

Appendix 1
Report to Cabinet 26th November 2009

WiFi in Schools – Stockton Borough Council’s Position

1. What is WiFi?

- 1.1 WiFi is short for Wireless Fidelity and is a particular type of wireless local area network (WLAN) - i.e., you don't need to plug your computer into a phone network via a cable. There are many types of WLAN but all of them allow two or more computers to form a network using radio frequency (RF) signals. They allow users to access and share data, applications, internet access or other network resources in the same way as wired (cable) systems.
- 1.2 WiFi and WLANs signals are very low power, typically 0.1 watt (100 milliwatts) in both the computer and the router (access point). Based on current knowledge and experience, radio frequency (RF) exposures from WiFi are likely to be lower than those from mobile phones. Also, the frequencies used in WiFi are broadly the same as those from traditional RF applications.

2. What are the advantages of WiFi?

A wireless LAN has some specific advantages over wired LAN:

- (a) Flexible Learning - the accommodation of different learning styles and the adaptation of any learning space to suit the type of learning taking place.
- (b) Accessible – access to the network can be from anywhere in the school within range of an access point, giving users the freedom to use ICT where and when it is needed.
- (c) Adaptable – it is typically easier and quicker to add or move devices on the network.
- (d) Cost – while the initial investment required for wireless LAN hardware can be similar to the cost of wired LAN hardware, installation expenses can be significantly lower.
- (e) Flexibility for teachers – a teacher with a wireless enabled laptop can access the wireless network to show students work, share resources, obtain information from the internet from anywhere within a range of an AP, without being tied to a wired PC.
- (f) Portability – they allow computer devices to move around the school with the pupil rather than the pupil going to a specific place to use the

device. This allows for outdoor field work and work in non-classroom spaces (common areas, library, canteen, gymnasium / sports hall, playground).

3. What are the disadvantages of WiFi?

- (a) Slower data transfer – the current data rates of wireless networks means that high bandwidth activities are better done on wired networks. As the number of devices using the network increases, the data transfer rate to each device will decrease accordingly.
- (b) Upgrading – as wireless standards change, it may be necessary, or at least desirable, to upgrade to higher specifications of wireless which could mean replacing wireless equipment (wireless NICs, access points, etc. Currently, wireless standards are changing more quickly than wired standards.
- (c) Security is more difficult to guarantee.
- (d) Signal Reception – devices will only operate at a limited distance from an access point, with the distance largely determined by the standard used. Obstacles between the access point and the user, like walls, glass, water, trees and leaves can also determine the distance of operation.
- (e) Configuration – as the number of people using wireless devices increases, there is the risk that certain radio frequencies used for wireless will become congested and prone to interference; particularly the 2.4GHz. frequency.

4. What are the proven effects on health of WiFi?

- (a) Wireless uses radio waves of a particular frequency – in this case 2.4GHz - to send and receive data. It is the same frequency on which microwaves, cordless phones and Bluetooth devices work. Radiowaves such as wireless, are a type of radiation called non-ionising.
- (b) Non-ionising radiation does not carry enough energy to ionise atoms and at high levels of exposure can only excite atoms, causing heating. This is the process by which microwave ovens heat food, by exciting the molecules that are exposed to the radiation, although a typical microwave oven has 100,000 times the radiation intensity of a Wi-Fi network.
- (c) It is the thermal effect that ICNIRP (International Commission on Non Ionising Radiation Protection) publishes its guidelines on limiting exposure in 1998.

- (d) When a radio terminal is used close to the body, some of the radio energy penetrates into the body and it is absorbed in the tissues. The pattern of this absorption and total amount of energy absorbed depends on parameters such as frequency, output power, position of use, antenna type, etc and it is not easy to predict without a detailed investigation. The exposure is characterised by the specific absorption rate of energy (SAR) in the tissues and this will generally have a spatial peak value near the surface of the body and close to the radiating antenna. Guidelines expect SAR to be averaged over various different tissue-masses and time-periods before comparison with the basic restrictions. The most stringent basic restrictions for the situation where low power radio transmitters are used near the body are those on localised SAR in the head, which involve an averaging mass of 10g and an averaging time of six minutes. For this situation, the ICNIRP guidelines for workers advise that SAR should not exceed 10 W/kg. The ICNIRP guidelines and Council Recommendation basic restriction for the general public is that SAR averaged in this way should not exceed 2 W/kg.
- (e) The signals from WiFi are very low power, typically 0.1 watt (100 milliwatts) in both the computer and the mast (or router) and resulting exposures should be well within internationally accepted guidelines

5. What are the Public Concerns about WiFi?

- (a) Some scientists have reported that low level radiation can do more than just excite atoms and the pulsating nature of the signal (modulated signals) can result in a non-thermal interaction. Modulated signals where the strength rises and falls in time with a lower frequency are exploited to transmit information in mobile phones. These signals have the potential to weaken cell membranes due to the interaction between the lower signal frequencies and charged molecules within the membrane, ultimately driving calcium out of the cell structure and weakening it. There is the potential for unwanted biological effects as a result, one being electrosensitivity where false sensations are caused through this leakage being similar to the signals used by the body to transmit sensations; in the ear for example:
In the ear this might produce unwanted sensations of pressure balance or sound (tinnitus)
In the brain, nerve impulses so generated may appear as hyperactivity, stress headaches or migraine.
In the heart, palpitations may be explained by leakage affecting the rhythm of contractions and
In the skin, leakage may cause inflammation and leave the skin more vulnerable to the influx of toxins and allergens and hence the increased likelihood of allergies
- (b) There is concern that the ICNIRP guidelines do not consider these potential biological effects and that they are therefore flawed as a standard to comply with. However there are no other agreed standards for exposure level.

- (c) Such biological effects are of greater concern in relation to children as they absorb greater proportions of radiation and in having a longer life expectancy would be more susceptible to any long term effects.
- (d) As in recent concerns use of mobile phones by children the use of laptops potentially brings low level ionising emissions into direct contact with their bodies.
- (e) The use of WLANs in schools results in exposure throughout the school and therefore there is no element of choice involved.

6. Who provides Authoritative Advice to the Council?

- (a) The HPA has UK-wide responsibility for providing advice on protecting people from radiation hazards, including those arising from exposure to electromagnetic fields (EMFs) such as radio waves. The International Commission for Non-Ionizing Radiation Protection (ICNIRP) is also an independent scientific organisation with responsibility in this area. Both the HPA and ICNIRP are formally recognised by the World Health Organisation in the field of EMF protection.
- (b) There is no UK legislation specifically requiring compliance with any EMF protection guidelines. Within the context of general UK safety legislation (the Health and Safety at Work etc Act 1974 and the Management of Health and Safety at Work Regulations 1999), the Health and Safety Executive have enforcement responsibility in schools but their advice (www.hse.gov.uk/radiation/nonionising/hse.htm) is based on compliance with ICNIRP standards.
- (c) Schools and Education Authorities main source of advice is BECTA (British Education Communications and Technology Agency) who's advice (foi.becta.org.uk/display.cfm?resID=15825) is like the HSE to refer to HPA guidelines.

7. What is the Council's Policy on Wi-Fi?

There is no specific policy in place, however, in general terms it would also follow the policy of the HPA in relation to health issues ([view the Wireless Local Area Networks \(WLANs\) page](#)).

8. What is the current position of HPA?

- 8.1 There is no consistent evidence to date that WiFi and WLANs adversely affect the health of the general population. The signals are very low power, typically 0.1 watt (100 milliwatts) in both the computer and the router (access point) and the results so far show exposures are well within internationally accepted (ICNIRP) guidelines. Based on current knowledge and experience, radio frequency (RF) exposures from WiFi

are likely to be lower than those from mobile phones. Also, the frequencies used in WiFi are broadly the same as those from traditional RF applications.

- 8.2 On the basis of the studies so far carried out in house, the Agency sees no reason why WiFi should not continue to be used in schools. However with any new technology it is a sensible precautionary approach, as happened with mobile phones, to keep the situation under ongoing review so that parents and others can have as much reassurance as possible.
- 8.3 The Health Protection Agency is currently conducting a research project, the aim of which is to assess exposures of children using WiFi equipment in both primary and secondary schools. The quantitative data generated by the project will then feed into a health risk review, but children's health is not being studied directly. The work is planned over two years (ending around Easter 2010). The four main work strands are:
 - (a) Review of exposure literature and technical standards
 - (b) Laboratory measurements of electromagnetic fields around selected WiFi equipment
 - (c) Measurements of fields from installed WiFi systems during different activities
 - (d) Computer modelling of RF energy absorption in the body from WiFi equipment
- 8.4 At July 2009 the HPA had completed lab based investigations on the equipment including WiFi-enabled laptops, access points, routers etc, as used in schools. The Next phase will be to look at exposure levels in schools.
- 8.5 Interim statement from the HPA is that "On the basis of the studies so far carried out in house, the HPA sees no reason why WiFi should not continue to be used in schools".
- 8.6 The HPA have not assessed potential links between ill health in schools and use of wifi but such research may be possible following completion of the current investigations.

9. What is the current position of ICNIRP

- 9.1 In August 2009 ICNIRP statement on their position was that in their opinion "The scientific literature published since the 1998 guidelines has provided no evidence of any adverse effect below the basic restrictions and does not necessitate an immediate revision of its guidance on limiting exposure to high frequency electromagnetic fields"
- 9.2 They went on to state "With regard to non-thermal interactions it is in principle impossible to disprove their possible existence but the

plausibility of the various non-thermal mechanisms that have been proposed is very low

10. Key Points

- 10.1 There is no consistent evidence to date that exposure to RF signals from WiFi and WLANs adversely affect the health of the general population.
- 10.2 The signals from WiFi are very low power, typically 0.1 watt (100 milliwatts) in both the computer and the mast (or router) and resulting exposures should be well within the only accepted ICNIRP guidelines.
- 10.3 The frequencies used are broadly the same as those from other RF applications such as FM radio, TV and mobile phones and based on current knowledge, RF exposures from WiFi are likely to be lower than those from mobile phones.
- 10.4 Precautionary measures to limit exposure of children to WiFi equipment should be proportional to those for use of mobile phones.
- 10.5 Decisions on installing WiFi in schools will be made based on a consideration of the advantages and disadvantages of the system based on educational benefits, reliability, cost and current guidance on risk to health.
- 10.6 The Council will rely on the HPA for current scientific advice on health issues regarding WiFi supported by the advice of BECTA, HSE , WHO and the LGA (Local Government Association).

Colin Snowdon

Environmental Health Manager

01642 526555

Colin.Snowdon@stockton.gov.uk