COMPARISON OF H- AND P- REFINEMENT IN A FINITE ELEMENT MAXWELL TIME DOMAIN SOLVER

A. Adelmann, PSI, Villigen;
P. Arbenz, ETH, Zürich;
C. Kraus, M. Wittberger, PSI, Villigen

Abstract

Two different frameworks are used and compared: FEMSTER [*] and Ng [**]. FEMSTER is a C++ class library of higher-order discrete differential forms. A discrete differential form is a finite element basis function with properties that mimic differential forms. The library consists of elements, basis functions, quadrature rules, and bilinear forms, i.e. the main building blocks for our FETD solver. Ng on the other hand is a software package providing amongst others basis functions for solving electromagnetic problems. The implemented higher order shape functions for edge-, face- and inner-elements were proposed by Schöberl et al. They show a local complete sequence i.e. for each edge, face and element an individual polynomial order can be chosen. For the convergence studies , the electric field in a cubic and cylindrical cavity is initialized randomly and integrated in time. The field was then analysed and compared with the analytic eigenfrequencies of the cavities. We show results of this convergence studies when changing the mesh size and the polynomial order of the basis functions in the FETD solvers.

[*] P. Castillo, et. al, Discrete differential forms: A novel methodology for robust computational electromagnetics. Technical Report UCRL-ID-151522, LLNL, 2003

[**] J. Schöberl, S. Zaglmayr. High order Nédélec elements with local complete sequence properties, COMPEL 24, 2, 374, 2005

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