



Commission for
Communications Regulation

Report

Programme of Measurement of Non-Ionising Radiation emissions

0497 - Saggart Hill

Site Measurement Date:

30th April 2004

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1 Introduction

The Commission for Communications Regulation (ComReg) is the licensing authority for the use of the radio frequency spectrum in Ireland. This spectrum is a 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.

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 have access. Non-ionising radiation is that part of the electromagnetic spectrum below 2420 million MHz. Radiowaves, infra-red radiation and visible light are examples of NIR.(See Annex 1)

This report is arranged as follows:

The first section is an introduction to the programme.

The second section outlines the role of the ComReg in the area of NIR. It also outlines Mason Communications role in the programme.

The third section is Mason Communications' report on the measurement programme for the site. The site report contains a conclusion on the extent of compliance of the site with the general public exposure limits of the ICNIRP Guidelines 1998.

The Annex section contains two sections 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.

There is also a glossary explaining each of the terms used through the report.

2 Background

2.1 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 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.

At the outset of the programme, ComReg invited nominations from the interested parties for telecommunication masts to be included. The last date for nominations was 6th June 2003 and on this date some thirty sites had been nominated by the public and 25 by the Minister's department. The other sites were chosen on a random basis by Mason/RFI. Both methods of choosing sites were based on population distribution.

2.2 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 and to produce a report on each site. Mason Communications Ireland Ltd. is a wholly owned subsidiary of Mason Group Ltd. Mason advises many of the leading organisations in 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.

3 NIR Site Measurements Conclusion and Results

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 surveyed¹. 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.

Section 3.2 provides a set of graphs and tables for each location where measurements were made.

At each location 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. To the left of each of the results tables, a graphical snapshot of the radio spectrum being analysed is presented.

The power density and the quotient contained in these graphs are given in exponential (E) format. The reason for this is that the value is too long to be represented as a decimal number in the tables. An example of this is as follows:

$$3.61469\text{E-}09 = 3.61469 \times 10^{-9} = .00000000361469$$

It is therefore very important to note the values after E to identify the highest reading at any site. For each table at each position the highest reading is at the top of the relevant list.

¹ See Annex 2 for the site measurement methodology



Site Survey Report from Mason Communications Ltd / Radio Frequency Investigation Ltd

Audit Site: MDS01 – Saggart Hill

	NAME	SIGNATURE	DATE
PREPARED BY	S. Roe		6 th May 2004
REVIEWED BY	I. McDonald		7 th May 2004
SIGNED-OFF BY	P. Coakley		10 th May 2004
This report has been reviewed by Mason Communications and accurately reflects the measurements taken at Saggart Hill by Dan Smith on 30 th April 2004.			

3.1 Conclusion of site report results

The following table is a summary of the highest readings taken at this site:

Site	Frequency Range	Highest reading W/m ²	ICNIRP guideline Limit W/m ²
Saggart Hill	30MHz – 85MHz	0.003790170	2
	85MHz – 95MHz	0.019663402	2
	95MHz – 105MHz	0.019349006	2
	105MHz – 115MHz	0.000000112	2
	115MHz – 170MHz	0.000298304	2
	170MHz – 230MHz	0.000006021	2
	230MHz – 470MHz	0.000493922	2
	470MHz – 670MHz	0.000000105	3.125
	670MHz – 870MHz	0.000001471	4.005
	870MHz – 1GHz	0.003393584	4.6995
	GSM 900	0.004108267	4.6991
	GSM 1800	0.000000004	9.25
	1GHz – 2GHz	0.000002908	7.165
	2GHz – 10GHz	0.000006929	10
	10GHz – 18GHz	0.000042040	10
18GHz – 40GHz	0.000941150	10	

The overall measurements taken at the site and given in part 3.2 of this report conclude that the NIR emissions from the site are below the ICNIRP guideline limits.

3.2 Site Report – Saggart Hill

3.2.1 Detailed Results

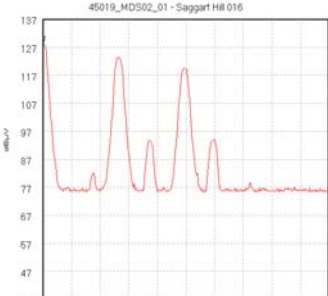
3.2.1.1 Position 1. Saggart Hill, Adjacent to Masts, 14 m South of Nearest Mast.

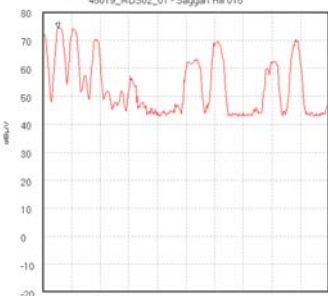
Site: Saggart Hill Location: Position 1 NGR: O 01735 22537 Date: 30/04/04 Officer: Dan Smith	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205 Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
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30 MHz to 85 MHz					
<p>45019_MD502_01 - Saggart Hill 018</p> <p>Start 30.0 MHz; Stop 85.0 MHz Ref 117 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 79.23 MHz; 116.12 dBµV Transducer Factors: Bi-Conical 30/04/2004 14:49:48</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	79.23	0.001085572	2	1842.346637	0.000542786
	80.05	0.000126374	2	15826.00672	6.31871E-05
	81.97	0.000000057	2	35186117.28	2.84203E-08
	76.48	0.000000030	2	65670654.68	1.52275E-08
	82.8	0.000000016	2	122848920.9	8.14008E-09
	84.17	0.000000016	2	128047571.4	7.8096E-09
	66.44	0.000000006	2	344644495	2.90154E-09
	70.43	0.000000006	2	354300157.9	2.82247E-09
	74.28	0.000000005	2	391175229.4	2.5564E-09
				Total Quotient	0.000606041

85 MHz to 95 MHz					
<p>45019_MD502_01 - Saggart Hill 017</p> <p>Start 85.0 MHz; Stop 95.0 MHz Ref 137 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 94.95 MHz; 128.7 dBµV Transducer Factors: Bi-Conical 30/04/2004 14:47:52</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	94.95	0.019663402	2	101.7118013	0.009831701
	86.25	0.000018521	2	107986.9676	9.26038E-06
	91.37	0.000018521	2	107986.9676	9.26038E-06
	89.12	0.000008085	2	247383.851	4.0423E-06
	93.55	0.000007407	2	270004.7136	3.70364E-06
	90.72	0.000000482	2	4153090.031	2.40785E-07
					Total Quotient

Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 1	Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
NGR: O 01735 22537	
Date: 30/04/04	
Officer: Dan Smith	

95 MHz to 105 MHz						
 <p>45019_MDS02_01 - Saggart Hill 016</p> <p>Start 95.0 MHz; Stop 105.0 MHz Ref 117 dBµV; Ref Offset 0.0 dB; 10 dB/oct RBW 100.0 kHz; VBW 100.0 kHz; Att 0.0 dB; Swp 0.0 pS Peak 95.02 MHz; 128.63 dBµV Transducer Factors: Bi-Conical 30042004 14:45:17</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	
	95.02	0.019349006	2	103.3644852	0.009674503	
	97.65	0.005776418	2	346.2353017	0.002888209	
	99.95	0.002430293	2	822.9460137	0.001215147	
	101	0.000007041	2	284034.6644	3.5207E-06	
	98.72	0.000006232	2	320901.2035	3.11622E-06	
	96.8	0.000000426	2	4692144.15	2.13122E-07	
					Total Quotient	0.013784709

105 MHz to 115 MHz					
 <p>45019_MDS02_01 - Saggart Hill 015</p> <p>Start 105.0 MHz; Stop 115.0 MHz Ref 80 dBµV; Ref Offset 0.0 dB; 10 dB/oct RBW 100.0 kHz; VBW 100.0 kHz; Att 0.0 dB; Swp 0.0 pS Peak 105.55 MHz; 74.3 dBµV Transducer Factors: Bi-Conical 30042004 14:42:41</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	105.55	0.000000071	2	28013756.27	3.56967E-08
	106.08	0.000000070	2	28600349.87	3.49646E-08
	106.83	0.000000029	2	69722242.31	1.43426E-08
	113.85	0.000000028	2	72006440.99	1.38876E-08
	111.13	0.000000024	2	83439433.31	1.19847E-08
	110.38	0.000000005	2	365907529.1	2.73293E-09
	113.13	0.000000005	2	430894892.1	2.32075E-09
	108.05	0.000000001	2	1446676230	6.9124E-10
	107.75	0.000000000	2	4879455323	2.04941E-10
					Total Quotient

Site: Saggart Hill Location: Position 1 NGR: O 01735 22537 Date: 30/04/04 Officer: Dan Smith	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205 Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
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115 MHz to 170 MHz

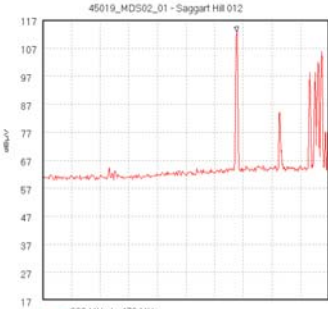
<p>45019_MD502_01 - Saggart Hill 014</p> <p>Start 115.0 MHz; Stop 170.0 MHz Ref 117 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 165.88 MHz; 107.57 dBµV Transducer Factors: Bi-Conical 30042004 14.36.28</p>	<table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>S (power density) W/m²</th> <th>ICNIRP Limit W/m²</th> <th>Times less than ICNIRP</th> <th>Quotient</th> </tr> </thead> <tbody> <tr> <td>165.88</td> <td>0.000151586</td> <td>2</td> <td>13193.84403</td> <td>7.57929E-05</td> </tr> <tr> <td>163.95</td> <td>0.000076148</td> <td>2</td> <td>26264.63355</td> <td>3.8074E-05</td> </tr> <tr> <td>122.29</td> <td>0.000000101</td> <td>2</td> <td>19832220.66</td> <td>5.0423E-08</td> </tr> <tr> <td>154.33</td> <td>0.000000052</td> <td>2</td> <td>38492077</td> <td>2.59794E-08</td> </tr> <tr> <td>123.8</td> <td>0.000000026</td> <td>2</td> <td>76625151.44</td> <td>1.30505E-08</td> </tr> <tr> <td>153.5</td> <td>0.000000025</td> <td>2</td> <td>80236383.57</td> <td>1.24632E-08</td> </tr> <tr> <td>168.63</td> <td>0.000000011</td> <td>2</td> <td>182966401.2</td> <td>5.46548E-09</td> </tr> <tr> <td>167.11</td> <td>0.000000005</td> <td>2</td> <td>389377942.4</td> <td>2.5682E-09</td> </tr> <tr> <td colspan="4">Total Quotient</td> <td>0.000113977</td> </tr> </tbody> </table>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	165.88	0.000151586	2	13193.84403	7.57929E-05	163.95	0.000076148	2	26264.63355	3.8074E-05	122.29	0.000000101	2	19832220.66	5.0423E-08	154.33	0.000000052	2	38492077	2.59794E-08	123.8	0.000000026	2	76625151.44	1.30505E-08	153.5	0.000000025	2	80236383.57	1.24632E-08	168.63	0.000000011	2	182966401.2	5.46548E-09	167.11	0.000000005	2	389377942.4	2.5682E-09	Total Quotient				0.000113977
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	167.11	0.000000005	2	389377942.4	2.5682E-09																																														
	Total Quotient				0.000113977																																														

170 MHz to 230 MHz

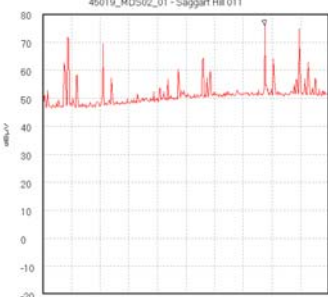
<p>45019_MD502_01 - Saggart Hill 013</p> <p>Start 170.0 MHz; Stop 230.0 MHz Ref 100 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 207.8 MHz; 93.58 dBµV Transducer Factors: Bi-Conical 30042004 14.36.28</p>	<table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>S (power density) W/m²</th> <th>ICNIRP Limit W/m²</th> <th>Times less than ICNIRP</th> <th>Quotient</th> </tr> </thead> <tbody> <tr> <td>207.8</td> <td>0.000006021</td> <td>2</td> <td>332178.3671</td> <td>3.01043E-06</td> </tr> <tr> <td>183.5</td> <td>0.000000847</td> <td>2</td> <td>2362497.436</td> <td>4.23281E-07</td> </tr> <tr> <td>189.65</td> <td>0.000000400</td> <td>2</td> <td>5004622.751</td> <td>1.99815E-07</td> </tr> <tr> <td>213.8</td> <td>0.000000334</td> <td>2</td> <td>5989234.89</td> <td>1.66966E-07</td> </tr> <tr> <td>190.1</td> <td>0.000000205</td> <td>2</td> <td>9735793.323</td> <td>1.02714E-07</td> </tr> <tr> <td>215.9</td> <td>0.000000134</td> <td>2</td> <td>14872067.43</td> <td>6.72401E-08</td> </tr> <tr> <td>192.95</td> <td>0.000000058</td> <td>2</td> <td>34464449.5</td> <td>2.90154E-08</td> </tr> <tr> <td>195.2</td> <td>0.000000037</td> <td>2</td> <td>54371503.93</td> <td>1.8392E-08</td> </tr> <tr> <td>191.75</td> <td>0.000000030</td> <td>2</td> <td>67355233.47</td> <td>1.48467E-08</td> </tr> <tr> <td colspan="4">Total Quotient</td> <td>4.0327E-06</td> </tr> </tbody> </table>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	207.8	0.000006021	2	332178.3671	3.01043E-06	183.5	0.000000847	2	2362497.436	4.23281E-07	189.65	0.000000400	2	5004622.751	1.99815E-07	213.8	0.000000334	2	5989234.89	1.66966E-07	190.1	0.000000205	2	9735793.323	1.02714E-07	215.9	0.000000134	2	14872067.43	6.72401E-08	192.95	0.000000058	2	34464449.5	2.90154E-08	195.2	0.000000037	2	54371503.93	1.8392E-08	191.75	0.000000030	2	67355233.47	1.48467E-08	Total Quotient				4.0327E-06
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	195.2	0.000000037	2	54371503.93	1.8392E-08																																																			
	191.75	0.000000030	2	67355233.47	1.48467E-08																																																			
Total Quotient				4.0327E-06																																																				

Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 1	Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
NGR: O 01735 22537	
Date: 30/04/04	
Officer: Dan Smith	

230 MHz to 470 MHz

 <p>45019_MDS02_01 - Saggart Hill 012</p> <p>Start 230.0 MHz; Stop 470.0 MHz Ref 117 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 300.0 kHz; VBW 300.0 kHz; Att 0 dB; Swp 0.0 pS Peak 392.6 MHz; 112.7 dBµV Transducer Factors: Log Periodic 30/04/2004 14:28:41</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	392.6	0.000493922	2	4049.219745	0.000246961
	463.4	0.000101779	2.317	22764.98581	4.39271E-05
	460.4	0.000043920	2.302	52413.92338	1.90789E-05
	453.8	0.000018309	2.269	123929.8278	8.06908E-06
	458	0.000017769	2.29	128877.4198	7.75931E-06
	428.6	0.000000696	2.143	3078672.704	3.24815E-07
	466.4	0.000000139	2.332	16790742.3	5.95566E-08
				Total Quotient	0.00032618

470 MHz to 670 MHz

 <p>45019_MDS02_01 - Saggart Hill 011</p> <p>Start 470.0 MHz; Stop 670.0 MHz Ref 80 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 625.0 MHz; 75.99 dBµV Transducer Factors: Log Periodic 30/04/2004 14:22:47</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	625	0.000000105	3.125	29661381.31	3.37139E-08
	649	0.000000079	3.245	41167647.61	2.42909E-08
	487.5	0.000000041	2.4375	60156972.92	1.66232E-08
	512	0.000000022	2.56	114177706.6	8.75828E-09
	582	0.000000007	2.91	401083078	2.49325E-09
	631	0.000000007	3.155	471346963.7	2.12158E-09
	655	0.000000005	3.275	652458141.2	1.53267E-09
	485	0.000000005	2.425	496653034.3	2.01348E-09
	564.5	0.000000003	2.8225	1006874404	9.93173E-10
				Total Quotient	9.25404E-08

Site: Saggart Hill Location: Position 1 NGR: O 01735 22537 Date: 30/04/04 Officer: Dan Smith	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205 Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
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670 MHz to 870 MHz

<p>45019_MDS02_01 - Saggart Hill 010</p> <p>Start 670.0 MHz; Stop 870.0 MHz Ref 90.0 dBµV; Ref Offset 0.0 dB; 10 dBdiv RBW 100.0 kHz; VBW 100.0 kHz; Att 0.0 dB; Swp 0.0 pS Peak 801.0 MHz; 83.55 dBµV Transducer Factors: Log Periodic 30/04/2004 14:18:33</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	
	801	0.000000601	4.005	6667205.949	1.49988E-07	
	776.5	0.000000131	3.8825	29747660.38	3.36161E-08	
	671.5	0.000000093	3.3575	35921740.53	2.78383E-08	
	704	0.000000054	3.52	64846122.69	1.54211E-08	
	807	0.000000048	4.035	83211794.77	1.20175E-08	
	833	0.000000010	4.165	416827492.6	2.39907E-09	
	752.5	0.000000008	3.7625	483969350.4	2.06625E-09	
	805	0.000000007	4.025	550943717.3	1.81507E-09	
	782.5	0.000000006	3.9125	603664588.9	1.65655E-09	
					Total Quotient	2.46818E-07

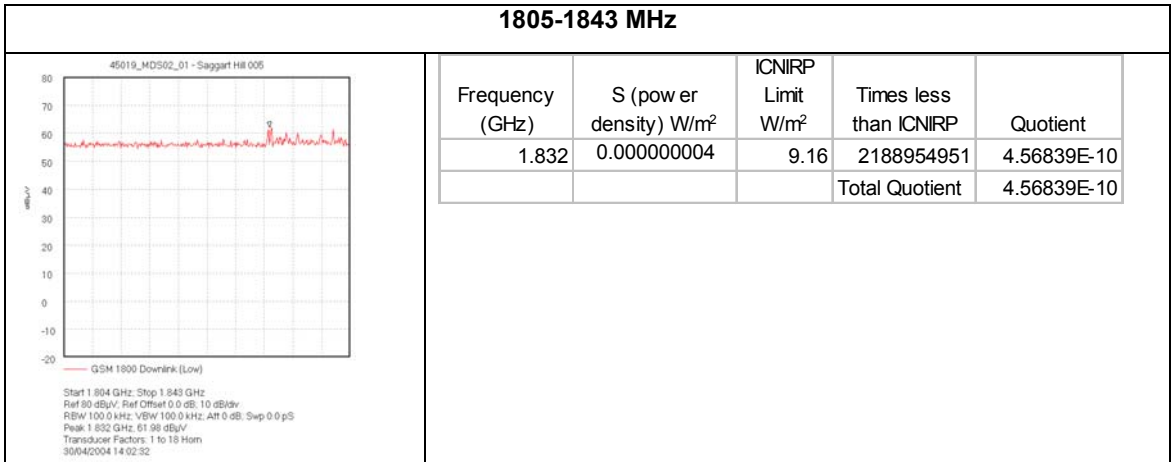
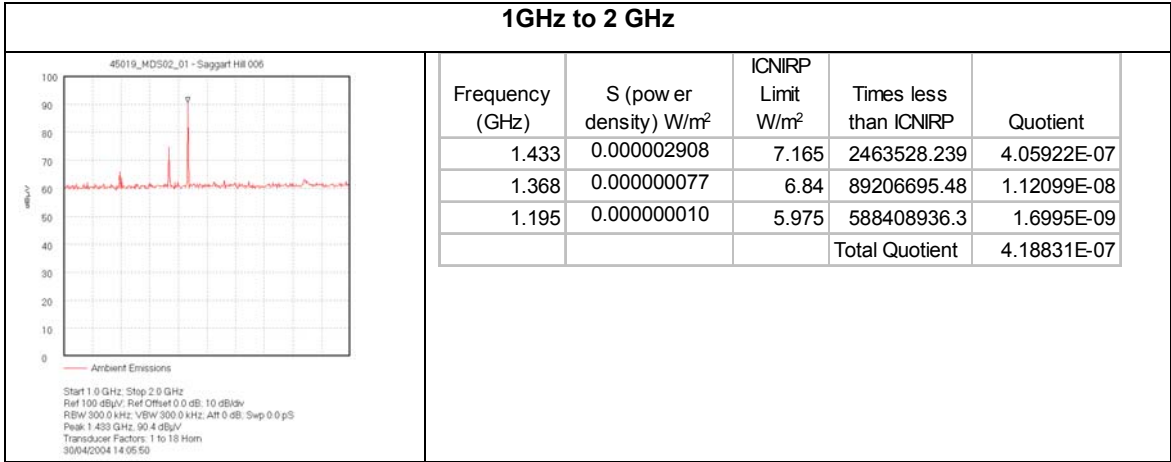
870 MHz to 1 GHz

<p>45019_MDS02_01 - Saggart Hill 008</p> <p>Start 870.0 MHz; Stop 1.0 GHz Ref 127.0 dBµV; Ref Offset 0.0 dB; 10 dBdiv RBW 100.0 kHz; VBW 100.0 kHz; Att 0.0 dB; Swp 0.0 pS Peak 939.9 MHz; 121.07 dBµV Transducer Factors: Log Periodic 30/04/2004 14:12:21</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	
	939.9	0.003393584	4.6995	1384.81897	0.000722116	
	944.1	0.000149506	4.7205	31573.98165	3.16716E-05	
	960	0.000008141	4.8	589634.0941	1.69597E-06	
	959.4	0.000006834	4.797	701957.9042	1.42459E-06	
	958.1	0.000004332	4.7905	1105916.136	9.04228E-07	
	953.8	0.000001076	4.769	4433724.183	2.25544E-07	
					Total Quotient	0.000758038

Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 1	Antenna: Manufacturer: EMCO Model: 3146A Serial Number: 3993
NGR: O 01735 22537	
Date: 30/04/04	
Officer: Dan Smith	

GSM 900					
<p>45019_MD502_01 - Saggart Hill 007</p> <p>Start 924.0 MHz; Stop 961.0 MHz Ref 127 dBµV; Ref Offset 0.0 dB; 10 dB/div RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 939.82 MHz; 121.9 dBµV Transducer Factors: sig periodic 30/04/2004 14:09:35</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	939.82	0.004108267	4.6991	1143.815658	0.000874267
	943.98	0.000166211	4.7199	28397.11025	3.52149E-05
	959.8	0.000007580	4.799	633128.8449	1.57946E-06
	959.06	0.000007058	4.7953	679449.4205	1.47178E-06
	957.67	0.000006913	4.78835	692671.37	1.44369E-06
	958.32	0.000006663	4.7916	719154.01	1.39052E-06
	945.09	0.000005113	4.72545	924239.4938	1.08197E-06
	954.15	0.000000683	4.77075	6981166.712	1.43243E-07
				Total Quotient	0.000916592

Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 1	
NGR: O 01735 22537	Antenna: Manufacturer: EMCO Model: 3115 Serial Number: 1203
Date: 30/04/04	
Officer: Dan Smith	



Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 1	Antenna: Manufacturer: EMCO Model: 3115 Serial Number: 1203
NGR: O 01735 22537	
Date: 30/04/04	
Officer: Dan Smith	

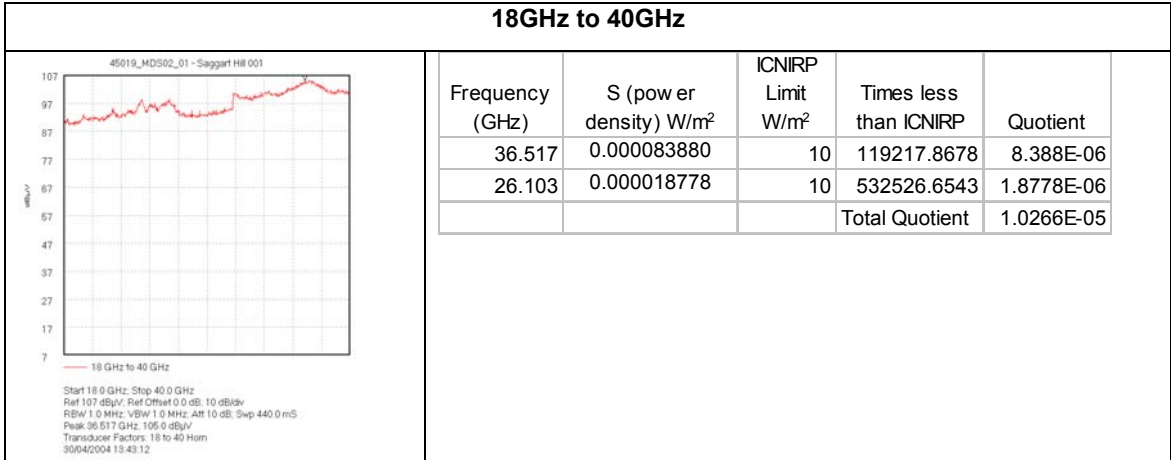
1842 – 1880MHz					
<p>46019_MDS02_01 - Saggart Hill 004</p> <p>Start 1.842 GHz; Stop 1.881 GHz Ref: 50 dBµV; Ref Offset: 0.0 dB; 1.0 dB/div RBW: 100.0 kHz; VBW: 100.0 kHz; Att: 0 dB; Step: 0.0 pS Peak: 1.85 GHz; 62.17 dBµV Transducer Factors: 1 to 18 Horn 30/04/2004 14:00:01</p>	Frequency (GHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	
	1.85	0.000000004	9.25	2115841265	
				Total Quotient	4.7263E-10
				Quotient	4.7263E-10

Site: Saggart Hill	Receiver: Manufacturer: Agilent/HP Model: 8565E Serial Number: 3846A01089
Location: Position 1	Antenna: Manufacturer: EMCO Model: 3115 Serial Number: 1203
NGR: O 01735 22537	
Date: 30/04/04	
Officer: Dan Smith	

2GHz to 10GHz																										
<p>45019_MD502_01 - Saggart Hill 003</p> <p>Start 2.0 GHz; Stop 10.0 GHz Ref 107 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 160.0 mS Peak 2.733 GHz; 94.17 dBµV Transducer Factors: 1 to 18 Horn 30042004 13:47:40</p>	<table border="1"> <thead> <tr> <th>Frequency (GHz)</th> <th>S (power density) W/m²</th> <th>ICNIRP Limit W/m²</th> <th>Times less than ICNIRP</th> <th>Quotient</th> </tr> </thead> <tbody> <tr> <td>2.733</td> <td>0.000006929</td> <td>10</td> <td>1443249.282</td> <td>6.92881E-07</td> </tr> <tr> <td>9.227</td> <td>0.000004204</td> <td>10</td> <td>2378709.189</td> <td>4.20396E-07</td> </tr> <tr> <td>9.48</td> <td>0.000001278</td> <td>10</td> <td>7822423.961</td> <td>1.27838E-07</td> </tr> <tr> <td colspan="3">Total Quotient</td> <td></td> <td>1.24111E-06</td> </tr> </tbody> </table>	Frequency (GHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	2.733	0.000006929	10	1443249.282	6.92881E-07	9.227	0.000004204	10	2378709.189	4.20396E-07	9.48	0.000001278	10	7822423.961	1.27838E-07	Total Quotient				1.24111E-06
	Frequency (GHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient																					
	2.733	0.000006929	10	1443249.282	6.92881E-07																					
	9.227	0.000004204	10	2378709.189	4.20396E-07																					
	9.48	0.000001278	10	7822423.961	1.27838E-07																					
Total Quotient				1.24111E-06																						

10GHz to 18GHz																
<p>45019_MD502_01 - Saggart Hill 002</p> <p>Start 10.0 GHz; Stop 18.0 GHz Ref 117 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 1.0 MHz; VBW 1.0 MHz; Att 20 dB; Swp 160.0 mS Peak 17.36 GHz; 102.0 dBµV Transducer Factors: 1 to 18 Horn 30042004 13:45:50</p>	<table border="1"> <thead> <tr> <th>Frequency (GHz)</th> <th>S (power density) W/m²</th> <th>ICNIRP Limit W/m²</th> <th>Times less than ICNIRP</th> <th>Quotient</th> </tr> </thead> <tbody> <tr> <td>17.36</td> <td>0.000042040</td> <td>10</td> <td>237870.9189</td> <td>4.20396E-06</td> </tr> <tr> <td colspan="3">Total Quotient</td> <td></td> <td>4.20396E-06</td> </tr> </tbody> </table>	Frequency (GHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	17.36	0.000042040	10	237870.9189	4.20396E-06	Total Quotient				4.20396E-06
	Frequency (GHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient											
	17.36	0.000042040	10	237870.9189	4.20396E-06											
Total Quotient				4.20396E-06												

Site: Saggart Hill	Receiver: Manufacturer: Agilent/HP Model: 8565E Serial Number: 3846A01089
Location: Position 1	Antenna: Manufacturer: EMCO Model: 3116 Serial Number: 9611-2330
NGR: O 01735 22537	
Date: 30/04/04	
Officer: Dan Smith	



3.2.1.2 Position 2. Saggart Hill, Adjacent to Masts, approximately 40 m South West of Nearest Mast.

Site: Saggart Hill Location: Position 2 NGR: O 01730 22782 Date: 30/04/04 Officer: Dan Smith	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205 Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
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30 MHz to 85 MHz																					
<p>45019_MD502_02 - Saggart Hill 001</p> <p>Start 30.0 MHz; Stop 85.0 MHz Ref 127 dBµV; Ref Offset 0.0 dB; 10 dB/dv REW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 79.23 MHz; 121.56 dBµV Transducer Factors: Br-Conical 30/04/2004 15:13:59</p>	<table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>S (power density) W/m²</th> <th>ICNIRP Limit W/m²</th> <th>Times less than ICNIRP</th> <th>Quotient</th> </tr> </thead> <tbody> <tr> <td>79.23</td> <td>0.003790170</td> <td>2</td> <td>527.680865</td> <td>0.001895085</td> </tr> <tr> <td>80.05</td> <td>0.000537847</td> <td>2</td> <td>3718.530482</td> <td>0.000268923</td> </tr> <tr> <td colspan="4">Total Quotient</td> <td>0.002164008</td> </tr> </tbody> </table>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	79.23	0.003790170	2	527.680865	0.001895085	80.05	0.000537847	2	3718.530482	0.000268923	Total Quotient				0.002164008
Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient																	
79.23	0.003790170	2	527.680865	0.001895085																	
80.05	0.000537847	2	3718.530482	0.000268923																	
Total Quotient				0.002164008																	

85 MHz to 95 MHz																																																								
<p>45019_MD502_02 - Saggart Hill 002</p> <p>Start 85.0 MHz; Stop 95.0 MHz Ref 127 dBµV; Ref Offset 0.0 dB; 10 dB/dv REW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 94.95 MHz; 121.58 dBµV Transducer Factors: Br-Conical 30/04/2004 15:13:02</p>	<table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>S (power density) W/m²</th> <th>ICNIRP Limit W/m²</th> <th>Times less than ICNIRP</th> <th>Quotient</th> </tr> </thead> <tbody> <tr> <td>94.95</td> <td>0.003816442</td> <td>2</td> <td>524.0483355</td> <td>0.0019082</td> </tr> <tr> <td>91.4</td> <td>0.000008122</td> <td>2</td> <td>246247.2255</td> <td>4.06096E-</td> </tr> <tr> <td>89.15</td> <td>0.000003595</td> <td>2</td> <td>556379.7895</td> <td>1.79733E-</td> </tr> <tr> <td>93.57</td> <td>0.000003182</td> <td>2</td> <td>628595.6132</td> <td>1.59085E-</td> </tr> <tr> <td>89.6</td> <td>0.000000497</td> <td>2</td> <td>4021345.112</td> <td>2.48673E-</td> </tr> <tr> <td>90.72</td> <td>0.000000164</td> <td>2</td> <td>12228448.13</td> <td>8.17765E-</td> </tr> <tr> <td>87.82</td> <td>0.000000131</td> <td>2</td> <td>15323971.86</td> <td>6.52572E-</td> </tr> <tr> <td>88.52</td> <td>0.000000080</td> <td>2</td> <td>24967286.56</td> <td>4.00524E-</td> </tr> <tr> <td>92.92</td> <td>0.000000061</td> <td>2</td> <td>32989166.73</td> <td>3.0313E-</td> </tr> <tr> <td colspan="4">Total Quotient</td> <td>0.0019161</td> </tr> </tbody> </table>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient	94.95	0.003816442	2	524.0483355	0.0019082	91.4	0.000008122	2	246247.2255	4.06096E-	89.15	0.000003595	2	556379.7895	1.79733E-	93.57	0.000003182	2	628595.6132	1.59085E-	89.6	0.000000497	2	4021345.112	2.48673E-	90.72	0.000000164	2	12228448.13	8.17765E-	87.82	0.000000131	2	15323971.86	6.52572E-	88.52	0.000000080	2	24967286.56	4.00524E-	92.92	0.000000061	2	32989166.73	3.0313E-	Total Quotient				0.0019161
Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient																																																				
94.95	0.003816442	2	524.0483355	0.0019082																																																				
91.4	0.000008122	2	246247.2255	4.06096E-																																																				
89.15	0.000003595	2	556379.7895	1.79733E-																																																				
93.57	0.000003182	2	628595.6132	1.59085E-																																																				
89.6	0.000000497	2	4021345.112	2.48673E-																																																				
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88.52	0.000000080	2	24967286.56	4.00524E-																																																				
92.92	0.000000061	2	32989166.73	3.0313E-																																																				
Total Quotient				0.0019161																																																				

Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 2	
NGR: O 01730 22782	Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
Date: 30/04/04	
Officer: Dan Smith	

95 MHz to 105 MHz

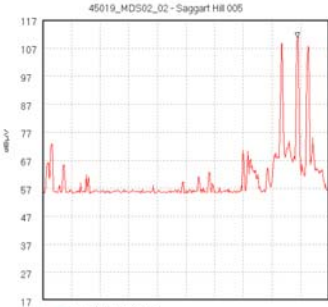
<p>45019_MDS02_02 - Saggart Hill 003</p> <p>Start 95.0 MHz; Stop 105.0 MHz Ref 127 dBµV; Ref Offset 0.0 dB; 10 dB/Oct RBW 100.0 kHz; VBW 100.0 kHz; Att 0.0 dB; Swp 0.0 pS Peak 97.7 MHz; 124.3 dBµV Transducer Factors: Bi-Conical 30/04/2004 15:21:33</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	97.7	0.007139350	2	280.1375627	0.003569675
	100	0.000410827	2	4868.232887	0.000205413
	98.75	0.000012124	2	164957.2264	6.06218E-06
	100.88	0.000001032	2	1938078.42	5.15975E-07
	99.25	0.000000121	2	16533749.21	6.04823E-08
	103.53	0.000000086	2	23247237.14	4.30159E-08
	102.73	0.000000083	2	24119669.13	4.14599E-08
	101.5	0.000000051	2	39117522.94	2.5564E-08
				Total Quotient	0.003781837

105 MHz to 115 MHz

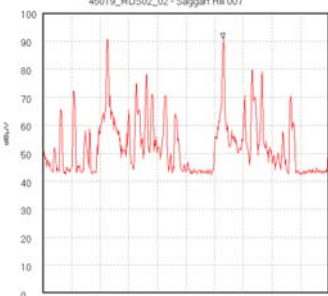
<p>45019_MDS02_02 - Saggart Hill 004</p> <p>Start 105.0 MHz; Stop 115.0 MHz Ref 80 dBµV; Ref Offset 0.0 dB; 10 dB/Oct RBW 100.0 kHz; VBW 100.0 kHz; Att 0.0 dB; Swp 0.0 pS Peak 107.9 MHz; 76.26 dBµV Transducer Factors: Bi-Conical 30/04/2004 15:23:53</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	107.9	0.000000112	2	17839034.52	5.60568E-08
	110.58	0.000000082	2	24455207.15	4.08911E-08
	105.68	0.000000033	2	60585869.61	1.65055E-08
	113.75	0.000000033	2	60585869.61	1.65055E-08
	106.08	0.000000032	2	61854506.44	1.6167E-08
	112.95	0.000000029	2	69401897.71	1.44088E-08
	106.88	0.000000018	2	108735497.5	9.19663E-09
	111.13	0.000000003	2	708551376.2	1.41133E-09
	111.55	0.000000001	2	2967367569	3.36999E-10
			Total Quotient	1.7148E-07	

Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 2	
NGR: O 01730 22782	Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
Date: 30/04/04	
Officer: Dan Smith	

115 MHz to 170 MHz

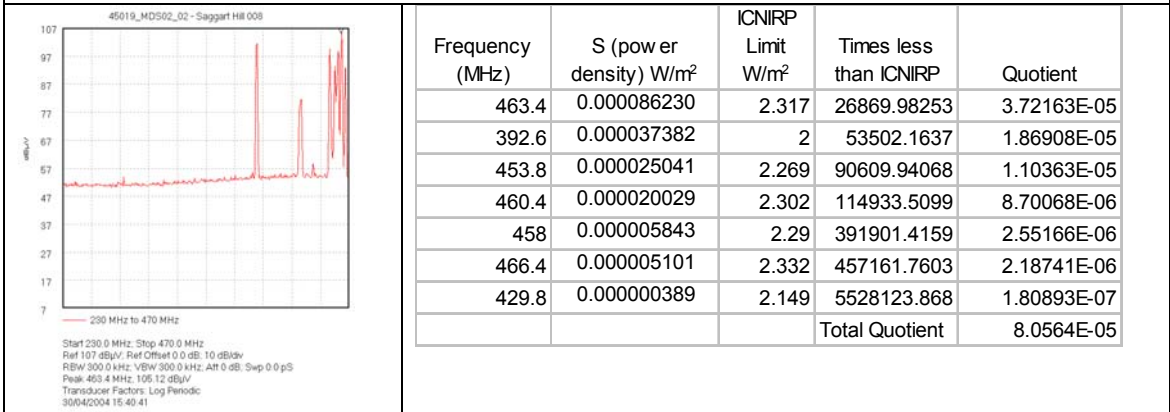
 <p>45019_MDS02_02 - Saggart Hill 005</p> <p>Start 115.0 MHz; Stop 170.0 MHz Ref 117 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 163.95 MHz; 110.51 dBµV Transducer Factors: Bi-Conical 30/04/2004 15:28:24</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	163.95	0.000298304	2	6704.576429	0.000149152
	160.79	0.000195731	2	10218.12817	9.78653E-05
	165.88	0.000157637	2	12687.36242	7.88186E-05
	166.84	0.000000085	2	23516427.46	4.25235E-08
	116.65	0.000000051	2	39027555.13	2.56229E-08
	153.5	0.000000031	2	63880947.03	1.56541E-08
	154.33	0.000000028	2	71840830.77	1.39197E-08
	118.99	0.000000009	2	219468070.7	4.55647E-09
	158.18	0.000000007	2	293340039.3	3.40901E-09
			Total Quotient	0.000325941	

170 MHz to 230 MHz

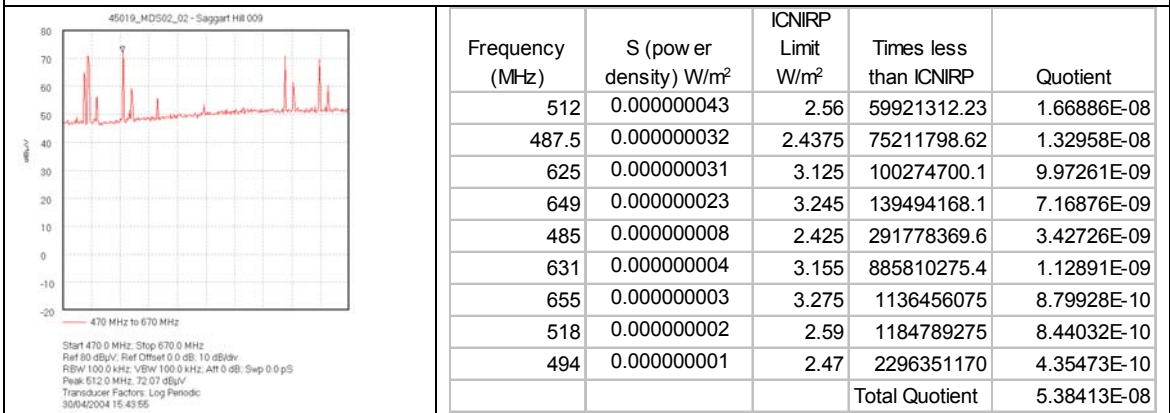
 <p>45019_MDS02_02 - Saggart Hill 007</p> <p>Start 170.0 MHz; Stop 230.0 MHz Ref 100 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 207.8 MHz; 90.51 dBµV Transducer Factors: Bi-Conical 30/04/2004 15:33:31</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	207.8	0.000003196	2	625707.4787	1.59819E-06
	183.5	0.000003174	2	630044.6757	1.58719E-06
	213.8	0.000000249	2	8023638.357	1.24632E-07
	215.9	0.000000208	2	9624348.618	1.03903E-07
	191.75	0.000000173	2	11571012.05	8.64229E-08
	189.65	0.000000081	2	24568087.26	4.07032E-08
	176.45	0.000000045	2	44093172.34	2.26792E-08
	192.95	0.000000032	2	61712245.03	1.62042E-08
	212.3	0.000000031	2	65068582.5	1.53684E-08
			Total Quotient	3.59529E-06	

Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 2	
NGR: O 01730 22782	Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
Date: 30/04/04	
Officer: Dan Smith	

230 MHz to 470 MHz

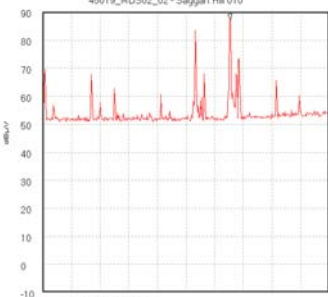


470 MHz to 670 MHz

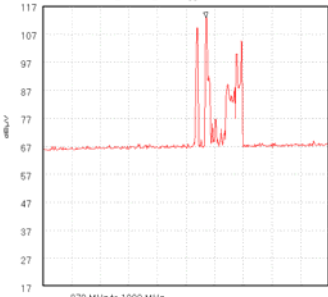


Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 2	Antenna: Manufacturer: Schaffner EMC Systems Serial Number: 3540
NGR: O 01730 22782	
Date: 30/04/04	
Officer: Dan Smith	

670 MHz to 870 MHz

 <p>45019_MDS02_02 - Saggart Hill 010</p> <p>Start 670.0 MHz; Stop 870.0 MHz Ref 90 dBµV; Ref Offset 0.0 dB; 10 dB/div RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 801.0 MHz; 57.44 dBµV Transducer Factors: Log Periodic 30/04/2004 15:47:26</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	801	0.000001471	4.005	2722349.442	3.6733E-07
	776.5	0.000000590	3.8825	6583438.981	1.51896E-07
	807	0.000000057	4.035	70337169.78	1.42172E-08
	671.5	0.000000025	3.3575	133769582.5	7.47554E-09
	782.5	0.000000017	3.9125	235936808.7	4.23842E-09
	805	0.000000016	4.025	244966803.3	4.08219E-09
	704	0.000000016	3.52	224328273.4	4.45775E-09
	833	0.000000010	4.165	422626140.7	2.36616E-09
	720	0.000000005	3.6	718859226	1.39109E-09
	Total Quotient				5.57454E-07

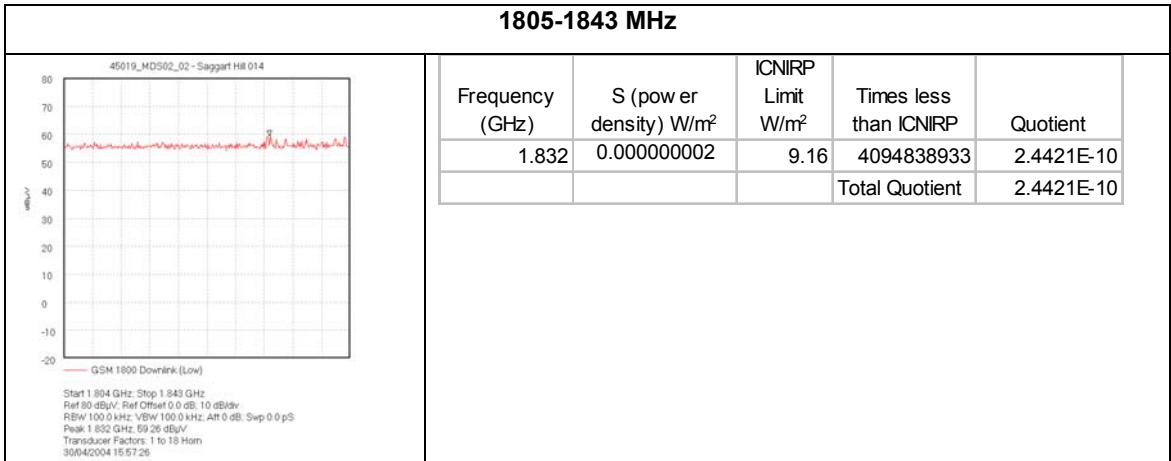
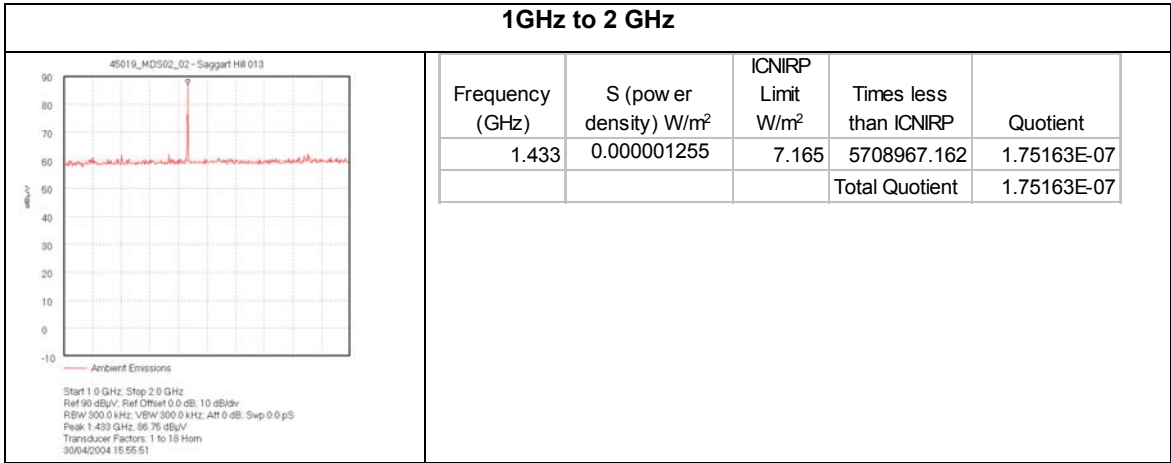
870 MHz to 1 GHz

 <p>45019_MDS02_02 - Saggart Hill 011</p> <p>Start 870.0 MHz; Stop 1.0 GHz Ref 117 dBµV; Ref Offset 0.0 dB; 10 dB/div RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 944.1 MHz; 112.84 dBµV Transducer Factors: Log Periodic 30/04/2004 15:51:10</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	944.1	0.000510104	4.7205	9253.996953	0.000108061
	939.9	0.000226287	4.6995	20767.92009	4.81512E-05
	960	0.000077385	4.8	62027.25865	1.61219E-05
	958.1	0.000026343	4.7905	181853.7222	5.49893E-06
	953.8	0.000002156	4.769	2211916.217	4.52097E-07
	948.3	0.000000123	4.7415	38659577.65	2.58668E-08
	947	0.000000084	4.735	56579790.3	1.76742E-08
	Total Quotient				0.000178329

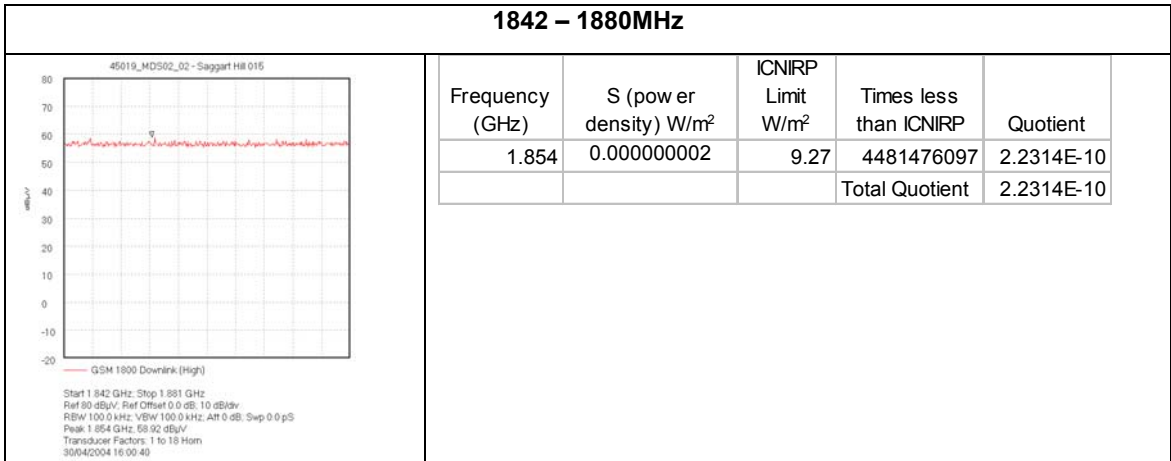
Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 2	Antenna: Manufacturer: EMCO Model: 3146A Serial Number: 3993
NGR: O 01730 22782	
Date: 30/04/04	
Officer: Dan Smith	

GSM 900					
<p>45019_MD502_02 - Saggart Hill 012</p> <p>Start 924.0 MHz; Stop 961.0 MHz Ref 117 dBµV; Ref Offset 0.0 dB; 10 dB/div RES 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 943.98 MHz; 113.61 dBµV Transducer Factors: log periodic 30/04/2004 15:54:09</p>	Frequency (MHz)	S (power density) W/m ²	ICNIRP Limit W/m ²	Times less than ICNIRP	Quotient
	943.98	0.000595194	4.7199	7930.017534	0.000126103
	939.72	0.000293534	4.6986	16006.99556	6.24727E-05
	959.7	0.000045150	4.7985	106278.8507	9.40921E-06
	957.48	0.000022838	4.7874	209624.0298	4.77045E-06
	945.18	0.000004043	4.7259	1169030.597	8.5541E-07
	958.41	0.000001215	4.79205	3943326.08	2.53593E-07
	956.56	0.000000553	4.7828	8650148.651	1.15605E-07
	954.15	0.000000507	4.77075	9417334.771	1.06187E-07
	953.04	0.000000326	4.7652	14602340.91	6.84822E-08
				Total Quotient	0.000204155

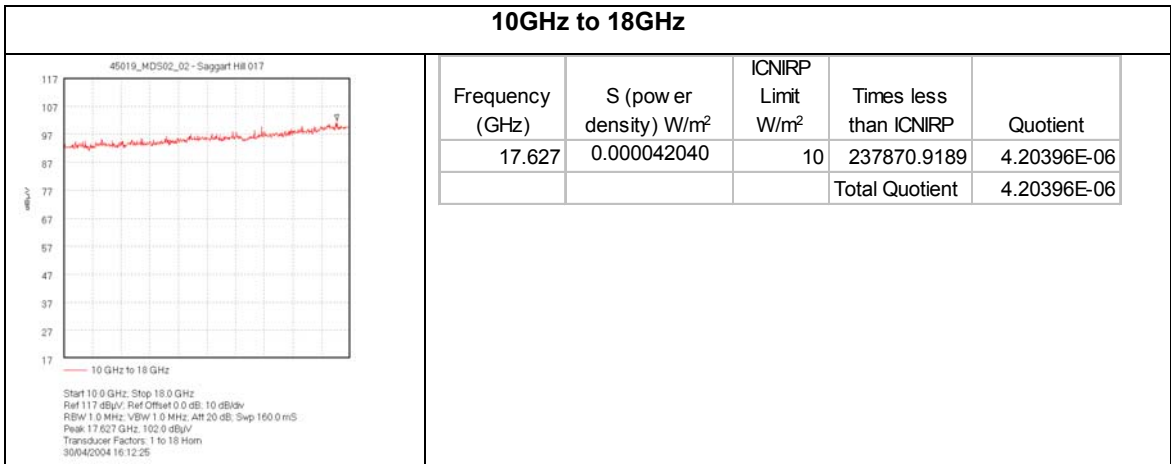
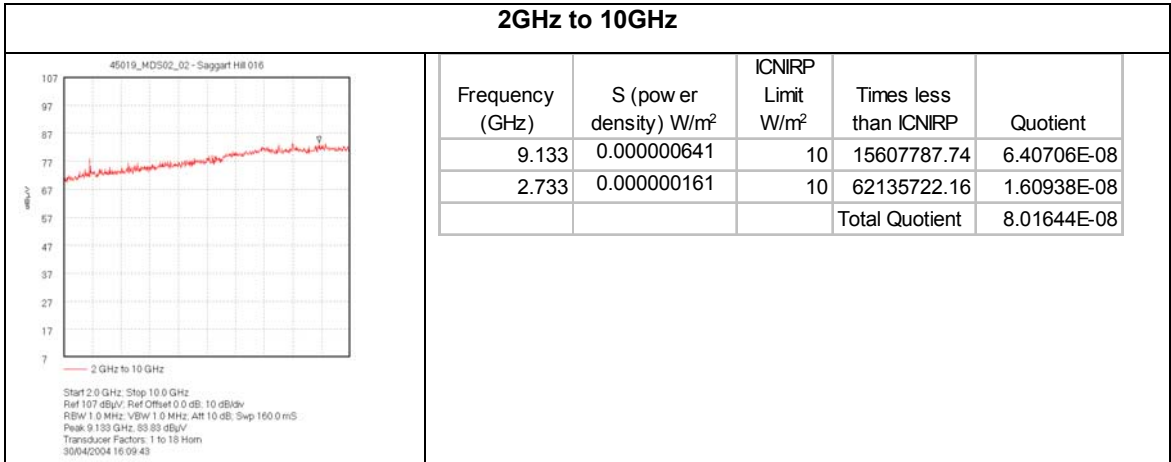
Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 2	
NGR: O 01730 22782	Antenna: Manufacturer: EMCO Model: 3115 Serial Number: 1203
Date: 30/04/04	
Officer: Dan Smith	



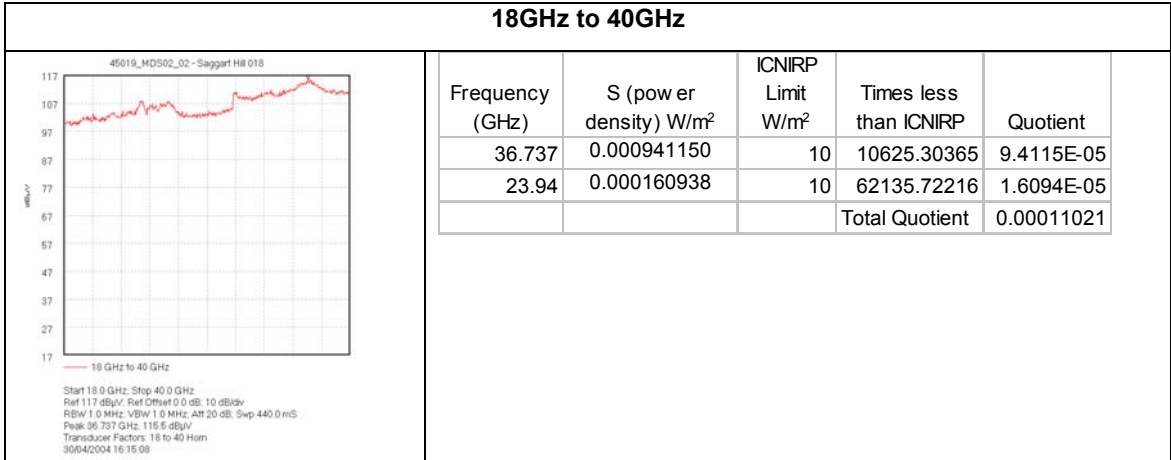
Site: Saggart Hill	Receiver: Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
Location: Position 2	Antenna: Manufacturer: EMCO Model: 3115 Serial Number: 1203
NGR: O 01730 22782	
Date: 30/04/04	
Officer: Dan Smith	



Site: Saggart Hill	Receiver: Manufacturer: Agilent/HP Model: 8565E Serial Number: 3846A01089
Location: Position 2	Antenna: Manufacturer: EMCO Model: 3115 Serial Number: 1203
NGR: O 01730 22782	
Date: 30/04/04	
Officer: Dan Smith	



Site: Saggart Hill	Receiver: Manufacturer: Agilent/HP Model: 8565E Serial Number: 3846A01089
Location: Position 2	Antenna: Manufacturer: EMCO Model: 3116 Serial Number: 9611-2330
NGR: O 01730 22782	
Date: 30/04/04	
Officer: Dan Smith	



3.2.2 SITE SKETCH MAP

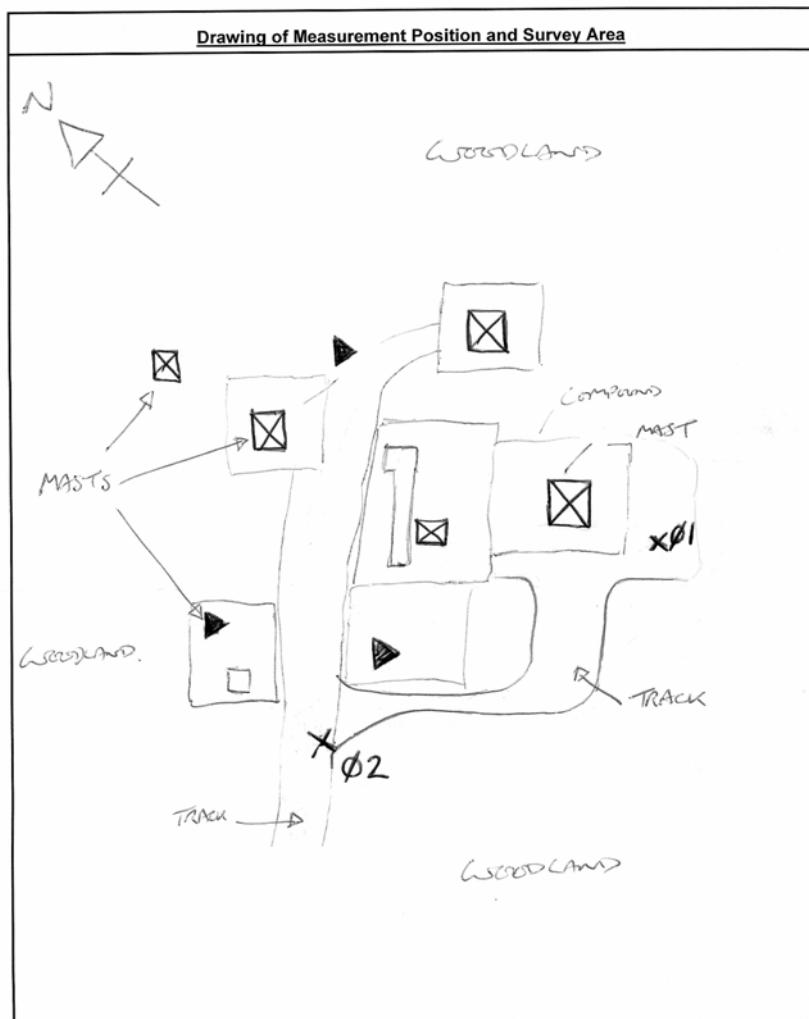
Position 1. Saggart Hill, Adjacent to Masts, 14 m South of Nearest Mast. (See Mark 01)

Position 2. Saggart Hill, Adjacent to Masts, approximately 40 m South West of Nearest Mast. (See Mark 02)

RADIO FREQUENCY INVESTIGATION LTD

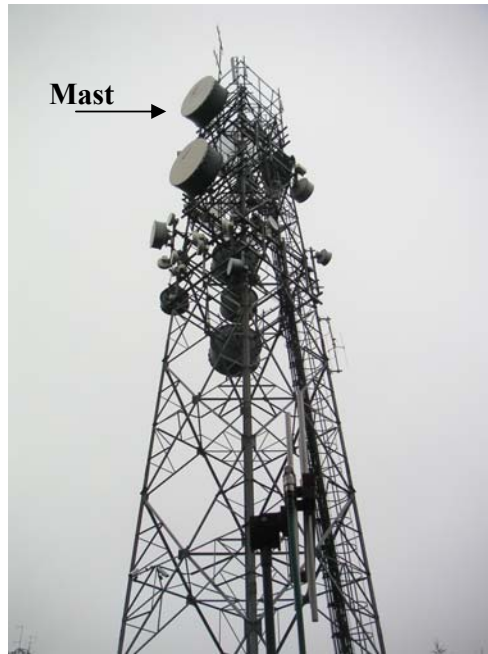
OFF-SITE WORKBOOK
Test No. 45019

For: Mason Communications
Survey Of:
Location:



3.2.3 SITE PHOTOGRAPHS

3.2.3.1 Position 1. Saggart Hill, Adjacent to Masts, 14 m South of Nearest Mast.



3.2.3.2 Position 2. Saggart Hill, Adjacent to Masts, approximately 40 m South West of Nearest Mast.



Annex 1

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

Non-ionising Radiation (NIR) Definition

Non-ionising radiation is that part of the electromagnetic spectrum below 2420 million MHz. Radiowaves, infra-red 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 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 put out a recommendation² which proposed to limit exposure of the general public to electromagnetic fields 0 Hz-300 GHz 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 to emissions within the radio spectrum, these limits are equivalent to the ICNIRP guideline limits used by the ODTR.

² Recommendation of the European Council 1999/519/EC of July 12, 1999

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:

FOR MEMBERS OF THE GENERAL PUBLIC

Frequency f (MHz)	Unperturbed RMS Electric Field Strength E(V/m)	Unperturbed RMS Magnetic 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	$1.375/f^{1/2}$	$0.0037/f^{1/2}$	f/200	UHF Television Broadcasting and Mobile Telephony Systems
2000-300000	61	0.16	1	Microwave Links, and MMDS

Note: “f” represents the frequency taken from the first column above

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.

Glossary

Antenna:

An antenna transmits energy to or receives energy from space.

Broadband Measurement:

Measurements carried out using a broadband probe measures the maximum power density at the site and compares it to the power density guideline limit in the ICNIRP guidelines. The probe reading is displayed as a percentage ratio of one to the other. In this project, the combined signal strengths of all radio transmissions in the area that is taken over the total range of frequencies between 100kHz to 40GHz is measured. The minimum sensitivity on the probe is 0.3% of the ICNIRP guideline limit, this means the probe will only pick up NIR levels when the level is equal to or greater than 1/3333 of the ICNIRP limit. As most measurements taken at sites using the probe are much less than 1/3333 of the ICNIRP limit, then the reading on the probe is generally zero.

Electric field strength:

This is a quantitative expression of the intensity of an electric field at a particular location. This is measured in volts per metre (V/m)

EMF:

Electric, magnetic, and electromagnetic fields.

Exposure:

This is the highest measured electric field strength converted to a power density equivalent.

Frequency:

The number of sinusoidal cycles completed by electromagnetic waves in 1 s; usually expressed in hertz (Hz).

Frequency Band:

A specific range of frequencies in the radio frequency spectrum, where each band has a defined upper and lower frequency limit.

ICNIRP:

International Commission for Non-Ionising Radiation Protection.

ICNIRP Limit:

This is the reference level, provided by the International Commission for Non-Ionising Radiation Protection (ICNIRP), for the maximum permitted non-ionising radiation emission levels for public exposure.

Reference Levels are frequency dependent and are currently defined as follows:

Frequency	ICNIRP Limit
10 – 400MHz	2W/m ²
400 MHz – 2GHz	((frequency in MHz)/200)W/m ²
2GHz – 300GHz	10 W/m ²

Narrowband Measurement:

Measurements carried out in specific frequency bands using a spectrum analyser and suitable antennas. The analyser is set up to measure one frequency band at a time to provide accurate readings over the particular range chosen.

Non-Ionizing 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 about 12 eV, wavelengths greater than 100 nm, and frequencies lower than 3×10^{15} Hz.

Power Density:

This is the radiant power incident perpendicular to a surface, divided by the area of the surface and is expressed in watts per square metre.

Quotient:

This is the ratio of the ICNIRP Limit to the maximum measured power density at a particular frequency. If the ratio is equal to or less than 1, then exposure levels are equal to or less than the ICNIRP Limits for the measured frequency.

Total Quotient:

This is the sum of the Quotients for a particular frequency band, or all measured bands, at the location of highest emissions at the site being measured.