



Save Lives, Save Nature, Reduce EMFs

www.emfsafetynetwork.org

PO Box 342, Windsor, CA 95492

The Honorable Robert F. Kennedy, Jr., Secretary
Department of Health and Human Services
200 Independence Avenue, S.W.
Washington, D.C. 20201

October 21, 2026

Re: Request for Information on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure, Docket: HHS-OASH-2026-0397

Attn: The Honorable Robert F. Kennedy, Jr.,

Thank you for this opportunity to submit documents to the HHS regarding EMF and Radiofrequency Radiation exposure so they will be part of the public record. We believe this may be the most important issue of our time, and we appreciate your positive action on this subject by opening up this docket inquiry.

A bit about who we are: The EMF Safety Network was founded in 2009 and became a non-profit public benefit organization in 2024. Our specific purpose is: (a) to provide public education on health, environmental, and safety impacts associated with electromagnetic fields (EMFs) and radiofrequency radiation (RFR), (b) to promote the precautionary principle and prudent avoidance to further limit widespread, chronic, EMF and RFR exposures, (c) to represent and advocate for the interests of residential and small commercial customers of electrical, gas, telephone and water corporations and agencies in California and elsewhere in the U.S., and (d) to promote safe, reliable and environmentally responsible utility services at reasonable and non-discriminatory rates.

We believe the biggest stumbling block in making any changes to solve the growing problem of EMF/RF radiation pollution is the Federal Communications Commission (FCC) and their inherent conflicts of interest.

In their recent Sept. 17, 2026 Public Notice ET 13-84 request for comments, the FCC reveals its primary function and purpose:

“Our organization **The FCC** regulates interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia and U.S. territories. A U.S. government agency overseen by Congress, the commission is the United States' primary authority for communications law, regulation and technological innovation. In its work facing economic opportunities and challenges associated with rapidly evolving advances in global communications, the agency capitalizes on its competencies in:

- Promoting competition, innovation and investment in broadband services and facilities
- Supporting the nation's economy by ensuring an appropriate competitive framework for the unfolding of the communications revolution
- Encouraging the highest and best use of spectrum domestically and internationally
- Revising media regulations so that new technologies flourish alongside diversity and localism
- Providing leadership in strengthening the defense of the nation's communications infrastructure”

Just four days following the posting of the FCC Public Notice, your HHS agency posted a request for comments in the Federal Register, titled: “Notice of Request for Information (RFI) on electromagnetic field (EMF) exposure and human health” dated Sept. 21, 2026.

HHS SUMMARY:

“Consistent with the Department of Health and Human Services' emphasis on evaluating environmental factors that may affect human health, particularly among children and other potentially vulnerable populations, HHS seeks information on electromagnetic field (EMF) emissions and exposure, particularly RF and wireless, and human health. RF radiation and other forms of non-ionizing electromagnetic (EMF) exposure, will hereafter be referred to as ‘RF/EMF.’

“Responses will help identify and assess the current state of the scientific evidence on RF/EMF exposures and health outcomes, compare existing domestic and international safety standards and regulatory approaches, identify research gaps and priority areas for future study, and inform practical, evidence-based recommendations for policymakers, public health stakeholders, families, schools, and communities. HHS welcomes input from researchers, clinicians, public health professionals, industry, standards organizations, educators, advocacy groups, and members of the public to clearly distinguish established evidence from emerging findings and areas of uncertainty, and supports transparent, science-informed decision-making.”

To better understand the goals HHS has prioritized, we discovered the following priorities on your website which specifically addresses conflicts of interest and implementation of “gold standard” science. Both these topics are applicable to your inquiries on EMF exposure and human health.

<https://www.hhs.gov/about/priorities/index.html>

Prevent conflicts of interest

The public must know that unbiased science—evaluated through a transparent process and insulated from conflicts of interest—guides the recommendations and programs of our health agencies. HHS will deprioritize partnerships with organizations that present conflicts of interest, politicize science, or otherwise compromise their objectivity or integrity in carrying out HHS-funded programs.

Achieve gold standard science

HHS has a robust plan to implement Gold Standard Science. To the extent permitted by law, HHS programs will prioritize programs and organizations that exhibit strategies to promote the tenets of Gold Standard Science, like innovative program designs to promote constructive skepticism, replicability studies, and research on how to make every dollar of science funding go further. Gold Standard Science is based on nine principles that help make federal science and scientific research reliable and trustworthy.

Nine Tenets of Gold Standard Science

1. Reproducibility
2. Transparency
3. Communication of error and uncertainty
4. Collaboration and interdisciplinary science
5. Constructive skepticism of findings and assumptions
6. Use of falsifiable hypotheses
7. Use of unbiased peer review
8. Acceptance of negative results as positive outcomes
9. Minimizing conflicts of interest

In our submission, we will be commenting on a number of topics as outlined below.

- Public Experiences and Reported Potential Adverse Health Effects (2)
- “Prevent conflicts of interest” and “Achieve gold standard science” (*from HHS website: • Priorities and Goals: <https://www.hhs.gov/about/priorities/index.html>*)
- What existing national and international exposure standards, guidelines, or regulatory frameworks should federal health agencies consider when evaluating the potential adverse health effects of human exposure to RF/EMF? (5)
- What scientific evidence exists about potential adverse health effects caused by current exposure limits? (6)
- According to scientific evidence, how do the technologies below affect cumulative exposure patterns? (5G-6G, Wi-Fi, Satellite-based communications, Internet of Things (IoT) Wearable technologies, Smart homes/appliances, Smart cities, Autonomous vehicles, Wireless medical devices, Communication enabled smart meters.) (13)
- What scientific evidence exists regarding potential adverse environmental effects associated with RF radiation? (14)
- What types of scientific evidence should be considered when evaluating RF exposure associated with wireless infrastructure? (15)

Public Experiences and Reported Potential Adverse Health Effects (2)

Many of us first became aware of the EMF/RF radiation problem by experiencing unexplained health issues. We had that “aha” moment when we discovered that the negative effects we were experiencing were from wireless devices in our homes or workplaces. Being away from these locations helped us feel better. In search of support, we discovered others who were experiencing the same problems. Groups formed, and awareness grew. We noticed the myriad sources of EMFs in our homes and communities, and learned about avoidance, mitigation, and shielding.

However, we’re also noticing, firsthand, the alarming changes in our environment that may be caused by the effects of wireless radiation pollution. Some of us no longer have flocks of birds visiting our trees, and in our yards where we have our organic gardens (that have never been sprayed) there are very few insects. One would think less bugs is a good thing, but it signals a very disturbing trend. Trees that once made plenty of fruit are no longer producing as they did, because there are fewer bees. Some are

blaming climate change, but there is an equally, and in our opinion, more profound situation going on here. Radiofrequency radiation has become so ubiquitous that it is changing the very fabric of our environment.

Many of us have purchased reliable consumer grade RF radiation detection meters to identify sources of RF radiation and made changes in our homes to eliminate as much RF radiation as possible. In states where it's available, we've replaced radiating smart utility meters with analog meters, hardwired devices inside our homes to eliminate wifi, and use cell phones sparingly.

Why are we doing all this? Because many of us are getting sick from EMFs and wireless radiation which is getting increasingly harder to avoid. What's the evidence that EMF/RFR is the cause?

Here's what we have learned. Many people began experiencing symptoms shortly after a smart meter was installed, a new router was hooked up in their home office or family room, or a cell tower was installed close to their house. Personal experience, before and after exposure, is usually a good indicator of the cause. When the cause of the exposure is removed and the symptoms go away, either immediately, or shortly thereafter, that tells us something. When the person is re-exposed and the symptoms return, that's almost a no-brainer. They know what to avoid to not get sick.

Living next to a "Small Cell" facility

A good friend began experiencing vertigo and flu-like symptoms within a week or so after a small cell antenna array was installed on a utility pole less than 50 feet from her home. She can now use only a few rooms of her house because spending time in the other rooms makes her feel sick. She sleeps in a shielded 8'x 9' shielded enclosure to avoid the radiation from the small cell, and this gives her some relief at night so her body can recover. It took her a year to finally obtain a well calibrated RF radiation meter, and she has now taken over a thousand RFR readings in different rooms of her house as well as her yard.

What is especially disturbing is the fact that workmen have needed to do work on this utility pole (or on the road immediately adjacent) and can be out there for an hour or longer. The RFR is never shut off. My friend knows this, as her meter still displays high readings while they are working. She has written letters to the utility companies and other city departments but has noticed the tower is always on. A sign on the utility pole with the small cell array (only 42 feet from her house) states:

"NOTICE: RF Exposure near antennas may exceed the FCC General Population Maximum Exposure limit. Workers should maintain a minimum approach distance of 20 feet."

Perhaps it is assumed that the occupational workers are aware of the dangers of close proximity to the antennas and there is no concern, since they are not considered part of the "general population." It is assumed they read the sign.

The FCC has information on their website about the RF radiation for occupational exposure as follows:



***FCC Notice on utility pole with small cell antennas:
"Maintain minimum approach distance of 20 feet."***

(2) “Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of *transient* persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. In situations when an untrained person is transient through a location where occupational/controlled limits apply, he or she must be made aware of the potential for exposure and be supervised by trained personnel pursuant to § 1.1307(b)(2) of this part where use of time averaging is required to ensure compliance with the general population exposure limit. The phrase *exercise control* means that an exposed person is allowed and also knows how to reduce or avoid exposure by administrative or engineering work practices, such as use of personal protective equipment or time averaging of exposure.

(3) “General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. For example, RF sources intended for consumer use shall be subject to the limits for general population/uncontrolled exposure in this section.”

[https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-1/subpart-I/section-1.1310#p-1.1310\(e\)\(1\)](https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-1/subpart-I/section-1.1310#p-1.1310(e)(1))

The “pluming effect” of RF radiation emissions

At my friend’s house, we’ve discovered interesting things, such as what times of day the small cell is most active (usually around 10pm) and where RFR readings are highest on her neighborhood block. Strangely, RFR levels directly at the foot of the tower are lower than about 200 feet down her street. We’ve learned about the “pluming effect” of this radiation, which spews out a bit like an erupting volcano. When we’re told by RF engineers that levels from these towers are only a small set percentage of the FCC guidelines, we just shake our heads, because we know how much they change and fluctuate, even within an hour, depending on a number of variables. Building biologists understand this experience since they take these RF radiation readings as part of their job. Our hearts go out to those who have had to leave their residences in order to avoid the radiation from a cell tower or small cell facility close to their homes. Unfortunately, my friend is unable to move away from the small cell due to limited financial resources.

Copper landlines being discontinued

People who still depend on copper landlines are alarmed that phone companies are in the process of removing them. Discontinuance notices have already been received by residents in many states. We can’t use the newer phone devices being offered that connect to a cellular network (with RF radiation) because we get symptoms from the wireless signal such as headaches, sleep disturbances, brain fog, tinnitus, exhaustion, and other health problems. If we have to contract with a Voice Over Internet connection (VOIP) via cable or fiber, we must do so safely with a router that does not emit RFR, and non-transmitting routers are rarely provided. In addition, all routers depend on a power source.

EMF Safety Network Health Survey

In 2019, EMF Safety Network published a survey on our website that was conducted from Nov. 2018 to Jan 2019 by our founding director (2009-2022), Sandra Maurer, (currently Vice Mayor of Sebastopol, CA) which is titled “The EMF Health Effects Survey 2019.” There were 879 respondents (anonymous to protect personal info) and over 1300 comments. Ms. Maurer hired Ed Halteman, PhD of Survey Design and Analysis to prepare a report of the survey results. She has submitted a letter in this docket with the comments and survey results. The Oct. 13 submission can be viewed at: <https://www.regulations.gov/comment/HHS-OASH-2026-0397-2571> or <https://emfsafetynetwork.org/?s=Survey>

Ms. Maurer states: “The top health problems all respondents experience and believe are related to EMF exposure are: sleep; fatigue; concentration, memory or learning problems; and stress and anxiety. The top EMF device(s), all respondents believe caused or worsened their health problems are: wi-fi; cell phone; smart meters; and cell or radio tower.” While this survey was not peer reviewed, Ms. Maurer points out that it provides important information about people’s experience.

Prevent Conflicts of Interest and Implement Gold Standard Science
(from HHS website: **Priorities and Goals**) <https://www.hhs.gov/about/priorities/index.html>

The FCC, ICNRP and Conflicts of Interest

The FCC is empowered to set guidelines for RF Radiation Maximum Permissible Exposure (MPE) levels for the use of all wireless facilities and devices. However, the FCC is not a health agency and therefore is not in the position to conduct studies on health or environmental effects of RFR. They must depend on other agencies to determine these levels. What we find most disturbing is that every local, county, and state government defers to the FCC for their safety guidelines in their decision making and facility permitting process.

We understand that the FCC is in the position of selling frequency spectrum to the wireless communications industry, which makes billions for the US Treasury, and in turn, makes billions for the industries to which they sell this spectrum.

Is this not an inherent conflict of interest since the FCC is selling spectrum, making enormous profits from these sales for the US Treasury, and simultaneously promoting industry expansion and profits for their “customers” (the telecommunications industry) whom they are charged with regulating?

A PubMed article dated July 15, 2020, titled “*Health risks from radiofrequency radiation, including 5G, should be assessed by experts with no conflicts of interest*” discusses obvious conflicts of interest on this subject. Excerpts from this paper are below: <https://pmc.ncbi.nlm.nih.gov/articles/PMC7405337/#sec4>

“An important factor may be the influence on politicians by individuals and organizations with inborn conflicts of interests (COIs) and their own agenda in supporting the no-risk paradigm. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has repeatedly ignored scientific evidence on adverse effects of RF radiation to humans and the environment. Their guidelines for exposure are

based solely on the thermal (heating) paradigm and were first published in ICNIRP 1998, updated in ICNIRP 2009 and have now been newly published in ICNIRP 2020, with no change of concept, only relying on thermal effects from RF radiation on humans. The large amount of peer-reviewed science on non-thermal effects has been ignored in all ICNIRP evaluations. Additionally, ICNIRP has successfully maintained their obsolete guidelines worldwide.

“COIs [Conflicts of Interest] can be detrimental, and it is necessary to be as unbiased as possible when assessing health risks. There are three points that should be emphasized. Firstly, the evidence regarding health risks from environmental factors may not be unambiguous, and therefore informed judgements must be made. Furthermore, there are gaps in knowledge that call for experienced evaluations, and no conclusion can be reached without value judgements. Secondly, paradigms are defended against the evidence and against external assessments by social networks in the scientific community. Thirdly, the stronger the impact of decisions about health risks on economic, military and political interests, the stronger will stakeholders try to influence these decision processes.

“COIs with links to industry are of great importance; these links may be direct or indirect funding for research, payment of travel expenses, participation in conferences and meetings, presentation of research, etc. Such circumstances are not always declared as exemplified above.

“ICNIRP is a non-governmental organization (NGO) based in Germany. Members are selected via an internal process, and the organization lacks transparency and does not represent the opinion of the majority of the scientific community involved in research on health effects from RF radiation. Independent international EMF scientists in this research area have declared that: *‘In 2009, the ICNIRP released a statement saying that it was reaffirming its 1998 guidelines, as in their opinion, the scientific literature published since that time has provided no evidence of any adverse effects below the basic restrictions and does not necessitate an immediate revision of its guidance on limiting exposure to high frequency electromagnetic fields. ICNIRP continues to the present day to make these assertions, in spite of growing scientific evidence to the contrary. It is our opinion that, because the ICNIRP guidelines do not cover long-term exposure and low-intensity effects, they are insufficient to protect public health’ ...*

“ICNIRP only acknowledges thermal effects from RF radiation. Therefore, the large body of research on detrimental non-thermal effects is ignored.”

Q. What existing national and international exposure standards, guidelines, or regulatory frameworks should federal health agencies consider when evaluating the potential adverse health effects of human exposure to RF/EMF? (5)

It’s a fact that the FCC’s guidelines have not been updated since 1996, despite the fact that much has changed in the past 30 years regarding the proliferation of wireless infrastructure and devices. Research reveals that these FCC guidelines were adopted from the 40+ year old IEEE-ICNIRP guidelines based solely on thermal (heating) effects at high levels of RFR exposure, and only for brief time periods of time (less than an hour). This was determined in the 1980’s by the de Lorge studies with eight rats and five monkeys which had resulted in “general population” Maximum Permissible Exposure for 30 minutes, and occupational exposure for 6 minutes (with five times the radiation intensity). Therefore, the FCC based their guidelines on IEEE and ICNIRP approval of these RF radiation limits dating back to the rats and monkeys experimental tests from the 1980’s.

Eight Rats and Five Monkeys

In 2023, the rats and monkeys experiments were explicitly discussed in the *International Journal of Environmental Research and Public Health* via a paper co-authored by 13 experts on behalf of the *International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF)*: These experts include: Paul Héroux, Igor Belyaev, Kent Chamberlin, Suleyman Dasdag, Alvaro Augusto Almeida De Salles, Claudio Enrique Fernandez Rodriguez, Lennart Hardell, Elizabeth Kelley, Kavindra Kumar Kesari, Erica Mallery-Blythe, Ronald L. Melnick, Anthony B. Miller, and Joel M. Moskowitz. The paper is titled “Cell Phone Radiation Exposure Limits and Engineering Solutions”.

https://www.researchgate.net/publication/369836628_Cell_Phone_Radiation_Exposure_Limits_and_Engineering_Solutions.



Eight Rats, Five Monkeys. In the 1980's, the de Lorge experimental tests involving eight rats and five monkeys led to the adoption of RF radiation guidelines by IEEE, ICNRP, and the FCC based on thermal heating of tissue for short time periods, 30 min and 6 minutes. The above graphic illustrates the role of IEEE, ICNRP, and the US FCC in the marketing of wireless devices that is still in effect today.

As stated in this important *ICBE-EMF* paper:

“The wireless industry has often claimed that there is “no mechanism” by which RFR can interact with biological systems at exposures below their thermal recommendations. In fact, the mechanisms are quite clear, involving the perturbation by RFR fields of the movement of charged particles, electrons, and protons that are spontaneously liberated by all living systems.

“These basic mechanisms have a multitude of downstream consequences at an almost unlimited number of points of action within and between important molecules that influence biological events. Life's processes depend so heavily on the movement of electrical charges that there is no hope of cataloging all

these points of action, although science should ultimately identify most of the highly vulnerable sites. It is the multiplicity of these RFR points of biological action that explains why the Oceania Radiofrequency Scientific Advisory Association database on Electro-Magnetic Field (EMF) Bioeffects already lists 400 scientific papers describing altered enzyme activities at power levels that are typical of everyday exposures, much below the safety thresholds promoted by ICNIRP's industry guidelines.

Q. What scientific evidence exists about potential adverse health effects caused by current exposure limits? (6)

The paper discussed above identify seven fundamental “Blind Spots” in the IEEE-ICNIRP evaluation of the biological effects of RFR. While they are all very important, for space, we will primarily be including sections of Blind Spot #1, #2, and briefly, #3. Edited version follows. For full copy, citations, footnotes and links:

https://www.researchgate.net/publication/369836628_Cell_Phone_Radiation_Exposure_Limits_and_Engineering_Solutions

Blind Spot #1: RFR Toxicology and Risk Assessment

“In the late 1960s, when the discussion of RFR safety limits started, there were already many papers documenting non-thermal biological impacts at RFR levels much lower than the current IEEE-ICNIRP safety limits. Contemporary lists of such non-thermal effects are available. Acknowledging these reports as genuine “effects” and classifying many of them as “observable” and “adverse” should have lowered the safety levels of RFR by many orders of magnitude. However, IEEE’s C95 committees were reluctant to accept these reports as observable or adverse. This reluctance is well illustrated by the intense attention devoted to heat, with which the engineering community was familiar, and which was falsely promoted as the only genuine or reproducible effect of RFR. This fixation on heat was used to supersede the traditional indicators of toxicity supported by biology and medicine.

“To avoid acknowledging them as “observable”, a need for replication was claimed, with strict criteria. In science, studies are very rarely exactly replicated, as replications are generally unpopular with investigators. Not only is funding more difficult to obtain, but it also removes the investigator’s right to originality, discovery, and possibly even patent applications, blighting the image of science moving forward. A second problem is that in bio-medicine, as opposed to physics or engineering, it is almost impossible to reproduce molecular, genetic, cellular, and animal studies exactly. Biological material, in its genetic and microbiome variations, for example, is inherently more difficult to control. A biological model is sensitive to a large variety of variables and can be investigated by a wide diversity of techniques. Placing unrealistic reproducibility requirements on non-thermal RFR biological observations deliberately ignored the practical limits experienced in laboratories when seeking to simulate the physical and biological complexities of the real world.

“Despite its rejection of classic risk assessment science, IEEE sought to keep control of the determination of Electromagnetic Radiation (EMR) safety thresholds. IEEE ultimately relied for RFR risk assessment on two behavioral studies conducted by the Naval Aerospace Medical Research Laboratory, one in rats (see the generic setup in Figure 1) and one in monkeys to set a starting point for the determination of a reference dose. IEEE pointed out that in these two experiments, behavioral thresholds for monkeys were similar to those of rats and therefore constituted replication. In view of the species differences, IEEE’s

exacting requirements for “replication” were considerably relaxed on this occasion. Other weaknesses of these two de Lorge studies are the very small numbers of animals and exposure sessions (8 rats and 5 monkeys; typically, 3 sessions) as well as their remarkably short durations (40-min in rats and 60-min in monkeys). An even more disturbing question is whether a single acute behavioral response is appropriate for general and long-term toxicity determinations.

“Behavioral screening techniques for toxicity determinations were developing at about the same time as de Lorge’s experiments. However, the consensus among scientists in that field at the time was that toxicity thresholds using behavioral methods could only be obtained reliably by using multiple rather than single variables. A historical account of the development of behavioral screening for toxicology states that a battery of tests is needed to find the most sensitive behavioral endpoint for a given agent. The testing arrays required are best described by the Functional Observational Battery (FOB) first published in 1985 by the US Environmental Protection Agency to impose structure in neurotoxicity tests. A FOB should include sensory effects, neuromuscular effects, learning and memory, and the histopathology of the nervous system.

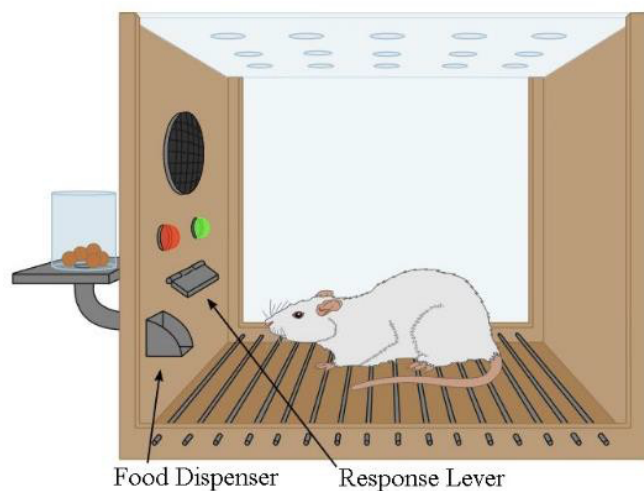


Figure 1. A version of a Skinner box for operant conditioning. The variable discussed is the rate at which a lever is pressed for food by the hungry animal when exposed to RFR.

“IEEE’s and ICNIRP’s determination, which underpins current guidance limits, rested on a single outcome, pressing a lever for food, while similar investigations of behavioral toxicity required 20 to 30 different endpoints. It should have been realized that the general toxicity of RFR could not be reliably determined using a test that did not even meet the standards of the day for behavioral toxicity, and certainly not for general toxicity or carcinogenicity. Such a decision could only be justified from an a priori conviction that the only real effects of RFR were thermal.

“The rat and monkey tests conducted by de Lorge were 1 hour or less at 0.225, 1.3, and 5.8 GHz and were performed at extremely high doses of RFR. The lowest RFR exposure in any monkey test was 50,000,000 $\mu\text{W}/\text{m}^2$, and the highest was 1,500,000,000 $\mu\text{W}/\text{m}^2$. These RFR intensities were so high that they produced minor burns on the faces of three of the five monkeys. These levels are also huge compared to those now considered safe for long-term daytime human exposures by the European Academy for Environmental Medicine (EUROPAEM) working group, 10 to 100 $\mu\text{W}/\text{m}^2$. This factor of a million in intensities between de Lorge’s acute data and EUROPAEM recommendations begs the

question as to whether the same class of effects was being investigated. Facial burns to radar operators over 1 hour are clearly undesirable in a military context, but are these effects relevant to cancer induction over a lifetime of exposure to cell phone RFR?

“The context of de Lorge’s tests is difficult to reconcile with a general toxicity determination because very high-power densities were used to disturb the animal’s observing responses, and all these responses were exclusively interpreted in a thermal context. Rather, it seems that de Lorge investigated the Maximum Tolerable Doses of RFR heat over 40 min (“40m-MTD”) and related them to a preferred variable, a 1 °C rectal temperature increase in the monkeys, a connection that is itself cast into doubt. In toxicology, MTDs correspond to a dose that does not heavily alter physiology, will not compromise the survival of the animals by causes other than carcinogenicity, or that results in up to a 10% lower body weight after 3 months of exposure. de Lorge’s experiments were investigating tolerance to heat, but could not actually be used to determine general toxicity, NOELs [No-Observable-Effect Levels], NOAELs, [No-Observable-Adverse-Effect Levels], or LOAELs [Lowest-Observable-Adverse-Effect Levels]. The gulf between the RFR safety limits suggested in 1966 by the American National Standards Institute (ANSI), the precursor to IEEE’s C95 committees, and those of EUROPAEM 50 years later is explained below.

*“First, although evidence of non-thermal effects of RFR had been accumulating for decades, a legal challenge to the thermal views of ANSI-1966 and of the commercial practices of the US Federal Communications Commission (FCC) was only successfully mounted in 2020 by multiple plaintiffs including the Environmental Health Trust and the Children’s Health Defense in a US federal appeals court.

“Second, common exposures in 1966 involved military personnel for field communications and radar operations, and the public, exposed to remote broadcasting towers. Fifty years later, most of the world’s population (4.4 billion in 2017) uses cellular phones routinely placed against the head.

[Note: Efforts to inform people when purchasing a new cell phone to keep phone away from head during cell calls have been unsuccessful due to industry pressure. <https://www.prlog.org/12299052-cell-phone-radiation-label-bill-passes-maine-legislature-before-dying.html>
<https://www.prlog.org/12383163-berkeley-proposed-cell-phone-right-to-know-ordinance.html#>]

“Third, the composition of the committee assessing RFR in 1966 was completely different from later health-oriented groups, reflecting a shift in the population of users. The 1966 representation of wireless “consumers” was mostly from the military (left in Figure 2 below). The EUROPAEM specialists, 50 years later (right of Figure 2), were devising “guidelines for differential diagnosis and potential treatment of EMF-related human health problems”, essentially involved in the protection of the population now known as the electromagnetically hypersensitive, but earlier designated as victims of “microwave sickness”. Two powerful RFR sources had been progressively added to the environment over 50 years: a source held against the head and the almost ubiquitous network of weaker signals from cell phone base station towers.

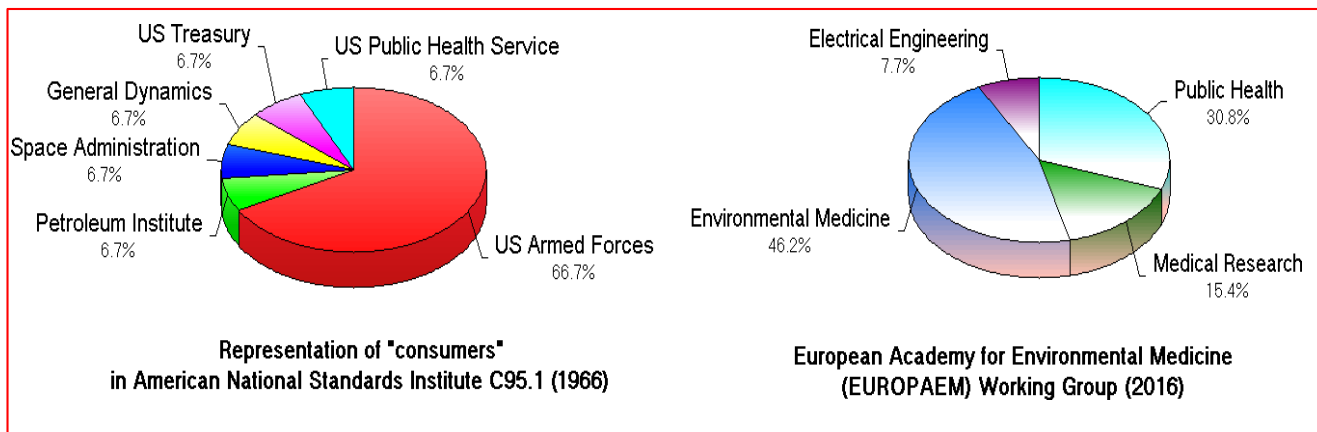


Figure 2. Task forces assessing biological impacts of RFR in 1966 (IEEE) at left, and EUROPAEM, 50 years later, at right.

“At the moment of decision, a 1 °C body temperature rise might have seemed to IEEE as sufficiently equivalent to a slight fever to allay fears of RFR dangers when presented to the public. However, with this focus on heat, IEEE heavily shifted its reference dose towards higher exposures.

“IEEE’s 2005 document C95 on RFR safety acknowledges that the “rules protect against adverse health effects associated with heating”, and that the safety limits are “designed to protect against adverse health effects resulting from tissue heating, the only established adverse effect of exposure to RF energy at frequencies above 100 kHz”. Further, the document restricts “established health effects” to shocks, “behavioral disruption, heat exhaustion or heat stroke due to excessive whole-body RF exposures”. This document addresses heat as the only “established” effect of RFR and is clearly outdated and wrong based on the many hundreds of scientific studies published on non-thermal effects over the past 25 years.

“The symbiotic role of IEEE, ICNIRP, and the US FCC in the marketing of wireless devices can be summarized. IEEE, “the world’s largest technical professional organization dedicated to advancing technology” issues health protection limits based on heat. The baton is passed to ICNIRP, which is not a professional organization, but an ad hoc group formed to accommodate the rise in RFR exposures needed by new telecommunications hardware. This is carried out by claiming that IEEE recommendations account for all risks beyond heat and that these limits could, in fact, be relaxed. The FCC, a regulator of interstate and international communications, and essentially a spectrum allocation agency with no in-house health expertise, is positioned to set RFR exposure limits in the US. The path of regulation from the 1960s to now is a tunnel mostly insulated from biomedical knowledge that inevitably led to inadequate protection from RFR health risks to humans and the biota.”

Blind Spot #2: 40–60 Min Is Not a Lifetime

“Notably, de Lorge’s short “performance” experiments could not credibly be extended to cover all possible chronic health effects of RFR, but some data were fortunately available on the long-term thermal adaptation of animals to RFR exposures. This meant that a credible argument to support the high-exposure levels needed for future commercial deployments could be made if the discussion was entirely

limited to thermal health effects. Should de Lorge's acute exposure experiments (40–60 min) assessing a single outcome, pressing a lever for food, become the basis for general chronic toxicity in humans typically living up to 75 years?

“The philosophy that allowed this leap of faith by IEEE-ICNIRP is well illustrated by an ICNIRP representative's comment: “ICNIRP only considers acute effects in its precautionary principle approach. Consideration of long-term effects is not possible”. Essentially, IEEE-ICNIRP believe that long-term effects of RFR are “not corroborated”, not replicated, or not consistent, imposing arbitrary requirements on the reproducibility and reliability of health effects research within the privacy of their committees. Notably, de Lorge's acute (40–60 min) animal data represent a most extreme case of long-term extrapolation. IEEE used these acute experiments focused exclusively on heat and behavior (Blind Spot #1) to set safety limits within their C95 committee, while at the same time promoting in other public and government forums that their safety limits encompassed all risks and applied over a human lifetime.”

Blind Spot #3: Averaging Human Exposures over 6 or 30 Minutes

“IEEE-ICNIRP's maximum permissible RFR limits quantify exposures by averaging and compiling 6- or 30-min exposures into a single number. This averaging was justified by the relation between the total energy of the RFR signal and the predictable temperature increase in tissues. However, IEEE-ICNIRP's averaging procedure erases the rapid variations of the RFR signal over short time intervals, while it is precisely within these short times that biological reactions occur. Transfer of electrons and protons as well as enzymatic reactions occur over time intervals much shorter than 6 or 30 min, [as shown in table]. This averaging procedure also allows extremely high RFR intensities during very short periods, exceeding the activation levels of specific biological reactions....”

Again, use this link for accessing more info on Blind Spots #4,#5,#6 & #7, including reference tables.
https://www.researchgate.net/publication/369836628_Cell_Phone_Radiation_Exposure_Limits_and_Engineering_Solutions

Q. According to scientific evidence, how do the technologies below affect cumulative exposure patterns? (5G-6G, Wi-Fi, Satellite-based communications, Internet of Things (IoT) Wearable technologies, Smart homes/appliances, Smart cities, Autonomous vehicles, Wireless medical devices, Communication enabled smart meters.) (13)

Aggregate (accumulated) exposure using FCC calculations

It is inconceivable that in 2026, with the average home having numerous radiating sources including wifi, smart TVs, wireless laptops, computers, printers, wireless security cameras, smart meters, smart assistants (Alexa or Siri), smart watches on wrists, wireless earbuds in ears, and a cell phone in the pocket or purse, that the aggregate or accumulated radiation is not being determined for safe RFR exposure. With a cell tower, small cell, or antenna array on a building nearby, the aggregate radiation levels can be much higher from the cumulative exposure. Typical home exposure must be considered when using the prescribed formula for determining RF radiation MPE levels. How much radiation are people being exposed to if they are in their home for more than 30 minutes, as we all are?

The FCC has a detailed formula for calculating the RFR from all sources to determine the MPE level. Does an RF engineer from the wireless industry who is presenting a Radiofrequency Compliance Report to a local governing body ever refer to this formula or actually use it in their calculations? Do they also consider the nearby metal buildings, that can cause high reflection or even metal stadium bleachers on a sports stadium that can affect the RFR levels? What about reflection from wet ground during a rainy season which can cause an increase in the ambient radiation levels by up to a factor of 4?

The following formula requires consideration of all sources operating at the same time. *Warning:* This formula might require someone with an advanced degree in mathematics to understand. (The Greek sigma simply means to “sum over: the sources that follow it.) [https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-1/subpart-I/section-1.1307#p-1.1307\(b\)\(3\)\(ii\)\(B\)](https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-1/subpart-I/section-1.1307#p-1.1307(b)(3)(ii)(B))

FCC Formula

For fixed RF sources operating in the same time-averaging period.

[https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-1/subpart-I/section-1.1307#p-1.1307\(b\)\(3\)\(ii\)\(B\)](https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-1/subpart-I/section-1.1307#p-1.1307(b)(3)(ii)(B))

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using [paragraph \(b\)\(3\)\(i\)\(B\)](#) of this section for P_{th} , including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using [paragraph \(b\)\(3\)\(i\)\(C\)](#) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th,i}$ = the exemption threshold power (P_{th}) according to [paragraph \(b\)\(3\)\(i\)\(B\)](#) of this section for fixed, mobile, or portable RF source i .

ERP_j = the ERP of fixed, mobile, or portable RF source j .

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of [paragraph \(b\)\(3\)\(i\)\(C\)](#) of this section.

$Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

$Exposure\ Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k , as applicable from [§ 1.1310 of this chapter](#).

The FCC table below explains how limits for MPE are calculated depending on Frequency range, Electric or Magnetic field strength, Power density, and Averaging time in minutes. The explanation for this table is difficult to follow as it discusses Specific absorption rate (SAR), whole body versus body

extremities exposure, peak spatial average limits, and the use of supported measurement or computational methods as well as exposure conditions. The purpose for including this is to paint a full picture of the complicated process involved when determining Maximum Permissible Exposure for both occupational workers and the general population.

TABLE 1 TO § 1.1310(E)(1)—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

[https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-1/subpart-I/section-1.1310#p-1.1310\(e\)\(1\)](https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-1/subpart-I/section-1.1310#p-1.1310(e)(1))

§ 1.1310 Radiofrequency radiation exposure limits.

(a) Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).

(b) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.

(c) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

(d) (1) Evaluation with respect to the SAR limits in this section must demonstrate compliance with both the whole-body and peak spatial-average limits using technically supported measurement or computational methods and exposure conditions in advance of authorization (licensing or equipment certification) and in a manner that facilitates independent assessment and, if appropriate, enforcement. Numerical computation of SAR must be supported by adequate documentation showing that the numerical method as implemented in the computational software has been fully validated; in addition, the equipment under test and exposure conditions must be modeled according to protocols established by FCC-accepted numerical computation standards or available FCC procedures for the specific computational method.

(2) For operations within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 in paragraph (e)(1) of this section, may be used instead of whole-body SAR limits as set forth in paragraphs (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part, except for portable devices as defined in § 2.1093 of this chapter as these evaluations shall be performed according to the SAR provisions in § 2.1093.

(3) At operating frequencies above 6 GHz, the MPE limits listed in Table 1 in paragraph (e)(1) of this section shall be used in all cases to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part.

(4) Both the MPE limits listed in Table 1 in paragraph (e)(1) of this section and the SAR limits as set forth in paragraphs (a) through (c) of this section are for continuous exposure, that is, for indefinite time periods. Exposure levels higher than the limits are permitted for shorter exposure times, as long as the average exposure over a period not more than the specified averaging time in Table 1 in paragraph (e)(1) is less than (or equal to) the exposure limits. Detailed information on our policies regarding procedures for evaluating compliance with all of these exposure limits can be found in the most recent edition of FCC's *OET Bulletin 65*, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields," and its supplements, all available at the FCC's internet website: <https://www.fcc.gov/general/oet-bulletins-line>, and in the Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) (<https://www.fcc.gov/kdb>).

The FCC's MPE for general population exposure is 1.0 mW/cm² (or 10,000,000 uW/m²) for frequency ranges from 1500 to 100,000 MHz (1.5 GHz to 100 GHz). When calculating for any frequency range under 1500 MHz, a formula of $f/1500$ is used. Smart utility meters usually transmit in the 900 MHz

range, which means the MPE power density would be calculated as .6 (a little more than half) of the higher frequencies transmitting at 1500 MHz or above. These are important distinctions.

From their information above, the FCC states: “Both the MPE limits listed in Table 1 in paragraph (e)(1) of this section and the SAR limits as set forth in paragraphs (a) through (c) of this section are for **continuous exposure, that is, for indefinite time periods**. Exposure levels higher than the limits are permitted for shorter exposure times, as long as the average exposure over a period not more than the specified averaging time in Table 1 in paragraph (e)(1) is less than (or equal to) the exposure limits.”

Really? This above paragraph apparently confuses Maximum Permissible Exposure with RFR exposure. The FCC MPE limits are actually for **continuous** exposure and **indefinite** periods of time. The higher RFR exposure levels are permitted for shorter times as long as the MPE is not exceeded. Note: This seems confusing, unless confusion is the point! The FCC has time exposures of 30 minutes and 6 minutes. Any reasonable person would ask, what about times longer than 30 minutes or 6 minutes?

Time averaging exposure using FCC calculations- extended up to 24 hours: Our Chart

Regarding the time averaging exposure, FCC guidelines do not calculate for extended exposure times such as 60 minutes, two hours, eight hours or even 24 hours of exposure. Since the FCC Maximum Permissible Exposure timeline only considers a 30 minute exposure for the general population, and a 6 minute exposure for occupational workers, it seems obvious that longer time frames must be considered if we are to adhere to the prescribed FCC guidelines.

While trying to make some sense out of these exposure levels, we created a chart calculating RFR exposures for a fixed MPE of a full hour (60 min) as opposed to 30 minutes, then two hours, eight hours, and finally 24 hours. Using the FCC’s own calculation formula and only one antenna frequency at a time (in sample frequency ranges of 700, 850, 1900, 3700, 11,000 MHz or 1.9, 3.7, and 11.0 GHz) and with our extended time frames, we wanted to find out what power density could be inflicted on an average person without going over the FCC limit. It seemed obvious that the longer the time frame, the lower the power density of exposure should be, as measured in milliwatt per centimeter squared mW/cm², or uW/m². (Note: 1.0 mW/cm² and 10,000,000= uW/m²) Using the FCC formula calculation, we discovered that for a 24 hour exposure, the power level should be reduced to only 1% or 2% of the 30 minute power density. (eg: reduced from 10,000,000 uW/cm² to 100,000 uW/m² or from 5,000,000 uW/m² to 50,000 mW/m²) That’s a big difference!

The chart below displays a sample of 13 antennas on a typical cell tower. The FCC formula is used to calculate the MPE levels using the basic math formula of *power density multiplied by exposure time*. While this chart may be difficult to understand for the lay person, the point is this: To calculate the FCC maximum permissible exposure level at any location and for any telecommunications facility, with multiple antennas, multiple sources of radiation, and indefinite (without limit) time periods, it would seem logical that the actual calculation must be extended to longer periods rather than just 30 or 6 minutes.

FCC Maximum Permissible Exposure Levels for Radiofrequency Radiation

<i>Limits for Occupational / Controlled Exposure (FCC MPE chart)</i>		
Frequency	Power Density	Averaging Time
Range	(S)	[E] ² , [H] ² , or S
(MHz)	(mW/cm ²)	(minutes)
300–1500	f/30	6
1500–100,000	5	6
<i>Limits for General Population / Uncontrolled Exposure</i>		
Frequency	Power Density	Averaging Time
Range	(S)	[E] ² , [H] ² , or S
(MHz)	(mW/cm ²)	(minutes)
300–1500	f/1500	30
1500–100,000	1	30
<i>f = frequency in MHz</i>		

USING THE FCC'S FORMULA

<i>Limits for General Population / Uncontrolled Exposure adj.*</i>		
Frequency	Power Density	Averaging Time
Range	(S)	[E] ² , [H] ² , or S
(MHz)	(mW/cm ²)	(minutes)
700–850	0.50	30
1500–100,000	1	30

<i>Limits for General Population / Uncontrolled Exposure adj.*</i>		
Frequency	Power Density	Averaging Time
Range	(S)	[E] ² , [H] ² , or S
(MHz)	(mW/cm ²)	(minutes)
700–850	0.25	60 (1 hr.)
1500–100,000	0.50	60 (1 hr.)

<i>Limits for General Population / Uncontrolled Exposure adj.*</i>		
Frequency	Power Density	Averaging Time
Range	(S)	[E] ² , [H] ² , or S
(MHz)	(mW/cm ²)	(minutes)
700–850	0.125	120 (2 hrs)
1500–100,000	0.25	120 (2 hrs)

<i>Limits for General Population / Uncontrolled Exposure adj.*</i>		
Frequency	Power Density	Averaging Time
Range	(S)	[E] ² , [H] ² , or S
(MHz)	(mW/cm ²)	(minutes)
700–850	0.03125	480 (8 hr.)
1500–100,000	0.0625	480 (8 hr.)

<i>Limits for General Population / Uncontrolled Exposure adj.*</i>		
Frequency	Power Density	Averaging Time
Range	(S)	[E] ² , [H] ² , or S
(MHz)	(mW/cm ²)	(minutes)
700–850	0.0104	1440 (24 hrs)
1500–100,000	0.0208	1440 (24 hrs)
<i>f = frequency in MHz</i>		

*Adjusted for time exposure, frequency range, and associated power density

SAMPLE OF TYPICAL ANTENNAS ON A CELL TOWER– May 2024 (without collocation: 13 antennas)

8- Quintel f band: 700, 850, 1900, 2100 MHz
4-Ericsson: 3700 MHz
1-Andrew (millimeter wave): 11,000 MHz

MPE (Maximum Permissible Exposure)
The longer the exposure time, the lower the
“permissible” power density must be.
MPE rate = power density multiplied
by time of exposure.

OCCUPATIONAL EXPOSURE:

Exposure time: **6 Minutes**

Frequency Range of 8 antennas @ 700 & 850 MHz:

$$f/300 = 700/300 = 2.3 \text{ mW/cm}^2$$

$$f/300 = 850/300 = 2.8 \text{ mW/cm}^2$$

Power Density approx: **2.5 mW/cm²**

Frequency: 1900, 2100, 3700, 11,000 MHz

Power Density: **5 mW/cm²**

GENERAL POPULATION EXPOSURE:

(See adjusted charts at left using FCC formula)

Exposure time: **30 Minutes**

Frequency Range of 8 antennas @ 700 & 850 MHz:

$$f/1500 = 700/1500 = .46 \text{ mW/cm}^2$$

$$f/1500 = 850/1500 = .56 \text{ mW/cm}^2$$

Power Density approx: **.50 mW/cm²**

Frequency: 1900, 2100, 3700, 11,000 MHz:

Power Density: **1 mW/cm²**

Exposure time: **60 Minutes (1 hr)**

Frequency Range of 8 antennas @ 700 & 850 MHz:

Power Density: **.25 mW/cm²**

Frequency: 1900, 2100, 3700, 11,000 MHz:

Power Density: **.50 mW/cm²**

Exposure time: **120 Minutes (2 hrs)**

Frequency Range of 8 antennas @ 700 & 850 MHz:

Power Density: **.125 mW/cm²**

Frequency: 1900, 2100, 3700, 11,000 MHz:

Power Density: **.25 mW/cm²**

Exposure time: **480 Minutes (8 hrs)**

Frequency Range of 8 antennas @ 700 & 850 MHz:

Power Density: **.03125 mW/cm²**

Frequency: 1900, 2100, 3700, 11,000 MHz:

Power Density: **.0625 mW/cm²**

Exposure time: **1440 Minutes (24 hrs)**

Frequency Range of 8 antennas @ 700 & 850 MHz:

Power Density: **.0104 mW/cm²**

Frequency: 1900, 2100, 3700, 11,000 MHz:

Power Density: **.0208 mW/cm²**

1.0 mW/cm² (milliwatts per centimeter squared) =
10,000,000 uW/m² (microwatts per meter squared)

EMF Safety Network 2024

Q. What scientific evidence exists regarding potential adverse environmental effects associated with RF radiation? (14)

Some excellent resources on adverse environmental effects are identified below.

Levitt, B. B., Lai, H. C., Manville, A. M., II, & Scarato, T. (2025). Flora and fauna—How nonhuman species interact with natural and man-made EMF at ecosystem levels and public policy recommendations. *Frontiers in Public Health*, 13, 1693873. <https://doi.org/10.3389/fpubh.2025.1693873>

Levitt, B. B., Lai, H. C., & Manville, A. M., II. (2022). Low-level EMF effects on wildlife and plants: What research tells us about an ecosystem approach. *Frontiers in Public Health*, 10, 1000840. <https://doi.org/10.3389/fpubh.2022.1000840>

Levitt, B. B., Lai, H. C., & Manville, A. M., II. (2022a). Effects of non-ionizing electromagnetic fields on flora and fauna, Part 1: Rising ambient EMF levels in the environment. *Reviews on Environmental Health*, 37(1), 81–122. <https://doi.org/10.1515/reveh-2021-0026>

Levitt, B. B., Lai, H. C., & Manville, A. M., II. (2022b). Effects of non-ionizing electromagnetic fields on flora and fauna, Part 2: Impacts—How species interact with natural and man-made EMF. *Reviews on Environmental Health*, 37(3), 327–406. <https://doi.org/10.1515/reveh-2021-0050>

Levitt, B. B., Lai, H. C., & Manville, A. M., II. (2022c). Effects of non-ionizing electromagnetic fields on flora and fauna, Part 3: Exposure standards, public policy, laws, and future directions. *Reviews on Environmental Health*, 37(4), 531–558. <https://doi.org/10.1515/reveh-2021-0083>

Manville, A. M., II, Levitt, B. B., & Lai, H. C. (2024). Health and environmental effects to wildlife from radio telemetry and tracking devices—State of the science and best management practices. *Frontiers in Veterinary Science*, 11, 1283709. <https://doi.org/10.3389/fvets.2024.1283709>

Thill, A., Cammaerts, M.-C., & Balmori, A. (2024). Biological effects of electromagnetic fields on insects: A systematic review and meta-analysis. *Reviews on Environmental Health*, 39(4), 853–869. <https://doi.org/10.1515/reveh-2023-0072>

Panagopoulos, D. J., Karabarbounis, A., & Chrousos, G. P. (2024). Biophysical mechanism of animal magnetoreception, orientation and navigation. *Scientific Reports*, 14(1), 30053. <https://doi.org/10.1038/s41598-024-77883-9>

Balmori, A. (2021). Electromagnetic radiation as an emerging driver factor for the decline of insects. *Science of the Total Environment*, 767, 144913. <https://doi.org/10.1016/j.scitotenv.2020.144913>

Q. What types of scientific evidence should be considered when evaluating RF exposure associated with wireless infrastructure? (15) *(Note, similar to question #13, cumulative exposure should be considered along with wireless infrastructure, including the RFR from wireless devices and cell phones.)*

The studies below specifically address cell towers infrastructure:

Balmori, A. (2022). Evidence for a health risk by RF on humans living around mobile phone base stations: From radiofrequency sickness to cancer. *Environmental Research*, 214, 113851. <https://doi.org/10.1016/j.envres.2022.113851>

Pearce, J. M. (2020). Limiting liability with positioning to minimize negative health effects of cellular phone towers. *Environmental Research*, 181, 108845. <https://doi.org/10.1016/j.envres.2019.108845>

Rodrigues, N. C. P., Dode, A. C., Andrade, M. K. N., O'Dwyer, G., Monteiro, D. L. M., Reis, I. N. C., Rodrigues, R. P., Frossard, V. C., & Lino, V. T. S. (2021). The effect of continuous low-intensity exposure to electromagnetic fields from radio base stations to cancer mortality in Brazil. *International Journal of Environmental Research and Public Health*, 18(3), 1229. <https://doi.org/10.3390/ijerph18031229>

Dode, A. C., Leão, M. M. D., Tejo, F. A. F., Gomes, A. C. R., Dode, D. C., Dode, M. C., Moreira, C. W., Condessa, V. A., Albinatti, C., & Caiaffa, W. T. (2011). Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil. *Science of the Total Environment*, 409(19), 3649–3665. <https://doi.org/10.1016/j.scitotenv.2011.05.051>

Levitt, B. B., & Lai, H. (2011). Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays. *Environmental Reviews*, 19, 495–514. <https://doi.org/10.1139/A10-018>

Khurana, V. G., Hardell, L., Everaert, J., Bortkiewicz, A., Carlberg, M., & Ahonen, M. (2010). Epidemiological evidence for a health risk from mobile phone base stations. *International Journal of Occupational and Environmental Health*, 16(3), 263–267. <https://doi.org/10.1179/107735210799160192>

In Summary

Thousands of studies have been conducted in the last 30+ years showing conclusive evidence of biological harm to both humans and animals from low frequency wireless radiation at non thermal and non-ionizing levels. Non-ionizing radiation should not be assumed to be safe. It only means that the primary mechanisms of biological damage are different.

It boggles the mind to see the amount of research that's been done on RF radiation showing harmful biological effects. HHS is certainly being presented with plenty of them during this comment period. Yet the FCC, in its inherent conflict of interest and allegiance to the industries that make use of all levels of wireless radiation, must turn a blind eye to these studies and these effects.

A final quote about Electromagnetic Hypersensitivity or what is now referred to as EMR Syndrome is important to include. In the earlier referenced paper, the ICBE-EMF authors state:

“The increase in ELF exposures in the last century and of RFR exposures more recently resulted in the emergence of electromagnetic hypersensitivity (EHS) in human populations. Despite exploration and documentation of the EHS syndrome, industry and governments have not reacted to curb emissions. Yet, ICNIRP acknowledged that their guidelines may not accommodate the sensitive: “Different groups in a population may have differences in their ability to tolerate a particular non-ionizing radiation (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”.

https://www.researchgate.net/publication/369836628_Cell_Phone_Radiation_Exposure_Limits_and_Engineering_Solutions. (pg 10)

Again, the FCC is not in the position to be mandating MPE levels for worker and public safety. Yet at just about every city or county planning commission meeting where a new cell tower or collocation is presented, we have heard the local governing board say the same admission: “Our hands are tied. The FCC sets these exposure guidelines and if the applicant says RF exposure is under these limits, we have to approve the permit application. If you don’t like our decision, take it up with the FCC.” We’ve even been at court hearings where we’ve heard the same thing.

On a positive note: future thinking engineers, scientists, and even curious tinkerers with a passion for protecting people and the planet can come up with creative solutions to allow connectivity without causing harm to our biological systems. But first, the FCC and industry must acknowledge the problem with their excessive RF exposure guidelines so the door can be opened for funding innovative ideas and novel approaches.

We appreciate your request for information to support your decision-making, identify your research priorities, and inform your “practical strategies to reduce unnecessary exposure where appropriate.”

Respectfully submitted,
Sidnee Cox
Dr. Richard N Boyd, PhD Physics
and EMF Safety Network team

ADDITIONAL RESOURCES:

Scientific Documentation That Limits Are Inadequate

Melnick, R. L., Moskowitz, J. M., & International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF). (2026). Exposure limits to radiofrequency EMF do not account for cancer risk or reproductive toxicity assessed from data in experimental animals. *Environmental Health*, 25(1), 42. <https://doi.org/10.1186/s12940-026-01288-6>

International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF). (2022). Scientific evidence invalidates health assumptions underlying the FCC and ICNIRP exposure limit determinations for radiofrequency radiation: Implications for 5G. *Environmental Health*, 21(1), 92. <https://doi.org/10.1186/s12940-022-00900-9>

Lai, H., & Levitt, B. B. (2024). Cellular and molecular effects of non-ionizing electromagnetic fields. *Reviews on Environmental Health*, 39(3), 519–529. <https://doi.org/10.1515/reveh-2023-0023>

Lai, H., & Levitt, B. B. (2022). The roles of intensity, exposure duration, and modulation on the biological effects of radiofrequency radiation and exposure guidelines. *Electromagnetic Biology and Medicine*, 41(2), 230–255. <https://doi.org/10.1080/15368378.2022.2065683>

Lai, H. (2021). Genetic effects of non-ionizing electromagnetic fields. *Electromagnetic Biology and Medicine*, 40(2), 264–273. <https://doi.org/10.1080/15368378.2021.1881866>

Lai, H., & Levitt, B. B. (2025). Radiofrequency radiation-induced gene expression. *Reviews on Environmental Health*. Advance online publication. <https://doi.org/10.1515/reveh-2025-0104>

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