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Application of Electromagnetic spectrum in various field

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Abstract:

The electromagnetic radiation consists of electromagnetic waves, which are synchronized oscillations of electric and magnetic fields that propagate at the speed of light through a vacuum. The oscillations of the two fields are perpendicular to each other and perpendicular to the direction of energy and wave propagation, forming a transverse wave .Electro Magnetic Radiation generated by the electronic appliances such as desktop computers, laptops, personal grooming appliances, kitchen appliances, televisions, mobile phones In this paper we explain application of Electromagnetic Spectrum in various fields

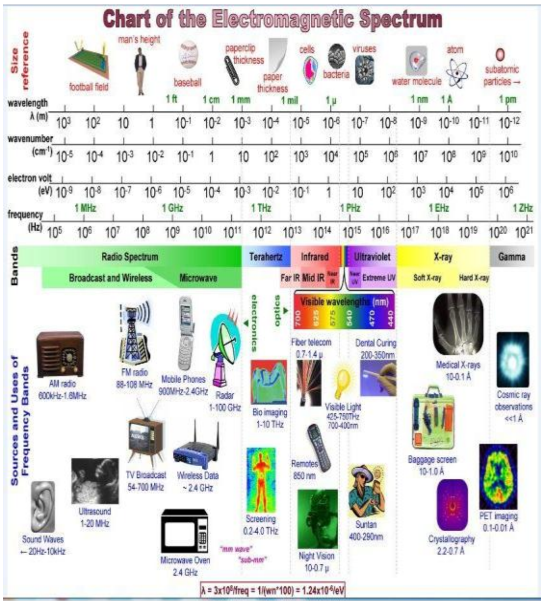
Keyword: Electromagnetism spectrum, GPS,

Radar, X-RAY

INTRODUCTION

EM spectrum:

The electromagnetic spectrum consists of all the different wavelengths of electromagnetic radiation, including light, radio waves, and X-rays. We name regions of the spectrum rather arbitrarily, but the names give us a general sense of the energy of the radiation; for example, ultraviolet light has shorter wavelengths than radio light. The only region in the entire electromagnetic spectrum that our eyes are sensitive to is the visible region.



(Radio, Infrared, Ultraviolet, Visible Light, X-Ray and Gamy) Spectrum)

1- Radio Waves:

Are longer than 1 mm. Since these are the longest waves, they have the lowest energy and are associated with the lowest temperatures. Radio wavelengths are found everywhere: in the background radiation of the universe, in interstellar clouds, and in the cool remnants of supernova explosions, to name a few. Radio stations use radio wavelengths of electromagnetic radiation to send signals that our radios then translate into sound. Radio stations transmit electromagnetic radiation, not sound. The radio station encodes a pattern on the electromagnetic radiation it transmits, and then our radios receive the electromagnetic radiation, decode the pattern and translate the pattern into sound.

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Volume 04 Issue 10
September 2017

2- Infrared Wavelength:

Span from 710 nm – 1 millimeter (from the width of a pinpoint to the size of small plant seeds). At a temperature of 37 degrees C, our bodies give off infrared wavelengths with a peak intensity near 900 nm.

3- Ultraviolet Radiation:

Has wavelengths of 10 – 310 nm (about the size of a virus).

Young, hot stars produce a lot of ultraviolet light and bathe interstellar space with this energetic light.

4- Visible Light:

Covers the range of wavelengths from 400 – 700 nm (from the size of a molecule to a protozoan). Our sun emits the most of its radiation in the visible range, which our eyes perceive as the colors of the rainbow. Our eyes are sensitive only to this small portion of the electromagnetic spectrum.

5- X-Rays:

Range in wavelength from 0.01 – 10 nm (about the size of an atom). They are generated, for example, by super-heated gas from exploding stars and quasars, where temperatures are near a million to ten million degrees.

6- Gama-Ray:

Have the shortest wavelengths, < 0.01 nanometers (about the size of an atomic nucleus). This is the highest frequency and most energetic region of the electromagnetic spectrum. Gamma rays can result from nuclear reactions and from processes taking place in objects such as pulsars, quasars, and black holes.

Note: Microwaves is branch of Radio frequencies.

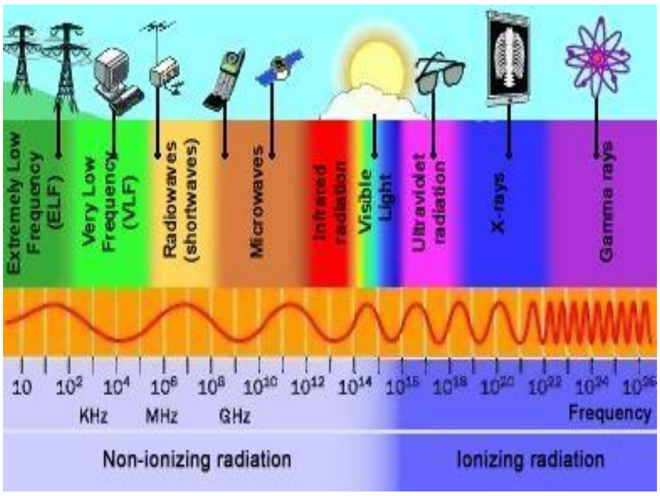
EM Spectrum Applications

There are many applications for electromagnetic spectrum in real life as the below shown pictures and

for each component we need to know:

1- Range of wavelength.
2- Its uses.
3- Any harmful effects (The higher the frequency, the larger the amount of energy)
4- Source.

5- Detector.



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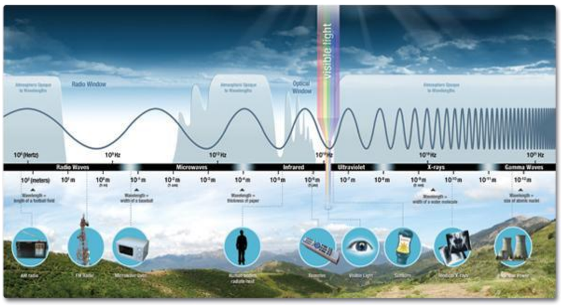
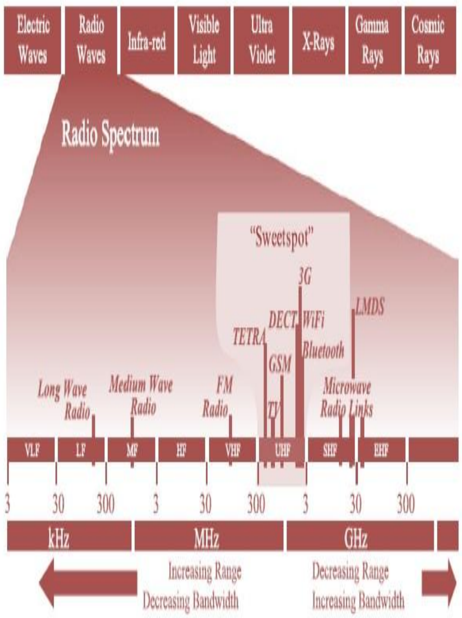


RF applications Have the longest wavelengths and lowest frequencies of all the electromagnetic waves.



<u>The General applications of RF is:</u>

1. Wireless communications (space, cellular phones, cordless phones, WLANs, Bluetooth, satellites etc.)
2. Radar and Navigation (Airborne,vehicle, weather radars, GPS,

MLS, imaging radar etc.)

3. Remote sensing (Meteorology, mining, land surface, aviation and marine traffic etc.)
4. RF Identification (Security, product tracking, animal tracking, toll collection etc.)
5. Broadcasting (AM,FM radio, TV etc.)
6. Automobile and Highways (Collision avoidance, GPS, adaptive cruise control, traffic control etc.)
7. Sensors (Temperature, moisture sensors, robotics, buried object detection etc.)
8. Surveillance and EW (Spy satellites, jamming, police radars, signal/radiation monitoring etc.)
9. Medical (MRI, Microwave Imaging, patient monitoring etc.)
10. Radio Astronomy and Space Exploration (radio telescopes, deep space probes, space monitoring etc.)
11. Wireless Power Transmission (Space to space, space to ground etc. power transmission)

Global Positioning Systems (GPS)

Measure the time it takes a radio wave to travel from several satellites to the receiver, determining the distance to each satellite. Each GPS satellite transmits signals on two frequencies: **L1 (1575.42 MHz) and L2 (1227.60 MHz)**. The L1 frequency contains the civilian Coarse Acquisition (C/A) Code as well as the military Precise (P) Code. The L2 frequency contains only the P code. The P code

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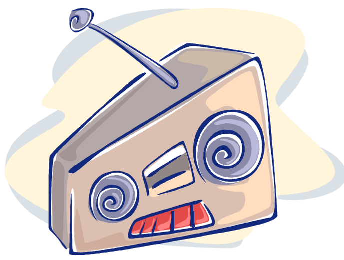
is encrypted by the military—using a technique known as anti-spoofing—and is only available to au thorized personnel. The encrypted P code is referred to as the Y Code. Civilian GPS receivers use the C/A Code on the L1 frequency to compute positions—although high-end survey grade civilian receivers use the L1 and L2 frequencies' carrier waves directly. Military GPS receivers use the P (Y) Code on both L1 and L2 frequencies to compute positions. FM, AM And TV Broadcasting:

A radio picks up radio waves through an antenna and converts it to sound waves. Each radio station in an area broadcasts at a different

frequency.

FM: Frequency modulation, FM is widely used for a variety of radio communications applications. FM broadcasts on the VHF bands **(usually 87.5 to 108.0 MHz is used)** still provide exceptionally high quality audio, and FM is also used for a variety of forms of two way radio communications, and it is especially useful for mobile radio communications, being used in taxis, and many other forms of vehicle. In view of its widespread use, frequency modulation, FM, is an important form of modulation, despite many forms of digital transmission being used these days. FM, frequency modulation has been in use for many years. However its advantages were not immediately apparent. In the early days of wireless, it was thought that a narrower bandwidth was required to reduce noise and interference.

AM: Amplitude modulation, AM radio ranges from **535 to 1705kHz** (kilohertz, or thousands of cycles per-second of electromagnetic energy). Stations can theoretically be placed every 10KHz, along the AM band. This means that there are a total of 117 different channels available for AM radio stations. If it all stopped there, things would be rather simple; but, unfortunately, other factors come into play. How far an AM station's signal travels depends on such things as the station's frequency (channel), the power of the transmitter in watts, the nature of the transmitting antenna, how conductive the soil is around the antenna (damp soil is good; sand and rocks aren't), and, a thing called ionosphere refraction. The ionosphere is a layer of heavily charged ion molecules above the earth's atmosphere.



TV: Television is transmitted on various bands or frequencies. Transmission bands vary by country. In America, bands III to V are used, which include VHF and UHF signals. All standard television signals that are transmitted in the United States follow NTSC regulations. NTSC (National Television Standards Committee) states that the video signal must have a video line resolution of 525 lines with a 3.58 MHz chroma carrier (color

e-ISSN: 2348-6848
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Volume 04 Issue 10
September 2017

TV signal) and must cycle at 60 cycles per second. It also states that frames are to be displayed at 30 frames per second. NTSC standards make it easy for all TV sets to pick up the same signals that broadcast companies transmit. It is important to note that this standard is for analog television only.

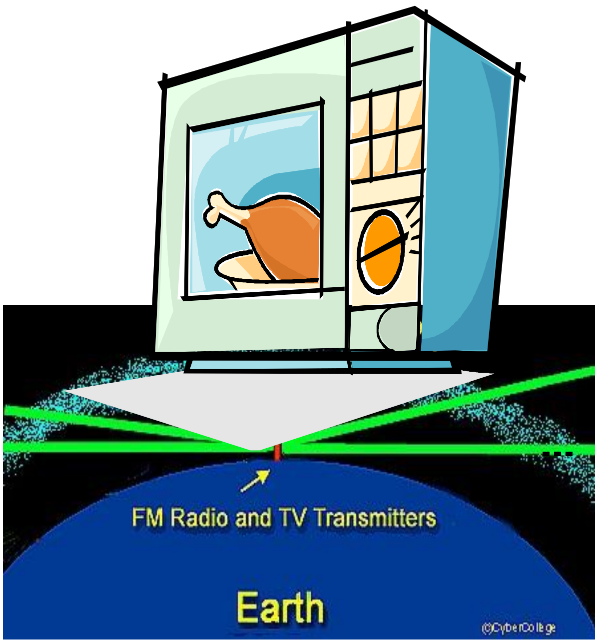
Bands III , IV, and V

A Normal TV signal is located on Band III, IV, or V. Usually, these bands require bandwidth to carry both audio and video signals. Most TV signals have about 4MHz of bandwidth for the video portion, when the signal's sound portion is added the signal will have a total of about 6 MHz. The FCC has allocated each TV channel to a bandwidth of 6 MHz. The channels are as followed:

Band III – Channels 2 to 6 (54 to 88 MHz)

Band IV – Channels 7 to 13 (174-216 MHz)

- **Band V – Channels 14 to 83 (470 to 890 MHz)**



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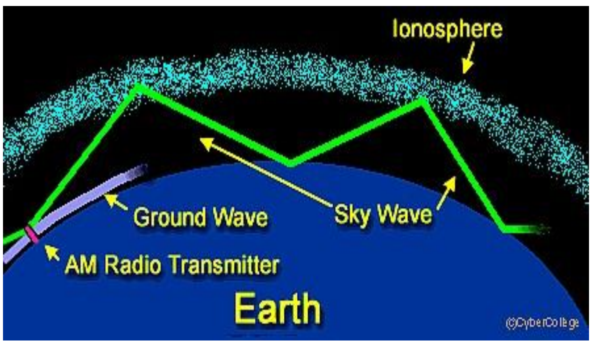
VHF and UHF

VHFs (very high frequencies) are channels that usually include channels 2 to 13. UHFs (ultra high frequencies) are channels that usually include channels 14 to 83.Both VHF and UHF are great frequencies for carrying TV signals (both audio and video). They have a long range and can penetrate structures such as Microwave Oven: (0.915 or 2.45 GHz)

Transfer energy to the water in the food causing them to vibrate which in turn transfers energy in the form of heat to the food. a transmitter, very much like a radio transmitter, sets up an electromagnetic field in the oven which reverses its polarity some 2 or 5 billion times every second (it operates at a frequency of either 915 or 2450 million cycles per second, compared to wall socket currents at 60 cycles, and FM radio signals at some 100 million cycles per second). Considering the frequency of **2,450 MHz,** the wavelength of microwave oven radiation is about 12 cm and the quantum energy of a microwave photon is about 1 x 10^{-5} eV. The radiation interaction at such energies is limited to the production of molecular rotation and torsion. The average thermal energy at 20°C is about 1/40 eV, so any ordered rotational motion created by the microwave interaction is quickly randomized by collisions with molecules of kinetic energy 2500 times greater than the microwave photon energy



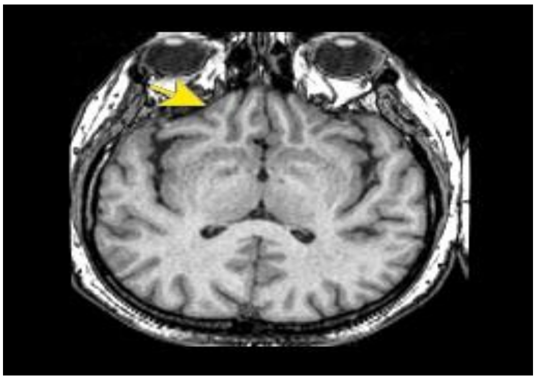
provided. So the net result of microwave interaction in microwave ovens is to heat the material in the oven. MRI: (MAGNETICRESONACE IMAGING)

Uses Short wave radio waves with a magnet to create an image. MRI systems provide highly detailed images of tissue in the body. The systems detect and process the signals generated when hydrogen atoms, which are abundant in tissue, are placed in a strong magnetic field and excited by a resonant magnetic excitation pulse. Hydrogen atoms have an inherent magnetic moment as a result of their nuclear spin. When placed in a strong magnetic field, the magnetic moments of these hydrogen nuclei tend to align. Simplistically, one can think of the hydrogen nuclei in a static magnetic field as a string under tension. The nuclei have a resonant or "Larmor" frequency determined by their localized magnetic field strength, just as a string has a resonant frequency determined by the tension on it. For hydrogen nuclei in a typical

1.5T MRI field, the resonant frequency is approximately **64MHz.** Proper stimulation by a resonant magnetic or RF field at the resonant frequency of the hydrogen nuclei can force the magnetic moments of the nuclei to partially, or completely, tip into a plane perpendicular to the applied field. When the applied RF-excitation field is removed, the magnetic moments of the nuclei precess in the static field as they realign. This realignment generates an RF signal at a resonant frequency determined by the magnitude of the applied field. This signal is detected by the MRI imaging system and used to generate an image.

RADAR (Radio Detection and Ranging):

Used to find the speed of an object by sending out radio waves and measuring the time it takes them to return. The term "radio" refers to the use of electromagnetic waves with wavelengths in the so-called radio wave portion of the spectrum, which covers a wide range from 10^4 km to 1 cm. Radar systems typically use wavelengths on the order of 10 cm, corresponding to frequencies of about **3 GHz.** The detection and ranging part of the acronym is accomplished by timing the delay



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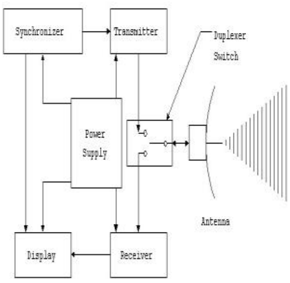
between transmission of a pulse of radio energy and its subsequent return. If the time delay is Dt, then the range may be determined by the simple formula:

R=cDt/2

where c = 3 x 10^8 m/s, the speed of light at which all electromagnetic waves propagate. The factor of two in the formula comes from



the observation that the radar pulse must travel to the target and back before detection, or twice the range. A radar pulse train is a type of amplitude modulation of the radar frequency carrier wave, similar to how carrier waves are modulated in communication systems. In this case, the information signal is quite simple: a single pulse repeated at regular intervals.

-Radio Frequency Identification (RFID) technology:

The RFID tags spectrum is:

LF : 125 kHz - 134,2 kHz : low frequencies, HF : 13.56 MHz : high frequencies, UHF : 860 MHz - 960 MHz : ultra high frequencies, SHF : 2.45 GHz : super high frequencies

The most RFID systems consist of tags that are attached to the objects to be identified. Each tag has its own ―read only‖ or ―rewrite‖ internal memory depending on the type and application. A typical configuration of this memory is to store product information, such as an object's unique ID manufactured date, etc. The RFID reader generates magnetic fields that enable the RFID system to locate objects (via the tags) that are within its range. The highfrequency electromagnetic energy and query signal generated by the reader triggers the tags to reply to the query; the query frequency could be up to 50 times per second. As a result communication between the main components of the system i.e. tags and reader are established. As a result large quantities of data are generated. Supply chain industries control this problem by using filters that are routed to the backend information systems. In other words, in order to control this problem, software such as Savant is used. This software acts as a buffer between the IT and the RFID reader. The RFID system consists of various components which are integrated in a manner defined in the above section. This allows the RFID system to deduct the objects (tag) and perform various operations on it. The integration of the RFID components enables the implementation of an RFID solution. The RFID system consists of following five components:

- Tag (attached to an object, unique identification).
- Antenna (tag detector, creates magnetic field).
- Reader (receiver of tag information, anipulator).
- Communication infrastructure (enable reader/RFID to work through IT infrastructure).
- Application software (user database/application/interface). **F, HF and UHF RFID tags**

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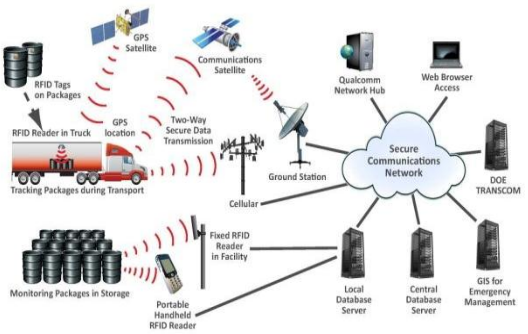
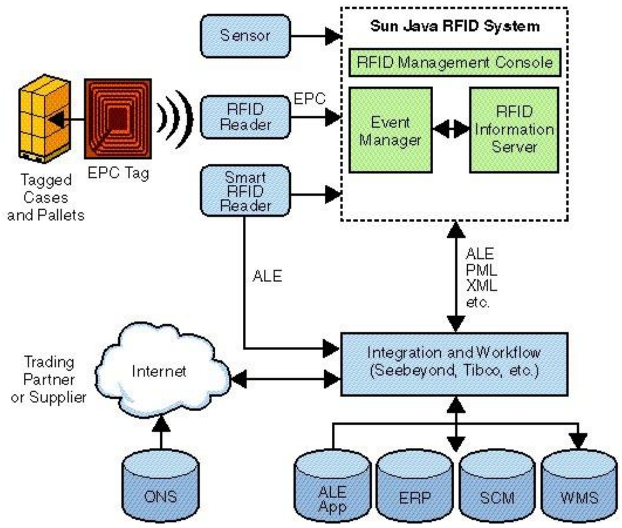
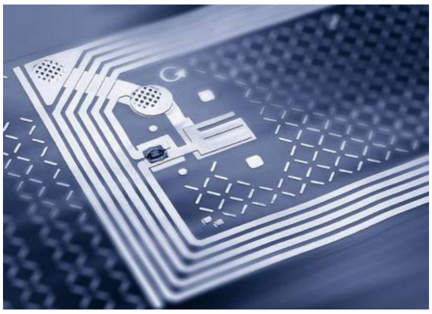
Volume 04 Issue 10
September 2017

RFID LF tags are well adapted for logistics and traceability applications. Glass tags are small and light. They can used be with all kinds of material - textiles, metals, plastics etc.

- RFID HF tags are used in traceability and logistics applications. Loop antenna can be printed or etched on flexible substrates.
- RFID UHF tags have dipole like antenna etched or printed on all kind of substrate. The read range of such a tag can be around 3 to 6 or even 8 meters. Specific antenna design is required for metallic or wet environments.







- Radio Telescope:

Radio telescope is simply a telescope that is designed to receive radio waves from space. In its simplest form it has three components:

One or more antennas to collect the incoming radio waves. Most antennas are parabolic dishes that reflect the radio waves to a receiver, in the same way as a curved mirror can focus visible light to a point.

A receiver and amplifier to boost the very weak radio signal to a measurable level. These days the amplifiers are extremely sensitive

- and are normally cooled to very low temperatures to minimise interference due to the

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noise generated by the movement of the atoms in the metal (called *thermal noise*).

A recorder to keep a record of the signal. Most radio telescopes nowadays record directly to some form of computer memory disk as astronomers use sophisticated software to process and analyses the data.

Antenna: The parks has a parabolic dish antenna, 64 m in diameter with a collecting area of 3,216 m^2. The dish is made up of aluminum panels supported by a lattice-work of supporting struts. To incoming radio waves from space, the dish surface acts in the same manner as a smooth mirror. The waves are reflected and focused into a *feed horn* in the base of the telescope's *focus cabin*. The dish has a mass of 300 tones and distorts under its own weight as it points to different parts of the sky. Due to clever engineering design, however, this distortion is accounted for so that the radio waves are always reflected to the focus cabin. The telescope operates at frequencies from

440 MHz to 23 GHz which corresponds to radio waves of 75 cm to 7 mm. For any radio wave to be reflected form the dish it must be smoother than a fraction of the wavelength. For the Parks telescope the dish surface is accurate to within 1-2 mm of the best-fit parabola, allowing 7 mm radio waves to be reflected.

Receiver: The Parks multibeam receiver, shown here without its insulating cover. It has 13 feed horns, seen here as the bronze tubes.

The weak radio signals are channeled by the *feed horn* into a *receiver* located in the *focus cabin* located at the top of the telescope. Radio receivers amplifies the incoming signal about a million times. Parks has a suite of receivers that are optimized for different frequency ranges and applications. The receivers are cryogenicall

cooled, typically with helium gas refrigerators that cool them to about 10 Kelvin (-260° C) to minimise the thermal noise in the electronics that would otherwise swamp the incoming signal.

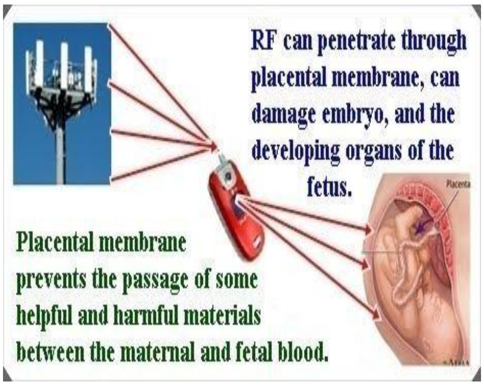
For pulsar observations at Parks observers typically use either the central beam of the *Parkes Multibeam* receiver, the *HOH* receiver, both of which detect 21 cm (1420 MHz) radiation or the *Dual-Band* receiver that can observe at 10 cm and 50 cm simultaneously.

Recorder: The amplified signals are carried by fiber optic cable from the receivers in the focus cabin down into the tower where they are stored on computer disks. Depending on the type of observation some processing of the data is performed on-site using computers in the tower. For pulsar observations the rate at which data is received can be extremely high.

Biological Effect Of RF Radiation:

The quantity used to measure how much RF energy is actually absorbed in a body is called the specific absorption rate (SAR). It is usually expressed in units of watts per kilogram (W/kg) or milliwatts per gram (mW/g). In the case of whole-body exposure, a standing human adult can absorb RF energy at a maximum rate when the frequency of the RF radiation is in the range of about 80 and 100 MHz, meaning that the whole-body SAR is at a maximum under these conditions (resonance). Because of this resonance phenomenon, RF safety standards are generally most restrictive for these frequencies.

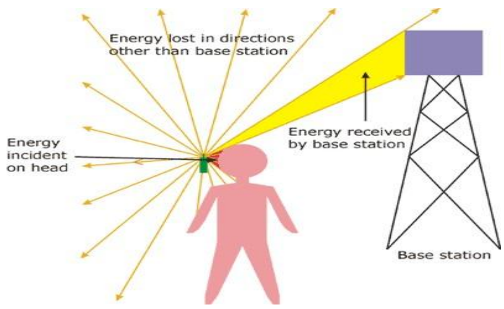
Region	**Wavelength Range, um**	**Wave number Range,cm-1**	**Frequency Range, Hz**
Near	**0.78-2.5**	**12800-4000**	**$3.8x10^{14}$-$1.2x10^{14}$**
Middle	**2.5-50**	**4000-200**	**$1.2x10^{14}$-$6.0x10^{12}$**
Far	**50-1000**	**200-10**	**$6.0x10^{12}$-$3.0x10^{11}$**
Most used	**2.5-15**	**4000-610**	**$1.2x10^{14}$-$2.0x10^{13}$**



Biological effects that result from heating of tissue by RF energy are often referred to as "thermal" effects. It has been known for many years that exposure to very high levels of RF radiation can be harmful due to the ability of RF energy to rapidly heat biological tissue. This is the principle by which microwave ovens cook food. Tissue damage in humans could occur during exposure to high RF levels because of the body's inability to cope with or dissipate the excessive heat that could be generated. Two areas of the body, the eyes and the testes, are particularly vulnerable to RF heating because of the relative lack of available blood flow to dissipate the excessive heat load. At relatively low levels of exposure to RF radiation, that is, levels lower than those that would produce significant heating, the evidence for harmful biological effects is ambiguous and unproven. Such effects have sometimes been referred to as "nonthermal" effects. It is generally agreed that further research is needed to determine the effects and their possible relevance, if any, to human health

Infrared Applications

Infrared spectrometry is applied to the qualitative and quantitative determination of molecular species of all types. The most widely used region is the midinfrared that extends from about 670 to 4000 cm^{-1} (2.5 to 14.9 m). The near-infrared region from 4000 to 14,000 cm^{-1} **(0.75 to 2.5 m)** also finds considerable use for the routine quantitative determination. The far-infrared region has been for the determination of the



structures of inorganic and metal-organic species.

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Volume 04 Issue 10
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The General Applications of IR is:

Common IR Window Materials

Window Material	Applicable Range, cm^{-1}	Water Solubility, g/100 g H_2O, 20°C
Sodium chloride	40,000–625	36.0
Potassium bromide	40,000–385	65.2
Potassium chloride	40,000–500	34.7
Cesium iodide	40,000–200	160.0
Fused silica	50,000–2,500	Insoluble
Calcium fluoride	50,000–1,100	1.51×10^{-3}
Barium fluoride	50,000–770	0.12 (25°C)
Thallium bromide-iodide, KRS-5	16,600–250	<0.0476
Silver bromide	20,000–285	1.2×10^{-7}
Zinc sulfide, Irtran-2	10,000–715	Insoluble
Zinc selenide, Irtran-4	10,000–515	Insoluble
Polyethylene	625–30	Insoluble

1- Gas in an evacuated cylinder
2- Solutions
3- Dissolved in solvents
4- Liquid in cell
5- Solids
6- Pellets
7- Mulls

MID-INFRARED BSORPTION SPECTROMETRY:

Sample Handling:

No good solvents exist that are transparent throughout the region of interest. As a consequence, sample handling is frequently the most difficult and time-consuming part of an infrared spectrometric analysis. **Gases:** The spectrum of a low-boiling liquid or gas can be obtained by permitting the sample to expand into an

evacuated cylindrical cell equipped with suitable windows. **Solutions:** A convenient way of obtaining infrared spectra is on solutions prepared to contain a known concentration of sample. This technique is somewhat limited in its applications, however, by the availability of solvents that are

transparent over significant regions in the infrared. **Solvents:** No single solvents is transparent throughout the entire mid-infrared region. Water and alcohols are seldom employed, not only because they absorb strongly, but also because they attack alkali-metal halides, the most

common materials used for cell windows.

Cells: Sodium chloride windows are most commonly employed; even with care, however, their surfaces eventually become fogged due to absorption of moisture. Polishing with

a buffing powder returns them to their original condition.

Liquids: When the amount of liquid sample is small or when a suitable solvent is unavailable, it is common practice to obtain spectra on the pure (neat) liquid. A drop of the neat liquid is squeezed between two rock-salt plated to give a layer that has a thickness of 0.01 mm or less. The two plates, held together are then mounted in the beam path. Such a technique does not give reproducible transmittance data, but the resulting spectra are usually satisfactory for qualitative investigations.

R effects On Human Skin :

Heat is a form of energy that may be transmitted by IR radiation, which results in raised skin temperature. Human skin is exposed daily to natural sunlight. We found that the temperature of human skin can increase to more than 40°C under direct IR irradiation due to the conversion

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of IR into heat. There is clinical evidence indicating that chronic heat exposure of human skin may cause alterations. The skin disease called erythema abigne is known to be caused by chronic heat exposure. It is characterized clinically by reticular pigmentation of the skin and histologically by the presence of solar elastosis in the dermis similar to what is seen in photoaged skin. Furthermore, severe skin aging may develop occasionally on bakers' arms, because of exposure to hot ovens, and on the faces of glass blowers. However, the effects of IR radiation and heat on cutaneous aging are still largely unknown.

X-Ray Applications

The general applications of XRF is:

1. **Treatment**

The x-rays used in clinic treatment is mainly for cancer. It is found that x-rays can induce a series of biological effects in human body (ionizing, Compton effect, producing electron-positron pairs). They can damage especially the biological tissue cells which are active in fission. Cancer cells are such cells. Therefore, the x-rays can kill them or at least can reduce their fission speed.

2. **CT Scanner**

CT Scanner: Computerized Tomography Scanner: an x-ray machine that can produce stereographic images (former name: CAT Scanner (Computer-Aided Tomography).

- **X-CT CT: Computerized Tomography.**

- **Basic principle of CT**: As different tissue has different absorbing coefficient and different thickness also has different absorbing coefficient, the coefficient are taken as a parameter. The principle is to set up the distribution of the coefficient in each part of every layer of the material in question and using computer to reconstruct the image of the material.

4. Diagnosis

- **Fluoroscopy and photography :**

As different parts and organs in human body have different absorbing abilities of x-rays, the homogeneous intensity of xrays will be not homogeneous after penetrating human body.

If the non-homogeneous x-rays are projected onto fluorescent screen, the image of the organs can be formed on the screen. This is called x-ray fluoroscopy. If the transmitted x-rays irradiate on a negative film, the picture can be seen after development. The technique is called x-ray photography.

- **Digital subtraction angiography:**

1. Digital: The general principle of this technique is to change the photograph data into digital signal;
2. subtraction and angiography: In the blood vessel, we could inject some material, called contrast medium, which can absorb more x-rays. If we take two photographs, one of them is normal and the other contains contrast medium, then we translate them into digital signals (numerical data), and then subtract one by the other, the blood vessel's picture can be obtained. According to this picture, you could find the status of blood vessel whether it is in normal or abnormal situation. For example, you could

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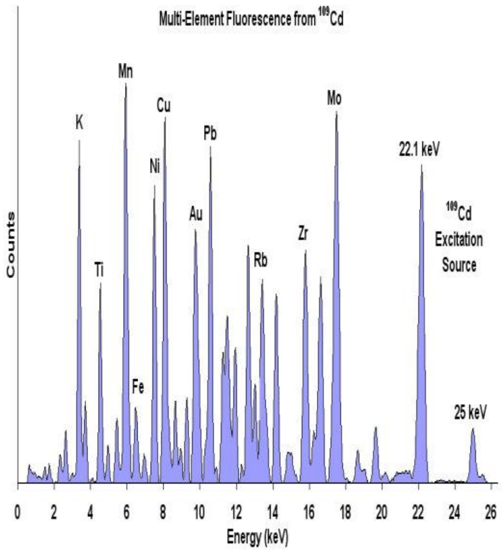
Volume 04 Issue 10
September 2017

easily find the positions where it becomes narrow, where it has a tumor, where the blood is obstructed , where it is deformity or malformation and so on.



An ED XRF spectrum of a calibration standard:

Hand-Held XRF Technology:

1. Miniaturized XRF technology

2. applications are growing:

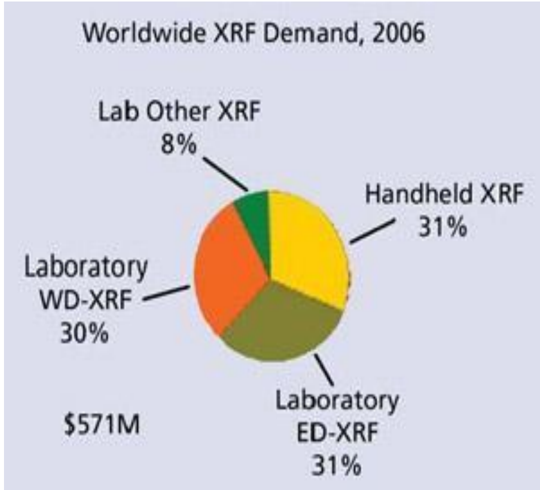
Mining Geology

Environmental analysis

Alloy analysis

3. Utilize lightweight x-ray tubes and Si PiN diode detector

No radioactive isotopes



Applications of Hand-Held XRF Technology:

- Rapid, non-invasive XRF analysis of wood waste found in Hurricane Katrina debris for arsenic.

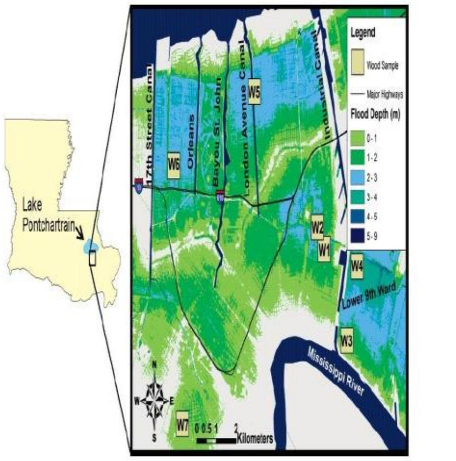


FIGURE 1. Sampling locations W1 through W7 where treated wood samples were evaluated using the XRF unit. The image was developed using the GPS coordinate recorded during the sampling event. Background image showing inundation depths was provided by Dean Whitman of Florida International University and Tim Dixon of the University of Miami.

Wood contains chromate copper arsenate (CCA, now banned), which was used to pressure-treat lumber

Detection limit for As in low-density samples is 10-100 ppm

a. Using K□ and K□ lines at 10.54 and 11.73 keV

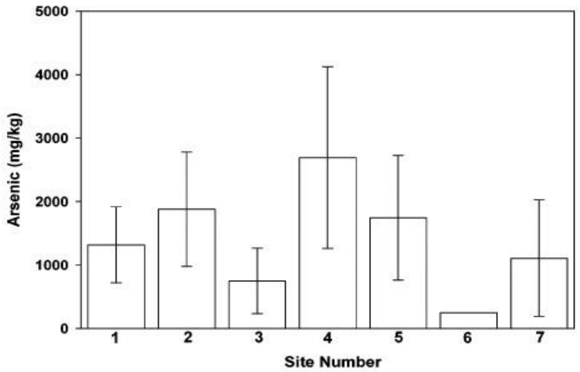


FIGURE 2. Average arsenic concentrations from the samples tested as CCA at seven sites (The error bar represents the standard deviation for the sample set for that particular site. For site-6, only one sample tested positive for CCA, hence no error bar is shown for this site).

X-Ray Risks

X-ray hazards

An x-ray is high energy electromagnetic radiation that passes through the body. Metal, bone and dense material block some radiation and that shows up as shadows on the x-ray film or digital sensor. Once it pass through your, it is gone. None stays in your body.

Can damage some cells

But what can happen is that the high energy of the radiation can damage a very small amount of your body's cells. In most cases, the cells simply die prematurely. The amount of cell damage from an x-ray is many times less than you get from cosmic radiation you are exposed to when you fly in an airliner.

Some of the cells may not die, but instead they may have genetic damage done to them. In an extremely rare situation, that genetic damage can result in the cell becoming cancerous. **Genetic damage to a reproductive cell**

A greater risk than cancer is a genetic damage to a reproductive cells. Damage to an ovum in a woman or sperm cells in a man could result in a deformed baby or a miscarriage. The reason physicians will cover your private parts with a lead shield is to prevent this damage from happening. You can get an x-ray in another part of your body, and your reproductive organs will be protected.

Some conservative physicians recommend that a woman of childbearing age wait until at least two menstrual cycles after getting xrayed before having unprotected sex.

Pregnant women and unborn children

Since their cells are growing rapidly, unborn children are most sensitive to radiation. Because of this, U.S. Federal standards state that the dose

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of radiation to an unborn child throughout the *entire pregnancy* cannot exceed 0.5 rem or 500 millirems over 9 months.

Note: Radiation units of measurement can be confusing, because several different ones are used. A millirem, mrem,millirad and mrad are all the same thing. Also, 1 mSv = 100 millirem.

Maximum of 10

That equates to a maximum of about 10 medical x-rays that would irradiate the womb area. It is unlikely that a pregnant woman would ever receive that many x-rays in that region of her body, but if she was required to have a large number of x-rays for some serious ailment, the x-ray technician should make sure she is well shielded in the critical areas.

It is unlikely dental x-rays would affect an unborn child, since they are highly focused and about 1/3 of the strength of a medical x-ray. Yet, caution is always wise.

Use caution

If you are pregnant and need to be x-rayed, verify with your physician that the x-ray is absolutely necessary. If it is necessary, tell the x-ray technician that you are pregnant to make sure you are well shielded.

If have already been x-rayed, realize that the chances of damage to your unborn child are highly unlikely unless you have exceeded the maximum dosage.

Cancer risk

The risk of getting cancer from x-rays is very small. Government studies state that receiving 5000 millirem (50 mSv) of radiation in a year will increase the rate of cancer deaths by 0.3%, which is insignificant. That means that if you got 300 medical x-rays in a year, it would increase your chances of getting cancer by only 1%.

CONCLUSION

The Electro Magnetic Radiation generated by the electronic appliances such as desktop computers, laptops, personal grooming appliances, kitchen appliances, televisions, mobile phones and their towers, and their related health effects, reason for health effects along with the measures to reduce the radiation are proposed. Zero radiation emission cannot be achieved in the technological world. But by following safety measures protection from harmful radiation is possible.

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