

# Impact of EM spectrum

Dr. M.Z Khan, Dept. of Physics

Dr. C.V. Raman University, Bilaspur

**Abstract:** An Electromagnetic Spectrum contains an array of electromagnetic waves of different frequencies but is unseen to human with naked eyes. In our daily life we are surrounded by these waves as everyone is exposed to electric and magnetic fields, both at home and at work, from the generation and transmission of electricity, domestic appliances[1] and industrial equipment, to telecommunications and broadcasting. The article provides the summary of the types of electromagnetic radiations which have their effects on human body as well as medical usage of these radiations for the treatment of various diseases. These effects are short term effects and long term effects. The long term effects that are commonly seen are irreversible hearing problems, damaging of embryonic development, risk of miscarriage increase, sperms count decrease, brain tissue damage, cardiovascular disease, memory loss, lymphoma and DNA damage.

Keywords:

- 1. INTRODUCTION:** Electromagnetic (EM) radiation is a form of energy that is all around us and takes many forms, such as radio waves, microwaves, X-rays and gamma rays. Sunlight is also a form of EM energy, but visible light is only a small portion of the EM spectrum, [2]which contains a broad range of [3]magnetic. Radiation[4] is energy that travels and spreads out as it goes. EM radiations are microwaves, infrared and ultraviolet light, X-rays and gamma-rays. The electromagnetic spectrum can be expressed in terms of energy, wavelength, or frequency. Electromagnetic radiations are used in many areas of science and technology such as television, radar, microwave ovens wireless phones and MRI. Electromagnetic radiation has many benefits but have many risks that threaten people lives and affect human health. The rapid increase in used of electromagnetic radiation technology make the pollution of electromagnetic field of radio frequency generate by telecommunication system is the biggest environmental problems of twentieth century. Electromagnetic spectrum has range of all possible frequencies of electromagnetic radiation. "Electromagnetic Spectrum" has characteristic distribution of electromagnetic radiation emitted or absorbed by particular object. The long wavelength is the size of the universe itself, while it is thought that the short wavelength limit is in the vicinity of the Planck length. Radiation is energy that travels and spreads out as it goes. EM radiations are microwaves; infrared and ultraviolet light X-rays and gamma-rays. The electromagnetic spectrum can be expressed in terms of energy, wavelength, or frequency. Regular increased in technological development worldwide. This generates a great interest by people to follow the evolution. Environmental pollution occurs in different forms such as air, water, soil, radioactive,

noise, thermal, and light pollution. Pollution in its various types doesn't simply negatively affect the natural world, but they can have measurable impact on human being.

The electromagnetic spectrum is divided into several bands. These definitions are generally informal and vague, and the bands may overlap. There seems to be a gap between the ultra-violet and X-ray bands. Sometimes, the choice of band depends on how the radiation is generated. For example, radiation from radioactive decay is always referred to as gamma rays, even if its photon energy would class it as X-rays.

The main bands used, in order of decreasing wavelength (hence increasing frequency and photon energy) are:

- Microwaves
- Infra-Red
- Visible light
- Ultra-violet
- X-rays
- Gamma ray
- Radio wave

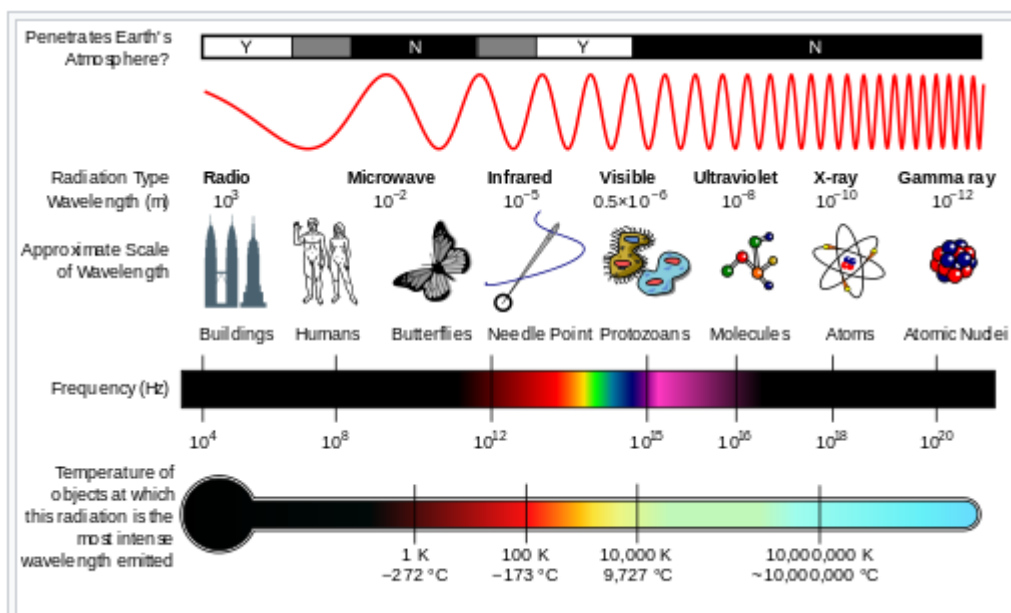


Fig: Electromagnetic radiation spectrum

**GAMMA RADIATION LITERATURE:** Gamma radiation, also known as gamma rays, and denoted by the Greek letter  $\gamma$ , refers to electromagnetic radiation of an extremely high frequency and therefore consists of high-energy photons. Gamma rays are ionizing radiation, and have biologically hazardous properties. Electromagnetic radiation from radioactive decay of atomic nuclei is referred to as “gamma rays” no matter its energy, atomic nucleus so that there is no lower limit to gamma energy derived from radioactive. The “rays” emitted by radioactive elements were named in order of their power to

penetrate various materials, using the first three letters of the Greek alphabet alpha rays as the least penetrating, followed by beta rays, followed by gamma rays as the most penetrating. Rutherford also noted that gamma rays were not deflected by a magnetic field, another property making them unlike alpha and beta rays. Rutherford measured the wavelengths of gamma rays from radium, and found that they were similar to X-rays, but with shorter wavelengths and has higher frequency. A gamma decay was then understood to usually emit a single gamma photon. Rutherford initially believed that  $\gamma$  rays has extremely fast beta particles, but their failure to be go over by a magnetic field indicated that they had no charge Fig.

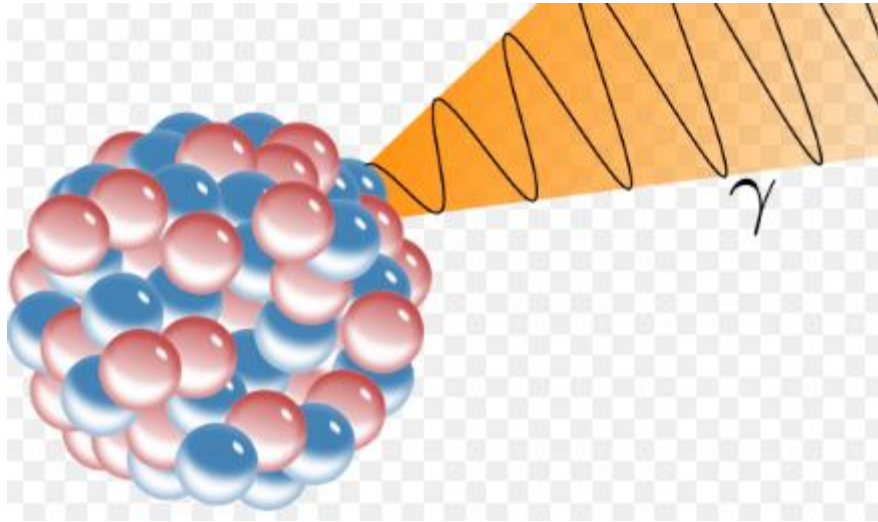


Fig: Gama radiation

**IMPACTS OF MICROWAVE RADIATIONS:** The word “radiation” refers to energy radiating from a source and not to radioactivity. It has not been shown conclusively that microwaves have significant adverse biological effects[5] at low levels. Some, but not all, studies suggest that longterm exposure may have a carcinogenic effect. This is separate from the risks associated with very highintensity exposure, which can cause heating and burns like any heat source, and not a unique property of microwaves specifically.

**IMPACTS OF RADIO WAVES:** High-power extremely low frequency RF with electric field levels in the low kV/m range are known to induce perceivable currents within the human body that create an annoying tingling sensation. These currents will typically flow to ground through a body contact surface such as the feet, or arc to ground where the body is well insulated.

**Microwaves:** Microwave exposure at low-power levels below the Specific absorption rate set by government regulatory bodies are considered harmless non-ionizing radiation and have no effect on the human body. The mechanism is unclear but may include changes in heat sensitive enzymes that normally protect cell proteins in the lens. Another mechanism that has been advanced is direct damage to the lens from pressure waves induced in the aqueous humor [97]. High-power exposure to microwave RF is known to create a range of effects from lower to higher power levels, ranging from unpleasant burning sensation on the skin and microwave auditory effect, to extreme pain at the mid-range, to physical burning and blistering of skin and internals at high power levels.

**Broadcasting:** Broadcasting is the distribution of audio and/or video content to a dispersed audience via any electronic mass communications medium, but typically one using the electromagnetic spectrum (radio waves), in a one-to-many model Fig.



**RISK ASSESSMENT OF ELECTROMAGNETIC SPECTRUM:** The assessment of human exposure to electromagnetic radiation under occupational and environmental conditions is one of the most complicated problems of public health science and practice. The problems arise from the very essence of EMR, the conflicting requirements of the measuring instruments, the complexity of electromagnetic waves in the working environment, and the still unknown mechanisms of their biological effects. Definitions have been given mainly regarding tissues' electric and magnetic characteristics, and regarding the energetic parameters of EMR, without description of concrete methods of exposure assessment in different complicated cases of wide-ranging impulsive, non-homogeneous radiation.

**CONCLUSION:** After this study it can be concluded that electromagnetic fields are harmful and can have adverse effect on human body depending upon the intensity and frequency of electromagnetic field. It is always a good idea to avoid the unnecessary exposure to electromagnetic fields whenever possible. Though technology makes our life very comfortable but at the expense of our health, it is our first duty to save our life. Along with the widespread use of technological products in daily life, the biological effects of electromagnetic waves have begun to be more widely discussed. EMR exposure at the highest frequencies (X-Rays, Gamma rays) is a source of serious biological damage. Considering the potential long-term danger, physicians and public health officials should alert individual patients and the public to this issue and provide ongoing information on precautions to diminish potential risk associated with EMF exposure.

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