Template: VersaLab Sole Source Justification

This document is intended as an aid in drafting the sole source justification portion of a grant proposal for purchasing a Quantum Design VersaLab. Such documents typically include:

- A clear statement of the unique performance factors of the product or vendor specified
- Why those unique factors are required
- What other products or vendors were evaluated
- The reason(s) for rejecting the other products or vendors (price is not a justification for a sole source award)

Below we will address these points.

Unique performance: The PPMS VersaLab from Quantum Design is a unique instrument that is relevant in both materials research as well as science laboratory instruction. The VersaLab provides fully automated temperature control over a range of 50 – 400 K and magnetic field control from -3 to 3 tesla. Stability and accuracy of field and temperature systems are industry-leading and match the performance of Quantum Design's research-grade PPMS instruments used by scientists around the world. In addition to this highly reliable base system, Quantum Design offers an array of automated physical properties measurement modules such as electrical transport, magnetization, heat capacity and thermal transport. Within minutes of being trained on the instrument, users can begin collecting publication quality data on their material of choice and can program the instrument to run unattended.

To bring this research grade instrument into the undergraduate laboratory, Quantum Design has developed educational modules which explain the inner workings of the VersaLab as well as the sample measurements. Students are guided through important materials physics measurements such as determining the Hall mobility in germanium, measuring the superconducting transition in High-Tc cuprates or investigating the magnetocaloric effect in gadolinium.

Another important factor is that the VersaLab has minimal infrastructure requirements for the lab: it needs only 190-240 V / 16A single-phase power, has a footprint of less than one square meter, and can be easily moved as both the VersaLab and the compressor are on casters. No cooling water or 3-phase power is needed.

Why are these unique factors required?

1) *Students get a taste of real research and materials discovery*. With this automated platform in the teaching laboratory, it is a launching pad for significant new materials exploration that can now be realized within one academic quarter/semester which is something that was beyond the reach of most undergraduate labs before now.
2) *Faculty can make significant contributions to science literature with the research conducted on VersaLab.* Students can be involved in lab courses as well as longer guided research programs to publish in leading physics and materials journals, just as other VersaLab users are doing.

3) *Solid state physics experiments are under-represented in undergraduate teaching labs*. The measurement principles and materials investigated here are very relevant both to students who continue on to graduate research as well those who go on to work in industry where they will be required to understand this type of equipment.
4) *Students' imagination can be captivated by presenting them with the state of the art in measurement equipment*, and not just experiments which are over 100 years old. The VersaLab shows how solid state physics is used to build a sophisticated instrument and furthermore how that instrument probes materials that are relevant to their lives.
5) *Limited infrastructure available in some teaching labs:* the portability, simple power requirements, and small footprint of the VersaLab can be key advantages in finding a place for it in the undergraduate teaching laboratory.
6) *Familiarity with Quantum Design equipment is a great asset for students continuing in materials research.* Many materials research labs around the world use Quantum Design products, so a real mastery of them – as provided in our guided educational modules – enables the student to immediately become a contributing member of the research team.

Other products/vendors evaluated and reasons for rejecting those. To our knowledge, there is no comparable product to perform such an array of solid state physics experiments over this range of temperature and magnetic field, and which also provides ready-made experiments that demonstrate each of the measurements. The following vendors supply some of the measurements covered by VersaLab:
http://www.cryogenic.co.uk/
http://www.lakeshore.com/Pages/Home.aspx
However, any comparable system requires more laboratory power and water cooling infrastructure and lacks the educational modules which are so important in making this instrument immediately useful in a teaching lab.