

Debates on the health effects of fifth-generation (5G) telecommunications systems

Introduction

The potential health effects of the introduction of fifth-generation (5G) telecommunications systems have raised a number of questions among the general public and professionals. As a result, the Hungarian Academy of Sciences (MTA) has set up an *ad hoc* 5G Working Committee¹ to arrive at an opinion on the health effects of 5G mobile technology. The members of the Working Committee have reviewed issues related to the introduction of 5G technology, international practices, regulations, scientific and research findings and issues of concern to the public. In autumn 2020, they shared the results of their work and their proposals with relevant professional, business and governmental circles, and then presented them to the wider public at a conference held as part of the Hungarian Science Festival². The key findings and recommendations of the MTA 5G Working Committee are summarised below.

1) 5G mobile phone service and technology

The fifth-generation (5G) mobile system, similarly to previous mobile phone (or wireless) telecommunications technologies (e.g. 2G, 3G, 4G, WiFi), uses electromagnetic (EM) waves. By optimising data and voice traffic, as well as network coverage, the 5G service will enable much faster data transfer speeds while serving considerably more users at the same time. The 5G service to be introduced will partly use the same radio frequency (RF) bands as the previous technologies, while new frequency bands have also been designated on the basis of international conventions. In Europe, including Hungary, the service will be launched in the 3.6 GHz frequency band and, later, in the 26 GHz frequency band.

2) Changes in residential and environmental RF exposures since the introduction of 5G

Based on current modelling and measurements, the average daily per capita RF exposure of residents is not expected to increase with the use of 5G technology. Due to the higher data transfer speeds, the time required for data transmission will be significantly reduced, and this will also reduce the electromagnetic exposure of users. In a denser network, due to better radio connectivity, mobile phones and other devices operate at lower power levels, and the way they are used also changes (less talk, more data traffic), and this is likely to further reduce users' exposure from devices. Due to the application of the beamforming and MIMO (*multiple-input and multiple-output*) technologies used in 5G, and due to the optimised service more generally, the level of coverage as well as the nature of the environmental RF exposure will change, although the average environmental electromagnetic exposure – currently well below the statutory health limit value – is not expected to increase.

3) Questions regarding the health effects of 5G

The World Health Organization (WHO), based on decades of scientific research and monitoring, is of the opinion that electromagnetic fields do not pose a significant risk to health provided they remain below the limits set by international bodies. There is currently no clear scientific evidence or counterargument regarding the harmful effects of technologies that use various electromagnetic fields (e.g. 2G, 3G, 4G) in the manner and to the extent recommended, and so further more comprehensive research needs to be conducted on this matter.

¹Members of the Working Committee: Prof Dr György Kosztolányi (Chairman), Dr István Hernádi, Dr Lajos Nagy, Prof Dr Miklós Neményi, Dr Ferenc Oberfrank, Dr Géza Sáfrány, Dr György Thuróczy.

²The presentations given at the conference can also currently be viewed at (<https://youtu.be/PieaqRhBZ6s>).

The expected health effects of 5G technology can be partially estimated based on the identified effects of the frequencies used by the previous 4G, 3G and 2G technologies. The WHO continuously monitors the health and environmental-health effects of electromagnetic fields, and has even launched a separate project for this purpose, titled the *WHO EMF Project*³.

4) International and Hungarian recommendations and legislation

With regard to the extent of electromagnetic radiation emanating from mobile devices and base stations, the recommendations of the *International Commission on Non-Ionizing Radiation Protection (ICNIRP)* are applicable. For national governments, the WHO and the EU recommend incorporating the exposure limits under the ICNIRP's recommendations into radiation protection laws. In Hungary, the health limit values specified in the EU regulations must be complied with (as per Decree ESZCsM 63/2004 (VII. 26.) of the Ministry of Health, Welfare and Family Matters). It is important to note that the ICNIRP published its latest recommendation on RF emissions in March 2020 under the title *ICNIRP Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz)*⁴.

5) Research-related tasks

In our opinion, it is necessary to provide additional resources for the regular measurement and monitoring of health limits applicable to 5G, and for research work to be conducted in relation to this. Furthermore, scientifically-based controls and long-term follow-up studies on physiological and public health effects are needed in order to assess potentially adverse health effects, and the findings arising from them may require adjustments to the system's installation and application specifications. In addition to the individual human (physiological) and public health (epidemiological) impacts, an assessment of ecological aspects and impacts on domestic ecosystems is also required where the environmental impacts of the emerging infrastructure and of 5G RF are relevant. It is recommended that a related independent and comprehensive, medium-term research programme be implemented in Hungary to examine the scientifically relevant issues as well as those that most concern – and are most concerning to – the public. This includes, in particular, monitoring, an examination of physiological effects and environmental biology research.

6) Communication and the broad dissemination of information

Information disseminated through the media and on social platforms have a huge impact on public opinion regarding 5G technology. For example, both the WHO and the EU have had to publish information on their websites clarifying the connection (or lack thereof) between the coronavirus and 5G in order to prevent the spread of misinformation^{5,6}.

Further controls and long-term follow-up studies are needed to assess potential adverse health effects. Dealing with the various opinions about the installation and application of the system through communications involving members of the scientific community will be an ongoing task in the coming years.

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³<https://www.who.int/peh-emf/en/>

⁴<https://www.icnirp.org/en/activities/news/news-article/rf-guidelines-2020-published.html>

⁵<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters>

⁶https://ec.europa.eu/info/live-work-travel-eu/health/coronavirus-response/fighting-disinformation_en