

Public Comment on Electromagnetic Fields, Radiofrequency Radiation, and Wireless Radiation Exposure

Engineering-Based Assessment of RF/EMF Exposure in 5G and Emerging 6G Wireless Networks: Exposure Measurement, Health Evidence, Regulatory Standards, and Federal Research Priorities

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Agency: U.S. Department of Health and Human Services, Office of the Assistant Secretary for Health

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Professional Perspective: RF Design and Network Engineer

Submission Capacity: Individual

Executive Summary

I sincerely give this public answer to the U.S. On September 21, 2026, the Department of Health and Human Services released a Request for Information on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure in the Federal Register.

I have more than ten years of experience in radio frequency engineering, wireless network design, spectrum management, interference analysis, LTE and 5G network optimization, antenna-system engineering, and regulatory compliance.

I make these insights in my professional capacity. They are based on established exposure assessment frameworks, government publications, publicly available scientific literature, and engineering concepts. I am not reporting on clinical observations; I am not claiming that I have independently shown a link between wireless radiation and specific diseases.

With the growing proliferation of wireless communications through 5G, new 6G systems, satellite connectivity, Internet of Things (IoT) devices and more dense wireless infrastructure, federal health agencies require reliable methods to assess the actual human exposure levels for a range of technologies and operational environments.

I recommend that HHS:

- Develop a coordinated, technology-aware RF exposure study program, under realistic conditions of wireless network operation.
- Promote consistent and reproducible exposure measurement procedures for current wireless systems.
- Evaluate evidence on long-term, intermittent, simultaneous and cumulative RF exposure without presuming that all biological changes reported are harmful health impacts.
- Enhance studies in youngsters, workers exposed occupationally and other possibly susceptible populations.
- Work with the FCC, FDA, NIH, CDC, NIST and independent scientific organizations to improve exposure characterisation, communication to the public, and transparency in research.
- Develop standardized engineering data sets for exposure studies that preserve commercially sensitive information and personal privacy.
- The purpose of these proposals is to enhance scientific evaluation and public understanding without unduly constraining wireless technologies that offer significant communications, public safety, and economic benefits.

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Question 2: Respondent's Professional Perspective

I am an RF Design and Network Engineer by experience and have professional experience in cellular network planning, LTE and 5G infrastructure, antenna selection and configuration, propagation analysis, spectrum utilization, RF performance evaluation and regulatory engineering documentation.

My work covers the RF exposure characterization of technical parameters such as the transmitter power, the effective isotropic radiated power (EIRP), the antenna gain, the operating frequency, the height of the antenna, the azimuth, the electrical and mechanical tilt and the propagation of the signal.

I believe these engineering disciplines may make substantial contributions to public health research by enhancing the accuracy, reproducibility and interpretation of RF exposure measurements.

Questions 5 and 6: Exposure Standards, Regulatory Frameworks, and Scientific Evidence

The U.S. RF exposure guidelines in place today provide a well-established scientific foundation for assessing human exposure to wireless transmitters and electronic equipment.

Under 47 CFR § 1.1310, the FCC sets forth specific absorption rate (SAR) and maximum permissible exposure (MPE) limitations based on frequency, exposure conditions, and the measurement or computational method used.

The FCC requires a maximum average SAR of 0.08 W/kg for the total body, and a maximum spatial average SAR of 1.6 W/kg averaged across one gram of tissue for the general public. The respective occupational limitations are higher, because the paradigm for controlled occupational environments is different.

HHS should take into account the following scientific and regulatory structures:

- RF Exposure Compliance Requirements – 47 CFR §§ 1.1307 and 1.1310.
- IEEE Std C95.1-2019 “Safety Levels Considering Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”
- The 2020 guidelines from the International Commission on Non-Ionizing Radiation Protection (ICNIRP) include RF electromagnetic energies from 100 kHz to 300 GHz.
- World Health Organization (WHO) and International Agency for Research on Cancer (IARC) relevant evaluations.
- National Toxicology Program investigations of radiofrequency radiation in the U.S.
- Recent systematic reviews of the human epidemiology evidence.

The journal Wireless Radiation and Health, published by Environmental Health Sciences, publishes studies that indicate biological changes linked with RF exposure, such as oxidative stress, genetic impacts, reproductive effects, and neurological effects.

These reports demand continuous scientific assessment. However, it is important to separate claimed biological effects from known unfavorable health outcomes, particularly when laboratory exposure circumstances do not reflect real-world human exposures.

The National Toxicology Program, in its 2018 studies, found that male rats exposed to high doses of 900 MHz RF radiation had a definite link to carcinogenic activity, based on malignant cardiac schwannomas. Some other tumors were also included in the study and some evidence was found.

Crucially, the NTP warned that its experimental exposure circumstances are not exactly comparable to normal mobile-phone use by humans.

Conversely, a 2024 systematic review by Karipidis and colleagues, framed in the WHO evidence-assessment approach, indicated that RF exposure from mobile phones probably does not enhance the risk of a number of well-studied brain and head malignancies.

These findings should be considered in light of the study design, characterization of exposures, species differences, uncertainty, and methodological constraints.

I urge HHS to conduct an independent, open review of whether current exposure assessment protocols appropriately reflect realistic wireless operating settings and whether new information warrants adjustments to federal recommendations. Such a review should analyze the adequacy of the exposure limits and the effectiveness of compliance testing, without pre-judging its outcome.

Questions 7 and 8: Methods for Characterizing Human RF Exposure

Reliable characterization of the electromagnetic environment and of the operational behavior of the transmitting equipment is needed for an accurate estimate of RF exposure. In cellular engineering, the conditions of exposure depend upon: the frequency, the EIRP, the antenna designs, the transmit duty cycle, the beam steering, the propagation loss, the building materials, the activity of the user equipment and the distance from the transmitting antennas.

1. RF measurements on frequency-selective

For the differentiation of individual frequency bands and services calibrated spectrum analyzers, suitable isotropic field probes and frequency selective equipment should be used. Consider uncertainty, probe calibration, bandwidth, average time, environmental variables;

2. Spatial and temporal characterisation of exposure

Measure typical indoor and outdoor conditions . Variation of sample in time and space. A single measurement in one network situation should not be interpreted as representative of long-term exposure.

3. Network-aware simulation of exposure

LTE, 5G and future 6G systems including base-station layouts, antenna patterns, traffic loading, beamforming and transmitter statuses. Augment network observations with vetted propagation and computational electromagnetic modeling.

4. Multiple-source assessment

Take into account simultaneous contributions from cellular systems, Wi-Fi, linked devices and other transmitters. Summation approaches for frequency-specific compliance should not be automatically used as measures of cumulative biological risk.

5. Reproducibility and uncertainty estimates

Record details of locations, frequencies, equipment, calibrations, exposure units, uncertainty budgets, assumptions and limits of the measurements to allow independent replication.

I recommend that HHS coordinate with NIST and FCC technical experts to develop reference measurement standards for today's wireless networks.

Question 9: RF Exposure and Public Disclosure

Transparency would be improved if the public had access to intelligible, technically correct exposure information. In communicating with the consumer, it is necessary to differentiate between measured ambient exposure, device certification limitations, and estimations of individual absorbed energy.

- Relevant radio frequency (RF) sources of emission and bands of operation.
- The method of exposure measurement or modeling.
- Measured electric field strength, power density or SAR, as appropriate.
- Percentage of exposure limits applicable under well-defined conditions.

- Procedures relevant for spatial and temporal averaging.
- Uncertainty and constraints of measurement.
- The contrast between normal operational settings and cautious compliance assessment scenarios.

In consumer information an RF measurement should not be used to demonstrate a health hazard or lack of risk. Personal information, network security and commercially sensitive operational data must also be protected by public reporting.

Question 11: Exposure Assessment for Sensitive Populations

HHS should evaluate whether exposure assessment methodologies adequately address vulnerable populations that may be affected, such as children, pregnant women, the elderly, persons with implanted medical devices, and individuals with significant occupational exposures.

Children may differ from adults in their physical measurements, tissue features, usage habits and lifetime exposure patterns. Environmental Health Sciences spotlights research showing toddlers and adults absorb RF energy differently. These findings should be carefully considered by age-specific computational dosimetry and independently validated anatomical models.

However, changes in predicted absorption alone do not prove differences in disease risk.

Employers should consider the most effective way to evaluate workers' real job activities, proximity to transmitting equipment, access to prohibited areas, and applicable occupational exposure restrictions.

Agencies should deal with electromagnetic compatibility and device interference separately for people with implanted medical devices, not as the same as direct RF biological consequences.

I suggest population-specific characterization of exposure, scientifically justifiable uncertainty factors, and focused study when data is lacking.

Question 12: Scientific Evidence on Levels of Exposure Under Current Federal Limits

Regulatory research should continue to look for potential biologic responses at exposure levels below the current regulatory limitations.

The EHS paper examines research that show oxidative stress, gene expression alterations, neurological reactions, and reproductive or developmental impacts in different experimental exposure situations. These findings highlight research problems related to duration of exposure, repeatability, dosimetry, and possible processes.

The fact that a biological reaction is measured doesn't mean it's clinically relevant or that current limits are insufficient.

Assessment should consider:

- Were exposures measured correctly?
- If the temperature and other experimental variables were regulated.
- Whether results were replicable in separate laboratories.
- Whether there was a plausible dose-response connection.
- Whether observed end points reflect a detrimental health effect
- Relevance of findings to real-life human exposure conditions.

HHS should focus on well-designed experimental and epidemiologic research with clear reporting of both positive and null results.

Question 13: 5G, 6G, Wi-Fi, Satellite Communications, IoT, and Other Technologies

Wireless technologies should not be rated only by the generation labels of their commercial deployment. RF exposure is better described by frequency, transmitted power, antenna configuration, propagation environment, transmitter activity, distance, and human use conditions.

5G networks

5G systems use a mix of low-band, mid-band and, where installed, millimeter-wave spectrum. Massive MIMO and adaptive beamforming can focus the radiated energy in a spatial and dynamic manner. In assessing exposure, beam direction, beam occupancy, traffic changes and scheduling must be considered.

Emerging 6G networks

Because 6G deployment configurations and operational scenarios are still evolving, HHS should support prospective exposure characterization rather than presuming 5G measurements are representative of future systems. Research should consider proposed higher frequency systems, distributed antennas and integrated sensing and communications.

Wi-Fi and IoT

Indoor environments may comprise several RF devices with different transmit power, bandwidth, duty cycle and user proximity. Studies should define emissions and exposure from user-operated devices at access points.

Satellite-based communications

Low-power user reception, transmitting user terminals, terrestrial gateways and other ground-based transmitting infrastructure are to be differentiated.

Wearables and wireless medical devices

Near-field measurement and dosimetry techniques are needed for devices operating in the near field close to the body.

Describe cumulative exposure over time across all categories using scientifically supported criteria, not by simple transmitter counting. I advocate the use of standardized technology-specific data sets for future studies to explore long-term patterns of exposure.

Question 15: Wireless Infrastructure and Exposure Assessment

Measure wireless infrastructure with scientifically valid metrics of exposure and functional characteristics, not just by location or number of antennas.

Distance from a base station is not the only factor determining RF exposure. Actual exposure is dependent on antenna radiation patterns, transmitted power, antenna elevation, downtilt, geography, building attributes and network circumstances .

For example, a person in proximity to a cellular site may be exposed at a different level than a person further away, according to the directionality of antennas and propagation conditions.

Nor do more tiny cells always increase overall exposure in the same proportion. They may modify infrastructure emissions and the transmit power required from neighboring user equipment.

Residential environments

Representative Indoor and Outdoor RF Exposure by Building Type and Location.

Schools and childcare institutions

Frequency-specific surveys Age-appropriate scenarios for exposure Realistic device use.

Small-cell roll-outs

Densification, antenna arrangement and environmental exposure and mobile-device transmit power relationships.

Cumulative neighborhood exposure

Multiple operating networks, including overlapping frequencies, time-varying emissions.

Antenna density

Not just infrastructure counts, but emissions, spatial dispersion and exposure circumstances.

Researchers should gather as much specific, anonymous technical parameters as possible for the development and validation of reliable exposure models.

Question 16: Highest Priority Federal Research Gaps

Priority 1: Long-term exposure characterization

Make longitudinal datasets across years, rather than device-use questionnaires or cross-sectional assessments.

Priority 2: Existing 5G and emerging 6G conditions

Dynamic beamforming, flexible allocations, higher frequencies, densification and sophisticated antenna topologies.

Priority 3: Exposure to several sources

Validate techniques for characterizing many transmitting devices and infrastructure systems functioning simultaneously.

Priority 4: Integration of exposure and health outcome data

Add technically valid RF exposure assessments to relevant epidemiological and biological studies.

Priority 5: Populations at risk

Develop representative anatomical models, behavioral scenarios, and study approaches for potentially sensitive populations.

Priority 6: Independent reproducibility

Encourage independent replication, especially of discoveries that claim effects below existing limits.

These targets would assist separate verifiable exposure patterns from unknown health impacts, and enhance the evidence base available to policy makers.

Question 17: Coordination of Federal Research

Coordination among federal agencies is required given the complexity of the recent wireless environment. I recommend that HHS convene an interagency technical and scientific working group that includes the FDA, NIH, CDC, FCC, NIST, and other appropriate agencies. The group should establish common research priorities, common reporting methods, common scientific review procedures, and common means of sharing non-sensitive research data.

- FDA: Review evidence of interactions between relevant electronic products and medical devices.
- NIH: Support experimental studies, epidemiology, dosimetry and independent replication.

- CDC: Develop public health surveillance technologies and understand population-level findings.
- FCC: Engineering and Regulatory Expertise on Authorized RF Services, Infrastructure, and Equipment Compliance
- NIST: Develop measurement science, calibration, uncertainty evaluation and reproducible technical processes.

Independent researchers, academic institutions, standards bodies, and qualified RF engineering specialists should also be engaged. The ensuing federal guidance would be more credible if the processes and evidence reviews were publicly published and transparent.

Question 18: Further technical recommendations

I suggest a national RF exposure characterization effort using field measurements, validated mathematical models, and standardized wireless technical data.

First: Define a reference framework to measure RF exposure

Minimum technical specifications for frequency coverage, instrumentation, calibration, geographical sampling, temporal averaging, reporting units and uncertainty should be established.

Second: Support for representative wireless environmental studies

Include urban, suburban, and rural settings, such as schools, offices, homes, public transportation facilities, and areas with many connected devices.

Third: Establish a clear process for evaluating scientific evidence

Critically assess peer-reviewed studies, official reports and experimental data, discern between settled conclusions, credible concerns, contradicting evidence and open questions.

One source of research questions and literature references is the Environmental Health Sciences compilation of RF exposure and health-related studies. These findings should be viewed within the framework of systematic reviews, independent replication studies and established regulatory assessments.

Future regulatory suggestions should be commensurate with the weight of the evidence and reflect both the protection of public health and the technological features of critical wireless communications systems.

Conclusion

I look forward to commenting from a technical perspective on RF/EMF exposure, human health, and the ongoing evolution of wireless communications technologies.

The rapid development of wireless technologies raises the need for accurate exposure characterization, independent scientific evaluation, and good cooperation across engineering and public-health disciplines.

I encourage HHS to focus on reliable RF measurements, realistic modeling of exposure from networks, transparent scientific reviews, research on potentially sensitive groups, and collaboration at the federal level.

A good, evidence-based technological approach can improve public health decision-making and promote the continuous deployment of dependable, safe, and effective wireless communications systems.

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Individual Commenter

References

- U.S. Department of Health and Human Services. (2026). Request for Information on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure. Federal Register, 91, 59792–59794. Docket HHS-OASH-2026-0397. <https://www.regulations.gov/document/HHS-OASH-2026-0397-0001>
- Environmental Health Sciences. Wireless Radiation and Health. <https://ehsciences.org/wireless-radiation-and-health/>
- Environmental Health Sciences. Science on Cell Tower and Wireless Radiation Health Effects. <https://ehsciences.org/science-on-wireless-health-effects/>
- Federal Communications Commission. 47 CFR § 1.1310: Radiofrequency Radiation Exposure Limits. <https://www.ecfr.gov/current/title-47/section-1.1310>
- Federal Communications Commission. 47 CFR § 1.1307: Actions That May Have a Significant Environmental Effect. <https://www.ecfr.gov/current/title-47/section-1.1307>
- Institute of Electrical and Electronics Engineers. (2019). IEEE Std C95.1-2019: IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz. <https://standards.ieee.org/ieee/80/4940/>
- International Commission on Non-Ionizing Radiation Protection. (2020). Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz). Health Physics, 118(5), 483–524. <https://doi.org/10.1097/HP.0000000000001210>
- National Toxicology Program. (2018). Toxicology and Carcinogenesis Studies in Sprague Dawley Rats Exposed to Whole-Body Radio Frequency Radiation at 900 MHz. NTP Technical Report 595. <https://www.ncbi.nlm.nih.gov/books/NBK561726/>
- National Institutes of Health. (2018). High Exposure to Radio Frequency Radiation Associated with Cancer in Male Rats. <https://www.nih.gov/news-events/news-releases/high-exposure-radio-frequency-radiation-associated-cancer-male-rats>
- Karipidis, K., et al. (2024). The Effect of Exposure to Radiofrequency Fields on Cancer Risk in the General and Working Population: A Systematic Review of Human Observational Studies—Part I: Most Researched Outcomes. Environment International, 191, 108983. <https://doi.org/10.1016/j.envint.2024.108983>
- Karipidis, K., et al. (2025). The Effect of Exposure to Radiofrequency Fields on Cancer Risk in the General and Working Population: A Systematic Review of Human Observational Studies—Part II: Less Researched Outcomes. Environment International, 196, 109274. <https://doi.org/10.1016/j.envint.2025.109274>
- Environmental Health Trust et al. v. Federal Communications Commission, No. 20-1025 (D.C. Cir. 2021). <https://law.justia.com/cases/federal/appellate-courts/cadc/20-1025/20-1025-2021-08-13.html>