SPECFICATIONS FOR VAIRABLE PRESSURE FIELD EMISSION SCANNING ELECTRON MICROSCOPE (INTEGRATED FESEM+EDX+EBSD)
(1.0nm at 15kV)

S.No.	Description	Requirement
1.0 Variable Pressure Field Emission Scanning Electron Microscope (VP FESEM)		
1.1	Resolution	In high vacuum (SE) (1.0nm at 15kV) In Low Vacuum (SE) (2.0nm at 30kv)
1.2	Variable Pressure Vacuum	2-133pa
1.3	Magnification	12-900000x
1.4	Acceleration voltage	0.1 to 30KV
1.5	Probe current	4PA to 40NA or better
1.6	Electron Gun	Field Emission Gun, Schottky emission, Thermal type
1.7	Detectors	1. Inlens /Through lens/semi-inlens/in beam SE detector 2. Evarhart-Thornly Secondary, 3. Back scattered 4. IR-CCD 5. Low vacuum SE detector
1.8	Specimen type	Suitable even for observation and analysis of non-conductive samples without coating.
1.9	Chamber size	(284mm left to right) Provision for 8 ports or better. Chamber design should allow changing the specimens quickly.
1.10	Stage	5 Axis computer controlled eucentric motor stage with manual control panel with suitable standard stubs (including multi stubs) for specimen fixing. (X,Y =100mm, Z=50mm, R=360◦, T=-3 to 70) or better.
1.11	Lens system	Suitable system to adjust spot size. State of art stigmator coil, scanning coil and beam blanking
1.12	Computer	Latest state of art computer with USB ports and Ethernet ports for data transfer and net connectivity with latest Windows operating system and at least 19" TFD monitor with latest laser printer

1.13	Software	Total system control and user friendly Graphical user interface including fail safe protection and Auto functions. Latest state of art Image processing with auto image brightness & contrast, auto beam setting, auto axial alignment, autofocus, auto stigmatism, raster rotation, auto data recording, fast mode, spot mode, dynamic focus, line scan, line profile, built in image filing and image post processing functions (binary, grey measurements, grain size, grain geometry etc), pseudo color, histogram, multiple viewing screens, scan rotation, tilt compensation, dual magnification, gamma and LUT manipulation, data display, stereo imaging, navigation etc.
1.14	Image recording	Image achieve, image export to various formats (Tiff, GIF, JPG,BMP etc.) including digital video recording (AVI).
1.15	Anti-vibration working table	Anti vibration table for chamber, microscope column and support for monitor.
1.16	Support PC	Latest state of art PC for data storage and internet connectivity.
1.17	Vacuum	Fully automated pneumatic valve control with ion getter pumps, turbomolecular pump and air compressor
2.0 Energy Dispersive Analysis of X-Rays (EDS)		
2.1	EDS system	The EDS system should be latest, state of art system designed to be integrated with any make of FE SEM along with latest state of art computer with colour laser printer
2.2	Detector	The EDS detector should be Liquid Nitrogen Free detector based on latest Silicon Drift Detector technology. The SDD crystal should be a large area crystal having size of at least 40mm^2 or more. The analysis element range should be from Be to Uranium.

2.3	Resolution	The following resolutions is to be guaranteed at Site. Carbon C: 72 Ev or better Fluorine F: 75 Ev or better Mangenese Mn: 129 Ev or better. The EDS detector and hardware should guarantee the shift in peak position and resolution (less than) <1Ev over the entire count rate range
2.4	General	• The EDS system should have a facility to check the variation in SEM beam current and apply corrections for the accurate elemental analysis. • The EDS system should offer reliable automatic identification of peaks during real time acquiring of the spectrum. • The EDS system should be using Quantification correction algorithm for accurate elemental analysis.
2.5	Software	EDS system software should be designed to be extremely user friendly catering to applications • Elemental analysis, • multi element mapping with chemical information, • in built help, • Customized reporting, • Automatic qualitative & qualitative analysis, • Smart map, • Pt & ID – Image correlated area analysis and automatic data collection in specified analysis area, • Cameo, • phase analysis, • spectrum synthesis, etc.

3.0 Electron Back Scattered Detector System (EBSD)		
3.1	System	The EBSD system should work on the same computer platform as that of EDS system with user friendly graphical user interface for all functions.
3.2	Camera	• The EBSD camera system should be highly sensitive type catering to Nano-area analysis application. • The EBSD camera should be using minimum 12 bit digital CCD with on-chip integration. • The EBSD camera should have rectangular phosphor exactly matching with the CCD chip size. The phosphor should be optimised for low –kV data application while working with FEG SEMS. • The EBSD camera should have motorised insertion and retraction mechanism with remote control digital handset. • The EBSD camera should have provision to install 6 Forward scattering Diodes as imaging detectors to acquire images with atomic, orientation, channelling contrast. • The camera interface to SEM should have sliding and tilting interface plate to correctly position the camera at the shortest possible EBSD WD for optimal special resolution.
3.3	***Forescatter detector***	***(Optional)***
3.4	Softwares	• Data Acquisition Software • Phase Reflector File Creation Software- • Pole Figure Software • Mapping Software • ODF Software • Imaging and Beam Control Software • Stage Control Software • Phase Identification Software • NIST Structural Database (NSD)
4.0	*Spares*	Three extra emitters along with recommended essential spares for three years of operation. The replacement should be carried out at site at the earliest.

5.0	Remote control	Preferably Via TCP/IP
6.0	Support and maintenance kit	Standard support and maintenance kit is to be provided.
7.0	Calibration standards	Necessary multi element calibration standards
8.0	Installation and Erection and commissioning	Erection and commissioning should be carried out by the supplier at the site. It is the responsibility of the supplier to integrate all the systems and ensure the functionality. Supplier should intimate their requirements for erection and commissioning along with offer.
9.0	Power requirement	As per Indian Electrical standards
10.0	Manuals	Two sets of the following manuals in English should be supplied along with the system • Detailed user instruction manual, operation/instruction manual, trouble shooting manual, CDROM tutorials for FESEM,EDS and EBSD • Detailed circuit and fault diagnostic software, detailed circuit diagram of the equipment (FESEM, EDS and EBSD), maintenance and service manuals
11.0	Up-gradation	The supplier shall supply any software for FESEM,EDS and EBSD operation whenever they are upgraded free of cost for a period of five years.
12.0	Application notes	The supplier shall provide detailed application notes of FESEM,EDS,EBSD systems in hard and soft copies
13.0	Pre-dispatch inspection	Pre-dispatch inspection for ensuring the functions of FESEM+EDX+EBSD [may be combined with training (14.0)]

14.0	Training	Two personnel from BHEL R&D shall be trained for 5 working days thoroughly at the factory. Charges may be indicated. Travel expenses and stay will be borne by BHEL
15.0	List of references & services	Should have supplied minimum of 3 Numbers of FESEM in India and availability of trained service engineers in India for attending the problem in 48 hrs.
16.0	Guarantee /warrantee	12months from the date of E&C or 18months from the date of shipment.
17.0	AMC	AMC for a period of 5 years after warrantee period to be quoted
18.0	Site requirements	Supplier should specify site requirements.
19.0	Compliance Statement	Supplier should supply technical compliance of each point of technical specifications given above for consideration of the offer.

For any technical clarifications, please contact :

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