

Office of Utility Regulation

# **Audit of Emissions from Radio Masts in Guernsey:**

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## **Report and Information Notice**

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**Office of Utility Regulation**  
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# 1. Introduction

The telecommunications sector in the Bailiwick of Guernsey has over the past three years or so witnessed significant change. Among the developments is the emergence of competing operators to the incumbent, C&W Guernsey (“C&WG”). The introduction of competition to the telecoms market is already delivering benefits to the consumer, in the form of falling prices, improved quality of service and greater choice.

In addition alternative networks have been deployed by new entrants. This has included the roll-out of new radio based networks, the most obvious being Wave Telecom’s 2G & 3G mobile networks. It is important when deploying radio based networks that all operators have regard to their obligations, not just with respect to their licence conditions, but also to the wider community.

For operators in the telecoms markets, whether providing fixed or mobile services, these obligations are laid out in the form of their duties under the various applicable laws, such as the Regulation of Utilities (Bailiwick of Guernsey) Law 2001 (“Regulation Law”) and the Telecommunications (Bailiwick of Guernsey) Law 2001 (“Telecoms Law”). Further, the licence conditions<sup>1</sup> that operators are required to comply with also include conditions that are designed to protect consumers and the environment. Of particular relevance in the context of this report is the condition which covers the requirement of all operators to ensure that emissions from any radio sites operated or controlled by a licensee complies with the highest international standard with respect to the levels of emissions. This condition states that:

*“The Licensee shall ensure that non-ionising radiation emissions from its Licensed Telecommunications Network are within the limits specified by the guidelines published by the International Commission for Non-Ionising Radiation Protection (ICNIRP) and that it complies with any radiation emission standards adopted and published from time to time by ETSI, the European Committee for Electrotechnical Standardisation and any other standards specified by the DG.”*

The Director General (“DG”) has undertaken this review against the International Commission for Non-Ionising Radiation Protection’s (“ICNIRP”)<sup>2</sup> standard as it is recognized by most developed countries as being the highest and most relevant standard that can be applied. It is to this standard that the DG has assessed the degree to which operators in the Bailiwick are in compliance. ICNIRP is a formally recognized non-governmental organization in non-ionizing radiation for the World Health Organization and the International Labour Office.

This is the first such audit of emissions from radio masts in the Bailiwick and it is

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<sup>1</sup> Document OUR 01/19 <http://www.regutil.gg/docs/our0119.pdf>

<sup>2</sup> [www.icnirp.de](http://www.icnirp.de)

important that a base level of information is gathered at this time and the compliance of the operators concerned assessed. This audit will provide a platform for future assessment of on-going compliance. The audit methodology is described in detail later in sections 4 and 5.

The DG is mindful that there exists a level of public concern regarding emissions from radio masts, a concern that is not unique to Guernsey. The DG hopes that by publishing in full the findings of this audit that this may help allay some of those concerns. Full details of the masts audited and the audit findings are included in Section 4 of this report.

Since the audit was completed in November 2004 further masts sites have been activated by operators. It is inevitable, when taking a snapshot such as this audit, that further developments will occur. For this reason that the DG believed it vitally important that the processes and procedures that the operators have in place to ensure on-going compliance are detailed, appropriate and rigorously applied. Details of the audit of operators' processes and procedures are contained in Section 5.

The audit of any masts not covered by this report – that is to say masts that have been installed since the audit was completed - is a matter that has been raised with the OUR. It is not envisaged that the scale of audit undertaken on this occasion will be undertaken each year. The number of additional masts, particular masts associated with mobile networks, is not expected to be substantial. The DG however does intend that there will be further reviews and this is dealt with in Section 7.

The OUR is aware that significant debate exists with regard to the safety or otherwise of emissions from radio masts and the related issue of the effects of mobile phone handsets. These are not issues that the OUR is qualified to express an opinion upon and as such this report is not a critique of the current recognized standard against which compliance has been assessed. The current audit has been undertaken to assess the degree to which, within the Bailiwick, operators are complying with the highest recognized and internationally accepted standards.

## 2. Structure of this Report

The rest of this paper is structured as follows:

- Section 3:** Describes the background to the audit, the ICNIRP standard and details how members of the public may access further information on the detailed results of the audit;
- Section 4:** Sets out the results of the audit of each mast site;
- Section 5:** Details the results of the audit of the individual operators processes and procedures for ensuring compliance with their licence obligations;
- Section 6:** Summarises the issues identified by the audit and the recommendations arising from the review; and
- Section 7:** Sets out the conclusions and further work in relation to future on-going compliance

The DG would like to thank C&WG, Newtel Solutions and Wave Telecom for their co-operation and assistance to both the OUR and to Cellular Design Services Ltd (“CDS”), the consultants engaged by the OUR to undertake this audit.

### **2.1. The Auditors**

The audit has been undertaken on behalf of the OUR by Cellular Design Services Ltd (“CDS”). CDS is independent of operators and equipment vendors and provides a range of services connected with the provision of telecommunications services, with particular emphasis on mobile cellular systems. It has provided services to a range of clients including cellular operators, cellular equipment manufacturers, local councils and private individuals.

### 3. Background

The OUR was established in October 2001 to regulate the telecommunications, post and electricity sectors in Guernsey independently from the companies and from the States of Guernsey.

Among the objectives of the OUR is the requirement set out in the Regulation Law to

*“ensure that utility activities are carried out in such a way as to best serve and contribute to the economic and social development and well-being of the Bailiwick” and to “lessen where practicable, any adverse impact of utility activities on the environment”.*

These general duties are further reflected in the licence conditions under which all telecoms operators provide services. In particular, a specific licence condition has been included to cover the management of radio based networks, of which the most common are mobile networks and point-to-point links. These are the most prevalent radio based networks in the Bailiwick. This licence condition states that:

*“The Licensee shall ensure that non-ionising radiation emissions from its Licensed Telecommunications Network are within the limits specified by the guidelines published by the International Commission for Non-Ionising Radiation Protection (ICNIRP) and that it complies with any radiation emission standards adopted and published from time to time by ETSI, the European Committee for Electrotechnical Standardisation and any other standards specified by the DG.”*

Clearly with the development of competition in the telecoms market, and in particular the mobile market, the number of mast sites required to gain full Bailiwick coverage has increased. While the sharing of mast sites is encouraged, and is more common than it is perhaps understood, it is not always possible to mast share on every occasion because of the particular characteristics of different radio networks.

However to ensure that operators are in compliance with their licence obligations, the DG has undertaken an audit of operators using radio spectrum in the Bailiwick. The audit comprised of two specific separate workstreams. These are:

- An audit of the processes and procedures that each operator has in place to ensure on-going compliance and to ensure the safety of the public, its own staff and others who may have reason to be in close proximity to a mast site; and
- An individual audit of each site operated by the C&WG, Newtel Solutions and Wave Telecom (as of November 2004).

Sections 4 and 5 sets out the findings of the audit of mast sites and reports on the processes and procedures in place by the telecoms operators.

### **3.1. Radio Emissions from Radio Masts**

All radio waves are electromagnetic (“EM”) waves which are composed of electric and magnetic fields. These waves are described as ‘non-ionising radiation’ as distinct from the ionising radiation produced by radioactive sources.

Exposure to EM waves is measured in terms of the electric and magnetic field strengths which are produced by a transmitter at locations which could be accessed by the public. The electric field strength, E, is measured in volts per meter [V.m-1]. The power which could be absorbed by an object at a given location is proportional to the area of the object multiplied by the square of the electric field strength.

We are all regularly exposed to EM radiation from a variety of sources. Besides mobile phone systems, common sources of radio waves include television broadcasts which in the Bailiwick (and the UK) operate at frequencies between 400 MHz and 860 MHz and microwave communication links (dishes) which usually operate at frequencies above 1000 MHz.

The potential health impact of EM fields has been studied for many years. The increase in the usage of mobile phones has caused an increased public concern in this area, with the result that a number of bodies have been set up and tasked with overseeing research into such effects. The conclusions from these investigations are used to set regulatory limits on field exposure which reflect a precautionary principle based on the current state of knowledge.

### **3.2. The ICNIRP Standard**

The limit chosen by the OUR which operators in the Bailiwick are required to comply with is the standard set by ICNIRP. The ICNIRP standards sets out the safe levels of emissions that the ICNIRP believes telecoms operators should comply with in respect of the safe operation of their radio networks. Detailed information about ICNIRP and its work is available on the ICNIRP website ([www.icnirp.de](http://www.icnirp.de)) and it includes information on how its standards are arrived at and the factors it takes account of in deriving those standards. Appendix 1 also sets out some further detail on the ICNIRP standards.

### **3.3. Publication of the Results**

It is important to the DG that the public has confidence in the ability of the licensed telecoms operators within the Bailiwick, and in particular those using radio spectrum as part of their networks, to manage those networks for the good of all and that their networks are in compliance with the highest possible standards.

The ICNIRP guidelines, against which each mast site has been assessed, are recognized as being the most stringent test available at this time. The DG proposes to ensure that Guernsey’s standards will remain consistent with the highest international standard and

will monitor the ICNIRP standard, and any other relevant standard, so that any changes will be immediately communicated to the operators licensed by this Office.

In order to help promote confidence and to reassure the general public, the DG is publishing full details of the audit. The summary details of the individual site audits are set out in section 4. The actual individual site reports are available from the OUR free of charge. Should any member of the public require a copy of any specific mast report, they should contact the OUR by:

- phone – 711120
- email – [info@regutil.gg](mailto:info@regutil.gg)

specifying the site report you are interested in and the name and address to which you would like the report sent.

The OUR has also published a summary of the results for each site on the OUR website – [www.regutil.gg](http://www.regutil.gg). The website contains details of each site location in Guernsey, Alderney and Sark and the results of the audit of each site. The audit results for each site are presented in a way which demonstrates how far a particular site is below the ICNIRP guidelines.



## **4. Results of the Audit of Mast Sites**

### **4.1. Audit Process**

The audit of the sites listed below was carried out between 8<sup>th</sup> November and 26<sup>th</sup> November 2004. The same procedures were followed at each site and are described in detail below. The surveys were conducted by a qualified radio engineer and consisted of:

1. A visual inspection of the site to determine its type, the type of antennas deployed and their height;
2. An inspection of the signs put by the operators around the site to warn of the existence of RF (radio frequency) emissions;
3. A GPS reading of the site location;
4. A measure of the RF field strength levels in all the frequency bands transmitted at the site using a frequency-selective probe; and
5. A photograph of the site, and of the measurement location.

The detailed results of these surveys were delivered to the OUR in individual site audit reports. The summary findings of the audit are listed in section 4.3.

### **4.2. Survey Methodology**

EM field levels were measured in these surveys using a carefully designed and controlled methodology. Elements of this methodology include:

1. A peak search around the site performed in order to determine with accuracy the location where the maximum radiation levels were received. To achieve this, the survey engineer walked in the area surrounding the site along a pre-defined template path, using the hand-held probe and noted the location of maximum reading.
2. Subject to accessibility, walks were limited to a nominal 100m from the site. Generally, stretching up to the point (and slightly beyond) where the peak values were measured.
3. A note of the position of the peak reading was made by the engineer.
4. The probe was then positioned on a tripod at the exact location of the maximum radiation level readings and the measurement taken. The height of the probe was approximately 1.5m above the ground.
5. The exact measurement position was recorded using a GPS receiver and photos

of the site were taken.

The measurements were performed using:

- An isotropic field probe, which reacts to all polarisations (directions) of the electric field; and.
- A carefully calibrated exposure level meter for all cellular frequencies to ensure that that the measurements are meaningful and accurate.

As already mentioned, the site audits were conducted between the 8th and the 26th of November 2004, generally within working hours (except for the airport terminal which was carried out at 19:00) and only on working days (Monday-Friday).

### **4.3 Summary of Results**

The table on the following page shows the results of the EM emission surveys from all Bailiwick sites.

Site Name	Frequency [MHz]	Operator	Survey date	Survey time	Max field strength [V/m]	ICNIRP Reference Level Relative to Max field strength	Band Exposure Quotient	Band Exposure Quotient Relative to ICNIRP
Airport terminal	900	C&W	23-Nov-04	19:00	2.57	17	0.009061002	1/ 110
Airport terminal	1800	Wave	23-Nov-04	19:00	0.02402	2482	0.00000150	1/ 665977
Airport Tower	5800	Newtel	15-Nov-04	9:15	0.0222	2753	0.0000001320	1/ 7578460
Alderney Exchange	900	C&W	23-Nov-04	14:15	0.27	159	0.000143025	1/ 6992
BBC Pleinmont	900	C&W	22-Nov-04	14:00	0.30	144	0.000172669	1/ 5791
BBC Pleinmont	1800	Wave	22-Nov-04	14:00	0.52810	113	0.00020212	1/ 4947
BBC Rohais	900	C&W	26-Nov-04	8:20	1.02	42	0.002267647	1/ 441
Beau Sejour	900	C&W	15-Nov-04	15:00	0.21	202	0.000249517	1/ 4008
Beau Sejour	1800	Wave	15-Nov-04	15:00	0.48440	123	0.00026166	1/ 3822
Beau Sejour	2200	Wave	15-Nov-04	15:00	0.04780	1276	0.00000492	1/ 203108
Beau Sejour	2400	Newtel	15-Nov-04	15:00	0.0125	4872	0.0000000421	1/ 23738920
Beau Sejour	2400	Newtel	15-Nov-04	15:00	0.0040	15407	0.0000000042	1/ 237389202
Beau Sejour	2400	Newtel	15-Nov-04	15:00	0.0031	19397	0.0000000027	1/ 376236530
Beau Sejour	5800	Newtel	15-Nov-04	15:00	0.0089	6882	0.0000000211	1/ 47365373
Cadastre Building	2400	Newtel	13-Nov-04	9:15	0.0314	1946	0.0000002642	1/ 3785001
Centenary House	900	C&W	24-Nov-04	16:00	1.18	36	0.001945751	1/ 514
Civil Defence Bunker	900	C&W	24-Nov-04	10:45	0.87	49	0.001630001	1/ 613
Cour de Parc	2400	Newtel	18-Nov-04	15:00	0.0050	12268	0.0000000066	1/ 150494612
Cour de Parc	2400	Newtel	18-Nov-04	15:00	0.0031	19443	0.0000000026	1/ 378025374
Digimap	2400	Newtel	24-Nov-04	15:40	0.0124	4930	0.0000000411	1/ 24308654
Falcon	1800	Wave	25-Nov-04	8:15	0.63100	94	0.00027509	1/ 3635
Falcon	2200	Wave	25-Nov-04	8:15	0.06510	937	0.00000574	1/ 174136
Fort Doyle	900	C&W	23-Nov-04	11:00	1.61	26	0.003876008	1/ 258
Fort George	900	C&W	19-Nov-04	10:45	0.31	140	0.000205186	1/ 4874
Fort George	1800	Wave	19-Nov-04	10:45	0.00553	10791	0.00000067	1/ 1493548
Fort George	2200	Wave	19-Nov-04	10:45	0.00850	7180	0.00000099	1/ 1006249
Fort Saumarez	900	C&W	25-Nov-04	9:20	0.03	1417	0.00000408	1/ 245013
Gervais	1800	Wave	25-Nov-04	9:00	0.50080	119	0.00036070	1/ 2772
Gervais	2200	Wave	25-Nov-04	9:00	0.14360	425	0.00003351	1/ 29838
Guernsey Electricity	900	C&W	8-Nov-04	11:00	1.10	441	0.00006240	1/ 16026
Guernsey Electricity	1800	Wave	8-Nov-04	11:00	0.09641	618	0.00002344	1/ 42663
Guernsey Electricity	2200	Wave	8-Nov-04	11:00	0.74601	82	0.00098041	1/ 1020
Harbour	900	C&W	18-Nov-04	9:45	0.96	44	0.003053495	1/ 327
Harbour	1800	Wave	18-Nov-04	9:45	0.52890	113	0.00072315	1/ 1383
Harbour	2200	Wave	18-Nov-04	9:45	0.14105	432	0.00003599	1/ 27786
Homefield	1800	Wave	24-Nov-04	12:30	0.51270	116	0.00026915	1/ 3715
Homefield	2200	Wave	24-Nov-04	12:30	0.04878	1251	0.00000509	1/ 196418
Jamblin	1800	Wave	9-Nov-04	11:15	0.31260	191	0.00010044	1/ 9957
Jamblin	2200	Wave	9-Nov-04	11:15	0.06593	925	0.00000857	1/ 116719
JEC telecom	5.8	Newtel	12-Nov-04	11:30	0.6844	89	0.0001258873	1/ 7944
Kings Mills	900	C&W	26-Nov-04	9:00	0.06	707	0.000000537	1/ 186321
La Tonnelle House	5800	Newtel	17-Nov-04	9:30	0.0200	3054	0.0000001072	1/ 9327753
Marais	1800	Wave	12-Nov-04	10:30	0.48110	124	0.00031809	1/ 3144
Marais	2200	Wave	12-Nov-04	10:30	0.13973	437	0.00003534	1/ 28300
Maraive	1800	Wave	9-Nov-04	12:00	0.71460	83	0.00043242	1/ 2313
Maraive	2200	Wave	9-Nov-04	12:00	0.10613	575	0.00002077	1/ 48138
Mignot Plateau	1800	Wave	17-Nov-04	13:00	0.61590	97	0.00033054	1/ 3025
Mignot Plateau	2200	Wave	17-Nov-04	13:00	0.54914	111	0.00053177	1/ 1881
Norman Piette Hse	5800	Newtel	12-Nov-04	8:00	0.0140	4363	0.0000000525	1/ 19036230
NTL Les Touillets	900	C&W	26-Nov-04	12:30	0.13	332	0.00008420	1/ 11877
NTL Les Touillets	1800	Wave	26-Nov-04	12:30	0.30870	193	0.00007207	1/ 13876
NTL Les Touillets	2200	Wave	26-Nov-04	12:30	0.09478	644	0.00001400	1/ 71419
Oakfield	1800	Wave	17-Nov-04	9:00	0.39420	151	0.00019042	1/ 5252
Oakfield	2200	Wave	17-Nov-04	9:00	0.13350	457	0.00003234	1/ 30925
Odeon	900	C&W	23-Nov-04	12:00	0.63	68	0.000589089	1/ 1698
Project & Hire	2400	Newtel	11-Nov-04	16:00	0.0180	3396	0.0000000867	1/ 11530205
Quav side	2400	Newtel	8-Nov-04	13:00	0.0204	2994	0.0000001116	1/ 8961203
Quav side	5800	Newtel	8-Nov-04	13:00	0.0117	5236	0.0000000365	1/ 27412171
Ronez	900	C&W	12-Nov-04	9:15	0.47	91	0.000599306	1/ 1669
Royal Court	2400	Newtel	11-Nov-04	9:00	0.0257	2378	0.0000001769	1/ 5654137
Sark Harbour	900	C&W	11-Nov-04	11:30	0.66	64	0.000585032	1/ 1709
Sark TE	900	C&W	11-Nov-04	9:15	0.22	193	0.000151205	1/ 6614
Sigma-Aztec Complex	2400	Newtel	9-Nov-04	10:00	0.0249	2449	0.0000001667	1/ 5998822
Sir Charles Frossard	900	C&W	18-Nov-04	15:15	0.70	61	0.000670731	1/ 1491
Sir Charles Frossard	2400	Newtel	18-Nov-04	15:15	0.0089	6821	0.0000000215	1/ 46528284
Smith Street	900	C&W	18-Nov-04	9:30	1.34	32	0.002292598	1/ 436
St Martin's Hotel	1800	Wave	24-Nov-04	8:30	0.17130	348	0.00002220	1/ 45046
St Peter's Exchange	900	C&W	24-Nov-04	13:30	0.69	62	0.000844251	1/ 1184
St Peter's Exchange	1800	Wave	24-Nov-04	13:30	0.10590	563	0.00001552	1/ 64451
St Peter's Exchange	2200	Wave	24-Nov-04	13:30	0.04381	1392	0.00000428	1/ 233762
Town & Country Hse	2400	Newtel	17-Nov-04	8:45	0.0224	2721	0.0000001350	1/ 7405953
TRS	900	C&W	17-Nov-04	13:00	0.28	153	0.000245568	1/ 4072
Victoria Tower	1800	Wave	17-Nov-04	10:45	0.17870	334	0.00003841	1/ 26037
Victoria Tower	2200	Wave	17-Nov-04	10:45	0.54791	111	0.00052940	1/ 1889
Watchtower	900	C&W	26-Nov-04	10:00	0.63	67	0.000640587	1/ 1561
Watchtower	1800	Wave	26-Nov-04	10:00	0.48790	122	0.00023507	1/ 4254
Watchtower	2200	Wave	26-Nov-04	10:00	0.10890	560	0.00002076	1/ 48160
Water Tower	900	C&W	23-Nov-04	8:00	0.39	109	0.000513931	1/ 1946
Westwood	1800	Wave	24-Nov-04	9:45	0.52960	113	0.00020597	1/ 4855
Westwood	2200	Wave	24-Nov-04	9:45	0.27035	226	0.00012967	1/ 7712
XKO	2400	Newtel	17-Nov-04	8:00	0.0281	2167	0.0000002129	1/ 4697178

Figure 2 Results of the EM emission surveys from all Bailiwick sites

#### 4.4 Review of the Results

The summary of the audit clearly shows that all mast sites are well within the ICNIRP guidelines for emissions from masts. The column marked “*Band Exposure Quotient relative to ICNIRP*” denotes the number of times the maximum reading (as identified by the survey described in section 4.2) at a particular site is below the recommended level by the ICNIRP.

The exposure quotient, which expresses the accumulated exposure at all frequencies in the band as a ratio of the ICNIRP Reference level<sup>3</sup> for public exposure, remained well below unity across all sites and is seen to vary between 1/110 and 1/378025374 of the ICNIRP band EQ. A band Exposure Quotient of unity (one) would mean that the ICNIRP *Reference* level was reached across the frequency band of the operator.

It will be noted that for the various radio frequencies used by operators there are significant differences between the magnitude by which the maximum reading is in compliance with the ICNIRP guideline. A number of factors can contribute to why, even for similar technology (i.e. GSM, 3G, links), different sites can produce results that vary significantly. The most likely factors are:

- **The power of the transmitted EM field;** the different operators use different power levels according to the limitations specified by their wireless telegraphy licence. Operators will also use different power from one site to another depending on the configuration of their network in order to optimise their quality of service.
- **The distance between the antenna and the measurement location;** the greater the distance from the transmitter, the greater the loss. (This is because EM power transmitted from a point reduces at a rate equal to the inverse square of the distance);
- **The clutter around the site and the measurement location;** measurements with a direct line-of-sight to the antenna will generally produce greater signal strength than when there is an obstruction along the propagation path. This is the case for instance when the antenna is mounted on the roof, at some distance behind the roofline.
- **The number of channels transmitted at the site;** the greater the number of channels, the larger the band Exposure Quotient as this is calculated as the sum of contributions from all channels within the band. As a result, sites with many channels such as at Beau Sejour or Harbour (Cambridge Berth) will generate higher band EQ than sites with single channels.

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<sup>3</sup> The term ‘reference level’ is explained in Appendix 2

- **The activity of the cell at the time of the survey;** in carrying out the audit, the auditors made sure that, as much as possible, surveys were conducted during working hours, and that only working days (Monday-Friday) were surveyed on. This ensured that the networks were operating under “normal” capacity conditions. There might however be instances where peak conditions might be reached for a particular cell (e.g. a flight landing at the airport, students coming out of college at the end of the school day, a sports or entertainment venue on the day of an event).

These instances would be exceptional and may drive the power of a site to its maximum capacity. There was no evidence however of any site during the audit where used capacity was significantly lower than available capacity. As a result, the difference between the observed levels and the levels that would be measured in a full capacity scenario would be marginal. This evidence is supported by the fact that in the field strength plots (which show the field strength vs frequency in the EM emission reports), the number of channels that were active at the time of the survey and that the number of these channels compare well with the number of channels available at each site.

- **Configuration of the antennae;** tilt and orientation of the antennas will have a significant effect on the measured field strength. Antennas with high tilt will produce more power in the vicinity of the site than those with low tilt. In built-up areas, high antenna tilts are generally used by operators to cover hot spots in the close neighbourhood of the site. In rural areas, the antennas are more likely to be configured with a low tilt in order to provide coverage further away from the site.

## **5. Audit of Operators' Processes and Procedures**

Ensuring that radio networks are compliant with the ICNIRP standard on an on-going basis is dependent to a large degree upon operators having in place correct procedures for the installation, operation and maintenance of their networks. The auditors looked to identify what processes are currently followed by the operators in implementing the roll-out of their networks to ensure on-going compliance.

### **5.1. Audit Process**

Each of the operators was required to provide details of their current process and procedure manuals and copies of signage that each operator places in the vicinity of its masts to inform the public, staff and others who may have access to the site area (in particular where a mast site is shared or where it is located where other occupational workers may have access to the site). The documentation requested included:

- Health and Safety documents regarding working in the vicinity of active sites;
- Site share policy document describing the procedure for dealing with site visits when a site is shared by more than one operator; and
- Site signage policy

The auditors reviewed this information for each operator against best practice and sought clarification from the operators as part of the process. They also, in the context of the site audit, verified that the information provided in the processes and procedures manuals was consistent with what it was witnessing during its site visits.

### **5.2. The Results**

Arising from the audit of the processes and procedures, the auditors made a number of recommendations to the operators and this has been communicated separately to each operator. The main issues identified in the audit related to site access, site signage and the power levels at which C&WG was transmitting in the airport terminal. These issues are detailed further below.

Whilst all operators were complying with the ICNIRP guidelines on emissions from masts, the processes and procedures documentation was not always consistent on this point. That is, certain documentation referenced the ICNIRP guideline standard whereas certain other documents referenced other relevant standards, such as the NRPB (National Radiological Protection Board) standard.

### **5.3. Antenna Accessibility and Site Signage**

The sites deployed in the Bailiwick are a mixture of roof-mounted, pole-mounted, wall-

mounted and masts. Most sites were found to be difficult or impossible to access without specialist climbing equipment, or were fenced off with a locked gate.

However, a number of sites were identified during the survey which had “easy” access to their antennas namely:

- Beau Sejour (multi-operator),
- Mignot Plateau (Wave Telecom),
- JEC Telecom hut at Barker’s Quarry (Newtel),
- Airport Tower (Newtel),
- the Cable & Wireless shop on Smith Street (C&WG),
- the Airport Terminal (multi-operator),
- Fort Doyle in Alderney (C&WG) and
- Fort Doyle in Alderney (C&WG).

The word “easy” is used here to refer to the fact that no specialist access equipment would be required to get within touching distance of the antenna, either because the building roof is accessible through a door or a pre-installed ladder, or that the antenna is at ground level.

Access to the Beau Sejour and the airport tower roofs are through locked doors, while the antenna at Mignot Plateau is wall-mounted but is within touching distance (see Figure 1 below). The antennas at JEC Telecom hut and Smith Street shop on the other hand are only at 2.2m and 1.5m above ground respectively and are easily within reach, although neither site is in an area accessible to the general public.



Figure 1 Antenna at Mignot Plateau

The sites at Beau Sejour and Mignot Plateau were found to have clear signs indicating the

existence of an electromagnetic radiation source. At Beau Sejour, the sign was found at the base of the roof section hosting the antenna as shown on the photograph in Figure 2 below, and on the door leading to the roof. At Mignot Plateau, the sign was found on the gate at the bottom of the path leading to the antenna.



Figure 2 Photograph of poster by the Beau Sejour antennas (Newtel and Wave signs)

However, no signs were found at the other mentioned sites (JEC Telecom hut, Airport Terminal and Smith Street). The antennas at these sites are fixed to walls and, even though they were found to be difficult to get access to by members of the public, and could as a result be assumed to be at the required safety distance, the auditors believe that these antennas should be clearly signed so that members of the general public, such as general building maintenance workers, are warned of the potential hazard.

#### **5.4. Airport Terminal**

The auditors believed that it would be more appropriate for the power levels for the antennas in the airport terminal building to be reduced. The OUR is aware as a result of this audit that certain airport authorities in the UK include specific requirements with respect to antennas in their airport buildings as part of their internal health and safety requirements. The OUR believes it appropriate that operators in Guernsey adopt this approach. While the emissions from the antenna in the airport terminal are well within the recommended guidelines, the OUR is of the view that the power at which it is transmitting should be reduced to the levels recommended by the auditors.



## 6. Recommendations and Findings

As already described, this audit provides the operators, the general public and the OUR with a snapshot of the radio frequency sites operating in the Bailiwick of Guernsey in November 2004.

The overall conclusion reached by the auditors regarding compliance with the licence conditions insofar as they related to emissions from masts is very positive. Each of the operators has put in place the necessary procedures and guidelines for:

- identifying clearance distances around sites;
- marking exclusion zones around active sites with clear signs;
- setting up strict policies for accessing sites (shared and not shared) for maintenance and antenna work, and
- restricted access to sites to workers and set-up a Permit to Work system whereby any maintenance on sites, shared or not-shared, has to be submitted prior to any work being carried out on a site.

The auditors are satisfied that these processes and procedures are adequate to prevent exposure to radiation levels exceeding the recommended ICNIRP guidelines. In addition each site audited was well within the ICNIRP recommended levels for safe emissions from such sites.

In the process of conducting this survey, the auditors noted a number of areas where operators and the OUR can contribute in order to strengthen the procedures already in place. As a result the OUR will be requiring operators to implement the following recommendations:

- In view of the change over time in the recommendations from NRPB, the auditors recommend that the OUR issue more specific guidance to operators on the need to apply ICNIRP public exposure levels. While it is noted that all operators are in compliance with this standard already, certain documentation in the processes and procedures manuals do not reflect this. The OUR accepts this recommendation and will be requiring all operators to update their processes and procedures.
- The auditors recommend that the OUR keep an up-to-date record of operational sites on the islands of Guernsey, Alderney and Sark to assist in ensuring on-going compliance. The OUR will implement this recommendation and will be writing to all operators requesting appropriate information.
- The auditors recommend that the OUR issue guidelines on “easy-access” antennas transmitting above the “touch-safe” limit of 13dBm as derived from ICNIRP’s guidelines and that can be accessed by the general public, and that these antennas should be clearly signed as such. The OUR accepts this recommendation and will be communicating this directly to each operator.

- On a more general aspect, the auditors suggest that the OUR request the operators to set-up a procedure for future site deployment, particularly in the vicinity of existing sites, and that clear guidelines are issued by operators on whether planned sites are likely to increase the overall resulting exposure level over the band beyond the ICNIRP levels. The OUR has noted this suggestion and will be requiring the operators to implement an appropriate process and will discuss with the operators how this can be best achieved.
- The auditors recommend that the OUR establish a programme of ongoing audits following similar methodologies to those used in this study. This will ensure that changes to site parameters and new sites continue to comply with licence requirements, and that the recommendations described in this report have been complied with. The OUR accepts this recommendation and the proposed approach to this is set out in Section 7.

The OUR is aware that certain of these recommendations have already been complied with by the operators during the course of the audit. The OUR has already made contact with the operators on these recommendations and will be working with each operator with regard to the detail of these recommendations. This Office will be ensuring compliance with the recommendations in the course of the normal day-to-day work with the operators.

## 7. Conclusions and Next Steps

The DG is pleased that the audit of the mast sites carried out in November 2004 has demonstrated that all sites are very clearly within the ICNIRP guidelines. Each of the operators has demonstrated that it has put in place appropriate procedures and takes its obligations, not just in respect of its licence conditions, but also to the wider community, seriously.

Of particular value is that while all sites are clearly within the existing guidelines, the auditors have been able to identify a number of steps that can be taken to improve further upon the current processes and procedures in place. These will all be acted upon and discussions will commence with the operators to ensure that those recommendations identified in Section 6 not already implemented are progressed in a timely manner.

As was noted in the introduction, this is the first full audit of mast sites in the Bailiwick. However, because of the dynamic nature of network roll-out, since the audit was completed further masts have been deployed. It is inevitable when taking a snapshot, such as this audit, that further development will occur and it was therefore important that the audit also addressed the processes and procedures that the operators have in place.

As mentioned in the introduction, the future audit of any additional masts not covered by this report is a matter that has been raised with the OUR. It is not envisaged that the scale of audit undertaken on this occasion will be done each year as the number of additional masts is not expected to be substantial.

However, the OUR does believe, and the auditors have recommended, that there is a need for on-going testing. The OUR has, following discussions with OFCOM, (the UK communications regulatory body) agreed that OFCOM will undertake random site audits in the Bailiwick during the course of this year. This will be part of OFCOM's continuing UK audit and it is expected that a small number of sites will be audited. The OUR will work closely with OFCOM to ensure that this information is easily accessible to residents in the Bailiwick once the results are available.

In conclusion, the DG believes that this report, and the quality of the audit undertaken by CDS, will help address some of the concerns that may exist with regard to the location of and emissions from radio masts but more importantly helps to contribute to the on-going consideration and examination of the issues associated with radio networks.

**/END**

## Appendix 1

### International Committee on Non-ionizing Radiation Protection (ICNIRP)

ICNIRP is an independent non-governmental scientific organization, for the World Health Organization and the International Labour Office, responsible for providing guidance and advice on the health hazards of non-ionizing radiation exposure<sup>4</sup>. It was established to advance non-ionizing radiation protection for the benefit of people and the environment: Its terms of reference are:

- To develop international guidelines on limits of exposure to non-ionizing radiations which are independent and science based.
- To provide science-based guidance and recommendations on protection from non-ionizing radiation exposure.
- To establish principles of non-ionizing radiation protection for formulating international and national protection programmes.
- To maintain a close liaison and working relationship with all international bodies engaged in the field of non-ionizing radiation protection.
- To represent radiation protection professionals worldwide through its close collaboration with the International Radiation Protection Association and its national societies.

After examining available research, ICNIRP issued guidelines for exposure based on *reference field strengths*<sup>5</sup>. Figure 3 shows the reference levels for public and occupational exposures in the range 100kHz to 6GHz.

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<sup>4</sup> <http://www.icnirp.de/>

<sup>5</sup> International Commission on Non-Ionizing Radiation Protection, "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300GHz), Health Physics, vol. 75, no. 4, pp. 494-522, April, 1998.

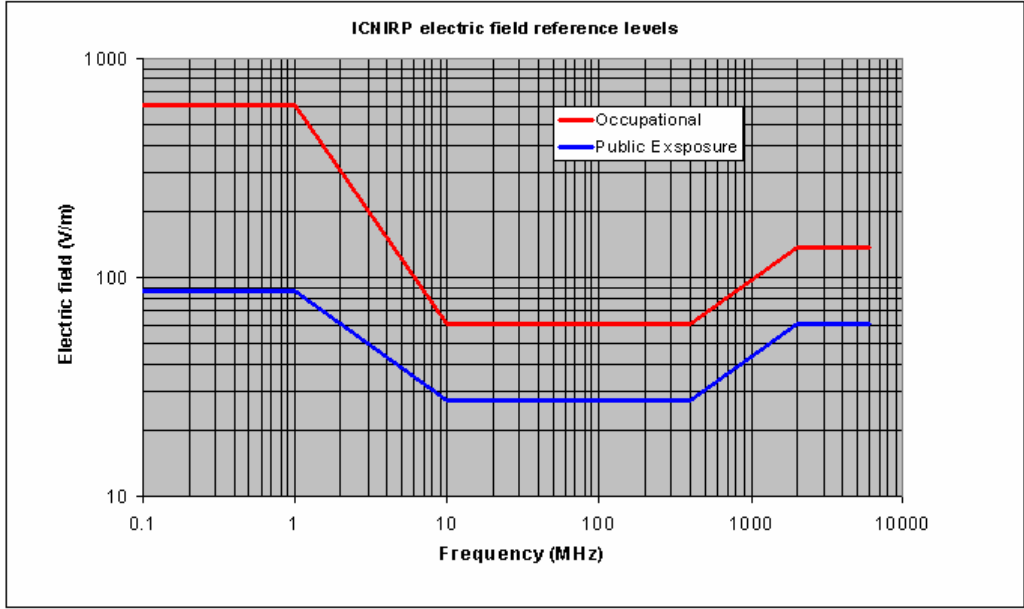


Figure 3 ICNIRP Reference Field Strength Levels versus frequency for public (blue line) and occupational (red line) exposures

Reference field strength limits for typical cellular frequencies are shown in Table 1 below:

ICNIRP Reference Field Strengths, [ $Vm^{-1}$ ]	>10MHz <400MHz	900 MHz	1.8 GHz	>2GHz <300GHz
Field Workers	61	90	127.3	137
General Public	28	41.25	58.3	61

Table 1 ICNIRP Reference field strengths

### ICNIRP 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 relevant basic restrictions using measurements and/or computational techniques and some reference levels address perception and adverse indirect effects of exposure to EMFs.

The derived quantities are electric field strength (E), magnetic field strength (H), magnetic flux density (B), power density (S), and limb current (*IL*). Quantities that address perception and other indirect effects are (contact) current (*IC*) and, for pulsed fields, specific energy absorption (SA).

In any particular exposure situation, measured or calculated values of any of these quantities can be compared with the appropriate reference level. Respect of the reference level will ensure respect of the relevant basic restriction. If the measured value exceeds the reference level, it does not necessarily follow that the basic restriction will be exceeded. Under such circumstances, however, there is a need to establish whether there is respect of the basic restriction.