



Walther-Meißner-Institut

Bayerische Akademie der Wissenschaften



Walther-Meißner-Seminar

Walther-Meißner-Institut, Seminar Room 143

Date: **Special date: Wednesday, 30 May 2018, 15:00 h**

Speaker: **Prof. Dr. Gerhard Kirchmair**

*Institut für Quantenoptik und Quanteninformation
Technikerstr. 21a
6020 Innsbruck, Austria*

Title: **Superconducting Qubits for Analog Quantum Simulation**

Abstract:

In this talk I want to present the research activities of the Superconducting Quantum Circuits group at the Institute for Quantum Optics and Quantum Information in Innsbruck.

In the first part I will give an introduction to circuit quantum electrodynamics and our 3D circuit QED architecture. I will show how we want to use this architecture to realize a platform for quantum many body simulations of dipolar XY models on 2D lattices using state of the art circuit QED technology. The central idea is to exploit the naturally occurring dipolar interactions between 3D superconducting qubits to simulate models of interacting quantum spins. The ability to arrange the qubits on essentially arbitrary geometries allows us to design spin models with more than nearest-neighbor interaction in various geometries.

Combining these ideas with our waveguide architecture, will allow us to study open system dynamics with interacting spin systems. The platform will allow us to investigate the interplay between short range direct interactions, long range photon mediated interaction via the waveguide and the dissipative coupling to an open system. Especially interesting in this context are dissipative state preparation protocols and engineering the spectrum of our bath in the spirit of band engineering in photonic crystals.