

Plenary Talk

PV V Wed 9:00 E 415

One, two, three, many: Exploring quantum systems one atom at a time — ●SELIM JOCHIM — Physikalisches Institut, Universität Heidelberg, 69120 Heidelberg, Germany

Experiments with ultracold gases have been extremely successful in studying many body systems, such as Bose Einstein condensates or fermionic superfluids. These are deep in the regime of statistical physics, where adding or removing an individual particle does not matter.

For a few-body system this can be dramatically different. This is

apparent for example in nuclear physics, where adding a single neutron to a magic nucleus dramatically changes its properties. In our work we deterministically prepare generic model systems containing up to ten ultracold fermionic atoms with tunable short range interaction.

In our bottom-up approach, we have started the exploration of such few-body systems with a two-particle system that can be described with an analytic theory. Adding more particles one by one we enter a regime in which an exact theoretical description of the system is exceedingly difficult, until the particle number becomes large enough such that many-body theories provide an adequate approximation.