Tender Notification for the procurement of a **"Dual beam (FIB - FE SEM) system"** at IISc *(Last Date for submission of tenders: 31st March 2016)*

Dear Sir/Madam,

Kindly send your best quotation for the following item on C.I.P. Bangalore basis. Your quotation should clearly indicate the terms of delivery, delivery schedule, E.D., payment terms etc. The tender should be submitted in two separate sealed envelopes - one containing the technical bid and the other containing the commercial bid, both of which should reach us, duly signed on or before 1700 hours 31st March 2016.

Please enclose a compliance certificate along with the technical bid.

Specifications of the product:

Item: A dual beam system comprising of FIB-FE SEM (Focused ion beam + Field Emission Scanning microscope) capable of performing 3 dimensional orientation imaging microscopy and TEM lamellae preparation. The detailed technical specification of the equipment should be as follows:

Technical Specifications

Item	Requirement	Indicate compliance	Provide information	Provide	Post-installation acceptance criterian
Electron Column					
Electron beam source	Schottky field emitter	X			
Electron beam Voltage range	350V or less - 30kV or more	X	Step size		
Electron beam Current range	1 pA or less to 100nA or more	X	Continuous/ stepped Step size		
Electron beam Landing voltage	20 V or less to 30 kV or more	X	Methodology for deceleration		
Magnification	I Million X or more	X			
Resolution	At dual beam coincidence point At accelerating voltage of 30/20 keV 15 keV 1keV At minimum landing voltage and dual beam coincidence point Accelerating voltage of 30/20 keV 15 keV 1keV Best achievable resolution At accelerating voltage of 30/20 keV 15 keV 1keV better than 1nm at all keV	X	Provide information about (i) tiff images (ii) State sample used Provide information State working distance and all operational parameters, such as aperture size etc, probe current, probe size state for immersion lens if and non immersion lens if applicable state detector configuration		Post installation acceptance with comparable images
Electron Beam probe size			Probe size vs probe current Continuous or stepped Step size		
Electron beam current stability			Provide information		
Magnetic samples	Strategies for magnetic field free imaging		Describe for information		
Apertures, aperture sizes and insertion and retraction methods			Provide information		

Image acquisition system:	Image acquisition size Bit depth Electronic Image shift Dynamic focus for stage tilt		Provide information		
Scan features	Point and line scan Focus window Image rotation, shift tilt compensation Scan speed	X	Provide description Range , stepped or continuous		
Field of View	Maximum without distortion		State operation parameters		
ION COLUMN					
Ion source	Ga liquid metal ion source Source life 1000 µ amp hour and above	X			
Ion beam voltage	500V or less to 30 kV or more	X	Stepped or continuous State step size if applicable		
Ion beam current	1pA or less to 50 nA or more	X	Stepped or continuous State step size if applicable		
Probe size			Provide minimum probe size Provide probe size vs current data		
Ion beam profile	Circularity is important Significant deviation from circularity will be cause for disqualification	X		Provide tiff images at combinations of high and low probe currents and sizes on a standard Si sample	Demonstrate similarity after installation
Ion beam milling rate	for Si $\geq 0.25\ \mu m^3/nC$	X	State operational parameters		
SEM-FIB angle			For information		
Magnification			For information		
Working distance at dual beam coincidence point			For information		
Ion beam apertures			Indicate sizes, movement and centering methodology		
Serial sectioning	Fully automated Automated imaging with BSE, EDX,EBSD at each slice No sample movement for acquisition of BSE, SE and EDX signals from dual beam coincident point Minimum slice thickness	X	Describe details in response Indicate rotation and tilt requirements from dual beam coincident point from EBSD Provide information		

Spatial resolution	At dual beam coincident point At accelerating voltages of 30kV 3 nm or less		Indicate all operating conditions such as current, probe size, working distance, standard sample	Provide tiff images on standard samples	Demonstrate conformance on site after installation
Ion beam image acquisition size and performance	Image size and bit depth: Image shift:		Provide information		
Beam control	rotating the ion beam raster in a 360 degree continuous fashion, and shall have a function to reset this rotation to 0 degrees. capable of reduced-raster, spot-mode, and line-scan ion- imaging modes	X			
IMAGING DETECTORS FOR ELECTRON AND ION BEAM COMUMNS					
In column/lens detectors SE and BSE		X			
4 quadrant BSE detector		X			
Ion detector					
In chamber IR camera		X			
Probe current measurement		X			
STEM SYSTEM					
STEM Detector Capability	bright field and dark field STEM imaging with a retractable STEM detector. Selectable angular range for dark field imaging	X X			
resolution	At accelerating voltage of 30keV 1nm or better at 30kV	X	Indicate all operating parameters And standard sample	Provide TIFF images with standard sample	Demonstrate after installation
TEM AND ATOM PROBE SAMPLE PREPARATION					
Requirements	In situ micromanipulator for transmission electron microscopy (TEM) and atom probe tip samples under computer control without operator intervention. Pneumatic insertion and retraction	X			Demonstrate after installation
Probe performance	In situ manipulator with 4 degrees of freedom	X			Demonstrate after installation
	Drift, vibration, repeatability		Provide information		Demonstrate after installation

ENERGY DISPERSIVE XRAY ANALYSIS					
Requirement	Operation at dual beam coincident point without sample tilt Motorized insertion and retraction	X			
System	silicon drift detector (SDD), pulse processor, and system computer	X			
	Active area better than 30 mm ^{2}	X			
	Energy resolution at Mn K alpha Better than 134 eV	X			Demonstarteafter installation
	Detection down to Boron	X			
	Passive cooling	X			
Supporting Software and Computer	System computer with a supported Windows operating system, adequate storage hard drive, sufficient internal memory, LCD monitor, Microsoft Office and all necessary vendor software for operation, acquisition of data and data analysis	X			
Standards			To be provided		
EBSD SYSTEM					
Requirement	acquiring diffraction patterns at a rate of over 100 patterns per second and auto indexing of the patterns to generate crystallographic mapping information, collecting data at low accelerating voltages (3 kV). The EBSD System shall be capable of functioning at the dual-beam working distance of the system.	X			
Detector position	EBSD detector positions away from the line of sight of ion streaming during serial ion sectioning				
Camera	Camera should be capable of collecting data at least up to 1000 indexed points per second; 1200-1500 frames per second. CCD resolution better than: 1000X1000 pixels Pixel binning: 1x1, 2x2, 4x4, 8x8, 16x16 Angular accuracy of at least 0.05deg. Fluorescent screen: Rectangular, matching the aspect ratio of the CCD Spatial resolution during Orientation imaging: at least 10 nm.	X			Demonstrate after installation

	Orientation precision less than 0.1 degrees Insertion and retraction of the camera should be motorised and controlled via the EBSD software The camera movement should have audible safety alarm with auto retract mechanism. The camera interface to SEM should have sliding and tilting interface plate to correctly position the camera at the shortest possible EBSD EDS for optimal resolution. Desirable:Fore-scatter detector: 6 independent diodes to be integrated around the EBSD detector, with built-in electrical feed through IR filter for protecting the camera during in-situ heating experiments.				
Transmission EBSD holder			To be provided		
Standards	EBSD (Recrystallised Ni alloy)		To be provided		
GAS INJECTION SYSTEM					
Requirements	A gas injection system with more than two injection modules enabling beam induced Pt and Au deposition	X			
Stage	A stage with motorized axes with adequate degrees of freedom required for the accurate positioning of the needle in the working area. Automated nozzle positioning and angle Injection line must allow precise control over gas flow, and heating of individual lines The stage must be capable of depositing finely spaced nanosized deposits in arrays at spacings of at least ¼ micron.	X	Provide detailed description		Demonstrate after installation
Precursors	Standard reservoir for Pt and Au	X			

SAMPLE STAGE AND HOLDER REQUIREMENTS					
Main chamber size			Provide information		
Maximum sample size	Taking into account use of electron and ion column (at coincident point) and all necessary tilt angles for EBSD/EDX/Ion milling and other detector restrictions		Provide information		
Stage performance	Piezo driven stage movement compucentric rotation where stage rotation is accompanied by X and Y translation to maintain the same sample field of view during stage rotation.	X	Provide information on sample movement and rotation limits		
Holders	**Standard holders** Specialized holders with precise pretilt angles suitable for FIB serial sectioning, and imaging with BDSE/SE and EDS signal collection without sample movement are required. Sample holders for with precise pre-tilt suitable for EBSD are required The vendor will describe stage movements required for serial ion sectioning and EBSD of the milled section surface. The vendor will indicate the accuracy of and precision of such stage moments to enable precise return without backlash to original positions The vendor will indicate whether tilt from positions normal to electron beam to tilt angles suitable for EBSD can be automated without changing sample position. **Holders for STEM imaging** The vendor will indicate maximum sample dimension, shape and weights for each such holder	X	Provide information on maximum /minimum sample dimensions, shape restrictions and weight restrictions for each holder		
INTEGRATED PLASMA CLEANER AND CRYO-CLEANER FOR CLEANING THE SAMPLE SURFACE AND CHAMBER WALLS		X			

VACUUM SYSTEM					
System description			Provide complete description of system in response		
System requirements	oil free system electron gun, accelerator region and any differential pumping chambers shall be continuously evacuated by ion pumps column components and chambers below the electron gun and ion gun will be evacuated turbomolecular pumps or equivalent oil-free system. mechanical pumps used to achieve rough vacuum levels will prevent back-streaming of oil into the vacuum system	X			
	Chamber vacuum		Provide information		
	Gun Vacuum		Provide information		
	FIB gun vacuum		Provide information		
	Pumping rate of main chamber		Provide information		
Sample loading and unloading	Load lock for specimen exchange				
SUPPORTING SOFTWARES					
EDS Software Capability	Capabilities of point analysis, area analysis, elemental mapping, line scanning etc., Quantification of spectra into weight and atomic percentage of the elements indexed. User interactive qualitative and standard less/ standards based quantification with K, L, M, N line database. Quantification based on eZAF and PeBaZAF. Quantification algorithm for uneven surfaces and under tilted conditions Quantification algorithm for carbon coated samples. Automatic and manual determination of background correction for element identification and quantification.	X			

	Grey scale map of total EDS counts 3D EBSD map generation software.				
EBSD Software Capability	EBSD software should work on the same computer platform as that of EDS system	X			
	configurable for Transmission Kikuchi pattern acquisition, indexing and all post processing studies.	X			
	allow data acquisition from large areas using beam and /stage control to maintain focus over each mapped field to reconstruct large area Maps.	X			
	capable of reconstructing large area images	X			
	drift correction option	X			
	EDS and EBSD data collection should be possible for analysis of phases with same crystal structures.	X			
	binning, background correction, gain etc. should be adjustable both automatically and manually	X			
	Pole Figure plotting, Inverse pole figure plotting, inverse pole figure image mapping, orientation distribution function plotting, image quality mapping, grain mapping, various misorientation plotting, Imaging and Beam Control, Stage Control, phase Identification through integration with ICDD data base etc	X			
	One additional analysis software license should be provided	X			
3d Image Reconstruction	automatic acquisition by slice-and-view	X			
	3D reconstruction of EDS acquired chemical maps, ABSD orientation maps secondary electron and back scatter electron images	X			
	3 D EBSD acquisition and analysis automation software using slice-and-view technique software should be integrated with the Dual-beam FESEM.	X			
	3D reconstruction software, must also be provided with at least 2 licenses (one with the system and one stand alone).	X			
Ion Beam support Data	Files containing Ga beam etch rates for most standard metals and alloys (viz., Fe, Ti, Ni, Cr, Si, Al, Steel, SiN, SiC etc.) must be present in the system	X			

Software supporting Stage holder movements for automated functions		X			
Software supporting detector configurations that enhance analysis of SE, BSE and Ion Images		X			
free s/w upgrades for 10 years after equipment installation and acceptance		X			
functional details of each software package			Provide information		
AUXILIARY EQUIPMENT					
UPS requirements for stable, power shut-down free equipment operation will be provided in supplier response. IISc will procure such auxiliary equipment to specifications provided by the supplier		X			
The supplier will provide any auxiliary cooling required for equipment cooling such as water chillers and cost such equipment in its response		X			
SITE PREPARATION REQUIREMENTS					
The chosen supplier shall indicate all site requirements including those for stable equipment operation within one week of order placement		X			

The chosen supplier shall construct an initial site survey immediately after order placement and provide written preliminary assessment site suitability. The supplier will provide a written declaration of site suitability in all aspects before equipment installation of equipment		X			
It is the responsibility of IISc to ensure that the site is meets with all specifications of the supplier in time for equipment installation					
SPARES'					
Spare FEG source		X			
Long-life Ga source		X			
Spare stubs – 100 nos		X			
70 deg pre-tilt holders (4 nos.)		X			
Load lock with suitable holders (2 sets minimum) should be provided.		X			
STEM holder kit		X			
Supplier will, indicate any additional spares required for one year trouble free operation		X			

Terms and conditions

1. Two bid system (separate technical and financial bids) in sealed tenders
2. Technical bid and price bids to be sent within three weeks of receipt of tender.
3. The technical bid must follow the prescribed format given below. It should include the exact format of quotation in the price bid without including the prices. Vendors who include price information in the technical bids will be automatically disqualified.
4. Technical bids will be opened first. IISc may seek clarifications after opening of technical bids. Vendors may be required to give presentations. The technical specifications are provided as a table. The items for which conformance to specifications is required are indicated by a X in the second column. There are several items that require information to be provided by the supplier. If information is not provided against any of these items, this will disqualify the supplier. After technical evaluation by a committee, vendors may be asked to re-quote in a specific format to facilitate comparison of prices. IISc also reserves the right to cancel the tender at any time without assigning any reason whatsoever.
5. Price bids of only technically qualified vendors will be considered and the vendors will be informed the day of opening the price bids.
6. The price bids must offer CIF Bangalore prices.
7. Prices to be quoted separately for baseline system and options. Prices will should be quoted in adequate detail with relation to packing details to cover insurance compensation in case of damage to any specific modules
8. Indicate separately price of spares listed above in terms of unit cost. The price of these spares will be included in the price comparison. Any additional spares recommended by the company will be considered for ordering but not included in the comparison. The buyer reserves the right to make the final decision on ordered spares
9. Indicate price for annual maintenance contract.
10. The payment will be by letter of credit: payable 80% on shipping, 20% after satisfactory installation and acceptance.
11. Indicate Delivery period
12. Order will be placed on lowest bid from technically qualified vendor
13. Additional terms and conditions are indicated below:

Training		**Essential** Supplier shall provide comprehensive training on site on all details of use of instrument and associated software immediately following satisfactory installation. The costs shall be included in the cost of the basic equipment
Warranty period		**Essential** 1. The Contractor shall provide, at a minimum, a 1 year warranty for the equipment. Warranty shall include all parts and labor. Warranty shall be on-site or return to Contractor as deemed necessary by the Contractor. If on-site, all travel costs shall be included in the warranty. If returned to Contractor, all shipping charges and all responsibility for the shipments to and from IISc shall be the responsibility of the contractor. The cost of the first year warranty shall be included in the cost of the basic equipment. 2. Warranty shall begin on the instrument and its components when

		all specifications are met and IISc accepts the instrument. Any components delivered and installed at a later date will have a 3 -year warranty period beginning upon acceptance of the individual component. In addition, the warranty shall include, at no additional cost, two routine service visits during the warranty period to clean and make routine adjustments. The Contractor shall be responsible for warranty of the entire system, including ALL third party components. **Optional** 3. For 2nd and 3rd year of warranty, vendor will quote the prices for service and parts separately, as separate line items in the price bid.
Annual Maintenance Contract	Period of 2 years following expiry of warrantee period	**Essential,** indicate terms and conditions. Vendor will quote the prices for service and parts separately, as separate line items in the price bid.
Equipment supplied in India	At least one equipment of a similar nature, that is, with an identical electron beam column and ion beam column, and detector configurations, capable of performing all the functions listed in the specifications, should have been supplied, installed and currently operational in India.	**Essential** Indicate the institution and contact details for all equipment of same type supplied in India.
Service	Trained service agent in India. Response time during warrantee period less than 48 hours of problem reporting	**Essential** Indicate number and location of trained service agents in India.

Please stick to the following format while responding to the tender:

Item	Price	Remarks
Dual Beam Baseline system Including • Ion column • Electron Beam Column • Standard detectors (ET, SE and BSE), • Retractable 4 quadrant BSE • In chamber IR camera • Standard Sample Holders (mention all standard detectors and sample holders) • gas injection system • Cooling system • Load lock • All necessary supporting hardware and software including computers (provide software list) , licenses and upgrades • 3d reconstruction software for imaging and EBSD software, licenses and upgrades • All necessary standards for all calibration Inclusive of: • on-site training for baseline and optional systems • 1 year warranty with service and parts • all documentation		Will be included in price comparison

STEM System, detector and holders		Will be included in price comparison
EBSD-EDAX system including detectors, standards and associated software		Will be included in price comparison
In-situ micromanipulator for TEM/Atom Probe sample preparation		Will be included in price comparison
Optional detectors • Ion • Probe current measurement		Will be included in price comparison
Specialty holders • EBSD • Transmission EBSD holder, • Dual Beam compatible for 3d EBSD		Will be included in price comparison
Integrated plasma cleaner		Will be included in price comparison
Cryo-cooler		Will be included in price comparison
Spares • Indicated • optional		Will be included in price comparison
Additional Load lock set up		Will not be included in price comparison
TOTAL CIF Bangalore		
Extended warrantee: 2 additional years • with service and parts • with service		Will not be included in price comparison
Post Warranty Annual Maintenance Contract • With service • With parts and service		Will not be included in price comparison

Please send the quotation to the following address:

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