PUBLIC COMMENT

Re: Request for Information on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure

Docket No.: HHS-OASH-2026-0397
Document ID: HHS-OASH-2026-0397-0001
Federal Register: 91 FR 59792
Submitted by: Engr. Vincent Onaji
Email: onajivincent@gmail.com
Professional Background: Telecommunications Engineering and Systems Engineering
Educational Qualifications: Bachelor of Engineering in Electronic Engineering; Master's Degree in Systems Engineering
Professional Experience: Over 15 years of telecommunications experience involving Ericsson, Motorola, and Huawei technologies across 2G, 3G, LTE, and 5G networks.

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

I. INTRODUCTION AND PURPOSE OF COMMENT

I respectfully submit these technical comments in response to the Request for Information issued by the U.S. Department of Health and Human Services on electromagnetic fields, radiofrequency radiation, and wireless radiation exposure, and on the implications of those exposures for human health [1].

My comments reflect more than 15 years of professional experience in telecommunications engineering, spanning several generations of mobile network technology: second-generation (2G), third-generation (3G), Long-Term Evolution (LTE), and fifth-generation (5G) wireless systems. That work has involved technologies associated with Ericsson, Motorola, and Huawei. It is supported by formal academic training in Electronic Engineering and Systems Engineering.

The telecommunications industry has changed substantially over that period. Radio access technologies and spectrum utilization have both moved on, antenna architectures have grown more complex, networks have become considerably denser, and transmission is now managed adaptively rather than statically. Each of these shifts bears on how radiofrequency exposure should be evaluated if the assessment is to represent the way modern wireless networks actually operate.

I respectfully recommend that HHS strengthen its evaluation of RF exposure through a coordinated, evidence-based approach. Such an approach would draw together telecommunications engineering and standardized exposure measurement, take account of how networks actually operate, and connect both to epidemiological research and to transparent risk communication.

The objective should be to ensure that federal public health assessments reflect actual exposure conditions and distinguish scientifically established effects from questions that remain unresolved. The resulting information needs to be technically reliable for a varied audience: federal agencies and telecommunications operators, researchers, workers whose duties place them near transmitting equipment, and members of the public.

These comments primarily address Questions 2, 5, 7, 8, 9, 10, 11, 13, 15, 16, 17, and 18.

II. PROFESSIONAL PERSPECTIVE AND TECHNICAL BASIS

Response to Question 2: Professional Perspective

I submit these comments in my individual professional capacity as a telecommunications engineering expert with experience across successive generations of mobile network infrastructure.

My observations and recommendations draw on established principles of radiofrequency engineering, on wireless network architecture and systems operation, and on the published regulatory and technical standards that govern exposure assessment [2], [4], [6], [7].

They do not constitute an assertion of clinical expertise or a claim that my professional experience independently establishes a causal relationship between RF exposure and specific health outcomes.

My principal contribution is to identify the technical considerations necessary for reliable exposure characterization, and to recommend measurement, data collection, and engineering practices capable of supporting rigorous public health evaluation.

III. EXPOSURE STANDARDS AND REGULATORY ASSESSMENT

Response to Question 5: Existing Standards and Opportunities for Improvement

The United States has an established regulatory framework governing human exposure to radiofrequency electromagnetic fields. The Federal Communications Commission's RF exposure requirements under 47 CFR § 1.1310 set numerical exposure limits, and OET Bulletin 65 supplies the evaluation methods used to demonstrate compliance with them [2], [3].

Internationally, the International Commission on Non-Ionizing Radiation Protection published updated guidelines in 2020 covering RF electromagnetic fields from 100 kHz to 300 GHz [4]. The IEEE maintains a parallel exposure standard, C95.1-2019, across a wider frequency range beginning at 0 Hz [6].

These regulatory and scientific frameworks provide important starting points for evaluating wireless exposure. They rest on a substantial published literature, which includes the large international epidemiological studies of wireless phone use, the IARC evaluation of radiofrequency fields, the long-term animal bioassays conducted by the National Toxicology Program and the Ramazzini Institute, and the systematic reviews commissioned by the World Health Organization [10]–[16].

However, regulatory compliance assessment and epidemiological exposure assessment serve different purposes. Compliance methodology is built around conservative, worst-case conditions evaluated at a fixed location [7]. A determination that equipment or a site complies with applicable exposure limits does not, by itself, describe how an individual's exposure varies over time.

I recommend that HHS, in coordination with the FCC and relevant standards organizations:

1. Compare existing exposure assessment methodologies with the operating characteristics of contemporary 4G and 5G networks [8].
2. Evaluate measurement protocols capable of representing simultaneous exposure from multiple transmitters and frequency bands [9].
3. Distinguish occupational exposure conditions from general-public exposure conditions.

4. Assess whether existing measurement and reporting practices provide sufficient information for scientifically meaningful long-term exposure studies.
5. Characterize the reproducibility and measurement uncertainty of RF assessments carried out under differing environmental and network conditions.

Any proposed change to exposure standards should rest on rigorous scientific evidence, appropriate dosimetry, and a documented assessment of health outcomes [12], [15], [16]. The arrival of a newer wireless technology is not, by itself, a basis for revising a limit.

IV. REAL-WORLD RF EXPOSURE CHARACTERIZATION

Response to Questions 7 and 8: Measurement Methods and Methodological Improvements

Modern wireless systems are dynamic. Transmission characteristics change with network traffic and the distribution of users, with where a device is and how well it is propagating, and with the power-control and antenna-configuration decisions the network makes from moment to moment [8], [9].

A single measurement taken at one location and one moment therefore cannot characterize the range of exposures that arises during ordinary network operation [9].

This matters most in LTE and 5G environments. There, multiple frequency bands and heterogeneous cell configurations combine with multiple-input multiple-output (MIMO) systems and adaptive beamforming, and all four can alter how RF energy is distributed in space and over time [8].

A standardized exposure assessment methodology would, in my view, need to incorporate the following elements.

A. Frequency-resolved measurements

Measurements should separate the contributions of individual operating bands and transmission sources rather than relying on aggregated readings alone [9].

B. Temporal exposure characterization

Network utilization and transmission activity change over time, and measurements should account for that across defined observation periods, with sampling intervals and averaging procedures that are scientifically justified rather than merely conventional [7].

C. Spatial exposure assessment

Field measurements should be taken at representative locations, and should record antenna orientation and propagation conditions together with height, distance, and any environmental obstructions [7].

D. Multi-source exposure evaluation

Protocols should address simultaneous contributions from cellular base stations, Wi-Fi systems, mobile devices, and other relevant RF sources, applying frequency-dependent assessment methods to each [9].

E. Measurement reliability

Instrumentation should be calibrated and suitable for the frequencies and exposure quantities being assessed. Reports should document measurement uncertainty, equipment characteristics, the conditions under which readings were taken, and whether the result is reproducible [7].

F. Network-specific operating parameters

Where such data are technically available and appropriate to disclose, measurements should be interpreted alongside the network parameters that produced them: transmission power and duty cycle, traffic loading, antenna configuration, and beam-management behavior [7], [8].

These recommendations would support a more consistent evidence base for comparing exposure patterns across network technologies, geographic settings, and deployment configurations.

V. PUBLIC DISCLOSURE AND EXPOSURE SURVEILLANCE

Response to Questions 9 and 10: Public Information and Monitoring Systems

Reliable public communication depends on keeping four things distinct: RF emissions, measured exposure, the applicable regulatory limits, and the evidence on potential health effects. In practice these are routinely conflated.

Standardized technical reporting guidance would help here, provided it is written to be understood by specialists and non-specialists alike.

Such guidance could include:

- Identification of relevant RF sources and frequency bands.
- Description of measurement procedures and operating conditions.
- Applicable exposure limits and the measured percentage of those limits.
- Measurement uncertainty and limitations.
- Distinctions between modeled and field-measured exposure.
- Procedures for investigating credible compliance concerns.

For public health surveillance, I recommend that HHS examine the feasibility of integrating appropriately collected RF exposure information with epidemiological research datasets [15], [16].

Such integration would require consistent metadata and privacy safeguards, documented quality assurance, and an explicit statement of the limits of the exposure measurements themselves.

A centralized or federated technical data resource could support research institutions in comparing exposure conditions across locations and periods without disclosing confidential network information or individual health records.

Exposure surveillance is not evidence of causation and should not be presented as such. Meaningful assessment of health effects requires appropriate epidemiological design, control of confounding factors, and independent scientific evaluation [15], [16].

VI. VULNERABLE POPULATIONS AND OCCUPATIONAL SETTINGS

Response to Question 11: Exposure Assessment for Sensitive Populations

I recommend that federal research distinguish among the exposure scenarios facing different groups: the general population; children and adolescents, whose exposure has been the subject of dedicated epidemiological work [11]; pregnant individuals; people with implanted medical devices; and telecommunications workers whose duties bring them close to transmitting antennas.

From an engineering perspective the differences that matter are proximity to the source, how long the exposure lasts, the transmission characteristics involved, and the physical environment in which it occurs.

In occupational settings the safeguards that matter are site-specific RF assessment and worker training, controlled access and signage where the assessment calls for it, and established procedures for working around active transmission systems [6], [7].

For schools, residences, and healthcare facilities, measurement protocols should be built around representative exposure conditions. Proximity to telecommunications infrastructure does not by itself determine exposure magnitude or health risk; measurements taken near 5G small cells indicate that exposure at a given distance depends heavily on traffic load and on the beamforming behavior of the antenna as it serves other users [8].

Electromagnetic compatibility deserves separate attention. Potential interference with implanted medical devices is an engineering question about device immunity, and it should be evaluated separately from claims about biological effects of RF exposure.

VII. TECHNOLOGICAL EVOLUTION AND CUMULATIVE EXPOSURE

Response to Question 13: Implications of 5G, Emerging 6G, and Connected Technologies

The transition from 2G and 3G systems to LTE and 5G has introduced substantial changes in wireless network architecture.

Spectral efficiency has improved and carrier aggregation is now routine. Deployments have become denser, antenna systems more advanced, and radio-resource management considerably more adaptive than in earlier generations.

However, adding wireless technologies does not necessarily produce a proportional increase in individual RF exposure [8], [9].

Exposure depends on actual transmission characteristics and network configuration, on frequency and proximity to the source, and on user behavior and environmental conditions. Recent microenvironmental surveys found that whether the person was actively transmitting mattered more than where they were standing [9].

HHS could usefully support comparative engineering studies that evaluate exposure under representative operating conditions for 2G, 3G, LTE, 5G, and emerging wireless technologies.

Such studies should distinguish between:

1. Exposure from network infrastructure and exposure from personal wireless devices.

2. Average exposure and short-duration peaks.
3. Stationary environmental exposure and exposure associated with active device usage.
4. Exposure from individual transmitters and combined exposure from multiple sources.
5. Changes resulting from network densification and changes resulting from improved signal quality and power control.

These distinctions are necessary to avoid oversimplified conclusions concerning the exposure implications of network modernization.

VIII. WIRELESS INFRASTRUCTURE AND COMMUNITY EXPOSURE

Response to Question 15: Infrastructure-Related Exposure Assessment

I recommend that federal agencies encourage scientifically defensible exposure assessment for telecommunications infrastructure sited near homes, schools, healthcare facilities, and workplaces [7].

The relevant factors are the antenna's own characteristics together with its transmission power and frequency; how heavily the network is loaded; the orientation of the antenna and any physical obstructions in the path; and the contribution of other RF sources in the vicinity [7], [9].

Although distance from a transmitting antenna is important, distance alone is not a reliable substitute for exposure measurement or technically validated modeling.

Community exposure evaluations should therefore use appropriate propagation models, field measurements, and clearly documented assumptions.

Where network densification or small-cell deployment is evaluated, agencies should distinguish between changes in the number of transmission sites and changes in actual human exposure [8]. The two do not necessarily move together.

This approach can improve the credibility of public reporting while supporting continued deployment of wireless communications infrastructure in compliance with applicable federal requirements.

IX. PRIORITY RESEARCH GAPS

Response to Question 16: Recommended Federal Research Priorities

From a telecommunications engineering perspective, I recommend prioritizing the following research areas:

Priority 1 - Real-world multi-source exposure assessment

Develop validated protocols for characterizing RF exposure associated with simultaneous use of multiple wireless technologies and frequency bands [9].

Priority 2 - Exposure characterization in adaptive 5G networks

Evaluate measurement approaches suited to beamforming and dynamic power allocation, to changing traffic demand, and to the spatial and temporal variation these produce [8].

Priority 3 - Longitudinal exposure datasets

Support the development of quality-controlled, privacy-preserving datasets capable of informing epidemiological research over extended periods [15], [16].

Priority 4 - Occupational exposure evaluation

Assess exposure measurement practices and protective procedures for workers involved in the installation, maintenance, and operation of telecommunications infrastructure [6].

Priority 5 - Measurement standardization and uncertainty

Improve consistency across instruments and calibration, modeling assumptions, uncertainty assessment, and technical documentation [7].

Priority 6 - Translation of technical findings into public information

Establish clear reporting methods that help stakeholders understand measured RF levels, applicable regulatory limits, scientific uncertainty, and practical exposure considerations.

These priorities would strengthen the technical evidence available to public health researchers without predetermining the findings of future health studies.

X. INTERAGENCY COORDINATION

Response to Question 17: Federal Research Coordination

A coordinated federal approach is needed here, one that recognizes the complementary responsibilities of health agencies, telecommunications regulators, scientific institutions, and standards organizations.

The National Institutes of Health is well placed to support multidisciplinary research drawing on epidemiology, exposure science, dosimetry, and the relevant biological investigations [12], [13], [14].

Within its statutory responsibilities, the Food and Drug Administration holds the relevant expertise on electronic product radiation, on medical devices, and on the scientific assessments that accompany both.

The Centers for Disease Control and Prevention brings occupational and environmental public health capability, together with experience in exposure surveillance and in translating research for practitioners.

The Federal Communications Commission is the source of regulatory and engineering expertise on RF exposure compliance, wireless infrastructure, and technical assessment practice [2], [3], [5].

Interagency technical working groups, common data definitions, and coordinated research protocols would also be worth establishing where agency mandates and available resources justify them.

Such collaboration would improve the consistency and practical usefulness of federal findings.

XI. ADDITIONAL TECHNICAL RECOMMENDATIONS

Response to Question 18: Proposed Engineering and Research Measures

To strengthen federal evaluation of RF exposure, I respectfully recommend that HHS consider the development of a **National RF Exposure Measurement and Assessment Protocol** in collaboration with relevant agencies, researchers, and standards organizations.

This proposed protocol should establish:

1. Minimum technical requirements for field measurement and simulation [7].
2. Consistent treatment of multi-frequency and multi-source exposure.
3. Procedures for documenting network operational conditions.
4. Quality assurance and uncertainty-reporting requirements.
5. Guidance for comparing observed exposure with applicable regulatory limits.
6. Appropriate data governance, reproducibility, and public reporting practices.
7. Mechanisms for periodic review as telecommunications technologies and scientific evidence evolve.

The protocol should initially be evaluated through controlled pilot studies using representative network environments and independently assessed measurement procedures before broader adoption is considered.

This recommendation is intended as a prospective technical proposal rather than a claim that such a protocol has already been developed, validated, or adopted.

XII. CONCLUSION

The continued evolution of wireless telecommunications requires public health research and regulatory assessment methods that remain technically relevant, scientifically defensible, and transparent.

Based on my professional experience across 2G, 3G, LTE, and 5G telecommunications technologies, I consider three things essential to informed federal decision-making: accurate exposure characterization, standardized measurement practice, and coordinated research between technical and public health institutions.

I respectfully encourage HHS to prioritize real-world exposure assessment and multi-source measurement, to insist on reproducible technical methods, to support longitudinal research, and to coordinate effectively with the Federal Communications Commission and other relevant institutions.

These measures would strengthen the scientific foundation for evaluating RF exposure and improve public confidence in the assessment process. They would also support evidence-based protection of public health without losing sight of the importance of reliable wireless communications infrastructure.

Thank you for the opportunity to contribute to this important federal consultation.

Respectfully submitted,
Engr. Vincent Onaji
onajivincent@gmail.com

REFERENCES AND REGULATORY SOURCES

1. 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 FR 59792–59794. https://www.govinfo.gov/content/pkg/FR-2026-09-21/html/2026-19252.htm
2. Federal Communications Commission. *47 CFR § 1.1310 - Radiofrequency Radiation Exposure Limits.* https://www.ecfr.gov/current/title-47/section-1.1310
3. Federal Communications Commission. *OET Bulletin 65 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields.* https://www.fcc.gov/general/oet-bulletins-line
4. 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
5. Federal Communications Commission. (2026). *FCC Seeks Comment on RF Exposure Issues Subject to D.C. Circuit Remand in Environmental Health Trust v. FCC.* ET Docket No. 13-84, 91 FR 60128–60131. https://www.govinfo.gov/content/pkg/FR-2026-09-22/html/2026-19364.htm
6. Institute of Electrical and Electronics Engineers. (2019). IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz (IEEE C95.1-2019). IEEE. https://standards.ieee.org/ieee/C95.1/4940/
7. International Electrotechnical Commission. (2025). Determination of RF field strength, power density and SAR in the vicinity of base stations for the purpose of evaluating human exposure (IEC 62232:2025, Edition 4.0). IEC. https://webstore.iec.ch/publication/64934
8. Aerts, S., Deprez, K., Verloock, L., Olsen, R. G., Martens, L., Tran, P., & Joseph, W. (2023). RF-EMF exposure near 5G NR small cells. Sensors, 23(6), 3145. https://doi.org/10.3390/s23063145
9. Veludo, A. F., Stroobandt, B., Van Bladel, H., Sandoval-Diez, N., Guxens, M., Joseph, W., & Röösli, M. (2025). Exploring RF-EMF levels in Swiss microenvironments: An evaluation of environmental and auto-induced downlink and uplink exposure in the era of 5G. Environmental Research, 266, 120550. https://doi.org/10.1016/j.envres.2024.120550
10. INTERPHONE Study Group. (2010). Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case–control study. International Journal of Epidemiology, 39(3), 675–694. https://doi.org/10.1093/ije/dyq079
11. Castaño-Vinyals, G., Sadetzki, S., Vermeulen, R., Momoli, F., Kundi, M., Merletti, F., Cardis, E., et al. (2022). Wireless phone use in childhood and adolescence and neuroepithelial brain tumours: Results from the international MOBI-Kids study. Environment International, 160, 107069. https://doi.org/10.1016/j.envint.2021.107069
12. International Agency for Research on Cancer. (2013). Non-ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields (IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 102). IARC. https://publications.iarc.who.int/126
13. National Toxicology Program. (2018). Toxicology and Carcinogenesis Studies in Hsd:Sprague Dawley SD Rats Exposed to Whole-body Radio Frequency Radiation at a Frequency (900 MHz) and Modulations (GSM and CDMA) Used by Cell Phones (NTP Technical Report 595). NTP. https://doi.org/10.22427/NTP-TR-595
14. Falcioni, L., Bua, L., Tibaldi, E., Lauriola, M., De Angelis, L., Gnudi, F., Belpoggi, F., et al. (2018). Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz GSM base station environmental emission. Environmental Research, 165, 496–503. https://doi.org/10.1016/j.envres.2018.01.037

15. Karipidis, K., Baaken, D., Loney, T., Blettner, M., Brzozek, C., Elwood, M., & Lagorio, S. (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
16. Karipidis, K., Baaken, D., Loney, T., Blettner, M., Mate, R., Brzozek, C., & Lagorio, S. (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