Risk Assessment for radiofrequency radiation exposures in pre-schools, schools, colleges, universities and places of care and residential accommodation for children and young people

For example, from technologies such as mobile/'smart' phones, cordless phones, Wi-Fi-enabled computers, Wi-Fi transmitters, wireless virtual reality headsets, 'smart' watches, wireless printers, Bluetooth, wireless security systems, 'smart' meters, mobile phone base station antennas and FM/digital radio transmitters. Schools are used here as an example but risks and actions may be applied to other workplaces and places where children, pregnant women or women of child bearing age spend considerable amounts of time.

Control Measures (in order of priority) – eliminate hazard, substitute with less hazardous alternative, prevent access to the hazard, control the amount of exposure, training, written instructions, personal protective equipment, welfare facilities, safety signs.

Key for Risk Assessment Form

Likelihood of hazard happening:

Low, highly unlikely to happen = Score 1

Medium, could happen, but unlikely = Score 2

High, likely to happen = Score 3

Severity:

Slightly harmful, minor = Score 1

Harmful = Score 2

Serious e.g. irreversible damage, fatal or life threatening = Score 3

Overall Risk = **Likelihood x Severity**:

Score: 6 & 9 = High, urgent action required

Score: 3 & 4 = Medium, action to an agreed timetable

Score: 1 & 2 = Low, or tolerable risk no action may be required

Risk factors shown in the table below are assuming no additional controls have been put in place. If suggested further actions are introduced, then risk levels could be reduced.

SERVICE AREA:

SECTION/LOCATION:

NAME OF ASSESSOR(S):

DATE OF ASSESSMENT:

Job Type/Work Activity:

FREQUENCY/DURATION:

What are the Hazards?	Who might be harmed and how? (Who is at special risk?)	What are you already doing? (Current control measures, including those for people at special risk)	What further action is necessary? (Further Control Measures)	Action by whom	Action by when	Done	Risk Factor		
							Likelihood	Severity	Risk Level

What are the Hazards?	Who might be harmed and how? (Who is at special risk?)	What are you already doing? (Current control measures, including those for people at special risk)	What further action is necessary? (Further Control Measures)	Action by whom	Action by when	Done	Risk Factor		
							Likelihood	Severity	Risk Level
Use of a mobile / 'smart' phone or cordless phone held to the head	All staff, children/pupils/students or visitors, but children and young people are at particular risk, because they absorb radiation more easily than adults and they are still developing[1,2]. Risk of possible long-term development of brain, head or neck tumours[e.g.1, 3-11]. Young people had increased odds of developing a brain or head tumour compared to adults[9,10]. Radiofrequency signals are currently classed as a WHO IARC Class 2B Possible Human Carcinogen (2011)[1], but more recent evidence has strengthened the association[e.g.3-9,11,12]. Possibility of altered brain activity [e.g.13-21], possible detrimental effects on cognitive function[e.g.22-48], hearing[49], behaviour or mental health[e.g.50-56], particularly in children or young people. Possible damage to DNA in the brain, head or neck[e.g.57-71], cell loss or increased dead cells in the brain[e.g.72-82], altered electrical properties or communication between neurones[e.g.83,84], altered gene expression[e.g.85-90], altered neurotransmitters or enzymes[e.g.91-99]. These may have adverse effects on cognition (e.g. dementia), brain development or brain function or increased risk of disorders. Increased risk of headaches[100].	As appropriate, for example: Children/young people and members of staff can use phones when they need to and cordless phones are used in offices or classrooms. Or Pupils are not allowed to use mobile/smart phones in school and corded phones are provided if they need to make a phone call. Or Staff, pupils/students and parents have been advised of the risks and members of staff use their phones in a designated area away from the pupils/students. Pupils cannot use mobile phones in school and do not keep them on them during school hours. Corded phones are provided for pupil use if they need to phone home. A policy is in place and staff have been informed.	Ban the use of mobile or 'smart' phones by children and young people on school premises, during school hours or whilst on school activities. Provide a wired landline phone for pupils to use when necessary in the school office or other areas. Policy in place; all employees, pupils and volunteers are aware of it. Educate pupils/students, staff and parents about the possible risks to their brain, head and neck of holding a mobile/'smart'/ cordless phone to their head whilst switched on. Staff, visitors and parents to use mobile/'smart' phones away from children or young people, in a designated area on school premises. Advise children, young people and employees that if they need to use a mobile/'smart' phone out of school or in a designated adult area, using speakerphone or an air tube headset, whilst keeping the phone away from their body, will reduce the risk. Provide a wired landline phone for use in school offices or other areas. Inform pupils and parents about the school rules and ask that they do not use their mobile or 'smart' phones at school, or to do so in designated areas. Staff on school trips to be advised to use their 'smart'/mobile phones at least 2 - 3 metres away from pupils and to use speaker phone or an air tube headset, keeping the phone away from their body.	Head teacher/ senior management team/ employer			Tumour adult: 1 Tumour child: 1 or 2 Brain activity: 3 Damage to DNA and cells: 2 Headache: 2	Tumour: 3 Brain activity: 1 or 2 Damage to DNA and cells: 2 or 3 Headache: 1 or 2	Tumour adult: 3 Tumour child: 3 or 6 Brain activity: 3 or 6 Damage to DNA and cells: 4 or 6 Headache: 2 or 4

What are the Hazards?	Who might be harmed and how? (Who is at special risk?)	What are you already doing? (Current control measures, including those for people at special risk)	What further action is necessary? (Further Control Measures)	Action by whom	Action by when	Done	Risk Factor		
							Likelihood	Severity	Risk Level
Use of Wi-Fi-enabled tablet computers, wireless laptops or wireless desktop computers	All staff, children/pupils/students and visitors who use them. Possible damage to areas of the body closest to the devices, including increased cancer risk[1,101,102], oxidative stress[e.g.103-111,118], cell death[e.g.110-112], damage to DNA[e.g.113-119], damage to male fertility[e.g.120-134], or female fertility[e.g.135-138 (135-138 not Wi-Fi frequencies)]. Exposures from Wi-Fi-enabled devices close to the body can be as high as from mobile phones (similar maximum Specific Absorption Rates, SARs[139]), so effects may be similar to those reported for mobile phones close to the body.	As appropriate, for example: Nothing at present, or Pupils/students keep devices away from the body and never use them on their lap, or Connections are wired with Ethernet or fibre optic cables and Wi-Fi, Bluetooth and other transmitters are disabled on the devices. Policy in place and staff aware.	Children and young people to be given wired computers and wireless transmitters to be switched off on the devices or desktop computers. Where pupils/students bring their own devices to school, they are to be connected with wires to access the internet or intranet and wireless functions switched off. Children not to use wireless computers, and not to place them on their lap whilst the wireless function is enabled. Policy in place and communicated to staff, volunteers and pupils. Regular monitoring by Senior Management Team/ Managers and reported to Governing Body.	Head teacher/ employer/ manager			For children and young people: 1 or 2 For adults: 1	2 or 3, depending on aspect affected	For children: 2 – 6 For adults: 2 - 3
Cordless phone base stations, constantly emitting radiofrequency signals	People working within a few metres of the cordless phone base station[e.g.140-144].	As appropriate, for example: Nothing at present, or Cordless phones have been replaced by wired phones.	Choose corded phones in offices, classrooms and other places, as required. Provide wired phones for pupils to use in school, boarding houses and student accommodation. Educate staff, pupils/students and parents about the risks of spending time close to a cordless phone base station. Include in school policy.	Head teacher/ employer/ manager			1 or 2	2	2 - 4

What are the Hazards?	Who might be harmed and how? (Who is at special risk?)	What are you already doing? (Current control measures, including those for people at special risk)	What further action is necessary? (Further Control Measures)	Action by whom	Action by when	Done	Risk Factor		
							Likelihood	Severity	Risk Level
Wi-Fi access points, constantly emitting radiofrequency signals	Children/students in classrooms or other areas, staff, volunteers and visitors Possible effects on brain activity[145-146], altered brain development, cognitive impairment, behavioural or mental health problems[147-148,112,113,115]. Possible effects as a result of oxidative damage, damage to DNA or cell death in a range of organs, including damage to reproductive health (see Wi-F references, page 3). Possible increased risk of tumours[1]. Possible increase in bacterial antibiotic resistance[149-150].	As appropriate, for example: Wi-Fi access points throughout the school, constantly on, or Wi-Fi access points are switched off in each room when not being used for educational purposes, or Wi-Fi is not used/ has been switched off and wired computer points have been installed where necessary.	Wi-Fi to be switched off when not in use, with a planned timetable to switch it off completely and move to using only wired connections, particularly for children, young people, pregnant women and those with existing medical conditions. Wi-Fi to be switched off in all rooms where examinations are taking place. Wi-Fi to be switched off in boarding houses, care homes and student accommodation (including universities) and wired internet connections to be provided in rooms. Policy in place and communicated to staff, volunteers, pupils/students and parents. Regular monitoring by Senior Management Team/ Managers and reported to Governing Body.	Head teacher/ employer/ IT manager			1 or 2	2 or 3, depending on aspect affected	2 - 6
Keeping 'smart'/mobile phones in pockets or on the body; devices on or near the body such as 'smart' watches, wireless virtual reality headsets, wireless headphones or wireless-enabled clothing or glasses	Anyone who is keeping wireless devices on or next to their body Possibility of oxidative damage, damage to DNA, cell death (see previous references) or increased risk of tumour(s)[e.g. 151,1]. Possible damage to the brain, altered brain activity (see previous references), effects on immune system or blood cells[e.g. 152-153]. Possible damage to hearing[155-156], the eyes[157] or decreased fertility (see previous references).	As appropriate, for example: Pupils and staff can use any devices, except in examinations, or Pupils currently do not have phones on them during the school day, they are collected in in the morning and returned at the end of the day. Teachers have been advised not to wear wireless devices on their body and to carry in a bag, not in pockets or bras. The school has advised parents, pupils and staff that body-worn devices should be non-radiofrequency-emitting.	Pupils and parents have been advised that no mobile phones, Wi-Fi- or Bluetooth-enabled devices are to be carried by pupils next to the body, or used during school hours. Phones and other wireless technologies can be handed in in the morning and collected at the end of the day. Policy in place and stakeholders aware. Information about possible risks has been given to children/students, parents and staff and wireless risks have been added to the PSHE (Personal, Social and Health Education) curriculum.	Head teacher/ employer/ manager			2	2 or 3, depending on aspect affected	4 - 6

What are the Hazards?	Who might be harmed and how? (Who is at special risk?)	What are you already doing? (Current control measures, including those for people at special risk)	What further action is necessary? (Further Control Measures)	Action by whom	Action by when	Done	Risk Factor		
							Likelihood	Severity	Risk Level
Wireless mouse or keyboard	Anyone using them. Possible effects, as above.	As appropriate	Wired keyboards and computer mice to be provided where necessary and student and staff devices to use wired versions. Included in policy and communicated to all stakeholders.	Head teacher/ employer/ manager			1 or 2	1 or 2	1 - 4
Exposures from transmitters further away from the body such as 'smart' meters, wireless printers, wireless security systems, mobile phone base stations and FM/digital radio transmitters	Anyone using the building or close to the transmitter. Possible detrimental effects on behaviour, mental health or cognition[e.g.158-161]. Possible increased risk of type 2 diabetes[202]. Other possibilities include damage to male fertility[162] and effects as described for Wi-Fi access points.	As appropriate	It is not possible to control all exposures in our environment, but schools can choose not to have wireless 'smart' meters or place phone base stations or FM/digital transmitters on or near to their premises. Wired printers can be chosen, or if not available, they can be connected with a wire and wireless functions turned off. Schools, colleges and universities can object to phone base stations or microcells / picocells being placed near to their premises, in order to safeguard children, young people and members of staff. A distance of greater than 300m is preferred.	Head teacher/ employer/ manager			1	2 or 3, depending on aspect affected	2 or 3
Special precautions are needed for pregnant women, to protect the unborn child	Pregnant members of staff, pregnant pupils/students or pregnant visitors. Harmful effects on foetal development have been reported in the scientific literature: e.g., damage to DNA[e.g.163-164], dead cells/cell loss[e.g.165-175], increased risk of miscarriages[176-178], increased risk of speech problems in children[179], increased risk of behavioural problems in children[180-182], changes in brain development, hyperactivity or impaired learning[e.g.183-189], and increased oxidative stress[e.g.190-196].	As appropriate	All pregnant women/pupils/students to be offered a non-wireless work environment. Wired computers, phones and other technologies to be provided. Wi-Fi, Bluetooth and other wireless radiofrequency transmitters to be switched off in the work environment. Members of staff not to be required to use a mobile phone for work, but if they choose to do so, they are advised to use speakerphone or air tube headset and to keep the phone away from the body. Policy in place and all staff and pregnant women informed.	Head teacher/ employer/ manager			1 or 2	2 or 3, depending on aspect affected	2 - 6

What are the Hazards?	Who might be harmed and how? (Who is at special risk?)	What are you already doing? (Current control measures, including those for people at special risk)	What further action is necessary? (Further Control Measures)	Action by whom	Action by when	Done	Risk Factor		
							Likelihood	Severity	Risk Level
Some people may be more at risk from radiofrequency exposures than others	For some effects, some people may be more at risk than others: e.g. risk of tachycardia or heart arrhythmias[140,197], possible risk of fainting (from reduced oxygen to the brain)[198], possibility of increased excitability in the brain for people with epilepsy or reduced seizure threshold[199-201], possible increased risk of type 2 diabetes[202], or possibility of proliferation of leukaemia cells for people with leukaemia[203]…etc. Children or staff with existing medical conditions may be adversely affected and others may suffer medical conditions as a result of the wireless exposures[204].	As appropriate	Ensure an individual healthcare plan is in place for children/young people who have an existing medical condition which may be worsened by exposures to radiofrequency signals or for children/young people who experience adverse effects in wireless environments. Under 'Supporting pupils at school with medical conditions'[205], the governing body must ensure that arrangements are in place to support pupils to ensure that they can access and enjoy the same opportunities at school as any other child. Check exposures are low in all areas in which the individuals spend time (wireless transmitters switched off), and staff have been informed and trained. Review and update at regular intervals, working with parents and other healthcare professionals.	Head teacher/ senior management team/ employer/ manager/ Governing Body			2 (for at risk individuals)	2 or 3 (severe headaches, fainting, seizures, or tachycardia may impair ability to work and possibility of irreversible damage)	4 or 6

Control Measures Acceptable Yes / No Delete as appropriate **Revision date: - …………………**

SIGNED OFF BY: …………………………………………. DATE: ……………………..

Further controls need to be in place and monitored as satisfactory before finally signing off this assessment

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S. Starkey, PhD June 2018

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