EVIDENCE BRIEF / HHS-OASH-2026-0397

5G, wireless radiation and public health

Scientific literature synthesis for the U.S. HHS Request for Information
Prepared October 9, 2026 | Public comments due October 21, 2026

The strongest defensible conclusion: typical RF exposure from compliant wireless technology has not been shown to cause adverse human health effects. That is different from saying every conceivable risk has been disproven.

Four findings that should guide the RFI

- **Human cancer studies:** a 2024 WHO-commissioned systematic review of 63 epidemiologic papers found no increased risk for several studied head tumors with mobile-phone use. [1]
- **Measured 5G exposure:** a UK 2025 study at 56 5G macro base stations found worst-case RF levels no higher than 5% of a reference public limit at sampled sites. [3]
- **Blinded human research:** large reviews of controlled trials found no reproducible significant effect on studied cognitive tests or short-term nonspecific symptoms. [4,5]
- **Real uncertainty:** selected rodent studies detected tumors, the IARC Group 2B classification persists, and long-term higher-frequency 5G evidence is limited. [6,7,12]

What this does - and does not - establish

Radiofrequency electromagnetic fields (RF-EMF) are **non-ionizing**, meaning that individual RF photons lack the energy to directly ionize molecules as X-rays can. High-power RF can still harm tissue by heating it. The relevant public-health question is the actual frequency, absorbed dose, duration and compliance with applicable protective standards - not whether a tower has the label “5G.” [10,13,15]

Results from cell-phone cohorts are informative but are not automatically equivalent to studies of outdoor 5G base stations. A phone near the body can create different exposure patterns from distant infrastructure. Different 5G bands (sub-6 GHz versus millimeter wave) also deserve distinct exposure assessment. The links below distinguish these evidence types.

Method: This is an independently written synthesis of publicly available original studies, systematic reviews and agency assessments. The papers themselves are not reproduced. Every evidence item has a source link, limitations and an application to HHS questions.

01 | Cancer evidence in humans

Most informative synthesis: Karipidis and colleagues pooled 63 human epidemiological publications spanning 22 countries in a WHO-commissioned 2024 systematic review. Their mobile-phone-use results were consistent with no increase in the investigated tumors, including glioma (pooled RR 1.01, 95% CI 0.89-1.13), meningioma (0.92, 0.82-1.02), and acoustic neuroma (1.03, 0.85-1.24). They found no association of modeled fixed-site transmitter exposure with the studied childhood leukemia or pediatric brain-tumor outcomes. [1]

A 2025 companion review found mobile-phone exposure was not associated with leukemia, non-Hodgkin lymphoma or thyroid cancer, although the reviewers rated evidence certainty as **low** for these less-studied outcomes. It found too little evidence about fixed transmitters for many other tumors. [2]

Cross-check: independent population data

The U.S. National Cancer Institute describes generally stable adult glioma rates across decades of expanding mobile-phone use and reviews multiple large human cohorts. A separate SEER-based study in 2025 likewise found declining malignant brain-tumor incidence over 2000-2021 despite large increases in phone subscriptions. Population trends are relevant checks, **not** proof that a small rare risk cannot exist. [10,19]

What the evidence supports

- No credible basis to declare that everyday wireless communication is an **established cause** of brain cancer in humans.
- Continue better exposure estimation and cancer surveillance rather than assume either absolute safety or established harm.

What it cannot yet resolve

- Lifetime exposure, early-life vulnerability, rare effects in heavily exposed subgroups and exposure error across rapidly changing technologies.
- Distinct implications of older handset technologies, environmental antennas, and newer 5G spectrum bands.

HHS question fit: Q6, Q11, Q12, Q15, Q16 and Q18. Original studies: [1] 2024 cancer review; [2] 2025 follow-up; [10] NCI overview.

02 | 5G-specific exposure and studies

Real-world emissions: measured, not guessed

Calderon, Addison and Peyman (2025) sampled **56 active 5G macro base stations at 30 public locations** in the United Kingdom, testing ordinary background and data-traffic scenarios. Even extrapolated worst-case total exposure was no more than **5%** of the 1998 ICNIRP public reference levels used for comparison at these sites. On average, 5G contributed less than **10%** of all measured RF. [3]

These are concrete reassuring measurements. They are neither a health outcome study nor proof of compliance at every tower. Independent field measurements should cover realistic beamforming, traffic peaks, device use, distance, time averaging and multiple simultaneous transmitters.

Higher frequencies: targeted review

Karipidis and colleagues (2021) reviewed **107 experimental** and **31 epidemiologic** studies relevant to RF frequencies above 6 GHz. They found no confirmed hazard from the low-level exposures investigated, but emphasized that many studies used unreliable dosimetry and experimental controls. Higher-frequency RF is absorbed more superficially (especially in skin and eye tissues) than lower-frequency RF. [8,15]

2026 controlled experiment at 26 GHz

Michelant and colleagues compared short real and sham 26 GHz exposures in a randomized triple-blind crossover study involving 31 healthy adults. They found no detectable changes in studied EEG frequency bands over the brief experimental period. This is relevant direct high-frequency human evidence, **not** a study of decades of exposure or cancer risk. [9]

Standards worth evaluating

ICNIRP 2020: 100 kHz to 300 GHz, covering high-frequency 5G. **IEEE C95.1-2019:** another international electromagnetic field exposure standard. **FCC:** the applicable U.S. legal framework. Assess their differences explicitly; never treat ICNIRP percentages as measured fractions of FCC limits without conversion. [13,14]

HHS question fit: Q5, Q7-Q9, Q12-Q13, Q15-Q17. Sources: [3] UK measured 5G article; [8] >6 GHz review PDF; [9] human 26 GHz trial.

03 | Cognition, symptoms, Wi-Fi and smart meters

Controlled human outcomes

A 2024 systematic review of **76 human experimental studies** (3,846 total participants) found no significant acute effect of RF exposure on measured cognitive performance in its meta-analyses, though conditions often used older mobile signals. [4]

Another 2024 systematic review of **41 controlled human studies** (2,874 participants) found no or small statistically non-significant effects on self-reported headaches, sleep disturbance and combined nonspecific symptoms in the evaluated exposure settings. This is not a reason to discount a person's symptoms; it means a causal RF mechanism was not demonstrated by the blinded evidence. [5]

Wi-Fi in schools

The UK Health Security Agency's 2025 guidance finds no consistent evidence of adverse health effects from ordinary Wi-Fi signals. Its school exposure-measurement program found exposure low relative to international reference limits. The agency does not recommend removing Wi-Fi from schools on health grounds. [16]

Smart meters

Australia's federal radiation-protection authority describes smart meters as transmitting intermittently at low power, with everyday exposures substantially below applicable limits and no established adverse effects from their RF emissions. Configuration and compliance should still be verified for actual devices. [17]

Reproductive outcomes and sensitivity

Not every possible outcome is well characterized. A 2024 review of human observational studies reported **very uncertain** findings for several adverse female reproductive outcomes. That uncertainty supports better studies, not declaring pregnancy risks proved or disproved. Particular attention to children, pregnant people, workers, and implanted medical devices is appropriate; medical-device electromagnetic interference should be evaluated separately from tissue effects. [18]

HHS question fit: Q11-Q13, Q16-Q18. Sources: [4] cognition review; [5] symptom review; [16] UKHSA Wi-Fi; [17] smart meters.

04 | Contrary results and unresolved questions

Scientific credibility requires acknowledging the strongest contrary data. In 2011 IARC classified RF electromagnetic fields as possibly carcinogenic to humans (Group 2B), an assessment based on then-limited epidemiologic and other evidence. A 2024 IARC advisory group recommended an updated RF evaluation as a high priority for 2025-2029. That recommendation is not itself a reclassification. [12]

Laboratory animal cancer findings

The U.S. National Toxicology Program reported elevated heart schwannomas in male rats exposed to high-level, 2G/3G-like whole-body RF for much of each day. NTP warned against directly comparing those conditions with ordinary human mobile-phone use. [11]

Mevissen and colleagues' 2025 systematic review of animal cancer studies, **corrected in July 2026**, assessed selected male-rat heart schwannoma and glioma results as high-certainty evidence in animal studies. The correction revised key counts and details without eliminating that interpretation. Crucially, its authors explicitly acknowledged that deriving human risk from such rodent experiments is complex. [6]

A 2026 reanalysis by Belenki and colleagues used a different quantitative method and judged evidence certainty **moderate for malignant heart schwannoma** and **low for malignant glioma** in animals. This is an active methodological disagreement, not a consensus that daily 5G exposure is carcinogenic or that animal findings should be ignored. [7]

What a responsible HHS assessment should say

- **Established:** sufficiently high RF intensity can heat biological tissue and produce harm.
- **Not established:** typical guideline-compliant 5G, Wi-Fi or smart-meter exposure causing cancer or nonspecific illness in humans.
- **Uncertain:** rare, delayed or subgroup-specific effects; some reproductive endpoints; long-term mmWave exposure; interpretation of selected animal findings.
- **Action:** preregistered protocols, independent replication, transparent dosimetry and updated health-risk assessment instead of rhetorical certainty.

HHS question fit: Q6, Q11-Q12, Q16-Q18. Sources: [6] corrected animal review; [7] 2026 reappraisal; [12] IARC advisory PDF.

05 | Recommendations for HHS

The RFI asks for research, standards, disclosure, exposure characterization and future work. The following recommendations are proportionate to the evidence; none assumes that an unevidenced health hazard has already been proven.

A. Preserve enforceable protection while comparing frameworks (Q5-Q6)

Maintain RF safety standards and compliance checks. Clearly distinguish U.S. FCC legal limits from ICNIRP 2020 and IEEE C95.1-2019, including how basic restrictions, reference levels, averaging times and frequency regions differ. Evaluate proposals against validated data.

B. Measure the right exposure (Q7-Q9, Q13, Q15)

Publish independent, repeatable measurements around representative antenna deployments and inside school and residential environments. Include aggregate exposure, realistic device duty cycles, distance, antenna beamforming, time of day, short peaks, and older radio technologies already present. Use appropriate dosimetry rather than tower counts or visual proximity alone.

C. Fund studies able to change decisions (Q11-Q12, Q16)

Prioritize longer-term cohorts with improved measured exposure, direct research at high-frequency 5G (e.g., around 26-28 GHz), childhood and reproductive outcomes, comparison of practical cumulative exposure settings, and research into susceptible groups. Pre-register analytical plans, share exposure protocols, replicate positive signals and make null results findable.

D. Assess non-health issues separately (Q11, Q18)

Keep electromagnetic compatibility with implanted medical devices and equipment as a distinct engineering/clinical question; do not conflate interference with an assertion that guideline-compliant ambient RF causes cancer.

E. Communicate uncertainty precisely (Q17-Q18)

Publish an evidence table showing each exposure source, observed outcome, study type, applicability to everyday levels, quality limitations and whether a causal relationship has been established. Treat first-person symptoms respectfully without substituting anecdotes for evidence of mechanism or causality.

Policy bottom line: maintain protective limits and transparent monitoring, continue targeted research, and reject claims that normal compliant 5G exposure is a proven public-health hazard.

Read the official notice: HHS Federal Register RFI, September 21, 2026. Submit on regulations.gov by October 21, 2026.

06 | Research library and original documents

The links below open the original publication, authoritative full-text page, or original PDF, as indicated. They are **not** copies of the studies inside this packet. Download source papers from the linked publishers or repositories if you want to attach originals separately. DOIs are permanent scholarly identifiers.

Note on redistribution: The evidence packet consists of our own summaries. Copyright/licensing and publisher permissions vary by paper; the PDF itself does not reproduce or claim to package other authors' complete texts.

[1] Karipidis et al. (2024) - human cancer, Part I
Karipidis K, et al. The effect of exposure to radiofrequency fields on cancer risk in the general and working population, Part I. Environment International 191:108983 (2024).
Systematic review | 63 human epidemiologic articles
Original source | Original PDF | DOI
Why included: Pooled phone-use data did not show increased risks of glioma, meningioma, acoustic neuroma and selected other tumors. Evidence concerning fixed transmitters was reassuring for childhood leukemia and pediatric brain tumors. **Limit:** Mostly pre-5G exposure; observational exposure misclassification and long-latency gaps remain.

[2] Karipidis et al. (2025) - human cancer, Part II
Karipidis K, et al. The effect of exposure to radiofrequency fields on cancer risk in the general and working population, Part II. Environment International 196:109274 (2025).
Systematic review | less-studied human cancers
Original source | DOI
Why included: No association identified between mobile-phone use and leukemia, non-Hodgkin lymphoma, or thyroid cancer in the pooled comparisons. **Limit:** Low certainty for these outcomes; insufficient fixed-site exposure studies to draw conclusions about many cancers.

[3] Calderon, Addison & Peyman (2025) - measured 5G emissions
Calderon C, Addison D, Peyman A. In-Situ Measurements of Radiofrequency Electromagnetic Fields Around 5G Macro Base Stations in the UK. Bioelectromagnetics 46:e70012 (2025).
Field measurements | 56 base stations, 30 public sites
Original source | DOI
Why included: Total RF, including modeled worst case, did not exceed 5% of ICNIRP 1998 public reference levels in the sampled places; 5G was less than 10% of measured RF on average. **Limit:** Site- and period-specific measurements under one regulatory reference scheme; not representative of every site worldwide.

[4] Pophof et al. (2024) - human cognition
Pophof B, et al. The effect of exposure to radiofrequency electromagnetic fields on cognitive performance in human experimental studies. Environment International 191:108899 (2024).
Systematic review | 76 human experiments
Original source | DOI
Why included: Meta-analyses found no statistically significant differences in tested short-term cognitive performance between actual exposure and sham. **Limit:** Many experiments used older GSM signals; mostly acute experimental exposures, not lifelong follow-up.

[5] Bosch-Capblanch et al. (2024) - human symptoms
Bosch-Capblanch X, et al. The effects of RF electromagnetic fields exposure on human self-reported symptoms: A systematic review of experimental studies. Environment International 187:108612 (2024).
Systematic review | 41 human experiments
Original source | DOI
Why included: No or small non-significant effects on headache, sleep problems, and composite symptom scores for the exposures tested. **Limit:** Cannot resolve every chronic complaint or rare syndrome; intervention conditions and evidence certainty varied.

[6] Mevissen et al. (2025; corrected 2026) - animal tumors
Mevissen M, et al. Effects of radiofrequency electromagnetic field exposure on cancer in laboratory animal studies: a systematic review. Environment International 199:109482 (2025); corrigendum 214:110368 (2026).
Systematic review + published correction | animals
Original source | DOI
Why included: The corrected review continued to rate evidence for greater glioma and heart schwannoma occurrence in male rats in selected animal experiments as high certainty. **Limit:** The authors themselves cautioned against straightforward extrapolation to human everyday RF exposure. Use the corrected 2026 article.

07 | Research library (continued)

[7] Belenki et al. (2026) - independent animal reappraisal
Belenki D, Baaken D, Meyer F, Kuhne J. Commentary on systematic review of RF field exposure and animal cancer. Environment International 209:110154 (2026).
Methodological reanalysis | 2026
Original source | DOI
Why included: Performed alternative meta-analyses, reaching moderate evidence certainty for male-rat heart schwannomas and low certainty for malignant glioma. **Limit:** The conflicting certainty judgments show legitimate scientific debate; neither establishes 5G danger in people.

[8] Karipidis et al. (2021) - high-frequency 5G review
Karipidis K, Mate R, Urban D, Tinker R, Wood A. 5G mobile networks and health: a state-of-the-science review of low-level RF above 6 GHz. J Expo Sci Environ Epidemiol 31:585-605 (2021).
Review | 107 experiments, 31 epidemiologic studies
Original source | Original PDF | DOI
Why included: No confirmed health hazard from low-level RF above 6 GHz emerged across evaluated studies, but many studies had methodological shortcomings. **Limit:** Radar studies are proxies, not decades-long 5G follow-up; some experimental studies used poor dosimetry.

[9] Michelant et al. (2026) - controlled 26 GHz EEG
Michelant L, et al. Millimeter-wave high frequency 5G (26 GHz) electromagnetic fields do not modulate human brain electrical activity. Environmental Research 289:123349 (2026).
Randomized triple-blind crossover | 31 adults
Original source | DOI
Why included: A brief 26 GHz exposure under the study protocol did not significantly change assessed EEG spectral activity versus sham. **Limit:** Preliminary, small and acute; cannot address cancer, long-term effects, or effects in other groups.

[10] National Cancer Institute (2024) - U.S. evidence overview
U.S. National Cancer Institute. Cell Phones and Cancer Risk (reviewed April 4, 2024).
U.S. government health evidence assessment
Original source
Why included: Covers non-ionizing physics, cancer cohorts, U.S. and international cancer trends, rodent findings, uncertainty and monitoring. **Limit:** Contains data mainly from older phone generations; scientific updates remain necessary.

[11] NTP/NIH (2018) - high-exposure rodent findings
U.S. National Institutes of Health. High exposure to radio frequency radiation associated with cancer in male rats (2018).
Primary government report of animal research
Original source
Why included: Reports male-rat cardiac schwannomas after sustained high-level 2G/3G-like whole-body RF exposure. **Limit:** Experimental rat exposures cannot be directly equated to normal human handset or base-station exposure.

[12] IARC advisory priorities 2025-2029
International Agency for Research on Cancer. Advisory Group Report on Priorities for IARC Monographs During 2025-2029 (2024).
WHO/IARC hazard-classification planning report
Original source | Original PDF
Why included: Records existing Group 2B (possible carcinogenicity) RF classification and recommends renewed evaluation as a high priority. **Limit:** Priority for reevaluation is not itself an updated cancer classification or proof of harm.

[13] ICNIRP (2020) - RF exposure guidelines
International Commission on Non-Ionizing Radiation Protection. Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz). Health Physics 118:483-524 (2020).
Exposure protection framework | through 300 GHz
Original source | Original PDF | DOI
Why included: Sets general public and worker limits that cover cellular networks, Wi-Fi, 5G and other RF applications. **Limit:** Guideline is not direct proof of every health outcome; U.S. FCC rules are a distinct regulatory framework.

08 | Research library (continued)

[14] IEEE C95.1-2019 - electromagnetic exposure standards
IEEE. Standard C95.1-2019, Safety Levels for Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz.
Standards framework | not an epidemiologic study
Original source | DOI
Why included: Provides another science-based set of exposure limits for comparison with FCC and ICNIRP rules. **Limit:** Access to complete paid standard may require authorization; see publicly accessible summary.

[15] WHO (2020) - 5G technical health Q&A
World Health Organization. Radiation: 5G mobile networks and health (2020).
Public health guidance | background, not a new trial
Original source
Why included: Identifies heating as the main established RF interaction, explains shallower penetration at higher frequencies, and stresses adherence to guidelines and research. **Limit:** This web fact sheet dates to 2020; pair it with studies published through 2026.

[16] UKHSA (2025) - Wi-Fi exposure and health
UK Health Security Agency. Wi-Fi radio waves and health (updated February 19, 2025).
National public-health guidance
Original source
Why included: Finds no consistent evidence Wi-Fi exposures adversely affect public health; classroom measurements were far below ICNIRP reference levels. **Limit:** Not a substitute for testing any specific noncompliant device or installation.

[17] ARPANSA - smart meters and health
Australian Radiation Protection and Nuclear Safety Agency. Smart meters and health.
National regulator assessment
Original source
Why included: Notes intermittent low-power transmission; typical RF emissions are very low relative to safety limits, with no established RF-related health harms. **Limit:** Meter communication configurations can vary by country and product.

[18] Johnson et al. (2024) - female reproductive outcomes
Johnson EE, et al. The effects of radiofrequency exposure on adverse female reproductive outcomes. Environment International 190:108816 (2024).
Human observational systematic review
Original source | DOI
Why included: Evidence linking RF exposure with certain birth outcomes was very uncertain; data were too limited for confident conclusions. **Limit:** Avoid making broad no-risk claims for pregnancy and fertility based on existing research.

[19] U.S. brain cancer incidence trends (2025)
Muscat JE, et al. Trends in Malignant and Benign Brain Tumor Incidence and Mobile Phone Use in the U.S. (2000-2021): A SEER-Based Study (2025).
Ecological trend analysis using SEER
Original source
Why included: Found malignant tumor rates decreasing slightly while mobile subscriptions increased substantially, inconsistent with a large population-level brain-cancer effect. **Limit:** Ecological comparisons cannot rule out small individual-level effects or long latency.

[20] HHS Federal Register RFI (2026)
U.S. Department of Health and Human Services. Request for Information on EMFs, RF radiation, and wireless radiation exposure. 91 FR 59792-59794, document 2026-19252.
Official RFI | comment deadline October 21, 2026
Original source | Original PDF
Why included: Lists HHS question numbers, perspectives, public-comment instructions and evidence priorities. **Limit:** The screenshot comment field is limited to 5,000 characters; the longer annotated brief is designed as a separate attachment.

09 | Submission checklist

1. Paste the comment. Open the separate file *HHS_5G_Public_Comment.txt*, select all and paste it into the RFI Comment field. It is 4,804 characters including spaces and newlines at the time this packet was created, below the 5,000-character count visible in the supplied form screenshot.

2. Attach the evidence packet. Upload *HHS_5G_Evidence_Packet.pdf* under “Attach Files.” This file is the annotated source dossier. If you want to add the original publications, use the links in the source library to download their PDFs individually and upload those as additional attachments.

3. Check the submission identity. The notice permits anonymous comments, says comments become public, and asks the contributor to identify their perspective. The draft says “individual member of the public” and contains no personal health details. Do not add personally identifying or medical information unless you knowingly choose to publish it.

4. Keep citations aligned. The nine numbered references at the end of the comment correspond to [1]-[9] in this packet. References [10]-[20] expand the context, limitations, physical principles and requested research program.

5. Follow the docket process. Comments must be received no later than **October 21, 2026**. The image provided shows a maximum of **5,000 characters** in the comment box and a separate attachment section indicating up to **20 files, 10 MB each**. Confirm any last-minute website validation on submission.

Files in the companion download kit

- *HHS_5G_Public_Comment.txt* - paste into the 5,000-character comment box.
- *HHS_5G_Public_Comment.pdf* - printable copy of the same public comment.
- *HHS_5G_Evidence_Packet.pdf* - this annotated research brief; upload it as supporting evidence.
- *Original_Research_Download_Links.html* - clickable directory for source papers and government reports.

Evidence reviewed through October 9, 2026. This is not a systematic review conducted by the packet author, and it does not substitute for the cited original research.