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Polaron Properties of a Fermi Impurity in a Dipolar Condensate[1]

HONG LING, Department of Physics and Astronomy, Glassboro, New Jersey 08028, BEN KAIN, Department of Physics, College of the Holy Cross, Worcester, Massachussets 01610 — Motivated by recent experimental advancement in achieving dipolar quantum gases, we consider a polaronic model in which impurity fermions interact with background bosons in a dipolar Bose-Einstein condensate (BEC). The polaron phenomenon in such a model arises from the coupling between impurities and phonons of the dipolar condensate, which, due to the competition between the attractive and repulsive part of the dipole-dipole interaction, obey an anisotropic dispersion spectrum. We use an effective self-energy on the mass shell to investigate how this anisotropy affects the Cerenkov radiation of Bogolubov phonon modes, which can be directly verified by experiments in which a dipolar BEC moves against an obstacle. We characterize the polarons using Fermi liquid theory and study the spectral function and radio-frequency (rf) spectroscopy of the impurity fermions, which are directly accessible to the rf spectroscopy experiments in cold atoms.

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