

The Body Electric

Factors in Electrobiolgy:
Electromagnetic Radiation & Health

Larry Gust, Gust Environmental, Ventura, CA
www.GustEnviro.com • 805-644-2008

5G Free California, Inn at the Seventh Ray, Nov 8, 2021



Dr. Martin Blank, PhD

- Guest Lecturer Department Physiology and Cellular Biophysics, Columbia University, College of Physicians and Surgeons
- PhD physical chemistry (1957) Columbia University
- PhD colloid science (1960) University of Cambridge
- Appointments at 11 universities, five industrial research labs and the US Office of Naval Research
- Research on membranes, transport processes, excitation & health effects of electromagnetic radiation
- Author: [BioInitiative Report's section on Stress Proteins](#)
- Excerpt Common Wealth Club, Oct 2010; full talk on You Tube===

<https://vimeo.com/17266941>

<https://vimeo.com/17266941>

Overview Topics to Be Covered

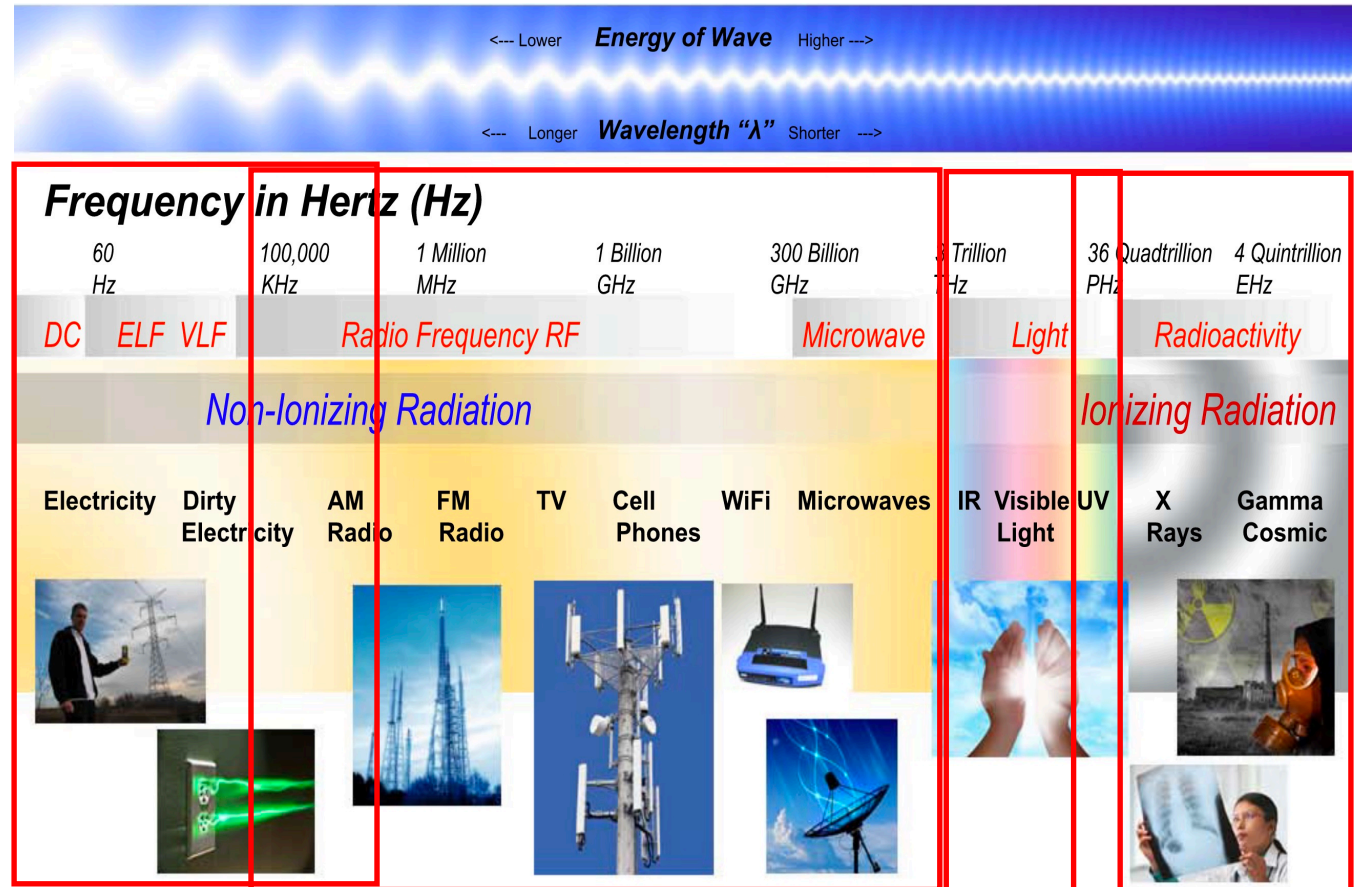
- Relationship between EMF types via the Electromagnetic Spectrum
- Power System Energy Fields
 - Electric
 - Magnetic
 - Health Issues
- Radio Frequency Energy Fields
 - Devices that Generate RF
 - Health Issues & Safety Standards
 - What is 5G; What are the Issues
- Shielding EMF
- RF in Schools
- BioInitiative Report
- Measurement Equipment



The Electromagnetic Spectrum 8ø

EMR sources of importance

- Power system and components (wires, dishwasher, fridge, etc.)
- Communications Radiations
- Visible light- natural and man-made
- Nuclear
 - Medical===



Power System Electromagnetic Fields

Produce invisible energies in the air

- **Magnetic Fields** from current flow in amps (milliGauss)
- **Electric Fields** from energized potential as voltage (Volts/meter)===

Power system **Magnetic** Fields

Sources

- Utility lines (line source)
- Wiring faults in the building (line source)
- Current flow on water & gas pipes, ducts, AC lines (line **source**)
- Electrical Devices (point sources)
- Utility transformers (point source)

Measurement

- **Gauss meter** – used to measure strength of field
- MilliGauss (mG)===

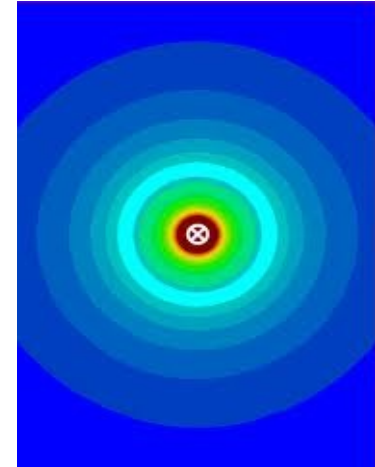


Magnetic Field Health Effects

- Cancer
- Childhood Leukemia
- Migraine Headaches
- Cardiovascular Disorders
- Sleep Disorders
- Hormone Disorders===



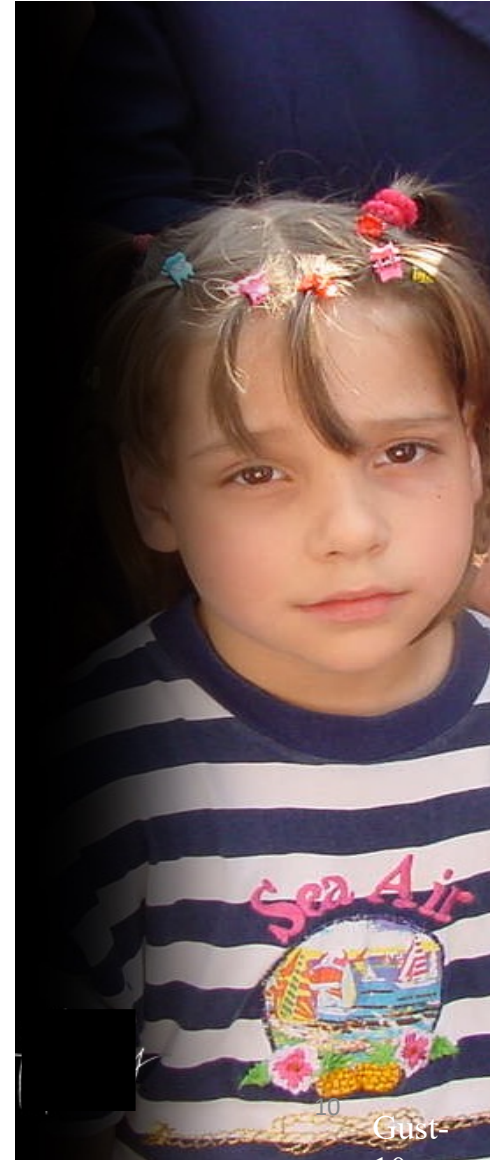
Magnetic Field **Prudent** Avoidance



- Sleeping area is first priority
- No magnetic field point sources near bed
- Or on other side of a wall or under floor
- Avoid electric blanket, water bed, heating pad
- Move clock away or get battery powered clock
- Use LCD TV. No Plasma TV
- Fix wiring problems that cause elevated magnetic fields===

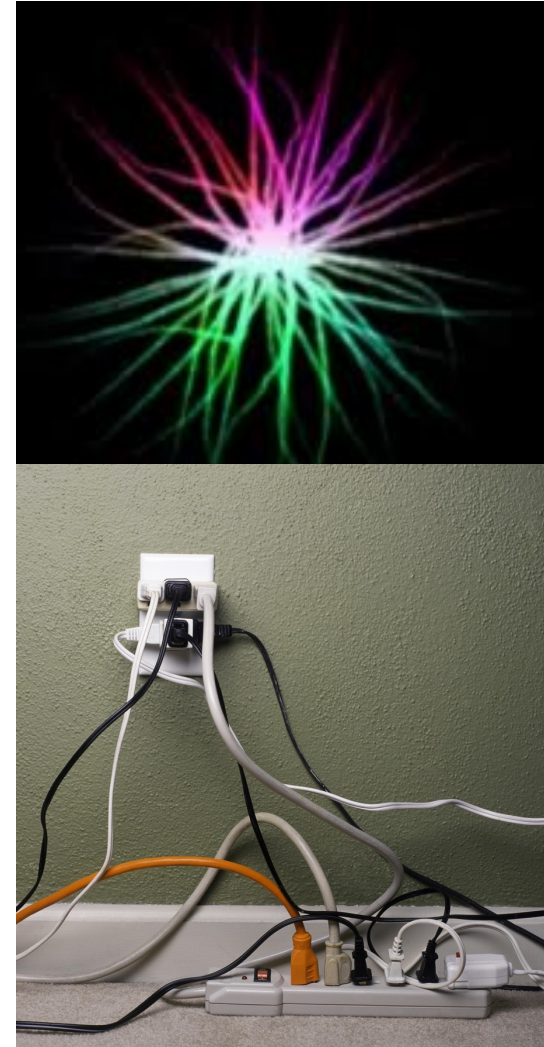
Case Study: **Magnetic** Fields

- Healthy four-year-old girl in Marin CA
- Became lethargic, no appetite, rectal bleeding
- Medical exam gave no clue as to the problem
- 80 milliGauss found in child's bed and play yard
- The child is moved and recovers completely
- Instruments make the invisible visible---



Power System **Electric** Fields

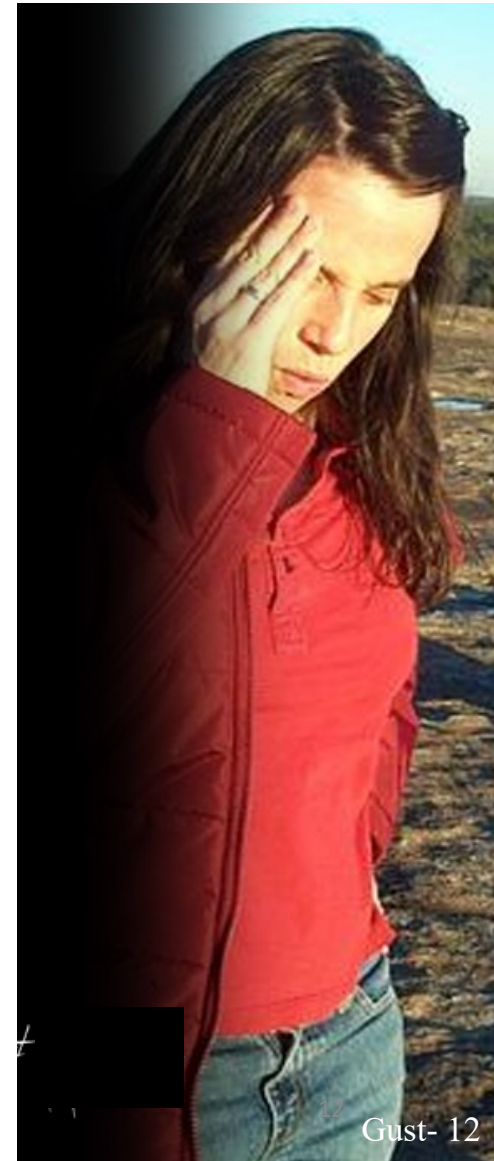
- Sources:
 - Lamp, appliance, and extension cords
 - Electric blanket, waterbed heater
 - Energized wiring in the walls, ceiling, floor
- E-Fields pervade space in all rooms
- Our body acts as an antenna for the fields
- An alternating voltage is produced on; in body
- Measurement with an e- field meter
Volts per meter (V/m) ==



Electric Field Health Effects

Scientific observation (based on 10,000 inspections)

- Aggravates allergies
- Disturbs sleep
- Night sweats
- Heart palpitations
- Muscle and nerve pain (the doctor)
- Waking tired
- Daytime irritability
- Bed wetting in children==



Case Study: **Electric** Fields

- 13-year-old boy
- History of bed wetting
- Many medical consultations
- No organic problems identified
- Psychiatric treatment started
- Special underpants set off alarm
- No results
- 5000 mV electric fields was reduced
- Bed wetting ended that night---



Electric Field **Prudent** Avoidance

- Unplug all electrical devices within 6 feet.
- No extension chords, power strips near bed.
- Eliminate electric blanket, pads, waterbed heater (Run bed heater during day & unplug at night).
- Unplug electrically operated beds
- For typical home with plastic jacketed wiring
 - Turn off circuit breaker for bedroom and adjoining rooms
 - Use a meter; find circuits that cause fields and turn off
 - Electric field meter or body voltage meter===



Radio Frequency Fields or RF

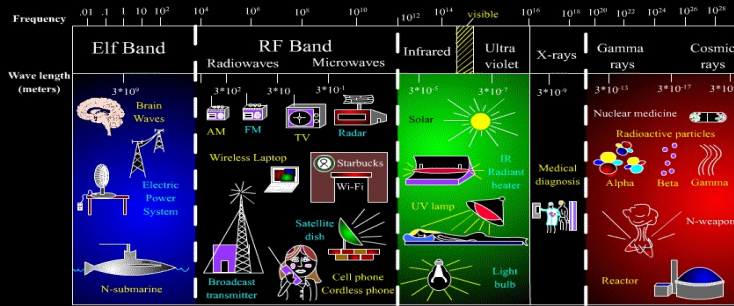
International Scientists' Appeal on Electromagnetic Fields,

May 21, 2015

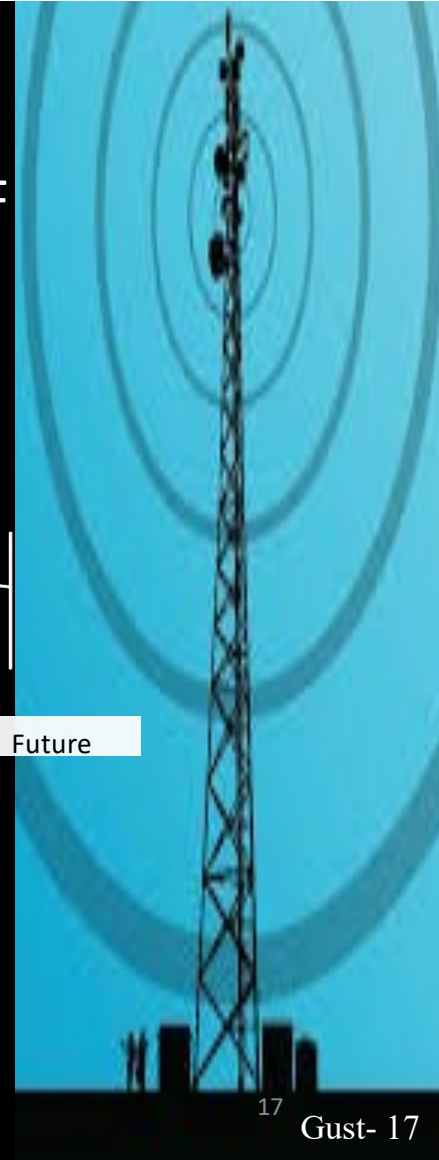
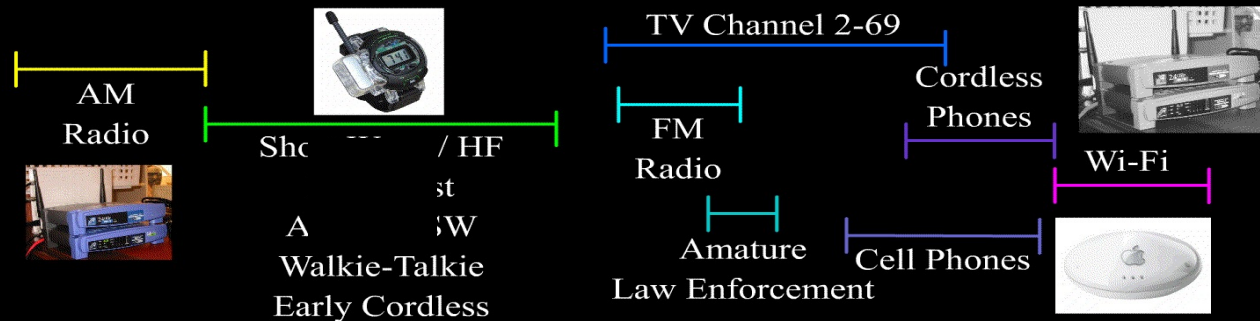
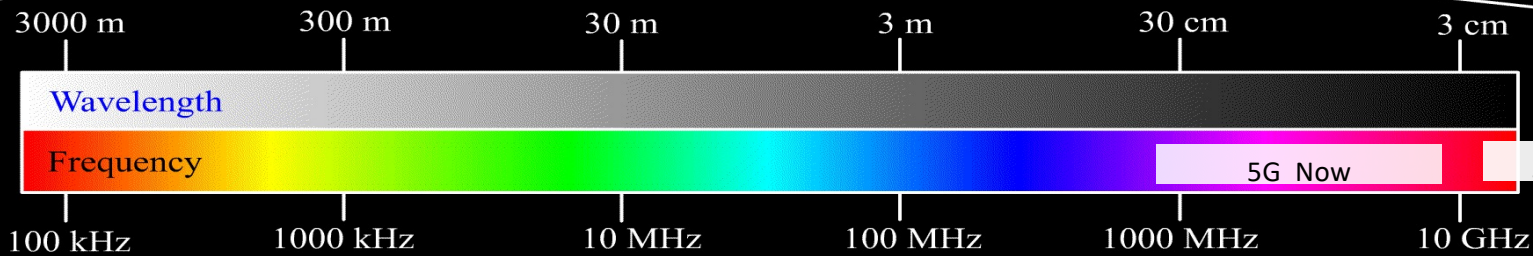
Spokesperson: Martin Blank, PhD,



The electromagnetic spectrum:



Radio Frequency- RF
EM Radiation



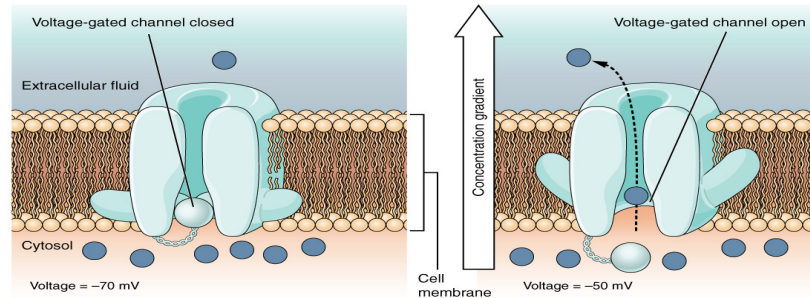


Wireless Devices Causing RF

- Smart phones– old and new with 5G capability
- Cellular system antennas
- Bluetooth devices (phone, computer, car, earphone)
- Baby monitors (audio & video)
- Utility smart meters, most concerning: electric meter
- Cordless phones (DECT)
- Wireless Internet (Wi-Fi)
- Neighborhood Internet service (WiMax)
- Wirelessly connected computers, tablets, etc
- Wireless games (X-box, Wii)
- Digital broadcast TV
- Home entertainment system components
- Sources are inside and outside the home---

RF Health Issues

- Thermal (microwave oven effect)
- Non-thermal
- Factors
 - Field strength
 - Frequency
 - Modulation===



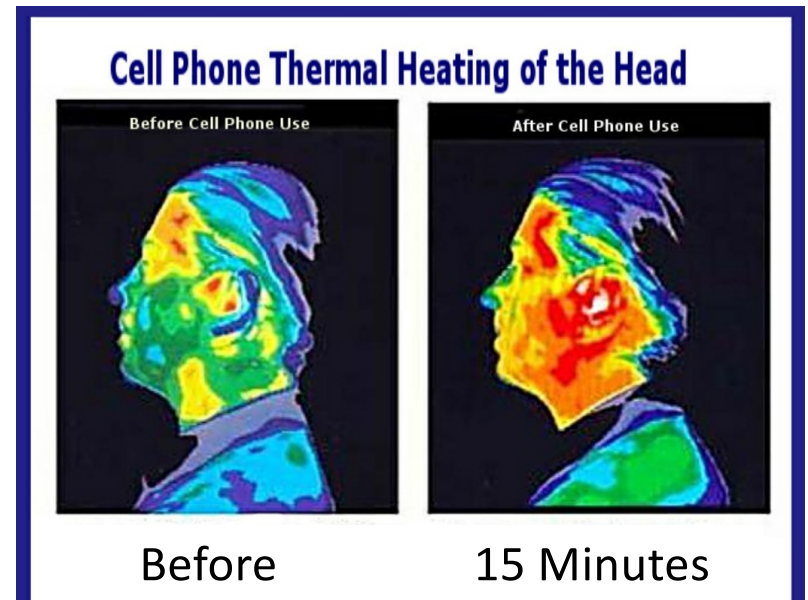
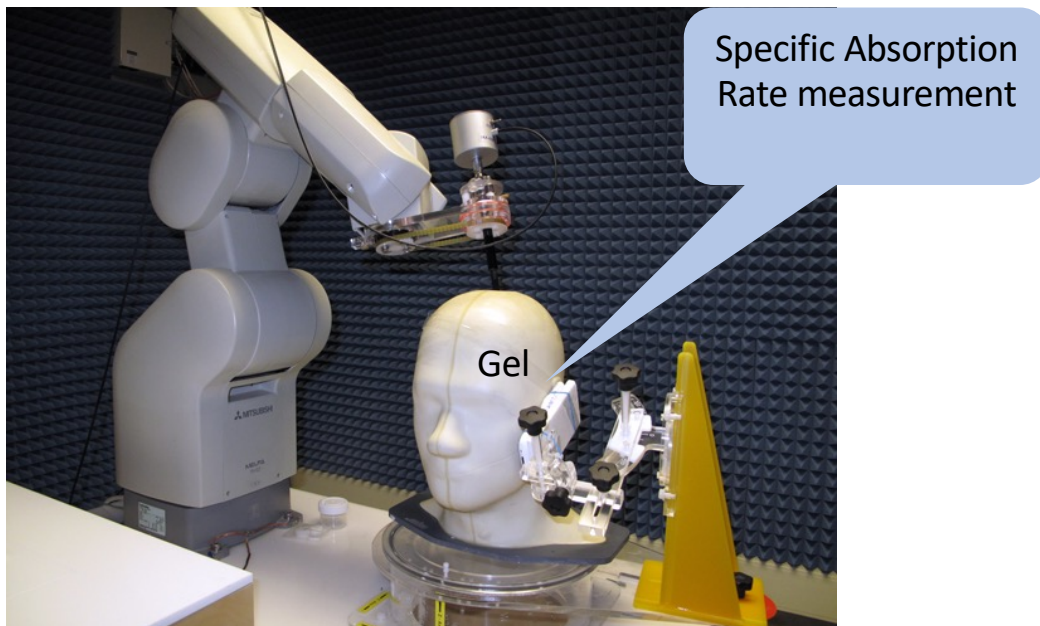
Voltage Gated Calcium Channels

FCC RF Safety Standard Thermal Protection

- Based on tissue heating from the ‘microwave oven’ effect.
- Vibration = heat
- Safe limit = 1/10 needed for tissue heating
- SAR, Specific Absorption Rate
- Many unfounded assumption in setting the SAR limit of 1.6 W/kg
 - For example: eye vs flesh===



SAR = Maximum Allowable Tissue Heating



Penetration depth depends on frequency

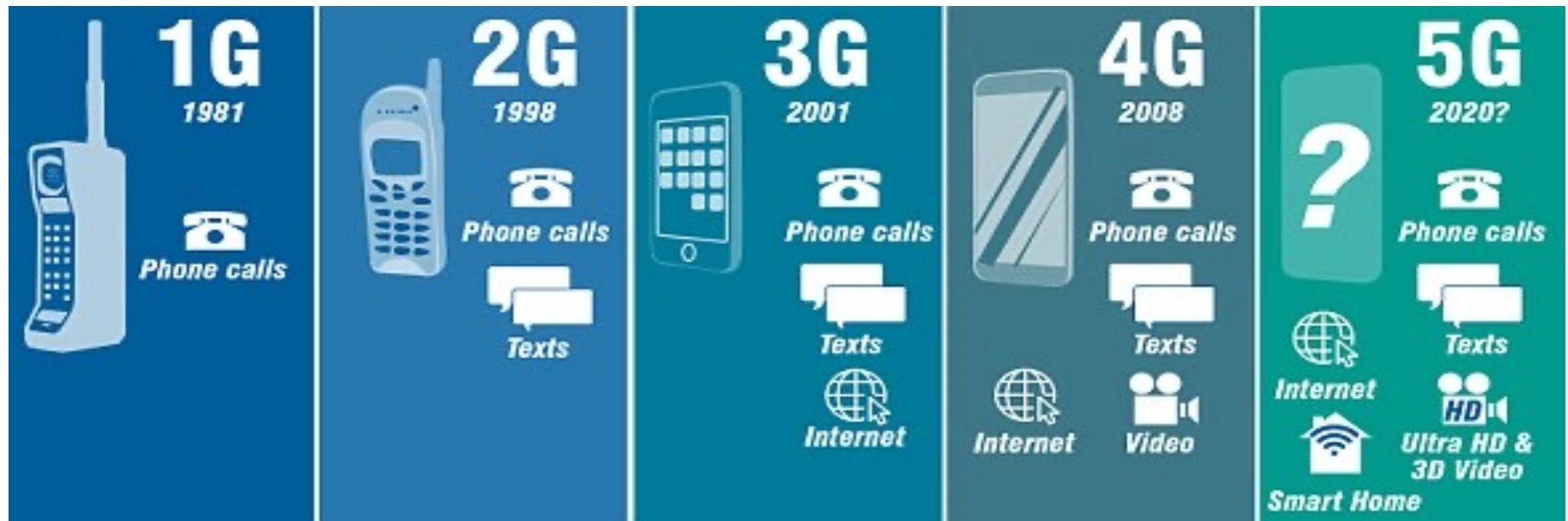
Cell phone range $\frac{1}{2}$ - 4 in

FCC Radiation Standard is Deficient

- Ignores low energy effects on the cells
- Since 1997, ~10,000 studies show cell non-thermal effects
- **This radiation affects the general population at non-thermal levels, not just phone user**
- Regulator (FCC) has a conflict of interest
 - RF Spectrum was sold on time payment plan
 - Gov't collects a 5% tax on cell service revenues
- FCC re-evaluated exposure standard in 2017
 - Conclusion– no need to change it
 - FCC Sued by CHD;
 - Aug 13, 2021: Favorable decision by the DC circuit===



The Freight Train is Coming



<https://www.dailymail.co.uk/sciencetech/article-6880805/S-Korea-roll-5G-services-beating-U-S-Chin.html>

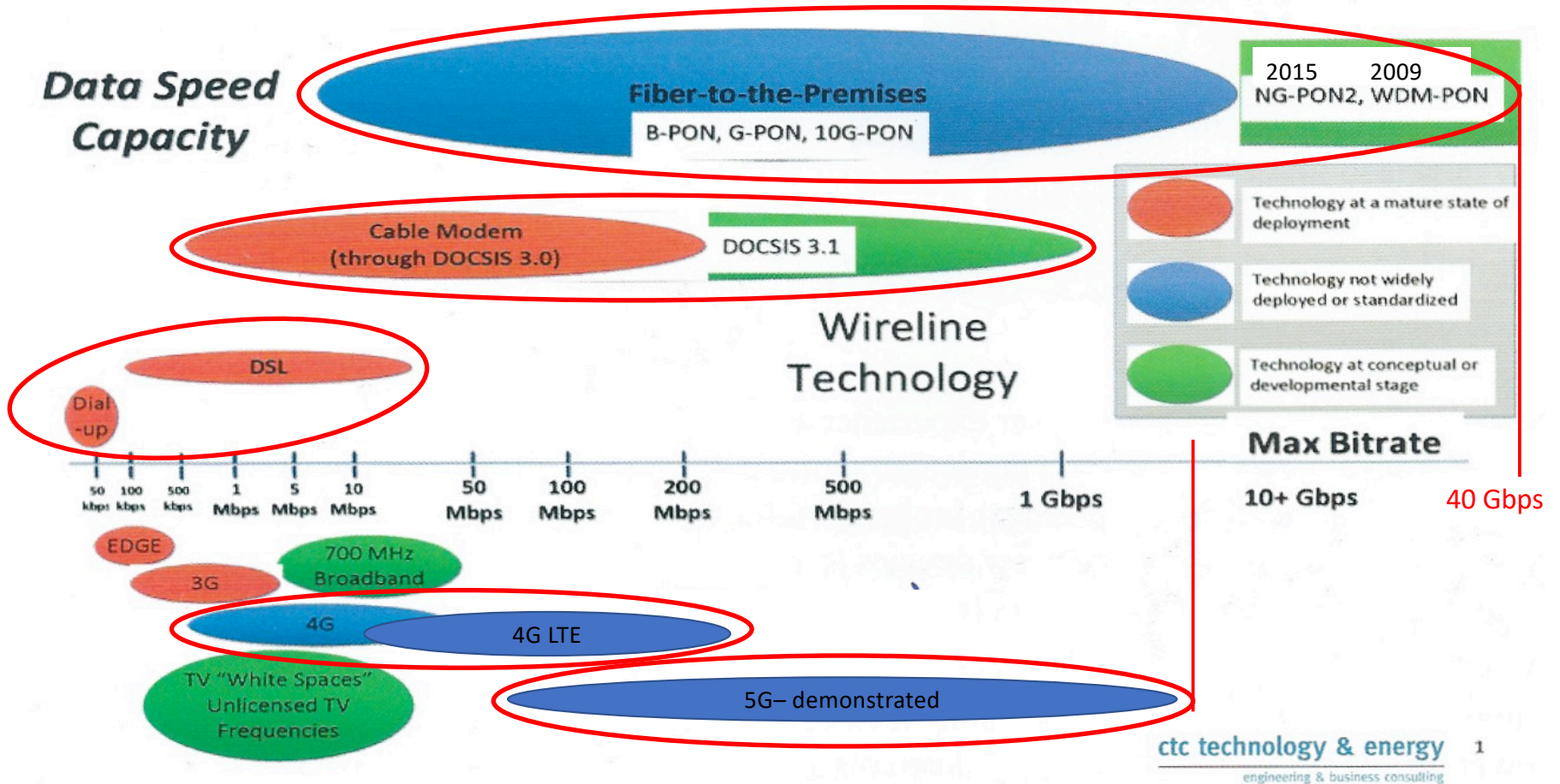
5G— Promises much faster downloads, lower latency (more “real time”), automation, self-driving cars, smart cities, VR, its the IoT==

Overview of The 5G System

- Multiple technologies to be released in next 10 years
- Infrastructure to support the *Internet of Things*
- 1G-4G were for people
- 5G is for FAST data: for IoT, not used for talk, text, etc.
- Not 5 GHz — Wi-Fi and cordless phone frequency
- Complicated expensive, unnecessary, very slow
- **Free public summary of 5G**
www.buildingbiologyinstitute.org

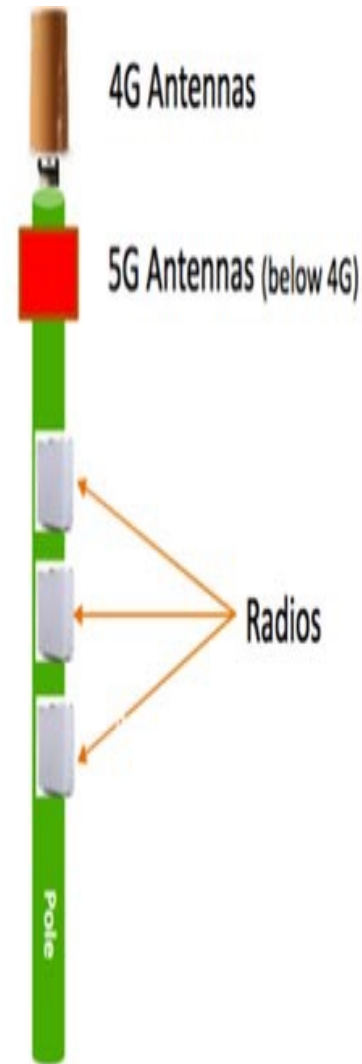


Technologies and Speeds:

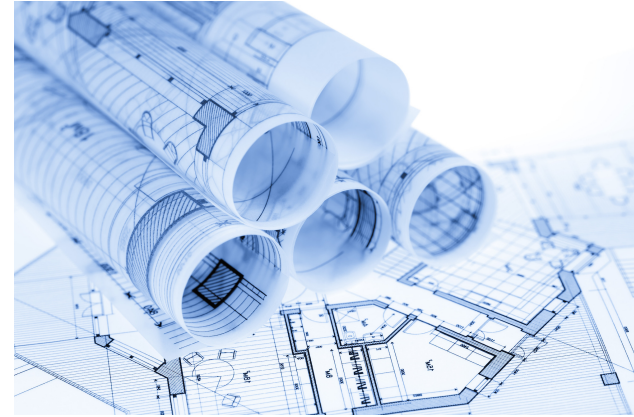


The Essence of 5G

- Requires massive data movement through the air
- This technology requires antennas in front of homes & offices
- Signal is fed to these antennas by fiber optic cable
- Data is blasted thru the last ~1000 ft of air into your home to reach
 - Stationary devices
 - Mobile devices [BUT the connection is unreliable]
- Why isn't fiber optic be run directly to your house?
 - Because fees would be regulated!!
 - Industry is forecasting \$11 trillion revenue by 2025---



Cell Industry Plans



- FCC Order 18-133 (September 2018)
 - Fast-tracks 4G/5G deployment in neighborhoods
 - Overrides local control of small cell placement and caps leasing fees paid to municipalities
- Many cities fighting 5G over lease fees, not health
- Collecting/selling data on building occupants. You are just data to them.
- Need to resolve loss of signal to moving mobile devices===

Issues for People

- Exposes residents to difficult-to-shield, always-on RF close by
- The levels of RF are unprecedented (graph next)
- Over 233 scientists from 40 countries demand 5G moratorium
<https://ehtrust.org/scientists-and-doctors-demand-moratorium-on-5g-warning-of-health-effects>
- “Human beings near the small cell will be affected by even narrow bursts of energy.....

To the human body, these pulses (less than a millisecond) are quite long enough to give lots of (*Health*) problems.” Trevor Marshal, PhD
- Military has developed crowd control weapons that use 5G frequencies in focused, directed energy===



Antenna Outside Your House

- 4G Antenna
- 60 ft from child's bedroom

Courtesy of Eric Windheim, BBEC, Sacramento



Antenna Outside Your Window – Effects

- Immediate symptoms
- Family vacated front rooms
- Applied foil to walls in back rooms to block radiation
- Radiation increases 100-400X
- Difficult to shield strong radiation===



Demands of 5G Activists

- Verizon 28 GHz fixed device Internet trials showed
 - 5G signal traveled 2-3,000 feet 3/5ths mile!
 - So, restrict 5G to existing cell towers (1-1.5 miles apart, 150 feet above roof lines)
- Restricted 5G to commercial & industrial areas
- Keep 4G / 5G out of residential neighborhoods
- Become an Activist; without you there will be no change
 - Local officials have to be pressured to organize & pressure state AGs to sue the Federal Govt.

<https://5gfreesantabarbara.wordpress.com>

www.5GFreeCalifornia.org

Case Study - RF Radiation

- Chicago, North side, 4 years
- Mom: headaches, lethargy, depression
- Dad: insomnia, concentration, inability to do job as lawyer, losing clients, fearful
- Children: anger, volatility, focus, memory issue



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Case Study- RF Radiation

Findings & Actions

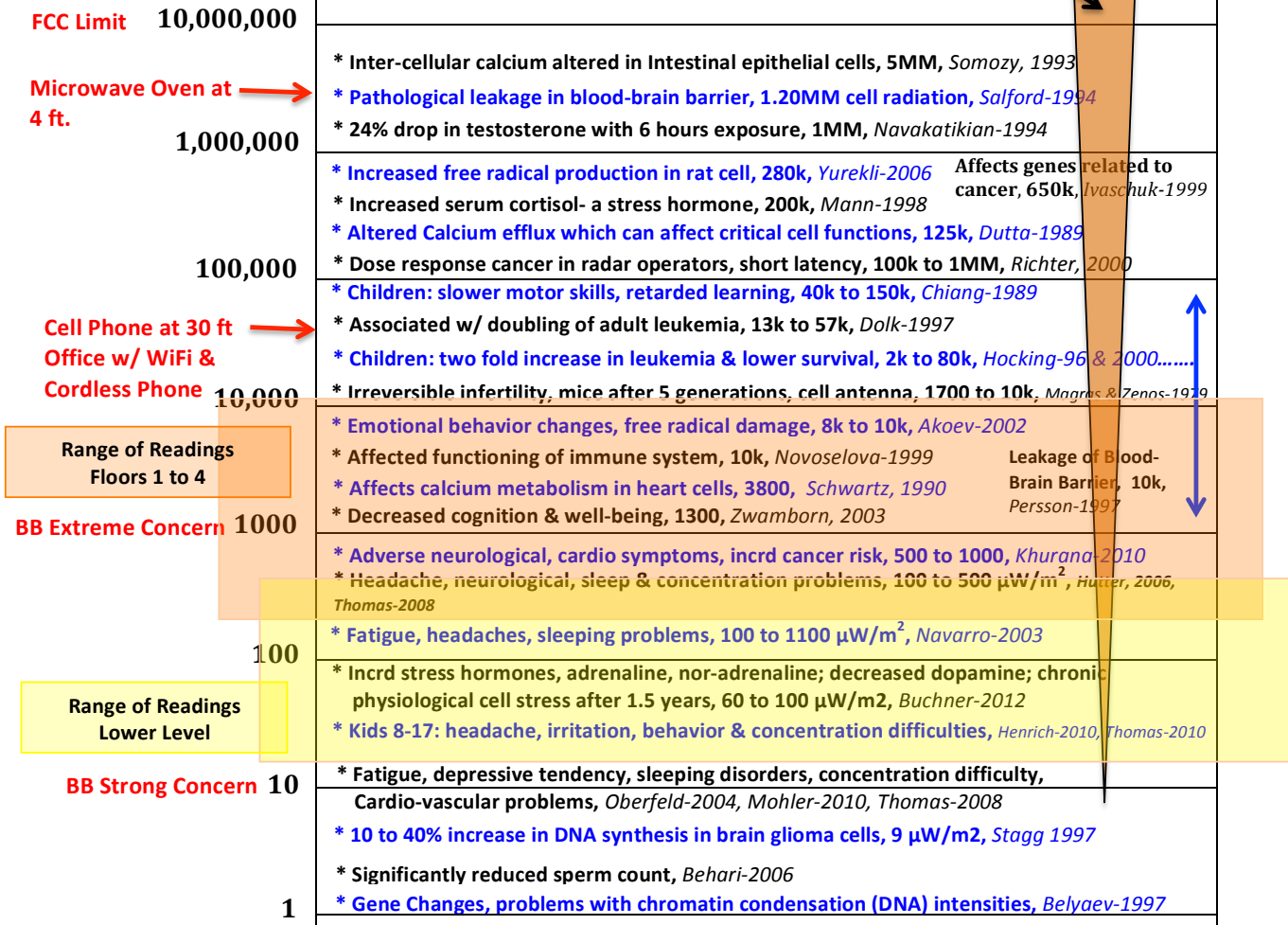
- Smart home- 15 wireless routers; removed
- Smart Home Dimmer 'RF noise'
- High outside RF affecting living space
Roof: >30,000; LR: 4,000; MB 3,000 $\mu\text{W}/\text{m}^2$
- Everyone got an RF tent for bed
- Parents moved to basement bedroom
- Dad says: "You saved my life"
- Moved to house with about 30 $\mu\text{W}/\text{m}^2$ ---



Power Density $\mu\text{W}/\text{m}^2$

Health Effects of RF Radiation

DNA damage exceeds repair ability



Prudent Avoidance of RF

- Join with your neighbors; fight 5G in your community and State
- Reduce usage of wireless phones (2 minute rule)
- Use hands free device for all calls
- Use land-lines for majority of phone time
- At home forward cell phone to land line; put in 'Airplane' mode
- Keep your children off wireless phones
- Remove multiple handset cordless (DECT) phone systems
- Hard-wired Internet & turn off radio in wireless router
- No wireless baby monitor
- No Bluetooth devices (mouse; keyboard; headset)
- At a minimum, sleep in a protected space===

Next Topics

- Methods of Shielding EMR
- RF in Schools
- BioInitiative Report
- Implicated disease states
- Meters to Measure EMF

Shielding **Magnetic** Fields

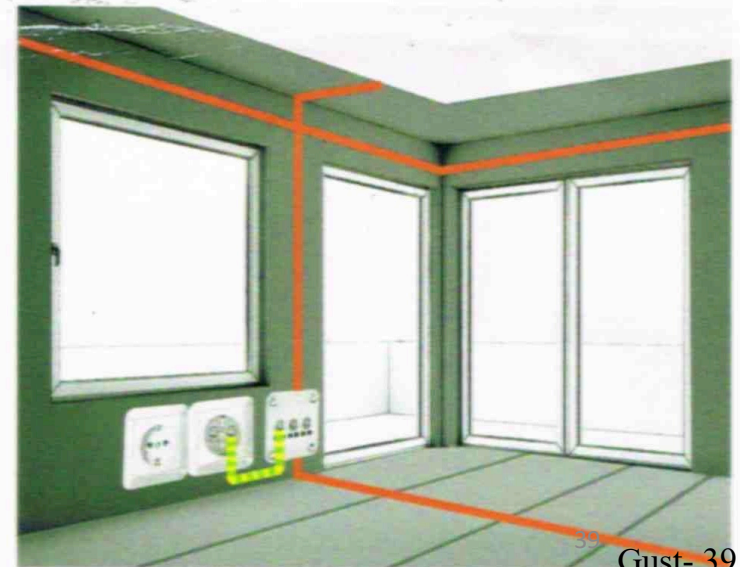
- Cannot easily be blocked
- Requires a more 'attractive' material than air
- Need materials with better permeability than air
- Distance is your friend



| Material | Relative Permeability |
|-------------------------------|--|
| Air / Wood / Water / Concrete | 1.0 |
| Aluminum | 1+ |
| Copper | 1- |
| Carbon Steel (2' x 4', 18 ga) | ~400 (~\$5/ft ²) |
| Electric Steel | ~4000 |
| Mu-metal (15") | 20,000 – 50,000 (~\$20/ft ²) |
| FineMet (18.5") | 70,000 (\$15/ft ²) |
| G-iron (25.5") | 7,000 (\$21/ft ²) |

Shielding RF

- Frequency: ~100 MHz to 18 GHz
- Source antenna >~ 10 feet away
- Shield between source & occupants
- Potential materials & efficiency
 - Metal - 100% (siding, roofing)
 - Al Foil - 100%
 - Carbon Paint - 99.997%
 - Window Film - 99.95%
 - SwissShield Fabrics- ~99%
 - Newest Low-e glass- ~99.999%---



Shielding RF

- SwissShield bed canopy
- Shield effect (SwissShield Fabric)
 - Daylite weave: 99.6%
 - Naturell weave 99.9%
- Depends on tight fit
- May require shielding on floor==

See www.GustEnviro.com



RF in Schools

- No acceptable way to have wireless and a healthy environment
- Some rooms are always close to a wireless router
- High power wireless router are likely to be used
- Every child using a wireless device is right next to the signal output from their device & the others
- Combined power is more significant than the router alone
- Cell Tower near a school is a huge a issue too---



Information Sources

- [BuildingBiologyInstitute.org](https://www.buildingbiologyinstitute.org)
 - Non-profit: On-line courses, Videos, Live Seminars, Certification
- [ElectroMagneticHealth.org](https://www.electromagnetichealth.org)
 - Non-profit, educational information site; connect with experts
- [AntennaSearch.com](https://www.antennasearch.com)
 - Antenna & tower location data
- [BioInitiative.org](https://www.biointiative.org)
 - International working group of scientists, researchers, public health policy professionals
- [5GFreeCalifornia.org](https://www.5gfreecalifornia.org)
 - Creating effective strategies & sharing other communities; CA, USA, World===



www.BioInitiative.org

Updated 2014 & 2020

because of this, the BioInitiative Report presents a solid scientific and public health policy assessment that is evidence-based.

BioInitiative 2012

A Rationale for Biologically-based Exposure Standards for Low-Intensity Electromagnetic Radiation

BioInitiative Working Group 2012

Jitendra Behari, PhD, India
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Cite this report as: BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors.
 BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation at
www.bioinitiative.org, December 31, 2012

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Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure (Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Multiply Power density by 10,000 to get $\mu\text{W}/\text{m}^2$

| Power Density (Microwatts/centimeter ² - $\mu\text{W}/\text{cm}^2$) | | Reference |
|---|--|----------------------|
| 0.01 - 0.05 $\mu\text{W}/\text{cm}^2$ | Adults (18-91 yrs) with short-term exposure to GSM cell phone radiation reported headache, neurological problems, sleep and concentration problems. | Hutter, 2006 |
| 0.005 - 0.04 $\mu\text{W}/\text{cm}^2$ | Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated) | Thomas, 2008 |
| 0.015 - 0.21 $\mu\text{W}/\text{cm}^2$ | Adults exposed to short-term GSM 900 radiation reported changes in mental state (e.g., calmness) but limitations of study on language descriptors prevented refined word choices (stupidified, zoned-out) | Augner, 2009 |
| 0.05 - 0.1 $\mu\text{W}/\text{cm}^2$ | RFR linked to adverse neurological, cardio symptoms and cancer risk | Khurana, 2010 |
| 0.05 - 0.1 $\mu\text{W}/\text{cm}^2$ | RFR related to headache, concentration and sleeping problems, fatigue | Kundi, 2009 |
| 0.07 - 0.1 $\mu\text{W}/\text{cm}^2$ | Sperm head abnormalities in mice exposed for 6-months to base station level RF/MW. Sperm head abnormalities occurred in 39% to 46% exposed mice (only 2% in controls) abnormalities was also found to be dose dependent. The implications of the pin-head and banana-shaped sperm head. The occurrence of sperm head observed increase occurrence of sperm head abnormalities on the reproductive health of humans living in close proximity to GSM base stations were discussed." | Ottolouju, 2010 |
| 0.38 $\mu\text{W}/\text{cm}^2$ | RFR affected calcium metabolism in heart cells | Schwartz, 1990 |
| 0.8 - 10 $\mu\text{W}/\text{cm}^2$ | RFR caused emotional behavior changes, free-radical damage by super-weak MWs | Akoev, 2002 |
| 0.13 $\mu\text{W}/\text{cm}^2$ | RFR from 3G cell towers decreased cognition, well-being | Zwamborn, 2003 |
| 0.16 $\mu\text{W}/\text{cm}^2$ | Motor function, memory and attention of school children affected (Latvia) | Kolodynski, 1996 |
| 0.168 - 1.053 $\mu\text{W}/\text{cm}^2$ | Irreversible infertility in mice after 5 generations of exposure to RFR from an 'antenna park' | Magras & Zenos, 1997 |
| 0.2 - 8 $\mu\text{W}/\text{cm}^2$ | RFR caused a two-fold increase in leukemia in children | Hocking, 1996 |
| 0.2 - 8 $\mu\text{W}/\text{cm}^2$ | RFR decreased survival in children with leukemia | Hocking, 2000 |
| 0.21 - 1.28 $\mu\text{W}/\text{cm}^2$ | Adolescents and adults exposed only 45 min to UMTS cell phone radiation reported increases in headaches. | Riddervold, 2008 |

| | |
|--|---|
| Stress proteins, HSP, disrupted immune function | Brain tumors and blood-brain barrier |
| Reproduction/fertility effects | Sleep, neuron firing rate, EEG, memory, learning, behavior |
| Oxidative damage/ROS/DNA damage/DNA repair failure | Cancer (other than brain), cell proliferation |
| Disrupted calcium metabolism | Cardiac, heart muscle, blood-pressure, vascular effects ⁴³ |

IMPLICATED DISEASE STATES



Electro-Hyper-Sensitivity (EHS)

Measuring RF Radiation

Safe & Sound LED Detector, \$180

- 3rd Party Certified +/- 6 dB
- 200 MHz to 12 GHz Flat
- Sound
- Made in North America



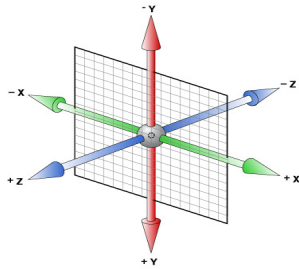
Safe & Sound Pro Meter, \$370

- 3rd Party Certified +/- 6 dB
- 200 MHz to 12 GHz Flat
- Sound
- Peak Hold
- Made in North America

See www.GustEnviro.com===



Measuring **AC Magnetic** Fields



Gauss Meters

- **3 Axis Meter - \$310**

www.GustEnviro.com

- **1 Axis GaussMaster \$35**

www.LessEMF.com Cat # A494



Measuring AC Electric and Magnetic Fields

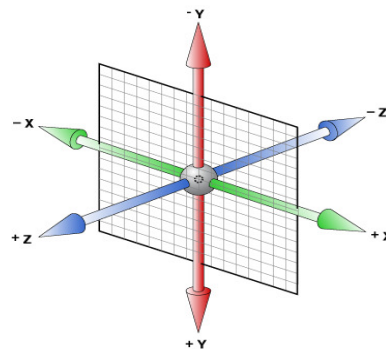
Gauss and Volts/meter

- **1-Axis GigaHertz Meter \$238**

www.GustEnviro.com

- **3-Axis GigaHertz NFA1000 \$2,106**

www.GustEnviro.com



Shielding EMR

- Power system magnetic fields
- Power system electric fields
- Radio frequency fields



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