MASTER IN PHOTONICS – "PHOTONICS BCN"
ERASMUS+ "EUROPHOTONICS-POESII"

MASTER THESIS PROPOSAL

Dates: April - September 2018

Laboratory : Mitchell group (Quantum optics, ultracold atoms, quantum sensors)
Institution: ICFO
City, Country : Barcelona, SPAIN

Title of the master thesis: Simulation of magnetic phase transitions and spontaneous symmetry breaking in a spinor Bose-Einstein condensate.

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Keywords : Quantum optics, atomic physics

Summary of the subject (maximum 1 page) :

A spinor Bose-Einstein condensate SBEC is an ultra-cold gas of atoms with a spin degree of freedom, leading to simultaneous magnetic and superfluid behaviour. In our SBEC, which is ^{87}Rb in the F=1 ground state, the magnetic interaction is ferromagnetic, giving a ferromagnetic superfluid. Such a material is extremely sensitive to magnetic fields, and displays a range of unusual behaviours. While the equations of motion for the SBEC (the multi-component Gross-Pitaevskii equation) are well established, their numerical solution by traditional CPU computation is very slow. We are seeking a motivated student with good programming skills to develop GPE simulations in advanced multi-processor platforms (GPU, cluster, or supercomputer). Topics of study will include magnetic phase transitions and spontaneous symmetry breaking.

Additional information : contact us with any questions.

* Required skills : Strong motivation, coursework in quantum optics and atomic physics. Strong programming background.

* Miscellaneous