IISER THIRUVANANTHAPURAM

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH THIRUVANANTHAPURAM [IISERTVM]

PH.-0471 2778019,
EMAIL: purchasestores@iisertvm.ac.in

MARUTHAMALA.P.O VITHURA. P.O
THIRUVANANTHAPURAM 695551,
KERALA, INDIA
GST No.32AAAJI0299R1ZS

Date: 30 Aug 2022

CORRIGENDUM-I TO TENDER NO

No: IISER/PUR/0437/BCD/SP/22-23

Sub: Supply, Installation and Commissioning of Atomic Force Microscope : reg

Ref: Tender Enquiry No. 2022_IISRT_706054_1

1. The following changes are hereby made to the technical specifications of the above mentioned tender document: -

Section C (3a): Deleted the word 'True'.
Section C (3b): Deleted the entire point.
Section D(2): 'This can be considered as optional if budget cross the projected amount' is removed.
Section G(1): System must uses at least 20 -bit electronics (ADC/DAC) in order to generate the XY and Z piezo scan signals.
Section H(1): A typo SKPM updated to KPFM.

The revised technical specification sheet is placed at annexure 1

2. The revised dates for submission of bids and date of opening are as follows:-

Due Date: 10 Sep 2022 (3PM)

Date of Opening: 12 Sep 2022 (3:30 PM)

Thanking You,

Yours Faithfully

30/08/2022

Deputy Registrar (P&S)

Annexure I

Specifications of Atomic Force Microscope with advanced conducting modes and accessories

Purpose: Nanoscale characterizations of thin film devices

The Atomic Force Microscope (AFM) with complete system capable of imaging and measuring various properties at high resolution.

The system offered should be a complete system inclusive of all necessary computers, software, hardware, AFM accessories for all the specified imaging modes, vibration isolation, acoustic enclosure, and so on.

A.	**Scan head and Scanner Details**	
	1.	Preferable scan area range: 10 µm × 10 µm
	2.	The XY scanner design should be decoupled to eliminate the "bowing" artefact commonly seen in many standard system.
		The XY scanner and Z scanner must have both open loop and closed-loop feedback system.
	3.	The movement of X-Y-Z scanner should be completely separated from each axis, and independent from other axis movement and should have integrated position sensors for seamless closed loop operation.
	4.	The scanner should have mechanical XY-Z orthogonality error of less than 1.0 degree
	5.	The XY-scanner when used to scan a sample in the X and Y directions should guarantees its highly orthogonal 2D movement with minimum out-of-plane motion, which should have less than 2 nm of out-of-plane motion with Flexure hinge type scanner
	6.	Minimal specifications of XY scanner i. XY scan range: 10 - 20 µm range ii. XY scanner Noise in close loop: ≤ 0.6 nm iii. XY scanner resolution: 0.04 nm or better
	7.	Minimal specifications of Z scanner Z Scan range: ≥ 12 µm Noise: ≤ 0.03 nm XY scanner resolution: 0.06 nm or better All noise measurements are quoted as the average deviation measured up to 1kHz bandwidth in Closed Loop
	8.	The above specifications must be demonstrated in the laboratory after installation.
	9.	The Z scanner must have high feedback speed with resonant frequency 5 kHz or better.
	10.	The AFM system must allow software control and automated cantilever approach using the motorized Z stage.
Note 1: Scanner noise specifications and representative high resolution imaging examples must be available for inspection in publicly available brochures, datasheets or websites.		
Note 2: All noise measurements are quoted as the average deviation measured up to 1kHz bandwidth in Closed Loop		

B.	**Sample stage and size**	
	1.	Must accommodate sample size up to 50 mm having thickness up to 20 mm
	2.	System should have Manual/Motorized XY stage with at least 25 mm × 25 mm moveable range in step of 1 µm for both the X & Y travel
	3.	The travel range of Z stage should be at least 25 mm with 0.1 µm step with motorized software control with automatic engage
C.	**Standard AFM operational modes**	
	The microscope must be capable of the following scanning modes. Each of these signals must be recorded in both trace and retrace scan directions	
	1.	Contact mode
	2.	Tapping mode /AC mode
	3.	Non-contact mode (should specify Z scanner resonance frequency)
	4.	Lateral force mode (LFM).
	5.	Force curve mode
	6.	Force mapping mode (force volume)
	7.	Phase imaging
	8.	Quantitative nanoscale maps (QNM)
	9.	Electric Force Microscopy (EFM) (Lift mode/ dual pass)
	10.	Magnetic Force Microscopy (MFM) (Lift mode/ dual pass) Should also support Variable/High field Magnetic Field Module optionally
D.	**Advanced AFM operational modes**	
	1.	***Conductive AFM (C-AFM):*** o The system allows conductive measurements while scanning as well as at user specified locations (*I-V* curves). o The multiple gain range should be available from (10^6 to 10^12) with at least 7 different gain setups, o A standard sample bias of -10V to 10V is possible. Capable of applying sample bias 100 V or more with an optional HV setup. o Include all necessary hardware as well as software specification for this mode.
	2.	***Kelvin Probe Force Microscopy (KPFM) (Lift mode/ dual pass)*** o Include all necessary hardware as well as software specification for this mode.
E.	**Sample vision and camera**	
	1.	The AFM system must provide on-axis view of sample and cantilever from top
	2.	The AFM vision system must come with an 10X optical objective lens or better to view cantilever and sample clearly and direct view access will not be preferable/acceptable
	3.	The optic & CCD camera system should have resolution of 1 µm or better
	4.	The vision system should provide field of view of 480 µm × 360 µm or better using the objective lens.
	5.	There should be a separate focus stage on the AFM system, synchronized with motorized Z stage
F.	**Laser light source and photodetector**	
	1.	The instrument optical lever arm uses a low coherence light source (a super luminescent diode) to reduce artefacts from optical interference effects.

	2.	The instrument uses an infrared SLD for the optical lever arm to eliminate optical crosstalk with epi- and transmission- fluorescence measurements.
	3.	Using SLD (Super Luminescent Diode) with 830-860 nm wavelength or better, and with coherent length less than 50 µm.
	4.	Laser and photodetector must have option to adjust /control both vertical and lateral position for LFM and phase imaging application.
G.	**Controller and electronics & software requirements**	
	1.	System must uses at least 20 bit electronics (ADC/DAC) in order to generate the XY and Z piezo scan signals.
	2.	The system provides thermal tunes / cantilever oscillation up to 500 kHz or better
	3.	The electronics should have access to major signals on the controller. The controller should have embedded with signal Input & output ports
	4.	The software automatically recognizes the hardware and configures with the software appropriately
	5.	Should be able to acquire 16 channels or better simultaneously.
	6.	The data acquisition system must be capable of recording individual image sizes of minimum 4000 pixels or greater. All the above 16 channels should acquire higher pixels.
	7.	**System computer specifications:** o Latest computer with Windows 10 or higher OS o Dual 23/24" monitors o Preferably Intel Core i5 11th Generation or higher / equivalent processor o 16 GB RAM or higher o Internal storage space of 500 GB SSD or higher capacity o Include NVIDIA Chipset graphic card with 4GB memory or better o Multiple USB drive o Microsoft keyboard and Bluetooth mouse preferable
	8.	**Software for operation, image processing, and data analysis:** o The AFM system should have separate software for data analysis and data acquisition. o Able to perform multi-tasking with windows based data acquisition, or equivalent image processing programs at the same time. o The software must be available free of cost for all users or if software not free then the minimum 10 licenses must be provided for users. o 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 contact/ non-contact mode imaging and EFM, KPFM, PFM, force measurements, etc. o Software must include a feature that automatically optimizes parameter and acquisition of AFM topography without the needs of setup parameters like set-point, gains, and etc. o The feature must not use any predictive algorithm and the software must allow adjust/control of AFM feedback parameter in real time. o The data acquisition software should include modes, such as Auto Modes for new users and Manual Modes for expert user. o The data acquisition software should be user friendly, which enable new operator able to acquire topography images o AFM control software environment must include 3D rendering technology for advanced image display. This feature must allow the user to generate, display and visualize 3D images, as well as off-line processing.

		○ The data acquisition software should allow users to plot any two signal channels on the same real-time dual-axis graph for comprehensive analysis. ○ The data acquisition software must have built-in macros, which can be easily loaded and applied for repeating operations, such as moving the XY or the Z stage to a specific location or resetting the operation. Users can edit existing macros or create new ones as needed.
H.	**Standard Sample and Manuals**	
	1.	AFM calibration kit with necessary standard samples for all the above modes (included electrical modes like EFM, KPFM, CAFM, STM) should be provided. All the above modes (including electrical) must be demonstrated using standard sample.
	2.	The systems must come with demo probe kit and necessary tool kit.
	3.	Hard copy of the manual must be provided for all the above operational modes.
I.	**Instrument vibration isolation**	
	1.	The system includes a thermally- and acoustically isolating enclosure
	2.	The system must include a vibration isolation table suitable for the system performance and specifications. Not preferred integrated table or enclosure, must supply separate vibration table.
J.	**Additional upgrade/Optional features which must be offered separately.**	
	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 in future. *The quoted model should have future up-gradation possibilities without changing the scanner/controller/head largely.* If any controller/head needed for these optional items, the price should be included in the above offer as a standard.	
	1.	A temperature control stage for variable temperature studies from – 25 °C to 150 °C or more should be provided optionally. This should be compatible with the system and have the capability to control using any standard temperature controller available.
	2.	Scanning tunneling microscopy (STM)
	3.	Piezo response Force Microscopy (PFM)
	4.	Switching Spectroscopy PFM ○ Capable of domain writing by either using tip or sample DC bias. ○ Capable of measuring local polarization hysteresis.
	5.	Electrochemical Cell for Electrochemical AFM measurements (ECAFM)
	6.	Scanning capacitance microscopy (SCM)
	7.	Scanning spreading resistance microscopy (SSRM)
K.	**Power requirement**	
		Offer system compatible with standard power ratings and power sockets.
L.	**Spares to run the system at the time of installation**	
		Provide all necessary spares required during installation and demonstration.
M.	**Shipping Terms**	
		CIF up to Trivandrum

N.	Other terms and conditions	
	1.	***Compliance statement***
		Provide compliance statement in details for all specifications. The supplier must submit technical brochures and proper application notes adequately explaining and confirming the availability of the features in the model of the equipment being quoted.
	2.	***Installation and Operation Prerequisites***
		Vendor should submit all requirements to install the system for our regular operation with scaled schematics and list of items needed with the technical bids.
	3.	Installation and Training
		Vendor should provide training on operation and application at IISER TVM, Vithura after installation for at least 2 - 3 days
	4.	***User list with contacts***
		Vendor should provide us detail list of installations in India with all contact details. At least one installation in reputed Govt. organizations in India is must. End user certificate to be provided.
	5.	***Spares***
		The vender should provide the list of accessories required for smooth running of the system and should quote all the necessary accessories. The supplier of the instrument must confirm in writing that the spares for the entire system will be available for a period of at least ten years after the installation of the instrument.
	6.	***Demonstration and standards***
		Specifications quoted should be demonstrable on site at the time of installation.
	7.	***Manual (Soft and Hard Copy)***
		One set of operating manual and service manual including detailed drawings and circuit diagrams (in English) should be provided with the instrument.
	8.	***Warranty***
		Standard warranty of 01 year is preferable for all the major parts. And additional comprehensive warranty as optional offer.
	9.	***AMC***
		Year wise AMC cost after the expiry of warranty up to 5 years can be provided as optional offer.