॥ सा विद्या या विमुक्तये ॥

भारतीय प्रौद्योगिकी संस्थान धारवाड

Indian Institute of Technology Dharwad

EXPRESSION OF INTREST

No. IITDh/GA/CRF/2018-2019/02

EXPRESSION OF INTEREST (EoI) FOR PROCUREMENT

of

HIGH RESOLUTION ATOMIC FORCE MICROSCOPE (AFM)/SCANNING PROBE MICROSCOPE AS PER ANNEXURE-I

1. **Introduction**

IIT Dharwad is an Institute of National Importance created by an Act of Parliament in 2016. IIT Dharwad has been steadily establishing its operations in its transit campus. Simultaneously, the institute is employing bright young and accomplished faculty. A number of unique research and development programs are on the anvil. The institute now needs to raise the levels of the capacity with the best of the facilities and infrastructure. This will provide highly talented and accomplished faculty to pursue not only their research but also think of innovative way of introducing instructional/teaching/learning solutions to practical problem of the students.

2. **Objective**

The objective of this invitation of Expression of Interest (EoI) is to seek responses from eligible Vendors for SUPPLY, INSTALLATION, COMMISSIONING, DEMONSTRATION and TRAINING OF **High Resolution Atomic Force Microscope (AFM)/Scanning Probe Microscope as per Annexure-I**

3. Timelines

3.1 Major activities in the procurement process will be as given below: -

Sl No	Activity	Remarks
(a)	Pre-Bid Meeting	• To clarify the issues/ queries raised by intrested firms facilitate submission of bids.
(b)	Deadline for submission of EoI	• Till 10.00 Hrs on 03/10/2018
(c)	Issue of Tender Document	• Only to the vendors who submit the response to the EoI. Link for downloading the tender document to such vendors will be sent via e-mail on 04/10/2018
(c)	Submission of Tender Documents	• Deadline for bid submission 17/10/2018, 16.30 hrs based on updated specifications and tender document
(d)	Evaluation of Technical Bids	About 3 weeks (Tentative)
(e)	Opening of Commercial Bids	• The shortlisted bidders will be intimated by e-mail the schedule of opening of the commercial bids
(f)	Award of Contract	• The selected vendor will be awarded the contract.

4. MATERIAL DESCRIPTION

High Resolution Atomic Force Microscope (AFM)/Scanning Probe Microscope as per specifications described below in Annexure-I

4.1 Annexure-I

The single Scanning Probe Microscopy (SPM) system must be capable to address all major applications required for the analysis of samples in the field of Materials Science, Semiconductor Technology, Ceramic and Polymers. The SPM/AFM must be the state of art machine with the capacity of analyzing conducting and non-conducting nanomaterials.

The system should consist of	The SPM/AFM scan engagement mechanism must be automated, vertical, and fully software controlled.
	The SPM/AFM must have a tip-scanning configuration,
	The system must have a minimum amount of cables from the scanning Probe Microscopy (SPM) controller to the SPM/AFM head
	The SPM must include top-view optics, with an unobstructed optical path between optics & AFM cantilever.
	Complete Atomic Force Microscope system must be capable to scan small, medium and large size samples with zero background noise.
	System must include a general purpose imaging mode with all of the following features: 1. Automatic optimization of critical imaging parameters including setpoint, gains, scan rate and Z limit 2) The SPM/AFM system does not manually require that the cantilever resonance to be "tuned" 3) Mode automatically compensates for drift of the deflection signal
	Must come with motorised and independent x, y, and z stage with automated tip approach, focus and stage control Sample up to 50 mm x 50 mm and 20 mm thickness should be accommodated (XYZ)
	Preferably Integrated Acoustic Enclosure and Active Vibration Isolation system needs to be quoted and shipped along with the system
	Supply of a complete 3D Scanning System with accessories for high resolution imaging

Modes of Operation	The system must include the following scanning modes: 1. AFM Contact Mode 2. AFM True Non-Contact Mode 3. AFM Tapping Mode 4. Lateral Force Microscopy 5. Phase Imaging 6. Force Modulation Microscopy 7. Scanning tunneling Microscopy 8. Magnetic force microscopy 9. Force Distance (F-D) Spectroscopy with mechanical properties like Adhesion, elasticity, Young's modulus to be offered. 10. Electrical modes such as EFM, KPFM with external high voltage up to 150 V or higher 11. Photo-current mapping 12. Variable Gain Conductive Modes
Scanners	The quoted system should be compatible to use one or more Scanner to cover from large area to smallest possible areas with the best possible resolution as given below. The AFM system scanner design must be capable to eliminates artifacts in the images by keeping the relative position of the laser spot fixed in relation to the cantilever throughout the scan cycle. (Technical justification / explanation to be provided).
	The XY scanner and Z scanner should have both open loop and closed-loop feedback system.
	The scanner must have a XY axes scanning range ≥50 µm, and Z axes scanning range ≥10 µm.
	The X, Y, Z scanner design should be flexure hinge type, the movement of X-Y-Z scanner should be completely separated from each axis and independent from other axis movement. The XY scanner must have resolution of 0.1 nm or better The Z scanner must have scan resolution of 0.02 nm or better.
	The SPM system must ensure a constant tip-sample distance is maintained in non-contact mode without damaging the tip or sample.
	The Z scanner must have high feedback speed with resonant frequency 9 kHz or better.
	Motorized stage (XY) programmable for multi-site measurements Integrated stage control for fast sample navigation.
	The scanner should be with Piezo sensors in all X, Y, and Z. The quoted scanner must support all imaging modes as required.

AFM Tips/Probes/Cantilevers	Suitable Cantilevers should be offered for all the modes quoted. (Detailed technical specifications of all the tips/probes are to be provided
	Probe tip exchange must be very convenience without requiring special tools or head removal.
	The AFM system should allow user to mount cantilever purchased from 3rd party
Calibration	AFM calibration kit with necessary standard calibration samples (HOPG, Mica……) and other tools must be provided
System Optics	AFM scanning cantilever/probe optical surface should be viewable on axis in real time via Direct Optical Video Access by CCD.
	The Field-Of-View (FOV) must be software controlled zoom and cover the range from 1465 μm down to 180 μm or better.
	The resolution of the optics must be 1 μm or better.
	The AFM must include top-view optics with motorized focus & digital zoom.
	The optics must have software-controlled white LED illumination.
	The optics must include a 5-Megapixel or higher camera, and software to display and store the optical image from within the AFM software.
System controller	The system must provide the capability to calibrate the cantilever spring constant by thermal tuning of the cantilever.
	It must be produce data sets with minimum 5,000 x 5,000 pixel (or better) density for all channels. Enables simultaneously acquisition of 16 or more images.
	The system must allow for up to 8 simultaneous channels in real time scanning.
	It must be support use of micro actuated cantilevers for fast scanning.
	It must be provide fully software-controlled, digital Q-control of the cantilever's.
	It must be allow customizable input/output signal paths through a signal access module integrated inside the controller with BNC connector whose function is software-selectable.
	Must provide at least 3 user accessible lock-in amplifiers
	The electronic signal inputs should be at least 18 channels of 24 bit ADC. The electronic signal output should be at least 12 channels of 20 bit DAC.
	It must be provide real time adjustment to all scanning parameters – scan rate, scan size, scan offset, gains and others.
	It must be include an intuitive, easy-to-follow graphic user interface for beginners, which automatically adjusts the scanning parameters (including gains, scan speed, set

	point,..) without user interaction.
	The AFM controller should have built in signal access port, i.e. Pixel, line, Frame, NCM mode, AC mode etc.
Light source /Detector	Appropriate laser light source, Detailed Instruction Manuals must be supplied with the instruments Four Quadrant (or better) position sensitive photo detector
Data acquisition and image processing software	The AFM system should have software for multiple data acquisition and display. Able to perform multi-tasking with Microsoft windows based data acquisition or equivalent, optical view and for imaging processing, analysis and presentation for all modes in SPM/ AFM should be provided Should facilitate seamless data transfer to the analysis software
Image analysis software and features	a). Cross section analysis b). Roughness measurement c). Grain size analysis d). Depth analysis e). Power spectral analysis f). Histogram analysis g). Fractal analysis h). Fourier analysis i). Image mixing j). Auto-correlation k).Enhanced image filtering tools
Image modification and presentation software & features	a). Force-distance curve analysis b).2D Fast Fourier analysis c). Plane-fit d). High pass and low pass filters e). Zoom in/out f). Optional grid on images and curves g). Variable shading and display angle, tilt h). Color bar completely user definable 2D and 3D height presentation

	i). Menu for image series presentation
Image and data export format at least	a) Export to BMP, JPG, TIFF b) Export to ASCII format and MatLab c) Must include automated system configuration for operation in liquids to operate these modes by one mouse click d) Must include automated system configurations for advanced modes like SKM, MFM etc e) Software must be a sole package for all modes and attachments with no need for additional software programs. f) Software package must include both image acquisition and data processing software in one package with no need for different programs operation. g) Software must be free-for copy, e.g., can be installed on unlimited number of off-line PC
Computer with Monitor	The system must have SPM /AFM compatible latest version high performance computer with Intel i7 processor or better and Windows based operating system, LED 24" or higher monitor, sufficient number of USB port, 8GB RAM, DVD RW, Mouse, Keyboard, etc. Appropriate cables and power cables to be provided.
Others	Please specify any other technical details (if any) which has not been covered above but is/are part of the system
Power supply and back up	The instrument and computer should be compatible with the power supply specification in India, 220V, 50/60 Hz, (Operating range 210-240 V) Suitable UPS providing 1 hour or more backup with PANASONIC Batteries should be included
Installation and training	The system must be installed, and demonstrated by factory trained service engineers at our site free of charge; Comprehensive on-site training required to our satisfaction
Warranty and Support	a. Three years' comprehensive warranty (not including the down time) must be included along with the bid/offer separately. b. Warranty should start from date of installation. c. Service response time, turn-around time & up-time of the equipment should be

	clearly specified. d. Service response time must be 48 hours. e. The AFM must have provision for on-line diagnosis of faults. f. Must provide one-time free shifting and re-installation of the system from the transit campus to the permanent campus of IIT Dharwad
Required Documents along with technical specifications	For the equipment quoted, the supplier must provide: a. List of at least 3 users in India, with (exactly) similar systems installed preferably in last 5 years. b. The name(s) of the service engineer(s) employed by them who is/are competent to service the equipment being quoted with their locations in India. c. The supplier should provide calibration/traceability certificate of the equipment as per National institute of Standards & Technology (NIST)/National Physical Laboratory (NPL) UK / United Kingdom Accreditation System (UKAS) preferably d. Detailed user instruction manual, operation/instruction manual, troubleshooting manual, CDROM tutorials for AFM e. Detailed circuit and fault diagnostic software, detailed circuit diagram of the equipment (AFM), maintenance and service manuals

DETAILS OF PRE-BID MEETING

To clarify the issues/queries raised by intrested firms and to facilitate in submission of bids, the pre-bid meeting would be held as follows:

Place	Time	Date
Board Room, Admin Building, IIT Dharwad	11.00 am	04/10/2018

PROCEDURE FOR SUBMISSION OF RESPONSE TO THE EoI

The response to the EoI should reach IIT Dharwad on or before 03/10/2018 by 10.00 hrs on the following address:

The Officer on Special Duty
(Admin, Finance & Contracts)
P.B. Road, Near High Court, Dharwad-580011

Or can be forwarded by e-mail at pro@iitdh.ac.in on or before 03/10/2018 by 10.00 hrs.

For any queries, you may reach us at 0836-2212839

Please acknowledge the receipt of this invitation for EoI

Sd/-
Officer on Special Duty
(Admin, Finance & Contracts)
IIT Dharwad