

**Special Seminar**  
**MPQ/LMU**

**Date:** Thursday, October 12, 2017

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

**Presentation:** Ms. Saba Zia H a s s a n, Master Student  
Research Group Quantum Optics/  
Prof. M. Weitz  
Institute f. Applied Physics  
University of Bonn  
D-53115 Bonn

**Title:** Experimental Realization of the Quantum Rabi Model  
with Ultra-cold Rubidium Atoms

**Location:** Discussion Room H 311  
Faculty of Physics/Ludwig Maximilians University

Division of Laserspectroscopy & Faculty of Physics/LMU  
Research Group Prof. H. Weinfurter  
Chair: Director Professor Professor Theodor W. Hänsch

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**Experimental Realization of the Quantum Rabi Model**  
**with Ultra-cold Rubidium Atoms**

**Abstract:**

The quantum Rabi model describes the interaction between a two-level quantum system and a single bosonic mode. This model has been thoroughly explored in the moderate and strong coupling regimes.

However, the deep strong coupling regime, which we study here, is inaccessible to experiments using natural light-matter interactions.

Our experimental implementation gives access to this previously inaccessible parameter regime simulating the quantum Rabi model using ultracold rubidium atoms, in a periodic optical lattice potential, where the occupation of the Bloch bands of the lattice represent the effective two-level system. This qubit is coupled to a bosonic field mode represented by an harmonic potential provided by an optical dipole trap. Via this system, the dynamics of the quantum Rabi model in the deep strong coupling regime can be studied.

In this talk, I shall present the current status of the experiment.