C2N Seminar

Wednesday December 1th- 11h00

Amphithéâtre

Centre de Nanosciences et de Nanotechnologies

10 boulevard Thomas Gobert

91120 Palaiseau

“Quantum networks with neutral atoms in optical cavities.”

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Cavity QED systems constitute an ideal interface to connect flying and stationary qubits in a quantum network. The stationary qubits can be realized with trapped neutral atoms, while the flying qubits are encoded either in the polarization degree of a photon or in the phase of a coherent laser pulse.
I will present a series of experiments employing the strong nonlinearity provided single atoms in two cavity QED setups to implement useful tools for quantum information processing and quantum communication in a network-ready architecture.
These tools comprise a photon-photon quantum gate mediated by an intra-cavity atom and a gate between two atoms in one cavity executed via the reflection of a single photon. Furthermore, the atom-cavity system also allows for the deterministic generation of entangled atom-light Schrödinger-cat states.
I will show how the connection of two cavity QED setups can be employed to implement a nonlocal quantum gate between two atoms located in 60 m distant cavities. Also, the same system can be used to perform teleportation of quantum information from one atom to the other and to nondestructively detect flying optical photons multiple times.