Kolloquium Quantentechnologien

TECHNISCHE UNIVERSITÄT DARMSTADT

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Ort: Gebäude S2|15, Raum 51

Quantum simulation and quantum computing with atomic arrays

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Abstract: Neutral atoms trapped in optical lattices are a versatile platform to study many-body physics in and out of equilibrium. Single-atom sensitive quantum gas microscopes provide a unique toolbox to prepare, control and detect such systems at the level of individual quanta.

In the first part of my talk, I will showcase the capabilities of this experimental platform by reporting on the realization and characterization of extended Hubbard models for Rubidium atoms in optical lattices using off-resonant coupling to highly excited Rydberg states, so-called Rydberg dressing. Furthermore, I will describe our efforts on uncovering the exotic relaxation behavior in tilted Hubbard models with strong kinetic constraints by combining local initial-state control with site-resolved measurements. We find signatures of Hilbert space fragmentation in two spatial dimensions, as well as fractonic excitations on top of otherwise immobile initial states.

In the second part of the talk, I will introduce a new strontium setup that combines large-scale optical lattices with local control achieved through tweezer arrays. I will present our work on controlling individual strontium atoms for realizing large-scale quantum simulators for spin models, scalable quantum registers, as well as Hubbard systems assembled bottom up in optical lattices without the need for evaporation.

Der Sprecher wird betreut von Herrn Professor Genes und Herrn Prof. Birkl