



UK Health
Security
Agency

Guidance

5G technologies: radio waves and health

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Mobile telecommunications technology has developed through several generations. There are now many 2nd and 4th generation (2G and 4G) base stations installed throughout the environment. These provide services to users of mobile phones and other devices. 5th generation (5G) devices and networks are the latest evolution in mobile communications technology.

Public exposure

Over the decades, since the networks were first introduced, there has been a general trend towards increasing numbers of smaller transmitters that individually provide services to smaller geographical areas and have reducing radiated powers.

Against this background, many measurements have been made, and these continue to show that exposures of the general public to radio waves are well within the international health-related guideline levels that are used in the UK. These guidelines are from the [International Commission on Non-Ionizing Radiation Protection \(ICNIRP\)](https://www.icnirp.org/en/frequencies/radiofrequency/index.html) (<https://www.icnirp.org/en/frequencies/radiofrequency/index.html>) and underpin health protection policies at UK and European levels.

Current technical standards that draw on the ICNIRP guidelines apply to 5G products that have been or will be developed. UK network operators are already committed to complying with the ICNIRP guidelines.

5G frequencies

With the increase in the volume of information being transferred, more spectrum is being made available. The highest frequencies being discussed for future use by 5G are around 10 times higher than those used by current network technologies, up to a few tens of gigahertz (GHz).

Their use is not new. They have been used for point-to-point microwave links and some other types of transmitters that have been present in the environment for many years. ICNIRP guidelines apply up to 300 GHz, well beyond the maximum (few tens of GHz) frequencies proposed for 5G.

Research studies

Exposure to radio waves is not new and health-related research has been conducted on this topic over several decades. In particular, a large amount of new scientific evidence has emerged since the year 2000 through dedicated national and international research programmes that have addressed concerns about rapidly proliferating wireless technologies.

The main focus of recent research studies has been on exposure to the types of radio signals used by current communications technologies and the frequencies they use, up to a few GHz.

The UK Health Security Agency (UKHSA) carried out an extensive programme of research to assess exposures from 5G Base Stations as the technology is rolled out in the UK.

The results of this comprehensive programme are now published in the peer-reviewed journal Bioelectromagnetics, [In-situ Measurements of Radiofrequency Electromagnetic Fields Measurements around 5G Macro Base Stations in the UK \(https://onlinelibrary.wiley.com/doi/10.1002/bem.70012\)](https://onlinelibrary.wiley.com/doi/10.1002/bem.70012).

The results confirm UKHSA's existing advice that exposure to radio waves from 5G Base Stations is well below the guidelines set by the ICNIRP.

The results also suggest that electromagnetic field (EMF) exposure from 5G signals, are generally lower or similar to 4G EMF exposure.

UKHSA's advice in using 5G technologies remains the same in light of this publication.

Fewer studies have been carried out at higher frequencies. However, the biophysical mechanisms that govern the interaction between radio waves and body tissues are well understood at higher frequencies and are the basis of the present ICNIRP restrictions. The main change in using higher frequencies is that there is less penetration of radio waves into body tissues and absorption of the radio energy, and any consequent heating, becomes more confined to the body surface.

Summary

It is possible that there may be a small increase in overall exposure to radio waves when 5G is added to an existing network or in a new area. However, the overall exposure is expected to remain low relative to guidelines and, as such, there should be no consequences for public health.

UKHSA is committed to monitoring the evidence applicable to this and other radio technologies, and to revising its advice, should that be necessary.



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