

# Overview of EMFs and Solutions

Conscious Life Expo

February 21, 2016

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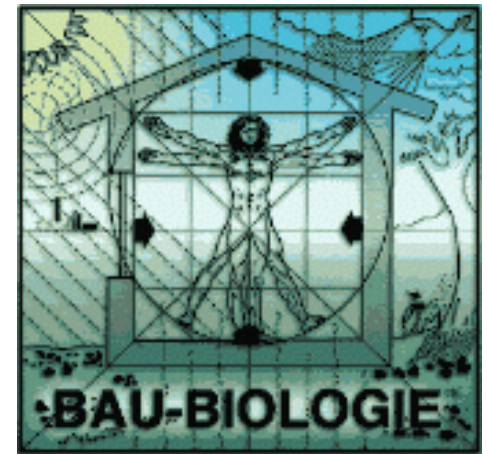
West Los Angeles, California

310-720-7686

[www.createhealthyhomes.com](http://www.createhealthyhomes.com)

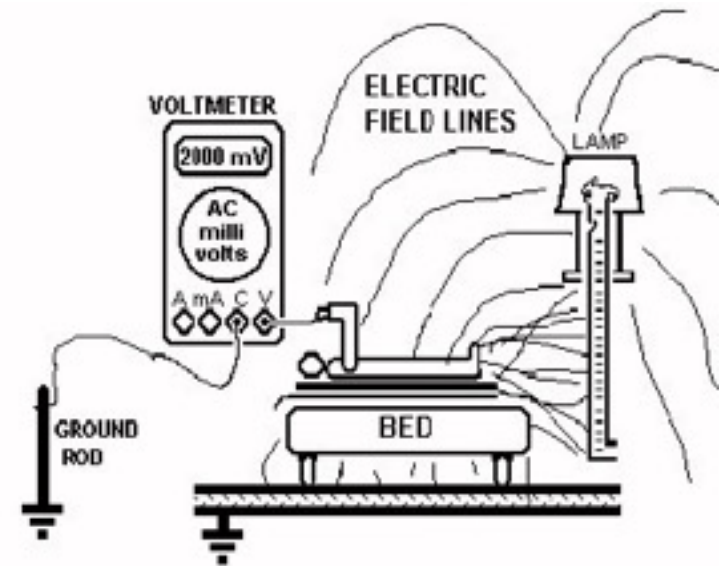
# What is Building Biology®?

- ▶ The relationship between homes and human health
- ▶ Founded in Germany in the 1970s
- ▶ Brought to North America 25 years ago by Helmut Ziehe
- ▶ International Institute for Bau-biologie® and Ecology (IBE), Clearwater, Florida [www.hbelc.org](http://www.hbelc.org)
- ▶ Over 120 Certified Building Biology® Environmental Consultants (BBECs) in USA and Canada



# Goals of Building Biology®

- ▶ Find and reduce sources of toxicity in the home or office – IAQ, EMFs, Outgassing Building Materials
- ▶ Strengthen your tolerance to toxic influences outside the home
- ▶ By reducing exposure to household toxins and creating an EMF-free sleeping, living and work environment



Courtesy Spark Burmaster, EE, BBEC

# Building-Related Causes of Ill Health

Two groups of clients for Building Biologist:

- ▶ 60-70 % of clients are electrically hypersensitive (EHS)
- ▶ Two thirds of these clients are also symptomatic
- ▶ 30-40% of overall clients are not sensitive or symptomatic, just health conscious
- ▶ You always have an interaction between sources of EMF toxicity and diet, heredity, stress levels, healing modalities

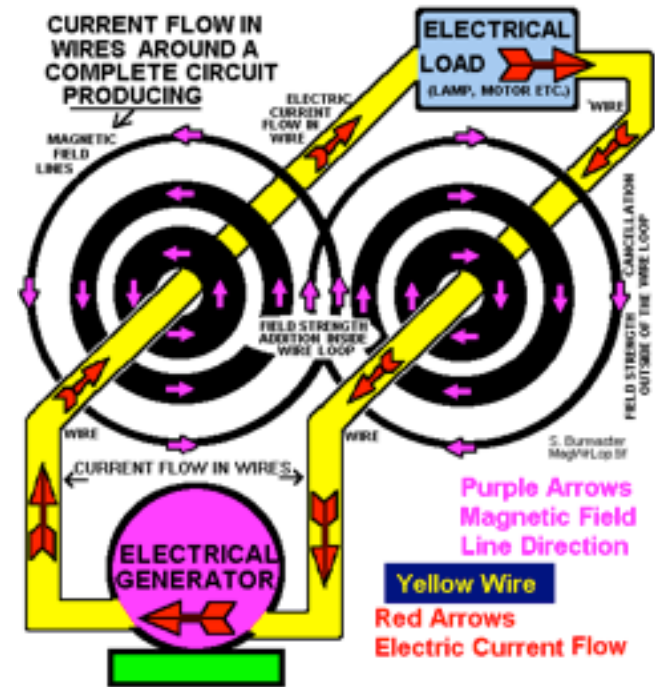
# Building-Related Causes of Ill Health

## Among the General Public:

- ▶ Only 3-5% are electrically hypersensitive (EHS)
- ▶ Yet, up to one third are estimated to be symptomatic from chronic use of wireless devices used at close proximity
- ▶ *Everyone* has cellular damage from RF exposure
- ▶ Thus, two-thirds of population can repair the cellular damage at night and do not become symptomatic (a number that is expected to decrease)
- ▶ Your risk ratio for disease is one out of the three chances

# Four types of “EMFs”

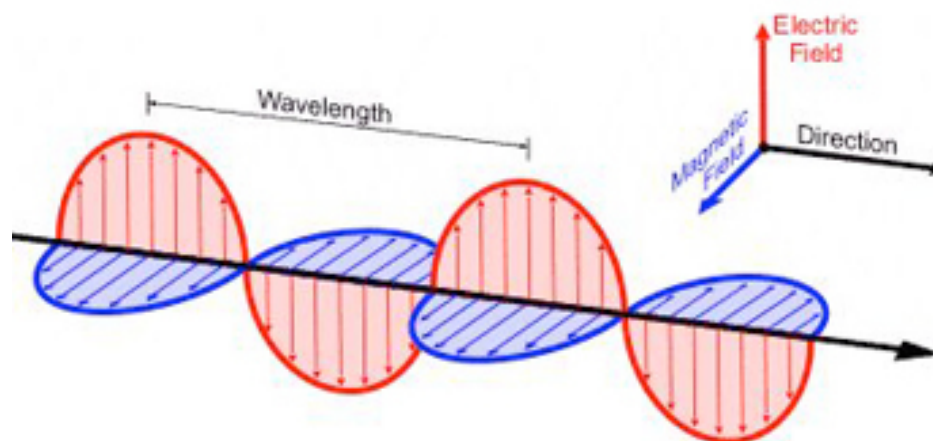
- ▶ AC Electric Fields from house wiring and power lines (at 60 Hz)
- ▶ AC Magnetic Fields from house wiring and power lines (at 60 Hz)
- ▶ Radio Frequency (RF) Fields (800, 900, 2,400 MHz)
- ▶ “Dirty Electricity” from harmonic frequencies (2,000 — 100,000 Hz)



Courtesy Spark Burmaster, EE, BBEC

# Electric & Magnetic Field (EMF) Exposure

- ▶ AC Electromagnetic Fields are created by alternation of polarity (positive to negative to positive) of AC electricity on electric power lines, circuits and power cords, at 60 times per second
- ▶ The “M” in EMF is the magnetic field component
- ▶ The “E” in EMF is the electric field component
- ▶ These fields emit off power lines, circuits and power cords at right angles to each other
- ▶ They enter our living space and can affect our health



[www.ixquick.com](http://www.ixquick.com)

# Electric & Magnetic Field (EMF) Exposure

- ▶ Considered by industry and FCC to be relatively harmless
- ▶ A potentially significant health risk to everyone, like cigarettes in 1950s and 60s
- ▶ Most research comes from Europe
- ▶ Europe, Israel, Russia, India limiting Wi-Fi and alerting citizens to dangers of RF
- ▶ Yet US is promoting Wi-Fi for everything
- ▶ EMFs interfere with healing and treatment from health care practitioners
- ▶ Most people improve with reduction in EMF exposure



# Credible Scientific Research

- ▶ The International Commission for Electromagnetic Safety [www.icems.eu](http://www.icems.eu)
- ▶ The Swedish Association for the ElectroSensitive [http://www.feb.se/index\\_int.htm](http://www.feb.se/index_int.htm)
- ▶ Powerwatch (UK) [www.powerwatch.org.uk](http://www.powerwatch.org.uk)
- ▶ International EMF Alliance [www.iemfa.org](http://www.iemfa.org)



**FEB** - The Swedish Association for the ElectroSensitive

**Powerwatch**

# EMFScientist.org



**International Electromagnetic Field Scientist Appeal**  
Over 200 scientists issued an appeal to the UN and WHO in May 2015 urging them to take action on health effects

[www.emfscientist.org](http://www.emfscientist.org)

*Oram Miller, BBEC, EMRS*

# French Government Restricts Wi-Fi

“France law bans Wi-Fi in daycares, restricts wireless infrastructure”

– Le Monde, February 1, 2015

## France law bans Wi-Fi in daycares, restricts wireless infrastructure

1 February 2015 at 10:07am | 🔥 11,935 hits

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by Pierre Le Hir, Le Monde | [see original article](#) | commentary: Arthur Firstenberg | translation: [André Fauteux](#)



**LE SMACKDOWN EN WIFI:** A new law in France bans Wi-Fi in childcare facilities, bans all advertising targeting children under 14, and requires the use of hand-free kits to be recommended.

# The BioInitiative Report



## **BioInitiative Report:**

A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)

[www.bioinitiative.org](http://www.bioinitiative.org)

# The BioInitiative 2012 Report

1,800 New Studies Since 2007

- ▶ Effects on Fertility
- ▶ Effects on Fetus - behavioral problems in teens
- ▶ Leukemia and Childhood Cancers
- ▶ Genotoxicity
- ▶ Stress Proteins
- ▶ Immune Function
- ▶ Autism and Alzheimer's Disease
- ▶ Brain Tumors and Acoustic Neuromas
- ▶ DNA as fractal antenna

# The BioInitiative 2012 Report

4+ pages of reported biological effects from Radiofrequency (RF) radiation at low-intensity exposure, *below* FCC safe exposure level

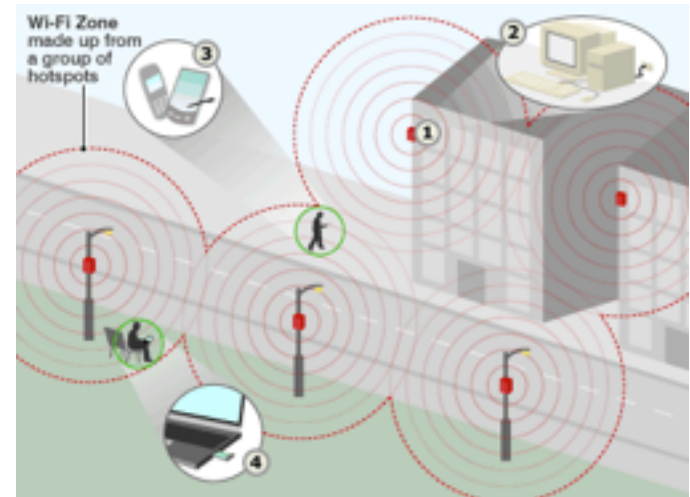
Power Density (Microwatts/centimeter <sup>2</sup> - uW/cm <sup>2</sup> )		Reference
0.5 uW/cm <sup>2</sup>	Significant degeneration of seminiferous epithelium in mice at 2.45 GHz, 30-40 min.	Saunders, 1981
0.5 - 1.0 uW/cm <sup>2</sup>	Wi-Fi level laptop exposure for 4-hr resulted in decrease in sperm viability, DNA fragmentation with sperm samples placed in petri dishes under a laptop connected via Wi-Fi to the internet.	Avendano, 2012
1.0 uW/cm <sup>2</sup>	RFR induced pathological leakage of the blood-brain barrier	Persson, 1997
1.0 uW/cm <sup>2</sup>	RFR caused significant effect on immune function in mice	Fesenko, 1999
1.0 uW/cm <sup>2</sup>	RFR affected function of the immune system	Novoselova, 1999
1.0 uW/cm <sup>2</sup>	Short-term (50 min) exposure in electrosensitive patients, caused loss of well-being after GSM and especially UMTS cell phone radiation exposure	Elititi, 2007
1.3 - 5.7 uW/cm <sup>2</sup>	RFR associated with a doubling of leukemia in adults	Dolk, 1997
1.25 uW/cm <sup>2</sup>	RFR exposure affected kidney development in rats (in-utero exposure)	Pyrpasopoulou, 2004
1.5 uW/cm <sup>2</sup>	RFR reduced memory function in rats	Nittby, 2007
2 uW/cm <sup>2</sup>	RFR induced double-strand DNA damage in rat brain cells	Kesari, 2008
2.5 uW/cm <sup>2</sup>	RFR affected calcium concentrations in heart muscle cells	Wolke, 1996
2 - 4 uW/cm <sup>2</sup>	Altered cell membranes; acetylcholine-induced ion channel disruption	D'Inzeo, 1988
4 uW/cm <sup>2</sup>	RFR caused changes in hippocampus (brain memory and learning)	Tattersall, 2001
4 - 15 uW/cm <sup>2</sup>	Memory impairment, slowed motor skills and retarded learning in children	Chiang, 1989
5 uW/cm <sup>2</sup>	RFR caused drop in NK lymphocytes (immune function decreased)	Boscolo, 2001
5.25 uW/cm <sup>2</sup>	20 minutes of RFR at cell tower frequencies induced cell stress response	Kwee, 2001
5 - 10 uW/cm <sup>2</sup>	RFR caused impaired nervous system activity	Dumansky, 1974
6 uW/cm <sup>2</sup>	RFR induced DNA damage in cells	Phillips, 1998

[www.bioinitiative.org](http://www.bioinitiative.org)

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# Radio Frequency Field Exposure

- ▶ Considered to be “the largest human biological experiment ever” - Salford et. al.
- ▶ Evidence of harm is increasing worldwide
- ▶ Efforts are underway to remove Wi-Fi from schools, libraries and hospitals in Russia, Israel, Switzerland, Austria, France, Germany, Belgium, Ireland, India and Australia



# Sources of Radio Frequency Field Exposure Outdoors

- ▶ Radio and TV broadcast towers
- ▶ Cell phone antennas
- ▶ Smart Utility Meters
- ▶ Wi-Fi routers in neighbors' homes and businesses



# Sources of Radio Frequency Field Exposure Indoors

- ▶ Wi-Fi routers and laptops
- ▶ Cordless telephone base station is “always on”
- ▶ Both emit continuous pulsed digital carrier frequencies in standby mode
- ▶ Think of them like ashtrays with burning lit cigarettes, filling room with smoke



[velocidaddeinternet.com](http://velocidaddeinternet.com)



[china-telecommunications.com](http://china-telecommunications.com)



[photographersdirect.com](http://photographersdirect.com)

# Sources of Radio Frequency Field Exposure Indoors

- ▶ Tablets
- ▶ e-Readers



[www.nickolexie.en.busytrade.com](http://www.nickolexie.en.busytrade.com)



[en.wikipedia.org](http://en.wikipedia.org)

# FCC Versus the Rest of the World

- ▶ FCC's safe exposure guidelines for cell phones listed at 1.0 milliWatts/centimeter squared ( $\text{mW}/\text{cm}^2$ )
- ▶ Yet that translates to 10 *million* microWatts/meter squared ( $\mu\text{W}/\text{m}^2$ ), the units used by rest of the world
- ▶ Other countries recommend lower RF safe exposure levels than the US
- ▶ Building Biology recommends RF levels of one hundred thousand to one million times less than FCC (100-10  $\mu\text{W}/\text{m}^2$  or 0.000,1-0.000,001  $\text{mW}/\text{cm}^2$ )
- ▶ FCC's guidelines based solely on thermal effects; ignore non-thermal, biological effects

# Official FCC Safe Exposure Guidelines for Radio Frequencies (RF)

**Table 1. LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)**  
**(B) Limits for General Population/Uncontrolled Exposure**

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time E/2, H/2 or S (minutes)
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1,500	--	--	f/1,500	30
1,500-100,000 (1.5-100 GHz)	--	--	1.0	30

# Conversion Table

milliWatts per square centimeter	microWatts per square meter
0.000,000,01 mW/cm <sup>2</sup>	0.1 μW/m <sup>2</sup>
0.000.000,1 mW/cm <sup>2</sup>	1 μW/m <sup>2</sup>
0.000,001 mW/cm <sup>2</sup>	10 μW/m <sup>2</sup>
0.000,01 mW/cm <sup>2</sup>	100 μW/m <sup>2</sup>
0.000,1 mW/cm <sup>2</sup>	1,000 μW/m <sup>2</sup>
0.001 mW/cm <sup>2</sup>	10,000 μW/m <sup>2</sup>
0.01 mW/cm <sup>2</sup>	100,000 μW/m <sup>2</sup>
0.1 mW/cm <sup>2</sup>	1,000,000 μW/m <sup>2</sup>
<b>1.0 mW/cm<sup>2</sup></b>	<b>10,000,000 μW/m<sup>2</sup></b>
10 mW/cm <sup>2</sup>	100,000,000 μW/m <sup>2</sup>
100 mW/cm <sup>2</sup>	1,000,000,000 μW/m <sup>2</sup>
1,000 mW/cm <sup>2</sup>	10,000,000,000 μW/m <sup>2</sup>
10,000 mW/cm <sup>2</sup>	100,000,000,000 μW/m <sup>2</sup>

# Comparative Chart on International Safe Exposure Guidelines

1800 MHz Public Exposure Guidelines	PFD $\mu\text{W}/\text{m}^2$	Equivalent V/m	c.f. speed m.p.h.
<b>FCC (USA) OET-65</b>	<b>10,000,000</b>	61	3000
ICNIRP (1998), WHO	9,000,000	58	2847
Belgium (exc Wallonia)	1,115,000	21	1002
Italy (sum of frequencies)	100,000	6	300
Russia, PRChina	100,000	6	300
Switzerland, Lichtenstein, Luxembourg	95,000	6	292
Belgium Wallonia	24,000	3	147
Typical 100m from a base station (0.2 to 6 V/m)	10,000	1.9	95
Vienna (sum GSM)	10,000	1.9	95
Italy (single frequency)	1,000	0.6	30
Salzburg 1998 (sum GSM)	1,000	0.6	30
EU-Parl, GD Wissenschaft, STOA GSM (2001)	100	0.2	9
Median level, 15 US cities 1977 (mainly VHF & TV)	48	0.14	7
Salzburg GSM/3G outside houses (2002)	10	0.06	3
Salzburg GSM/3G inside houses (2002)	1	0.02	1
Burgerforum BRD proposal, waking areas (1999)	1	0.02	1
Burgerforum BRD proposal, sleeping areas (1999)	0.01	0.002	0.1

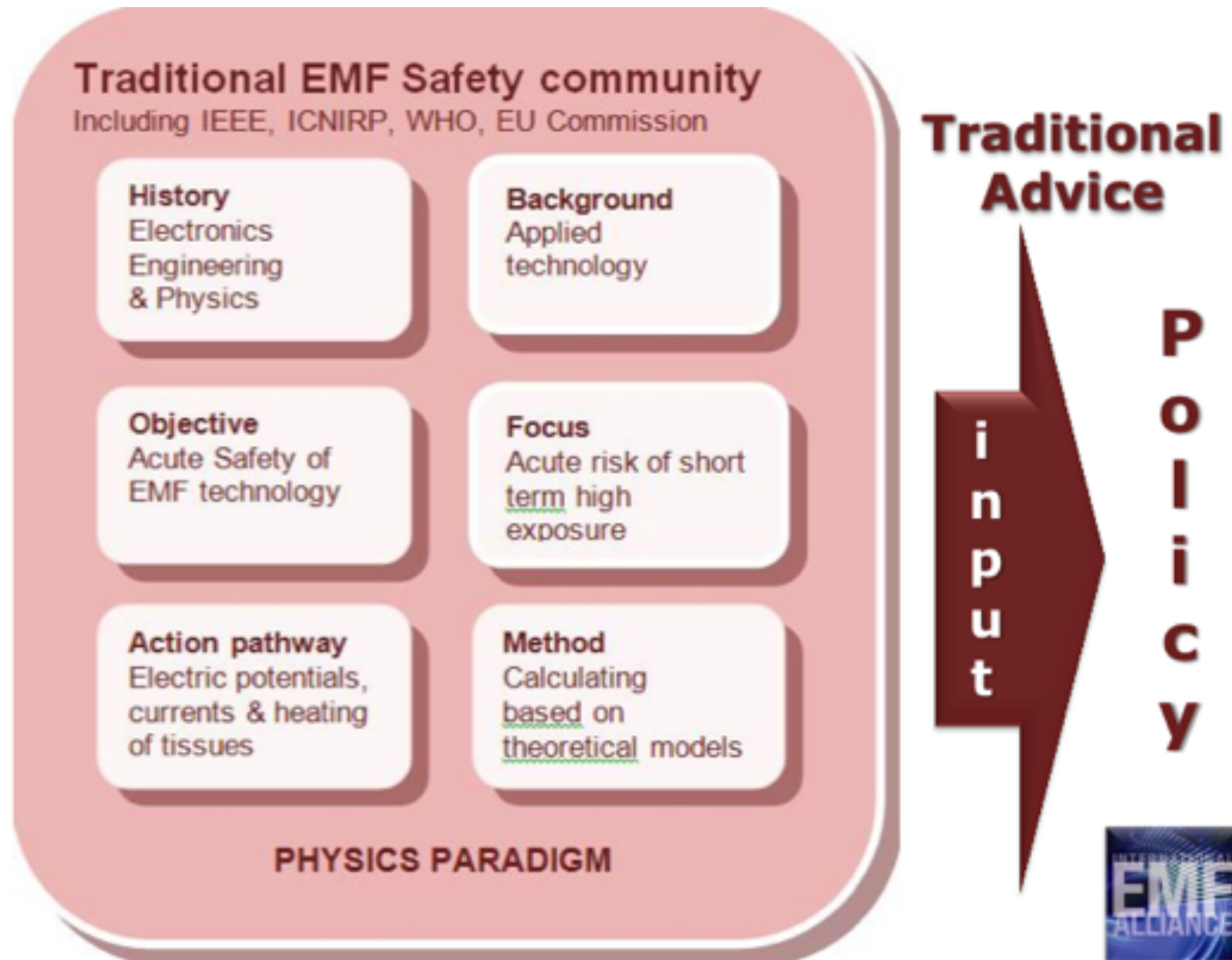
# Building Biology Safe Exposure Guidelines for RF

Building Biology Evaluation Guidelines for Sleeping Areas,  
SBM-2008, Page I

Radiofrequency Radiation (High Frequency, Electromagnetic Waves)

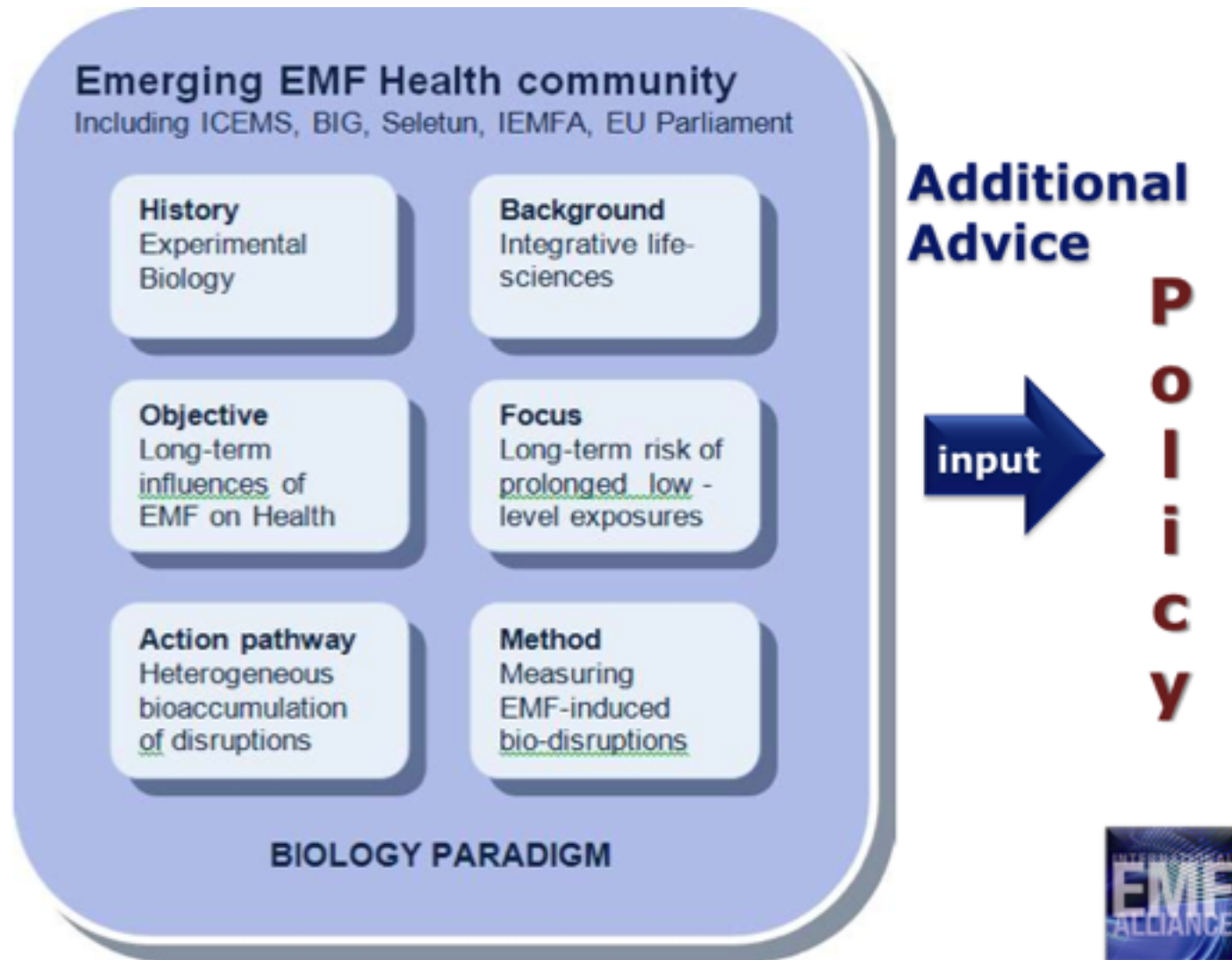
	No Anomaly	Slight Anomaly	Severe Anomaly	Extreme Anomaly
Power Density in microWatts/meter squared ( $\mu\text{W}/\text{m}^2$ )	< 0.1	0.1 - 10	10 - 1,000	> 1,000

# Comparing EMF Paradigms



[www.international-emf-alliance.org](http://www.international-emf-alliance.org)

# Comparing EMF Paradigms



[www.international-emf-alliance.org](http://www.international-emf-alliance.org)

# Health Effects of Radio Frequency (RF) Field Exposure — Summary

- ▶ Thermal (heating) and non-thermal (non-heating) frequencies both cause health effects
- ▶ Pulsed digital frequencies and distortion of the wave form cause biological harm
- ▶ Safe exposure limits from emerging EMF community are biology-based, not just based upon tissue heating
- ▶ Effects drop off exponentially with distance away from source; look for additional sources of EMFs in house
- ▶ Review “Cell Phone and Radio Frequency Risks” and “Articles on EMFs” on [www.createhealthyhomes.com](http://www.createhealthyhomes.com)

# The Bottom Line

If you use a cell phone, cordless phone, tablet, laptop or have a smart meter, you must ask yourself:



[turbohealthcare.com](http://turbohealthcare.com)

“How many cigarettes am I willing to smoke on a daily basis?”

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Reduce Use
- ▶ Increase Distance
- ▶ Favor Hardwired Connections
- ▶ Prefer speakerphone and texting
- ▶ Air tube earphone for cell phones and cordless telephones  
[www.lessemf.com](http://www.lessemf.com)
- ▶ Place “snap bead” on earphone cord  
[www.lessemf.com](http://www.lessemf.com)



Ferrite “Snap”  
Bead



RF3 Air Tube Ear Phone

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Keep your landline telephone and use it
- ▶ Use corded telephones rather than cordless
- ▶ Tell family and friends to call your home landline corded telephone number first
- ▶ Hardwired network using Ethernet cables
- ▶ Must disable Wi-Fi on router *and* computer
- ▶ Put tablet, e-Reader, laptop & cell phone in Airplane mode when not receiving or transmitting



Corded Telephone



CAT-5e or 6 Wiring

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Internet network should ideally be hardwired using Ethernet cable, creating Local Area Network, or LAN
- ▶ Use Ethernet cables to connect devices (computers, printers, TVs) to router
- ▶ Amazon sells 50 and 100 foot Ethernet cables for less than \$13
- ▶ Use data switch for multiple computers, printers in one room



[www.amazon.com](http://www.amazon.com)



[www.amazon.com](http://www.amazon.com)

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ If not electrically hypersensitive (EHS) and installing Ethernet network is not affordable, use pair of network adapters
- ▶ Netgear Powerline 200 or 500 Mbps
- ▶ Avoid models with Wi-Fi on second adapter
- ▶ This technology does generate dirty electricity on house circuits



[www.amazon.com](http://www.amazon.com)

*Oram Miller, BBEC, EMRS*

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ MOCA (Multi-media Over Cable Alliance) technology should be tolerated by electrically hypersensitive individuals
- ▶ Uses existing co-axial TV cables already in walls
- ▶ Co-axial cable is shielded
- ▶ No dirty electricity generated
- ▶ Can still run television signals through co-axial cable using splitter



# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ You *must* manually disable Wi-Fi on router *and* laptop or desktop computer to get rid of Wi-Fi radio frequencies
- ▶ Plugging in Ethernet cable will *not* automatically disable Wi-Fi on its own on either your router or your laptop
- ▶ Consult with router's manufacturer, manual, or Internet Technology (IT) person to help disable Wi-Fi on router and computer



[iccinforcentre.com](http://iccinforcentre.com)



[piratstudenterna.se](http://piratstudenterna.se)

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ No cordless keyboard and mouse
- ▶ Replace with *corded* keyboard and mouse
- ▶ Disable Bluetooth on computer
- ▶ Turn off power on cordless keyboard and mouse — will still transmit in the drawer



[en.wikipedia.org](http://en.wikipedia.org)



[ebay.pl](http://ebay.pl)

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Mac Air and Macbook have no Ethernet port
- ▶ Use Thunderbolt-to-Ethernet adapter or USB-to-Ethernet adapter



[www.apple.com](http://www.apple.com)



[www.apple.com](http://www.apple.com)



[iphonehoesjeshop.nl](http://iphonehoesjeshop.nl)

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Hardwired workaround for iPad and iPhone
- ▶ Put in Airplane mode — Get Internet without radio waves
- ▶ Go to Safer Use of Computers at [www.createhealthyhomes.com](http://www.createhealthyhomes.com)



[gottabemobile.com](http://gottabemobile.com)



[www.amazon.com](http://www.amazon.com)



[www.amazon.com](http://www.amazon.com)



[www.amazon.com](http://www.amazon.com)



[iphonehoesjeshop.nl](http://iphonehoesjeshop.nl)

*Oram Miller, BBEC, EMRS*

# Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Avoid Wi-Fi by providing hardwired Ethernet connection to TV for streaming video for Netflix, Hulu
- ▶ Plug Ethernet cable into Roku 1 or 2 or Apple TV device
- ▶ Automatically disables Wi-Fi on Roku 1 & 2 and Apple TV 1 & 2
- ▶ With Apple TV 3, must disable Airplay with onscreen command
- ▶ Cannot disable Wi-Fi on Roku 3. We recommend not using
- ▶ Verify that Wi-Fi is disabled with RF detector, if you have one



[commons.wikimedia.org](https://commons.wikimedia.org)



[zdnet.com](http://zdnet.com)

# Protect Yourself from Harmful Radio Frequency Fields from Cell Towers

- ▶ Look up location of cell antennas and broadcast antennas near your home
- ▶ [www.antennasearch.com](http://www.antennasearch.com)



Steelintheair.com



Longdistancecarriers.us

# Protect Yourself from Smart Utility Meters

- ▶ Smart Electric, Gas and Water meters now installed in Southern California and throughout most of the country
- ▶ Emit harmful “beacon signals” throughout the day and night to “synchronize” smart meters in mesh network
- ▶ Emit much stronger radio frequency signals one or more times per day to transmit data to home office
- ▶ Short (20-40 microSeconds), sharp/fast rise time and persistent (24/7) nature of beacon signals make smart meters more harmful than Wi-Fi, cell phones



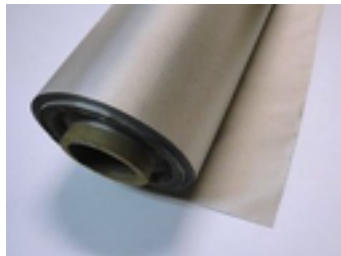
# Protect Yourself from Harmful Radio Frequency Field Exposure

Block RF from outside sources (cell towers, smart meters, radio & TV towers):

- ▶ RF reflecting paint
- ▶ Fabric, bed canopy
- ▶ Metal window screen or film on windows

▶ [www.lessemf.com](http://www.lessemf.com)

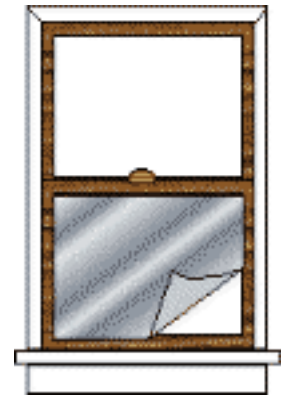
▶ [www.safelivingtechnologies.com](http://www.safelivingtechnologies.com)



RF Shielding Materials & Fabrics



Y-shield® Paint



Scotch tint® Window Film



Bed Canopy

# Sources of Dirty Electricity Exposure

- ▶ Electronic dimmer switches
- ▶ Compact Fluorescent Lamps (CFLs)
- ▶ Switched Mode Power Supplies



[www.conrad.com](http://www.conrad.com)

# Protect Yourself from Harmful “Dirty Electricity” Exposure

- ▶ Ideally eliminate sources
- ▶ Avoid Compact Fluorescent Lamps
- ▶ Use full spectrum incandescent bulbs
- ▶ LED bulbs (“line-voltage,” non-transformer bulbs)
- ▶ Install straight on/off switches rather than dimmer switches
- ▶ Then use Dirty Electricity Filters (repair wiring errors first)



# Chips and Pendants

- ▶ I believe they are useful
- ▶ Building Biology profession now has a position paper at [hbelc.org](http://hbelc.org)
- ▶ No measurable change with EMF meters
- ▶ Research does support their use:
- ▶ Less damage to rat DNA, less rouleaux formation (clumping of red blood cells on live cell analysis), blues and greens (cooling of tissues) vs. reds and yellows (heating of tissues) on thermography
- ▶ Thousands of testimonials
- ▶ Do not use as exclusive means of protection

# EMF Meters and Instruments

## Magnetic Fields

- ▶ Gauss Master, Digital Gauss meter (single axis)
- ▶ FW Bell, Magnii (triple axis)
- ▶ Tri-Field Flat Response model, not Frequency Weighted model (not recommended for electric or radio fields—RF)
- ▶ “Buzz Stick”
- ▶ See list at EMF Meters and Instruments on [www.createhealthyhomes.com](http://www.createhealthyhomes.com)



FW Bell Gauss Meter



Single Axis Gauss Meter



Buzz Stick



Gauss Master



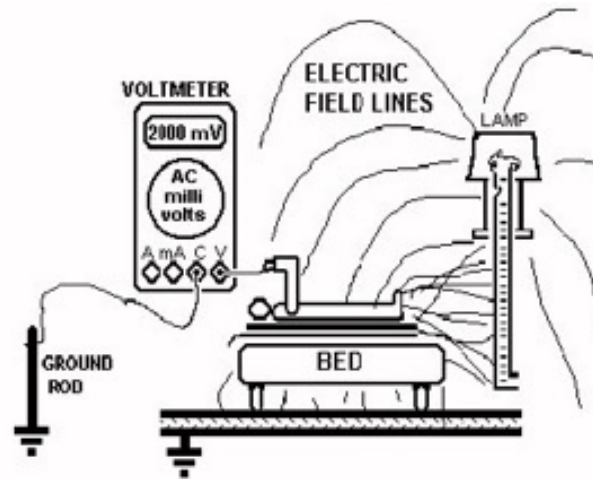
Tri-Field Meter  
Flat Response

*Oram Miller, BBEC, EMRS*

# EMF Meters and Instruments

## Electric Fields

- ▶ Body Voltage Meter
- ▶ Hand-held Meter



Courtesy Spark Burmaster, EE, BBEC



Body Voltage Meters



Hand-held Meters

# EMF Meters and Instruments

## Radio Frequency (RF) Fields

- ▶ Hand-held Meters
- ▶ Pay attention to frequency range



Cornet RF Meter



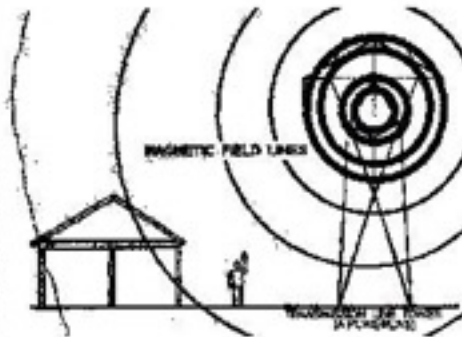
Gigahertz Solutions HF35C



3-Axis RF Meter

# COMPARISON OF AC MAGNETIC AND AC ELECTRIC FIELDS

## MAGNETIC FIELDS

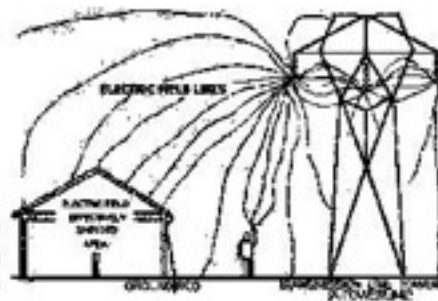


ARE THE ENERGIZATION OF THE SPACE AROUND ELECTRIC CURRENT FLOW

PRODUCED BY  
ELECTRIC  
CURRENT FLOW

DETECTED/ MEASURED BY:  
GAUSSMETER/ AMP METER

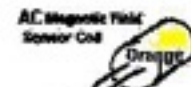
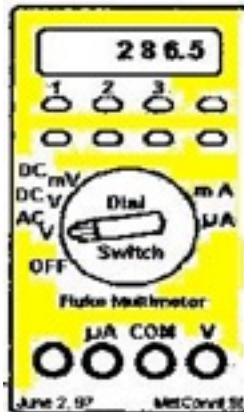
## ELECTRIC FIELDS



ARE THE ENERGIZATION OF THE SPACE BETWEEN VOLTAGE DIFFERENCES

PRODUCED BY  
VOLTAGE

DETECTED/ MEASURED BY:  
VOLT METER

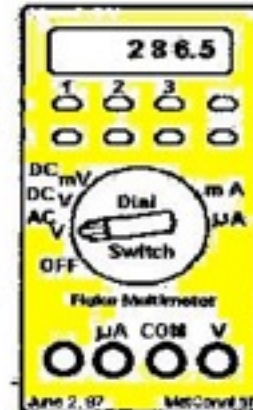


COM V  
Set Meter Dial Switch to AC Volts

AC Electric Current Flow  
Amp Clamp On



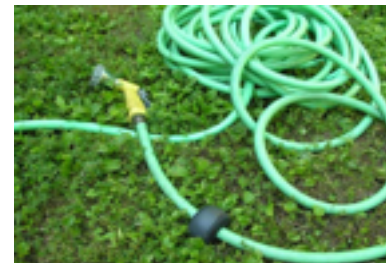
Set Meter Dial Switch to Micro Amps (u A) (for millamp measurements)



AC Electric Fields:  
Body Voltage  
Probe



COM V  
Ground Rod  
Set Meter Dial Switch to AC Volts



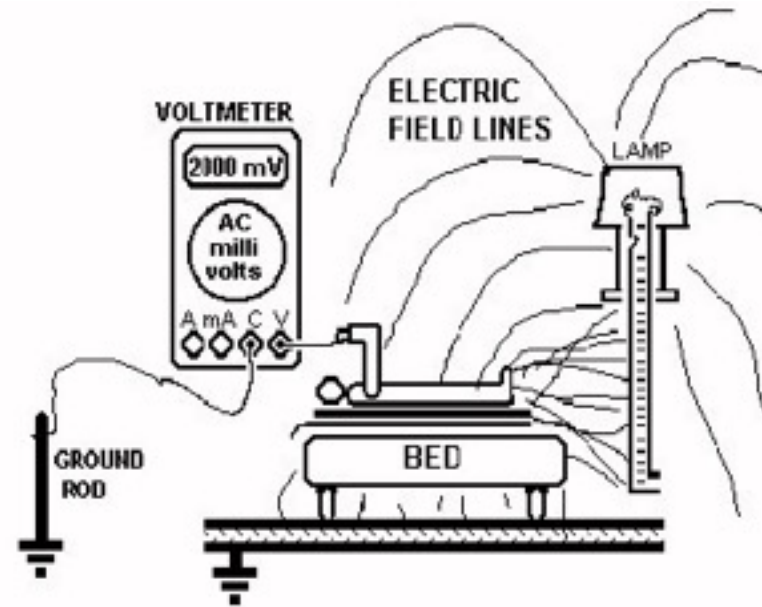
28-Fs

Courtesy  
Spark  
Burmester,  
EE, BBEC

Oram Miller, BBEC, EMRS

# AC Electric Field Basics

- ▶ Produced by differences in electric voltage
- ▶ Measured with Volt meter (not Gauss meter)
- ▶ Similar to *pressure* in water hose (not flow)
- ▶ The “Unknown EMF”
- ▶ Independent of AC Magnetic Fields



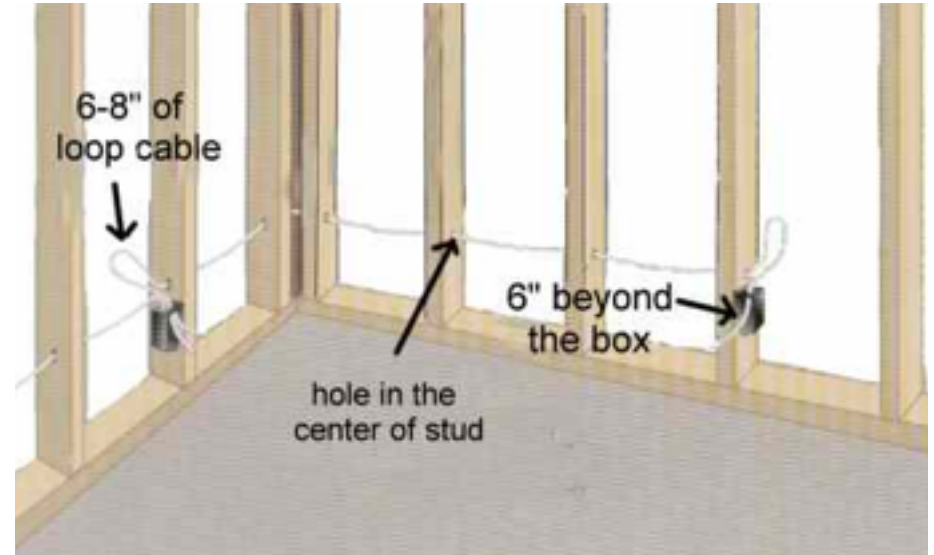
Courtesy Spark Burmaster, EE, BBEC



Oram Miller, BBEC, EMRS

# Sources of AC Electric Field Exposure

- ▶ AC Electric fields present even if current is not flowing (e.g., lamp is off)
- ▶ Extends up to 6-8 feet from plastic-jacketed wiring (Romex) in walls
- ▶ Also extends 6-8 feet from unshielded AC power cords
- ▶ Decreases with distance
- ▶ Fields are present even when these devices are turned off but plugged in
- ▶ Affects people primarily while sleeping



Unshielded Romex Wiring

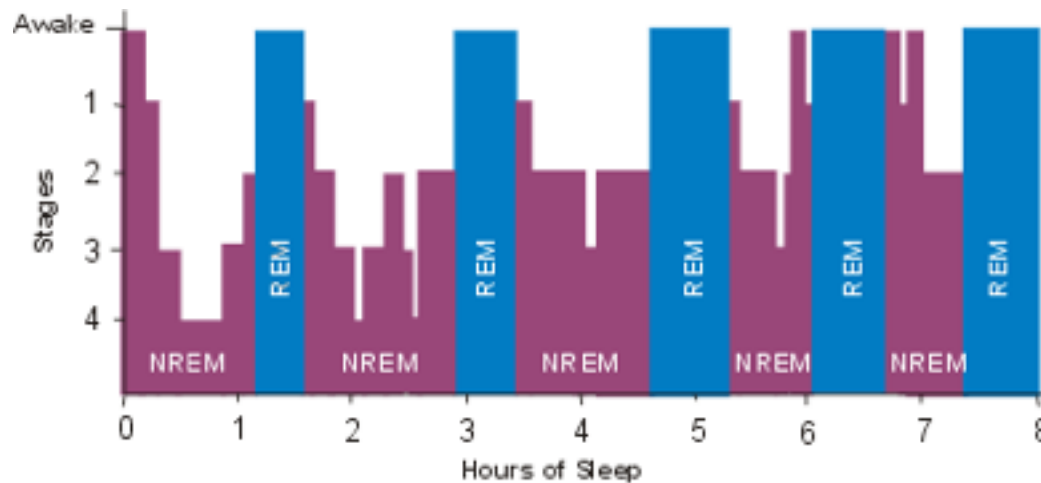


Bedside Lamp Cord

[www.etsy.com](http://www.etsy.com)

# Adverse Health Effects from Exposure to AC Electric Fields

- ▶ Prevents deep, Stage Four Sleep
- ▶ Diminishes normal night time production of melatonin
- ▶ Causes chronic fatigue, fibromyalgia, sleep disorders, restless leg syndrome, allergies
- ▶ Also hyperactivity, depression, headaches



Sequences of states and stages of sleep on a typical night

Oram Miller, BBEC, EMRS

# Improvements With Reduction of AC Electric Fields

- ▶ Deeper levels of Stage Four sleep
- ▶ Increase in normal night time melatonin production
- ▶ Results in:

Increased vitality and alertness

Reduction of muscle pain and joint stiffness

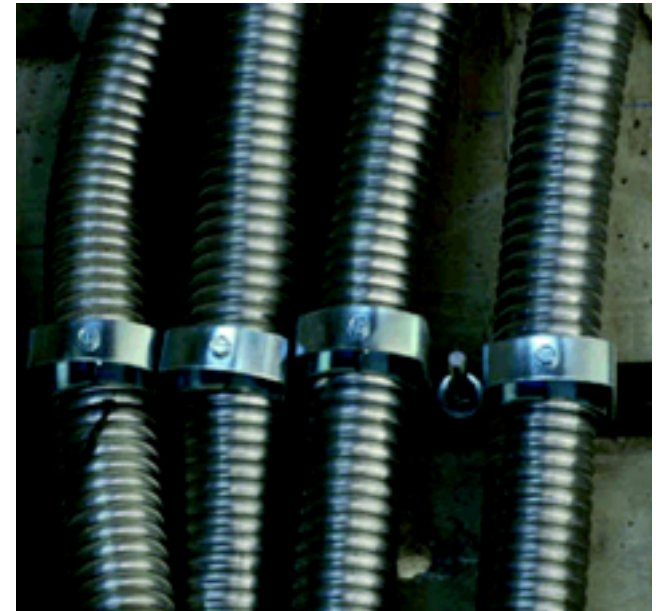
Increase in flexibility and range of motion

Reduction of fatigue, allergies, depression, cancer

Greater response to medical therapies

# Reduce Electric Field Exposure in Sleeping Areas

- ▶ Create an electrically clean sleeping environment
- ▶ Ideally use flexible steel or aluminum MC (metal clad) or rigid (EMT) conduit for all circuits
- ▶ At least within 6-8 feet around, above, and below each bed
- ▶ Shut-off switch for outlets within 6-8 feet of bed
- ▶ Also reduce electric fields in day use areas (desk, easy chair)
- ▶ Rewire lamps, appliances with shielded AC power cord



Flexible Metal Clad Wiring

# Reduce Electric Field Exposure in Sleeping Areas

- ▶ Remotely shut off plastic (Romex) circuits to and through bedroom walls, floor (Contactor/Remote Switch)
- ▶ When metal clad Flex/EMT circuits are present, have a shut-off switch at the wall
- ▶ In the short term: unplug all AC power cords 6-8 feet from bed
- ▶ Use plug-in switches, shielded power strip
- ▶ Re-wire lamp with shielded Mu-Cord ([LessEMF.com](http://LessEMF.com))
- ▶ Avoid electric blankets and electric heating pads (watch for reverse polarity on plug)
- ▶ Use battery-operated clocks
- ▶ Have home evaluated professionally for EMFs
- ▶ AC laptop power cords: 3-pronged, grounded



# Reduce Electric Field Exposure at Your Desk

## Ungrounded Laptop AC Power Cords – PCs

- ▶ Big source of energy-draining, unhealthy electric fields
- ▶ Many laptops have two-pronged (ungrounded) plugs
- ▶ Plug needs to be three-pronged (grounded)
- ▶ Purchase USB Ground Cord from [www.lessemf.com](http://www.lessemf.com)
- ▶ Also, outlet needs to be grounded
- ▶ Purchase circuit tester from hardware store to test ground at outlet – *both* amber lights need to be lit

## Two-pronged plug:



## Three-pronged plug:



# Reduce Electric Field Exposure at Your Desk

## Ungrounded Laptop AC Power Cords – Macs

- ▶ For Mac laptops, use the AC power adapter with the three-pronged plug
- ▶ Do not use the two-pronged adapter that slides directly into the transformer
- ▶ Pull the two-pronged adapter, shown on the left in the upper right corner, off the transformer, and slide on the cord shown on the right with the three-pronged plug
- ▶ Future models from Mac will not allow you to do this

### Two-pronged plug:



[laptopbatterylife.com](http://laptopbatterylife.com)

### Three-pronged plug:



[mactechgear.com](http://mactechgear.com)

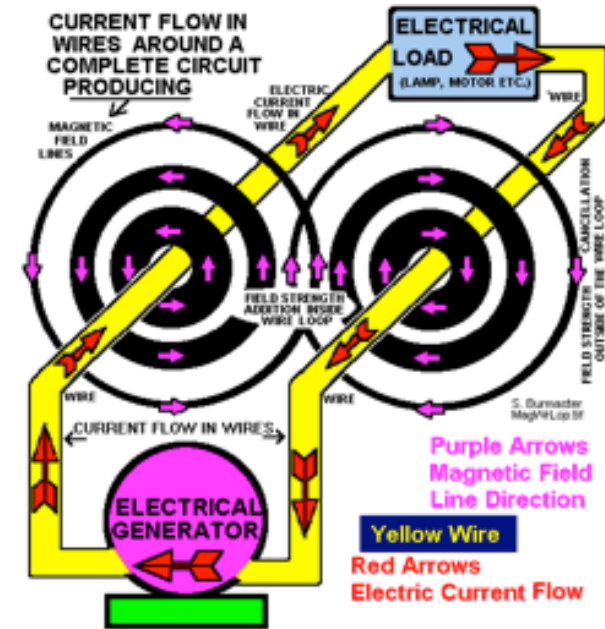


[shop.accessory4you.com](http://shop.accessory4you.com)

*Oram Miller, BBEC, EMRS*

# AC Magnetic Field Basics

- ▶ AC Magnetic Field exposure produced by current flow through a closed loop
- ▶ Occurs *only* when current is flowing
- ▶ Like *flow* of water through garden hose (not pressure)
- ▶ Independent of AC Electric Fields

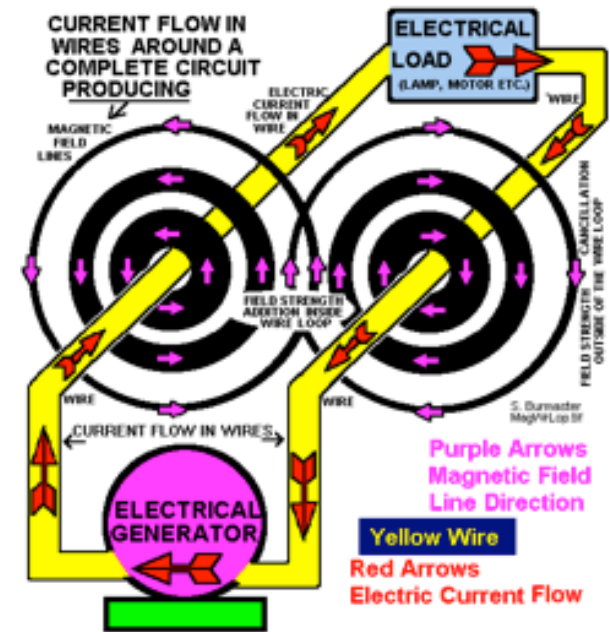


Courtesy Spark Burmaster, EE, BBEC

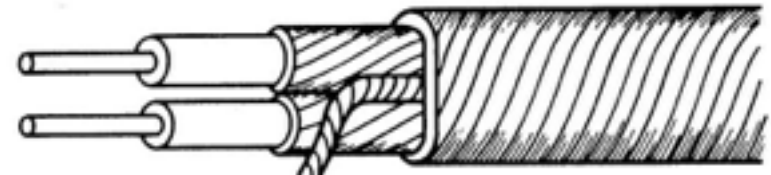


# AC Magnetic Field Basics

- ▶ Decreases with distance from the source
- ▶ Extends only 2-4 feet from typical point sources
- ▶ Can extend 6-10 feet from current on grounding system
- ▶ Occurs when wires are separated (hot from neutral)
- ▶ Fields are cancelled when wires run together

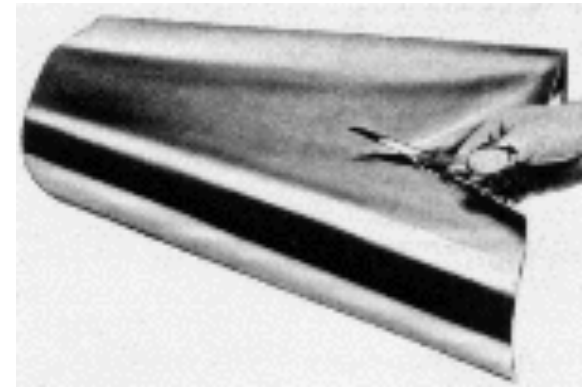


Courtesy Spark Burmaster, EE, BBEC



# AC Magnetic Field Basics

- ▶ Shielding is difficult
- ▶ Requires special materials, such as Mu Metal  
[www.lessemf.com](http://www.lessemf.com)
- ▶ Best to eliminate or move yourself several feet away from source
- ▶ “Distance is your friend”



Mu Metal

# Sources of AC Magnetic Field Exposure

Four major sources of AC magnetic fields in homes:

1. Overhead outside power lines, especially high tension power lines – wires are widely separated



2. Point sources: motors (refrigerator), transformers (black box, inside stereo, TV, clock radio), electric meter, breaker panel

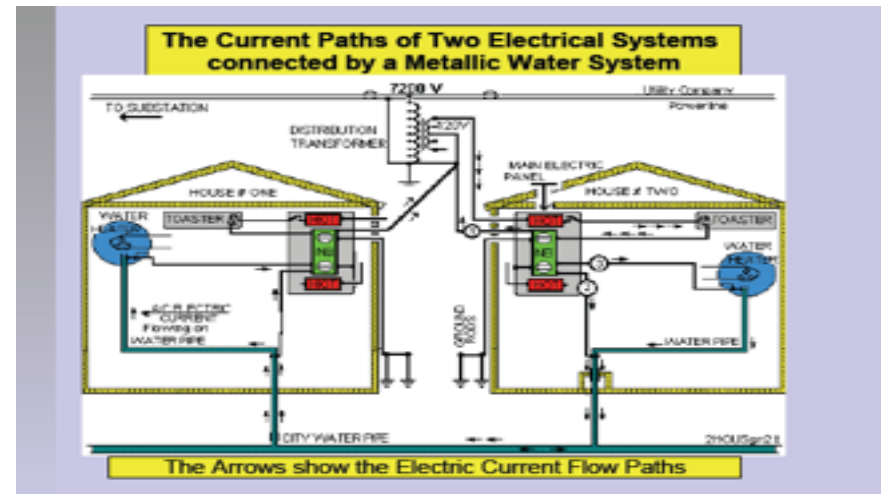


# Sources of AC Magnetic Field Exposure

Major sources in homes  
(continued):

3. Wiring errors in branch circuits – parallel paths;  
Knob & Tube wiring –  
wires are separated

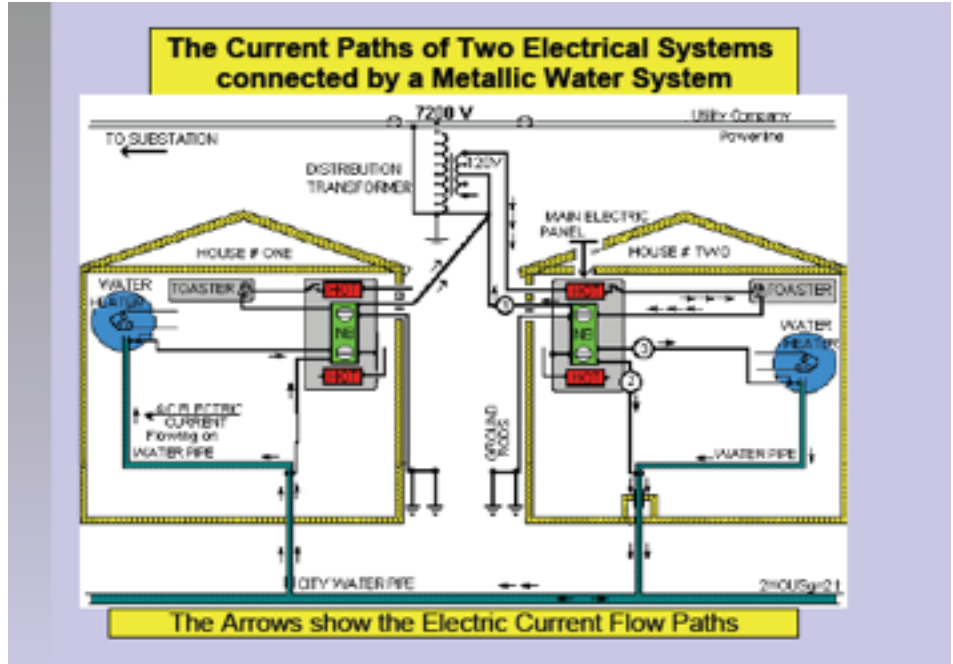
4. Current on grounding system. Enters from  
neighbor's homes on  
incoming water pipes (also  
on cable TV line – parallel  
paths)



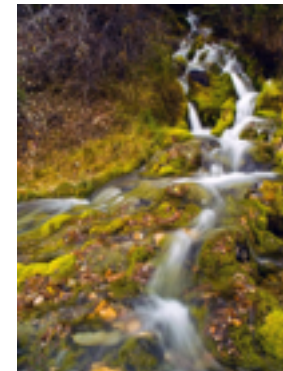
Courtesy Spark Burmaster, EE, BBEC

# Sources of AC Magnetic Field Exposure

- ▶ Electricity takes all available paths
- ▶ Not *only* the path of least resistance
- ▶ Similar to a stream taking all available paths to flow down a mountain



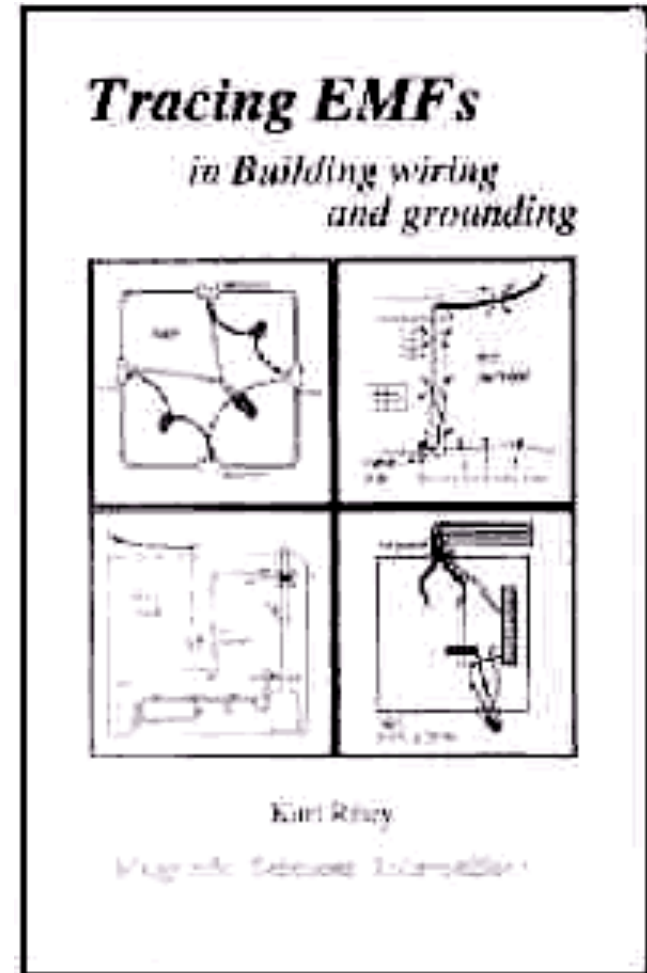
Courtesy Spark Burmaster, EE, BBEC



*Oram Miller, BBEC, EMRS*

# Sources of AC Magnetic Field Exposure

- ▶ Tracing EMFs in Building Wiring and Grounding
- ▶ Karl Riley, 3rd Edition
- ▶ Available from [www.lessemf.com](http://www.lessemf.com)
- ▶ Provided by Southern California Edison EMF Consultants to customers



## Service Drop Configurations



Poor Meter and Panel Location:  
Next to Occupied Space.  
Worse Case: Sleeping Area.



Better: Meter &  
Panel on Garage  
Far Wall.



Best: Meter & First Panel  
Away from House.  
Central Point  
for Feeds to Well  
and Out Buildings.

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Courtesy Spark Burmaster, EE, BBEC

Oram Miller, BBEC, EMRS

# Reduce Magnetic Field Exposure

- ▶ Do not live near high tension power lines
- ▶ Do not sleep near electric meter or breaker panel
- ▶ Do not sleep or sit on other side of refrigerator or TV
- ▶ Current on return path needs to equal current on outgoing path (neutral must stay in same conduit or “raceway” as hot conductor)
- ▶ Current should only flow on intended paths (insulated wires), not on grounding paths (avoid “objectionable” current on ground).

- M. Spark Burmaster, EE, BBEC, and NEC

# Summary of EMFs Basics

- ▶ Flow of current produces magnetic fields
- ▶ Pressure of voltage produces electric fields
- ▶ EMFs found at various frequencies
- ▶ Meters and instruments used as detectors
- ▶ Can cause health problems
- ▶ Design home and office to avoid EMFs in first place

# Summary of Steps to Reduce EMFs Magnetic Fields

- ▶ Keep current on intended paths: insulated hot and neutral conductors within circuits
- ▶ Keep current off grounding paths: water pipes, TV cable sheathing
- ▶ Check for wiring errors prior to occupancy
- ▶ Avoid proximity to point sources: breaker panel, refrigerator, transformer, digital clock at front of stove
- ▶ Do not build on property near power lines

# Summary of Steps to Reduce EMFs Electric Fields

- ▶ Metal clad circuits (Flex or EMT) in and around bedrooms
- ▶ Shut off switch for outlets within 6-8 feet of bed
- ▶ With Romex circuits, use remote shut off switch for circuits
- ▶ Rewire lamps with shielded cord (MuCord)
- ▶ Move unshielded cords away from you at computer desk
- ▶ Use three-pronged, grounded AC power cords for laptops

# Summary of Steps to Reduce EMFs Radio Frequencies

- ▶ Reduce Use
- ▶ Increase distance
- ▶ Favor hardwired connections for Internet, telephone, media, security system, speaker, thermostat, intercom, & baby monitor connections
- ▶ Opt out of smart meters or use shielding
- ▶ Half mile to three-quarters of mile from most cell towers
- ▶ Incorporate shielding when necessary

# Summary of Steps to Reduce EMFs Dirty Electricity

- ▶ Replace CFLs with traditional light bulbs or LED bulbs
- ▶ Prefer straight on/off switches to dimmers
- ▶ Central control system dimmers (Lutron, Crestron) more clean than off-the-shelf dimmers
- ▶ Avoid ECM variable speed HVAC motors
- ▶ Replace smart utility meter with analog meter

# Create Healthy Homes

Oram Miller, BBEC, EMRS

West Los Angeles, California

310.720.7686

[www.createhealthyhomes.com](http://www.createhealthyhomes.com)