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Tender No.: IISER/PUR/0173/DJN-P/SP/22-23 Date: 27 Jun 2022

CORRIGENDUM TO TENDER

Sub: Supply Installation and commissioning of Cryogen Free Closed Cycle Cryostat (CCR) with a measurement insert –Change in technical specifications: reg.

Ref: Tender ID No. 2022_IISRT_696847_1

Revised technical specifications are placed at annexure 1.

Revised Technical specification as per corrigendum is only to be considered.

All other Terms and Conditions remains same.

Thanking You,
Yours Faithfully,

27/06/2022

Deputy Registrar (P&S)

SL No	Description	
01	**Cryogen free closed cycle cryostat (CCR) with a measurement insert.** **Specifications:** • **Base System:** • System should be fully cryogen-free, i.e., no requirement of liquid Helium and/or liquid Nitrogen at any point of time. Single 2-stage Pulse Tube cryocooler to cool both the superconducting magnet and the sample space. Power at the 1st stage should be at least 30 W at 65 K and power at the 2nd stage should be at least 0.5 W @ 4.2 K. The maintenance interval should not be less than 20,000 hours. • Any Liquid Helium and/or cold Helium gas flow into sample chamber or to any other parts within the system, and all low temperature operations must be handled in fully automated way through electronic and computer controls. The system should NOT have any manual control in the entire operation of the system. • Cold head of the cryocooler should be separate from the sample chamber. Liquid helium should be collected in a separate pot that must be transferred to the sample chamber for providing low temperatures. • The system should be equipped with temperature sensors both at the bottom of the sample chamber to measure sample temperature and at the neck of the sample chamber for diagnostic purposes. Thermometers should also be mounted on the cryocooler and magnet to monitor their temperatures through the main operating software. • All electronics must be USB based without GPIB interfaces. • The system must have a large sample chamber of at least 30 mm diameter that can either be under vacuum or use various exchange gases. • The capability of the system performance and specifications have to be supported with valid and certified documents and published works (at least 50+) along with list of installations worldwide including the contact details (address, phones and emails) of the customers. • **Superconducting solenoid magnet:** • ± 7 Tesla field strength (longitudinal field) • Sweep rate: Up to 120 Oe/sec. • Field Homogeneity: ± 0.1 % over 3 cm on axis	

- Field Stability: 30-50 ppm/hr
- Magnet has to be cooled by solid conduction without any liquid helium.
- Magnet ramping should not affect the temperature stability
- Magnet to be fully quench protected by a protection circuitry. Automatic discharge of the magnet if the cryocooler system fails (For example, due to water chiller failure or power supply failure).
- Software monitored temperature sensors to be fitted to the magnet.
- Magnet control software monitors the temperature of the magnet and cryostat at various locations to ensure proper operation of the magnet system from quenches.
- Bi-polar power supply with over voltage protection and indication.
- Magnet power supply with a 16 bit resolution across full range (approximately 0.08 mT).
- Low stray field: 5G line to be situated at less than 1 m from the field centre both axially and radially.

- **Temperature Control:**

- Continuous-flow Variable temperature insert (VTI) with automatic flow control and two-loop temperature stabilisation to provide excellent temperature performance, including high stability, linear ramping and fast cooling. VTI to have an internal diameter of 30 mm.
- The system should have pump and gas reservoir to operate the VTI.
- Cryostat assembly which will include sample chamber, radiation shields and other assembly must be cooled by expanding liquid helium (collected at another pot) for efficient cooling and efficient use of cooling resources. Helium flow control to be achieved by an automated needle valve. It should be continuous low temperature operation. All the operations must be fully automated without user intervention.
- The system should enable cooling of samples from highest temperature to the lowest at the highest specified cooling rate at any given magnetic field of up to ±7 T without affecting the system performance including the heating of magnet. The same procedures should hold for heating of the samples as well.
- System should have sophisticated temperature control and provide seamless transition between high temperature (400 K) with minimal cooling power needs, intermediate temperature with rapid slewing and large cooling needs and stable operation near the base temperature (1.6 K) with cooling provided by evaporation of liquid helium.
- Temperature range of 1.6 to 400 K with milli-Kelvin stability and

accuracy.

- Temperature stability should be at least
  at 10K 5 mK (0.05%)
  at 100K 10 mK (0.01%)
  at 300K 50mK (0.02%)
  irrespective of the magnitude of applied magnetic field.

- Suitable temperature controller to control the temperatures in the VTI
- Suitable temperature sensor to monitor the system temperatures.
- Airlock system for fast sample exchange without the need to warming the VTI to room temperature.
- Temperature of 1.6 K for the samples must be achieved from room temperature with a fast cooling not more than 60 minutes. Sweeps through 4.2 K should be smooth and monotonic on cooling and warming sequences.
- Accuracy: ± 1%.
- Maximum heating rate: at least 8 K/min; Maximum cooling rate: at least 5 K/min irrespective of the magnitude of applied magnetic field.
- Fast Settle, No Overshoot, and Sweep mode.
- Temperature control should be fully automated.
- Various modes of reaching low temperatures must be given in details.
- Required thermometers and heaters to manage temperature gradients and to ensure smooth temperature control throughout the accessible temperature range.

- **Vacuum pumps and fittings:**
- Vacuum pumps and fittings along with vacuum gauges, meter, standard vacuum coupling essential for the uninterrupted functioning of the instrument and its various measurements options must be included.
- All pumps must be dry pumps. The system should have an integrated cryopump and necessary vacuum gauges for controlling sample environment. This fully integrated option should allow to change the chamber environment during a programmed sequences or script.
- **Data acquisition and analysis:**
- Licensed windows based operating software and State of the art computer control system compatible with the measurement options. Data acquisition system must be the latest version based on modular architecture (company must specify their data acquisition system) not using GPIB. The software should be able to run the various

measurement options automatically and in different modes. There must be a scope to control the external instruments by using different programs for the experiments designed by users.

- Fully automated measurements (except changing samples). Temperature, field control and sample measurement shall be fully automated. The software shall control all aspects of the instrument's electronics, hardware, gas handling, data acquisition and data analysis. Remote user access to the system via Internet.
- The software must allow the users to remotely control and monitor experiments over any internet connection.
- System should have capability to control temperature and magnetic field from external programs like lab view or any other third party software.
- A PC should be provided for data acquisition.

- **Measurements System:**

- **Multi-Function probe:**
  - Probe to make a user-defined set-up.
  - Two hermetic co-axial Lemo connectors on the two ends of the probe from which electrical connections can be taken to connect measurement bridge at room temperature to the Lemo connectors.
  - Should have the separate thermometer for accurate temperature reading.

Optional Items:

- **On-line UPS:** Please quote for a power rating of the UPS that is according to the machine requirement with maximum backup time.
- **Water Chiller:** Please quote for a water chiller whose configuration is in accordance to the machine requirement.