HQOC

HARVARD Quantum Optics Center

Special Seminar

Thursday | Jan. 23 | 11:00 AM
Lyman 425

Manuel Endres

Postdoctoral Researcher, Max-Planck Institute for Quantum Optics

"Probing Quantum Many-body Systems at the Single-particle Level "

The manipulation and detection of *individual* quantum excitations forms the basis of modern quantum physics experiments. However, most of these experiments have been restricted to systems composed of only a few particles.
In recent years, tremendous experimental progress has been made in probing strongly interacting many-body systems at the level of individual particles. This was achieved using single-site- and single-atom-resolved imaging and manipulation of quantum gases in optical lattices. With this technique, 'snapshots' of a fluctuating many-body system are obtained, where individual excitations are directly visible and, by shining light through the imaging system, are also directly addressable.
I will review these developments and present a few chosen experiments in more detail: the single-site-resolved detection of correlation functions [1], the detection of an amplitude 'Higgs' mode [2], and the observation of the quantum dynamics of a mobile spin impurity [3]. I will conclude by analyzing the current limitations and possible future developments, particularly concerning the detection of entanglement in quantum many-body systems.

Refreshments will be served