Site Measurements of Electromagnetic Mitigation Techniques

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As today's businesses become more reliant upon electronic commerce, isolation from potentially disruptive electromagnetic emissions has greater importance. In the past, isolating sensitive equipment from the effects of electromagnetic interference has received extensive attention in the form of hardening of critical facilities. The wide range of present-day civilian environments, and the varying levels of protection required for each category, necessitates further investigation into low-cost and widely-applicable mitigation techniques. The shielding protection afforded any given facility depends upon the characteristics of the materials used, their installation and the basic geometry of the configuration. A variety of readily available materials have been characterized but their site-specific performance needed to be quantified. To this end, an experiment was constructed to measure the effectiveness of a variety of mitigation techniques applied to an existing structure. The selected site was a 16' x 16' x 8' building of cinder block construction with a composite roof. It had a single entry door and two windows. Due to its size and relatively simple construction, it could easily be numerically modeled. The focus was on characterizing cost-effective means to mitigate the penetration of electromagnetic interference to the interior of this specific building so that the techniques can be applied to other buildings and structures. The measurement frequency range was between 400 MHz and 3 GHz. The isolation was measured by illuminating it with an external swept-frequency source and measuring the received power with a spectrum analyzer. Prior to the illumination sequence, the background environment around the facility was measured. Preliminary measurements showed that the building itself only provided about 10 dB isolation from the impinging field and was a good candidate to establish the effectiveness of simple mitigation techniques.

Specifically, techniques to reduce the electromagnetic penetration through the walls and window apertures will be presented. In addition, techniques to lower the Q of the structure, and consequently the peak field levels in the interior region, will be presented as well (C. E. Baum, "Damping Transmission-Line and Cavity Resonances," Interaction Note 503, 24 May 1994). Preliminary results show that simple techniques can be used to reduce the undesired signal levels within the structure by 10 – 20 dB.