

Specifications for He-3 Insert and 8" clear bore magnet

1. The base temperature of the cryostat should be 310 mK or below. The vibration level of the cryostat should be good enough to obtain atomic resolution images on Si(111) surface by scanning tunneling microscopy (STM) near the base temperature. The vendor should send a list of users who use the same model of the cryostat as quoted for STM applications with contact information. If the vendor fails to provide this list, their bid will be rejected. It will be preferred (but not absolutely necessary) if the vendor has an installation in India where it is successfully used for STM.
2. The holding time at the base temperature should be 80 hours minimum.
3. He-3 insert specification :
 - a) Top insert flange including radiation baffles, pumping ports etc. should be installed.
 - b) Central sample delivery tubing with minimum 1.25" inner diameter should be installed so that a sample holder of 1.24 inch diameter can be transferred to the coldest part of the cryostat without difficulty.
 - c) Gate valve with minimum 1.25" clear shot should be located on top of the sample delivery tubing.
 - d) Annular charcoal sorption pump with 1.25" central line of sight should be installed.
 - e) 25 ohm heater should be installed on the charcoal sorption pump.
 - f) Calibrated silicon diode or cernox thermometer (whichever is appropriate) should be installed on the charcoal sorption pump. The calibration data should be provided.
 - g) Charcoal sorption pump cooling lines with evacuation valve and flow gauge including integrated flow control valve should be provided.
 - h) Annular 1K pot with 1.25" central line of sight should be integrated.
 - i) Silicon diode or cernox thermometer with standard calibration should be installed on the 1K pot. The calibration data should be provided.
 - j) Appropriate evacuated 1K pot needle valve should be provided.
 - k) 1K pot pumping port with pressure relief valve and isolation valve should be provided.
 - l) Additional acoustic noise reducer should be installed inside the 1K pot. The details of the working principle and the design of the same should be provided in the technical bid.
 - m) Annular He-3 pot with minimum 1.25" central line of sight should be installed.
 - n) Sufficient He-3 gas (**10 NTP minimum**) should be provided to meet the guaranteed holding time.
 - o) Generic RuO thermometer with standard calibration (and with maximum possible measurement range and resolution for such thermometers) should be installed on the He-3 pot. The calibration data should be provided.
 - p) Appropriate heater should be installed on the He-3 pot such that the temperature can be varied from the base temperature to the highest possible temperature. The vendor should quote the temperature range that the cryostat can achieve. The vendor providing a significantly larger

temperature range than others without compromising the overall performance of the system will be considered with preference.

- q) Stainless steel He-3 gas storage vessel with vacuum/pressure compound gauges should be provided.
- r) Provisions (screw holes) at the bottom of the He-3 pot should be provided for mounting of STM support.
- s) Indium sealed vacuum chamber (IVC) with tail to fit in the superconducting magnet (see below) should be provided.
- t) IVC evacuation valve and safety pressure relief valve should be provided.
- u) 4 x 32-pin hermetic electrical feed through and should be labeled as Feedthrough-A, Feedthrough-B, Feedthrough-C, and Feedthrough D respectively.
- v) Feedthrough-A should be for heater and thermometer wires on the He-3 pot, 1 K pot, and charcoal sorption pump.
- w) Feedthrough-B, -C, and -D should be wired to the sample area.
- x) Radiation shutters located inside the IVC should be provided to block the room temperature radiation after the sample is loaded.
- y) Sliding seal assembly with G-10 outer tube and matching top-flange o-ring should be provided.

4. Supporting magnet specification :

- a) It should have Solenoid configuration.
- b) The field should be 7 Tesla central field (4.2K).
- c) +/- 0.1% central main coil field homogeneity over a 10 mm DSV or better.
- d) It should have 8.0 inches clear bore. 7 inches bore will also be acceptable but below 7 inch will not be acceptable.
- e) Persistent mode switch should be installed.
- f) It should be fully protected against damage due to quench.
- g) It should be fully tested at 4.2K.

5. Magnet Support specifications :

- a) Vapor cooled brass high current leads.
- b) Carbon resistance thermometer should be installed at the bottom of the magnet.
- c) Liquid nitrogen fill and push-out tubing should be installed.
- d) Helium level sensor should be provided.
- e) The Liquid Cryogen Monitor specifications :
 - i. The display should be TFT LCD.
 - ii. Full numeric keypad with directional arrows should be provided.
 - iii. Ethernet and USB computer connectivity should be provided.
 - iv. The output should be appropriate (preferred: in between 4-20 mA and 0-10 V)
 - v. There should be options for IEEE-488.2 or RS-232
 - vi. It should support Universal Power input
 - vii. All the dimensions should be compact.
 - viii. Should be configurable as a single channel unit to monitor liquid helium and liquid nitrogen. But if required, provisions should be provided to disable the configuration so that each unit can be controlled independently.

- ix. Separate alarm (or refill setpoints) for each channel should be provided .
- x. Sample and hold operation, burnout protection should be provided.

6. Superconducting magnet Power Supply should have :

- 4-quadrant, true bipolar systems featuring smooth sweeps through zero.
- Automatic quench detection and protection.
- A full color, backlit TFT liquid crystal display clearly indicating output current, voltage, limit settings, and system status.
- Current settability of 0.1 milliamps or better.
- At least five (5) programmable sweep rate ranges.
- Persistent switch heater power supply;
- 15 foot length output cables.
- USB, IEEE-488.2, and Ethernet computer interfaces .
- Safety interlocks for persistent switch enable/disable and changing of important magnet parameters and limits.
- Visual confirmation of current present in leads should be provided that would alert users to be mindful of safety, even if line power is off.
- A working option should be provided to make the field zero at low temperature (remnant correction). This should be provided as a software option.

7. The system should have Lakeshore Model 336 automatic temperature controller which should have:

- Four channels, dual heater, Autotuning PID, Ethernet, GPIB, USB, Alarm and Relay.

8. It should have appropriate pumping station (mechanical pump) with:

- 5.0 feet stainless steel flexible pumping hose, Isolation Valve, Venting manifold.

9. Additional features: The vendor should clearly mention if they can provide additional features.

10. All necessary accessories for running the system efficiently should be provided. This includes the pumps, valves, gauges, transfer tubes for cryogenics etc.

The price should be quoted for all the materials and their installation. Minimum two years warranty should be provided on the entire system – for all parts.