Determination of the Shielding Effectiveness of an Aluminum Honeycomb Panel Modeled as an Array of Cylindrical Waveguides

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Aluminum honeycomb panels are widely used for structural support on NASA spacecraft projects. These panels provide a combination of relatively low mass and high strength, which is highly advantageous in space applications. While the mechanical features of these panels are well known, the electrical characteristics are not well understood. This paper investigates the shielding effectiveness of aluminum honeycomb panels. This is done by modeling the panel as an array of cylindrical waveguides and determining the penetration of an incident electromagnetic (EM) field. If the panels are found to perform well as EM shields, future NASA projects might use that feature to address electromagnetic compatibility (EMC) issues.

A model for determining the shielding effectiveness of an aluminum honeycomb panel is presented. The reflected field above the panel and the transmitted field below the panel are represented with Floquet modes (B. Widenberg, S. Poulsen, and A. Karlsson, *J. Electro. Waves Applic.*, **14**, 1303-1328, 2000). The fields within the panel are modeled using cylindrical waveguide modes. Enforcing boundary conditions on tangential fields at the interfaces gives an infinite system of equations describing the unknown Floquet mode and waveguide mode coefficients. The system of equations is then truncated and solved using standard techniques.

This paper considers two cases for the cross-section of the cylindrical waveguides: rectangular and circular. Future work will consider the use of waveguides with hexagonal cross-section. It is anticipated that while the hexagonal case most clearly resembles the physical structure of the panel, the circular or rectangular results may prove equally reliable in the determination of shielding effectiveness.