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Standard Terminology Relating to NDT by Infrared Thermography¹

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absorptance, α —the ratio of radiant flux absorbed by a surface to that incident upon it.

apparent temperature—the temperature of an object as determined solely from the measured radiant exitance, assuming an emissivity of unity.

background radiation—all radiation received by the infrared sensing device that was not emitted by the specified area of the surface being examined.

blackbody—an ideal thermal radiator (emissivity = 1.0) that emits and absorbs all of the available thermal radiation at a given temperature.

blackbody equivalent temperature—the apparent temperature of an object as determined from the measured radiance and the assumption that it is an ideal blackbody with emissivity of 1.0.

differential blackbody—an apparatus for establishing two parallel isothermal planar zones of different temperatures, and with effective emissivities of 1.0.

emissivity, ϵ —the ratio of the radiance of a body at a given temperature to the corresponding radiance of a blackbody at the same temperature.

extended source—a source of infrared radiation whose image completely fills the field of view of a detector.

NOTE—The irradiance is independent of the distance from the source to the region of observation. In practice, sources that are not extended sources are considered to be point sources; see **point source**.

field of view (FOV)—the shape and angular dimensions of the cone or the pyramid which define the object space imaged by the system; for example, rectangular, 4° wide by 3° high.

Discussion—The size of the field of view is customarily expressed in units of degrees.

imaging line scanner—an apparatus that scans in a single dimension and is moved perpendicular to the scan direction to produce a two-dimensional thermogram of a scene.

infrared imaging system—an apparatus that converts the two-dimensional spatial variations in infrared radiance from any object surface into a two-dimensional thermogram of the same scene, in which variations in radiance are displayed in gradations of gray tone or in color.

infrared sensing device—one of a wide class of instruments used to display, record or both, information related to the thermal radiation received from any object surfaces

viewed by the instrument. The instrumentation varies in complexity from spot radiometers to two-dimensional real-time imaging systems.

infrared thermography—see **thermography, infrared**.

instantaneous field of view (IFOV)—for a scanning system, the angular dimensions in object space within which objects are imaged by an individual detector (unit = deg or rad).

NOTE—The IFOV is equivalent to the horizontal and vertical fields of view of the individual detector. For small detectors, the detector angular subtenses or projections, α and β , are defined by $\alpha = a/f$ and $\beta = b/f$ where a and b are the horizontal and vertical dimensions of the detector and f is the effective focal length of the optic. (IFOV may also be expressed as a solid angle in units of sr.)

irradiance, E —the radiant flux (power) per unit area incident on a given surface (unit = W/m^2).

limiting resolution—the highest spatial frequency of a target that an imaging sensor is able to resolve.

line scanner—an apparatus that scans along a single line of a scene to provide a one-dimensional thermal profile of the scene.

minimum detectable temperature difference (MDTD)—a measure of the compound ability of an infrared imaging system and an observer to detect a target of unknown location at one temperature against a large uniform background at another temperature when displayed on a monitor for a limited time.

Discussion: For a given target size, the MDTD is the minimum temperature difference between the target and its background at which the observer can detect the target. The standard target is a circle whose size is given by its angular subtense, and both target and background are isothermal blackbodies.

minimum resolvable temperature difference (MRTD)—a measure of the ability of an infrared imaging system and the human observer to recognize periodic bar targets on a display. The MRTD is the minimum temperature difference between a standard periodic test pattern (7:1 aspect ratio, 4 bars) and its blackbody background at which an observer can resolve the pattern as a four-bar pattern (see Fig. 1).

modulation transfer function (MTF)—in infrared imaging systems, the modulus of a Fourier transform that describes the spatial distribution of the overall attenuation in amplitude of a thermal imaging system.

NOTE—MTF is a sensitive function of spatial frequency.

noise equivalent temperature difference (NETD)—the target-to-background temperature difference between a blackbody target and its blackbody background at which the signal-to-noise ratio of a thermal imaging system or scanner is unity.

¹ This terminology is under the jurisdiction of ASTM Committee E-7 on Nondestructive Testing and are the direct responsibility of Subcommittee E07.10 on Emerging NDT Methods.

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