



**Center for Nano Science and Engineering
Indian Institute of Science, Bengaluru-560012**

20th April 2016

To Whom It May Concern

This is a RFQ (Request For Quote) for procurement of a Reflection High-Energy Electron Diffraction system (referred to as RHEED in the RFQ) at the Center for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bangalore. The Centre is a platform for interdisciplinary research in IISc and houses a 9000 sq. ft. characterization facility. About 50 faculty members from all over IISc are associated with it in one way or another. It is unique in the annals of IISc and in many ways is indeed unique in India.

The RHEED facility being procured through this RFQ will be part of our National Nanofabrication Center (NNFC) that supports the activities in IISc.

To the extent possible, the RHEED price should be broken up into as many individual components. This aids price comparison on commercial bids.



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Procedure:

1. Vendors will be required to submit a technical proposal and a commercial proposal in **two separate envelopes**.
2. The deadline for submission of proposals is the 10th May 2016, 5 pm. Proposals should arrive at the office of Prof.Srinivasan Raghavan, Centre for Nano Science and Engineering, Indian Institute of Science, India, 560012 by the above deadline.
3. The technical proposal should contain a compliance table that should describe your compliance in a “Yes” or “No” response against each of the items in the table listed in this RFQ. **If “No” the second column should state the extent of deviation. The “third” 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.
4. Items in addition to that listed in the technical table that you would like to bring to the attention of the committee can be listed at the end of the compliance table.
5. **Vendors are encouraged to highlight the advantages of their tools over comparable tools from the competitors.**

Technical Requirements: Please note that the requirements listed below are only guidelines. It does not disbar tools that do not meet the criteria listed. Vendors are requested to quote for tools that meet the criteria to the best extent possible and list deviations. Deviations are NOT an automatic reason for disqualification. They will be discussed by the technical committee prior to making an informed decision.



Detailed technical requirements of the RHEED system:

Center for Nano Science and Engineering, Indian Institute of Science, Bangalore, India is seeking potential sources that are capable of providing a Reflection High-Energy Electron Diffraction (RHEED) system as a part of an ultra-high vacuum (UHV) system for the purpose of determining surface structure and quality of the surface during the growth of function oxides on silicon and also on oxide on oxide epitaxy by pulsed laser deposition (PLD) system. Thickness and growth rate are monitored by the RHEED oscillations. For the study of epitaxial films, surface reconstructions need to be observed at high pressures for which a two stage differential pumping system for the electron gun is necessary. For monitoring the uniformity across the sample the ability to scan at different areas of the sample of at least 5x5 mm² is required. The deposition happens currently in on-axis geometry, but the ability to upgrade the gun to have an azimuth rotation is desired to support off-axis sample geometry. The RHEED system should also allow for the upgrade to energy filtering and in-situ electron energy loss spectroscopy measurements in future is desired.

The electron gun parameters need to be electronically controlled using the Software (SW) installed on the personal computer (PC). Beam blanking need to have the capability to synchronize with external input is desired. RHEED data acquired on the fluorescent screen need to be acquired onto a CCD and the image need to be transferred to attached software on the personal computer.

Contractors responding should specify that their equipment meets the specifications provided below and provide detailed product information to show clear technical compliance. Additionally, sales history, including recent commercial companies sold to should be included to determine commerciality.

The required specifications for the RHEED System are:

- 1) No mu-metal presence
- 2) RHEED gun parameters
 - i) Electron Energy minimum 5 keV @ 10⁻⁶ Torr and beyond, 30keV@ 100mTorr (min).
 - ii) Working/focusing distance minimum 50-60 mm @ 100mTorr
 - iii) Double differential pumping.
- 3) Gun electronics
 - (a) Deflection unit
 - (b) Power supply
 - (c) Manual Control
 - (d) Computer interface, cables, etc.
 - e) Computer control capable
 - (i) Beam rocking
 - (ii) Beam blanking
 - (iii) Beam position



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- (iv) Beam voltage, current, focus, grid voltage
 - (v) Differentially pumping control
 - f) Beam finder
- 4) Flange size minimum 55 mm desired.
- 5) RHEED screen (fluorescent screen) required with a min of 55mm screen mounted 6 inch flange along with the screen shutter.
- 6) Data Acquisition Package
- a) Digital camera (12 bit)
 - i. Resolution minimum 686 x 492 pixel
 - ii. Frame rate minimum 88 fps
 - iii. Minimum of ½ inch sensor
 - iv. Camera enclosure for 6" flange
 - b) Software functions
 - i. Real time video
 - ii. Image Capture
 - iii. Growth rate/RHEED oscillations
 - iv. Peak tracking
 - v. Background subtraction
 - vi. Prefer upgradable software requirements, with Windows 10 OS
 - vii. RHEED imaging with zoom in and out functions without flux compromising.
 - viii. Image archiving capability, storing image as well as image acquisition parameters.
 - ix. In-plane lattice spacing, in-plane coherence length determination.
 - x. External triggering capability.
- 7) Gate valve of minimum of 55 mm for the sample insertion.



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Clauses	
1	Operating system should be specified and if not Windows 10 duration of support for older versions and cost of upgrades to newer versions should be included in the commercial bid
2	Monitors should be 19” (diagonal) LCD monitors or better.
3	On all systems an annual maintenance contract should be included for the next 5 years that includes at least three maintenance visit and three emergency visits within 48 hours per year.
4	On all systems initial installation and training of up to 10 people should be included.
5	OPTION: On all systems, training for up to 20 people per year on standard specimens for 5 years should be quoted as an option.
6	On all systems, please include options currently available that can be added on in the future.
7	On all systems include standards to be used for calibration of tool parameters.
8	On all systems, cost of travel, lodging and boarding for preshipment inspection for the required number of days should be included on a per person basis.
9	On all systems the cost of shipping up to IISc should be included. IISc will help with customs clearance at Bangalore Airport. Please include your payment option. IISc would prefer to retain at least 20% of payment till instruments have been commissioned and successfully demonstrated.
10	On all systems please list a set of acceptance tests for on-site (vendor) inspection and after installation at IISc.
11	On all systems spares for up to one year should be included.
12	On all systems a set of basic tools required for performing routine maintenance. A tool cart that can be locked and that can accommodate these tools should be provided.
13	On all systems the payment terms will be specified in the commercial proposal and is subject to negotiation.
14	Please provide details of the number of trained personnel in India, number in the southern region or in Bangalore who can service the machine.

All interested contractors shall submit a response demonstrating their capabilities to produce the requested equipment to the Primary Point of Contact listed below.

Direct all questions concerning this acquisition to Prof. Srinivasan Raghavan at sraghavan@cense.iisc.ernet.in.