AMTA

Australian Mobile Telecommunications Association

EME Update

March 2023

Contents

Foreword

Welcome to the March 2023 Edition of AMTA's EME Update, a collection of news on electromagnetic energy (EME) in Australia and from around the world.

AMTA remains confident in the EME safety of mobile networks based on the ongoing findings of research from around the world and here in Australia. In this issue we look at the extensive research program being undertaken by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

We attended the opening of ARPANSA's new EME research and calibration laboratory in Melbourne in November last year, providing an insight into EME science for the latest mobile technologies, including 5G mmWave.

The Australian regulator, the Australian Communications and Media Authority (ACMA) has moved quickly to adopt the new RPS S-1 standard into their regulatory regime for carriers and manufacturers. The ACMA has now published the results of its extensive audit of EME safety of 5G network technology, including a new publicly accessible EME Checker website.

EME levels in Australia and around the world have not changed significantly following the introduction of 5G. Along with the ACMA measurements, which includes contributions from AMTA's members, measurements from around the world show that EME levels have been stable over a very long time.

AMTA brings together regulators, academics and the industry to share and discuss their research and findings at our annual AMTA EME Symposium, which took place in November last year in Melbourne. The event helps ensure stakeholders approach EME safety and regulation holistically based on the latest science and technology insights, including feedback from communities (received by the industry) and the government agencies (on their experience with the deployment of mobile technologies).

This edition of AMTA's EME Update also looks at the recent publications and announcements from large international studies, including reviews of potential health effects from the UK, New Zealand and the EU. We also review research on how EME may impact flora and fauna in the environment, an area where quality research has been lacking. All research shows that jurisdictions around the world have no need to change EME policies, based on these latest findings.

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

Louise Hyland, AMTA CEO

Australia continues support for EME research

In November 2022, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) inaugurated its new $2.35 million EME anechoic chamber, with the capability to calibrate equipment up to 40 GHz and research radio waves up to 100 GHz.

The chamber was officially opened by the Federal Assistant Minister for Health and Aged Care Ged Kearney and ARPANSA CEO Dr Gillian Hirth.

Associate Professor Sarah Loughran, ARPANSA's Radiation Research and Advice Director, explained that 5G is expected to use frequencies beyond the 8 GHz limit of the previous chamber that was built in 1979:

'Because of that, it was vitally important that we built a new laboratory to make sure that we are well placed to continue providing science-based health advice to the Australian community on wireless-technology now and into the future.'

Support for Australian EME research

The chamber upgrade is part of the ARPANSA 2020-2023 EME Action Plan, which also includes support for research. In addition to studies undertaken by ARPANSA scientists, funding is also being provided for a 5G *in vitro* study led by RMIT; a new investigation of electromagnetic hypersensitivity led by the University of Wollongong; and a project to develop an exposure system for biological experiments above 6 GHz led by Swinburne University of Technology.

Don Wijayasinghe SMIEEE, Assistant Director – EMR, ARPANSA and Dr Gillian Hirth, CEO ARPANSA.

Associate Professor Sarah Loughran, Radiation Research and Advice Director, ARPANSA

WHO Task Group on Radiofrequency Fields and Health Risks

Associate Professor Loughran has also been nominated as one of the members of the WHO (World Health Organization) Task Group on Radiofrequency Fields and Health Risks.

The WHO convened Task Group will meet throughout 2023 to formulate an overall health risk assessment for EME exposure, compile information on national good practice interventions and identify research gaps.

The last time the WHO convened a Task Group on radiofrequency EME was in 1990, with the resulting monograph published in 1993.

No ‘sound scientific evidence’ that EME impacts animals or plants

The German Federal Office for Radiation Protection (BfS) concludes that there is no ‘*sound scientific evidence of adverse effects*’ of low-level EME impac*ting o*n animals or plants under realistic environmental conditions.

This conclusion, only recently published, was based on the results presented at a three-day scientific workshop in November 2019 at Munich, Germany, with the participation of 64 experts from 15 countries.

The workshop collected and discussed the currently available knowledge about possible effects of artificial EME at all frequencies on the living environment, i.e. animals and plants.

The German scientists BfS warn:

> **‘Extrapolations from laboratory animal studies, often performed at higher exposure levels, do not allow conclusions on ecological effects of RF-EMFs [radiofrequency electromagnetic fields] at low levels. Field studies of an appropriate quality are scarce in both animals and plants and so far do not show clear evidence supporting adverse effects of RF-EMFs.’**

Some studies suggested possible links with EME exposure but other environmental changes such as increased light at night, temperature extremes, and pollution are alternative explanations.

At lower frequencies used by broadcasting and from power lines, the data was less clear ‘*because there are many unknowns on the underlying mechanistic principles and sensory structures*’. The workshop indicated a need for more research both on basic mechanisms and robust field trials.

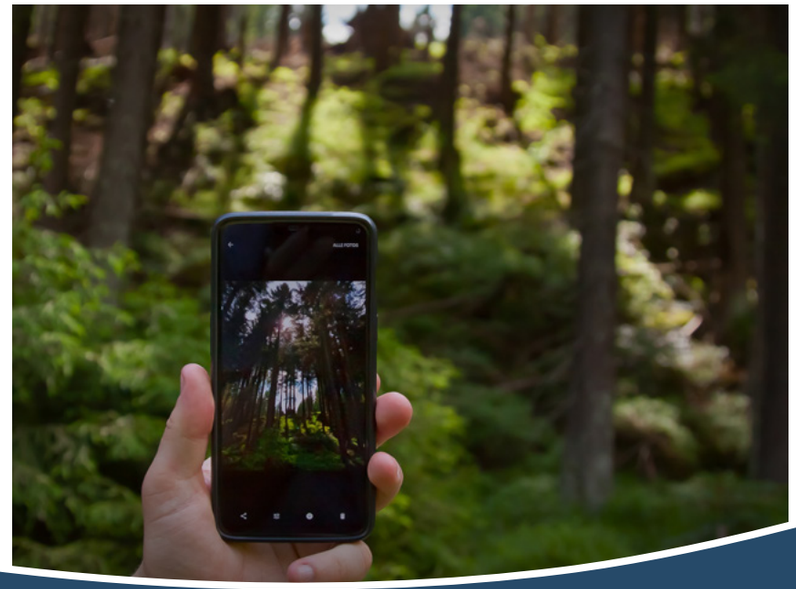
An unconnected review for the Swiss Federal Office for the environment released in January 2023 finds that EME effects on insects are ‘*at least partially established [but], it is very difficult to estimate the scope of these effects at larger scales (population, ecosystems, etc.)*’.

The Swiss review notes that many of the studies restricted the movement of insects during EME exposure and, ‘*therefore experimental exposures do not reflect necessarily environmental exposures.*’ The review calls for ‘*robust, reproducible, large-scale studies*’.

Australian review

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) says that Australian EME limits ‘*are adequate in providing protection to the environment*’.

Scientists from ARPANSA and Swinburne University are preparing a systematic collection of all the available evidence on whether EME has a negative impact on plants and the environment. This work is being undertaken as part of a Federal government program to promote health and safety and address misinformation about EME emissions.



Experts see no reason to change EME policies

Expert groups from France, Germany and Sweden have concluded that current evidence provides no reason to change EME policies. They also identified areas where more information is needed.

France – no new health risks from 5G according to available data

An expert group of ANSES, the Agency for Food, Environmental and Occupational Health & Safety, points out that current 5G deployments in France are mostly in the 700 MHz to 2.1 GHz band, frequencies that have been used by existing 2G, 3G, and 4G technologies. Measurements of the new 5G band at 3.5 GHz '*do not suggest a significant increase in population exposure*' and ANSES '*considers it unlikely at present that new health risks will be created by the deployment of 5G in the frequency band*'.

France is yet to licence 5G at 26 GHz and here there is less information on expected exposure levels. ANSES states that '*the data available at this time are insufficient to conclude whether or not there are health effects.*'. The expert group recommends more research to characterise exposure levels and experimental studies to investigate possible '*links between exposure and biological or health effects*'. In December 2022, ANSES announced support for six new EME research projects, four of which relate to 5G.

Germany – no risks when people are exposed below the limit values

The Radiation Protection Commission (SSK) examined research on EME exposures at frequencies up to 7 GHz, the upper limit of the 5G frequency range 1 (FR1). For these frequencies, the Commission says there is '*no fundamental difference*' between 5G and the current 4G standard.

Therefore, SSK concludes that based on current knowledge '*the limit values for high-frequency emissions currently applicable in Germany and the specifications for product safety are sufficient in their protective function.*' Australia uses similar EME limit values.

A future SSK report will examine frequencies above 20 GHz (5G FR2).

Sweden – no new health risks but research and precaution remain important

The 2021 annual report of the Swedish Radiation Safety Authority (SSM) expert group on EME covers studies published during 2020 and was delayed by COVID-19 disruptions. It concludes that '*no new established causal relationships between EMF exposure and health risk have been identified*', and, therefore, there is no reason to change EME policies.

However, there are indications of '*biological effects in animals due to weak radio wave exposure*' that warrant further research and justify Swedish precautionary thinking. The latter includes a recommendation to use a handsfree kit to reduce exposure during voice calls.

Quality of EME research needs to improve

The SSM report points out that many studies had to be excluded due to poor quality. They say that this makes their results '*irrelevant*' and that such studies are '*also a waste of money, human resources and, in many cases, experimental animals.*'

An Italian review of *in vitro* (cell) studies found that of 121 relevant papers only 42 met basic quality criteria. Problems included inadequate descriptions of the EME exposure conditions, lack of temperature control and too few replications. A majority of the included studies showed no effects of EME exposure. The authors say that a '*huge effort*' is needed to improve '*experimental quality, which is crucial to guarantee the reliability, robustness and reproducibility of results.*'

A 2019 analysis from the USA found that lower quality EME studies were more likely to report effects.

Australia follows global best practice for EME protection

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has based Australian EME rules on the limits recommended by the International Commission on Non-Ionising Radiation Protection (ICNIRP).

A recent ICNIRP statement provides a description of ICNIRP's independent and best practice guidance that protects people and the environment from exposure to non-ionizing radiation (NIR).

ICNIRP is formally recognized as a collaborative body by the World Health Organization (WHO), the International Labour Organization (ILO), and the European Union (EU).

ICNIRP stress that members '*... do not have any professional or financial ties with entities having commercial activities... that have the risk of influencing their judgement on NIR safety issues*'.

ICNIRP receives no funds from industry. Its funding comes from non-profit governmental and scientific organisations and institutions.

When evaluating scientific evidence, ICNIRP considers all available studies and applies a weight of evidence approach:

> **'ICNIRP's advice is based on a detailed evaluation of all the available scientific evidence and does not ignore or overlook any scientific evidence. However, it is important to note that no single study considered in isolation will provide a meaningful answer to the question of whether or not NIR can cause or contribute to adverse health effects in people or in the environment. In order to make an informed conclusion, it is important to weigh the science in its totality.'**

From time-to-time groups challenge the adequacy of the ICNIRP EME guidelines and a recent commentary accused ICNRIP of '*false suppositions*'. However, as ARPANSA points out the commentary was based on '*cherry picked*' studies rather than the science in its totality.

International test methods for base station and mobile phone compliance

The Australian regulator, the ACMA gives effect to the ARPANSA EME limits through legal obligations on carriers and manufacturers of radio equipment.

In 2022 ACMA consulted on updating the EME rules for devices using millimetre waves to incorporate the latest international test methods described in IEC 63195.

The international EME assessment standard for base stations (IEC 62232 Ed3) was approved towards the end of 2022. IEC 62232 contains new methods for 5G and more accurate approaches for the assessment of the active antennas increasingly used by mobile networks. It is expected that these methods will be reflected in Australian EME assessment standards and regulation in the near future.

ACMA EME Checker increases transparency

The Australian Communications and Media Authority (ACMA) recently launched EME Checker so that the public can find out the average EME from base stations in areas where ACMA has conducted testing.

Following EME surveys of 5G-enabled base station sites in Victoria during 2021, ACMA announced the results of measurements at 129 sites in NSW during 2022.

All measurements were below 1.2% of the Australian EME limit with the majority less than 1%.

Originally launched with the results of the ACMA measurements in NSW and Victoria, EME Checker now also includes data for Queensland and WA.

The ACMA measurements showed that '*carrier EME predicted levels were, in all cases, higher than the actual levels measured*' and for 99% of sites, total EME was less than 50% of the carrier predicted level.

An ACMA audit also found that carriers are meeting the mobile base station deployment code obligations in relation to public consultation on new base station deployments:

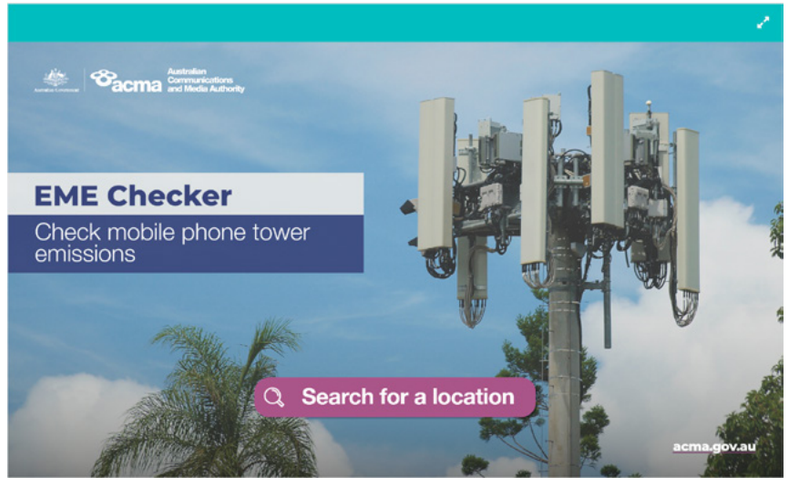
'The audit demonstrated that carriers are consulting with councils, local communities and interested and affected parties and providing the necessary information for proposed 5G mobile phone base station deployments.'

Arson attacks linked to 5G misinformation

In another publication, ACMA reported that the Australian mobile industry spent an estimated $11 million across calendar years 2019 and 2020 as a direct result of misinformation about EME and/or 5G. All carriers experienced arson attacks or vandalism of sites related to EME misinformation.

However, ACMA reports that there was a sharp decline in anti-5G misinformation narratives during 2021 following public communications campaigns by the Federal government (such as eme.gov.au) and Australian industry, as well as actions by social media platforms.

Other countries have not been as successful. A January 2022 survey of 12,000 people across six European countries found that 14% of those surveyed '*think that the symptoms most people blame on coronavirus appear to be linked to 5G network radiation*'.



Environmental measurements show stable EME levels

Measurements across European countries consistently show low EME levels that have not changed significantly with the introduction of new mobile technologies.

No significant trend in European EME levels

Researchers analysed public data on EME levels from networks of fixed EME monitors in five European countries (France, Greece, Romania, Serbia and Spain) and measurement programs by authorities in France and Catalonia (Spain). The data from the monitoring systems covered differing years between 2013 and 2022. The measurement programmes covered 2001 to 2022 (France) and 2012 to 2019 (Catalonia).

Typical levels were much lower than EME limits and there were '*no significant trends*' in EME levels over time. Levels were generally higher in areas with higher population density and also in outdoor locations compared to indoors.

Norwegian EME levels 'relatively constant over time'

Authorities in Norway measured at the same 16 locations at the same time of the day and the same time of the week in the city of Kristiansand (the sixth largest city in the country) from June 2013 to October 2019.

Most of the measured EME levels were below 1% of the limits and exposure was '*relatively constant over time even though new technologies are introduced*'.

'Moderate' EME levels in Switzerland

In 2021, Switzerland implemented a nationwide EME monitoring system that combines data from portable dosimeters that allow measurements in public areas and public transport; spot measurements made in homes and stationary EME measurement devices.

In the first year of operation more than 450,000 data points were collected. This data showed that the population exposure to EME is '*generally moderate*', with levels '*clearly below the exposure limit value*'. The Swiss Federal Office of the Environment states that '*the first results of the monitoring report show that health protection is guaranteed*'.

Latest EME research continues to show no brain cancer risk

New analysis of brain cancer rates from the Nordic countries, New Zealand and the UK continues to exclude the possibility of a large risk from mobile phone use.

Million Women Study finds no increase in risk of brain tumours for mobile phone users

A study using data for almost 800,000 participants in the UK Million Women Study found '*little to suggest that the use of cellular telephones increases the risk of brain tumors, overall or by subtype or by tumor location*.'

Between 1996 and 2001, the Million Women Study recruited 1.3 million women, who gave permission for researchers to access their national health data.

For the brain tumour study, women were asked about their mobile phone use in 2001 and again in 2011. This data was then combined with health registry information for brain cancer.

The authors, from the International Agency for research on Cancer (IARC) and the University of Oxford, concluded that the results support '*the accumulating evidence that cellular telephone use under usual conditions does not increase brain tumor risk*.'

However, there remain uncertainties about long-term use and the lead investigator Dr Joachim Schüz from IARC said:

> **'Mobile technologies are improving all the time, so that the more recent generations emit substantially lower output power. Nevertheless, given the lack of evidence for heavy users, advising mobile phone users to reduce unnecessary exposures remains a good precautionary approach.'**

The German Society of Neurology said that the results of the UK Million Women Study adds to the '*increasing evidence that mobile phone use does not increase risk and incidence for brain tumours under usual conditions*.'

25 years of data shows no link between phones and New Zealand brain tumour rates

An analysis of New Zealand brain cancer rates from 1995 to 2020 found '*no evidence of an increase in incidence in the age range 10–69*.' There was also:

> **'… no increase in the narrower age range 20–39, where mobile phone use might be expected to be higher, and no increase in glioma originating in the parietal or temporal lobes of the brain, where the absorption of radiofrequency energy from the use of a mobile phone would be maximal.'**

There was an increased incidence of brain cancer in the over 80 age group, which the authors say is '*similar to that seen in other countries and consistent with improved diagnostic methods*.'

The study used New Zealand cancer registry data. Australian statistics also show no link between mobile phones and brain cancer.

The researchers say that the results '*reasonably exclude*' the possibility of a '*moderate*' risk increase for a latency of 20 years but that the study can't '*exclude a small effect in a small subset of the population*.'

Limitations in past studies may explain claims of increased cancer risk

Scientists from IARC compared the real incidence of glioma (a type of brain cancer) in Denmark, Finland, Norway and Sweden from 1979 to 2016, with predicted rates assuming different levels of increased risk associated with mobile phone use and for cancer latencies of 10-years, 15-years and 20-years.

The study focussed on men because they had the longest periods of phone use and the highest usage in this period. The analysis showed that claims of a large risk increase were '*implausible and likely attributable to biases and errors in self-reported use of mobile phone*.'

Previous studies, such as the 13-country INTERPHONE project, relied on people to estimate their past phone usage and this has been shown to be subject to large uncertainties.

An IARC news item stresses that '*the absence of an observable impact on the glioma incidence rates provides evidence against any significant contribution of mobile phone use to the risk of glioma*.'

This IARC study was able to exclude risk increases of less than 8% in the observed incidence of glioma (much less than the risk reported in some previous studies that have raised concerns) and for latency periods up to 20 years.

Everyday use of wireless technologies increasing

The increased use of wireless technologies in homes has led to questions about the EME levels and whether these are changing.

Wi-Fi main EME source in homes

French researchers investigated these questions by means of an App installed by more than 250,000 users from 13 countries (including Australia). The App could record mobile network levels, Wi-Fi and Bluetooth signals.

Over 3.6 million EME measurements were collected and these showed that Wi-Fi was '*by far the largest contributor to exposure*.' Overall exposure was '*orders of magnitude lower than any regulation [EME] limits in the considered countries*.' Between 2017 and 2020, exposure increased by a factor of 2.3 times due to Wi-Fi, while 2G and 3G exposure was reduced. People were more exposed at home, and this was mainly Wi-Fi.

They also looked at the number of sources and found that '*beyond four to five sources, additional sources have little influence to individual exposure*.'

Low EME levels from 100 devices in smart apartment

Telstra measured EME levels under various use scenarios in a smart apartment equipped with up to 100 devices operating at the same time. Wi-Fi produced the highest levels but was still less than 1% of Australian EME limits. 5G had the lowest levels at less than 0.1% of the EME limits, '*even under extreme load*.'

Phone use no longer good estimate of EME exposure

The MOBI-Kids study found no evidence of a link between wireless phone use by young people and brain cancer. As part of the study, the authors developed a model to calculate the total EME dose taking into account factors such as duration of use, device type and wireless technology.

The model worked best for 2G voice calls but agreement between duration of use and EME exposure was close to zero for 3G. The authors warn that relying on duration to quantify EME exposure '*is becoming a poorer exposure proxy as communication systems available for voice calls tend to become more complex with time*.'

A UK study of adolescents found that the use of smartphones over Wi-Fi meant that operator call data is no longer the '*gold standard*' for this age group.

European Commission seeks advice on updating EME rules

The European Commission has tasked the Scientific Committee on Health, Environmental and Emerging Risks (SCHEER) with advising on whether Europe should adopt the updated international EME limits as the basis for policy for public and worker exposure. Australia completed that process in early 2021.

In August 2022, SCHEER produced a preliminary opinion (draft report) for public consultation that addresses the frequencies from 100 kHz to 300 GHz. A second SCHEER report due in July 2023 will respond for the lower frequencies.

The preliminary opinion on high-frequency EME states that '*SCHEER could not identify moderate or strong level of evidence for adverse health effects resulting from chronic or acute RF EMF exposure*' at levels below present EME limits.

Specifically for cancer SCHEER concludes that '*there is overall uncertain to weak weight of evidence that exposure to RF EMF [EME] increases the risk of neoplastic diseases*.'

SCHEER '*advises positively*' on updating the European recommendation for public EME limits and the directive for worker EME limits.

The public consultation was open until 25 September, with the final SCHEER opinion expected in early 2023.

29 million for new EME research

Under the European Union Horizon 2021 research program €29 million (more than $44 million AUD) was allocated to four new EME research projects.

- ETAIN – *Exposure To electromAgnetic fIelds and plaNetary health* – aims to assess the impact of emerging EME technology from a human and planetary perspective, and will include a citizen science paradigm to map exposure levels across European cities.
- GOLIAT – *5G expOsure, causaL effects, and rIsk perception through citizen engAgemenT* – will monitor EME exposure, particularly from 5G, provide novel insights into its potential health effects, and understand how exposures and risks are perceived and best communicated.
- NextGEM – *Next Generation Integrated Sensing and Analytical System for Monitoring and Assessing Radiofrequency Electromagnetic Field Exposure and Health* – will generate relevant knowledge of EME exposure in residential, public and occupational settings across multiple frequency bands.
- SEAWave – *Scientific-Based Exposure and Risk Assessment of Radiofrequency and mm-Wave Systems from children to elderly (5G and Beyond)* – aims to contribute to the scientific basis for health risk assessment of 5G and offer the means for effective health risk communication and results dissemination to all stakeholders.

The projects will last between three to five years. Each includes multiple research institutions from around Europe, and some have partners from Asia and North America.

Round-up of other EME developments

Belgium updates EME limits to support 5G

Each of the three regions of Belgium, one of the smallest countries in Europe, has a different EME policy but all are being updated to support 5G deployment. The Flanders region has already completed that process and 5G services are available. Wallonia will update EME limits to be similar to Flanders but it proposes to block millimetre wave 5G due to '*insufficient*' evidence on safety.

The Brussels capital region will increase the current limit of 6 V/m to 9.19 V/m indoors and 14.57 V/m outdoors (at 900 MHz). The international (and Australian) EME limit at this frequency is 41.2 V/m. An impact assessment found that an extra 1,200 macro sites would be needed for 5G under the existing Brussels limit, but only 46 with the proposed limit, and none if Brussels adopted the international EME limit.

When the process is complete, all three regions will continue to have limits more restrictive than the international EME limits. The Belgian telecommunications regulator previously warned that restrictive EME limits increase the risk of congestion on 4G networks and hinder the rollout of 5G.

EME restrictions in Switzerland impact 5G quality

Opensignal uses crowd sourced data from smartphone users to analyse the quality of mobile networks. A comparison of user experience data from Switzerland, Germany, France and Italy found that Swiss users experienced '*worse signal strength*' and lower average download speeds. Opensignal links this finding to the '*particularly tight regulations*' on EME in the country.

A proposal for a referendum on additional EME restrictions was withdrawn after criticism of a supporting organization for promoting conspiracy theories that were '*anti-democratic and anti-science*.' Swiss authorities launched the site 5g-info.ch to answer questions about 5G technology and EME levels.

GSMA calls on countries to adopt international EME rules

The GSMA EMF Forum 2022 called on authorities to monitor the WHO risk assessment process for EME; adopt the latest international EME guidelines and implement international EME assessment standards. GSMA also launched a report on EME and 5G millimetre waves. GSMA is the global trade association for the mobile industry.

A recording of the event, which includes Australian government and industry speakers, can be watched via the GSMA website.

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