Designation: E1543 – 00 (Reapproved 2011)

Standard Test Method for Noise Equivalent Temperature Difference of Thermal Imaging Systems[1]

This standard is issued under the fixed designation E1543; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the noise equivalent temperature difference (NETD; NEΔT) of thermal imaging systems of the conventional forward-looking infrared (FLIR) or other types that utilize an optical-mechanical scanner; it does not include charge-coupled devices or pyroelectric vidicons.

1.2 Parts of this test method have been formulated under the assumption of a photonic detector(s) at a standard background temperature of 295°K (22°C). Besides nonuniformity, tests made at other background temperatures may result in impairment of precision and bias.

1.3 The values stated in SI units are to be regarded as standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E1213 Test Method for Minimum Resolvable Temperature Difference for Thermal Imaging Systems

E1316 Terminology for Nondestructive Examinations

3. Terminology

3.1 *Definitions:*

3.1.1 *blackbody simulator*—a device that produces an emission spectrum closely approximating that emitted by a blackbody (surface with emissivity of 1.0), usually a cavity or a flat plate with a structured or coated surface having a stable and uniform temperature.

3.1.2 *dwell time*—the time spent, during one frame, in scanning one angular dimension of a single pixel (picture element) of the image within the instantaneous field of view (IFOV) of a detector. Thus, for example, if a single pixel is scanned *n* times during one frame, the dwell time is given by *n* times the duration of a single scan of the pixel.

3.1.3 *FLIR*—an acronym for forward-looking infrared, originally implying airborne, now denoting any fast-frame thermal imaging system comparable to that of television and yielding real-time displays. Generally, these systems employ optical-mechanical scanning mechanisms.

3.1.4 See also Section J: Infrared Examination, of Terminology E1316.

4. Summary of Test Method

4.1 The target is a blackbody source of uniform temperature that is viewed by the infrared thermal imaging system through an aperture of prescribed size. A specified temperature difference is established between the target and its background. Measurements are made of the peak-to-peak signal voltage from the target and the RMS noise voltage from the background, both across a standard reference filter, and of the target and background temperatures. From these measured values, the NETD is calculated.

5. Significance and Use

5.1 This test method gives an objective measure of the temperature sensitivity of a thermal imaging system (relative to a standard reference filter) exclusive of a monitor, with emphasis on the detector(s) and preamplifier.

NOTE 1—Test values obtained under idealized laboratory conditions may or may not correlate directly with service performance.

[1] This test method is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.10 on Specialized NDT Methods.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.