

EMF Health Concerns associated with RF Metering in California's Smart Grid

Dr. Karl Maret

President, Dove Health Alliance

As part of Panel

“The High (?) Road to a True Smart Grid”



Jan 28, 2014

WHO Health Definition



“State of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”

- *Electromagnetic Fields (EMFs)* are now an emerging health hazard
- The current scientific debate is centered on whether long-term, low level (non-thermal) exposure can evoke biological responses and influence people's well-being.

2011: EMFs pose a Potential Health Hazard

International Agency for Research on Cancer



World Health
Organization

PRESS RELEASE
N° 208

31 May 2011

IARC CLASSIFIES RADIOFREQUENCY ELECTROMAGNETIC FIELDS AS POSSIBLY CARCINOGENIC TO HUMANS

Lyon, France, May 31, 2011 -- The WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency electromagnetic fields as [possibly carcinogenic to humans \(Group 2B\)](#), based on an increased risk for [glioma](#), a malignant type of brain cancer¹, associated with wireless phone use.

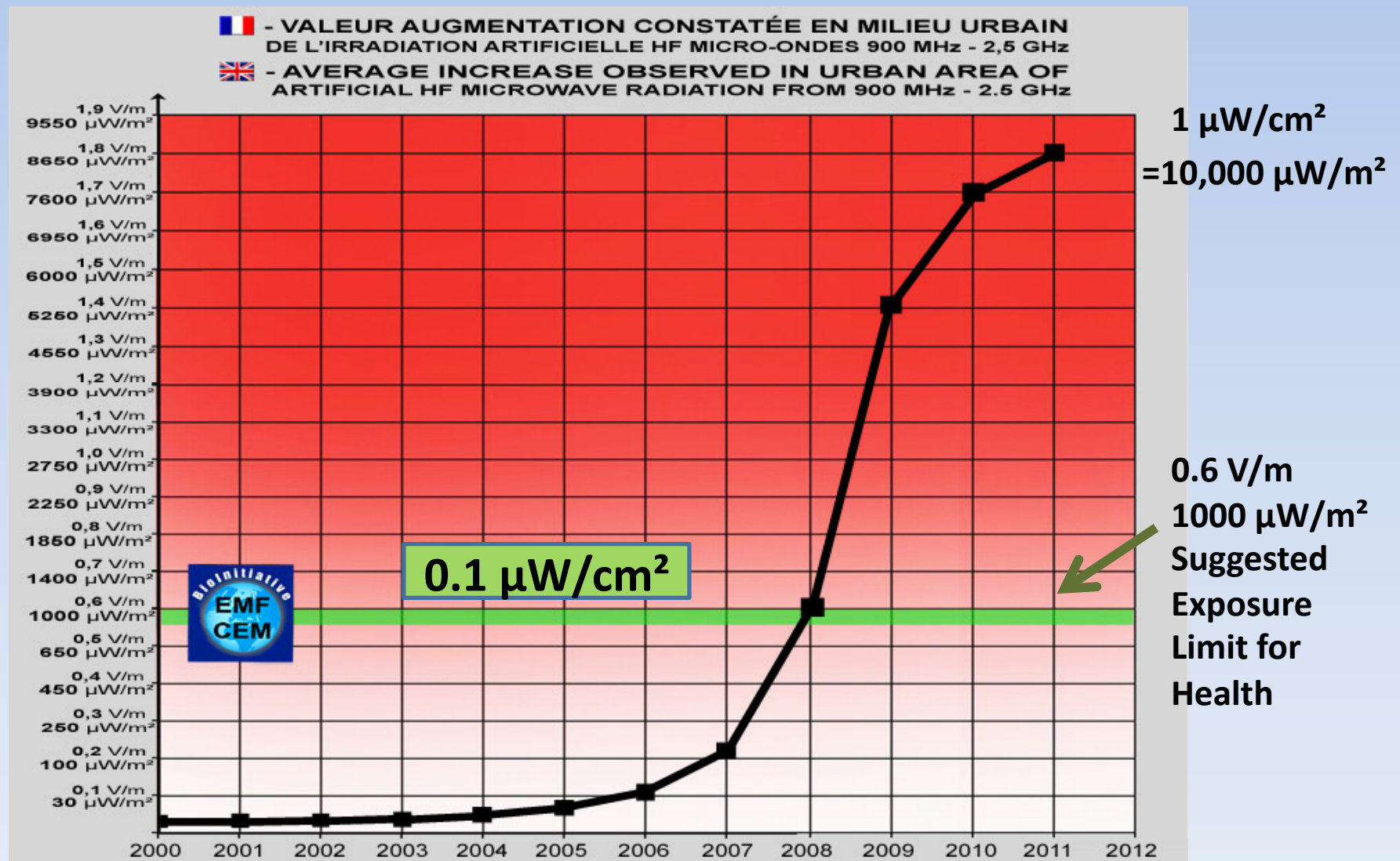
This classification applies to all RF-emitting devices, including WiFi.

- Robert A. Baan, PhD, IARC

This classification justifies the implementation of the Precautionary Principle.

- Dr. Darius Leszczynski, IARC

Exponential Rise in Microwave Radiation Levels



Courtesy: Next-Up Organization



Review Article

Fielding a current idea: exploring the public health impact of electromagnetic radiation

Stephen J. Genuis*

Faculty of Medicine, University of Alberta, 2935–66 Street, Edmonton, AB, Canada T6K 4C1

- 2008 review article surveying 112 peer reviewed studies
- Concludes that there is strong epidemiological evidence of considerable potential for injury and affliction as a result of non-ionizing radiation exposure from EMFs.
- Evidence for reproductive dysfunction, cancer and CNS dysfunction
- Describes industrial vested interests that biased scientific research, promote doubt and uncertainty to minimize potential harm of EMFs

2013: Human disease resulting from exposure to electromagnetic fields

Volume 28, Issue 4 (Nov 2013)



- Good review of state of science and dangers of EMFs by David Carpenter MD published recently
- This review also summarizes that excessive exposure to **Radio Frequency Radiation (RFR)** increases risk of cancer, male infertility, and neurobehavioral abnormalities.

Sources of Radio Frequency Radiation

- Cell Phones



- Cordless Telephones (especially DECT)



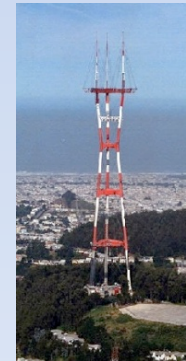
- Smart Meters – Home Area Networks



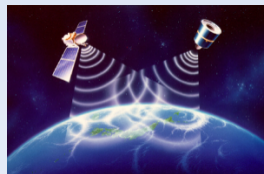
- Wi-Fi in Homes



- High Power Radio & TV Towers



- Satellites – Communication, GPS

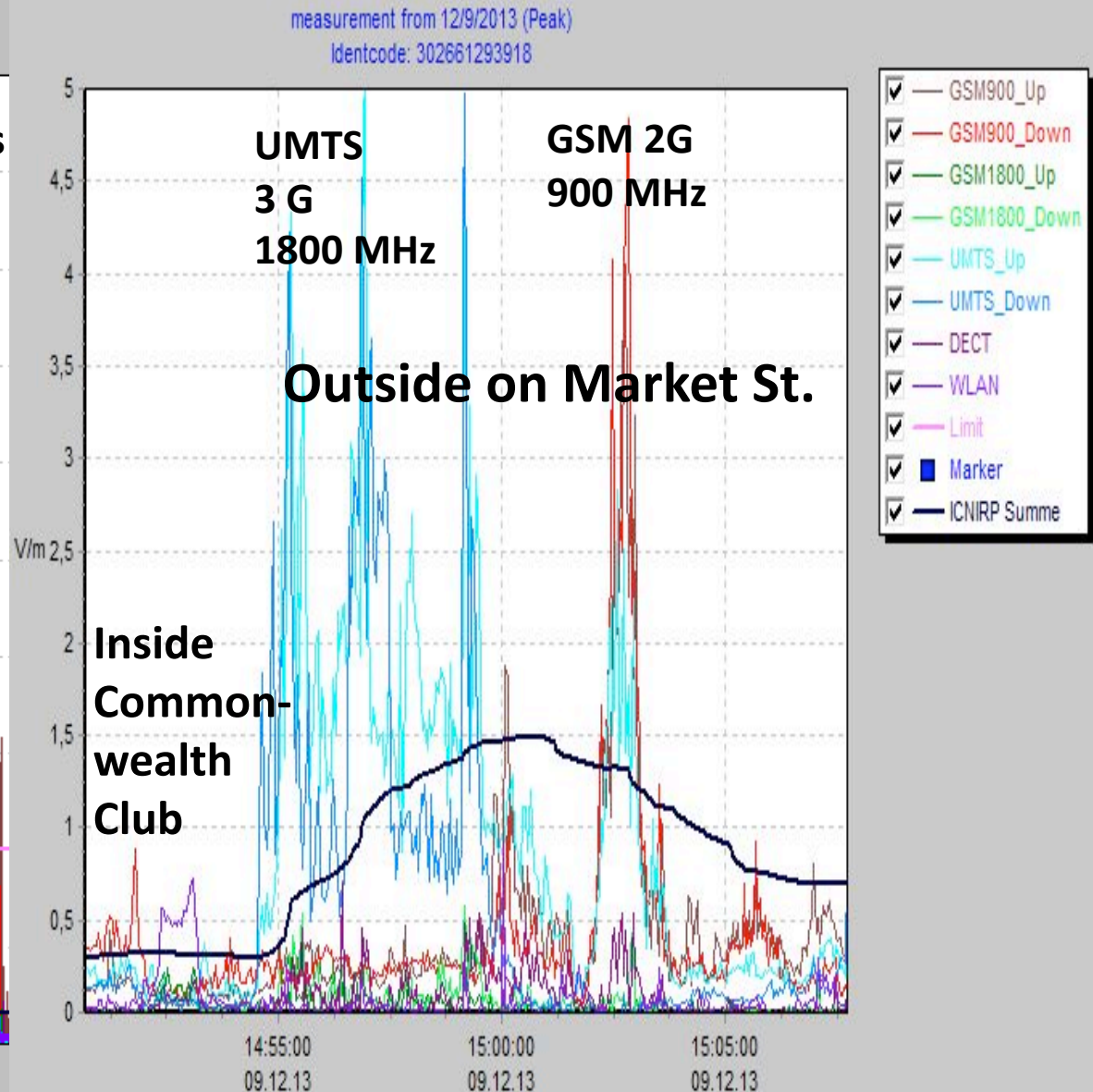
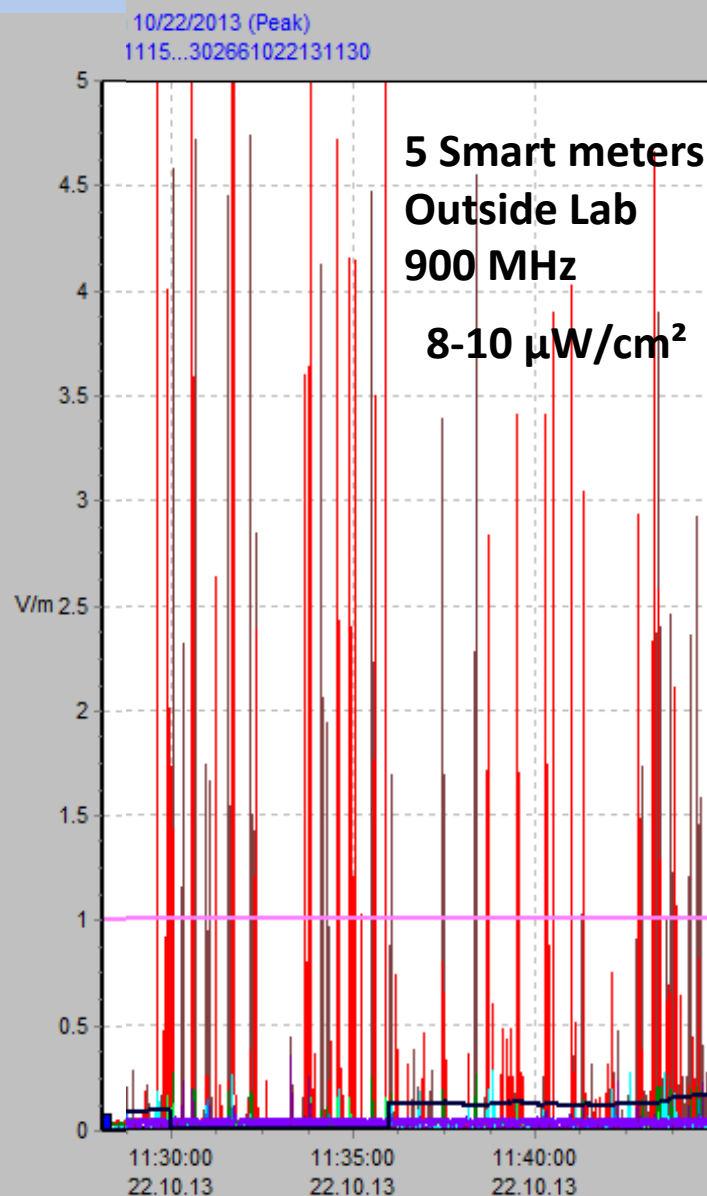


Scientific Studies on Health Effects of Smart Meter Emissions

- None were carried out by the utility industry prior to deployment
- The industry's assertion that non-thermal microwave exposure is harmless is not substantiated by science
- Exposure guidelines are only for short-term exposure (30 min) not for long-term or cumulative exposure
- Smart Meters affect Whole Body with Non-thermal radio frequency radiation, similar to cell towers

Smart Meters @ 8 feet : Market St. San Francisco

15 minutes on Oct 22, 2013 15 minutes on Dec 9, 2013



2010: Review of 10 Cell Tower studies

Epidemiological Evidence for a Health Risk from Mobile Phone Base Stations

VINI G. KHURANA, LENNART HARDELL, JORIS EVERAERT, ALICJA BORTKIEWICZ, MICHAEL CARLBERG, MIKKO AHONEN

- Int. J Occup. Envir Health, Vol 16(3):263-267, 2010
- Analysis of 4 studies were from Germany, and 1 each from Austria, Egypt, France, Israel, Poland, Spain
- 7 studies showed altered neurobehavioral effects near cell towers
- 3 studies showed increased cancer incidence Effects occurred < 500 meters from cell towers
- Authors recommended lower exposure guidelines

San Francisco Cell Towers Map (2011)

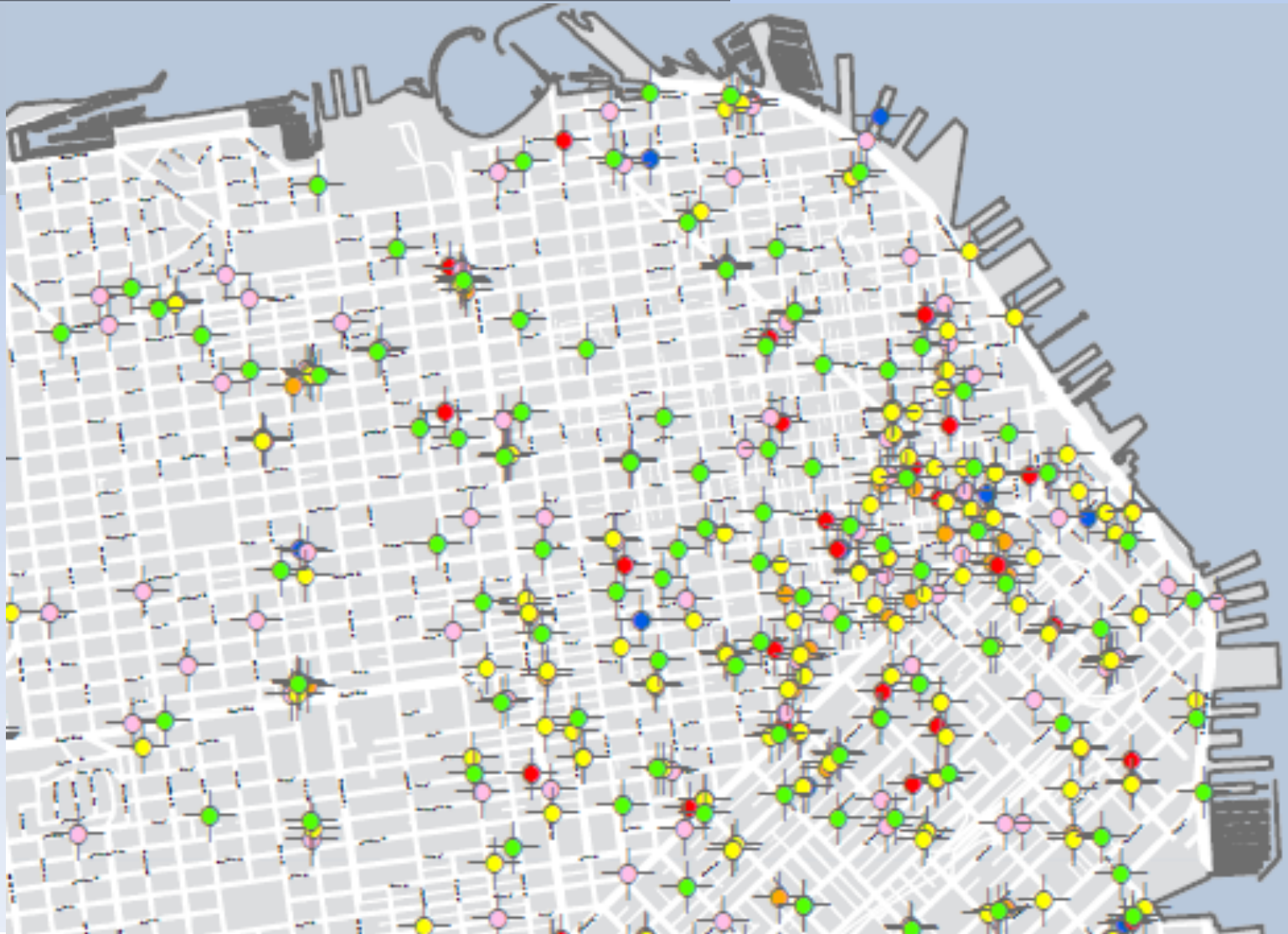


SAN FRANCISCO
PLANNING DEPARTMENT

Wireless Telecommunications Facilities

April 2011

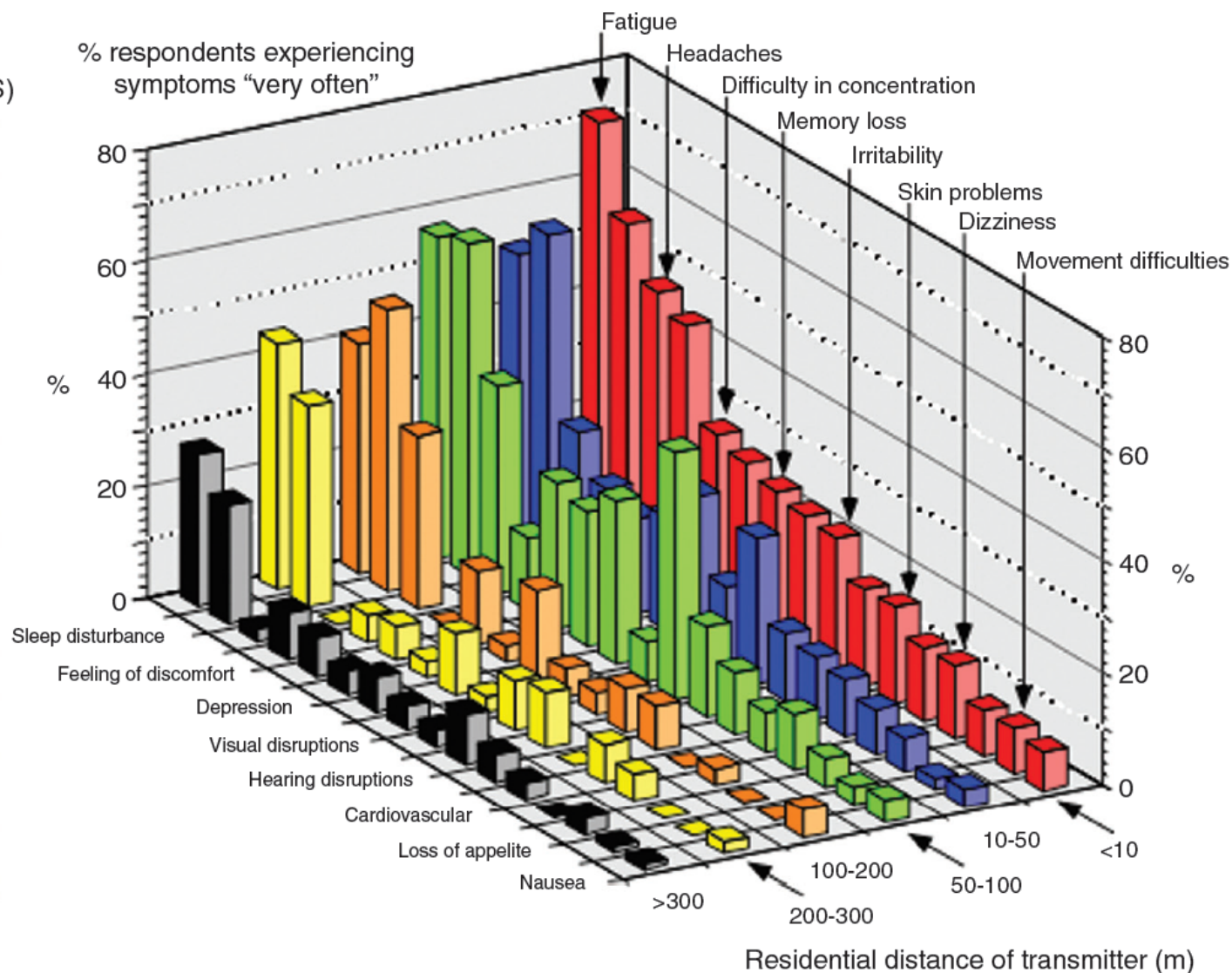
- AT&T
- MetropCS
- NexTel
- Sprint
- T-Mobile
- Verizon



Neurobehavioral Symptoms near Cell Towers

Rapid aging syndrome (RAS)
Electro-Hyper-Sensitivity (EHS)

1. Fatigue
2. Sleep disturbance
3. Headaches
4. Feeling of discomfort
5. Difficulty concentrating
6. Depression
7. Memory loss
8. Visual disruptions
9. Irritability
10. Hearing disruptions
11. Skin problems
12. Cardiovascular
13. Dizziness
14. Loss of appetite
15. Movement difficulties
16. Nausea



Work of Santini et al (France): Pathol Biol. 2002;50:S369–73.

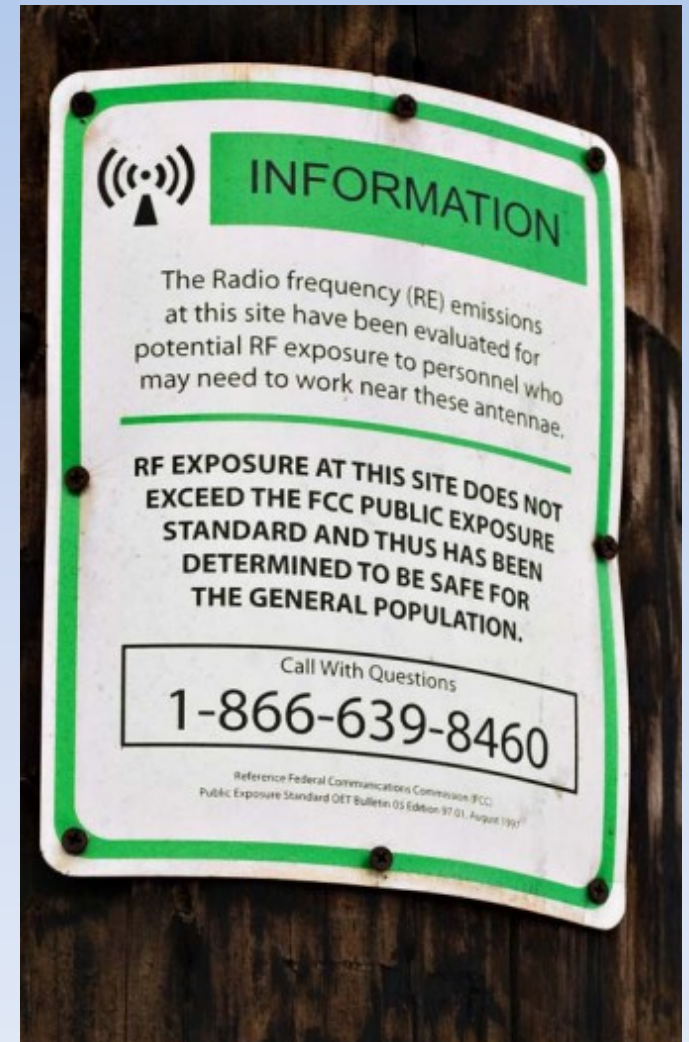
Cell Towers Adverse Health Effects

- Neurobehavioral Changes
- Increased Cancer Risk
- Hormonal Changes
- Conditions similar to Microwave Sickness already known about since the 1960's.

New Utility Pole Mini Cell Towers add EMFs



Antenna near
695 Central Ave.
San Francisco



- Safety of these Devices are based only on Thermal Exposure Criteria uses (Antennas from NextG Networks)

2013: International Concerns about Wi-Fi

Electromagnetic Biology and Medicine, June 2013; 32(2): 200–208

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informa
healthcare

Wi-Fi technology – an uncontrolled global experiment on the health of mankind

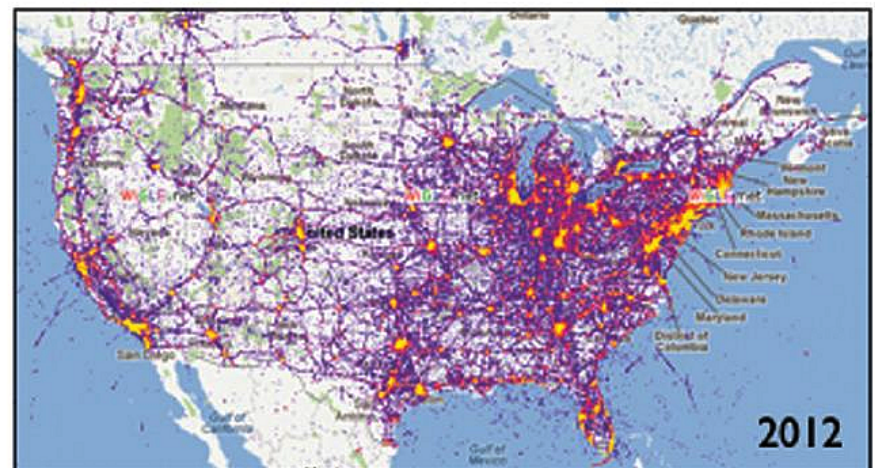
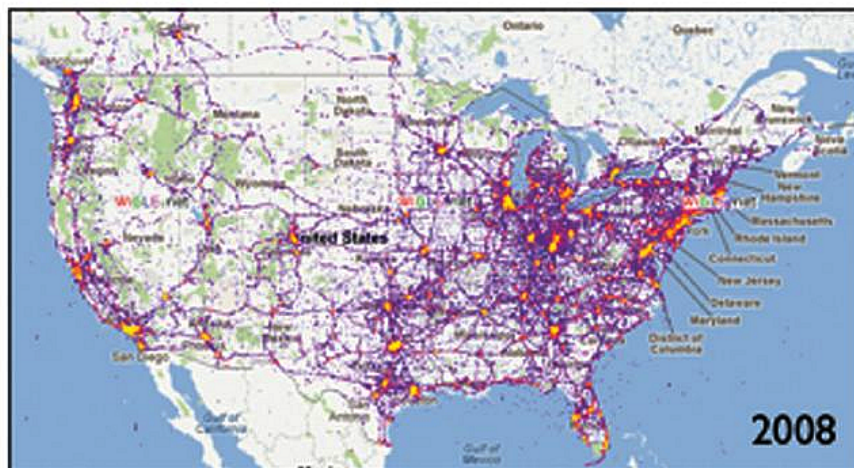
Marko Markov¹ & Yuri G. Grigoriev²

¹*Research International, Williamsville, NY, USA, and* ²*Russian National Committee of Non-Ionizing Radiation Protection, Moscow, Russia*

U.S. has done little research on Microwave Exposure since 1996 Telecommunications Act became law

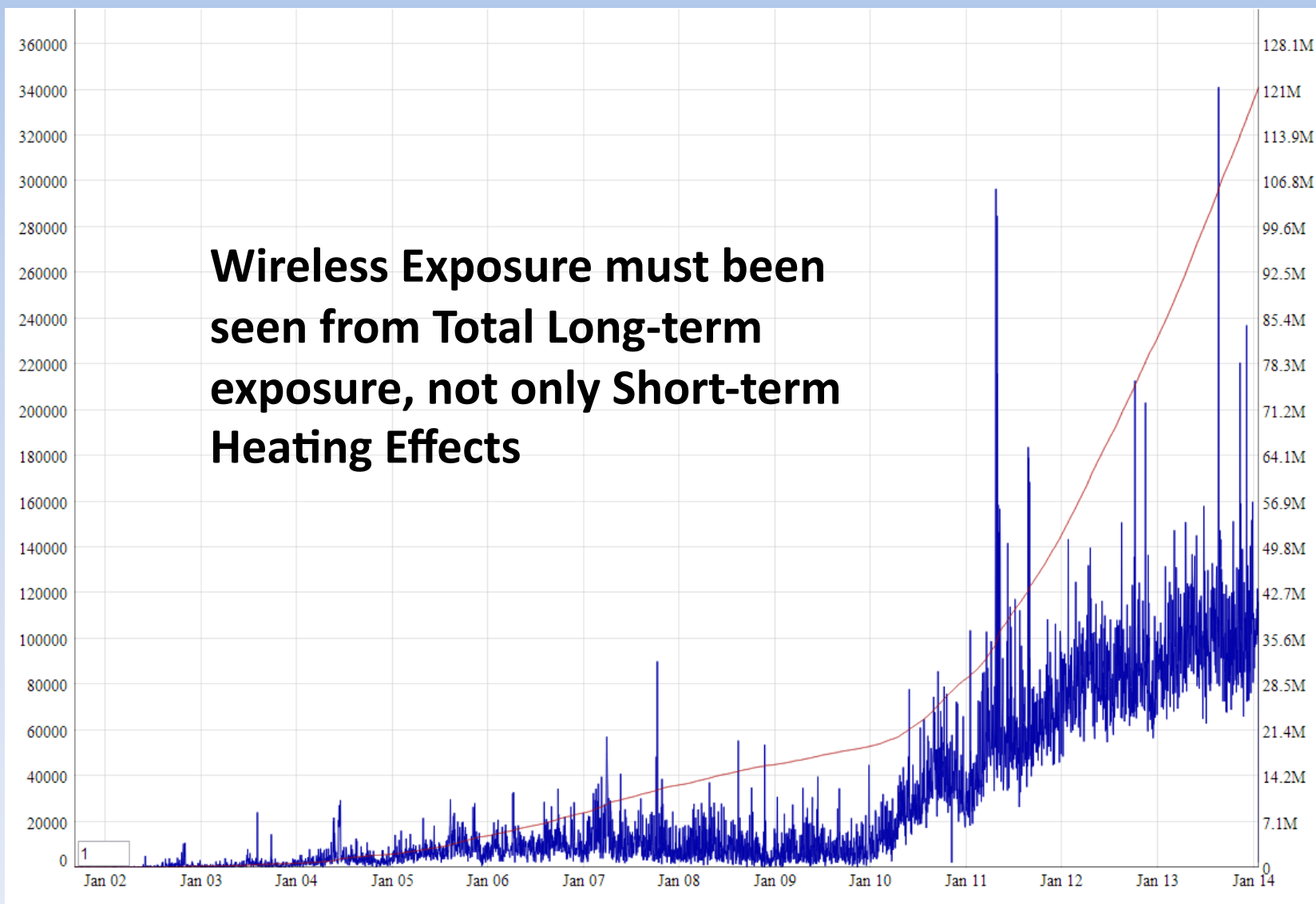
Russians have done extensive research on Microwave Impacts on Health and have lower exposure guidelines

Growth in WiFi Networks 2002 - 2012



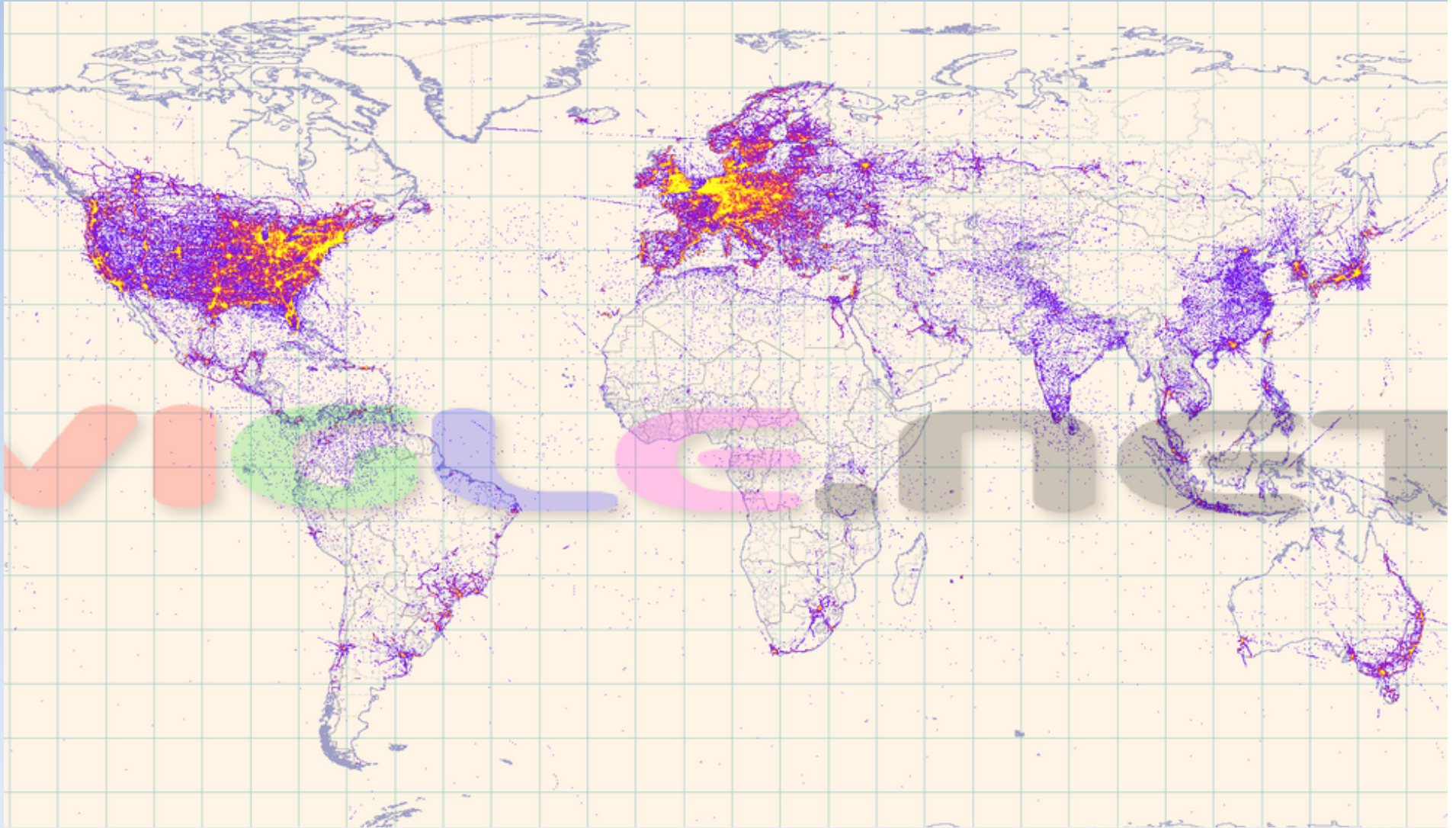
- Source: www.wigle.net

Growth in WiFi Networks 2002 - 2013



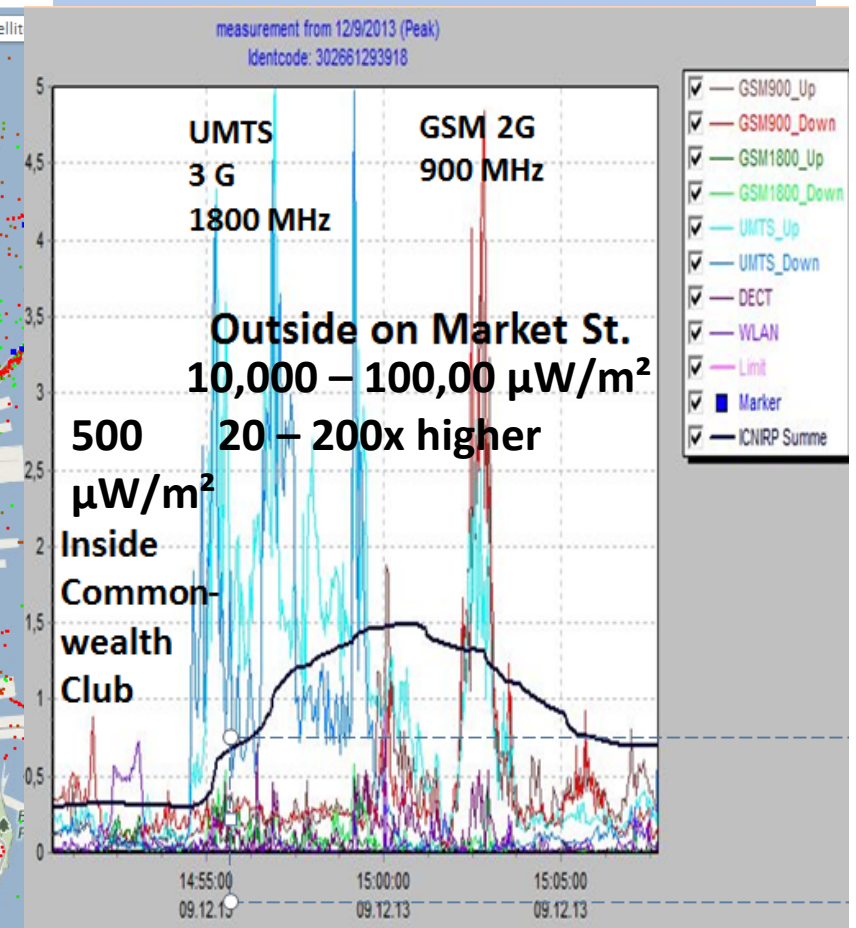
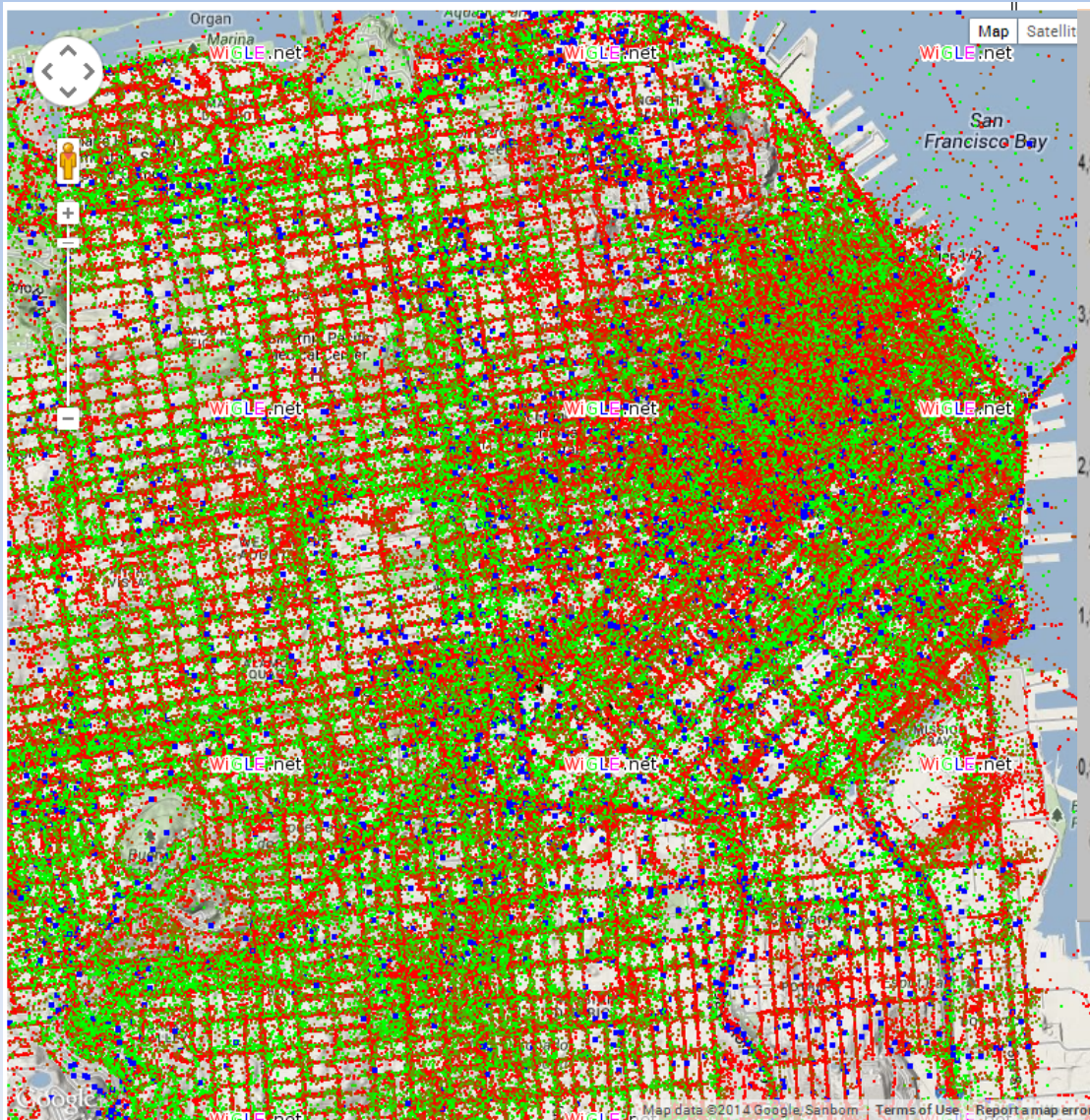
- Source: www.wigle.net WiFi in the World = 120 Million Networks

Wireless Map of World 2014



- Source: www.wigle.net

Wireless Map: San Francisco Center



EMF Measurements by Dr. Maret
Dec 9, 2013 3 pm Market St.

- Source: www.wigle.net

WiFi Reported Health Effects (2.45 GHz)

- Neurological: Headaches, dizziness, concentration difficulties, insomnia, fatigue, numbness/tingling
 - Cardiac: Palpitations, arrhythmias
 - Eyes: Pressure in eyes, poor vision
 - Ears: Ringing in ears
 - Other: Skin problems, digestive problems, impaired smell, light sensitivity
 - Long-term Effects: Not fully studied since technology is new but increasingly widespread. WiFi is mostly always on and will add to total body burden over time.
-
- **Current Exposure Guidelines are for Short-term only**
 - **Solution: Wired (Ethernet) system are faster and do not radiate**

Feb 2013: Harvard Pediatric Neurologist and Neuroimaging Specialist Dr. Martha R. Herbert advises against Wi-Fi Deployment in LA Schools

HARVARD MEDICAL SCHOOL

Martha R. Herbert, Ph.D., M.D.
Assistant Professor, Pediatric Neurology
Director, TRANSCEND Research Program
www.transcendresearch.org
transcend@partners.org



MASSACHUSETTS GENERAL HOSPITAL

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149 13th Street, Room 10.018
Boston, Massachusetts 02129
Phone: (617) 724-5920
Fax: (617) 812-6334
mherbert1@partners.org

TO: Los Angeles Unified School District
FROM: Martha R Herbert, PhD, MD
RE: Wireless vs. Wired in Classrooms
DATE: February 8, 2013

LA Unified School District Wireless Initiative to place Wi-Fi in all schools

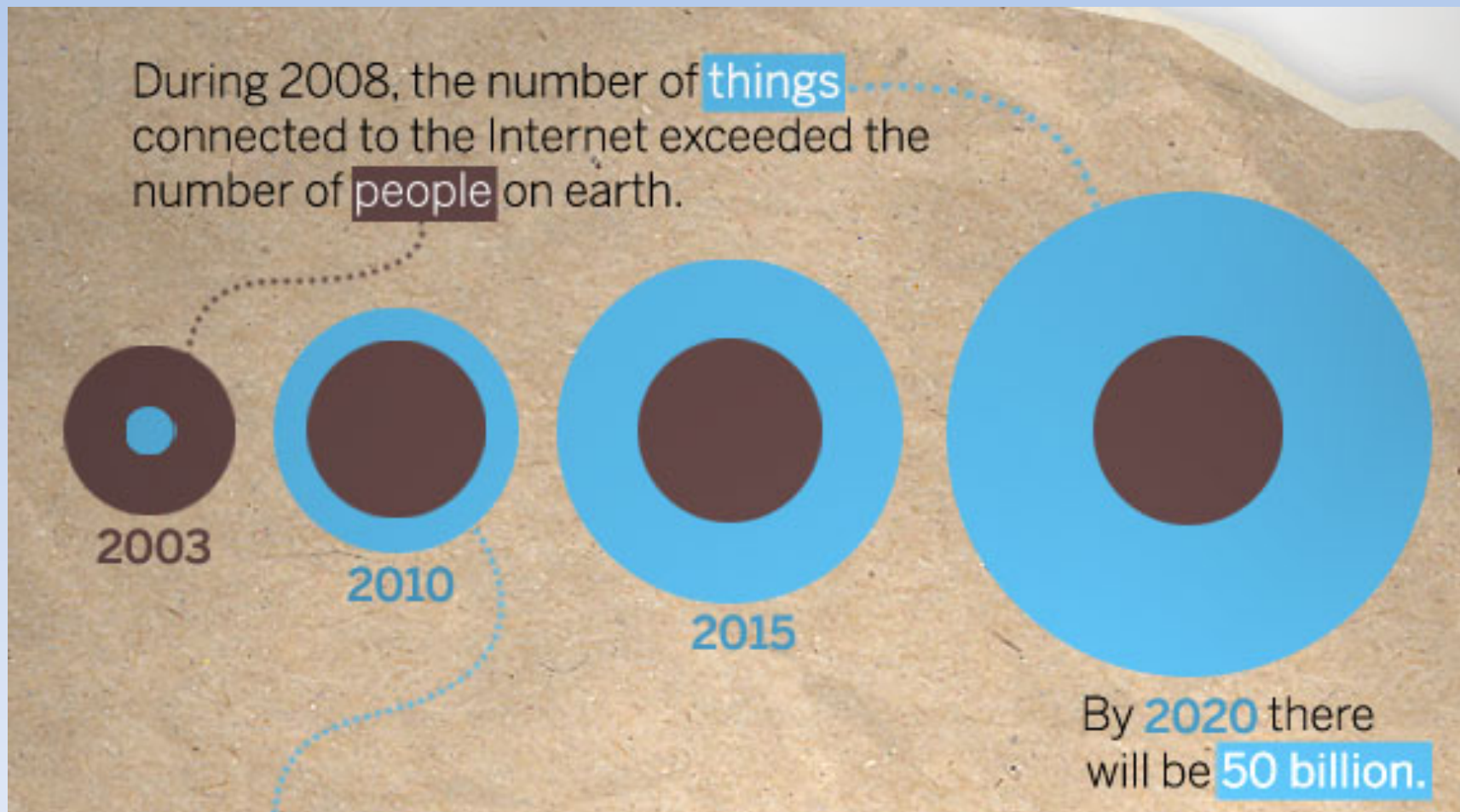
- Response by Harvard pediatric neurologist and neuroscientist Martha Herbert, PhD, MD
- “EMF/RFR from wifi and cell towers can exert a disorganizing effect on the ability to learn and remember, and can also be destabilizing to immune and metabolic function. This will make it harder for some children to learn, particularly those who are already having problems in the first place. “

Internet of Things (IoT)



- Devices connecting to the internet/web via low power radios are now being developed for creating a wireless, internet connected life
- According to Gartner and ABI Research there will be between 26 - 30 billion devices on the Internet of Things by 2020
- Health concerns have not been considered in design.

The Internet of Things is Growing



- Potentially massive levels of EMF Exposure may result

IoT is Big Business: Smart Meters Industry as part of it



- Current IoT includes GPS, electronic toll devices, WiFi enabled plugs sockets and light switches, WiFi appliances, smart parking meters, among others
- Estimated Research firm IDC predicts shift will generate \$9 Trillion by 2020; GE estimates \$15T by 2020 which would equal the annual U.S. GDP.
- Health concerns and potential costs are not considered

How Much Microwave Radiation Today?

- 1980 Background Microwave was $0.001 \mu\text{W}/\text{cm}^2$ (0.06 V/m)
- Now in cities can be around $3 \mu\text{W}/\text{cm}^2$ ($\sim 3 \text{ V/m}$)
- Background RFR has increased more than 1000 – 3000 x !!
- MESH Networks from Smart Meters will add to this
- Microwaves effects often have slow onset; direct causality is hard to prove --> Typically > 10+ year latency for cancer
- PREVENTION is the Key >>Precautionary Principle (Europe)
- French Government is Currently Implementing this regarding EMF Exposure

2009: European Parliament advocates the Precautionary principle on EMFs

P6_TA(2009)0216



European Parliament

Health concerns associated with electromagnetic fields

European Parliament resolution of 2 April 2009 on health concerns associated with electromagnetic fields (2008/2211(INI))

- Health Concerns from EMFs of concern in Europe
- Recognizes Electrohypersensitivity is a disability

27. Is greatly concerned about the fact that insurance companies are tending to exclude coverage for the risks associated with EMFs from the scope of liability insurance policies, the implication clearly being that European insurers are already enforcing their version of the precautionary principle;

28. Calls on Member States to follow the example of Sweden and to recognise persons that suffer from electrohypersensitivity as being disabled so as to grant them adequate protection as well as equal opportunities;

Increasing Levels of Background RF



- So far, their device can collect up to 5 milliwatts (mW) of power, and their short term goal is to collect 20 mW of power, which is just enough to keep the phone charged in standby mode.
- **HOW IS THIS LEVEL OF AMBIENT RF AFFECTING LIVING SYSTEMS ?**

How did EMF Exposure Guidelines Originate?

In 1960's, most EMF researchers were only concerned with Tissue Heating Effects

Microwave Safety Standards – 1966

Based only on Thermal Considerations: (Hasn't changed yet)

- Parties that deliberated on ANSI Standard C95.1-1966
- This standard was developed by producers for industrial and military users, not by health experts for all citizens
- Wireless technologies were not widespread then

American Petroleum Institute

Armed Forces Institute of Pathology

General Dynamics

National Aeronautics and Space Administration

U.S. Department of the Air Force, Office of the Surgeon General

U.S. Department of the Air Force, Rome Air

U.S. Department of the Army, Electronics Command

U.S. Department of the Army, Environmental Hygiene Agency

U.S. Department of the Army, Materiel Command

U.S. Department of the Army, Office of the Surgeon General

U.S. Department of the Interior, Bureau of Mines

U.S. Department of the Navy, Bureau of Medicine and Surgery

U.S. Department of the Navy, Bureau of Naval Weapons

U.S. Department of the Navy, Bureau of Ships

U.S. Department of the Navy, Marine Corps

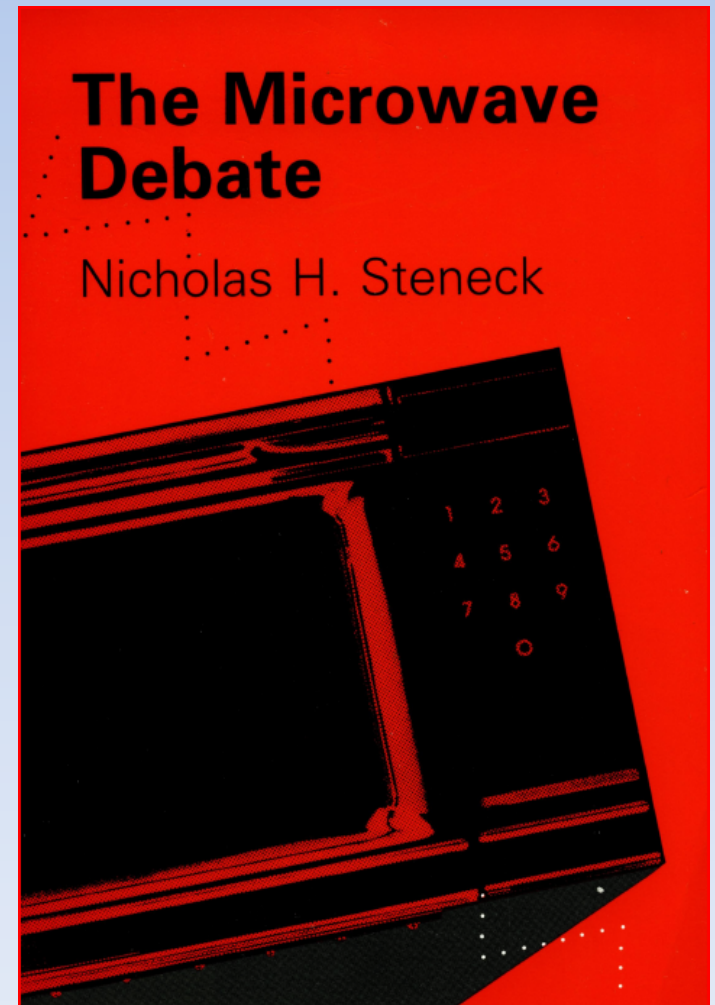
U.S. Department of the Treasury, Coast Guard

U.S. Public Health Service⁴¹



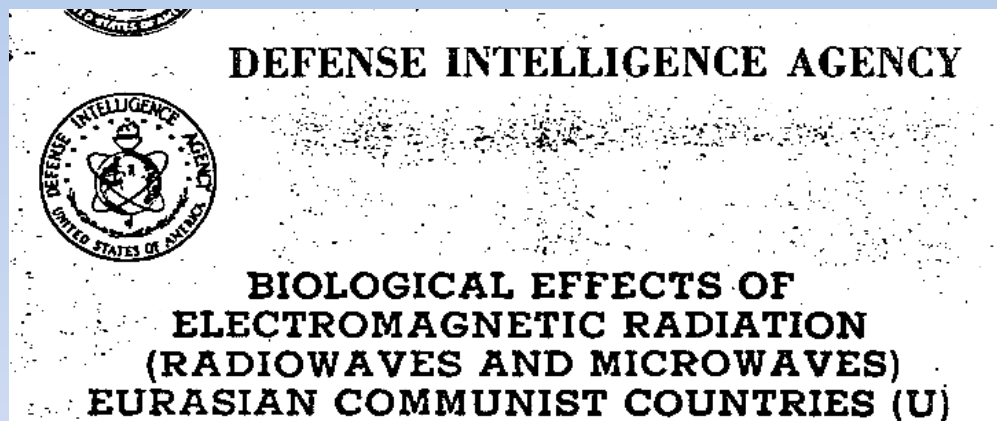
MIT Prof. Nicholas Steneck 1984

- Wrote how military and industry research had been the primary drivers of RF and microwave technology.
- “What community has the greatest interest in expanding the use of RF technology? The military and industry, whose values are most strongly represented in [safety exposure standard] C95.1-1982... At heart C95.1-1982 is a military industrial standard.”



Military Studied Microwave Effects

- Extensive Studies done in 1970s

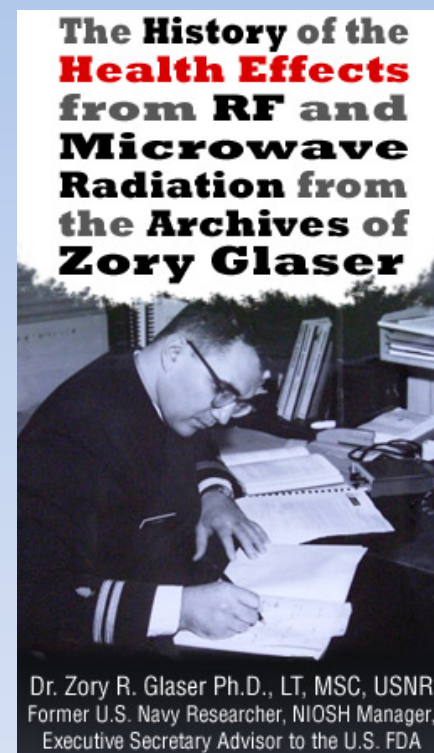


- 1976 DoD, Defense Intelligence Agency Report outlined Soviet research results

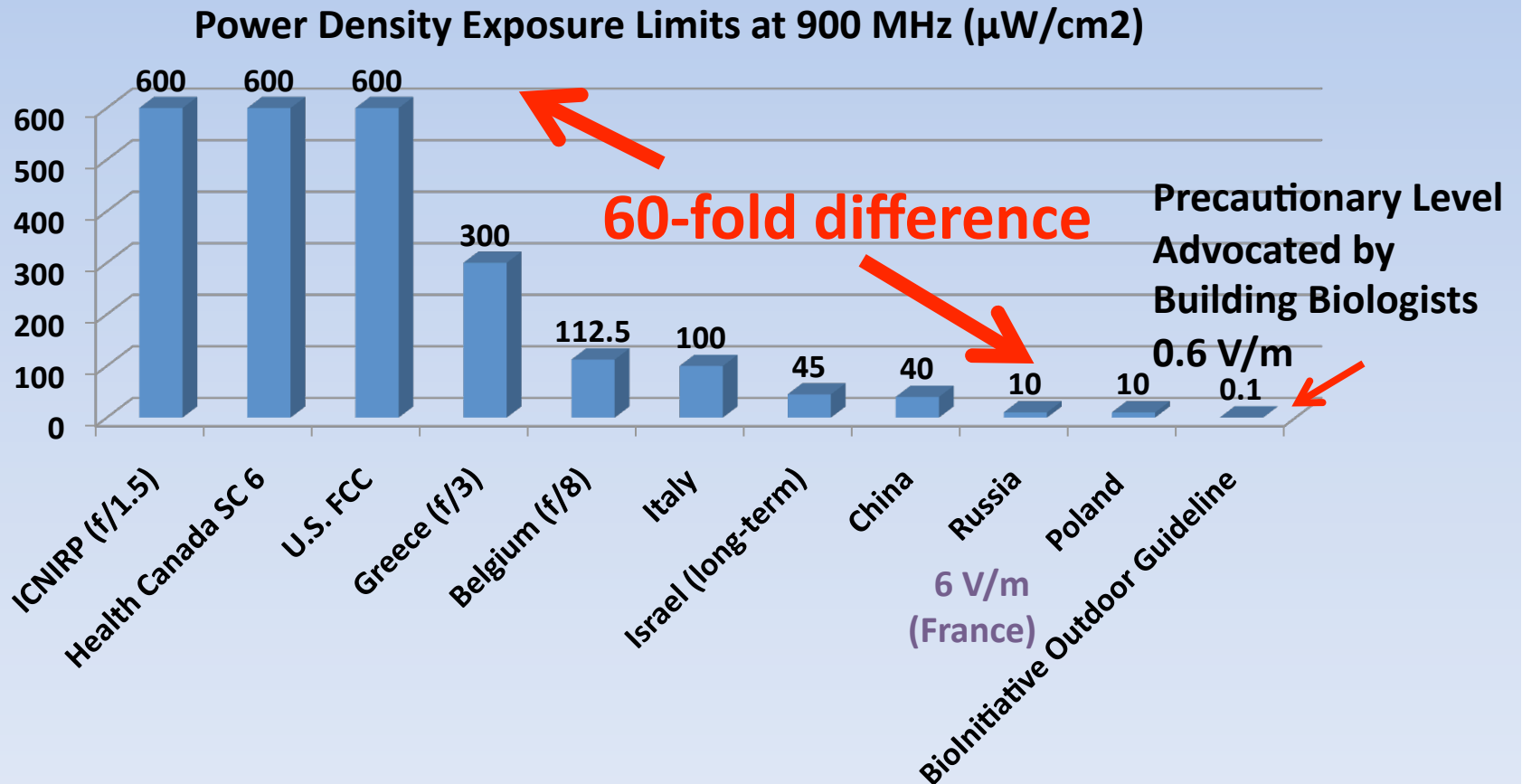
Soviet research has produced guidelines which were used to establish a value of $10 \mu\text{W}/\text{cm}^2$ per working day as the maximum admissible value for microwave irradiation. Higher exposures, at values of 0.01 to $0.1 \text{ mW}/\text{cm}^2$, are permissible for up to two hours per day or $1 \text{ mW}/\text{cm}^2$ for 15 to 20 minutes per day. Protective glasses are required in the latter case.

- $10 \mu\text{W}/\text{cm}^2$ recommended, current U.S. standards are $600 \mu\text{W}/\text{cm}^2$; Smart Meters produce fields of $9^+ \mu\text{W}/\text{cm}^2$

Many records available at: www.magdahavas.com



Power Density Exposure Limits at Smart Meter Frequencies can vary by Countries



- Bioinitiative guidance based on Non-thermal exposures to EMFs is considerably lower at $0.1 \mu\text{W}/\text{cm}^2$



Bioinitiatives Report 2012

- 29 Authors: 9 MDs, 21 PhDs authored the report
- Experts from 10 countries: USA (10), Sweden (6), Austria (2), Canada (2), Greece (2), India (2), Italy (2), Denmark (1), Russia (1), Slovak Republic (1)
- Had over 2-1/2 Millions hits 30 days after it was released.
Total report had 1480 pages
- Covers 24 sections including Fetal and neonatal Effects, Autism and ASD, Genotoxic and Metabolic Mechanisms of low intensity EMFs, Stress response, immune impacts, impacts on blood-brain barrier, need for application of precautionary approaches
- Calls for lower exposure guidelines, $1000 \mu\text{W}/\text{m}^2$ ($0.1 \mu\text{W}/\text{cm}^2$)

Various Exposure Limits for 900 MHz

- $0.001 \mu\text{W}/\text{cm}^2$ Salzburg, Austria Guidance for Safety and Sleep Disturbances (Schwarzenburg Study)
- $0.1 \mu\text{W}/\text{cm}^2$ "Precautionary limit" Austria
Bioinitiative Working Group ($1000 \mu\text{W}/\text{m}^2$)
- $4.5 \mu\text{W}/\text{cm}^2$ ECOLOG-recommendation (Germany)
- $8.8 \mu\text{W}/\text{cm}^2$ [Tell Report on PG&E Smart Meter emission](#)
- $10 \mu\text{W}/\text{cm}^2$ Exposure limit in Russia, Poland, Hungary
Switzerland, Luxemburg, Bulgaria
- $12 \mu\text{W}/\text{cm}^2$ Measured Peaks from SM @ 4 feet
- $600 \mu\text{W}/\text{cm}^2$ US Exposure limit by FCC (Heating effects)

Maine Public Utilities Commission didn't address smart meter safety, court says

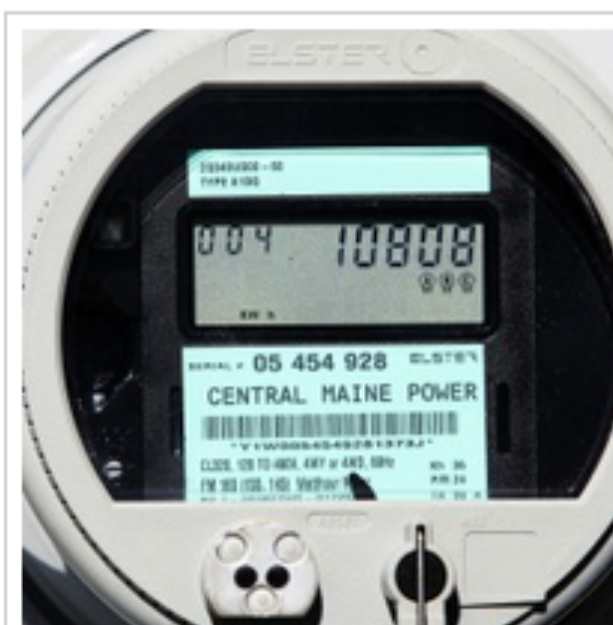
By DAVID SHARP, The Associated Press

Posted July 12, 2012, at 8:03 p.m.

PORTLAND, Maine — Maine's highest court ruled Thursday that state regulators failed to adequately address safety concerns about Central Maine Power's smart meters but the ruling had no immediate impact on more than 600,000 smart meters already installed in homes and businesses across the state.

The Supreme Judicial Court ordered the Maine Public Utilities Commission to reconsider a complaint that raised health concerns, and lead plaintiff, Ed Friedman of Bowdoinham, urged the panel to use the opportunity "to hold full evidentiary hearings on this and look at it under the bright lights."

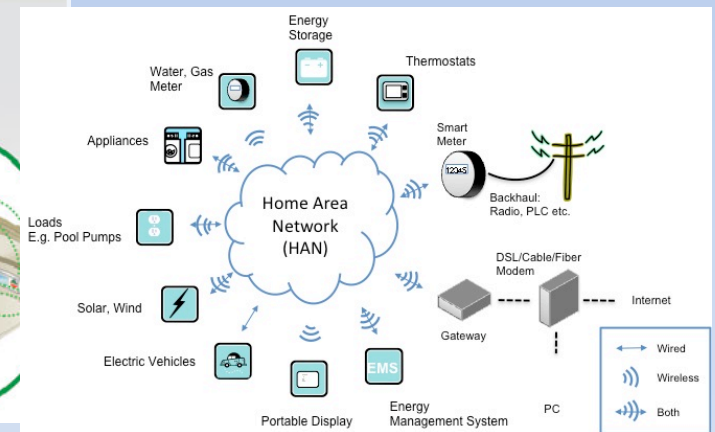
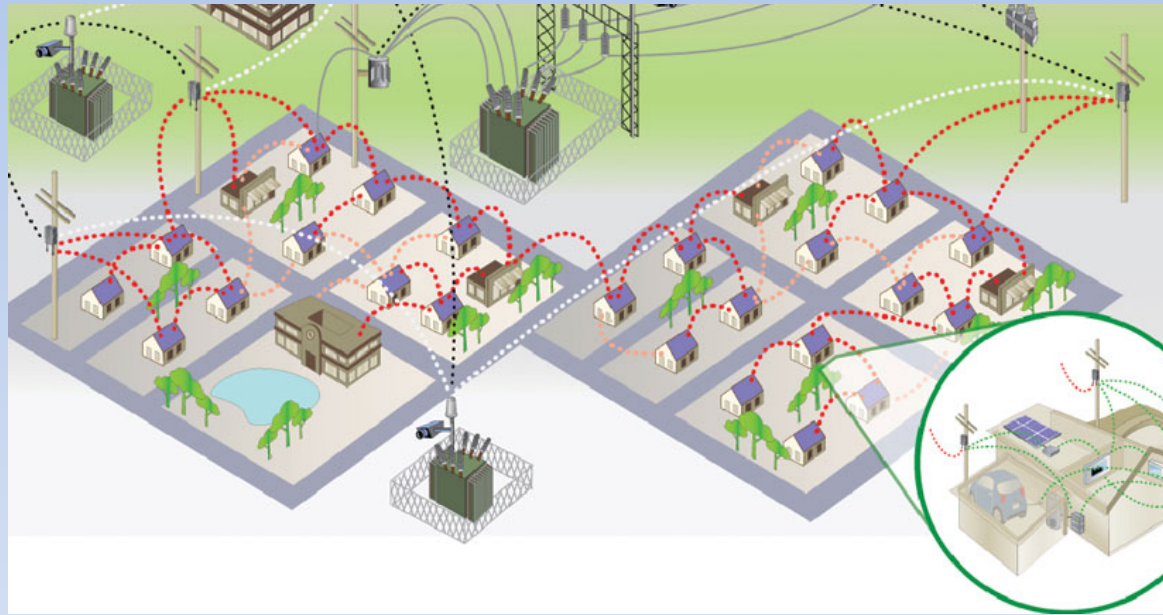
"We understand that the horse is out of the barn in terms of the meters being in, but they should've vetted these smart meters for safety before they were deployed instead of waiting until they're deployed to see that there's well-known biological effects," Friedman said.



AP Photo/Robert F. Bukaty

A new Central Maine Power smart meter displays electricity usage at a business in Freeport in fall 2010.

Mesh Networks & Home Area Network



- Smart meters (at 902-928 MHz) in Neighborhood are connected in a Mesh Network passing information back and forth to central collection points at higher placements.
- Home Area Network is to link appliances and devices wirelessly together (2.4 GHz Zigbee or similar WiFi) and is within the Smart Meter architecture. Appliance WiFi may not be disabled.

Living within the Wireless HAN (Home Area Network)

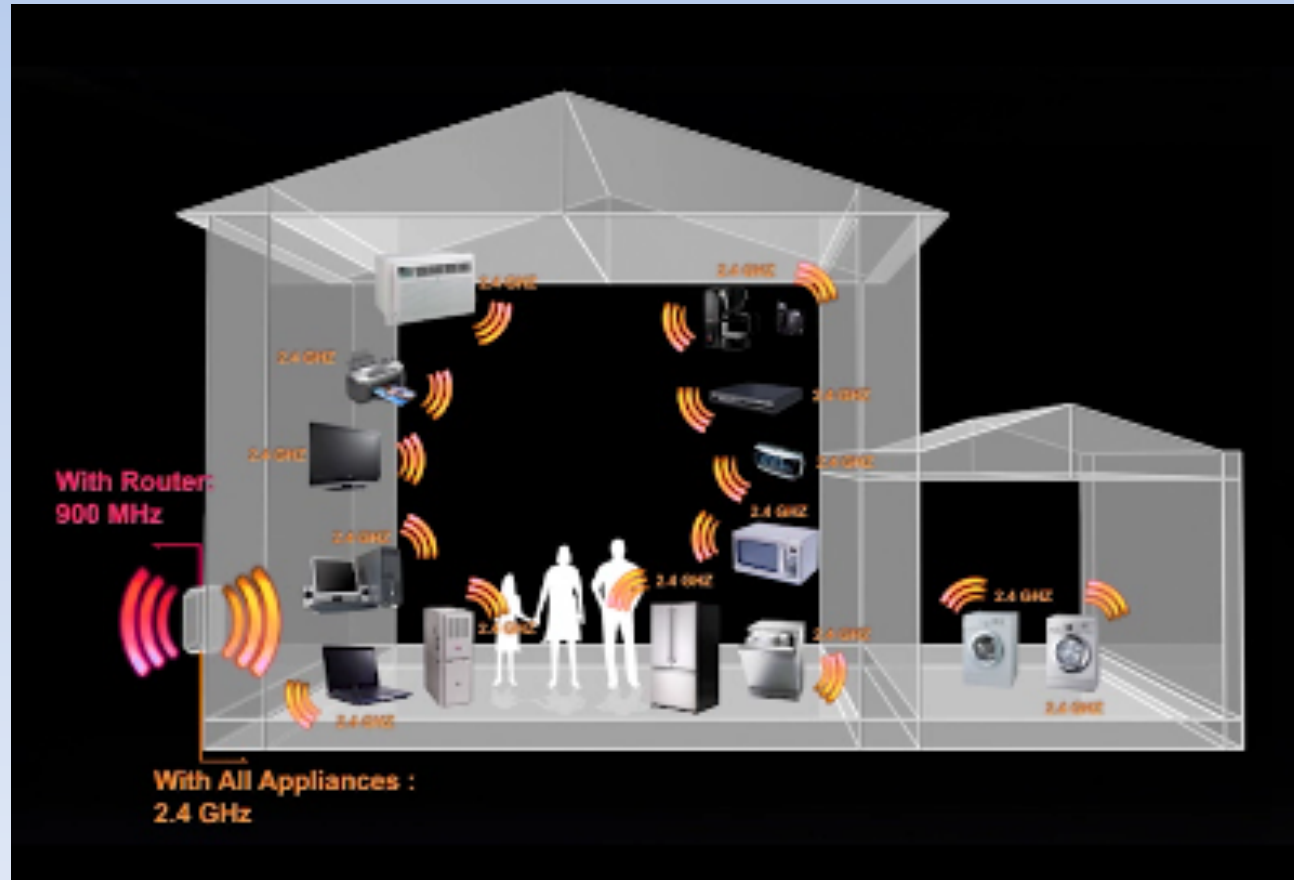


Image: Take Back your Power

- What are the Long-term Health Effects of his System?

Additional Issues in the Internet of Things

- International Data Corporation predicts that there will be more than 30 Billion wireless connected devices in the world by 2020.
- Between Dec 23, 2013 – Jan 6, 2014 home wireless devices, including at least one smart refrigerator, were hijacked in first proven cyber-attack originating from connected appliances



Source: http://www.cnn.com/2014/01/17/tech/gaming-gadgets/attack-appliances-fridge/index.html?hpt=hp_bn5

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WIRELESS

Santa Clara, Calif., Combines Public Wi-Fi with Smart Metering

The new advanced smart metering program sends meter data across a secure Wi-Fi channel while also providing free Wi-Fi access to the public.

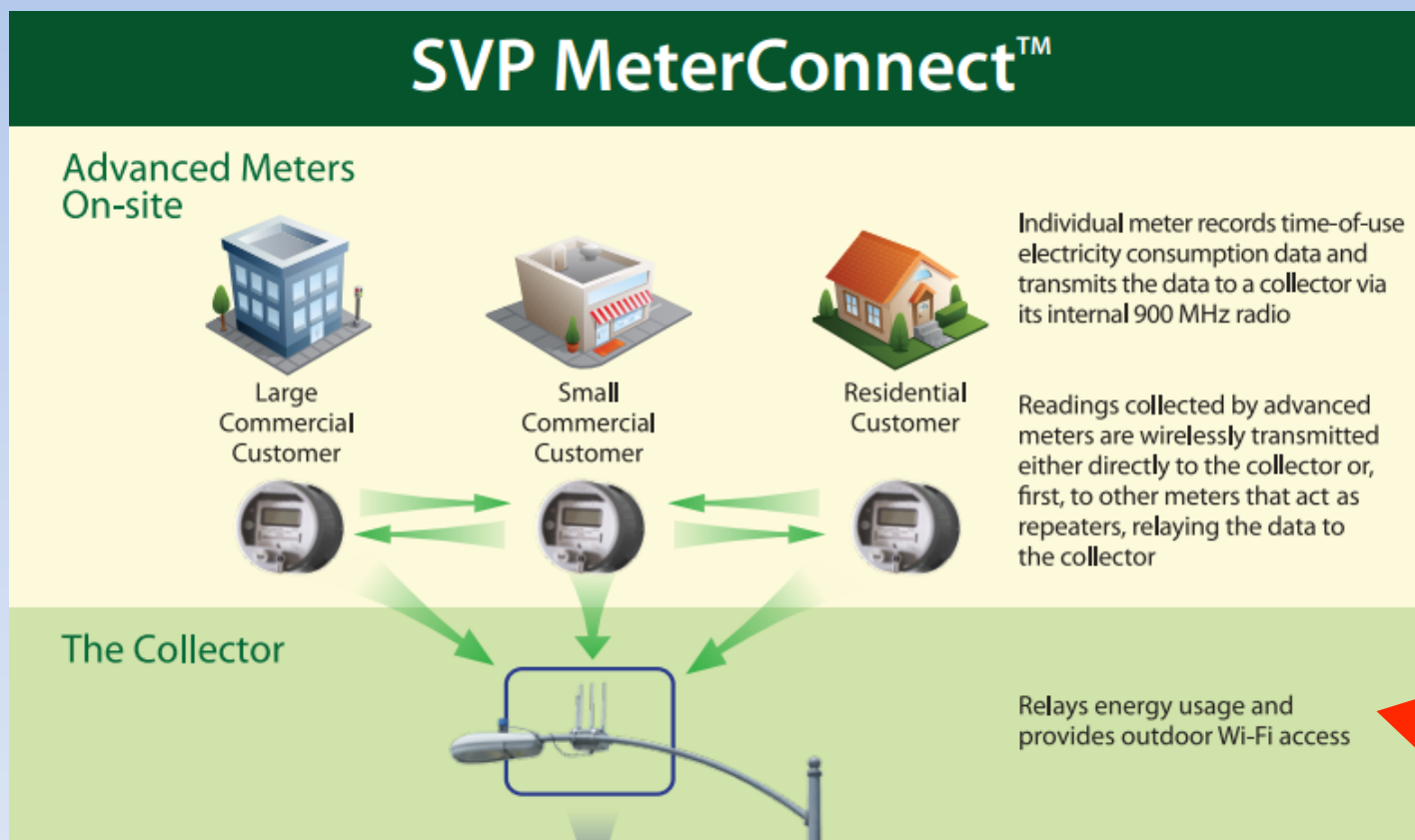
BY SARAH RICH / APRIL 16, 2013

0

- Smart Meters are being used in Santa Clara by municipal electric utility, Silicon Valley Power, as Public WiFi Transmitters
- Will increase Continuous 2.4 GHz Wireless Microwave Exposure
- Only 2 channels of 16-channel Wi-Fi network in use; expansion plans are already in the works.

www.govtech.com/wireless/Wi-Fi-Network-Transmits-Smart-Meter-Data-in-Santa-Clara-Calif-.html

Silicon Valley Power SM Public WiFi



- According to company's website, SVP's Elster Smart Meters will emit 75% less EM radiation than PG&E's Smart Meters.
- Will transmit less frequently and at low power than PG&E

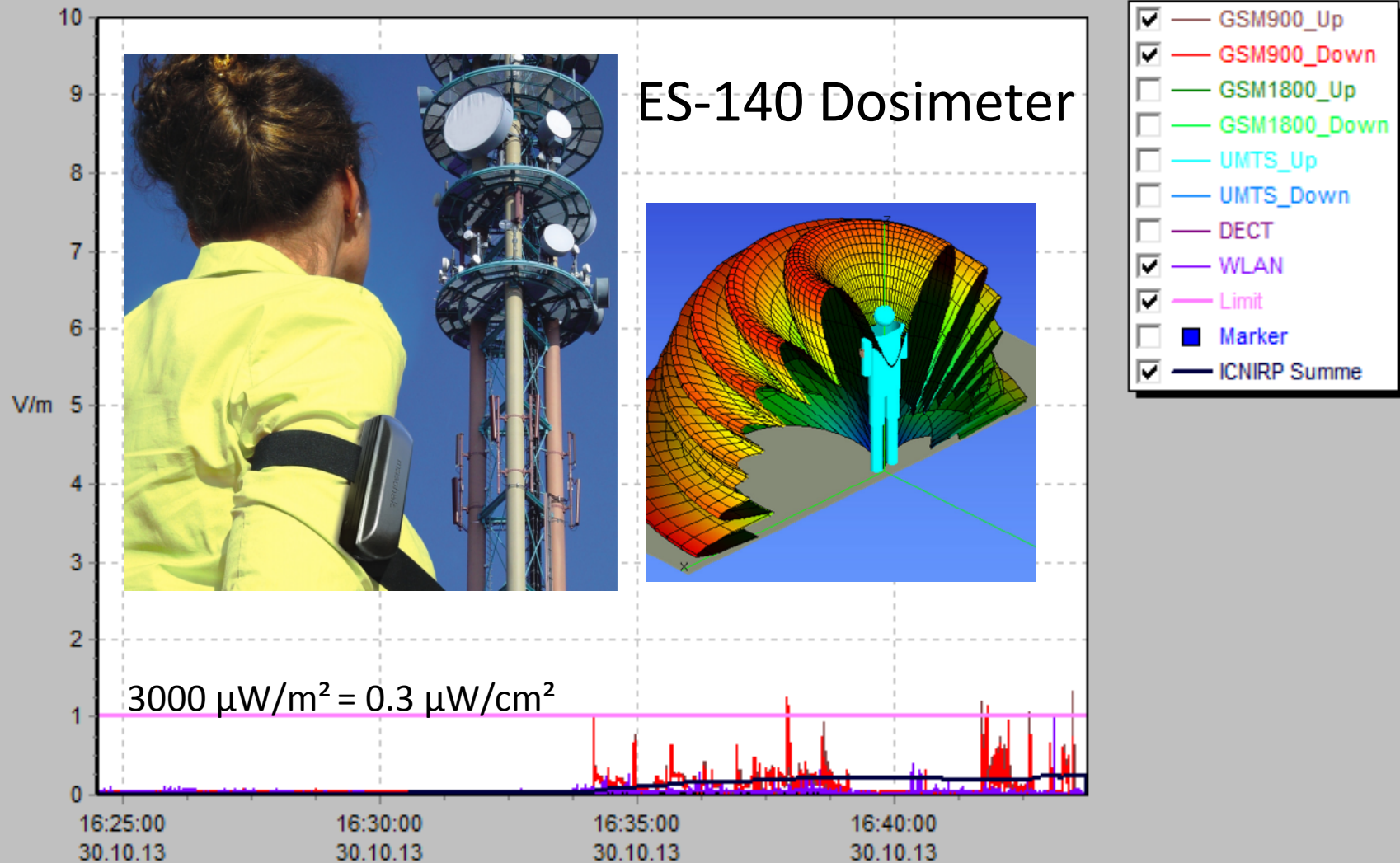
<http://siliconvalleypower.com/index.aspx?page=1970>

iPhone at 3 feet from Subject

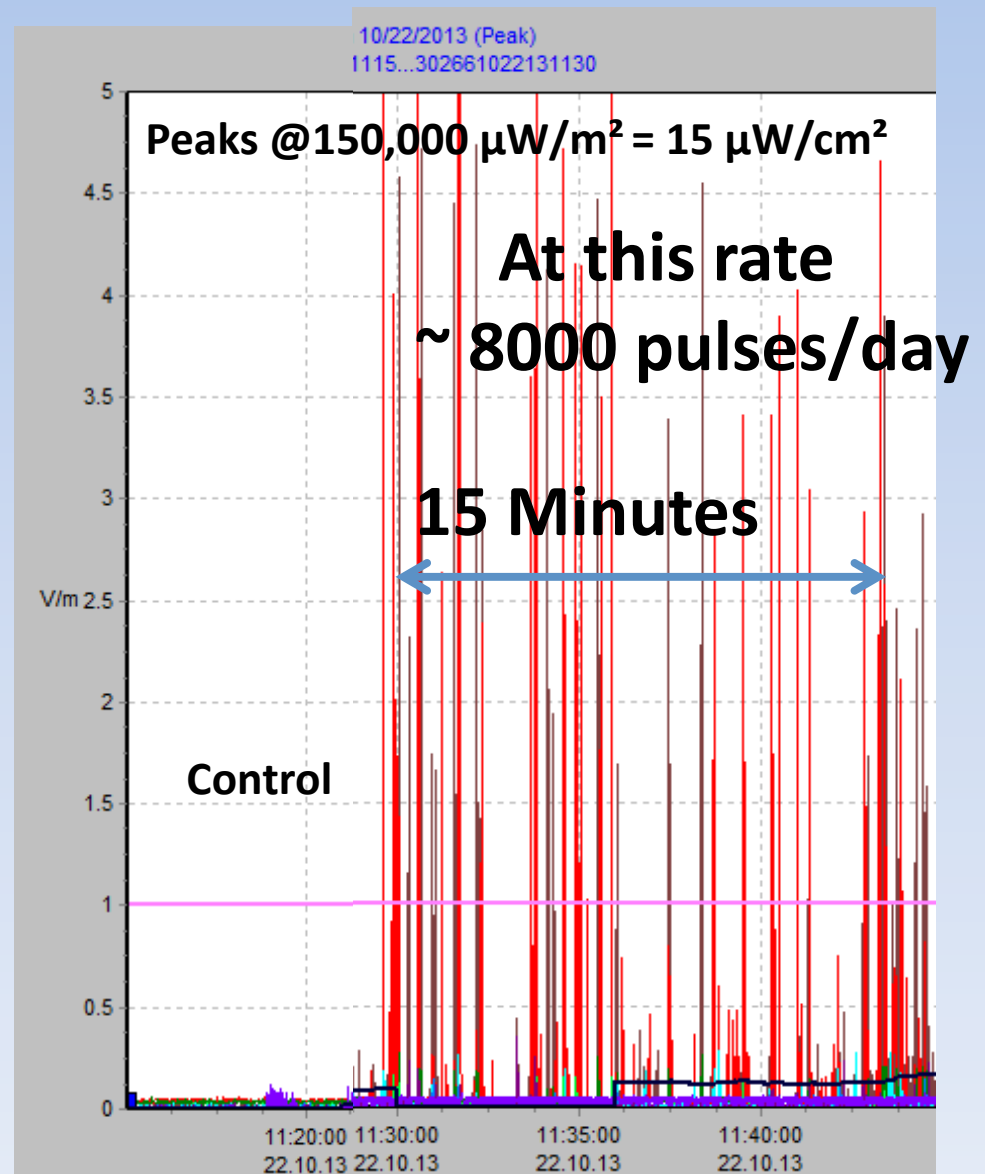
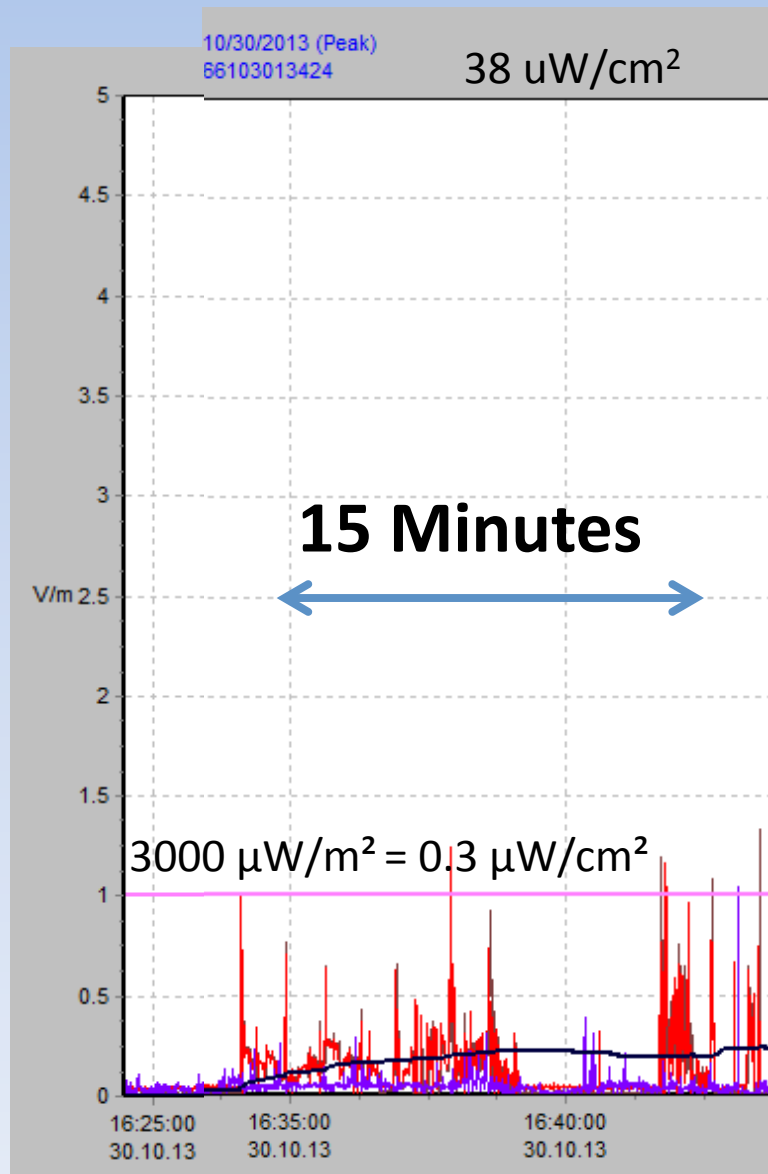
Recorded Oct 30, 2013 for 15 minutes

measurement from 10/30/2013 (Peak)

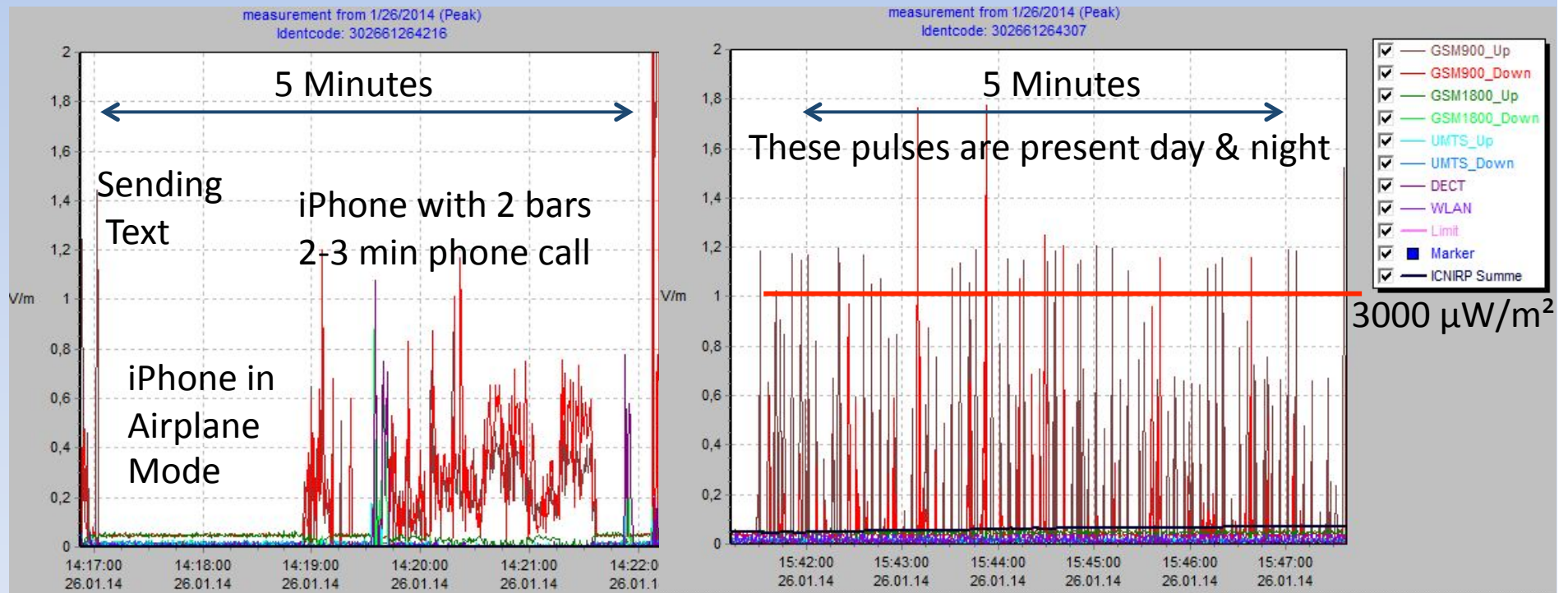
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iPhone during call vs. 8ft. from 5 Smart Meters

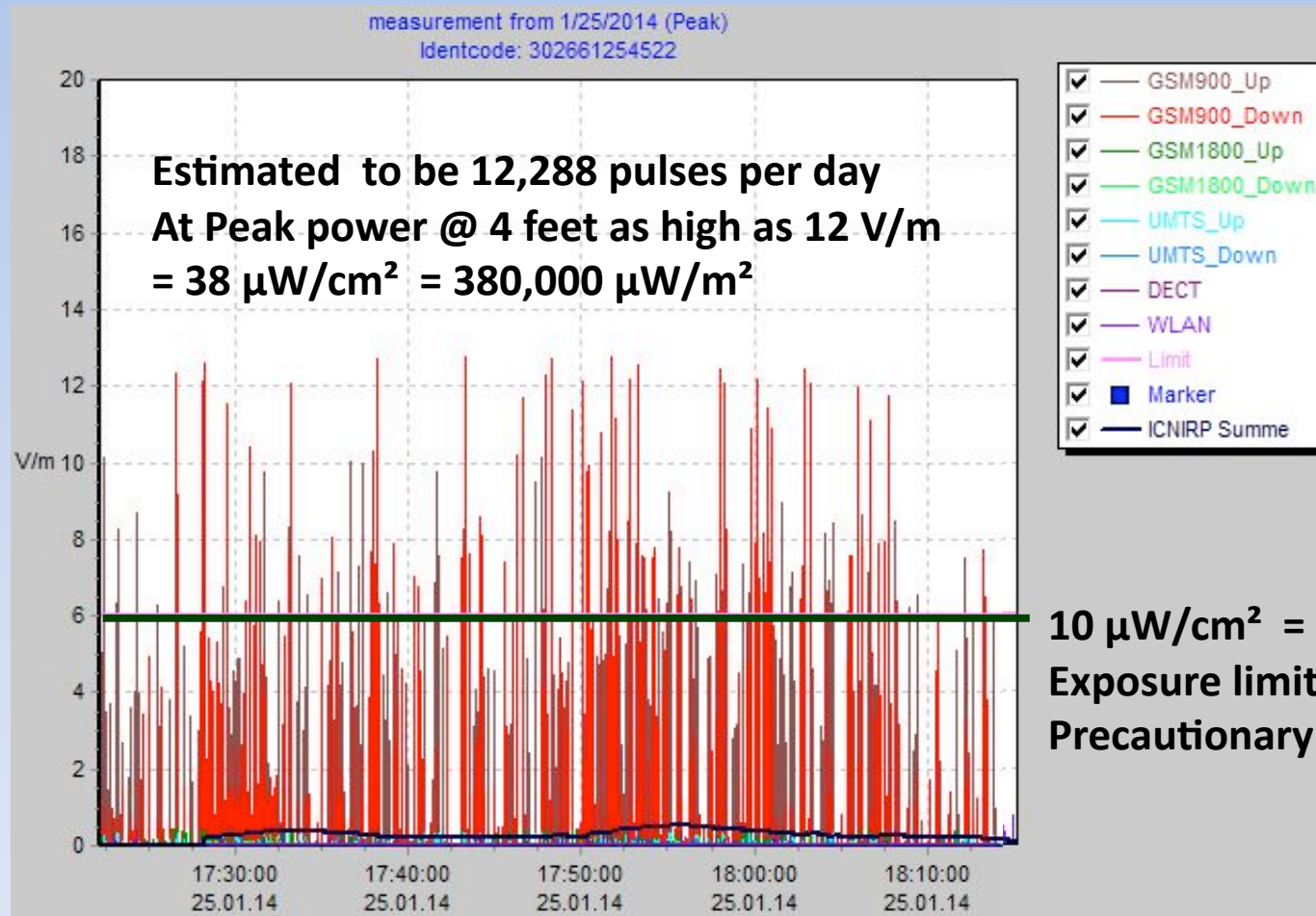


Personal Dosimeter Whole Body Comparison iPhone vs. 5 Smart Meters (inside building)



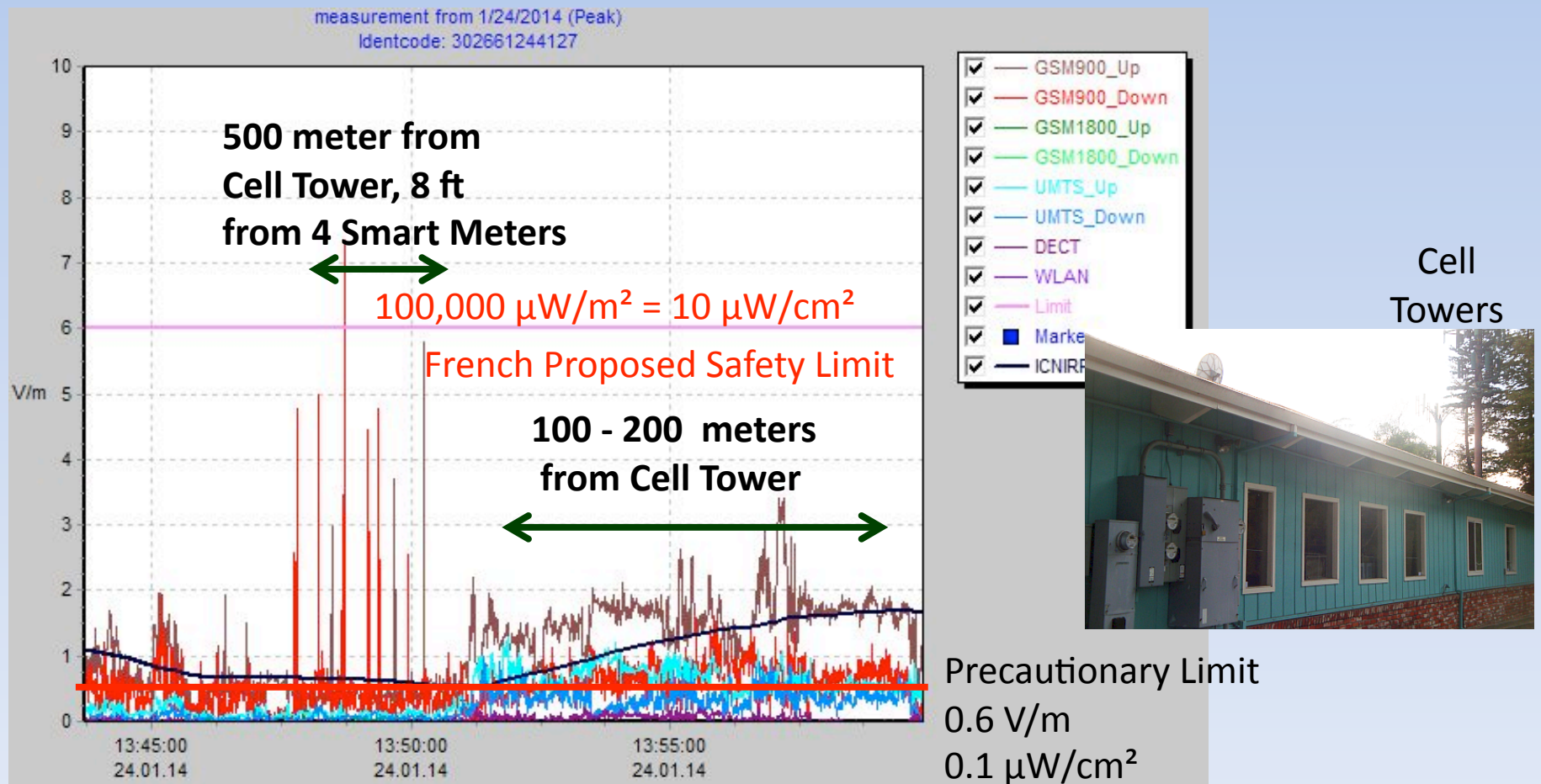
- Whole Body Exposure from both iPhone and inside building with 5 Smart Meters on outside wall show similar peak levels.
- This short burst pulsed EMFs from Smart Meters is new to living systems and should have been studied prior to deployment.

Daily Pulses Generated by SM indoors



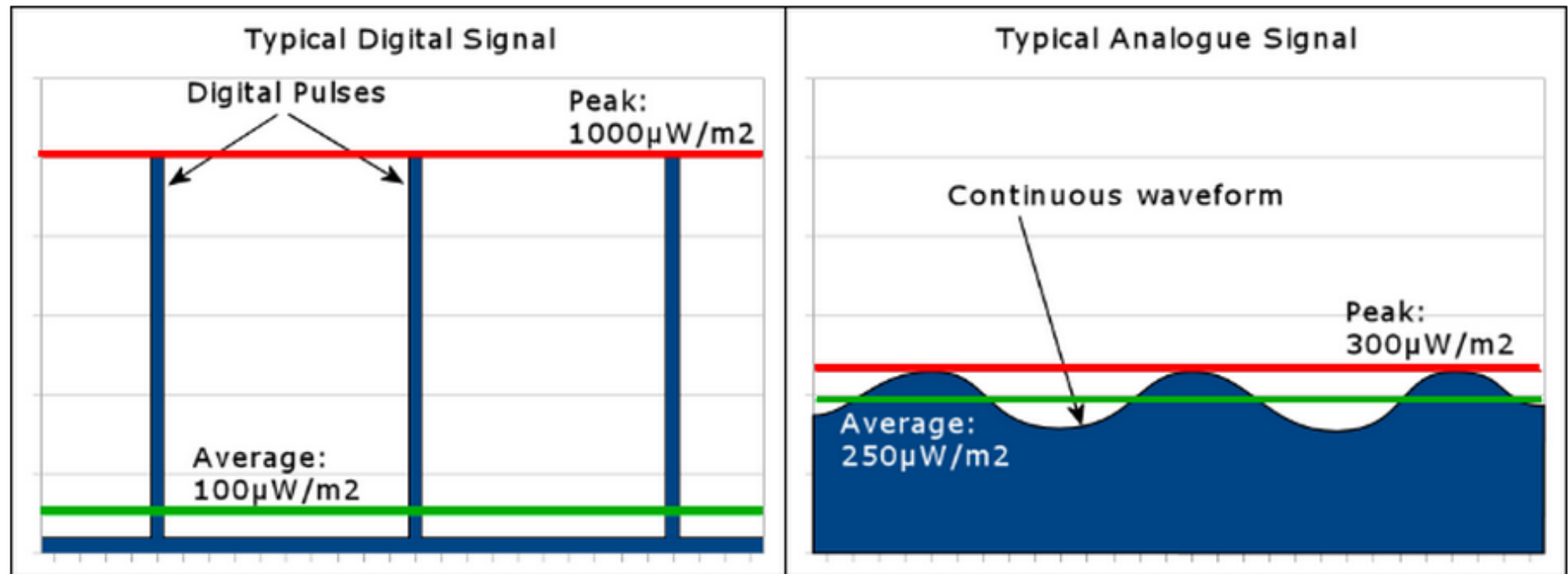
- Depends on Duty Cycle and other meters in the Mesh network
- Data from 5 meters shows 340 pulses in 40 minutes = 12,288/day
- Emissions are brief (5 msec), but fast pulses affect nervous system

Actual Smart Meter Peak Measurements near Cell Tower in Aptos



- Smart Meters measured at 2.5 meters (8 feet)

Peak Levels in Digital Signals are Higher



- Smart Meters send out high intensity short pulses
- Peak pulse intensities trigger biological systems more powerfully
- Average power levels underestimate the problem

Effect of Pulsed Microwaves

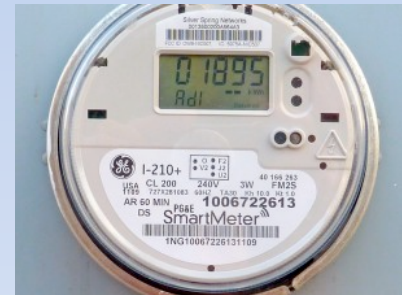
- Causes leakage in the protective Blood Brain Barrier
- Affect the Opiate-Dopamine Neurotransmitters
- Affect Sex Hormone levels
- Shown to Decrease Sperm Production in Men
- Shown to affect Heart Rate and Heart Rate Variability
- EEG changes – also in sleep, reduction of learning, memory problems
- Shown to lower Hormones : Melatonin – pineal gland hormone – affects sleep
- Pulsed EMFs were estimated to have 2-1/2 times more adverse effects than continuous microwave radiation

What some Customers have reported after Smart Meter Installations

- Numerous Customers are reporting headaches, sleep problems, ringing in the ears, searing ear pain, nausea, dizziness, agitation and other symptoms since the Smart Meters were installed.
- These people may be suffering from *Electromagnetic Hypersensitivity Syndrome (EHS)*
- EHS is estimated to affect 3 - 5% of the population or more

2011 Survey after Smart Meters Installation

- 443 respondents to a survey, 93% over 40 years of age
- 78% from California, 73% women, 49% reported EHS
- 76% had meters installed neighborhood > 6 months, 41% had meters installed in their homes
- Complaints:
 - Sleep Issues = 49%
 - Stress, anxiety, irritability = 43%
 - Headaches = 40%
 - Ringing in Ears = 38%
 - Heart Problems / palpitations = 26%

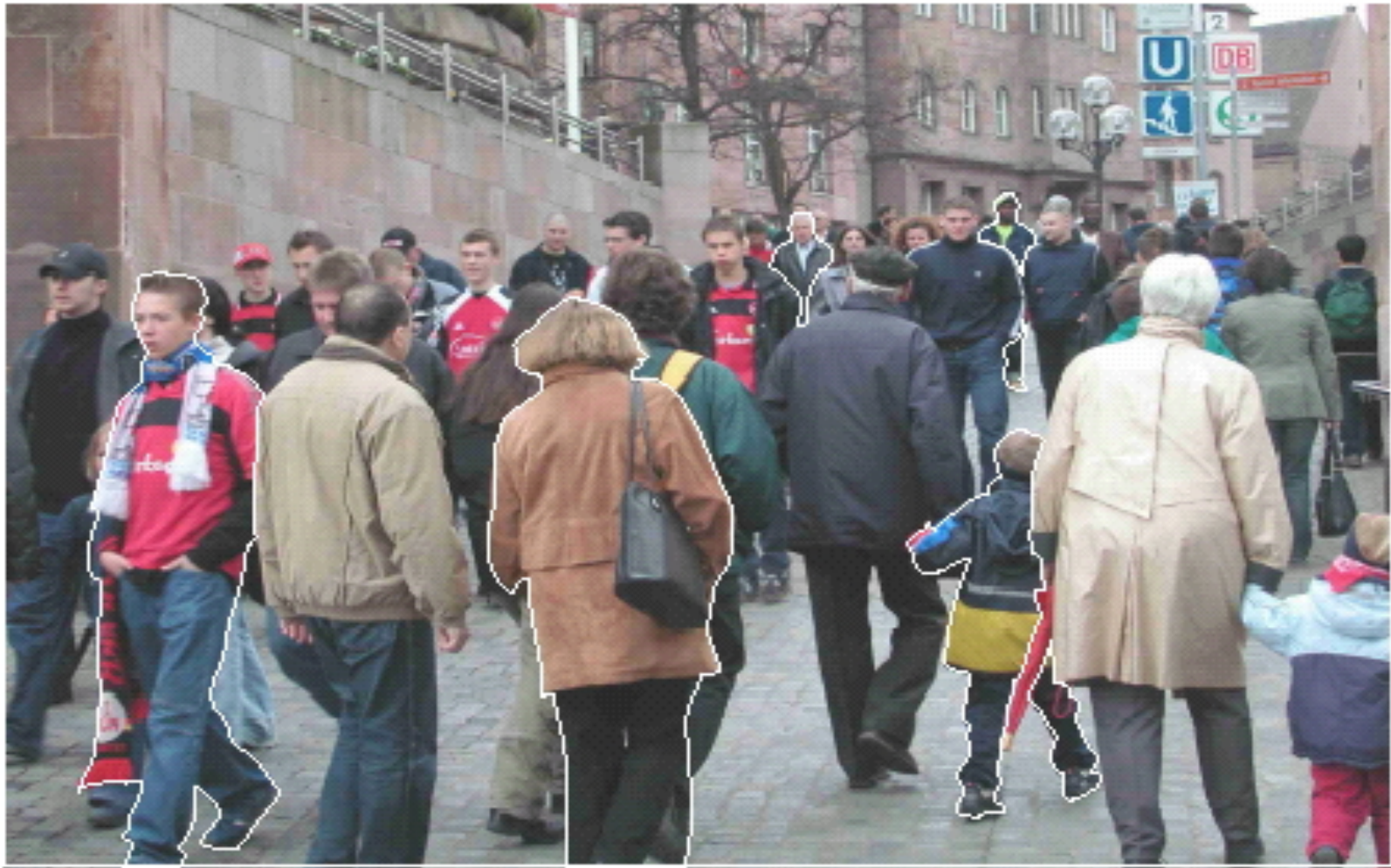


- Source: Halteman, Ed (2011) Wireless Utility Meter Safety Impacts Survey. Available at <http://emfsafetynetwork.org/wp-content/uploads/2011/09/Wireless-Utility-Meter-Safety-Impacts-Survey-Results-Final.pdf>

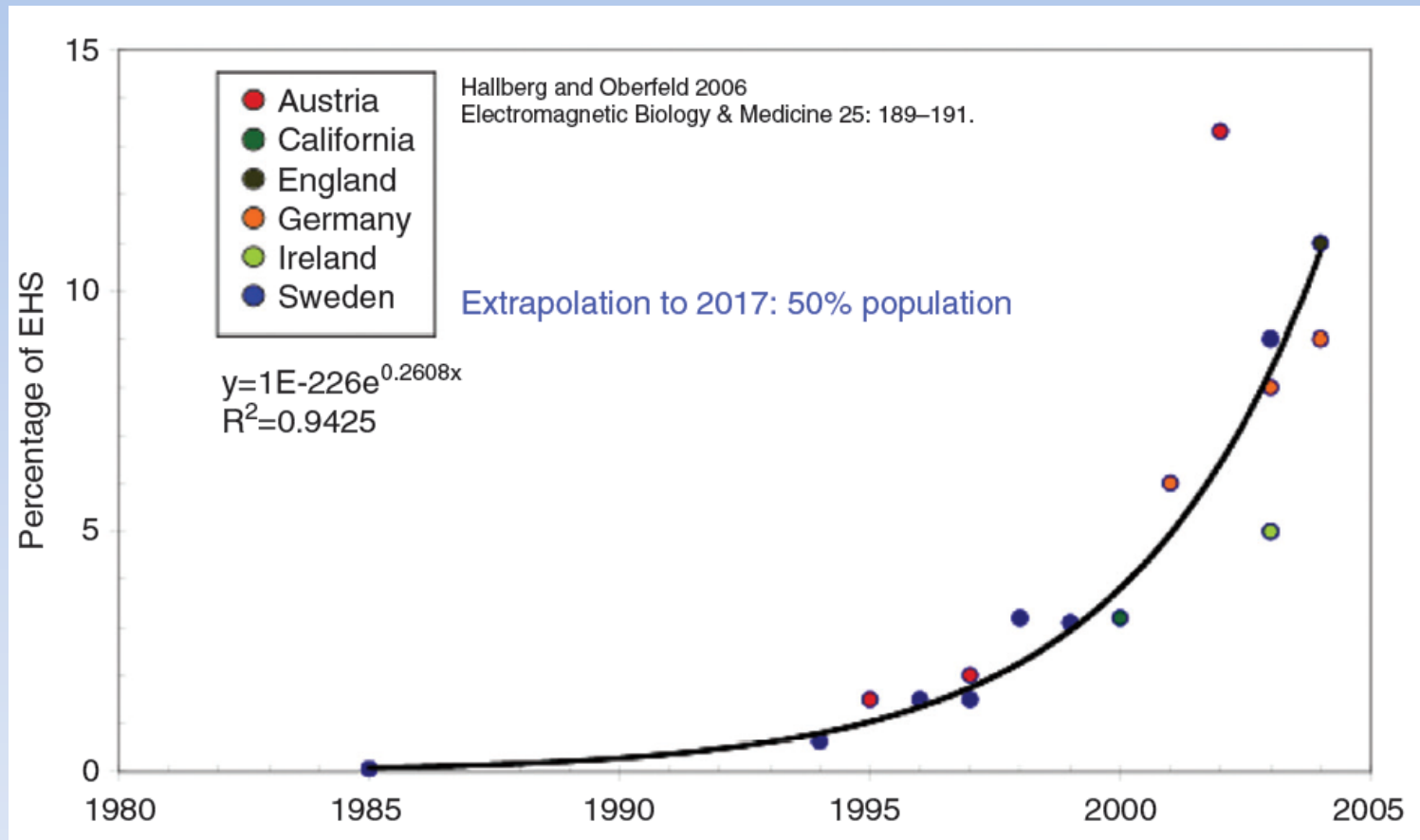
Who is Most at Risk?

- Children and Babies (Brains developing & Skull is Thinner allowing greater EMF penetration)
- Immune compromised Individuals
- Elderly and Infirm
- Electrically Hypersensitive People and often people with Multiple Chemical Sensitivities

3 - 5% of general population in Europe are now Electrosensitive

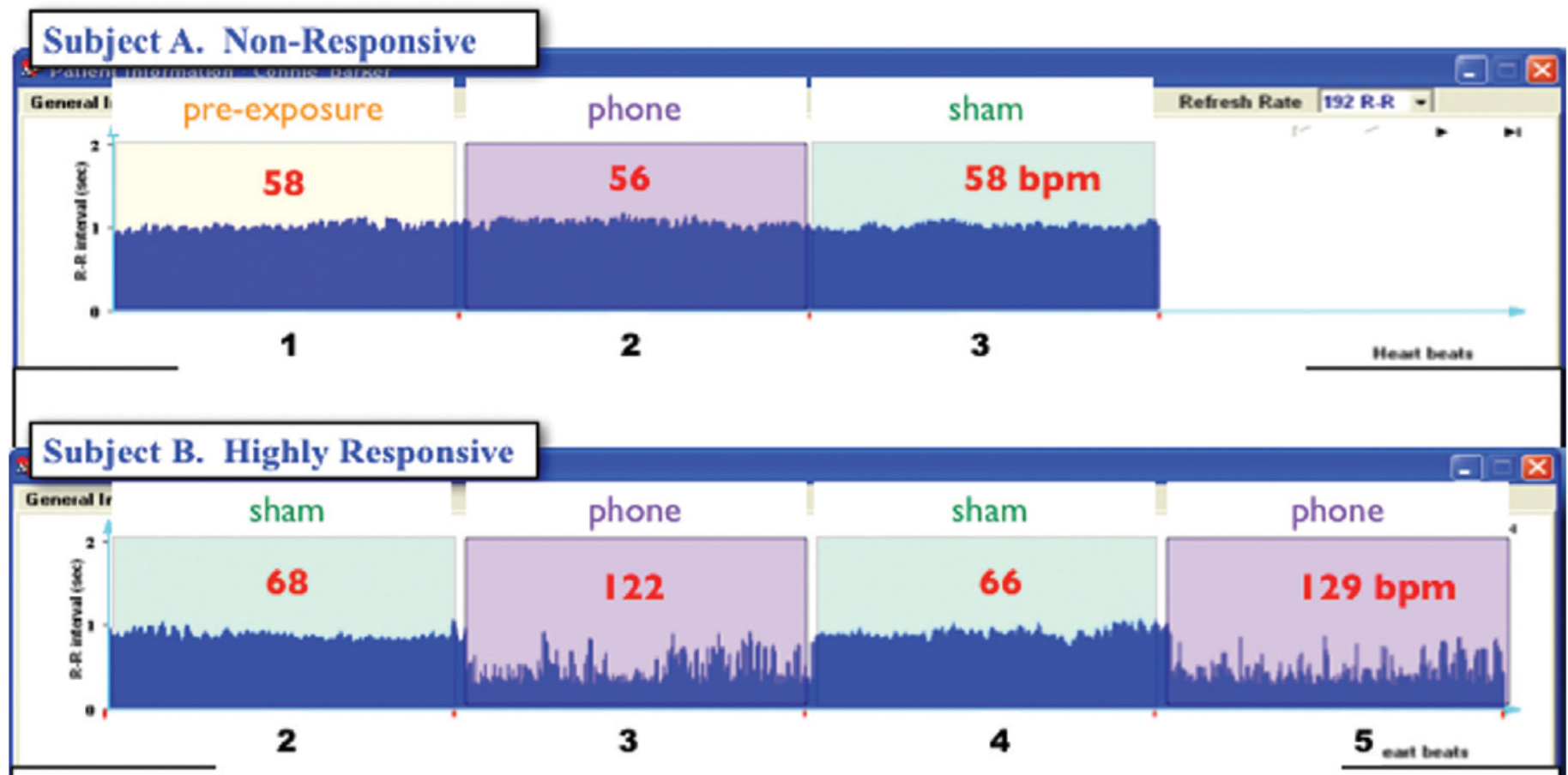


2006: Estimated EHS Population Growth



- 2013 California Population with EHS estimated at 3% would be 1,150,000 people. Most of these people would be unaware of their hypersensitivity.

Objective Heart Rate Variability changes in EHS subject on Double Blinded Exposure to 2.4 GHz Cordless Phone



- Source: Magda Havas 2013

EHS: Somatic Response is not Conscious

Int J Neurosci. 2011 Jul 28. [Epub ahead of print]

ELECTROMAGNETIC HYPERSENSITIVITY: EVIDENCE FOR A NOVEL NEUROLOGICAL SYNDROME.

McCarty DE, Carrubba S, Chesson AL, Frilot C, Gonzalez-Toledo E, Marino AA.

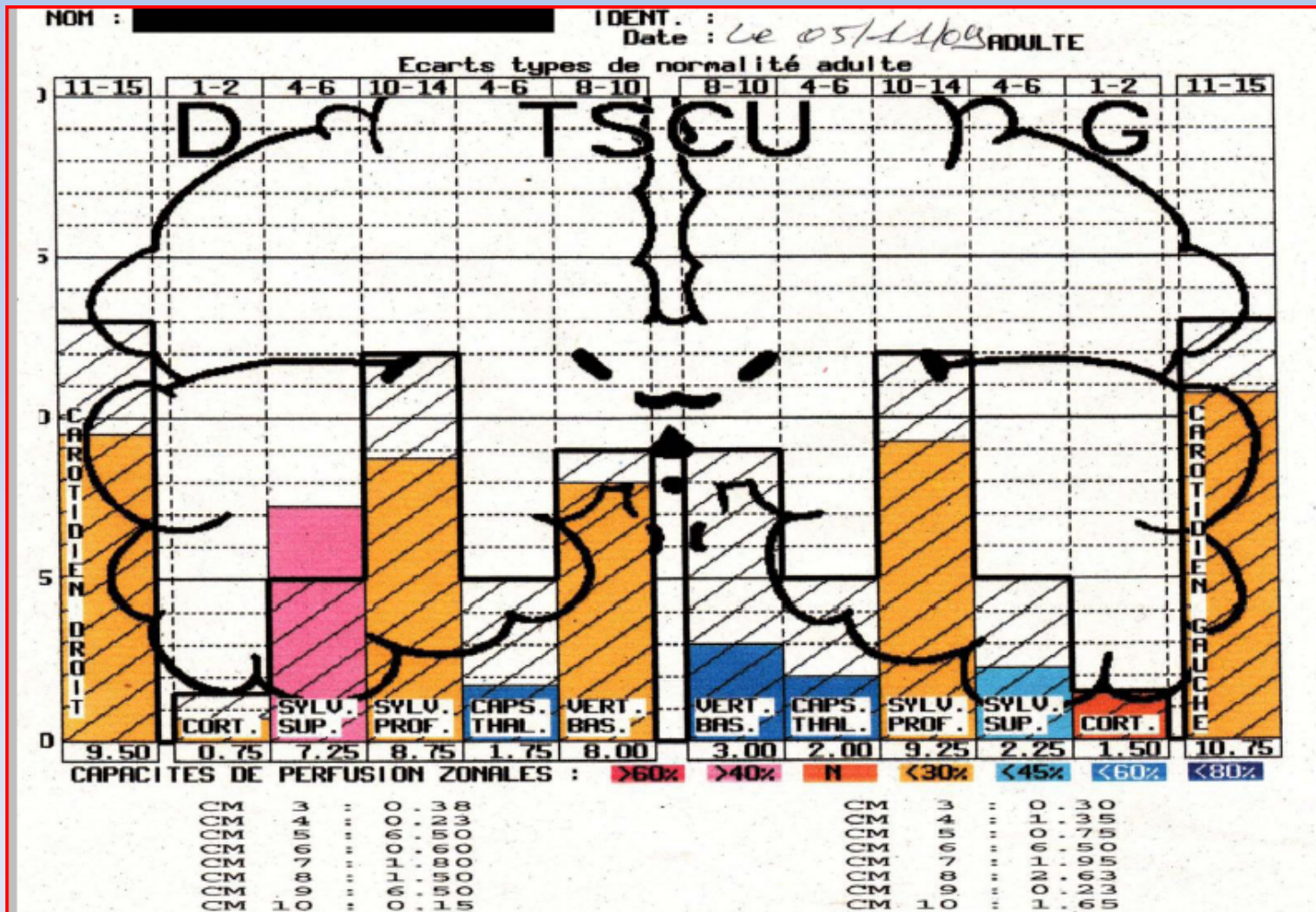
aDepartment of Neurology, LSU Health Sciences Center , Shreveport, LA , USA.

Abstract

ABSTRACT Objective: We sought direct evidence that acute exposure to environmental-strength electromagnetic fields 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 to 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 ($P < 0.05$). 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.

PMID: 21793784 [PubMed - as supplied by publisher]

Effect of Electrosmog on Brain Perfusion

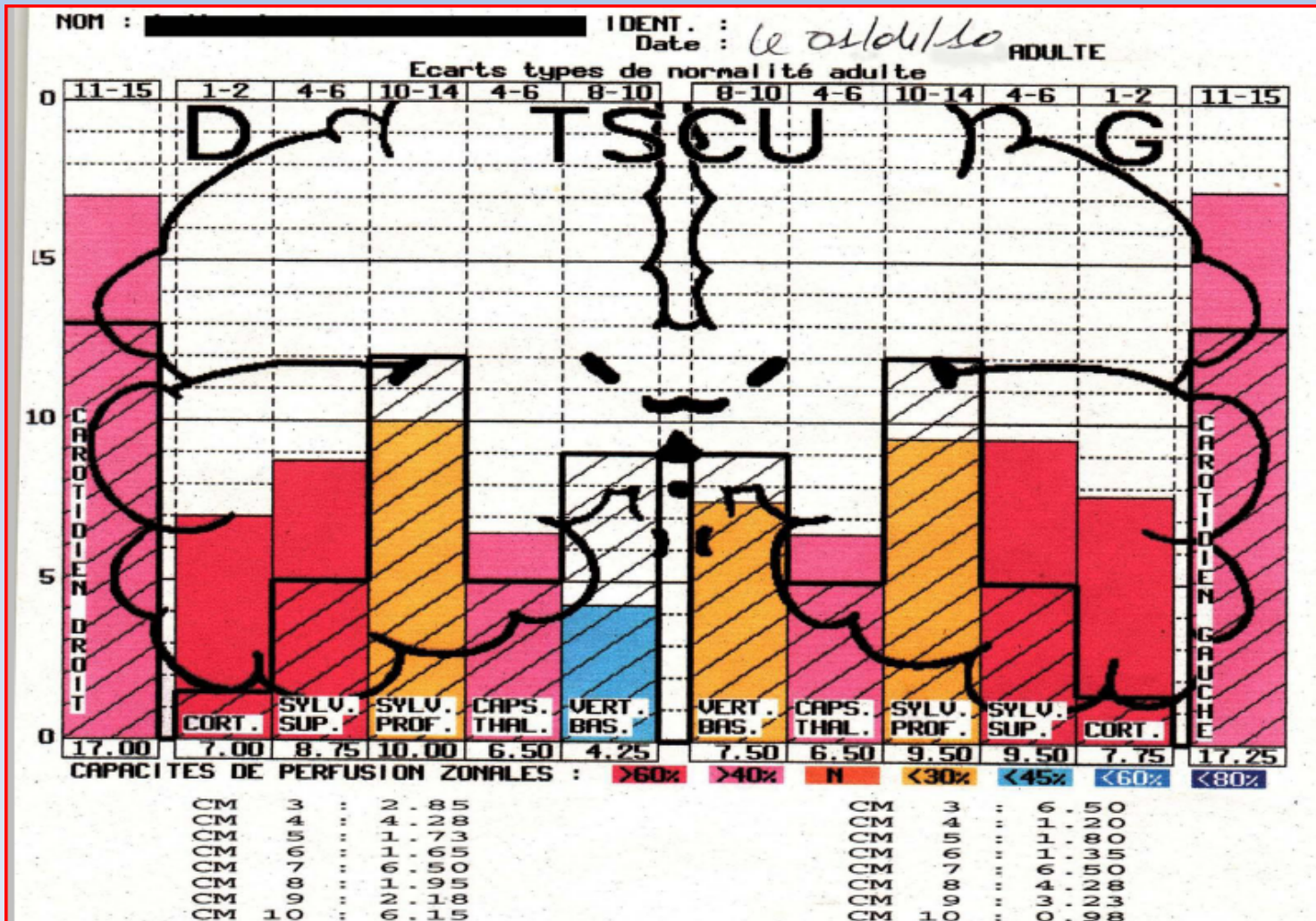


Nov 5
2009

CENTRE D'EXPLORATION DE LA FONCTION CÉRÉBRALE PARIS

Diagram 1 represents the encephalogram of Philippe EHS before his arrival in the Forêt de Saoû. It is clear that after living for several years in an average town and being exposed to its artificial electromagnetic microwave pollution, he is in a weakened state. In this first diagram the circulation levels in several areas of both hemispheres are seen to be seriously affected.

Effect of Electrosmog on Brain Perfusion

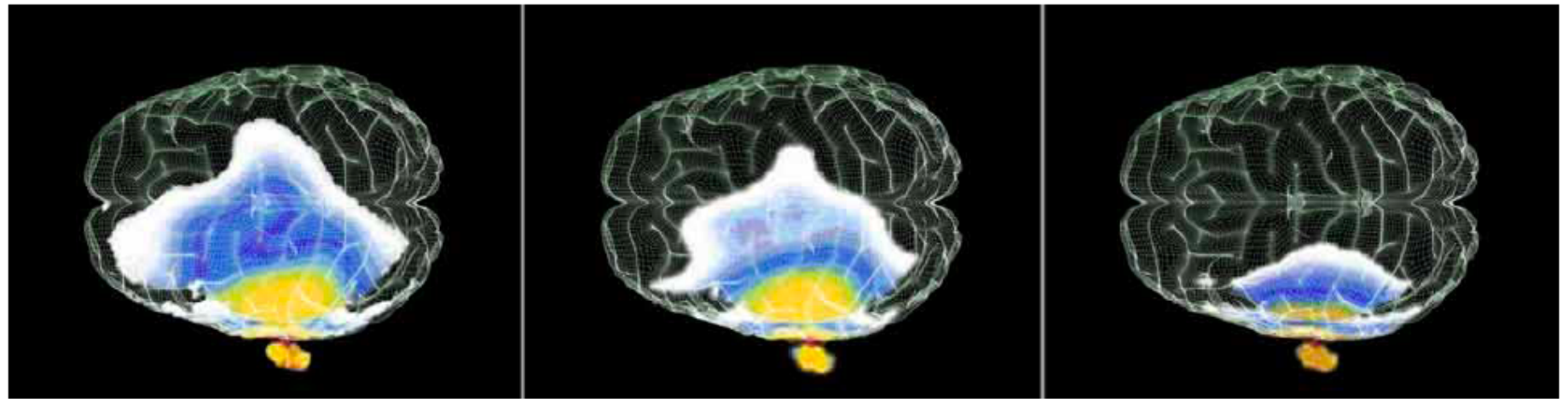


Feb 1
2010

CENTRE D'EXPLORATION DE LA FONCTION CÉRÉBRALE PARIS

Diagram 2 represents the encephalogram of Philippe EHS after living 3 months in the Forêt de Saoû (an area with very low artificial EM radiation). A spectacular improvement can be seen in the circulation in the 2 hemispheres of the brain. Visible physical consequence: Philippe was no longer in a weakened state.

900 MHz Microwaves penetrate the Brains of Children more than Adults



5 year old child

10 year old child

adult

Electromagnetic fields from cell phones are estimated to penetrate the brain, especially in children. Model estimate of the absorption of electromagnetic radiation from a cell phone based on age (Frequency GSM 900 Mhz).

Research of O. Gandhi, University of Utah

5 year old

10 year old

Adult

These are Cell Phone Studies but Smart Meters use same Frequencies



American Academy of Environmental Medicine

6505 E Central • Ste 296 • Wichita, KS 67206

Tel: (316) 684-5500 • Fax: (316) 684-5709

www.aaemonline.org

American Academy of Environmental Medicine Recommendations Regarding
Electromagnetic and Radiofrequency Exposure

- The AAEM recommends that:
- Patients with (certain) medical conditions and disabilities be accommodated to protect their health.
- No Smart Meters be on these patients' homes;
- Smart Meters be removed within a reasonable distance of patients' homes depending on the patients' perception and/or symptoms;



County of Santa Cruz 0257

HEALTH SERVICES AGENCY

POST OFFICE BOX 962, 1060 EMELINE AVE., SANTA CRUZ, CA 95061-0962
TELEPHONE: (831) 454-4114 FAX: (831) 454-5049 TDD: (831) 454-4123

Poki Stewart Namkung, M.D., M.P.H.
Health Officer
Public Health Division

Memorandum

Date: January 13, 2012
To: Santa Cruz County Board of Supervisors
From: Poki Stewart Namkung, M.D., M.P.H. *pon*
Health Officer
Subject: Health Risks Associated With SmartMeters

- Santa Cruz Public health officer found real health risks associated with Smart meters
- Concerned about non-thermal effects and lack of safety of long-term use of Smart meters
- Supported adoption of installation moratorium
- Concerned about 3.2% of California Electrically Hypersensitive population (Levallios 2002 study)

Moratorium against Smart Meter Installation passed by California Local Governments

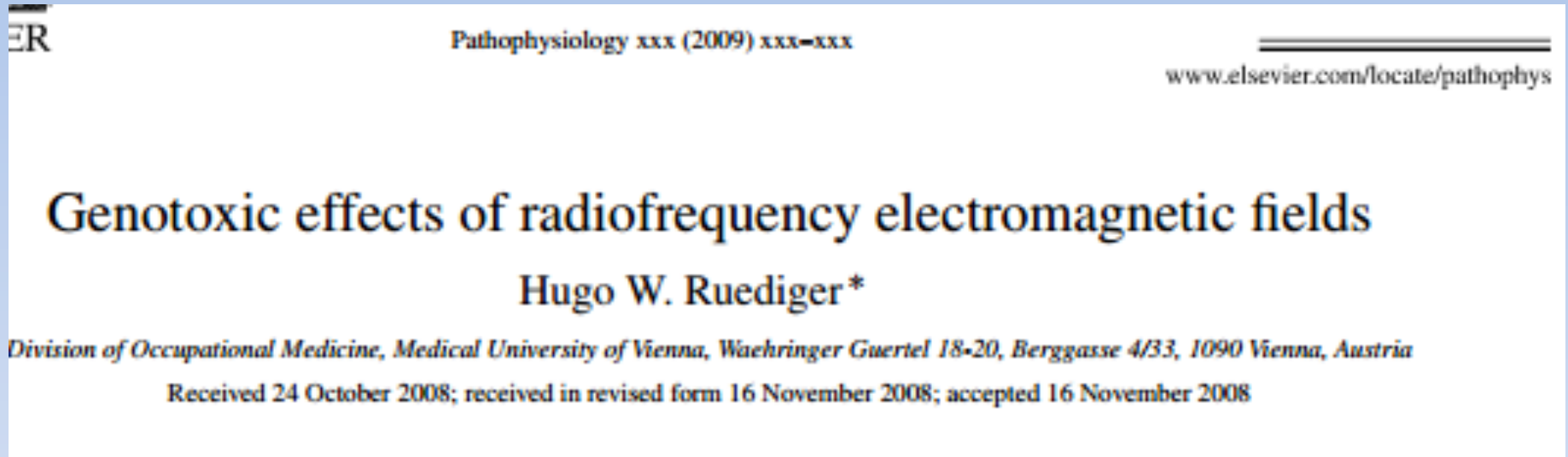
- These were passed due to Health concerns, billing accuracy and privacy concerns
- Municipalities included Berkeley, Bolinas, Camp Meeker, Capitola, Fairfax, Cotati, Marin county, Mendocino county, Novato, Ojai, San Anselmo, Santa Cruz, Santa Rosa, Sebastopol, Watsonville, to name a few
- 43 CA government entities passed similar ordinances
- The utilities have blatantly ignored the wishes of these municipalities and installed them anyway.

Biological versus Health Effects

One really needs to distinguish between biological effects and health effects.

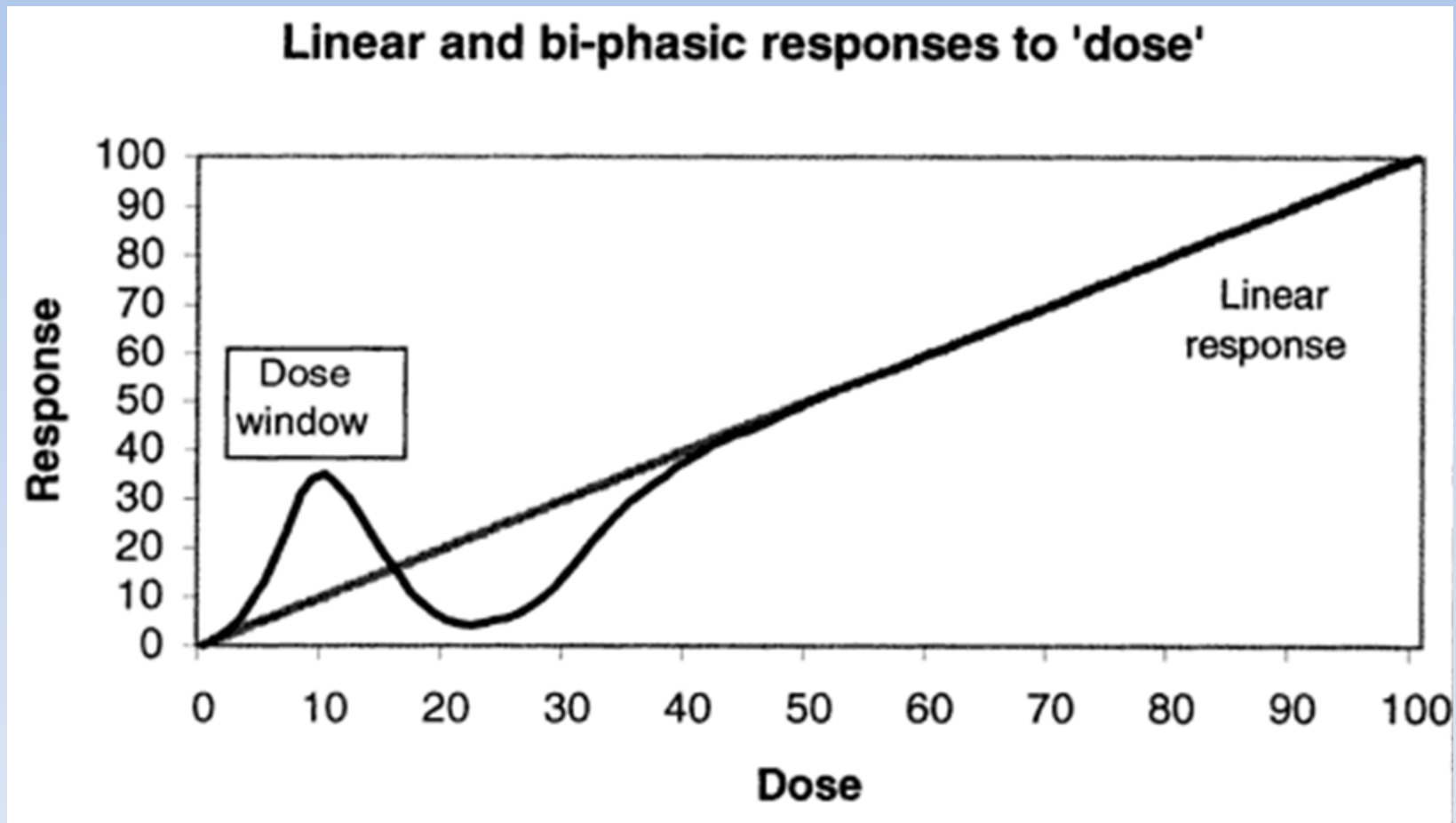
There are definite biological effects, but do they constitute health hazards?

2009 paper: RF-EMFs harm our Genes



- Review paper of 101 studies: 49 reported genotoxic effects from Radiofrequency EMFs, 42 did not
- 8 studies showed an enhancement of genotoxic effects from chemicals when RF radiation was also present

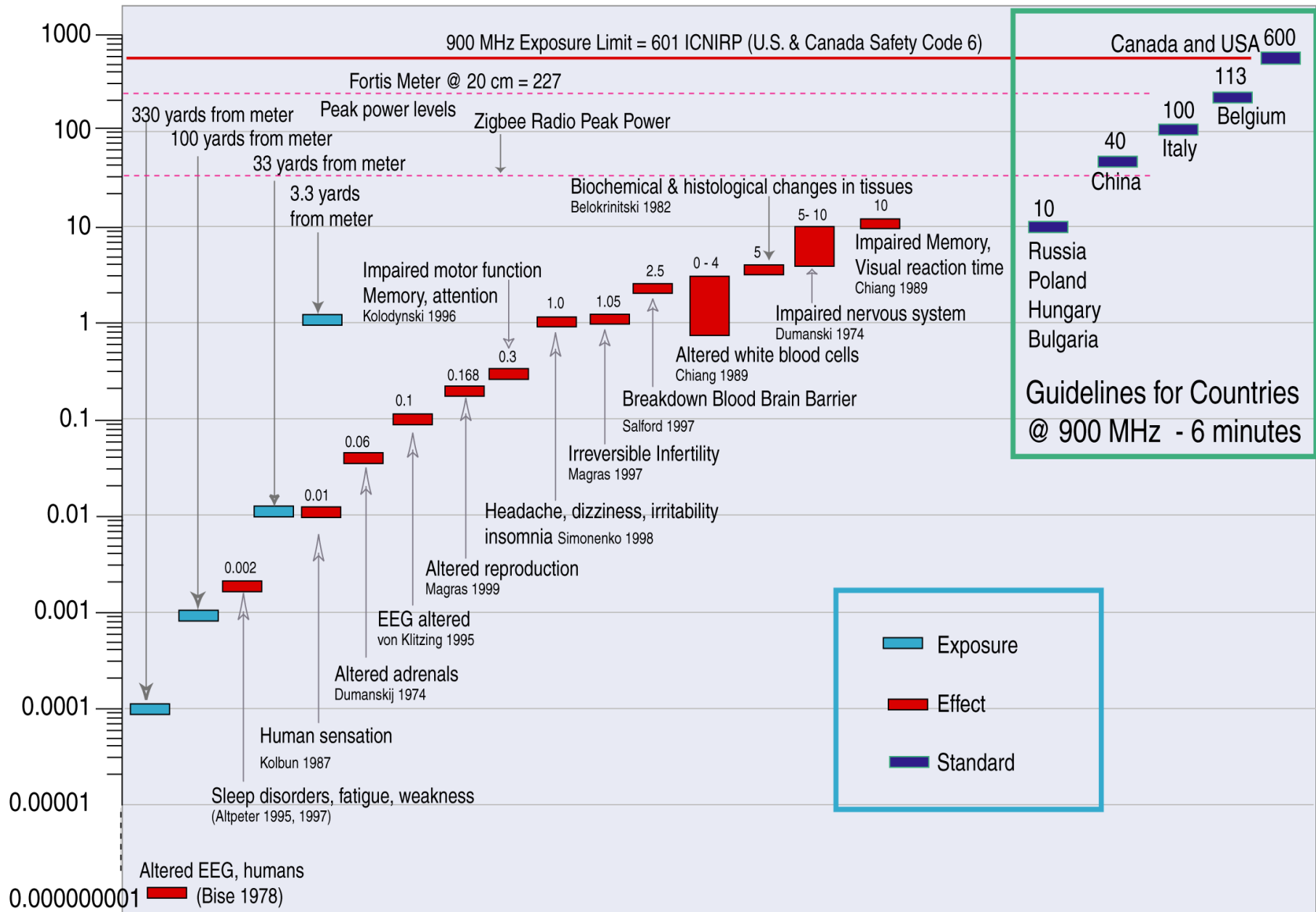
EMFs can show a Non-linear Response



Lower EMF non-thermal exposures may lead to greater physiological responses or potential adverse health effects

Source: A. Philips in Electromagnetic Environments and Health in Buildings

Power Density ($\mu\text{W}/\text{cm}^2$)

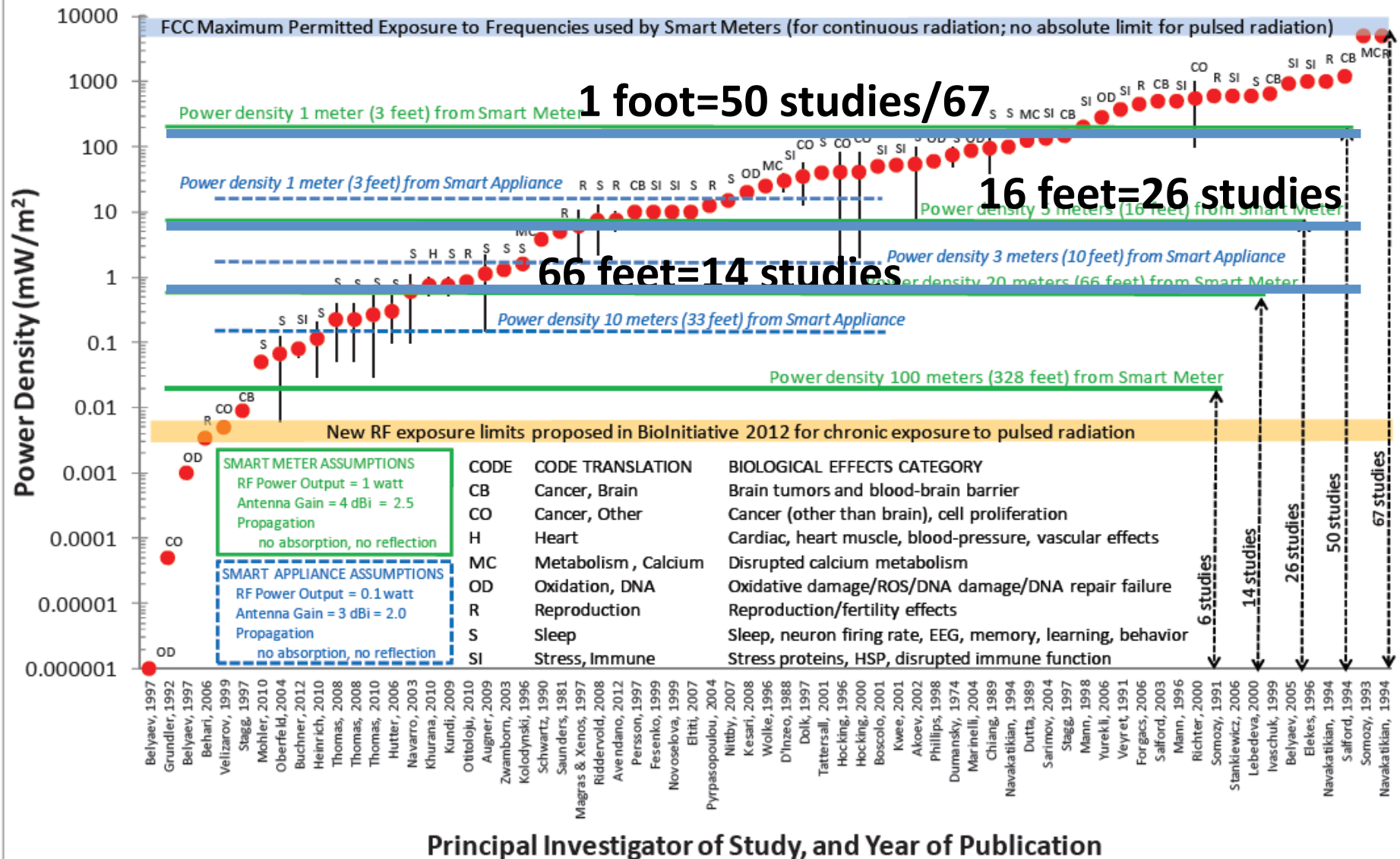


June 11, 2013

Reported Biological Effects from RF Radiation at Low-Intensity Exposure in Each of the 67 Studies Referenced in the "BioInitiative 2012" Report (Cell Tower, Wi-Fi, Wireless Laptop, and Smart Meter Power Densities)

Ronald M. Powell, Ph.D.

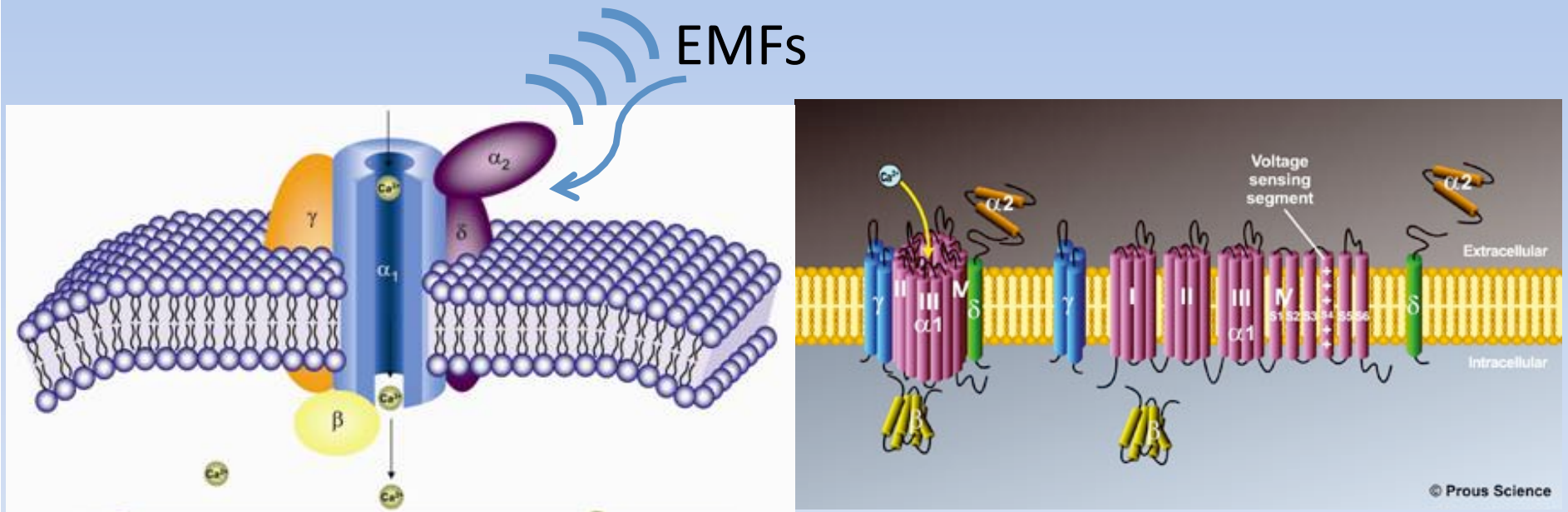
Reference for data dots (red), data range indicators (vertical black lines through red dots), biological effects categories for the red dots, and new proposed limits (yellow line): BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors. BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation at www.bioinitiative.org, December 31, 2012. For references for other information on this chart, including the FCC Maximum Permitted Exposure limits, and the power densities of Smart Meters and Smart Appliances, see accompanying paper.



Reported Mechanisms of EMF Damage by Non-Thermal Fields

- Activation of Voltage-Gated Calcium Channels
- Microwave Absorbing Magnetite in Brain Tissue
- Free Radicals causing Oxidative Stress
- Enzyme System Alteration (cellular kinases)
e.g ERK, MAPK
- DNA single strand and double strand breaks →
mutations can lead to serious diseases (cancer)

EMFs affect Voltage-Gated Calcium Channels on Cell Membranes



- Various types are present in every Cell Membrane
- Respond to Low Level Electromagnetic Fields (EMFs)
- Causes changes in Calcium ion release in cell
- Response of Calcium channels to EMFs is real since they can be blocked by Ca^{++} Channel Blocker Drugs

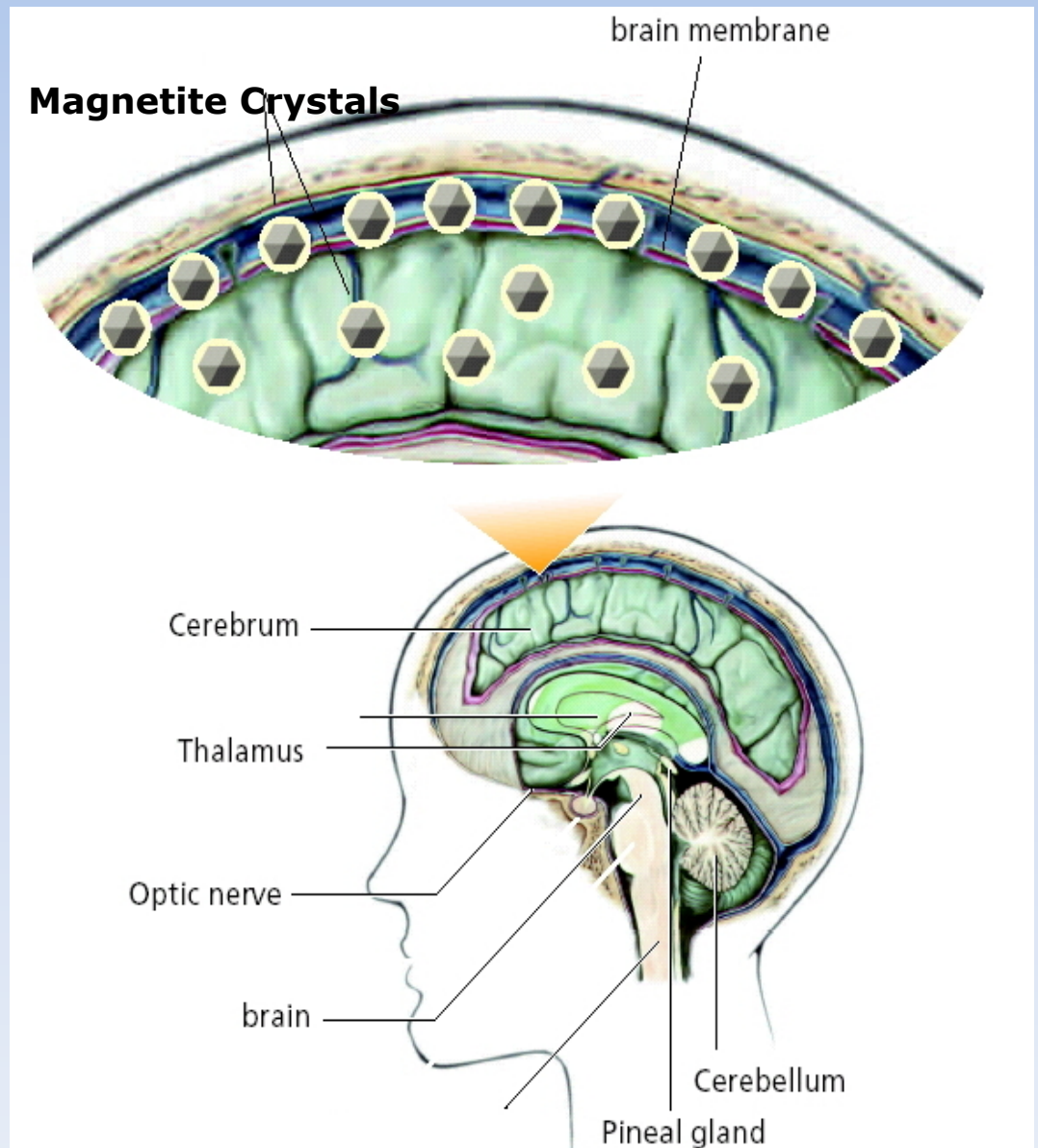
Magnetite Crystals in Human Brain

5 million crystals/gram
In Brain tissue

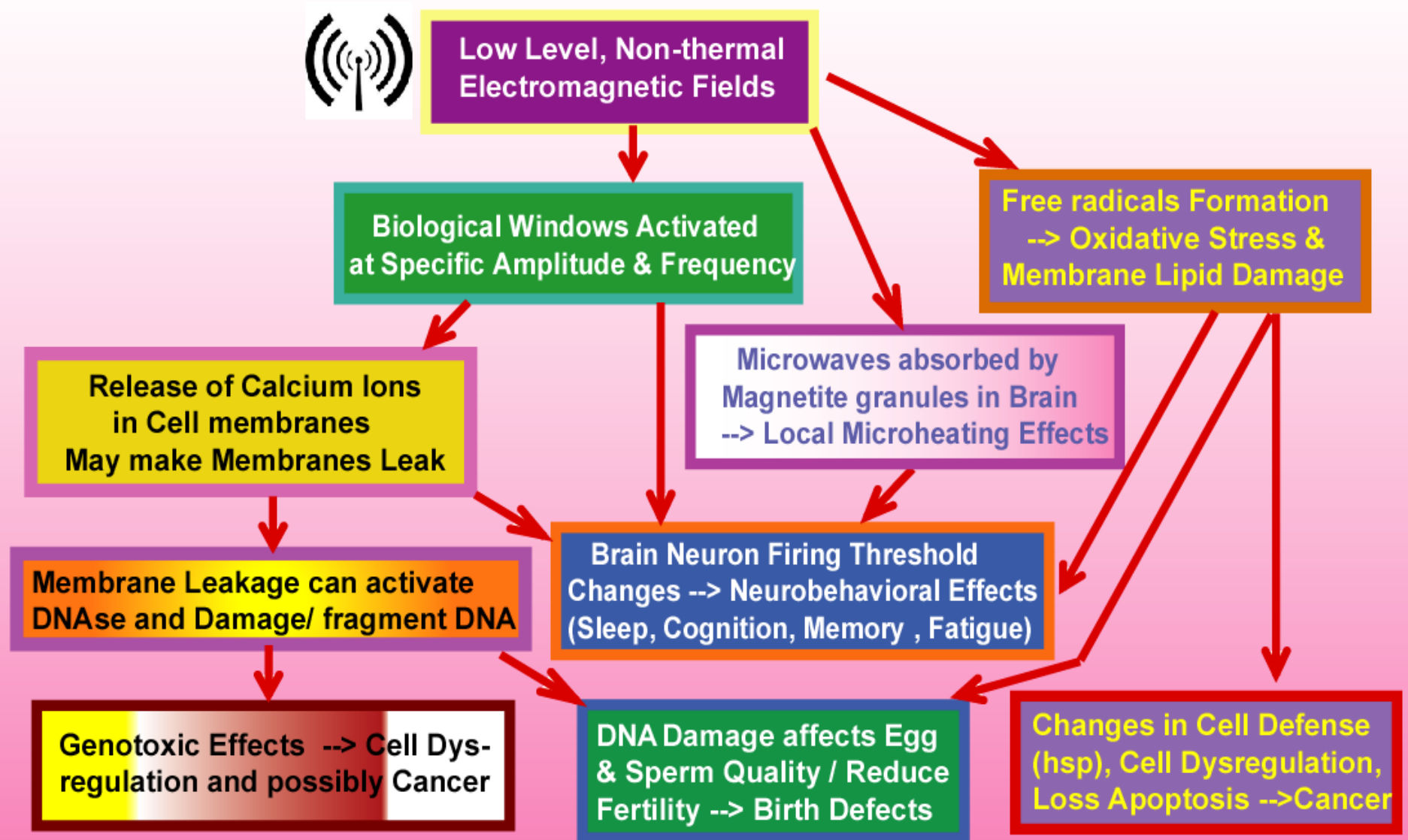
100 million crystals/gram
in brain membranes

Magnetite absorbs wide
range of Microwave
Radiation with Frequency
Absorption Spectrum
from 0.5 – 10 GigaHertz

Source: Kirschvink JL: Bioelectromagnetics
17(3):187-194, 1996



Mechanisms of Non-thermal EMFs



Review

Pathophysiology of cell phone radiation: oxidative stress and carcinogenesis with focus on male reproductive system

Nisarg R Desai^{1,2}, Kavindra K Kesari³ and Ashok Agarwal¹

Address: ¹Center for Reproductive Medicine, Glickman Urological and Kidney Institute and Obstetrics and Institute, Cleveland Clinic, Cleveland, Ohio, USA, ²Department of Internal Medicine, Staten Island University, USA and ³School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, India

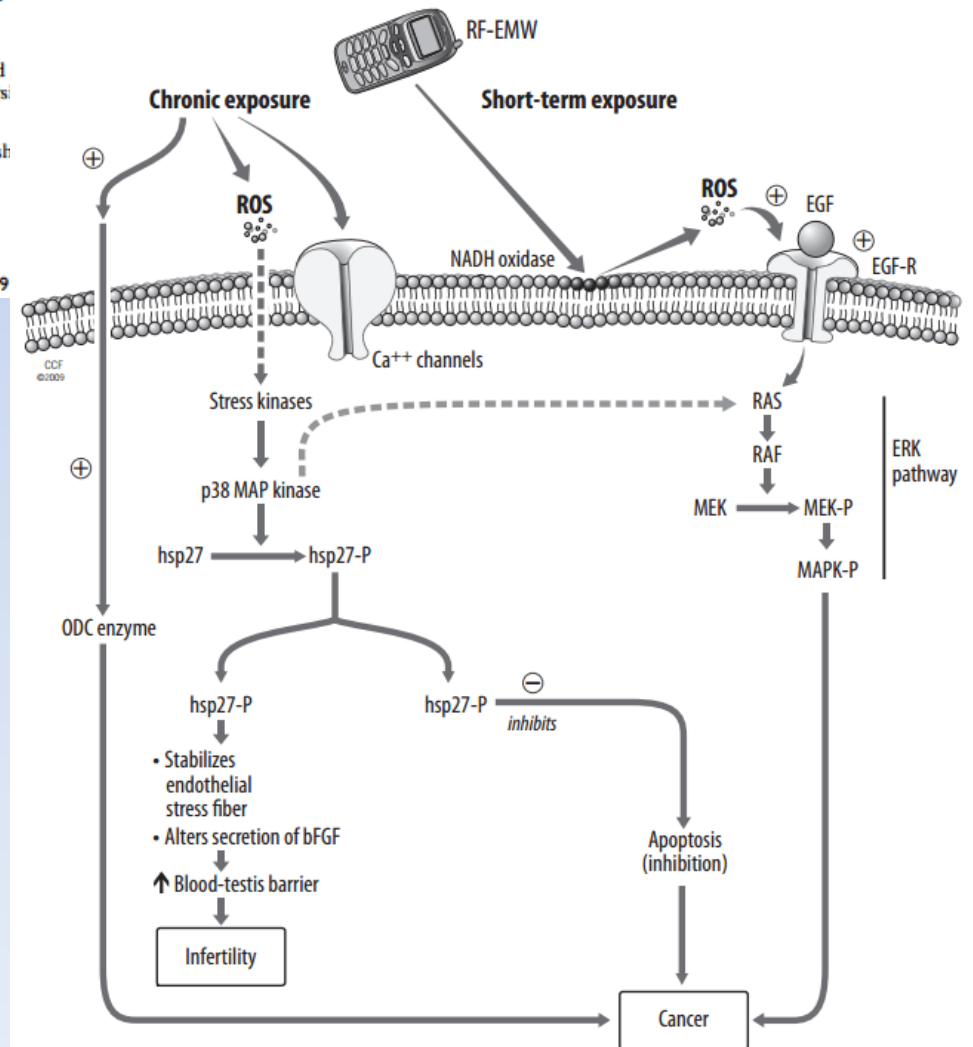
Email: Nisarg R Desai - nisargdesai@hotmail.com; Kavindra K Kesari - kavindra_biotech@yahoo.co.in; Ashok Agarwal - ashokagarwal@hotmail.com

* Corresponding author

Published: 22 October 2009

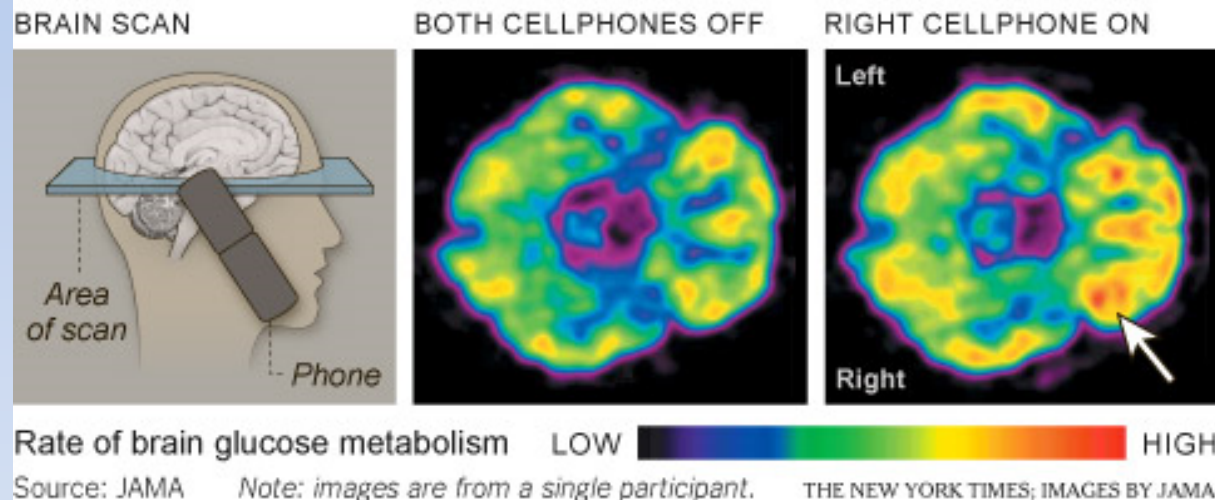
Received: 13 August 2009

- Oxidative stress from cell phones causes excess free radicals that contribute to infertility, sperm changes and cancer



2011: Brain is sensitive to Non-thermal EMFs

CELLPHONES AND THE BRAIN Researchers tested 47 people by placing a cellphone at each ear. Both phones were off in one test, and in the other test the right phone was on a muted call. After 50 minutes, brain scans showed increased consumption of glucose, or sugar, in areas of the brain near the activated phone.



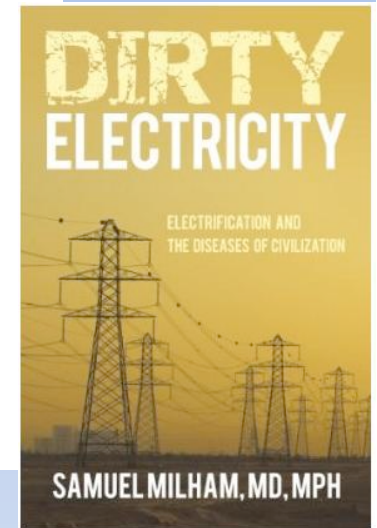
Images JAMA

- Positron Emission Tomography (PET Scan) study by Dr. Volkow at NIH and Brookhaven National Laboratory showed changes in glucose in 3 regions of brain at non-thermal EMFs.
- Metabolic effect was highest nearest to the antenna
- Source: Journal American Medical Association (JAMA) Feb 23, 2011



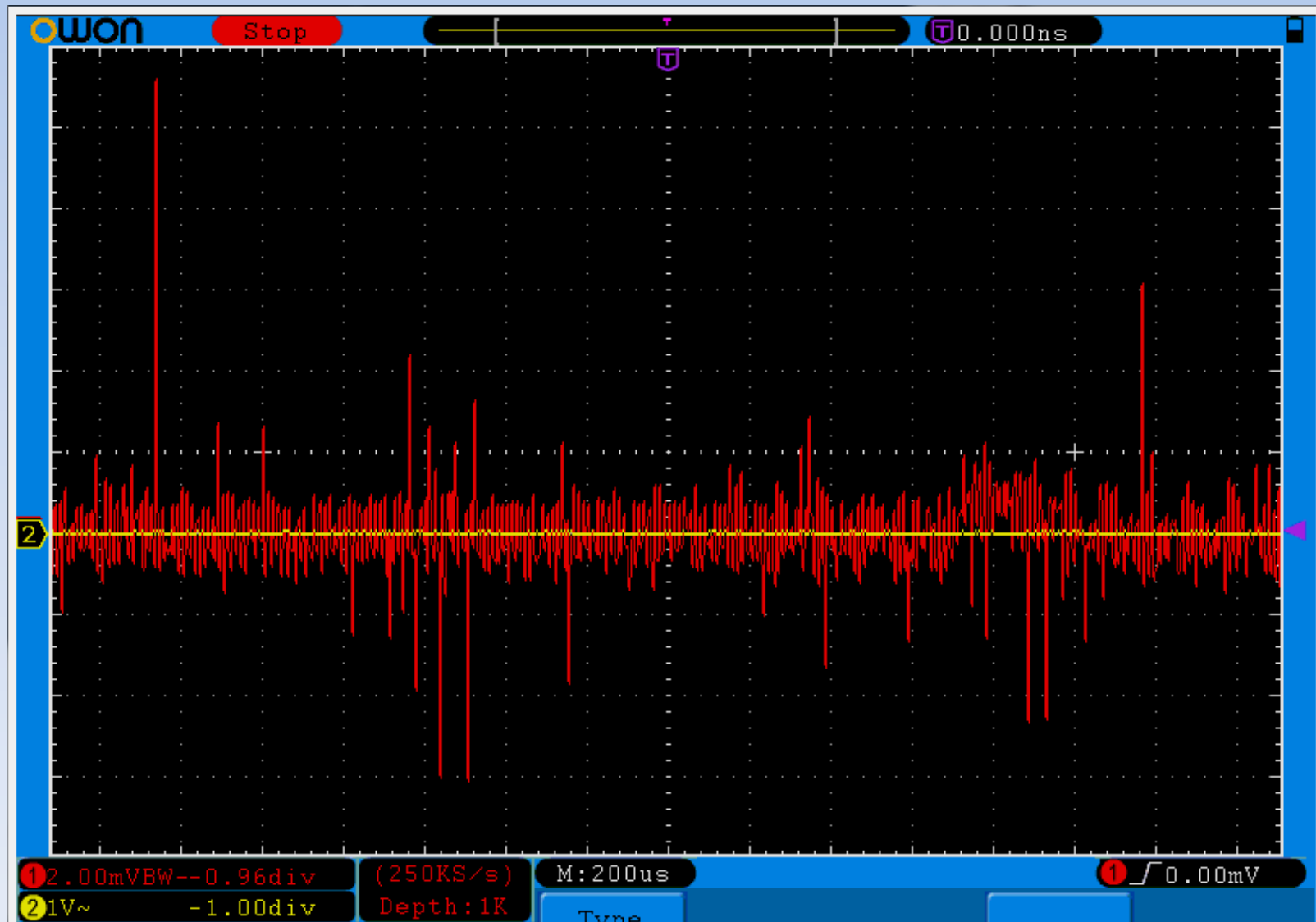
A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated With Increased Cancer Incidence in Teachers in a California School

Samuel Milham, MD, MPH^{*,†} and L. Lloyd Morgan, BS[†]

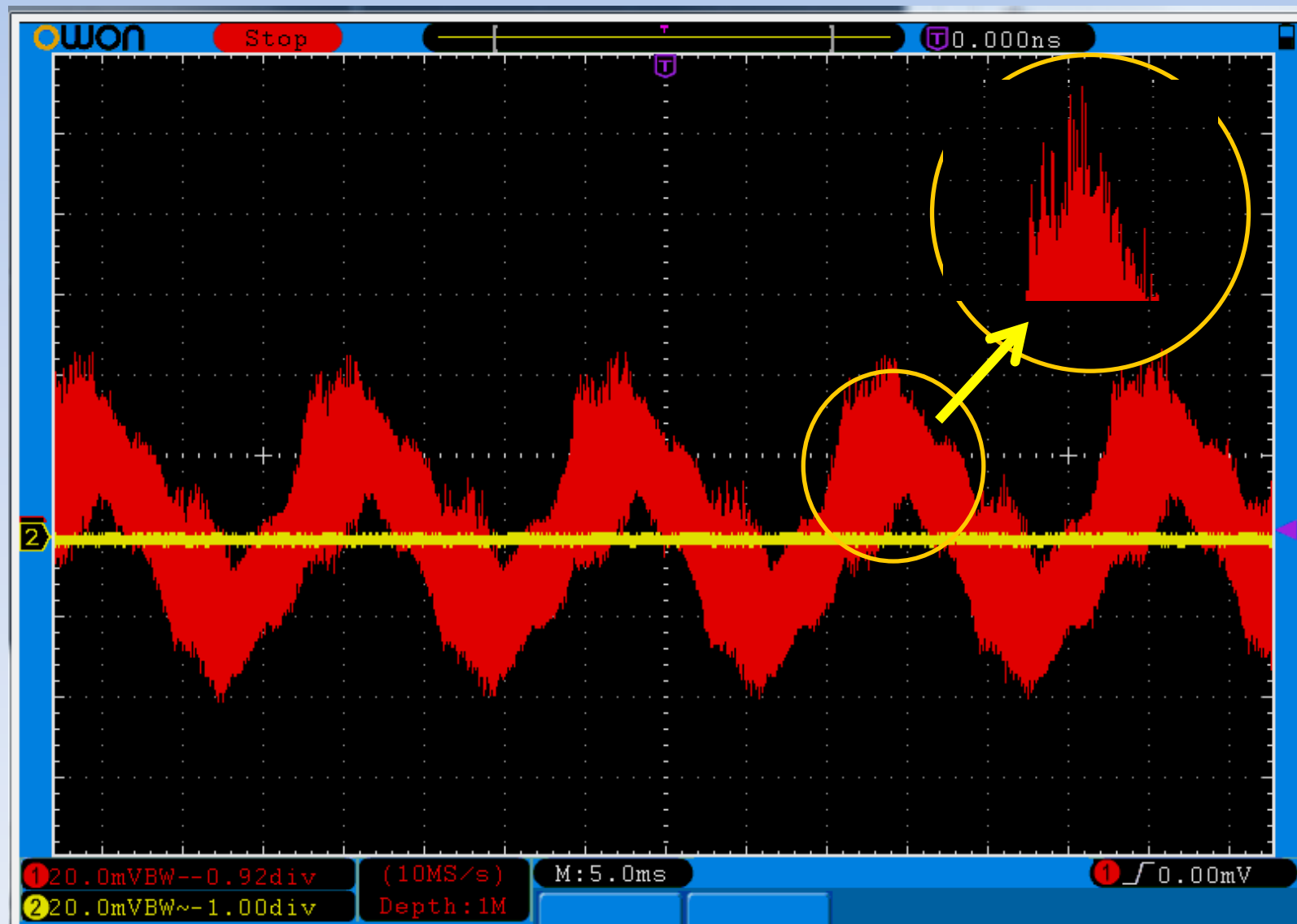


- Since 2008, concept of “Dirty Electricity” has become more widespread, especially work of Sam Milham MD
- Represents high frequency transients from digital equipment, dimmers, Smart Meter switching power supplies
- EHS people are especially adversely affected by these transients present in their house wiring
- Can be partly filtered out by power line capacitors

Digital Pulses in Ground



Digital Pulses on 60 Hz in Air



Solutions: Finding Our Way Forward



- Make Microwave Emitting Smart Meters voluntary
 - This was done in the Netherlands after customer revolt
- Ask Utilities to contribute 10 cents a month for every customer for new research on EMF effects of SM
- Fund independent studies to demonstrate unequivocally that no long-term EMF hazard from Smart Meters exists
- Educate customers on the potential hazards of EM radiation
- Create new, lower exposure guidelines
- Consider widespread filtering technologies for digital noise or “dirty electricity” on power lines
- Consider reprogramming Smart Meters for transmitting readings at specific times until a wired Ethernet or fiber-optic information system is ready (Google/Yellowstrom in Germany)
- Envision a more Direct Current based home power system including transverters and home gateways that fully support green home-based power generation and full grid integration.

Thank you for your Attention



Getting Smarter About the Smart Grid



Commonwealth Club of California - January 28, 2014