

# Abstract

Efficiency improvement in the the electromagnetic (EM) analysis of passive microwaves devices and scatterers is a subject of increasing interest. Even with the recent advancements in computing power, which allows the execution of very complex programs, optimization of the computational efficiency keeps on being important because of the tendency to increase the radio frequency in different EM applications. This thesis collects a series of tools for the improvement of the efficiency for the EM analysis in open and closed environments by means of a compilation of papers published in scientific press, that are presented in a reasoned manner. In first place, it applies the Wavelet transform to the analysis of cylindrical scatterers by means of the Integral Equation technique. Later, different techniques concerning discretization, specifically designed solutions of eigenvalues and eigenvectors problems adapted to the matrix structure and parallel processing are introduced in the analysis of closed space devices. In particular, we have applied them to the two-dimensional Boundary Integral Resonant Mode Expansion (BI-RME) technique. This method provides the modal expansion of a waveguide with arbitrary contour in terms of the corresponding modal expansion of a canonical reference waveguide. Finally some improvements in the BI-RME technique applied in the three-dimensional space for the analysis of cavities of arbitrary geometry are described. In all cases, the aim consists in obtaining an improvement of the computing time and memory required over the original technique with very low precision loss. All this work has been integrated in an existent commercial software, that is being employed at present in the design and characterization of passive microwave devices for space applications.