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

******

Mercredi 12 octobre 11h15

Orme des Merisiers SPEC Salle Itzykson, Bât.774

Multi-Qubit Circuit Q3D

Leo DiCarlo

Quantum Transport Group,

Kavli Institute for Nanoscience, TU Delft (the Netherlands)

In circuit quantum electrodynamics (cQED), microwave resonators are used to isolate, couple and readout multiple superconducting quantum bits. The traditional cQED architecture is a planar integrated circuit with resonators built from terminated coplanar-waveguide transmission lines. The realization of simple quantum algorithms and, very recently, basic quantum error correction using planar cQED attest to its versatility. However, a major challenge moving forward is extending the coherence time of quantum bits (qubits) in planar cQED, at present a few microseconds and the bottleneck to fidelity of quantum gate operations. Recently, the Schoelkopf group at Yale has demonstrated order-of-magnitude extensions in qubit coherence by replacing the coplanar-waveguide resonator with a three-dimensional superconducting cavity. This new approach, here dubbed cQ3D, minimizes the participation ratio of lossy surfaces and interfaces by storing most electromagnetic energy in vacuum. I will present our adoption of cQ3D at TU Delft with the long-run objective of realizing quantum feedback schemes with applications in quantum computing (for example, entanglement by measurement). I will present our ongoing characterization of two- and three-transmon-qubit cQ3D devices. Highlights include a maximum qubit relaxation time of 85 microseconds, a coherence time of 94 microseconds achieved by dynamical decoupling, and 93% single-shot readout.

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