

An Expression of interest is invited for a He3 cryostat.

- 1) Provide quote for all minor experimental accessories like bias tee separately as we can compare prices if any vendor is unable to source them.
- 2) Also quoting in itemized pricing for all items is preferred over blanket quotes for all items as some options may be relaxed for cost.
- 3) Technical committees decision is final in award of points
- 4) We reserve the right to call for detailed presentations or queries.
- 5) Provide quotes in 2 part system .

General:

Helium 3 system with

- 1) 300 mK base temp
- 2) Around 60 hrs hold time
- 3) Sample space ~ 60 mm dia in IVC tail.

Around 10-15 cm below He3 stage before approaching magnet & at least 10 -15 cm between 300mK and 1K plate.

Part-I: He-3 insert

Item #1: He-3 insert

1. Insert top flange including radiation baffles, pumping ports, and etc.;
2. G-10 sliding seal tube for easy pull out . Seal must have KF-16 connection to blow Helium gas when pulling in or out.
3. Indium sealed IVC can;
4. Charcoal sorption pump;
5. Charcoal sorption pump heater;
6. Generic silicon diode or cernox thermometer on charcoal sorption pump with standard calibration;
7. Separate Hermetic charcoal sorption pump cooling line so that the He-3 insert will still function at low liquid helium level;
8. Charcoal cooling line control valve with flow gauge;
9. 1K pot;
10. Hermetic 1K pot operating needle valve so that the He-3 insert will still function at low liquid helium level; (quote fixed impedance as additional option for low noise and temperature stability)
11. Generic silicon diode or cernox thermometer on 1K pot with standard calibration;
12. 1K pot pumping port with pressure relief valve;
13. He-3 pot;
14. He-3 pot heater;
15. Generic RuO2 thermometer RO-600 on He-3 pot with standard calibration;
16. Sufficient He-3 gas to meet the guaranteed performance specs (6 NTP liters minimum);
17. Stainless steel He-3 gas storage vessel with vacuum/pressure compound gauge;
18. Three (3) hermetically sealed 25-pin hermetic electrical feedthrough installed on the IVC pumping line (labeled as "Feedthrough-A", "Feedthrough-B", and "Feedthrough-C" feed through C respectively);

19. Feedthrough-A is used for heaters and thermometers; If necessary 12 can be used for thermometry from A. All wiring twisted pair configurations must correspond to lakeshore AC-bridge for 4 wire measurement i.e V+ and V- and I+ & I- must be a twisted pair. 25th pin must be for grounding wire.
20. 24 x 0.005" diameter insulated manganin wires (in 12 x twisted pairs) will be installed on feedthrough-B, C and D. Feedthrough C & D must have twisted pairs based on adjacent numbering in mini-D-sub i.e (1,2) (3,4) forming twisted pairs. All wires must be thermally anchored at 4.2K (IVC flange) and 1K pot, then terminated near B-field centre.
21. 24 x 0.005" diameter insulated manganin wires (in 16 x twisted pairs) will be installed on feedthrough-C; All wires will be thermally anchored at 4.2K (IVC flange) and 1K pot, then terminated at approximately 18.0" below the He-3 pot; Wiring must have a break with cinch type connectors to accommodate filters.
22. Six (6) double-ended hermetic SMA feedthrough installed on the IVC pumping manifold;
23. 4x model UT-85-SS semi-rigid coaxial cables with SMA bulk head connectors mating Attenuators 10 dB XMA-corp cryogenic attenuators www.xmacorp.com part number 2082-6418-10-CR or equivalent Rosenberger Nichrome thin film attenuators at 4K , 1K and 300 mK stage. Cables must have enough thermal length to block heat and must be bent at several locations approx. twice the min bend radius to provide stress relief.
24. The outer conductors of the semi-rigid coaxial cables will be thermally anchored at 4.2K and 1.6K properly preferably on a removable OFHC disk with holes for a bulk head SMA connector.
25. 2X UT-85 cables from KEY COM ULT-05 cable with 1dB attenuators 2082-6418-01-CR anchored at 300 mK , 1K and 4.2K stages anchored via bulkhead connectors
26. 3- Bias tees to be installed on 300 mK stage (BT-1800 NC from Miteq i.e no ferromagnetic core) www.miteq.com
27. One cryogenic amplifier + circulator to be installed in one of the UT-85 ULT-05 line with bias tees. Drawings will be provided after order acknowledgement
28. All lines must extend to field centre provided with SMP connectors for parallel field orientation. (Exact design to be confirmed after order)
29. Cold finger: Cylindrical OFHC base ~60 mm outer dia and 50mm inner dia mounted on He3 plate. OFHC tube with slots to cover the sample area mounted on the Cylindrical base. OFHC bus bars to sandwich cables.
30. One set of manganin twisted pair set must reach field centre.
31. One additional clear shot port with 6 Hermetic SMA connectors.

Magnet:

1. Solenoid configuration;
2. 8 Tesla central field (4.2K)
3. 4" clear bore in case of solenoid
4. Quote for 8 Tesla Solenoid and 1 T Split pair in horizontal axis. In this case quote Bore size to accommodate 60 mm sample space + appropriate IVC
5. +/- 0.1% central field homogeneity over a 10 mm DSV;
6. Persistent mode switch installed.
7. Fully protected against damage due to quench;

8. Please quote for field cancellation as an option at least +5 and -5 cm above and below 300 mK stage. (Only for solenoid in case of 2-axis magnets) . Specify lowest fields attainable.

Magnet support

Assembly with top flange, radiation baffles, quench relief port, and etc.;

1. One (1) pairs of vapor cooled brass high current leads;
2. Vapor cooled brass high current leads;
3. Magnet leads must be properly isolated from cryostat for proper grounding.
4. Carbon resistance thermometers installed at the bottom/top of the magnet with pins to readout four wire resistance.
5. Liquid nitrogen fill and push-out tubing;
6. Helium level sensor;

Level meter Model LM-510 or equivalent liquid cryogen monitor:

7. Appropriate displays/key pads for local control of magnet
8. standard ethernet and USB computer connectivity;
9. 4-20mA and 0-10V analog output standard;
10. Options for IEEE-488.2 or RS-232;
11. Universal power input;
12. Compact dimensions;
13. Configurable as a single channel unit to monitor liquid helium or liquid nitrogen;
14. Separate alarm (or refill set points) for each channel;
15. Sample and hold operation, burnout protection, and de-ice cycle for liquid helium level sensors;
16. Level Indication in centimeters, inches, or %;
17. LabVIEW® drivers;

Magnet Power supply:

1. 4-quadrant, true bipolar system featuring smooth sweeps through zero;
2. Automatic quench detection and protection;
3. Clear display of magnet status
4. Current setting resolution of 0.1 milliamps;
5. Five (5) programmable sweep rate ranges;
6. Persistent switch heater power supplies;
7. 15 foot length output cables;
8. USB, IEEE-488.2, and Ethernet computer interfaces standard;
9. Safety interlocks for persistent switch enable/disable and changing of important magnet parameters and limits;

10. Visual confirmation of current present in leads to alert users to be mindful of safety when operating the power supply, even if line power is off;]
11. Option to power off supply when in persistent mode.
12. Labview drivers and ASCII programming instruction for supply must be provided
13. Power supply must be low noise to measure sensitive devices like SQUIDS from reputed manufacturer like Oxford instruments or American magnetics etc.
14. Quote two supplies or integrated -2 unit supply for 2- axis option separately.

Remote: Helium re-liquefier:

A PTR based re-liquefier must be connected to the cryostat via flexible transfer lines and must be able to recondense the vapours and also re-circulate the liquid from a small satellite container. PTR cannot be mounted on dewar./

1. PT410 cold head (mounted inside re-liquefier assembly)
 - a. (PT410 re-liquefier – approximately 10 Liters/day)
2. CP289C water cooled compressor package;
3. 220/230VAC; 3 Phase; 50 Hertz;
4. Stainless steel flexible lines:
 - a. 1/2" Aeroquip to 3/4" Aeroquip: 1.0" diameter line, length = 66 FT;
 - b. 3/4" Aeroquip both ends. 1.0" diameter, length = 66 feet;
5. Cold head motor cord: length = 66 feet;
6. Diode cord;
7. Cryostat assembly:
 - a. Cryostat with liquid helium drain leg: $\text{Ø} \sim 1/2''$ or $\text{Ø} \sim 3/8'' = 3/8$; length = 24";
 - b. Temperature monitor/controller;
 - c. Silicon diode temperature sensor;
 - d. Pressure relief valve;
 - e. Vapor line with valve;
 - f. Heater 50W 50V 50Ohm;
8. Re-liquefier stand with stand tool kit;
9. Under normal operation cryostat boil off must be < 100 mL per day or better.
10. System must be connected to Helium recovery line with appropriate over pressure valves. When pressure in main dewar or re-liquefier is not manageable the system should vent the excess Helium to a recovery line.
11. Valve to manually recover during transfer must be provided.
12. **Main cryostat dewar+ insert must be electrically isolated from PTR compressor. This must be done by derlin flanges connecting to motor head.**

Temperature controller:

- 1) Lake Shore 336 AC-Bridge cum controller
- 2) 50 ohm heater with 50 ohm nichrome wiring on He-3 stage
- 3) Two heater channels
- 4) Four sensor channels
- 5) PID controls with labview drivers

Dewar;

- 1) Vapour cooled Dewar with vacuum jacket and Belly design to accommodate magnet.
- 2) Must be serviceable to repair or change magnet if necessary.
- 3) Option to raise or lower dewar +magnet or insert must be provided via pulley with weights or manual winch.
- 4) Aluminium frame to raise and lower insert or insert+dewar.

Accessories:a) UPS:

1) One 6 KW with 300% over rating for 100mS for magnet+ pumps(increase rating based on **power supply+ magnet needs**)

2) One 6 KW for measurement system

3) Appropriately rated UPS for re-liquefier water chiller

All UPS units must have 30 mins back-up , isolation transformer. with **5 year warranty for battery +UPS**. Preferred UPS vendors with good local service for lab equipment in Chandigarh Mohali area (Messrs Essar Engineers (sanjeev.gupta@essarups.com) and Messrs Power One systems www.poweroneups.com)

4) Pumping station

Dry pumping station for IVC with scroll backing pump and 80 lps turbo.

5) 1K pot pump Rotary vane pump with oil mist filter and KF connections

6) Bellows for IVC 3m and 1K pot 4 m etc. (OEM or KJ Lesker or Excel Instruments Mumbai)

7) Spare Semi-rigid Coax UT-85 10 m BeCu or cupro-nickel with no silver plating (in units of 1 m) Coax-Co Japan, Rosenberger Microcoax or Huber-Suhner KEY-COM.

8) one chiller with outdoor heat exchanger unit and indoor controls and water tank. **Must have remote interface to monitor chiller. Chiller must have 5 years warranty.**

9) One control PC (HP or Dell with Windows 7/8) Intel I-5 .

10) 19” Instrumentation rack for magnet power supply, AC bridge and control PC . One additional 32-34 U rack to be provided.(**Valrack or any brand supplied by OEM**)

11) Stand for insert servicing or wiring insert.

Manuals Drawings etc:

- 1) All drawings of system must be submitted for approval around 1 month from PO

- 2) All wiring drawings for thermometers , heaters
- 3) User manual for main equipment and all accessories.
- 4) Please give ceiling height/pit depth requirements etc

Service & Installation:

- 1) Entire unit including re-liquefier must be installed
- 2) Service for all components must be provided.

Warranty:

- 1) 1 year on Cryostat + pumps etc.
- 2) 5 years on recondenser including consumables for PTR compressor etc

Qualification Criteria:

wet system :

- 1) Companies must have manufactured and tested atleast 3 systems helium 3 or Dilution fridge with recondensing systems.
- 2) Atleast one recondensing system tested with a high field integrated magnet or magnet systems with recovery.
- 3) Atleast supplied 3-5 helium3 systems or dilution fridge systems

Dry system:

- 4) Must have supplied atleast 3 PTR based He3 systems with inegrated magnets

General :

- 5) We may call bidders for a presentation and further evaluate competence of bidder or clarify any technical or financial issues.
- 6) Minor deviations in specs or qualification criteria will be at the discretion of the technical committee.

Alternate Options:

Compaines may quote for dry system with integrated magnets and following features in place of wet system. Qualifying criteria would be more than 3 dry He3 systems with integrated magents must have been supplied.

- 1) All wiring, microwave cables , coldfinger, temperature control etc etc must be same as specified above.
- 2) All necessary accessoried like UPS etc must be quoted as per specs,
- 3) ~ 1W @4.2K PTR based system.
- 4) System must have remote motor head located on floor to provide low vibrations.

- 5) System must have vibrations < 150 nm in low frequency range milli Hz to ~ few Khz.
Appropriate stands must be provided to reach this level.
- 6) Sample must have puck for bottom loading load lock/puck 6 microwave connections upto 18 GHz in parallel field and perpendicular field configurations separately. One additional DC 48 twisted pairs and 3 RF connections.
- 7) Only vector magnets 8-1T with field cancellation in He3 stage will be accepted as home made small field coils in horizontal axis are cumbersome in dry systems.
- 8) Appropriate systems like hydraulic lift for mounting and unmounting magnet etc. antivibration stand etc must be provided.
- 9) Must have nitrogen cold pipe to cool magnet fast. System+magnet must cooldown in < 36 hrs.
- 10) Additional thermometers and channel/scanner to monitor magnet and all stages must be provided.
- 11) If using compressors for initial condensation compressor must have a by-pass.
- 12) Warranty must be 5 years comprehensive including consumables for whole system (e.g PTR head servicing, compressors for condensing charge , UPS etc must be covered)

Point system for evaluation:

- 6) Wet system with recondenser and all other specs will be awarded upto 50 points
- 7) Dry system with all criteria including 2-axis magnet will be awarded 40 points
- 8) Dry system with sample loadlock/puck for RF and DC wiring upto + 10 points
- 9) Hold time 10 points (one company may quote two ranges of hold times to maximize chance of winning)
- 10) Overall Cost of system 40 points.
- 11) We may reject system with too less points.