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The Nature of the Superconductivity of Tl_5Te_3 KATHRYN ARPINO, DAVID WALLACE, SEYED KOOHPAYEH, JIAJIA WEN, The Johns Hopkins University, KATHARINE PAGE, Lujan Neutron Scattering Center, Los Alamos National Laboratory, TINGYONG CHEN, Arizona State University, C.L. CHIEN, TYREL MCQUEEN, The Johns Hopkins University — The search for topologically non-trivial states of matter, such as topological insulators, has sparked significant interest in the impact of spin-orbit coupling on strongly correlated electronic behaviors, such as superconductivity. The known compound Tl_5Te_3 exhibits a superconducting transition at $T_c = 2.4$ K, and contains heavy elements, making it an ideal compound in which to look for new physics at the intersection between superconductivity and strong spin-orbit coupling. In 1973, Haemmerle et al. conjectured that two-gap superconductivity might explain previous anomalous superconducting volume fractions observed in their polycrystalline samples. We have reinvestigated the superconductivity of Tl_5Te_3 using magnetic susceptibility, heat capacity, and point contact measurements on powder and single crystal samples, and resolved these previous discrepancies. Further, we report on long-range and local structure determination of superconducting and non-superconducting Tl_5Te_3 samples, as well as the relationship between structural details and the observed superconductivity.

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