

Tender Ref. No: NABI/2(096)/19-20/N-PUR

**Modified Technical Specifications after Pre-Bid Meeting held at NABI**

**Specifications for FE-SEM**

**Amendments/Changes mentioned in Yellow Colour**

**Technical Specification: FE-SEM System along with accessories**

**Quantity: 01 No**

**Technical Specifications for ‘FESEM’ system’**

S No	Features	Specifications
<b>FESEM should be capable to do In situ study of materials in their natural state with Minimize sample preparation and charge-free imaging &amp; analysis of nonconductive and/or hydrated specimens.</b>		
1.	Resolution	<b>0.7 nm @ 15kV (SE) or better</b> <b>1.0 nm @ 1 kV (SE) or better</b>
2.	Electron beam parameters:	<ul style="list-style-type: none"><li>• Beam current range: <b>10 pA to 300 nA or more</b></li><li>• <b>Accelerating voltage range: 20 V – 30 kV</b></li><li>• Magnification: 25x 10,00000x</li><li>• <b>Beam deceleration/Gentle beam mode/ Tandem decal mode / BDT /Beam Booster technology</b></li></ul>
3.	Chamber Size	Large chamber with at least 10 or more accessory port
4.	<b>Anti-contamination Device</b>	<b>Sample / chamber cleaning: Cryo Cleaner, Integrated/ Stand alone separate Plasma Cleaner</b>
5.	Detectors	FESEM should detect up to four signals simultaneously from any combination of the available detectors or detector segments:
6.		<b>Essential Detectors</b> <ul style="list-style-type: none"><li>• ETD – Everhart-Thornley SE detector/ Lower detector/ Chamber mounted SE detector</li><li>• <b>Upper detector/ In-lens SE/BSE detector</b></li><li>• IR camera for viewing sample in chamber</li><li>• DBS – Retractable/ Retractable Back scatter detector / or lens-mounted segmented under-the lens Directional Back Scatter detector</li></ul>

7.	<b>Electron optics</b>	<ul style="list-style-type: none"> <li>• High-resolution field emission SEM column with a high stability Schottky field emission gun to provide stable high-resolution analytical currents <ul style="list-style-type: none"> <li>• Super Hybrid lens / Electrostatic lens + Electromagnetic lens must be present</li> <li>• FESEM must be able to do magnetic samples at lower working distances</li> </ul> </li> </ul> <p>The filament should be covered in the warranty period, as many filaments required in the warranty period has to be supplied free of cost as and when required</p>
8.	<b>Vacuum system</b>	<p>Suitable Fully automated TMP based system backed by Rotary pump</p> <p>Complete oil-free vacuum system</p> <ul style="list-style-type: none"> <li>• 10 to 100 Pa chamber pressure or More</li> </ul>
9.	<b>Goniometer stage</b>	<p>Eucentric goniometer stage</p> <p>5-axes motorized</p> <p>X = 70 mm or more, Y = 50 mm or more</p> <p>Motorized Z = 39mm or more</p> <p>Rotation 360°</p> <p>Tilt -4° to +70°</p> <p>Chamber with airlock specimen exchange required</p> <p>During cross-sectional imaging with stage tilt astigmatism, wobbling, aberration correction etc. should be controllable with proper adjustment of focusing. It is also mandatory while tilting the sample from perpendicular position with respect to beam, the imaging parameters should not get changed for any predefined magnification.</p>
10.	<b>Water chiller</b>	Air / water cooled Chiller of appropriate capacity
11.	<b>Compressor</b>	Suitable low noise (quite) compressor (If required) and its accessories for all pneumatic operations
12.	<b>System Control</b>	64-bit GUI with Windows, keyboard, optical mouse 23-inch or better LCD display with up to 4 simultaneously active images joystick/trackball and manual user interface (knob board)
13.	<b>Energy Dispersive System</b>	<p><b>Liquid Nitrogen free Silicon Drift Detector (SDD)</b></p> <p>Resolution should be Mn-K<math>\alpha</math> should be equal to 129eV or better (lower in magnitude)</p> <p>Detector area should be 30mm<sup>2</sup></p> <p><b>EDS Software Should have following Features</b></p> <p>Quantitative and qualitative analysis</p> <p>Dot mapping</p>

		<p>Elemental line scans  Automatic spectrum acquisition at multiple pre-defined locations  Elemental mapping and save mapped images in different colour  Capability to add, subtract and otherwise  Manipulate elemental images  standard 'samples for quantitative analysis.  Complete workable system Instrument should be a fully workable system</p>
14.	<b>Documentation</b>	<ul style="list-style-type: none"> <li>• Online user guidance</li> <li>• Operating instructions handbook</li> <li>• Online help</li> <li>• (remote diagnostic support)</li> <li>• Warranty and Training</li> <li>• List of users in India, with (nearly) similar systems with similar/equivalent configurations installed preferably in last 3 years</li> </ul> <p>The name(s) of the service engineer(s) with their locations in India</p>
15.	Warranty	<p><b>Two Year</b>  -Additionally, provide AMC charge on per year basis for 05 years after completion of two years warranty.  Additionally, provide CMC charge (including parts &amp; Labour) on per year basis for 05 years after two year warranty. (optional not considered for financial comparison)  Bidder has to provide a new “Schottky Emitter” as and when required by NABI within a period of 03 year from date of installation. It should be free of charge</p>
16.	Installation requirements	<ul style="list-style-type: none"> <li>• Power: Voltage 100 – 240 V AC (-6%, +10%)</li> <li>• Frequency : 50 Hz</li> <li>• Environment:</li> <li>• Temperature (20 ± 3)°C</li> <li>• Relative humidity below 60 ~ 80%</li> </ul> <p>Pre-installation requirements has to be mentioned in the quotation for FESEM, also after getting PO, engineer has to visit and to physical inspection of site with survey tools and advise the site requirements</p>
17.	Pre-Installation Requirements	<p>Pre-installation requirements such as room size, tolerable limits of EM field and vibration (mechanical), required power rating; utility requirements are to be stated clearly, and to be verified/surveyed by the supplier at the installation site.</p>
18.	Training	<p>One week’s days training immediately after installation and similar trainings in next Six months as and when required by NABI</p>

19.	<b>Sputter Coating Unit for FESEM</b>	<p><b>Work chamber</b>  Borosilicate glass 152mm Ø (inside) x 127mm H OR more  Safety shield: Integral polyethylene terephthalate (PET) cylinder</p> <p>Display: 145mm 320 x 240 color graphic TFT (Thin Film Transistor) display User Interface</p> <p>Intuitive full graphical interface with touch screen buttons, includes features such as a log of the last ten coatings carried out</p> <p><b>Sputtering target</b>  Disc style 57mm Ø x 0.3mm thick chromium target is fitted as standard</p> <p><b>Specimen stage</b>  50mm Ø rotating stage. Rotation speed 8-20 rpm  <b>Vacuum:</b> Turbo molecular pump  Internally mounted 70L/s air-cooled turbomolecular pump</p> <p>Rotary pump: Edwards RV3 50L/s two-stage rotary pump, with vacuum hose, coupling kit and oil mist filter</p> <p><b>Vacuum measurement</b>  Pirani gauge fitted as standard. A full range gauge should be available as an option</p> <p><b>Typical ultimate vacuum</b>  <math>5 \times 10^{-5}</math> mbar in a clean system after pre-pumping with dry nitrogen gas  Sputter vacuum range: Between <math>5 \times 10^{-3}</math> and <math>5 \times 10^{-1}</math> mbar</p> <p><b>Processes</b></p> <p><b>Sputtering:</b> 0-150mA to a pre-determined thickness (with optional FTM) or by the built-in timer. The maximum sputtering time is 60 minutes (without “breaking” vacuum and with built in rest periods)</p> <p><b>Carbon evaporation:</b> A robust, ripple free D.C. power supply featuring pulse evaporation ensures reproducible carbon evaporation from rod or fibre sources. Current pulse: 1-90 Amps</p> <p><b>Metal evaporation &amp; aperture cleaning insert (option)</b>  For thermal evaporation of metals from filaments or boats. For cleaning SEM or TEM apertures a standard molybdenum boat should be fitted. The metal evaporation head should be set up for downwards evaporation, but upward evaporation can also be achieved by fitting two terminal extensions Evaporation time: up to four minutes</p>
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20.	<b>Man Power</b>	The vendor should provide a skilled manpower for operating the system, the manpower will work as employee of the Vendor, NABI will not have any legal, financial liability of the operator. Provide the year's wise breakup of the cost in INR. Please note the party should have at least 15 FESEM installations across the country for last 10 years. All the features (resolution, stage size, etc) should be available globally
21.	Future upgradation	The quoting equipment should be upgradable to attach the following Accessories in future (on site only) 1. Software controlled -20° C to +60° C Peltier cold stage 2. Cryo-stage 3. STEM – Retractable Scanning Transmission detector <b>(The above three items need not to be quoted in the BoQ)</b>

**Other requirements:**

- FESEM supplier must guarantee the stability of probe current
- Full screen of Live image should be possible
- Four simultaneous live images should be possible
- Images can be stores in JPG, TIFF, BMP format
- FESEM should have a recipe feature
- FESEM should have a provision of Liquid Nitrogen trap/ anti contamination facility, to prevent contamination
- FESEM should have an airlock specimen exchange
- Charge free scan should be possible in FESEM
- FESEM should have Large depth of focus feature
- FESEM should have energy filter to select pure SE or pure BSE signals as well as signal mixing

The last date for the submission of ebids is extended upto 20<sup>th</sup> Feb' 2020.

**All other Terms and Conditions of the tender remain unchanged**

**Stores and Purchase Officer**