Quantum nanolaser sources

A PhD position is open as a joint project between the C2N (France) and the IMN (Madrid). This project aims to realize quantum photonic sources based on nonlinear interactions in optical nanocavities with few photons. Unlike conventional semiconductor quantum sources that require deterministic coupling of cavity modes to single nanoemitters (i.e. quantum dots) and operate at ultralow temperatures, this PhD thesis will focus on the realization of nanophotonic devices capable of achieving quantum correlations with few photons using material optical nonlinearities at room temperature, in coupled nanocavities. Such capabilities will rely on a few recent observations at C2N of highly nonlinear phenomena in laser nanocavities with moderate to low photon numbers [1,2]. Building blocks will be hybrid III-V semiconductor photonic crystal nanocavities and nanolasers, incorporating active materials such as InP-based quantum wells (C2N) or quantum 2D materials (IMN). The candidate will explore innovative technological developments that will ultimately enable room-temperature, single photon sources in the telecommunication C-band, with a high potential for integration. The PhD work will include design and modeling, clean room fabrication, and experimental characterization.

The candidate should ideally have a strong background in physics, with particular emphasis on experimental skills. Previous experience in quantum optics and/or nanofabrication will be appreciated.

The candidate may send a CV and/or request further information to

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[1] P. Hamel et al, *Spontaneous mirror-symmetry breaking in coupled photonic-crystal nanolasers*, Nat Photon. **9**, 311 (2015).
[2] M. Marconi, et al, *Far-from-equilibrium route to superthermal light in bimodal nanolasers*, Phys. Rev. X **8**, 011013 (2018).