

Tender Notification for the procurement of a cryogen-free dilution refrigerator at Department of Instrumentation and Applied Physics, IISc

(Last date for submission of tenders is 1700 hrs on the 9th November 2018):

REF: IAP/01/OT/BS/2018-19/15Oct2018

Dear Sir/Madam,

Kindly send your best quotation for the following item on C.I.P Bengaluru basis. Your quotation should clearly indicate the terms of delivery, delivery schedule, E.D., payment terms etc. The tender should be submitted in **two separate sealed envelopes - one containing the technical bid and the other containing the commercial bid**, both of which should reach us, duly signed on or before 1700 hours of the 9th November 2018.

The bids should be addressed to:

The Chairman,
Department of Instrumentation and Applied Physics
Indian Institute of Science,
Bengaluru 560012, India.

The bids should be sent to:

Dr. Baladitya Suri,
Assistant Professor,
Department of Instrumentation and Applied Physics,
Indian Institute of Science,
Bengaluru 560012, India.

Email: surib@iisc.ac.in

Phone: +91 80 2293 3619

Please enclose a compliance statement along with the technical bid.

Yours Sincerely,

Chairman,
Department of Instrumentation and Applied Physics,
IISc, Bengaluru, India.

Specifications of the cryogen-free dilution refrigerator

Core Specifications:

- 1) **Base Unit:** Cryogen-free dilution refrigerator with the below technical and user specifications.
- 2) **Base temperature and total cool-down time:** Guaranteed base temperature **less than 10 mK (expected value less than 8 mK) at the sample position (away from the mixing chamber). This base temperature should be achieved with factory installed wiring and RF cabling (optional line item below).** Total cool-down time should be less than 24 hours to reach the base temperature from room temperature (Note that this includes the pre-cooling time, if any to an intermediate temperature stage). Please provide the plots of measurements of the system performance (such as cool-down vs time) clearly specifying the conditions under which the measurement was conducted.
- 3) **Cooling power:** **At least 10 microwatt (expected value around 12 microwatt or more) of cooling power at the sample position (measured away from the mixing chamber) at 20 mK,** at least 250 microwatt of cooling power (measured away from the mixing chamber) at 100 mK, at least 360 microwatt of cooling power (measured away from the mixing chamber) at 120 mK. The system should have an appropriate amount of He3/He4 mixture to achieve the above-mentioned parameters. Please specify the amount of He3/He4 gases.
- 4) **Pulsetube cryocooler:** A pulse tube cryocooler (with compressor) having a **cooling power of at least 1 watt at 4.2 K.**
- 5) **Cryostat:** The cryostat should preferably have a single vacuum space with all hermetic seals such as O-ring seal at room temperature -- no exchange gas, no indium seal, no Kapton seal, light-weight outer vacuum jacket and radiation shields enabling one-person manual assembly.
- 6) **Dimensions of the cold plate and sample space:** The cold plate at mixing chamber should be **at least 290 mm in diameter** and it should have **at least 240 mm of vertical space** below the mixing chamber plate (till the inner most radiation shield).
- 7) **Temperature Controller:** Fully automated temperature control with appropriate temperature sensors, heaters and heat-switches.
- 8) **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. If not, please include suitable pumping system for sample vacuum space evacuation.
- 9) **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.
- 10) **Cold trap:** Appropriate cold traps to operate the fridge for long durations (> 6 months) without blockage issues in the circulation loop.
- 11) **Support feature:** Floor mounted standard support frame for the pumping bellows and the cryostat
- 12) **Mechanical Vibrations:** Less than 100nm amplitude near 100 Hz (in both horizontal and vertical directions) at the mixing chamber plate while the fridge is in operation.
- 13) **Isolation:** Pulse tube should have mechanical vibration isolation from the rest of the cryostat. Pulse tube and compressor should be electrically isolated from the cryostat.

- 14) **Cooldown procedure, safety and control software:** Automatic cool down to base temperature. Safety interlocks allowing unattended operation; remote control operation; continuous monitoring and logging of the system parameters.
Control software should be based on windows 7 or higher version operating system architecture. Free upgrades of software.
- 15) Testing and training should be done during onsite installation
- 16) Provide soft and hard copy of the manual and supporting documents
- 17) **Warranty:** Three years comprehensive warranty for the whole system with all the components. Please specify the service plan like whether the local distributor will address the issue or parent company. Please mention which parts are field replaceable.
- 18) **List of customers and references:** Proven track record of installation and service to customers based in India and at least five sites globally.
- 19) Terms and conditions for the annual maintenance contract beyond the warranty period should be mentioned.
- 20) **Payment Terms:** The quotation should be in the currency of the country of origin. The payment will be through confirmed irrevocable Letter of Credit. Alternate modes of payment can be suggested with suitable justification.

Optional specifications: The following may be included in the quotation as an optional line item

- Suitable UPS backup system for the whole setup with at least a 2hour backup
- Appropriate water chiller system for coolant water
- Air compressor for pneumatic valves
- Warm up heaters to reduce the warm up time from base temperature to room temperature
- **Coaxial wiring:**
 1. 4x 0.86mm SCuNi-CuNi (centre conductor is silver plated) attenuated semi-rigid SMA (18 GHz) coaxial lines from RT to 4K flange with feed-through thermalization flanges with F/F SMA bulkheads.
 2. 4x 0.86mm NbTi-NbTi semirigid superconducting SMA (18GHz) co-axial line from 4K flange to mixing chamber. Including feed-through thermalization flanges with F/F SMA bulkheads.
 3. 4x 0.86mm SCuNi-CuNi (centre conductor is silver plated) attenuated semi-rigid SMA (18GHz) coaxial line from room temperature to 4K flange – including appropriate attenuators at 50K and 4K, and feedthrough thermal flanges with F/F SMA bulkheads.
 4. 4x 0.86mm SCuNi-CuNi (centre conductor is silver plated) attenuated semirigid SMA (18GHz) coaxial lines from 4K flange to mixing chamber – including cryo attenuators at still and subsequent cold stages and mixing chamber.
 5. 4x 0.86mm SCuNi-CuNi (centre conductor is silver plated) attenuated semirigid K-2.92mm (40 GHz) coaxial lines from room temperature to 4K flange – including appropriate attenuation at the 50K and 4K stages, feedthrough thermalization flanges and F/F K-2.92 mm connectors.
 6. 4x 0.86mm SCuNi-CuNi (centre conductor is silver plated) attenuated semirigid K-2.92 mm (40 GHz) coaxial lines from 4K flange to mixing chamber – including cryo attenuators at still and subsequent cold stages and mixing chamber and feedthrough thermalization flanges and F/F 2.92 mm connectors.

- **Experimental DC wiring:**
 1. 12x twisted pair experimental wiring (24 wires 36 AWG phosphor-bronze) from room temperature to mixing chamber flange – additional breakout at 4K.
 2. 12x low-Ohmic twisted pair experimental wiring (Cu+NbTi/CuNi) from room temp. to mixing chamber – additional thermal anchoring to pulse tube and break out at 4K.
 3. 12x twisted pair experimental wiring (24 wires of 35 AWG Cu) from room temp to 4K flange.

Common specifications for 1), 2) and 3): All wires should be terminated with suitable connectors at room temperature, 4 K plate, and at mixing chamber plate. All wires should have proper thermal anchoring at each temperature stage.

Yours sincerely

Baladitya Suri,

Assistant Professor,

Department of Instrumentation and Applied Physics

Indian Institute of Science,

Bengaluru-560012.

Email: surib@iisc.ac.in

Phone: +91 80 2293 3619