Special Seminar
MPQ/LMU

Date: **Friday, November 2, 2012**

Time: **10 a.m. s.t.**

Presentation: **Dr. Sarah Beavan**
Centre for Quantum Computation & Communication Technology
Research School of Physics & Engineering
The Australian National University
Canberra, ACT 0200
Australia

Title: **Rephasing Spontaneous Emission in a Rare-Earth Ion-Doped Crystal**

Location: **Discussion Room H 311**
LMU

Division of Laserspectroscopy & LMU/Chair:
Director Professor Professor Theodor W. Hänsch

Abstract:

Spontaneous emission is often considered as an incoherent process, and usually for an experimentalist represents a source of noise. In this talk I will discuss an experiment where spontaneous emission is detected from an ensemble of ions, then the ensemble is rephased using photon-echo techniques and emits an 'echo' of the spontaneous emission. The initial spontaneous event and its echo can be non-classically correlated, and the photon-echo based recall of the second photon is on-demand. This process has applications in developing a quantum repeater protocol to extend the range of quantum communication links.

The experiment was performed in a praseodymium doped yttrium orthosilicate crystal. In this material it is possible to have long coherence times on both optical and rf transitions (on the order of 100 μs and seconds respectively). Largely due to their long coherence times, rare earth ion doped crystals are promising systems for the development of quantum information processing devices.
