Presentation of the New "Ultrafast Bio- and Nanophotonics" Laboratory at INL

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A new laboratory devoted to light-matter interaction on the nanoscale is being set up at INL-International Iberian Nanotechnology Laboratory. We are going to present the different techniques, which are being implemented and developed to allow optical and magneto-optical sensitivities reaching into femtosecond and nanometer scales.

Fluorescence (lifetime) spectroscopy will be available to study e.g. the sensitivity of plasmonic biosensors. To obtain spatially resolved information of nanostructured material or biological samples, several imaging techniques, one of them reaching below the optical diffraction limit, are going to be implemented. To obtain 3D super-resolution sensitivity a concept developed last year by Chizhik et al. [Chizhik2014], based on the interaction of fluorophores with a thin metal film, shall be set up and further developed to allow for 3D multicolor life cell imaging.
Taking advantage of the available femtosecond laser, several techniques based on nonlinear interaction effects, such as multi-photon microscopy and 3D laser lithography will be made available.
For increased imaging contrast in multi-photon microscopy the pulse characteristics will be optimized, e.g. using supercontinuum generation in photonic crystal fibers (in collaboration with U Porto).
Optically detected magnetic resonance ODMR on color centers in nanodiamonds shall be used to develop a magnetometry technique with nanoscale sensitivity, e.g. to precisely characterize magnetic fields around ferromagnetic nanostructures or biological material, e.g. neurons.

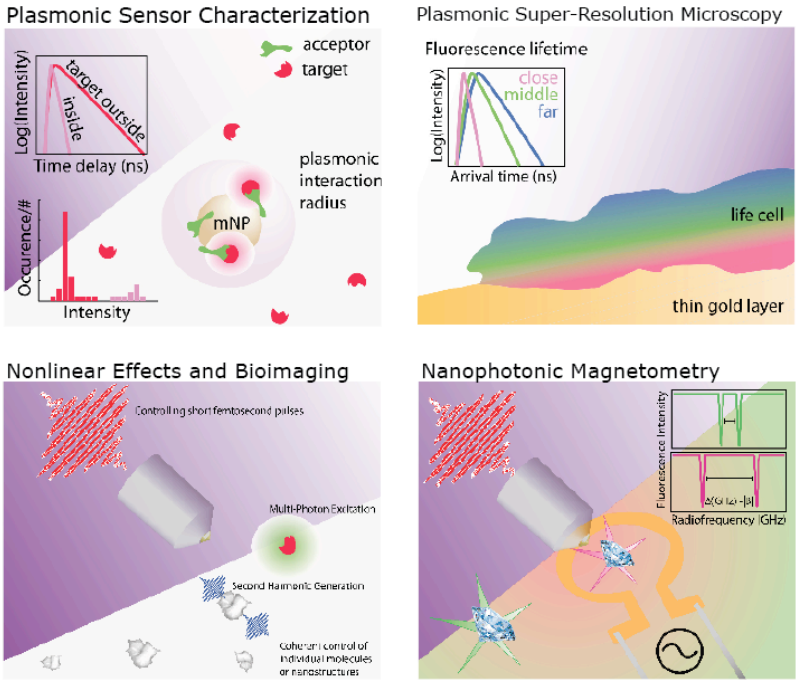

Figure: *Visualization of techniques available and to be developed in the "Ultrafast Bio- and Nanophotonics" laboratory at INL-International Iberian Nanotechnology Laboratory.*

References

[Chizhik2014] "Metal-Induced Energy Transfer for Live Cell Nanoscopy", A. I. Chizhik, J. Rother, I. Gregor, A. Janshoff, J. Enderlein, Nature Photonics 8, 124–127 (2014)