Physical Sciences Seminar

Zooming in on Ultracold Few-Fermion Systems

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Host: Onur Hosten

Strongly interacting Fermi systems are at the heart of many open questions in condensed matter, nuclear, and high-energy physics. Ultracold atoms provide a unique opportunity to study their most interesting aspects - such as strongly correlated superfluids and collective excitations - in a tunable laboratory setting.

Here we experimentally observe the "birth" of a collective mode in a few-body system of ultracold fermions. Using optical tweezers, we deterministically prepare few fermions in the ground state of a two-dimensional trap. This system exhibits a shell structure of stable "magic" particle numbers. We perform many-body spectroscopy and find both single-particle and two-particle excitations. The latter consist of pairwise excitations akin to Cooper pairs and can be identified as the precursor of the Higgs mode in a two-dimensional Fermi gas.

In the future, we will probe such mesoscopic systems with single-particle resolution. We have recently demonstrated spin-resolved fluorescence imaging of atoms in free space, which will allow us to detect the momentum of every particle in the system. We expect to directly see the formation of Cooper pairs.

Monday, March 23, 2020 09:00am - 10:00am
IST Austria Campus Mondi Seminar Room 2, Central Building

This invitation is valid as a ticket for the IST Shuttle from and to Heiligenstadt Station. Please find a schedule of the IST Shuttle on our webpage: https://ist.ac.at/en/campus/how-to-get-here/ The IST Shuttle bus is marked IST Shuttle (#142) and has the Institute Logo printed on the side.