Electronic dimensionality in UTe_2 probed by FIB microstructures

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The heavy-fermion superconductor UTe2 hosts multiple superconducting phases. Probing the anisotropy of the reinforced superconductivity along the b-axis (SC2) is challenging due to its field-dependent order parameter. Anisotropic voltages measured in the flux-flow regime evidence unexpectedly strong two-dimensionality in the SC2 phase, contrasting with the low anisotropy of its zero-field superconductivity. Experiments are based on electronic transport measurements with varying current densities along different crystalline axes in a focused-ion-beam-fabricated microstructure. The high-current-measurement is ensured by high-quality contact, achieved through a combination of RF etching and sputtering techniques. While a-direction currents induce negligible voltage up to 35T in high current densities, substantial flux-flow voltage is observed for c-direction currents even at the lowest current density applied. This large vortex mobility vanishes with small field misalignment above 4° off H\\b. These results suggest a strong vortex lock-in effect, typically induced by strong modulation of the order parameter in layered superconductors, such as pnictides or cuprates.