INDIAN ASSOCITION FOR THE CULTIVATION OF SCIENCE
2A & 2B , Raja S.C. Mullick Road, Jadavpur, Kolkata-700032

NIT No. IACS/SCS/JD/Project/57 **Date: 27.05.2021**

Sealed tender in two bids system (Technical bid and Price bid) is invited from bonafide, resourceful and eligible manufacturer/exclusive distributor/vendors for **Scanning Probe Microscopy.**

Part-I (Technical Bid) of the tender should contain technical specifications in detail as well as commercial terms and conditions. Part-II (Price Bid) should clearly indicate group-wise price, if needed, as mentioned in the technical bid. The Technical Bid and Price Bid are to be submitted in separately sealed envelopes, distinctly marked accordingly and both to be put inside another envelope, that should be sealed and superscribed with tender notice no. and due date. The bidders may submit bids duly signed in their own letterheads.

Completed tender bids should reach the office of the **Registrar, Indian Association for the Cultivation of Science (IACS), 2A & 2B Raja S. C. Mullick Road, Jadavpur, Kolkata-700032** on or before the scheduled date and time specified below:

Tender Notice No.	**IACS/SCS/JD/Project/57, Dt 27.05.21**
Last date and time of submitting tender	27/06/2021, within 3.00 PM
Pre-bid meeting(date, time & place) to discuss technical specification	12/06/2021, 2.30 PM (Room No. 107A, Main Building, IACS)
Date and time of opening tender (Technical Bids)	28/6/2021, 2.30 PM
Place of opening tender	Room No. 107A, Main Building, IACS
Date and time of opening of Price Bid	The Price Bids of the bidders qualifying the technical bid will only be opened, the date of which will be intimated to the short-listed bidders at their email addresses. The rest of the bids will be rejected.
Contact	Email: ocjd@iacs.res.in Tel.+91 33 2473 4971 [Ext 1405]

The technical bids will be opened first to judge/evaluate the technical specifications of the said instrument and thereafter the price bids of only technically qualified bidders will be opened.

Technical Bid Evaluation: The Technical Bids will be evaluated in the presence of the representatives of intending bidders who will be able to clarify technical aspects of their bids, if any, required by the Technical Evaluation Team.

Opening of price-bid: The Price Bids of the bidders qualifying the technical bid will only be opened, the date of which will be intimated to the short-listed bidders at their email addresses. The rest of the bids will be rejected.
Please note that IACS will not provide any accommodation or reimburse any expenses to any of the bidders for attending opening of technical bid.

Quotations received incomplete or beyond the stipulated time will be summarily rejected.

Bidders should submit their past experience for supplying and successful installation of similar units to other research Institutes/Universities/other organizations in India and abroad. Please provide documentary proofs of such successful installation and supportive documents that the instruments are running successfully.

The equipment is estimated to cost of Rs. 95,00,000/-
(This estimate however is mentioned merely as rough guide and indicative)

1. TECHNICAL BID
The technical bid should contain technical specifications and should be kept in a separate sealed envelope duly superscribed as 'TECHNICAL BID' on the outer cover of the envelop as already detailed above. **It should be clearly mentioned on the envelope as "Technical Specification for Scanning Probe Microscopy".**

Tender specifications for Scanning Probe Microscopy

S.No.	Name	Specifications
1.	Instrument Resolution	The instrument must have demonstrated atomic lattice resolution in AC mode and contact mode imaging. This must be done with the same large scan-range scanner that can also image at least 120 μm x 120 μm (XY) & 15 μm (Z) in closed loop. This allows large survey scans with the ability to zoom-in to get high resolution images at a region of interest.
2.	Instrument Geometry	• The XY scanner must be separate from the Z scanner to eliminate the "bowing" artefact commonly seen in Piezo-tube based (XYZ scanners) AFM systems. • If the system configuration allows a single scanner to be able to achieve large area and small area high resolution images. • The instrument must accommodate samples sizes up to 80mm (dia) and 10mm thick. • Each axis of motion is independently actuated using its own piezo stack and flexure stage. Should have Integrated LVDT position sensors in all three axes provide seamless closed loop operation. • The cantilever holder and the optical lever assembly (laser, optics and detector) must be housed within a single rigid frame. This eliminates artifacts due to relative motion between the optical lever arm and the cantilever during imaging and force measurements. • System must be designed such that the probe (cantilever), laser module and photodetector move together in the Z axis such that it minimizes "false deflection" error due to relative motion between these components. False deflection

		refers to when the deflection signal changes as the probe moves in the Z axis even though the cantilever is not experiencing any force that is deflecting it. • Beam used for deflection detection must approach the probe at an angle that is significantly (>20 degrees) off vertical relative to the sample, such that reflections from the sample surface do not reflect back into the light source or into the detector.
3.	Operating Modes	The microscope must be capable of the following scanning modes, each of which requires at minimum that the signals noted in the corresponding parentheses be recordable simultaneously. Each of these signals must be recorded in both trace and retrace scan directions. Here, auxiliary signals refer to external inputs that are independent of the microscope: • Scanning Tunnelling Microscope with same large area scanner • Contact Mode • Electric Force Microscopy (EFM) • Force Curve Mode • Force Mapping Mode (Force Volume) • Force Modulation • Frequency Modulation • Fluid imaging • Kelvin Probe Force Microscopy (KPFM) • Lateral Force Mode (LFM) • Magnetic Force Microscopy (MFM) • Nanolithography/ Nanomanipulation • Phase Imaging • Piezoresponse Force Microscopy (PFM) • Switching Spectroscopy PFM • Tapping Mode (AC Mode) • Tapping Mode with Q-control • Vector PFM • Two frequency mode - Amplitude and phase response at a second frequency (often a higher mode) to provide useful additional image contrast while the primary topographic feedback loop runs at the fundamental frequency. In order to optimize signal to-noise the second frequency must be driven simultaneously along with the fundamental resonance. • Resonance tracking mode - Operating on resonance to improve the measurement signal to noise for operating modes like piezo response force microscopy and contact resonance imaging. • The AFM system must be able to image samples and

		perform measurements in air and in liquid and even for commonly used electrical modes in air like EFM, PFM & KPFM etc using the same cantilever holder. The cantilever holder must be compatible with most commercial cantilevers. • Any other modes, which occur default modes with the quoted system should also be clearly mentioned.
4.	Optical Lever Arm: Light Source and Photodetector	• The instrument optical lever arm must use a low coherence light source (for example, a super luminescent diode, SLD or equivalent Laser source) to reduce artifacts from optical interference effects. • The instrument must use an infrared SLD (or equivalent) for the optical lever arm to eliminate optical crosstalk with epi- and transmission- fluorescence measurements.
5.	System Scanner	• System should scan the sample in XY and the tip in Z, with independently controlled piezo stack and flexure stage. • System should include a closed-loop XY scanner with a range of 120 µm. • XY sensor noise <0.6nm in a 0.1Hz to 1kHz bandwidth (closed loop). Closed loop sensor Noise numbers should be mandatorily demonstrated during installation at site. • System includes a closed loop Z scanner with a range of 15 µm (extendable up to 40 µm). • Z sensor noise <0.25nm in a 0.1Hz to 1kHz bandwidth (closed loop). Closed loop sensor Noise numbers should be mandatorily demonstrated during installation at site. **System Noise:** Height Noise must be less than 60pm ADev in a 0.1Hz to 1kHz BW (<20pm in quiet environments).
6.	Sample Stage	The SPM must have manual X, Y and Z positioning stage for coarse movement. • The instrument must accommodate samples sizes up to 80mm (dia) and 10mm thick or more. This is an essential requirement to render flexibility to the system for mounting various samples. • **Sample positioning:** XY sample positioning with travel range > 10 mm and an accuracy of minimum 2 micron. • **Sample viewing:** Suitable camera system for tip / sample viewing should be included
7.	Controller, Electronics & Software Minimal requirements	System must use at least 24-bit digital-to-analog converters (DACs) in order to generate the XY and Z piezo scan signals. At both 120-micron and 10-nm scan sizes, the corresponding bit resolution must be sub-Angstrom (<0.1nm). Note that this specification applies to the generation of the scanner drive signals, not the sampling of the scanner position sensors.

		• The system must provide thermal tunes of the cantilever up to at least 2 MHz. • The instrument must allow digital Q-control in the range 2 kHz – 2 MHz. • System must be able to support multifrequency AC mode (tapping mode) operation where two specific frequencies are driven simultaneously and detected simultaneously by lockin amplifiers to measure the amplitude and phase response at each frequency. Lockin detection alone at two frequencies is not sufficient, as both frequencies must be driven simultaneously with a mixed drive signal. Accordingly, the system must be equipped with dual / triple lock in amplifiers as required based in individual system design. • Control and analysis must be user-programmable natively in an entirely open-source software programming language. • The system's software must include a one-click configuration tool that sets up the software for standard and user-defined operation modes, such as AC imaging in air and liquid, contact mode, EFM, KPFM, PFM, force measurements, etc. • System must include the ability to track a changing resonance frequency during operating modes like piezoresponse force microscopy and contact resonance imaging. Phase locked loops (PLL) do not offer sufficient stability to satisfy this specification. System should use in-built lock-in amplifiers and same AFM software for resonance tracking PFM mode. Use of external lock-in amplifiers & third party software for tracking resonance is not acceptable. • Software must include a feature that automatically optimizes the imaging gain and setpoint for AC Mode (tapping mode) operation. The feature must use a predictive algorithm such that operation is stable and producing high quality data within the first few scan lines. • The data acquisition system must be capable of recording individual image sizes of 8000x8000 pixels or greater. • AFM control software environment must include 3D rendering technology for advanced image display. This feature must allow the user to generate, display and visualize 3 & 4D real-time scan images, as well as off-line processing.

		• Must include drift compensation software. Software must allow a region of interest to be tracked in real time to within 1nm of precision while eliminating any scan distortion in the image. Drift compensation must be able to be applied to any imaging, spectroscopy or advanced characterization mode, and in conjunction with sample heating and cooling options. • System must include a feature that automatically calibrates the cantilever sensitivity and spring constant by simply selecting the probe type and clicking a button, without contact to sample surface.
8.	Instrument Isolation	• The system must include a thermally- and acoustically-isolating enclosure. • The system must include a vibration isolation table / platform suitable for the system.
9.	Optional	These will be purchased only if the price falls within the budget available. However, the vendors must state/certify that the AFM system provided will be compatible with these attachments in case these are purchased separately now or in the future. 1. Quantitative Nano Scale Maps - System configuration includes imaging mode that is capable of generating quantitative nanoscale maps of storage and loss modulus, and loss tangent (loss modulus divided by storage modulus), at high pixel resolution (at least 1024x1024 pixels). Data capture must occur during normal AC mode imaging of topography at normal scan rates (<20 minutes per scan). A wide range of samples can be studied within 50 kPa to 300 GPa. 2. Conductive AFM - The system allows conductive measurements while scanning as well as at user specified locations (I-V curves). A sample bias of -10V to 10V is possible. The software allows user-specified wave forms for I/V spectroscopy (square, sine, triangle, pulse, or user defined). The current sensing range with output channels provide gains of 1e6 (1uA/V) & 1e9 (1nA/V), (4pA to 10uA). The bandwidth of the transimpedance amplifier must be at least 17kHz 3. The Offered Instrument should have the capability to increase the Bandwidth of both vertical and deflection signals up to 5MHz. 4. Extended Z scan range upto 40 microns or more.
10.	Service Facility	Service Facility within India is a must, while service engineer available locally in the region of Kolkata will be preferred. An Application Scientist should be available for the support required.

11.	Additional facility required	A suitable 3KVA online UPS with 30 minute back up and one ultra low temperature Freezer (Temperature Range,-60°C to -86°C)for various biomedical samples storage must be supplied with the system. The ultra-low temperature cabinet is designed as a personal freezer for everyday use suitable for storage of sensitive articles such as research samples, chemicals, and viruses where contents must remain changeless.
12.	Warranty	One year warranty from the date of installation of the equipment with lifetime support. An additional 2 years of warranty of the equipment should be provided in the quotation in year wise format.

13. The vendors should have successfully installed at least 10 systems of the same platform in India with institutes of high repute. User's list and contact details should be provided.

A compliance table (see below) must be prepared and submitted along with the technical bid.

Sr. No	Tender specification	Your offered instrument specification	Extent of compliance

2. PRICE BID:

The financial bid indicating (item-wise) price for the item(s) mentioned in the technical bid should be kept in a separate sealed envelope duly superscribed as 'PRICE BID' on the outer cover of the envelop as already detailed above. Price bids of only technically qualified bidders will be opened and they will be intimated the date and time of the opening of price bid at their e-mail ids. Rest of the bidders will stand rejected.

PRICE: Price to be quoted on CIF Kolkata and also FOB basis.

3. BID SECURITY:

a. An Account payee Demand Draft/Pay Order of any of the Nationalized Banks for Rs. 2,50,000 (Rupees two lakhs & fifty thousand only) drawn in favour of "Indian Association for the Cultivation of Science (State Bank of India, Jadavpur University Branch, A/C No. 11079699211, IFSC: SBIN000093, MICR Code: 700002048)" is to be furnished by the bidders except those who are registered with the Central Purchase Organizations, National Small Industries Corporation or the concerned Ministry or Department, as Bid Security money or Earnest Money Deposit (EMD). Alternatively, the Bidder shall have the option to furnish the EMD in the format of Bank Guarantee (BG).

b. The Demand Draft for the Bid-Security should have at least 90 (ninety) days validity period of opening of the bids.

c. In case of non-award of the work the Bid Security money would be returned to the unsuccessful Bidders.

4. PERFORMANCE SECURITY:

An Account Payee Demand Draft on any nationalized bank of India of 10% of the order value in the name of "Indian Association for the Cultivation of Science" is to be furnished by the successful bidder as Performance security. Performance security money should remain valid for a period of 60 days beyond the date of completion of all contractual obligations of the supplier including warranty obligations. Bid security money or EMD will be refunded to successful bidder on receipt of the Performance security money.

5. TERMS OF PAYMENT:

Payment will be made through irrevocable Letter of Credit in two instalments. 90% of the money will be released on submission of shipping of documents. Remaining 10% will be released after successful installation of the instrument.

6. GENERAL INSTRUCTIONS:

1. Validity of tender: Tender submitted should remain valid for at least six months from the date of opening the tender. Validity beyond six months from the date of opening of the tender shall be lapsed by mutual consent.

2. The tender should accompany a compliance chart.

3. Incomplete and conditional tenders as well as tenders received after the due date will be summarily rejected without assigning any reasons thereof.

4. At any time prior to the bid due date, IACS may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder during pre-bid meeting, modify the bidding documents. The amendment(s) will be notified on the institute website. Prospective bidders are advised to occasionally to visit the website (www.iacs.res.in/tender) for any amendment.

5. Installation/Demonstration/Application training at site: Installation & user training at IACS, free of cost by the supplier.

6. Service facility: In India, preferably Kolkata, supplier should mention their details of service setup and man powers who are responsible for after sales support. Response time should be within 24 hrs.

7. The model number, make and a printed literature of the product should be submitted positively.

8. Proposed delivery schedule should be mentioned clearly.

9. Manufacturers / exclusive distributors / vendors should have history of supplying this type of instruments to this or other scientific organizations. Availability of a list in this regard would be preferred.

10. Authorized dealership certificate should be provided in case of principal manufacturing company is not quoting directly.

11. Guarantee certificate, users manuals etc. are to be handed over to the user after successful commissioning of the system.

12. In the event of date being declared a closed holiday for purchaser's office, the due date for submission of bids and opening of the technical bids will be the following working day at the appointed time.

13. In case of any dispute, the decision of IACS authority shall be final and binding on the bidders.

14. For any clarification regarding technical specifications, information etc., please send your queries **to Prof. Jyotirmayee Dash** (ocjd@iacs.res.in).

15. The authority of IACS reserves the right to reject any or all of the tenders received without assigning any reason thereof.

Acting Registrar