



AMTA

Australian Mobile
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Association

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Foreword



Louise Hyland, AMTA CEO

Minister for Communications, the Hon. Paul Fletcher has declared 2021 will be the ‘Year of 5G’. AMTA’s members are embracing this and forging ahead with rolling out the latest in 5G infrastructure, bringing new and faster services to the Australian community.

A key step in the 5G technology roadmap is the Australian Government’s recent auction of the 26 GHz spectrum allocations, allowing the very latest in high-speed, high capacity, and low latency applications to be deployed on the new ‘mmWave’ networks.

However, for some, new technologies raise new concerns, and AMTA welcomes the recent release of the new Australian RF safety standard, known as ‘RPS S-1’. After 20 years of additional scientific research and analysis, the new standard is now 5G ready, specifically addressing the new mmWave frequencies and augmenting the knowledge base for both existing and all future mobile network technologies.

The public can be confident that our members deploy and operate their networks in accordance with the very latest safety standards and scientific analysis.

AMTA has also been busy looking at how governments at every level can help make the regulatory framework which underpins the rollout of 5G as ‘5G ready’ as possible. AMTA has recently published its State and Territories 5G Readiness Assessment Report.

The report reviews the regulatory arrangements in each state and territory to highlight best practice and identify reform opportunities in each jurisdiction and lays out a suite of 21 recommendations that the states and territories can implement to ensure they take advantage of the 5G evolution.

Using the report, AMTA has already commenced dialogue with some state governments to gain early momentum for regulatory change. You can read more about the report and the opportunities it identifies at [AMTA 5G Infrastructure Readiness Assessment](#).

In this EME Update we provide our stakeholders with an introduction to ARPANSA’s new RF safety standard. We also look at some of the new research by ARPANSA and others that reinforces the safety of mmWave spectrum and, indeed, all generations of mobile technology. We also consider how jurisdictions around the world are moving to remove arbitrary constraints on the deployment of 5G in recognition of the great benefits it offers for businesses, consumers, and the economy. We explore what 5G will offer for energy efficiency, sustainability and for better managing all the important contributors to climate change.

We hope you enjoy this Winter 2021 edition of AMTA’s EME Update. We welcome all your comments and feedback via contact@amta.org.au

Australia adopts new global EME standard to provide strong health protection

In February 2021, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) released an updated [radio wave safety standard](#) based on the latest global guidelines of the International Commission on Non-Ionizing Radiation (ICNIRP).

Dr Ken Karipidis, Assistant Director, Assessment and Advice at ARPANSA said:

‘The exposure limits in the new Standard continue to be set conservatively, meaning they remain well below the level at which any harm can occur, and will protect the community from all new and existing technologies using radio waves.’

The updated standard (known as RPS S-1) replaces the existing limits published in 2002. Many of the limits in RPS S-1 are similar to those from 2002 confirming that, after an additional 20 years of research, the limits remain protective of all people - including children, adolescents, and pregnant women - against all established health risks.

There are refinements, including additional restrictions for radio signal exposure at higher frequencies, above 6 GHz. This is important for 5G and other future technologies using these higher frequencies. The updated standard also includes new rules for deciding on the application of worker or public exposure limits.

Dr Carl-Magnus Larsson, CEO at ARPANSA added:

‘The new Standard is also a critical component of the Australian Government’s enhanced Electromagnetic Energy (EME) Program, which aims to promote health and safety and address misinformation about EME emissions.’

Under the EME program, [ARPANSA](#) will:

- continue to assess radio wave exposure levels in the community
- fund and lead radio wave research
- build a world-class radio wave laboratory

- collaborate with international organisations on radio wave science
- engage with the Australian community to address misinformation on radio waves and health

The publication of the updated standard by ARPANSA follows a public consultation held in 2020 that received 61 submissions: 36 from the public, 11 from industry, and 14 from other organisations (including academic and research, government and non-government). These 61 submissions included 451 individual comments.

Implementation of RPS S-1 by the Australian regulatory bodies in telecommunications, manufacturing and health sectors is expected to commence over the coming months. For radio base stations and mobile phones, the regulator in relation to public exposure is the Australian Communications and Media Authority (ACMA) and it is expected that the ACMA will propose the adoption of the updated safety rules in the second half of 2021 with implementation to include a 12 month transition period.

Millimetre wave safety confirmed by ‘world-first reviews’

The mobile industry is on the cusp of deploying the latest in new millimetre wave technology to bring even faster and more responsive 5G services to the Australian public.

In April 2021, the Australian Communications and Media Authority (ACMA) completed the auction of 5G spectrum in the millimetre wave band at 26 GHz, raising almost \$650 million.

Nerida O’Loughlin, Chair at [ACMA](#) said:

‘This outcome represents another significant milestone for 5G in Australia. The successful allocation of this spectrum will support high-speed communications services in metropolitan cities and major regional centres throughout Australia.’

Adoption of new technology often raises concern for some members of the community. A pair of reviews by scientists from the Australian Radiation Protection and Nuclear Safety Agency ([ARPANSA](#)) and Swinburne University of Technology found no evidence of adverse health effects from the millimetre wave radio waves used in 5G.

The [first review](#) identified 138 studies on low-level radio waves at frequencies above 6 GHz, part of the band termed millimetre waves because of the approximate wavelength of the radio signals. These studies were divided into 107 experimental studies of various biological effects and 21 studies of people exposed to radar, which uses frequencies similar to that of some 5G bands.

Dr Ken Karipidis, Assistant Director, Assessment and Advice at ARPANSA said:

‘In conclusion, a review of all the studies provided no substantiated evidence that low-level radio waves, like those used by the 5G network, are hazardous to human health.’

The [second review](#) described a meta-analysis of the 107 experimental studies, combining the results from the individual studies to look for possible patterns. The meta-analysis also looked at the quality of the studies.

Dr Karipidis said:

‘This meta-analysis of the experimental studies also presented little evidence of an association between millimetre waves and adverse health effects. Studies that did report biological effects were generally not independently replicated and most of the studies reviewed employed low-quality methods of exposure assessment and control.’

The scientists recommend technical improvements for future experimental studies and continued monitoring of possible long-term health effects in the population related to wireless telecommunications.

The scientific reviews have been published in the [Journal of Exposure Science and Environmental Epidemiology](#).



Studies find no evidence of cancer increase due to mobile phones

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and the University of Auckland examined the numbers of parotid and other salivary gland cancers occurring in Australia from 1982 to 2016 and found no link between mobile phone use and these cancers.

The 34 year period overlaps with the increased use of mobile phones across the general population and Assistant Director, Assessment and Advice at ARPANSA, Dr Ken Karipidis explains:

'When using a mobile phone against the head, the salivary glands and especially the parotid gland, which is located in front of the ear, are amongst the most exposed areas of the body.'

While the researchers found no indications of increased risk due to mobile phones, they did see an increase in parotid gland cancer in females since 2006, which they speculate could be due to *'other factors specifically related to females.'* They call for further research to address this finding.

The study was published in the scientific journal, Cancer Epidemiology.

Radio wave interaction mechanism not 'validated'

In recent years, claims have circulated online that low-level radio waves could affect cells by interacting with channels in the cell membrane that allow the passage of calcium ions, an important messenger for cell activities. However, a December 2020 review published in the journal *Radiation Research* by experts from ARPANSA and Swinburne University found that the claims were *'not supported by scientific evidence.'*

Dr Karipidis said:

'After 50 years of research into possible effects of radio waves on cellular calcium levels, none of the reviewed studies were able to validate the claim that exposure to radio waves affects calcium movement or causes any non-thermal health effects.'

Influence of information on risk perception

A pilot study lead by Monash University found that providing people with information on their personal exposure from Wi-Fi sources did not change individual perception about exposure or risk from Wi-Fi. The study involved almost 400 participants, of whom 63 were given devices to monitor their exposure over 24-hours to radio signals, including Wi-Fi.

ARPANSA says that Wi-Fi exposure is much lower than Australian safety standards and there 'is no established scientific evidence of adverse health effects from the Wi-Fi RF exposure.'

ARPANSA measurements of Wi-Fi in classrooms found typical levels to be 500,000 times below limits.

In another study, the Illawarra Health and Medical Research Institute at the University of Wollongong, examined the influence of selective reporting on risk perception. For the study, groups were provided with partial or complete results for the Interphone study of mobile phone use and cancer. The group that only heard about evidence for an increased risk in the heavy mobile phone use group of the Interphone study (which the authors of the study described as '*unrealistic*') showed increased risk perception compared to the group who received the full results, which showed that for other than the heavy users, there were no statistically significant increased risks.

The authors describe the selective reporting of results as a '*malpractice*' that distorts risk perception.



Examining whether radio signals cause cellular stress

A research [review](#) conducted by two scientists at the request of the Swiss Federal Institute of the Environment concludes that a trend is emerging from animal and cell studies. The research suggests that low level electromagnetic fields can cause 'changes in cellular oxidative balance' and that studies in humans are needed to estimate the risk for human health.



Oxidative stress is a natural biological process that can sometimes be involved in disease but is also a by-product of healthy activities such as exercise and has a beneficial role in the immune system. Antioxidants are natural or man-made substances that may help to stop or delay oxidative cell damage. The cellular oxidative balance refers to the balance between these two mechanisms.

The research trend was also observed by a [Swedish expert group](#) in a 2019 report:

'The results are however not an established effect and further studies are needed to confirm the association in animals and to establish whether, and to what extent, it may occur in humans.'

This topic has been examined by international standards setting organisations such as the [IEEE International Committee on Electromagnetic Safety](#) who commented:

'The magnitude of the reported effects are generally very small, often in the range of variability that normally occurs in clinical laboratory tests ordered by physicians, and thus, the direct health implication of such reports would remain unclear even if they were independently verified.'

Study quality is important to evaluating the strength of evidence for any topic. In 2019, a [review](#) by scientists from the University of Texas Health Science Center concluded that higher quality studies of cells exposed to radio signals were less likely to report health effects.

The review prepared for the Swiss authorities commented on the quality of some studies, but studies were not excluded in order to provide an overview of all available studies. In contrast, a systematic review aims to collect all relevant studies, assess each study for quality and present an unbiased, balanced summary of findings. The World Health Organization (WHO) has commissioned a systematic review of research on radio signals and oxidative stress as part of a broad health risk assessment of radio signals. The WHO supported analysis is expected to be published no earlier than late 2022.

French health agency conclude there are ‘no new health risks’ from 5G

A public consultation draft of an expert appraisal for the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) led the agency to conclude that:

‘It is unlikely at present that new health risks will be created by the deployment of 5G in the frequency band around 3.5 GHz.’

However, no exposure data was available for 5G at 26 GHz and ANSES concludes *‘the data available at this time are insufficient to conclude whether or not there are health effects’* for this band. ANSES stressed the need for further research, especially on the evolution of 5G exposure as the use of the networks increases.

The public consultation closed on 1 June 2021 and ANSES says that, if necessary, a supplemental report will be issued after reviewing the responses.

In the Netherlands, a similar recommendation to delay the use of the 26 GHz was rejected by the Dutch government as *‘according to the WHO, European Commission and ICNIRP there is no reason at the moment to assume that using the 26 GHz band has negative health effects.’*

After COVID-19 delayed the auction process, French 5G networks were launched in late 2020 but have continued to face resistance from some municipalities, including the City of Paris, which agreed to a charter for 5G deployment in March 2021. The French spectrum agency plans an expanded measurement programme for 5G sites, and they placed radio signal monitors in five French cities - Mulhouse, Marseille, Nantes, Paris and Bordeaux - to provide real-time continuous information on exposures.



5G EME levels are low and similar to other wireless technologies



Results from measurements and calculation studies conducted in Australia, South Korea, and Switzerland consistently show radio wave levels from 5G mobile networks that are low and similar to other wireless technologies.

In December 2018, South Korea was one of the first countries in the world to launch 5G, and in November 2019 researchers from France visited to assess exposure levels in the early phase of roll out. Measurements showed that the 5G signal level was low compared to other technologies and that smart antennas that direct radio energy towards users reduced exposure in *'unnecessary areas.'*

In a separate study, measurements made on the commercial Swisscom 5G network in Berne found that when the network was not being used the 5G signal level was *'negligible.'* At maximum possible download traffic, the extrapolated level was 0.5-0.6% of international safety guidelines (the limits used in Australia).

In Australia, [Telstra](#) took a different approach setting up a smart apartment with over 50 devices and challenging a family to *'max out the network'* over a long weekend.

The background radio signal levels from the mobile and Wi-Fi connections were very low. During the attempt to max out the network, the maximum level for all mobile (4G/5G) and Wi-Fi connections combined was 0.008% of the public safety limit. For comparison, the measured level of the local TV and FM radio stations on the balcony was 0.011%. For individual devices, the highest level was from a baby monitor 0.813%, measured at 20cm separation.

The dynamic nature of 5G signals from network antennas that vary both in level and direction as call traffic changes has led to new approaches to ensuring compliance with safety limits. One approach is to track the changes and calculate a continuously updated average to ensure that exposure stays below a predefined level. This power lock method has been validated and deployed in commercial 5G networks. However, it does not come without a cost, with Ericsson researchers estimating that a power threshold set at 25% of the peak power would result in a 10% loss in data throughput.

Data has also been [published](#) on the output powers of 5G devices in commercial networks in Australia and South Korea. Typical power levels from 5G devices were 1% of the maximum transmit power based on 545 million measurement samples across the two networks. The number of users on the 5G networks had negligible effect on the device power. This level is similar to previous results for 4G.

5G and the environment: 5G improves mobile network energy efficiency



Since 2010, total data traffic has increased approximately tenfold, while electricity consumption for the ICT sector has increased by less than 10 per cent. However, governments and mobile carriers continue to be interested in improving the energy efficiency of mobile networks.

5G technology was designed from the start with energy efficiency targets and real-world measurements in Spain in late 2020 confirmed 5G as 90% more efficient per traffic unit than legacy networks.

This is further illustrated by a [study](#) for the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. The study analysed the climate footprint of high definition (HD) video streaming by different transmission technologies. The lowest emissions were produced for HD streaming at home over fibre at only 2 grams of CO₂ per hour of video. This compared to 4 grams for 5G, 13 grams for 4G, and 90 grams for 3G.

On the upside, mobile technology can enable greenhouse gas (GHG) emissions savings by other sectors of society.

A 2019 analysis by the Global System for Mobile Communications Association ([GSMA](#)) the global mobile industry association, stated that:

‘The mobile technology enabled emissions savings were almost ten times greater than the global carbon footprint of the mobile industry.’

5G and the environment: EME absorption by insects is not biologically significant

Computer studies by Belgian researchers showing greater electromagnetic energy (EME) absorption by bees and other insects at higher radio frequencies have been misinterpreted as suggesting an increased risk.

It is well established that EME absorption varies with radio signal frequency for several reasons, including the size of an organism relative to the wavelength of the radio wave. In effect, an organism will absorb more energy when the body size is comparable to the wavelength. At higher EME frequencies, the wavelength is shorter and so smaller organisms will absorb proportionally more energy.

[Moreland City Council in Melbourne](#) asked scientists from the Swinburne University of Technology to undertake a study around the impacts of 5G on energy absorption of insects, such as bees, and other small organisms.

The Swinburne computer models confirmed enhanced energy absorption at higher frequencies, by a factor of two or three times over background levels. The resulting temperature rise would be a few tenths of a degree, which the Swinburne scientists contrast with environmental temperature changes of tens of degrees experienced by small organisms. They conclude that the EME induced temperature rise is not *'biologically significant.'*

Overall, the report concludes that:

'Our overall conclusion is that 5G RFR [Radiofrequency Radiation] will not present any deleterious effect on organisms in the environment and that 5G RFR is in many ways similar to 4G and previous generations of mobile telecommunications systems, without noticeable environmental effects.'

This is in line with the conclusion of [German authorities](#) who say that:

'Although limited effects on plants and animals have been observed in some laboratory and field studies, there is still no scientific proof of a risk to plants or animals posed by electromagnetic fields below the limit values.'



5G misinformation

5G misinformation resurfaces in India

In May 2021, Indian authorities announced that 5G trials would commence later in the year. Before the trials could commence and with no equipment in place, both traditional and social media carried claims that 5G was killing birds and people. The claims also linked 5G to the increasing numbers of COVID-19 cases, a myth dispelled by the World Health Organization in April 2020.

The Ministry of Communications responded:

‘The claims linking the 5G technology with the COVID-19 pandemic are false and have no scientific basis. Moreover, it is informed that the testing of the 5G network has not yet started anywhere in India. Hence, the claim that 5G trials or networks are causing coronavirus in India is baseless and false.’

Australians not worried about 5G

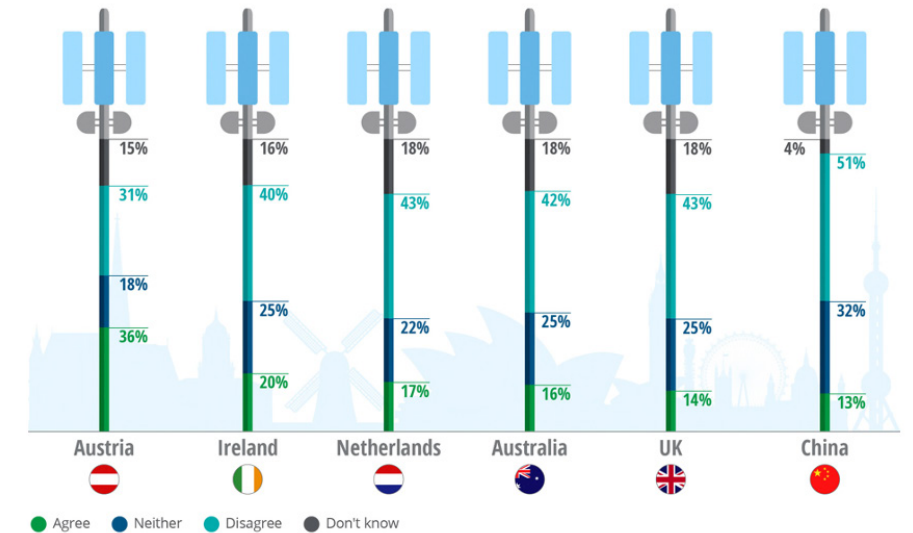
Even during the height of the pandemic in the middle of 2020, Australians were among the most sceptical around 5G health risk claims.

Research conducted by Deloitte found that 16% of Australians were concerned about 5G health risks while 42% were not concerned. The percentage concerned about 5G was more than twice as high in Austria.

Nonetheless, authorities in Australia quickly moved to counter any links with 5G and COVID-19 conspiracy theories, with the then Australian Chief Medical Officer, Professor Brendan Murphy, issuing a [statement](#):

‘There is no link between 5G and COVID-19. 5G does not cause COVID-19. It does not spread COVID-19. Nor does it increase the severity of COVID-19 or make people more susceptible to COVID-19.’

Consumer 5G misinformation by country



Q. Thinking about the rollout of 5G, to what extent do you agree or disagree with the following statements: 'I believe there are health risks associated with 5G'.

Weighted base: All respondents who have phone or smartphone aged 18-75 years, Australia (1,915), Austria (952), China (1,880), Ireland (948), Netherlands (1,953), UK (3,841)

5G misinformation

The role of social media

EU DisinfoLab, an independent NGO focused on disinformation campaigns targeting the European Union, identified content moderation '*shortcomings*' on Twitter and YouTube when dealing with false claims linking 5G and COVID-19. EU DisinfoLab said that content moderation has improved but it is not comprehensive and is often slow.

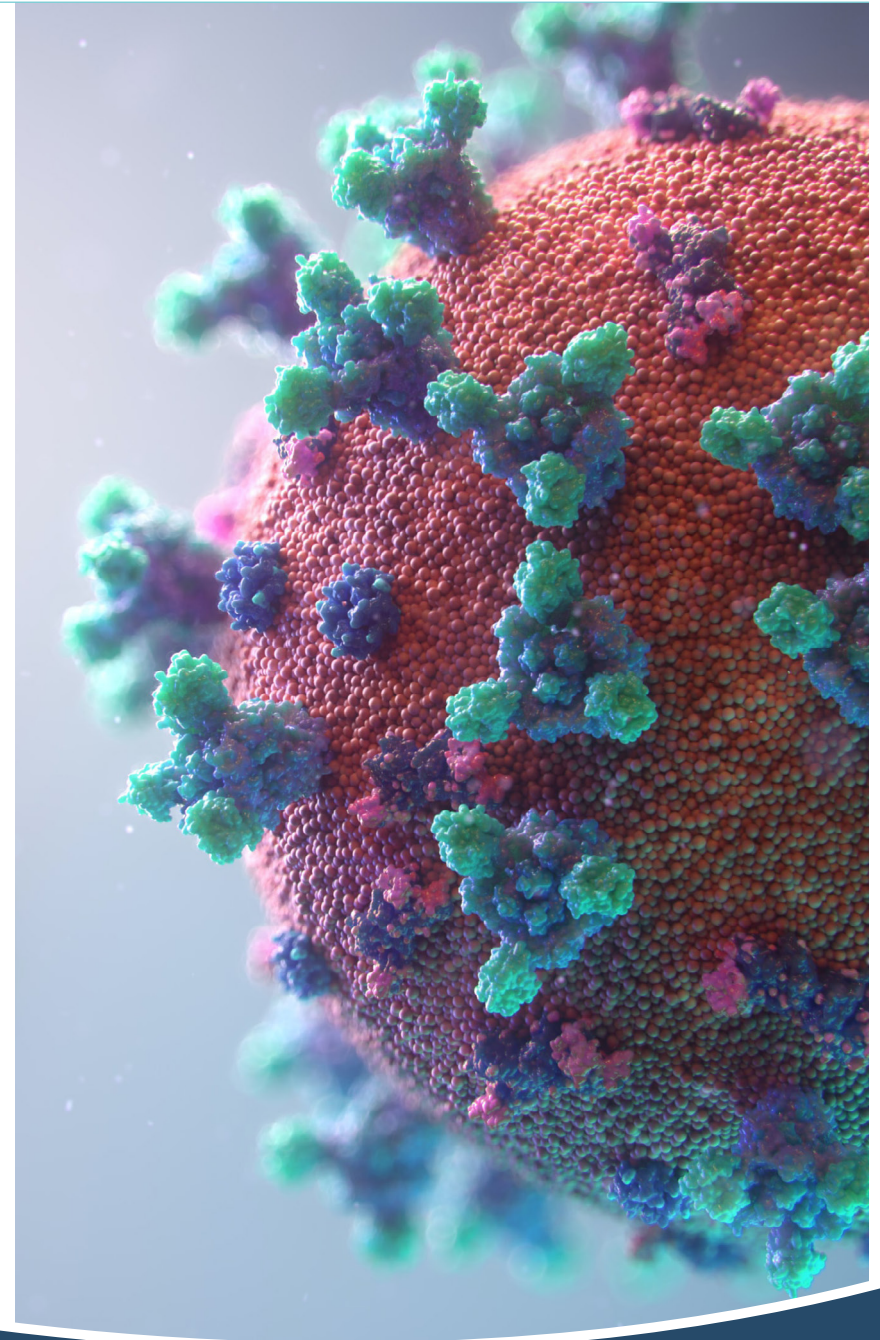
Misinformation around 5G and COVID-19 triggered attacks on telecommunications masts in Europe, especially in the UK and the Netherlands, as well in Australia and New Zealand. These still continue at a lower rate with January 2021 incidents in South Africa linked to false claims by a local politician.

Reliable 5G information

In recognition of the ongoing need for reliable information about 5G safety, the International Telecommunications Union launched an update to its multilingual [EMF Guide](#) mobile app to include information about 5G and the latest international safety guidelines.

On 5G, the EMF Guide quotes the [WHO](#) advice:

'Provided that the overall exposure remains below international guidelines, no consequences for public health are anticipated.'



Berkeley, California, mobile phone warning lawsuit dismissed

A judge dismissed the long-running lawsuit by CTIA, the US wireless industry association, against the City of Berkeley, California, ordinance requiring a warning notice at the point of sale in mobile phone retailers. Federal Judge Chen in the Northern District of California ruled that *'the Berkeley ordinance – as worded – overwarns and stands as an obstacle to the accomplishment of balancing federal objectives by the FCC.'* The FCC (Federal Communication Commission) is the US telecommunications regulator.

The ruling followed a June 2020 FCC submission in the case arguing that *'... additional notices risk "overwarning" and misleading consumers into believing that RF emissions from FCC-certified cell phones are unsafe.'* Judge Chen accepted the FCC argument that the Berkeley warning was pre-empted by Federal law.

Berkeley had first proposed the warning notice in 2015 with legal wins and losses on both sides in the intervening years before the US Supreme Court in July 2018 ordered a rehearing of the case in the light of other court rulings.

iPhone lawsuit also dismissed

In October 2020, in the same Northern District of California, Federal Judge Alsup dismissed a lawsuit against Apple that alleged iPhones exceeded safety limits. In this case Judge Alsup also accepted that Federal rules pre-empted the plaintiffs' claims finding that on the basis of FCC submissions:

'... even if a certified phone exceeded the federal limits under such normal use against the body, the order found that large safety margins had been built into the existing testing requirements and RF exposure limits would still sufficiently protect human safety.'

The Apple lawsuit had arisen out of a 2019 Chicago Tribune article alleging that some phones did not comply with safety limits when tested for use very close to the body. In December 2019 the FCC published the results of its own testing concluding that *'all tested sample devices comply with the FCC's strict RF exposure guidelines.'*

The reasons for the differing test results are not clear but Apple had asserted that the Chicago Tribune tests *'were inaccurate due to the test setup not being in accordance with procedures necessary to properly assess the iPhone models.'*

Other US litigation continues

These cases do not bring to an end all mobile phone litigation in the USA. In January 2021, the United States Court of Appeals for the DC Circuit heard a challenge by NGOs against the 2019 decision by the FCC to keep US safety limits largely unchanged. A ruling is expected in 6 to 12 months.

On 12 July 2021, the District of Columbia Court of Appeals will conduct a Daubert evidentiary hearing of the expert witnesses in a personal injury case that commenced in November 2001. Under US law, the Daubert standard is the set of criteria used to determine the admissibility of expert witness testimony in federal court. The judge acts as gatekeeper to ensure that only scientifically based testimony is presented to juries.

In previous mobile phone personal injury litigation, Judge Catherine Blake found that the testimony of a key plaintiff's witness did not meet the Daubert standard. Her decision was upheld on appeal and the case eventually dismissed in 2003.

5G and EME: News from around the world

Belgium - Brussels at risk of 4G network saturation in 2022

The Belgian telecommunications regulator (BIPT) examined how the country's varied but restrictive radio signal exposure limits will influence the possibility of mobile network saturation (when the mobile network has reached full capacity and can no longer handle any more calls). For Brussels, which has the most restrictive limit, BIPT predicts that *'nearly a third of the city's 4G cells were associated with a medium or high risk of saturation in 2022.'*

For Liège, in the French speaking Wallonia region, a high risk of saturation was estimated for 5% of 4G sites in 2022, while the Dutch speaking city of Antwerp was a low risk of saturation at 95% of 4G sites. Liège and Antwerp will benefit from 5G deployment in the future to relieve congestion, but this would not be possible in Brussels due to their current EME limits. However, in early June in 2021, a committee of Brussels' citizens and parliamentarians provided recommendations to enable 5G deployment that included increasing the city's restrictive EME limit.

Spain - Expert group finds no link between cell phones and brain cancer

A new report from the Spanish expert group, the Scientific Advisory Committee, on Radio Frequencies and Health (CCARS), finds *'no relationship between the number of mobile phone users and the incidence of tumors'* in Spain and observes that 5G technology trends *'would point to lower exposure levels close to the base stations.'*

The conclusions are set out in a 254 page report published in October 2020 covering the period 2016 to 2019 with final editing completed in March 2020 to include the updated international safety guidelines.

CCARS also concludes:

'New published evidence continues to confirm that no adverse health effects are observed from exposure to RF from cell phone antennas, radio and TV transmission, wireless systems (Wi-Fi) used at work, school or home...'

The expert group believes that more work is needed to dispel misinformation and apply critical thinking to avoid the spread of non-verified information.



5G and EME: News from around the world

Bermuda - 5G moratorium at an end

In May 2021, the Regulatory Authority of Bermuda officially implemented the recommendation of an Advisory Panel and ended a temporary moratorium on 5G deployment.

The Advisory Panel report concluded that:

‘Provided that RF-EMF exposure from 5G is of the magnitude found in recent measurement studies, and thus does not exceed the IEEE or ICNIRP restrictions, it will not cause harm to people.’

IEEE and ICNIRP both produce international safety guidelines for radio signal exposure with equivalent restriction values. The Advisory Panel was made up of local and international scientists, including Professor Rodney Croft from the University of Wollongong.

The 5G moratorium was commenced in July 2020 following fears expressed in a public consultation about plans for 5G deployment. In lifting the moratorium, the Regulatory Authority also cited compelling benefits of 5G to consumers, and local and international businesses.





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