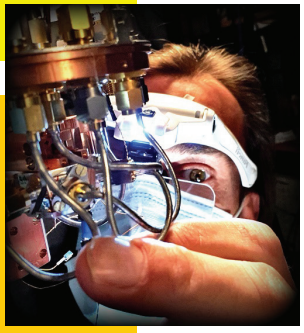
PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik
der Goethe-Universität Frankfurt am Main

Mittwoch, den 19.01.2022, 16 Uhr c.t.
Großer Hörsaal, Raum _0.111, Max-von-Laue-Str. 1

– – – in PRÄSENZ* – – –



Dr. Jürgen Lisenfeld

Karlsruher Institut für Technologie (KIT)
Karslruhe

Atomic Tunneling Defects in Superconducting Quantum Computers

Superconducting quantum bits have reached a pole position in the race to realize a quantum computer.

However, the coherence of such solid-state qubits is severely limited by structural defects in the circuit materials. These provide a bath of parasitic two-state quantum systems, so-called TLS, which give rise to fluctuations and dissipation of qubit energy. Understanding the microscopic origins of TLS defects is thus vital for the progress towards practical quantum computers.

In this talk, I will give a brief introduction to superconducting qubits and show how they can be operated as sensitive detectors to study individual TLS defects.

In our experiments, we manipulate the defects' quantum states by resonant microwave driving and read them out by coherent swap operations. Moreover, tuning of TLS by applied mechanical strain and tailored electric fields provides novel spectroscopy methods that reveal mutual defect interactions and allow one to determine the defects' locations in a given qubit sample.

These techniques provide a new insight into disordered materials and yield valuable information to guide improvements in sample fabrication that are urgently needed to obtain higher coherence in micro-fabricated quantum devices.

Die Dozenten der Physik

local host: Prof. Dr. Jens Müller, j.mueller@physik.uni-frankfurt.de

* Teilnehmen dürfen ausschließlich Angehörige der Universität unter 3G Bedingungen