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Standard Terminology Relating to Space Simulation¹

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INTRODUCTION

These definitions pertain to technologies related to space environment simulation. Where possible, existing international and national standard definitions have been used.

ELECTROMAGNETIC RADIATION TERMS

FUNDAMENTAL CONCEPTS

absorption, n —transformation of radiant energy to a different form of energy by interaction with matter.

complex radiation, n —radiation composed of a number of monochromatic radiations.

diffusion, n —change of the spatial distribution of a beam of radiation when it is deviated in many directions by a surface or a medium.

emission, n —release of radiant energy.

infrared radiation, n —radiation for which the wavelengths of the monochromatic components are greater than those for visible radiation, and less than about 1 mm.

NOTE 1—The limits of the spectral range of infrared radiation are not well defined and may vary according to the user. Committee E-2.1.2 of the CIE distinguishes in the spectral range between 780 nm and 1 mm:

IR-A	780 to 1400 nm
IR-B	1.4 to 3 μ m
IR-C	3 μ m to 1 mm

irradiation, n —application of radiation to an object.

monochromatic radiation, n —radiation characterized by a single frequency. By extension, radiation of a very small range of frequency or wavelength that can be described by stating a single frequency or wavelength.

radiation, n —(1) emission or transfer of energy in the form of electromagnetic waves or particles.

(2) the electromagnetic waves or particles.

NOTE 2—In general, nuclear radiations and radio waves are not considered in this vocabulary, only optical radiations, that is, electromag-

netic radiations (photons) of wavelengths lying between the region of transition to X-rays (1 nm) and the region of transition to radio waves (1 mm).

reflection, n —return of radiation by a surface without change of frequency of the monochromatic components of which the radiation is composed.

refraction, n —change in the direction of propagation of radiation determined by change in the velocity of propagation in passing from one medium to another.

spectrum of radiation, n —(1) spatial display of a complex radiation produced by separation of its monochromatic components.

(2) composition of a complex radiation.

transmission, n —passage of radiation through a medium without change of frequency of the monochromatic components of which the radiation is composed.

ultraviolet radiation, n —radiation for which the wavelengths of the monochromatic components are smaller than those for visible radiation and more than about 1 nm.

NOTE 3—The limits of the spectral range of ultraviolet radiation are not well defined and may vary according to the user. Committee E-2.1.2 of the CIE distinguishes in the spectral range between 100 and 400 nm:

UV-A	315 to 400 nm
UV-B	280 to 315 nm
UV-C	100 to 280 nm

visible radiation, n —any radiation capable of causing a visual sensation.

NOTE 4—The limits of the spectral range of visible radiation are not well defined and may vary according to the user. The lower limit is generally taken between 380 and 400 nm and the upper limit between 760 and 790 nm (1 nanometer, nm = 10^{-9} m).

QUANTITIES

absorptance, n —ratio of the absorbed radiant or luminous flux to the incident flux. Symbol: α_e , α_v , α .

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NOTE 5—In general, the value of the absorptance depends upon the mode of irradiation, the spectral composition, and the state of polarization of the incident radiation.

absorptivity of an absorbing material, n —internal absorptance of a layer of the material such that the path of the radiation is of unit length.

diffuse reflection, n —diffusion by reflection in which, on the macroscopic scale, there is no regular reflection.

diffuse transmission, n —transmission in which diffusion occurs independently, on the macroscopic scale, of the laws of refraction.

directional emissivity of a thermal radiator, n —ratio of the thermal radiance of the radiator in a given direction to that of a full radiator at the same temperature. Symbol: $\epsilon(\theta, \phi)$; $\epsilon(\theta, \phi) = L_{e,th}(\theta, \phi)/L_e(\epsilon = 1)$.

emissivity of a thermal radiator, n —ratio of the thermal radiant exitance of the radiator to that of a full radiator at the same temperature. Symbol: ϵ , $\epsilon = M_{e,th}/M_e(\epsilon = 1)$.

NOTE 6—Formerly “*pouvoir émissif*” (fr.).

frequency, n —reciprocal of the period. Symbol; f , ν .

NOTE 7—When the independent variable is time, the unit of frequency is the hertz. Symbol: Hz (1 Hz = 1 s⁻¹). (This unit is also called “cycle per second,” c/s.)

full radiator: blackbody (USA), Planckian radiator, n —thermal radiator that absorbs completely all incident radiation, whatever the wavelength, the direction of incidence, or the polarization. This radiator has, for any wavelength, the maximum spectral concentration of radiant exitance at a given temperature.

goniophotometer, n —photometer for measuring the directional light distribution characteristics of sources, lighting fittings, media, and surfaces.

NOTE 8—A goniophotometer for measuring the spatial distribution of luminous intensity is also called a distribution photometer.

gray body, n —nonselective radiator whose spectral emissivity is less than one.

integrating (Ulbrecht) sphere, n —part of an integrating photometer. A sphere that is coated internally with a white diffusing paint as nonselective as possible and is provided with an associated equipment for making a photometric measurement at a point of the inner surface of the sphere. A screen placed inside the sphere prevents the point under observation from receiving any radiation directly from the source.

internal absorptance of a homogeneous nondiffusing plate, n —ratio of the radiant or luminous flux absorbed between the entry and exit surfaces of the plate to the flux which leaves the entry surface. Symbol: a_i , $a_i + \tau_i = 1$.

NOTE 9—For a given plate, the internal absorptance is a function of the path length of the radiation in the plate and thus of the angle of incidence. The fundamental concept is spectral internal absorptance, $a_i(\lambda)$.

internal transmission density, n —logarithm to the base 10 of the reciprocal of the internal transmittance. Symbol: D_i , $D_i = -\log_{10} \tau_i$.

NOTE 10—See Note 12 of **internal transmittance**.

NOTE 11—In German, the symbol E is still in use and the natural logarithm is also used sometimes instead of the common logarithm; the corresponding quantity is then called “natürliches Absorptionsmass.” (= $\ln 1/\tau_i$).

internal transmittance of a homogeneous nondiffusing plate, n —ratio of the radiant or luminous flux reaching the exit surface of the plate to the flux which leaves the entry surface.

NOTE 12—For a given plate, the internal transmittance is a function of the path length of the radiation in the plate and thus of the angle of incidence. The fundamental concept is “spectral internal transmittance” $\tau(\lambda)$.

irradiance at a point on a surface, n —quotient of the radiant flux incident on an element of the surface containing the point by the area of that element. Symbol: E_e , E ; $E_e = d\Phi_e/dA$; Unit: Watt per square metre, W·m⁻².

NOTE 13—In ultraviolet radiation therapy and photobiology, this quantity is called dose rate (International Photobiology Committee, 1954).

linear absorption coefficient of an absorbing medium, n —quotient of the internal absorptance of a path element traversed by the radiation, by the length d of this element. Symbol: a ; $-d\Phi = a\Phi dl$; Unit: m⁻¹; $al = \ln 10D_i$.

NOTE 14—The linear absorption coefficient is also the part of the linear attenuation coefficient that is due to absorption.

NOTE 15—In German practice, a linear absorption coefficient is also defined for a homogeneous medium of finite thickness d , as the quotient of the “Absorptions-mass” (logarithm of the reciprocal of the internal transmittance), by the thickness d of the layer. According to whether the natural logarithm or the logarithm to the base 10 is used, one may distinguish the “natürliche Absorptionskoeffizient” (m_n) quotient of the “natürliche Absorptionsmass” (see Note 2, **internal transmission density**) by the thickness d of the layer traversed by the radiation, and the “dekadische Absorptionskoeffizient” (m) quotient of the internal transmission density by the thickness d of the layer.

NOTE 16— a/ρ , where ρ is the density of the medium, is called “mass absorption coefficient.”

linear attenuation (extinction) coefficient of an absorbing and diffusing medium, for a collimated beam of radiation, n —quotient of the relative decrease in spectral concentration of radiant or luminous flux of a collimated beam of radiation during traversal with normal incidence of an infinitesimal layer of the medium by the thickness of that layer. Symbol: μ ; $-d\Phi = \mu\Phi dl$; Unit: m⁻¹.

NOTE 17—This concept only applies strictly to slightly diffusing media.

NOTE 18— μ/ρ , where ρ is the density of the medium, is called the “mass attenuation coefficient.”

mixed reflection, n —partly regular and partly diffuse reflection.

NOTE 19—The irradiance or illuminance received from a point source after regular (diffuse) reflection varies inversely as the square of the distance to the source (diffuser).

mixed transmission, n —partly regular and partly diffuse transmission.

NOTE 20—The irradiance or illuminance received from a point source, after regular (diffuse) transmission, varies inversely as the square of the distance to the source (diffuser).