Master Thesis Project

Novel plasmonic materials for near field super-resolution microscopy

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Project description
Fluorescence lifetime imaging microscopy (FLIM) combined with substrates for near field sensing, e.g. a thin metal film (see Figure) can be used to obtain super resolved 3D images with axial resolution of ~3 nm. When a biological sample labeled with a fluorescent dye is illuminated and emits light, the lifetime of emitted fluorescence is dependent on the nanoscale distance from the metal substrate underneath, enabling us to measure the nanoscale distance of each fluorescent dye and reconstructing a super resolved 3D image. FLIM is suited for the study of live cells and biomolecules, such as antibodies, or DNA in aqueous media.

The candidate will perform proof-of-principle experiments with novel plasmonic materials developed at the “Metamaterials group” at DTU and using a custom FLIM setup developed in the “Ultrafast Bio- and Nanophotonics group” at INL - International Iberian Nanotechnology Laboratory (INL), Braga, Portugal. The candidate will also perform simulation of fluorescence lifetime dependency using MATLAB-based scripts and GUIs available in the INL group. Moreover, the candidate will perform nanofabrication tasks in INL’s clean room facilities (e.g. PE-CVD, spin-coating), to develop a phantom that can be used to probe the functionality of the substrate.

Practical details
The project is a joint project between DTU and INL, and part of project will be conducted at INL, Portugal.