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Characterizing the Uniformity of the Electric Field Distribution of an Indoor NEMP Simulator installed in a Semi-Anechoic Chamber

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The aim of this paper is to study the field homogeneity of an indoor Nuclear Electromagnetic Pulse (NEMP) simulator, installed in a semi anechoic chamber (SAC). The objective is to understand potential inhomogeneities caused by the metallic walls and ceiling of the chamber. By characterizing the field distribution, it's possible to gain a better understanding of the working volume of the indoor NEMP simulator.

The NEMP simulator, is installed at the Directed Energy Research Center at the Technology Innovation Institute, Abu Dhabi, UAE. The simulator was manufactured by montena technology sa [1]. The dimensions of the NEMP simulator are 18.8×8.2×6.1 m3 (L×W×H). The septum consists of 30 metallic wires connected between the pulser output and the matching resistors. These resistors, in turn, are connected to the walls of the SAC. The pulser employed is a 520 kV Marx generator with 2 ns rise time and 20 ns FWHM. It is compliant with MIL-STD-461 / RS-105 [2].

Simulations and experimental verifications are employed for the analysis of the structure, without including the EUT. The availability of specific theoretical benchmarks for this study is limited. However, the obtained results will be compared with the expected distribution in a free space NEMP [3]. The full setup was simulated using the time domain solver of CST Microwave Studio. Each simulation required around 2 hours to complete. To account for low-frequency absorbance, magnetic losses of the SAC walls were considered.

The electric field was measured at 9 points, as illustrated in Figure 1 (a) and Figure 1 (b). A D-Dot sensor operating with 10 GHz max frequency was used for the measurements. An example of a measurement is shown in Figure 1 (c). The D-Dot sensors were connected to a Lecroy LabMaster 10-20Zi-A oscilloscope via fiber optic. The measured signals were compensated and integrated and compared with the simulations. During the presentation, simulation and measurement results will be provided demonstrating the good results agreement which confirm the available volume of the test facility.

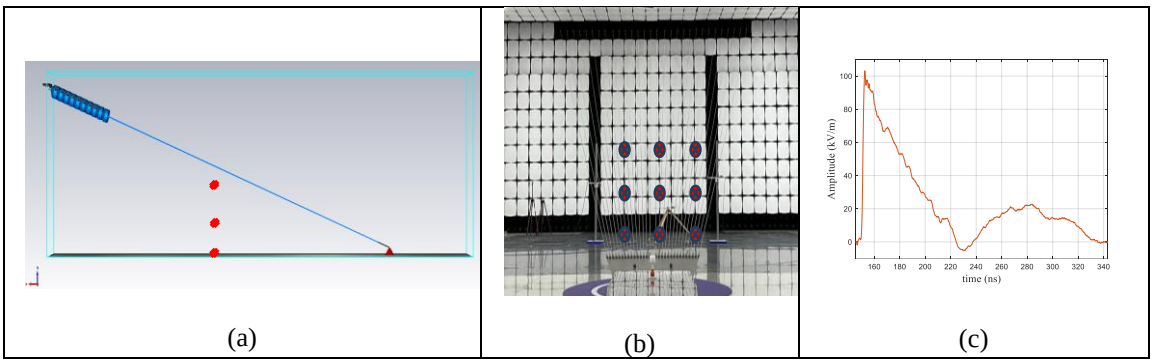

Fig.1 (a) Side view, location of the probes in the CST simulation (b) frontal view, location of the D-Dot sensors in the NEMP simulator (c) Example of a measured waveform

References

[1] Montena Technology S.A, Rossens, Switzerland, https://www.montena.com/system/home/
[3] MIL-STD-461G, "Requirements for the control of electromagnetic interference characteristics of subsystems and equipment", Department of defense interface standard, 2015.
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