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Open letter to Edmund Stoiber, president of the federal state of Bavaria, Germany

Dr Edmund Stoiber
 State Chancelry
 PO Box 220011
 80535 Munich

Urgent suspicions of serious health damage from pulsed high frequency electromagnetic fields (mobile phone base stations, DECT phones, W-LAN, Bluetooth etc.) at levels below exposure guidelines.

Dear Prime Minister,

Allow me to represent many doctors personally to you.

For eight months doctors in Oberfranken and another places have been making extremely worrying observations of patients, who live in the vicinity of mobile phone base stations. After initial suspicions at locations in Forchheim, Hirschaid, Walsdorf, Memmelsdorf and Bamberg survey measurements were made of 356 such residents in 40 locations, all in Oberfranken. Meanwhile 64 Hofer doctors, 30 Lichtenfelser, 61 Coburger, 20 from Bayreuth and countrywide, added their names to the Bamberger appeal.

The result all these medical findings is as follows.

Many people have become ill with a characteristic combination of symptoms, which is new to us as doctors, at exposure levels far below the guideline limits, which apply only to thermal effects. Residents in the vicinity of masts have one or more of the following symptoms:

Sleep disturbance, tiredness, headache, restlessness, lethargy, irritability, inability to concentrate, forgetfulness, trouble finding words, depressive tendency, noises in the ears, impaired hearing, dizziness, nosebleeds, visual disturbances, frequent infections, sinusitis, joint and muscle pains, feeling deaf, palpitations, increased blood pressure, hormone disturbances, gaining weight, hair loss, nocturnal sweating, nausea.

The following statements strengthened our suspicions:

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- Frequently, many residents become sick with these symptoms at the same time, when living near a base station (e.g. Schweinfurt: Eselshöhe, In Kulmbach: Senioren-Wohnanlage Mainpark, In Hof: Kösseinestraße, In Forchheim: Ortstell Burk).
- Many patients have reported rapid recovery when removed from exposure (by temporary relocation, removal of the source, screening, disconnection).
- After relocation, doctors have proven during re-examination of the patients, among other things, that blood pressure, heart rhythm, hormone disturbances, visual disturbances, neurological symptoms, and blood profile have returned to normal.
- Many doctors' families have in the course of the last months removed their DECT phones and were thereafter free among other things from headache, concentration disturbances, dizziness, restlessness, tinnitus, and sleep disturbance.

We therefore requested the responsible authorities (Federal Office for Radiation Protection, Federal Ministry for the Environment, Conservation and Nuclear Safety, members of the Radiation Protection Commission and the WHO) to organise local health surveys. Despite the serious, medical concern, all the authorities have refused to investigate the (to some degree) intolerable living conditions of those living locally.

Not one official health survey has been made at any base station in Germany! The SSK and the BFS have thus no level of knowledge concerning the long-term effects on resident living in the vicinity. From a medical viewpoint is this unacceptable.

I therefore turn to you to request your assistance for our patients who have no other recourse. We doctors from Oberfranken are ready to help. We urge you to immediately arrange local health surveys among people in the vicinity of base stations, at locations in Bavaria. Our concern is not that there are 'unfortunate individual cases', but that there is a medical disaster spreading to all parts of the population! To investigate our concerns, it must also be possible to switch transmitters off. From a medical viewpoint, we are seeing an emergency situation, which requires rapid action by all political means.

I implore you to take action to avoid health damage among many children, young people and adults.

Faithfully

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News :: 22/07/2005 - German Doctors unite on RF health effects from masts

Send Powerwatch Feedback

Summary:

A number of German doctors are combining together to put forward their observations of diverse health effects from pulsed high-frequency EMFs (microwave) to the Prime Minister of Bavaria, Dr. Edmund Stoiber. The health effects include headaches, tiredness, inability to concentrate and dizziness, and show an alarming trend.

The following is a foreword written by the doctor who is representing the group, Dr. Cornelia Waldmann-Balsam:

Open letter to Edmund Stoiber, Prime Minister of Bavaria in Germany

These reports show that the people for years have been ill due to pulsed high frequency electromagnetic fields, without the treating doctors recognising the cause. For that reason, people who are receiving the high frequency at home or at work have suffered and are suffering and they receive no therapy. The deciding [effective] therapy is to end the exposure.

The continually repeated assertion in the media by the Radiological Protection Commission (Strahlenschutzkommission), that there is no proof for health risks under the present valid limits, has had the consequence that most doctors, (including myself until a year ago) have not drawn a relationship between the many unexplained illness patterns and high frequency radiation. The doctors do not know that at not one single mobile phone base station have investigations into the health-state of the people been carried out. Thus, the evaluation of the Strahlenschutzkommission in 2001 has no scientific basis.

In Oberfranken, we have just evaluated the medical complaints of 356 people who have had long-term [radiation] exposure in their homes.

- The pulsed high frequency electro magnetic fields (from mobile phone base stations, from cable-less DECT telephones, amongst others), led to a new, previously unknown pattern of illnesses with a characteristic symptom complex.
- People suffer from one, several or many of the following symptoms: Sleep disturbances, tiredness, disturbance in concentration, forgetfulness, problem with finding words, depressive mood, ear noises, sudden loss of hearing, hearing loss, giddiness, nose bleeds, visual disturbances, frequent infections, sinusitis, joint and limb pains, nerve and soft tissue pains, feeling of numbness, heart rhythm disturbances, increased blood pressure episodes, hormonal disturbances, night-time sweats, nausea.
- Even at $10\mu\text{W}/\text{m}^2$ (only 0.06 V/m average) many people are becoming ill.
- The symptoms occur in temporal and spatial relationship to exposure. It is no way only a subjective sensitivity disturbance. Disturbances of rhythm, hearing problems, sudden deafness, hearing loss, loss of vision, increased blood pressure, hormonal disturbances, concentration

impairments, and others can be proved using scientific objective measures.

- Some of the health disturbance disappears immediately the exposure ceases (removal of DECT telephone, temporary moving away from home, permanently moving away, using shielding).

Therefore, the expansion must be stopped immediately. Mobile phone base stations, in whose fields people are exposed to more than $10\mu\text{W}/\text{m}^2$ must be turned off.

DECT telephones must be changed.

Affected people, relatives and doctors must jointly commit themselves and work together with all their energy [to this end].

Evaluation of symptoms of 356 people under long time home exposure to high frequency pulsed electromagnetic fields (DECT, telephones, mobile phone base stations) versus the level of the power flux density in microwatts per square metre.

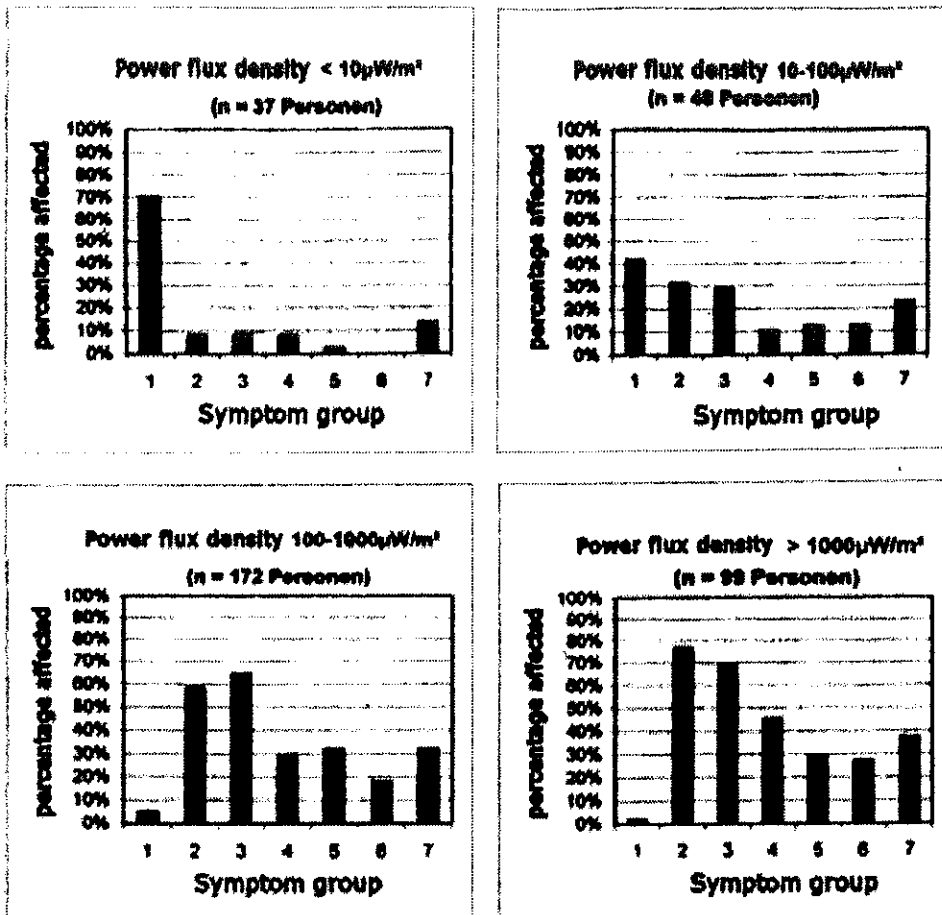
Foreword - Documented Health Damage under the Influence of High Frequency Electromagnetic Fields

Dr. Cornelia Waldmann Selsam, Karl-May-Str.48, 96049 Bamberg

The results of the evaluations are as follows: (* See below the graph for the definitions of the Symptom Groups")

It is worth explaining the indicated levels. The values convert approximately as follows:

- $10\ \mu\text{W}/\text{m}^2 = 0.06\ \text{V}/\text{m}$ average
- $100\ \mu\text{W}/\text{m}^2 = 0.2\ \text{V}/\text{m}$ average
- $1000\ \mu\text{W}/\text{m}^2 = 0.6\ \text{V}/\text{m}$ average



The symptom groups are defined as follows:

Group 1: No symptoms

Group 2: Sleep disturbance, tiredness, depressive mood

Group 3: Headaches, restlessness, dazed state, irritability, disturbance of concentration, forgetfulness, learning difficulties, difficulty finding words.

Group 4: Frequent infections, sinusitis, lymph node swellings, joint and limb pains, nerve and soft tissue pains, numbness or tingling, allergies

Group 5: Tinnitus, hearing loss, sudden hearing loss, giddiness, impaired balance, visual disturbances, eye inflammation, dry eyes

Group 6: Tachycardia, episodic hypertension, collapse

Group 7: Other symptoms (Hormonal disturbances, thyroid disease, night sweats, frequent urge to urinate, weight increase, nausea, loss of appetite, nose bleeds, skin complaints, tumours, diabetes)

If true, this is a very clear trend. For those where it is under 10 μ W/m² 70% of the sample (37 people) suffered no adverse health effects. For those where the power flux density is over 100 μ W/m² only 5-6% of the sample (172 people) did not experience adverse health effects. **Please look at this graph to see how these levels translate to exposure from a typical mast. Microwave signals are often above 0.6 μ W/m² within 400 metres!** There are no confounding factors listed in the data, but the strength of the trend is extremely pronounced.

This is further evidence to support the potential adverse health effects that may be synonymous with the pulsed Microwave technology that surround us in everyday life. Those in the medical profession are beginning to voice their concerns, and it is worth bearing in mind that they have first hand experience of real people with real problems. It is important not to discard this evidence due to lack of experimental control, as it seems that a number of qualified professionals have independently found the same trends. At the very least this should call for more organised research into these findings.



TNO Physics and Electronics Laboratory

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TNO-report

FEL-03-C148

Effects of Global Communication system radio-frequency fields on Well Being and Cognitive Functions of human subjects with and without subjective complaints.

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Effects of Global Communication system radio-frequency fields on Well Being and

Cognitive Functions of human subjects with and without subjective complaints.

Probleemstelling

Ondanks eerder wetenschappelijk onderzoek naar de relatie tussen elektromagnetische velden en klachten van mensen, is het trekken van duidelijke wetenschappelijk verantwoorde conclusies daarover moeilijk. Het in de wetenschappelijke literatuur gepubliceerde onderzoek richt zich sterk op de mogelijke effecten die gebruikers van mobiele telefoons kunnen ondervinden of toeschrijven aan radiofrequente (GSM) velden. Het Tweede-Kamerlid Wagenaar diende bij het overleg over de nota Nationaal Antennebeleid een motie in (Tweede Kamer, 2000-2001, 27 561, nr. 10) waarin de regering verzocht werd "initiatieven te nemen om tot onafhankelijk wetenschappelijk epidemiologisch onderzoek te komen naar de effecten van straling door antennes op de langere termijn en onderzoek te laten verrichten naar geuite klachten". Daarmee werd specifiek aandacht gevraagd voor klachten die mensen toeschrijven aan de aanwezigheid van GSM basisstations. Dit onderzoek kan gezien worden als een eerste antwoord op die motie en heeft dan ook de onderzoeksvraag meegekregen om de subjectieve klachten die werden toegeschreven aan GSM basisstations nader te onderzoeken.

Het onderzoek is verricht door TNO Fysisch en Elektronisch Laboratorium (TNO-FEL) in samenwerking met het onderzoeksbureau Clinical Research Facilities International (CRF-I) in Schaijk en TNO Technische Menskunde (TNO-TM) te Soesterberg. TNO heeft voor dit onderzoek opdracht gekregen van het directoraat-generaal Telecommunicatie en Post DGTP van het Ministerie van Economische Zaken (voorheen van het Ministerie van Verkeer en Waterstaat), het Ministerie van Volksgezondheid, Welzijn en Sport en het Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer. Het

ministerie van Economische Zaken coördineerde namens de opdrachtgevende Ministeries. Het onderzoek is uitgevoerd op basis van een vooraf door de Medisch Ethische Toetsingscommissie (METC) goedgekeurd onderzoeksprotocol.

Beschrijving van de werkzaamheden

Dit onderzoek is uitgevoerd met twee groepen van elk 36 proefpersonen groot. Eén groep bestond uit mensen die zich in het verleden hebben aangemeld bij het Meldpuntennetwerk Gezondheid en Milieu. Zij schrijven de door hen ervaren klachten toe aan de aanwezigheid van GSM basisstations. De andere groep noemen we in dit rapport groep A. De andere groep was onze referentiegroep bestaande uit mensen zonder aangegeven hinder van deze GSM basisstations. De referentiegroep is gerekruteerd door middel van advertenties in kranten, via aankondigingen op het Internet en mond op mond reclame. De referentiegroep noemen we in dit rapport groep B.

In het onderzoek is getracht een relatie te vinden tussen blootstelling aan elektromagnetische velden afkomstig van een antenne voor mobiele telefonie en (meetbare) effecten bij mensen. De hypothese was dat er geen relatie gevonden zou worden. Tijdens het onderzoek zijn het ervaren welzijn van de mensen en de cognitieve prestaties gemeten. Het onderzoek is uitgevoerd met behulp van verschillende vragenlijsten en een, door TNO-TM vastgestelde en standaard toegepaste, set van cognitieve testen in een speciale daarvoor ingerichte onderzoeksruimte bij TNO-FEL. Deze ruimte was afgeschermd van de buitenwereld voor wat betreft de radiofrequente velden. Daardoor wisten de onderzoekers precies aan welk veld en niveau de proefpersonen werden blootgesteld.



FEL-03-C148

September 2003

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Effects of Global Communication system radio-frequency fields on Well Being and Cognitive Functions of human subjects with and without subjective complaints.

Resultaten en conclusies

Het resultaat van het onderzoek is dat er een statistisch significante relatie gevonden is tussen de aanwezigheid van radiofrequente velden die lijken op die van een UMTS basisstationsignaal en het ervaren welzijn van de proefpersonen. Deze statistisch significante relatie is voor zowel groep A als voor groep B gevonden. Met betrekking tot de cognitieve prestaties vinden we, net als in de literatuur, statistisch significante relaties die veelal een verbetering van de cognitieve prestaties inhouden. Afhankelijk van de cognitieve taak vinden we voor GSM900, GSM1800 en UMTS voor zowel groep A als groep B statistisch significante relaties tussen de uitgevoerde taak en het wel of niet aanwezig zijn van het elektromagnetische veld. Een eenduidige conclusie over de oorzaken en het biologisch mechanisme hierachter is op basis van deze resultaten niet te geven. In de internationale wetenschappelijke literatuur zijn dergelijke statistisch significante relaties in de cognitieve prestaties ook beschreven. In deze onderzoeken heeft de blootstelling echter steeds plaatsgevonden met de relatief hoge veldsterkten van mobiele telefoons bij het hoofd. Locale thermische effecten zijn in deze onderzoeken als mogelijke oorzaak gesuggereerd. Het TNO-onderzoek is uitgevoerd met lage veldsterkten, vergelijkbaar met die afkomstig van een basisstation waaraan men in de dagelijkse praktijk maximaal kan zijn blootgesteld.

Computerberekeningen tonen aan dat het onwaarschijnlijk is dat de in dit onderzoek gevonden statistisch significante effecten van thermische oorsprong zijn.

Aanbeveling

Zonder twijfel zijn de resultaten van dien aard dat nader wetenschappelijk onderzoek gerechtvaardigd en noodzakelijk is. Het door ons uitgevoerde onderzoek dient gerepliceerd te worden door een van TNO onafhankelijke onderzoeksgroep. Dit is noodzakelijk om de gevonden effecten te bevestigen. Verder zal nader wetenschappelijk onderzoek moeten worden uitgevoerd of er een relatie bestaat tussen veldsterkteniveau, gebruikte frequentie en puls vormen maar ook of er verschillen te vinden zijn tussen mannen en vrouwen en tussen volwassenen en kinderen.

De definitie van gezondheid van de Wereldgezondheidsorganisatie luidt: "a state of complete physical, mental and social well being and not merely the absence of disease or infirmity". Binnen deze definitie van de WHO is het ervaren welzijn onderdeel van de gezondheid. Het is daarom van groot belang aandacht te schenken aan de vraagstelling of er daadwerkelijk, en zo ja in welke mate, er een (blijvend) effect op de gezondheid bestaat. Belangrijk is onderzoek te verrichten naar de mogelijke biologische mechanismen die verantwoordelijk zijn voor de gevonden effecten.

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Abbreviations

AE	Adverse Event
ANOVA	Analysis of Variance
CDR	Cognitive Drug Research
CDROM	Compact Disc Read Only Memory
CRF	Case Report Form
CRF-I	Clinical Research Facilities International B.V.
DNA	Deoxyribo Nucleic Acid
EM	Electromagnetic
FDA	Food and Drug Administration
GCP	Good Clinical Practice
GSM	Global System for Mobile Communication
Hz	Hertz, unit of frequency
IARC	International Agency on Research on Cancer
ICH	International Conference on Harmonization
ICNIRP	International Commission on Non-Ionizing Radiation Protection
(k)g	(kilo)gram, unit of mass
METC	Dutch acronym, translated into Medical Ethical Review Committee
Neo FFI	Neo (New) Five-Factor InventoryQAQuality Assurance
QOL	Quality Of Life
SAE	Serious Adverse Event
SAR	Specific Absorption Rate
Sec	Second, unit of time
SAS	Statistical Analysis System
Std	Standard Deviation
SEM	Standard Error of the Mean
TNO	Netherlands Organisation for Applied Scientific Research
TNO-FEL	TNO Physics and Electronics Laboratory
UMTS	Universal Mobile Telecommunications System
V/m	Volts per meter, unit of electric field strength
W	Watt, unit of power
WHO	World Health Organization

1. Introduction

Worldwide, the introduction of the Global System for Mobile Communication (GSM) in the 1990's has dramatically increased the use of cellular telephones. Full-wave electromagnetic and thermal numerical models give insight into the thermal effects related to exposure to electromagnetic fields. However, very little information is available on the non-thermal influence of the electromagnetic fields caused by these telephones on human tissues and more specifically on brain tissues. Regularly reports on health effects associated with the use of mobile telephone systems are published in scientific magazines and usually taken over by the lay press. In virtually all cases the reports relate to experiments that are either studies in animals or short-term studies in human subjects. The investigated items are the incidence of brain tumors [1,2,3], influence on Electroencephalogram [4,5], excretion of pituitary hormones [6], cognitive functions [7-18], thermal changes in the brain [19-21], DNA damage [22], lymphocyte and mitogen stimulation [23], visual functions [24] etc.

The existing scientific evidence does not support the hypothesis that a relation exists between the incidence of brain tumors and the use of GSM-telephones. An extensive international epidemiological study is presently ongoing under the coordination of the International Agency on Research on Cancer (IARC). In this study the relationship between the use of a GSM-telephone and the incidence of tumors in the head and neck region is being investigated. Initial results will probably not be available until 2004.

Many studies with contradictory results on the influence of cellular phones have been published. Concerning the cognitive functions we have found five publications [7,8,9,12,13] that report on short-term effects on cognitive functions. Recently, Cook *et.al.* [25] published an overview. A slightly significant increase in reaction time was found by Preece *et.al.* [7] but was not supported by results obtained by Koivisto *et.al.* [8]. Krause *et.al.* [9] reported a slight increase for some memory tasks in humans exposed to a GSM-like signal. All above mentioned studies concern the acute effect on the items studied in either healthy subjects or in animals which were exposed to GSM-like signals.

Concerning hypersensitivity symptoms we have found two papers [16,18] that report a relation between subjective symptoms and RF-fields and two papers [10,17] that report no statistically significant relations.

Hietanen *et.al.* [10] studied the hypothesis that there are hypersensitive persons who perceive subjective complaints attributed to electromagnetic fields emitted by hand held mobile telephones. Double blind provocation experiments were used. From their research, they concluded that no causal link was found between exposure to cellular telephones and hypersensitivity complaints.

The present study contributes to the research on finding a relation between electromagnetic fields and brain functions. In contrast to Hietanen *et.al.* [10]

- We focused our research on people living close to base station antennas.
- We measured the cognitive functions of the subjects during the exposure (including placebo).
- We measured the Well Being by using a questionnaire.
- We performed our measurements under controlled electromagnetic conditions inside a shielded semi-anechoic chamber.
- We did not measure the physical parameters Blood Pressure and Heart Rate.

In this kind of studies, assuring reproducibility in dosimetry and electromagnetic environment is a very important issue to guarantee.

1.1 Scientific goal

The goal of this research was to determine whether a relation exists between electromagnetic fields and the subjective complaints together with cognitive performance associated with an electromagnetic stimulus. Note that only effects present during and shortly after exposure to electromagnetic fields have been studied. In addition, we examined whether thermal effects can be responsible for possible effects found in this study.

This research goal was pursued by using a double blind crossover design in order to investigate the real influence of fields on the complaints reported. Comparing the complaints as reported by the subjects with and without the presence of GSM and UMTS-like fields, and without their knowledge of that exposure condition, eliminates subjectivity. At the same time cognitive functions have been evaluated.

The objectives of the study were:

- To investigate under double-blind conditions whether or not certain complaints were reported more frequently with exposure to GSM and UMTS-like fields than in periods without GSM and UMTS-like fields, without revealing to the subject the exposure conditions at that moment.
- To investigate under double blind conditions the influence on cognitive functions of exposure (including Placebo) to GSM fields.
- To investigate under double-blind conditions the influence on cognitive functions of exposure (including Placebo) to UMTS-like fields.

1.1.1 Subjects

One way to study if the reported complaints are really an effect of exposure is to bring these subjects into an experimental setting in which they randomly undergo a period with exposure and a period without exposure, without knowing which is which. If the complaints are an effect of the GSM and UMTS-like fields the subjects should more frequently report complaints during a period of exposure than during a period without exposure.

By choosing this experimental set-up it is assumed that, if the relationship exists, this pertains to a short-term effect. In general the complaints arise shortly after exposure to GSM fields and go away once exposure is stopped. This typical feature of the complaints reported by the study subjects supports this assumption. However, not all subjects report the same complaints and not under all exposure conditions. This makes it difficult to select an optimal experimental set-up that covers all reported complaints.

In the Netherlands, people can address complaints that they ascribe to environmental factors to the Monitoring Network for Environmental Health, a non-profit organization. Subsequently, they are entitled to register their complaints. These registered people form an interesting study population. Due to legal restrictions concerning privacy protection, the Monitoring Network for Environmental Health was asked to cooperate in this study and it has acquired half the subjects for this study from their database.

The subjects for this study are classified into two groups. Group A denotes the group of subjects that have previously reported to experience complaints and have attributed these complaints to GSM exposure, Group B denotes the reference group, namely a group of subjects without any complaints. It is noted that subjects who have an impaired health status have been excluded. Persons suffering from coronary disease and psychiatric illness have been excluded as well.

1.1.2 Experimental setup

The subjects within group B do not experience complaints at any given GSM exposure and at any instance that they are exposed. Therefore it is necessary to perform the study by means of comparing the occurrence of complaints between groups. As elucidated in Chapter 16 of our study protocol [26], we have calculated that with a total sample size of 72 subjects we obtain a power of 80% to find statistically significant results regarding reported complaints between the periods with exposure and without exposure. The proposed sample size of the experiment has been capable of statistically detecting a difference of 5% on the cognitive tests that have been used.

Every subject (from groups A and B) is requested to undergo a period with GSM and UMTS-like exposure and a period without exposure. In this way every subject will serve as his/her own control. Within the design of the study a washout period has been adhered to, in order to make sure that possible effects of the exposure are not carried over to the next exposed period.

Exposure arms that have been used in the study are

1. Placebo.
2. GSM900.
3. GSM1800.
4. UMTS-like signals.

1.1.3 Experimental design

With respect to the electromagnetic field strength used in this study, it is noted that due to the lack of scientific data a prediction of reasonable electromagnetic exposure during the experiments is not possible. Exposures presented in literature were generally in the near field, because mobile phones have been used as the source of exposure. Instead, we have chosen to generate electromagnetic field strengths that can be considered a maximum value that can be found occasionally in a general living environment. We focus on base-station exposure because that is to what the subjects of group A attribute their subjective complaints.

Currently, there is no scientific evidence that electromagnetic fields induce a cumulative effect that leads to any kind of saturation. Therefore, the authors assume the absence of cumulative effects and saturation.

The scientific community lacks data concerning the causal relationship between electromagnetic field strength (stimulus) and the symptoms subjectively attributed to the stimulus. The number of symptoms and the subject's perception is diverse.

Our test system, denoted as Taskomat, which has been used in this study, has proven to be effective in the evaluation of cognition as an exponent of brain functioning, the influence of pathological processes and the effect of drugs [27].

Finally, it is noted that the constant presence of the base-station antennas during the measurements might invite the subjects to malingering the results. If that is the case, the design of the proposed study will lead to the conclusion that no relationship between electromagnetic field and the subjective complaints from this electromagnetic stimulus are found.

2. Study design considerations

Experience with questionnaires related to quality of life has shown that the first time a subject fills in such a questionnaire, the answers are given in an exaggerated way. Even a randomization as scheduled in this study and thus creating the possibility to eliminate a sequence effect cannot prevent that the discriminative power of the comparison has been affected substantially. Therefore in the present study the subjects have been evaluated during all four sessions. During the first session the subjects filled out the questionnaire and performed the cognitive function test for training reasons only. It is stressed that during that first session none of the subjects have been exposed to electromagnetic fields. The subjects were informed on the absence of GSM and UMTS-like fields.

During the second, third and the fourth session the real comparison took place under double-blind randomized conditions. The subject information sheet states that during each session it is possible that there could be exposure to GSM and UMTS-like fields. However, it was unknown to the subject during which session(s) this took place.

To ensure reproducibility of the data, the field was generated in a controlled environment. The physical parameters of the exposure were monitored and stored during the experiments. A field strength has been used that can be considered as a maximum value to account for field strengths measured in public places which are generated by GSM base stations. For uniformity within the study, we used a similar field strength for the UMTS-like fields.

On the basis of numerous measurements we determined that the electromagnetic field strengths in houses and other freely accessible locations generally does not exceed 1 V/m. Therefore, the electromagnetic field value located at a height of 1.5 m was chosen to be 1 V/m at the location of the subjects. This value is within the pertaining exposure guidelines [28] and corresponds to less than 2.5% of the lowest reference value. The measurement setup is presented in more detail in Chapter 3.

2.1.1 Hypothesis

In this study, the following hypothesis are verified:

Null-hypothesis: There is no statistically significant difference with respect to any of the subjective complaints and the Taskomat parameters as recorded during placebo exposure, relative to standardized 900 MHz exposure, 1800 MHz GSM field exposure or 2100 UMTS-like field exposure.

Alternative hypothesis: The data analysis shows that there is a statistically significant difference between one or more subjective complaints and/or Taskomat parameters as recorded during placebo exposure, relative to standardized 900 MHz exposure, 1800 MHz exposure or 2100 UMTS-like field exposure ($\alpha=0.05$, two-tailed).

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2004/onderzoek_tno_near_effect/tno_fel
report_03148_def.pdf](http://www.tno.nl/tno/actueel/tno_nieuws/2004/onderzoek_tno_near_effect/tno_fel_report_03148_def.pdf)

11.5 Discussion on hypersensitivity and Well Being

Concerning hypersensitivity symptoms, we have found two papers [16,18] that report a relation between subjective symptoms and RF-fields and two papers [10,17] that report no statistically significant relations. New in our research is that we haven't studied subjective hypersensitivity symptoms, but studied the relation between GSM and UMTS-like exposure and the well-being sumscore. From the well-being sumscores, presented in 11.3.1, it may be concluded that before entering the test procedure, a difference between both groups with respect to well-being exists.

For the UMTS-like fields we have found a statistically significant effect on the well-being sumscore for both groups. Also, it is noted that in literature research to hypersensitivity has not been conclusive [10,16,17,18]. Although hypersensitivity and Well Being are two separate parameters, we would like to discuss a recently published paper on hypersensitivity by Hietanen *et.al.* [10]. We are not convinced that the study by Hietanen *et.al.* [10] has been performed in an appropriate way. First, it is not adequately verified that the electromagnetic environment was sufficiently low. They reported that their RF-environment was lower than 2 W/m^2 , which indicates that the electric field strength is less than 27 V/m . Our conclusion is that they have used an inappropriate E-field sensor to verify their electromagnetic environment for their purpose. They should have verified their electromagnetic environment at least in the mV/m range, preferably frequency dependent, by using appropriate equipment and simultaneously during the experiments. Their findings that the subjects were not able to distinguish real RF-exposure to sham exposure might be compromised because it is not clear that during sham exposure the electromagnetic environment was sufficiently low with respect to the studied exposure. If that would be the case, the RF-exposure considered as stimulus could lead to non-measurable differences in the parameters under consideration.

In our research we have a completely controlled electromagnetic environment assuring that our measurements are not influenced by unknown electromagnetic sources. Secondly, Hietanen *et.al.* [10] report that the subjects were asked to describe their experienced subjective complaints. It is our opinion that the present set up provides a better way to evaluate subjective complaints by using a questionnaire for each subject throughout the study and thus obtaining an objective measure to be analyzed statistically.

Interpretation of the results should be done very carefully. It is noted that the dimension of the changes observed in the Well Being for UMTS-like exposure, though statistically significant, is relatively small. On the other hand, factors such as carry-over between sessions and the relative short exposure that is used might limit the effects observed.

12. Conclusions and recommendations

The research is carried out according to rigorous scientific standards and exhibits no major problems with respect to methodology, sample size and analysis. This is the result of two independent specialists who have reviewed the relevant documents.

From our research it is concluded that our hypotheses to find no causal relation between the presence of RF-fields and the measured parameters is rejected. We have found a statistically significant relation between UMTS-like fields with a field strength of 1 V/m and the Well Being. Both group A and group B show similar effects in the well-being results. It is noted that the World Health Organization (WHO) the definition of health reads as "a state of complete physical, mental and social well being and not merely the absence of disease or infirmity". Within this WHO definition the perceived Well Being is part of health.

Also, a statistically significant difference is observed between the generally experienced Well Being within group A and group B. The bias introduced by the selection procedure together with the different demographical structure between both groups makes a direct comparison between group A and group B invalid.

From the cognitive tasks, it is observed that a slightly higher number of significant effects is found in group B when compared to group A. The results are unlikely to be attributed to statistical noise. From the 30 cognitive function tests, we found that eight cognitive function tests are statistically significant. Statistical noise could allow up to four false statistically significant results. Note that each exposure frequency is associated with changes in some tasks or parameters, while other frequencies are not.

In Table 12.1, statistical significancies obtained from the study are presented.

Table 12.1: Overview of Statistical Significancies.

	Group A			Group B		
	GSM900	GSM1800	UMTS-like	GSM900	GSM1800	UMTS-like
Well Being						
Sumscore	-	-	X	-	-	X
Anxiety	-	-	X	-	-	-
Somatic	-	-	X	-	-	-
Inadequacy	-	-	X	-	-	X
Cognitive Test						
Reaction time	X	-	-	-	-	X
Memory comparison	-	-	-	-	X	X
Visual Selective	-	-	X	-	-	X
Dual tasking	-	-	-	-	X	-
Filtering irrelevant information	X	-	-	-	-	-

In literature, similar results on cognition are found. From our results and the available literature, it is not possible to speculate on a scientifically justified hypothesis to explain the potential effects of RF fields on cognition. However, one aspect can be tackled. In literature, it is speculated that the effects on the cognitive parameters may be explained by an unknown mechanism induced by thermal effects. In our study, it is shown that the thermal effects are negligible and therefore, an explanation based on thermal effects seems highly unlikely for effects on the cognitive parameters.

An important scientific issue is the fact that relations that are found must be reproducible. Since this research is the first one to find a statistically significant relation on Well Being by using a subset of Bulpitt's questionnaire, reproduction of our research by a research group independent of TNO is necessary.

Without any question, the results justify more scientific research into this area. Apart from the reproduction as mentioned above, research is recommended in the following area's:

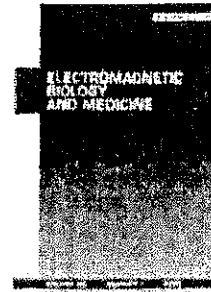
- Examine a dose-response relation, decrease and increase the radio frequency field strength in order to find the effects on the dimensions found in the Well Being.
- Examine whether a difference exists between sex and adult versus children.

- Examine the biological mechanism to better understand whether the effects found can be ascribed to physical quantities and to better understand the impact to health related questions.
- Examine the biological mechanism within the brain functions to understand the potential effects on cognitive tasks.
- Examine the effect of different pulse forms and frequencies used.
- Examine why some cognitive function tests exhibit response to an RF stimulus while other cognitive function tests do not.
- Examine if the effects found for the UMTS-like signal also holds for other CDMA signals.

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The Microwave Syndrome: A Preliminary Study in Spain

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The Microwave Syndrome: A Preliminary Study in Spain

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Abstract

A health survey was carried out in Murcia, Spain, in the vicinity of a Cellular Phone Base Station working in DCS-1800 MHz. This survey contained health items related to "microwave sickness" or "RF syndrome." The microwave power density was measured at the respondents' homes. Statistical analysis showed significant correlation between the declared severity of the symptoms and the measured power density. The separation of respondents into two different exposure groups also showed an increase of the declared severity in the group with the higher exposure.

Keywords

Public health, Cellular phone, Base stations, Microwave sickness

Introduction

The hypothesis that radiofrequency (RF) exposure might produce health damage has been analyzed mainly from several epidemiological studies. Insomnia, cancer, leukemia in children, and brain tumors are the clinical entities more frequently described (Dolk et al., 1997; Hocking et al.,

1996; Maskarinec et al., 1994; Minder and Pfluger, 2001; Selvin et al., 1992). Moreover, the clinical consequences of being exposed to microwave radiation such as radar has been evaluated from military and occupational studies (Balode, 1996; Garaj-Vrhovac, 1999; Goldsmith, 1997; Johnson-Liakouris, 1998; Robinette et al., 1980).

A specific symptomatology, linked to radar exposure at low levels of RF, has been termed "microwave sickness" or "RF syndrome." (Johnson-Liakouris, 1998) With few exceptions, functional disturbances of the central nervous system have been typically described as a kind of radiowave sickness, neurasthenic or asthenic syndrome. Symptoms and signs include headache, fatigue, irritability, loss of appetite, sleepiness, difficulties in concentration or memory, depression, and emotional instability. This clinical syndrome is generally reversible if RF exposure is discontinued.

Another frequently described manifestation is a set of labile functional cardiovascular changes including bradycardia, arterial hypertension, or hypotension (Johnson-Liakouris, 1998). This form of neurocirculatory asthenia is also attributed to nervous system influence. More serious but less frequent neurologic or neuropsychiatric disturbances have occasionally been described as a diencephalic syndrome (Johnson-Liakouris, 1998). All these disturbances following low level exposures (of the order of microwatts/cm²) have been reported for many years from Eastern Europe. The exposures have been mainly low level and long term (Goldsmith, 1997; Johnson-Liakouris, 1998).

Also, several articles have found biological dysfunction at very low density of radiation without temperature elevation, favoring the hypothesis of nonthermal biological effects and pointing to the probability of clinical dysfunction below the actual standard of safety norms in the European Union (Arber and Lin, 1985; Baranski, 1972; Byus et al., 1988; Daniells et al., 1998; de Pomerai et al., 2000; D'Inzeo et al., 1988; Dutta et al., 1989; Kues et al., 1992; Lai and Singh, 1995-1997; Lai et al., 1984, 1989; Malyapa et al., 1998; Sanders et al., 1985; Sarkar et al., 1994; Stagg et al., 1997; Wachtel et al., 1975).

Low levels of RF are found around the GSM-DCS cellular phone Base Stations (BS), where antennas are usually located on the roofs or in the top of tall towers. GSM-DCS cellular phones use pulsed microwaves. These signals have a spectral similarity to radar signals. The spectral power distribution of pulsed signals includes low frequency

harmonics. Typical pulse duration time ranges from 100 msec to 0.050 μ sec in radar, and 576.9 μ sec for each slot of GSM-DCS.

From this point of view, the hypothesis of a "microwave sickness" in the neighborhood of the GSM-DCS Base Stations is analyzed in this study. The present analysis tries to evaluate if there is some statistical justification to the complaints and related dysfunction locally associated with RF exposure from the GSM-DCS Base Stations, as has been found in previous studies (Santini et al., 2001, 2002a&b).

Materials and Method

A local team, specially trained for this work, delivered the questionnaires in La Ñora, a town of Murcia in Spain during January 2001. This was always introduced to respondents as a part of a study to evaluate the impact on the area of the cellular phone Base Stations (GSM-DCS). In general, the people were quite prepared to cooperate (the ratio of returned to delivered was about 70%). The questionnaire was a Spanish language adaptation of the Santini publication (Santini et al., 2001). This was composed of 25 different items mainly concerning health information about the respondents.

The respondents scored and marked from 0 to 3 the presence of the suffered health dysfunction: 0 never, 1 sometimes, 2 often, 3 very often.

The asked symptoms were those described in earlier studies of the microwave syndrome: fatigue, irritability, headache, nausea, appetite loss, insomnia, depression, discomfort, difficulty in concentration, memory loss, skin alterations, visual dysfunction, auditory dysfunction, dizziness, gait difficulty, and cardiovascular alterations.

Questions included demographic data: address, sex, and age, distance to the antennas (distance in meters to the Base Station), exposure time in days/weeks, hours/days, and time from the beginning of the emissions. The questionnaire also collected information about proximity to power lines, and the use of personal computer and cellular phone.

More than 5% of the population of La Ñora (around 1900 habitants) answered the questionnaire. Questionnaires from people with a history of deep psychological or neurological disease were excluded. Finally, 101 surveys were considered valid.

The survey was supplemented with electric field measurements, conducted February 24, 2001, and March 10, 2001 (Saturday). Measurements were carried out from 11:00 hr to 19:00 hr each day, in the bedrooms of each respondent. More measurements were carried out in the streets during working days and weekends, to check the possible variability in time of the measurements. The measurements were individually added to the survey of each respondent.

A portable broadband (1 MHz-3 GHz) electric field meter (EFM) was used. The EFM was hand-oriented in order to measure the maximum field strength above the bed. The electric field in each room presented a standing wave pattern because of reflection of the waves from the walls and metallic structures such as windows and metallic furniture. Therefore the EFM was held around 1 m from the walls, 1.2 m above the ground, and was moved around a circle of 25 cm of radius, orienting the antenna to get the maximum electric field strength.

The EFM was calibrated in the anechoic chamber of the University of Valencia with a standard measurement set-up using a network analyzer HP-8510C.

To check the intensity of TV and radio channels, as well as the number of working channels of the GSM-DCS BS, measurements of the spectral power density were carried out with a probe antenna and a portable spectrum analyzer.

The TV and radio channels maintained their intensities during the measurements, but the cellular phone channels presented dramatic differences in amplitude from channel to channel, some of them going on and off the air at random times.

The probe was mounted on a linen phenolic tripod about 1.2 m above the ground. The location of the probe was the same on both days, on a hill next to the town, 20 m from the BS. With the spectrum analyzer we scanned the GSM and DCS bands, at the beginning of the journey, taking the average over a period of 6 min. The measurement of the spectrum was similar on both days, having a difference in the peak estimation (carriers of the channels) of about 1 dB.

Results

The respondents were 47% male and 53% female, with a wide age range: 15-25 years (22%), 26-35 years (22%), 36-45

years (19%), 46-55 years (11%), 56-65 years (13%), and over 65 years (13%).

The exposure time, explained as the time spent in the vicinity of the BS, was more than 6 hr per day, 7 days a week, for 95% of the respondents. The bedroom was where the electric field was measured.

Concerning the attitude of the respondents about the use of cellular phone: 24% of them declared themselves to be active users of mobile GSM-DCS phone for more than 20 min per day.

The measurements were very low compared with European safety guidelines 1999/519/EC DOCE 30/7/99 (1999/519/EC:). Actually the levels were lower than $0.2 \mu\text{W}/\text{cm}^2$. The Spanish legislation established a maximum limit of $450 \mu\text{W}/\text{cm}^2$ at a single frequency (900 MHz), the same as the European safety guidelines 1999/519/EC DOCE 30/7/99. This is one of the characteristics of the present work: the low levels of RF exposures.

We divided the surveys into two groups: One group with high exposure, averaging $0.11 \mu\text{W}/\text{cm}^2$, consisted of 47 respondents. These respondents declared themselves to be living less than 150 m from the BS. The second group, with an average exposure of $0.01 \mu\text{W}/\text{cm}^2$, were at a distance greater than 250 m.

Although both groups were obviously at different distances from the BS, there was still the risk of a distance perception that could influence the survey.

Table 1 shows the average declared severity in both groups.

Table 1. Average Severity of the Reported Symptoms in Two Groups Having Different Exposure: Higher Exposure with Average Power Density 0.11 $\mu\text{W}/\text{cm}^2$ (Distance < 150 mts), and Lower Exposure with Average Power Density 0.01 $\mu\text{W}/\text{cm}^2$ (Distance > 250 mts).

	P value
Respondents	
	N = 54
	N = 47
Average power density $\mu\text{W}/\text{cm}^2$	
	0.11 \pm 0.19
	0.01 \pm 0.04
	< 0.001
Distance to BS	
	< 150 m
	(107 \pm 57 m)
	> 250 m
	(284 \pm 24 m)
	< 0.001
	Average value of reported severity
	Average value of reported severity
Fatigue	
	1.11 \pm 1.13
	0.74 \pm 1.07
	n.s.
Irritability	
	1.56 \pm 1.08
	1.04 \pm 1.02
	< 0.05

Headache	2.17 ± 0.86 1.53 ± 1.00 < 0.001	
Nausea	0.93 ± 0.99 0.53 ± 0.88 < 0.05	
Appetite loss	0.96 ± 1.03 0.55 ± 0.88 < 0.05	
Discomfort	1.41 ± 1.11 0.87 ± 0.97 < 0.02	
Gait difficulty	0.68 ± 0.93 0.94 ± 1.07 n.s.	
	8.81 ± 4.79 6.21 ± 5.33 < 0.02	<u>ASTHENIC symptoms</u>
Sleep disturbance	1.94 ± 0.92 1.28 ± 1.10 < 0.01	
Depression	1.30 ± 1.19 0.74 ± 1.01 < 0.02	
Difficulty in concentration	1.56 ± 1.14 1.00 ± 1.06 < 0.02	
Memory loss	1.41 ± 1.05 1.04 ± 1.08 n.s.	
Dizziness		

1.26 ± 1.14
0.74 ± 1.05
< 0.05

DIENCEPHALIC symptoms

7.46 ± 3.90
4.81 ± 4.34
< 0.01

Skin alterations

0.72 ± 0.96
0.45 ± 0.93
n.s.

Visual dysfunction

1.11 ± 1.07
0.96 ± 1.12
n.s.

Auditory dysfunction

1.06 ± 1.12
0.81 ± 1.12
n.s.

SENSORIAL symptoms

2.89 ± 2.72
2.32 ± 2.45
n.s.

Cardiovascular alterations

0.76 ± 1.10
0.49 ± 0.93
n.s.

A possible relationship between the declared severity of the symptom and the microwave power density was explored. A mathematical model with logarithmic dependence on the measured electric field (EFM) was used. The SPSS statistical package, with different regression methods, was used for this analysis. The results for the correlation coefficient and statistical significance are presented in Table 2. Correlation coefficients were grouped in four sections: asthenic, diencephalic, sensorial, and cardiovascular symptoms.

Table 2. Correlation Coefficient Between Severity of the Reported Symptoms and the Logarithm of the Measured Electric Field.

Correlation coefficient with power density		
p value		
<u>ASTHENIC symptoms</u>		
		Fatigue
0.438	< 0.001	
		Irritability
0.515	< 0.001	
		Headache
0.413	< 0.001	
		Nausea
0.354	< 0.001	
		Appetite loss
0.485	< 0.001	
		Discomfort
0.544	< 0.001	
		Gait difficulty
0.127	n.s.	
<u>DIENCEPHALIC symptoms</u>		
		Sleep disturbance
< 0.001	0.413	
		Depression
< 0.001	0.400	
		Difficulty in concentration

< 0.001	0.469	
		Memory loss
< 0.001	0.340	
		Dizziness
< 0.001	0.357	

SENSORIAL symptoms

		Skin alterations
	0.358	
	< 0.001	
		Visual dysfunction
	0.347	
	< 0.001	
		Auditory dysfunction
	0.163	
	n.s.	

CARDIOVASCULAR symptoms

		Cardiovascular alterations
		0.290
< 0.01		

Second Column is the Statistical Significance (p) of the Correlation Coefficient.

Discussion

It is interesting to compare the severity of the reported symptoms between both groups of Table 1: more severe symptoms were reported in the first group. The first group (< 150 m from BS) was exposed to a mean EMF power density 10 times higher than the second group (> 250 m from BS). Asthenic syndrome was 42% higher in the first group, diencephalic syndrome was 55% higher in the first group, sensorial alterations were 25% higher in the first group, and cardiovascular alterations 55% higher as well.

However, the use of mobile phones was 30% in the first group and 17% in the second group. Use of the personal

computer was 16% in the first group and 1% in the second group. Therefore, these differences could bias the health response. The use of the mobile cellular phone implies a considerably higher exposure of the head to microwaves during the phone call, roughly 5 mW/cm², 10,000 times higher than the maximum EMF exposure attributed to the BS. Moreover, the symptomatic response could be influenced by personal or human idiosyncrasy. The exposure to radiation from the computer screen occurs at extremely low frequencies and is under 0.3 μ T, at normal distances. It is therefore not considered significant, but will be the subject of a future work.

Results from Table 2 indicate the correlation between severity of the reported symptoms and the logarithm of the measured electric field (EFM) with $p < 0.001$. We find that discomfort (0.544), irritability (0.515), and appetite loss (0.485) are the most relevant symptoms correlated with exposure intensity. Others symptoms, fatigue (0.438), headache (0.413), difficulty in concentrating (0.469), and sleep disturbances (0.413), also show a significant correlation with exposure intensity. However, other symptoms such as auditory dysfunction, gait difficulty, and cardiovascular, have a lower correlation coefficient, but significant $p < 0.01$.

However, the most interesting aspect of our results is the significance of the dependence between both variables: The declared severity of the symptom and the logarithm of the measured electric field. Another interesting observation is that four of the highly correlated symptoms (Table 2) such as headache, sleep disturbances, concentration difficulty, and irritability also show the most relevant differences between both groups and the highest values in the clinical scale, 2.17, 1.94, 1.56, and 1.56 respectively (Table 1).

The validity and interpretation of the results of Tables 1 and 2 must be analyzed in the proper context, by comparison with results from other researchers, or with our results from previous similar surveys. Actually there are no studies similar to the presented in this communication. However, our work shows a similarity in procedure and results with previous surveys on noise annoyance. Results for the correlation coefficients (Table 2) are similar to those obtained in previous social surveys on noise annoyance, where the maximum correlation coefficient was around 0.35 (Schultz, 1978).

If there is a casual relationship between severity of the symptoms and the measured electric field, it may be that the logarithmic approach is still too approximate, and a

more elaborate model would be convenient. The logarithmic model is extended in the analysis of noise annoyance, since the devices used in noise measurements use logarithmic scales (dB_A). Moreover, the used measurement was a spatial-point, timepoint, measurement. This would most likely be an improvement in correlation for EMF average levels during days or weeks. However, the existence of appropriate instrumentation is a limitation.

It is worth pointing out that noise is a recognized environmental pollutant, and the social surveys on noise annoyance address its subjective response. Although noise is perceived by the senses, the same is not true for the electromagnetic field. Therefore biasing is less likely in the present study, and the results are probably more objective than in the surveys on noise annoyance.

Trying to find comparisons between our results and previous work, we can claim a strong similarity with the Lilienfeld study (Johnson-Liakouris, 1998), which showed a dose-response relationship between various neurological symptoms and microwave exposure. These symptoms were grouped under the name "microwave syndrome" or "radiofrequency radiation sickness."

The present results demonstrate a significant correlation between several symptoms of what is called microwave sickness and the microwave power density associated with the Base Station located on a hill at the edge of the town. The severity of the symptoms weakens for people who live far away, at a distance greater than 250 m from the main EMF source and at a power density lower than 0.1 $\mu\text{W}/\text{cm}^2$.

As there is a significant difference between both groups in terms of the irradiated power density, a hypothetical relationship between the DCS emission and the severity of symptoms may exist.

There is a large and coherent body of evidence of biological mechanisms that support the conclusion of a plausible, logical, and causal relationship between RF exposure and neurological disease. Hence it is possible that cell sites are causing adverse health effects. Public health surveys of people living in the vicinity of cell site BSs should be carried out immediately, and continued over the next 2 decades. Prompt effects such as miscarriage, cardiac disruption, sleep disturbance, and chronic fatigue could well be early indicators of adverse health effects.

This is the first social survey concerning the microwave syndrome carried out in Spain, and is a preliminary study. Future surveys in another geographical locations are underway. More research and comparison of statistical results from different areas would be useful.

At present, the electromagnetic/microwave power density is not a recognized environmental pollutant. The reported results are obtained from one of the first social surveys on the health of the population living in the vicinity of a Base Station of GSM-DCS cellular phone.

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Benevento Resolution

The International Commission for Electromagnetic Safety (ICEMS) held an international conference entitled *"The Precautionary EMF Approach: Rationale, Legislation and Implementation"*, hosted by the City of Benevento, Italy, on February 22, 23 & 24, 2006. The meeting was dedicated to W. Ross Adey, M.D. (1922-2004). The scientists at the conference endorsed and extended the 2002 Catania Resolution and resolved that:

1. More evidence has accumulated suggesting that there are adverse health effects from occupational and public exposures to electric, magnetic and electromagnetic fields, or EMF¹, at current exposure levels. What is needed, but not yet realized, is a comprehensive, independent and transparent examination of the evidence pointing to this emerging, potential public health issue.
2. Resources for such an assessment are grossly inadequate despite the explosive growth of technologies for wireless communications as well as the huge ongoing investment in power transmission.
3. There is evidence that present sources of funding bias the analysis and interpretation of research findings towards rejection of evidence of possible public health risks.
4. Arguments that weak (low intensity) EMF cannot affect biological systems do not represent the current spectrum of scientific opinion.
5. Based on our review of the science, biological effects can occur from exposures to both extremely low frequency fields (ELF EMF) and radiation frequency fields (RF EMF). Epidemiological and *in vivo* as well as *in vitro* experimental evidence demonstrates that exposure to some ELF EMF can increase cancer risk in children and induce other health problems in both children and adults. Further, there is accumulating epidemiological evidence indicating an increased brain tumor risk from long term use of mobile phones, the first RF EMF that has started to be comprehensively studied. Epidemiological and laboratory studies that show increased risks for cancers and other diseases from occupational exposures to EMF cannot be ignored. Laboratory studies on cancers and other diseases have reported that hypersensitivity to EMF may be due in part to a genetic predisposition.
6. We encourage governments to adopt a framework of guidelines for public and occupational EMF exposure that reflect the Precautionary Principle² -- as some nations have already done. Precautionary strategies should be based on design and performance standards and may not necessarily define numerical thresholds because such thresholds may erroneously be interpreted as levels below which no adverse effect can occur. These strategies should include:
 - 6.1. Promote alternatives to wireless communication systems, e.g., use of fiber optics and coaxial cables; design cellular phones that meet safer performance specifications, including radiating away from the head; preserve existing land line phone networks; place power lines underground in the vicinity of populated areas, only siting them in residential neighborhoods as a last resort;
 - 6.2. Inform the population of the potential risks of cell phone and cordless phone use. Advise consumers to limit wireless calls and use a land line for long conversations.
 - 6.3. Limit cell phone and cordless phone use by young children and teenagers to the lowest possible level and urgently ban telecom companies from marketing to them.
 - 6.4. Require manufacturers to supply hands-free kits (via speaker phones or ear phones), with each cell phone and cordless phone.

¹ EMF, in this resolution, refers to zero to 300 GHz.

² The Precautionary Principle states when there are indications of possible adverse effects, though they remain uncertain, the risks from doing nothing may be far greater than the risks of taking action to control these exposures. The Precautionary Principle shifts the burden of proof from those suspecting a risk to those who discount it.

- 6.5. Protect workers from EMF generating equipment, through access restrictions and EMF shielding of both individuals and physical structures.
 - 6.6. Plan communications antenna and tower locations to minimize human exposure. Register mobile phone base stations with local planning agencies and use computer mapping technology to inform the public on possible exposures. Proposals for city-wide wireless access systems (e.g. Wi-Fi, WIMAX, broadband over cable or power-line or equivalent technologies) should require public review of potential EMF exposure and, if installed, municipalities should ensure this information is available to all and updated on a timely basis.
 - 6.7. Designate wireless-free zones in cities, in public buildings (schools, hospitals, residential areas) and, on public transit, to permit access by persons who are hypersensitive to EMF.
7. ICEMS³ is willing to assist authorities in the development of an EMF research agenda. ICEMS encourages the development of clinical and epidemiological protocols for investigations of geographical clusters of persons with reported allergic reactions and other diseases or sensitivities to EMF, and document the effectiveness of preventive interventions. ICEMS encourages scientific collaboration and reviews of research findings.

We, the undersigned scientists, agree to assist in the promotion of EMF research and the development of strategies to protect public health through the wise application of the precautionary principle.

Signed:

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Date of Release: September 19, 2006. For more information, contact Elizabeth Kelley, Managing Secretariat, International Commission For Electromagnetic Safety (ICEMS), Montepulciano, Italy. Email: info@icems.eu Website: www.icems.eu

³ International Commission For Electromagnetic Safety. For information, link to www.icoms.eu.

CATANIA RESOLUTION September 2002

**The Scientists at the International Conference
"State of the Research on Electromagnetic Fields – Scientific and Legal Issues",
organized by ISPEL*, the University of Vienna and the City of Catania,
held in Catania (Italy) on September 13th – 14th, 2002, agree to the following:**

1. Epidemiological and *in vivo* and *in vitro* experimental evidence demonstrates the existence of electromagnetic field (EMF) induced effects, some of which can be adverse to health.
2. We take exception to arguments suggesting that weak (low intensity) EMF cannot interact with tissue.
3. There are plausible mechanistic explanations for EMF-induced effects which occur below present ICNIRP and IEEE guidelines and exposure recommendations by the EU.
4. The weight of evidence calls for preventive strategies based on the precautionary principle. At times the precautionary principle may involve prudent avoidance and prudent use.
5. We are aware that there are gaps in knowledge on biological and physical effects, and health risks related to EMF, which require additional independent research.
6. The undersigned scientists agree to establish an international scientific commission to promote research for the protection of public health from EMF and to develop the scientific basis and strategies for assessment, prevention, management and communication of risk, based on the precautionary principle.

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Umberto Scapagnini, Neuropharmacology, University of Catania, Italy, Member of the Research Comm. of the European Parliament

Stanislaw Szmigielski, Military Institute of Hygiene and Epidemiology, Warsaw, Poland

*** = Istituto Superiore per la Prevenzione e la Sicurezza del Lavoro, Italy
(National Institute for Prevention and Work Safety, Italy)**



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About Us >> Welcome

Welcome from the Head of School



Welcome to Washington Montessori School - a unique place where your child can develop the independence, self-confidence and motivation that are vital to personal and academic success.



We take advantage of children's innate curiosity and ability to learn from their surroundings. Our classrooms are warm and welcoming communities where, with the guidance of their teachers, children learn at their own pace and discover academic interests on their own, stimulating their excitement for learning. Our academic program is as demanding as it is flexible. It is designed to help students build skills and develop a passion for learning that lasts a lifetime.



In the words of Maria Montessori, "Education is a natural process - and is acquired not by listening to words, but by experiences in the environment." At Washington Montessori School, we enable our students to have these experiences that shape their lives. Our students leave here with the self-esteem and inner motivation they need to think and act independently and responsibly.

If you have any questions about our school, I invite you to contact me directly. I look forward to telling you more about Washington Montessori School and the life-changing opportunities it can provide for your child.

Warm regards,
Patricia Werner, Head of School
(860) 868-0551
pwerner@washingtonmontessori.org

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[ABOUT US](#)[EDUCATIONAL PROGRAMS](#)[ADMISSION](#)[CAMPUS COMMUNITY](#)[GIVING TO WMS](#)[TEACHER TRAINING](#)[Educational Programs >> Lower School](#)

Lower School

Ages 3 to 6 years



The WMS Lower School classrooms feature tactile and visually appealing materials that are interesting and engage children in learning. Academic achievement is a natural outcome of working with these materials, yet early academic achievement is not a Lower School goal. Instead, the Lower School classrooms foster continual self-discovery, allowing children the opportunity to choose activities that interest them and soak up each experience at their own pace.

Lower School classrooms are specially designed for the children who use them: chairs, tables, and shelves are sized proportionately, giving students a sense of independence as they move about the classroom.



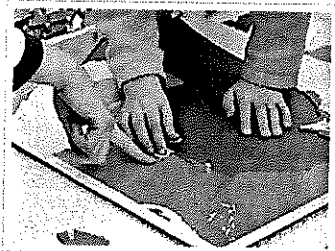
Each Lower School classroom operates as a community. The three-year mixed age grouping provides continuity from year to year; older children assist younger ones, fostering self-esteem and independence. Weekly community meetings create an atmosphere of mutual respect and cooperation, helping children learn the art of living in a world beyond home.

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Lower Elementary

Ages 6 to 9 years



Accountability and self-motivation are integral to the Lower Elementary program. Students at this age are curious and eager to learn about the world around them. They work independently to complete research and creative writing. Each child has a schedule for the week and is responsible for completing the necessary work on time. In the mixed-aged classroom, younger children are inspired by watching older children at work; those who are capable of understanding more complicated concepts can join more advanced lessons.



Some children become so inspired that they create their own books or learn new math facts so they can perform more challenging work. It is not unusual to find WMS third graders who understand basic algebraic equations.

In addition to academic work, Lower Elementary students develop important social skills. Through weekly classroom community meetings, they discuss and solve problems and focus on individual responsibility and democratic decision-making.

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Upper Elementary

Ages 9 to 11 years

Students at this level are prepared to tackle more varied and rigorous activities. Increasingly, the academic program leads them to become more involved with the rest of the WMS community and to take on larger roles and more responsibilities within the classroom.

The history, geography, and science curriculum provides still more opportunities to connect with the WMS community. Each year the students focus on one historic period, thoroughly learning its geography, culture, literature, and science. This culminates in a cultural fair where students share their knowledge with peers and parents, and express their creativity by dressing in period clothes, decorating their exhibit booths, and sometimes cooking meals from the era.



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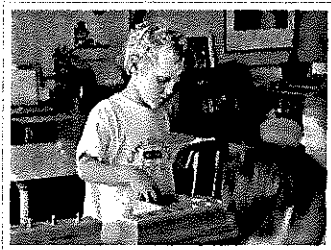
Additional Programs



The **Montessori After-school Program (MAP)** provides before- and after-school care. There is an option for children to be dropped off at 7:45 a.m Monday - Friday and picked up at 5pm Monday - Thursday.

The **WRAP program** provides after-school care for children ages 2 to 4 years old. The program is available from 11:30am to 3:15pm and it will include play time, quiet time and outdoor time.

The **Montessori After-school Program (MAP)** also offers **Enrichment** classes in topics such as cooking, music lessons, circus, sculpture, and golf. [Download](#) the MAP brochure for Spring 09. [Download](#) the MAP signup form.



Through the **Parent-Child Program**, a teacher trained in early childhood development provides constructive support to parents of children aged 9 months to 18 months.

The **Young Children's Community** is a classroom of 12 children aged 18 months to three years that meets for three hours a day, four days a week. Learning materials have a distinct purpose, such as developing fine motor coordination, and are a source of engagement and fun for the children. Developing trust and independence is also a goal of the program.

Through our **Supplementary Learning Support Services**, children can receive additional assistance such as:

- Academic, speech and language, and sensory integration evaluations
- Assessments by outside professionals as needed
- Individualized or small group tutorial programs

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Washington Montessori School at a Glance



Location: New Preston, Connecticut 06777

Affiliation: Independent, coeducational day school

Founded: 1965

Enrollment: 280 students

Grade levels: Pre-kindergarten through eighth grade

Staff: 56 full- and part-time

Facilities: 48-acre wooded campus including one regulation soccer/baseball field, one playing field, and two playgrounds; 57,000-square-foot building including a theatre and gymnasium

Financial Aid: 22 percent of students receive some form of financial aid

Accreditation: Connecticut Association of Independent Schools

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ZONING REGULATIONS OF THE TOWN OF WARREN, CONNECTICUT

AMENDED TO:
October 12, 2007

(Section 3.1.5c; 4.1.8c; 7.4; 11.7 & 11.10)

Amended: May 10, 2005

Effective: June 1, 2005

(Section 7.1.1 & Section 15.24)

Amended: May 22, 2007

Effective: May 25, 2007

(Section 17 – Driveways)

Amended: October 9, 2007

Effective: October 12, 2007

ZONING REGULATIONS

Feasibility study and other copy of Zoning Records of the Town of Warren, Conn. - 11/1/07

TOWN OF WARREN

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SECTION 22 - SPECIAL PERMIT FOR TELECOMMUNICATIONS FACILITIES AND TOWERS

22.1 PURPOSE:

The Purpose of this Regulation is to:

- A. Preserve the character and appearance of the Town of Warren while allowing adequate telecommunications services to be developed.
- B. Protect the scenic, historic, environmental, and natural or man-made resources of Warren.
- C. Locate towers and/or antennas in a manner which protects property values, as well as the general safety, health, welfare and quality of life of the citizens of Warren and all those who visit this community.
- D. Minimize the total number and height of towers throughout Warren.
- E. Provide standards and requirements for the regulation, placement, design, appearance, construction, monitoring, modification and removal of telecommunications facilities and towers.
- F. Require the sharing of existing towers, and the clustering of new facilities/towers where possible.
- G. Locate towers so that they do not have negative impacts such as – but not limited to – attractive nuisance, noise, and falling objects.
- H. Insure that new commercial uses are compatible with prevailing rural residential land-use patterns as specified in The Town of Warren Plan of Development.
- I. Provide a procedural basis for action within a reasonable period of time for requests for authorization to place, construct, operate or modify telecommunications facilities.

22.2 CONSISTENCY WITH FEDERAL LAW:

These regulations are intended to be consistent with The Telecommunications Act of 1996 in that: a) they do not prohibit, or have the effect of prohibiting, the provision of Personal Wireless Services; b) they are not intended to be used to unreasonably discriminate among providers of functionally equivalent Services; c) they do not regulate Personal Wireless Services on the basis of the environmental effects of radio frequency emissions to the extent that the regulated Services and Facilities comply with the FCC's regulations concerning such emissions.

22.3 DEFINITIONS AND WORD USAGE:

The following terms shall have the meanings indicated. The word "shall" or "will" indicate mandatory requirements; "may" is advisory and indicates recommendations which are not mandatory.

ADEQUATE COVERAGE - Coverage is considered to be "adequate" within that area surrounding a Base Station where the predicted or measured median field strength of the transmitted signal is such that the majority of the time, transceivers properly installed and operated will be able to communicate with the base station. In the case of cellular communications in a rural environment like Warren, this would be a signal strength of at least -90 dBm for at least 75% of the coverage area. It is acceptable for there to be holes within the area of Adequate Coverage where the signal is less than -90 dBm, as long as the signal regains its strength to greater than -90 dBm further away from the Base Station. For the limited purpose of determining whether the use of a Repeater is necessary or desirable, there shall be deemed not to be Adequate Coverage within said holes. The outer boundary of the area of Adequate Coverage, however, is that location past which the signal does not regain strength of greater than -90 dBm.

ADEQUATE CAPACITY - Capacity is considered to be "adequate" if the Grade of Service (GOS) is p.05 or better for median traffic levels offered during the typical busy hour, as assessed by direct measurement of the Personal Wireless Service Facility in question. The GOS shall be determined by the use of standard Erlang B Calculations. As call blocking may occur in either the land line or radio portions of a wireless network, Adequate Capacity for this regulation shall apply only to the capacity of the radio components. Where capacity must be determined prior to the installation of the Personal Wireless Services Facility in question, Adequate Capacity shall be determined on the basis of a 20% busy hour (20% of all offered traffic occurring within the busiest hour of the day), with the total daily traffic based on aggregate estimates of the expected traffic in the Coverage Area.

ANTENNA - A device which is attached to a Tower or other structure for transmitting or receiving electromagnetic waves. Examples include, but are not limited to, whip, panel, and dish antennas.

AVAILABLE SPACE - The space on a tower or structure to which antennas of a telecommunications provider are both structurally able and Electromagnetically able to be attached.

BASE STATION - The primary sending and receiving site in a wireless Telecommunications network. More than one base station and/or more than one variety of telecommunications providers can be located on a single tower or structure.

BULLETIN 65 - Published by the FCC Office of Engineering and technology specifying radiation levels and methods to determine compliance.

CAMOUFLAGED FACILITY - Any telecommunications facility that is designed to blend into the surrounding environment, such as towers and/or attached equipment designed to look like trees or barn silos, etc.

CHANNEL - The segment of the radiation spectrum from an antenna which carries one signal. An antenna may radiate on many channels simultaneously.

CO-LOCATION - the use of a single mount on the ground by more than one carrier (vertical co-location), and /or several mounts on an existing structure by more than one carrier.

COMMISSION - The Planning and Zoning Commission of the Town of Warren.

DBM - Unit of measure of the power level of an electromagnetic signal expressed in decibels referenced to 1 mill watt (1/1000th watt), correctly written as "dBm".

ELECTROMAGNETICALLY ABLE - The determination that the new signal from and to the proposed new Antennas will not significantly interfere with the existing signals from and to other facilities located on the same Tower or structure as determined by a qualified professional telecommunications engineer. The use of available technologies to alleviate such interference shall be considered when making this determination.

ELEVATION - The elevation at grade or ground level shall be given in Above Mean Sea Level (AMSL). The height of the wireless service facility shall be given in Above Ground Level (AGL).

AGL is a measurement of height from the natural grade of a site to the highest point of a structure. The total elevation of the wireless service facility is AGL plus AMSL.

EMF - Electromagnetic Fields, often expressed in wavelengths or frequencies to indicate their placement on the electromagnetic spectrum. The radio frequencies usually radiate away from their generating source -- hence wireless capability. The radio frequencies are identified between 3 kilohertz to 300 gigahertz and include AM & FM radio, TV, radar, cellular/PCS technologies, emergency fire & police, paging services, and satellite broadcasting among many others. Microwaves are a portion of the radio frequencies.

ENVIRONMENTAL ASSESSMENT (EA) - An EA is the document required by The Federal Communications Commission (FCC) and the National Environmental Policy Act (NEPA) when a wireless communication facility is placed in certain designated areas such as wetlands and sensitive habitats.

ERP - Effective Radiated Power

EQUIPMENT SHELTER - An enclosed structure, cabinet, shed or box located at the Base Station designed principally to house batteries and electrical equipment used in connection with Personal Wireless Service Transmissions.

FACILITY SITE - a property or any part thereof, which is owned or leased by one or more telecommunications providers and upon which one or more telecommunications facility(s) and required landscaping are located. This includes any lot or location, having met all other criteria in this telecommunication facility may be able to provide Adequate Coverage and Adequate Capacity to a significant portion of the Town of Warren.

FALL ZONE - The area on the ground within a prescribed radius from the base of a wireless communications facility. The fall zone is the area within which there is a potential hazard from falling debris (such as ice) or collapsing material.

FCC - Federal Communications Commission. The government agency Responsible for regulating telecommunications in the United States.

FCC-97-326 - A report and order which sets new national standards for Exposure to radio frequency emissions from FCC-regulated transmitters.

GHZ - Gigahertz. A measure of electromagnetic radiation equaling one Billion hertz.

GRADE OF SERVICE - A measure of the percentage of calls which are able to connect to the Base Station, during the busiest hour of the day. Grade of Service is expressed as a number, such as p.05, which means that 95% of callers will connect on their first try. A lower number (p.04) indicates a better Grade of Service.

HEIGHT OF TOWER - The vertical distance from the highest point of the structure, plus any device attached, to the grade before construction.

HERTZ - One hertz is the frequency of an electric or magnetic field which reverses polarity once each second, or one cycle per second.

LICENSED CARRIER - A company authorized by the FCC to construct and operate a Wireless Communications facility.

LOCATION - References to site location as the exact longitude and latitude, to the nearest tenth of a second, with bearing or orientation referenced to true North.

MAJOR MODIFICATION OF AN EXISTING FACILITY - Any change, or proposed change in power input or output, number of Antennas, change in Antenna(s) type or model, repositioning of Antenna(s), change in number of Channels per Antenna above the maximum number approved under an existing Special Permit.

MAJOR MODIFICATION OF AN EXISTING TOWER - Any increase, or Proposed increase in dimensions of an existing and permitted Tower or other structure designed to support telecommunications transmission, receiving, and/or relaying antennas, and/or equipment.

MHZ - Megahertz. A measure of electromagnetic radiation equaling one million hertz.

MONITORING - The measurement, by use of instruments in the field, of non-ionizing radiation exposure at a site as a whole, or from individual telecommunications facilities, towers, antennas, or repeaters.

MONITORING PROTOCOL - The testing protocol, such as the Cobbs Protocol, or the FCC Regulations (Title 47, Part 1, Section 1.1307 referenced as IEEE C95.3 1991), or one substantially similar, including compliance determined in accordance with the National Council on Radiation Protection and Measurements, (Reports 86 and 119) which is to be used to monitor emissions and determine exposure risk from existing and new telecommunications facilities. The Warren Planning and Zoning Commission may, as the technology changes, require by written regulation, the use of other testing protocols. A copy of the Monitoring Protocol shall be on file with the Town Clerk.

MONOPOLE - A single self-supporting vertical pole with no guy wire anchors, usually consisting of a galvanized or other unpainted metal, or a wooden pole with below grade foundations. (See Towers.)

MOUNT - the structure or surface, upon which antennas are mounted, including the following four types of mounts:

ROOF MOUNTED - on the roof of a building

SIDE MOUNTED - on the side of a building

GROUND MOUNTED - mounted on the ground (see Tower)

STRUCTURE MOUNTED - mounted on a structure other than a building.

OMNIDIRECTIONAL (WHIP) ANTENNA - A thin rod that transmits and receives signals in all directions.

PANEL ANTENNA - A flat surface antenna usually developed in multiples.

PERSONAL WIRELESS SERVICES - Commercial mobile services, unlicensed wireless services, and common carrier wireless exchange access services. These services include: cellular services, Personal Communications Systems (PCS), specialized mobile radio services, and paging services.

PERSONAL WIRELESS SERVICE FACILITY - All equipment (including Repeaters) with which a Personal Wireless Service Provider broadcasts and receives the radio frequency waves which carry their services and all locations of said equipment or any part thereof. This Facility may be sited on one or more Towers or structure(s) owned and permitted by another owner or entity.

PERSONAL WIRELESS SERVICE PROVIDER - An entity, licensed by the FCC to provide Personal Wireless Services to individuals or institutions.

RADIAL PLOTS - Radial plots are the result of drawing equally-spaced lines (radials) from the point of an antenna, calculating the expected signal and indicating this graphically on a map. The relative signal strength may be indicated by varying the size or color at each point being studied along the radial; a threshold plot uses a mark to indicate whether that point is strong enough to provide adequate coverage -- i.e. the points meeting the threshold of adequate coverage. The drawback is the concentration of points close to the antenna and the divergence of points far from the site near the ends of the radials.

RADIATED-SIGNAL PROPAGATION STUDIES OR COVERAGE PLOTS -

Computer generated estimates of the signal emanating, and prediction of coverage, from antennas or repeaters sited on a specific tower or structure. The height above ground, power input and output, frequency output, type of antenna, antenna gain, topography of the site and its surroundings are all taken into account to create these simulations. They are the primary tool for determining whether a site will provide Adequate Coverage for the telecommunications facility proposed for the site.

RADIO FREQUENCY ENGINEER - An engineer specializing in the design, review, and monitoring of radio frequency technologies.

REGULATED FACILITY, SERVICE, AND/OR SITE - The equipment, towers, mount, antennas and other structures subject to local zoning regulation. This includes all telecommunication services not exempt from local regulation under the provisions of the Connecticut General Statutes and the authority of the Connecticut Siting Council, or not exempt from local regulation pursuant to the Telecommunications Act of 1996, or other such federal legislation or federal authority.

REPEATER - A small receiver/relay transmitter of not more than 20 watts Output designed to provide service to areas which are not able to receive Adequate Coverage directly from a Base Station.

SECURITY BARRIER - A locked, impenetrable wall, fence or berm that completely seals an area from unauthorized entry or trespass.

SEPARATION - The distance between one carrier's array of antennas and another carrier's array.

STANDING WAVE PHENOMENON - A localized concentration of energy. This can occur for instance when radio frequencies that are supposed to take off into space, concentrate around metal objects instead (metal roofs, certain architectural supports, water towers, guy wires, etc.), creating "RF hot-spots" that exceed federal guidelines.

STRUCTURALLY ABLE - The determination that a Tower or structure is capable of carrying the load imposed by the proposed new Antennas under all reasonably predictable conditions as determined by professional structural engineering analysis.

TELECOMMUNICATIONS FACILITY - All equipment (including repeaters) with which a telecommunications provider broadcasts and receives the Radiofrequency waves which carry their services and all locations of said equipment or any part thereof. This facility may be sited on one or more towers or structures owned and permitted by another owner or entity.

TELEPORT - A facility utilizing satellite dishes of greater than 2.0 meters in diameter designed to uplink to communications satellites for transmitting in the C-Band (4 - 6 GHz) spectrum.

TILED COVERAGE PLOTS - Tiled plots result from calculating the signal at uniformly spaced locations on a rectangular grid, or tile, of the area of concern. Unlike radial plots, tiled plots provide a uniform distribution of points over an area of interest; usually the same grid will be used as different sites are examined, and it is not necessary that the transmitter site be within the grid or area of interest. As with radial plots, the graphic display or plot can be either signal strength or adequate threshold. This method requires substantially more topographic data and longer (computer) execution time than radial plots, but is preferable for comparative analysis.

TOWER - A support structure intended to support antennas and associated equipment. This includes:

GUYED TOWER: A monopole tower or lattice tower that is tied to the ground or other surface by diagonal cables.

LATTICE TOWER: A type of mount that is self-supporting with multiple legs and cross bracing of structural steel.

MONOPOLE TOWER: The type of mount that is self-supporting with a single shaft of wood, steel, fiberglass, or concrete, and a platform (or racks) for panel and whip antennas arrayed at the top.

22.4 EXEMPTIONS AND DISALLOWANCES:

The following wireless telecommunications facilities are exempt: police, fire, ambulance and other emergency dispatch; amateur (HAM) radio, citizens band radio; any existing commercial radio tower, and radio dispatch services for local businesses. Also exempt from this regulation are antennas used solely for residential household television and radio reception, and satellite dishes measuring 2 meters or less in diameter. No personal wireless service facility shall be considered exempt from this article for any reason, whether or not said facility is proposed to share a tower or other structure with such exempt uses. Teleports utilizing satellite dishes of greater than 2.0 meters in diameter designed to uplink to communications satellites are not allowed in the Town of Warren.

22.5 PROVISION FOR HIRING INDEPENDENT CONSULTANTS

A. Due to the complex technical character of the information to be provided by an applicant pursuant to these regulations and the monitoring, testing and inspection of facilities and operation provisions, the Commission shall hire such consultants as it deems reasonably necessary to assist it with such the determinations as are to be made by it concerning such matters. All expenses incurred by the Commission for such services as part of an application process shall be deemed to be part of the application fee and paid by the applicant. All expenses incurred by the Planning and Zoning Commission for such consultation services incurred in performing its monitoring, testing and inspection shall be paid by the applicant or current permit fee. Any failure to pay such expenses shall constitute a violation of the permit and automatically cause the revocation of the permit and all rights there under.

B. These consultants shall be qualified professionals with an appropriate combination of training, record of service, and/or certification in one of the following fields: a) telecommunications/radiofrequency engineering; b) structural engineering; c) assessment of electromagnetic fields; and, if determined by the Commission, d) other fields.

C. Upon submission of a complete application for a special use permit, the Commission will provide its independent consultant(s) with the full application for their analysis and review.

D. Applicants for any special permit shall obtain written permission from the owners of the proposed property(s) or facility(s) site(s) for the town's independent consultant(s) to conduct any necessary site visit(s).

E. Upon submission of a complete application, the independent consultant(s) will provide an estimate for the cost of reviewing the application to the Commission. The Commission will forward this estimate in writing to the applicant. The applicant will pay this fee during the review process, separate from the general application fee, and include this fee as part of the application process. No application will be processed without full payment. In lieu of estimates, the Commission may require the applicant to fund an account which the town may draw upon to insure reimbursement of those fees.

F. The consultants shall work under the direction of the Warren Planning and Zoning Commission. Copies of the consultant's findings and reports shall be made available to the applicant not less than seven (7) days prior to any meeting of the Commission to consider the consultant's report, and the applicant shall be given opportunity to respond to said report in writing and at the next hearing when the consultant's report(s) will be considered.

22.6 FINDINGS OF THE WARREN PLANNING AND ZONING COMMISSION

22.6.1 Special Permits: No tower or telecommunications facility shall be erected, constructed, or installed without first obtaining a special use permit from the Commission. A special use permit is required for: a) new tower construction or major modification of an existing tower(s) or repeater(s), b) telecommunications facilities or major modification of existing facilities, to be mounted on a tower or structure.

22.6.2 Applicable Regulations: In acting on the special permit application, the Commission will proceed in accordance with Section 9 of the Warren Planning and Zoning regulations for special permits.

22.6.3 Findings by the Commission: The applicant shall comply with the requirements set forth in Section 17.5 to 17.15.2, inclusive, and shall provide all information reasonably required to permit the Commission. The Commission shall, in consultation with independent consultants, make all of the following applicable findings before granting the special permit.

A. Applicant is not already providing Adequate Coverage and/or Adequate Capacity to the Town of Warren.

B. Applicant is not able to use an existing tower/facility, either within or outside of Warren, either with or without the use of Repeaters, to provide Adequate Coverage and/or Adequate Capacity to the Town of Warren.

C. Applicant has endeavored to provide Adequate Coverage and Adequate Capacity to the Town of Warren with the least number of towers and antennas which is technically and economically feasible.

D. Applicant will be providing at least 50% of its coverage to the Town of Warren.

E. Efforts have been made to locate new towers adjacent to existing towers.

F. Applicant has agreed to rent or lease available space on the tower under the terms of fair-market lease, with reasonable conditions and without discrimination to other telecommunications providers.

G. Proposed telecommunications facility(s) or tower(s) should make use of available municipal lands if those lands conform to appropriate setbacks for this regulation, and where visual impact can be minimized.

H. The proposal shall comply with rules as adopted in FCC-97-326 and procedures outlined in FCC Bulletin 65 regarding emissions and exposure to electromagnetic radiation, and that the required monitoring program shall be paid for by the applicant.

I. Towers and telecommunications facilities shall be located so as to minimize the following potential impacts:

1. Visual/Aesthetic: Unless adequate coverage and adequate capacity cannot otherwise be achieved, towers shall be sited off ridgelines, and where their visual impact is least detrimental to highly rated scenic areas such as, but not limited to, those sites designated as scenic in the Warren Plan of Development. In determining whether or not a tower will have an undue adverse visual impact on the scenic or natural beauty of a ridge or hillside, the Commission shall consider, but not be limited to:

a. The period of time, and the frequency of viewing, during which the proposed tower would be seen by the traveling public on a public highway.

- b. The degree to which the tower is screened by topographic features;
 - c. Background features in the line of sight to the proposed tower that obscures the facility or make it more conspicuous;
 - d. The distance of the proposed tower from the viewing vantage point and the proportion of the facility that is visible above the skyline;
 - e. The number of vehicles traveling on a public highway or waterway at or near the critical vantage point;
 - f. The sensitivity or unique value of the particular view affected by the proposed development.
2. Devaluation of property. Siting shall be in as low population density areas as possible.
 3. Safety hazards: In cases of structural failure, ice accumulation and discharge, and attractive nuisance.
 4. Electromagnetic radiation: In case the tower, guy wires, or telecommunications facility is found to exceed the FCC guidelines.

22.6.4 Documentation of Denial: Any decision of the Warren Planning and Zoning Commission to deny an application for a special permit under this regulation shall be in conformance with 47 U.S.C.#332(7) (B) (iii) of the Telecommunications Act of 1996, in that it shall be in writing and supported by substantial evidence contained in a written record.

22.7 GENERAL PROJECT/SITE REQUIREMENTS

22.7.1 Applicants: If the applicant is not the landowner, the landowner will be considered a co-applicant and must submit the required documentation under section 16.8.2 of these regulations.

22.7.2 Access Roads and Underground Utilities: Where new telecommunications towers and facilities require construction of or improvements to access roads, to the extent practicable roads shall follow the contour of the land and be constructed or improved within existing forest fringe areas, and not in open fields. Utility or service lines shall be buried underground. The Commission shall request input from the Chiefs (or their designees) of Fire, Police, and other Emergency services regarding the adequacy of emergency access for the planned drive or roadway to the site. The Commission may waive the underground requirement at its discretion.

22.7.3 Landscaping/Screening: Screening shall be required at the perimeter of the site. If the tower or facility site is in a wooded area, a natural vegetated buffer strip of undisturbed trees shall be retained for at least 100' in depth, and at least 15' in height at all times around the perimeter, and only minimally disturbed where the access drive is located. If the tower or facility site is not in a wooded area, a vegetated barrier at least 50' deep by 10' high around the perimeter shall be planted by the applicant. It shall be of a type that has the potential to reach a height of at least 15 feet at maturity. Existing vegetation surrounding the site shall be preserved and maintained to the greatest extent possible. All landscaping shall be properly maintained to ensure its good health and viability at the expense of the owner(s). All areas disturbed during project construction shall be replanted with vegetation. Applicant shall obtain a financial surety (to be determined by the Commission) to cover the cost of the remediation on any damage to the landscape which occurs during the clearing of the site. The Commission may require landscaping in excess of any written requirements as is deemed reasonably necessary in order to enhance compatibility with adjacent residential and non-residential land uses.

22.7.4 Fencing and Signs: The area around the tower and communication equipment shelter(s) shall be completely fenced for security to a height of not less than 8' or more than 12', and gated. Use of razor wire is not permitted. A sign of no greater than two (2) square feet indicating the name of the facility owner(s) and a 24-hour emergency telephone number, either local or toll-free, shall be posted adjacent to the entry gate. In addition, No Trespassing or other warning signs, and the federal registration plate (where applicable) shall be posted on the fence or as required to meet federal requirements.

22.7.5 Building Design: Communication equipment shelters and accessory buildings shall be designed to be architecturally similar and compatible with each other, and shall be no more than 12' high or 750 square feet. The buildings shall be used only for the housing of equipment related to this particular site. Whenever possible, the buildings shall be joined or clustered so as to appear as one building. Buildings and related structures shall use materials and textures that will blend them into the natural setting to minimize the visual impact. Buildings shall be finished or painted in stealth or neutral color tones.

22.7.6 Height of Towers: New Towers shall not exceed the minimum height necessary to provide adequate coverage for the telecommunications facilities proposed for use on the tower. Applicant may submit a request for additional height to accommodate future sharing, and shall provide design information to justify such additional height. In no event shall towers exceed 150' measured from the grade at the base of the tower before construction to the highest point shown on the Facility Plan. The Commission will hire an Independent Consultant to verify Adequate Coverage and justify tower height.

22.7.7 Tower Finish: New Tower(s) shall have a galvanized finish unless otherwise required by the Commission. The Commission may require the tower(s) to be painted or otherwise camouflaged to minimize the adverse visual impact.

22.7.8 Tower Sharing/Camouflaging: Tower(s) must be of a structural type which will maximize potential sharing. Lattice type structures are preferred, but where a monopole is required, applicant must demonstrate the future utility of such structure for expansion of service for applicant and other future applicants. The Commission reserves the right to require stealth designs such as towers made to resemble trees or other structures.

22.7.9 Use of Repeaters: The applicant shall demonstrate that it is not reasonably able to assure adequate coverage or to create adequate coverage in the Town of Warren from base stations located in other towns or to fill holes within the area of otherwise adequate coverage by use of repeaters. Site Plan review before the Commission shall be required. Applicants shall detail the number, location, power output, and coverage of any proposed Repeaters in their systems and provide engineering data to justify their use.

22.7.10 Coverage Area: If primary coverage (greater than 50%) from proposed telecommunications facility is outside of the Town of Warren, then the permit may be denied unless the applicant can demonstrate an inability to locate within the town which is primarily receiving service from the proposed facility.

22.7.11 Commercial Advertising: Commercial advertising shall not be allowed on any antenna, tower, or accessory building or communications equipment shelter.

22.7.12 Lighting: No external lighting is permitted, except for manually operated emergency lights for use only when operating personnel are on site.

22.7.13 Noise: Noise-producing equipment shall be sited and/or insulated to guarantee that no increase in noise above ambient levels measured at the property line occurs.

22.7.14 Air Navigation: No tower or telecommunications facility that would be classified as a hazard to air navigation, as defined by the Federal Aviation Regulations (Title 14 CFR) is permitted.

22.7.15 Lot Size/Setback Requirements: Tower setbacks shall be measured from the base of the tower (unless guy-wired) to the nearest point along each property line of the parcel on which it is located.

A. The minimum lot size for any telecommunications tower(s) or facilities shall be 10 acres.

B. No Repeater shall be closer than 200' to a dwelling unit measured at ground level, nor less than 35' above the ground.

C. Where guy wire supports are used, setbacks will begin at the base of the guy wire anchor (d) to the ground, not at the base of the tower.

D. No telecommunications facility or tower, including guy-wire anchors and protective fencing, if any, shall be located:

1. Closer than 1,500' horizontally to any structure existing at the time of application which is used as a primary or secondary residence; to the property of any school (both public and private); to any church; or to any other public building? Primary or secondary residences are those dwelling units that include toilet facilities, and facilities for food preparation and sleeping.

2. Closer than 1500 feet horizontally to any boundary line of the property upon which the tower(s) or facilities are located except, this restriction may be reduced to 200' if the applicant has obtained an easement from the owners of all properties located within 1500', precluding such owners, their heirs successors, administrators and assignees from locating any structure used for a primary or secondary residence, private or public school, church or other public structures within 1500' of such towers or facility.

3. Within the habitat of any state-listed rare or endangered wildlife or species.

4. Within 300' horizontally of any Warren, State of Connecticut, or Federally regulated wetlands.

5. Within 300' of the outer riparian zone measured horizontally from any river or perennial stream.

6. Within 1500' of any historic building or property listed, or Capable of being listed, on the State or Federal Register of Historic Places.

7. Within 500' horizontally of any known archaeological site. (The Commission may consult the State Archaeologist as to the Archaeology significance of any proposed site.)

8. The Fall Zones for guy wire towers shall be at least 4 times the tower height; and for non-guyed towers, 2 and one half times the tower height.

9. In reviewing special permit applications, the Commission may allow the Fall Zones to extend within a neighboring property if it finds that a substantially better design will result from such a reduction.

Such neighboring property shall not be developed and will be subject to a legally binding agreement, secured by the applicant, preventing development during the time the tower is in place.

22.8 GENERAL APPLICATION REQUIREMENTS AND REQUIRED DOCUMENTATION:

The following shall be required in all applications:

22.8.1 Contract with Provider: Applicants for a telecommunications tower or facility special use permit must be a telecommunications provider, and/or must provide a copy of its lease/contract with an existing telecommunications provider. A special use permit will not be granted for a tower/facility to be built on speculation. Copies of all lease/contracts must be provided with the application. The applicant will also provide copies of any applications in other towns within a 10 mile radius of the proposed site. The Commission may submit this copy to any other host town for review and comment.

22.8.2 Appropriate Signatures/Contacts: All applications shall require that the landowners, if separate from the tower owners and/or service providers, be co-applicants. Required documents include 1 each displaying original signature(s), and 5 photocopies. The following shall be provided:

- A. Signature(s) of landowner(s), applicant(s), tower owner(s).
- B. An affidavit from the owner of the property acknowledging responsibility for the removal of a tower or facility that is deemed "abandoned" or unsafe by the Commission, or is in violation of this section, or whose permit has expired and has not been renewed by the Commission.

C. Landowners shall also provide an affidavit expressing written consent for co-application, and copies of any and all leases or other agreements with tower owners, applicant(s) or other service providers.

D. Contacts: The applicant shall submit the exact legal name, address or principal place of business and phone number of the following:

i. Applicant. If any applicant is not a natural person, it shall also give the type of business entity and the state in which it is registered. If any applicant is a corporation, trust, association, or other organized group or legal entity, it shall also provide the state under which it was created or organized and the date of such creation.

ii. Person to whom correspondence or communications in regard to the application are to be sent. Notice, orders and other papers may be served upon the person so named, and service shall be deemed to be service upon the applicant.

iii. Person to be contacted in the event of an emergency involving the facility. This should be someone available on a 24-hour basis that is authorized by the applicant to act on behalf of the applicant regarding an emergency situation.

iv. Owner of the property on which the proposed tower shall be located and of the owner(s) of the tower on which the proposed facility shall be located. Written permission of the owner(s) to apply for the special use permit on the proposed property or facility site(s) for the town's independent consultant(s) to conduct any necessary site visit(s).

v. Identification, address, phone number and contact person for each proposed service provider who might be named as an applicant, in addition to the landowner.

E. The names and address of the record owners of all abutting properties.

22.8.3 Evidence of Need:

A. Existing Coverage: Applicant shall provide written documentation demonstrating that existing telecommunications facility sites in Warren, in abutting towns, and within a 30-mile radius of the proposed site cannot reasonable be made to provide Adequate Coverage and/or

Adequate Capacity to the Town of Warren. The documentation shall include, for each facility site listed which is owned or operated by the applicant, the exact location (in longitude and latitude, to degrees, minutes and seconds to be nearest tenth of a second), ground elevation, height of the tower or facility, type of antennas, antenna gain, height of antennas on tower(s), output frequency, number of channels, power output and maximum power output per channel. Potential adjustments to these existing facility sites, (including changes in antenna type), orientation, gain, height or power output shall be specified. Radial or tiled coverage plots showing each of these facility sites, as they exist, and with adjustments as above, shall be provided as part of the application.

B. Repeater: Applicant shall demonstrate with written documentation that they have analyzed the feasibility of repeaters in conjunction with all facility sites listed in compliance with 16.8.2A (above) to provide Adequate Coverage and/or Adequate Capacity to the Town of Warren. Radial or tiled coverage plots of all repeaters considered for use in conjunction with these facility sites shall be provided as part of the application.

C. Indirect Service: Applicant shall demonstrate which portion of a tower or facility and which antennas, if any, are to reduce or eliminate reliance on land-lines, or otherwise provide communications capability to the applicant, as opposed to providing direct service to customers. Such provision of indirect service may be considered if reasonable alternatives are not available and the overall effect is consistent with the purposes set forth in Section 16.1 of this regulation.

D. Five Year Plan: All applications shall be accompanied by a written five-year plan for the utilization of the proposed facilities. This plan should include justification for capacity in excess of immediate needs, as well as plans for any further development within the Town of Warren.

E. The applicant shall further demonstrate with written documentation that it has investigated all available "state of the art" alternative technologies which might be effectively employed to provide Adequate Coverage and/or Adequate Capacity to the Town of Warren in lieu of its proposed facility.

22.9 REQUIRED LEGAL AND TECHNICAL DOCUMENTATION: The following documents are required in all applications:

22.9.1 Federal/State Permits: Applicant shall submit copies of all pertinent submittals and showings pertaining to: FCC permitting/licensing; Environmental Assessments and Environmental Impact Statements; FAA Notice of Construction or Alteration; Aeronautical Studies; all pertinent data, assumptions and calculations relating to service coverage; and all pertinent calculations and/or measurements data related to non-ionizing radiation emissions and exposure, regardless of whether categorical exemption from routine environmental evaluation under the FCC rules is claimed. Copies of all information submitted in compliance with requirements of the Connecticut State Siting Council and the Connecticut Department of Public Utilities shall also be submitted.

22.9.2 Surety: Details of proposed method of financial surety as required in Section 16.7.C (Landscaping/Screening), 16.16 (Abandonment), 16.17 (Duty of Remove) and 16.18 (Failure to Remove) of these regulations.

22.9.3 Commitment to Available Space: Applicants for new tower construction or modification permits shall provide a written, irrevocable commitment valid for the duration of the existence of the tower, to rent or lease available space for co-location on the tower at fair market prices and terms, without discrimination to other telecommunications providers.

22.9.4 Lease of Tower: Applicants for a special use permit for a facility to be installed on an existing tower shall provide a copy of its lease/contract with the owner of the existing structure.

22.9.5 Applications/Plans for Other Facility Sites: Applicants shall submit any applications or plans for other facility sites within a 10-mile radius of the Town of Warren. Applicants shall submit any existing facility sites within a 30-mile radius of the Town of Warren.

22.9.6 Site Plans and Maps: Required are physical plant plans, prepared, stamped and signed by a professional engineer. Survey plans shall be stamped and signed by a land surveyor registered in Connecticut. Signal propagation and radio-frequency studies, plots and related material shall be prepared, clearly identified and signed by a qualified radiofrequency engineer. Power density calculations shall be in accordance with "worst case" formulas in the Office of Engineering and Technology (FCC Bulletin 65, August 1997). Radial plots shall be in bright colors, showing clear demarcations between signals strengths.

Plans shall be on 24" x 36" sheets, on as many sheets as necessary, and at scales which are no smaller (i.e. no less precise) than listed below. Each plan sheet shall have a title block indicating the project title, sheet title, sheet number, date, revision dates, scale(s), and original seal(s) and signature(s) of the professional(s) who prepared the plan. Proposed site plans (include 5 copies) require the following:

22.9.6.1 Location Map: Copy of a portion of the most recent U.S.G.S. Quadrangle Map, at a scale of 1:25:000, and showing the area within at least two miles from the proposed tower site. Indicate the tower location and the exact latitude and longitude (degrees, minutes, and seconds to the nearest tenth).

22.9.6.2 Vicinity Map at a scale of 1" = 416' (1:5000) with contour intervals no greater than 10 feet (3 meters) showing the entire vicinity within 2500' radius of the tower site, and including the topography, public and private roads and driveways, buildings and structures, bodies of water, wetlands, landscape features, historic and archaeological sites, and habitats for endangered or threatened species. Indicate the property lines of the proposed tower site parcel and of all abutters to the tower site parcel (from assessor's maps or available surveys). Indicate any access easement or right of way needed for access from a public way to the tower and/or facility site, and the names of all abutters or property owners along the access easement or who have deeded rights to the easement. Locate all residential or commercial structures, schools, churches, or public buildings within 1750' of the proposed Base of the Tower.

22.9.6.3 Existing Conditions Plan: A recent survey of the area within 500' of the tower site at a scale no smaller than 1" = 40' with topography drawn with a minimum of 2' contour intervals, showing existing utilities, property lines, existing buildings or structures, stone walls or fence lines, wooded areas, existing water wells and springs, individual trees with diameters greater than 12" within a 200' radius from the base of the proposed tower (labeled with their current heights). Show the boundary of any wetlands or floodplains or watercourses, and of any bodies of water included in the Watershed Protection District within 500' from the tower or any related facilities or access ways, or appurtenances. The survey must have been completed, on the ground, by a land surveyor registered in Connecticut within two years prior to the application date.

22.9.6.4 Proposed Site Plan: Proposed facility site layout, grading and utilities at the same scale or larger than the Existing Conditions Plan (above).

A. Proposed tower location and any appurtenances, including supports and guy wires, if any, and any accessory building (communication equipment shelter or other). Indicate property boundaries and setback distances to the base(s) of the tower and to the nearest corners of each of the appurtenant structures to those boundaries, and dimensions of all proposed improvements. Where protective fencing is proposed, indicate setback distances from the edge of the fencing.

B. Indicate proposed spot elevations at the base of the proposed tower and at the base of any guy wires, and the corners of all appurtenant structures.

C. Proposed utilities, including distance from source of power, sizes of service available and required, locations of any proposed utility or communication lines, and exact locations of the underground route. Detailed plans for emergency power generation including:

- i.** Demonstration of percent of electrical demand being proposed in event of loss of commercial power.
- ii.** Type of fuel, storage method and expected means and frequency of fuel delivery to the site for power generation.
- iii.** Amount of generator time based on historic power reliability for the area of the facility, proposed frequency and duration of tests, and description of muffler system and methods for noise abatement.
- iv.** Feasibility of wind and/or solar power in conjunction with storage batteries.

D. Limits of areas where vegetation is to be cleared or altered, and justification for any such clearing or alteration.

E. Any direct or indirect wetlands alteration proposed.

F. Detailed plans for drainage of surface and/or sub-surface water; plans to control erosion and sedimentation both during construction and as a permanent measure.

G. Plans indicating locations and specifics of proposed screening, landscaping, ground cover, fencing, etc.; any exterior lighting or signs.

H. Plans of proposed access driveway or roadway and parking area at the tower site. Include grading, drainage, and traveled width. Include a cross section of the access drive indicating the width, depth of gravel, paving or surface materials.

I. Plans showing any changes to be made to an existing facility's landscaping, screening, fencing, lighting, drainage, wetlands, grading, driveways or roadways, parking or other infrastructure as a result of a proposed modification of the facility.

22.9.6.5 Proposed Tower and Appurtenances Plan: (include 5 copies)

A. Plans, elevations, sections and details at appropriate scales but no smaller than 1" = 10'.

B. Two cross sections through proposed towers drawn at right angles to each other, and showing the ground profile to at least 100 feet beyond the limit of clearing, and showing any guy wires or supports. Dimension the proposed height of tower above average grade at tower base. Show all proposed antennas, including their location on the tower.

C. Details of proposed tower foundation, including cross sections and details. Show all ground attachments, specifications for anchor bolts and other anchoring hardware.

D. Detail proposed finish of the tower.

E. Indicate relative height of the tower to the tops of surrounding trees as they presently exist, and the height to which they are expected to grow in ten years.

F. Illustration of the modular structure of the proposed tower indicating the heights of sections which could be removed or added in the future to adapt to changing communications conditions or demands.

G. A professional structural engineer's written description of the proposed tower structure and its capacity to support additional antennas or other communications facilities at different heights and the ability of the tower to be shortened if future communications facilities no longer require original height.

H. A description of available space on the tower, providing illustrations and examples of the type and number of telecommunications facilities which could be mounted on the structure.

22.9.6.6 Proposed Communications Equipment Shelter Plan:

A. Floor plans, elevations, and cross sections at a scale no smaller than 1/4" = 1' of any proposed appurtenant structure.

B. Representative elevation views, indicating the roof, facades, doors and other exterior appearance and materials.

22.9.6.7 Proposed Equipment Plan:

A. Plans, elevations, sections and details at appropriate scale, but no smaller than 1" = 10'.

B. Number of antennas and repeaters, as well as the exact locations of antennas and of all repeaters (if any) located on a map as well as by degrees, minutes and seconds to the nearest tenth of latitude and longitude.

C. Mounting locations on tower or structure, including height above ground.

D. A recent survey of the facility site at a scale no smaller than 1" = 40' showing horizontal and radial distances of antenna(s) to nearest point on property line, and to the nearest dwelling unit.

E. Antenna(s) types, manufacturer(s), model number(s).

F. For each antenna, the antenna gain, and antenna radiation pattern.

G. Number of channels per antenna, projected and maximum.

H. Power input to the antenna(s).

I. Power output, in normal use and at maximum output for each antenna and all antennas as an aggregate.

J. Output frequency of the transmitter(s).

K. For modification of an existing facility with multiple emitters, the results of an intermodulation study to predict the interaction of the additional equipment with existing equipment.

22.9.6.8 Visibility Maps/Sight Lines:

A. A minimum of eight (8) view lines in a zero (0) to two (2) mile radius from the site, shown beginning at True North and continuing clockwise at forty-five degree intervals.

B. Applicant shall utilize the U.S.G.S. Quadrangle map, at a scale of 1" = 400', with vertical scale of 1" = 40'. Trees shall be shown at existing heights and at projected heights in ten years.

C. A map of the Town of Warren on which any visibility of the proposed tower from a public way (including all existing public rights of way), shall be indicated.

22.9.7 Balloon Tests: Within 35 days of submitting an application, the applicant shall arrange to fly, or rise upon a temporary mast, a three foot diameter brightly colored balloon at the maximum height of the tower and within 50 horizontal feet of the center of the proposed tower. The dates (including a second date, in case of poor visibility on the initial date), times and location of this balloon test shall be advertised by the applicant at 7 and 14 days in advance of the first test date. Such notice will be printed in a newspaper with a general circulation in the Town of Warren such as The Waterbury Republican/American, the Litchfield County Times, the New Milford Times, and the Litchfield Enquirer. The applicant shall inform the Commission, the Board of Selectmen, and all abutting property owners, in writing, of the dates and times of the test, at least 14 days in advance. The balloon shall be flown for at least four consecutive hours sometime between 9:00 AM and 5:00 PM on the dates chosen.

22.9.8 Visual Analysis: The applicant shall develop and submit a written analysis of the visual impact of the proposed tower. This analysis shall include photographs of the balloon test taken from at least 10 different perspectives within the Town of Warren.

22.10 MONITORING AND EVALUATION OF COMPLIANCE: The Warren Planning and Zoning Commission, and the Zoning Enforcement Officer shall have authority over the hiring of independent engineers to enforce monitoring and compliance with this section.

22.10.1 Monitoring Protocol: The Commission will consult with an independent engineer regarding the choice of a monitoring protocol to be used. This may include the Cobbs Protocol, The FCC OET Bulletin 65, Edition 97-01, August 1997, referenced in FCC Regulations, Title 47, Part 1, Section 1.1307 as IEEE C95.3 1991, or any other protocol that the Commission adopts as the technology changes. The same protocol will be used from year to year until such time as new protocols are developed.

22.10.2 Pre-Testing: After the granting of a special permit and before the facility begins transmission, the applicant shall pay for an independent consultant RF engineer, chosen and hired by the Commission, to monitor the background levels of EMF radiation around the proposed facility site and at appropriate distances from it, and/or at any repeater locations to be utilized for the applicant's wireless facilities. The independent consultant shall use the specified monitoring protocol. A report of the monitoring results shall be prepared by the independent consultant and submitted to the Board of Selectmen, the Planning and Zoning Commission, the Building Inspector, and the Town Clerk.

22.10.3 Post-Testing: Within 30 days after transmission begins, the owner(s) of any wireless services located on the tower/facility site shall pay for an independent consultant RF engineer, chosen and hired by the Commission, to conduct testing and monitoring of EMF radiation emitted from said site, and to report results of said monitoring as follows:

A. There shall be routine annual monitoring of emissions by the independent RF engineer using actual field measurements of radiation, utilizing the monitoring protocol. This monitoring shall measure levels of EMF radiation from the facility site's primary antennas as well as from repeaters (if any). A report of the monitoring results shall be prepared by the RF engineer and submitted to the Board of Selectmen, the Planning and Zoning Commission, the Building Inspector, and the Town Clerk.

B. Any Major Modification of an existing facility, or the activation of any additional permitted channels, shall require new monitoring.

22.10.4 Excessive Emissions: Should the monitoring of a facility site reveal that the site exceeds the current FCC standards and guidelines, and then the owner(s) of all facilities utilizing the site shall be notified. In accordance with FCC requirements, the owner(s) must immediately reduce power or cease operation as necessary to protect persons having access to the site, tower, or antennas. In addition, the owner(s) shall submit to the Commission and the Building Inspector an analysis of what caused the problem and a plan for the reduction of emissions to a level that complies with the FCC standards within 10 business days of non-compliance. Failure to accomplish this reduction of emissions within 15 business days of initial notification of non-compliance shall be a Zoning Violation subject to fines and such other remedies as are otherwise available to the Town, Commission or ZEO pursuant to Connecticut General Statutes. Such fines shall be payable by those providers with antennas on the facility site, until compliance is achieved.

22.10.5 Structural Inspection: Tower owner(s) shall pay for an independent consultant, a licensed structural engineer chosen and hired by the Commission, to conduct inspections of the tower's structural integrity and safety. Guyed towers shall be inspected every three years. Monopoles and non-guyed lattice towers shall be inspected every five years. A report of the inspection results shall be prepared by the independent consultant and submitted to the Board of Selectmen, the Warren Planning and Zoning Commission, the Building Inspector, and the Town Clerk. Any major modification of an existing facility which includes changes to the tower dimensions or antenna numbers or type shall require a new structural inspection.

22.10.6 Unsafe Structure: Should the inspection of any tower reveal any structural defect(s) which, in the opinion of the independent consultant renders that tower unsafe, the following actions must be taken: Within 10 business days of notification of unsafe structure, the owner(s) of the tower shall submit a plan to remediate the structural defect(s). This plan shall be submitted within 10 business days of the submission of the remediation plan, and completed as soon as reasonably possible. Failure to accomplish this remediation of structural defect(s) within 10 business days of initial notification shall be a Zoning Violation subject to fines. Such fines shall be payable by the owner(s) of the tower until compliance is achieved.

22.11 CO-LOCATION AND TOWN SERVICES: Licensed carriers shall share facilities and sites with other licensed carriers where feasible, thereby reducing the number of stand-alone facilities. The conversion of a single-use facility to a co-location shall be considered a modification. The Commission may require as a condition of approval of the special permit that the tower/facility owners dedicate a space on the facility for the Town of Warren's municipal emergency services for public health and safety purposes. Any such dedications and/or improvements to existing emergency services will be negotiated prior to approval of the special permit.

22.12 SEPARATION OF TOWERS: Separation distances between communications towers shall be applicable for and measured between the proposed tower and those towers that are existing and/or have received special permit approval. The separation distances shall be measured by drawing a straight line between the base of the existing tower and the base of the proposed tower pursuant to the site plan. The separation distance (listed in linear feet) shall be as follows:

- A. Lattice - 5000 linear feet
- B. Guyed - 5000 linear feet
- C. Monopole (150' in height) - 3,500 linear feet
- D. Monopole (80' to 150' in height) - 2,500 linear feet
- E. Monopole (less than 80' in height) - 500 linear feet

The separation distances listed above may be modified by the Commission depending on other site criteria in co-locations.

22.13 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA): NEPA applies to all applications for wireless communications facilities. NEPA is administered by the FCC via procedures adopted as Subpart 1, Section 1.1301 et seq. (47CFR ChI). The FCC requires that an environmental assessment (EA) be filed with the FCC prior to beginning operations for any wireless communications facility proposed in, or involving, any of the following:

- A. Wilderness areas
- B. Wildlife preserves
- C. Endangered species habitat
- D. Historical site
- E. Indian religious site
- F. Flood plain
- G. Wetlands
- H. High intensity white lights in residential neighborhoods
- I. Excessive radio frequency radiation exposure.

22.13.1 At the time of application, an Environmental Assessment that meets FCC requirements shall be submitted to the Commission for each regulated facility site that requires such an environmental assessment to be submitted to the FCC.

22.13.2 The applicant shall identify and assess the impact of the proposed facility on areas recommended for conservation in the Warren Plan of Development, as well as the state plan of conservation and development.

22.13.3 The applicant will also list the location, type, and amount (including trace elements) of any materials proposed for use within the facility that are considered hazardous by federal, state, or local governments.

22.14 FEE SCHEDULE AND BONDING:

22.14.1 Application Fees: Upon submission of signed application that meets all of the criteria herein described, including all supporting documents and maps, an application fee shall be submitted to the Town of Warren in the amount of \$3500.00.

22.14.2 Financial Surety: As a condition of approval of a Special Permit, the applicant shall provide a separate Demolition Bond in an amount determined and approved by the Commission. The bond shall be for a duration, and in a form and manner of surety as determined by the Commission, with provision for inspection and town removal of facilities in the event of failure to perform by the responsible parties as defined in Section 16.17 (Duty of Remove).

22.14.3 Performance Bonds: The Commission will require additional Performance Bonding, payable at the time of application, as deemed necessary to protect facility building site(s) during construction; and to hire independent consultants/engineers to review applications and monitor facilities.

22.14.4 Independent Consultants Fees: At the time of application, the Commission may require a separate escrow fund, in an amount to be determined, to cover independent consultant's fees.

22.15 INSURANCE AND INDEMNIFICATION:

22.15.1 Insurance: The town of Warren shall not enter into any lease agreement, or otherwise authorize a tower site or facility by any telecommunications service provider until and unless the town obtains assurance that such operator (and those acting on its behalf) has adequate insurance as determined by the Commission. At a minimum, the following insurance requirements shall be satisfied:

A. A telecommunications facility operator shall not commence construction or operation of the facility without obtaining all insurance required under this section and approval of such insurance by the Commission, nor shall a telecommunications facility operator allow any contractor or subcontractor to commence work on its contract until all similar such insurance required of the same has been obtained and approved by the Commission. The required insurance must be obtained and maintained for the entire period the telecommunications facility is in existence. If the operator, its contractors or subcontractors do not have the required insurance, the town will order such entities to cease operation of the facility until such insurance is obtained and approved by the Commission.

B. Certificate(s) of insurance verifying such insurance shall be filed with the Commission at the time of application. For entities that are entering the market, the certificate(s) shall be filed prior to the commencement of construction and once a year thereafter, and as provided below in the event of a lapse of coverage. Such certificate(s) should provide the name, address and phone number of the insurance carrier; and identify an agent in case of inquiries.

C. The certificate(s) of insurance shall contain a provision that coverage's afforded under such policies shall not be canceled until at least thirty (30) days prior written notice has been given to the town. All insurance policies shall be issued by companies authorized to do business under the laws of the State of Connecticut.

D. Where applicable, in the event that the insurance certificate(s) provided indicates that the insurance will terminate or lapse during the term of the lease agreement with the town, then in that event the telecommunications facility(s) operator shall furnish a renewed certificate of insurance as proof that equal and like coverage remains in effect for the balance of the lease term, at least thirty (30) days prior to the expiration of the date of such insurance.

E. A telecommunications facility operator and its contractors or subcontractors engaged in work on the operator's behalf, shall maintain minimum insurance in the amounts determined by the Commission to cover liability, bodily injury, and property damage.

The insurance shall cover, but not be limited to, the following exposures: premises, operations, and certain contracts. Such coverage shall be written on an occurrence basis and shall also be required under any lease agreement between the town and the telecommunications facility operator.

22.15.2 Indemnification: The town shall not enter into any lease agreement or otherwise authorize tower siting by a telecommunications service provider until and unless the town obtains an adequate indemnification from such provider. This indemnification must at least:

- A.** Release the Town of Warren from, and against, any and all liability and responsibility in or arising out of the construction, operation or repair of the telecommunications facility. Each telecommunications facility operator must further agree not to sue or seek any monies or damages from the town in connection with the above mentioned matter.
- B.** Indemnify and hold harmless the Town of Warren, its elected and appointed officers, agents, servants, and employees, from and against any and all claims, demands, or causes of action whatsoever kind of nature, and the resulting losses, costs, expenses, reasonable attorney's fees', liabilities, damages, orders, judgments or decrees, sustained by the town or any third party arising out of, or by any reason of, or resulting from, or out of each telecommunications facility(s) operator's, agent's, employee's, or servant's negligent acts, errors, or omissions.
- C.** Provide that the covenants and representations relating to the indemnification provision shall survive the term of any agreement and continue in force and effect as to the responsibility of the party to indemnify.

22.16 ABANDONMENT AND DISCONTINUATION OF USE: Any telecommunications facility which ceases to operate for six (6) consecutive months shall be deemed to be abandoned and removed within ninety (90) days. "Cease to operate" is defined as not performing the normal functions associated with a telecommunications facility and its equipment on a continuous and on-going basis for a period of six (6) consecutive months. Determination of the date of abandonment shall be made by the Zoning Enforcement Officer who shall have the right to request documentation and/or affidavits from the telecommunications tower owner/operator/service provider(s) regarding the subject of tower usage. Failure or refusal for any reason by the owner/operator/service provider(s) to respond within twenty (20) days to such a request shall constitute a prima facie evidence that the communications tower has been abandoned.

Upon a determination of abandonment and notice thereof to the owner/operator/service provider(s), the owner(s) and all others listed as responsible parties in 16.17. (Below), shall remove the tower and all facilities, and remediate the site within 90 days. At the time of removal, the facility site shall be remediated such that all telecommunications facility improvements which have ceased to be utilized are removed. If all facilities on a tower have ceased to operate, the tower shall also be removed, and the site shall be revegetated. Existing trees shall only be removed if necessary to complete the required removal.

Applicant shall, as a condition of the special use permit, provide a financial surety bond payable to the Town of Warren and acceptable to the Commission to cover the cost of removal of the telecommunications facility, and the remediation of the landscape, should the facility cease to operate. (See 16.14 Fee Schedule/Bonding.) Any Special Permit granted for the facility will automatically expire.

22.17 DUTY TO REMOVE: The following are considered jointly and severally to be the responsible parties for tower/facility removal and site remediation:

- A. The owner of the abandoned tower (and if different, the operator of the abandoned tower.)
- B. The owner of the land upon which the abandoned tower is located.
- C. The lessee, if any, of the land upon which the tower is located.
- D. The sub lessee or sub lessees, if any, of the land upon which the tower is located.
- E. Any communications service provider who, or which, by ceasing to utilize the tower or otherwise failing to operate any of its transmitters or antennas on the tower for which it leased space or purchased the right to space on the tower for its transmitters or antennas, and by such ceasing or failure to utilize the tower, in fact caused the tower to become abandoned.
- F. Any person to whom, or entity to which, there has been transferred or assigned any license issued by the FCC and under which the tower owner/operator operated the tower/facility.
- G. Any person or entity which has purchased all or a substantial portion of the assets of the tower owner/operator/service provider(s).
- H. Any entity which has merged with, or which has arisen or resulted from a merger with, the tower owner or operator or service provider(s).
- I. Any person or entity which acquired the owner or the operator of the abandoned tower.

- J. Any parent or subsidiary of any of the foregoing which happens to be a corporation.
- K. Any managing partner of any of the foregoing which happens to be a limited partnership.
- L. Any partner of any of the foregoing which happens to be a general partnership.

22.18 FAILURE TO REMOVE: In the event that the responsible Parties have failed to remove the tower and/or restore the facility site within 90 days, the Town of Warren may remove the tower and restore the site using the surety bonds deposited at the time of application, and may thereafter initiate judicial proceedings against the Responsible Parties for any portion of the cost not covered by the surety bond.

22.19 FUTURE NON-CONFORMING USES: If at any time the Commission finds that the technologies pertaining to communications towers/facilities have changed such that wireless communications can be readily provided with no towers (such as satellite systems), or with towers or other structures that are substantially less intrusive to residential and commercial areas, and substantially more aesthetic for neighborhoods and commercial areas, or in that the service providers in the county and/or their customers, are making frequent uses of the new technologies (above 30% for customer-use, or above 30% of business-revenue base per service provider), in the installation of new communication systems, or in the expansion of existing systems (whether such installation or expansion are occurring in Warren or elsewhere), the Commission may declare to be Non-Conforming Uses all communications towers then existing in the Town of Warren. The Commission shall declare such towers/facilities to be non-conforming uses in an ordinance which amends these regulations to make such towers/facilities non-permitted uses altogether in residential and commercial areas. The Commission will then determine if the new technologies are appropriate uses for the preexisting sites. If it determines that the upgrading of the facilities are appropriate uses, the Commission may determine that the new technologies are permitted uses, or special exceptions requiring special permits. The Commission may then set such time limits as are reasonable and legally permissible for the service providers and tower owners/operators to remove non-conforming towers and replace them with the new technologies. This paragraph shall be effective only if, and to the extent not prohibited or preempted, by state or federal law.

22.20 PERMIT EXPIRATION: A Special Permit granted pursuant to this section shall expire five (5) years from the date of approval. The Special permit may be renewed for a new five (5) year period on applications to the Commission, in a form prescribed by the Commission, submitted to the Commission not later than ninety (90) days before the existing Special Permit expiration date. Upon such a renewal application, the applicant shall affirmatively demonstrate that all the conditions which form the basis of the initial approval as set forth in Section 16.6.3; 16.7.10; 16.8.1; 16.8.2 and 16.8.3, remain as those conditions existed on the date of the initial approval.

22.21 SEVERABILITY CLAUSE: The invalidity of any section or provision of this regulation shall not invalidate any other section or provision hereof.