

Abstract Submitted
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Superconductivity-induced changes in density-density correlation function enabled by Umklapp processes WEI-CHENG LEE, Binghamton Univ
— Motivated by the midinfrared scenario for high-temperature superconductivity proposed by Leggett, the effects of Umklapp processes on the density-density correlation function in the presence of long-range Coulomb interaction have been investigated. We show that because Umklapp processes enable scatterings that conserve total momentum only up to an integer times the reciprocal wave vector, significant amounts of spectral weight in the plasmonic excitations at long wavelength are transferred into lower frequency around the midinfrared regime. We further find that regardless of the gap symmetry, superconductivity generally suppresses the Umklapp scatterings due to the nature of Cooper pairs. This suppression is unique for the superconductivity due to the interplay between electron pairing and the odd parity of the matrix elements associated with Umklapp channels, which usually does not occur in other known competing orders. Specific predictions for the experimental signatures in optical conductivity and electron energy loss spectroscopy will be discussed.

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