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Technical Specification of Cryostat

Purchase and installation of Cryostat (Low Temperature) for PQuest Lab at IIT Bombay

The quotations are invited for the Cryostat (Low Temperature) system to be used for performing measurements for various superconductors, semiconductors, 2D materials etc, at cryogenic temperatures with optical and magnetic field access and control. The features and specifications are mentioned in Section-A and terms, conditions mentioned in Section-B of the tender document.

SECTION- A (Features and Specifications for Cryostat (Low Temperature))

- Please note that the Cryostat system with all the sub-parts have to be supplied and installed at IIT Bombay by the same tenderer to ensure guaranteed operation, a technical support/service during warranty period and after-sales repairs/ maintenance.
- All the sub-parts, consumables, tools/ accessories of the Cryostat system should be supplied by the tenderer and should provide the support for the future repairs and maintenance.

1) Closed cycle cryostat

1.1 Closed cycle Cryogen Free Cryostats

- Cryostat should be top loading design with 2" bore size
- Achieving base temperature 4K
- Cryostat should have extremely low vibrations suitable for SPM/Confocal/Magneto-Optical & electrical measurements i.e., vibration levels on sample: less than equal to 0.2 nm RMS (bandwidth of 200 Hz)
- Sample cooldown time: < 3h
- Should have Pulse Tube cryocooler & He compressor & Helium flex lines between compressor and cryostat (40 ft) and power consumption 9 kW (steady state 7.2kW).
- Temperature Sensor should be present @4K stage and also at the magnet.
- Isolated sample tube should be 2" (in outer diameter) and available sample space should be 49.7 mm (internal diameter)
- Power rating for compressor: 380/420V, 50 Hz, 3-phase

1.2 Cryogen free magnet:

3-axis vector magnet with maximum rotating vector field 1T. Should include magnet leads and magnet power supplies.

- Z-coil: 1T central field (at 4.2K)
- X & Y coil: X & Y coil should be split pair configuration and should be optimized for cryogen free operation. 1T central field (at 4.2K).
- X, Y & Z coil should be operational in driven mode only.

Combined Operation (Z, X & Y):

- 1T rotating vector
- All three magnets should have bipolar magnet power supply and superconducting magnet leads.
- Access top bore only in Z direction and X-Y coil magnet to be offered in split pair configuration.
- All the magnets to have full protection against damage due to accidental quench.

1.3 Temperature controller

- Temp. range between 4K - 300K
- Dual channel (magnet + sample temperature)
- PID/Table mode

1.4 Pumping kit

- Turbomolecular pump with backing pump
- Incl. all necessary KF fittings,
- Pumping speed 67 l/s (N), base pressure < 10⁻⁷ mbar

1.5 Optical Bread board

- There must be provision to mount optical components directly on platform which would be attached to the cryogen free cryostat for free beam experiments.
- Optical components: breadboard drawer: 500 mm X 475mm X 12.7 mm, distance between breadboard surface and top plate of cryostat insert: 75mm

2) Basic Insert with positioners, scanners and Objectives

2.1 Measurement Insert

- 2x12 low-resistance brass wires as twisted pairs and should include. 5m 12-pin patch cable and break-out panels to BNC
- 12 manganin wires as twisted pairs for customer use and should include 5m 12-pin patch cable and break-out panels to BNC
- heater stage with integrated calibrated T sensor
- base plate for sample mounting & cage plate for mounting LT-APO objective (easily adjustable in height via set screw fixation)
- optical access via top window (diameter 25mm, fused silica uncoated)
- breadboard based mounting stand for room temperature adjustments

2.2 Insert should include 2 semi-rigid coaxial cables (stainless steel / PTFE / silver plated stainless steel), SMA connectors on both ends & Vacuum feedthrough to be included, capacitance 95 pF/m, attenuation at 20°C: 3.30 dB/m@5 GHz, 6.88 dB/m@20 GHz

2.3 AR coating @ 600-1600 nm R avg. <0.7%, Material: IR Grade Fused Silica C7979, Clear Aperture: 85%. transmitted Wavefront

2.4 Positioners (for X& Y directions) with encoders and Positioners (for Z directions) with encoders:

- Positioners should be Non-magnetic and should be made from titanium.
- Footprint: 24mm X 24mm (for XYZ direction), Travel range: 5 mm X 5mm (for X & Y) & 4.8 mm (for Z direction).
- Positioner resolution: 200 nm & repeatability: 2 microns (for low temperature conditions i.e. 4K)

2.5 Electronics for Positioners:

- Electronics should be able to control closed loop positioners with 1 Ethernet cable, 1 USB Ethernet & adapter and country specific power cable (3 suitable connection cables).

2.6 Integrated Low Temperature Apochromatic objective:

- Temperature range 4K - 300K
- apochromatic objective for RAMAN measurements with excitation at 532 nm,
- Clear aperture 4.7 mm, Focal length $f = 2.88$ mm, Numerical Aperture $NA = 0.82$
- Working distance $WD = 0.64$ mm (1.40 mm on axis)
- monochromatic range (total transmission > 80%) 400-1000 nm
- apochromatic range (chromatic focal shift < +/- depth of focus) 520....695 nm

2.7 Base plate with quick exchange sample holder: Inclusive 8 electrical contacts connected to 4 co-axials.

2.8 Sample holders: Featuring 8 contact pads for wire bonding to sample and metal base plate for sample. 3 nos (for sample thickness 0 to 1.5 mm)

2.9 Sample holders: Featuring 8 contact pads for wire bonding to sample and metal base plate for sample 3 nos (for sample thickness 1.5mm to 3mm)

2.10 Additional cage plate 2" standard should be quoted.

3) Scanners:

3.1 Scanners for Low Temperature:

- Scanners should be made from Titanium for stability and high precision.
- Scan range: 50 μm x 50 μm x 24 μm (RT), 30 μm x 30 μm x 15 μm (LT)
- fine positioning resolution: sub-nm

3.2 Electronics for scanners:

- Modular design, allows for the integration of up to seven positioning modules
- manual control via touchscreen, single step mode: 0-150 V
- scan mode: 0-150 V (gain: 15), incl. 1 USB cable

3.3 Scanning modules (3 nos.)

- plug-in modules for open loop controller,
- scan mode: 0-150 V (gain: 15), incl. 1 positioner connection cable

(All controllers and associated electronics should be rack mountable)

4) Computer with necessary software and flat screen monitor-24" for operation of the system.

5) Min. 3 TR cooling capacity water Chiller including the installation material should be quoted

- Flow rate: Max. 20 - 30 lpm
- Required pressure: 3 – 5 bar
- Any impurities in media: RO purified water
- Max. operating ambient temperature: 50 °C
- Min. operating ambient temperature: 5 °C

SECTION – B (Additional requirements from the prospective supplier)

1) Tenderers should provide:

a) Complete technical specifications, Make and Model of the Cryostat system and necessary sub-parts and/ or accessories as mentioned in the tender document.

b) Soft copy of the technical brochures and website reference of the same must be included in the bid.

c) A local service/ maintenance centre should be available in India. A declaration from the manufacturer stating that the service support will be available at least for 5 years from the date of installation.

d) A copy of the Authorization Certificate issued by the Original Equipment Manufacturer (OEM). The certificate must be up-to-date. A letter in the official letterhead of the OEM declaring the Indian supplier as their authorized agency to bid contain the official tender enquiry number must be included with the technical bid.

e) The bidders will be requested to give the in-person presentation of the Cryostat system to the purchase committee at IIT Bombay. **(Details are mentioned in point (9) of this section).**

2) The tenderer should have a minimum 03 (three) years of experience in supplying and successful installation of the system of similar specifications and should provide references (installation sites) from premier Institutes, organisations in India or abroad **(preferably (not mandatory) Government Organizations in India).**

3) The tenderer should provide atleast 3 nos. of soft copies of PO (not older than 5 years) of similar or higher specifications supplied within India.

4) A duly signed detailed User List (at least 3 nos.) with the concerned person's valid contact details in India where the instrument is still in the operational condition must be provided.

5) A duly signed separate compliance sheet of the specification (at every point) mentioned in the technical part (Section-A) along with the deviation (if any). **This compliance sheet will not be considered as the technical specification of the instrument.**

6) Each bidder has to mandatorily quote for Cryostat system including all the sub-parts as mentioned in the tender document. Partial submission of bid is not permitted.

7) The Cryostat system should be supplied with the necessary sub-parts/ accessories to start using the system.

8) Tenderers should state categorically whether they have fully trained technical staff with certification from OEM for installation/ training of the equipment. Satisfactory installation/ commissioning and handover of the equipment should be completed within a week from the date of receipt of the material at the Institute premises or within the time as may be extended by the Institute.

9) Once the technical bids are opened, the bidders will be called to IIT Bombay for the in-person presentation on Cryostat system quoted by the bidder. In the presentation, the bidder will have to include the proposed set-up, equipment brand, specifications of the equipment, the procedure they

will adopt to execute the installation, infrastructure preparedness required from the user etc. Also, the bidders are requested to bring the hard-copy documents mentioned **in point 1(a) to 1(d) with stamp** and authorised signatures of the company. **For the presentations, the bidders will be informed by email.**

10) After-sales service support for repair/ replacement of non-functional parts should be provided by the tenderer (including all services under warranty).

11) Manufacturer should mention the centre in India to provide the service during warranty period and after-sales. The manufacturer should provide the certificate for the genuineness of the warranty and service centres.

12) The warranty will commence from the date of the satisfactory installation of the Cryostat system and the tenderer should give the warranty declaration.

13) Setup charges for the full system including installation and training should be included by the tenderer.

14) Warranty: - 01 Year