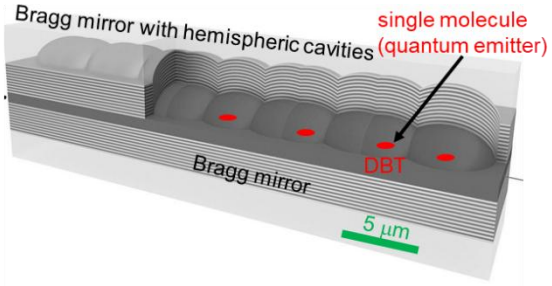
INTERNSHIP PROPOSAL

Laboratory name: Laboratoire de Physique des Lasers, Atomes et Molécules (PhLAM)
CNRS identification code: 8523
Internship director'surname: Alberto AMO
e-mail: alberto.amo-garcia@univ-lille.fr Phone number:
Web page: https://photonlattices.eu/
Internship location: Laboratoire PhLAM, Cité Scientifique in Villeneuve d'Ascq (next to Lille)

Thesis possibility after internship: YES
Funding: YES
If YES, which type of funding: EU QuantERA project in collaboration with Florence, Madrid and Prague.

Coupling quantum emitters to a photonic lattice

Coupling quantum emitters to the optical modes of a photonic lattice creates new opportunities for engineering exotic quantum light sources and developing novel quantum simulators with long-range interactions. It would allow studying non-classical states with spread entanglement and the implementation of strongly correlated phases of light [1].



The main goal of this internship is to experimentally study the optical properties of quantum emitters coupled to a lattice of photonic resonators. We have recently implemented an open cavity system with embedded individual molecules of DBT. Each molecule is a two-level system whose excitation couples to light. The open cavity is made of two mirrors brought in close proximity (about 2 microns apart) with the use of dedicated piezo actuators. One of the mirrors has been etched using focus ion beam technology to engineer lattices of hemispheric cavities, which define a photonic lattice.

The internship will consist in the characterization of the open cavity with quantum emitters and the study of superradiance and subradiance effects, which have never been observed in the context of lattice dynamics.

This internship is part of the QuantERA european project MOLAR in collaboration with Florence, Madrid and Prague, and it will be continued into a financed PhD thesis. The internship is also paid.

Group website: https://photonlattices.eu/

[1] A. González-Tudela and J. I. Cirac, Phys. Rev. Lett. **119**, 143602 (2017).

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics:	YES	Soft Matter and Biological Physics:	NO
Quantum Physics:	YES	Theoretical Physics:	NO