

Dirac Fermions and Possible Weak Antilocalization in LaCuSb₂

Institute for Quantum Matter EFRC DE-SC0019331

Scientific Achievement

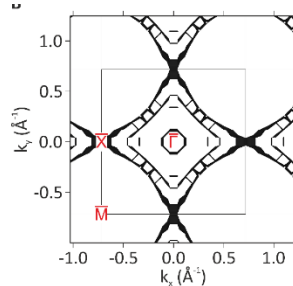
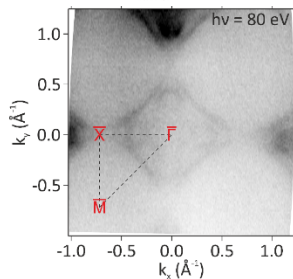
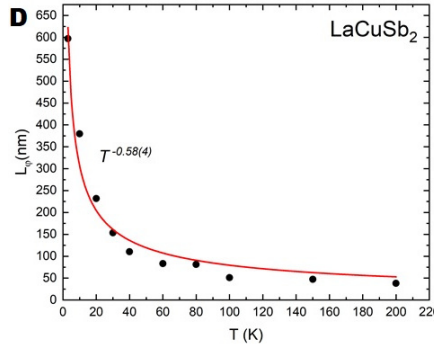
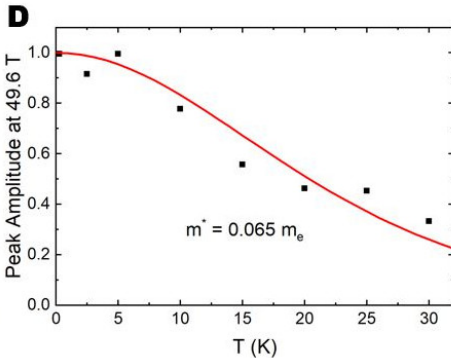
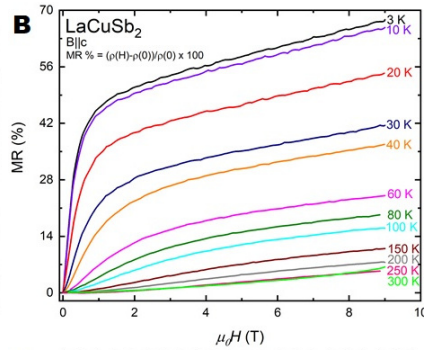
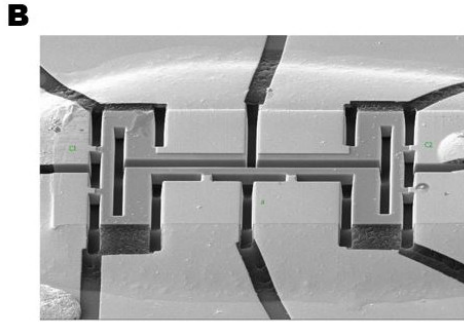
We predicted and then experimentally showed that LaCuSb₂, previously reported to be superconducting, hosts Dirac fermions with an effective mass of 0.06 m_e.

Significance and Impact

The finding of Dirac fermions in a putative family of superconductors enables the study of the connections between topology and superconductivity. In this material we further find experimental evidence for weak antilocalization where the sharpness of the “kink” in magnetoresistance versus field seemingly evades a simple two-band origin that has been used to explain prior observations of this phenomenon. Further, our findings provide experimental validation that square net lattices can effectively host topological behavior.

Research Details

The growth of cm-scale single crystals via a flux route combined with micron-scale device fabrication enabled the joint use of spectroscopic (ARPES) and transport, including SdH measurements, to probe the Dirac physics of this material. Sensible interpretation of the Hall data required consideration of the Hall angle to find a carrier density of 2.7·10¹⁸ cm⁻³. Finally, contrary to prior reports, the as-grown material does not exhibit superconductivity down to T = 0.27 K; exploration of T_c versus carrier density is in progress.



J.R. Chamorro, A. Topp, Y. Fang, M.J. Winiarski, C.R. Ast, M. Krivenkov, A. Varykhalov, B.J. Ramshaw, L.M. Schoop, and T.M. McQueen, invited submission (2019)



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