

## **Functional and Communications Theory Models in Susceptibility Analysis**

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**Modeling the failure of electronic systems from incident electromagnetic wave is a challenging enterprise that requires the combination of several disciplines including very complex boundary value problems along with models of the function of the electronics. Various digital systems are of interest. In particular, those systems consist of processors that communicate with each other over a variety of means including computer buses and network links. The analysis of their susceptibility to unwanted electromagnetic signals differs greatly, depending, for example, on structure, protocols, bandwidth, and electromagnetic environment. In this paper, we will consider two approaches to that model. The first is the use of information theory to look at the consequences of interruption of the information flow in the system. In the second, we will consider the consequences of functional or block failure in a system. The latter is important in systems that cascade information or function such as SCADAs and digital control systems.**

**Bus systems are a critical part of any digital system. Information flow on those systems is critical to their function and can be interrupted by noise on the bus system. Buses are sufficiently large that the form effective antennas and enhance coupling. In this analysis, the buses are treated as discrete dynamic systems excited by continuous variable dynamic systems. The complexity of the analysis is increased by error correction techniques used to protect the integrity of these systems.**

**In extended electronic systems, particularly real time systems, data is first retrieved from a remote sensor or processor. That data is processed, decisions made, and control signals are sent out to remote parts of the system, including the original sensor or processor. Any of the various subsystems can fail with often complex consequences. Analysis of the susceptibility of the subsystems can be simpler than the system as a whole, so the division contributes to the ability of the analyst to make a failure prediction.**