Master in Photonics – "PHOTONICS BCN"
ERASMUS+ "EUROPHOTONICS"

MASTER THESIS PROPOSAL

Dates: April - September 2020

Laboratory : Quantum Nano-optoelectronics (Koppens group)
Institution: ICFO
City, Country : Castelldefels

Title of the master thesis: Single photons from two-dimensional materials

Name of the master thesis supervisor: Frank Koppens,
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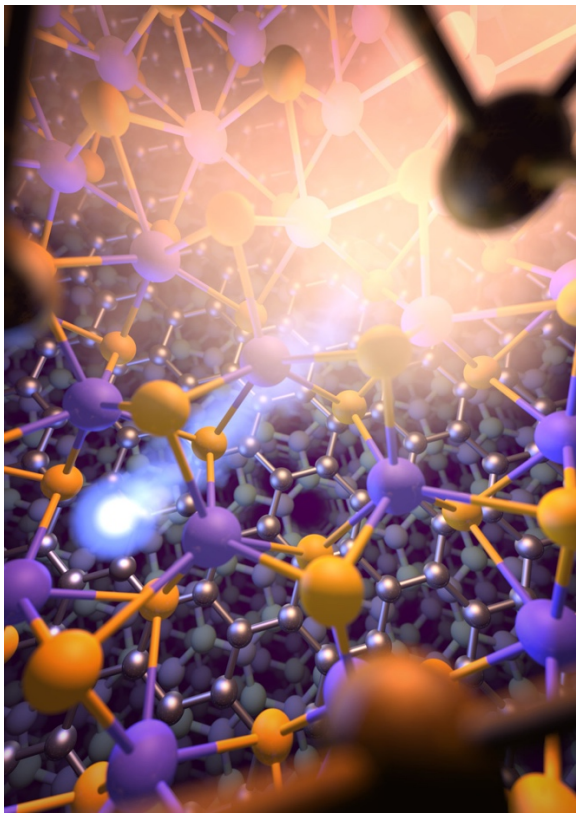
Keywords : quantum emitters, 2D materials

Summary of the subject (maximum 1 page) :

Very exciting quantum optical properties of materials that are only one atom thick have been discovered only during the last few years. These so-called two-dimensional materials showed, surprisingly, emission of light photon-by-photon, instead of a continuous photon stream. This single photon emission has so far not been fully controlled.
This project aims to generate single photon sources in 2D materials in a controllable manner. Several approaches will be investigated, including the shaping and patterning of the materials. The project, which will be carried out with a PhD student or postdoc, involves the manipulation of the materials, the measurements of photoluminescence at low temperatures and the analysis of experimental data.
This project is a step forward in the realization of on-chip quantum devices for quantum integrated photonic circuits to facilitate the development of secure quantum communication protocols, the scaling up of quantum computers and simulators, and the invention of novel quantum sensing applications.



References: Aharonovich, Igor, Dirk Englund, and Milos Toth. "Solid-state single-photon emitters." *Nature Photonics* (2016)

Additional information :

* Required skills : Physics studies
* Miscellaneous : The project will be carried out in the group of Prof. Frank Koppens at ICFO. This group has all the state-of-the-art facilities on 2D material research and technology development, and the work led to more than 80 articles on this topic that have received over 20.000 citations. See:
koppensgroup.icfo.eu
and
graphene.icfo.eu