



Commission for  
**Communications Regulation**

Report

## **Programme of Measurement of Non-Ionising Radiation emissions**

**0497 - Clermont Cairn**

**Site Measurement Date:**

**20th 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 6<sup>th</sup> 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 surveyed<sup>1</sup>. 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.

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<sup>1</sup> See Annex 2 for the site measurement methodology



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

Audit Site: MLH02 – Clermont Cairn

	NAME	SIGNATURE	DATE
<b>PREPARED BY</b>	S. Roe		10 <sup>th</sup> May 2004
<b>REVIEWED BY</b>	I. McDonald		10 <sup>th</sup> May 2004
<b>SIGNED-OFF BY</b>	P. Coakley		10 <sup>th</sup> May 2004
This report has been reviewed by Mason Communications and accurately reflects the measurements taken at Clermont Cairn by Dan Smith on 20 <sup>th</sup> 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 <sup>2</sup>	ICNIRP guideline Limit W/m <sup>2</sup>
Clermont Cairn	30MHz – 85MHz	0.000096307	2
	85MHz – 95MHz	0.080104820	2
	95MHz – 105MHz	0.088442019	2
	105MHz – 115MHz	0.144430412	2
	115MHz – 170MHz	0.000210697	2
	170MHz – 230MHz	0.000000648	2
	230MHz – 470MHz	0.000094986	2.212
	470MHz – 670MHz	0.000015983	2.6
	670MHz – 870MHz	0.010084599	4.245
	870MHz – 1GHz	0.000723867	4.7725
	GSM 900	0.000773853	4.7717
	GSM 1800	0.000000180	9.345
	1GHz – 2GHz	0.000001177	6.84
	2GHz – 10GHz	0.000000641	10
	10GHz – 18GHz	0.000032111	10
18GHz – 40GHz	0.001952804	10	

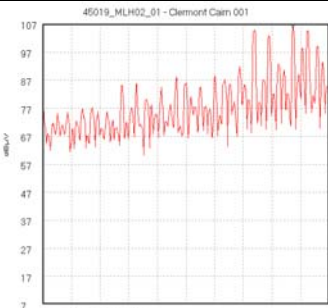
The overall measurements taken at the site and given in part 3.2 of this report conclude that the NIR emissions from the site are below the ICNIRP guideline limits.

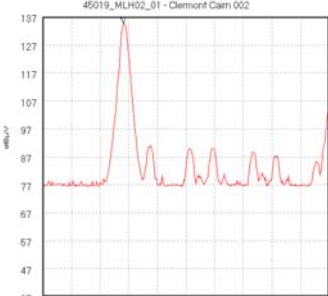
### 3.2 Site Report – Clermont Cairn

#### 3.2.1 Detailed Results

3.2.1.1 Position 1. Clermont Cairn, Adjacent to Mast, approximately 30 m South West of Mast.

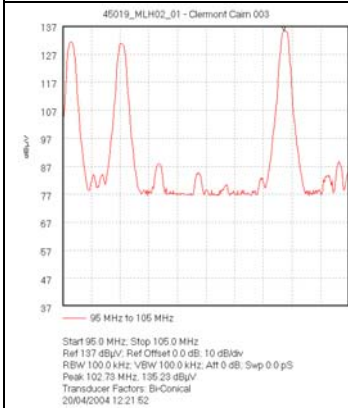
<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

30 MHz to 85 MHz					
 <p>45019_MLH02_01 - Clermont Cairn 001</p> <p>Start 30.0 MHz; Stop 85.0 MHz Ref 107 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 77.99 MHz; 105.6 dBµV Transducer Factors: Bi-Conical 2004/2004 12:13:04</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	77.99	0.000096307	2	20766.88442	4.81536E-05
	70.56	0.000083495	2	23953.63049	4.17473E-05
	80.87	0.000077030	2	25963.98478	3.85149E-05
	73.45	0.000051601	2	38758.89133	2.58005E-05
	82.8	0.000021363	2	93620.58399	1.06814E-05
	79.78	0.000018822	2	106260.3754	9.41085E-06
	83.76	0.000005803	2	344644.495	2.90154E-06
	75.24	0.000004973	2	402134.5112	2.48673E-06
	67.81	0.000004024	2	497017.117	2.012E-06
					Total Quotient

85 MHz to 95 MHz					
 <p>45019_MLH02_01 - Clermont Cairn 002</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 87.82 MHz; 134.8 dBµV Transducer Factors: Bi-Conical 2004/2004 12:17:18</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	87.82	0.080104820	2	24.96728656	0.04005241
	88.77	0.000003394	2	589347.3647	1.69679E-06
	90.95	0.000002659	2	752265.8481	1.32932E-06
	90.12	0.000002604	2	768017.9066	1.30205E-06
	92.32	0.000001998	2	1000855.421	9.99145E-07
	93.15	0.000001471	2	1359475.377	7.35578E-07
					Total Quotient

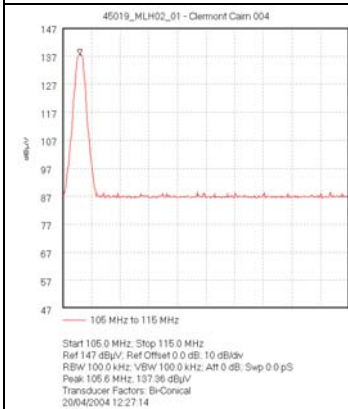
<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

### 95 MHz to 105 MHz



Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
102.73	0.088442019	2	22.61368539	0.04422101
95.27	0.035290568	2	56.67236621	0.017645284
97.02	0.031670772	2	63.14970787	0.015835386
104.63	0.000001908	2	1048024.284	9.54176E-07
98.35	0.000001617	2	1237004.689	8.08404E-07
99.75	0.000000788	2	2537297.233	3.9412E-07
104.25	0.000000618	2	3238704.658	3.08765E-07
			Total Quotient	0.077704145

### 105 MHz to 115 MHz



Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
105.6	0.144430412	2	13.84749911	0.072215206
			Total Quotient	0.072215206

<b>Site:</b> Clermont Cairn  <b>Location:</b> Position 1 <b>NGR:</b> J 09928 15802 <b>Date:</b> 20/04/04 <b>Officer:</b> Dan Smith	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205  <b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
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### 115 MHz to 170 MHz

<p>45019_MLH02_01 - Clermont Cairn 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 120.64 MHz; 109.0 dBµV  Transducer Factors: Bi-Conical  2004/2004 12:30:35</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	120.64	0.000210697	2	9492.297605	0.000105349
	123.53	0.000091973	2	21745.59753	4.59863E-05
	115.96	0.000057631	2	34703.34565	2.88157E-05
	117.75	0.000041177	2	48570.36262	2.05887E-05
	138.51	0.000009697	2	206239.262	4.84874E-06
	130.95	0.000006756	2	296054.2813	3.37776E-06
	128.2	0.000006305	2	317227.8778	3.15231E-06
	126.41	0.000005256	2	380514.6184	2.62802E-06
	135.76	0.000005184	2	385808.104	2.59196E-06
				Total Quotient	0.000217338

### 170 MHz to 230 MHz

<p>45019_MLH02_01 - Clermont Cairn 005</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 193.7 MHz; 83.83 dBµV  Transducer Factors: Bi-Conical  2004/2004 12:34:30</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	193.7	0.000000648	2	3085825.374	3.24062E-07
	208.7	0.000000601	2	3329441.173	3.00351E-07
	190.85	0.000000325	2	6157031.08	1.62416E-07
	201.2	0.000000279	2	7167560.144	1.39517E-07
	211.55	0.000000246	2	8135258.286	1.22922E-07
	203	0.000000203	2	9848528.497	1.01538E-07
	175.85	0.000000201	2	9939655.809	1.00607E-07
	198.35	0.000000140	2	14235454.77	7.02471E-08
	192.65	0.000000116	2	17193779.22	5.81606E-08
				Total Quotient	1.37982E-06

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

### 230 MHz to 470 MHz

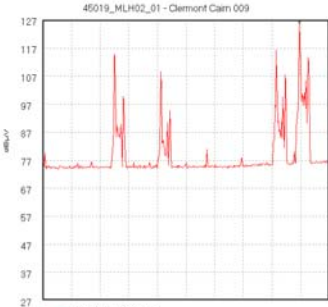
<p>45019_MLH02_01 - Clermont Cairn 007</p> <p>Start 230.0 MHz; Stop 470.0 MHz Ref 107 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 300.0 kHz; VBW 300.0 kHz; Att 0 dB; Swp 0.0 pS Peak 442.4 MHz; 105.54 dBµV Transducer Factors: Log Periodic 2004/2004 12:43:39</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	442.4	0.000094986	2.212	23287.6933	4.29411E-05
	435.2	0.000018692	2.176	116412.6676	8.59013E-06
	315.2	0.000012902	2	155014.1509	6.45102E-06
	304.4	0.000008844	2	226136.8539	4.4221E-06
	297.2	0.000007632	2	262042.2657	3.81618E-06
	306.2	0.000006348	2	315044.0965	3.17416E-06
	312.2	0.000005776	2	346235.3017	2.88821E-06
	299	0.000003211	2	622832.614	1.60557E-06
	317.6	0.000003018	2	662782.9777	1.50879E-06
				Total Quotient	7.53973E-05

### 470 MHz to 670 MHz

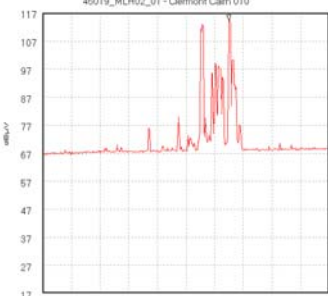
<p>45019_MLH02_01 - Clermont Cairn 008</p> <p>Start 470.0 MHz; Stop 670.0 MHz Ref 100 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 496.0 MHz; 93.93 dBµV Transducer Factors: Log Periodic 2004/2004 12:47:14</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	496	0.000006556	2.48	378262.2757	2.64367E-06
	520	0.000005078	2.6	512052.7445	1.95292E-06
	471.5	0.000004505	2.3575	523350.9919	1.91076E-06
	552.5	0.000002849	2.7625	969713.9358	1.03123E-06
	536.5	0.000002375	2.6825	1129486.595	8.85358E-07
	568.5	0.000001761	2.8425	1614514.031	6.19381E-07
	502	0.000000442	2.51	5675643.017	1.76191E-07
	499	0.000000433	2.495	5759859.637	1.73615E-07
	477.5	0.000000414	2.3875	5771447.248	1.73267E-07
				Total Quotient	9.5664E-06

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

### 670 MHz to 870 MHz

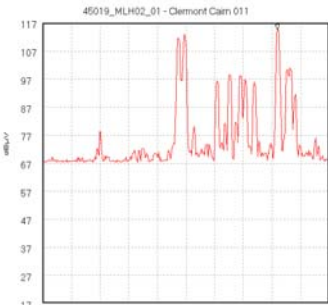
 <p>45019_MLH02_01 - Clermont Cairn 009</p> <p>Start 670.0 MHz; Stop 870.0 MHz Ref 127 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 849.0 MHz; 125.8 dBµV Transducer Factors: Log Periodic 2004/2004 12:51:08</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	849	0.010084599	4.245	420.9388835	0.002375642
	833	0.001136733	4.165	3664.007517	0.000272925
	720	0.000819707	3.6	4391.813112	0.000227696
	855	0.000648125	4.275	6595.951738	0.000151608
	752.5	0.000192601	3.7625	19535.19986	5.11896E-05
	839	0.000145767	4.195	28778.84203	3.47477E-05
	853.5	0.000090502	4.2675	47153.6027	2.12073E-05
	726	0.000025041	3.63	144959.9315	6.89846E-06
	837.5	0.000023750	4.1875	176317.8048	5.67158E-06
				Total Quotient	0.003147586

### 870 MHz to 1 GHz

 <p>45019_MLH02_01 - Clermont Cairn 010</p> <p>Start 870.0 MHz; Stop 1.0 GHz 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 954.5 MHz; 114.36 dBµV Transducer Factors: Log Periodic 2004/2004 12:55:26</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	954.5	0.000723867	4.7725	6593.063935	0.000151675
	942.5	0.000520785	4.7125	9048.835922	0.000110511
	956.4	0.000028553	4.782	167475.3608	5.97103E-06
	948.3	0.000020877	4.7415	227120.9024	4.40294E-06
	949.6	0.000016891	4.748	281094.3138	3.55752E-06
	947	0.000009765	4.735	484910.2157	2.06224E-06
	951.6	0.000007074	4.758	672613.8223	1.48674E-06
	931.7	0.000000276	4.6585	16849516.76	5.93489E-08
	943.8	0.000000250	4.719	18844791.1	5.30651E-08
				Total Quotient	0.000279779

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: EMCO Model: 3146A Serial Number: 3993
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

GSM 900					
Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient	
954.34	0.000773853	4.7717	6166.155627	0.000162176	
942.31	0.000526816	4.71155	8943.451466	0.000111814	
941.48	0.000386063	4.7074	12193.33352	8.2012E-05	
955.91	0.000034092	4.77955	140193.6553	7.13299E-06	
948.05	0.000018909	4.74025	250693.2249	3.98894E-06	
949.53	0.000018267	4.74765	259908.2381	3.84751E-06	
950.08	0.000012902	4.7504	368189.6113	2.71599E-06	
946.48	0.000011473	4.7324	412498.9011	2.42425E-06	
951.29	0.000010560	4.75645	450426.8656	2.22012E-06	
			Total Quotient	0.000378331	



45019\_MLH02\_01 - Clermont Cairn 011  
 GSM 900 Downlink  
 Start 924.0 MHz; Stop 961.0 MHz  
 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 954.34 MHz; 114.65 dBµV  
 Transducer Factors: log periodic  
 20/04/2004 12:59:25

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: EMCO Model: 3115 Serial Number: 1203
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

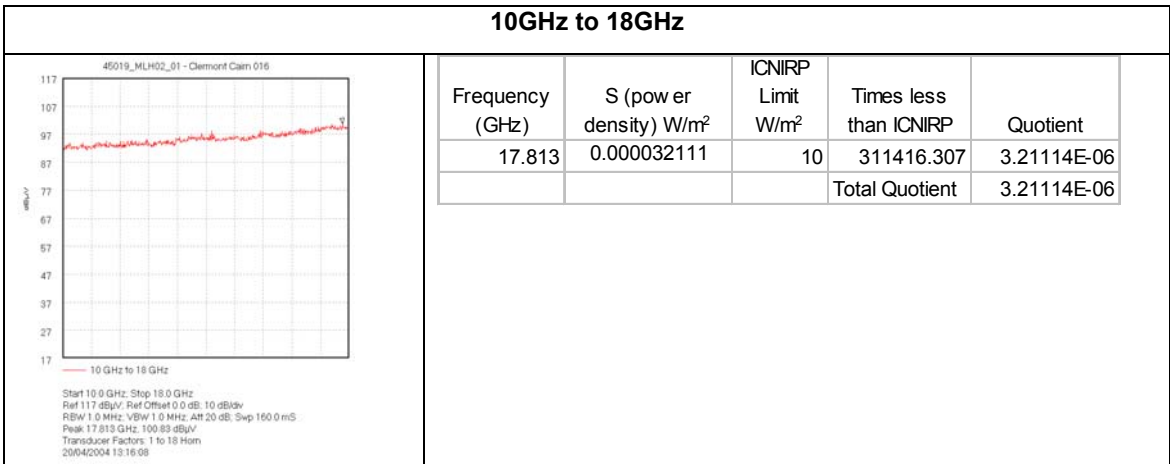
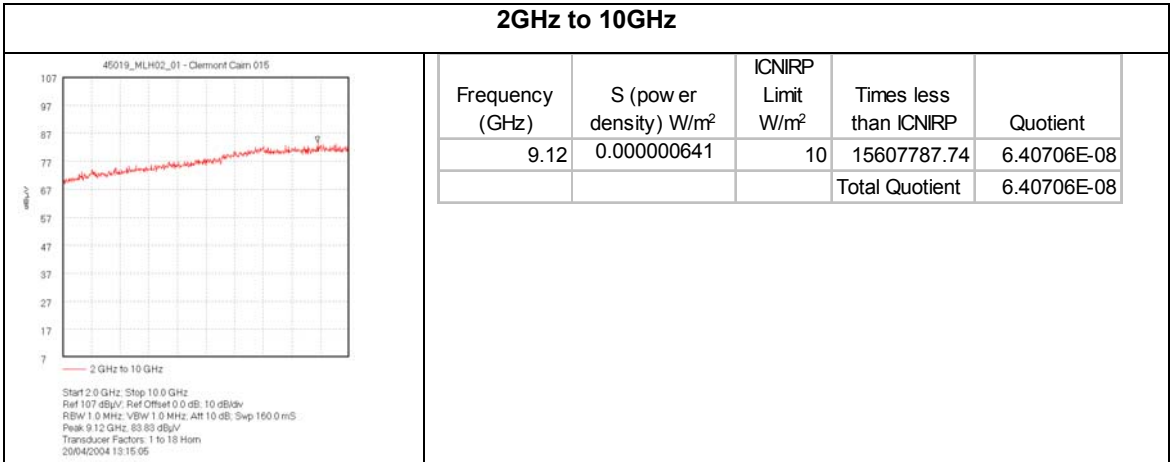
1GHz to 2 GHz					
<p>45019_MLH02_01 - Clermont Cairn 012</p> <p>Ambient Emissions</p> <p>Start 1.0 GHz; Stop 2.0 GHz Ref 90 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 300.0 kHz; VBW 500.0 kHz; Att 0 dB; Swp 0.0 pS Peak 1.368 GHz; 66.47 dBµV Transducer Factors: 1 to 18 Horn 20042004 15:01:34</p>	Frequency (GHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	1.368	0.000001177	6.84	5812961.572	1.72029E-07
	1.52	0.000000129	7.6	58769898.75	1.70155E-08
	1.818	0.000000075	9.09	120755030.9	8.28123E-09
	1.868	0.000000045	9.34	208299499.5	4.80078E-09
	1.828	0.000000026	9.14	350176942.1	2.8557E-09
	1.02	0.000000019	5.1	270340757.5	3.69904E-09
	1.843	0.000000019	9.215	492988387.9	2.02845E-09
	1.7	0.000000011	8.5	775818758	1.28896E-09
				Total Quotient	2.11999E-07

1805-1843 MHz					
<p>45019_MLH02_01 - Clermont Cairn 013</p> <p>GSM 1800 Downlink (Low)</p> <p>Start 1.804 GHz; Stop 1.843 GHz Ref 90 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 1.811 GHz; 71.79 dBµV Transducer Factors: 1 to 18 Horn 20042004 15:03:19</p>	Frequency (GHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	1.811	0.000000040	9.055	226063165.6	4.42354E-09
	1.831	0.000000032	9.155	282487801.6	3.53998E-09
	1.809	0.000000030	9.045	303913450.5	3.29041E-09
	1.843	0.000000029	9.215	320506387.9	3.12006E-09
	1.82	0.000000026	9.1	347842579.1	2.87486E-09
	1.82	0.000000026	9.1	351061126.9	2.84851E-09
	1.832	0.000000019	9.16	483322289.3	2.06901E-09
	1.835	0.000000018	9.175	510443200.6	1.95908E-09
	1.828	0.000000016	9.14	579812462.6	1.7247E-09
			Total Quotient	2.58502E-08	

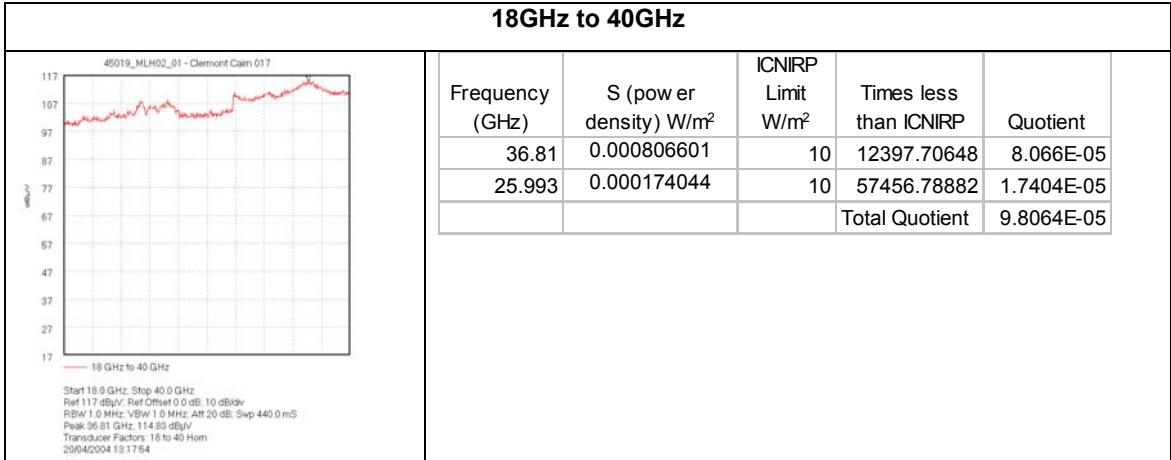
<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number 3108U00205
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: EMCO Model: 3115 Serial Number: 1203
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

1842 – 1880MHz					
	Frequency (GHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	1.855	0.000000067	9.275	137611671	7.2668E-09
	1.876	0.000000066	9.38	142739505.7	7.0058E-09
	1.849	0.000000039	9.245	236727256.9	4.2243E-09
	1.869	0.000000038	9.345	243175969.5	4.1122E-09
	1.866	0.000000036	9.33	258358642.5	3.8706E-09
	1.871	0.000000033	9.355	282738625.3	3.5368E-09
	1.86	0.000000033	9.3	284331056.5	3.517E-09
	1.864	0.000000024	9.32	387933480.2	2.5778E-09
	1.849	0.000000023	9.245	401095939.8	2.4932E-09
			Total Quotient	3.8604E-08	

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Agilent/HP Model: 8565E Serial Number: 3846A01089
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: EMCO Model: 3115 Serial Number: 1203
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

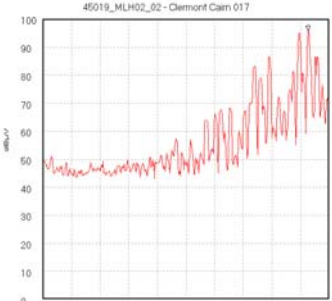


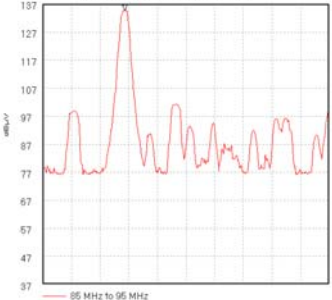
<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Agilent/HP Model: 8565E Serial Number: 3846A01089
<b>Location:</b> Position 1	<b>Antenna:</b> Manufacturer: EMCO Model: 3116 Serial Number: 9611-2330
<b>NGR:</b> J 09928 15802	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	



3.2.1.2 Position 2. Clermont Cairn, Adjacent to Mast, approximately 30 m North East of Mast.

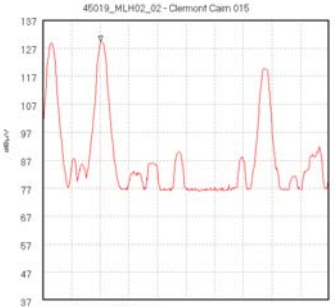
<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 2	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>NGR:</b> J 09957 15891	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

30 MHz to 85 MHz					
 <p>45019_MLH02_02 - Clermont Cairn 017</p> <p>Start 30.0 MHz; Stop 85.0 MHz Ref 100 dBµV; Ref Offset 0.0 dB; 10 dB/dv RESW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 81.01 MHz; 95.63 dBµV Transducer Factors: Bi-Conical 2004/02/04 14:21:30</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	81.01	0.000009697	2	206239.262	4.84874E-06
	79.23	0.000008603	2	232472.3714	4.30159E-06
	73.45	0.000001270	2	1575329.283	6.34788E-07
	82.25	0.000001185	2	1687995.738	5.92419E-07
	82.8	0.000001145	2	1747315.566	5.72306E-07
	70.7	0.000000563	2	3551169.041	2.81597E-07
	78.13	0.000000366	2	5462247.139	1.83075E-07
	79.91	0.000000311	2	6432374.86	1.55464E-07
	71.8	0.000000215	2	9297610.443	1.07555E-07
				Total Quotient	1.16775E-05

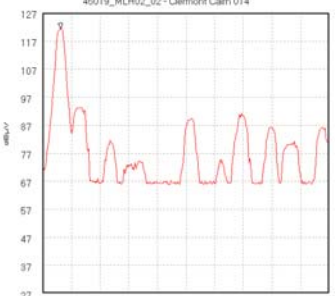
85 MHz to 95 MHz					
 <p>45019_MLH02_02 - Clermont Cairn 016</p> <p>Start 85.0 MHz; Stop 95.0 MHz Ref 137 dBµV; Ref Offset 0.0 dB; 10 dB/dv RESW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 87.87 MHz; 134.7 dBµV Transducer Factors: Bi-Conical 2004/02/04 14:19:38</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	87.87	0.078281412	2	25.54884937	0.039140706
	89.65	0.000036363	2	55001.09627	1.81815E-05
	86.12	0.000020543	2	97357.93323	1.02714E-05
	93.5	0.000011659	2	171542.3463	5.82946E-06
	90.95	0.000007650	2	261439.5852	3.82498E-06
	90.15	0.000005750	2	347833.4512	2.87494E-06
	92.35	0.000004194	2	476838.5359	2.09715E-06
	88.77	0.000003182	2	628595.6132	1.59085E-06
	94.57	0.000002855	2	700440.6556	1.42767E-06
				Total Quotient	0.039186804

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 2	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>NGR:</b> J 09957 15891	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

### 95 MHz to 105 MHz

 <p>45019_MLH02_02 - Clermont Cairn 015</p> <p>Start 95.0 MHz; Stop 105.0 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 p/s Peak 97.02 MHz; 129.26 dBµV Transducer Factors: Bi-Conical 2004/2004 14:17:47</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	97.02	0.022472876	2	88.99617593	0.011236438
	95.3	0.020028972	2	99.85535175	0.010014486
	102.7	0.002380448	2	840.1780783	0.001190224
	104.65	0.000004108	2	486823.2887	2.05413E-06
	99.75	0.000002665	2	750535.6847	1.33238E-06
	101.93	0.000001769	2	1130762.366	8.84359E-07
	96.07	0.000001516	2	1319384.403	7.57929E-07
	98.82	0.000001056	2	1893962.369	5.27994E-07
	98.17	0.000000538	2	3718530.482	2.68923E-07
				Total Quotient	0.022446973

### 105 MHz to 115 MHz

 <p>45019_MLH02_02 - Clermont Cairn 014</p> <p>Start 105.0 MHz; Stop 115.0 MHz Ref 127 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 p/s Peak 105.63 MHz; 121.38 dBµV Transducer Factors: Bi-Conical 2004/2004 14:14:37</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	105.63	0.003644674	2	548.7459726	0.001822337
	106.33	0.000005671	2	352672.2965	2.83549E-06
	111.95	0.000003449	2	579924.352	1.72436E-06
	110.2	0.000002305	2	867703.4933	1.15247E-06
	113	0.000001147	2	1743296.852	5.73626E-07
	114.78	0.000001081	2	1850850.522	5.40292E-07
	107.35	0.000000396	2	5050929.955	1.97983E-07
	113.78	0.000000356	2	5615279.083	1.78086E-07
	111.2	0.000000081	2	24681488.39	4.05162E-08
				Total Quotient	0.00182958

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 2	
<b>NGR:</b> J 09957 15891	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

### 115 MHz to 170 MHz

<p>45019_MLH02_02 - Clermont Cairn 013</p> <p>115 MHz to 170 MHz</p> <p>Start 115.0 MHz; Stop 170.0 MHz Ref 100 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 146.21 MHz; 97.87 dBµV Transducer Factors: Bi-Conical 2004/2004 14:12:45</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	146.21	0.000016243	2	123132.1169	8.12136E-06
	153.64	0.000000796	2	2514035.152	3.97767E-07
	138.51	0.000000270	2	7402379.49	1.35092E-07
	117.75	0.000000269	2	7436547.322	1.34471E-07
	120.64	0.000000196	2	10194627.13	9.80909E-08
	119.54	0.000000186	2	10773860.45	9.28172E-08
	156.39	0.000000107	2	18636800.05	5.36573E-08
	122.43	0.000000080	2	25024842.1	3.99603E-08
	115.69	0.000000057	2	35348529.01	2.82897E-08
<b>Total Quotient</b>					9.1015E-06

### 170 MHz to 230 MHz

<p>45019_MLH02_02 - Clermont Cairn 012</p> <p>170 MHz to 230 MHz</p> <p>Start 170.0 MHz; Stop 230.0 MHz Ref 90 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 185.15 MHz; 81.88 dBµV Transducer Factors: Bi-Conical 2004/2004 14:06:10</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	185.15	0.000000409	2	4890703.629	2.0447E-07
	183.35	0.000000379	2	5276808.65	1.89508E-07
	175.7	0.000000290	2	6892413.841	1.45087E-07
	192.65	0.000000185	2	10798696.76	9.26038E-08
	191	0.000000126	2	15862489.44	6.30418E-08
	225.95	0.000000074	2	27000471.36	3.70364E-08
	194.45	0.000000036	2	55510015.15	1.80148E-08
	193.7	0.000000026	2	75922647.83	1.31713E-08
	177.65	0.000000023	2	85186611.97	1.17389E-08
<b>Total Quotient</b>					7.74672E-07

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 2	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>NGR:</b> J 09957 15891	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

### 230 MHz to 470 MHz

<p>45019_MLH02_02 - Clermont Cairn 011</p> <p>Start 230.0 MHz; Stop 470.0 MHz Ref 100 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 300.0 kHz; VBW 300.0 kHz; Att 0 dB; Swp 0.0 p/s Peak 443.0 MHz; 96.77 dBµV Transducer Factors: Log Periodic 2004/2004 14:02:31</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	443	0.000012608	2.215	175677.0705	5.69226E-06
	281	0.000000484	2	4134008.316	2.41896E-07
	288.2	0.000000341	2	5866395.595	1.70462E-07
	396.2	0.000000172	2	11624421.42	8.60258E-08
	290.6	0.000000166	2	12060667.54	8.29142E-08
	279.2	0.000000143	2	13975628.44	7.15531E-08
	273.2	0.000000122	2	16419931.68	6.09016E-08
	296	0.000000115	2	17432968.52	5.73626E-08
	272	0.000000110	2	18254559.01	5.47808E-08
				Total Quotient	6.51816E-06

### 470 MHz to 670 MHz

<p>45019_MLH02_02 - Clermont Cairn 011</p> <p>Start 470.0 MHz; Stop 670.0 MHz Ref 107 dBµV; Ref Offset 0.0 dB; 10 dB/dv RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 p/s Peak 520.0 MHz; 97.8 dBµV Transducer Factors: Log Periodic 2004/2004 13:55:44</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	520	0.000015983	2.6	162672.7087	6.14731E-06
	496	0.000011903	2.48	208349.7727	4.79962E-06
	471.5	0.000007919	2.3575	297709.7456	3.35898E-06
	552.5	0.000005292	2.7625	521967.7093	1.91583E-06
	536.5	0.000001013	2.6825	2647775.022	3.77676E-07
	526	0.000000854	2.63	3078201.877	3.24865E-07
	502	0.000000792	2.51	3169677.461	3.1549E-07
	477.5	0.000000770	2.3875	3099450.683	3.22638E-07
	601	0.000000544	3.005	5523137.135	1.81057E-07
				Total Quotient	1.77435E-05

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 2	<b>Antenna:</b> Manufacturer: Schaffner EMC Systems Serial Number: 3540
<b>NGR:</b> J 09957 15891	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

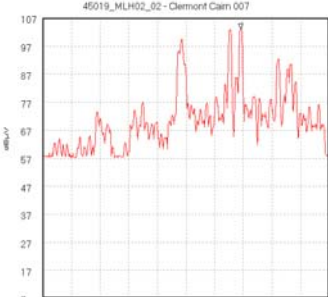
### 670 MHz to 870 MHz

	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient	
	849.5	0.005231891	4.2475	811.8480236	0.001231758	
	752.5	0.001724482	3.7625	2181.814676	0.000458334	
	833	0.000700904	4.165	5942.324387	0.000168284	
	720	0.000400552	3.6	8987.602388	0.00011264	
	855.5	0.000326331	4.2775	13107.84715	7.62902E-05	
	758.5	0.000082729	3.7925	45842.35708	2.18139E-05	
	853.5	0.000053169	4.2675	80262.90604	1.24591E-05	
	839	0.000050195	4.195	83574.40924	1.19654E-05	
	726.5	0.000020829	3.6325	174400.1978	5.73394E-06	
					Total Quotient	0.002097903

### 870 MHz to 1 GHz

	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	949.9	0.000055675	4.7495	85307.89824	1.17222E-05
	948.3	0.000054158	4.7415	87550.19246	1.1422E-05
	942.5	0.000019128	4.7125	246372.774	4.05889E-06
	954.8	0.000004962	4.774	962107.8649	1.03938E-06
	956.4	0.000003004	4.782	1592028.808	6.28129E-07
	952.2	0.000000250	4.761	19012513.34	5.25969E-08
	946.7	0.000000193	4.7335	24576709.25	4.06889E-08
	960	0.000000169	4.8	28482793.92	3.51089E-08
	937.3	0.000000105	4.6865	44790918.83	2.2326E-08
					Total Quotient

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 2	<b>Antenna:</b> Manufacturer: EMCO Model: 3146A Serial Number: 3993
<b>NGR:</b> J 09957 15891	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

GSM 900					
 <p>45019_MLH02_02 - Clermont Cairn 007</p> <p>Start 924.0 MHz; Stop 961.0 MHz Ref 107 dBµV; Ref Offset 0.0 dB; 10 dB/dv RES 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 0.0 pS Peak 949.62 MHz; 103.04 dBµV Transducer Factors: log periodic 20/04/2004 13:45:47</p>	Frequency (MHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	949.62	0.000053414	4.7481	88891.69906	1.12496E-05
	948.14	0.000050776	4.7407	93364.94022	1.07107E-05
	942.04	0.000022838	4.7102	206243.7033	4.84863E-06
	954.43	0.000004805	4.77215	993242.8247	1.0068E-06
	956.1	0.000003116	4.7805	1533962.253	6.51907E-07
	956.65	0.000000739	4.78325	6472386.306	1.54503E-07
	947.49	0.000000564	4.73745	8392396.415	1.19155E-07
	951.29	0.000000213	4.75645	22316407.65	4.48101E-08
	946.38	0.000000209	4.7319	22666105.62	4.41187E-08
			Total Quotient	2.88302E-05	

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 2	
<b>NGR:</b> J 09957 15891	<b>Antenna:</b> Manufacturer: EMCO Model: 3115 Serial Number: 1203
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

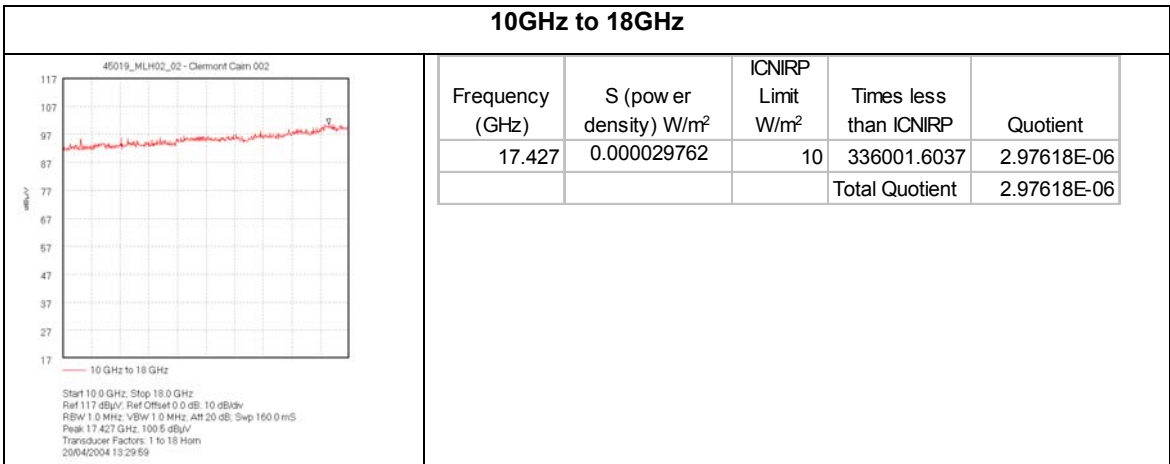
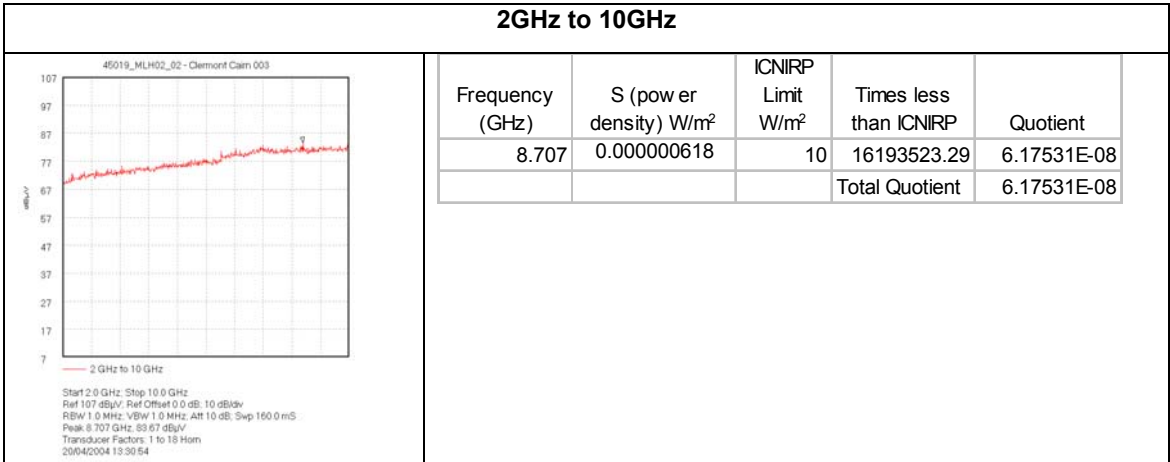
1GHz to 2 GHz					
Frequency (GHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient	
1.85	0.000000116	9.25	79521228.91	1.25753E-08	
1.873	0.000000087	9.365	108105834.1	9.25019E-09	
1.818	0.000000029	9.09	317618092.7	3.14844E-09	
1.828	0.000000021	9.14	434798008.2	2.29992E-09	
1.84	0.000000021	9.2	441701808.6	2.26397E-09	
1.368	0.000000013	6.84	522874487.5	1.9125E-09	
1.02	0.000000008	5.1	665137641.7	1.50345E-09	
			Total Quotient	3.29537E-08	

1805-1843 MHz					
Frequency (GHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient	
1.843	0.000000086	9.215	107111645.1	9.33605E-09	
1.835	0.000000038	9.175	240961369.7	4.15004E-09	
1.828	0.000000027	9.14	341418889.9	2.92895E-09	
1.833	0.000000023	9.165	396710613.4	2.52073E-09	
1.82	0.000000022	9.1	410565774.1	2.43566E-09	
1.82	0.000000022	9.1	419162809.4	2.38571E-09	
1.818	0.000000019	9.09	484066728.8	2.06583E-09	
1.831	0.000000013	9.155	691830491.2	1.44544E-09	
1.837	0.000000013	9.185	715188480.8	1.39823E-09	
			Total Quotient	2.86667E-08	

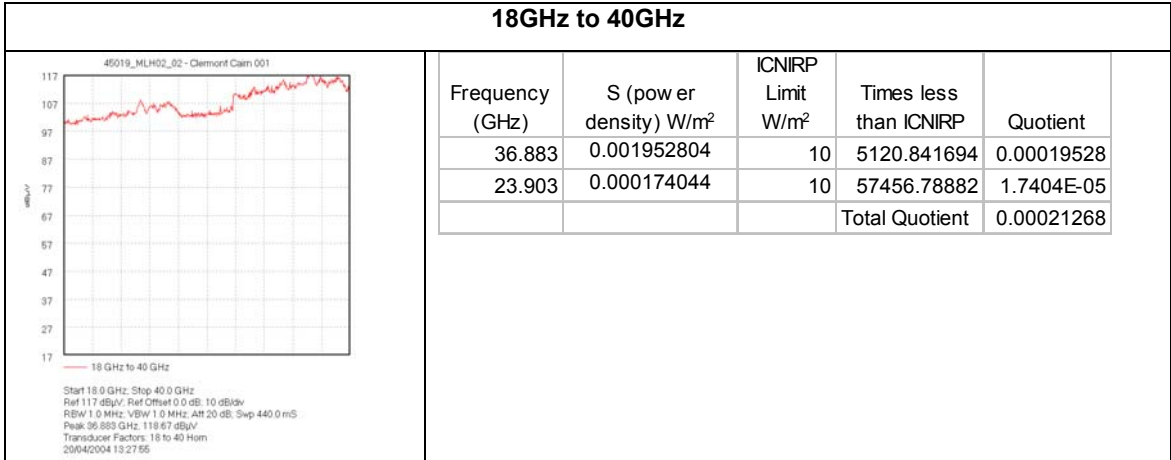
<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Hewlett Packard Model: 8594A Serial Number: 3108U00205
<b>Location:</b> Position 2	<b>Antenna:</b> Manufacturer: EMCO Model: 3115 Serial Number: 1203
<b>NGR:</b> J 09957 15891	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	

1842 – 1880MHz					
	Frequency (GHz)	S (power density) W/m <sup>2</sup>	ICNIRP Limit W/m <sup>2</sup>	Times less than ICNIRP	Quotient
	1.869	0.000000180	9.345	51870526.46	1.9279E-08
	1.866	0.000000180	9.33	51906649.17	1.9265E-08
	1.843	0.000000098	9.215	93937000.75	1.0645E-08
	1.871	0.000000067	9.355	139439283.3	7.1716E-09
	1.86	0.000000044	9.3	213709731.5	4.6792E-09
	1.855	0.000000034	9.275	276474619.2	3.617E-09
	1.846	0.000000029	9.23	321028102.1	3.115E-09
	1.876	0.000000029	9.38	328506667.5	3.0441E-09
	1.864	0.000000028	9.32	335550015	2.9802E-09
			Total Quotient	7.3797E-08	

<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Agilent/HP Model: 8565E Serial Number: 3846A01089
<b>Location:</b> Position 2	<b>Antenna:</b> Manufacturer: EMCO Model: 3115 Serial Number: 1203
<b>NGR:</b> J 09957 15891	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	



<b>Site:</b> Clermont Cairn	<b>Receiver:</b> Manufacturer: Agilent/HP Model: 8565E Serial Number: 3846A01089
<b>Location:</b> Position 2	<b>Antenna:</b> Manufacturer: EMCO Model: 3116 Serial Number: 9611-2330
<b>NGR:</b> J 09957 15891	
<b>Date:</b> 20/04/04	
<b>Officer:</b> Dan Smith	



### 3.2.2 SITE SKETCH MAP

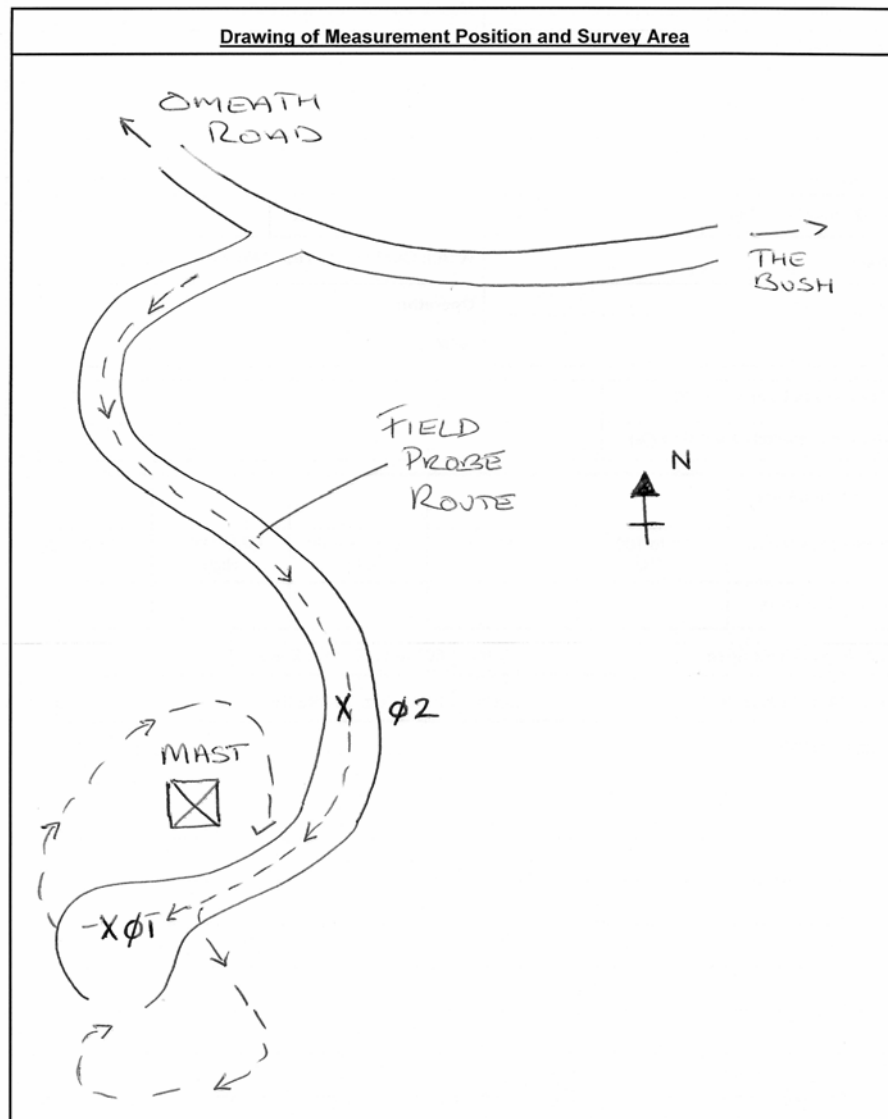
Position 1. Clermont Cairn, Adjacent to Mast, approximately 30 m South West of Mast. (See Mark 01)

Position 2. Clermont Cairn, Adjacent to Mast, approximately 30 m North East of Mast. (See Mark 02)

RADIO FREQUENCY INVESTIGATION LTD

OFF-SITE WORKBOOK  
Test No. 45019

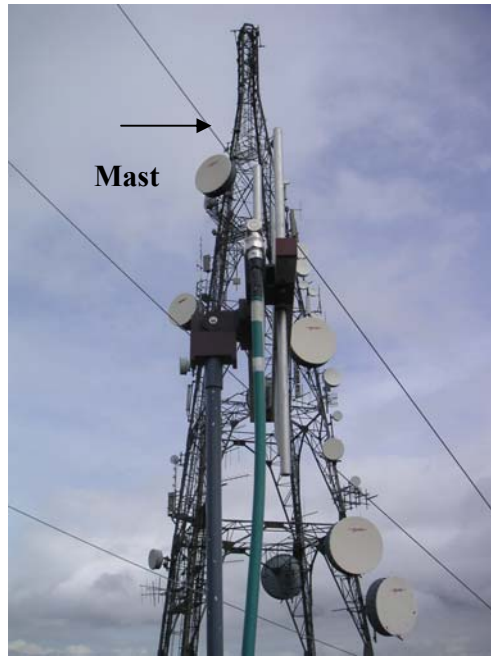
For: Mason Communications  
Survey Of:  
Location:





### 3.2.3 SITE PHOTOGRAPHS

3.2.3.1 Position 1. Clermont Cairn, Adjacent to Mast, approximately 30 m South West of Mast.



3.2.3.2 Position 2. Clermont Cairn, Adjacent to Mast, approximately 30 m North East of 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 recommendation<sup>2</sup> 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.

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<sup>2</sup> 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 <sup>2</sup> )	Radio Service
0.003-0.15	87	5	-	
0.15-1	87	0.73/f	-	LW and MW Radio Broadcasting
1-10	$87/f^{1/2}$	0.73/f	-	
10-400	28	0.073	0.2	VHF Radio and Television Broadcasting
400-2000	$1.375f^{1/2}$	$0.0037xf^{1/2}$	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 <sup>2</sup>
400 MHz – 2GHz	((frequency in MHz)/200)W/m <sup>2</sup>
2GHz – 300GHz	10 W/m <sup>2</sup>

**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  $3 \times 10^{15}$  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.