BUILDING MOBILE BRITAIN

Mobile UK

5G and Health:

Questions and Answers

May 2019

About Mobile UK

Mobile UK is the trade association for the UK's mobile network operators - EE, O2, Three and Vodafone.

About Building Mobile Britain

Building Mobile Britain is a campaign that supports the mobile industry's collaboration with national and local government, regulators, industry, consumers, and citizens to overcome the challenges to expanding mobile networks, while also developing innovative services for customers.

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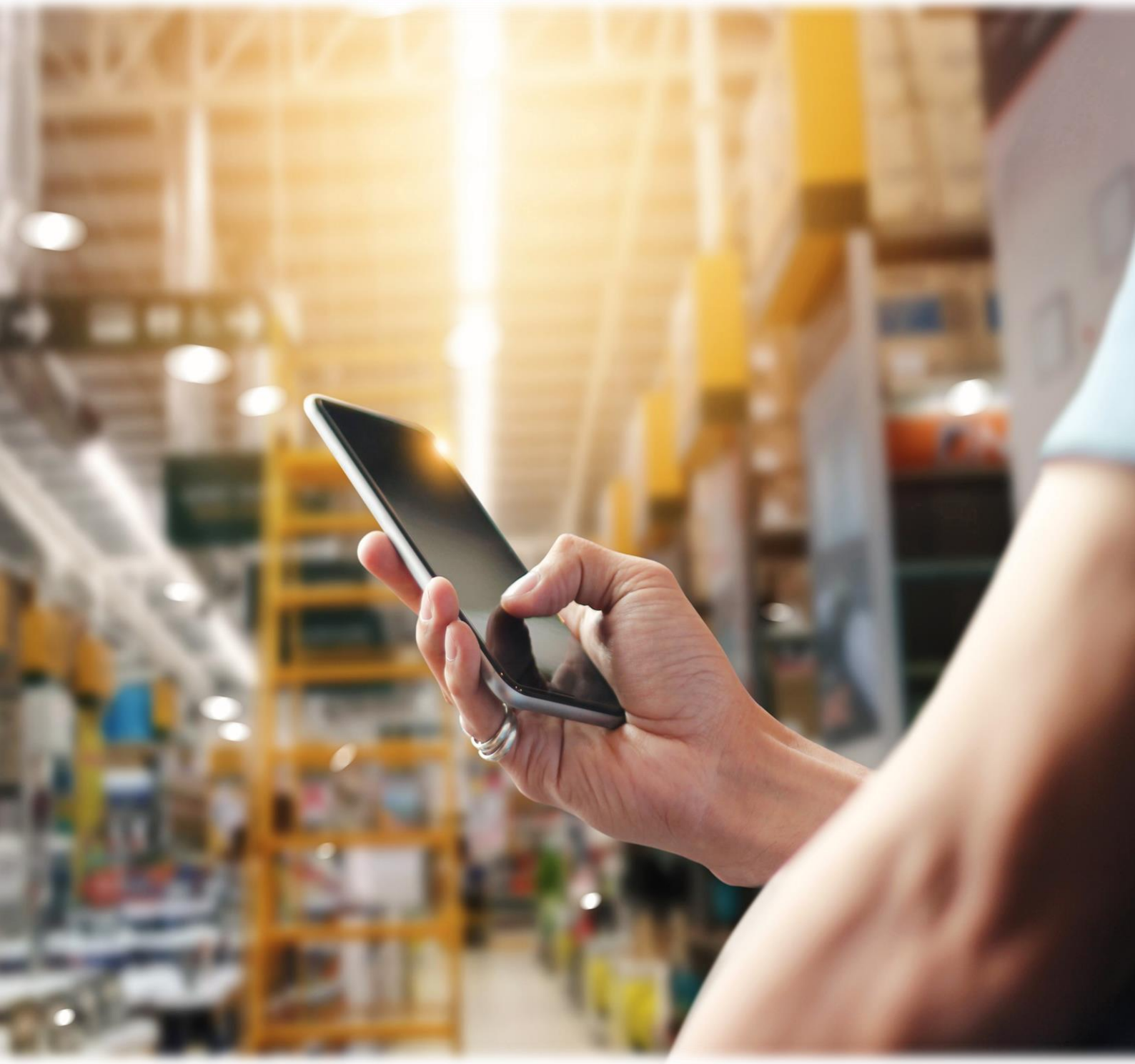
What are radio signals and 5G?



What is 5G?

5G is short for 'fifth generation mobile networks.' It is a true game changer technology that will provide the underlying wireless infrastructure to support a host of new applications such as connected cars, virtual and augmented reality and the foundations for emerging smart city and Internet of Things (IoT) technologies.

What are the features of 5G?

Faster download speeds: 5G will provide much faster speeds than are achievable with today's 4G networks. 5G is expected to provide speeds between 1GBps and 10GBps. This would mean a full HD movie could be downloaded in 10 seconds as opposed to 10 minutes today.

Lower Latency: 5G will also have significantly lower latency meaning very little lag (or buffering). This will enable applications that simply aren't possible today, such as: multiplayer mobile gaming, factory automation, and other tasks that demand quick responses.

Greater Capacity: 5G will also have vastly greater capacity so that networks can better cope with not only the rapidly increasing data demands of customers today but the growth of high-demand applications being planned in the future.

What are radio signals?

Wireless networks and devices that exchange information (e.g. voice or data) via Radio Frequency (RF) signals – a form of electromagnetic energy, also called electromagnetic fields (EMFs). RF signals are around us everywhere and form part of our everyday lives. They are emitted both by natural sources like the sun and the Earth, and by artificial sources such as mobile networks, TV and radio.

Current and future mobile networks, including 5G, are designed to comply with existing exposure limits required by the UK Government.

Exposure limits are the main way the public are protected against possible risks from EMFs.

Are 5G and mobile signals safe?

Mobile signals in the UK are governed by exposure guidelines and the consensus of reviews by independent public health authorities, including Public Health England, expert groups and the World Health Organization (WHO) is that these guidelines provide protection for all people (including children) against all established health hazards..

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Exposure Limits and 5G

UK and international guidelines for exposure limits

The exposure guidelines in the UK have been developed by the **International Commission on Non-Ionizing Radiation Protection (ICNIRP)**, following a comprehensive assessment of all the peer-reviewed scientific literature, including thermal and non-thermal effects. The guidelines are based on evaluations of biological effects that have been established to have health consequences. The WHO recommends that countries adopt the ICNIRP guidelines.

any independent expert groups have reviewed the available evidence. The GSMA, the global body representing the worldwide mobile communication industry, hosts a comprehensive tabulation of such reports dating back to 1978 on its website.[1]

Do current guidelines cover 5G?

Yes, current UK and international guidelines cover all frequencies used for mobile telephony, including those being allocated to 5G.

The ICNIRP exposure guidelines for frequencies up to 300 GHz were published in 1998. They are being revised and replaced step by step where independent reviews have established that this is necessary. Revisions of the static and low-frequency parts are already finalised and published. Currently, ICNIRP is revising the guidelines on limiting exposure EMF in the frequency range 100 kHz - 300 GHz. The updated guidelines are expected to be published in final form in 2019. It is the opinion of ICNIRP, and other bodies such as the WHO, that there is no convincing evidence of adverse health effects at exposure below guideline levels.

What kind of research exists on the possible health risks from exposure to 5G?

Information on new research and details of individual studies can be found in the EMF-Portal web database maintained by the RWTH Aachen University, Germany: https://www.emf-portal.org/en

The radio signal exposure characteristics of 5G are similar to those of existing mobile technologies. In particular, the new applications use similar transmitting powers and operate in similar frequency ranges.

A European Commission expert committee concluded that current knowledge about how

[1] http://www.gsma.com/publicpolicy/consumer-affairs/emf-and-health/expert-reports

EMF interacts with the human body can be used to set exposure limits for the whole frequency range up to 300 GHz. Therefore, existing health risk assessments are valid independently of the wireless technology for the whole frequency range.

Are RF signals a possible human carcinogen, and what does that mean?

In May 2011 a working group of the International Agency for Research on Cancer (IARC) classified RF electromagnetic fields as possibly carcinogenic to humans (Group 2B). The WHO explains this is a category used when a causal association is considered credible, but when chance, bias or confounding cannot be ruled out with reasonable confidence.

It is important to note that following the classification, the WHO has not recommended any changes to the exposure limits for wireless networks and devices. Further research has been identified to address the uncertainties. The IARC classification was based on evidence related to wireless devices used close to the head. There is uncertainty as to how to interpret the available data. When considering environmental sources (such as mobile network base stations, broadcast antennas, Wi-Fi networks) and the exposure of RF workers, the evidence has been judged to be inadequate.

The WHO is conducting an overall risk assessment of all health outcomes related to RF exposure. The final report is expected termed a 'monograph' is expected in 2019/20.

What is the advice from Public Health England?

Public Health England's main advice, republished in May 2019, about radio waves from base stations is that:

"The guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) should be adopted for limiting exposures.

After reviewing the evidence, ICNIRP set guidelines to avoid excessive heating of the body, an established impact of exposure which can have detrimental effects. The ICNIRP guidelines apply to frequencies up to 300 gigahertz and cover exposures arising from new 5G base stations as well as from older technologies."[2]

[2] Public Health England, 2019

What is the advice from the WHO on mobile phones and health?

The position of the WHO in regard to health effects from mobile phones is that:

"A large number of studies have been performed over the last two decades to assess whether mobile phones pose a potential health risk. To date, no adverse health effects have been established as being caused by mobile phone use."

In respect of long-term effects WHO says:

"While an increased risk of brain tumours is not established, the increasing use of mobile phones and the lack of data for mobile phone use over time periods longer than 15 years warrant further research of mobile phone use and brain cancer risk. In particular, with the recent popularity of mobile phone use among younger people, and therefore a potentially longer lifetime of exposure, WHO has promoted further research on this group. Several studies investigating potential health effects in children and adolescents are underway."

Are children at a greater risk?

There have been many independent scientific reviews, and these have consistently concluded the international guidelines are protective of all persons, including children.

There are currently few studies specific to children and this topic remains an active research area. The international exposure guidelines have been developed based on conservative assumptions to be protective of all persons.

"Although a substantial amount of research has been conducted in this area, there is no convincing evidence that RF field exposure below guideline levels causes effects in adults or children." (United Kingdom Health Protection Agency (2012)).[3]

Can I reduce exposure?

Mobile phones are designed to automatically reduce power to the lowest possible level to make a quality connection. When used in areas of good reception a mobile phone will operate at lower transmit power. For those who are concerned, exposure to radio signals can be reduced by limiting use of wireless devices or increasing the distance between the device and the body.

[3] Health Effects from Radiofrequency Electromagnetic Fields – RCE 20, Advisory Group on Non-ionising Radiation (AGNIR), Health Protection Agency, April 2012

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5G Equipment

5G is broadcast at a higher frequency so does that mean higher exposure?

No, higher frequency does not mean higher exposure. Higher frequencies generally mean shorter ranges. The increase of the available bandwidth provides for the possibility of higher data rates. Current experiments and future deployment will use frequencies already covered by existing exposure standards.

Does higher data rates mean higher network exposure?

One of the goals of 5G deployments is to provide much higher data rates. This is needed to meet the high expectations and demands customers place on mobile communication applications and services both in their professional and private life. Based on the results from current 5G test networks, it is expected that the maximum exposure levels in areas around base stations will be similar to those from existing mobile services that use similar transmitter powers.

With the introduction of new technologies, there may be a small increase in the overall level due to the fact that more transmitters are active. Based on the transition from previous wireless technologies we can expect that the overall exposure levels will remain relatively constant and a small fraction of the international exposure guidelines.

Will 5G replace earlier mobile network technologies?

Early 5G deployments will be in locations where it is needed to boost the capacity of current networks. Further rollouts will occur as demand dictates. It is expected that 5G will work alongside other technologies, i.e. 2G, 3G and 4G, providing continuity of service for customers who can continue to use their devices on existing networks.

Does 5G mean an antenna on every street corner and inside all buildings?

Wherever possible, an operator will place 5 antennas on an existing site, potentially replacing one of the existing antennas on the site. Only where additional capacity and/or coverage is needed will additional sites be built.

Mobile networks today consist of a mix of macrocell sites to provide wide area coverage and small cells to improve localised coverage and increase capacity. Over the next few years, the number of small cell installations will increase. Small cells can be used for both coverage and capacity objectives. As small cells are close to the users of mobile phones, it means that the phone will operate more efficiently, improving the available data rate and reducing the exposure of the user.

'Small cells' is an umbrella term for operator-controlled, low-powered radio communications equipment (base stations) that provide mobile and internet services within localised areas. Small cells typically have a low visual impact and have a range from ten metres to several hundred metres. Mobile network macrocells typically serve larger areas.

Will 5G network antennas look different?

Many of the antennas used for 5G will look similar to those already present in the environment. Advanced antenna technologies such as beamforming require the use of arrays of antennas to optimise the delivery of the wanted radio signal to connected mobile devices.

A conventional base station antenna transmits a radio signal to a wide area regardless of how many users are connected. Advanced beam forming antennas transmit radio signals only to connected users reducing unwanted exposure.

Beamforming involves combining the signal from multiple antennas to improve performance. However, operation at higher frequencies means that while some could be larger, the size of many of the antennas is expected to be similar to that of existing installations

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