

Single plasmonic nanostructure: a playground for nonlinear and quantum optics

Tuesday 24 July 2018 08:30 (30 minutes)

In this talk, we will explore quantum and nonlinear optical effects due to interaction of a single quantum emitter with a plasmonic nanostructure in an external electromagnetic field.

First, we will discuss our experimental results on nonlinear optical interaction of laser radiation with a single gold nanostructure in the split-hole resonator geometry, which shows several multipole plasmon resonances that will lead to SHG, THG, and light generation at the mixed frequencies. The THG nearfield amplitude reaches 0.6% of the fundamental frequency field amplitude, which enables creation of UV radiation sources with a record high intensity. The UV THG may then find many important applications including biomedical ones.

Second, we will overview the mechanisms of modification of the local field and radiative and nonradiative decay rates of a two-level quantum emitter located in close proximity to a plasmonic nanoparticle and will analyze the polarization distribution at the nanoscale around the nanoparticle. We will also analyze the photon-number statistics in resonance fluorescence of the quantum emitter near a metal nanosphere and the antibunching effect of photons from the resonance fluorescence.

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