

Active control of plasmon-polaritons in periodic structures

Ilya Akimov

Experimentelle Physik 2, Technische Universität Dortmund, D-44221 Dortmund, Germany

The key object of plasmonics is the surface plasmon polariton (SPP) - the coupled oscillation of the electromagnetic field and the electron plasma in metals. The excitation of a SPP leads to significant electromagnetic energy localization near the metal surface and thereby enhances nonlinear effects and light-matter interaction. Current state-of-the-art criteria in telecommunications requires plasmonics to be active, i.e. a possibility for control by means of an external stimulus must be provided in the timescale of several nanoseconds or shorter. In my talk I will concentrate on plasmonic crystals, which are formed by structuring the metal film with a period comparable to the SPP wavelength. In addition I will consider a hybrid magneto-plasmonic crystal where the metal is patterned at the top of the ferromagnetic film. I will describe three types of experiments where the propagation constant and ultrafast dynamics of SPP are controlled by: (i) external magnetic field; (ii) femtosecond optical pulse; (iii) and coherent THz acoustic phonons.