ANNEXURE – I

TECHNICAL SPECIFICATION for Cryostat Magneto-Electrical Transport

Bidder Eligibility Criteria:

1.0	Bidder Eligibility Criteria-II	Compliance (Yes/No)	Reference Page No.	Remarks, If any
1	The bidder/OEM should have supplied at least 3 similar products to IITs, NITs, IISERs, CSIR Labs or other Govt. R&D organizations in the last 10 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims. Supplier must have one Indian local staff for technical troubleshooting			

2.0 Technical Compliance:

S.No	SPECIFICATION		Compliance (Yes/No)	Reference Page No.
1.	**CRYOCOOLER**			
	Cryocooler type	Quote should specify type of Cryocooler (GM Cryocooler or Pulse Tube Cryocooler or GM-JT Cryocooler or Solvay Cryocooler). Cold head and compressor manufacturer name should be provided.		
	Sample Environment	Sample in vacuum and in direct contact with cold head		
	Cooling capacity/power	2nd stage: ≥ 0.16 W@ 4.2 K, at 50 Hz 1st stage: ≥ 3 W @ 45K, at 50 Hz		
	Base Temperature (Minimum Experimental Temperature) at the Sample Stage	≤4.2 K		
	Maximum Experimental temperature	325 K		
	Cooldown time to 4.2 K	Less than 150 minutes to reach the least sample platform temperature from room temperature.		
	Temperature stability @4.2 K	±3 mK		
	Sample vibrations	≤ 20 μm (peak to peak) at the sample stage.		
	Sample Type	Thin Film, Single Crystal		
	Sample Size	10 mm x 10 mm		
	Power consumption (Input power)	All component's operating voltage: 220-250 Volts AC, 50 Hz, single-phase		
	Cold head maintenance time	minimum10,000 hours		

2.	**VACUUM SHROUD AND RADIATION SHIELD:**			
	Narrow Gap Closed Vacuum Shroud should be made of nonmagnetic material (e.g., Aluminum) to use for magnetic application			
	Narrow Gap Closed Vacuum Shroud O. D **should be 50 mm (1.968") or less**. Demountable non-optical compact outer vacuum tail shroud (to be inserted into an electromagnet with 50 mm pole separation)			
	Vacuum shroud safety pressure relief valve of 2 PSI should be provided			
3.	**COMPRESSOR AND HELIUM HOSES:**			
	Compressor Cooling Type:	Indoor Water cooled		
	Electrical Power supply:	220-250 Volts AC, 50 Hz, single-phase		
	Power consumption:	2.25-2.4 kW at 50 Hz/		
	Ambient Operating Temperature:	4° C to 50° C (40° F to 122° F)		
	Cooling Water Flow Rate:	2 to 10 LPM @ 2 to 3 Bar pressure		
	Cooling water inlet temperature:	4° C to 27° C (39° F to 81° F)		
	Dimensions:	Dimension should be less than 40 x 40 x 40 inch and specified in quote		
	Weight:	Should be less than 200 Kg and mentioned in the quote		
	Recommended Compressor Maintenance:	≥30,000 hours		
	Power cable compressor:	Suitable length (10 ft) and power rating (16A) cable should be provided		
	One pair of flexible interconnecting helium gas hoses between Cold Head and compressor must be provided.	The length should be 10 ft minimum		
	The compressor should be either on a movable trolley or fixed with wheels which can be locked and unlocked			
4.	**TEMPERATURE CONTROL**			
	Minimum 4 pin hermetic feedthrough with required wires and suitable plug and receptacle for control and monitoring of temperature through two sensors and heater must be provided.			
	Calibrated (1.4 K-325 K) **Cernox temperature sensor** should be installed at cold head to monitor cold head (1st Stage) temperature.			
	A second calibrated (1.4 K-325 K) Cernox sensor temperature sensor thermalized on the sample holder (2nd Stage) should be quoted.			
	High power heater installed on extended sample mount should be provided for control of temperature.	Heater resistance should be compatible with temperature controller. Heater Should be tested with temperature controller during installation.		
5.	**TEMPERATURE CONTROLER**			
	Temperature controller compatible to the cryostat should be supplied with the following features	Autotuning Temperature Controller cables, Setup, Test, and Integration with Cryostat should be provided		
	a) Interconnecting cable to cryostat	Required		
	a) Two Channel Sensor Input	Required		
	b) Two independent heater output loops	Required		
	c) USB & Ethernet Port or/and IEEE-488 or/and RS-232C interfaces	Required		

	d) PID control Zones	Required		
	e) Autotuning PID	Required		
	f) Should also supports diode, RTD, and thermocouple sensors.	Required		
	g) Sensor should be calibrated from <1.5 K to 350 K	Required		
	h) Sensor excitation current reversal option to eliminate thermal EMF errors in resistance sensors	Required		
	i) Two autotuning control loops : (50W and 25W, or 75W and 1W)	Required		
	j) Control loop 2: variable DC voltage source from 0 to 10V maximum.	Required		
	k) Cryostat to controller interface cabling included.	Required		
	l) Fully integrated and tested with system	Required		
6.	**WIRING FOR MEASUREMENTS**			
	DC Sample Wiring: All wiring will be done by the manufacturer.	System should have one 44-pin (or 2x 22-pin) Fischer feedthrough connector with 36 AWG, 22 twisted-pair DC lines preinstalled (total 44 DC wires should be there) along with the system.		
	Spare blank feedthrough ports should be provided for additional electrical connections.			
7.	**SAMPLE HOLDER:**			
	Two 44 pin LCC Sample Holder with One Socket Vertical Orientation and One Socket Horizontal Orientation should be quoted under optional item	1- Vertical Orientation Socket 2- Horizontal Orientation Socket		
	Sample holder material	OFHC Copper material		
	Tapped hole provision for sensor mounting			
	Sample holders should be detachable from cold head via a multipin arrangement.			
8.	**WARRANTY:**			
	Minimum one year from the date of installation for all components including Cryocooler, compressor and for rotary vacuum pumping system			
	Complete system test report should be provided			
9.	**MANUALS:**			
	Installation kit (including wrenches and setup tools) and tools required for connecting to pumps etc. should be provided.			
	User manual, technical manuals with detailed drawings must be provided.			
10.	**OTHERS:**			
	Installation to be done by supplier Acceptance test like base temperature (≤4.2 K), vacuum level, etc. should be done during installation.			

S.No	Optional Items		Compliance (Yes/No)	Reference Page No.
1.	**VACUUM SHROUD AND RADIATION SHIELD:**			
	One additional Vacuum Shroud with 2 high purity quartz optical windows should be quoted separately for the same cryostat.			
2.	**HIGH FREQUENCY RF SAMPLE WIRING:**			
	Two SMP Hermetic Electrical Feedthroughs Mounted In Feedthrough Flange With Cri/oFlex® 2 cables that run to sample mount (Cables should have SMP connectors Installed onThe sample stage end of the cable)			
	Two Cri/oFlex® cables with SMP connectors Installed on Both End of Cable.			
	Frequency range	Min DC Max 18 GHz		
	Signal Isolation (Crosstalk)	< -60 dB, flex to flex		
	Impedance	Designed for 50 Ω		
	Operating Temperature	10 mK→ 400 K		
	Connector Configuration	Straight or Right-angle depending on the space		
	Connector Type	Straight SMP / Straight Mini-SMP/ Right Angle Compact SMP		
3.	**SAMPLE HOLDER:**			
	A set of 10 LCC chip carrier compatible with LCC Sample Holder should be provided			
4.	**CABLES:**			
	One 4 m long shielded cable with 44 pin Fischer connector both ends should be provided for connection from cold head to measurement switch box.			
5.	**VACUUM PUMPING SYSTEM:**			
	Pumping system should be a Turbo Molecular Vacuum pump with oil free Dry backing pump. Should provide Turbo Molecular Vacuum pump digital controller with Digital Pirani and Penning Combined Gauge.			
	Pumping speed	35 lit/s or better		
	Ultimate vacuum at the intake (With Gas ballast Closed):	$<1 \times 10^{-7}$ mbar or better.		
	Vacuum with gas ballast open:	$5x10^{-2}$ mbar		
	Vacuum connection:	KF-25 (or compatible KF flange with cold head vacuum shroud)		
	Exhaust port:	KF-25(or compatible KF flange with cold head vacuum shroud)		
	Cooling: air cooling:	Air cooling		

	Power Requirement:	230 V AC, 50 Hz		
	All other suitable connecting vacuum accessories to connect the rotary pumping system with Pirani gauge and digital controller to the above close cycle cryostat have to be quoted.			
6.	**WATER CHILLER**			
	Media Flow Rate:	5 to 10 LPM @ 2 to 3 Bar		
	Bar pressure Adjustable	Pressure should be Adjustable		
	Cooling Capacity:	1 TR, 3,000 Kcal/Hr		
	Media Temperature Range:	4 to 25^0C Adjustable		
	Media Specification:	Clean Water or DM Water		
	Tank capacity:	40 to 50 LTRS (or whatever is compatible with the cryostat)		
	Power Supply:	Voltage rating: Single Phase, 220-volt, 50 Hz		

SIGNATURE OF BIDDER ALONG WITH
SEAL OF THE COMPANY WITH
DATE