



April 15th , 2024

To Whom It May Concern

Global Tender for a DRIE System

This is an RFQ (Request for Quote) for procurement of a DRIE system as part of a global tender for the Centre for Nano Science and Engineering (CeNSE) at IISc, Bangalore.

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 also runs a program called Indian Nanoelectronics Users Program (INUP) which has allowed 4200 participants from more than 700 universities and institutes all over India to use the facilities at CeNSE. Consequently, any tool in CeNSE receives significant exposure to scientific community at IISc and beyond. The vendors are requested to factor in the value of this exposure in to their quotes. Details of existing facilities and INUP 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/>

Also, CeNSE hosts equipment on behalf of vendors, as a national standard or 'model' system. If the vendor is interested, CeNSE can consider working out a similar arrangement for the DRIE system.

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 the 6th May 2024, 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 quotes should be CIF Bangalore, India. So please include cost of shipping.
11. Please indicate the warranty provided with the tool. Warrant of 3 years of more is preferred.
12. 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.
13. Clarify if periodic (preventive) maintenance be done by a trained on-site engineer or requires a specialist from the OEM.
14. 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.
15. 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.
16. 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.	Primary application	<ul style="list-style-type: none"> • Deep Reactive ion etching of Si substrates • Shallow etches of Silicon (<5um depth) • Must conform to some SEMI standard for ICP equipment manufacturing, e.g. SEMI SEMI E6-0914, SEMI E15-0698E2, SEMI S21-1106E, SEMI S19-0311 (Reapproved 0816), etc.
2.	Secondary application	<ul style="list-style-type: none"> • Isotropic etch of Si
3.	Process capability	<ul style="list-style-type: none"> • Through Silicon etch using BOSCH process with the minimum (CD)critical dimension(50um) for substrate thickness of 500um and above • Silicon etch >50um deep, with CD <=2um on SOI, with less or no trenching and notching(footing) • High etch rate(>15um/min) and low etch rate(<5um/min) recipes • Anisotropic etch profile i.e vertical side walls of 90° with +/- 1° variation • Shallow etch of Si(<5micorn) with high aspect ratios, please specify the aspect ratios achieved



		<ul style="list-style-type: none"> • Etch uniformity <5% with design(etch) density of 30% to 60% for same CDs and <10% for varied dimensions • CD variation of <5% after etch across 4inch wafer • Etch aspect ratio 1:50 or better for trenches from nm to micron ranges • Soft landing on thin membranes of material like SiO₂(Thermal, PECVD, LPCVD etc.,) of thickness <500nm(minimum 100nm) , of square or circular dimension of <1mm (minimum 50um) • High etch selectivity of >250 with SiO₂ mask and >200 with AZ4562 • Smooth side wall scallop/roughness <50nm for low etch rate and <300nm for high etch rates • No grass formation/micro masking on the bottom surface of the etch • Plasma dicing for die separation and etch for substrate planarization • Metal etch mask without effecting the cleanliness of the tool and standard processes(optional) • Provide detailed technical literature for the system use, such as your prior experience and technical data on etch processes and tool capabilities
4.	Process recipes	<ul style="list-style-type: none"> • Provide standard high and low etch rate recipes at the time of installation • Provision to create, edit and save minimum of 25 recipes
5.	Substrate details	<ul style="list-style-type: none"> • Processing of upto 6 inch Silicon wafers, Glass(optional) • Suitable substrate adapters to process 4 inch wafers should be available as an option • Thickness: 300um to 1000um
6.	Etch Mask	<ul style="list-style-type: none"> • SiO₂(Thermal, PECVD) • Photoresist (AZ4562) • Metals(Optional) • Please specify other possible materials and their etch selectivity
7.	Tool requirements	<ul style="list-style-type: none"> • Load lock chamber: software-controlled load and unload options • Wider matching network • The roughing vacuum pump for main chamber and load lock chamber should be dry pumps with appropriate pumping capacity. Turbomolecular pump with appropriate capacity for ensuring the required process vacuum. • Helium substrate cooling • High speed mass flow controllers



8.	Substrate temperature	<ul style="list-style-type: none"> -10 to 30°C.
9.	Power level	<ul style="list-style-type: none"> Dual HDP ICP source (upto 3kW) Radio and low frequencies wafer biasing, with pulsing possibility
10	Chuck configuration	<ul style="list-style-type: none"> Bipolar electrostatic chuck with the provision to handle 6 inch wafers Give options for the use of 4 inch wafer as well Options to be given for manual chuck as well, with the pro and cons of using the same.
11	End point detection	<ul style="list-style-type: none"> Give all the options available, itemize cost
12	Process gases lines required	<p>1.O2 2.N2 3.SF6 4. C4F8 5. He</p> <p>Two independent gas sources should be provided, centre and edge for more uniform process</p>
13	Gas Manifold	High speed digital MFC's for need to be installed. All the lines should have swagelok VCR fittings and welding if any should be orbital welding. The lines should be SS316L electro-polished suitable for corrosive and non corrosive gases used for the specific process.
14	Footprint& weight	<ul style="list-style-type: none"> The system should compatible with better than class 1000 cleanroom environment. Please specify the total foot print in cm x cm, and weight.
15	Process software	<ul style="list-style-type: none"> Front panel displaying equipment and process status along with appropriate software to be supplied. The software must allow varying levels of instrument access. A simplified basic access for a user to a full access to an engineer. Interlock that can interface with the online reservation system, so that the tools can only be used by authorized users. 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 Latest Software need and to be supported for the lifetime of the tool
16	Periodic Maintenance	<ul style="list-style-type: none"> The system should require minimal maintenance.



		<ul style="list-style-type: none"> • Mention the recommended preventive maintenance schedule for the system. Any accessories needed for periodic preventive maintenance for 3 years e.g. O-rings, should be mentioned in separately the itemized quote. • Can the preventive maintenance be done by a trained on-site engineer or requires a specialist from the OEM? If the latter, please provide cost of a 3 year AMC with required kit/consumables. • The system should be supported by a trained local representative and should have a 48hour window of response
17	Installation and Training	<ul style="list-style-type: none"> • Installation and training 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. • If periodic maintenance can be done by the on-site engineer, please include the cost of training the engineer.
18	Power& utilities	<ul style="list-style-type: none"> • The instrument should work with Indian standards • Mention the power requirement. • Mention any utility requirement (water, air, exhaust, etc.)
19	Gas abatement system	<ul style="list-style-type: none"> • Specify if any the scrubbing system is needed for treating exhaust gases from etching
20	Safety	<ul style="list-style-type: none"> • Mention any special safety requirement of the tool • The tool must come with a complement of interlocks to prevent common user errors. • Any malfunction should have an audible alarm system. • Flashing lights during emergencies should also be an option
21	Recommendation	<ul style="list-style-type: none"> • The system must submit references from atleast 3 previous installations • The names and contact addresses of the referees must be submitted with the proposal, so the purchase committee can contact them independently.
22	Pre-purchase testing	<ul style="list-style-type: none"> • To ensure the equipment conforms for specifications, the committee requires the vendor to perform some standard tests <i>before</i> the purchase process is complete. The validity of the tender will hinge on the successful and accurate measurement of these test samples. • The vendor must conclude the testing and submit the data within 1 week of receipt of samples.
23	Acceptance tests	<ul style="list-style-type: none"> • Si etch of CD<2um and depth of 50um on SOI • Through Silicon via etching of Si, CD 10um , depth 500um

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		<ul style="list-style-type: none">• Demonstrate working of all the accessories including endpoint detector
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Thanking you,

(Signature)

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