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Optical Conductivity From Pair Density Waves[1] ZHEHAO DAI, PATRICK LEE, Massachusetts Inst of Tech-MIT — We present a theory of optical conductivity in systems with finite-momentum Cooper pairs. In contrast to the BCS pairing where AC conductivity is purely imaginary in the clean limit, there is nonzero AC absorption across the superconducting gap for finite-momentum pairing if we break the Galilean symmetry explicitly in the electronic Hamiltonian. Vertex correction is crucial for maintaining the gauge invariance in the mean-field formalism and dramatically changes the optical conductivity in the direction of the pairing momentum. We carried out a self-consistent calculation and gave an explicit formula for optical conductivity in a simple case. This result applies to the Fulde-Ferrell-Larkin-Ovchinnikov state and candidates with pair density waves proposed for High-Tc cuprates. It may help detect PDW and determine the pairing gap as well as the direction of the pairing momentum in experiments.

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