POZVÁNKA

na seminář oddělení 15 Fyzikálního ústavu AV ČR, v.v.i.

Seminář se koná

ve čtvrtek 10. srpna 2017 v 10:00

v zasedací místnosti budovy A (vedle knihovny) Fyzikálního ústavu, Cukrovarnická 10, Praha 6.

Na programu je přednáška

Relativistic theory of magnetisation dynamics and of the inverse Faraday effect

kterou prosloví

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Abstrakt

Fast and ultrafast dynamical processes in magnetic systems have become the subject of intense research for last the two decades, since the pioneering discovery of Beaurepaire et al. [PRL 76, 4250] of femtosecond demagnetization in nickel by an intense laser pulse. Here, we study the magnetization dynamics from a Dirac-Kohn-Sham framework, by deriving the extended Pauli Hamiltonian which includes the nonrelativistic Pauli Hamiltonian and additional relativistic terms. Our results show that (i) the relativistic spin-flip effects do not provide an explanation towards the ultrafast demagnetization [PRB 91, 174415], (ii) the relativistic spin-orbit coupling leads to the Gilbert damping [PRB 94, 144419], (iii) the higher-order spin-orbit coupling leads to the magnetic inertial dynamics [PRB 96, 024425], and in addition, the Gilbert damping and magnetic inertia parameter scale with the imaginary and real part of the susceptibility tensor respectively for a harmonic field. Furthermore, we show the existence of two new torques: the field-derivative torque and optical spin-orbit torque. We furthermore calculate the laser-induced magnetization in several classes of magnetic materials due to the inverse Faraday effect, and show that for nonmagnetic metals and antiferromagnets the induced magnetization is antisymmetric in the light's helicity, however, for ferromagnets the induced magnetization is only asymmetric in the light's helicity [PRL 117, 137203]. Finally, relativistic contributions to the inverse Faraday effect will also be discussed.
