CSIR- NATIONAL PHYSICAL LABORATORY

Dr. K.S. Krishnan Marg,

New Delhi – 110012 (INDIA)

Contact: 011 4560 8624

Email: sr.cosp@nplindia.org

purchase-so1@nplindia.org

From: Director, CSIR-NPL

Ref No. 14-VIII/SSK(27-GTE)2024PB/T-242 Dated : 07.03.2025

CORRIGENDUM

With reference to NPL's Global Tender ID: **2025_CSIR_790564_1**, for "Electron Beam Lithography (EBL) System". Inadvertently, old technical specifications were uploaded on the portal. Now, the finalized specifications by TSC is being uploaded on the portal. **Revised specifications are as follows:**

Revised technical specifications

Annexure-1: Technical specification of "Electron Beam Lithography (EBL) system"

Scope of supply: Electron beam lithography (EBL) system should align and expose various layers on a ≤ 100 mm wafer with a minimum feature size of ≤ 10 nm and a writing field of ≥ 1000 µm.

1. Electron source:

1.1. Thermal field emission Schottky source is needed for long-term stability, low noise and a typical lifetime of 5000 hours or more.

1.2. Fully digital electron optics column, acceleration voltage ≥ 30 kV, routinely useable.

1.3. The e-beam current to the samples should be ≤ 100 pA to 10 nA or more.

1.4. Appropriate apertures should be provided to control the current.

1.5. Column pressure at the gun should be ≤ 5E-6 Pa and should include adequate isolation and interlock features to avoid lasting gun damage.

2. Electron Optics system:

2.1. Beam position stability: ≤ 300 nm/hr at ambient with fluctuation of ± 0.5 °C.

2.2. Beam current stability ≤ 1% over 4 hrs or larger time at ambient with fluctuation of ± 0.5 °C.

2.3. Beam spot size: ≤2 nm.

2.4. The beam blanking speed should be compatible with with the maximum writing speed of pattern generator the system,.

3. Lithography resolution:

3.1. The system should be capable of writing a minimum feature size of 10 nm or less.

3.2. The end system should be capable to expose grating patterns with a linewidth of ≤ 40 nm.

3.3. The system should have the largest writing field of 1000 μm or more.

3.4. Overlay accuracy should be ≤ 40nm (mean+3sigma).

3.5. Field stitching: ≤ 50 nm

4. Specimen stage and sample holder:

4.1. The movement of the stage should be controllable by external hardware or using the control software of the system, by scripting, and by pointing to the scanned images.

4.2. A 100 × 100 mm travel range laser interferometer controlled stage for X-Y positioning and 5 mm for Z direction.

4.3. The resolution for X and Y movement of the laser interferometric stage should be ≤ 1 nm.

4.4. The sample holder should be able to accommodate wafers of size 2", 3" and 4" as well as rectangular/square samples of size ≤ 10 mm × 10 mm.

5. Main chamber and load lock:

5.1. Main chamber should be able to accommodate the above-mentioned specimen stage.

5.2. Main Chamber should be able to pump down to pressure ≤ 5E-3 Pa

5.3. If the operation of the system requires a CCD camera in the main chamber, the same should be provided by the vendor.

5.4. The main chamber should have adequate safety interlocks/alarms.

5.5. Load lock option for automatic/manual substrate pickup holder into the process chamber.

5.6. System should be equipped with dry vacuum pumps for oil-free system vacuum.

5.7. Both load lock as well as main chamber should have proper suitable full-range vacuum gauges.

5.8. The control software of the system should have the provision of display of the vacuum levels of the system

6. Pattern generator and design software:

6.1. Should be able to write patterns with speed of $\geq$ 20 MHz. All base primitives should be available (e.g. circle, rectangle, triangle, polygon). System should also have provision of exposing the patterns using raster as well as vector scans.

6.2. The system should have mechanism for astigmatism and focus correction.

6.3. The user should be able to adjust the mark locate algorithm's contrast and brightness settings where the alignment algorithm fails to locate the mark.

6.4. The SEM dwell times should match pattern generator speed, i.e. dwell times of 50 ns or lower should be supported.

6.5. A workstation with a Windows software environment with the capability of interfacing with the system interlocks, and essential software, including proximity effect correction software, for patterning and features.

6.6. The design software should be capable of supporting design pre-processing offline. Floating network license or remote login for offline processing is preferable.

6.7. Second software license for offline processes along with the latest and compatible computer system should be provided.

6.8. The system should be capable of accepting DXF, GDSII and other common imaging formats pattern files. Vendor should clearly mention all the other pattern file types that the system is able to accept.

7. System safety and accessories:

7.1. Calibrations and corrections for deflection, focus, astigmatism and height variations.

7.2. Measurement and calibration of beam current, beam position, focus, field size and height must be provided.

7.3. The tool must come with a complement of interlocks to prevent common user errors. Any malfunction or error should display screen error message/signal.

7.4. The system should have sufficient interlocks for safety against malfunctioning of power, vacuum, compressed air and water supply.

7.5. Gun should have adequate interlocks and isolation valves for protection against gun trips.

7.6. Vendor should provide detailed vibration isolations, utility parameters for the best performance of the instrument.

8. Detectors:

8.1. Secondary electron detector should be provided.

9. Current measurement:

9.1. A picoammeter should be provided with a minimum resolution of the order of 10 *f*A and maximum detected current matching the SEM current.

9.2. All the sample holders/stage should have Faraday Cup with an integrated auto range pico-ammeter having an accuracy of better than 0.5%.

10. Installation, Training, spares and warranty

10.1 The end system should be capable to expose grating patterns with a linewidth of 40 nm or less with a gap of 40 nm or less and isolated line with minimum feature size of ≤ 10 nm.

10.2 The complete system must have a comprehensive warranty of 01 year (for the complete system) with support for spares and accessories continuously for up to 10 years from the date of Installation.

10.3 Standard accessories such as necessary tools, maintenance kit etc. should be provided.

10.4 System installation and commissioning at the CSIR-NPL New Delhi is to be done by the vendor/supplier and the full capability of the system has to be demonstrated as per the acceptance criteria .

10.5 A hands-on training course for the users, by experts/engineers, for using the instrument after the installation process is complete on a set of data for at least two users onsite for 5 working days. Maintenance-level training also to be provided.

10.6 A complete technical manual shall be supplied listing all the capabilities and operations of the instrument.

10.7 Vendor should recommend suitable resist and developer for best pattern fidelity, uniformity, and yield. Vendor should provide resist coated wafers for patterning of 10 nm features for installation, commissioning and training purpose.

10.8 Copies of customer feedback/installation reports for the quoted system from at least 3 different installations shall be submitted.

10.9 Site Survey and pre-installation requirements including the utilities (EM noise, acoustic and floor vibration measurements on-site & computer analysis of the impact on system performance; supply check) and utility parameters by supplier engineers.

10.10 Vendor has to provide the pre-installation requirement to the customer which should include the details of all the utilities being required for operation of the electron beam writing tool.

10.11 Provision for factory acceptance test of the complete system at the factory by the team of 2 persons of CSIR-National Physical Laboratory, New Delhi. The expenditure shall be borne by the CSIR-National Physical Laboratory.

10.12 Vendor should have service support in Indi with qualified Engineers with relevant experience of 2 years or more.

11. Acceptance criteria

11.1 Demonstration of beam current and stability as per the quoted system.
11.2 Demonstration of beam position stability as per the quoted system.
11.3 Demonstration of overlay accuracy as per the quoted system.
11.4 Demonstration of field stitching as per the quoted system.
11.5 Demonstration of isolated line of minimum feature size of less than 10 nm.
11.6 Demonstration of grating patterns with a linewidth of 40 nm or less with a gap of 40 nm or less.

12. General terms and conditions

12.1 Any item not specifically mentioned in the technical specification but essential for successful implementation of the system must be quoted.
12.2 Bidders should clearly specify after sales, the service/application support/AMC capabilities.
12.3 Provide all information related to pre-installation requirements (i.e. room, environment, air filters, temperature, area, etc.) for the system installation.
12.4 Original warranty certificate to be provided for all the procured items.
12.5 The electrical power input requirements of all the equipment and accessories should be as per Indian standards.

Therefore, PBC meeting is reschedule on 18th March 2025 at 11AM. and following extension in due date of submission & date of opening of the said tender may be read exactly as follows:

Due date & time of tender submission

For : 03.04.2025 up to 3.00PM (IST)
Read as : 10.04.2025 up to 3.00PM (IST)

Date & Time of Tender Opening

For : 04.04.2025 at 3:00PM (IST)
Read as : 11.04.2025 at 3.00PM (IST)

All other terms & conditions of said tender will remain the same. Revision in specifications, if any shall be intimated in due course.

Sr. Controller of Stores & Purchase