Poster 10

Signatures of a charge-density wave quantum-critical point in superconducting 2H-TaS_{2-x} induced by disorder

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Many superconductors exist in close proximity to various forms of electronic order, particularly in unconventional superconductors and transition-metal dichalcogenides, where charge-density-waves (CDWs) and superconductivity can coexist and compete. Anomalous electrical transport behaviour is often exhibited when such superconductors are tuned to a quantum critical point where superconductivity is optimized. Despite extensive research efforts, the origin of such strange-metal behaviour remains a mystery. Here we report the evolution of long-range CDW and superconductivity in 2H-TaS_{2-x} with various levels of disorder induced by sulfur vacancies. Measurements of complementary magnetization, electronic and thermal transport properties show that the long-range CDW is continuously suppressed, leading to strange-metal behaviour with linear resistivity at the endpoint of the long-range CDW, which is accompanied by the emergence of a short-range CDW phase. The superconductivity shows at first a two-step-like behaviour but reaches a maximum at the endpoint of long-range CDW with a single homogeneous phase, suggesting an interplay between superconductivity and CDW order. Moreover, our results suggest that the strange-metal behaviour, which could arise from the short-range charge density fluctuations, is a signature of quantum criticality with Planckian dissipation.