

Manipulating light through nano- and micro-structures

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Abstract

In this presentation I will discuss how light can be manipulated in a controlled way in various applications by properly interacting it with nano- and micro-structures. I will overview several applicable fields dealing with imaging, bio-medical sensing and data processing and collection. I will also elaborate on laser induced way for fabricating such structures.

I will start by showing how special metallic nanoparticles can be implemented for realizing unique super-resolved imaging concepts allowing breaking the laws of diffraction in near field microscopy. I will then review how nano particles interacting with light can be used for biomedical applications such as early in-vivo detection of cancer or for detection of DNA mutations.

Then, I will speak about nano particles, nano antennas and nano-structures used for optical data processing, its wireless transmission and as well as for the enhanced collection of data. The optical data processing and its wireless transmission is done by realizing photonic nano-transistors, nano-logic gates and nano-antennas that efficiently convert light to plasmons and vice versa. The enhanced data collection is done by developing of special near field scanning tips to replace tips of atomic force and optical near field scanning microscopes. I will also demonstrate integration of photosynthetic complexes into nano structures in order to enhance the desired light-matter interaction.

In the last part of my talk, I will touch base with laser-induced forward transfer (LIFT) fabrication process that can be used for fabrication by performing 3D printing of some of the above-mentioned micro/nano devices and structures.