Abstract

In moiré heterostructures, gate-tunable insulating phases driven by electronic correlations have been recently discovered. Here, we use transport measurements to characterize the gate-driven metal-insulator transitions and the metallic phase in twisted WSe2 near half filling of the first moiré subband. We find that the metal-insulator transition as a function of both density and displacement field is continuous. At the metal-insulator boundary, the resistivity displays strange metal behaviour at low temperature with dissipation comparable to the Planckian limit. Further into the metallic phase, Fermi-liquid behaviour is recovered at low temperature which evolves into a quantum critical fan at intermediate temperatures before eventually reaching an anomalous saturated regime near room temperature. An analysis of the residual resistivity indicates the presence of strong quantum fluctuations in the insulating phase. These results establish twisted WSe2 as a new platform to study doping and bandwidth controlled metal-insulator quantum phase transitions on the triangular lattice.