



June 4, 2025

## Expert Report

**Re:** De Novo Hearing Before the Santa Cruz County Board of Supervisors to Consider Appeal of Application 221049, a Proposed 151.1-Foot Tall Monopine Cell Tower at 186 Summit Drive (Assessor's Parcel Number 080-062002)

Kent Chamberlin, PhD

## Executive Summary

CTI Towers, Inc. ("CTI") is applying for a permit to build and operate a 151.1-foot tall monopine cell tower on a site at 186 Summit Drive, where AT&T Mobility ("AT&T") will be the primary tenant. The stated justification for the new infrastructure is that existing cellular infrastructure does not provide sufficient coverage, resulting in significant gaps in coverage. The only evidence for this claim of insufficient coverage is found in a letter to the Board of Supervisors, dated February 25, 2025, submitted by Travis Brooks of Miller Starr Regalia. A close examination of that letter demonstrates that the claim of insufficient coverage is not, in fact, justified. The objective of this report is to respond to the findings presented in that letter and to provide independent conclusions regarding available coverage. As is documented herein, the Brooks letter does not provide supportable evidence that significant coverage gaps exist, while industry-provided and community member provided evidence strongly suggest that cell coverage is adequate in the region of the proposed tower. My overall conclusion is that there is no significant gap in coverage for the provision of wireless service by AT&T in this specific region, and hence the building of a new 151.1-foot monopine cell tower at the proposed site is not justified.

With regard to in-house wireless coverage from fixed broadband cell towers, too many variables exist to predict what types of cell towers at what heights outfitted with what numbers and types of antennas pointed in which directions and transmitting at what frequencies are needed to provide reliable in-building wireless service in a sparsely populated, forested, mountainous, rural area. Robust wireless service typically requires clear line of sight from the transmitting tower to the end user. Foliage, topography, and buildings may substantially degrade wireless signals. Moreover, the construction materials used in a building greatly affect the penetrability of wireless signals into the building. For example, RF signals penetrate steel-reinforced concrete-walls far less robustly than into a wood frame structure. And a metal frame trailer home or RV home may act as a Faraday cage and block the wireless signals from penetrating into the structure. Thus, it is unrealistic to expect that CTI's proposed 151.1-

foot cell tower at 186 Summit Drive would provide robust in-building Internet and cell coverage throughout the broad, mountainous, forested, and sparsely populated Bonny Doon area.

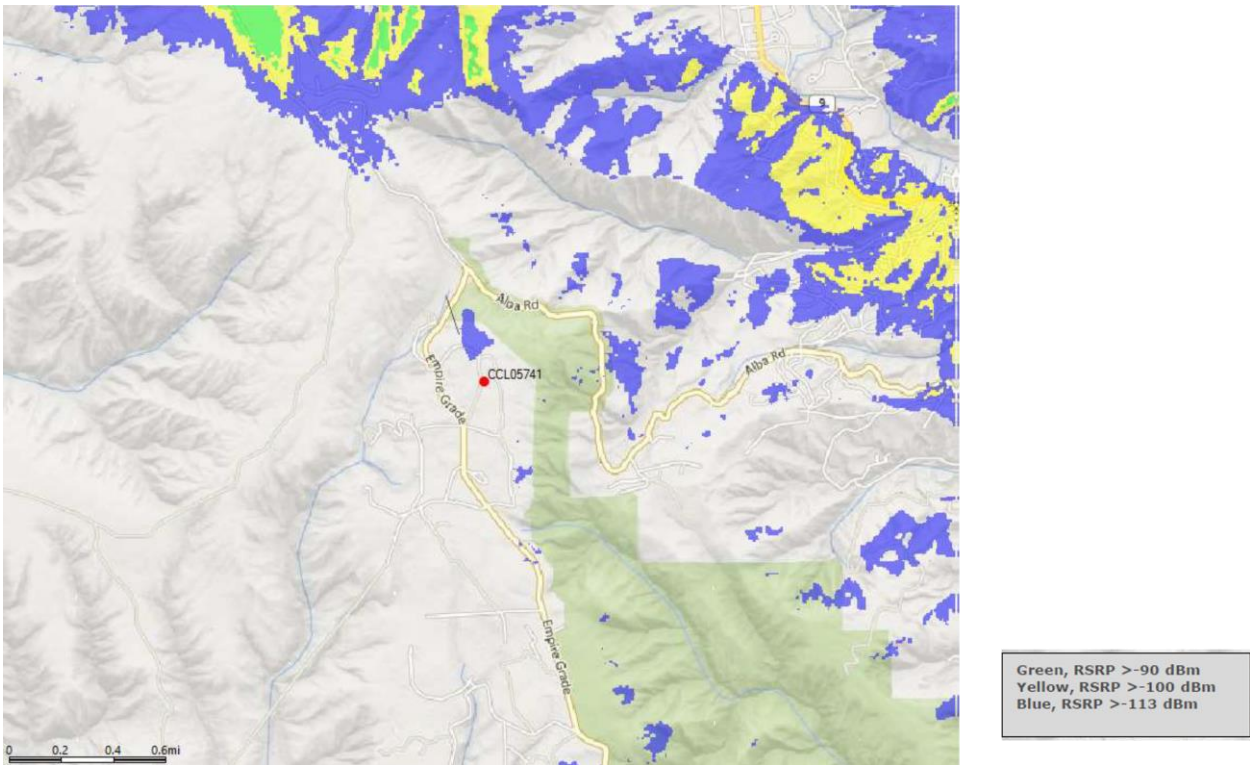
### **The Case:**

CTI is seeking a permit for a cell tower at or near 186 Summit Drive in Santa Cruz, California, on which AT&T intends to lease space as the primary tenant. Its stated reason for needing the tower is that there are gaps of coverage in the vicinity of the proposed tower. AT&T has provided computer-generated coverage maps indicating that gaps exist, although it has not offered dropped-call logs, which are the gold standard for demonstrating that gaps exist. A dropped-call log is a record of calls that unexpectedly disconnect before either party ends the call, and it is a primary indicator of a gap in coverage; if dropped calls are logged in a region, it provides compelling evidence that gaps exist. AT&T's failure to provide dropped-call logs has prevented an important piece of information from being considered in assessing whether gaps in coverage actually exist although there are other ways to make that assessment as described below.

A significant indication that gaps do not exist is that community members claim that they are able to place cellphone calls and download audio and video content within the purported gap regions. In the absence of dropped-call logs, the fact that users can meaningfully operate their wireless devices in purported gap regions represents solid evidence that coverage does exist.

My role in this matter is to evaluate the information provided to the Board of Supervisors by CTI and AT&T, and to introduce other relevant public-domain data to assess the veracity of AT&T's claim that such a significant gap in its wireless coverage exists in the area around 186 Summit Drive that a new solo 151.1-foot tall monopine cell tower is needed to close that gap, and is, in fact, the least intrusive technologically-feasible means of closing that significant gap in coverage.

The Brooks letter (80-page letter report from Travis Brooks of Miller Starr Regalia to the Santa Cruz Board of Supervisors dated February 25, 2025) states the case for the proposed tower on page 21/80: "The proposed wireless communications facility at 186 Summit Dr., Santa Cruz (the "Property") is needed to close a coverage gap in 4G LTE service in an area roughly bordered by 0.7 miles north of Empire Grade and Alba Road to the north, Alba Road to the east, Empire Grade and Pine Flat Road to the south, and ½ mile west of Empire Grade Road to the west," and justifies the need for the tower in a computer-generated coverage map (Exhibit 1 on page 25/80). That map is recreated in this report as Figure 1. What is suggested by the map in Figure 1 is that there is very little area in the vicinity of the proposed tower that has coverage by existing cell tower infrastructure, hence the claim of a significant gap.



*Figure 1* Modeled coverage map for 4G LTE provided by AT&T to justify new cell tower. Map was copied from Exhibit 1, page 25/80, of the Brooks, February 25 letter.

There is almost no information about the modeling process provided in the Brooks letter that would permit an assessment of the quality of the modeled coverage presented in Figure 1. All that is stated in the letter is that “AT&T uses industry standard propagation tools to identify the areas in its network where signal strength is too weak to provide reliable service quality. This information is developed from many sources including terrain and clutter databases, which simulate the environment, and propagation models that simulate signal propagation in the presence of terrain and clutter variation.” This suggests that AT&T employed standard RF engineering practices involving terrain-aware models, but it does not specify whether it used models like Okumura-Hata, COST-231, Longley-Rice, or others. This is important because models can provide very different results for different conditions. For example, one model may give more accurate results in mountainous environments, while another may give more accurate results in urban areas. Also, model results are dependent on input parameters that are used to describe the environment to be modeled. Without knowing what model was used and without knowing what input parameters were used to generate the map, what is presented in Figure 1 has little utility in realistically estimating coverage gaps.

Fortunately, there are other sources of information available to perform a reasonability check on the data presented in Figure 1. One is reports from community members that they can use their cellphones in the gap areas as mentioned above. Another source of information is the FCC National Broadband Map website,<sup>i</sup> which provides information about where cellphone coverage does and does not exist. This site uses coverage data submitted by the Internet Service Providers (ISPs), and it is unlawful for the providers to misrepresent their coverage areas. It is worth noting that FCC National Broadband Map requires providers to fol-

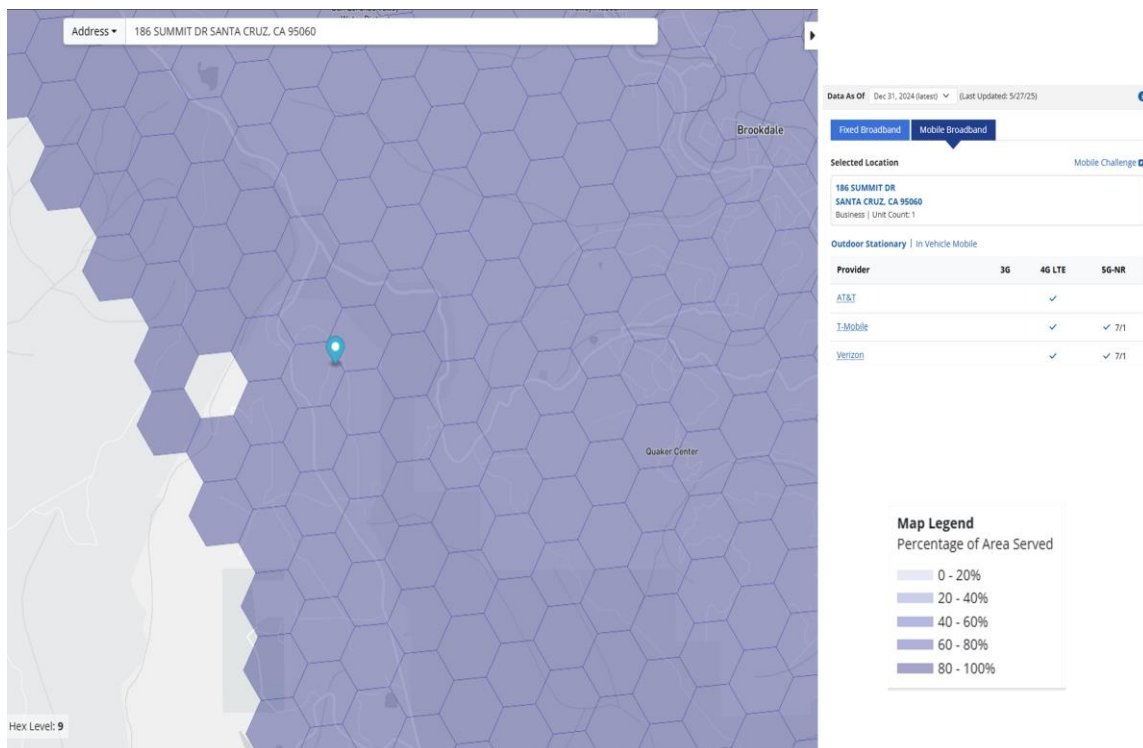


Figure 2 Plot of industry-reported wireless coverage for the region shown in Figure 1, where the color coding indicates the wireless coverage percentage within each of the pentagons.

low strict consistent guidelines for providing data in order to assure apples-to-apples comparisons.<sup>ii</sup>

Figure 2 shows a plot of industry-reported mobile broadband coverage area for the region shown in Figure 1, where the color coding indicates the coverage area within each of the pentagons. As seen in the legend of Figure 2, blue coding indicates 80-100% coverage, and this is the designation of areas within the purported gap region coverage map shown in Figure 1. To emphasize that contrast, refer to Figure 3 which shows a transparent overlay of Figures 1 and 2.

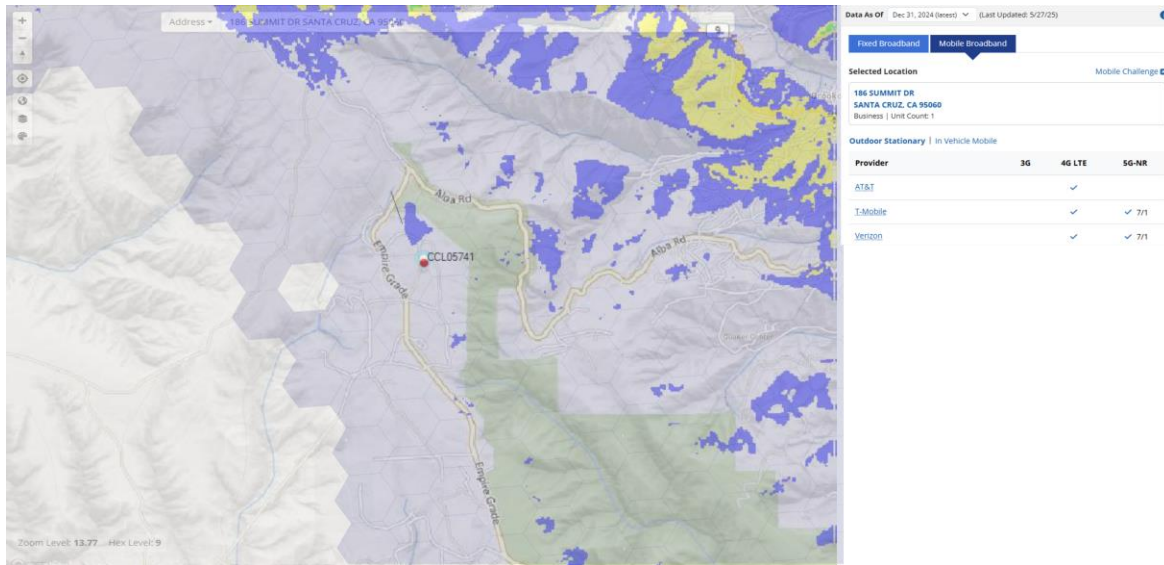


Figure 3 Overlay of maps of Figures 1 and 2, which highlights the sharp contrast between the two, where the industry reported data of Figure 2 shows no significant gaps in the vicinity of the proposed tower.

The settings used to create the map of industry-provided coverage data were “Mobile Broadband” for “Outdoor Stationary,” which is a much more controllable condition than “in-vehicle” which is dependent on the type of vehicle, whether windows are open or shut, whether there's a roof antenna being used, and the testing equipment being used to collect the data (e.g., just a cell phone or some testing unit).

A map of AT&T-reported mobile broadband coverage for AT&T alone is given in Figure 4, where the purple outlined pentagons report AT&T data. Again, the AT&T data do not show the types of gaps reported in Figure 1.

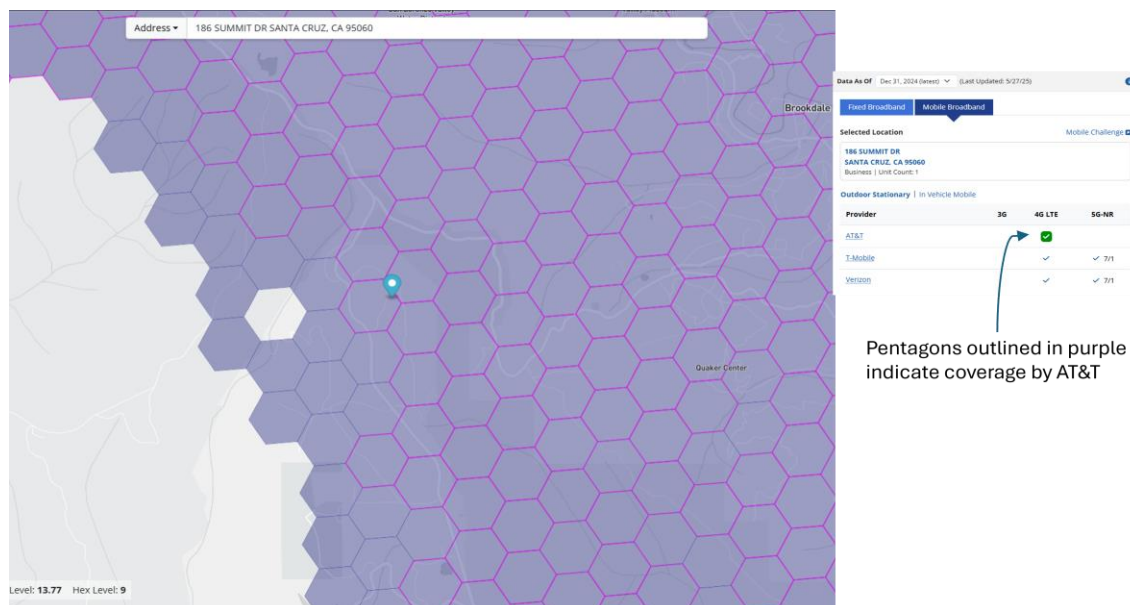


Figure 4 Map showing industry reported coverage for AT&T infrastructure.

The Brooks letter also reports the results of a drive test in Exhibit 2 on page 26/80 and reproduced here in Figure 5. The only information provided about the drive test is that

“AT&T conducted a drive test to measure actual signal strength in the area. Exhibit 2 provides the drive test results, which validate the significant service coverage gap depicted in Exhibit 1.” No information is provided regarding the equipment used to perform the measurements, whether or not the equipment was calibrated, where the antenna was located, and whether or not the measurements were repeatable. It is completely conclusory and self-serving to leave out all the necessary details for assessing the validity of the results presented.

Given the lack of information about how the measurements were collected, it would be difficult to provide comments regarding its accuracy. What is clear from the plot is that it shows large regions of marginal or gap coverage, which contradicts community member-reported reception as well as the industry-reported mobile broadband coverage presented above. The reporting of results for the drive test would not be acceptable in any respectable journal or conference proceedings, and it should not be considered in justifying the need for a cell tower, particularly considering the negative impact of installing a new tower.

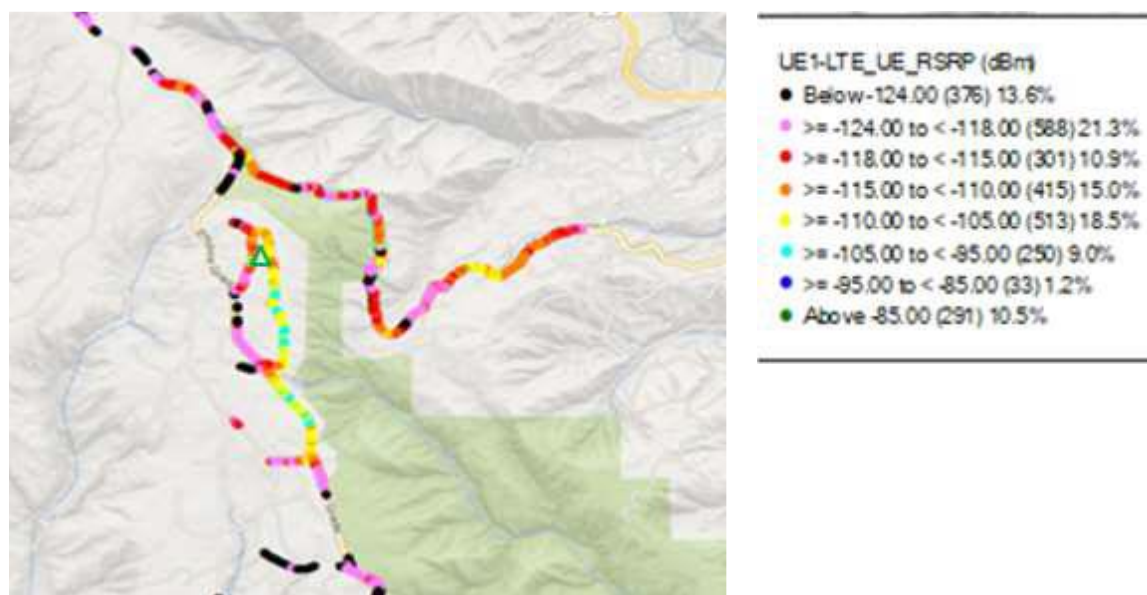


Figure 5 Copy of Exhibit 2 from page 26/80 of the Brooks letter showing the results of a drive test. The area displayed in this figure covers roughly the same area as previous figures in this report.

Additional industry-reported evidence supporting the fact that there is no significant gap in the region of the proposed tower comes from AT&T's application to be relieved from its Carrier of Last Resort (COLR) obligation. An overview of AT&T's wireless coverage in the Bonny Doon area is found in AT&T's recent application for relief from its Carrier of Last Resort ("COLR") obligation which I have extracted from the California Public



#### Map of Proposed Areas for Relief From COLR Obligation

This map depicts areas in California where AT&T has applied for relief from its Carrier of Last Resort (COLR) obligation.

Blue shaded sections represent the areas in AT&T California's service territory in which AT&T seeks to withdraw as a COLR. Violet shaded sections represent the territory AT&T California proposes that it should be allowed to withdraw from as a COLR in the future through a proposed streamlined advice letter process. The Commission has not yet approved this proposed streamlined process.

This is part of an application that has not yet been approved by the California Public Utilities Commission. Multiple parties oppose the application, and the Commission must still approve the application before AT&T withdraws as COLR, after evaluating the evidence from all parties, as well as public input. For more information about this application please visit the [Commission's website](#).

Customers may share their concerns with the Commission by attending a [Public Participation Hearing](#), by submitting comments on this proceeding's [Docket Card](#), or by mailing in written comments to "CPUC Public Advisor's Office, 505 Van Ness Ave., San Francisco, CA 94102." If you mail comments, please include the proceeding number A.23-03-003 on the envelope.

*Figure 6* Description extracted from website relating to AT&T's application to be relieved from being a Carrier of Last Resort.

Utilities Commission website<sup>iii</sup> and is presented in Figure 6. Receiving relief from that obligation would be a boon for the company as it would no longer need to maintain its less profitable landlines and would force people to use its more lucrative wireless services. The coverage map submitted by AT&T in its application for COLR relief for the vicinity of the proposed cell tower is given in Figure 7. As noted in the announcement of Figure 6, the blue sections represent areas in AT&T service where it seeks to withdraw immediately from its COLR obligations,

implying that wireless coverage is sufficient in those regions to provide adequate phone service coverage even if wired landline service is removed. The violet regions are where it intends to withdraw from COLR obligations in the future. The takeaway from Figure 7 is that the AT&T-reported data do not show coverage gaps in the vicinity of the proposed tower.

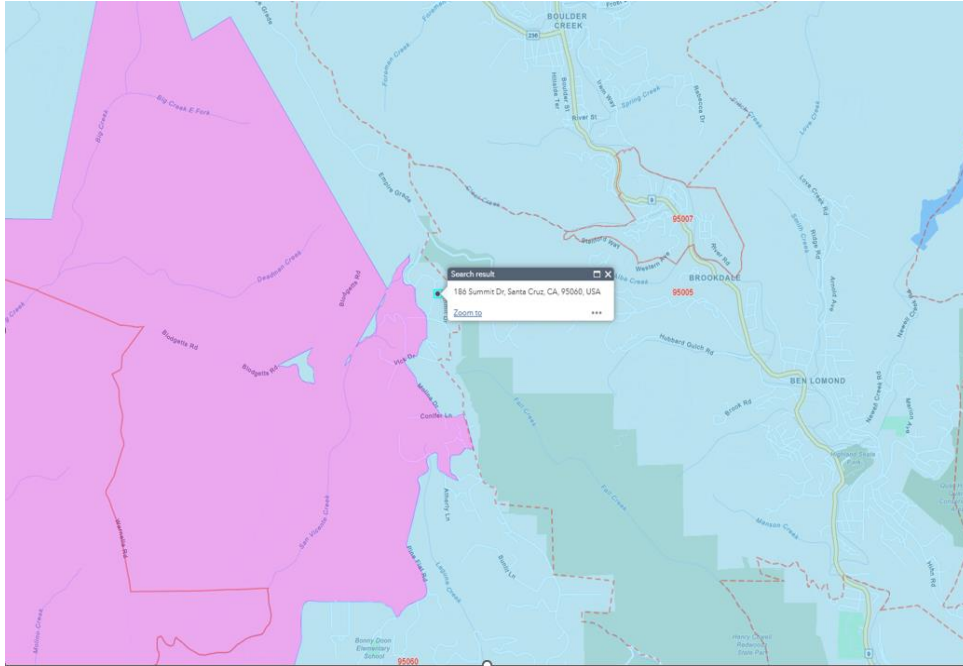


Figure 7 AT&T coverage data used in application to be relieved of Carrier of Last Resort

## Conclusion

The evidence presented in the Brooks letter suggesting that there is a significant gap in AT&T's wireless coverage in the area specified appears to be very weak. Significantly, there are no dropped-call logs to support claims about gaps in coverage, and the modeled and measured data presented in the letter are so inadequately described that they do not stand up to scrutiny. Simply stated, AT&T's evidence for coverage gaps in the vicinity of the proposed tower comes nowhere close to passing the reasonability test.

On the other hand, the evidence suggesting that no significant gaps exist in AT&T's wireless coverage is supported by community member reports, the absence of dropped-call logs, and two cases of industry-reported coverage in the purported gap areas. **Based on this information, I can only conclude that there are no significant gaps in AT&T's wireless coverage in the region of the proposed tower, and hence there is no justification for the proposed tower.**

The focus of this report is whether significant gaps in coverage exist that would warrant the installation of a new cell tower at the proposed location, and as noted above, the conclusion is that current coverage is adequate without new infrastructure. However, should evidence arise demonstrating that the existing infrastructure is not sufficient to fulfill the needs of the community, there is an obvious solution offered by an existing 150'-tall tower that is approximately 1,000' from the proposed site at 186 Summit Drive. That lattice tower, located on Patrick Road, could be used to provide nearly the same coverage as would be realized from the proposed site and hence should be considered as a viable option in the event that its usage is considered necessary. Locating antennas at the Patrick Road site is addressed in the Brooks letter (statement attributed to James Temple of AT&T Mobility Services, LLC) which says: "And Exhibit 7 demonstrates that a replacement tower at the Patrick Road location (the existing HAM radio tower would likely not support collocation) also would not close AT&T's significant service coverage gap." The opinion about

why collocation is not an option is not supported by any evidence in the letter, and the opinion about covering purported gap areas is based on computer model projections given on page 32/80 of the Brooks letter. As has been shown in this report, those model results are inconsistent with user observations and industry-reported information and cannot be considered to be reliable. However, the similarity between the modeled results seen in Exhibit 8, which compares coverage areas predicted for the proposed sites on Summit Drive and Patrick Road, does not show either site to be markedly superior, particularly in light of what is being reported for coverage from existing infrastructure.

### **Qualifications of Dr. Chamberlin:**

My career has been spent exploring the manner in which electromagnetic waves interact with a range of physical objects. An overview of my career is offered in my attached *Curriculum Vitae* (exhibit A), with somewhat greater relevant details provided below.

My first professional work experience was as a coop student with the Air Force Avionics Laboratory, where I was involved in projects relating to electronic countermeasures. This is relevant to the case being considered because I learned about the jamming of signals and the generation of signals that can confound communications.

In graduate school, I performed research for the Federal Aviation Administration, investigating the effects of terrain, vegetation and buildings on navigation and communication systems. My PhD dissertation presented measured and modeled data on the effects of trees on VHF communication links, and I received the Radio Technical Commission for Aeronautics (RTCA) William E. Jackson Award for it. That work in Avionics led to a Visiting Professorship at the FAA Technical Center where I worked on a range of navigation issues such as collision avoidance, building-scattering, and the use of GPS for non-precision approaches. The information I learned in this position is relevant to the case as it provided insights into the mechanisms that impact the propagation of high-frequency radio waves such as the signals relating to cellular communication.

In 1982, I assumed a faculty position at Ohio University, where I continued my research in Avionics and taught in areas relating to electromagnetics. Then, in 1985, I left Ohio University for a faculty position at the University of New Hampshire where I continued to pursue research and teaching in the general area of electromagnetics. One relevant focus area was the development and evaluation<sup>iv</sup> of propagation models.

In 1993, I took a sabbatical year at The Pennsylvania State University, where I continued to work on different aspects of propagation modeling and electromagnetics modeling in general.

After my first sabbatical, I returned to UNH to continue my regular teaching and research duties, where I expanded the scope of my research to include biomedical engineering while continuing my work in propagation modeling. One of my efforts involved the modeling of electromagnetic fields so that they could be used to heat soil in cold regions, thus enabling the use of bacteria for bioremediation of oil spills. We also found a sponsor interested in using a similar type of approach to shrink prostate tissue by heating it, although that proposal was not funded.

In 2000, I served out a Fulbright Distinguished Chair position in Aveiro, Portugal. My work there involved teaching and working with researchers on a variety of electromagnetics and communications-related projects. After returning from my second sabbatical, I expanded my efforts in biomedical engineering while continuing my non-biomedical efforts. UNH did not have a large biomedical program at that time and obtaining funding in that area was challenging. Despite not having funding, I was able to work with others to perform some publishable work relating to electromagnetic aspects of acupuncture.<sup>v vi vii</sup> The relevance of this work in Biomedical Engineering is that it provided me with insights into the interaction of electromagnetic waves and human health.

In the early 2000s, I worked periodically on a contract for the United States Department of Justice.<sup>viii</sup> This work involved a range of topics, which included radiowave propagation modeling and measurements<sup>ix,x</sup> and alternatives to cellphone communications in emergency situations.<sup>xi</sup> The reason that [alternatives](#) were sought is because wireless communications are vulnerable to saturation, hacking, and jamming. This is relevant to the case under consideration because all wireless infrastructure suffers from these vulnerabilities.

Also of note is that I was appointed as an Associate Editor for the Institute of Electrical and Electronics Engineers (IEEE) Transactions on Antennas and Propagation, the preeminent journal in the field of radiowave modeling and measurements. In my role of Associate Editor, I was responsible for shepherding the review process for manuscripts that had been submitted to the journal. As part of that process, I would review papers submitted to the journal myself, send them to three reviewers with suitable experience to perform the reviews, and then make a decision about publication once the reviews had been returned. This experience provided good insights into how to evaluate peer-reviewed papers, and it provided more insights into the capabilities and limitations of propagation modeling. Even though I am no longer an Associate Editor for IEEE, I am on the editorial review board for several scientific publications.

My teaching duties throughout my career have focused on electromagnetic theory at both the undergraduate and graduate levels, and computational electromagnetics which includes working with students on the development and validation of propagation models. Validation entails collecting signal measurements in the field and comparing them to modeled results. One major insight that I have gained in working with computer models is that they are highly sensitive to the input data parameters. A computer model will always give an answer, and that answer may not be accurate even if it has given accurate results for similar configurations. One of the key points I have tried to instill in my students is that computer models can be very useful tools, although they need to be used with care.

In related work, I continue to perform research in areas relating to biomedical engineering, and I have continued to work with the electrical and electromagnetic aspects of acupuncture<sup>xii</sup> as well as the measurement<sup>xiii</sup> and analysis<sup>xiv</sup> of biological electromagnetic signals. Because these efforts involved human subjects, I applied for and received approval from the University of New Hampshire Institutional Review Board (IRB) multiple times.

In 2014, I assumed the role of Chair of the Electrical and Computer Engineering Department at UNH. In that role, I was able to continue my funded research and teaching. My primary research effort during that time involved the development of an electromagnetics/thermal model of the plastic pipe-fusing process for a large plumbing and heating

company. A major contribution of my work for that company was to show how off-the-shelf models can be used to effectively support the design of new products. An important finding that is worth sharing here is that even very high-end models can require extensive manipulation in order to give accurate results.

In the Fall of 2019, I was asked to serve on a New Hampshire State Commission charged with exploring the health and environmental impacts of wireless communication. While I realize that health and the environment cannot be used to deny a cell tower permit, those factors should be taken into account by decision makers. After all, if radiation from these towers is completely benign, as is stated by industry, then far fewer people would be fighting cell towers, and I would not be serving as an expert witness in this case.

The New Hampshire Commission I served on was formed as a result of legislation ([HB-522](#)) that was passed by both houses of the legislature and signed by the governor. I was asked to serve on the Commission by the University System of New Hampshire (USNH) Chancellor because the legislation convening the Commission called for a representative from USNH with experience in Radio Frequency Engineering. The Commission was comprised of thirteen members who had backgrounds that included physics, toxicology, electromagnetics, epidemiology, biostatistics, occupational health, medicine, public health policy, business, and law. With this membership, the Commission had the expertise to address the issues and questions presented to it. It is important to note that, except for the Commission members representing the telecommunications industry, members were not compensated for their service and thus their service was considered to be independent. It is also important to note that when I was asked to serve on the Commission, I did not believe that wireless radiation was particularly harmful.

The Commission met for over a year to explore information relating to wireless radiation and health. This not only included an in-depth study of existing peer-reviewed publications, but also interviews with nine recognized experts in fields relating to wireless radiation exposure and health. Of those nine experts, all of them except one acknowledged the negative health impacts of wireless radiation exposure. The one who claimed that exposure is harmless was the expert brought in by the telecommunication industry (CTIA<sup>xv</sup>), and that expert was the only one who was paid to present to the Commission. It is also to be noted that the Commission invited participation from the Federal Communications Commission (FCC), Food and Drug Administration (FDA), and Environmental Protection Agency (EPA), but none of them provided representatives to meet with us nor did they provide answers to our questions that were posed via email or phone. Our explanation for government agencies' lack of cooperation with a formal State commission is that they had been captured by industry.<sup>xvi</sup>

The New Hampshire Commission released its [final report](#) in November 2020,<sup>xvii</sup> with the overall finding being that wireless radiation is harmful, whether that radiation is generated by cellphones, cell towers, Wi-Fi, smart meters, etc. The 390-page report contains a list of 15 recommendations that provide for better protecting people and the environment against long-term wireless radiation exposure.

Since serving on the New Hampshire Commission, I have been active in educating lawmakers, administrators, and the public about its findings. I have made over seventy public presentations, which have included a presentation at the Royal Society of Medicine

in London, England, as part of a speaking tour in Europe, and more recently, presentations relating to a speaking tour in China. I am a founding member of the International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF),<sup>xviii</sup> a group of recognized scientists with expertise in fields relating to wireless radiation and its biological effects. Working with members of ICBE-EMF, I have been a coauthor on two papers relating to the harm of wireless radiation, with one documenting the inadequacy of current FCC guidelines,<sup>xix</sup> and the other demonstrating how cellphones can be modified to lower exposure for the user.<sup>xx</sup> I am coauthor on another paper that advocates for the Precautionary Principle,<sup>xxi</sup> which suggests that efforts should be undertaken to prove the safety of new technologies before deploying them.

I am currently serving as President of the Environmental Health Trust<sup>xxii</sup> (EHT) which is a think tank that promotes a healthier environment through research, education, and policy. A focus of EHT is the toxic effect of wireless radiation exposure. The above connection between wireless radiation and health is given to show how I became involved in this issue; acknowledging that health and the environment cannot be used to deny a permit, I refer to that connection only peripherally as I address issues in this case.

## References

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<sup>i</sup> <https://broadbandmap.fcc.gov/about?version=dec2024>

<sup>ii</sup> [Information for Filers | Federal Communications Commission](#)

<sup>iii</sup> <https://attcacolr.maps.arcgis.com/apps/webappviewer/index.html?id=5d00a721f508432c9c7f1894084abc20>

<sup>iv</sup> Chamberlin, Kent A. and Luebbers, Raymond J., "An Evaluation of Longley-Rice and GTD Propagation Models", *IEEE Transactions on Antennas and Propagation*, AP-30, No. 6, November 1982

<sup>v</sup> H. Sathyendra, J. Chan, K. Sivaprasad, K. Chamberlin and J. LaCourse, "Transmission Line Modeling for Acupuncture Modal Therapy," NE Bioengineering Conference, Newark, NJ, March 2003

<sup>vi</sup> Kondagunta Sivaprasad, Kent Chamberlin and John LaCourse, "Transmission Line Axon Model for Acupuncture Therapy," International Union of Radio Science (URSI) meeting in New Delhi, India in October 2005

<sup>vii</sup> Kent Chamberlin, Christopher Glynn, Kondagunta Sivaprasad, "Transmission Line Axon Model for Acupuncture Therapy," Invited, presented at the 2007 North American Radio Science Meeting, Ottawa, ON, Canada

<sup>viii</sup> National Institute of Justice Grant #2001-LT-BX-K010

<sup>ix</sup> Kent Chamberlin, Amalia Barrios and Josh Jenkins, "Data Collection, Analysis and Model Validation of Low-Altitude Propagation for VHF Mobile Radio," presented at the 2006 International Union of Radio Sciences (URSI) meeting in Boulder, Colorado, January 2006

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- <sup>x</sup> Kent Chamberlin, Amalia Barrios, Kondagunta Sivaprasad and Josh Jenkins, “Data Collection, Analysis and Model Validation of Low-Altitude Propagation for VHF Mobile Radio,” International Union of Radio Science (URSI) meeting in New Delhi, India in October 2005
- <sup>xi</sup> Scott A. Valcourt, Kent Chamberlin, Benjamin McMahon, and Andrew Kun, “Systems Engineering of Datacasting for Public Safety Vehicles,” 2007 IEEE Conference on Technologies for Homeland Security, Woburn, MA
- <sup>xii</sup> Keith Spaulding and Kent Chamberlin, “Measurements Relevant to Electrical Energy Transport both On and Off Acupuncture Meridians,” February 2011, Journal of Complementary and Alternative Medicine
- <sup>xiii</sup> Kent Chamberlin, Ph.D., Wayne Smith, Ph.D., Seshank Appasani, Christopher W Chirgwin and Paul T Rioux, “Analysis of the Charge Exchange between the Human Body and Ground: Evaluation of “Earthing” from an Electrical Perspective,” Journal of Chiropractic Medicine, DOI: 10.1016/j.jcm.2014.10.001
- <sup>xiv</sup> Ronald Croce, Amber Craft, John Miller, Kent Chamberlin and David Filipovic, “Quadriceps mechano- and electromyographic time-frequency responses during muscular contractions to volitional exhaustion,” Muscle & Nerve Journal, July 2015
- <sup>xv</sup> Cellular Telecommunications Industry Association: [CTIA - Home](#)
- <sup>xvi</sup> Alster, Norm. “[\*Captured Agency: How the Federal Communications Commission Is Dominated by the Industries It Presumably Regulates\*](#),” 2015
- <sup>xvii</sup> [Final Report](#) on Commission to Study the Environmental and Health Effects of Evolving 5G Technology (RSA 12-K:12-14, HB 522, Ch. 260, Laws of 2019)
- <sup>xviii</sup> [The International Commission on the Biological Effects of Electromagnetic Fields - International Commission on the Biological Effects of Electromagnetic Fields](#) (ICBE-EMF)
- <sup>xix</sup> Igor Belyaev; Carl Blackman; Alvaro Augusto Almeida de Salles; **Kent Chamberlin** ; Suleyman Dasdag; William Dingeldein; Claudio Enrique Fernandez Rodriguez; Lennart Hardell; Kesari Kavindra; Paul Heroux; Elizabeth Kelley; Don Maisch; Erica Mallery-Blythe; Joel Moskowitz; Ron Melnick; Wenjun Sun; Igor Yakymenko, "Scientific Evidence Invalidates Assumptions Underlying the FCC and ICNIRP Exposure Limits for Radiofrequency Radiation: Implications for 5G ", Environmental Health, October 2022  
<https://doi.org/10.1186/s12940-022-00900-9>
- <sup>xx</sup> Igor Belyaev, **Kent Chamberlin**, Suleyman Dasdag, Alvaro Augusto Almeida De Salles, Claudio Enrique Fernandez Rodriguez, Lennart Hardell, Elizabeth Kelley, Kavindra Kumar Kesari, Erica Mallery-Blythe, Ronald L. Melnick, Anthony B. Miller, Joel M. Moskowitz and Paul Héroux, “Cell Phone Radiation Exposure Limits and Engineering Solutions”, International *Int. J. Environ. Res. Public Health* **2023**, 20(7), 5398; <https://doi.org/10.3390/ijerph20075398>
- <sup>xxi</sup> Ben Ishai, P., Baldwin, H. Z., Birnbaum, L. S., Butler, T., **Chamberlin, K.**, Davis, D. L., ... Taylor, H. (2024). Applying the Precautionary Principle to Wireless Technology: Policy

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Dilemmas and Systemic Risks. *Environment: Science and Policy for Sustainable Development*, 66(2), 5–18. <https://doi.org/10.1080/00139157.2024.2293631>

<sup>xxii</sup> [Environmental Health Trust | Information About Cell Phone, Wi-Fi, 5G, and Bluetooth Radiation Science Facts on Health Effects](#)



## Kent A. Chamberlin, Ph.D.

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### **Education**

1968-1973 University of Cincinnati

-Co-op experience with Air Force in Electronic Countermeasures

1974 BSEE Ohio University

1976 MSEE Ohio University

-*Thesis: Design of a Digital Phase Lock Loop for Airborne Navigation*

1982 Ph.D. Ohio University

-*Dissertation: VHF Air-Ground Propagation Modeling*

### **Areas of Expertise:**

Computational Electromagnetics (Finite-Difference, Time-Domain (FDTD)); Propagation modeling (Geometrical Theory of Diffraction (GTD) and Physical Optics); Biological Signal Analysis (Frequency Domain and Wavelet)

### **Professional Experience Summary**

Current	Professor and Chair Emeritus President, Environmental Health Trust Founder in high-tech startup company Special Expert, International Commission on the Biological Effects of Electromagnetic Radiation Chair of the Virtual Learning Academy Charter School Board of Trustees
2014-2021	Professor and Chair, University of New Hampshire Dept. of Electrical & Computer Engineering
1985-2014	Professor, UNH Dept. of Electrical and Computer Engineering
2010 (Spring)	Visiting Professor: SRM University, Chennai, India
2000 – 2001	Fulbright Distinguished Chair in Antennas and Computational Electromagnetic at the University of Aveiro, Portugal
1993- 1994	Visiting Prof. at The Pennsylvania State University Department of Electrical Engineering. One-semester appointment to the Applied Research Labs
1982- 1985	Asst. Prof. at Ohio University Department of Electrical and Computer Engineering

1981 (Fall)	Visiting Professor at the FAA Technical Center
1977-1981	Senior Research Engineer with the Ohio University Avionics Engineering Center

### ***Personal***

United States Citizen, Married, Three Children

### ***Research Experience***

Below is a listing of research programs participated in along with the sponsoring agency and dates:

- “Error Correction Techniques for Chirped Fourier Transform in Dispersive Delay Lines”, Antenum, Inc, Jan, 2022-July 2022
- “Electromagnetic Pipe Fusion Analysis and Optimization,” Watts Water Corporation, Sept. 2017- Sept. 2020.
- “Low Cost, High Bandwidth, and Non-Intrusive Machining Force Measurement System,” The National Science Foundation, June 1, 2009- May 31, 2013
- “The Use of Datacast Signals for Public Safety Applications,” National Institute of Justice, January 2006- December 2007
- “Data Collection and Analysis of Low Altitude Propagation Effects for Mobile Radio,” U.S. Navy (SPAWAR), Feb. 04- Feb. 05.
- “Modeling the Wireless Ground-to-Ground Communication Channel”, Department of Justice (Project 54), June 2001- July 2004.
- “Distance Education Module Development,” part of an E2T2 (Enhancing Education Through Technology) grant obtained for the Seacoast Professional Development Center as part of the No Child Left Behind program, 8/04- 2/05.
- "Digital Air-Ground Link Modeling", Federal Aviation Administration, 7/1/98-9/30/01.
- "Sidewall Dielectric Damage by RIE: Detection by Scanning Probe Microscopy and the Effect on Signal Propagation", Semiconductor Research Corporation, 4/1/98-3/31/2001
- Development and Evaluation of a Distance Learning Classroom, Davis Educational Classroom, 1/99 - 12/99.
- “Development of the GELTI Propagation Model”, Federal Aviation Administration, 5/96- 9/97.

- “Electric Field Measurement by Scanning Probe Microscopy to Detect the Effect of Nanoscale Material Inhomogeneity on Signal Propagation in High Density Interconnects”, Semiconductor Research Corp., 10/96-12/97.
- “Propagation Model for Digital Radio in Airborne Platform”, MadenTech (Subcontract from the U.S. Army), 9/95-9/96.
- “Development of Digital Signal Processing Techniques for Avionics Instrumentation Package”, Airfield Technologies, 1/95-8/95.
- “Modeling Propagation Path Loss for the Microwave Landing System (MLS) Operating on Humped Runways,” CTA (subcontract from the Federal Aviation Administration), 8/89-12/93.
- “Application of the Finite-Difference, Time-Domain Approach to aid in the design of low-cost, computer cabinetry that will meet FCC requirements for Radio Frequency Interference,” Digital Equipment Corporation, 6/92-12/93.
- “Investigation into reflection from terrain and building surfaces as applied to Microwave Landing System Modeling”, CTA (subcontract from the Federal Aviation Administration), 7/92-9/92.
- “Capability Enhancement of the COSITE Computer Model for Use in Air-Ground Communications Facility Design and Telecommunications Analysis,” Information Systems and Networks, Inc. (subcontract from the Federal Aviation Administration), 10/90-3/92.
- “Enhancement of FAA Modeling Capabilities,” Pabon, Sims, Smith & Associates (subcontract from the Federal Aviation Administration), 2/87-2/88.
- “Enhancement of FAA Modeling Capabilities,” Information Systems and Networks, Inc. (Subcontract from the Federal Aviation Administration, 11/86- 11/87.
- “Development of a Graphics-Oriented, Finite-Difference, Time-Domain Code in the C Programming Language, Microsoft Corporation, Summer, 1988.
- “Modeling and Validation of VOR and TACAN Errors Resulting from Near-Zone Parasitic Scatterers,” Graph-Tech, Inc. (subcontract from the Federal Aviation Administration), 11/84-8/85
- “VHF Omni-Range Maintainability and Course Accuracy, Federal Aviation Administration, 4/85-8/85

- “Modeling and Validation of VHF Air-Ground Communications Coverage in the Presence of Long-Range Radar Antennas,” Ohio University, Graph-Tech, Inc. (subcontract from the Federal Aviation Administration, 11/84-8/85)
- “Microwave Landing System (MLS) Critical Areas Investigation,” Ohio University, Federal Aviation Administration, 9/83-11/84
- “Extension and Validation of the Geometrical Theory of Diffraction Propagation Model,” Ohio University, Electromagnetic Compatibility Analysis Center via Southeastern Center for Electrical Engineering Education, 6/82-1/83
- “Delivery of GTD Glide Slope Model and Operations Manual, “ Ohio University, Government of India, 10/83
- “Study of Glide Slope Signal Derogation Due to Presence of Aircraft Near Glide Slope Critical Area”, Federal Aviation Administration
- “Electromagnetic Interference Measurements on Emissions from Industrial, Scientific, and Medical (ISM) Equipment and Their Effects on ILS Localizer Receiver Performance,” Federal Aviation Administration
- “Development of Ground-to-Air Coverage-Area Prediction for VHF/UHF Communications,” Federal Aviation Administration

Other research efforts include: A centralized computer monitor system for O’Hare Airport (FAA); Development of a mathematical model and computer simulation for the Memory-Aided, Phase Lock Loop (MAPLL) for the Naval Avionics Facility in Indianapolis; Evaluation of Omega navigation receivers for the U.S. Coast Guard; Investigation of snow effects on the ILS Glide Slope.

### ***Consulting (abbreviated)***

Expert Witness for multiple law firms on issues relating to wireless signal propagation.

**AMI, Inc.:** Modeling microwave devices to exploit frequency-dependent characteristics including the Chirped Fourier Transform.

**Most & Associates:** Expert witness for Main Coalition to Stop Smart Meters v. Maine Public Utilities Commission, Maine Supreme Court.

**Byonyks, Inc:** Exploring electromagnetic compatibility (EMC) issues on circuits for medical devices.

**Remcom, Inc.:** Provide engineering support and analysis relating to electromagnetics modeling efforts.

**New Hampshire Public Television:** Performed a signal coverage study as a pre-pilot program to implement datacasting for public safety applications.

**KAI, Inc.:** Performed FDTD analysis of heating effects of an antenna positioned in oil-bearing soil.

**Information Systems & Networks Corporation:** Aided in specifying a frequency management strategy for siting multi-channel, air-ground communication facilities.

**Pacific Telecommunications Corporation, Alaskom Division:** Investigated radiation patterns for meteor burst communication systems. This effort included computer simulation and airborne data collection for directional 40 MHz systems operating in the presence of irregular terrain.

### ***Memberships***

International Commission for the Biological Effects of Electromagnetic Fields (ICBE-EMF), IEEE (Senior Life Member): Antennas and Propagation Society and Electromagnetic Compatibility Society, Sigma Xi, Tau Beta Pi, Applied Computational Electromagnetics Society (ACES), International Union of Radio Scientists URSI)

### ***Honors***

Honorary title of Distinguished Professor of Renmin Hospital of Wuhan University, April 2025

Awarded the UNH College of Engineering and Physical Sciences Outstanding Teacher for 2014

Awarded a Fulbright Distinguished Chair, served in Aveiro Portugal

Received a UNH Industrial Research Consulting Center Research Award

Awarded a Fulbright Fellowship in 1993 but was unable to accept because a family member could not take a requisite vaccine.

Received the Radio Technical Commission for Aeronautics William E. Jackson Award presented by the FAA Administrator

### ***Professional Service***

Active reviewer for several IEEE publications

Associate Editor for IEEE Transactions on Antennas and Propagation

Associate Editor of the International Journal for Computing

Proposal Reviewer for National Science Foundation, the National Institute for Health and the American Association for the Advancement of Science

Session Chair for numerous IEEE and URSI conferences

Editorial Review Board for SciTech Publishing

Served as member of the Evaluation Team, coordinated by the New Hampshire Department of Education, for the American University of Madaba in Jordan

### ***Refereed, Invited, and Award-Winning Papers***

Ben Ishai, P., Baldwin, H. Z., Birnbaum, L. S., Butler, T., **Chamberlin, K.**, Davis, D. L., ... Taylor, H. (2024). Applying the Precautionary Principle to Wireless Technology: Policy Dilemmas and Systemic Risks. *Environment: Science and Policy for Sustainable Development*, 66(2), 5–18. <https://doi.org/10.1080/00139157.2024.2293631>

Igor Belyaev, **Kent Chamberlin**, Suleyman Dasdag, Alvaro Augusto Almeida De Salles, Claudio Enrique Fernandez Rodriguez, Lennart Hardell, Elizabeth Kelley, Kavindra Kumar Kesari, Erica Mallery-Blythe, Ronald L. Melnick, Anthony B. Miller, Joel M. Moskowitz and Paul Héroux, “Cell Phone Radiation Exposure Limits and Engineering Solutions”, *International J. Environ. Res. Public Health* **2023**, 20(7), 5398; <https://doi.org/10.3390/ijerph20075398>

Igor Belyaev; Carl Blackman; Alvaro Augusto Almeida de Salles; **Kent Chamberlin** ; Suleyman Dasdag; William Dingeldein; Claudio Enrique Fernandez Rodriguez; Lennart Hardell; Kesari Kavindra; Paul Heroux; Elizabeth Kelley; Don Maisch; Erica Mallery-Blythe; Joel Moskowitz; Ron Melnick; Wenjun Sun; Igor Yakymenko, "Scientific Evidence Invalidates Assumptions Underlying the FCC and ICNIRP Exposure Limits for Radiofrequency Radiation: Implications for 5G ", *Environmental Health*, October 2022 <https://doi.org/10.1186/s12940-022-00900-9>

Patrick Abrami, Kenneth Wells, Gary Woods, James Gray, Tom Sherman, Denise Ricciardi, Brandon Garod, Esq., Carol Miller, David Juvet, **Kent Chamberlin**, Bethanne Cooley, Michele Roberge, and Paul Héroux, “Final Report on Commission to Study the Environmental and Health Effects of Evolving 5G Technology,” (RSA 12-K:12-14, HB 522, Ch. 260, Laws of 2019), DOI: 10.13140/RG.2.2.31724.59528

K Chamberlin, B McMahon, “Magnetic-field antenna for mobile reception of horizontally-polarized digital television-band signals,” *International Journal of Wireless and Mobile Computing* 19 (2), 133-137

Michael Klempa and Kent Chamberlin, “Broadband Termination Technique,” in review, *IEEE Microwave Magazine*.

Minu Valayil and Kent Chamberlin, “Enhancement of Parameters of Slotted Waveguide Antennas Using Metamaterials,” *APPLIED COMPUTATIONAL ELECTROMAGNETICS SOCIETY JOURNAL*. 34: 272-279. Feb 2019

Ronald Croce, Amber Craft, John Miller, Kent Chamberlin and David Filipovic, “Quadriceps mechano- and electromyographic time-frequency responses during muscular contractions to volitional exhaustion,” *Muscle & Nerve Journal*, July 2015.

Amber Craft, Ronald Croce, John Miller, Kent Chamberlin and David Filipovic, “Shifts in Spectral Power Detected By Fourier and Wavelet Transforms During Muscular Contractions To Volitional Exhaustion,” *Clinical Kinesiology* 69(2):5-10 · December 2014

Ronald Croce, John Miller, Kent Chamberlin, David Filipovic and Wayne Smith, "Wavelet analysis of Quadriceps power spectra and amplitude under varying levels of contraction intensity and velocity," *Muscle & Nerve* 11/2014; 50(5). DOI:10.1002/mus.24230

Kent Chamberlin, Ph.D., Wayne Smith, Ph.D., Seshank Appasani, Christopher W Chirgwin and Paul T Rioux, "Analysis of the Charge Exchange between the Human Body and Ground: Evaluation of "Earthing" from an Electrical Perspective," *Journal of Chiropractic Medicine*, DOI: 10.1016/j.jcm.2014.10.001 .

Keith Spaulding and Kent Chamberlin, "Measurements Relevant to Electrical Energy Transport both On and Off Acupuncture Meridians," February 2011, *Journal of Complementary and Alternative Medicine*.

Kent Chamberlin, "Intermodulation Product Interference: Theory and Practice," Keynote Address, International Conference on Communications & Computing (ICCC '10), Chennai, India, April 2010.

Benjamin McMahon, Kent Chamberlin & Scott Valcourt, "Datacasting in the Mobile Environment," *Journal of Networks*, Issue 7, 2008.

Jason Chan, K. Sivaprasad, and Kent Chamberlin, "Modeling Frequency-Dependent Stripline Losses at High Frequencies," *IEEE Trans. Packaging Materials*, March 2007

Kent Chamberlin and Shahaji Bhosle, "A Robust Solution for Preprocessing Terrain Profiles for Use with Ray-Tracing Propagation Models," *IEEE Trans. on Antennas & Propagation*, October 2004

Kent Chamberlin and Maxim Khankin, "Measuring the Impact of In-Vehicle-Generated EMI on VHF Radio Reception in an Unshielded Environment," Proceedings of the 2004 International Symposium on Electromagnetic Compatibility and winner of an "Excellence of the Presented Papers Award", Sendai, Japan

Kent Chamberlin and Dragan Vidacic, "Analysis of Finite-Differencing Errors to Determine Cell Size When Modeling Ferrites and other Lossy Electric and Magnetic Materials Using FDTD," *IEEE Trans. on Electromagnetic Compatibility*, November 2004

Todd S. Gross, Kevin G. Soucy, Ebrahim Andideh, and Kent Chamberlin, "Detection of Plasma-Induced, Nanoscale Dielectric Constant Variations in Carbon-Doped CVD Oxides by Electrostatic Force Microscopy," *Journal of Applied Physics*, 35 (2002) pg. 723-728.

Todd S. Gross, Christopher M. Prindle, Kent Chamberlin, Nazri bin Kamsah, and Yuanyan Wu, "Two-dimensional, electrostatic finite element study of tip-substrate interactions in electric force Microscopy of high-density interconnect structures," *Ultramicroscopy Journal*, 87 (2001) pg. 147-154

Kent Chamberlin, Mikhailo Seledtsov, and Petar Horvatic, "Modeling Large and Small-Scale Fading on the DPSK Datalink Channel Using a GTD Ray-Tracing Model", invited paper, Proceedings of, the 2000 Applied Computational Electromagnetics Symposium, Monterey, California.

Jennifer Bernhard, Kent Chamberlin, and Chris Williamson, "A Student Perspective on an Internet-Based Synchronous Distance Learning Course Experience," *The Journal of the American Association of Engineering Education*, January 2000.

Bruce Archambeault, Kent Chamberlin, and Omar Ramahy, "EMC Modeling of Shielded Enclosures with Apertures and Attached Wires in a Real-World Environment", Journal of the Applied Computational Electromagnetics Society

Kent Chamberlin, "Terrain-Effect Modeling Using the Geometrical Theory of Diffraction," invited paper, The Radio Science Bulletin, International Union of Radio Science, March 1997.

Kent Chamberlin, "An Automated Approach for Implementing GTD to Model 2-Dimensional Terrain Effects at Microwave Frequencies," *IEEE Transactions on Electromagnetic Compatibility*, February 1996

Kent Chamberlin and Lauchlan Gordon, "Modeling Good Conductors Using the Finite-Difference, Time-Domain Technique," *IEEE Transactions on Electromagnetic Compatibility*, Vol. 37, No. 2, May 1995.

Kent Chamberlin, Ken Komisaruk, and Kondagunta Sivaprasad, "A Method of Moments Solution to the Twisted-Pair Transmission Line", *IEEE Transactions on Electromagnetic Compatibility*, February 1995.

Kent Chamberlin, "Overview of Terrain-Effect Modeling Using the Geometrical Theory of Diffraction," Invited Paper, Proceedings of the 1994 Beyond Line-of-Sight Conference, University of Texas, August 1994.

Kent Chamberlin, "Applications for Theory of Re-Radiation by Non-Linearly Terminated Antennas," Invited Paper, Proceedings of the 1993 URSI/IEEE Symposium, Kyoto, Japan.

R. Luebbers, K. Kunz, and K. Chamberlin, "An FDTD Analysis of Transient Response from Non-Linearly Terminated Scatterers," *IEEE Transactions on Antennas and Propagation*, Vol. 41, no. 5, May 1993.

Chamberlin, Kent, "Computer Modeling of MLS Signal Strength in The Presence of Runway Hump Shadowing," Invited Paper, Proceedings of ANTEM'92 Symposium on Antenna Technology and Applied Electromagnetics, Winnipeg, Manitoba, Canada, August, 1992.

Kent Chamberlin, Jarrett Morrow, and Raymond Luebbers, "Frequency-Domain and FDTD Predictions of Harmonic Radiation by Nonlinearly-Terminated Dipole," *IEEE Transactions on Electromagnetic Compatibility*, November 1992.

Luebbers, R.J., Kunz, K.S., and Chamberlin, K., "Finite-Difference, Time-Domain Solution to the Wave Equation for Classroom Applications", *IEEE Transactions on Education*, November 1989 (Special Edition on Electromagnetics).

Chamberlin, Kent, "Quantitative Analysis of Intermodulation Product Interference", *IEEE Transactions on Electromagnetic Compatibility*, November, 1989.

Chamberlin, Kent, "The Effect of Tree Cover on Air-Ground, VHF, Propagation Path Loss", *IEEE Transactions on Communications*, September 1986

Chamberlin, Kent A. and Luebbers, Raymond J., "An Evaluation of Longley-Rice and GTD Propagation Models", *IEEE Transactions on Antennas and Propagation*, AP-30, No. 6, November, 1982

### ***Reviewed Conference Papers (abbreviated)***

Minu Valayil and Kent Chamberlin, "Enhancement of Antenna Parameters of Slotted Waveguide Antennas Using Metamaterials," presented 2014 IEEE International Symposium on Antennas and Propagation

Kent Chamberlin and Daniel Carchidi, "Rapid Course Development Using OCW Resources: Applying the Inverted Classroom Model in an Electrical Engineering Course," Cambridge 2012: Innovation and Impact - Openly Collaborating to Enhance Education

Rama Rao and Kent Chamberlin, "Path Gain Measurements at 868/915 MHz for Wireless Sensor Communications in Indoor Corridors," 5th IEEE International Conference on Advanced Networks and Telecommunication Systems (ANTS), IEEE ANTS 2011, Bangalore, India

Todd Gross and Kent Chamberlin, "Low Cost, High Bandwidth, and Non-Intrusive Machining Force Measurement System," Proceedings of 2011 NSF Engineering Research and Innovation Conference, Atlanta, Georgia

Dan Brogan and Kent Chamberlin, "Comparison of Single-Frequency Monopulse Techniques that Mimic the Results of Multiple-Frequency, Single-Aperture Interferometry," 159th Meeting of the Acoustical Society of America, Baltimore, MD, April 2010

Dan Brogan and Kent Chamberlin, "Phase and Amplitude Monopulse Techniques to Increase the Accuracy of Within-Beam Bearing Estimates of Volume Scatterers," 158th Meeting of the Acoustical Society of America, October 2009, San Antonio, TX

Daniel S. Brogan and Kent A. Chamberlin, "Use of Within-Beam Mapping in Conjunction with Kalman Filtering to Improve Angle of Arrival Estimation Accuracy in Multi-beam Echo-Sounding," 158th Meeting of the Acoustical Society of America, October 2009, San Antonio, TX

Kent Chamberlin, Andrew Kun, Scott Valcourt and Benjamin McMahon, "Evaluation of Datacasting in the Mobile Environment," Invited presentation, the 2008 International Wireless Communications Expo in Las Vegas, February 2008

Scott A. Valcourt, Pushpa Datla, Kent Chamberlin, Benjamin McMahon, "Information Integration for Public Safety Officers," in Proceedings of the SPIE Defense & Security Conference, Orlando, FL, March 2008.

Scott A. Valcourt, Pushpa Datla, Kent Chamberlin, Benjamin McMahon, "Using Two-Way Datacasting to Deliver Real-Time Public Safety Information," in Proceedings of the 2008 IEEE International Conference on Technologies for Homeland Security, Boston, MA, May 2008.

Kent Chamberlin, Christopher Glynn, Kondagunta Sivaprasad, "Transmission Line Axon Model for Acupuncture Therapy," Invited, presented at the 2007 North American Radio Science Meeting, Ottawa, ON, Canada.

Kent Chamberlin, Andrew Kun, Benjamin McMahon, Scott Valcourt, "Measuring Datacast Channel Characteristics for the Mobile Environment," Invited, presented at the 2007 North American Radio Science Meeting in Ottawa, ON, Canada.

Scott A. Valcourt, Kent Chamberlin, Benjamin McMahon, and Andrew Kun, "Systems Engineering of Datacasting for Public Safety Vehicles," 2007 IEEE Conference on Technologies for Homeland Security, Woburn, MA

Kent Chamberlin, Scott A. Valcourt, Benjamin McMahon and Andrew Kun, "Measurement of Propagation Effects for High-Speed, Digital UHF Channels," 2007 IEEE AP-S International Symposium on Antennas and Propagation in Honolulu, Hawaii, June 10-15, 2007

Henk Spaanenburg, Andrzej Rucinski, Kent Chamberlin, Thaddeus Kochanski and Lennart Long, "Globally-Collaborative Homeland" Security System Design," presented at and in the proceedings of the 2007 International Conference on Microelectronic Systems Education, San Diego, CA.

Kent Chamberlin, Andrew Kun, Benjamin McMahon and Scott Valcourt, "Evaluation of Data-casting in the Mobile Environment," presented at and in the proceedings of the 2007 IEEE 66th Vehicular Technology Conference, Baltimore, MD

Kent Chamberlin, Larry Brady and Raymond Luebbers, "Computer Simulation to Assess Effects of Aircraft Structures on Flight Inspection Antenna Performance," presented at and in the proceedings of the International Flight Inspection Symposium in Toulouse, France, June 2006.

Kent Chamberlin, Amalia Barrios and Josh Jenkins, "Data Collection, Analysis and Model Validation of Low-Altitude Propagation for VHF Mobile Radio," presented at the 2006 International Union of Radio Sciences (URSI) meeting in Boulder, Colorado, January 2006.

Kondagunta Sivaprasad, Kent Chamberlin and John LaCourse, "Transmission Line Axon Model for Acupuncture Therapy," International Union of Radio Science (URSI) meeting in New Delhi, India in October 2005.

Kent Chamberlin, Amalia Barrios, Kondagunta Sivaprasad and Josh Jenkins, "Data Collection, Analysis and Model Validation of Low-Altitude Propagation for VHF Mobile Radio," International Union of Radio Science (URSI) meeting in New Delhi, India in October 2005

Jason Chan, K. Sivaprasad & K. Chamberlin, "An Improved Estimation of Composite Strip-Line Losses" PIERS 2004, Pisa, Italy, March '04.

Kent Chamberlin, K. Sivaprasad and Maxim Khankin, "Measuring Small-Scale Fading at VHF Frequencies," presented at the 2004 International Union of Radio Sciences (URSI) meeting in Boulder, Colorado, January 2004.

Chan, Sathyendra, Sivaprasad, Chamberlin, "Estimation of Strip-Line Losses in Printed Circuit Boards," Proceedings of the 2003 International Symposium on Antennas, Propagation, and EM Theory (ISAPE), Beijing, China

H. Sathyendra, J. Chan, K. Sivaprasad, K. Chamberlin and J. LaCourse, "Transmission Line Modeling for Acupuncture Modal Therapy," NE Bioengineering Conference, Newark, NJ, March 2003.

K. Chamberlin, M. Khankin, A. Barrios, "Progress on the Validation of Short-Distance, Ground-to-Ground Propagation Models at VHF Frequencies," USNC/CNC/URSI North American Radio Science Meeting in Columbus, Ohio, June 2003

Chamberlin, Kent, "Evolution of a Bottom-Up Distance Education Program," Proceedings of the 2002 American Society of Engineering Education Conference in Berlin, Germany

Chamberlin, Kent, "A Streamlined Approach for Collecting Signal Strength Data to Validate a Ground-To-Ground Propagation Model," presented at the International Union of Radio Scientists (URSI) meeting in Boulder, Colorado, January 2002

Barbara Dziurla-Rucinska and Kent Chamberlin, "Not so distant distance learning", Proceedings of the 6th Annual Advanced Technology Workshop ATW'98, May 19-20, 1998, Ajaccio, Corsica, France

## ***Presentations Relating to Service on New Hampshire Commission on Wireless Radiation***

<b>Date</b>	<b>Presentation Details</b>
2/24/2021	Keene City Council meeting (Zoom)
3/13/2021	Overview of New Hampshire Commission (YouTube)
4/7/2021	Interview Regarding NH Commission (YouTube)
6/16/2021	Presentation to York, Maine Board of Trustees and Citizens (Zoom)
6/24/2021	Movements of Safe Technology in North America Conference (Brazil via Zoom)
7/5/2021	Public Information Session for Pittsfield, MA (Zoom)
7/22/2022	Presentation to Environmental Working Group Administrators
7/30/2021	Radio Interview about Wireless Radiation (CKWR)
7/30/2021	Radio Interview about Wireless Radiation (WTBR)
8/17/2021	Public Information Session in York Maine (Zoom)
8/19/2021	Presentation to Lenox, MA Board of Health (Zoom)
9/3/2021	Presentation to National Call for Safe Technology (Zoom)
9/17/2021	Presentation to Mass. Public Utilities Commission on Wireless Radiation (Zoom)
9/23/2021	Public Presentation about wireless radiation at York, ME public library (in-person)
9/28/2021	Radio Interview about Wireless Radiation (Housatonic Live radio & podcast, Episode 71.7 )
9/29/2021	Radio Interview about Wireless Radiation (David DeHaas radio & podcast)
10/7/2021	Podcast Interview about Wireless Radiation (John Krol)
11/3/2021	Presentation to Canadian Riding Representatives
11/9/2021	Environmental Health Trust Podcast
12/1/2021	Public Presentation about wireless radiation at Berwick, ME public library (in-person)
12/8/2021	New Hampshire Commission Setback Justification
1/13/2022	Testimony for HB1644 in NH House of Reps. Science, Technology & Energy Committee (in-person)
1/18/2022	Birmingham, MI presentation to School Board and Parents Part 1 (Zoom)
2/16/2022	Birmingham, MI presentation to School Board and Parents Part 2 (Zoom)
3/8/2022	Presentation to Stanley County, NC County Commissioners (Zoom)
3/15/2022	Testimony for HB1644 in NH House of Reps. Science, Technology & Energy Subcommittee (in-person)
3/29/2022	Radio Interview and Podcast with Green Street Radio
5/11/2022	Testimony for HB1644 in NH House of Reps. Science, Technology & Energy Subcommittee (in-person)
5/18/2022	Buckland, MA Public Hearing (Zoom)
6/1/2022	White Plains, NY City Council & Citizens
7/22/2022	Environmental Working Group (Uloma Uche, Olga Naidenko, Tasha Stoiber)
10/19/2022	Oley Township, PA Board of Supervisors and Citizens
10/25/2022	White Plains, NY 5G: An Undeniable Risk (my part at 16:30)
11/17/2022	Lenox, MA forum with Scott, Theodora, me and Andy Molner
1/25/2023	Queens, NY Community Board #1
3/30/2023	Let's Connect- Expert Forum hosted by Pittsfield & Wyandotte Communities
4/6/2023	Presentation to Hartford Health Director (Liany Arroyo) and Hispanic Community Leaders
4/12/2023	Presentation to Dr. Jeffery Robinson and Faculty of the Paul Robeson Malcolm X Academy

4/14/2023 Presentation to concerned parents of students at Starkey Ranch School  
 5/16/2023 Commissioner Mariano and Legal Team: they decide on permit for tower on Starkey Ranch School  
 6/12/2023 European Tour: Bexhill by Sea  
 6/13/2023 European Tour: Wimbledon  
 6/14/2023 European Tour: Royal Society of Medicine  
 6/15/2023 European Tour: Oxford, UK  
 6/17/2023 IEEE TC95 Meeting Presentation in Newbury, UK  
 6/17/2023 European Tour: Belgium-Riège; Europeans for Safe Connections  
 6/18/2023 European Tour: York, UK  
 6/23/2023 European Tour: Interview with Stichting EHS group in Amsterdam  
 6/27/2023 Presentation to The Netherlands Knowledge Platform for Charging Infrastructure  
 8/18/2023 Interview at Conway Daily Sun  
 9/26/2023 Turning Down the Dial on Wireless Radiation in NC's Schools  
 10/18/2023 Stamford, CT Land-Use Commission of the Board of Representatives  
 11/15/2023 North Conway, NH Pope Memorial Library  
 1/18/2024 Green Street Radio Interview about OneName Project with Ruth Moss  
 1/29/2024 Presentation to Williamson County, TN Commission  
 2/15/2024 Testimony for Wanaque County, NJ Planning Board  
 3/5/2024 Hawaii Dept. of Education, Michael Otsuji  
 5/14/2024 National Spectrum Managers Association (NSMA)  
 5/21/2024 The Wave Forward Podcast with Michaela Z  
 5/30/2024 Environment + Energy Podcast/Vodcast Series with Jessica Hunt  
 6/4/2024 Presentations at Yale Symposium  
 6/12/2024 Presentation to Pittsfield, MA City Council in recognition of EMS Day Proclamation  
 6/12/2024 Interview on Channel 8 regarding proposed cell tower in Carlsbad, CA  
 7/5/2024 Presentation regarding smart meters with Paul Hèroux  
 8/8/2024 Presentation to Administrators of the Village of Egg Harbor, WI

### ***Administrative, Committee, and Outreach Experience***

Organizing Committee for the OneName Project (Fall 2023- present): This group was formed in an effort to determine a single name to represent what is currently known as Electromagnetic HyperSensitivity (EHS). Presently, there are multiple names used to describe EHS, and this multiplicity poses a challenge when advocating for those with the affliction.

New Hampshire State Commission HB522 5G (August 2019-November 2020): This commission was convened to evaluate how the State should respond to potential health impacts associated with the rollout of 5G communications. I was appointed to this commission by the USNH Chancellor.

URC/ISE Planning Committee (Co-Chair, AY13-18): College committee charged with planning the logistics of the UNH Undergraduate Research Conference

URC/ISE Steering Committee (AY13): University committee addresses conference details from a university perspective

University Research and Engagement Academy Proposal Selection Committee (AY12-Present): University committee charged with selecting inductees into the Academy based upon their research proposals.

ECE Technician Search Committee (Chair, AY13): This departmental committee worked with HR to define the position and then successfully fill it.

UNH Disclosure Review Committee (AY99-02 and AY13-18): This university committee meets on a regular basis to determine whether relationships identified by proposal submitters constitute a conflict of interest according to university rules.

ECE Department Graduate Committee (Chair for over 15 years until AY14): Performed regular duties of graduate coordinator for ECE Masters and Doctoral programs, plus dealing with a program review and the addition of a non-thesis Master's option.

Search Committee for Electrical Engineering Technology Faculty Member at UNH Manchester (AY 13)

Advanced Manufacturing Cluster Hiring in Statistics Committee (AY2013): This committee was convened to ensure continuity and coordination in the Advanced Manufacturing cluster hire.

ad-hoc Committee on Promotion and Tenure Standards (AY13-17): This committee was formed by the Faculty Senate to look at issues that have arisen over the years relating to P&T. I was elected by the college to serve.

Faculty Activity Reporting Working Group (AY13): I was appointed by the Faculty Senate to monitor the process by which the FAR is being evaluated and revised.

CEPS e-Learning Committee (AY12 (Chair)): The mission of this committee is to determine next steps necessary to move forward with online programs, with findings documented in a final report.

eUNH Working Group (AY12): This group is advisory to the eUNH Steering Committee and was involved with tasks such as evaluating proposals submitted by outside vendors interested in partnering with UNH on online initiatives.

CEPS Curriculum and Academic Planning Committee (AY12):

College Promotion and Tenure Committee (AY01-03 and AY010-11(Chair)): The work of this time-consuming committee was complicated by unclear guidelines involving research faculty. Efforts outside of normal P&T Committee duties took place to help clarify those guidelines.

Faculty Senate Research and Public Service committee (AY11, Chair): This committee responded to all of the eight charges assigned to us.

President's Panel on Internationalization (AY11): I served on this panel as the representative of the Faculty Senate.

UNH Research Council (AY11): I served on this committee because of my role as Chair of the Faculty Senate Research & Public Service Committee

Sustainability Dual Major Leadership Team (summer-fall 2012): the goal of our team is to create a dual major in Sustainability that can be taken by all undergraduates at UNH.

Search Committee for Computer Science- Engineering Technology Faculty Member at UNH Manchester (AY10)

New Markets Working Group of the Strategic Planning Committee (Spring 09): as its name implies, this working group was charged with identifying new revenue streams for UNH.

CEPS Graduate Scholarship Committee (AY07- 09): this committee awards college scholarships to graduate students, including summer stipends and one-year fellowships that are used as a recruitment tool for outstanding applicants.

Faculty Moderator for the College of Engineering and Physical Sciences (AY08-09): this elected position entails the responsibility for conducting all college wide meetings and elections. The moderator works closely with the Dean's Office to help ensure that governance is carried out efficiently and according to policy.

Faculty Fellow for Distributed and Distance Education (AY03-04): the primary goal of this position, which received 50% support by the Provost's office, was to identify and articulate a University Vision on distance education. Duties included convening a working group to represent constituencies across campus in addition to meeting with individuals both on and off campus to obtain information and insights germane to distance education and e-learning in general.

Duties also included taking the lead on writing a proposal to consolidate distance learning at the University of New Hampshire. The proposal was submitted to the governing body overseeing state-funded higher education (USNH), and it laid out a plan for the partnering of all state organizations involved with distance education. This proposal was not endorsed by USNH.

University of New Hampshire Outreach Scholars Program (AY05): The Outreach Scholars Program is a faculty development initiative specifically designed to advance the University's academic strategic plan with a specific focus on outreach scholarship and engagement. The goals of this program include the development of mutually beneficial collaborative partnerships between faculty, extension educators, staff (New Hampshire Public Television, Office of Outreach Education), students and external partners with a specific focus on outreach scholarship and engagement.

Board of Trustees for the Great Bay Charter School (2003- 2013): This charter school, which began in Fall 2005) is affiliated with the Exeter School district and was initially targeted towards high-school students at risk. As such, emphasis is placed on project-based learning and electronically mediated learning. In addition to the normal functions performed by a Board of Trustees, the Great Bay Board provides oversight on the appropriate uses of technology in teaching. Experience with this type of education has shown that its positive effect is not limited only to students at risk.

Chair, Virtual Learning Academy Charter School (VLACS) Board of Trustees (January 2008-present): VLACS is a state-run, online charter school that provides an alternate means for New Hampshire junior high and high school students to obtain credits towards graduation. Major challenges for the Board have been to scale for rapidly increasing demand as well as to contend with a changing political/funding landscape.

Division of Continuing Education (DCE) Strategic Planning Group (AY04): This group of administrators, faculty and DCE staff met regularly throughout the year to develop a plan to reduce and redefine the scope of DCE so that it would be sustainable. That plan realigned the three main programmatic areas of DCE (Noncredit Programming and Marketing, Professional Development and Training, and Interhostel and Familyhostel) with other UNH entities in order to capitalize on synergies and best use limited resources.

New Hampshire Technology Council (AY04-05): The Council was an advisory group to the NH Department of Education regarding implementation of the State Educational Technology Plan. This assistance to the Department's Office of Educational Technology included developing policy guidelines to foster effective statewide technology integration, pursuing funding opportunities, designing infrastructure, identifying and disseminating information and resources, enlisting private sector support, and evaluating progress toward the vision of effective technology integration.

Seacoast Professional Development Center (SPDC) Advisory Board (Fall 02-10): the SPDC was created with funds from the *No Child Left Behind* grant, and the purpose of the center is to provide schoolteachers in the Seacoast region with training that will enable them to perform their jobs more effectively. The major duties of the Advisory Board are to evaluate assessment data on ongoing efforts and to make recommendations regarding future initiatives.

Faculty Instructional Technology Development Grant Committee (AY00-05): The primary responsibility of this committee was to evaluate proposals submitted to the grant program, which focuses on improving student learning experiences through the use of information technology.

Task Force on the Undergraduate Experience (AY02-03): This task force was charged with exploring ways to improve the undergraduate experience, particularly in the freshman year. The objective of the committee was to make recommendations about how the experience could be improved, and measures that should be undertaken to bring about those improvements. A conclusion reached by the task force in its first year was that the freshman year experience could be enhanced by a series of inquiry courses. In an effort to bring these courses to fruition, the task force worked on defining those courses, including budgetary information, during its second year. After obtaining a go-ahead from the Provost office, requests for proposals for inquiry courses were distributed. Upon receiving the proposals, the task force evaluated them and made recommendations as to which one should be adopted.

Task Force on Network Security (Chair AY02): The purpose of the task force was to provide guidance to the President in shaping a policy that balances privacy with the need to increase network security. The result of Task Force efforts, performed in conjunction with the Faculty Senate, was a report that outlines acceptable boundaries between security and privacy.

Academic Computing Advisory Committee (Chair, AY00-02): This committee was advisory to the President and Provost and focused on the centrality of computing to UNH's teaching, research and public service missions. The committee represented all parts of the community and included faculty representatives from each college, including UNHM. The committee was charged with the development of short-term goals and long-range plans for academic and research computing at UNH, including all aspects of instructional and informational technology. The responsibility of the Chair of this committee was to facilitate liaison between university administration, faculty, and students on issues relating to the use of technology, and then to garner

consensus on technology policy within the formal committee. The recommendations of this committee were and are used to determine how technology funds are spent on campus.

Faculty Fellow in CEPS to Direct a Distance Learning Pilot Program (Fall 97- Present (unofficial)): This position, which initially included release time support, entails all aspects of the execution of pilot courses over the Internet. The duties associated with this position include:

- The selection and purchase of course delivery hardware and software
- Working with CIS support staff to maintain software and equipment
- Developing courseware for remote course delivery
- Providing training and support for other participating faculty
- Marketing distance education courses
- Writing proposals to obtain outside funding for distance education initiatives. Funding obtained from one such proposal enabled the development of a classroom that is being used for simultaneous delivery to on-campus and off-campus students.
- Writing a strategic plan for CEPS use of distance education

New Hampshire Distance Learning Commission (appointed by Governor Shaheen in September 1999): This commission was charged with coordinating and promoting distance education initiatives throughout the state. The commission met regularly to identify means for working with industries, businesses and schools to make distance education an affordable reality in New Hampshire. There were fifteen other members of this commission, representing constituencies ranging from industry and business to government agencies and schools.

College Entrepreneurial Campus Committee (Fall 96- Spring 98): This committee acted as a steering committee in the planning of a UNH-affiliated enterprise facility on campus. This committee was comprised of two Deans, the Vice President for Research, the Directors of Research Computing and the Industrial Research Center, the Executive Director of Pease Development, and six faculty members. This committee established and coordinated the efforts of three subcommittees.

College Academic/Industry Alliance Subcommittee of the Entrepreneurial Campus Committee (Fall 96- Spring 98): The charge of this subcommittee was to look at the nature of University faculty, staff, and student involvement with the Entrepreneurial Campus. This committee was comprised of five faculty members and one Dean. Its primary mission was to develop criteria for academic and industrial alliances that would ensure success in a research-based economic development program.

College Facilities Subcommittee of the Entrepreneurial Campus Committee (Fall 1996- Spring 98): The charge of this subcommittee was to estimate the nature and size of the space that would be needed in the envisioned Entrepreneurial Campus. One facet of the subcommittee's work was to assess the space needs in each of the CEPS departments.

Coach and Advisor for the UNH Karate Club (AY88 through AY00 except for sabbatical year): Coaching responsibilities entailed teaching one or two classes per week, as well as partici-

pating in tournament judging and belt testing. Advising duties included maintaining class rosters, promotion records, travel arrangements, finances in addition to overseeing routine club activities and budgets.

University Distance Education Committee (AY97-98 through AY99-00): This committee was concerned with distance learning from a university-wide perspective. The committee explored ways in which the University might better serve the State by offering different education delivery methods. This committee became a subcommittee of the Academic Computing Advisory Committee.

Special Commission on the Budget Deficit (Fall 1995): Because of uncertainty regarding the magnitude of the projected budget deficit in fiscal year 97, the former Chairs of the Academic Senate Budget and Planning Committee were convened in the Fall semester to target the amount of that deficit. The primary duties of Commission members were to analyze the budget, contact individuals throughout the University to assess the expected shortfall in their particular areas, and then to aid in writing the final report that was presented to the University community.

College Freshman Calculus Committee (AY96): Reports of poor performance in follow-on courses, and concerns regarding retention, prompted a reevaluation of the manner in which freshman calculus was taught at UNH. The freshman calculus committee explored a variety of options and made recommendations that led to the creation of the Studio Physics/Calculus course as well as other changes.

University Budget and Planning Committee (Spring 89- Spring 93; Chair AY 92-93): The Budget and Planning Committee was formed by the Academic Senate to provide oversight of the University budget and to make recommendations regarding University planning issues. Gaining information regarding the budget in sufficient depth to make meaningful recommendations was achieved through frequent meetings with Trustees, the President and Vice-Presidents, Deans, and other constituencies. Committee recommendations were disseminated to the University community through open forums and regular presentations in the Academic Senate. Committee members, particularly the Chair, participated in a wide range of university committees, as documented below.

Space Allocation/R&R Committee (non-voting member AY92-93): This committee, which was comprised of the University Vice-Presidents, was charged with making final decisions regarding all building initiatives, swing space, space allocation, renovations, leases, handicap access, and toxic waste.

UNH Planning Council (Fall 91- Spring 93): Formerly the Task Force on the Reallocation of Resources, this council included the full complement of Vice President and Academic Deans, and was tasked with providing both short and long-range visions for the University. Those visions translated into recommendations for the distribution of funds on campus, and it was formed by in-depth analyses of every department, both academic and non-academic, on campus.

President's Cabinet (AY 92): The eighteen-member President's Cabinet met weekly to discuss issues of general interest to the University Community. The issues discussed ranged from the volume of the bells in Thompson Hall, to diversity, to University policy. The objective of the cabinet was to serve as a focus group for then-President Dale Nitzschke.

Academic/Faculty Senate (AY92-93 and AY10-11): Served as representative of the Electrical & Computer Engineering Department and Chair of the Budget & Planning Committee.

Accreditation Steering Committee (AY92-93): This group provided guidance in the generation of the documents supporting UNH's ten-year accreditation effort. This steering committee established task forces to address each of the major topics relating to accreditation, and then combined the reports from those task forces into a single document. Accreditation was awarded as a result of the report.

Accreditation Task Force for Standard Two, Planning and Evaluation (Chair): It was the responsibility of this task force to write the part of the accreditation self-study that dealt with the university's progress in planning and evaluation since the last accreditation effort. This part of the report described planning and evaluation as it pertained to coping with budget rescission, academic programs, finance, and the physical plant.

Accreditation Task Force for Standard Nine, Financial Resources: This task force was responsible for writing the part of the accreditation self-study that dealt with financial resources, stability, reporting, and planning. The task force was chaired by the Vice President for Finance.

Faculty Observer: Trustees' Academic Affairs Committee (AY92-93): This trustee committee has the responsibility to approve or deny changes in any academic programs, to evaluate class access, to provide honorary degrees, and to look at promotion and tenure issues.

Task Force on the Reallocation of Resources (Spring 89- Spring 91): This task force was initiated by the Budget and Planning Committee and was put in place by the President to define a plan for addressing the budget deficits. This 13-member committee (which included five faculty, two Deans, one PAT, and five administrators) was charged with evaluating every department and office on campus, both academic and nonacademic, and then making recommendation as to the amount of cuts each could sustain while minimizing the negative impact to the University as a whole.

Department Industrial Associates Program (IAP): Committee (regular participant and presenter): The IAP offers a means by which local industry can advise and support the Department of Electrical & Computer Engineering. The IAP committee provides liaison with the participating companies and organizes the annual meeting.

University Advising Center Advisor (AY88- 89): The UAC is set up primarily to advise undeclared students across campus, and to give them insights into particular majors. The UAC serves many students who have been readmitted to UNH after having been removed due to poor academic performance.