kiutra

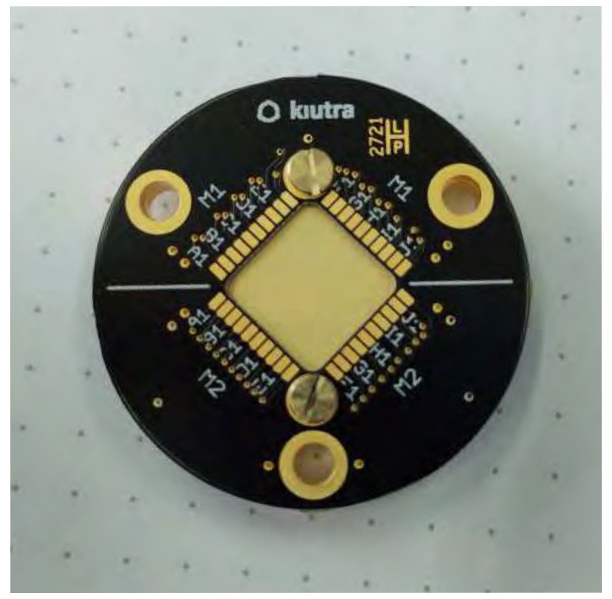
APPLICATION NOTE

L-Type Rapid

Resistivity of thin-film samples

Simple sample preparation

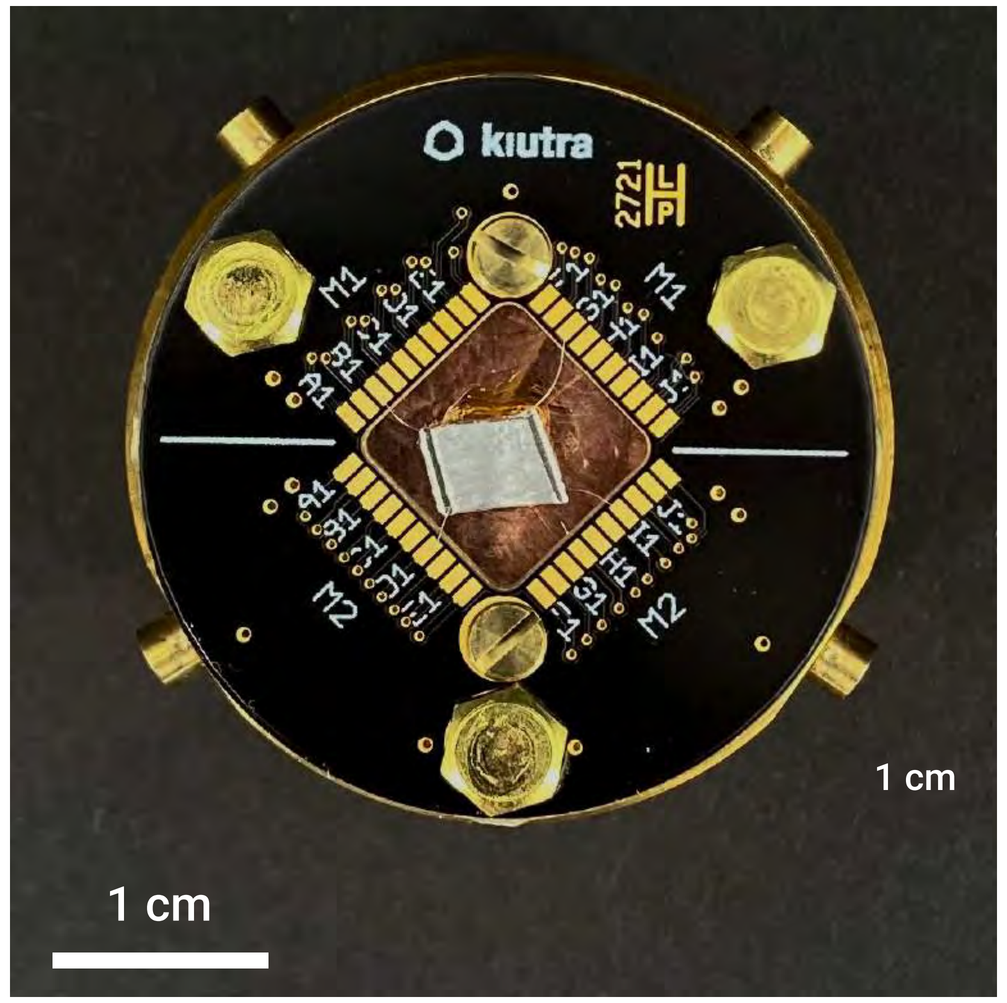
Using kiutra's Sample Carrier Pads or a similar custom sample holder helps optimizing the testing process and shorten sample preparation time. By having a large number of similar sample holders available, the operator can use an automatic wire bonder to prepare a sample on these carrier pads, which are then easily mounted onto the Puck. Large batches of samples can then be stored ready to be loaded in the L-Type Rapid minimizing the down time between measurements.



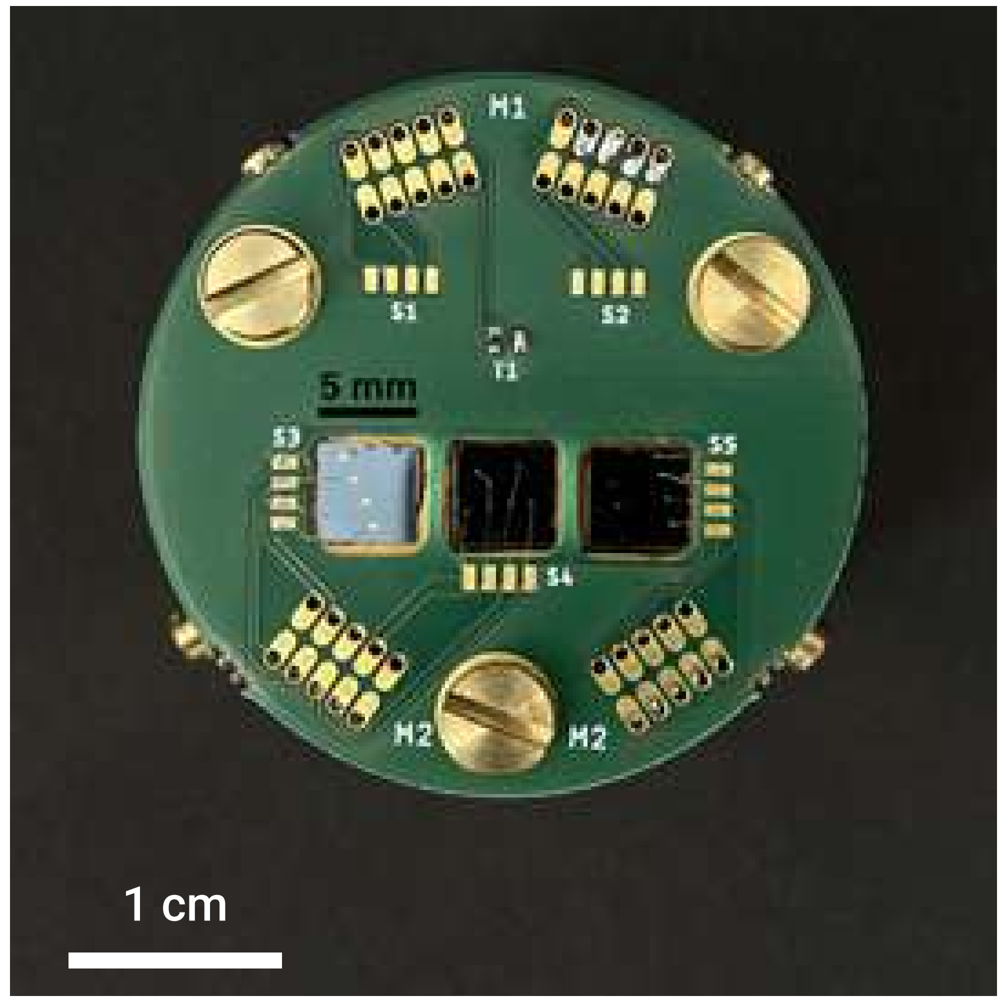
Sample Carrier Pad 40
top view

Sample Carrier Pad 40
bottom view

Sample Carrier Pad 40
mounted on RF Puck 36



Thin film sample wire bonded on a standard kiutra Sample Carrier Pad 40.



Custom PCB-based sample holder for 4-point resistivity measurements of up to three samples, simultaneously.

Courtesy of Walter-Schottky-Insitute, TUM.

Resistivity of thin-film samples

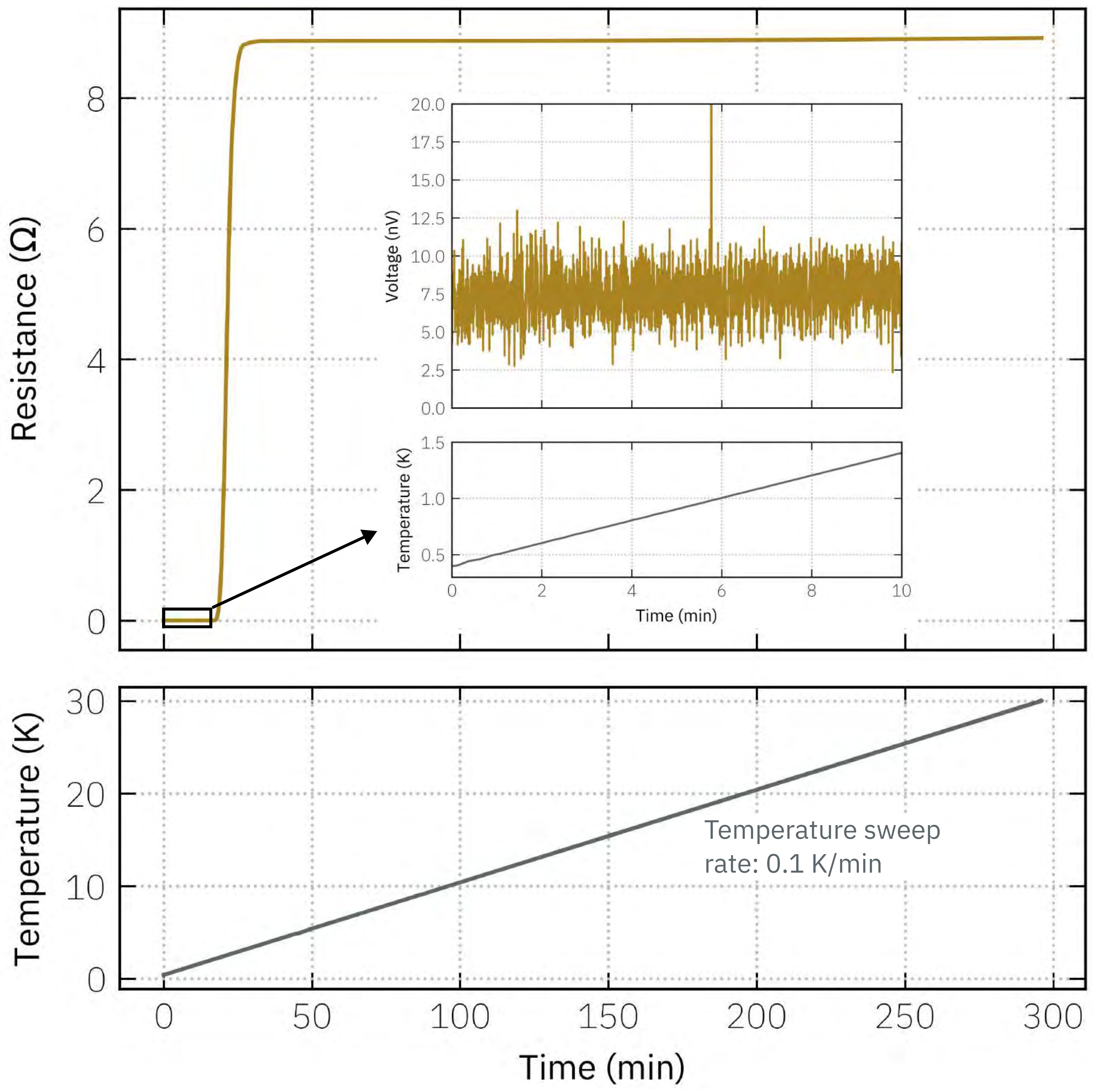
Large temperature range

The L-Type Rapid combines closed-cycle refrigeration with continuous adiabatic demagnetization refrigeration (cADR) to offer continuous temperature ramps from 100 mK to room temperature. Our intelligent temperature controller handles the cooling completely automatically providing a very stable temperature ramp over a large temperature range.

Tracking a superconducting transition

To identify the superconducting transition in a thin-film material, typically four-point voltage measurements are performed using a lock-in technique.

The figure shows the superconducting transition of a Tantalum film on an Silicon substrate. The data was recorded using a lock-in amplifier in an L-Type Rapid cryostat. It shows a very homogenous temperature control rate from < 500 mK to 30 K at an ultra-low noise level of < 5 nV rms.



Temperature dependence of the resistivity of a thin film from 0.4 K to 30 K measured in a single temperature sweep with a stable rate of 0.1 K/min.

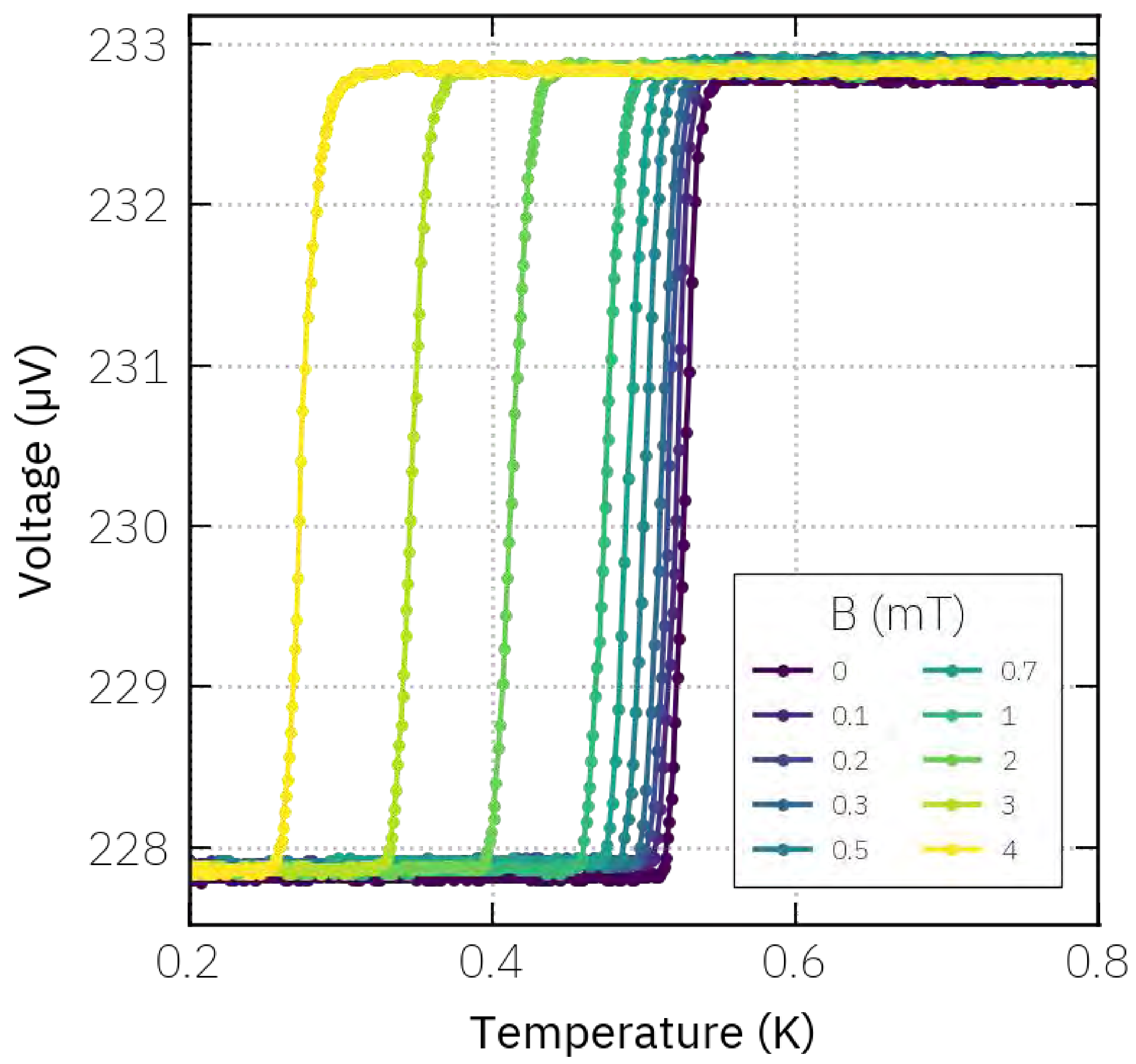
Resistivity of thin-film samples

Magnetic field dependence

To study magnetic properties of various materials and devices such as magneto-resistance and Hall effect, a Sample Magnet generating a homogeneous field of up to 5 Tesla at the sample position can be integrated in the L-Type Rapid cryostat.

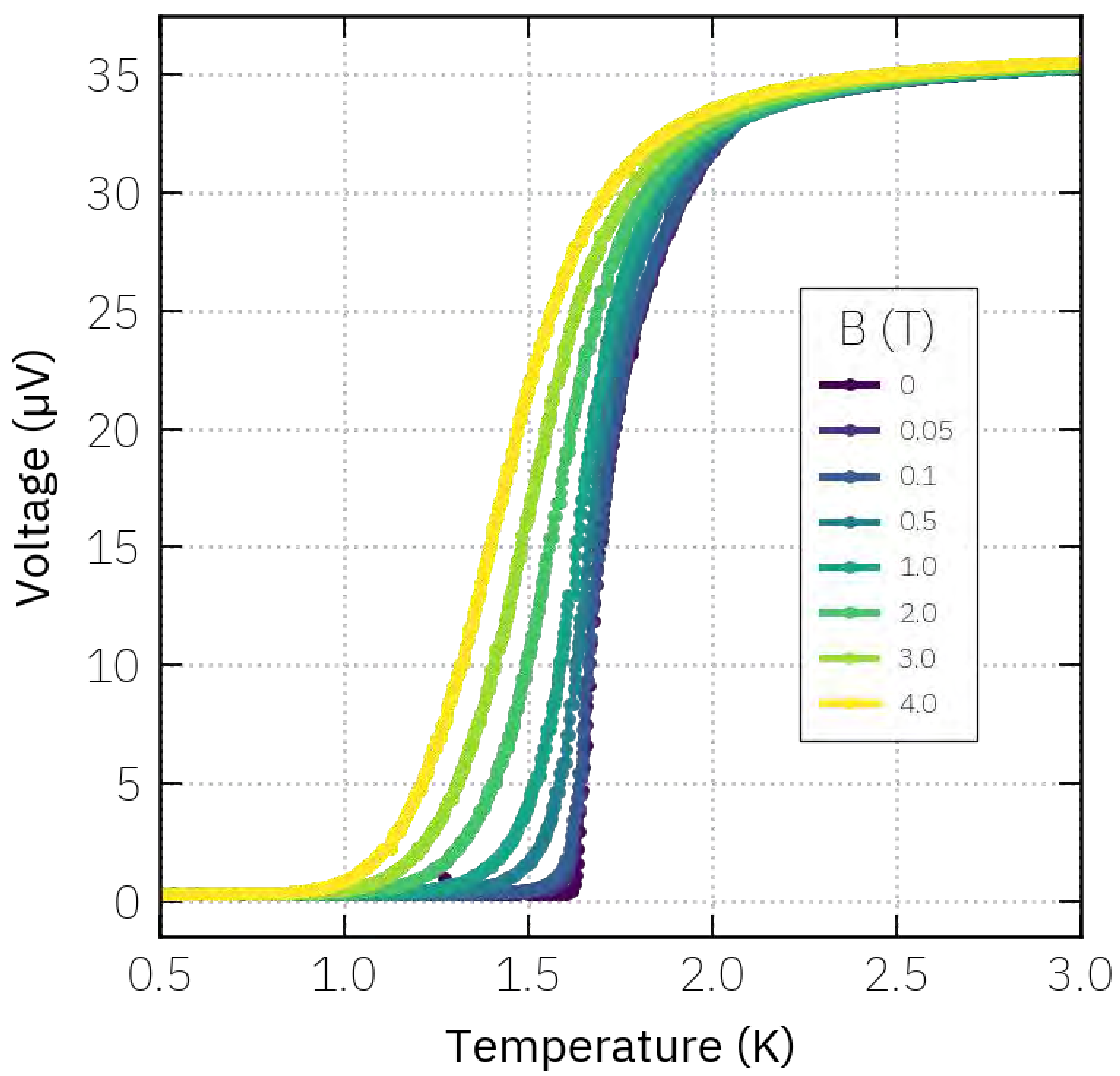
The superconducting electromagnet is powered using a bipolar digital power supply allowing for a high precision control of the magnetic field with steps smaller than 0.1 mT (1 G).

Magnet operation is compatible with magnetic cooling and doesn't disturb the temperature control in the ADR mode.



Thin film measurements at sub-Kelvin temperatures and very small magnetic fields.

Courtesy of SEEQC.



Thin film measurements covering a wide temperature range below 4 K at various magnetic fields, up to 4 T.

Courtesy of Walter-Schottky-Insitute, TUM.