Schur Complement Based Method of Moments Solution for 2D Scattering Problem from Mixed Dielectric-conductor Targets

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Abstract— In this paper, we deal with the two dimensional scattering problem from mixed dielectric-conductor targets. In particular, we analyze a Schur-complement based Method of Moments technique as the solution procedure. In fact, different solutions to the mixed dielectric-conductor scatterer problem [1–3] and several works on Schur preconditioners can be found in the literature [4, 5]. Here, what we propose is simply that the currents on different kinds of scatterer must be appended in different vectors. For this purpose, we use a rectangular mesh to discretize the dielectric scatterers. Pulse functions are used as basis functions and the integral of the Green's function on the discretized rectangles is analytically calculated by using the well-known circle approximation [6]. For the conductor objects the surface is discretized into points and the integrals of Green's function is numerically calculated on the lines which connect the discretized points. Finally, dirac-delta functions are used as weighting functions and an equation system for the currents on the scatterers are obtained. As stressed above, the currents on the different kind of materials (dielectric-conductor) are casted into two different vectors. Then the inversion of "the object equation" are done by means of the Schur complement. By doing so, the inversion of the large Green matrix turns into the inversion of two subblocks of this matrix. The accuracy of this Schur complement based Method of Moments solution is tested against the analytical solution of the scattering from a dielectric coated conductor. Moreover, an error rate analysis is made by comparing the theoretical expressions with the simulated fields. Obtained results show that the Schur complement based inversion of object equation increases the validity range of the solution obtained from Method of Moments.

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