



International Commission on Illumination
Commission Internationale de l'Eclairage
Internationale Beleuchtungskommission

E-ILV

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luminance

L_v ; L

density of [luminous intensity](#) with respect to projected area in a specified direction at a specified point on a real or imaginary surface



where I_v is [luminous intensity](#), A is area and α is the angle between the normal to the surface at the specified point and the specified direction

Note 1 to entry: In a practical sense, the definition of luminance can be thought of as dividing a real or imaginary surface into an infinite number of infinitesimally small surfaces which can be considered as [point sources](#), each of which has a specific [luminous intensity](#), I_v , in the specified direction. The luminance of the surface is then the integral of these luminance elements over the whole surface.

The equation in the definition can mathematically be interpreted as a derivative (i.e. a rate of change of [luminous intensity](#) with projected area)

and could alternatively be rewritten in terms of the average **luminous intensity**, , as:



Hence, luminance is often considered as a quotient of averaged quantities; the area, A , should be small enough so that uncertainties due to variations in **luminous intensity** within that area are negligible; otherwise, the quotient  gives the **average luminance** and the specific measurement conditions have to be reported with the result.

Note 2 to entry: For a surface being irradiated, an equivalent formula in terms of **illuminance**, E_v , and **solid angle**, Ω , is , where θ is the angle between the normal to the surface being irradiated and the direction of **irradiation**. This form is useful when the **source** has no surface (e.g. the sky, the plasma of a discharge).

Note 3 to entry: An equivalent formula is , where Φ_v is **luminous flux** and G is **geometric extent**.

Note 4 to entry:

Luminous flux can be obtained by integrating luminance over projected area, $A \cdot \cos \alpha$, and **solid angle**, Ω : .

Note 5 to entry: Since the **optical extent**, expressed by $G \cdot n^2$, where G is **geometric extent** and n is **refractive index**, is invariant, the quantity expressed by $L_v \cdot n^{-2}$ is also invariant along the path of the beam if the losses by **absorption**, **reflection** and diffusion are taken as 0. That quantity is called "basic luminance".

Note 6 to entry: The equation in the definition can also be described as a function of **luminous flux**, Φ_v . In this case, it is mathematically interpreted as a second partial derivative of the **luminous flux** at a specified point (x, y) in space in a specified direction (ϑ, φ) with respect to projected area, $A \cdot \cos \alpha$, and **solid angle**, Ω ,



where α is the angle between the normal to that area at the specified point and the specified direction.

Note 7 to entry: The corresponding radiometric quantity is "**radiance**". The corresponding quantity for photons is "**photon radiance**".

Note 8 to entry: The luminance is expressed in candela per square metre ($\text{cd} \cdot \text{m}^{-2} = \text{lm} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$).

Note 9 to entry: This entry was numbered 845-01-35 in IEC 60050-845:1987.

Note 10 to entry: This entry was numbered 17-711 in CIE S 017:2011.

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