

# Wireless Technology in schools

## WiFi

Schools are in a very difficult position with regard to whether to install WiFi. One school, built 'ecologically' and with a full ethernet system for computers, was effectively forced to go WiFi in order to get government IT grants. WiFi is slower, less reliable and less secure than ethernet, irrespective of any health considerations.

Philip Parkin, general secretary for Voice, formerly the professional Association of Teachers, said in July 2008, that he was worried about reports linking wireless technology with loss of concentration, fatigue, reduced memory and headaches. He believes that a generation of children are effectively 'guinea pigs in a large-scale experiment.' Voice is calling for a moratorium on new WiFi networks and the suspension of existing WiFi if possible.

Symptoms reported by children in schools with WiFi include headaches, dizziness/nausea/vertigo, visual and auditory distortion, racing heart rate (tachycardia), memory loss, attention deficit, skin rash, hyperactivity, night sweats and insomnia. Some of these symptoms are also present in many cases of Attention Deficit Hyperactive Disorder (ADHD), which has had a four-fold increase since 1997. It is estimated by the National Institute for Clinical Excellence (NICE) that as many as 5% of children have this problem. Some parents report children dropping a grade point, no longer getting on with friends and new behavioural problems.

Adverse symptoms start to show in more sensitive people exposed to background peak signal levels above about 0.05 V/m. Typical signal levels in schools with WiFi are between 2 and 40 times higher than this.

Girls are born with their supply of immature eggs, waiting for puberty before their ovaries start releasing them. Should the mitochondrial (non-repairing) DNA within an egg be damaged by WiFi radiation, that damaged DNA will get passed on to a daughter conceived with this egg, and down successive generations.

Teachers in the UK are demanding the removal of WiFi from schools lest it jeopardize the health and fertility of children. The Association of Teachers and Lecturers (ATL)'s annual meeting in April 2009 wanted a long-term study to probe WiFi's impact on health. A study (Papageorgiou [2011](#)) looking at the effects of WiFi found changed attention and memory, especially in males.

In the US, they are saying that wired computers have had their day. There is a consensus that smartphones like the iPhone will be the delivery device of choice. The discussion is moving in the direction of education at the point of delivery, not necessarily in the classroom, but wherever the student may be. The current call is for a laptop for every child, but portable digital assistants (PDAs) and the new generation of ultra mobile PCs (UMPCs) offer greater flexibility, a wider range of classroom applications and longer battery life.

The Education Ministry of New Zealand takes an Auckland industry consultant's advice that it is okay to make it compulsory for school children to use a mobile phone as a learning aid, unlike the much more precautionary approach taken by its neighbour, Australia.

In December 2007, some members of the Discussion Group set up to advise the government on EMF issues made the following request:-

**“We call on the HPA to fundamentally change the announced programme of work so that it primarily collects health and performance data on school pupil WiFi users.**

“Our initial suggestions for study include:

“(1) To study secondary school children in the 12-15 year-old age-range as we have reports that this group is more affected than primary school children.

“(2) School records should be used for health, behaviour and performance monitoring and some specific mental ability tests carried out.

“(3) Schools with and without WiFi could be compared and also one or two schools with WiFi should also be equipped with wired networks and work 'half a term WiFi-on' and 'half a term WiFi-off' with suitable performance testing and well-being score at the end of each period for a couple of years.

“(4) It would be important also to record, for these children, mobile-phone usage and home exposure to base station, DECT and WiFi signals.”

Some of this could be integrated with the MTHR funded childhood illness research. It would result in some valuable information to feed into the evaluation of ICNIRP guidelines.

The HPA carefully worded their recommendations to schools so as to place all legal responsibility on the schools' governing bodies, who are therefore left holding full legal responsibility, perhaps individually, for any ill effects of WiFi on both students and staff.

Unfortunately, since December 2007, it seems that schools without WiFi are getting harder to find, and primary school-age children are increasingly having WiFi systems set up in their schools, too, mostly due to cost.

According to the Daily Mail in August 2007, approximately 70% of primary schools and 81% of secondary schools (15,000 schools) now have WiFi computing networks installed. An increasing number of schools have a 100% wireless network; 41% of secondaries have no wireless network at all (BECTA 2008). 1% of primary schools and 11% of secondaries allow mobile phones in lessons. 95% of 15-year-olds use a mobile phone.

BECTA, the UK schools technology advisory service says that WiFi can be used as “an extension of, but not an alternative to, a main wired ethernet network.” Schools can and should turn off the WiFi access points when they are not in active use. Generally you need one access point for every 10 to 20 children in order for the system to work efficiently (i.e. at least one per classroom). These should be fed by a wired network and turned off when WiFi laptops/handhelds are not being used for that lesson.

However, there is some concern by parents about their children's exposure to this extra type of microwave radiation. The Times reported that 3 schools had re-thought their policy on providing wLAN equipment in their schools due to pressure from parents or teachers. In school classrooms with wLANs the pupils are exposed to the microwaves from the computer's wLAN card and from the classroom wLAN unit. The radiation from microwave transmitters has been associated with loss of concentration, headaches, fatigue, memory and behavioural problems and possibly cancer in the long term.

Haringey council in London recommended in July 2007 that no new WiFi systems be installed in schools and that existing ones should be discontinued pending "full consultation with parents and staff." The recommendation was welcomed as "excellent news" by the Professional Association of Teachers, which believes the proliferation of networks in schools could be having serious implications for the health of some staff and pupils. In Newham, alone, more than 4,000 students have their own laptops (Guardian January 2008).

In April 2009, Hérouville-Saint-Clair, a municipality in Normandy, adopted the precautionary principle and removed all WiFi equipment from its primary schools.

In a study by Havas (2010) she discusses the effects found from RF exposure from DECT phones on heart rate. She points out that the effects on heart-rate have also been demonstrated using a WiFi router/Access point. Some children in schools with WiFi are being diagnosed with, and medicated for, heart irregularities that they believe may be linked to WiFi.

The UK Professional Association of Teachers wrote to the Education Secretary (April 2007) to demand an official enquiry because of its concerns over WiFi. In August 2007 they said "*WiFi should be halted until a full scientific inquiry has assessed health risks. We call on schools to dismantle WiFi networks immediately and replace them with cables. If this is impossible, the schools should measure the radiation levels around the school and sign 'hotspots'*" They also point out that cable networks are more reliable. The Health protection Agency (HPA) was granted £300,000 in 2007 to investigate WiFi in schools. However, they decided not to record any reported health issues for this research, but just to measure the signals. They have said (in advance of the start of the project) "*this work should help put public fears to rest*". It is unclear how this pre-judgement can be considered to be 'open-minded' science, neither will the public's fears about health issues be allayed if they are not addressed.

These WiFi networks have been banned in Salzburg, Austria, due to concerns for the health of children. Dr Gerd Oberfeld, head of the Public Health department, the official advice of which is for not to use WLAN or DECT in schools or kindergartens, says the symptoms for children exposed to RF are headaches, concentration difficulty, restlessness, memory problems, etc. The Austrian medical association, to which all the country's doctors belong, is lobbying against the deployment of WiFi. In March 2007, the Bavarian parliament issued a recommendation to all schools in the German province not to use the technology, and in 2006, the Frankfurt city government said it would not install it until its safety was proven. In December 2007 Paris libraries turned off their WLAN systems following health complaints from members of the staff. 40% of people working in the libraries complained about headaches, giddiness, nausea and tiredness after the system was switched on. Employees are calling for internet connections to be made using standard or fibre optic cables.

In July 2007 Haringey council unanimously voted to ban WiFi in all schools in the borough. However, 2 months later this was overturned by the executive committee without reason. Subsequently a letter went to all schools in the borough recommending WiFi.

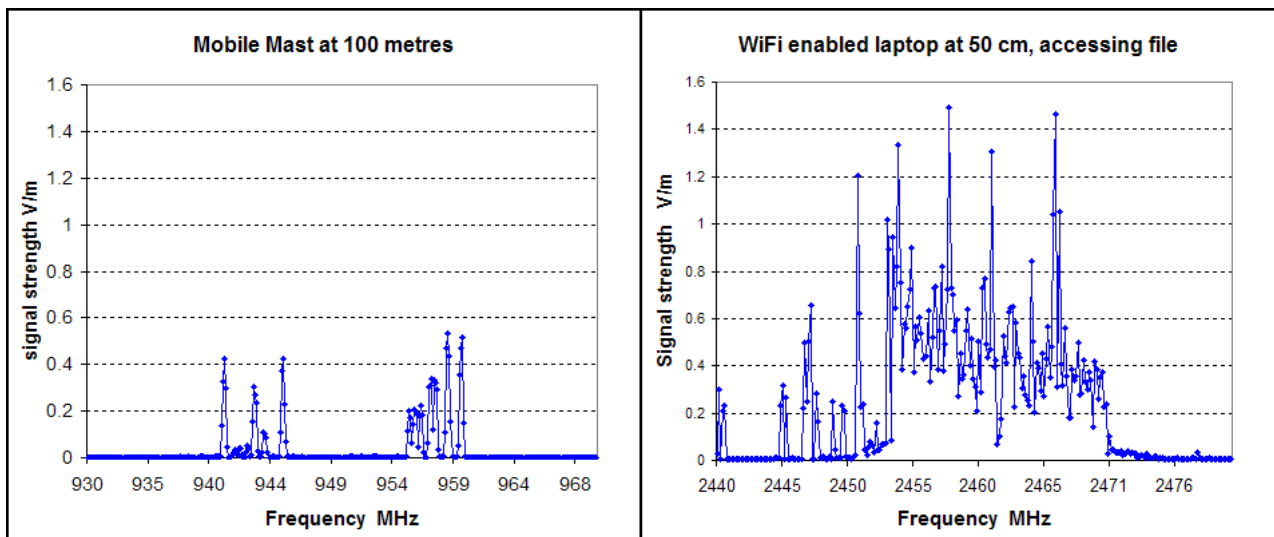
Professor Lawrie Challis, head of the committee on mobile phone safety research, says children should be discouraged from putting their laptops on their lap when using wireless internet connections. This will result in parts of their body which are sensitive to microwave emissions, such as testicles, ovaries and other internal organs being close to the transmitting antennas embedded in the laptop, exposing the user to microwave levels similar to a mobile phone. He believes youngsters' health should be monitored.

'Interactive whiteboard' systems are also beginning to appear in both our secondary and our primary schools. This system may have a wireless unit on the classroom ceiling and the whole room is then bathed in radiofrequency microwaves. The system is on all day. If the school your children attend have such a system, you, together with the teachers, might want to monitor the effect on the children. The teachers themselves may be affected, especially those who spend most of their working day in a classroom that has such a system installed. Microwave exposure has

been associated with behavioural disturbance, concentration and short-term memory problems. This does not seem to be the ideal environment for learning.

Some school pupils are being supplied with wireless laptops to boost e-learning in school and at home. Cost-conscious councils report that the cost of laptops is less than installing desktop PCs and rewiring buildings to provide connections. The new cheap-ish netbooks are becoming the 'in thing' for classrooms and homework.

## The Measurements



The peak signals from a WiFi system are up to about 6 V/m and environmental signals that people are exposed to in rooms with wLAN hubs typically vary from about 0.1 to 3 V/m.

The levels are lower in areas in the school without the Access Points and most wireless PCs can work down to reception levels well below 0.001 V/m, though the actual laptop PC transmitter will still be transmitting a signal of about 1 V/m or more to the user. The peak signal levels users are exposed to are generally in the range 0.2 to 2 V/m. It is possible to have higher signals if sitting very close to the equipment, especially the Wireless Access Point.

Most WiFi units emit a background  $\sim 10$  Hz beacon signal (a brain-wave frequency) pulsing at full power in 20 to 50 microsecond bursts even when not transferring files.

The HPA-RPD found average signal strength levels of 0.3 and 0.4 V/m respectively from a laptop PC and from a wireless Access Point, with peak levels probably in the order of 0.5 to 2.5 V/m. (Adam Lowe, HPA-RPD Leeds, December 2003).

In June 2005, SAEFL, the Swiss Agency for Environment, Forests and Landscape, published a report "Electrosmog in the Environment" (DIV 5801-E downloadable from [www.buwalshop.ch](http://www.buwalshop.ch)). This states signal strengths at one metre from both wireless PCs and normal strength Access Points to be in the range 0.7 to 2.8 V/m.

A report given by Neils Kuster, Foundation for Research on Information Technologies in Society (IT'IS) to a WHO Workshop meeting in July 2005 ([http://www.who.int/peh-emf/meetings/archive/bsw\\_kuster.pdf](http://www.who.int/peh-emf/meetings/archive/bsw_kuster.pdf)) found that the typical peak signal strength at 1 metre was about 1 V/m, rising to 2 V/m at a distance of 0.5 metres.

## Mobile Phone use and other technologies

Some schools are wanting to take advantage of mobile phone technology, rather than ban phones for their disruptive influence. Pupils attending King James's, Knaresborough, are encouraged to take video clips in lessons on their mobile phones and share them. They are being integrated into lessons to collect data, or exchange ideas. In languages, oral assignments are recorded on to phones (BECTA 2008).

Although France is introducing legislation to ban the use of mobile phones in nurseries and primary schools, in the UK BECTA, a government advisory group set up to promote technology in schools, has published a study recommending a 'gradual adoption' of mobiles until their use is "as natural as any other technology" employed in lessons (Express November 2009). Philip Parkin, general secretary of the teaching union Voice, said he was appalled that a government training agency should be advocating the use of mobile phones as an aid to teaching. "This is ignoring clear advice that children should not be using mobile phones." The current Department of Health recommendation is that children should only use mobile phones in an emergency.

Essa Academy, in Bolton, spent £120,000 equipping pupils with an iPod Touch to help them with their school work and keep in touch with teachers.

## School reactions

Prebendal School in Chichester had been having problems with the reliability of the wireless network and decided to change it for a conventional cabled system. At Ysgol Pantycelyn, in Carmarthenshire, the Head Teacher agreed to switch off the wireless network as he said "the concerns of the parents are of greater importance than our need to have a wireless network." A concerned parent said "they are like having a phone mast in the classroom and the transmitters are placed very close to the children." The radiation from microwave transmitters has been associated with loss of concentration, headaches, fatigue, memory and behavioural problems and possibly cancer in the long term.

Stowe School in Buckinghamshire removed part of its wireless network after one of their teachers who had been at the school for 28 years became too ill to teach as he had had such a violent reaction to the network, suffering from headaches, pains throughout his body, sudden flushes, pressure behind the eyes, skin pain and burning sensations and bouts of nausea. The head teacher intends to put cabled networks in all new classrooms and boarding houses.

Ballinderry Primary School in County Antrim removed its WiFi system in 2009. The principal, Ian Thompson, said "We don't really know the biological end of this, which is the thing that really concerns us."

Two students are now on heart medication and one is scheduled for heart surgery in a Toronto school. One pupil fainted while standing near a WiFi antenna.

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