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Interactions and Dynamics of Bosons Embedded in a Fermi Gas

KRUTIK PATEL, GEYUE CAI, University of Chicago, B.J. DESALVO, Indiana University, CHENG CHIN, University of Chicago — Bosons immersed in a degenerate Fermi gas are predicted to interact at long range through excitations of the Fermi surface via the RKKY (Ruderman-Kittel-Kasuya-Yosida) mechanism. This interaction is expected to exhibit oscillations from attractive to repulsive akin to Friedel oscillation with a length scale set by the Fermi energy. We study fermion-mediated interactions based on quantum degenerate mixtures of bosonic ^{133}Cs and fermionic ^6Li , where the large mass-imbalance leads to a small Bose condensate immersed in a much larger degenerate Fermi gas. We employ high-resolution microscopy and a digital micro-mirror device to facilitate detection and control of the mixture at the one micron length scale. We will discuss schemes and progress towards direct observation of the long-ranged interactions mediated by the Fermi gas.

Krutik Patel
University of Chicago

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