1077-15-2225   **Joseph Kolibal*** (`Joseph.Kolibal@usm.edu`), Department of Mathematics, The University of Southern Mississippi, Box 5045, Hattiesburg, MS 39406, and **Eowyn Cenek**. *A fast iterative Toeplitz solver.* Preliminary report.

We introduce an efficient iterative solver suitable for inverting or finding solutions to some large dense or full matrices that typically arise in a variety of engineering and signal processing problems, and provide suitable criteria for convergence as well as examining methods to assure the convergence of the iteration. In particular, in solving $Ax = b$, we show that for diagonally dominant Toeplitz matrices that we can solve for x using $O(2^k n \log n)$ operations, for a small integer k. If the Toeplitz matrix is not diagonally dominant, but does have an extended dominant diagonal, we can still solve the problem using $O(2^k n \log n)$ operations. While the method is computationally efficient, there are a number of computational issues which require attention, including the need for extended precision arithmetic to achieve accurate results due to the potential large growth in numerical errors when applying the method. (Received September 21, 2011)