Numerical modeling of scattering properties of tunable hybrid nanostructures

Viktor Iudin[1], Yali Sun[1], Evgeniy Minkevich[1], Eduard Ageev[1], and Dmitry Zuev[1]

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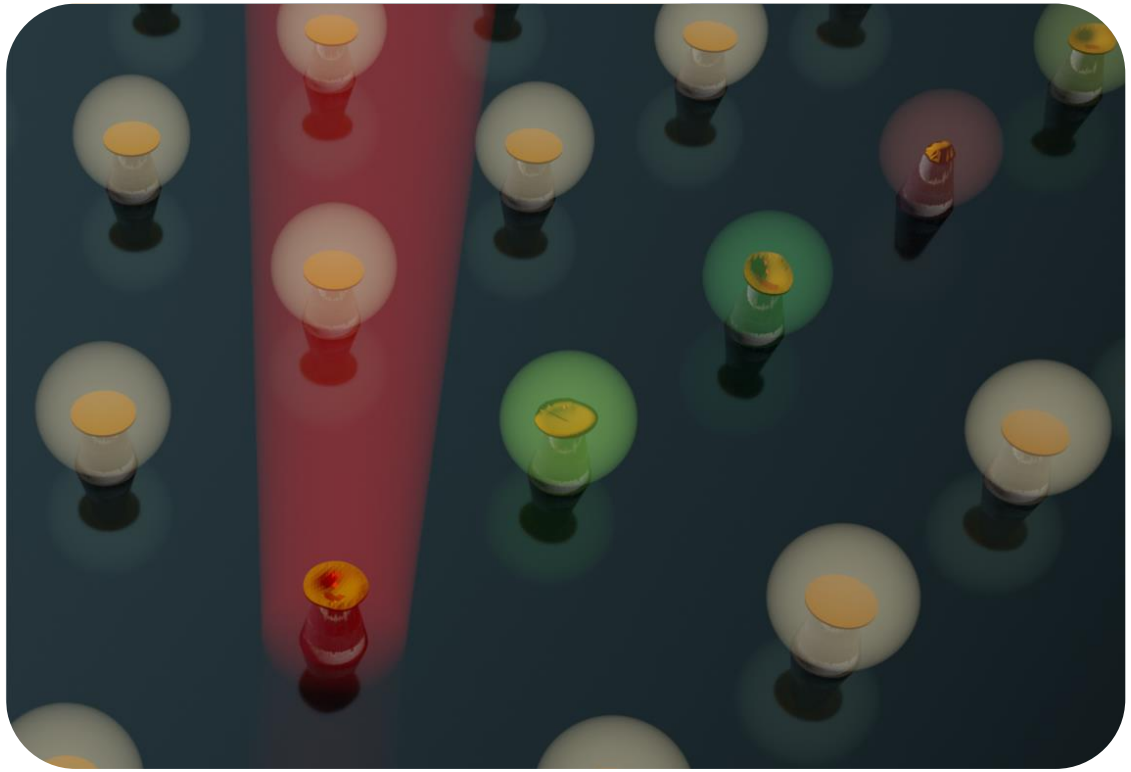

Developments of optical data storage systems tend to arouse scientific interest as such systems can potentially provide a higher storage capacity compared to existing technologies. In this work, we are introducing results of optical properties numerical modeling of tunable hybrid metal-dielectric nanoantennas whose geometric parameters and shape can be modified via fs-laser induced melting. We find geometries of the system which can provide distinct reconfiguration of scattering and absorption spectrum in the visible range in dependence of the gold component shape. The results obtained in this work can be used to develop a system for optical information recording with high density.

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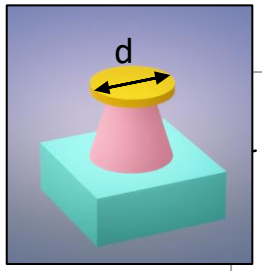
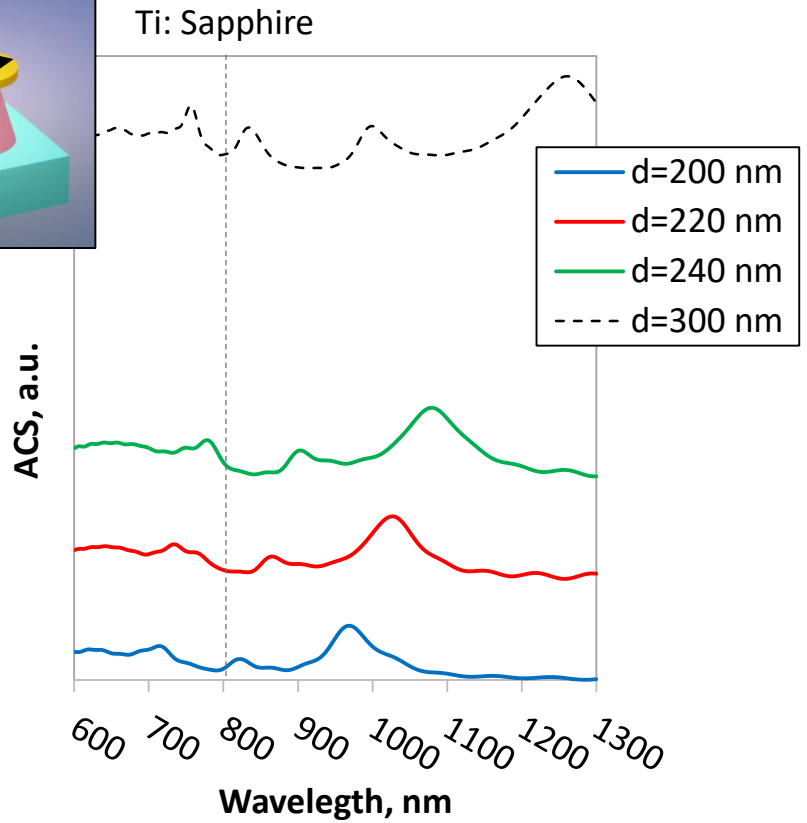
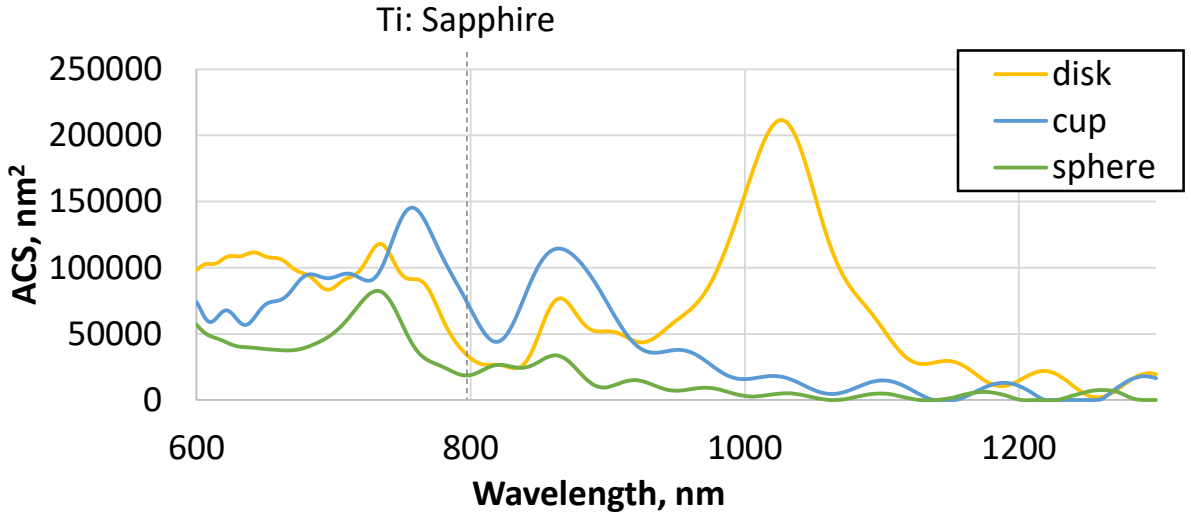
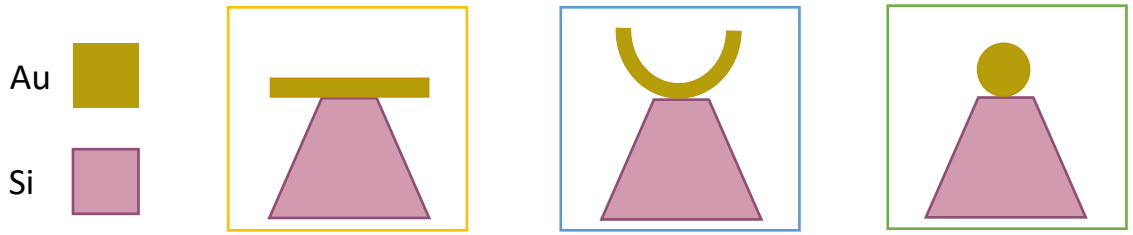
ACS for different diameter of nanoantenna





ACS for different shape of nanoantenna





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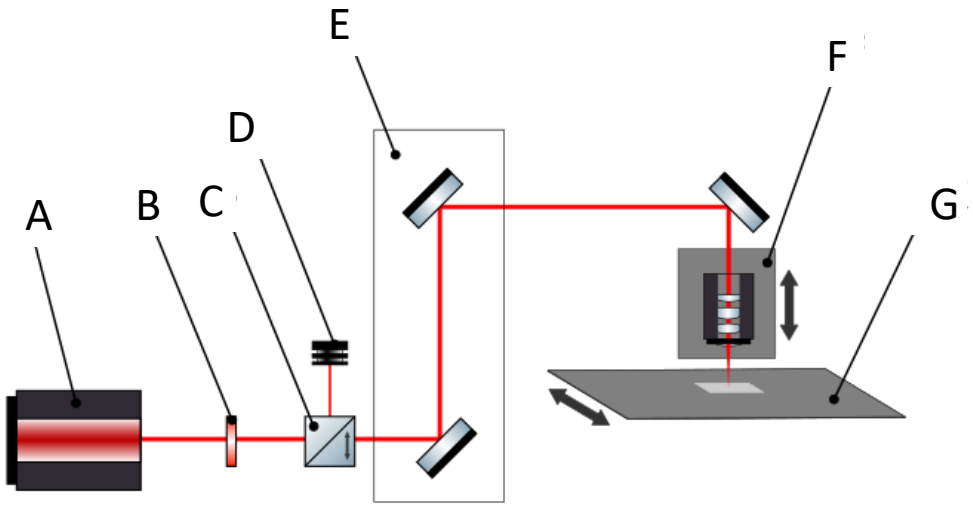
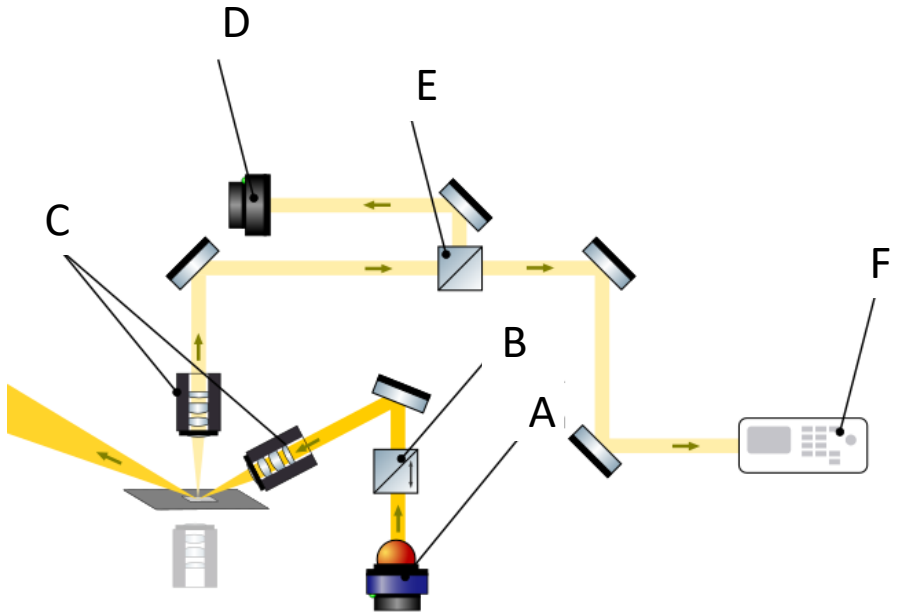
Setup for laser modification



A – Ti: Sapphire fs-laser
B, C, D – Attenuator
E – Beam delivery system
F, G – Beam positioning system

Setup for DF spectroscopy



A – Halogen lamp
B – Polarizer
C – Objectives
D – CCD camera
E – Beam splitter
F – Spectrometer

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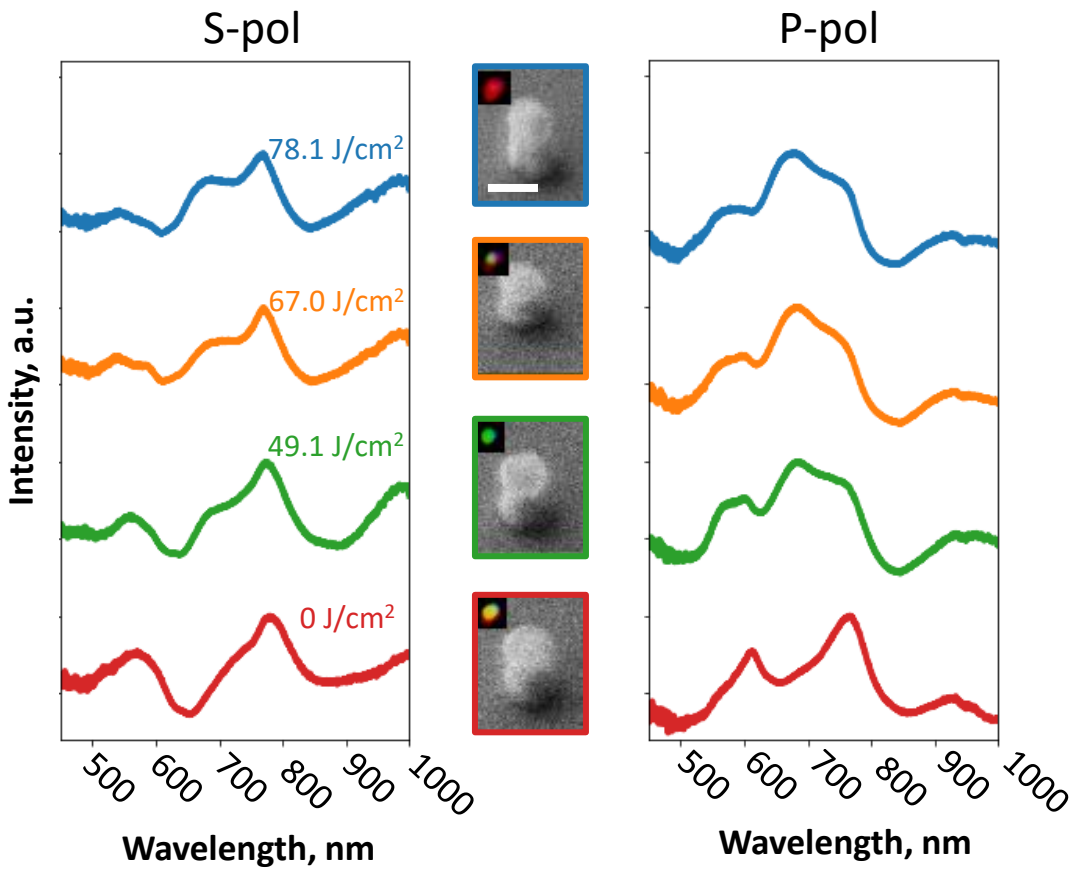
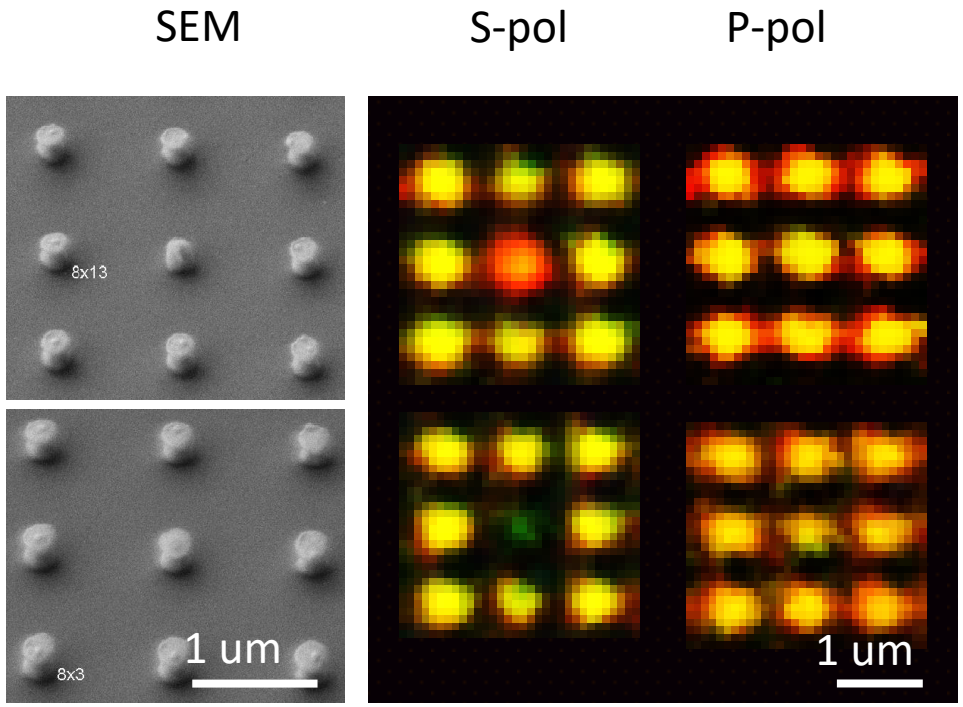
Measured DF spectra of nanoantennas



DF images of modified structures in massive of particles



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- We investigate the influence of the gold component shape of hybrid nanoantenna on the scattering and absorption properties of the system.
- In these calculations, we take into account optimal parameters of initial gold disk geometry suitable for modification on the operation wavelength of solid state Ti: Sapphire laser.
- The results of the experiments demonstrate that the structures are potentially can be used as application for optical data storage system with high density.

V International Conference on Metamaterials and Nanophotonics
METANANO 2020

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