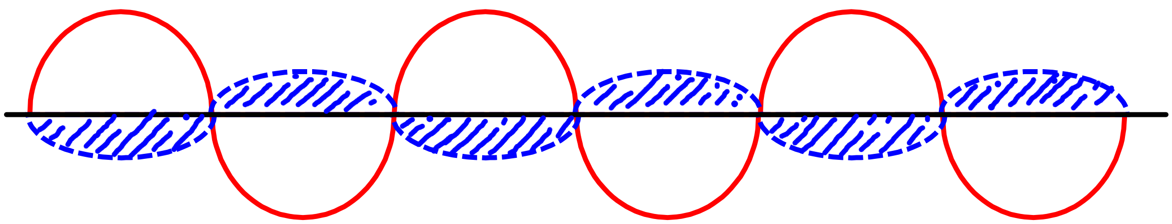
PHYSICS

ELECTROMAGNETIC WAVES

COLOUR AND WAVELENGTH

____Light is an ***electromagnetic wave***. This means that it is actually composed of two interlaced waves, an electric wave and a magnetic wave.



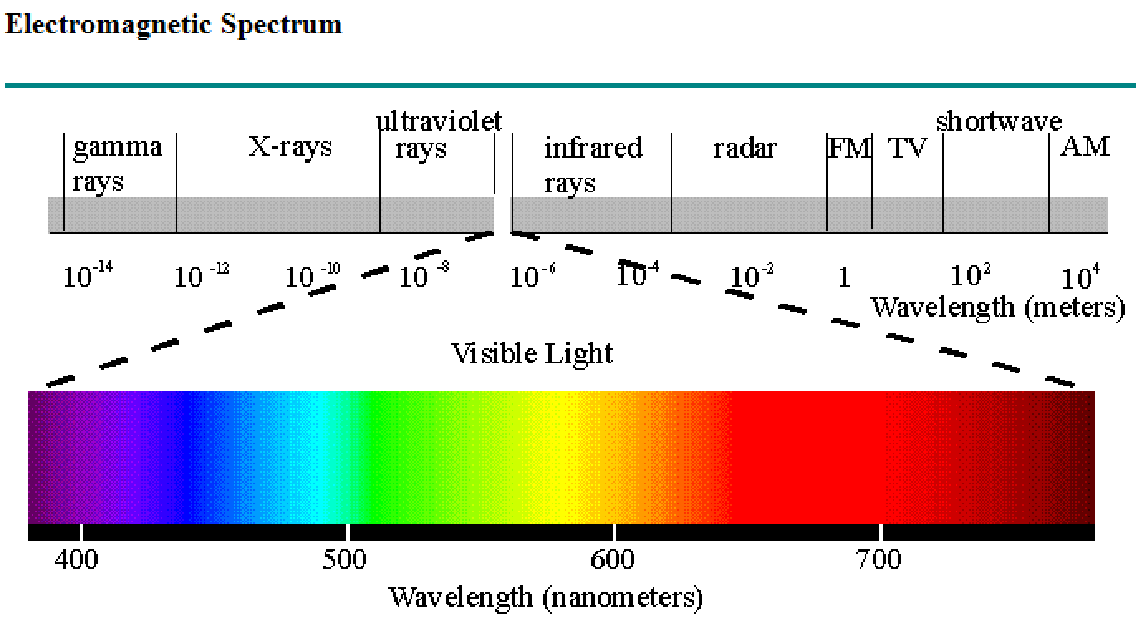
The electromagnetic spectrum is comprised of many different types of waves depending on wavelength.

Wavelength	Electromagnetic Wave Type
600 m - 200 m	AM Radio
187 m - 5.55 m	Short Wave Radio
0.55 m - 0.187 m	FM Radio and TV
187 mm - 10 mm	Microwaves, Radar
1 mm - 750 nm	Infrared
750 nm - 400 nm	Visible Light
400 nm - 10 nm	Ultraviolet
10 nm – 10 pm	X-Rays
< 10 pm	Gamma-Rays

PHYSICS

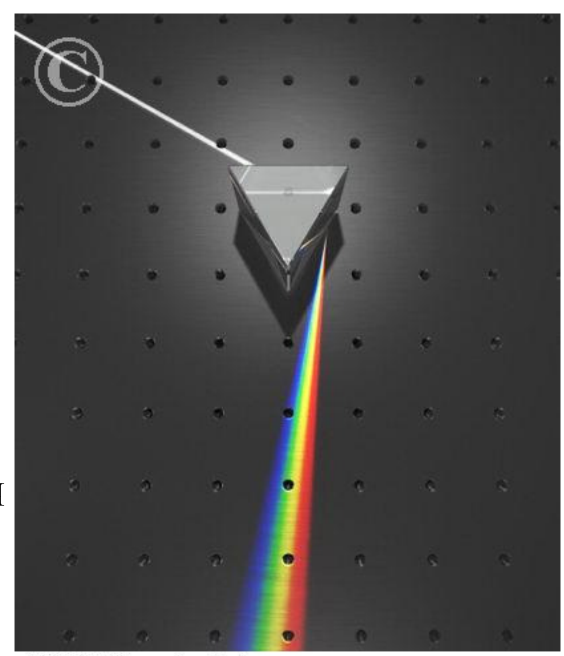
ELECTROMAGNETIC WAVES

COLOUR AND WAVELENGTH



White light is made up of all possible colours of light. This is referred to as the visible spectrum. The human being is capable of seeing light that ranges in wavelength from 400 to 750 nm.

Colour	Wavelength (nm)
Violet	400 – 450
Blue	450 – 500
Green	500 – 570
Yellow	570 – 590
Orange	590 – 610
Red	610 – 750



http://www.youtube.com/watch?v=OQSNhk5ICTI

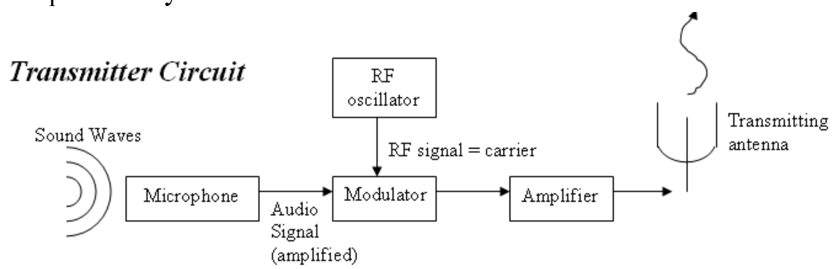
PHYSICS

ELECTROMAGNETIC WAVES

APPLICATIONS OF ELECTROMAGNETIC WAVES

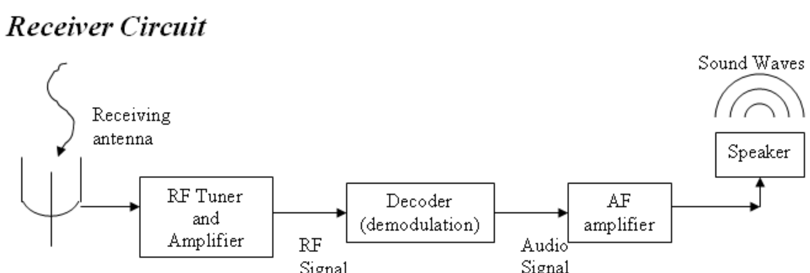
Radio and Television Communications

Marconi first recognized the potential for transmitting information over long distances, using electromagnetic waves without any direct connection by wires. From his early experiments involving the transmission of Morse code pulses evolved present day radio and television networks.



Sound waves are detected by a microphone and converted to an audio signal. This signal is then amplified before it is passed through a modulator. The modulator either modulates the amplitude (AM) or the frequency (FM) based on the input from the radio-frequency (RF) oscillator. The created RF signal is different for each radio station. The RF signal is then amplified and supplied to a transmitting antenna, generating an EM wave.

A television signal is created in much the same way. The difference in television is that the carrier frequency is mixed with two signals: one for audio and one for video. With both radio and television, electrons in the transmitting antennal oscillate back and forth at the carrier frequency. The accelerating charges produce the EM wave, which travels at the speed of light outward from the antenna



In a receiver circuit, the EM waves are detected by a receiving antenna. The incoming, oscillating electric fields cause the electrons in the conducting material to move, creating a weak electrical current in the receiving antenna. The net effect is the production of a small electrical signal in the antenna, containing a mixture of frequencies from many different transmitting stations.

It is then the job of the RF tuner to "tune" the receiver to the exact frequency (or amplitude) for a specific station. This specific signal is then amplified and sent tc a demodulator which separates the audio and video signals. When the audio signal has been separated, it is amplified and sent to a speaker for conversion into sound waves. The video signal is sent to the picture tube where it is converted to a visual image.

PHYSICS

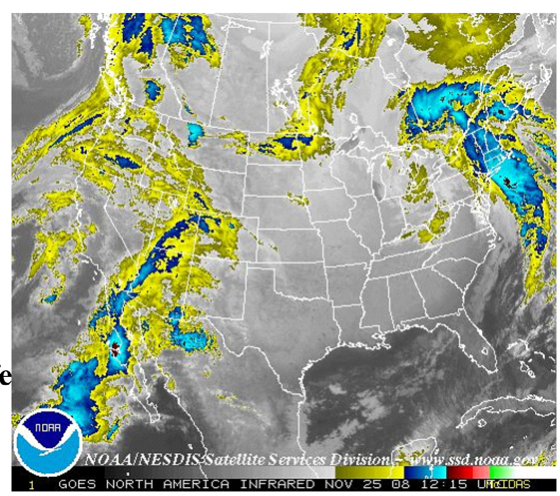
ELECTROMAGNETIC WAVES

APPLICATIONS OF ELECTROMAGNETIC WAVES

Infrared

Infrared radiation (IR) occupies the portion of the electromagnetic spectrum just below the visible range. Very hot objects emit IR radiation. As a stove element is heated, one can feel the heat coming off of it (IR radiation). As the elem continues to heat up, some of the energy is emitted as light energy in the visible spectrum (the element glows red). If something continually heats up, like the filament of a light bulb, its visible energy changes from red to bright white. However, even in the case of the light bulb, one can still feel heat or IR radiation coming off of it that cannot be seen with the eye. Thus, as matter heats up, the radia it emits is at higher and higher frequencies, but the lower IR frequencies are still present.

The most common detectors of infrared radiation are cameras that are sensitive to the in the IR range. Applications for this type of image are used in medicine, reconnaissance, and satellite imagery.



http://www.youtube.com/watch?v=UhYKc2W7f_A

http://www.youtube.com/watch?v=IqI_7Vhqnk0&fe

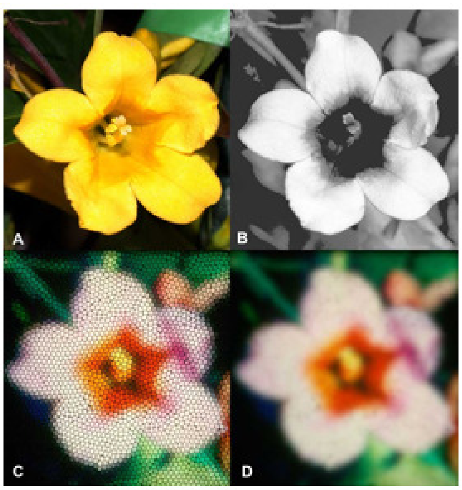
PHYSICS

ELECTROMAGNETIC WAVES

APPLICATIONS OF ELECTROMAGNETIC WAVES

Ultraviolet

____Ultraviolet radiation (UV) is a band of frequencies lying between visible light and x-rays. UV is emitted by very hot objects. Approximately 7% of the Sun's radiation is UV. Small exposure to UV is beneficial to humans as it stimulates the production of vitamin D. However, prolonged exposure leads to sunburn and increased risk of skin cancer. Some animals have their vision shifted into the UV range. Below is an approximation of what a bee sees.



A. Human vision
B. UV only
C. False colour image taken through an optical device simulating bee shape and colour vision.
D. Removed facets to accurately portray Bee vision.