Quantum Design

van der Pauw-Hall

DynaCool (D542) / PPMS (P542) / VersaLab (V542)

The van der Pauw technique allows for the determination of a material's resistivity for a sample of arbitrary shape so long as it is uniformly thick. To achieve optimal accuracy using this technique, multiple unique permutations of the current and voltage leads must be measured and properly averaged. The van der Pauw – Hall Option automatically performs these measurements and calculations so highly accurate resistivity measurements can be easily conducted as a function of temperature or magnetic field. The same switching and measurement hardware can further be leveraged to acquire the Hall coefficient and infer the charge carrier concentration with the application of sufficiently strong magnetic fields. With both the resistivity and the Hall coefficient known, the software can automatically calculate the carrier mobility μ as a function of temperature across the full range of the PPMS.

van der Pauw – Hall Transport Specifications*

Resistance [R]

Range:	10 $\mu\Omega$ to 5 MΩ
Sensitivity:	15 nV RMS typical**

Drive Parameters

Current Range:	2 nA to 8 mA
Compliance Voltage:	4 V, maximum
Frequency:	5 Hz square wave
Operational Range:	1.8 to 400 K; 0 to 16 T

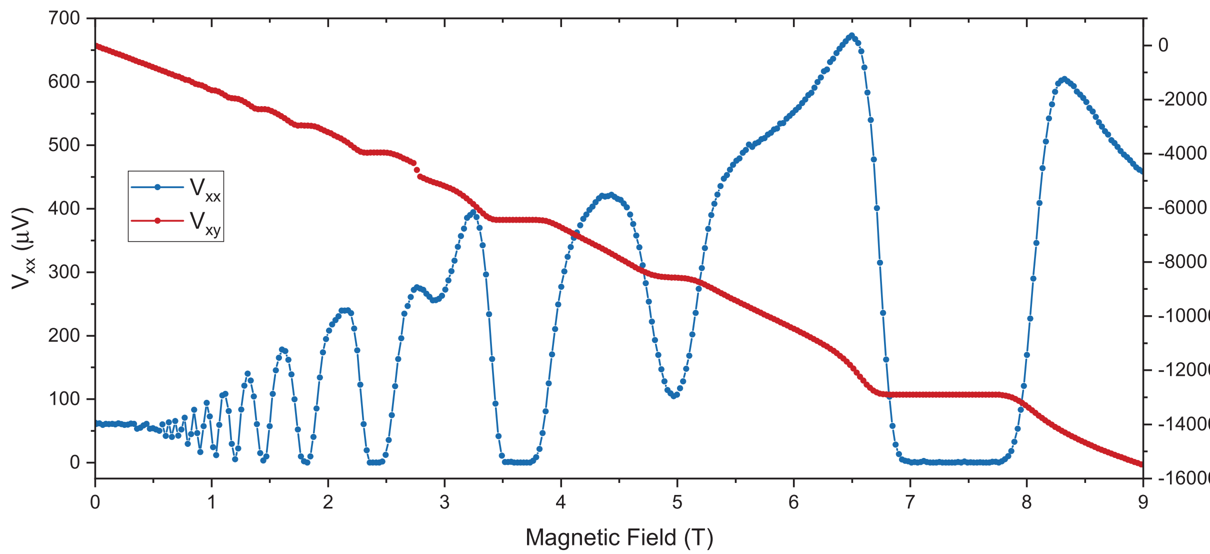
*The vdP-H Option uses the DC Resistance hardware for measurements and thus shares its specifications.
**This corresponds to 2 $\mu\Omega$ at 8 mA excitation.

Specifications are subject to change without notice.

Automated switching controller

Key Features:

- Option software fully integrated to MultiVu, enabling sequence commands to configure a measurement of the van der Pauw resistivity, Hall coefficient, or combined mobility.
- IV-Curve utility allows for a measure of sample contact quality to be made at the start of every single measurement
- Switching wiring permutations is handled automatically by MultiVu for common measurements (vdP, Hall, mobility)



Field-dependent longitudinal and transverse voltage signals measured for a GaAs 2-D electron gas system at 1.7 K with 1 µA sourced DC excitation current in the van der Pauw geometry. In the upper frame, plateaux demonstrating the integer quantum Hall effect correspond to where the Fermi level falls in an area of localized states between neighboring Landau levels. Sample provided by M. Pendharkar, Chris Palmstrøm Group, University of California Santa Barbara.