

PHOTONICS - EUROPHOTONICS MASTER COURSE

PROPOSAL FOR A MASTER THESIS

2015-2016

Laboratory : Dep of Physics, UPC, Campus Terrassa;
City, Country : Terrassa, Barcelona, Spain

Title of the master thesis : Beam propagation in periodic gain-loss meta-materials

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Summary of the subject (maximum 1 page) :

We find recently, that the beams propagating in periodic meta-materials, where the gain-loss is periodically modulated, can show a very unexpected and peculiar behaviour: self-collimation, spatial focalisation, spatial filtering effects. The beam propagation effects are similar to those in photonic crystals /where the refraction index is modulated on a wavelength scale), but also show important differences.

The idea of the spatial beam transformations in modulated materials is to be developed, by making FDTD (finite difference time domain) studies. In particular we plan to investigate the concrete gain/loss modulated material, the modulated semiconductor microlaser – a device of fundamental importance in photonic technologies.

The student can participate in development of the general theory of wave propagation in periodic gain/loss materials. The student can also participate in the numerical FDTD simulations, FDTD design, and FDTD optimization of the concrete samples of broad area semiconductor amplifiers, and semiconductor lasers. Possibly the student can be also involved in experimental studies (depending on the availability of the new samples at the period of Master work).

Keywords : Photonic crystals, gain/loss modulation, metamaterials, beam formation. broad emission area laser

Additional information :

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