Contribution ID: **553** Type: **Oral**

Magnetic Shielding Effectiveness of Layered Medium-Walled Structures

Thursday 27 June 2019 11:00 (15 minutes)

A 3-axis custom built probe is utilized to measure the diffused magnetic field magnitude inside a shielded structure with walls composed of conductive and magnetic materials. The probe has a sensitivity of 2 mV per tesla per second at a spatial resolution of approx. 0.3 cm3 per coil. The probe's temporal resolution of 1.5 microseconds is more than sufficient to capture the sinusoidal magnetic field with an approximate frequency of 6.3 kHz.

Layers of aluminum and mild steel are used to create alternating highly conductive and high permeability shields. The shielding performance of these material layers is analyzed and compared to determine the most effective method of shielding that reduces overall wall thickness while minimizing diffused magnetic field for external field amplitudes of 200 mT with 9,000 T/s as the measured dB/dt rise. Introducing an approximately 2.5 mm air gap between two half skin depth thick walls resulted in a reduction of diffused internal field by roughly 20%.

The impact of partially filling a shielded structure with conductive material away from the shield surface is also analyzed. As the magnetic flux that diffuses through the shield is largely independent of the structure's leftover air-volume, the magnetic flux density inside the structure increases as the volume becomes filled with conductive material. Experimental results were compared with the previously simulated, obtained with FEM simulations performed with COMSOL Multiphysics, which indicated a factor of two increase in the internal magnetic field when the volume was 60% filled. That is, without making any changes to the shield walls themselves, the induced voltage in a victim circuit inside the shielded structure would also increase simply by filling up the structure with more conducting material.

Author: BUNTIN, Tyler (Texas Tech University)

Co-authors: COLLIER, Landon (Texas Tech University); Mr JAMES, Colt (Raytheon); DICKENS, James (Texas Tech University); Prof. MANKOWSKI, John (Texas Tech University); NEUBER, Andreas (Texas Tech University)

Presenter: BUNTIN, Tyler (Texas Tech University)

Session Classification: 8.1 Electromagnetic Launch

Track Classification: 8.1 Electromagnetic Launch