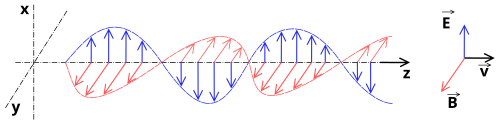


**Electromagnetic radiation**

|  |  |
| --- | --- |
| through space. It encompasses a broad spectrum, classified by [frequency](https://en.wikipedia.org/wiki/Frequency) or its inverse, wavelength, | A [linearly polarized](https://en.wikipedia.org/wiki/Linear_polarization) electromagnetic wave going in the z-axis, with E denoting the [electric field](https://en.wikipedia.org/wiki/Electric_field) and perpendicular B denoting [magnetic field](https://en.wikipedia.org/wiki/Magnetic_field) |

In [physics,](https://en.wikipedia.org/wiki/Physics) **electromagnetic radiation** (**EMR**) is a selfpropagating [wave](https://en.wikipedia.org/wiki/Wave) of the [electromagnetic](https://en.wikipedia.org/wiki/Electromagnetic_field)  [field](https://en.wikipedia.org/wiki/Electromagnetic_field) that carries [momentum](https://en.wikipedia.org/wiki/Momentum)  and [radiant](https://en.wikipedia.org/wiki/Radiant_energy)  [energy](https://en.wikipedia.org/wiki/Radiant_energy)



# [1][2]

ranging from [radio](https://en.wikipedia.org/wiki/Radio_waves)  [waves](https://en.wikipedia.org/wiki/Radio_waves), [microwaves,](https://en.wikipedia.org/wiki/Microwaves) [infrared,](https://en.wikipedia.org/wiki/Infrared) [visible light](https://en.wikipedia.org/wiki/Visible_light), [ultraviolet](https://en.wikipedia.org/wiki/Ultraviolet), [X-rays](https://en.wikipedia.org/wiki/X-ray), and [gamma rays.](https://en.wikipedia.org/wiki/Gamma_rays)[3][4] All forms of EMR travel at the speed of light in a vacuum and exhibit [wave–particle duality,](https://en.wikipedia.org/wiki/Wave%E2%80%93particle_duality) behaving both as waves and as discrete particles called photons.

Electromagnetic radiation is produced by accelerating charged particles such as from the Sun and other celestial bodies or artificially generated for various applications. Its interaction with matter depends on wavelength, influencing its uses in communication, medicine, industry, and scientific research. Radio waves enable [broadcasting](https://en.wikipedia.org/wiki/Broadcasting) and [wireless communication](https://en.wikipedia.org/wiki/Wireless), infrared is used in [thermal imaging,](https://en.wikipedia.org/wiki/Thermography) visible light is essential for vision, and higher-energy radiation, such as X-rays and gamma rays, is applied in medical imaging, cancer treatment, and industrial inspection. Exposure to high-energy radiation can pose health risks, making shielding and regulation necessary in certain applications.

In [quantum mechanics](https://en.wikipedia.org/wiki/Quantum_mechanics), an alternate way of viewing EMR is that it consists of [photons](https://en.wikipedia.org/wiki/Photon), uncharged [elementary particles](https://en.wikipedia.org/wiki/Elementary_particle) with zero [rest mass](https://en.wikipedia.org/wiki/Rest_mass) which are the [quanta](https://en.wikipedia.org/wiki/Quantum) of the [electromagnetic field,](https://en.wikipedia.org/wiki/Electromagnetic_field) responsible for all electromagnetic interactions.[5] [Quantum electrodynamics](https://en.wikipedia.org/wiki/Quantum_electrodynamics) is the theory of how EMR interacts with matter on an atomic level.[6] Quantum effects provide additional sources of EMR, such as the [transition of electrons](https://en.wikipedia.org/wiki/Atomic_electron_transition) to lower [energy levels](https://en.wikipedia.org/wiki/Energy_level) in an atom and [black-body radiation.](https://en.wikipedia.org/wiki/Black-body_radiation)[7]