

(DRAFT #1 ElectroHyperSensitivity (EHS))

Part A contains an alphabetized list of peer reviewed journal articles and their abstracts that have addressed EHS. Although only Sweden recognizes EHS completely as a disease, research reveals that prominent researchers are supporting its inclusion in diagnostic criteria. The WHO's ICD revision is due to be implemented in 2013, and many organizations are pushing for EHS to be included.

Part A also contains reports presented on the topic to governmental bodies, a European Parliament Declaration, a letter to the editor that presents statistics on self reported EHS over the years in 7 countries, proceedings from WHO workshops and other workshops on EHS, an Irish doctors association position statement on emf,

Part A.

11.1 Al-Khlaiwi T, Meo SA. *Association of mobile phone radiation with fatigue, headache, dizziness, tension and sleep disturbance in Saudi population* Saudi Med J. 25(6):732-736, 2004 **Partial Abstract:** METHODS: This study was conducted in the Department of Physiology, College of Medicine, King Saud University, Riyadh, Kingdom of Saudi Arabia during the year 2002 to 2003. In the present study, a total of 437 subjects (55.1% male and 39.9% female) were invited, they have and had been using mobile phones. RESULTS: The results of the present study showed an association between the use of mobile phones and health hazards. The overall mean percentage for these clinical findings in all groups were headache (21.6%), sleep disturbance (4.%), tension (3.9%), fatigue (3%) and dizziness (2.4%). CONCLUSION: Based on the results of the present study, we conclude that the use of mobile phones is a risk factor for health hazards.

11.2 Altpeter et al. 2006. *Effect of Short-Wave (6-22 MHz) Magnetic Fields on Sleep Quality and Melatonin Cycle in Humans: The Schwarzenburg Shut-Down Study*. Bioelectromagnetics 27:142-150. Abstract: This paper describes the results of a unique "natural experiment" of the operation and cessation of a broadcast transmitter with its short-wave electromagnetic fields (6-22 MHz) on sleep quality and melatonin cycle in a general human population sample. In 1998, 54 volunteers (21 men, 33 women) were followed for 1 week each before and after shut-down of the short-wave radio transmitter at Schwarzenburg (Switzerland). Salivary

melatonin was sampled five times a day and total daily excretion and acrophase were estimated using complex cosinor analysis. Sleep quality was recorded daily using a visual analogue scale. Before shut down, self-rated sleep quality was reduced by 3.9 units (95% CI: 1.7-6.0) per mA/m increase in magnetic field exposure. The corresponding decrease in melatonin excretion was 10% (95% CI: -32 to 20%). After shutdown, sleep quality improved by 1.7 units (95% CI: 0.1-3.4) per mA/m decrease in magnetic field exposure. Melatonin excretion increased by 15% (95% CI: -3 to 36%) compared to baseline values suggesting a rebound effect. Stratified analyses showed an exposure effect on melatonin excretion in poor sleepers (26% increase; 95% CI: 8-47%) but not in good sleepers. Change in sleep quality and melatonin excretion was related to the extent of magnetic field reduction after the transmitter's shut down in poor but not good sleepers. However, blinding of exposure was not possible in this observational study and this may have affected the outcome measurements in a direct or indirect (psychological) way.
<http://www.ncbi.nlm.nih.gov/pubmed> PMID: 16342198

11.3 Aschermann C. *Electrosensitivity: A Patient with Burn-like Skin Manifestations. Original study in German:* ASCHERMANN C (2011), Umwelt-Medizin Gesellschaft 24(2): 141-146 Case study on an individual with self described Hyper sensitivity to electromagnetic environments.
http://www.kompetenzinitiative.net/assets/aschermann_electrosensitivity_final_2011.pdf

11.32 Balik HH, Turgut-Balik D, Balikci K, Ozcan *Some ocular symptoms and sensations experienced by long term users of mobile phones.* In this study, a survey was conducted to investigate the possible effects of long term usage of mobile phone (MP) on eyes. The studied symptoms are blurring of vision, redness on the eyes, vision disturbance, secretion of the eyes, inflammation in the eyes and lacrimation of the eyes. There is no effect on redness on the eyes and vision disturbance, but some statistical evidences are found that MP may cause blurring of vision, secretion of the eyes, inflammation in the eyes and lacrimation of the eyes. (ICD Z58: Problems related to physical environment and microwave syndrome (T66),

These results suggest an awareness of the symptoms and sensations.

11.4 Berg M, Arnetz BB, Liden S, Eneroth P, Kallner A. Techno-stress. A psychophysiological study of employees with VDU-associated skin complaints. *J Occup Med.* 1992 Jul; 34 (7):698-701. Abstract: Little is known about the causes of health complaints associated with work with video display units (VDUs). The symptoms are to a large degree similar to those of "multiple chemical sensitivity." We observed 47 white-collar employees with and without VDU-associated skin complaints during a regular workday and a day of leisure. VDU workers with skin symptoms had higher levels of the stress-sensitive hormones thyroxin and prolactin compared with employees without symptoms. They also had lower levels of the anabolic hormone testosterone during work. VDU workers with skin complaints also reported more occupational mental strain. A model is proposed in which physiological signals act as unconditioned stimuli and the VDU environment as the conditioned stimuli. <http://www.ncbi.nlm.nih.gov/pubmed/1386626>

11.5 Bergdahl J. Psychological aspects of patients with symptoms presumed to be caused by electricity or visual display units. *Acta Otolaryng Scand* 1995; 53:304-310. Abstract:

11.6 Bergqvist U, Vogel E Possible health implications of subjective symptoms and electromagnetic fields. A report prepared by a European group of experts for the European Commission, DG V. Arbete och Hälsa 19, 1997. Swedish National Institute for Working Life, Stockholm, Sweden. ISBN 91-7045-438-8. Abstract: The WHO references this report in its description of the symptoms of EHS on its website. [Copy filed in Docket]

11.7 Blettner M, Schlehofer B, Breckenkamp J, Kowall B, Schmiedel S, Reis U, Potthoff P, Schuez J, Berg-Beckhoff G ***Mobile phone base stations and adverse health effects: Phase 1: A population-based cross-sectional study in Germany.*** *Occup Environ Med.* Nov 18 2008 The aim of this first phase of a cross-sectional study from Germany was to investigate whether proximity of residence to mobile phone base stations as well as risk perception is associated with health complaints.

METHODS: We conducted a population-based multi-phase cross-sectional study within the context of a large panel survey regularly carried out by a private research institute in Germany.

In the initial phase, which we will report on in this paper, 30,047 persons from a

total of 51,444 who took part in the nationwide survey also answered questions on how mobile phone base stations affect their health. A list of 38 health complaints was used. A multiple linear regression model was used to identify predictors of health complaints including proximity of residence to mobile phone base stations and risk perception.

RESULTS: Of the 30,047 participants (response rate 58.6%), 18.7% of participants were concerned about adverse health effects of mobile phone base stations, while an additional 10.3% attributed their personal adverse health effects to the exposure from them. Participants who are concerned about or attribute adverse health effects to mobile phone base stations and those living in the vicinity of a mobile phone base station (500 m) reported slightly more health complaints than others.

CONCLUSIONS: A substantial proportion of the German population is concerned about adverse health effects caused by exposure from mobile phone base stations. The observed slightly higher prevalence of health complaints near base stations can however not be fully explained by attributions or concerns.

11.8 Buchner and Eger 2011. Changes of Clinically Important Neurotransmitters under the Influence of Modulated RF Fields—A Longterm Study under Real-life Conditions. Original study in German: Umwelt-Medizin-Gesellschaft 24(1): 44-57. After the activation of the GSM base station, the levels of the stress hormones adrenaline and noradrenaline increased significantly in human subjects during the first six months; the levels of the precursor dopamine decreased substantially. As an indicator of the dysregulated chronic imbalance of the stress system, the phenylethylamine (PEA) levels dropped significantly until the end of the study period. [Abnormally low concentrations of endogenous PEA are found in those with attention-deficit hyperactivity disorder (ADHD) or clinical depression. Abnormally high concentrations are positively correlated with schizophrenia.] The effects showed a dose-response relationship and occurred well below current limits for technical RF radiation exposures. Chronic dysregulation of the catecholamine system has great relevance for health and is well known to damage human health in the long run.

11.9 Chia SE, Chia HP, Tan JS, ***Prevalence of headache among handheld cellular telephone users in Singapore:*** Environ Health Perspect 108(11):1059-1062, 2000 Prevalence of headache among handheld cellular telephone users in Singapore: A community study. We carried out a cross-sectional community study

in Singapore to determine the prevalence of specific central nervous system (CNS) symptoms among hand-held cellular telephone (HP) users compared to nonusers and to study the association of risk factors and CNS symptoms among HP users.

A total of 808 men and women between 12 and 70 years of age, who lived in one community, were selected using one-stage cluster random sampling and responses to a structured questionnaire. The prevalence of HP users was 44.8%.

Headache was the most prevalent symptom among HP users compared to non-HP users, with an adjusted prevalence rate ratio of 1.31 [95% confidence interval, 1.00-1.70]. There is a significant increase in the prevalence of headache with increasing duration of usage (in minutes per day).

Prevalence of headache was reduced by more than 20% among those who used hand-free equipment for their cellular telephones as compared to those who never use the equipment. The use of HPs is not associated with a significant increase of CNS symptoms other than headache.

11.10 Cohen, Andrew, G. Carlo, A. Davidson, M. White, C. Geoghan, A. Goldsworthy, O. Johansson *Sensitivity to Mobile Phone Base Station Signals* This is a critique of Eltiti et al. 2007. Environmental Health Perspectives Vol 116, No. 2, Feb. 2008. Summary: The authors describe erroneous conclusions, and describe that significant findings are largely ignored. The critique asks the question whether provocation studies are appropriate for testing where there is often a lag time from exposure to symptoms. The critique points out that despite limitations, this study has produced positive results that support claims that EHS people can be affected by microwave transmissions from mobile phone base stations. [Copy filed in Docket]
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2235207/pdf/ehp0116-a0062a.pdf>

11.11 COST244bis (1998) Proceedings from Cost 244bis International Workshop on Electromagnetic Fields and Non-Specific Health Symptoms. Sept 19-20, 1998, Graz, Austria Proceedings of the COST 244: Biomedical Effects of Electromagnetic Fields - Workshop on Electromagnetic Hypersensitivity, edited by Simunic, D., Brussels/Graz: EU/EC (DG XIII), 1995; 52-57. 22:161-69. a study in Spain.

11.12 Cox RA, Luxton LM, *Cerebral symptoms from mobile telephones*. Occup Environ Med (letter to the editor) 57(6):431, 2000 Mobile phones affect the inner ear in 5-8% of users leading to dizziness, disorientation, nausea, headache and transient confusion.

11.13 Croft RJ, Chandler JS, Burgess AP, Barry RJ, Williams JD, Clarke AR. Acute mobile phone operation affects neural function in humans. Clin Neurophysiol. 2002 Oct; 113 (10):1623-32. Abstract:

11.131 Dahmen N, Ghezel-Ahmadi D, Engel A. *Blood laboratory findings in patients suffering from self-perceived electromagnetic hypersensitivity (EHS)*. Bioelectromagnetics. 2009 May;30(4):299-306. PMID: 19259984; Study and results: analysed clinical laboratory parameters including thyroid-stimulating hormone (TSH), alanine transaminase (ALT), aspartate transaminase (AST), creatinine, hemoglobine, hematocrit and c-reactive protein (CRP) in subjects suffering from EHS and in controls that are routinely used in clinical medicine to identify or screen for common somatic disorders. Our results identified laboratory signs of thyroid dysfunction, liver dysfunction and chronic inflammatory processes in small but remarkable fractions of EHS sufferers as potential sources of symptoms that merit further investigation in future studies. In the cases of TSH and ALT/AST there were significant differences between cases and controls. The hypotheses of anaemia or kidney dysfunction playing a major role in EHS could be unambiguously refuted. [Copy filed in Docket]

11.14 Del Seppia C, Ghione S, Luschi P, Ossenkopp KP, Choleris E, Kavaliers M. *Pain perception and electromagnetic fields*. Neurosci Biobehav Rev. 2007;31(4):619-42. Epub 2007 Feb 14. Review. Abstract: A substantial body of evidence has accumulated showing that exposure to electromagnetic fields (EMFs) affects pain sensitivity (nociception) and pain inhibition (analgesia). Consistent inhibitory effects of acute exposures to various EMFs on analgesia have been demonstrated in most studies. This renders examinations of changes in the expression of analgesia and nociception a particularly valuable means of addressing the biological effects of and mechanisms underlying the actions of EMFs. Here we provide an overview of the effects of various EMFs on nociceptive sensitivity and analgesia, with particular emphasis on opioid-mediated responses.

We also describe the analgesic effects of particular specific EMFs, the effects of repeated exposures to EMFs and magnetic shielding, along with the dependence of EMF effects on lighting conditions. We further consider some of the underlying cellular and biophysical mechanisms along with the clinical implications of these effects of various EMFs. <http://www.ncbi.nlm.nih.gov/pubmed/17374395>

11.15 Divan et al. 2010. ***Cell phone use and behavioural problems in young children.***

J Epidemiol Community Health (2010). What this study adds: “There is an association between prenatal as well as postnatal use and behavioural problems by age 7 years among a general population of mothers who are cell phone users. These results replicate the findings of an association observed among only early technology adopters. These new results also reduce the likelihood that these are chance findings or findings that did not adequately consider the influence of other important factors for behavioural problems.”

11.16 Eger and Jahn, 2010. Specific Health Symptoms and Cell Phone Radiation in Selbitz (Bavaria, Germany)—Evidence of a Dose-Response Relationship. Original German umwelt-medizin-gesellschaft 23 2/2010. A significant dose-response relationship was observed in relation to objectively determined exposure levels for symptoms, such as sleep problems, depressions, cerebral symptoms, joint problems, infections, skin problems, cardiovascular problems as well as disorders of the visual and auditory systems and the gastrointestinal tract.

11.17 Eltiti et al. 2007. ***Development and Evaluation of the Electromagnetic Hypersensitivity Questionnaire.*** Bioelectromagnetics 28:137-151 (2007). This study provides a screening tool for EHS for use by researchers and indicates which symptoms tend to be found together.

11.18 ***European Parliament, WRITTEN DECLARATION*** pursuant to Rule 123 of the Rules of Procedure on the recognition of multiple chemical sensitivity and electrohypersensitivity in the International Statistical Classification of Diseases and Related Health Problems (ICD), 2012 Excerpt (pg 2): Whereas multiple chemical sensitivity (MCS) patients are vulnerable to environmental pollution and electrohypersensitivity (EHS) patients to electromagnetic radiation, both involving

serious risks in several areas over which they have no influence, such as the air they breathe and exposure to EM radiation; 1. recommends that Member States which have not yet done so include MCS and EHS in their own ICDs and in their ILO-based Lists of Occupational Diseases; suggests that the WHO Assembly include MCS and EHS in its upcoming ICD-11; **[Copy filed in Docket]**

11.91 Gangi S, Johansson O, (Intentionally numbered out of order) "***A theoretical model based upon mast cells and histamine to explain the recently proclaimed sensitivity to electric and/or magnetic fields in humans***", Med Hypotheses 2000; 54: 663-671 Abstract: The relationship between exposure to electromagnetic fields (EMFs) and human health is more and more in focus. This is mainly because of the rapid increasing use of such EMFs within our modern society. Exposure to EMFs has been linked to different cancer forms, e.g. leukemia, brain tumors, neurological diseases, such as Alzheimer's disease, asthma and allergy, and recently to the phenomena of 'electrosensitivity' and 'screen dermatitis'. There is an increasing number of reports about cutaneous problems as well as symptoms from internal organs, such as the heart, in people exposed to video display terminals (VDTs). These people suffer from subjective and objective skin and mucosa-related symptoms, such as itch, heat sensation, pain, erythema, papules and pustules. In severe cases, people can not, for instance, use VDTs or artificial light at all, or be close to mobile telephones. Mast cells (MCs), when activated, release a spectrum of mediators, among them histamine, which is involved in a variety of biological effects with clinical relevance, e.g. allergic hypersensitivity, itch, edema, local erythema and many types of dermatoses. From the results of recent studies, it is clear that EMFs affect the MC, and also the dendritic cell, population and may degranulate these cells. The release of inflammatory substances, such as histamine, from MCs in the skin results in a local erythema, edema and sensation of itch and pain, and the release of somatostatin from the dendritic cells may give rise to subjective sensations of on-going inflammation and sensitivity to ordinary light. These are, as mentioned, the common symptoms reported from patients suffering from 'electrosensitivity'/'screen dermatitis'. MCs are also present in the heart tissue and their localization is of particular relevance to their function. Data from studies made on interactions of EMFs with the cardiac function have demonstrated that highly interesting changes are present in the heart after exposure to EMFs. One could speculate that the cardiac MCs are responsible for these changes due to degranulation after exposure to EMFs. However, it is still not known how, and through which mechanisms, all these different cells are affected by EMFs. In this article, we present a theoretical model, based upon observations on EMFs and their

cellular effects, to explain the proclaimed sensitivity to electric and/or magnetic fields in humans. <http://www.ncbi.nlm.nih.gov/pubmed/10859662>

11.19 Faucon G, Le Bouquin Jeanes R, Maby E. ***Short-term effects of GSM mobiles phones on spectral components of the human electroencephalogram.*** Conf Proc IEEE Eng Med Biol Soc. ;1(1):3751-3754., 2006 The aim of the study was to investigate whether the GSM (global system for mobile) signals affect the electrical activity of the human brain. Nine healthy subjects and six temporal epileptic patients were exposed to radiofrequencies emitted by a GSM mobile phone signals. Electroencephalographic (EEG) signals were recorded using surface electrodes with and without radiofrequency. In order to obtain a reference, a control session was also carried out. The spectral attributes of the EEG signals recorded by surface electrodes were analyzed. The significant decrease of spectral correlation coefficients under radiofrequency influence showed that the GSM signal altered the spectral arrangement of the EEG activity for healthy subjects as well as epileptic patients. For the healthy subjects, the EEG spectral energy decreased on the studied frequency band [0-40 Hz] and more precisely on occipital electrodes for the alpha-band. For the epileptic patients, these modifications were demonstrated by an increase of the power spectral density of the EEG signal.

11.20 Frey AH. ***Headaches from cellular telephones: are they real and what are the implications?*** Environ Health Perspect 106(3):101-103, 1998 There have been numerous recent reports of headaches occurring in association with the use of hand-held cellular telephones. Are these reported headaches real? Are they due to emissions from telephones? There is reason to believe that the answer is "yes" to both questions. There are several lines of evidence to support this conclusion. First, headaches as a consequence of exposure to low intensity microwaves were reported in the literature 30 years ago. These were observed during the course of microwave hearing research before there were cellular telephones. Second, the blood-brain barrier appears to be involved in headaches, and low intensity microwave energy exposure affects the barrier. Third, the dopamine-opiate systems of the brain appear to be involved in headaches, and low intensity electromagnetic energy exposure affects those systems. In all three lines of research, the microwave energy used was approximately the same--in frequencies, modulations, and incident energies--as those emitted by present day cellular telephones. Could the current reports of headaches be the canary in the coal mine, warning of biologically significant effects?

11.21 Hallberg O, Oberfeld G. ***Letter to the Editor: Will We All Become Electrosensitive?*** *Electromagnetic Biology and Medicine*, 2006 25: 189–191. This published letter contains data from 7 countries, and two graphs that show how the prevalence of self reported electrosensitivity has increased exponentially since the 1980's which is the timeframe of the advent of the wireless revolution.
<http://www.ncbi.nlm.nih.gov/pubmed/21793784> [Copy filed in Docket]

11.92 Hardell L, Carlberg M, Söderqvist F, Hardell K, Björnfoth H, van Bavel B, Lindström G. ***Increased concentrations of certain persistent organic pollutants in subjects with self-reported electromagnetic hypersensitivity--a pilot study.***

Electromagn Biol Med. 2008;27(2):197-203. doi: 10.1080/15368370802089053. Results: The concentration of several persistent organic pollutants was higher in EHS subjects than in controls. Lower concentrations were found for hexachlorobenzene and two types of chlordanes. The only significantly increased odds ratios (ORs) were found for polybrominated diphenyl ether (PBDE) #47 yielding OR=11.7, 95% confidence interval (CI)=1.45-94.7 and the chlordane metabolite MC6 with OR=11.2, 95% CI=1.18-106. The results were based on low numbers and must be interpreted with caution. This hypothesis generating study indicates the necessity of a larger investigation on this issue.

11.22 Haugsdal B, Hauger E, Mild KH, Oftedal G, Sandstrom M, Wilen J, Tynes T. ***Comparison of symptoms experienced by users of analogue and digital mobile phones: a Swedish-Norwegian epidemiological study.*** *Arbetslivsrapport 23*: 1998 Study of mobile phone users showed a statistically significant association between calling time/number of calls per day and the prevalence of warmth behind/around the ear, headaches, and fatigue.

11.23 Havas Magda, ***Electromagnetic hypersensitivity: biological effects of dirty electricity with emphasis on diabetes and multiple sclerosis.*** *Electromagn Biol Med*. 2006;25(4):259-68: ReviewAbstract: Dirty electricity is a ubiquitous pollutant. It flows along wires and radiates from them and involves both extremely low frequency electromagnetic fields and radio frequency radiation. Until recently, dirty electricity has been largely ignored by the scientific community. Recent inventions of metering and filter equipment provide scientists with the tools to measure and reduce dirty electricity on electrical wires. Several case studies and anecdotal reports are presented. Graham/Stetzer (GS) filters have been installed in

schools with sick building syndrome and both staff and students reported improved health and more energy. The number of students needing inhalers for asthma was reduced in one school and student behavior associated with ADD/ADHD improved in another school. Blood sugar levels for some diabetics respond to the amount of dirty electricity in their environment. Type 1 diabetics require less insulin and Type 2 diabetics have lower blood sugar levels in an electromagnetically clean environment. Individuals diagnosed with multiple sclerosis have better balance and fewer tremors. Those requiring a cane walked unassisted within a few days to weeks after GS filters were installed in their home. Several disorders, including asthma, ADD/ADHD, diabetes, multiple sclerosis, chronic fatigue, fibromyalgia, are increasing at an alarming rate, as is electromagnetic pollution in the form of dirty electricity, ground current, and radio frequency radiation from wireless devices. The connection between electromagnetic pollution and these disorders needs to be investigated and the percentage of people sensitive to this form of energy needs to be determined. <http://www.ncbi.nlm.nih.gov/pubmed/17178585>
[Copy filed in Docket]

11.24.0 Havas et al. 2010. ***Provocation Study using Heart Rate Variability shows Microwave. Radiation from cordless phone affects Autonomic Nervous System.*** European Journal of Oncology-Library Vol. 5. Some subjects experienced tachycardia or arrhythmia when exposed in a double blind study to radiation from a cordless phone at 2.4 GHz at levels less than 1% of FCC and Health Canada guidelines and United States. [Copy Filed in Docket] A YouTube video of the “Double Blind Study” results can be seen at: http://mcs-america.org/index_files/EHS.htm (accessed Feb 2013)

11.24.1 Havas M. Dirty electricity elevates blood sugar among electrically sensitive diabetics and may explain brittle diabetes. *Electromagn Biol Med.* 2008;27(2):135-46. PMID: 18568931 [Copy filed in Docket]

11.25 Hillert L, Hedman BK, Söderman E, Arnetz BB. Hypersensitivity to electricity : working definition and additional characterization of the syndrome. *Journal of Psychosomatic Research*, 1999; 47:429-438. Abstract:

11.26 Hillert L, Berglind N, Arnetz BB, Bellander T. Prevalence of self-reported hypersensitivity to electric and magnetic fields in a population-based questionnaire survey. *Scand J Work Environ Health* , 2002; 28:33-41. Abstract:

11.27 Hocking B. Microwave Sickness: a reappraisal. *Occup Med.* 2001; 51; (10 66-69). <http://occmed.oxfordjournals.org/content/51/1/66.long> [Copy filed in Docket accessed February 2013] Abstract: Microwave sickness (MWS) has been a disputed condition. The syndrome involves the nervous system and includes fatigue, headaches, dysaesthesia and various autonomic effects in radiofrequency radiation workers. This paper describes the early reports of the syndrome from Eastern Europe and notes the scepticism expressed about them in the West, before considering comprehensive recent reports by Western specialists and a possible neurological basis for the condition. It is concluded that MWS is a medical entity which should be recognized as a possible risk for radiofrequency radiation workers.

11.28 Hocking B and Westerman R ***Case Report: Neurological changes induced by a mobile phone.*** *Occup Med.* 2002; 52 (7); 413-415).

11.29 Hocking B and Westerman R. ***Neurological effects of radiofrequency radiation.*** *Occup Med.* 2003; 53:123–127.

11.30 Hocking B, Westerman R, ***Neurological abnormalities associated with Mobile phone use*** *Occup Med* 50: 366-368, 2000 Dysaesthesiae of the scalp after mobile phone use have been previously reported but the pathological basis of these symptoms has been unclear. We report finding a neurological abnormality in a patient after prolonged use of a mobile phone. He had permanent unilateral dysaesthesiae of the scalp, slight loss of sensation, and abnormalities on current perception threshold testing of cervical and trigeminal nerves. A neurologist found no other disease. The implications regarding health effects of mobile phones and radio-frequency radiation is discussed.

11.31 Hocking B. ***Preliminary report: symptoms associated with mobile phone use.*** *Occup Med* 1998; 48: 357-60. Mobile phone use is ubiquitous, although the alleged health effects of low level radio-frequency radiation (RFR) used in transmission are contentious. Following isolated reports of headache-like symptoms arising in some users, a survey has been conducted to characterize the symptoms sometimes associated with mobile phone usage.

A notice of interest in cases was placed in a major medical journal and this was publicized by the media. Respondents were interviewed by telephone using a structured questionnaire.

Forty respondents from diverse occupations described unpleasant sensations such as a burning feeling or a dull ache mainly occurring in the temporal, occipital or auricular areas. The symptoms often began minutes after beginning a call, but could come on later during the day. The symptoms usually ceased within an hour after the call, but could last until evening. Symptoms did not occur when using an ordinary handset, and were different from ordinary headaches.

There were several reports suggestive of intra-cranial effects. Three respondents reported local symptoms associated with wearing their mobile phone on their belts. There was one cluster of cases in a workplace. Seventy-five per cent of cases were associated with digital mobile phones.

Most of the respondents obtained relief by altering their patterns of telephone usage or type of phone. Cranial and other diverse symptoms may arise associated with mobile phone usage. Physicians and users alike should be alert to this. Further work is needed to determine the range of effects, their mechanism and the possible implications for safety limits of RFR.

11.32 Huber et al. 2002. *Electromagnetic fields, such as those from mobile phones, alter regional cerebral blood flow and sleep and waking.* EEG, J. Sleep Res. (2002) 11, 289–295. Pulse-modulated electromagnetic fields (EMF) alters waking rCBF and (2) pulse modulation of EMF is necessary to induce waking and sleep EEG-changes.

11.33 .

11.34 Hutter HP, Moshhammer H, Kundi M. **Mobile telephone base stations: effects on health and wellbeing. In Biological effects of EMFs.** 2nd international workshop, Rhodes, Greece, 2002; 344-352

11.35 Hutter HP, Moshhammer H, Wallner P, Kundi M *Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations*

Occup Environ Med. 63(5):307-313, 2006 The erection of mobile telephone base stations in inhabited areas has raised concerns about possible health effects caused by emitted microwaves. METHODS: In a cross-sectional study of randomly selected inhabitants living in urban and rural areas for more than one year near to 10 selected base stations, 365 subjects were investigated. Several cognitive tests

were performed, and wellbeing and sleep quality were assessed. Field strength of high-frequency electromagnetic fields (HF-EMF) was measured in the bedrooms of 336 households. RESULTS: Total HF-EMF and exposure related to mobile telecommunication were far below recommended levels (max. 4.1 mW/m²). Distance from antennae was 24-600 m in the rural area and 20-250 m in the urban area. Average power density was slightly higher in the rural area (0.05 mW/m²) than in the urban area (0.02 mW/m²). Despite the influence of confounding variables, including fear of adverse effects from exposure to HF-EMF from the base station, there was a significant relation of some symptoms to measured power density; this was highest for headaches. Perceptual speed increased, while accuracy decreased insignificantly with increasing exposure levels. There was no significant effect on sleep quality. CONCLUSION: Despite very low exposure to HF-EMF, effects on wellbeing and performance cannot be ruled out, as shown by recently obtained experimental results; however, mechanisms of action at these low levels are unknown.

11.36 Hyams KC. *Developing case definitions for symptom-based conditions: the problem of specificity*. Epidemiol Rev , 1998; 20:148-156.

11.37 Irish Doctors' Environmental Association (IDEA), *IDEA position on electromagnetic radiation*. 2004. <http://www.ideaireland.org/emr.htm>

11.38 Johansson O. *Electrohypersensitivity: state-of-the-art of a functional impairment*. Electromagn Biol Med. 2006;25(4):245-58. Review. Abstract: Recently, a new category of persons, claiming to suffer from exposure to electromagnetic fields, has been described in the literature. In Sweden, electrohypersensitivity (EHS) is an officially fully recognized functional impairment (i.e., it is not regarded as a disease). Survey studies show that somewhere between 230,000-290,000 Swedish men and women report a variety of symptoms when being in contact with electromagnetic field (EMF) sources. The aim of our studies has been to investigate possible alterations, in the cellular and neuronal systems of these person' skin. As controls, age- and sex-matched persons, without any subjective or clinical symptoms or dermatological history, served. Immunohistochemistry using antisera to the previously characterized marker substances of interest has been utilized. In summary, it is evident from our preliminary data that various alterations are present in the electrohypersensitive person' skin. In view of recent epidemiological studies, pointing to a correlation

between long-term exposure from power-frequent magnetic fields or microwaves and cancer, our data ought to be taken seriously and further analyzed.

<http://www.ncbi.nlm.nih.gov/pubmed/17178584>

11.39 Johansson O, ***"Screen dermatitis and electrosensitivity: Preliminary observations in the human skin"***, In: Electromagnetic Environments and Health in Buildings (ed. D Clements-Croome), Spon Press, London & New York, 2004, pp 377-389

11.40 Johansson O, Liu P-Y, ***"No differences found by immunohistochemical screening of certain neuropeptides in patients suffering from so-called "screen dermatitis" "***, Enheten för Experimentell Dermatologi, Karolinska Institutet, Stockholm, Rapport nr. 3, 1998, ISSN 1400-6111

11.41 Johansson O, Hilliges M, Han SW, ***"A screening of skin changes, with special emphasis on neurochemical marker antibody evaluation, in patients claiming to suffer from screen dermatitis as compared to normal healthy controls"***, Exp Dermatol 1996; 5: 279-285

11.42 Johansson O, Hilliges M, Bjornhagen V, Hall K, ***"Skin changes in patients claiming to suffer from "screen dermatitis": a two-case open-field provocation study"***, Exp Dermatol 1994; 3: 234-238

11.43 Karinen et al. 2008. ***Mobile phone radiation might alter protein expression in human skin.*** BMC Genomics 2008, 9:77 doi:10.1186/1471-2164-9-77. This is the first study showing that molecular level changes might take place in human volunteers in response to exposure to RF-EMF. Our study confirms that proteomics screening approach can identify protein targets of RF-EMF in human v

11.432 Landgrebe M, Frick U, Hauser S, Langguth B, Rosner R, Hajak G, Eichhammer P. ***Cognitive and neurobiological alterations in electromagnetic hypersensitive patients: results of a case-control study.*** Psychol Med. 2008 Dec;38(12):1781-91. Epub 2008 Mar 26. PMID: 18366821 (Full Copy in Docket)

11.433 Landgrebe, Michael, Simone Hauser, Berthold Langguth, Ulrich Frick, Goran Hajak, Peter Eichhammer ***Altered cortical excitability in subjectively electrosensitive patients: Results of a pilot study*** Journal of Psychosomatic Research, 2007. [Copy filed in Docket]

11.44 Levallois P, Neutra R, Lee G, Hristova L. ***Study of self-reported hypersensitivity to electromagnetic fields in California.*** Environ Health Persp 2002b; 110 (suppl 4): 619-623. [Excerpt page 622] This is the first study to evaluate this problem in North America. On the basis of a population telephone survey, we found that about 3% of the California adult population self-reports being sensitive to sources of EMFs such as power lines, computers, or electrical appliances and 0.5% decided to change jobs because of it. Although no clinical confirmation of the reported symptoms was available, these data demonstrate that, because of its prevalence and possible life impact, this perception is of public health importance in California and perhaps in North America. The present study showed that perception of risk is not an explanation for the reported syndrome. Moreover, characteristics of people reporting hypersensitivity to EMFs were generally different from those of people reporting chemical sensitivity. Abstract: Cases of alleged hypersensitivity to electromagnetic fields (EMFs) have been reported for more than 20 years, and some authors have suggested some connection with the "multiple chemical sensitivity" illness. We report the results of a telephone survey among a sample of 2,072 Californians. Being "allergic or very sensitive" to being near electrical devices was reported by 68 subjects, resulting in an adjusted prevalence of 3.2% (95% confidence interval = 2.8, 3.7). Twenty-seven subjects (1.3%) reported sensitivity to electrical devices but no sensitivity to chemicals. Characteristics of the people reporting hypersensitivity to EMFs were generally different from those of people reporting being allergic to everyday chemicals. Alleging environmental illness or multiple chemical sensitivity diagnosed by a doctor was the strongest predictor of reporting being hypersensitive to EMFs in this population. Other predictive factors apart from self-reporting chemical sensitivity were race/ethnicity other than White, Black, or Hispanic; having low income; and being unable to work. The perception of risk of exposure to EMFs through the use of hair dryers (vs. exposure to power and distribution lines) was the factor the most associated with self-reporting about hypersensitivity to EMFs. However, risk perception was not sufficient to explain the characteristics of people reporting this disorder.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241215/>

11.45 Liakouris, Ana G. ***Radiofrequency (RF) Sickness in the Lilienfeld Study: An Effect of Modulated Microwaves?*** The Archives of Environmental Health June 1998 Vol. 53 No. 3. **Summary:** The author reviewed US literature and found that a review of statistically significant health effects noted in the Lilienfeld Study provided evidence that the disregarded health conditions match the cluster

attributed to the radiofrequency sickness syndrome that was still a controversy at that time. Thus her review establishes a possible correlation between health effects and chronic exposure to low-intensity, modulated microwave radiation. She discusses a review by Mitchell in 1985 where he confirmed that Soviet researchers considered the existence of neurological manifestations to be proven in response to low level chronic low intensity RF exposure. The US professionals dismissed the syndrome. However, the author cites 7 studies conducted between 1953 and 1991 of acute exposure that offer substantive evidence for the syndrome. The author discusses these effects relative to exposure parameters recorded at the US Embassy in Moscow and the Soviet 10 microwatt safety standard for the public. [Copy filed in Docket] This is a very important historical discussion.

11.50 Lyskov E, Sandström M, Hansson Mild K. *Neurophysiological study of patients with perceived electrical hypersensitivity*. Int J Psychophysiol 2001; 42: 233-41. EHS patients have a dysbalance of the autonomic nervous system regulation with a trend to hyper-sympathotonia, as measured by heart rate and electrodermal activity, and a hyperreactivity to different external physical factors, as measured by brain evoked potentials and sympathetic skin responses to visual and audio stimulation. Provides evidence that persons who report being EHS differ from SHAM exposed.

11.51 McCarty DE, Carrubba S, Chesson AL, Frilot C, Gonzalez-Toledo E, Marino AA *Electromagnetic hypersensitivity: evidence for a novel neurological syndrome*. Int J Neurosci. 2011 Dec;121(12):670-6. [Copy filed in Docket] Abstract: OBJECTIVE: We sought direct evidence that acute exposure to environmental-strength electromagnetic fields (EMFs) could induce somatic reactions (EMF hypersensitivity). METHODS: The subject, a female physician self-diagnosed with EMF hypersensitivity, was exposed to an average (over the head) 60-Hz electric field of 300 V/m (comparable with typical environmental-strength EMFs) during controlled provocation and behavioral studies. RESULTS: In a double-blinded EMF provocation procedure specifically designed to minimize unintentional sensory cues, the subject developed temporal pain, headache, muscle twitching, and skipped heartbeats within 100 s after initiation of EMF exposure ($p < .05$). The symptoms were caused primarily by field transitions (off-on, on-off) rather than the presence of the field, as assessed by comparing the frequency and severity of the effects of pulsed and continuous fields in relation to sham exposure. The subject had no conscious perception of the field as judged by her inability to report its presence more often than in the sham control. DISCUSSION: The subject demonstrated statistically reliable somatic reactions in response to exposure

to subliminal EMFs under conditions that reasonably excluded a causative role for psychological processes. CONCLUSION: EMF hypersensitivity can occur as a bona fide environmentally inducible neurological syndrome.

<http://www.ncbi.nlm.nih.gov/pubmed/21793784>

11.52 Meo SA, Al-Drees AM *Mobile phone related-hazards and subjective hearing and vision symptoms in the Saudi population*. Int J Occup Med Environ Health. 18(1):53-57, 2005 It is concluded that the use of mobile phone is a health risk factor, and thus it is suggested that excessive use of mobile phones should be avoided and social awareness increased through health promotion activities, such as group discussions or public presentations and via electronic and printed media sources.

11.521 Muir & Zegarac, 2001

11.53 Müller Ch., Krueger H., Schierz Ch.: “Project NEMESIS: Double-Blind Study on Effects of 50 Hz EMF on Sleep Quality and Physiological Parameters in People Suffering from Electrical Hypersensitivity”; Proceedings of the 22nd Annual Meeting of the Bioelectromagnetics Society BEMS, München (D), 2000; June 11.-16.; 89-90 (15-4) report in <http://www.who.int/peh-emf/meetings/archive/en/mueller.pdf> [Copy filed in Docket; abstract below]

11.54 Müller, Ch., Krueger, H., Schierz. Project NEMESIS: Perception of a 50 Hz Electric and Magnetic Field at Low Intensities (Laboratory Experiment. Bioelectromagnetics 23 (1), BEMJ January 2002; 26-36. Abstract: The Electrical Hypersensitivity Syndrome (EHS) is a condition where people suffer from various nonspecific health symptoms attributed to an assumed adverse effect of electric and magnetic fields (EMF). Many EHS patients report the ability to consciously perceive EMF at very low intensities. The existence of a direct EMF perception could be the key to explain at least partially the aetiology of EHS through stress mechanisms and allow the comparison with well known environmental stressors such as noise or odor. The double blind laboratory experiment tested the hypothesis that there are subjects with the ability to perceive 50 Hz EMF at 100 V/m and 6 microT (EMF sensitive) and to investigate the prevalence of EMF sensitivity in a group consisting of subjects with or without self-reported EHS. A total of 63 volunteers, 49 with EHS and 14 controls, took part in the EMF perception experiment, where 10 sham and 10 exposed 2 min blocks had to be judged in randomized sequence (field on/field off). Seven out of 63 subjects reached a statistically significant result which points to the existence of a small

EMF sensitive subgroup within the study group. There was no relevant difference between the subjects with self reported EHS and those without in terms of the success rate in the field perception experiment, as well as the number and types of symptoms encountered during the test. The results of the EMF perception experiment suggest that EHS is not a prerequisite for the ability to consciously perceive weak EMF and vice versa.

<http://www.ncbi.nlm.nih.gov/pubmed/11793403>

11.55 Müller Ch., Krueger H., Schierz Ch.: ***“Project NEMESIS: Effects of Electric and Magnetic Fields on People Suffering from Hypersensitivity to Electricity”***; Archives of Complex Environmental Studies ACES, 1999; 11 (1-2); 1-13

11.56 Navarro EA, Sequera J, Portoles M, Gomez-Perretta de Mateo C. ***The Microwave Syndrome: A Preliminary Study in Spain.*** Electromag Biol Med 22:161-169, 2003. 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.

11.57 Oberfeld G 2004. ***“The Microwave Syndrome—Further aspects of the Spanish Study.”*** Presented at an International Conference in Kos, Greece, May 2004. Significant exposure-response associations were found between the E-field and fatigue, irritability, headaches, nausea, loss of appetite, sleeping disorder, depressive tendency, feeling of discomfort, difficulty concentrating, loss of memory, visual disorder, dizziness and cardiovascular problems. Ideally levels for radiation should not exceed $\mu\text{W}/\text{cm}^2$ for indoor environments.

11.58 Oberfeld G 2008

11.59 Oftedal G, Wilen J, Sandstrom M, Mild KH, ***Symptoms experienced in connection with mobile phone use.*** Occup Med (Lond) 50(4):237-245, 2000 Many people in Norway and Sweden reported headaches, fatigue, and other symptoms experienced in connection with the use of a mobile phone (MP). Therefore, we initiated a cross-sectional epidemiological study among

17,000 people, all using an MP in their job. Thirty-one percent of the respondents in Norway and 13% of those in Sweden had experienced at least one symptom in connection with MP use.

Next to the sensations of warmth on the ear and behind/around the ear, burning sensations in the facial skin and headaches were most commonly reported. Most symptoms usually began during or within half an hour after the call and lasted for up to 2 h. Relatively few had consulted a physician or been on sick leave because of the symptoms, but about 45% among those with an MP attributed symptom had taken steps to reduce the symptom.

11.60 Rea W, Pan Y, Sujisawa I, Suyama H, Samadi N, Ross G. *Electromagnetic Field Sensitivity Journal of Bioelectricity*, 1991; 10 (1&2), 241-256. Update available at http://www.aehf.com/articles/em_sensitive.html. [Copy filed in Docket]

11.61 Rea, William J. M.D. "*Basis for EMF Sensitivity Clinical Responses*" Abstracts from the 15th Annual International Symposium on Man and His Environment 1997; The Annual International Symposium focused on the Environmental Aspects of EMF and Bioelectricity. The extracellular matrix and the ground regulation system are the environmental receptor system within the body. It is an open-ended dynamic molecular dissipative energy system, which is labile because of its molecular oscillation and the fact it is a receptor for all environmental stimuli, including electromagnetic, electric, atmospheric pressure, static electricity, spherics circadian rhythms and cycles, nutrition and total body pollutant or traumatic load, life forces, and subtle energy. The ground regulation system controls homeostasis and is part of every defense and inflammatory reaction. The regulation of this system depends upon the spontaneity of molecular reactions with homeostasis being a dynamic balance between entropy (the random distribution of molecules) and enthalpy (the structured organization of molecules). Excess entropy means that there is an excess of exchanges of energy and this structure is lost; therefore, acute inflammation, allergy, rheumatoid disease, and tumors occur. Excess enthalpy means there is too little free exchange of energy; therefore, supermolecular states of order occur with sclerosis, nodules, sarcomas, aneurysms, dissecting aneurysms, and valvular disturbances occurring.

Understanding the ground regulation system results in the idea that energy ($E=Mc^2$) can be changed into mass and that inappropriate input of pollutants,

bacteria, or viral energy can result in pathologic processes. Rajkovic V, Matavulj M, Johansson O, "Light and electron microscopic study of the thyroid gland in rats exposed to power-frequency electromagnetic fields", J Exp Biol 2006; 209: 3322-3328 Note: Other Rea Studies can be found at http://www.mcscanadian.org/res_rea.html (accessed Feb 2013)

11.70 Rajkovic V, Matavulj M, Johansson O, "***Histological characteristics of cutaneous and thyroid mast cell populations in male rats exposed to power-frequency electromagnetic fields***", Int J Radiat Biol 2005; 81: 491-499

11.71 Rajkovic V, Matavulj M, Johansson O, "***The effect of extremely low-frequency electromagnetic fields on skin and thyroid amine- and peptide-containing cells in rats: An immunohistochemical and morphometrical study***", Environ Res 2005; 99: 369-377

11.72a Rööslı M, Huss A. ***Mobile phone base station exposure and symptoms.*** Environ Health Perspect. 2008 Feb;116(2):A62-3; author reply A64-5. doi: 10.1289/ehp.10771. Comment on Negative study by Does short-term exposure to mobile phone base station signals increase symptoms in individuals who report sensitivity to electromagnetic fields? A double-blind randomized provocation study. [Environ Health Perspect. 2007] [**copy filed in Docket with Zinelis and**

11.72b Rööslı M, Moser M, Baldinini Y, Meier M, Braun-Fahrländer C. ***Symptoms of ill health ascribed to electromagnetic field exposure--a questionnaire survey.*** Int J Hyg Environ Health. 2004 Feb;207(2):141-50.

Institute of Social and Preventive Medicine, University of Basel, Basel, Switzerland. Roeoesli@ispm.unibe.ch **Abstract:** From June 2001, health questionnaires were distributed to people who complained about symptoms of ill health which they ascribed to exposure to electromagnetic fields (EMF). The objective of the survey was to gain a better knowledge of the anxieties of complainants, to obtain hints of possible problems and of actions that should be taken to solve the problems. The survey was not designed to establish a causal association between exposure to EMF and symptoms of ill health. Within one year, 429 questionnaires were returned of which 394 persons reported symptoms. The average age of the complainants was 51.0 years and 57 percent were female. The complainants were older, had a higher educational level and were more likely to be married compared to the general Swiss population. A mean of 2.7 different symptoms were reported. Sleep disorders (58%), headaches (41%), nervousness or

distress (19%), fatigue (18%), and concentration difficulties (16%) were most common complaints. Complainants related their symptoms most frequently to exposure to mobile phone base stations (74%), followed by mobile phones (36%), cordless phones (29%) and power lines (27%). No distinct symptoms related to a specific field source could be identified. Eighty-five percent of the people who consulted a public authority because of their symptoms were unsatisfied with the response, whereas consultation of self-help groups or building ecologists usually fulfilled expectations. Two thirds of complainants had taken some action to reduce their symptoms. The most common measure was to avoid exposure if possible. Removing or disconnecting indoor sources was judged to be the most effective action.

11.73 Sandström M, Lyskov E, Hörnsten R, Hansson Mild K, Wiklund U, Rask P, Klucharev V, Stenberg B, Bjerle P. Holter ***ECG monitoring in patients with perceived electrical hypersensitivity***. Int J Psychophys 2003; 49: 227-35. Heart rate variability is impaired in people with electrical hypersensitivity. EHS patients had a disturbed pattern of circadian rhythms.

11.74 Sandstrom M, Wilen J, Oftedal G, Hansson-Mild K, ***Mobile phone use and subjective symptoms. Comparison of symptoms experienced by users of analogue and digital mobile phones***. Occup Med (Lond) 51(1):25-35, 2001 The alleged health effects of low level radio-frequency radiation (RFR) used in transmission are contentious. Following isolated reports of headache-like symptoms arising in some users, a survey has been conducted to characterize the symptoms sometimes associated with mobile phone usage. A notice of interest in cases was placed in a major medical journal and this was publicized by the media. Respondents were interviewed by telephone using a structured questionnaire. Forty respondents from diverse occupations described unpleasant sensations such as a burning feeling or a dull ache mainly occurring in the temporal, occipital or auricular areas. The symptoms often began minutes after beginning a call, but could come on later during the day. The symptoms usually ceased within an hour after the call, but could last until evening. Symptoms did not occur when using an ordinary handset, and were different from ordinary headaches. There were several reports suggestive of intra-cranial effects. Three respondents reported local symptoms associated with wearing their mobile phone on their belts. There was one cluster of cases in a workplace. Seventy-five per cent of cases were associated with digital mobile phones.

Most of the respondents obtained relief by altering their patterns of telephone usage or type of phone. Cranial and other diverse symptoms may arise associated with mobile phone usage. Physicians and users alike should be alert to this. Further work is needed to determine the range of effects, their mechanism and the possible implications for safety limits of RFR.

11.75 Santini R, Santini P, Danze JM, Le Ruz P, Seigne M. ***Study of the health of people living in the vicinity of mobile phone base stations: I. Influence of distance and sex*** Pathol Biol (Paris) 50(6):369-373, 2002 A survey study using questionnaire was conducted in 530 people (270 men, 260 women) living or not in vicinity of cellular phone base stations, on 18 Non Specific Health Symptoms. Comparisons of complaints frequencies (CHI-SQUARE test with Yates correction) in relation with distance from base station and sex, show significant ($p < 0.05$) increase as compared to people living > 300 m or not exposed to base station, till 300 m for tiredness, 200 m for headache, sleep disturbance, discomfort, etc. 100 m for irritability, depression, loss of memory, dizziness, libido decrease, etc. Women significantly more often than men ($p < 0.05$) complained of headache, nausea, loss of appetite, sleep disturbance, depression, discomfort and visual perturbations.

This first study on symptoms experienced by people living in vicinity of base stations shows that, in view of radioprotection, minimal distance of people from cellular phone base stations should not be < 300 m.

11.76.0 Santini R, Seigne M, Bonhomme-Faivre L, Bouffet S, Defrasne E, Sage M. ***Symptoms experienced by users of digital cellular phones:*** Article in French Pathol Biol (Paris) 49(3):222-226, 2001 A survey study, using questionnaire, was conducted in 161 students and workers in a French engineering school on symptoms experienced during use of digital cellular phones.

A significant increase in concentration difficult ($p < 0.05$) was reported by users of 1800-MHz (DCS) cellular phones compared to 900-MHz (GSM) phone users. In users of cellular phones, women significantly ($p < 0.05$) complained more often of sleep disturbance than men. This sex difference for sleep complaint is not observed between women and men non-users of cellular phone.

The use of both cellular phones and VDT significantly ($p \leq 0.05$) increased concentration difficulty. Digital cellular phone users also significantly ($p < 0.05$) more often complained of discomfort, warmth, and picking on the ear during phone conversation in relation with calling duration per day and number of calls

per day. The complaint warmth on the ear might be a signal to users for stopping the call.

11.76.1 Schreier N, Huss A, Rössli M (2006). *"The prevalence of symptoms attributed to electromagnetic field exposure: a cross-sectional representative survey in Switzerland"*. Soz Praventivmed 51 (4): 202–9. doi:10.1007/s00038-006-5061-2. PMID 17193782.

11.77 Schooneveld and Kuiper, 2007. *Electrohypersensitivity (EHS) in the Netherlands—A Questionnaire survey*. © Stichting EHS (Dutch EHS Foundation). 70% of respondents suffered from chronic fatigue, headache, concentration problems and other psychosomatic ailments. Somatic problems included impaired vision, smell and hearing as well as skin problems and pains in joints and muscles. Living in an apartment with several neighbours is a risk factor due to EMFs traveling through wall and floors.

11.78 Schreier N, Huss A, Rössli M (2006). *"The prevalence of symptoms attributed to electromagnetic field exposure: a cross-sectional representative survey in Switzerland"*. Soz Praventivmed 51 (4): 202–9. doi:10.1007/s00038-006-5061-2. PMID 17193782.

11.79 Stenberg B. *Characterising EHS, Proceedings from International Workshop on Electrical Hypersensitivity Prague, Czech Republic* October, 2004; 43-51. Note: It takes almost two years for the proceedings to be transcribed. The full proceeding was published 2006. [copy filed in Docket as Proceedings 11b.12]

11.80 Sears M. *The Medical Perspective on Environmental Sensitivities*. Canadian Human Rights Commission, 2007 Abstract: Approximately 3% of Canadians have been diagnosed with environmental sensitivities, and many more are somewhat sensitive to traces of chemicals and/or electromagnetic phenomena in the environment. People experience neurological and numerous other symptoms, and avoidance of triggers is an essential step to regaining health. The Canadian Human Rights Commission commissioned this report to summarize scientific information about environmental sensitivities. For those interested in the original scientific and technical literature, an annotated bibliography is available on request from environmentalhealthmed@gmail.com This report addresses issues such as the definition and prevalence of environmental sensitivities; recognition by medical authorities; education and training within the medical community; origins, triggers

and symptoms of sensitivities; impact of environmental sensitivities in the workplace; government policies and standards for building codes, air quality and ventilation as they affect individuals with environmental sensitivities; and guidelines for accommodation within the workplace. For people with environmental sensitivities, their health and ability to work rests with the actions of others, including building managers, co-workers and clients. Accommodating people with environmental sensitivities presents an opportunity to improve workplace environmental quality and workers' performance, and may help prevent the onset of sensitivities in others. **[filed in Docket]**

11.81 Södergren L, Johansson O, "***Commentary: Mobile telephones - will the golden goose become the mad cow?***", J Aust Coll Nutr & Env Med 2001; 20: 29-30

11.82 Stenberg B, Bergdahl J, Edvardsson B, Eriksson N, Lindén G, Widman L. ***Medical and social prognosis for patients with perceived hypersensitivity to electricity and skin symptoms related to the use of visual display terminals.*** Scand J Work Environ health 2002; 28: 349-57.

11.83 Szyjkowska A, Bortkiewicz A, Szymczak W, Makowiec-Dabrowska T. ***Subjective symptoms related to mobile phone use*** [Article in Polish] Pol Merkuriusz Lek. 19(112):529-532, 2005 The large number of young people complaining of headache and impaired concentration calls for further research to investigate the underlying reasons. It cannot be excluded that one of them may be exposure to EMF emitted by mobile phone. The explanation should be sought through further experimental and epidemiologic studies.

11.84 The National Radio Quiet Zone (NRQZ) was established by the Federal Communications Commission (FCC) in Docket No. 11745 (November 19, 1958) and by the Interdepartment Radio Advisory Committee (IRAC) in Document 3867/2 (March 26, 1958) to minimize possible harmful interference to the National Radio Astronomy Observatory (NRAO) in Green Bank, WV and the radio receiving facilities for the United States Navy in Sugar Grove, WV. <http://www.gb.nrao.edu/nrqz/nrqz.html> It is also a place now where "Electrosensitives", (people who are sensitive to EMF and RF) have been flocking to get away from WiFi, cell phones, cell towers and other wireless devices. An article about Green Bank, West Virginia is filed in the Docket.

11.84b Tuengler A, von Klitzing L. Electromagn Biol Med. 2013 Jan 9.

Hypothesis on how to measure electromagnetic hypersensitivity.

Source Institute of History, Theory and Ethics in Medicine, and Human Technology Centre (HumTec), RWTH Aachen University, Aachen, Germany.
Abstract Electromagnetic hypersensitivity (EHS) is an ill-defined term to describe the fact that people who experience health symptoms in the vicinity of electromagnetic fields (EMFs) regard them as causal for their complaints. Up to now most scientists assume a psychological cause for the suffering of electromagnetic hypersensitive individuals. This paper addresses reasons why most provocation studies could not find any association between EMF exposure and EHS and presents a hypothesis on diagnosis and differentiation of this condition. Simultaneous recordings of heart rate variability, microcirculation and electric skin potentials are used for classification of EHS. Thus, it could be possible to distinguish "genuine" electromagnetic hypersensitive individuals from those who suffer from other conditions.

11.85 Van den Bergh O, Stegen K, Van Diest I, Raes C, Stulens P, Eelen P, Veulemans H, Van de Woestijne KP, Nemery B. ***Acquisition and extinction of somatic symptoms in response to odours: a Pavlovian paradigm relevant to multiple chemical sensitivity.*** Occup Environ Med. 1999 May; 56 (5):295-301.

11.86 WHO Factsheet 296 ***"Electromagnetic fields and public health: Electromagnetic Hypersensitivity"***. World Health Organisation December 2005. Excerpts: Although there are no diagnostic criteria for EHS, and it is not yet identified as a medical diagnosis, the WHO does recognize it as a "condition" with real symptoms. In fact the WHO held a Workshop on Electrical Hypersensitivity in Prague, Czech Republic in 2004. In their fact sheet listed here, the WHO describes the symptoms most commonly experienced: dermatological symptoms (redness, tingling, and burning sensations) as well as neurasthenic and vegetative symptoms (fatigue, tiredness, concentration difficulties, dizziness, nausea, heart palpitation, and digestive disturbances). EHS resembles multiple chemical sensitivities (MCS), another disorder associated with low-level environmental exposures to chemicals. The WHO also recognizes the prevalence in the general population. Some studies suggest that certain physiological responses of EHS individuals tend to be outside the normal range; in particular, hyper reactivity in the central nervous system and imbalance in the autonomic nervous system. Currently working on the International EMF project since 2002. Nine progress reports are available, fact sheets and the WHO monologues which most recently

labeled RF as a “possible carcinogen” <http://www.who.int/peh-emf/publications/facts/fs296/en/> Accessed Feb. 2013.

11.87 **WHO Workshop on Electromagnetic Hypersensitivity (2004)**, October 25 - 27, Prague, Czech Republic, Partial Conclusion: National authorities should not ignore the plight of (EHS) IEI individuals as it affects some 2- 3% of populations in a number of countries. Governments need to provide general physicians with appropriate advice based on information provided by qualified experts. Governments should also note that IEI patients have real symptoms, but that there is no scientific evidence of causal link with EMF exposure, and therefore no grounds to use (EHS) IEI as a diagnostic classification. [Minutes of proceeding provided to the Docket] www.who.int/peh-emf/meetings/hypersensitivity_prague2004/en/index.html

11.88 Wilén J, Sandstrom M , Hansson Mild K. ***subjective symptoms among mobile phone users – a consequence of absorption of radiofrequency fields.*** Bioelectromagnetics, 2003; 24; 152-159.

11.89 Zinelis SA. ***Short-term exposure to mobile phone base station signals.*** Environ Health Perspect. 2008 Feb;116(2):A62; author reply A64-5. This study disagrees with Eltiti et al. (2007), that concludes EHS is not physical. The data in the study by Eltiti et al. (2007) do not support their conclusion. . [full critique and references provided to Docket] <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2235207/?tool=pubmed>

11.90 Zwamborn A, Vossen S, van Leersum B, Ouwens M, Mäkel W. ***Effects of global communication system radio-frequency fields on well being and cognitive functions of human subjects with and without subjective complaints.*** The Hague, Netherlands: TNOPhysics and Electronics Laboratory (TNO-report FEL-03-C148). Available from: URL: www.ez.nl. See also www.gr.nl/pdf.php?ID=1042. Report nr TNO-report 2003; FEL-03-C148.

11.91 (see Gangi in alpha order---skipped numbering)

Part B -Recognition of EHS in the United States and Other Countries

1. United States Federal Register; Part II Architectural and Transportation Barriers Compliance Board; 36 CFR Parts 1190 and 1191 Americans With Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Final Rule; et al Tuesday September 3, 2002 Federal Register Vol. 67, No 170 [copy filed in Docket]

2. AFFIDAVIT of Nicols Fox to the FCC, June 3, 2009 . Nicols Fox of the West Virginia County of Greenbrier (The Quiet Zone) was a regular correspondent for The Economist magazine. His articles and essays have appeared in numerous US and international publications including The Washington Post and The New York Times. He is the author of four books, two of them on medical topics. He developed electrical hypersensitivity and moved from Maine to West Virginia. His testimony to FCC on 3rd day of June, NIBS Indoor Environmental Quality Project, Published by the National Institute of Building Sciences for the Architectural and Transportation Barriers Compliance Board (Access Board); and independent federal agency devoted to accessibility for people with disabilities. In November 1999, the Access Board issued a proposed rule to revise and update its accessibility guidelines. During the public comment period on the proposed rule, the Access Board received approximately 600 comments from individuals with multiple chemical sensitivities (MCS) and electromagnetic sensitivities (EMS). [Copy filed in Docket]

3. Ladberg, Gunilla, Forced to Disconnect, Electrohypersensitive fugitives in Sweden Gunilla Ladberg Pedagogik & Språk gunilla@ladberg.se www.ladberg.se; Original Title: Ett vackert fängelse Translation: Agneta Jonsson 1st Edition. 2008. Swedish. Ett vackert fängelse 2nd Edition. 2009. Swedish 3th Edition. 2010. German 4th Edition. 2010. English [Copy filed in Docket]

4. Geirland, John, The Quiet Zone; Cell phones, pagers, WiFi, Bluetooth-the wireless revolution is everywhere. Except here. Article from Wired Magazine 12.02 ; http://www.wired.com/wired/archive/12.02/quiet_pr.html [Copy filed in Docket]

5. IDEA Statement, The Irish doctors Environmental Association – Position

statement on Electro-magnetic Radiation and Electrohypersensitivity, [Copy filed in docket] accessed Feb. 2013 <http://ideaireland.org/library/idea-position-on-electro-magnetic-radiation/>

6. Austrian Medical Association, ***Guideline of the Austrian Medical Association for the diagnosis and treatment of EMF-related health problems and illnesses (EMF syndrome) Consensus paper of the Austrian Medical Association's EMF Working Group (AG-EMF)*** Adopted March 3, 2012. The Austrian Medical Association has developed a guideline for differential diagnosis and potential treatment of unspecific stress-related health problems associated with electrosmog. Its core element is a patient questionnaire consisting of a general assessment of stress symptoms and a specific assessment of electrosmog exposure. The guideline is intended as an aid in diagnosing and treating EMF-related health problems. [Copy filed in Docket]

7. ***The History of Electrosensitivity Research***, by the Cellphone Task Force; Article Can be found at www.cellphonetaskforce.org
NIBS, Final Report National Institute of Building Sciences (NIBS) Indoor Environmental Quality (IEQ) Project Operations & Maintenance Committee, 7/14/2005. [Copy filed in Docket]

8. EHS in the United States under the ***Americans with Disabilities Act***. Recommendations from National Institute of Occupational Safety and Health (NIOSH) A summary of the Access Board's Report and legal issues. [Copy filed in Docket]

9. ***Proceedings of the International Workshop on EMF Hypersensitivity*** Prague, Czech Republic October 25-27, 2004; Electromagnetic Hypersensitivity Editors: Kjell Hansson Mild Mike Repacholi Emilie van Deventer Paolo Ravazzani; Published by the World Health Organization 2006 [Copy filed in Docket]
Sears, Margaret E. May 2007. *The Medical Perspective on Environmental Sensitivities*. The Canadian Human Rights Commission. The Canadian Human Rights Commission commissioned this report to summarize scientific information about environmental sensitivities. This report addresses issues such as the definition and prevalence of environmental sensitivities; recognition by medical authorities; education and training within the medical community; origins, triggers and symptoms of sensitivities; impact of environmental sensitivities in the workplace; government policies and standards for building codes, air quality and

ventilation as they affect individuals with environmental sensitivities; and guidelines for accommodation within the workplace. [Copy filed in Docket]

10. Formal submittal to WHO REGISTRY IN GENEVA ON MAY 12, 2011: WORLD DAY FOR CENTRAL SENSITIZATION ILLNESSES: MULTIPLE CHEMICAL SENSITIVITY, ELECTROMAGNETIC SENSITIVITY CHRONIC FATIGUE SYNDROME AND FIBROMYALGIA Subject: **RECOGNITION OF ENVIRONMENTAL ILLNESSES: MCS AND EHS by Spanish and Italian organizations, doctors and scientists that recognize EHS and MCS as disease.** [Copy filed in Docket]

11. **Italy's Supreme Court Decision** as reported by two news sources. Note: The verdict is available only in Italian. Table of Countries and their Reports of Electrosensitivity

12. **EHS Refuge Zone – Italy**; Article from Next-up.org Creation of the First EHS Refuge Zone in Italy. Includes the location and photos, as well as a discussion of why it is needed.

13. **EHS Refuge Zone – France** Abelous, Daniel, France has its first radiation-free refuge in the Drome; Article from Agence France Presse, 9.10.2009
EHS Refuge Zone – Spain <http://www.lambtonshores.ca/Docs/Olvera.pdf> Spain

19.a Ahonen, M. & Koppel, T. (2012). **Mobile Learning and Health-Risk Management of Pulsed Microwave Technologies**. mLearn Conference, Conference Proceedings, Helsinki 2012.

19.b Ahonen, M. (2010). ***Voltage transients and possible effects on health through cell membrane functionality disturbance. Proceedings of the 4th International HYVITE Symposium on Wellbeing Technology***, 9th June 2010, Book of abstracts. Tampere, Finland.

20. Australia Decision

11b.22-28 Alasdair's Report on EHS.

29. Firstenberg, Arthur, ***Silent Wireless Spring*** An Article explaining the history

of the Telecommunications Act of 1996, the FCC's exemption of the telecom industry [Copy filed under Section 10 Other 10.11]