

**National Centre for Nanoscience & Nanotechnology,
University of Mumbai,
(NCNNUM),**



National Center for Nanoscience and Nanotechnology, Ramkrishna Bajaj Sanskrut Bhavan,
II floor ,University of Mumbai, Vidyanagari, Santacruz (E), Mumbai 400 098, India.
Tel: (022) 2654 3495, Fax (022) 26530299 Email: director@nano.mu.ac.in

Tender Document for

Physical Property Measurements at low temperatures and high magnetic fields

No: NCNNUM/Tender/298 b/2012

Date: 9th February 2012

Part A - Terms and Conditions

Part B – Specifications

Price: Rs. 500/- (non refundable)

Important Dates:

Period of Sale of Tender Document	9 th February till 28 th February , 2012,
Last Date of Receiving sealed Bids/Tenders:	29 th February, 2012, 1.00 pm
Time and date of Tender opening	1 st March, 2012, 4.00 pm

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Part A - Terms and Conditions

Tender Notice

National Center for Nanoscience and Nanotechnology
Ramkrishna Bajaj Sanskrut Bhavan, II floor
University of Mumbai, Vidyanagari, Santacruz (E),
Mumbai 400 098, India
Tel: (022) 2654 3495, Fax (022) 26530299
NCNNUM/ 298 b/ of 2012
Date: 9th February 2012

Sealed Tenders / bids for the purchase of Tender Document for **Physical Property Measurements at low temperatures and high magnetic fields**, for National Center for Nanoscience and Nanotechnology, University of Mumbai are invited for and on behalf of University of Mumbai by the Director, NCNNUM.

Tender Document containing terms and conditions and technical specifications of the equipment are available in the Office of the Director National Center for Nanoscience and Nanotechnology, University of Mumbai, Vidyanagari, Santacruz (E), Mumbai 400 098, on all working days between 11.00 a.m. to 4.00 p.m. from 9th February 2012, to till 4 pm of 28th February, 2012 by paying Rs.500/- (Rs. Five hundred only) in cash /Demand Draft from any Scheduled Bank/Nationalized bank, drawn in favour of **“Finance and Accounts officer, University of Mumbai”**. Terms & conditions and technical specifications can also be downloaded. In case, the tender document is downloaded from the website, the Tender Document fee of Rs. 500/- should be enclosed in the Technical Bid Envelope, in the form of a Demand Draft from any Nationalized bank, drawn in favour of **“Finance and Accounts officer, University of Mumbai”**. The tenders bids duly complete in all respects, along with the necessary documents and EMD of Rs 1,50,000/- (Rs. One Lac Fifty thousand only) should be submitted to **The Director, National Center for Nanoscience and Nanotechnology, University of Mumbai on 29th February 2012 at 1.00 p.m..**

The tenders / bids so received shall be opened on 1st March 2012, at 4 pm in the office of The Director, National Center for Nanoscience and Nanotechnology, University of Mumbai in the presence of the representatives of the suppliers. The names of shortlisted tenderers shall be announced on the website after scrutinizing the Technical bids and evaluating their suitability to meet the University requirements.

Right to reject any or all tenders without assigning any reason there for is reserved by the University of Mumbai.

Sd/-
Director,
NCNNUM,
University of Mumbai

Terms and Conditions of Supply:

1. The tender document along with terms & conditions are available for sale from 9th February 2012, to till 4 pm of 28th February, 2012 2012 in the office of the Director, National Centre for Nanoscience and Nanotechnology, University of Mumbai, Vidyanagari, Santacruz-E, Mumbai during office hours from 11.00.am To 4.00 .pm by paying tender fee of Rs 500/- in cash or a Demand Draft by any Scheduled Bank / Nationalised bank drawn in favour of **“Finance and Accounts officer, University of Mumbai”**. **The tender fee is not refundable.** The completed sealed Tender/Bid in all respect will be accepted up to 29th February 2012 at 1.00 pm in the office of Director NCNNUM, Ramkrishna Bajaj Sanskrut Bhavan, II floor, Santacruz (E), Mumbai 400 098, India.
1. The received Tenders / Bids will be opened on 1st March 2012 at 4.00 pm before the Tender opening committee in presence of the tender representatives of the tenders / bidders at the office of the Director NCNNUM.
2. Tenderers /Bidders shall submit the following documents along with their tender and **be placed in the Technical Bid Envelope i.e . Envelope No. 1).**
 - (a) Income-Tax clearance certificate from the Income-Tax Officer concerned, certifying that the tenderer has cleared all the Income-Tax dues.
 - (b) Tenderers should be either manufacturer or authorized dealer of the said equipment and should submit the proof for the same. Also, the Tenderers should state whether they are a Proprietary Firm, Partnership Firm or a Private/Public Limited Company and furnish the proof of the same. If the tenderer is a partnership firm, the necessary partnership deed, disclosing the names of all partners and their interest in the firm shall be enclosed.
 - (c) Tenderer should enclose the list of names of the organizations and laboratories to which similar equipment have supplied and a certificate to the effect that the performance of the supplied equipment was satisfactory.
 - (d) The tender document must be accompanied by Earnest Money Deposit shall be EMD of Rs 1,50,000/-(Rs. One Lac Fifty thousand only). Earnest Money Deposit in the form of a Demand Draft drawn in favour of **“Finance and Accounts officer, University of Mumbai”** on any Scheduled/ Nationalized Bank, payable at Mumbai.
 - (e) In case, the tender document is downloaded from the website, the Tender Document fee of Rs. 500/-(Rs Five hundred only) should be enclosed in the form of a Demand Draft from any Scheduled / Nationalised Bank drawn in favour of **“Finance and Accounts officer, University of Mumbai”**
 - (f) VAT Registration No.
 - (g) Technical specifications offered by the Supplier. (h) Technical compliance table
 - (i) Proprietary certificate
 - (j)The authority to sign to tender document shall be submitted invariably by the tenderer.
5. The rates should be mentioned in the **Schedule** attached with the Tender Document. Each page of the tender shall be signed in full and stamped with the seal by the Tenderer. The Tenderer must clearly state in what capacity he or she is signing the tender **(which should be placed in the Financial Bid Envelope i.e. Envelope No.2)**

6. The Tenderer shall submit the tender in two envelopes. The first envelope (Technical Bid) shall contain all the documents referred to in **para four above** and sealed. The second envelope (Commercial Bid) shall contain the **Schedule**, in which the Tenderer shall register the rates of equipment. The second envelope shall also, likewise, be sealed. Both the envelope then should be put together, and shall be sealed in an envelope, and shall prescribe time and date. The Technical Bid shall be opened first to ensure that Tenderer have submitted all the requisite documents. If the Technical Bids are found not in order or are deficient in some respect, the commercial bids in respect of such tenders shall not be opened. The date and time of opening the financial bids shall be announced immediately after opening all the Technical bids.
7. Tender / bids not accompanied by the requisite amount of Earnest Money Deposit are liable to be rejected.
8. The Earnest Money Deposit paid by the supplier shall be forfeited, if the supplier fails to pay the necessary security deposit in the event of his tender being accepted.
9. The amount of Security Deposit/Performance Guarantee shall be 5 % of the accepted cost. In case of successful tenderer the amount of Earnest Money Deposit shall be converted in Security Deposit/Performance Guarantee. Security Deposit/Performance Guarantee shall be refunded after the warranty period is over. The Security Deposit/Performance Guarantee can be paid in the form of Demand Draft or a Bank Guarantee from a Nationalised scheduled bank drawn in favour of **“Finance and Accounts officer, University of Mumbai”**.
10. Bidder should read carefully all the instructions and terms and conditions, etc before registering rates in the prescribed schedule of the tender. Price registering in the schedule of price to tender should be inclusive of all taxes and duties. The rate /price quoted shall be F.O.R/C.I.F Mumbai and to reach to the office of CNUM or as directed in the order.
11. The offers made by the Tenderers shall be valid for 120 days after the last date of submission of tender.
12. **The Technical Documents shall be opened** by The Director, National Center for Nano science and Nanotechnology, **at 400 p.m. on 1st of March, 2012**, for those bids for which minimum three Bidders have participated. The tenderers or their authorized representatives shall be allowed to be present at the time of opening of the tenders. Financial bids of only qualified tenderers shall be opened. The date and time of opening the financial bids shall be announced after opening and evaluating all the Technical bids.
13. In case of imported items/equipments, the rates should be quoted in the light of exemptions enjoyed by educational institutions. University is exempted from the payment of Octroi and the necessary certificate/form can be issued by the University. The customs duty applicable to the University of Mumbai is maximum 5% of the invoice.
14. Technical specifications of the instruments/equipments/articles are given in **Annexure** to these papers i.e. Part B.
15. The delivery, installation & operational training of the instruments/equipment should be completed within 3 months from placing of the order, in case of the imported equipment

and within 15 days if the instrument/equipment is made in India. No extension shall be granted to the contractors/suppliers for the period of delivery, under any circumstances.

16. If the supplier fails to deliver the article as per the delivery schedule, the University of Mumbai shall be free to procure the balance/undelivered supply, at the risk and cost of the supplier, from other such suppliers
17. The goods, articles, materials equipment supplied by the supplier shall be accepted after inspection by an officer authorized by the competent authority. No articles/materials which do not conform to the specifications laid down in the terms and conditions or damaged in transit accepted.
18. The bills of the suppliers shall be paid by the University after all the materials /articles/equipments have been received inspected and found in good condition as mentioned above.
19. **Vendor must submit Compliance statement in tabular form comparing each specification of the quoted item with that given in the Tender Document part B. The Vendor also must supply a soft copy of the Table only Microsoft in word format.**
20. **If the equipment is imported and requires PC, printer other peripherals, they can be bought from India and should be of International brand such as HP. The monitor should be LCD/TFT screen. The printer should be LaserJet printer. The processor should be Intel latest processor. The amount quoted for the items bought in India, installation; servicing etc. can be in Indian Rupees and the imported items can be quoted in foreign currency.**
21. **The warranty period shall be of Three years from the date of complete and satisfactory installation of the equipment.**
22. As the suppliers shall be responsible for the supply and installation (wherever necessary) of equipment at Mumbai, the cost towards insurance until destination in the University, shall be borne by suppliers.
23. In the event of any breach of the terms and conditions of the supply, the University of Mumbai may terminate the contract placed with the supplier, forfeit the security deposit of the supplier and make alternative arrangements for procurement of supplies at the risk and cost of supplier.
24. **Proprietary certificate, if any, should be included in the Technical bid.**
25. **The Conditional offers are liable to be summarily rejected.**
26. **Right to reject any or all tenders without assigning any reason there for is reserved by the University of Mumbai.**

Envelope No.1

**National Centre for Nanoscience & Nanotechnology,
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PART B SPECIFICATIONS

Envelope No.2
(Financial/Price Bid)

SCHEDULE TO TENDER

Note:

1. Tenderers are advised to read carefully the Terms and Conditions of supply and the Instructions to the Tenderers" before recording the rates in this schedule.
2. No erasures or overwriting shall be allowed, unless they are authenticated under the full signature and the seal of the tenderer.
3. The Rates shall be FOR/CIF, at destinations/godowns/places indicated in the supply order.

Item no	Description of goods with details of specifications	Number/ quantity	Price/ Rate per Unit	Taxes	Duties	etc	Total

Total price

In wordsonly

Date
Place

Signature of the Tenderer
Name of the signatory on tender
Seal of the Firm/Co./

Specifications

An integrated system for the “Physical Property Measurements at low temperatures and high magnetic fields” with the following details is required:

The System should be capable of integrating a Superconducting Magnet (typically 9 Tesla), Temperature controlling facility (1.9 K to 400K), AC-DC Electrical Transport Resistivity, Vibrating Sample Magnetometer (VSM), Thermal Transport System to measure the heat capacity, thermal conductivity and Seebeck Coefficient, High Vacuum System (as required by the Thermal Transport System), Supporting Software with Computer and Printer compatible for all the above.

A variable temperature in the range 2K - 400K and variable magnetic field up to 9 Tesla – Fully computer controlled system is to provided as a common basic system suitable for various measurements mentioned above to be carried out.

Various Sample holders pucks which are required for measurements at various magnetic fields and temperatures should be provided.

The following are required for the above mentioned basic system:

Specifications for the Superconducting Magnet:

□ Longitudinal with minimum field of ± 9 Tesla.

- a. The magnet should have a field uniformity of $\pm 0.01\%$ over at least 5 cm x 1 cm diameter cylindrical volume,
- b. Magnet should be powered by a highly stable bi-polar power supply.

The magnet should have the following control modes: Persistent and Driven Modes:

Linear, Oscillating, No Overshoot with very good resolution of magnetic field.

Please specify explicitly the stability and uniformity of the field and the range of slew rate possible.

Temperature Control specifications:

- a. Temperature range 2 K – 400 K or wider with an accuracy of $\pm 1\%$ or better in zero to full magnetic field.
- b. SLEW RATE 0.01–6 K/min.

c. Temperature control modes: No Overshoot, Fast Settle and Sweep mode.

Please indicate the temperature stability for a typical sample size of 2.5 cm (1 inch) at temperatures say $T < 10\text{ K}$ and $T > 10\text{ K}$.

No Loss Helium Dewar:

Integrated Cryo cooler based Helium dewar to re condense the Liquid Helium directly within the dewar. Dewar should have following Features:

Dewar operations should be integrated with basic systems operation allowing atomic operation of all functions, including helium level control in the dewar.

Initial cool down of should be possible from Helium gas without transferring of any liquid Helium.

System should be supplied with Air Cooled Compressor.

Specifications:

-- Nominal Liquid He Capacity: 6liters

- Liquid He Volume maintained in Dewar: 4 liters (Under normal Condition)

- Estimated Cool Down Time: < 30 Hrs.

- Power Requirement: 380-415V 50Hz 3 phase

- Maintenance Time on Compressor: After 20,000 hrs.

- Maintenance Time on the Cold Head: After 20,000 Hrs.

Heat Capacity Measurement System:

Should be operable between 2 K – 350 K or wider range

Please indicate the sample size dimensions required for this measurement

Resolution of measurement need be at least 10nJ/K @ 2K or better

Cryo pump required to produce high vacuum at sample is to be provided

Micro calorimeter, sample frame, Low temperature controller and other accessories required to

achieve accurate measurements need be supplied with the system.

AC-DC Electrical Transport (Resistivity Measurements): The system should be equipped with four independent channels to be used for van der Pauw and four-wire resistance measurements (up to two or more samples in a single sequence) with the following specifications:

- a. AC Current Range: 10 μ A to 2A or wider. The current should be continuous at least till 500 mA.
- b. Frequency Range: 1 Hz to 1 kHz or wider
- c. Should be capable of measuring AC Resistivity, Hall Effect, I-V Curve, and Critical Current measurements in superconductors.
- d. The measurable resistance range should be n Ω - Ω or wider
- e. The sensitivity and accuracy of the measurements should be at least n Ω
- f. A Low noise Pre Amplifier is to be incorporated , which is compatible with the above. required. Please mention the specifications of the preamplifier being quoted.
- g. Please specify the Common Mode Rejection Ratio levels.
- h. DC Current Range: 5 nA to 5 mA or wider; Sensitivity: 20 nV or better.
- i. Please indicate the wattage of the calibrated resistors being provided.
- j. The stability of the current should be better than 1 μ A at a given temperature and over a time of 1 hour

AC Susceptibility

Temperature Range : 2 K – 350 K or wider

AC Frequency Range : 10 Hz – 10 kHz

AC Field Amplitude Range : a few mOe to more than 10 Oe

Sensitivity Range : 2 X 10⁻⁸ emu (2 X 10⁻¹¹ Am² @ 10 kHz)

Linear Motor based Vibrating sample magnetometer:

System should have a fast, sensitive and fully automated vibrating sample magnetometer facility with following parameters:

- a. Longitudinal configuration: magnetic field, VSM vibration and moment detection all along vertical axis.
- b. Coil-set bore: at least 6 mm Optional 12mm.
- c. Sample holders to be provided: Brass half tube: please mention inner diameter & outer diameter of the sample holder.
- d. Fused quartz paddle: Indicate its dimensions.
- e. Please specify the Coilset baseline.
- f. Should be possible to measure on samples of mass < 1 g (typically 100 – 200 mg)
- g. The VSM oscillation frequency range (to be chosen not to interfere with line frequency) is to be specified.
- h. VSM oscillation amplitude: To be in a Range of 0.1 mm - 5mm or wider
- i. Data rate and averaging window (typical): 1 sec - Range of 0.5 to 750 sec or better.
- j. Sensitivity using the above typical parameters and longitudinal coilset: (rms sensitivity) to be better than 10^{-6} emu or better.
- k. Indicate the relative Noise levels.
- l. Please indicate the accuracy using cylindrical shaped Palladium (Pd) standard.
- m. Should be capable of measuring on thin films or bulk of sizes ~ 5 mm x 2 mm x 1 mm
- J. The largest measurable moment should be at least 40 emu/ peak amplitude(mm)
- K. Rapid and Completely Automated Sample Centering operation should be available.
- L. Standard Temperature Range 1.9K to 400K.

High temperature attachment for the VSM

- a. Range of Temperature: 300 - 1000 K
- b. RMS Sensitivity: $< 10^{-5}$ emu or 0.5% or better.
- c. Noise Floor: $< 10^{-5}$ emu rms (H = 0).
- d. Accuracy $\sim 1 \times 10^{-5}$ emu/ tesla or better.

e. Temperature Precision: 0.5 K or better.

f. Temperature Accuracy: 2% or better.

Mention the details of the sample holder being provided in order to heat the sample to 1000 K.

Please mention details of arrangements being given to heat the sample up to 1000 K.

Indicate if any accessories are required for the high temperature attachment and please quote for the accessories separately.

Ultra Low Field capability attachment

This should be compatible to both VSM and AC Susceptibility measurements.

A superconducting nulling coil should be employed to cancel the residual remnant field in the superconducting magnets facilitating the samples under study to be taken to ultra low fields.

Desirable :

Residual Field : < 0.1 Oe at any point in the measurement space

Residual Field Uniformity : $< \pm 0.1$ Oe along 4 cm at the center of the coil set

Thermal Transport System:

a. THERMAL CONDUCTANCE

Thermal conductance with an accuracy of $\pm 5\%$ or better should be possible to be measured at various temperatures like 15 K, 200K and 300 K

Dynamic range of $1\text{mW/K} - 25\text{ mW/K}$ or wider is required at various temperatures say 400 K, 50 K, 1.9 K typically.

b. SEEBECK COEFFICIENT

It should be possible to measure the seebeck coefficient in the range $1\ \mu\text{V/K}$ to $1\ \text{V/K}$ or wider.

The error in measurement of seebeck coefficient should be $0.5 \mu\text{V/K}$ or less.

c. **RESISTIVITY** (ρ)

A current of at least 200 mA should be possible to be applied to carry out measurements Resistivity measurements

The noise levels in the field due to induction effects at 1 Hz measurement frequency should be $\pm 1 \text{ m}_\rho$ or less.

d. **Speed Acquisition :**

The typical temperature Slew rate should be $\pm 0.2 \text{ K / min}$ or low for $T < 20 \text{ K}$ and should be $\pm 0.5 \text{ K/min}$ or low for $T > 20 \text{ K}$

Horizontal and vertical sample rotators: The system should have option for rotating the sample in horizontal and vertical planes to obtain the information about angular dependence of magnetic properties. A thermometer, in direct contact with the sample mount should enable accurate determination of the sample temperature. Both rotators should incorporate standard motors.

Specifications:

- a. Should be compatible with the VSM option
- b. Angle of rotation should be in the range from: -10° to 370° with a well defined Angular Step Size of about 0.010 or small
- c. Should be usable in the entire temperature range of 2 K to 300 K at least and above if possible with oven attachment.
- d. Specify the highest temperature up to which the rotator assembly can be used.

Multi-functional probe option: Multi-Functional Probe option should extend measurement capabilities of the system by allowing easily addable hardware such as fiber optics, microwave wave guides, high current leads and external electrical leads to customize the experiment. This probe should be adaptable within the main system including the software and electrical controls of the main unit.

Helium – 3 Stage

With this attachment, it should be possible to cool the sample to 0.5 K or low

This option should be compatible with Heat capacity, Resistivity and AC transport measurement attachments.

Please mention if your system is a continuously circulating system

Indicate the typical time required to cool the sample from 300 K to 0.5 K.

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Torque Magnetometer :

..Should be capable of measuring small, anisotropic samples such as single crystals and thin Films.

..Should be capable of performing fully automated high-sensitivity, angular-dependent measurements of magnetic torque over the full range of magnetic fields and temperatures.

..Should be usable for typical sample sizes of 1 mm x 1 mm x 0.5 mm or bigger. Also mention the RMS torque noise level.

..The torque noise level should be 1×10^{-9} Nm or less for 40 sec sampling time.

..The desirable RMS moment sensitivity should be 2×10^{-6} emu or better at 9 Tesla for 40 sec sampling time

..The maximum measurable torque should be 1×10^{-5} Nm or more

Standard samples with the data should be supplied for each of the individual type of measurements for calibration whenever the attachment is altered to facilitate the multi-user needs.

Operating Software with computer and printer to be included in the basic system. Mention explicitly the possible customer service if the computer system develops problems after the warranty period of minimum 3 years

Minimum 5 to 6 installations of similar configurations in Indian Market.

Min. two Factory trained Service engineers to be located in India for after sales service.

Sd/-
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