

# Unified framework for numerical methods to solve the time-dependent Maxwell equations.

De Raedt H, Kole JS, Michiels K, Figge MT (2003) Unified framework for numerical methods to solve the time-dependent Maxwell equations. *Computer Physics Communication* 156, 43-61.

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## Abstract

We present a comparative study of numerical algorithms to solve the time-dependent Maxwell equations for systems with spatially varying permittivity and permeability. We show that the Lie–Trotter–Suzuki product-formula approach can be used to construct a family of unconditionally stable algorithms, the conventional Yee algorithm, and two new variants of the Yee algorithm that do not require the use of the staggered-in-time grid. We also consider a one-step algorithm, based on the Chebyshev polynomial expansion, and compare the computational efficiency of the one-step, the Yee-type, the alternating-direction-implicit, and the unconditionally stable algorithms. For applications where the long-time behavior is of main interest, we find that the one-step algorithm may be orders of magnitude more efficient than present multiple time-step, finite-difference time-domain algorithms.

## Beteiligte Forschungseinheiten

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