HPM-Testing of COTS Network Equipment

Go / No Go Test of 19″ cabinet in HPM-Simulator SUPRA (Germany)

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***Abstract*— Commercial off the shelf (COTS) equipment is increasingly used in critical infrastructure applications. Mission critical electronics is usually HEMP-protected by expensive shielding and filtering techniques. To understand the effects of newer threats such as IEMI, this work describes a HPM go / no go test. This test investigates the behavior of electronics protected by shielding and filtering components readily available on the market to protect against HEMP. The equipment and some meters of cables which form a loop to monitoring equipment outside the test chamber are exposed to HPM-radiation. The system is permanently monitored while irradiated with different HPM field levels and frequencies.**

Keywords: HPM, HPM-testing, computer network components, IEMI, SUPRA, COTS, 19″ EMC enclosure, HEMP-filters

I. INTRODUCTION

Many critical infrastructure applications increasingly rely on commercial off the shelf (COTS) electronics rather than using dedicated and especially hardened equipment. Especially in the fast progressing information technology commercial equipment provides the benefits of the latest technology at an unbeatable price. To cope with HEMP and other EM-threats such as IEMI [1] mission critical equipment is usually installed in especially hardened facilities consisting of shielded rooms and special protection filters against conducted threats. In this work we investigate a partial protection concept of computer network components using commercial off the shelf protection components, which are placed in a cabinet. The whole cabinet including the attached wires are irradiated by High-Power Microwaves (HPM).

II. Equipment under Test and Test Setup

A. *Equipment under Test*

For this test commercial network components were installed in a commercially available 19" cabinet (Schroff®) designed for EMC applications. This cabinet uses a frame, which is fitted with conductive textile EMC gaskets, which link the cover metal sheets in an electrical conducting manner. According to the manufacturer this construction provides a shielding effectiveness of 60 dB up to 1 GHz and 40 dB up to 3 GHz. All cabling attached to the cabinet are protected by commercially available HEMP- and lightning protection components (Meteolabor®) which are installed in a feed-through panel of the cabinet.

Work done in collaboration with WIS, Munster, Germany

B. *Test Setup*

The equipment under test (EUT) is placed in the anechoic chamber of the German HPM-simulator SUPRA [2] at a distance of 14 m from the antenna (see schematic test-setup in Fig.1). The cabinet and several meters of cables are illuminated by the HPM-radiation in the frequency range from 0.9 to 1.5 GHz. The other ends of the cables are fed through the same types of EMP-filters to a monitoring room outside the anechoic chamber, where the data from the network components are permanently monitored and fed back to the cabinet in a closed loop manner.

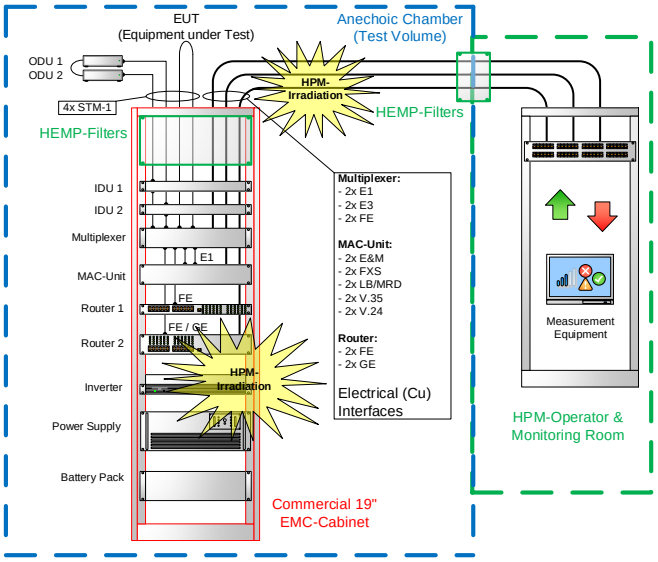

Figure 1: Schematic HPM Test-Setup

III. Results and Conclusions

The protection by commercial components results in a considerably improved immunity of the system against HPM compared to an unshielded setup. No damages occurred during this test. In some configurations various disturbances have been observed. More details will be presented during the conference.

REFERENCES

[1] Workshop on "Electromagnetic Terrorism and Adverse Effects of High Power Electromagnetic (HPE) Environments", Proceedings of the 13th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility, February 16-18, 1999

[2] IEC/TR 61000-4-35, Technical Report, HPEM-Simulator Compendium, 2009-07, IEC Geneva, Switzerland