3D Bistatic Scattering from a Curved Resistive Sheet Using a Modified PO Current and Numerical Simulation

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For a perfectly conducting (PEC) body, the physical-optics (PO) approximation surface current is given by twice the tangential component of the magnetic field of the illuminating wave. By the use of a multiplicative factor involving surface resistivity to describe an equivalent PO surface current for a planar resistive sheet (D. Dwyer, et. al., 2005 National Radio Science Meeting, Boulder, CO), the modified PO current for bistatic scattered field calculations has been validated numerically and experimentally.

The PO approximation is often applied to curved, as well as flat, PEC surfaces. Applicability of this planar modified PO current to curved structures is investigated by calculating the electromagnetic field scattered from a curved resistive sheet, and comparing to both numerical and experimental results.

For a resistive cylindrical shell, a TE or TM normally-incident plane wave is considered. The two-dimensional (2D) bistatic radar cross section (RCS) is determined analytically using a series solution, and compared to the RCS found by integrating the modified PO current over the illuminated portion of the surface. The three-dimensional (3D) bistatic radar cross section (RCS) is determined numerically using a Method of Moments (MoM) solution. To avoid the error introduced by the presence of significant currents in the shadow region, a segment of a 3D cylindrical shell is used to calculate the RCS and is validated by comparison to MoM. A full 3D cylindrical shell is considered for comparison of the calculated results to the RCS measured in the Air Force Institute of Technology free-field scattering range.

[2] The views of the co-author expressed in this article do not reflect the official policy of the U.S. Air Force, Department of Defense, or the U.S. Government.