STATE OF VERMONT
ENVIRONMENTAL BOARD

Re: Burlington Broadcasters, Inc. Land Use Permit Application
Charlotte Volunteer Fire and Rescue Services, Inc. #4C1004R-EB
and John Lane

and

Re: Burlington Broadcasters, Inc. d/b/a WIZN D.R. Request #322
and

Re: NYNEX Mobile Limited Partnership 1 D.R. Request #323
d/b/a Verizon Wireless
(Formerly d/b/a Bell Atlantic NYNEX Mobile)

APPLICANT WIZN'S SUPPLEMENTAL FINDINGS OF FACT

I. History

A. Background

This matter involves Burlington Broadcasters, Inc., d/b/a WIZN (WIZN), which broadcasts an FM radio signal at a frequency of 106.7 MegaHertz (MHz) from an antenna located on a communications tower on the northwest face of Pease Mountain in Charlotte, Vermont, just southeast of the intersection of U.S. Route 7 and Church Hill Road (the Tower).

The Tower is on a tract of land larger than ten acres owned by John Lane, the successor in interest to Henry Lane. A portion of the tract is leased to WIZN, and on the leased land a 199-foot, unlighted Tower was built in 1987. The Tower replaced a previous tower on the Lane tract, which had been on the site for decades and which was owned by Charlotte Volunteer Fire and Rescue Service, Inc. (CVFRS). The Tower was erected near the site of the old tower. After the new Tower was built by WIZN, it was immediately conveyed to CVFRS, the entity that continues to own the Tower.

CVFRS uses the Tower to receive and transmit signals for fire and rescue calls and other emergencies. CVFRS also leases Tower space to WIZN for its FM radio antennas and to NYNEX Mobile Limited Partnership 1 d/b/a Verizon Wireless (Verizon Wireless) for its cellular communications antennas.

Before the Tower was built in 1987, CVFRS and WIZN obtained a Project Review Sheet from the District #4 Coordinator that stated that no Act 250 Permit was necessary for the Tower.

In 1996, the Appellants sought a jurisdictional opinion from the District #4 Coordinator. The Coordinator issued Jurisdictional Opinion #4-116 on March 29, 1996, which held that the Tower was subject to Act 250 jurisdiction when it was built in 1987 despite the fact that CVFRS and WIZN had received a Project Review Sheet at that time concluding that no jurisdiction had attached.

On April 24 and 25, 1996, WIZN and Verizon Wireless each filed Petitions for Declaratory Rulings with this Board. Both Petitions appealed the conclusions of Jurisdictional Opinion #4-116. In particular, both petitions sought to invoke the doctrine of equitable estoppel with regard to the 1987 Project Review Sheet and the parties' reliance thereon. At about the same time, WIZN and CVFRS filed an application for an "as-built" permit for the Tower, and the Appellants sought to revoke Verizon Wireless' Act 250 permit, which had been obtained in 1991 by a predecessor-in-interest. In a Continuance Order dated September 24, 1997, the Board placed the Declaratory Ruling matters on hold pending the outcome of the Tower Permit and revocation cases.

By this decision, the Board issues a Land Use Permit for the Project. This Board previously dismissed the revocation action. Therefore, the Declaratory Rulings Requests are moot and are hereby dismissed.

B. Permit #4C0901 Revocation Petition

Verizon Wireless' predecessor-in-interest obtained an Act 250 permit (Land Use Permit #4C0901, issued on December 5, 1991), prior to placing its equipment on the Tower. On April 24, 1996, a group of Charlotte residents filed a Petition to Revoke or Void that Permit. By Memorandum of Decision and Dismissal Order, dated August 7, 2000, this Board dismissed that Petition. No appeal was taken of that dismissal, which is final.

C. Permit #4C1004R

On September 13, 1996, WIZN and CVFRS filed an application for an "as-built" permit for the Tower. The Board placed the Declaratory Rulings on hold pending the outcome of this proceeding. The District #4 Environmental Commission held extensive hearings in 1997 and 1998. On June 5, 1998, the District Commission issued a decision denying the Application under Criteria 1 (air) and 9(K). On June 26, 1998, Verizon Wireless filed a Motion to Alter with the Commission. On June 30, 1998, WIZN filed an appeal of the permit denial with the Environmental Board. Thereafter, several cross-appeals were filed. The Board in an Order, dated July 17, 1998, held that jurisdiction remained in the Commission as the result of a timely filing of the Motion to Alter.

After granting the Motion to Alter, the Commission held additional hearings in 1998 and 1999. On June 4, 1999, the District #4 Environmental Commission issued Land Use Permit #4C1004R to WIZN and CVFRS (Permit). The Permit approved the construction and maintenance of the Tower and its appurtenances and installation and operation of radio transmission and receiving apparatus by WIZN and CVFRS.

D. Permit #4C1004R-EB

In early 1999, Mary Beth Freeman, Graeme Freeman, Elaine Ittleman and Citizens for Appropriate Siting of Telecommunications Facilities (Appellants) filed an appeal of the Permit with the Environmental Board. On July 14, 1999, Verizon Wireless filed a Cross Appeal on party status issues.

In the summer of 1999, after negotiating in good faith with the Appellants and other parties, WIZN agreed to seek a new location for its transmitter. The Board and the parties agreed to stay the proceeding while WIZN sought the necessary approvals for that move.

Between 1999 and 2003, WIZN diligently and in good faith pursued alternative locations, but without success. WIZN first applied for a tower location in Willsboro, New York. However, on August 14, 2001, the Adirondack Park Agency denied the application for that location. Subsequently, WIZN sought to locate its transmitting antenna on an existing (multi-use) tower on Mount Pritchard in St. George, Vermont. In February 2003, that application was denied after almost a year of hearings. During the course of the stay, WIZN investigated many other sites in addition to the ones identified above.

In March of 2003, WIZN determined that it was no longer reasonable to seek an alternative site and requested the Board to remove the stay. Shortly thereafter, these proceedings were re-activated.

II. Parties

The original Applicants in this appeal were the landowner, John Lane, the Tower owner and Tower user, CVFRS, and Tower user, WIZN. Verizon Wireless also sought party status at the District Commission level due to its co-located facilities for which it has already received an Act 250 Permit.

The Chair's Order Regarding Stipulation, dated January 6, 2004, adopted the parties' agreement that the Appellants were no longer challenging the current or future existence of the Tower itself or the Verizon Wireless or CVFRS use of it, but only WIZN's radio frequency emissions. Therefore, Verizon Wireless was permitted to withdraw as a Cross-Appellant. As the Tower owner, CVFRS

remained as a co-applicant, but did not further participate in the proceeding because its use of the Tower was no longer being challenged by the Appellants.

The Appellants are the Charlotte Congregational Church, Frank and Elaine Ittleman, and Citizens of Appropriate Siting of Telecommunications Facilities. The Town of Charlotte appeared as a party but submitted no evidence.

III. Scope of Appeal

In its Memorandum of Decision, dated August 8, 2003, the Board ruled that it does not have jurisdiction over radiofrequency interference ("RFI") under any Criterion.

The Prehearing Order, as modified by the Chair's Order Regarding Stipulation, dated January 6, 2004 and the Memorandum of Decision Regarding Stipulation, dated January 22, 2004, limits the issues in this appeal as follows;

1. Whether, pursuant to 10 V.S.A. § 6086(a)(1), the Project will result in undue air pollution.

2. Whether, pursuant to 10 V.S.A. § 6086(a)(6), the Project will cause an unreasonable burden on the ability of a municipality to provide educational facilities.

3. Whether, pursuant to 10 V.S.A. § 6086(a)(8), the Project will "have an undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites or rare and irreplaceable natural areas."

4. Whether, pursuant to 10 V.S.A. § 6086(a)(9)(K), the Project will materially jeopardize or interfere with the public's use or enjoyment of certain lands adjacent to the project owned or controlled by the University of Vermont.

5. Whether, pursuant to 10 V.S.A. § 6086(a)(10), the Project is in conformance with the applicable Town and Regional Plans.

After the parties stipulated to the narrowing of issues described above, the Board issued a Memorandum of Decision Regarding Stipulation, dated January 22, 2004. That Memorandum states, in pertinent part:

> Each party with party status on a criterion on appeal shall limit its presentation of evidence under such criterion to the alleged health and safety effects of radiofrequency radiation (RF). The Board has not addressed whether such health or safety effects could constitute a violation of any criterion on appeal other than Criterion 1(air).

The Board finds that the issues regarding RF are limited to Criterion 1 and that the Appellants provided no evidence as to how issues of RF applied to any other Criteria. Therefore, the only issue addressed in this proceeding is whether the WIZN antenna results in undue air pollution pursuant to Criterion 1 (Air). As discussed below, the Board finds that a project must create an adverse health or safety effect to result in undue air pollution under that Criterion. Therefore, this Decision concerns only the alleged health and safety effects of the WIZN's transmissions under Criterion 1 (air).

IV. Findings of Fact

A. If Proposed Findings are Not Granted, They are Denied

1. To the extent any proposed findings of fact and conclusions of law are included below, they are granted; otherwise, they are denied. *See Secretary, Agency of Natural Resources v. Upper Valley Regional Landfill Corporation*, 167 Vt. 228, 241-42 (1997); *Petition of Village of Hardwick Electric Department*, 143 Vt. 437, 445 (1983).

B. The Project

2. The Project is located on a seventeen-acre tract on the northwest side of Pease Mountain, which sits immediately east of Route 7 and south of Church Hill Road in Charlotte, Vermont. The Project consists of a 199-foot, unlighted broadcast and communications Tower and an equipment building, both of which were constructed in 1987. The Tower replaced a 100-foot tower which had been on the tract for decades and which was located near the current site of the Tower. The Tower is owned by CVFRS and co-locates three users, WIZN, CVFRS, and Verizon Wireless. The WIZN antennas on the Tower broadcast an FM radio signal at a frequency of 106.7 MHz.

3. The Tower and guy wires are not readily accessible to the public. The Tower site is located 800 feet up a logging trail from Church Hill Road, and is accessible only by a very steep (30+% grade) woods road that is not traversable by standard vehicles.

4. The access road and the area around the Tower are clearly posted with approved and appropriate warnings and signage. There is a blue notice sign on the access road to the Tower, a yellow caution sign on the Tower, and three blue notice signs are posted on the three guy wire anchors informing the general public of possible exposure to RF in excess of public limits inside the restricted (fenced) areas. The signs posted at the Project are standard radiofrequency hazard warning signs as recommended by

the American National Standards Institute (ANSI). There are also "No Trespassing" signs posted along the entire boundary of the Project. Further, the boundary between the Project and the property to the south is fenced with a four foot (4') high, wire fence.

5. The Charlotte Congregational Church is located across Church Hill Road to the north and is approximately 1,450 feet from the Tower.

6. Several years after the Tower was constructed in 1987, a residential subdivision was approved which adjoins the property tract to the south. The nearest home in the subdivision is located approximately 1,400 feet from the Tower.

7. In 1987, another residential subdivision was approved. It is located across Church Hill Road and north of the Tower site on the nearby Jones Hill. The nearest home in that subdivision is located approximately 1,250 feet from the Tower.

C. WIZN's Experts on RF

8. WIZN introduced the testimony of Ronald C. Petersen. Mr. Petersen is an experienced engineer with a background in electrophysics. He also holds leadership roles in a number of committees, including the Institute of Electrical and Electronic Engineers (IEEE) International Committee on Electromagnetic Safety (ICES) (Chair), IEEE Standards Coordinating Committee 34 – Product Performance Relative to the Safe Use of Electromagnetic Energy (Chair), the International Electrotechnical Commission (IEC) Technical Committee TC-106 – Assessment of Human Exposure to Electric, Magnetic and Electromagnetic Fields (Chair), the National Council on Radiation Protection and Measurements (NCRP) Scientific Committee 89 – Non-Ionizing Radiation (Chair) and the American National Standards Institute (ANSI) Accredited Committee Z136 – Laser Safety (Chair). He is a fellow of the IEEE and the Laser Institute of America (LIA). Mr. Petersen has been a member of the International Committee on Electromagnetic Safety (formerly called IEEE Standards Coordinating Committee 28, and before that, from 1960 until 1990, it was called ANSI Committee C95), for more than 25 years. He has been a member of the Bioelectromagnetics Society since it was organized more than 25 years ago.

9. WIZN also introduced the testimony of Kenneth R. Foster, PhD, P.E. Dr. Foster is a full Professor of Bioengineering at the University of Pennsylvania. He is also an engineer, researcher and writer on issues related to the interaction of non-ionizing electromagnetic fields and risk issues related to radiofrequency energy. He has published approximately

100 papers in peer-reviewed journals related to these subjects, and two books related to science and the law.

Dr. Foster is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and has held a number of leadership positions within IEEE, including President of the IEEE Society on Social Implications of Technology, former Chair of the IEEE Committee on Man and Radiation (COMAR), AdCom of the IEEE Engineering in Medicine and Biology Society.

Dr. Foster is also a member of the National Council on Radiation Protection and Measurements (NCRP) and IEEE International Committee on Electromagnetic Safety (ICES), among other professional associations. He is a Fellow of the American Institute for Medical and Biological Engineering (AIMBE), a member of Radiation Research Society, and a member of the Bioelectromagnetics Society.

Dr. Foster has written numerous articles on issues relating to RF, including basic biophysical studies related to mechanisms of interaction, studies related to medical applications of RF energy, modeling of thermal responses of tissue to RF energy exposure, modeling of the absorption of RF energy from antennas, risk assessment related to RF energy exposure, including several invited encyclopedia articles that survey the entire subject of RF.

Dr. Foster is a longtime member of IEEE C95 (now known as ICES), which sets the major exposure limits in the United States on which the Federal Communications Commission (FCC) RF Guidelines are based in part. Dr. Foster has also been active in the international arena on RF issues. In 2000, he spent nine months on sabbatical with the EMF Program of the World Health Organization, which deals with potential health risks of electromagnetic fields. He also participates extensively in European meetings on the subject of possible hazardous of EMF and has published extensively about the issue from the European perspectives.

D. Background on RF

a. Basic Explanation of EME/RF

10. In order to explain the basics of electromagnetic energy (EME) and radiofrequency radiation (RF), the following and concepts must be discussed:

- electromagnetic energy (EME),
- electromagnetic waves,
- the electromagnetic spectrum,
- ionizing and non-ionizing radiation,
- radiofrequencies;
- RF radiation (RF),
- the interaction of EM waves with humans,
- the difference between the effects of RF and ionizing radiation,
- specific absorption rate (SAR).
- maximum permissible exposure (MPE)

b. Electromagnetic Energy (EME)

11. Electromagnetic energy is energy associated with electric and magnetic fields. A measure of an electric field is the force it exerts on a charged particle; a measure of the magnetic field is the force it exerts on a moving charges particle. The electric field strength is measured in volts per meter (V/m), the magnetic field strength is measured in amperes per meter (A/m).

c. Electromagnetic Waves

12. The term "electromagnetic waves" describes electric and magnetic phenomena that result in the propagation or radiation of electromagnetic energy through space in the form of waves. These waves consist of an electric field and a magnetic field – both vary with time at the same frequency. In addition to the electric and magnetic fields, strength frequency and wavelength, “power density,” is an important parameter. Power density is a measure of the radiated power incident on a unit area of a surface. The accepted unit for this parameter is watts per square meter (W/m^2). At optical wavelengths/frequencies, power density is called “irradiance.”

13. The irradiance, or power density, of the sun at noon in most of the U.S. is of the order of 250 to 1000 W/m^2 (25 to 100 mW/cm^2). By comparison, as described below, the power density permitted under the FCC Guidelines is 0.2 mW/cm^2 (a factor of 125 to 500 times less than the irradiance of the sun) at the frequency used by WIZN.

d. The Electromagnetic Spectrum

14. The electromagnetic spectrum is an ordered continuum of properties of electromagnetic waves and particles. The electromagnetic spectrum is usually depicted graphically.

A typical presentation would be a horizontal axis with 20 or so “decades” of frequency, beginning at a few hertz (Hz) or fractions of a Hz up through a billion-billion Hz or so. A thousand Hz is called a “kilohertz” (kHz), a million Hz is called a “megahertz” (MHz), and a billion Hz is called a “gigahertz” (GHz). A parallel axis presenting the corresponding wavelength for each frequency is usually included and in many cases, on a third parallel axis, the corresponding equivalent “photon” energy is also included. Descriptive nomenclature for the various frequency bands is included in many presentations. For example, formally defined frequency bands, such as (in order of increasing frequency):

Non-Ionizing

Sub-Extremely Low Frequency (SELF) (0- 30 Hz)
Extremely Low Frequency (ELF) (30 – 300 Hz),
Very Low Frequency (LF) (30 kHz – 300 kHz),
Medium Frequency (MF) (0.3 - 3 MHz),
High Frequency (HF) (3 - 30 MHz),
Very High Frequency (VHF) (30 - 300 MHz),
Frequency Modulation Band (FM) (87.9 - 107.9 MHz),
Ultra High Frequency (UHF), (300 - 3000 MHz),
Super High Frequency (SHF), (3 - 30 GHz),
Extremely High Frequency (EHF), (30 - 300 GHz),
Infrared Radiation (300 GHz - 300,000 GHz),
Visible light (VL)(approximately 430,000 - 750,000 GHz),

Ionizing

Ultraviolet Radiation (UV)
X-rays
Gamma rays, i.e., nuclear radiation, and other forms of high-energy radiation that have the ability to disrupt molecular bonds in a single interaction event.

e. Ionizing and Non-Ionizing Radiation

15. Inclusion of the “photon” energy in a depiction of the electromagnetic spectrum is important because it separates ionizing radiation (frequencies above the UV band) from non-ionizing radiation. Photon energy arises from what is called “wave-particle duality.” Some electromagnetic phenomena, e.g., diffraction, can readily be explained when the energy is considered a wave, while other phenomena, such as the photo-electric effect, can best be explained when the energy is considered discrete packets of energy, called photons, that behave as if they were particles.

The energy of these photons is directly proportional to the frequency of the electromagnetic wave and is usually expressed in units of electron volts (eV). It takes about 10-12 eV to cause ionization, i.e., removing an electron from a simple atom or disrupting a chemical bond of a simple molecule thereby producing free radicals (the photon energy of an electromagnetic wave at 100 MHz is smaller by a factor of more than 60,000 than the weakest chemical bond). For this reason, electromagnetic waves at frequencies where the photon energy is greater than about 10-12 eV is considered ionizing radiation, which includes gamma rays, X-rays, nuclear radiation, cosmic radiation and other forms of high-energy radiation. A wavelength of 100 billionths of a meter (corresponding to a frequency of 3 billion MHz), which is in the ultraviolet band, is usually taken as the dividing point between the ionizing and non-ionizing radiation regions of the electromagnetic spectrum.

Thus, the radiofrequencies -- including the FM band in which WIZN broadcasts -- are clearly a form of non-ionizing radiation and their photon energies are far less than even those of infrared radiation and visible light.

f. Radiofrequencies

16. Radiofrequency is usually defined as frequencies in the portion of the electromagnetic spectrum that is between audio frequencies and the infrared (IR) region. For current applications, the practicable RF range is roughly 3 kHz to 300 GHz. WIZN broadcasts in this range at 106.7 MHz.

g. RF Radiation (RF)

17. RF radiation means the propagation or radiation of electromagnetic energy in the form of waves at radiofrequencies. The radiofrequencies are used for communications, e.g., AM, FM and TV broadcast, personal wireless communications systems such as cellular telephones and cordless telephones in the home, two-way radio for police and other emergency services, and for a host of other applications including intrusion alarms, baby monitors, radio-controlled toys, and wireless Internet access in the home. Radiofrequencies are also used for automatic garage-door openers, navigation systems such a Loran and the global satellite positioning system (GPS), for heating applications such as microwave ovens, rapid blood-warming applications in hospitals or diathermy. Radiofrequency energy is applied, at levels far higher than those relevant to WIZN, to the human body for medical treatments, including diathermy used in sports medicine and MRI scanners.

h. Interaction of EM Waves With Humans

18. When an electromagnetic wave interacts with a human, part of the energy is reflected and part is absorbed. This is true at radiofrequencies and at higher frequencies, e.g., IR and visible light. The electric field associated with the absorbed energy causes ions (charged particles) and water molecules to move back and forth or to rotate at the frequency of the electromagnetic wave. These motions occur in a viscous media where there are frictional forces and the end result is heating. The amount of energy absorbed depends on the frequency, the size of the body, the orientation of the body with respect to the direction of the incident field, the presence of nearby reflecting surfaces, and other factors. The mass-normalized rate at which energy is absorbed is called the "specific absorption rate" (SAR), which is expressed in units of watts per kilogram (W/kg).

i. The Difference Between The Effects Of RF and Ionizing Radiation

19. The very great differences in biological effects arising from RF energy and ionizing radiation result from the ability of ionizing energy to disrupt chemical bonds and form charged species (called free radicals) in tissue. These charged species are highly reactive and highly damaging to tissue. This is not possible with RF energy, because the quantum of energy is far too small to ionize molecules. Despite considerable speculation and much argument over the years, no mechanism has been accepted by the scientific community that RF energy creates any hazardous effects, apart from excessive heating at certain threshold levels.

20. Effects of RF depend on frequency. This is because the amount of RF that is absorbed by the body varies with frequency, due to the antenna characteristics of the body. For that reason, safety limits for human exposure to RF depend strongly on frequency. Exhibit B-3 (OET-65), at Appendix A, Table 1.

j. Specific Absorption Rate (SAR)

21. As indicated above, SAR is a measure of the rate at which energy is absorbed by an object in an incident electromagnetic field. The concept was developed by researchers in the 1970's to quantify the amount of RF energy absorbed by subjects in experimental bioeffects studies, and came to be regarded by investigators, journals, and health agencies as an essential measure of exposure. Before the acceptance of SAR as a measure of exposure, investigators usually reported only incident power density, and as a result it was impossible to compare effects of exposure to different subjects to RF energy of different frequencies. While the

incident power density is important, the amount of energy absorbed in the body is more important.

k. Maximum Permissible Exposure (MPE)

22. Because the determination of SAR depends on frequency, the safety Guidelines are presented in terms of derived limits or "maximum permissible exposure" (MPE) values, which are related to the SAR but are expressed in terms of more easily measurable quantities. The MPEs, which are defined as the electromagnetic fields to which a person may be exposed without harmful effect and with an acceptable safety factor, are expressed in terms of the more readily quantifiable incident fields, i.e., electric or magnetic field strength and power density. *See generally,* Exhibit B-3, OET-65, Appendix A. The results of dosimetry studies, including numerical simulations and thermographic studies of various models exposed to RF/microwave fields were used to derive the MPE values by relating the incident fields to the resulting SAR. The MPE is set out one-50^{th} of the established SAR for established health effect . *See* discussion of Margin of Safety, below, at ¶¶ 31-35. Compliance with the MPE limits ensures compliance with the basic restrictions. Conversely, because of the conservative assumptions that were employed in these dosimetry studies, exceeding the MPEs does not necessarily mean that the threshold level of health effects is reached. For the exposure to RF at 100 MHz, the MPE value of 200 uW/ cm^2 applies for continuous exposure, 24 hours a day, 7 days a week. As described in detail below, the measured RF levels near the Project a generally less than one-tenth of that value.

E. REGULATION OF RF

a. The Development of the FCC Guidelines Regarding Exposure to EM/RF

23. The RF safety Guidelines adopted by the FCC are a hybrid of the standard developed by IEEE Standards Coordinating Committee 28 (SCC-28) and recommendations of NCRP Scientific Committee 53 (now SC-89).

24. These FCC standards were developed through an extensive due process typical of that used by all Federal regulatory agencies, which includes weighing comments submitted by the public and other Federal agencies. Thus, the FCC limits and its rules for enforcement of the limits are also shaped by Federal regulatory processes and are not simply the IEEE and NCRP limits (although those limits provided the chief technical basis of the FCC limits).

25. The Institute of Electrical and Electronics Engineers (IEEE) is an international non-profit, technical professional association of more than 360,000 individual members in approximately 175 countries. Through its members, the IEEE is a leading authority in technical areas ranging from computer engineering, biomedical technology and telecommunications, to electric power, aerospace and consumer electronics, among others.

Through its technical publishing, conferences and consensus-based standards activities, the IEEE produces 30 percent of the world's published literature in electrical engineering, computers and control technology, holds more than 300 major conferences annually and has nearly 900 active standards with another 700 under development.

Within the IEEE are a number of societies that cover a wide range of interests. These include the IEEE Antennas and Propagation Society, Communications Society, Consumer Electronics Society, Education Society, Electromagnetic Compatibility Society, Engineering in Medicine and Biology Society, Information Theory Society, Neural Networks Society, Society on Social Implications of Technology, plus about twenty others. Many of these societies sponsor the development of standards. When the scope of a standard overlaps the scope of more than one of these societies, those standards are developed by a Standards Coordinating Committee that is sponsored by the IEEE Standards Association Standards Board and operates under its policies and procedures to ensure openness and due process.

The 1991 standard developed by SCC-28, C95.1-1991 (IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz) was reaffirmed in 1997 and portions were revised in 1999 for clarification.

26. The Subcommittee which developed the 1991 IEEE standard was comprised of participants with the following backgrounds: approximately 30% from university research laboratories, 6% from non-profit research laboratories, 12% military research laboratories, 24% representatives of federal public health agencies, including EPA, FDA, NIOSH, and OSHA, 10% from industry, 3% consultants to industry, 4% from government administrative offices and 11% independent consultants or represented the general public. Approximately 33% were physical scientists (physics, biophysics, engineering, etc.), 43% were life scientists (biology, genetics, etc.), 10% were physicians and research physicians, 3% were radiologists, toxicologists, pharmacologists, and 11% were from the law, safety and medical professions. Exhibit B-37.

No other committee or expert panel that develops safety criteria for exposure to RF energy has the broad, diversified science-based support as does IEEE SCC-28. It would be impracticable for a federal health agency or local or state government agency, such as this Board, to assemble the expertise and broad scientific background of the active membership of SCC-28 in order to develop different RF standards or guidelines.

27. The NCRP (National Council on Radiation Protection and Measurements) is a non-profit corporation chartered by Congress. The Charter of the NCRP includes as one of its objectives:

> To collect, analyze, develop and disseminate in the public interest information and recommendations about (a) protection against radiation (referred to herein as radiation protection) and (b) radiation measurements, quantities and units, particularly those concerned with radiation protection.

The NCRP has published two reports on non-ionizing radiation:, Report No. 67 (Radiofrequency Electromagnetic Fields – Properties, Quantities and Units, Biophysical Interaction, and Measurements) and Report No. 86 (Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields). Report 86 contains the recommendations on which the FCC safety Guidelines are based in part.

b. IEEE Standard C95.1-1991

28. Development of the IEEE C95.1-1991 standard began with a comprehensive review and critical evaluation of the relevant scientific literature to identify all reliable studies that reported biological responses associated with exposure to RF energy. These responses ranged from reversible effects and responses of adaptation to irreversible and biologically harmful effects. This literature review included studies that reported effects at exposure levels far below the basic restrictions of the (then current) American National Standards Institute (ANSI) C95.1-1982 standard. The literature that formed the basis of the 1991 C95.1 standard satisfied rigid criteria including correct dosimetry, proper experimental design, a sufficient number of subjects (including controls), and repeatable results.

The conclusion of this critical evaluation was that the most sensitive and reliable biological response was the disruption of food-motivated learned behavior in laboratory animals. The SAR at which this effect reliably occurs is associated with an increase in body temperature. The response of the exposed animals typically involves changing from a task performed to receive food, to a different behavior which typically is of the kind that the

animal uses to cool itself in an excessively warm environment. Foster Tr. at 349.

The standards setting committee did not specify whether this effect is thermal or non-thermal in origin. Although this effect is both modest and reversible, it identifies a threshold for potentially harmful effects. Disruption of learned behavior in laboratory animals has consistently been found to be the most sensitive and reliable biological endpoint, i.e., other confirmed effects occur at higher exposure levels. A summary of the threshold effect is set forth in Exhibit B- 92 BIO ELECTRO MAGNETICS, Supplement 6, December 2003, *The Behavioral and Cognitive Effects of Microwave Exposure,* John A. D'Andrea, Eleanor R. Adair, and John O. de Lorge:

> Research conducted during the past three decades has shown that exposure of laboratory animals to RFR can cause a variety of behavioral changes. These changes range from subtle effects such as perception of microwave pulse-induced sound to behavioral disruption and complete cessation of behavioral performance due to hyperthermia. …
>
> ...[D]isruption of observing behavior was associated with a rectal temperature increase, during microwave exposure, by 1˚C or more. This temperature increase was highly correlated with a whole body SAR near 4 W/kg. This protocol, measuring behavioral disruption, has proven to be one of the most sensitive and repeatable measures of potentially harmful biological effects.
>
> In all cases, the disruption of ongoing behavior during acute RF exposure is associated with 1 ˚C increase of body temperature. The disruption of a highly demanding operant task is a statistically reliable endpoint that is associated with whole body SARs in a narrow range between 3.2 and 8.4 W/kg, despite considerable differences in carrier frequency...Thermal changes seems to account for nearly all of the reported behavioral effects of absorbed RF energy across the limited frequency range explored. ...
>
> ...[T]he threshold for disruption of ongoing behavior in rats and nonhuman primates always exceeded a whole body SAR of 3.2-4 W/kg...[which] value has again been adopted as the working threshold for unfavorable biological effects in human beings in the frequency range from 100 kHz to 300 GHz/RF.

Exhibit B-92 at S57.

29. As discussed in further detail below, a variety of biological effects has been reported at even lower exposure levels. Some of these were observed in the absence of what the investigator considered significant heating. Such effects have been called “non-thermal” or “athermal effects.” However, many of these effects have been scientifically controversial for a number of reasons, including inadequate dosimetry, the possibility of significant artifacts in the study, or failure to be independently observed by other scientists in following studies.

The IEEE committee concluded that:

> Research on the effects of chronic exposure and speculations on the biological significance of non-thermal interactions have not yet resulted in any meaningful basis for alteration of the [1982] standard.

The does not mean studies reporting such athermal effects were ignored. These studies were evaluated but the results were inconsistent, unreliable or could not be related to adverse effects in humans.

As discussed in further detail below, other organizations, including ICNIRP, NCRP and Health Canada, have independently reached this same conclusion.

30. The RF standards and Guidelines are based on the results of laboratory studies with exposures lasting from hours to several days, but a number of studies are included in the most recent standards where the exposures lasted throughout the life of the animals. There is no evidence of cumulative effects due to chronic exposure. The weight of the evidence does not support the conclusion that RF energy can initiate or promote cancer in humans or laboratory animals.

c. The Built-in Margin of Safety

31. To account for any uncertainties in the data and increase confidence that adverse effects will not occur, the established threshold SAR in the IEEE standard (4 W/kg) was reduced by a factor of 10 to provide an additional margin of safety, i.e., 10% of the established threshold SAR.

32. This safety factor of 10 was applied to the threshold SAR to establish the basic restriction for exposures in controlled environments (exposures in occupational settings, such as inside fenced antenna sites).

33. As a precautionary measure, a further additional factor of 5, i.e., 2% of the established threshold SAR, was applied for an added margin of safety for

exposures in uncontrolled environments, where exposure to the general public could occur.

34. Thus, the basic restrictions in terms of SAR (for frequencies between 100 kHz and 6000 MHz) are

    For occupational exposure: one-tenth (1/10 or 10%)
    For public exposure one-fiftieth (1/50 or 2%)

35. The standards are set at the threshold value for the most sensitive, confirmed effects that could be related to human health and are based on worst-case exposure scenarios -- 0.4 W/kg and 0.08 W/kg for occupational and public exposure, respectively. The standards assume, for example, that a subject stands motionless for 6 to 30 minutes in a position to absorb the most energy, a situation that seldom or never occurs in real world exposures. The MPE values presented in the standards, Guidelines and by the FCC, ensure that these basic restrictions are not exceeded.

d. NCRP SC-53 Recommendations

36. In the mid-1970's, NCRP Scientific Committee 53 (SC-53 – now SC-89-5) was established to review the scientific literature and recommend limits for exposure to RF/microwave energy. SC-53 consisted of 6 members, 5 advisory members and 5 consultants. NCRP SC-53 was organized and began its work in 1981. In 1986, the SC-53 literature review was published with exposure criteria for RF electromagnetic fields (NCRP Report No 86). Although the recommendations were based on the 1982 ANSI C95 exposure limits, a major charge was the incorporation of an additional safety factor of 5 for exposure of the public.

e. "Controlled" or "Uncontrolled" Exposure

37. The terms, "controlled" exposure and "uncontrolled" exposure, refer to the environment in which the exposure takes place. A controlled environment means an area that is accessible to those who are aware of the potential for exposure as a concomitant of employment, to individuals cognizant of exposure and potential adverse effects, or where exposure is the incidental result of passage through areas posted with warnings, or where the environment is not accessible to the general public and those individuals having access are aware of the potential for adverse effects. "Uncontrolled exposure" generally refers all individuals who may experience exposure, except those in controlled environments, i.e., the general public. Exposure can be controlled in a number of ways -- for

example by restricting access with barriers, by posting warning signs or by establishing RF safety or educational programs.

38. At the recommendation of the EPA and other federal public health agencies, the FCC adopted as Guidelines a hybrid of the NCRP recommendations and IEEE Std C95.1-1991. Both of these documents contain two tiers in the SAR region: one tier for occupational exposure (or exposures in controlled environments), the other for exposure of the public. The FCC Guidelines are based on the same basic restrictions as IEEE, NCRP, and ICNIRP.

39. The FCC Guidelines are MPE values expressed in terms of the incident electric and magnetic fields and power density that will ensure compliance with the basic restrictions of contemporary standards and Guidelines. As with all contemporary RF safety Guidelines, the FCC Guidelines are dependent on frequency.

For occupational exposure, the maximum permissible exposure (MPE) values are as follows:

0.3 - 30 MHz –100 mW/cm^2;
3 - 30 MHz – $(900/f^2)$ mW/cm^2;
300 MHz - 1 mW/cm^2;
300-1500 MHz - f/300 mW/cm^2;
1500-100,000 MHz - 5 mW/cm^2.

Where “f” is the frequency in MHZ

For exposures in uncontrolled environments, i.e., exposure of the general public, the maximum permissible exposure (MPE) values are 1/5 of the above values except for frequencies below 1.34 MHz where the MPEs for both environments are the same, as follows:

0.3 - 1.34 MHz – 100 mW/cm^2;
1.34 - 30 MHz – $180/f^2 mW/cm^2$;
30 - 300 MHz – 0.2 mW/cm^2;
300 - 1500 MHz – f/1500 mW/cm^2;
1500 - 100,000 MHz – 1 mW/cm^2.

Where “f” is the frequency in MHz

F. The FCC Guidelines Have Been Almost Universally Adopted

40. The FCC’s RF safety Guidelines are substantially similar to the standards and Guidelines relied upon throughout the world. This similarity results

from the broad consensus developed from the science-based recommendations of the recognized international committees.

41. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is a body of independent scientific experts whose precise focus is addressing the possible adverse effects on human health of exposure to non-ionizing radiation. After undertaking an exhaustive review of the science, ICNIRP adopted effectively the same standards as the FCC for RF exposure in the range of the RF spectrum at issue in this case. *See* Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz) - ICNIRP Guidelines," Health Physics, Vol. 74, No. 4, at 494-522 (1998) (Exhibit B-43).

42. Countries of the EU are adopting safety Guidelines based on the recommendations of ICNIRP, including the Netherlands (*see* Exhibits B-44, B-46), France (*see* Exhibit B-64) and the United Kingdom (*see* Exhibits B-63, B-68).

43. Many other countries around the world have adopted similar standards including Canada (*see* Exhibit B-45) and Australia (*see* Exhibit B-46).

44. The World Health Organization has recommended adoption of the standards set by ICNIRP.

G. The Standards Are Based Upon the Best Scientific and Health Research

a. The FCC Consulted with the Appropriate Health Agencies

45. To understand the scientific basis underlying the FCC's adoption of its Guidelines, and the amount of work that went in to adopting the Guidelines, and the reasons for adhering to the Guidelines, it is helpful to refer to the FCC's own materials. These include not only the Guidelines themselves, *see* Report and Order, In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, 11 FCC Rcd. 15123 (1996)(FCC RF Order), Exhibit B-1, but also OET Bulletin 56, Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields (4th ed. Aug. 1999), Exhibit B-2; A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance (June 2000), Exhibit B-4; and OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields (Aug. 1997), Exhibit B-3.

46. Appellants assert that the FCC has recognized that it is not a "health agency" and, therefore request this Board, which is clearly not a health agency, to reject the FCC Guidelines.

47. As discussed above, the standards were adopted based upon recommendations of the National Council on Radiation Protection and Measurements NCRP, a non-profit corporation chartered by the United States Congress. The express mission of the NCRP is:

> to formulate and widely disseminate information, guidance and recommendations on radiation protection and measurements which represent the consensus of leading scientific thinking . . .

See generally Exhibit B-40.

48. In addition to the NCRP recommendations, the FCC safety Guidelines were also based upon the standards developed by IEEE Standards Coordinating Committee 28 (SCC-28) (Safety Levels with Respect to Human Exposure to Radio Frequency), which is the preeminent developer of voluntary RF safety standards. Since 2000, SCC-28 operates as the IEEE International Committee on Electromagnetic Safety (ICES).

49. Moreover, in adopting its Guidelines the FCC sought and took input from those federal agencies that are active in the area of public health with respect to human exposure to radiofrequency energy including:

1. The Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH), which develops and administers product performance standards for devices that emit electromagnetic energy such as microwave ovens;

2. The National Institute for Occupational Safety and Health (NIOSH), which is the federal agency responsible for conducting research and making recommendations for the prevention of work-related disease and injury. NIOSH, which is part of the Centers for Disease Control and Prevention (CDC), develops criteria documents for the development of regulations by other agencies;

3. The Environmental Protection Agency (EPA) which develops RF guidance documents for use by the federal agencies; and

4. The Occupational Safety and Health Administration (OSHA), which enforces workplace rules.

In addition, the FCC relied upon various quasi-governmental organizations, including:

5. The American National Standards Institute (ANSI), which is a private non-profit organization that administers and coordinates the US voluntary standardization and conformity assessment system;

6. The National Council on Radiation Protection and Measurements;

7. The Institute of Electrical and Electronics Engineers (IEEE).

b. The Research upon which the FCC Guidelines is Based is Constantly Updated

50. Appellants assert that the FCC Guidelines are based upon outdated research and should be disregarded. It is true that the literature cutoff date for IEEE Std C95.1-1991 (which was reaffirmed in 1997 and republished with a supplement in 1999) was 1986. However, the scientific literature is continually reviewed, and the scientific basis of the IEEE standard remains valid today. Exhibit B-37.

51. Appellants' contention that the Guidelines are outdated exhibits a fundamental misunderstanding of the review and reaffirmation process of the IEEE. On September 26, 1991, the 1991 IEEE standards were approved by the IEEE standards board. Exhibit B-39. The 1991 IEEE standards were then approved in November of 1992 by the American National Standards Institute (ANSI). Petersen Tr. at 65. The FCC adopted the 1991 IEEE standards in 1996 as its Guidelines. The Guidelines became effective in 1997. Exhibit B-1. When the Guidelines were adopted by the FCC, the science was again reviewed.

52. The IEEE standards are subject to review or reaffirmation every five years. In 1997, the ANSI board reaffirmed the 1991 ANSI standards. Exhibit B-39; Petersen Tr. at 71. The members of the IEEE who voted on the reaffirmation participated in an ongoing literature evaluation. A literature surveillance group reviews all of the pertinent literature and places it in the IEEE database. This way, members of the IEEE standards committee can review all of the current relevant literature when they vote on the reaffirmation of the standard. The 1997 reaffirmation of the 1991 standards was based on scientific literature from 1985 until the time in 1997 when ANSI voted to reaffirm the standard. Petersen Tr. at 127, 142-146.

53. In 1999, the ANSI standards board approved a supplement to the 1991 ANSI standards involving unrelated substantive changes. Petersen Tr. at 70, 93-94; Exhibit B-41.

54. The IEEE standards board recently granted the standards committee an extension until December of 2005 to complete the revision of the standards. The reason for the extension was because the literature evaluation was so extensive that the members of the committee were unable to finish the literature evaluation in order to publish it in 2002 as it should have been. The 1991 IEEE standards are still in effect today. Petersen Tr. at 92-93, 161.

55. The new ICES database contains more than 1800 citations published through December 2003. Newer important papers are being considered as they are published. All of these current literature reviews support the conclusions of IEEE and NCRP and the FCC MPE values. Each of these reviews considered all of the relevant literature, including those studies that report "non-thermal" effects. While the literature originally supporting IEEE Std C95.1-1991 may predate 1986, the conclusions resulting from that evaluation remain valid. The standards setting organizations and federal agency representatives continue to keep abreast of the latest scientific developments. Exhibits B-37, B-60.

56. The ICES Subcommittee 4 literature evaluation process, which includes participation from representatives from federal public health and safety agencies, is the most extensive and thorough review ever undertaken. The thousands of papers are each evaluated independently by two randomly selected life-science subject matter experts from an appropriate literature evaluation working group, i.e., In Vitro, In Vivo, and Epidemiology. The papers are also independently reviewed by two randomly selected subject matter experts from the Engineering Evaluation WG. As stated above, the literature cutoff date is December 2003 but any important new papers are placed into the process. The papers are categorized by biologic endpoint and study protocol, e.g., cell culture studies, animal studies, epidemiology studies. There is no prejudgment regarding interaction mechanism, e.g., thermal, non-thermal - all studies are evaluated on their scientific merit. Exhibit B-37, Petersen Tr. at 79.

57. The results of the literature review are being used by the Risk Assessment Working Group to determine whether or not there is any new evidence that would warrant a change to the basic restrictions of the 1991 standard. The results are also being used to generate reports on a number of broad topic areas including the effects of RF energy on homeostasis and metabolism, epidemiological studies of RF exposures and human cancer, calcium efflux studies, cancer studies, teratogenesis, thermoregulatory responses, effects on life span, ocular effects, behavioral effects, and human perception. These papers have been published in a special issue of BIO ELECTRO MAGNETICS (Supplement 6, 2003), the journal of the Bioelectromagnetics Society. Each paper underwent external peer review before publication. Each paper summarizes the literature in a specific

topic area and provides a conclusion relative to that topic as it relates to human health. Exhibit, B-92.

58. To date, all conclusions support the position that the basic restrictions of the current standards adequately protect human health. There is basis for making any change to those standards. Exhibit B-92.

59. The results of the literature evaluation by IEEE is set forth in Exhibit B- 92 the journal BIO ELECTRO MAGNETICS, Supplement 6, December 2003, published by the Bioelectromagnetics Society, the Society For Physical Regulation in Biology and the European Bioelectromagnetics Association. The journal is a comprehensive survey of the currently available scientific literature. More than 1300 relevant research papers were evaluated through a complex and extensive review mechanism. *See* Exhibit B-92. A listing of the individual papers in Exhibit B- 92 the journal BIO ELECTRO MAGNETICS, Supplement 6, December 2003, and selected excerpts from the summaries of those papers, show the scope of the scientific review and the current status of the science regarding the health and safety effects of RF. These papers show that no adverse health effects from low-level RF have been scientifically demonstrated.

60. Reviews of Effects of RF Fields on Various Aspects of Human Health: Introduction, C-K. Chou and J.A. D'Andrea, at S5-S6.

> The IEEE *Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields*, 3 kHz to 300 GHz, C95.1-1991, was published in 1991, reaffirmed in 1997, and amended in 1999 with no changes in the exposure limits. A complete revision of the standard by the subcommittee we co-chair, now in progress, will be based on the peer reviewed literature identified by the Literature Surveillance Working Group.
>
> More than 1300 relevant research paper have been evaluated...A Mechanisms Working Group works in parallel with the RAWG to evaluate possible mechanisms of interaction, both nonthermal and thermal mechanisms. In addition, review papers have been prepared on cancer, reproduction, calcium efflux, behavior, thermoregulation, nervous system, ocular and auditory effects, homeostasis and metabolism, survival, epidemiology, and in vitro studies....
>
> The consensus of the Revision Working Group and SC4 was as follows:
>
> 1. The RF safety standard should be based on science.

2. RF safety standard revision should be derived from peer reviewed publications and documents that are reviewed by the SC4.

3. The adverse effect level remains at 4 W/kg subject to revision following completion of the literature evaluation and review papers.

4. The maximum exposure limits should be based on established adverse effects after inclusion of an appropriate safety factor(s).

5. Safety factor(s) should consider uncertainties in the biological database (e.g., measurements, environmental conditions, exposure duration, individual variability, and other factors).

6. Non-thermal RF biological effects have not been established and none of the reported non-thermal effects are proven adverse to health (does not apply to electrostimulation.) Thermal effect is the only established adverse effect.

7. The microwave hearing effect is not adverse and should not be used for setting the peak power limit.

8. The shape and size of the averaging volume and the peak SAR limit are still to be determined. The important end point is the temperature change. [During Revision Working Group meeting held on September 9-10, 2002, “temperature change” was revised to “absolute temperature.”]

9. The RF standard should be harmonized with other international standards to the extent where scientifically defensible.

10. Rationales must be documented for all changes relative to the current standard.

11. The editorial committee will add in the informative section a paragraph dealing with potentially sensitive subpopulations, such as children.

12. Reconsider the two tier approach (whole body average SAR 0.4 and 0.09 W/kg), the peak SAR value and the averaging volume.

The above 12 criteria remain the guiding principles of the revision. The first criterion is that the standard must be based on science, and the Revision Working Group is committed to explaining the

> scientific rationale of the standard. Although all relevant biological effect papers are reviewed, the emphasis is on adverse effects as stated in revision criterion #4. The Revision Working Group defined an adverse effect as "A biological effect characterized by a harmful change in health. For example, such changes can include organic disease, impaired mental function, behavioral dysfunction, reduced longevity, and defective or deficient reproduction." In general, the "weight of evidence" approach used by the National Toxicology Program, Environmental Protection Agency, and other health and regulatory agencies world-wide is used in our review and assessment processes. The weight of evidence approach was used to determine whether or not an adverse effect has been established. An adverse effect is considered "established" when there are consistent findings published in peer reviewed scientific literature from independent laboratories, and there is consensus that the effect occurs for the specified exposure conditions. For safety standards settings, only *established adverse effects* should be considered.

Exhibit B-92 at S6 (emphasis in original).

61. *Historical Review of RF Exposure Standards and the International Committee on Electromagnetic Safety (ICES),* John M. Osepchuk and Ronald C. Petersen, at S15.

> ...Although extensive, much of the peer reviewed literature reporting bioeffects of EM energy is of poor quality. Often experiments are plagued by artifacts, many of which are the result of deficiencies in the microwave engineering. In many cases reported findings cannot be replicated. Even if valid, papers sometimes do not present sufficient quantitative information for use in setting standards.
>
> …The importance of replicated studies and confirmed effects for use in standards-setting cannot be over emphasized. Although the literature reporting "athermal" bioeffects of exposure to microwave/RF energy (other than electrostimulation) is included in the review process, it has been found to be inconsistent and not useful for purposes of setting standards....

Exhibit B-92 at S15.

62. *Thermoregulatory Responses to RF Energy Absorption*, Eleanor, R. Adair and David R. Black, at S33:

> The study of the biological effects of RF energy is a mature scientific discipline with over a 50 years history and an extensive literature database. This review has emphasized established changes in human and animal thermophysiological responses, stimulated by tissue heating when RF/microwave energy is present. Laboratory and clinical studies of human volunteers demonstrate their superior thermoregulatory ability over other endotherms during RF exposure at, or even above current human exposure Guidelines. A few problem areas for humans remain, including drug/RF interactions and exposure to millimeter waves or high peak power microwaves. The current animal data are already reassuring on the benign nature of such conditions.

Exhibit B-92 at S33.

63. *Epidemiological Studies of Radio Frequency Exposures and Human Cancer,* J. Mark Elwood:

> The epidemiological results fall short of the strength and consistency of evidence which is required to come to a conclusion that RF emissions are a cause of human cancer. Exhibit B-92 at S72.

64. *Radio Frequency Electromagnetic Fields: Cancer, Mutagenesis, and Genotoxicity,* Louis N. Heynick, Sheila A. Johnston, and Patrick A. Mason, at S96:

> A large number of epidemiologic/occupational studies are reviewed herein, pertaining to whether exposure of various population segments to electromagnetic fields in the nominal frequency range of 3kHz to 300 GHz can initiate or promote cancer. Although positive findings on carcinogenic effects from exposure to RFEMF were reported in some studies, the weight of the statistical evidence supports the conclusion of no RFEMF induced cancer effects in humans.

Overall, pending any positive findings of new studies under way or planned, the findings of this review indicate that there is no reproducible scientifically valid experimental basis for the claims about a linkage between such exposures and the initiation, promotion, or copromotion of cancer.

65. *Survival and Cancer in Laboratory Mammals Exposed to Radiofrequency Energy,* Joe A. Elder:

The results of the studies listed in Table 1 provide a weight-of-evidence argument to (1) support the conclusion of Chou et al. [1992] that questioned the biological significance of the statistically significant increase in malignancy in the absence of truncated longevity and (2) conclude that the effects on cancer development and survival in Szmigielski et al. [1982] have not been confirmed by more recent studies with good dosimetry. Therefore, these effects are not useful in defining the adverse effect level for RF exposure.

Results reviewed here also show that long term, low level exposure ($\leq$4 W/kg) to RF energy did not affect survival adversely [Chou et al., 1992; Liddle et al., 1994; Toler et al., 1997; Frei et al., 1998a,b; Adey et al., 1999, 2000; Heikkinen et al., 2001; Zock Simmens 2001; Utteridge et al., 2002]. The absence of a detrimental effect on longevity in these studies provides evidence that low level RF exposure does not cause life shortening diseases and supports the weight-of-evidence that RF exposure does not affect carcinogenic processes.

In conclusion, the weight-of-evidence in studies of the same animal populations shows that RF exposure does not adversely affect survival or cancer incidence at whole body SARs $\leq$4 W/kg and brain SARs $\leq$2.3 W/kg.

Exhibit B-92 at S105-106.

c. The International Scientific Community Has Continuously Reviewed the Science and Found the FCC/ICNIRP Standard Appropriate to Protect Health and Safety

65. Recently, many international agencies and health agencies of other countries have independently reviewed the scientific research data and have come to the conclusion that the appropriate health and safety standard is the FCC and ICNIRP standard. Exhibits B-37, B-60. This supports the view that the FCC standard should be adhered to, and rebuts the claim that the FCC standard is outdated or otherwise fails to protect health and safety.

66. In 1998, the International Commission on Non-Ionizing Radiation Protection undertook an exhaustive analysis of the health and safety effects of RF, and recommended a standard similar to the FCC's. *See* Exhibit B-43 *Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz).*

67. In 1999, Health Canada published "A Review of the Potential Health Risks of Radiofrequency Fields from Wireless Telecommunication Devices." Royal Society of Canada for Health Canada. March (1999) (*See* Exhibit B-67) and Canada adopted standards similar to the FCC standards in "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz," Safety Code 6, Environmental Health Directorate, Health Protection Branch. Published by authority of the Minister of Health (1999). *See* Exhibit B-45.

68. The French Health General Directorate studied the issues in 1999, and supported the ICNIRP standards. *See* Exhibit B-64, *Zmirou Report to the French Health General Directorate, January 2001*.

69. In the United Kingdom in 2000, the Independent Expert Group on Mobile Phones (IEGMP), often referred to as the Stewart Expert Group (UK, 2000) issued its report, See Exhibit B-63, and found : "Balance of evidence is that exposures to RF energy below [present safety limits in the UK] [which are similar to FCC limits] do not cause health effects to the general population."

70. The Australian Radiation Protection and Nuclear Safety Agency in 2002 issued its Radiation Protection Standard in a report "Maximum Exposure Levels to Radiofrequency Field," - 3 kHz to 300 GHz, Radiation Protection Series Publication No. 3 (2002), which is similar to the FCC's. *See* Exhibit B-46.

71. The Health Council of the Netherlands undertook an evaluation in 2002, which adhered to the ICNIRP standard. *See* Exhibit B-44 "Mobile Telephones, An Evaluation of Health Effects," Health Council of the Netherlands (2002). See also Exhibit B-66 "Electromagnetic fields: Annual Update 2003" Health Council of the Netherlands (2003).

72. Less than a year ago, the United Kingdom's National Radiologic Protection Board issued its "Health Effects from Radiofrequency Electromagnetic Fields" Report of an Independent Advisory Group on Non-Ionizing Radiation. National Radiologic Protection Board, Volume 14, Chairman: Professor A. J. Swerdlow. November (2003), which supported adherence to the ICNIRP standard. *See* Exhibit B-68.

d. The Vermont Department of Public Service Undertook An Independent Review of RF Standards and Concluded that the FCC Guidelines Were Appropriate.

73. In the 1995 legislative session, the Vermont Legislature directed the Department of Public Service to:

> report to the general assembly with the results of the commissioner's review of available information and current research concerning nonionizing electromagnetic radiation, and his or her investigation of whether or not such radiation poses any significant health risk to the public, or any negative electronic interference effects. The report shall include any recommendations the commissioner deems appropriate for regulation of facilities and equipment that emit nonionizing electromagnetic radiation.

Section 2 of General Assembly Bill H.765, Exhibit B-8 at 3-4.

In responding to the legislature's directive, the Department held two public meetings at which several comments and concerns were expressed regarding the health effects of RF. After hearing these comments and reviewing the relevant literature and data, the Department determined that:

> **[s]pecific changes to the federal RFR regulations are not recommended at this time.**

Radiofrequency Radiation: Health Effects and Interference, Status of Current Research and Regulation, Technical Report No. 38, Department of Public Service, at 39 (December 1996), Exhibit B-8 at 39 (emphasis supplied).

H. In Adopting Its Standards, The FCC Did Examine The Possibility Of Non-Thermal Effects and Such Alleged Effects Have Been Extensively Addressed by the Many National And International Boards and Reviews Which Have Reviewed the Science.

74. The Appellants claim that the FCC Guidelines, and other standard-setting bodies, have failed to consider so-called "non-thermal" effects of low-level exposure to RF and have ignored "new" scientific studies regarding such alleged effects.

a. IEEE and FCC considered all potential health and safety effects of RF

75. The FCC Guidelines are based on the recommendations of NCRP Scientific Committee 53 (NCRP Report No. 86) and IEEE Standards Coordinating Committee 28 (IEEE C95.1-1991). Neither of these committees expressly developed recommendations and standards based on an assumed thermal mechanism of interaction, i.e., to protect only against "thermal" effects. Both committees developed recommendations to protect against any and all effects that could be considered harmful to humans. There was no prejudgment as to the interaction mechanism of RF energy with biological systems. The literature database reviewed and interpreted by both committees included all of the relevant literature, including reports of effects that occurred at exposure levels far below the limits in the standards current at the time. Exhibit B-37.

The result of this critical evaluation was that the most sensitive and reliable biological response that could be considered potentially harmful to humans was the disruption of food-motivated learned behavior in laboratory animals. *See* discussion of threshold effect in Exhibit B- 92 BIO ELECTRO MAGNETICS, Supplement 6, December 2003, *The Behavioral and Cognitive Effects of Microwave Exposure,* John A. D'Andrea, Eleanor R. Adair, and John O. de Lorge at S39, S57; Exhibit B-37. Below this level, the studies did not support both a finding of response to RF *and* a harmful effect on humans, as demonstrated below.

b. Continuing Scientific Reviews Have Not Supported Allegations of Adverse "Non-Thermal " Effects.

76. In spite of claims that certain studies report effects at low levels ("non-thermal" effects), such studies have been found to be unreliable, inconsistent, contradictory, and do not demonstrate a link to adverse effects in humans. Exhibits B-37, B-60.

77. The journal BIO ELECTRO MAGNETICS, Supplement 6, December 2003, and selected excerpts from the summaries of those papers, show the scope of the scientific review, and the current status of the science regarding the lack of scientific support for non-thermal health and safety effects of RF. *See* Exhibit B-92.

78. *Reviews of Effects of RF Fields on Various Aspects of Human Health: Introduction,* C-K. Chou and J.A. D'Andrea.

> [T]he consensus of the Revision Working Group and SC4 was as follows:
> …
> 6. Non-thermal RF biological effects have not been established and none of the reported non-thermal effects are proven adverse to

health (does not apply to electrostimulation.) Thermal effect is the only established adverse effect.

Exhibit B-92 at S6.

79. *Historical Review of RF Exposure Standards and the International Committee on Electromagnetic Safety (ICES),* John M. Osepchuk and Ronald C. Petersen:

> Although the literature reporting "athermal" bioeffects of exposure to microwave/RF energy (other than electrostimulation) is included in the review process, it has been found to be inconsistent ....

Exhibit B-92 at S15.

80. *Survival and Cancer in Laboratory Mammals Exposed to Radiofrequency Energy,* Joe A. Elder:

> In conclusion, the weight-of-evidence in studies of the same animal populations shows that RF exposure does not adversely affect survival or cancer incidence at whole body SARs $\leq$4 W/kg and brain SARs $\leq$2.3 W/kg.

Exhibit B-92 at S105-106.

81. *Radiofrequency (RF) Effects on Blood Cells, Cardiac, Endocrine, and Immunological Functions,* David R. Black and Louis N. Heynick:

> An accumulated body of evidence published over the last three decades has identified, investigated, and quantified the responses of mammalian neuroendocrine and intercellular hormonal control systems to RFEMF exposure.
>
> ...
>
> Whilst the literature retains numerous studies with unconfirmed findings as well as some, which are contradictory, these are not suitable for use in health protection. However, there is sufficient coherent data on which to base thresholds for human exposure safety standards. Overall, the body of published literature on the bioeffects of RFEMF to the humoral and endocrine systems does not provide any valid experimental basis to alter acceptance of 3-4 W/kg as the threshold on which to base exposure standards to protect against adverse human health effects.

Exhibit B-92 at 193.

82. *Radiofrequency Exposure and Mammalian Cell Toxicity, Genotoxicity, and Transformation,* Martin L. Meltz:

…

A number of important conclusions can be drawn from the discussion of all of the studies described above.

1. There is extensive evidence that RF exposures at different frequencies, at SAR levels that do not result in exposing cells at elevated temperatures over time, are not toxic. This is the case for both in vitro and in vivo exposures, both acute (short term) and chronic (long term).

2. There is an abundance of evidence that RF exposures at various frequencies and modulations at SAR levels that do not result in exposing cells at elevated temperatures over time do not cause a wide range of different types of genotoxic damage. The measures of genotoxic damage that are absent after RF exposures, by the weight of evidence, include the induction of DNA SSBs or DSBs, the induction of chromosomal aberrations, and the induction of SCEs.

3. Limited evidence is available indicating the absence of induction of phenotypic mutations by RF exposure and the inability of RF exposure to interfere with DNA repair synthesis after the DNA is damaged by another agent (UV). There is no evidence contradicting either observation.

4. There is some evidence indicating that RF exposure does not interact synergistically with several different chemical mutagenic agents. The evidence which initially appeared to contradict this was not reproduced over time in the same laboratory that reported it.

5. There is limited evidence that RF exposure, using some exposure systems, results in the induction of micronuclei; considerable other evidence exists that this does not occur. The induction of micronuclei is not consistent with the demonstrated absence of chromosome aberrations and DNA strand breaks. This matter is under further formal investigation.

6. There is limited evidence that RF exposure does not result in cancer-like changes of cells, as measured by the technique of in vitro cell transformation. There is no evidence by the technique of in vitro cell transformation. There is no evidence contradicting this observation.

7. There is limited evidence that RF exposure is not a cocarcinogen from studies involving either X-ray exposure or treatment with the chemical carcinogen benzo(a)pyrene.

Most of these conclusions are based on studies where the temperature of the biological sample was reported not to increase above the physiological temperature of 37° C for both short and prolonged exposure times. Some studies did involve elevated temperatures due to the RF exposure or water bath heating. Clearly, the results discussed challenge the statement that studies of RF bioeffects at "athermal" (or "non-thermal" or "normothermal") conditions have not been performed. Many such studies have been performed. The weight of evidence, as stated above, indicates an absence of toxic or genotoxic effects of low level exposures to RF electromagnetic fields.

Exhibit B-92 at S211.

c. Various International Studies Have Examined the Issue of Alleged Non-Thermal Effects and Have Rejected any Change in Standards Based Upon Such Speculative Claims

83. Expert committees around the world have independently reached the same conclusion, and were very explicit about the lack of reliable evidence for possible hazards from low-level exposures or "non-thermal" effects. Exhibits B-37, B-60.

84. For example, as stated in the latest ICNIRP Guidelines:

> Overall, the literature on athermal effects of AM [amplitude modulated] electromagnetic fields is so complex, the validity of reported effects so poorly established, and the relevance of the effects to human health is so uncertain, that it is impossible to use this body of information as a basis for setting limits on human exposure to these fields.

Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz). International Commission on Non-Ionizing Radiation Protection Guidelines. (1998). Exhibit B-43 at 9.

85. The 1999 Health Canada Report: "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz." Safety Code 6 states:

> Scientific studies performed to date suggest that exposure to low intensity non-thermal RF fields do not impair the health of humans

> or animals. However, the existing scientific evidence is incomplete and inadequate to rule out the possibility that these non-thermal biological effects could lead to adverse health effects. Moreover, without an understanding of how low energy RF fields could cause these biological effects, it is difficult to establish safety limits for non-thermal exposures…

Exhibit B-45.

86. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) in 2002 undertook an exhaustive study of the science. It dedicated a particular supplement to its report - Annex 4 in Exhibit 46 – examining around 80 different studies done after the 1998 ICNIRP review which were relevant to effects of low-level exposures of RF, and it still adopted standards similar to the FCC standards:

> The studies reviewed here do not suggest that current exposure standards, such as ICNIRP, need to be revised downwards.

"Maximum Exposure Levels to Radiofrequency Fields 3 kHz to 300 GHz," Australian Radiation Protection and Nuclear Safety Agency. (2002). Exhibit B-46.

87. After reviewing the science, including studies cited by Dr. Blank, the position of the French Health General Directorate does not support the claims of Appellants:

> No risk has yet been demonstrated, in spite of the considerable amount of work done over the past several years.

Zmirou Report to the French Health General Directorate, January 2001. Exhibit B-64, "Conclusions" Section.

88. In 1999, Royal Society of Canada for Health Canada, after reviewing the science, found:

> The panel found no evidence of documented health effects in animals or humans exposed to non-thermal levels of radiofrequency fields. The panel therefore does not recommend that Safety Code 6 be altered to include regulation at the non-thermal levels of RF which have been shown to produce these biological effects.

"A Review of the Potential Health Risks of Radiofrequency Fields from Wireless Telecommunication Devices," Royal Society of Canada for Health Canada, March (1999). Exhibit B-67.

89. As recently as November of 2003, after reviewing the science, including studies cited by Appellants, the United Kingdom's National Radiologic Protection Board does not support the claims by Appellants:

> The weight of evidence now available does not suggest that there are adverse health effects from exposure to RF fields below guideline levels…

"Health Effects from Radiofrequency Electromagnetic Fields," Report of an independent Advisory Group on Non-ionizing Radiation. National Radiologic Protection Board, Volume 14, Chairman: Professor A. J. Swerdlow, November (2003). Exhibit B-68.

90. These reports were largely addressed to concerns about possible health effects of RF and microwave energy from mobile communications systems, but they considered all relevant evidence related to possible health risks of RF energy at all frequencies. Exhibit B-60.

91. The consistent conclusions of these international expert organizations and health agencies confirm that the FCC Guidelines on RF continue to represent the best scientific thought on the health and safety effects of RF. Exhibits B-37, B-60. The Board sees no reason to depart from these well-considered and thoroughly studied exposure limits.

d. The Issues Raised by Appellants Have Been Raised by Related Parties and Rejected in FCC Proceedings and the Courts

92. When the FCC adopted the current RF emissions Guidelines in 1996, it considered all aspects of RF emissions related to public safety, including non-thermal effects. *Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, Report and Order, 11 FCC Rcd. 15123 (1996)(*FCC RF Order*), Exhibit B-1.

93. In 1997, the FCC reaffirmed its decision and rejected petitions for reconsideration which asserted that the 1996 revisions were inadequate to protect against non-thermal biological effects. Those petitions were accompanied by many of the same studies addressed in this proceeding. *See Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, Second Memorandum Opinion and Order and Notice of Proposed Rulemaking, 12 FCC Rcd. 13494, 13503-05 (1997)(*FCC RF Reconsideration Order*), Exhibit B-1.

94. In 1999, in the context of an attempt to stop the consolidation of broadcast towers on a mountain "antenna farm" overlooking Denver, Colorado, the FCC was confronted with a claim that it should revise its RF Guidelines by

taking into account non-thermal effects of RF. *Canyon Area Residents for the Environment*, 14 FCC Rcd. 8152, 8155 (1999). In response, the FCC held:

> CARE claims that the Commission has violated the National Environmental Policy Act (NEPA) of 1969 (Sections 5 and 6) and that the Commission's Guidelines are not sufficiently protective of human health. The Commission adopted new RF exposure Guidelines (ET Docket 93-62) following a one-year period for public comment with hundreds of pages of comments being filed with the Commission from industry, trade associations, citizens and expert federal health and safety agencies. CARE's collateral attack on the Commission's RF exposure Guidelines is not timely and is dismissed."

Id. (citations omitted). The FCC concluded that:

> it is important to point out that biological 'effects' are not the same as biological 'hazards.'

Id. at 8157.

95. In 2000, the FCC Guidelines were upheld as reasonable by an appellate court in *Cellular Phone Taskforce v. FCC*, 205 F.3d 82, 90 (D.C. Cir. 2000), *cert. denied,* 531 U.S. 1070 (2000). The Court found that:

> In promulgating their standards, both the ANSI and the NCRP considered non-thermal effects.

Id. The Court went on to find that there was "no reliable scientific data" to show non-thermal effects to be "meaningfully related to human health" and that:

> the existence of non-thermal effects is clouded by a host of conflicting reports and opinions.

Id.

96. In 2001, EMR Network petitioned the FCC to commence a new proceeding to examine the issue of non-thermal effects of RF emissions. Appellants' witness, Mr. Kasevich, serves on the Board of Advisors of EMR Network. Kasevich Tr. at 619, 737-38. The FCC declined to initiate a new proceeding, concluding that EMR Network had presented no new evidence to link non-thermal effects of RF emissions to a public health risk, and that no other expert agency, such as the EPA, had changed its position on this issue so as to warrant further FCC action. The FCC concluded that:

> This is not to say that this Commission could not or would not initiate action in the face of compelling evidence of a need for such action. But, where, as here, other more expert agencies have the same information as we have and do not see reason for action . . . it would be difficult for us to ignore the tacit conclusions of those agencies, absent a compelling case to do so.
>
> *Id.* at 16824, n. 14.

97. *EMR Network Petition for Inquiry to Consider Amendments of Parts 1 and 2 Regarding Effects of Radiofrequency Radiation*, Order, 18 FCC Rcd. 16822, 16824-26 (2003), *appealed sub nom. EMR Network v. FCC*, 03-1336 (D.C. Cir.), *oral argument set for September 27, 2004*.

98. The FCC also rejected EMR Network's claim that the IEEE could not be trusted to evaluate RF issues because of an innate industry bias. *Id.* at 16826 (The IEEE is a non profit organization "with members representing a variety of interests, including government, industry, and academia" and that it is "composed of leading experts in this area").

99. A Federal District Court in Maryland has rejected expert testimony claiming a causal link between low-level RF emissions from cell phones (well below the RF Guidelines) and cancer. *Newman v. Motorola, Inc.*, 218 F. Supp. 2d 769, 783 (D. Md. 2003), *aff'd*, 78 Fed. Appx. 292; 2004 U.S. App. 21367; 62 Fed. R. Evid. Serv. (Callaghan) 1289 (4th Cir. Oct. 22, 2003). The testimony of Dr. Neil Cherry was rejected by the Court as "largely irrelevant to the issue of causation." Similarly, the testimony of Dr. Henry Lai was rejected on grounds of relevance and fit, and because "(h)is published studies have not been replicated by other scientists."

100. The FCC continues to vigorously enforce its RF Guidelines, and when necessary, it fines licensees who operate facilities which emit RF at levels higher than the Guidelines. *See Americom Las Vegas Limited Partnership (KWNZ, Carson City Nevada), Forfeiture Order*, DA 04-1533, 2004 FCC LEXIS 2825 (EB, rel. May 28, 2004) (station fined $10,000 for exceeding the public MPE).

I. Appellants Presented No Credible Evidence that Exposure to Low Levels of RF Causes Adverse Health Effects

a. The Issues and Studies Cited by Appellants are Not New. They Have Been Fully Reviewed and Rejected as the Basis for New Standards

101. Appellants' expert, Raymond Kasevich, claims that the few studies he cites provide new scientific data that there are "medical effects resulting from chronic exposure to [RF] field intensities at or below the current FCC MPE limits" Exhibit A-1, RSK 1 at 43.

102. Appellants' expert, Dr. Martin Blank, asserts that his studies and the other studies he cites provide new scientific data that "long term, low-level exposure to radio frequency radiation – even in ranges previously thought to be safe may present a serious health risk. " Exhibit MB-1 at 21.

103. As discussed above, the opinions of Dr. Blank and Mr. Kasevich are not supported by the various national and international scientific and regulatory bodies that have examined the issue in detail. Dr. Blank and Mr. Kasevich have chosen to focus upon a few unrelated studies that they believe support their viewpoint, but choose to ignore thousands of relevant studies that have been reviewed by independent scientific expert panels. Exhibits B-37, B-60.

104. The Appellants' assertion that they are presenting "new" science to the Board that was not considered by the expert panels is false. Both of Apellants' experts assert that the studies that they cite have been ignored by the various national and international scientific and regulatory bodies who have examined the issue. This is false. The primary studies cited by Blank and Kasevich have in fact been reviewed, as summarized in the table below:

Studies cited by Appellants	Exhibits Demonstrating Consideration of the Studies cited by Appellants
A. Ahlbom et al., A pooled analysis of magnetic fields and childhood leukemia" (2000)	B-65 at 50 (Netherlands)
B. Boscolo, P. "Effects of electromagnetic fields produced by radio-television broadcasting stations on the immune system of women" (2002)	B-44 at 69 (Sweden)
C. Greenland et al., "A Pooled Analysis of	B-65 at 50 (Netherlands)

	Magnetic Fields, Wire Codes, and Childhood Leukemia" (2000)	
D.	Michelozzi, et al., "Adult and Childhood Leukemia near a High-Power Radio Station in Rome, Italy" (2001)	B-68, at 142; B-69, at 26; B-71, at S73; B-92, at S73;
E.	Persson, Salford, Brun, "Blood-brain permeability in rats exposed to electromagnetic fields used in wireless communication" (1997)	B-44 at 75; B-46 at 106; B-66 at 112; B-68 at 89; B-69 at 26; Exhibits B-92 at S145;
F.	Repacholi, et al., "Lymphomas in Eu-Pim 1 Transgenic Mice Exposed to Pulsed 900 MHz Electromagnetic Fields" (1997)	Exhibits B-43 at 28; B-44 at 75; B-46 at 106; B-63 at 140; B-66 at 112; B-67 at 139; B-68 at 89; B-69 at 26; B-72 at S99; B-92 at S106, S213;
G.	Utteridge (2002)	B-66 at 113; B-68 at 89; B-69 at 27; B-72 at S99; B-92 at S99, S106, S213
H.	Zwamborn, "Effects of Global Communication system radio-frequency fields on Well Being and Cognitive Functions of human subjects with and without subjective complaints" (2003)	B-68 at 98; B-68 at 118

105. Moreover, the studies cited by Kasevich and Blank suffer from severe limitations. The studies cited by Kasevich have limitations that prevent any firm conclusions being drawn from them (as has been pointed out in the expert reviews). These include: (1) very small size, which means that the studies have very poor statistical power; (2) ecological design (i.e. lack of individual measures of exposure and control of individual subjects, which makes it impossible to control for confounding variables) and (3) nonexistent exposure assessment or very large uncertainties in exposure assessment. Finally, other epidemiology studies on the same subject have failed to support the conclusions in these reports, and there is no supporting animal data or a plausible biological rationale for health effects of the sort that were reported. For all of these reasons, these studies have

not been persuasive to the expert objective scientific committees that evaluated them. Exhibit B-60.

b. Most of the Research Cited by Appellants Relates to Irrelevant Frequencies

106. As a threshold matter, any testimony regarding "microwave radiation" is not relevant to the RF generated by WIZN. The frequency at which WIZN operates, 106.7 MHz, is well below (one-tenth the frequency of) the microwave band (1000 - 300,000 MHz), and its emissions are not properly characterized as microwaves. Most of the research involving potential health problems from microwave energy involved exposures to energy at 915 MHz to 2.45 GHz or (up until about 1990) and more recently at cellular phone frequencies ranging from 800 MHz to 1.9 GHz. These studies have very limited relevance to bioeffects from exposures at 106.7 MHz. Exhibit B-60.

107. At the other end of frequency spectrum, nearly all of the studies cited by Blank involve exposure to extremely low frequency (ELF) fields, such as from power lines operating at 50-60 Hz. The frequency is so different (operating at 50-60 Hz vs. 106,000,000 Hz) that there is no reason to expect that the studies have any relevance at all to RF. All known biological effects of electric or magnetic fields depend on the frequency. For example, it is possible to get a shock from 60 Hz currents. The thresholds for producing shocks from 600 Hz currents are far higher than at 60 Hz, and currents at 6 MHz do not produce shocks at all. Consequently, reported biological effects at 60 Hz have no relevance at all to possible effects from fields at the frequency at which WIZN operates, 106.7 MHz (a frequency with a wavelength 2000 lines shorter than 60 Hz). Exhibit B-60.

108. Dr. Blank's own research has focused almost exclusively on EM fields from power lines or extremely low frequencies (ELF), not RF. Blank Tr. at 473. Likewise, the studies from other scientists which he submitted to the Board dealt almost exclusively with ELF, not RF. Blank Tr. at 474. There has been no demonstration that the scientific community accepts ELF studies as probative on issues of health effects from RF.

109. The relevance of studies relating to power lines to those effects of radio waves is "so remote as to be nonexistent" Foster Tr. at 245, 372-3; Exhibit B-60.

c. Dr. Blank's Contentions that National and International Scientific Boards and Regulatory Agencies are Biased and Lack Expertise are Not Credible

110. Dr. Blank testified that national and international entities charged with protecting health - such as ICNIRP, the EEU, Health Canada and the World Health Organization – are biased, in that they have an agenda that differs from their stated goal of protecting human health. Blank Tr. at 512-13. His attack on the claimed lack of expertise, and bias of the numerous expert bodies that support the FCC Guidelines and ICNIRP standards, is not substantiated or persuasive. Dr. Blank's opinion that the entities that recommend adhering to the existing standard - i.e., the NCRP, IEEE, FCC, ICNIRP, etc. - have a "psychological, political or personal commitment to recommendations made in the past" is speculation and is unsupported by any other demonstrable evidence or a finding by any body of competent jurisdiction. Exhibit A-4 at 8-9, Blank Tr. at 476.

111. Likewise, this Board cannot dismiss the unanimous conclusions of these entities based on Dr. Blank's opinion that they have "limited expertise." It should be noted that the entity Dr. Blank claims has the most expertise - the Bioelectromagnetics Society - does not support Dr. Blank's scientific position, but rather maintains a position of neutrality on the issue of low level RFR exposure. *See* Exhibit B-92. As demonstrated above, the organizations that have traditionally reviewed scientific evidence and recommended standards represent the best cross-section of experts in their field. The expertise these entities possess is certainly far greater than the Board's own and the universe of studies they considered far greater than the few studies relied upon by Mr. Kasevich and Dr. Blank.

d. A Biological Response to Low Levels of RF Does Not Equate to Adverse Health Effects

112. Dr. Blank claims that his own research findings regarding low-level RF show a biological effect in the form of cellular stress protein synthesis, a so-called non-thermal effect of RF. By itself, however, this proves nothing. As Appellants' own expert testified, a biological response does not mean there is a health effect or an adverse health effect. Kasevich Tr. at 748-49. *Cf.* Exhibit B-37 at 19-21. Mr. Kasevich further elaborated on this point.

113. The lack of a connection between a simple biological response, such as cellular stress protein synthesis, and actual biological harm has been enunciated by a number of expert organizations.

114. In 2002, the Health Council of the Netherlands specifically addressed the difference between biological effect and adverse effect:

> In analysing the available data, it is important to distinguish between biological effects and health effects. A biological effect is considered to be a physiological effect that is induced by an external cause and that falls within the natural limits between which processes and functions of a living organism can vary without this leading to adverse health effects. A health effect is the negative consequence for the health of an organism of the inability to sufficiently compensate physiological effects. If an effect has been demonstrated in experimental research on an isolated biological system, for instance an effect on cultured cells, this does not necessarily imply that there will be adverse effects for the health of the organism as a whole. Nor, in the absence of supporting evidence, should effects detected by sensitive measurement methods, such as subtle changes in reaction speed or in the natural

> pattern of brain waves during sleep in humans, be regarded as harmful to health. The reason for this is that the human body has a great capacity for adequately processing all sort of influences acting on it from outside and, if necessary, effectively resisting them (with the aid of the immune system), compensating for them (homeostasis) or successfully adapting to them physiologically (specifically with the nervous and the endocrine systems).
>
> An example of a biological effect that cannot be regarded as an adverse effect on health is the change brought about by visible light which is also electromagnetic fields-in the rods and cones in the cells of the retina. These changes lead to electrical signals which are relayed via the optic nerve to the brain, where they are interpreted, allowing individuals to see their environment. One of the most important sensory observations in man is thus brought about by virtue of the fact that electromagnetic fields induce biological effects in the body.

"Mobile Telephones: An Evaluation of Health Effects," Health Council of the Netherlands (2002). Exhibit B-44 at 41-42.

115. In 1999, Royal Society of Canada for Health Canada, after reviewing the science, including studies cited by Appellants, agreed that there may be biological effects of RF, but there is no evidence that such effects are adverse:

> It is clear to the panel that there are a number of observed biological effects of exposure of cells or animals to non-thermal levels of exposure to RF fields. These observed biological effects meet the common standards for scientific observation in that the experiments were well-designed, had appropriate positive and/or negative controls, contained valid RF exposure parameters, included appropriate statistical evaluation of the significance of the data, and have been observed to occur by more than one investigator (see body of report for details).
>
> The importance of these observed biological effects mediated by non-thermal levels of RF exposure in relation to regulation of RF exposure to the human population as outlined in Safety Code 6, lies in the degree of association of these biological effects with documented health effects. Not all of the biological effects observed in cells and animals following exposure to a variety of stimuli result in adverse health effects to the organism. For example, when a phone rings, a person can hear the sound, is capable of responding to the sound by picking up the phone or, in some cases, may be startled in response. Clearly, this is a

> biological effect that does not have any overt adverse health effects on the organism. For this reason, the panel was particularly sensitive as to whether the biological effects which have been observed in cells and animals following RF exposure have been documented by additional studies to show adverse health effects in the exposed organism. The panel found no evidence of documented health effects in animals or humans exposed to non-thermal levels of radiofrequency fields. The panel therefore does not recommend that Safety Code 6 be altered to include regulation at the non-thermal levels of RF which have been shown to produce these biological effects.

"A Review of the Potential Health Risks of Radiofrequency Fields from Wireless Telecommunication Devices," Royal Society of Canada for Health Canada, March (1999). Exhibit B-67 at 110-11.

116. Moreover, in the paper entitled *Microwave Effects on the Nervous System*, the authors discuss the differentiation between biological effect and adverse effect:

> An adverse effect is a biological effect characterized by a harmful change in health. For example, such changes can include organic disease, impaired mental function, behavioral dysfunction, reduced longevity, and defective or deficient reproduction. Adverse effects do not include: biological effects without a detrimental health effect, changes in subjective feelings of well-being that are a result of anxiety of RF effects or impacts of RF infrastructure that are not related to RF emissions, or indirect effects caused by electromagnetic interference with electronic devices. An adverse effects exposure level is the condition or set of conditions under which an electric, magnetic, or electromagnetic field has an adverse effect.

Exhibit B-92 at S138.

e. Appellants' Experts Concede that Research on Stress Protein Response Does Not Demonstrate Adverse Health Effects

117. Even if we assume that low-level exposure to RF which is not the consensus view, Bernstein Tr. at 752-53, causes a statistically meaningful increase in stress protein synthesis, Appellants' experts admit that this does not establish the existence of adverse human health effects. Stress protein synthesis is an orderly and normal biological process that has in fact been shown to have beneficial health effects. Blank Tr. at 538, 543-44. As Dr. Blank concedes, humans "go through this process of protein synthesis all the time." Blank Tr. at 538. It has not been proven that

stress protein synthesis from low level exposure to RFR is anything other than orderly. Dr. Blank further admits that "whether there is an interaction with DNA, I don't know." Blank Tr. at 552. Dr. Blank could not testify with any certainty that there is a negative interaction with DNA. Blank Tr. at 552-53. Dr. Blank admits that the health effects of protein synthesis "haven't been investigated sufficiently." Blank Tr. at 543. Accordingly, this Board cannot conclude that stress protein synthesis has any negative effects on DNA.

118. Appellants' own experts concede that the research on biological effects from low-level exposure to RFR has not demonstrated such exposure causes adverse human health effects. Dr. Blank squarely admitted:

> {T]he fact is there isn't enough data there to kind of make that linkage between exposure and some deleterious change in a human. . . . I can't say that it is harmful . . .

Blank Tr. at 50. Dr. Blank could not assert that the people of Charlotte were in harm's way due to the tower, "because the data are not strong enough in terms of health." Blank Tr. at 536.

119. Dr. Bernstein readily agreed that no adverse human health effects had been proven from low-level exposure. Bernstein Tr. at 749, 751.

120. Mr. Kasevich recognized the absence of proof of health effects. Kasevich Tr. at 859, 883. He conceded that there is no definitive proof of health effects at exposures below the FCC standard and that there is no consensus within the medical community on low-level RF exposure. Kasevich Tr. 757-59. Unlike the ionizing radiation exposure in Hiroshima, low level exposure over a long period of time would not have similar effects. Mr. Kasevich Tr. at 772. Kasevich was also not aware of anything that demonstrates that there is a change in the structure of DNA as a result of low-level exposure to RF.

121. It would be pure speculation at this point for this Board to find that low-level exposure to RFR causes adverse health effects. At best, Appellants have made the case that low-level RF exposures deserve continuing study. As summarized by Dr. Blank: "We're at the beginning of things. We don't know quite where we are going. ... [T]here are unexplored areas we really don't know [enough] about." Blank Tr. at 527- 28. As Blank admitted, his cell research is at a very early stage. It would be improper for this Board to prematurely speculate as to where this research will lead.

122. As succinctly stated by Dr. Bernstein: "[C]ell studies don't prove adverse health effects", Bernstein Tr. at 749, and "there are no health effects that we know of from the changes in Dr. Blank's studies." Bernstein Tr. at 764-

65.

f) Claims that Low Levels of RF May Cause Cancer are Totally Unsupported.

123. In his prefiled testimony, Dr. Blank subtly, but clearly, raised the specter of cancer with a strained chain of unsupported speculation. He claimed that RF can cause stress protein synthesis which may affect DNA at the cellular level, and:

> Cancer is believed to result from mutations in DNA, and stimulation of DNA to start protein synthesis indicates that RFR can stimulate DNA…. Are DNA breaks indicative of cancer? We do not know, but breaks in DNA are certainly one possible mechanism to cause a mutation… The cell is very complicated and there are still more questions than answers, but most will agree that a linkage between RFR and cancer is possible through reported effects on DNA.

Exhibit MB-1 at 20.

124. In his live testimony Dr. Blank was also very cautious about the claim.

> I don't want to use the word cancer, but that is the word that has motivated a lot of the research around here. It's been a bit of a red herring because people - you know, they throw it in and some people react. They get violent. They say it can't be cancer. Other people say it must be.

Blank Tr. at 524.

125. In his prefiled testimony, Mr. Kasevich never made a claim regarding cancer, but does submit a few studies which touch on the issue.

126. Despite such carefully limited claims in the testimony, Appellants' counsel used the word "cancer" eighteen (18) times, in the proposed findings submitted prior to the hearing, with many claims of causation.

127. There is absolutely no reasonable basis to conclude that low levels of RF cause cancer. Appellants' experts provide no credible evidence, and there is none. It is pure speculation.

128. The Health Council of the Netherlands addressed the issue in "Electromagnetic Fields: Annual Update 2003,":

> The Committee concludes that there is no convincing evidence that, in experimental animals, the incidence of lymphomas and

> other types of tumours is influenced by life-time, virtually daily exposure to electromagnetic fields…

Exhibit B-66 at 95.

129. In 2000, the United Kingdom's Independent Expert Group on Mobile Phones, Exhibit B-63 at 102, after reviewing the science, including studies cited by Appellants, found:

> The epidemiological evidence currently available does not suggest that RF exposure causes cancer. This conclusion is compatible with the balance of biological evidence, which suggests that RF fields below Guidelines do not cause mutation, or initiate or promote tumor formation.

Exhibit B-63 at 102.

130. In 1998, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) stated:

> There is no evidence that ELF fields alter the structure of DNA and chromatin, and no resultant mutational and neoplastic transformation effects are expected. This is supported by results of laboratory studies designed to detect DNA and chromosomal damage, mutational events, and increased transformation frequency in response to ELF field exposure

Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz). International Commission on Non-Ionizing Radiation Protection Guidelines. (1998). Exhibit B-43, at 9

131. In the Bioelectromagnetic Journal, an article entitled, *Epidemiological Studies of Radio Frequency Exposures and Human Cancer,* by J. Mark Elwood, concludes:

> The epidemiological results fall short of the strength and consistency of evidence which is required to come to a conclusion that RF emissions are a cause of human cancer. Although the epidemiological evidence in total suggests no increased risk of cancer, the results cannot be unequivocally interpreted in terms of cause and effect. The results are inconsistent; and most studies are limited by lack of detail on actual exposures, short follow-up periods, and the limited ability to deal with other relevant factors. In some studies, there may be substantial biases in the data used. For these same reasons, the studies are unable to confidently exclude any possibility of an increased risk of cancer. Further

> research to clarify the situation is justified. Priorities include further studies of leukemia in both adults and children, and of cranial tumors in relationship to mobile phone use.

Exhibit B-92 at S72.

132. In the Bioelectromagnetic Journal, an article entitled, *Radio Frequency Electromagnetic Fields: Cancer, Mutagenesis, and Genotoxicity,* by Louis Henicks, Sheila Johnson and Patricia Mason, concludes:

> A large number of epidemiologic/occupational studies are reviewed herein, pertaining to whether exposure of various population segments to electromagnetic fields in the nominal frequency range of 3 kHz to 300 GHz can initiate or promote cancer. Although positive findings on carcinogenic effects from exposure to RF/EMF were reported in some studies, the weight of the statistical evidence supports the conclusion of no RF/EMF induced cancer effects in humans. If future epidemiologic studies are to be conducted, they should provide greater statistical power to pick up more obscure cancer effects (if they exist) within larger populations, such as from exposure to the rapidly increasing use of mobile phone systems.
> …
> Overall, pending any positive findings of new studies under way or planned, the findings of this review indicate that there is no reproducible scientifically valid experimental basis for the claims about a linkage between such exposures and the initiation, promotion, or copromotion of cancer.

Exhibit B-92 at S96.

133. In the Bioelectromagnetic Journal, an article entitled, *Survival and Cancer in Laboratory Mammals Exposed to Radiofrequency Energy,* by Joe Elder, concludes:

> In conclusion, the weight-of-evidence in studies of the same animal populations shows that RF exposure does not adversely affect survival or cancer incidence at whole body SARs $\leq$4 W/kg and brain SARs $\leq$2.3 W/kg.

Exhibit B-92 at S106.

134. Despite all of the above, Mr. Kasevich testified that, based upon "the papers sited [sic] in [his] testimony, there is scientific evidence that long term, low-level exposure to radio-frequency and microwave radiation may cause long term problems, especially in pregnant women, unborn children, small children, elderly and other sensitive populations." Exhibit A-1 at 16**.**

The scientific evidence does not support a connection between long term, low-level exposure to RF and health problems for alleged sensitive populations. As discussed above, reviews of the subject by national and international scientific boards and regulatory bodies have consistently found this claim to be unsubstantiated. Mr. Kasevich's opinion is not scientifically valid and is well outside the mainstream of scientific evidence.

f. Mr. Kasevich's Calculations Show that Biological Effects Are Only Triggered at Levels in Excess of the FCC Guidelines

135. Dr. Blank claims that there is a stress protein response at levels ranging from 8 to 20 Milligauss (mG). Exhibit A-2, MB-1, Table at 12 . That table shows background levels equal to around 1 mG.

136. Asked to convert the relative levels of RF, Mr. Kasevich stated: "If you take a hundred percent of the FCC limit, the full 200 microwatts [per centimeter squared], that represents a milligauss." Kasevich Tr. at 847.

137. Given the chance, by Appellants' counsel, to reconsider his calculations, Mr. Kasevich only reaffirmed them. Kasevich Tr. at 874-75, 877-878, 929-934. When asked what two to three mG would mean, he answered "it would be something like 400" [microwatts per centimeter squared]. Kasevich Tr. at 879. This level would be twice the FCC limits.

138. Almost all of the 600 RF readings for the Project show levels less than 10% of the FCC standard, which is less than 20 microwatts per centimeter squared. Therefore, according to Mr. Kasevich's calculations, the Charlotte RF levels would be 10 % of the background levels of 1 mG . At such levels, there is no evidence that the RF levels in the vicinity of the Project would come close to those levels of mG required to create a stress protein response, assuming the studies are reliable.

J. The Project is in Compliance with the FCC Guidelines

a. WIZN's Expert, Donald L. Haes, Jr., Provided Credible Evidence of Compliance with FCC Standards

139. Donald L. Haes, Jr., MS, CHP, is one of WIZN's expert witnesses on RF. Mr. Haes is a Consulting Health Physicist and Radiation Safety Specialist. He has a Master's Degree in Science, in Radiological Sciences and Protection. He specializes in the field of non-ionizing radiation, including radio-frequency and microwaves, lasers, and ultraviolet radiation. He has extensive experience in the United States and the U. S. territories calculating potential exposure to, and performing field measurements of

RF from radar installations, TV/AM/FM antennas, telecommunications facilities, RF induction heater/sealers, as well as medical and biological research facilities.

140. Mr. Haes was the Radiation Protection Officer at the Massachusetts Institute of Technology (MIT) from 1988 to 2001. He has been a consultant for numerous State, Federal, and local governmental agencies, industry, and local communities since 1988. He currently teaches radiation safety courses at the Harvard School of Public Health Continuing Education Program, and at MIT.

141. Mr. Haes currently hold memberships in the Health Physics Society (HPS); the American Academy of Health Physics (AAHP); the Laser Institute of America (LIA), the Institute of Electrical and Electronics Engineers (IEEE); and the International Committee for Electromagnetic Safety (ICES). At ICES, he is involved in the following subcommittees (SC): SC-2: Terminology and Units of Measurement; SC-3: Safety Levels With Respect to Human Exposure, 0-3 kHz; SC-4 Safety Levels With Respect to Human Exposure, 3 kHz-300 GHz. Mr. Haes is on the Institute of Electrical and Electronics Engineers, Inc. (IEEE) Board as an independent consultant. The IEEE sets state safety standards for various industries and was the board that worked on the Guidelines adopted by the FCC, with which FM broadcasters such as WIZN must comply.

142. Mr. Haes is a board-certified health physicist. There are fewer than 20 board-certified health physicists in the world who deal with non-ionizing radiation, such as FM radio. Mr. Haes's Curriculum Vitae is set forth in Exhibit B-49.

(i). Equipment and Methods Used by Mr. Haes in his RF Testing

143. Mr. Haes performed a series of RF tests at the Project and the surrounding area in 1997 and 1998, and again in 2003 and 2004. Mr. Haes has taken over 600 actual RF readings at more than 50 different locations in the vicinity of the Tower. These readings are shown in more detail in ten reports issued by Mr. Haes, as further detailed in Exhibits B-50, B-78a to B-85 and Exhibit B-91. All of the readings in the reports are well within the limits set by the FCC Guidelines.

144. In undertaking his testing, Mr. Haes followed the procedures specified in the Federal Communications Commission [FCC] Office of Engineering and Technology [OET] Bulletin 65: *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*, Edition 97-01; August 1997. Within these guidelines are also references to the American National Standards Institute (ANSI),

"Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave," ANSI/IEEE C95.3-1991; the National Council on Radiation Protection and Measurements (NCRP), "Radiofrequency Electromagnetic Fields; Properties, Quantities and Units, Biophysical Interaction, and Measurements," NCRP Report No. 67, 1981; the National Council on Radiation Protection and Measurements (NCRP), "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," NCRP Report No. 86, 1986, and the National Council on Radiation Protection and Measurements (NCRP), "A Practical Guide to the Determination of Human Exposure to Radiofrequency Fields," NCRP Report No. 119, 1993.

145. Mr. Haes used the following equipment to take his readings:

i. A Narda Model 8715 Electromagnetic Radiation Meter directly coupled (no connecting cable) with Model B8742D Broadband Isotropic Electric Field Probe. The Model B8742D probe provides a meter read-out in % MPE for members of the public (percent of FCC Guidelines Maximum Permissible Exposure for uncontrolled areas). The probe of choice in a mixed-frequency environment is the broadband type - that is, it responds to a wide range of frequencies. Cost: $3,000.

ii. Narda Model 8718 Electromagnetic Radiation Meter, coupled with 1 meter of cable to Model 8731 Magnetic Field Probe. Cost: $6,000.

iii. Narda is one of the world's leading companies in the manufacture of accurate, reliable RF field strength meters and is the industry standard equipment for RF field measurements for assessing human exposure. The instruments used by Mr. Haes satisfy the criteria outlined in FCC Bulletin OET-65.

146. For his field measurements, Mr. Haes used equipment calibrated within one year. Mr. Haes performed a spot check with the internal check source of the meter prior to obtaining the measurements. All of the equipment was working properly and within its operating temperature range when Mr. Haes took the RF measurements that were submitted to the Board.

(ii). The Project is in Compliance with the Guidelines in the Theoretical Modeling and the Actual Testing

147. Utilizing the protocols established by the FCC's Office of Engineering Technology, Mr. Haes has twice determined that the Project is in full compliance with the FCC Guidelines in reports that are entitled: "The Evaluation of Compliance with RF Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields," dated August 17, 1997, and

October 31, 2003 (the "Haes Compliance Reports"). Exhibits B-50 and B-85.

148. The Haes Compliance Reports used the procedure specified in the FCC's OET 65 Supplement A, to determine compliance with the FCC Guidelines for RF exposure. Mr. Haes considered all transmitters mounted at their particular heights above ground on the Tower, and the location of the Tower relative to the surrounding topography. Using the FCC's OET 65 Supplement A as a guide, he prepared theoretical calculations of potential worst case RF field values, and compared the results to the established Guidelines for RF exposure.

149. The worst case would include areas where antennas on the Tower are lower than the surrounding terrain. These locations consisted of azimuths projecting to the East and Southeast up Pease Mountain, and to the North up Jones Hill. While the FCC requires consideration of any source that may produce a field in excess of 5% of the limits, Mr. Haes's methodology considered all potential sources of RF from the Tower, each simultaneously operating at full capacity. For the personal wireless services provider (Verizon Wireless), he assumed full capacity of the system (this is rarely the case except under extreme conditions). For the CVFRS communications, he assumed a perpetual "talk" mode (this situation could not occur due to potential over-heating of the equipment, and the inability to carry on a two-way conversation). For WIZN-FM, he considered both the main and auxiliary antennas. In addition, he assumed the ground would reflect the incident RF wave into the subsequent wave "in phase" such that the result would be almost twice ground conditions (actually 1.6 times greater). As power density and value are related by the square of field strength, a fraction of $(11.6)^2$ or 2.56 was used. Lastly, he assumed all transmitters were pointed in the same direction.

150. The net result of this worst, worst-case calculation was that the site was in compliance with the FCC guidelines.

(iii). Results of Mr. Haes's RF Field Tests

151. Haes has undertaken over 600 individual tests at over 50 different locations in the vicinity of the Tower. These measurements are consistent with the results of the theoretical model and show full compliance with the FCC Guidelines. To the extent that the actual readings differ from the theoretical model, those differences in all cases were a matter of a few percent, and do not call into question the validity of the theoretical model.

152. Over 95% of the results show readings under 10% of the MPE limits set by the Guidelines. No reading outside the Tower site was more than 12.3% of the MPE limits. The highest reading was a single reading of

25.4% of the MPE limits near the easterly guy wire anchor, which area is enclosed by a fence and posted with warnings.

153. Haes took over 110 readings at the Charlotte Central School. He tested in every room at the school and continuously measured the entire length of the school playground. All of the readings at the school were well under the Guidelines. In fact, only 3 readings were over 1% of the MPE limits and the highest reading was one reading at 2.11% of the MPE limits. Exhibits B-50, B-82, B-83 and B-90.

154. Mr. Haes also tested at the Charlotte Congregational Church. He tested in the Church parking lot, the children's room, the pastor's office, the secretary's office, at the playground, in the sanctuary, and in the parsonage. Of the 26 readings at the Church and the Church parking lot, the highest was 6.1% of the MPE limits. Most were less than 2% of the MPE limits. Exhibits B-50, B-51, B-82 and B-90.

155. Mr. Haes has tested in at least ten different residences in the vicinity, including tests at homes requested by Appellants. Most of the readings were less than 5% of the MPE limits. The highest reading was 8.4% of the MPE limits. Exhibits B-50, B-51, B-82 and B-90.

156. Mr. Haes's RF readings at the Tower area and on UVM land were also well within the limits set by the Guidelines. The highest reading on UVM land was 10.73% of the MPE.

157. The highest readings at the guy wires and the fences (areas not easily accessible by members of the public, and clearly marked with signage warning of nearby RF emission sources) were also below the limit set by the Guidelines. The highest reading was under 26% of the MPE. Exhibit B-84. All three sets of guy wires are completely enclosed by wooden fences.

158. The Haes Compliance Reports, even using worst case scenarios, combined with extensive field testing, show that all areas surrounding the Tower base, locations to the East and Southeast up Pease Mountain, and locations to the North up Jones Hill are projected to have, and in fact do have, RF levels significantly below FCC's Guidelines. Exhibit B-48.

159. The fact that the Tower on the Project is on the side of a hill did not present barriers to obtaining accurate RF readings. To deal with issues of re-radiation or scattering, the FCC, ANSI/IEEE, NCRP, and other professional organizations, recommend the use of an isotropic probe to read RF levels regardless of direction from which the RF comes. Mr. Haes used isotropic probes.

160. Based on his calculations, verified by more than 600 field measurements taken at more than 50 locations near the Project, and along the entire property boundary at the Project, Mr. Haes concluded that operation of the WIZN radio station is in full compliance with the FCC Guidelines for public RF exposure. Exhibits B-78 - 85 and B-90. Appellants' expert engineering witness confirmed that "none of [Mr. Haes] measurements violate the FCC limits." Kasevich Tr. at 803.

161. Based on his calculations, which are verified by more than 600 field measurements taken at more than 50 locations near the Project, and along the entire property boundary at the Project, Mr. Haes concluded that the Project will not create "undue air pollution."

162. Based upon his knowledge and experience, and the data he collected, Mr. Haes testified persuasively that the Project does not create a public health hazard.

b. The FCC Has Found WIZN's RF To Be In Compliance With Its Guidelines

163. In the FCC's Renewal of WIZN's License, dated July 1, 1999, the FCC found WIZN's transmitter to be in compliance with FCC Guidelines, based on its own testing:

> *Radiofrequency ("RF") exposure*. Fournier also expressed several concerns regarding the effects of excessive RF exposure at the WIZN site. In light of the complexity of the site, the staff referred all related data to the Office of Engineering and Technology ("OET"), the Commission's expert office in such matters. **OET has determined that, based upon its review of the instant data, along with its own measurements from a previous, unrelated visit to the site, the WIZN site complies with all pertinent Commission RF exposure Guidelines.** In particular, OET cited WIZN (FM)'s addition of insulating material to the Tower guy wires to eliminate excessive fields. Furthermore, OET noted several factors regarding the location and surrounding area that would indicate the remoteness of the site and the relative difficulty of access.

Exhibit B-77 at 3 (emphasis supplied).

164. The findings of the FCC in 1999 are consistent with the Mr. Haes' studies in 1998, as well as those undertaken in 2003 and 2004. Both use of the FCC's theoretical model and the more than 600 data points show compliance with the FCC Guidelines. There have been no subsequent

changes to the WIZN transmission facilities which would alter this conclusion.

c. The Appellants' Expert, Raymond Kasevich, was Not Credible, Especially in Regard to his Data from Contact or Near Contact Readings

165. Mr. Kasevich is Chairman of the Board and Chief Scientist of KAI Technologies, LLC, and Vice President and Chief Scientist of CS Medical technologies, LLC. Mr. Kasevich is a registered Professional Engineer in Massachusetts.

166. Mr. Kasevich spends a significant portion of his time in the field of medical research relating to the use of invasive microwave technology. Exhibit A-1. His only direct experience with the siting of a commercial broadcast radio facility was when he evaluated a proposed site in Greenwich, Connecticut in 2001. Exhibit A-1. As that was a proposed, not an operating broadcast station, Mr. Kasevich did not perform any RF field tests on the project. His analysis was never used in any proceeding. Kasevich Tr. at 629.

167. WIZN is the "very first" operating broadcast station that Mr. Kasevich has ever evaluated. Kasevich Tr. at 628.

168. Mr. Kasevich emphasized the alleged complexity of the area surrounding this particular Project. Exhibit A-1 at 27-27; 30-34. Kasevich Tr. at 633. However, he also testified that he believes that all sites are complex. Kasevich Tr. at 641.

(i). Mr. Kasevich's RF Field Test Records are Incomplete and Suspect

169. Mr. Kasevich failed to correctly record the days on which he performed his testing. Kasevich Tr. at 676-77.

170. Mr. Kasevich's "performed a lot of screening measurements" which went unreported (Kasevich Tr. at 651), and he testified that he failed to record additional measurements, submitting only those he "wrote down," *Id.* at 652. Furthermore, readings from December 4th were excluded. *Id.* at 678. This unrecorded and unreported data represents a complete failure of the scientific method, suggesting that he discarded data inconsistent with his hypothesis. This concern is buttressed by the Appellants' objection to providing the records of any other readings he may have taken. *Id.* at 655.

171. Mr. Kasevich testified that he always repeats reading and that he sometimes “looked at certain spots again.” Kasevich Tr. at 709. However, his field notebook failed to record whether a particular reading was the first, or the second time, and he may have discarded data that he considered inconsistent.

(ii). Results of Mr. Kasevich's RF Field Tests that were Disclosed

172. Mr. Kasevich submitted some RF readings taken around the Project that appear to exceed the limits set by the FCC Guidelines. *See* Kasevich Prefiled Testimony (Exhibit A-1). Mr. Kasevich measured five areas that appeared to be over the FCC Guidelines - Locations 3 (Haes F3!!), 4 (Haes F4!!), 8 (Haes G8!!), and 11 (Haes E 18!!), 18 (Haes E18!!). Mr. Kasevich referred to the locations of these readings as "hot spots." See Kasevich Exhibit RSK 23 and Exhibit B-90 at Table 5.

173. On March 4, 2004, Mr. Haes, WIZN's RF expert, met Mr. Kasevich in Charlotte, Vermont, and tested at all but two of the locations that were previously tested by Mr. Kasevich (Mr. Haes was not provided access to those two locations), including the locations that the Appellants claimed were in excess of the MPE. Mr. Kasevich accompanied Mr. Haes to each testing location and showed him exactly where he obtained his measurements. Exhibit B-90.

174. Mr. Haes's measurements which were taken at the same locations where Mr. Kasevich tested were much lower than Mr. Kasevich's and well within the Guidelines. Mr. Haes's highest reading at the alleged "hot spots" was under 9% of the limits set by the Guidelines. See Exhibit B-90 at Table 5.

175. Mr. Kasevich's readings are inaccurate and much higher than Mr. Haes's readings because Mr. Kasevich did not use his equipment properly when making his field readings. Nor did Mr. Kasevich use established scientific methodology when he took his field measurements.

(iii). Mr. Kasevich Did Not Use His Equipment Properly

176. For all of his RF field measurements, Mr. Kasevich used a recently purchased (Fall 2003) Alpha Lab, Inc. RF Field Strength Meter, S/N9912-0016. The meter is a non-directional, single axis reading meter, with a sensitivity of +/-25%. According to the manufacturer's web site, its current cost is $299. Kasevich Tr. at 663.

177. There are no real instructions on how to use this meter. (Kasevich Tr. at 675). The meter did not include in its directions the kind of antenna used,

where it is located, how big it is, how it is coupled to the detection circuitry, and how nearby metal objects impact performance. Kasevich Tr. at 667. The opportunity for misunderstandings and misuse of the Alpha Lab meter are obvious.

178. The vendor of Mr. Kasevich's meter states it has an accuracy of +/-25%. But that claim is not supported by any data from measurements on fields, but rather by a test signal introduced into the meter. There is evidence that the meter is highly unreliable for field measurements. One independent test of the Alpha Lab meter, the type used by Kasevich, showed an average error of more than 200% in measurements of fields, which corresponds to more than 400% average error in measurements of power density of the field. *See* http://www.emfservices.com/RF-meters.htm.

179. Mr. Kasevich originally testified that the Alpha Lab meter indicated that the signals measured were from WIZN, and that he could tell this from Alpha Lab meter readings by switching between the wide and narrow band positions. Yet later, Kasevich admitted that WIZN (at 106.7 MHz) would appear on readings in both positions, as the wide band position measures signals from 0.5 MHz to 3 GHz, and the narrow band position measures signals from 100 MHz to 3 GHz. Kasevich Tr. at 681.

180. There is no certificate of calibration for the meter used by Mr. Kasevich, and no evidence that the actual meter used by Mr. Kasevich was calibrated. Kasevich Tr. 669. In particular, there is no evidence that meter was calibrated in close proximity to reflective surfaces. Kasevich Tr. 671-672. Nor is there evidence that the meter was calibrated for temperatures below 30 degrees F.

181. The Alpha Lab meter used by Mr. Kasevich does not fit the criteria for proper RF field strength determination outlined in the FCC's OET Bulletin 65. Exhibit B-3.

(iv). Mr. Kasevich Did Not Use Established Scientific Methodology in Testing

182. Mr. Kasevich consciously did not use established scientific methodology when he took his RF field measurements. He said he did not want "to be saddled with a standard operating procedure." Kasevich Tr. at 635.

183. Mr. Kasevich did not follow the standards set forth in Bulletin 65 in taking measurements. Kasevich Tr. at 634.

184. Further, Mr. Kasevich is not aware of the IEEE C.95.3 standard for measurement (Kasevich Tr. at 638), nor is he familiar with the NRCP Report No. 117 (Kasevich Tr. at 639). In fact, Mr. Kasevich's testing was not in conformance with any established protocol. Kasevich Tr. at 687, 693-94.

185. Mr. Kasevich had no way of knowing if local transmissions, from a cell phone, wireless computer network, security alarm, baby monitor, or wireless PA system were affecting his readings. Nor did he inquire about such transmissions before taking his readings. Kasevich Tr. at 682-85.

186. Though he was aware of the Alpha Lab instrument's published operating range minimum of 30 degrees Fahrenheit (F.) (Kasevich Tr. 703), most of his outside measurements were taken at temperatures well below 30 degrees F. Some measurements were taken when the temperature was probably 17 degrees F. (Kasevich Tr. 701), others when temperatures were 12 to 18 degrees F. (Kasevich Tr. 702). Kasevich failed to record temperatures in any notebook. Kasevich Tr. 706-707.

(v). Mr. Kasevich's "Hot Spot" Readings Result from His Decision to Take Measurements Near or in Direct Contact with Metallic Objects and Reflective Surfaces, in Direct Conflict with Industry Accepted Testing Practices

187. Mr. Kasevich described his protocol for taking measurements as follows: he placed the meter facing the tower; the meter was set to "wide"; readings were viewed directly from the meter face in units of microwatts per square centimeter; the meter was taped onto a PVC pole and on a stand in most cases. In cases where a window faced the tower, especially on an upper floor, he put the meter directly against the window frame, or sill, and into the corners of the window frame and the house. Kasevich Tr. at 692.

188. Mr. Kasevich told Mr. Haes that each of Mr. Kasevich's measurements that showed high readings was taken at distances of 1 cm. or less from the conducting surface. In fact, some of the readings were taken when the instrument was in **actual** contact with the **window frame**, sill and other surfaces. Kasevich Tr. at 673 (corner of window), at 674 (metal object close), at 675 (close proximity, to a conducting surface; contact with a conducting surface).

189. Despite stated concerns that he not allow his body to reradiate signals (Kasevich Tr. at 700, "you have to be five or six feet away"), Mr. Kasevich took numerous readings in corners and against windows (Kasevich Tr. at 695), and near a metal strip (Kasevich Tr. at 696). Mr. Kasevich was concerned with coupling to a human body, but not concerned about the "meter being in contact with or in close proximity to another conducting surface." Kasevich Tr. at 675.

190. The FCC/IEEE standard cautions "that 20 cm should be the minimum separation distance where reliable field measurements to determine adherence to MPEs can be made." Exhibit B-3 (OET-65) at 46. "The ANSI/IEEE 1992 standard specifies 20 cm as a minimum separation distance for such measurements." *Id.* at 49. When the RF probe comes very close to, or touches a metal object, the metal object becomes part of the antenna of the probe and the meter erroneously displays a higher level of RF than exists in the actual RF field. There is **no** increase in the RF field strength. The increase is due to the fact that the meter is calibrated for its internal antenna. When the probe is close or touching the metal object, the object becomes part of the antenna without any corresponding adjustment to the calibration to reflect the larger antenna. Therefore, the meter readings are inaccurate. Moreover, when the instrument is close or in contact with a conducting object that is immersed in an RF field, currents are coupled into the antenna that is inside the meter and into

other parts of the instrument. Under these conditions the meter acts as a voltage divider and the reading on the display is not a representation of the actual RF field.

191. About 10 of Mr. Kasevich's readings are meaningfully higher than those of Mr. Haes because Mr. Kasevich did not follow proper scientific methods for taking RF field readings. Therefore, Mr. Kasevich's high readings are meaningless for assessing compliance. Accurate measurements relevant to human exposure should be made with a separation distance of at least 20 cm from conducting objects and secondary sources, such as window frames, metal poles, guy wires, etc. Placing an RF sensing antenna (as in the AlphaLab RF meter) close to or even in contact with a conducting surface within an RF field will cause erroneously high and meaningless results.

192. The readings that Mr. Kasevich took at distances greater than 20 cm from conducting objects were close to the actual RF fields measured by Mr. Haes. Mr. Kasevich agreed that all of his readings, except for nine or ten "contact or near contact measurements" [referring to contact or near contact with conducting objects] were less than 10% of the OET-65 MPE. Kasevich Tr. at 716, 728. The highest reading made by Kasevich at distances greater than 20 cm from conducting objects was 18% of the MPE. Kasevich Tr. at 716.

193. Kasevich's field readings, taken within 1 cm. of the conducting object (see Exhibit B-90, Locations E18!!; E11!!; F3!!; F4; and G8!!) are not reliable because they were taken using a method specifically warned against by standard industry literature, and taken with inferior equipment not designed to take such "coupled" readings. Mr. Kasevich also failed to utilize appropriate scientific methodology as required by the FCC in OET Bulletin 65. The Board will not consider those readings.

194. The remainder of the Kasevich readings are not consistent with Mr. Kasevich's unexplained more complex theoretical model, but rather are consistent with Mr. Haes's theoretical model, Mr. Haes's 600 data points, and the FCC's findings of compliance following on site testing. Of all the approaches taken in this proceeding, we find Mr. Haes's approach to be the most credible and adopt his findings as to the actual RF environment surrounding the Project site.

K. The FCC Guidelines Are the Only Standards Supported by the Scientific Evidence

a. Dr. Blank's Threshold, at One-Billionth of the Universal Standard, is Unsupported and Unachievable

195. Appellants' experts were unable to provide the Board with a practical or scientifically-sound standard for RF exposure as an alternative for the FCC Guidelines. Despite the Board's repeated requests to Appellants' experts to provide some meaningful guidance with regard to an alternative standard, none was provided.

196. In his prefiled testimony, Dr. Blank wrote:

> [T]he biological threshold is about 10^{-12} W/kg. This means that the accepted safe occupational exposure level and the measured biological thresholds for cellular changes differ by a factor of over a billion.

Exhibit A-2 at 18.

197. Blank was not able to propose any practical mitigating measures to get down to this extremely low level. Blank Tr. at 586.

198. Nonetheless, Dr. Blank expressly admitted that he did not have an answer when asked to recommend an alternative standard (Blank Tr. at 515), ultimately suggesting that the public first be educated on the subject and then vote on it. Blank Tr. at 515-17. He suggested minimizing the standard (Blank Tr. at 532), but admitted that "we don't really know what the level should be." Blank Tr. at 532.

b. Kasevich's Exclusion Zone is Unsupported and Unachievable

199. Mr. Kasevich testified that he would support a standard that approximates what he asserts is background levels of 0.05 to 0.1 uW/cm^2. That level is 2000 to 4000 times lower than the current FCC standard of 200 uW/cm^2. Kasevich Tr. at 807, 817 and 836.

200. To achieve the Kasevich proposed standard, there could be no occupied structures within one to two miles of any broadcast antenna. Kasevich Tr. at 809-10, or within 5000 meters [16, 000+ feet ,or over 3 miles]. Kasevich Tr. at 843-44. No home within those (varying) distances could have window frames facing WIZN. Kasevich Tr. at 813.

201. There would be few places in the urbanized areas of Vermont which could meet such a standard. Kasevich Tr. at 810 (comment of Mr. Rainville).

c. The Bernstein Standard of 10% of the FCC Guidelines is Arbitrary and Unsupported.

202. Dr. Bernstein proposes a standard at 10% of the FCC Guidelines. Exhibit C5 at 2.

203. Dr. Bernstein admitted he did not consider himself to be an expert on the safety of RFR. Bernstein Tr. at 743. He conceded that he was not a scientist in the area, and was not well versed enough in the science to know the exact number to recommend. Bernstein Tr. at 764-65.

204. Dr. Bernstein's 10% recommendation was a number picked out of thin air, with no more basis than 5%, 20%, or any other number for that matter. Bernstein Tr. at 759-60, 765.

205. Dr. Bernstein admits that his 10% proposal has no logical connection with Dr. Blank's scientific claim that cellular change occurs at an RF level one-billionth of that permitted by FCC Guidelines. Bernstein Tr. at 764-75.

d. The Exclusion Zone Inherent in the FCC Guidelines Suffices to Protect the Public

206. There is a an exclusion zone inherent in the FCC Guidelines. Both Dr. Foster (Foster Tr. at 202) and Mr. Haes (Haes Tr. at 461-62) testified that any point more than 300 feet from the WIZN antenna, at the approximate height of the antenna, which is 180 feet above the ground, will meet the FCC Guidelines in regard to RF exposure. At points closer, the RF exposure would exceed the public MPE, and WIZN is required to fence or otherwise protect the public from access to that area, which it already does. The nearest residence to the tower is some 1250 feet away, or four (4) times the distance deemed to be safe by the FCC.

207. For a cellular base stations like the Verizon Wireless antennas on the Charlotte tower, such radius would be only 12 feet (because of the difference in power to the antenna). Haes Tr. at 464.

208. There is neither land accessible to the general public, nor inhabited structures within the exclusion zones created by the application of the FCC Guidelines to this site. Therefore, no further exclusion zone is required by the FCC Guidelines.

L. Conclusions of Law

Before issuing a permit, the Board must find that the Project "[w]ill not result in undue . . . air pollution." 10 V.S.A. § 6086(a)(1). The burden of proof is on Applicant under Criterion 1. *Id*. at § 6088(a).

1. "Undue air pollution" is not specifically defined in Act 250. *John A. Russell Corp.*, #1r0949-EB, Findings Of Fact, Conclusions Of Law, and Order at 43 (July 10, 2001). However, it has been interpreted in a number of Board decisions. A substance may be considered "air pollution" only if it may cause adverse health effects. *Id*.; *Re: Bull's Eye Sporting Center*, #5W743-2-EB, Findings Of Fact, Conclusions Of Law, and Order at 14 (February 27, 1997) ("noise is considered air pollution where its occurrence may cause adverse health effects"). More importantly for the instant case, a threshold requirement for "undue" air pollution is that the substance in fact cause adverse health effects at the levels resulting from the project under review. *Id.* ("the test for undue air pollution caused by noise is whether the noise has impacts arising above annoyance and aggravation to cause adverse health effects such as hearing damage"). In other words, absent a showing that the substance causes adverse human health effects at the levels resulting from the project, it cannot be considered undue air pollution.

Uncertainty about possible health effects is not enough to conclude that a substance results in undue air pollution under Criterion 1. *See Burlington Street Dept.*, #4C0516-1-EB, Findings Of Fact, Conclusions Of Law, and Order at 17 (April 13, 1983) (fact that questions about the effects of acid gases "have not yet been definitively answered" did not bar permit); *L&S Assocs.*, #2W0434-8-EB, Revised Findings Of Fact, Conclusions Of Law, and Order at 52 (September 22, 1993)(disagreement over federal and state standards for diesel emissions and claim that "too little is known" did not bar permit).

If there is the threshold showing that a substance has adverse human health effects at the levels caused by the project, the Board must then consider whether this level is necessary in light of other factors before it can conclude that it is "undue". As set forth in *John A. Russell Corp.* at 43:

> Whether a pollutant is 'undue' depends on a number of factors such as the nature and amount of the pollution, the character of the surrounding area, whether the pollutant complies with certain standards or recommended levels, and whether effective measures will be taken to reduce the pollution. 'Undue' has been defined . . . to mean 'that which is more than necessary - exceeding what is appropriate or normal.'

2. As set out in the Prehearing Order, and as further modified by the Chair's Order Regarding Stipulation, dated January 6, 2004, and the Memorandum of Decision Regarding Stipulation, dated January 22, 2004, the issue on Criterion 1 has been modified so that each party with party status with respect to a criterion on appeal limited its presentation of evidence under such criterion to the alleged health and safety effects of radiofrequency radiation (RF). The Appellants provided no evidence as to how issues of RF applied to any other Criteria. Therefore, the only issue addressed in this proceeding was whether the WIZN antenna results in undue air pollution pursuant to Criterion 1 (Air).

3. After reviewing all of the evidence and testimony, the Board makes the following Conclusions of Law:

   a. The threshold RF levels for adverse human health effects upon which the FCC Guidelines are based are supported by the federal agencies responsible for health (FDA, EPA, OSHA and NIOSH), are continuously reviewed and updated as necessary, are consistent with the recommendations of national and international panels and standards setting organizations (ICNIRP, NCRP and IEEE), and are similar to the standards adopted or endorsed throughout the world, including the World Health Organization, the EU, Australia and Canada.

   b. The Board concludes that the FCC Guidelines are the appropriate standard for this Board to use in assessing whether the RF from a broadcast transmitter results in undue air pollution under Criterion 1. Although the Board is not legally bound to do so, the Board hereby adopts the FCC Guidelines for evaluating the environmental effects of radiofrequency radiation as part of the Board's review of the Project's compliance with Criterion 1(air).

c. We believe that the FCC Guidelines represent the best scientific thought on exposure to RF. The Guidelines were formulated after review of thousands of scientific studies from many government and independent agencies and organizations. The research supporting the Guidelines is constantly updated. The Guidelines are consistent with an almost universal standard for exposure to RF, which has been adopted by most international scientific bodies and regulatory agencies. Most importantly, the FCC Guidelines more than adequately protect human health and safety at and around the Project.

d. The Board, after due consideration, rejects the Appellants' argument that we should use some standard other than the FCC Guidelines to measure undue air pollution on the grounds that the Guidelines allegedly do not protect against the effects of low-level RF exposure. First, as admitted by Appellants' own experts and revealed in the extensive scientific evidence, it has not been shown that low-level RF exposure in fact causes adverse human health effects. The almost universal opinion of expert bodies that have exhaustively reviewed the relevant literature is that low-level RF does not harm humans. Even assuming the existence of the cellular changes from low-level RF, to which Dr. Blank testified, the link between such changes and adverse human health effects has not been made. At best there is a need for further study of the issue, which is not a permissible basis to deny the permit. Second, and equally problematic, Appellants have not given the Board a workable or scientifically sound alternative standard to substitute for the FCC Guidelines. Third, this Board is not willing, based on the limited evidence presented by a few experts in three days of hearings, to substitute its judgment as to the threshold level at which RF adversely affects humans, for the judgment of health agencies and expert bodies, both national and international, that have extensively reviewed the issue.

e. Scientific knowledge is not static. Neither are the FCC Guidelines. Under the current state of scientific knowledge, RF at the levels from the WIZN tower have not been shown to have adverse human health effects. If there is a change in the scientific knowledge, the FCC standards will change and WIZN will be required to comply with any new standard. Requiring more from WIZN than compliance with the FCC Guidelines would, at this point, be based on no more than pure speculation, which this Board cannot do.

f. Appellants' expert, Raymond Kasevich, did not utilize the appropriate methodology for taking RF field measurements. We decline to consider Mr. Kasevich's "hot spot" RF measurements as

evidence of WIZN's alleged lack of compliance with the Guidelines. The Board was particularly disturbed by Mr. Kasevich's failure to record and submit all of his data. Conversely, WIZN's expert, Donald L. Haes, Jr., employed standard scientific methodology for taking RF field measurements, including equipment sanctioned by the FCC. We accept Mr. Haes's readings.

g. The hundreds of RF field readings taken by WIZN's expert, Donald L. Haes, Jr., conclusively show that the Project is well within the limits set by the FCC Guidelines. None were controverted by Appellants' expert, Mr. Kasevich.

h. The Applicant WIZN has met its burden on Criterion 1(air) by sufficient evidence demonstrating that the project will not result in undue air pollution.

M. ORDER.

1. The Project complies with 10 V.S.A. § 6086(a)(1).

2. Land Use Permit #4C1004R-EB is issued.

3. Declaratory Ruling Requests 322 (WIZN) and 323 (Verizon Wireless) are moot and hereby dismissed.

DATED AT Burlington, Vermont, this 25th day of June, 2004.

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