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Strange thermal transport properties of $(Ca_xSr_{1-x})_3Rh_4Sn_{13}$ below the superconducting transition temperature XIAOYE CHEN, University of Cambridge, SWEE K. GOH, The Chinese University of Hong Kong, HIBIKI KANAGAWA, MASAKI IMAI, KAZUYOSHI YOSHIMURA, Kyoto University, MICHAEL SUTHERLAND, University of Cambridge — The quasi-skutterudite superconducting material family $(Ca_xSr_{1-x})_3Rh_4Sn_{13}$ have a composition induced structural quantum phase transition that can be suppressed to zero temperature. [1] The resulting soft phonon modes bring about many intriguing effects, like increasing electron-phonon coupling and enhanced superconductivity. [2] At temperatures well below the superconducting transition temperature T_c, we expect the thermal conductivity of the sample to be dominated by phonons, which in the boundary scattering limit, is proportional to T^3 - the temperature dependence of the heat capacity. Here, we discuss the thermal conductivity measurement of six samples of $(Ca_xSr_{1-x})_3Rh_4Sn_{13}$ spanning the phase diagram, and show that the thermal conductivity exhibits a temperature dependence that is well below T^3 near the critical doping. Through a comparison with other thermodynamic measurements as well as theoretical calculations, we consider the consequences of scattering from soft phonon modes near the critical region for heat transport.

[1]S. Goh et al., Phys. Rev. Lett. **114**, 097002 (2015).
[2]W. C. Yu et al., Phys. Rev. Lett. **115**, 207003 (2015).

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