



Master in Photonics – “PHOTONICS BCN” Master ERASMUS Mundus “EuroPhotonics”

MASTER THESIS PROPOSAL

Starting full time from April 2025

Presentation at the end of July or beginning of September 2025

Laboratory: Quantum Nano-Optoelectronics (QNOE)

Institution: ICFO (The Institute of Photonic Sciences)

City, Country: Castelldefels (BARCELONA), Spain

Title of the master thesis: Electrical detection of 2D polaritons and vibrational modes of gases interacting at the strong coupling regime

Name of the master thesis supervisor and co-supervisor:

Frank Koppens, Sebastián Castilla

(for external proposals a co-supervisor from the Master program and a collaboration agreement is needed)

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Keywords:

Summary of the subject (maximum 1 page):

The project will consist of designing polaritonic nanoresonators to optically couple their resonances with the vibrational modes of the gases. The polaritonic resonances will be tuned geometrically by varying the metallic nanostructures and electrically by changing the Fermi level of graphene. Therefore, we would obtain an active platform to achieve the strong coupling regime. We will work with industrially relevant gases such as ethylene and acetone. The project will involve performing optical simulations, machine learning algorithms, and gas sensing measurements using an optical setup in the mid-infrared regime.

Objectives:



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Additional information (if needed):

- * Required skills:
- * Miscellaneous: