Before the

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FEDERAL COMMUNICATIONS COMMISSION

Washington, DC 20554

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In the Matter of	)	
	)	
Procedures for Reviewing Requests for	)	
	)	
Relief From State and Local Regulations	)	WT Docket No. ~~97-197~~ 97-192
	)	
Pursuant to Section 332(c)(7)(B)(v) of the	)	
	)	
Communications Act of 1934	)	

COMMENTS BY MARK F. HUTCHINS OF BRATTLEBORO, VERMONT

1. My name is Mark F. Hutchins, and I submit these comments as a communications consultant and broadcast engineer with over 30 years' experience; I have been certified by the Society of Broadcast Engineers as a Senior Broadcast Engineer since 1977. I am a former broadcast station owner, cognizant of what sometimes seems to be redundant regulatory burden when permitees and licensees of the Commission, having satisfied your requirements, face similar questions from local and/or state regulatory bodies. I also come before you as a citizen who is impressed by how adversarial the situation has become as many communities feel that communications facilities are being forced upon them without regard to local health and safety concerns.

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2. The limitation[1] of state or local regulation of siting of personal wireless facilities on the basis of the environmental effects of radio frequency (RF) emissions has, in my experience in permit proceedings since its adoption, only served to increase concern regarding compliance by licensees and enforcement by the Commission. I have provided expert testimony in Charlotte, Vermont, involving a 200-foot tower owned by the local fire & rescue service on which space was leased for FM (50,000-watt effective radiated power) broadcast station WIZN[2] and, later, for a cellular telephone base station operated by Bell Atlantic NYNEX Mobile (BANM). Hearings held by the Charlotte Zoning Board[3] (following passage of the Telecommunications Act of 1996) in response to a Notice of Violation by the Charlotte Zoning Administrator focused almost exclusively on RF interference and the operation of WIZN. However, in conjunction with this proceeding, a detailed (8-page) safety study[4] was prepared by Bell Laboratories and submitted by BANM to demonstrate the safety of the site and compliance with the applicable Rules. This study failed to address the rather substantial RF radiation contribution of the collocated 50,000-watt FM station, in spite of the fact that the station had been operating at the site for almost 10 years! Although the cellular base station's contribution to the overall RF exposure possible at the site has never been a major issue, the presentation of this deficient study - fol-

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[1] 47 U.S.C. § 332(c)(7)(B)(iv).
[2] FCC File No. BMLH-940805KE
[3] Town of Charlotte, Zoning Board of Adjustment - In re: Appeal of Burlington Broadcasters: General Findings of Fact, July 11, 1996.
[4] Attachment A: "Safety Analysis of the Electromagnetic Environment in the Vicinity of a Proposed Cellular Radio Installation, Pease Mountain, Charlotte, Vermont", prepared by Bell Laboratories, Radiation Protection and Product Safety Department, Murray Hill, NJ; March 14, 1996.

lowed by several public statements by the other tower tenants that the site was "in compliance" - has left my clients and other members of this community suspicious of the veracity of your licensees, and skeptical of safety in the residential area near the site. This is particularly so after subsequent measurements by 3 experts have shown the site not compliant with the new RFR guidelines.

3. Given the notoriety of the Charlotte situation, I feel it is reasonable for local and state permitting proceedings to seek the more detailed showing suggested in the NPRM[5]. A requirement for field measurements is not necessarily burdensome. In my engineering practice, I have used probes "shaped" to the applicable standard which yield the percentage of Maximum Permissible Exposure (MPE) considering all the emitters at a site. My Narda Model 8722, for example, will show percent of (NCRP-1986 occupational) exposure standard for all emitters from 300 kHz to 40 GHz; it is usually possible to ascertain compliance of everyone at a site in a short period of time. Indeed, my billable hours may not be substantially less for evaluating a site by means of calculations when the site involves numerous emitters. The use of calculations usually involves some margin for uncertainty and the use of "worst-case" formulae may lead to fencing or otherwise restricting a larger area than may be necessary. Although the Bell Laboratories study failed to properly consider the effects of WIZN, it correctly pointed to the relatively low percentage of the MPE by a typical cellular base station. If the emissions really "...will be at least 203 times below the exposure limits of OSHA, ANSI, IEEE, NCRP and the limits of all states that

[5] FCC 97-303, ¶141.

regulate RF exposure"[6], the permit applicant will be better served if that fact is confirmed through measurements which will almost certainly mitigate public concern. I find that a surprising number of those who are signatory to, or otherwise responsible for, RF radiation compliance statements, because they do not know the difference between "emissions" and "exposure", may erroneously assume that their facility is compliant. Given the number of facilities for which a permit - and compliance statement - for the specific facility is not required, a rebuttable presumption of compliance by the Commission will not sufficiently protect the public. While the process might be open for an interested or affected party to make a *prima facie* case for non-compliance, I feel that the financial burden to those outside the industry is daunting enough to make this less likely to occur. Since permitees and licensees are required to be compliant, they must already make that determination; demonstrating compliance is a relatively minor, incremental step for them.

4. The State of Vermont has a process by which environmental factors are considered before issuing land-use permits. There is an established method by which certain parties - the abutting property owners, for example - are granted statutory "party status" in a proceeding, and others - individuals and organizations - may petition for status by demonstration that they have an interest in the outcome. If the Commission decides to limit participating parties to those "adversely affected" as suggested in the NPRM[7], I urge the Commission to recognize or consider any prior determination of those entities at the local or state level. Although more likely to ex-

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[6] Attachment A: "Safety Analysis...", ¶7.
[7] FCC 97-303, ¶147.

tend beyond the abutting property in broadcast and building-mounted personal wireless facilities, the predicted blanketing-interference zones suggest an area within which residents and businesses may be "electronic abutters" and, therefore, I urge that they be considered potentially adversely affected.

5. I oppose any move to preempt efforts of private entities to regulate placement of personal wireless facilities. Homeowner associations, where the covenants accomplish the same function as a municipal code or zoning ordinance, might be the only case where a private entity could be considered similar to a local government. In Vermont, a significant amount of land is in trust to preserve it from development, and many - probably the majority of - Vermonters consider the land trusts to be sacred. Since Vermont depends heavily on tourism - which, in turn, depends on maintaining the healthy and visually-pleasing aspect of our land - there is an enormous potential economic impact from any development of that land, particularly if it involves a communications tower. I have been very successful in utilizing existing structures and designing facilities which otherwise minimize the environmental impact. I see too many siting proposals that do not show this effort. The technological advances that give us new services have also given engineers effective tools for designing communications facilities.

Respectfully submitted,

October 8, 1997

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ATTACHMENT A

Mark F. Hutchins, October 8, 1997, re: WT Docket No. 97-197

Bell Laboratories
Division of Lucent Technologies

Safety Analysis of the Electromagnetic Environment in the Vicinity of a Proposed Cellular Radio Installation, Pease Mountain, Charlotte, Vermont

Radiation Protection and Product Safety Department
Bell Laboratories
Murray Hill, New Jersey 07974-0636

Summary

This report is a safety analysis of the electromagnetic environment surrounding the Bell Atlantic NYNEX Mobile (BANM) cellular radio facility proposed for installation in Charlotte, Vermont. The analysis utilizes engineering data provided by BANM, together with well-established analytical techniques for calculating the radiofrequency (RF) electromagnetic fields associated with cellular radio transmitting antennas. Worst-case assumptions were used to ensure safe-side estimates, i.e., the actual values will be significantly lower than the corresponding analytical values.

The results of this analysis indicate that the maximum level of RF energy to which the public may be exposed is below all applicable health and safety limits. Specifically, in all normally accessible areas surrounding the facility, the maximum level of RF energy associated with *simultaneous and continuous operation of all transmitters* will be at least 203 times below the exposure limits of OSHA, ANSI, IEEE, NCRP and the limits of all states that regulate RF exposure.

Prepared for
Chris Ciolfi
Bell Atlantic NYNEX Mobile
46 Broadway
Menands, New York 12204

March 14, 1996

Cellular Radio Site: Charlotte, VT - 2

1. Introduction

This report was prepared in response to a request from Bell Atlantic NYNEX Mobile (BANM) for a safety analysis of the radiofrequency (RF) electromagnetic environment in the vicinity of the proposed cellular radio installation, and an opinion regarding the concern for public health associated with long-term exposure in this environment.

2. Technical Data

The antennas of the proposed cellular radio installation are to be located on a lattice tower-type structure located on Pease Mountain, Charlotte, VT. The antennas will transmit at frequencies between 869 and 894 million hertz (MHz). (These frequencies were formerly allocated for UHF television channels 79 through 83.)

For a cellular radio system, the radiated power is typically less than 10 watts per transmitter (channel) and the actual *total* radiated power is usually less than 200 watts (assuming the maximum number of transmitters are installed and operate *simultaneously and continuously*, which is rarely, if ever, the case). This is an extremely low power system when compared with other familiar radio systems, such as AM, FM, and television broadcast, which operate upwards of 50,000 watts. Figure 1 is a diagram of the electromagnetic spectrum which also lists common uses of RF energy. Table 1 below lists engineering specifications for the proposed system.

Table 1
Engineering Specifications for the
Proposed Cellular Radio System, Pease Mountain, Charlotte, Vermont

Site Specifications	Bell Atlantic NYNEX Mobile
antenna centerline height above grade	125 ft
maximum ERP per channel†	100 watts
actual radiated power per channel	10 watts
actual *total* radiated power	200 watts
number of transmit antennas	2
number of receive antennas	2
maximum number of transmitters	20
antenna manufacturer	Decibel Products
model number	DB810
gain	12.15 dBi
type	omni-directional
downtilt	N/A

†ERP - *Effective Radiated Power*. ERP is a measure of how well an antenna concentrates RF energy; it is not the actual power radiated from the antenna. To illustrate the difference, compare the brightness of an ordinary 100 watt light bulb with that from a 100 watt spot-light. Even though both are 100 watts, the spot-light appears brighter because it concentrates the light in one direction. In this direction, the spot-light effectively appears to be emitting more than 100 watts. In other directions, there is almost no light emitted by the spot-light and it effectively appears to be much less than 100 watts.

3. Environmental Levels of RF Energy

The antennas used for cellular radio propagate energy in a relatively narrow beam (in the vertical plane) which is directed toward the horizon. The reason for this is to provide uniform coverage. Hence, levels of RF energy directly under the antennas are not remarkably different from the levels at points more distant.

For the case at hand, the maximal potential exposure levels associated with *simultaneous and continuous* operation of all BANM transmitters can be readily calculated at any point in a plane at any height above grade. Based on the information shown in Table 1, the maximum power density at any point in a horizontal plane 6 ft above grade will be less than 2.7 millionths of a watt per centimeter squared (2.7 μW/cm^2) and will be less than 3.2 μW/cm^2 at any point in a corresponding plane 16 ft above grade. The latter is representative of the maximum power density immediately outside the upper floor of nearby private homes (assuming level terrain).

The above values are the theoretical maxima that could occur and are not typical values. The calculations include the effect of field reinforcement from in-phase reflections. The assumption was also made that the maximum number of transmitters are installed and operate continuously and at the highest power that normally would be used. Because of the intermittent nature of the transmission from these antennas, the actual time-weighted-average values will be lower than those above. Moreover, experience has shown that the analytical technique used is extremely conservative. That is, actual power density levels have always been found to be smaller than the corresponding calculated levels[1]. Also, levels inside nearby homes and buildings will be lower than those immediately outside because of the high attenuation of common building materials at these frequencies and, hence, will not be significantly different from typical ambient levels.

4. Comparison of Environmental Levels with RF Standards

Table 2 shows the calculated maximal RF power density levels in the vicinity of the installation; Table 3 shows the pertinent federal, state and consensus exposure limits for human exposure to RF energy. The various exposure limits range from 550 μW/cm^2 (public exposure) to 10,000 μW/cm^2 (occupational exposure), while the corresponding calculated maximum power density levels in the environment around the proposed installation are 2.7 μW/cm^2 (at 6 ft above grade) and 3.2 μW/cm^2 (at 16 ft above grade). The power density in the main beam will be less than 10.0 μW/cm^2 at any distance greater than 170 ft from the antennas.

Table 2
Calculated Maximal Levels for the Proposed Cellular Radio Antennas, Charlotte, Vermont

Location	Power Density (μW/cm^2)
6 ft above grade	< 2.7
16 ft above grade	< 3.2
In the main beam, at any distance greater than 170 ft from the antennas	< 10.0

1. Petersen, R.C., and Testagrossa, P.A., Radiofrequency Fields Associated with Cellular-Radio Cell-Site Antennas, *Bioelectromagnetics*, Vol. 13, No. 6 (1992).

Table 3
Summary of State, Federal and Consensus Guidelines for Exposure to Radiofrequency Energy at Frequencies Used for Cellular Radio

Organization/Government Agency	Exposure Population	Exposure Limits ($\mu W/cm^2$)
Occupational Safety & Health Administration..... (OSHA - 29 CFR 1910.97)	Occupational	10,000
American National Standards Institute..... (ANSI C95.1 - 1982)	Occupational Public	2,750 2,750
Institute of Electrical and Electronic Engineers†..... (ANSI/IEEE C95.1-1992)	Occupational Public	2,750 550
National Council on Radiation Protection & Measurements (NCRP Report 86 - 1986)	Occupational Public	2,750 550
U.S. Federal Communications Commission†† ..... (requires FCC licensees to comply with ANSI C95.1-1982)	Occupational Public	2,750 2,750
New Jersey Administrative Code..... (NJAC 7:28-42)	Public	2,750
Massachusetts Department of Health ..... (105 CMR 122)	Public	550
New York State, Department of Health ..... (follows NCRP Report 86)	Public	550

† Latest revision of ANSI C95.1 - 1982.

†† Because of the low transmitter power, the FCC has categorically excluded cellular-radio from hazard analyses by the licensee.

5. Discussion of Health Standards

Recently, press coverage has suggested an association between health effects and exposure to magnetic fields from electric-power distribution lines, and from the use of hand-held cellular telephones. This press coverage has heightened concern among some members of the public about the possibility that health effects may be associated with any exposure to electromagnetic energy. Many people feel uneasy about new or unfamiliar technology and often want absolute proof that something is safe. Such absolute guarantees are not possible since it is virtually impossible to prove that something does not exist. However, sound judgments can be made as to the safety of a physical agent based on the weight of the pertinent scientific evidence. This is exactly how safety guidelines are developed.

The overwhelming weight of scientific evidence unequivocally indicates that biological effects associated with exposure to RF energy are threshold effects, i.e., unless the exposure level is sufficiently high the effect will not occur regardless of exposure duration. (Unlike ionizing radiation, e.g., X-rays and nuclear radiation, repeated exposures to low level RF radiation, or nonionizing radiation, are not cumulative.) Thus, it is relatively straightforward to derive safety limits. By adding safety factors to the threshold level at which the most sensitive effect occurs, conservative exposure guidelines have been developed to ensure safety.

At present, there are more than 10,000 reports in the scientific literature which address the subject of RF bioeffects. These reports, most of which describe the results of epidemiological studies and animal studies, have been critically reviewed by leading researchers in the field and all new studies are continuously being reviewed by various groups and organizations whose interest is developing health standards. These include the U.S. Environmental Protection Agency, the National Institute for Occupational Safety and Health, the National Council on Radiation Protection and Measurements, the standards committees sponsored by the Institute of Electrical and Electronics Engineers, the International Radiation Protection Association under the sponsorship of the World Health Organization, and the National Radiological Protection Board of the UK. All of these groups have recently either reaffirmed existing health standards, developed and adopted new health standards, or proposed health standards for exposure to RF energy.

For example, in 1986, the National Council on Radiation Protection and Measurements (NCRP) published recommended limits for occupational and public exposure[2] . These recommendations were based on the results of an extensive critical review of the scientific literature by a committee of the leading researchers in the field of bioelectromagnetics. The literature selected included many controversial studies reporting effects at low levels. The results of all studies were weighed, analyzed and a consensus obtained establishing a conservative threshold upon which safety guidelines should be based. This threshold corresponds to the level at which the most sensitive, reproducible effects were reported in the scientific literature. Safety factors were incorporated to ensure that the resulting guidelines would be at least ten to fifty times lower than the established threshold, even under worst-case exposure conditions. The NCRP recommended that continuous occupational exposure to cellular radio frequencies should not exceed approximately 2,750 $\mu W/cm^2$, and continuous exposure of the public should not exceed 550 $\mu W/cm^2$.

In July of 1986, the Environmental Protection Agency published a notice in the Federal Register, calling for public comment on recommended guidance for exposure of the public[3]. Three different limits, ranging from approximately 275 to 2,750 $\mu W/cm^2$, were proposed. In 1987 the EPA abandoned its efforts and failed to adopt official federal exposure guidelines. However, in 1993 the EPA, in its comments on the Federal Communications Commission's (FCC) Notice of Proposed Rule Making[4], recommended adoption of the 1986 NCRP limits.

Also, in September 1991, the RF safety standard developed by Subcommittee 4 of the Institute of Electrical and Electronics Engineers (IEEE) Standards Coordinating Committee SCC-28 was approved by the IEEE Standards Board[5]. (IEEE SCC-28 was formerly the American National Standards Institute C95 Committee.) In November 1992, the ANSI Board of Standards Review approved the IEEE standard for use as an American National Standard. The limits of this standard are identical to the 1982 ANSI RFPGs[6] for occupational exposure and approximately 550 $\mu W/cm^2$ for exposure of the general public at cellular radio frequencies. Like those of the

2. NCRP - *Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields*, NCRP Report No. 86, National Council on Radiation Protection and Measurements, Bethesda, MD, (1986).
3. Federal Register, Vol. 51, No. 146, Wednesday, July 30, 1986.
4. Notice of Proposed Rule Making *In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, August 13, 1993. ET Docket No. 93-62
5. IEEE *Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz*, ANSI/IEEE C95.1-1992, Institute of Electrical and Electronics Engineers, Piscataway, NJ.

NCRP, these limits resulted from an extensive critical review of the scientific literature by a large committee of preeminently qualified scientists, most of whom were from academia and federal research laboratories.

In implementing the National Environmental Policy Act[7] regarding potentially hazardous RF radiation from radio services regulated by the FCC, the FCC categorically excluded land mobile services, including cellular radio, from hazard analyses because "individually or cumulatively they do not have a significant effect on the quality of the human environment"[8]. The FCC pointed out that there was no evidence of excessive exposure to RF radiation during routine normal operation of these radio services. The FCC is now in the process of reviewing comments on its 1993 Notice of Proposed Rule Making[4] to adopt the 1992 ANSI/IEEE guidelines.

More recently, the World Health Organization's International Commission on Non-Ionizing Radiation Protection[9] and the National Radiological Protection Board in the United Kingdom[10] independently developed and published guidelines similar to those of ANSI/IEEE. Finally, what was formerly the USSR, which traditionally had the lowest exposure guides, twice has revised upward its limits for public exposure. Thus, there is a converging consensus of the world's scientific community as to what constitutes safe levels of exposure.

With respect to the proposed cellular radio antennas, be assured that the actual exposure levels in the vicinity of the Charlotte, VT installation will be below any health standard used anywhere in the world and literally thousands of times below any level reported to be associated with any verifiable functional change in humans or laboratory animals. This holds true even when all transmitters operate *simultaneously and continuously*. Power density levels of this magnitude are not even a subject of speculation with regard to an association with adverse health effects.

6. For Further Information

Anyone interested can obtain additional information about the environmental impact of cellular radio communications from:

Dr. Robert Cleveland, Jr.
Federal Communications Commission
Office of Engineering and Technology
Room 7002
1919 M Street NW
Washington, DC 20554
(202) 653-8169

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6. American National Standard *Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz*, ANSI C95.1-1982, American National Standards Institute, New York, NY.
7. Although there are no federal limits per se, in order to fulfill its obligation under the National Environmental Policy Act, the FCC requires licensees to comply with the 1982 ANSI C95.1 limits.
8. Action by the Commission February 12, 1987, by Second Report and Order (FCC 87-63), and Third Notice of Proposed Rulemaking (FCC 87-64). General Docket No. 79-144.
9. *Electromagnetic Fields (300 Hz to 300 GHz)*, Environmental Health Criteria 137, World Health Organization, Geneva, Switzerland (1993).
10. *Board Statement on Restrictions on Human Exposure to Static and Time Varying Electromagnetic Fields and Radiation*, Documents of the NRPB, Vol. 4, No. 5, National Radiological Protection Board, Chilton, Didcot, Oxon, United Kingdom (1993).

7. Conclusion

A safety analysis has been performed with respect to potential public exposure to RF energy in the environment associated with BANM cellular radio antennas proposed for installation in the Charlotte, Vermont. The analysis utilized engineering data provided by BANM, together with well-established analytical techniques for estimating the environmental levels of RF energy associated with cellular radio transmitting antennas. Worst-case assumptions were used to ensure safe-side estimates, i.e., the actual values will be significantly lower than the corresponding analytical values.

The results of this analysis indicate that the maximum level of RF energy to which the public may be exposed will meet all applicable health and safety limits. Specifically, in all normally accessible areas surrounding the facility, the maximum level of RF energy associated with *simultaneous and continuous operation of all transmitters* will be at least 203 times below the exposure limits of OSHA, ANSI, IEEE, NCRP and the limits of all states that regulate RF exposure.

Enclosure: Figure 1. Electromagnetic Spectrum

ELECTROMAGNETIC SPECTRUM

Non-Ionizing Radiation | Ionizing Radiation

ELF, VF	Radio Frequencies	Infrared	UV	X-rays, γ-rays

Light

AM Radio: *535 - 1605 kHz*
CB Radio: *27 MHz*
Cordless Phones: *49 MHz*
TV Ch 2-6: *54 - 88 MHz*
FM Radio: *88 - 108 MHz*
Marine Radio: *160 MHz*
TV Ch 7-13: *174 - 216 MHz*
TV UHF Ch 14-69: *470 - 800 MHz*
Cellular Radio, Specialized Mobile Radio, Paging: *806 - 946 MHz*
Antitheft devices: *10-20 kHz and/or 915 MHz*
Microwave oven: *915 and 2450 MHz*
Personal Communication Services: *1800 - 2200 MHz*
Intrusion alarms / door openers: *10.5 GHz*
Microwave radio: *1 - 40 GHz*
Satellite Communications: *100 MHz - 275 GHz*

Power Frequency

10^3 10^6 10^9 10^{12} 10^{15} 10^{18}

60 Hz 1kHz 1MHz 1GHz Frequency (Hz) ⟹