How to take action and measure cell tower radiation while not getting lied to.

Draft Version

Prepared by our neighborhhod

Contents

Step 1:

Make a list of the name, address, phone number, email address and business affiliation of everybody who makes money off of the cell phone tower:

A. The building owner
B. The building tenant
C. The sub-tenant
D. The State
E. The licensing agency
F. The tax department
G. The service and maintenance company who checks on the towers under contract
H. The school district
I. Parents or workers who have stock or employment benefits programs tied into any of the above
J. The City
K. The Federal government
L. The contractor who erects the towers (ie: Harris)
M. The contractor who wires up the towers
N. The cell companies who send signals through the towers
O. The advertisers who pay the cell companies who send signals through the towers
P. Other related beneficiaries

Step 2

The popularity of cell phones and wireless communication devices has resulted in a proliferation of cell towers across the American landscape. Opposition to the placement of these towers has sometimes developed among segments of the population, usually based upon esthetics, concern over the electromagnetic radiation, or both.

The report that we provide will permit comparison of measured levels with FCC Maximum Permissible Exposures (MPEs), precautionary guidelines, and routine background levels for comparable environments. If new antennas or towers are planned for our location, a site survey will be used to establish a baseline RF level for later comparison (before and after testing). Follow-up readings will then be provided at substantially reduced cost compared to the initial survey.

The purpose of this testing is to empower our community to make responsible, fact-based decisions about the RF environment surrounding our community, facility, home, or school. We are using advanced equipment to perform the most accurate and comprehensive RF exposure assessments in the industry. We are addressing the issue of low-level, long-term, non-thermal exposures, and articulating the scientific rationale for a precautionary exposure guideline.

This is NOT a standard RF compliance surveys. This is enhanced testing that involves more detailed data collection, and a more extensive and broader coverage report, than a conventional compliance survey. Our surveys incorporate procedures and equipment to separately measure cellular power density, in addition to the composite power density (the combination of all RF signals present). We are using top quality professional equipment, and extensive procedural safeguards, to ensure the highest degree of RF measurement accuracy.

Standards vs. Guidelines - The Rationale for Testing

Regulations adopted by the Federal Communications Commission (FCC) in 1996, and fully implemented in 2000, limit human exposure to electromagnetic radiation from cell phone, broadcast, and other radio communication systems. Both U.S. and international standards governing exposure to radio frequency (RF) fields have long existed, and the FCC regulations were adapted from a pre-existing standard. They establish Maximum Permissible Exposures, or MPEs, for the full range of frequencies encountered near transmitting equipment, towers, and antennas. These are the formal exposure standards in the U.S., and have full regulatory force. The cell phone industry lobbied these standards into effect and that industry is known to be compromised on a profits-over-safety basis.

For broadcast towers and building mounted cellular antennas, much higher exposures are possible, although the MPEs are still unlikely to be exceeded in areas accessible to the public. So why are people concerned about cell towers, or RF exposure in general? Is some caution warranted? Three reasons for this concern are recognized:

1. Some people don't trust the cell phone companies or the government to act with the public's best interest in mind.

2. Many people equate the potential adverse health effects of **cell phone** use, which has received a lot of media coverage, with the presence of **cell towers**.

3. The existing exposure limitations are based primarily on the avoidance of energy deposition in the body sufficient to cause heating of tissue. More recent research data indicates that some types of radio frequency fields influence cellular function through mechanisms that do **not** involve heating. Therefore, the existing limitations may be based upon incomplete and outdated science, and thus not fully protective.

To address the issues raised by recent health effects research (#3 above), it is necessary to look beyond the current exposure limits. Through a review of research on exposure to radio frequency radiation, it is possible to identify a range of numbers below which no adverse effects have been noted (or which have been reported only in limited or questionable studies), and above which potentially adverse effects have been seen. This range of numbers can form the basis for a "**precautionary guideline**." However, reference to such a precautionary guideline will permit those individuals who seek a level of protection beyond that conferred by existing standards to do so in a rational manner while research proceeds on this important public health issue.

Technical Challenges for RF Site Surveys

Measurement of the emissions from cell towers presents particular technical challenges beyond those encountered for broadcast antenna sites. To understand these challenges, a few comments about radio frequency measurement are required.

Protocols for the measurement of RF energy for the purpose of human exposure assessment often recommend the use of an "isotropic broadband probe" because this type of sensor responds equally to energy arriving from any direction, and over a broad frequency range, as does the human body. These instruments are commonly used because they permit a quick and simple measurement. Unfortunately, some of the meters used for typical RF compliance surveys are unable to accurately measure the low power densities present at some cell sites. An alternate approach is required.

Isotropic Broadband RF Meter

A related problem involves the concurrent presence of other signals besides those from the cell phone system. The "broadband" characteristic of the isotropic broadband probe means that it will measure any signals across a wide range of frequencies. The reading produced by the instrument will be the combination of all signals present. In a large number of cases, the other signals present near a cell tower will be as strong as the cellular signals that one is trying to measure. Realistically, this composite measurement of all signals may be the most relevant exposure metric, but an interpretation of the significance of a reading sometimes requires that one know the frequency of the signal that produced it. For instance, is it FM, TV, cellular, or something else?

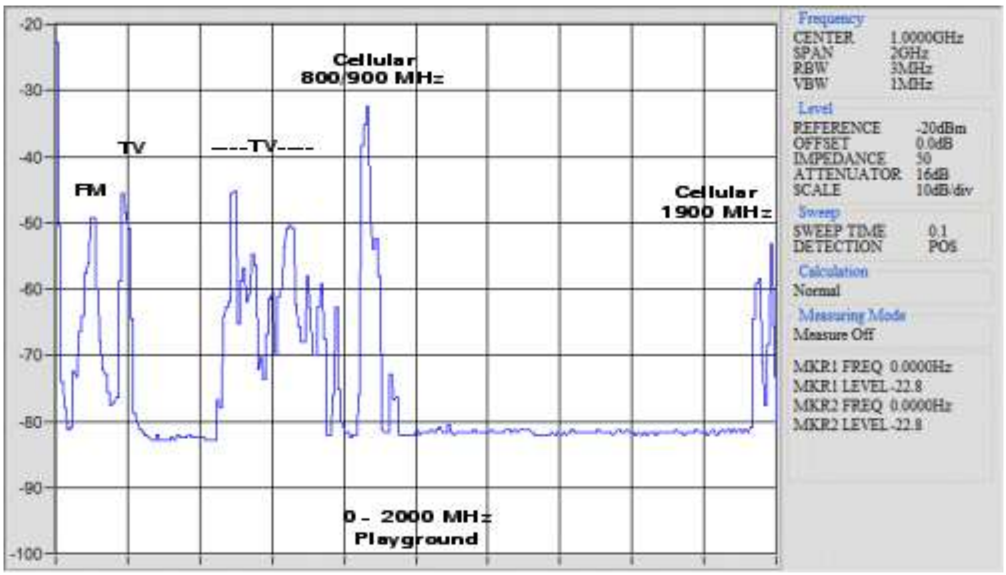
One of the most significant RF measurement problems, and one responsible for some of the greatest inaccuracy, involves an instrument erroneous response that can occur when there are two or more strong signals present at the same time. A very large proportion of antenna sites (cell and broadcast) now have multiple strong signals. Instrument design can minimize this problem, but many of the commonly used isotropic broadband meters perform very poorly in this multi-signal environment. The result is a reading that is much higher than actual, sometimes double (100% error).

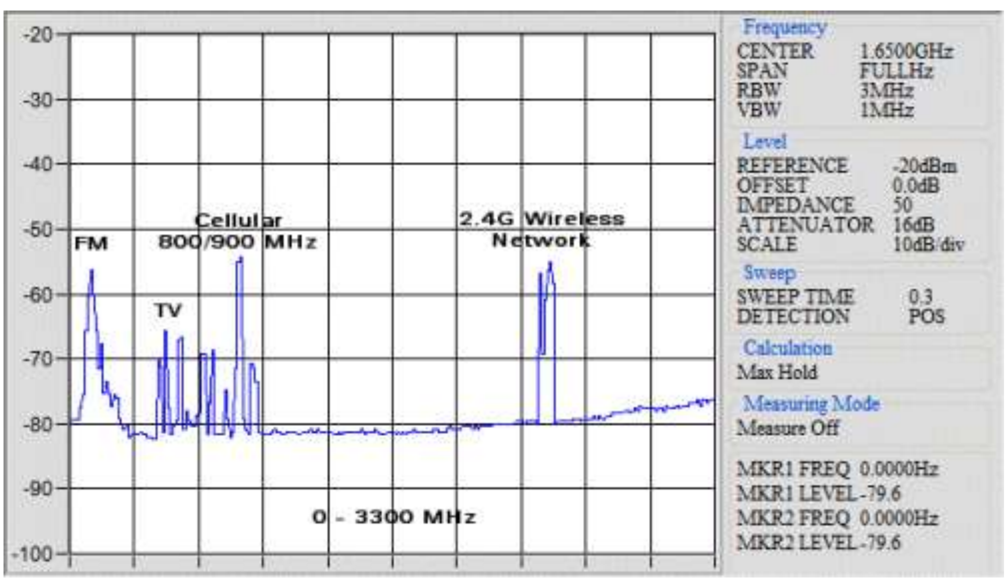
Portable Spectrum Analyzer from Agilent Technologies

An additional challenge results from the fact that power density levels at a cell tower site are not always constant, as they usually are at a broadcast antenna site. People use their cell phones more at some times of the day, and on some days of the week, than at others. The cellular service providers maintain additional capacity in the form of multiple channels which will become active as needed to meet demand. Each active channel adds to the measured power density at the cell site. The variable nature of power density levels at some sites must be taken into account. When necessary, we shall employ timed signal averaging or data logging to produce an accurate assessment.

Calibrated Broadband Antenna from Aaronia USA

RF measurement surveys conducted by us will employ procedures and equipment to address each of the challenges noted above. A **spectrum analyzer** is used for identification of RF sources, and for assessment of the relative magnitude of signals in different frequency ranges. The use of this instrument with a calibrated antenna will allow a sensitive and precise "channel power measurement" across selected frequency ranges, or measurement of the strength of an individual signal. In some cases, we also use a high sensitivity **isotropic broadband probe** for measurement of the composite power density. Our comprehensive analytical report summarizes all this data in a concise and understandable format, but includes an Appendix with detailed site data, such as the spectrum analyzer plots shown below.





Investigative Report

Radio Frequency Fields of the OUR TOWN School District Antenna Emissions in biologically and/or carcinogenic inducing ranges.

Prepared by OUR TOWN Parents and Community Review Board. OUR TOWN, California

Site Location: OUR TOWN School Grounds

Survey Dates:

Date 1:

Date 2:

Provided to:

Parents of the children of the OUR TOWN School District: The Governor's office- State of California; The OUR TOWN School District; The Mayors Office- City of OUR TOWN; Producer- 60 Minutes; Editor- San Francisco Chronicle; Editor- The New York Times; Editor- The Oakland Tribune; Editor- The Marin Independent Journal; Regional Director- Federal Bureau of Investigation; Attorney General- State of California; Director- Federal Communications Commission;

Introduction

Exposure to electromagnetic fields, or EMF, has become an issue of concern for a great many people and is an active area of biophysical research. Discussion over the possible biological effects of electromagnetic fields first began to surface in the late 1960s following the introduction of new, higher voltage electric power transmission lines. An argument can be made that initial speculation regarding possible detrimental health effects of these lines arose among property owners who objected to their presence due to esthetic factors and the resulting loss of property values. In association with environmental action groups, who opposed construction of the lines on the basis of physical destruction and segmentation of habitat, an alliance was formed which worked to bring the issue into public awareness.

The first scientific study to attract serious interest in the issue came in 1979 following the work of epidemiologist Nancy Wertheimer, who was looking for possible causes for a number of childhood leukemia cases in the Denver metropolitan area. Her research, performed with physicist Ed Leeper, found that children with leukemia were more than twice as likely to have lived in homes near high current power lines, where the electromagnetic fields were stronger. Research on the issue has accelerated since that time, with mixed results, and will be discussed in greater detail later in this article.

Compromised Parties

Based on forensic investigation, the following persons, organizations and entities receive a financial, political, business advantage or ***asset-of-other-value*** incentive from the broadcast towers in question and any input or action by them should be considered compromised and invalid:

1.

2.

3.

4.

5.

Those parties who have failed to disclose their compromised relationship to our organization are subject to a legal filing by our organization of a **Racketeer Influenced and Corrupt Organizations Action Suit.**

(http://en.wikipedia.org/wiki/Racketeer_Influenced_and_Corrupt_Organizations_Act)

Physical Science Concepts

The understanding of a few simple physical concepts is important to the discussion of any interaction between external physical agents and biological systems. Surrounding any wire or conductor that carries electricity, there exist both electric and magnetic fields, collectively referred to as electromagnetic fields, or EMF. These fields often extend for considerable distances around the wire. Although the early health effects studies looked primarily at the effects of large cross-country power transmission lines, and to some extent the public still associates EMF with these lines, it has become clear that anywhere electricity is in use, electric and magnetic fields will be present, often at significant intensities. This includes overhead and underground power distribution lines running throughout residential and commercial neighborhoods, certain types of interior structural wiring, as well as many common electrical devices. If detrimental bioeffects were to be confirmed, the ubiquitous nature of electricity in modern society could represent widespread public exposure to a potentially harmful physical agent.

The types of field that we are concerned about from a health effects standpoint are alternating current, or time-varying, fields whose strength and direction change regularly with time. They arise exclusively from man-made sources, specifically electric power and communications systems, and have been present in our environment for only about the past century. The earth's strong, steady-state magnetic field is often cited as a point of comparison with these fields, but this comparison is not especially meaningful since the influence on matter can be quite different between time-varying fields and static (non-time-varying) fields. It should be noted that naturally occurring time-varying fields, associated with geological and meteorological phenomena, do exist but are not considered detrimental. For the purposes of this article we will look at only a small part of the electromagnetic spectrum, the extremely low frequency, or ELF portion. Electric power distribution in the United States is at a frequency of 60 Hz, and falls within this region. This is the part of the spectrum where most of the research has been concentrated, although substantial work has also been done in relation to radio frequency and microwave fields.

Electromagnetic waves at these low frequencies contain relatively small amounts of energy and are often referred to as non-ionizing radiation. An important distinction must be drawn between this and the ionizing radiation with which most of us are familiar. Ionizing radiation, represented by X-rays, gamma rays, cosmic rays, and alpha and beta particle emissions from radioactive materials, has dramatic and well documented detrimental effects on living things. These high frequency waves or particles have enough energy to eject electrons from molecules, and can damage the structure of cells (including DNA) directly, or through the creation of highly reactive free radicals within cells. Low frequency, non-ionizing radiation does not react with matter in this way. It also differs from radiation in the microwave portion of the spectrum in that it lacks the energy to damage cells by thermal effects. For these reasons, well characterized interaction models which examine the effect of physical or chemical agents have proven inadequate for studying the effects of low frequency electromagnetic fields, and researchers have been presented with a new challenge in identifying biophysical mechanisms of interaction.

Research History and Funding

Many hundreds of studies have been conducted over the past two decades, with many more currently underway. Funding for this research in the U.S. has at various times come from the Environmental Protection Agency, the Department of Energy, the National Institute of Environmental Health Sciences, the National Cancer Institute, The National Institute of Occupational Safety and Health, the Food and Drug Administration, the Department of Defense, and a few state programs. The Electric Power Research Institute, a utility organization, has also funded a great deal of research. Some studies sponsored by the National Cancer Institute have incorporated EMF as one part of a broader epidemiological approach. Worldwide, at least 27 countries are involved in EMF research.

Most work currently underway in the U.S. is a part of what has come to be known as the Research and Public Information Dissemination (RAPID) Program. Mandated by Congress as a part of the Energy Policy Act of 1992, this was planned as a five year effort to determine if exposure to low level, low frequency electromagnetic fields is detrimental to health, and if so, to provide an assessment of risk. Funding was set at $65 million for the five years, with half this amount to come from industry and half from the government. This full sum was not forthcoming, since the industry contributions were not mandatory. The DOE and the NIEHS were charged with directing this research. A report to Congress is required in 1998.

At least four large scale literature reviews have been produced by or for agencies of the government in the last seven years. These reports often reached vastly different conclusions, and have served to heighten the controversy surrounding the issue. A report to the Congressional Office of Technology Assessment in 1989 concluded that there was clear evidence of biological effects related to electric and magnetic fields, but that the risk to health was unclear. The authors stressed the importance of additional research, and proposed a policy of "prudent avoidance," which refers to taking those steps to reduce EMF exposure that can be done with minimal cost, until more is known about the possible health effects. In 1990, the EPA produced their "Evaluation of the Potential Carcinogenicity of Electromagnetic Fields." This report, released only in draft form and then withdrawn under some controversy, classified magnetic field exposure as a potential human carcinogen. A report by the Committee on Interagency Radiation Research and Policy Coordination (CIRRPC) of Oak Ridge Associated Universities, at the request of the White House Office of Science and Technology Policy, reached the opposite conclusion. This report, released in 1992, found no convincing evidence of health hazards from electromagnetic fields. In 1991, before initiation of the RAPID Program, Congress had asked the National Academy of Sciences to review the available literature and provide information on the possible biological effects of EMF and, if possible, to perform a risk assessment. This National Academy of Sciences report, released in 1996, concluded that the current body of scientific data is insufficient to show that exposure to electric and magnetic fields constitutes a health hazard, primarily because no mechanism of action has been identified. It does, however, recognize that a clear association exists between residence near certain types of power lines and the incidence of childhood leukemia, although fields from the lines cannot be proven as the cause.

An extensive rewrite of the 1990 EPA report was completed, and progressed through several steps of scientific and administrative review, but has not been released to the public. Comments from reviewers indicate that it also recognizes an association between cancer and residence near power lines. Limited portions of the draft copy of another report, by the National Council on Radiation Protection, have been published in Microwave News, a scientific newsletter. This report recognized a possible EMF - cancer connection and proposed interim exposure guidelines. Release of these reports are not immediately anticipated.

It must be noted that almost all of the studies which show no effect or which state that cell towers have no biological impact **were funded directly, or indirectly by the communications industry.**

Epidemiology

Research into the possible biological effects of electromagnetic fields has proceeded along three tracks in the years since 1979: epidemiology, whole animal studies, and cell studies. Epidemiology is that branch of medical research which examines patterns of illness in human populations. As an observational technique, it can reveal a statistical association between an illness and a suspected causative agent, but taken alone it is insufficient to prove causality. Supporting evidence, in the form of cell or animal studies and a plausible mechanism of biologic action, is generally required to establish a cause and effect relationship. Most of these epidemiological studies have used some form of cancer as an endpoint.

As noted earlier, an association between childhood leukemia and proximity to power lines was the first realistic indication that exposure to electromagnetic fields may be harmful to health. To date several studies have examined the association between childhood cancer and power lines. The outcomes of these studies are complex and subject to varied interpretation, but at least eight have reported positive results. As the methodologic shortcomings of earlier studies have been overcome by better study designs, the trend of positive results has continued. Many of these studies have shown relative risks of around 1.5 to 2.0, indicating a doubling of the incidence of illness in the exposed population. A widely reported Swedish study, released in late 1992, revealed for the first time some indication of a dose-response gradient, with the number of cases increasing in the presumed higher exposure categories. Large meta-analyses that pool the results of several studies have been performed and the positive association still holds, even when individual studies with positive results are removed from the calculations. It is this consistent pattern of association in the childhood cancer studies that has continued to drive the research into EMF bioeffects.

Epidemiological studies of adult cancers in relation to occupational and residential exposure have shown some clear associations, but overall the results are mixed, with variation in both the strength of associations and in the cancer types noted. Studies which evaluate non-cancer endpoints, such as adverse reproductive outcomes, suicide and depression, and developmental problems have, with a few exceptions, produced negative results.

Cell Studies

Laboratory research on cultured cell systems, referred to as in-vitro research, is often beneficial in establishing the response of a certain cell type to a suspected toxic or mutagenic agent, and in elucidating the molecular mechanism by which an effect may occur. Studies which expose cells to a wide range of electric and magnetic fields have examined the effect of these fields on signal transduction events, intracellular calcium concentrations, genotoxicity, and patterns of gene expression. Effects have been observed on some measures of cellular response, but in most cases at levels many times higher than those likely to be environmentally encountered. No genotoxic effects have been confirmed under any exposure conditions. Some insight into the means by which very weak signals may influence cellular processes has been gained, but no clear mechanism of action has been demonstrated.

Animal Studies

Studies of animals exposed to suspected toxic agents are important in predicting potential toxicity to humans, and in confirming an effect indicated by an epidemiological study. They also provide valuable information for estimating the level at which toxicity may occur. Studies of animals, and to a lesser degree humans, exposed to electric and magnetic fields have produced interesting results; but these results neither confirm nor contradict the increased cancer incidence reported in some epidemiological studies.

There has been some evidence in un-compromised studies that EMF alone can cause cancer in animals. However, carcinogenesis is recognized as a multistage process. In a simplification of a clearly complex process, an agent recognized as an initiator can bring about the transformation of a cell in a manner that can lead to cancer. This process can be enhanced by, and is sometimes dependent upon, the effect of an additional agent called a promoter. A few studies of animals treated with a known chemical initiator have shown greater numbers of tumors, or greater tumor mass, in those animals subsequently or concurrently exposed to magnetic fields at moderate to high levels. This effect has most recently been reported in regard to mammary tumors in rodents.

Another effect that has been extensively investigated is suppression of the hormone melatonin, which is produced in the pineal gland of many animals, including humans. Animal studies have shown that certain types of magnetic field exposure can reduce the production of melatonin. Studies of human volunteers under exposure conditions have reported mixed results. Melatonin is important in regulating circadian rhythms in the animal. It is also recognized as having oncostatic properties and is thought to function as an antioxidant in preventing oxidative damage from intracellular free radicals. If it could be shown that EMF exposure alters melatonin production in any significant way, this would represent one mechanism whereby exposure influences cancer development.

Risk Assessment

Risk assessment, in regard to agents that are thought to pose a public health problem, is a well defined process that can produce meaningful and quantitative results. This information can be used by policy makers in developing programs to protect the public from these agents, if protection is warranted, and by individuals in making important life decisions. One of the steps in this process is exposure assessment. This involves determining the extent to which people are exposed to the agent in question. In regard to electromagnetic fields, this has been particularly difficult because the specific characteristics of exposure that may produce detrimental biological effects have not been defined. Examples of proposed exposure metrics include: the average field intensity over a period of time, time spent in the field over some threshold value, field variability, the presence of switching transients on the field waveform, time in the day-night cycle when exposure is received, and the strength and direction of the earth's geomagnetic field in relation to the power frequency field. Until the mechanisms by which electromagnetic fields interact with biologic systems are better understood, these questions cannot be answered, and a fully valid risk assessment will not be possible.

For most people, however, perception of risk is more subjective and qualitative, with perceived risk showing little correlation with actual risk. This has probably been the case in regard to electromagnetic fields, and for a number of reasons. First is the fact that the agent is invisible and not perceptible. Second, exposure is usually involuntary in that many people are financially unable to change their place of residence or place of employment in order to avoid a high exposure environment. Third, electricity and radiation of any type are mysterious, poorly understood, and inherently frightening to most people. On top of all this, the potential consequence of exposure, cancer, is very serious indeed. As an example, for an article in USA Weekend Sunday Magazine in 1993, readers' questions were solicited on a number of environmental health issues. Concern about EMF topped the list. A survey conducted in late 1995 by the Harvard Center for Risk Analysis showed that while most people were somewhat unsure about EMF risk, approximately 38% of them placed the risk in the high category.

Economic Aspects

The economic costs of a large scale response to the issue of electromagnetic fields in the environment is potentially very great. Transmission lines would have to be relocated out of densely populated areas, or the homes along the power line corridor would have to be abandoned and the property purchased to provide a buffer zone on both sides of the line. Neighborhood distribution lines would have to be replaced with new low field designs. Changes would also be required in the way power is distributed to individual homes and within large commercial buildings. Who pays for all these changes? If the electric utilities bear the burden, then everyone who pays an electric bill will pay a share. If the government picks up the tab, this translates into higher taxes for everyone. Public opinion surveys show that people in low field environments, who would be largely unaffected by these changes, are reluctant to pay even slightly higher bills to cover the cost of protecting the relative few who would immediately benefit.

The consequences of a premature response, based on fear and public pressure rather than on legitimate risk information, would be that we all pay substantial costs for unproven benefits, and that resources which could have been utilized in addressing more widely recognized public health problems may have been misdirected. If, on the other hand, no action is taken, and the detrimental health effects of EMFs are confirmed, then lives may be lost unnecessarily. This is the dilemma facing policy makers and the scientists who advise them.

Conclusion

Although the science is far from conclusive, a substantial base of data exists from years of research which is highly suggestive of an association between exposure to electromagnetic fields and the development of certain health problems. It is possible that a subset of the population, which may have a genetic predisposition to the development of these conditions, or who have been exposed to chemical or physical initiating agents, may experience enhanced sensitivity to the promotional effects of electromagnetic fields. Identification of these groups of people would be impractical given our current state of knowledge, but their risk would be greater than the general population. The need for continued research, carefully directed toward answering the salient questions raised by previous work, is clear. In the interim, until a realistic risk assessment can be performed and an appropriate societal or regulatory response initiated, the responsibility lies with each individual to learn more about their electromagnetic environment and to exercise a degree of caution consistent with their own approach to uncertain risks.

Appendix

Detailed Measurement Results

DETAILED MEASUREMENT RESULTS

PT #	Survey	Location	Total RF Power nW/cm²	% MPE	% Total Power from FM	% Total Power from TV	% Total Power from Cell	Total Cell RF Power nW/cm²
1	1st	Sample Location 1 Outside	8.2	0.00%	22%	5%	73%	6.0
	2nd							
2	1st	Sample Location 2	1.1	0.00%	51%	14%	35%	0.4
	2nd							
3	1st	Sample Location 3	1.5	0.00%	49%	19%	31%	0.5
	2nd							
4	1st	Sample Location 4	0.5	0.00%	50%	20%	30%	0.2
	2nd							
5	1st	Sample Location 5	0.4	0.00%	38%	37%	26%	0.1
	2nd							
6	1st	Sample Location 6	0.2	0.00%	50%	12%	38%	0.1
	2nd							
7	1st	Sample Location 7	0.7	0.00%	47%	35%	18%	0.1
	2nd							
8	1st	Sample Location 8	1.0	0.00%	71%	9%	20%	0.2
	2nd							
9	1st							
	2nd							
10	1st	Sample Location 10 Outside	28.7	0.01%	11%	14%	75%	21.5
	2nd							
11	1st	Sample Location 11 Outside	62.7	0.01%	8%	38%	53%	33.5
	2nd							
12	1st	Sample Location 12 Outside	202.4	0.04%	1%	19%	80%	**162.6**
	2nd							
13	1st	Sample Location 13	2.2	0.00%	3%	50%	47%	1.0
	2nd							
14	1st	Sample Location 14	6.1	0.00%	3%	46%	51%	3.1
	2nd							
15	1st	Sample Location 15	0.9	0.00%	9%	25%	66%	0.6
	2nd							

Notes

% MPE = % FCC Maximum Permissible Exposure. Calculation is based on cumulative MPEs for multiple frequency ranges.

Total Cell levels exceeding 100 nW/cm² are highlighted in red (represents informal precautionary exposure guideline for pulsed signals).

1000 nanoWatts (nW/cm²) equals 1 microWatt (uW/cm²)

100 nanoWatts (nW/cm²) equals 0.1 microWatt (uW/cm²)

1 nanoWatts (nW/cm²) equals 0.001 microWatt (uW/cm²)

DETAILED MEASUREMENT RESULTS

PT #	Survey	Location	Total RF Power nW/cm²	% MPE	% Total Power from FM	% Total Power from TV	% Total Power from Cell	Total Cell RF Power nW/cm²
16	1st	Sample Location 15	0.4	0.00%	34%	63%	4%	0.0
	2nd							
17	1st	Sample Location 15	5.6	0.00%	1%	97%	1%	0.1
	2nd							
18	1st	Sample Location 15	0.2	0.00%	54%	12%	34%	0.1
	2nd							
19	1st	Sample Location 15	0.2	0.00%	21%	63%	16%	0.0
	2nd							
20	1st	Sample Location 20	6.3	0.00%	0%	99%	0%	0.0
	2nd							
21	1st	Sample Location 21 Outside	15.5	0.00%	15%	79%	6%	0.9
	2nd							
22	1st							
	2nd							
23	1st	Sample Location 23 Outside	6.3	0.00%	20%	52%	28%	1.8
	2nd							
24	1st	Sample Location 24 Outside	35.9	0.01%	6%	51%	44%	15.7
	2nd							
25	1st	Sample Location 25 Outside	5.9	0.00%	3%	10%	87%	5.1
	2nd							
26	1st	Sample Location 26	9.3	0.00%	1%	98%	1%	0.1
	2nd							
27	1st	Sample Location 27	0.9	0.00%	42%	51%	7%	0.1
	2nd							
28	1st	Sample Location 28	1.1	0.00%	11%	86%	4%	0.0
	2nd							
29	1st	Sample Location 29	2.5	0.00%	17%	81%	2%	0.1
	2nd							
30	1st	Sample Location 30	0.4	0.00%	23%	53%	24%	0.1
	2nd							

Notes

% MPE = % FCC Maximum Permissible Exposure. Calculation is based on **cumulative MPEs for multiple** frequency ranges.

Total Cell levels exceeding 100 nW/cm² are **highlighted in red** (represents informal precautionary exposure **guideline** for pulsed signals).

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100 nanoWatts (nW/cm²)

equals

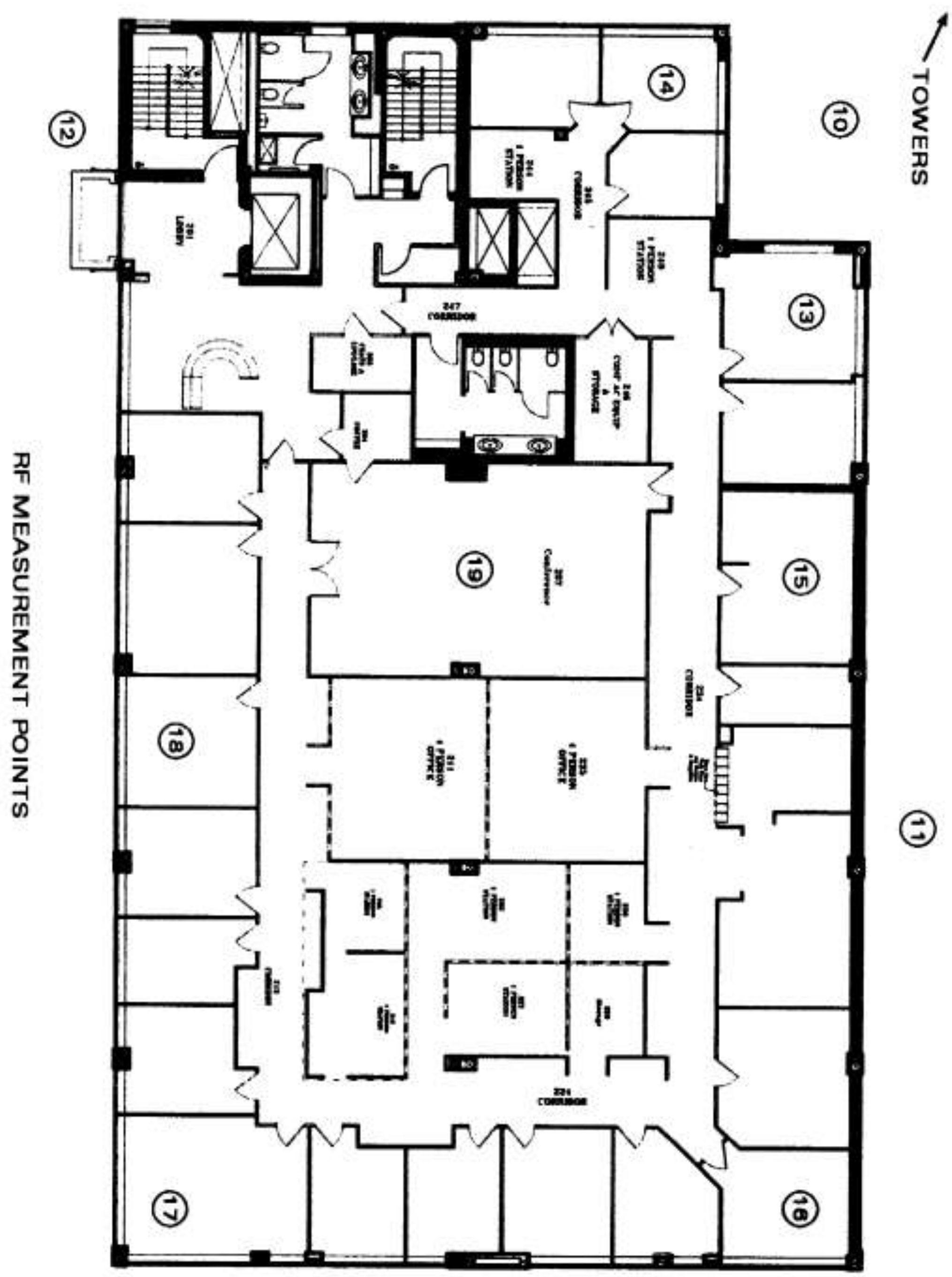
0.1 microWatt (uW/cm²)

1 nanoWatts (nW/cm²)

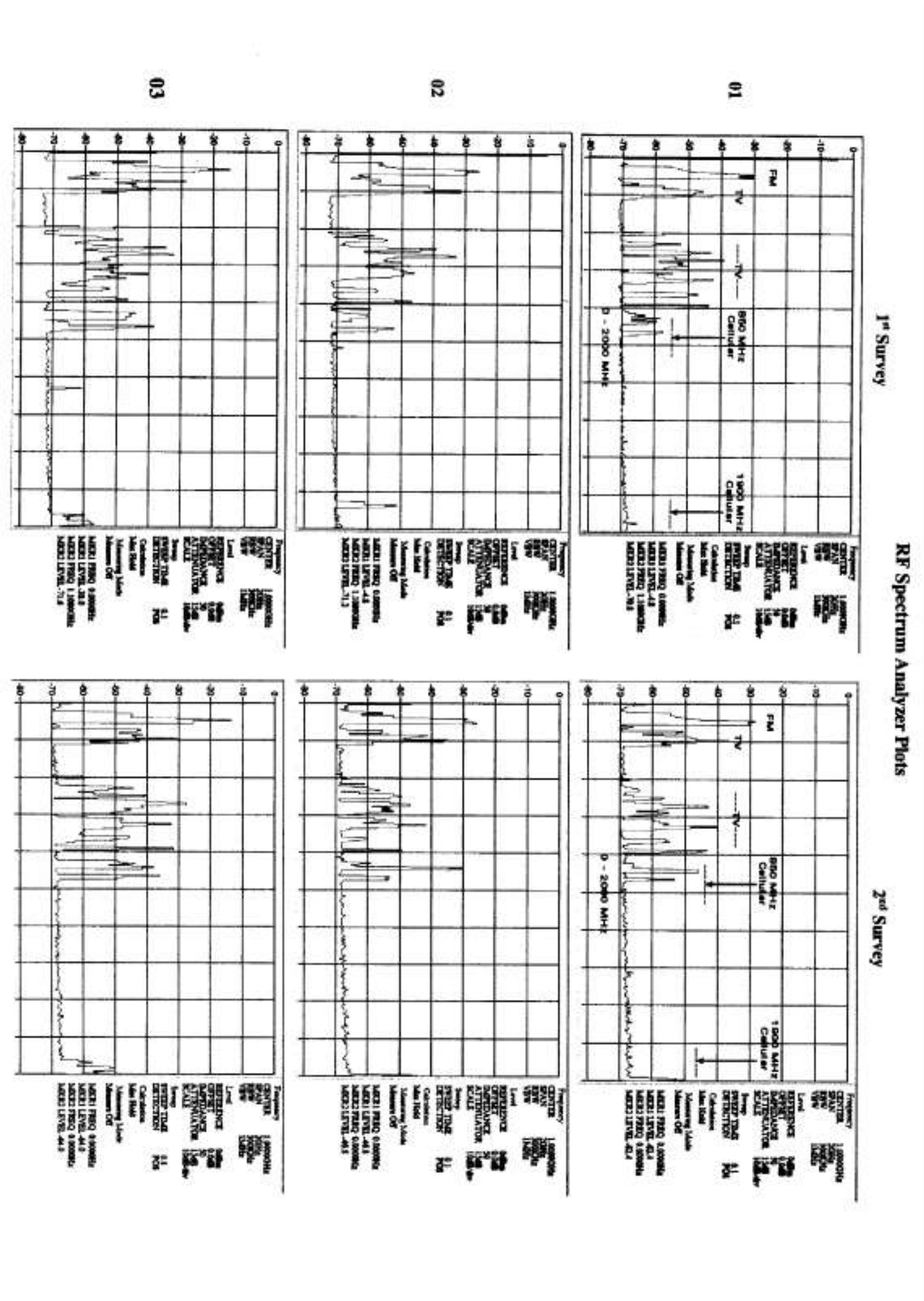
equals

0.001 microWatt (uW/cm²)

Test Locations



Spectrum Analyzer Plots



Site Photos

Equipment Calibration Verification

(Copies of certificates from manufacturer supplied with equipment)

RF Guideline References

International RF Protection Guidelines

The table below includes both enforceable regulatory standards, and precautionary guidelines that have been recommended by international scientific advisory groups. It is an overview only, and does not include all frequencies, types of environment, countries, or organizations.

Selected International Guidelines for General Population Exposure

Country or Organization		Thermal	Non-thermal	Regulatory	Advisory	Power Density uW/cm²	Field Strength V/m
US FCC - OET Bulletin 65	(1900 MHz)	X		X		1000	61.4
Canada - Canadian Safety Code 6	(1900 MHz)	X		X		1000	61.4
ICNIRP[1]	Much of Western Europe, other countries (1900 MHz)	X		X		950	59.8
Italy[2]			X	X		9.5	6.0
Russia, China, Poland[3]			X	X		10	6.1
Switzerland[4]			X	X		4.3 - 9.5	4.0 - 6.0
Salzburg Resolution[5]	(non-pulsed signals)		X		X	10	6.1
Salzburg Resolution[5]	(pulsed signals)		X		X	0.1	0.6
Ecolog-Institut[6]	(Germany, 2000)		X		X	1	1.9
The BioInitiative Working Group[7]			X		X	0.1	0.6

Conversion Data

Conversion of V/m to Power Density in uW/cm² (American) and uW/m² (European)

Measured E-Field V/m	RF Power Density uW/cm² (American)	RF Power Density uW/m² (European)
.050	0.0007	7
.100	0.0027	27
.150	0.0060	60
.200	0.011	106
.250	0.017	166
.300	0.024	239
.350	0.032	325
.400	0.042	424
.450	0.054	537
.500	0.066	663
.550	0.080	802
.600	0.095	955
.650	0.112	1,121
.700	0.130	1,300
.750	0.149	1,492
.800	0.170	1,698
.850	0.192	1,916
.900	0.215	2,149
.950	0.239	2,394
1.000	0.265	2,653
1.100	0.321	3,210
1.200	0.382	3,820
1.300	0.448	4,483
1.400	0.520	5,199
1.500	0.597	5,968
1.600	0.679	6,790
1.700	0.767	7,666
1.800	0.859	8,594
1.900	0.958	9,576
2.000	1.061	10,610
2.100	1.170	11,698
2.200	1.284	12,838
2.300	1.403	14,032
2.400	1.528	15,279
2.500	1.658	16,578
2.600	1.793	17,931

Measured E-Field V/m	RF Power Density uW/cm² (American)	RF Power Density uW/m² (European)
2.700	1.934	19,337
2.800	2.080	20,796
2.900	2.231	22,308
3.000	2.387	23,873
3.100	2.549	25,491
3.200	2.716	27,162
3.300	2.889	28,886
3.400	3.066	30,663
3.500	3.249	32,493
3.600	3.438	34,377
3.700	3.631	36,313
3.800	3.830	38,302
3.900	4.034	40,345
4.000	4.244	42,440
4.100	4.459	44,589
4.200	4.679	46,790
4.300	4.905	49,045
4.400	5.135	51,353
4.500	5.371	53,714
4.600	5.613	56,127
4.700	5.859	58,594
4.800	6.111	61,114
4.900	6.369	63,687
5.000	6.631	66,313
5.500	8.024	80,239
6.000	9.549	95,491
6.500	11.207	112,069
7.000	12.997	129,973
7.500	14.920	149,204
8.000	16.976	169,761
8.500	19.164	191,645
9.000	21.485	214,854
9.500	23.939	239,390
10.000	26.525	265,252
10.500	29.244	292,440
11.000	32.095	320,955

Reference Documents

1. International Commission for Non-Ionizing Radiation Protection (functions under the auspices of the World Health Organization).
http://www.icnirp.de/PubEMF.htm

2. Decree No. 381 of the Italian Ministry of the Environment, 10 September 1998. (Decreto 10 settembre 1998 n.381). Applies to fields from fixed (permanently installed) communications antennas, and in locations used for stays of 4 hours or more.
www.ambiente.it/impresa/legislazione/leggi/1998/dm381-98.htm

3. Foster, K. 2001. *Exposure Limits for Radiofrequency Energy: Three Models.* Proceedings of the Eastern European Regional EMF Meeting and Workshop. Varna, Bulgaria : 28 April - 3 May 2001.
http://www.who.int/peh-emf/meetings/en/day2Varna_Foster.pdf

4. Ordinance regarding protection against non-ionising radiation (NISV), Swiss Federal Council, 23 December 1999.
[For sensitive use areas: schools, hospitals, residential areas. Level is frequency dependent.]

5. International Conference on Cell Tower Siting. 2000. *Salzburg Resolution.* Salzburg, Austria, June 7-8, 2000.
Resolution and Signatories: http://www.salzburg.gv.at/salzburg_resolution_e.pdf
Summary: http://www.salzburg.gv.at/proceedings_(01)_title_and_summary.pdf
Full proceedings, access to individual papers: http://www.salzburg.gv.at/celltower_e

6. ECOLOG-Institut. 2000. *Mobile Telecommunications and Health - Review of the current scientific research in view of precautionary health protection.* [Scientific review commissioned by T-Mobil (DeTeMobil Deutsche Telekom MobilNet GmbH).]
Summary: http://www.hese-project.org/hese-uk/en/niemr/ecologsum.php
Full Report: http://www.hese-project.org/hese-uk/en/papers/ecolog2000.pdf

7. The BioInitiative Working Group. 2007. *BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields ELF and RF.*
Website: http://www.bioinitiative.org/
Full Report: http://www.bioinitiative.org/report/docs/report.pdf