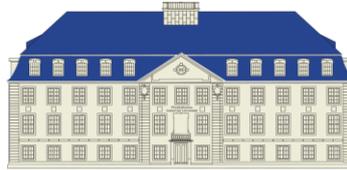




Institut für
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RHEINISCHE
FRIEDRICH-WILHELMS-UNI-
VERSITÄT BONN

SPECIAL COLLOQUIUM „OPTICS AND CONDENSED MATTER“

Wenchao Xu

ETH Zurich, Switzerland

Quantum science with Rydberg ensembles: from one to many

Quantum science promises great potential to revolutionize our current technologies such as quantum simulation and computation. Arrays of individual atoms trapped in optical tweezers has emerged as an attractive architecture for implementing quantum technologies. Rydberg states of atoms are often used to facilitate two-qubit gate operations and to simulate quantum many-body systems. However, for most schemes, readout of a Rydberg qubit is a destructive process that precludes its reuse and the application of many quantum error-correcting protocols.

To address these challenges, we take an alternative approach based on arrays of atomic ensembles. By harnessing the collective optical response of the atomic ensemble, we demonstrate a rapid preparation, manipulation, and non-demolish readout of a single Rydberg qubit embedded in an atomic ensemble. Scaling up the system towards large arrays of atomic ensembles have been achieved with apparatus upgrade, and preliminary results have demonstrated fast, parallel qubit readout.

January 12th, 14:15 h, live room 3.020 IAP or via Zoom

<https://uni-bonn.zoom.us/j/98441612025?pwd=a01SSjlkY1Q3SDFhL09JQk1qc1V6dz09>

Meeting-ID: 984 4161 2025

Kenncode: 294164