

# PPMS<sup>®</sup> VersaLab<sup>®</sup>

A cryogen-free  
material characterization  
platform for quantum  
materials teaching labs



 Quantum Design

[discoveryteachinglabs.com](http://discoveryteachinglabs.com) | [qdusa.com](http://qdusa.com)



Experimental teaching lab courses, in particular those devoted to material characterization, are in need of an update in order to keep up with the next generation of materials research. Typically, a given lab-based course experiment takes one of two forms. The first being a completely makeshift combination of various disparate, and often aged, components. The second is the highly polished commercial setup that is typically better suited for lecture-based demonstrations and are rarely able to perform more than one type of measurement. While both types of experimental setups do have a place as an educational tool, neither is particularly versatile nor adaptable to a wide range of materials characterization techniques.

The VersaLab provides an easy-to-use cryogen free measurement platform capable of measurements spanning 50-400 K and magnetic fields up to 3 tesla. As the name suggests, the VersaLab is incredibly versatile, enabling an industry standard suite of electric, thermal, and magnetic measurement capabilities in one easy-to-use instrument.



### Access to Advanced Equipment:

Provide students hands-on experience with research-grade instrumentation, enhancing their experimental skills and deepening their understanding of advanced scientific concepts early in their academic career.

### Curriculum Enhancement:

Offer engaging and relevant educational experiences, ensuring students are exposed to the latest techniques and technologies, thereby elevating the overall quality of the STEM education offered by your institution.

### Career Preparedness:

Equip students with practical experience and proficiency in using advanced scientific instruments, enhancing their employability and readiness for careers in academia, research and industry sectors, all which value hands-on technical skills and experimental problem-solving capabilities.

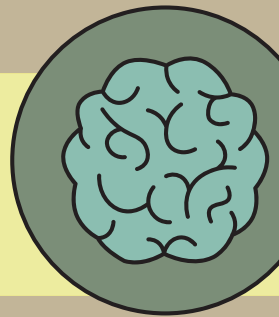
**Portable, cryogen-free** cryocooler-based material characterization platform. Allows students to gain hands-on experience in sample testing using a world class physical properties measurement system.

- Automated temperature and field control
- World class measurement performance in a small, portable package
- A growing collection of vetted, step-by-step experiments for the teaching of solid-state physics
- Customizable scripting for custom experiments
- Freedom from liquid cryogenes
- Freedom from cooling water and high-power requirements



Learn More

Customizable | Easy to Use | Versatile  
**Education and Research**



# Prepared Curricula: Education Modules

13 (and growing) freely available education modules each with detailed descriptions and methodologies including:



## ELECTRICAL

- Hall Effect Measurement in Copper
- Hall Effect Measurement in Germanium
- YBCO Synthesis and Characterization
- $\text{Fe}_3\text{O}_4$  (Magnetite) Electronic Characterization



## THERMAL

- Heat Capacity Measurement of Vanadium Oxide Powder
- Thermal Transport of Nickel Alloy, Semiconductor and Lanthanide Samples
- Heat Capacity of  $\text{Fe}_3\text{O}_4$  (Magnetite)

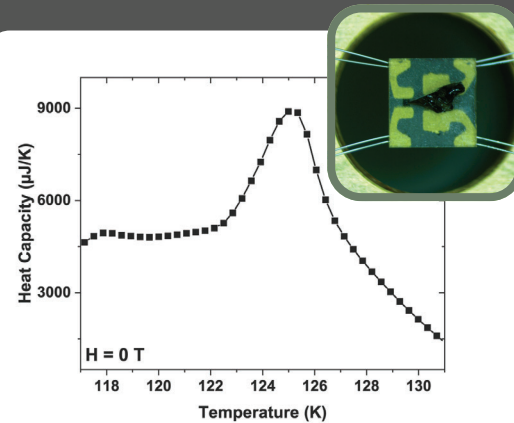
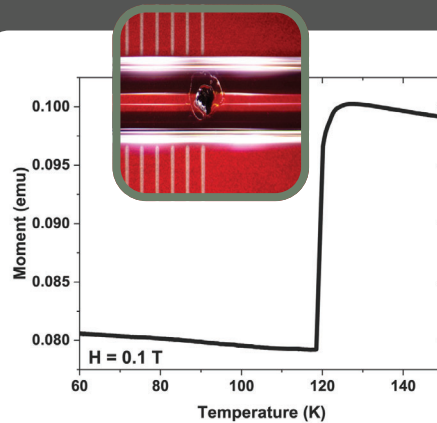
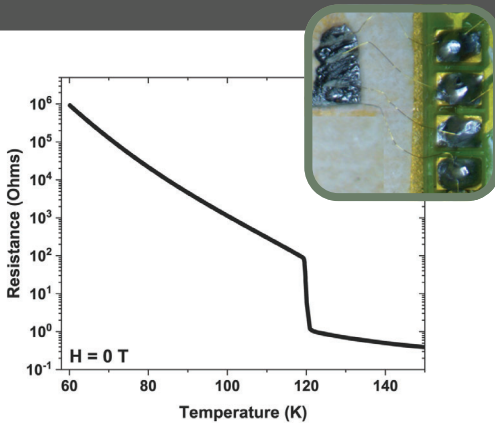


## MAGNETIC

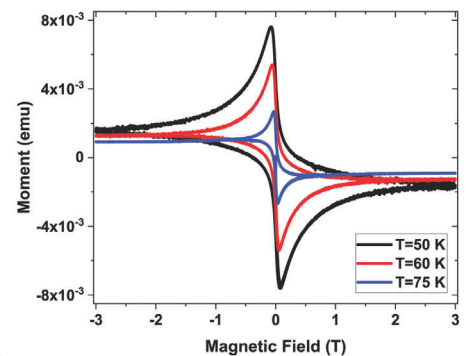
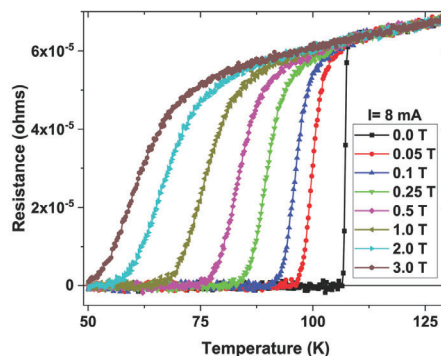
- Magnetic Properties of a Paper Clip – Vibrating Sample Magnetometer Option
- Magnetic Signatures of Some Common States of Materials Using the VSM
- YBCO Magnetic Characterization Using the VSM
- $\text{Fe}_3\text{O}_4$  (Magnetite) Magnetic Characterization
- Doping-Dependent Spin Reorientation
- AC Susceptibility: (AC Measurement Option - ACMSII)

## Example Measurements

### 1. Correlated Electric/Magnetic/Thermal Characterization of Magnetite



### 2. Electric and Magnetic Characterization of Bismuth Strontium Calcium Copper Oxide



“VersaLab has been such an amazing tool when it comes to materials science here at Prairie View A&M University. I remember when we first got the equipment and how intimidated I was with all of its capabilities, but I quickly learned. For a student who just started working and knew nothing about material science, VersaLab made it very easy to catch up and produce data. Now almost three years later, I am about to graduate, and I am so thankful to the VersaLab, Quantum Design family, and my professor Dr. Kevin Storr, for all the work we have accomplished and the new things I learned that got me to this point.

**Lauren Allen, Student at Prairie View A&M University**



“This new lab is unique because it bridges teaching and research using industry-grade scientific instruments rarely available to undergraduates. They can create their own experiments without worrying too much. It also required significant support and vision from the department and the University recognizing the importance of modern instrumentation in education.

**Prof. Mengkun Liu, Stony Brook University**



“Instruments like this will really help our students feel like they’re going to get something out of being at Cal State, San Marcos and out of choosing physics as a major and doing research in the physics laboratory thanks to Quantum Design.

**Jackie Trischmann, Dean of CSTEM, CSUSM**



## Our Approach

The Discovery Lab Initiative seeks to partner colleges and universities with leading technology companies to develop new curricula emphasizing hands-on experiential learning. By introducing industry-standard research instruments, students are inspired to “take theory into practice”, thereby better training themselves to be successful in the next stage of their scientific careers.

- Increasing career potentials through more robust science education
- Accelerating the development of future scientists, leading to research and technological innovation
- Enhancing curricula by providing hands-on instrumentation

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## Partner Universities

UC San Diego

