

PHOTONICS - EUROPHOTONICS MASTER COURSE

MASTER THESIS PROPOSAL

Course 2014 –2015

Laboratory: UB

City, Country: Barcelona

Title of the master thesis:

Numerical design of focused fields with predetermined amplitude and polarization distributions

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Summary of the subject (maximum 1 page):

Keywords: Optical Physics, Polarization, Resolution, Spatial Light Modulators

The study of the properties of light in the focal area of a high numerical aperture objective lens is currently attracting the interest of many authors. Multiple interesting problems are being considered: radially polarized beams for improving resolution, sub-diffraction optical needles, beams that remain unpolarized in the focal area, etcetera.

In this master thesis project, we plan to develop an approximate numerical method to synthesize the corresponding incident paraxial beam from the specifications (amplitude, polarization, angular momentum) of the focused field. In particular we concentrate on the development of fields with a focal spot below the resolution limit and the three-dimensional modeling of the Point Spread Function. The resulting beam is encoded using holographic methods and spatial light modulators and subsequently implemented and tested.

Some related references that may help you to understand the proposed problem:

1. D. Maluenda et al., Opt. Express **21**, 5432-5439 (2013)
2. R. Martínez-Herrero et al., Opt. Lett. **38**, 2065-2067 (2013)
3. D. Maluenda et al., Opt. Express **22**, 6859-6867 (2014)

Additional information:

* Amount of the monthly allowance (if it is the case): ---

* Required skills: Python or Matlab / Labview. Good lab work skills.

* Miscellaneous: