

INTERNSHIP PROPOSAL

Laboratory name: Laboratoire de Physique des Lasers, Atomes et Molécules (PhLAM)
CNRS identification code: 8523
Internship director's surname: Alberto AMO
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Web page: <https://photonlattices.eu/>
Internship location: Laboratoire PhLAM, Cité Scientifique in Villeneuve d'Ascq (next to Lille)

Thesis possibility after internship: YES

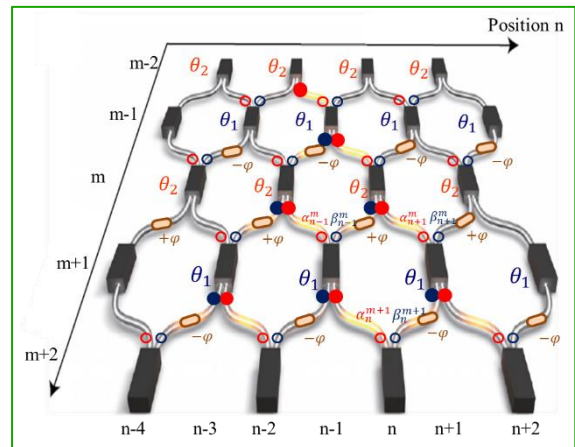
Funding: YES

If YES, which type of funding: EU QuantERA project in collaboration with Florence, Madrid and Prague.

Synchronization and Nonlinear Dynamics in an optical lattice

The study of nonlinear light propagation is a highly active field of research, renowned for its complexity and the rich physical phenomena it reveals. Coupling these nonlinear dynamics with a lattice structure, where light can tunnel between sites, enables the exploration of collective effects such as gap solitons and synchronized arrays of photonic resonators.

This internship project aims to investigate both numerically and experimentally the emergence of nonlinear phenomena in a unique lattice of coupled fibre rings. In this system, light evolves in discrete steps. This evolution leads to nonlinear dynamics that are fundamentally distinct from those in standard photonic lattices, giving rise to effects like long-range synchronization across the lattice and novel topological phases [1].



The main objective is to characterize these effects through numerical modelling and to observe them in laboratory experiments. This internship is part of a collaboration with the École Normale Supérieure de Lyon and the Institute for Fundamental Physics in Madrid. It is designed to lead directly into a PhD thesis in our group.

Group website: <https://photonlattices.eu/>

[1] R. Asapanna et al., [Phys. Rev. Lett. 134, 256603 \(2025\)](#).

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