

Well Wired For Health: Electrical Hygiene & Safety

A Green Life or Green Lie?
The Bio-Science of Creating Healthy Spaces

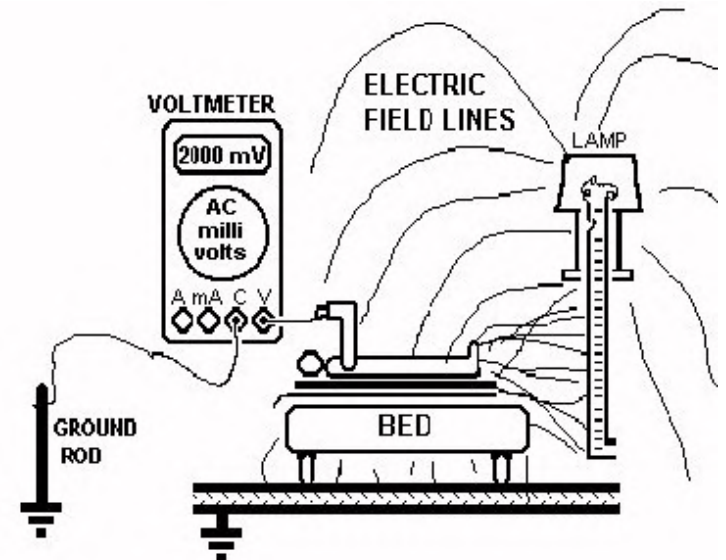
October 28, 2017

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

www.createhealthyhomes.com

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 when 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:

- ▶ 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
- ▶ Always have a balance between sources of EMF toxicity versus diet, heredity, stress levels, healing modalities

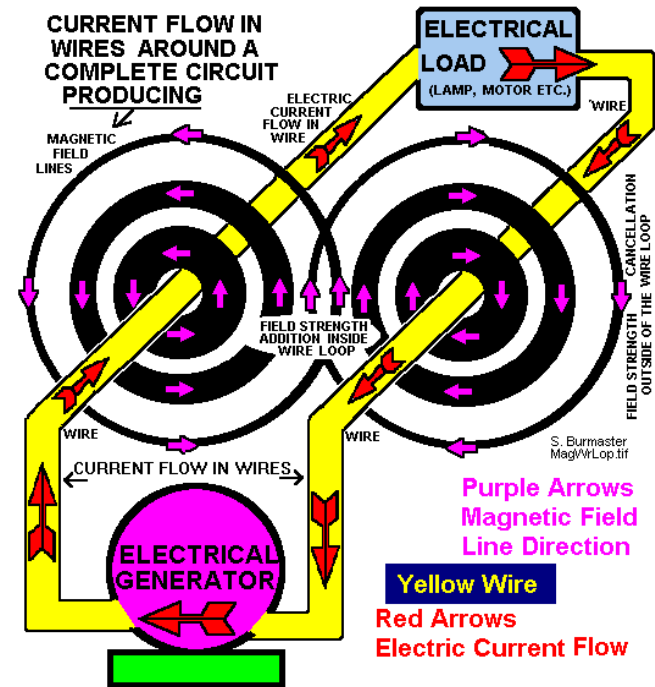
Building-Related Causes of Ill Health

Among the General Public:

- ▶ Only 3-5% are known to be electrically hypersensitive (EHS)
- ▶ Yet, up to one third are estimated to be symptomatic from chronic exposure to EMFs
- ▶ *Everyone* has cellular damage from wireless 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 three chances

Four types of “EMFs”

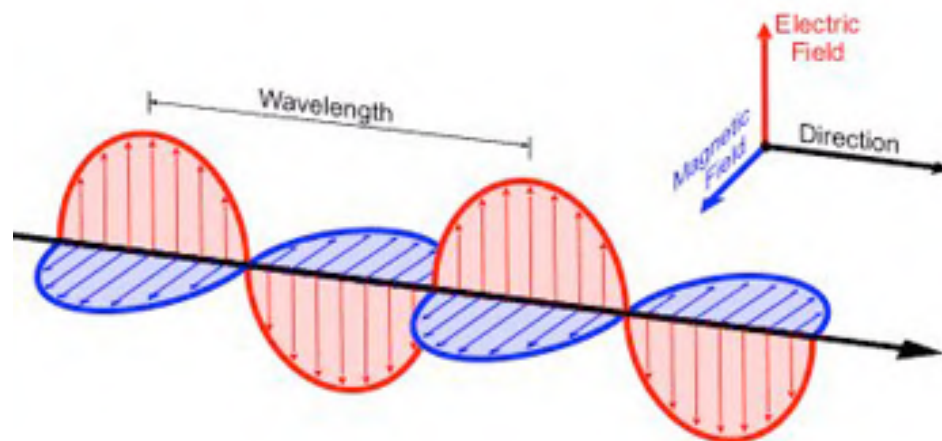
- ▶ AC Electric Fields
- ▶ AC Magnetic Fields
- ▶ Radio Frequency (RF) Fields
- ▶ “Dirty Electricity” from harmonic frequencies



Courtesy Spark Burmaster, EE, BBEC, EMRS

Electric & Magnetic Field (EMF) Exposure

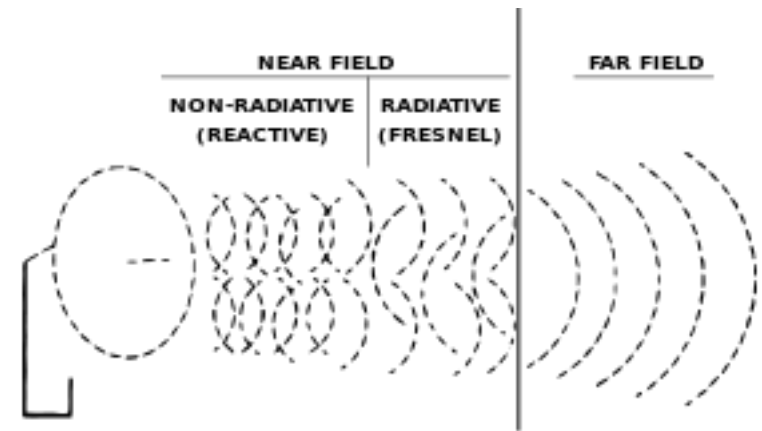
- ▶ AC Electromagnetic Fields are created by alternation of polarity (positive to negative to positive) of AC electricity on electric power lines, circuits and power cords, at 60 times per second
- ▶ The “M” in EMF is the magnetic field component
- ▶ The “E” in EMF is the electric field component
- ▶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

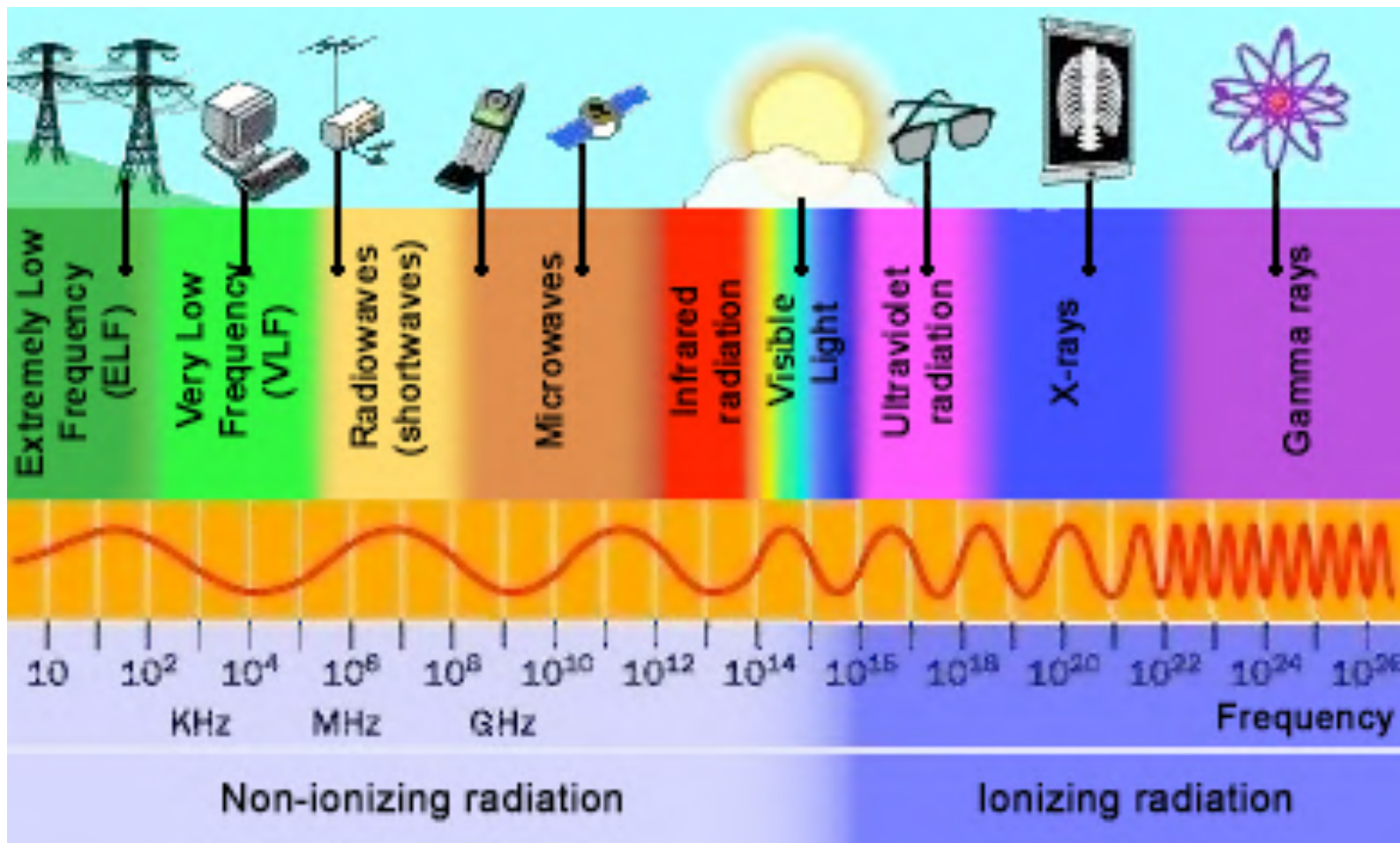
Electric & Magnetic Field (EMF) Exposure

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



www.ixquick-proxy.com

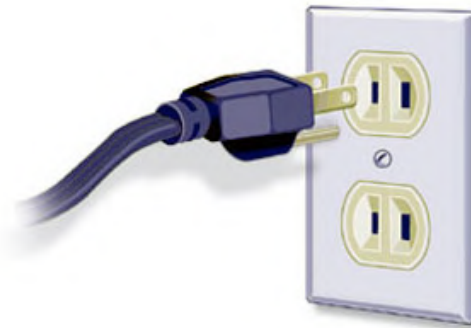
Electro-Magnetic Spectrum



www.astrosurf.com

Three Main “Deal Breakers”

- ▶ 1. Outside overhead power lines with high magnetic fields —
Shielding is ineffective
- ▶ 2. Cell tower in close proximity
- ▶ 3. Knob and tube or ungrounded NM Romex circuits
- ▶ Cause high electric fields and the inability to ground computers and appliances

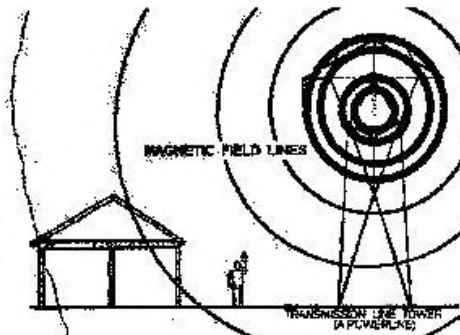


Remainder of EMFs Can Be Mitigated

- ▶ They include:
- ▶ AC Magnetic field EMFs from wiring errors, current on grounding paths (metal water service pipe, TV cable sheathing) and from point sources (transformers and motors)
- ▶ AC Electric field EMFs from NM (non-metallic) Romex in sleeping areas and ungrounded computers
- ▶ Radio frequency EMFs from wireless devices

COMPARISON OF AC MAGNETIC AND AC ELECTRIC FIELDS

MAGNETIC FIELDS

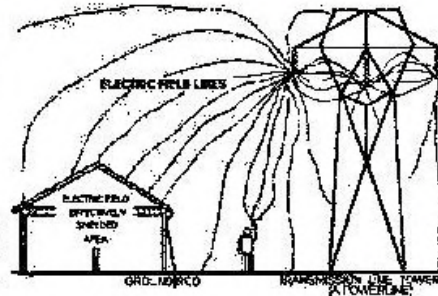


ARE THE ENERGIZATION OF THE SPACE AROUND ELECTRIC CURRENT FLOW

PRODUCED BY
ELECTRIC
CURRENT FLOW

DETECTED/ MEASURED BY:
GAUSSMETER/ AMP METER

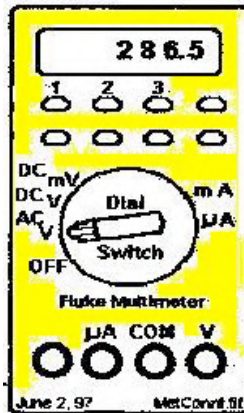
ELECTRIC FIELDS



ARE THE ENERGIZATION OF THE SPACE BETWEEN VOLTAGE DIFFERENCES

PRODUCED BY
VOLTAGE

DETECTED/ MEASURED BY:
VOLT METER



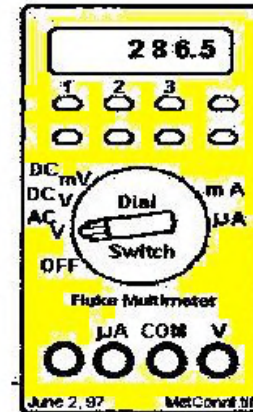
AC Magnetic Field
Sensor Coil

Set Meter Dial Switch
to AC Volts

AC Electric Current Flow
Amp Clamp On



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



AC Electric Fields:
Body Voltage
Probe



Set Meter Dial Switch
to AC Volts

28-Fs

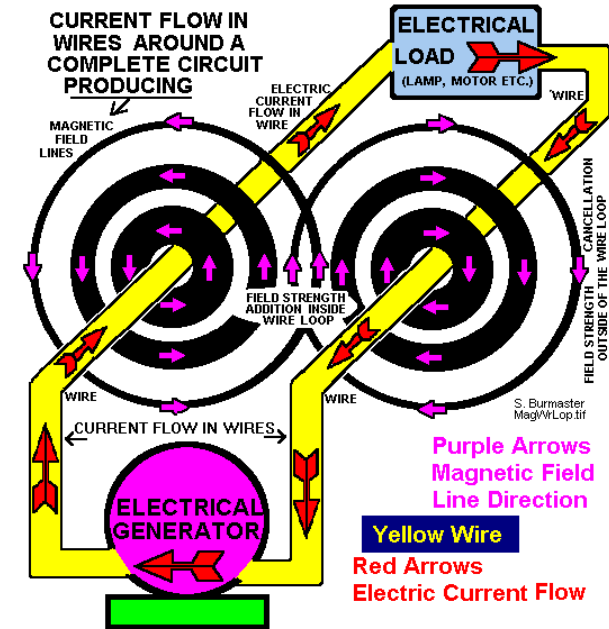


Courtesy
Spark
Burmaster,
EE, BBEC,
EMRS

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AC Magnetic Field Basics

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

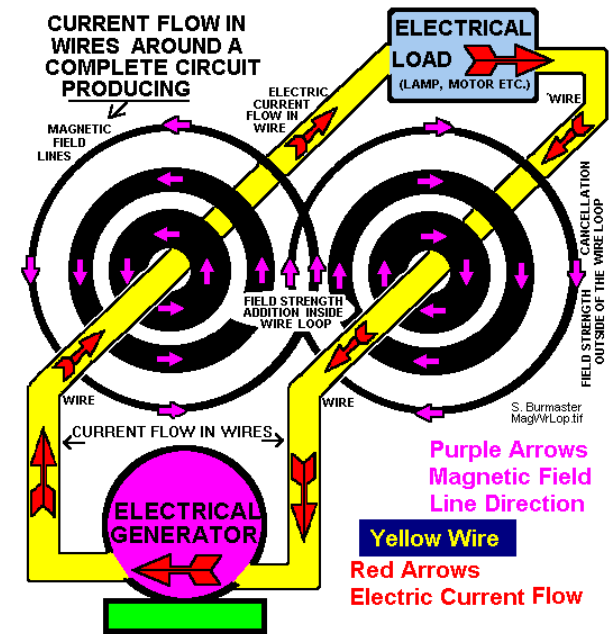


Courtesy Spark Burmaster, EE, BBEC, EMRS

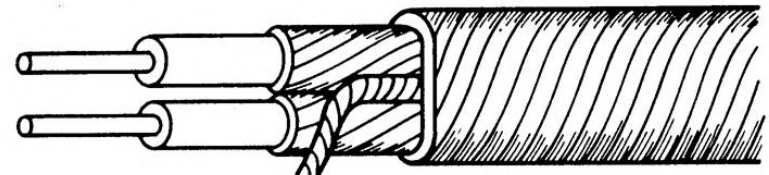


AC Magnetic Field Basics

- ▶ 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 (and are balanced)

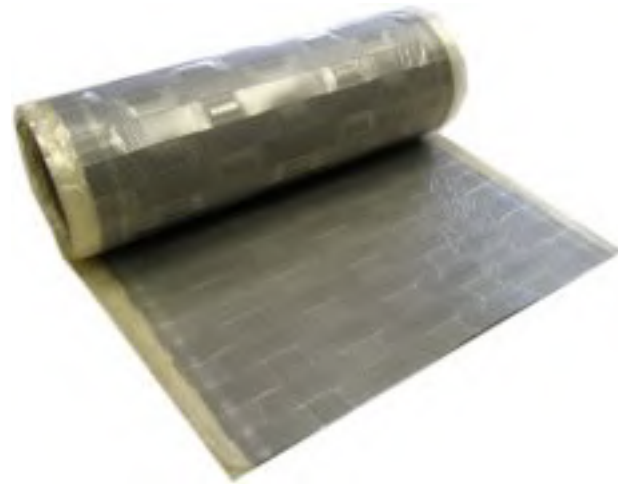


Courtesy Spark Burmaster, EE, BBEC, EMRS



AC Magnetic Field Basics

- ▶ Shielding is difficult
- ▶ Requires special materials, such as G-Iron
www.slt.co
- ▶ Best to eliminate or move yourself several feet away from source
- ▶ “Distance is your friend”



G-Iron

Sources of AC Magnetic Field Exposure

Four major sources of AC magnetic fields in homes:

1. Outside overhead power lines, especially high tension power lines – wires are widely separated



2. Point sources: motors (refrigerator), transformers, electric meter, breaker panel

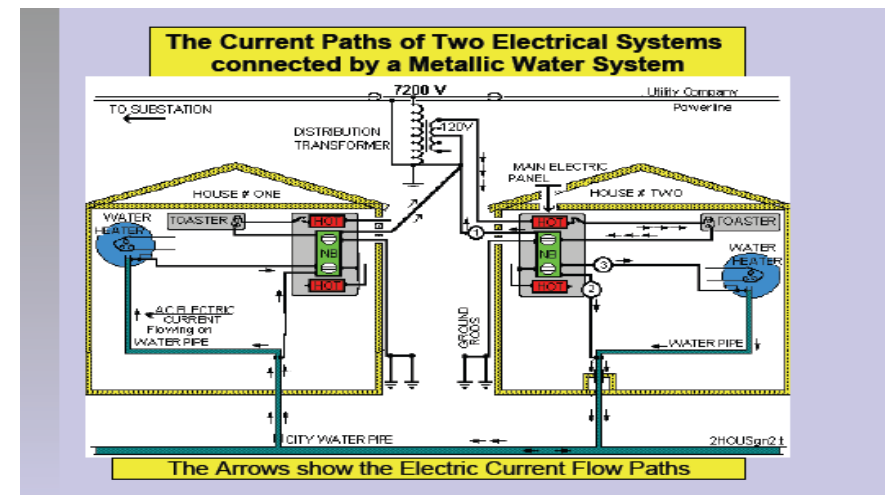
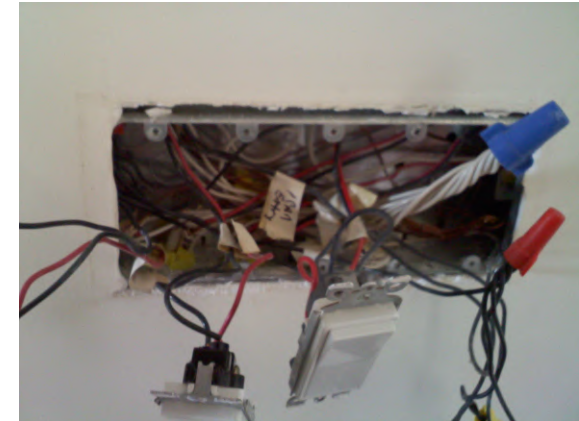


Sources of AC Magnetic Field Exposure

Major sources in homes
(continued):

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

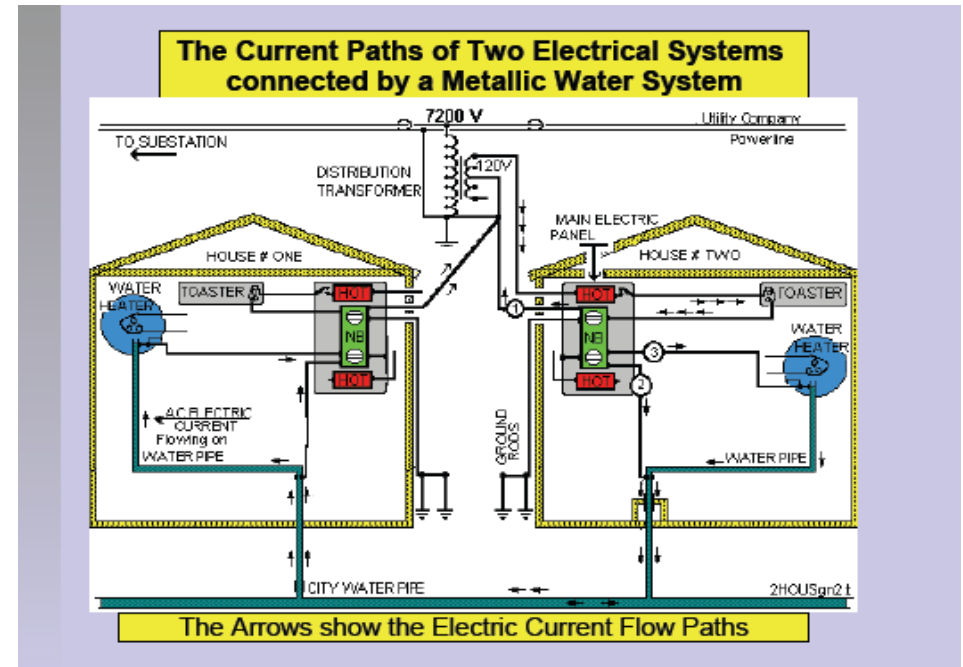
4. Current on grounding system. Enters from neighbor's homes on incoming metal water pipe and incoming cable TV sheathing – both are parallel paths



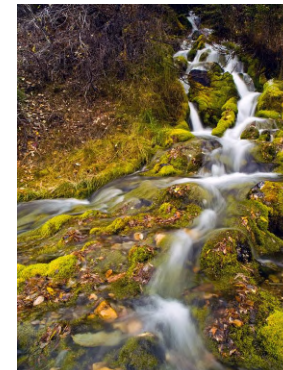
Courtesy Spark Burmaster, EE, BBEC, EMRS

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



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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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EMF Meters and Instruments

Magnetic Fields

- ▶ GigaHertz Solutions ME3030B (single axis)
- ▶ NFA Series (triple axis)
- ▶ Available from Safe Living Technologies — www.slt.co
- ▶ “Buzz Stick”
- ▶ Triplet 9200A Clamp Meter, Clamp Leaker



Hand-held Meters



www.amazon.com

Triplet Clamp Meter



Clamp Leaker



Buzz Stick

Oram Miller, BBEC, EMRS

Wiring Errors

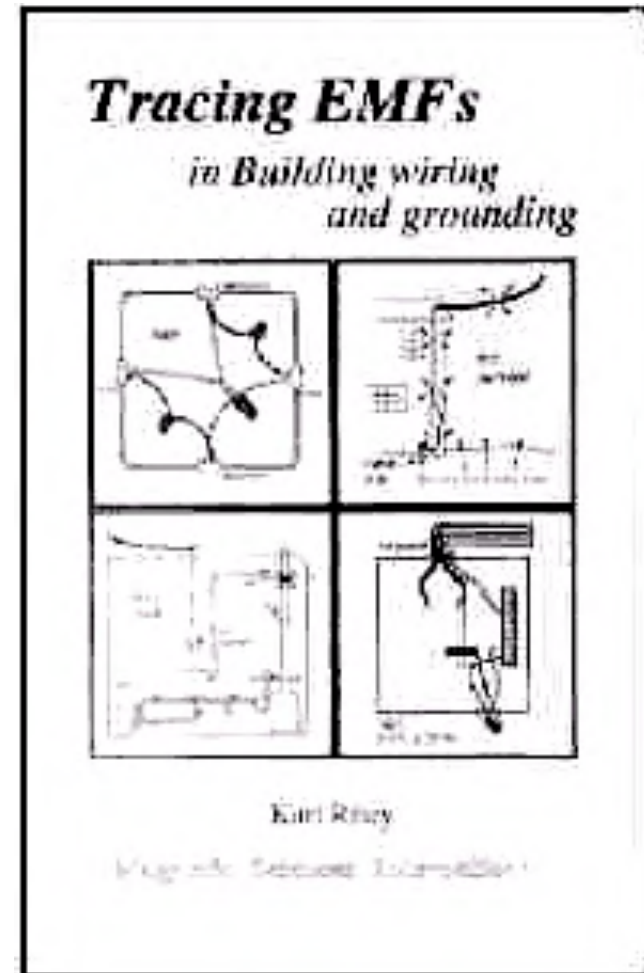
- ▶ Preventable, fixable cause of magnetic fields in homes and condo/apartment buildings
- ▶ Up to one-third of homes in US have wiring errors
- ▶ Misconfigured wiring connections in switch, outlet and lighting fixture (junction) boxes
- ▶ Can be neutral-to-neutral or neutral-to-ground interties, also current on grounding paths
- ▶ ARC-Fault and GFCI breakers trip when first turned on if wiring errors are present
- ▶ Electricians are only now paying attention to them

Wiring Errors

- ▶ Violations 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
- ▶ City code inspectors have not been looking for wiring errors

Wiring Errors

- ▶ Tracing EMFs in Building Wiring and Grounding
- ▶ Karl Riley, 3rd Edition
- ▶ Available as book and DVD from www.lessemf.com
- ▶ DVD of Karl produced by Southern California Edison provided by their EMF consultants to customers

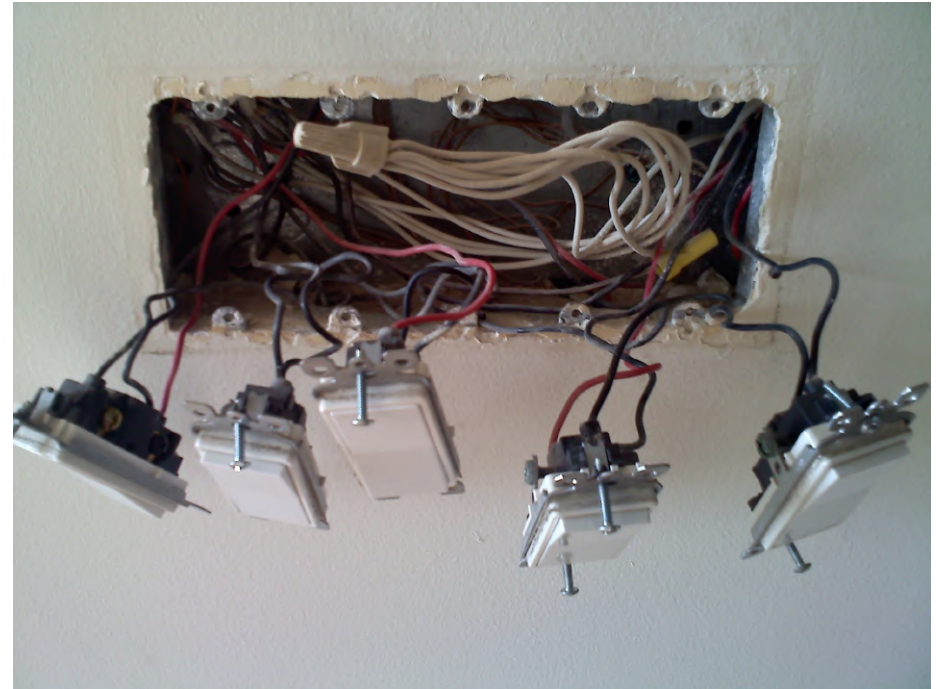


Screening for Wiring Errors

- ▶ Hold Gauss meter 2 feet from wall, 2 feet above light switches
- ▶ Measure magnetic field with lights off
- ▶ Turn lights on — Magnetic field level should not increase
- ▶ If magnetic field is present, likely due to wiring error

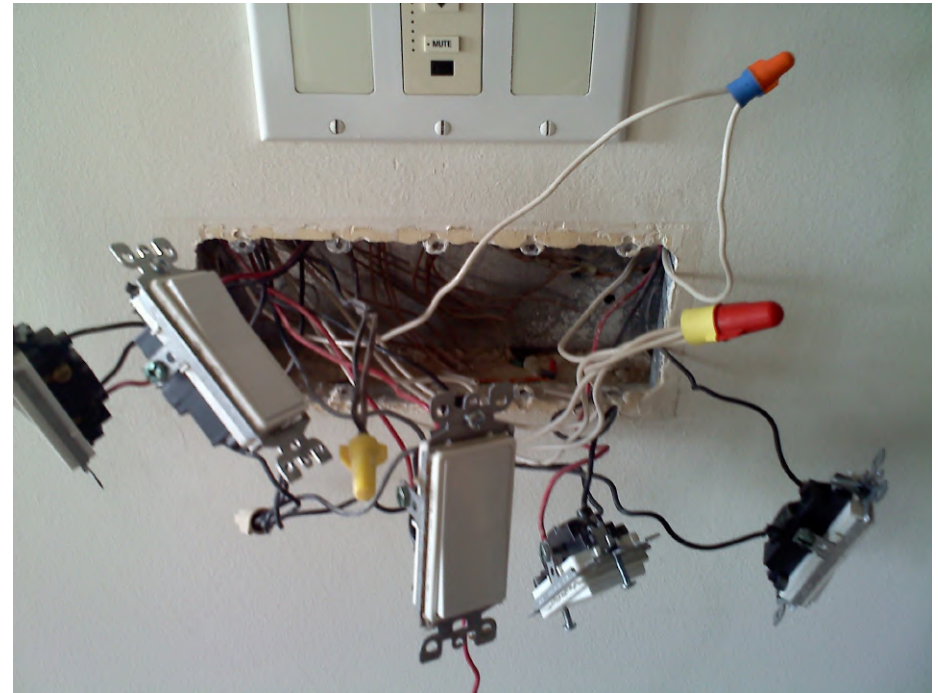
Neutral-to-Neutral Wiring Errors

- ▶ Two 12-3 circuits in box
- ▶ Hot conductors are separated
- ▶ Neutral conductors of both circuits are wire-nutted together
- ▶ Results in net current and lack of cancellation of magnetic fields on hot and neutral conductors of each circuit to breaker panel



Neutral-to-Neutral Wiring Errors

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



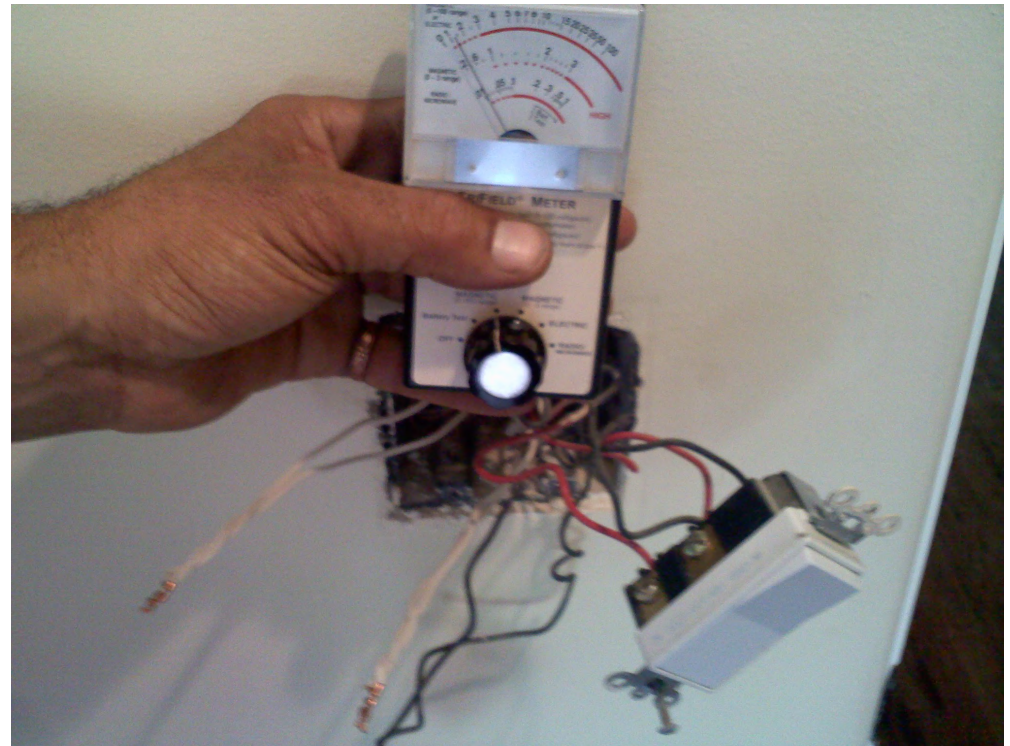
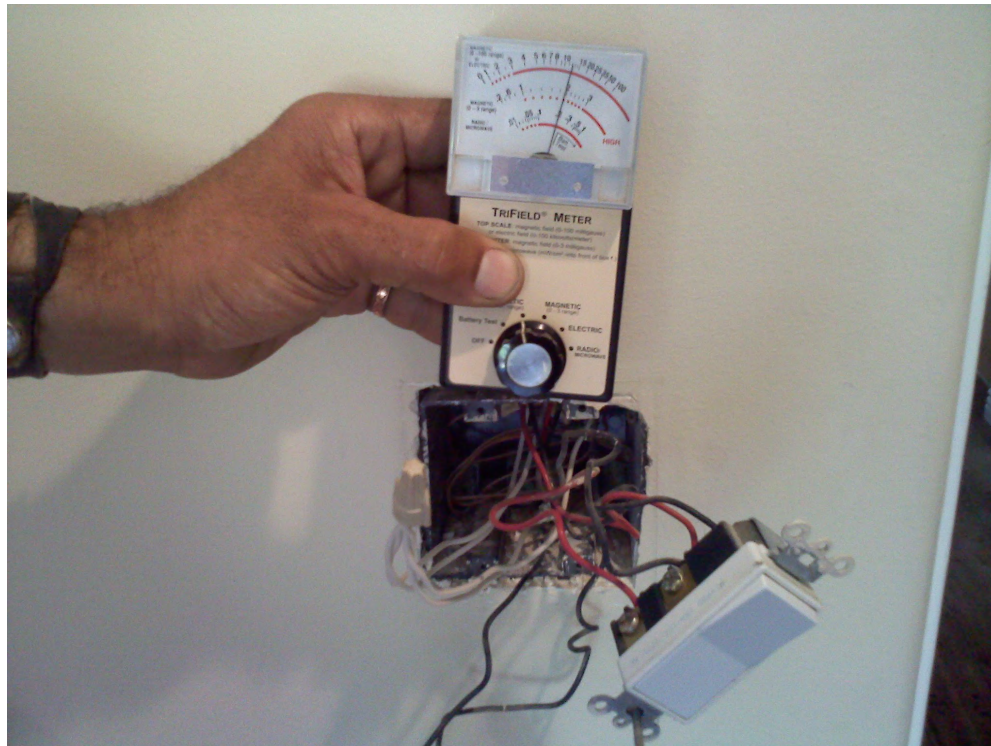
Measuring Neutral-to-Neutral Wiring Errors

- ▶ Measure for net current with Amp clamp
- ▶ Net current clears up when neutrals are properly separated



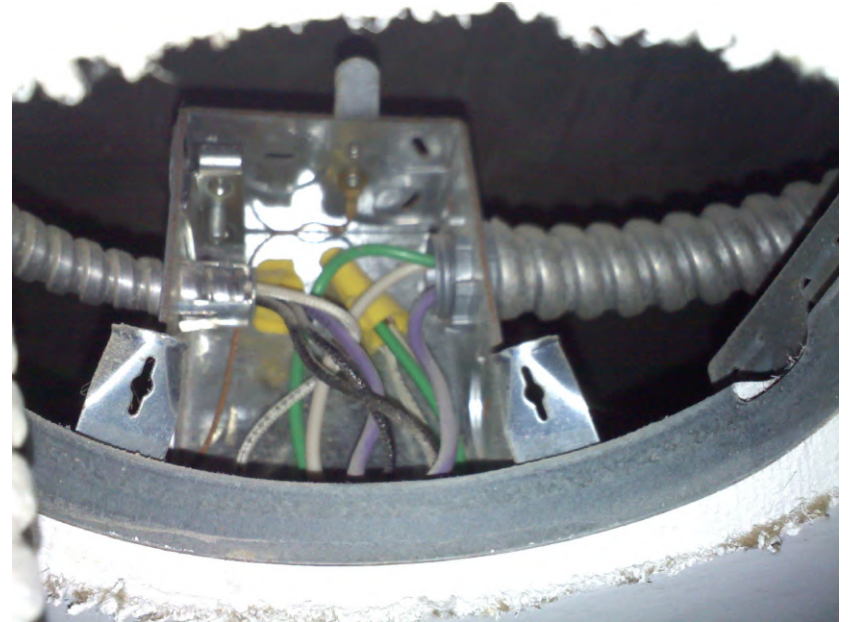
Neutral-to-Ground Wiring Errors

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



Neutral-to-Ground Wiring Errors

- ▶ Includes:
- ▶ Bare ground wire touching neutral screw in outlet — Best to tape over contacts on outlets when installing
- ▶ Ground mixed with neutral conductors under wire nut
- ▶ Nick in insulation of neutral as it crosses lip of metal box



Neutral-to-Ground Wiring Errors

- ▶ Sub-panel: neutrals and grounds cannot be together
- ▶ Bonding strap must not be connected to neutral bus
- ▶ If grounds are on neutral bus, current will flow back to main panel on grounding paths
- ▶ Neutral conductor has less current than hot conductors — Results in net current and magnetic fields
- ▶ Remove bonding strap or screw
- ▶ Grounds on separate bus



justanswer.com



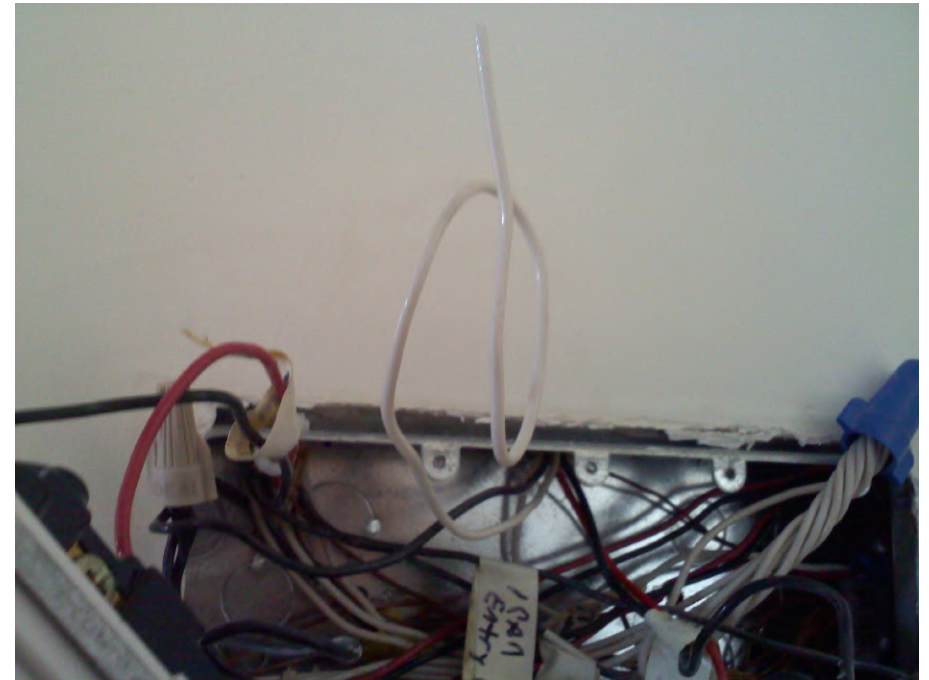
hammerzone.com



doityourself.com

Wiring Errors

- ▶ Unused hot or neutral conductor
- ▶ Current only flows on one conductor, not both: Therefore, 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

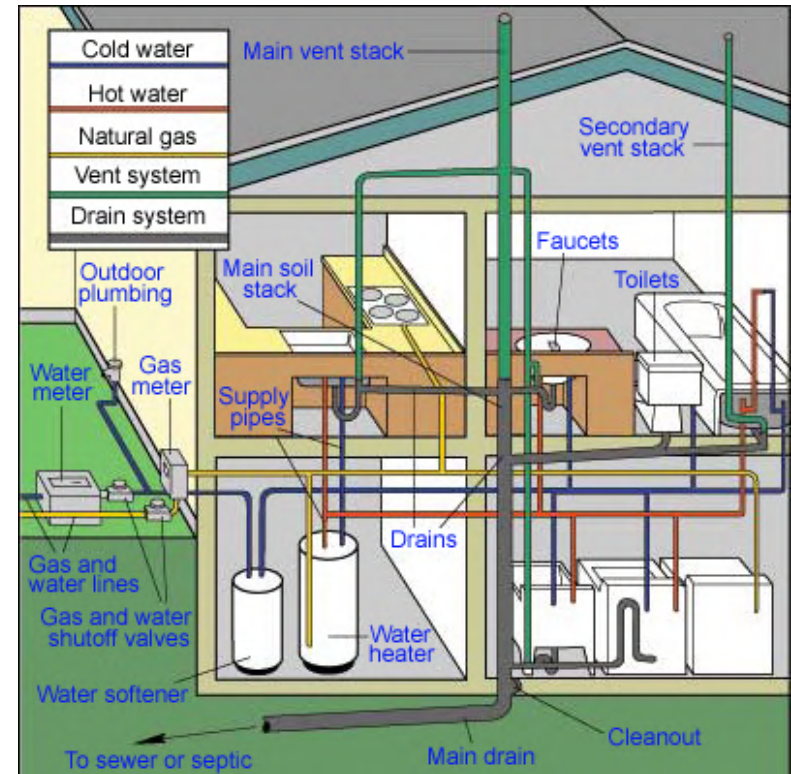


Avoid Wiring Errors

- ▶ Follow these three easy steps to avoid wiring errors:
- ▶ Hot and neutral wires always together in same path
- ▶ Current on return neutral wire always same as current on outgoing hot wire, no more, no less – net zero Amps
- ▶ No current on grounding paths, except in emergency
- ▶ Remember, ARC Fault and GFCI 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
- ▶ Can be mitigated with dielectric union in water pipe and cable isolation filter in TV cable coming in from street



Reduce Magnetic Field Exposure

- ▶ Plastic water service supply pipes avoid electrical connectivity to neighbors' homes
- ▶ Or insert dielectric union
- ▶ 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 near electric meter or breaker panel
- ▶ Do not sleep or sit on other side of refrigerator or entertainment center

Reduce Magnetic Field Exposure

- ▶ Transformer at front of stove for digital clock and electronics can cause magnetic field at abdomen when standing to cook, if transformer is right behind clock
- ▶ Ideally purchase stove with clock and electronics at back or side of stove
- ▶ Even gas stoves without visible clock or electronics can have transformer at front – must check with Gauss meter
- ▶ Dishwasher lids may also have transformer – check with Gauss meter
- ▶ Avoid induction cooktops altogether – cause massive magnetic fields when on



ovens.review.com



thesweethome.com



consumerreports.com

Reduce Magnetic Field Exposure

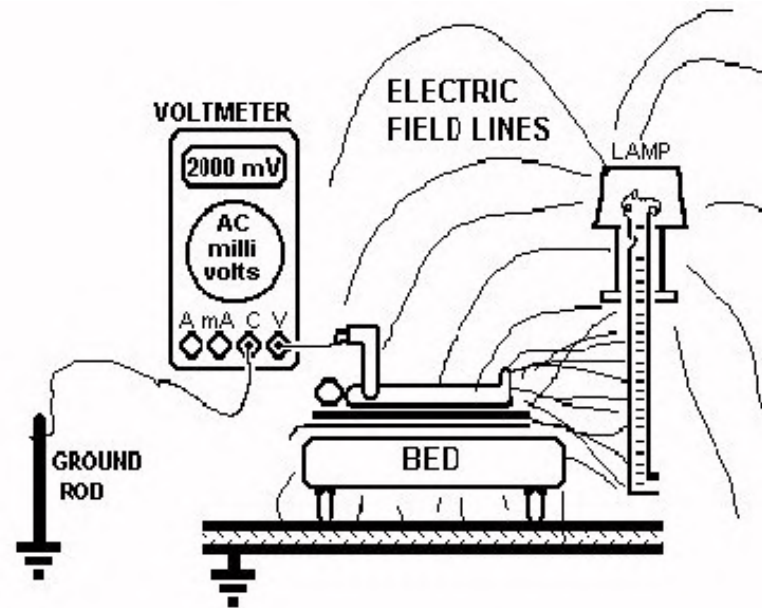
- ▶ Keep transformer for halogen track lighting away from beds and sitting areas
- ▶ Do not sleep over fluorescent light fixtures or fan motors in ceiling of room below
- ▶ No motorized or electric beds without plugging AC power cord into switched power strip – *always* switch off at night



Halogen Track Lighting

AC Electric Field Basics

- ▶ Produced by differences in electric voltage
- ▶ Measured with Electric Field meter (not Gauss meter)
- ▶ Similar to *pressure* in water hose (not flow)
- ▶ Considered the “Unknown EMF”



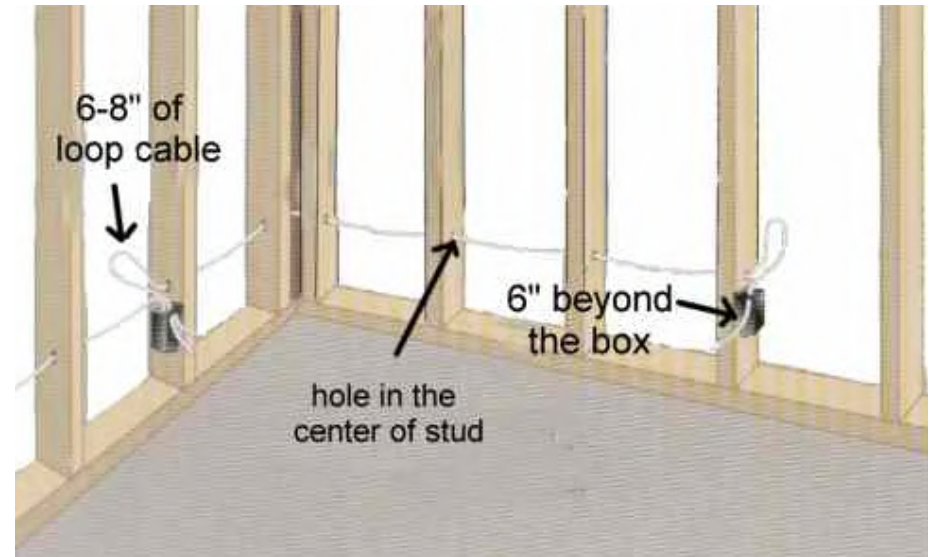
Courtesy Spark Burmaster, EE, BBEC, EMRS



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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 into room from plastic-jacketed NM Romex wiring in walls
- ▶ Also extends 6-8 feet from un-shielded AC power cords
- ▶ Decreases with distance
- ▶ Affects people primarily while sleeping, also daytime from ungrounded laptops



Unshielded Romex Wiring



Bedside Lamp Cord

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

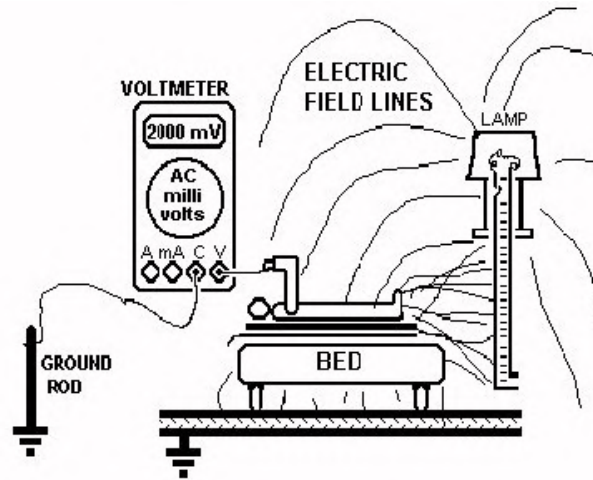
Fields are present even when these devices are turned off but plugged in



EMF Meters and Instruments

Electric Fields

- ▶ Hand-held Meters
- ▶ Body Voltage Meter
- ▶ Available from Safe Living Technologies
- ▶ www.slt.co



Courtesy Spark Burmaster, EE, BBEC



Hand-held Meters

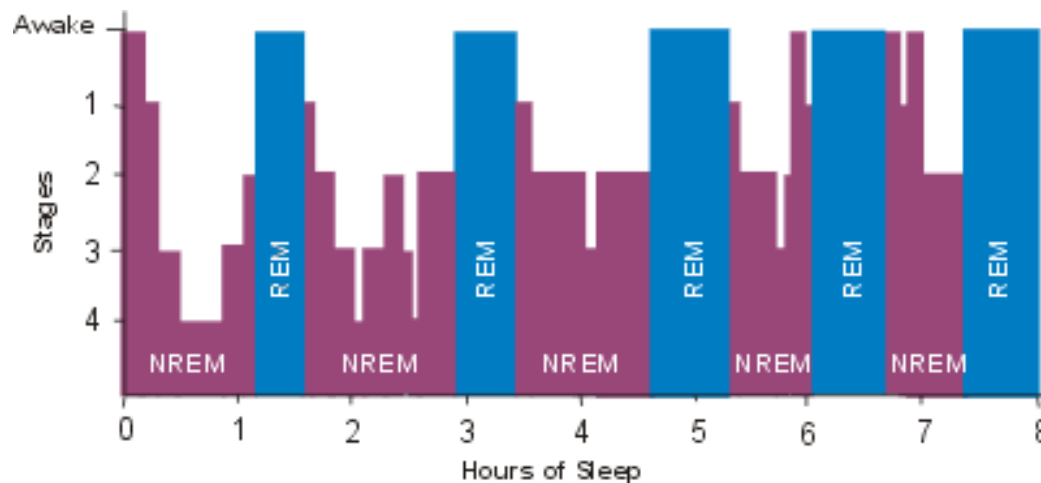


Body Voltage Kit

Oram Miller, BBEC, EMRS

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

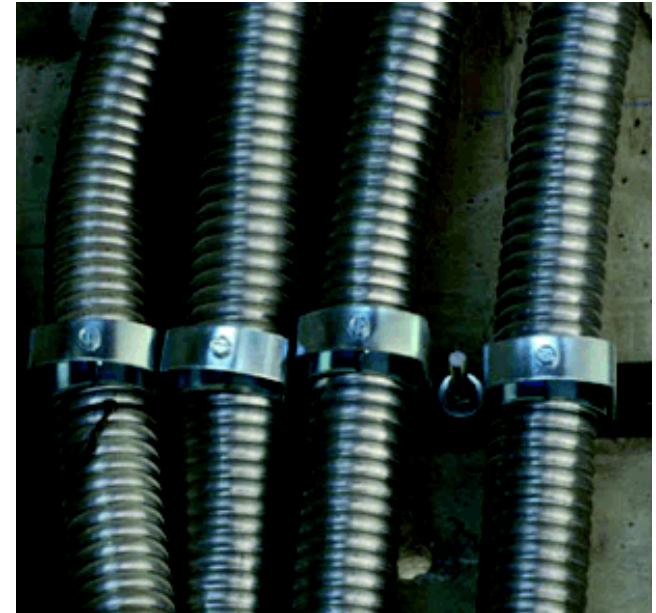
Greater response to medical therapies

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

- ▶ Create an electrically clean sleeping environment
- ▶ Shut-off switch for NM Romex circuits within 6-8 feet of bed
- ▶ Ideally use flexible steel or aluminum MC (metal clad) or rigid (EMT) conduit for entire house, or at least for circuits near desk, couch, easy chair, play area
- ▶ Rewire lamps near bed or chair with shielded AC MuCord from LessEMF

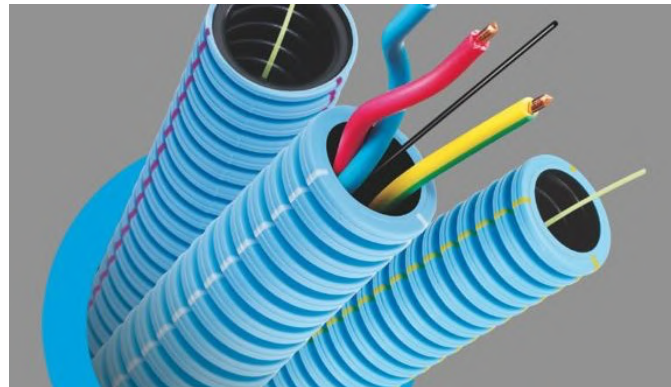


Flexible Metal Clad Wiring

Reduce Electric Field Exposure

- ▶ Sweet Ohms wiring — www.sweetohms.com
- ▶ Flexible dual-extruded plastic, semi-conductive inside
- ▶ Shields Electric Fields — Verified by Healthy Building Science, San Francisco, www.healthybuildingscience.com
- ▶ Avoids Magnetic Fields when properly installed (no wiring errors) — hot and neutral conductors are twisted
- ▶ Being brought to North America from France
- ▶ Projected to cost one-half price of flexible metal-clad (MC) conduit

Sweet ohms



Reduce Electric Field Exposure

- ▶ Remotely shut off NM Romex circuits (Contactor/Remote Switch) www.slt.co
- ▶ Metal clad Flex/EMT circuits require shut off switch at the wall
- ▶ Re-wire lamp with Mu-Cord
- ▶ Avoid electric blankets and electric heating pads (watch for reverse polarity on plug)
- ▶ Use battery-operated clocks
- ▶ AC laptop power cords: 3-pronged, grounded



Reduce Electric Field Exposure

Earthing Pad

- ▶ Thousands of testimonials from satisfied customers
- ▶ Negative ions from earth flow up to body (“earthing”)
- ▶ However, can also shunt man-made electric fields to earth through body from nearby NM Romex circuits in walls & plastic AC cords (“grounding”)
- ▶ Problem for electrically-sensitive people — Voltage runs through body, even though “body voltage” meter shows low levels, causes some to feel agitated
- ▶ Solution is to always reduce electric field exposure levels in bedroom first, then use earthing pad



radiantlifecatalog.com

Reduce Electric Field Exposure

Ungrounded Laptop AC Power Cords – PCs

- ▶ Big source of unhealthy, vitality-draining electric fields
- ▶ Many laptops have two-pronged (ungrounded) plugs
- ▶ Plug needs to be three-pronged (grounded)
- ▶ If not, purchase USB Ground Cord from LessEMF.com
- ▶ Also, test outlet for proper grounding
- ▶ Purchase circuit tester from hardware store to test ground at outlet – *both* amber lights need to be lit



Two-pronged plug:



www.ebay.com

Three-pronged plug:



www.popscreen.com



www.popscreen.com

Reduce Electric Field Exposure

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

Two-pronged plug:



laptopbattery.com

Three-pronged plug:



mactechgear.com



shop.accessory4you.com

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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
- ▶ Small Cell 5G Towers



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
- ▶ Entering the era of the Internet of Things (IoT)



velocidaddeinternet.com



china-telecommunications.com



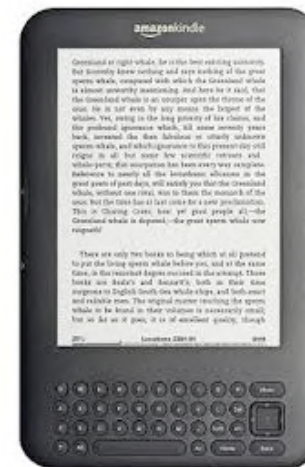
photographersdirect.com

Sources of Radio Frequency Field Exposure Inside Home

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



www.nickolexie.en.busytrade.com



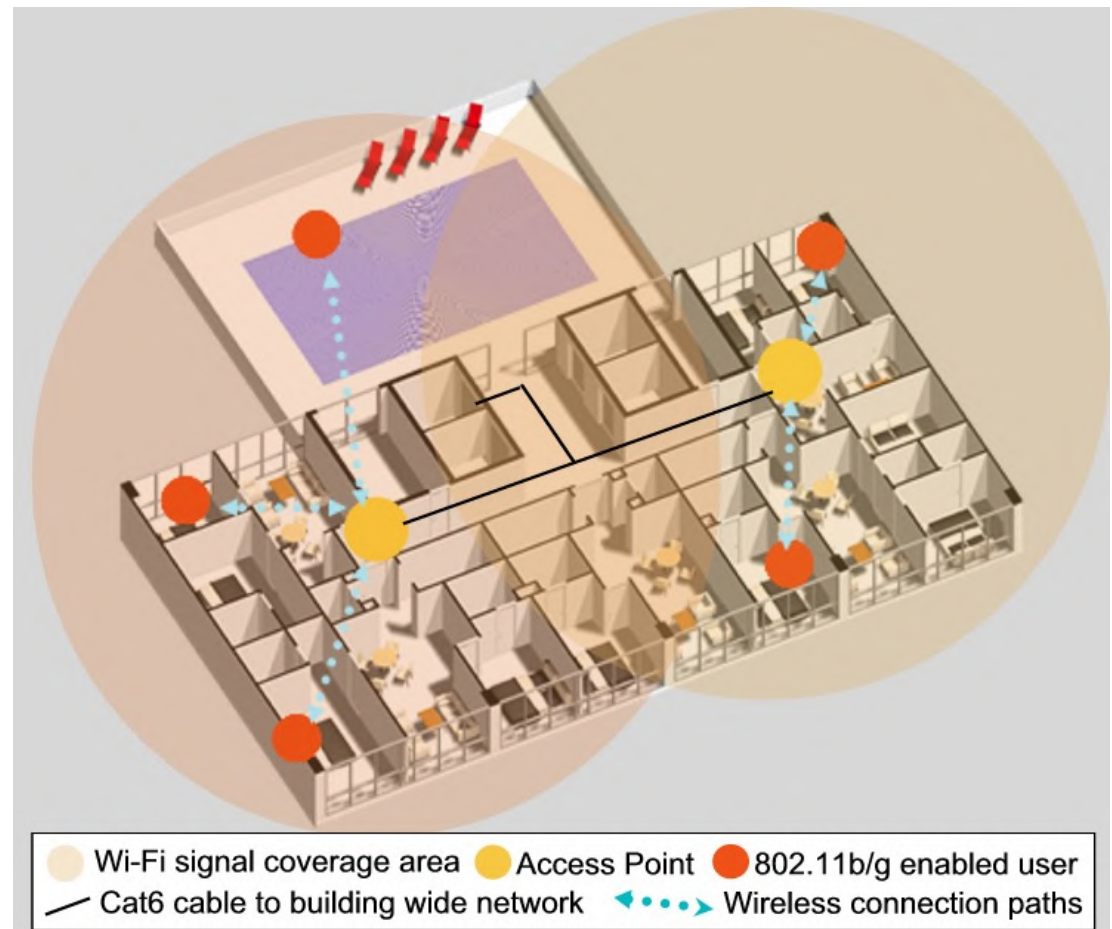
en.wikipedia.org

Sources of Radio Frequency Field Exposure Inside Home and Office

Exposure from Wi-Fi router and Wireless Access Points (WAPs)



cnet.com



EMF Meters and Instruments

Radio Frequency (RF) Fields

- ▶ Hand-held RF Meters
- ▶ Available from Safe Living Technologies
- ▶ www.slt.co



Acoustimeter



Gigahertz Solutions HF35C

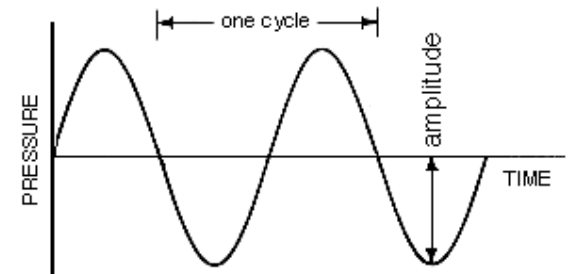


Gigahertz Solutions HF59B

Radio Frequency Field Exposure

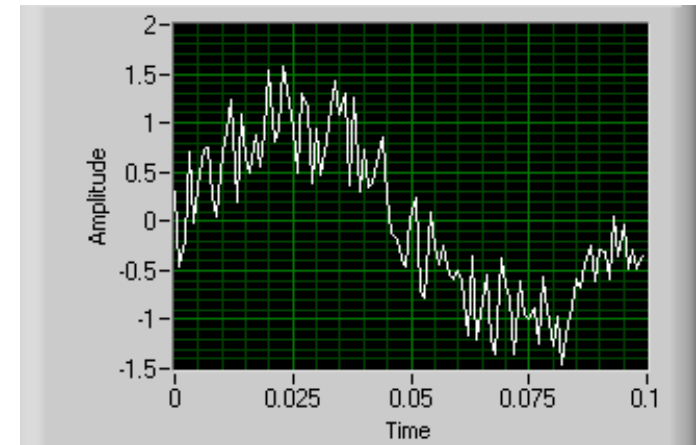
Harm comes from:

- ▶ 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

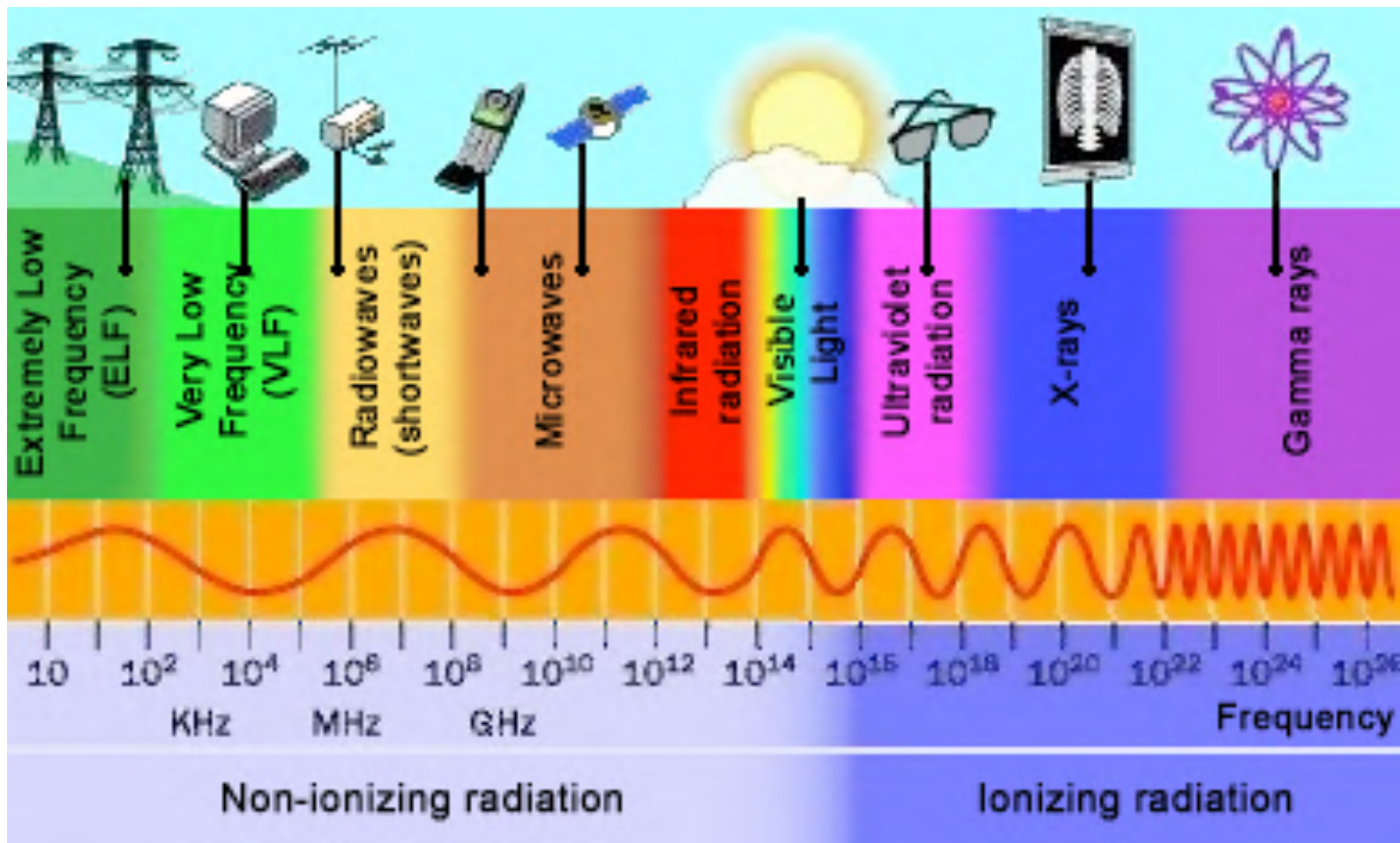
Smooth Analog Signals –
Well Tolerated



Zone.ni.com

Pulsed Digital Signals –
Not Well Tolerated

Electro-Magnetic Spectrum



www.astrosurf.com

FCC Compared to the Rest of the World

- ▶ FCC's safe exposure guidelines for cell phones listed at 1.0 milliWatts/centimeter squared (mW/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 ($100\text{-}10 \mu\text{W}/\text{m}^2$ or $0.000,1\text{-}0.000,001 \text{ mW}/\text{cm}^2$)
- ▶ 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 ²)	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 ²)	30
30-300	27.5	0.073	0.2	30
300-1,500	--	--	f/1,500	30
1,500-100,000	--	--	1.0	30

Conversion Table

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

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.
FCC (USA) OET-65	10,000,000	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

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

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 Concern	Slight Concern	Severe Concern	Extreme Concern
Power Density in microWatts/meter squared ($\mu\text{W}/\text{m}^2$)	< 0.1	0.1 - 10	10 - 1,000	> 1,000

The Bottom Line

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



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
- ▶ Prefer speakerphone and texting
- ▶ Air tube earphone for cell phones and cordless telephones
www.rfsafe.com
www.lessemf.com
- ▶ Place “snap bead” on earphone cord
www.lessemf.com



Ferrite “Snap”
Bead



RF3 Air Tube Ear Phone

Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Keep landline telephone and use it
- ▶ Corded telephones rather than cordless
- ▶ Tell family and friends to call your home 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 be hardwired using Ethernet cable
- ▶ Create Local Area Network, or LAN
- ▶ Use Ethernet cables to connect devices (computers, printers, TVs) to router
- ▶ Use data switch for multiple computers, printers in one room

3 Port QuickPlate
1 Data, 1 Video, 1 Phone Port



www.cableorganizer.com



www.amazon.com

Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ You *must* manually disable Wi-Fi on router *and* laptop or desktop computer to avoid Wi-Fi radio frequencies
- ▶ Plugging in Ethernet cable does *not* automatically disable Wi-Fi
- ▶ Consult with router's manufacturer, manual, or Internet Technology (IT) person to disable Wi-Fi on router and computer



iccinforcentre.com



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



ebay.pl

Protect Yourself from Harmful Radio Frequency Field Exposure

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



www.apple.com



www.apple.com



iphonehoesjeshop.nl

Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Newest MacBooks have no USB port, only USB-C
- ▶ Use USB-C Digital Multiport Adapter, then USB-to-Ethernet adapter



www.amazon.com



www.amazon.com

Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Hardwired workaround for iPad and iPhone
- ▶ Put in Airplane mode — Internet access without RF
- ▶ Plug USB Ground Cord into USB hub to avoid electric fields



USB Camera Adapter



USB Extension Cable



Ethernet Cable



USB-to-Ethernet Adapter



Powered USB Hub

Oram Miller, BBEC, EMRS

Protect Yourself from Harmful Radio Frequency Field Exposure

- ▶ Hardwired connection to TV for streaming video — Netflix
- ▶ Plug Ethernet cable into Roku or Apple TV device
- ▶ Automatically disables Wi-Fi on Apple TV 1 & 2
- ▶ With Apple TV 3, must disable Airplay with onscreen command
- ▶ Verify with RF detector



commons.wikimedia.org



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



Steelintheair.com



Longdistancecarriers.us

Protect Yourself from Harmful Radio Frequency Field Exposure

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

- ▶ RF shielding paint and foil
- ▶ Metal window screen or film on windows
- ▶ Fabric, bed canopy
- ▶ Available from Safe Living Technologies
- ▶ www.slt.co



Y-shield® Paint



Signal Protect Window Film



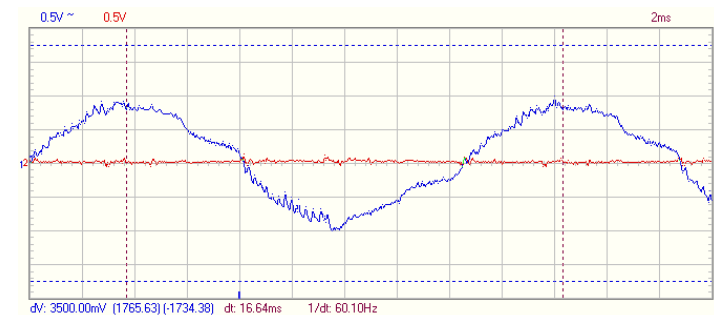
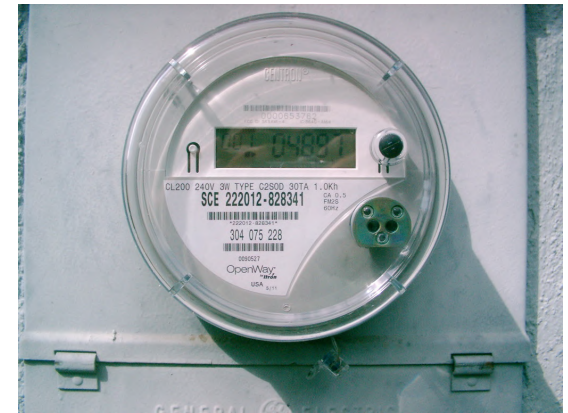
Bed Canopy



RF Shielding Foil

Protect Yourself from Smart Electric Meters

- ▶ Transmits data once to several times per day
- ▶ Emit “beacon signals” twice or more per minute on average to “synchronize” smart meters in mesh network
- ▶ Signal strength varies from manufacturer to manufacturer
- ▶ Many people experience health symptoms
- ▶ Some models also emit harmonics of “dirty electricity”
- ▶ Opt Out programs available from some electric utilities, either voluntary or mandated by state’s Public Utility Commission



Oram Miller, BBEC, EMRS

Sources of Dirty Electricity Exposure

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



www.conrad.com

Protect Yourself from Harmful “Dirty Electricity” Exposure

- ▶ Ideally eliminate sources
- ▶ Avoid Compact Fluorescent Lamps
- ▶ Use Halogen incandescent bulbs
- ▶ LED bulbs
- ▶ Install straight on/off switches rather than dimmer switches
- ▶ 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, desks, easy chairs, couches, play areas
- ▶ 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)
- ▶ Keep 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
- ▶ Use 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) cleaner than off-the-shelf dimmers
- ▶ Avoid ECM variable speed HVAC motors
- ▶ Replace smart utility electric meter with analog meter

Create Healthy Homes

Oram Miller, BBEC, EMRS

Los Angeles, California

310.720.7686

www.createhealthyhomes.com