

Notice Inviting Quotation (E-Procurement mode)

INDIAN INSTITUTE OF TECHNOLOGY DELHI

HAUZ KHAS, NEW DELHI-110016

Dated: 21/06/2016

Open Tender Notice No.IITD/BEEN(SP-455)/2016

Indian Institute of Technology Delhi is in the process of purchasing following item(s) as per details as given as under.

Details of the item	Inert atmosphere (nitrogen/argon) glove box integrated automated cluster growth system
Earnest Money Deposit to be submitted	Rs. 6,00,000/-
Warranty	2 Years comprehensive and 1 Year warranty to be quoted separately, along with any AMC charges
Performance security	NIL

Tender Documents may be downloaded from Central Public Procurement Portal <http://eprocure.gov.in/eprocure/app> . Aspiring Bidders who have not enrolled / registered in e-procurement should enroll / register before participating through the website <http://eprocure.gov.in/eprocure/app> . The portal enrolment is free of cost. Bidders are advised to go through instructions provided at ‘Instructions for online Bid Submission ‘.

Tenderers can access tender documents on the website (For searching in the NIC site, kindly go to Tender Search option and type ‘IIT’. Thereafter, Click on “GO” button to view all IIT Delhi tenders). Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website <http://eprocure.gov.in/eprocure/app> as per the schedule given in the next page.

No manual bids will be accepted. All quotation (both Technical and Financial should be submitted in the E-procurement portal).

Note: Only emailed queries will be responded to.

Schedule

Name of Organization	Indian Institute of Technology Delhi
Tender Type (Open/Limited/EOI/Auction/Single)	Open
Tender Category (Services/Goods/works)	Goods
Type/Form of Contract (Work/Supply/ Auction/ Service/ Buy/ Empanelment/ Sell)	Buy
Product Category (Civil Works/Electrical Works/Fleet Management/ Computer Systems)	Scientific equipment
Source of Fund (Institute/Project)	Project Code RP03195
Is Multi Currency Allowed	YES: USD, INR
Date of Issue/Publishing	21/06/2016 (17:00 Hrs)
Document Download/Sale Start Date	21/06/2016 (17:00 Hrs)
Document Download/Sale End Date	19/07/2016 (17:00 Hrs)
Date for Pre-Bid Conference	None
Venue of Pre-Bid Conference	Not applicable
Last Date and Time for Uploading of Bids	19/07/2016 (17:00 Hrs)
Date and Time of Opening of Technical Bids	21/07/2016 (11:00 Hrs)
Tender Fee	Rs.NIL/- (For Tender Fee)
EMD	Rs.6,00,000/- (For EMD) (To be paid through RTGS/NEFT. IIT Delhi Bank details are as under: Name of the Bank A/C : IITD Revenue Account SBI A/C No. : 10773572622 Name of the Bank : State Bank of India, IIT Delhi, Hauz Khas, New Delhi-110016 IFSC Code : SBIN0001077 MICR Code : 110002156 Swift No. : SBININBB547 (This is mandatory that UTR Number is provided in the on-line quotation/bid. (Kindly refer to the UTR Column of the Declaration Sheet at Annexure-II)
No. of Covers (1/2/3/4)	02
Bid Validity days (180/120/90/60/30)	90 days (From last date of opening of tender)
Address for Communication	Dr. Madhusudan Singh, Department of Electrical Engineering, IIT Delhi, Hauz Khas, New Delhi, India – 110 016
Contact No.	+91-11-2659-1063
Email Address	msingh@ee.iitd.ac.in

**Chairman Purchase Committee
(Buyer Member)**

Instructions for Online Bid Submission:

As per the directives of Department of Expenditure, this tender document has been published on the Central Public Procurement Portal ([URL:http://eprocure.gov.in/eprocure/app](http://eprocure.gov.in/eprocure/app)). The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

More information useful for submitting online bids on the CPP Portal may be obtained at:

<http://eprocure.gov.in/eprocure/app>

REGISTRATION

- 1) Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal ([URL:http://eprocure.gov.in/eprocure/app](http://eprocure.gov.in/eprocure/app)) by clicking on the link “Click here to Enroll”. Enrolment on the CPP Portal is free of charge.
- 2) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
- 3) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.
- 4) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.), with their profile.
- 5) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.
- 6) Bidder then logs in to the site through the secured log-in by entering their userID / password and the password of the DSC / eToken.

SEARCHING FOR TENDER DOCUMENTS

- 1) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.
- 2) Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective ‘My Tenders’ folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
- 3) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

PREPARATION OF BIDS

- 1) Bidder should take into account any corrigendum published on the tender document before submitting their bids.
- 2) Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the

bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

- 3) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black and white option.
- 4) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use “My Space” area available to them to upload such documents. These documents may be directly submitted from the “My Space” area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

SUBMISSION OF BIDS

- 1) Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
- 2) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
- 3) Bidder has to select the payment option as “on-line” to pay the tender fee / EMD as applicable and enter details of the instrument. Whenever, EMD / Tender fees is sought, bidders need to pay the tender fee and EMD separately on-line through RTGS (Refer to Schedule, Page No.2).
- 4) A standard BoQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BoQ file, open it and complete the white colored (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected.

OR

In some cases Financial Bids can be submitted in PDF format as well (in lieu of BOQ).

- 5) The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.
- 6) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done.
- 7) The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
- 8) Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.
- 9) Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet.

ASSISTANCE TO BIDDERS

- 1) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.
- 2) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is 1800 233 7315.

General Instructions to the Bidders

- 1) The tenders will be received online through portal <http://eprocure.gov.in/eprocure/app> . In the Technical Bids, the bidders are required to upload all the documents in .pdf format.
- 2) Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through <https://eprocure.gov.in/eprocure/app>. Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site <https://eprocure.gov.in/eprocure/app> under the link “Information about DSC”.
- 3) Tenderer are advised to follow the instructions provided in the ‘Instructions to the Tenderer for the e-submission of the bids online through the Central Public Procurement Portal for e Procurement at <https://eprocure.gov.in/eprocure/app> .

**Department of Electrical Engineering,
Indian Institute of Technology
Hauz Khas, New Delhi-110 016**

NOTICE INVITING QUOTATIONS

Dated: 21/06/2016

Subject: Inert atmosphere (nitrogen/argon) glove box integrated automated cluster growth system

Invitation for Tender Offers

Indian Institute of Technology Delhi invites online Bids (Technical bid and Commercial bid) from eligible and experienced OEM (Original Equipment Manufacturer) OR OEM Authorized Dealer for supply, installation, and qualification demonstration of an **inert atmosphere (nitrogen/argon) glove box integrated automated cluster growth system** with (warranty period as stated at page #1 of this tender) on site comprehensive warranty from the date of receipt of the material as per terms & conditions specified in the tender document, which is available on CPP Portal <http://eprocure.gov.in/eprocure/app>

Every claim of compliance to the specifications should be accompanied with **quantitative evidence** of that claim, along with references in scientific data, and / or (preferably) scientific literature, that are exemplars of that claim for the specific tool you are bidding. Merely writing, “Yes” will not be sufficient, given the complexity of this tool. Compliance will be judged on the basis of the evidence you provide, and the body of literature referencing your bid tool and configuration, and not mere unsupported statements. All documentation about similar installs done at least 2 years prior to the bid by the vendor must correspond to a configuration either identical to the one required in this tender, or vastly similar, with a due list of differences noted explicitly in each case.

TECHNICAL SPECIFICATION:

Sl. No.	Technical Specifications
1.	<p><i>Base configuration:</i> The inert atmosphere glove box integrated automated cluster growth system will consist of automated thermal (multiple sources), sputter growth (multiple sources), a vacuum oven, a spin coater, integrated with multi-port glove box(es), and other growth systems (listed in optional items), that ensure that: a) when a clean substrate enters the growth chain, it is not exposed to ambient oxygen and water vapor / humidity whether or not it is inside the growth chamber(s) (in vacuum), b) multiple material thin films can be grown successively without breaking vacuum, c) exposure to any solvent vapor is contained and does not interact with samples undergoing processing in any growth systems. Thus, the spin coater must not be present in the same glove box that contains any of the vacuum growth systems. Further, the system design should include future expansion possibility so that all optional items listed in this tender document, and other unlisted growth / characterization systems (which in turn could integrate with the inert glove box cluster system via connected glove boxes) can be added later without the base system needing to be moved, dismantled, or significantly interrupted in its operation in any manner.</p> <p>The electrical and mechanical control systems should meet top industry standards, and must permit both manual and automated operation of thin film growth, and basic glove box operations. The bidder must provide detailed system, chamber(s) and component level layout diagrams, in addition to any other required information, that demonstrates that they meet every specification. The bidder must be willing to provide additional evidence in form of demonstrations as may be requested by the PFC.</p>

	<p>The bidder must submit detailed facility requirements for electrical, gas and water supplies. The bidder should provide 2 years (or greater) comprehensive warranty.</p> <p>The bidder must, in addition, provide extensive details of at least 10 prior installations done all over the world with a very similar base configuration (with a list of minor differences noted explicitly in each case), date of installation, pictures of the installed systems, how long the systems have been in use (minimum: 2 years), cleaning and regeneration protocols followed, downtime statistics for each system, reasons for any downtime (including operator error), and complete contact information of the research group and PI who can be contacted (email and phone). In addition, the bidder must provide at least 20 references (overall, and at least 2 years old) of electronic and optoelectronic device and materials-related publications in refereed internationally acclaimed journals published by reputable publishers and academic societies, with journal impact factors (IF) exceeding 7, resulting from the use of the glove box integrated cluster growth system (which must be explicitly mentioned in each of the publications).</p>
<p>2.</p>	<p><i>Growth system(s): The vendor may opt for a single chamber or dual chamber design to meet with the specifications.</i></p> <p>The growth chamber(s) should be large (minimum rectangular cross section of at least 26" x 20", or larger) with 28" height, with sliding front doors, and permit enough space for comfortable operator access through the glove boxes, and future expansion needs, and made out of a high thermal conductivity non-magnetic material such as aluminium. Removable debris shields should be provided. None of the screws or mounting mechanisms should be difficult to handle through two layers of gloves.</p> <p>The system must employ computer controlled wide voltage range sources (without any need to change wires manually to switch between operating ranges) with water cooled high current (min. 200A) feedthroughs and infinite resolution SCR power controller and 2500 VA transformer, capable of growing a wide-range of materials: organic semiconductor materials, oxides, inorganic species (besides Ga) metals like Al, Au, Ag, Mg, Ca, etc., with minimal rate accuracy of 0.01 A°/s, and a film thickness accuracy of at least 0.1A°. Specifically, in addition to the above, the vendor must demonstrate this level of accuracy for common surface dopants like CsF and LiF.</p> <p>Sputter capabilities of the growth system must include DC, reactive and RF magnetron, with programmed (and upon user choice, manual) co-deposition capability, and tilt (manually modifiable) confocal sputtering with variable working distance.</p> <p>The growth system(s) must contain a minimum of a) two high-temperature capable controlled resistive thermal deposition sources, b) one 3" circular DC sputter source, c) two 3" circular RF sputter sources. Any needed boats, graphite with BN coating, preferred, or alternately with Mo/W/Ta, should be provided, including open boats for Au, Ag, Cu, and wire filaments for alloying materials like Al and Ti (barring Ga). Each source must have full enclosure twin wall shielding to prevent cross contamination.</p> <p>The sputter system sources must be compatible with DC, pulsed DC and RF power supplies, and with a threaded clamp for quick target replacement. The base configuration must include a DC power supply (min. 1.2 kW) with ripple less than 0.02% of rated voltage at full load, and have arc, over-voltage and over-current protection. An RF filter unit to reduce feedback into the DC power supply must be provided. For the two RF sources, an RF power supply (13.56 MHz) with an automatic matching network (min 600 W) must be provided.</p> <p>Reactive sputtering must use a gas ring near the substrate to minimize contamination from debris at the gas ring, control ion energy loss, and be positioned to limit racetrack poisoning of the target, to the extent possible. The possible process gases for reactive sputtering include nitrogen, oxygen, and</p>

acetylene/methane. The system must include downstream gas pressure control with a recipe dependent software controlled pressure stabilization during operation and gas consumption. Gas mixing for mixed gas recipes must be provided using mass flow controllers and the pressure monitored using a capacitance diaphragm process gauge (up to 100 mTorr).

All sources must have individual pneumatic shutters with high quality magnetic fluid rotatory feedthroughs. A door interlock should interrupt power to the sources when the chamber door is open. The minimum distance between evaporation sources/sputter targets and substrates must not be shorter than 6" (for sputter) and 22" (for thermal resistive) to ensure optimal substrate coverage and uniformity (see spec on control system). A Z-stage linear manipulator should be provided to control the working distance. Documentation on calculated plume profiles must be provided along with actual measured data in the configuration you are bidding.

A user mountable and removable rotating (user controlled, up to 50 rpm) substrate holder must be able to accommodate at least four 1" x 1" substrates (ITO/glass, Si/SiO₂, or steel/aluminum) with a minimum size of 6" x 6", should be provided. The free form design should contain multiple screw holes sunk in an array 2 cm apart, with removable screw clips designed to hold shadow masks and substrates on to the holder when inverted for operation. A second substrate holder with easy shadow mask alignment capability (for 1"x1" substrates) obtained through a 6 x 6 pattern of grooves, and a mechanism to secure the substrate and the mask frame should be provided. A split substrate shutter with high quality magnetic fluid rotatory feedthroughs, motorized to accurately terminate growth of thin films when target thickness is met, should be included.

Two simple user designed mask frames should also be provided. The design files (DXF) for the substrate holders should be provided as a part of the system design.

The bidder must provide detailed design schematics, detailed data that attests to the specifications above, system design specifications, as well as provisioning for any additional sources listed in optional items, as well as any needed additional film growth sensors.

3. *Sensors and film thickness monitoring:* A sensors package must be provided, which will consist of easily user replaceable quartz crystal monitors mounted on shielded stages to eliminate cross-talk, and must be sufficient in number and adequately chosen in location within the chamber(s) to accomplish monitoring of the growth rates and extent of growth of thin films for each single and co-deposition conceivable in the chamber(s), without cross-talk. At least one sensor should be located next to the substrate, and monitor net film growth. Sensor construction should not allow any movement and vibration during operation to ensure accuracy of sensor calibration during all depositions. The bidder must provide data to attests to these requirements.

4. *Vacuum system:* The chamber(s) should be capable of supporting a minimum base pressure of 5e-8 Torr, or better, with automated (or manual, depending on user choice) pumping, venting and regeneration. Cryo-pump (per chamber) with pumping speed of 1500 liter/sec (or faster) with any needed compressor, He recharge adapters, etc. should be included, along with any backing pumps needed. The pump down time to a working pressure of 2e-6 Torr must not exceed 45 minutes. The bidder must provide pump down curves and data to support its claims.

The chamber(s) should provide shielded and offset viewport(s) at the substrate holder level for visual inspection of the substrate during operation, and the design must protect against material deposition that might block it. Any metal to O-ring to metal seals used for the growth chamber must be over planar surfaces (not curved). The inside surface of the chamber(s) should have a glass bead blast finish.

The chamber(s) must contain an additional sealed door at the rear that permits the movement of powder

	<p>samples directly from the lab without going through the glove box to prevent contamination and coating of surfaces in the glove box, as well as the capability to clean the chamber without crashing the glove box (by holding the chamber door(s) through positive pressure).</p> <p>The cleaning protocol for the growth chamber(s) must be clearly and individually defined, and must not involve crashing any of the glove box(es).</p>
<p>5.</p>	<p><i>Glove box specifications:</i> The glove boxes with automatic pressure control and column valves, enclosing the cluster tool must have transparent, low reflectivity Lexan windows with circular gloveports, and ambidextrous butyl gloves (with replacement blanks) capable of withstanding organic solvent (halogenated and non-halogenated) exposure. Variable speed blower (at least 60 cfm) must be provided. The inside surface must be made of non-corrosive material like SS 304 with powder coated finish. All needed roughing pumps must be provided and be run through the control system. All gas flow piping and fittings must be stainless steel. Any antechambers and load lock assembly for sample ingress and egress, or sample transfer between glove boxes should be designed for successive vent and purge cycles with the inert gas to prevent any oxygen / water vapour contamination from air. Any needed pumps must be provided and vented into the room / exhaust (and not the glove box). All large antechambers must have sliding trays and rods for easy sample transfer. All other moving or motorized parts must be external to the glove boxes to minimize particulate contamination.</p> <p>The glove boxes must use HEPA filters (0.3 um), with a leak rate < 0.05 vol%/hr (ISO 10648-2), with a single column gas purifier (copper catalyst and molecular sieve) with absorption capacity > 40 liter O₂, >1.5 kg H₂O, and activated carbon in line solvent removal (capacity >= 5 kg). The glove box and cluster design should separate spin coater and vacuum oven from the growth systems to reduce cross contamination. Each glove box port pair not addressing a growth chamber must be able to reach shelving and integrated electrical connections located at the back wall of that glove box for powering (230V, 50 Hz, 5/15A) ancillary equipment like hot plates, etc. (these ancillary equipment are not a part of the tender).</p> <p>The glove boxes must provide timed purge capability with user definable oxygen levels. Any needed gases for glove box regeneration should be clearly specified and ports should be provided for such gases. Further, regeneration cycle must be provided in software as an automated process with ability for user to manually override the steps. One free recharge of the purifier column (activated charcoal, etc.) should be provided after 3 years of use. Connection tubes for connecting purging gas and regeneration gas cylinders to the glove box should be provided (8m).</p> <p>Each glove box with an integrated space must be equipped with solvent resistant electrochemical impurity detection in the form of a) oxygen and b) water analyzers, at least. The post regeneration operating oxygen and water levels must not exceed 0.2 ppm and 0.1 ppm, respectively under ambient lab test conditions at 90% relative humidity and 35°C temperature. The impurity sensors and pressure control (with foot pedal) must be capable of user programming (with password control), provide integrated pressure and blower control on the same screen, and offer configurable audible alarms. The sensors must provide impurity data in the 0-1000 ppm range with a resolution of 0.1 ppm. The glove boxes must offer the ability to quickly isolate from external gas supply, and manual and auto purge capability. The sound level of the glove box must not exceed common industry practice.</p> <p>One additional glove box space connected proximally to each growth system (for two chamber designs, this space can be shared between both chambers) must be included for sample preparation and storage of common growth materials, with any needed slots for easy placement of substrate holder(s) while they are being loaded or unloaded, along with a 3 level height adjustable shelf. This glove box must provide the following feedthroughs: a) 4xKF40 single sided flange with clamp, centering ring and</p>

	<p>blank plate, b) 1xKF40 double sided flange with 2x BNC connectors, c) 1xKF40 double sided flange with a triax connector, d) 1xKF40 fiber optic feedthrough, 1000 um VIS fiber (transmission in 400-2100nm), e) 1xKF- 40 feedthrough with 1 USB 2.0 Type A M/M cable, 1 RJ- 45 cable, 1x9- pin D- sub RS 232 cable, 1 VGA cable all potted together (2" cable at each end).</p> <p>The glove box with spin-coater must provide the following feedthroughs: a) 4xKF40 single sided flange with clamp, centering ring and blank plate, b) 2xKF40 double sided flange with 2x BNC connectors, c) 1xKF40 fiber optic feedthrough, 1000 um VIS fiber (transmission in 400- 2100nm), d) 1xKF- 40 feedthrough with 1 USB 2.0 Type A M/M cable, 1 RJ- 45 cable, 1x9- pin D- sub RS 232 cable, 1 VGA cable all potted together (2" cable at each end).</p>
6.	<p>Size and weight limitations: Total height of the system must not exceed a) 6 feet 8 inches in shipped boxes, b) 8 feet in operation to limitations in access to and at the installation site. Owing to limitations on equipment movement on campus, no shipped item must weigh more than 700 kg, including any packaging materials or structures used (this is the maximum shipped box weight). No box must exceed (L x W x H) 3m x 2.2m x 2.2m in size. The maximum space available for the final installed cluster growth system (not counting optional and unlisted items) is 3.6m x 3.6m (including all items attached to the cluster tool or needed solely for its operation).</p>
7.	<p>Spin-coater: 8" Teflon bowl with max. substrate size of 6" with integrated chemically resistant drain. Chucks for ½", 1" and 4" substrates should be provided. Microprocessor based control, with communication port for external control. Profile storage (25 programs with 15 steps each). Rotational speed (0-9999 rpm) should be adjustable in 1 rpm increments, 0.1 second time increments and 1 second increment for dwell time (0-999 seconds). Power: 230 V, 50 Hz.</p>
8.	<p>In-situ IR annealing system: It should be possible to carry out in situ (during growth) IR annealing of the substrate at temperatures up to 500°C. The body of the chamber(s) must be made of an aluminum metal alloy with sufficiently high thermal conductivity so that the heat from sources and the substrate can be effectively dissipated while running high temperature processes without damaging seals, and additionally not lead to passive evaporation from other sources (or the substrate) while not in operation due to thermal cross-talk. The chamber must be capable of a complete bakeout. The bidder must provide thermal modeling results, and distributed heat map measurements for different in situ temperatures, especially data for temperature distribution in close proximity of inactive sources when a heated source is active. Further, needed cooling for the substrate and the chamber should be provided so that the system can be brought down to room temperature in no more than 5 hours.</p>
9.	<p>Vacuum oven: A 10" x 10" two door PID controlled vacuum oven (stainless steel construction) connected to the glove boxes, with copper substrate holder (with tapped holes), should be provided. The heating source should be IR lamp, and the chamber design should have high thermal reflectivity to ensure high efficiency. It should be accessible from within the glove box through space exposed to solvent vapours in the glove box, and also from the outside ambient, and be capable of annealing in the inert gas atmosphere, or vacuum, with a max temperature of 500°C and uniformity of 1% or better. The vacuum oven must be designed to not place additional thermal strain on the glove box through expansion of inert gas or thermal conductive heating of the metal, through efficient trace heat dissipation during operation (maximum external temperature should be 50°C or less). The operational protocol for ramp up and ramp down times for every representative temperature should be specified for in glove box, and out of glove box operation.</p>
10.	<p>Control system and software: The control system should be PLC-based and its software front end should be user-friendly (running, a minimum of Windows 7). This control system must be used for all growth functions, and offer complete process integration between mechanical/vacuum and deposition components of the system. The system must provide autotune for PID parameters, in-process idle steps for sources, and temperature stabilization functions.</p> <p>The deposition controller should accept inputs from the sensor package, and thermocouples, and</p>

provide rate uniformity of 0.1 A°/sec or better. Auto-tuning of temperature and thickness control loops should be possible by a suitably trained user. The distribution of power controllers and sensors should enable co-deposition so that multiple materials (at least 4) can be programmed (or manually upon user choice) to be grown in a ratio-ed manner. The user should be able to select computer controlled ratio-ed growth for pairs of materials (in case of 4 source co-deposition) with manual control for two of the sources. A thickness uniformity of +/- 3% or better (for thermal and sputter growth) should be provided over 100 cm² area. Rate stability must be 20% or better for rate of 0.02 A°/s, and 2.5% or better for 0.2 A°/s. In case of co-deps, maximal doping ratios must be 100:1 or better for a 2A°/s host growth rate.

The bidder should provide any relevant control system firmware and software updates for the entire lifecycle of the tool. Diagnostic capabilities of the tool should include capacity for offsite help and access upon user authorization (IIT Delhi follows a complex authenticated proxy-based networking system) over a secure https port (443) for any needed debugging and log analysis. It should provide separate logins for each user (with a shared growth recipe namespace), in addition to superuser privileges to one specified user. The control system must implement all safety interlocks and alarms needed for safe and efficient operation of the cluster tool. Any log files should be in ASCII text, separately for each recipe, and be comprehensible by a user with basic computer literacy. Any call-home behavior of the software should be user configurable. The system should maintain automated rolling backups of saved recipes, as well as complete data logs of all runs with process values.

The software must support an infinite number of user-defined recipes for materials, and contain all needed material parameters for common growth items such as organics, inorganic non-metals and metals. The software must be capable of automated growth with user specified PID parameters, and be capable of doing unattended “last layer” growth, upon which the system would power off sources/targets and leave the chamber in a pumped down state. The growth recipe must provide pre-bake, ramp up, bake, dwell, growth, ramp down steps in synchronization with needed shutter operations.

The software should be capable of understanding real-time power outage data provided by laboratory UPS systems (voltages available: 220 V single phase, 380 V 3 phase/60A) over SNMP, and take remedial measures assuming a safe shut down time of 5 minutes on backup power.

Any needed computer (with monitor + keyboard with mouse) on a swivel stand (requiring no separate table) should be provided with the tool along with a detailed user manual along with detailed electrical and mechanical technical diagrams. A copy of all control software should be provided separately, along with a cloned hard drive containing all the initial settings, which can be swapped in as need arises to provide a clean starting point. The software must provide a factory reset capability in protected storage so that a clean starting state can be rapidly obtained.

The entire system must provide one (preferably) or more large prominent emergency stop button for rapid shutdown of all operations, that is easily accessible from all parts of the chain. Such a shutdown should trigger a sequence that ensures survivability of the system and is non-destructive (beyond a maximum of possible fuse blowouts).

- 11. *Tools and spare-parts:*** One complete set of all the tools needed for servicing of the tool and all its components should be provided. Spare parts (in addition to the items in the initial install) must include: a) 1 set of spare O rings for each vacuum feedthrough, b) 3 spare O-rings each for the main and rear door seals, c) 1 set each for any SwageLok fittings along with specifications, d) 1 replacement vacuum gauge filament for each item, e) 1 spare substrate heater filament/lamp, f) 2 spare fuse kits, g) spare debris shields with screws to secure them, h) 1 spare set of gloves for each circular port, and g) any copper/brass gaskets. In addition, one set of recommended lubricants for the system should be

	included.
12.	Training and maintenance: Besides installation and system startup, bidder must provide a) initial training to 3 persons during the installation in all essential functions and features, b) training for upkeep maintenance to the same persons, along with an SOP, c) similar training as in a) and b) for a maximum of 2 people on every subsequent site visit, and d) lifetime phone and email support for the tool after installation. Bidder accepts that its service engineers will be provided food and lodging on IIT Delhi campus at one of the guesthouses on every visit, if needed.

Sl. No.	List of optional items
1.	Magnetically coupled linear transfer arm(s): This should be provided as an option for mask exchange for each growth chamber (to enable change of masks without breaking vacuum), and standoff storage for at least 3 mask frames in vacuum (attached to the side of the chamber).
2.	Sputter targets: Any / all of sputter targets (3") for Al, Cr, Cu, Fe, SiO ₂ , Ti, W with any needed backing plates (priced individually). Any information regarding preferred vendor for follow-on purchases should be provided.
3.	Crucibles: (All 2 cc) 15 alumina crucibles, 10 alumina crucibles with graphite lining, 10 W/Mo/Ta crucibles, and 5 quartz crucibles should be provided, along with needed vendor information for follow-on purchases.
4.	Atomic layer deposition system: An plasma enhanced (300W ICP) ALD tool capable of growing oxides of Hf, Ta, V, Ti and Al, and GaN (minimum 8 precursor valves) with monolayer resolution must be integrated into a two port glove box with the following specifications: a) Should be able to handle substrate sizes up to 150 mm, b) dual zone reactor (substrate temperature of 25-300C with +/- 1°C uniformity), c) ozone generator and exhaust abatement system, d) two heated bottles and inert gas assist for low vapor pressure precursors, with easy bottle swap out, e) better than 1% (on wafer) and 2% from batch to batch uniformity for Al ₂ O ₃ , f) PC and user recipe controlled (the needed computer /monitor /keyboard /mouse and software should be included), g) the layout must use a side mounted geometry or a bottom mounted geometry to free up the glove box for sample preparation and storage.
5.	Pulsed DC power supply: A pulsed DC power supply capable of running in DC/pulsed DC modes, with low arc energy and synchronous pulsing capability. Maximum frequency will be 100 kHz with a max 2.5 A of current. The bidder must provide documentation of prior experience with, and results of, integration with the base system.
6.	Variable or glancing angle deposition stage: Tilt (+/- 95°) and rotation (0-40 rpm) capability with full software servomotor control eucentric about the center of front of substrate (minimum 150 mm). User defined recipes for patterns: a) zig-zag, b) square/logarithmic spiral, c) tree root growth, with capacity for customization. Coverage over the entire area should be optimized. The bidder must provide documentation of prior experience with, and results of, integration with the base system. A ferrofluidic hollow rotatory arm should be used for any rotational movements (no O ring) to prevent particulate generation under heavy use.
7.	Programmable spray coating system: The spray coating system (standalone part of the cluster tool) should be able to spray liquid-based fine mist with minimum track size no larger than 1 mm, and be uniform over an area of at least 300 mm x 300 mm using an ultrasonic nozzle. The repeatability should be at least 25 um, and resolution of 20 um, or better. The tool must have at least 48 digital and 4 analog I/Os which should be programmable easily with user defined pattern using supplied software and include any needed control computers. The bidder must provide documentation of prior experience with, and results of, integration with the base system.
8.	Low temperature thermal sources: One RADAK/LTE style effusion cell with minimum 2 cc volume, capable of growing oxide materials, and organic semiconductors. Temperature uniformity must within +/- 1K, and bidder must demonstrate that organic dyes can be grown without catastrophic rise in

	growth rate with small changes in power. Maximum growth temperature must be 1500°C. Crucible power supply must be shaped to provide uniformity of heating, and to prevent cracking of the source under normal operation. High purity alumina or PBN sources should be included. The bidder must provide documentation of prior experience with, and results of, integration with the base system.
9.	<i>E-beam metallization source:</i> One multi-pocket (6) e-beam source (7cc) with a recipe controlled automated crucible indexer and integrated mirror for pocket viewing. The source should be programmable with a 2-axis sweep controller, with storage of at least 8 sweep patterns with user-defined center and sweep limits permitting automated layer to layer sweep pattern selection in an automated recipe definable by a user prior to growth. Sweep patterns must include user selectable ramp and harmonic waveforms. The bidder must provide documentation of prior experience with, and results of, integration with the base system.
10.	<i>Material printer:</i> Material printer (aqueous, solvent, acidic or basic inks) as a standalone part of the cluster tool with the following specifications: a) capacity for single user fillable piezo-based heated inkjet cartridge with at least 16 nozzles, b) flat substrate on vacuum platen with at least 210 mm x 260 mm area, c) adjustable substrate temperature (up to 50°C), d) Repeatability of 25 um or better, e) camera for substrate alignment, and measurement, f) drop jetting observation system and cartridge cleaning, f) computer system for user recipes and patterns.
11.	<i>Material printer (integrated):</i> Material printer (same as above) but integrated completely into the growth system (inside glove box). The bidder must provide documentation of prior experience with, and results of, integration with the base system.
12.	<i>Vacuum and gas feedthroughs:</i> Vacuum and gas feedthroughs (1/4") for the sample preparation glove box.
13.	<i>Antistatic protection:</i> Antistatic protection should be provided for all glove boxes (priced individually).
14.	<i>Chiller and recirculation system:</i> Any needed chiller (common for glove box circulator and growth systems) and recirculation system for a tank of DI water. The specifications of the needed chiller should be provided by the vendor if this option is not chosen. The bidder must provide documentation of prior experience with, and results of, integration with the base system.
15.	<i>Turbo molecular pump:</i> (Instead of the cryopump), a suitable turbo molecular pump system (with pumping speed of app. 950l/s which can work in economode) and backed by a rotary pump/dry scroll pump with capacity>16CFM.
16.	<i>Warranty:</i> 1 Year warranty to be quoted separately, along with any AMC charges for additional years.

A complete set of tender documents* may be Download by prospective bidder free of cost from the website <http://eprocure.gov.in/eprocure/app>. Bidder has to make payment of requisite fees (i.e. Tender fees (if any) and EMD) online through RTGS/NEFT only.

Terms & Conditions Details

Sl. No.	Specification
1.	Due date: The tender has to be submitted on-line before the due date. The offers received after the due date and time will not be considered. No manual bids will be considered.
2.	Preparation of Bids: The offer/bid should be submitted in two bid systems (i.e.) Technical bid and financial bid. The technical bid should consist of all technical details along with commercial terms and conditions. Financial bid should indicate item wise price for the items mentioned in the technical bid in the given format Financial Bids to be submitted in PDF format. The Technical bid and the financial bid should be submitted Online.
3.	EMD (if applicable): The tenderer should submit an EMD amount through RTGS/NEFT. The Technical Bid without EMD would be considered as UNRESPONSIVE and will not be accepted. The EMD will be refunded without any interest to the unsuccessful bidders after the award of contract. Refer to Schedule (at page 1 of this document) for its actual place of submission.
4.	Refund of EMD: The EMD will be returned to unsuccessful Tenderer only after the Tenders are finalized. In case of successful Tenderer, it will be retained till the successful and complete installation of the equipment.
5.	Opening of the tender: The online bid will be opened by a committee duly constituted for this purpose. Online bids (complete in all respect) received along with EMD (if any) will be opened as mentioned at “Annexure: Schedule” in presence of bidders representative if available. Only one representative will be allowed to participate in the tender opening. Bid received without EMD (if present) will be rejected straight way. The technical bid will be opened online first and it will be examined by a technical committee (as per specification and requirement). The financial offer/bid will be opened only for the offer/bid which technically meets all requirements as per the specification, and will be opened in the presence of the vendor’s representatives subsequently for further evaluation. The bidders if interested may participate on the tender opening Date and Time. The bidder should produce authorization letter from their company to participate in the tender opening.
6.	Acceptance/ Rejection of bids: The Committee reserves the right to reject any or all offers without assigning any reason.
7.	Pre-qualification criteria: (i) Bidders should be the manufacturer / authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) on the same and specific to the tender should be enclosed. (ii) An undertaking from the OEM is required stating that they would facilitate the bidder on a regular basis with technology/product updates and extend support for the warranty as well. (Ref. Annexure-II) (iii) OEM should be internationally reputed Branded Company. (iv) Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradiction between bidder specification and supporting documents etc. may lead to rejection of the bid. (v) In the tender, either the Indian agent on behalf of the Principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for the same item/product in the same tender. (vi) If an agent submits bid on behalf of the Principal/OEM, the same agent shall not submit a bid on behalf of another Principal/OEM in the same tender for the same item/product.
8.	Performance Security: The supplier shall require to submit the performance security in the form of irrevocable bank guarantee issued by any Indian Nationalized Bank for an amount which is stated at page #1 of the tender document within 21 days from the date of receipt of the purchase order/LC and should be kept valid for a period of 60 days beyond the date of completion of warranty period.
9.	Force Majeure: The Supplier shall not be liable for forfeiture of its performance security,

	<p>liquidated damages or termination for default, if and to the extent that, it's delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.</p> <ul style="list-style-type: none"> ● For purposes of this Clause, "Force Majeure" means an event beyond the control of the Supplier and not involving the Supplier's fault or negligence and not foreseeable. Such events may include, but are not limited to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes. ● If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such conditions and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.
10.	Risk Purchase Clause: In event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from the other source on the total risk of the supplier under risk purchase clause.
11.	Packing Instructions: Each package will be marked on three sides with proper paint/indelible ink, the following: <ol style="list-style-type: none"> i. Item Nomenclature ii. Order/Contract No. iii. Country of Origin of Goods iv. Supplier's Name and Address v. Consignee details vi. Packing list reference number
12.	Delivery and Documents: Delivery of the goods should be made within a maximum of 08 to 16 weeks from the date of placement of purchase order and the opening of LC. Within 24 hours of shipment, the supplier shall notify the purchaser and the insurance company by cable/telex/fax/e mail the full details of the shipment including contract number, railway receipt number/ AAP etc. and date, description of goods, quantity, name of the consignee, invoice etc. The supplier shall mail the following documents to the purchaser with a copy to the insurance company: <ol style="list-style-type: none"> 1. 4 Copies of the Supplier invoice showing contract number, goods' description, quantity 2. unit price, total amount; 3. Insurance Certificate if applicable; 4. Manufacturer's/Supplier's warranty certificate; 5. Inspection Certificate issued by the nominated inspection agency, if any 6. Supplier's factory inspection report; and 7. Certificate of Origin (if possible by the beneficiary); 8. Two copies of the packing list identifying the contents of each package. 9. The above documents should be received by the Purchaser before arrival of the Goods (except where the Goods have been delivered directly to the Consignee with all documents) and, if not received, the Supplier will be responsible for any consequent expenses.
13.	Delayed delivery: If the delivery is not made within the due date for any reason, the Committee will have the right to impose penalty 1% per week and the maximum deduction is 10% of the contract value / price.
14.	Prices: The price should be quoted in net per unit (after breakup) and must include all packing and delivery charges. The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. However the percentage of taxes & duties shall be clearly indicated. The price should be quoted without custom duty and excise duty, since IIT Delhi is exempted from payment of Excise Duty and is eligible for concessional rate of custom duty. Necessary

	<p>certificate will be issued on demand.</p> <p>In case of imports, the price should be quoted on FOB Basis only. Under special circumstances (eg. perishable chemicals), when the item is imported on CIF/CIP, please indicate CIF/CIP charges separately upto IIT Delhi indicating the mode of shipment. IIT Delhi will make necessary arrangements for the clearance of imported goods at the Airport/Seaport. Hence the price should not include the above charges.</p>
15.	<p>Notices: For the purpose of all notices, the following shall be the address of the Purchaser and Supplier.</p> <p>Purchaser: Dr. Madhusudan Singh, Department of Electrical Engineering, Indian Institute of Technology Hauz Khas, New Delhi - 110016.</p> <p>Supplier: (To be filled in by the supplier) (All supplier's should submit its supplies information as per Annexure-II).</p> <p>_____</p> <p>_____</p>
16.	<p>Progress of Supply: Wherever applicable, supplier shall regularly intimate progress of supply, in writing, to the Purchaser as under:</p> <ol style="list-style-type: none"> 1. Quantity offered for inspection and date; 2. Quantity accepted/rejected by inspecting agency and date; 3. Quantity dispatched/delivered to consignees and date; 4. Quantity where incidental services have been satisfactorily completed with date; 5. Quantity where rectification/repair/replacement effected/completed on receipt of any communication from consignee/Purchaser with date; 6. Date of completion of entire Contract including incidental services, if any; and 7. Date of receipt of entire payments under the Contract (In case of stage-wise inspection, details required may also be specified).
17.	<p>Inspection and Tests: Inspection and tests prior to shipment of Goods and at final acceptance are as follows:</p> <ul style="list-style-type: none"> • After the goods are manufactured and assembled, inspection and testing of the goods shall be carried out at the supplier's plant by the supplier, prior to shipment to check whether the goods are in conformity with the technical specifications attached to the purchase order. Manufacturer's test certificate with data sheet shall be issued to this effect and submitted along with the delivery documents. The purchaser shall be present at the supplier's premises during such inspection and testing if need is felt. The location where the inspection is required to be conducted should be clearly indicated. The supplier shall inform the purchaser about the site preparation, if any, needed for installation of the goods at the purchaser's site at the time of submission of order acceptance. • The acceptance test will be conducted by the Purchaser, their consultant or other such person nominated by the Purchaser at its option after the equipment is installed at purchaser's site in the presence of supplier's representatives. The acceptance will involve trouble free operation and ascertaining conformity with the ordered specifications and quality. There shall not be any additional charges for carrying out acceptance test. No malfunction, partial or complete failure of any part of the equipment is expected to occur. The Supplier shall maintain necessary log in respect of the result of the test to establish to the entire satisfaction of the Purchaser, the successful completion of the test specified. • In the event of the ordered item failing to pass the acceptance test, a period not exceeding one weeks will be given to rectify the defects and clear the acceptance test, failing which the

	<p>Purchaser reserve the right to get the equipment replaced by the Supplier at no extra cost to the Purchaser.</p> <ul style="list-style-type: none"> • Successful conduct and conclusion of the acceptance test for the installed goods and equipment shall also be the responsibility and at the cost of the Supplier.
18.	<p>Resolution of Disputes: The dispute resolution mechanism to be applied pursuant shall be as follows:</p> <ul style="list-style-type: none"> • In case of Dispute or difference arising between the Purchaser and a domestic supplier relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Indian Arbitration & Conciliation Act, 1996, the rules there under and any statutory modifications or re-enactments thereof shall apply to the arbitration proceedings. The dispute shall be referred to the Director, Indian Institute of Technology (IIT) Delhi and if he is unable or unwilling to act, to the sole arbitration of some other person appointed by him willing to act as such Arbitrator. The award of the arbitrator so appointed shall be final, conclusive and binding on all parties to this order. • In the case of a dispute between the purchaser and a Foreign Supplier, the dispute shall be settled by arbitration in accordance with provision of sub-clause (a) above. But if this is not acceptable to the supplier then the dispute shall be settled in accordance with provisions of UNCITRAL (United Nations Commission on International Trade Law) Arbitration Rules. • The venue of the arbitration shall be the place from where the order is issued.
19.	<p>Applicable Law: The place of jurisdiction would be New Delhi (Delhi) INDIA.</p>
20.	<p>Right to Use Defective Goods If after delivery, acceptance and installation and within the guarantee and warranty period, the operation or use of the goods proves to be unsatisfactory, the Purchaser shall have the right to continue to operate or use such goods until rectifications of defects, errors or omissions by repair or by partial or complete replacement is made without interfering with the Purchaser's operation.</p>
21.	<p>Supplier Integrity The Supplier is responsible for and obliged to conduct all contracted activities in accordance with the Contract using state of the art methods and economic principles and exercising all means available to achieve the performance specified in the contract.</p>
22.	<p>Training The Supplier is required to provide training to the designated Purchaser's technical and end user personnel to enable them to effectively operate the total equipment.</p>
23.	<p>Installation & Demonstration The supplier is required to done the installation and demonstration of the equipment within one month of the arrival of materials at the IITD site of installation, otherwise the penalty clause will be the same as per the supply of materials.</p> <p>In case of any mishappening/damage to equipment and supplies during the carriage of supplies from the origin of equipment to the installation site, the supplier has to replace it with new equipment/supplies immediately at his own risk. Supplier will settle his claim with the insurance company as per his convenience. IITD will not be liable to any type of losses in any form.</p>
24.	<p>Insurance: For delivery of goods at the purchaser's premises, the insurance shall be obtained by the supplier in an amount equal to 110% of the value of the goods from "warehouse to warehouse" (final destinations) on "All Risks" basis including War Risks and Strikes. The insurance shall be valid for a period of not less than 3 months after installation and commissioning. In case of orders placed on FOB/FCA basis, the purchaser shall arrange Insurance. If orders placed on CIF/CIP basis, the insurance should be up to IIT Delhi.</p>
25.	<p>Incidental services: The incidental services also include:</p> <ul style="list-style-type: none"> • Furnishing of 01 set of detailed operations & maintenance manual.

	<ul style="list-style-type: none"> ● Arranging the shifting/moving of the item to their location of final installation within IITD premises at the cost of Supplier through their Indian representatives.
26.	<p>Warranty:</p> <p>(i) Warranty period shall be (as stated at page #2 of this tender) from date of installation of Goods at the IITD site of installation. The Supplier shall, in addition, comply with the performance and/or consumption guarantees specified under the contract. If for reasons attributable to the Supplier, these guarantees are not attained in whole or in part, the Supplier shall at its discretion make such changes, modifications, and/or additions to the Goods or any part thereof as may be necessary in order to attain the contractual guarantees specified in the Contract at its own cost and expense and to carry out further performance tests. The warranty should be comprehensive on site.</p> <p>(ii) The Purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty. Upon receipt of such notice, the Supplier shall immediately within in 02 days arrange to repair or replace the defective goods or parts thereof free of cost at the ultimate destination. The Supplier shall take over the replaced parts/goods at the time of their replacement. No claim whatsoever shall lie on the Purchaser for the replaced parts/goods thereafter. The period for correction of defects in the warranty period is 02 days. If the supplier having been notified fails to remedy the defects within 02 days, the purchaser may proceed to take such remedial action as may be necessary, at the supplier's risk and expenses and without prejudice to any other rights, which the purchaser may have against the supplier under the contract.</p> <p>(iii) The warranty period should be clearly mentioned. The maintenance charges (AMC) under different schemes after the expiry of the warranty should also be mentioned. The comprehensive warranty will commence from the date of the satisfactory installation/commissioning of the equipment against the defect of any manufacturing, workmanship and poor quality of the components.</p> <p>(iv) After the warranty period is over, Annual Maintenance Contract (AMC)/Comprehensive Maintenance Contract (CMC) up to next two years should be started. The AMC/CMC charges will not be included in computing the total cost of the equipment.</p>
27.	<p>Governing Language</p> <p>The contract shall be written in English language. English language version of the Contract shall govern its interpretation. All correspondence and other documents pertaining to the Contract, which are exchanged by the parties, shall be written in the same language.</p>
28.	<p>Applicable Law</p> <p>The Contract shall be interpreted in accordance with the laws of the Union of India and all disputes shall be subject to place of jurisdiction.</p>
29.	<p>Notices</p> <ul style="list-style-type: none"> ● Any notice given by one party to the other pursuant to this contract/order shall be sent to the other party in writing or by cable, telex, FAX or e mail and confirmed in writing to the other party's address. ● A notice shall be effective when delivered or on the notice's effective date, whichever is later.
30.	<p>Taxes</p> <p>Suppliers shall be entirely responsible for all taxes, duties, license fees, octroi, road permits, etc., incurred until delivery of the contracted Goods to the Purchaser. However, VAT in respect of the transaction between the Purchaser and the Supplier shall be payable extra, if so stipulated in the order.</p>
31.	<p>Duties</p> <p>IIT Delhi is exempted from paying custom duty under notification No.51/96 (partially or full) and</p>

	<p>necessary “Custom Duty Exemption Certificate” can be issued after providing following information and Custom Duty Exemption Certificate will be issued to the shipment in the name of the Institute, no certificate will be issued to third party:</p> <p>a) Shipping details i.e. Master Airway Bill No. and House Airway No. (if exists) b) Forwarder details i.e. Name, Contact No., etc.</p> <p>IIT Delhi is exempted from paying Excise Duty and necessary Excise Duty Exemption Certificate will be provided for which following information are required.</p> <p>b) Quotation with details of Basic Price, Rate, Tax & Amount on which ED is applicable c) Supply Order Copy d) Proforma-Invoice Copy.</p>
32.	<p>Agency Commission: Agency commission if any will be paid to the Indian agent in Rupees on receipt of the equipment and after satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in Tender even in case of Nil commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent.</p>
33.	<p>Payment:</p> <p>(i) For imported items Payment will be made through irrevocable Letter of Credit (LC). Letter of Credit (LC) will be established in favour of foreign Supplier after the submission of performance security. The letter of credit (LC) will be established on the exchange rates as applicable on the date of establishment. For Imports, LC will be opened for 100% FOB/CIF value. 80% of the LC amount shall be released on presentation of complete and clear shipping documents and 20% of the LC amount shall be released after the installation and demonstration of the equipment at the INST site of installation in faultless working condition for period of 60 days from the date of the satisfactory installation and subject to the production of unconditional performance bank guarantee as specified in Clause 8 of tender terms and conditions.</p> <p>(ii) For Indigenous supplies, 100% payment shall be made by the Purchaser against delivery, inspection, successful installation, commissioning and acceptance of the equipment at IITD in good condition and to the entire satisfaction of the Purchaser and on production of unconditional performance bank guarantee as specified in Clause 9 of tender terms and conditions.</p> <p>(iii) Indian Agency commission (IAC), if any shall be paid after satisfactory installation & commissioning of the goods at the destination at the exchange rate prevailing on the date of negotiation of LC documents, subject to DGS&D registration for restricted items.</p> <p>(iv) All the bank charges within India will be borne by the Institute and outside India will be borne by the Supplier.</p>
34.	<p>User list: Brochure detailing technical specifications and performance, list of industrial and educational establishments where the items enquired have been supplied must be provided. (Ref. Annexure-III)</p>
35.	<p>Manuals and Drawings</p> <p>(i) Before the goods and equipment are taken over by the Purchaser, the Supplier shall supply operation and maintenance manuals. These shall be in such details as will enable the Purchaser to operate, maintain, adjust and repair all parts of the works as stated in the specifications.</p> <p>(ii) The Manuals shall be in the ruling language (English) in such form and numbers as stated in the contract.</p> <p>(iii) Unless and otherwise agreed, the goods equipment shall not be considered to be completed for the purposes of taking over until such manuals and drawing have been supplied to the Purchaser.</p>
36.	<p>Application Specialist: The Tenderer should mention in the Techno-Commercial bid the</p>

	availability and names of Application Specialist and Service Engineers in the nearest regional office. (Ref. to Annexure-III)
37.	<p>Site Preparation: The supplier shall inform to the Institute about the site preparation, if any, needed for the installation of equipment, immediately after the receipt of the purchase order. The supplier must provide complete details regarding space and all the other infrastructural requirements needed for the equipment, which the Institute should arrange before the arrival of the equipment to ensure its timely installation and smooth operation thereafter.</p> <p>The supplier shall visit the Institute and see the site where the equipment is to be installed and may offer his advice and render assistance to the Institute in the preparation of the site and other pre-installation requirements.</p>
38.	<p>Spare Parts</p> <p>The Supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the Supplier:</p> <ul style="list-style-type: none"> ii. Such spare parts as the Purchaser may elect to purchase from the Supplier, providing that this election shall not relieve the Supplier of any warranty obligations under the Contract; and iii. In the event of termination of production of the spare parts: iv. Advance notification to the Purchaser of the pending termination, in sufficient time to permit the Purchaser to procure needed requirements; and v. Following such termination, furnishing at no cost to the Purchaser, the blueprints, drawings and specifications of the spare parts, if requested. <p>Supplier shall carry sufficient inventories to assure ex-stock supply of consumable spares for the Goods, such as gaskets, plugs, washers, belts etc. Other spare parts and components shall be supplied as promptly as possible but in any case within six months of placement of order.</p>
39.	<p>Defective Equipment: If any of the equipment supplied by the Tenderer is found to be substandard, refurbished, un-merchantable or not in accordance with the description/specification or otherwise faulty, the committee will have the right to reject the equipment or its part. The prices of such equipment shall be refunded by the Tenderer with 18% interest if such payments for such equipment have already been made. All damaged or unapproved goods shall be returned at suppliers cost and risk and the incidental expenses incurred thereon shall be recovered from the supplier. Defective part in equipment, if found before installation and/or during warranty period, shall be replaced within 45 days on receipt of the intimation from this office at the cost and risk of supplier including all other charges. In case supplier fails to replace above item as per above terms & conditions, IIT Delhi may consider "Banning" the supplier.</p>
40.	<p>Termination for Default</p> <p>The Purchaser may, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Supplier, terminate the Contract in whole or part:</p> <ul style="list-style-type: none"> i. If the Supplier fails to deliver any or all of the Goods within the period(s) specified in the order, or within any extension thereof granted by the Purchaser; or ii If the Supplier fails to perform any other obligation(s) under the Contract. iii If the Supplier, in the judgment of the Purchaser has engaged in corrupt or fraudulent practices in competing for or in executing the Contract. <ul style="list-style-type: none"> ● For the purpose of this Clause: <ul style="list-style-type: none"> i. “Corrupt practice” means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution. ii. “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition;”

	<ul style="list-style-type: none"> ● In the event the Purchaser terminates the Contract in whole or in part, the Purchaser may procure, upon such terms and in such manner, as it deems appropriate, Goods or Services similar to those undelivered, and the Supplier shall be liable to the Purchaser for any excess costs for such similar Goods or Services. However, the Supplier shall continue the performance of the Contract to the extent not terminated.
41.	Shifting: After 1-2 years once our new Academic Block will be ready, the supplier has to shift and reinstall the instrument free of cost (if required).
42.	Downtime: During the warranty period not more than 5% downtime will be permissible. For every day exceeding permissible downtime, penalty of 1/365 of the 5% FOB value will be imposed. Downtime will be counted from the date and time of the filing of complaint with in the business hours.
43.	Training of Personnel: The supplier shall be required to undertake to provide the technical training to the personnel involved in the use of the equipment at the Institute premises, immediately after completing the installation of the equipment for a minimum period of one week at the supplier's cost.
44.	Disputes and Jurisdiction: Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within New Delhi.
45.	Compliance certificate: This certificate must be provided indicating conformity to the technical specifications. (Annexure-I)
46.	“In case of CIF/CIP shipments, kindly provide the shipment information at least 2 days in advance before landing the shipment along with the documents i.e. invoice, packing list, forwarder Name, address, contact No. in India to save demurrage charges (imposed by Indian Customs) . Otherwise these charges will be recovered from the supplier/Indian Agent.”

COMPLIANCE SHEET

Every claim of compliance to the specifications should be accompanied with **quantitative evidence** of that claim, along with references in scientific data, and / or (preferably) scientific literature, that are exemplars of that claim for the specific tool you are bidding. Merely writing, “Yes” will not be sufficient, given the complexity of this tool. Compliance will be judged on the basis of the evidence you provide, and the body of literature referencing your bid tool and configuration, and not mere unsupported statements. All documentation about similar installs done at least 2 years prior to the bid by the vendor must correspond to a configuration either identical to the one required in this tender, or vastly similar, with a due list of differences noted explicitly in each case.

TECHNICAL SPECIFICATION

Sl. No.	Technical Specifications	Compliance Y/N	Evidence Enclosed Y/N
1.	<p>Base configuration: The inert atmosphere glove box integrated automated cluster growth system will consist of automated thermal (multiple sources), sputter growth (multiple sources), a vacuum oven, a spin coater, integrated with multi-port glove box(es), and other growth systems (listed in optional items), that ensure that: a) when a clean substrate enters the growth chain, it is not exposed to ambient oxygen and water vapor / humidity whether or not it is inside the growth chamber(s) (in vacuum), b) multiple material thin films can be grown successively without breaking vacuum, c) exposure to any solvent vapor is contained and does not interact with samples undergoing processing in any growth systems. Thus, the spin coater must not be present in the same glove box that contains any of the vacuum growth systems. Further, the system design should include future expansion possibility so that all optional items listed in this tender document, and other unlisted growth / characterization systems (which in turn could integrate with the inert glove box cluster system via connected glove boxes) can be added later without the base system needing to be moved, dismantled, or significantly interrupted in its operation in any manner.</p> <p>The electrical and mechanical control systems should meet top industry standards, and must permit both manual and automated operation of thin film growth, and basic glove box operations. The bidder must provide detailed system, chamber(s) and component level layout diagrams, in addition to any other required information, that demonstrates that they meet every specification. The bidder must be willing to provide additional evidence in form of demonstrations as may be requested by the PFC.</p> <p>The bidder must submit detailed facility requirements for electrical, gas and water supplies. The bidder should provide 2 years (or greater) comprehensive warranty.</p> <p>The bidder must, in addition, provide extensive details of at least 10 prior installations done all over the world with a very similar base configuration (with a list of minor differences noted explicitly in each case), date of installation, pictures of the installed systems, how long the systems have been in use (minimum: 2 years), cleaning and regeneration</p>		

	<p>protocols followed, downtime statistics for each system, reasons for any downtime (including operator error), and complete contact information of the research group and PI who can be contacted (email and phone). In addition, the bidder must provide at least 20 references (overall, and at least 2 years old) of electronic and optoelectronic device and materials-related publications in refereed internationally acclaimed journals published by reputable publishers and academic societies, with journal impact factors (IF) exceeding 7, resulting from the use of the glove box integrated cluster growth system (which must be explicitly mentioned in each of the publications).</p>		
<p>2.</p>	<p><i>Growth system(s): The vendor may opt for a single chamber or dual chamber design to meet with the specifications.</i></p> <p>The growth chamber(s) should be large (minimum rectangular cross section of at least 26" x 20", or larger) with 28" height, with sliding front doors, and permit enough space for comfortable operator access through the glove boxes, and future expansion needs, and made out of a high thermal conductivity non-magnetic material such as aluminium. Removable debris shields should be provided. None of the screws or mounting mechanisms should be difficult to handle through two layers of gloves.</p> <p>The system must employ computer controlled wide voltage range sources (without any need to change wires manually to switch between operating ranges) with water cooled high current (min. 200A) feedthroughs and infinite resolution SCR power controller and 2500 VA transformer, capable of growing a wide-range of materials: organic semiconductor materials, oxides, inorganic species (besides Ga) metals like Al, Au, Ag, Mg, Ca, etc., with minimal rate accuracy of 0.01 Å/s, and a film thickness accuracy of at least 0.1Å. Specifically, in addition to the above, the vendor must demonstrate this level of accuracy for common surface dopants like CsF and LiF.</p> <p>Sputter capabilities of the growth system must include DC, reactive and RF magnetron, with programmed (and upon user choice, manual) co-deposition capability, and tilt (manually modifiable) confocal sputtering with variable working distance.</p> <p>The growth system(s) must contain a minimum of a) two high-temperature capable controlled resistive thermal deposition sources, b) one 3" circular DC sputter source, c) two 3" circular RF sputter sources. Any needed boats, graphite with BN coating, preferred, or alternately with Mo/W/Ta, should be provided, including open boats for Au, Ag, Cu, and wire filaments for alloying materials like Al and Ti (barring Ga). Each source must have full enclosure twin wall shielding to prevent cross contamination.</p> <p>The sputter system sources must be compatible with DC, pulsed DC and RF power supplies, and with a threaded clamp for quick target replacement. The base configuration must include a DC power supply</p>		

	<p>(min. 1.2 kW) with ripple less than 0.02% of rated voltage at full load, and have arc, over-voltage and over-current protection. An RF filter unit to reduce feedback into the DC power supply must be provided. For the two RF sources, an RF power supply (13.56 MHz) with an automatic matching network (min 600 W) must be provided.</p> <p>Reactive sputtering must use a gas ring near the substrate to minimize contamination from debris at the gas ring, control ion energy loss, and be positioned to limit racetrack poisoning of the target, to the extent possible. The possible process gases for reactive sputtering include nitrogen, oxygen, and acetylene/methane. The system must include downstream gas pressure control with a recipe dependent software controlled pressure stabilization during operation and gas consumption. Gas mixing for mixed gas recipes must be provided using mass flow controllers and the pressure monitored using a capacitance diaphragm process gauge (up to 100 mTorr).</p> <p>All sources must have individual pneumatic shutters with high quality magnetic fluid rotatory feedthroughs. A door interlock should interrupt power to the sources when the chamber door is open. The minimum distance between evaporation sources/sputter targets and substrates must not be shorter than 6" (for sputter) and 22" (for thermal resistive) to ensure optimal substrate coverage and uniformity (see spec on control system). A Z-stage linear manipulator should be provided to control the working distance. Documentation on calculated plume profiles must be provided along with actual measured data in the configuration you are bidding.</p> <p>A user mountable and removable rotating (user controlled, up to 50 rpm) substrate holder must be able to accommodate at least four 1" x 1" substrates (ITO/glass, Si/SiO₂, or steel/aluminum) with a minimum size of 6" x 6", should be provided. The free form design should contain multiple screw holes sunk in an array 2 cm apart, with removable screw clips designed to hold shadow masks and substrates on to the holder when inverted for operation. A second substrate holder with easy shadow mask alignment capability (for 1"x1" substrates) obtained through a 6 x 6 pattern of grooves, and a mechanism to secure the substrate and the mask frame should be provided. A split substrate shutter with high quality magnetic fluid rotatory feedthroughs, motorized to accurately terminate growth of thin films when target thickness is met, should be included.</p> <p>Two simple user designed mask frames should also be provided. The design files (DXF) for the substrate holders should be provided as a part of the system design.</p> <p>The bidder must provide detailed design schematics, detailed data that attests to the specifications above, system design specifications, as well as provisioning for any additional sources listed in optional items, as well as any needed additional film growth sensors.</p>		
<p>3.</p>	<p><i>Sensors and film thickness monitoring:</i> A sensors package must be provided, which will consist of easily user replaceable quartz crystal monitors mounted on shielded stages to eliminate cross-talk, and must be</p>		

	<p>sufficient in number and adequately chosen in location within the chamber(s) to accomplish monitoring of the growth rates and extent of growth of thin films for each single and co-deposition conceivable in the chamber(s), without cross-talk. At least one sensor should be located next to the substrate, and monitor net film growth. Sensor construction should not allow any movement and vibration during operation to ensure accuracy of sensor calibration during all depositions. The bidder must provide data to attest to these requirements.</p>		
4.	<p>Vacuum system: The chamber(s) should be capable of supporting a minimum base pressure of 5e-8 Torr, or better, with automated (or manual, depending on user choice) pumping, venting and regeneration. Cryo-pump (per chamber) with pumping speed of 1500 liter/sec (or faster) with any needed compressor, He recharge adapters, etc. should be included, along with any backing pumps needed. The pump down time to a working pressure of 2e-6 Torr must not exceed 45 minutes. The bidder must provide pump down curves and data to support its claims.</p> <p>The chamber(s) should provide shielded and offset viewport(s) at the substrate holder level for visual inspection of the substrate during operation, and the design must protect against material deposition that might block it. Any metal to O-ring to metal seals used for the growth chamber must be over planar surfaces (not curved). The inside surface of the chamber(s) should have a glass bead blast finish.</p> <p>The chamber(s) must contain an additional sealed door at the rear that permits the movement of powder samples directly from the lab without going through the glove box to prevent contamination and coating of surfaces in the glove box, as well as the capability to clean the chamber without crashing the glove box (by holding the chamber door(s) through positive pressure).</p> <p>The cleaning protocol for the growth chamber(s) must be clearly and individually defined, and must not involve crashing any of the glove box(es).</p>		
5.	<p>Glove box specifications: The glove boxes with automatic pressure control and column valves, enclosing the cluster tool must have transparent, low reflectivity Lexan windows with circular gloveports, and ambidextrous butyl gloves (with replacement blanks) capable of withstanding organic solvent (halogenated and non-halogenated) exposure. Variable speed blower (at least 60 cfm) must be provided. The inside surface must be made of non-corrosive material like SS 304 with powder coated finish. All needed roughing pumps must be provided and be run through the control system. All gas flow piping and fittings must be stainless steel. Any antechambers and load lock assembly for sample ingress and egress, or sample transfer between glove boxes should be designed for successive vent and purge cycles with the inert gas to prevent any oxygen / water vapour contamination from air. Any needed pumps must be provided and vented into the room / exhaust (and not the glove box). All large antechambers must have sliding trays and rods for easy sample transfer. All other moving or motorized parts must be external to the glove boxes to</p>		

minimize particulate contamination.

The glove boxes must use HEPA filters (0.3 μm), with a leak rate < 0.05 vol%/hr (ISO 10648-2), with a single column gas purifier (copper catalyst and molecular sieve) with absorption capacity > 40 liter O_2 , >1.5 kg H_2O , and activated carbon in line solvent removal (capacity ≥ 5 kg). The glove box and cluster design should separate spin coater and vacuum oven from the growth systems to reduce cross contamination. Each glove box port pair not addressing a growth chamber must be able to reach shelving and integrated electrical connections located at the back wall of that glove box for powering (230V, 50 Hz, 5/15A) ancillary equipment like hot plates, etc. (these ancillary equipment are not a part of the tender).

The glove boxes must provide timed purge capability with user definable oxygen levels. Any needed gases for glove box regeneration should be clearly specified and ports should be provided for such gases. Further, regeneration cycle must be provided in software as an automated process with ability for user to manually override the steps. One free recharge of the purifier column (activated charcoal, etc.) should be provided after 3 years of use. Connection tubes for connecting purging gas and regeneration gas cylinders to the glove box should be provided (8m).

Each glove box with an integrated space must be equipped with solvent resistant electrochemical impurity detection in the form of a) oxygen and b) water analyzers, at least. The post regeneration operating oxygen and water levels must not exceed 0.2 ppm and 0.1 ppm, respectively under ambient lab test conditions at 90% relative humidity and 35°C temperature. The impurity sensors and pressure control (with foot pedal) must be capable of user programming (with password control), provide integrated pressure and blower control on the same screen, and offer configurable audible alarms. The sensors must provide impurity data in the 0-1000 ppm range with a resolution of 0.1 ppm. The glove boxes must offer the ability to quickly isolate from external gas supply, and manual and auto purge capability. The sound level of the glove box must not exceed common industry practice.

One additional glove box space connected proximally to each growth system (for two chamber designs, this space can be shared between both chambers) must be included for sample preparation and storage of common growth materials, with any needed slots for easy placement of substrate holder(s) while they are being loaded or unloaded, along with a 3 level height adjustable shelf. This glove box must provide the following feedthroughs: a) 4xKF40 single sided flange with clamp, centering ring and blank plate, b) 1xKF40 double sided flange with 2x BNC connectors, c) 1xKF40 double sided flange with a triax connector, d) 1xKF40 fiber optic feedthrough, 1000 μm VIS fiber (transmission in 400- 2100nm), e) 1xKF-40 feedthrough with 1 USB 2.0 Type A M/M cable, 1 RJ- 45 cable, 1x9-pin D- sub RS 232 cable, 1 VGA cable all potted together (2" cable at each end).

	The glove box with spin-coater must provide the following feedthroughs: a) 4xKF40 single sided flange with clamp, centering ring and blank plate, b) 2xKF40 double sided flange with 2x BNC connectors, c) 1xKF40 fiber optic feedthrough, 1000 um VIS fiber (transmission in 400- 2100nm), d) 1xKF- 40 feedthrough with 1 USB 2.0 Type A M/M cable, 1 RJ- 45 cable, 1x9- pin D- sub RS 232 cable, 1 VGA cable all potted together (2" cable at each end).		
6.	Size and weight limitations: Total height of the system must not exceed a) 6 feet 8 inches in shipped boxes, b) 8 feet in operation to limitations in access to and at the installation site. Owing to limitations on equipment movement on campus, no shipped item must weigh more than 700 kg, including any packaging materials or structures used (this is the maximum shipped box weight). No box must exceed (L x W x H) 3m x 2.2m x 2.2m in size. The maximum space available for the final installed cluster growth system (not counting optional and unlisted items) is 3.6m x 3.6m (including all items attached to the cluster tool or needed solely for its operation).		
7.	Spin-coater: 8" Teflon bowl with max. substrate size of 6" with integrated chemically resistant drain. Chucks for ½", 1" and 4" substrates should be provided. Microprocessor based control, with communication port for external control. Profile storage (25 programs with 15 steps each). Rotational speed (0-9999 rpm) should be adjustable in 1 rpm increments, 0.1 second time increments and 1 second increment for dwell time (0-999 seconds). Power: 230 V, 50 Hz.		
8.	In-situ IR annealing system: It should be possible to carry out in situ (during growth) IR annealing of the substrate at temperatures up to 500°C. The body of the chamber(s) must be made of an aluminum metal alloy with sufficiently high thermal conductivity so that the heat from sources and the substrate can be effectively dissipated while running high temperature processes without damaging seals, and additionally not lead to passive evaporation from other sources (or the substrate) while not in operation due to thermal cross-talk. The chamber must be capable of a complete bakeout. The bidder must provide thermal modeling results, and distributed heat map measurements for different in situ temperatures, especially data for temperature distribution in close proximity of inactive sources when a heated source is active. Further, needed cooling for the substrate and the chamber should be provided so that the system can be brought down to room temperature in no more than 5 hours.		
9.	Vacuum oven: A 10" x 10" two door PID controlled vacuum oven (stainless steel construction) connected to the glove boxes, with copper substrate holder (with tapped holes), should be provided. The heating source should be IR lamp, and the chamber design should have high thermal reflectivity to ensure high efficiency. It should be accessible from within the glove box through space exposed to solvent vapours in the glove box, and also from the outside ambient, and be capable of annealing in the inert gas atmosphere, or vacuum, with a max temperature of 500°C and uniformity of 1% or better. The vacuum oven must be designed to not place additional thermal strain on the glove box through expansion of inert gas or thermal conductive heating of the metal, through efficient trace heat dissipation during operation (maximum external temperature should be		

	50°C or less). The operational protocol for ramp up and ramp down times for every representative temperature should be specified for in glove box, and out of glove box operation.		
10.	<p>Control system and software: The control system should be PLC-based and its software front end should be user-friendly (running, a minimum of Windows 7). This control system must be used for all growth functions, and offer complete process integration between mechanical/vacuum and deposition components of the system. The system must provide autotune for PID parameters, in-process idle steps for sources, and temperature stabilization functions.</p> <p>The deposition controller should accept inputs from the sensor package, and thermocouples, and provide rate uniformity of 0.1 A°/sec or better. Auto-tuning of temperature and thickness control loops should be possible by a suitably trained user. The distribution of power controllers and sensors should enable co-deposition so that multiple materials (at least 4) can be programmed (or manually upon user choice) to be grown in a ratio-ed manner. The user should be able to select computer controlled ratio-ed growth for pairs of materials (in case of 4 source co-deposition) with manual control for two of the sources. A thickness uniformity of +/- 3% or better (for thermal and sputter growth) should be provided over 100 cm² area. Rate stability must be 20% or better for rate of 0.02 A°/s, and 2.5% or better for 0.2 A°/s. In case of co-deps, maximal doping ratios must be 100:1 or better for a 2A°/s host growth rate.</p> <p>The bidder should provide any relevant control system firmware and software updates for the entire lifecycle of the tool. Diagnostic capabilities of the tool should include capacity for offsite help and access upon user authorization (IIT Delhi follows a complex authenticated proxy-based networking system) over a secure https port (443) for any needed debugging and log analysis. It should provide separate logins for each user (with a shared growth recipe namespace), in addition to superuser privileges to one specified user. The control system must implement all safety interlocks and alarms needed for safe and efficient operation of the cluster tool. Any log files should be in ASCII text, separately for each recipe, and be comprehensible by a user with basic computer literacy. Any call-home behavior of the software should be user configurable. The system should maintain automated rolling backups of saved recipes, as well as complete data logs of all runs with process values.</p> <p>The software must support an infinite number of user-defined recipes for materials, and contain all needed material parameters for common growth items such as organics, inorganic non-metals and metals. The software must be capable of automated growth with user specified PID parameters, and be capable of doing unattended “last layer” growth, upon which the system would power off sources/targets and leave the chamber in a pumped down state. The growth recipe must provide pre-bake, ramp up, bake, dwell, growth, ramp down steps in synchronization with needed shutter operations.</p>		

	<p>The software should be capable of understanding real-time power outage data provided by laboratory UPS systems (voltages available: 220 V single phase, 380 V 3 phase/60A) over SNMP, and take remedial measures assuming a safe shut down time of 5 minutes on backup power.</p> <p>Any needed computer (with monitor + keyboard with mouse) on a swivel stand (requiring no separate table) should be provided with the tool along with a detailed user manual along with detailed electrical and mechanical technical diagrams. A copy of all control software should be provided separately, along with a cloned hard drive containing all the initial settings, which can be swapped in as need arises to provide a clean starting point. The software must provide a factory reset capability in protected storage so that a clean starting state can be rapidly obtained.</p> <p>The entire system must provide one (preferably) or more large prominent emergency stop button for rapid shutdown of all operations, that is easily accessible from all parts of the chain. Such a shutdown should trigger a sequence that ensures survivability of the system and is non-destructive (beyond a maximum of possible fuse blowouts).</p>		
11.	<p>Tools and spare-parts: One complete set of all the tools needed for servicing of the tool and all its components should be provided. Spare parts (in addition to the items in the initial install) must include: a) 1 set of spare O rings for each vacuum feedthrough, b) 3 spare O-rings each for the main and rear door seals, c) 1 set each for any SwageLok fittings along with specifications, d) 1 replacement vacuum gauge filament for each item, e) 1 spare substrate heater filament/lamp, f) 2 spare fuse kits, g) spare debris shields with screws to secure them, h) 1 spare set of gloves for each circular port, and g) any copper/brass gaskets. In addition, one set of recommended lubricants for the system should be included.</p>		
12.	<p>Training and maintenance: Besides installation and system startup, bidder must provide a) initial training to 3 persons during the installation in all essential functions and features, b) training for upkeep maintenance to the same persons, along with an SOP, c) similar training as in a) and b) for a maximum of 2 people on every subsequent site visit, and d) lifetime phone and email support for the tool after installation. Bidder accepts that its service engineers will be provided food and lodging on IIT Delhi campus at one of the guesthouses on every visit, if needed.</p>		

Optional Items:

Sl. No.	List of optional items	Compliance Y/N	Evidence enclosed Y/N
1.	<p>Magnetically coupled linear transfer arm(s): This should be provided as an option for mask exchange for each growth chamber (to enable change of masks without breaking vacuum), and standoff storage for at least 3 mask frames in vacuum (attached to the side of the chamber).</p>		
2.	<p>Sputter targets: Any / all of sputter targets (3") for Al, Cr, Cu, Fe, SiO₂, Ti, W with any needed backing plates (priced individually). Any information regarding preferred vendor for follow-on purchases should be provided.</p>		
3.	<p>Crucibles: (All 2 cc) 15 alumina crucibles, 10 alumina crucibles with</p>		

	graphite lining, 10 W/Mo/Ta crucibles, and 5 quartz crucibles should be provided, along with needed vendor information for follow-on purchases.		
4.	Atomic layer deposition system: An plasma enhanced (300W ICP) ALD tool capable of growing oxides of Hf, Ta, V, Ti and Al, and GaN (minimum 8 precursor valves) with monolayer resolution must be integrated into a two port glove box with the following specifications: a) Should be able to handle substrate sizes up to 150 mm, b) dual zone reactor (substrate temperature of 25-300C with +/- 1°C uniformity), c) ozone generator and exhaust abatement system, d) two heated bottles and inert gas assist for low vapor pressure precursors, with easy bottle swap out, e) better than 1% (on wafer) and 2% from batch to batch uniformity for Al ₂ O ₃ , f) PC and user recipe controlled (the needed computer /monitor /keyboard /mouse and software should be included), g) the layout must use a side mounted geometry or a bottom mounted geometry to free up the glove box for sample preparation and storage.		
5.	Pulsed DC power supply: A pulsed DC power supply capable of running in DC/pulsed DC modes, with low arc energy and synchronous pulsing capability. Maximum frequency will be 100 kHz with a max 2.5 A of current. The bidder must provide documentation of prior experience with, and results of, integration with the base system.		
6.	Variable or glancing angle deposition stage: Tilt (+/- 95°) and rotation (0-40 rpm) capability with full software servomotor control eucentric about the center of front of substrate (minimum 150 mm). User defined recipes for patterns: a) zig-zag, b) square/logarithmic spiral, c) tree root growth, with capacity for customization. Coverage over the entire area should be optimized. The bidder must provide documentation of prior experience with, and results of, integration with the base system. A ferrofluidic hollow rotatory arm should be used for any rotational movements (no O ring) to prevent particulate generation under heavy use.		
7.	Programmable spray coating system: The spray coating system (standalone part of the cluster tool) should be able to spray liquid-based fine mist with minimum track size no larger than 1 mm, and be uniform over an area of at least 300 mm x 300 mm using an ultrasonic nozzle. The repeatability should be at least 25 um, and resolution of 20 um, or better. The tool must have at least 48 digital and 4 analog I/Os which should be programmable easily with user defined pattern using supplied software and include any needed control computers. The bidder must provide documentation of prior experience with, and results of, integration with the base system.		
8.	Low temperature thermal sources: One RADAK/LTE style effusion cell with minimum 2 cc volume, capable of growing oxide materials, and organic semiconductors. Temperature uniformity must within +/- 1K, and bidder must demonstrate that organic dyes can be grown without catastrophic rise in growth rate with small changes in power. Maximum growth temperature must be 1500°C. Crucible power supply must be shaped to provide uniformity of heating, and to prevent cracking of the source under normal operation. High purity alumina or PBN sources should be included. The bidder must provide documentation of prior experience with, and results of, integration with the base system.		
9.	E-beam metallization source: One multi-pocket (6) e-beam source (7cc)		

	with a recipe controlled automated crucible indexer and integrated mirror for pocket viewing. The source should be programmable with a 2-axis sweep controller, with storage of at least 8 sweep patterns with user-defined center and sweep limits permitting automated layer to layer sweep pattern selection in an automated recipe definable by a user prior to growth. Sweep patterns must include user selectable ramp and harmonic waveforms. The bidder must provide documentation of prior experience with, and results of, integration with the base system.		
10.	Material printer: Material printer (aqueous, solvent, acidic or basic inks) as a standalone part of the cluster tool with the following specifications: a) capacity for single user fillable piezo-based heated inkjet cartridge with at least 16 nozzles, b) flat substrate on vacuum platen with at least 210 mm x 260 mm area, c) adjustable substrate temperature (up to 50°C), d) Repeatability of 25 um or better, e) camera for substrate alignment, and measurement, f) drop jetting observation system and cartridge cleaning, f) computer system for user recipes and patterns.		
11.	Material printer (integrated): Material printer (same as above) but integrated completely into the growth system (inside glove box). The bidder must provide documentation of prior experience with, and results of, integration with the base system.		
12.	Vacuum and gas feedthroughs: Vacuum and gas feedthroughs (1/4") for the sample preparation glove box.		
13.	Antistatic protection: Antistatic protection should be provided for all glove boxes (priced individually).		
14.	Chiller and recirculation system: Any needed chiller (common for glove box circulator and growth systems) and recirculation system for a tank of DI water. The specifications of the needed chiller should be provided by the vendor if this option is not chosen. The bidder must provide documentation of prior experience with, and results of, integration with the base system.		
15.	Turbo molecular pump: (Instead of the cryopump), a suitable turbo molecular pump system (with pumping speed of app. 950l/s which can work in economode) and backed by a rotary pump/dry scroll pump with capacity>16CFM.		
16.	Warranty: 1 Year warranty to be quoted separately, along with any AMC charges for additional years.		

I have also enclosed all relevant documents in support of my claims, (as above) in the following pages.

Signature of Bidder

Name: _____

Designation: _____

Organization Name: _____

Contact No. : _____

**<< Organization Letter Head >>
DECLARATION SHEET**

We, _____ hereby certify that all the information and data furnished by our organization with regard to this tender specification are true and complete to the best of our knowledge. I have gone through the specification, conditions and stipulations in details and agree to comply with the requirements and intent of specification.

This is certified that our organization has been authorized (Copy attached) by the OEM to participate in Tender. We further certified that our organization meets all the conditions of eligibility criteria laid down in this tender document. Moreover, OEM has agreed to support on regular basis with technology / product updates and extend support for the warranty.

The prices quoted in the financial bids are subsidized due to academic discount given to IIT Delhi.

We, further specifically certify that our organization has not been Black Listed/De Listed or put to any Holiday by any Institutional Agency/ Govt. Department/ Public Sector Undertaking in the last three years.	NAME & ADDRESS OF THE Vendor/ Manufacturer / Agent
1 Phone	
2 Fax	
3 E-mail	
4 Contact Person Name	
5 Mobile Number	
6 TIN Number	
7 PAN Number	
(In case of on-line payment of Tender Fees)	
8 UTR No. (For Tender Fee)	
(In case of on-line payment of EMD)	
9 UTR No. (For EMD)	

(Signature of the Tenderer)

Name:

Seal of the Company

Bid Submission

Online Bid Submission:

The Online bids (complete in all respect) must be uploaded online in **two** Envelops as explained below:-

Envelope – 1 (Following documents to be provided as single PDF file)			
Sl. No.	Documents	Content	File Types
1.	Technical Bid	Compliance Sheet as per Annexure - I	.PDF
2.		Organization Declaration Sheet as per Annexure - II	.PDF
3.		List of organizations/ clients where the same products have been supplied (in last two years) along with their contact number(s). (Annexure-III)	.PDF
4.		Technical supporting documents in support of all claims made at Annexure-I (Annexure-IV)	.PDF
Envelope – 2			
Sl. No.	TYPES	Content	
1.	Financial Bid	Price bid should be submitted in PDF format.	.PDF

<Department/Centre Name>
Indian Institute of Technology Delhi
Hauz Khas, New Delhi-110016

Date: XX/XX/XXXX

Subject: Purchase of <Item> (Following format is used for imported items)

S. No.	Currency	Description and Specification of the Item	Qty. in Units	Unit Price (a)	Agency Commission (If applicable) (b)	Discount (c)	Ex-works price (d=a+b-c)	Packing + Handling + DOC + Inland Freight (e)	FOB Price (f=d+e)	Insurance + Freight (g)	CIF Price (f+g)
1											

For indigenous items please quote as per following format.

S. No.	Description and Specification of the Item	Qty. in Units	Unit Price in Rs.	Excise Duty %	CST/VAT%	Octroi%	Total Price in Rs.
1.							
2.							

Note: The above financial template should be strictly followed. Any deviation from the above template (in terms of description and specification of the item) may lead to cancellation of the tender.