MAR15-2014-020125

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

**Numerical solutions of the time-dependent Schroedinger equation for atoms and molecules in intense laser fields**[1]

XIAOXU GUAN, Louisiana State University

Recent progress in ab initio computational methods allows us to treat the laser-atom, laser-molecule interaction, and other collision processes with improved accuracy. Full-dimensional quantum calculations for even a few particles are extremely demanding because of the unfavorable scaling of the full quantum wave function, but they are of significant importance for understanding the entangled response of electrons and nuclei in a system strongly influenced by intense lasers and particle beams. In this talk I will concentrate on the applications of grid-based approaches to the time-dependent problems of atoms and molecules driven by intense ultrafast laser pulses. The spatial coordinates are discretized via the finite-element discrete-variable representation. Examples include ionization dynamics in complete breakup processes through few-photon absorption in helium atoms and hydrogen molecules, and also time-delayed attosecond transient absorption spectra in helium.

[1]This work was supported by DOE DE-FG02-13ER16403, NSF PHY-0757755, NSF PHY-1068140, and XSEDE PHY-090031.