

# Theoretical Analysis of Convergence of Rao-Wilton-Glisson Method and Subhierarchal Parallel Algorithm for Solving Electric Field Integral Equation

Y. G. Smirnov

Penza State University, Russia

We consider three-dimensional problem of the electromagnetic wave diffraction by bounded and perfectly conducting screen of arbitrary shape in free space. The problem is reduced to the electric field integral equation (EFIE) [1]. We use very popular Rao-Wilton-Glisson (RWG) method for solving this problem. We have proved theorem of convergence in special Sobolev spaces and obtained estimation of the rate of convergence for RWG method.

The main difficulties in RWG method are very large time of calculations of matrix elements with sufficiently high accuracy and occurrence of large and dense matrices in systems of linear algebraic equations obtained after discretization of the problem.

If one uses RWG method for the problem discretization, the matrix elements may be calculated independently. A natural way to calculate the matrix elements is utilization of parallel computations using supercomputers or clusters. Note in addition that the structure of matrices is not arbitrary: in the diffraction problems. We have the so-called structured matrices with  $O(n)$  different elements, where  $n$  denotes the matrix dimension.

We have created and elaborated efficient solvers for several types of diffraction problems on the basis of subhierarchal algorithms of parallel computations [2].

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## REFERENCES

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2. Medvedik, M. Y. and Y. G. Smirnov, "Subhierarchal parallel computational algorithm and convergence of Galerkin Method in electromagnetic diffraction problem on plane screen," *Izvestiya Vyzov, Povolzsky Region, Estestvennye Nauki*, ü 5, 3–19, 2004 (in Russian).