ICNIRP Compliance Assessment of the mobile phone installation located on the roof of No.102 High Street, Harrow-on-the-Hill, London.

Summary:

The mobile phone Base Station installation operated by 3 complies with the International Commission for Non-Ionising Radiation Protection (ICNIRP) guidelines by large margins.

The highest level of the total electromagnetic power density measured in the property next to the installation at No.100 High Street was only 0.0006 Watts per square metre (W/m^2). This level is more than 16,600 times below the ICNIRP maximum permitted public guideline value of 10 W/m^2 set for the frequencies used by the operator 3. The low values found at this address are due to the main signal path from the antennas passing over the roof of the property.

The highest level of the total electromagnetic power density measured within a flat more remote from the installation was only 0.0016 W/m^2. This value is 6,250 times below the ICNIRP maximum permitted public guideline value of 10 W/m^2.

The highest value of the total electromagnetic power density measured within the surrounding area at street level was 0.0035 W/m^2. This value is more than 2,800 times below the maximum permitted ICNIRP public guideline value set for the frequencies used by 3.

It can therefore be concluded, as the ICNIRP guidelines are designed to provide for the full protection of everyone at the maximum permitted public values, then when considering the very much lower measured values, no harm should be expected to result to anyone living in these buildings or nearby.

Compliance Assessment Survey

The Measurement Survey was conducted by Garry Homer, Director, Electromagnetic Surveys Limited on 4 March 2004, between 1.00 pm and 3.20 pm.

1. Background

The mobile phone operator 3 has a Base Station located at No.102 High Street. The antennas are mounted within the top section of a slim mast designed to appear as a flagpole on the roof of the building. Concerns have been raised by local residents about their safety while living close to the installation. This survey was commissioned to address these concerns.

2. Instrumentation

The instrument used for this survey was a Wandel & Goltermann EMR 300, serial number AP-0052, fitted with a probe that had a frequency response covering 100 kHz to 3000 MHz. The instrument was within its calibration period and functioned normally throughout the tests.

This professional instrument provides the total value for all the electromagnetic fields that are present within the frequency range of the probe. The probe is also isotropic, which means the probe does not need to be pointed in any particular direction to correctly interact with the electromagnetic fields that surround it.

3. Safety Standards

The Independent Expert Group on Mobile Phones chaired by Sir William Stewart recommended that as a precautionary measure, all mobile phone companies should use the guidelines issued by the International Commission for Non-Ionising Radiation Protection (ICNIRP) for areas where the public have access. Previously, the guidelines issued by the National Radiological Protection Board (NRPB) were used.

The Stewart Report only made precautionary recommendations to increase the protection afforded to the public. The NRPB guidelines can still be applied to all mobile phone occupational situations and to both public and occupational situations for all other radio frequency sources.

Like the NRPB guidelines, the ICNIRP guidelines are not statutory limits. However, there is a general 'Duty of Care' provision within Health & Safety legislation that requires compliance with guidelines issued by authoritative bodies such as the NRPB and ICNIRP.

The NRPB and ICNIRP guidelines were created after careful reviews of all the health related research that had been carried out worldwide. As the research did not show causation of other health outcomes, both the NRPB and ICNIRP guidelines are designed to prevent our bodies overheating. They start from the knowledge that has been gained over the past decades, that a $1^{o}C$ rise in body temperature is easily controlled by our bodies perspiring etc.

What ICNIRP has done is to first set a value for the protection of workers to limit this temperature rise to a small fraction of $1^{o}C$. This ensures their body temperatures are not elevated by any more than about $0.1^{o}C$ while working at the maximum permitted occupational levels. Then, as it is assumed that working employees are healthier than the general public, the maximum permitted public guideline level is set at one fifth of the occupational level.

This very much lower public level is set to ensure that even when the electromagnetic field levels are at their maximum permitted public levels, then no harm will be caused to anyone, young or old, no matter what state of health they are in.

The operator 3 uses a frequency of approximately 2,100 MHz for their transmissions from the Base Station to their customer's handsets. At this frequency, the ICNIRP occupational guideline is set at a power density of 50 W/m^2, averaged over any six-minute period. The ICNIRP public guideline for this frequency is set at one fifth of this value at 10 W/m^2, again averaged over any six-minute period.

The NRPB guideline for this frequency is 100 W/m^2 for both public and occupational situations, averaged over any 15-minute period.

The average value is specified within the guidelines to take account of the variations in the signal level that can be created by different radio frequency technologies. These times are the maximum time over which the readings should be averaged. Where the signal is known not to vary, then one instantaneous value will suffice.

4. Methodology

As the ICNIRP guidelines specify averaged values; the measuring instrument was also set to indicate averaged values to ensure any transient events were included correctly. The measurement time allowed for each reading was that sufficient for the indicated value to become stable and constant but did not exceed the 6-minute limit. Therefore, all the values recorded in this report were measured in accordance with the guidelines and can be directly compared with the maximum permitted guideline values to calculate the level of compliance at each measurement location. The level of compliance for each location is shown in the attached Tables of Results.

The instrument probe is sensitive to a wider range of frequencies than those used by this Base Station. This means the recorded values also include contributions from the wall mounted Orange antenna that is also located at No.102 High Street and the other local antennas on the roof above No.43 to No.47 High Street. There will also be small contributions from more distant mobile phone, emergency services, radio and television transmissions etc. Therefore, this measurement method will overestimate the contribution from the 3 Base Station and therefore provide a more severe assessment of compliance for the installation.

Where it was both possible and appropriate, all measurement locations were selected that had line-of-sight of the antennas. This was done to ensure that maximum values were captured. Common building materials can reduce the radio frequency power density level by factors of 10 or more.

5. Discussion

5.1 Survey Findings

Concern was expressed about the close proximity of the installation with No.100 High Street. However, the highest level of the total electromagnetic power density measured during the survey was found at street level near to No.17 London Road. The values measured within No.100 High Street were found to be low and comparable to some of the lowest values measured around the local area. This confirms expectations where, due to the height of the antennas and the shape of their radio frequency emissions, the main signal path from the antennas pass over the building.

During the measurement survey at this address, the signal level was seen to vary in a way that is uncharacteristic of the more constant 3G transmissions. This indicates that other significant radio frequency sources were present. However, approximations were not used to reduce the measured values to take account of these sources. Therefore, this methodology provides a 'worse case' assessment of the mobile phone installation operated by 3.

The significance of these other radio frequency sources can be interpreted from the Tables of Results. Measurements made at the rear of 45 High Street revealed a value of 0.0018 W/m^2. This was at a position where the 3 installation could not be seen but where there was a clear line-of-sight of the antennas above this row of buildings. Measurements made at the front of these buildings were much lower where these antennas were not visible, even though there was clear line-of-sight of the 3 installation. The signal from these antennas was intermittent in a way that is characteristic of taxi, emergency services and paging transmissions.

5.2 Radiation

Most health concerns associated with mobile phone installations arise from the use of the term radiation. The Press and protest groups deliberately use this term to describe the emissions from mobile phone installations without providing any explanation of its meaning. People then become anxious as they are left to link these emissions with the dangers of nuclear sources of radiation, such as atom bombs and X-Ray machines etc.

Electromagnetic radiation is split into two parts, ionising and non-ionising. Ionising radiation occurs at frequencies above that of visible daylight, starting in the ultra-violet part of the electromagnetic spectrum and progressing through X-Rays and Gamma Rays to Cosmic Rays. It is the ionising energy of ultra-violet light that has led to serious concerns about skin cancer and the length of time that is spent in strong sunlight or on sun-beds.

Non-ionising electromagnetic radiation is everything below the ultra-violet part of the electromagnetic spectrum mentioned above. Mobile telephone frequencies are just a small part of this non-ionising electromagnetic radiation that includes radiated heat from fires, light, television and radio transmissions etc. It is referred to as non-ionising radiation as it does not have sufficient energy to change the electrical charge on atomic structures. It also does not have sufficient energy to significantly alter particle collisions in tissue or to break chemical bonds and affect our DNA. This is why most Physicists do not believe that low-level non-ionising electromagnetic radiation at levels, set by such authoritative bodies as ICNIRP and the NRPB, can pose any health risk.

5.3 Relevance of ICNIRP

The guidelines set by ICNIRP are being used by more and more countries as the basis for their own standards. Australia has recently issued their new guidelines with ICNIRP type reasoning and values. Previously, they had a lower temporary guideline that was introduced to allow them time to study the research data and to form their own opinion of what precautions were necessary.

The NRPB has recently completed a review of the research that has been undertaken since the Stewart Report was issued. They have not found any evidence of any effect that would undermine the relevance of the ICNIRP guidelines.

Some pressure groups champion the application of a standard based upon 3 Volts per metre (V/m), (equivalent to 0.0238 W/m^2), or some other parameter the mainstream worldwide scientific community does not accept. It should be noted the 3 V/m level has not been derived from any consideration of appropriate Health and Safety issues. This value has been set under European Electromagnetic Compatibility (EMC) regulations to avoid unnecessary interference with very sensitive electronic equipment. This is because some electronic equipment will contain metallic structures that can act as receiving antennas. They can also contain amplifiers that will boost the unwanted signals to levels that interfere with the normal operation of the equipment. However, the Tables of Results also show that all the electric fields recorded during this survey were smaller than 3 V/m.

It is widely accepted that interference to sensitive electronic equipment is possible at radio frequency levels below those contained in guidelines set to protect human health. Some older electronic equipment has not been deliberately designed to be immune to this type of interference. This is why some countries have introduced stricter guidelines based upon 1V/m for areas close to Hospitals. It is not done to protect the people directly from the radio frequency levels but to ensure the older medical equipment will function better.

It has been reported that an Australian solution to the potential problem of using a mobile phone in a hospital is to install small Base Stations within the hospital. A mobile phone's Adaptive Power Control reacts to the close proximity of a Base Station by lowering the phone's output power. A mobile phone will transmit at up to about $1/10^{th}$ of the permitted ICNIRP guideline when it is used far away from a Base Station. Next to a Base Station, a mobile phone may transmit at about $1/1000^{th}$ of the permitted ICNIRP guideline. This solution was introduced because the hospital administrators could not persuade their own consultants to turn their mobile phones off and not to use them at the patient's bedside.

Adaptive Power Control was designed into mobile phones to extend the time a phone could operate on one charge of its battery.

Potential interference problems in hospitals still exist from the type of two-way radios the Porters and security staff use. These two-way radios can be found to operate very close to the permitted maximum ICNIRP guideline values.

6. Conclusions

1. The mobile phone Base Station installation operated by 3 complies with the International Commission for Non-Ionising Radiation Protection (ICNIRP) guidelines by large margins.

2. The highest level of the total electromagnetic power density measured in the property next to the installation at No.100 High Street was only 0.0006 Watts per square metre (W/m^2). This level is more than 16,600 times below the ICNIRP maximum permitted public guideline value of 10 W/m^2 set for the frequencies used by the operator 3.

3. The highest level of the total electromagnetic power density measured within a flat more remote from the installation was only 0.0016 W/m^2. This value is 6,250 times below the ICNIRP maximum permitted public guideline value of 10 W/m^2.

4. The highest value of the total electromagnetic power density measured within the surrounding area at street level was 0.0035 W/m^2. This value is more than 2,800 times below the ICNIRP maximum permitted public guideline value.

5. As the ICNIRP guidelines are designed to provide for the full protection of everyone at the maximum permitted public values, then when considering the very much lower measured values, no harm should be expected to result to anyone living in these buildings or nearby.

Garry Homer B.Sc. MIEEE
Director

6 March 2004

Tables of Results

Measurement Locations:	Measured Power Density W/m^2	Times below the ICNIRP Public guideline of 10 W/m^2	Electric Field V/m
No.100 High Street, side bedroom window overlooking the base of the flagpole style antenna	0.0006	16,667	0.48
No.100 High Street, centre of the above bedroom	0.0003	33,333	0.34
No.100 High Street, attic bedroom, near the wall nearest the mast	0.0002	50,000	0.27
No.100 High Street, attic bedroom, by the window	0.0003	33,333	0.34
No.100 High Street, study, by the desk near the window	0.0002	50,000	0.27
No.80 High Street, Lilly's bedroom, by the window overlooking High Street	0.0016	6,250	0.78
No.80 High Street, main bedroom, by the window	0.0004	25,000	0.39
No.80 High Street, living room, by the window	0.0001	100,000	0.19
High Street, by the gateway to 'The Park'	0.0002	50,000	0.27
High Street, outside No.74	0.0003	33,333	0.34
High Street, outside the 'Connoisseur'	0.0006	16,667	0.48
High Street, outside No.45	0.0005	20,000	0.43
High Street, outside No.49	0.0004	25,000	0.39
High Street, outside No.53	0.0005	20,000	0.43
High Street, outside No.57	0.0007	14,286	0.51
High Street, opposite No.100	0.0021	4,762	0.89
High Street, outside No.100	0.0022	4,545	0.91
London Road, outside No.9	0.0020	5,000	0.87
London Road, outside No.17	0.0035	2,857	1.15
London Road, outside 'Tithegate'	0.0029	3,448	1.05

Tables of Results

Measurement Locations:	Measured Power Density W/m^2	Times below the ICNIRP Public guideline of 10 W/m^2	Electric Field V/m
London Road, outside No.29	0.0017	5,882	0.80
London Road, outside 'Herga House'	0.0010	10,000	0.61
London Road, outside 'Tall Gate Cottage'	0.0010	10,000	0.61
London Road, outside 'Highlands'	0.0003	33,333	0.34
London Road, outside 'littlecourt'	0.0001	100,000	0.19
Harrow Park, opposite the driveway to 'Cairnryan Cottage'	0.0001	100,000	0.19
Harrow Park, opposite 'Syon'	0.0001	100,000	0.19
Harrow Park, opposite 'High Brow'	0.0004	25,000	0.39
Harrow Park, rear of 45 High Street	0.0018	5,556	0.82
Byron Hill Road, opposite No.5	0.0002	50,000	0.27
Byron Hill Road, opposite No.8	0.0001	100,000	0.19
Byron Hill Road, opposite No.14	0.0001	100,000	0.19
West Hill, by the roadway leading to 'West Hill Motors'	0.0002	50,000	0.27
West Hill, near to lamppost 'K980'	0.0001	100,000	0.19
West Hill, near to lamppost 'K1058'	0.0001	100,000	0.19
Roxeth Hill, outside 'Mount Pleasant Flat'	0.0002	50,000	0.27

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