Mediated Interactions of Bosons Embedded in a Fermi Gas

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Particle exchange plays an essential role in the understanding of long-range interactions in high energy and condensed matter physics. For example, the exchange of massive bosons leads to the Yukawa potential. Phonon exchange between electrons gives rise to Cooper pairing in superconductors. Given a Bose-Einstein condensate embedded in a degenerate Fermi gas, we show that interspecies interactions can give rise to an attractive boson-boson interaction mediated by fermions due to the Ruderman-Kittel-Kasuya-Yosida (RKKY) mechanism. We further observe that such mediated interactions can convert a stable BEC into a train of "Bose-Fermi solitons". Future challenges to characterize the nature of the RKKY interactions will be discussed.