Designation: E1213 – 14 (Reapproved 2018)

Standard Practice for Minimum Resolvable Temperature Difference for Thermal Imaging Systems[1]

This standard is issued under the fixed designation E1213; 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 practice covers the determination of the minimum resolvable temperature difference (MRTD) capability of the compound observer-thermal imaging system as a function of spatial frequency.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E1316 Terminology for Nondestructive Examinations

3. Terminology

3.1 *Definitions:*

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

3.1.2 See also Terminology E1316.

4. Summary of Practice

4.1 A standard four-bar target is used in conjunction with a differential blackbody that can establish one blackbody isothermal temperature for the set of bars and another blackbody isothermal temperature for the set of conjugate bars, which are formed by the regions between the bars (see Fig. 1). The target is imaged onto the monochrome video monitor of a thermal imaging system where the image is viewed by an observer. The temperature difference between the bars and their conjugates, initially zero, is increased incrementally only until the observer can distinguish the four bars. This critical temperature difference is the MRTD.

4.2 The spatial distribution of temperature of each target must be measured remotely at the critical temperature difference that determines the MRTD. The mean temperature of each bar must not differ from that of any other bar by more than the measured MRTD. A similar requirement applies to the temperature of each conjugate bar. Otherwise the MRTD value is unacceptable.

4.3 The background temperature and the spatial frequency of each target must be specified together with the measured value of MRTD.

4.4 The probability of resolution must be specified together with the reported value of MRTD.

5. Significance and Use

5.1 This practice relates to a thermal imaging system's effectiveness for discerning details in a scene.

5.2 MRTD values provide estimates of resolution capability and may be used to compare one system with another. (Lower MRTD values indicate better resolution.)

5.3 Due to the partially subjective nature of the procedure, repeatability and reproducibility are apt to be poor and MRTD differences less than 0.2 °C are considered to be insignificant.

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

6. Apparatus

6.1 The apparatus consists of the following:

[1] This practice 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.