

# Health and safety issues of wireless networks and recommendations

## Applicable Legislation

In the UK, control of exposure to non-ionising radiation in the workplace (as emitted by wireless networking equipment) is governed through the provisions of the Health and Safety at Work Etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999. These reference the publications of three organisations: restrictions on exposure to electromagnetic fields published by the National Radiological Protection Board (Health Protection Agency), international standards for optical radiation published by the American Conference of Governmental Industrial Hygienists (ACGIH), and guidelines of the International Commission on Non-Ionising Radiation Protection (ICNIRP). The Health Protection Agency has adopted the ICNIRP recommendations rather than maintain its own. An EC Directive is due to be in place in 2009, and consultation is currently being undertaken. The Directive will reference the ICNIRP documents. Note that the guidelines address the aspects of acute exposure and not those of chronic, or long-term, exposure.

## Summary of Current Position

In general, according to the Health Protection Agency and the Wi-Fi® Alliance, wireless LAN (WLAN) networks do not appear to provide a cause for concern regarding health when properly handled. The legislation is changing, so it is well worth maintaining a watching brief on the Health and Safety at Work Act and related laws to keep up to date in this matter. Note that mobile telephones and masts have also been the subject of studies regarding health, and different issues pertain to these as compared with WLANs – they are of higher power output, and when in use they transmit continuously, unlike LAN packet traffic patterns.

The Health Protection Agency has published results on WLAN measurements within the office environment. Power densities were found to be much lower than their guideline levels. The Health Protection Agency comments that levels would be higher the closer you are to the device, such as a laptop on the knees, where distances may be a few centimetres. However, it considers that the transmitters are of low power and unlikely to provide a problem in terms of compliance with the guidelines. It notes that ‘if an explicit statement that exposures are within guidelines is required, this would have to be obtained from the manufacturers; however, it could be argued that this is implicit in the CE marking.’

The Wi-Fi Alliance, as one would expect, is sensitive to WLAN health and safety issues, and states that: ‘Manufacturers of Wireless Networking products design their products to operate within the guidelines of [these] standards and recommendations and, therefore, are considered safe.’ In this light, along with the Health Protection Agency statement, it would

seem wise to purchase equipment which has the appropriate markings – CE with regard to any applicable European legislation, and Wi-Fi, for the Wi-Fi Alliance.

The ICNIRP guidelines do not necessarily preclude interference with medical devices, including pacemakers, cochlear implants and so on. Affected persons should consult the manufacturer or physician for advice (see ICNIRP guidelines). Some suppliers publish information on tests with certain medical equipment.

There is also a phenomenon called microwave-induced auditory response, which can be caused by exposure. This auditory effect may become stressful if it is evoked in people with normal hearing, and it is recommended that they avoid exposure and move away from the wireless device.

## **Recommendations for Use**

All the authorities consulted agree that normal use of wireless networking equipment does not expose the user to harmful levels of radiation. However, to further reduce the level of radiation experienced, the following practical steps may be considered:

- The location of all wireless network installations must be registered and published by the institution in an area where it can be readily consulted by the user community. Signage also could assist in identifying wireless areas. For such areas, the potential for microwave-induced auditory effects should be noted, and avoidance recommended. The potential effect on prosthetic devices must be noted and users pointed towards consultation with manufacturers and/or health authorities on their particular case.
- Purchase CE- and Wi-Fi marked equipment and follow manufacturer's instructions for installation and operation. Proper operation and installation of access points and PC cards is required to reduce exposure to below recommended guideline limits.
- Do not touch or move antenna(s) while units are transmitting or receiving. Do not hold any component containing a transmitting radio such that the antenna is very close to or touching any exposed parts of the body, especially face or eyes. In particular for open areas, the proximity of transmitters must be considered (for example, touching is to be avoided). This may be very relevant in informal areas of use where crowding may be common (cafeteria, etc.). The considerate and careful location of PC aerials must be noted. For an antenna user, always orient the antenna so that it is at least 20cm away from the body.

## **Recommendations for Siting**

One must be sensitive to where wireless devices and access points are installed. The major problem is likely to be interference with existing services or equipment using the same ISM (Industrial Scientific & Medical) band (2.4GHz), or perhaps through electromagnetic interference. Note that several kinds of equipment are known to deploy the ISM band – for example, some motion detecting security devices are known to interfere with WLAN access points. There is a general warning not to operate wireless devices in explosive environments unless they are of a type specially qualified for that use.

Particular attention may need to be given to sensitive areas containing safety or medical equipment. The Medicines and Healthcare Products Regulatory Agency (MHRA) suggests that WLAN equipment is unlikely to interfere with medical equipment itself, which should be

shielded. However, there may be interference where ISM equipment is deployed to provide services, and therefore a study of the proposed locale should be undertaken to avoid this. In such cases, close consultation with current incumbents is required as well as good coverage studies.

## URLs

- Cisco – wireless LAN equipment in medical settings, an example of manufacturer documentation:  
[http://www.cisco.com/en/US/customer/products/hw/wireless/ps430/products\\_white\\_paper09186a008011a606.shtml](http://www.cisco.com/en/US/customer/products/hw/wireless/ps430/products_white_paper09186a008011a606.shtml) [1] (registration required)
- ICNIRP Guidelines on limiting human exposure to electromagnetic fields:  
<http://www.icnirp.org/documents/emfgdl.pdf> [2]
- HSE and Non-Ionising Radiation (UK):  
<http://www.hse.gov.uk/radiation/nonionising/index.htm> [3]
- MHA Medicines and Healthcare products Regulatory Agency (search for ‘wireless’):  
<http://devices.mhra.gov.uk/> [4]
- Health Protection Agency Wireless Local Area Networks (WLANs):  
[http://www.hpa.org.uk/radiation/understand/radiation\\_topics/emf/wlans.htm](http://www.hpa.org.uk/radiation/understand/radiation_topics/emf/wlans.htm) [5]
- Health Protection Agency Position Statement on Wifi:  
[http://www.hpa.org.uk/radiation/understand/radiation\\_topics/emf/wifi.htm](http://www.hpa.org.uk/radiation/understand/radiation_topics/emf/wifi.htm) [6]
- Health Protection Agency Restrictions on human exposure to static and time-varying electromagnetic fields and radiation:  
[http://www.hpa.org.uk/radiation/publications/documents\\_of\\_Health\\_Protection\\_Agency/abstracts/absd4-5.htm](http://www.hpa.org.uk/radiation/publications/documents_of_Health_Protection_Agency/abstracts/absd4-5.htm) [7]
- Access point comparison by University of Utah:  
<http://wireless.utah.edu/global/research/ap-reqs.html> [8]
- WHO/IRPA Task Group on Electromagnetic Fields (300 Hz to 300 GHz):  
<http://www.inchem.org/documents/ehc/ehc/ehc137.htm> [9]

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## Links

- [1] [http://www.cisco.com/en/US/customer/products/hw/wireless/ps430/products\\_white\\_paper09186a008011a606.shtml](http://www.cisco.com/en/US/customer/products/hw/wireless/ps430/products_white_paper09186a008011a606.shtml)
- [2] <http://www.icnirp.org/documents/emfgdl.pdf>
- [3] <http://www.hse.gov.uk/radiation/nonionising/index.htm>
- [4] <http://devices.mhra.gov.uk/>
- [5] [http://www.hpa.org.uk/radiation/understand/radiation\\_topics/emf/wlans.htm](http://www.hpa.org.uk/radiation/understand/radiation_topics/emf/wlans.htm)
- [6] [http://www.hpa.org.uk/radiation/understand/radiation\\_topics/emf/wifi.htm](http://www.hpa.org.uk/radiation/understand/radiation_topics/emf/wifi.htm)
- [7] [http://www.hpa.org.uk/radiation/publications/documents\\_of\\_Health%20Protection%20Agency/abstracts/absd4-5.htm](http://www.hpa.org.uk/radiation/publications/documents_of_Health%20Protection%20Agency/abstracts/absd4-5.htm)
- [8] <http://wireless.utah.edu/global/research/ap-reqs.html>
- [9] <http://www.inchem.org/documents/ehc/ehc/ehc137.htm>