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CORRIGENDUM

Subject: Reference e-Tender Notice – NITJ/PUR/IIC/48/2020 for purchase of Field Emission Scanning Electron Microscope (FESEM) with Accessories

In reference to tender on subject cited above, it is for the information of bidders that detailed specifications for the said tender have been amended as under:-

High Resolution Schotkey emitter FE-SEM (Field Emission -Scanning Electron Microscope) is a high resolution scanning electron microscope which is intended for use for characterization and studying a wide variety of materials **(MAGNETIC as well as NON MAGNETIC)**, which could be metallic, ceramic, semiconductor, polymer, rubber, emulsion/gel (frozen condition) and biological samples for investigating the ,microstructure and perform chemical analysis using Energy Dispersive X-Ray Spectroscopy (EDS), Texture & Phase analysis etc using EBSD.

(A) Detailed Specifications (Revised):

1.	**Resolution**	(a) 0.9 nm or better @ 15kV/20kV and 1.7 nm or better at 1 kV in normal high vacuum Secondary Electron (SE) mode. (b) Less than ≤2.5 nm in Back Scattering Electron (BSE) mode (c) **1.5** nm or better in low vacuum mode The above-mentioned resolution must be demonstrated at the given acceleration voltages at the time of installation. Also, it should be mentioned in the brochure.
2.	**Magnification**	100× to 10,00,000×
3.	**EHT/ Acceleration Voltage**	0.2 - 30 kV, continuously adjustable and maximum voltage should be sufficient for the highest magnification. All the KV settings must be operated /achieved by software only.
4.	**Chamber**	Suitable chamber for accommodating a minimum sample size of 100 mm diameter with atleast 10 accessory ports, two of them suitable for EDS attachments. Chamber design should allow changing of the specimens quickly. Quick-fit Specimen holder for holding at least 7 suitable stubs.
5.	**Stage**	5 axis Eucentric/compucentric motorized stage with movements equivalent to or Better X= 100 mm or more Y = 50 mm or more Z = 40 mm or more Tilt = up to 60° or higher
6.	**Probe Current**	At least **100** nA or more. High resolution to be guaranteed at highest probe current setting.
7.	**Detectors**	a)**Chamber Secondary electron imaging (SEI) detector.**

		b) In-lens SEI **(secondary electron)** detector for high resolution imaging in high Vacuum at low KV. c) CCD-camera with IR illumination for in-chamber viewing. d) In Chamber **Backscattered Electron Detector (BSED)** e) Low vacuum detector for analysis of non-conducting samples such as polymers, plastics, concrete, etc.
8.	**User Interface**	Keyboard, Mouse, Control Panel with multifunction for the control and adjustment of frequently used SEM parameters, Manual Joystick control for stage axis.
9.	**Optics**	1) Optics should be appropriate for scanning of lowest particle size. High resolution objective lens to observe large specimens with high resolution. 2) Optics should have final electrostatic lens or equivalent technology to image magnetic material at high resolution 3) Beam deceleration or equivalent technology must be built in for high resolution imaging at low KV.
10.	**Display**	2No. 24” TFT Monitors for FEG-SEM, One for control and another for Imaging. Configurable for single frame display or 4-quadrant display. Data display date, accelerating voltage, magnification, micron bar/value, film number and user comments, etc. Latest MS Windows based system (graphical user interface, key board, optical mouse). Line profile display. Comprehensive image annotation facilities with desirable fonts and colors.
11.	**Vacuum System**	Suitable vacuum system having **Ion pump/Sputter Ion Pumps**, **Turbo molecular Pump** and **Rotary Pump** for attaining required and hassle free operations. **Two ion getter pumps/ Sputter Ion Pumps** along with the associated power supplies for the microscope column and vacuum gauges. **A turbo-molecular pump backed by a two stage rotary pump for the specimen chamber**. The vacuum system should be operated with computer controlled, pneumatic operated valves with full safe protection for mains/high voltage and vacuum failures. Isolation valves for specimen chamber and high vacuum system during sample loading. Automatic venting with dry nitrogen. Seamless transition between the vacuum modes. Faster vacuum recovery after breaking for specimen exchange (less than 5 min.). In high vacuum mode, the specimen **chamber should achieve less than or equal to 10^{-3} Pa vacuum** In low vacuum mode imaging, chamber pressure should **be adjustable from 10 Pa to 120 Pa or better**.
12.	**Integrated EDS**	Fully automated and integrated EDS system with standard sample for calibration.
13.	**EDS details**	Integrated EDS system.

		A. EDS: LN2 free SDD detector with $30mm^2$ or higher and 127ev or better. Resolution providing reliable and accurate results over the entire spectral range B to U, at typical SEM microscope operating condition. The EDS should be capable of selective element mapping, line scan, selected area analysis, Quantitative Analysis, Qualitative Analysis Multipoint Analysis (in micro and nano scale range) . It should be possible to do thin film analysis with nanometer scale resolution in both space and depth . B. Supplied EDS server & analysis software should be capable of performing data acquisition, storing and transfer in common Windows based application format. It should have features like peak auto identification routine, spectral match analysis, automatic background subtraction, spectrum process using filters, least square fitting and peak de-convolution. Pile up correction and and back ground noise reduction, simultaneous imaging and analysis should be possible C. EDS should provide ultra-high throughput for fastest measurements. Should provide high counts even at low beam currents. EDS detector should be compact and low weight. All these capabilities should be applicable for polished flat specimens, powder samples, thin films, fractured samples and nanostructured particulate systems. Backup software must be provided in optical media. Any further version of the software and updates must be provided free of cost for 5 years. The supplier should arrange for seamless interfacing, software, installation and commission for EDS system.
14.	**EBSD***	The EBSD system should work on the same computer platform as that of EDS system, EBSD camera system should be CMOS based with 3000 fps or more, **pixel resolution of 680x480** or more. The EBSD should be optimized for low –kV data application while working with SEMS; camera should have motorized insertion and retraction mechanism. The position accuracy is to be 0.1mm .The camera should have Forward scattering Diodes as imaging detectors to acquire images with atomic, orientation, channeling contrast; 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. Simultaneous EBSD & EDS data acquisition. Detector capable of in-situ adjustable for the optimum working distance. Software controlled detector positioning for automatic calibration. The EBSD system software should include following features: (i) Data Acquisition Software (ii) Phase Reflector File Creation Software

		(iii)Pole Figure Software (EBSD result should include Pole Figure & inverse pole figures, mis-orientation profile, phase information, grain map and other detailed crystallographic information Software should be capable to reanalyze the obtained result.) (iv)Mapping Software (v) ODF Software (vi)Imaging and Beam Control Software (vii) Stage Control Software (viii) Phase Identification Software. (ix) Should include optional FSE/BSE imaging system that provide detailed color coded orientation contrast images. ICDD Date base should be provided for material phases and diffraction data of different material. One Pre tilt Sample holder. 2 offline license should be provided
15.	**Automatic electrolytic polishing and etching machine****	I. Table top mode, no programming needs to be done. II. Scanning function- the machine should determine etching machine. III. The current density curve automatically by scanning the sample at pre-defined voltage range, thereby automatically select correct polishing and etching voltage. IV. Mask set with 0.5, 1.2, 2.5 cm^2 apertures and one without aperture should be quoted. V. Touch pad control with minimum 128x240 dots (16x40 characters and display the parameter like current, electrolysis, temperature and elapsed polishing/etching time. VI. Facility to set a temperature limit for electrolyte at which the cooling is started automatically and the cooling should stop as soon as the electrolyte is cooled to the same limit. VII. There should be facility to connect the polishing unit to an external cooling unit. OUTPUT VOLTAGE / CURRENT SPECIFICATIONS Polishing 0-100 V (1V steps)/6A Etching 0-25V (0.5V steps)/6A External Etching 0-15V (0.5V steps)/1.5A
16.	**Work station and computer**	Graphical user interface with latest windows software, microscope control software, DVD or hard disk in various formats (TIFF, JPG, BMP, etc.). The microscope should be controlled from graphical user interface running at a 1280x1024 screen resolution. The workstation should include a 24" LCD/LED monitor, and standard keyboard and optical mouse. Branded desktop PC with following configurations: 3 GHz or higher speed Intel Pentium i7 or higher Processor, 16 GB RAM, I TB hard disk, original Intel motherboard, DVD RW, 3 button scroll optical

		mouse with pad and standard keyboard on USB, and appropriate number of USB/other ports for operation of SEM and accessories.
17. .	**Printer**	Color photo laser jet printer with a minimum resolution of 1200 x 1200 dpi. High quality photo laser jet duplex printer (min 18 pages per minute) for image and report printing suited for A4 size paper.
18.	**Software**	Original licensed software for the comprehensive operation of the microscope, computer, motorized stage / stage control, CCD camera and vacuum interlocks. Software for acquiring SSE and SE images. The software should be embedded in the microscope control software. Latest version of Microsoft Office utility.
19.	**Calibration**	Accessories (standards) for calibration of magnifications, dimensional and resolution, EDS system etc
20.	**FESEM Table**	Anti-vibration table for chamber, the microscope column and support for monitor, optical mouse, keyboard.
21.	**Supporting Tools**	Specimen handling tools, stage tools and specimen preparation Tools materials and general tools maintenance of FEGSEM. Conductive carbon tapes of 20m to be provided.
22.	**Essential Accessories**	i) IRCCD camera ii) Suitable Chiller with **water/air circulation system** (Suitable for North Indian Climate- Ambient temperature upto 48° C) iii) Compressor iv) Interface between SEM and EDS, EBSD v) UPS 10 KVA with 2 hr back up vi) **1** Nos. Spare Filament (in the form of coupons) vii) Sputtering and gold coating system. Gold sputter for coating thin layer of gold on the samples. System should consist of different coating /sputtering programs including different time and current values. Sputtering/ Coating program should be editable as per sample requirement. Low noise two stage rotary pump to create vacuum –inside coating chamber. System should be capable of read out accurate vacuum inside chamber unit. The target holder should be able to hold 2 inch diameter target. Gold target (at least (≥2 inch diameter and 0.2 mm thickness, 99.9 purity should be provided along with the system. Rotational multi stage holder to hold multiple samples in a single run process. The machine shall be supplied with all the accessories required for its working.
23.	**Recommended essential spares**	Quote should also be submitted for recommended essential spares and consumables for uninterrupted operation of the equipment for five years.
24.	**Maintenance**	The supplier shall provide uninterrupted supply of spares and accessories for a ·period of 10 years after warranty.
25.	**Up-gradation**	(i) The supplier shall supply any software for FESEM and EDS, EBSD operation whenever

		they are upgraded. (ii) The equipment shall have the provision for upgradations like Electron Beam Lithography, WDS, nano Indentation etc.
26.	**Application notes**	The supplier shall provide detailed application notes of FESEM and EDS, EBSD systems in hard and soft copies.
27.	**Man Power**	The supplier will have to provide a high skilled and experienced (atleast 1 year experience) full time operator to run the system for a period of 5-years from the date of installation of the system in the institute at their own cost. The cost of 2 years of operator service after installation to be quoted in the bid. After 2 years, payment will be released on 6 monthly basis on satisfactory performance. The operator will work as an employee of the vendor and institute shall have no responsibility for his/her service liabilities

(B) Installation & operational requisites:

(a) All the prerequisites for installation and operation (Special electricity, cooling water, air, any other) have to be quoted. Institute will only provide standard electricity at 220V, 50Hz, normal quality water and space.

(b) Successful bidder shall depute their engineer to visit the site of installation within 15 days of placement of supply order to suggest the required civil work and any other specific site preparation requirement.

(C) Warranty and maintenance:

1. The complete comprehensive onsite warranty for 3 years (excluding breakdown periods) for the entire system, including the filaments etc.

2. In case of breakdown during the warranty period, a competent service engineer of
the supplier should make as many visits as are necessary to rectify the problem and replace the faulty parts, without any liability of cost. But it should be repaired within 72 working hours from the date and time of complaint lodged by the user. In case of any delay in repair without adequate justification, there will be penalty of rupees 5,000/- per day for the down time. Supplier should ensure to provide all spares required for making the instrument operational. The spares recommended for keeping in inventory along with the instrument may also be quoted.

(D) Annual maintenance contract:

After warranty, AMC (year wise) charges should also be quoted as optional.

(E) Installation and training

Installation should be done by the manufacturer. On-site two week training for operation and application may be given to the users free of cost.

(F) Spare parts

The supplier of the instrument must confirm in writing that the spares for the entire instrument will be available for a period of at least ten years after the model of equipment
supplied has been phased out. For frequently required spares, there should be adequate inventory with the Indian agency.

(G) Manual

One set of operating manual and service manual including detailed drawings and circuit diagrams(in English) should be provided with the instrument

(H) User list with contacts

Vendor should provide us a list of installations in India with all contact details and model details so that NIT Jalandhar can approach the contact person for any feedback. In case of any doubt about capability

of the machine, the vendor will have to arrange demonstration at any site bearing the cost including the travel and other expanses of NIT Jalandhar representatives.

(I) Compliance statement

- The supplier must submit technical brochures and proper application notes adequately explaining and confirming the availability of the features in the model of the equipment being quoted.
- The supplier must submit a table indicating the compliance of the features of the model of the equipment being quoted with those given in the indent. Features not matching – must be clearly indicated.
- Additional features and Features in the quoted equipment which are better than those in the indent – may be clearly explained.
- The vendor must certify that the equipment and accessories quoted provide a complete package for use of SEM along with analysis by EDS, EBSD.

(J) Other Requirements:

1. Demonstration of all the functionalities of FESEM imaging process, showing specified resolution on standard samples such as Gold and Tin ball, and testing on various user's sample must be done at the time of installation. All standard specimens should be provided by the vendor.
2. The vendor should have at least 5 FESEM installations across the country in last 5 years. The Committee may relax the number of installation required.
3. Lifelong upgradation of all software for imaging, analysis, EBSD & EDS etc should be included.
4. List of spares that can be kept in stock should be provided with price

Further the last date of submission of e-bids has been extended as under:-

I	Last date of submission of online bids	End Date: 10.11.2020 upto 11:00 AM
II	Physical submission of Tender Fee and EMD	End Date: 11.11.2020 upto 11:00 AM
III	**Opening of Technical e-Bid (online)**	**11.11.2020 at 11:00 AM**

Other terms & Conditions of the tender will remain same.

Registrar