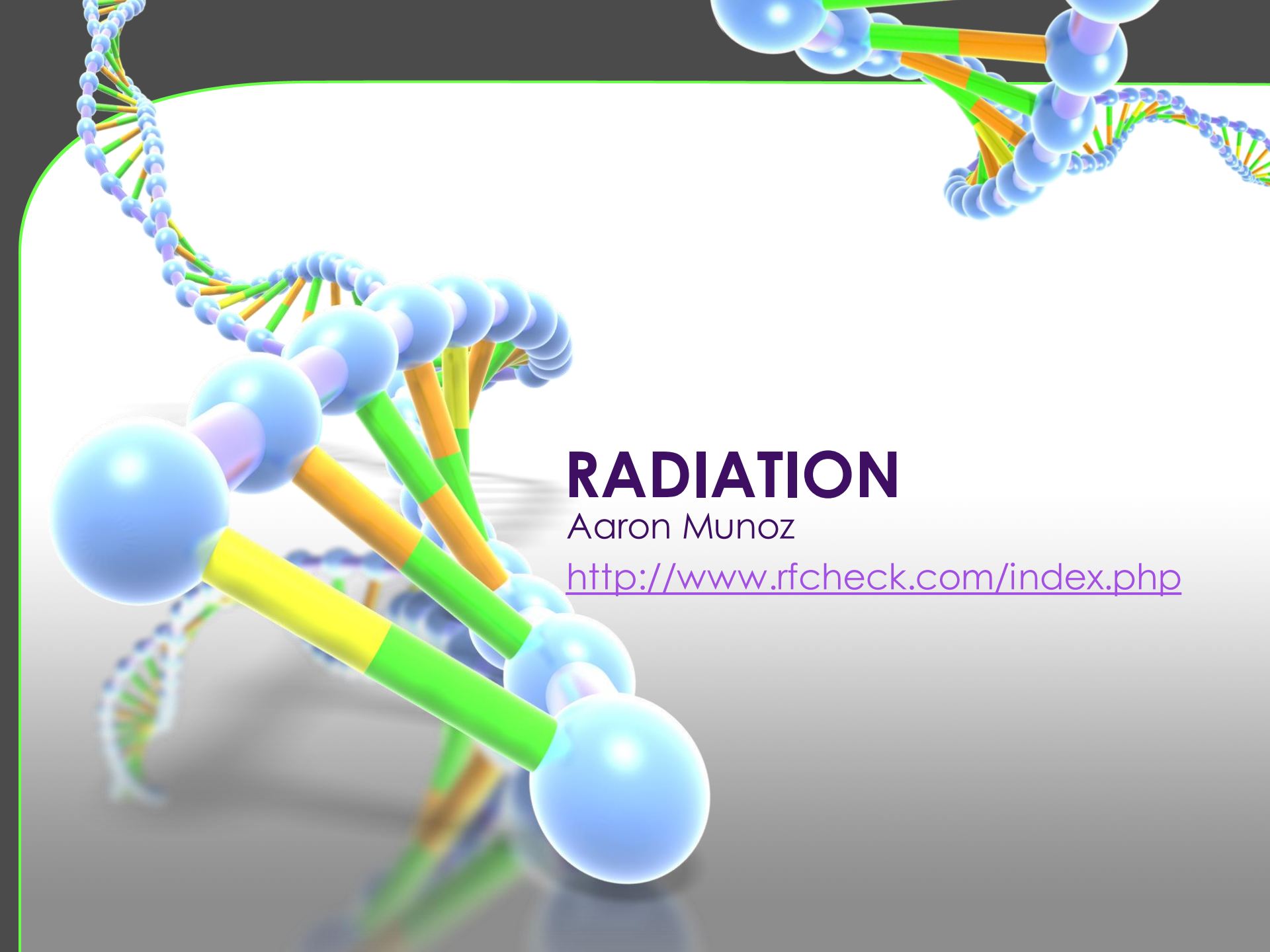


RADIATION

Aaron Munoz

http://www.rfcheck.com/index.php

Objective?

Understand radiation

Review Subpart D 1926.54 Occupational Health and Environmental Controls --- Nonionizing radiation

- Importance to our workers
- What we can do NOW

•What is radiation?

1

Radiation is the third process of heat transfer after conduction and convection. Unlike conduction and convection, radiation does not require a material medium for heat transfer. It can take place in a vacuum. For example heat from the sun reaches the earth by the process of radiation

2

Part of the problem with explaining radiation is that there are multiple units of measurement in play and they're all unfamiliar to the average Joe and Jane.

3

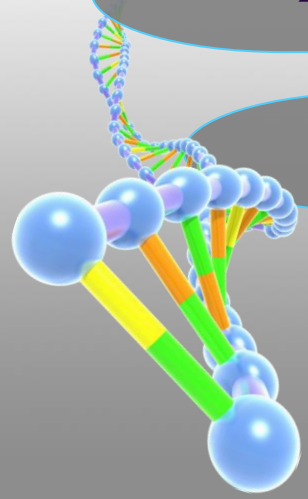
Try to think of radiation doses with a number system that everybody knows and uses everyday—money. Deciding arbitrarily that 1 sievert of exposure is worth $1000.

4

Once you've got that established, it's easier to understand relative doses. In this system, getting $4000 all at once is a deadly dose.

5

Most of us get $2.00-$3.00 a year in background radiation exposure. A mammogram is worth .40.



•Long Term Risk?

According to the EPA, an average of 2,000 out of every 10,000 adults will die from some form of cancer. If you expose everyone in that group to an extra $10.00 of radiation in one year, the number will jump to about 2,005 people.

- • Part Number: 1926
- • Part Title:
- Safety and Health Regulations for Construction
- • Subpart:
- D
- • Subpart Title:
- Occupational Health and Environmental Controls
- • Standard Number:
- 1926.54
- • Title:
- Nonionizing radiation.
- • Applicable Standards:
- 1910.97(a)(3)
- • GPO Source:
- e-CFR
- **1926.54(a)**
- Only qualified and trained employees shall be assigned to install, adjust, and operate laser equipment.
- **1926.54(b)**
- Proof of qualification of the laser equipment operator shall be available and in possession of the operator at all times.
- **1926.54(c)**
- Employees, when working in areas in which a potential exposure to direct or reflected laser light greater than 0.005 watts (5 milliwatts) exists, shall be provided with antilaser eye protection devices as specified in Subpart E of this part.
- **1926.54(d)**
- Areas in which lasers are used shall be posted with standard laser warning placards.
- **1926.54(e)**
- Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a substantial period of time, such as during lunch hour, overnight, or at change of shifts, the laser shall be turned off.
- **1926.54(f)**
- Only mechanical or electronic means shall be used as a detector for guiding the internal alignment of the laser.
- ***..1926.54(g)***
- **1926.54(g)**
- The laser beam shall not be directed at employees.
- **1926.54(h)**
- When it is raining or snowing, or when there is dust or fog in the air, the operation of laser systems shall be prohibited where practicable; in any event, employees shall be kept out of range of the area of source and target during such weather conditions.
- **1926.54(i)**
- Laser equipment shall bear a label to indicate maximum output.
- 1926.54(j)
- Employees shall not be exposed to light intensities above:
- **1926.54(j)(1)**
- Direct staring: 1 micro-watt per square centimeter;
- **1926.54(j)(2)**
- Incidental observing: 1 milliwatt per square centimeter;
- **1926.54(j)(3)**
- Diffused reflected light: 2 1/2 watts per square centimeter.
- **1926.54(k)**
- Laser unit in operation should be set up above the heads of the employees, when possible.
- **1926.54(l)**
- Employees shall not be exposed to microwave power densities in excess of 10 milliwatts per square centimeter.

Ionizing? Non-ionizing?

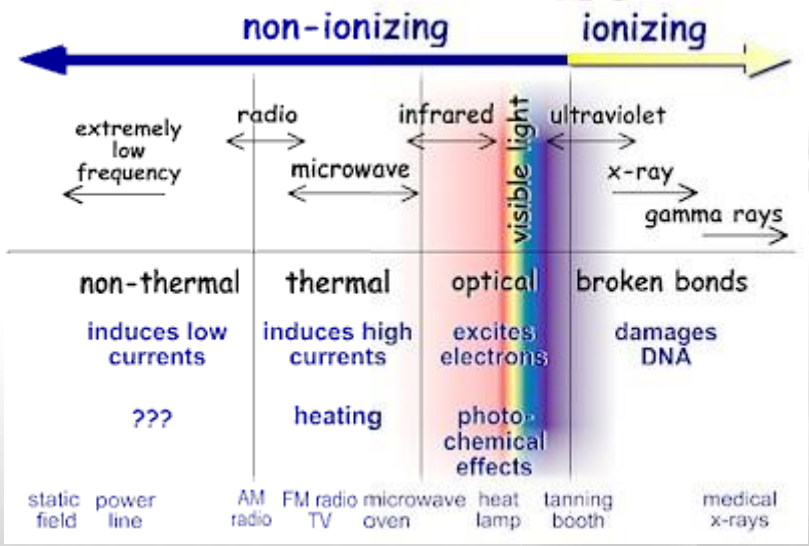
NON-IONIZING

- Radiation that has enough energy to move atoms in a molecule around or cause them to vibrate, but not enough to remove electrons, is referred to as "non-ionizing radiation." Examples of this kind of radiation are sound waves, visible light, and microwaves.

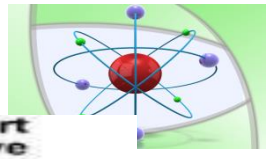
IONIZING RADIATION

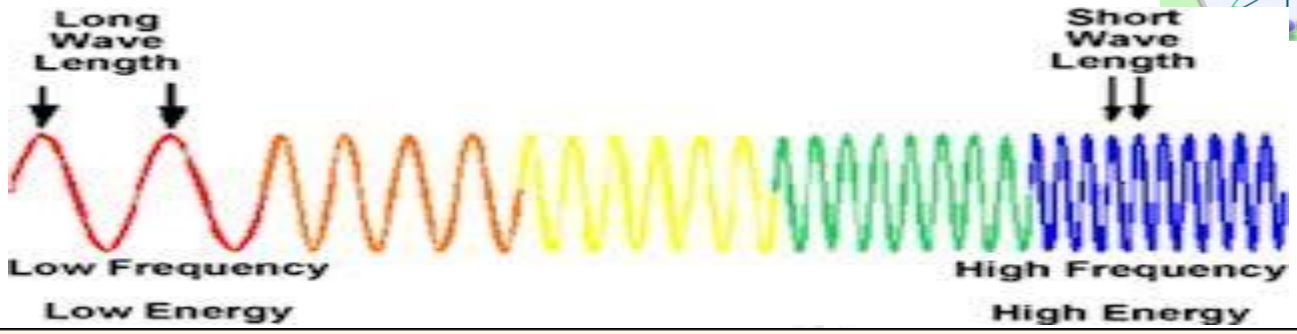
- Radiation that falls within the ionizing radiation" range has enough energy to remove tightly bound electrons from atoms, thus creating ions. This is the type of radiation that people usually think of as 'radiation.' We take advantage of its properties to generate electric power, to kill cancer cells, and in many manufacturing processes.

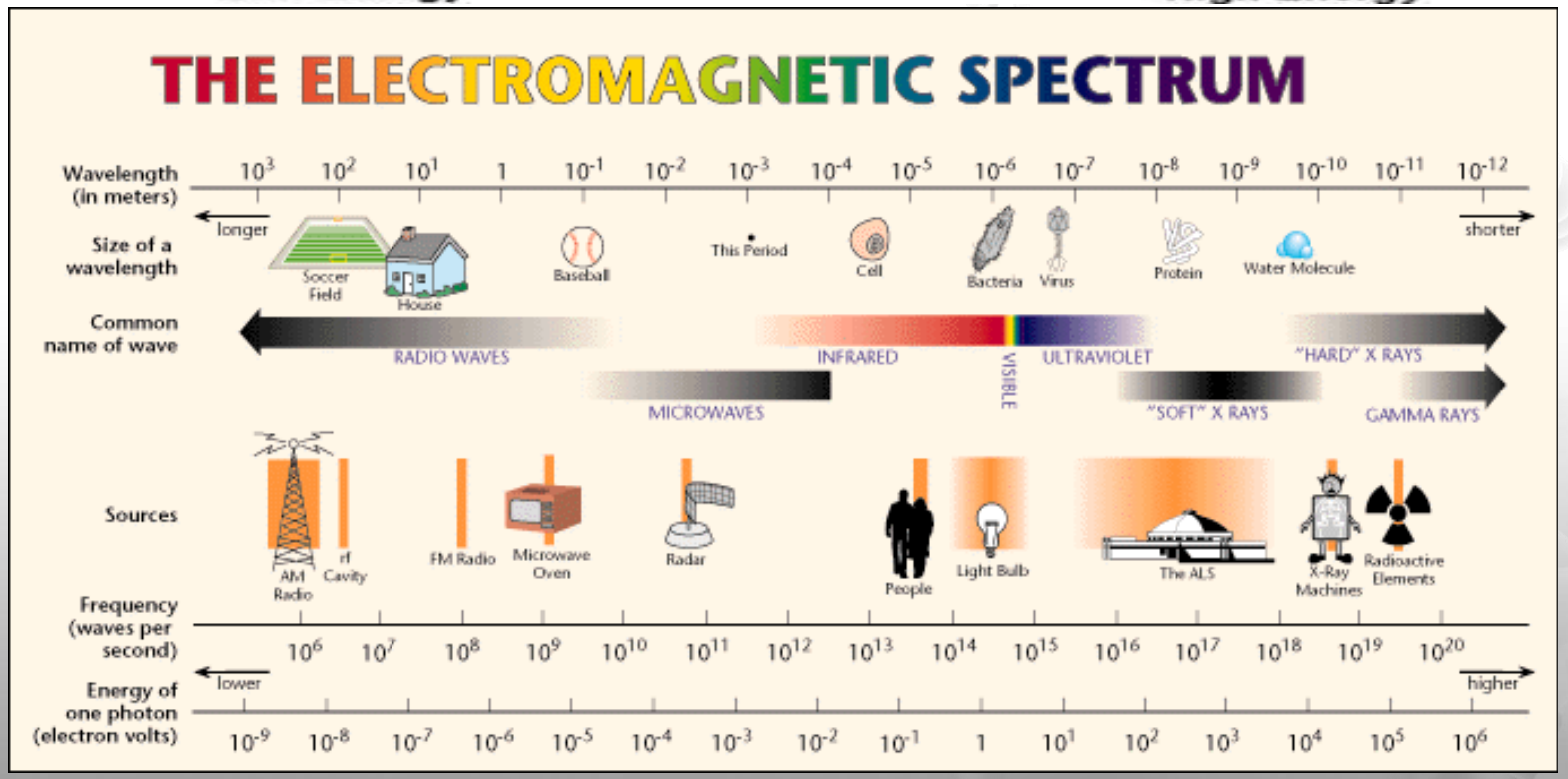
Ionizing? Non-ionizing?



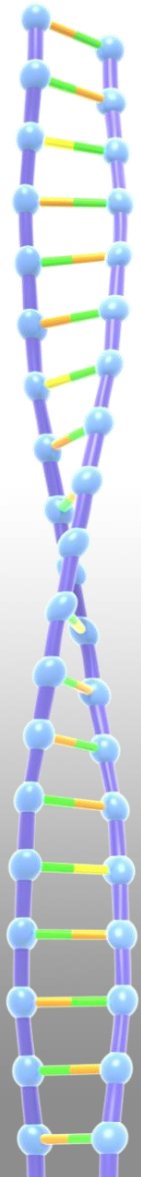
•Wavelength




Long Wave Length
Short Wave Length
Low Frequency
High Frequency
Low Energy
High Energy

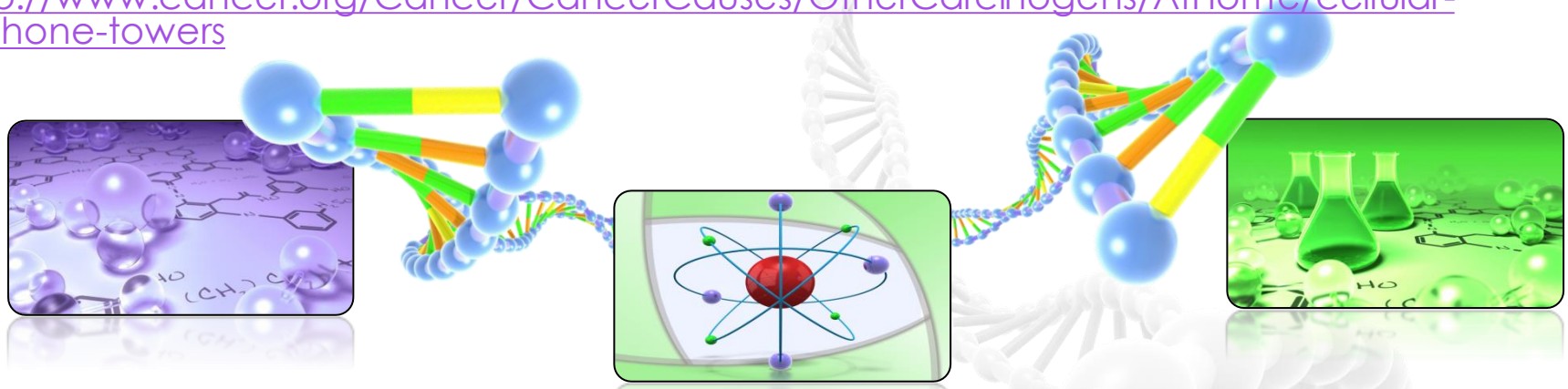

THE ELECTROMAGNETIC SPECTRUM
Wavelength (in meters)
longer
shorter
Size of a wavelength
Soccer Field
House
Baseball
This Period
Cell
Bacteria
Virus
Protein
Water Molecule
Common name of wave
RADIO WAVES
INFRARED
VISIBLE
ULTRAVIOLET
"HARD" X RAYS
MICROWAVES
"SOFT" X RAYS
GAMMA RAYS
Sources
AM Radio
rf Cavity
FM Radio
Microwave Oven
Radar
People
Light Bulb
The ALS
X-Ray Machines
Radioactive Elements
Frequency (waves per second)
lower
higher
Energy of one photon (electron volts)

•Cell towers



•Will I get cancer?

http://www.cancer.org/Cancer/CancerCauses/OtherCarcinogens/AtHome/cellular-phone-towers



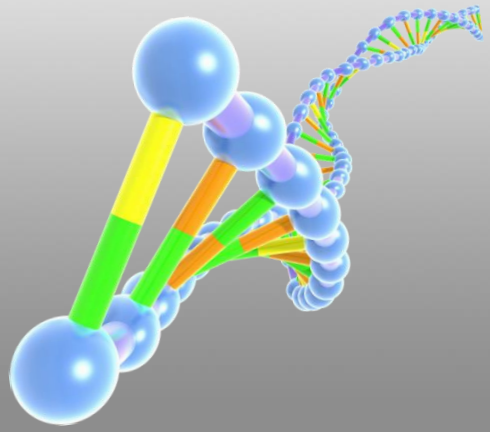
Cell towers and cancer

- Cell phones communicate with nearby cell towers mainly through radiofrequency (RF) waves, a form of energy in the electromagnetic spectrum between FM radio waves and microwaves. Like FM radio waves, microwaves, visible light, and heat, they are forms of non-ionizing radiation. This means they cannot cause cancer by directly damaging DNA. RF waves are different from stronger types of radiation such as x-rays, gamma rays, and ultraviolet (UV) light, which can break the chemical bonds in DNA.
- At very high levels, RF waves can heat up body tissues. (This is the basis for how microwave ovens work.) But the levels of energy used by cell phones and towers are much lower.

•Cell tower exposure risk

http://www.professionalroofing.net/article.aspx?id=1774#145

The danger and health and safety risk of RF radiation is, absent a thermal injury, it cannot be identified by human sensory functions such as touch, taste, smell, sound or sight. An individual may sustain a non-thermal injury and not realize he or she has been subjected to overexposure. Symptoms may not immediately present themselves. Eventual symptoms may be subtle and potentially confused with other conditions or causes. Sleep problems, mood swings, memory loss, reduced mental abilities and signs of depression are eventual symptoms of RF radiation overexposure.



•Location on roof and you

Look for warning signs!

Workers must be given training and develop site-specific safety plans that establish a standardized RF safety protocol that includes the participation of all required stakeholders. The time for complacency and neglect of this issue and the safety of workers has passed.

•What to teach

Bob Curtis, OSHA Salt Lake Technical Center

Location of sources and potentially hazardous areas.

Health effects and safety standards.

Extent of exposures compared to standards and common sources.

Required SOP's and controls.

Emergency procedures.

How to know when things are "abnormal".

Optional controls employees may use.

•Standard operating procedure

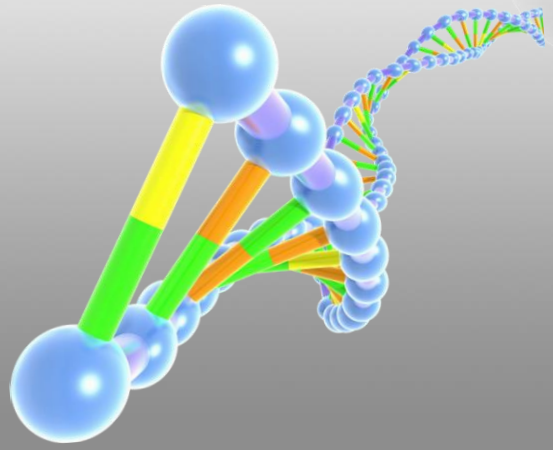
Assess your area. Is there a sign? If so what type? Have you spoke with property administrator?

If a sign is present does it have a number to call?

Make the call!
Call number on sign, call your supervisor and call your safety manager.

Get the tower shut down and locked out!

If it does not look right, do not proceed.



•Your first clue

This is the order in which you proceed

Engineering controls

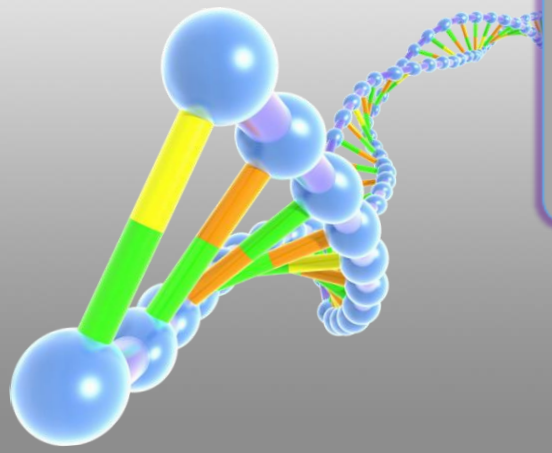
Administrative controls

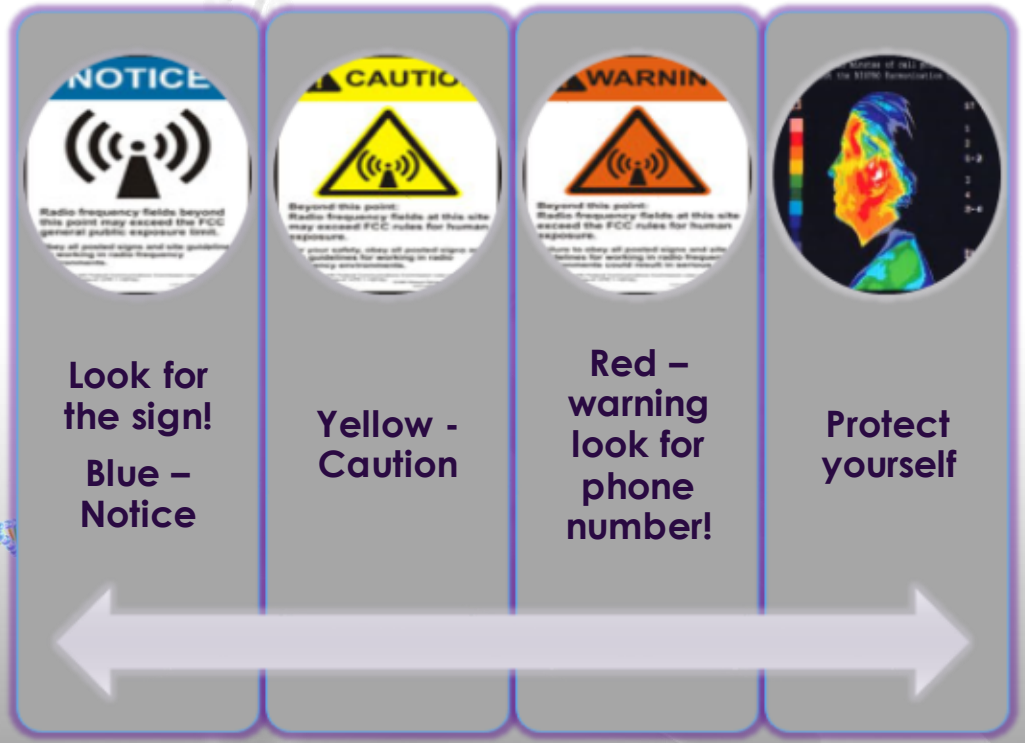
Personal Protective Equipment LAST!

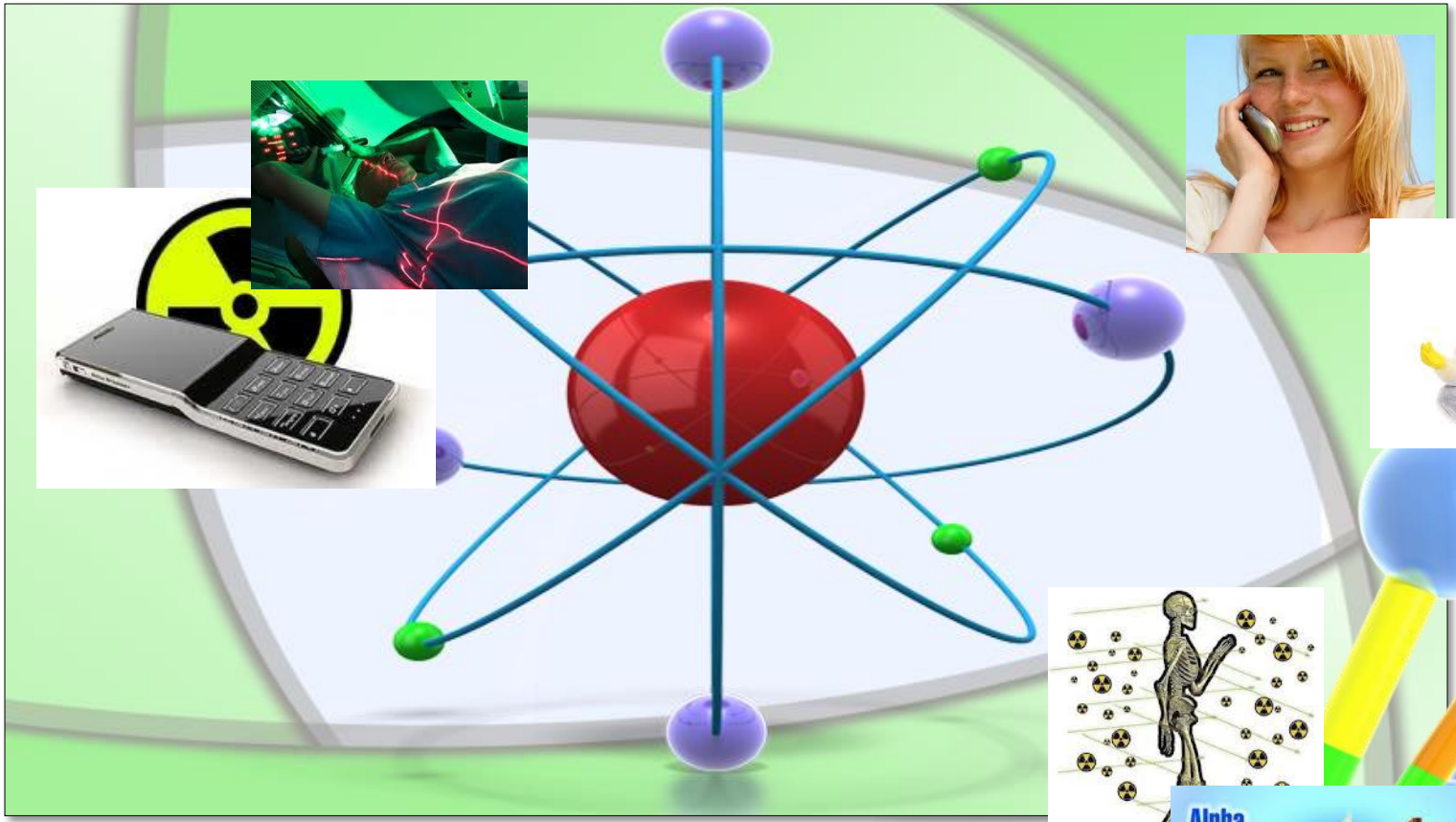
•Standard Operating Procedure

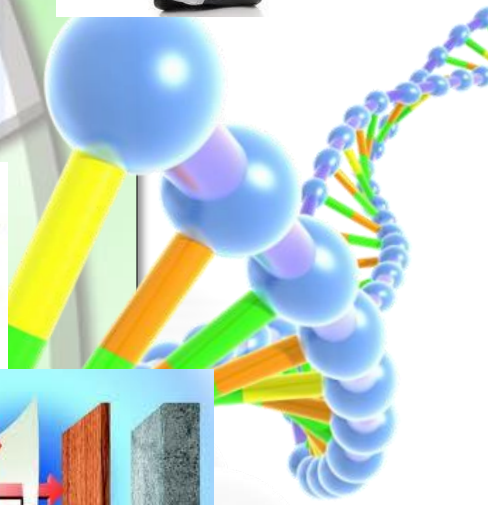
We need to make sense of all this and be aware of our soundings. Make sure your employees understand radiation. Look for signs! Make the proper calls. Check with property managers. Most of all, IF IT DOES NOT LOOK RIGHT STOP AND CALL BEFORE YOU PROCEED!

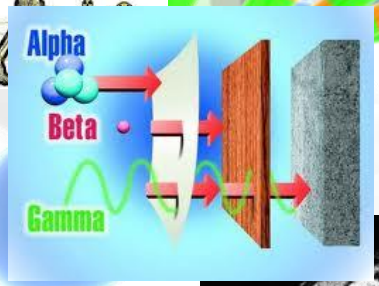
GET INVOLVED!





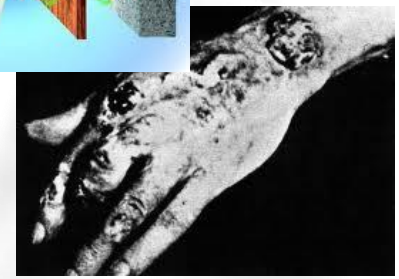






- **Radiation is all around us.**

  With proper precautions we can live with it.



http://boingboing.net/2012/05/07/an-interesting-way-to-explain.html

http://www.blurtit.com/q428721.html

http://www.epa.gov/rpdweb00/understand/ionize_nonionize.html#ionizing

http://www.cancer.org/Cancer/CancerCauses/OtherCarcinogens/AtHome/cellular-phone-towers