

Ultrafast spectroscopy and time-dependent density functional theory

Zusammenfassung

Important future aspects of nanotechnology will be based on ultrafast properties of nano-scaled matter, e.g. magnetic switching. The goal of this project is to develop a fully relativistic ab-initio scheme within the time-dependent (current) density functional theory, that describes ultrafast phenomena occurring on a time scale of femtoseconds (10^{-15} s) in magnetic nano-systems characterized by a length scale of less than 10 - 20 nanometers ($1 \text{ nm} = 10^{-9} \text{ m}$), like ultrafast demagnetization processes seen in pump-probe experiments. The involved re-search groups have both expertise in analysis and numerics for models for matter interacting with fields, in particular the time-dependent Dirac-Maxwell equations (mathematicians) and in calculating the magneto-optical properties of layered systems etc. (physicists). The project will be in close collaboration with one of the "founding fathers" of Density Functional Theory, Vienna born Walter Kohn.

Keywords:

ultrafast spectroscopie, nano solid state physics, time dependent density functional theory, partial differential equations in relativistic quantummechanics

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Weiterführende Links zu den beteiligten Personen und zum Projekt finden Sie unter
<https://wwtf.at/programmes/mathematics/MA04-045>