

COUPLED VOLUME AND BOUNDARY INTEGRAL EQUATIONS FOR ELECTROMAGNETIC SCATTERING

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ABSTRACT. We study frequency domain electromagnetic scattering at a bounded, penetrable, and inhomogeneous obstacle. By defining constant reference coefficients, a new representation formula for interior and exterior vector fields is proposed, based on the general form of the Stratton-Chu integral representation. The final integral equation system consists of surface integral operators arising from a Poggio-Miller-Chang-Harrington-Wu-Tsai (PMCHWT) formulation and compact volume integral operators with weakly singular kernels. The problem is solved with a Galerkin approach with usual Curl-conforming and Div-conforming finite elements on the surface and in the volume. Compression techniques and special quadrature rules for singular integrands are required for an efficient and accurate solution. Numerical experiments provide evidence that our new formulation enjoys promising properties.

Keywords: volume integral equations, boundary integral operators, boundary elements, finite elements, electromagnetic waves.

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