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Identifying a forward scattering superconductor through pump-probe spectroscopy ANKIT KUMAR, Department of Physics, North Carolina State University, STEVEN JOHNSTON, Department of Physics and Astronomy, The University of Tennessee, ALEXANDER KEMPER, Department of Physics, North Carolina State University — Understanding the mechanism behind high temperature superconductivity has been one of the challenges in condensed matter physics. The particular momentum structure of the electron-boson coupling plays a crucial role in the formation of Cooper pairs, which can lead to the enhanced superconductivity. One such example is electron-phonon interaction that is peaked in the forward direction. This interaction has been suggested as an essential ingredient for enhanced superconductivity observed in FeSe monolayers on STO substrates. We study the superconducting state of a system dominated by forward scattering using non-equilibrium methods and contrast its behavior against the standard isotropic BCS case. An analysis of the electron's dynamics in the pump-driven non-equilibrium state reveals that the superconducting order in the forward-focused case is robust and persistent against the pump-induced perturbations. The superconducting order parameter also exhibits a non-uniform melting in momentum space, which could be measured by time-resolved ARPES. We show that this behavior is in sharp contrast to the isotropic interaction case and propose that time-resolved approaches are a potentially powerful tool to differentiate the nature of the dominant coupling in correlated materials.

Ankit Kumar
North Carolina State Univ

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