



**UTKAL UNIVERSITY  
BHUBANESWAR – 751004, INDIA**

Phone : (0674) 2567387

No. PH/ 770 /2017

Dt. 29.03.2017

**INVITATION FOR TENDER FOR SUPPLY OF EQUIPMENTS**

Sealed tender offers are invited in two separate sealed covers (Technical and Financial offers) for the \* marked items and single offers for the other items from eligible manufacturers/suppliers or their direct Indian agents for the supply of the scientific equipments and accessories. The tender document, details of the equipments, terms and condition can be downloaded from the university website [www.utkaluniversity.nic.in/tender](http://www.utkaluniversity.nic.in/tender). Please ensure that your quotation reaches no later than **21.04.2017 at 15:00 hrs** in the following address: **Head, Dept. of Physics, Utkal University, Vani Vihar, Bhubaneswar, 751004, India**. The authorities reserve the right to reject any or all the Tenders without assigning any reason thereof.

**Registrar  
Utkal University**

**Tender details, terms and conditions**

The final configuration will be selected based on the available budget and requirement. **The Bidders are requested to quote for Educational Institutional Price for Machine/ Equipment, since we are eligible for the same.** Bidders are to send the offers ALONG WITH DESCRIPTIVE CATALOGUE/ BROCHURE. The validity of the bid should be at least four months (120 days) or more from the date of the opening of this tender.

Tender Reference	<b>No. PH/ 770 / 2017 Dated 29.03.2017</b>
Price of Tender Document	<b>NIL</b>
Last Date and Time for submitting the tender document	<b>21<sup>st</sup> April, 2017, 3PM</b>
Time and Date of Opening of Bids	<b>22<sup>nd</sup> April 2017, 10.30 AM (Technical Bid) 22<sup>nd</sup> April 2017, 3 PM (Financial Bid)</b>
Place of Opening tender offers	<b>Dept. of Physics Utkal University, Vani Vihar Bhubaneswar, 751004, India</b>
Address of Communication	<b>As stated above</b>
Contact Telephone Numbers	<b>(0674) 2567387 (Registrar, Utkal University)</b>
E-mail	<b>registrar@utkal-university.org swapna.mahapatra@gmail.com</b>

## **GENERAL TERMS & CONDITIONS**

1. TENDER ARE INVITED COMPLYING THE REQUIREMENT FOR TENDER AS DETAILED IN THE TENDER SPECIFICATION [ANNEXURE-I] TO BE SUBMITTED IN THE COMPANY'S / FIRM'S LETTERHEAD NEATLY PRINTED / TYPED DULY SIGNED BY AUTHORIZED PERSON WITH THE SEAL OF THE BIDDERS AS A TOKEN OF ACCEPTANCE OF ALL TERMS AND CONDITIONS IN THE BID DOCUMENT.
2. MANUFACTURER/AUTHORIZED DEALERS OF REPUTED BRANDS OF HIGH TECHNICAL QUALITY WITH ADEQUATE AFTER-SALES SUPPORT FACILITIES ARE ELIGIBLE TO APPLY. THE BIDDER MUST HAVE SUPPLIED SIMILAR GOODS TO REPUTED ORGANIZATION TO THEIR FULL SATISFACTION AND FURNISH A LIST OF THE SAME.
3. THE BID SUBMITTED BY THE BIDDER MUST FOLLOW THE TWO-BID PROCEDURE COMPRISING THE FOLLOWING:

### **PART – I (TECHNICAL BID)**

- (a) DETAILED TECHNICAL SPECIFICATIONS, CONFORMING TO THE GIVEN SPECIFICATIONS (**VIDE ANNEXURE – I**), AND CATALOGUE /LITERATURE /DRAWINGS /MANUALS OF THE GOODS/SERVICES TO BE SUPPLIED
- (b) AUTHORIZED DEALERSHIP CERTIFICATE FROM THE ORIGINAL MANUFACTURER (IN CASE OF AUTHORIZED DEALER/DISTRIBUTOR)
- (c) CREDENTIALS AND LIST OF ORGANIZATIONS WHERE THE BIDDER SUPPLIED SIMILAR ITEMS
- (d) WARRANTY PERIOD (COMPREHENSIVE ON-SITE)
- (e) VALID SALE-TAX / VAT CLEARANCE CERTIFICATE

### **PART – II (FINANCIAL BID)** (VIDE ANNEXURE-II)

PLEASE QUOTE FOR EDUCATIONAL INSTITUTIONAL PRICE FOR MACHINE/EQUIPMENT, AS WE ARE ELIGIBLE FOR THE SAME.

**PRICE BIDS FOR FOREIGN FIRMS:** PRICES ARE TO BE QUOTED ON 'EX-WORKS' DULY PACKED OR ON "FCA/FOB" INTERNATIONAL PORT" BASIS AND ALSO INCLUDING AGENCY COMMISSION PAYABLE TO YOUR INDIAN AGENTS, IF ANY SHOWING CLEARLY THE FOLLOWING BREAK UP:-

- I) EX-WORKS PRICE
- II) PACKING & FORWARDING
- III) FREIGHT
- IV) ANY OTHER RELEVANT EXPENSES.
- V) TAXES PAYABLE BY THE UNIVERSITY

**PRICE BIDS FOR INDIAN FIRMS:** PRICES ARE TO BE QUOTED ON F.O.R., UTKAL UNIVERSITY, BHUBANESWAR, ON DOOR DELIVERY BASIS CLEARLY SHOWING THE BREAK UP.

INDIAN AGENTS ADDRESS AND PERCENTAGE OF AGENCY COMMISSION INCLUDED IN ABOVE F.O.B./EX-WORKS PRICE. (THIS WILL BE PAID TO THE INDIAN AGENTS IN INDIAN RUPEES ONLY AND NOT IN FE). PLEASE ENCLOSE COPY OF AGENCY AGREEMENT ENTERED INTO WITH YOUR PRINCIPALS INDICATING THE NATURE OF AFTER SALES SERVICES OF INDIAN AGENTS, PRECISE RELATIONSHIP & MUTUAL INTEREST IN THE BUSINESS.

THE UNIVERSITY SHALL PROVIDE THE CONCESSIONAL CUSTOMS DUTY AND EXCISE DUTY EXEMPTION CERTIFICATE AS PER GOVT. NOTIFICATION NO. 51/96 CUSTOMS DATED: 23.07.1996 AND CENTRAL EXCISE DUTY EXC]EMPTION IN TERMS OF GOVT. NOTOFICATION NO. 10/97 – CENTRAL EXCISE DATED: 01.03.1997 AS AMENDED FROM TIME TO TIME.

4. QUOTATIONS ARE TO BE SUBMITTED IN TWO SEPARATE SEALED COVERS MARKED **PART-I** (TECHNICAL BID) AND **PART-II** (FINANCIAL BID) CONTAINING RELEVANT DOCUMENTS. THESE TWO SEALED COVERS ARE TO BE PLACED IN A SEPARATELY SEALED LARGER COVER. FURTHER, THE SENTENCE **‘NOT TO BE OPENED BEFORE [10 AM ON 22<sup>nd</sup> April 2017] AND [2 PM ON 22<sup>nd</sup> April 2017]’ FOR THE TECHNICAL BID AND THE FINANCIAL BID, RESPECTIVELY, IS ALSO TO BE SUPER SCRIBED ON THESE ENVELOPES.**
5. YOU ARE REQUESTED TO SUBMIT YOUR BID OFFER LATEST BY **15.00 HOURS ON - 21.04.2017.**
6. **VALIDITY OF BID**  
BID SHALL REMAIN VALID FOR NOT LESS THAN **120 DAYS** AFTER THE DEADLINE DATE SPECIFIED FOR SUBMISSION.

**7. EVALUATION OF BIDS**

TECHNICAL BIDS WILL BE OPENED ON **22<sup>nd</sup> April 2017 AT 10 AM** AT THE OFFICE OF **THE HEAD, DEPT. OF PHYSICS, UTKAL UNIVERSITY , BHUBANESWAR** IN THE PRESENCE OF THE BIDDERS. BIDDERS/AGENTS WHO HAVE RESPONDED TO THE TENDER ONLY WILL BE ALLOWED TO BE PRESENT. THE TECHNICAL BIDS WILL BE EVALUATED TO SHORTLIST THE ELIGIBLE BIDDERS. THE FINANCIAL BIDS OF ONLY THE SHORT LISTED BIDDERS SHALL BE CONSIDERED FOR FURTHER PROCESSING. BIDDERS WHOSE TECHNICAL OFFER IS FOUND ACCEPTABLE AND MEETING THE ELIGIBILITY REQUIREMENTS AS SPECIFIED IN THIS TENDER WILL BE INFORMED TO BE PRESENT.

ONLY THOSE BIDDERS WHOSE BIDS HAVE BEEN TECHNICALLY FOUND ACCEPTABLE AND MEETING THE ELIGIBILITY REQUIREMENTS AS SPECIFIED IN THIS TENDER WILL ONLY BE INVITED FOR PARTICIPATION IN THE FINANCIAL BID. SUCH FINANCIAL BIDS WILL BE OPENED IN THE PRESENCE OF THE BIDDERS OR THEIR AUTHORIZED REPRESENTATIVES WHO CHOOSE TO ATTEND THE FINANCIAL BID OPENING ON THE SAME DAY (I.E. **22<sup>nd</sup> April 2017 AT 2 PM**) AT THE OFFICE OF THE **HEAD, DEPT. OF PHYSICS, UTKAL UNIVERSITY , BHUBANESWAR**. ONLY TECHNICALLY ACCEPTED COMPETITIVE BIDS WILL BE CONSIDERED FOR PLACING PURCHASE ORDER. THE FINANCIAL OFFERS OF THE VENDORS WHOSE TECHNICAL OFFERS ARE FOUND TO BE TECHNICALLY DEFICIENT OR DO NOT MEET THE

QUALIFICATION CRITERIA AS SPECIFIED IN THIS TENDER WILL BE RETURNED TO THEM WITHOUT OPENING.

## 8. AWARD OF CONTRACT

THE UNIVERSITY WILL AWARD THE CONTRACT TO THE BIDDER WHOSE QUOTATION HAS BEEN DETERMINED TO BE SUBSTANTIALLY MEETING THE TECHNICAL SPECIFICATIONS (ANNEXURE I) AND WHOSE PRICE WOULD BE THE LOWEST. THE UNIVERSITY RESERVES THE RIGHT FOR FURTHER PRICE NEGOTIATIONS WITH THE LOWEST BIDDER, IF NECESSARY.

9. NOTWITHSTANDING THE ABOVE, THE UNIVERSITY RESERVES THE RIGHT TO ACCEPT OR REJECT ANY QUOTATIONS AND TO CANCEL THE BIDDING PROCESS AND REJECT ALL QUOTATIONS AT ANY TIME PRIOR TO THE AWARD OF CONTRACT WITHOUT ASSIGNING ANY REASONS WHATSOEVER.
10. THE UNIVERSITY DOES NOT BIND ITSELF TO OFFER ANY EXPLANATION TO THOSE BIDDERS WHOSE TECHNICAL BID HAS NOT BEEN FOUND ACCEPTABLE BY THE EVALUATION COMMITTEE OF THE UNIVERSITY.
11. THE UNIVERSITY RESERVES THE RIGHTS TO PLACE ORDER FOR FULL QUANTITY OR PART THEREOF AS CONSIDERED NECESSARY.
12. THE BIDDER WHOSE BID IS ACCEPTED WILL BE NOTIFIED OF THE AWARD OF CONTRACT BY THE PURCHASER PRIOR TO EXPIRATION OF THE QUOTATION VALIDITY PERIOD. THE TERMS OF THE ACCEPTED OFFER SHALL BE INCORPORATED IN THE PURCHASE ORDER.
13. DELIVERY SHALL BE MADE AT **DEPARTMENT OF PHYSICS, UTKAL UNIVERSITY, BHUBANESWAR.**
14. ITEMS SUPPLIED ARE SUBJECT TO INSPECTION AND ACCEPTANCE AND THE SUPPLIER SHOULD COLLECT REJECTED ITEMS AT HIS COST.
15. THE SUCCESSFUL BIDDER MUST SUBMIT A VALID BANK GUARANTEE ON ANY NATIONALIZED BANK OF **10%** OF THE ORDER VALUE TOWARDS **PERFORMANCE SECURITY** DURING THE WARRANTY PERIOD.
16. **LIQUIDATED DAMAGE** WILL BE APPLICABLE AT THE RATE OF **0.5%** PER WEEK. THE UNIVERSITY HAS THE RIGHT TO CANCEL THE PURCHASE ORDER WHEN LD ACCUMULATES TO 10 %.
17. SETTLEMENT OF ANY DISPUTE WILL BE MADE UNDER THE JURISDICTION OF BHUBANESWAR ONLY.
18. THE ITEMS MUST BE DELIVERED WITHIN **60 DAYS** FROM THE DATE OF PLACEMENT OF PURCHASE ORDER AT THE **DEPARTMENT OF PHYSICS, UTKAL UNIVERSITY, BHUBANESWAR.**
19. **WARRANTY / GUARANTEE:**  
COMPREHENSIVE WARRANTY / GUARANTEE SHALL REMAIN VALID FOR 36 MONTHS AFTER THE GOODS (OR ANY PORTION THEREOF AS THE CASE MAY BE) HAVE BEEN DELIVERED AND COMMISSIONED AT THE FINAL DESTINATION.

20. ALL TENDERS (UNLESS OTHERWISE SPECIFIED) ARE TO BE SUBMITTED / HANDED OVER TO **HEAD, DEPT. OF PHYSICS, UTKAL UNIVERSITY, VANI VIHAR BHUBANESWAR 751004, INDIA.** THE BID CAN BE SUBMITTED IN PERSON OR THROUGH POST/COURIER (PURCHASER WILL NOT BE RESPONSIBLE FOR DELAYED / LATE QUOTATIONS SUBMITTED / SENT BY POST / COURIER ETC. RESULTING IN DISQUALIFICATION/REJECTION OF ANY BID) TO REACH ON OR BEFORE THE DUE DATE AND TIME. FAX / E-MAIL / TELEGRAPHIC / TELEX TENDERS WILL NOT BE CONSIDERED.

**21. THE FOLLOWING DOCUMENTS/INFORMATION ARE REQUIRED FROM THE INDIAN AGENTS OF FOREIGN FIRMS:**

- I. FOREIGN PRINCIPAL'S PROFORMA INVOICE INDICATING THE COMMISSION PAYABLE TO THE INDIAN AGENT AND NATURE OF AFTER SALES SERVICE TO BE RENDERED BY THE INDIAN AGENT.
- II. COPY OF THE AGENCY AGREEMENT WITH THE FOREIGN PRINCIPAL INDICATING THE NATURE OF AFTER SALES SERVICES, PRECISE RELATIONSHIP BETWEEN THEM AND THEIR MUTUAL INTEREST IN THE BUSINESS.
- III. PLEASE ENCLOSE THE DOCUMENT(S) RELATED TO THE ENLISTMENT OF THE INDIAN AGENT WITH DIRECTOR GENERAL OF SUPPLIES & DISPOSALS (DGS & R) UNDER THE COMPULSORY REGISTRATION SCHEME OF MINISTRY OF FINANCE.
- IV. PLEASE CONFIRM WHETHER YOU ARE AUTHORISED TO QUOTE ON BEHALF OF YOUR PRINCIPALS AND IF SO, PLEASE ENCLOSE A COPY OF SUCH AUTHORISATION WITH YOUR QUOTATION.
- V. WHETHER ANY EXPORT LICENCE IS REQUIRED FROM YOUR GOVERNMENT, IF SO, PLEASE CONFIRM WITH DETAILS.
- VI. COUNTRY OF ORIGIN OF THE GOODS IS TO BE MENTIONED.
- VII. BIDDERS TO ENCLOSE THE FOLLOWING DOCUMENTS:-
  - A) CURRENT INCOME TAX AND SALES TAX CLEARANCE CERTIFICATES AND PAN NO.
  - B) BANKER'S SOLVENCY CERTIFICATE
  - C) SUMMARY OF AUDITED STATEMENT OF ACCOUNTS FOR THE LAST THREE YEARS TO BE ENCLOSED AND FINANCIAL HIGHLIGHTS AND THE KEY PERFORMANCE DURING THE LAST THREE QUARTERS TO BE ENCLOSED AS PER FORMAT:-
  - D) CUSTOMER SATISFACTION CERTIFICATE FROM ONE SUCH ORGANIZATION IS TO BE ATTACHED WITH THE TECHNICAL BID AND PRICE BID.

**IMPORTANT**

1. University authority may accept or reject any or all the bids in part or in full without assigning any reason and does not bind itself to accept the lowest bid. The University at its discretion may change the quantity / upgrade the criteria / drop any item or part thereof at any time before placing the Purchase Order.

2. Promptly make arrangements for repair and / or replacement of any damaged item (s) irrespective of settlement of claim.
3. In case of any dispute, the decision of the university authority shall be final and binding on the bidders.
4. For any query pertaining to this bid document correspondence may be addressed to Prof. Swapna Mahapatra, at the address mentioned above.

**LAST DATE FOR SUBMISSION OF SEALED BIDS: 21<sup>st</sup> April 2017, 15.00 HRS**

- 1) Please Note that the University remains closed during Sundays and all specified government holidays.
- 2) Fax, e-mail Tender will not be accepted.
- 3) The General Terms and Conditions as stated above relate to supply of stores / equipment /assets etc. and for specific service other terms and conditions of the University will apply.

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## List of Equipments

- \*1. Cryogen free Physical Properties Measurement System
- \*2. Fourier Transform Infrared Spectrometer
- \*3. AFM with STM
- \*4. Liquid Chromatography Mass Spectrometer
- \*5. Rapid Thermal Processing Unit
- 6. Thermal Cycler-gradient
- 7. Micropipette (with 5 volumetric variants)
- \*8. Fourier Transform Spectroscopy (Table Top)
  - 9. Michelson interferometer on the laser optics
- 10. Kerr effect
- 11. Stefan Boltzmann law, Determining Planck's constant
- 12. Frank-Hertz experiment
- 13. Raman scattering (student version)
- \*14. Gamma ray spectroscopy, Compton effect, Rutherford scattering (NIM BIN based)
- \*15. X-ray (and other optical) diffraction (tabletop)
  - 16. ESR and NMR
- 17. Cloud Chamber
- \*18. Muon Lifetime, Time coincident techniques, Correlation in Nuclear decay (NIM BIN based)
- \*19. Automated Water purification system
- 20. Digital Storage Oscilloscope (4 Channel)
- \*21. HPCF



## Technical Specifications

### 1. Cryogen free Physical Properties Measurement System:

Sealed tender is invited for the supply and installation of completely integrated and fully automated, computer controlled cryogen free system for measurement of physical properties as a function of temperature (1.8-400 K) and magnetic field up to 9 T. The system should be fully compatible with various measurement probes such as *vibrating sample magnetometer, electrical transport and ac susceptibility*.

#### **BASE System:**

1. System should be fully cryogen-free, i.e. no requirement of liquid Helium and/or liquid Nitrogen for cooling of the magnet as well as sample.
2. Any liquid helium and/or cold helium gas flow into sample chamber or to any other parts within the system, and all low temperature operations must be handled in fully automated way through electronic and computer controls. The system should not have any manual control in the entire operation of the system.
3. The system should be equipped with number of thermometers at different stages/locations to monitor their temperatures through the main operating software.
4. System should be well isolated for low noise measurements.
5. Magnet control software monitors the temperature of the magnet and cryostat at 3 locations to ensure proper operation of the magnet system and avoid time consuming quenches.

#### **Temperature Controller:**

1. Cryostat assembly which will include sample chamber and radiation shields and other assembly must be cooled by counter flow heat exchange mechanism for efficient cooling and efficient use of cooling resources. It should be continuous low temperature operation. All the operations must be fully automated without user intervention
2. The system should enable cooling of samples from highest temperature to the lowest at the highest specified cooling rate at any given magnetic field (up to 9T) without affecting the system performance or heating of magnet or resulting in a magnet quench. Same thing should hold for heating of the samples as well.
3. Temperature range of 1.8 to 400 K , with mili kelvin stability and accuracy.
4. Temperature stability should be at least  $\pm 0.5\%$  for  $T < 10$  K /  $\pm 0.05\%$  for  $T > 10$  K
5. Cool down time from RT to 1.8 K not more than 60 minutes sweeps through 4.2 K are smooth and monotonic on cooling and warming sequences.
6. Accuracy:  $\pm 1\%$ , with sweep rate of at least 10 K/min irrespective of the magnitude of applied magnetic field.
7. Temperature Stability: at least  $\pm 0.2\%$  or better
8. Fast Settle, No Overshoot, and Sweep mode.
9. Temperature control should be fully automated.

#### **AC and DC transport:**

1. 2-wire & 4-wire resistivity and simultaneous Hall effect measurement, I-V characteristics and differential resistance measurement ( $dV/dI$  vs. I or  $dV/dI$  vs V).
2. Should have two built-in independent sources and meters so that two measurement channels are truly independent.
3. In addition to standard mode (4-wire resistance up to  $10M\Omega$ ), there should be high impedance mode - 2-wire resistance measurement up to  $5G\Omega$ .

4. Current Source: DC & AC, **10nA** (or less) to 100 mA (or more) or better continuous (1 Hz to 200hz or better for ac)
5. Sensitivity: 20 nV or better.

**AC Susceptibility:**

1. AC magnetic measurements with minimum of 10E-7 emu sensitivity.
2. Drive amplitude 5mOe to 15 Oe
3. Frequency range 10Hz to 10 KHz
4. Phase resolution 0.5 deg
5. Stability: +/- 1% for T < 50 K : 1/- 0.5% for T > 50K
6. Accuracy: +/- 0.5% over the entire temperature and field range
7. DC sensitivity 10<sup>-6</sup> emu

**Vibrating Sample Magnetometer:**

1. Sensitivity 10<sup>-6</sup> emu.
2. Amplitude of vibration 2-4 mm.
3. Accuracy 0.5%

**2. Fourier Transform Infrared Spectrometer:**

1.	System should be compatible for Solid, liquid, and thin film samples. Holder for all kind of samples should be included in the quote.
2.	The Interferometer must be a dynamically aligned, non-air bearing Michelson design. The interferometer must be capable of supporting an optional Automatic Beamsplitter exchanger accessory without modification. Standard warranty on the interferometer must be 5 years. The spectrometer must support optional external or internal NIR modules, GC-IR and sample compartment TGA accessory modules. It should be also upgradeable to FTIR Microscope.
3.	Working spectral range from 8000-100cm <sup>-1</sup>
4.	The Beam source should be ceramic or Hg- arc. and Please mention power. The infrared source must have a guaranteed lifetime of 5 years and must be user replaceable.
5.	System should be equipped with Completely sealed Ge coated KBr Beam splitter.
6.	All the optics /mirrors must be coated with highly reflective materials.
7.	The Spectrometer enclosure should be properly sealed and moisture resistant. It should have purging facility with nitrogen gas. It should have heating facility for protection against high humidity. The sample compartment should have facility to accommodate different FTIR accessories like DR, ATR, large IR cells for In-situ studies. It should have facility to take the IR beam out of the sample compartment for external measurement.
8.	It must contain Either DTGS or MCT type of detector.
9.	It should have Single to noise ratio should be not less than 50000:1 peak to peak in 1 min scan or better.
10.	The Wavelength precision should be 0.01cm <sup>-1</sup> or better.

11.	The Resolution should be better than $0.4\text{cm}^{-1}$
12.	It must have Photometry performance which should be better than 0.1% T
13.	The Spectra collection rate should be minimum as 25 spectra per second
14.	The system should be quoted with ATR and should include all accessories required for the measurement.
15.	Supplier should provide FTIR data acquisition software with latest hardware configuration with USB interface and a i7 processor PC with windows 10 Operating System.
16.	The ATR accessories should be quoted as optional items <ul style="list-style-type: none"> <li>• It should have reflection accessories with <math>15\text{-}80^\circ</math> variable angle for grazing angle measurements.</li> <li>• The Polarizer compatible with suggested range.</li> <li>• Any other accessory.</li> </ul>
17.	<b>IR microscope with the specification as follows. Accessories should be included as optional.</b> <ol style="list-style-type: none"> <li>a) The Working range start from <math>8000\text{-}100\text{cm}^{-1}</math> or better</li> <li>b) It should have 15x IR objective equipped with micro ATR</li> <li>c) Containing 4x glass objective</li> <li>d) The Binoculars with adjustable eyepiece</li> <li>e) It contains Focussing optics</li> <li>f) It should have Motorised stage with min <math>126\text{x}76\text{mm}</math> travel</li> <li>g) It contains Grazing angle measurement (variable and fixed</li> <li>h) angle)</li> <li>i) It should include polarizer kit</li> </ol>
18.	Three year Warranty

### 3.AFM with STM:

The AFM and STM should have a state-of-the-art design and with latest technology for use to analyze various kinds of samples. AFM and STM can use two different samples at a same time.

### **Main System Specifications for AFM**

#### **Scanning Features:**

The AFM system should have Tip Scanning technique in XYZ.

#### **Minimum Requirement for System Performance**

The system should achieve high resolution on graphite and mica with scanner  $100\ \mu\text{m}$  XY

XY Linearity mean error:  $\leq 0.1\%$  or better

#### **Scanner**

1. AFM scan head with Flexure-based electromagnetically actuated XY-scanner; Piezo-based Z-actuator; Optical Z-position sensor; Closed loop Z-control
2. Scan range in **XY:  $100\ \mu\text{m}$**
3. Scan range in **Z:  $10\ \mu\text{m}$**
4. **Drive resolution in XY :  $6\ \text{pm}$  or Better**
5. **Drive resolution in Z:  $0.6\ \text{pm}$  or Better**

## **Standard Modes Required**

- Static Force
- Dynamic Force
- Lateral Force Microscopy
- Phase Contrast
- Magnetic Force Microscope(MFM)
- Electrostatic Force Microscope(EFM)
- Piezoresponse Force Microscopy (PFM)
- Kelvin Probe Force Microscopy (KPFM)
- Force Modulation,
- Conductive AFM (C-AFM)
- Spreading resistance (conductive),
- Multiple Spectroscopy modes,
- Lithography and Manipulation modes.
- Liquid modes

## **Control Electronics**

The AFM must have state-of-the-art controlled electronics and following inclusions

1. 24 bit digital to analog converters for scan controlling XY and Z
2. 24 Bit ADC/DAC for Zoom-In and precise acquisition
3. Analog signal handling for minimum electronic noise
4. X/Y/Z-Axis Position Measurement : 3 x 24Bit ADC, 200kHz or Better
5. Analog signal input bandwidth : DC to 5MHz or Better
6. Up to 8000x8000 data points or better,24Bit Zoom In 8 acquisition channels with dynamic digital filters
7. X/Y Sample slope correction and Over scan
8. Power 90-240 V AC, 70W, 50/60Hz

## **Software**

Software must be a single package for all modes and attachments with no need for additional software programs. Software package must include both image acquisition and data processing software in one package with no need for different programs operation. Automatic cantilever spring constant calibration. 2D Fast Fourier analysis, Plane-fit, High pass and low pass filters, Zoom in/out, Optional grid on images and curves Color bar completely user definable 2D and 3D height presentation etc.

## **Video Camera:**

Dual view camera Focus: Motorized, user-controlled focus for each camera Zoom range: 4-Fold digital zoom in 3 steps Video output: USB 2.0

**Top View** Type: Color video Resolution: 3.1 MP (2048 × 1536 pixel or better)

**Side View:** Type: High-contrast black and white Resolution: 1.3 MP (1280 x 1024 pixel or better)

## **Probes / tips**

1. At least 40 nos of respective tips / probes for Static & Dynamic modes. At least 10 nos of tips for each standard modes asked in the tender must be included for as per applications.

## **Accessories**

- 1) **Active vibration isolation:**  
Highly compact active vibration isolation for the better measurement
- 2) **Acoustic Enclosure:** Provides acoustic isolation during measurements & Also shields against light, electric and air flow disturbances
- 3) **Micrometer Translation Stage**

Travel range: 13 mm

XY Position Reproducibility: <10 µm

4) Tool set , Standard Sample for Static, Dynamic, MFM etc modes

## **Main System Specifications for STM**

Complete All in One STM for Nano-education to measure atomic resolution & other nanoexperiments. System should have Integrated controller, airflow shielding & vibration isolation.

### **System Specification:**

Scan Range ( X & Y) : 500 nm × 500 nm

Scan Range ( Z) : 200 nm

Current amplifier : Max 100nA or better

Imaging modes : Const. current (topography), Const. Height (Current)

Sample approach : Stick-slip motor

Sample size : Min 10 mm diameter or better,  
Min 3 mm thickness or better

Data points : Imaging: up to 2048×2048 or better

Power supply : 90–240 V AC, 50/60 Hz, 30 W

### **Accessories:**

#### **1) STM Basic Sample Kit:**

Gold on sample support

Graphite (HOPG) sample on sample support

Sample support - 4 pcs.

#### **2) Pt/Ir wire: 0.25mm dia & 30cm length – 2No**

### **Computer**

Latest Compatible Computer with necessary configuration (Min i5,8GB RAM,1TB Hard drive) and 2 screens with Color Laser Printer – 2 no

### **Service Center:**

Supplier should have service facility in Kolkata and nearby place. Response time should be 48-72 hours.

**Warranty: 2 years**

### **Optional Item:**

#### **1) Small Sample Heater**

Sample holder for heating samples. Materials selected for minimal drift

Temperature range: Room temperature to +120 °C

Diameter: 60 mm

#### **2) Temperature Controller.**

Temperature resolution: 0.1 °C

Additional Temperature Sensor: Thermocouple Type K

#### **3) Environmental Control Chamber**

Allows measurement under controlled atmosphere (inert, dry, humid).

Transparent hood and base plate with 4 cable feed throughs and 4 festo gas inlets for 6mm tubing compatible with System

#### **4) Cantilever Holder Liquid and cantilevers suited for experiments in liquids**

#### 4.Liquid Chromatography Mass Spectrometer:

##### **Liquid Chromatography Quadrupole Time-of-Flight (LC-Q-TOF) High Resolution Mass Spectrometer System**

A LC-Q-TOF is required for: Quantification and confirmation of small and large molecules and other target compounds in known /unknown matrices also for Unknown and /non targeted identification

##### **Core Specifications**

Item	Specifications	Description
1	One Vendor Solution	Both the Liquid Chromatograph and Q-Tof mass spectrometer must be manufactured, supplied and installed by a single vendor to provide a seamless integration between the LC and Q-Tof
2	Service and Support	Both the Liquid Chromatograph and Q-Tof Mass Spectrometer must be fully supported by the supplier to provide a seamless instrument diagnostics between the LC and Q-Tof. At least 10 years spares support need to be provided.

##### **Quadrupole ToF Specifications**

Item	Specifications
1	<b>Ion Source</b> Must have ESI and APCI source and facility of changing source without interrupting vacuum
2	<b>Mass Range</b> 100-10,000 amu or better
3	<b>Analyser Type</b> Suitable analyzer geometry capable of providing resolution >20,000FWHM
4	<b>Mass Accuracy</b> Minimum mass accuracy in MS and MSMS mode must be 3ppm for internal and external standards across the entire mass range
5	<b>Mass acquisition mode</b> Must be capable to do all analysis including MS, MSMS together in single analysis
6	<b>Sensitivity</b> Picogram level sensitivity required
7	<b>Linear Dynamic Range</b> Must have 5 orders of linear dynamic range
8	<b>Temperature Stability</b> Operating temperature 16-30deg centigrade or better
9	<b>Spectral Acquisition rate</b>

	Must be 50 spectra/sec or better in MS and MSMS mode
10	<b>Vacuum System</b>
	Highly efficient vacuum systems consist of Turbo molecular pumps followed by rotary mechanical pumps must be provided

#### Liquid Chromatograph Specifications

Item	Specification	Description
1	<b>Pump</b>	Must be quaternary gradient pump capable of high pressure mixing and delivering solvents at a min 600bar pressure
2	<b>Flow Rate</b>	Must be 0.001-5ml/min in 0.001ml increment
3	<b>Flow Precision</b>	Must be less than 0.07% RSD
4	<b>Flow Accuracy</b>	Must be better than 1%
5	<b>Composition Accuracy</b>	0.4% or better
6	<b>Composition Range</b>	Settable range should be 0-100%
7	<b>Auto Sampler</b>	Must be capable of holding at least 96 samples or better.
8	<b>Column Oven</b>	Column oven should go till 90deg

#### Data Management System

Item	Specifications with Description
1	Computer and Printer to be supplied along with instrument
2	<b>Integrated software to control MS and LC together</b> The Software should be capable to generate chemical formula and structure of unknown compounds Need a proper software for peptide mapping and deconvolution Suitable MS compatible C18 columns in two nos to be supplied
3	The Software shall be capable of Auto calibration and all quantitative work flow
4	All necessary gases including nitrogen generator need to be supplied with the instrument
5	UPS 20KVA with built and of capable to take load for 1hr to be supplied
6	<b>Warranty</b>

### 5. Rapid Thermal Processing Unit:

**Furnace Structure:** Double layer steel casing with air cooling keeps furnace surface temperature lower than 60°C.

High purity fibrous alumina insulation for maximum energy saving.  
Split cover with Interlock protection, cut the power if lid open during furnace heating process.

**Power Input:** 208-240 AC, 50/60 Hz single phase, 9 KW Max.

**Heating Elements:** 8 pcs 1Kw Halogen light tube

**Standard working life:** 2000 hrs.

**Working Temperature:** 1200°C Max.

**Max. Heating Rate:** 50°C/sec

**Temperature Controller:** PID control and auto-tune function, +/- 1 °C temperature control accuracy

Quartz Tube & Sample Holder

Vacuum Flange

## **7. Specification for variable micropipette,**

### **model: Eppendorf Research plus Pipettes**

- Spring Loaded Tip Cone: Improved ergonomics, Tight fit to the tip (not in 5ml and 10ml pipettes)
- Adjustment opening: Adjust your pipettes to a specific liquid and volume.
- Control Button: Very low operating force, Colour indicates pipette volume.
- Ejector: Very low operating force, positioned for perfect ergonomics.
- It should be IVD Conformation.
- Volume Display: 4 Digits. Magnifying shape.
- Piston System: Ultra light system made of Forton.
- Quick Connection Clip: Remove lower part easily.
- Fully Autoclavable
- Warranty- 3 Years

#### Volume range:

- 0.1– 2.5 ul
- 0.5 – 10 ul
- 2 – 20 ul
- 10 - 100 ul
- 20 – 200 ul
- 100 – 1000 ul
- 0.5 – 5ml
- 1 – 10 ml

## **14. Gamma ray spectroscopy, Compton effect, Rutherford scattering (NIM BIN based)**

1. 0-3 kV (or higher) NIM HV Power supply with 2 or more channels, current/ch ~ 3 mA or higher, suitable for PMT based applications with output available on SHV connectors. Independent channel control would be preferable. (One unit)
2. NIM BIN power supply (12 NIM width) with NIM type connectors having +/- 6 V, +/- 12 V and +/-24 V outputs. Crate wattage must be ~ 90W or higher
3. NIM Single channel analyser with standard INTEGRAL, NORMAL and WINDOW modes, pulse-pair resolution 1 mic sec or better, Dynamic range better than 300:1 (500:1 is preferable)
4. Counter timer: Must be NIM crate compatible, capable of counting both positive and negative pulses from 10 mV to 10 V with a maximum frequency of 1 Mhz or higher. The unit must have all possible user facilities for counting viz START, STOP, ERASE, PRESET etc. Module with gate input (NIM or TTL), carry output and programming capability preferable.
5. Integrated NaI(Tl) (1"x1") Scintillation detector with bi-alkali PMT. System must be complete with pre-amplifier, voltage divider base and cables. Power cables must have SHV male connectors at both ends. Pre-amp power connection must be compatible with standard D-connectors provided in the BIN power supply as well as spectroscopy amplifiers. The resolution at 660 keV must be better than 8.5%. Suitable NIM type HV unit must be quoted. (One set)



6. Spectroscopy Amplifier: Gain max 1500 with semi-Gaussian pulse shaping, active differentiation and integration; noise: less than 5 micro V for unipolar output referred to input.  
Must be NIM crate compatible (One unit)
7. NIM CF Discriminator: min 50 Mhz rate capability, -5mV min threshold with CF, LE and SRT modes preferable, NIM crate compatible (Two units)
8. PC Based MCA with range 4K or higher with analysis software

## 18. Muon Lifetime, Time coincident techniques, Correlation in Nuclear decay (NIM BIN based)

1. Photomultiplier tube: 1.5 " diameter 12 stage 21 pin with matching base and voltage divider
2. 0-3 kV (or higher) NIM HV Power supply with 2 or more channels, current/ch ~ 3 mA or higher, suitable for PMT based applications with output available on SHV connectors. Independent channel control would be preferable. (One unit)
3. NIM CF Discriminator: min 50 Mhz rate capability, -5mV min threshold with CF, LE and SRT modes preferable, NIM crate compatible (Two units)
4. NIM BIN power supply (12 NIM width) with NIM type connectors having +/- 6 V, +/- 12 V and +/-24 V outputs. Crate wattage must be ~ 90W or higher
5. NIM Single channel analyser with standard INTEGRAL, NORMAL and WINDOW modes, pulse-pair resolution 1 mic sec or better, Dynamic range better than 300:1 (500:1 is preferable)
6. Time to amplitude convertor for measuring nano second life time.
7. Counter timer: Must be NIM crate compatible, capable of counting both positive and negative pulses from 10 mV to 10 V with a maximum frequency of 1 Mhz or higher. The unit must have all possible user facilities for counting viz START, STOP, ERASE, PRESET etc. Module with gate input (NIM or TTL), carry output and programming capability preferable.
8. PC Based MCA with range 4K or higher with analysis software

## 19. TECHNICAL SPECIFICATION OF Automated WATER PURIFICATION SYSTEM

### Stage1: Pre Filter to counter the Particulate Load & Iron

The System should be quoted with proper prefilter & Iron Removal Filter. Both of these have to be provided by the same company who manufactures the water System.

One Stage Purification 5 Micron or 1 Micron Polypropylene graded density wrapped type depth filter with Low Voltage 20 Watts powered DC Pump with noise levels of Less than 48 Decibels.

Iron Removal Filter: The system is connected with back wash able Iron removal filter to deliver 0.1 ppm output.

Feed Water Quality:-

Potable Tap Water

Conductivity : < 2000  $\mu$ s/Cm.

PH : 4-10

Total Chlorine: < 3ppm.

Fouling Index : < 12.

### Stage2: Analytical Grade Water System (Type II)

System should produce Type II water directly from tap water feed.

Product Water should meet or exceed Type II water quality corresponding to analytical –grade water as defined by ASTM, CAP, NCCLS and ISO 3696/BS 3997 with the following Product Water Technical Specifications:

- Resistivity 10-15 Megh Ohms
- TOC Levels less than 30 ppb
- Flow Rate 3 Ltrs/Hr

The System should have ideally a three stage Purification system:

**Stage 1:** Pretreatment Cartridge with anti scaling compounds, activated carbon filter and 1 Micron Particulate filter to obtain Chlorine and Colloid free water, and compatible with Feed Water Quality of SDI levels up to 12 and total Chlorine level of 3 ppm and conductivity of 2000 micro Siemens/cm. Should be fitted with a easy lock and release mechanism for future maintenance.

**The cartridge should have an RFID tag for traceability.**

**Stage 2:** The system should have A high Flux thin RO Membrane with 200 Daltons cutoff. The system should compulsorily have conductivity cells before and after the RO Membrane to 95-99 % rejection of Inorganic Ions 99% rejection of all Dissolved organic substances.

Product Resistivity Coaxial Cell Design for faster ionic variation detection and RFID Tag for Automatic traceability of consumables.

RO cartridge Sealing- to avoid ionic leakage in the permeate and Quantum Locking Mechanism for easy and safe connection of polishing cartridge

RO cartridge should have high recovery loop to reduce the wastage of feed water to drain.

**Stage 3: The System should have the Electro De-ionization module (EDI Module), with mixed Bed Ion Exchange Resin along with Carbon Beads at cathode to avoid scaling so that the Regeneration of the Resins happens on application of Electric current.**

The system should have Temperature Compensation of Product water temperature of max +/- 0.1 degree irrespective of temperature changes.

The system should have the following:

- In built display to ensure the system parameters are displayed all the times
- Auto diagnostic facility with Error NO and Alarm Code and real time clock to log reports with date and time to ensure complete traceability.
- Automatic Cleaning, Rising, and Flush mode.
- The screen should change colour to indicate maintenance or poor quality water delivery.

**Stage 3: Specifications for Storage Reservoir**

Blow molded Polypropylene reservoir with 60 Ltrs Capacity with sensor rod float switch and single 3 stage vent filter consisting of soda lime, activated carbon and 0.22 micron hydrophobic membrane and have the option of using Automatic sanitization Module.

**Type I water purification system**

Type I water should be produced from two stage mixed bed ion exchange and activated carbon cartridge, 185/254 nm dual wavelength UV lamp. TOC monitor and conductivity sensor, and an option for final filter in dispensing arm.

**STAGE 4:**

- Type II water should pass through feed water specific cartridge for removal of trace contaminants.
- 17watt, low pressure mercury vapor lamp made of ultrapure quartz with dual wavelength ( 185 and 254nm ). The lamp has an electro polished 316L ss housing
- Application Specific cartridges to remove ionic and organic contaminants to trace levels
- Built in TOC monitor with the ability for self calibration and check curve display.
- To prevent deterioration of water quality during periods of non-use, the ultrapure water system will be able to recirculate water to maintain high water quality.

- Water production unit that can be placed either on the bench , under the bench or on the wall with Multi colour monitor displaying : resistivity, TOC, level of water in reservoir, volume dispensed and other alarms, printing etc

**Dispensing arm:**

1. Adjustable height and rotating arm-adjustable to any glassware.
2. **Volumetric dispensing from 250 ml till 60L can be set from the system.**

**STAGE 6: Final Filters Options :**

- a) Pharmaceutical grade , final filter with 0.22micron membrane filter in stack disc configuration.

**UltraPure (Type I) water:**

Ultrapure Water (Type 1) Flow Rate (L/min).....	0.05 to 2( Programmable flow rate)
Ultrapure Water Resistivity (MΩ·cm at 25°C).....	18.2
Microorganisms (cfu/mL).....	<0.1
Particulates < 0.22 μm ( / mL).....	< 1
Pyrogen Levels (EU/mL) .....	<0.001
RNase Level (ng/mL) .....	< 0.01
DNase Level (pg/μL) .....	< 4
TOC (ppb) .....	< 5 with TOC display

- ❖ Must have 100 installations in Orrisa and more than 700 installations in the east.
- ❖ Compatible with RS-232 Port.

## 20. Digital Storage Oscilloscope

Display:	Colour (5.7" or bigger)
Bandwidth:	200 MHz
Channels:	4 (analog)
Ext Trig:	1 extra analog channel
Sample rate:	1GS/s in each channel
Rec Length:	2.5k points/ch or better
V. Resoln:	8 bits
V. Sensitivity:	2mV to 5 V/div or better
Max <sup>m</sup> input:	300Vrms CAT I or better
BW limit:	20 MHz
Input Coupling:	AC,DC and Ground
Input Impedance:	1M-Ohm in Parallel with suitable Capacitance
Time base:	2.5ns to 50s/div or better
Trig:	Edge, PE, Video, slope, alternate, etc
Front panel quick setup, and measurement options.	
Measure and Math functions: Suitable measurements and math functions	
Probes: Standard +HV probe (optional)	
Display zoom facility will be preferred.	
Warrantee & Calibration : 3 yrs (preferable)	

## 21.HPCF :

<b>High Performance Computing Facility</b>
<p>MASTER NODE–Qty 1:            2xIntel Xeon E5-2630 V3 8core, 2.4Ghz Processor            64GB DDR4 Reg ECC 2133Mhz RAM Memory            3x1TB NL-SAS 7.2K, 6Gbps Hot Plug Hard Drive (3TB total)InfiniBand Card            40Gbps or Higher            4x Gigabit Ethernet Ports</p>
<p>COMPUTE NODE–Qty 8:            2xIntel Xeon E5-2670 V3 12core, 2.3Ghz Processor            64GB DDR4 Reg ECC 2133Mhz RAM Memory            2x 1TB SATA/NL SAS 7.2K RPM 2.5-in Hot-Plug Hard Drive            InfiniBand Card 40Gbps or Higher            2x Gigabit Ethernet Ports</p>
<p>Storage Node –Qty 1:            ( 2x MDS Nodes &amp; 2 x OSS Nodes)            2xIntel Xeon E5-2630 V3 8core, 2.4Ghz Processor            32GB DDR3 Reg ECC 2133Mhz RAM Memory            2x 1TGB NL-SAS 7.2K RPM 2.5-in Hot-Plug Hard Drive            InfiniBand 40Gbps or Higher Card            Dual 8Gbps/16Gbps FC HBA            2x Gigabit Ethernet Ports</p>
<p>IB Switch (Mellanox) –Qty 1:            18 port 40Gbps or Higher IB switch with suitable no of IB cables</p>
<p>Networking (High Speed Infinite Band Connection)</p>
<p>Rack–Qty 1:            42U Industry Standard Server Rack with all accessories</p>
<p>Gigabit Ethernet Switch –Qty 1:            24port Gigabit switch along with required cables</p>
<p>Supply and Installation of 10KVA UPS system with            half an hour battery backup</p>
<p>Supply and Installation of 7.5TR Precision AC air            cooled system</p>
<p>Software</p>
<p>AMC</p>

### Details of Software Requirement

Sl. N.	Items	Justifications
1	<p><b>HPC Software</b>            Red Hat Linux            Cluster Management Software with GUI            web based Management</p>	<p>System software</p>

	& Monitoring Job Scheduler Software C/C++, Fortran Compilers and Parallel Libraries GUI Portal for Job Submission	
2	Matlab	Numerical Computation
3	Mathematica	Numerical Computation
4	IDL	Data Analysis and imaging
3	Maple	Numerical Computation & GTR Calculation
4	Gaussian 09 (Revision D.01) for Linda	Electronic structure theory calculation/Density Functional Theory (DFT) calculation
5	Ansys Fluent	Computational Fluid Dynamics

## 6. Dual block gradient PCR system

1. Universal dual block with 64 and 32 wells
2. Block should accommodate PCR tube strips, 0.2ml & 0.5 mL PCR tubes or divisible PCR plate
3. At least there should be 200 installations of offered system in India.
4. Should be capable of testing temperatures at Denaturation, Annealing & Extension steps
5. Should have 12°C gradient range
6. Gradient technology should ensure identical ramp rates in both gradient and normal operation
7. Gradient temperature range from 30 – 99°C
8. Heating and cooling of block must be through peltier technology
9. Should use patented Triple Circuit Technology ensuring precise control of temperature
10. Block temperature control range must be 4°C to 99°C
11. Fast, Standard and Safe' temperature control modes are must
12. Lid Temperature range: 37 - 110 °C
13. Block Temperature Accuracy:  $\pm 0.2^{\circ}\text{C}$
14. Block Homogeneity:  $\leq \pm 0.3^{\circ}\text{C}$  (20°C to 72°C);  $\leq \pm 0.4^{\circ}\text{C}$  (90°C)
15. Heating rate: 3 °C/s; Cooling rate: 2 °C/s
16. Lid descent and closing pressure must use Flexlid technology with Thermal sample Protection (TSP) to accommodate PCR tubes with flat or domed caps
17. Should have large display with Intuitive Graphic programming
18. Should have Administrator and user login with or without PIN for enhanced security
19. Inbuilt advance scheduling feature for users convenience will be a preference

20. Preprogramed protocol templates for easy selection
21. Should have Time or Temperature increment with cycles in PCR program
22. Adjustable ramp rate is must to meet critical amplification conditions
23. Customized programming allows a maximum of 20 steps and 99 cycles
24. Auto Restart facility with user defined time interval when power fails and resumes
25. Instrument status indicating the step, cycle and remaining runtime during the run
26. Should display Runtime in larger font for better view from distance
27. Should have Two USB ports: for Protocol transfer, Self-test, USB, printer / mouse
28. Should have Log book function for error messages and new calibration
29. E-mail Notification
30. Power save Standby function
31. Cooling vents at bottom and rear allow placing other instruments in limited bench space
32. System should have provision to connect any TWO other systems (96-well block, 64/32 dual block, and/or flat block) for ultimate throughput
33. Optional Self-test dongle to check functionality of all 6 peltier elements
34. Interface: USB, Ethernet, CAN in, CAN out
35. Dimensions (W x D x H) in cm: 25 x 41.2 x 33
36. Weight: 11 kg
37. Maximum power consumption: 700 W
38. Calibration according to NIST (USA), DKD/PTB (Germany) UKAS/NPL (UK), UL/cUL listed
39. Should comply to RoHS (2011/65/EU)
40. Two year warranty
41. Online UPS with 1 hour back should be supplied with PCR machine