IEEE 100

THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS

SEVENTH EDITION

IEEE
Published by
Standards Information Network
IEEE Press

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where
D_V = voltage distortion factor in percent,
V_1 = rms value of the fundamental frequency component,
V_n = rms value of an individual non-fundamental frequency component,
f_1 = the fundamental frequency,
f_n = frequency of other individual waveform components, including harmonics and inter-harmonics (non-integral multiples of the fundamental),
f_{max} = the maximum frequency of measurement.
(PEL) 1515-2000

distortion, field-time waveform *See:* field-time waveform distortion.

distortion, intermodulation *See:* intermodulation distortion.

distortion, keystone *See:* keystone distortion.

distortion-limited operation (fiber optics) The condition prevailing when the distortion of the received signal, rather than its amplitude (or power), limits performance. The condition is reached when the system distorts the shape of the waveform beyond specified limits. For linear systems, distortion-limited operation is equivalent to bandwidth-limited operation. *See also:* multimode distortion; bandwidth-limited operation; distortion; attenuation-limited operation. (Std100) 812-1984w

distortion, linear *See:* linear distortion.

distortion, linear TV waveform *See:* linear TV waveform distortion.

distortion, line-time waveform *See:* line-time waveform distortion.

distortion, pattern *See:* pattern distortion.

distortion, percent harmonic *See:* percent harmonic distortion.

distortion, phase delay *See:* phase delay distortion.

distortion, pin-cushion *See:* pin-cushion distortion.

distortion power (A) (single-phase two-wire circuit) At the two terminals of entry of a single-phase two-wire circuit into a delimited region, a scalar quantity having an amplitude equal to the square root of the difference of the squares of the apparent power and the amplitude of the phasor power. *Note:* Mathematically, the amplitude of the distortion power D is given by the equation

$$D = (U^2 - S^2)^{1/2} = (U^2 - P^2 - Q^2)^{1/2}$$
$$= \left[\sum_{r=1}^{r=\infty}\sum_{q=1}^{q=\infty}\left\{E_r I_q^2 E_r E_q I_r I_q \cdot \cos\left[(\alpha_r - \beta_r) - (\alpha_q - \beta_q)\right]\right\}\right]^{1/2}$$

where the symbols are as in power, apparent (single-phase two-wire circuit). If the voltage and current are quasi-periodic and the amplitudes are slowly varying, the distortion power at any instant may be taken as the value derived from the amplitude of the apparent power and phasor power at that instant. By this definition the sign of distortion power is not definitely determined, and it may be given either sign. In the absence of other definite information, it is to be taken the same as for the active power. Distortion power is expressed in volt-amperes when the voltage is in volts and the current in amperes. The distortion power is zero if the voltage and the current have the same waveform. This condition is fulfilled when the voltage and current are sinusoidal and have the same period, or when the circuit consists entirely of non-inductive resistors. *See also:* apparent power. **(B) (polyphase circuit)** At the terminals of entry of a polyphase circuit, equal to the sum of the distortion powers for the individual terminals of entry. *Notes:* 1. The distortion power for each terminal of entry is determined by considering each phase conductor, in turn, with the common reference point as a single-phase, two- wire circuit and finding the distortion power for each in accordance with the definition of distortion power (single-phase two-wire circuit). The common reference terminal shall be taken as the neutral terminal of entry, if one exists, otherwise as the true neutral point. The sign given to the distortion power for each single-phase current, and therefore to the total for the polyphase circuit, shall be the same as that of the total active power. 2. Distortion power is expressed in volt-amperes when the voltages are in volts and the current in amperes. 3. The distortion power is zero if each voltage has the same wave form as the corresponding current. This condition is fulfilled, of course, when all the currents and voltages are sinusoidal. (Std100/Std100) 270-1966

distortion, pulse *See:* pulse distortion.

distortion, short-time waveform *See:* short-time waveform distortion.

distortion, single frequency *See:* single frequency distortion.

distortion, spiral *See:* spiral distortion.

distortion tolerance (telegraph receiver) The maximum signal distortion that can be tolerated without error in reception. *See also:* telegraphy. (COM) [49]

distortion, total *See:* total distortion.

distortion, total harmonic *See:* total harmonic distortion.

distortion, waveform *See:* waveform distortion.

distributed Spread out over an electrically significant length or area. (EEC/PE) [119]

distributed architecture A computer architecture characterized by its suitability for distributed processing. (C) 610.10-1994w

distributed constant (waveguide) A circuit parameter that exists along the length of a waveguide or transmission line. *Note:* For a transverse electromagnetic wave on a two-conductor transmission line, the distributed constants are series resistance, series inductance, shunt conductance, and shunt capacitance per unit length of line. *See also:* waveguide. (MTT) 146-1980w

distributed computer network A network in which all node pairs are connected either directly or through redundant paths through intermediate nodes. *See also:* decentralized computer network; centralized computer network. (C) 610.7-1995

distributed control system A system comprised of software, hardware, cabling, sensors, and activators, which is used to control and monitor equipment. (PE/EDPG) 1050-1996

distributed coordination function (DCF) A class of coordination function where the same coordination function logic is active in every station in the basic service set (BSS) whenever the network is in operation. (C/LM) 8802-11-1999

distributed database (A) A database that is not stored in its entirety at a single physical location, but is dispersed over a network of interconnected computers. **(B)** A database under the overall control of a central database management system, whose storage devices are not all attached to the same processor. (C) 610.5-1990

distributed data processing (DDP) The use of computers for processing information within a distributed system. (C) 610.2-1987

distributed element (waveguide) (for a transmission line) A circuit element that exists continuously along a transmission line. *Note:* For a transverse electromagnetic wave on a two-conductor transmission line, the distributed elements are series resistance, series inductance, shunt conductance, and shunt capacitance per unit length of line. (MTT) 146-1980w

distributed element circuit (microwave tubes) A circuit whose inductance and capacitance are distributed over a physical distance that is comparable to a wavelength. (ED) [45]

distributed function (dot logic, wired logic) A logic function (either AND or OR) implemented by connecting together outputs of the appropriate type; these outputs are the inputs of the logic function thus formed; the joined connection is the output. (GSD) 91-1984r

Distributed Interactive Simulation (DIS) A time-and-space-coherent synthetic representation of world environments designed for linking the interactive, free play activities of people in operational exercises. The synthetic environment is created

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the above equation. K_m and K'_m are derived from the basic SI definition of luminous intensity and have the values 683 lm/W and 1754 lm/W respectively. *Note:* The value of K_m 683 lm/W was recommended by the International Committee for Weights and Measures in 1977. *See also:* spectral luminous efficiency; candela; values of spectral luminous efficiency for photopic vision; values of spectral luminous efficiency for scotopic vision. (EEC/IE) [126]

luminous flux density at a surface, $d\Phi/dA$ (illuminating engineering) The luminous flux per unit area at a point on a surface. *Note:* This need not be a physical surface; it may also be a mathematical plane. *See also:* illuminance; luminous exitance, $M = d\varphi/dA$. (EEC/IE) [126]

luminous gain (optoelectronic device) The ratio of the emitted luminous flux to the incident luminous flux. *Note:* The emitted and incident luminous flux are both determined at specified ports. *See also:* optoelectronic device. (ED) [46]

luminous intensity (A) (television) (of a source of light in a given direction) The luminous flux per unit solid angle in the direction in question. Hence, it is the luminous flux on a small surface normal to that direction, divided by the solid angle (in steradians) that the surface subtends at the source. *Note:* Mathematically, a solid angle must have a point as its apex; the definition of luminous intensity, therefore, applies strictly only to a point source. In practice, however, light emanating from a source whose dimensions are negligible in comparison with the distance over which it is observed may be considered as coming from a point. **(B)** (of a point source of light in a given direction) The luminous flux per unit solid angle in the direction in question. Hence, it is the luminous flux on a small surface centered on and normal to that direction divided by the solid angle (in steradians) which the surface subtends at the source. Luminous intensity may be expressed in candelas or in lumens per steradian (lm/sr). *Note:* Mathematically a solid angle must have a point as its apex; the definition of luminous intensity, therefore, applies strictly only to a point source. In practice, however, light emanating from a source whose dimensions are negligible in comparison with the distance from which it is observed may be considered as coming from a point. Specifically, this implies that with change of distance (1) the variation in solid angle subtended by the source at the receiving point approaches $1/(\text{distance})^2$ and that (2) the average luminance of the projected source area as seen from the receiving point does not vary appreciably. For extended sources see equivalent luminous intensity of an extended source at a specified distance. The word intensity as defined above is used to designate luminous intensity (or candlepower). It is also widely used in other ways either informally or formally in other disciplines. Stimulus intensity may be used to designate the retinal illuminance of a proximal stimulus or the luminance of a distal stimulus. Intensity is used in the same sense with other modalities such as audition. Intensity has been used to designate the level of illuminance on a surface or the flux density in the cross section of a beam of light. In physical optics, intensity usually refers to the square of the wave amplitude. *See also:* distal stimulus; proximal stimulus. (BT/EEC/IE/AV) 201-1979, [126]

luminous reflectance (illuminating engineering) Any of the geometric aspects of reflectance in which both the incident and transmitted flux are weighed by the luminous efficiency of radiant flux [V (λ)]. *Note:* Unless otherwise qualified, the term "luminous reflectance" is meant by the term "reflectance." (EEC/IE) [126]

luminous sensitivity (camera tubes or phototubes) The quotient of signal output current by incident luminous flux, under specified conditions of illumination. *Notes:* 1. Since luminous sensitivity is not an absolute characteristic but depends on the spectral distribution of the incident flux, the term is commonly used to designate the sensitivity to radiation from a tungsten-filament lamp operating at a color temperature of 2870 K. 2. Luminous sensitivity is usually measured with a collimated beam at normal incidence. (ED) 161-1971w

luminous transmittance (illuminating engineering) Any of the geometric aspects of transmittance in which the incident and transmitted flux are weighed by the luminous efficiency of radiant flux [V(λ)]. *Note:* unless otherwise qualified, the term luminous transmittance is meant by the term transmittance. (EEC/IE) [126]

luminous-tube transformer (power and distribution transformers) Transformers, autotransformers, or reactors (having a secondary open-circuit rms of 1000 V or more) for operation of cold-cathode and hot-cathode luminous tubing generally used for signs, illumination, and decoration purposes. (PE/TR) C57.12.80-1978r

lumped Effectively concentrated at a single point. (EEC/PE) [119]

lumped capacitive load A lumped capacitance that is switched as a unit. (SWG/PE) C37.100-1992

lumped element circuit (microwave tubes) A circuit consisting of discrete inductors and capacitors. (ED) [45]

Luneburg lens antenna A lens antenna with a circular cross section having an index of refraction varying only in the radial direction such that a feed located on or near a surface or edge of the lens produces a major lobe diametrically opposite the feed. (AP/ANT) 145-1993

lux (1) (lx) (illuminating engineering) The SI unit of illuminance. One lux is one lumen per square meter (lm/m^2). (EEC/IE) [126]

(2) (metric practice) The illuminance produced by a luminous flux of one lumen uniformly distributed over a surface of one square meter. (QUL) 268-1982s

(3) (electric power systems in commercial buildings) The metric measure of illuminance that is equal to 1 lm uniformly incident on 1 m^2 (1 lux = 0.0929 fc). (IA/PSE) 241-1990r

Luxemburg effect A nonlinear effect in the ionosphere, as a result of which, the modulation on a strong carrier wave is transferred to another carrier passing through the same region. *See also:* radiation. (EEC/PE) [119]

LV *See:* layer manager; metal-enclosed low-voltage power circuit-breaker switchgear.

Lyapunov function (equilibrium point $\mathbf{x}_e$ of a system) A scalar differentiable function V(x) defined in some open region including $\mathbf{x}_e$ such that in that region

$$V(\mathbf{x}) > 0 \text{ for } \mathbf{x} \neq \mathbf{x}_e \quad (1)$$

$$V(\mathbf{x}_e) = 0 \quad (2)$$

$$V'(\mathbf{x}) \leq 0 \quad (3)$$

Notes: 1. The open region may be defined by (norm of $\mathbf{x} - \mathbf{x}_e$) < constant. 2. For the system $\mathbf{x}' = \mathbf{f}(\mathbf{x})$, $V'(\mathbf{x}) \equiv$ [grad $V(\mathbf{x}) \cdot \mathbf{f}(\mathbf{x})$]. *See also:* feedback control system. (CS/IM) [120]

Lyapunov stability (of a solution $\phi(x(t_0);t)$) For every given $\varepsilon > 0$ there exists a $\delta > 0$ (which, in general, may depend on ε and on t_0) such that $\|\Delta\mathbf{x}(t_0)\| \leq \delta$ implies $\|\Delta\phi\| \leq \varepsilon$ for $t \geq t_0$. *Notes:* 1. The solution $x = 0$ of the system $\dot{x} = ax$ is Lyapunov stable if $a < 0$, and is Lyapunov unstable if $a > 0$. 2. For a linear system with an irreducible transfer function $T(s)$, Lyapunov stability implies that all the poles of $T(s)$ are in the left-half s plane and that those on the $j\omega$ axis are simple. *See also:* control system. (CS/IM) [120]

LYRIC *See:* Language for Your Remote Instruction by Computer.

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