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Seminaires du LPTM , Universite de Cergy Pontoise

Mardi 15 Janvier 2019, 14 :00
LPTM, 4.13 St Martin II
Domaines : cond-mat

Titre : *Electron-vibration and electron-photon interaction in nanoscale hybrid systems*

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Résumé : *Engineered nanoscale systems, as nanomechanical resonators or microwave photon cavities coupled to mescoscopic conductors, have emerged as a versatile platform for fundamental science and applications. Their tailored properties offer paradigms for nonlinear dynamical couplings in the quantum regime, facilitating the unraveling of new phenomena. For example, these systems open the avenue to engineered quantum light sources, which can be tuned purely by applied voltages. Similarly, they provide a way to access the quantum regime of large mechanical systems containing many billions of individual atoms. To achieve the latter goal, a crucial requirement is cooling the mechanical resonator, integrated in an electrical circuit, to very low temperature.*

I will present a theoretical study about the nonequilibrium states of nanomechanical resonators or microwave cavities coupled to quantum dots. One of the main results is that ground state cooling of the mechanical resonator can be realistically achieved using spin-polarised current [1,2] or superconducting contacts [3,4]. Furthermore, I will show that a spin-polarized current passing through a quantum dot can efficiently excite a photon cavity and it encodes a special single-atom laser that is characterized by the emergence of complex switching dynamics between multiple limit-cycles [5].

For the different proposals and in various regimes, I will discuss how the nonequilibrium states of the resonator can be readily detected by direct measurements of the dc current.