

TEHNIČNE IN DRUGE ZAHTEVE NAROČNIKOV

Tender Specification – High-Resolution Laser-Integrated Dual Beam System

IMT seeks to procure a state-of-the-art, high-resolution Dual Beam system that integrates a Femtosecond Laser within a Focused Ion Beam-Scanning Electron Microscope (FIB-SEM) platform – one instrument. The system will be used for advanced nanofabrication, high-throughput sample preparation, and 3D analyses. The instrument must combine high-resolution imaging, precise ion milling, and laser ablation capabilities, with comprehensive automation and advanced detection options to ensure productivity, reproducibility, and future-proof flexibility. The following technical specifications set out the minimum required performance and configuration.

1. SEM Column and Imaging Requirements

- The SEM must be a Field Emission Scanning Electron Microscope (FESEM), with a high-brightness gun capable of delivering:
 - Landing voltage range: 500 eV to 30 keV, continuously variable
- Beam current: Up to at least 40 nA
- Secondary electron image resolution (minimum):
 - 1 nm or better at 15 kV (lower number means better resolution)
 - 1.5 nm or better at 1 kV less
- Detection features:
 - Everhart-Thornley SE detector
 - At least 2 In-lens/in-column detectors for simultaneous detection of SE and both low-loss and no-loss BSE
 - In-lens SE and BSE signals should be simultaneously displayed
 - Integrated beam current monitor
 - Live IR CCD image viewable simultaneously with live SED image; must be displayed within the main GUI (full screen or smaller view). IR illumination must automatically disable during BSE operation.
 - A FIB optimised secondary ion detector

2. EDS

- Minimum area of SDD chip $\geq 70\text{mm}$
- LN₂-free technology
- Resolution $\leq 125\text{ eV Mn K}\alpha$
- Detection Energy range Al L line 73eV - Am
- AIL to AIK peak height ratio of 1:1 at 2.5 kV on Al stub
- Resolution Stability $>90\%$ at 200 kcps
- Throughput $> 850\text{ K output cps at }2.0\text{ M input cps}$
- Motorised retractable movement of the detector
- Silicon nitride window, which permits greater transmission of low-energy X-rays
- Full vacuum inside the detector module to increase low-energy X-ray detection
- Collection of low elements, carbon peaks, possible at $>500\text{K CPS}$
- Control PC, monitor 24", Windows 10 or higher with 64-bit operating system compatible
- Software functionality
- All the standard software features to be able to make elemental analysis in point, multipoint, and linescan
- Automated Elemental mapping

- Automated Phase mapping
- Advanced reporting
- 2 Offline software licences
- Drift correction
- Free updates for the time of the service-contract

3. FIB Column and Milling Capabilities

- FIB current: Up to 100 nA with a tight, round spot
- Acceleration voltage range: 500 V to 30 kV
- Resolution: 3 nm or better at 30 kV using the selective edge method
- Aperture control:
 - Automated aperture strip
- Visualisation modes:
 - Simultaneous patterning and imaging
 - Intermittent patterning and imaging
 - SE/SI signal visible inside the pattern area during milling

4. Stage and Chamber Specifications

- Vacuum system:
 - Oil-free turbomolecular pumps
 - Fully automated vacuum control
- Plasma cleaner:
 - For cleaning both the sample and the microscope chamber
- Sample stage:
 - Stage for high precision movements of at least three axes: X, Y, R
 - Travel ranges(at least):
 - X/Y: 100 mm
 - Z: 10 mm
 - Tilt: compatible for EBSD measurements
 - Tilt at least: -4° to +60°
 - Rotation: 360°
 - Stage must support eucentric (compucentric) tilt and rotation

5. Laser Integration

- Fully integrated pulsed femtosecond laser module
- Minimum specifications:
 - Wavelength: 515 nm (green)
 - Pulse duration: < 500 fs

6. Nanomanipulation and Gas Injection Systems

- Nanomanipulator with x/y/z travel and 360° rotation.
- Gas Injection Systems: Pt

7. Automation and Software

- Software for unattended automatic preparation of multiple TEM samples, with the capability of thinning the lamellae on the TEM grid
- Automation software for:
 - Serial sectioning and imaging/EDX and EBSD over a defined volume

- Control of columns, detectors, stage, and site alignment with programmable logic and looping
- Automated multiple mosaic acquisitions for large area imaging and stitching capabilities.
- 3D visualization and segmentation software
- Scripting software for automation
- All softwares should be provided with (at least) 2 Offline software licence.

8. User Interface and Controls

- Comprehensive scan system:
 - Frame averaging, line averaging, and interlaced scanning
- Manual User Interface (MUI):
 - USB control panel with knobs for focus, magnification, contrast, brightness, beam shift, and stigmatism

9. Hardware

The quotation must also include the following for the operation of the system

- Computer(s) for controlling the FIB and supporting PC data management and remote access, Windows 10 or higher with a 64-bit operating system compatible
- 3 Monitors, 2 x 24" and 1 x 50" (4K) to be mounted on the wall
- Operation panel with contrast, brightness, focus, astigmatism...
- Table
- Offline software licence

10. Additional

- UPS provides at least 30 minutes of support in the event of an electricity blackout
- Water Chiller for the closed cooling system

11. Training

- Basic training at the installation on site (5 days) (3+2 days)
- Advanced training for 3D applications and TEM lamella preparation automation on site (2 days)
- Osnovno usposabljanje ob namestitvi na lokaciji (5 dni) (3 + 2 dni)
- Napredno usposabljanje za 3D aplikacije in avtomatsko izdelavo TEM lamel na lokaciji (2 dni)

12. Servisni pogoji

Ponudnik mora zagotoviti servisno podporo pod naslednjimi pogoji:

- Trajanje servisne pogodbe: 5 let po poteku garancijskega obdobja.
- Način plačila: letno plačevanje servisne pogodbe.
- Odzivni čas: najkasneje v roku 48 ur po prijavi okvare na lokaciji uporabnika oziroma remote.

Servisna pogodba mora vključevati:

- Neomejeno servisno podporo (on-site in remote).
- Vključeni vsi stroški transporta, potnih stroškov in nastanitve serviserjev.
- Vzdrževanje vakuumskega sistema, hladilnega sistema in črpalk.
- Letni preventivni servisni pregled celotnega sistema (1x letno).
- Dodaten pregled mikroskopa in kalibracija (1x letno).
- Dve (2x) zamenjavi FEG izvora v času trajanja servisne pogodbe.

- Eno (1x) menjavo Ga izvora na leto, v petletnem obdobju trajanja pogodbe, skupaj z vsemi potrebnimi deli, ki jih je treba zamenjati za zagotovitev polne zmogljivosti ionskega izvora.
- Tri (3x) menjave platinastega rezervoarja v obdobju petih let trajanja pogodbe.
- Software updates/upgrades za obdobje trajanja servisne pogodbe.
- Servisna pogodba mora zajemati celovito vzdrževanje in zagotavljanje stalnega delovanja sistema brez dodatnih skritih stroškov.
- Ponudnik mora zagotoviti kvalificirano in ustrezno usposobljeno osebje za izvedbo vseh servisnih in vzdrževalnih storitev.

13. Plačilni pogoji

Ponudnik mora v ponudbi upoštevati naslednje plačilne pogoje:

- Prvi obrok: 45 % vrednosti pogodbe plačljivo najkasneje do 30. 4. 2026.
- Drugi obrok: 5 % vrednosti pogodbe plačljivo najkasneje do 1. julija 2026.
- Tretji obrok: 50 % vrednosti pogodbe plačljivo najkasneje do 1. novembra 2026.

Tehnične specifikacije morajo biti razvidne in dokazljive z uradne spletne strani ali uradne brošure s strani PROIZVAJALCA naprave. Ponudniki k svoji ponudbi predložijo originalno brošuro naprave, iz katere mora biti razvidna tehnična specifikacija naprave ali pa povezavo do uradne spletne strani proizvajalca naprave.

Ponudnik mora naročniku zagotavljati originalne nadomestne dele za napravo, še vsak deset (10) let po izteku garancijskega roka.