Analysis of Natural Frequencies of Cavities and Scatterers Using an Impulsive Current Model

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Abstract—**A recently suggested method of moments solution to generalized formulations for electromagnetic scattering from perfectly conducting and material bodies of smooth shape is applied to compute the natural frequencies of such bodies. Impulsive expansion functions are used for the fictitious currents that simulate the source free fields in the relevant regions and a point matching procedure is adopted for the enforcement of the boundary conditions. The result is a generalized impedance matrix whose singularities in the complex frequency plane represent the natural frequencies of the body. The numerical solution is simple to execute, computationally efficient, and can be applied to a broad class of bodies of smooth shape. Results are given and compared with available analytic solutions to demonstrate the excellent accuracy of the suggested procedure.**

these dipoles, with a judicious choice of source origins, can satisfactorily represent the actual smooth fields on the boundary. Finally, since we are actually employing a basis of smooth field functions for expanding the boundary fields, it is not necessary to resort to testing procedures that average out surface field inaccuracies, and even a point matching procedure can be applied for testing. To this end, the boundary conditions are strictly enforced at a finite set of points on the boundary. The result is a generalized impedance matrix. The determinant of this matrix is then analyzed and we search for the real and complex frequencies at which this quantity vanishes.

It should be clear that since the procedure is numerical,