Laser-induced Quantum Dots assisted by Selective Plane Illumination Microscopy and Complex Beam Shaping

UNIVERSITAT JAUME·I

Project description: Selective Plane Illumination Microscopy (SPIM) is a revolutionary imaging technique especially attractive for volumetric imaging in fields ranging from biology to neuroscience. Additionally, the labelling of biological samples with Quantum Dots (QDs), produced by Laser Fragmentation in Liquids (LFL), has emerged as a transformative approach in fluorescence imaging. In this context, the precise control over electric field associated with focused ultrashort laser beams should play an important role in understanding the interaction of laser radiation with liquids. On this point, Complex Beam Shaping (CBS) offers excellent strategies for the accuracy and dynamic management of laser beams. Hence, the combination of SPIM with CBS strategies can provide further insight into the synthesis of QDs by LFL.

Expected results: In this research project, a novel implementation of SPIM based on CBS will allow the development of a versatile and fast Dynamic Fluorescence Analyzer to explore time-dependent processes concerning QDs generation in liquids and the internalization of QDs in living cells. From the development of this project new information regarding the effects of setting user-defined focal amplitude and phase profiles on the optical properties i.e., photoluminescence, absorption coefficient or spectral shifts, of QDs produced by LFL are expected. In addition, the high precision control over the illumination path of SPIM should result in processed biological images with improved characteristics.

Requirements

- Undergraduate degree (or equivalent) in relevant fields (e.g. physics, engineering physics, applied mathematics, scientific computing, computational physics) form an institution outside of the European Union.
- Undergraduate studies must have finished after January 1, 2019.

Desired

- Strong background in Fourier optics.
- Microscopy background.
- Basic knowledge of light field microscopy.

Host institution Universitat Jaume I - Castellón de la Plana, Spain
Supervisor Omel Mendoza Yero (omendoza@uji.es)

Gross allowance

1st and 2nd year	22.835 euros
3rd year	24.210 euros
4th year	29.795 euros

1.600 euros additional for the first-year travel to Valencia, Spain.
Application Deadline 01/10/2024

For application information registre@uji.es

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