FAKULTÄT für PHYSIK
LUDWIG-MAXIMILIANS-UNIVERSITÄT
MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 30.11.2017, 16^{15} Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1
Treffen zum gemeinsamen Kaffee 16 Uhr

Prof. Michael Köhl

(Univ. Bonn)

Non-equilibrium physics with strongly-interacting fermions

Ultracold atomic Fermi gases are a new paradigm to study strongly-correlated fermions in the unitary regime. In this talk, I will firstly review experiments shedding light onto the equilibrium properties of this remarkable superfluid, such as the equation of state. Subsequently, I will discuss new experiments exploring the non-equilibrium physics. In particular, I will focus on the collective modes of the superfluid, the most prominent of which are the Higgs and Goldstone modes. Whereas the low-energy Goldstone (phase) mode is always stable, additional symmetries are required to prevent the Higgs (amplitude) mode from rapidly decaying into low-energy excitations. In high-energy physics, where the Higgs boson has been found after a decades-long search, the stability is ensured by Lorentz invariance. In the realm of condensed-matter physics, particle-hole symmetry can play this role and a Higgs mode has been observed in weakly-interacting superconductors. However, whether the Higgs mode is also stable for strongly-correlated superfluids has been subject of numerous discussions. We have observed the Higgs mode in a strongly-interacting superfluid Fermi gas by inducing a periodic modulation of the amplitude of the superconducting order parameter. For strong coupling between the fermions, we observe a defined mode, which, eventually, disappears when the Cooper pairs turn into tightly bound dimers signalling the eventual instability of the Higgs mode.

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