

Gamma Ray Encyclopedia Article

Gamma Ray

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Gamma Ray

Gamma rays are a kind of electromagnetic **radiation**, or **light energy**. Just as visible light, infrared **waves**, **microwaves**, **radio** waves, ultraviolet rays, and **x rays** are forms of electromagnetic radiation, so too are gamma rays. Gamma rays are highly energetic waves with very short wavelengths. Gamma ray wavelengths range from 10^{-10} to 10^{-13} meters long. Because of their extremely short length, gamma rays have very high frequencies. Typically, gamma rays have frequencies of greater than 1,018 hertz, or cycles per second. Each cycle is the complete passage of one full **wavelength** past a given point.

Gamma rays, also called **gamma radiation**, are photons that are emitted from very unstable atomic nuclei. Some gamma rays reach Earth's atmosphere from outer **space**. Of the kinds of radiation, gamma radiation is the most energetic and the most penetrating. Gamma rays can be thought of as energized x rays. While other forms of radiation can be blocked with paper and thin sheets of metal, glass, or plastic, gamma rays can easily pass through these. Shielding from gamma rays requires thick layers of concrete or lead. Passing unhindered through living tissue, gamma radiation is very damaging to cells. Intense exposure to gamma rays can cause immediate cell death by damaging protein and DNA. Mutated DNA as the result of chronic low level exposure, as with any form of radiation, can cause cancer. Gamma rays are often accompanied by alpha and **beta radiation** as well.

Like x rays, gamma rays are used in industry to inspect metal castings and welds. Another use of gamma rays is in gamma ray **astronomy**. This branch of astronomy analyzes distant objects in space such as **stars**, **pulsars**, and supernovas by examining the gamma rays they emit. In 1992, NASA launched the Compton Gamma Ray Observatory into space. This large orbiting space **telescope** detects gamma ray emissions from very distant sources for analysis back on Earth. Because they are of such high energy, gamma rays are some of the longest reaching electromagnetic waves, illuminating the far reaches of space to our earthbound eyes.