



Seminar Announcement

Speaker: **Dr. Margareta Wallquist**
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Title: **Polar molecules coupled to superconducting stripline cavities for quantum computing**

Time: Tuesday, 3 April, 2007, 10 c.t.

Location: Uni Regensburg, seminar room PHY 4.1.13

Abstract:

A scalable quantum information processor requires the coherent control of a large-scale quantum system for a sufficiently long time. The integration of superconducting systems, which have straightforward control techniques using local electric signals but decohere rapidly, and quantum optical systems with much better coherence properties, is the main goal of this work.

In particular, we study the encoding of quantum information in long-lived rotational states of a polar molecule. An applied electric field mixes the rotational states and the molecule acquires a large dipole moment. Confining the molecule in an electric field trap at a short distance from a superconducting stripline cavity, the molecular qubit can exchange energy with other molecular or superconducting qubits by the exchange of microwave photons. To acquire the best coherence properties, it is desirable to cool the motional degree of freedom of the molecule in the trap to the ground state, without exciting the vibrational or electronic levels of the molecule. Due to the lack of laser cooling techniques for molecules, we study a cavity-assisted cooling process, assuming the cavity to be on resonance with the molecular qubit and strongly coupled to its environment. Also, the implementation of quantum information processing with this hybrid system will be discussed.
