



**CSIR – NATIONAL PHYSICAL LABORATORY
(COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH)
DR. K. S. KRISHNAN MARG, PUSA, NEW DELHI INDIA – 110012**

**EXPRESSION OF INTEREST
for
FINDING / SEARCHING DOMESTIC MANUFACTURERS OR SUPPLIERS FOR
SCIENTIFIC / R&D ITEMS**

NPL REF: NPL/EOI/MII/2020

HARD COPY of your proposal to be submitted to:

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CSIR - NATIONAL PHYSICAL LABORATORY
(COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH)
DR. K. S. KRISHNAN MARG, PUSA, NEW DELHI INDIA – 110012**

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LAST DATE FOR SUBMITTING WRITTEN PROPOSAL: Oct. 22, 2020

**ENQUIRIES SEEKING NAMES OF INDENTORS / END USERS SHALL NOT BE ENTERTAINED. ALL
INSTRUCTIONS ARE AVAILABLE IN THIS DOCUMENT ONLY. PLEASE READ IT THOROUGHLY.**

CSIR - National Physical Laboratory (NPL) New Delhi, country's National Measurement Institute and a premier laboratory of Council of Scientific & Industrial Research (CSIR), intends to procure various scientific instruments/ items as per the detailed specifications provided in this document. Normally most of these items with the kind of specifications and parameters required for users in NPL for their research purposes are available through international manufacturers / suppliers. In pursuance of recent policies / guideline /orders issued by various Ministries of the Govt. of India to encourage domestic manufacturing and preference to domestic suppliers under various programs like Make in India, AtmaNirbhar Bharat etc., interested firms capable of offering the listed items are requested to respond to this notice.

Firms are requested to refer to the **Order Nos. P-45021/2/2017-PP (BE-II) dt. 15.06.2017 as amended vide order of even number 28.05.2018, 29.05.2019, 04.06.2020, and 16.09.2020** issued by Public Procurement Section of DPIIT, Min. of Commerce & Industry, Government of India in their own interest to know about the provisions related to domestic suppliers for participation in open tenders. Firms may also refer to various other policies / programs of the Govt. related to promoting domestic manufacturing and/or supply.

Following is the list of items with their detailed specifications that are required by users in CSIR-NPL to meet their research requirements. WE STRONGLY ENCOURAGE INDIAN MANUFACTURERS / SUPPLIERS OF SAME / SIMILAR ITEMS TO GO THROUGH THE TECHNICAL PARAMETERS AND WRITE TO US EXPRESSING THEIR INTEREST TO MANUFACTURE / SUPPLY THE SAME. WHEREVER IT IS FELT THAT ANY / SOME PARAMETERS ARE RESTRICTIVE OR SUPERFLUOUS IN NATURE, DOMESTIC MANUFACTURERS CAN BRING THE SAME TO OUR NOTICE.

DOMESTIC MANUFACTURERS / SUPPLIERS, INDIAN SUBSIDIARIES OR AGENTS OF FOREIGN MANUFACTURERS / SUPPLIERS ARE REQUESTED TO GO THROUGH THE PROVISION OF ORDERS ISSUED BY DPIIT, MIN. OF COMMERCE & INDUSTRY OR ANY OTHER ORDER / CIRCULAR ISSUED BY OTHER MINISTRIES TO EXPRESS THEIR INTEREST TO SUPPLY THE ITEMS REQUIRED BY CSIR-NPL IN COMPLIANCE OF THE PROVISIONS OF THE THOSE ORDER(S)/CIRCULARS.

AFTER EVALUATING RESPONSE TO THIS EOI NOTICE, CSIR-NPL WILL DECIDE ABOUT FLOATING GLOBAL TENDER ENQUIRY (GTE) AFTER SEEKING APPROVAL OF THE COMPETENT AUTHORITY ONLY FOR SUCH ITEMS FOR WHICH NO DOMESTIC MANUFACTURER OR SUPPLIER HAS EXPRESSED INTEREST TO SUPPLY THE ITEMS WITH THE REQUIRED SPECIFICATIONS IN PURSUANCE OF THE SAID GOVT. CIRCULARS / ORDERS / NOTIFICATIONS.

| | |
|---|--|
| 1 | Item Name : Technical Specifications of Cryogen Free Low Temperature Magneto Transport Measurement System & Inserts for Cryogen Free Low Temperature Magneto Transport Measurement System |
| | Qty. 01 Brief Summary of Use of Item: A dedicated cryogen free refrigerator down to ~ 2K with superconducting magnets is required to access continuous experimental feedback for optimal sample synthesis and extensive studies of superconducting properties in ultrathin films and to explore how the superconductivity modifies at reduced dimensions before processing for devices. Low temperature inserts for various transport measurements namely, insert for electrical transport for performing ac-resistance, I-V, and differential resistance, (dV/dI vs. I) measurements; insert for ac-susceptibility measurement for studies of vortex dynamics; insert for ferromagnetic resonance spectroscopy for the studies of spin dynamics in superconductor/ferromagnet proximity system; torque magnetometry insert for the studies of superconducting fluctuations; insert for the studies of effects of light shining in transport properties of within the variable temperature and magnetic field environment would be useful. |
| | Tentative Specifications : <u>I. Basic System:</u> <ol style="list-style-type: none"> System should be fully cryogen-free and only small amount of helium gas should be required for its fully automated startup and operation. All low temperature operations must be fully automated and user friendly. Preference |

would be given to automatic gas flow control over manual control for having better control on temperature operation and temperature stability. Vendor should explain their temperature control mechanism.

- c) Necessary vacuum and gas purging system should be integral to the base system and their operations should have been fully automated. A high vacuum system, for example a cryo-pumping option (10^{-4} Torr), should be included.

1) Superconducting magnet:

- a) Longitudinal magnetic field of ± 12 T or higher should be available with highly stable bipolar power supply with over-voltage protection and low noise.
- b) Field charging rate: 150Oe per second or higher
- c) Time to cool down the magnet from initial starting should be efficient (m35 Hrs.).Magnet cool down data should be provided.
- d) Magnet control software must monitor the temperature of the magnet and cryostat at various locations to ensure proper operation of the magnet system from quenches.

2) Temperature control:

- a) Fully automated cooling and warm up operation in the temperature range ~ 400 K to ~ 1.9 K. Vendor must provide approx. helium gas usage for sample cool down from 400 K to 1.9 K. The time required for a cooling down from 400 K to 1.9 K or a warming up from 1.9 K to 400 K should both be less than 1 hour. Vendor should provide supporting data.
- b) The system must be able to hold the measurement temperature within 0.1% in the temperature range of ~ 1.9 K to 20 K under magnetic fields of up to 9T (or higher) and within 0.05% at temperatures of 20 K to 400 K. Vendor should provide temperature stability data at 1.9 K at a magnetic field of 9T. The data should have been collected as prescribed below:
 - i) Set sample temperature to 1.9 K at zero-field
 - ii) Stabilize sample temperature at 1.9 K for 10 min;
 - iii) Continuously ramp magnetic field to 9T while recording the temperature.Please provide recorded data in a temperature versus time format, clearly indicating the steps as specified above.

- 3) **Data acquisition and analysis:** Licensed Windows based operating software and computer control system compatible with the measurement options. It should allow fully automated measurements (except changing samples). The software shall control all aspects of the instrument's electronics, hardware, gas handling, data acquisition and data analysis.
- 4) Other accessories: Spare fuses, O-rings, Hoses for chiller unit, Helium gas regulators.

II. Measurement Options:

A. Electrical Transport:

- (a) Temperature range: ~ 1.9 K . ~ 400 K
- (b) AC resistance, I-V characteristics and differential resistance measurement (dV/dI vs. I or dV/dI vs. V).
- (c) Must have two built-in independent sources and meters so that two measurement channels are truly independent.
- (d) In addition to standard mode (4-wire resistance from $\sim 10\mu\Omega$ up to $10M\Omega$ or higher), there should be high impedance mode - 2-wire resistance measurement at least up to $5G\Omega$.
- (e) Drive parameters:
 - i. Current amplitude range: 10nA (or lower) to 100 mA (or higher)
 - ii. Frequency range: 1Hz (or lower) . 175Hz (or higher)
 - iii. Voltage amplitude range: 10mV (or lower) . 10V (or higher)

B. DC Resistivity:

- (a) Temperature range: ~ 1.9 K . ~ 400 K
- (b) Four independent channels that can be used for two and four-wire resistance

measurements at least up to three samples in a single sequence.

- (c) Current Range: ≈ 2 nA to ≈ 8 mA
- (d) Sensitivity: ≈ 20 nV
- (e) System should include sample wiring test station
- (f) Must have configurable bridge parameters to limit the voltage, current, or power at the sample for protecting sensitive devices, films, etc

C. FMR Measurement:

- (a) The option must be able to measure effective magnetization (M_{eff}), anisotropy (K), gyromagnetic ratio (γ), damping (α), inhomogeneous broadening (ΔH_0), exchange stiffness (A), inverse spin Hall effect (ISHE) voltage in ultrathin films.
- (b) Temperature Range: ≈ 1 K to ≈ 400 K.
- (c) Broadband FMR measurement with FMR Bandwidth of 2GHz . 18 GHz or higher.
- (d) At least 5 research articles should be attached in support of broadband FMR measurement and capability by the quoted instruments.

D. AC Susceptibility& DC Magnetization Measurement:

- a) Temperature Range: ≈ 1.9 K to ≈ 400 K.
- b) Along with AC magnetization option, DC magnetization measurement must be possible without any change in the hardware, sample or sample mount.
- c) Drive AC Amplitude must range from 0.1Oe . 12Oe or higher. Please provide data.
- d) AC drive frequency of 10 Hz to 10 kHz or above should be possible. (please provide data)
- e) Magnetization sensitivity should be at least 5×10^{-8} emu (for AC measurements) and 5×10^{-5} emu (DC measurements).
- f) Ability to accurately separate real and imaginary components of AC response.
- g) Thermometer should be mounted directly on the AC coil in order to reduce errors from the thermal lags that may exist, particularly at higher temperature.
- h) Measurement mode like five, three and one point option should be available.
- i) Option for higher harmonic measurements should be quoted.
- j) Measurement unit must calibrate itself real-time at each measurement point while performing measurements.
- k) There should be an option to measure AC susceptibility down to 50 mK in future.
- l) Vendor has to provide at least 10 research articles references/copy of measurements data to support the measurements and accuracy.

E. Torque Magnetometry:

- (a) Should provide the measurement of magnetic torque $mB \sin \theta$ for ≈ 1.9 K to ≈ 400 K temperature range.
- (b) Moment sensitivity of 3×10^{-7} emu at 9T or better
- (c) Must include sample rotation along horizontal rotation axis with rotation range of -10 degrees to 370 degrees
- (d) Angular step rotation must be 0.005 degrees/step or better
- (e) Vendor must provide a data of Torque Curves of 100 nm thick magnetic film as a function of the angle of the applied field (with respect to the film normal). Data must show the anisotropy of the sample at 1.5T, 2.5T, 5T and 9T magnetic fields.
- (f) There should be Four independent channels for performing DC resistivity
- (g) Vendor has to provide at least 5 research articles references/copy of measurements data to support the measurements and accuracy of Torque magnetometry.

F. Optical Probe Measurements:

- a) Temperature range ≈ 5 K to ≈ 350 K
- b) Must have a customizable 1+ (SM1) free-beam access port and internal $\frac{1}{2}$ + (SM05) mounts along the optical path.
- c) Modular feedthroughs should be available for electrical signals into the sample space
- d) Multiple contacts should be provided on removable PCB sample platform for electrical

- measurements
- Should have an integrated optical camera to allow fine alignment and focus for in situ XYZ positioning.
 - At least 3 mm X 3 mm X 3 mm sample positioning should be available in all the axis.
 - Must have complete integration of imaging and positioning with the system software.
 - Should provide a test station for ex-situ alignment of optical elements and testing for proper electrical connections to the sample.
 - Data sheets and documents should be attached in support of the optical measurement by the quoted option.

G. Other Components:

- Water chiller unit:** Suitable water chiller unit with the suitable capacity for trouble free continuous running of the main system should be offered.
- UPS:** A suitable UPS system should be quoted.

III. Provision for future upgradation:

The system must be field upgradable to the following options in future

- Dilution refrigerator,
- AC Susceptibility up to Dilution temperature (50 mK)
- Dilatometer

2 Item Name : Femtosecond Pulsed Laser Source

Brief Summary of Use of Item: Femtosecond pulsed laser source with MHz repetition rate will be used as source of photon for single photon detection activity.

Tentative Specifications:

| S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity |
|--------|--|--|
| | Femtosecond Pulsed Laser Source | 1 no. |
| 1 | Pulse repetition rate | ~ 50MHz |
| 2. | Output port | PM Fiber coupled |
| 3. | Minimum pulse width | ~ 250fs |
| 4. | No. of pulse widths which can be tuned upto 15ps | 5 or more |
| 5. | Tunable wavelength range | ~ 1540nm to ~ 1560 nm |
| 6. | Primary output power | ~ 1 mW |
| 7. | Trigger /Electrical Sync output | SMA connector |
| 8. | Optical output port | FC/ PC or FC/APC |
| 9. | Time jitter | <1ps |
| 10. | Secondary output power | ~ 10 μ W |
| 11. | Peak power | ~ 10W |
| | Other Details | |
| 1. | Power requirement: Compatible with Indian standard. | |
| 2. | Standard warranty: 12 months from the date of acceptance/successful installation of the equipment. | |
| 3. | One person (at least) should be trained in the laboratory for operation, basic maintenance. | |
| 4. | Vendor should provide list of user academic/government funded institutions in India/ overseas. | |

| 3 | Item Name : | Sensors & Accessories for Power and Energy Measurements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | Brief Summary of Use of Item: These will be used in single photon detection activity for measuring extremely low level laser power & energy down to pW and PJ respectively over a broad wavelength range at least from 200 - 1650nm.This is an un avoidable step in order to be able to count number of photons. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Tentative Specifications : | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table> <tr> <th>S. No.</th><th>Items / Measurement Capability / Functionality / Parameter</th><th>Description / Specification / Quantity</th></tr> <tr> <td>A.</td><td>Photodiode sensor</td><td>1 no.</td></tr> <tr> <td>1.</td><td>Spectral Range</td><td>n800 nm to ~ 1650 nm</td></tr> <tr> <td>2.</td><td>Power Range</td><td>n20pW to ~ 125mW</td></tr> <tr> <td>3.</td><td>Power Resolution</td><td>m0.0001 nW</td></tr> <tr> <td>4.</td><td>Detector type</td><td>InGaAs</td></tr> <tr> <td>5.</td><td>Fiber adaptor</td><td>FC/PC and SMA</td></tr> <tr> <td>6.</td><td>Accessories</td><td>Mounting accessories (base plate etc.,) compatible with the sensor</td></tr> <tr> <td>B.</td><td>Photodiode sensor</td><td>1 no.</td></tr> <tr> <td>1.</td><td>Spectral Range</td><td>n200 to ~ 1100 nm</td></tr> <tr> <td>2.</td><td>Power Range</td><td>n20pW to ~ 200mW</td></tr> <tr> <td>3.</td><td>Power Resolution</td><td>n0.001 nW</td></tr> <tr> <td>4.</td><td>Detector type</td><td>Silicon</td></tr> <tr> <td>5.</td><td>Fiber adaptor</td><td>FC /PC and SMA</td></tr> <tr> <td>6.</td><td>Accessories</td><td>Mounting accessories (base plate etc.,) compatible with the sensor</td></tr> <tr> <td>C.</td><td>Photodiode energy sensor</td><td>1 no.</td></tr> <tr> <td>1.</td><td>Absorber type</td><td>Si Photodiode</td></tr> <tr> <td>2.</td><td>Spectral Range</td><td>n200 nm to ~ 1100 nm</td></tr> <tr> <td>3.</td><td>Energy scales</td><td>n250 pJ to ~ 200 nJ</td></tr> <tr> <td>4.</td><td>Max. Pulse width</td><td>(5±1) s</td></tr> <tr> <td>5.</td><td>Max. Pulse rep. rate</td><td>~ 20kHz</td></tr> <tr> <td>6.</td><td>Fiber adaptor</td><td>SMA and FC/PC</td></tr> <tr> <td>7.</td><td>Accessories</td><td>Mounting accessories (base plate etc.,) compatible with the sensor</td></tr> <tr> <td>D.</td><td>Photodiode energy sensor</td><td>1 no.</td></tr> <tr> <td>1.</td><td>Spectral Range</td><td>n0.7 m to ~ 1.8 m</td></tr> <tr> <td>2.</td><td>Absorber type</td><td>Ge Photodiode</td></tr> <tr> <td>3.</td><td>Energy scales</td><td>n250 pJ to ~ 20 nJ</td></tr> <tr> <td>4.</td><td>Max. Pulse width</td><td>(5±1) s</td></tr> <tr> <td>5.</td><td>Max. Pulse rep. rate</td><td>~ 10 kHz</td></tr> <tr> <td>6.</td><td>Fiber adaptor</td><td>SMA and FC/PC</td></tr> <tr> <td>7.</td><td>Accessories</td><td>Mounting accessories (base plate etc.,) compatible with the sensor</td></tr> <tr> <td>E.</td><td>Display unit-laser power/ energy meter</td><td>1 no.</td></tr> <tr> <td>1.</td><td>Compatibility</td><td>The display unit should provide plug-and-play operation with above sensors</td></tr> <tr> <td>2.</td><td>Features</td><td>Color touch screen with features to display bar graph/chart. analogue needle, power with energy, frequency etc.</td></tr> <tr> <td>3.</td><td>Data storage</td><td>External USB flash drive</td></tr> <tr> <td>4.</td><td>Computer interface</td><td>USB, RS232</td></tr> </table> | S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity | A. | Photodiode sensor | 1 no. | 1. | Spectral Range | n800 nm to ~ 1650 nm | 2. | Power Range | n20pW to ~ 125mW | 3. | Power Resolution | m0.0001 nW | 4. | Detector type | InGaAs | 5. | Fiber adaptor | FC/PC and SMA | 6. | Accessories | Mounting accessories (base plate etc.,) compatible with the sensor | B. | Photodiode sensor | 1 no. | 1. | Spectral Range | n200 to ~ 1100 nm | 2. | Power Range | n20pW to ~ 200mW | 3. | Power Resolution | n0.001 nW | 4. | Detector type | Silicon | 5. | Fiber adaptor | FC /PC and SMA | 6. | Accessories | Mounting accessories (base plate etc.,) compatible with the sensor | C. | Photodiode energy sensor | 1 no. | 1. | Absorber type | Si Photodiode | 2. | Spectral Range | n200 nm to ~ 1100 nm | 3. | Energy scales | n250 pJ to ~ 200 nJ | 4. | Max. Pulse width | (5±1) s | 5. | Max. Pulse rep. rate | ~ 20kHz | 6. | Fiber adaptor | SMA and FC/PC | 7. | Accessories | Mounting accessories (base plate etc.,) compatible with the sensor | D. | Photodiode energy sensor | 1 no. | 1. | Spectral Range | n0.7 m to ~ 1.8 m | 2. | Absorber type | Ge Photodiode | 3. | Energy scales | n250 pJ to ~ 20 nJ | 4. | Max. Pulse width | (5±1) s | 5. | Max. Pulse rep. rate | ~ 10 kHz | 6. | Fiber adaptor | SMA and FC/PC | 7. | Accessories | Mounting accessories (base plate etc.,) compatible with the sensor | E. | Display unit-laser power/ energy meter | 1 no. | 1. | Compatibility | The display unit should provide plug-and-play operation with above sensors | 2. | Features | Color touch screen with features to display bar graph/chart. analogue needle, power with energy, frequency etc. | 3. | Data storage | External USB flash drive | 4. | Computer interface | USB, RS232 | |
| S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A. | Photodiode sensor | 1 no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Spectral Range | n800 nm to ~ 1650 nm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Power Range | n20pW to ~ 125mW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Power Resolution | m0.0001 nW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Detector type | InGaAs | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Fiber adaptor | FC/PC and SMA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Accessories | Mounting accessories (base plate etc.,) compatible with the sensor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B. | Photodiode sensor | 1 no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Spectral Range | n200 to ~ 1100 nm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Power Range | n20pW to ~ 200mW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Power Resolution | n0.001 nW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Detector type | Silicon | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Fiber adaptor | FC /PC and SMA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Accessories | Mounting accessories (base plate etc.,) compatible with the sensor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C. | Photodiode energy sensor | 1 no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Absorber type | Si Photodiode | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Spectral Range | n200 nm to ~ 1100 nm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Energy scales | n250 pJ to ~ 200 nJ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Max. Pulse width | (5±1) s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Max. Pulse rep. rate | ~ 20kHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Fiber adaptor | SMA and FC/PC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. | Accessories | Mounting accessories (base plate etc.,) compatible with the sensor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D. | Photodiode energy sensor | 1 no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Spectral Range | n0.7 m to ~ 1.8 m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Absorber type | Ge Photodiode | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Energy scales | n250 pJ to ~ 20 nJ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Max. Pulse width | (5±1) s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Max. Pulse rep. rate | ~ 10 kHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Fiber adaptor | SMA and FC/PC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. | Accessories | Mounting accessories (base plate etc.,) compatible with the sensor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| E. | Display unit-laser power/ energy meter | 1 no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Compatibility | The display unit should provide plug-and-play operation with above sensors | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Features | Color touch screen with features to display bar graph/chart. analogue needle, power with energy, frequency etc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Data storage | External USB flash drive | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Computer interface | USB, RS232 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | |
|-----------|--|--|
| 5. | Compatible detectors | Photodiode, Pyroelectric, Thermopile |
| 6. | Screen/display refresh rate | ~ 15 Hz |
| 7. | Multi sensor options | ~ 2 nos. of sensors can be connected and measure independently |
| F. | Other details | |
| 1. | Power requirement: Compatible with Indian standard. | |
| 2. | Standard warranty: 12 months from the date of acceptance/successful installation of the equipment. | |
| 3. | Vendor should ensure that all goods/components are new and unused. | |
| 4. | Installation / commissioning should include complete demonstration at user site to verify functionalities and capabilities of the system quoted. | |
| 5. | One person (at least) should be trained in the laboratory for operation, basic maintenance. | |
| 6. | Vendor should provide list of user academic/government funded institutions in India/overseas. | |

4 Item Name : Optical Workstation

Brief Summary of Use of Item: Optical platform with better positional stability, consistent vibration control & less energy transfer to the table is must for better sensitivity of optical studies.

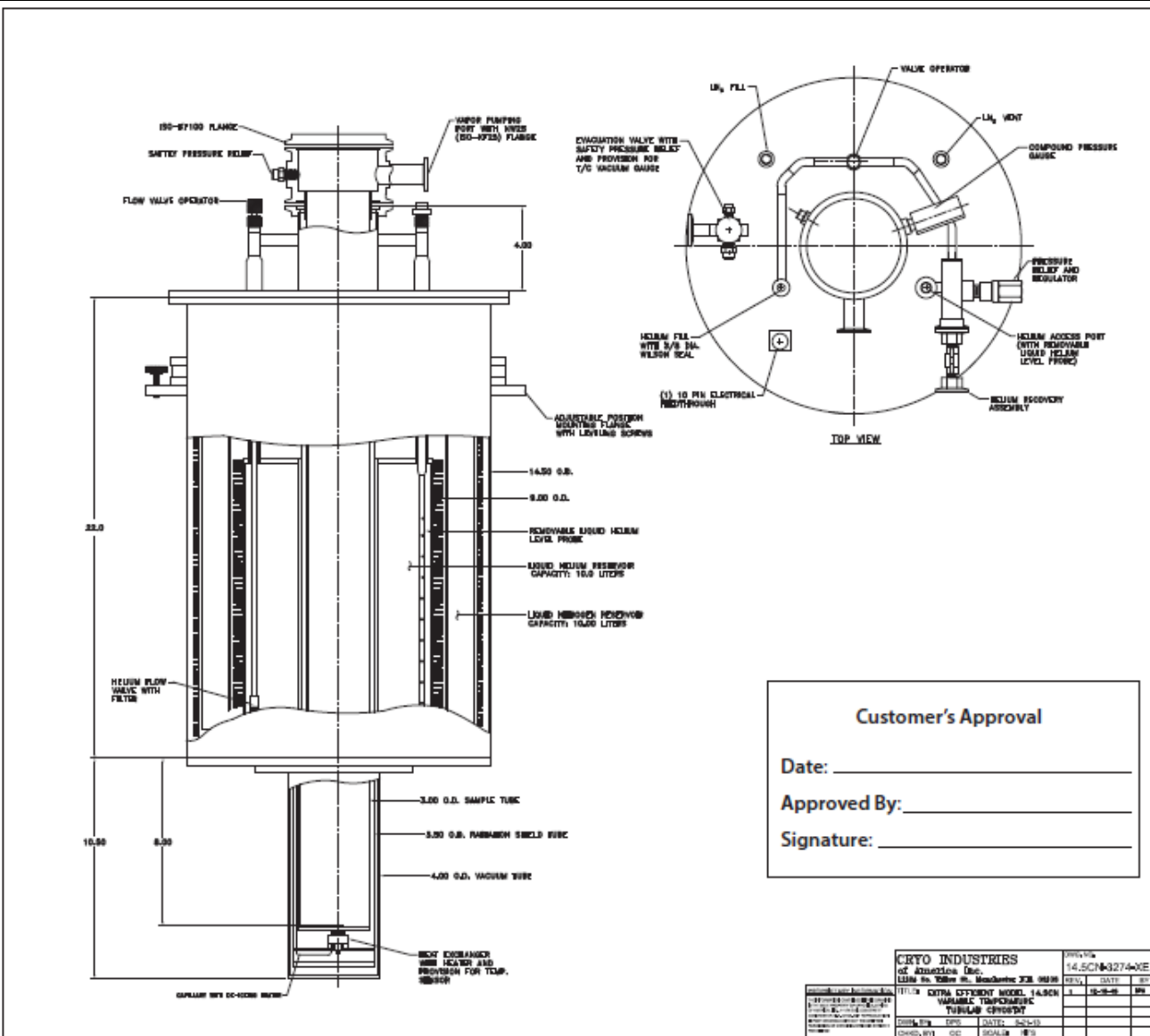
Tentative Specifications:

| S. No. | Items | Description / Specification | Qty. |
|--------|--|---|-------|
| 1. | Non-magnetic Optical Table (Metric) | <ul style="list-style-type: none"> - Dimension: 1200 (±100)mm X 2500 (±100)mm X 210 (±25)mm - Flatness of top skin/surface : Within ±0.15mm - Top & bottom Plates: 5 (±1)mm thick 304L Grade Stainless Steel - Mounting hole: Metric, M6 tapped holes on 25mm centers/grids - Sealed holes | One |
| 2. | Optical Table Frame (Metric) for above optical table | <ul style="list-style-type: none"> - Frame Height: 700 (±50)mm - Isolation Type: Active/Pneumatic, Self-leveling - No of Isolator: Four - Vertical Resonant Frequency: Within 0.8Hz - 1.5Hz - Horizontal Resonant Frequency: Within 0.8Hz - 1.5Hz - Vertical Transmissibility/Amplification at Resonance: Within 6dB - 12dB - Horizontal Transmissibility/Amplification at Resonance: Within 6dB - 12dB - Leveling Repeatability/Accuracy: Within ±0.7mm - Maximum Isolator Air Pressure: ~ 540kPa | One |
| 3. | Overhead Shelving Unit | <ul style="list-style-type: none"> - Should be compatible with above optical table & table frame - Should span across the length of the optical table - Number of shelves: 2 - Should have height adjustment options | One |
| 4. | Air Compressor | <ul style="list-style-type: none"> - Max. air pressure: ~ 800 kPa (116 psi) - Air tank size: Within 3 - 4 ltrs. - Noise level: ~ 80dB at 1ft - Voltage Rating: Compatible with Indian standard | One |
| 5. | Air Filter/Regulator | <ul style="list-style-type: none"> - Filter Efficiency: 5(±1) µm particles - Should be compatible with above optical table & table frame | One |
| 6. | Compressor | - Compressor Oil compatible for the Air compressor, ~ 750ml | 1Unit |

| | | | |
|-----------|--|---|-----|
| | Oil | | |
| 7. | Surge-Protected Power Strip | - Voltage Rating: Compatible with Indian standard - Current Rating: ~ 12A - Number of Outlet: ~ 20 | Two |
| 8. | LED Light Strips | - Should be compatible with above optical table & table frame - Length: Should span across the length of the optical table - Brightness: ~ 3500Lumens | Two |
| 9. | Cable Trays for keeping electrical / fibre optic cables | - Length: Should span across the length of the optical table - Should have the provision to attach either underneath or to the front of the overhead shelf frame | Two |
| 10. | 19" Rack Chassis | - Should be compatible with table frame - Standard 19" equipment rack - 8U capacity - Load capacity: ~ 50 kgs | One |
| 11. | 19" Rack Drawer | - Height: 4U - Full extension ball-bearing drawer slides - Lockable - divider kit | Two |
| 12. | Other accessories | - Should provide access for installing various accessories such as computer monitor, component trays etc. | Two |
| F. | Other Details | | |
| 1. | Power requirement: Compatible with Indian standard. | | |
| 2. | Standard warranty: 12 months from the date of acceptance/successful installation of the equipment. | | |
| 3. | Vendor should ensure that all goods/components are new and unused. | | |
| 4. | Installation / commissioning should include complete demonstration at user site to verify functionalities and capabilities of the system quoted. | | |
| 5. | One person (at least) should be trained in the laboratory for operation, basic maintenance. | | |

| 5 | Item Name : | SNSPD Based Two-channel Optical Photon Registration Insert for Liquid Helium Cryostat | | | | | | | | | |
|----------|---|---|--|--|--|--|--------------|----|---|---|--|
| | Brief Summary of Use of Item: Reference detector with known figure is must to integrate several accessories and optimize the performance of low temperature measurement set up. | | | | | | | | | | |
| | Tentative Specifications: | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>S. No.</th><th>Items / Measurement Capability / Functionality / Parameter</th><th>Description / Specification / Quantity</th></tr> </thead> <tbody> <tr> <td></td><td>SNSPD Based Two-channel Optical Photon Registration Insert for Liquid Helium Cryostat</td><td>1 no.</td></tr> <tr> <td>1.</td><td>Two channel cryogenic insert compatible with existing liquid helium cryostat (Fig.1) includes required number of</td><td> - Operating temperature: m2.0K - No. of Channel (Ch): Two - Two nos. of SNSPDs (specified below as Ch#1 and Ch#2) to be mounted on insert. Coax cable & SMA coaxial feed-through for electrical connections. Appropriate optical fiber& FC/ PC fiber optic feed-through for light shining - Two nos. of FC/PC-FC/PC adapter - Two nos. of coaxial cables with SMA connector </td></tr> </tbody> </table> | S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity | | SNSPD Based Two-channel Optical Photon Registration Insert for Liquid Helium Cryostat | 1 no. | 1. | Two channel cryogenic insert compatible with existing liquid helium cryostat (Fig.1) includes required number of | - Operating temperature: m2.0K - No. of Channel (Ch): Two - Two nos. of SNSPDs (specified below as Ch#1 and Ch#2) to be mounted on insert. Coax cable & SMA coaxial feed-through for electrical connections. Appropriate optical fiber& FC/ PC fiber optic feed-through for light shining - Two nos. of FC/PC-FC/PC adapter - Two nos. of coaxial cables with SMA connector | |
| S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity | | | | | | | | | |
| | SNSPD Based Two-channel Optical Photon Registration Insert for Liquid Helium Cryostat | 1 no. | | | | | | | | | |
| 1. | Two channel cryogenic insert compatible with existing liquid helium cryostat (Fig.1) includes required number of | - Operating temperature: m2.0K - No. of Channel (Ch): Two - Two nos. of SNSPDs (specified below as Ch#1 and Ch#2) to be mounted on insert. Coax cable & SMA coaxial feed-through for electrical connections. Appropriate optical fiber& FC/ PC fiber optic feed-through for light shining - Two nos. of FC/PC-FC/PC adapter - Two nos. of coaxial cables with SMA connector | | | | | | | | | |

| | | | |
|-----|--|--|--|
| | | | <ul style="list-style-type: none"> - Temperature sensor (with accuracy $\pm 1.5\text{mK}$ at 4.2K) for monitoring temperature at sample stage, heater arrangement for controlling and maintaining sample temperature |
| 2. | Channel #1 | | <ul style="list-style-type: none"> - One SNSPD with following specifications: - Wavelength range: 630-640 nm - System quantum efficiency: $\sim 83\%$ - Dead time: $\leq 20\text{ ns}$ - Jitter: $\leq 50\text{ ps}$ - Dark counts rate: $\leq 15\text{ cps}$ |
| 3. | Channel #2 | | <ul style="list-style-type: none"> - One SNSPD with following specifications: - Wavelength range: 1540-1560 nm - System quantum efficiency: $\sim 83\%$ - Dead time: $\leq 20\text{ ns}$ - Jitter: $\leq 50\text{ ps}$ - Dark counts rate: $\leq 110\text{ cps}$ |
| 4.. | Control Unit | | <ul style="list-style-type: none"> - Two channel precision DC-bias sources for SNSPDs - Temperature measurement capability - Set of connecting cables and SMA connectors - Software & Drivers (as per requirement) |
| | Other Details | | |
| 1. | Power requirement: Compatible with Indian standard. | | |
| 2. | Standard warranty: 12 months from the date of acceptance/successful installation of the equipment. | | |
| 3. | Vendor should ensure that all goods/components are new and unused. | | |
| 4. | Installation / commissioning should include complete demonstration at user site to verify functionalities and capabilities of the system quoted. | | |
| 5. | One person (at least) should be trained in the laboratory for operation, basic maintenance. | | |
| 6. | Vendor should provide list of user academic/government funded institutions in India/ overseas. | | |



6 Item Name : Power Supply for DC Magnetron Sputtering

Brief Summary of Use of Item: DC power supplies with options for output regulation very precisely with constant voltage, current or power, automatic arc suppression ability would greatly enhance the ability to control the sputtering process and thereby the quality of samples.

Tentative Specifications:

| S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification/ Quantity |
|--------|--|--|
| A. | Power Supply for DC Magnetron Sputtering | 2 nos. |
| 1. | Output power | ~ 500W |
| 2. | Output voltage | ~ 800V |
| 3. | Output current | ~ 800mA |
| 4. | Regulation | Selectable Voltage / Current / Power regulation mode |
| 5. | Arc suppression | Option for arc suppression |
| 6. | Operation/Communication | Manual as well through A/D interface |

| | | | |
|---------------|--|---|---|
| | 7. | Display | Digital display for voltage, current and power |
| | 8. | Cooling (if requires) | Air cooled |
| | B | Switch Box | 1 No. |
| | 1. | Multiple output | Switch box should be configured so that at least 3 nos. of sputtering sources can be connected at a time for sequential deposition. |
| | C. | Cable for sputter source | 6 Nos. |
| | 1. | Cable for sputter source | Cable (~ 3m long) with N-type male connector at the sputter source side. |
| | | Other Details | |
| | 1. | Power requirement: Compatible with Indian standard. | |
| | 2. | Standard warranty: 12 months from the date of acceptance/successful installation of the equipment. | |
| | 3. | Vendor should ensure that all goods/components are new and unused. | |
| | 4. | Installation / commissioning should include complete demonstration at user site to verify functionalities and capabilities of the system quoted. | |
| | 5. | One person (at least) should be trained in the laboratory for operation, basic maintenance. | |
| | 6. | Vendor should provide list of user academic/government funded institutions in India/overseas. | |
| 7 | Item Name : Turbo Molecular Pumping System and Accessories | | |
| | Brief Summary of Use of Item: Compact turbo pumping station is required for routine maintenance of vacuum system. | | |
| | Tentative Specifications: | | |
| S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity | |
| 1. | Turbo Molecular Pumping Station | 1 no. | |
| | | Turbo Pump ➤ Pumping speed for N ₂ ~ 250 l/s ➤ Inlet mesh screen (for protection), with appropriate display control unit ➤ Ultimate pressure better than 1x10 ⁻¹⁰ mbar ➤ Mains cable and the interconnecting connecting cable of ≥3 meter length ➤ Inlet Flange: DN 100 CFF ➤ High vacuum side Bearing : Maintenance free, permanent magnetic bearing Backing pump ➤ Pumping speed: ~ 1.8m ³ /h Control Unit Control unit for the above pumping station should display the following parameters: - ➤ Speed of the pump in terms of Hz and rpm ➤ Current drawn by the pump ➤ Operating hours ➤ Temperature of ceramic bearing, motor part, bottom part and electronics | |

| | | |
|-----|--|--|
| 2. | Roughing / Rotary Vane Pump | 1 no. |
| | | <ul style="list-style-type: none"> ➤ Flange (In-let): DN 16 ISO-KF ➤ Flange (Out-let): DN 16 ISO-KF ➤ Pumping speed: ~ 9m³/h ➤ Ultimate pressure without gas ballast: 4×10^{-3} mbar ➤ Integrated with high speed hydraulically controlled high vacuum safety valve. ➤ Forced oil lubricated bearings. ➤ Pump should be supplied with all accessories such as oil mist separator, and mains cable of ~ 3 meter length. |
| 3. | Corrugated hose | 1 no |
| | | Corrugated hose, DN 25 ISO-KF stainless steel, flexible, length ≥ 1000mm. |
| 4. | Centering Rings and Clamps (DN 25 ISO-KF) | 6 nos |
| | | Centering Rings and Clamps (DN 25 ISO-KF) |
| 5. | Centering rings and clamps (DN 40 ISO-KF) | 4 nos. |
| | | Centering rings and clamps (DN 40 ISO-KF) |
| 6. | Air cooling kit for Turbo pump | 1 no. |
| | | Air cooling kit for Turbo pump, Suitable Venting valve (auto operation, vent device for protection during power failure) |
| 7. | Splinter shield | 1 no. |
| | | Splinter shield for DN 100 CFF and suitable reducing adapter from DN 100 CFF to DN 25 ISO KF |
| 8. | T piece DN 25 ISO KF | 1 no. |
| | | DN 25 ISO KF T piece |
| 9. | Manual operated Isolation Angle Valve DN 25 ISO KF | 1 no. |
| | | Manually operated angle valve DN 25 ISO KF for isolating the Turbo pumping station. |
| 10. | vacuum gauge | 1 no. |
| | | Full range vacuum gauge Flange: DN 25ISO KF, Measurement Range: 1000 mbar to 1×10^{-8} mbar or higher |
| 11. | Display and control unit for vacuum gauge | 1 no. |
| | | Display and control unit for above full range vacuum gauge with USB interface |
| 12. | Sensor cable | 1 no. |
| | | Sensor cable between vacuum gauge and controller, length ≥ 3m |
| 13. | Oil for rotary vane pump | 5ltrs. |
| | | Oil for the above rotary vane pump |
| | Other Details | |
| 1. | Power requirement: Compatible with Indian standard | |
| 2. | Standard warranty: 12 months from the date of acceptance/successful installation of the equipment. | |
| 3. | Vendor should ensure that all goods/components are new and unused. | |

| | |
|----------|---|
| | <div>4. Installation / commissioning should include complete demonstration at user site to verify functionalities and capabilities of the system quoted.</div> <div>5. One person (at least) should be trained in the laboratory for operation, basic maintenance.</div> <div>6. Vendor should provide list of user academic/government funded institutions in India/ overseas.</div> |
| 8 | <div>Item Name : UV Exposure System</div> <div> Qty. 01 Brief Summary of Use of Item: This facility would be used for patterning of micron size superconducting structures for their detail transport measurements. </div> <div> Tentative Specifications: <ol style="list-style-type: none"> 1. Light Source: UV-LED 2. Lifetime of UV-LED source: > 10 000 hours 3. Substrate/Wafer Size: At least upto 4 Inch dia. 4. Resolution: m^2 m 5. Emission spectrum: 365 nm and/or 405 nm 6. Beam Intensity: 20 . 50 mW / cm² 7. Control unit / touch screen interface for exposure cycles programming 8. Real time in-situ temperature control of the substrate environment 9. No warm-up time 10. Hermetic UV exposure chamber for ensuring safety operation Other Details <ol style="list-style-type: none"> 1. Power requirement: Compatible with Indian standard 2. Standard warranty: 12 months from the date of acceptance/successful installation of the equipment. 3. Vendor should ensure that all goods/components are new and unused. 4. Installation / commissioning should include complete demonstration at user site to verify functionalities and capabilities of the system quoted. 5. One person (at least) should be trained in the laboratory for operation, basic maintenance. 6. Vendor should provide list of user academic/government funded institutions in India/ overseas. 7. The vendor should provide compliance statement with respect to each technical specification in the tender document duly supported by the manufacturer's literature along with the technical bid. 8. Technical evaluation by the Institute may ask demonstration to verify functionalities and capabilities of the system quoted. 9. Vendor must submit Factory Acceptance Test procedure supported with relevant printed literature and certificates. </div> |
| 9 | <div>Item Name : Spin Coater System</div> <div> Qty. 01 Brief Summary of Use of Item: Programmable spin coating system having option of mounting 5mm x 5mm or smaller wafer is necessary for defining contact pads and micro structures using standard lithographic technique </div> <div> Tentative Specifications: <ul style="list-style-type: none"> ➤ Speed: up to 12,000 RPM or higher with +/-1 RPM increment. ➤ Acceleration: up to 12,000 RPM/sec or higher. ➤ Spin Time: up to 1 Hour or higher with <0.1 sec. increment ➤ Spin coater system should have Natural Polypropylene (NPP) housing and components </div> |

- Maximum wafer size: at least 150mm diameter.
- NPP Fragment chuck adapter · fits over above chuck for holding ~ 5 mm wafer.
- System should have safety door interlock (disallows rotation when door is open).
- Suitable vacuum pump for spin coater system should be provided by vendor.

Other Details

1. Power requirement: Compatible with Indian standard
2. Standard warranty: 12 months from the date of acceptance/successful installation of the equipment.
3. Vendor should ensure that all goods/components are new and unused.
4. Installation / commissioning should include complete demonstration at user site to verify functionalities and capabilities of the system quoted.
5. One person (at least) should be trained in the laboratory for operation, basic maintenance.
6. Vendor should provide list of user academic/government funded institutions in India/ overseas.
7. The vendor should provide compliance statement with respect to each technical specification in the tender document duly supported by the manufacturer's literature along with the technical bid.
8. Technical evaluation by the Institute may ask demonstration to verify functionalities and capabilities of the system quoted.
9. Vendor must submit Factory Acceptance Test procedure supported with relevant printed literature and certificates.

10 Item Name : Vacuum Pump

Brief Summary of Use of Item: Vacuum pumps are required for vacuum deposition system used for thin film fabrication for SNSPD activity.

Tentative Specifications:

| S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity |
|--------|--|---|
| | Turbo Molecular Pump | 1 no. |
| | | <ul style="list-style-type: none"> ➤ Compression ratio for N₂: > 1 X 10¹¹ ➤ Connection flange (in): DN 100 CF-F ➤ Cooling method: Air ➤ Pumping speed for N₂: ~ 250 l/s ➤ High vacuum side Bearing: Maintenance free, permanent magnetic bearing ➤ Accessories |
| 2. | Roughing / Rotary Vane Pump | 1 no. |
| | | <ul style="list-style-type: none"> ➤ Flange (In-let): DN 16 ISO-KF ➤ Flange (Out-let): DN 16 ISO-KF ➤ Pumping speed: ~ 9m³/h ➤ Ultimate pressure without gas ballast: m4x10⁻³ mbar ➤ Integrated with high speed hydraulically controlled high vacuum safety valve. ➤ Forced oil lubricated bearings. ➤ Pump should be supplied with all accessories such as oil mist separator, and mains cable of ~ 3 meter length. |

| 11 | Item Name : | Lock-in Amplifier | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|---|--|--------|--|--|--|--------------------------|--------------|-----------|------------------------|--|----|-----------------------------------|-------------------------|-----------|-----------------------|--|----|-----------------------|-----------------|----|-----------------|--|----|------------------------|---------|----|---------------------|---------------------------|----|------------------------------|-------------------|----|---------------------|---------------------|----|-----------------------|-----------------------|----|-------------------------|-----------------|----|------------------------|-----------------------|-----------|--------------------------|--|----|-----------------|---------------------|----|--------------------------------|--------------------|----|----------------------------------|------------------|-----------|---------------------|--|---|-----------------|----------------------|----|--------------|--|----|----------------------|------------------|----|------------------|-------------------------------|-----------|----------------|--|----|-------------------------|--|----|------------------------|------------------------------------|----|----------------------------|---|----|-------------------------|-------------------------------------|-----------|--------------|--|----|-------------|-------------------------------------|
| | <p>Qty: 01</p> <p>Brief Summary of Use of Item: Lock-in amplifier to perform transport measurements with low level ac-signal of superconducting thin films and devices and also to monitor output signal of single photon detectors in sub-GHz range would be an essential step for monitoring and optimizing device performances.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <p>Tentative Specifications:</p> <table> <tr> <th>S. No.</th><th>Items / Measurement Capability / Functionality / Parameter</th><th>Description / Specification / Quantity</th></tr> <tr> <td></td><td>Lock-in Amplifier</td><td>1 no.</td></tr> <tr> <td>A.</td><td colspan="2">Operating Modes</td></tr> <tr> <td>1.</td><td>Internal/ External reference mode</td><td>Single and dual lock-in</td></tr> <tr> <td>B.</td><td colspan="2">Signal Channel</td></tr> <tr> <td>1.</td><td>Input Frequency range</td><td>DC to ~ 600 MHz</td></tr> <tr> <td>2.</td><td>Input impedance</td><td>50 Ω or 1 M Ω (18 pF)</td></tr> <tr> <td>3.</td><td>Inputs Dynamic reserve</td><td>~ 80 dB</td></tr> <tr> <td>4.</td><td>Input voltage noise</td><td>m5 nV/$\sqrt{\text{Hz}}$</td></tr> <tr> <td>5.</td><td>Input full range sensitivity</td><td>m10 nV to ~ 1.0 V</td></tr> <tr> <td>6.</td><td>Input range (AC+DC)</td><td>± 3 V or higher</td></tr> <tr> <td>7.</td><td>Inputs A/D conversion</td><td>~ 12 bit, ~ 1.5 GSa/s</td></tr> <tr> <td>8.</td><td>Outputs Frequency range</td><td>DC to ~ 600 MHz</td></tr> <tr> <td>9.</td><td>Outputs D/A conversion</td><td>~ 14 bit, ~ 1.5 GSa/s</td></tr> <tr> <td>C.</td><td colspan="2">Reference Channel</td></tr> <tr> <td>1.</td><td>Frequency range</td><td>m10 Hz to ~ 600 MHz</td></tr> <tr> <td>2.</td><td>Reference frequency resolution</td><td>m10 μHz</td></tr> <tr> <td>3.</td><td>Reference phase angle resolution</td><td>m2.0 μ°</td></tr> <tr> <td>D.</td><td colspan="2">Demodulators</td></tr> <tr> <td>1</td><td>Frequency range</td><td>m10 mHz to ~ 600 MHz</td></tr> <tr> <td>2.</td><td>Filter slope</td><td>6, 12, 18, 24, 30, 36, 42 dB/Oct or more</td></tr> <tr> <td>3.</td><td>Filter time constant</td><td>m45 ns to ~ 75 s</td></tr> <tr> <td>4.</td><td>Filter bandwidth</td><td>m90 μHz to ~ 5 MHz</td></tr> <tr> <td>E.</td><td colspan="2">Sweeper</td></tr> <tr> <td>1.</td><td>Sweeper Scan parameters</td><td>Oscillator frequency, Demodulator phase shift, Auxiliary Offset, Signal Output Amplitudes, Signal Output Offset, PID Setpoint etc.</td></tr> <tr> <td>2.</td><td>Parameter sweep ranges</td><td>Full range, Linear and Logarithmic</td></tr> <tr> <td>3.</td><td>Sweeper Display parameters</td><td>Demodulator Output (X, Y, R, θ, f), Auxiliary Input</td></tr> <tr> <td>4.</td><td>Sweeper Display options</td><td>Single Plot, Dual Plot, Multi-trace</td></tr> <tr> <td>F.</td><td colspan="2">Scope</td></tr> <tr> <td>1.</td><td>Scope modes</td><td>Time domain, frequency domain (FFT)</td></tr> </table> | | S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity | | Lock-in Amplifier | 1 no. | A. | Operating Modes | | 1. | Internal/ External reference mode | Single and dual lock-in | B. | Signal Channel | | 1. | Input Frequency range | DC to ~ 600 MHz | 2. | Input impedance | 50 Ω or 1 M Ω (18 pF) | 3. | Inputs Dynamic reserve | ~ 80 dB | 4. | Input voltage noise | m5 nV/ $\sqrt{\text{Hz}}$ | 5. | Input full range sensitivity | m10 nV to ~ 1.0 V | 6. | Input range (AC+DC) | ± 3 V or higher | 7. | Inputs A/D conversion | ~ 12 bit, ~ 1.5 GSa/s | 8. | Outputs Frequency range | DC to ~ 600 MHz | 9. | Outputs D/A conversion | ~ 14 bit, ~ 1.5 GSa/s | C. | Reference Channel | | 1. | Frequency range | m10 Hz to ~ 600 MHz | 2. | Reference frequency resolution | m10 μHz | 3. | Reference phase angle resolution | m2.0 μ° | D. | Demodulators | | 1 | Frequency range | m10 mHz to ~ 600 MHz | 2. | Filter slope | 6, 12, 18, 24, 30, 36, 42 dB/Oct or more | 3. | Filter time constant | m45 ns to ~ 75 s | 4. | Filter bandwidth | m90 μHz to ~ 5 MHz | E. | Sweeper | | 1. | Sweeper Scan parameters | Oscillator frequency, Demodulator phase shift, Auxiliary Offset, Signal Output Amplitudes, Signal Output Offset, PID Setpoint etc. | 2. | Parameter sweep ranges | Full range, Linear and Logarithmic | 3. | Sweeper Display parameters | Demodulator Output (X, Y, R, θ , f), Auxiliary Input | 4. | Sweeper Display options | Single Plot, Dual Plot, Multi-trace | F. | Scope | | 1. | Scope modes | Time domain, frequency domain (FFT) |
| S. No. | Items / Measurement Capability / Functionality / Parameter | Description / Specification / Quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Lock-in Amplifier | 1 no. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A. | Operating Modes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Internal/ External reference mode | Single and dual lock-in | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B. | Signal Channel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Input Frequency range | DC to ~ 600 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Input impedance | 50 Ω or 1 M Ω (18 pF) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Inputs Dynamic reserve | ~ 80 dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Input voltage noise | m5 nV/ $\sqrt{\text{Hz}}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Input full range sensitivity | m10 nV to ~ 1.0 V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Input range (AC+DC) | ± 3 V or higher | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. | Inputs A/D conversion | ~ 12 bit, ~ 1.5 GSa/s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. | Outputs Frequency range | DC to ~ 600 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. | Outputs D/A conversion | ~ 14 bit, ~ 1.5 GSa/s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C. | Reference Channel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Frequency range | m10 Hz to ~ 600 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Reference frequency resolution | m10 μHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Reference phase angle resolution | m2.0 μ° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D. | Demodulators | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Frequency range | m10 mHz to ~ 600 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Filter slope | 6, 12, 18, 24, 30, 36, 42 dB/Oct or more | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Filter time constant | m45 ns to ~ 75 s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Filter bandwidth | m90 μHz to ~ 5 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| E. | Sweeper | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Sweeper Scan parameters | Oscillator frequency, Demodulator phase shift, Auxiliary Offset, Signal Output Amplitudes, Signal Output Offset, PID Setpoint etc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Parameter sweep ranges | Full range, Linear and Logarithmic | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Sweeper Display parameters | Demodulator Output (X, Y, R, θ , f), Auxiliary Input | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Sweeper Display options | Single Plot, Dual Plot, Multi-trace | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F. | Scope | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Scope modes | Time domain, frequency domain (FFT) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | |
|-----------|--|---|
| 2. | Sampling rates | n80 kSa/s to ~ 1.5 GSa/s |
| G. | Auxiliary Signals | |
| 1. | High-speed outputs | 4 channels, ± 10 V, R, , X, Y |
| 2. | High-speed inputs | ~ 2 channels, ± 10 V |
| 3. | D/A converter | ~ 16 bit, ~ 25 MSa/s |
| 4. | D/A analog bandwidth | ~ 5 MHz |
| 5. | A/D converter | ~ 16 bit, ~ 400 kSa/s |
| 6. | A/D analog bandwidth | ~ 100 kHz |
| H. | Spectrum Analyzer | |
| 1. | Spectrum Analyzer Center frequency range | 0 to ~ 600 MHz |
| 2. | Spectrum modes | FFT(X+iY), FFT(R), FFT(), FFT(f) and FFT((d /dt)/2) |
| 3. | Maximum number of samples per spectrum | ~ 8.0 MSa |
| I. | Connectivity & Others | |
| 1. | Host connection | LAN, USB / IEEE |
| 2. | Clock | ~ 10 MHz, input and output, ultra-high stable oscillator n0.5 ppm deviation |
| 3. | Digital I/O | ~ 32 bit, ~ 50 MHz, general purpose |
| 4. | Signal connectors | BNC/ SMA |
| 5. | PC operating systems compatibility | Windows 7 / Windows 8 / Windows 10 |
| J. | Other details | |
| 1. | Power requirement: Compatible with Indian standard. | |
| 2. | Standard warranty: 12 months from the date of acceptance/successful installation of the equipment. | |
| 3. | Vendor should ensure that all goods/components are new and unused. | |
| 4. | Vendor should provide list of user academic/government funded institutions in India/overseas. | |

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CONTROLLER OF STORES &PURCHASE

