Office of the Director of
Telecommunications
Regulation

Compliance with emission limits for non-ionising radiation

Second Audit Report, 2000

Document No. ODTR 00/06 **January 2000**

Foreword by the Director

Radio is required for a variety of purposes for the benefit of both private individuals and commercial organisations. These purposes include radio and television broadcasting, telecommunications services including fixed telecommunications services, mobile telephony, satellite services, radio navigation systems and equipment used in industry, medicine and commerce.

The use of radio in this country has accelerated in recent years and as the economy continues to flourish and technology advances this use will also continue to grow. An example of this growth is evident in the mobile telephony industry where, the market in Ireland has seen unprecedented growth from a penetration level of 22% in 1998 to 40% in 1999.

The future will see substantial growth in the application of radio as new technologies are developed and utilised. These include digital television, advanced mobile telephony services, and wireless based systems capable of providing advanced telecommunications services in areas of low population density.

Inevitably, as the use of radio based services increases, the number of masts required to deliver these services will also increase. In order to alleviate concern in relation to the non-ionising radiation emissions from these masts the ODTR has included a provision in relevant licences to ensure compliance with the international guidelines for general public exposure to electromagnetic fields.

In July 1998, I published the first audit report on compliance with emission limits for non-ionising radiation. On the basis of the auditors work, I concluded that all the companies audited have procedures and arrangements in place to ensure compliance with the general public exposure limits and that they are taking a responsible approach to ensuring compliance.

In July 1999, I arranged for a second audit of licensed operators to be carried out by Enterprise Ireland. The audit focused on compliance with the general public exposure limits specified in the guidelines published by the International Commission on Non-ionising Radiation Protection (ICNIRP) in 1998. This is an update of the first audit. In particular, the audit has investigated the extent to which the licensed operators have procedures in place and are taking a responsible approach to ensuring compliance with the ICNIRP guidelines. As with the first audit, this audit also included radio emission measurements at 30 sites throughout the country. These sites were chosen as representative of the different types of radio installations countrywide.

The report from Enterprise Ireland shows that all the companies audited have procedures and arrangements in place to ensure compliance with the general public exposure limits and are in compliance with the ICNIRP guidelines.

In addition to the above, written Statements of Compliance endorsed by senior management from the licensed companies have been provided.

The full report is available for inspection from my Office and contact details are shown in Section 1.1.2.

The audit was conducted to the most stringent standards in accordance with the international standard ISO 10011-1. Operators dealt with the documentary issues which were noted, and at all sites the complementary field tests showed that emissions were below the ICNIRP Guidelines.

I hope this report on the audit will serve to inform and reassure the public on the measures being taken by operators of radio installations to ensure compliance with the international guidelines for public exposure limits for non-ionising radiation.

I intend to arrange for further audits to be carried out as necessary, in order to continue to be satisfied that compliance requirements by operators are being met.

Etain Doyle
Director

Executive Summary

This is the second audit report commissioned by the Office of the Director of Telecommunications Regulation (ODTR) to ensure that licensed operators are in compliance with their licence conditions relating to emission limits for non-ionising radiation.

As the licensing authority for radiocommunications, the ODTR is responsible for ensuring that telecommunications operators comply with their licence conditions relating to non-ionising radiation, i.e. the radiation emissions from telecommunications masts must be within the levels set down in the latest international guidelines. In this regard, licensees must take full account of these guidelines when designing, constructing, and operating radio installations.

In 1998, in order to ensure that operators comply with this licence condition the ODTR arranged for an audit of major licensed operators to be carried out by Forbairt to check that the radiation emissions from telecommunications masts were within the IRPA (1988) levels. As a result of this audit it was concluded that, the telecommunications operators had adequate procedures in place to ensure compliance with their licence condition. The results of this audit were published in July 1998[1].

In July 1999, the ODTR arranged for a further audit to be conducted and, following a competitive tender process, Enterprise Ireland (formerly part of Forbairt) was contracted to carry out the audit.

As with the first audit, the independent consultants were contracted to:

- Audit the procedures put in place by the operators to ensure that their sites are in compliance with the latest international guidelines relating to non-ionising radiation emissions.

- Verify that the sites are in compliance with these guidelines by taking a series of test measurements on a number of sample sites.

The Director of Telecommunications Regulation informed the major operators of licensed radio installations, including the operators previously audited, that a second audit was to be conducted. She also advised them that this audit would be checking compliance with the updated international guidelines which had been issued by the International Commission on Non-Ionising Radiation Protection (ICNIRP) in 1998.

[1] First Audit Report on compliance with emission limits for non-ionising radiation, July 1998 (Doc. no. 98/23)

Audits were carried out in the following companies:

Radio Telefis Eireann
Radio Tara (Atlantic 252)
Cablelink Limited
Cable Management Ireland Limited
Princes Holdings Limited
Suir Nore Relays Limited
Esat Telecom
Eircom
Eircell Limited
Esat Digifone Limited
ESB

On the basis of this work Enterprise Ireland concluded that all the companies audited[2] have procedures and arrangements in place to ensure compliance with the general public exposure limits specified in the ICNIRP guidelines (1998) and are in compliance with these guidelines. In addition, the ODTR has received written Statements of Compliance endorsed by senior management from each relevant company[3].

The audits included measurements of emission levels at 30 sites throughout the country. 24 chosen by Enterprise Ireland and 6 chosen by the ODTR. For each site, the ODTR 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. For areas close-up to the transmitter, in cases where the ICNIRP limits are exceeded, adequate measures such as fencing and notices must be in place to prevent the public from gaining access.

Of the 30 sites selected, 28 were different from the sites chosen during the first audit. However, the RTE sites at Tullamore and Offaly which had exceeded the IRPA (1988) limits were again examined. During this audit, all 30 sites were within the ICNIRP (1998) guideline limits for general public exposure to non-ionising radiation.

The Director intends to carry out further audits as necessary in order to continue to be satisfied that operators of radio installations are in compliance with their licence obligations with regard to general public exposure limits for non-ionising radiation. It is further intended that such audits will be made available to the public.

[2] It should be noted that, Esat Telecom had no radio systems in operation at the time of the audit and no longer hold radio licences.
[3] As Esat Telecom no longer has a radio licence a statement of compliance was unnecessary.

SECTION I Introduction and Background to Audit

1.1 INTRODUCTION

1.1.1. Introduction

This report presents the results of the second audit of compliance on non-ionising radiation (NIR) from the radio masts of the major licensed radio operators in Ireland. The audit examined the procedures put in place by the radio operators to ensure compliance with the general public exposure limits of the International Commission on Non-Ionising Radiation Protection (ICNIRP) Guidelines 1998[4]. The audit also included measurements at 30 sites throughout the country. The audit was carried out by Enterprise Ireland on behalf of the Office of the Director of Telecommunications Regulation (ODTR).

For each site, the ODTR 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. For areas close-up to the transmitter, in cases where the ICNIRP limits may be exceeded, adequate measures such as notices and fencing must be in place to prevent the public from gaining access.

This report is arranged as follows:

Section I outlines the role of the ODTR in the area of NIR. This section also contains a brief description of what NIR is and the relevant international guidelines. The section concludes by outlining Enterprise Ireland's appointment to carry out the audit.

Section II is Enterprise Ireland's report on the audit of compliance. It contains the results of the audit of compliance for each of the licensed operators together with the results of the site measurements. Each audit report contains a conclusion by Enterprise Ireland on the extent of procedures and arrangements in place and on measurements recorded to ensure compliance with the general public exposure limits of the ICNIRP Guidelines 1998. A summary of the main aspects of the licensed operators procedures is also included.

Section III contains the compliance statements requested from each of the operators. These statements outlining each company's commitment to comply with the ICNIRP Guidelines and how each intend to carry out this commitment.

Section IV contains the conclusions of this Office.

1.1.2 Viewing the Full Audit Report

A copy of the NETC's full audit report with the site measurements is available for inspection at this Office during normal working hours. Requests to view the

[4] Vol. 74, No. 4, April 1998 in Health Physics

full report should be made to Ms Susan Fleming (tel. no. 01-804 9600; fax no. 01 804 9680).

1.2 BACKGROUND

1.2.1 Role of the Office of the Director of Telecommunications Regulation

The Office of the Director of Telecommunications Regulation (ODTR) is the licensing authority for the use of the radio frequency spectrum in Ireland. The frequency spectrum is a very valuable national resource, used for the transmission of a wide range of services including radio and television broadcasting, mobile telephony, telecommunications services, etc.

The frequencies used for radio communications are in the non-ionising part of the electromagnetic spectrum. The ODTR is not responsible for licensing the use of frequencies in the ionising part of the spectrum.

As a licensing authority, the ODTR reviewed the situation in relation to non-ionising radiation shortly after its establishment, in July 1997. In view of concerns about possible dangers to health, it was decided to include a provision in relevant licences, which already existed in the mobile phone licences, relating to non-ionising radiation, i.e. the radiation emissions from telecommunications masts must be within the international guidelines for exposure to electromagnetic fields.

In this regard, licensees must take full account of these Guidelines when designing, constructing, and operating radio installations.

In order to ensure that operators comply with this licence condition the ODTR, in 1998, contracted independent consultants, Enterprise Ireland, to:

- Audit the procedures put in place by the operators to ensure that their sites are in compliance with the IRPA (1988) levels

- Verify that the sites are in compliance with the IRPA levels by taking a series of test measurements on 30 sample sites.

The results of this audit were published by the ODTR in July 1998.

Following from this, the ODTR concluded that the telecommunications operators have adequate procedures in place to ensure compliance with their licence conditions.

During this audit it was noted that at 2 RTE medium wave radio transmitter sites (Tullamore and Athlone), the auditor measured emission levels in areas to which the public had access which were in excess of the IRPA 1988 limits. At both sites, the issue was the lack of adequate notices and fencing to prevent the public from gaining access.

Following discussions between the ODTR and RTE, remedial actions were undertaken to identify and secure the areas close-up to the transmitters where the public exposure levels are exceeded. In addition, actions were initiated by RTE to engage contractors to provide suitable permanent fencing around the restricted areas.

In relation to this issue the ODTR indicated that it would continue to monitor the position at Tullamore and Athlone to ensure that suitable permanent fencing and notices have been erected.

The aims of the second audit on compliance with emission limits were to check the operators continued compliance with their licence conditions relating to non-ionising radiation and to examine, in particular, mobile telephony masts in built up areas, and the use of shared sites.

Specific concerns for the audit were:

- In April 1998, the IRPA (1988) limits were superceded by the ICNIRP (1998) guidelines. In reality, the maximum exposure limits set by both the IRPA (1988) and ICNIRP (1998) are virtually identical (see S. 1.2.3). The ODTR wished to ensure that the operators had updated their documented procedures to ensure compliance to the new guidelines introduced by ICNIRP.

- To check the RTE Tullamore and Athlone transmitter sites

- To carry out site measurements at multiple user or shared sites to ensure that the total emissions from these sites are within the ICNIRP guidelines

- To carry out site measurements near population centres

Enterprise Ireland audited the procedure put in place by 11 licensed operators. This includes the 8 operators who were audited previously. The audit also includes measurements at 30 sites throughout the country. With the exception of the RTE Tullamore and Athlone sites all 28 sites are different from the sites measured during the first audit.

Several different types of radio systems, operating at different frequencies and output power levels were audited. These included:

- Eircom's microwave point to point links.

- ESB's microwave point to point links.

- RTE's radio and television broadcasting transmitters

- Radio Tara's radio broadcasting transmitter

- MMDS systems operated by Cable Management Ireland, Princes Holdings, Cablelink and Suir Nore Relays.

- Eircell and Esat Digifone's mobile telephony base stations.

1.2.2 What is non-ionising radiation ?

Non-ionising radiation is that part of the electromagnetic spectrum below 2420 million MHz. Radio waves, infra-red radiation and visible light are examples of NIR. Electromagnetic waves at frequencies above 2420 million MHz are known as ionising radiation and this includes X-rays and Gamma rays. A more detailed explanation of NIR is given in Annex B.

The ODTR is responsible for licensing radio services and these operate in the non-ionising radiation part of the spectrum.

1.2.3 Standards for emissions limits for non-ionising radiation

The International Radiation Protection Association (IRPA), in co-operation with the World Health Organisation (WHO) published their guidelines for NIR in 1988. The guidelines covered both public and occupational exposure limits for the frequency range 100 kHz to 300 GHz.

The first Audit report on Compliance with emission limits for non-ionising radiation (Doc. No. 98/23) which was issued by the ODTR in July 1998, was based on the IRPA (1988) limits.

The IRPA's successor, the International Commission for Non-Ionising Radiation Protection (ICNIRP) is a new independent, scientific organisation established in 1992. Its mandate is to investigate the hazards that may be associated with different forms of non-ionising radiation (NIR), to develop international guidelines on NIR exposure limits and to deal with all aspects of NIR protection. ICNIRP operates in co-operation with the Environmental Health Division of the World Health organisation and the United Nations Environment Programme. In 1996 ICNIRP issued a position paper on the health and safety aspects of NIR. This reviewed both thermal and athermal effects and its conclusion was to endorse the 1988 guidelines.

In April 1998, when the first audit was in progress, ICNIRP published their guidelines on NIR. These update the IRPA (1988) limits. The maximum exposure limits recommended by the IRPA in 1988 and the ICNIRP (1998) guidelines are virtually identical except in one instance. In the ICNIRP guidelines, there was an increase in the maximum permissible exposure level to magnetic fields in the frequency range 100 kHz to 10 MHz.

This second audit required operators to ensure compliance to 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 section 2.2.2.2.

1.2.4 Appointment and independence of Enterprise Ireland

Following a competitive tender process, the National Electronic Technology Centre (NETC) in Enterprise Ireland was chosen to carry out the external audits. The audits were carried out by the Quality Assurance Section of NETC while the site measurements were carried out by the Safety and Environmental Test Section of NETC.

NETC is the only Irish agency accredited by the National Accreditation Board (NAB) to measure the levels of non-ionising radiation from telecommunications masts. The NETC is accredited in accordance with the European harmonised standards where the requirements of independence, impartiality and integrity must be complied with.

SECTION II ENTERPRISE IRELAND'S REPORT ON AUDIT OF COMPLIANCE

2.1 Introduction

As part of its general obligations to ensure compliance with radio licensing conditions, the Office of the Director of Telecommunications Regulation (ODTR) has initiated an ongoing programme to monitor the procedures in place by the major licensed operators, in order to ensure compliance with the prescribed general public exposure limits for non-ionising radiation. These limits are contained in the "International Commission on Non-Ionising Radiation Protection" (ICNIRP) Guidelines published in 1998.

The National Electronics Technology Centre (NETC) of Enterprise Ireland were contracted by the Office of the Director of Telecommunications Regulation to be responsible for the 1999 programme, which was to consist of the following:

- An audit of the procedures and arrangements put in place by all the major licensed operators, to ensure compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

  and

- Detailed measurement of the actual non-ionising radiation emitted from a number of selected transmitters of each of the major licensed operators, at various locations around Ireland.

This report contains the major results of both the audit and measurement programme carried out by NETC, Enterprise Ireland.

2.2 SCOPE AND METHODOLOGY OF AUDIT AND SITE MEASUREMENTS

2.2.1 Audit of Compliance

The audits of compliance were planned and carried out by the Quality Assurance Section of NETC. To establish the structure of these audits, International Standard ISO 10011-1 "Guidelines for Auditing Quality Systems - Part 1: Auditing (1993-05-01) was used.

The scope of the audit was to ensure that the company was meeting the general public exposure limits requirements of its licence conditions with respect to non-ionising radiation and that the documentation, in respect of this scope, was available and adequate.

The Office of the Director of Telecommunications Regulation had written to each of the major licensed operators, in advance of the audit, informing them that an audit was scheduled and that appropriate documentation should be available for inspection, including the following:

- Written procedures in place to ensure compliance with licence conditions regarding non-ionising radiation.

- Any documentation necessary to give effect to these procedures.

- An inventory of sites as per a provided schedule.

- Any emission test reports for specific sites.

- The most recent internal audit to satisfy the company that ICNIRP emission limits are being fully complied with.

An audit programme was drawn up in advance of the audit visit and presented to the company representatives at the audit opening meeting. The programme was as follows:

- Review of the operation of the licensee and the procedures and documentation in place to ensure that the ICNIRP Guidelines (1998) limits for general public exposure are not exceeded.

- Review of the internal audit data.

On the basis of this review all observations were collected and recorded. These observations were assessed by the auditor to determine the degree of compliance of the licensee. Any areas of non-compliance were documented and made known to the company representatives at the audit closing meeting.

2.2.2 Site Measurements

2.2.2.1 Overview

The site measurements of non-ionising radiation were planned and carried out by the Safety and Environmental Test Section of NETC. At the request of the Office of the Director of Telecommunications Regulation, site measurements were performed at six defined sites prior to the audit of the licensees.

In conjunction with each audit of compliance, and using as a basis the complete listing of transmitting sites provided by the licensee, a number of sites were chosen from each listing which represented typical or maximum output configurations for each operator. Detailed measurements were then carried out of the non-ionising radiation emitted from these sites.

All measurements were carried out to the following criteria:

- The sites were measured against the reference levels for general public exposure contained in the ICNIRP Guidelines: 1998.

- No licensee was aware at which site or during what period the measurements would be made.

- The measurements were made using broadband equipment in the frequency range 100 kHz to 40 GHz and narrowband equipment over the frequency range from 30 MHz to 18 GHz, depending on the particular site characteristics.

- Measurements were made according to documented test procedures, using calibrated and traceable test equipment, by fully trained engineers.

- All measurement data and associated test records have been maintained and filed.

2.2.2.2 Site Measurements Specification and Limits

The ICNIRP document "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)", published in 1998, contains both occupational and general public exposure limits to non-ionising radiation over the frequency bandwidth from up to 1 Hz to 300 GHz. Its main purpose is to provide guidelines for limiting ElectroMagnetic Field (EMF) exposure that will provide protection against known adverse health effects.

The ICNIRP states in this document that the limits are based on scientific data alone, i.e. that no consideration was given to economic impact or other non-scientific priorities. It further states that, from currently available knowledge, the limits should provide an adequate level of protection from exposure to time-varying electromagnetic fields.

Two classes of guidance are presented in the ICNIRP Guidelines:

- **Basic Restrictions**

Restrictions on exposure to time-varying electric, magnetic, and electromagnetic fields that are based directly on established health effects. Different scientific bases were used in the development of basic exposure restrictions for various frequency ranges:

- Between 1Hz and 10 MHz, basic restrictions are provided on current density to prevent effects on nervous system functions.

- Between 10 kHz and 10 GHz, basic restrictions on Specific Absorption Rate (SAR) are provided to prevent whole-body heat stress and excessive localised tissue heating; in the 100 kHz to 10 MHz range, restrictions are provided on both current density and SAR.

- Between 10 GHz and 300 GHz, basic restrictions are provided on power density to prevent excessive heating in tissue at or near the body surface.

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 40 GHz, covered by this report are as follows:

FOR MEMBERS OF THE GENERAL PUBLIC

Frequency f (MHz)	**Unperturbed RMS Electric Field Strength E (V/m)**	**Unperturbed RMS Magnetic Field Strength H (A/m)**	**Equivalent Plane Wave Power Density (mW/cm^2)**	**Radio Service**
0.003 – 0.15	87	5	-	
0.15 - 1	87	0.73/ f	-	LW and MW Radio Broadcasting
1 – 10	$87/ f^{1/2}$	0.73/ f	-	
10 – 400	28	0.073	0.2	VHF Radio and Television Broadcasting
400 – 2000	$1.375f^{1/2}$	$0.0037f^{1/2}$	f/2000	UHF Television Broadcasting and Mobile Telephony Systems
2000 – 300000	61	0.16	1	Microwave Links, MMDS and Rurtel

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 18 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.

2.2.2.3 Characteristics of Measuring Equipment Used

NETC used both broadband and narrowband monitors in order to measure the non-ionising radiation emitted from each transmission site.

The broadband radiation hazard monitor measures and displays the total power density over its frequency bandwidth. However, as the ICNIRP Guideline limit is frequency dependent, it is not possible to easily identify the margin of compliance of a particular emitter of non-ionising radiation.

Broadband emissions were measured over the frequency range of 100 kHz to 40 GHz. This frequency bandwidth covers long-wave, medium-wave and FM radio broadcasts, VHF & UHF television, the cellular mobile telephone services, MMDS and Rurtel transmissions and microwave point to point links up to 40 GHz.

Narrowband emissions were measured, using measurement antennas and a spectrum analyser, over the frequency range of 30 MHz to 18 GHz. This enables the power level from each transmitter to be determined. This frequency range includes FM radio broadcasts, VHF & UHF television, cellular mobile telephone system, MMDS and Rurtel transmissions and microwave point to point links up to 18 GHz.

2.2.2.4. Measurement Techniques

Initially, broadband measurements were made to determine the position of maximum field strength. This reading was noted and subsequently narrowband measurements were taken at that point. At sites where the field strengths were less than the minimum sensitivity of the broadband monitor, engineering judgement was used to choose a measurement location where the fields would be expected to be at a maximum.

Narrowband measurements were initially taken over a broad frequency range, in order to identify the bands where there was a significant power density. Then narrower, more accurate plots were taken over these frequency bands of interest, such as the 930 MHz to 970 MHz band, for the cellular telephone frequencies. It is the narrowband results that are documented in this report. The results at each site are typically tabulated as four individual results. These are:

- The power density, over the frequency range of interest for the individual licence holder (e.g. the mobile telephony band, from 930 – 970 MHz for Esat Digifone or the MMDS band, from 2.5 to 2.686 GHz for Cable Management Ireland Limited).

- The times below the ICNIRP Guideline limit for this limited frequency range.

- The power density, over the entire frequency from 30 MHz to 18 GHz (covering VHF radio and television, UHF television, mobile telephony systems, microwave Point to Point links, MMDS and Rurtel).

- The times below the ICNIRP Guideline limit for this broad frequency range from 30 MHz to 18 GHz.

As the antenna used for narrowband measurements is directional and polarised, measurements were taken with the antenna oriented both horizontally and vertically, so as to obtain the maximum field strength and to ensure that ground reflected components were measured. The measurement height was approximately 1 metre.

The temperature and Relative Humidity at each location was recorded. It was also noted whether the ground conditions were wet or dry. Based on the results of these measurements the total power density for each site was calculated, making worst case assumptions regarding the number of transmitters operating at any one time.

2.3 RESULTS OF AUDITS OF COMPLIANCE AND SITE MEASUREMENTS

2.3.1 MMDS Licensees

2.3.1.1 Cable Management Ireland Limited

A. Results of Audits of Compliance

NETC carried out an audit at Cable Management Ireland Limited, 70 Capel Street, Dublin 1, on 28 October 1999. The company has licences for MMDS television service in Cells1, 2, 3 and 6.

The company representatives were Mr. John McLoughlin, Manager-The Technical Department and Mr. Tom Murray, RF Chief Engineer.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document CMI-P-014 "MMDS Safety Maintenance Procedure". This document includes:

- The specification of the maximum transmitter power per installation and the requirement that there must be documented approval of any changes of power output levels.

- The maintenance of an inventory of sites.

- Measurement data showing compliance with the ICNIRP Guideline limits, made by third party testing agencies in 1999, on several of Cable Management Ireland Limited's installations, including the installations radiating the highest power.

As a consequence of this audit one non-compliance was raised and presented to the company representatives at the closing meeting. The non-compliance related to the company's compliance document containing data appropriate to the IRPA Guidelines: 1988 but not relevant to the ICNIRP Guidelines: 1998.

Subsequent to the audit the company have re-drafted and issued their compliance document "MMDS Safety Maintenance Procedure" at Issue E. The document discharges the non-compliance detected during the audit of 28 October 1999.

As a result of the audit and the subsequent actions of the company, NETC concluded that Cable Management Ireland Limited has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from a Cable Management Ireland Limited's transmitter are as follows:

Site Location	**Total Power Density Value Recorded - MMDS Frequency Range mW/cm^2**	**Times Below ICNIRP Limit - MMDS Frequency Range**	**Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2**	**Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz**
Bralee, Coolaney, Co. Sligo [1]	1.5×10^{-6}	660,000	4.9×10^{-6}	100,000

All the measurements recorded by NETC at the selected sites of Cable Management Ireland were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 The Bralee site is owned by Eircom and transmitters on this multi-antenna mast include the Cable Management Ireland Limited's MMDS main transmitter antenna, Eircom Point-to Point links and Eircell and Esat Digifone mobile telephony. The Eircell mobile telephony consists of TACS (analogue) and GSM (digital).

2.3.1.2 Suir Nore Relays Limited

A. Results of Audits of Compliance

NETC carried out an audit at Suir Nore Relays Limited, 50/51 Upper John Street, Kilkenny, on 29 October 1999. The company has licences for MMDS television service in Cells 20 and 21.

The company representative was Mr. Tim Quinn, Technical Manager.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document "Suir Nore Relays Non-ionising Radiation Compliance Procedure". This document includes:

- The specification of the maximum transmitter power per installation and the checking, on a regular basis, that the power output is not exceeded.

The company also maintained an inventory of sites.

As a consequence of this audit two non-compliances were raised and presented to the company representative at the closing meeting. The non-compliances related to the lack of records available relating to the company's compliance regime.

Subsequent to this audit the company re-issued the compliance document " Non-Ionising Radiation Compliance Procedure". The document is dated November 1999 and it discharges the non-compliances detected during the audit of 29 October 1999.

As a result of these actions, and a subsequent verification audit at the company's Kilkenny office, NETC concluded that Suir Nore Relays Limited has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from a number of Suir Nore Relay's transmitters are as follows:

Site Location	**Total Power Density Value Recorded – MMDS Frequency Range mW/cm^2**	**Times Below ICNIRP Limit - MMDS Frequency Range**	**Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2**	**Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz**
Glencoum Wood, Graiguenamanagh Co. Kilkenny [1]	4.4×10^{-6}	230,000	4.6×10^{-5}	9,500
Knockane, Upperchurch Co. Tipperary (**low power beambender**)	4.0×10^{-7}	2,500,000	4.1×10^{-7}	2,100,000

All the measurements recorded by NETC at the selected sites of Suir Nore Relay's limited were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 The Glencoum Wood site is owned by Esat Digifone and transmitters on this multi-antenna mast are the Suir Nore Relay's MMDS main transmitter antenna and Esat Digifone GSM mobile telephony. Also in the immediate vicinity are other masts that house transmitters including Eircom Point-to Point links and Eircell mobile telephony. The Eircell mobile telephony consists of TACS (analogue) and GSM (digital).

2.3.1.3 Cablelink

A. Results of Audits of Compliance

NETC carried out an audit at Cablelink, Pembroke Place, Ballsbridge, Dublin 4, on 11 November 1999. Cablelink has licences for MMDS television service in Cells 4, 5, 13, 16 and 27.

The company representative was Mr. Mike Carter, Engineering Developments.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document "Procedures for Ensuring Compliance with Emission Limits for Non-Ionising Radiation at MMDS Transmitter Sites". This document includes:

- The specification of the maximum transmitter power per installation and the requirement that there must be documented approval of any changes of power output levels.
- The maintenance of an inventory of sites.
- Detailed calculations, for each transmission site, showing the power density value at 10 metres in front of the main beam and the power density at a point from the transmitting antenna where the main beam reaches a point 2 metres above flat ground. This data has been verified on an ongoing basis by actual measurements at sample sites.

As a consequence of this audit no non-compliances were raised.

As a result of the audit NETC concluded that Cablelink has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from a Cablelink transmitter are as follows:

Site Location	**Total Power Density Value Recorded - MMDS Frequency Range mW/cm^2**	**Times Below ICNIRP Limit - MMDS Frequency Range**	**Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2**	**Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz**
Tonabrocky, Co. Galway [1]	1.1 x 10^{-5}	95,000	7.0 x 10^{-5}	6,500

All the measurements recorded by NETC at the selected sites of Cablelink were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 The Tonabrocky site is owned by Eircom and transmitters on this multi-antenna mast include Cablelink's MMDS main transmitter antenna, Eircom Point-to Point links and Eircell Mobile telephony. The Eircell Mobile telephony consists of TACS (analogue) and GSM (digital).

2.3.1.4 Princes Holdings Ltd

A. Results of Audits of Compliance

NETC carried out an audit at Princes Holdings Limited, Corporate House, Mungret Street, Limerick, on 16 November 1999. Princes Holding Ltd. is the holding company for the following companies that have licences for the provision of Multi-point Microwave Distribution System (MMDS) television service:

Cork Communications Ltd.	Cells 25, 26 28 and 29
Independent Wireless & Cable Ltd.	Cells 7, 8, 9, 12, 17, 22 and 23.
Horizon T.V. Distribution Ltd.	Cells 10, 11, 14, 15, 18, 19, and 24.

The company representative was Mr Paul Browne, Engineering Manager.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document "Procedures for Complying with Limits for Non-Ionising Radiation". This document includes:

- The specification of the maximum transmitter power per installation and the checking, on a regular basis, that the power output is not exceeded.
- The maintenance of an inventory of sites.
- Extensive measurement data showing compliance with the ICNIRP Guideline limits, made by third party testing agencies, on several of Princes Holdings Limited's installations in 1999.

As a consequence of this audit no non-compliances were raised.

As a result of the audit NETC concluded that Princes Holdings Limited has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from a Princes Holdings Limited transmitter are as follows:

Site Location	Total Power Density Value Recorded - MMDS Frequency Range mW/cm^2	Times Below ICNIRP Limit - MMDS Frequency Range	Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2	Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz
Woodcock Hill, Co. Clare [1]	2.4×10^{-5}	42,000	4.6×10^{-4}	740

All the measurements recorded by NETC at the selected sites of Princes Holdings Limited were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 The Woodcock Hill site houses the Princes Holdings Limited MMDS main transmitter. Also in the immediate vicinity, on this multi-mast, multi-antenna site, is a Radio Telefis Eireann (RTE) high power mast broadcasting radio in the VHF band and television in the UHF band. Other masts in the vicinity house transmitters including Eircom Point-to Point links, Eircell mobile telephony (TACS and GSM), Esat Digifone mobile telephony, Treaty FM Radio and Radar.

2.3.2 Cellular Telephony Licensees

2.3.2.1 Eircell

A. Results of Audits of Compliance

NETC carried out an audit at Eircell, Richview Park, Clonskeagh, Dublin 14 on 18 October 1999. Eircell provide a combined analogue (TACS) and digital (GSM) national cellular telephone system and use microwave point to point links to provide communication between cellular telephone base stations and other points in the network.

The company representatives were Mr. Val Duffy, Engineer - Radio Planning Department and Dr. Diarmuid Moran, Health, Safety and Environmental Manager.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document "Non-Ionising Electromagnetic Radiation Levels - Theoretical Calculations and Measurement Procedures". This document includes:

- Extensive calculation and measurement data showing compliance with the ICNIRP Guideline limits, made by the company and third party testing agencies, on a large percentage of Eircell's installations.

- Assessment data, made by third party agencies, on Eircell's Cellular Telephone Transmitter Base Stations, which show compliance to the ICNIRP Guideline limits.

- The maintenance of an inventory of sites.

As a consequence of this audit no non-compliances were raised.

As a result of the audit NETC concluded that Eircell has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from a number of Eircell's transmitters are as follows. The calculations for total power density make the worst case assumption that all the phone channels are transmitting simultaneously in a particular sector. Also any significant emissions from Esat Digifone transmitters in the vicinity are included.

Site Location	**Total Power Density Value Recorded – Mobile Telephony Frequency Range mW/cm^2**	**Times Below ICNIRP Limit - Mobile Telephony Frequency Range**	**Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2**	**Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz**
Portarlington, Co Laois **(GSM)**	1.47×10^{-5}	32,000	1.49×10^{-5}	31,000
Monaghan Barracks, Co. Monaghan **(GSM & TACS)**	9.4×10^{-6}	50,000	9.4×10^{-6}	50,000
Greenmount Lane, Harold's Cross, Dublin **(GSM & TACS)**	1.2×10^{-3}	380	1.2×10^{-3}	380
Avoca, Co. Wicklow **(GSM)**	4.2×10^{-6}	110,000	4.2×10^{-6}	110,000
Seamus Ennis Road, Finglas, Dublin **(GSM & TACS)**	5.2×10^{-4}	900	5.2×10^{-4}	900
Edenderry, Co. Offaly **(GSM)**	4.83×10^{-5}	9,800	4.84×10^{-5}	9,700
Ballaghadereen, Co. Roscommon **(GSM & TACS)**	6.6×10^{-5}	7,200	6.6×10^{-5}	7,200
Ratholdrin, Navan, Co Meath[1] **(GSM & TACS)**	4.1×10^{-6}	110,000	4.1×10^{-6}	110,000
Ballymun, Dublin **(GSM)**	2.3×10^{-4}	2,100	2.3×10^{-4}	2,100
Birr, Co. Offaly [1] **(GSM)**	2.5×10^{-4}	1,900	2.5×10^{-4}	1,900
James Larkin Road, Clontarf, Dublin **(GSM microcell)**	4.4×10^{-4}	1,100	4.4×10^{-4}	1,100

All the measurements recorded by NETC at the selected sites of Eircell were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 The Birr and Ratholdrin transmitters are on ESB masts. These ESB masts also house Esat Digifone GSM transmitters.

Note: Other indications of the emissions from Eircell transmitters are shown in the results for Bralee, Co. Sligo (reference the Cable Management Ireland Limited section of this report), Tonabrocky, Co. Galway (reference Cablelink), Mohercrom, Co. Cavan (reference Eircom) and Montrose, Dublin (reference RTE).

2.3.2.2. Esat Digifone

A. Results of Audits of Compliance

NETC carried out an audit at Esat Digifone, Digifone House, 76 Lower Baggot Street, Dublin 2 on 18 November 1999. Esat Digifone provides a national GSM network and use microwave point to point links to provide communication between cellular telephone base stations and other points in the network.

The company representatives were Mr. Declan Drummond, Acquisitions Manager, Mr. Des Coburn, Head of Group Transmission Planning and Engineering, Ms. Sandra Dempsey, Network Sites and Mr Declan Roe, Technical Group (including Health and Safety).

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance documents which include:

- The specification of the maximum possible transmitted power for an Esat Digifone Base Transmission Station (BTS).
- The maintenance of an inventory of sites.
- Assessment and actual measurement data, showing compliance with the ICNIRP Guideline limits, made in the past year, on Esat Digifone's Base Transmission Stations (BTS).

As a consequence of this audit no non-compliances were raised.

As a result of the audit NETC concluded that Esat Digifone has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from a number of Esat Digifone's transmitters are as follows. The calculations for total power density make the worst case assumption that all the phone channels are transmitting simultaneously in a particular sector. Also any significant emissions from Eircell transmitters in the vicinity are included.

Site Location	**Total Power Density Value Recorded – Mobile Telephony Frequency Range mW/cm^2**	**Times Below ICNIRP Limit - Mobile Telephony Frequency Range**	**Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2**	**Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz**
Kilsaran, Co. Louth	1.66×10^{-5}	29,000	1.68×10^{-5}	28,000
Longford, Co. Longford	5.2×10^{-6}	90,000	5.5×10^{-6}	87,000
Enfield, Co Kildare[1]	1.1×10^{-5}	45,000	1.1×10^{-5}	45,000
Greystones, Co. Wicklow[1]	1.65×10^{-5}	29,000	1.68×10^{-5}	28,000
Roscommon Co. Roscommon[1]	4.5×10^{-5}	11,000	4.5×10^{-5}	11,000
Skibbereen, Co. Cork[1]	2.2×10^{-6}	220,000	2.2×10^{-6}	220,000
Ratholdrin, Navan, Co Meath[2]	4.1×10^{-6}	110,000	4.1×10^{-6}	110,000
Ballina, Co. Mayo [2]	9.5×10^{-5}	4,800	9.5×10^{-5}	4,800
Birr, Co. Offaly [2]	2.5×10^{-4}	1,900	2.5×10^{-4}	1,900
Mullingar, Co. Westmeath	8.3×10^{-5}	5,700	8.3×10^{-5}	5,700

All the measurements recorded by NETC at the selected sites of Esat Digifone were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 The Enfield, Greystones, Roscommon and Skibbereen GSM transmitters are housed on Garda station masts.

2 The Ratholdrin, Ballina and Birr transmitters are on ESB masts. The Ratholdrin and Birr ESB masts also house Eircell GSM transmitters.

Note: Other indications of the emissions from Esat Digifone transmitters are shown in the results for Bralee, Co. Sligo (reference the Cable Management Ireland Limited section of this report), Glencoum Wood (reference Suir Nore Relays), Woodcock Hill (reference Princes Holdings Limited), Mohercrom (reference Eircom) and Montrose, Dublin (reference RTE).

2.3.3 Telephony Licensees

2.3.3.1 Electricity Supply Board (ESB)

A. Results of Audits of Compliance

NETC carried out an audit at the ESB, on 27 October 1999. The audit took place at the company's offices in Lower Fitzwilliam Street, Dublin 2. The ESB operates a network of microwave Point to Point links throughout the country to carry Telecommunications traffic, and it was only this network that was subject to audit.

The company representatives were Mr. Pat Cooney, Team Leader – Radio Systems and Mr. Dave Lawson, Telecommunications Wide Area Support Team.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document "Compliance with Emission Limits for Non-Ionising Radiation". This document includes:

- The specification of the maximum transmitter power per installation. The microwave Point to Point links have a low power radiated from the antenna.
- Sample calculations showing the power density value at distances in front of the main beam, supplemented by actual measurements at various sites.
- The generation of an inventory of sites.
- Actual measurement data, showing compliance with the ICNIRP Guideline limits, made in the past year, on the ESB's transmission sites.

No non-compliances were raised as a consequence of this audit.

As a result of this audit NETC concluded that the company has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from an ESB transmitter are as follows:

Site Location	Total Power Density Value Recorded - Microwave Point to Point Links mW/cm^2	Times Below ICNIRP Limit – Microwave Point to Point Links	Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2	Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz
Saggart Hill Co. Dublin[1]	Below minimum sensitivity of instrument	-	7.4×10^{-5}	2,900

All the measurements recorded by NETC at the selected sites of the ESB were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 In the immediate vicinity of the ESB transmitter, on this multi-mast, multi-antenna site, are several other services.

2.3.3.2 Eircom

A. Results of Audits of Compliance

NETC carried out an audit at Eircom, on 1 November 1999. The audit took place at the company's offices in 5 Dame Lane, Dublin 2. Eircom operates a large number of microwave Point to Point links throughout the country to carry its Telecommunications traffic, and also operate Rurtel, a multi access radio system providing Telecommunications services to remote western areas.

The company representatives were Mr Brian McGuinness, Health and Safety Manager; and Mr. Barry Dillon, Health and Safety Executive.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document "Eircom Code of Practice on Protection of Staff Members, Contractors and Members of the Public from the Effects of Non-Ionising Electromagnetic Fields". This document includes:

- The specification of the maximum transmitter power per installation. Both the microwave Point to Point links and Rurtel have a low power radiated from the antenna.

- Sample calculations showing the power density value at distances in front of the main beam, supplemented by actual measurements at various sites.

- The maintenance of an inventory of sites.

- Actual measurement data, showing compliance with the ICNIRP Guideline limits, made in the past year, on Eircom's transmission sites.

No non-compliances were raised as a consequence of this audit.

As a result of this audit NETC concluded that the company has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from an Eircom transmitter are as follows:

Site Location	Total Power Density Value Recorded - Microwave Point to Point Links mW/cm^2	Times Below ICNIRP Limit – Microwave Point to Point Links	Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2	Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz
Mohercrom, Lough an Lae, Co. Cavan [1]	4.1×10^{-8}	24,000,000	5.0×10^{-4}	430

All the measurements recorded by NETC at the selected sites of Eircom were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 On this multi-mast, multi-antenna site are transmitters including Eircom Point-to Point links, Eircell mobile telephony (TACS and GSM) and Esat Digifone mobile telephony.

Note: Other indications of the emissions from Eircom transmitters are shown in the results for Bralee, Co. Sligo (reference the Cable Management Ireland Limited section of this report) and Tonabrocky, Co. Galway (reference Cablelink).

2.3.3.3 Esat Telecom

A. Results of Audits of Compliance

NETC carried out an audit at Esat Telecom, on 12 November 1999. The audit took place at the company's offices at Unit 8, Dundrum Business Park, Dublin 14. They had no transmitters sites commissioned/operational at the time of the audit.

The company representatives were Ms. Fiona Hanaphy, Project Engineer; and Mr. Myles Merriman, Director of Strategic Network Design.

The assurance that the company can meet the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document "Procedure for Power Density Monitoring". This document includes:

- The specification of the maximum transmitter power per installation.
- Sample calculations showing the power density value at distances in front of the main beam.
- The requirement to generate and maintain a listing of transmitter sites.
- The requirement to make measurements annually on a representative number of their transmitter sites.

No non-compliances were raised as a consequence of this audit.

As a result of this audit NETC concluded that the company has the procedures and arrangements in place to ensure compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

As Esat Telecom has no transmitters sites commissioned/operational at the time of the audit no measurements could be carried out.

2.3.4 Radio/TV Broadcasters

2.3.4.1 Radio Telefis Eireann (RTE)

A. Results of Audits of Compliance

NETC carried out an audit at Radio Telefis Eireann, Donnybrook, Dublin 4, on 19 October 1999. RTE broadcast radio and television, and use microwave point to point links in support of these broadcast activities.

The company representative was Ms. Emer Sheahan, Broadcast Engineer – Network Group.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance documents. These are "Procedures for Monitoring RTE Network Transmission Sites for Ongoing Compliance with General Public Guidelines on Non-Ionising Radiation" and "Procedures for Ensuring Compliance with General Public Guidelines on Non-Ionising Radiation for New RTE Transmission Sites". These document include:

- The specification of the maximum transmitter power per installation.
- Calculations, from RTE high power sites, showing the power density value at various distances from the antenna.
- The maintenance of an inventory of sites.
- Calculations for all microwave point to point links showing the power density value at various distances from the antenna.
- Actual measurement data, showing compliance with the ICNIRP Guideline limits on RTE's transmission sites. These include the medium wave transmitters at Athlone and Tullamore.

As a consequence of this audit no non-compliances were raised.

As a result of the audit NETC concluded that RTE has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from a number of Radio Telefis Eireann's transmitters are as follows:

Site Location	Total Power Density Value Recorded - Microwave Point to Point Links mW/cm^2	Times Below ICNIRP Limit – Microwave Point to Point Links	Total Power Density Value Recorded - Frequency Range 30 MHz – 18 GHz mW/cm^2	Times Below ICNIRP Limit -Frequency Range 30 MHz – 18 GHz
Montrose, Donnybrook, Dublin [1]	Below minimum sensitivity of instrument	-	1.9×10^{-5}	23,000

Notes:

1 The Montrose site is owned by RTE and on this multi-antenna mast is housed RTE Point to Point links, Eircell Mobile telephony (both GSM and TACS) and Esat Digifone GSM.

Site Location	Electric Field (Volts per metre)	Times Below ICNIRP Electric Field Limit	Magnetic Field (H) (Amperes per metre)	Times Below ICNIRP Magnetic Field (H) Limit
Athlone, Co. Westmeath [1, 2 &3]	12.0	7.3	0.08	14.9
Tullamore, Co. Offaly [1, 2 &3]	18.4	4.7	0.16	8.1

All the measurements recorded by NETC at the selected sites of RTE were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 For the frequency range of the Athlone and Tullamore medium wave transmitters, the ICNIRP limit is expressed in terms of Electric Field and Magnetic Field strengths, and not Power Density. Therefore both of Electric Field and Magnetic Field measurements were performed at these sites, as shown in the results table above. The ICNIRP Electric Field limit for both sites is 87 Volts per metre. The ICNIRP Magnetic Field limit for Athlone is 1.19 Amperes per metre and for Tullamore is 1.29 Amperes per metre.

2 Athlone and Tullamore are radio transmitter sites operating in the medium wave band. Broadband measurements of both the electric field and the magnetic field were made. The values shown are the highest levels that were measured on these RTE sites in areas accessible to the general public.

3 Both the Athlone and Tullamore transmitter sites were surveyed on behalf of the ODTR in 1998, and measurements in excess of the limits were recorded and reported. As a consequence of this, RTE has secured the sites with boundary fences in order to ensure that the general public guideline limits are not exceeded at and beyond these fences. In addition, warning notices are posted on the fences.

Note: Another indication of the emissions from RTE transmitters is shown in the results for Woodcock Hill, an RTE high power mast broadcasting radio in the VHF band and

television in the UHF band (reference the Princes Holdings Limited section of this report)

2.3.4.2 Radio Tara

A. Results of Audits of Compliance

NETC carried out an audit of Radio Tara, at the Atlantic 252 main transmitter site, on 24 November 1999. Radio Tara broadcast Atlantic 252, a long wave radio station whose transmitter is situated near Summerhill, Co. Meath.

The company representative was Mr. Tom Hand, Technical Manager.

The assurance that the company is meeting the ICNIRP Guideline limits for general public exposure is contained in the company's compliance document. "Atlantic 252 Non-ionising Radiation Measurement Procedures" which include:

- Theoretical calculation of the electric field strength at the boundary fence with the transmitter operating at full power.

- The specification and periodic checking and measurement of the maximum transmitter power.

- Actual measurement data, showing compliance with the ICNIRP Guideline limits at the transmission site. Both Radio Tara and third party testing agencies have made these measurements since the transmitter was commissioned.

As a consequence of this audit no non-compliances were raised.

As a result of the audit NETC concluded that Radio Tara has the procedures and arrangements in place and is operating in compliance with the general public exposure limits of the ICNIRP Guidelines: 1998.

B. Results of Site Measurements

The summary results of measured non-ionising radiation emitted from the Radio Tara (Atlantic 252) transmitter are as follows:

Site Location	Electric Field (Volts per metre)	Times Below ICNIRP Electric Field Limit	Magnetic Field (H) (Amperes per metre)	Times Below ICNIRP Magnetic Field Limit
Atlantic 252, Summerhill, Co. Meath[1, 2 &3]	19.8	4.4	0.17	17.6

All the measurements recorded by NETC at the selected sites of Radio Tara were within the ICNIRP Guideline 1998 limits for general public exposure to non-ionising radiation.

Notes:

1 For the frequency range of the Atlantic 252 long wave transmitter, the ICNIRP limit is expressed in terms of Electric Field and Magnetic Field strengths, and not Power Density. Therefore both of Electric Field and Magnetic Field measurements were performed at this site, as shown in the results table above. The ICNIRP Electric Field limit is 87 Volts per metre and the ICNIRP Magnetic Field limit is 2.9 Amperes per metre.

2 Atlantic 252 is a radio transmitter site operating in the long wave band. Broadband measurements of both the electric field and the magnetic field were made. The values shown are the highest levels that were measured at this site in areas accessible to the general public.

3 The Atlantic 252 radio transmitter site is secured, since transmission began, by a boundary fence. This is to ensure that the general public guideline limits are not exceeded at and beyond the fence.

SECTION III COMPLIANCE STATEMENTS

3.1 COMPLIANCE STATEMENTS

This section includes copies of Compliance Statements received from each of the companies audited. Each statement outlines the company's commitment to comply with the ICNIRP Guidelines and how they intend to carry out this commitment.

Suir Nore Relays Limited

50/51 JOHN STREET,
KILKENNY.
Tel.: (056) 61484
Fax: (056) 64052
E-mail: kilksnr@indigo.ie

24A FRIAR STREET,
THURLES.
Tel.: (0504) 23864
Fax: (0504) 23864
E-mail: thusnr@indigo.ie

15 PARNELL STREET,
CLONMEL.
Tel.: (052) 24869
Fax: (052) 25911
E-mail: clmsnr@indigo.ie

30th November 1999.

Office of the Director of
Telecommunications Regulation,
Abbey Court,
Irish Life Center,
Lower Abbey Street,
Dublin 1.

Dear Sirs,

It is the policy of Suir Nore Relays Lrd., to ensure that the general public exposure limits of the ICNIRP guidelines : 1998 are complied with.

The company has in place systems and procedures to ensure compliance with these ICNIRP guideline limits.

Yours faithfully,

JIM CRANWELL
Managing Director

Registered in Ireland No. 93011. Directors J. Cranwell, K. Cranwell (Secretary)

CABLE MANAGEMENT IRELAND
l i m i t e d
70 CAPEL STREET, DUBLIN 1.
PHONE: 01 805 0300 FAX: 01 872 2747
CUSTOMER RELATIONS: 01 805 0302 SALES DEPT: 01 805 0322
www.cmi.ie

The Office Of Director of Telecommunications Regulation
Abbey Court ,
Dublin 1

Date: 29th October 1999

To whom it may concern

It is the policy of Cable Management Ireland Ltd to comply with the general public exposure limits for Non- ionising radiation as specified within the International Commission on Non-Ionising Radiation Protection (ICNIRP) guidelines of 1998.

Cable Management Ireland Ltd operate maintenance procedures at MMDS transmission sites that ensure compliance with the ICNIRP guidelines of 1998.

Independent Non-ionisation audits are carried out at main MMDS transmitter sites by an Independent certified test centre to ensure compliance with the Non-ionisation radiation requirements in accordance with the ICNIRP guidelines of 1998.

Yours Sincerely,

Sam Warner

Company Secretary

REGISTERED IN IRELAND NO. 141817.
REGISTERED OFFICES: 70 CAPEL STREET DUBLIN 1

CABLELINK LIMITED
10 PEMBROKE PLACE, BALLSBRIDGE, DUBLIN 4
TELEPHONE: 01 7998400 FAX: 01 6686766
WEBSITE: WWW.CABLELINK.IE

Cablelink

STATEMENT

The Technical Regulations document R82 which forms part of Cablelink's operating licence requires the company to comply with the recommendations of the I.R.P.A. / ICNIRP as regards the levels of Electromagnetic Emissions that the general public may be exposed to, emanating from our MMDS sites.

It is Cablelink's policy to fully comply with these guidelines.

To ensure full compliance the following procedures stated in our document, "Procedures for Ensuring Compliance with Emission Limits at MMDS Transmitter Sites", are adhered to within the Company.

Signed:

Ian Jeffers
Managing Director

Date: 3rd November 1999

Suir Nore Relays Limited

50/51 JOHN STREET,
KILKENNY.
Tel.: (056) 61484
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15 PARNELL STREET,
CLONMEL.
Tel.: (052) 24869
Fax: (052) 26311
E-mail: clmsnr@indigo.ie

30th November 1999.

Office of the Director of
Telecommunications Regulation,
Abbey Court,
Irish Life Center,
Lower Abbey Street,
Dublin 1.

Dear Sirs,

It is the policy of Suir Nore Relays Lrd., to ensure that the general public exposure limits of the ICNIRP guidelines : 1998 are complied with.

The company has in place systems and procedures to ensure compliance with these ICNIRP guideline limits.

Yours faithfully,

JIM CRANWELL
Managing Director

Unit 9 Richview Office Park
Clonskeagh
Dublin 14 Ireland

Tel +353 1 203 7723
Fax +353 1 203 7901

Ms. Etain Doyle
Director
Office of the Director of Telecommunications Regulation
Abbey Court
Irish Life Centre
Lower Abbey Street
Dublin 1

Ref L910261a

26 October 1999

Dear Madam,

Compliance with emission limits for non-ionising radiation

Eircell is fully committed to compliance with the emission limits for non-ionising radiation specified by the International Commission on Non-Ionising Radiation Protection (ICNIRP,1998), the European Telecommunications Standards Institute ('ETSI'), the European Committee for Electro-technical Standardisation ('CENELEC') and all other standards specified in the law of the European Union.

Eircell has in place written procedures for the calculation and measurement of non-ionising electro-magnetic radiation levels which monitors on an on-going basis its compliance with the above guidelines.

Yours sincerely

Ann Donnelly
Company Secretary / Solicitor

Registered in Ireland at
Eircell House 6-8 College Green
Dublin 2 Ireland

Esat Digifone

• Esat Digifone Limited
Digifone House
76 Lower Baggot Street
Dublin 2, Ireland
Telephone +353 1 6095000
Fax +353 1 6095010
www.digifone.com

The Office of the Director of Telecommunications Regulation,
Abbey Court,
Irish Life Centre,
Lower Abbey Street,
Dublin 1

10/12/99

Compliance with the International Guideline limits for Non Ionising Radiation

To whom it may concern:

Esat Digifone wish to state that it is the policy of this company to comply with the general public exposure limits for non - ionising radiation as laid out by International Commission on Non-Ionising Radiation Protection (ICNIRP) in 1998.

To ensure we comply with these guideline limits Esat Digifone has set up internal compliance procedures and sample measurements of radio sites. To do this Esat Digifone have invested in the necessary measuring equipment for internal company use.

Yours sincerely,

Barry Maloney
Chief Executive.

eircom

Etain Doyle
Director
The Office of the Director of Telecommunications Regulation
Abbey Court
Irish Life Centre
Lower Abbey Street
Dublin

Group Chief Executive Office

eircom plc
114 St Stephens Green W
Dublin 2, Ireland
Tel +353 1 7015203
Fax +353 1 6796500
www.eircom.ie

26 November 1999

Dear Etain,

Compliance with emission limits for non-ionising radiation

eircom plc is fully committed to compliance with the emission limits for non-ionising radiation specified by the International Commission on Non-Ionising Radiation Protection (ICNIRP) in its guidelines issued in 1998.

The Company has in place a Code of Practice and an operational system to ensure on-going compliance with the above guidelines.

Yours sincerely

Alfie Kane
Group Chief Executive

Electricity Supply Board
Lower Fitzwilliam Street, Dublin 2, Ireland. Sráid Mhic Liam Íochtair, Baile Átha Cliath 2, Éire
Phone: 353-1-676 5831 / 702 5350 Fax: 353-1-676 [illegible]
www.esb.ie

ESB Corporate Centre

22nd November, 1999

Ms. Etain Doyle,
Director of Telecommunications Regulation,
Abbey Court,
Irish Life Centre,
Lower Abbey Street,
DUBLIN 1.

Dear Ms. Doyle,

Compliance with Emission Limits for Non-Ionising Radiation

This statement is provided to meet the requirements of the Office of the Director of Telecommunications Regulation.

It is ESB policy to comply with the general public exposure limits for non-ionising radiation, as contained in the International Commission on Non-Ionising Radiation Protection (ICNIRP) Guidelines 1998.

To ensure compliance with the ICNIRP limits, ESB has in place a Code of Practice which has been circulated to all relevant personnel.

Yours sincerely,

Larry Donald,
COMPANY SECRETARY.

RTÉ

Radio Telefís Éireann

ón Stiúrthóir Gnóthaí Eagraíochta / Rúnaí
from the Director of Corporate Affairs / Secretary

Baile Átha Cliath 4, Éire
Teileafón 01 208 2371
Facsuimhir 01 208 3197

Dublin 4, Ireland
Telephone 01 208 2371
Telefax 01 208 3052

27th October, 1999

To Whom It May Concern

Radio Telefís Éireann wishes to state that it is company policy to comply with the General Exposure Guidelines for non-ionising radiation as contained in the International Commission on Non-ionising Radiation Protection (ICNIRP) Guidelines.

To comply fully with these guideline limits, Radio Telefís Éireann has set up operational procedures to calculate and measure levels of Non-ionising Radiation at our transmission sites and ensure their ongoing compliance.

Tom Quinn

radioTARA

Mornington House, Summerhill Road, Trim, Co. Meath, Ireland.
Telephone (046) 36655, Facsimile (046) 36704.

Thursday, 02 December 1999

The Office of the Director
of Telecommunications Regulation
Irish Life Centre
Lower Abbey Street
Dublin 1

Ref: JOH/JA

Re: Compliance with the international guideline limits for non-ionising Radiation.

TO WHOM IT MAY CONCERN

It is the policy of Atlantic 252 to ensure that the general public exposure limits of the International Commission on Non-Ionising Radiation Protection Guidelines: 1998 are fully complied with.

The company has in place procedures to insure compliance with the International Commission on Non-Ionising Radiation Protection Guidelines: 1998 limits.

Yours faithfully

John O'Hara
Managing Director

SECTION IV ODTR CONCLUSIONS

4.1 CONCLUSION

On the basis of the auditor's work, Enterprise Ireland has concluded that, all the companies audited[7] have procedures and arrangements in place to ensure compliance with the general public exposure limits specified in the ICNIRP guidelines (1998) and are in compliance with these guidelines. In addition, written Statements of Compliance endorsed by senior management from each relevant company[8] were received.

The measurements recorded by Enterprise Ireland at all of the 30 selected sites were within the ICNIRP 1998 limits for general public exposure to non-ionising radiation.

These sites included:

- 16 shared or multiple user sites
- 20 sites in population centres
- 26 sites occupied by mobile telephony systems (including shared sites)
- 5 MMDS sites operated by Princes Holdings, Cablelink, CMI and Suir Nore (including shared sites)
- 5 microwave link site occupied by Eircom (including shared sites)
- 1 microwave link site operated by ESB
- The Radio TARA (Atlantic 252) radio transmitter site
- 4 TV and radio transmitter sites occupied by RTE

4.2 FURTHER AUDITS OF COMPLIANCE

The Director intends to arrange for further audits to be carried out as necessary in order to continue to be satisfied that operators of radio installations are in compliance with their licence obligations with regard to general public exposure limits for non-ionising radiation. These audits will also serve to reassure the public in this regard.

[7] It should be noted that, Esat Telecom had no radio systems in operation at the time of the audit and their radio licences were cancelled shortly after the audit.
[8] As Esat Telecom no longer has a radio licence a statement of compliance was unnecessary.

Annex A Glossary of Terms

ESB	Electricity Supply Board
Hertz	Unit of frequency (e.g. one million Hertz = 1 MHz)
ICNIRP	International Commission on Non-Ionising Radiation Protection
IRPA	International Radiation Protection Association
MMDS	Microwave Multipoint Distribution System
NETC	National Electronic Technology Centre in Forbairt
NIR	Non-Ionising Radiation
ODTR	Office of the Director of Telecommunications Regulation
SAR	Specific Absorption Rate
RTE	Radio Telefis Eireann
UHF	Ultra High Frequency
VHF	Very High Frequency
WHO	World Health Organisation

Annex B Brief Technical Description of Non-ionising Radiation

Electromagnetic waves are waves containing energy in the form of electric and magnetic fields that travel through the air at the speed of light (i.e. 300 million metres per second). This is equivalent to travelling around the world seven times in one second.

An important characteristic of an electromagnetic wave is its frequency. An electromagnetic wave has peaks and troughs, similar to the waves created when pebbles are tossed into a pond of water. The frequency of the signal is the number of peaks, or troughs, that pass a fixed point in one second. Frequency is measured in units of Hertz. A thousand hertz (1 kHz) is a kilohertz, while a million hertz (1 MHz) is a megahertz and a thousand million hertz (1 GHz) is a gigahertz.

The electromagnetic spectrum contains all the electromagnetic waves of different frequencies. The lowest frequencies in the electromagnetic spectrum are radio waves which are used for communication and entertainment purposes. As the frequency of the waves increase we encounter infra-red waves which we sense as heat, followed by visible light from the sun. Above visible light are ultra-violet waves which causes sunburn, followed by X-rays and Gamma rays.

Electromagnetic radiation can be divided into two types, namely non-ionising and ionising radiation. The amount of energy in an electromagnetic wave depends on the frequency of the wave. High frequency waves carry more energy than low frequency waves.

All matter, including humans, is made up of atoms which in turn consist of tiny electrons spinning around a nucleus. Ionisation occurs where electromagnetic waves with sufficient energy are able to disrupt atoms and molecules. This process occurs at frequencies above approximately 2420 million MHz, which corresponds to the region of the electromagnetic spectrum above ultra violet light.

Non-ionising radiation is electromagnetic radiation at frequencies below 2420 million MHz. The ODTR only licences the use of frequencies in the non-ionising section of the electromagnetic