Centre de Nanosciences et de Nanotechnologie

Soutenance de thèse

Mercredi 7 Mars 2018

14 h – C2N Site de Marcoussis, Salle R. Planel

Lorenzo De Santis

Single photon generation and manipulation with semiconductor quantum dot devices

Composition du jury :

Fabio Sciarrino	La Sapienza University, Rome	Rapporteur
Julien Claudon	CEA, Institut Nanosciences et Cryogenie	Rapporteur
Antoine Browaeys	Laboratoire Charles Fabry	Examinateur
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Abstract:

Single photons play a central role as quantum information carriers in quantum networks to connect distant nodes. A promising approach is the realization of efficient atom-cavity interfaces, which allows the deterministic and reversible transfer of information between the flying photons and the stationary atomic quantum bit. In this work, we use light-matter interfaces based on a single semiconductor quantum dot, acting as an artificial atom, deterministically coupled to a micropillar cavity. We show that such a device is both an efficient emitter and receiver of single photons, and can be used to implement basic quantum functionalities.

First, the device is shown to act as a source of single photons, which allows the generation of highly indistinguishable photons with a record brightness. These single-photon sources are then used to investigate path-entangled N00N states and propose a new tomographical method. And finally, we observe optical nonlinearities at the single photon level, and we demonstrate the filtering of single photon Fock states from classical incident light pulses.

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