# QUANTUM OPTICS SEMINAR

**Title:** Microwave Cavity QED: Observations of photon quantum jumps in a ultrahigh-Q superconducting cavity

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**Time:** Wednesday, March 28 at 11:15

**Place:** 1520-731

**Abstract:**

This presentation reports on the latest achievements in microwave cavity QED in the strong coupling regime.
Thanks to a recently developed type of niobium-sputtered superconducting mirrors, cavities with quality factors as high as $4.2\times10^{10}$ have been obtained, corresponding to a photon storage time of the order 0.1s. The special lifetime measurement techniques required for characterization of such ultrahigh quality cavities will be presented.
Probing the cavity field by circular Rydberg atoms, it has been possible to monitor in real time the thermally induced cavity photon number at a temperature of 0.8K, using a repeated Quantum Non-Demolition measurement scheme, based on dispersive atom-field interaction. Abrupt changes of the photon number are observed when a photon is randomly emitted or absorbed in the cavity, showing the alternation between the vacuum state |0Ñ and the one-photon Fock state |1Ñ. These are the first observations of photon quantum jumps, showing the birth, life, and death of single photons in the cavity.
A proposed photon decimation process has been realized experimentally, allowing photon number states up to n=4 to be distinguished in the cavity.

**Further information:**

S. Gleyzes et al.: *Observing the quantum jumps of light: birth and death of a photon in a cavity, Nature **446** 297 (2007)*

S. Kuhr et al.: *An ultrahigh finesse Fabry-Perot superconducting resonator as a photon box for cavity-QED experiments*, quant-ph/0612138, (2006)

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