A Re-Evaluation of ASTM D 4935 "Standard Test Method for Measuring the Electromagnetic Shielding Effectiveness of Planar Materials"

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In 1988 Wilson, Ma, and Adams published "Techniques for Measuring the Electromagnetic Shielding Effectiveness of Materials: Part I: Far-Field Source Simulation," *IEEE Trans. Electromagnetic Compatibility*, vol. EMC-30, pp. 239-250, August 1988. This paper was followed by the approval of ASTM D 4935 "Standard Test Method for Measuring the Electromagnetic Shielding Effectiveness of Planar Materials" in 1989. ASTM D 4935 was re-affirmed at the usual 5 year intervals in 1994 and 1999 but not in 2004 when it was withdrawn. The reason for the withdrawal of ASTM D 4935 is that challenges to its suitability arose. ASTM states that it lacks the expertise to evaluate these challenges. Without too much over-simplification it can be stated that the main challenge to ASTM D 4935 is that the test method is not suitable for measuring the shielding effectiveness (SE) of thick materials.

Since 2002 numerous SE measurements have been made on thin materials, particularly aluminum. The SE values measured have been in excellent agreement with SE values calculated from measurements of the dc sheet resistance of the material. One example is the NASA emergency space blanket (aluminum on Mylar) widely sold in sporting goods stores for use by campers. The measured dc sheet resistance was 1.713 ohms per square. The calculated SE value was 40.9 dB. The measured SE varied from 45 dB at 30 MHz to 35 dB at 1500 MHz. A second example is a 2-mil aluminum used in hydrophonic marijuana growing systems. The measured dc sheet resistance was 1.286 ohms per square. The calculated SE value was 49.3 dB. The measured SE varied from 60 dB at 30 MHz to 45 dB at 1500 MHz. It is strongly believed that that ASTM D 4935 is an appropriate test method for measuring the SE values of thin homogeneous materials such as aluminum and gold coatings on plastic and fabric and should be re-affirmed on that basis.

Measurements are now being made on thicker composite material made with metal fibers in a plastic matrix. This material is not homogeneous. The SE values of three samples with thickness 2.54 mm, 2.56 mm and 10.66 mm have been measured. These measured SE values show much greater variation with frequency than do the SE values for homogeneous material. Calculated SE values based upon the dc sheet resistance made using the van der Pauw resistivity method have been made. Although the agreement between measured and calculated SE values is not as good as that obtain for homogeneous material, there are frequency regions where there is good agreement.