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Health & Safety Guidelines Radio Emission Compliance for The Representative Church Body



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1) Objective

The objective is to establish guidelines for Health & Safety at all Mobile Telecommunication Base-Station installations with regards to the International Commission of Non-Ionizing Radiation Protection (ICNIRP) as expressed in the EU Council recommendation of the 12th July 1999* “on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300GHz)”.

*Reference 1999/519/EC guidelines

In Summary, these Health & Safety Guidelines ensure:

- That members of the general public cannot be exposed to power densities in excess of the ICNIRP general public emission guidelines.
- That all persons employed in the mobile telecommunications industry cannot be exposed to power densities in excess of the ICNIRP occupational emissions guidelines.

2) ICNIRP

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

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

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

All mobile phone service providers in Ireland have an obligation, as part of their license agreement, to operate within the ICNIRP guidelines.

Reference

ID	Reference	Version & Date
Ref_1	“Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)” International Commission on Non-Ionizing Radiation Protection Copyright © 1998 Health Physics Society www.icnirp.de/documents/emfgdl.pdf	April 1998

3) Occupational and Public Limits

ICNIRP have defined two exposure limits, one for members of the general public and one for people classified as occupational (e.g. telecommunication engineers).

The occupationally exposed population consists of adults who are generally exposed under known conditions and are trained to be aware of the potential risk and to take appropriate precautions.

The general public comprises individuals of all ages and of varying health status, and may include particularly susceptible groups or individuals.

In many cases, members of the public are unaware of their exposure to electromagnetic fields (EMF). Moreover, individual members of the public cannot reasonably be expected to take precautions to minimize or avoid exposure. It is these considerations that underlie the adoption of more stringent exposure restrictions for the public than for the occupationally exposed population.

4) Antenna Installation

1. Where possible all antennae should be positioned so that a member of the general public, as defined by ICNIRP, would not be able to stand in any area where the EMF may exceed the ICNIRP general public exposure limits.
2. To prevent members of the public standing in front of an antenna it is preferable that sector antennae are positioned as close as possible to the edge of the building nearest the direction of transmission (see fig.1).
3. If it is possible for a member of the general public to stand 3 to 5 meters to the front of a sector antenna the antenna should be at least 3.5m above the normal standing level. However, in certain cases the antenna may be mounted lower. An example of such a case is where the antenna is mounted close to the edge of the building. In all cases, compliance with the current ICNIRP general public EMF exposure guidelines must be proven by the operator.
4. For link antennas (dishes) the distance from standing level to the base of the antenna should be greater than 2.5 meters.
5. If it is not possible to position an antenna where it cannot be accessed by members of the general public then an exclusion zone must be defined around the antenna.
6. Provisions must be made to power down antennae if there is a possibility of maintenance personnel, painters, etc., entering an area where the EMF may exceed the general public limits.
7. For each site, the operator must supply contact details to ensure that antennae or other equipment can be powered down should the need arise.
8. Warning signage should be used at each site to ensure there is no possibility of accidental exposures in excess of the ICNIRP guidelines.
9. Operators should provide landlords with adequate safety information. This information should take the form of a "Site Information Pack" containing, the site drawings, explanation of signage used and the procedure for powering down antennae. This information should be made available to the Landlords employees or contractors who may come in close proximity with the antennae.
10. All metalwork in close proximity to EMF sources should be properly RF grounded.
11. All radio equipment should be installed in secure housings and have suitable warning signs posted on the housing.

5) Typical Mobile Telecommunications Installation

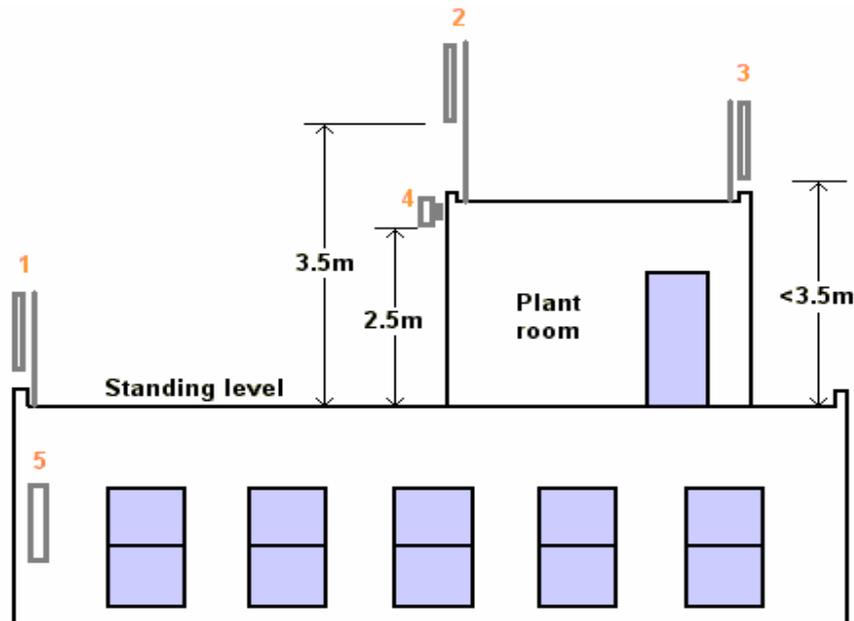


Fig.1 Examples of typical antenna locations on a rooftop installation

Figure 1 shows typical antenna positioning in a rooftop installation, however the same principles apply for any installation. The antenna positions shown in Fig.1 will not guarantee compliance but have been included to illustrate good practice, in all cases, the operator must ensure compliance.

Antenna 1 is located in a position that makes it impossible to stand in front of it. In this situation an exclusion zone should be defined and signage used to keep members of the general public a sufficient distance from the rear and sides of the antenna to ensure compliance with the general public guidelines.

Antenna 2 should be of sufficient height to ensure that the emissions at standing level are less than the general public exposure limits.

The base of **Antenna 3** may be mounted less than 3.5m above standing level if there is limited space between the side of the plant room and the edge of the building. Site specific calculations need to be performed by the operator to determine the required height and distance.

Antenna 4 is an example of a link dish - the base of this antenna should always be at least 2.5m above standing level.

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Antenna 5 is face mounted and may need to be powered down when the windows are being cleaned, etc. Details required to get antennae powered down should be included in the site information pack.

6) Exclusion zones

Careful antenna positioning should be the primary means of achieving compliance. Exclusion zones should be avoided wherever possible.

1. In any place in which a member of the general public could stand where EMF may exceed ICNIRP general public exposure limits, a physical barrier, e.g. plastic chain, must be used to define exclusion zones. Chains used to define an exclusion zone are to be supported at a height of 1100mm above standing level. The chain is to carry suitable warning signage.
2. A detailed drawing is to be left on site outlining any exclusion zones and the positions of any poles used for defining those exclusion zones to allow repositioning in case they are moved.
3. Where an exclusion zone is defined, a procedure must be in place to power down the antennas responsible for the exclusion zone in the event of access to that zone being required for maintenance or any other purposes.
4. All structures used to define the exclusion zone should be sufficiently robust to withstand unintentional movement.



Photo.1 Rooftop installation showing exclusion zone and signage

7) Signage

1. All access door(s)/route(s) leading to areas where antennae are positioned must have a securely fixed site entry sign posted specifying that RF is present.
2. All antennas should have antenna-warning signs posted on them facing all directions from which the antenna can be approached.
3. All physical barriers used for marking exclusion zones around antennas must have a warning sign on them.
4. Operators should ensure that all signs are in place before powering the transmitters.

Sample RF Warning Signs



Fig.2 Site Entry Sign



Fig.3 Antenna Sign



Fig.4 Exclusion Zone Warning Sign

8) Radiation Patterns of Mobile phone antennae

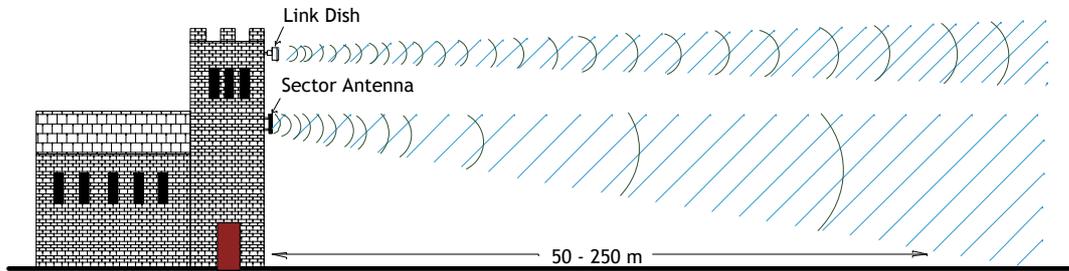


Fig. 5 Vertical radiation patterns of typical base station antennae.

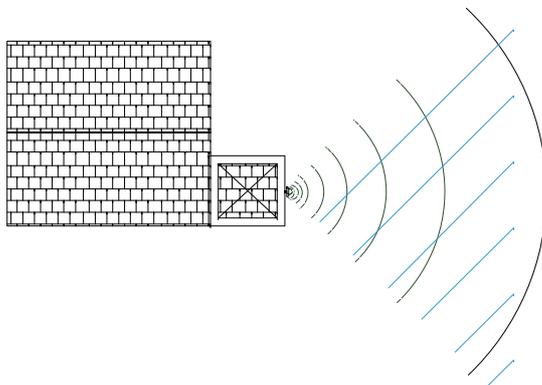


Fig. 6. Horizontal radiation pattern of a sector antenna.

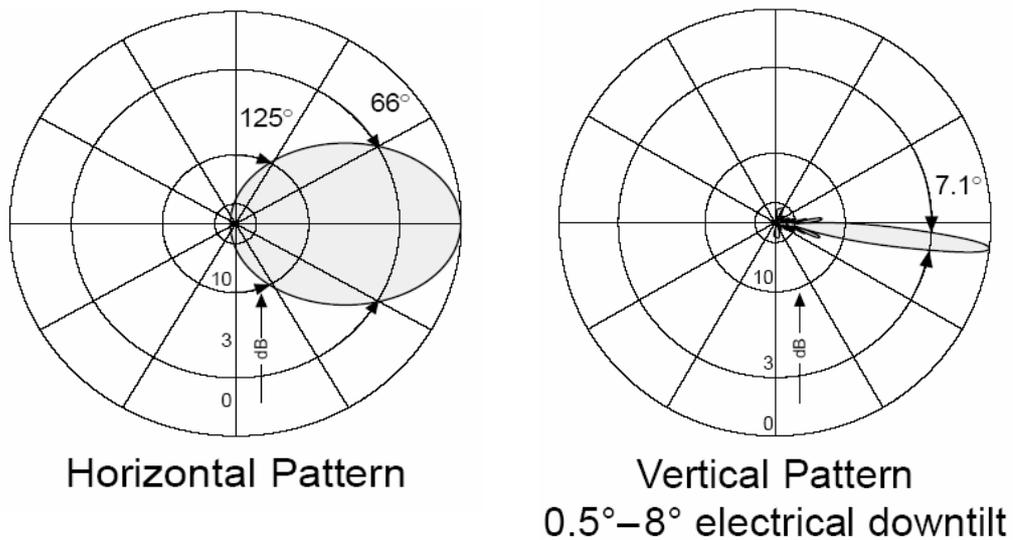


Fig. 7 Radiation patterns of an actual base station sector antenna

9) Summary

The ICNIRP definition of general public is any adult who is not trained to be aware of the potential risks associated with exposure to EMF and not trained to take appropriate precautions. As the general public cannot be excluded from accessing areas of buildings where RF installations are positioned, these areas must meet ICNIRP general public exposure guidelines.

Wherever possible, compliance with the relevant current ICNIRP exposure guidelines should be achieved using suitable antenna positioning rather than exclusion zones.

Signage should be placed on all access routes leading to areas where RF equipment and antennas are installed to inform people of the existence or potential existence of RF.

All equipment should be installed in such a way that physical and RF hazards are minimised.

The Operator should provide the Landlord with adequate safety information which should take the form of a "Site Information Pack".

Compliance with the ICNIRP guidelines should be proven by measurements where any doubt exists as to the safety of the site.

10) GLOSSARY

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

ComReg: - The Communications Regulator for the Republic of Ireland.

Electromagnetic field: - Combined electric and magnetic fields, in this case radiating from an antenna.

Exclusion Zone: - Area defined by a physical barrier.

General Public: - Individuals of all ages and of varying health status, and may include particularly susceptible groups or individuals.

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

Link Dish: - A Base station antenna used to connect the base station with the rest of the telecommunications network.

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

Occupational: - Adults who are exposed under known conditions and are trained to be aware of potential risk and to take appropriate precautions.

Operator: - The service provider associated with the Telecommunications installation, e.g Vodafone, O2.

Power Density: - A unit of measure used to quantify electromagnetic fields, usually expressed in Watts per square meter (W/m^2).

Radiation Pattern: - A diagram showing where an antennas emissions are at half the power of the main beam in the horizontal and vertical plane.

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

RF “hot spot”: A highly localized area of relatively more intense radio-frequency radiation that manifests itself in two principal ways:

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(a) The presence of intense electric or magnetic fields immediately adjacent to conductive objects that are immersed in lower intensity ambient fields (often referred to as re-radiation), and

(b) Localized areas, not necessarily immediately close to conductive objects, in which there exists a concentration of radio-frequency fields caused by reflections and/or narrow beams produced by high-gain radiating antennas or other highly directional sources. In both cases, the fields are characterized by very rapid changes in field strength with distance.

Sector Antenna: - A Base station antenna used to communicate with mobile phones.