Radiometric and photometric quantities and units

Photometry

Photometry is the measurement of light, in relation to its brightness to the human eye. The sensitivity of the eye is not equal to every wavelength of visible light. The way in which photometry deals with this is by weighing the power that is measured at each wavelength using a factor that shows the sensitivity of the eye at specific wavelengths. The Standardised (SI) unit of the eye's reaction to visible light is expressed using the luminosity function. Photopic vision is when there are light conditions, and, scotopic vision is when there are dark conditions. The eye has different reactions when it adjusts to these different conditions. Photometric measurements are based on the eye's response. Therefore, the measurements do not specify the brightness of the source when there are dim light conditions. The luminance levels for photopic vision is based on the eye's luminance levels over three candelas per square metre. Whereas, scotopic vision takes place below 2×10^{-5} cd/m^2 Measurement techniques for the effects of electromagnetic radiation changed based on the effects in the experiment and created different nomenclature. Thermometers are used to measure the heating effect of infrared radiation and this allowed for the development of radiometric units in relation to power and total energy. Research on the chemicals effects of ultraviolet radiation allowed for the classification by the total dose in photons per second.

Luminous Intensity

Luminous intensity is a measure of the amount of light that a point source radiates in a given direction. It is expressed by the luminous flux leaving the source in that direction per unit of solid angle. The SI unit of luminous intensity is the candela (cd). The human eye is only capable of viewing light in the visible spectrum and has a different sensitivity to light of different wavelengths. When there are photopic conditions, the eye is sensitive to light of wavelength 555 nm.

Luminous flux

Luminous flux is the measure of the observed power of light from the human eye. It's changed so that is displays the various sensitivities of the human eye to different wavelengths of light. The SI unit of luminous flux is the lumen (lm). One lumen is the luminous flux of light that is made by a light source which produces one candela of luminous intensity over a solid angle.

Luminance

Luminance is a measure of the luminous intensity per unit area of light travelling in a given direction. It expresses the amount of light that passes through a specific area, and it appears within a certain solid angle. The SI unit for luminance is candela per square metre (cd/m^2). A number of units have been used for luminance, apart from the candela per square metre. One candela per square metre is equal to, 10^{-4} stilbs, π apostilbs, $\pi \times 10^{-4}$ lamberts, 0.292 foot-lamberts.

Radiometry

Radiometry is a way of measuring electromagnetic radiation. The techniques used in radiometry calculate the supply of the power of the radiation in relation to space. Radiance and spectral radiance are measures of the amount of radiation that is passed through a surface and lies within a given solid angle in a specific direction. They are used in radiometry to show production and reflection of electromagnetic radiation.

Radiance

Radiance is used in astrophysics to calculate the radiation of particles such as neutrinos. The SI unit of radiance is watts per steradian per square metre (W•sr^{-1}•m^{-2}). The SI unit of spectral radiance is W•sr^{-1}•m^{-2}•Hz^{-1}, but, can also be W•sr^{-1}•m^{-3} depending whether the spectrum is a function of wavelength or frequency.

Radiant flux

Radiant flux or radiant power is the measure of the sum of the power of electromagnetic radiation. The power can be the total released from a source or the total falling on a specific surface. The SI unit of radiant flux is the watt (W), which is in SI units, joules/second.

Radiant intensity

Radiant intensity is a measure of electromagnetic radiation intensity. It is expressed as power per unit solid angle. The SI unit of radiant intensity is watts per steradian (W•sr^{-1}).

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