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Expert Testimony from Kent Chamberlin, PhD

In Support:

- **S.2306 An Act relative to smart meters**
- **H.3551 An Act relative to smart meters**
- **H.2413 An Act recognizing EMS as a disease dangerous to the public health, requiring inclusion in MAVEN, establishing the Massachusetts EMS registry and requiring biennial reporting as part of population health trends**

Esteemed Members of the Joint Committees on Public Health, and Telecommunications, Utilities and Energy,

Please enact the above three bills with urgency as the Emergency Preamble on the smart meter opt-out bills indicates, for the preservation of public health. It is also critical that Massachusetts account in MAVEN for the increasing number of electromagnetic sensitivity cases being reported to doctors and public health authorities so proper health protection protocols can be established.

While wireless radiation harms are new to many, I have spent my career as an engineer 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.

As you may know, wireless radiation was developed for military purposes. My first work experience was as a co-op student with the Air Force Avionics Laboratory, where I was involved in projects relating to electronic countermeasures. This is relevant to the bills 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 bills as it provided insights into the mechanisms that impact the propagation of high-frequency radio waves such as the signals that are generated by wireless smart meters.

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. I was also able to extend my research to electromagnetic interactions with non-linear media.

In 1993, I took a sabbatical year at The Pennsylvania State University, where I continued to work on non-linear effects as well as to work on electromagnetic related projects for the Applied Research Labs.

After my first sabbatical, I returned to UNH to continue my regular teaching and research duties. It was at this point where my career began to shift from being primarily Avionics focused to biomedical engineering. One of my funded efforts involved the modeling of electromagnetic soil heating so that bacteria could be used for bioremediation. We 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 placed more emphasis on 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 acupuncture [i,ii,iii]. 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 Department of Justice[iv]. This work involved a range of topics, which included radiowave propagation modeling and measurements [v,vi] and alternatives to cellphone communications in emergency situations [vii]. The reason that alternatives were sought is because wireless communications are vulnerable to saturation, hacking, and jamming. This is relevant to the bills under consideration because the wireless infrastructure (smart meters) being considered suffers from the same 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. In this role, 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 the paper myself, send it to three reviewers with suitable experience to perform the review, 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 those insights have proved to be invaluable as I have delved into contentious scientific issues relating to the harms of wireless radiation. Although I am no longer an associate editor for IEEE, I am on the editorial review board for several scientific publications.

In addition to carrying out my funded research, I continued to work in areas relating to biomedical engineering. I continued my work with acupuncture [viii] as well as the measurement [ix] and analysis [x] of biological signals. Because these efforts involved human subjects, I applied for and received approval from the University of New Hampshire Institutional Review Board (IRB) many times, one of which is currently active.

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. In the Fall of 2019, while serving as Department Chair, I was asked to serve on a **New Hampshire State Commission charged with exploring the health and environmental impacts of wireless communication**.

The Commission was formed as a result of legislation (HB-522) that was passed by both houses of the New Hampshire 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. In the final analysis, the Commission was comprised of thirteen members that had backgrounds that included physics, toxicology, electromagnetics, epidemiology, biostatistics, occupational health, medicine, public health policy, business, and law. Because of this, 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 independent.

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 with 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 was harmless was the expert brought in by the telecommunication industry (CTIA [xi]), 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. **Our explanation for government agencies lack of cooperation with a formal state commission is that they had been captured by industry** [xii].

The New Hampshire Commission that I served on released its final report in November 2020[xiii], 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 radiation exposure.

The following legislative session, NH Representative Patrick Abrami introduced **HB1644 to begin implementing the 5G Commission Report recommendations with a 1,640-foot/500 meter setback for new cell towers and antennas, and a statewide registry for citizens to report wireless radiation harm**. Industry derailed this and subsequent bill, leaving NH children, adults and the environment in harm's way.

Hopefully, MA legislators will take the time to investigate and take the opportunities presented in H.2413, S. 2306 and H. 3551 to protect the Commonwealth.

Since serving on the New Hampshire Commission, I have been active in active in educating lawmakers, administrators, and the public about its findings. I have made over seventy public presentations, which included a presentation at the Royal Society of Medicine in London as part of a speaking tour in Europe. I am a founding member of the International Commission on the Biological Effects of Electromagnetic Fields [xiv] (ICBE-EMF), 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 inadequacies of current FCC guidelines [xv], and the other demonstrating how cellphones can be modified to lower exposure for the user [xvi]. I am coauthor on another paper that advocates for the Precautionary Principle [xvii], 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 [xviii] (EHT) which is a think tank that promotes a healthier environment through research, education, and policy. A focus of this group is the toxic effect of wireless radiation exposure, and what is relevant about EHT and the Massachusetts bills is that EHT successfully brought suit against the FCC mandating that the agency vacate and update its 25-year-old exposure guidelines for radio-frequency radiation (RFR) from cell phones, cell towers, Wi-Fi, smart meters, 5G and other wireless communication devices.

Wireless Radiation, FCC Exposure Guidelines, and Smart Meters:

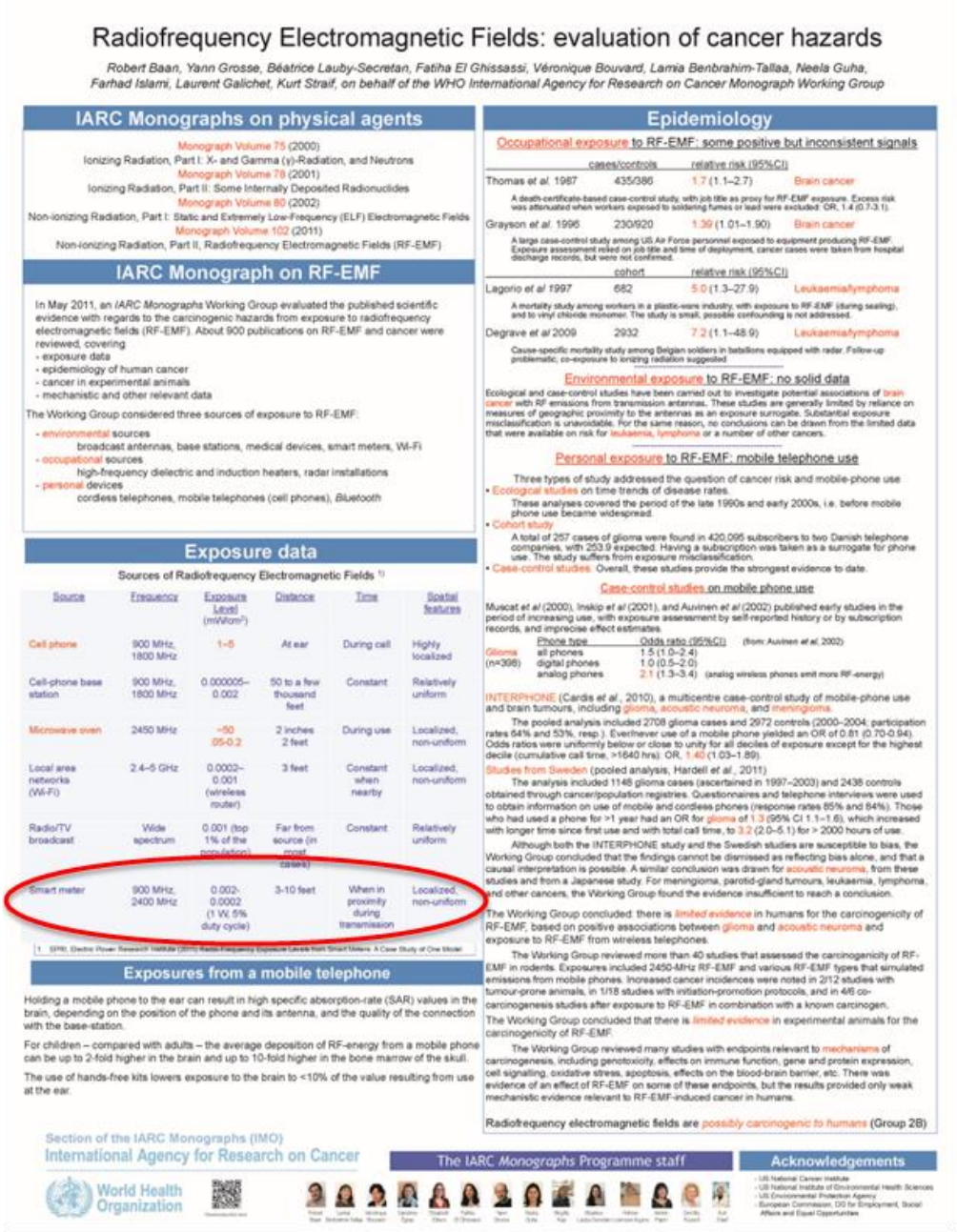
While the New Hampshire Commission did not explore the effects of smart meters as part of its charge, it investigated in depth the effects of similar forms of radiation. In particular, the Commission found that pulsed radiation at microwave frequencies can produce significant adverse health effects stemming from oxidative stress [xix] and the breakdown of the blood-brain barrier [xx]. Most of the studies reviewed by the Commission to reach its conclusions addressed cell-phone radiation, although those conclusions extend to smart-meter radiation because of the similarity in pulsation, frequency, and power density. Consequently, the known relationship between cell-phone radiation and illness can be used to demonstrate the relationship between smart-meter radiation and negative health effects. Regardless of emission source, the increasing number of citizens becoming sick should be captured in the MAVEN database.

One claim that is made by the proponents of smart meters, cell towers, 5G, personal wireless devices, etc., is that the radiation produced by them is within FCC guidelines for exposure, hence making that radiation "safe". As the NH Commission discovered, the FCC exposure guidelines were set in the 1980s and involved short duration (an hour or less) behavioral studies on a small number of animals (8 rats and 5 monkeys). The fundamental assumption underlying the study was that if a signal was not strong enough to heat tissues (as in a microwave oven), it would not cause harm. The animal study was carried out using rats and monkeys that had been trained to press a lever to obtain food, and these animals were food deprived at the beginning of the experiment. During the experiment, the animals were exposed to increasing levels of radiation until they were no longer able to press the lever to obtain food. That exposure level was designated as the *threshold dose*; it is noteworthy that some of the monkeys developed burns on their faces at the threshold dose. The threshold dose level was then divided by an *arbitrary* "safety factor" of 50 to establish the FCC exposure guideline for the general public (a factor of 10 was used for worker-exposure guidelines). Those guidelines are what is used now for the 24-7-365 exposures we receive, even though those guidelines are based on experiments lasting an hour or less. Those FCC exposure guidelines are often used to justify the deployment of smart meters near people's homes despite the fact that they do not account for long-term effects of exposure.

Given the clear inadequacies of the FCC exposure guidelines, it is not surprising that they have been challenged in court and have been found to be lacking. For example, in their ruling on August 13, 2021[xxi], the DC Circuit Court of Appeals stated that "… we find the Commission's [the Federal Communications Commission] order arbitrary and capricious in its failure to respond to record evidence that exposure to RF radiation at levels far below the Commission's current limits may cause negative health effects unrelated to cancer." In its findings, the Court ordered the FCC to update its guidelines by reviewing the thousands of pages of scientific research documenting the harm caused by wireless radiation. While the Court ordered the FCC to reevaluate its guidelines, no deadline was set for doing so. Consequently, no changes have been made to those guidelines since the Court ruling.

In 2011 the World Health Organization/International Agency for Research on Cancer (IARC) stated that it does not differentiate among technologies or source devices (in fact specifically includes smart meters), and it has classified the entire radiofrequency range from 30 KHz-300

GHz as possibly carcinogenic to humans (Class 2B) [xxii]. The WHO poster in



Radiofrequency Electromagnetic Fields: evaluation of cancer hazards

Robert Baan, Yann Grosse, Béatrice Lauby-Secretan, Fatiha El Ghissassi, Véronique Bouvard, Lamia Benbrahim-Tallaa, Neela Guha, Farhad Islami, Laurent Galichet, Kurt Straif, on behalf of the WHO International Agency for Research on Cancer Monograph Working Group

IARC Monographs on physical agents

Monograph Volume 75 (2000)
Ionizing Radiation, Part I: X- and Gamma (γ)-Radiation, and Neutrons
Monograph Volume 78 (2001)
Ionizing Radiation, Part II: Some Internally Deposited Radionuclides
Monograph Volume 80 (2002)
Non-ionizing Radiation, Part I: Static and Extremely Low-Frequency (ELF) Electromagnetic Fields
Monograph Volume 102 (2011)
Non-ionizing Radiation, Part II, Radiofrequency Electromagnetic Fields (RF-EMF)

IARC Monograph on RF-EMF

In May 2011, an *IARC Monographs* Working Group evaluated the published scientific evidence with regards to the carcinogenic hazards from exposure to radiofrequency electromagnetic fields (RF-EMF). About 900 publications on RF-EMF and cancer were reviewed, covering
- exposure data
- epidemiology of human cancer
- cancer in experimental animals
- mechanistic and other relevant data

The Working Group considered three sources of exposure to RF-EMF:
- environmental sources
  broadcast antennas, base stations, medical devices, smart meters, Wi-Fi
- occupational sources
  high-frequency dielectric and induction heaters, radar installations
- personal devices
  cordless telephones, mobile telephones (cell phones), *Bluetooth*

Exposure data

Sources of Radiofrequency Electromagnetic Fields [1]

Source	Frequency	Exposure Level (mW/cm²)	Distance	Time	Spatial features
Cell phone	900 MHz, 1800 MHz	1–5	At ear	During call	Highly localized
Cell-phone base station	900 MHz, 1800 MHz	0.000005–0.002	50 to a few thousand feet	Constant	Relatively uniform
Microwave oven	2450 MHz	~50 .05-0.2	2 inches 2 feet	During use	Localized, non-uniform
Local area networks (Wi-Fi)	2.4–5 GHz	0.0002–0.001 (wireless router)	3 feet	Constant when nearby	Localized, non-uniform
Radio/TV broadcast	Wide spectrum	0.001 (top 1% of the population)	Far from source (in most cases)	Constant	Relatively uniform
Smart meter	900 MHz, 2400 MHz	0.002-0.0002 (1 W, 5% duty cycle)	3-10 feet	When in proximity during transmission	Localized, non-uniform

1. EPRI, Electric Power Research Institute (2011) Radio Frequency Exposure Levels from Smart Meters: A Case Study of One Model

Exposures from a mobile telephone

Holding a mobile phone to the ear can result in high specific absorption-rate (SAR) values in the brain, depending on the position of the phone and its antenna, and the quality of the connection with the base-station.

For children – compared with adults – the average deposition of RF-energy from a mobile phone can be up to 2-fold higher in the brain and up to 10-fold higher in the bone marrow of the skull.

The use of hands-free kits lowers exposure to the brain to <10% of the value resulting from use at the ear.

Epidemiology

Occupational exposure to RF-EMF: some positive but inconsistent signals

	cases/controls	relative risk (95%CI)	
Thomas *et al.* 1987	435/386	1.7 (1.1–2.7)	Brain cancer

A death-certificate-based case-control study, with job title as proxy for RF-EMF exposure. Excess risk was attenuated when workers exposed to soldering fumes or lead were excluded: OR, 1.4 (0.7-3.1).

Grayson *et al.* 1996	230/920	1.39 (1.01–1.90)	Brain cancer

A large case-control study among US Air Force personnel exposed to equipment producing RF-EMF. Exposure assessment relied on job title and time of deployment, cancer cases were taken from hospital discharge records, but were not confirmed.

	cohort	relative risk (95%CI)	
Lagorio *et al.* 1997	682	5.0 (1.3–27.9)	Leukaemia/lymphoma

A mortality study among workers in a plastic-ware industry, with exposure to RF-EMF (during sealing), and to vinyl chloride monomer. The study is small, possible confounding is not addressed.

Degrave *et al.* 2009	2932	7.2 (1.1–48.9)	Leukaemia/lymphoma

Cause-specific mortality study among Belgian soldiers in batallions equipped with radar. Follow-up problematic, co-exposure to ionizing radiation suggested.

Environmental exposure to RF-EMF: no solid data

Ecological and case-control studies have been carried out to investigate potential associations of brain cancer with RF emissions from transmission antennas. These studies are generally limited by reliance on measures of geographic proximity to the antennas as an exposure surrogate. Substantial exposure misclassification is unavoidable. For the same reason, no conclusions can be drawn from the limited data that were available on risk for leukaemia, lymphoma or a number of other cancers.

Personal exposure to RF-EMF: mobile telephone use

Three types of study addressed the question of cancer risk and mobile-phone use
- Ecological studies on time trends of disease rates.
  These analyses covered the period of the late 1990s and early 2000s, i.e. before mobile phone use became widespread.
- Cohort study
  A total of 257 cases of glioma were found in 420,095 subscribers to two Danish telephone companies, with 253.9 expected. Having a subscription was taken as a surrogate for phone use. The study suffers from exposure misclassification.
- Case-control studies. Overall, these studies provide the strongest evidence to date.

Case-control studies on mobile phone use

Muscat *et al* (2000), Inskip *et al* (2001), and Auvinen *et al* (2002) published early studies in the period of increasing use, with exposure assessment by self-reported history or by subscription records, and imprecise effect estimates.

	Phone type	Odds ratio (95%CI)	(from Auvinen *et al*, 2002)
Glioma (n=398)	all phones	1.5 (1.0–2.4)	
	digital phones	1.0 (0.5–2.0)	
	analog phones	2.1 (1.3–3.4)	(analog wireless phones emit more RF-energy)

INTERPHONE (Cardis *et al*., 2010), a multicentre case-control study of mobile-phone use and brain tumours, including glioma, acoustic neuroma, and meningioma.

The pooled analysis included 2708 glioma cases and 2972 controls (2000–2004; participation rates 64% and 53%, resp.). Ever/never use of a mobile phone yielded an OR of 0.81 (0.70-0.94). Odds ratios were uniformly below or close to unity for all deciles of exposure except for the highest decile (cumulative call time, >1640 hrs): OR, 1.40 (1.03–1.89).

Studies from Sweden (pooled analysis, Hardell *et al*., 2011)

The analysis included 1148 glioma cases (ascertained in 1997–2003) and 2438 controls obtained through cancer/population registries. Questionnaires and telephone interviews were used to obtain information on use of mobile and cordless phones (response rates 85% and 84%). Those who had used a phone for >1 year had an OR for glioma of 1.3 (95% CI 1.1–1.6), which increased with longer time since first use and with total call time, to 3.2 (2.0–5.1) for > 2000 hours of use.

Although both the INTERPHONE study and the Swedish studies are susceptible to bias, the Working Group concluded that the findings cannot be dismissed as reflecting bias alone, and that a causal interpretation is possible. A similar conclusion was drawn for acoustic neuroma, from these studies and from a Japanese study. For meningioma, parotid-gland tumours, leukaemia, lymphoma, and other cancers, the Working Group found the evidence insufficient to reach a conclusion.

The Working Group concluded: there is *limited evidence* in humans for the carcinogenicity of RF-EMF, based on positive associations between glioma and acoustic neuroma and exposure to RF-EMF from wireless telephones.

The Working Group reviewed more than 40 studies that assessed the carcinogenicity of RF-EMF in rodents. Exposures included 2450-MHz RF-EMF and various RF-EMF types that simulated emissions from mobile phones. Increased cancer incidences were noted in 2/12 studies with tumour-prone animals, in 1/18 studies with initiation-promotion protocols, and in 4/6 co-carcinogenesis studies after exposure to RF-EMF in combination with a known carcinogen.

The Working Group concluded that there is *limited evidence* in experimental animals for the carcinogenicity of RF-EMF.

The Working Group reviewed many studies with endpoints relevant to mechanisms of carcinogenesis, including genotoxicity, effects on immune function, gene and protein expression, cell signalling, oxidative stress, apoptosis, effects on the blood-brain barrier, etc. There was evidence of an effect of RF-EMF on some of these endpoints, but the results provided only weak mechanistic evidence relevant to RF-EMF-induced cancer in humans.

Radiofrequency electromagnetic fields are *possibly carcinogenic to humans* (Group 2B)

Section of the IARC Monographs (IMO)
International Agency for Research on Cancer
World Health Organization

The IARC *Monographs* Programme staff

Acknowledgements

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- US National Institute of Environmental Health Sciences
- US Environmental Protection Agency
- European Commission, DG for Employment, Social Affairs and Equal Opportunities

Figure 1 WHO Flyer Showing Exposures Generated by a Smart Meter

Figure 1, where the information relating to smart meters is circled in red. More recently the National Toxicology Program (NTP) found clear evidence of some cancers from whole body exposure to frequencies within smart meter frequency and power ranges [xxiii]. A study similar to

the NTP study was performed by the Ramazzini Institute in Italy, and it showed similar results [xxiv].

While there are many top-tier, peer-reviewed publications that demonstrate the relationship between wireless radiation exposure and cancer, a publication that shows clearly this relationship is one of a study performed in Brazil between 1996 and 2006[xxv]. The study looked at the death rate by cancer as a function of the distance people live from a cell tower. At the time of the study, not all that many people in Brazil had cell phones, so the effects shown in the study are mostly due to exposure from the tower and not from personal electronic devices. It is also worth noting that the study was based on cancer deaths of over 7,000 people living near over 850 cell towers, so the number and diversity of subjects is large.

The results of the study referenced above are shown in Figure 2, where the death rate by cancer is plotted on the y-axis and the distance that the person lived from the cell tower is plotted on the x-axis; the red line represents the death rate for people participating in the study (those who died while living with one km of a cell tower), and the blue line represents the death rate for the population in general. The convergence of the red and blue traces with increasing distance from the tower is an expected result, and its monotonic decline suggests a dose-dependent relationship between exposure and effect. A meta study [xxvi] that combines the results of 38 previous studies on the health effects of living near a cell tower supports the findings of the Brazilian study in that negative health outcomes are associated with living closer to a radiating device. In the case of cell towers, it is seen that living within a kilometer of the radiator increases the relative risk, so it can be inferred that living in very close proximity to a smart meter or meters will be associated with similar negative health outcomes.

One claim that is often made about smart meters is that they do not radiate often because they do not have much data to transmit. However, measurements of smart-meter radiation show that this is not the case, particularly when multiple meters are operating as is typically the case in apartment complexes or in mesh networks. An example of actual smart-meter radiation is given in Figure 3, which shows radiation emitted by five smart meters operating outside of a laboratory. The figure plots smart-meter radiation over a 15-minute interval, where it is evident that the radiation is significant, and that it is far from sparse (approximately 12,288 pulses per day). The radiation from any particular smart meter will vary depending upon the specific configuration, but the level of radiation in the proximity of all wireless smart meters has been shown to have negative health impacts. It is noteworthy that emissions from smart meters are impulsive (typically 5 msec pulses), since such emissions have been shown to have a greater impact on human health and the environment than continuous waves [xxvii]. Impulsive radiation typically has an average value that is much lower than its peak value, so average-value measurements can unrealistically suggest that the signal is less impactful than it actually is.

There are several reasons why smart meters communicate as frequently as is evident in Figure 3, and that is that they do not only report on water and/or electricity usage, and that they are often configured in a mesh network. Configuring smart meters in a mesh network has both health and security implications, so a brief description of how they work is given below.

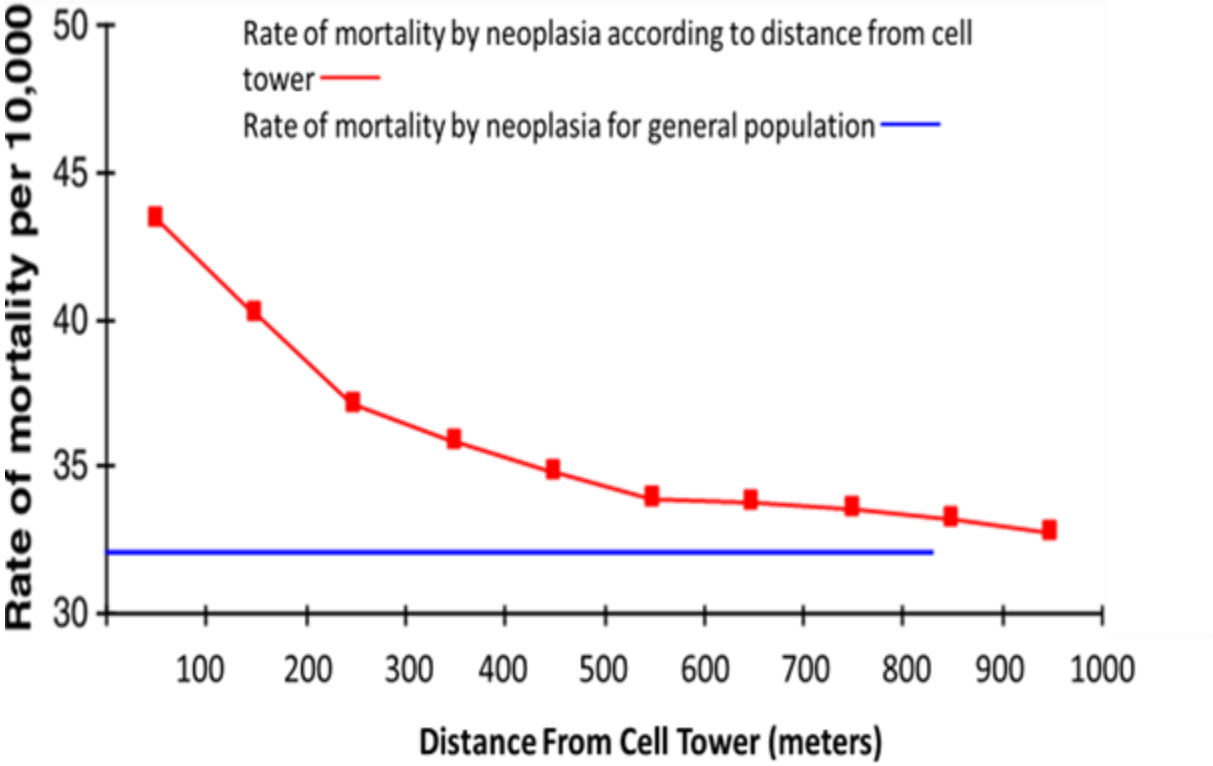

Figure 2 Death Rate from Cancer as a Function of the Distance People Lived from a Cellphone Tower in a Brazilian Study

Mesh networks, sometimes referred to as “wireless backhaul”, are often used when not all nodes (smart meters in this case) are able to communicate directly with the receiver (collector) of the data. In such cases, nodes that can communicate with the collector are used to rebroadcast the data. To illustrate how a mesh network works, consider Figure 4, which shows two types of connections between a smart meter and the final receiver. Case 1 shows a node that can connect directly to the collector which does not require a mesh network configuration. Case 2 shows the situation where there are meters that are not within communication coverage of the collector, and thus they use the meter that is within communication coverage to rebroadcast their signal and data to the collector. The health ramification of this type of configuration is that the smart meter rebroadcasting this signal is radiating far more energy than would a meter that connects directly to the collector.

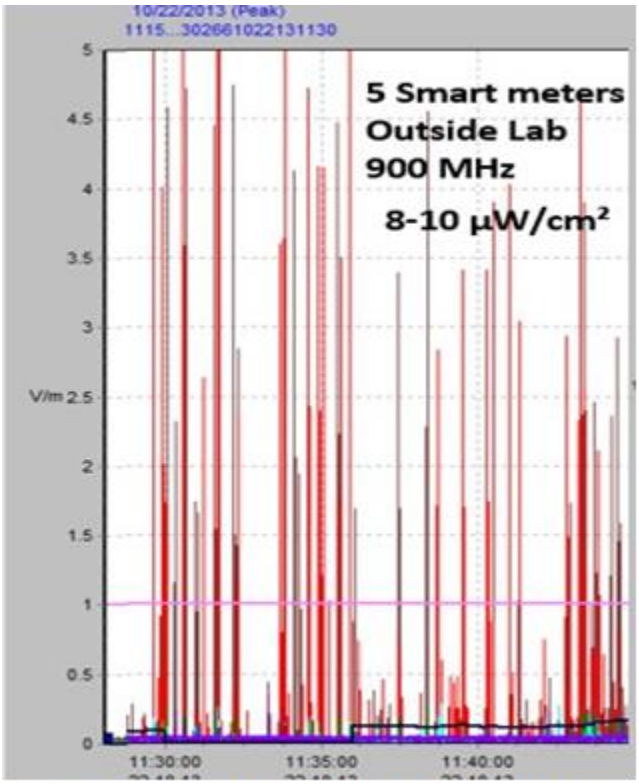

Figure 3 Measured Signal Level for 5 Smart Meters Operating Outside of a Laboratory

The takeaway from this section is that smart meters are a significant source of harmful radiation, and that they radiate a lot more than intuition would suggest based on the relatively small amount of data that needs to be transmitted, namely water, gas and/or electricity usage.

Wireless Smart Meters and Security

A major cybersecurity issue relating to any wireless connection is that they are more easily hacked than wired connections. The primary reason that they are more vulnerable is that wireless signals can be received over a large region around the wireless device, making people's transmissions available to hackers. By having access to those transmissions, the encoding being used to secure the signal can be

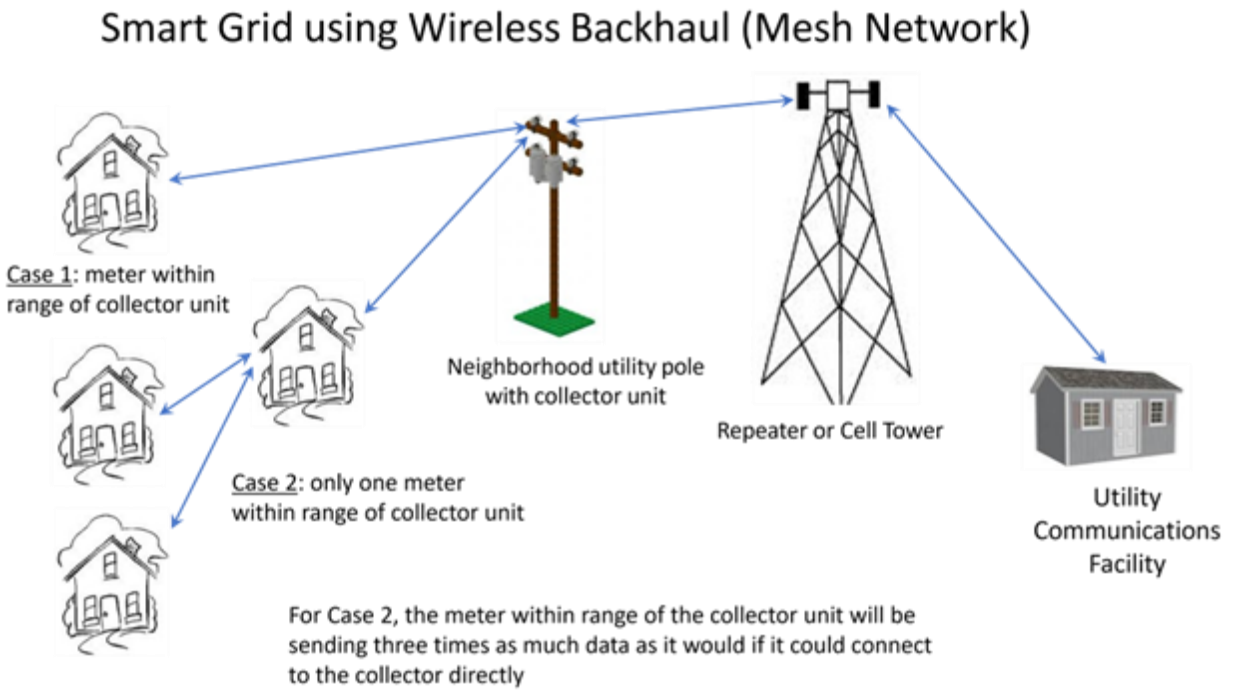

Figure 4 Illustration of a Mesh Network. Case 1 Shows a Single Meter Connecting Directly to the Local Collector, and Case 2 Shows How an Intervening Meter Can Pass Data to the Collector

decoded over time. Smart meters are particularly vulnerable to hacking as their signal is radiated outside people's homes, unlike Wi-Fi signals, and they are generated from fixed locations, unlike cellphone communications.

Having a household's water, gas and/or electricity be available to hackers poses security issues, in that the data obtained provides information about the number of people living in a home, their usage habits, and more importantly, it lets the hacker know when there is nobody home. Clearly, there are other ways to determine when a house is vacant, but hacking smart meter transmissions makes the hacker's job easier.

Hacking smart meter transmissions is not farfetched, as criminals are using increasingly sophisticated techniques. For example, burglars are using jammers to disable wireless security devices (e.g., cameras, window, door, and motion sensors) from functioning, enabling burglars to ply their trade undetected. While jamming signals is not legal, devices that can jam those communications are relatively inexpensive and are readily available. Adding the capability to monitor when people are in their homes would simply make a criminal more effective.

Conclusion/Solution:

As has been pointed out in the above, radiation from smart meters and all wireless devices/infrastructure can be injurious to human health and makes private information vulnerable to hacking. Fortunately, there is a robust solution that addresses both the health and

security issues. That solution is to wire the devices to the internet. Certainly, adding the step of connecting a meter to the internet will add to the cost of installation, but it will eliminate two significant problems because wired connections to the internet do not generate radiation, and they are far more challenging to hack.

An important first step is to pass these bills to allow citizens to opt out of toxic utility meters, and to begin tracking cases of illness. I am at your service to answer any questions you may have.

Sincerely,

Kent Chamberlin, PhD
Professor & Chair Emeritus

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Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF)

15 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

16 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

17 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

18 Environmental Health Trust | Information About Cell Phone, Wi-Fi, 5G, and Bluetooth Radiation Science Facts on Health Effects

19 Henry Lai, Compilation of 261 Studies that Explored Oxidative Stress Resulting from Low-Level, Non-Ionizing Radiation Exposure, Online Publication, June 11, 2020.

20 Cuicui Hu, Hongyan Zuo, Yang Li, "Effects of Radiofrequency Electromagnetic Radiation on Neurotransmitters in the Brain," Front. Public Health, 16 August 2021, Sec. Radiation and Health, Volume 9 – 2021, https://doi.org/10.3389/fpubh.2021.691880

21 EHT et al v. FCC Press Conference – Wireless Radiation Limits and 5G Wireless Harms 1/25/2021 - Environmental Health Trust

22 IARC [International Agency for Research on Cancer] Monographs on the Evaluation of Carcinogenic Risks to Humans, Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, Volume 102.

23 National Toxicology Program, U.S. Department of Health and Human Services, Cell Phone Radio Frequency Radiation, November 2018

24 L. Falcioni, et. al., "Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz GSM base station environmental emission," Environmental Research, Volume 165, August 2018, Pages 496-503

25 Adilza C. Dode, Mônica M.D. Leão, Francisco de A.F. Tejo, Antônio C.R. Gomes, Daiana C. Dode, Michael C. Dode, Cristina W. Moreira, Vânia A. Condessa, Cláudia Albinatti, Waleska T. Caiaffa, "Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil", Science of The Total Environment, Volume 409, Issue 19, 2011, Pages 3649-3665, ISSN 0048-9697

25 A. Balmori, "Evidence for a health risk by RF on humans living around mobile phone base stations: From radiofrequency sickness to cancer," Environmental Research, Volume 214, Part 2, November 2022, 113851

25 Dimitris J. Panagopoulos, Electromagnetic Fields of Wireless Communications: Biological and Health Effects, CRC Press, 2023

Exhibit A: Résumé for Kent A. Chamberlin, Ph.D.

Home Address: 20 Cold Spring Road, Durham, NH
e-mail: Kent.Chamberlin@unh.edu

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)

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

- 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 Int. 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 Komisarak, 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 Datacasting 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

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 ElectromagneticHyperSensitivity (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 participating 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 responsibly 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.