Documented Electromagnetic Effects

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In a special session in URSI General Assembly in 1999, there was recognition of the problem of Intentional Electromagnetic Interference (IEMI). This resulted in an URSI resolution, which was designed to inform researchers, engineers and the general public of the consequences of IEMI on Society. Present-day societies are highly dependent on computer and electronic systems in many areas, including communications, hospital services, banking and financial services, internet commerce and civil aviation. Technological advancement of the last two decades simultaneously enhances the quality of life, while making technologically complex societies vulnerable. A representative example is the electronic equipment in an operating room of a hospital that helps the patient, and for which an interfering signal (intentional or not) can be life threatening.

In this presentation we will describe many examples of documented electromagnetic effects on electronic components, sub and entire systems. Such effects are the result of electromagnetic (EM) field interaction and coupling. These effects can range from the innocuous (ex: a vacuum cleaner interfering with a TV signal) to the catastrophic (USS Forrestal incident off the coast of Vietnam in 1967). It is now well established that HPEM (High-Power Electromagnetics) or Electromagnetic Interfering Signals (intentional or not) can cause electronic damage in the frequency range of ~ 100 MHz to 5 GHz, although one must keep in mind that coupling and interaction is a very strong function of frequency and other parameters of incidence.

HPEM environments have been previously classified into four categories based on *bandwidth*. The electromagnetic effects (EME) caused by HPEM can also be classified into four categories based on their *severity*. The four types of effects are: 1) create noise, 2) false information, 3) transient upset and 4) permanent damage. Examples of effects outlined here include incidents in hospitals, F-16 aircraft's case history, Blackhawk helicopter, ABS system in Mercedes-Benz automobile, Spacelab 1985 incident, runaway wheelchair incident and some laboratory demonstration of electromagnetic effects.