

**TECHNICAL SPECIFICATION FOR HIGH-RESOLUTION ELECTRON  
MICROSCOPE FOR CHANNELLING CONTRAST IMAGING AND IN-SITU  
EXPERIMENTATION**

### Bidder Eligibility Criteria-I

Sl. No	Bidder Eligibility Criteria-I	Complied / Not Complied	Reference Page No.	Remarks, If any
1	The bidder/OEM should have supplied at least 5 similar items to IITs, NITs, IISERs, CSIR Labs or other Govt. R&D organizations in the last 5 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.			
2	Bidding firm should have authorized distributor and dedicated service personnel located in Chennai region. Details of Service Personnel to be submitted.			

### Technical Specifications II

The detailed specification for the CORRELATIVE HIGH-RESOLUTION ELECTRON MICROSCOPE FOR CHANNELLING CONTRAST IMAGING with the capability to carry out IN-SITU DEFORMATION EXPERIMENTS at VARIABLE ENVIRONMENTS are mentioned below.

S. No.	Technical Specifications	Complied / Not Complied	Reference, Page. No.
1	<b>Electron source and optics</b>		
	<ul style="list-style-type: none"> <li>• High stability Schottky field emission gun providing stable, high-resolution beam currents, required for the operation of SEM under high vacuum mode.</li> <li>• Adjustable Probe current (Automated aperture control): Minimum: <math>\leq 10</math> pA. Maximum: <math>\geq 300</math> nA.</li> <li>• Probe current range should be sufficient to operate all analytical techniques, such as EDS, WDS, EBSD, In-situ experiments etc.</li> <li>• Voltage range: Minimum: <math>\leq 200</math> eV. Maximum: <math>\geq 30</math> keV.</li> <li>• The lower kV range may be obtained with or without beam deceleration as appropriate.</li> <li>• Change in voltage should be continuous using appropriate software control resulting in high beam stability.</li> <li>• The system should have an appropriate lens configuration (solitary or combination of electrostatic &amp; electromagnetic) for high-resolution imaging of beam sensitive materials at a short working distance (<math>&lt; 5</math> mm).</li> <li>• Easy gun installation and maintenance procedures like auto focus, auto brightness, auto contrast.</li> <li>• Automated or semi-automated electron gun and column alignment.</li> </ul>		
2	<b>Imaging requirements</b>		
	<ul style="list-style-type: none"> <li>• Resolution in High Vacuum mode: <math>\leq 0.7</math> nm at 15 kV, <math>\leq 0.8</math> nm at 1 kV.</li> <li>• Magnification: Lower mag: <math>\leq 100</math> x ; Higher Mag: <math>\geq 2,000,000</math> x</li> <li>• The best achievable resolution at the above indicated voltages to be quoted which can be with or without beam deceleration technology or other methods as appropriate.</li> </ul>		
3	<b>Cameras and Detectors</b>		
	<ul style="list-style-type: none"> <li>• High resolution Everhart-Thornley SE Detector</li> </ul>		

	<ul style="list-style-type: none"> <li>• All applicable in-lens detectors (SE and BSE) for high-resolution imaging at high vacuum/low kV range (5-8 kV).</li> <li>• Possibility for simultaneously acquisition of In-lens SE &amp; BSE images.</li> <li>• CCD camera for live in-chamber viewing and appropriate navigation systems or cameras to be indicated.</li> <li>• Retractable, dedicated Annular AND/OR multi-quadrant BSE detector(s) capable for Electron Channelling Contrast Imaging (ECCI) (which may require large tilt angles at channelling conditions) to be included.</li> </ul>		
<b>4</b>	<b>Sample Stage</b>		
	<ul style="list-style-type: none"> <li>• The stage should be Compucentric, 5-axis Motorised stage (x, y, z, tilt and rotation): X axis: <math>\geq 110</math> mm Y axis: <math>\geq 110</math> mm Z (height): <math>\geq 50</math> mm Rotation <math>360^{\circ}</math> (Continuous rotation) Stage tilt = <math>\leq -4^{\circ}</math> to <math>\geq +70^{\circ}</math> The stage should be capable to take a load of approx. 3 kg or more to accommodate In-situ deformation platform (more details given in section 9).</li> <li>• Specimen exchange should be possible without breaking vacuum of the gun chamber. Sample exchange time should be less than 5 min.</li> <li>• Large chamber with at least 12 accessory ports in which there should be 2 dedicated ports for mounting 2 EBSD detectors simultaneously.</li> <li>• Separate Port for STEM and EDS detectors to be provided.</li> </ul>		
<b>5</b>	<b>Vacuum System</b>		
	<ul style="list-style-type: none"> <li>• Vacuum system should be completely automated, consisting of Ion getter pump, Turbo molecular pump, Oil-free pumping system and pneumatic valves.</li> <li>• The system should have integrated plasma cleaner for cleaning the chamber and sample.</li> <li>• Appropriate FEG source isolation mechanism incase of vacuum break down.</li> </ul>		
<b>6</b>	<b>Scanning and Display</b>		

	<ul style="list-style-type: none"> <li>• A high-definition display system (with 24 inch or more) for high-quality imaging in real time under graphical user interface.</li> <li>• Image frame size: High pixel density as applicable.</li> <li>• Frame averaging at least 250 frames.</li> <li>• Dwell time should be <math>\geq 20</math> ns.</li> <li>• Frame/Line/Pixel averaging acquisition Image should be viewed, averaged and integrated.</li> <li>• Drift corrected acquisition.</li> <li>• High end workstation with LCD/LED display operating on windows 10 platform or better for seamless control of microscope operations.</li> <li>• A 500 GB or higher capacity SSD for OS and 4 TB HDD or higher for storage with 16 GB or higher RAM, dedicated graphic card with 8 GB or higher.</li> <li>• Front and back panel USB ports (3.1) - minimum 8 ports, CD/DVD reader &amp; writer.</li> <li>• Storage of SEM images on hard disk in standard TIFF, BMP, JPEG formats in 8-bit or 16-bit depth or better.</li> <li>• Operating conditions need to be stored (and retrieved whenever required).</li> </ul>		
<b>7</b>	<b>Mandatory Accessories</b>		
	<ul style="list-style-type: none"> <li>• All necessary tool kits, spare parts and assembly line must be included for trouble free operation.</li> <li>• System cooling- With (chiller to be provided with the system) or without chiller, suitable air compressor to be provided for retractable detectors.</li> <li>• Standard samples for calibration and alignment must be provided.</li> <li>• Multiple sample holders to be provided which accommodates samples of different geometries and varying sizes in the range of 1 mm to 20 mm or larger.</li> <li>• Joystick and manual user interface for easy operation of microscope</li> </ul>		
<b>8</b>	<b>Pre-Installation requirement</b>		
	<ul style="list-style-type: none"> <li>• Pre-installation advice such as room, floor plan, size, electrical requirements should be sent immediately after the issue of purchase order.</li> <li>• Necessary environmental requirements, i.e. temperature, humidity, vibrations etc. for</li> </ul>		

	uninterrupted operation of microscope should be specified clearly as per feasibility test.		
<b>9</b>	<p><b>Pre-requisites and Mandatory Requirements</b></p> <ul style="list-style-type: none"> <li>• The quoted microscope should be compatible (stage movement, tilting and all possible maneuvers inside microscope) with the in-situ micro mechanical testing platform having dimensions of (w x h x l) 150 x 55 x 220 mm weighing approx. 3 kg and the same has to be demonstrated.</li> <li>• Microscope with all the quoted capabilities especially ECCI imaging on the sample provided by the end-user should be demonstrated (in person or via video conferencing) at mutually convenient time and location for technical compliance, system efficiency and cutting-edge performance verification. A sample for the demonstration would be provided to the concerned representative at least 1 week in advance.</li> <li>• The final decision on technical compliance will be based on live or satisfactory online demonstration of the quoted system.</li> <li>• Dedicated in-house training for 5 personnels for a minimum period of 2 weeks split in to two phases. Phase 1: Basic operations, Phase 2: advanced level training on gun alignment and beam condition optimization for ECCI.</li> </ul>		
	<b>Terms and Conditions</b>		
<b>1</b>	Warranty: Minimum of 1 year and preferably 3 year with the price of subsequent 5-Year comprehensive AMC to be quoted as optional including upgradation of user interface.		
<b>2</b>	The vendor must guarantee that all the spare parts for the offered microscope and attachments will be available for at least the next 10 years.		

(Note: It is mandatory for the bidders to provide the compliance statement in tabular column format along with catalogue page number (comply/not comply) for the Above points with document proof as required. Failing which bidders will be technically disqualified)