

No. 26-1121

**UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

In Re
**CHILDREN’S HEALTH DEFENSE, PETRA BROKKEN, DAVID O.
CARPENTER, MICHELE HERTZ,
ENVIRONMENTAL HEALTH TRUST,
PETITIONERS**

PETITION FOR WRIT OF MANDAMUS

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GLOSSARY

2013 NOI: *In re Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies*, 28 FCC Rcd 3498, 3570-3588 (2013)

2019 Order: *Resolution of Notice of Inquiry, Second Report and Order, Notice of Proposed Rulemaking, and Memorandum Opinion and Order*, 34 FCC Rcd 11,687, 11,689-90 (2019)

CHD: Children's Health Defense

Commission or FCC: Federal Communications Commission

EHT: Environmental Health Trust

EHT v. FCC: *Envtl. Health Trust v. FCC*, 9 F.4th 893 (D.C. Cir. 2021)

EMR-S: Electromagnetic Radiation Syndrome

Guidelines: 47 C.F.R. §§ 1.1307(b), 1.1310, applied to equipment authorizations in 47 C.F.R. Part 2, Subpart J

ICBE-EMF: International Commission on the Biological Effects of Electromagnetic Fields

ICNIRP: International Commission on Non-ionizing Radiation Protection

RF radiation: Radiofrequency radiation

TRAC: *Telecommunications Research & Action Ctr. v. FCC*, 750 F.2d 70, 79 (D.C. Cir. 1984)

TABLE OF CONTENTS

GLOSSARY	2
TABLE OF CONTENTS	3
I. INTRODUCTION AND OVERVIEW	5
II. JURISDICTIONAL STATEMENT	7
III. RELIEF SOUGHT	7
IV. ISSUES PRESENTED	8
V. FACTS	8
A. The FCC’s duty to set limits on RF emissions and the 2021 <i>EHT</i> v. FCC mandate regarding the Commission’s 1996 human exposure limits 8	
B. Continuing human and environmental harm and mounting scientific evidence that the 1996 exposure limits are inadequate	11
C. Increasing RF exposure	14
D. Ongoing FCC failure to comply with the mandate.....	16
E. FCC effort to hasten deployment of new wireless facilities	18
F. Protective exposure limits in other countries	20
G. FCC concealment of systematic testing and operational exposure limit violations	21
VI. REASONS THE WRIT SHOULD ISSUE	23
A. The Commission is violating a clear duty to act.....	25
B. The Commission’s delay is egregious.....	25
1. Delay and the rule of reason.....	26
2. Congressional direction	27
3. Effects on human health and welfare.....	29
4. Effects on important agency activities	30
5. Nature and extent of interests prejudiced by the delay.....	31
6. Bad faith	31
C. Petitioners have no adequate alternative remedy at law.....	31
VII. STANDING.....	33
A. Individual petitioners’ standing.....	33

1. Injuries in fact	33
2. Causation and redressability	35
B. Associational standing	36
1. Member standing.....	37
2. Organizational purpose and interests	37
VIII. CONCLUSION; RELIEF REQUESTED.....	39
CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES	41
A. Parties and <i>Amici</i>	41
B. Rulings Under Review	41
C. Related Cases	41
DISCLOSURE STATEMENTS	43
CERTIFICATE OF COMPLIANCE	44
CERTIFICATE OF SERVICE	45
ADDENDA.....	(separate volume)

I. INTRODUCTION AND OVERVIEW

This Petition is on behalf of individuals and organizations suffering ongoing harm as a result of the Federal Communications Commission's stubborn refusal to fully and lawfully assess whether it should update its 1996 limits for exposure to radiofrequency (RF) radiation.¹ These exposure limits, which are applied to wireless facilities and devices through equipment authorizations and operational rules, are designed to protect against short-term thermal effects of RF radiation but do nothing to protect against well-documented, widespread non-thermal effects on human and environmental health.²

Over four and a half years ago, in *Envtl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) ("*EHT v. FCC*"), this Court found that the Commission failed to provide a reasoned explanation for its conclusion that the 1996 limits adequately protect against such harmful effects by, among other things, not responding to a mountain of evidence that exposure to RF radiation at levels below the maximum

¹ See 47 C.F.R. §§ 1.1307(b), 1.1310.

² RF radiation is "non-ionizing" and is said to not be sufficiently energetic to strip electrons from atoms. All agree that non-ionizing radiation can, however, lead to harmful tissue heating. The current guidelines are based on avoiding this "thermal" effect. The problem is that non-thermal exposures also clearly evoke both beneficial and harmful biological responses, yet the FCC has consistently refused to meaningfully acknowledge or address harmful non-ionizing, non-thermal effects.

allowed under the thirty-year-old exposure limits can cause negative health effects.

The Court ordered the FCC to:

- (i) provide a reasoned explanation for its decision to retain its testing procedures for determining whether cell phones and other portable electronic devices comply with its guidelines,
- (ii) address the impacts of RF radiation on children, the health implications of long-term exposure to RF radiation, the ubiquity of wireless devices, and other technological developments that have occurred since the Commission last updated its guidelines, and
- (iii) address the impacts of RF radiation on the environment.

EHT v. FCC, 9 F4th at 914.

Wireless facilities and devices have continued to massively proliferate. RF radiation exposure has skyrocketed and evidence of harms from RF radiation—especially from pulsed or modulated signals—has continued to accumulate since the Court issued the mandate. Petitioners and others affected daily by the inadequacy of the 1996 limits have submitted petitions, motions, and requests that the Commission comply with the *EHT v. FCC* mandate.

The FCC, however, has ignored the mandate. Instead of taking *any* steps to comply with the order, the Commission has taken *significant* steps to hasten nationwide buildout of wireless infrastructure, notwithstanding the serious, ongoing harm to individuals, communities, *flora*, and *fauna* that flows from these growing exposures.

By refusing to act, the Commission has nullified the mandate, insulated its unlawful decision regarding the 1996 limits from review, and perpetuated a

regulatory regime the Court has already found deficient. Petitioners seek a Writ of Mandamus ordering the Commission to comply with the mandate but this time with specific instructions. The Commission has a clear duty to act; the delay in acting is egregious; the six “*TRAC* factors” heavily favor issuance of the Writ; and no alternative remedy for relief exists. Mandamus is not merely appropriate; it is essential.

II. JURISDICTIONAL STATEMENT

The All Writs Act, 28 U.S.C. § 1651(a) grants jurisdiction to issue the requested writ in order to “effectuate or prevent the frustration of orders previously issued.” *NetCoalition v. S.E.C.*, 715 F.3d 342, 354 (D.C. Cir. 2013) (internal quotation marks, citation omitted); *see also United States v. New York Tel. Co.*, 434 U.S. 159, 172 (1977). Additionally, the Court has jurisdiction under the Administrative Procedure Act, 5 U.S.C. §§ 551 *et seq.*, which provides authority to compel agency actions unreasonably delayed or unlawfully withheld. 5 U.S.C. § 706.

III. RELIEF SOUGHT

Petitioners respectfully request that this Court issue a Writ of Mandamus directing the Commission to comply with the *EHT v. FCC* mandate by providing the required reasoned explanation within 90 days. The Court should provide specific instructions, using the language set forth in Part VIII, below.

IV. ISSUES PRESENTED

1. Whether the FCC unreasonably delayed complying with this Court's Order in *EHT v. FCC*, warranting issuance by this Court of a Writ of Mandamus.
2. What relief should be provided through the Writ.

V. FACTS

A. The FCC's duty to set limits on RF emissions and the 2021 *EHT v. FCC* mandate regarding the Commission's 1996 human exposure limits

The Commission issued the current RF radiation human exposure limits in 1996 pursuant to Congressional directive. *EHT v. FCC*, 9 F.4th at 901. Significantly, these limits “are designed to protect against ‘thermal effects’ of exposure to RF radiation, but not ‘non-thermal’ effects.” *Id.* Although the human exposure limits were originally promulgated to meet “purely procedural” requirements in the National Environmental Policy Act,³ they have been applied to substantive effect beyond just environmental assessment for major federal action, including to equipment authorizations in 47 C.F.R. Part 2, Subpart J. Some courts have construed them to reflect implementation of the FCC's 47 U.S.C. § 303(e) substantive “purity and sharpness” rules and part of its overall substantive rulemaking power in § 303(r). *See, e.g., Cohen v. Apple Inc.*, 46 F.4th 1012, 1017

³ 42 U.S.C. §§ 4321, *et seq.* The U.S. Supreme Court reaffirmed NEPA's “purely procedural” nature in *Seven Cty. Infrastructure Coal. v. Eagle Cty.*, 145 S. Ct. 1497, 1507 (2025).

(9th Cir. 2022). Every person who is exposed to RF radiation from a wireless facility or device is affected by the 1996 limits, whether or not the exposure is consensual.

In March 2013, the Commission issued *In re Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies*, 28 FCC Rcd 3498, 3570-3588 (2013) (“2013 NOI”) to determine whether there was a need to reassess the 1996 limits “in response to changes in the ubiquity of wireless devices and in scientific standards and research since 1996.” *EHT v. FCC*, 9 F.4th at 902.

The 2013 NOI acknowledged the Commission’s “fundamental” regulatory responsibility to “provide for the appropriate protection of consumers, workers, and other members of the public.” 2013 NOI ¶¶209, 210. However, the Commission decided to not update the 1996 limits, and in 2019 issued a final order terminating the 2013 NOI. *Resolution of Notice of Inquiry, Second Report and Order, Notice of Proposed Rulemaking, and Memorandum Opinion and Order*, 34 FCC Rcd 11,687, 11,689-90 (2019) (“2019 Order”).

Petitioners challenged the 2019 Order in separate petitions consolidated in this Court. *EHT v. FCC*, 9 F. 4th at 902. On August 13, 2021, the Court found, under a “highly deferential standard of review,” that:

the Commission’s [2019] order [was] arbitrary and capricious in its failure to respond to record evidence that exposure to RF radiation at levels below the

Commission's current limits may cause negative health effects unrelated to cancer. . . . That failure undermines the Commission's conclusions regarding the adequacy of its testing procedures, particularly as they relate to children, and its conclusions regarding the implications of long-term exposure to RF radiation, exposure to RF pulsation or modulation, and the implications of technological developments that have occurred since 1996, all of which depend on the premise that exposure to RF radiation at levels below its current limits causes no negative health effects. Accordingly, we find those conclusions arbitrary and capricious as well. Finally, we find the Commission's order arbitrary and capricious in its complete failure to respond to comments concerning environmental harm caused by RF radiation.

EHT v. FCC, 9 F.4th at 903.

The Court pointed to voluminous record evidence submitted in response to the *2013 NOI* but ignored in the *2019 Order*, including multiple studies and reports published after 1996, “purporting to show that RF radiation at levels below the Commission's current limits causes negative health effects unrelated to cancer, such as reproductive problems and neurological problems that span from effects on memory to motor abilities” (*id.* at 903); “approximately 200 comments submitted by individuals who advised the Commission that either they or their family members suffer from radiation sickness, a constellation of mainly neurological symptoms that manifest as a result of RF exposure” (*id.* at 904 (internal punctuation omitted)); and “substantive evidence of potential environmental harms.” *Id.* at 909.

The Court found that the evidence before the FCC “challenge[d] a fundamental premise of the Commission's decision to terminate its *2013 NOI*—

namely, the premise that exposure to RF radiation at levels below the Commission's current limits does not cause negative health effects.” *Id.* at 907. The Court observed that “the Commission’s order remains bereft of any explanation as to *why*, in light of the studies in the record, its guidelines remain adequate.” *Id.* at 906 (emphasis in original). It added, “an agency cannot simply ignore evidence suggesting that a major factual predicate of its position may no longer be accurate.” *Id.* at 907.

B. Continuing human and environmental harm and mounting scientific evidence that the 1996 exposure limits are inadequate

During the years since the *EHT v. FCC* mandate issued, the harms from RF radiation to human beings and the natural environment have continued unabated, while the scientific evidence that current limits are inadequate to protect health has advanced far beyond “purport” and is now undeniable.

The individual Petitioners’ Declarations detail some of their own and their family members’ ongoing suffering due to RF radiation, describing symptoms such as extreme fatigue, brain fog, memory loss, shortness of breath, blurry vision, eye pain, fainting, nosebleeds, skin cracking/bleeding, headaches and shooting head pain, cardiac arrhythmia, insomnia, and Grave’s disease, *See* Brokken@¶¶4, 11-12, 19-21; Hertz@¶¶12-16 (Addendum 6).

Petitioners are far from alone in their suffering. For additional evidence of ongoing health effects on human beings, the Court need look no further than the

FCC's own proceedings, where individuals experiencing adverse health consequences from EMF exposure continue to detail their experiences, to deaf ears. Docket WT 25-276 contains comments discussing health effects from RF exposures including myriad neurological, cardiovascular, pulmonary, and other ongoing effects, along with efforts taken by individuals to improve their conditions by reducing or eliminating those exposures. *See Reply Comments of CHD et al*, <https://www.fcc.gov/ecfs/document/1011524866943/1>, pp. 13-15 (linking comments); *see also* comments of [Hank Allen](#), [Shannon Bishop](#), [Thea Becker](#), [Deanna Bernhard](#), [Mark Blossom](#), [Patricia Buckelew](#), [Scott Bauer](#), [Beth Bauer](#), [Julie S. Calderwood](#), [Earis Corman](#), [Margot DesBois](#), [Gary Feltman](#), [Heather Hahn](#) and [Roxanne Huffman](#) for another sampling.

Similarly, in GN 22-69, numerous comments detail suffering by individuals whose lives have been turned upside down by the debilitating effects of wireless radiation. *See* [Reply Comments by Advocates for the EMS Disabled, pp. 6-11; Addendum: Stories of the EMS Disabled In Their Own Words](#). As one individual explains, “[i]ntolerable symptoms prevent me from accessing essential services or participating fully in society.” *Id.* Many other comments in that proceeding describe similar experiences.

In addition to individual instances of suffering, the body of scientific articles and other publications detailing the ill effects of RF radiation and the inadequacy

of current exposure limits has continued to grow. Addendum 2 provides a short list of representative post-2019 publications, including several addressing the issues specifically remanded by the Court, such as the mechanisms of harm, laboratory studies, clinical studies, epidemiological and population data, effects on children, and RF radiation effects on *flora* and *fauna*.⁴

Recent science on wireless radiofrequency electromagnetic fields has solidified a range of critical biological impacts in plants, insects, experimental animals, animal and human cell cultures, and human beings. Reported effects reinforce the prior evidence of oxidative stress, DNA damage, altered calcium signaling, membrane and mitochondrial disruption, reproductive and developmental effects, sperm damage, neurobehavioral changes, immune and endocrine effects, altered gene expression, blood–brain barrier changes, and increased cancer-related signals in some animal and epidemiologic datasets. These non-thermal biological effects flow from chronic and simultaneous exposure and ever-more intense modulation. They especially impact vulnerable populations, something the guidelines and testing procedures completely ignore.

Environmental evidence has also strengthened. [Levitt, Lai, Manville, and Scarato \(2025\)](#) argue that anthropogenic EMF should be treated as an ecosystem-

⁴ See *Health and Environmental Impacts of RF radiation (2019-2026)*, Addendum 2.

level stressor, especially for species relying on geomagnetic cues for migration, orientation, mating, feeding, and territorial behavior. New dosimetry by [Jeladze et al.](#) found substantial frequency-dependent absorption in insects including honeybees, wasps, ladybugs, and mantises. Together, these findings support far more protective and biologically based exposure limits, especially before further wireless densification.

C. Increasing RF exposure

Even as evidence of harm continues to mount, wireless facilities have proliferated at lightning speed. Wireless exposures at home, at work, and at school continue to increase. Addiction to social media fuels increased daily use of wireless devices, thereby increasing users' duration and proximity to devices and the resulting radiation.⁵ New technologies with untested modulation techniques roll out at an increasing pace. This has led to unprecedented exposure levels and patterns.

⁵ In 2025, 35 State Attorneys General filed litigation against social media companies concerning addiction to their products. As of April 1, 2026, 2,407 civil cases were consolidated under the MDL. *People of the State of California v. Meta Platforms, Inc.*, No. 4:23-cv-05448 (N.D. Cal., filed Oct. 24, 2023); *In re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation*, MDL No. 3047 (N.D. Cal., filed Oct. 24, 2023); see <https://cand.uscourts.gov/cases-e-filing/cases/423-cv-05448-ygr/people-state-california-v-meta-platforms-inc-et-al?utm>.

There were approximately 24,800 cell towers in the United States in 1996.⁶ By 2025, there were 254,850 large “macro” cell sites, 198,100 outdoor “small” cells, and 830,350 indoor small cell nodes.⁷

The amounts, types, and uses driving RF radiation exposure have exponentially grown in every age group from infancy to adult, and in every setting from homes to workplaces to schools since 1996. According to a survey of 8,000 U.S. internet households, “the average U.S. household with internet access had 17 connected devices in 2023.”⁸

Children use cell phones and other wireless devices in ways and for durations that the Commission did not anticipate when it set the 1996 limits. According to Common Sense Media, 40% of children today have a tablet by age two, and nearly one in four have a personal cellphone by age eight.⁹ For children under two, average daily screen use is approximately one hour, whereas two to four year-olds average over two hours per day.¹⁰ Children between five and eight

⁶ Katie Dean, [*Cell Towers Take Root on Farms*](#), WIRED (Jan. 10, 2000).

⁷ Benton Institute for Broadband & Society, “[Wireless Infrastructure By the Numbers: 2025 Key Industry Statistics](#),” (Mar. 18, 2026).

⁸ Park Assocs., [Parks: Average U.S. Internet Home Had 17 Connected Devices in 2023 \(Jan. 10, 2024\)](#).

⁹ Common Sense Media, [The 2025 Common Sense Census: Media Use by Kids Zero to Eight](#) (Feb. 26, 2025).

¹⁰ *Id.* at 1.

years old average almost 3.5 hours per day.¹¹ A 2024 CDC data brief concluded that, during July 2021 through December 2023, 50.4% of teenagers ages twelve to seventeen had four hours or more of daily screen time.¹² According to Pew research, 96% of U.S. teens now say they use the internet every day, and since 2014-15, the share of teens who report being online “almost constantly” has nearly doubled, from 24% to 46%.¹³

D. Ongoing FCC failure to comply with the mandate

Despite requests by Petitioners and other individuals and groups, the Commission has ignored the *EHT v. FCC* mandate. The Commission has not provided *any* explanation for its 2019 termination of the 2013 *NOI*, let alone a reasonable one. Similarly, the Commission has not reopened the terminated proceeding, nor has it issued any notices to reassess RF exposure limits or proposed any substantive changes or additions to existing RF exposure limits.

There is no indication this will change any time soon. The Commission’s “Unified Agenda” published at 90 Fed. Reg. 45888-45642 (Sept. 22, 2025) does not list anything related to “exposure,” nor does the list of [Executive Order](#)

¹¹ *Id.*

¹² Benjamin Zablotzky, et al, July 2021, [Daily Screen Time Among Teenagers: United States December 2023](#), NCHS Data Brief No. 513 (Oct. 2024).

¹³ Pew Research Center, [Teens and Internet, Device Access Fact Sheet](#), (July 10, 2025).

[Submissions under Review](#). The FCC issued a Notice of Proposed Rulemaking (NPRM) *In re Modernizing the Commission's Nat'l Env'tl. Policy Act Rules*, 40 FCC Rcd 6377 (Aug., 2025) that would largely exempt wireless facility licensing from NEPA review. However, this NPRM expressly states in ¶ 51 & n. 153 (40 FCC Rcd at 6397) that “we do not propose changes to [the exposure limit] rule sections as part of this proceeding.” The Commission’s apparent intent is to continue to do nothing in response to the *EHT v. FCC* mandate.

Petitions and other requests urging the Commission to comply with the mandate include the following:

- On November 30, 2021, EHT formally asked the FCC to reopen and refresh the RF exposure dockets with up-to-date scientific evidence after the D.C. Circuit’s remand.¹⁴
- In June 2022, the Environmental Working Group petitioned to reopen RF exposure dockets.¹⁵
- On April 4, 2023, CHD petitioned the FCC to honor the mandate.¹⁶
- On August 6, 2025, EHT petitioned the FCC to honor the mandate.¹⁷

¹⁴ See [EHT 11/30/21 Request to Reopen and Refresh the RF Exposure Record in ET Docket Nos 03-137 and 13-84](#).

¹⁵ See [EWG 6/30/22 Petition to Reopen RF Exposure Dockets filed in ET Dockets 13-84 and 03-137](#).

¹⁶ See [CHD Petition to Proceed and Honor Mandate and CEQ NEPA Procedures](#).

¹⁷ See [EHT v. FCC PETITION AND ATTACHMENTS](#).

- On November 25, 2025, CHD joined the EHT August 6, 2025 Petition and renewed CHD's earlier April 2023 petition.¹⁸
- In late 2025, over three thousand formal comments from organizations, individuals, and governmental entities were submitted opposing the proposals in WT 25-276, *Build America: Eliminating Barriers to Wireless Deployments*. Many comments demanded that the FCC deal with the *EHT v. FCC* remand before promoting further wireless deployment.¹⁹

The Commission has not formally responded to any of these entreaties.

E. FCC effort to hasten deployment of new wireless facilities

During the four and a half years that the FCC has ignored the *EHT v. FCC* mandate, the Commission has busied itself with ensuring that wireless telecommunication companies are able to enjoy frictionless rollout of wireless facilities in communities across the nation, regardless of whether the facilities are wanted or needed in those communities.

The Commission's website announces: "[FCC Aims to Accelerate Wireless Infrastructure Buildout](#)," and the Commission's Notice of Proposed Rulemaking

¹⁸ See [Joinder In Environmental Health Trust Petition To Implement D.C. Circuit Judgment And Mandate, Reopen Notice Of Inquiry And Perform Tasks Ordered By The Court, And Request For Prompt Administrative Action And Renewed Separate Motion For Similar Relief](#).

¹⁹ For just a small sample, see comments of the [International Commission on Biological Effects of EMFs \(ICBE-EMF\)](#), 5-6; [Local Communities Wireless Coalition](#), 35-37; [West Montgomery County Citizens Association](#), 2; [City of Phoenix](#), 6-7. See also [ICBE-EMF May 14, 2026 Ex Parte](#).

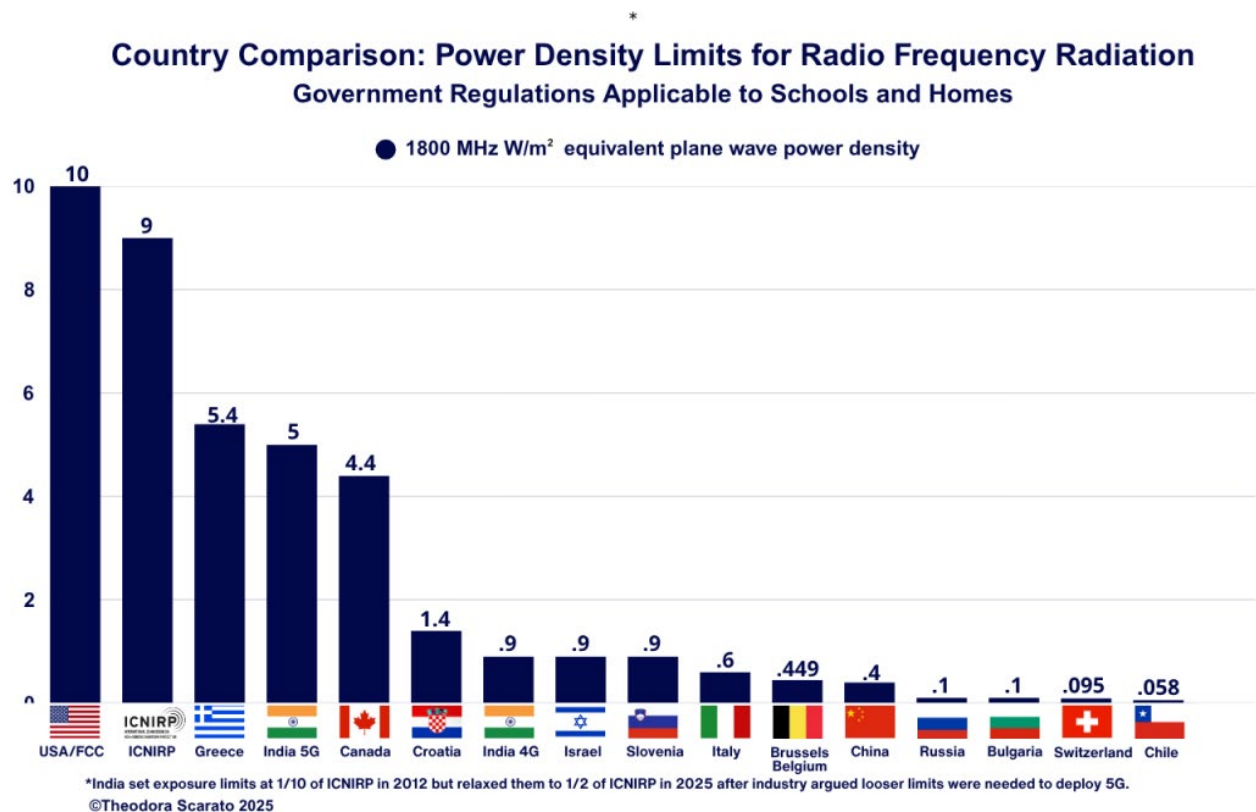
(“NPRM”) in WT 25-276, *Build America: Eliminating Barriers to Wireless Deployments*,²⁰ proposes to fast-track wall-to-wall wireless facility deployment.

The Telecommunications Act of 1996 (“TCA”) *already* preempts state and local governments from considering environmental effects of RF radiation when regulating placement, construction, and modification of personal wireless service facilities, and this preemption has been broadly interpreted to preclude regulation based on human health effects as well. *See* 47 U.S.C. § 332(c)(7)(B)(iv). If enacted, the rules and other actions contemplated in the NPRM would virtually eliminate remaining state and local zoning authority over wireless facilities, effectively transferring that traditional authority to private telecommunication companies. Communities would be forced to accept new and expanded wireless facilities in locally-unwanted settings: residential neighborhoods and parks, on top of schools, in rural and historic districts, in woodlands and on mountaintops and other locations held in high value by communities, even though that buildout under the 1996 exposure limits will further harm human and environmental health.

²⁰ The NPRM was released on September 30, 2025, and published in the Federal Register on December 1, 2025. 90 FR 55066.

F. Protective exposure limits in other countries

The FCC's 1996 exposure limits are the highest in the world, making the U.S. an outlier. By contrast, most developed nations have adopted substantially lower limits, with the majority having limits less than 20% of the FCC's.²¹



Russia and Switzerland have the lowest exposure limits in the world but still maintain robust and reliable mobile connectivity.²² Switzerland's limits are about

²¹ National Spectrum Management Association, 2026 Annual Conference, *"Your Radiation Weather Report": National RF Emission Map & Monitoring Networks: Real Time, Prior Measured & Predictive*, (hereinafter NSMA 2026) (May 13, 2026). See, Addendum 3.

²² [EHT v. FCC Petition \(2025\)](#) at 23.

3% of the FCC's. Switzerland started with the International Commission on Non-ionizing Radiation Protection (ICNIRP) recommendations as the base but adds strict precautionary installation limits (ILV) for base stations, especially near sensitive areas (homes, schools, etc.). For networks operating in the 900 MHz spectrum band, the radiation limit is roughly 1/10 to 1/100 of ICNIRP (~ 4.6 V/m or $\sim 0.04\text{--}0.1$ W/m²).²³

G. FCC concealment of systematic testing and operational exposure limit violations

The Court remanded for a reasoned explanation for the decision to retain current testing procedures, but this too remains unaddressed. One potential reason is that the Commission knows its testing regime's failures allow non-compliant devices to flow into commerce, thereby harming consumers, and it prefers to keep that information out of public view.

In 2019, Commission engineers tested selected devices and determined they exceeded limits when within 2 mm of the body.²⁴ The Commission tried to

²³ [Federal Office for the Environment \(FOEN/BAFU\), Topic: Electrosmog, Health and Environment](#); For specific, see NSMA 2026 at pp 9-19 (Addendum 3); See generally, [EHT Switzerland Policy Recommendations for Cell Phone Radiation Health](#).

²⁴ EHT, *EHT v. FCC* Petition (2025) at 68, citing [Press Release: Concealed FCC Cell Phone Radiation Tests Show Human 'Exposure Limits Were Exceeded', Environmental Health Trust \(Apr. 22, 2024\)](#) (Addendum 4).

suppress disclosure of this event, but the records were finally produced under FOIA in 2023.²⁵

Other independent tests using standardized equipment and FCC-compliant procedures have revealed that certain devices placed into general commerce are non-compliant.²⁶ These devices had previously cleared the FCC registration process, which demonstrates that the testing regime fails to properly catch violating equipment at the front end.

Cellular antennas also routinely cause exposure zones exceeding general population limits. The Commission rules require “positive access control”²⁷ restricting access to those areas, but violations are common and the rules are not

²⁵ [*EHT v. FCC* Petition \(2025\)](#) at 9. citing EHT, [*Federal Communications Commission \(FCC\) Release of 11 Records to the Environmental Health Trust \(EHT\) in response to a Freedom of Information Act \(FOIA\)*](#), Apr. 21, 2024. See also, [*Press Release: Concealed FCC Cell Phone Radiation Tests Show Human ‘Exposure Limits Were Exceeded’*](#), EHT, (Apr. 22, 2024) (Addendum 4).

²⁶ FCC-certified lab results from tested mobile phones revealed exposures exceeding FCC limits. See Addendum 5, *Certificate of Testing: R&D SAR Evaluation*, RF Exposure Lab (Oct. 13, 2025). This report documented exceedances at 5mm from the body for the Samsung Galaxy S, Nokia 5165, Motorola MicroTAC, Nokia 101, Nokia 1000, and Motorola StarTAC.

²⁷ See 47 C.F.R. § 1.1307(b)(2) (definition of “positive access control”), (b)(4)(iii) (Mitigation actions).

actively policed. The FCC instead relies on complaints by property owners or other members of the public.²⁸

In sum, the public evidence indicates that testing for compliance with even the overly-permissive rules is wholly inadequate and non-compliance may well be systemic, which means the public is currently being widely exposed to RF radiation at levels even the FCC agrees is harmful.²⁹

VI. REASONS THE WRIT SHOULD ISSUE

A Writ of Mandamus is warranted when the petitioner demonstrates “(1) a clear and indisputable right to relief, (2) that the government agency or official is violating a clear duty to act, (3) and that no adequate alternative remedy exists.” *Am. Hosp. Ass’n v. Burwell*, 812 F.3d 183, 189 (D.C. Cir. 2016). Mandamus is appropriate when a Court finds “compelling equitable grounds.” *In re Medicare Reimbursement Litigation*, 414 F.3d 7, 10 (D.C. Cir. 2005) (internal quotation marks and alteration omitted). “On the equities, the central question is whether the agency’s delay is so egregious as to warrant mandamus.” *In re Ctr. for Biological Diversity & Ctr. for Food Safety*, 53 F.4th 665, 670 (D.C. Cir. 2022) (internal quotation marks and citation omitted).

²⁸ See, e.g., *In the Matter of T-Mobile License, LLC, Licensee of Stations WQGB378, WQGA745, WQQQ249, Phoenix, Arizona*, Notice Of Apparent Liability For Forfeiture, 30 FCC Rcd 12677 (2015).

²⁹ [EHT v. FCC Petition \(2025\)](#) at 20, 26, 34, 68-73.

Here, the Court is faced with an FCC failure to obey a judicial mandate over four and a half years old, and a failure to lawfully address safety guidelines that are thirty years old. As in *Ctr. for Biological Diversity*, “[t]he mandamus petition in this case arises from relatively unique circumstances that implicate two distinct sources of mandamus jurisdiction under the All Writs Act: [the Court’s] power to compel unreasonably delayed agency activity and [the Court’s] power to require compliance with [the Court’s] previously issued orders.” *Id.* Where, as here, an agency has failed to act on a remand from this Court, this failure is the “decisive factor.” *Id.* at 671 (internal punctuation and citation omitted).

By ignoring the *EHT v. FCC* mandate for years, the Commission has effectively nullified this Court’s determination that the *2019 Order* was erroneous, because the remand without *vacatur* left the 1996 human exposure limits in place. Until the FCC states its explanation for the decision to terminate the *2013 NOI* in a final order, Petitioners cannot mount a challenge to the decision or the rules in issue. *See id.* at 670-71.

While the FCC has been ignoring the mandate, human and environmental harms from ever-increasing exposure to RF radiation have continued to mount. Moreover, as wireless facilities proliferate and become ubiquitous, individuals who suffer health effects from RF radiation find it ever more difficult to escape involuntary exposure, in part because federal preemption eliminates communities’

ability to consider or do anything about health and environmental effects from wireless facilities.

The FCC's delay in acting is egregious and the equities are compelling. All conditions are met for the Writ to issue.

A. The Commission is violating a clear duty to act.

The Commission's charge is to regulate facilities, equipment and devices that emit RF radiation "in the public interest, *including in regard to public health.*" *EHT v. FCC*, 9 F.4th at 906 (internal citation omitted, emphasis added). Consistent with this responsibility, this Court's *EHT v. FCC* mandate requires the FCC to act, by—among other things—dealing with the voluminous scientific evidence that the 1996 exposure limits do not protect human or environmental health. The FCC has a "crystal-clear legal duty" to act, *see In re Nat'l Nurses United*, 47 F.4th 746, 752 (D.C. Cir. 2022), but is violating that duty through its wholesale disregard of this Court's mandate.

B. The Commission's delay is egregious.

To determine "whether the agency's delay is so egregious as to warrant mandamus," the Court considers six factors:

(1) the time agencies take to make decisions must be governed by a rule of reason; (2) where Congress has provided a timetable or other indication of the speed with which it expects the agency to proceed in the enabling statute, that statutory scheme may supply content for this rule of reason ; (3) delays that might be reasonable in the sphere of economic regulation are less tolerable when human health and welfare are at stake; (4) the court should

consider the effect of expediting delayed action on agency activities of a higher or competing priority; (5) the court should also take into account the nature and extent of the interests prejudiced by delay; and (6) the court need not find any impropriety lurking behind agency lassitude in order to hold that agency action is unreasonably delayed.

Telecommunications Research & Action Ctr. v. FCC (“*TRAC*”), 750 F.2d 70, 79-80 (D.C. Cir. 1984) (internal quotation marks and citations omitted); *see also, In re Public Emples.*, 957 F.3d 267, 273 (D.C. Cir. 2020); *In re Core Communs., Inc.*, 531 F.3d 849, 855 (D.C. Cir. 2008).

Where, as here, an agency ignores a court order, “although the *TRAC* factors are ‘not unimportant,’ a lesser showing is necessary to justify mandamus.” *Ctr. for Biological Diversity*, 53 F.4th at 671 (internal quotation marks and citation omitted). However, even under a more stringent analysis, the Commission’s failure to take any action on the Court’s order for over four and a half years is egregious, and the *TRAC* factors weigh heavily in favor of mandamus.

1. Delay and the rule of reason

The first and most important *TRAC* factor is the “rule of reason.” *In re Core Commc’ns*, 531 F.3d at 855. While “[t]here is no *per se* rule as to how long is too long to wait for agency action . . . a reasonable time for agency action is typically counted in weeks or months, not years.” *In re Am. Rivers & Idaho Rivers United*, 372 F.3d 413, 419 (2004) (internal quotation marks and citations omitted); *see also Midwest Gas Users Assoc. v. Federal Energy Regulatory Com.*, 833 F.2d 341, 359

(D.C. Cir. 1987) (a reasonable time for an agency decision could encompass months, occasionally a year or two, but not several years or a decade); *MCI Telecommunications Corp. v. FCC*, 627 F.2d 322 (D.C. Cir. 1980) (four-year delay in determining a just and reasonable tariff was unreasonable); *Public Citizen Research Health Grp. v. Auchter*, 702 F.2d 1150, 1157 (D.C. Cir. 1983) (three years); *Air Line Pilots Ass’n, Int’l v. C.A.B.*, 750 F.2d 81, 86 (D.C. Cir. 1984) (five-years). Importantly, lack of a hard deadline “does not give government officials *carte blanche* to ignore their legal obligations.” *In re Public Emples.*, 957 F.3d at 274 (internal quotation marks, citation omitted).

Here, the FCC has not even begun to act on a Court mandate that is over four and a half years old. Moreover, the subject of the mandate—the *2019 Order*—was issued seven years ago, based on the now thirteen-year-old *2013 NOI*, questioning thirty-year-old exposure limits. There is no justification for this delay, especially given the ongoing and increasingly widespread harm. The Commission’s rush to hasten ever more wireless deployments while the 1996 limits are still in place makes the delay all the more egregious.

2. Congressional direction

Under the second *TRAC* factor, the Court considers whether Congress provided a “timetable or other indication of the speed with which it expects the agency to proceed.” Congress has not provided an express deadline for the actions

sought in this Petition, but given the significant health and environmental concerns involved, there is considerable force to the proposition that the FCC has the legal duty to regularly revisit the human exposure limits, just as it does its other significant rules. First, the FCC implicitly acknowledged a duty to update in the *2013 NOI*³⁰ and the *2019 Order*.³¹ Second, 47 U.S.C §§ 332(a)(1), 151, 154(n), 254(c)(1)(A), 324, 332(a)(1), 336(h)(4)(B), 925 (b)(2)(C), 1455(a)(3) each appear to impose an ongoing public health and safety obligation. *See also Mozilla Corp. v. FCC*, 940 F.3d 1, 59 (D.C. Cir. 2019).

The Commission has recently been identifying other wireless related rules it deems “outdated, obsolete, unlawful, anticompetitive, or otherwise no longer in the public interest” to “eliminat[e] outdated rules, reduc[e] unnecessary regulatory burdens, accelerat[e] infrastructure deployment, promot[e] network modernization, and spur[] innovation.” *In re Delete, Delete, Delete*, 40 FCC Rcd 8686 ¶¶ 1-2 (Oct. 28, 2025). In contrast, it is consciously and conspicuously ignoring the exposure limits and their severe deficiencies as part of its rush to push ever more wireless infrastructure that will create even more involuntary exposure.

³⁰ 28 FCC Rcd at 3571, ¶¶209, 210.

³¹ 34 FCC Rcd at 11693, ¶10.

3. Effects on human health and welfare

The third *TRAC* factor weighs heavily in favor of mandamus, because “delays that might be reasonable in the sphere of economic regulation are less tolerable when human health and welfare are at stake.” *TRAC*, 750 F.2d at 80. *See, e.g., Ctr for Biological Diversity*, 53 F.4th at 671; *Pub. Citizen Health Research Grp. v. Auchter*, 702 F.2d 1150, 1157 (D.C. Cir. 1983).

Here, “human health and welfare” are undeniably at stake, given ongoing and mounting exposure to RF radiation under regulatory assumptions the Court has already found inadequately justified. RF radiation exposure at or under the 1996 limits harms human beings. Additionally, RF radiation exposure at or under the 1996 limits harms the environment upon which all human life depends. *Cf. In re Bluewater Network*, 234 F.3d 1305, 1316 (D.C. Cir. 2000). Moreover, the threat to human health and welfare posed by RF radiation is magnified by the fact that exposure is becoming increasingly unavoidable, regardless of consent.

The threat to human health and welfare is broader and less attenuated than threats that this Court has previously found to weigh heavily in favor of mandamus. For example, in *Pub. Citizen Health Research Grp. v. Auchter*, the court found that OSHA’s three-year delay in updating exposure standards for a work-place chemical was unreasonable. The principal focus was “exposure of workers who work near sterilizing equipment in the health care industry.” 702 F.2d

at 1152. The principal focus of *this* case is significantly broader: wireless facilities and devices have proliferated to such an extent that almost every man, woman, and child in the country is exposed to RF radiation on an ongoing basis, unless deliberate (and often drastic) steps are taken to avoid exposure, while the *flora* and *fauna* on which we all depend cannot avoid exposure at all.

The threat here is less attenuated than that in *Ctr for Biological Diversity*, where the Court considered EPA's failure to determine adverse effects of a new pesticide on an endangered species. 53 F.4th at 671. Here, the FCC's failure to act directly threatens human health and welfare across the Nation.

4. Effects on important agency activities

Under the Fourth *TRAC* factor, the Court considers "the effect of expediting delayed action on agency activities of a higher or competing priority." *TRAC*, 750 F.2d at 80. Here, the FCC is not just nullifying the judicial mandate; it is strategically prioritizing activities that make noncompliance worse. But this Court's remand order elevates rather than reduces the importance of FCC action. The FCC's foot-dragging stymies Petitioners' ability to obtain judicial review, and it is clear that the Commission "never intends to resolve the issue at all." *See In re Monroe Commc'ns Corp.*, 840 F.2d 942, 946-47 (D.C. Cir. 1988).

5. Nature and extent of interests prejudiced by the delay

The fifth *TRAC* factor concerns the nature and extent of the interests prejudiced by agency delay. Here, the FCC's ongoing failure to act on the *EHT v. FCC* mandate prejudices the interests of Petitioners and of the general public because of ongoing health and environmental effects, while also preventing judicial review of the Commission's inaction.

6. Bad faith

Mandamus does not require that the agency's delay be driven by improper conduct or motive, *TRAC*, 750 F.2d at 80; egregiousness of the delay is itself sufficient. Here, even if not in bad faith, the FCC's rush to accelerate wireless buildout while doing nothing to address the remand strongly implies an intent to take advantage of the lack of a *vacatur* since action on the remand might complicate deployment and operation.

C. Petitioners have no adequate alternative remedy at law.

When, as here, a case “is simply remanded, and the agency drags its feet, the winning party's only recourse is to bring a mandamus petition and clear all the hurdles such actions entail.” *Citizens for Resp. & Ethics in Washington v. Fed. Election Comm'n*, 316 F. Supp. 3d 349, 414–15 (D.D.C. 2018), *aff'd*, 971 F.3d 340 (D.C. Cir. 2020) (internal punctuation and citation omitted). Because the Commission has failed to act on the *EHT v. FCC* mandate, there is no final order to

challenge, and judicial review is unavailable. *Cf. Ctr. for Biological Diversity*, 53 F.4th at 67. This lack of remedy is compounded by judicial decisions holding the Communications Act expressly or impliedly preempts all state and local authority over RF exposures and all remedies for personal and property injuries. Many courts have held that there is no private right of action for violation of several of the underlying provisions in the Communications Act. The FCC has also decided that there is no private cause of action at the FCC for violation of the relevant FCC regulations. If and to the extent those decisions are correct, Petitioners have no other means to challenge the application of the 1996 exposure limits to them even though exposures are often involuntary.

Indeed, private relief through adjudication is not available even at the FCC. Commission rules do not contemplate specific relief to individuals harmed by wireless facilities or user devices. There is no statutory provision for, and no FCC rule allows, complaints about wireless licensee actions that cause personal injury when the licensee is operating in accordance with applicable rules but harm nonetheless results, as would often be the case here.

Petitioners are left with FCC rulemaking as the only source of relief and the remanded proceeding is the only proceeding where that can occur. The statutory limitations period for petitions for review of the *2019 Order* has long passed, so a new action is not available. The *EHT v. FCC* petitioners took a timely petition for

review and prevailed but the FCC refuses to honor the mandate. Mandamus is the only possible remedy.

VII. STANDING

Petitions for mandamus do not have to address standing. Petitioners, however, acknowledge that Article III standing is required. *United States v. Straker*, 800 F.3d 570, 586 (D.C. Cir. 2015). Thus, we briefly discuss why the individual and organizational Petitioners have standing, supported by standing declarations submitted with this Petition.

Addendum 6 contains a Declaration by each Petitioner in support of standing. Importantly, all Petitioners in this filing were named plaintiffs in *EHT v. FCC*, and on that basis alone have standing to enforce the *EHT v. FCC* mandate to protect interests that continue to be harmed by the Commission's inaction.

A. Individual petitioners' standing

Two of the individual Petitioner are members of Petitioner CHD, and the third individual is a longtime supporter. Each has injury in fact, causation, and redressability. *See In re Public Empl.*, 957 F.3d at 272.

1. Injuries in fact

For individual Petitioners, illness from toxic environmental agents and harmful exposures from inadequate safety limits provide standing. *NRDC v. EPA*, 464 F.3d 1, 7 (D.C. Cir. 2006); *Nuclear Energy Inst., Inc. v. EPA*, 373 F.3d 1251,

1265-66 (D.C. Cir. 2004); *Mountain States Legal Found. v. Glickman*, 92 F.3d 1228, 1234-35 (D.C. Cir. 1996).

Two petitioners suffer from Electromagnetic Radiation Syndrome (“EMR-S”) and related conditions. Brokken@¶¶4-13; Hertz@¶¶7-8, 12-16. These injuries are both particularized and concrete: they have had to, *inter alia*, quit jobs and school, avoid public spaces, stop traveling by air, and spend money to shield themselves from RF/EMF emissions and to minimize future exposures, (*e.g.*, buying shielding to block radiation, moving homes). Brokken@¶¶14-18, 27; Hertz@¶¶9, 12, 16-17, 20. The financial harm from these expenditures also provides standing. *Czyzewski v. Jevic Holding Corp.*, 580 U.S. 464 (2017); *see also Twin Rivers Paper Co. LLC v. SEC*, 934 F.3d 607, 616 (D.C. Cir. 2019).

Standing arises from the violation of a procedural right that threatens a concrete interest. *City of Dania Beach v. FAA*, 485 F.3d 1181, 1185 (D.C. Cir. 2007). One need not, however, show that “correcting the procedural violation would necessarily alter the effect of the agency’s action on the plaintiffs’ interest.” *Mendoza v. Perez*, 754 F.3d 1002, 1010 (D.C. Cir. 2014). Here, the Communications Act requires the FCC to protect citizens from unnecessarily harmful RF/EMF exposures. The APA obligates the FCC to consider relevant materials indicating that human health and environment may be adversely affected or that the FCC’s cellphone testing procedures are inadequate. All individual

Petitioners have alleged that the FCC’s refusal to comply with the *EHT v. FCC* mandate concretely and significantly harms their interests, and the harm is ongoing and reasonably expected to continue absent this Court’s intervention. *See e.g.*, Brokken@¶¶27-29; Carpenter@¶¶60-65; Hertz@¶¶23-24.

Scientists and physicians have a legally-protected interest in the ability to engage in their chosen professions, in accordance with ethical and other duties imposed by law or custom. Agency action that significantly undercuts their ability to do so is a “professional injury,” that provides standing. The FCC’s refusal to honor the *EHT v. FCC* mandate has caused reputational harm to and frustrated the professional Petitioner’s ability to effectively practice public health.

Carpenter@¶¶61-65.

2. Causation and redressability

The injuries here are caused by FCC’s inaction in response to the *EHT v. FCC* remand, which renders the Petitioners’ court win in that case meaningless. The FCC’s “do nothing” response to the mandate is functionally no different than termination of the 2013 *NOI*—the outcome found unlawful and remanded by the Court. The *EHT v. FCC* Court intended to provide redress, but the Commission is functionally denying the fruits of Petitioners’ victory by ignoring the mandate.

The same causation and redressability that were present in *EHT v. FCC* remain to this day. Moreover, as discussed above, there is additional, continuing

and accumulating injury from the Commission's refusal to set meaningful, biologically based exposure limits. The Court must act to ensure its original effort to provide redress comes to fruition, but it should also act to deal with all the additional harm caused by the FCC's continued and ongoing misadministration of its statutory duties.

When the FCC finally acts by adapting its rules to biological responses other than tissue heating, all regulated entities will respond by bringing themselves into compliance with any changes by adjusting their behavior, thereby providing relief to the Petitioners. If the result is, once again, no changes to the regulations but only a more reasoned explanation for the decision, the Petitioners will have an opportunity to challenge the reasoning and justification before this Court or in a regular APA appeal. Petitioners will at least finally get the "reasoned justification" the Court properly held was required and appropriate.

B. Associational standing

An association has standing to bring suit on behalf of its members when: (a) its members would otherwise have standing to sue in their own right; (b) the interests it seeks to protect are germane to the organization's purpose; and (c) neither the claim asserted nor the relief requested requires the participation of individual members in the lawsuit. CHD and EHT are appropriate representatives for their members and constituents.

1. Member standing

Two of the individual Petitioners in this case are CHD members and have standing to sue in their own right. Brokken@¶1; Hertz@¶1; *see also* Eckenfels@¶8. As for EHT, many of EHT's members and supporters are individuals who are directly and continuously exposed to RF radiation from wireless devices, infrastructure, and related technologies. Sandri@@¶5. These individuals suffer concrete and particularized injuries in the form of heightened health risks, including potential biological effects documented by peer-reviewed scientific evidence, such as impacts on neurological development, reproductive health, and other physiological systems. *Id.* These injuries are actual or imminent, traceable to the challenged agency action, and redressable by a favorable court decision. *Id.*

2. Organizational purpose and interests

The interests CHD and EHT seek to protect through this Petition are germane to each organization's interest.

CHD's mission is to end childhood health epidemics by eliminating the toxic exposures that underlie them, including exposure to harmful RF radiation. CHD's priorities and initiatives are shaped by members of the CHD community, who belong to chapters around the country through which they impact CHD's policies, advocacy, actions, and lawsuits. Eckenfels@¶¶3-6. Through its EMR & Wireless

program, CHD responds to and provides legal and other assistance to members and communities who have concerns about wireless facilities, including their health and environmental effects. Eckenfels@¶9. Additionally, CHD leads a nationwide initiative involving over 100 safe-tech organizations and many thousands of individuals seeking to restore state and local control over siting of wireless facilities. Eckenfels@¶10. On behalf of its members and constituents, CHD was a lead plaintiff in *EHT v. FCC* and has filed comments in various FCC proceedings involving wireless standards and facilities. Eckenfels@¶¶11-12.

EHT's mission is to identify emerging environmental hazards, advance research on their health effects, and formulate proactive preventative solutions. EHT champions environmental health research, policy advice and support, and public education on emerging environmental health hazards and their impact on the health of humans and all living things. Supporters include a global network of scientific, business, and legal advisors. Its leadership team comprises public health professionals, clinicians, scientists, engineers and community outreach professionals. EHT conducts and supports independent scientific, engineering and clinical research and then applies the results to educate the public and advocate for and achieve science-based effective public policy. Sandri@¶¶3, 6.

3. Participation of individual members

CHD's and EHT's claims and requested relief do not demand individualized proof for every affected member; a showing for some—and specifically for the individual Petitioners—more than suffices. Relief for them and each organization will also remedy the needs and interests of the organizations' other members.

Sandri@¶7; Eckenfels@¶17.

VIII. CONCLUSION; RELIEF REQUESTED

Petitioners respectfully request that this Court issue a writ of mandamus directing the Commission to comply with the *EHT v. FCC* mandate within 90 days by issuing a Commission-level order that confronts the evidence, provides a reasoned explanation for the *2019 Order* and is judicially reviewable. The explanation must, in particular, address the specific issues identified by the Court:

- (i) the decision to retain the then-current testing procedures for determining whether cell phones and other portable electronic devices comply with its guidelines;
- (ii) the impacts of RF radiation on children, the health implications of long-term exposure to RF radiation;
- (iii) why retention is appropriate given the ubiquity of wireless devices, and other technological developments that have occurred since the Commission last updated its guidelines in light of the extensive record evidence; and

(iv) address the impacts of RF radiation on the environment and specifically impacts on *flora* and *fauna*.

As part of its order the Court should prohibit the Commission from issuing a final order in any of the several other proceedings where the FCC is trying to further accelerate wireless facility deployment and device utilization before it responds to the order in this case.

Finally, the Court should retain jurisdiction to ensure compliance and require a 45-day status update. *See Ctr for Biological Diversity*, 53 53 F.4th at 673.

Respectfully Submitted,

/s/ W. Scott McCollough
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CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES

Pursuant to D.C. Circuit Rule 28(a)(1), counsel for Petitioners certifies as follows:

A. Parties and *Amici*

The Petitioners are Children’s Health Defense (“CHD”), Environmental Health Trust (“EHT”), two CHD members and one CHD supporter. Respondents are the Federal Communications Commission and the United States of America. No *Amici* are currently known.

B. Rulings Under Review

There are no rulings under review. Petitioners seek a writ of mandamus to order the Federal Communications Commission to comply with a prior decision, judgment and mandate before this court, *Env’tl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) (“*EHT v. FCC*”) requiring a reasoned explanation for a 2019 decision to terminate and close the *2013 NOI*.

C. Related Cases

There are several pending Commission proceedings where the underlying issues have been raised by many commentators. *In re Modernizing the Commission’s Nat’l Env’tl. Policy Act Rules*, 40 FCC Rcd 6377 (Aug., 2025) would largely exempt wireless facility licensing from NEPA review. This NPRM expressly states in ¶ 51 & n. 153 (40 FCC Rcd at 6397) that “we do not propose changes to [the

exposure limit] rule sections as part of this proceeding.” Many commentators, however, have contended that the Commission should not take the proposed action until it complies with the *EHT v. FCC* mandate.

Similarly, the Commission’s Notice of Proposed Rulemaking (“NPRM”) in WT 25-276, *Build America: Eliminating Barriers to Wireless Deployments*,” proposes to fast-track wall-to-wall wireless facility deployment. Once again, many commentators have contended that the Commission should not take the proposed action until it complies with the *EHT v. FCC* mandate.

One of the FCC dockets from which the *2019 Order* issued is ongoing. *Targeted Changes to the Commission’s Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields*, ET No. 19-226. Two have been terminated. *In the Matter of Proposed Changes in the Commission’s Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields*, ET 03-137 (Terminated) and *Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies*, ET 13-84 (Terminated). The Court remanded the decision to terminate ET 13-84 in *EHT v. FCC*.

/s/ W. Scott McCollough

DISCLOSURE STATEMENTS

Pursuant to Circuit Rule 26.1, Petitioner associations respectfully submit this Corporate Disclosure Statement as follows:

1. Children’s Health Defense (“CHD”) is a national non-profit 501(c)(3) organization whose mission is to end the epidemic of children’s chronic health conditions by working aggressively to eliminate harmful exposures to environmental toxins via education, obtaining justice for those already injured and promoting protective safeguards. CHD has no parent corporation, and no publicly-held company has a 10% or greater ownership interest in the organization.

2. Environmental Health Trust (“EHT”) is a non-profit 501(c)(3) scientific and educational organization whose mission is to safeguard human health and the environment by publishing scientific research, empowering people with state-of-the-art information, and working directly with various constituencies to mitigate health and environmental risks. EHT has no parent corporation, and no publicly-held company has a 10% or greater ownership interest in the organization.

3. The other Petitioners are all individuals with no corporate identity.

/s/ W. Scott McCollough

CERTIFICATE OF COMPLIANCE

With Type-Volume Limit, Typeface Requirements and Type-Style Requirements

1. This document complies with the type-volume limit of Fed. R. App. P. 21 (d)(1). This document contains 7727 words.
2. This document complies with the typeface requirements of Fed. R. App. P. 32(a)(5) and the type-style requirements of Fed. R. App. P. 32(a)(6) because it has been prepared in a proportionally spaced typeface using Times New Roman, 14 point.

/s/ W. Scott McCollough

CERTIFICATE OF SERVICE

I hereby certify that on this May 18, 2026, a copy of the attached Petition for Writ of Mandamus was filed with the Clerk of the Court for the U.S. Court of Appeals for the D.C. Circuit through the CM/ECF System and overnight mail and was separately served on Respondents.

To FCC, by email (by consent; *see* 47 C.F.R. § 1.1.13(b)):

LitigationNotice@fcc.gov

To the Department of Justice by email and overnight mail:

USADC.ServiceCivil@usdoj.gov

Civil Process Clerk
U.S. Attorney's Office for D.C.
601 D Street, NW
Washington, DC 20530

/s/ W. Scott McCollough

No. _____

**UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

In Re

**CHILDREN’S HEALTH DEFENSE, PETRA BROKKEN, DAVID O.
CARPENTER, MICHELE HERTZ,
ENVIRONMENTAL HEALTH TRUST,
PETITIONERS**

ADDENDA TO PETITION FOR WRIT OF MANDAMUS

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ADDENDA TABLE OF CONTENTS

ADDENDA TABLE OF CONTENTS.....	1
Addendum 1 – Panel Opinion, Judgment and Mandate	3
A. <i>EHT v. FCC</i> Panel Opinion	3
B. <i>EHT v. FCC</i> Judgment.....	48
C. <i>EHT v. FCC</i> Mandate.....	50
Addendum 2 - Table with Representative Post 2019 Science	52
Addendum 3 - National Spectrum Management Association, 2026 Annual Conference, “Your Radiation Weather Report”: National RF Emission Map & Monitoring Networks: Real Time, Prior Measured & Predictive, (NSMA 2026) (May 13, 2026).....	57
Addendum 4 - FOIA on FCC Testing	81
Addendum 5 – Certified Lab Test Results – Handsets.....	87
Addendum 6 – Declarations in Support of Standing	252
A. Declaration of Miriam Eckenfels	252
B. Declaration of Petra Brokken	257
C. Declaration of David O. Carpenter	265
D. Declaration of Michele Hertz	320
E. Declaration of Joseph M. Sandri, Jr.....	330

Addendum 1 – Panel Opinion, Judgment and Mandate**A. *EHT* v. *FCC* Panel Opinion**

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued January 25, 2021

Decided August 13, 2021

No. 20-1025

ENVIRONMENTAL HEALTH TRUST, ET AL.,
PETITIONERS

v.

FEDERAL COMMUNICATIONS COMMISSION AND UNITED
STATES OF AMERICA,
RESPONDENTS

Consolidated with 20-1138

On Petitions for Review of an Order
of the Federal Communications Commission

W. Scott McCollough argued the cause for petitioners.
With him on the joint briefs were *Edward B. Myers* and *Robert
F. Kennedy, Jr.*

Sharon Buccino was on the brief for *amici curiae* Natural
Resources Defense Council and Local Elected Officials in
support of petitioners.

Dan Kleiber and *Catherine Kleiber*, pro se, were on the brief for *amici curiae* Dan and Catherine Kleiber in support of petitioners.

James S. Turner was on the brief for *amicus curiae* Building Biology Institute in support of petitioners.

Stephen L. Goodman was on the brief for *amicus curiae* Joseph Sandri in support of petitioners.

Ashley S. Boizelle, Deputy General Counsel, Federal Communications Commission, argued the cause for respondents. With her on the brief were *Jonathan D. Brightbill*, Principal Deputy Assistant Attorney General at the time the brief was filed, U.S. Department of Justice, *Eric Grant*, Deputy Assistant Attorney General at the time the brief was filed, *Jeffrey Beelaert* and *Justin Heminger*, Attorneys, *Thomas M. Johnson, Jr.*, General Counsel at the time the brief was filed, Federal Communications Commission, *Jacob M. Lewis*, Associate General Counsel, and *William J. Scher* and *Rachel Proctor May*, Counsel. *Richard K. Welch*, Deputy Associate General Counsel, entered an appearance.

Before: HENDERSON, MILLETT and WILKINS, *Circuit Judges*.

Opinion for the Court filed by *Circuit Judge* WILKINS.

Opinion dissenting in part filed by *Circuit Judge* HENDERSON.

WILKINS, *Circuit Judge*: Environmental Health Trust and several other groups and individuals petition for review of an order of the Federal Communications Commission (“the Commission”) terminating a notice of inquiry regarding the

adequacy of the Commission's guidelines for exposure to radiofrequency radiation. The notice of inquiry requested comment on whether the Commission should initiate a rulemaking to modify its guidelines. The Commission concluded that no rulemaking was necessary. Petitioners argue that the Commission violated the requirements of the Administrative Procedure Act by failing to respond to significant comments. Petitioners also argue that the National Environmental Policy Act required the Commission to issue an environmental assessment or environmental impact statement regarding its decision to terminate its notice of inquiry.

We grant the petitions in part and remand to the Commission. The Commission failed to provide a reasoned explanation for its determination that its guidelines adequately protect against the harmful effects of exposure to radiofrequency radiation unrelated to cancer.

I.

The Federal Communications Commission regulates various facilities and devices that transmit radio waves and microwaves, including cell phones and facilities for radio, TV, and cell phone communications. 47 U.S.C. §§ 301, 302a(a); see *EMR Network v. FCC*, 391 F.3d 269, 271 (D.C. Cir. 2004). Radio waves and microwaves are forms of electromagnetic energy that are collectively described by the term "radiofrequency" ("RF"). Office of Eng'g & Tech., Fed. Commc'ns Comm'n, *OET Bulletin No. 56, Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields* 1 (4th ed. Aug. 1999). The phenomenon of radio waves and microwaves moving through space is described as "RF radiation." *Id.*

We often associate the term "radiation" with the term "radioactivity." "Radioactivity," however, refers only to the

emission of radiation with enough energy to strip electrons from atoms. *Id.* at 5. That kind of radiation is called “ionizing radiation.” *Id.* It can produce molecular changes and damage biological tissue and DNA. *Id.* Fortunately, RF radiation is “non-ionizing,” meaning that it is not sufficiently energetic to strip electrons from atoms. *Id.* It can, however, heat certain kinds of materials, like food in your microwave oven or, at sufficiently high levels, human body tissue. *Id.* at 6–7. Biological effects that result from the heating of body tissue by RF energy are referred to as “thermal” effects, and are known to be harmful. *Id.* Exposure to lower levels of RF radiation might also cause other, “non-thermal” biological effects. *Id.* at 8. Whether it does, and whether such effects are harmful, are subjects of debate. *Id.*

The National Environmental Policy Act (“NEPA”) and its implementing regulations require federal agencies to “establish procedures to account for the environmental effects of [their] proposed actions.” *Am. Bird Conservancy, Inc. v. FCC*, 516 F.3d 1027, 1032 (D.C. Cir. 2008) (per curiam). If an agency proposes a “major Federal action[]” that stands to “significantly affect[] the quality of the human environment,” the agency must prepare an environmental impact statement (“EIS”) that examines the adverse environmental effects of the proposed action and potential alternatives. 42 U.S.C. § 4332(C). Not every agency action, however, requires the preparation of a full EIS. *Theodore Roosevelt Conservation P’ship v. Salazar*, 616 F.3d 497, 503 (D.C. Cir. 2010). If it is unclear whether a proposed action will “significantly affect[] the quality of the human environment,” 42 U.S.C. § 4332(C), the responsible agency may prepare a more limited environmental assessment (“EA”). See 40 C.F.R. § 1501.5(a). An EA serves to “[b]riefly provide sufficient evidence and analysis for determining whether to prepare an [EIS] or a finding of no significant impact.” 40 C.F.R. § 1501.5(c)(1).

Additionally, an agency may use “categorical exclusions” to “define categories of actions that normally do not have a significant effect on the human environment and therefore do not require preparation of an environmental impact statement.” 40 C.F.R. § 1500.4(a); *see also* 40 C.F.R. § 1501.4(a).

To fulfill its obligations under NEPA, the Commission has promulgated guidelines for human exposure to RF radiation. *Cellular Phone Taskforce v. FCC*, 205 F.3d 82, 87 (2d Cir. 2000). The guidelines set limits for RF exposure. Before the Commission authorizes the construction or use of any wireless facility or device, the applicant for authorization must determine whether the facility or device is likely to expose people to RF radiation in excess of the limits set by the guidelines. 47 C.F.R. § 1.1307(b). If the answer is yes, the applicant must prepare an EA regarding the likely effects of the Commission’s authorization of the facility or device. *Id.* Depending on the contents of the EA, the Commission may require the preparation of an EIS, and may subject approval of the application to a full vote by the Commission. Office of Eng’g & Tech., Fed. Commc’ns Comm’n, *OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields* 6 (ed. 97-01, Aug. 1997). If the answer is no, the applicant is generally not required to prepare an EA. 47 C.F.R. § 1.1306(a).

The Commission last updated its limits for RF exposure in 1996. *Resolution of Notice of Inquiry, Second Report and Order, Notice of Proposed Rulemaking, and Memorandum Opinion and Order*, 34 FCC Rcd. 11,687, 11,689–90 (2019) (“2019 Order”); *see also* Telecommunications Act of 1996, Pub. L. No. 104-104, § 704(b), 110 Stat. 56, 152 (directing the Commission to “prescribe and make effective rules regarding the environmental effects of radio frequency emissions” within 180 days). The limits are based on standards for RF exposure

issued by the American National Standards Institute Committee (“ANSI”), the Institute of Electrical and Electronic Engineers, Inc. (“IEEE”), and the National Council on Radiation Protection and Measurements (“NCRP”). *In re Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, 11 FCC Rcd. 15,123, 15,134–35, 15,146–47 (1996). The limits are designed to protect against “thermal effects” of exposure to RF radiation, but not “non-thermal” effects. *EMR Network*, 391 F.3d at 271.

In March 2013, the Commission issued a notice of inquiry regarding the adequacy of its 1996 guidelines. *See Reassessment of Radiofrequency Exposure Limits & Policies, Notice of Inquiry*, 28 FCC Rcd. 3,498 (2013) (“2013 Notice of Inquiry”). The Commission divided its notice of inquiry into five sections. In the first section, it sought comment on the propriety of its exposure limits for RF radiation, particularly as they relate to device use by children. *Id.* at 3,575–80. In the second section, the Commission sought comment on how to better provide information to consumers and the public about exposure to RF radiation and methods for reducing exposure. *Id.* at 3,580–82. In the third section, the Commission sought comment on whether it should impose additional precautionary restrictions on devices and facilities that are unlikely to expose people to RF radiation in excess of the limits set by the Commission’s guidelines. *Id.* at 3,582–85. In the fourth and fifth sections, the Commission sought comment on whether it should change its methods for determining whether devices and facilities comply with the Commission’s guidelines. *Id.* at 3,585–89.

The Commission explained that it was issuing the notice of inquiry in response to changes in the ubiquity of wireless devices and in scientific standards and research since 1996. *Id.* at 3,570. Specifically, the Commission noted that the IEEE had

“published a major revision to its RF exposure standard in 2006.” *Id.* at 3,572. The Commission also noted that the International Commission on Non-Ionizing Radiation Protection had published RF exposure guidelines in 1998 that differed somewhat from the Commission’s 1996 guidelines, and was likely to release a revision of those guidelines “in the near future.” *Id.* at 3,573. And the Commission noted that the International Agency for Research on Cancer (“IARC”) had classified RF radiation as possibly carcinogenic to humans, and was likely to release a detailed monograph regarding that classification prior to the resolution of the notice of inquiry. *Id.* at 3,575 & n.385. The Commission invited public comment on all of these developments, but underscored that it would “work closely with and rely heavily—but not exclusively—on the guidance of other federal agencies with expertise in the health field.” *Id.* at 3,571.

In December 2019, the Commission issued a final order resolving its 2013 notice of inquiry by declining to undertake any of the changes contemplated in the notice of inquiry. *See 2019 Order*, 34 FCC Rcd. at 11,692–97.

In January 2020, Petitioners Environmental Health Trust, Consumers for Safe Cell Phones, Elizabeth Barris, and Theodora Scarato timely petitioned this Court for review of the Commission’s 2019 final order. In February 2020, Petitioners Children’s Health Defense, Michele Hertz, Petra Brokken, Dr. David O. Carpenter, Dr. Paul Dart, Dr. Toril H. Jelter, Dr. Ann Lee, Virginia Farver, Jennifer Baran, and Paul Stanley, M.Ed., timely petitioned the Ninth Circuit for review of the same order, and the Ninth Circuit transferred their petition to this Court pursuant to 28 U.S.C. § 2112. This Court consolidated the petitions. We have jurisdiction under 47 U.S.C. § 402(a) and 28 U.S.C. § 2342(1).

II.

Petitioners challenge the 2019 final order under NEPA and the Administrative Procedure Act (“APA”). We begin with the APA.

A.

Petitioners argue that the order is arbitrary and capricious and therefore must be set aside under 5 U.S.C. § 706(2)(A) for the following reasons: (1) the order fails to acknowledge evidence of negative health effects caused by exposure to RF radiation at levels below the limits set by the Commission’s 1996 guidelines, including evidence of cancer, radiation sickness, and adverse effects on sleep, memory, learning, perception, motor abilities, prenatal and reproductive health, and children’s health; (2) the order fails to respond to comments concerning environmental harm caused by RF radiation; (3) the order fails to discuss the implications of long-term exposure to RF radiation, exposure to RF pulsation or modulation (two methods of imbuing radio waves with information), and the implications of technological developments that have occurred since 1996, including the ubiquity of wireless devices and Wi-Fi, and the emergence of “5G” technology; (4) the order fails to adequately explain the Commission’s refusal to modify its procedures for determining whether cell phones comply with its RF limits; and (5) the order fails to respond to various “additional legal considerations,” Pet’rs’ Br. at 84.

Before discussing these arguments, and the Commission’s responses to them, we clarify our standard of review. The arbitrary and capricious standard of the Administrative Procedure Act “encompasses a range of levels of deference to the agency.” *Am. Horse Prot. Ass’n v. Lyng*, 812 F.2d 1, 4 (D.C. Cir. 1987). We completely agree with the dissenting

opinion that the Commission's order is entitled to a high degree of deference, both because it is akin to a refusal to initiate a rulemaking, *see id.* at 4–5, and because it concerns highly technical determinations of the kind courts are ill-equipped to second-guess, *see Am. Radio Relay League, Inc., v. FCC*, 524 F.3d 227, 233 (D.C. Cir. 2008). So as to the governing law, the dissenting opinion and we are on the same page. Nevertheless, the Commission's decision to terminate its notice of inquiry must be "reasoned" if it is to survive arbitrary and capricious review. *See Am. Horse*, 812 F.2d at 5; *Am. Radio*, 524 F.3d at 241. As with other agency decisions not to engage in rulemaking, we will overturn the Commission's decision if there is "compelling cause, such as plain error of law or a fundamental change in the factual premises previously considered by the agency[.]" *Flyers Rights Educ. Fund, Inc. v. Fed. Aviation Admin.*, 864 F.3d 738, 743 (D.C. Cir. 2017) (quoting *WildEarth Guardians v. EPA*, 751 F.3d 649, 653 (D.C. Cir. 2014)). When an agency in the Commission's position is confronted with evidence that its current regulations are inadequate or the factual premises underlying its prior judgment have eroded, it must offer more to justify its decision to retain its regulations than mere conclusory statements. *See Am. Horse*, 812 F.2d at 6; *Am. Radio*, 524 F.3d at 241. Rather, the agency must provide "assurance that [it] considered the relevant factors," and it must provide analysis that follows "a discernable path to which the court may defer." *Am. Radio*, 524 F.3d at 241.

i.

Under this highly deferential standard of review, we find the Commission's order arbitrary and capricious in its failure to respond to record evidence that exposure to RF radiation at levels below the Commission's current limits may cause negative health effects unrelated to cancer. (As we explain

below, we find that the Commission offered an adequate explanation for its determination that exposure to RF radiation at levels below the Commission's current limits does not cause cancer.) That failure undermines the Commission's conclusions regarding the adequacy of its testing procedures, particularly as they relate to children, and its conclusions regarding the implications of long-term exposure to RF radiation, exposure to RF pulsation or modulation, and the implications of technological developments that have occurred since 1996, all of which depend on the premise that exposure to RF radiation at levels below its current limits causes no negative health effects. Accordingly, we find those conclusions arbitrary and capricious as well. Finally, we find the Commission's order arbitrary and capricious in its complete failure to respond to comments concerning environmental harm caused by RF radiation.

Petitioners point to multiple studies and reports, which were published after 1996 and are in the administrative record, purporting to show that RF radiation at levels below the Commission's current limits causes negative health effects unrelated to cancer, such as reproductive problems and neurological problems that span from effects on memory to motor abilities. *See, e.g.*, J.A. 3,068 (BIOINITIATIVE WORKING GROUP, BIOINITIATIVE REPORT (Cindy Sage & David O. Carpenter eds., 2012) (describing evidence that human sperm and their DNA are damaged by low levels of RF radiation)); J.A. 5,243 (Igor Yakymenko et al., *Oxidative Mechanisms of Biological Activity of Low-Intensity Radiofrequency Radiation*, ELECTROMAGNETIC BIOLOGY & MED., EARLY ONLINE, 1–16 (2015)); J.A. 5,259–69 (Henrietta Nittby et al., *Increased Blood-Brain Barrier Permeability in Mammalian Brain 7 Days After Exposure to the Radiation from a GSM-900 Mobile Phone*, 16 PATHOPHYSIOLOGY 103 (2009)); J.A. 5,320–68 (Henry Lai, *A Summary of Recent Literature on*

Neurobiological Effects of Radiofrequency Radiation, in MOBILE COMMUNICATIONS AND PUBLIC HEALTH 187–222 (M. Markov ed., 2018)); J.A. 5,994–6,007 (Milena Foerster et al., *A Prospective Cohort Study of Adolescents’ Memory Performance and Individual Brain Dose of Microwave Radiation from Wireless Communication*, 126 ENV’T HEALTH PERSPS. 077007 (July 2018)). Petitioners also point to approximately 200 comments submitted by individuals who advised the Commission that either they or their family members suffer from radiation sickness, “a constellation of mainly neurological symptoms that manifest as a result of RF[] exposure.” Pet’rs’ Br. at 30–31, 30 n.99.

The Commission argues that its order adequately responded to this evidence by citing the Food and Drug Administration (“FDA”)’s determination that exposure to RF radiation at levels below the Commission’s current limits does not cause negative health effects. The order cites three statements from the FDA. First, the order cites an FDA webpage titled “Do cell phones pose a health hazard?” that, as of December 4, 2017, stated that “[t]he weight of scientific evidence has not linked cell phones with any health problems.” 2019 Order, 34 FCC Rcd. at 11,692–93, 11,693 n.31. Second, the order cites a February 2018 statement from the Director of the FDA’s Center for Devices and Radiological Health advising the public that

As part of our commitment to protecting the public health, the FDA has reviewed, and will continue to review, many sources of scientific and medical evidence related to the possibility of adverse health effects from radiofrequency energy exposure in both humans and animals and will continue to do so as new scientific data are published. Based on our ongoing evaluation

of the issue, the totality of the available scientific evidence continues to not support adverse health effects in humans caused by exposures at or under the current radiofrequency energy exposure limits.

Id. at 11,695 n.42. Third, the order cites an April 2019 letter from the Director of the FDA’s Center for Devices and Radiological Health that does not discuss non-cancer-related health effects but instead addresses a 2018 study by the National Toxicology Program that found that exposure to RF radiation emitted by cell phones may cause cancer in rodents. *2019 Order*, 34 FCC Rcd. at 11,692 & n.28. The letter explains that “[a]s a part of our ongoing monitoring activities, we have reviewed the results and conclusions of the recently published rodent study from the National Toxicology Program in the context of all available scientific information, including epidemiological studies, and concluded that no changes to the current standards are warranted at this time.” Letter from Jeffrey Shuren, M.D., J.D., Dir., Ctr. for Devices & Radiological Health, Food & Drug Admin., Dep’t of Health & Hum. Servs., to Julius Knapp, Chief, Off. Of Eng’g & Tech., FCC (April 24, 2019).

We do not agree that these statements provide a reasoned explanation for the Commission’s decision to terminate its notice of inquiry. Rather, we find them to be of the conclusory variety that we have previously rejected as insufficient to sustain an agency’s refusal to initiate a rulemaking. In *American Horse*, this Court considered whether the Secretary of Agriculture had offered a satisfactory explanation under the APA of his refusal to institute rulemaking proceedings regarding the practice of deliberately injuring show horses by fastening heavy chains or similar equipment—referred to as “action devices”—to the horses’ front limbs. 812 F.2d at 2. In

response to the argument that a certain study presented facts that merited a new rulemaking, the Secretary offered the following two-sentence explanation:

6. I have reviewed studies and other materials, relating to action devices, presented by humane groups, Walking Horse industry groups, and independent institutions, including the study referred to in the Complaint.

7. On the basis of this information, I believe that the most effective method of enforcing the Act is to continue the current regulations.

Id. at 5. This Court found these “two conclusory sentences . . . insufficient to assure a reviewing court that the agency’s refusal to act was the product of reasoned decisionmaking.” *Id.* at 6. *American Horse* explained that the study at issue “may or may not remove a ‘significant factual predicate’ of the original rules’ gaps[,]” and remanded to the Secretary to make that determination. *Id.* at 7.

Similarly, in *American Radio*, this Court considered whether the Commission had offered a satisfactory explanation for its decision to retain in its regulations a particular “extrapolation factor”—an estimate of the projected rate at which radio frequency strength decreases from a radiation-emitting source—despite studies submitted in a petition for reconsideration indicating that a different extrapolation factor would be more appropriate. 524 F.3d at 240–41. The Commission explained its decision by asserting that “[n]o new information has been submitted that would provide a convincing argument for modifying the extrapolation factor . . . at this time.” *Id.* (internal alterations omitted). We rejected that explanation as conclusory and unreasoned. *Id.*

The statements from the FDA on which the Commission's order relies are practically identical to the Secretary's statement in *American Horse* and the Commission's statement in *American Radio*. They explain that the FDA has reviewed certain information—here, “all,” “the weight,” or “the totality” of “scientific evidence.” And they state the FDA's conclusion that, in light of that information, exposure to RF radiation at levels below the Commission's current limits does not cause harmful health effects. But they offer “no articulation of the factual . . . bases” for the FDA's conclusion. *Am. Horse*, 812 F.2d at 6 (internal quotation marks omitted). In other words, they do not explain why the FDA determined, despite the studies and comments that Petitioners cite, that exposure to RF radiation at levels below the Commission's current limits does not cause harmful health effects. Such conclusory statements “cannot substitute for a reasoned explanation,” for they provide “neither assurance that the [FDA] considered the relevant factors nor [do they reveal] a discernable path to which the court may defer.” *Am. Radio*, 524 F.3d at 241. They instead represent a failure by the FDA to address the implication of Petitioners' studies: The factual premise—the non-existence of non-thermal biological effects—underlying the current RF guidelines may no longer be accurate.

When repeated by the Commission, the FDA's conclusory statements still do not substitute for the reasoned explanation that the APA requires. It is the Commission's responsibility to regulate radio communications, 47 U.S.C. § 301, and devices that emit RF radiation and interfere with radio communications, *id.* § 302a(a), and to do so in the public interest, including in regard to public health, *Banzhaf v. FCC*, 405 F.2d 1082, 1096 (D.C. Cir. 1968). Even the Commission itself recognizes this. See *2019 Order*, 34 FCC Rcd. at 11,689 (“The Commission has the responsibility to set standards for RF emissions”); *2013 Notice of Inquiry*, 28 FCC Rcd. at 3,571

(explaining that the Commission opened the notice of inquiry “to ensure [it] [was] meeting [its] regulatory responsibilities” and that it would “work closely with and rely heavily—*but not exclusively*—on the guidance of other federal agencies with expertise in the health field” in order to “fully discharge[] [its] regulatory responsibility”) (emphasis added). And the APA requires that Commission’s decisions concerning the regulation of radio communications and devices be reasoned. The Commission’s purported reasoning in this case is that it chose to rely on the FDA’s evaluation of the studies in the record. Absent explanation from the FDA as to how and why it reached its conclusions regarding those studies, however, we have no basis on which to review the reasonableness of the Commission’s decision to adopt the FDA’s conclusions. Ultimately, the Commission’s order remains bereft of any explanation as to *why*, in light of the studies in the record, its guidelines remain adequate. The Commission may turn to the FDA to provide such an explanation, but if the FDA fails to do so, as it did in this case, the Commission must turn elsewhere or provide its own explanation. Were the APA to require less, our very deferential review would become nothing more than a rubber stamp.

The Commission also argues that its order provided a reasoned explanation for its decision to terminate the notice of inquiry, despite Petitioners’ evidence, by observing that “no expert health agency expressed concern about the Commission’s RF exposure limits,” and that “no evidence has moved our sister health and safety agencies to issue substantive policy recommendations for strengthening RF exposure regulation.” *2019 Order*, 34 FCC Rcd. at 11,692. The silence of other expert agencies, however, does not constitute a reasoned explanation for the Commission’s decision to terminate its notice of inquiry for the same reason that the FDA’s conclusory statements do not constitute a reasoned

explanation: silence does not indicate why the expert agencies determined, in light of evidence suggesting to the contrary, that exposure to RF radiation at levels below the Commission's current limits does not cause negative health effects unrelated to cancer. Silence does not even indicate whether the expert agencies made any such determination, or whether they considered any of the evidence in the record.

Our decision in *EMR Network* is not to the contrary. There, we rejected the argument that the Commission improperly delegated its NEPA duties by relying on input from other government agencies and non-governmental expert organizations in deciding whether to initiate a rulemaking to modify its RF radiation guidelines. 391 F.3d at 273. We found the Commission “not to have abdicated its responsibilities, but rather to have properly credited outside experts,” and noted that “the FCC’s decision not to leap in, at a time when the EPA (and other agencies) saw no compelling case for action, appears to represent the sort of priority-setting in the use of agency resources that is least subject to second-guessing by courts.” *Id.* (citing *Am. Horse*, 812 F.2d at 4). We agree with the dissenting opinion that the Commission may credit outside experts in deciding whether to initiate a rulemaking to modify its RF radiation guidelines. To be sure, “[a]gencies can be expected to respect the views of such other agencies as to those problems for which those other agencies are more directly responsible and more competent.” *City of Boston Delegation v. FERC*, 897 F.3d 241, 255 (D.C. Cir. 2018) (internal alteration and quotation marks omitted). What the Commission may not do, however, is rely on an outside expert’s silence or conclusory statements in lieu of some reasoned explanation for its decision. And while it is certainly true that an agency’s decision not to initiate a rulemaking at a time when other agencies see no compelling case for action may represent “the sort of priority-setting in the use of agency

resources that is least subject to second-guessing by courts,” *EMR Network*, 391 F.3d at 273, the same is true of most agency decisions not to initiate a rulemaking, *see Am. Horse*, 812 F.2d at 4–5. Nevertheless, an agency’s decision not to initiate a rulemaking must have some reasoned basis, and an agency cannot simply ignore evidence suggesting that a major factual predicate of its position may no longer be accurate. *Id.* at 5.

Nor does *Cellular Phone Taskforce* help the Commission. There, the Second Circuit rejected the argument that the Commission was required to consult with the Environmental Protection Agency (“EPA”) or other outside agencies before declining to modify its RF radiation guidelines in the face of new evidence regarding non-thermal effects caused by RF radiation. 205 F.3d at 90–91. In so holding, the Second Circuit found that “[i]t was fully reasonable for the FCC to expect the agency with primacy in evaluating environmental impacts to monitor all relevant scientific input into the FCC’s reconsideration, particularly because the EPA had been assigned the lead role in RF radiation health effects since 1970,” and that the Commission was not required to “supply the new evidence to the other federal agencies with expertise in the area.” *Id.* at 91. But the Second Circuit did not hold that the Commission could rely solely on the silence or unexplained conclusions of other federal agencies to justify its own inaction. It merely held that the Commission was not required to consult with outside agencies before declining to modify its RF radiation guidelines. No party before us today questions the propriety of that holding.

Finally, the Commission argues that the Commission itself addressed the major studies in the record in its order terminating the notice of inquiry. Specifically, the Commission points to its statement that “[t]he vast majority of filings were unscientific.” 2019 Order, 34 FCC Rcd. at 11,694.

Elsewhere, however, the order acknowledges that “the record include[d] some research information” and “filings that sought to present scientific evidence.” *Id.* The order dismisses that research and evidence as “fail[ing] to make a persuasive case for revisiting our existing RF limits,” *id.*, but again, such a conclusory statement cannot substitute for the minimal reasoning required at this stage, *Am. Radio*, 524 F.3d at 241. And while “[a]n agency is not obliged to respond to every comment, only those that can be thought to challenge a fundamental premise,” *MCI WorldCom, Inc. v. FCC*, 209 F.3d 760, 765 (D.C. Cir. 2000), the studies in the record to which Petitioners point *do* challenge a fundamental premise of the Commission’s decision to terminate its notice of inquiry—namely, the premise that exposure to RF radiation at levels below the Commission’s current limits does not cause negative health effects. But the Commission said nothing at all in its order about any specific health effects unrelated to cancer.

The Commission also points to its statement that “the record [does not] include actionable alternatives or modifications to the current RF limits supported by scientifically rigorous data or analysis.” *2019 Order*, 34 FCC Rcd. at 11,692; *see also id.* at 11,694. Had the notice of inquiry focused exclusively on whether the Commission should modify its RF exposure limits, we might agree that the failure of any commenter to propose actionable modifications to the RF limits would have justified the Commission’s decision to terminate the notice of inquiry. But the notice of inquiry did not focus exclusively on whether the Commission should modify its RF exposure limits. Instead, it also sought comment on how to better provide information to consumers and the public about exposure to RF radiation and methods for reducing exposure, and whether the Commission should impose additional precautionary restrictions on devices and facilities that are unlikely to expose people to RF radiation in

excess of the Commission's limits. The Commission needed no actionable alternative to its current limits in order to provide additional information to the public or to impose precautionary restrictions in addition to its current limits. The failure of any commenter to propose actionable modifications to the Commission's RF exposure limits therefore does not justify the Commission's decision to terminate the notice of inquiry.

ii.

The Commission's failure to provide a reasoned explanation for its determination that exposure to RF radiation at levels below its current limits does not cause negative health effects unrelated to cancer renders the order arbitrary and capricious in three additional respects. First, it undermines the Commission's explanation for retaining its procedures for determining whether cell phones and other portable electronic devices comply with its RF limits. These procedures consist of testing the device against the head of a specialized mannequin, *2013 Notice of Inquiry*, 28 FCC Rcd. at 3,586 n.434, and no more than 2.5 centimeters away from the body of the mannequin, *id.* at 3,588 n.447. Petitioners claim that the testing is inaccurate because of the space between the device and the mannequin's body. On this point, the Commission's order cites the "large safety margin" incorporated in its existing RF exposure limits as a justification for its refusal to modify these procedures to include testing against the body. *2019 Order*, 34 FCC Rcd. at 11,696. Because the Commission's existing RF limits are overprotective, the order explains, the Commission need not worry about whether its testing procedures accurately detect devices that are likely to expose people to RF emissions in excess of the Commission's limits. *See id.* ("[E]ven if certified or otherwise authorized devices produce RF exposure levels in excess of Commission limits under normal use, such exposure would still be well below levels considered to be

dangerous, and therefore phones legally sold in the United States pose no health risks.”). As the Commission itself recognizes, this explanation depends on the premise that RF radiation does not cause harmful effects at levels below its current limits. *See id.* at 11,696 n.49 (“We note that any claim as to the adequacy of the FCC required testing, certification, and authorization regime is no different than a challenge to the adequacy of the federal RF exposure limits themselves. Both types of claims would undermine the FCC’s substantive policy determinations.”). The Commission’s failure to provide a reasoned explanation for its determination that exposure to RF radiation at levels below its current limits does not cause negative health effects therefore renders inadequate the Commission’s explanation for its refusal to modify its testing procedures.

Second, the Commission equally failed to provide a reasoned explanation for brushing off record evidence addressing non-cancer-related health effects arising from the impact of RF radiation on children. Many commenters, including the American Academy of Pediatrics, urged the Commission to adopt limits that account for the use of RF-emitting devices by vulnerable children and pregnant women. *See, e.g., J.A.* 4,533–34. In dismissing those concerns, the Commission again relied on a conclusory statement from the FDA that “[t]he scientific evidence does not show a danger to any users of cell phones from RF exposure, including children and teenagers.” *2019 Order*, 34 FCC Rcd. at 11,696. But, as we have already explained, such a conclusory and unexplained statement is not the “reasoned” explanation required by the APA. In addition, the Commission noted that the testing to determine compliance with its limits “represents a conservative case” for both adults and children. *Id.* at 11,696 n.50. Whether the testing of compliance with existing limits was conservative is not the point. The unanswered question remains whether low

levels of RF radiation allowed by those existing limits cause negative health effects. So once again, the Commission's failure to provide a reasoned or even relevant explanation of its position that RF radiation below the current limits does not cause health problems unrelated to cancer renders its explanation as to the effect of RF radiation on children arbitrary and capricious.

Third, the Commission's failure to provide a reasoned explanation for its determination that exposure to RF radiation at levels below its current limits does not cause negative health effects unrelated to cancer renders inadequate the Commission's explanation for its failure to discuss the implications of long-term exposure to RF radiation, exposure to RF pulsation or modulation, or the implications of technological developments that have occurred since 1996, including the ubiquity of wireless devices and Wi-Fi, and the emergence of "5G" technology. In its brief, the Commission responds that it was not required to address these topics in its order because it "rationally concluded that the weight of scientific evidence does not support the existence of adverse health effects from radiofrequency exposure below the FCC's limits, regardless of the service or equipment at issue." Resp't's Br. at 45–46. (The Commission points out that "5G" cell towers, unlike traditional cell towers, are subject to its RF exposure limits.) Again, this explanation depends on the premise that RF radiation does not cause harmful health effects at levels below the Commission's current limits, and will not suffice absent a reasoned explanation for the Commission's determination that that premise is correct.

iii.

In addition to the Commission's inadequate response to the non-cancer-related effects of RF radiation on human health,

the Commission also completely failed even to acknowledge, let alone respond to, comments concerning the impact of RF radiation on the environment. That utter lack of a response does not meet the Commission's obligation to provide a reasoned explanation for terminating the notice of inquiry. The record contains substantive evidence of potential environmental harms. Most relevantly, the record included a letter from the Department of the Interior voicing concern about the impact of RF radiation from communication towers on migratory birds, see J.A. 8,379, 8,383–86. In the Department of the Interior's expert view, the Commission's RF radiation limits "continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today." J.A. 8,383. "The [current environmental] problem," according to the Department of the Interior, "appears to focus on very low-level, non-thermal electromagnetic radiation." *Id.* Although the Commission has repeatedly claimed that it considered "inputs from [its] sister federal agencies[,]" 2019 *Order*, 34 FCC Rcd. at 11,689, the Commission entirely failed to address the environmental harm concerns raised by the Department of the Interior. To be sure, the Commission could conclude that the link between RF radiation and environmental harms is too weak to warrant an amendment to its RF radiation limits. All we hold now is that the Commission should have said something about its sister agency's view rather than ignore it altogether. That lack of any reasoned explanation as to environmental harms does not satisfy the requirements of the APA.

iv.

The dissenting opinion portrays this case as about the Commission's disregard of just five articles and one Department of Interior letter. Not so. The record contained substantial information and material from, for example, the

American Academy of Pediatrics, J.A. 4,533; the Council of Europe, J.A. 4,242–44, 4,247–57; the Cities of Boston and Philadelphia, J.A. 4,592–99; medical associations, *see, e.g.*, J.A. 4,536–40 (California Medical Association); thousands of physicians and scientists from around the world, *see, e.g.*, J.A. 4,197–4,206 (letter to United Nations); J.A. 4,208–17 (letter to European Union); J.A. 5,173–86 (Frieburger Appeal by over one thousand German physicians); and hundreds of people who were themselves or who had loved ones suffering from the alleged effects of RF radiation, *see, e.g.*, J.A. 8,774–9,940; *see also* J.A. 4,218–39 (collecting statements from physicians and health organizations expressing concern about health effects of RF radiation).

The dissenting opinion then offers its own explanation as to why those select sources were not worth being addressed by the agency. This in-the-weeds assessment of scientific studies and assessments falls “outside our bailiwick[.]” Dissenting Op. at 10. More to the point, the Commission said none of what the dissenting opinion does. If it had and if those six sources fairly represented the credible record evidence seeking a change in Commission policy, that discussion likely would have sufficed. But just as *post hoc* rationales offered by counsel cannot fill in the holes left by an agency in its decision, neither can a dissenting opinion. *See Grace v. Barr*, 965 F.3d 883, 903 (D.C. Cir. 2020) (“[W]hen ‘assessing the reasonableness of [an agency’s action], we look only to what the agency said at the time of the [action]—not to its lawyers’ post-hoc rationalizations.’”) (second and third alterations in original) (quoting *Good Fortune Shipping SA v. Commissioner*, 897 F.3d 256, 263 (D.C. Cir. 2018)).

Instead, the Commission chose to hitch its wagon to the FDA’s unexplained disinterest in some similar information. Importantly, the dissenting opinion does not dispute that the

FDA's conclusory dismissal of that evidence ran afoul of our precedent in *American Horse* and *American Radio*. It just says that the deficiency in the FDA's analysis cannot be imputed to a second agency, and so the dissenting opinion would hold dispositive "the fact that the Commission and the FDA are, to state the obvious, distinct agencies." Dissenting Op. at 5.

They certainly are. But that does not amount to a legal difference here. While imitation may be the highest form of flattery, it does not meet even the low threshold of reasoned analysis required by the APA under the deferential standard of review that governs here. One agency's unexplained adoption of an unreasoned analysis just compounds rather than vitiates the analytical void. Said another way, two wrongs do not make a right. Compare *City of Tacoma v. FERC*, 460 F.3d 53, 76 (D.C. Cir. 2006) ("[T]he action agency must not blindly adopt the conclusions of the consultant agency, citing that agency's expertise. Rather, the ultimate responsibility for compliance with the [Endangered Species Act] falls on the action agency."), and *Ergon-West Virginia, Inc. v. EPA*, 896 F.3d 600, 612 (4th Cir. 2018) ("Although the EPA is statutorily required to consider the [Department of Energy]'s recommendation, it may not turn a blind eye to errors and omissions apparent on the face of the report, which [petitioner] pointed out and the EPA did not address in any meaningful way. In doing so, the EPA 'ignore[d] important aspects of the problem.'") (internal citations omitted), with *Bellion Spirits, LLC v. United States*, No. 19-5252, slip op. at 13–14 (D.C. Cir. Aug. 6, 2021) (approving consultation by the Alcohol and Tobacco Tax and Trade Bureau ("TTB") with the FDA where the TTB "did not rubberstamp FDA's analysis of the scientific evidence or delegate final decisionmaking authority to FDA," but instead "systematically evaluated and explained its reasons for agreeing with FDA's analysis of each scientific study" and "then made its own determinations" about the claims at hand).

B.

Petitioners' remaining challenges under the APA are unavailing.

Petitioners first argue that the Commission failed to respond to record evidence that exposure to RF radiation at levels below the Commission's current limits may cause cancer. Specifically, Petitioners argue the Commission failed to mention the IARC's classification of RF radiation as possibly carcinogenic to humans, and its 2013 monograph regarding that classification, on which the Commission's notice of inquiry specifically sought comment. Petitioners also argue that the Commission failed to adequately respond to two 2018 studies—the National Toxicology Program (“NTP”) study and the Ramazzini Institute study—that found increases in the incidences of certain types of cancer in rodents exposed to RF radiation. Had these 2018 studies been available prior to the IARC's publication of its monograph, Petitioners assert, the IARC would have likely classified RF radiation as “probably carcinogenic,” rather than “possibly carcinogenic.” This is so, according to Petitioners, because the IARC will classify an agent as “possibly carcinogenic” if there is “limited evidence” that it causes cancer in humans and animals, and as “probably carcinogenic” if there is “limited evidence” that it causes cancer in humans and “sufficient evidence” that it causes cancer in animals. In its 2013 monograph, the IARC found “limited evidence” that RF radiation causes cancer in humans and animals, and therefore classified RF radiation as “possibly carcinogenic.” Int'l Agency for Rsch. on Cancer, *Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields*, 102 IARC MONOGRAPHS ON THE EVALUATION OF CARCINOGENIC RISKS TO HUMANS 419 (2013) (emphases omitted). Petitioners assert that the NTP and Ramazzini Institute studies provide “sufficient evidence” that RF radiation

causes cancer in animals. Therefore, according to Petitioners, had those studies been available prior to the IARC's publication of its monograph, the IARC would have found "limited evidence" that RF radiation causes cancer in humans and "sufficient evidence" that it causes cancer in animals, and would have accordingly classified RF radiation as "probably carcinogenic."

Although the Commission's failure to make any mention of the IARC monograph does not epitomize reasoned decision making, we find that the Commission's order adequately responds to the record evidence that exposure to RF radiation at levels below the Commission's current limits may cause cancer. In contrast to its silence regarding non-cancerous effects, the order provides a reasoned response to the NTP and Ramazzini Institute studies. It explains that the results of the NTP study "cannot be extrapolated to humans because (1) the rats and mice received RF radiation across their whole bodies; (2) the exposure levels were higher than what people receive under the current rules; (3) the duration of exposure was longer than what people receive; and (4) the studies were based on 2G and 3G phones and did not study WiFi or 5G." 2019 Order, 34 FCC Rcd. at 11,693 n.33. And the order cites a response to both studies published by the International Commission on Non-Ionizing Radiation Protection that provides a detailed explanation of various inconsistencies and limitations in the studies and concludes that "consideration of their findings does not provide evidence that radiofrequency EMF is carcinogenic." INT'L COMM'N ON NON-IONIZING RADIATION PROT., ICNIRP NOTE ON RECENT ANIMAL CARCINOGENESIS STUDIES 6 (2018), <https://www.icnirp.org/cms/upload/publications/ICNIRPnote2018.pdf>; see also 2019 Order, 34 FCC Rcd. at 11,693 n.34. Petitioners' contention that the IARC would have classified RF radiation as "probably carcinogenic" had the NTP and Ramazzini Institute studies

been published earlier is speculative, particularly in light of the International Commission on Non-Ionizing Radiation Protection's evaluation of those studies. And the IARC monograph's classification of RF radiation as "possibly carcinogenic" is not so contrary to the Commission's determination that exposure to RF radiation at levels below its current limits does not cause cancer as to render that determination arbitrary or capricious.

Petitioners also argue that the Commission's order impermissibly fails to respond to various "additional legal considerations." Specifically, Petitioners argue that the order (i) ignores "express invocations of constitutional, statutory and common law based individual rights," including property rights and the rights of "bodily autonomy and informed consent"; (ii) fails to explain whether FCC regulation preempts rights and remedies under the Americans with Disabilities Act and the Fair Housing Act; (iii) does not assess the costs and benefits associated with maintaining the Commission's current limits; (iv) does not resolve the question of whether "those advocating more protective limits have to prove the existing limits are inadequate," or whether the Commission carries the burden of proving that its existing limits are adequate; and (v) overlooks that the Supreme Court's decision in *Jacobson v. Massachusetts*, 197 U.S. 11 (1905), "flatly requires that the Commission allow for some remedy for those who suffer from exposure." Pet'rs' Br. at 84–101.

These arguments are not properly before us. The Communications Act provides that a petition for reconsideration is a "condition precedent to judicial review" of "questions of fact or law upon which the Commission . . . has been afforded no opportunity to pass." 47 U.S.C. § 405(a). We will accordingly only consider a question raised before us if "a reasonable Commission *necessarily* would have seen the

question . . . as part of the case presented to it.” *NTCH, Inc. v. FCC*, 841 F.3d 497, 508 (D.C. Cir. 2016) (quoting *Time Warner Ent. Co. v. FCC*, 144 F.3d 75, 81 (D.C. Cir. 1998)). Petitioners did not submit a petition for reconsideration to the Commission, and they point to no comments raising their “additional legal considerations” in such a manner as to necessarily indicate to the Commission that they were part of the case presented to it.

Although Petitioners assert that the “Cities of Boston and Philadelphia specifically flagged [the issue of whether FCC regulation preempts rights and remedies under the Americans with Disabilities Act and the Fair Housing Act] and sought clarification,” Pet’rs’ Br. at 86, they are incorrect. The Cities of Boston and Philadelphia merely observed that the Second Circuit’s decision in *Cellular Phone Taskforce* did not address whether “‘electrosensitivity’ [is] a cognizable disability under the Americans with Disabilities Act,” J.A. 4,598. And the Cities noted that “the FCC and its sister regulatory agencies share responsibility for adherence to the ADA,” J.A. 4,598–99, and urged the Commission to “lead in advice to electrosensitive persons about prudent avoidance,” J.A. 4,599. This did not put the Commission on notice that the question whether FCC regulation preempts rights and remedies under the Americans with Disabilities Act and the Fair Housing Act was part of the case presented to it. Nor did a comment asserting that “[t]he telecommunications Act should not be interpreted to injure an identifiable segment of the population, exile them from their homes and their city, leave them no place where they can survive, and allow them no remedy under City, State or Federal laws or constitutions.” J.A. 10,190. And Petitioners point to no comments that did a better job of flagging their other “additional legal considerations” for the Commission. The Commission therefore did not have an opportunity to pass on

these arguments, so we may not review them. 47 U.S.C. § 405(a).

C.

Petitioners also argue that NEPA required the Commission to issue an EA or EIS regarding its decision to terminate its notice of inquiry.

Petitioners are wrong. The Commission was not required to issue an EA or EIS because there was no ongoing federal action regarding its RF limits. The Commission already published an assessment of its existing RF limits that “‘functionally’ satisfied NEPA’s requirements ‘in form and substance.’” *EMR Network*, 391 F.3d at 272 (quoting *Cellular Phone Taskforce*, 205 F.3d at 94–95). NEPA obligations attach only to “proposals” for major federal action. *See* 42 U.S.C. § 4332(c); *see also* 40 C.F.R. § 1502.5. Once an agency has satisfied NEPA’s requirements, it is only required to issue a supplemental assessment when “there remains major federal action to occur.” *W. Org. of Res. Councils v. Zinke*, 892 F.3d 1234, 1242 (D.C. Cir. 2018) (internal quotation marks omitted) (quoting *Marsh v. Ore. Nat’l Res. Council*, 490 U.S. 360, 374 (1989)). An agency’s promulgation of regulations constitutes a final agency action that is not ongoing. *Id.* at 1243. Once an agency promulgates a regulation and complies with NEPA’s requirements regarding that regulation, it is not required to conduct any supplemental environmental assessment, *even if* its original assessment is outdated. *Id.* at 1242. Such is the case here. As we explained in *EMR Network* in response to the argument that new data required the Commission to issue a supplemental environmental assessment of its RF guidelines under NEPA, “the regulations having been adopted, there is at the moment no ongoing federal action, and no duty to

supplement the agency's prior environmental inquiries." 391 F.3d at 272 (internal quotation marks and citation omitted).

That the Commission voluntarily initiated an inquiry to "determine whether there is a need for reassessment of the Commission radiofrequency (RF) exposure limits and policies" does not change the analysis. *2013 Notice of Inquiry*, 28 FCC Rcd. at 3,501. As the Supreme Court explained long ago, "the mere contemplation of certain action is not sufficient to require an impact statement" under NEPA, *Kleppe v. Sierra Club*, 427 U.S. 390, 404 (1976) (internal quotation marks omitted), because, as in this case, "the contemplation of a project and the accompanying study thereof do not necessarily result in a proposal for major federal action," *id.* at 406. *See also Pub. Citizen v. Off. of U.S. Trade Representatives*, 970 F.2d 916, 920 (D.C. Cir. 1992) ("In accord with *Kleppe*, courts routinely dismiss NEPA claims in cases where agencies are merely contemplating a particular course of action but have not actually taken any final action at the time of suit.") (collecting cases). Were the Commission to propose revising its RF exposure guidelines, it might be required to prepare NEPA documentation. But since the Commission for now has not proposed to alter its guidelines, it need not yet conduct any new environmental review.

III.

For the reasons given above, we grant the petitions in part and remand to the Commission to provide a reasoned explanation for its determination that its guidelines adequately protect against harmful effects of exposure to radiofrequency radiation unrelated to cancer. It must, in particular, (i) provide a reasoned explanation for its decision to retain its testing procedures for determining whether cell phones and other portable electronic devices comply with its guidelines, (ii)

address the impacts of RF radiation on children, the health implications of long-term exposure to RF radiation, the ubiquity of wireless devices, and other technological developments that have occurred since the Commission last updated its guidelines, and (iii) address the impacts of RF radiation on the environment. To be clear, we take no position in the scientific debate regarding the health and environmental effects of RF radiation—we merely conclude that the Commission’s cursory analysis of material record evidence was insufficient as a matter of law. As the dissenting opinion indicates, there may be good reasons why the various studies in the record, only some of which we have cited here, do not warrant changes to the Commission’s guidelines. But we cannot supply reasoning in the agency’s stead, *see SEC v. Chenery Corp.*, 318 U.S. 80, 87–88 (1943), and here the Commission has failed to provide any reasoning to which we may defer.

So ordered.

KAREN LECRAFT HENDERSON, *Circuit Judge*, dissenting in part: “[A] court is not to substitute its judgment for that of the agency.” *Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). We thus must “uphold a decision of less than ideal clarity if the agency’s path may reasonably be discerned.” *Id.* (quoting *Bowman Transp., Inc. v. Arkansas-Best Freight Sys., Inc.*, 419 U.S. 281, 286 (1974)). I believe my colleagues’ limited remand contravenes these first principles of administrative law. Because I would deny the petitions in full, I respectfully dissent from Part II.A.i.–iv. and Part III of the majority opinion.

I.

It is important to emphasize how deferential our standard of review is here—where, first, an agency’s decision to terminate a notice of inquiry without initiating a rulemaking occurred after the agency opened the inquiry on its own and, second, the inquiry involves a highly technical subject matter at the frontier of science. As the majority recognizes, “[t]he arbitrary and capricious standard of the Administrative Procedure Act ‘encompasses a range of levels of deference to the agency.’” Maj. Op. 8 (quoting *Am. Horse Prot. Ass’n v. Lyng*, 812 F.2d 1, 4 (D.C. Cir. 1987)). The majority further acknowledges that the Federal Communications Commission’s (Commission or FCC) “order is entitled to a high degree of deference.” *Id.* at 9. And our precedent also makes plain that “[i]t is only in the rarest and most compelling of circumstances that this court has acted to overturn an agency judgment not to institute rulemaking.” *WWHT, Inc. v. FCC*, 656 F.2d 807, 818 (D.C. Cir. 1981); see also *Cellnet Commc’n, Inc. v. FCC*, 965 F.2d 1106, 1111 (D.C. Cir. 1992) (“an agency’s refusal to initiate a rulemaking is evaluated with a deference so broad as to make the process akin to non-reviewability”). For the reasons that follow, I believe the Commission’s order does not fit those rarest and most compelling circumstances.

2

A.

We have held that research articles containing tentative conclusions do not provide a basis for disturbing an agency's decision not to initiate rulemaking. *See EMR Network v. FCC*, 391 F.3d 269, 274 (D.C. Cir. 2004). Nevertheless, the majority rejects reaching the same conclusion here regarding the petitioners' assertion that radiofrequency (RF) radiation exposure below the Commission's limits can cause negative health effects unrelated to cancer. To do so, it relies on five research articles in an over 10,500-page record. *See* Maj. Op. at 10–11.¹

A close inspection of the five research articles confirms that they also “are nothing if not tentative.” *EMR Network*, 391 F.3d at 274. The Foerster article concludes “[o]ur findings *do not provide conclusive evidence* of causal effects and should be *interpreted with caution* until confirmed in other populations.” Joint Appendix (J.A.) 6,006 (Milena Foerster et al., *A Prospective Cohort Study of Adolescents' Memory Performance and Individual Brain Dose of Microwave Radiation from Wireless Communication*, 126 ENV'T HEALTH PERSPS. 077007 (July 2018)) (emphases added).² The Lai

¹ “The record in an informal rulemaking proceeding is ‘a less than fertile ground for judicial review’ and has been described as a ‘sump in which the parties have deposited a sundry mass of materials.’” *Pro. Drivers Council v. Bureau of Motor Carrier Safety*, 706 F.2d 1216, 1220–21 (D.C. Cir. 1983) (quoting *Nat'l Res. Def. Council, Inc. v. SEC*, 606 F.2d 1031, 1052 (D.C. Cir. 1979)).

² *See also* J.A. 5,995 (“[T]he health effects of [exposure to radiofrequency electromagnetic fields (RF-EMFs)] are still unknown. . . . [T]o date studies addressing this topic have produced inconsistent results.”); J.A. 6,005 (“Although we found decreases in figural memory, some experimental and epidemiological studies on

article provides a similarly murky picture of the current science. See J.A. 5,320–68 (Henry Lai, *A Summary of Recent Literature (2007–2017) on Neurological Effects of Radiofrequency Radiation*, in MOBILE COMMC'NS & PUB. HEALTH 187–222 (M. Markov ed., 2018)). In summarizing the results of human studies on the behavioral effects of RF radiation, the Lai article lists 31 studies that showed *no significant* behavioral effects compared to 20 studies that showed behavioral effects. See J.A. 5,327–32. Moreover, of the 20 studies that showed a behavioral effect, at least four found behavioral *improvements*, not negative health effects.

Even the Yakymenko article, which asserts that 93 of 100 peer-reviewed studies found low-intensity RF radiation induces oxidative effects in biological systems, fails to address the critical issue—whether RF radiation below the Commission's current limits can cause negative health effects. See J.A. 5,243–58 (Igor Yakymenko et al., *Oxidative Mechanisms of Biological Activity of Low-Intensity Radiofrequency Radiation*, ELECTROMAGNETIC BIOLOGY & MED., EARLY ONLINE, 1–16 (2015)). Specifically, the Yakymenko article discusses the International Commission on Non-Ionizing Radiation Protection's (ICNIRP) recommended RF exposure limit—a specific absorption rate of 2 W/kg. See J.A. 5,243–44. But the ICNIRP's recommended RF exposure limit is significantly higher than the Commission's current limit—0.08 W/kg averaged over the whole body and a peak spatial-average of 1.6 W/kg over any 1 gram of tissue. See 47 C.F.R. § 1.1310(c). Accordingly, it is uncertain how many, if

RF-EMF found *improvements* in working memory performance.”) (emphasis added).

any, of the referenced peer-reviewed studies were conducted at RF radiation levels below the Commission's current limits.³

Given this record, I believe we should have arrived at the same conclusion we did in *EMR Network*—"nothing in th[e]se studies so strongly evidenc[es] risk as to call into question the Commission's decision to maintain a stance of what appears to be watchful waiting." *EMR Network*, 391 F.3d at 274. "An agency is not obliged to respond to every comment, only those that can be thought to challenge a fundamental premise." *MCI WorldCom, Inc. v. FCC*, 209 F.3d 760, 765 (D.C. Cir. 2000). A review of the five articles on which the majority opinion relies makes plain that the articles do not challenge a fundamental premise of the Commission's order. Instead, it "cherry-pick[s] the factual record to reach [its] conclusion." *Ortiz-Diaz v. U.S. Dep't of Hous. & Urb. Dev.*, 867 F.3d 70, 79 (D.C. Cir. 2017) (Henderson, J., concurring in the judgment).

My colleagues assert that "[t]he dissenting opinion portrays this case as about the Commission's disregard of just five articles." Maj. Op. 22. But their attempt to "turn the tables" plainly fails. It is they who chose the five articles, *see* Maj. Op. 10–11, to rely on as the basis for their remand, *see id.* at 15 ("the Commission's order remains bereft of any explanation as to why, *in light of the studies in the record*, its guidelines remain adequate") (emphasis altered); *id.* at 18 ("*the studies in the record* to which Petitioners point *do* challenge a fundamental premise of the Commission's decision to terminate its notice of inquiry") (first emphasis added). I discuss the five articles *only* to demonstrate that the studies "are nothing if not tentative." *EMR Network*, 391 F.3d at 274. Because the studies on which the majority relies plainly are

³ The BioInitiative Report the majority opinion cites is hardly worth discussing because the self-published report has been widely discredited as a biased review of the science.

tentative, they do not challenge a fundamental premise of the Commission's decision and therefore cannot provide the basis for the majority's limited remand under our precedent.⁴

B.

I reach the same conclusion regarding the majority's remand of the petitioners' environmental harm argument. *See* Maj. Op. 21–22. The majority relies on a 2014 letter from the U.S. Department of the Interior (Interior) to the U.S. Department of Commerce about, *inter alia*, the impact of communications towers on migratory birds. But the Interior letter itself concedes that “[t]o date, no independent, third-party field studies have been conducted in North America on impacts of tower electromagnetic radiation on migratory birds.” J.A. 8,383.

Moreover, the petitioners did not raise the Interior letter in the environmental harm section of their briefs. “We apply forfeiture to unarticulated [legal and] evidentiary theories not only because judges are not like pigs, hunting for truffles buried in briefs or the record, but also because such a rule ensures fairness to both parties.” *Jones v. Kirchner*, 835 F.3d 74, 83 (D.C. Cir. 2016) (alteration in original) (citation omitted). And finally, the environmental harm studies on which

⁴ The majority's hand wave to other record information, *see* Maj. Op. 22–23, does not carry the day. Rather than provide “substantial information,” *id.* at 22, the cited material consists primarily of letters expressing generalized concerns about RF limits worldwide.

the petitioners *did* rely “are nothing if not tentative.” *EMR Network*, 391 F.3d at 274.⁵

C.

More importantly, the majority’s limited remand runs afoul of our precedent on this precise subject matter. In *EMR Network*, the petitioner asked “the Commission to initiate an inquiry on the need to revise [its] regulations to address the non-thermal effects” of RF radiation. 391 F.3d at 271. In denying the petition, we concluded “the [Commission]’s decision not to leap in, at a time when the [Environmental Protection Agency (EPA)] (and other agencies) saw no compelling case for action, appears to represent the sort of priority-setting in the use of agency resources that is least subject to second-guessing by courts.” *Id.* at 273.

This time around, the majority faults the Commission for the U.S. Food and Drug Administration’s (FDA) allegedly “conclusory statements” in response to the Commission’s 2013 notice of inquiry. *See* Maj. Op. 14. The crux of the majority’s position is that “[t]he statements from the FDA on which the Commission’s order relies are practically identical to the Secretary’s statement in *American Horse* and the

⁵ *See, e.g.*, J.A. 5,231 (Albert Manville, II, *A Briefing Memorandum: What We Know, Can Infer, and Don’t Yet Know about Impacts from Thermal and Non-Thermal Non-Ionizing Radiation to Birds and Other Wildlife* 2 (2016)) (“the direct relationship between electromagnetic radiation and wildlife health continues to be complicated and in cases involving non-thermal effects, still unclear”); J.A. 6,174 (Ministry of Env’t & Forest, Gov’t of India, *Report on Possible Impacts of Communication Towers on Wildlife Including Birds and Bees* 4 (2011)) (“exact correlation between radiation of communication towers and wildlife, are not yet very well established”).

Commission's statement in *American Radio*." *Id.*⁶ But the analogy to *American Horse* and *American Radio* does not hold water. The majority's Achilles' heel is the fact that the Commission and the FDA are, to state the obvious, distinct agencies.

In *American Horse*, the appellant relied on the results of a study commissioned by the U.S. Department of Agriculture (Agriculture) to support its request for revised Agriculture regulations. *Am. Horse*, 812 F.2d at 2–3. The study found that devices Agriculture had declined to prohibit caused effects falling within the statutory definition of the condition known as "sore";⁷ and the Congress had charged Agriculture to eliminate the practice of soring show horses. *Am. Horse*, 812 F.2d at 2–3. Against this backdrop, we found the Agriculture Secretary's "two conclusory sentences [dismissing the need to revise agency regulations] . . . insufficient to assure a reviewing court that the agency's refusal to act was the product of reasoned decisionmaking." *Id.* at 6. But an agency head's terse dismissal of his own agency's study is not the case here. First, as noted *supra*, there is no conclusive study in the record, much less one commissioned by the agency whose regulations are being considered for revision. Instead, the record contains dozens of highly technical studies from various sources—the credibility and findings of which we are ill-equipped to evaluate. And crucially, unlike in *American Horse*, the Commission requested the opinion of the FDA—the agency charged with "establish[ing] and carry[ing] out an electronic

⁶ See *Am. Radio Relay League, Inc. v. FCC*, 524 F.3d 227 (D.C. Cir. 2008).

⁷ See 15 U.S.C. § 1821(3) ("The term 'sore' when used to describe a horse means that [as a result of any substance or device used on a horse's limb] such horse suffers, or can reasonably be expected to suffer, physical pain or distress, inflammation, or lameness when walking, trotting, or otherwise moving . . .").

product radiation control program,” 21 U.S.C. § 360ii(a)—studied that opinion and explained why it relied thereon in making its decision.

Similarly, in *American Radio*, the studies summarily dismissed by the FCC were studies the FCC sought to evaluate *itself*; we remanded for the FCC to explain why it failed to do so. *See Am. Radio*, 524 F.3d at 241. Moreover, *American Radio* addressed the reasoning underlying the FCC’s *promulgation* of a rule, an action subjected to far less deference than an agency’s decision not to initiate a rulemaking.⁸

I believe the Commission reasonably relied on the conclusions of the FDA, the agency statutorily charged with protecting the public from RF radiation. *See* 21 U.S.C. § 360ii(a) (FDA “shall establish and carry out an electronic product radiation control program designed to protect the public health and safety from electronic product radiation”).⁹ Our precedent is well-settled that “[a]gencies can be expected to ‘respect [the] views of such other agencies as to those

⁸ *See, e.g., ITT World Commc’ns, Inc. v. FCC*, 699 F.2d 1219, 1245–46 (D.C. Cir. 1983), *rev’d on other grounds*, 466 U.S. 463 (1984) (“Where an agency promulgates rules, our standard of review is diffident and deferential, but nevertheless requires a searching and careful examination of the administrative record to ensure that the agency has fairly considered the issues and arrived at a rational result. Where, as here, an agency chooses *not* to engage in rulemaking, our level of scrutiny is even more deferential . . .” (emphasis in original) (footnotes and internal quotations omitted)).

⁹ *See also In re Guidelines for Evaluating the Env’t Effects of Radiofrequency Radiation*, 11 FCC Rcd. 15,123, 15,130 ¶ 18 (1996) (“The FDA has general jurisdiction for protecting the public from potentially harmful radiation from consumer and industrial devices and in that capacity is expert in RF exposures that would result from consumer or industrial use of hand-held devices such as cellular telephones.”).

problems’ for which those ‘other agencies are more directly responsible and more competent.’” *City of Bos. Delegation v. FERC*, 897 F.3d 241, 255 (D.C. Cir. 2018) (second alteration in original) (quoting *City of Pittsburgh v. Fed. Power Comm’n*, 237 F.2d 741, 754 (D.C. Cir. 1956)). That is precisely what the Commission did here.

The Commission’s 2013 *Notice of Inquiry* explained that the Commission intended to rely on, *inter alia*, the FDA to determine whether to reassess its own RF exposure limits. See *In re Reassessment of Fed. Commc’ns Comm’n Radiofrequency Exposure Limits & Policies*, 28 FCC Rcd. 3,498, 3,501 ¶ 6 (2013) (2013 *Notice of Inquiry*) (“Since the Commission is not a health and safety agency, we defer to other organizations and agencies with respect to interpreting the biological research necessary to determine what [RF radiation] levels are safe.”). And the Commission has consistently deferred to expert health and safety agencies in this context. See *id.* at 3,572 ¶ 211 (RF exposure limits adopted in 1996 “followed recommendations received from the [EPA], the [FDA], and other federal health and safety agencies”).¹⁰

The Commission was true to its word. On March 22, 2019, it asked the FDA if changes to the RF exposure limits were

¹⁰ See also *In re Guidelines for Evaluating the Env’t Effects of Radiofrequency Radiation*, 12 FCC Rcd. 13,494, 13,505 ¶ 31 (1997) (“It would be impracticable for us to independently evaluate the significance of studies purporting to show biological effects, determine if such effects constitute a safety hazard, and then adopt stricter standards that [sic] those advocated by federal health and safety agencies. This is especially true for such controversial issues as non-thermal effects and whether certain individuals might be ‘hypersensitive’ or ‘electrosensitive.’”).

warranted by the current scientific research.¹¹ On April 24, 2019, the FDA responded:

FDA is responsible for the collection and analysis of scientific information that may relate to the safety of cellphones and other electronic products. . . . As we have stated publicly, . . . the available scientific evidence to date does not support adverse health effects in humans due to exposures at or under the current limits, and . . . the FDA is committed to protecting public health and continues its review of the many sources of scientific literature on this topic.

J.A. 8,187 (Letter from Jeffrey Shuren, M.D., J.D., Dir., Ctr. for Devices and Radiological Health, U.S. Food & Drug Admin., Dep't of Health & Hum. Servs., to Julius Knapp, Chief, Off. of Eng'g & Tech., U.S. Fed. Commc'ns Comm'n (April 24, 2019)).¹² In my view, the Commission, relying on

¹¹ See J.A. 8,184 (Letter from Julius Knapp, Chief, Off. of Eng'g & Tech., U.S. Fed. Commc'ns Comm'n, to Jeffrey Shuren, M.D., J.D., Dir., Ctr. for Devices and Radiological Health, U.S. Food & Drug Admin. (March 22, 2019)) ("Given that existing studies are continually being evaluated as new research is published, and that the work of key organizations such as [the Institute of Electrical and Electronics Engineers] and ICNIRP is continuing, we ask FDA's guidance as to whether any changes to the standards are appropriate at this time.").

¹² See also *Statement from Jeffrey Shuren, M.D., J.D., director of the FDA's Center for Devices and Radiological Health on the recent National Toxicology Program draft report on radiofrequency energy exposure*, FOOD & DRUG ADMIN. (Feb. 2, 2018), <https://www.fda.gov/news-events/press-announcements/statement-jeffrey-shuren-md-jd-director-fdas-center-devices-and-radiological-health-recent-national> (Since 1999, "there have been hundreds of

the FDA, reasonably concluded no changes to the current RF exposure limits were warranted at the time. *See In re Reassessment of Fed. Comm'n's Comm'n Radiofrequency Exposure Limits & Policies*, 34 FCC Rcd. 11,687, 11,691 ¶ 10 (2019) (2019 Order).

Simply put, the Commission's reliance on the FDA is reasonable "[i]n the face of conflicting evidence at the frontiers of science." *See Cellular Phone Taskforce v. FCC*, 205 F.3d 82, 90 (2d Cir. 2000). The majority takes issue with what it categorizes as "conclusory statements." Maj. Op. 14. But the Supreme Court's *State Farm* [decision] does not require a word count; a short explanation can be a reasoned explanation." *Am. Radio*, 524 F.3d at 247 (Kavanaugh, J., dissenting in part). Brevity is even more understandable if the agency whose rationale is challenged relies on the agency the Congress has charged with regulating the matter.

Granted, "[w]hen an agency in the Commission's position is confronted with evidence that its current regulations are inadequate or the factual premises underlying its prior judgment have eroded, it must offer more to justify its decision to retain its regulations than mere conclusory statements." Maj.

studies from which to draw a wealth of information about these technologies which have come to play an important role in our everyday lives. Taken together, all of this research provides a more complete picture regarding radiofrequency energy exposure that has informed the FDA's assessment of this important public health issue, and given us the confidence that the current safety limits for cell phone radiation remain acceptable for protecting the public health. . . . I want to underscore that based on our ongoing evaluation of this issue and taking into account all available scientific evidence we have received, we have not found sufficient evidence that there are adverse health effects in humans caused by exposures at or under the current radiofrequency energy exposure limits.").

Op. 9. But the majority opinion rests on an inaccurate premise—the Commission was not confronted with evidence that its regulations are inadequate nor have the factual premises underlying its RF exposure limits eroded. Sifting through the record’s technical complexity is outside our bailiwick. If the record here establishes one point, however, it is that there is no scientific consensus regarding the “non-thermal” effects, if any, of RF radiation on humans. More importantly, the FDA, not the Commission, made the allegedly “conclusory statements” with which the majority takes issue and I believe the Commission adequately explained why it relied on the FDA’s expertise.¹³

¹³ The majority asserts that “[o]ne agency’s unexplained adoption of an unreasoned analysis just compounds rather than vitiates the analytical void.” Maj. Op. 24. As set out *supra*, however, the Commission adequately explained its reliance—for the past 25 years—on the FDA’s RF exposure expertise. Plus, after a review of “hundreds of studies,” the FDA’s conclusion is far from unreasoned. See *supra* note 12. And the two cases to which the majority points are inapposite. See Maj. Op. 24 (citing *City of Tacoma v. FERC*, 460 F.3d 53, 76 (D.C. Cir. 2006), and *Ergon-West Virginia, Inc. v. EPA*, 896 F.3d 600, 612 (4th Cir. 2018)). Importantly, unlike these petitions, neither case involves a decision not to initiate a rulemaking. As noted, inaction is reviewed under an especially deferential standard. It would be inappropriate to apply precedent using a less deferential standard to modify the standard applicable here. And finally, the Commission did not “blindly adopt the conclusions” of the FDA. See *City of Tacoma*, 460 F.3d at 76. Nor did it “turn a blind eye to errors and omissions apparent on the face of” the FDA’s conclusions. See *Ergon-West Virginia*, 896 F.3d at 612.

The majority’s citation to *Bellion Spirits, LLC v. United States*, No. 19-5252 (D.C. Cir. Aug. 6, 2021), is even further afield. First, *Bellion Spirits* addressed a “statutory authority” question—it did not apply arbitrary and capricious review, much less the especially

As in *EMR Network*, the record does not “call into question the Commission’s decision to maintain a stance of what appears to be watchful waiting.” 391 F.3d at 274. To hold otherwise begs the question: what was the Commission supposed to do? It has no authority over the level of detail the FDA provides in response to the Commission’s inquiry. It admits that it does not have the expertise “to interpret[] the biological research necessary to determine what [RF radiation] levels are safe.” 2013 *Notice of Inquiry*, 28 FCC Rcd. at 3,501 ¶ 6. The Commission opened the 2013 *Notice of Inquiry* “as a matter of good government” despite its “continue[d] . . . confidence in the current [RF] exposure limits.” *Id.* at 3,570 ¶ 205. If it *had* reached a conclusion contrary to the FDA’s, it most likely would have been attacked as *ultra vires*. For us to require the Commission to, in effect, “nudge” the FDA stretches both our jurisdiction as well as its authority beyond recognized limits.

Accordingly, I respectfully dissent from the limited remand set forth in Part II.A.i.–iv. and Part III of the majority opinion.¹⁴

deferential standard applicable to a decision not to initiate a rulemaking. *See Bellion Spirits*, slip op. at 13. Second, to the extent *Bellion Spirits* is remotely relevant, I believe it supports my position. There, the Alcohol and Tobacco Tax and Trade Bureau “consulted with [the] FDA on a matter implicating [the] FDA’s expertise and then considered that expertise in reaching its own final decision.” *Id.* at 14. Again, in my view, the Commission did the same thing.

¹⁴ Although I join Part II.B. of the majority opinion, I do not agree with the majority’s aside, contrasting the Commission’s purported silence regarding non-cancerous effects and its otherwise reasoned response. *See* Maj. Op. 26. As explained *supra*, I believe the Commission reasonably relied on the FDA’s conclusion that RF radiation exposure below the Commission’s limits does not cause negative health effects—cancerous or non-cancerous.

Addendum 1 – Panel Opinion, Judgment and Mandate**B. *EHT* v. *FCC* Judgment**

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 20-1025

September Term, 2020
FILED ON: AUGUST 13, 2021

ENVIRONMENTAL HEALTH TRUST, ET AL.,
PETITIONERS

v.

FEDERAL COMMUNICATIONS COMMISSION AND UNITED STATES OF AMERICA,
RESPONDENTS

Consolidated with 20-1138

On Petitions for Review of an Order
of the Federal Communications Commission

Before: HENDERSON, MILLETT and WILKINS, *Circuit Judges*

J U D G M E N T

These causes came on to be heard on the petitions for review of an order of the Federal Communications Commission and were argued by counsel. On consideration thereof, it is

ORDERED and **ADJUDGED** that the petitions for review be granted in part and the case be remanded to the Commission to provide a reasoned explanation for its determination that its guidelines adequately protect against harmful effects of exposure to radiofrequency radiation unrelated to cancer, in accordance with the opinion of the court filed herein this date.

Per Curiam

FOR THE COURT:
Mark J. Langer, Clerk

BY: /s/

Michael C. McGrail
Deputy Clerk

Date: August 13, 2021

Opinion for the court filed by Circuit Judge Wilkins.
Opinion dissenting in part filed by Circuit Judge Henderson.

Addendum 1 – Panel Opinion, Judgment and Mandate**C. *EHT* v. *FCC* Mandate**

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 20-1025

September Term, 2021

FCC-19-126

Filed On: October 5, 2021 [1916917]

Environmental Health Trust, et al.,

Petitioners

v.

Federal Communications Commission and
United States of America,

Respondents

Consolidated with 20-1138

M A N D A T E

In accordance with the judgment of August 13, 2021, and pursuant to Federal Rule of Appellate Procedure 41, this constitutes the formal mandate of this court.

FOR THE COURT:

Mark J. Langer, Clerk

BY: /s/

Daniel J. Reidy

Deputy Clerk

[Link to the judgment filed August 13, 2021](#)

Addendum 2 - Table with Representative Post 2019 Science

Health and Environmental Impacts of RF Radiation (2019–2026)

Note: Links are embedded in citations. Descriptions emphasize main health or environmental impacts and study interpretation.

In vitro / cellular, oxidative stress, and DNA damage

Linked citation	Health or environmental impact
Meyer et al., 2024	WHO-supported systematic review of experimental in vitro and in vivo evidence on oxidative-stress biomarkers. The review reported mixed evidence overall, but recurring signals of altered ROS pathways, antioxidant depletion, oxidative injury markers, and stress-response biology under some exposure conditions.
Joushomme et al., 2023	Human skin-cell study of 5G-modulated 3.5 GHz exposure. The authors reported no conclusive molecular or genotoxic effects under the tested conditions, underscoring that effects may depend on exposure parameters, cell type, and endpoint selection.
Haidar et al., 2025	In vitro 5G-modulated 3.5 GHz study examining oxidative stress and DNA repair in skin cells. No significant oxidative stress or impaired DNA repair was observed under the tested protocol.
Taha et al., 2025	Human spermatozoa exposed to RF fields showed altered motility and apoptotic-pathway changes. This study is relevant to reproductive biology because sperm are especially sensitive to oxidative and mitochondrial stress.
Kim et al., 2026	Experimental study reporting that 5G RF-EMF exposure modulated UVA-induced genotoxic stress responses. The findings suggest RF exposure may interact with other environmental stressors rather than acting only as an isolated exposure.

In vivo / animal and experimental biology

Linked citation	Health or environmental impact
Mevisen et al., 2025	Systematic review of laboratory animal cancer studies reporting evidence of carcinogenic associations and DNA damage in some RF-exposed animal studies, while emphasizing variability in study quality, exposure systems, and tumor endpoints.
Cordelli et al., 2024	Systematic review of male fertility evidence in non-human mammals and human sperm. The review found uncertain but possible effects on sperm quality and testicular oxidative-stress pathways, while concluding that fecundity effects in rodents were not clearly established.
Pacchierotti et al., 2021	Systematic review of experimental evidence on RF exposure, male fertility, and pregnancy outcomes. The paper is useful for framing reproductive and developmental endpoints in animal evidence.

Clinical and human experimental evidence

Linked citation	Health or environmental impact
Pophof et al., 2024	Systematic review and meta-analysis of short-term RF exposure and cognitive performance in human experimental studies. The review

	found no consistent evidence that acute RF exposure impairs cognitive performance.
Benke et al., 2024	Systematic review and meta-analysis of observational studies on long-term RF exposure and cognition. The review did not identify clear long-term cognitive impairment, but exposure misclassification remains a central limitation.
Sauter et al., 2025/2026	Randomized sham-controlled study in healthy elderly participants. The study reported no measurable adverse cognitive effects from short-term RF-EMF exposure under the tested conditions.

Epidemiology / population studies

Linked citation	Health or environmental impact
Feychting et al., 2024 — COSMOS	Large prospective cohort study reporting no increased incidence of major brain tumours among long-term mobile-phone users. Increased risk evident in those exposed at younger ages, but not analyzed as such!
Karipidis et al., 2024	WHO-commissioned systematic review concluding that available epidemiologic evidence does not demonstrate increased risk for several major tumour types from mobile-phone RF exposure. The review acknowledges limitations in cumulative exposure assessment.
Karipidis et al., 2025	WHO-related review of less-researched neoplasms, including thyroid and other cancers. Useful for documenting evidence gaps beyond brain tumours.
Gulati et al., 2024	Study of biomarkers in residents near telecommunications base stations reporting increased chromosomal aberrations among higher-exposure participants. Study of residents chronically exposed to GSM and LTE base-station radiation. Blood samples were evaluated for oxidative stress biomarkers, DNA damage, micronuclei, chromosomal aberrations, and cancer-related genetic markers. Chromosomal aberration significantly increased in the higher-exposure group and correlated with LTE/GSM exposure intensity and proximity to antennas. Authors concluded the findings were consistent with chronic RF-EMF–associated genomic instability.
Mate et al., 2026	Occupational RF-EMF epidemiology study reporting no evidence of association with glioma risk for studied groups and times.

Children: developmental, psychological, and physiological impacts

Linked citation	Health or environmental impact
Davis et al., 2023	Review focused on wireless technologies and children, emphasizing that children have longer lifetime cumulative exposure, developing tissues, and distinct vulnerability considerations. The paper discusses reproductive, neurological, developmental, and physiological concerns not adequately addressed by thermal-only standards calls for precautionary policies.
Birks et al., 2020	International epidemiologic study of prenatal and early-life mobile-phone exposure and child neurodevelopment. It reported possible

	behavioural and emotional associations, while also noting uncertainty and the need for stronger exposure assessment.
Madigan et al., 2020	Longitudinal pediatric study linking higher screen exposure with poorer developmental screening outcomes. Although not solely an RF exposure study, it is relevant because wireless devices combine RF exposure with digital behavioural and psychological exposures.
WHO RF-EMF review program	WHO review program highlights continuing uncertainty regarding chronic RF exposure, including developmental and neurological outcomes in populations with early-life exposure.

Birds, bats, bees, insects, wildlife, flora, and fauna

Linked citation	Health or environmental impact
Levitt, Lai, Manville & Scarato, 2025	Frontiers in Public Health ecological review addressing RF-EMF effects on flora and fauna, including birds, bats, insects, pollinators, mammals, plants, trees, and aquatic organisms. The review emphasizes that RF-EMF may affect wildlife at ecosystem levels by disrupting geomagnetic orientation, migration, navigation, nesting, pollination, oxidative stress pathways, circadian regulation, reproduction, and habitat behaviour.
Levitt, Lai & Manville, 2022 — Part I	Reviewed mechanisms by which low-level EMF may affect wildlife and plants, including oxidative stress, calcium signalling, circadian disruption, immune effects, and reproductive biology.
Levitt, Lai & Manville, 2022 — Part II	Summarized evidence suggesting effects on avian magnetoreception, migratory orientation, nesting behaviour, pollinator navigation, and biologically mediated environmental sensing.
Levitt, Lai & Manville, 2022 — Part III	Argued that current RF regulatory frameworks are inadequate for ecosystem-level exposure because they focus almost exclusively on human thermal thresholds rather than chronic ecological effects.
Pophof et al., 2023	Review of biological effects of RF-EMF above 100 MHz on flora and fauna. The paper covers behavioural, reproductive, oxidative-stress, and physiological endpoints across plants, insects, birds, and wildlife, while noting methodological variability.
Thill et al., 2023	Honeybee study reporting altered behaviour, oxidative-stress markers, and colony-level physiology following RF exposure. Relevant to pollinator vulnerability in RF-dense environments.

Additional Ecological and Mechanistic Studies

Citation	Study Description
Levitt, Lai, Manville & Scarato, 2025	Expanded Frontiers in Public Health review examining biological and ecological effects of anthropogenic radiofrequency radiation on flora and fauna, including birds, bats, pollinators, insects, mammals, trees, and aquatic organisms. The review emphasized evidence suggesting RF-EMF may affect wildlife at ecosystem levels through disruption of geomagnetic orientation, migration, navigation systems, reproductive biology, oxidative stress pathways, circadian regulation, and habitat behavior.

Multisource RF exposure in the general environment

Linked citation	Health or environmental impact

Brzozek et al., 2024	Review of anthropogenic RF fields emphasizing that real-world exposures arise from multiple simultaneous sources, including antennas, Wi-Fi, mobile devices, smart infrastructure, and environmental background fields.
Gulati et al., 2024	Base-station study relevant to involuntary environmental exposure. Reported increased chromosomal aberrations among residents exposed to higher RF levels near telecommunications antennas.
Base-station biomarker studies, 2024	Molecular investigations report oxidative imbalance, altered antioxidant enzyme activity, micronucleus formation, genomic instability, and ROS-related biomarkers among populations living near RF-emitting antennas.
Jeladze V et al., 2025	International Journal of Radiation Biology publication addressing RF-induced oxidative stress, genomic instability, altered cellular signalling, and cumulative multisource exposure. It highlights the need for improved biologically based exposure assessment.

Oxidative stress, ROS, and cancer-relevant mechanisms NOT RF specific

Linked citation	Health or environmental impact
ROS signalling and cancer, 2023	Review explaining how oxidative stress can contribute to DNA strand breaks, genomic instability, altered methylation, cellular signalling disruption, and cancer progression.
Oxidative stress and cancer review, 2025	Detailed review describing how ROS may induce chromosomal instability, tumour microenvironment signalling, and oncogenic transformation.
Environmental ROS and cancer	Foundational mechanistic review outlining how environmental ROS sources may promote carcinogenesis through oxidative DNA damage, chromosomal aberrations, and epigenetic alteration.

Addendum 3 - National Spectrum Management Association, 2026 Annual Conference, “*Your Radiation Weather Report*”: *National RF Emission Map & Monitoring Networks: Real Time, Prior Measured & Predictive*, (NSMA 2026) (May 13, 2026)

"Your Radiation Weather Report"

National RF Emission Map & Monitoring Networks: Real Time, Prior Measured & Predictive

May 13, 2026 - NSMA

Joseph M. Sandri



Table of Contents

- I. Environmental Health Trust et al. v. Federal Communications Commission Petition
- II. Previous NSMA Presentations on RF Exposure 7
- III. Waterford 8
- IV. Country Comparison 9
- V. RF Radiation Exposure “Weather” 10
- VI. Stricter RF Exposure Standards in Switzerland, Italy, China 11
 - I. Switzerland 12
 - II. Italy 13
 - III. China 14
- VII. General Reading on Comparisons and on RF Exposure in General 15
- VIII. Conversion Calculations 16–17

Table of Contents

VIII. In Addition To the Government's Air Quality Index, the USA Should Have Wireless Radiation Exposure Quality Index

IX. AQI Equivalent for Wireless Radiofrequency Radiation Exposure 19

X. National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS) 20

XI. Satellite Mega Constellations: No Escaping RF Radiation.....21

XII. Human Biomagnetism and the Environment 22

Environmental Health Trust et al. v. Federal Communications Commission Federal Court Mandate - Continuous Monitoring

- Requests prompt administrative action on the outstanding judgment and mandate issued by the United States Court of Appeals for the District of Columbia Circuit in Environmental Health Trust et al. v. Federal Communications Commission
- Case was originally filed by EHT challenging [the Commission's decision not to modify its RF exposure guidelines](#)
- Decided August 2021. Court has ordered a remand, mandating that the Commission provide a reasoned explanation for its decision to retain its RF testing procedures for cell phones and other portable electronic devices, as well as address, among other things, the impacts of RF radiation on children and the environment
- Documents released by FCC under the Freedom of Information Act (FOIA) show violations of the FCC's RF exposure limit for cell phones
 - FCC had conducted specific absorption rate (SAR) tests on selected cell phones as early as 2016, found phones to be in violation of the exposure limit
 - That information was never submitted to the record in the EHT v. FCC case, resulting in the remand
- See: On Petitions for Review of an Order of the Federal Communications Commission, Environmental Health Trust et al. v. Federal Communications Commission, No. 20-1025 (D.C. Cir. Aug. 13, 2021). <https://docs.fcc.gov/public/attachments/DOC-374936A1.pdf>.

Environmental Health Trust et al. v. Federal Communications Commission

Petition filed August 2025

“The Commission currently lacks sufficient transparency, oversight, and surveillance mechanisms to ensure that wireless devices and wireless infrastructure comply with its RF radiation limits... RF radiation monitoring systems should ensure a focus on sensitive populations (e.g., schools, daycare facilities, and parks) and “ecologically sensitive areas” as identified by EPA, the Department of the Interior (“DOI”), Bureau of Land Management (“BLM”), National Marine Fisheries Service (“NMFS”), USFWS, and the U.S. Army Corps of Engineers (“USACE”).” (pg. 34) (emphasis supplied)

Environmental Health Trust et al. v. Federal Communications Commission Petition

“Real-time monitoring for RF radiation exposure emissions are entirely possible. The French government makes RF radiation measurements from base stations publicly available. The French National Frequency Agency (“ANFR”) has installed RF monitoring devices in Paris and other cities to collect data on 5G health impacts. The ANFR launched a website offering live data on RF radiation exposure around 5G sites. In Australia, the Radio Frequency National Site Archive (“RFNSA”), developed by the Australian Mobile Telecommunications Association (“AMTA”), allows users to search for base stations throughout the country and access information about them, including Electromagnetic Energy (“EME”) reports. In Israel, the Noise Prevention and Radiation Safety Department, part of the Ministry of Environmental Protection, is tasked with reducing the public’s exposure to RF radiation. To do so, it supervises parties dealing with sources of non-ionizing and ionizing radiation and uses monitoring stations throughout the country to track environmental background radiation. **If France, Australia, Israel, and other advanced, developed countries can conduct real-time RF radiation monitoring, so can (and should) the United States.**” (citations omitted) (pgs. 34–35) (emphasis supplied)

Previous Selected NSMA Presentations on RF Exposure

- Human RF Exposure ([George Kizer](#)) ([Justin Daviault](#)) ([Panel](#)) ([Video](#)) (2021)
 - Spectrum Management & Human RF Exposure ([Joe Sandri](#)) ([George Kizer](#)) ([Video](#)) (2022)
 - Using Drones & Artificial Intelligence: RF Interference and EMF Exposure ([Tom Brinkoetter](#)) ([Timothy Newman](#)) ([Video](#)) (2023)
 - Spectrum Management & Human RF Exposure – 2023 Recap ([Jonathan Mirin](#)) ([Joe Sandri](#)) ([Theodora Scarato](#)) ([Video](#)) (2023)
 - History of the Wireless Technology Research (WTR), The World's Largest Research Project into Wireless Safety ([George Carlo](#)) ([Video](#)) (2024)
- [George Kizer](#)
([Kent Chamberlin](#)) ([Sarah Seguin](#)) ([Joe Sandri](#)) ([Video](#)) (2024)
- [Joe Sandri](#)) (2025)
- [Joe Sandri](#)) (2025)
- [Dr. Robert Brown](#)) (2025)
- [Thomas Ferguson](#)) (2025)
- [Dr. Devra Davis](#)) (2025)

- U.S. companies like WATERFORD have pioneered the ability to simultaneously conduct and broadcast radiation exposure levels and real time video at wireless base station locations
- It is recommended that real time 24/7/365 live feeds become available in all locations, much like full time weather and Air Quality Index (AQI) reports are available full time.



RFIS
RF INFRASTRUCTURE SENTRY

Ensuring Compliance ... Limiting Liability

Radio Frequency Infrastructure Sentry
Until now, there has been no way of ensuring that wireless sites are continuously safe and compliant





DELIVERING CUTTING EDGE INNOVATION

Waterford's patented RFIS device combines frequency spectrum analysis with Waterford's industry-leading RoofMaster™ software to assess and monitor the radio frequency emissions, regulatory compliance, and mitigation control status associated with a wireless telecommunications site.

**Versatility**
Suitable for every wireless site type (e.g. rooftops, small cells, in-building/DAS, towers, water tanks, etc.)

**Speed to Market**
Aids in zoning and permitting approval by local jurisdictions in difficult to develop areas

**Cost Savings**
Remote monitoring replaces the need for traditional compliance methods

**Peace of Mind**
Addresses municipal, neighborhood, environmental, and personal safety concerns related to RF emissions

**Reduces Risk**
Eliminates risk of fines due to non-compliance by facilitating real-time remediation

**Compliance Visibility**
Easy-to-use dashboard allows visibility and on-demand compliance reporting

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 **WATERFORD**



RFIS
RF INFRASTRUCTURE SENTRY

Ensuring Compliance ... Limiting Liability

Technical Features

- ✓ Patented technology developed by Waterford; manufactured in U.S.
- ✓ 24/7 RF compliance monitoring delivers round-the-clock protection
- ✓ Delivers immediate alert notification if changes in compliance or RF environment detected
- ✓ Versatile mounting hardware permits quick and easy installation



Technical Data

Operating Range:	830 MHz to 1.90 GHz
RF Detection Threshold:	>90 dBm
Power Requirements:	110 - 220V AC, 48V DC
Power Consumption:	18 - 25 W
Operating Temperature:	-40°F to 140°F (-40°C to 60°C)
Network Compatibility:	LTE or CAT5
Dimensions:	Depth 4.1 in (104 mm) Height 10.25 in (260 mm) Width 10.25 in (260 mm)
Weight:	2.5 lbs (1.14 kg)

Typical Applications





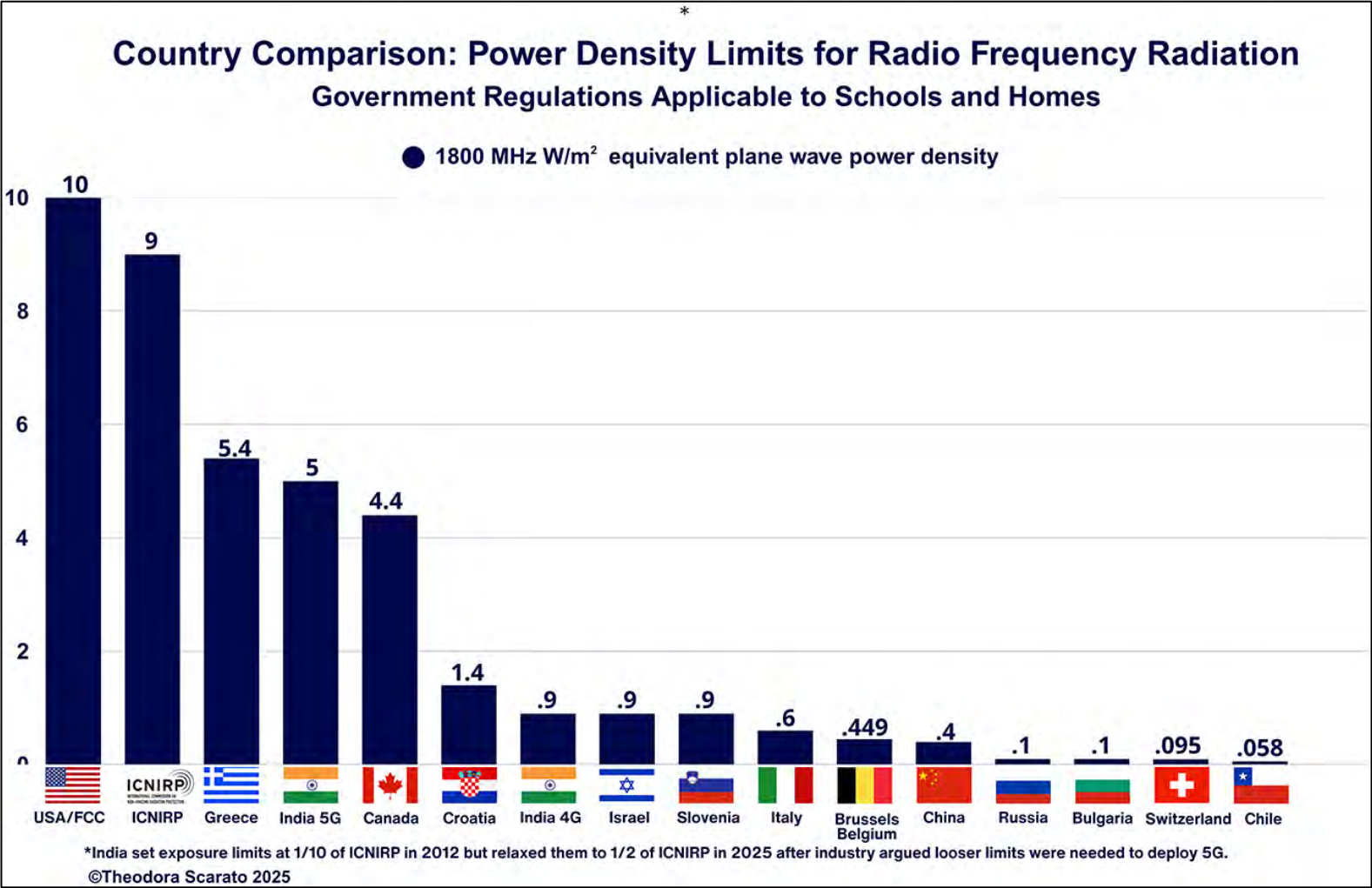
Monitoring Features
The RFIS dashboard provides clients with access to important alerts in real-time, as well as pertinent site related data including:

- ✓ 24/7 EME compliance reporting
- ✓ Compliance status
- ✓ RF sensor monitoring
- ✓ Mitigation controls status
- ✓ On-demand photos

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 **WATERFORD**

Country Comparison



<https://www.fcc.gov/ecfs/document/101291988427134/1> (citing Theodora Scarato, *U.S. policy on wireless technologies and public health protection: regulatory gaps and proposed reforms*, 13 Front. Public Health 1677583, 11 (2025), <https://doi.org/10.3389/fpubh.2025.1677583>).

RF Radiation Exposure “Weather”

0.048 W/kg versus the U.S. 1.6 W/kg limit

Calculation:

- $3\% = 0.03$
- $0.03 \times 1.6 = 0.048$

So, 3% of 1.6 Watts per Kilogram is 0.048 W/kg

Context for RF Radiation Exposure (SAR):

- Watts per Kilogram (W/kg) is the unit for Specific Absorption Rate (SAR), which measures how much radio-frequency (RF) energy is absorbed by the body (e.g., from cell phones or other wireless devices).
- The 1.6 W/kg value is a maximum allowable regulatory limit in the U.S. FCC limit for localized SAR in the head/body for mobile devices, averaged over 1 gram of tissue.
- The U.S. SAR levels have not effectively changed despite (i) accumulating evidence in the scientific and medical literature and (ii) the dramatically lower values in other countries.
- 3% of that limit equals 0.048 W/kg, well below the U.S. safety thresholds.
- 10% of 1.6 W/kg is 0.16 W/kg.

Stricter RF Exposure Standards in Switzerland, Italy, China

Note on SAR vs. Environmental Limits: Device SAR (Specific Absorption Rate, in W/kg) for mobile phones is generally aligned with or follows ICNIRP (2.0 W/kg over 10g) or FCC (1.6 W/kg over 1g) standards in these countries. The "stricter" aspects typically apply to 'environmental exposure' from base stations/towers (power density in W/m² or V/m), often 10–100× lower than ICNIRP/FCC reference levels due to precautionary policies.

- Uses ICNIRP as the base but adds strict precautionary installation limits (ILV) for base stations, especially near sensitive areas (homes, schools, etc.).
- Example: At 900 MHz, installation limit ~4–6 V/m or ~0.04–0.1 W/m² (roughly 1/10 to 1/100 of ICNIRP).
- Official source: Federal Office for the Environment (FOEN/BAFU) – <https://www.bafu.admin.ch/bafu/en/home/topics/electrosmog.html>
- Summary: <https://ehtrust.org/switzerland-policy-recommendations-cell-phones-wireless-radiation-health/>
- Older overview: <https://emraustralia.com.au/blogs/news-1/stricter-radiation-standards-in-switzerland>



- Has 'attention values' and 'quality goals' stricter than ICNIRP for fixed sources (e.g., ~6 V/m attention value in sensitive areas, vs. ICNIRP ~41 V/m at ~900 MHz).
- Limits from 1998/2003 decrees (partially updated but precautionary approach maintained despite industry pressure).
- Key reference: Framework Law and DPCM 8.07.2003.
- Overview:
<https://radiationprotection.se/5g/italy-pressure-limits-for-radiation-exposure/>
- Historical decree details: Search for "Italy Decree 381 / 1998 RF limits" or see comparisons in <https://www.emf-portal.org/en/cms/page/home/more/limits/limit-values-compared-internationally>



- Follows a version of ICNIRP 1998 but with stricter public exposure limits in GB 8702–2014 (e.g., power density often $\sim 0.4 \text{ W/m}^2$ or lower in practice for certain bands, vs. ICNIRP 10 W/m^2 ; some sources note $\sim 40 \mu\text{W/cm}^2$ at mobile frequencies).
- Mobile phone SAR aligns closer to 2.0 W/kg (10g), but environmental/base station rules are more conservative.
- Official standard: GB 8702–2014 – http://english.mee.gov.cn/Resources/standards/Radioactivity/Electromagnetic_Radiation/201605/t20160512_337592.shtml
- Comparison: <https://ehsciences.org/cell-tower-radiation-limits-worldwide/> (and related papers on GB8702).



General Reading on Comparisons and on RF Exposure in General

- Detailed PDF on international limits:
https://mazar.atwebpages.com/Downloads/EMC_Europe2016_Wroclaw_Sep%202016_Mazar_20April16_EMF.pdf
- WHO/ICNIRP context: <https://www.who.int/news-room/fact-sheets/detail/electromagnetic-fields-and-public-health-mobile-phones>
- Dr. Rob Brown's [*UnPlug: A Radiologist Explores the Damage Caused by Electropollution and How You Can Prevent It*](#) (2026)
- Dr. Devra Davis' [*Disconnect: A scientist's solutions for safer technology*](#) (2024)
- Dr. George Carlo's & Martin Schram's [*Cell Phones: Invisible Hazards in the Wireless Age: An Insider's Alarming Discoveries About Cancer and Genetic Damage*](#) (2001)

Conversion Calculations

NOTE: There is no universal direct conversion from incident power density (W/m^2 — environmental field strength) to SAR (W/kg — absorbed power per unit mass of tissue). The relationship depends on frequency, tissue properties, exposure geometry, and whether it's whole-body or localized.

Approximate Calculation Method (Far-Field Plane Wave)

1. Convert power density **S** (W/m^2) to electric field **E** (V/m):

$$E \approx \sqrt{S \times 377} \quad (377 \, \Omega = \text{free-space impedance}).$$

– For $0.04 \, \text{W}/\text{m}^2$: $E \approx 3.88 \, \text{V}/\text{m}$

– For $0.1 \, \text{W}/\text{m}^2$: $E \approx 6.14 \, \text{V}/\text{m}$

2. Local SAR inside tissue $\approx (\sigma \times E_{\text{internal}}^2) / \rho$

(σ = tissue conductivity in S/m , $\rho \approx 1000\text{--}1200 \, \text{kg}/\text{m}^3$). E_{internal} is lower than external due to reflection and body shielding.

Calculators:

<https://ib-lenhardt.com/kb/calculators/specific-absorption-rate-sar>

<https://www.everythingrf.com/rf-calculators/sar-rf-exposure-calculator>

Conversion Calculations

Rough Equivalent Estimates at Mobile Frequencies (900–1800 MHz):

- Whole-body average SAR from these environmental levels is typically in the range of a few $\mu\text{W/kg}$ to $\sim 0.01\text{--}0.05\text{ mW/kg}$ (i.e., 0.000001 to 0.00005 W/kg).
- This is orders of magnitude below ICNIRP whole-body limit of 0.08 W/kg .

Comparison to 0.048 W/kg (localized device exposure):

Swiss-style base station limits ($0.04\text{--}0.1\text{ W/m}^2$) correspond to ‘extremely low equivalent whole-body exposure’ — roughly $1,000\times$ lower or more than 0.048 W/kg localized.

Bottom line: $0.04\text{--}0.1\text{ W/m}^2$ represents very low environmental exposure, well below device-related localized SAR values or regulatory limits.

Useful sources:

- Swiss official electrosmog page (NISV ordinance):
<https://www.bafu.admin.ch/bafu/en/home/topics/electrosmog.html>
- Power density to V/m conversion:
<https://www.powerwatch.org.uk/science/unitconversion.asp>
- General SAR vs. power density explanations: <https://www.rfwireless-world.com/calculators/rf-exposure-calculator>
- International limits overview: <https://ehsciences.org/cell-tower-radiation-limits-worldwide/>

In Addition To the Government's Air Quality Index, the USA Should Have Wireless Radiation Exposure Quality Index

Air Quality Index (AQI) Basics

What is the U.S. Air Quality Index (AQI)?

The U.S. AQI is EPA's index for reporting air quality.

How does the AQI work?

The U.S. Air Quality Index (AQI) is EPA's tool for communicating about outdoor air quality and health. The AQI includes six color-coded categories, each corresponding to a range of index values. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 or below represents good air quality, while an AQI value over 300 represents hazardous air quality.

For each pollutant an AQI value of 100 generally corresponds to an ambient air concentration that equals the level of the short-term national ambient air quality standard for protection of public health. AQI values at or below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is unhealthy: at first for certain sensitive groups of people, then for everyone as AQI values get higher.

The AQI is divided into six categories. Each category corresponds to a different level of health concern. Each category also has a specific color. The color makes it easy for people to quickly determine whether air quality is reaching unhealthy levels in their communities.

Five major pollutants

EPA establishes an AQI for five major air pollutants regulated by the Clean Air Act. Each of these pollutants has a national air quality standard set by EPA to protect public health:

- ground-level ozone
- particle pollution (also known as particulate matter, including PM_{2.5} and PM₁₀)
- carbon monoxide
- sulfur dioxide
- nitrogen dioxide

AQI Basics for Ozone and Particle Pollution

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

[AQI Basics | AirNow.gov](https://www.airnow.gov)

AQI Equivalent for Wireless Radiofrequency Radiation

Color	Level of Concern	Values of Index	Description of RF Exposure Level
Green	Good	0 W/kg	No concern for all populations
Yellow	Moderate	0 – 0.01 W/kg	Little concern to all populations except for severest EHS sufferers
Orange	Unhealthy for Sensitive Groups	0.01- 0.048 W/kg	Concerning to severe EHS sufferers
Red	Unhealthy	0.048 – 0.16 W/kg	Concerning to EHS sufferers and immune or other vulnerabilities
Purple	Very Unhealthy	0.16 W/kg – 0.5 W/kg	Concerning to all
Maroon	Hazardous	0.5 W/kg - +2.0 W/kg	Very concerning

National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS)

<https://www.noaa.gov/>

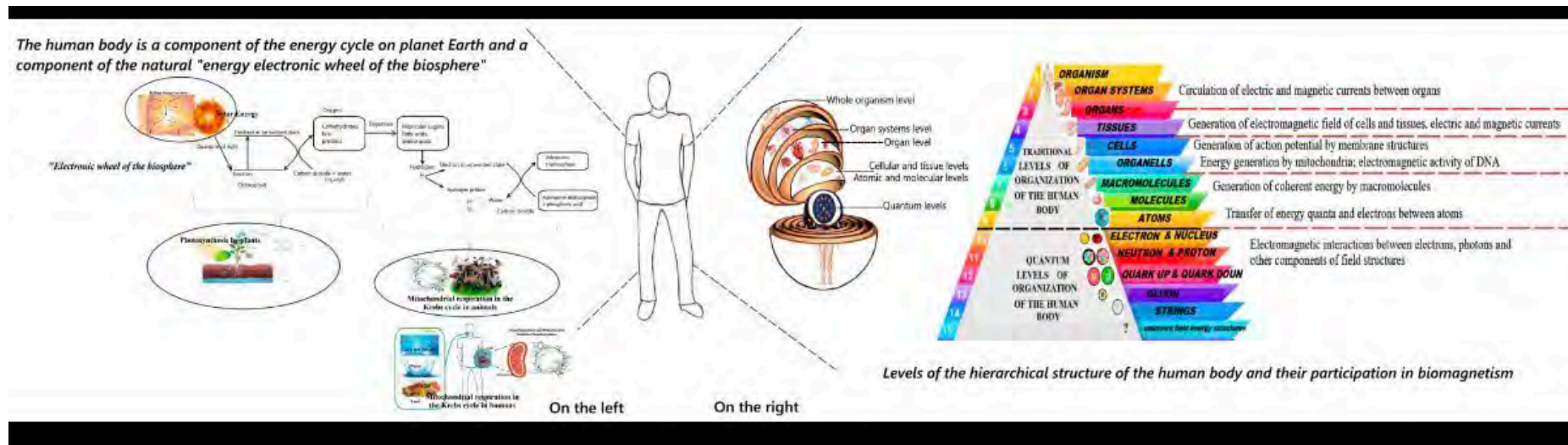


Satellite Mega Constellations: No Escaping RF Radiation



Human Biomagnetism and the Environment

New Publication: *Human Bioelectromagnetism and the Environment: Introduction to the Problem* by Nevoit et al.,¹ which concludes, "There is a proven interaction between the human body and external electromagnetic fields, as the body is part of the Earth's electromagnetic landscape and has biophysical mechanisms for coupling with it. The increase in anthropogenic electromagnetic radiation is an electromagnetic environmental problem, and this requires further study of the safety issues and the impact of anthropogenic electromagnetic fields on the human body, and a reassessment of their biological impact on the human body, tightening the standards and requirements for electromagnetic safety in places where people live, a moratorium on further deployment of 5G, urgent application of the precautionary principle, and stricter exposure limits, especially for Wireless Communication Electromagnetic Fields."



<https://doi.org/10.3390/app16083627>

Thank You

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Addendum 4 - FOIA on FCC Testing



EHTrust Reveals Concealed FCC cell phone Tests

Posted on ~~April 24, 2024~~ April 24, 2024 by LVsA

Environmental Health Trust reveals concealed FCC cell phone tests showing human radiation exposure limits exceeded.



Environmental Health Trust is seeking to shed light on FCC's tests of cell phone radiation exposure.

WASHINGTON, DC, April 22, 2024 — The **Environmental Health Trust** (<https://ehtrust.org/>) (EHT) revealed today that the Federal Communications Commission (FCC) hid test results showing that radiation exceeded federal limits when smartphones were in close proximity to the human body, such as in a pants pocket. The FCC apparently failed to disclose this information to the U.S Court of Appeals for the D.C. Circuit.

In 2019 the agency tested several Apple, Samsung, Blu and Motorola smartphone models for cell phone radiation SAR levels.

The FCC test results for phones in the pocket (2 mm) were not public until September 29, 2023, when they were released to EHT as a result of a Freedom of Information Act (FOIA) request. The **FCC FOIA letter** (<https://ehtrust.org/wp-content/uploads/FCC-Letter-on-Cell-Phone-Radiation-Tests-Exceeding->

EHT also has **filed an appeal to the FCC** (<https://ehtrust.org/wp-content/uploads/EHT-Scarato-Appeal-RE-FOIA-Control-Nos.-2023-000281-and-2023-000325-FCC-2-mm-Cell-Phone-Radiation-SAR-Tests-December-28-2023-.docx.pdf>), as seven records were withheld from the FOIA response. The appeal has not been addressed.

In 2019, when the FCC conducted the tests, it also had an open rule-making regarding its 1996-era limits concerning human exposure to wireless radiation. The FCC's rule-making was followed by a federal court challenge, which resulted in the FCC and the Food and Drug Administration being subject to a court-ordered remand in August 2021.

"The FCC and FDA did not reveal these cell phone tests during the court case, and have yet to respond to the court-ordered remand, which is a matter of grave concern," said Kent Chamberlin, incoming president of EHT.

Theodora Scarato, EHT vice president for policy and education stated:

- *" Why did the FCC perform these tests and then decide to not release the results to the public while it was conducting a rule-making on this very subject?*
- *Why did the FCC refuse to release all the records on this issue?*

It is outrageous that the U.S. allows phones to be tested with whatever separation distance the companies want. Phones should be tested the way they are used. Children and adults use and carry phones pressed to their body for hours every day.

- *We need a strong oversight and compliance program, including post-market RF emission and health effect surveillance. It is time for a new approach to cell phone testing, one that reflects the way people use phones today. "*

The FOIA appeal and entire FCC FOIA response are available on EHT's website **here** (<https://ehtrust.org/environmental-health-trust-foia-project/>):

Source – EHTrust.org – Environmental Health Trust reveals concealed FCC cell phone tests showing human radiation exposure limits exceeded (<https://ehtrust.org/press-release-concealed-fcc-cell-phone-radiation-tests-show-human-exposure-limits-were-exceeded/>).

-
- **Phonegate** (<https://levaudsansantennes.ch/phonegate-2/>).
 - **No budget in Switzerland to protect people's health from dangerous phones?** (<https://phonegatealert.org/en/no-budget-in-switzerland-to-protect-peoples-health/>).
 - **The Testing Behind Your Wireless Devices. Decoding the Telecom Industry's Silence.** (<https://levaudsansantennes.ch/2023/07/27/the-testing-behind-your-wireless-devices-decoding-the-telecom-industrys-silence/>).
 - **Pas de budget en Suisse pour protéger la santé de la population contre les téléphones dangereux?** (<https://phonegatealert.org/pas-de-budget-en-suisse-pour-protger-la-sante/>).



Kaveh Moraghebi

From: Kaveh Moraghebi <kaveh@baclcorp.com>
Sent: Wednesday, December 28, 2016 7:44 PM
To: 'jzreik@ddmbrands.com'
Cc: 'Daniel Deng'; simon.ma@baclcorp.com; 'Well Wang'
Subject: FCCID: A4JANDY55MVR Post-Market Surveillance Testing Result

Dear Jose Zreik ,

Unfortunately I need to inform you that your product with FCCID: A4JANDY55MVR failed the SAR testing Post Market Surveillance Testing (PMST) and at this moment is considered non-compliant to the FCC part 2.1093 regulation. The SAR PMST testing was initially performed to configuration: LTE Band 7 Low channel (2510 MHz) Back Side 10 mm to the phantom and the result was 2.27 W/kg averaged over 1 gram body tissue. After discovering the failure, testing was repeated and the result measured as 2.46 W/kg. Also the SAR testing was performed on the middle channel (2535 MHz) and the high channel (2560 MHz) with the measured results of 2.64 W/kg and 2.83 W/kg.

Launching this product in the market is against FCC regulation and may cause the FCC to take serious actions which may include the dismissal of your grant and penalize your company. We need an statement from your company that you stop selling and marketing this devise in any market with FCC ID or advertised as approved by FCC .

As per FCC regulation, we are required to inform FCC that your sample is failing PMST. Within 30-days of this notification(12/28/2016), please provide the report of the actions taken or that will be taken to correct this situation. Your report will be submitted to FCC as per their requirement. Per FCC KDB 6100077 D01 v06r01, we as your TCB are required to continue to work with you until this issue is resolved or until it is determined that is it not resolvable.

We look forward to your response about how to resolve this issue. Please let me know if you have any questions.

Best regards,

=====
Kaveh Moraghebi
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Addendum 5 – Certified Lab Test Results – Handsets



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 TEL (760) 471-2100 • FAX (760) 471-2121
<http://www.rfexposurelab.com>

CERTIFICATE OF TESTING R&D SAR EVALUATION

Thought Delivery
 8070 Georgia Avenue, Suite 301
 Silver Spring, MD 20910

Dates of Test: October 6-10, 2025
 Test Report Number: R&D.20251001

Laboratory Accreditation Number: US1195

Model(s):	Motorola V300, Sharp Sidekick, Samsung Galaxy S, Nokia 5165, Nokia 3390, Nokia 3595, Motorola MicroTAC, Nokia 101, Nokia 1000, Motorola StarTAC
Test Sample:	Production Unit
Equipment Type:	Cellular Phone
Classification:	Portable Transmitter Next to Body
TX Frequency Range:	824 – 849 MHz; 1850 – 1910 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	Not Measured
Signal Modulation:	AMPS, CDMA, WCDMA, GSM
Antenna Type:	Internal
Application Type:	Evaluation
FCC Rule Parts:	Part 2, , 22, 24
KDB Test Methodology:	KDB 447498 D01 v06, KDB 648474 D01 v01r05, KDB 941225 D01 v03r01, KDB941225 D05 v02r05, KDB 941225 D06 v02r01
Max. Stand Alone SAR Value:	See Table Below on Page 2
Separation Distance:	0 mm, 2 mm & 5 mm for Both Head and Body

This wireless mobile and/or portable device has been evaluated for localized specific absorption rate (SAR) for uncontrolled environment/general exposure limits specified in ANSI C95.1 – 1999 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, ANSI C95.3 – 2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields, IEEE Std.1528 – 2013 Recommended Practice and has been tested in accordance with the measurement procedures specified in KDB 447498, KDB 648474 and KDB 941225 (See test report).

I attest to the accuracy of the data. All measurements were performed by myself or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Jay M. Moulton
 Vice President



Testing Cert. # 2387.01

Cell Phone Tested	RF Exposure (SAR) Limit	Position	Maximum SAR Value Measure		
			0 mm Test	2 mm Test	5 mm Test
Motorola V300	1.6 W/kg	Head	0.872	0.639	0.463
	1.6 W/kg	Body	1.49	1.08	0.634
Sharp Sidekick	1.6 W/kg	Head	1.02	0.729	0.511
	1.6 W/kg	Body	1.56	1.17	0.831
Samsung Galaxy S	1.6 W/kg	Head	0.546	0.478	0.311
	1.6 W/kg	Body	3.60	2.31	1.65
Nokia 5165	1.6 W/kg	Head	1.46	1.29	0.754
	1.6 W/kg	Body	4.58	3.07	2.15
Nokia 3390	1.6 W/kg	Head	1.26	1.03	0.769
	1.6 W/kg	Body	1.61	1.32	1.10
Nokia 3595	1.6 W/kg	Head	1.15	0.946	0.587
	1.6 W/kg	Body	1.52	1.08	0.681
Motorola MicroTAC	1.6 W/kg	Head	1.55	1.03	0.697
	1.6 W/kg	Body	3.26	2.11	1.69
Nokia 101	1.6 W/kg	Head	0.987	0.562	0.327
	1.6 W/kg	Body	4.97	3.52	2.84
Nokia 1000	1.6 W/kg	Head	0.976	0.502	0.367
	1.6 W/kg	Body	5.25	3.79	3.01
Motorola StarTAC	1.6 W/kg	Head	1.53	1.29	0.995
	1.6 W/kg	Body	3.91	2.68	1.72

Table of Contents

1. Introduction	5
SAR Definition [5]	6
2. SAR Measurement Setup	7
Robotic System	7
System Hardware	7
System Electronics	8
Probe Measurement System	8
3. Probe and Dipole Calibration	16
4. Phantom & Simulating Tissue Specifications	17
Head Simulating Mixture Characterization	17
5. ANSI/IEEE C95.1 – 1992 RF Exposure Limits [2]	18
Uncontrolled Environment.....	18
Controlled Environment	18
6. Measurement Uncertainty	19
7. System Validation	20
Tissue Verification	20
Test System Verification	20
8. SAR Test Data Summary.....	21
Procedures Used To Establish Test Signal.....	21
Device Test Condition.....	21
9. FCC 2G/3G Measurement Procedures	22
9.1 Procedures Used to Establish RF Signal for SAR	22
9.2 SAR Measurement Conditions for WCDMA/HSDPA/HSUPA	22
9.3 SAR Measurement Conditions for GSM	22
9.4 SAR Measurement Conditions for AMPS	22
9.5 SAR Measurement Conditions for CDMA.....	23
10. Test Equipment List	26
11. Conclusion	27
12. References	28
Appendix A – System Validation Plots and Data.....	29
Appendix B – SAR Test Data Plots.....	34
Appendix C – Test Setup Photos.....	54
Appendix D – Probe Calibration Data Sheets	134
Appendix E – Dipole Calibration Data Sheets.....	144
Appendix F – DAE Calibration Data Sheets.....	157
Appendix G – Phantom Calibration Data Sheets	163

Comment/Revision	Date
Original Release	October 13, 2025

1. Introduction

This measurement report shows the result of the Motorola V300, Sharp Sidekick, Samsung Galaxy S, Nokia 5165, Nokia 3390, Nokia 3595, Motorola MicroTAC, Nokia 101, Nokia 1000, Motorola StarTAC Cellular Phones with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices. The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on August 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC regulated portable devices. [1]

The test results recorded herein are based on a single type test and therefore apply only to the tested sample(s).

The test procedures, as described in ANSI C95.1 – 1999 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, ANSI C95.3 – 2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields, IEEE Std.1528 – 2013 Recommended Practice, KDB 447498, 648474 and KDB 941225 were employed.

SAR Definition [5]

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ).

$$SAR = \frac{d}{dt} \left(\frac{dW}{dm} \right) = \frac{d}{dt} \left(\frac{dW}{\rho dV} \right)$$

SAR is expressed in units of watts per kilogram (W/kg). SAR can be related to the electric field at a point by

$$SAR = \frac{\sigma |E|^2}{\rho}$$

where:

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m³)

E = rms electric field strength (V/m)

2. SAR Measurement Setup

Robotic System

These measurements are performed using the DASY52 automated dosimetric assessment system. The DASY52 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Intel Core2 computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig. 2.1).

System Hardware

A cell controller system contains the power supply, robot controller teach pendant (Joystick), and a remote control used to drive the robot motors. The PC consists of the HP Intel Core2 computer with Windows XP system and SAR Measurement Software DASY52, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

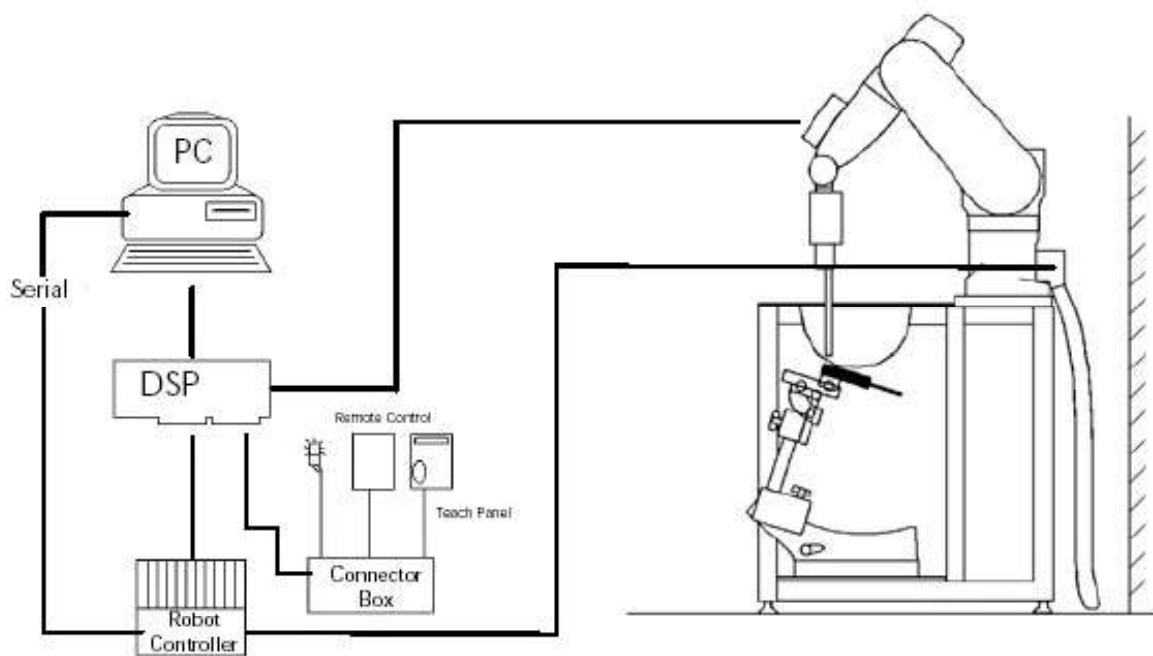


Figure 2.1 SAR Measurement System Setup

System Electronics

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

Probe Measurement System

The SAR measurements were conducted with the dosimetric probe EX3DV4, designed in the classical triangular configuration (see Fig. 2.2) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi fiber line ending at the front of the probe tip. (see Fig. 2.3) It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY52 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.



DAE System

Probe Specifications

Calibration: In air from 10 MHz to 6.0 GHz
In brain and muscle simulating tissue at Frequencies of 450 MHz, 835 MHz, 1750 MHz, 1900 MHz, 2450 MHz, 2600 MHz, 3500 MHz, 5200 MHz, 5300 MHz, 5600 MHz, 5800 MHz

Frequency: 10 MHz to 6 GHz

Linearity: $\pm 0.2\text{dB}$ (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

Range: Linearity: $\pm 0.2\text{dB}$

Dimensions: Overall length: 330 mm

Tip length: 20 mm

Body diameter: 12 mm

Tip diameter: 2.5 mm

Distance from probe tip to sensor center: 1 mm

Application: SAR Dosimetry Testing
Compliance tests of wireless device

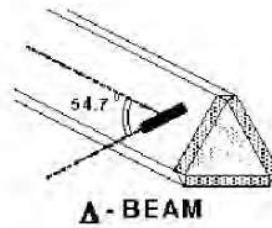


Figure 2.2 Triangular Probe Configurations



Figure 2.3 Probe Thick-Film Technique

Probe Calibration Process

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described in with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in and found to be better than +/-0.25dB. The sensitivity parameters (Norm X, Norm Y, Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) of the probe is tested.

Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a waveguide above 1GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm².

Temperature Assessment *

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium, correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor based temperature probe is used in conjunction with the E-field probe

$$SAR = C \frac{\Delta T}{\Delta t}$$

$$SAR = \frac{|E|^2 \cdot \sigma}{\rho}$$

where:

where:

Δt = exposure time (30 seconds),

σ = simulated tissue conductivity,

C = heat capacity of tissue (brain or muscle),

ρ = Tissue density (1.25 g/cm³ for brain tissue)

ΔT = temperature increase due to RF exposure.

SAR is proportional to $\Delta T / \Delta t$, the initial rate of tissue heating, before thermal diffusion takes place.

Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

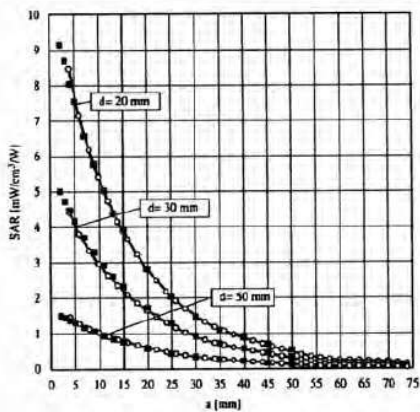


Figure 2.4 E-Field and Temperature Measurements at 900MHz

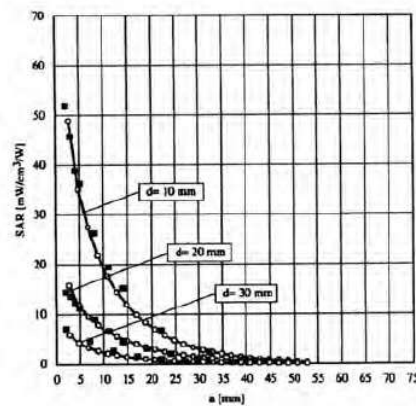


Figure 2.5 E-Field and Temperature Measurements at 1800MHz

Data Extrapolation

The DASY52 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given like below;

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with

- V_i = compensated signal of channel i (i=x,y,z)
- U_i = input signal of channel i (i=x,y,z)
- cf = crest factor of exciting field (DASY parameter)
- dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with

- V_i = compensated signal of channel i (i = x,y,z)
- Norm_i = sensor sensitivity of channel i (i = x,y,z)
μV/(V/m)² for E-field probes
- ConvF = sensitivity of enhancement in solution
- E_i = electric field strength of channel i in V/m

The RSS value of the field components gives the total field strength (Hermetian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with

- SAR = local specific absorption rate in W/g
- E_{tot} = total field strength in V/m
- σ = conductivity in [mho/m] or [Siemens/m]
- ρ = equivalent tissue density in g/cm³

The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{true} = \frac{E_{tot}^2}{3770}$$

with

- P_{true} = equivalent power density of a plane wave in W/cm²
- E_{tot} = total electric field strength in V/m

Scanning procedure

- The DASY installation includes predefined files with recommended procedures for measurements and system check. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.
- The „reference“ and „drift“ measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT's output power and should vary max. +/- 5 %.
- The highest integrated SAR value is the main concern in compliance test applications. These values can mostly be found at the inner surface of the phantom and cannot be measured directly due to the sensor offset in the probe. To extrapolate the surface values, the measurement distances to the surface must be known accurately. A distance error of 0.5mm could produce SAR errors of 6% at 1800 MHz. Using predefined locations for measurements is not accurate enough. Any shift of the phantom (e.g., slight deformations after filling it with liquid) would produce high uncertainties. For an automatic and accurate detection of the phantom surface, the DASY5 system uses the mechanical surface detection. The detection is always at touch, but the probe will move backward from the surface the indicated distance before starting the measurement.
- The „area scan“ measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The scan uses different grid spacings for different frequency measurements. Standard grid spacing for head measurements in frequency ranges ≤ 2 GHz is 15 mm in x - and y- dimension. For higher frequencies a finer resolution is needed, thus for the grid spacing is reduced according the following table:

Area scan grid spacing for different frequency ranges	
Frequency range	Grid spacing
≤ 2 GHz	≤ 15 mm
2 – 4 GHz	≤ 12 mm
4 – 6 GHz	≤ 10 mm

Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation. Results of this coarse scan are shown in annex B.

- A „zoom scan“ measures the field in a volume around the 2D peak SAR value acquired in the previous „coarse“ scan. It uses a fine meshed grid where the robot moves the probe in steps along all the 3 axis (x,y and z-axis) starting at the bottom of the Phantom. The grid spacing for the cube measurement is varied according to the measured frequency range, the dimensions are given in the following table:

Zoom scan grid spacing and volume for different frequency ranges			
Frequency range	Grid spacing for x, y axis	Grid spacing for z axis	Minimum zoom scan volume
≤ 2 GHz	≤ 8 mm	≤ 5 mm	≥ 30 mm
2 – 3 GHz	≤ 5 mm	≤ 5 mm	≥ 28 mm
3 – 4 GHz	≤ 5 mm	≤ 4 mm	≥ 28 mm
4 – 5 GHz	≤ 4 mm	≤ 3 mm	≥ 25 mm
5 – 6 GHz	≤ 4 mm	≤ 2 mm	≥ 22 mm

DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in annex B. Test results relevant for the specified standard (see section 3) are shown in table form in section 7.

Spatial Peak SAR Evaluation

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of all points in the three directions x, y and z. The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 1 to 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

SAM PHANTOM

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. (see Fig. 2.6)

Phantom Specification

Phantom: SAM Twin Phantom (V4.0)
Shell Material: Vivac Composite
Thickness: 2.0 ± 0.2 mm



Figure 2.6 SAM Twin Phantom

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0 the Mounting Device (see Fig. 2.7), enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately, and repeat ably be positioned according to the FCC, CENELEC, IEC and IEEE specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).



Figure 2.7 Mounting Device

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce infinite number of configurations. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

3. Probe and Dipole Calibration

See Appendix D and E.

4. Phantom & Simulating Tissue Specifications

Head Simulating Mixture Characterization

The head mixture consists of the material based on the table listed below. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue.

Table 4.1 Typical Composition of Ingredients for Tissue

Ingredients		Simulating Tissue	
		900 MHz Head	1900 MHz Head
Mixing Percentage			
Water		Proprietary Purchased From Speag	
Sugar			
Salt			
HEC			
Bactericide			
DGBE			
Dielectric Constant	Target	41.50	40.00
Conductivity (S/m)	Target	0.97	1.40

5. ANSI/IEEE C95.1 – 1992 RF Exposure Limits [2]

Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 5.1 Human Exposure Limits

	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIROMENT Professional Population (W/kg) or (mW/g)
SPATIAL PEAK SAR ¹ Head	2.00	10.00
SPATIAL AVERAGE SAR ² Whole Body	0.08	0.40
SPATIAL PEAK SAR ³ Hands, Feet, Ankles, Wrists	4.00	20.00

¹ The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

² The Spatial Average value of the SAR averaged over the whole body.

³ The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

6. Measurement Uncertainty

Exposure Assessment Measurement Uncertainty

Relative DASY5 Uncertainty Budget for SAR Tests								
According to IEC62209-2/2010 (30 MHz - 6 GHz range)								
Error Description	Uncertainty Value	Probability Distribution	Divisor	c _i	c _i	Standard Uncertainty		v _i ² or
				(1g)	(10g)	± %, (1g)	± %, (10g)	v _{eff}
Measurement System								
Probe calibration	± 6.6%	Normal	1	1	1	± 6.6%	± 6.6%	∞
Axial isotropy	± 4.7%	Rectangular	√3	0.7	0.7	± 1.9%	± 1.9%	∞
Hemispherical isotropy	± 9.6%	Rectangular	√3	0.7	0.7	± 3.9%	± 3.9%	∞
Boundary effects	± 2.0%	Rectangular	√3	1	1	± 1.2%	± 1.2%	∞
Probe linearity	± 4.7%	Rectangular	√3	1	1	± 2.7%	± 2.7%	∞
System detection limits	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%	∞
Modulation response	± 2.4%	Rectangular	√3	1	1	± 1.4%	± 1.4%	∞
Readout electronics	± 0.3%	Normal	1	1	1	± 0.3%	± 0.3%	∞
Response time	± 0.8%	Rectangular	√3	1	1	± 0.5%	± 0.5%	∞
Integration time	± 2.6%	Rectangular	√3	1	1	± 1.5%	± 1.5%	∞
RF ambient noise	± 3.0%	Rectangular	√3	1	1	± 1.7%	± 1.7%	∞
RF ambient reflections	± 3.0%	Rectangular	√3	1	1	± 1.7%	± 1.7%	∞
Probe positioner	± 0.8%	Rectangular	√3	1	1	± 0.5%	± 0.5%	∞
Probe positioning	± 6.7%	Rectangular	√3	1	1	± 3.9%	± 3.9%	∞
Post-processing	± 4.0%	Rectangular	√3	1	1	± 2.3%	± 2.3%	∞
Test Sample Related								
Device positioning	± 2.9%	Normal	1	1	1	± 2.9%	± 2.9%	145
Device holder uncertainty	± 3.6%	Normal	1	1	1	± 3.6%	± 3.6%	5
Power drift	± 5.0%	Rectangular	√3	1	1	± 2.9%	± 2.9%	∞
Phantom and Setup								
Phantom uncertainty	± 7.9%	Rectangular	√3	1	1	± 4.6%	± 4.6%	∞
SAR algorithm correction	± 1.9%	Normal	1	1	0.84	± 1.9%	± 1.9%	∞
Liquid conductivity (meas.)	± 5.0%	Rectangular	√3	0.78	0.71	± 0.1%	± 0.1%	∞
Liquid permittivity (meas.)	± 5.0%	Rectangular	√3	0.26	0.26	± 0.1%	± 0.1%	∞
Temp. Unc. – Conductivity	± 3.4%	Rectangular	√3	0.78	0.71	± 1.5%	± 1.5%	∞
Temp. Unc. – Permittivity	± 0.4%	Rectangular	√3	0.23	0.26	± 0.1%	± 0.1%	∞
Combined Uncertainty						± 12.4%	± 12.3%	330
Expanded Std. Uncertainty						± 24.8%	± 24.6%	

Worst case uncertainty budget for DASY5 assessed according to IEC62209-1528/2020 standard. The budget is valid for the frequency range 30 MHz – 6 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

7. System Validation

Tissue Verification

Table 7.1 Measured Tissue Parameters

		900 MHz Head		900 MHz Head		1900 MHz Head	
Date(s)		Oct. 6, 2025		Oct. 8, 2025		Oct. 9, 2025	
Liquid Temperature (°C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ϵ		41.50	41.34	41.50	40.86	40.00	39.65
Conductivity: σ		0.97	0.98	0.97	1.00	1.40	1.42

See Appendix A for data printout.

Test System Verification

Prior to assessment, the system is verified to the $\pm 10\%$ of the specifications at the test frequency by using the system kit. Power is normalized to 1 watt. (Graphic Plots Attached)

Table 7.2 System Dipole Validation Target & Measured

	Test Frequency	Targeted SAR _{1g} (W/kg)	Measure SAR _{1g} (W/kg)	Tissue Used for Verification	Deviation (%)	Plot Number
06-Oct-2025	900 MHz	11.00	11.50	Head	+ 4.55	1
08-Oct-2025	900 MHz	11.00	11.70	Head	+ 6.36	2
09-Oct-2025	1900 MHz	40.60	40.70	Head	+ 0.25	3

See Appendix A for data plots.

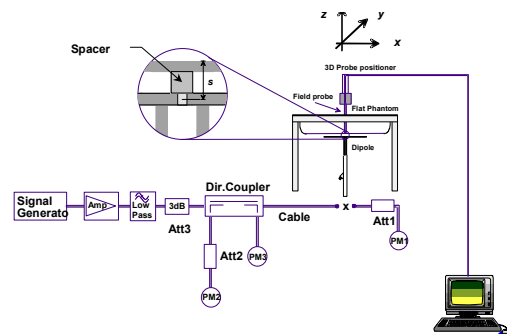


Figure 7.1 Dipole Validation Test Setup

8. SAR Test Data Summary

See Measurement Result Data Pages

See Appendix B for SAR Test Data Plots.

See Appendix C for SAR Test Setup Photos.

Procedures Used To Establish Test Signal

The device was either placed into simulated transmit mode using the manufacturer's test codes or the actual transmission is activated through a base station simulator or similar equipment. See data pages for actual procedure used in measurement.

Device Test Condition

The conducted power measurements were not performed in order to maintain the integrity of the phone. The nominal setting programmed into the phone's firmware was used for the testing.

All testing was conducted based on the test plan agreed upon by the client.

9. FCC 2G/3G Measurement Procedures

Power measurements were performed using a base station simulator under average power.

9.1 Procedures Used to Establish RF Signal for SAR

The device was placed into a simulated call using a base station simulator in a screen room. Such test signals offer a consistent means for testing SAR and recommended for evaluating SAR. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5% occurred, the tests were repeated.

9.2 SAR Measurement Conditions for WCDMA/HSDPA/HSUPA

Configure the call box MT8820C to support all WCDMA tests in respect to the 3GPP 34.121 (listed in Table below). Measure the power at Ch4132, 4182 and 4233 for US cell; Ch9262, 9400 and 9538 for US PCS band.

For Rel99

- Set a Test Mode 1 loop back with a 12.2kbps Reference Measurement Channel (RMC).
- Set and send continuously Up power control commands to the device

For HSDPA Rel 6

- Establish a Test Mode 1 loop back with both 1 12.2kbps RMC channel and a H-Set1 Fixed Reference Channel (FRC). With the 8960 this is accomplished by setting the signal Channel Coding to "Fixed Reference Channel" and configuring for HSET-1 QKSP.
- Set beta values and HSDPA settings for HSDPA Subtest1 according to Table below.
- Send continuously Up power control commands to the device
- Repeat the measurement for the HSDPA Subtest2, 3 and 4 as given in Table below.

For HSUPA Rel 6

- Use UL RMC 12.2kbps and FRC H-Set1 QPSK, Test Mode 1 loop back. With the 8960 this is accomplished by setting the signal Channel Coding to "E-DCH Test Channel" and configuring the equipment category to Cat5_10ms.
- Set the Absolute Grant for HSUPA Subtest1 according to Table below.
- Set the device power to be at least 5dB lower than the Maximum output power
- Send power control bits to give one TPC_cmd = +1 command to the device. If device doesn't send any E-DPCH data with decreased E-TFCI within 500ms, then repeat this process until the decreased E-TFCI is reported.
- Confirm that the E-TFCI transmitted by the device is equal to the target E-TFCI in Table below. If the E-TFCI transmitted by the device is not equal to the target E-TFCI, then send power control bits to give one TPC_cmd = -1 command to the UE. If UE sends any E-DPCH data with decreased E-TFCI within 500 ms, send new power control bits to give one TPC_cmd = -1 command to the UE. Then confirm that the E-TFCI transmitted by the UE is equal to the target E-TFCI in Table below.

9.3 SAR Measurement Conditions for GSM

Configure the MT8820C box to support GMSK and 8PSK call respectively, and set one timeslot and two timeslot transmission for GMSK GSM/GPRS and 8PSK EDGE.

9.4 SAR Measurement Conditions for AMPS

Configure the E5515 box to support IS136 AMPS call, and set the channel to the required channel for test.

9.5 SAR Measurement Conditions for CDMA

The 1xRTT testing was conducted in RC3 with the device configured using TDSO/SO32 with FCH transmitting at full rate. The power control was set to "All Bits Up." 1xRTT did not require SAR testing due to the measured power being less than $\frac{1}{4}$ dB of Rev. 0.

The Rev. 0 testing was conducted with the Reverse Data Channel rate of 153.6 kbps. The Forward Traffic Channel data rate is set to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots. The power control was set to "All Bits Up." Other rates were not tested due to the conducted power measured was less than $\frac{1}{4}$ dB higher than 153.6 kbps.

The Rev. A Subtype 2 testing was conducted with the Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots. The Forward Traffic Channel data rate is set to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots. The power control was set to "All Bits Up." Rev. A did not require SAR testing due to the measured power being less than $\frac{1}{4}$ dB of Rev. 0.

Plot No.	Band	Modulation	Phone Model	Position	Gap (mm)	Ch.	Freq. (MHz)	Measured 1g SAR (W/kg)
	Band 2	GSM	Motorola V300	Head	0mm	661	1880.0	0.872
	Band 2	GSM			2mm	661	1880.0	0.639
	Band 2	GSM			5mm	661	1880.0	0.463
	Band 2	GPRS		Body	0mm	661	1880.0	1.49
	Band 2	GPRS			2mm	661	1880.0	1.08
	Band 2	GPRS			5mm	661	1880.0	0.634
	Band 5	GSM	Sharp Sidekick	Head	0mm	128	842.2	1.02
	Band 5	GSM			2mm	128	842.2	0.729
	Band 5	GSM			5mm	128	842.2	0.511
	Band 5	GPRS		Body	0mm	128	842.2	1.56
	Band 5	GPRS			2mm	128	842.2	1.17
	Band 5	GPRS			5mm	128	842.2	0.831
	Band 2	WCDMA	Samsung Galaxy S	Head	0mm	9262	1852.4	0.546
	Band 2	WCDMA			2mm	9262	1852.4	0.478
	Band 2	WCDMA			5mm	9262	1852.4	0.311
1	Band 2	WCDMA		Body	0mm	9262	1852.4	3.60
2	Band 2	WCDMA			2mm	9262	1852.4	2.31
3	Band 2	WCDMA			5mm	9262	1852.4	1.65
	Band 5	AMPS	Nokia 5165	Head	0mm	384	836.04	1.46
	Band 5	AMPS			2mm	384	836.04	1.29
	Band 5	AMPS			5mm	384	836.04	0.754
4	Band 5	AMPS		Body	0mm	384	836.04	4.58
5	Band 5	AMPS			2mm	384	836.04	3.07
6	Band 5	AMPS			5mm	384	836.04	2.15
	Band 5	GSM	Nokia 3390	Head	0mm	190	836.6	1.26
	Band 5	GSM			2mm	190	836.6	1.03
	Band 5	GSM			5mm	190	836.6	0.769
7	Band 5	GPRS		Body	0mm	190	836.6	1.61
	Band 5	GPRS			2mm	190	836.6	1.32
	Band 5	GPRS			5mm	190	836.6	1.10

Plot No.	Band	Modulation	Phone Model	Position	Gap (mm)	Ch.	Freq. (MHz)	Measured 1g SAR (W/kg)
	Band 2	GSM	Nokia 3595	Head	0mm	661	1880.0	1.15
	Band 2	GSM			2mm	661	1880.0	0.946
	Band 2	GSM			5mm	661	1880.0	0.587
	Band 2	GPRS		Body	0mm	661	1880.0	1.52
	Band 2	GPRS			2mm	661	1880.0	1.08
	Band 2	GPRS			5mm	661	1880.0	0.681
	Band 5	CDMA	Motorola MicroTAC	Head	0mm	384	836.5	1.55
	Band 5	CDMA			2mm	384	836.5	1.03
	Band 5	CDMA			5mm	384	836.5	0.697
8	Band 5	CDMA		Body	0mm	384	836.5	3.26
9	Band 5	CDMA			2mm	384	836.5	2.11
10	Band 5	CDMA			5mm	384	836.5	1.69
	Band 5	AMPS	Nokia 101	Head	0mm	384	836.04	0.987
	Band 5	AMPS			2mm	384	836.04	0.562
	Band 5	AMPS			5mm	384	836.04	0.327
11	Band 5	AMPS		Body	0mm	384	836.04	4.97
12	Band 5	AMPS			2mm	384	836.04	3.52
13	Band 5	AMPS			5mm	384	836.04	2.84
	Band 5	AMPS	Nokia 1000	Head	0mm	384	836.04	0.976
	Band 5	AMPS			2mm	384	836.04	0.502
	Band 5	AMPS			5mm	384	836.04	0.367
14	Band 5	AMPS		Body	0mm	384	836.04	5.25
15	Band 5	AMPS			2mm	384	836.04	3.79
16	Band 5	AMPS			5mm	384	836.04	3.01
	Band 5	CDMA	Motorola StarTAC	Head	0mm	384	836.5	1.53
	Band 5	CDMA			2mm	384	836.5	1.29
	Band 5	CDMA			5mm	384	836.5	0.995
17	Band 5	CDMA		Body	0mm	384	836.5	3.91
18	Band 5	CDMA			2mm	384	836.5	2.68
19	Band 5	CDMA			5mm	384	836.5	1.72

10. Test Equipment List

Table 10.1 Equipment Specifications

Type	Calibration Due Date	Calibration Done Date	Serial Number
Staubli Robot TX60L	N/A	N/A	F07/55M6A1/A/01
Measurement Controller CS8c	N/A	N/A	1012
SAM Phantom	N/A	N/A	1416
Device Holder	N/A	N/A	N/A
Data Acquisition Electronics 4	01/15/2026	01/15/2025	1321
SPEAG E-Field Probe EX3DV4	02/11/2026	02/11/2025	3662
Speag Validation Dipole D900V2	05/10/2026	05/10/2024	1d044
Speag Validation Dipole D1900V2	05/06/2026	05/06/2024	5d116
Agilent N1911A Power Meter	02/28/2026	02/28/2025	GB45100254
Agilent N1922A Power Sensor	02/28/2026	02/28/2025	MY45240464
Agilent (HP) 8596E Spectrum Analyzer	02/28/2026	02/28/2025	3826A01468
Agilent (HP) 83752A Synthesized Sweeper	02/28/2026	02/28/2025	3610A01048
Agilent (HP) 8753C Vector Network Analyzer	02/28/2026	02/28/2025	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	02/28/2026	02/28/2025	2904A00595
Copper Mountain R140 Vector Reflectometer	02/28/2026	02/28/2025	21390004
Anritsu MT8820C	N/A	N/A	6201176199
Agilent 778D Dual Directional Coupler	N/A	N/A	MY48220184
MiniCircuits BW-N20W5+ Fixed 20 dB Attenuator	N/A	N/A	N/A
MiniCircuits SPL-10.7+ Low Pass Filter	N/A	N/A	R8979513746
Apriel Dielectric Probe Assembly	N/A	N/A	0011
Head Equivalent Matter (900 MHz)	N/A	N/A	N/A
Head Equivalent Matter (1900 MHz)	N/A	N/A	N/A

11. Conclusion

These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body is a very complex phenomena that depends on the mass, shape, and size of the body; the orientation of the body with respect to the field vectors; and, the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

12. References

- [1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation, August 1996
- [2] ANSI/IEEE C95.1 – 1992, American National Standard Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300kHz to 100GHz, New York: IEEE, 1992.
- [3] ANSI/IEEE C95.3 – 2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, 2002.
- [4] IEEE Standard 1528 – 2013, IEEE Recommended Practice for Determining the Peak-Spatial Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques, June 2013.

Appendix A – System Validation Plots and Data

Test Result for UIM Dielectric Parameter

Mon 06/Oct/2025

Freq Frequency(GHz)

eH Limits for Head Epsilon

sH Limits for Head Sigma

Test_e Epsilon of UIM

Test_s Sigma of UIM

Freq	eH	sH	Test_e	Test_s
0.8000	41.68	0.90	41.52	0.89
0.8100	41.63	0.90	41.47	0.90
0.8200	41.58	0.90	41.41	0.91
0.8300	41.53	0.90	41.46	0.91
0.8360	41.512	0.906	40.962	0.936*
0.8365	41.511	0.907	40.961	0.937*
0.8366	41.51	0.907	40.96	0.937*
0.8400	41.50	0.91	41.43	0.92
0.8422	41.50	0.912	40.946	0.942*
0.8500	41.50	0.92	41.41	0.93
0.8600	41.50	0.93	41.39	0.94
0.8700	41.50	0.94	41.37	0.95
0.8800	41.50	0.95	41.36	0.96
0.8900	41.50	0.96	41.35	0.97
0.9000	41.50	0.97	41.34	0.98
0.9100	41.50	0.98	41.33	0.99
0.9200	41.49	0.98	41.32	0.99

* value interpolated

Test Result for UIM Dielectric Parameter

Wed 08/Oct/2025

Freq Frequency(GHz)

eH Limits for Head Epsilon

sH Limits for Head Sigma

Test_e Epsilon of UIM

Test_s Sigma of UIM

Freq	eH	sH	Test_e	Test_s
0.8000	41.68	0.90	41.04	0.91
0.8100	41.63	0.90	40.99	0.92
0.8200	41.58	0.90	40.93	0.93
0.8300	41.53	0.90	40.98	0.93
0.8360	41.512	0.906	40.962	0.936*
0.8365	41.511	0.907	40.961	0.937*
0.8366	41.51	0.907	40.96	0.937*
0.8400	41.50	0.91	40.95	0.94
0.8422	41.50	0.912	40.946	0.942*
0.8500	41.50	0.92	40.93	0.95
0.8600	41.50	0.93	40.91	0.96
0.8700	41.50	0.94	40.89	0.97
0.8800	41.50	0.95	40.88	0.98
0.8900	41.50	0.96	40.87	0.99
0.9000	41.50	0.97	40.86	1.00
0.9100	41.50	0.98	40.85	1.01
0.9200	41.49	0.98	40.84	1.01

* value interpolated

Test Result for UIM Dielectric Parameter

Thu 09/Oct/2025

Freq Frequency(GHz)

eH Limits for Head Epsilon

sH Limits for Head Sigma

Test_e Epsilon of UIM

Test_s Sigma of UIM

Freq	eH	sH	Test_e	Test_s
1.8500	40.00	1.40	39.75	1.40
1.8524	40.00	1.40	39.745	1.402*
1.8600	40.00	1.40	39.73	1.41
1.8700	40.00	1.40	39.71	1.41
1.8800	40.00	1.40	39.69	1.42
1.8900	40.00	1.40	39.67	1.42
1.9000	40.00	1.40	39.65	1.42
1.9100	40.00	1.40	39.63	1.43
1.9200	40.00	1.40	39.62	1.44
1.9300	40.00	1.40	39.60	1.44

* value interpolated

RF Exposure Lab

Plot 1

DUT: Dipole 900 MHz D900V2; Type: D900V2; Serial: D900V2 - SN:1d044

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: HSL900; Medium parameters used: $f = 900$ MHz; $\sigma = 0.98$ S/m; $\epsilon_r = 41.34$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/6/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065

Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

900 MHz Head/Verification/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.19 W/kg

900 MHz Head/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 31.568 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.43 W/kg

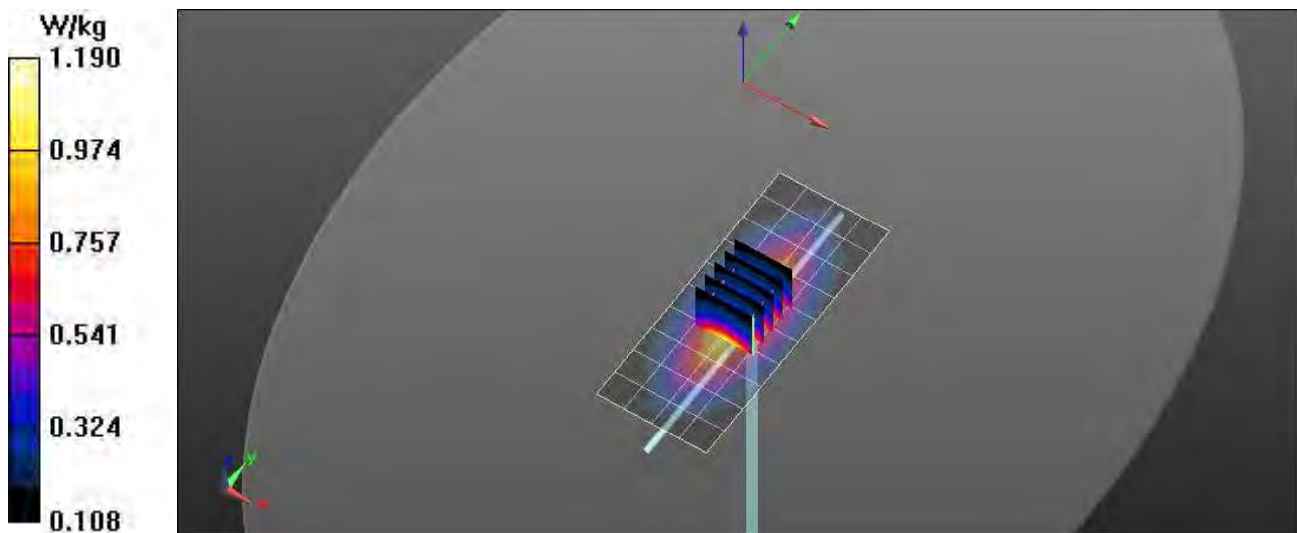
$P_{in} = 100$ mW

SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.712 W/kg

Smallest distance from peaks to all points 3 dB below = 10.2 mm

Ratio of SAR at M2 to SAR at M1 = 38.4%

Maximum value of SAR (measured) = 1.2 W/kg



RF Exposure Lab

Plot 2

DUT: Dipole 900 MHz D900V2; Type: D900V2; Serial: D900V2 - SN:1d044

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: HSL900; Medium parameters used: $f = 900$ MHz; $\sigma = 1$ S/m; $\epsilon_r = 40.86$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/8/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065

Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

900 MHz Head/Verification/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.22 W/kg

900 MHz Head/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 31.897 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 1.46 W/kg

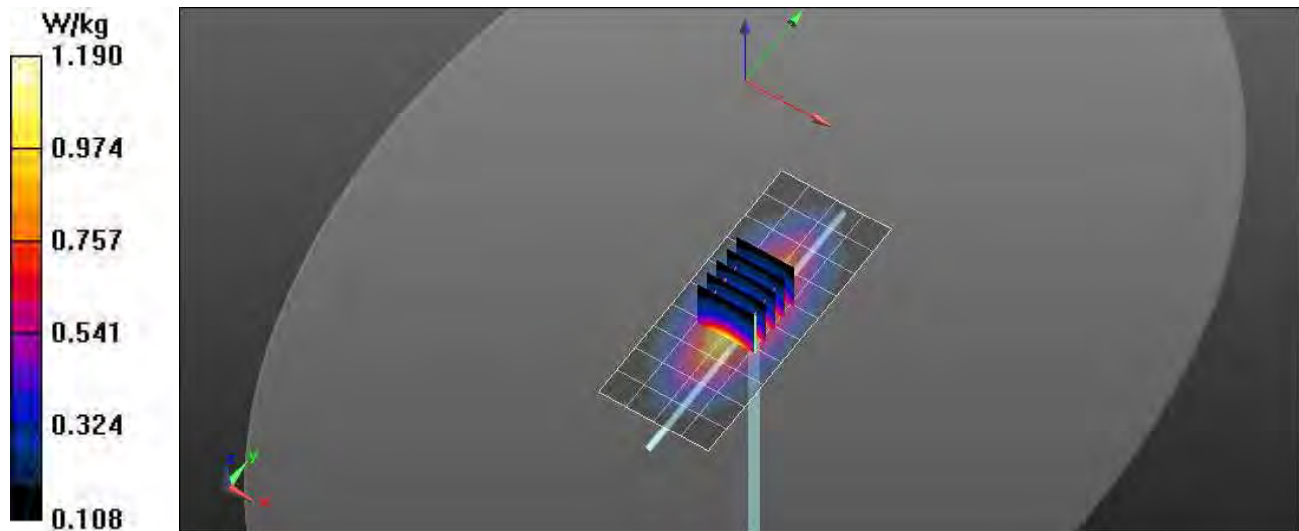
$P_{in} = 100$ mW

SAR(1 g) = 1.17 W/kg; SAR(10 g) = 0.715 W/kg

Smallest distance from peaks to all points 3 dB below = 11.9 mm

Ratio of SAR at M2 to SAR at M1 = 40.9%

Maximum value of SAR (measured) = 1.19 W/kg



RF Exposure Lab

Plot 3

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d116

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL1900; Medium parameters used: $f = 1900$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 39.65$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/9/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(7.28, 7.45, 6.36); Calibrated: 2/11/2025;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1065

Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

1900 MHz/Verification/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 5.52 W/kg

1900 MHz/Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 31.453 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 7.23 W/kg

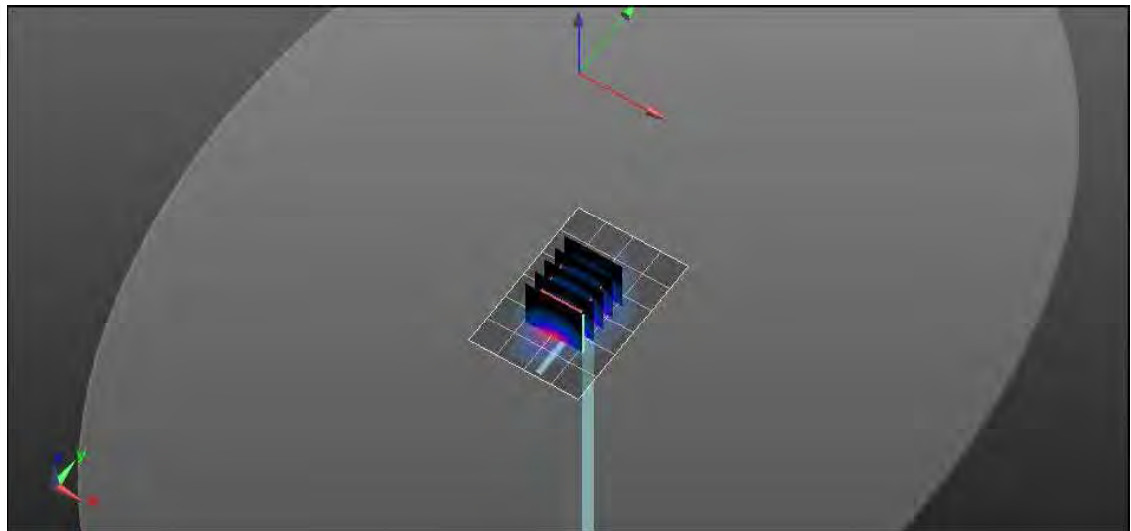
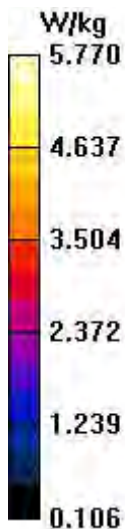
SAR(1 g) = 4.07 W/kg; SAR(10 g) = 2.13 W/kg

P_{IN} =100 mW

Smallest distance from peaks to all points 3 dB below = 9.7 mm

Ratio of SAR at M2 to SAR at M1 = 35.6%

Maximum value of SAR (measured) = 5.76 W/kg



Appendix B – SAR Test Data Plots

RF Exposure Lab

Plot 1

DUT: Samsung Galaxy S; Type: Cell Phone; Serial: N/A

Communication System: UMTS (WCDMA); Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: HSL1900; Medium parameters used (interpolated): $f = 1852.4$ MHz; $\sigma = 1.402$ S/m; $\epsilon_r = 39.745$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/10/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(7.28, 7.45, 6.36); Calibrated: 2/11/2025

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: SAM with CRP; Type: SAM; Serial: 1416

Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Samsung Galaxy S Body/0 mm Gap/Area Scan (6x12x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.69 W/kg

Samsung Galaxy S Body/0 mm Gap/Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.458 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 7.34 W/kg

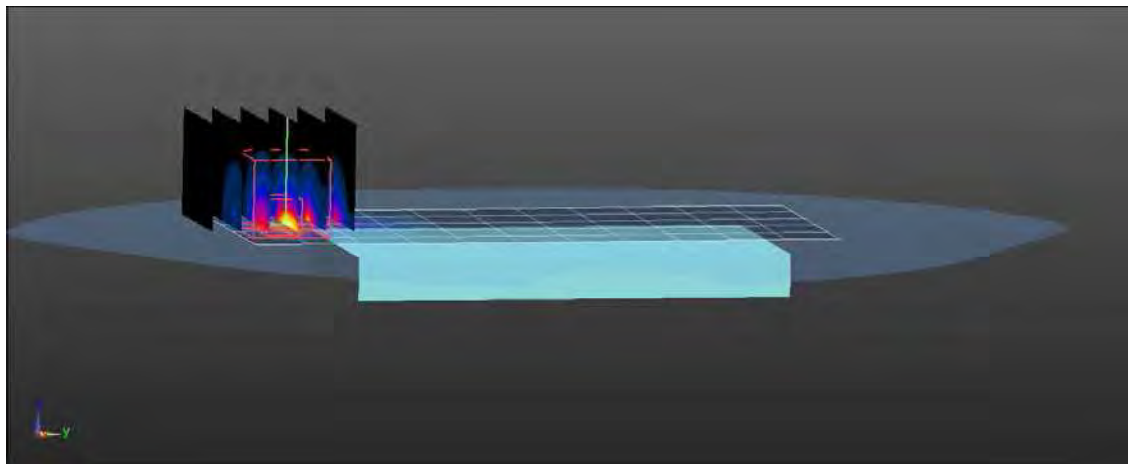
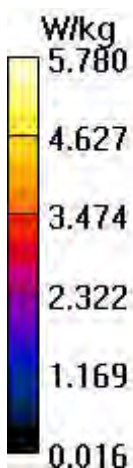
SAR(1 g) = 3.6 W/kg; SAR(10 g) = 1.63 W/kg

Smallest distance from peaks to all points 3 dB below = 9.8 mm

Ratio of SAR at M2 to SAR at M1 = 46.8%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 5.78 W/kg



RF Exposure Lab

Plot 2

DUT: Samsung Galaxy S; Type: Cell Phone; Serial: N/A

Communication System: UMTS (WCDMA); Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: HSL1900; Medium parameters used (interpolated): $f = 1852.4$ MHz; $\sigma = 1.402$ S/m; $\epsilon_r = 39.745$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/10/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(7.28, 7.45, 6.36); Calibrated: 2/11/2025

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: SAM with CRP; Type: SAM; Serial: 1416

Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Samsung Galaxy S Body/2 mm Gap/Area Scan (6x12x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.04 W/kg

Samsung Galaxy S Body/2 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.793 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 4.31 W/kg

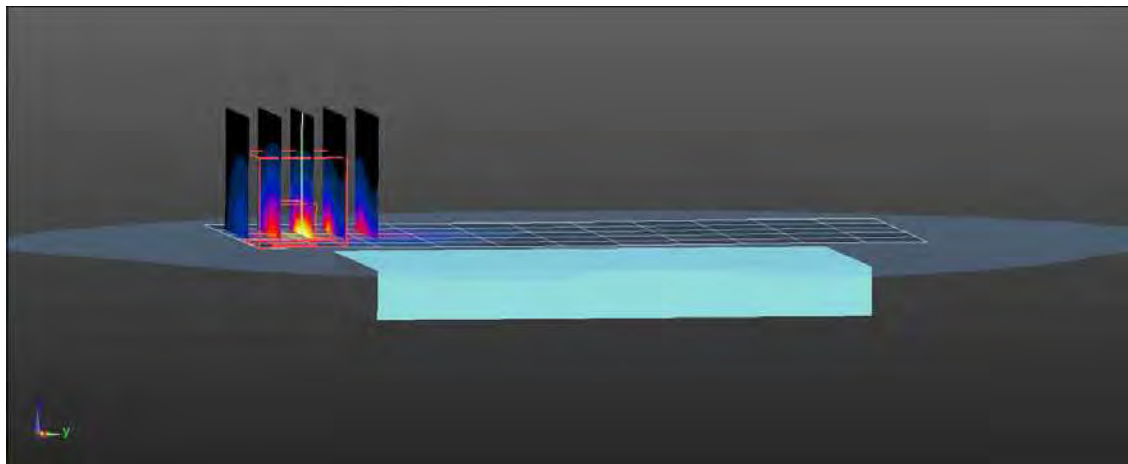
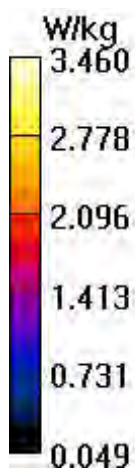
SAR(1 g) = 2.31 W/kg; SAR(10 g) = 1.12 W/kg

Smallest distance from peaks to all points 3 dB below = 9.6 mm

Ratio of SAR at M2 to SAR at M1 = 51.9%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.46 W/kg



RF Exposure Lab

Plot 3

DUT: Samsung Galaxy S; Type: Cell Phone; Serial: N/A

Communication System: UMTS (WCDMA); Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: HSL1900; Medium parameters used (interpolated): $f = 1852.4$ MHz; $\sigma = 1.402$ S/m; $\epsilon_r = 39.745$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/10/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 – SN3662; ConvF(7.28, 7.45, 6.36); Calibrated: 2/11/2025

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: SAM with CRP; Type: SAM; Serial: 1416

Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Samsung Galaxy S Body/5 mm Gap/Area Scan (5x12x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.18 W/kg

Samsung Galaxy S Body/5 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.407 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 2.89 W/kg

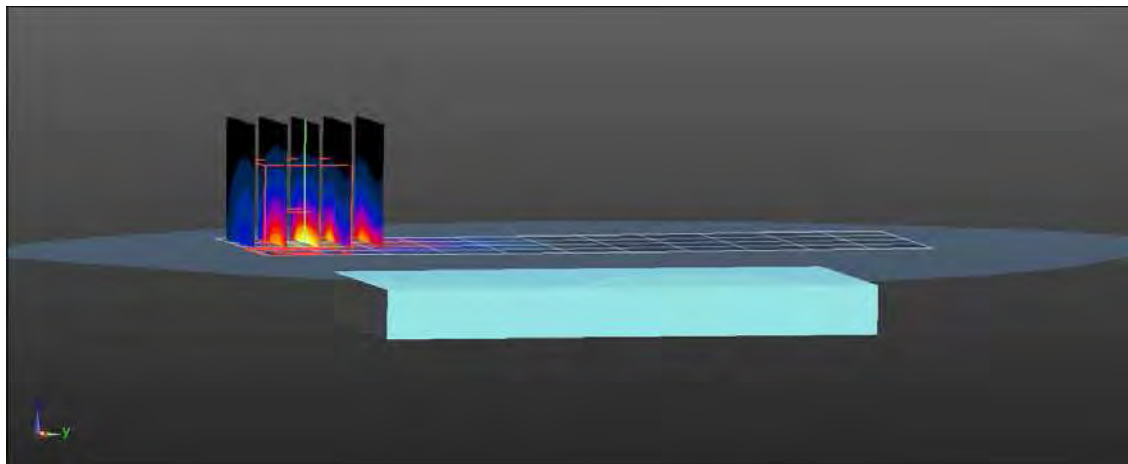
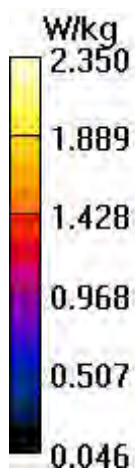
SAR(1 g) = 1.65 W/kg; SAR(10 g) = 0.850 W/kg

Smallest distance from peaks to all points 3 dB below = 10.2 mm

Ratio of SAR at M2 to SAR at M1 = 55.3%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.35 W/kg



RF Exposure Lab

Plot 4

DUT: Nokia 5165; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/6/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 5165 Body/0 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.42 W/kg

Nokia 5165 Body/0 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.52 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 6.17 W/kg

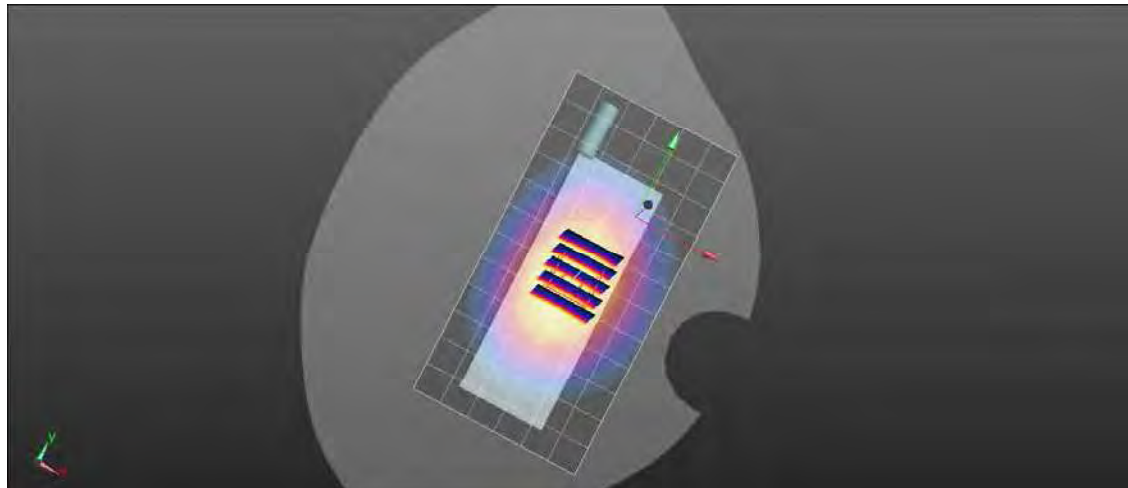
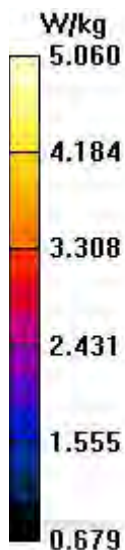
SAR(1 g) = 4.58 W/kg; SAR(10 g) = 3.17 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 79.5%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 5.06 W/kg



RF Exposure Lab

Plot 5

DUT: Nokia 5165; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1

Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/6/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: SAM with CRP; Type: SAM; Serial: 1416

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 5165 Body/2 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.28 W/kg

Nokia 5165 Body/2 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.59 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.89 W/kg

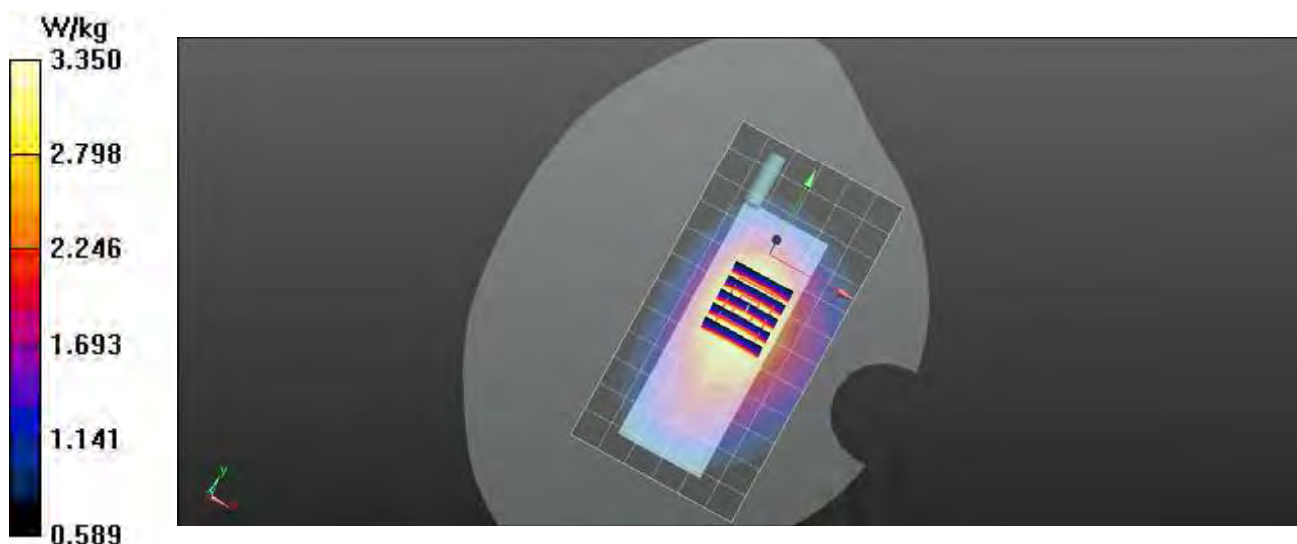
SAR(1 g) = 3.07 W/kg; SAR(10 g) = 2.26 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 79.3%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.35 W/kg



RF Exposure Lab

Plot 6

DUT: Nokia 5165; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1

Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/6/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: SAM with CRP; Type: SAM; Serial: 1416

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 5165 Body/5 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.34 W/kg

Nokia 5165 Body/5 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.57 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 3.05 W/kg

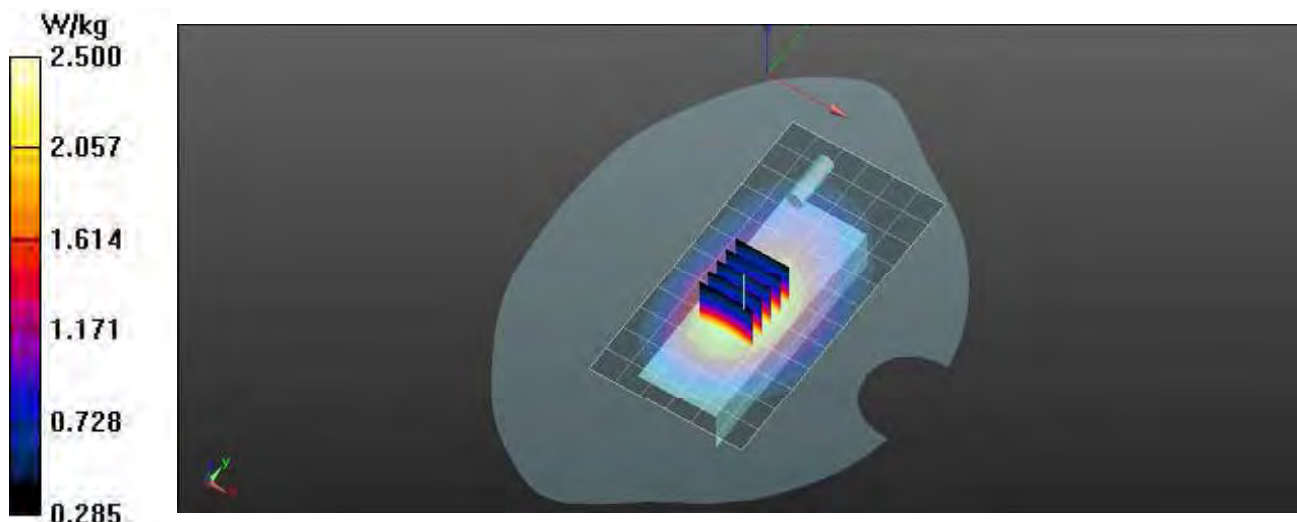
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.55 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 77.5%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.184 W/kg



RF Exposure Lab

Plot 7

DUT: Nokia 3390; Type: Cell Phone; Serial: N/A

Communication System: GPRS 2-Slot (GMSK); Frequency: 836.6 MHz; Duty Cycle: 1:4.00037
Medium: HSL835; Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.937$ S/m; $\epsilon_r = 40.96$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/7/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 3390 Body/0 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 1.81 W/kg

Nokia 3390 Body/0 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.68 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 2.47 W/kg

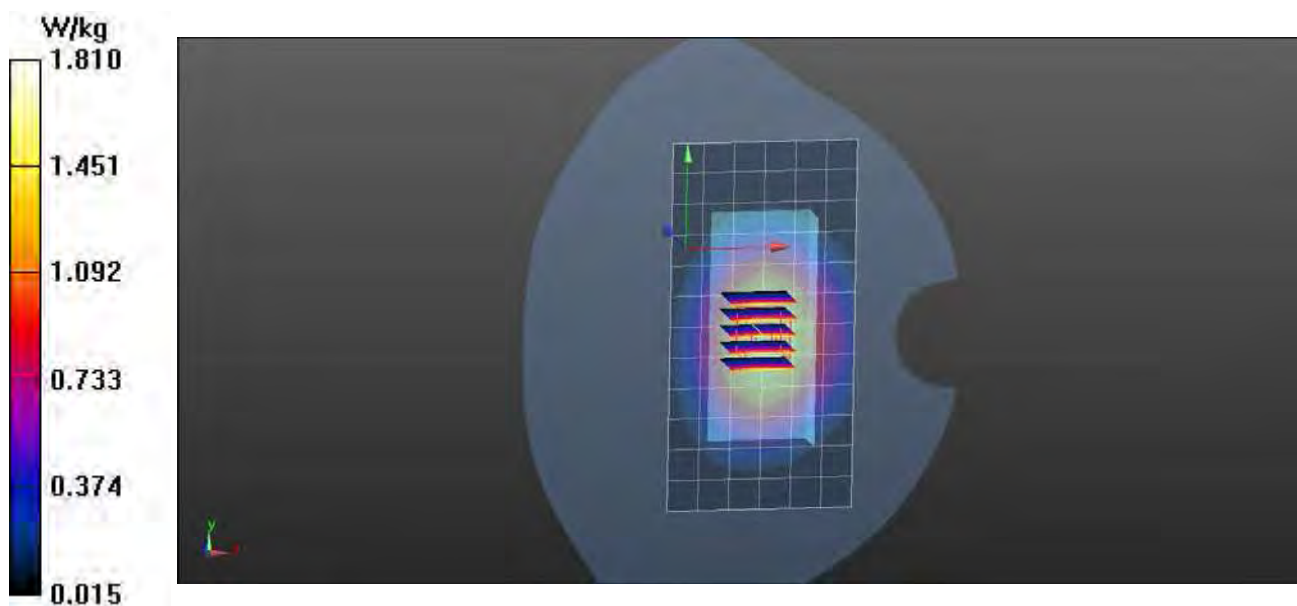
SAR(1 g) = 1.61 W/kg; SAR(10 g) = 1.23 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 80.2%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.83 W/kg



RF Exposure Lab

Plot 8

DUT: Motorola MicroTAC; Type: Cell Phone; Serial: N/A

Communication System: CDMA (1xRTT); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.937$ S/m; $\epsilon_r = 40.961$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/8/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Motorola MicroTAC Body/0 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.69 W/kg

Motorola MicroTAC Body/0 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.964 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 4.26 W/kg

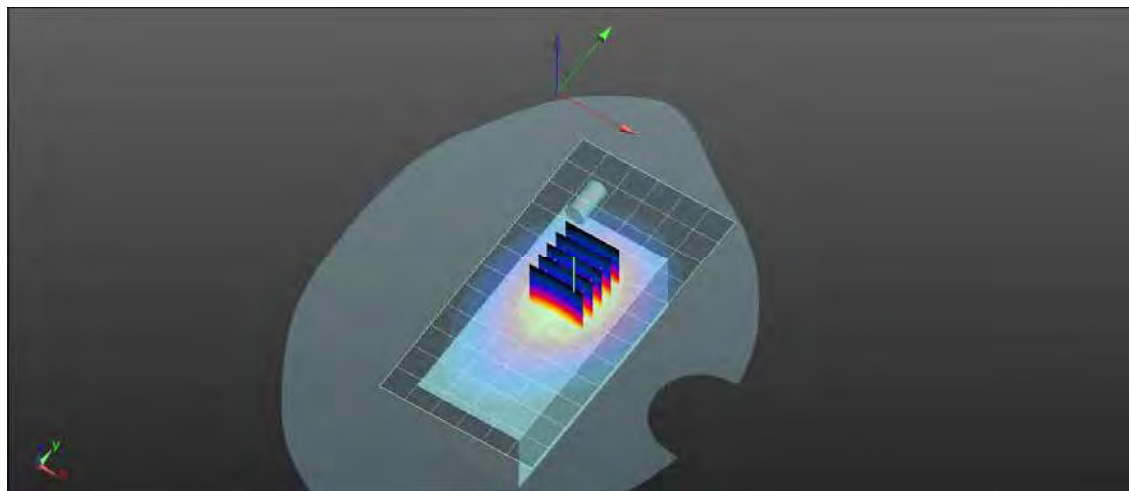
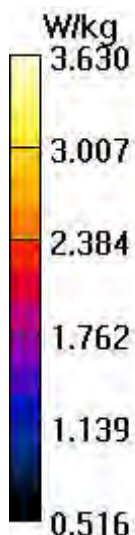
SAR(1 g) = 3.26 W/kg; SAR(10 g) = 2.39 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 79.5%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.63 W/kg



RF Exposure Lab

Plot 9

DUT: Motorola MicroTAC; Type: Cell Phone; Serial: N/A

Communication System: CDMA (1xRTT); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.937$ S/m; $\epsilon_r = 40.961$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/8/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Motorola MicroTAC Body/0 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.41 W/kg

Motorola MicroTAC Body/0 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.549 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 2.84 W/kg

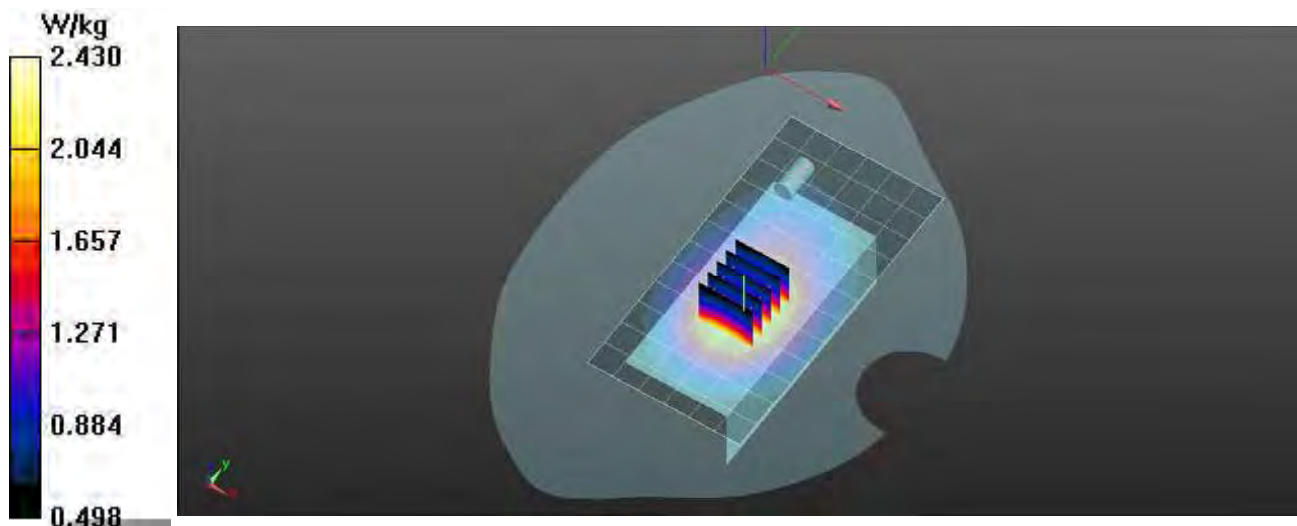
SAR(1 g) = 2.11 W/kg; SAR(10 g) = 1.56 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 78.4%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.43 W/kg



RF Exposure Lab

Plot 10

DUT: Motorola MicroTAC; Type: Cell Phone; Serial: N/A

Communication System: CDMA (1xRTT); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: HSL835; Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.937$ S/m; $\epsilon_r = 40.961$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/8/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: SAM with CRP; Type: SAM; Serial: 1416

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Motorola MicroTAC Body/0 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.03 W/kg

Motorola MicroTAC Body/0 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.544 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 2.42 W/kg

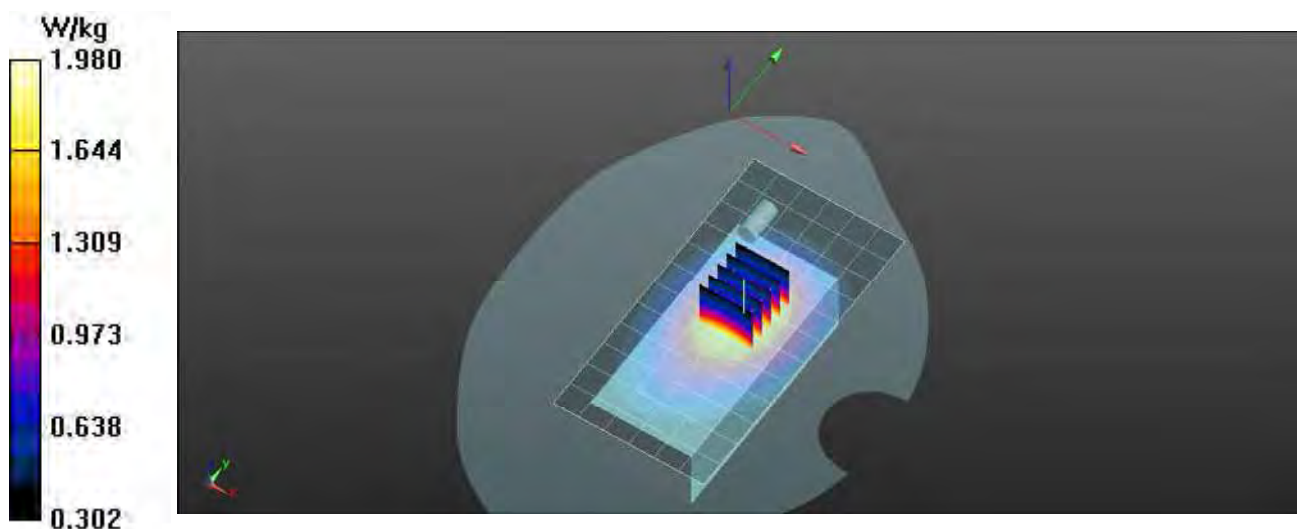
SAR(1 g) = 1.69 W/kg; SAR(10 g) = 1.3 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 78.9%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.98 W/kg



RF Exposure Lab

Plot 11

DUT: Nokia 101; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/8/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 101 Body/0 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 5.44 W/kg

Nokia 101 Body/0 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.96 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 6.20 W/kg

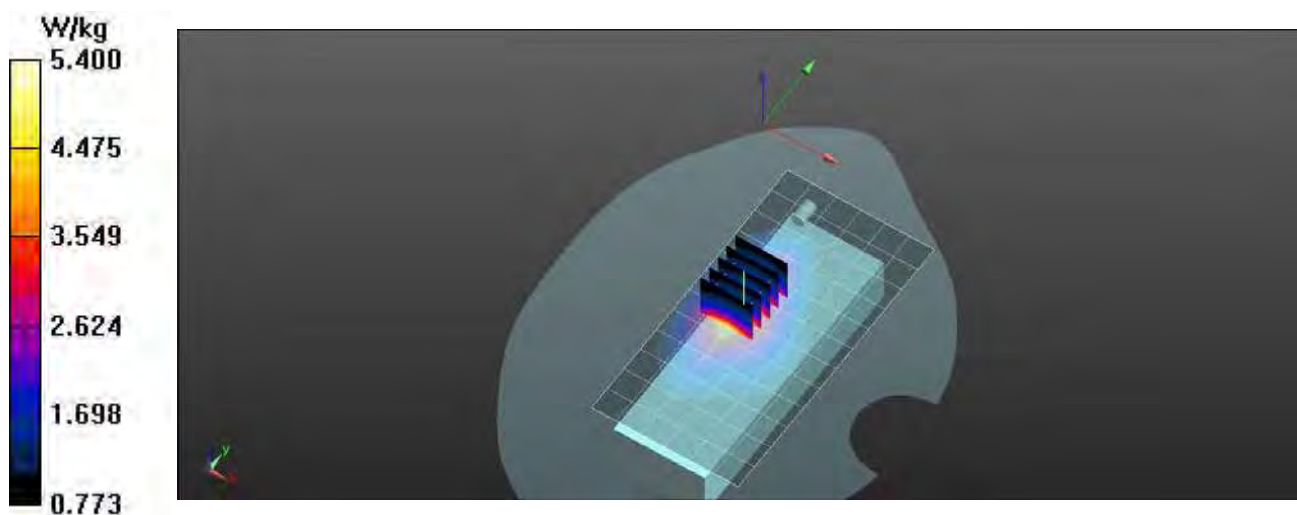
SAR(1 g) = 4.97 W/kg; SAR(10 g) = 3.27 W/kg

Smallest distance from peaks to all points 3 dB below = 15.8 mm

Ratio of SAR at M2 to SAR at M1 = 63.9%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 5.40 W/kg



RF Exposure Lab

Plot 12

DUT: Nokia 101; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/8/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 101 Body/2 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.40 W/kg

Nokia 101 Body/2 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.20 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 4.96 W/kg

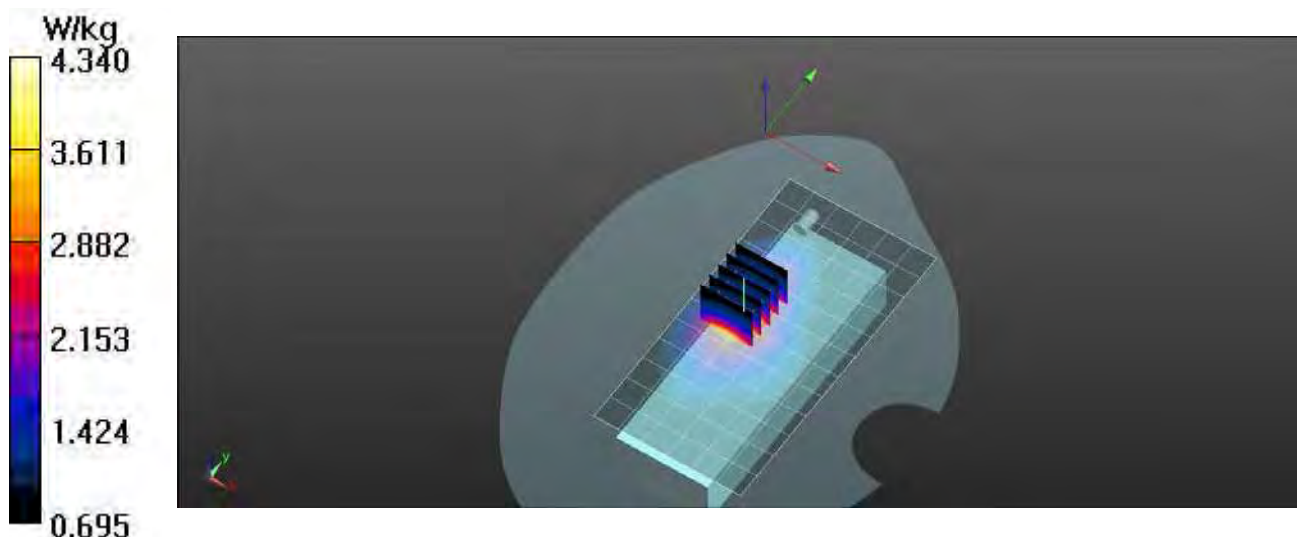
SAR(1 g) = 3.52 W/kg; SAR(10 g) = 2.71 W/kg

Smallest distance from peaks to all points 3 dB below = 15.8 mm

Ratio of SAR at M2 to SAR at M1 = 64.5%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.34 W/kg



RF Exposure Lab

Plot 13

DUT: Nokia 101; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/8/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 101 Body/5 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.14 W/kg

Nokia 101 Body/5 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.18 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 3.57 W/kg

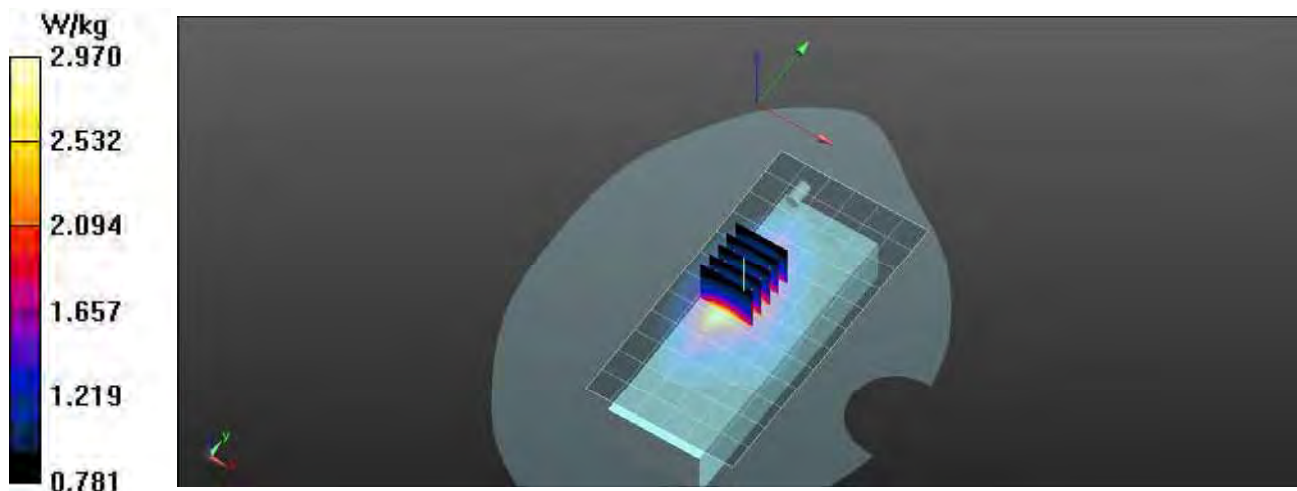
SAR(1 g) = 2.84 W/kg; SAR(10 g) = 2.26 W/kg

Smallest distance from peaks to all points 3 dB below = 14.4 mm

Ratio of SAR at M2 to SAR at M1 = 64.8%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.97 W/kg



RF Exposure Lab

Plot 14

DUT: Nokia 1000; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/9/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 1000 Body/0 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 6.88 W/kg

Nokia 1000 Body/0 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.45 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 7.71 W/kg

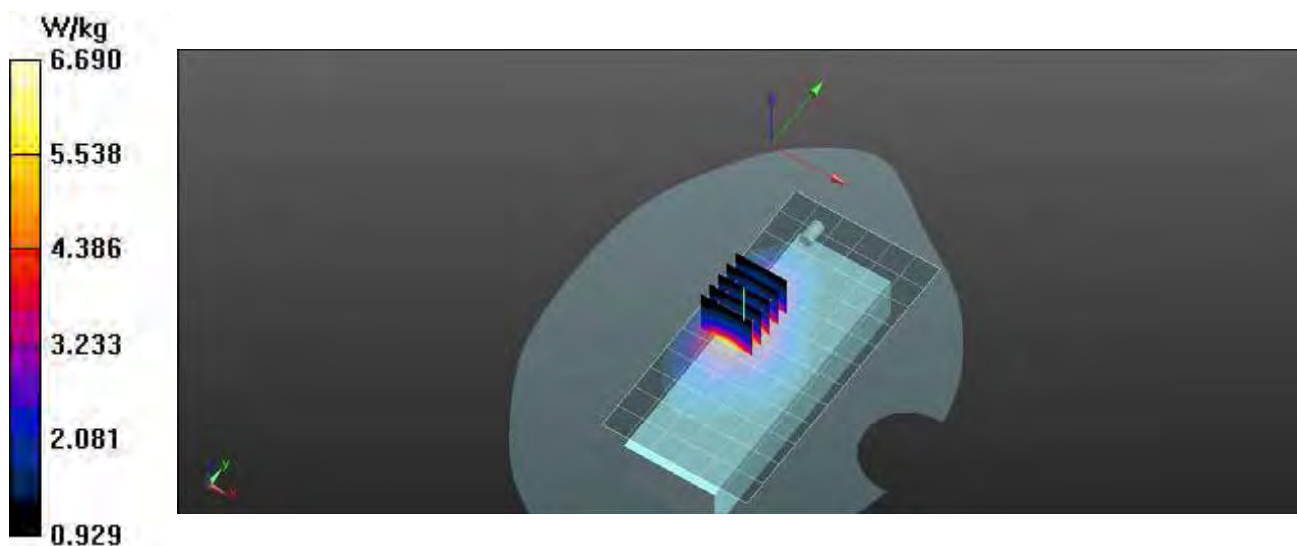
SAR(1 g) = 5.25 W/kg; SAR(10 g) = 4.05 W/kg

Smallest distance from peaks to all points 3 dB below = 14.8 mm

Ratio of SAR at M2 to SAR at M1 = 64.3%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 6.69 W/kg



RF Exposure Lab

Plot 15

DUT: Nokia 1000; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1

Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/9/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: SAM with CRP; Type: SAM; Serial: 1416

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 1000 Body/2 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.59 W/kg

Nokia 1000 Body/2 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.90 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 5.05 W/kg

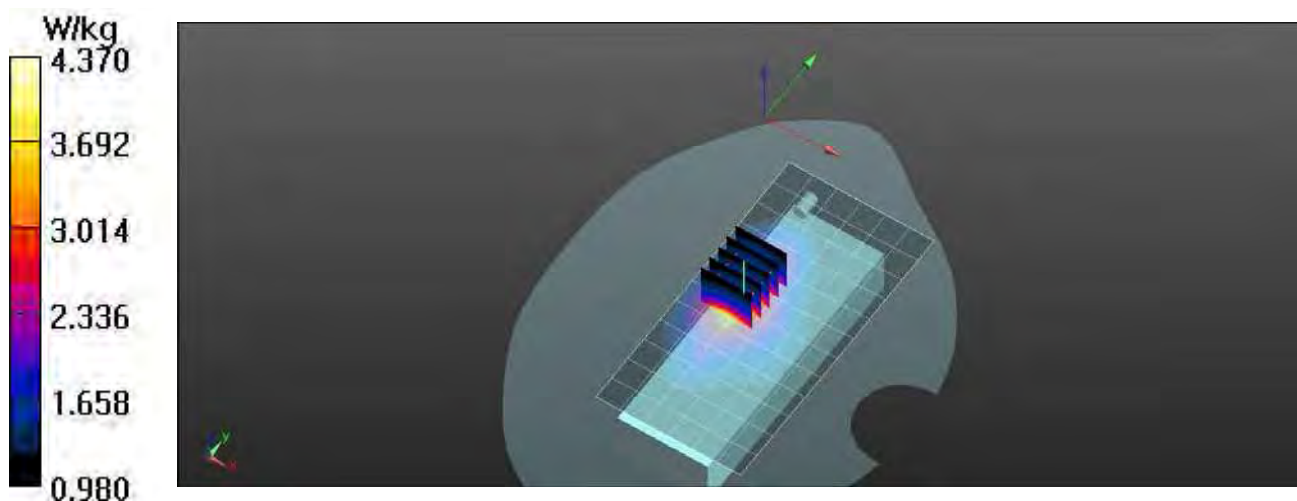
SAR(1 g) = 3.79 W/kg; SAR(10 g) = 2.86 W/kg

Smallest distance from peaks to all points 3 dB below = 15.2 mm

Ratio of SAR at M2 to SAR at M1 = 64.6%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.37 W/kg



RF Exposure Lab

Plot 16

DUT: Nokia 1000; Type: Cell Phone; Serial: N/A

Communication System: AMPS (FM); Frequency: 836.0 MHz; Duty Cycle: 1:1

Medium: HSL900; Medium parameters used (interpolated): $f = 836.0$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 40.962$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: Date: 10/9/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1321; Calibrated: 1/15/2025

Phantom: SAM with CRP; Type: SAM; Serial: 1416

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Nokia 1000 Body/5 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.78 W/kg

Nokia 1000 Body/5 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.28 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 4.35 W/kg

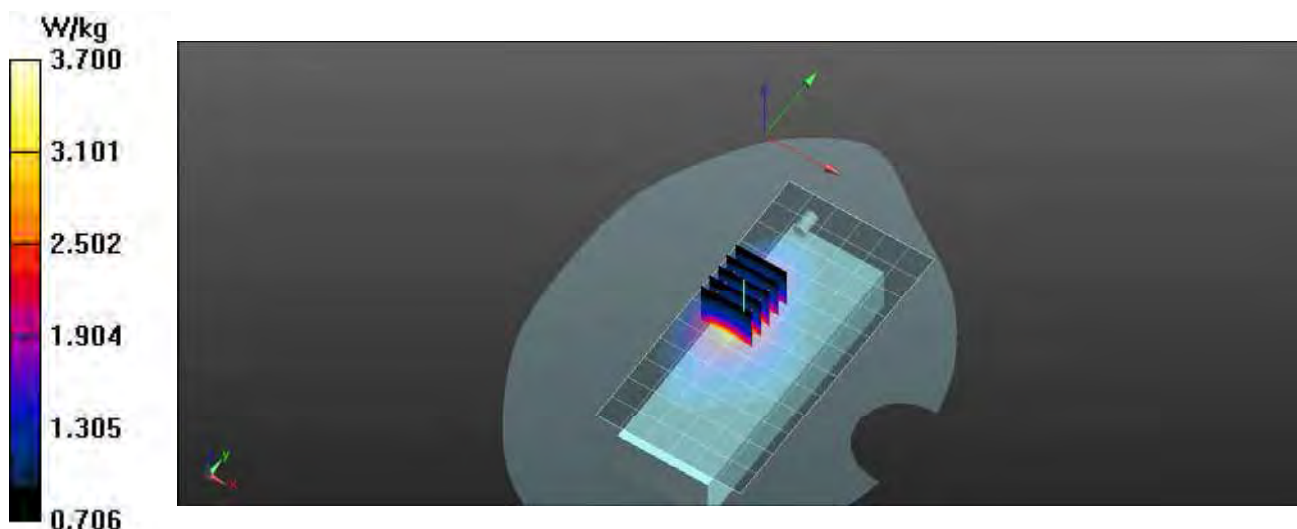
SAR(1 g) = 3.01 W/kg; SAR(10 g) = 2.32 W/kg

Smallest distance from peaks to all points 3 dB below = 14.4 mm

Ratio of SAR at M2 to SAR at M1 = 65%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 3.70 W/kg



RF Exposure Lab

Plot 17

DUT: Motorola StarTAC; Type: Cell Phone; Serial: N/A

Communication System: CDMA (1xRTT); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.937$ S/m; $\epsilon_r = 40.961$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/9/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Motorola StarTAC Body/0 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.64 W/kg

Motorola StarTAC Body/0 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.667 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 5.78 W/kg

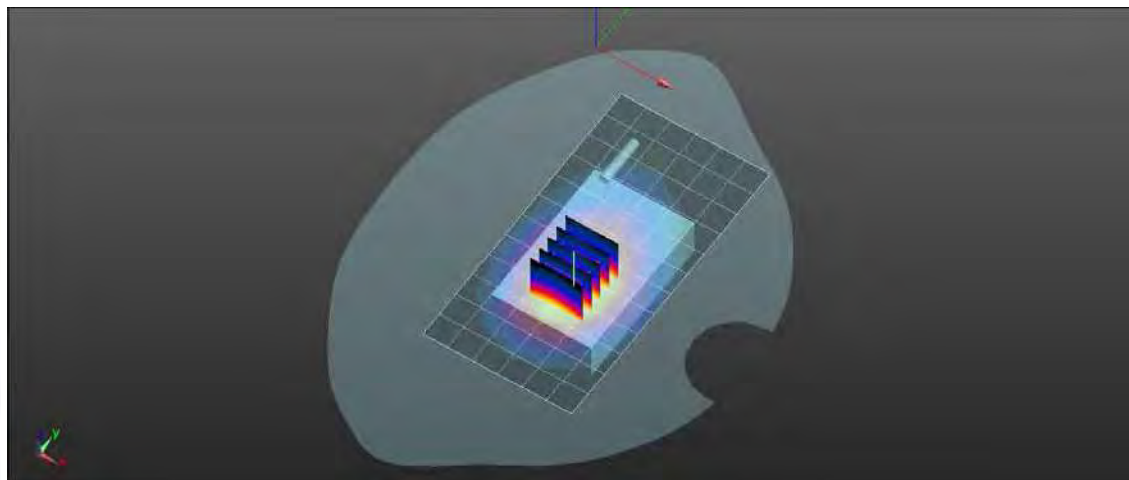
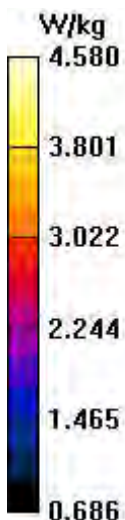
SAR(1 g) = 3.91 W/kg; SAR(10 g) = 2.98 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 78.5%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.58 W/kg



RF Exposure Lab

Plot 18

DUT: Motorola StarTAC; Type: Cell Phone; Serial: N/A

Communication System: CDMA (1xRTT); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.937$ S/m; $\epsilon_r = 40.961$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/9/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Motorola StarTAC Body/2 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.76 W/kg

Motorola StarTAC Body/2 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.815 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 3.19 W/kg

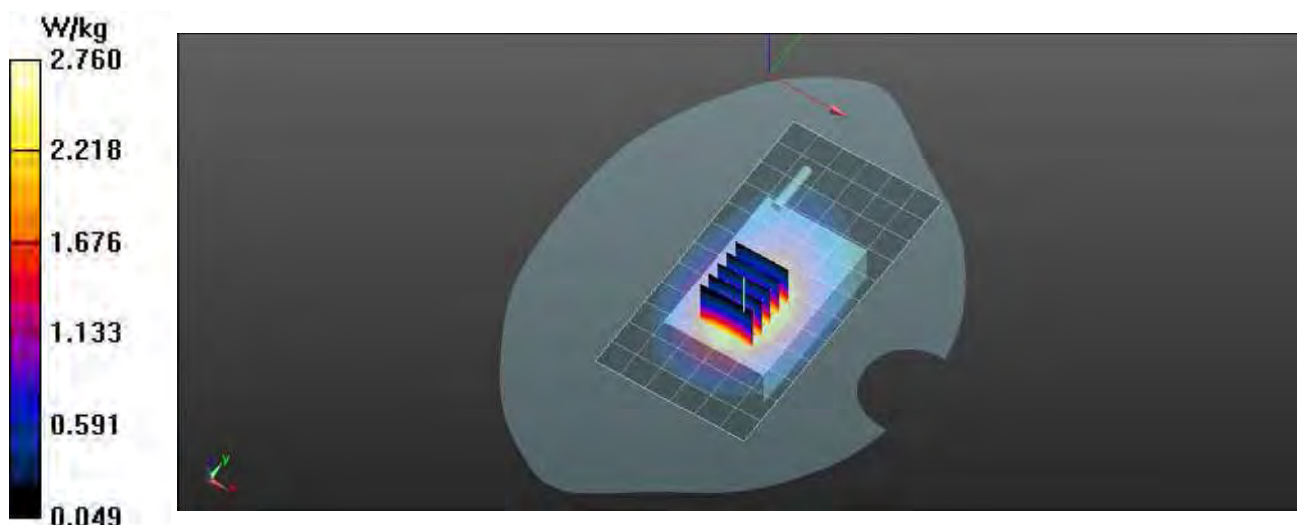
SAR(1 g) = 2.68 W/kg; SAR(10 g) = 1.76 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 78.7%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.67 W/kg



RF Exposure Lab

Plot 19

DUT: Motorola StarTAC; Type: Cell Phone; Serial: N/A

Communication System: CDMA (1xRTT); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: HSL900; Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.937$ S/m; $\epsilon_r = 40.961$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Test Date: Date: 10/9/2025; Ambient Temp: 23 °C; Tissue Temp: 21 °C

Probe: EX3DV4 - SN3662; ConvF(8.35, 8.54, 7.29); Calibrated: 2/11/2025
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1321; Calibrated: 1/15/2025
Phantom: SAM with CRP; Type: SAM; Serial: 1416
Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Procedure Notes:

Motorola StarTAC Body/5 mm Gap/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.04 W/kg

Motorola StarTAC Body/5 mm Gap/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.746 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 2.34 W/kg

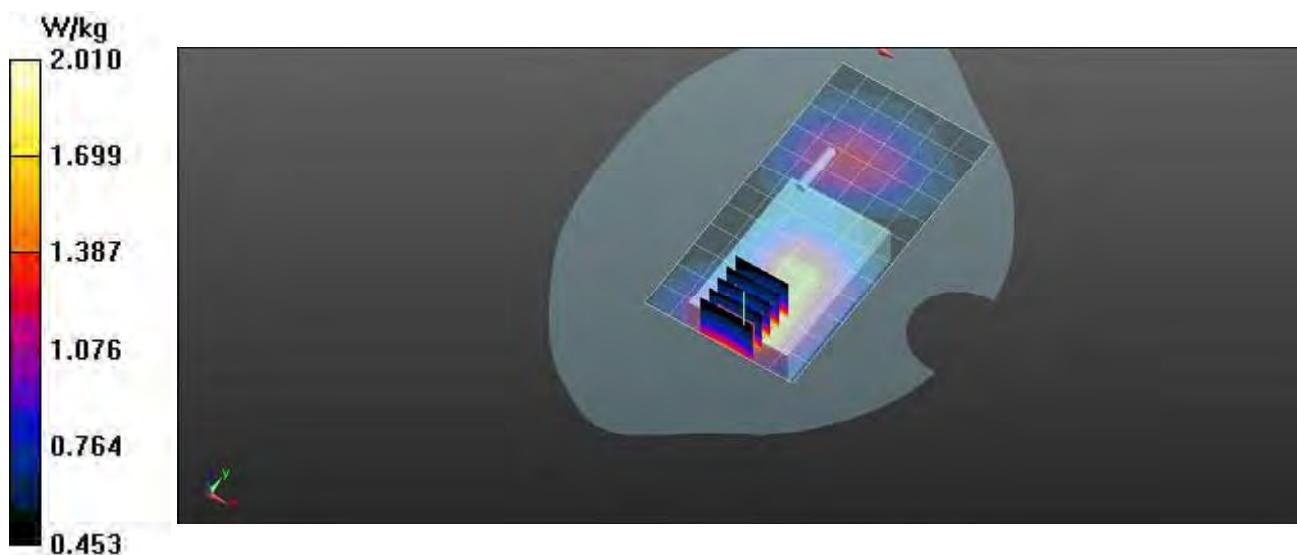
SAR(1 g) = 1.72 W/kg; SAR(10 g) = 1.43 W/kg

Smallest distance from peaks to all points 3 dB below = 20.4 mm

Ratio of SAR at M2 to SAR at M1 = 68.9%

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.01 W/kg



Appendix C – Test Setup Photos



Motorola V300 Right Touch Configuration 0 mm Gap



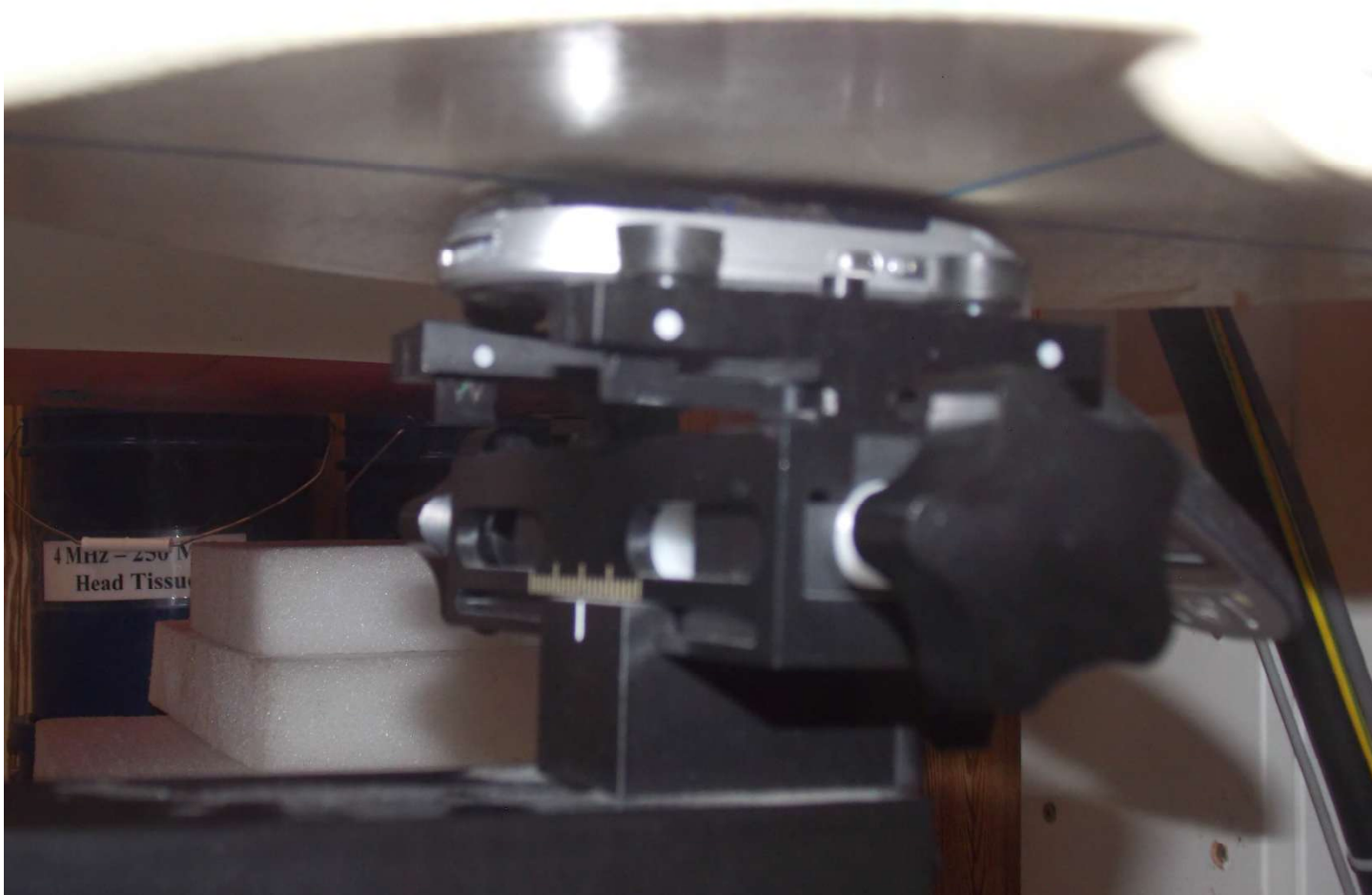
Motorola V300 Right Touch Configuration 2 mm Gap



Motorola V300 Right Touch Configuration 5 mm Gap



Motorola V300 Body 0 mm Gap



Motorola V300 Body 2 mm Gap



Motorola V300 Body 5 mm Gap



Front of Device



Back of Device



Sharp Sidekick Right Touch Configuration 0 mm Gap



Sharp Sidekick Right Touch Configuration 2 mm Gap



Sharp Sidekick Right Touch Configuration 5 mm Gap



Sharp Sidekick Body 0 mm Gap



Sharp Sidekick Body 2 mm Gap



Sharp Sidekick Body 5 mm Gap



Front of Device



Back of Device



Samsung Galaxy S Right Touch Configuration 0 mm Gap



Samsung galaxy S Right Touch Configuration 2 mm Gap



Samsung Galaxy S Right Touch Configuration 5 mm Gap



Samsung Galaxy S Body 0 mm Gap



Samsung Galaxy S Body 2 mm Gap



Samsung Galaxy S Body 5 mm Gap



Front of Device



Back of Device



Nokia 5165 Right Touch Configuration 0 mm Gap



Nokia 5165 Right Touch Configuration 2 mm Gap



Nokia 5165 Right Touch Configuration 5 mm Gap



Nokia 5165 Body 0 mm Gap



Nokia 5165 Body 2 mm Gap



Nokia 5165 Body 5 mm Gap



Front of Device



Back of Device



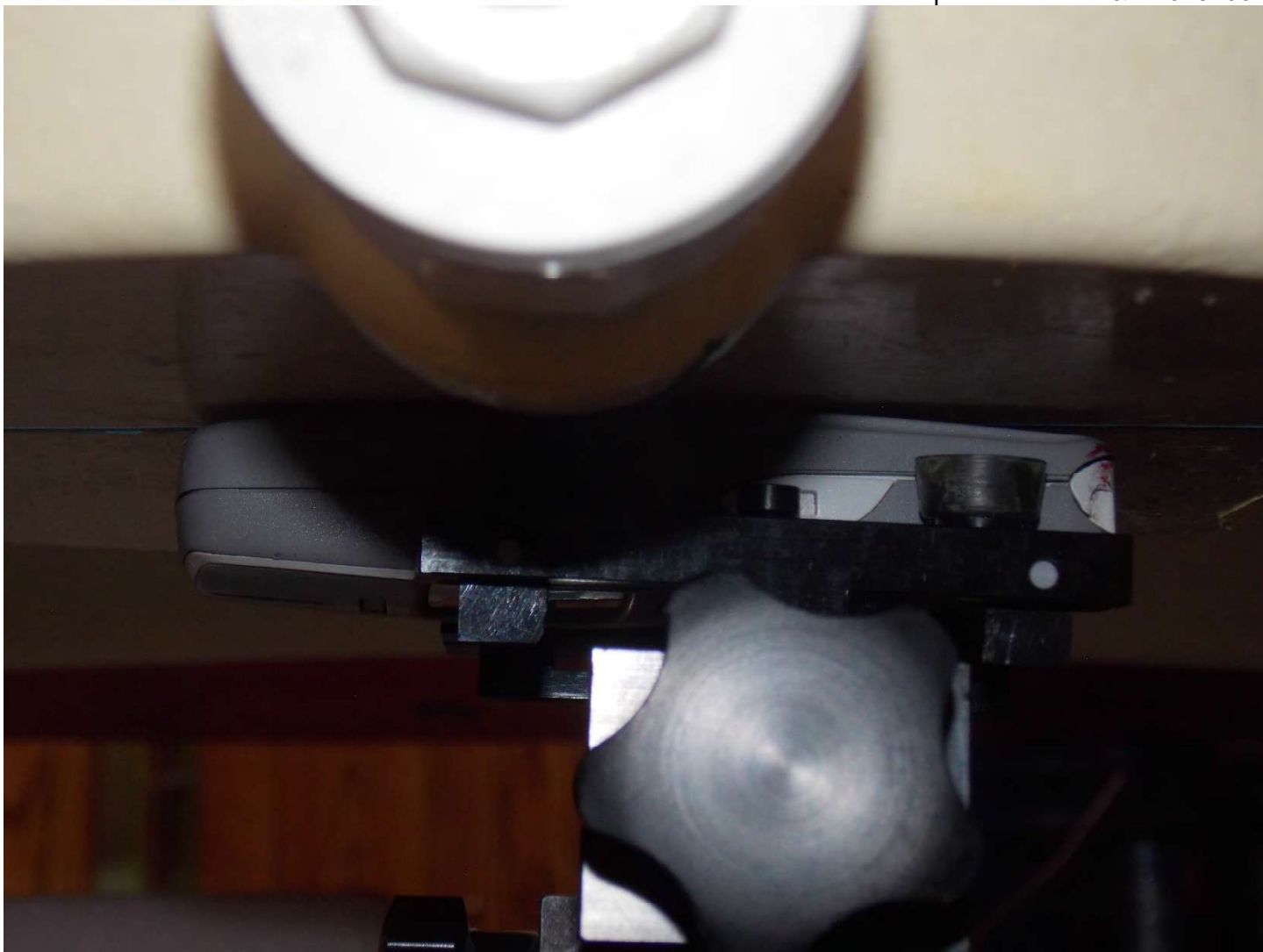
Nokia 3390 Right Touch Configuration 0 mm Gap



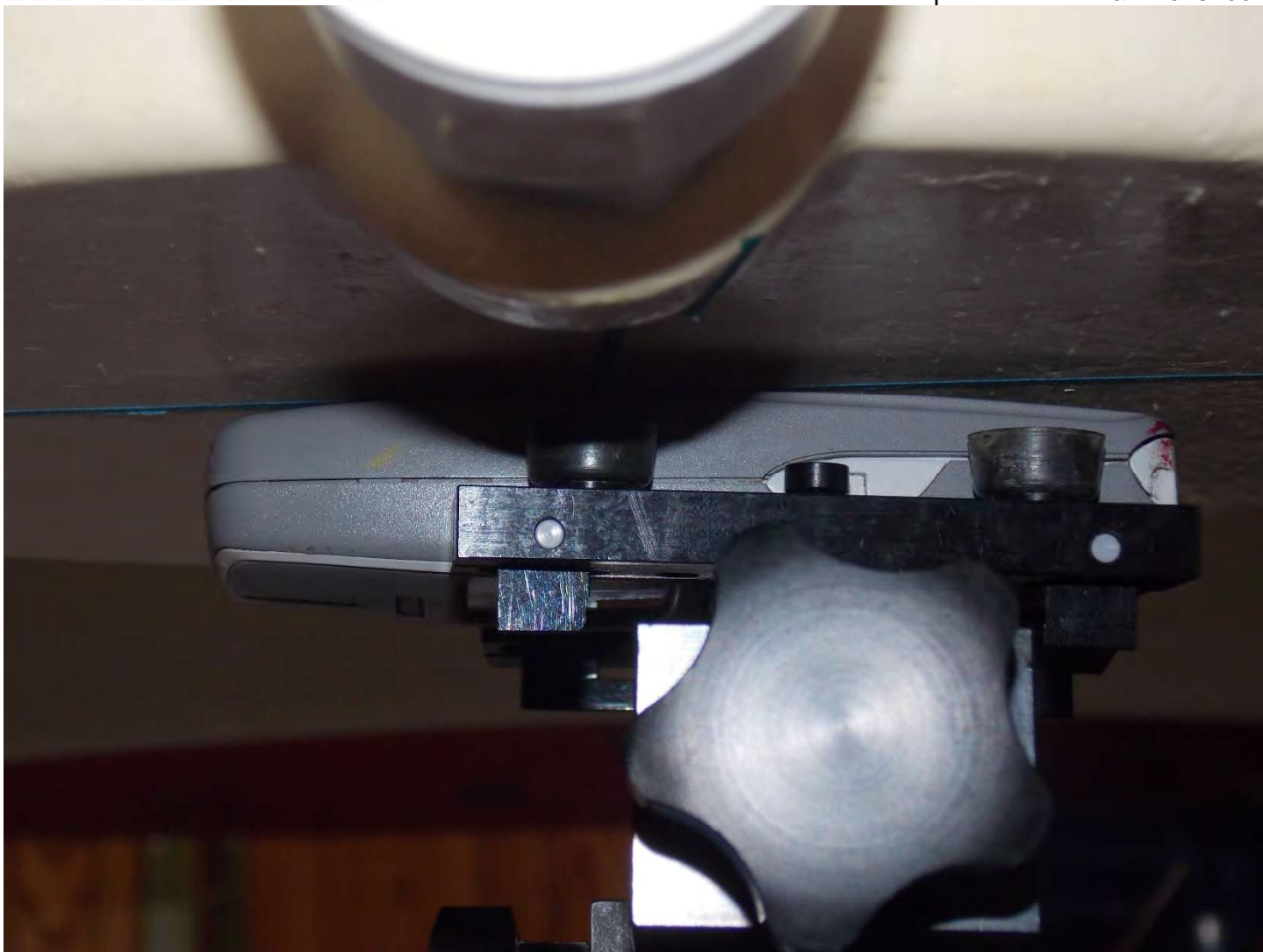
Nokia 3390 Right Touch Configuration 2 mm Gap



Nokia 3390 Right Touch Configuration 5 mm Gap



Nokia 3390 Body 0 mm Gap



Nokia 3390 Body 2 mm Gap



Nokia 3390 Body 5 mm Gap



Front of Device



Back of Device



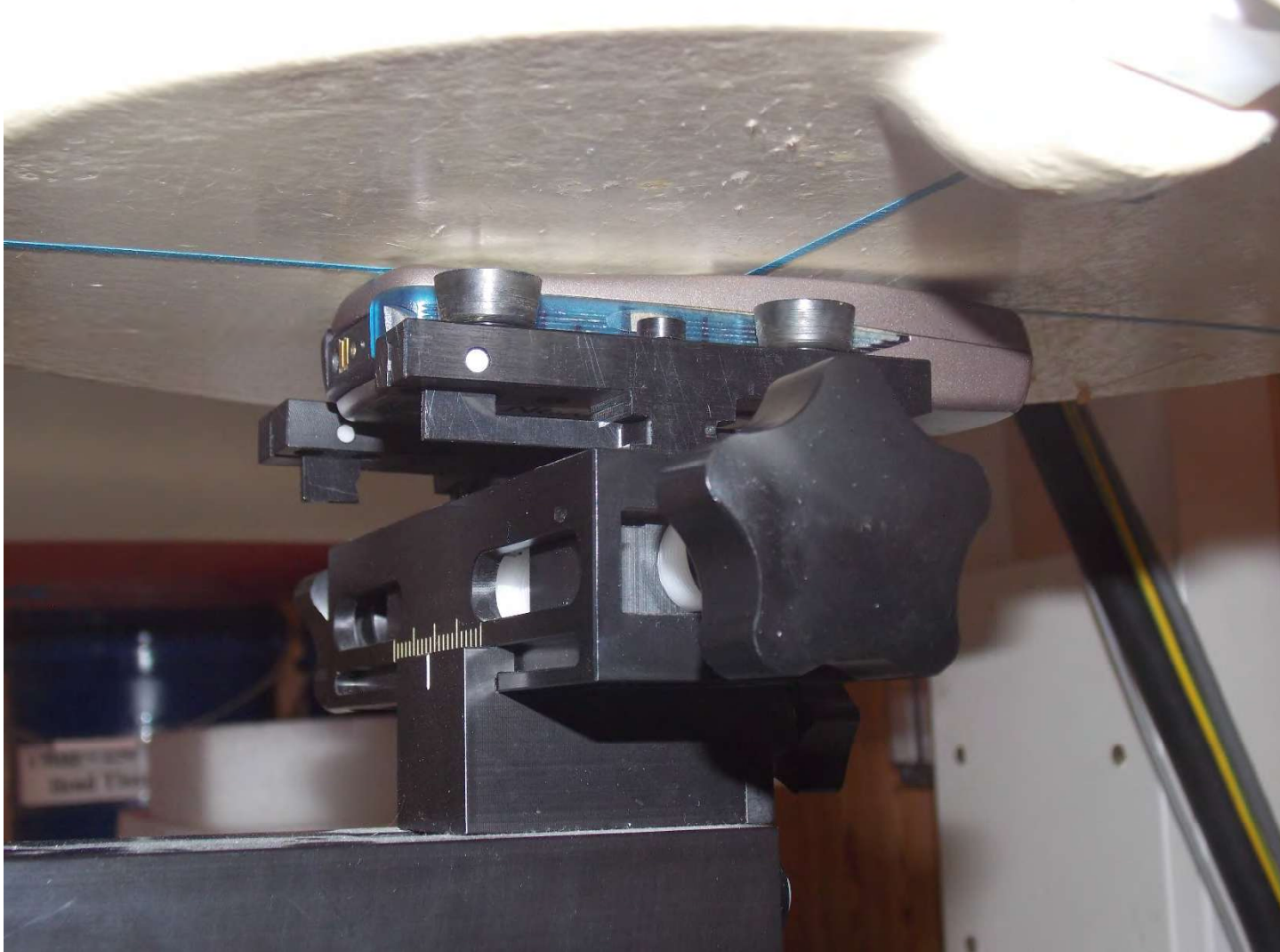
Nokia 3595 Right Touch Configuration 0 mm Gap



Nokia 3595 Right Touch Configuration 2 mm Gap



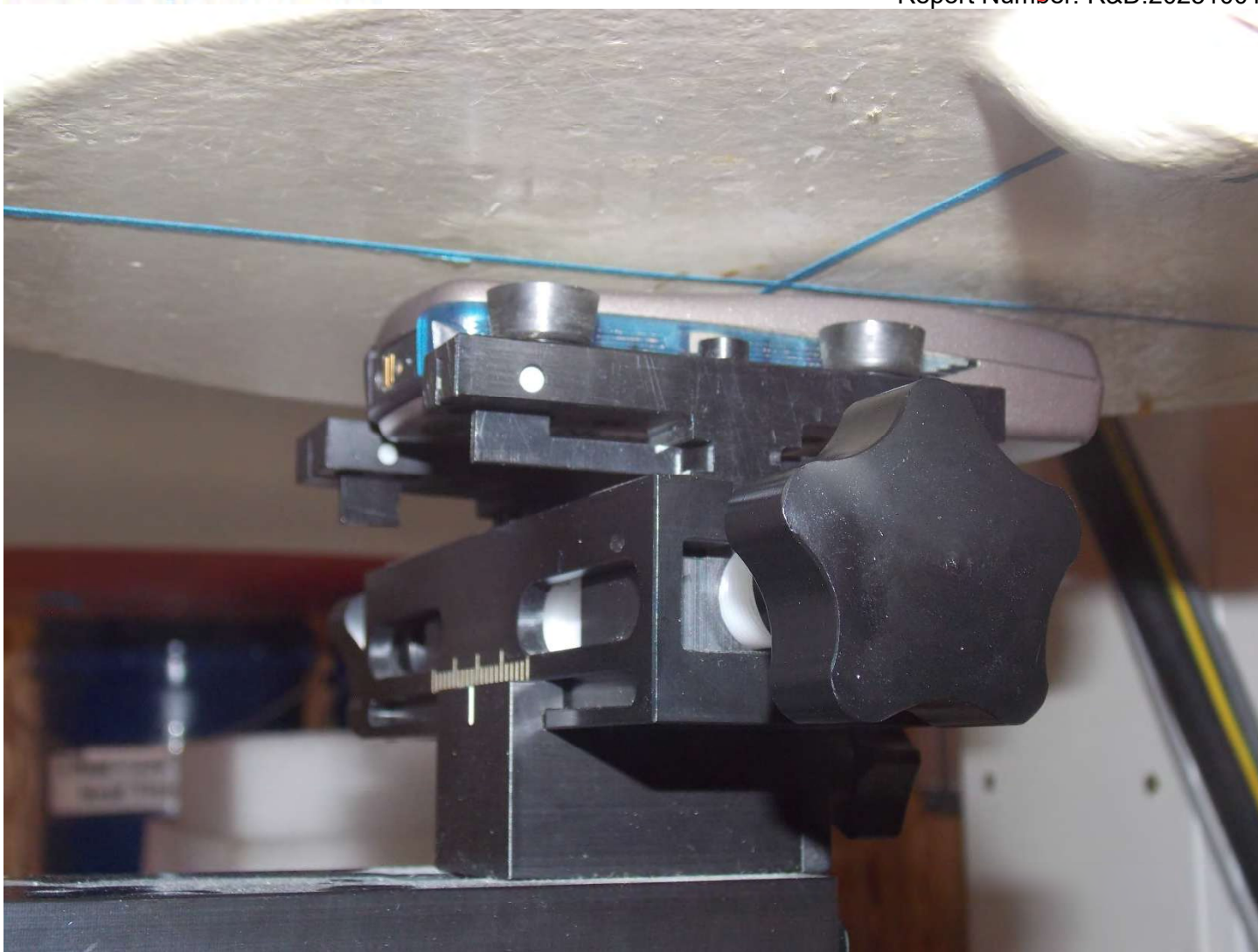
Nokia 3595 Right Touch Configuration 5 mm Gap



Nokia 3595 Body 0 mm Gap



Nokia 3595 Body 2 mm Gap



Nokia 3595 Body 5 mm Gap



Front of Device



Back of Device



Motorola MicroTAC Right Touch Configuration 0 mm Gap



Motorola MicroTAC Right Touch Configuration 2 mm Gap



Motorola MicroTAC Right Touch Configuration 5 mm Gap



Motorola MicroTAC Body 0 mm Gap



Motorola MicroTAC Body 2 mm Gap



Motorola MicroTAC Body 5 mm Gap



Front of Device



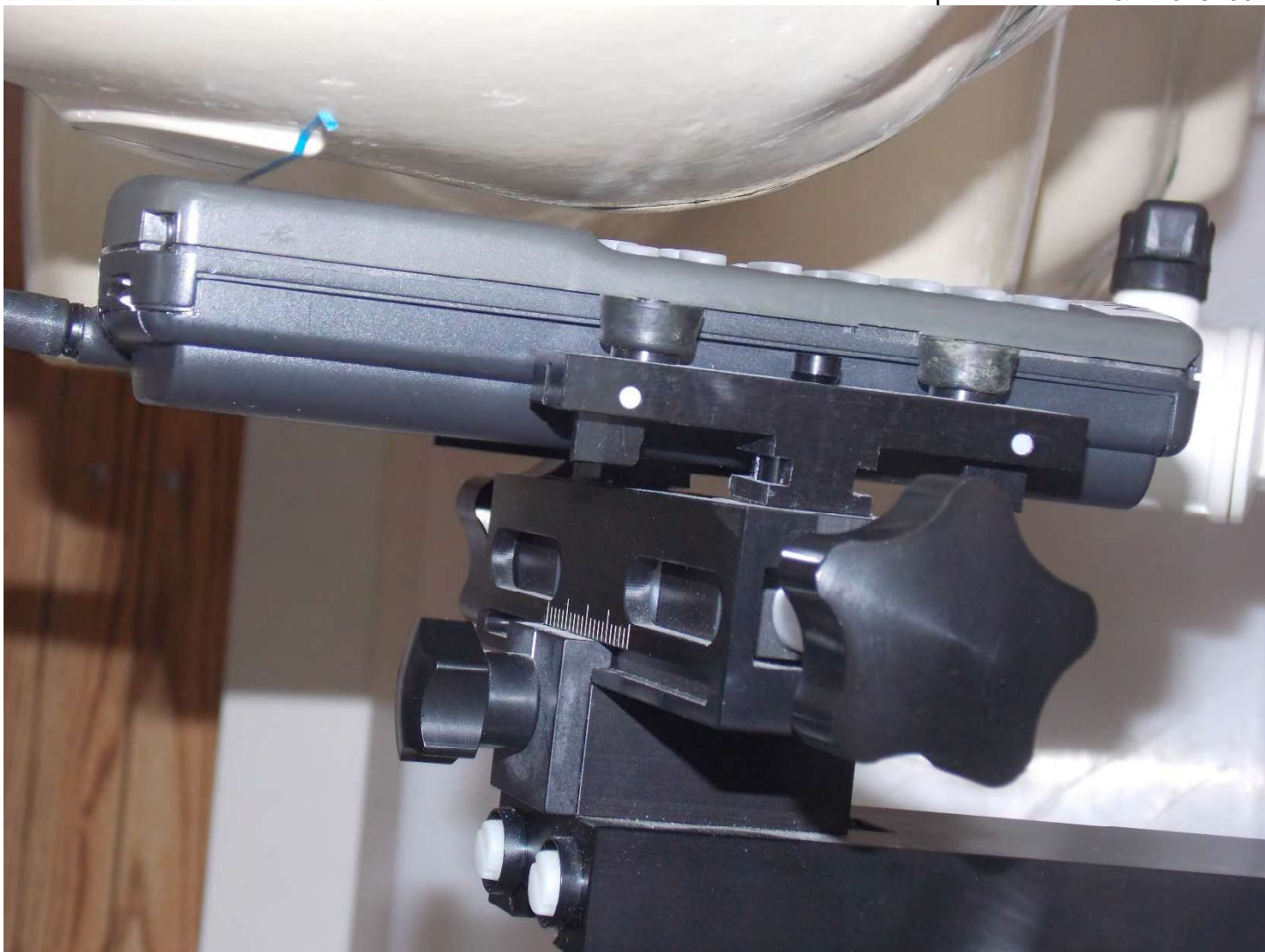
Back of Device



Nokia 101 Right Touch Configuration 0 mm Gap



Nokia 101 Right Touch Configuration 2 mm Gap



Nokia 101 Right Touch Configuration 5 mm Gap



Nokia 101 Body 0 mm Gap



Nokia 101 Body 2 mm Gap



Nokia 101 Body 5 mm Gap



Front of Device



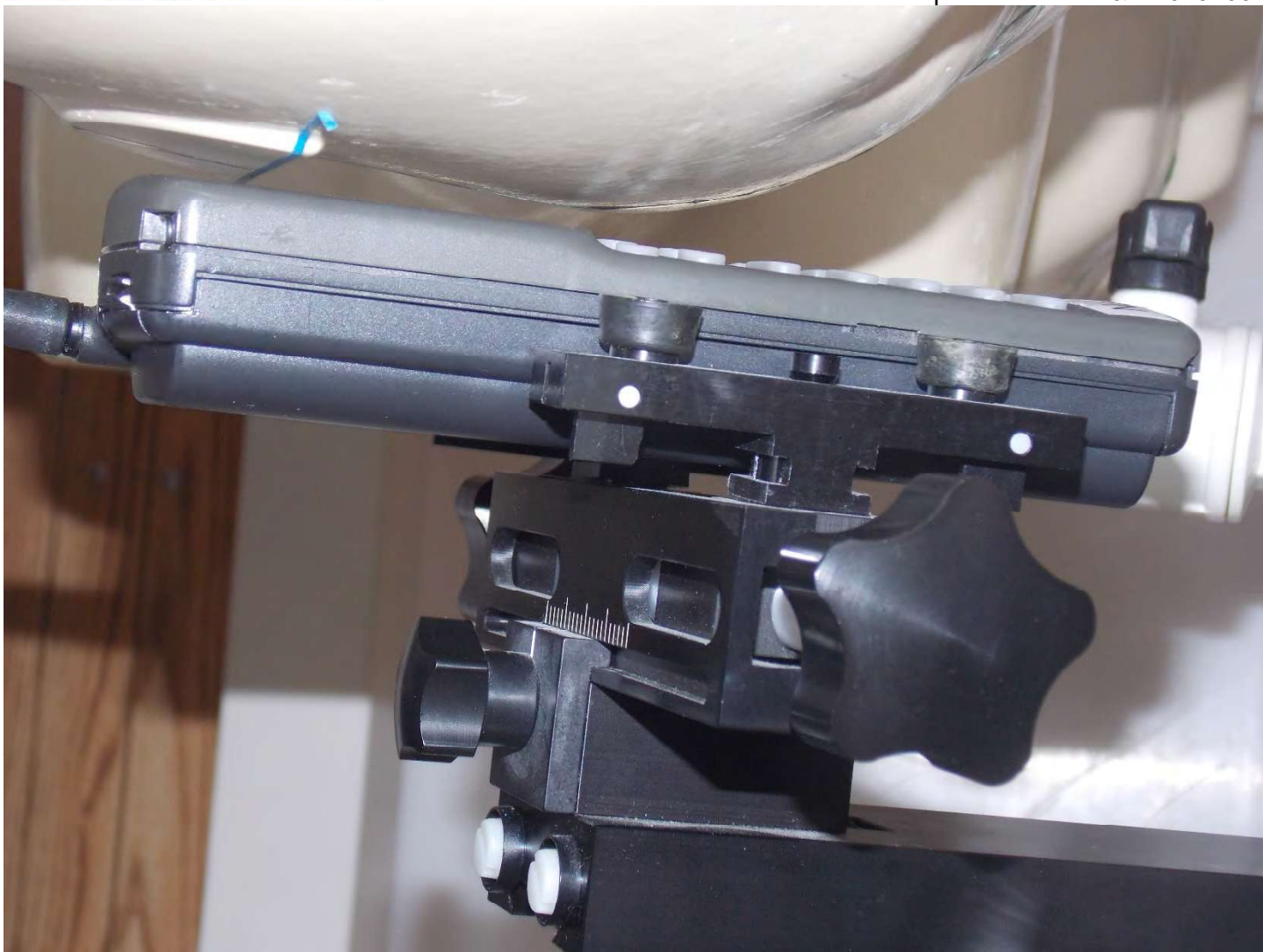
Back of Device



Nokia 1000 Right Touch Configuration 0 mm Gap



Nokia 1000 Right Touch Configuration 2 mm Gap



Nokia 1000 Right Touch Configuration 5 mm Gap



Nokia 1000 Body 0 mm Gap



Nokia 1000 Body 2 mm Gap



Nokia 1000 Body 5 mm Gap



Front of Device



Back of Device



Motorola StarTAC Right Touch Configuration 0 mm Gap



Motorola StarTAC Right Touch Configuration 2 mm Gap



Motorola StarTAC Right Touch Configuration 5 mm Gap



Motorola StarTAC Body 0 mm Gap



Motorola StarTAC Body 2 mm Gap



Motorola StarTAC Body 5 mm Gap



Front of Device



Back of Device

Appendix D – Probe Calibration Data Sheets



Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: **SCS 0108**

Client

RF Exposure Lab
San Marcos, USA

Certificate No.

EX-3662_Feb25

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3662**

Calibration procedure(s) **QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6,
QA CAL-25.v8
Calibration procedure for dosimetric E-field probes**

Calibration date **February 11, 2025**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3) ^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Calibration Date (Certificate No.)	Sched. Cal.
Power Sensor R&S NRP-33T	SN: 100967	28-Mar-24 (No. 217-04038)	Mar-25
Short [S6019i] + Attenuator [S6020i]	SN: L1119	26-Mar-24 (No. 217-04048)	Mar-25
OCP DAK-12	SN: 1016	24-Sept-24 (No. OCP-DAK12-1016_Sep24)	Sep-25
OCP DAK-3.5	SN: 1249	23-Sept-24 (No. OCP-DAK3.5-1249_Sep24)	Sep-25
Reference Probe EX3DV4	SN: 7349	10-Jan-25 (No. EX3-7349_Jan25)	Jan-26
DAE4	SN: 1301	07-Nov-24 (No. DAE4-1301_Nov24)	Nov-25

Secondary Standards	ID	Check Date (in house)	Sched. Check
ACAP 2020 Calibration Box	SN: L1404	30-Sept-24 (No. Report_ACAP2020E-Cave_20240930s)	Sep-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: February 11, 2025

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Accredited by the Swiss Accreditation Service (SAS)

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Accreditation No.: SCS 0108

Glossary

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices – Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal. DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

Parameters of Probe: EX3DV4 - SN:3662**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc ($k = 2$)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.41	0.49	0.52	$\pm 10.1\%$
DCP (mV) ^B	100.1	99.9	98.3	$\pm 4.7\%$

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B $\text{dB}\sqrt{\mu\text{V}}$	C	D dB	VR mV	Max dev.	Max Unc ^E $k = 2$
0	CW	X	0.00	0.00	1.00	0.00	147.1	$\pm 0.9\%$	$\pm 4.7\%$
		Y	0.00	0.00	1.00		147.2		
		Z	0.00	0.00	1.00		134.4		

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of Norm X,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Page 5).

^B Linearization parameter uncertainty for maximum specified field strength.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Parameters of Probe: EX3DV4 - SN:3662**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle	77.7°
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3–4 mm for an *Area Scan* job.

Parameters of Probe: EX3DV4 - SN:3662**Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) ^C	Relative Permittivity ^F	Conductivity ^F (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc ^H (k = 2)
150	52.3	0.76	11.34	11.71	10.15	0.00	1.25	±13.3%
220	49.0	0.81	10.99	11.34	9.84	0.00	1.25	±13.3%
450	43.5	0.87	10.18	10.18	10.18	0.16	1.30	±13.3%
750	41.9	0.89	8.66	8.87	7.56	0.36	1.27	±11.0%
900	41.5	0.97	8.35	8.54	7.29	0.35	1.27	±11.0%
1640	40.2	1.31	7.69	7.88	6.72	0.34	1.27	±11.0%
1750	40.1	1.37	7.56	7.74	6.60	0.34	1.27	±11.0%
1900	40.0	1.40	7.28	7.45	6.36	0.34	1.27	±11.0%
2300	39.5	1.67	7.61	7.79	6.64	0.34	1.27	±11.0%
2450	39.2	1.80	7.18	7.35	6.27	0.33	1.27	±11.0%
2600	39.0	1.96	7.31	7.48	6.38	0.33	1.27	±11.0%
5250	35.9	4.71	5.84	5.98	5.10	0.30	1.27	±13.1%
5600	35.5	5.07	5.19	5.31	4.53	0.27	1.27	±13.1%
5750	35.4	5.22	5.35	5.48	4.67	0.26	1.27	±13.1%

^C Frequency validity above 300 MHz of ±100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ±50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4–9 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.

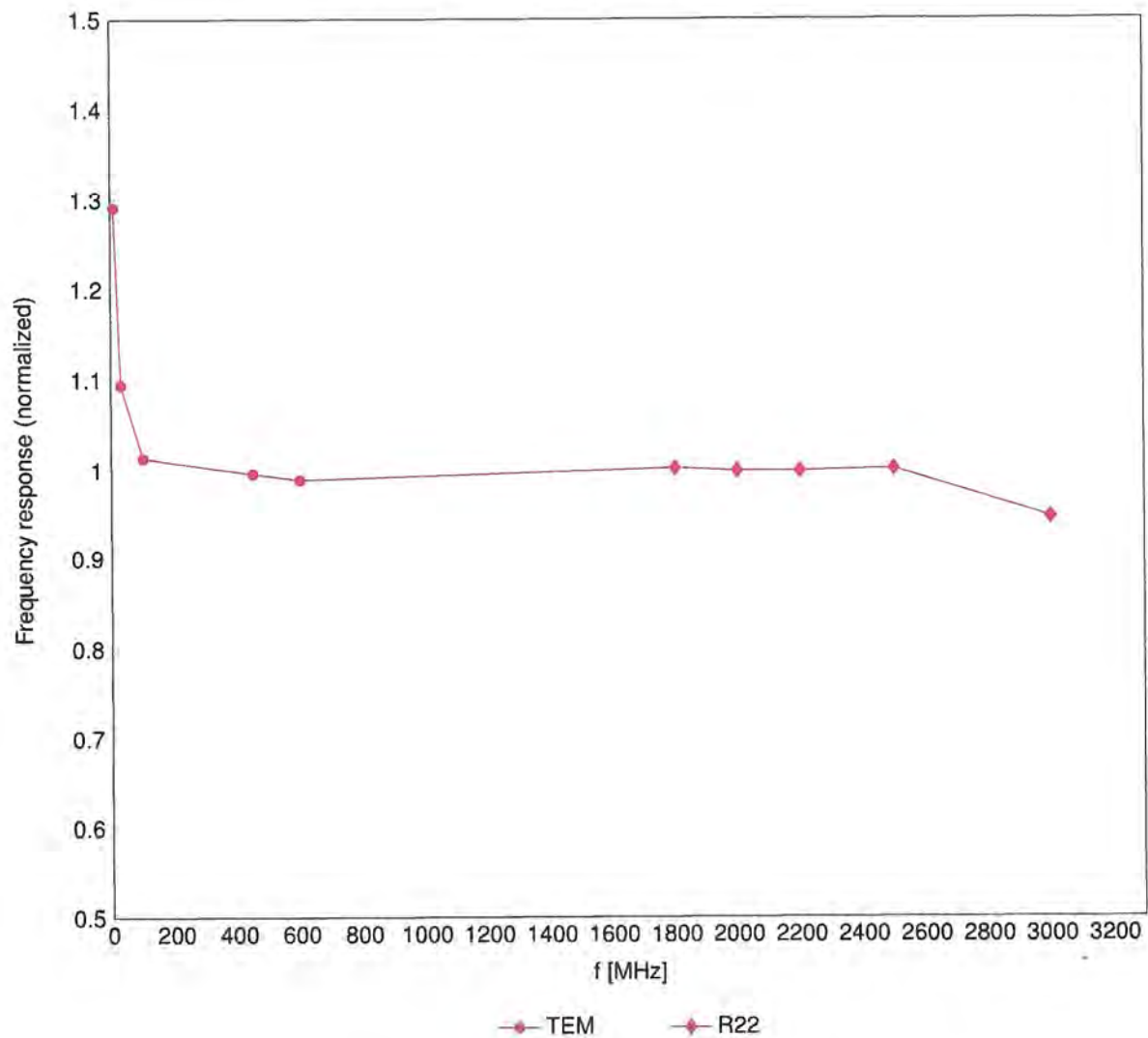
^F The probes are calibrated using tissue simulating liquids (TSL) that deviate for ϵ and σ by less than ±5% from the target values (typically better than ±3%) and are valid for TSL with deviations of up to ±10% if SAR correction is applied.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz and below ±2% for frequencies between 3–6 GHz at any distance larger than half the probe tip diameter from the boundary.

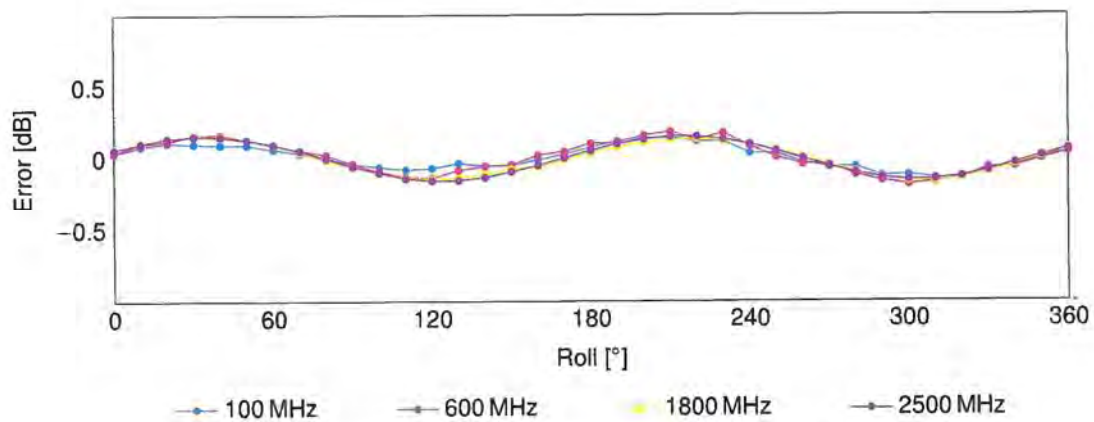
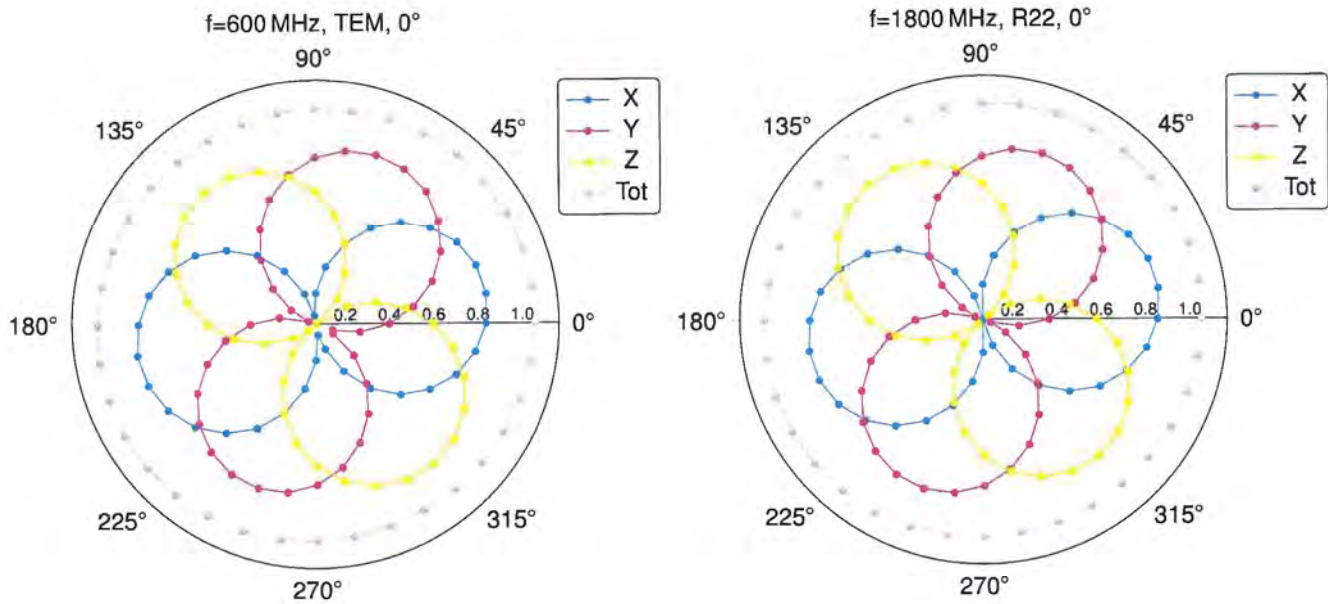
^H The stated uncertainty is the total calibration uncertainty (k = 2) of Norm-ConvF. This is equivalent to the uncertainty component with the symbol CF in Table 9 of IEC/IEEE 62209-1528:2020.

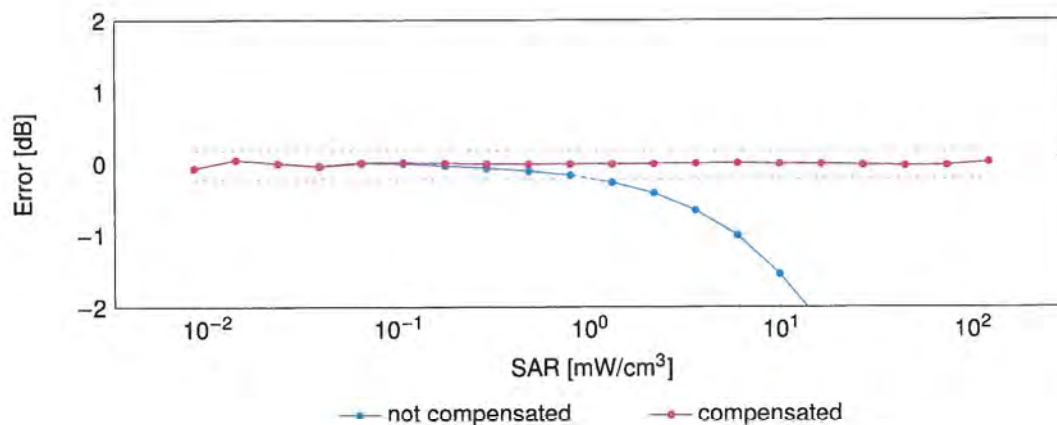
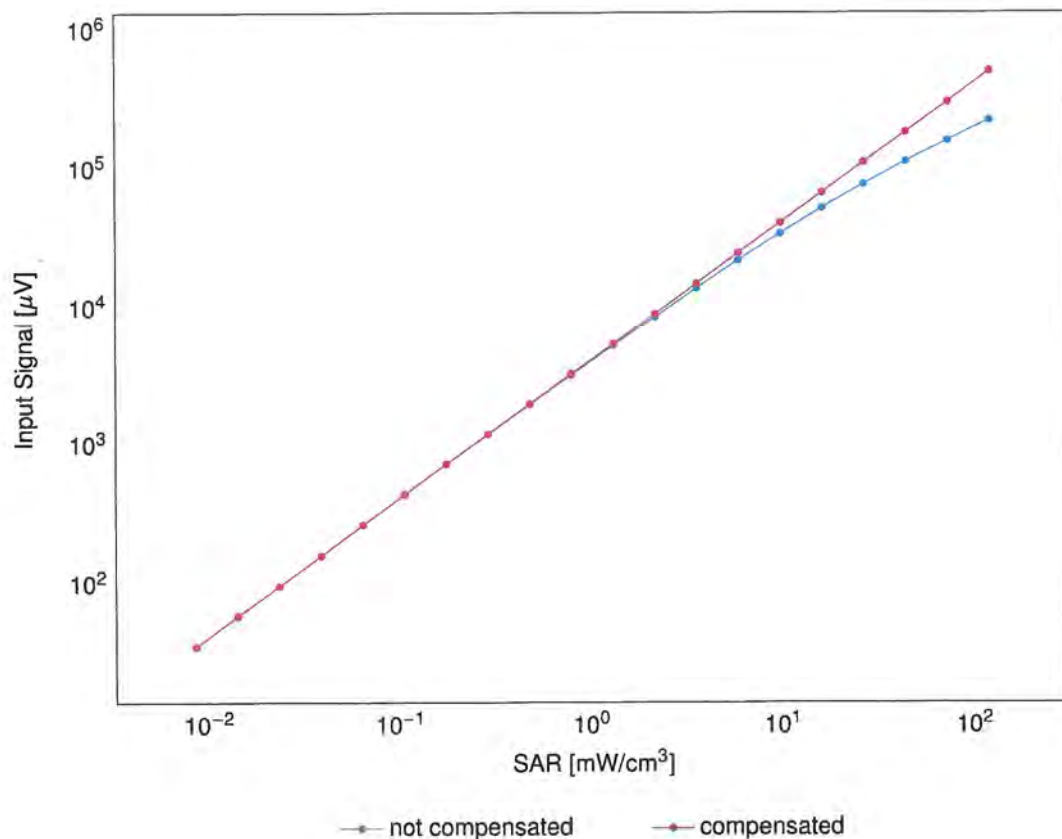
Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide:R22)

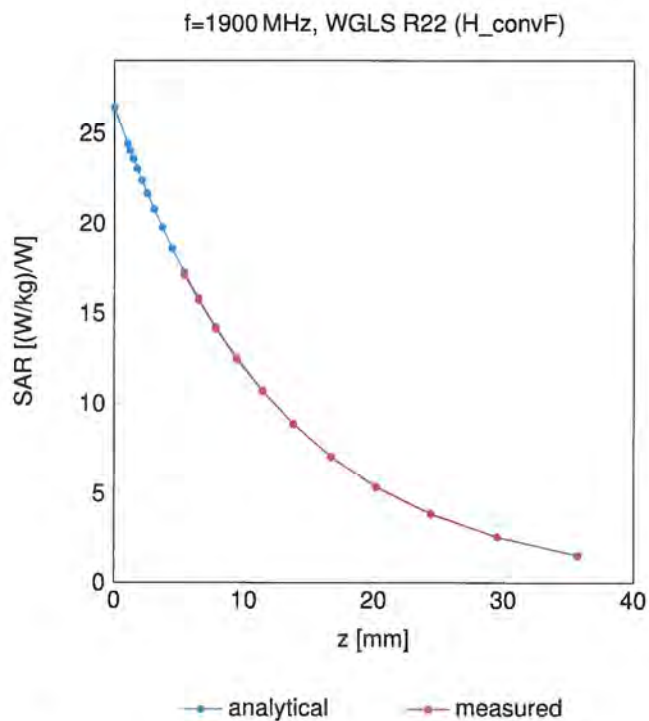


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$ Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

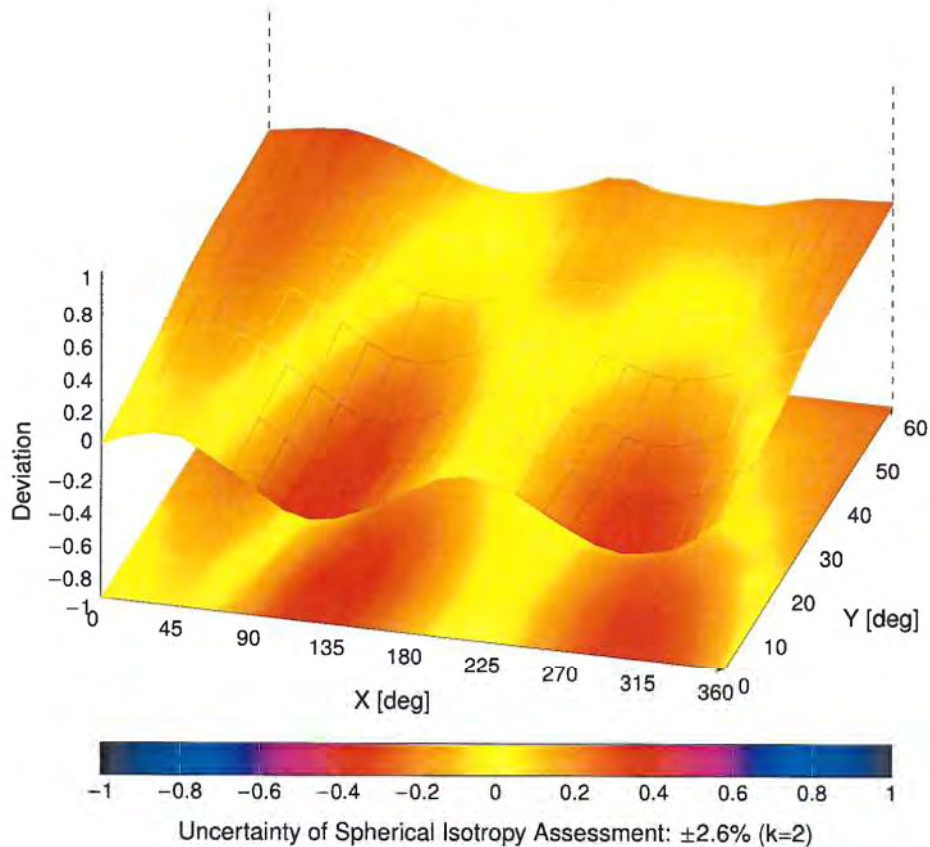
Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f_{\text{eval}} = 1900\text{MHz}$)Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900$ MHz



Appendix E – Dipole Calibration Data Sheets



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client RF Exposure Lab
San Marcos, USA

Certificate No. D900V2-1d044_May24

CALIBRATION CERTIFICATE

Object D900V2 - SN:1d044

Calibration procedure(s) QA CAL-05.v12
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: May 10, 2024

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	26-Mar-24 (No. 217-04036/04037)	Mar-25
Power sensor NRP-Z91	SN: 103244	26-Mar-24 (No. 217-04036)	Mar-25
Power sensor NRP-Z91	SN: 103245	26-Mar-24 (No. 217-04037)	Mar-25
Reference 20 dB Attenuator	SN: BH9394 (20k)	26-Mar-24 (No. 217-04046)	Mar-25
Type-N mismatch combination	SN: 310982 / 06327	26-Mar-24 (No. 217-04047)	Mar-25
Reference Probe EX3DV4	SN: 7349	03-Nov-23 (No. EX3-7349_Nov23)	Nov-24
DAE4	SN: 601	30-Jan-24 (No. DAE4-601_Jan24)	Jan-25

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by: Name Aidonia Georgiadou Function Laboratory Technician

Approved by: Sven Kühn Technical Manager

Signature

Issued: May 13, 2024

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:** This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	42.8 $\pm$ 6 %	0.95 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.70 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	11.0 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	7.05 W/kg $\pm$ 16.5 % (k=2)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.3 Ω - 6.6 j Ω
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.409 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

Extended Calibration

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (<-20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 865664 D01 v01r04.

D900V2 SN: 1d044 - Head						
Date of Measurement	Return Loss (dB)	$\Delta\%$	Impedance Real (Ω)	$\Delta\Omega$	Impedance Imaginary (j Ω)	$\Delta\Omega$
5/10/2024	-23.5		49.3		-6.6	
5/9/2025	-24.6	4.7	50.9	1.6	-6.2	0.4

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d044

Communication System: UID 0 - CW; Frequency: 900 MHz

Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 0.95 \text{ S/m}$; $\epsilon_r = 42.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.62, 9.62, 9.62) @ 900 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2024
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 65.98 V/m; Power Drift = 0.01 dB

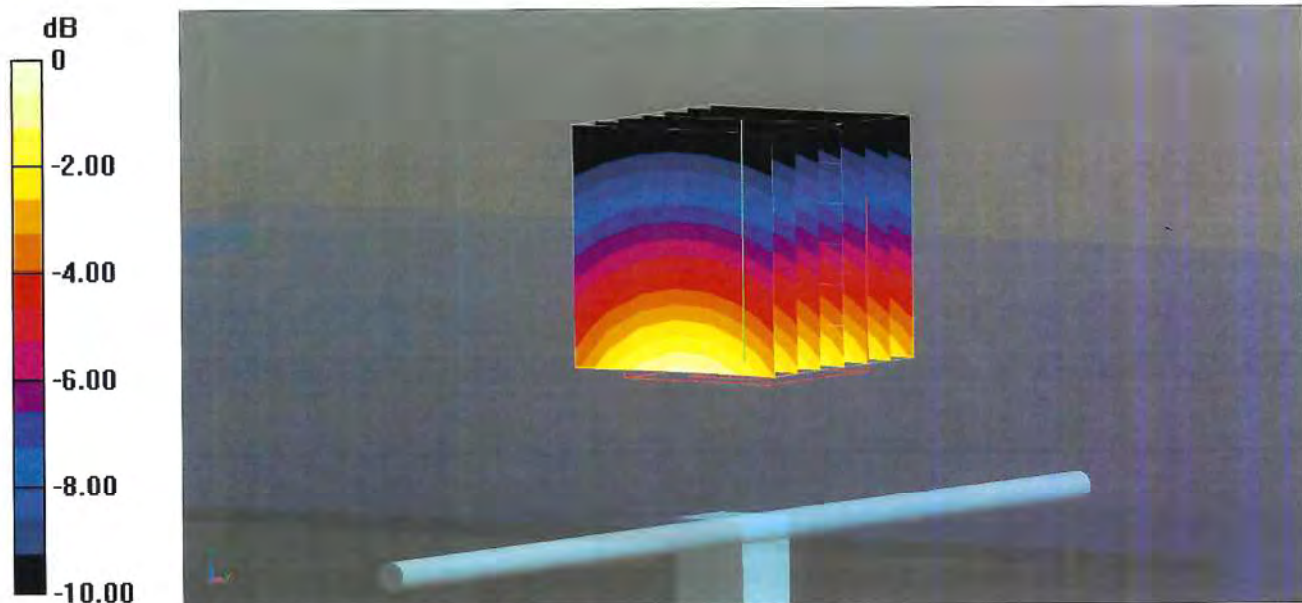
Peak SAR (extrapolated) = 4.17 W/kg

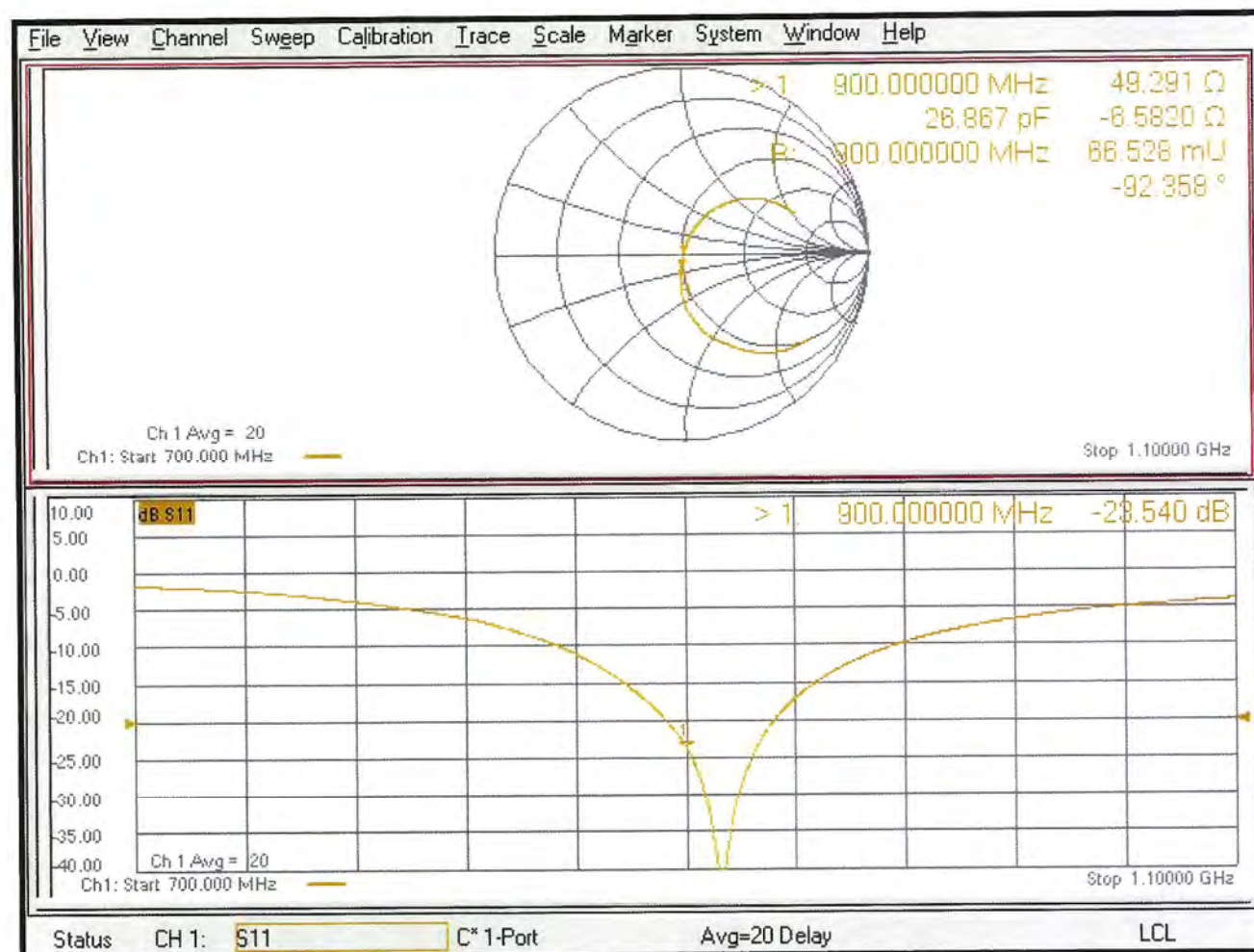
SAR(1 g) = 2.70 W/kg; SAR(10 g) = 1.73 W/kg

Smallest distance from peaks to all points 3 dB below = 16 mm

Ratio of SAR at M2 to SAR at M1 = 64.9%

Maximum value of SAR (measured) = 3.65 W/kg







Accredited by the Swiss Accreditation Service (SAS)

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Multilateral Agreement for the recognition of calibration certificates

Client **RF Exposure Lab**
San Marcos, USA

Certificate No. **D1900V2-5d116_May24**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d116**

Calibration procedure(s) **QA CAL-05.v12**
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **May 06, 2024**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP2	SN: 104778	26-Mar-24 (No. 217-04036/04037)	Mar-25
Power sensor NRP-Z91	SN: 103244	26-Mar-24 (No. 217-04036)	Mar-25
Power sensor NRP-Z91	SN: 103245	26-Mar-24 (No. 217-04037)	Mar-25
Reference 20 dB Attenuator	SN: BH9394 (20k)	26-Mar-24 (No. 217-04046)	Mar-25
Type-N mismatch combination	SN: 310982 / 06327	26-Mar-24 (No. 217-04047)	Mar-25
Reference Probe EX3DV4	SN: 7349	03-Nov-23 (No. EX3-7349_Nov23)	Nov-24
DAE4	SN: 601	30-Jan-24 (No. DAE4-601_Jan24)	Jan-25

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-22)	In house check: Oct-24
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-22)	In house check: Oct-24
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician**

Approved by: **Sven Kühn** Name: **Sven Kühn** Function: **Technical Manager**

Signature

Issued: May 6, 2024

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:** This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.1 $\pm$ 6 %	1.40 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.6 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.2 W/kg $\pm$ 16.5 % (k=2)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.7 Ω + 6.1 j Ω
Return Loss	- 24.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

Extended Calibration

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (<20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 865664 D01 v01r04.

D1900V2 SN: 5d116 - Head						
Date of Measurement	Return Loss (dB)	$\Delta\%$	Impedance Real (Ω)	$\Delta\Omega$	Impedance Imaginary (jΩ)	$\Delta\Omega$
5/6/2024	-24.3		49.7		6.1	
5/6/2025	-25.8	6.2	51.8	2.1	5.8	-0.3

Date: 06.05.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d116

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.4$ S/m; $\epsilon_r = 41.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2024
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.5 V/m; Power Drift = 0.08 dB

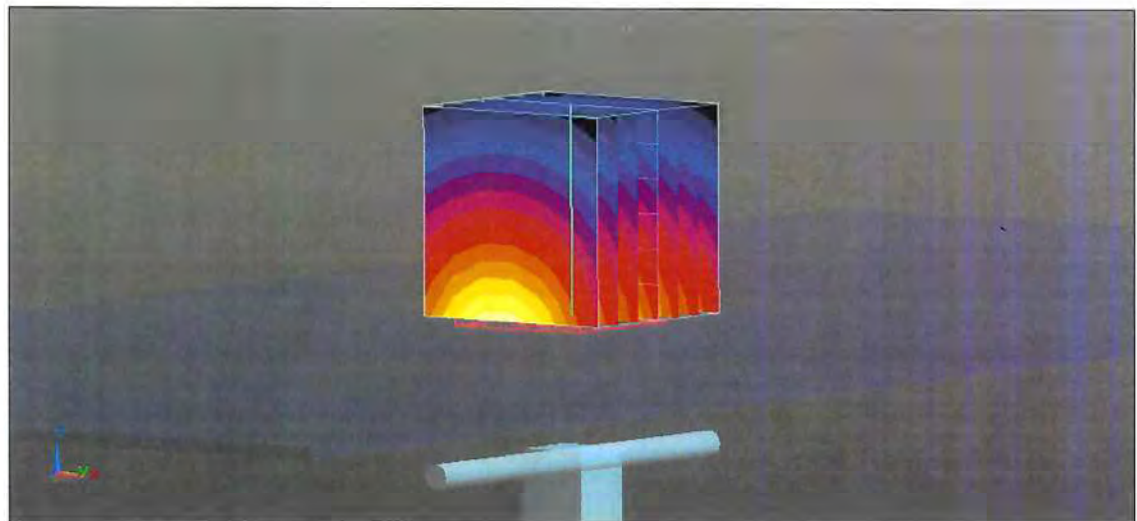
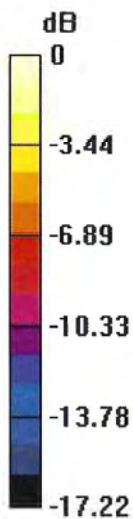
Peak SAR (extrapolated) = 18.6 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.27 W/kg

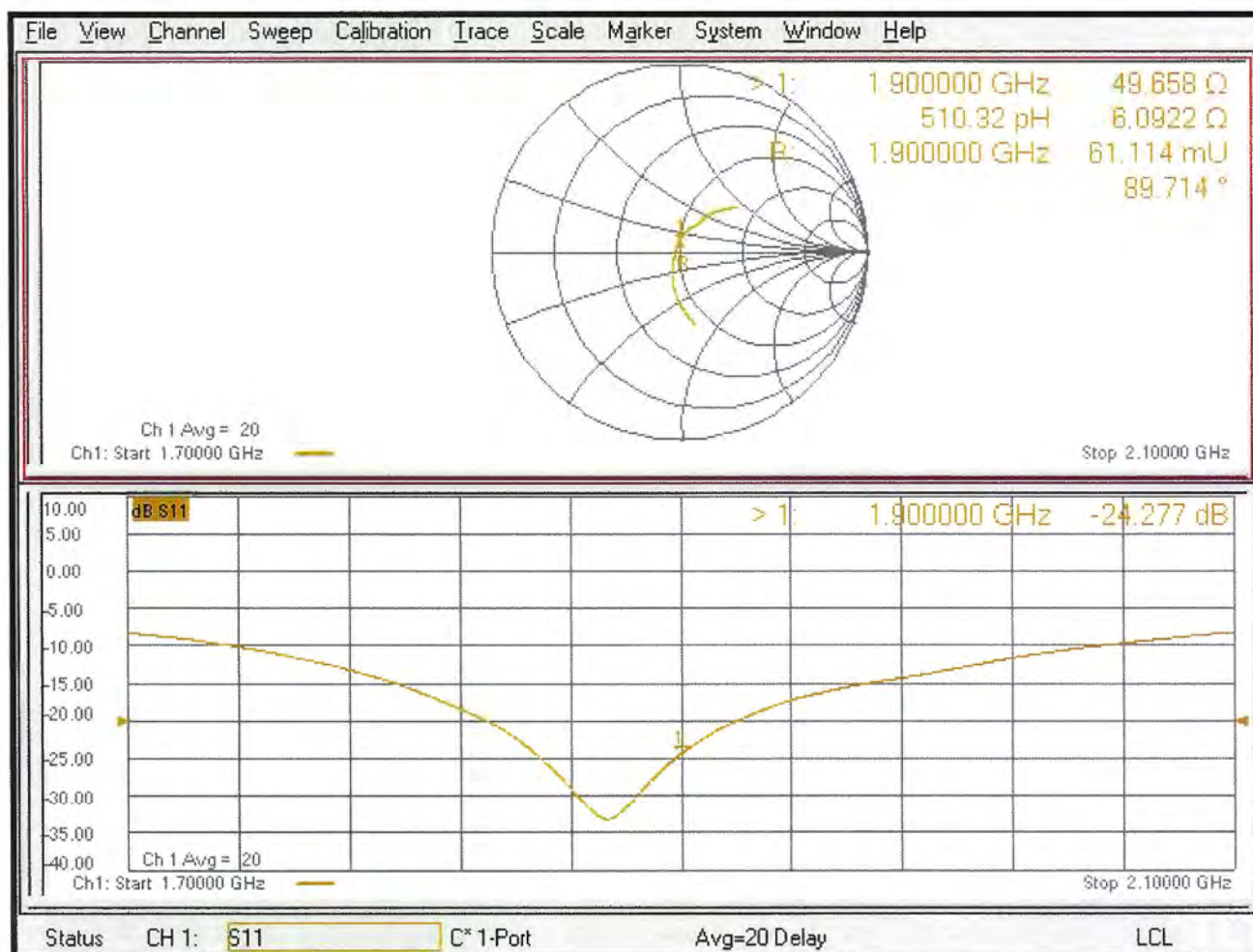
Smallest distance from peaks to all points 3 dB below = 9.8 mm

Ratio of SAR at M2 to SAR at M1 = 55%

Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg



Appendix F – DAE Calibration Data Sheets



Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **RF Exposure Lab**
San Marcos - USA

Certificate No: **DAE4-1321_Jan25**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 1321**

Calibration procedure(s) **QA CAL-06.v30**
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **January 15, 2025**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility; environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	27-Aug-24 (No:40547)	Aug-25
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	23-Jan-24 (in house check)	In house check: Jan-25
Calibrator Box V2.1	SE UMS 006 AA 1002	23-Jan-24 (in house check)	In house check: Jan-25

Calibrated by: **Name**
Adrian Gehring **Function**
Laboratory Technician

Approved by: **Sven Kühn** **Technical Manager**

Signature




Issued: January 15, 2025

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
 - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
 - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
 - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
 - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 61µV, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	405.014 ± 0.02% (k=2)	404.843 ± 0.02% (k=2)	405.255 ± 0.02% (k=2)
Low Range	3.96697 ± 1.50% (k=2)	3.99549 ± 1.50% (k=2)	4.00450 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	243.0 ° ± 1 °

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	199994.22	-0.43	-0.00
Channel X + Input	20003.49	0.94	0.00
Channel X - Input	-19996.93	5.07	-0.03
Channel Y + Input	199992.70	-1.82	-0.00
Channel Y + Input	20001.78	-0.69	-0.00
Channel Y - Input	-20003.67	-1.61	0.01
Channel Z + Input	199991.69	-2.75	-0.00
Channel Z + Input	20000.76	-1.84	-0.01
Channel Z - Input	-20001.40	0.59	-0.00

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2001.09	-0.25	-0.01
Channel X + Input	203.11	1.43	0.71
Channel X - Input	-197.68	0.33	-0.17
Channel Y + Input	2002.02	0.58	0.03
Channel Y + Input	200.50	-1.28	-0.64
Channel Y - Input	-198.75	-0.71	0.36
Channel Z + Input	2001.53	0.20	0.01
Channel Z + Input	199.63	-1.99	-0.99
Channel Z - Input	-198.77	-0.66	0.33

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	16.74	15.11
	- 200	-14.39	-16.02
Channel Y	200	1.53	1.31
	- 200	-3.33	-3.57
Channel Z	200	-13.96	-13.73
	- 200	12.34	12.23

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	0.73	-4.12
Channel Y	200	8.66	-	2.84
Channel Z	200	10.59	5.92	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15470	14859
Channel Y	15581	15755
Channel Z	16358	16164

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	1.26	0.17	2.34	0.48
Channel Y	-0.55	-1.80	0.88	0.56
Channel Z	-0.28	-1.50	1.50	0.58

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

Appendix G – Phantom Calibration Data Sheets

Schmid & Partner Engineering AG
 Zeughausstrasse 43, 8004 Zurich, Switzerland
 Phone +41 1 245 9700, Fax +41 1 245 9779
 info@speag.com, http://www.speag.com

Certificate of Conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich Switzerland

Tests

The series production process used allows the limitation to test of first articles.

Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series items (called samples) or are tested at each item.

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 ff.
Material thickness at ERP	Compliant with the requirements according to the standards	6mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05	Material samples
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility.	DEGMBE based simulating liquids	Pre-series, First article, Material samples
Sagging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

Standards

- [1] CENELEC EN 50361
- [2] IEEE Std 1528-2003
- [3] IEC 62209 Part I
- [4] FCC OET Bulletin 65, Supplement C, Edition 01-01

(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standards [1] to [4].

Date 07.07.2005

Signature / Stamp

s p e a g
 Schmid & Partner Engineering AG
 Zeughausstrasse 43, 8004 Zurich, Switzerland
 Phone +41 1 245 9700, Fax +41 1 245 9779
 Info@speag.com, http://www.speag.com

Addendum 6 – Declarations in Support of Standing

A. Declaration of Miriam Eckenfels

No. _____

**UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

***In re* CHILDREN’S HEALTH DEFENSE, PETRA BROKKEN, DAVID
O. CARPENTER, MICHELE HERTZ,**

ENVIRONMENTAL HEALTH TRUST,

PETITIONERS

PETITION FOR WRIT OF MANDAMUS

AFFIDAVIT OF MIRIAM ECKENFELS IN SUPPORT OF STANDING

1. My name is Miriam Eckenfels. My work address is c/o Children’s Health Defense, 852 Franklin Ave., Suite 511, Franklin Lakes, NJ 07417.
2. I am the Director of the Electromagnetic Radiation & Wireless Program (“EMR & Wireless Program”) at Children’s Health Defense (“CHD”). This Affidavit is to provide evidence of CHD’s standing to pursue the matter as an association representing the interests of its members and supporters.
3. CHD, a nonprofit organization headquartered in Franklin Lakes, New Jersey, has employees, volunteers, members, participants, donors, and followers nationwide and throughout the world. Our mission is to end the epidemic of childhood chronic disease caused by toxic environmental exposures, including electromagnetic radiation.
4. CHD seeks to hold responsible parties accountable and to establish safeguards to prevent future harm to children's health. We have over 20 state chapters, most of which are incorporated within CHD, as well as a chapter dedicated to military members, and several international chapters. The chapters, inter alia, act as a communication channel by which members of the CHD community impact the policies, advocacy, actions, and lawsuits the organization files.
5. CHD’s community includes lifetime members, “insiders,” and other individuals supportive of CHD’s mission.

6. Until 2024, CHD offered paid lifetime memberships for \$10; these memberships are still active. Petitioners Petra Brokken and Michele Hertz are both CHD members. Since 2024, individuals who provide CHD with financial support of \$10 per month or a one-time donation of \$150 are considered “insiders.” The insiders are in effect members who have access to special programming beyond the many resources CHD makes available to lifetime members and the general public.

7. The CHD community directly shapes the organization's priorities, determines which cases CHD pursues, and guides its advocacy, educational, and publication initiatives.

8. CHD’s community of over 500,000 people in the United States interacts with CHD through a variety of channels. Community members bring potential education, advocacy, litigation, and science projects to the organization for funding, collaboration, and publicity on a constant basis, as well as topics of interest for publications by CHD’s online news sources, The Defender and CHD TV.

9. Radiofrequency (RF) based wireless technologies and the pulsed and modulated radiation they emit contribute to the growing epidemic of chronic illness among children. Many of our members and supporters are concerned about and/or experience the health and environmental effects of RF radiation. CHD’s mission requires that we address wireless radiation’s contribution to the epidemic of toxicity-related illnesses in children.

10. Our work has become even more urgent in light of the FCC’s failure to respond to the remand order in *Env’tl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) (“EHT v. FCC”), coupled with the exponential rise in children’s exposure to electromagnetic radiation in the 30 years since the FCC issued the 1996 exposure guidelines. The FCC’s current guidelines allow wireless license-holders to operate transmitters that emit RF radiation that penetrates the bodies of our constituents and their children, and flows over real property without consent. The Commission’s failure to act on the remand order in *EHT v. FCC* has directly injured each and every one of our members and their children.

11. Within CHD, the EMR & Wireless Program works in two ways to combat the ills associated with wireless radiation on behalf of our members, insiders, and other constituents. First, through our Stop5G community empowerment consulting service, we provide legal representation, ordinance drafting, education, advocacy, and advising to communities and individuals that contact us seeking assistance with concerns about wireless facilities. The number of consult requests we receive continues to grow each month. The communities and individuals who contact us directly influence our activities, and some also provide financial support, thereby

becoming insiders—in effect, members. Additionally, the Stop 5G initiative provides step-by-step guides for communities that do not directly use our services. See [Stop5g.org](https://stop5g.org).

12. Second, our 704 No More initiative recognizes the effects of federal preemption on all communities and individuals affected by wireless radiation, including those communities and individuals who seek assistance from our community empowerment consulting program. This initiative involves a nationwide, nonpartisan coalition of over 100 safe technology and environmental organizations, representing hundreds of thousands of individuals, that seeks to restore state and local control over cell tower and antenna siting. See 704nomore.org.

13. On behalf of our members' interests, CHD was a lead plaintiff in *Envtl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021).

14. On behalf of our members' interests, CHD has made various filings with the FCC in connection with wireless-related issues, including the following:

- On April 4, 2023, CHD petitioned the FCC to honor the *EHT v. FCC* mandate. See “CHD Petition to Proceed and Honor Mandate AND CEQ NEPA Procedures” at <https://www.fcc.gov/ecfs/search/search-filings/filing/104040414904765>.
- On November 25, 2025, CHD joined the EHT's August 6, 2025 Petition to honor the *EHT v. FCC* mandate and renewed CHD's earlier April 2023 petition. See “Joinder In Environmental Health Trust Petition To Implement D.C. Circuit Judgment And Mandate, Reopen *Notice Of Inquiry* And Perform Tasks Ordered By The Court, And Request For Prompt Administrative Action And Renewed Separate Motion For Similar Relief,” <https://www.fcc.gov/ecfs/document/112586420384/1>.
- On December 31, 2025, CHD filed comments in opposition to WT Docket No. 25-276, *Build America: Eliminating Barriers to Wireless Deployments*, see <https://www.fcc.gov/ecfs/filing/status/detail/confirmation/20251231650411819>, and on January 15, 2026, CHD filed reply comments in the same matter. See <https://www.fcc.gov/ecfs/document/1011524866943/1>.

15. CHD exists solely because of donations of its supporters. If CHD did not serve the interests of its community, it would cease to exist.

16. The FCC's refusal to comply with the *EHT v. FCC* mandate concretely and significantly harms the interests of our members, and the harm is ongoing and reasonably expected to continue absent this Court's intervention.

17. This concludes my Affidavit.

Pursuant to 28 U.S.C. § 1746, I certify under penalty of perjury that the foregoing is true and correct.



MIRIAM ECKENFELS

5/14/2026

DATE

Addendum 6 – Declarations in Support of Standing

B. Declaration of Petra Brokken

No. _____

**UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

***In re* CHILDREN’S HEALTH DEFENSE, PETRA BROKKEN, DAVID
O. CARPENTER, MICHELE HERTZ,**

ENVIRONMENTAL HEALTH TRUST,

PETITIONERS

PETITION FOR WRIT OF MANDAMUS

AFFIDAVIT OF PETRA BROKKEN IN SUPPORT OF STANDING

1. My name is Petra Brokken. My home address is 15695 37th Street South, Afton, MN 55001. I am one of the named Petitioners in the above-captioned proceeding and I am a member of Children’s Health Defense.
2. The purpose of this Affidavit is to provide evidence of my standing to pursue the matter. I will provide some of the facts particular to my individual circumstances to demonstrate that I have suffered an injury-in-fact traceable to the FCC’s failure to act on the mandate of this Court in *Envtl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) (*EHT v. FCC*) that could be redressed by an order from this Court. I am also relying on the Affidavits of Miriam Eckenfels, and Dr. David Carpenter for the purpose of explaining why the particular facts described below demonstrate standing.
3. I was a named petitioner in *Envtl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) (“*EHT v. FCC*”).
4. I am an attorney and a mother of two children. One of my two now adult daughters and I have both developed Microwave Sickness from various wireless radiation sources at levels permitted by the FCC, and which the FCC considers safe. Since both my daughter and I have become ill, clearly those levels are not safe. We are part of the evidence so demonstrating.
5. I filed comments at the FCC in the proceedings below and asked them to re-evaluate the current radiofrequency (RF) standards to take into account the current state of science as to biological effects. This would address adverse health effects from non-thermal levels of radiation as the current guidelines, such as they are,

AFFIDAVIT OF PETRA BROKKEN IN SUPPORT OF STANDING

only cover thermal effects. Since wireless technology emits mostly non-thermal levels of radiation, the FCC guidelines currently are not scientifically applicable.

6. I asked the FCC to create a more biologically based standard so that the United States could move to a safer technology. I also asked the FCC to consult with Dr. Carl Blackman, formerly a scientist at the Environmental Protection Agency (EPA), to create a more biologically based standard that takes into consideration not only the levels of radiation but also the pulsation and the modulation used for this technology. Dr. Blackman worked for the EPA's lab that specialized in studying the effects of microwave radiation before the lab was shut down without explanation in 1986. In his paper, *Cell phone radiation: Evidence from ELF and RF studies supporting more inclusive risk identification and assessment*, Carl Blackman review the science of the top of RF health effects and summarizes the many studies he conducted.

7. In this paper, he explains the importance of including the effects of modulation in public health standards. In section 1.2 of his paper, titled *Modulation as a critical element* he writes:

“Modulation signals are one important component in the delivery of EMF signals to which cells, tissues, organs and individuals can respond biologically.”

8. I have personally spoken to Carl Blackman, and he explained that the 30 people working on the RF standards were told to stop investigating the biological effects of RF and microwave radiation, modulation and pulsation. The EPA was originally the agency responsible for creating standards for RF. Its continued efforts to create biologically based guidelines that address also effects of long-term exposure to non-thermal, pulsed and modulated RF frequencies and radiation were frustrated. These efforts ended around 1996, at the time the Telecommunications Act was enacted, when oversight was given to the FCC, which is not a health or environmental agency. Dr. Blackman's lab showed that pulsed and modulated microwave frequencies at non-thermal levels create bio-effects. The EPA should have been allowed to go forward to publish their biological standards back in 1996. The EPA should have been involved in any standards or guidelines enacted by the FCC. Instead, the FCC ignored the EPA and its scientific research. The EPA has continued to assert that the FCC guidelines are not protective and letters sent by the EPA to that effect are in the docket below.

9. Because of the failure of the FCC guidelines to protect the public, my daughter and I have both been harmed for years from the biological effects of this technology. We have been forced to change how we live. We are not able to live a full life because we are hindered in our ability to go into the community near us as

AFFIDAVIT OF PETRA BROKKEN IN SUPPORT OF STANDING

well as throughout the United States. Had the FCC worked with the EPA back in 1996 to come out with actual standards that are based on health and science, neither my daughter nor I would have been injured.

10. I was harmed beginning in 2010, though it may already have been earlier from a cordless phone that I had near my bed. In 2010, I moved to a new home at the same time that I went back to work after a maternity leave. At that time, the new house had high levels of radiation from extreme radar because it is less than 1.5 miles away from a major airport, and had well over 200 towers and antennas within a two-mile radius of my home, including one large grouping of antennas very near my home. At the time we also had Wi-Fi in the home. When I went back to work, Wi-Fi was spreading through the office and the courthouse.

11. My symptoms began with extreme fatigue. I was unable to stay awake after work, and often got into bed at 5:00 pm when I got home. I was unable to make dinner or be involved fully with my children. After the fatigue, I next developed brain fog, short-term memory loss, a prickling sensation on the top of my head, as well as shortness of breath and heart palpitations. The feelings of unease and irritability were also present. I have experienced blurry vision and eye pain.

12. I did not understand why I was getting these symptoms and went to doctors for help. The doctors were not able to tell me where these symptoms were coming from. As time went on, I got worse. The symptoms occurred more frequently and with growing intensity. Eventually, I began to pass out in my home. One night I fainted repeatedly, falling and then getting up at least six times. The final time was in the kitchen – I fell into a glass cake plate, which fell on the floor and shattered around me.

13. It took me approximately a year to understand that it was the radiofrequency radiation from wireless sources that was making me ill. It was a tech person at work who suggested it may be the cause. One day, I felt ill again at work. Then, a group of us went to the suburbs for an employee lunch and sat outside. I felt much better. Then, back in the office in the afternoon, within a half hour I was ill again. I felt ill in front of my computer and remembered that I had not felt ill in front of my old computer. I called my IT person to ask for my old computer back and told him how ill I felt in front of the new one, and he told me, “I have heard about this, it is the Wi-Fi, just turn it off.” When I did, I felt immediately better. In this case, my IT person knew more than my MD.

14. After I realized the source of my symptoms was the wireless radiation, I was able to shield myself from the radiation at my home, to a reasonable degree. This improved my health significantly. To shield myself in my home, I first bought canopies specially made for shielding, to put over every bed. Then, I painted the

AFFIDAVIT OF PETRA BROKKEN IN SUPPORT OF STANDING

bedrooms with special shielding paint, and placed a window film over the glass in the windows. Then, I placed metal screening over the bedroom windows. This did not reduce the amount of radiation in the house to a degree that I could live there, so I replaced the siding of the home with metal, and then placed metal insulation in the attic as well. Of course we hard-wired our home, paid extra for an opt-out for a smart water meter, had to shield the home from the smart electrical meter, and replace all telephones with landlines. We also replaced windows with new ones that at least partially block radiation. This has all come at some significant cost. My health has improved significantly from the shielding.

15. At work, I had no choice but to be exposed to wireless radiation. My job provided me with some minimal accommodations initially, which in the past two years have ended. Every day I made myself ill just to be able to work. I got headaches and had fatigue. Since I am a trial lawyer, when I was actually in trial, I was exposed to the most radiation. I have had to wear a shielding scarf over my head to ward off the radiation. The scarf is made of fabric which contains metal fibers and as metal blocks radiation, these scarves provide some shielding. I have also worn a blue shielding coat with dress pants for trial, which makes me look ridiculous. If I have been in trial, it is more than just headaches and fatigue; the old symptoms can start reoccurring. I was forced to work part-time so that I would not get too sick.

16. Ironically, though it was someone at work who alerted me to what was going on, I was told at work that it was not a real condition, and that it was psychological. In the beginning, I got emails stating it was psychological, and little whispers about how I should go to therapy. To anyone who has experienced these symptoms, to be told that it is psychological, is laughable. I would only wish it were psychological. When I am around it, I feel ill. When I am not, I feel fine. This occurs whatever the situation, even, for example, at a friend's home where I am relaxing and having fun.

17. Shielding my home from wireless allowed me to feel pretty well in my home. The past few years, the radiation near that home has gone up, new wireless utility "smart" meters are in the neighborhood more and more, more towers have come in, and more wireless devices. Having places where I feel truly well becomes increasingly difficult. Since the time of the initial affidavit, I have moved into the country where there are fewer cell towers. I still do not have Wi-Fi in the home, and no smart meters, or other sources of wireless radiation. I feel much better than I did in the city.

18. Although I stopped working outside my home in 2022, radiation still affects me in the community. Everywhere I go, I constantly check to make sure that I am

AFFIDAVIT OF PETRA BROKKEN IN SUPPORT OF STANDING

not sitting or standing under a Wi-Fi access point. I do not go out much, as I am unwilling to pay the physical price of feeling unwell just to go out to dinner. Because people often do not turn their cell phones off all of the way, but just turn off the sound, when I am in a large group of people I will frequently become ill. It is difficult to travel, since almost all airlines have Wi-Fi. Most hotels and other accommodations have Wi-Fi. I can only stay at Air-bnbs where I can unplug the Wi-Fi, and even then I need to go far out of my way to the country, as staying in a city is generally not possible.

19. My daughter has been harmed from wireless radiation as well. At first, it was nosebleeds when she was at school. She had her nose cauterized, but it did not stop. The amount of blood was so extreme that it was the most the school nurse had ever seen come from a nose. She bled straight for an hour one day, with clots of blood as large as one inch and more. She also frequently got swollen clogged sinuses and a very stuffy nose when she was not ill.

20. I asked her to try to keep track of when it happened and what was going on. First, she thought that the symptoms were simply random. Then she started having skin problems. Her hands would get cracks and dry out, and then would bleed. We first believed that this might be from dry weather and tried to handle the matter with skin cream. This did not work. One day she counted 16 bleeding cracks in her skin; the blood was running down her hand in rivulets.

21. Then, one day, on a school trip, she sat at the front of the bus and felt ill. She had not been stuffed up, but suddenly was. Her hands became red and she felt head pain. She realized that on the return trip at the back of the bus the symptoms were not as severe. When she returned from the trip she told me what had happened. We asked what was different at the front of the bus and were told that there were two Wi-Fi routers there. She then began to realize that when she was somewhere with Wi-Fi, whether at a friend's home, at school, or in a coffee shop, she started to experience the symptoms. When she went under a cell tower while we were driving, she could feel pain in her head. I have now met other mothers whose children have the same exact symptoms, the nosebleeds, the head pain, the cracking and bleeding of the red hands, as well as the stuffy nose, from Wi-Fi at school.

22. When we brought the issue to the attention of the school, they moved the access point to the hallway instead of in the classroom. Her symptoms improved, and although her hands would get red, and she had a chronic stuffy nose, her nosebleeds stopped. It is difficult to get an education when just being at school causes serious physical effects. I fear for her as the world becomes more and more filled with wireless radiation and it becomes more difficult to avoid, especially as

AFFIDAVIT OF PETRA BROKKEN IN SUPPORT OF STANDING

she is just starting out, and will not likely have the leeway to work part-time, or to live in areas of the country where there is less radiation.

23. I was lucky to find a family doctor trained in integrative medicine who was aware of this environmental condition. She was able to diagnose me some years after I developed symptoms, she also assessed my daughter. She has had other patients with microwave sickness as well. See my diagnosis letter attached as Exhibit 1; my daughter's diagnosis letter attached as Exhibit 2.

24. I personally know more and more people with this illness, including other attorneys, a couple of doctors, a teacher, a Judge in Minneapolis, and most recently, my appliance repairman. I am sad for the countless individuals who do not have access to a doctor who is educated on this condition, both because they may not know why they are ill, and because they may not be able to get a diagnosis or any accommodation. Many people have headaches or other symptoms of microwave sickness, but unless they have been alerted to this issue, and experiment to see how they feel when they are not exposed, they will not realize it is the wireless radiation. We are a country whose individuals are sicker and sicker. Wireless radiation is one of the reasons. I have studied radiofrequency radiation extensively. There are not many studies on 5G, but the studies that do exist show it to be dangerous to the health of living things. We have become a sicker country with the increase in wireless radiation.

25. Some years ago, my daughter and I were working with others to educate an elected official about the effects of wireless radiation in schools. My daughter wrote a letter about her experience, which was provided to this elected official. In the letter, she explained how wireless technology had affected her life. She wrote that she did not like to talk to other children about how wireless technology affected her, "*because I know that most of them do not understand it.*" She stated that:

Around wifi now, my hands get a rash, and if I am around the wifi regularly, then they will crack and bleed. My hands get better on the weekends when I am not around wifi, and then when I go back to school I get the rash again. When I am away from wifi and cell towers, I feel great, and I have no headaches, no stuffiness, and no rashes.

26. The elected official declined to provide any help for children who are experiencing illness from wireless radiation in schools.

27. If the FCC had created actual biological standards, my life would be different. I would have had the freedom to work full time. I would be able to travel freely with my family. I would not have had to spend a great deal of money on

AFFIDAVIT OF PETRA BROKKEN IN SUPPORT OF STANDING

shielding from this radiation. Instead of feeling ill frequently, I would be able to enjoy the robust good health I had as a child. Further, my daughter would not have had to face the physical discomfort and symptoms from this radiation, as well as the psychological burden of knowing that others do not understand these symptoms.

28. The FCC order did not adequately consider or reasonably respond to my comments or those of others who raised similar issues. Their decision to retain their existing rules entirely fails to resolve the problems my child and I face in daily life as a result of constant exposure to harmful radiation. My child and I have been harmed by rules that do not adequately protect health and safety, and in fact directly allow continuous harm. This harm will continue until the rules are changed to truly protect health and safety, and take into account the needs of those who are or may become injured by electromagnetic radiation.

29. The FCC's refusal to comply with the *EHT v. FCC* mandate concretely and significantly harms my interests, and the harm is ongoing and reasonably expected to continue absent this Court's intervention

30. This concludes my Affidavit, but as noted above I am also relying on the Affidavits of Miriam Eckenfels and Dr. David O. Carpenter for the purpose of explaining why the particular facts described above demonstrate standing.

Pursuant to 28 U.S.C. § 1746, I certify under penalty of perjury that the foregoing is true and correct.

/s/ 
Petra Brokken

5-15-26
Date

Addendum 6 – Declarations in Support of Standing

C. Declaration of David O. Carpenter

No. _____

**UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

***In re* CHILDREN’S HEALTH DEFENSE, PETRA BROKKEN, DAVID
O. CARPENTER, MICHELE HERTZ,**

ENVIRONMENTAL HEALTH TRUST,

PETITIONERS

PETITION FOR WRIT OF MANDAMUS

**AFFIDAVIT OF DAVID O. CARPENTER MD IN SUPPORT OF
STANDING**

1. My name is David O. Carpenter. My address is 2749 Old State Road, Schenectady, NY 12303. I am one of the named Petitioners in the above captioned proceeding.
2. This Affidavit is to provide evidence of my standing to pursue the matter. I will provide some of the basic facts particular to my individual circumstances to demonstrate that I have suffered an injury-in-fact traceable to the FCC’s failure to act on the mandate of this Court in *Envtl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) (*EHT v. FCC*) that could be redressed by an order from this Court. I also provide scientific support for my co-Petitioners’ individual claims of injury.
3. I was a named petitioner in *Envtl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) (“*EHT v. FCC*”).
4. I filed comments and several expert reports in the FCC proceedings below on August 26, 2013, and November 13, 2013. I am also part of the BioInitiative Working Group (BIWG)¹, which filed additional materials on April 13, 2014, and November 8, 2017. I and BIWG provided evidence and analysis and made positive recommendations.
5. The expert reports I and the BIWG filed in the FCC proceedings largely rely on the BioInitiative Report (“BIR”).¹ We testified that “evidence for health risks

¹ The Bioinitiative Report, including full titles and affiliations of authors in Section 25, is at www.bioinitiative.org.

comes directly from thousands of published scientific and public health studies showing that increasing Radio Frequency (“RF”) radiation (RFR) levels are producing ‘epidemiologically-visible’ health harm across very large populations of exposed people. Our expert submission concluded that RFR levels common today are creating intolerable health problems and should be rolled back. The evidence since that time only adds greater support for that conclusion.

Credentials

6. I am the Vincent O’Leary Professor of Environmental Health Sciences within the College of Integrated Health Sciences, and Co- Director of the Institute for Health and the Environment at the University at Albany, State University of New York. Our Institute is a Collaborating Center of the World Health Organization. I graduated from Harvard Medical School and chose a career in public health and research rather than clinical medical practice. I have been a medical doctor and public health expert for 50+ years and have served the federal government and the State of New York. I have published over 500 peer-reviewed scientific papers.

7. Public health medicine practitioners do not directly treat individual patients. We focus on preventing disease. We try to identify what causes disease, and then identify ways to reduce and prevent those causes. We study the health of *populations*, not individuals. My research is directed at studying environmental causes of human disease.

8. In the past 50 years, one major focus of my public health work has been the study of human health effects of electromagnetic fields (EMFs).

9. I have served on both national and international organizations addressing the topic and constantly working on policy and safety guidelines. I have published 16 articles on various aspects of health effects of EMFs in peer-reviewed journals, wrote an invited chapter on the subject for a standard textbook, edited six books, two of which were entitled *Biological Effects of Electric and Magnetic Fields*, and published many invited book chapters and reviews. I am a Commissioner in the International Commission on the Biological Effects of Electromagnetic Fields. I am the immediate past Editor in Chief of *Reviews on Environmental Health*. I was the founding Editor-in-Chief and now Editorial Advisor of *Cellular and Molecular Neurobiology*. I am also on the editorial boards of *International Archives of Occupational and Environmental Health*; *Global Health Perspective*; *Environment International*; and *International Journal of Environmental Research and Public Health*.

10. I have testified on the subject at hand before the U.S. House of Representatives and the President’s Cancer Panel, in addition to a number of state

hearings. I have been confirmed as a testifying expert in court cases on the topic of causation from wireless technology (G, a 12-year-old minor using by a factious name for privacy reasons, MOTHER, and FATHER, suing under fictious names to protect the identify and privacy of G, their minor child, Plaintiffs v. The Fay School, Inc (by and through its Board of Trustees and ROBERT J. GUSTAVSON, JR), Defendants. United State District Count, District of Massachusetts. Civil Action No. 415-CV-40116-TSH.

11. Two of my previous positions include serving as a Commissioner Officer in the U.S. Public Health Services, stationed at the National Institute of Mental Health in Bethesda, MD, and Director of the Neurobiology Department at the Armed Forces Radiobiology Research Institute, the research arm of the Defense Nuclear Agency located at the Naval Medical Center in Bethesda. In the latter role I became familiar with concerns that exposure to EMFs from radar were causing adverse health effects. This was an active research area within the Navy in 1973-1979. Radar, like wireless technology, uses non-ionizing microwave frequencies and emits radiation at non-thermal intensities. The Navy investigated the potential health effects because soldiers exposed to radar kept getting sick and showing symptoms similar to those now being experienced by the general population after excessive exposure to pulsed and modulated RFR.

12. In 1980 I was appointed Director of the Wadsworth Center for Laboratories and Research of the New York State Department of Health (NYSDOH). At that time, the Wadsworth Center had over 1,000 employees; it was the third largest public health laboratory in the U.S. after the National Institute of Health (NIH) and Centers for Disease Control (CDC). While employed by the NYSDOH I was appointed Administrator of the New York State Powerlines Project. Our task was to determine whether magnetic fields coming from electricity cause adverse health effects. These studies confirmed earlier results showing that children living in homes that had elevated magnetic fields from neighborhood power lines had a higher risk of leukemia, and also found significant biological effects in cellular and animal studies. After the Project concluded in 1987, I served as the spokesperson for New York State on the issue of health effects of EMFs until I moved to the University at Albany in 1998. My CV is attached and marked Carpenter Exhibit 1.

The BioInitiative Report

13. I was the Co-Editor in Chief of the BioInitiative Report (BIR), which was prepared by the BioInitiative Working Group (BIWG) comprised of 29 the world's leading scientists and public health experts on the subject of health effects of RF/EMFs. It is the most comprehensive independent review of the scientific evidence on the biological and health effects of wireless technology. The purpose

was to provide “*a rationale for a biologically-based public exposure standards for electromagnetic fields and RF.*”

14. The 2012 BIR contains 1,500 pages of detailed scientific reviews of 3,800 peer-reviewed studies addressing RF radiation (RFR) and extremely low frequencies (ELFs). The report was first published in 2007, updated in 2012, 2014, 2017 and most recently in 2020.

15. **The FCC position:** The FCC takes the position that the only hazards of RF are those where the intensity is sufficiently high to cause tissue heating. This is only a hypothesis and it has been disproven. This position comes from organizations such as the Institute of Electrical and Electronics Engineers (IEEE), an organization that has no health expertise, and others in the physics community who believe that non-thermal levels of non-ionizing radiation are insufficient to cause biological effects. That is an assumption, not evidence, and it is false. In biology, unlike in physics, it is the response of the organism, not the power of the source, that determines the effects. Organisms respond to RF/EMFs in many ways that have nothing to do with thermal heating, and those responses often lead to human diseases.

16. The BIR was developed to present in encyclopedic detail the existence of clear and reproducible scientific evidence of biological and adverse effects of RF/EMFs that can lead to significant human harm and illness, and to show that the FCC guidelines are false and do not protect the public’s health.

17. **The BIR conclusions and recommendations are in section 24 which I co-authored. We conclude:**

We determined that bioeffects are clearly established and occur at very low levels of exposure to electromagnetic fields and radiofrequency radiation. Bioeffects can occur in the first few minutes at levels associated with cell and cordless phone use. Bioeffects can also occur from just minutes of exposure to mobile phone masts (cell towers), Wi-Fi, and wireless utility ‘smart’ meters that produce whole-body exposure. Chronic base station level exposures can result in illness. Many of these bioeffects can reasonably be expected to result in adverse health effects if the exposures are prolonged or chronic. This is because they interfere with normal body processes (disrupt homeostasis), prevent the body from healing damaged DNA, produce immune system imbalances, metabolic disruption and lower resistance to disease across multiple pathways. Essential bodily processes can eventually be disabled by incessant external stresses (from system-wide electrophysiological interference) and lead to pervasive impairment of metabolic and reproductive functions.

More recently there has been the widespread rollout of 5G, for which health impacts have not been studied but which dramatically increases human exposure to RFR. This is shown in Figure 1 from Bandara and Carpenter, 2018.²

The BIR Science

18. **Sections:** BIR reviewed and provided evidence for Effects on Gene And Protein Expression (Section 5); Evidence For Genotoxic Effects (Section 6); Evidence for Stress Response (Stress Proteins) (Section 7); Evidence For Effects On The Immune System (Section 8); Evidence for Effects on Neurology and Behavior (Section 9); Evidence for effects of Electromagnetic Fields From Wireless Communication upon the Blood-Brain Barrier (Section 10); Evidence For Brain Tumors And Acoustic Neuromas (Section 11); Evidence for Disruption by the Modulating Signal (Section 15); Evidence based on EMF Medical Therapeutics (Section 17); Electromagnetic Field Exposure Effects (ELF-EMF and RFR) on Fertility and Reproduction (Section 18); Fetal and Neonatal Effects of EMF (Section 19); Findings in Autism (ASD) Consistent with Electromagnetic Fields (EMF) and Radiofrequency Radiation (RFR) (Section 20). The evidence of each section was reviewed by the leading relevant experts.

19. **Color Chart:** To help visualize the extent of the scientific evidence, the BIR includes two RF Color Charts of Reported Biological Effects from Radiofrequency Radiation at Low-Intensity (i.e., non-thermal) Exposure. The charts are color-coded—each of the eight colors represents a different harm. Among the harms shown: creation of stress proteins and disrupted immune function; reproductive effects; DNA repair damage; oxidative stress; disruptive calcium metabolism; brain tumors; damage to the Blood-Brain Barrier (BBB); neurological effects; cancer and cell proliferation; and vascular system effects. Each chart contains about 60 studies.

20. The first chart presents studies which rely on power density levels. The studies are arranged from the lower levels (the first study shows effects at $0.000,000,000,000,001 \mu\text{W}/\text{cm}^2$) progressing up to the maximum FCC-allowed levels which are between $200\text{--}1,000 \mu\text{W}/\text{cm}^2$ depending on the frequency. This table shows biological effects from levels that are even $50,000,000,000,000,000$ times lower than the FCC-allowed levels. The second table presents studies with Specific Absorption Rate (SAR) levels used for devices in close proximity, such as cell phone. The studies reveal harms at levels $25,000$ times lower (0.000064 w/kg) than the maximum FCC-allowed levels of 1.6 w/kg

² 2018 Lancet Planetary Health 2: e515-e514.

21. **BIR Authors:** The BIR authors have extraordinary credentials and associations. They include some of the most accomplished scientists on EMF/RFR worldwide. Among the authors are three former Presidents (Blank, Blackman and Mild) and five full members of the prestigious Bioelectromagnetics Society (BEMS). One distinguished author is the Chair of the Russian National Committee on Non-Ionizing Radiation (Grigoriev). Another is a former Senior Advisor to the European Environmental Agency (Gee). Three of the authors (Blackman, Hardell and Belyaev) were part of the 2011 IARC panel that classified RFR as a “Possible” (2B) human carcinogen. These are truly the leading scientists on this issue worldwide.

22. **BIR Conclusion Section:** Additional BIR sections address policy issues including Summary for the Public and Conclusions (Section 1); Statement of the Problem (Section 2); The Existing Public Exposure Standards (Section 3); Evidence of Inadequacy of the Standards (Section 4); and Key Scientific Evidence and Public Health Policy Recommendations (Section 24).

23. **BIR Report published:** Much of the 2007 BIR content was published in a special two-volume issue of the peer-reviewed *Journal of Pathophysiology*.³ The public health chapter was also published with slight revision after peer-review in *Reviews on Environmental Health* in 2008. Because of its crucial importance, we also published the whole BIR as a website to ensure it is accessible to everyone without cost.

24. **EU Parliament 2009:** The 2007 BIR formed the basis for the European Parliament’s 2009 Resolution on “Health concerns associated with electromagnetic fields” calling for greater transparency relating to RFR exposure and adoption of precautionary measures.⁴

25. **BIR Updates Reflected Newer and Stronger Evidence:** The BIR 2012 update found stronger and more consistent scientific evidence for health harm, and at even lower exposure levels. The 2014 and 2017 updates continued to see this trend, and the evidence continues to get stronger each year.

26. The BIR alone (independent of all the other evidence presented to the FCC) demonstrates that any objective and unbiased review of the current science leaves no doubt that wireless technology has biological effects at non-thermal intensities. These exposures can be and are highly injurious to health at radiation intensities an

³ August 2009, *Pathophysiology* 16: 2,3.

⁴ Resolution (INI/2008/2211), <https://ecfsapi.fcc.gov/file/7521323876.pdf>.

order of magnitude below the FCC's current guidelines, especially when the frequencies are pulsed and modulated.

27. **Cost of doing nothing:** My expert report advised the FCC that “The cost of doing nothing is unacceptable. Substantial evidence for health risks from chronic exposure to wireless technologies cannot be dismissed, and if we do nothing, it will simply worsen rates of chronic diseases, disability and premature mortality.” I also published two papers on the public health implications “*Human Health Effects of EMFs: The Cost of Doing Nothing*”⁵ and “*Electromagnetic Fields and Cancer: The Cost of Doing Nothing*.”⁶

28. **Recommendations:** The BIR conclusion urged the FCC to 1) recognize non-thermal health effects harms caused by constant and ever-growing RF emissions 2) adopt immediate measures to warn the public 3) develop concrete and biologically based guidelines based on “observed effects” in humans and 4) establish guidelines that take into account long-term chronic exposure to non-thermal effects of RF/EMF, including effects of pulsation modulation and peak exposures.

The FCC treatment.

29. The Commission dismissed the evidence in the record, including the BIR, without any substantive or scientific analysis.

30. The only discussion appears in *RF Order* ¶¶10-15 and the essence of it is in ¶12.⁷

31. The FCC made a conclusory statement that the evidence of harm was not persuasive.

32. **The FCC dismissal of the BIR:** The only explanation the FCC gave for rejecting the scientific and medical evidence of harm in the BIR was because it would allegedly require emissions levels so low that “No device could reliably transmit any usable level of energy by today's technological standards while meeting those limits.”

⁵<https://ecfsapi.fcc.gov/file/109303096909269/Carpenter.2010.Human%20health%20effects%20of%20EMFs.Cost%20of%20doing%20nothing.pdf>

⁶ January, 2010, Reviews on environmental health 25(1):75-80.

⁷ *Resolution of Notice of Inquiry, Second Report and Order, Notice of Proposed Rulemaking, and Memorandum Opinion and Order*, 34 FCC Rcd 11,687, 11,689-90 (2019).

33. **BIR Recommended levels based on human studies:** Unlike the FCC guidelines, which are based on obsolete and disproven assumptions, the BIR 2012 recommended levels as goals that are based on actual effects found in humans. The BIR-recommended levels are based on an ‘observed effects level’ in individuals living near cell towers.

34. **Goals not standards:** It is important to note that the BIR recommended goals, not regulatory standards. It is true that achieving such low exposure levels and developing safer and less bio-active modulations levels would require effort on the part of the FCC and the telecom industry. However, it is not an excuse to deny the evidence of harm.

35. **Asked to take action:** I and my Co-Editor of the BIR meet with the FCC in their office in Washington and advised the FCC that the responsible action would be to accept and admit that non-thermal RF/EMF poses danger to human health. We asked the FCC to take immediate action to reduce exposures to the greatest degree that can be accomplished without undue social disruption. As in every situation where public health confronts economic and social barriers, one must balance cost vs. benefit. But the first step for responsible action is to stop denying the scientific facts and the evidence of human injuries. Our request was ignored.

The FCC’s Guidelines

36. The FCC’s 1996 guidelines are entirely based on the fallacious assumption that the only effects from exposure to non-ionizing EMFs can occur from levels that create tissue heating, a concept known as the “thermal effect.” The FCC guidelines do not even protect from thermal effects from long-term exposure. They look at only 30 minutes of exposure and from only one source of radiation.

37. To ensure the “safety” of wireless devices, the FCC is using a mannequin head which approximates the size of a head of a 6 foot, 220-pound man. It is filled with liquid, supposedly to simulate brain tissue. The mannequin measures the absorption of “heat” from the RFR in the brain. Mannequins do not have brains, and human brains are an extremely complex bioelectrical organ, not liquid. Exposure to RF/EMFs could induce chemical, physiological, psychological and behavioral effects in the brain that have nothing to do with heat absorption. The effects are documented in brain scans, functional MRIs, SPECT scans and EEGs. For example, human EEG studies reveal the effects of RF/EMFs on brain physiology, alpha brain waves, cortical activity, brain synchronization, sleep and epileptic seizures. Studies show effects on cognitive functions, sleep, memory, learning, perception, vision, motor abilities and auditory effects. Studies also showed impaired blood flow to the brain, damage to the Blood Brain Barrier and

metabolic effects in humans. There is also evidence of effects on brain glucose metabolism.

38. **Use in medical technology:** Pulsed and modulated EMFs have been successfully used for medical purposes for many years. BIR Section 17 addressed “Evidence based on EMF Medical Therapeutics,” showing how pulsed EMFs have been used to promote bone healing after a fracture when all other efforts have failed. Pulsed EMFs are also used for chronic pain management. This every-day beneficial medical use belies the assumption behind the FCC standards.

39. **The FCC guidelines do not even protect from exposure to thermal damage from peak exposures:** The FCC “safety” measurements are only exposures lasting 30 minutes, and they are averaged. We advised the FCC that its failure to address this issue is leading to sickness from “Smart Meters.” Smart meters are wireless transmitting devices that record electricity usage and wirelessly send that information to the utility. These meters have been installed on homes, sometimes without people’s knowledge or permission. They send a cluster of very brief but extremely high intensity pulses, repeated multiple times a minute, 24/7 continuously, sometimes up to 190,000 pulses a day. While the average intensity over periods of time is not particularly high, many people have been injured by smart meters. The very high intensity pulses exceed FCC thermal guidelines, but because of the FCC “averaging,” the real exposure levels are obscured. EMF pulses are known to be bioactive (to have effects on living tissue). Despite many complaints by individuals who have been injured from these meters, and despite the evidence provided by the BIR and other experts, the FCC has done nothing to address the problem and completely ignored them in its decision. For years now I have received desperate pleas from the injured who cannot even be in their own home. I have written letters, provided expert opinions and traveled extensively, trying to support them with legislators or in courts. Because of the FCC decision, I will have to continue and work to support their efforts, but I am not sure what more can be done. This is why I joined this Petition.

40. **Do not protect from current types of exposure:** The current radiation levels can even be a quintillion times higher than what humans have evolved to tolerate. See Exhibit 3. The FCC’s guidelines completely fail to protect the public from current real exposures - from constant exposure to RFR/EMFs from numerous sources, operating on different frequencies and using different pulsations and modulations. They test for only one device for 30 minutes. No tests using pulsation and modulations are required, though this is what people encounter in the real world.

41. The BIR established that the FCC's thermal assumption is invalid. It has been disproven, and the SAR levels are completely irrelevant to assess the effects of existing exposures and protect the public's health. The FCC failure not only does not protect the public; it has actually been creating harm. I see it every day in my work.

42. **Non-Ionizing Radiation Sickness:** The human evidence of the failure and irrelevance of the FCC guidelines are most apparent from the growing reports of **Non-Ionizing** Radiation Sickness, also known as "microwave illness," "microwave syndrome," "electro-hypersensitivity," or "EMR Syndrome." The sickness is growing but is largely an ignored public health problem.

43. The syndrome consists mainly of neurological symptoms, including headaches, fatigue, cognitive dysfunction, ringing in the ears, and often cardiac arrhythmias. Non-Ionizing Radiation Sickness is likely the most immediate and widespread manifestation of the harm from exposure to wireless emissions within the FCC's current limits. Hundreds of studies show that Non-Ionizing Radiation Sickness symptoms can be caused by exposure to RF/EMFs. Studies also suggest these symptoms indicate serious physiological injuries such as impaired blood flow to the brain, BBB leakage and oxidative stress.

44. The first reports of this sickness started decades ago. U.S. soldiers were exposed to RF systems and radar. At the time, only military personnel and a few professionals were exposed to the RFR levels that are now inflicted on the entire civilian population. I published two papers on the history of the condition: *Excessive exposure to radiofrequency electromagnetic fields may cause the development of a syndrome of electro-hypersensitivity*⁸ and *"The microwave syndrome or electro-hypersensitivity: Historical background."*⁹ There is increasing evidence that the "Havana Syndrome" is due to intentional human exposure to high intensity microwaves.¹⁰

45. For over a decade I have been approached by growing numbers of people. They or their children have developed the sickness and they are desperate. It is becoming a health and human rights crisis. Some of this illness could have been avoided if the public had been warned about the potential effects. Instead, because

⁸ *Excessive exposure to radiofrequency electromagnetic fields may cause the development of a syndrome of electro-hypersensitivity*; Altern Ther Health Med. 2014;20(6):40-42.

⁹ *"The microwave syndrome or electro-hypersensitivity: Historical background*; Reviews on Environmental Health 30: 217-222: 2015.

¹⁰ US National Academy of Sciences. <https://doi.org/10.17226/25889>.

of FCC assurances of safety, people who are suffering from Non-Ionizing Radiation Sickness often don't know that it is their wireless devices that are the cause of their symptoms and problems. Doctors are often unaware of the science and misdiagnose their patients and give them incorrect treatment and unnecessary medications. Children are getting psychiatric medications for ADHD while for many turning off the Wi-Fi router would solve their problem.

46. As a doctor who dedicated his life to public health, I have been working tirelessly to raise public awareness and to educate public health professionals about the RF harms and the resulting sickness. Because of the FCC's failures, denial of harm, and its insistence to force even more of this toxic radiation on the public I will have to continue to work to help protect the public not only from RF/EMFs, but also from the FCC.

Response to The FCC Claims

47. The FCC summarily dismissed all the evidence and pretended none of it was convincing or reliable.

48. **Claim 1: RF Order ¶10** states *“we find no appropriate basis for and thus decline to initiate a rulemaking to reevaluate the existing RF exposure limits. This decision is supported by our expert sister agencies, and the lack of data in the record to support modifying our existing exposure limits.”*

49. The BIR has sufficient authority to establish evidence of harm. The evidence is overwhelming and conclusive: evidence of harm, from thousands of irrefutable, peer-reviewed and published scientific studies along with testimonials of hundreds of individuals (and often medically documented) reports of injury, in the agency record.

50. **Claim 2: “Sister Agencies”/FDA:** The FCC referred to “sister agencies,” but the only agency that meaningfully participated was the Food and Drug Administration (FDA). The director of the FDA Center for Devices and Radiological Health filed a letter in April 2019 stating that “no changes to the current standards are warranted at this time.” In one short paragraph, without any meaningful analysis or explanation, he rejected all the science.

51. This rejection is astounding considering the FDA commissioned the National Toxicology Program (NTP) of the National Institute of Environmental and Health Science (NIEHS) to conduct a study that would provide definitive answers relating to health implications from wireless emissions. The NTP was designed to address long-term exposure to modulated RFR. The study found clear evidence of cancer and DNA damage. The cancers in rodents were gliomas of the brain and Schwannomas, which is the same tumor that causes acoustic neuromas of

the auditory nerve in humans who hold their cell phone to their ear. Some additional cancers were seen from whole body exposure, not just the head. It also confirmed the effects of modulation.

52. Very importantly, the NTP studies also demonstrated clear damage to DNA. DNA damage is a precursor for the development of cancer.

53. The Ramazzini Institute in Italy performed a similar study, but one where the intensity of exposure to the rodents was at the levels similar to those that humans would be exposed to if they live near a cell tower. This study, even though conducted at a much lower intensity, confirmed the development of the same two cancers seen in the NTP results. These studies, combined with other animal studies and epidemiological studies, leave no room for doubt regarding the carcinogenic effects and DNA damage of RFR.

54. **IARC:** In 2011, the International Agency for Research on Cancer (IARC) found that RFR is a possible carcinogen. Considering the relatively short time we have been using wireless technology and the long time it takes cancer to develop, a 2B carcinogen at that time should have been alarming. IARC explained that while there was epidemiological evidence for a higher classification, more animal studies were needed. The NTP and Ramazzini Institute studies have now established the missing link that held back IARC. But even so, the lower designation should have given the Commission pause, especially after the NTP and Ramazzi findings.

55. Nevertheless, the FDA director of the Department of Radiology and Devices rejected the conclusions of the \$25 million NTP study commissioned by his own office. Although the protocols of the study were confirmed by the FDA, he stated that the results “should not be applied to humans.” This position was rejected by a panel of 11 experts that were appointed by the NIEHS. The FCC never explained why it decided to ignore all the independent experts, including many in government or appointed by government, who say the FCC regulations are based on false premises and are causing great harm.

56. **Claim 3: No evidence in the docket:** The FCC claims that “The record does not demonstrate that the science underpinning the current RF exposure limits is outdated or insufficient to protect human safety.” The BIR as well as hundreds of additional reports and studies published since the last BIR version (and referenced in the docket) completely contradict that claim. The FCC assertion is scientifically and factually indefensible.

57. **Claim 4: Evidence is not persuasive:** *RF Order* ¶12 states: “While the record includes some research information, there is no persuasive case in the record to evaluate the quality and significance of that research.” The BIR provides a strong and persuasive case showing the FCC guidelines are irrelevant and not

evidence-based. It is the FCC that fails to provide any evidence, let alone “persuasive” evidence, to support its decision or claims.

58. **Claim 5: The Commission goes on to claim that “no scientific evidence establishes a causal link between wireless device use and cancer or other illnesses.”** We already know at least some of the causal mechanisms between RF/MW radiation and biological systems. The BIR reported that 90% of 225 studies show RF/EMF causes oxidative stress, an established mechanism of harm that can lead to cancer, non-cancer illnesses and DNA damage. Oxidative stress is involved in cancer, radiation sickness and neurological damage from RF/EMF. There is evidence of other related mechanisms of harm such as damage to cell membranes, and mitochondria, which are the energy factories of our cells, and damage to the Blood Brain Barrier (BBB).

59. **Claim 6: Multi-agency consensus:** The FCC asserts it has support of “sister” agencies. One FDA department supported the FCC position. The only agency with current expertise is the NTP, which is another arm of DHHS. The FDA had to contract with the NTP to perform the NTP cell phone study. When the EPA had experts on this issue, before its EMF program was defunded, EPA studies revealed harms. Dr. Carl Blackman, one of the BIR authors, was with EPA at the time. The EPA repeatedly advised the FCC that the current guidelines do not protect against long-term exposure to pulsed and modulated non-thermal levels RFR.

60. **Inaction not an option.** In the 50 years working in public health, I’ve seen numerous public health failures. Many are a result of government agencies’ reliance on industry-friendly science committees (think: Tobacco). The failure to protect the public health from excessive exposure to wireless radiation is, in my opinion, the worst failure. Everyone is exposed and no one can any longer choose **not** to be exposed, even those who must not be exposed for their survival. The damage has manifested, and the sickness is all around us. Ignoring the evidence is merely increasing the size of an already gargantuan problem. Inaction is no longer an option.

Standing

61. **Personal injuries:** I have a direct and personal stake in this matter. First, and most fundamentally, I and my family are personally injured by EMF/RFR emissions pursuant to the FCC’s authority and within its guidelines. My wife suffers from a mild case of Non-Ionizing Radiation Sickness. When she is exposed to high levels of Wi-Fi she develops tinnitus (ringing in the ears) that goes away when she is not close to the source. I clearly understand the science showing this radiation adversely affects our cells with every minute of exposure. This damage

over prolonged exposure can lead to illness. I personally object to the harmful bodily intrusions that constantly occur without my consent, and which are causing me direct personal injury. All the petitioners in this case are similarly injured.

62. **Professional injury:** The FCC's and FDA's denial of the science has been harmful to my reputation as a scientist. Scientists who have publicly acknowledged the harms are dismissed by FCC officials and called "conspiracy theorists" and even Russian or Chinese agents; our science is labelled "bogus." I have personally been subjected to professional injury. In an article in the New York Times on July 16, 2019, entitled "The 5G Health Hazard that Isn't," William J. Broad implied that I was an agent of the Russian government only because I did an interview on RT America on the adverse health effects of cell phones. His article was found to have violated the truth and accuracy code of Ireland by the Press Ombudsman for the Press Council of Ireland. The BIR has been attacked as "unscientific" and "scientifically discredited." The FCC has harmed my name, my professional integrity and my professionalism.

63. The FCC did not disclose its reasoning, if there even was any. The BIR research used and applied all the necessary protocols and tools for analysis. Much of it was peer-reviewed and published. Yet the FCC rejected it. I now have no idea what information the Commission deems relevant, or what it would take to secure the needed change. As a result, I cannot provide evaluation or analysis, or conduct research on the topic since I simply do not know what more to do. This materially impedes my ability to practice public health.

64. I am bound by professional ethics even though I am a public health practitioner and researcher rather than a clinical physician. I am a member of the American Medical Association. My Hippocratic oath¹¹ requires that I take all necessary steps to "prevent disease whenever I can, for prevention is preferable to cure." The AMA Code of Ethics has a section relating to medical research and innovation. Code of Medical Ethics Opinion 7.2.1 states that:

Physicians have an ethical responsibility to learn from and contribute to the total store of scientific knowledge. When they engage in biomedical or health research, physicians have obligations as scientists, which include disseminating research findings. Prompt presentation to scientific peers and publication of research findings are foundational to good medical care and

¹¹ "A Modern Hippocratic Oath" by Dr. Louis Lasagna, Dean, School of Medicine at Tufts University, 1964.

promote enhanced patient care, early evaluation of clinical innovations, and rapid dissemination of improved techniques.¹²

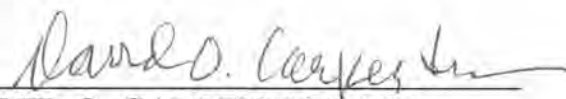
65. Opinion 7.2.1 recognizes that research and dissemination of findings is for the “ultimate benefit of patients,” so my research is ultimately about how to care for individuals with health conditions, and actively preventing environmental conditions that harm human beings. My ethical duties require that I do everything in my power to expose the FCC’s active suppression and denial of the science on this topic, because the bottom line is that the FCC’s current standards threaten the population at large and are inflicting grave harm on large numbers of individuals who suffer from exposure-related sicknesses.

66. The FCC’s continuing failure to respond to the Court’s mandate in *EHT v. FCC* fails to resolve the problems caused by excessive exposure to harmful non-ionizing radiation at currently permitted levels. These injuries and harms will continue until the rules are changed to take into account the needs of those who are or may become injured by electromagnetic radiation and to truly protect health and safety.

67. If the Court grants this Petition, the FCC will have to acknowledge the harm it has been causing, then craft standards that reduce or eliminate the harm. Changes to the FCC guidelines that would address non-thermal levels and modulated, pulsed signals will safeguard my life and the lives of others. A mandate that requires the FCC to address the situation and allow accommodations for those who are already suffering and who need to avoid nonconsensual exposure to wireless radiation would significantly mitigate the harm.

68. This concludes my Affidavit.

Pursuant to 28 U.S.C. § 1746, I certify under penalty of perjury that the foregoing is true and correct.

/s/ 
DAVID O. CARPENTER, MD

15 May 2026
DATE

¹² Full text available at <https://www.ama-assn.org/delivering-care/ethics/principles-disseminating-research-results>.

CURRICULUM VITAE

Name: David O. Carpenter

Home Address: 2749 Old State Road
Schenectady, New York 12303

Current Position: Vincent O'Leary Professor of Environmental Health Sciences
College of Integrated Health Sciences, University at Albany
1400 Washington Avenue, Albany, NY 12144

Co-Director, Institute for Health and the Environment
University at Albany

Honorary Professor
Queensland Children's Medical Research Institute
University of Queensland
Brisbane, Australia

Education:
1959 B.A., Harvard College, Cambridge, MA
1964 M.D., Harvard Medical School, Boston, MA

Positions Held:

9/61-6/62 Research Fellow, Department of Physiology, University of Göteborg, Sweden with Professor Anders Lundberg

7/64-6/65 Research Associate, Department of Physiology, Harvard Medical School, Boston, MA under the direction of Dr. Elwood Henneman

7/65-2/73 Neurophysiologist, Laboratory of Neurophysiology, National Institutes of Mental Health, Dr. Edward V. Evarts, Chief, Assistant Surgeon, USPHS, currently a Reserve Officer in the USPHS.

2/73-3/80 Chairman, Neurobiology Department Armed Forces Radiobiology Research Institute, Defense Nuclear Agency, Bethesda, MD

3/80-9/85 Director, Wadsworth Center for Laboratories and Research, New York State Department of Health, Albany, NY

9/85-1/98 Dean, School of Public Health, University at Albany

9/85-Pres. Professor, Departments of Environmental Health Sciences and Biomedical Sciences, School of Public Health, University at Albany.

9/85-7/98 Research Physician, Wadsworth Center for Laboratories and Research, New York State Department of Health, Albany, NY

1/98-1/05 Adjunct Professor in the Center for Neuropharmacology & Neuroscience, Albany Medical College, Albany, NY

2001-Pres. Director, Institute for Health and the Environment, University at Albany, SUNY, Rensselaer, NY. The Institute was named a Collaborating Center of the World Health Organization in 2011.

2005-2010 Senior Fellow, Alden March Bioethics Institute, Albany Medical College/Center, Albany, New York

2011-Pres. Honorary Professor, Queensland Children's Medical Research Institute, University of Queensland, Brisbane, Australia

Editor-in-Chief: Cellular and Molecular Neurobiology, 1981 – 1987
Editor-in Chief: Reviews on Environmental Health 2012-2025
Editor-in-Chief: Environmental Pollution 2015-2019
Editorial Advisor: Cellular and Molecular Neurobiology, 1987 – Present
Academic Editor: Journal of Environmental and Public Health, 2009-2013
Academic Editor: PLoS ONE 2014-2016
Editorial Boards: Journal of Public Health Management and Practice, 1995 - 2002
International Journal of Occupational Medicine & Environmental Health
1996 – 2016
Journal of Alzheimer's Disease – Associate Editor, 2007-2009
Reviews on Environmental Health; 2008-2012
International Archives of Occupational and Environmental Health; 2009-present.
Environmental Health Perspectives, 2010-2017
Global Health Perspective, 2012-present
Environment International 2013-present
International Journal of Environmental Research and Public Health: 2019-present.

National and International Committees:

1978, 1981 Physiology Study Section (Ad hoc member)
 1979-1985 NIH International Fellowship Study Section
 1974-1981 Member, Steering Committee of the Section on the Nervous System, American Physiological Society (Chairman of the Committee, 9/76-4/80)
 1981-1989 Member, USA National Committee for the International Brain Research Organization
 1985-1986 Committee on Electric Energy Systems of the Energy Engineering Board, National Research Council
 1986-1987 Member, Neurophysiology Peer Panel for the National Aeronautics and Space Administration
 1987-1989 Member, Science Advisory Council of the American Paralysis Association
 1987-1990 Advisory Panel for the Electric Energy System Division, U.S. Department of Energy
 1985-1993 Committee #79, National Council on Radiation Protection and Measurements
 1986-1997 Member, Legislative and Education Committees, Association of Schools of Public Health
 1989-1994 Member, Neuroscience Discipline Working Group, Life Sciences Division of the NASA
 1994, 1995 Federation of American Societies for Experimental Biology Consensus Conference on FY 1995 Federal Research Funding
 1994-1997 Member, Legislative Committee of the Association of Schools of Public Health
 1997 Member, Executive Committee of the Association of Schools of Public Health
 1997-2000 National Advisory Environmental Health Sciences Council of the National Institutes of Health
 1998-2015. Member, U.S. Section of the Great Lakes Science Advisory Board of the International Joint Commission
 2000-Pres. Member, Board of Directors, Pacific Basin Consortium for Hazardous Waste Health and Environment; Treasurer, 2001-2004, 2008-pres; Chair, 2004-2008
 2001-2008 United States Co-Chair, Workgroup on Ecosystem Health of the Science Advisory Board of the International Joint Commission
 2002-2003 Member, Committee on the Implications of Dioxin in the Food Supply, The National Academies, Institute of Medicine
 2001-Pres. Member, Board of Directors, Alliance for Public Health and Associates, Inc.
 2003-2008 Member, United States Environmental Protection Agency, Children's Health Protection Advisory Committee
 2003-2012 Chair, Advisory Committee to the World Health Organization and National Institute of Environmental Health Sciences on collaborative activities.
 2004-2012 Member, Blue Ocean Institute Curriculum Advisory Board.
 2007-2011 Chair, Workgroup on Risks vs. Benefits of Fish Consumption, Science Advisory Board,

2013 International Joint Commission.
 Invited Expert, International Agency for Research on Cancer, Panel for Monograph 107,
 Carcinogenicity of Polychlorinated Biphenyls.
 2013-Pres. Member, Global Burden of Disease Panel
 2025-Pres. Commissioner, International Commission on the Biological Effects of Electromagnetic
 Fields

State and Local Committees:

1980-1987 Executive Secretary, New York State Power Lines Project
 1985-1989 Board of Scientific Advisors, Institute of Basic Research, OMRDD, N.Y.
 1986-1989 Member, Steering Committee, Health Policy and Administrative Consortium of the Capital
 District
 1991-1992 Member, Connecticut Academy of Sciences and Engineering Committee on
 Electromagnetic Field Health Effects
 1991-1992 Member, Board of Directors of the Capital District Chapter of the Alzheimer's Disease and
 Related Disorders Association, Inc.
 1991-1992 Member, State Task Force for the Reform of Middle Level Education in NY State
 1992-1993 Member, State Needs Task Force on Health Care and Education
 1987-1998 Delegate-at-Large, New York State Public Health Association
 1991-1995 Member, Board of Directors of the Capital District Amyotrophic Lateral Sclerosis
 Association
 1994 Chair, Council of Deans, University at Albany, SUNY
 1997-2008. Member, Board of Directors, (Chair 1998-2004) Albany-Tula Inc.: A Capital Region Alliance
 2000-Pres. Member, Board of Directors, Healthy Schools Network, Inc.
 2000-2003 Member, Medical Advisory Board, Hepatitis C Coalition, New York
 2000-2004 Member, Environmental Protection Agency /National Association of State Universities and
 Land Grant Colleges Task Force
 2001-2008 Member, Board of Directors, Environmental Advocates of New York
 2004-2007 Member, Ad Hoc Advisory Group on Brownfield Cleanup Standards
 2005-Pres. Member, Schooling Chefs Curriculum Advisory Board
 2005-Pres. Member, Advisory Board, Healthy Child Healthy World
 2005-2008 Member, Board of Directors, Citizens Environmental Coalition
 2006-2009 Member, Board of Directors, Marine Environmental Research Institute
 2007-2009 Member, New York State Renewable Energy Task Force
 2013-2015 Member, Medical Society of the State of New York (MSSNY)
 2013-2015 Member, Preventive Medicine and Family Health Committee, MSSNY
 2014-Pres. Member, Board of Directors, Regenerative Research Foundation
 2014-Pres. Member, Board of Directors, International Institute for Health and Education

Honors, Awards and Fellowships:

1959 B.A. awarded magna cum laude. Thesis entitled "Metamorphosis of visual pigments: A
 study of visual system of the salamander, Ambystoma tigrinum" (Thesis advisor, Professor
 George Wald)
 Elected to Phi Beta Kappa and to Sigma Xi
 1964 M.D. awarded cum laude for a thesis in a special field. Thesis entitled "Electrophysiological
 observations on the importance on neuron size in determining responses to excitation and
 inhibition in motor and sensory systems" (Thesis advisor, Dr. Elwood Henneman)
 1964 Awarded the Leon Resnick Prize given to a Harvard Medical School graduate showing
 promise in research
 1970 Awarded the Moseley Traveling Fellowship for study in England (Fellowship declined)

- 1971 Invited as Visiting Professor of Physiology, Centro de Investigacion y de Estudios Avanzados, del Institute Politecnico Nacional, Mexico 14, D.F., Mexico, for 3 months
- 1982, 86, 87 Visiting Professor of Physiology, Department of Physiology, Kyushu University, Fukuoka, Japan, for a period of three months each
- 1989 Awarded Jacob Javits Neuroscience Investigator Award from the National Institute of Neurological and Communicative Diseases and Stroke
- 1999 Awarded Homer N. Calver Award from the American Public Health Association for studies in environmental health.
- 2001 Awarded 2001 Academic Laureate from the University at Albany Foundation.
- 2010 Awarded the Albion O. Bernstein, M.D. Award in recognition of an outstanding contribution to public health and the prevention of disease through lifelong research of environmental health hazards and for limitless devotion to medical education by the Medical Society of the State of New York.
- 2011 Awarded the Rodney Wylie Eminent Visiting Fellowship 2011 at the University of Queensland, Brisbane, Australia for a period of four weeks.
- 2013 Awarded the Annual Kenneth V. Dodgson, M.D., Lectureship at the University of Rochester Department of Occupational and Environmental Medicine Grand Rounds.
- 2019 Received the Third Age Achievement Award for Education, given by Senior Services of Albany
- 2020 Awarded the Theo Colborn Career Achievement Award for Research and Advocacy in Environmental Health by the Environmental Health Symposia.
- 2023 Awarded Hudson Hero award by Riverkeeper

Federal Grants Held: (Principal Investigator Only)

- 1980-1983 United States Air Force, "Mechanisms of Radiation-Induced Emesis in Dogs", \$76,847 total direct costs.
- 1982-1988 National Institute of Health, "Mechanisms of Desensitization at Central Synapses", \$464,786 total direct costs.
- 1984-1986 Defense Nuclear Agency, "Mechanisms of Radiation-Induced Emesis in Dogs", \$330,504 total direct costs.
- 1986-1996 National Institute of Health, "Mechanisms of Excitatory Amino Acids Actions and Toxicity", 1986-1989 \$231,848 total direct costs; 1990-1996 \$562,926 total direct costs.
- 1989-1993 National Institute of Health, "Mechanisms of Lead Neurotoxicity" \$373,576 total direct costs
- 1990-1995 National Institute of Environmental Health Sciences, Superfund Basic Research Program, "Multidisciplinary Study of PCBs and PCDFs at a Waste Site", D.O. Carpenter, P.I. \$5,783,419 total direct costs.
- 1995-2001 Fogarty International Center, National Institutes of Health, International Training Program in Environmental and Occupational Health. A Central/Eastern European Environ/Occup Training Program, D.O. Carpenter, P.I. \$657,520 total costs.
- 1995-2001 National Institute of Environmental Health Sciences, Superfund Basic Research Program, "Multidisciplinary Study of PCBs," D.O. Carpenter, P.I. \$12,653,709 total direct costs.
- 1998-1999 Environmental Protection Agency, A Indoor Air Risk at Akwesasne - Pilot Project, D.O. Carpenter, P.I. \$9,996 total costs.
- 2000-2002 Association Liaison Office for University Cooperation in Development, A Cooperative

- Program in Environmental Health between the Institute of Public Health at Makerere University, Kampala, Uganda and the School of Public Health, University at Albany, USA@, D.O. Carpenter, P.I. \$96,432 total costs.
- 2001-2007 Fogarty International Center, National Institutes of Health, International Training Program in Environmental and Occupational Health. AMultidisciplinary Environmental Health Training@, D.O. Carpenter, P.I. \$850,000 total costs.
- 2006-2011 Pakistan-US Science and Technology Cooperative Program (US National Academy of Sciences). "Association of particulate matter with daily morbidity in an urban population," D.O. Carpenter, P.I., \$391,104 total costs.
- 2009-2013 Exploratory Center on Minority Health and Health Disparities in Smaller Cities. Project 2: Environmental contaminants and reproductive health of Akwesasne Mohawk women. \$387,825 for year 1. D.O. Carpenter, Co-PI.
- 2010-2013 Department of the Army, "Gulf War Illness: Evaluation of an Innovative Detoxification Program: D.O. Carpenter, P.I., \$636,958 total costs.
- 2010-2013 Higher Education for Development of the United States Agency for International Development, "Drinking Water Supply, Sanitation, and Hygiene Promotion : Health Interventions in Two Urban Communities of Kampala City and Mukono Municipality, Uganda". D. O. Carpenter, P.I., \$299,736 total costs.
- 2011-2016 National Institute of Environmental Health Sciences (1RO1ES019620), "Protecting the health of future generations: Assessing and preventing exposures." PK Miller, FA von Hippel, CL Buck and DO Carpenter, Co-P.I.s, \$471,521 for the period 8/08/11-4/30/12, \$2,354,871 for the period 2011-2016.
- 2017-2025 National Institute of Environmental Health Sciences (2RO1ES19620-06A1), "Protecting the Health of Future Generations: Assessing and Preventing Exposures to Endocrine Disrupting Flame Retardant Chemicals & PCBs in Two Alaska Native Arctic communities on St. Lawrence Island." PK Miller, FA von Hippel, CL Buck and DO Carpenter, Co-PIs. \$554,464 for the period 2018.
- 2020-2025 National Institute of Environmental Health Sciences (RO1 ES032392) . "Restoring Northeast Cape for the Health and Well-Being of the Yupik Communities of St. Lawrence Island, Alaska." F von Hippel, C Buck, DO Carpenter, PK Miller, Co-PIs. 11/01/2021-10.31.2025. Total Award Amount (including indirect costs): \$2, 985,224.

Research Interests:

- Exposure to persistent organic pollutants and risk of diabetes, cardiovascular disease, and hypertension.
- Cognitive and behavioral effects of environmental contaminants on children (IQ, ADHD) and older adults (dementias, Parkinson's Disease and ALS).
- Ionizing and non-ionizing radiation biology.
- Effects of air pollution on respiratory and cardiovascular function.

Other Professional Activities:

Host, The Public Radio Health Show (a 30 min public health information show carried on 170+ stations nationwide), plus the Armed Forces Radio Network and Voice of America, 1985-2001.

Authored a biweekly health column in The Troy Record, a local newspaper, 1997-1999.

Member of the Ethics Board, Town of Guilderland, 2013 – 2023

Albany Mayor's Advisory Committee on Air Pollution in the South End, 2016-present.

Board member and treasurer: Health Schools Network, 200-present.

Board member: Regenerative Research Foundation; 2010-present

Board member: National Toxic Encephalopathy Foundation, 2019 – present.

Board member: RADIX Ecological Sustainability Center, 2018-2021.

Major Peer-Reviewed Publications:

1. Carpenter, D.O., Lundberg, A. and Norrsell, U. Effects from the pyramidal tract on primary afferents and on spinal reflex actions to primary afferents. Experientia, 18:337, 1962.
2. Carpenter, D.O., Engberg, I. and Lundberg, A. Presynaptic inhibition in the lumbar cord evoked from the brain stem. Experientia, 18:450, 1962.
3. Carpenter, D.O., Lundberg, A. and Norrsell, U. Primary afferent depolarization evoked from the sensorimotor cortex. Acta Physiol. Scand., 59:126-142.
4. Carpenter, D.O., Engberg, I., Funkenstein, H. and Lundberg, A. Decerebrate control of reflexes to primary afferents. Acta Physiol. Scand., 59:424-437, 1963.
5. Carpenter, D.O., Engberg, I. and Lundberg, A. Differential supraspinal control of inhibitory and excitatory actions from the FRA to ascending spinal pathways. Acta Physiol. Scand., 63:103-110, 1965.
6. Henneman, E., Somjen, G.G. and Carpenter, D.O. Excitability and inhibibility of motoneurons of different sizes. J. Neurophysiol., 28:599-620, 1965.
7. Henneman, E., Somjen, G.G. and Carpenter, D.O. Functional significance of cell size in spinal motoneurons. J. Neurophysiol., 28:560-580, 1965.
8. Somjen, G.G., Carpenter, D.O. and Henneman, E. Selective depression of alpha motoneurons of small size by ether. J. Pharmacol., 148:380-385, 1965.
9. Somjen, G., Carpenter, D.O. and Henneman, E. Response of motoneurons of different sizes to graded stimulation of supraspinal centers of the brain. J. Neurophysiol., 28:958-965, 1965.
10. Carpenter, D.O., Engberg, I. and Lundberg, A. Primary afferent depolarization evoked from the brain stem and the cerebellum. Arch. Ital. Biol., 104:73-85, 1966.
11. Carpenter, D.O. and Henneman, E. A relation between the threshold of stretch receptors in skeletal muscle and the diameter of axons. J. Neurophysiol., 29:353-368, 1966.
12. Carpenter, D.O. Temperature effects on pacemaker generation, membrane potential, and critical firing threshold in Aplysia neurons. J. Gen. Physiol., 50:1469-1484, 1967.
13. Chase, T.N., Breese, G., Carpenter, D., Schanberg, S. and Kopin, I. Stimulation-induced release of serotonin from nerve tissue. Adv. Pharmacol., 6A:351-364, 1968.
14. Carpenter, D.O. and Alving, B.O. A contribution of an electrogenic Na⁺ pump to membrane potential in Aplysia neurons. J. Gen. Physiol., 52:1-21, 1968.
15. Olson, C.B., Carpenter, D.O. and Henneman, E. Orderly recruitment of muscle action potentials. Arch. Neurol., 19:591-597, 1968.
16. Carpenter, D.O. Membrane potential produced directly by the Na⁺ pump in Aplysia neurons. Comp. Biochem. Physiol., 35:371-385, 1970.
17. Carpenter, D.O. and Gunn, R. The dependence of pacemaker discharge of Aplysia neurons upon Na⁺ and Ca⁺⁺. J. Cell. Physiol., 75:121-127, 1970.

18. Kraus, K.R., Carpenter, D.O. and Kopin, I. R. Acetylcholine-induced release of norepinephrine in the presence of tetrodotoxin. J. Pharmacol. Exp. Therap., 73:416-421, 1970.
19. Barker, J.L. and Carpenter, D.O. Thermosensitivity of neurons in the sensorimotor cortex of the cat. Science, 169:597-598, 1970.
20. Carpenter, D.O., Hovey, M.M. and Bak, A. Intracellular conductance of Aplysia neurons and squid axon as determined by a new technique. Intl. J. Neurosci., 2:35-48, 1971.
21. Carpenter, D.O., Breese, G., Schanberg, S. and Kopin, I. Serotonin and dopamine: Distribution and accumulation in Aplysia nervous and non-nervous tissues. Int. J. Neurosci., 2:49-56, 1971.
22. Hovey, M.M., Bak, A.F. and Carpenter, D.O. Low internal conductivity of Aplysia neuron somata. Science, 176:1329-1331, 1972.
23. Carpenter, D.O. Electrogenic sodium pump and high specific resistance in nerve cell bodies of the squid. Science, 179:1336-1338, 1973.
24. Carpenter, D.O. and Rudomin, P. The organization of primary afferent depolarization in the isolated spinal cord of the frog. J. Physiol. (Lond.), 229:471-493, 1973.
25. Shain, W., Green, L.A., Carpenter, D.O., Sytkowski, A.J. and Vogel, Z. Aplysia acetylcholine receptors: Blockage by and binding of α -bungarotoxin. Brain Res., 72:225-240, 1974.
26. Pierau, Fr.-K., Torrey, P. and Carpenter, D.O. Mammalian cold receptor afferents: Role of an electrogenic sodium pump in sensory transduction. Brain Res., 73:156-160, 1974.
27. Saavedra, J.M., Brownstein, M.J., Carpenter, D.O. and Axelrod, J. Octopamine: Presence in single neurons in Aplysia suggests neurotransmitter function. Science, 185:364-365, 1974.
28. Willis, J.A., Gaubatz, G.L. and Carpenter, D.O. The role of the electrogenic sodium pump in modulation of pacemaker discharge of Aplysia neurons. J. Cell. Physiol., 84:463-472, 1974.
29. Brownstein, M.J., Saavedra, J.M., Axelrod, J., Zeman, G.H. and Carpenter, D.O. Coexistence of several putative neurotransmitters in single identified neurons of Aplysia. Proc. Natl. Acad. Sci. (USA), 71:4662-4665, 1975.
30. Carpenter, D.O. and Gaubatz, G.L. Octopamine receptors on Aplysia neurons mediate hyperpolarization by increasing membrane conductance. Nature, 252:483-485, 1974.
31. Pierau, Fr.-K., Torrey, P. and Carpenter, D.O. Afferent nerve fiber activity responding to temperature changes of the scrotal skin of the rat. J. Neurobiol., 38:601-612, 1975.
32. Carpenter, D.O. and Gaubatz, G.L. H₁ and H₂ histamine receptors on Aplysia neurons. Nature, 254:343-344, 1975.
33. Carpenter, D.O., Hovey, M.M. and Bak, A.F. Resistivity of axoplasm. II. Internal resistivity of giant axons of squid and Myxicola. J. Gen. Physiol., 66:139-148, 1975.
34. Zeman, G.H. and Carpenter, D.O. Asymmetric distribution of aspartate in ganglia and single neurons of Aplysia. Comp. Biochem. Physiol., 52C:23-26, 1975.
35. Pierau, Fr.-K., Torrey, P. and Carpenter, D.O. Effect of ouabain and potassium-free solution on mammalian thermosensitive afferents in vitro. Pflugers Arch., 359:349-356, 1975.
36. Swann, J.W. and Carpenter, D.O. The organization of receptors for neurotransmitters on Aplysia neurons. Nature, 258:751-754, 1975.
37. Yarowsky, P.J. and Carpenter, D.O. Aspartate: distinct receptors on Aplysia neurons. Science, 192:806-809, 1976.
38. Foster, K.R., Bidinger, J.M. and Carpenter, D.O. The electrical resistivity of aqueous cytoplasm. Biophys. J., 16:991-1001, 1976.

39. Carpenter, D.O., Greene, L.A., Shain, W. and Vogel, Z. Effects of eserine and neostigmine on the interaction of α -bungarotoxin with Aplysia acetylcholine receptors. Mol. Pharmacol., 12:999-1006, 1976.
40. Saavedra, J.M., Ribas, J., Swann, J. and Carpenter, D.O. Phenylethanolamine: A new putative neurotransmitter in Aplysia. Science, 195:1004-1006, 1977.
41. Carpenter, D.O., Swann, J.W. and Yarowsky, P.J. Effect of curare on responses to different putative neurotransmitters in Aplysia neurons. J. Neurobiol., 8:119-132, 1977.
42. Yarowsky, P.J. and Carpenter, D.O. GABA mediated excitatory responses on Aplysia neurons. Life Sci., 20:1441-1448, 1977.
43. Willis, J.A., Myers, P.R. and Carpenter, D.O. An ionophoretic module which controls electroosmosis. J. Electrophysiol. Tech., 6:34-41, 1977.
44. Yarowsky, P.J. and Carpenter, D.O. Receptors for gamma-aminobutyric acid (GABA) on Aplysia neurons. Brain Res., 144:75-94, 1978.
45. Carpenter, D.O., Gaubatz, G., Willis, J.A. and Severance, R. Effects of irradiation of Aplysia pacemaker neurons with 20 MeV electrons. Rad. Res., 76:32-47, 1978.
46. Yarowsky, P.J. and Carpenter, D.O. A comparison of similar ionic responses to gamma-aminobutyric acid and acetylcholine. J. Neurophysiol., 41:531-541, 1978.
47. Blum, B., Aufer, C.R. and Carpenter, D.O. A head holder and stereotaxic device for the rattlesnake. Brain Res. Bull., 3:271-274, 1978.
48. Swann, J.W., Sinback, C.N. and Carpenter, D.O. Dopamine-induced muscle contractions and modulation of neuromuscular transmission in Aplysia. Brain Res., 157:167-172, 1978.
49. Swann, J.W., Sinback, C.N. and Carpenter, D.O. Evidence for identified dopamine motor neurons to the gill of Aplysia. Neurosci. Lett., 10:275-280, 1978.
50. Keabian, P.R., Keabian, J.W. and Carpenter, D.O. Regulation of cyclic AMP in heart and gill of Aplysia by the putative neurotransmitters, dopamine and serotonin. Life Sci., 24:1757-1764, 1979.
51. Carpenter, D.O. Interchangeable association of neurotransmitter receptors with several ionophores. Brain Res. Bull., 4:149-152, 1979.
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Addendum 6 – Declarations in Support of Standing

D. Declaration of Michele Hertz

No. _____

**UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

***In re* CHILDREN’S HEALTH DEFENSE, PETRA BROKKEN, DAVID
O. CARPENTER, MICHELE HERTZ,**

ENVIRONMENTAL HEALTH TRUST,

PETITIONERS

PETITION FOR WRIT OF MANDAMUS

AFFIDAVIT OF MICHELE HERTZ IN SUPPORT OF STANDING

1. My name is Michele Hertz. I am one of the named Petitioners in the above captioned proceeding and I am a member of Children’s Health Defense.
2. The purpose of this Affidavit is to provide evidence of my standing to pursue the matter. I will provide some of the facts particular to my individual circumstances to demonstrate that I have suffered an injury-in-fact traceable to the FCC’s failure to act on the mandate of this Court in *Envtl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) (*EHT v. FCC*) that could be redressed by an order from this Court. I am also relying on the Affidavits of Miriam Eckenfels and Dr. David O. Carpenter for the purpose of explaining why the particular facts described below demonstrate standing.
3. I was a named petitioner in *Envtl. Health Trust v. FCC*, 9 F. 4th 893 (D.C. Cir. 2021) (“*EHT v. FCC*”).
4. Additionally, I filed comments with the FCC in the proceedings below and asked it to change its rules to address the concerns I raised regarding radiofrequency (RF) exposure limits. (FCC Docket No. 13-39, FCC Docket No. 03-137 and WT Docket No. 12-357, ET Docket No. 13-84, FCC Docket No. 12-152, WTB Docket No. 16-421, FCC Docket No. 17-79, FCC Docket No. WTB 19-71.) Additionally, in 2025, I submitted comments to FCC Docket No. 25-276.
5. I know reside in Briarcliff Manor, New York. When I submitted comments to the FCC, before 2018, I resided in Hastings on Hudson, New York.

6. For the purpose of this Affidavit, the following definitions shall apply:
- Electronic Digital Utility Meter (DU Meter) -- includes AMR - Automatic Meter Reader, ERT - Encoder Receiver Transmitter, non-transmitting digital, Smart Meter. DU Meters may utilize radiofrequency signals to read and transmit utility usage both with one-way antenna and /or two-way antenna.
 - Analog utility meter -- a purely electro-mechanical utility meter that contains no electronic components or antenna.
7. Until 2008, when I was injured by the radiofrequency (RF) radiation emissions from an electronic DU Meter, I led a normal life. I and my family lived life to the fullest, our children were happy, we traveled and both my husband and I had careers that we loved. In our home we used wifi and both my husband and I used cell phones. Suddenly, out of the clear blue, I got sick. Another member of our household developed health issues but mine were the most severe and unrecognizable (for more details please see enclosed #1 "Notarized FCC 2012 Declaration").
8. It was not until 2010 that I figured out what was causing me to be so ill. It was unequivocally the radiofrequency (RF) and electrical radiation caused by three DU Meters. One had been installed 150 feet away from my home at my property in upstate New York, and the others had been installed directly on my house in Hastings on Hudson, New York. I was lucky. I figured this out and when those offending meters were removed the worst of my health problems ended. This was a clear indication that something was wrong with DU Meters. I immediately began contacting the utilities, elected officials, government agencies, including the FCC and others, to report that there was something wrong with these new meters. The irresponsible, dismissive, discourteous and lame responses I received, including from the FCC, stunned me.
9. After our youngest son went to college I began living, part-time, at our house in upstate New York because I could no longer tolerate living in our neighborhood in Hastings, which was flooded with RF radiation from cell towers, DU Meters for water and gas and wifi routers. There were nights, when I was in Hastings, that I would wake up thinking there was an earthquake, but it was my own body quaking and shaking. We had loved

living in Hastings. We spent 22 years carefully restoring our historic 1910 home, getting involved in community and school affairs and feeling at home in the Hastings community. We had been so happy there but we had to move away. In 2018, after 22 years, my husband and I were forced to move from our home in Hastings to where we now reside.

10. I am now 67 years old. After what I endured that was caused by DU Meters my life has never been the same. I have RF sickness with indications that are similar to Havana Syndrome, which is what the American embassy workers in Cuba and China have reported after they were possibly exposed to RF weaponry or spy equipment.
11. In the following paragraphs, I will explain how RF Sickness presently affects me:
12. **Digital Utility Meters:** When I am in the vicinity of one or more DU Meters I will get shooting pains in my temple and head and feel my temperature rise and my heart weirdly thumps and skips beats and I cannot sleep. In 2021, my husband and I visited New Orleans to meet our new baby granddaughter. We stayed in a rental house for a week, Not knowing that the DU Meter was just on the other side of an outdoor wall. I accidentally spent some time in that room just on the other side of the wall from the DU Meter. I developed a heart arrhythmia. It was frightening but I was also very concerned about going to an emergency room, with all of the wireless equipment there. I quietly hoped it would just stop. This lasted for a month and then suddenly stopped. Since that time, I completely avoid DU Meters for fear of this happening again.
13. **Wifi Routers:** When exposed to wifi radiation, I get a tightening sensation on the top of my skull and headaches. When I try to sleep, where there is wifi, my brain feels like it goes into spasms and I cannot sleep deeply - for days on end. For this reason, traveling is torturous.
14. **Cell Phones:** I get shooting pains through my temples. I can be sitting in a restaurant, enjoying the company of friends and family, and I will suddenly be struck with a shooting pain through my head that stops me mid-sentence, bends me over in pain and makes me forget what I was saying. I then realize upon turning around that someone behind me, who had been out of my sightline, is using a cell phone. We do not allow the use of cell phones in our home. Many times, when someone forgets or tries to sneak a quick cell

phone call in our home, I will get shooting pains in my temples and head and feel my temperature rise and my heart weirdly thumps and skips beats, and I cannot sleep.

15. **Cell Towers:** If I am near a cell tower I will get those same shooting pains in my temples and head and feel my temperature rise and my heart weirdly thumps and skips beats, and I cannot sleep. When I am driving, especially on long trips, if I feel tired and need to rest for a while, I cannot stop near cell towers/transmitters because they prevent me from falling asleep. This puts my life in danger when I cannot find a place to rest.
16. **Computers:** I have developed Grave's disease since this whole problem began, which has seriously affected my eyes. Computers hurt my eyes. I wear protective glasses and I have applied a special blue light cover on the screen of my computer.
17. I now try to live in a way that best protects me from exposure to RF radiation. However, this is becoming a terribly difficult challenge
18. It is going on 17 years since I was first afflicted with RF sickness. While the FCC covets seriously outdated RF guidelines, people everywhere get sick like me. I hear from people who say that they wonder how they can live in a world that is so painfully uncomfortable. I understand this. Through the years I have tried to help as many people as I can but I can never really help them because it is not in my control, and completely out of control.
19. I created an educational website relating to DU Meters, and also a group of us formed a non-profit organization devoted to this topic. People from across New York contact us for help. I am including below examples of email comments that we have received The more recent comments are first:
 - **M.J., New York State - 2026 - Email Message:** Please call me they told me I do not have a smart meter they charge me 12 dollars a month I have a picture of it I truly believe it is a smart meter I'm very ill headaches, tinitis, blood nose , no sleep , etc please call me asap (phone number removed) how do I know if it is a smart meter it says aclura it the numbers move fast on it it digital it not analog the other meter is a focus meter they said it not smart meter that my landlord meter I opted out but think it a smart meter please help me!!!
 - **P.R., New York State - 2026 - Email Message:** Hi: I am seeking help to stop the utility company from changing my meter to a smart meter. First, I have

opted out of all smart meters. They are using many ploys to get these meters installed on my home. They are now building a case of my impeding them from being on compliance with the public utility law. They say they will be changing my meters to non-communicating meters, I understand that they are giving everyone smart meters. The difference for those that opt-out is that the technology to transmit data will not be activated. So knowing this there is really no opt-out option, it is a facade. This very concerning to me due to the health ramifications to me and family we are very sensitive to emf/rf frequencies, so much so that all devices that require internet access are hardwired except our cellphones, I seeking legal help with this matter at this point, can you help me or know some who can?

- **H.F., New York State - 2025 - Email Message:** Years ago, my house was one of the first in the neighborhood to get an unwanted digital meter. I was not informed of this, but noticed the new meter by accident when I happened to walk nearby. I had been having a difficult time falling and staying asleep recently, but had no idea why. After I saw the digital meter I did some research, found out some nasty effects of exposure to its emf dosing. So I called central hudson to ask for a return of the analog meter. It was very hard to get any answers from ch and eventually I just gave up trying. I had to change where I sleep and my problem disappeared right away. My spouse however remained in that bedroom exposed to the toxic electronic effects. He has a chronic illness and often negative sleep issues. I got your email address from a small paper tacked to the library board and wrote down some of its info. Do you have any advice about how to get this lousy electric co. to remove its toxic machine so that an analog meter can be installed in its place? Thank you for any help you can supply
- **E.M., New York - 2024 - Email Message:** Hello, I'm contacting you to see if there's a way you can help us get an analog meter placed back on our home. We have submitted the Natl Grid opt-out forms required -twice - back in August 2022, and again in January 2024 and included physicians' letters for medical urgency. We've made numerous phone calls between those dates yet are still going round and round with National Grid. We have contacted our Assemblyman. If there's something more we can be doing or you have recommendations, please advise.
I have already been forced from another home due to my EHS diagnosis and no accommodation, and now it is happening again. I am running out of options.
- **G.M., New York State - Email Message** "My building has 14 smart meters on each floor, only a few feet away from our doors. In addition, I am being exposed to 14 meters above and below me, for a total to 42 meters I am being exposed to. I am only able to opt out for only my meter. Contacted both Con

Edison and Public Service Commission with problem with no results. Sleeping has become difficult, headaches frequent, jerky body movements, and blood in eyes...etc. All after smart meters were installed. I am terrified, but cannot get any help. Please tell where I can find help before it is too late."

- **J.C., Queens, New York - Email Message** "I rent a 1st floor apartment in a house with three other apartments, in Queens NY. There are four electric meters in the garage (one for each apartment), which were allswitched over to smart meters about three weeks ago. Since then, I've been experiencing ring in my ears all day (I work from home), and am afraid it has something to do with these meters. I saw somewhere...."
- **J.P.R., Ulster County, New York - Email Message** "In October of 2013 I moved into an apartment in Kingston NY. I immediately experienced difficulty sleeping, uncomfortable shocks surges in my body and really intense nightmares. I initially attributed this to living in a new space. The difficulty sleeping continued and new symptoms began: ringing in my ears, headaches, dizziness, and nausea. All symptoms worsened. It became clear that my symptoms were coming from something in my apartment, as I didn't experience them when sleeping elsewhere. Two digital meters/smart meters directly outside of my living space turned out to be the problem. Eventually I was forced to break my lease and seek alternative living space which didn't have a smart meter."
- **A.G., Ulster County, New York - Email Message:** "I am a cancer survivor who teaches piano in my home. When Central Hudson installed a smart meter, I was made ill immediately. I still live with the symptoms. The proximity to the meter made it impossible to be at the piano. I went through the entire process of trying to get the utility to return an analog meter, having a hearing with the Public Service Commission and appealing the PSC's decision. No one helped. The meter remains. Central Hudson told me, "If you want electricity, you'll take any meter we choose to give you."
- **V.S., Oneida County, New York - Email Message:** (A bank of electronic utility meters installed outside their living room wall) "WE HAVE BEEN SUFFERING FOR OVER FIVE YEARS! My Family has been terribly impacted by "smart" meters. Utilities are lying about the safety of these meters. We have silently been suffering with severe health issues. It is obvious that these things are not safe! This radiation exposure is destroying our lives - physical, emotional and relationships. This is a nightmare and we would like to opt out of this illegal human experimentation as radiation victims! We need to be compensated for the damage that is being forced on us - NOW! This is wrong and it should have been addressed well over 5 years ago!"

- A woman from the Bronx, New York contacted me and told me the following story: Two men from Con Edison came to her home to replace her analog utility meter with a DU Meter. She refused it. The next day they came again. Her husband was home and he let them in. They went to the basement and changed the meter. Later when she got home, she heard loud buzzing coming from the basement, which she attributed to the electricity in her home. Her husband and daughter heard it too. They reported this to the utility. The next day, a different person from Con Edison came. He told her that he was there to read the meter. She asked him why he was there to read the meter when, just the day before, they had installed a DU Meter. He said something like the following - Look, this is what they told me. They told me to come and read the meter. She let him in and he went to the basement. She did not go down with him but he did something that stopped the buzzing. She asked him about it when he came back up the stairs and he told her that he only read the meter. Not long after that she developed severe headaches. She had an MRI that showed nothing. Within a year she became very sick. There were closing of arteries to her brain and she was diagnosed with a brain tumor. She attributed this all to the DU Meter.
20. By 2013, because we had found no relief from the problems being caused by DU Meters, a small group of us hired an industry RF engineer for \$5000.00, to come to Hastings to measure the RF radiation caused by DU Meters. He discovered and documented that not only were the meters transmitting RF bursts every 30 seconds, they were also causing this RF to conduct onto the electrical wiring. This was and remains an unprecedented whole-body RF radiation exposure surrounding us in buildings. One of the people living in the home where he documented this was very sick. He also documented that the meters transmitted every 30 seconds, non-stop when the utility companies told us it was only once a day or week.
21. This helped me understand why in 2008-9, when I was exposed to the RF radiation from a DU Meter that was 150 feet away from my home connected by buried wires, I still got sick. Although radiation drops off at a distance, it does not do so when it conducts and causes "hot-spots," as described in the Isotope Report. (Please see enclosed Isotope Report.) The Isotope Report further explains that the FCC tested and approved DU Meters based on Federal Communications Commission (FCC) Part 15 testing. This test was designed to detect interference. It was set up for wireless devices that employ power cords. This test was/is improper for testing DU meters because they do not employ power cords. Instead of developing proper

testing for DU Meters, the FCC-accredited workers altered the DU Meter by fastening a power cord to it and plugging it into an isolated electric outlet. They altered the meter to fit a test modality that was not designed for utility meters. This laboratory set-up, in isolated conditions, also failed to include utility-side wiring, consumers' circuit breaker panels, consumers' electrical circuitry and real-life electrical events like voltage surges. Together this colossal system design failure and negligent testing has resulted in suffering and loss of life and property. State regulators approved DU Meters based on this flawed FCC approval.

22. In 2024, Verizon Wireless proposed to build a cell tower near our home in in upstate New York, a nightmare for our community and for me personally. This company has 100% coverage in the area and there is no "need" at all for a tower to be built there. This area has been a refuge for those of us (and wildlife) that need relief from constant bombardment of RF radiation. The FCC's intentionally weak regulations, which it barely adheres to, allows the telecommunications industry to destroy lives and the environment. Verizon's case for building the tower is weak. However, the lead agency for the Town is also weakened by the constant threats by Verizon that the company will sue the Town, with the support of the FCC, if the Town does not approve the tower. The collateral damage will be us, the community, the wildlife and especially the people and children living in the shadow of the extreme RF radiation that we all know will surround the 5G/4G cell tower for many miles around. It has been scientifically proven over and over again that RF radiation causes injury to humans, animals and the environment. This is what the FCC continues to ignore. The FCC is a failed agency and is clearly influenced by the industry it should be regulating. Since 1996, every Republican and Democratic Administration has been an accomplice to these dangerous, destructive and deceitful practices.
23. The FCC order did not ever adequately consider or respond to my comments or those of others who raised similar issues. The FCC's decision to retain its existing rules entirely fails to resolve the problems I, my family and my children face in daily life as a result of constant exposure to harmful radiation. I have been harmed by rules that do not adequately protect health and safety and, to the contrary, directly allow continuous harm. This harm will continue until the rules are changed to truly protect health, safety, and the environment and take into account the needs of those who are or may become injured by electromagnetic radiation.

24. The FCC's refusal to comply with the *EHT v. FCC* mandate concretely and significantly harms my interests, and the harm is ongoing and reasonably expected to continue absent this Court's intervention
25. This concludes my Affidavit, but as noted above I am also relying on the Affidavits of Miriam Eckenfels and Dr. David Carpenter for the purpose of explaining why the particular facts described above demonstrate standing.

Pursuant to 28 U.S.C. § 1746, I certify under penalty of perjury that the foregoing is true and correct.

/s/ Michele Hertz
Michele Hertz

5/15/26
Date

Addendum 6 – Declarations in Support of Standing

E. Declaration of Joseph M. Sandri, Jr.

UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

In re:

CHILDREN'S HEALTH DEFENSE,
PETRA BROKKEN, DAVID O.
CARPENTER, MICHELE HERTZ,
ENVIRONMENTAL HEALTH TRUST,

Petitioners.

No. _____

**STANDING DECLARATION ON BEHALF OF THE ENVIRONMENTAL HEALTH
TRUST**

DECLARATION OF JOSEPH M. SANDRI, JR.

I, Joseph M. Sandri, Jr., declare under penalty of perjury pursuant to 28 U.S.C. § 1746 that the following is true and correct to the best of my knowledge:

1. I am the President and General Counsel of Environmental Health Trust ("EHT"), a 501(c)(3) nonprofit organization. I have personal knowledge of the facts stated in this Declaration and, if called as a witness, could competently testify to them.
2. EHT is an original petitioner in the case at issue, Envtl. Health Trust v. FCC, 9 F. 4th 893 (D.C. Cir. 2021).
3. EHT champions environmental health research, policy advice and support, and public education on emerging environmental health hazards and their impact on the health of humans and all living things. We are supported by a global network of scientific, business, and legal advisors, a leadership team of industry leaders and experts (public health professionals, clinicians, scientists, engineers), and community outreach professionals. Examples of our work include:
 - Advancing clinical research on biomarkers of non-ionizing radiation exposure
 - Providing independent research data to policymakers for government and industry regulations
 - Supplying experts on the science and legal matters related to radiation exposure
 - Persuading regulatory agencies to adopt safer cell phone standards
 - Advocating for stronger local rules on cell tower deployment

- Offering public health resources, training programs, and outreach materials

We envision a world where consideration of the environment and the health of all living things is at the forefront of technological advancements.

Our mission is to champion the identification of emerging environmental hazards, advance research on their health effects, and formulate proactive preventative solutions.

Our approach:

Scientific Research

- We conduct scientific, engineering, and clinical research to advance our understanding of environmental factors impacting human health.
- We identify where scientific study and practical applications intersect, by supporting independent research, free of any commercial bias.
- We work with world-class experts to conduct cutting-edge research that can help inform improved safety standards for sources of pollution, including devices that emit microwave radiation.
- We author articles in peer-reviewed journals about controllable environmental health hazards.
- We sponsor technical conferences with leaders from multiple disciplines to confer on unified approaches to developing safer standards.

Legal and Public Policy

- We work with local, national, and international public policy and legislators to ensure protective measures are taken to promote health safety and to prevent harm.
- We brief governments and decision-makers to promote constructive policy changes in support of public and environmental health.
- We work with decision-makers at local, state, national, and international levels to develop and promote sound public health policies based on peer-reviewed research and input from experts.
- We research, document, and summarize worldwide policies to raise awareness of environmental risks, both among policymakers and the public.
- We provide expert opinions to qualified parties in legal disputes at the state, federal, and international levels.
- We provide advisory and professional outreach to groups and individuals working on EMF-related standards.

Education and Public Outreach

- We help parents, individuals, and communities access cutting-edge environmental health research and support their efforts to advance environmental health in their homes, schools, places of work, and neighborhoods.
- We develop science-based multimedia tools to educate individuals, families, health and education professionals, and communities about public health threats.
- We build community outreach programs to support citizens concerned about wireless radiation exposures.
- We offer solutions for the safer use of technology in homes, schools, and public spaces.
- We distribute groundbreaking scientific research on environmental health.
- We make available and translate scientific research into practical solutions to be adopted by the public, policy, and decision makers.
- We work with local, national, and international nonprofits to create public awareness campaigns.

See: <https://ehtrust.org/about/>

4. EHT satisfies the requirements for associational standing set forth in Hunt v. Washington State Apple Advertising Commission, 432 U.S. 333, 343 (1977).
5. First, EHT's members and supporters would otherwise have standing to sue in their own right. Many are individuals (including parents, children, and concerned citizens) who are directly and continuously exposed to radiofrequency electromagnetic radiation from wireless devices, infrastructure, and related technologies. These individuals suffer concrete and particularized injuries in the form of heightened health risks, including potential biological effects documented by peer-reviewed scientific evidence, such as impacts on neurological development, reproductive health, and other physiological systems. These injuries are actual or imminent, traceable to the challenged agency action, and redressable by a favorable court decision.
6. Second, the interests EHT seeks to protect in this matter—safeguarding public health and the environment from unsafe levels of wireless radiation and related environmental hazards—are directly germane to EHT's organizational purpose of researching, educating about, and advocating for the prevention of environmental health risks associated with electromagnetic fields and emerging technologies.

7. Third, neither the claims asserted in this petition nor the relief requested (including and not limited to Federal Communications Commission compliance with the court's original mandate, or other relief under the Administrative Procedure Act) requires the participation of individual EHT members in the lawsuit. The issues presented are predominantly legal and policy-based, involving agency compliance with statutory and constitutional requirements, and the relief sought would inure generally to EHT's members and the public without necessitating individualized proof.
8. I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 15th day of May 2026, at Silver Spring, Maryland.

Signed,



Joseph M. Sandri, Jr.