INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH THIRUVANANTHAPURAM [IISERTVM]

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GST NO.32AAAJI0299R1ZS

IISER/PUR/1353/MT-P/SP/25-26

Date:27 Mar 2026

RETENDER CORRIGENDUM-I

Sub: Supply, Installation and commissioning of Dilution Refrigerator and accessories for IIT Bombay, IIT Delhi and IISER Thiruvananthapuram: reg

Ref: Tender Enquiry No. 2025_IISRT_890454_1

1. Since the quoted price exceeds the estimated price, the above mentioned tender is re-tendered with revised technical specification at Annexure 1.

2. The due date and date of opening will be as follows:-

Due Date: 22 April 2026 1500 Hrs
Date of opening: 23 April 2026 1530 Hrs

3. All other Terms and Conditions remain the same: Bidders may quote accordingly

Thanking You,

Yours Faithfully

27/3/26

Joint Registrar

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Annexure 1 to tender No. IISER/PUR/1353/MT-P/SP/25-26

Tender specifications: Dilution refrigerator & Accessories

S/N	Item Description	Specification	Qty
1	**Dilution refrigerator**		4
1	Operation	Cryogen-free	
2	Base temperature & Temperature stability	10mK or lower, with factory installed wires and cables, On-site demonstration at all installation sites is mandatory	
		Temperature stability: ± 1mK <100mK, ±1% >100mK.	
3	Cooling power @4 K flange	The available cooling power at the 4 K flange should be 300 mW at 3.6 K	
4	Cooling power @100 mK & above	Should be greater than > 300 uW @100mK, with factory installed wires and cables, measured away from the mixing chamber. On-site demonstration at all installation sites is mandatory	
5	Cooling power @ 20mK	Should be ≥ 12uW, with factory installed wires and cables, measured away from the mixing chamber. On-site demonstration is mandatory.	
6	Cooldown time from RT to the Base temperature without magnet	Should be < 30 Hrs. with factory installed wires and cables	
		This should include any pre cool down time to reach any intermediate temperature range.	
		The plots of measurements of the system performance (such as cool-down vs time), clearly specifying the conditions under which the measurement was conducted, should be provided.	
		On-site demonstration is mandatory.	
7	Cooldown time from room temperature to the Base temperature with 8T magnet	Should be < 60 Hrs. with factory installed wires and cables. This should include any pre cool down time to reach any intermediate temperature range.	
		The plots of measurements of the system performance (such as cool-down vs time), clearly specifying the conditions under which the measurement was conducted, should be provided.	
		On-site demonstration is mandatory	

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8	3-He volume	Adequate amount of 3-He/4-He mixture should be included.	
9	The dilution refrigerator insert	(a) The dilution unit should be removable/replaceable without disturbing the experimental plates/wiring (b) The pulse tube unit should be replaceable without disturbing the dilution unit/experimental plates	
10	Cryostat	Should consist of single vacuum space with all hermetic seal such as O-ring seal at room temperature. Should not require exchange gas indium seal and Kapton seal. All the vacuum jacket and radiations shield should be light-weight enabling one-person manual assembly (a) The vacuum enclosure and the radiation shields should be light weight and split in two/three parts to gain access to the dilution unit conveniently. (b) A turbomolecular pump separate from the one used for the 3He circulation should be provided for vacuum pumping	
11	Dimensions of the cold plate and sample space:	The cold plate at the mixing chamber stage must have a minimum diameter of 275 mm.	
		Vertical clearance below the mixing chamber plate (measured down to the innermost radiation shield) when magnet is removed: A minimum vertical space of 575 mm must be available. The space beneath the mixing chamber should be wider than the bore of the superconducting magnet and sufficiently long to accommodate the same.	

12	Gas handing system & pumps	Pumping system: Suitable dry pumping system for the dilution unit having turbo molecular pump with oil free backing pump, compressor for the mixture. Please specify the specification of all pumps and compressors. Please specify if the same pumping system can also be used to evacuate the sample vacuum space. (a) The gas handling system (GHS) should provide the possibility of (i) computer-controlled fully automatic, as well as, (ii) completely manual control of the cool-down sequence, to reach the base temperature. (b) The gas handling system should be completely oil-free, using suitable pumps for 3He circulation and other requirements. (c) The GHS should be provided with both internal and external liquid nitrogen cold trap. (d) Control valves, flowmeters, safety and pressure regulators, gauges and electronic units of the GHS should be of very high quality (sourced from well-established manufacturers with proven track-record of reliability) (e) Provision for robust electrical and mechanical isolation of the GHS from the cryostat using suitable clamps, spacers, and dampers should be provided. (f) The turbomolecular pump for 3He circulation should be separated from the one for vacuum pumping of the cryostat.	
		Suitable gas handling system: With required pressure gauges and overpressure valves etc. The pumps should be electrically isolated from the cryostat. The gas handling system should have appropriate pressure release valves to collect the mixture back to the dump in the event of power failure or emergencies.	
		The gas handling system should be optimized for usability and reliability, featuring a compact, modular design with low-noise-isolation and integrated cold traps for clean, long-term helium circulation.	

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13	Cooldown procedure, safety, and control system and software:	Automatic cool down to base temperature.	
		Safety interlocks allowing unattended operation; remote control operation; continuous monitoring and logging of the system parameters.	
		Control System	
		System should have an Integrated Programmable Logic Controller with appropriate real-time communication for robust system control and diagnostics.	
		System shall ensure efficient operation of the dilution refrigerator with integrated process control and facilitate helium recovery to tanks during power failures through overpressure valve protection.	
		Control Software	
		User-friendly software interface for automated cooldown and warm-up procedures with remote access capabilities.	
		Equipped with advanced diagnostics for proactive monitoring and reduced downtime	
		Control software should be based on the latest suitable operating system. Free upgrades of software for the next 8 years should be provided	
14	Experimentally accessible ports for the user	(a) The insert should have all the necessary KF or equivalent ports on the top flange, for (i) the pulse tube, (ii) the condensing line, (iii) the pumping line for the cryostat vacuum, (iv) the still pumping line, (v) the current leads for the superconducting magnet, and (vi) magnet diagnostic line. Additional KF or equivalent ports allowing the necessary wiring (described later) should also be available on the top flange.	
15	Pulse-tube cryo-cooler with compressor	Pulse Tube: Pulse-tube cryocooler should be of remote motor type with a cooling power of 2 W at 4.2 K	
		The cooling water specifications (temperature and flow rate) should be clearly mentioned	
		The electrical load should be clearly specified	

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		The unit should be compatible with Indian electrical standards	
		Mention requirement of single phase or three phase supply	
16	Mechanical vibration levels	<2 um both vertically and horizontally at 100Hz, at the mixing chamber plate while the fridge is in operation.	
		Pulse tube should have mechanical vibration isolation from the rest of the cryostat. Pulse tube and compressor should be electrically isolated from the cryostat	
17	Cold trap	Appropriate cold traps to operate the fridge for long duration (>6 months) without any blockage issues in the mixture circulation loop.	
18	Thermometry	The system should be equipped with suitable temperature sensors necessary for the operation and diagnostics. Suitable resistance thermometers should be provided for the top and bottom of the magnet.	
		The system must also include suitable resistance temperature sensors at 50K, 4K, Still and mixing chamber stages	
		Integrated heaters must be present at the Still and Mixing Chamber (MXC) flanges, operable in manual or closed-loop mode. **Warmup heaters should be quoted**	
		one additional calibrated RuOx sensor calibrated down to 10 mk for measuring the sample stage temperature.	
19	Temperature controller	Fully automated temperature controller capable of controlling all the heaters, heat switches and, monitoring all the temperature sensors.	
		Temperature Controller must have sufficient channels that can be used for thermometry.	
		The temperature controller parameters should be accessible and controllable using an external data acquisition program such as QCODES and Labview using LAN or USB interfaces. ¬ (a) The necessary electronic unit for control and monitoring of the resistance thermometers and heaters should be provided, along with the appropriate software to run the unit from a PC and through web interface.	

20	Magnet	The superconducting magnet should be capable of producing a field of minimum 8 Tesla	
		The bore diameter should be equal to or larger than 105 mm, such that the sample space is minimum 90 mm.	
		with a homogeneity better than (or equal to) *±0.1% DSV*	
		The magnet should have suitable quench protection mechanism.	
		Field compensation must be present.	
		The magnet should have a persistent mode switch offering field stability better than 50 ppm drift per hour at full field.	
		The magnet should be provided with the necessary power supply, magnet temperature sensor and readout, and current leads. The power supply should be capable of "four-quadrant" operation and smooth zero crossing. No mechanical switching or glitch should occur when the magnetic field is ramped through zero value.	
		The magnet should be easily removable from the bottom of the dilution unit.	
		The field stability must be better than 0.05% drift per hour. Ramp rate up to approximately 0.1 Tesla/minute is required. All the functions of the magnet supply should be accessible through an LAN/USB interface. Necessary accessories enabling use of the system without the magnet should be provided.	
21	Experimental wiring-DC	Following DC wiring should be provided:	
		4x12 twisted pairs (total 96 lines) of CuNi or Ph-Br wiring from 24-pin Fischer connector at room temperature to mixing chamber plate, with micro-D break at 4 K. - proper heat-sinking at every stage	

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22	Experimental high-frequency wiring-RF	Vacuum flanges with necessary feedthroughs and additional thermal anchoring flanges at 50 K and 4 K for the experimental wiring mentioned below should be provided. 5 nos of SK terminated x 0.86 mm SCuNi-CuNi (centre conductor is silver plated) coaxial cables capable of supporting signals up to 40 GHz in frequency, thermalized using in-line attenuators on each plate and feedthrough thermalization flanges at all temperature stages, down to the mixing chamber. The appropriate attenuator for each stage will be discussed after order finalization. 5 nos of SMA terminated x 0.86 mm SCuNi-CuNi (centre conductor is silver plated) coaxial cables capable of supporting signals up to 18 GHz in frequency, thermalized using in-line attenuators on each plate and feedthrough thermalization flanges at all temperature stages, down to the mixing chamber. The appropriate attenuator for each stage will be discussed after order finalization.	
		43 nos. SMA terminated individual coaxial cables supporting signals up to 1 GHz in frequency, thermalized using in-line attenuators on each plate and feedthrough thermalization flanges at all temperature stages, down to the mixing chamber. The appropriate attenuator for each stage will be discussed after order finalization.	
23	Filter	1 set of filters for operation at the base temperature (on the cold finger mounted to the mixing chamber plate), for which the following specifications should be quoted: 1. Should comprise of one low frequency (RC) filter board and one radio frequency (RF) filter board, with 24 channels. 2. 25-pin micro-D connectors, pin-out compatible with most dilution refrigerators. 3. Should be designed for easy mounting on or below the mixing chamber plate in dilution refrigerators. 4. The electron temperature with and without the filter, keeping all other parameters of the circuitry within and outside the dilution refrigerator unchanged, should be specified (preferably using a single electron transistor as a test probe). 5. Should be provided with high conductivity copper enclosure, with non-magnetic gold plating. 6. Should be compatible with low temperatures and high magnetic fields.	
24	Cold-finger for Dilution refrigerator	1 gold-plated Be-Cu cold finger, as per the design provided by us should be included.	
25	Amplifier Wiring	a) 2x4 triple twisted pair (48 Nos.). Cu (35 AWG) wiring routed from the room temperature 24-pin Fischer connector to the micro-D connector at the 4 K flange.	
		b) Bias cables, micro-D clamps, adapters, mounting beams and brackets, and necessary assemblies for at least 4 LNAs (suitable for the requirement, to be specified later).	
26	Mounting	Floor mounting supporting frames for the cryostat, gas handling systems and pumps.	
27	Warranty from the date of Installation	a) Standard warranty of 1-year for the main system, all components and accessories from the date of installation and commissioning. b) 1-year of comprehensive warranty for the system including all components after the expiration of standard warranty, except for the superconducting magnet. AMC should be quoted for additional 3 years.	
28	Other terms and Condition	(1) Factory test reports of base-temperature, cooling power and cooldown times of the system should be communicated before shipping the item.	

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		(2) should have supplied and installed at least 2 similar cryogen-free systems (with magnet) in the country. Please provide a list of existing customers (with copies of PO or customer completion certificate) in the country.	
		(3) Presentations with detailed technical explanations are mandatory. Installation, commissioning, and training should be provided by the vendor at our site. The cost towards this should be included in the quotation. The quoted price should be CIF at installation site.	
		(4) The lead time for the delivery of the equipment should not be more than 11 months.	
II	**Water Chiller for the Dilution refrigerator**	Suitable air-cooled i water chiller meeting the capacity, the required inlet and outlet flowrates together with the required manifold along with proven service support in the region has to be provided. Standard warranty should be included	4
III	**Air Compressor for the dilution refrigerator**	Air compressor for providing compressed air to operate pneumatic valves. Standard warranty should be included	4
IV	**Online UPS for the Dilution refrigerator**	60 KVA - inline - 3phase input, 3-phase output, Form factor <1sq-m, true sinusoid, power factor => 0.85 with battery for 15 min power backup, Galvanic Isolation transformer, 1-year warranty.	4
V	**Helium Leak detector For the dilution refrigerator**	Capable of operating in vacuum and sniffing leak detection modes, with minimum leak detection rates of 5 x10-12 mbar l/s and 5x10-9 mbar l/s, respectively, supported by oil free pumping system, must be included in the quote. Standard warranty.	2

- Items I-IV: Two units need to be delivered at IIT Bombay, Powai, Mumbai 400076, Maharashtra, India; one unit at IIT Delhi, Hauz Khas, New Delhi 110016, India; one unit at IISER Thiruvananthapuram, Maruthamala P.O., Vithura, Thiruvananthapuram 695551, India.
- Item-V: One unit need to be delivered at IIT Bombay, Powai, Mumbai 400076, Maharashtra, India; one unit at IIT Delhi, Hauz Khas, New Delhi 110016, India.