Impedance Matrix Compression (IMC) Using Iteratively Selected Wavelet Basis

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***Abstract*— In this paper, we present a novel approach for the incorporation of wavelets into the solution of frequency-domain integral equations arising in scattering problems. In this approach, we utilize the fact that when the basis functions used are wavelet-type functions, only a few terms in a series expansion are needed to represent the unknown quantity. To determine these dominant expansion functions, an iterative procedure is devised. The new approach combined with the iterative procedure yields a new algorithm that has many advantages over the presently used methods for incorporating wavelets. Numerical results which illustrate the approach are presented for three scattering problems.**

***Index Terms*—Electromagnetic scattering, wavelet transforms.**

a few terms; namely, when one expands such a signal in a wavelet series, only few terms are dominant and constitute the major part of the signal energy. This fact has mainly been applied for compression purposes in signal processing [6]–[8], but recently it has also been used in computational electromagnetics [9], [10]. In [9], [10], instead of solving for all the coefficients in the wavelet expansion of the unknown induced current, only those expected to be dominant based on the physical optics approximation of the current have been solved for.

In this paper, the determination of the dominant coefficients is affected systematically using an iterative procedure. The iterative procedure allows to zoom in on the fine details of