

CEA - Saclay 91191 Gif-sur-yvette Cedex
Service de Physique de l'Etat Condensé
SÉMINAIRE

Mercredi 06 juillet 11h15

Orme des Merisiers SPEC Salle Itzykson, Bât.774

Quantum state tomography of an itinerant squeezed microwave field

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In an increasing number of experiments, the desired information (for example the state of nanomechanical resonators or of superconducting qubits) is successfully encoded into the state of a coherent microwave field. However these experiments suffer from the lack of high efficiency detectors at microwave frequencies: the best commercially available amplifiers add twenty times more noise than the intrinsic quantum fluctuations of the field. Our group has made a crucial step to overcome this important limitation by developing quantum limited Josephson Parametric Amplifiers (JPAs) [1].

In this talk I will show how we dramatically increase the performance of the quantum state tomography at microwave frequencies by using our JPAs. More precisely I will present the reconstruction of the Wigner function of an itinerant squeezed microwave field [2]. Besides being conveniently generated by parametric amplifiers, squeezed states of the light field are of great interest as they form the basis of a complete quantum information processing strategy, known as the continuous variables quantum information. The achieved degree of squeezing and the quantum efficiency of the quantum state tomography will be presented from the perspective of generating distributable and unconditional entanglement on chip.

[1] Amplification and squeezing of quantum noise with a tunable Josephson metamaterial, M. Castellanos-Beltran et al., Nat. Phys. 4, 929-931 (2008). [2] Quantum state tomography of an itinerant squeezed microwave field, F. Mallet et al., Phys. Rev. Lett. 106, 220502 (2011) .

A coffee break will be served at 11h00. The seminar will be given in English.