



**Received from Don Chambers on 30 October 2008 from the SAE AE8C1 meeting**

MIL-STD-1344 Test Method 3008 versus EIA 364-66

In October, a number of items in reference to EIA 364-66 (shielding Effectiveness 1GHz - 10GHz) need to be addressed. The specification, MIL-DTL-38999L, paragraph 4.5.22, directs shielding effectiveness (S.E.) testing for 1GHz-10GHz be tested in accordance with EIA-364-66 (TP-66A originally dated May 5, 2000) Past MIL-DTL-38999 S.E. specifications for 1GHz to 10GHz were tested in accordance to MIL-STD-1344, Method 3008 (dated 10 Sep 1980). There are some significant differences between the two test methods. The reason for concern is EIA-364-66 requires new special test equipment, modifies the test setup, reconfigures the connector/conduit assembly, and mandates 6000 point data collection per frequency. It was assumed EIA-364-66 procedures were essentially the same as 1344 method 3008.

TP-66 includes new, improved equipment such as computer automation, horn antennas, and impedance matching cabling, etc. Upgrading equipment, improving techniques, and automation are improvements. Although, equipment cost, transition time from one method to another, and increase of testing time per sample are impediments to meeting the EIA-364-66 method. All current QPL'ed 38999 manufacturers originally qualified their products in accordance with method 3008. When MIL-DTL-38999L was approved (May, 2008) EIA 364-66 replaced Method 3008 as the SE test; there is no recourse. At this moment, all manufacturers are required to qualify their new products and platings to shielding effectiveness test method EIA-364-66. How will the EIA 364-66 data correlate with MIL-STD-1344 Method 3008 measurements?

1) Differences in test set-ups:

- a. TP-66 requires a continuous rotating (tuning) motor and stepper motor (discrete tuning). TP-66, figures 1 and 2 does not show the continuous rotating motor. Method 3008 describes discrete sample averaging and continuous sample averaging systems. Method 3008 gives the option of either system TP-66 requires both.
- b. TP-66 figures 1 and 2 and Annex A.2 requires that broad band ridged horn antennas (for reference and input) are to be utilized in the 1GHz-10GHz range. Method 3008 fig. 1, fig 2, Appendix A, and Appendix B describe wire antennas with their impedance matching tapers. Concern for data correlation between horn and wire antennas is one item and cost of purchasing horn antennas is another.
- c. TP-66 fig. 1 and 2 depict the use of discrete tuning with a method of data collection. Method 3008, fig 1 depicts a "data collection system" as defined in 3.2.2, and fig 2 shows a receiver only (manual operation see 3.2.2). Method 3008 allows for either method. Concern is implementing the cost of a data collection system and increased test time. The cost of receiver upgrades to employ data collection is a concern.



I could see how an automated data collection system would definitely be needed to record the 1000s of readings required by TP-66, as compared to the average readings per frequency required by method 3008 continuous average sampling system.

Questions:

1) TP-66 Para 1.2.4 d "NOTE - It shall be acceptable to use either the discrete-tuned or the continuous tuned method in measurement". Can either tuning method be used from 1GHz - 10GHz? 3008 allows either tuning method.

2) Is there any reason that a wire antenna could not be used in lieu of the Input and reference horn antennas?

3) Differences in sample prep and installation (types of adapters, Impedance matching, and VSWR):

a) Adaptors: Figure 3 of method 3008 indicates two methods to prepare samples. The method depicted at the top of Fig. 3 allows for the use of somewhat rectangular/square shaped adaptors with what appears to be a shielded conduit with a wire passing through the inside of the mated connector pair, while the alternate method below indicates the use of cone shaped adaptors with impedance matching tapered conduit passing through the inside of the mated pair.

Figure 3 in TP-66 indicates only cone shaped adaptors (Annex E, E.2.1, describes "a circular connector with an impedance-matching center conductor rod and tapered adaptor as shown in figure 3".

Is there a reason why the other method of preparing test specimens with square shaped adaptors was not included in TP-66? Note that TP-66 paragraph 3.2.1.2, which discusses these adaptors, references Annex E, which states in E.1.1 that the "transition between the CUT and the 50 ohm conduit can be achieved by the use of tapered or otherwise compensated adaptors with matching center conductors"... the key words above would be "otherwise compensated adaptors" E.2.1 states "NOTE- It shall be acceptable to use matching structures other than the tapered adaptor to achieve the required (50 ohm) impedance match".

b) Impedance matching and VSWR: TP-66, 3.2.1 discusses impedance matching requirements, while 3.2.2 discusses VSWR. A new requirement is that impedance matching is to be maintained at 50 ohms (3.2.1.1) and system VSWR be maintained below 2.5:1 (see 3.2.2) and the individual components with a VSWR of 1.3:1 (see 2.1.3.1) through the sample under test. NO VSWR or impedance matching requirement is given in 3008. Will the VSWR requirement vary with frequency as does the SE requirements? Will tapered adaptors and impedance matching device through the connector allow a 1.3:1 ratio from 1GHz-10GHz? How much improvement does the impedance matching technique offer the SE measurement accuracy? Are VSWR measurements of each individual component of the system be required for each test?



4) Calculation of Shielding Effectiveness:

a) Method 3008, paragraphs 4.2 through 4.4: At each frequency, reference and shield measurements are taken, then shielding effectiveness is calculated using the formula in para. 4.4. In TP-66, Para 4.3.1.1 (discrete meas.) requires 400 measurements total (200 at ref antenna and 200 at the sample), and 4.4.1.1 (continuous) requires 6000 readings total. The test time will be significantly increased over the time required by 3008 continuous average sampling method

Consideration has been given to outsourcing SE testing for EIA-364-66; NTS, Fullerton, and Garwood Labs will not bid on this test method

Please let me know if any changes are being considered for TP-66 to better match the requirements originally defined in method 3008.

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