Keynote Address:
Implicit Adaptive Time Domain Methods in Computational Electromagnetics
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Abstract

The use of time domain methods for the solution of electromagnetic field problems is a widely established technique, especially when it comes to consider problems with strong nonlinear material properties or complex multi-physically coupled field problems. In these schemes, the geometric discretization of Maxwell equations yields large time-continuous systems of ordinary differential or differential-algebraic systems of equations, which need to be integrated in time. For explicit time integration schemes, commonly used for high-frequency problems as e.g. Yee’s FDTD leapfrog scheme, the time step selection is determined by the numerical Courant-Friedrich-Levy stability condition. Time step selection in implicit time integration schemes is rather governed by accuracy issues and the added computational effort required to repeatedly solve large algebraic systems equations. This suggests the use of error-estimator controlled adaptive discretization techniques for both time and space dimensions of the problem. This paper gives an overview on such implicit time domain techniques used for the numerical simulation of electric, magnetic and electromagnetic fields.

Biography

Markus Clemens was born in Wittlich (Germany) in 1968. He graduated in Applied Mathematics (1995) at the Universität Kaiserslautern. He received his Phd (1998) and his Venia Legendi (2003) at the Technische Universität Darmstadt. In 2004 he became head of the “Chair for Theory in Electrical Engineering and Computational Electromagnetics”, Helmut-Schmidt-University, University of the Federal Armed Forces Hamburg, with tenure as full professor in 2006. His main research area is Computational Electromagnetics.