

# Electromagnetic spectrum

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## Electromagnetic spectrum

Main bands: Electromagnetic waves have a huge span of frequencies from long to short wavelengths. There are three important physical properties by which the electromagnetic spectrum is described: Wavelength  $\lambda$ , the frequency  $f$  and the photon energy  $E$ . First to mention are radio waves with a frequency of 10 Hz and a very long wavelengths (longer than 1 m) and low energy photons of less than  $10^{(-5)}$  electron volts (eV). The next band will be the infrared light which starts at an wavelength of around 700 nm and a frequency of around  $10^{12}$  Hz and occurs with an energy of  $10^{(-2)}$  eV. When the wavelength becomes shorter than 700 nm light becomes visible. Each colour has its own wavelength. The smallest of the wavelengths of visible light is violet (400 nm) followed by blue (450 nm) and green (520 nm) yellow becomes visible at around 560 nm orange at 600 nm and red around 625 nm. If the wavelength is becoming shorter than 400 nm we are talking about the ultraviolet region which extends down to 10 nm and  $10^2$  eV. This type of the electromagnetic spectrum is not absorbed by our atmosphere. Downwards from 10 nm we reach the region of X-rays. And with a frequency of around  $10^{23}$  Hz we can talk about high energy gamma radiation. WOULDNT IT BE BETTER TO PUT ALL OF THIS IN A TABLE?

To sum up I want to add that as the wavelength of the electromagnetic spectrum grows in length it decreases the frequency. But as the frequency increases the Energy of the specific photon will do the same. HOW ABOUT GIVING PLANCK'S EQUATION? Of high physical importance is also the function of each of these bands which I will focus in the next part of my paper.

Function and physical importance: Radio waves are mainly used for the transmission of data such as radio, television or mobile phones. Dues to the very long wavelength it is also used for medical treatment. For example for magnetic resonance imaging. Like all the other electromagnetic waves they travel with speed of light (in vacuum). Infrared light is extending from the red edge of visible light. Infrared may be used to determine objects when there is no visible light, if the object has enough thermal energy (for example humans or animals). It is associated with the vibration and rotation of molecules. By human beings these light is recognized as heat. Visible radiation is of huge importance. It helps us to distinguish between different colours and enables us to see the way we are seeing. But if we take a look at the image of the electromagnetic spectrum above we can see how narrow the part which is visible to us as human beings is compared to the whole electromagnetic spectrum. Ultraviolet radiation is not absorbed by our atmosphere. It plays a big role in the production of Vitamin D which is very important for the balance of the Calcium metabolism as well as the bone building. However in large doses it can damage the human body, it may induce cancer. Glass can protect us slightly from damages. Best example are sunglasses. X-rays are also of very high medical importance. They can pass through substances with some absorption and enables us see through the body. There may also be a subdivision between hard and soft X-rays. Hard ones have a shorter wavelength. As well as X-rays, gamma radiation is an ionizing radiation mostly produced by atomic nuclei. When nuclear explosions with high gamma radiation are occurring this is avery dangerous and also life threatening event.

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