



IEEE Standard P2716 Update: Characterization of the Effectiveness of Printed Circuit Board Level Shielding

By Prof. D. Pissoort, KU Leuven, BE, IEEE P2716 Working Group Chair

Introduction

At the IEEE EMC and EMC Europe Symposia in 2013, the idea was raised to continue the work that had been started by IEEE 299 and IEEE 299.1 around the characterization of the shielding effectiveness (SE) of enclosures. IEEE 299-2006 (“IEEE Standard Method for Measuring the Effectiveness of Electromagnetic Shielding Enclosures”) covers enclosures having all dimensions greater than or equal to 2.0m. IEEE 299.1 (“IEEE Standard Method for Measuring the Effectiveness of Electromagnetic Shielding Enclosures”) covers enclosures and boxes having all dimensions between 0.1 m and 2 m. The question raised in 2013 was if there was interest in and need for an IEEE standard on the characterization of the effectiveness of shielding enclosures with even smaller sizes. As a side effect, the question on whether an IEEE standard around the characterization of the SE of planar materials was needed as no such guidance document was available at the time.

History of P2715 and P2716

After these first meetings and discussions, a small study group was started under the leadership of Prof. J. Catrysse (KU Leuven, BE), a well-known expert on nearly everything related to electromagnetic shielding. An overview of the existing methods and literature on the topics of small shielding enclosures and planar materials was made as well as an overview of the academic and industrial questions and needs in this area. After further meetings of the study group at the IEEE EMC Symposia in 2014 and 2015, it was decided to officially submit two Project Authorization Requests (PARs) to the IEEE EMC Society’s Standards Development and Education Committee (SDE-Com). On the one hand P2715 “Guide for the Characterization of the Shielding Effectiveness of Planar Materials” and on the other hand P2716 “Guide for the Characterization of the Effectiveness of Printed Circuit Board Level Shielding.” In this article, I would like to give some more detail about the latter.

Scope of P2716

The scope of IEEE P2716 reads as “This Guide provides manufacturers and users of printed-circuit-board-level shielding with appropriate methods for the characterization of the shielding effectiveness of the board-level shields. It also discusses the effect of various techniques to mount shields to printed-circuit boards and the effect on shielding effectiveness. This document guides the user in the selection of the appropriate test method to determine the level of shielding provided in the

intended application.”

The characterization of the SE of Board Level Shielding is specifically challenging for several reasons. First, the Board Level Shield only has five sides when purchased, such that the full enclosure is only formed when actually mounting it on the Printed Circuit Board. The way this connection is made, hence, also determines the overall SE of the Board Level Shield. Second, given the extremely small size of a typical Board Level Shield, we are talking about shielding in the (very) near-field. In this region, what is actually been put inside the Board Level Shield will co-determine the actual SE. Hence, the question arises as to whether or not one needs to put dissipative content on the shield-under-test during the characterization. Third, one can raise the question what is the most appropriate definition for the SE of Board Level Shields: is it a field ratio or an energy ratio or even something else? Fourth, a Board Level Shield is likely to be in another enclosure housing the Printed Circuit Board. Do we need to take this into account during the characterization? If yes, how?

Current Activity and Round-Robin Test

Since 2016, the P2716 working group (Chair: D. Pissoort, Vice-Chair: J. Dawson, Secretary: Y. Ariën) has been meeting regularly. An in-person meeting typically is held every year at the IEEE EMC and the EMC Europe Symposia. Online meetings are held the third Friday of every month. As a particular action, a round-robin test has been performed. In this round-robin test, seven Board Level Shields of different sizes and types were sent around and characterized with different methods: double reverberation rooms, nested reverberation rooms, single reverberation rooms, stripline method, and the G-TEM method. Participants included Schlegel Electronic Materials, University of York, Laird, Università Politecnica Delle Marche, University of Twente, Parker, KU Leuven and Leibniz University Hannover. At this moment, a first draft of the guidance document is almost ready and is being internally reviewed. The insights of the round-robin test are of course at the basis of this guidance document.

Tutorial on P2716 at the 2021 Joint IEEE International Symposium on EMC+SIPI and EMC Europe – Thursday, August 5

If you are interested in more detailed information about the different characterization methods and the outcomes of the round-robin

test, I suggest you attend the Tutorial on the activities of the IEEE P2716 working group on Thursday, August 5, during the virtual 2021 Joint IEEE International Symposium on Electromagnetic Compatibility, Signal & Power Integrity, and EMC Europe.

The agenda of this Tutorial is as follows:

- Introduction to IEEE P2716 (D. Pissoort, KU Leuven)
- What makes characterizing the SE of Board Levels Shields so challenging? (A. Marvin, University of York)
- Reverberation Room Methods:
 - o Nested Reverberation Room (V. Primiani, Università Politecnica delle Marche)

- o Double Reverb Room/VIRC (R. Vogt, TU Twente)
- o Single Reverb Room (J. Dawson, University of York)
- Stripline Method (D. Pissoort, KU Leuven)
- G-TEM Based Method (C. Reschka, University of Hannover)
- Round Robin Overview (D. Pissoort, KU Leuven and J. Dawson, University of York)

For More Information

If you would like to get more actively involved and participate in the monthly online working group meetings, please send your contact details to Y. Ariën at yoeri.arien@schlegelemi.com. **EMC**

Do You Know About the Opportunities to Attend Technical Community Activities in August - *Virtually?*

During the 2021 Joint IEEE International Symposium on EMC+SIPI and EMC Europe you can attend a variety of technical community activities VIRTUALLY during the month of August! By registering for the complimentary guest pass, you can attend any one or all of the following meetings at NO CHARGE:

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- **Special Committee Meetings** addressing Smart Grid, Power Electronics, and other topics.
- **Standards Working Group Meetings** addressing the many standards under development within the EMC Society, including new standards, such as P2715 Shielding Effectiveness of Planar Materials; P2716 Shielding Effectiveness PC-Level; P2717 Passive Intermodulation; P2718 Near-Field Characteristics, Stochastic Radiators; P2885 EM Characterization of Cables and Connectors, plus several other standards topics.
- **Standards Continuity Group Meetings** addressing Risk Management, Shielding, Probes and Calibration, Simulation and Modeling, as well as other areas of importance to ensure standards keep up with technological advances.

View the Virtual Symposium website below for an updated schedule of meetings, find the topics that interest you, then register for the guest pass and attend! All meetings are open to IEEE members and non-members. For more information, contact Ross Carlton, Chair of the EMC Society's Standards Development and Education Committee (SDECom), at ross.carlton@ets-lindgren.com.

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