Supplementary Information

Comparison of two superconducting phases induced by a magnetic field in UTe_2

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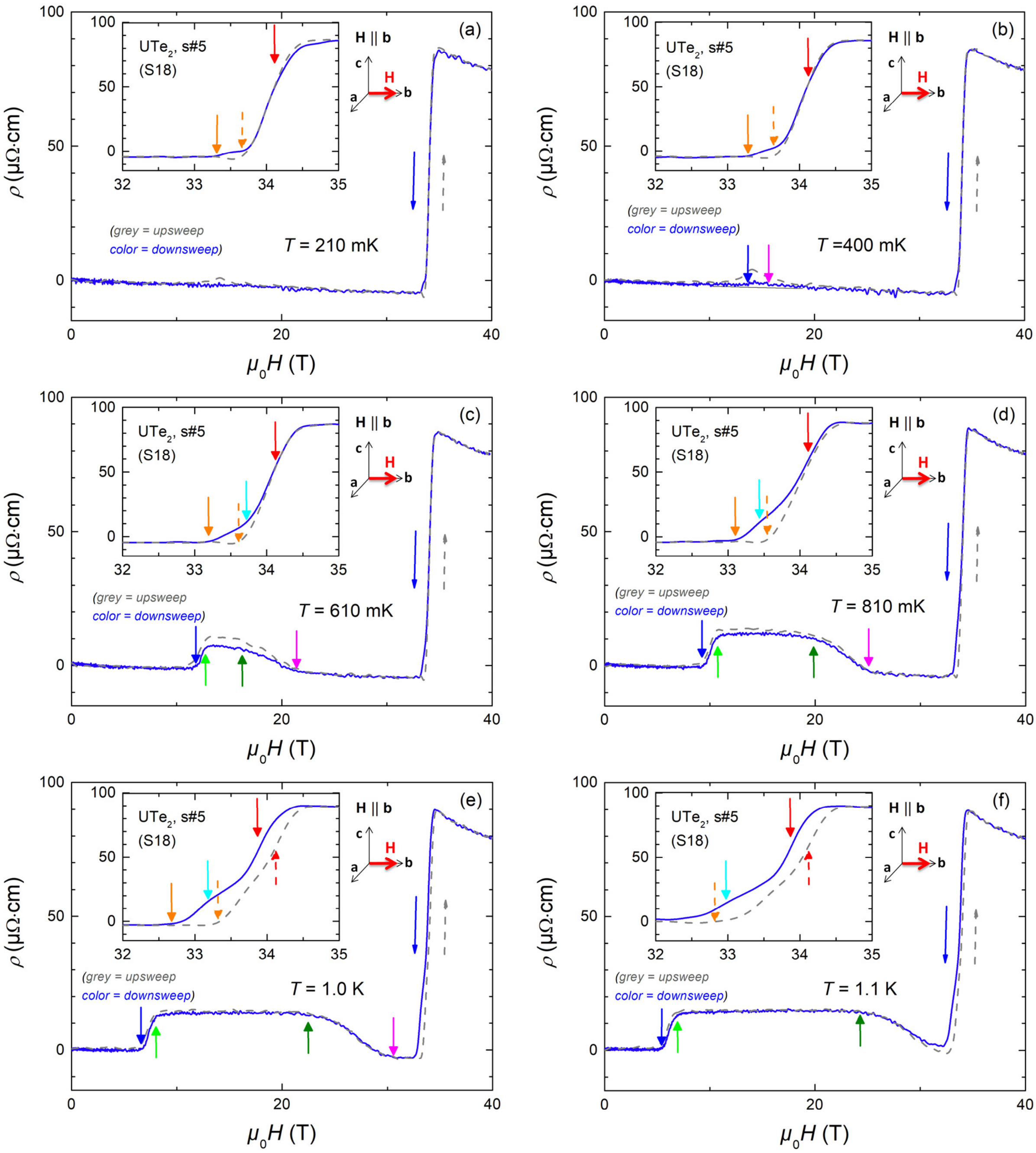
Supplementary Note 1

In Supplementary Figures 1-4, we present complementary plots of the low-temperature resistivity data. In particular, a comparison of field-up and field-down data is shown, indicating almost negligible eddy current heating of the sample in the magnetic field pulses.

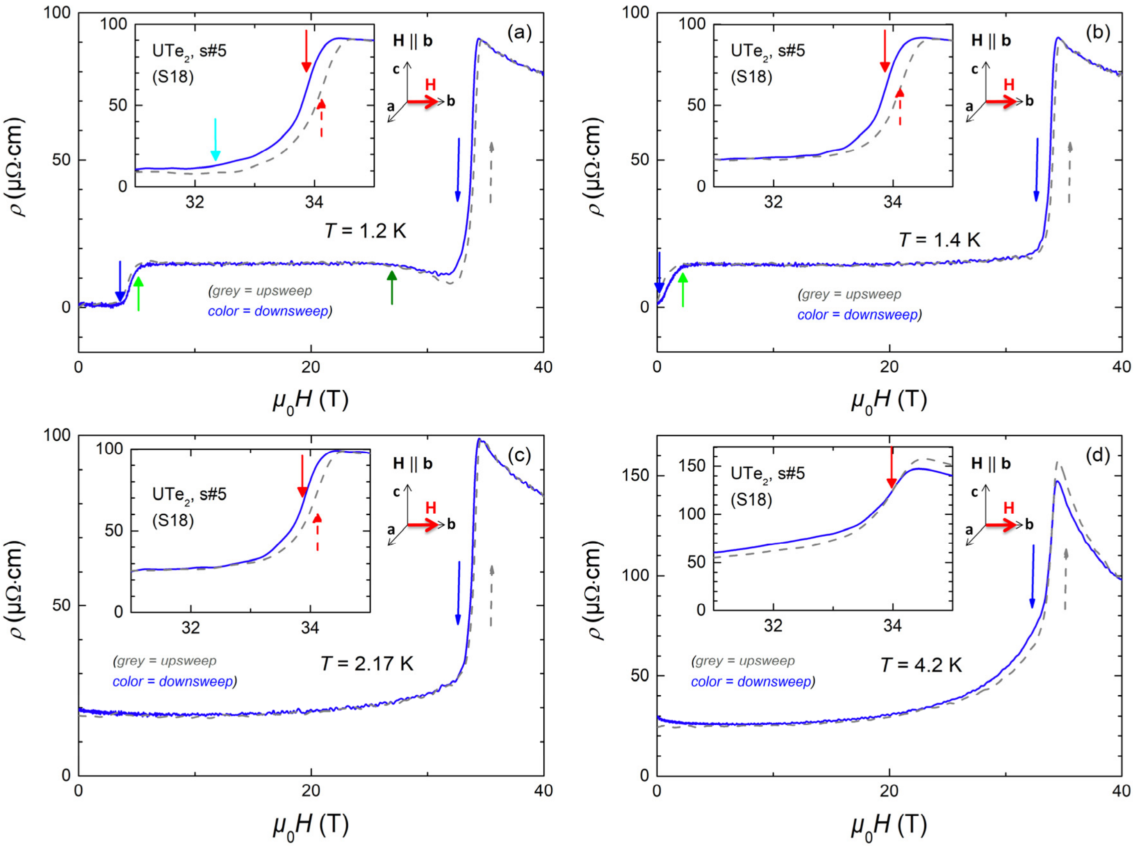
Supplementary Figure 5 (a) shows a zoom on the low-temperature resistivity of UTe_2 in a magnetic field **H**||**b** close to H_m. A small negative value of ρ is due to out-of-phase contamination in the resistive signal in high fields. At $T = 1$ and 1.4 K, a hysteresis of field width $\Delta H = 0.25$ T is visible at the first-order transition field H_m, which reaches 33.9 and 34.15 T (minimum of slope of ρ) for falling and rising fields, respectively. Supplementary Figure 5(b) shows that the hysteresis observed at H_m at $T = 1.8$ and 2.2 K is lost at low temperatures once superconductivity develops. We do not understand the reason of this feature in our pulsed-field data. We note that a hysteresis, observed at temperatures down to 450 mK, was found to extend up to 35.5 T in a steady magnetic field by Niu *et al* [59]. No out-of-phase contamination is observed in this set of data.

Supplementary Figure 6 presents resistivity versus temperature plots in magnetic fields **H** || **b** and **H** tilted by 27±5 ° from **b** in the (**b**,**c**) plane. In Supplementary Figure 7, the Fermi-liquid like fits to the electrical resistivity data are presented. These fits were used to extract the magnetic-field variations of the quadratic coefficient A and of the residual resistivity ρ_0.

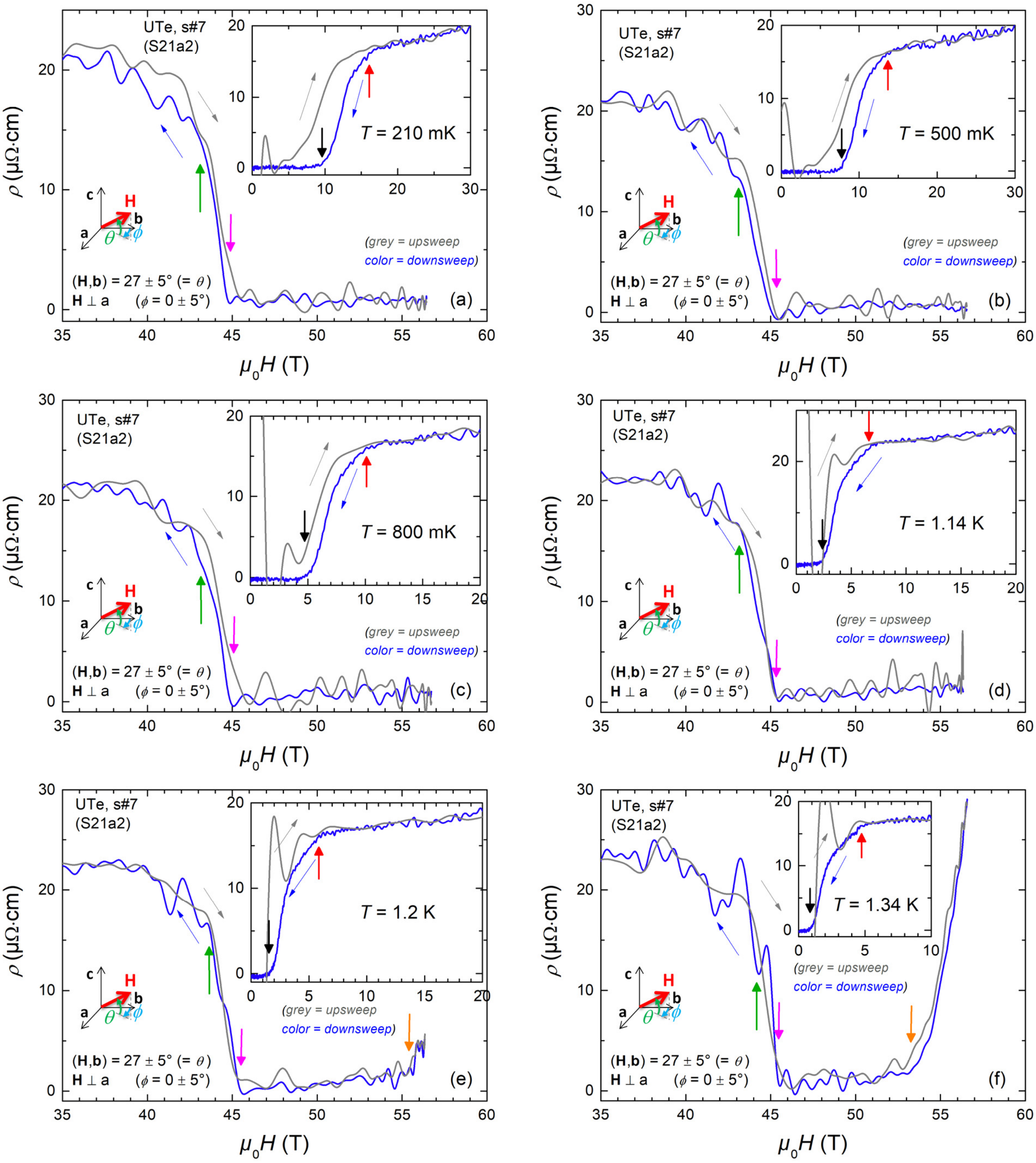
Supplementary Figures



Supplementary Figure 1. Electrical resistivity of UTe$_2$ in a magnetic field H||b. Comparison of field-up and field-down sweeps at temperatures from 210 mK to 1.1 K.



Supplementary Figure 2. Electrical resistivity of UTe_2 in a magnetic field H||b. Comparison of field-up and field-down sweeps at temperatures from 1.2 K to 4.2 K.



Supplementary Figure 3. Electrical resistivity of UTe_2 in a magnetic field H tilted by 27±5 ° from b in the (b,c) plane. Comparison of field-up and field-down sweeps at temperatures from 210 mK to 1.34 K.

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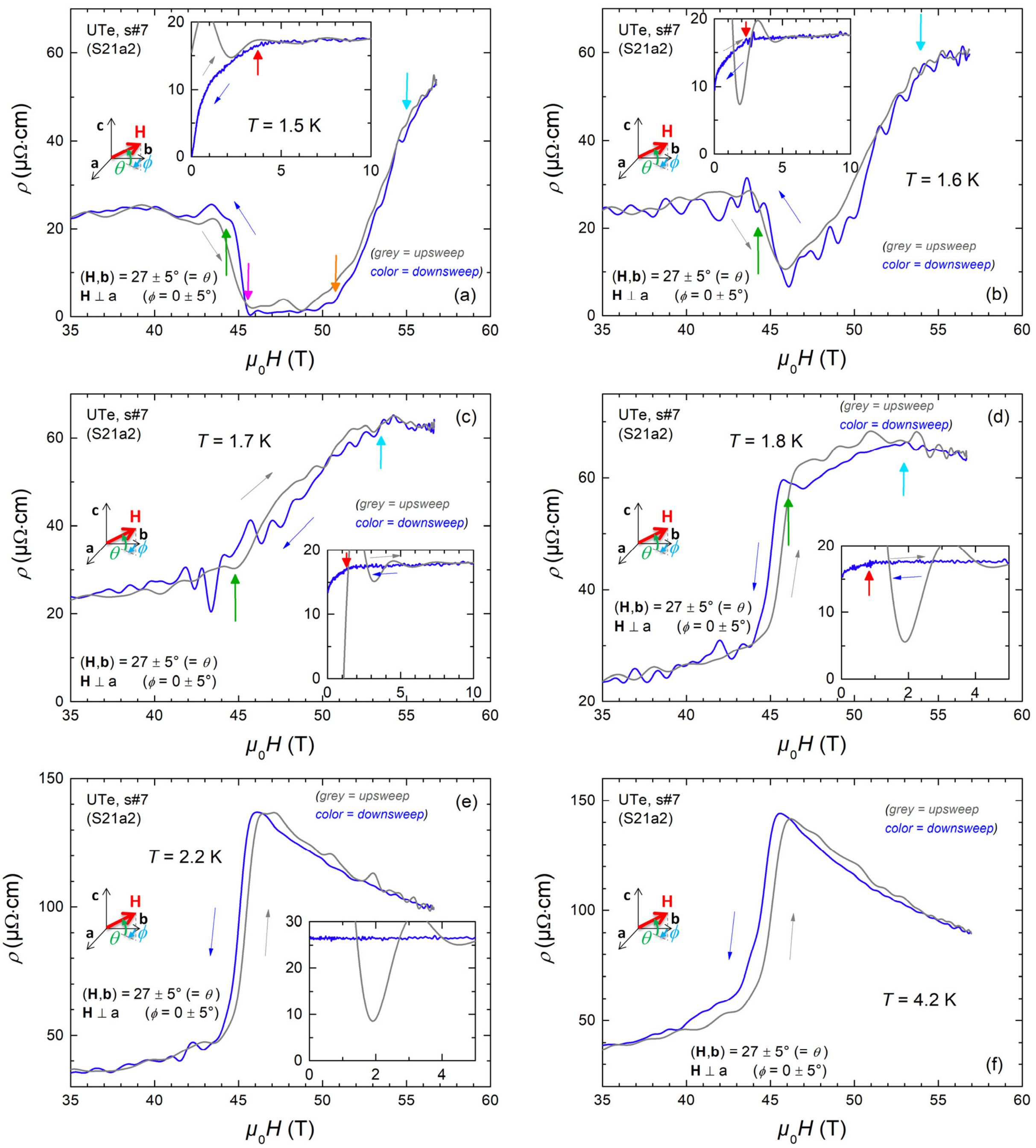
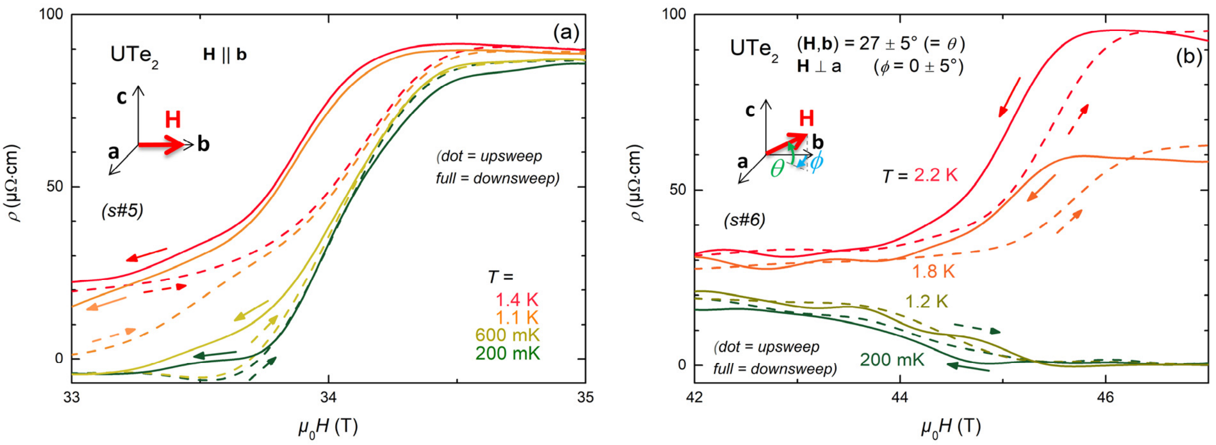
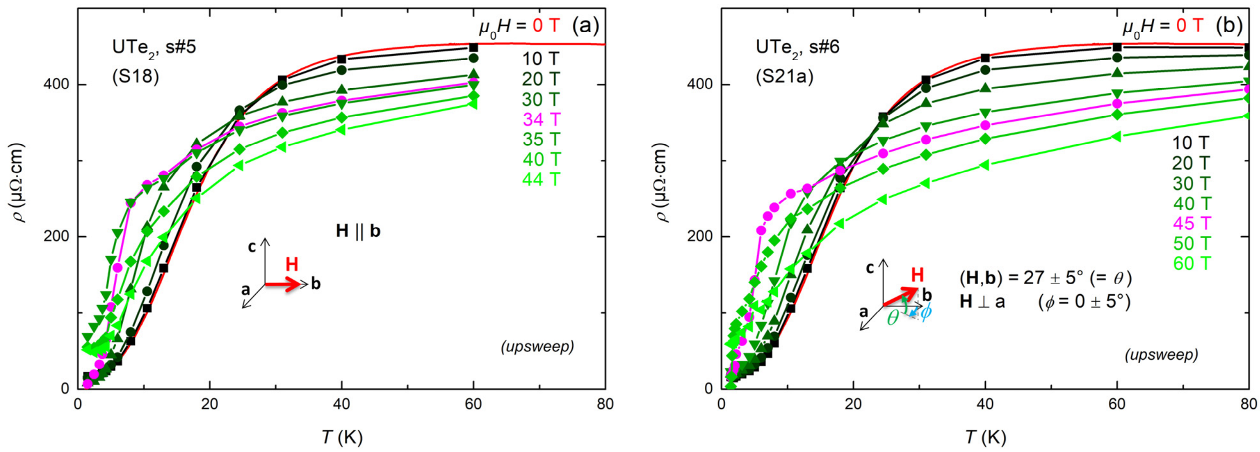


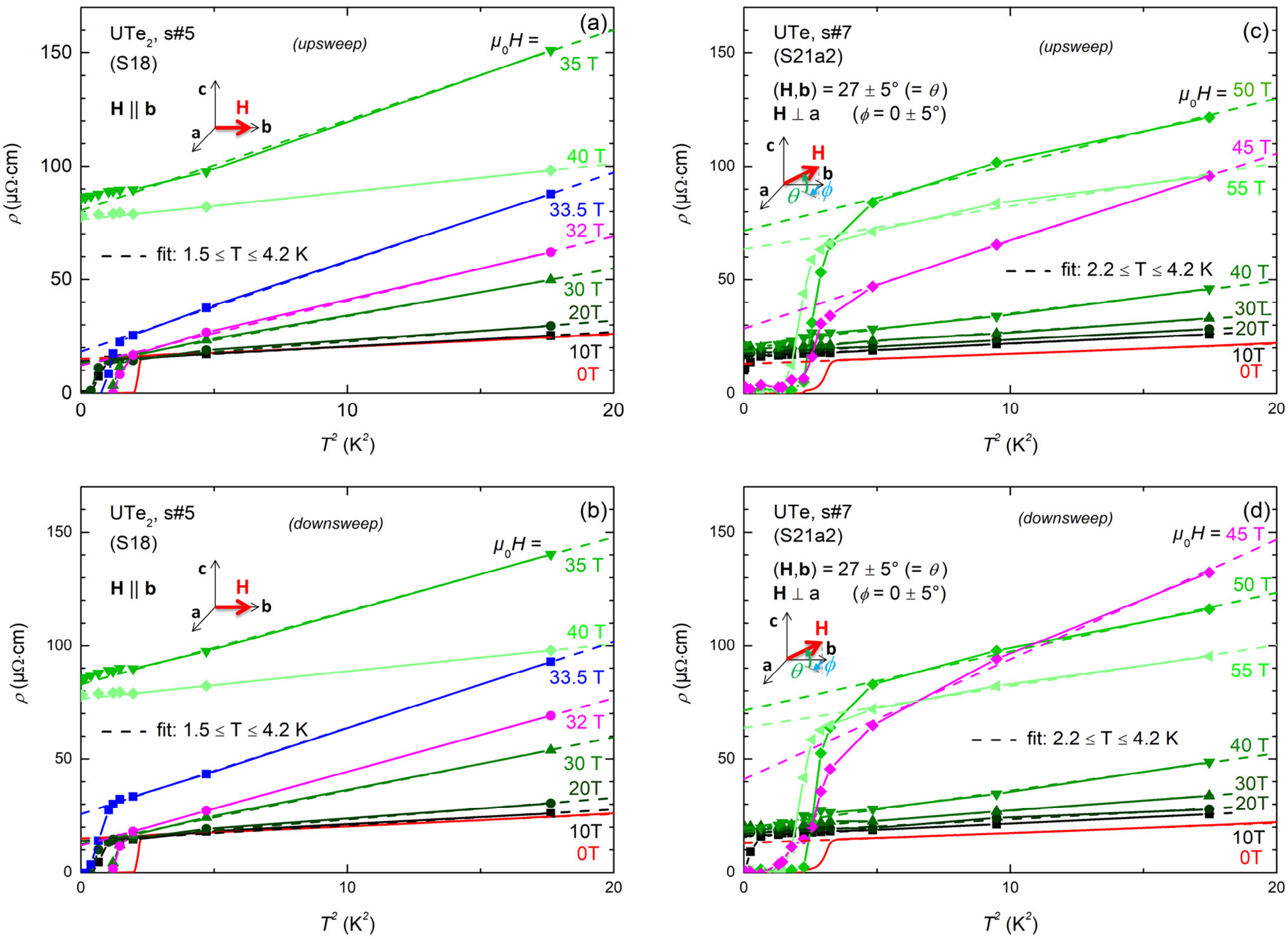
Supplementary Figure 4. Electrical resistivity of UTe_2 in a magnetic field H tilted by 27±5 ° from b in the (b,c) plane. Comparison of field-up and field-down sweeps at temperatures from 1.5 K to 4.2 K.



Supplementary Figure 5. Electrical resistivity of UTe_2 in the vicinity of the metamagnetic transition. (a) Low-temperature resistivity of UTe_2 in a magnetic field **H**||**b**. (b) Low-temperature resistivity of UTe_2 in a magnetic field **H** tilted by 27±5 ° from **b** in the (**b**,**c**) plane.



Supplementary Figure 6. Electrical resistivity of UTe_2 versus temperature in magnetic fields H || b and H tilted by 27±5 ° from b in the (b,c) plane. Data are presented for field-up sweeps.



Supplementary Figure 7. Electrical resistivity of UTe_2 versus square of temperature and its T^2 fits in magnetic fields H ||b and H tilted by 27±5 ° from b in the (b,c) plane. Data are presented for field-up and field-down sweeps.