

5G and Health

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The next generation of mobile phone services, usually referred to as 5G (as in fifth generation), will address consumer needs for higher data transfer rates and capacity, and lower latency (effectively 'dead time' in transmitting messages). Its commercial introduction in New Zealand is expected in 2020; limited test installations will operate before then.

5G is simply a new application of radio technology. Existing research on the possible health effects of radiofrequency (RF) fields applies as much to 5G as to any other radio system in use. 5G transmitters are covered by the New Zealand RF field exposure standard,¹ and 5G cellsites will have to comply with Resource Management Act (RMA) 1991 rules about cellsites. These rules include compliance with the exposure standard.

A lot of research investigating the possible health effects of RF fields has been published, and health and scientific bodies around the world have reviewed such research thoroughly. The Ministry of Health website has links to some recent reviews.² In reviewing the research, health and scientific bodies take a systematic approach, to be as objective as possible in their conclusions. They consider and evaluate both positive and negative studies (that is, studies that report effects as well as ones that do not) their strengths and weaknesses, and they consider studies that have followed good laboratory practices to be more informative, and give such studies more weight in their overall evaluations. The Health Council of the Netherlands' review of animal studies on the effects of RF fields on cancer, to which there is a link on the Ministry website, provides an example.

5G frequencies

Each radio service is allocated a frequency to prevent it interfering with other services. 5G services in New Zealand will initially use frequencies around 3.5 GHz. This is similar to frequencies used by existing cellsites. Higher frequencies around 26 GHz (sometimes referred to as millimetre waves or mmWaves) will be introduced later, especially where high data rates or capacity are needed. Millimetre waves have been widely used for many years for point-to-point communication links. Existing research into the health effects of RF fields covers all the frequency bands proposed for 5G; as noted above, the New Zealand Standard for RF field exposure also covers them.

¹ NZS 2772.1:1999 *Radiofrequency fields – Maximum exposure levels – 3 kHz to 300 GHz*. See Ministry of Health. 2019. URL: <https://www.health.govt.nz/our-work/environmental-health/non-ionising-radiation/radiofrequency-field-exposure-standard> (accessed 24 July 2019).

² Ministry of Health. 2019. *Research into Non-ionising Radiation*. URL: <https://www.health.govt.nz/our-work/environmental-health/non-ionising-radiation/research-non-ionising-radiation> (accessed 24 July 2019).

The New Zealand exposure standard

At the frequencies used by cellsites, the quantity most relevant to determining whether a radio signal has harmful effects is the signal's intensity, rather than its frequency. Exposures to high-intensity radio signals at any frequency can cause harmful effects, which is why the New Zealand exposure Standard limits public exposures to levels at least 50 times below those at which harm might occur. These limits protect people of all ages, including children.

The New Zealand exposure Standard's limits are recommended by the International Commission on Non-Ionizing Radiation Protection, which the World Health Organization recognises for its independence and expertise in this area. The Commission has reviewed and reaffirmed these limits periodically (most recently in 2017);³ it bases any changes to them on the findings of health research, and not the requirements of telecommunications or other industries. Compliance with the set limits is mandated under the RMA.

Many countries (including Australia, Canada, France and Germany) use exposure limits similar to those in New Zealand. Some countries or cities have adopted much stricter limits; generally in order to limit overall exposures, rather than on the basis of a health evaluation. Brussels, for example, had strict limits that were subsequently increased to accommodate 4G cellsites. An expert committee convened by the Environment-Brussels concluded that the research did not demonstrate any health effects below limits of the type used in New Zealand.⁴

Exposures from 5G sites

5G will make increased use of beam-forming antennas. Instead of transmitting fixed radio beams that cover a 120-degree-wide sector, 5G antennas will usually produce a large number of discrete radio beams. These cover a much smaller area, and are powered up and directed where and when they are needed (and turned off when they are not). In other words, when a user is downloading data from a 5G site, the radio signal carrying the data is directed towards that user, and is not spread out over a wide area – mostly in directions where it is not needed – as currently occurs. The beam is turned off when the data has been transferred. This, alongside the faster rates at which data is transferred, will most likely result in lower exposures than if existing technologies were used.

Measurements at laboratory and operational 5G sites in Australia have shown that exposures to 5G signals are similar to, or lower than, those from existing cellsites, and small fractions of the public limit in the standard. These measurements were made with the 5G site loaded by downloading high-resolution video or carrying out a speed test.

³ International Commission on Non-Ionizing Radiation Protection. 2017. *Revision of the HF Guidelines*. Munich: International Commission on Non-Ionizing Radiation Protection. URL: <http://www.icnirp.org/en/activities/news/news-article/revision-of-hf-guidelines-2017.html> (accessed 24 July 2019).

⁴ Bruxelles-Environnement. 2018. *Rapport du comité d'experts sur les radiations non ionisantes. 2017–2018*. Bruxelles-Environnement: Region de Bruxelles-Capitale. URL: http://document.environnement.brussels/opac_css/elecfile/20180108_Radiation_report_2017_FR.PDF (accessed 24 July 2019).

As current cellsites are, 5G cellsites will be installed to meet user demand. If there is high demand in a particular area, more sites will be installed. Because each site will be serving a smaller area, they can operate at lower power, which also has the effect of lowering exposures.

What is the Ministry of Health doing?

To keep up to date with developments, the Ministry of Health convenes an expert advisory committee, known as the Interagency Committee on the Health Effects of Non-Ionising Fields, to review new research in this area. The Committee meets every six months. Where it has a reasonable suspicion of health hazards, or other significant issues, the Committee's terms of Reference require it to bring relevant information to the direct attention of the Minister of Health. The Committee will continue to monitor new research as it becomes available. In addition, the Ministry participates in a World Health Organization project⁵ to assess the health effects of electromagnetic fields.



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⁵ World Health Organization. 2019. *Electromagnetic Fields*. URL: <https://www.who.int/peh-emf/en/> (accessed 24 July 2019).