Real-time propagation of coupled Maxwell-Schrödinger systems — •Rene Jestädt[1], Heiko Appel[1] Angel Rubio[2] — [1]Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin, Germany — [2]Nano-Bio Spectroscopy Group and ETSF Scientific Development Center, Dpto. de Física de Materiales, Universidad del País Vasco UPV/EHU, San Sebastián, Spain

Since the Maxwell equations have a symplectic structure and are first order in time, it is possible to transform them, by using the Rieman-Silberstein vector [1], into a matrix spinor representation similar to the Dirac equation [2]. Such a spinor representation is advatageous for a coupled propagation of Maxwell's and Schrödinger's equations. In our present work we use unitary propagation techniques developed for the Schrödinger equation [3] in order to propagate the Rieman-Silberstein vector with perfeclty matched layer boundary condition in two dimensions with arbitrary geometry and matter distributions. Using the result of the classical time evolution of the electromagnetic field, we quantize the field and consider a dipole-coupling to a single atom.

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Part: CPP
Type: Vortrag;Talk
Topic: Quantum optics
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