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Fermion Pairing Across a Dipolar Interaction Induced Resonance
ZHE-YU SHI, Institute for Advanced Study, Tsinghua University — It is known from the solution of the two-body problem that an anisotropic dipolar interaction can give rise to s-wave scattering resonances, which are named dipolar interaction induced resonances (DIIR). We study the zero-temperature many-body physics of a two-component Fermi gas across a DIIR. In the low-density regime, it is very striking that the resulting pairing order parameter is a nearly isotropic singlet pairing and the physics can be well described by an s-wave resonant interaction potential with finite range conditions, despite the anisotropic nature of the dipolar interaction. The pairing energy is as strong as a unitary Fermi gas near a magnetic Feshbach resonance. In the high-density regime, the anisotropic effect plays an important role. We find phase transitions from singlet pairing to a state with mixed singlet and triplet pairing and then from mixed pairing to pure triplet pairing. The state with mixed pairing spontaneously breaks the time-reversal symmetry.

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