

# EMF Evaluations in Home Inspecting

Inspection Universe  
Orlando, Florida

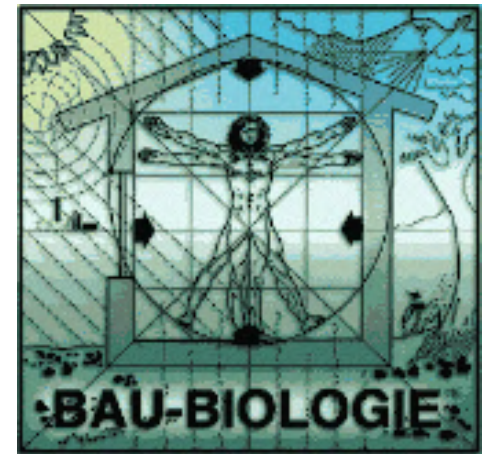
March 15, 2016

Oram Miller, BBEC, EMRS  
Certified Building Biology Environmental Consultant,  
Electromagnetic Radiation Specialist

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

# Source of this Knowledge: Building Biology® Profession

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



# Seminars on EMR from International Institute for Building Biology

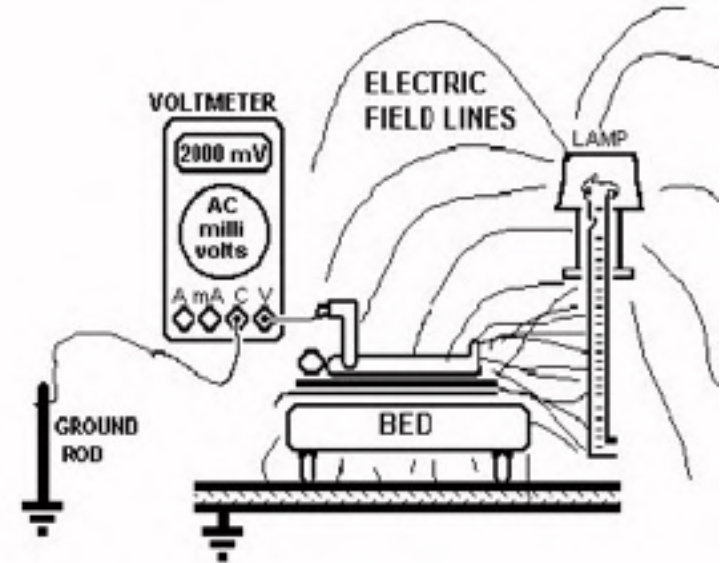
- ▶ Basic Electromagnetic Radiation (EMR) Seminar, 212, August 16-21, 2016, Santa Fe, New Mexico
- ▶ Advanced EMR Seminar 312, December 1-5, 2016, Santa Fe, NM (held every two years—next one after this year will be in December 2018)
- ▶ Building Physics, Building Biology Principles and Natural Building Materials Seminar, 213, Feb 29-Mar 4, 2016, Santa Fe, NM
- ▶ Indoor Air and Water Quality Seminar, 211, May 2-6, 2016, Walworth, Wisconsin
- ▶ Sponsored by Institute for Building Biology and Ecology (IBE) [hbelc.org](http://hbelc.org)
- ▶ Contact Michael Conn, IBE Executive Director, Santa Fe, NM at [infopod@buildingbiology.net](mailto:infopod@buildingbiology.net)
- ▶ Each seminar provides 40 CEUs, accepted by InterNACHI, AIA, and ACAC

# Webinars on Reducing Occupant Exposure to EMFs in Residential Construction

- ▶ Six part webinar series presented by the Green Home Institute  
[www.greenhomeinstitute.org](http://www.greenhomeinstitute.org)
- ▶ Hosted by Oram; Presented by Oram and three other Building Biologists
- ▶ Introduction to EMFs, followed by:
- ▶ Separate webinars on each type of EMF in residential construction
- ▶ Free
- ▶ Go to [www.createhealthyhomes.com](http://www.createhealthyhomes.com), then “Oram on the Radio and Video”
- ▶ CEUs in GBCI, AIA (HSW), CGP (NARI/NAHB), AIBD

# Goals of Building Biology®

- ▶ Find and reduce sources of toxicity in the home or office
  - IAQ, EMFs, Outgassing Building Materials
- ▶ Strengthen the client's tolerance to toxic influences outside the home
- ▶ Accomplish this by reducing exposure to household toxins and creating an EMF-free sleeping environment



Courtesy Spark Burmaster, EE, BBEC, EMRS

# 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

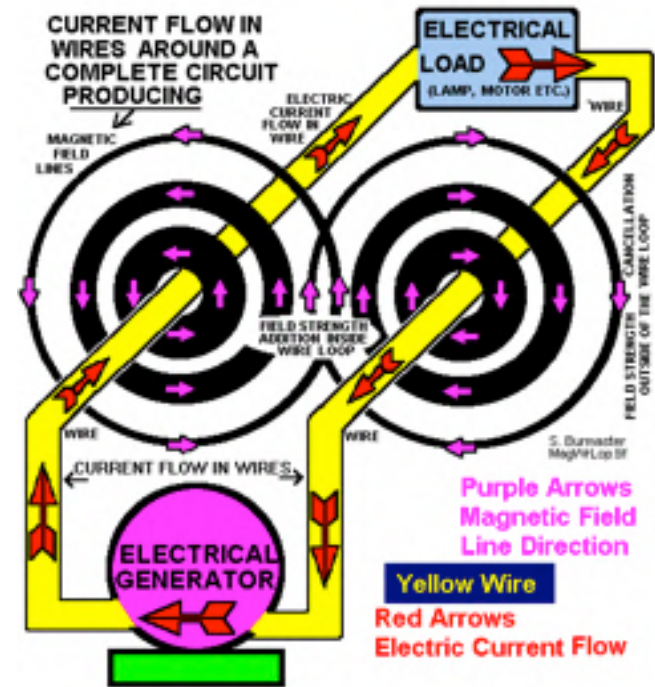
# Building-Related Causes of Ill Health

## 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)

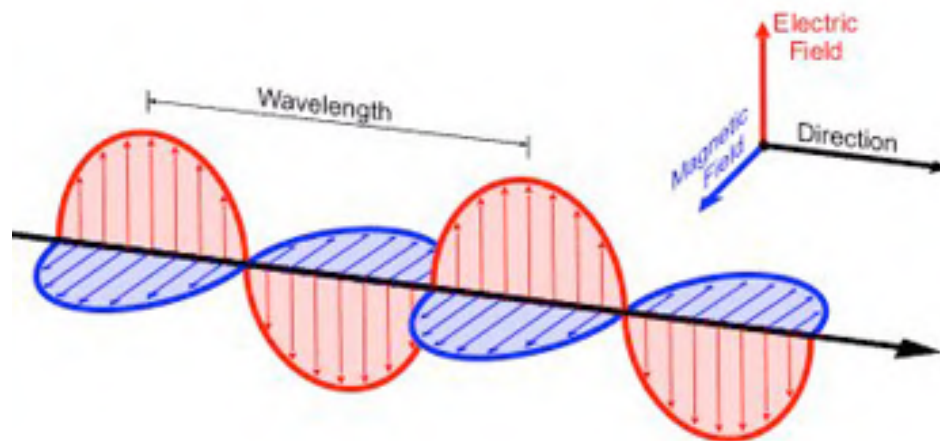


Courtesy Spark Burmaster, EE, BBEC



# Electric & Magnetic Field (EMF) Exposure

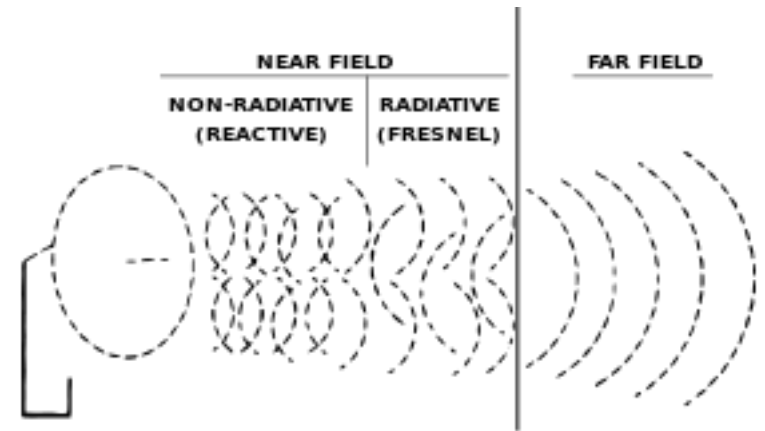
- ▶ AC Electromagnetic Fields are created by alternation of polarity (positive to negative to positive) of AC electricity on electric power lines, circuits and power cords, at 60 times per second
- ▶ The “M” in EMF is the magnetic field component
- ▶ The “E” in EMF is the electric field component
- ▶ 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)

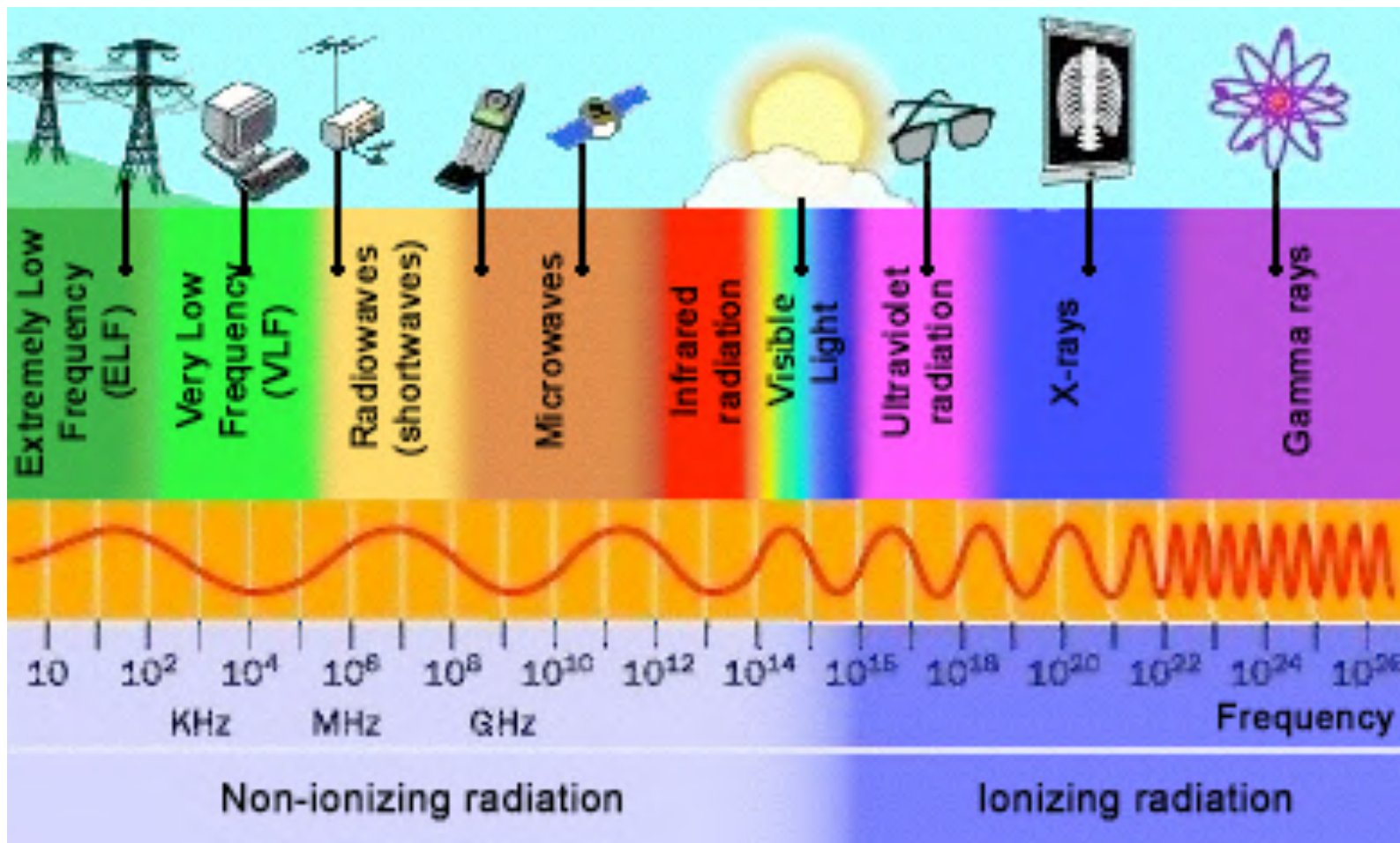
# Electric & Magnetic Field (EMF) Exposure

- ▶ Electric and magnetic fields are coupled in the far field
- ▶ Far field is defined as 3 or more wavelengths from source
- ▶ Within near field, electric and magnetic fields are uncoupled
- ▶ Wavelength for 60 Hz is 3,100 miles — we are always in near field
- ▶ EMFs from house wiring must be measured separately
- ▶ Can have electric field without magnetic field
- ▶ Electric fields are often missed (“unknown EMF”)



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

# Electro-Magnetic Spectrum



[www.astrosurf.com](http://www.astrosurf.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*

# Credible Scientific Research

- ▶ Research on health effects of human exposure to magnetic and electric fields is primarily conducted outside United States (no support for research in US — Industry tries to suppress evidence of harm)
- ▶ Links to abundant research can be found on the following websites:
- ▶ The Swedish Association for the ElectroSensitive <http://www.feb.se/REFERENCES/A.htm>
- ▶ The BioInitiative Working Group <http://www.bioinitiative.org/>
- ▶ The International Commission for Electromagnetic Safety <http://www.icems.eu/>
- ▶ Lloyd Burrell at Electricsense [www.electricsense.com](http://www.electricsense.com)
- ▶ Safe Living Technologies [www.slt.co](http://www.slt.co)
- ▶ Larry Gust, EE, BBEC [www.gustenviro.com](http://www.gustenviro.com)
- ▶ Articles on EMFs, Article on Magnetic Fields [createhealthyhomes.com](http://createhealthyhomes.com)

# Three Main “Deal Breakers” for Purchase of New Home from EMF Perspective

- ▶ 1. Outside overhead power lines — cause high magnetic fields; shielding is ineffective
- ▶ 2. Cell tower in close proximity — shielding can be done but expensive
- ▶ 3. Knob and tube or ungrounded Romex circuits — causes high electric fields and the inability to ground computers and appliances



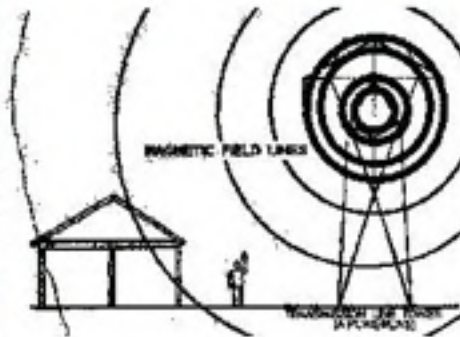


# Remainder of EMFs Can Be Mitigated

- ▶ Other sources of EMFs are common to all homes
- ▶ These can be mitigated — they include:
- ▶ AC Magnetic Field EMFs from wiring errors, electric current on grounding paths (metal water service pipe, TV cable sheathing) and from point sources (transformers and motors)
- ▶ AC Electric Field EMFs from voltage on Romex circuits in sleeping areas, and from daytime use of ungrounded computers
- ▶ Radio frequency EMFs from wireless devices

# COMPARISON OF AC MAGNETIC AND AC ELECTRIC FIELDS

## MAGNETIC FIELDS

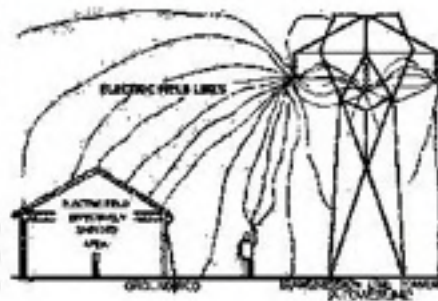


ARE THE ENERGIZATION OF THE SPACE AROUND ELECTRIC CURRENT FLOW

PRODUCED BY  
ELECTRIC  
CURRENT FLOW

DETECTED/ MEASURED BY:  
GAUSSMETER/ AMP METER

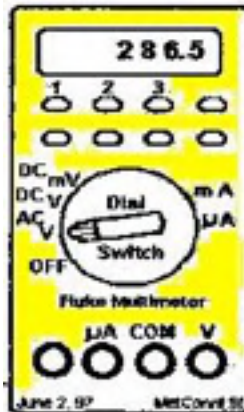
## ELECTRIC FIELDS



ARE THE ENERGIZATION OF THE SPACE BETWEEN VOLTAGE DIFFERENCES

PRODUCED BY  
VOLTAGE

DETECTED/ MEASURED BY:  
VOLT METER



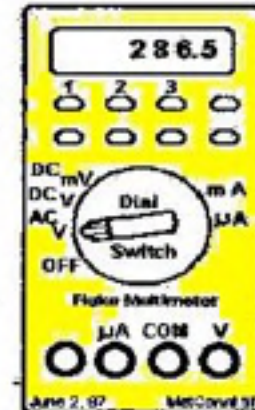
AC Magnetic Field  
Sensor Coil

COM V  
Set Meter Dial Switch  
to AC Volts

AC Electric Current Flow  
Amp Clamp On



Set Meter Dial Switch to Measure  
Amps (mA) (or millamp measurement)

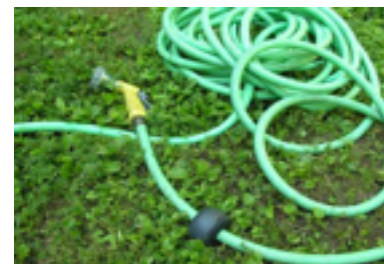


AC Electric Fields:  
Body Voltage  
Probe



Set Meter Dial Switch  
to AC Volts

28-Fs

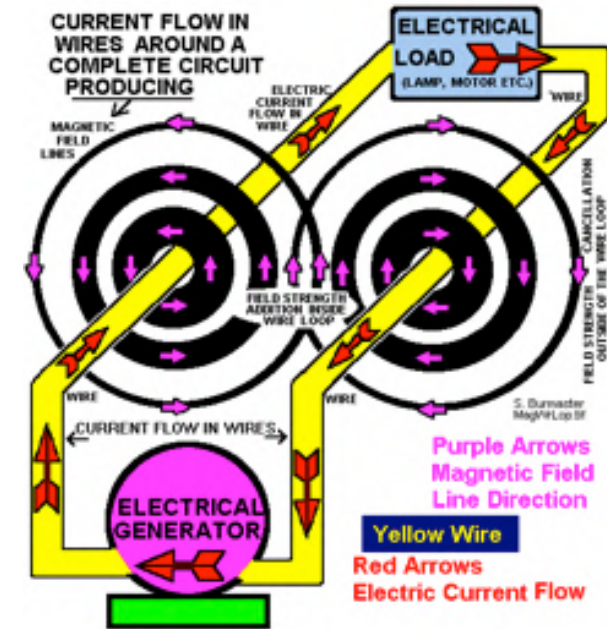


Courtesy  
Spark  
Burmester,  
EE, BBEC, EMRS

Oram Miller, BBEC, EMRS

# AC Magnetic Field Basics

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

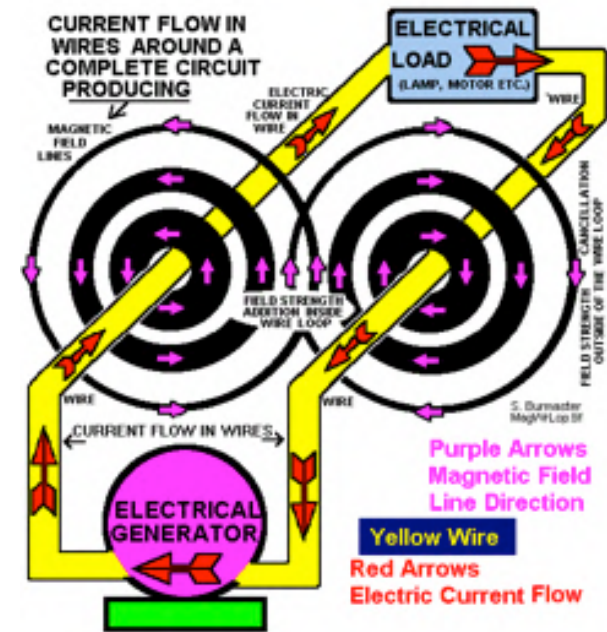


Courtesy Spark Burmaster, EE, BBEC, EMRS

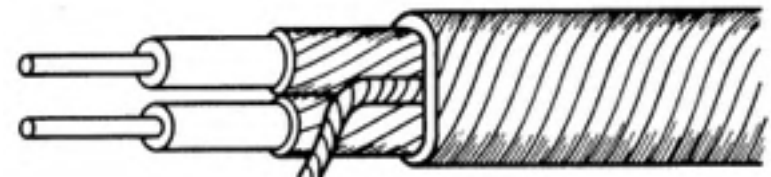


# AC Magnetic Field Basics

- ▶ Field strength decreases with distance from source
- ▶ Extends only 2-4 feet from typical point sources (transformers, motors)
- ▶ Can extend 6-10 feet from current on grounding system or wiring errors
- ▶ Occurs when hot and neutral are separated — overhead power lines, knob and tube circuits
- ▶ Fields are cancelled when wires run together — modern Romex, flex

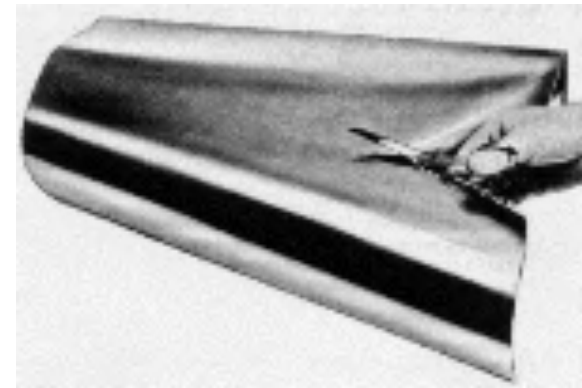


Courtesy Spark Burmaster, EE, BBEC, EMRS



# AC Magnetic Field Basics

- ▶ Shielding is difficult and very expensive
- ▶ Requires special materials, such as Mu Metal [www.lessemf.com](http://www.lessemf.com)
- ▶ Best to eliminate source 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

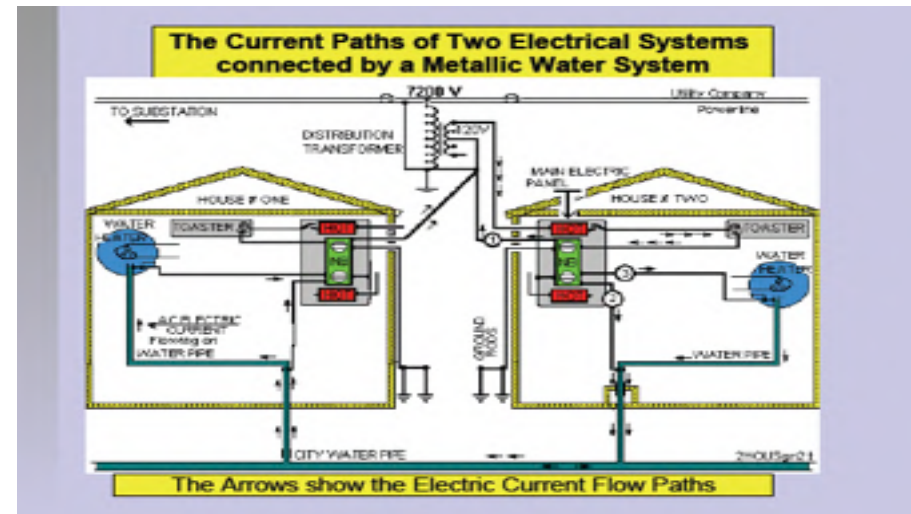


# Sources of AC Magnetic Field Exposure

Major sources in homes (continued):

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

4. Current on grounding system – parallel return paths to transformer. Flows from neighbor's homes on incoming water pipes; also on cable TV line sheathing

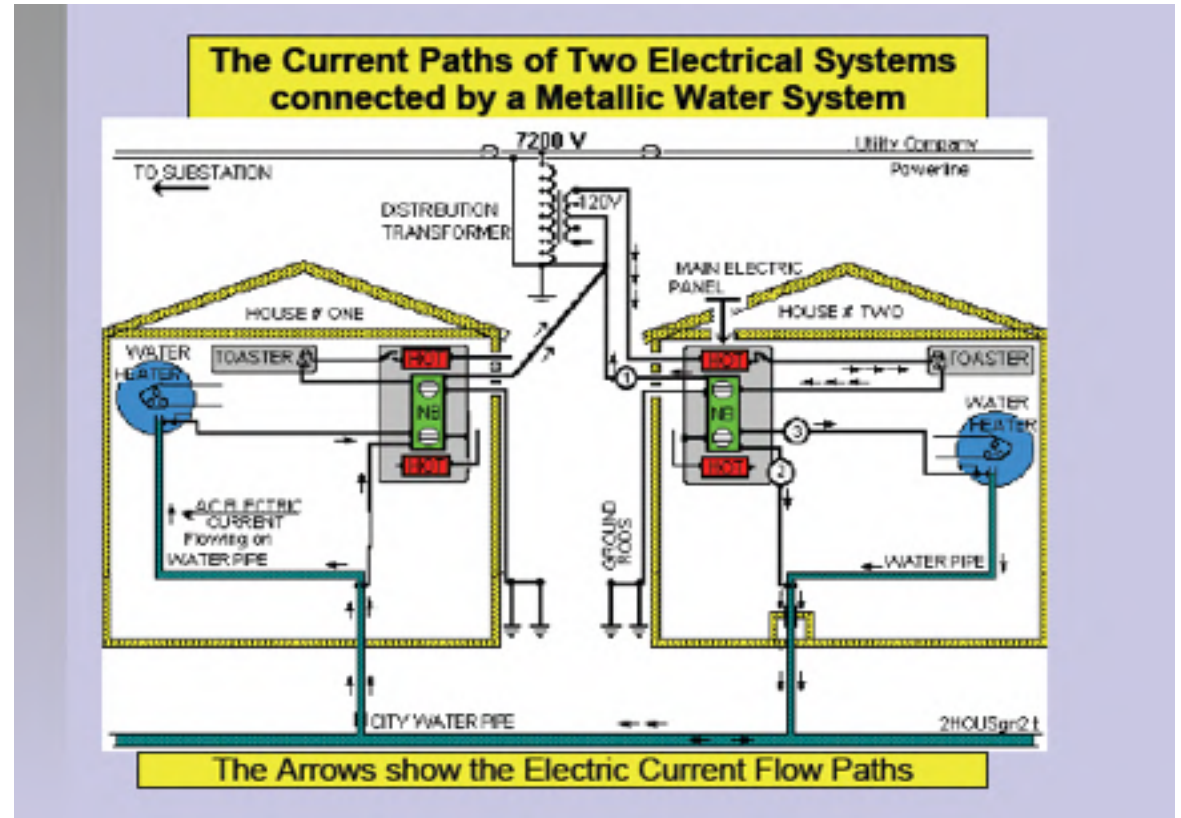
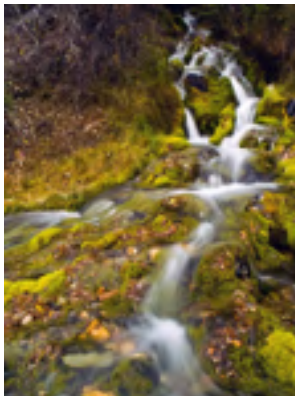


Courtesy Spark Burmaster, EE, BBEC, EMRS

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# 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, EMRS



## 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.

16

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# EMF Meters and Instruments

## Magnetic Fields

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



Single Axis Gauss Meter



Gauss Master



Buzz Stick



Tri-Field Meter  
Flat Response



FW Bell Gauss Meter



Magnii Gauss Meter

# Building Biology Safe Exposure Guidelines for AC Magnetic Fields

Building Biology Evaluation Guidelines for Sleeping Areas,  
SBM-2015

AC Magnetic Fields (Low Frequency, ELF/VLF)

	No Anomaly	Slight Anomaly	Severe Anomaly	Extreme Anomaly
Flux Density in milliGauss (mG)	< 0.2	0.2 - 1	1 - 5	> 5

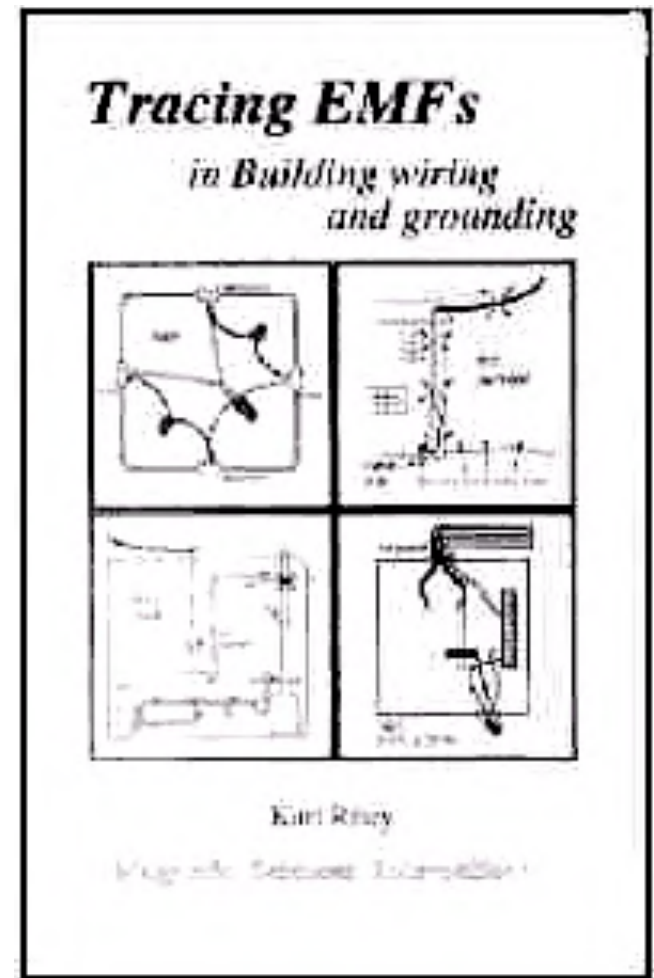


# Neutral-to-Neutral Wiring Errors

- ▶ Violation of National Electric Code:
- ▶ “All conductors of the same circuit — including the neutral and all equipment grounding conductors — must be run in the same raceway, cable tray, trench, cable, or cord”
- ▶ — NEC 301-3(b)
- ▶ “...prohibits connecting a neutral to another neutral such that a parallel return path to the panel is set up, unless the conductors are 1/0 or larger and meet exacting conditions” — NEC 310-4

# Wiring Errors

- ▶ Tracing EMFs in Building Wiring and Grounding, 3rd Edition
- ▶ Written by Karl Riley
- ▶ Available from [www.lessemf.com](http://www.lessemf.com)
- ▶ Also, has produced a 23 minute video for electricians
- ▶ Provided by Southern California Edison EMF Consultants to their customers



# Neutral-to-Neutral Wiring Errors

- ▶ Example would be two or more 12-2 circuits in a junction box
- ▶ Hot conductors are appropriately separated
- ▶ However, neutral conductors of both circuits are grouped together under one wire nut
- ▶ Results in net current and lack of cancellation of magnetic fields on hot and neutral conductors of each circuit to and from breaker panel



Two circuits in one junction box — Neutrals are all grouped together

# Neutral-to-Neutral Wiring Errors

- ▶ Neutral conductors are now properly separated and follow the path of each circuit's hot conductors
- ▶ Neutrals always need to follow hot conductors of their circuit and not be mixed with neutrals of another circuit



Two circuits in one junction box — Neutrals of each circuit are now separated

# Measuring for Wiring Errors

- ▶ Measure for net current with Amp clamp, present on the left
- ▶ Should always be zero Amps
- ▶ Net current clears up when neutrals are properly separated





# Neutral-to-Ground Wiring Errors

- ▶ Two 12-3 circuits in junction box
- ▶ Neutrals incorrectly together on left, producing magnetic field
- ▶ Neutrals properly separated on right, resulting in no net magnetic field



# Neutral-to-Ground Wiring Errors

- ▶ Includes bare ground wire touching neutral screw in outlet
- ▶ Best to tape over hot and neutral contacts on outlets when installing outlets
- ▶ Ground wire mixed with neutral conductors under same wire nut
- ▶ Nick in plastic insulation of neutral as it crosses lip of metal box allows neutral to contact ground



# Neutral-to-Ground Wiring Errors

- ▶ In sub-panel, neutrals and grounds cannot be together
- ▶ Bonding strap or screw must not be connected to neutral bus
- ▶ If connected, some current will flow back to main panel on grounding paths
- ▶ Neutral conductor will have less current than hot conductors, resulting in net current in supply circuit and magnetic fields
- ▶ Remove bonding strap or screw
- ▶ Put grounds on separate bus bar



justanswer.com



hammerzone.com



doityourself.com

# Wiring Errors

- ▶ Unused hot or neutral conductor
- ▶ Current only flows on the one conductor and not both, providing no cancellation
- ▶ Must find where return current flows and restore it on this neutral
- ▶ Often seen when hot is abandoned but neutral is left connected



Neutral conductor not connected to any other conductor in junction box

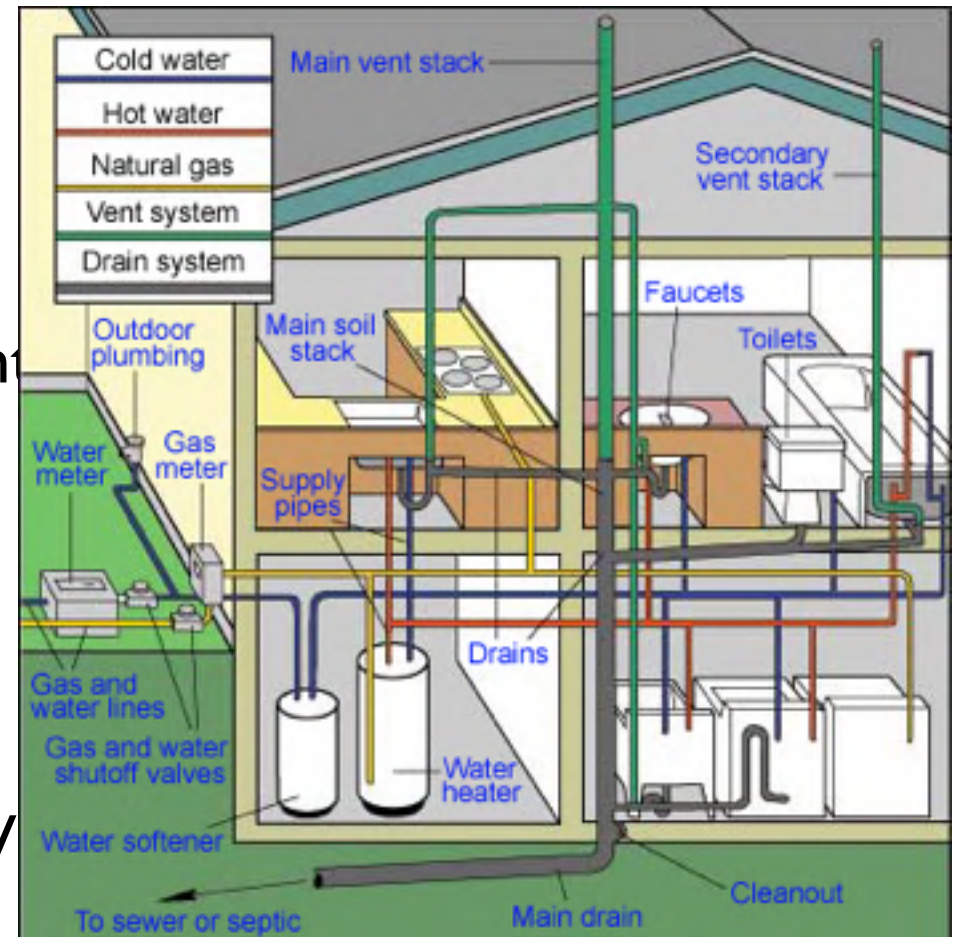
# Screening for Wiring Errors

- ▶ Hold Gauss meter 1-2 feet above light switches and 1-2 feet from wall
- ▶ Measure magnetic field with light off. Should be  $< 1.0$  mG
- ▶ Turn light on. Magnetic field level should not increase
- ▶ If magnetic field increases, likely due to wiring error
- ▶ ARC Fault Breakers will trip if wiring error is present



# Current on Grounding Paths

- ▶ Current should only flow on grounding paths in cases of lightning strike or over-current
- ▶ Current flowing on grounding paths has no cancellation of magnetic field
- ▶ Includes metal water pipes, grounding conductors, cable TV sheathing



# Reduce Magnetic Field Exposure

- ▶ Mitigated with dielectric union in water service supply pipe from street
- ▶ Ground loop isolator can be installed in TV cable from street
- ▶ Represents largest avoidable source of AC magnetic field exposure in homes
- ▶ Use PEX for domestic water lines for same reason



# Reduce Magnetic Field Exposure

- ▶ Do not live near high tension power lines
- ▶ Do not sleep within 4 feet of electric meter (analog or digital) or breaker panel
- ▶ Do not sleep or sit on other side of refrigerator or TV
- ▶ Move transformers and uninterruptible power supply at computer work station 2-3 feet away from your feet and legs
- ▶ 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

*Oram Miller, BBEC, EMRS*



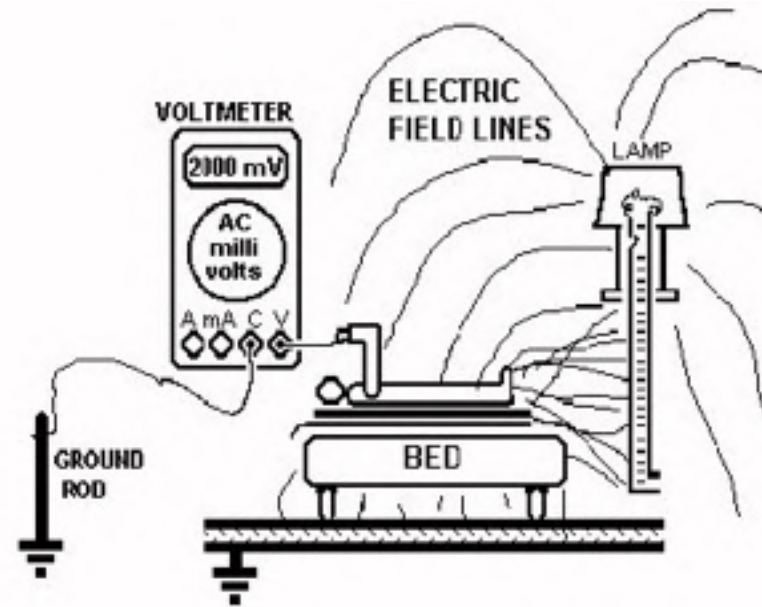
# Reduce Magnetic Field Exposure

- ▶ Transformer for halogen track lighting away from beds or sitting areas
- ▶ Do not sleep over fluorescent light fixtures or fan in ceiling of room underneath
- ▶ No motorized or electric beds without plugging into power strip with on/off switch

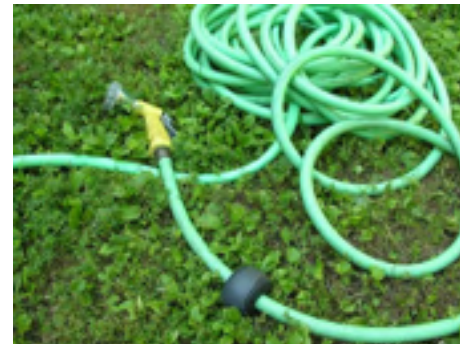


# AC Electric Field Basics

- ▶ 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



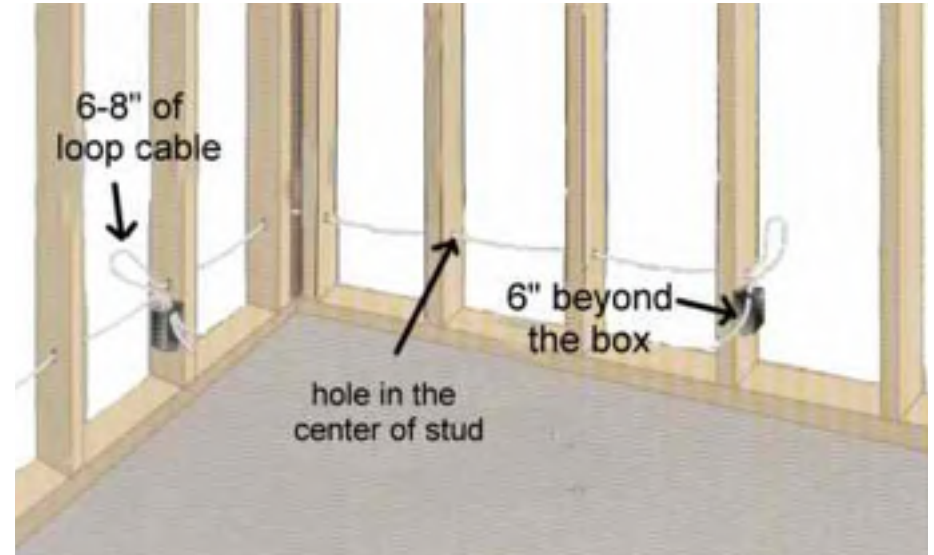
Courtesy Spark Burmaster, EE, BBEC



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# 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)

# Sources of AC Electric Field Exposure

Large electric field exposure from:

1. Electric blankets
2. Electric heating pads
3. Water bed heaters

Fields are present even when these devices are turned off but plugged in

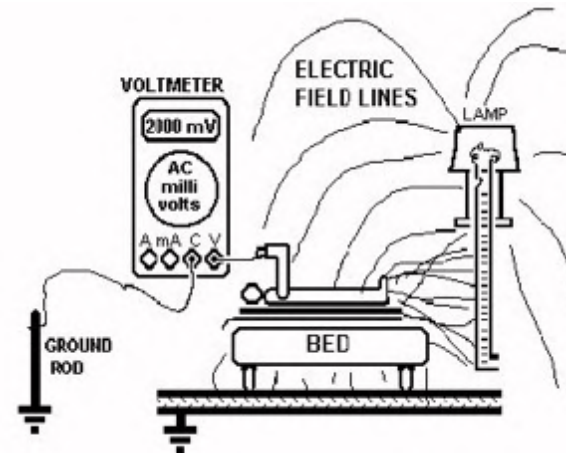


# EMF Meters and Instruments

## Electric Fields

- ▶ Body Voltage Meter
- ▶ Hand-held Meter
- ▶ See EMF Meters and Instruments

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



Courtesy Spark Burmaster, EE, BBEC



Body Voltage Meters



Hand-held Meters

*Oram Miller, BBEC, EMRS*



# Building Biology Safe Exposure Guidelines for AC Electric Fields

Building Biology Evaluation Guidelines for Sleeping Areas,  
SBM-2015

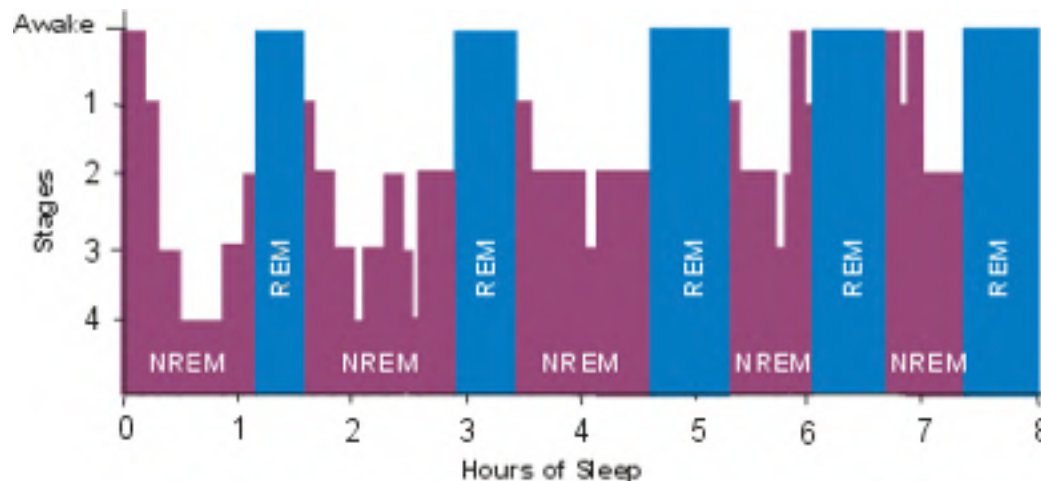
AC Electric Fields (Low Frequency, ELF/VLF)

	No Anomaly	Slight Anomaly	Severe Anomaly	Extreme Anomaly
Field Strength potential-free in Volt per meter (V/m)	< 0.3	0.3 - 1.5	1.5 - 10	> 10
Body Voltage with ground potential in milliVolt (mV)	< 10	10 - 100	100 - 1,000	> 1,000



# 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

# Comments from Clients

- ▶ “My wife and I have not slept this soundly since we moved in!! ... I sleep undisturbed until 6:30 or 7 AM without interruption.”  
– j.r., North Tustin
- ▶ "I'm sleeping better. I used to wake up 5-7 times a night. Now I wake up maybe once, and sometimes not at all... My husband's sleeping better, too. Seems to be a big difference.”  
– n.j., Santa Ana
- ▶ "We slept so good. We shut off all necessary (marked) breakers. Just like you said, it felt like we were camping.”  
– d.b., Long Beach

# Reduce Electric Field Exposure — Plastic Romex Circuits in Walls

- ▶ Create an electrically clean sleeping environment
- ▶ If plastic-jacketed Romex circuits are in walls and floor, electric fields will extend 6-8 feet from circuits into bedroom
- ▶ Create zone without electric fields around, above, and below each bed
- ▶ Determine which circuit breakers to shut off by following protocol on EMF Meters and Instruments page at [createhealthyhomes.com](http://createhealthyhomes.com), in section on Electric Fields
- ▶ Remote shut-off switch and contactor can be installed to turn off circuits from bedroom



hdimagegallery.net

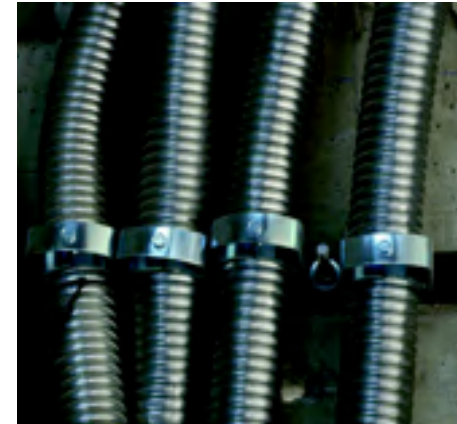


safelivingtechnologies.com

*Oram Miller, BBEC, EMRS*

# Reduce Electric Field Exposure — Metal-Clad Circuits in Walls

- ▶ Create an electrically clean sleeping environment
- ▶ If walls contain flexible steel or aluminum MC (metal clad) or rigid (EMT) conduits, there will not be any electric fields in the room
- ▶ You do not need to shut off breakers
- ▶ Use plug-in switches, shielded power strip
- ▶ Rewire lamps, appliances with shielded AC power cord (Mu Cord)



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



# Reduce Electric Field Exposure

- ▶ Avoid electric blankets and electric heating pads (watch for reverse polarity on non-polarized plug)
- ▶ Use battery-operated clocks
- ▶ Laptop AC power cords and refrigerator AC power cords both must be 3-pronged and outlets must be properly grounded



wurchelectric.com

# Reduce Electric Field Exposure

## Earthing Pad

- ▶ Thousands of testimonials from satisfied customers
- ▶ Brings beneficial negative ions from earth up to body (“earthing” versus “grounding”)
- ▶ However, shunts man-made electric fields to earth through your body from circuits in walls & AC cords
- ▶ This is a problem for electrically-sensitive people, as voltage runs through their body, even though “body voltage” meter shows low levels
- ▶ Best to reduce electric field exposure levels in bedroom first by shutting off circuits, then add earthing pad



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

# 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:



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

## Three-pronged plug:



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



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

# 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)

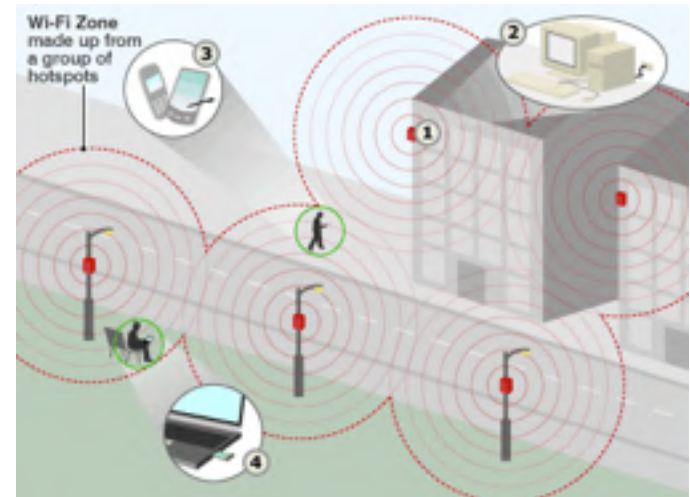


[shop.accessory4you.com](http://shop.accessory4you.com)

*Oram Miller, BBEC, EMRS*

# 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 Outside Home

- ▶ Radio and TV broadcast towers
- ▶ Cell phone antennas
- ▶ City-wide Wi-Fi
- ▶ Wi-Fi routers in neighbors' homes and businesses



# Sources of Radio Frequency Field Exposure Inside Home

- ▶ 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 Inside Home

- ▶ Tablets
- ▶ e-Readers
- ▶ Smart Electric Meters



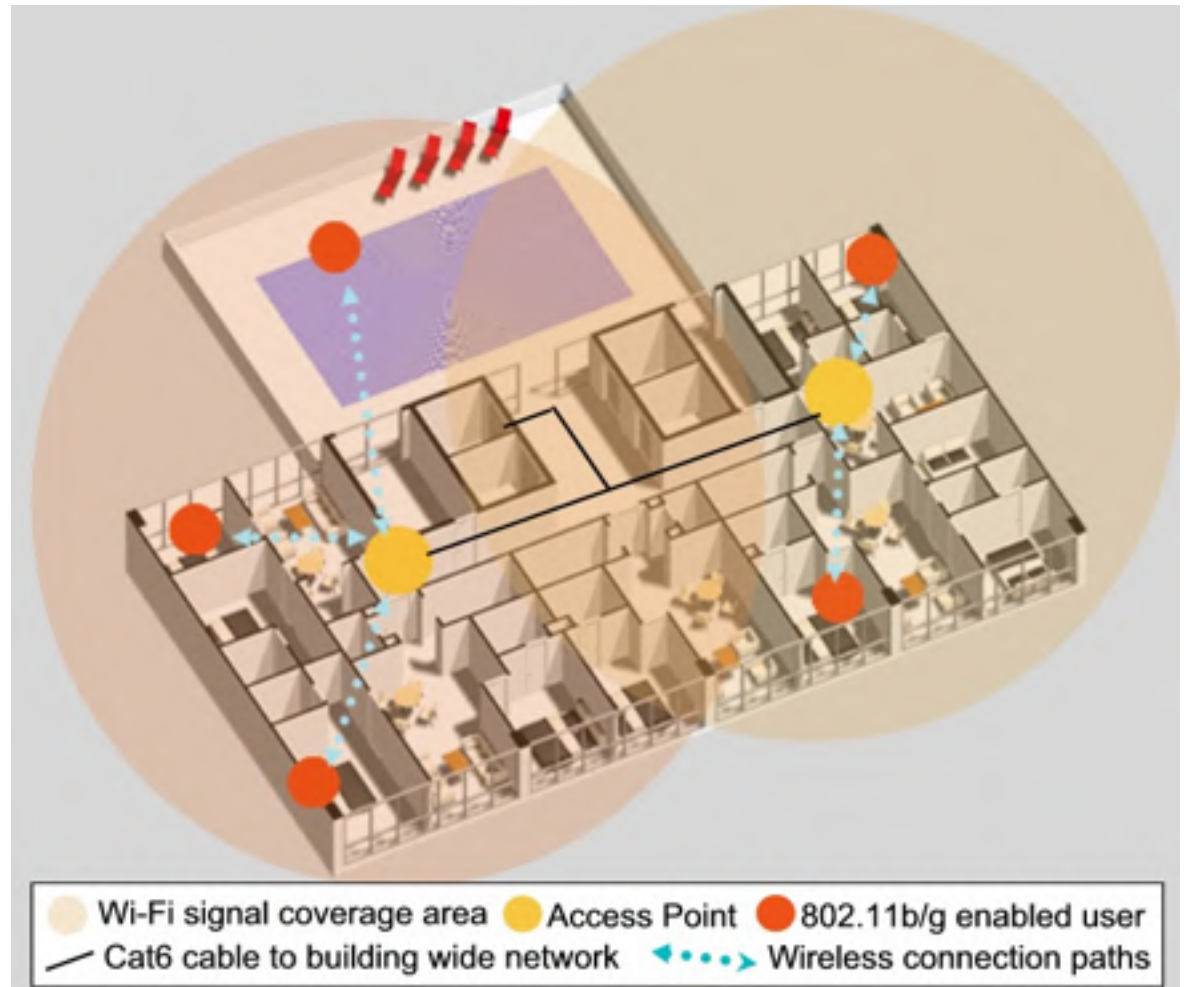
[www.nickolexie.en.busytrade.com](http://www.nickolexie.en.busytrade.com)



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

# Sources of Radio Frequency Field Exposure Inside Home and Office

Exposure from Wi-Fi router “nodes”



# EMF Meters and Instruments

## Radio Frequency (RF) Fields

- ▶ Hand-held Meters
- ▶ Pay attention to frequency range
- ▶ See EMF Meters and Instruments [www.createhealthyhomes.com](http://www.createhealthyhomes.com)



Cornet RF Meter



Gigahertz Solutions HF35C



3-Axis RF Meter



# 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.

# French Government Restricts Wi-Fi

Features of the new legislation, enacted January 29, 2015:

- ▶ Banning of Wi-Fi in all daycare centers and nurseries for children under 3 years of age
- ▶ All Wi-Fi must be disabled on routers in grade school classrooms when not in use (they emit RF on standby)
- ▶ Prohibits cell phone advertising targeting children under 14
- ▶ Establishes “a precautionary approach addressing the potential health risks of radio frequencies”
- ▶ Prior notice to mayors of cell tower placement (allows citizen input—*not* allowed in the US for health reasons)

# 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 on Human Health from Exposure to Radio Frequencies 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 a 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)

Oram Miller, BBEC, EMRS



# Actions by European Governments in Response to Original Bio-Initiative Report

“EU calls for urgent action on wi-fi radiation” – The New Zealand Herald, 9/16/07

- “Europe's top environmental watchdog is calling for immediate action to reduce exposure to radiation from Wi-Fi, mobile phones and their masts (towers). It suggests that delay could lead to a health crisis similar to those caused by asbestos, smoking and lead in petrol.”



# “Council of Europe calls for dramatic reduction in EMF exposure”

“Non-ionizing frequencies... appear to have more or less potentially harmful, non-thermal, biological effects on... the human body, even when exposed to levels that are below the official threshold values...

“There could be extremely high human and economic costs if early warnings are neglected...

“Take all reasonable measures to reduce exposure to electromagnetic fields...

“Reconsider the scientific basis for the present standards on exposure to electromagnetic fields...



Council of Europe

# “Council of Europe calls for dramatic reduction in EMF exposure”

“Put in place information and awareness-raising campaigns on the risks of potentially harmful long-term biological effects...”

“Encourage research to develop telecommunication based on other technologies...”

“Pay particular attention to ‘electrosensitive’ people who suffer from a syndrome of intolerance to electromagnetic fields and introduce special measures to protect them, including the creation of wave-free areas not covered by the wireless network...”

“Undertake appropriate risk-assessment procedures for all new types of device prior to licensing...”



Council of Europe

# “Council of Europe calls for dramatic reduction in EMF exposure”

“Introduce clear labeling indicating the presence of... electromagnetic fields, the transmitting power or the specific absorption rate (SAR)... and any health risks connected with its use...”

“Recommend the use of wired, fixed telephones at home...”

“For children in general, and particularly in schools and classrooms, give preference to wired Internet connections...”

“Pay heed to and protect ‘early warning’ scientists...”

“Increase public funding of independent research...”

- Adopted May 2011



Council of Europe

# Covered by Major Newspapers in London

“Ban mobile phones and wireless networks in schools, say European leaders”

- London Telegraph, May 14, 2011

<http://www.telegraph.co.uk/technology/mobile-phones/8514380/Ban-mobile-phones-and-wireless-networks-in-schools-say-European-leaders.html>

## The Telegraph

Home Video News World Sport Finance Comment Culture Travel Life Women Fashion  
Apple iPhone Technology News Technology Companies Technology Reviews Video Games Technology

HOME » TECHNOLOGY » MOBILE PHONES

### Ban mobile phones and wireless networks in schools, say European leaders

Mobile phones and computers with wireless internet connections pose a risk to human health and should be banned from schools, a powerful European body has ruled.

f 5K t 578 p 3 in 11 S 5K Email



Print this article

#### Mobile Phones

News » Science »  
Science News »  
Technology »  
Education News »



# “World Health Organization Classifies RF EMFs as Possible Cancer Risk”

- ▶ Resolution by the International Agency on Research on Cancer (IARC), May 31, 2011
- ▶ Reversal of previous position that cell phones were safe
- ▶ Exposure to wireless devices now "possibly" carcinogenic, Category 2(b)
- ▶ Similar to gasoline and DDT

International Agency for Research on Cancer

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# Interphone Study Group

“...the results will still only be **partial results**, publishing the data on gliomas and meningiomas but not the other tumor types studied...”

“Data collected on the 1,100 acoustic neuromas and 400 parotid gland tumors, or tumors that are closest to the ear, **will not be included** in the results...” (emphasis added)

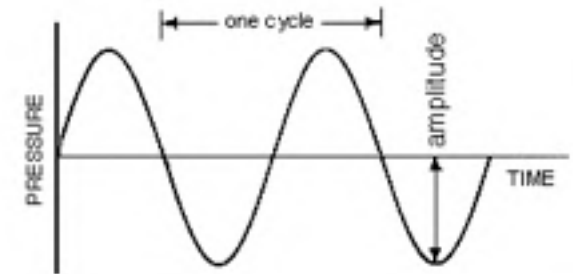
– International EMF Collaborative Advisory on  
Forthcoming Interphone Brain Tumor Study  
[www.electromagnetichealth.org](http://www.electromagnetichealth.org), May 13, 2010

Electromagnetic  
Health.org

# Radio Frequency Field Exposure

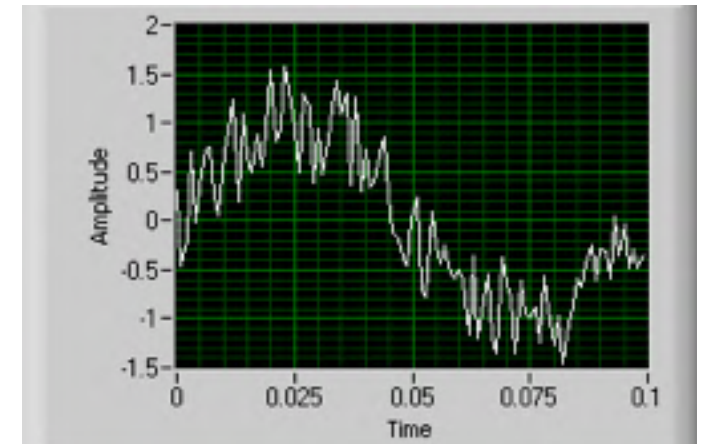
Harm comes from:

- ▶ Frequency
- ▶ Power Output
- ▶ Distortion of Waveform
- ▶ Smooth analog wave form is best
- ▶ Pulsed digital frequencies interfere with biological functions
- ▶ Effects are cumulative



[www.sfu.ca](http://www.sfu.ca)

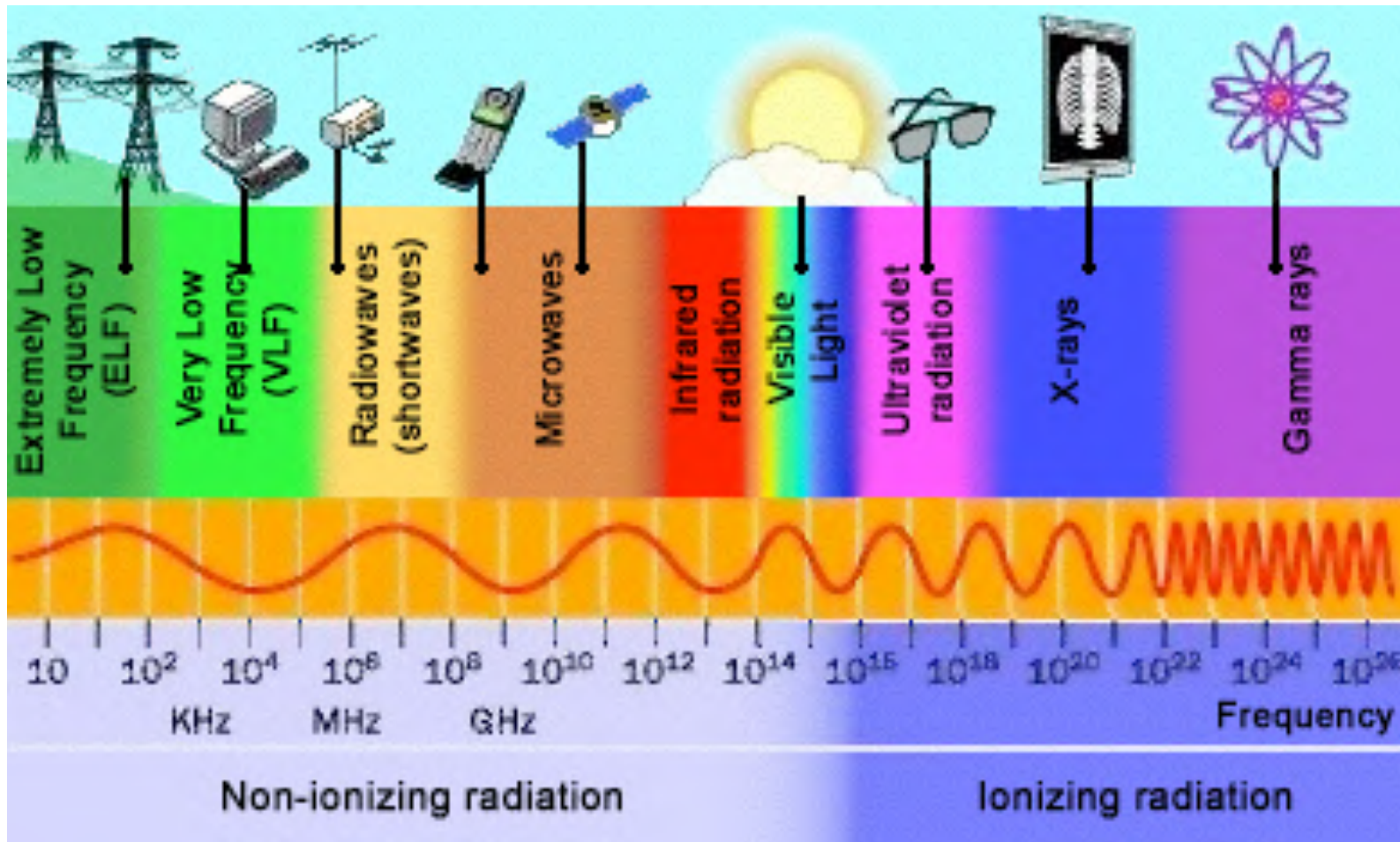
Smooth Analog Signals –  
Well Tolerated



Zone.ni.com

Pulsed Digital Signals –  
Not Well Tolerated

# Electro-Magnetic Spectrum



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

# “Membrane Sensitivity Syndrome”

## Dr. George Carlo

Four biological “effect windows” on human health:

1. Ionizing Radiation: X-rays, gamma rays and cosmic rays at  $10^{22}$ - $10^{24}$  Hz – breaks DNA bonds, but has safe exposure level
2. Electric Fields and Magnetic Fields at 60 Hz – causes headaches, insomnia, chronic fatigue, fibromyalgia, but has safe exposure level
3. Carrier Wave Frequencies of wireless devices in microwave range at 800 Mz - 5.8 GHz – causes thermal (heating) effects on cells, but has safe exposure level (SAR)
4. “Information-carrying radio waves” at low frequencies (16 Hz & 219-230 Hz) – causes athermal, non-heating biological effects on cell membrane and DNA

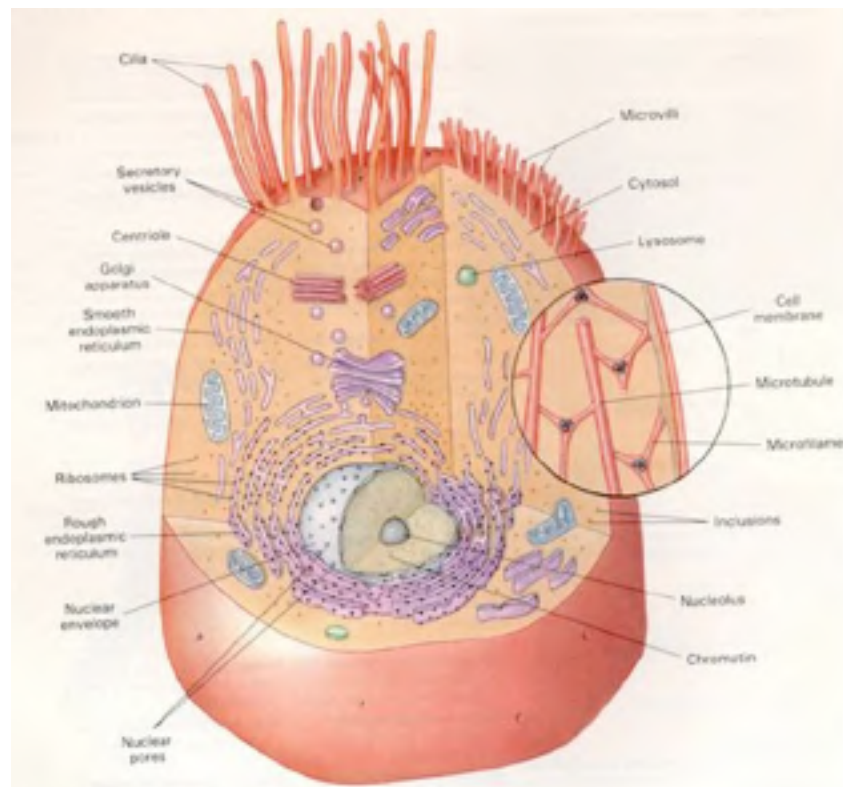
**No safe exposure limits** to effects of information carrying radio waves

**Non-thermal, biological effects are cumulative**

# “Membrane Sensitivity Syndrome”

## Dr. George Carlo

Cell membrane affected by low-frequency EMFs



<http://homepages.cwi.nl/~gollum/SiC/PICT/CELL.jpg>

# Health Effects of Radio Frequency (RF) Field Exposure

“In the past twelve years there have been hundreds of studies showing these non-thermal effects:

- ▶ DNA damage and non-repair
- ▶ Opening of the blood-brain barrier (toxins enter)
- ▶ Lowered immunity
- ▶ Decreased melatonin levels
- ▶ Effects on stress proteins (indicating cell damage)
- ▶ Formation of micro-nuclei (markers for cancer)
- ▶ Changes in calcium metabolism
- ▶ Changes in brainwave patterns seen on EEG”

— Margaret Meade Glaser, EMR Network



# Health Effects of Radio Frequency (RF) Field Exposure

Types of cancer linked to cell phone use:

- ▶ Glioma (Brain Cancer)
- ▶ Acoustic Neuroma (tumor on acoustic nerve)
- ▶ Meningioma (tumor of the meninges)
- ▶ Salivary Gland cancer (parotid gland in cheek)
- ▶ Eye Cancer
- ▶ Testicular Cancer
- ▶ Leukemia
- ▶ Thyroid Cancer
- ▶ Breast Cancer

— Children's Health Expert Panel, Stonington, CT, June 28, 2013

# Health Effects of Radio Frequency (RF) Field Exposure

## Research on cancer–cell phone link

- ▶ Children and teenagers five times more likely to develop brain cancer if they use mobile phones – Professor Lennart Hardell, University Hospital, Orebro, Sweden
- ▶ Brain cancer increasing past ten years, particularly among 20-29 year olds – Dr. Ronald Herberman
- ▶ Cell phone radiation can cause DNA breaks – Science
- ▶ Ten or more years cell phone use doubles glioma risk – Interphone Study
- ▶ Cell phones related to increased brain tumors, genotoxicity, childhood leukemia, and adult cancers – Bioinitiative 2012 Report

# Health Effects of Radio Frequency (RF) Field Exposure

“What Americans need to know, and are not being told, is that three out of four independent (non-industry sponsored) research studies worldwide are showing biological effects from low-level, non-ionizing radiation similar to that used in wireless communications. These are called ‘nonthermal’...The telecom industry, and the FCC’s safe exposure guidelines, recognize only thermal ‘heating’ effects. That means that exposure at intensity (power) levels below that threshold are officially being considered ‘safe’ while the research is suggesting otherwise.”

— Margaret Meade Glaser, EMR Network



# FCC Compared to 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 $\mu$ W/m <sup>2</sup>
0.000.000,1 mW/cm <sup>2</sup>	1 $\mu$ W/m <sup>2</sup>
0.000,001 mW/cm <sup>2</sup>	10 $\mu$ W/m <sup>2</sup>
0.000,01 mW/cm <sup>2</sup>	100 $\mu$ W/m <sup>2</sup>
0.000,1 mW/cm <sup>2</sup>	1,000 $\mu$ W/m <sup>2</sup>
0.001 mW/cm <sup>2</sup>	10,000 $\mu$ W/m <sup>2</sup>
0.01 mW/cm <sup>2</sup>	100,000 $\mu$ W/m <sup>2</sup>
0.1 mW/cm <sup>2</sup>	1,000,000 $\mu$ W/m <sup>2</sup>
<b>1.0 mW/cm<sup>2</sup></b>	<b>10,000,000 <math>\mu</math>W/m<sup>2</sup></b>
10 mW/cm <sup>2</sup>	100,000,000 $\mu$ W/m <sup>2</sup>
100 mW/cm <sup>2</sup>	1,000,000,000 $\mu$ W/m <sup>2</sup>
1,000 mW/cm <sup>2</sup>	10,000,000,000 $\mu$ W/m <sup>2</sup>
10,000 mW/cm <sup>2</sup>	100,000,000,000 $\mu$ W/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

<http://www.powerwatch.org.uk/science/intguidance.asp>

Oram, Miller, BBEC, EMRS

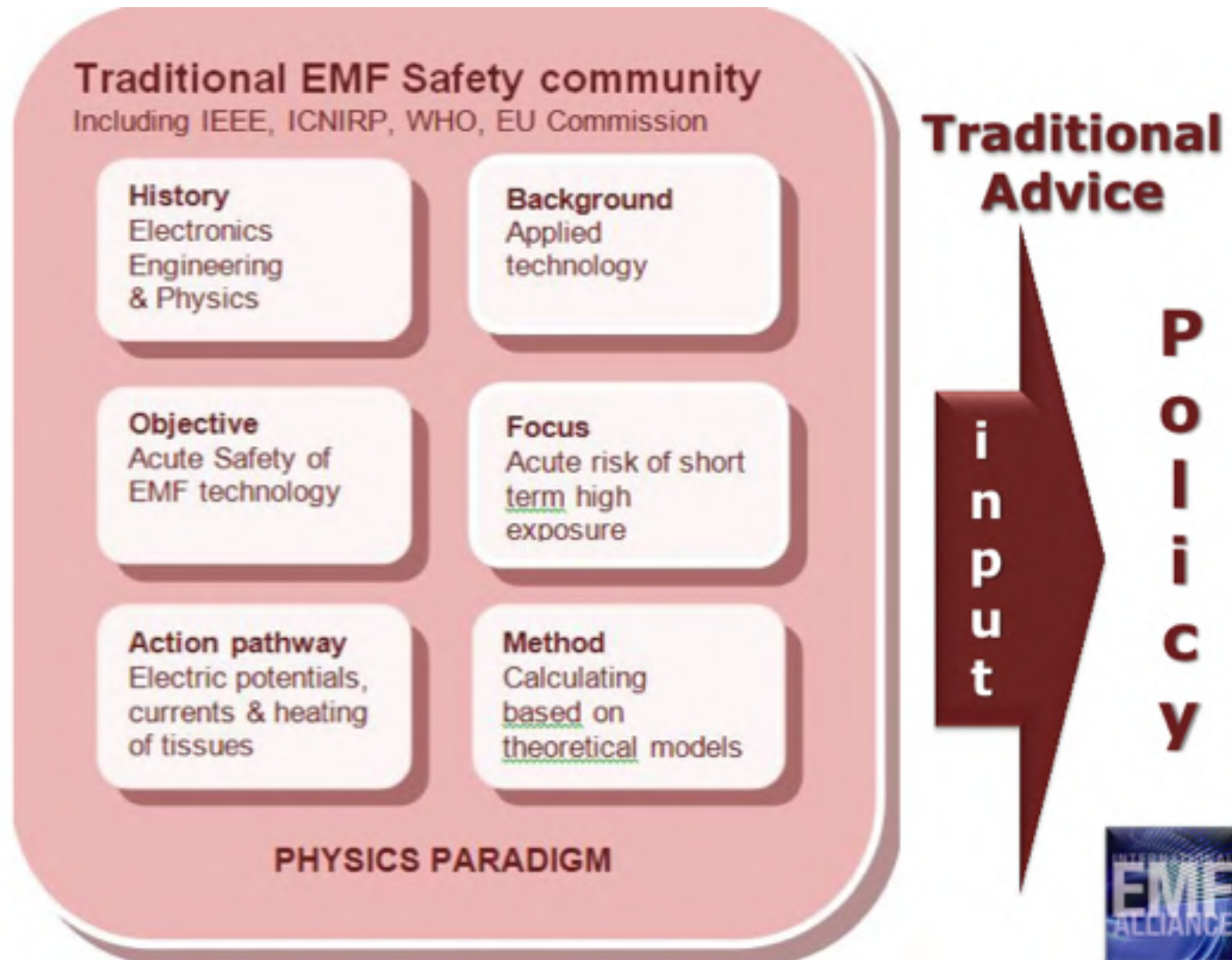
# Building Biology Safe Exposure Guidelines for RF

Building Biology Evaluation Guidelines for Sleeping Areas,  
SBM-2008, Page 1

Radiofrequency Radiation (High Frequency, Electromagnetic  
Waves)

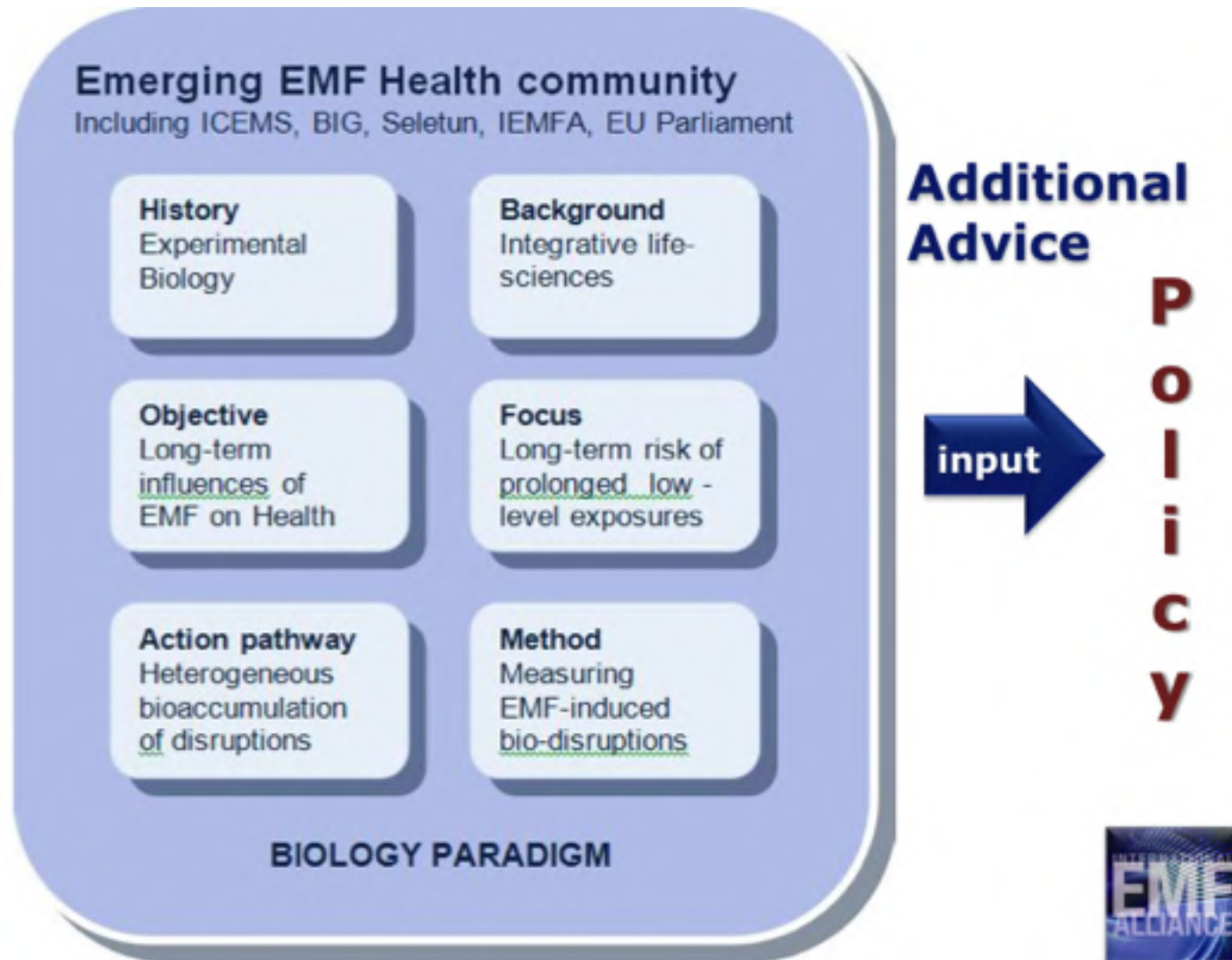
	No Anomaly	Slight Anomaly	Severe Anomaly	Extreme Anomaly
Power Density in microWatts/meter squared ( $\mu\text{W}/\text{m}^2$ )	< 0.1	0.1 - 10	10 - 1,000	> 1,000

# 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 cause biological 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 EMF” 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 Outside

- ▶ Look up location of cell 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 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





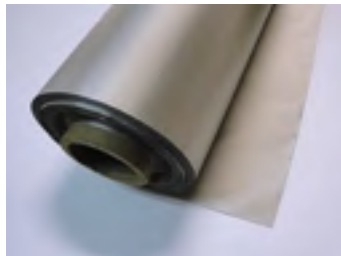
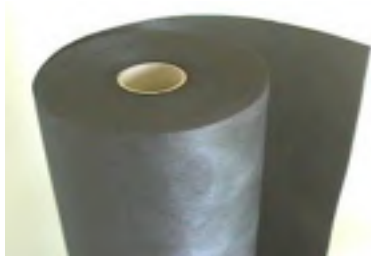
# Protect Yourself from Harmful Radio Frequency Field Exposure

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)

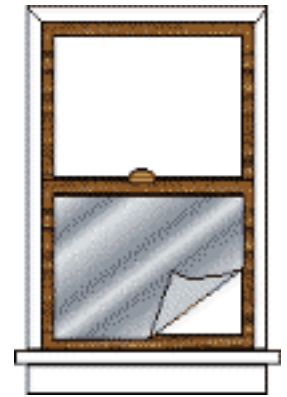
▶ [www.safelivingtechnologies.com](http://www.safelivingtechnologies.com)



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 Greenwave or Stetzer Filters (repair wiring errors first)



# Summary of EMF 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

# Seminars on EMR from International Institute for Building Biology

- ▶ Basic Electromagnetic Radiation (EMR) Seminar, 212, August 16-21, 2016, Santa Fe, New Mexico
- ▶ Advanced EMR Seminar 312, December 1-5, 2016, Santa Fe, NM (held every two years—next one after this year will be in December 2018)
- ▶ Building Physics, Building Biology Principles and Natural Building Materials Seminar, 213, Feb 29-Mar 4, 2016, Santa Fe, NM
- ▶ Indoor Air and Water Quality Seminar, 211, May 2-6, 2016, Walworth, Wisconsin
- ▶ Sponsored by Institute for Building Biology and Ecology (IBE) [hbelc.org](http://hbelc.org)
- ▶ Contact Michael Conn, IBE Executive Director, Santa Fe, NM at [infopod@buildingbiology.net](mailto:infopod@buildingbiology.net)
- ▶ Each seminar provides 40 CEUs, accepted by InterNACHI, AIA, and ACAC

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