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Fermion-mediated interactions in a quantum degenerate Bose-Fermi mixture KRUTIK PATEL, B.J. DESALVO, GEYUE CAI, CHENG CHIN, University of Chicago — When a Bose-Einstein condensate (BEC) is immersed in a degenerate Fermi gas (DFG), the Fermi sea can significantly modify the properties of the condensate. It alters the confinement felt by the condensate, and introduces an effective interaction between bosons mediated by fermionic excitations near the Fermi surface (spinless analog of the Ruderman-Kittel-Kasuya-Yosida mechanism). These interactions are expected to be long-ranged, with a functional form determined by Fermi statistics. We observe experimentally that the presence of degenerate fermions induces an attractive interaction between bosons. Our system is based on a quantum degenerate mixture of ^{133}Cs and ^{6}Li, where the large mass imbalance between the two species allows the Cs BEC to be fully embedded in the much larger Li DFG. Our measurements of the strength of this fermion-mediated interaction are in fair agreement with theoretical predictions. Furthermore, we demonstrate that these interactions can cause qualitative changes to the bosonic ground state, leading to collapse and soliton formation in an otherwise stable BEC.

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