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SPECIAL SEMINAR

סמינר מיוחד

Characterizing a uniform Fermi gas with Raman spectroscopy

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Abstract

In recent years, ultracold Fermi gases were proven to be a powerful platform for advancing quantum technologies and discovering rich many-body physics. The information regarding properties of these systems is often hidden in their momentum distribution, emphasizing the importance of measuring this quantity directly. We perform Raman spectroscopy in which the atoms undergo stimulated absorption and emission of two-photons. In this process, their momentum and energy are changed, which provides a new degree of freedom we control. The significant momentum imprint of the Raman process allows us to probe the atoms momentum distribution and study some of its novel characteristics. In particular, we apply a dynamical decoupling scheme to flatten the confining potential experienced by the atoms. Using this scheme, we generate an atomic ensemble with a spatially uniform density and probe observables, such as the condensed fraction and the contact parameter, without complications arising from varying thermodynamic conditions across the cloud. Theoretically, we show that the periodic driving leaves the interaction Hamiltonian invariant and does not heat the atomic ensemble. We apply Raman spectroscopy in this scenario and verify that the momentum distribution indeed follows the prediction for a homogeneous gas. We also extract the gas temperature and demonstrate the absence of heating by the periodic driving. Finally, we present Raman spectra taken with a strongly-interacting homogeneous Fermi gas in the BEC-BCS crossover regime.

ההרצאה תתקיים ביום שני , ה22.3.21 בשעה 13:30
בזום https://technion.zoom.us/j/91390871568
The lecture will take place on Monday, 22.3.21 at 13:30
Via zoom https://technion.zoom.us/j/91390871568

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