



DOTTORATO DI RICERCA
UNIVERSITÀ DI PISA

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Dottorato in Fisica

AVVISO DI SEMINARIO

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ore 10:00

Dipartimento di Fisica
Sala 248 - I piano - Ed. C

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"Rare Earth doped Nanoparticles as stable probes for Multiphoton Microscopy"

Abstract: During the past two decades, Imaging biological structures with high resolution is a challenge since the last years. The researches are directed in two directions, the first one concerns the development of optical probes with improved two-photon absorption cross sections and better photostability. The other direction is devoted to techniques of microscopy allowing better axial and lateral resolution. Among them, the STED (Stimulated Emission Depletion) technique provides the better results but at the expense of the very high price. Furthermore, multiplexing of the signals is not possible with this technique. We demonstrate that Rare Earth doped Nanoparticles (RE/NPs) represent an interesting alternative to common optical probes for multiphoton microscopy. RE/NPs are recognized since few years as potential optical nanoprobes for biological imaging [1-3] and the biocompatibility has already been demonstrated. Due to their high photo-stability, long time observations can be achieved. The upconversion process by energy transfer (ETU), discovered in the sixties, well before the use of coherent sources, is particularly efficient and visible emissions are obtained under coherent or non coherent infrared excitation. Furthermore depending on the nature of the dopants or their respective concentration, several colors (red, green, blue) of the dopants are observed that open the way to multiplexing of signals in a way similar to the multiplexing use of quantum dots. Several examples will be given and illustrated by single particle images as well as spectroscopic properties of a single particle. Raster-scanned images showed an enhanced spatial resolution by a factor compatible with the square root of the number of photons involved in the excitation process. An enhancement of the lateral resolution will be demonstrated.

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