

IEMI Immunity Test Methods for Equipment and Systems

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Abstract— This paper describes a standard being developed by the International Electrotechnical Commission (IEC) Sub Committee 77C (SC 77C) concerning test methods for the evaluation of equipment and systems against Intentional Electromagnetic Interference (IEMI) environments.

Keywords—IEMI; assessment methods; test methods; equipment; systems.

I. INTRODUCTION

The use of electromagnetic sources to generate Intentional Electromagnetic Interference (IEMI) is of increasing concern as the reliance of society on technology increases significantly. Many technical papers have been published that show the effects of IEMI are cause for concern and are summarized in [1]. The effects of IEMI on equipment can be similar to the effects caused by High Power Electromagnetic (HPEM) environments such as High Intensity Radiated Fields (HIRF) generated by Radio and Radar systems, Lightning Electromagnetic (LEMP) fields and Electrostatic Discharge (ESD). Some of these HPEM environments have similar characteristics to those sources used to cause IEMI but are unintentional EMI sources; i.e. non-malicious. However, it is possible to use information regarding qualification of equipment and systems to these environments to inform the likely response to IEMI (i.e. malicious use of EMI sources).

This paper describes a new technical standard being developed by the IEC SC 77C which covers IEMI test methods for electronic equipment and systems. This standard will be published as IEC 61000-4-36 in 2015.

II. INTENTIONAL ELECTROMAGNETIC INTERFERENCE

The IEC defines IEMI within IEC 61000-2-13 [2] as ‘Intentional malicious generation of electromagnetic energy introducing noise or signals into electric and electronic systems, thus disrupting, confusing or damaging these systems for terrorist or criminal purposes’. Within this definition it is possible to also include jammers, which are designed to overload antenna receiver circuits (front doors) by operating at or close to the victim receiver frequency of operation. Jammers typically require low power to operate due to the fact that receivers are designed to operate at very low power levels (nW or less).

III. IEMI TEST LEVEL DERIVATION

IEC 61000-4-36 provides a thorough discussion of IEMI environments and relates these to both capability groups and deployment scenarios (a typical deployment scenario is shown in Figure 1). The capability groups considered include novice, skilled and specialist and the deployment scenario considers IEMI sources varying from those that are man portable to those that are air delivered.

For each capability group, the range of various types of IEMI sources likely to be technically available to the group is discussed along with an estimation of the E-field range (E_r) product. Further to this, an Example Protection Level (EPL) is defined for a given scenario which allows the user of the standard to choose a total EPL (expressed in dB) taking into consideration range between the source and the victim, path loss and any barrier attenuation. These EPL are then related to test levels applicable for each IEMI source type (Hyperband, Mesoband, Hypoband) along with other important parameters (when relevant) such as rise-time, pulse width, pulse repetition frequency, pulse length, center frequency. Test levels are provided for both radiated and conducted scenarios.

IV. INFORMATIVE ANNEXES

IEC 61000-4-36 includes a number of informative annexes that provides the user with useful information regarding testing electronic equipment and systems against IEMI environments. The annexes include:

- Failure Mechanisms and Performance Criteria
- Developments in IEMI Source Environments
- Interaction with Buildings
- Relation between plane wave immunity testing and immunity testing in a reverberation chamber
- Complex Waveform Injection – Test Method
- Significance of Test Methodology Margins
- Intentional EMI – The Issue of Jammers

REFERENCES

- [1] Threat of Electromagnetic Terrorism, Lessons learned from documented IEMI attacks, F Sabath, EUROEM 2012, July 2012, http://www.researchgate.net/publication/230815457_Plenary_Presentation_on_Threat_of_electromagnetic_terrorism/file/d912f504d9d4f9fa50.pdf
- [2] IEC 61000-2-13 Electromagnetic compatibility (EMC) - Part 2-13: Environment - High-power electromagnetic (HPEM) environments - Radiated and conducted

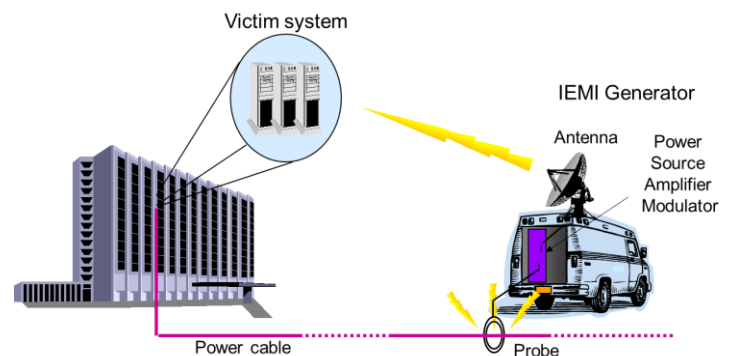


Figure 1. Example of Radiated and Conducted IEMI Interaction with a Building