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An Efficient Preconditioner for Iterative Solvers

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Abstract: The method of moments solution of the Maxwell's equations leads to a dense system of complex equations. Direct solution of these equations using LU factorization becomes unwieldy as the size of the scatterer increase in terms of wavelength. Iterative solvers, such as those based on Krylov projection methods, offer an alternative approach for solving large system of equations. Most often, the iterative methods are used in combination with some kind of preconditioning to improve the condition number of the system matrix A in order to acheive accelerated convergence [1-2]. This paper discusses the application of Multi-Frontal Preconditioners (MFPs) for the Krylov projection methods for an efficient solution of the dense system of linear equations. The MFP uses combined unifrontal/multi-frontal approach to handle arbitrary sparsity patterns and enables a general fill-in reduction[3]. The paper specifically focuses on the efficient solution of complex general systems, without making any assumptions regarding the positive definitness of the operators. Performances of several popular Krylov projection methods are presented to demostrate the computational efficiency of the present method, using the MFP.

Key Words: Method of Moments, iterative solution, LU factorization, Krylov projection, Conjugate Gradient Normal Solver