Electromagnetic Interference Experiments on Complex Systems in a Reverberation Chamber – the Search for the Optimal Frequency

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Identifying electromagnetic susceptibilities in complex systems can be particularly challenging. One of the many complicating factors is associated with the often non-standard electromagnetic topology of the system and components; for example, wires are not identically placed in each system manufactured. In addition, one may be interested in characterizing a class of systems rather than focusing on a particular model, which opens up the parameter space even further. For cases of this type, a rigorous first principal approach wherein one attempts to derive or model electromagnetic interactions by way of computational electromagnetics is neither practical nor viable. A research project whose primary focus is on the generation of large amounts of empirical data executed in conjunction with a project focused on understanding the failure mechanisms and identifying commonalities in the different systems is the best approach. It facilitates quick answers and offers the promise of generalization to untested systems.

In keeping with the premise for the optimal research program, it is our contention that a multi-phase test program is generally in order to insure a thorough treatment of the problem. As part of this multi-phase program, Electromagnetic Interference (EMI) testing in a reverberation chamber can in many cases be a cost effective and time effective first stage of testing. This paper discusses the specifics of the first phase of a research project wherein a specific complex system is studied, the objective being the identification of susceptible radio-frequency radiation parameters. To that end, twelve test assets were acquired. All twelve of the assets were of different models and different manufacturers. The test assets were run through an extensive test matrix that explored both continuous wave (CW) and pulsed-CW sources. Testing was conducted in a reverberation chamber. Waveform modulation was not explored during this first phase of testing. Some of the results from the test series will be discussed as well as how they feed into the next step of the research project.