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

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

Docket No.: HHS-OASH-2026-0397

Submitted by: Willa Brenden | New Mexico, U.S.A.

Date: October 9, 2026 (consolidated submission)

Subject: Public Comment and Supporting Evidence Regarding RF/EMF Health Effects, Exposure, Neurological Interaction, and Related Electromagnetic Technologies

RF AND EMF PUBLIC COMMENT AND SUPPORTING REPORTS

Final Public Comment and Supporting Evidence

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

Docket HHS-OASH-2026-0397

Willa Brenden | New Mexico, U.S.A. | October 9, 2026

This coordinated response contains three coordinated reports: Report 1 presents the public comment and health evidence; Reports 2 and 3 provide supporting technical material.

Contents and guide to HHS questions

Part	Subject	HHS questions addressed
Report 1	Health evidence, personal experience, exposure, and protective action	2, 3, 5-18
Report 2	Sensory patents, RF hearing, contemporary wireless studies, and emerging 6G	5, 7-9, 11-13, 15-18
Report 3	Atmospheric and geophysical mechanisms, patent proposals, and agency research questions	Primarily 13-18
Closing	Professional request and personal statement	Coordinated conclusion

Each report has its own reference numbering. Report 1 and Report 2 use R1 and R2 citation labels. Report 3 retains its original reference structure. Patent publications are engineering records, and atmospheric proposals are supporting technical information requiring appropriate agency expertise. They do not establish that ordinary wireless exposure controls weather, earthquakes, or human thought.

HHS REQUEST FOR INFORMATION — OFFICIAL QUESTIONS ADDRESSED

Docket HHS-OASH-2026-0397 | Federal Register, September 21, 2026, 91 FR 59792–59794

This coordinated submission addresses HHS Questions 2, 3, and 5–18, with particular emphasis on Questions 5, 7–9, 11–18. The following guide identifies where the subjects of the official questions are discussed. The question descriptions below are condensed summaries, not verbatim quotations.

Questions 2–3 — Respondent perspective and personal experiences: Report 1 describes my perspective as an individual and massage therapist, my personal observations, and my exposure-reduction practices.

Questions 5–6 — Exposure standards, risk assessment, and evidence relevant to current limits: Reports 1 and 2 examine biological evidence, standards, SAR, power density, modulation, beamforming, cumulative exposure, and possible improvements to safety evaluation.

Questions 7–10 — Exposure measurement, real-world assessment, disclosure, and surveillance: Reports 1 and 2 recommend independent measurements, transparency, environmental monitoring, and long-term public-health research.

Question 11 — Sensitive populations: Report 1 addresses children, schools, and potentially vulnerable individuals.

Question 12 — Evidence below federal exposure limits: Report 1 reviews relevant studies and the limitations of current evidence; Report 2 considers how such evidence should inform emerging technologies.

Question 13 — Cumulative exposure from emerging and existing technologies: Reports 1 and 2 address 5G, 6G, Wi-Fi, satellite-based communications including Starlink Direct to Cell, smart meters, and combined sources.

Question 14 — Potential environmental effects: Reports 1 and 2 address animal and plant research, ecological uncertainty, natural bioelectrical processes, and the need for environmental monitoring.

Question 15 — Wireless infrastructure and nearby environments: Reports 1 and 2 address involuntary exposure, schools, homes, cumulative neighborhood exposure, antenna deployment, and the need to evaluate livestock and other living systems.

Questions 16–17 — Research priorities and federal coordination: Reports 1 and 2 propose independent research into chronic, cumulative, developmental, bioelectrical, and ecological outcomes and coordinated evaluation across federal agencies.

Question 18 — Additional scientific and technical information: Report 3 provides supplementary material on ionospheric and atmospheric electromagnetic research and relevant patents; Report 2 provides additional satellite-network, spectrum, and exposure-control information.

The foundational premise and closing articulate the overarching concern that living systems depend on natural bioelectrical processes and that possible interactions with artificial RF/EMF exposure merit rigorous investigation. Inclusion of a question number identifies relevance, not a claim that every subpart has been answered exhaustively.

Official question text: U.S. Department of Health and Human Services, Request for Information on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure, 91 FR 59792–59794 (September 21, 2026), https://www.govinfo.gov/content/pkg/FR-2026-09-21/html/2026-19252.htm

FOUNDATIONAL PREMISE — THE NATURAL ELECTRICAL FOUNDATIONS OF LIFE AND THE EARTH'S ELECTROMAGNETIC ENVIRONMENT

Life is electrical.

This is not simply a philosophical statement. It is an established biological fact supported by scientific research. Every human being, animal, and plant depends upon electrical and electrochemical processes that contribute to cellular communication, neurological function, cardiac activity, development, growth, and tissue repair.

McCaig and colleagues (2005) documented endogenous electrical fields involved in wound healing [F1]. Levin (2014) described how naturally occurring bioelectrical patterns contribute to cell behavior and developmental organization [F2]. Fromm and Lautner (2007) reviewed electrical signaling in plants and its physiological significance [F3]. These are examples of electrical processes fundamental to life; they do not imply that every organism emits a distinct radiofrequency signal.

The Earth itself is also an electromagnetic system. It possesses a geomagnetic field, an atmospheric electrical system, and naturally occurring electromagnetic resonances, including the Schumann resonances [F4–F5]. Life evolved within this natural environment. Studies of magnetoreception demonstrate that certain animals use information from the Earth's magnetic field for orientation [F6].

These findings establish two scientific foundations: electrical activity is fundamental to living systems, and at least some organisms respond to natural electromagnetic conditions. They do not, by themselves, establish that all living organisms are synchronized to a single planetary frequency or that environmental RF exposure necessarily disrupts natural electrical regulation.

I believe that nothing is more powerful or more perfectly suited to sustaining life than the natural conditions of nature itself. The natural electrical processes of life are not inventions of modern technology. They are fundamental features of living systems, shaped within the environment of the Earth. I believe we have a responsibility to understand and protect these conditions rather than assume that continuously introducing artificial electromagnetic signals into them is without consequence.

Before we alter the electromagnetic environment of the entire planet, should we not first understand how deeply life depends upon its natural conditions?

This is the foundational question of my submission to the United States Department of Health and Human Services. I am concerned that chronic and combined artificial RF/EMF exposure may interfere with biological regulation in ways that have not been adequately investigated. The existence of natural bioelectricity makes this a serious question to test; it is not proof of a harmful interaction at ordinary environmental exposure levels.

Many people experience profound restoration in relatively undisturbed natural environments. Research supports benefits from time in nature, but it has not established that those benefits result specifically from lower RF exposure or synchronization with the Earth's Schumann resonances. I ask that the possible contribution of natural electromagnetic conditions be investigated through controlled, independent research.

As satellite-to-cellular networks expand into remote regions, I also ask whether humans, wildlife, and ecosystems will retain access to comparatively low-RF environments. Such places deserve consideration as ecological settings, personal choices, and independent scientific reference environments.

I am not asking HHS to assume that these interactions are harmful without evidence. I am asking HHS to investigate them independently, comprehensively, and without allowing technological or financial interests to determine the scientific conclusions. The reports that follow examine biological research, expanding wireless technologies, patents, and regulatory responsibilities in light of this premise.

FOUNDATIONAL SCIENTIFIC REFERENCES

[F1] McCaig, C. D., Rajnicek, A. M., Song, B., and Zhao, M. (2005). Controlling cell behavior electrically: current views and future potential. Physiological Reviews 85(3), 943–978. https://doi.org/10.1152/physrev.00017.2004

[F2] Levin, M. (2014). Molecular bioelectricity: how endogenous voltage potentials control cell behavior and instruct pattern regulation in vivo. Molecular Biology of the Cell 25(24), 3835–3850. https://doi.org/10.1091/mbc.E13-12-0708

[F3] Fromm, J., and Lautner, S. (2007). Electrical signals and their physiological significance in plants. Plant, Cell & Environment 30(3), 249–257. https://doi.org/10.1111/j.1365-3040.2006.01614.x

[F4] NOAA National Centers for Environmental Information, Geomagnetic Field Modeling. https://www.ncei.noaa.gov/products/geomagnetic-field-model

[F5] Schumann, W. O. (1952). Über die strahlungslosen Eigenschwingungen einer leitenden Kugel, die von einer Luftschicht und einer Ionosphärenhülle umgeben ist. Zeitschrift für Naturforschung A 7, 149–154. (Original theoretical treatment of Earth–ionosphere resonances.)

[F6] Wiltschko, R., and Wiltschko, W. (2005). Magnetic orientation and magnetoreception in birds and other animals. Journal of Comparative Physiology A 191, 675–693. (Research review on biological magnetic orientation.)

Part 1 — Public comment and health evidence

Report 1

RF and EMF health evidence, public exposure, and protective action

Willa Brenden | New Mexico, U.S.A. | October 9, 2026

1. My request to HHS

I ask HHS to give the documented harmful effects of electromagnetic exposure the serious, independent review they deserve. The evidence includes established injury from sufficiently intense fields, animal cancer findings, experimental DNA and reproductive damage, associations in some human cancer studies, and effects on pollinator behavior. These findings warrant specific answers about the adequacy of current safeguards, the conditions under which harm occurs, and the evidence needed to protect people throughout a lifetime of exposure.

The public needs more than a statement that a device meets a limit. We need to understand what that limit protects against, which exposures were tested, what remains uncertain, and how new evidence changes policy. I request a published, study-by-study response to the central evidence in this report, with an independent research plan and a timetable for action.

This report responds principally to HHS questions 2, 3, and 5-18. Question 12 specifically concerns effects below federal limits. The evidence cited here has different exposure conditions; findings above those limits must not be presented as proof of harm below them. [R1-1]

2. My experience and the need for meaningful choice

I submit this comment as an individual consumer and a professional massage therapist. I choose not to own or routinely use a cellular telephone. At home I turn off Wi-Fi at my modem and use wired Ethernet for my computers. My utility required installation of a smart meter. I am concerned about the limited ability to decline wireless equipment near my home.

When Wi-Fi operates around me, I have noticed a feeling somewhere between anxiety and anger: internal stress or heightened activation. In my work, calm attention, breathing, muscle tension, and nervous-system regulation matter to the care I provide. I want this reported experience taken seriously and studied objectively. I do not have measured exposure records or controlled observations that establish its cause, and I am not presenting a diagnosis or patient research data.

Protective choices should remain practical for adults as well as children. I request wired options, understandable equipment specifications, accessible smart-meter alternatives where feasible, and exposure information for homes, workplaces, schools, and healthcare settings. The people least able to choose their surroundings deserve particular consideration.

3. What electromagnetic exposure can demonstrably do

EMF covers different physical exposures. Extremely low-frequency magnetic fields associated with electrical power are distinct from the RF used by wireless communication. At sufficiently intense levels, electromagnetic fields can injure through tissue heating or stimulation; RF can also interfere with medical equipment. “Non-

ionizing" describes photon energy. It does not mean energy cannot interact with tissue or produce harm. [R1-2, R1-32]

ICNIRP's 2020 RF guidelines address substantiated adverse effects and discuss the literature on other proposed effects. Their principal RF restrictions prevent excessive heating; lower-frequency stimulation also matters near the bottom of their frequency range. It would be inaccurate to say that the guidelines never consider nonthermal research. The important question is whether their evidence judgments, averaging periods, dose metrics, and safety margins adequately protect against chronic exposure and vulnerable circumstances. [R1-2]

A change in EEG, glucose metabolism, or another laboratory marker is an observed biological effect. A tumor, impaired reproduction, or tissue injury is an adverse outcome. Both deserve assessment, but they answer different questions. Patent claims are a third category: proposed engineering methods whose efficacy must be independently tested. These distinctions apply throughout the three reports.

4. Animal cancer: a central reason for concern

U.S. National Toxicology Program

The NTP's two-year rat investigation found clear evidence of malignant heart schwannomas in male rats exposed to 900 MHz GSM- or CDMA-modulated RF. It also reported some evidence of gliomas and adrenal-medulla tumors in male-rat experiments. Exposure began during gestation and used whole-body SARs of 1.5, 3, or 6 W/kg, with intermittent exposure totaling approximately nine hours daily. Findings in females and mice were weaker or equivocal. [R1-3]

These are observed adverse outcomes from a major federal toxicology program. The whole-body doses exceeded general-public whole-body limits; comparison with a phone's localized SAR requires separate dosimetry. That limits direct estimates of everyday human risk, but it does not remove the experimental cancer finding.

Ramazzini Institute

Falcioni and colleagues exposed 2,448 rats to 1.8 GHz GSM fields at 5, 25, or 50 V/m from prenatal life through natural death, approximately 19 hours daily. Male heart schwannomas increased significantly at 50 V/m. The reported female glioma increase and Schwann-cell hyperplasia increases were not statistically significant. This independently conducted experiment strengthens concern about the heart-tumor endpoint at a substantially lower absorbed dose than NTP's. Its highest estimated whole-body SAR, about 0.1 W/kg, still requires careful comparison with public limits and human anatomy. [R1-4]

Corrected systematic review

Mevissen and colleagues' 2025 animal-cancer review, read with its 2026 corrigendum, retained high certainty of increased gliomas and heart schwannomas in male rats. The corrected inventory is 51 studies, including 10 chronic bioassays. The correction changed counts and extracted details without changing the authors' principal conclusions. Importantly, the review authors noted that the two tumor types with high certainty of evidence in animals are the same tumor types for which the IARC Working Group had identified limited evidence in humans. Most other organ systems had minimal or no evidence of an effect. The strongest finding therefore concerns particular tumors and experimental conditions, not every cancer or every RF exposure. [R1-5]

New results and a replication dispute

The 2026 Japanese and Korean collaborative studies used male rats exposed to 900 MHz CDMA at a single whole-body SAR of 4 W/kg. Their authors reported no statistically significant carcinogenic or genotoxic effects

under their protocols. The Korean study nevertheless observed two heart schwannomas among 70 exposed animals and none in its sham or cage controls; that difference was not statistically significant. [R1-6, R1-7]

A July 2026 commentary by Melnick, Moskowitz, and Héroux disputes whether these studies can refute NTP, pointing to fewer animals, one dose group, and omission of NTP's 6 W/kg group. This is a methodological critique, not another positive experiment. HHS should compare statistical power, survival, pathology, exposure schedules, and dose-response sensitivity across the studies and commission a sufficiently powered resolution of the rare-tumor question. [R1-8]

5. Human cancer findings that require a direct response

IARC classified RF as possibly carcinogenic to humans, Group 2B, in 2011, principally because of limited evidence involving glioma and acoustic neuroma. This is a hazard classification, not a numerical prediction of an individual's risk. The later animal findings justify an updated assessment. [R1-9]

Study	Finding supporting concern	Interpretation that must accompany it
INTERPHONE, 2010	Highest cumulative call-time category, at least 1,640 hours: glioma odds ratio 1.40, 95% CI 1.03-1.89.	Overall use showed no increase; recall and selection bias and implausible reported use limited causal interpretation.
CERENAT, 2014	At least 896 lifetime hours: glioma OR 2.89, CI 1.41-5.93; meningioma OR 2.57, CI 1.02-6.44.	Regular use overall was not associated with either tumor; retrospective exposure estimates can be biased.
Hardell and Carlberg, 2015	Pooled Swedish case-control data: mobile-phone glioma OR 1.3, CI 1.1-1.6; latency over 25 years OR 3.0, CI 1.7-5.2.	Retrospective use and confounding remain concerns; publications from overlapping datasets are not independent replications.

These associations are meaningful supporting evidence for further investigation, particularly of heavy use and long latency. They do not individually establish causation. [R1-10-R1-12]

The prospective COSMOS study found no association: among 264,574 participants, the highest cumulative call-time category had glioma HR 1.07, CI 0.62-1.86; use exceeding 15 years also showed no association. Its median prospective follow-up was 7.12 years. The 2024 Karipidis review judged with moderate certainty that mobile-phone exposure likely does not increase several studied head-tumor risks. These substantial findings must be addressed alongside the positive case-control results. [R1-13, R1-14]

A 2025 methodological critique challenges aspects of WHO-commissioned reviews, including exposure classification and evidence evaluation. A 2026 quantitative assessment argues that animal tumor and fertility results justify substantially lower exposure limits. Its human-risk estimates are model-based extrapolations, not measured human cancer rates or adopted federal standards. HHS should publish its response to these arguments, including assumptions and uncertainty factors, instead of leaving the public to reconcile competing conclusions alone. [R1-15, R1-16]

6. DNA damage and oxidative mechanisms

Smith-Roe and colleagues' NTP-associated 2020 study detected increased comet-assay DNA damage in selected tissues: male-rat hippocampus after CDMA exposure, male-mouse frontal cortex after either modulation, and female-mouse blood after CDMA. Micronucleus testing was negative. Tissue, sex, modulation, and assay specificity matter. The findings do not imply that RF photons directly ionize DNA. [R1-17]

NIEHS's 2025 follow-up used a newly developed exposure system in short, five-day experiments and found no comet-assay DNA damage in the tested tissues. It was not a two-year cancer replication. The different outcome demands comparison of exposure system, duration, biological sampling, and assay sensitivity. [R1-18]

Earlier Lai and Singh experiments reported rat-brain DNA strand breaks following acute 2.45 GHz exposure. Laboratory studies also report oxidative pathways that could mediate indirect damage. Yakymenko and colleagues' narrative review collected many positive oxidative-stress findings, whereas Meyer's 2024 systematic review found inconsistent results and very low certainty. Counting positive papers alone does not establish effect magnitude or overcome bias. [R1-19-R1-21]

HHS should fund independent, preregistered replication with blinded assays, temperature control, validated dosimetry, and functional outcomes. A proposed oxidative pathway should be tested at realistic doses and linked to persistent damage or disease, rather than inferred from an isolated marker.

7. Reproductive damage and fertility

De Iuliis and colleagues exposed human sperm in vitro to 1.8 GHz RF at SARs of 0.4-27.5 W/kg for 16 hours. They reported reduced motility and vitality and increased reactive oxygen species and DNA damage. The 2013 correction revised a figure and clarified that three biological replicates were used. This is evidence of cell damage under laboratory conditions, not a demonstrated infertility rate among phone users. [R1-22]

Houston and colleagues' 2019 mouse study used 905 MHz at 2.2 W/kg for 12 hours daily across one, three, and five weeks. It reported sperm oxidative stress and DNA damage. The dose exceeds public whole-body limits and should not be labeled ordinary environmental exposure. [R1-23]

Cordelli and colleagues' animal and human-sperm systematic review, read with its 2025 corrigendum, rated evidence that RF-EMF exposure reduced pregnancy rate in the animal experiments as high certainty. In the corrected analysis, the pooled odds ratio for nonpregnant females after exposed-male mating was 1.68 (95% CI 1.06-2.65). The authors also emphasized that this result was strongly influenced by one study using an extremely high SAR of 43.4 W/kg; excluding that study reduced the pooled estimate to 1.32 with a confidence interval crossing the null. Evidence for reduced sperm count was low certainty, while corrected litter-size analysis was consistent with no effect. This combination is important: the systematic review contains a statistically significant adverse reproductive finding with a high GRADE rating, while its applicability to ordinary public exposure remains unresolved rather than disproven. [R1-24]

Rahban and colleagues' 2023 study of 2,886 young Swiss men associated frequent self-reported phone use with lower sperm concentration and total count. Motility and morphology were not associated, and carrying a phone in a trouser pocket was not associated with poorer semen parameters. It did not directly measure RF dose. Kenny and colleagues' 2024 review judged the human observational evidence very uncertain. [R1-25, R1-26]

The combined evidence supports a serious reproductive research program: measured absorbed exposure, prospective fertility outcomes, pregnancy and developmental endpoints, adequate sample sizes, and independent animal replication. It does not yet establish that compliant everyday RF exposure causes human infertility.

8. Brain activity, cognition, sleep, and autonomic function

Volkow and colleagues' PET experiment found increased regional brain glucose metabolism near an active phone antenna. A 2025 EEG systematic review found evidence of increased resting alpha activity with 2G exposure under eyes-open conditions; none of its included studies was free of risk of bias. These are biological responses, whose clinical significance needs investigation. [R1-27, R1-28]

Foerster and colleagues' adolescent cohort linked estimated brain RF dose to poorer figural-memory development in an operator-record subgroup. The full-sample estimate did not reach statistical significance, and verbal memory was not associated. Exposure modeling and residual confounding limit attribution. This is a reason for better adolescent research, not proof of universal memory injury. [R1-29]

Salford's 2003 rat experiment reported neuronal damage after GSM exposure. Poulletier de Gannes and colleagues' 2009 study did not reproduce blood-brain barrier leakage or neuronal degeneration under its tested conditions. Pophof's 2024 meta-analysis likewise found no significant short-term cognitive effect across pooled human experiments. [R1-30, R1-31, R1-33]

Long-term sleep, autonomic regulation, endocrine stress responses, muscle tension, attention, and neurological function should be measured together with exposure. Studies must distinguish RF from screen light, notifications, device content, sleep displacement, and other behavioral influences. Smartphone dependence alone does not identify a radiation mechanism. Report 2 provides the patent and contemporary 5G/26 GHz evidence relevant to these questions.

9. Reported electromagnetic sensitivity

Symptoms deserve respectful care even when their cause is unsettled. Rubin and colleagues reviewed 46 blinded provocation studies involving 1,175 volunteers and found no robust evidence that acute EMF exposure caused the reported symptoms; expectation effects were supported. This does not make the symptoms unreal. It means that a person's perceived source cannot substitute for controlled exposure evidence. [R1-34]

I ask HHS to support symptom research that combines blinded exposure with objective autonomic, sleep, and functional measures, includes appropriate clinical assessment, and tests relevant chronic patterns. Study results should improve care and practical accommodations without promising an unproven RF treatment or diagnosis.

10. Children, pregnancy, adults, and medical devices

Protection must cover all people, including developing children, pregnant people, older adults, workers, people with chronic illness, and those dependent on implants or medical equipment. Different anatomy, exposure duration, and device use warrant specific dosimetry and surveillance. These considerations identify research priorities; they do not establish equal susceptibility to every frequency.

ELF magnetic-field epidemiology adds a separate concern. Ahlbom's pooled analysis found a childhood-leukemia relative risk of 2.00, CI 1.27-3.13, at at least 0.4 microtesla, based on a small highly exposed group; lower exposures were near no association. IARC subsequently classified ELF magnetic fields as Group 2B. This is power-frequency evidence and must not be counted as a Wi-Fi or 5G result. [R1-35, R1-36]

FDA documents the possibility of RF interference with pacemakers and other medical devices, including RFID systems. Exposure limits and equipment compatibility are different safeguards. Device-specific interference can matter without demonstrating RF-induced cancer. Magnets in consumer devices present another, distinct interference mechanism. [R1-32]

France's 2015 law prohibits installation of fixed Wi-Fi equipment in specified spaces caring for children under three and requires primary-school Wi-Fi to be switched off when unused for digital learning. It is not a general ban on Wi-Fi for everyone under twelve. HHS should compare the rationale, implementation, and outcomes of international precautions. A law is policy evidence, not a clinical experiment. [R1-37]

11. Wildlife and the environment

Treder and colleagues' 2023 field experiment at 2.4 and 5.8 GHz found impaired honeybee homing after long-term exposure; brood development and longevity were not affected. A 2025 plant-visitation experiment reported decreased bumblebee visitation under its RF conditions. These findings add direct behavioral endpoints to environmental concerns and warrant independent field replication. They do not establish RF as the cause of population-wide pollinator decline. [R1-38, R1-39]

Research should examine species-specific absorption, orientation, navigation, foraging, reproduction, and colony outcomes with realistic exposure mapping. Pesticides, habitat loss, disease, and weather must be measured rather than left as untested alternative explanations. HHS should coordinate this work with agencies responsible for environmental and agricultural health.

12. Mixtures, smart meters, and exposure measurement

A person may encounter phones, Wi-Fi, Bluetooth, smart meters, wearables, public infrastructure, connected vehicles, and other transmitters during the same day. Number of devices is not a dose metric. Simultaneous exposures must be measured with frequency, position, duration, and absorbed energy in view; an assumed biological synergy also requires testing.

Sagar and colleagues' European microenvironment review generally found measured averages below limits, while heterogeneous methods limited comparisons. Such averages do not describe every person's peaks, body contact, indoor location, or lifetime pattern. Personal meters can be affected by body shielding and may inadequately capture rapidly varying beams or broadband signals. [R1-40, R1-41]

For smart meters, I request disclosure of actual transmission frequency, burst power, duty cycle, placement, mesh-network behavior, and household measurements under realistic operation. I do not claim that every meter continuously emits at its peak power. Wired alternatives, siting choices, and straightforward procedures for obtaining specifications would make consumer choice meaningful.

Exposure studies should report peak and time-averaged fields, simultaneous sources, near- versus far-field conditions, localized and whole-body SAR where appropriate, absorbed power density for higher frequencies, temperature, and measurement uncertainty. They should assess busy network periods, overnight environments, occupational settings, and long-term patterns. Compliance and health inference must use comparable metrics and averaging periods.

13. Cordless and DECT telephones: near-field and residential RF exposure

Cordless telephones should be included in cumulative residential RF assessment. They communicate between a portable handset and base station using radiofrequency electromagnetic fields. Modern DECT systems use digitally modulated RF transmissions. Exposure can include near-field RF from a handset used close to the head and lower-level residential exposure from the base station. A German Interphone analysis specifically used a DECT base station close to the bed as a proxy for continuous low-level nighttime RF exposure. [R1-46]

Published epidemiology has specifically examined cordless-phone use and brain tumors. Hardell, Carlberg, and Hansson Mild pooled two Swedish case-control studies of malignant brain tumors diagnosed during 1997-2003. For more than 2,000 cumulative lifetime hours of cordless-phone use, they reported OR 2.3 (95% CI 1.5-3.6). For high-grade astrocytoma with more than 10 years of latency, cordless-phone use yielded OR 2.2 (95% CI 1.3-3.9). [R1-47] A later pooled analysis including living and deceased subjects reported, for astrocytoma with more than 10 years of latency, OR 1.8 (95% CI 1.2-2.9) for cordless-phone use and reported higher estimates among those whose first wireless-phone use occurred before age 20. [R1-48]

A later analysis from the same research program examined tumor laterality and reported OR 5.0 (95% CI 2.3-11) for ipsilateral cordless-phone use and astrocytoma in the greater-than-10-year latency group. [R1-49] These publications are important positive findings, but several arise from overlapping Hardell study populations and should not be counted as wholly independent replications. Case-control studies relying on recalled historical telephone use can also be affected by recall, selection, and exposure-classification bias.

Other evidence does not show the same increase. In the German Interphone analysis of 747 incident brain-tumor cases and 1,494 matched controls, a DECT base station close to the bed was not associated with

increased glioma (OR 0.82, 95% CI 0.29-2.33) or meningioma (OR 0.83, 95% CI 0.29-2.36), and risk did not increase with duration; the investigators emphasized that the number of exposed subjects was small. [R1-46]

A 2024 systematic review of 63 human observational articles likewise found no statistically significant pooled increase associated with cordless-phone use: glioma mRR 1.04 (95% CI 0.74-1.46), meningioma mRR 0.91 (95% CI 0.70-1.18), and acoustic neuroma mRR 1.16 (95% CI 0.83-1.61). The review characterized the cordless-phone evidence as low-certainty evidence that near-field cordless-phone exposure may not increase these risks. [R1-50] Thus, individual studies reporting substantial associations should be preserved in the evidence record, while the current pooled evidence does not establish that cordless phones cause these tumors.

The engineering record also shows that DECT exposure can be reduced. Patent CN101860379B describes a DECT cordless telephone that adjusts RF transmitting power according to communication conditions, with reduction of electromagnetic radiation identified as an objective. [R1-51] This is evidence that exposure-reduction engineering is technically feasible; the patent itself is not evidence that ordinary DECT exposure causes disease.

I ask HHS to include historical and modern cordless-phone use in cumulative RF exposure assessment; distinguish older analog/digital cordless systems from DECT; characterize handset and base-station emissions during calls and standby; determine whether cellular-phone epidemiology adequately controlled for cordless-phone use; and evaluate whether adaptive-power, low-emission, non-transmitting-when-idle, speakerphone, and wired designs can reduce unnecessary exposure without sacrificing communication.

14. Patents on managing absorbed RF exposure

Three engineering publications show how manufacturers treat body proximity and combined radios as exposure-management problems. They add technical support for better disclosure and mixture assessment; they are not clinical evidence that the devices cause cancer.

Publication	Documented engineering proposal	Relevance to this report
US8417296B2	Proximity-based radio power control in an electronic device.	Body position and power adjustment matter to exposure.
US20220368366A1	Hierarchical management of RF exposure, including SAR and maximum-permissible-exposure budgets.	Multiple radios and averaging windows require coordinated control.
WO2026020006A1	Cross-technology SAR management using operational context and budgets for different radio access technologies.	Simultaneous technologies cannot be described adequately by device count alone.

I request independent testing of these controls during realistic use, including failures, accessories, contact positions, and simultaneous transmissions. The patent record describes engineering intentions; actual performance requires measurement. [R1-42-R1-44]

15. Accountability, standards, and independent research

The D.C. Circuit's 2021 decision in Environmental Health Trust v. FCC required a reasoned explanation addressing parts of the record on noncancer effects, children, long-term exposure, and environmental effects. It did not judicially establish RF causation or abolish the exposure limits. The decision supports my request for a transparent agency response to submitted evidence. [R1-45]

Funding disclosure must apply to industry, advocacy groups, laboratories, and advisory bodies alike. I request public conflict declarations, preregistered methods, access to suitable de-identified data and code, independent pathology review, and publication of positive and negative findings. Institutional affiliation alone neither invalidates a study nor establishes its accuracy.

I ask HHS to:

- Publish an endpoint-specific response to the animal cancer, DNA, fertility, neurological, and pollinator evidence cited here, including corrections and replication disputes.
- Review whether exposure limits adequately protect chronic, localized, simultaneous, and vulnerable-population circumstances, with explicit uncertainty factors and dosimetry.
- Commission adequately powered independent replication of rare tumors and reproductive damage and prospective human cohorts with measured exposure and long latency.
- Establish coordinated exposure mapping and health surveillance with transparent methods, privacy safeguards, and public reporting.
- Preserve feasible wired options and require usable public information about transmitters, device controls, and smart meters.
- Set research milestones, identify responsible agencies, and publish a timetable for revisiting standards when evidence changes.

I believe the evidence of harmful effects is substantial enough to require action on research, transparency, and safeguards now. The remaining uncertainty should define the work HHS must do, rather than justify indefinite delay.

SUPPLEMENTAL SECTION — SATELLITE COVERAGE, CUMULATIVE EXPOSURE, AND LOW-RF ENVIRONMENTS (October 9, 2026)

Starlink Direct to Cell extends communications coverage into regions previously without conventional cellular service. Coverage availability is not equivalent to a measured exposure dose; satellite downlinks and handset uplinks must be measured separately. An individual can disable household Wi-Fi or decline to use a mobile phone, but cannot directly control signals from surrounding infrastructure.

The public-health question is whether increasingly broad satellite and terrestrial coverage changes actual time-averaged environmental RF exposure and limits practical opportunities to choose comparatively low-RF settings. HHS should support independent measurements in rural, urban, indoor, and remote settings, with transparent characterization of frequency, power density, time variation, and simultaneous sources.

HHS should also assess handset transmitting power and SAR during satellite connections, network transitions, and terrestrial-only service. Measurements of combined exposure should be distinguished from unproven claims that multiple signals necessarily interact biologically.

Cross-reference: Report 2, supplemental section on Starlink Direct to Cell, comparative exposure, patent disclosures, and regulatory oversight.

Sources: SpaceX, Direct to Cell Service (Feb. 2025), https://starlink.com/public-files/DIRECT_TO_CELL_SERVICE_FEB_25.pdf ; FCC, Supplemental Coverage from Space, FCC 24-28, https://docs.fcc.gov/public/attachments/FCC-24-28A1.pdf .

Satellite Coverage, Cumulative RF Exposure, and Low-Exposure Environments

Satellite-to-cell services can extend wireless connectivity into rural and remote places that previously lacked terrestrial cellular coverage. Availability of a signal is not equivalent to measured absorbed dose: satellite downlink fields, handset uplinks, network activity, and distance must be characterized separately.

People may limit personal exposure by using wired internet, disabling Wi-Fi, or not carrying a mobile phone. They generally cannot control transmissions from surrounding infrastructure or neighboring devices. The expansion of satellite service therefore warrants independent mapping of environmental RF levels, especially in places previously used as comparatively low-exposure reference environments.

A hybrid satellite–terrestrial system may supplement rather than replace conventional infrastructure. Whether aggregate exposure rises, falls, or remains similar depends on measured power density, device activity, time averaging, and the particular combination of sources. The presence of several frequencies alone does not establish a biological interaction.

HHS should fund reproducible field surveys in urban, rural, and remote locations; compare pre- and post-deployment conditions where baseline data exist; investigate long-term biological outcomes; and evaluate the feasibility of preserving independently characterized low-RF research environments. Ecological monitoring should include relevant species and habitats, rather than assuming human exposure limits protect every organism.

For engineering details, exposure-control patents, and the biological literature around the proposed 800 MHz band, see the corresponding supplemental section in Report 2.

SUPPLEMENT — NATURAL BIOELECTRICITY, EARTH'S ELECTROMAGNETIC ENVIRONMENT, AND RESTORATIVE LOW-RF SETTINGS

Living organisms are electrically active, but internal ionic signaling and environmental radiofrequency fields are not interchangeable phenomena. The scientific question is whether exposure at realistic intensities, frequencies, and durations measurably changes membrane potentials, ion-channel function, neural signaling, development, repair, circadian processes, or other biological endpoints.

The Earth's geomagnetic field, atmospheric electrical activity, and Schumann resonances are natural phenomena. Some species have demonstrated magnetic orientation or responses to altered magnetic conditions. These findings support investigating environmental interactions; they do not demonstrate that human health depends on synchronizing to 7.83 Hz or that an 800 MHz signal necessarily disrupts natural bioelectricity.

Nature exposure is associated with psychological and physiological benefits, but quieter surroundings, natural light, physical activity, air quality, and other factors may contribute. Controlled comparisons should examine whether RF exposure has an independent effect after accounting for these variables.

I request that HHS coordinate independent, reproducible studies of bioelectrical endpoints, natural electromagnetic conditions, and combined artificial RF exposure; preserve low-RF research reference environments; and consider wildlife and plant systems alongside human health. Satellite service availability must be distinguished from measured exposure.

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NATURAL CONDITIONS, BIOLOGICAL RHYTHMS, AND THE PRESERVATION OF LOW-RF ENVIRONMENTS

I believe that nothing is more powerful or more perfectly suited to sustaining life than the natural conditions of nature. Living organisms possess intricate electrical and electrochemical systems that regulate essential biological functions. Scientific studies of wound healing, development, and plant signaling demonstrate the importance of endogenous electrical processes [F1–F3]. Studies of magnetoreception show that some animals respond to the Earth’s magnetic field [F6].

These findings raise important questions about the relationship between natural electromagnetic conditions and biological regulation. They do not establish that all artificial RF signals disrupt these processes. Nevertheless, I believe the natural conditions of the Earth deserve careful protection and that we should not assume widespread artificial RF exposure is biologically inconsequential without adequate investigation.

The relationship between natural electromagnetic rhythms, reduced artificial RF exposure, and human physiological restoration remains incompletely understood. HHS should support controlled research that measures RF exposure and relevant physiological outcomes while accounting for light, noise, air quality, physical activity, expectations, and other environmental influences.

I request that HHS examine chronic and combined exposure effects on bioelectrical regulation in humans, animals, and plants, and evaluate the preservation of comparatively low-RF natural environments for scientific research and voluntary exposure reduction.

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Part 2 — Patents and emerging wireless systems

Report 2

Patents, neurological interaction, 5G exposure, and emerging 6G

Willa Brenden | New Mexico, U.S.A. | October 9, 2026

1. Why this report matters

Electromagnetic interaction with living systems is a legitimate research question. Patent records describe deliberate sensory and nervous-system stimulation, and published experiments establish that certain pulsed RF exposures can generate an auditory sensation. Modern wireless equipment adds complex modulation, spatially changing exposure, and simultaneous radios. HHS should assess these mechanisms with independent expertise and measured doses rather than dismiss the entire subject or equate every proposal with a demonstrated effect.

I request an evidence-based examination of the patented technologies below and of contemporary RF effects on brain activity, autonomic function, sleep, and behavior. Report 1 supplies the cancer, DNA, reproductive, and environmental evidence. This report chiefly addresses HHS questions 5, 7-9, 11-13, and 15-18.

The evidence levels are identified once here: a patent documents an inventor's proposed method and claims; an experiment documents outcomes under tested conditions; a deployment record documents actual equipment and operation. None automatically establishes the other two. No source reviewed for this report establishes that public 5G networks remotely control people's thoughts.

2. Seven sensory and nervous-system patents retained from the earlier drafts

The following Hendricus G. Loos publications describe different physical modalities. Their distinctions are essential to useful testing. Publication numbers identify the original records; current enforceability is not a measure of biological efficacy. [R2-1-R2-7]

US5899922A - Manipulation of nervous systems by electric fields

The patent proposes weak electric fields near a subject, pulsed at selected low frequencies associated with claimed sensory resonances, including approximately 0.5 and 2.4 Hz. Insulated electrodes and timing circuits are described. Proposed neurological and autonomic responses require a defined field at the body, exposure duration, and independent replication. A low-frequency electric field from a nearby electrode is physically different from a GHz communications carrier.

US6167304A - Pulse variability in electric-field manipulation

This record extends the electric-field approach with variable pulse timing and proposed reduction of habituation. Timing can be deterministic or stochastic; circuit descriptions include interacting timing arrangements. An independent test should reproduce the actual waveform and compare regular, variable, and sham exposure with blinded outcomes. Varying a wireless network's traffic alone does not establish this proposed coupling to a nervous system.

US5935054A - Magnetic excitation of sensory resonances

The patent proposes weak oscillating magnetic fields at selected low frequencies, including approximately 0.5 Hz, with programmable timing. Magnetic geometry, field gradients, and induced currents require measurement. These conditions cannot be inferred from the presence of Wi-Fi or a cellular antenna, and low-frequency magnetic stimulation must be evaluated separately from high-frequency RF absorption.

US6238333B1 - Remote magnetic manipulation of nervous systems

This proposal uses rotating permanent magnets to generate an oscillating field at a distance. Its standoff claims require experimental assessment of distance-dependent field strength, background fields, shielding, and measurable response. A mechanical magnetic source is not evidence of steering a 5G radio beam into a person's brain.

US6017302A - Subliminal acoustic manipulation of nervous systems

The proposed stimulus uses acoustic pulses or amplitude changes, including low-frequency modulation, delivered through an audio pathway. Ear and vestibular coupling and audibility must be controlled. Acoustic energy is a distinct exposure modality; an effect from sound would not establish harm from an RF field.

US5800481A - Thermal excitation of sensory resonances

The patent proposes periodic weak heating at the skin using sources such as resistive heaters, infrared delivery, air jets, or pulsed microwave energy. Temperature magnitude and rate, sensory detection, and thermal transfer are central variables. The proposed microwave embodiment makes delivered thermal dose especially relevant; it does not demonstrate equivalent effects from routine wireless operation.

US6506148B2 - Nervous system manipulation by electromagnetic fields from monitors

The record proposes low-frequency pulsing of displayed image intensity, approximately 0.1-15 Hz, and fields emitted by monitors as a sensory-resonance stimulus. Testing must separate electromagnetic exposure from visible flicker, expectation, ordinary display content, and acoustic artifacts. A display-intensity proposal is not proof that communications infrastructure performs the same function.

3. RF hearing: experimental evidence plus a related patent family

Frey's 1962 human experiments reported auditory sensations from modulated electromagnetic energy. Foster and Finch's 1974 study supported a thermoacoustic explanation: sufficiently rapid energy deposition produces expansion and an acoustic pressure wave that can stimulate hearing. A pulse can have relevant peak power even when its time average is low. An auditory response does not itself establish tissue injury. [R2-8, R2-9]

US6470214B1, granted in 2002 to the U.S. Air Force, describes a method and device intended to exploit RF hearing to convey intelligible speech, using signal preprocessing and suppressed-carrier amplitude modulation. Its related divisional publication, US6587729B2, describes an apparatus for audibly communicating speech through the RF hearing effect. These are two publications in a related patent family, not two independent experimental confirmations. [R2-10, R2-11]

This is a stronger technical addition than treating all patents as merely speculative: the underlying auditory phenomenon has experimental support, while the patent's speech-communication claims and practical performance need separate validation. Required variables include carrier frequency, pulse width and repetition, energy per pulse, peak field, absorption geometry, audible endpoint, and safety margins. Neither the phenomenon nor the patents establish thought reading, remote behavioral control, or deployment through ordinary public cellular networks.

I ask HHS and agencies with relevant technical authority to distinguish established RF hearing, demonstrated injury thresholds, proposed communication systems, and actual operating records. Any public-health assessment must identify the exposure conditions rather than infer a mechanism from an experience alone.

4. Carrier frequency, envelope, and the missing coupling question

A GHz RF carrier can have a slowly changing amplitude envelope. That does not make the electromagnetic field identical to a directly applied 0.5 Hz electric or magnetic stimulus. Frequency components, nonlinear demodulation, induced currents, absorption, and thermal responses depend on the system and the tissue.

To connect a patent's low-frequency resonance proposal to wireless RF, researchers must demonstrate a coupling pathway, dose-response relation, and reproducible biological outcome. An envelope resemblance alone is insufficient. Conversely, measuring only average carrier power may miss variables needed to test a pulse-dependent effect, as the RF-hearing literature illustrates.

A useful investigation should preserve the complete waveform rather than replace every technology with an unmodulated laboratory signal. It should document peak and average exposure, burst spacing, duty cycle, modulation, and absorbed dose and compare plausible mechanisms without assuming the answer.

5. Contemporary experiments relevant to neurological and stress concerns

Brain electrical activity

Prins and colleagues' 2025 review identified evidence of altered resting alpha activity with 2G RF under eyes-open conditions, with substantial methodological limitations. This supports study of electrophysiological response rather than a claim of demonstrated clinical brain injury. Jamal and colleagues' 2023 3.5 GHz experiment did not find an overall EEG change under its tested conditions; isolated electrode findings should not be recast as a global adverse effect. [R2-12, R2-13]

A separate 2025 randomized, double-blind, sham-controlled study in 34 CACNA1C-genotyped volunteers adds a different neurological finding. After 30-minute pre-sleep exposure to 3.6 GHz and 700 MHz 5G RF-EMF, the investigators reported a significant exposure-by-genotype interaction: 3.6 GHz exposure was associated with a faster NREM sleep-spindle center frequency in T/C carriers but not matched T/T carriers. This does not establish neurological disease, but it is evidence of a measurable, genotype-dependent electrophysiological response under the tested 5G exposure conditions and supports investigation of biological susceptibility rather than assuming uniform response across individuals. [R2-22]

Autonomic and skin responses at 3.5 GHz

Jamal and colleagues' 2024 triple-blind crossover experiment in 44 healthy adults reported small temperature and electrodermal changes during 3.5 GHz exposure at approximately 1-2 V/m. Values remained within physiological ranges, and uncontrolled factors could have contributed. A 2025 published correction added a previously omitted funding statement identifying European Union Horizon Europe support under grant agreement No. 101057262; the correction did not reverse the experimental findings. The study supplies a measurable-response question, not proof of illness. [R2-14]

Stress physiology at 28 GHz in rats

Matsumoto and colleagues' 2025 experiment investigated 28 GHz exposure at whole-body SARs of 3.7 and 7.2 W/kg, with ambient-temperature and restraint conditions considered. In freely moving rats, stress-hormone changes were linked particularly to exposure accompanied by more than approximately one degree of rectal temperature increase. These doses are far above general-public whole-body limits. This supports an absorbed-

dose and heating interpretation under the experiment's conditions, not an inference of equivalent stress from a neighborhood 5G installation. [R2-15]

6. The four 26 GHz human reports already included in the expanded draft

These reports are retained because their actual results affect the interpretation of modern RF exposure. They tested short exposures in healthy adults; related protocols and investigator groups must not be counted automatically as four independent populations. [R2-16-R2-19]

Endpoint and publication	Protocol in brief	Reported result
EEG, DOI 10.1016/j.envres.2025.123349	31 adults; approximately 26.5-minute 26 GHz exposure, head 2 V/m and torso 1 V/m.	No detected exposure-related EEG change in the reported analyses.
Electrodermal activity, DOI 10.1080/09553002.2026.2678295	22 adults; approximately 25.5-minute exposure with comparable field levels.	No detected change in electrodermal parameters.
Heart-rate variability, DOI 10.1080/15368378.2026.2730027	31 adults; triple-blind randomized crossover, comparable field levels.	No significant real-versus-sham HRV difference.
Skin physiology, DOI 10.1038/s41598-026-49616-7	31 adults under the acute 26 GHz protocol.	No detected acute change in the assessed skin parameters.

The results provide evidence against the tested acute effects at those exposure levels. They do not answer all questions about years of exposure, children, illness, unusual pulse patterns, or combined sources. The next studies should target those missing conditions directly instead of repeatedly testing the same brief healthy-adult scenario.

7. 5G beamforming and multiple transmitters

A phased antenna array changes element phases and amplitudes to shape energy in space. Beamforming and massive-MIMO systems make exposure dependent on beam direction, traffic, antenna configuration, distance, and reflections. A beam directed toward a communicating device does not itself demonstrate biological targeting or nervous-system control.

HHS should require realistic, time-resolved assessment during network operation, including beam movement, concurrent beams, uplink devices, reflections, and near-field conditions where applicable. Measurements should identify the source and frequency rather than combine every transmitter into an unexplained number. Report 1's proximity-control and multi-radio SAR patents provide additional engineering evidence that position and combined transmissions require coordinated management.

Compliance assessment should disclose averaging windows and spatial treatment so that a public statement about limits can be checked. Health experiments should use the measured conditions and test peak-dependent hypotheses explicitly. The concern is whether relevant effects are being captured by the assessment method, not whether beamforming alone proves harm.

8. Emerging 6G: what is documented and what is prospective

ITU-R M.2160 describes the IMT-2030 framework with six usage scenarios: immersive communication; hyper-reliable low-latency communication; massive communication; ubiquitous connectivity; artificial intelligence and communication; and integrated sensing and communication. These are development objectives, not established public-health findings. [R2-20]

ITU-R M.2541 examines technical feasibility above 100 GHz, including propagation and component research at higher frequencies. Measurements around 142 GHz and research extending toward terahertz frequencies do

not mean that present consumer networks operate at 3 THz, or that all future 6G will use only high bands. [R2-21]

Integrated sensing raises questions about exposure, privacy, and possible feedback between sensing and transmission. These should be examined before wide deployment through actual specifications, measured operating conditions, and independent studies. Data processing and behavioral influence through software must be distinguished from a demonstrated RF effect on tissue.

9. An independent testing program that can settle specific claims

Research component	Minimum information or control
Source and waveform	Carrier, bandwidth, modulation, pulse width, repetition, envelope, duty cycle, peak and average fields.
Geometry and absorption	Distance, orientation, polarization, beam steering, near/far field, whole-body/localized SAR or absorbed power density as appropriate.
Thermal and sensory artifacts	Tissue/skin temperature, audible sound, visible flicker, vibration, sham equivalence, instrumentation interference.
Biological outcomes	Prespecified EEG and autonomic endpoints plus symptoms, sleep, cognition, functional performance, and adverse outcomes.
Duration and mixtures	Acute versus repeated/chronic exposure; multiple sources and realistic patterns, each characterized.
Reliability	Preregistration, adequate power, randomization, blinding, calibrated dosimetry, correction for multiple comparisons, independent replication.
Public accountability	Funding and conflicts, accessible methods/data where feasible, publication of all outcomes, and a response to disputed studies.

Experiments on the Loos patents should reproduce the stated modality and waveform, not substitute a convenient RF carrier. RF-hearing studies should establish perception and safety separately. Contemporary network studies should test actual signals and relevant absorbed doses. Patient or sensitive-person research should include clinical care and objective measures without presuming either causation or fabrication.

10. My request for a federal response

I ask HHS to commission a technically specific evaluation of the patent claims, the established RF-hearing pathway, measured modern exposures, and the neurological and reproductive findings described across Reports 1 and 2. Each conclusion should identify the tested conditions, confidence, missing evidence, responsible agency, and next action.

Protection should advance with technology. The public should not have to accept an expanding exposure environment without a clear, independently verifiable account of its health effects. I request research milestones and accessible findings that can guide practical safeguards before new systems become unavoidable.

SUPPLEMENTAL SECTION — STARLINK DIRECT TO CELL, COMPARATIVE RF EXPOSURE, EXPOSURE-CONTROL PATENTS, AND REGULATORY QUESTIONS (October 9, 2026)

1. Documented technology. SpaceX describes a satellite-to-device service communicating with compatible ordinary cellular handsets through mobile-network partners. Its February 2025 technical report discusses LTE spectrum, engineering tests, and commercial integration. These performance tests are not equivalent to long-term biological safety studies.

2. New developments. In October 2026, Reuters reported a SpaceX agreement to acquire nationwide 800 MHz spectrum, pending regulatory approval, to expand Starlink Mobile capabilities. A spectrum acquisition is not itself evidence of a deployed network or of reduced or increased biological exposure.

3. Comparative exposure pathways. Independent testing should separately measure (a) satellite downlink field strengths at ground level, (b) phone-to-satellite uplink power, duty cycle and localized SAR, and (c) combined or sequential exposure during network transitions alongside conventional terrestrial service, Wi-Fi, and other sources. Handset power control and satellite receiver sensitivity mean that greater transmission distance alone does not establish higher handset absorption.

4. Earlier patented exposure controls. US6272325B1, originally assigned to Globalstar LP, expressly describes accounting for cumulative transmitted RF exposure when a user terminal operates across satellite and terrestrial communications systems, with potential reduction or termination of transmission at thresholds. EP0753943A2 likewise describes satellite-user RF exposure monitoring and control. Neither patent is evidence that SpaceX owns, uses, or has implemented these methods, or that any particular health outcome has been demonstrated.

5. Regulatory distinctions. FCC 24-28 establishes a Supplemental Coverage from Space framework. FCC DA 26-398 describes SpaceX direct-to-device spectrum applications. Radio-interference protections, exposure-limit compliance, and independent long-term biological studies address different questions and must not be conflated.

6. Proposed proprietary phone. Claims of a low-priced X-branded handset, a ten-year guarantee, or global phone-to-phone relaying were not established by the primary documents reviewed. Such claims should not be treated as operational facts without corroboration.

7. Requests to HHS. Obtain SpaceX and partner exposure assessments and relevant nonconfidential technical data; commission blinded, independent comparative measurements of satellite and terrestrial handset SAR and transmitted power; examine realistic cumulative exposure and low-RF locations; identify whether exposure-minimizing controls beyond regulatory compliance are implemented; and publish the evidence and uncertainty transparently.

Conclusion. The currently reviewed materials do not establish whether Starlink Direct to Cell produces lower, higher, or equivalent absorbed RF exposure relative to conventional cellular networks. That question requires comparative measurement, not inference from coverage or satellite distance.

SOURCES FOR SUPPLEMENTAL SECTION

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STARLINK DIRECT TO CELL AND PROPOSED 800 MHz NETWORK: COMPARATIVE EXPOSURE AND BIOLOGICAL EVIDENCE

1. Purpose and verified scope

This supplement examines whether SpaceX satellite-to-cell communications are associated with lower, comparable, or higher RF exposure than conventional terrestrial cellular service. Starlink Direct to Cell is documented; claims of a commercially available X-branded phone with a ten-year warranty or worldwide phone-to-phone relay were not substantiated in the primary materials reviewed. Those claims are excluded from the technical conclusions.

2. What changes in a hybrid satellite–terrestrial network

Direct-to-cell satellites communicate with compatible handsets using spectrum and arrangements with mobile-network operators. Satellite antennas, beam steering, sensitive receivers, adaptive handset power control, duty cycles, and network handoffs all influence actual exposure. Proposed use of additional 800 MHz spectrum must be distinguished from completed deployment and measured exposure. A spectrum transaction or regulatory authorization is not evidence of a specific biological dose.

3. Comparison that HHS should require

The appropriate comparison uses the same or technically matched phones and usage scenarios: terrestrial-only calls and data; satellite-only communications; transitions between networks; indoor and outdoor operation; and low-signal conditions. Record handset conducted and radiated power, transmission duty cycle, localized SAR where applicable, incident environmental fields, and time-averaged exposure. Report measurement uncertainty, operating bands, modulation, beam configuration, and network load.

A satellite hundreds of kilometers away does not automatically cause a handset to emit more RF power than a terrestrial connection. Receiver sensitivity and network power control matter. Nor does broad geographic satellite coverage imply high RF intensity at ground level. Comparative absorbed exposure cannot be determined from frequency or distance alone.

4. Patented exposure-management approaches

US6272325B1 describes consideration of user-terminal transmitted power across multiple communications systems, including terrestrial and satellite operation. EP0753943A2 describes monitoring and controlling user RF exposure in satellite communications. These are evidence that technical exposure-management concepts were contemplated; they do not prove SpaceX owns, practices, or has omitted these inventions. HHS should ask whether current systems employ analogous monitoring or power-limiting controls.

5. Biological research relevant to approximately 800 MHz

The 800 MHz region is non-ionizing RF radiation, historically used by terrestrial radio systems. Frequency alone cannot establish health risk: intensity, modulation, absorption, duration, and species matter. Research near 800–900 MHz is informative but is not a direct assessment of the proposed Starlink network.

The U.S. National Toxicology Program's two-year rat study at 900 MHz reported clear evidence of malignant heart schwannomas in male rats and findings involving brain gliomas. These were controlled whole-body animal exposures at levels and patterns that should not be equated with ordinary satellite downlink exposure. The results justify carefully designed follow-up studies, not a conclusion that the proposed 800 MHz system causes cancer in people.

Human observational evidence on mobile-phone RF exposure includes large reviews that have not consistently found increased risk for several major brain and head tumors. Exposure reconstruction, latency, changing technology, and understudied outcomes remain limitations. Human findings should be reported alongside animal results rather than selectively omitted.

6. Plants, wildlife, and ecosystems

A systematic evidence map identified 334 relevant publications, including 237 on fauna and 97 on flora, covering RF exposure from 100 kHz to 300 GHz. Most were laboratory studies; the authors highlighted methodological weaknesses and the need for better field research. These studies do not establish ecosystem-wide harm from a future 800 MHz satellite network, but they reveal gaps concerning insects, birds, plant growth, development, behavior, and reproduction.

Protection of humans under existing RF exposure rules should not automatically be interpreted as comprehensive protection for every species. HHS should coordinate with environmental agencies to evaluate exposure and biologically meaningful endpoints in representative habitats, including baseline measurements and appropriate unexposed or lower-exposure comparison sites.

7. Regulatory questions

The FCC's 2024 Supplemental Coverage from Space framework governs integration of satellite and terrestrial services. Rules addressing interference between radio services serve a different purpose from human RF exposure standards. Compliance with applicable limits is necessary, but it is not a substitute for studying every long-term biological or ecological endpoint. Existing rules can account for multiple RF sources under specified conditions; the outstanding question is the adequacy of those methods for evolving networks.

8. Requested HHS action

HHS should obtain relevant SpaceX and partner exposure assessments, device certifications, and nonconfidential technical data; commission independent, blinded where practicable, terrestrial-versus-satellite measurements; investigate handset power and SAR under realistic use; quantify combined environmental exposure; review animal and human evidence; and coordinate ecological research on flora, fauna, and low-exposure reference environments.

The central scientific question remains open: current documentation does not establish that Starlink's hybrid network is safer, more harmful, or equivalent to conventional cellular service in terms of absorbed RF exposure or long-term biological effects.

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BIOELECTRICAL MECHANISMS — CROSS-REFERENCE TO REPORT 1

The biological questions in Report 1 also apply to proposed 800 MHz satellite–terrestrial communications. Studies should distinguish established cellular electrophysiology from proposed RF interaction mechanisms. Relevant endpoints include membrane potentials, ion-channel activity, neuronal and cardiac signaling, developmental and repair processes, and magnetosensory behavior where appropriate. Research should measure incident fields, absorbed dose, temporal characteristics, and modulation, and should not infer biological disruption from the existence of natural electrical activity alone.

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Part 3 — Atmospheric and geophysical report
Report 3

RF and EMF atmospheric weather and geophysical research

Evidence Relevant to the Investigation of Potential RF/EMF Effects on Atmospheric, Ionospheric, Weather, and Geophysical Systems

Submitted as supporting material to the U.S. Department of Health and Human Services

Request for Information: Electromagnetic Fields, Radiofrequency Radiation, Wireless Technology, and Human Health

Docket No.: HHS-OASH-2026-0397

I. PURPOSE AND SCOPE

This report is submitted as supporting material to the U.S. Department of Health and Human Services inquiry into electromagnetic fields (EMF), radiofrequency radiation (RF), wireless technology, and human health.

The purpose of this report is narrower than a general discussion of weather modification or earthquakes. It concerns technologies, patents, scientific research, and proposed systems involving:

- radiofrequency electromagnetic radiation;
- high-frequency electromagnetic transmission;
- ionospheric heating and modification;
- atmospheric ionization and charged particles;
- electromagnetic interactions with aerosols and atmospheric particles;
- RF-based or electrically assisted weather-modification proposals;
- RF/EMF interactions with atmospheric and ionospheric systems;
- electromagnetic observations associated with seismic activity;
- proposed RF/EMF intervention in the ionosphere in connection with earthquakes or volcanic activity;
- and the need to determine whether technologies described in patents are presently being researched, tested, licensed, operated, or deployed.

The purpose is **not** to claim that every technology described in a patent is operational, that every electromagnetic anomaly is artificially produced, or that RF energy has been demonstrated to cause weather or earthquakes.

Rather, the existence of these technologies and proposals warrants transparent scientific investigation into their capabilities, limitations, environmental consequences, and actual use.

II. AUTHOR'S PERSPECTIVE

I AM NOT NEUTRAL ON THIS SUBJECT.

I have serious concerns about the biological and environmental consequences of electromagnetic and radiofrequency technologies.

I believe the existing research warrants substantially more independent investigation into the effects of RF/EMF exposure and into technologies capable of altering electromagnetic, atmospheric, ionospheric, or charged-particle environments.

I also believe that technologies described in patents should not automatically be dismissed simply because a patent does not prove that the technology has been constructed or deployed.

At the same time, I recognize that:

1. A patent is evidence of a proposed invention, not proof of implementation.

2. A proposed mechanism is not proof that the mechanism works.

3. A laboratory demonstration is not proof of large-scale environmental capability.

4. An electromagnetic anomaly associated with a natural event is not automatically evidence that humans caused the event.

5. Weather and seismic events have many natural causes.

6. Correlation does not establish causation.

My request is therefore for **independent investigation and verification**, rather than for any particular conclusion to be assumed in advance.

III. WHY ATMOSPHERIC IONS ARE RELEVANT TO RF/EMF RESEARCH

The atmosphere and ionosphere are electrically active environments containing ions, electrons, charged aerosols, and naturally occurring electric fields.

RF energy can interact with electrically charged or conductive materials under appropriate conditions. Depending on field strength, frequency, material properties, and environmental conditions, electromagnetic energy can produce heating, excitation, plasma effects, or changes in charged-particle behavior. Frequency alone does not establish these effects.

This makes atmospheric ionization and charged particles relevant to an RF/EMF investigation.

The scientific question is not simply whether ions exist in the atmosphere. They unquestionably do.

The important questions are:

- Can externally generated RF energy measurably alter ion concentrations?
- Under what frequencies and field strengths?
- At what altitudes?
- Under what humidity, temperature, pressure, and magnetic-field conditions?
- Can RF energy alter charged aerosol behavior?
- Can charged particles influence cloud microphysics?
- Can electromagnetic fields change particle trajectories?
- Can artificially generated plasma or ionized regions produce measurable atmospheric effects?
- What are the limits of these effects?
- What happens when multiple electromagnetic sources operate simultaneously?

These are experimentally testable questions.

IV. RECENT RESEARCH ON ATMOSPHERIC IONS AND PARTICLE FORMATION

Recent atmospheric research demonstrates that very small charged particles and ions are important components of atmospheric chemistry and particle formation.

A 2026 study by Tuovinen and colleagues, Estimation of atmospheric particle production based on measured ion concentrations, examined atmospheric ion concentrations and particle formation at Hyytiälä, Finland, and Beijing, China.

The study examined approximately 2-2.3 nm negative ions/charged particles as well as larger particle-size ranges.

The study reports relationships between measured charged-particle concentrations and particle production. Its observational correlations and estimation model do not by themselves establish a causal ion-driven weather-modification mechanism.

This is relevant to the present report because it establishes that ions and charged particles are not merely theoretical concepts; they are measurable atmospheric components involved in physical and chemical processes.

However, this research **does not demonstrate that RF energy caused those atmospheric ions**, nor does it demonstrate artificial atmospheric manipulation.

That distinction is important.

The appropriate scientific question is whether externally generated RF/EMF energy can produce measurable changes in these naturally occurring processes under controlled conditions.

V. IONIZATION IS NOT THE SAME AS PARTICLE CHARGING

Two related but distinct processes must be considered.

Ionization

Ionization involves creating ions by removing or adding electrons to atoms or molecules.

Particle charging

A pre-existing particle can acquire electrical charge without necessarily undergoing the same type of ionization process.

Charged particles can respond to electric and magnetic fields.

Consequently, research should distinguish:

- atmospheric ion production;
- electron density;
- charged aerosol concentration;
- particle charging;
- plasma formation;
- electromagnetic heating;
- particle acceleration;
- particle transport;
- and chemical transformation.

These distinctions are especially important when evaluating claims involving atmospheric aerosols and RF energy.

RF ionization requires a specified mechanism

RF is non-ionizing radiation in the photon-energy sense. A charged aerosol is not automatically a collection of free metal ions. Where a patent proposes ionization through energetic electrons, discharge, or plasma processes, the required energy transfer and operating conditions must be identified. Ordinary wireless transmission should not be presumed to ionize atmospheric metals.

VI. RF AND CHARGED-PARTICLE INTERACTIONS

RF electromagnetic energy can interact with matter through several mechanisms, depending on frequency, power, field strength, conductivity, geometry, and the properties of the material.

Potential mechanisms requiring investigation include:

- dielectric heating;
- conductive heating;
- plasma excitation;
- electron acceleration;
- ionization;
- changes in electron density;
- changes in charged-particle trajectories;
- electromagnetic forces on charged particles;
- changes in aerosol behavior;
- and changes in atmospheric chemical reactions.

The existence of these physical mechanisms does not establish that a particular weather-modification system works.

It does establish that the interaction between RF fields and atmospheric electrical systems is scientifically appropriate for controlled experimental investigation.

VII. U.S. PATENT 4,686,605 - EASTLUND

U.S. Patent 4,686,605

Title: Method and apparatus for altering a region in the earth's atmosphere, ionosphere, and/or magnetosphere

Inventor: Bernard J. Eastlund

Filed: 1985

Issued: 1987

This patent is important because it describes using electromagnetic radiation to alter a selected region of the atmosphere, ionosphere, and/or magnetosphere.

The patent discusses:

- electromagnetic radiation;
- electron cyclotron resonance heating;
- charged particles;
- ionization;
- increased charged-particle density;
- and the deliberate creation or alteration of an energized region.

The patent describes using electromagnetic energy to affect a selected region rather than merely transmitting information through the atmosphere.

The existence of this patent does not prove that every capability described was implemented.

However, it establishes that deliberate electromagnetic modification of atmospheric/ionospheric regions has been a subject of formal technological development and patent activity.

The patent describes transmitting circularly polarized electromagnetic radiation upward from the Earth's surface, substantially parallel to naturally occurring magnetic field lines.

The stated mechanism includes:

- electron-cyclotron-resonance heating;
- heating charged particles;
- accelerating charged particles;
- increasing charged-particle energy;
- ionizing neutral particles;
- increasing charged-particle density;
- and altering selected regions of the upper atmosphere.

The patent specifically describes creating an altered plasma region through electromagnetic radiation.

This is not a claim that electromagnetic energy merely “might” interact with plasma.

The patent describes a proposed engineering system designed around that interaction.

These are descriptions of the proposed system, not independent experimental validation.

https://patents.google.com/patent/US4686605A/en

VIII. U.S. PATENT 4,712,155

U.S. Patent 4,712,155

Title: Method and apparatus for creating an artificial electron cyclotron heating region of plasma

This patent is related to the Eastlund/Ramo technological line.

It describes concepts involving:

- an artificial electron-cyclotron-heating region;
- electromagnetic radiation;
- plasma;
- charged particles;
- magnetic-field-line concepts;
- and controlled heating or modification of a selected plasma region.

Again, this should be understood as evidence of a proposed technical capability - not evidence that the described system has been deployed for weather modification.

Additional engineering detail

This patent extends the plasma-heating concept.

It describes creating an artificial electron-cyclotron-resonance heating region of plasma by transmitting electromagnetic radiation from the Earth's surface.

The patent discusses:

- artificial magnetic-field lines;
- selected plasma regions;
- electron-cyclotron resonance;
- electromagnetic radiation;
- charged-particle heating;
- ionization;

- and modification of plasma conditions.

The patent specifically describes creating an artificial plasma-heating region at a selected altitude.

The significance is that this is a second closely related patent documenting a specific RF/plasma engineering approach.

It demonstrates that deliberate manipulation of upper-atmospheric plasma was not limited to one isolated patent.

https://patents.google.com/patent/US4712155A/en

IX. WEATHER MANAGEMENT USING SPACE-BASED POWER SYSTEM

U.S. Patent Application 2006/0201547 A1

Title: Weather Management Using Space-Based Power System

Inventors: James Rogers and Gary Spirnak

This patent application is particularly relevant because it explicitly connects RF energy with proposed weather modification.

The application proposes using RF energy generated in space and focusing that energy into a selected atmospheric region.

The described parameters include:

- RF frequencies in approximately the 2-12 GHz range;
- focusing RF energy into an atmospheric region approximately 1-10 km in size;
- extremely high proposed energy densities;
- modification of temperature;
- modification of airflow;
- modification of inversion layers;
- weakening or dissipation of hurricanes, typhoons, and tropical cyclones;
- and potentially changing the direction or path of storm systems.

The application also discusses the possibility of introducing RF-absorbing materials into a weather system.

Examples described include:

- aluminum oxide;
- plastic;
- RF-absorbing materials;
- and materials potentially coated with iron oxide.

The proposed materials would have a large surface-to-mass ratio so they could remain associated with an air mass.

The application was ultimately abandoned.

That legal status is important.

An abandoned application does not establish an operational system.

Nevertheless, the application is relevant because it documents a concrete proposal for using RF energy and RF-responsive atmospheric materials for weather modification.

Proposed power and geographic scale

The application describes focused RF energy at approximately:

10^9 watts/km²

and proposes application to weather elements with diameters of approximately **1-10 km**.

It also describes focusing RF energy over approximately 5 km and using the energy to:

- alter airflow;
- create an inversion layer;
- weaken a storm;
- and change the path of a weather system.

This is substantially more direct than the Eastlund patents.

The patent application does not merely discuss plasma.

It explicitly describes **RF energy as a mechanism for altering weather.**

The stated 10^9 W/km² corresponds to 1,000 W/m². This is a proposed power density, not a measured environmental exposure. The description also gives a separate approximately 1-2 GW focused-power embodiment. These figures must be assessed with beam area, atmospheric absorption, transmission losses, duration, and total delivered energy; they cannot be treated as parameters of ordinary cellular networks.

https://patents.google.com/patent/US20060201547A1/en

X. RF-ABSORBING ATMOSPHERIC MATERIALS

The concept of introducing RF-absorbing materials into an atmospheric system deserves independent examination.

Questions include:

- What happens when electrically conductive or RF-absorbing particles are suspended in clouds?
- How does particle size affect RF absorption?
- Does particle composition alter heating?
- How does humidity affect conductivity?
- Does particle charging alter aggregation?
- Can RF energy change the temperature of a particle sufficiently to affect cloud microphysics?
- Can charged particles influence condensation or precipitation?
- Could introduced materials change the propagation of electromagnetic energy through an atmospheric region?

These questions should be experimentally tested rather than inferred from patents alone.

Proposed absorbing-material pathway

The application describes these materials absorbing RF energy and converting it into thermal energy that is then transferred to the surrounding weather system.

It also describes designing the material with a large surface-area-to-mass ratio so that it can remain suspended in an air mass.

The earlier report also identifies iron-oxide coatings described in the application. The proposed pathway is introduction of absorbing material, directed RF absorption, thermal transfer, and a claimed weather response.

Material composition alone does not establish absorption at the selected frequency, deployment, or a measurable weather effect.

XI. EP 2,309,842 A1 - ELECTRICAL WEATHER MODIFICATION

EP 2,309,842 A1

Title: Apparatus and related methods for weather modification by electrical processes in the atmosphere

This patent family describes weather modification through electrical processes involving atmospheric water particles, aerosols, molecular clusters, and water molecules.

The proposed concepts include:

- changing electrical forces between atmospheric particles;
- cloud charging;
- atmospheric electrical instability;
- precipitation enhancement;
- precipitation reduction;
- and electrical modification of atmospheric water processes.

The system includes a microwave generator and antenna as an electromagnetic source for heating an emitter electrode remotely.

This is directly relevant to an RF/EMF investigation because electromagnetic energy is incorporated into the proposed electrical weather-modification mechanism.

The patent does not establish successful deployment.

It does establish that electrical and electromagnetic weather modification has been formally proposed and documented.

Electrical precipitation pathway

The document discusses:

- water particles;
- aerosols;
- molecular clusters;
- water molecules;
- atmospheric electrical forces;
- particle charging;
- ion production;
- cloud charging;
- precipitation;
- and redistribution of atmospheric moisture.

It specifically describes weather modification as affecting microphysical atmospheric processes through electrical influences.

The patent describes embodiments involving:

- remote cloud charging;
- changing precipitation;
- increasing or decreasing precipitation;
- fog dispersion;

- cloud modification;
- and atmospheric moisture redistribution.

Importantly for an RF/EMF investigation, the patent also describes a **microwave generator with an antenna** as an electromagnetic source used to remotely heat an emitter electrode.

Thus, electromagnetic energy is incorporated directly into the proposed atmospheric electrical system.

The microwave component described here heats an emitter electrode; it should not be represented as proof of direct microwave heating of an entire cloud. This is a different proposed mechanism from the space-based RF application.

https://patents.google.com/patent/EP2309842A1/en

XII. U.S. PATENT APPLICATION 2011/0174892 A1

A related U.S. patent application describes electrical weather-modification concepts involving atmospheric electrical processes.

It is relevant as part of the broader patent family because it demonstrates continued technological interest in manipulating atmospheric processes through electrical and electromagnetic mechanisms.

As with the other patents in this report, patent documentation should be treated as evidence of proposed technology, not proof of operational deployment.

The European and U.S. publications describe related patent-family material. Multiple publications of a family are not independent experimental replications.

https://patents.google.com/patent/US20110174892A1/en

XIII. U.S. PATENT APPLICATION 2024/0074362 A1

Title: Apparatus and related method for global weather modification and precipitation enhancement

Inventor: Konstantin A. Borisov

Priority: September 5, 2022

Publication: March 7, 2024

Patent publication is documented; its legal status does not demonstrate implementation.

This application is particularly significant because it explicitly describes a proposed system for global weather modification and precipitation enhancement.

The described system involves:

- charge carriers;
- an ionizer;
- a voltage source;
- an electromagnetic device;
- pulses that push charge carriers outward;
- trajectories influenced by planetary electromagnetic fields;
- collisions with atmospheric molecules;
- ionic wind;
- moisture redistribution;
- condensation;
- and precipitation.

The application proposes using electromagnetic pulses to influence charged particles whose trajectories are affected by Earth's electromagnetic environment.

Again, this is a patent application and not proof of successful implementation.

However, its existence demonstrates that technological concepts involving electromagnetic manipulation of charged atmospheric particles continue to be proposed.

Charge carriers and the proposed sequence

The proposed chain is:

ionization → charge carriers → electromagnetic acceleration → planetary electromagnetic-field trajectory → collisions with atmospheric molecules → ionic wind → moisture redistribution → condensation → precipitation.

The application even describes global-scale embodiments.

This is important because it demonstrates that **electromagnetic control of atmospheric charge carriers remains an active technological concept in recent patent literature.**

The document describes charge carriers including:

- electrons;
- protons;
- positrons;
- alpha particles;
- ions;
- and other electrically non-neutral particles.

It describes using an electromagnetic device to accelerate the particles.

It then proposes that the particles interact with ordinary atmospheric molecules and create an “ionic wind” or “electric wind.”

The proposed atmospheric result is movement and redistribution of moisture followed by condensation and precipitation.

The claimed planetary-scale trajectories and moisture effects require independent assessment of collisions, charge loss, delivered energy, transport distance, and scale. The general ability of fields to act on charge does not validate the claimed global outcome.

https://patents.google.com/patent/US20240074362A1/en

XIV. SUMMARY OF RF/ELECTRICAL WEATHER-MODIFICATION PATHWAYS

The patent record reviewed in this report describes several different proposed pathways.

These include:

1. Electromagnetic heating

RF energy is used to heat an atmospheric or ionospheric region.

2. Plasma creation or modification

RF energy is used to create or modify an ionized plasma region.

3. Electron-density modification

Electromagnetic energy is proposed as a means of altering electron density in an ionospheric region.

4. Charged-particle manipulation

Electric or electromagnetic fields are proposed to alter the trajectories of charged particles.

5. Atmospheric electrical modification

Electrical forces between atmospheric particles are proposed as a mechanism for altering precipitation.

6. RF-responsive atmospheric materials

Materials capable of absorbing electromagnetic energy are proposed for interaction with weather systems.

These mechanisms are not interchangeable.

Each requires independent experimental verification.

Seven distinct mechanisms

Mechanism 1 - RF heating of plasma

Electromagnetic radiation is directed into an ionized region of the atmosphere to heat and alter charged particles.

Mechanism 2 - Electron-cyclotron-resonance interaction

RF energy is selected to interact with charged particles at resonant frequencies, increasing particle energy and potentially changing plasma conditions.

Mechanism 3 - Ionization

Energy is used to create additional ions and electrons, increasing the charged-particle population.

Mechanism 4 - Charged aerosol interaction

Electrical forces are used to influence water particles, aerosols, molecular clusters, and other atmospheric matter.

Mechanism 5 - Electromagnetic acceleration of charge carriers

Electromagnetic pulses are used to accelerate charged particles, after which planetary electric and magnetic fields influence their trajectories.

Mechanism 6 - RF absorption and localized heating

RF-absorbing material is introduced into a weather system and then heated remotely by focused RF energy.

Mechanism 7 - Atmospheric electrical redistribution

Electrical forces and charged particles are proposed to alter moisture movement, cloud behavior, and precipitation.

These are distinct mechanisms.

They should not be collapsed into a single claim about HAARP.

Proposed pathways across the patent record

PATHWAY A - RF PLASMA HEATING

RF energy → electron-cyclotron resonance → charged-particle heating → plasma alteration

Documented in the Eastlund patents.

PATHWAY B - RF IONIZATION

RF energy → increased particle energy → ionization → increased charged-particle density

Documented in the Eastlund patent family.

PATHWAY C - RF WEATHER HEATING

Focused RF → atmospheric/weather target → energy absorption → temperature change → altered airflow/weather

Documented in US 2006/0201547 A1.

PATHWAY D - RF-ABSORBING PARTICLES

RF-absorbing material → introduction into weather system → focused RF → absorption → thermal transfer → weather modification

Documented in US 2006/0201547 A1.

PATHWAY E - ATMOSPHERIC ELECTRICAL MODIFICATION

Electrical charging → atmospheric ions/aerosols → altered electrical forces → altered cloud microphysics → precipitation modification

Documented in EP 2,309,842 A1 and related applications.

PATHWAY F - ELECTROMAGNETICALLY ACCELERATED CHARGE CARRIERS

Ionization → charged particles → electromagnetic acceleration → planetary electromagnetic trajectory → atmospheric collisions → ionic wind → moisture movement → precipitation

Documented in US 2024/0074362 A1.

The sequences above describe proposed pathways. They do not constitute a demonstrated causal chain linking every patent, atmospheric particle formation, storm control, and seismic effects.

XV. HAARP - WHAT IS ACTUALLY ESTABLISHED

The High-frequency Active Auroral Research Program (HAARP) in Alaska is a real RF/EM research facility.

HAARP uses a high-frequency radio transmitter and antenna array to transmit HF electromagnetic energy into the ionosphere.

Its research involves:

- ionospheric heating;
- plasma physics;
- controlled ionospheric irregularities;
- artificial plasma structures;
- low-frequency wave generation;

- and observations of ionospheric responses.

HAARP therefore demonstrates that humans possess the technical ability to transmit substantial amounts of RF energy into a selected ionospheric region.

This fact should not be confused with claims that HAARP can control weather or earthquakes.

HAARP's own published information describes its purpose as ionospheric research and states that its effects are primarily confined to the ionosphere.

The distinction between **demonstrated RF/ionospheric capability** and **unproven large-scale weather or seismic control** is essential.

Correct technical description

HAARP is an HF electromagnetic transmitter, rather than simply a magnetic heater. Its radio energy heats electrons and perturbs ionospheric plasma. Earth’s magnetic field affects plasma motion, but is not the transmitted energy source. University of Alaska Fairbanks states that HAARP cannot control weather and explains that its transmitted frequencies are not absorbed by the troposphere and stratosphere in the manner needed for weather control. This counterevidence must be considered alongside the patent proposals.

https://haarp.gi.alaska.edu/faq

XVI. EASTLUND PATENTS AND HAARP SHOULD NOT BE EQUATED AUTOMATICALLY

There is an important distinction between patents and facilities.

The existence of Eastlund Patent 4,686,605 does not prove that HAARP was constructed according to that patent.

Likewise, the existence of HAARP does not prove that every capability described in Eastlund patents has been implemented there.

The appropriate question for an independent investigation is:

Which patented technologies, if any, have actually been constructed, tested, licensed, modified, or incorporated into operational facilities?

That question can be answered through:

- patent ownership records;
- licensing records;
- government contracts;
- research grants;
- procurement records;
- facility records;
- technical publications;
- environmental assessments;
- engineering documentation;
- and independent physical measurements.

XVII. KIRTLAND AIR FORCE BASE AND NEW MEXICO

New Mexico deserves particular attention because of its longstanding concentration of aerospace, electromagnetic, atmospheric, and advanced-technology research.

Kirtland Air Force Base and the Air Force Research Laboratory's Space Vehicles Directorate have participated historically in space and ionospheric-related research.

The history of collaboration among U.S. research facilities and HAARP-related scientific programs warrants examination.

This is not an assertion that Kirtland currently conducts weather modification.

It is a request that relevant records be examined to determine:

- what RF/EM research has been conducted;
- what atmospheric or ionospheric experiments have occurred;
- what facilities have possessed high-power RF transmission capability;
- what contracts and research programs have existed;
- and whether any work has involved atmospheric modification or charged-particle manipulation.

Documented historical connection

An AFRL Battlespace Environment Laboratory fact sheet, current as of April 2011, lists HAARP among locations where its LIDAR instruments were used. This documents historical research connections and atmospheric instrumentation, not RF weather-modification deployment at Kirtland.

https://www.kirtland.af.mil/Portals/52/documents/AFD-111103-022.pdf

XVIII. THE VERY LARGE ARRAY AND RF TRANSMISSION

The Very Large Array in New Mexico is a radio astronomy observatory. NRAO describes antennas and receivers that collect faint cosmic radio signals. Steerable dishes, receiver bandwidth, and sophisticated signal processing do not demonstrate a high-power transmitting capability.

I request clarification of any specifically documented transmission or atmospheric-research activity associated with the facility, should such records be identified. This request is not evidence that such activity occurred. The VLA should not be categorized as an ionospheric heater or weather-modification transmitter without equipment specifications and operating records establishing that capability.

https://public.nrao.edu/telescopes/vla/

XIX. ALUMINUM, BARIUM, STRONTIUM, AND ATMOSPHERIC MATERIALS

Claims concerning aluminum, barium, strontium, or other materials in the atmosphere require careful scientific treatment.

These elements can occur naturally and through ordinary human activities.

Their detection does not, by itself, establish deliberate atmospheric dispersal.

However, because some of the patent material reviewed in this report specifically discusses aerosols, RF-absorbing materials, charged particles, and atmospheric electrical processes, independent atmospheric sampling could be scientifically informative.

Appropriate research should include:

- precise chemical composition;
- particle size;
- isotope ratios;
- altitude;
- geographic distribution;

- concentration;
- temporal variation;
- meteorological conditions;
- known industrial sources;
- aircraft-related sources;
- natural sources;
- and source-attribution analysis.

The objective should be to determine what is actually present and where it came from.

XX. RF-AEROSOL EXPERIMENTAL RESEARCH GAP

A major research gap concerns the interaction between RF energy and atmospheric particles under realistic environmental conditions.

Experiments should vary:

- frequency;
- field strength;
- modulation;
- pulse characteristics;
- duty cycle;
- particle size;
- particle composition;
- particle charge;
- humidity;
- temperature;
- pressure;
- altitude;
- magnetic-field strength;
- conductivity;
- particle concentration;
- and atmospheric chemistry.

Measurements should include:

- particle trajectory;
- charge state;
- aggregation;
- heating;
- condensation;
- nucleation;
- cloud-droplet formation;
- precipitation behavior;
- chemical reactions;
- and electromagnetic propagation.

Such experiments would help distinguish real physical effects from speculation.

Additional atmospheric endpoints

Experiments should also measure ion mobility, charged-cluster formation, atmospheric conductivity, particle growth, droplet charge, cloud lifetime, and the response of biological particles where a defined hypothesis warrants it. Measure the change itself and its uncertainty, rather than inferring a response merely because a particle carries charge.

XXI. WORLDWIDE WEATHER, DROUGHT, HEAT, FLOODING, AND THE QUESTION OF RF/EMF INFLUENCE

I am concerned by the increasingly widespread occurrence of drought, extreme heat, flooding, wildfire conditions, and abnormal precipitation around the world.

Current international monitoring documents substantial global hydrological and weather extremes.

The World Meteorological Organization reported in September 2026 that 2025 was among the driest years for global river discharge in approximately 35 years, that abnormal river-flow conditions had persisted, that terrestrial water storage had declined over the preceding decade, and that Asia and Africa were particularly affected by water-related disasters.

In August 2026, WMO also reported continuing record-breaking heat, drought, wildfire activity, and flooding around the world.

These observations do **not** establish that RF/EMF technology caused these events.

There are well-established natural and anthropogenic climate mechanisms that must be investigated, including greenhouse-gas forcing, ocean-atmosphere circulation, land-use change, natural variability, and other factors.

Nevertheless, I believe the scale and geographic distribution of extreme weather justify investigating whether **any additional technological electromagnetic influences exist**, particularly where technologies capable of altering atmospheric electrical or ionospheric conditions have been proposed.

The appropriate scientific question is therefore:

Can large-scale RF/EMF systems produce measurable changes in atmospheric or ionospheric conditions that influence weather under any circumstances?

That question should be answered experimentally.

XXII. ELECTROMAGNETIC PHENOMENA ASSOCIATED WITH EARTHQUAKES

The earthquake material in this report is included **only because it concerns electromagnetic and RF/ionospheric phenomena.**

There is a scientific literature investigating electromagnetic signals and ionospheric disturbances associated with earthquakes.

Research areas include:

- ULF electromagnetic signals;
- VLF electromagnetic signals;
- ionospheric electron-density changes;
- total electron content;
- magnetic-field anomalies;
- atmospheric electrical changes;
- electromagnetic emissions;

- and lithosphere-atmosphere-ionosphere coupling.

These observations are scientifically interesting because they raise questions about how electromagnetic conditions in the Earth system may interact across different layers.

However, the existence of an electromagnetic anomaly before or around an earthquake does **not** establish that an external RF source caused the earthquake.

The direction of causality remains an important scientific question.

Possible explanations include electromagnetic consequences of natural geophysical processes, atmospheric-ionospheric coupling, measurement artifacts, environmental noise, or other mechanisms.

XXIII. LITHOSPHERE-ATMOSPHERE-IONOSPHERE COUPLING

Lithosphere-atmosphere-ionosphere coupling, commonly abbreviated LAIC, is an active area of scientific investigation.

Researchers have examined whether processes associated with earthquakes may produce measurable changes in:

- atmospheric electricity;
- electromagnetic fields;
- ionospheric electron density;
- magnetic fields;
- atmospheric waves;
- and other ionospheric parameters.

The existence of this research does not prove that earthquakes are caused by electromagnetic radiation.

It demonstrates instead that measurable electromagnetic interactions may occur within the coupled Earth-atmosphere-ionosphere system.

That makes the system relevant to an RF/EMF investigation.

Specific research examples and limits

Romanovskaya and colleagues (2012) examined total-electron-content disturbances around 2005-2006 seismic events. Karpov and colleagues (2012) modeled ionospheric responses to proposed electric currents associated with earthquake preparation. These are examples of observational interpretation and modeling in the literature, not demonstrations that a transmitter causes or prevents an earthquake.

https://arxiv.org/abs/1205.0419

https://arxiv.org/abs/1205.0415

Any claimed precursor must be tested prospectively against non-earthquake periods and alternative sources of variation, including solar and geomagnetic activity, atmospheric changes, instrumental artifacts, and human interference. Correlation, model fit, and repeatable prediction are separate standards of evidence.

XXIV. ELECTROMAGNETIC EARTHQUAKE RESEARCH AND RF INTERVENTION ARE DIFFERENT QUESTIONS

Two separate questions must not be confused.

Question 1

Can natural geophysical processes produce electromagnetic or ionospheric changes?

There is published research investigating this possibility.

Question 2

Can humans deliberately alter electromagnetic or ionospheric conditions using RF energy?

There are demonstrated technologies for ionospheric RF transmission and patents proposing deliberate modification.

The second question does not follow automatically from the first.

However, because both involve the same electromagnetic environment, controlled research should investigate whether externally generated RF fields can reproduce, modify, amplify, suppress, or otherwise influence relevant electromagnetic/ionospheric conditions.

XXV. JP2022069361A - RF/HIGH-FREQUENCY EARTHQUAKE INTERVENTION PATENT

One patent is particularly relevant to this report:

JP2022069361A

Title: Earthquake occurrence prevention method and volcanic eruption prevention method

Inventor: Hitoshi Ishii

Priority: October 24, 2020

Publication: May 11, 2022

Patent-database status labels are not evidence of efficacy or deployment; current legal status requires confirmation from the relevant patent office.

The application proposes returning an abnormal ionospheric electron count toward an average value by irradiating the ionosphere with high-frequency electromagnetic waves.

The application specifically proposes:

- high-frequency irradiation of the ionosphere;
- artificial manipulation of ionospheric electron density;
- use of a weather-modification device;
- use of a HAARP facility as an example;
- use of ground-based antennas;
- and, alternatively, high-frequency transmission from space-based platforms.

The application claims that changing ionospheric electron density could affect electrical conditions at the Earth's surface and proposes this as a means of preventing earthquakes and volcanic eruptions.

The patent's theory is **not established scientific fact**.

Indeed, the patent itself contains speculative explanations and does not establish that the proposed mechanism works.

Nevertheless, this patent is highly relevant to an RF/EMF investigation because it demonstrates that **deliberate high-frequency irradiation of the ionosphere for a geophysical objective has actually been proposed in a formal patent application.**

This warrants scientific scrutiny independent of whether the proposed method ultimately proves valid.

https://patents.google.com/patent/JP2022069361A/en

XXVI. WHAT THE EARTHQUAKE/RF EVIDENCE DOES AND DOES NOT ESTABLISH

The evidence reviewed here supports several factual conclusions:

1. Electromagnetic phenomena associated with earthquakes are an active subject of scientific research.

2. The ionosphere can be measured for changes in electron density and electromagnetic conditions.

3. Human technology can transmit RF energy into the ionosphere.

4. HAARP demonstrates controlled high-frequency ionospheric transmission.

5. Patents have proposed deliberately modifying the ionosphere using high-frequency electromagnetic radiation.

6. At least one patent explicitly proposes such modification in connection with earthquake prevention.

The evidence does **not** establish:

- that HAARP causes earthquakes;
- that RF technology currently creates earthquakes;
- that worldwide earthquakes are being artificially generated;
- that every ionospheric anomaly is artificial;
- or that the patent described above has successfully demonstrated its proposed effect.

Those questions remain matters for investigation.

XXVII. THE NEED FOR INDEPENDENT RF/EMF GEO-PHYSICAL EXPERIMENTS

Because both atmospheric and ionospheric systems are electrically active, independent experiments should test whether externally generated RF energy can produce measurable effects beyond ordinary communications.

Experiments should measure:

- electron density;
- ion density;
- plasma temperature;
- electric fields;
- magnetic fields;
- total electron content;
- ULF/VLF/HF electromagnetic emissions;
- atmospheric electricity;
- charged aerosols;
- cloud microphysics;
- and relevant meteorological parameters.

Experiments should include sham or control periods and independent monitoring.

The RF source should be completely characterized.

That means documenting:

- frequency;
- bandwidth;

- waveform;
- modulation;
- pulse structure;
- duty cycle;
- peak power;
- average power;
- antenna characteristics;
- polarization;
- beam direction;
- beam steering;
- geographic footprint;
- altitude of interaction;
- duration;
- and simultaneous RF sources.

Without these measurements, it is difficult to determine what exposure or interaction actually occurred.

XXVIII. REAL-WORLD RF/EMF MIXTURES MUST BE CONSIDERED

Environmental electromagnetic exposure is rarely a single-frequency exposure.

People and ecosystems can experience overlapping signals from:

- cellular systems;
- Wi-Fi;
- Bluetooth;
- radio;
- television;
- radar;
- satellites;
- aircraft;
- terrestrial transmitters;
- telecommunications infrastructure;
- and other RF systems.

Similarly, an atmospheric experiment should consider simultaneous electromagnetic sources and background electromagnetic activity.

Testing one isolated frequency may fail to represent real-world conditions.

XXIX. EMERGING 6G AND FUTURE RF SYSTEMS

Future wireless systems are moving toward increasingly sophisticated spatial and frequency-domain technologies.

The International Telecommunication Union's IMT-2030 framework identifies capabilities including:

- ubiquitous connectivity;
- artificial intelligence and communications;
- integrated sensing and communications;
- immersive communications;
- massive communications;
- and highly reliable low-latency communications.

ITU technical work also examines frequencies above 100 GHz and into the sub-THz/THz range.

Future systems may use:

- highly directional antennas;
- beamforming;
- massive antenna arrays;
- integrated sensing;
- localization;
- high-frequency propagation;
- satellites;
- high-altitude platforms;
- and terrestrial systems.

These technologies are not evidence of weather modification.

However, they make it increasingly important to evaluate environmental electromagnetic effects before technologies become ubiquitous.

XXX. RESEARCH AND OVERSIGHT RECOMMENDATIONS

I respectfully request independent research addressing the following:

1. Patent-to-deployment tracing

Identify whether technologies described in the patents in this report have:

- been constructed;
- tested;
- licensed;
- modified;
- incorporated into other technologies;
- funded by government agencies;
- or deployed operationally.

2. Facility identification

Identify facilities possessing the capability to generate and direct substantial RF energy into:

- the atmosphere;
- ionosphere;
- magnetosphere;
- or other environmental regions.

3. Independent electromagnetic monitoring

Establish independent monitoring capable of detecting:

- HF;
- VHF;
- UHF;
- microwave;
- ULF;
- ELF;
- magnetic-field changes;

- ionospheric electron-density changes;
- and other relevant electromagnetic phenomena.

4. Atmospheric particle monitoring

Conduct independent sampling for:

- charged particles;
- aerosols;
- metals;
- RF-absorbing materials;
- particle-size distributions;
- and chemical/isotopic signatures.

5. RF-weather interaction experiments

Conduct controlled experiments examining whether RF energy can measurably influence:

- atmospheric temperature;
- ionization;
- charged-particle behavior;
- condensation;
- cloud formation;
- precipitation;
- atmospheric electrical fields;
- or storm development.

6. RF-ionosphere experiments

Determine the magnitude, duration, geographic extent, and reversibility of ionospheric changes produced by different RF frequencies and power levels.

7. Electromagnetic-seismic research

Continue independent research into:

- electromagnetic earthquake precursors;
- ionospheric anomalies;
- magnetic anomalies;
- ULF/VLF signals;
- total electron content;
- and RF interaction with the ionosphere.

The purpose should be to determine whether externally generated RF energy can influence any of these parameters - not to assume that it does.

8. Full transparency

Results should include both positive and negative findings.

Null results should not be suppressed.

Positive results should be independently replicated.

Additional safeguards and study endpoints

The research program should include droplet formation and charge, aggregation, nucleation, growth, precipitation, cloud lifetime, particle trajectories, conductivity, and ion mobility. Test RF-absorbing materials and proposed charge-carrier systems under controlled conditions with realistic concentrations and a quantified energy budget before considering environmental-scale conclusions.

Disclose funding sources and conflicts of interest, preserve independent oversight, preregister primary outcomes, publish null findings, and require independent replication. Environmental experiments should be bounded by prior safety review and appropriate agency authority. HHS should coordinate environmental and geophysical questions with the agencies possessing the relevant expertise.

XXXI. INVESTIGATE WHERE THESE PATENTS AND DERIVATIVE TECHNOLOGIES ARE BEING USED

I respectfully request that the Department of Health and Human Services, together with other appropriate independent scientific and governmental bodies, investigate the **current status and actual use** of technologies described in the patents and technical material identified in this report.

The investigation should determine, where possible:

- who owns the relevant patents;
- who has licensed them;
- whether derivative technologies have been developed;
- whether government agencies have funded related work;
- what contracts have been issued;
- what facilities possess the relevant equipment;
- what countries or organizations are conducting related research;
- whether field experiments have occurred;
- whether atmospheric or ionospheric experiments have been conducted;
- whether RF weather-modification experiments have occurred;
- whether electromagnetic geophysical experiments have occurred;
- and what regulatory oversight governs such activity.

I am **not asking that a patent automatically be treated as proof of operational capability**.

I am asking that the government determine what has actually been built, tested, funded, licensed, or deployed.

If independent investigation establishes that a technology can intentionally or unintentionally produce harmful effects on human health, ecosystems, atmospheric systems, or other essential Earth systems, appropriate safeguards, restrictions, or prohibitions should be considered.

Technological capability should not automatically equal unrestricted permission to use that capability.

The public should have a meaningful right to know when powerful electromagnetic technologies are capable of affecting the environment in ways that may extend beyond ordinary telecommunications.

Evidence matrix

Patent / technology	Electromagnetic mechanism	Atmospheric target	Proposed effect
US 4,686,605	RF / electron-cyclotron resonance	Ionospheric plasma	Alter plasma and charged-particle density
US 4,712,155	RF / artificial plasma heating	Selected plasma region	Heat/alter plasma

Patent / technology	Electromagnetic mechanism	Atmospheric target	Proposed effect
US 2006/0201547 A1	Focused RF, 2-12 GHz	Hurricanes/storms	Change temperature, airflow, strength, direction
US 2006/0201547 A1	RF-absorbing material + RF	Weather systems	Convert RF energy into localized heat
EP 2,309,842 A1	Electrical charging / microwave-assisted system	Aerosols, water particles, clouds	Modify precipitation and atmospheric conditions
US 2011/0174892 A1	Electrical atmospheric processes	Clouds/precipitation	Weather modification
US 2024/0074362 A1	Electromagnetic pulses + charge carriers	Atmosphere	Ionic wind, moisture movement, precipitation
HAARP	High-power HF RF	Ionosphere	Controlled plasma perturbation

What is established and what still requires testing

Strongly documented

- Electromagnetic fields interact with charged particles.
- RF can heat plasma.
- Electron-cyclotron resonance can be used as an RF/plasma mechanism.
- Ionization can increase charged-particle populations.
- Atmospheric ions participate in particle formation.
- Electrical weather-modification methods are described in patent publications.
- RF weather-modification methods are described in patent publications.
- RF-absorbing materials have been proposed for use inside weather systems.
- Electromagnetic pulses have been proposed for accelerating atmospheric charge carriers.
- Planetary electric and magnetic fields can affect charged-particle trajectories.

Requires experimental verification

- Whether particular patented RF weather systems can achieve their claimed effects under real atmospheric conditions.
- Whether the proposed energy levels are practically achievable at the necessary scale.
- Whether RF can produce useful weather modification without intermediate absorbing materials.
- How atmospheric aerosols respond to controlled RF fields.
- How ionization changes cloud microphysics under realistic conditions.
- Whether RF-induced plasma changes can significantly couple to lower-atmosphere weather.
- Whether charged-particle systems can redistribute moisture at meaningful geographic scales.

Not established by these patents alone

- That HAARP currently controls weather.
- That HAARP has implemented the Eastlund patents.
- That aircraft are currently dispersing aluminum, barium, or strontium for RF weather modification.
- That a specific storm was caused or steered by HAARP.
- That every proposed patent system is operational.
- That patented capability automatically means demonstrated effectiveness.

XXXII. CONCLUSION

The material presented in this report does not establish that humans currently control weather or earthquakes through RF/EMF technology.

It does establish something more limited but important:

There are real technologies capable of transmitting RF energy into the ionosphere.

There are patents describing deliberate atmospheric, ionospheric, charged-particle, and weather-related manipulation using electromagnetic or electrical processes.

There are scientific studies investigating electromagnetic and ionospheric phenomena associated with earthquakes.

There are continuing developments toward increasingly sophisticated RF systems, including beamforming, integrated sensing, high-frequency communications, satellites, and future sub-THz/THz technologies.

The scientific questions surrounding these capabilities deserve independent investigation.

I believe it is reasonable to ask whether some environmental electromagnetic effects currently attributed to natural processes could, under particular circumstances, be influenced by human-generated RF/EMF energy.

I also believe it is reasonable to ask whether technologies described in patents have progressed from theoretical proposals into actual research, testing, or deployment.

The answer should come from measurements, records, controlled experiments, independent replication, and transparent scientific investigation.

REFERENCES AND SOURCE MATERIAL

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https://patents.google.com/patent/US4686605A/en

2. U.S. Patent 4,712,155, Eastlund/Ramo, Method and apparatus for creating an artificial electron cyclotron heating region of plasma.

https://patents.google.com/patent/US4712155A/en

3. U.S. Patent Application 2006/0201547 A1, James Rogers and Gary Spirnak, Weather Management Using Space-Based Power System.

https://patents.google.com/patent/US20060201547A1/en

4. EP 2,309,842 A1, Apparatus and related methods for weather modification by electrical processes in the atmosphere.

https://patents.google.com/patent/EP2309842A1/en

5. U.S. Patent Application 2011/0174892 A1, related electrical weather-modification patent family.

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6. U.S. Patent Application 2024/0074362 A1, Konstantin A. Borisov, Apparatus and related method for global weather modification and precipitation enhancement.

https://patents.google.com/patent/US20240074362A1/en

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8. Tuovinen, S. et al. (2026), Estimation of atmospheric particle production based on measured ion concentrations, Environmental Science: Atmospheres, DOI: 10.1039/D6EA00045B.

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9. High-frequency Active Auroral Research Program (HAARP), University of Alaska Fairbanks, official technical and frequently asked questions material concerning high-frequency ionospheric research.

https://haarp.gi.alaska.edu/faq

10. International Telecommunication Union, ITU-R M.2160, Framework and overall objectives of the future development of IMT for 2030 and beyond (IMT-2030).

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12. World Meteorological Organization, Record-breaking heat and extreme weather continue, August 12, 2026.

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14. Romanovskaya et al. (2012), Searching for seismo-ionospheric earthquakes precursors. https://arxiv.org/abs/1205.0419

15. Karpov et al. (2012), Modeling of the ionosphere response on the earthquake preparation. https://arxiv.org/abs/1205.0415

16. AFRL, Battlespace Environment Laboratory fact sheet, current April 2011. https://www.kirtland.af.mil/Portals/52/documents/AFD-111103-022.pdf

17. NRAO, Very Large Array technical overview. https://public.nrao.edu/telescopes/vla/

IMPORTANT EVIDENTIARY QUALIFICATION

This report intentionally distinguishes among:

Documented technology - technology or facilities that are demonstrably real.

Patent proposals - technologies formally described in patent applications but not thereby proven to work or to have been deployed.

Scientific observations - measured atmospheric, ionospheric, electromagnetic, or geophysical phenomena.

Scientific hypotheses - proposed explanations that require additional testing.

Author concerns or beliefs - questions the author believes warrant investigation but that have not been established as scientific fact.

This distinction is essential to ensuring that the requested investigation is based upon evidence rather than assumptions.

FINAL CONCLUSION — PROTECTING THE NATURAL ELECTRICAL FOUNDATIONS OF LIFE

The evidence and questions presented in these reports return to one fundamental consideration: living organisms are electrically active systems existing within the Earth's natural electromagnetic environment.

Wireless technologies bring real benefits, including communication, emergency assistance, and connection across great distances. But technological capability, compliance with exposure limits, and comprehensive long-term biological safety are different questions.

Research has demonstrated biological effects under certain RF exposure conditions, while other studies have found no adverse effects under their tested conditions. Important uncertainties remain about long-term and combined exposures, developmental outcomes, ecological effects, and emerging satellite–terrestrial systems. I believe those uncertainties warrant independent investigation rather than assumptions in either direction.

The worldwide expansion of satellite-to-cell communications makes this inquiry more pressing because it can reach places that have historically had comparatively little terrestrial wireless infrastructure. I ask HHS to investigate actual changes in exposure, possible effects on natural bioelectrical signaling, and whether current human-centered limits adequately address animals, plants, and ecosystems.

I also ask that comparatively low-RF environments be preserved for independent research and for people who wish to minimize exposure. Natural environments are living systems, not merely unused spaces awaiting technological coverage.

If these technologies are safe under realistic long-term and combined exposure conditions, the public deserves clear, independently verifiable evidence. If important risks exist, the public deserves to know and to receive meaningful protection. Where uncertainty remains, it should be acknowledged openly.

Progress should not require us to surrender the opportunity to understand, protect, and coexist with the natural systems that sustain life.

We should not assume that our technological ability to alter the electromagnetic environment gives us a greater understanding of life than the natural systems that have sustained it.

Professional closing

Thank you for the opportunity to submit this information. I appreciate HHS for opening this investigation and Secretary Kennedy for undertaking this examination. I respectfully request an independent, transparent review of the harmful-effect evidence and technologies described in these reports. Please publish a study-by-study response, identify the exposure conditions and populations requiring protection, and set a timetable for research, review of standards, and effective safeguards. Disputed findings should receive adequately powered independent replication, with public methods, conflict disclosures, and publication of all outcomes. I want technological progress to be supported by evidence that the public can examine and trust. My goal is to know the truth and to protect the people who live with these technologies.

Personal closing

I want technology to advance. I want to know our safety is what is important. I want people to be connected. And I want that progress to be demonstrably safe. Most of all, I want the science to tell us the truth. For the Land of the Free and The Home of the Brave to be good stewards of this technology on our own soil for the people, not tilted in the interest of big money to use us as pawns.

Sincerely,

Willa Brenden

New Mexico, U.S.A.