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Low Temperature Thermal Conductivity in Cuprate Superconductors Amidst Coexisting Charge Order: Part II - Effect of Self-Consistent Disorder and Vertex Corrections PHILIP SCHIFF, ADAM DURST, Stony Brook University — As in Part I, we consider a d-wave superconductor (dSC) in which the superconductivity coexists with charge density wave (CDW) order of wavevector (π,0). Here we discuss two significant improvements to the calculation of the low temperature thermal conductivity. First, rather than taking the 4-by-4 self-energy matrix to be a scalar and a constant, independent of the CDW order parameter, we compute it from an impurity density and scattering potential, within the self-consistent Born approximation. We find that self-consistency requires two off-diagonal terms in the self-energy matrix, in addition to the diagonal term. Furthermore, we find that these off-diagonal terms dominate in the clean limit. Second, we include ladder corrections to the bare vertex, as required to satisfy Ward identities. We compute their contribution, which is verified to be small in the low impurity density limit. However, the contribution of the off-diagonal terms in the self-energy matrix is found to be quite important, significantly reducing the critical value of the CDW order parameter beyond which the thermal conductivity vanishes. Results are used to identify signatures of the effect of charge order on low temperature thermal conductivity, with an eye toward understanding the effect of charge order on quasiparticle transport in the underdoped cuprates.

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