Wireless and EMF Program
Environmental Health Sciences

Environmental Health Sciences Comments: Feedback to the Public Consultation on the evolution of the threshold of atypical points regarding exposure to electromagnetic fields in application of articles L.123-19-1 of the Environmental Code and L.32-1 of the Postal and Electronic Communications Code

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Environmental Health Sciences offers comments to ANFR on its proposal to loosen its threshold of atypical points. We recommend that ANFR prioritize public health by minimizing public exposure to electromagnetic fields (EMFs), not increasing it. The decision by ANFR to propose raising the atypical point threshold from 6 V/m to 9 V/m in urban areas reflects a shift in priority away from protecting public/environmental health and toward accommodating the commercial interests of the telecommunications industry.

Raising the atypical point threshold as proposed is a step *in the wrong direction* that risks allowing higher exposure levels for millions of citizens and for wildlife. We recommend that policymakers enact the most protective measures with regard to this pervasive environmental pollutant, because the ICNIRP limits do not protect against long-term health effects, nor do these limits address wildlife impacts.

While some European countries have indeed weakened their thresholds, these changes reflect well-funded industry pressure rather than new safety evidence; on the contrary, emerging research supports the need for tighter limits. **Strong political will and well-designed policy are essential to ensure public safety is not undermined by market forces that prioritize convenience and cost over protection. Policymakers must hold firm against pressures to weaken safeguards.**

ICNIRP limits simply do not protect against long-term health effects.[1–5] They are solely designed to protect for short-term heating effects only. Using the ICNIRP limit as any kind of benchmark does not protect health/environment, even if a proposed threshold is at 1/10th or lower of ICNIRP limits. The reality is that while today's ubiquitous exposure is involuntary, chronic and continuous day and night, ICNIRP limits have not evolved to ensure protection for effects of years of such cumulative exposure. ICNIRP/FCC/IEEE limits are based on decades-old studies exposing animals to *under an hour* of high-intensity wireless microwave frequencies, with the threshold of harm identified when the overheated animals stopped pressing a lever for food.[1]

Due to the limitations of ICNIRP limits regarding long term health effects, it is unacceptable for the ANFR to move in the opposite direction of safety by raising thresholds, which would weaken

public health protections instead of reinforcing them. Until the science is adequate to ensure safety, limits should be kept as low as possible.

As will be comprehensively referenced in this comment, substantial published science continues to mount, indicating adverse impacts at non-thermal levels. Therefore, thresholds should be revised downwards.

As an example, a recent study funded by the French Ministry of Ecology Program reported that radiofrequency (RF) exposure at levels considered "safe" under current international limits can disrupt brain development in rats, causing reduced neuronal growth, DNA damage, and abnormal cell differentiation.[6] The authors conclude that, "findings suggest that key cellular events for brain ontogenesis are likely to undergo changes with RF-EMF 900 MHz exposure during early development. These support the hypothesis that the developing central nervous system is vulnerable to RF-EMF exposures in rodents at regulatory thresholds... These data support the hypothesis of a vulnerability of developing organisms towards RF-EMF exposures and to maintain caution regarding RF-EMF exposures of pregnant women and young children during telecommunication use." This study is one of many[7,8] that suggest thresholds do not ensure protection for vulnerable groups such as children, making any increase in exposure limits both premature and unjustified.

In the United States, the American Academy of Pediatrics has long called for reducing exposure and strengthening exposure limits.[9] Because their brains are still rapidly developing, children are sensitive to even small impacts, which can have lasting consequences for learning, behavior, and long-term health.[10]

Due to their thinner skulls, unique physiology and higher water content, wireless RF radiation can penetrate deeper and more intensely into critical regions of a child's brain and body compared to adults. Scientific modeling has found RF absorption rates in children are higher than in adults, 2-fold greater in the cerebellum, 2 to 5-fold in the eyes, 10-fold greater in the skull, and 30-fold greater in the hippocampus.[11,12] Studies simulating children with Wi-Fi laptops in a classroom have found exposure to a child's head and back increased up to 40-fold when surrounded by other children with laptops, due to cumulative emissions from all the nearby devices.[12] All in all, children are highly exposed and exposures should be decreased as much as possible to protect them and reduce their risk. They will be exposed for a lifetime.

While wireless RF is non-ionizing electromagnetic (EMF) radiation, there is a substantial and growing body of research that indicates that non-ionizing EMF exposure may affect multiple biological systems. Importantly, wireless signals are pulsed and employ sophisticated modulation techniques involving multiple frequencies to transmit data, including ELF

components. The waveform is highly variable, and such complex features are among the key parameters that enhance biological impacts from wireless signals, yet regulations do not address the ELF components. [4,13–15]

While not all studies find impacts, scientific studies on non-ionizing EMF have reported:

- **Cancer and Tumors:** Increased glioblastoma brain cancer, acoustic neuromas, thyroid cancer and prostate cancer are linked to higher cell phone use.[16–21] Breast cancer has been reported in the specific area where women regularly carried cell phones in their bras.[22,23]
- **Brain:** Experimental studies have observed loss of brain cells, altered brain activity, blood-brain barrier disruption, and impacts to neurotransmitters.[6,8,24–26]
- **Neurodevelopment:** Prenatal exposure is associated with lower cognitive scores, and postnatal exposure is associated with behavioral issues in children.[27–29] Higher wireless exposure in the home has been linked to neurodevelopmental delays. [30]
- **Memory:** Replicated studies on teenagers have found memory damage from cell phone radiation exposure, a finding also documented in animal experimental studies.[25,31–33]
- **Reproduction:** Exposure is linked to decreased and damaged sperm, decreased testosterone, testicular damage, and impacts to the ovaries.[34–44]
- **Endocrine System:** Wireless exposure is associated with impacts to the thyroid gland, adrenal gland, thymus, and corticosterone levels.[45–48]
- **Immune Function:** Accumulated data suggest that EMF exposure could affect the number and function of immune cells.[49–53]
- **Genetic:** EMF exposure is linked to DNA damage, changes to chromatin conformation, increased frequency of micronuclei, and impaired DNA repair process.[54–59]
- **Epigenetic Impacts:** Epigenetic changes, including DNA methylation, modifications of histones, and microRNA expression, have been documented.[60–62] Air Force research found 114 genes significantly differentially methylated in human skin cells exposed to RF. [63] EMF can cause sperm DNA damage, leading to epigenetic abnormalities.[64]
- **Synergistic Impacts:** Enhanced toxicity has been documented when EMF is combined with other toxic exposures.[65,66] Studies have observed synergistic impacts with atrazine,[67]

phthalates,[68] carbon black,[69–71] lead,[72–74] as well as tumor promotion with formaldehyde,[75] and ionizing radiation.[76–79]

EMFs have been found to induce oxidative stress which, when prolonged, can lead to chronic inflammation that disrupts cellular communication and damages critical components like DNA.[4,57,80–83] This can contribute to the progression of numerous health conditions, including cancer and neurodegenerative disease.

Numerous publications conclude effects at exposure levels well below ICNIRP heat-based limits.

A study by U.S. Army and Air Force Research Laboratories found that high powered pulsed microwave exposures could reach the same threshold pressures of explosive blast brain and football head impact injuries even at levels considered "safe" and compliant with current ICNIRP and FCC RF limits.[84] What could the impact be of repeated exposures, at lower levels over the course of a lifetime?

Dr. Henry Lai and B. Blake Levitt published an extensive review of the research on 112 low-intensity RF studies that found that biological effects of RFR could occur at a median specific absorption rate of 0.0165 W/kg.[85] According to their paper, governments should adopt a maximum full-body Specific Absorption Rate (SAR) of 1.65 milliwatts per kilogram which is 48 times lower than the current wireless exposure limits that allow the public to be exposed to a full-body SAR of 80 milliwatts per kilogram.

A 2023 study by a team from both General Dynamics Information Technology as well as the Air Force Bioeffects Lab published in *Bioelectromagnetics* found epigenetic effects with 114 genes "significantly differentially methylated," in human skin cells after a single, one-hour exposure to very weak 900 MHz radiation —a frequency commonly used in wireless communications.[63] The study exposure was very low, less than 0.01 W/Kg —a fraction of 4W/kg, the level that current ICNIRP standards assume to be the threshold for harmful RF effects.

DNA methylation has been described as "a major epigenetic factor influencing gene activities and improper methylation of a single gene can have 'drastic consequences."[86]

ANFR should not weaken its policies until high certainty evidence exists to ensure safety regarding the broad range of health outcomes detailed above. Currently, established up to date evidence concluding safety if exposures are within ICNIRP limits *simply does not exist.*

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Growing Science on Cancer Risk

In 2011, the World Health Organization's International Agency for Research on Cancer (WHO/IARC) classified wireless RF as a Group 2B "possible" human carcinogen, primarily based on epidemiological studies linking prolonged cell phone use to increased brain tumor risk.[87] Since then, further human and animal research[19,20,88–90] has strengthened the link prompting calls for a WHO/IARC re-evaluation. Many experts argue that the current evidence could support an RF classification as a "probable" or even "known" human carcinogen.[3,91–95] Animal studies such as the National Toxicology Program and Ramazzini Institute rodent studies, which were deemed high certainty evidence in a recent WHO-funded systematic review[90], were analyzed in an earlier paper that found the data indicated US FCC and ICNIRP limits should be strengthened by at least 200 to 400 times to protect children.[96] ANFR should not take any action until the WHO/IARC has met to evaluate the totality of evidence on cancer.

ANFR should not weaken environmental limits until wildlife protections are in place.

Despite rising environmental levels of wireless radiation, the exposure limits of France are only designed to ensure protection for humans, but not for flora and fauna. Limits that protect birds, bees, trees, and other wildlife do not exist. This is a critical regulatory gap. They must be protected with federally developed science-based limits. Until then, increasing exposures cannot be defended as safe.

Scientific research has documented wireless exposure impacts to wildlife, including birds, mammals, amphibians, and insects, reporting disrupted behavior, orientation, migration, reproduction, nesting, and survivorship, interference with bird navigation and embryonic development, and in mammals, cancer, DNA damage, neurological impairments, reduced fertility, and lower birth weights.[97–102,102–109]

Pollinators, especially bees are at risk. Studies on bees found decreased egg laying rate, reduced colony strength and impacts to behavior and physiology.[110,111] A 2023 systematic review on insects and non-ionizing EMF (including radiofrequency) found that non-thermal EMF exposures could harm insects by reducing reproduction and impairing development, causing DNA damage and oxidative stress, disrupting orientation, memory, and circadian rhythms, altering metabolism via calcium/VGCC pathways, and weakening populations (e.g., near base stations), with effects reported under 6 V/m.[112]

Further, 5G and emerging network technologies operate at higher millimeter-wave frequencies, which interact with the smaller size of insects, resulting in increased EMF absorption in their brains and bodies.[113,114] Bees and insects can absorb the higher frequencies of 5G at rates between 3% to 370% higher leading the scientists to warn, "This could lead to changes in insect behavior, physiology, and morphology over time…." [113]

Until ANFR has evidence of protective safety thresholds for flora and fauna, loosening limits would risk serious, irreparable harm to wildlife, especially to pollinators.

Averaging Exposure for Atypical Points Masks Peak Pulses

ANFRs points are averaged levels, not actual exposure levels. The ICNIRP guidelines define compliance based on 6-minute averaging for the general public. Averaging masks true exposure because peak RF-EMF pulses can far exceed the permitted average, yet compliance is only checked against 6-minute averaged values.

ICBE-EMF states the use of averaging is misleading in their comments to ANFR[115] because, "based on the pulsatile nature of the waveform of RF-EMF emissions, peak exposure levels from all RF-EMF emission sources can be more than 10 times greater than average levels over 6-minute intervals. As a result, the average time allows extremely short electromagnetic exposures from pulses to greatly exceed the permitted average. This is important because the human body reacts to very brief field impulses when their intensity crosses an activation level."

Hundreds of Scientists Appeal for Safety Limits That Protect Against Biological Impacts

Hundreds of independent scientists (International EMF Scientist Appeal) and numerous medical groups state safety is not assured due to the current body of evidence reporting effects at low levels of EMF exposure and they call for policies that reduce public exposure.[116,117] While ICNIRP dismisses the scientific findings showing non-thermal effects and claims that such harm is "not established", the organization and its connected scientists have been criticized for longstanding industry influence, bias, and conflicts of interest.[118–125] Studies financed by industry show no effect more often than those independently funded.[124,126–129]

ANFR should not weaken its threshold but instead strengthen its regulations to protect public health and the environment. Any decision to loosen thresholds does not rest on a solid base of scientific evidence. Instead of weakening protections, we request ANFR implement measures

that shift industry towards research and design of technologies that mitigate exposure and prioritize consumer and environmental protection, especially for schools and urban/rural residential areas. [130–133] France should lead by encouraging innovation in low EMF exposure technologies, smarter network design, and prioritizing faster, safer, and more secure wired networks to and through buildings.

Before proceeding with the weakening of the atypical threshold, the ANFR must:

1. Justify any threshold change by providing strong, independent scientific evidence that raising limits will not harm public or environmental health.
2. Address ICNIRP limitations and explain why France should use heat-based ICNIRP limits as the basis for their threshold despite their failure to account for long-term, non-thermal, or cumulative effects.
3. Properly review health endpoints including cancer (brain, thyroid, breast, prostate), DNA and genetic damage, epigenetic changes, nervous system, neurodevelopmental and neurological effects, endocrine and reproductive impacts, immune dysfunction, oxidative stress and inflammation, synergistic effects, children's unique vulnerabilities, and risks to wildlife and ecosystems (addressing all the endpoints documented in Levitt et al. 2021 review [98]) before considering any threshold change. Explain how children, pregnant women, and other sensitive populations will be protected if exposures rise.
4. Explain why France should allow higher environmental exposures despite no current evidence-based limits developed that even safeguard flora and fauna. Show evaluation of wildlife impacts, develop and disclose protections for birds, insects, pollinators, and ecosystems.
5. Account for complex signal characteristics, address pulsing, modulation, and ELF components that contribute to biological effects but are not covered by existing standards.
6. Justify how averaging during measurements of exposure faithfully represents real exposures *without masking dangerous peak pulses.*
7. Disclose conflicts of interest, ensure transparency regarding industry influence in shaping policy.
8. Show why exposure reduction strategies such as promoting wired networks nationwide in businesses, educational institutions (including universities), hospitals, libraries, cars and homes are not preferable to weakening thresholds.

Theodora Scarato MSW

Director, Wireless and EMF Program, Environmental Health Sciences

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