Maria Jesus Salvatierra Valderrama, "Characterization of the network parameters of critical equipment at radio frequencies (RF)", 2013.

Abstract

Intentional Electromagnetic Interference (IEMI) or Electromagnetic Terrorism is a new threat to electronic and electric systems. In today's modern society, the dependence on information technology and electric energy is increasing. High power electromagnetic source technologies can radiate electromagnetic spectrum from tens of MHz to several GHz, frequencies that are significantly higher than those associated with lightning and high altitude nuclear electromagnetic pulses (HEMP). Although the susceptibility of individual electronic systems (such as electronic components and computers) to IEMI sources has been the subject of investigations, there is little work on the response of large and extended infrastructures, such as power systems and their relevant equipment.

For numerically estimating the equipment response to perturbations in the range of frequencies of HPEM sources, their network parameters need to be modeled, or specified from measurements. The measurement of network parameters at RF of equipment connected through non-traditional ports such power inlets, Ethernet, or telephone ports constitute a challenge that has to be tackled with both numerical modeling and microwave theory.

In this project, a method for measuring the input impedance at the power line or communication inlets of equipment that could be connected to critical infrastructure is presented. The S-parameters of the device under test (DUT) are measured in a common mode configuration and processed to get the differential impedances. The technique is presented for one, two and N-port networks.