and 108 MHz.

Frequency Selective Measurement: - A measurement carried out using a receiver and an antenna which measures the received signal strength at specific frequencies. A spectrum analyser is usually used as the receiver, and a range of antennas is used which are suitable for reception of all the frequencies to be measured.

ICNIRP: - The International Commission on Non-Ionizing Radiation Protection.

Ionising radiation: - Ionising radiation, also called radioactivity, is electromagnetic (EM) radiation whose waves contain energy sufficient to overcome the binding energy of electrons in atoms or molecules, thus creating ions. It occurs at frequencies higher than ultraviolet light and includes x-rays and gamma rays. The sources of electromagnetic fields measured in this survey do not produce any ionising radiation.

Isotropic probe: Receives electromagnetic signals regardless of polarisation or direction of travel. An isotropic probe is designed to give the same reading, no matter which way it is pointed.

Non-ionising radiation (NIR): - Includes all radiations and fields of the electromagnetic spectrum that do not normally have sufficient energy to produce ionization in matter; characterized by energy per photon less than approximately 12 electron Volts, wavelengths greater than 100 nm, and frequencies lower than 3×10^{15} Hz.

Occupational Exposure: - All exposure to EMF experienced by individuals who are exposed under known conditions in the course of performing their work and who are trained to be aware of potential risk and to take appropriate precautions.

Public Exposure: - All exposure to EMF experienced by members of the general public, excluding occupational exposure and exposure during medical procedures.

P-CPICH: - Primary Common Pilot channel. P-CPICH is a downlink channel broadcast by UMTS Node-Bs (i.e. 3G base stations) with constant power. It allows extrapolation to a maximum traffic signal level for a UMTS channel.

Radiofrequency (RF): - For this survey any radio signals between the frequencies 100 kHz to 40 GHz.

Spectrum analyser: - An instrument that displays signal amplitude (strength) as it varies by signal frequency. The frequency appears on the horizontal axis, and the amplitude is displayed on the vertical axis. It can be set to sweep a frequency band where the amplitude of the received signals show up as spikes on the recorded trace.