Introduction.

Mobile phone base stations are low power (typically a few tens of watts) radio transmitters with antennae either mounted on towers, often positioned on top of buildings, or attached directly to buildings. High frequency radio waves are emitted into the area, or cell, around the base station. The radiofrequency (RF) power is usually radiated in conical fan-shaped beams that are essentially directed towards the horizon with a slight downward tilt. As such the radio wave levels below the antennae (e.g. at the base of the tower) will be considerably less than exposure guideline levels (see below). Also, the beams spread out with distance and will be incident at ground level at distances greater than a few tens of metres from the antennae. The power levels at these distances are much reduced from those directly in front of the transmitter and will be typically many orders of magnitude below exposure guideline levels.

There are two ways by which health could be affected as a result of exposure to RF radiation. These are by thermal (or heating) effects, and possible non-thermal effects. At the current time the non-thermal effects are not completely understood by the international scientific community, however considerable research is on-going. The radiation transmitted from base stations does not have sufficient energy to damage DNA directly and thus cannot cause cancer. They may, however, give rise to other effects and there have been suggestions that they could impede the body’s ability to repair or destroy cancerous cells that have been caused by other agents.

In 1998, the International Commission on Non-Ionising Radiation Protection (ICNIRP) published guidelines covering exposure to RF radiation [1]. These guidelines are based on the need to avoid known adverse health effects. In 2000, the UK governments Independent Expert Group on Mobile Phones, chaired by Sir William Stewart, published its report entitled ‘Mobile Phones and Health’ [2]. This report makes a number of conclusions and recommendations, which include:

- The balance of evidence to date suggests that exposure to RF radiation below ICNIRP guidelines does not cause adverse health effects to the general public.
However, they recommend that a ‘precautionary approach’ to the use of mobile phone technology be adopted until more detailed and scientifically robust information on any health effects becomes available.

They recommend the establishment of clearly defined exclusion zones around base station antennae, which delineate areas within which exposure guidelines may be exceeded.

The use of mobile phone technology provides obvious benefits to the University of Liverpool and to society as a whole. However, at this time such usage must be ‘precautionary’ and this means adopting the applicable recommendations of the Stewart Report plus complying with ICNIRP guidelines.

This draft code of practice aims to provide a formal procedure for the screening of proposed base station installations on University buildings, and reassure all stakeholders that the safety issues associated with such installations are given careful and structured consideration prior to possible consent being given to the manufacturer. It was approved by the University’s Committee on Safety in June 2002.

**Procedure.**

The first point of contact within the University for manufacturers proposing to install a base station on a University building should be the Assistant Director of Facilities Management (Operations and Maintenance).

The Assistant Director of Facilities Management will make the manufacturer aware of the points listed below and provide them with a questionnaire (Appendix 1) for completion. The information gathered on this questionnaire is required by the Radiation Protection Office. Facilities Management will send this information to the University Radiation Protection Adviser (URPA) for his review. On completion of this review, the URPA will report to the Assistant Director of Facilities Management on the radiation safety aspects of the proposed installation. With this report the Assistant Director of Facilities Management will decide on whether the installation should proceed based on the advice received.

Once the antenna(e) have been erected, staff of the University Radiation Protection Office will visit the installation in order to carry out a safety inspection. Any recommendations for further action resulting from this inspection will be reported to the Assistant Director of Facilities Management.
The manufacturer must be made aware of the following points and, using the questionnaire shown in Appendix 1, provide the information requested therein:

1. **Location of Proposed Base Station.**
   On which University building is it proposed to install the base station? Information on the position of the antenna(e) on the roof of this building must also be supplied.

2. **Supporting Structures.**
   Details of the structures that support the RF antenna(e) must be supplied e.g. height of tower, structural integrity etc.

3. **Exclusion Zones.**
   The University of Liverpool defines an ‘exclusion zone’ as an area or areas surrounding an RF antenna within which the levels of electric field strength (V/m), magnetic flux density (µT) and power density (W/m²) are above the ICNIRP occupational reference levels [1] for electromagnetic radiation exposure for the particular frequencies involved. No person should enter an exclusion zone whilst the antennae are transmitting. The manufacturer must demonstrate that all reasonably practicable steps to restrict unauthorised access to exclusion zones e.g. barriers, position of aerials etc have been taken. The manufacturer must ensure that suitable warning signs are clearly displayed at the perimeter of all exclusion zones, or at more appropriate positions around the supporting structure so long as these positions are not within an exclusion zone. A minimum of 3 warning signs must be erected around each exclusion zone. Each must be no smaller than A4 in size. They must bear the British Standard warning symbol for RF radiation and details of the wording must be provided to the University for consideration prior to installation. The University reserves the right to erect additional warning/information signs as it sees fit.

4. **Antenna Details.**
   The manufacturer must endeavour to provide the University with details of the transmitters. Such technical information should include:
   - type of antenna e.g. sectoral, omni-directional etc.
   - number of antennae per supporting structure
   - transmitted frequency
   - maximum transmitted power (W) per antenna
   - for sectoral antennas, beam width and angulation towards the ground
   - distance from the antenna at which the uninterrupted beam meets ground level (or any area accessible by the public).
   - maximum power density (W/m²) at ground level (or any area accessible by the public).
   - distribution of transmitted power density (W/m²) around the supporting structure e.g. plots of iso-power density lines.

5. **Public Protection.**
   The manufacturer must supply a written declaration which clearly states that the levels of power density (W/m²) at ground level, or in adjacent

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buildings, or in any area accessible by the general public are at least a factor of 10 below the ICNIRP general public reference levels [1] for the particular frequency involved.

6. Manufacturers Safety Procedures. The manufacturer should supply the University with a copy of its own safety procedures for installation and on-going maintenance.

References.


# INSTALLATION OF MOBILE TELEPHONE BASE STATION

Application for Installation of mobile telephone base station and/or associated equipment on university property

Please complete the following:

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<th>1. Location of Proposed Base Station</th>
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<td>State on which University building it is proposed to install the base station?</td>
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- Maximum power density (W/m²) at ground level (or any area accessible by the public)
- Distribution of transmitted power density (W/m²) around the supporting structure e.g. plots of iso-power density lines
- Transmitted Frequency
### 5 Public Protection

The manufacturer must supply a written declaration which clearly states that the levels of power density (W/m²) at ground level (or any area accessible by the general public) are at least a factor of 10 below the ICNIRP general public reference levels (1) for the particular frequency involved.

Confirm attached  YES / NO

### 6 Manufacturers Safety Procedures

The manufacturer should supply the University with a copy of its own safety procedures for installation and on-going maintenance.

Confirm attached  YES / NO

### References:

1. ICNIRP (1998) guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (Up to 300 Ghz) Health Physics, 74(4) pp494-522
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