Integration of Electromagnetic Topology with Experimentally Determined Transfer Function Parameters for Aperture Interaction Studies

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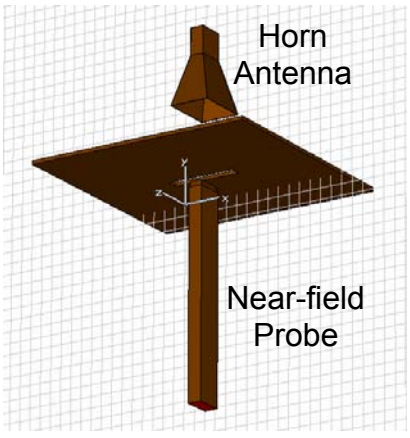
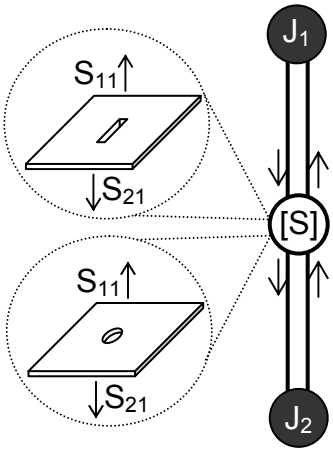
High power radio-frequency (HPRF) external pulse effects on large electronic systems through openings, e.g., apertures, cracks, etc., are investigated through electromagnetic topology (EMT) based simulation techniques (C. E. Baum, Interaction Notes, 400, 1980). For external pulse interactions through apertures it is necessary to generate transfer functions for interactions when topological methods are used for analysis. The transfer function known as a key element to describe the exterior-to-interior interaction can be generated through coupling generators with measured constant coefficients and used as input to the Multiconductor Transmission Line Network (MTLN) code (J-P. Parmantier and J-P. Aparicio, Zurich EMC Symp., 595-600, 1991). The transfer function can also be created through a combination of measured and computed data for coupling generators (P. Kirawanich, N. Kranthi, R. Gunda, A. R. Stillwell, and N. E. Islam, Jour. Appl. Phys., 96, 2004).

In this presentation, instead of measuring constant coefficients, the transfer function was defined and characterized by using measured S-parameters. The experiments for such a measurement were carried out by using a horn antenna and a near-field probe in the frequency range of 8 – 12 GHz. The coupling of the electromagnetic pulse with cables near the aperture is then computed by integrating the topological-based MTLN code with the transfer function parameters.



Experimental setup to obtain S-parameters



Configuration of topological network for aperture interactions