Understanding Electromagnetic Radiation (EMR) and Electromagnetic Fields (EMF)

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Opening

- Whenever new technology is implemented, it is important to test its impact on human health, as well as on animal, plant, and insect life. It needs to include its short term impact as well as long term impact. This applies to biotechnology (GMOs), new prescription drugs, and even new vaccines.
- The new technology that that is being addressed is with electronic devices. We need to include issues with existing wiring, as well.
- What we are really covering is part of the electromagnetic spectrum.
- This includes cell phones, microwaves, various appliances, television, light bulbs, even wires that crisscross our country. The list is quite long. And it keeps growing with the term smart phones, smart meters, and now smart houses.
- Later in this presentation, to really understand electromagnetic radiation, we are going to cover some basics concepts based on physics.

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- Types of Electromagnetic Radiation (Ionizing and Non-Ionizing)
- Sources of Electromagnetic Radiation
- Various Names for Electromagnetic Radiation
- Physics Side of Electromagnetic Radiation or Electromagnetic Spectrum
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- Electromagnetic Fields Definition
- Types and Examples of EMRs (also Fields)
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- What types of EMFs that Certified Electromagnetic Radiation Specialists test
- Suggested Types of Corded Telephones (Order through Amazon)
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Source: Report of the Comprehensive EMR Assessment for the Clarke Residence in Cumberland, MD, by Ray Pealer.

Electromagnetic Spectrum

- The electromagnetic spectrum covers the complete range of energy that includes all kinds of electric, magnetic, and visible radiation, from gamma rays having a wavelength of 0.001 angstrom to long waves having a wavelength of more than 1 million km. It ranges from extremely low to extremely high levels.
- To really understand what electromagnetic radiation is, you need to realize that electromagnetic radiation is part of the electromagnetic spectrum. It is not the entire spectrum that is a problem, certain parts of it are generally defined as fields (or categories). It is also the cumulative exposure to various components of the electromagnetic spectrum.
- This can be considered to be part of physics. It can be seen as a sine curve, and it varies with different frequencies.

Electromagnetic Spectrum continued

- Some of these frequencies are found in nature and some of it is man-made.
- What this presentation addresses are the frequencies that can cause bodily harm, including total amount of exposure. This varies from individual to individual, depending upon their degree of sensitivity.
- The electromagnetic radiation spectrum can be seen as a guitar string stretched over eight frets. Play the lowest note and you get radio waves, play the highest one and you get gamma rays. On a guitar, different vibrational patterns in the string will give off distinct sounds in the form of notes — our perception of them varies, but they're all basically the same thing set on different intensity settings. Similarly, different oscillation patterns of magnetic and electrical fields will generate various kinds of EMR. We perceive them as completely different (some we can't directly sense at all,) but they're all basically the same phenomena on different intensities
- The next slide discusses in more detail electromagnetic radiation (EMR) followed by electromagnetic fields (EMF).

Some authors use EMF and EMR interchangeably. They are not quite the same.

Electromagnetic Radiation Definition (EMR)

- A kind of radiation including visible light, radio waves, gamma rays, and X-rays, which electric and magnetic fields vary simultaneously. (Source: Oxford Dictionary)
- All of these types of radiation can be thought of as waves, like the ripples that spread out when you drop a pebble into a calm pool of water.
- Electric and magnetic fields vary simultaneously. It is also physics. Examples of these Electromagnetic fields includes:
  - gamma radiation
  - infrared light
  - microwaves
  - propagating (radiating)
  - radio waves
  - ultraviolet light
  - visible light
  - X-ray
- It is part of the electromagnetic spectrum. It can be considered a generic term and is also known as EMR.

Types of Electromagnetic Radiation

Ionizing Radiation

- Type of radiation that carries enough energy to break bonds between molecules and ionize atoms.
- Examples of ionizing radiation are the gamma rays emitted by radioactive materials, cosmic rays, and X-rays

Non-ionizing Radiation

- This type of radiation does not carry enough energy break molecular bonds and ionize atoms.
- Examples of non-ionizing are ELF (extremely low frequencies) and RF (radio frequencies) radiation or wireless, produced by modern electronics. *(Actually, this type of radiation can also cause problems, damaging the DNA in a different way according to Dr. Mercola.)*

Source: Both Dr. Joseph Mercola and Bill Cadwallader cover this in different ways as to how they affect our bodies.

Sources of Electromagnetic Radiation

Wires

- Appliances
- Electrical wiring
- Power lines

Wireless

- Cell and cordless phones
- Cell towers
- Surveillance systems
- WIFI
- Wireless laptops
- Wireless routers
- Wireless utility meters

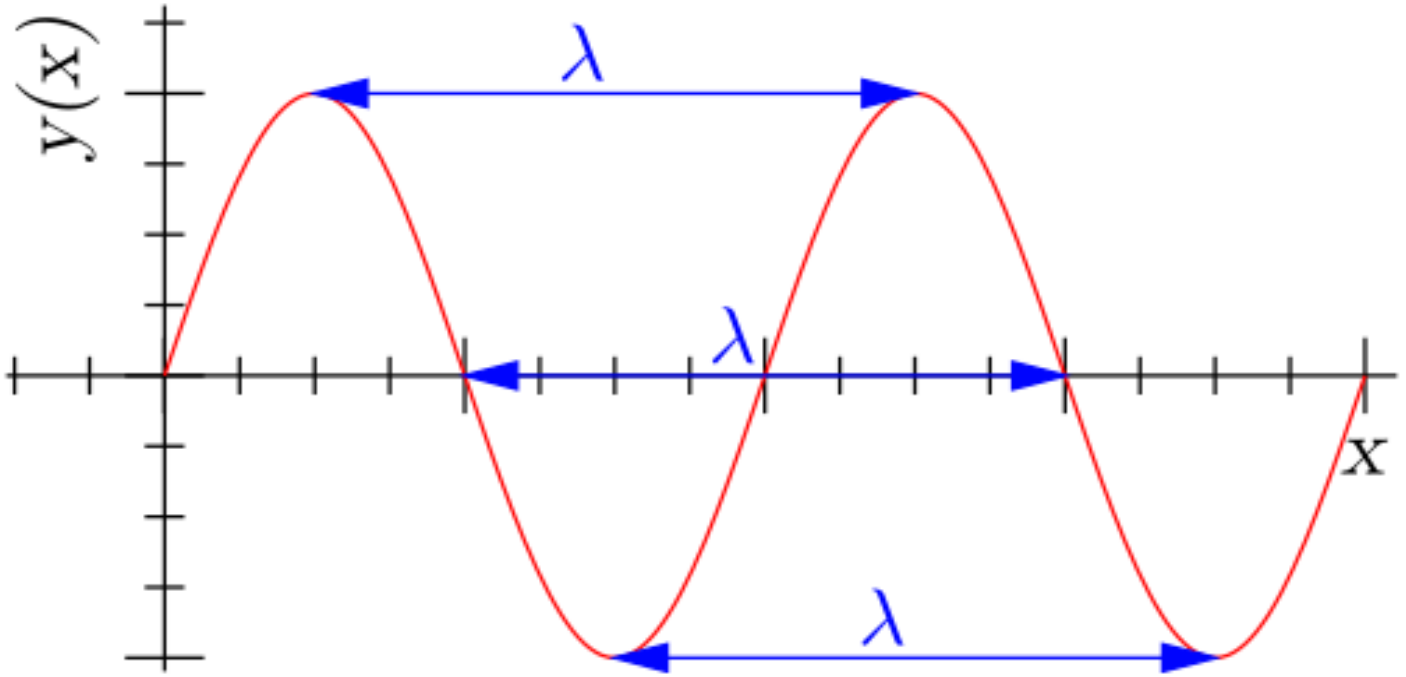
Source: Exposed, pages 30-33

Various Names for Electromagnetic Radiation

- Bluetooth Radiation
- Dirty Electricity
- Electric Fields
- Electric Radiation
- Electro-pollution
- Electro-smog
- Electromagnetic Fields (EMF)
- Electromagnetic Interference (EMI)
- Electromagnetic Radiation (EMR)
- Magnetic Fields
- Magnetic Radiation
- Microwave Radiation
- Radio Frequency (RF)
- WiFi Radiation
- Wireless Radiation

Source: Exposed, page 29

The Physics Side of EMR



Just measure the distance between same-points on the wave.

Image credits Richard F. Lyon / Wikipedia.

Wavelength is equal to speed over frequency and is usually taken to represent the distance between two successive crests. Electromagnetic waves are typically described by any of the following three physical properties: the frequency f, wavelength λ, or photon energy E. (Source: Wikipedia)

Source: https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/

The Physics Side of EMR continued

Relation of wavelength to frequency & speed. The shorter the wavelength, the frequency is the higher. More technically, wavelength is inversely proportional to wave frequency.

All electromagnetic waves move at or close to the speed of light. It is different from looking at the wavelength and frequency of an electromagnetic wave.

The speed of an electromagnetic wave, expressed in meters per second is equal to wavelength (in meters) x frequency (in oscillations per second or Hertz, abbreviated as Hz). Hertz - Hz is defined as the number of cycles per second of any oscillating or repeating phenomenon, but usually used to define electrical signals, or electrical field frequencies such as those of electromagnetic fields, radio signals, or computer processing clock cycles.

The term Hertz as used in frequency measurement was named for German physicist Heinrich Hertz (1857-1894), who studied electromagnetism, clarified Maxwell's electromagnetic theory of light, and demonstrated the existence of electromagnetic waves.

The term Hertz was established by the International Electrotechnical Commission in 1930.

Source: https://inspectapedia.com/emf/Electromagnetic_Frequency_Hertz_Definitions.php

The Physics Side of EMR - Hertz

- Hertz, unit of frequency. The number of Hertz (abbreviated Hz) **equals the number of cycles per second**. The frequency of any phenomenon with regular periodic variations can be expressed in Hertz, but the term is used most frequently in connection with alternating electric currents, electromagnetic waves (light, radar, etc.), and sound.
- The next two slides cover various Hertz measurements.

Frequency Definitions	Frequency in words	Frequency in Exponent Form
Definition of Hertz Hz	One Hertz - one cycle per second	10^{-1}
Definition of Decahertz daHz	Tens of cycles per second	10^{1}
Definition of Hectohertz hHz	Hundreds of cycles per second	10^{2} Not in common use
Definition of Kilohertz KHz	One kilohertz - one thousand cycles per second = 1,000	10^{3}
Definition of Megahertz MHz	One megahertz - one million cycles per second = 1,000,000	10^{6}
Definition of Gigahertz GHz	One gigahertz - one billion cycles per second = 1,000,000,000	10^{9} to 10^{12} (range)
Definition of Terahertz THz	One terahertz - one trillion of cycles per second = 1,000,000,000,000	10^{12} to 10^{15} (range)

Source: https://inspectapedia.com/emf/Electromagnetic_Frequency_Hertz_Definitions.php

The additional Hertz incredibly-high frequencies listed below are not likely to be found in use describing electromagnetic radiation such as those discussed in these articles - these are not in common use, but may be used to describe quantum-mechanical wave functions.

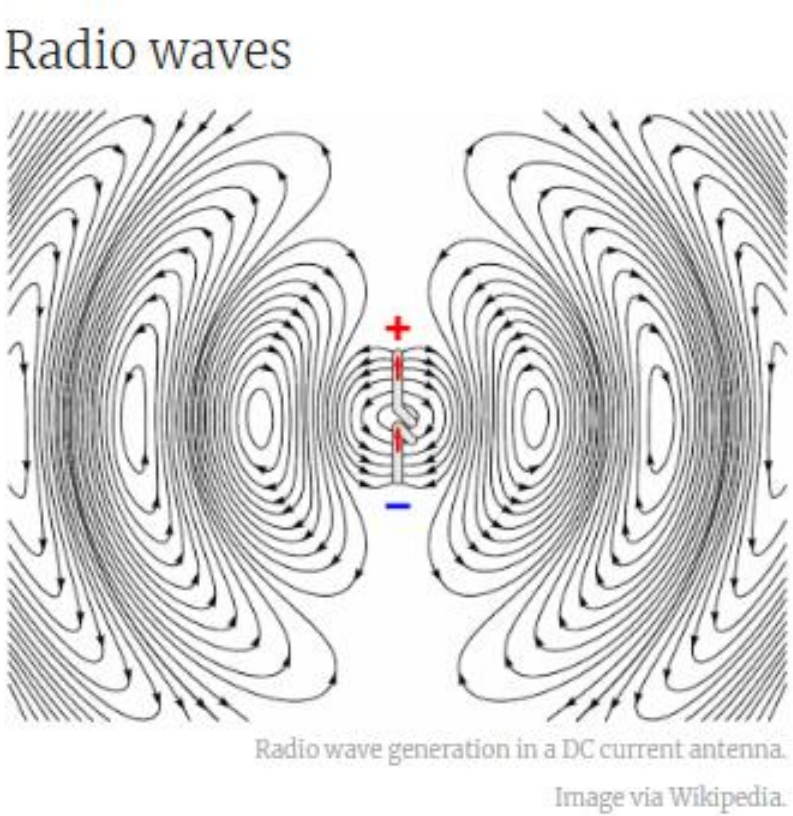
Definition of Petahertz PHz	One petahertz - one followed by 15 zeros, or more formally, One One Petahertz PHZ = 1 x 10^{15} [cycles per second if we are discussing frequency]	10^{15}
Definition of Exahertz EHz	One exahertz - one followed by 18 zeros, or One EHZ = 1 x 10^{18}	10^{18}
Definition of Zetahertz ZHz	One zetahertz -one followed by 21 zeros, or One ZHz = 1 x 10^{21}	10^{21}
Definition of Yotahertz YHz	One yotahertz - one followed by 24 zeros, or One YHz = 1 x 10^{24}	10^{24}

Source: https://inspectapedia.com/emf/Electromagnetic_Frequency_Hertz_Definitions.php

Types and Examples of Electromagnetic Fields (and also Electromagnetic Radiation)

- radio waves
- microwaves
- infrared radiation
- visible light
- ultraviolet radiation
- X-rays
- gamma rays

Radio Waves



Radio wave generation in a DC current antenna.
Image via Wikipedia.

Frequencies for radio waves range from 3 KHz to 300 GHz.

Radio waves have the lowest frequencies of all types of EMR, and its photons carry the least amount of energy.

They are good for long range communications.

Source:
https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/

Microwaves

- Frequencies for microwaves range between 300 MHz (wavelength 100 cm) and 300 GHz (0.1 cm).
- They have a bit more energetic photons and a shorter wavelength (which means more energy density), they're kinda-radio-wave-ish really.
- Are used in communications with some differences from radio waves. You need a direct line of sight to the receiver, as microwaves don't bend (diffract) around hills or mountains, they don't reflect back from the ionosphere, or follow the planet's curvature as surface waves. But they pack more of a punch than radio waves and can pierce through some of the things that radio can't — like thick clouds or dust — due to their higher frequency.
- Microwaves are used to transmit data over wireless networks, to communicate with satellite and spacecraft, in autonomous and classical vehicles for collision avoidance systems, some radio networks, keyless entry systems, and garage door remotes.
- Microwaves can be used to heat food. It can heat up water which is found in food. (Note: It is suggested that microwave ovens do not be used for food preparation because it reduces their nutritional content.)

Source: https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/

Infrared Radiation

Frequencies in infrared radiation range from 300 GHz to 430 THz.

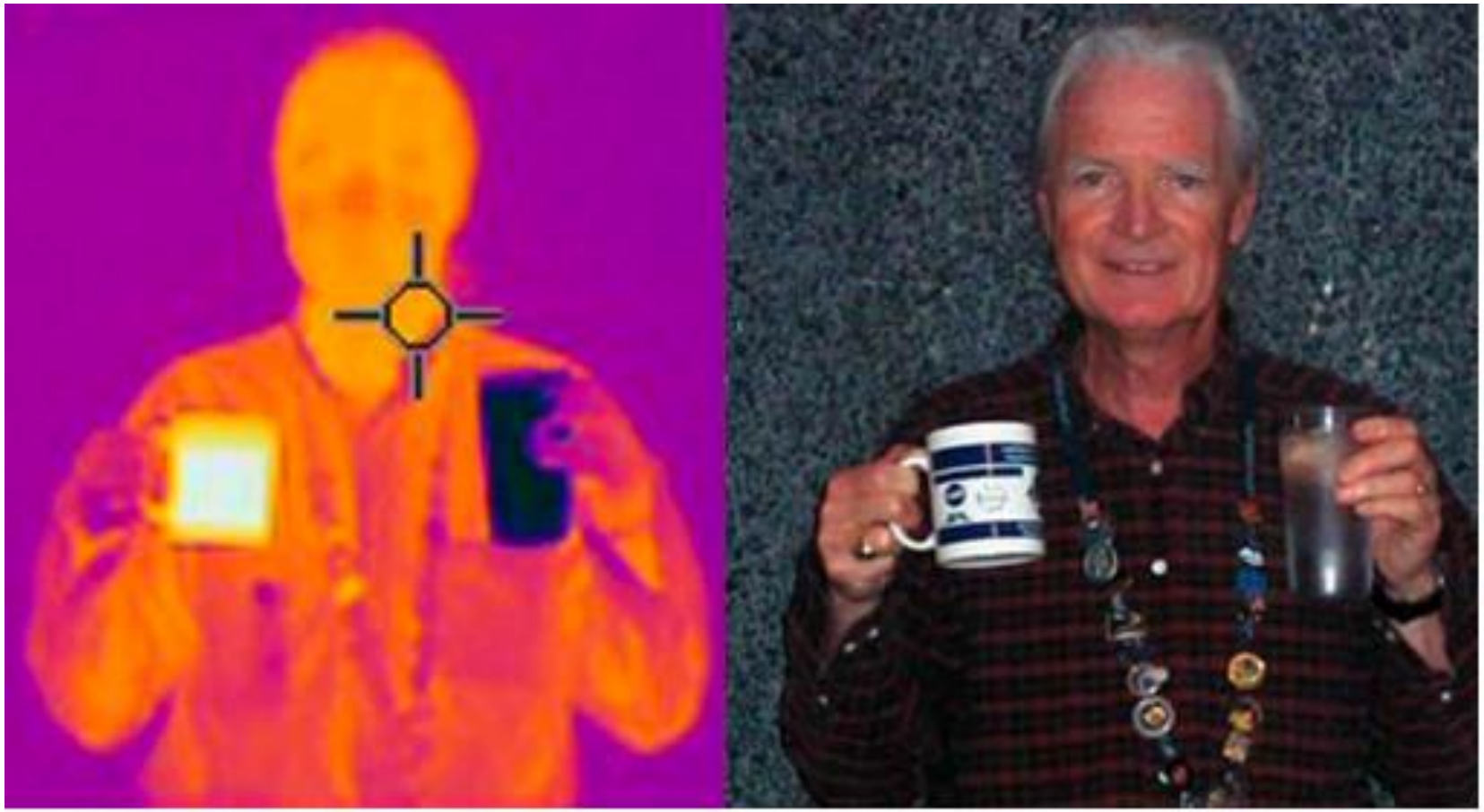
Unlike radio and microwave radiation, infrared radiation interacts with dipoles (heavily polarized chemical molecules such as water), meaning it gets absorbed by a wide range of substances — and almost all organic substances — that turn its vibration into heat. However, the reverse is also true, meaning that bulk substances generally radiate some levels of IR as they release their heat.

It is not good for long-range communications. However, it is useful for the TV remote as it covers short distances successfully.

It can detect if heat is being given off. It can beam heat, as well.

Like all other electromagnetic radiation, IR carries energy and behaves both like a wave and like a quantum particle, the photon. A bit over half of all the solar energy that reaches Earth does so as infrared radiation — that's why sunlight feels so warm.

Infrared Radiation



NASA / JPL staff member Art Hammond viewed through an infrared camera.

https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/

Visible Light

Frequencies for visible light range from 430 to 770 THz.

This is the interval of electromagnetic radiation that your eyes are tuned to pick up.

We see different colors because certain bits of this spectrum get absorbed by objects, and the rest gets reflected. For something to appear red to you, it needs to absorb the wavelengths that don't correspond to the color and reflect just red wavelengths for your eyes to pick up.

However, color can also arise from the way light interacts with a particular object. An object's texture is also created by much the same mechanism. Snow, for example, appears to be white, matte and reflective at the same time — but individual snow crystals look like bits of glass.

Source: https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/

Ultraviolet Light

- Frequencies for ultraviolet light is over the frequency of 789 terahertz (THz).
- Ultraviolet light is composed of really short waves, from 10 nm to 400 nm, and carry a lot of energy
- In fact, starting from the UV border, photons carry enough energy to alter certain chemical bonds into new arrangements. This is not good for our DNA. At lower levels, it can cause skin burns and on higher levels, cancer.
- The ozone layer does give us some protection from ultraviolet radiation.
- It does help with the synthesis of vitamin D.

Ultraviolet radiation

Before and after sunscreen, as seen by UV camera, demonstrating its effects.

Image: Wikimedia Commons

Note Slide: Ultraviolet Light

The EM spectrum over the frequency of 789 terahertz (THz) or more is called ultraviolet. Ultraviolet light is composed of really short waves, from 10 nm to 400 nm, and carry a lot of energy.

In fact, starting from the UV border, photons carry enough energy to alter certain chemical bonds into new arrangements. Which is hell if you're a DNA molecule just trying to preserve information. Even worse for living stuff, certain UV subtypes that don't have enough energy to damage DNA directly (such as subtype A) still pose a risk because they produce reactive oxygen species inside the body, highly reactive compounds that hijack chemical bonds in DNA.

Overall, UV radiation is energetic enough that it starts being a real hazard to life. Even relatively low-energy UV can cause nasty skin burns, far worse than those caused simply by temperature (since they're also radiation-burns, as explained above). Exposure to higher-energy UV can lead to cancer, as the waves wreak havoc on DNA strands.

This ability to damage living organisms will be a common feature from now on the list, as frequencies will only keep increasing further on. At the higher ends of the UV spectrum (around 125 nm or less, sometimes called "extreme UV"), the energy carried by these waves is so high that it can actually strip electrons from atoms' shells in a process called photoionization.

Considering that UV radiation constitutes about 10% of the sun's total light output, it would cause a lot of trouble for anything living on land (since water does a pretty good job of absorbing UV). Luckily for us Earthlings, we're protected by the ozone layer and the rest of the atmosphere, which filter out most UV rays before they cause any real damage.

It's not all bad news, however. UV radiation is key to the synthesis of vitamin D in most land vertebrates, including humans. UV rays are also used in photography and astronomy, in certain security applications (to authenticate bills or credit cards), in forensics, as a sterilizer, and of course, on tanning beds.

https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/

X-Rays / Rontgen Radiation

- With frequencies ranging from 30 petahertz to 30 exahertz (‘peta’ means 15 zeros, ‘exa’ means 18 zeros) and wavelengths from 0.01 to 10 nanometers, X-rays are very energetic.
- X-rays (and the more energetic gamma rays) are made up of photons that all carry minimum-ionization energy (they can all photoionize), and are thus called ionizing radiation.
- Doctors use them to assess bone health issues.
- They are named after Wilhelm Röntgen, the German scientist who discovered them on November 8, 1895.

Note Slide:
X-Rays / Rontgen Radiation
With frequencies ranging from 30 petahertz to 30 exahertz (‘peta’ means 15 zeros, ‘exa’ means 18 zeros) and wavelengths from 0.01 to 10 nanometers, X-rays are very energetic. Those with wavelengths under 0.2–0.1 nm are called ‘hard’ X-rays. Doctors use them to see the bones inside the body because they’re so tiny and powerful that our soft tissues are virtually transparent to them. Same goes with luggage at the airport — hard X-rays can see right through them. Their wavelength is comparable to the size of individual atoms, which is why geologists use them to determine crystal structures.

X-rays (and the more energetic gamma rays) are made up of photons that all carry minimum-ionization energy (they can all photoionize), and are thus called ionizing radiation. They can inflict massive damage on organisms and biomolecules, often affecting tissues very deeply below the skin as they easily penetrate through most matter.

They are named after Wilhelm Röntgen, the German scientist who discovered them on November 8, 1895. Röntgen himself called them X-radiation because it was quite mysterious at the time — nobody really understood what this radiation was or what it did.

https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/

Gamma Rays

- They have frequencies in excess of 30 exahertz, and wavelengths of under 10 picometers (1 picometer is a thousandth of a nanometer or a thousandth of a billionth of a meter), which is less than the diameter of an atom.
- They are a deadly form of electromagnetic radiation. Luckily, they are largely absorbed by the earth's atmosphere.

Note Slide:
Gamma Rays
These are the EMRs with the single highest-energy photons we know of. They have frequencies in excess of 30 exahertz, and wavelengths of under 10 picometers (1 picometer is a thousandth of a nanometer or a thousandth of a billionth of a meter), which is less than the diameter of an atom. They're mostly resulted from radioactive decay here on Earth (like nukes or Chernobyl), but can also come in ridiculously powerful gamma-ray bursts, likely the product of dying stars going supernova or the larger hypernova before collapsing into neutron stars or black holes. They are the single most deadly type of EM radiation for living organisms. Luckily, they're largely absorbed by Earth's atmosphere.

Artificial gamma rays are sometimes used to alter the appearance of gemstones, such as turning white topaz into blue topaz. The US is also experimenting with using them to create a sort-of X-ray machine on steroids that can scan up to 30 containers per hour. To get an idea of how ridiculously penetrative gamma rays are, know that mining operations use gamma ray generators to look through huge piles of ore and select the richest for processing. Other uses include irradiation (used to sterilize medical equipment or foodstuffs), to kill cancer tumors, and in nuclear medicine.

In short, these are the categories we use to describe electromagnetic radiation. They have things they like to pass through, and things that they reflect from. They're the light you can't see and can be pleasant, very dangerous, and sometimes, insanely deadly.
https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/

Additional Electromagnetic Fields

- In addition to the radio frequency field covered under the electromagnetic spectrum, we have four additional fields that need addressing. They are:
- Dirty Electricity (DE)
- Electric Fields (EF)
- Magnetic Fields (AC Magnetic Fields - MG)
- Radio Frequency Radiation (RF)
- These four types of fields can be measured by a certified electromagnetic radiation specialist. Each of these four fields will be covered in further detail in the next four slides.

Dirty Electricity

- Dirty electricity is electrical pollution in the form of high frequency voltage transients and harmonics found on electrical wiring.
- It is also generated by fluorescent lighting fixtures, AC (alternating current) power supplies, dimmer switches, computers and other new appliances.
- Standard wiring emits invisible electric fields into the room.
- It is a “noise” and a frequency that reverberates throughout our surroundings.

Source: Report of the Comprehensive EMR Assessment for the Clarke Residence in Cumberland, MD, by Ray Pealer, page 42. A separate meter is needed to measure this dirty electricity in the home. A Certified Electromagnetic Radiation Specialist can measure this.

Electric Fields

- Electric fields are generated from non-shielded electrical wiring, traveling in a distance of 10 to 20 feet in all directions.
- Our bodies absorb these electric fields and become “charged” with not only the 60 Hz cycle alternating current, but added on to existing electrical exposure.

Source: Report of the Comprehensive EMR Assessment for the Clarke Residence in Cumberland, MD, by Ray Pealer, pages 4 and 47.
A separate meter is needed to measure these electric fields.
A Certified Electromagnetic Radiation Specialist can measure these levels both inside the home and outside the home.

Magnetic Fields

- Magnetic fields are created by the flow of electricity through a wire or other metallic path. Generally, the higher the flow of electricity, the higher the levels of magnetic fields.
- Levels are generally higher near large power lines, electric panels and large appliances.
- Magnetic fields can also be generated or created by stray currents on water pipes.
- Levels drop off with distance.
- Wiring errors is another source of AC magnetic fields.
  - Wires have three wires, one is the hot wire (black) which sends out electricity. A second one is the neutral wire which is white. And the third one is the ground wire, which is bare copper for safety purposes.
  - Ideally, electricity needs to travel on the hot black wire and it produces a magnetic fields. When electricity comes back on the white neutral wire will also produce a magnetic fields, but in the opposite direction and they cancel each other out.
  - An example of an error: Two circuits have their neutrals joined together. This creates what is called a “net current”.

Source: Report of the Comprehensive EMR Assessment for the Clarke Residence in Cumberland, MD, by Ray Pealer, pages 8, 16, and 18.

AC means alternating current. A separate meter is needed to measure magnetic fields and a Certified Electromagnetic Radiation Specialist can measure this.

Radio Frequency Radiation

- This RF radiation is emitted by wireless technology, from cell and radio towers.
- Also, from devices like cordless phones, smart meters, Bluetooth, baby monitors, and anything which transmits information through the air without wires.
- Wireless radiation does not drop off quickly with distance and can travel through walls and buildings.

Source: Report of the Comprehensive EMR Assessment for the Clarke Residence in Cumberland, MD, by Ray Pealer, page 4.

Comparing Electromagnetic Fields (EMFs) versus Electromagnetic Radiation (EMR)

(and what can be measured in a home assessment)

- There are really five types of categories of electromagnetic radiation to be aware of:
  - Radio frequencies (along with WiFi, Wireless, RF- Radio Frequency, and Microwaves)
  - Electric radiation
  - Magnetic radiation
  - Dirty Electricity
  - Natural sources of radiation (found in nature)

The first four are ones that can be measured in a home assessment by a certified electromagnetic radiation specialist.

Note: Certain light bulbs also give out radiation, too.

Types of EMFs

EMFs in Nature

- Direct current
- Very low frequencies
- Very low power density (except lighting)
- Non-polarized
- Few sources

Man Made EMFs

- Alternating and direct current
- Much higher frequencies
- Much higher power density
- Polarized
- Huge number of sources and growing

Top 6 Sources of EMFs in the home

- Cell phones, laptops, and tablets
- WiFi Routers
- Cordless DECT phones (DECT means Digital Enhanced Cordless Technology)
- Microwave ovens
- Bluetooth devices (headphones, air pods, fitness trackers, keyboards, wireless mice, printers, baby monitors, hearing aids, speakers, gaming consoles and controllers, and any smart device)
- Smart electric, gas, and water meters

Source: EMF*D, by Dr. Joseph Mercola, page 5

Health Issues Related to EMR/EMF Exposure

- Three main types of health issues associated with EMF/EMR exposure:
  - 1. Damages the DNA
  - 2. Compromises the blood-brain barrier
  - 3. Weakens the immune system
- Issues when it comes to children
  - Our children are much more vulnerable to EMF/EMR exposure
  - Children's brains absorb 50% to 75% more microwave radiation from all phones than adult brains (Source: Exposed, page 83)
  - Schools' use of WiFi has resulted in a decline in linear reasoning and sequential communication (Source: Exposed, page 23)

More Specific Health Issues Related to EMR exposure

- Neck and head area
- Chest and abdominal and pelvic area
- Blood cancer
- Skin cancer and skin disease
- Other disorders (includes autism, ADD/ADHD, and etc.)

Source: Exposed, page 13 (A more comprehensive listing)

More Specific Health Issues Related to EMR Exposure

- Neck and Head Area (brain tumors, salivary gland cancer, thyroid cancer, acoustic neuroma, cancer of the larynx, esophageal cancer, headaches, persistent nosebleeds, dizziness, tinnitus, and cognitive impairment)
- Chest, Abdominal and Pelvic areas (cancer of the breast, colon, ovaries, uterus, testes, pancreas, kidneys; nausea, fertility and reproductive issues)
- Blood (leukemia, multiple myeloma)
- Skin (melanoma, rashes, and itching and burning on the skin)
- Other (ADD/ADHD, autism, neurological diseases, respiratory diseases, tremors and muscles, weakened immunity, lymphoma, insomnia, chronic fatigue, fibromyalgia, heart palpitations, some forms of diabetes, and hair loss)

Source: Exposed, page 13

More specific Health Issues with EMR

Electrohypersensitivity

- Fatigue
- Headaches
- Heart palpitations
- Insomnia
- Sensations of skin prickling

Other Health Issues

- Alzheimer's
- Anxiety
- Cancer
- Decreased sperm counts
- Depression
- Impaired Sleep

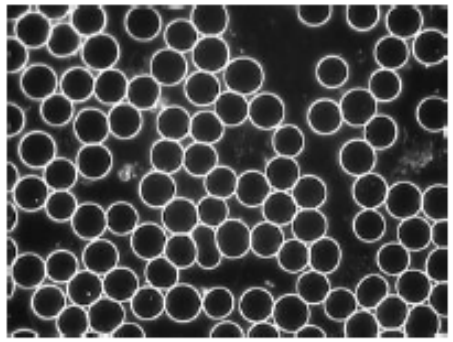
Source: EMF*D: 5G, WiFi, and Cell Phones, Hidden Harms and How to Protect Yourself, (2020) by Dr. Joseph Mercola. (Publisher: Hay House, Inc.) page xii and xiii.

Example of how cell phone use can affect our blood cells

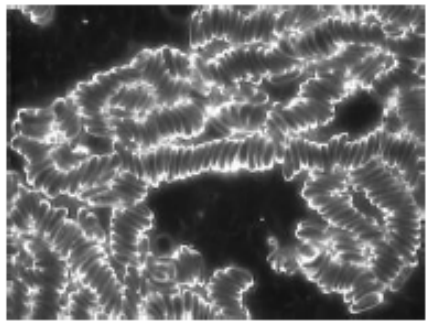
Short-Term Exposure to Cell Phone Radiation Effects on Blood

Weston A Price Foundation Study

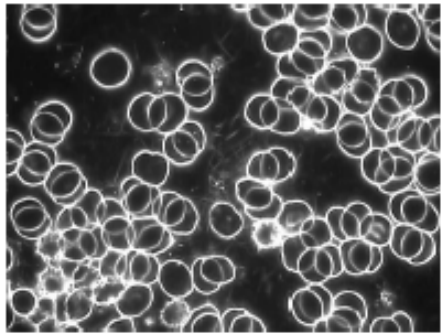
Effects of carrying a smart phone in a backpack



Before exposure



After carrying smart phone in backpack – (not in airplane mode).



45 mins after turning off cell phone

Source: Report of the Comprehensive EMR Assessment for the Clarke Residence in Cumberland, MD, July 2020 by Ray Pealer.
Test used in this situation is live blood analysis.

What is 5G?

- 5G refers to fifth generation of electromagnetic frequency between cell phones as well as smart appliances.
- In order for 5G to work, it needs more access points.
- It also exposes more people this type of radiation.
- Research studies shows that it poses harm to all of us.

Health Effects of 5G

- 1. Coldness
- 2. Paralysis
- 3. Hallucinations
- 4. Pain
- 5. All of the above

Source: EMP*D, by Dr. Joseph Mercola, page 46

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- Suggestions and Recommendations

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- EMF Practical guide by Lloyd Burrell
- EMF*D: 5G, Wi-Fi & Cell Phones: Hidden Harms and How to Protect Yourself (2020) by Dr. Joseph Mercola. (Publisher: Hay House, Inc.)
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- https://www.zmescience.com/science/physics/different-types-electromagnetic-radiation/
- http://www.tesengineering.com/electrical-engineering-what-is-dirty-power/
- "International Appeal to Stop 5G on Earth and Space." June 7, 2019, https://www.5gSpaceAppeal.org.
- https://stopdirtyelectricity.com/99-tips-to-lower-emfs/
- Report of the Comprehensive EMR Assessment for the Clarke Residence in Cumberland, MD, July 2020
- Zapped: Why Your Cell Phone Shouldn't Be Your Alarm Clock and 1,268 Ways to Outsmart the Hazards of Electronic Pollution (2010) by Ann Louise Gittleman. (Publisher: HarperCollins)

Appendix A: FCC (Federal Communications Commission)

- The FCC is the U.S. federal agency responsible for regulating the telecommunications industry.
- They do not do real in-depth studies on the health impact both short term and long term on human health from EMR exposure
- One type of testing that they do is based on a 200 lb. male, which is not applicable to women and children using SAR.

Source: EMF*D, by Dr. Joseph Mercola, page 7

Appendix A: Glossary

- Alternating Current (AC) is a type of electrical current, in which the direction of the flow of electrons switches back and forth at regular intervals or cycles. Direct current (DC) is electrical current which flows consistently in one direction. (Note: DC is better for us, and there are more issues with AC.)
- Airplane Mode – Setting found on cell phones and other electronic devices that turns off cellular, WiFi, and Bluetooth using the airplane mode. (Check under settings and locate airplane mode.)
- Blood Brain barrier - a naturally occurring barrier created by the modification of brain capillaries (as by reduction in fenestration and formation of tight cell-to-cell contacts) that prevents many substances from leaving the blood and crossing the capillary walls into the brain tissues. This is important to protect the brain from being harmed by substances that don't belong inside the brain.
- Bluetooth – Bluetooth is a computing and telecommunications industry specification that describes how devices can communicate with each other. Devices that use Bluetooth include computers, a computer keyboard and mouse, personal digital assistances, and smartphones. Bluetooth is an RF (radio frequency) technology that operates at 2.4 GHz, has an effective range of 32-feet (10 meters) (this range varies on the power class), and has a transfer rate of 1 Mbps and throughput of 721 Kbps.

Appendix A: Glossary continued

- Cell Phones – Is dependent on the towers that receive and transmits radio waves
- Certified Electromagnetic Radiation Specialist-Is someone trained and certified to assess electromagnetic radiation inside and outside homes and buildings, using specific meters and making recommendations for rectification.
- Cordless telephones- Uses radio waves to communicate between the base of the phone and the handset
- Direct Current – See Alternating Current
- Dirty Electricity – Comes from a variety of sources including the wiring within the walls and floors.

Appendix A: Glossary continued

- Electromagnetic Hypersensitivity (Symptoms)-According to one source, about 3% of the population may be sensitive to EMR. (Note: I suspect that the actual number is much higher.)
- Electromagnetic spectrum – the complete range of electronic frequencies, including those found in nature and man-made.
- EMF – Electromagnetic Fields – EMFs are invisible lines of force created whenever electricity is generated or used. EMFs are produced by power lines, electric wiring, and electric equipment and appliances. The frequency of EMFs is measured in Hertz (Hz, or cycles per second). (Note: I would add that it refers to specific frequencies in the electromagnetic spectrum.)
- EMR – Electromagnetic Radiation

Appendix A: Glossary continued

- 5G – 5G stands for fifth generation in how the electronic devices work. Compared to 4G, 4G is like a mountain stream and 5G is like a vast ocean. The frequencies are different for each generation. 5G needs a different arrangement for cell towers or antennas. 5G needs more coverage from satellites in our air space.
- FCC – Federal Communication Commission, the U.S. federal government regulatory agency that overseas electronic frequencies, radio, and internet
- Gamma Rays – A type of EMR with a 10 to the power of 22 Hertz (It means ten times ten 22 times and results in an extremely large number)
- Hertz – measurement of the electromagnetic radiation (1000 Hz is Kilohertz; 1,000,000 Hz is Megahertz; 1,000,000,000 is Gigahertz)
- Internet of Things – At the present time, the internet connects us with websites and email. The internet of things expands connections to meters, objects and appliances.

Appendix A: Glossary continued

- Magnetic Fields – Our bodies have a magnetic properties or field. It is measured in tesla (t) or gauss (g).
- MMW – type of electromagnetic wave used for 5G, the length of one wave is less than 10 millimeters. MMW stands for millimeter waves. More information can be transmitted on this wave, however, more cell towers or antennas are needed.
- Nm - one billionth of a meter, measurement. (Full name is nanometer.)
- Photon - a particle representing a quantum of light or other electromagnetic radiation. A photon carries energy proportional to the radiation frequency but has zero rest mass. (a physics term)
- RF Energy – a form of electromagnetic radiation called radio frequency (RF) energy
- SAR – Specific Absorption Rate . The criteria is based on 220 lb. male. It does not address cellular changes. It measures how much radiation is absorbed by the human body. (Source: Exposed, p. 44)
- Telecommunications Act of 1996 – The most recent major legislation overseeing telecommunications in the United States. This act is in need of a major overhaul.
- WiFi - It gives you wireless access to the Internet.

Appendix A: Glossary-Dirty Electricity

- **ELECTRICAL ENGINEERING : WHAT IS DIRTY POWER?**
- **Posted by Mike Ruff on in Engineering, Fundamentals**
- “Dirty power” is an abnormality in the power quality that is being delivered to a system. These abnormalities can include low power factor, voltage variations, frequency variations, and surges. All electrical systems are based on a supply of power at a certain voltage and frequency. Equipment and electronic devices are chosen based on this expected supply of power.
- When the power delivered to a system doesn’t match what is expected, equipment can malfunction, prematurely fail, or not work at all. In rare cases, power quality can be affected by the power company. The power company’s old infrastructure or inability to supply the high demand of its customers can decrease the quality of power. Most problems however, are caused by upstream systems (other customers) or the actual system itself (your site).
- Upstream electrical systems can produce “dirty power” which then moves into power lines and the lower quality power will then be delivered to all downstream systems. An electrical system can actually lower its own power quality by connecting too many digital loads that dump higher frequencies into the system. In order to improve power quality, one must understand the causes and what can be done to resolve these problems.

Source: http://www.tesengineering.com/electrical-engineering-what-is-dirty-power/

Appendix A: Glossary – Ionizing Radiation

- **Ionizing radiation** - ionizing radiation is electromagnetic waves powerful enough to change (ionize) molecules of a substance (human tissue, for example) that they strike. Ionizing means creating an "ion" form of a molecule - that is, detaching an electron, converting the molecule to an "ionized" form with a different electrical charge. Ionizing radiation is known to be dangerous to humans and other animals.
- It is the energy level of an electromagnetic wave that causes it to become ionizing, not the number of waves that occur. Short-wavelength (high frequency UV [ultra violet], X-rays, gamma rays) radiation is ionizing while low-frequency radiation is not.
- Examples of ionizing radiation include high frequency radiation such as from X-rays, gamma rays, or nuclear radiation, alpha rays, beta rays, and neutrons from a nuclear reaction.
- **Non-ionizing radiation** - low power non-ionizing radio waves at low levels of transmission power, such as older analog cell phone signals and cell phone radiation.

Source: https://inspectapedia.com/emf/EMF_RF_Definitions.php

Appendix A: Health Issues Additional Listing

- Aches and Pain
- ADD/ADHD
- Anxiety
- Buzzing/High Pitched Noise
- Cancer Risk, Increased
- Chest Pain
- Concentration Issues
- Decreased Appetite
- Depression
- Diabetes
- Dizziness
- Fatigue
- Feeling Bad
- Headaches
- Heart Rate, Fluctuation
- Irritability
- Light and Sound Sensitivity
- Memory Loss
- Neurological Issues
- Premature Aging
- Prickly Skin
- Skin Rashes

Source: Report of the Comprehensive EMR Assessment for the Clarke Residence in Cumberland, MD, by Ray Pealer, page 42.

Appendix A: Meters

Electromagnetic Radiation	Name of Meter	Name of Meter
WiFi Wireless RF- Radio Frequency Microwaves	Safe and Sound Classic Gives general guidelines, like extreme, high, moderate, and slight Price: $149	Acousticom 2 Gives actual readings from 200MHz to 8gHz Price: $179
Electric Radiation and Magnetic Radiation	Gigahertz ME3030B Two settings, E for Electric Field M for Magnetic Field Price: $158	
Dirty Electricity	Greenwave Dirty Electric Meter Measures levels of dirty electricity on the wiring in buildings $130	Stetzer Dirty Electricity Meter Has a digital display, measures harmful electromagnetic "energy“ $99

Source: Exposed, pages 195-200

Note: Not covering filters

Appendix A: Natural forms of Radiation

- Earth's magnetic field
- Atmosphere's electric field
- Lightening
- The sun
- From our own cells

Source: EMF*D, by Dr. Joseph Mercola, page 32

Appendix A: Recommendations to improve cell phone safety

- 1. Keep the phone away from the body
- 2. Use the speaker phone settings
- 3. Use text messages instead of talking
- 4. Carry the phone in a back pack, briefcase, or purse, not in a pocket, bra, or belt holster.

Source: Exposed, pages 109-110

Appendix A: RF Energy from all phones Issues

- 1. Brain cancer and tumors of the acoustic nerve (needed for hearing and maintaining balance) and salivary glands
- 2. Lower sperm counts and inactive and less mobile sperm
- 3. Headaches and effects on learning, memory, hearing, behavior, and sleep

Source: California Dept. of Health in Exposed, page 100

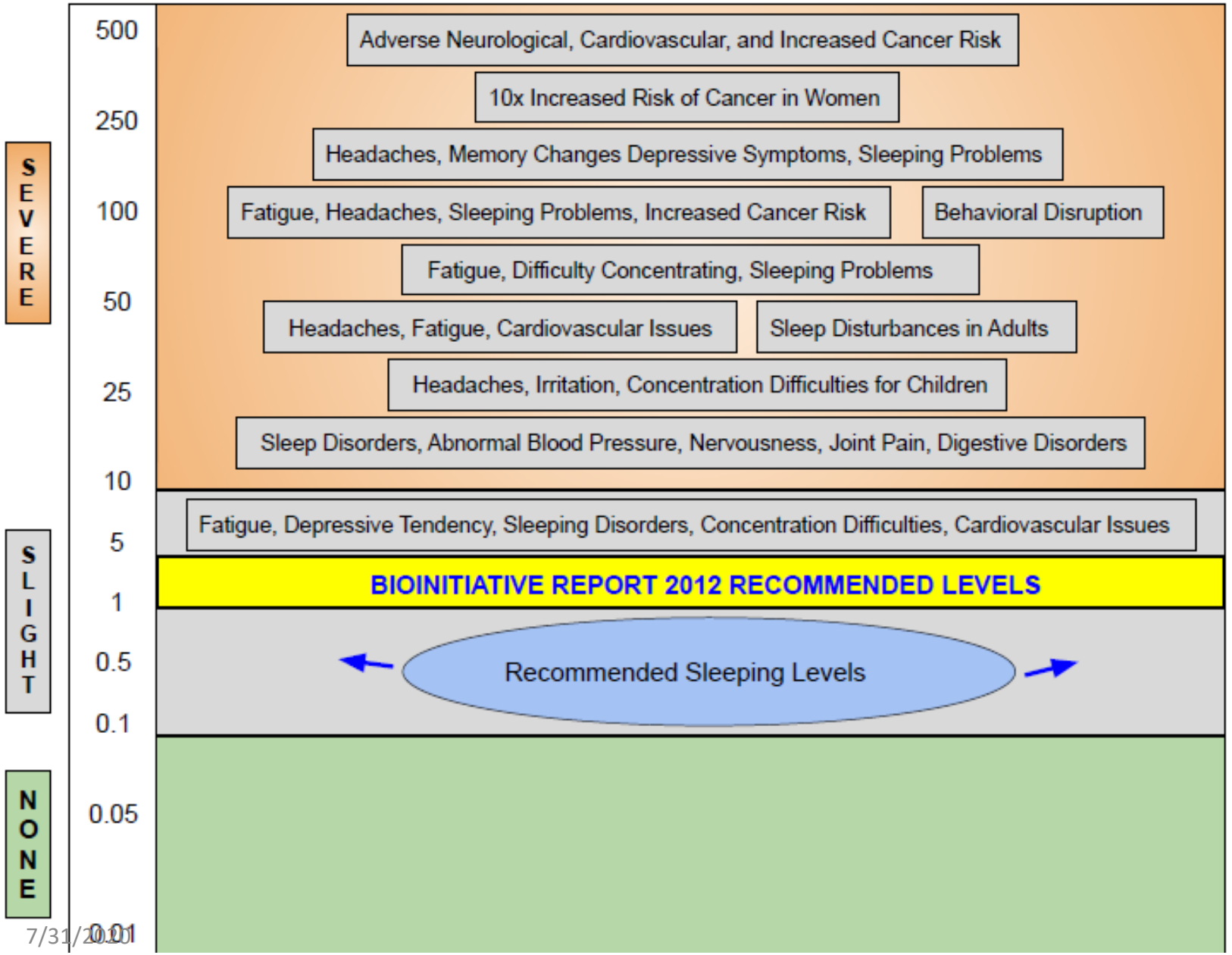
Appendix A: Resources

- AntennaSearch.com (can locate cell towers in specific geographic locations)
- ElectricSense.com
- https://buildingbiologyinstitute.org/free-downloads/
- http://www.emrsafety.net/
- International Commission on Non-Ionizing Radiation Protection (ICNIRP)
- Stopdirtyelectricity.com
- YouTube: A number of YouTube videos are available under Stop Dirty Electricity.

Appendix A: Types of Devices and Steps to Protect from Radiation

- Shielded power strips
- Remote control power strips
- EMF inspection
- Light bulbs – use incandescent light bulbs
- No dimmers
- No microwaves
- Use land line phones

Note: A room can be configured to reduce electromagnetic radiation.



Source:

Ray Pealer, Certified Electromagnetic Radiation Specialists
July 2020

Appendix A: Suggestions and Recommendations

- One, it would be a good idea to include EMR assessments along with building/house inspections before purchasing a home or other type of physical property. It would also be a good idea to test all public buildings especially schools and medical facilities.
- Anyone experiencing chronic and long term health issues, including cancer, may check out their home's EMR status.
- Nutritional supplementation can be implemented to strengthen one's reaction against EMR/EMF exposure.
- Research on this issue needs be done by third party independent sources. Furthermore, the role of government is to protect public health, and not serve the private sector's interests. This is why there is suppose to be an arm's length relationship between government regulatory agencies and the industry.
- This issue also underscores the need for a medical bill of rights in the United States. Cookie cutter medicine is actually dangerous medicine and what works for one person can harm another person.

Appendix B

- What a Certified Electromagnetic Radiation Specialist is
- What types of EMFs that Certified Electromagnetic Radiation Specialists test
- Suggested Types of Corded Telephones (Order through Amazon)
- Suggested Types of Light Bulbs

Source: Report of the Comprehensive
EMR Assessment for the Clarke Residence
in Cumberland, MD

Appendix B: What a Certified Electromagnetic Radiation Specialist is

A certified electromagnetic radiation specialist is trained to measure electromagnetic radiation and consult for detection and protection in homes, schools, and businesses. Also, they can cover indoor and outdoor environments.

To find a certified electromagnetic radiation specialist in your area, check out: https://buildingbiologyinstitute.org/find-an-expert/

Appendix B: What Types of EMFs that a Certified Electromagnetic Specialists Test for

Types of EMF Measurements Evaluated:

1. AC magnetic fields

Magnetic fields are created by the flow of electricity through a wire or other metallic path. Generally the higher the flow of electricity, the higher the levels of magnetic fields present. Levels are typically higher near large power lines, electric panels, and large appliances. They can also be created by stray currents on water pipes and wiring errors.

2. RF Radiofrequency radiation

RF radiation is emitted by wireless technology – cell and radio tower cordless phones, smart meters, Bluetooth, baby monitors, anything which transmits information through the air without wires. Wireless radiation does not drop off as quickly with distance and can travel through walls and buildings.

3. Dirty electricity

Dirty electricity is electrical pollution in the form of high frequency transients and other radiation found in the wiring. It is generated by fluorescent lighting fixtures, AC power supplies, dimmer switches, computers and other new appliances. Given that standard wiring emits an invisible but always present electric field into the room, these transients, "noise", or other unintended frequencies then reverberate throughout our surroundings.

4. Electric Fields

Electric fields are emitted from non-shielded electrical wiring. Whatever frequencies are present in the electric wires will be emitted for a distance of 10-20 feet in all directions. Our bodies absorb these electric fields and become "charged" with not only the 60 Hz cycle alternating current, but any and all dirty electricty that is riding on top of it. We try to reduce the electric fields as much as possible in sleeping and work areas.

Appendix B: Suggested Types of Corded Telephones

Corded Telephones:

Reach out and touch someone without radiating yourself.

Best black telephone without answering machine: AT&T 2940

Best white telephone without answering machine: AT&T 2909

Best white telephone with answering machine: AT&T 4940

Best 2-line telephone with backlight display AT&T 17929

There are also a variety of other styles of phones, including retro.

Long white cord 

Long black cord 

The best thing is to have an electrician install a wall plate.

This way the phone can be securely mounted on the wall and you can stretch the cord without the phone falling off a counter or desk.

Appendix B: Suggested Types of Light Bulbs

Light Bulbs

Halogen Filled Incandescent Light Bulbs

BR30 Halogen

Conclusion

- Electromagnetic radiation is an emerging threat to everyone's health. What makes this threat extremely dangerous is that it is invisible (like the current coronavirus pandemic). What is noticeable about the EMR and EMF issues is that these rays are invisible unless you use certain meters to check their levels.
- It is both the short term and long term effects that everyone needs to be concerned about, including the synergistic effects. Ignorance is not bliss when it comes to EMR/EMF exposure.
- This whole situation indicates the subversive role industry is playing in government actions, especially on the federal level, and the need for all citizens to educate themselves as well as government officials, especially legislators about the need to focus on health.
- It is our health that is our true wealth.

- In West Virginia, Ray Pealer is a certified electromagnetic radiation specialist and he can assess your home for radiation exposure. He follows up with a written assessment.
  - His contact information is:
  - Ray Pealer, BA, BBEC, EMRS
  - 802-497-6264
  - info@emrsafety.net
  - Emrsafety.net
  - Note: He has 25 years of experience.