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An American National Standard

# Standard Test Method for Electromagnetic Shielding Effectiveness of Durable Rigid Wall Relocatable Structures[1]

This standard is issued under the fixed designation E 1851; 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 The test method described in this standard can be used to determine the electromagnetic shielding effectiveness of durable relocatable shielded enclosures.

1.1.1 The intended application of this test method is for virgin shielded enclosures that do not have any equipment or equipment racks. It is recommended that tests be conducted before the interior finish work begins. However, the shield assembly including all enclosure penetrations shall be completed and required penetration protection devices shall be installed in accordance with the design specification. The test method can also be used on existing shielded enclosures after repair work is done to verify workmanship, but it may be necessary to remove equipment or equipment racks to gain access to a test area.

1.1.2 The test procedures delineated in this document are comprehensive and may require several days to complete for a room-size shielded enclosure. A user can apply this test method for a first article test that requires proof of concept and validation of design and fabrication technique. Appendix X2 provides guidance on choosing test points so shielding effectiveness tests on a room-size shielded enclosure may be completed in about one-half day for which it applies to shielded enclosures coming off an assembly line.

1.2 This test method is for use in the following frequency ranges: 140 to 160 kHz, 14 to 16 MHz, 300 to 500 MHz, 900 to 1000 MHz, and 8.5 to 10.5 GHz. Specific test frequencies within these ranges are required (see 10.1.1 and 10.2.1). Additional measurements in the range of 10 kHz to 10.1.5.1 GHz may be performed. For specific applications, the frequency range may be extended from 50 Hz to 40 GHz. Appendix X1 provides guidance on selecting measurement frequencies.

1.3 This test method is not applicable to individual components such as separate walls, floors, ceilings, or shielded racks.

1.4 This standard may involve hazardous materials, operations, equipment, or any combination.

1.5 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.6 *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 *IEEE Standards:*

IEEE Std 299-1997, IEEE Standard Method for Measuring the Effectiveness of Electromagnetic Shielding Enclosures

IEEE Std C95.1-1991, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

2.2 *Military Standard:*

MIL-STD-188-125, High Altitude Electromagnetic Pulse (HEMP) Protection for Ground Based $C^4I$ Facilities Performing Critical, Time-Urgent Missions

2.3 *OSHA Standard:*

OSHA Regulation, 29 CFR 1910, Department of Labor, July 1992

## 3. Summary of Test Method

3.1 *Test Configuration*—A transmitting antenna is connected to an electromagnetic source set to a specific frequency and amplitude. A receiving antenna is placed a specified distance from the transmitting antenna, and the received electromagnetic field level is recorded as a reference or calibration measurement. The transmitting antenna and electromagnetic source are placed outside the shielded enclosure. The receiving antenna and associated test equipment are placed inside the shielded enclosure. The transmitting and receiving antenna's separation, frequency, and amplitude are the reference measurements. The transmitting and receiving antennas are at the same height for a given test point. The received electromagnetic field level is recorded as the test measurement. The ratio of the test measurement to the reference measurement is the electromagnetic shielding effectiveness of the shielded structure at the measurement location and frequency. The

[1] This test method is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.53 on Materials and Processes for Durable Rigidwall Relocatable Structures.

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