

# Development of a HEMP and IEMI Protection and Testing Guide using IEC SC 77C

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**Abstract**— IEC SC 77C has been developing standards and reports dealing with the protection of the civil infrastructures against the threats of High-altitude Electromagnetic Pulse (HEMP) and Intentional Electromagnetic Interference (IEMI) for more than 20 years. While many of these publications deal with hardening measures and testing of facilities, there is no comprehensive single document to describe how to develop and test a hardened facility. IEC SC 77C plans to begin that effort in 2014, and this paper will describe the plans.

**Keywords**—IEC, IEMI, HPEM, Standards, Critical Infrastructures

## I. INTRODUCTION

Work began in the International Electrotechnical Commission (IEC) in 1989 to develop standardized electromagnetic environments, protection techniques, and test methods applicable for civil society to protect critical equipment and systems from the electromagnetic threat created by a detonation of a high-altitude nuclear burst (known today as HEMP). The work expanded from a working group under TC 77 to a full subcommittee SC 77C in 1992. Later in 1999 the work was expanded to deal with the threat of electromagnetic weapons, now known as intentional electromagnetic interference (IEMI). Figure 1 below indicates graphically the status of publications in SC 77C before 2013 (in black) and the newest projects (in orange) that are active in 2014.

61000-1- (General)	-3 HEMP Effects On Systems		-5 HPEM Effects On Systems	
61000-2- (EM Environment)	-9 HEMP Radiated Environment	-10 HEMP Conducted Environment	-11 Classification Of HEMP Environments	
61000-4- (Testing and Measuring Techniques)	-23 Test Methods Radiated	-24 Test Methods Conducted Amdt	-25 HEMP Immunity Tests	-32 HEMP Simulator Compendium
	-35 HPEM Simulator Compendium		-36 IEMI Immunity Test Methods	
61000-5- (Installation and Mitigation Guidelines)	-3 HEMP Protection Concepts	-4 Specifications For Radiated Protection	-5 Specifications For Conducted Protection	-6 Mitigation Of External EM Influences
	-7 EM Code	-8 HEMP Protection Methods For The Distributed Civil Infrastructure	-9 System-level Susceptibility Assessments For HEMP and HPEM	
61000-6- (Generic Standards)	-6 Generic Standard For HEMP Immunity			

Figure 1. Publications developed by IEC SC 77C.

## II. CATEGORIES OF PUBLICATIONS

The 20 publications prepared thus far in IEC SC 77C are split into two main categories – HEMP and IEMI (which is occasionally referred to as HPEM). There are some

publications that deal with both areas. This paper will review the 20 publications and describe those papers that provide protection methods for HEMP and IEMI and those that provide test techniques that are required to ensure that the protection methods are properly achieved.

For this one page paper we will only list below only the publications developed thus far that deal with HEMP testing, but the presentation will identify which publications contain relevant information for protecting and testing critical civil facilities from both of these high power electromagnetic threats.

## III. LIST OF IEC SC 77C TESTING PUBLICATIONS

IEC/TR 61000-1-3 (2002-06): The effects of high-altitude EMP (HEMP) on civil equipment and systems.

IEC/TR 61000-1-5 (2004-11): High power electromagnetic (HPEM) effects on civil systems.

IEC 61000-4-23 (2000-10): Test methods for protective devices for HEMP and other radiated disturbances.

IEC 61000-4-24 (1997-02): Test methods for protective devices for HEMP conducted disturbance.

IEC 61000-4-25 Ed. 1 Amd. 1 (2012-05): HEMP immunity test methods for equipment and systems.

IEC/TR 61000-4-32 (2002-10): High-altitude electromagnetic pulse (HEMP) simulator compendium.

IEC 61000-4-33 (2005-09): Measurement methods for high power-transient parameters.

IEC/TR 61000-4-35 (2009-07): High-power electromagnetic (HPEM) simulator compendium.

IEC/TS 61000-5-9 (2009-07): System-level susceptibility assessments for HEMP and HPEM.

IEC 61000-6-6 (2003-04): Generic standards – HEMP immunity for indoor equipment.

## IV. SUMMARY

This paper will describe the key protection and test aspects found within the 20 publications produced thus far by IEC SC 77C. The objective of the new project in IEC SC 77C is to provide in a single document a complete hardening and testing guide for critical infrastructure facilities to be protected from both HEMP and IEMI.