

To Whom It May Concern

Domestic Tender to supply Scrubber System by local vendor only.

This is an RFQ (Request for Quote) for procurement of e-beam evaporation tool as part of an open tender for the Centre for Nano Science and Engineering (CeNSE) at IISc, Bangalore. The tender invitation is for Indian Original Equipment Manufacturer (OEM)/Class-1/Class-2 or their Indian authorized distributor only.

CeNSE is a multidisciplinary research department at IISc that houses a 14,000 sq. ft. cleanroom and characterization facility used by 50 faculty members from various disciplines at IISc. CeNSE is also a user-facility which has hosted over 6000 participants from more than 700 universities and institutes all over the world. Consequently, any tool in CeNSE receives significant exposure to scientific community in India and beyond. The vendors are requested to factor in the value of this exposure in to their quotes.

Being a user-facility puts additional technical burden on the tool. We need a tool that can tolerate heavy usage (at least 50 hours/week), has a high uptime, can be serviced and maintained for the foreseeable future (at least 5 years), and has a track record of reliability at comparable facilities in India and abroad. Details of existing facilities and the user program can be gleaned from:

<http://nnfc.cense.iisc.ac.in/>

<http://www.mncf.cense.iisc.ac.in/>

<https://www.inup.cense.iisc.ac.in/>

Procedure

1. Vendors will be required to submit a technical proposal and a commercial proposal in **two separate sealed envelopes**. Only vendors who meet the technical requirement will be considered for the commercial negotiation.
2. **The deadline for submission of proposals is 8th July 2022, 5:30 pm Indian Standard Time**. Proposals should arrive at the Main office, GF-15, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India, by the above deadline.
3. The decision of purchase committee will be final.
4. The technical proposal should contain a compliance table with 5 columns. The first column must list the technical requirements, in the order that they are given in the technical configuration below. The second column should describe your compliance in a "Yes" or "No" response. If "No" the third column should provide the extent of the deviation (please provide quantitative responses). The fourth column should state the reasons for the deviation, if any. The fourth column can be used to compare your tool with that of your competitors or provide details as requested in the technical requirements table below.
5. Any additional capabilities or technical details, that you would like to bring to the attention of the purchase committee can be listed at the end of the technical table.

6. Vendors are encouraged to highlight the advantages of their tools over comparable tools from the competitors
7. If multiple systems can fulfill the requirements, vendors can submit multiple bids.
8. In the commercial bid, please provide itemized cost of the system and *required* accessories, such as software, power supply, etc.
9. As an option, please provide itemized cost for any *suggested* accessories/add-ons that may enhance the usability, capability, accuracy or reliability of the tool. Vendors are encouraged to quote for as many add-ons as their tool portfolio permits.
10. The commercial comparison will be done as per Government of India rules, specifically GFR 2017. Note that GFR has recently been amended.
11. As per recent edits to the GFR, there are three classes of vendors distinguished by their “local content”. In the cover letter, vendors must mention which applies to them:
 - Class 1 supplier: Goods and services have a local content of equal to or more than 50%
 - Class 2 supplier: Goods and services have a local content more than 20% but less than 50%
 - Non-local supplier: Goods and services have a local content of equal to or less than 20% 5.Quotes will be entertained from Class 1 or Class 2 suppliers only.
12. Please indicate the warranty provided with the tool. A warranty of 3 years or more is preferred.
13. The quotations should be on FOR-IISc Bangalore basis in INR only.
14. Provide itemized cost for *required* spares for 2 years of operation. For sake of this calculation, the vendor may assume active tool usage of 20 hours/ week. This number will be used to estimate the life cycle cost of the tool.
15. Clarify if periodic (preventive) maintenance be done by a trained on-site engineer or requires a specialist from the OEM.
16. If maintenance requires OEM, as an additional option, provide cost of an annual maintenance contract (AMC) for 3 years, post warranty. The AMC must cover 1 scheduled and 1 emergency visit per year. It must also indicate who will service the AMC, an Indian agent or the OEM. The AMC cost must also include an itemized list of spares that are essential for the scheduled visits.
17. The RFQ must include references of 3 previous installations, preferable in India. Please provide the names and contact addresses of the referees, so that the committee can contact them independently.
18. Any questions can be directed to Dr. Savitha P, GF-20, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India. (savithap@iisc.ac.in)

Technical Requirements

1.	APPLICATION	<ul style="list-style-type: none"> Electron beam evaporation to deposit a variety of thin films from metals to dielectrics.
2.	CHAMBER	<ul style="list-style-type: none"> Strictly 1000 class Cleanroom compatible material. Material of Construction (MOC): SS 304 grade non magnetic, water cooled, bakeable to 150°C. Baseplate approx. 400 mm X 400 mm Removable shields/liners to minimize deposition on chamber walls. Suitable view ports, shuttered and bolted for monitoring of sources and substrate. Leak test port for He leak detector or RGA.
3.	PUMPING	<ul style="list-style-type: none"> The base pressure for a properly conditioned, clean, dry and empty chamber with copper and Viton gaskets should be 2×10^{-7} Torr or lower. Pressure of $<1 \times 10^{-6}$ Torr achieved in 15 minutes and a pressure of $<2 \times 10^{-7}$ Torr in less than 60 minutes. Combination of a turbo pump and a DRY backing/roughing pump. <p>High vacuum pump:</p> <ul style="list-style-type: none"> A Turbo molecular pump (PFEIFFER/LEYBOLD/ALCATEL/VARIAN/ EDWARDS or equivalent) having suitable pumping speed (minimum 500 lit/sec) to achieve the above specifications. <p>Should include pump down curves along with the technical bid. Chamber base pressure and time to reach base pressure given the pumping capacity should be specified.</p> <p>Dry Scroll pump:</p> <ul style="list-style-type: none"> Dry scroll pump (10 m³/hr or higher) (Make PFEIFFER/ LEYBOLD / EDWARD / VARIAN or equivalent) for roughing and backing operations. <p>Vacuum and High Vacuum Valves:</p> <ul style="list-style-type: none"> Electro pneumatically operated right angle for roughing, backing and high vacuum applications. Vent valve, fine control needle valves to be provided. Electro pneumatically operated gate valve. Gate Valve fully integrated with the HMI. Gate valve of SS construction and HV or VAT make. <p>c). Vacuum Gauges:</p>

		<ul style="list-style-type: none"> Imported Pirani & Penning Gauges (INFICON / AGILENT / Pfeiffer/Edwards) for vacuum measurement.
4.	SUBSTRATE	<ul style="list-style-type: none"> Deposition on small cut pieces (1cm x 1cm) to 6 inch substrates. Rotation built in and heating substrates up to 350°C with +/- 1°C accuracy. The system shall be delivered with different substrate holders for different applications. Changing of substrate holders performed by trained operator should be in less than 15 minutes. Details of fixturing for wafers of different sizes should be included. Clips and mounting fixtures should be such that they do not introduce a point load that will can introduce wafer defects and/or cause breakage. The ability to adjust source to target distance should be included. Ability to upgrade tilt sample stage (GLAD) in future should be given as optional. A planetary rotation capability that allows for conformal coatings should be quoted as an option.
5.	HEARTH	<ul style="list-style-type: none"> 20 cc x 6 evaporation sources; rotatable hearth with programmable XY sweep control. Automated turret rotation to allow for automated multi-layer programming and integration to the thin film controller. Total thickness of deposition of each of selected metals (Au, Ti, Al, Ni, Ta, Cr) on a 6" wafer for a single charge should be mentioned. Electron beam gun source (Temescal/Ferrotec/Telemark/Thermionics)
6.	FILM UNIFORMITY	<ul style="list-style-type: none"> Thickness uniformity in single wafer deposition (6 inch) and for batch across all wafers should be $\leq \pm 3\%$. A map of uniformity across 2 inch, 3 inch, 4 inch and 6 inch wafers should be demonstrated.
7.	ELECTRON SOURCE	<ul style="list-style-type: none"> A 10 kW electron source (~10 kV and ~1 A) that can be controlled to yield point heating and distributed heating for evaporation. The minimum controllable deposition rates should be Au, Ti, Ni (2 Å/sec), Ta (1Å/sec) and Al (5 Å/sec). The maximum controllable rates possible, taking into consideration such as crucible failure, should be included in the quote. Adjustable constant voltage stable beam position, better than $\pm 1\%$ voltage / current regulation. The sweeping of the electron beam and the sweep profiled should be programmable. Electron beam power supply make (Temescal/Ferrotec/Telemark)
8.	OTHERS	<ul style="list-style-type: none"> Quartz crystal monitor to monitor deposition rates at the substrate plane.

		<ul style="list-style-type: none"> • Quartz Crystal Deposition Controller make INFICON SQC310 based on a multi-microprocessor design. Thickness Display: 0.000 to 999.9 KA ; Rate Display: 0.0 to 999 A/sec. Controller to interface seamlessly with HMI/PLC control system for manual/automated hand over • In addition, quartz crystal monitors should be provided, as option, above the source plane and below the shutter to stabilize evaporation rates prior to exposing the substrates to the metal flux. • Suitable shutter below the substrate plane. Pneumatically controlled Source Shutters for the E-Beam Gun. Also a suitable pneumatically controlled substrate shutter should be offered • 3 gas flow line: Ar, O2, N2 with MKS/Alicat/Sierra or equivalent make MFC's and Swagelok valves/fittings.
9.	OPTIONAL	<ul style="list-style-type: none"> • An ion beam, neutralizer and its details for pre-deposition cleaning and assisted deposition can be added as optional.
10.	SYSTEM CONTROL	<ul style="list-style-type: none"> • Machine parameters controlled through a PLC and accessible through a human machine interface (HMI) or a laptop. • Process recipes for deposition of selected materials should be provided and should be programmable through the HMI. • Safety interlocks on the system and the cause/effect diagram that summarizes these safety features should be provided. • Complete logs of all the process and system parameters to be available and stored for future trouble shooting • Graphical representation of tool and process parameters • Provision to alert the user in case of emergencies and an option to integrate the alarm system to NNFC building monitoring software • Software need to be supported for the lifetime of the tool.
11.	INSTALLATION AND TRAINING	<ul style="list-style-type: none"> • Installation and demonstration of tool functionality after upgrade and spare replacement at customer site, by the experts from principals should be part of the package. • During the installation all the specifications of the processes should be verified for acceptance by the customer. • Tool training post installation. • Provide a list of Nanofabrication cleanroom facilities where your tool is installed (India and abroad)
12.	POWER & UTILITIES	<ul style="list-style-type: none"> • A floor plan and list of utility requirements needed. System should be compatible with 240±10V, 50 Hz single phase or 415±20V, 50 Hz 3 phase supplies. • Any additional power or utility requirement arising from this tool should be clearly mentioned

13.	SAFETY	<ul style="list-style-type: none"> The tool should be designed to minimize all risks of injury to users. Equipment shall be in full compliance with government and commercial safety and health and environmental regulations and requirements. An emergency off (EMO) button easily visible and accessible to users in case of emergency should be provided.
14.	ACCEPTANCE TESTS	<ul style="list-style-type: none"> Demonstration of growth of single and multiple metal layers mutually agreed upon and characterized. Materials to be deposited and typical rates: Au, Ti, Ni (2 Å/sec), Ta (1Å/sec) and Al (5 Å/sec). Thickness and sheet resistance uniformity $<\pm 3\%$, across 6" and run to run. Uniformity mapping across 2 inch, 3 inch, 4 inch and 6 inch wafers should be demonstrated. Cycle time expected from loading to unloading for a single 6" wafer for deposition time of Ti/Al/Ni/Au of 20/120/30/50 nm thickness should be quoted and demonstrated during acceptance.
15.	SUPPLY OF SPARES	<ul style="list-style-type: none"> Quote should include a list of spares that need to be replaced periodically to ensure that the system is in operation.
16.	MAINTENANCE	<ul style="list-style-type: none"> Availability of trained engineers in India for servicing. System operation, process and troubleshooting manuals and detailed drawings are required. A set of basic tool required for routine maintenance should be included.
17.	SUPPORT	<ul style="list-style-type: none"> Capability for online diagnostics from a remote location in case of tool problems. Provide details of after sales service and support available in India. Provide details of trained personnel in India authorized to service the machine, and number of tools sold in India.
18.	SHIPPING	<ul style="list-style-type: none"> Cost of shipping up to IISc, Bangalore.
19.	PAYMENT TERMS AND CONDITIONS	<ul style="list-style-type: none"> 90 % Letter of Credit; 10% of payment after instruments have been installed and successfully demonstrated.