

Before the  
Federal Communications Commission  
Washington, DC 20555

In the Matter of	)	
	)	
Proposed Changes in the Commission’s Rules	)	ET Docket No. 03-137
Regarding Human Exposure to Radiofrequency	)	(Terminated)
Electromagnetic Fields	)	
	)	
Reassessment of Federal Communications	)	ET Docket No. 13-84
Commission Radiofrequency Exposure Limits and	)	(Terminated)
Policies	)	
	)	
Targeted Changes to the Commission’s Rules	)	ET Docket No. 19-226
Regarding Human Exposure to Radiofrequency)	)	
Electromagnetic Fields	)	

**To:** Federal Communications Commission, Washington, DC 20554

**Date:** June 17, 2020

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## About ORSAA

The Oceania Radiofrequency Scientific Advisory Association Inc. (ORSAA) was formed in 2015 by a group of academics and researchers throughout Australia.

ORSAA is a not-for-profit organisation of scientists and professionals of various academic disciplines who have observed a discrepancy between the declarations of public regulators and the scientific research regarding the important effects of artificial electromagnetic fields on humans, animals and the environment. ORSAA's focus is on radiofrequency electromagnetic radiation (RF-EMR), which includes high frequency microwaves widely used for wireless communication and surveillance technologies.

ORSAA maintains the world's largest a categorised [database](#) of peer reviewed radiofrequency and power frequency scientific papers. The ORSAA database is continually updated as the latest research becomes available in an unbiased manner and is freely available to the public and wider research community. The database currently contains over 3500 peer-reviewed publications, of which, approximately 70% show significant biological effects<sup>1</sup>.

ORSAA's ethos is to provide an independent perspective on the relevant science so as to facilitate evidence-based decision making regarding EMR exposures by government and industry policy makers and service providers, including all government departments, clinicians, educators, and safety officers. ORSAA receives advice from an independent international advisory [panel](#) of cross-disciplinary experts.

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<sup>1</sup> Website: [www.orsaa.org](http://www.orsaa.org)

ORSAA Database: [https://n431.fmphost.com/fmi/webd#Research\\_Review\\_V4](https://n431.fmphost.com/fmi/webd#Research_Review_V4)

Database usage instructional videos: <https://www.orsaa.org/orsaa-database.html>

# ORSAA response to the Federal Communications Commission (FCC) ET Docket No. 19-226

The FCC is implementing an RF exposure guideline on which they hold no expertise. Instead, the FCC is relying on expert advice from the Institute of Electrical and Electronics Engineers (IEEE) and the Food and Drug Administration (FDA). This introduces a number of concerns:

1. The IEEE is an association that is top heavy in electrical engineers and physicists, many having close connections with industry and the military, with both sectors being beneficiaries of maintaining the status quo with respect to radiofrequency (RF) exposure limits.
2. The public would be right to ask whether the FDA is truly independent and trustworthy because the FDA is a government body that is vulnerable to influences from government policy makers and industry lobbyists. Governments around the world see 5G as being critical for their technology programs and the economy.

It is concerning that not so long ago, governments and their health departments were advising that asbestos and tobacco smoking were safe, all in the face of mounting scientific evidence suggesting harm. The same is happening today with RF exposures, particularly with regards to the scientific evidence of harm being dismissed or ignored. This will be discussed further in this response document to the FCC (under the topic of health).

Unfortunately, it appears that the FCC is very selective in whom it looks to for advice. A large number of independent scientists who suggest potential harm are collectively being ignored. Also, the FCC appears to ignore the science that underpins other international RF Standards that are up to 100 times more restrictive than those the FCC has chosen to adopt. It would appear the FCC are more interested in listening to those who have a financial interest in this technology.

When using the recent FDA review of Electromagnetic field (EMF) literature<sup>2</sup> as the basis for evaluating the competence and validity of the FCC report, there are some causes for concern (See Appendix 1 for a high-level review of the FDA report). Similar parallels exist with other international government sponsored RF Study reviews, including the Australian Radiation and Nuclear Safety Agency (ARPANSA) Technical Report Series 164 (TRS-164)<sup>3</sup>, the UK Health Protection Agency (HPA) Advisory Group on Non-ionising Radiation (AGNIR) report<sup>4</sup> and the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) report<sup>5</sup>. These reports all demonstrate a lack of a stringent review process and therefore exhibit the following deficiencies:

1. Poor review methodology;
2. Misrepresentation of the science;
3. Scientific inaccuracy: conclusions that do not accurately reflect the evidence;
4. Evidence dismissed and ignored in conclusions; and
5. Dismissing sound evidence under the guise of undefined 'methodological limitations'.

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<sup>2</sup> Review of Published Literature between 2008 and 2018 of Relevance to Radiofrequency Radiation and Cancer <https://www.fda.gov/media/135043/download>

<sup>3</sup> Leach, V.A. and S. Weller, *Radio Frequency Exposure Risk Assessment and Communication: Critique of ARPANSA TR-164 Report. Do We Have a Problem?* Radiation Protection of Australia, 2017. **34**(2): p. 9-18.

<sup>4</sup> Starkey S.J. (2016). *Inaccurate official assessment of radiofrequency safety by the Advisory Group on Non-ionising Radiation.* Review of Environmental Health, 31p. 493-503.

<sup>5</sup> Complaint to the European Commission concerning the 2015 SCENIHR opinion on potential health effects of exposure to electromagnetic fields. <http://www.iemfa.org/wp-content/pdf/Complaint-to-the-European-Commission-SCENIHR-2015-08-31.pdf>

Confirmation bias is also apparent in the aforementioned reviews.

A **confirmation bias** is a type of cognitive bias that involves favouring information that confirms previously existing beliefs or biases.

FCC claims:

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*“Today, we take a number of steps regarding these limits to ensure the health and safety of workers and consumers of wireless technology...”*

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Most modern dictionaries define the word “ensure” as follows:

***To make a pledge to (someone); to promise, guarantee (someone of something); to assure.***

It is not possible to provide a guarantee of safety when there is significant evidence from thousands of experimental studies showing a range of potentially harmful biological effects that are occurring at levels well below current public restrictions. These effects include DNA damage, oxidative stress, impacts on immune, hormonal, metabolic, reproductive and neurological functions, cognitive and behavioral effects along with many other biological effects that are repeatedly being found in scientific studies. There can never be absolute safety, and moreover, these ‘effect’ studies evidence sufficient doubt regarding safety. Therefore, a precautionary approach must be taken and this is the principle underlying the need for effective risk management strategies<sup>6</sup>.

The FCC’s insular treatment of RF as an isolated source gives no consideration for combinative and synergistic effects with other environmental toxins (ionizing radiation, drugs and chemicals). The appropriateness of this approach is questionable. There is in fact evidence that certain carcinogenic chemicals are enhanced when used in combination with RF exposure. To overlook this fact has serious implications, particularly for those who are occupationally exposed to potential hazardous materials or chemicals and simultaneously exposed to RF. Further details of the biological effects and their consequences to health are discussed later in this document.

The FCC cannot consider the rollout of new transmitters utilizing higher frequencies and novel modulation patterns (that define 5G) to be safe when there has been no pre-market testing to verify safety. Large assumptions are being made that if found to be in error will have significant and long-term consequences for the health and wellbeing of the nation along with the environment. A precautionary approach is completely absent. There is some limited research available looking at radar emissions using higher frequencies which do show links to cancer and other wellbeing challenges<sup>7</sup> (however, it is noted the signal modulations are not the same as 5G).

ORSAA response continues on the next page

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<sup>6</sup> Gee, D., *Late Lessons from Early Warnings: Towards realism and precaution with EMF?* Pathophysiology, 2009. 16(2): p. 217-231.

<sup>7</sup> Russian radar study Kolodynski, A. A., & Kolodynska, V. V. (1996). *Motor and psychological functions of school children living in the area of the Skruna Radio Location Station in Latvia.* Science of the Total Environment, 180(1), 87-93

The FDA claims:

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“weight of scientific evidence has not linked cell phones with any health problems.”

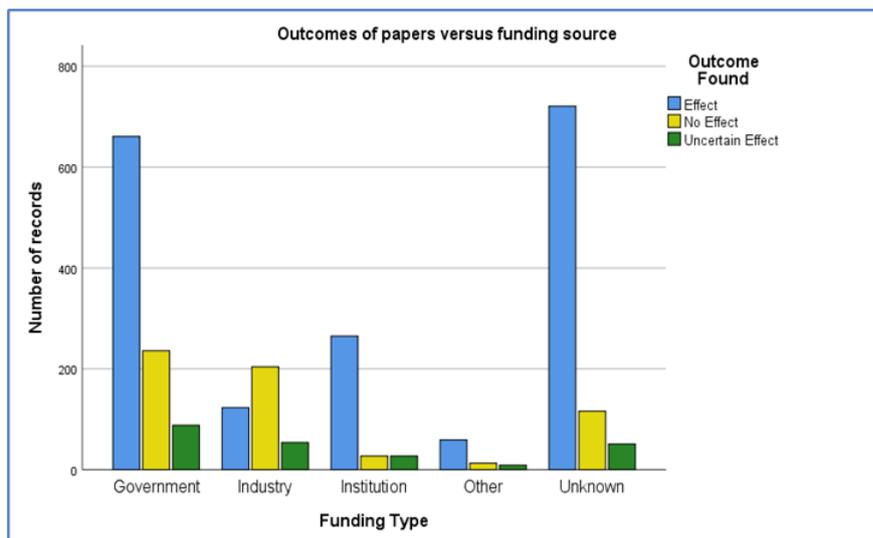
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This statement is falsifiable by a large volume of scientific evidence. The FDA report has been found to have misrepresented the balance of evidence as most of the peer-reviewed studies actually report biological impacts when all relevant papers are included; see Appendix 1.

Further, the FDA has not taken into consideration the following attributes as part of its review:

1. Funding source (which introduces potential biases)
2. Researchers connections with industry (potential conflicts of interest)
3. A significant evidence base showing statistically significant biological effects, not just cancer, that are potentially hazardous over the long term if sustained.
4. Missing or excluding relevant papers in the review process.

ORSAA<sup>8</sup>, the Bioinitiative Group<sup>9</sup>, the FDA, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the World Health Organization (WHO) have all used the same peer-reviewed scientific papers as their common evidence base. Intriguingly, these organizations have come to different conclusions, split into two main camps of sufficient evidence of harm, versus no conclusive evidence of harm. The issue of conflicts of interest is at the heart of this schism with the latter position being taken by the organizations with industry ties. Using all the recorded RF-EMR papers in the ORSAA database (which have been entered without ‘cherry picking’), it is possible to compare funding source with outcomes reported. Figure 1 below clearly illustrates how studies that have had industry funding are much more likely to report ‘No Effects’ (i.e. no statistically significant biological effects). This further strengthens the peer-reviewed findings of Huss *et al.* 2007<sup>10</sup>



**Figure 1: Sources of funding for papers and the relative likelihood of reporting statistically significant biological “effects” and “no effects” due to RF-EMR exposures.**

<sup>8</sup> OCEANIA RADIOFREQUENCY SCIENTIFIC ADVISORY ASSOCIATION INC. [www.orsaa.org](http://www.orsaa.org)

<sup>9</sup> THE BIOINITIATIVE REPORT 2012 <https://bioinitiative.org>

<sup>10</sup> Source of Funding and Results of Studies of Health Effects of Mobile Phone Use: Systematic Review of Experimental Studies <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1797826/>

Studies funded by government or institution sources are much more likely to report ‘Effects’ whereas industry-funded studies are reporting “No Effect” outcomes. This reversal in reporting strongly suggests that industry funded studies have introduced a bias to under-report the impacts on health. The large number of industry-sponsored “No Effect” papers are distorting the balance of evidence and therefore creating a level of uncertainty. Furthermore, industry-funded reviews also tend to omit studies that show evidence of harm. A similar picture also develops when government communication regulatory agencies provide funding for research where results again are skewed towards “No Effects”. This is likely to be due to financial ties to industry (i.e. “follow the money”).

This situation is reminiscent of the tactics that were applied by the Tobacco industry to cover up the harms of tobacco smoking<sup>11</sup>. It appears that the same unethical tactics have been adopted by the wireless industry. This has been eloquently described by independent journalists Hertsgaard and Dowie in a 2018 article entitled *How big wireless made us think that cell phones are safe: a special investigation*.<sup>12</sup>

## Exposure Limits

FCC claims:

*Second, based on our existing limits, we revise our implementing rules to reflect modern technology and today’s uses..... replacing our prior regime of service-based exemptions with a set of formulas for situations in which the risk of excessive RF exposure is minimal*

Unfortunately, the definition of ‘excessive RF exposure’ is very subjective, as indicated by other countries with more strict safety limits. In the mind of the FCC, only thermal levels are considered excessive. Most transmitters, especially those that are to be “exempt” by FCC regulations, are considered (by the FCC) to be low power. However, in reality most device emissions are operating at levels that are billions of times higher than natural background levels. These man-made RF emissions from so-called “low power” devices are far from trivial.

Aside from the intensity (levels of exposure), man-made RF-EMF is highly polarized, in phase at specific frequencies, can constructively and destructively interfere, often contains complex low frequency modulations and are nothing like natural radiation in the frequency bands utilized. Just because man-made radiation is non-ionizing this does not automatically make it harmless. Artificial electromagnetic radiation (EMR) does not exist as single photons in space but are a series of waves containing a billion trillion photons in each cubic meter, acting synchronously and creating an overall force field that can move charges on molecules, including electrons (see below). Therefore, the argument that there is insufficient energy of individual photons to break molecular bonds is an inaccurate description of how non-ionizing electromagnetic waves interact with biological matter. The ‘low level non-ionizing radiation cannot do damage’ argument is simply industry spin on the science, which is analogous to saying that a tsunami wave cannot do material damage because an individual water molecule does not have sufficient energy.

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<sup>11</sup> *Mechanisms of influence—Industry-funded research*

<https://www.tobaccoinaustralia.org.au/chapter-10-tobacco-industry/indepth-10a-strategies-for-influence/10a-3-the-mechanisms-of-influence-industry-funded> and *Inventing Conflicts of Interest: A History of Tobacco Industry Tactics*

[https://www.researchgate.net/publication/51807532\\_Inventing\\_Conflicts\\_of\\_Interest\\_A\\_History\\_of\\_Tobacco\\_Industry\\_Tactics](https://www.researchgate.net/publication/51807532_Inventing_Conflicts_of_Interest_A_History_of_Tobacco_Industry_Tactics)

<sup>12</sup> How big wireless made us think that cell phones are safe: a special investigation

<https://www.thenation.com/article/archive/how-big-wireless-made-us-think-that-cell-phones-are-safe-a-special-investigation/>

Force field explanation: RF-EMR radiation power density of  $1 \text{ mW/m}^2$  ( $\sim 0.61 \text{ V/m}$ ) coming from an antenna and composed of 1 GHz photons, then the number of photons passing this surface of one square meter per second equals to  $1.5 \times 10^{21}$  or  $1.5 \times 10^{17}$  photons per square centimeter<sup>13</sup>.

## Scientific Advice

The FCC claims to “collaborate with other federal agencies and the international community to ensure our limits continue to reflect the latest science.” However, there is a large disparity in public exposure limits between the US and other countries that have avoided thermal-based IEEE/ICNIRP guidelines, and instead, implemented stricter biologically based RF Standards. Nevertheless, even those more protective standards may not be fully protective against a number of potentially harmful biological effects that have been demonstrated in scientific studies.

The FCC goes on to say “Indeed, as noted in the inquiry, our limits for devices held close to the body are more restrictive than other more recently published international limits.” This statement is a slight of hand used to give the reader the impression that the FCC is providing safer RF exposure guidelines. Clearly the FCC is comparing its guidelines with the recently updated ICNIRP Guidelines and not the RF Standards adopted by India, China, Russia, Eastern Europe and other countries. Unfortunately, ICNIRP as an organization is tainted with conflicts of interest (COI) of its members, where there is also a lack of transparency and accountability. ICNIRP, like the FCC, lacks sufficient credible biomedical expertise and does not follow world’s best practices when it comes to precaution, radiation risk assessment and risk management philosophies (see Annexure for more details on ICNIRP).

FCC States:

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*“The vast majority of filings were unscientific, and even the filings that sought to present scientific evidence failed to make a persuasive case for revisiting our existing RF limits.”*

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A ‘persuasive case’ in the FCC’s eyes is in reality very subjective. In fact, the FCC should be excusing itself from such determinations because of potential conflicts of interest and a lack of expertise in biomedical and radiation health risk management matters.

The FCC has chosen to ignore advice provided by prominent independent scientific experts, many of whom are far more qualified than the commission to understand health risks associated with RF exposures. The bar for acceptance of scientific evidence is being set unusually high such that no real scientific studies are able fulfil the FCCs criteria (which is also not fulfilled by their own studies). Many radiation protection bodies require “established evidence of harm” (essentially requiring proof) before they will acknowledge and accept there might be a problem. This is tantamount to a dead body count policy. That is, there is a requirement to provide proof and mechanistic details of how RF can cause a person to develop health issues before acknowledging that a risk exists. This stance is unprecedented and is not required by law. Establishing evidence is a very important topic to be explored later in this submission.

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<sup>13</sup> Dr. Leendert Vriens <https://www.stopumts.nl/doc.php/Artikelen/12536/redirect>

We recommend that the Commissioners read the document entitled “CRITICISM OF THE HEALTH ASSESSMENT IN THE ICNIRP GUIDELINES FOR RADIOFREQUENCY AND MICROWAVE RADIATION (100 kHz - 300 GHz) by Dr Neil Cherry (2002)<sup>14</sup>. Dr Cherry was ahead of his time in the recognition of the dangers of RF exposures and the corruption of the scientific process used to evaluate harm by ICNIRP. The same accusation can also be directed towards the FDA and the FCC.

## Clear Conflict of Interest (COI)

The FCC makes significant income from spectrum licenses and is in close contact and collaborating with the industry that it regulates. To have a government body that derives income from the sales of licenses, an income that could be jeopardized if it were to acknowledge potential harm associated with long term chronic RF exposures represents a clear conflict of interest.

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*“Reconsideration may be denied where a petitioner fails to present facts and arguments unconsidered by the Commission.”*

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Ideally a separate arbitration body should be managing potential “reconsideration” conflicts. The commission cannot be said to be impartial due to financial interests nor can it be seen as an independent body for passing judgment on the merit of a complaint against its own materials due to previously stated COI.

## Revision of RF exposure guidelines

FCC States:

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*we believe they reflect the best available information concerning safe levels of RF exposure for workers and members of the general public, including input from our sister federal agencies charged with regulating safety and health and from well established international standards.*

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The FCC is suggesting above that there are well established international standards. This is incorrect, at least in the RF protection space. International harmonization, an objective of the WHO’s International EMF Project, has not been achieved because at least 40% of the worlds’ population enjoy RF Standards up to 100 times more restrictive (protective) than what ICNIRP and FCC are promoting. ICNIRP Guidelines, like the FCC RF exposure guidelines, have also been challenged by the greater scientific community<sup>15</sup> in regards to their ability to protect long term health because they can only provide assurances against short term acute exposures and thermal related injuries. ICNIRP Guidelines and the FCC RF exposure guidelines ignore non-thermal effects that are linked to various pathologies including cancer and therefore are not relevant for chronic long-term public exposures.

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<sup>14</sup> <https://researcharchive.lincoln.ac.nz/handle/10182/3933>

<sup>15</sup> **The International EMF Scientist Appeal** <https://www.emfscientist.org/>

FCC states:

*“In other words, while the record includes scientific papers of variable quality and significance that allude to more restrictive RF exposure limits under certain circumstances, they fail to provide any specific, pragmatic recommendation for how our RF exposure limits could be adjusted as a result of this research.”*

This statement has several parts that need addressing.

- Specific recommendations have been suggested by the highly qualified international panel of the Bioinitiative Report. The panel have discussed the research in great detail and have included information on health risks. However, the Bioinitiative Report recommendations have not been heeded or incorporated into FCC’s RF exposure guideline.
- The RF limits proposed by the Bioinitiative group likely fail to meet the second point in the statement above of being ‘pragmatic’ (in the eyes of the FCC) due to the significant costs that would be imposed on industry in order to make transmitters and devices safer.

In effect, safer RF exposure guidelines are being held hostage to economic interests and so gives the impression that health impacts are not seen by the FCC to be a high priority. Lower limits would directly impact the FCC’s revenue stream and prevent current wireless devices and transmitters from being deployed and utilized. A counter argument is that current FCC RF exposure guidelines are actually stifling industry innovation to make their devices safer because there is no obligation to do so and because the guidelines provide so much headroom.

Changing limits is unlikely to have an effect on behavior without education and clear labelling on wireless device packaging about health risks. Today, willful blindness by regulatory authorities to the health risks that science is presenting, is the sign of the times. The obfuscation, misrepresentations and denials surrounding the official handling of RF exposures means that the general public are not being provided with clear warnings on device packaging, nor guidance on safe usage.

In a democratic system, where elected officials are mandated with the responsibility to protect their citizens, it should not be up to individuals or different non-inclusive groups to propose new RF exposure guidelines. Instead, government needs to establish an independent working group that includes representation from all interested parties (government, industry, independent scientists and members of the public) to resolve this issue. Any organization that is clearly aligned with industry and excludes those with different viewpoints on the issue of health and safety, cannot achieve an independent and accurate assessment of the validity of the RF exposure guidelines.

FCC States:

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*“Commenters that provided scientific articles did not answer our request for a specific, quantitative goal but many provided descriptive references to the BioInitiative Report and Building Biology, which specify extremely low limits (0.3-0.6 nW/m<sup>2</sup> and 0.1 μW/m<sup>2</sup>, respectively) for RF energy exposure—limits that are millions to billions times more restrictive than FCC limits.”*

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The suggested 'low limits' provided by the Bioinitiative Report are precautionary limits and they are still millions of times higher than natural background levels. Precaution is what is missing today.

Radiation protection and risk management philosophy is centrally concerned with applying a precautionary principle. With ionizing radiation, there is uncertainty as to the impacts to health at low level exposures, thus a precautionary approach is taken by the International Commission on Radiological Protection (ICRP). A hierarchy of controls and the implementation of as low as reasonably achievable (ALARA) procedures are followed. This philosophy is completely absent in both ICNIRP and the FCC's RF exposure guidelines. Instead of radiation protection, we are experiencing radiation promotion into our environment under the false premise that only thermal levels are harmful. Because there are no precautionary aspects included, this is resulting in potentially unhealthy usage of wireless technologies such as wireless enabled nappies<sup>16</sup> that advise the parent via smart phone that nappies need changing. Low level RF exposures have been shown in many animal experiments to affect fertility, development, behavior and spatial memory.

FCC states:

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*"While some commenters seek Commission action to tighten RF exposure standards, others suggest that the Commission should revise its RF exposure standards to be consistent with less restrictive international standards, like the IEEE or the ICNIRP RF standard... we decline to make changes that would tighten the current standard, we decline to make any changes that would effectively relax our current standard."*

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It is unlikely that the general public would be requesting an alignment with IEEE or ICNIRP. This is an industry request. The FCC's response is a token gesture to suggest that they are not taking sides.

In addition, the FCC is incorrect in its designation of ICNIRP providing an RF Standard. Unlike official IEEE standards, that require rigorous formation and testing by experts, ICNIRP provides guidelines only, formulated by a committee whose expertise is questionable.

FCC States:

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*The Commission has the responsibility to set standards for RF emissions*

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The Commission claims it has the responsibility to set standards for RF emissions yet the commission lacks suitably qualified staff with appropriate biomedical expertise and furthermore, the commission is not directly involved in RF health research. The commission also stands accused of being a [industry] captured agency. As such, any proclamations that it makes are questionable and potentially untrustworthy<sup>17</sup>.

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<sup>16</sup> Did Your Kid Pee? This Pampers Smart Diaper Will Let You Know <https://www.pcmag.com/news/did-your-kid-pee-this-pampers-smart-diaper-will-let-you-know>

<sup>17</sup> Alster N. 2015. Captured Agency; How the Federal Communications Commission Is Dominated by the Industries It Presumably Regulates. Available from: [https://ethics.harvard.edu/files/center-for-ethics/files/capturedagency\\_alster.pdf](https://ethics.harvard.edu/files/center-for-ethics/files/capturedagency_alster.pdf)

The problem that the community faces today is that it has no real voice in the process. Decisions have already been made and public consultations are merely a flag waving exercise to address the governments need to include invited public feedback. In reality, public concerns are brushed aside. A similar futile exercise was conducted by ICNIRP prior to the release of their latest RF Guidelines. Close to 100 submissions<sup>18</sup> were made; however, ICNIRP subsequently published their updated RF Guidelines without addressing the non-thermal effects and health issues raised by highly qualified independent scientists.

FCC States:

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*“The new rules we adopt are consistent with general engineering principles and the exposure limits themselves.”*

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Engineering principle are not adequate to address the **biophysics** inherent with RF exposures. What is missing is the application of biomedical guidance based on biological principles. Also missing are important radiation protection philosophies including a precautionary approach. Instead, the rules are geared towards radiation promotion. There is a lack of application of any radiation risk assessment methodology. A whole list of potential hazardous bio-effects that are occurring in the absence of heating (see Figure 2), documented in the peer reviewed literature, have been collectively ignored. Detrimental combinative and synergistic effects with other environmental toxins are also not considered despite a small but growing evidence base showing how RF can facilitate such action.

FCC States:

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*“In terminating our Inquiry, we have rigorously analyzed our existing RF exposure framework and have dismissed the notion that the existing framework should be altered on account of any ‘non-thermal’ effects.”*

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The basis for FCC to dismiss non-thermal effects is unclear and the biological qualifications of the FCC members who took this decision are brought into question. Research clearly shows biological effects occurring in the absence of heating. Some of these effects are clearly hazardous, such as DNA damage and blood brain barrier breaches. We believe the FCC is negligent for not accounting for such non-thermal effects, which are real and numerous as indicated by more than a thousand experimental studies investigating RF exposures at non-thermal levels [ORSAA Database]<sup>19</sup>.

ORSAA response continues on the next page

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<sup>18</sup> ICNIRP RF Public Consultation; [https://www.icnirp.org/excel/RFPCD\\_Amendments\\_and\\_Comments.html](https://www.icnirp.org/excel/RFPCD_Amendments_and_Comments.html)

<sup>19</sup> ORSAA – Public EMF Database: <https://www.orsaa.org/orsaa-database.html>

## Man-made radiofrequency exposures and human health

FCC claims:

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*Upon review of the record, we find no appropriate basis for and thus decline to initiate a rulemaking to re-evaluate the existing RF exposure limits.*

*The record does not demonstrate that the science underpinning the current RF exposure limits is outdated or insufficient to protect human safety.*

*Nor does the record include actionable alternatives or modifications to the current RF limits supported by scientifically rigorous data or analysis.*

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These are questionable statements considering countries, regions or even cities within the same country, especially in Europe (e.g., Poland, Russia, Italy, Switzerland, Paris city and regions in Belgium), have used limits that are significantly lower<sup>20</sup>.

The crux of the issue is that an alternative that would be favorable for the FCC and Industry does not exist. A broken standard has therefore been adopted because it is better than nothing and furthermore, to adopt a more stringent RF Standard would have a negative financial impact (FCC revenue stream), be seen as a burden on industry and impact military function. Another potential block for more restrictive RF Standards is they would shine the spotlight on those who have claimed in the past to have been injured by RF exposure (especially brain tumors linked to heavy cell phone usage). If these claims were to come to light and be vindicated, significant litigation against Industry and the Government would ensue. This is already happening in Italy with occupational mobile phone exposures and brain tumors (acoustic neuroma)<sup>21</sup>.

The FCC statements above are unreliable and bring into question the validity of the RF exposure guidelines, which are based on flawed judgements that are challenged by the identification of health risks from peer reviewed research described in this document.

The discussion of protective standards should not be the remit of the FCC due to lack of expertise and conflicts of interest. Such activities need to be performed by an independent body that is not beholden to industry, military or government needs. Such a body cannot be the IEEE, ICNIRP or WHO (whose EMF project leader has no bio-medical qualifications and has connections with both the IEEE and industry.) The suggested body would also need to include scientists from a multitude of disciplines (not just physics and engineering) with differing viewpoints (which automatically excludes ICNIRP). Such a body would also need to include representatives from the general public, since the general public are one of the largest stakeholders and face the greatest risks as a result of lifetime

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<sup>20</sup> The impact of RF-EMF exposure limits stricter than the ICNIRP or IEEE guidelines on 4G and 5G mobile network deployment ITU-T K-series Recommendations – Supplement 14

<sup>21</sup> Six Italian Courts Have Ruled That Cell Phones Cause Brain Tumors <https://thefullest.com/2020/03/20/six-italian-courts-have-ruled-that-cell-phones-cause-brain-tumors/>

exposures to both consensual (personal wireless devices) and non-consensual exposures (smart meters, radars, cell towers, public Wi-Fi, surveillance devices etc.).

### **Established Effects of Non-Thermal Exposures**

The accumulated research (more than 50 years' worth) reveals that exposure to microwave RF-EMR from wireless devices such as Bluetooth, Wi-Fi, mobile phones, cordless phones, smart meters, radar and cell towers can affect the body on many levels including:

- genes (DNA)
- cell metabolism and related functions
- the nervous system
- the cardiovascular system
- the hepatic system
- the renal system
- the hematologic system
- the endocrine system
- the immune system

Some of these effects are transient and disappear soon after exposure is ceased. Cell adaptive responses appear to provide some level of short-term protection. However, the clinical studies that show marked differences in health indicators between long term occupationally exposed workers and less exposed populations reveal that adaptive responses are only relevant to short term exposures, and therefore cannot be relied on to compensate for long term exposures to this stressor. Moreover, with wireless devices placed nearly everywhere, the opportunity to avoid exposure to allow the body to fully recover becomes a significant challenge, if not impossible.

ORSAA response continues on the next page

Find Search Summary Totals					
Peer Reviewed Studies Showing Biological Effects		Number of records used : <b>2003</b> of <b>3602</b>			
Auditory Dysfunction / Hearing loss / Tinnitus	34	Apoptosis (Programmed Cell Death)	101	Brain Tumours	52
Blood Brain Barrier Permeability Changes	15	Breast Cancer	6	Cellular Stress	63
Brain Development / Neuro Degeneration	55	Biochemical Changes	220	EEG changes / Brain Waves	112
Neuro Behavioural Effect / Cognitive Effects	194	Cell Irregularities/ Damage/ Morphological Changes	201	Effects on Mitochondria	42
Calcium Influx / Efflux	24	Fatigue	38	Altered Enzyme Activity / Protein Levels / Protein Damage	381
Circadian Rhythm Disruption	15	Altered Gene Expression	160	Headaches/Migraines	66
DNA Damage / Mutagenic / Genotoxic	157	Altered Glucose Level / Glucose Metabolism	19	Inflammation	25
Endocrine / Hormone Effects	72	Cardiovascular/Vascular Effects	63	Hepatic Effects (Liver)	25
Miscarriage / Spontaneous Abortion / Foetus Resorption	5	Immune System Effects	65	Impaired / Reduced Healing/ Bone Density Changes	7
Memory Impairment	61	Oxidative Stress / ROS/ Free Radicals	256	Speech Impairment	3
Sperm /Testicular Effects	94	Sleep Effects	62	Haematological Effects	54
Tumour Promotion	47	Neurotransmitter Effects	35	Synergistic/Combinative Effects	60
Thyroid Effects	15	Visual Disturbances/ Ocular Effects	40	Autism	8
Leukemia	9	Parotid Gland Malignancy	4	Neoplasia/ Hyperplasia (Abnormal Tissue Growth)	7
Depression	23	Induced Adaptive Response	51	Dizziness / Vertigo / Vestibular Effects	23

**Figure 2: Summary of biological endpoints showing the number of peer reviewed scientific papers investigating RF-EMR exposures that show statistically significant effects (source ORSAA database).**

There are many peer reviewed scientific studies contained within the ORSAA database (Refer to Figure 2 above) that link man-made RF exposure to<sup>22</sup>:

- **Structural and functional changes of the brain**
- **Neuronal cell damage<sup>23</sup> that leads to neurodegeneration, affecting memory<sup>24</sup> (e.g., Alzheimer's) and motor control<sup>25</sup> (e.g. Parkinson's disease).**
- **Altered neurotransmitter (NT) levels and associated receptor expression<sup>26</sup>**

<sup>22</sup> Note - a single reference is provided for each endpoint listed as example but there are many more examples available – Figure 2 shows actual paper counts.

<sup>23</sup> Biochemical Modifications and Neuronal Damage in Brain of Young and Adult Rats After Long-term Exposure to Mobile Phone Radiations. <https://www.ncbi.nlm.nih.gov/pubmed/24801773?dopt=Abstract>

<sup>24</sup> Deleterious impacts of a 900MHz electromagnetic field on hippocampal pyramidal neurons of 8-week-old Sprague Dawley male rats. <https://www.ncbi.nlm.nih.gov/pubmed/26239913?dopt=Abstract>

<sup>25</sup> Maternal exposure to a continuous 900-MHz electromagnetic field provokes neuronal loss and pathological changes in cerebellum of 32-day-old female rat offspring. <https://www.ncbi.nlm.nih.gov/pubmed/26391347?dopt=Abstract>

<sup>26</sup> Changes of Clinically Important Neurotransmitters under the Influence of Modulated RF Fields — A Long-term Study under Real-life Conditions <http://www.avaate.org/IMG/pdf/Rimbach-Study-20112.pdf>

Neurotransmitters are chemical messages that travel across neuron synapses. The human bodily functions and the mind are fully dependent on neurotransmitters. NT imbalances have direct implications on physical health, mental health and wellbeing. Electromagnetic radiation from wireless transmitters have been shown to alter neurotransmitter levels. The type of physiological and psychological effects observed with imbalances in various neurotransmitter are shown below. Experimental and epidemiological studies are finding that radiofrequency emissions impact the levels of all of the neurotransmitters listed below. Note that some of the **symptoms** are very common at present and are attributed with electromagnetic hypersensitivity (EHS), previously called “microwave sickness”.

- **Gamma-aminobutyric acid (GABA) imbalances:** anxiety, inner tension and excitability, tinnitus (ringing in the ears), blurred vision, chest discomfort, irritability, oversensitivity;
  - **Dopamine imbalances:** depression, fatigue, learning disorders, irritability and outbursts;
  - **Serotonin imbalances:** migraines/headache, rapid heart rate/irregular heart-beat, tremor, insomnia, fatigue, depression, reduced emotional control;
  - **Acetylcholine imbalances:** learning disabilities, memory lapses, diminished comprehension, slowed mental responsiveness, attention deficit disorder (ADD).
- **Blood brain barrier (BBB) breaches.** The BBB integrity is essential to protect the brain from a wide range of harmful toxins and pathogens such as chemicals, viruses etc. A loss of integrity can lead to brain infections, neurodegeneration and other pathological effects of the brain<sup>27</sup>.
  - **EEG changes**<sup>28</sup> provide the most convincing evidence of a direct impact on brain by RF exposure. However, the mechanism remains to be studied.
  - **Cognitive function** effects leading to learning, behavioral and spatial memory deficiencies<sup>29</sup>
  - **Increased oxidative stress.**<sup>30</sup> Oxidative stress is associated with common pathological and inflammatory conditions, such as cardiovascular disease, cancer and diabetes.
  - **Mitochondrial dysfunction.**<sup>31</sup> Mitochondria are the energy producing powerhouses within cells and play a vital role in facilitating cellular function. Disrupted mitochondrial function can have serious health consequences i.e. neuropathy, visual problems, hearing problems, learning disabilities, diabetes, cancer, heart disease, liver disease, kidney disease, gastrointestinal disorders, respiratory disorders, neurological problems, autonomic dysfunction, dementia, chronic fatigue syndrome etc.
  - **Dysregulation of blood glucose levels** that are likely to underpin the epidemic of insulin resistance ((pre-diabetic condition) and may have a role in the current increase in Type 2 diabetes<sup>32</sup>.
  - **Chromosomal Aberrations/DNA damage** including fragmentation, oxidative modification of DNA, and micronuclei induction (which is a precursor for cancer)<sup>33</sup>.

<sup>27</sup> Effects of Microwaves from GSM Mobile Phones on the Blood-brain Barrier and Neurons in Rat Brain <http://www.teslabel.be/001/documents/Effects%20of%20Microwaves%20from%20GSM%20Mobile%20Phones%20on%20the%20Blood-brain%20Barrier%20and%20Neurons%20in%20Rat%20Brain.pdf>

<sup>28</sup> Radiofrequency signal affects alpha band in resting electroencephalogram. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4416621/>

<sup>29</sup> Motor and psychological functions of school children living in the area of the Skrunda Radio Location Station in Latvia <http://www.sciencedirect.com/science/article/pii/S004896979504924X>

<sup>30</sup> Low intensity microwave radiation induced oxidative stress, inflammatory response and DNA damage in rat brain [www.ncbi.nlm.nih.gov/pubmed/26511840](http://www.ncbi.nlm.nih.gov/pubmed/26511840)

<sup>31</sup> Effect of 3G Cell Phone Exposure with Computer Controlled 2-D Stepper Motor on Non-thermal Activation of the hsp27/p38MAPK Stress Pathway in Rat Brain. <https://www.ncbi.nlm.nih.gov/pubmed/23949848>

<sup>32</sup> Association of Exposure to Radio-Frequency Electromagnetic Field Radiation (RF-EMFR) Generated by Mobile Phone Base Stations with Glycated Hemoglobin (HbA1c) and Risk of Type 2 Diabetes Mellitus. <https://www.ncbi.nlm.nih.gov/pubmed/26580639>

<sup>33</sup> Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice following subchronic exposure <https://www.ncbi.nlm.nih.gov/pubmed/31633839>

- **Impacts on sperm quality and motility**<sup>34</sup>. Damages sperm DNA, with serious fertility implications. Men typically carry their mobile phones in their trouser pockets, very close to reproductive organs. Sperm counts in men from America, Europe, Australia and New Zealand have dropped by more than 50 percent in less than 40 years.<sup>18</sup> There is strong evidence suggesting that mobile phones are a potential cause, and this initial research needs further substantial investigation.
- **Tumor** initiating and tumor promoting<sup>35</sup>.
- **Cancer**. There are many scientific studies showing RF exposure is associated with brain tumors<sup>36</sup>, leukemia<sup>37</sup>, breast cancer<sup>38</sup>, thyroid cancer<sup>39</sup> and more recently a possible association with rectal and colon cancer<sup>40</sup>.

The list of biological effects is quite extensive and to cover them all in greater detail with respect to their implications to health is impossible within this brief document. None of the information being presented here is new. Many of these effects were documented many decades ago by the US military<sup>41, 42</sup>.

Today, there is no consideration on what different modulation frequencies have on health. It is known that pulsed waves are more bioactive than continuous waves. The embedded low frequency modulations are also linked to biological responses that cannot be considered to be safe.

If mobile devices had been tested with the same rigor as medical devices or pharmaceutical drugs, they would never have made it past the trial phase. Here resides the heart of the matter, wireless devices have never formally been tested for real-world long-term human health impacts prior to being released onto the market.

Many of observed effects and the predicted outcomes (described by independent researchers in their study conclusions) are in reality being reflected in the declining health of Americans today, where the average life expectancy is in decline, neurodegeneration and cancer is affecting more and more people and at younger and younger ages.

### Sensitive People are Not Protected

The FCC has not given consideration to sensitive or vulnerable populations, as though these people do not exist. On the other hand, those people who have sensitivity to other forms of electromagnetic radiation (EMR) such as light (photosensitivity) are supported by the medical

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<sup>34</sup> Mobile Phone Radiation Induces Reactive Oxygen Species Production and DNA Damage in Human Spermatozoa In Vitro <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0006446&type=printable>

<sup>35</sup> Tumour promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans (a replication of Tillman study) <https://www.ncbi.nlm.nih.gov/pubmed/25749340>

<sup>36</sup> Cellular and cordless telephone use and the association with brain tumors in different age groups <https://www.ncbi.nlm.nih.gov/pubmed/16121902>

<sup>37</sup> Decreased survival for childhood leukemia in proximity to television towers <http://www.ncbi.nlm.nih.gov/pubmed/15369273>

<sup>38</sup> Multi focal Breast Cancer in Young Women with Prolonged Contact between Their Breasts and Their Cellular Phones <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3789302/>

<sup>39</sup> Incidence of cancer adjacent to a mobile telephone basis station in Westfalia <https://www.emf-portal.org/en/article/16844>

<sup>40</sup> Colorectal Cancer Soaring in Young Adults; Are Smartphones in the Mix? <https://microwavenews.com/news-center/de-kun-li-crc>

<sup>41</sup> Naval Medical Research Institute - Reported Biological Effects Attributed to Microwaves (1971) [https://www.orsaa.org/uploads/6/7/7/9/67791943/\\_naval\\_research\\_1971\\_on\\_rf.pdf](https://www.orsaa.org/uploads/6/7/7/9/67791943/_naval_research_1971_on_rf.pdf)

<sup>42</sup> US Defence Intelligence Agency - Biological Effects of Electromagnetic Radiation (1976) [https://www.orsaa.org/uploads/6/7/7/9/67791943/\\_us\\_dia\\_1976\\_biological\\_effects\\_of\\_electromagnetic\\_radiation.pdf](https://www.orsaa.org/uploads/6/7/7/9/67791943/_us_dia_1976_biological_effects_of_electromagnetic_radiation.pdf)

profession. However, sensitives to alternative wavelengths are deemed to be preposterous and labelled 'psychosomatic'. Double standards are being employed, which is not scientifically rational.

There is suggestion by the WHO and some influential psychologists that health issues that the public are implicating to RF exposure are likely to be of psychological origin, i.e. the 'nocebo effect'. This is a mere hypothesis: speculative, unproven and in conflict with a significant evidence base showing biochemical and physiological effects. One needs to look at the origins of such claims. The WHO's International EMF Project, and ICNIRP, are heavily influenced by industry (see below). This includes industry connected psychology researchers such as Rodney Croft from Australia and his collaborator, James Rubin, in the UK. Clinical evidence and biomedical opinions appear to be over looked in favor of psychological theory which only serves to benefit the industry and government agencies that depend on industry income, such as the FCC. As a result, many people are suffering around the world from exposures, and being labelled as overly anxious about technology by Croft, Rubin and their co-authors (several of whom have close ties with industry).

### Establishing Health Effects

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*"[t]he weight of scientific evidence has not linked cell phones with any health problems" and "the current safety limits for cell phones are acceptable for protecting the public health."*

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This quotation is the catch-cry of many radiation protection authorities around the world who stand accused of misrepresenting the balance of evidence, dismissing important evidence under the guise of methodological flaws or ignoring evidence that falsifies their position.

FCC States:

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*"Indeed, no scientific evidence establishes a causal link between wireless device use and cancer or other illnesses."*

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This is incorrect because the wrong methodology is being applied to the evaluation of the scientific evidence. When evaluating the large collection of published studies on the ORSAA database in light of the Bradford Hill Criteria, there is a clear indication of a causal link between RF exposure and cancer and other diseases; see Appendix 1.

### Scientific Proof and Established Evidence

To request *proof* of harm before acting, fundamentally misconstrues how progress in science is made and ignores the fundamental processes of risk management. Science does not require or provide absolute proof in order to accept an evidence-based notion with regards to a health risk. For

example, there has never been a single scientific study that has conclusively proven that tobacco smoking causes cancer or that has described the exact mechanism by which this occurs. Yet these requirements are being held up as the necessary hurdle to be overcome before industry and government agencies will concede that radiofrequency exposures are harmful.

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***“A demand for scientific proof is always a formula for inaction and delay and usually the first reaction of the guilty ... in fact scientific proof has never been, is not and should not be the basis for political and legal action” (S J Green 1980)***

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What science can provide is:

1. Evidence that serves to either support or counter a scientific theory or hypothesis; and
2. Converging evidence (similar conclusions from many different sources and types of studies).

Some radiation protection agencies suggest that scientific evidence is established *when it is consistent and generally accepted by the broader scientific community... Generally, studies must be replicated or be in agreement with similar studies. The evidence for an effect is further strengthened if the results from different types of studies (epidemiology and laboratory) point to the same conclusion.*

In response to this definition of established evidence we note:

- The ORSAA database provides a significant amount of scientific evidence that dismisses the hypothesis that radiofrequency exposure to levels that are at, or below, current public limits are perfectly safe (see Figure 1).
- A large part of the scientific research is high quality and also concludes that that RF is potentially harmful. However, these studies are being collectively ignored by the FCC and its sister agencies<sup>43</sup>.
- The demand for complete consistency demonstrates a lack of understanding of biology where epigenetics, state of health, and genetic differences come into play giving diverse outcomes as biological responses to this exposure. Even if one well conducted study finds a biological effect that is potentially harmful, it is not automatically cancelled by a study that is not a true replication and makes no obvious finding. In all areas of science, 100% replications are extremely rare in experimental research.
- All the criteria required to establish sufficient evidence have been met. There are successful replication papers i.e. RF acts as a tumor promotor Tillman 2010<sup>44</sup> and Lerchl 2015<sup>45</sup>. Converging evidence also exists, where many different studies, although not exact replications, find the same outcomes across different experimental types (*in vivo*, *ex vivo* and *in vitro* studies) and aligning with what is found in well conducted epidemiological studies. Converging evidence is the widely accepted criteria for accepted theory within science, and this criterion has been met in the case of radiofrequency exposure research.

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<sup>43</sup> International Appeal - Scientists call for Protection from Non-ionizing Electromagnetic Field Exposure <https://www.emfscientist.org/index.php/emf-scientist-appeal>

<sup>44</sup> Indication of co-carcinogenic potential of chronic UMTS-modulated radiofrequency exposure in an ethylnitrosourea mouse model <https://www.tandfonline.com/doi/full/10.3109/09553001003734501>

<sup>45</sup> Tumour promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans (a replication of Tillman study) <https://www.ncbi.nlm.nih.gov/pubmed/25749340>

## Relevance of EMF/EMR exposure research to cancer

It is widely accepted that UV radiation is capable of causing skin cancer. UV exposure has also been associated with photoaging, which is a form of premature aging. Photoaging results in altered skin structures leading to skin damage, wrinkles, discoloration etc. UV-C, which is ionizing radiation, is fully absorbed by the atmosphere before it reaches the earth's surface. This means skin cancer and cell damage to skin is being caused by non-ionizing radiation (UV-A and UV-B rays). Scientific research demonstrates that UV radiation exposure also induces oxidative stress resulting in free radicals which is capable of damaging cell macromolecules and DNA.

When independent scientists suggest that radiofrequencies (another form of non-ionizing radiation) also damages DNA and causes cancer it is being routinely dismissed as implausible. Despite what some physicists are saying, photons do not need to have sufficient energy to knock off an electron from an atom to cause physical changes and damage as evidenced by our understanding and acceptance that non ionizing UV radiation causes cancer and damages skin cells. We also have clear evidence provided by 2 recent animal studies (that were consequently downplayed by ICNIRP and the FDA) for RF acting as a carcinogen. There are also more than 250 peer reviewed scientific publications in the ORSAA database that show RF exposure also creates free radicals and oxidative stress. We reported in 2017 that 89% of 242 studies to be positive for oxidative stress markers<sup>46</sup>.

Of critical importance is the lack of honesty in the appraisal of the potential genotoxic effects that RF exposure has on the body. This is important because the world is faced with a cancer tidal wave as advised by the WHO in 2014<sup>47</sup>. Cancer is invariably a life shortening disease and a major health burden. Very little research is being conducted to understand whether increased RF radiation exposure over the last 30 years is contributing to this increase. Ecological studies linking cancer databases to geo-location data are not being performed in most western nations. These are necessary in order to ascertain whether mobile phone base stations have a role to play in the incidence of cancer (clusters) within communities. However, there is some research available that does suggest a plausible link<sup>48</sup>. Further research is required but it is not being funded or conducted.

The classification by the International Agency for Research on Cancer (IARC) of all types of manmade RF exposure as a Group 2B Carcinogen is not being treated with the seriousness it deserves. Instead, precaution is being thrown out the window to enable government and industry to pave the way for more transmitters in our community as part of the big push to 5G and the Internet of Things (IoT).

Many independent scientists have been calling out RF as a genotoxic agent and the IARC may yet upgrade the carcinogenic rating when a review is performed in the next 5 or so years. RF has been identified as a priority for re-review.

The evidence has grown significantly since the original 2B classification in May 2011 with the NTP and Ramazzini Institute studies showing clear evidence of tumors in rodents. Human studies, including the CERENAT study further strengthens this view. The claims of RF carcinogenicity are supported by a number of epidemiological studies that have been performed around the

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<sup>46</sup> Bandara P and Weller S. Biological effects of low-intensity radiofrequency electromagnetic radiation – time for a paradigm shift in regulation of public exposure. Radiation Protection In Australasia, 2017 Nov; 34(2): 2-9.)

<sup>47</sup> Cancer 'tidal wave' on horizon, warns WHO; <https://www.bbc.com/news/health-26014693>

<sup>48</sup> Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil; <https://pubmed.ncbi.nlm.nih.gov/21741680/>

world<sup>49,50,51</sup>. No such studies are presently being conducted in the US to validate. Instead, regulatory bodies, such as the FCC remain in denial by not taking a precautionary stance.

The FCC and FDA are downplaying the findings of toxicologists and pathologists from academia and industry who reviewed the NTP study and even upgraded some of the classifications<sup>52</sup>. Both studies strengthen the case for the IARC to raise the carcinogenic rating to Group 1, a carcinogen.

The FCC is conflicted as is the Federal Government and its various departments because they have a vested interest in RF technology from an economic and military function perspective. Liabilities will also be at the forefront of the decision-making process. To admit harm may bankrupt the economy. However, so would an RF health compromised and a debilitated workforce. The current COVID-19 pandemic evidences the effect health challenges can have on the economy. The FCC needs to do a true cost-benefit analysis before proceeding with promotion of 5G wireless communication.

Cancer incidence is increasing year on year and also at younger ages showing that we are not managing the situation or trying to understand the causes. This is a serious indictment on the performance of Health protection agencies who are clearly failing the American public.

## World Health Organization

FCC States:

*“...we note that the World Health Organization (WHO) states that “[f]rom all evidence accumulated so far, no adverse short-or long-term health effects have been shown to occur from the RF signals produced by base stations”*

It is uncertain what evidence base the WHO is using to make this statement, as it has to ignore many studies showing effects or apply a thermal only effects’ filter. There are many peer reviewed scientific publications available via reputable online libraries and websites (Pubmed, emf-portal and ORSAA database) that challenge this view point.

The WHO definition of health does not only include being free of physical ailments but also considers mental wellbeing. All of the biological effects discussed in this document that are found in well conducted studies provide direct evidence of health effects.

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*“WHO goes on to say that the erroneous public perception of a possible risk from such exposure may, even while unsupported by evidence, still contribute to a feeling of uncertainty or a lack of control.”*

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In this specific case, WHO is in error in its interpretation of the science and understanding of risk. This would not be the first time given the past Tobacco science debacle that embroiled the WHO. It

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<sup>49</sup> The Influence of Being Physically Near to a Cell Phone Transmission Mast on the Incidence of Cancer [http://www.kiirgusinfo.ee/wp-content/uploads/2018/07/eger\\_naila\\_2004.pdf](http://www.kiirgusinfo.ee/wp-content/uploads/2018/07/eger_naila_2004.pdf)

<sup>50</sup> Incidence of cancer adjacent to a mobile telephone base station in Westfalia <https://www.emf-portal.org/en/article/16844>

<sup>51</sup> Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil <https://www.sciencedirect.com/science/article/pii/S0048969711005754>

<sup>52</sup> “Clear Evidence” of Cell Phone Cancer Risk, Say Leading Pathologists; <https://microwavenews.com/news-center/ntp-peer-review-sees-tumor-risk>

would appear the WHO has not learned or improved from this experience and is repeating the same mistake with RF science, especially when considering the International EMF Project receives funding from the wireless industry.

FCC also makes reference to the WHO EHC group who were assessing the science in 2014.

The International EMF Project (IEMFP) is largely funded by the wireless industry even though this is contrary to the guiding principles of the WHO. The IEMFP established an Environmental Health Criteria task group (EHC) to investigate and review all available scientific evidence on radiofrequencies to determine whether there are any health effects that need to be considered. A number of draft documents covering a restricted number of topics were created and the WHO invited public comment. The drafts were never finalized and the group was disbanded without completing the work.

When reviewing the EHC 'expert' composition ORSAA discovered that it was dominated by ICNIRP representatives, along with the following additional observations:

- The EHC expert panel appear to be over-represented by "No Effect" and "Thermal Effects Only" ICNIRP-associated scientists, particularly in the core group. This stacking of "no effect" scientists in the EHC is not representative of the balance of scientific evidence nor the divergent views of the scientific community in this field.
- Most members of the EHC group have performed research directly sponsored by industry and/or the military. Examples include the Electrical Power consortiums (such as EPRI), Telecommunications companies such as Motorola, Nokia, French Telecom, Telecom Italia Mobile etc. as well as industry groups or associations (GSM Association, Mobile Manufacturers Forum, Cellular Telecommunications & Internet Association) and the US Airforce. Therefore, COI are likely to exist.
- Some of the researchers in the EHC group are also known to cherry pick their data to support their "no evidence" or "no association" conclusions - particularly in relation to mobile phone usage and brain tumor studies. Several members of the same club of "no effect" scientists have been involved in many different review panels and expert advisory committees over the last 10 years (ICNIRP, AGNIR, SCENIHR, SSI). It is clear that the composition of the EHC group tasked with reviewing the literature on RF bio-effects was biased and most definitely not representative of the diverse opinions held in the wider scientific community.
- a lack of representation from countries that have RF Standards significantly lower than those proposed by ICNIRP. The exclusion of these scientists suggests that WHO and/or ICNIRP employed biased selection criteria when establishing the EHC group. However, the accumulated evidence suggests that even these more stringent standards are not protective enough.
- a lack of representation from scientists that are finding significant of biological effects in their studies.

There appears to be no attention being paid to accumulative and additive effects (different frequencies operating together need to be taken into account rather looking at individual frequencies in isolation) on long term health and wellbeing. No consideration of other concomitant effects and synergistic effects with other environmental toxins.

There is clear evidence that RF exposure is a biological stressor. People have varying responses to these challenges. Some people are more vulnerable and will not be protected by FCC RF exposure

guidelines. Today they are simply being ignored or worse, designated by proponents of wireless technology as likely to be suffering a psychosomatic illness.

## Exemptions

FCC States:

*“Specifically, we create three broad classes of RF exemptions: (i) for extremely low-power devices that transmit at no more than 1 mW; (ii) for somewhat higher-power devices with transmitting antennas that operate within 40 cm of the body, a formula based primarily on the localized specific absorption rate (SAR) limits; and (iii) for all other transmitters based on a set of formulas for the maximum permissible exposure (MPE) limits. For each class, we provide for both the single-transmitter case and the multiple transmitter case.”*

These exemptions have been constructed on a faulty view that low powered transmitters are by definition operating well within the public limits and are therefore safe.

These assumptions are too simplistic, making the suggested categories irrelevant. The assumption that 1mW is low power is also invalid. It is low power relative to the public limits but when compared to natural background radiation this is certainly not the case. What is clearly lacking is consideration for non-thermal bioeffects or signal modulation patterns used.

*“The record reflects that, at this level of power (The 1-mW exemption), emissions from RF sources would fall safely under our existing SAR or MPE exposure limits, which we do not disturb today.<sup>108</sup> Therefore, at these power levels, a blanket exemption, rather than a requirement for RF exposure evaluation or determination of exemption by other means, is appropriate.”*

The FCC is only considering the carrier frequency and power levels. There is no consideration for modulation frequencies nor for non-linear (biological) dose responses, variability in biological responses and neither is there consideration for intermittent variable exposures. Research shows pulsed radiation is far more bioactive than continuous waves. Higher power does not necessarily mean more risk to health when it comes to non-thermal interactions.

*“We adopt the proposals in the 2013 RF Further Notice to revise the various specific criteria that governed the exemptions from our RF evaluation requirements in favor of a single, generally applicable set of formulas for both single and multiple sources of RF emissions based on power, distance, and frequency of fixed, mobile, and portable transmitters.”*

It is unclear what consideration, if any, the FCC has given to the new MIMO phased array and beam steering technology, especially the characteristics of beam steering/collimated RF beams.

Research also suggests that there are frequency and intensity windows that are potentially hazardous to health. Short intense bursts, such as those used by smart meters, can lead to cellular stress and ultimately cell damage or even cell death. Cellular adaptive responses appear to struggle with such variable and short emission patterns as shown in experiments comparing DNA damage from continuous RF exposure with intermittent exposure of the same frequency and intensity.<sup>53</sup>

ORSAA response continues on the next page

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<sup>53</sup> Non-thermal DNA breakage by mobile-phone radiation (1800 MHz) in human fibroblasts and in transformed GFSH-R17 rat granulosa cells in vitro <http://www.sciencedirect.com/science/article/pii/S1383571805000896>

Although the FCC claim that exemptions will improve efficiency, provide consistency and be more practical, these strategies are clearly geared to industry rather than to specific public health requirements.

In relation to exemptions, it is unclear whether the FCC is legally responsible for any harm occurring from the use of products that on the balance of evidence are determined to induce cancer?<sup>54</sup>

## Specific Absorption Rate (SAR) and testing

SAR and Maximum Permissible Exposure (MPE) standards, taken together, addresses limits for partial-body and whole-body exposures. These standards have been created by Engineers and Physicists and are not grounded in basic biological principles. They only consider thermal effects and disregard a very large evidence base that shows non-thermal effects that cannot be said to be harmless. SAR is currently tested using a phantom called 'SAM' which is unable to address the complex biological responses to RF exposure. Models (phantoms) used for SAR calculation only validate that the radiation emissions from devices being tested lay within the prescribed limits. They provide no insight into cellular processes that are disrupted or impacted by this form of radiation. The SAM phantom and SAR methodology for testing mobile devices is also not protective of all head sizes<sup>55</sup>

The FCC is supportive of computer modelling Finite Difference Time Domain (FDTD) by changing its rules. However, although available for modelling mobile phone manufacturing, the FCC does not make use of computer modelling. These computational studies show that the heating exposure limit is exceeded in children<sup>56</sup>.

The SAR test uses chemical fluids to simulate human tissue or brain matter which cannot simulate complex biological responses. Evidence suggests that RF exposures interfere with cellular function: cell membrane permeability changes, cellular stress response marked by heat shock proteins (HSPs) being expressed as well as the increase in free radicals creating oxidative stress, disruption of signal transduction pathways resulting in a range of detrimental cellular effects. Moreover, the simulated fluid selected to represent adult brain matter is more conductive and therefore less resistive than real brain matter and would therefore underestimate real heating<sup>57</sup>. There appears to be no evidence that this reduced heating effect has not been empirically tested.

FCC was made aware<sup>58</sup> in March 2018 that the current US SAR limits for the general public for mobile phone use is exceeded by some mobile phones when used without an air gap. There is also currently ongoing debate around the possibility that SAR model testing is underestimating the heating for

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<sup>54</sup> The Court of Appeal of Turin confirms the link between a head tumor and mobile phone use.

<https://www.phonegatealert.org/en/the-court-of-appeal-of-turin-confirms-the-link-between-a-head-tumour-and-mobile-phone-use>

<sup>55</sup> Exposure limits: the underestimation of absorbed cell phone radiation, especially in children by Gandhi OP, Morgan LL, de Salles AA, Han YY, Herberman RB, Davis DL. <http://www.ncbi.nlm.nih.gov/pubmed/21999884> ORSAA Paper ID ; 772

<sup>56</sup> Assessment of induced SAR in children exposed to electromagnetic plane waves between 10 MHz and 5.6 GHz by Bakker JF, Paulides MM, Christ A, Kuster N, van Rhoon GC. <https://pubmed.ncbi.nlm.nih.gov/20463374/> ORSAA Paper UID: 763 and Electromagnetic absorption in the head of adults and children due to mobile phone operation close to the head by de Salles AA, Bulla G, Rodriguez CE. <http://www.ncbi.nlm.nih.gov/pubmed/17178592>

<sup>57</sup> Australian 2001 Senate inquiry Report of the Senate Environment, Communications, Information Technology and the Arts References Committee, May 2001 page 58 2,161

<sup>58</sup> Background and Facts Documenting PhoneGate and Our Call for Congressional Action

<https://www.phonegatealert.org/wp-content/uploads/2020/01/Background-and-Facts-on-PhoneGate-with-links.pdf>

rapid pulses to small target areas as will be the case for 5G<sup>59</sup> These uncertainties suggest a precautionary factor of 100 on the basis of use, due to the potential for localized overheating of tissue.

Given the many uncertainties associated with SAR phantom experimental test models<sup>60</sup> and the availability of FDTD computer models, the FCC have not adequately addressed over exposure from phones. No visible precautionary notices to users on the safe use of these devices have been issued. It appears that the FCC are incapable of regulating this industry in a science-and ethics-based manner.

FCC States:

*“Current evaluation procedures require consumer portable devices to be tested at maximum power under normal use conditions”*

Current normal use conditions include placing mobile devices against the ear. Normal usage is not 2.5 cm from the head. Manufacturers specifications for proper usage are often buried deep within the phone menu settings. There is a lack of clear labelling on packaging covering risks or even asking users to refer to the manual. Despite what the FCC implies within their document, wireless device usage is not risk free as shown by a number of studies linking heavy cell phone usage to specific types of rare brain tumors.

*“...so any potential dangers at zero-space would be mitigated.”* was linked to a statement *“Further, certain manufacturers design their phones to include features like proximity sensors, which reduce power when close to a user’s body”*

This is a welcome solution that improves safety. It should be mandated for all wireless transmitting devices rather than being left to manufacturers to decide whether they will choose to implement or not. Otherwise, it is a throwaway statement. Cell phone usage is associated with rare brain tumors and there is evidence to suggest that carrying of cellular phones in bras and trouser pockets is associated with breast cancer and the rising incidence of rectal/colon and testicular cancer respectively.

Some phones have been tested at zero distance and it has been discovered that their SAR ratings exceeded public limits. Phonegate<sup>61</sup> in France uncovered a number of phones that exceed public limits at zero distance and the same was also discovered in the US by the Chicago Tribune<sup>62</sup>. There are a host of studies with exposures at a fraction of public limits showing blood brain barrier breaches, increased DNA damage, chromosomal aberrations, cell death via apoptosis, necrosis, oxidative stress and resulting damage to cellular constituents such as lipids (cell membranes), proteins (enzymes and structural components) and DNA. The FCC and the FDA are yet to provide any convincing evidence that these biological effects are safe particularly if sustained over a long term (not acute exposures which RF Standards and exposure guidelines typically assume).

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<sup>59</sup> Discussion on Spatial and Time Averaging Restrictions Within the Electromagnetic Exposure Safety Framework in the Frequency Range Above 6 GHz for Pulsed and Localized Exposures, by Neufeld E, Samaras T, Kuster N. <https://pubmed.ncbi.nlm.nih.gov/31885092/> ORSAA paper ID: 3670

<sup>60</sup> Inaccuracies of a plastic "pinna" SAM for SAR testing of cellular telephones against IEEE and ICNIRP safety guidelines. <http://ieeexplore.ieee.org/document/1318798/> ORSAA paper ID: 2995

<sup>61</sup> "PhoneGate" French study finds 9 out of 10 Cell Phones Exceed Safe Radiation Limits <https://www.songmeaningsandfacts.com/didnt-i-by-onerepublic/>

<sup>62</sup> Chicago Tribune We tested popular cellphones for radiofrequency radiation. Now the FCC is investigating. <https://www.chicagotribune.com/investigations/ct-cell-phone-radiation-testing-20190821-72qgu4nzlfda5kyuhteieih4da-story.html>

RF Standards and exposure guidelines are typically based on protecting humans from short term acute exposures only. Many experiments that have been conducted on humans have been performed on healthy adults. This gives very little insight into effects on children, chronically ill, pregnant women or the elderly. Rodents are used as a substitute model for representing humans because they share similar biology and many human conditions can be replicated in animals. Rodent studies show long term RF exposures cause a rise in neoplasms, neurological degeneration, behavioral changes, hematological and immunological effects, cellular damage and structural/morphological changes. Many of these effects refute claims of safety.

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*“...phones legally sold in the United States pose no health risks”*

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The validity of this statement can be challenged given the significant amount of scientific evidence available that is in opposition to this claim. There is evidence of increased brain cancer risk, neurological impacts etc. associated with cell phone use. The FCC lacks substantive expertise in health matters to be making such declarations. There are a range of biological effects that are being found in well conducted peer reviewed research occurring at exposure levels well below public limits. These effects do have potential health implications if sustained and so therefore constitute a health risk. A pertinent question is why the FCC and its "sister agencies" ignoring them?

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*“The measurement test setup that is used was designed to test for effects on children as well as adults.”*

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FCC appears to be disregarding evidence of absorption difference and non-thermal bio effects on developing/differentiating cells. Regulatory bodies in some countries are admitting that there is very little research on children. So, how is FCC so confident when it is clearly in conflict with what other more qualified organizations (such as medical organizations) who are urging caution with children?

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*“...we make available information on the characterization of typical RF exposure levels emitted from base stations.”*

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These are typically theoretical calculations that do not take into consideration constructive interference and hot spots caused by reflection and other emitters in the same general location. Actual measurements using appropriate instrumentation are rarely taken.

FCC States:

*“SAR quantities in actual human heads do not vary as they do in homogeneous liquids that are used for standardized compliance testing, but the properties of those liquids were chosen to conservatively represent the heterogeneous tissues in real human heads, including age variation.”*

SAR testing using a SAM phantom provides no insight into cellular responses to an RF insult. It does not verify whether biological effects are occurring and whether they compromise cellular integrity and function.

There is also a false assumption that heating is all that we need to be concerned about. The FCC's RF exposure guidelines are not appropriate for long term chronic exposures or potentially hazardous non thermal biological effects. What is required are biological based standards. To establish biological RF exposure guidelines requires the application of biomedical thought processes along with physical sciences working together. Biologically based RF exposure guidelines would also need to include precautionary measures to minimize harm not just to humans, but also animals, plants and insects, which cannot apply any precautionary recommendations.

## Regulatory Controls

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*Commission's regulations concerning RF emissions, it expressly prohibits them from imposing their own regulations on such facilities on the basis of the environmental effects of such emissions. Thus, "[p]ursuant to Section 332(c)(7), and consistent with the Commission's general authority to regulate the operation of radio facilities, State and local governments are broadly preempted from regulating the operation of personal wireless service facilities based on RF emission considerations."*

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The FCC is able to restrict states from having a say in environmental matters, in spite of the inadequate regulation provided by the FCC, designed to protect industry and federal government interests. Environmental concerns also need to form the basis of any regulations. The continued degradation of the natural environment reveals a lack of consideration across many areas and all levels of government. Very valid concerns are being raised by members of the public and the independent research community that has expertise on RF biological effects. The FCC is using regulation to stamp out, what it sees as dissent that is disrupting the "expert balancing" view. Financial gains appear to outweigh public health. We also challenge the expertise being applied to understanding the science. Too much industry influence means that the voices of those who are challenging the status quo are simply being ignored. There is certainly no balance or accountability in this process<sup>63</sup>.

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*"state-level warning regimes risk contributing to an erroneous public perception or otherwise disrupt the federal regime."*

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A number of US state governments are actually listening to their public constituents (as mandated by the acts under which they serve) and are subsequently looking into the science with an open mind. Their concerns are very valid and supported by science. FCC's fallacious claims of safety on the other hand are clearly contestable.

ORSAA response continues on the next page

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<sup>63</sup> Weller S, et al., Comment on Letter: "Post-Normal Science and the Management of Uncertainty in Bioelectromagnetic Controversies" by A.W. Wood. <https://onlinelibrary.wiley.com/doi/full/10.1002/bem.22225>

## **Environmental Evaluation and Protection**

When it comes to setting RF exposure guidelines, it is unclear what consideration the FCC has given to the protection of the greater environment. RF Standards and exposure guidelines around the world focus on human exposure as if humans are the only inhabitants on this planet; e.g. SAR tests are conducted on models of human heads. It is reckless and negligent not to consider other species including plants, animals, insects and birds, noting that the space in front of fixed antenna is not a vacuum. Peer reviewed studies show that all species are impacted by man-made RF exposures but more attention needs to be paid to smaller creatures such as insects (especially pollinators) and birds.

The FCC claims that it had previously evaluated the environmental effects of RF exposure but it is not clear what studies the FCC has conducted to validate these claims.

*“The National Environmental Policy Act of 1969 (NEPA) requires agencies of the Federal Government to evaluate the effects of their actions on the quality of the human environment. To meet its responsibilities under NEPA, the Commission has adopted requirements for evaluating the environmental impact of its actions. One of several environmental factors addressed by these requirements is human exposure to radiofrequency (RF) energy emitted by FCC-regulated transmitters, facilities, and devices.”*

Environment evaluation only appears to be related to confirming compliance to limits. No tests have been performed to see if there are biological consequences that the radiating equipment has on the actual environment. No ecological studies, no epidemiological studies, no health surveillance studies. An organization that has the public’s best interest at heart would be conducting these studies as part of risk management process to validate and confirm the limits are appropriate.

Today, too much emphasis is placed on the benefits that wireless technology brings but very little consideration is applied to the potential health costs or to the environmental impacts (direct and indirect). Direct being physical damage induced in living organisms and indirect being the energy and natural resources used to create and operate the wireless network.

In effect, the US Government has appointed a non-health body to set RF exposure guidelines to protect human and planetary health. Common sense says it should be under the auspice of a health department or an environmental protection agency who would be far more qualified to make health and environmental impact determinations.

## **Safety Concerns – A lack of due diligence**

The FCC is supporting the rollout of new frequencies and modulation patterns without any due diligence and research being conducted to ensure they are biologically compatible. Assumptions that they are low power are not sufficient for demonstrating safety. The situation becomes even more intolerable when there is no regular monitoring because the public power density level limit could be exceeded and the agencies would have no knowledge of this occurring.

## **Signage**

*“AICC argues that the Category One sign is ‘dangerous and non-productive’ because the public may interpret it as indicating a problem when there is none.”*

This statement is misleading as it implies that exposures below public limits are safe and that there are no health risks. On the contrary, the accumulated peer reviewed scientific evidence indicates real risk. Furthermore, even if there is no “established evidence of harm”, safety cannot automatically be assumed because there is also no proof of safety. The FCC needs to educate itself and the industry regarding the definition of ‘risk’ and how appropriate signage and product labelling can help to mitigate potential hazards.

## Reduction Factors

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*“This factor of ten times the occupational limit is thermally based on a whole-body SAR threshold of 4 W/kg and is intended to protect against behavioral disruption.”*

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Peer review research is showing behavioral changes at levels far lower than public limits. Examples of behavioral changes observed in well conducted studies include spatial memory deficiencies, concentration deficiencies, reduced accuracy and increased anxiety (also demonstrated in animal experiments thereby excluding the possibility of placebo effects). However, it is extremely naive to think that we only need to protect against behavioral changes. There are other significant biological effects that are discussed in this document that are not being considered for their health implications.

*“While some commenters seek Commission action to tighten RF exposure standards, others suggest that the Commission should revise its RF exposure standards to be consistent with less restrictive international standards, like the IEEE or the ICNIRP RF standard.”*

FCC makes reference to the “ICNIRP RF standard” in their statement. ICNIRP does not provide a RF Standard, it only provides guidelines. The ICNIRP RF Guideline is designed for acute exposures as is the case for the FCC implemented RF exposure guidelines. Chronic exposures are not considered. Damaged cells, damaged DNA, neurodegeneration, cardiomyopathy, immune system disruption/dysfunction, behavioral and developmental effects are all not considered and disregarded. Meanwhile, there are clear indicators of declining health and rising incidences of chronic diseases associated with these biological endpoints. Rising incidence of disease parallels the incremental deployment of RF transmitters in our environment along with the rapid increase in personal device use. Yet, very little investigation is conducted to investigate associations.

## Poor Risk Management - A lack of precaution

As was discussed in a letter to the editor in the *Bioelectromagnetics Journal* (2019)<sup>64</sup>, risk management best practice calls for the identification of all potential risks, weighing them and developing mitigation strategies to prevent them from developing into full blown problems.

ORSAA response continues on the next page

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<sup>64</sup> Weller S, et al., Comment on Letter: "Post-Normal Science and the Management of Uncertainty in Bioelectromagnetic Controversies" by A.W. Wood. <https://onlinelibrary.wiley.com/doi/full/10.1002/bem.22225>

Currently, there are several thousand peer reviewed studies that show non-thermal bioeffects that pose real risks to health [Leach et al., 2018]<sup>65</sup>. The Precautionary Approach is used as a risk management framework in the face of scientific uncertainty [Gee, 2009]<sup>66</sup>.

There are two main factors that trigger the precautionary approach: the strength or balance of evidence, and the potential cost of doing nothing. Use of the ORSAA database can readily identify risks, which need to be handled appropriately.

The main tenants for implementing a sound risk management strategy include:

1. Identify the risks
2. Analyze the risks
3. Evaluate the risks
4. Treat the risks
5. Monitor and review the risks

Nowhere in this defined process is there a step to trivialize or ignore the risk, which is clearly happening on the part of Western regulatory agencies such as the FCC and the wireless industry. There is need for a publicly visible risk register that transparently lists all the risks, weighs them and provides details of how they are mitigated. Step 4 and 5 are missing today in most countries. RF infrastructure is continually being rolled out and has been so for many years. However, there are very few monitoring studies being conducted to review how RF background levels are rising and whether there are any measurable changes in the state of health of those living in close proximity to the deployed infrastructure over many years.

What FCC does provide is a very a detailed proposal on evaluating radiofrequency exposure levels and compliance. However, no details on what risks were considered, how they were evaluated and how the RF exposure guidelines mitigates against them. One can only assume the FCC does not see any risks, which of course is nonsensical as the scientific evidence shows the direct opposite, as can be demonstrated using the ORSAA database.

What is apparent is that there are many independent voices who are trying to refute claims of safety by highlighting poor risk management philosophy, conflicts of interest and inadequate expertise demonstrated by government scientists. These voices are being gagged or ignored<sup>67</sup>.

## Conclusions

The foundational basis of the FCC RF exposure guidelines is highly questionable and suspect because it was primarily developed by engineers and physicists without sufficient involvement of biomedical sciences. There is a clear need to develop new protective guidelines that are biologically based. This is important because there is a lot at stake and because many countries around the world have adopted RF Standards that provide more protection than what is being offered today by the FCC and ICNIRP.

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<sup>65</sup> **WHY THE PRECAUTIONARY APPROACH IS NEEDED FOR NON-IONISING RADIATION DEVICES** by V Leach and D Bromwich. Radiation Protection in Australasia (2018) Vol. 35, No. 1

<sup>66</sup> Gee, D., Late Lessons from Early Warnings: Towards realism and precaution with EMF? *Pathophysiology*, 2009. **16**(2): p. 217-231. [http://www.pathophysiologyjournal.com/article/S0928-4680\(09\)00008-X/fulltext](http://www.pathophysiologyjournal.com/article/S0928-4680(09)00008-X/fulltext)

<sup>67</sup> Serious Safety Concerns about 5G wireless deployment in Australia and New Zealand. Letter to the Editor. Radiation Protection Australasia (2020) Vol 37 No. 1 pp 47-54. [https://www.researchgate.net/publication/342085409\\_Serious\\_Safety\\_Concerns\\_about\\_5G\\_Wireless\\_Deployment\\_in\\_Australia\\_and\\_New\\_Zealand](https://www.researchgate.net/publication/342085409_Serious_Safety_Concerns_about_5G_Wireless_Deployment_in_Australia_and_New_Zealand)

The assessment of scientific evidence by ICNIRP, WHO EHC Group has been replicated by the FCC, by fixating on maintaining the RF-thermal only health effect viewpoint while rejecting or omitting all evidence that conflicts with this view. This has been termed as "Constructive Dismissal" by inappropriate use of a preconceived concept to effectively dismiss all evidence that challenges its existence.

The FCC has ignored important findings made by the NTP study and the Ramazzini Institute life-span carcinogenic study. These findings suggest that man-made radiofrequency exposure is a clear carcinogen, linked to certain rare tumors that are being found in association with cell phone RF emissions.

Health and the environment do not appear to be a priority for the FCC. These are being compromised for economic benefits, reduced costs to industry, erosion of human rights and support for exploitation and control via increased surveillance, tracking and data mining. The FCC appears to be above reproach and unaccountable even though it is making statements that are outside of its remit and professional capabilities.

The FCC says that alternative RF exposure limits have not yet been provided by those who question the validity of the current thermal only based RF exposure guidelines. It should not be up to private citizens to make these recommendations. However, they should most definitely be involved in the process to develop them with scientists and medical professionals that are conflict free. Independent scientists must have a voice in the process too. Risk assessment and management needs to be based on potential risks. We should not be waiting until we establish health effects before acting because waiting for a hazard to be established (proven) is not a recognized risk management best practice, considering the amount of personal exposure occurring (both consensual and non-consensual) already on a day to day basis.

We recommend as an interim step that a reduction factor of 1,000 be applied to the current limit for members of the public whose exposure is occurring 24/7 until a proper independent assessment of the science is performed that is free from industry interference. Such assessment must focus on non-thermal effects with particular consideration of frequency modulation, long term exposures, vulnerable populations and synergistic effects which are conspicuously absent with the current FCC assessment of safety. We also recommend that the general public and state government authorities be given a freedom of choice to determine whether they wish to have RF infrastructure deployed in their precincts especially as the number of people suffering adverse effects that have a basis in pathology<sup>68</sup> are increasing. Health considerations must be accepted as an inalienable right so that all levels of government and all citizens have the right to reject an RF transmitter installation. In such circumstances, the company that is wishing to install equipment should be required to provide proof of safety or provide alternative wired options.

We fully expect FCC to dismiss the evidence provided in this document because it is not in alignment with its goals and strategies. Unfortunately, we believe that the FCC is putting at risk the health of all Americans, both current and future generations.

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<sup>68</sup> Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It by Belpomme D and Irigaray P. mar 2020. <https://www.mdpi.com/1422-0067/21/6/1915/htm>

## Annexure

### The International Commission on Non-Ionizing Radiation Protection (ICNIRP)

ICNIRP is a self-appointed NGO body that has created a set of guidelines that ignores a significant evidence base. The members of ICNIRP appear to form an echo chamber that ignores any evidence contrary to their continued claim (since their inception in 1992) that only thermal (heating) effects cause harm.

- ICNIRP is an industry friendly NGO. Many ICNIRP members who have conducted research have received funding directly from industry or the military, and so conflicts of interest cannot be excluded.
- Membership to ICNIRP is by invitation only, and commissioners are selected through an undisclosed process that suits its objectives and which appears to be limited to scientists whose views are consistent with Telco interests. Independent scientists who advocate for a more precautionary approach are consistently excluded from ICNIRP.
- ICNIRP has no representation from scientists from countries that have adopted more stringent safety standards and does not include in its membership any scientists who have divergent opinions.
- ICNIRP does not have sufficient biomedically qualified members. This is a common problem with most government radiation regulatory bodies too.
- ICNIRP is a private NGO with no accountability and has appointed itself as the only body to develop international guidelines. The endorsement by the WHO's International EMF Project (both ICNIRP and the WHO's IEMFP had the same founding chairperson (Michael Repacholi) and has been operating as a "closed club").
- ICNIRP scientists make up the majority of the core EMF group liaising with the WHO IEMFP.

ICNIRP has recently released updated guidelines that do little to protect humans and the wider environment from chronic RF exposures. The concerns raised by prominent international scientists and members of the public in their submissions to a public consultation process preceding the RF guideline release have been ignored. We see a similar pattern occurring with the FCC handling of concerns raised by informed state governments, independent scientists and the public

Close to 100 submissions were made challenging ICNIRP's myopic interpretation of the science and continued incorrect claim that only thermal effects cause harm. Ignoring very valid concerns supported by peer reviewed research shows that this organization cannot be entrusted with protecting the health of nations. Again, this parallels what is happening with the FCC and FDA.

As mentioned previously, many ICNIRP members have connections with industry but also with the WHO via the WHO EMF Project. The WHO is an organization that has previously been embroiled in tobacco science corruption and appears to have not learned from the experience as the same issues are occurring again in relation to RF.

#### ICNIRP RF Guidelines:

- have been designed only to protect humans from heating (thermal) effects;
- do not consider non-thermal biological effects despite considerable research being available which establishes these types of effects can be linked to harm such as cancer;
- consider only short-term acute exposures;

- do not consider the effect of 24/7 long term chronic exposures;
- are not designed to protect birds, other animals or plants;
- have no evidence base to prove the stated levels are “safe” for humans living with current exposures;
- make no provision for protecting against perceptions of potential adverse effects on health (“perceived effects”) contrary to the WHO definition of wellbeing and the rights protected by the Human Rights Act;
- are incompatible with health and safety legislation which requires possible risks to human health to be identified and avoided;
- have been developed without research on, or consideration of, the effects of RF-EMR on pregnant women, children, the elderly, people with immune disorders, people with electronic body parts, or other more vulnerable members of the population.

In a philosophy statement released in 2002, ICNIRP acknowledged that their guidelines do not protect all people, recognizing that a sensitive and more vulnerable populations may exist:

*Different groups in a population may have differences in their ability to tolerate a particular NIR exposure. For example, children, the elderly, and some chronically ill people might have a lower tolerance for one or more forms of NIR exposure than the rest of the population. Under such circumstances, it may be useful or necessary to develop separate guideline levels for different groups within the general population, but it may be more effective to adjust the guidelines for the general population to include such groups<sup>53</sup> (p. 546).*

However, the latest published RF Guidelines have made the guidelines more lenient than the previous publication (rather than more stringent). At the same time, they have removed the requirements for extra protective measures for sensitive or vulnerable people, who have now been included as a subset of the general public.

*The general public is defined as individuals of all ages and of differing health statuses, which includes more vulnerable groups or individuals, and who may have no knowledge of or control over their exposure to EMFs ... Note that a fetus is here defined as a member of the general public, regardless of exposure scenario, and is subject to the general public restrictions<sup>54</sup> (p. 3).*

This change in position seems to be a deliberate legal maneuver to deny existence of harm to any persons, which in effect, means that the ICNIRP guidelines can no longer be called upon to protect such persons.

A previous chairman of ICNIRP, Paolo Vecchia said in 2008 that the ICNIRP Guidelines are not

*Mandatory prescriptions for safety, the “last word” on the issue or defensive walls for industry or others to hide behind.*

James Lin, a former member of ICNIRP has recently written

*Perhaps the time has come to judiciously reassess, revise & update [the ICNIRP] guidelines*

so that they do protect against long-term RF exposures.

## Appendix 1: The FCC relies on the FDA for a balanced assessment of risks.

The Food and Drug Administration (FDA) report on Cancer<sup>69</sup>

The FDA is responsible for protecting and promoting public health through the control and supervision of many consumer products, drugs, vaccines, medical devices, electromagnetic radiation etc. With the recent important NTP study showing clear evidence of GSM radiofrequency exposures causing rare tumors to rodents, the FDA decided to re-evaluate the science to validate previous safety claims. ORSAA has reviewed the FDA report and concludes this is a poor-quality scientific study<sup>70</sup>. It is clearly biased in favor of supporting the FCC and therefore [protecting] industry.

The FDA report purports to be a scientific assessment; however, it falls short in many respects. The rollout of wireless 5G technologies without pre-market safety testing is an unethical experiment on the human population, animals and the environment. This is not how a reputable risk management approach should work. For example, when considering the health risks of ionizing radiation at low doses (below 100 mSv), biological effects are observed, even though no proven health effects exist. In this case, the International Commission on Radiological Protection (ICRP), apply risk management principles such As Low As Reasonably Achievable (ALARA). This principle means that industry and government must do the following:

- design equipment to minimize exposure to users;
- administratively advise users on the safe use of devices;
- use alternative methods of service delivery to limit exposure.

In Health and Safety management, the “Hierarchy of controls” for dealing with risks are as follows:

1. Elimination,
2. Substitution,
3. Engineering controls,
4. Administrative controls and
5. Personal protective equipment.

Clearly with the level of use today, elimination is not practical, but substitution where possible for wired solutions is a clear (and safe) option. It is also clear that substitution of signal encoding can lead to safer technology<sup>71</sup>. USA technology assessors should be weighing up future technological advances free from vested interested and advising governments on safer options.

These philosophies of protection are completely absent from the rollout of wireless technology. This is even more important because man-made EMF, unlike low dose ionizing radiation, is not<sup>72</sup> found naturally in our environment. Life on earth has not biologically evolved with this polarized pulsed

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<sup>69</sup> Review of Published Literature between 2008 and 2018 of Relevance to Radiofrequency Radiation and Cancer <https://www.fda.gov/media/135043/download>.

<sup>70</sup> Mr Victor Leach of ORSAA: Critical review of the FDA 2020 Report <https://betweenrockandhardplace.wordpress.com/2020/04/27/victor-leach-of-orsaa-critical-review-of-the-fda-2020-report/>

<sup>71</sup> An integral predictive model that reveals a causal relation between exposures to non-thermal electromagnetic waves and healthy or unhealthy effects. By Geesink HJH and Meijer DKH. [https://www.researchgate.net/publication/340488204\\_An\\_integral\\_predictive\\_model\\_that\\_reveals\\_a\\_causal\\_relation\\_between\\_exposures\\_to\\_non-thermal\\_electromagnetic\\_waves\\_and\\_healthy\\_or\\_unhealthy\\_effects](https://www.researchgate.net/publication/340488204_An_integral_predictive_model_that_reveals_a_causal_relation_between_exposures_to_non-thermal_electromagnetic_waves_and_healthy_or_unhealthy_effects) ORSAA paper ID: 3668

<sup>72</sup> On the difference between Man-made and Natural Electromagnetic Fields/Radiation, in regard to Biological Activity <https://www.irseco.com/wp-content/uploads/Man-made-and-Natural-EMF-EMR-Dr.Leendert-Vries.pdf>

EMF. Similarly, ICNIRP statements that a short-term (6 minute) thermal guideline protects everyone are reckless and negligent.

The current research on existing wireless technologies tells us clearly that we should be taking a precautionary approach. The precautionary approach is seen as an unnecessary imposition on the telecommunications industry but is a prudent approach when certainty on long-term health are not fully resolved. Current estimates show that a doubling of brain cancer cases, as is occurring in some European countries<sup>73</sup>, could have a substantial burden on the health care industry in the same manner that tobacco smoking has had.

### FDA misses other Health evidence

The FDA report does not address all the subject areas shown below, so their review fails to address the many bio-effects that lead to long-term health issues as shown in Figure 3. The appropriate risk management approach is to apply the precautionary principle in the first instance. The FDA assessment of RF exposure and health was directed at cancer only and so is a very superficial treatment of health effects. When uncertainty exists in science reduction factors in RF-EMF standards and exposure guidelines for Occupational and Pubic Exposures must be applied.

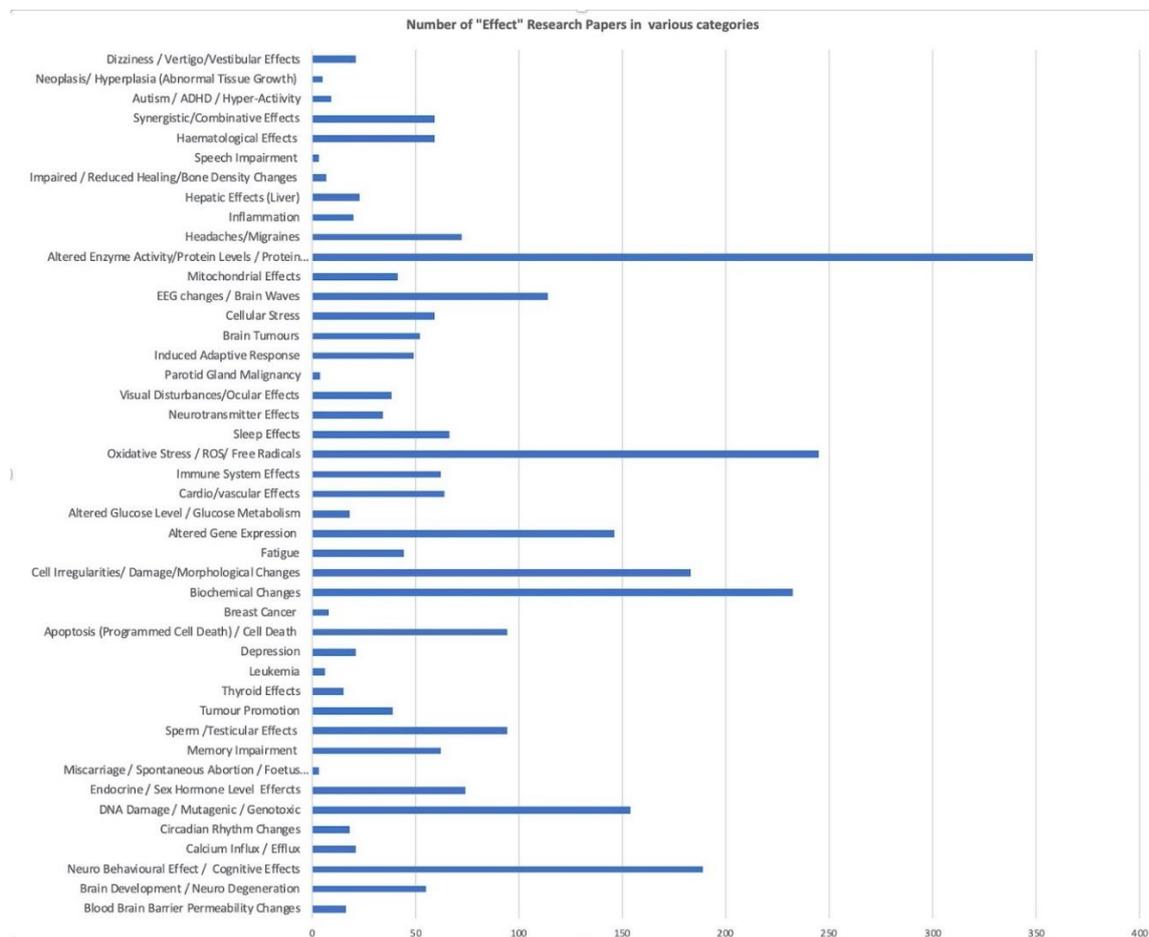


Figure 3. Constructed from the ORSAA database<sup>74</sup>

<sup>73</sup> Mobile phone cancer warning as malignant brain tumors double; <https://www.telegraph.co.uk/science/2018/05/02/mobile-phone-cancer-warning-malignant-brain-tumours-double/>

<sup>74</sup> A novel database of bio-effects from non-ionizing radiation by Leach VA, Weller S and Redmayne M. <https://www.degruyter.com/view/j/reveh.2018.33.issue-3/reveh-2018-0017/reveh-2018-0017.xml> ORSAA paper ID: 3088

DNA damage and hyperplasia occurring in animal experiments at levels permitted in current FCC RF exposure guidelines is evidence enough to take a precautionary approach and to implement risk management policies that put health first.<sup>75</sup> Health of the American people should not be sacrificed for corporate and government financial gains.

#### **A review of papers in the ORSAA database**

ORSAA performed a search using the ORSAA database for scientific papers investigating the genotoxic potential of RF exposures in the same time period selected by the FDA. The results showed all creatures and plants that were exposed to radiofrequencies experienced statistically significant DNA damage (DNA breaks, micronucleation, chromosomal aberrations).

A total of 150 records (out of ~270 records available on this topic) including in vivo, in vitro and epidemiological studies fulfilled the search criteria.

Definitions used in Figures 4 to 6 below are as follows:

*Effect* – represents a statistically significant finding when compared to controls/sham exposure

*Uncertain Effect* – represents a nonsignificant effect – A consistent increase in DNA damage is seen in exposed over control/sham exposure but not statistically significant

*No Effect* – represents no observable change between exposed and control/sham exposed

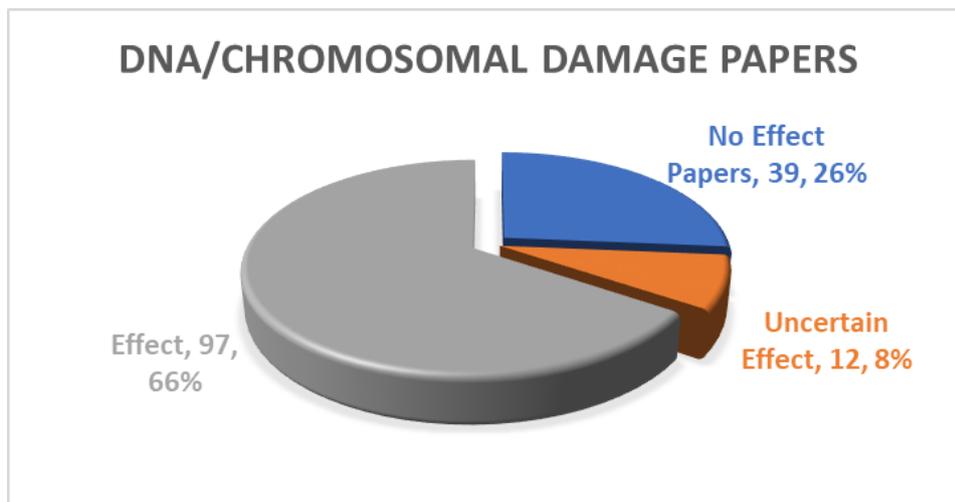


Figure 4: DNA damage/chromosomal aberration findings – not treated for funding source

ORSAA response continues on the next page

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<sup>75</sup> The Significance of Primary Tumors in the NTP Study of Chronic Rat Exposure to Cell Phone Radiation [Health Matters] <https://ieeexplore.ieee.org/document/8866792>. ORSAA paper ID: 3528

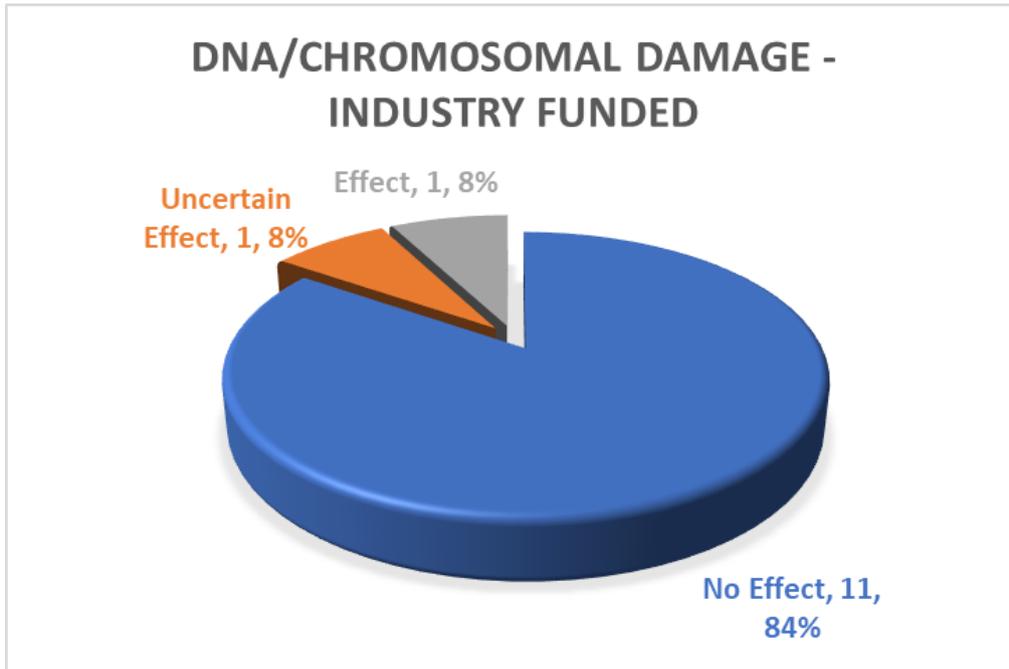


Figure 5: DNA damage/chromosomal aberration industry funded

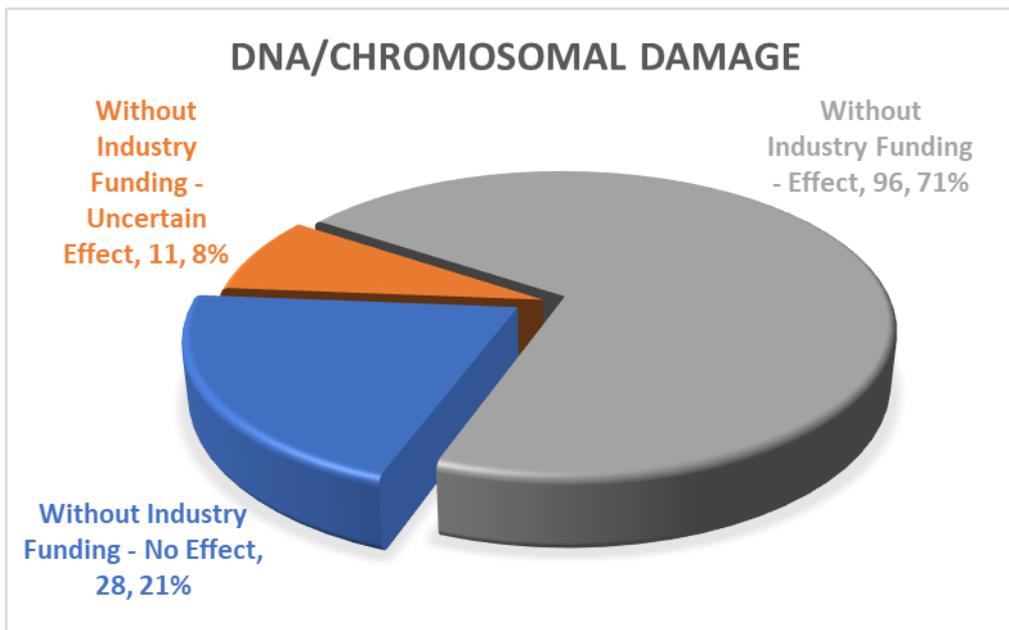


Figure 6: DNA damage/chromosomal aberration with industry funded papers excluded

What we see in these 3 graphs above is the following:

- Man-made RF is genotoxic - The balance of evidence shows RF exposures damages DNA;
- Industry funded studies are more than likely to find no effect. This raises suspicion that such studies are not reliable as the ratio of 'Effect' vs 'No Effect' is directly in opposition to what independent research is finding;
- There is a small amount of uncertainty and may come down to study methodology, cell types investigated (e.g. cell lines vs. primary cells), signal source – real devices (mobile phones) vs simulated with a signal generator and signal type (continuous waves or pulsed).

There are many variables that need evaluation and include duration of exposures, power density or

SAR levels applied, continuous or intermittent exposures as well as synergistic effects with other environmental exposures.

When exploring the ORSAA database for the science associated with non-thermal exposures in general the following results emerge:<sup>76</sup>

- **A compelling body of peer reviewed scientific evidence:**
  - A range of bio-effects with health implications; e.g., oxidative stress (now known to be associated with other serious health conditions such as heart disease and auto-immune disease)
  - About three times more biological “Effect” papers than “No Effect” papers
- **Non-thermal effects**
  - Over 1300 non-thermal studies revealed health or biological related effects.
- **Effects depend on the type of signal used**
  - When real mobile phones are used for *in vivo* (whole animal experiments) experiments, 7 times more “Effect” studies than “No Effect” studies are found
- **Effects below current safety limits:**
  - Bio-effects were occurring at much lower levels of exposure than what the current ICNIRP RF Guidelines and FCC RF exposure guidelines permit for public exposures
  - Many papers reveal mechanisms that operate at the cellular level and can drive these effects
- **Funding source appears to influence research outcomes see Figures 1, 4 to 6 above**
  - Nearly a third of the papers do not provide a statement clarifying funding source
  - Industry-funded studies more often conclude “No Effect” while institutionally funded studies more often conclude “Effect”.
  - There are a number of industry-funded researchers who consistently find “no effects”. These are the very same scientists who are members of a number of influential international review panels and committees. This includes ICNIRP. Such panels regularly make statements that suggest to the public that there is no evidence of harm, contrary to what the scientific evidence is indicating.

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<sup>76</sup> Radio Frequency Exposure Risk Assessment and Communication: Critique of ARPANSA TR-164 Report. Do we have a problem?  
[https://www.researchgate.net/publication/325169912\\_Radio\\_Frequency\\_Exposure\\_Risk\\_Assessment\\_and\\_Communication\\_Critique\\_of\\_ARPANSA\\_TR-164\\_Report\\_Do\\_we\\_have\\_a\\_problem](https://www.researchgate.net/publication/325169912_Radio_Frequency_Exposure_Risk_Assessment_and_Communication_Critique_of_ARPANSA_TR-164_Report_Do_we_have_a_problem)

