



Indian Institute of Science Bangalore

Prof. Mayank Shrivastava
Associate Professor
Department of Electronic Systems Engineering
Indian Institute of Science Bangalore
560012, Bangalore, Karnataka, India

Global Tender Notification for the procurement of Pulsed IV/RF Characterization System

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Request for Quote from Global Original Equipment Manufacturer (OEM) or their authorized distributor for Pulsed IV/RF Characterization System

Indian Institute of Science, Bangalore
(Last Date: 4th November 2022)

Dear Sir/Madam,

Kindly send your best price quotation for the following item with various accessories on CIP, Bangalore basis to the undersigned. Your quotation should clearly indicate the terms of delivery, delivery schedule, payment terms, etc.

Your quote should also include mode of payment and should reach the undersigned, duly signed on or before 1000 hours (IST) on 4th November 2022.

The quote must include all details of technical specifications of the equipment along with the commercial terms and conditions, the bill of materials, printed technical brochure and any other supporting document. Vendors will be required to submit a technical proposal and a commercial proposal in two separate sealed envelopes. Please enclose a compliance certificate, printed on your letter head, along with the quote. The commercial bid must be in CIP Bangalore and the quotation should address to:

The Chairman,
Department of Electronic Systems Engineering
Indian Institute of Science, Bangalore – 560 012

I. Technical Specifications of Pulsed IV/RF Characterization System

General Description:

1. The system is for pulsed IV and pulsed RF characterization for on-wafer measurements
2. The system should be capable of generating and applying electrical (current and voltage) pulses along with measurement of current/voltage response of semiconductor devices.
3. The system must be capable of delivering electrical pulses and measuring current/voltage response from atleast two terminals of a three/four terminal device (such as gate/base and drain/collector of a transistor) i.e., there should be 2 pulse channels. The pulse parameters of these 2 pulse channels must be separately controllable.
4. The system must include external power supplies allowing the user to provide the quiescent and non-quiescent voltages for both gate/base and drain/collector terminals of a transistor.
5. The calibration standards, protocols, and documentation must be provided with.

E-mail : mayank@iisc.ac.in (write to msdlab.ese@iisc.ac.in for tender related queries)
Phone : +91-80-2293-2732
Faculty Web : <https://faculty.dese.iisc.ac.in/mayank/>
Institute Web : <http://www.iisc.ac.in/>



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- The system should be compatible with probe station allowing on-wafer measurements. Specialized adapters for compatibility with micro-positioners/manipulators and appropriate probe tips must be provided for this purpose.
- The system must have a user interface which allows software control of electrical pulse parameters (such as, pulse width, repetition rate, rise/fall time).
- The system must be capable of accepting and responding to external trigger signal (0V-5V TTL signal) allowing it to be synchronized with other characterization systems (such as, a thermal imager). The response delay of the pulsed IV system must be ≤ 160 ns. Moreover, it should be predictable and it should be repeatable (the delay must not deviate with time)..
- All required cables, accessories, calibration kit and other required items to run the system must be provided.

Specific Description:

<i>Hardware Specifications:</i>	
Pulsed IV/RF capability	The pulsed IV/RF system must have two pulse channels: Channel 1: Drain Head Channel 2: Gate Head allowing simultaneous pulsing of two terminals of semiconductor devices with > 2 terminals These channels must be capable of generating and transmitting voltage/current pulses to the semiconductor device. And they should be capable of measuring voltage and current response from the same. (Refer to PERFORMANCE section for detailed specifications of the pulses)
Accessories for the pulsed IV/RF system	<ul style="list-style-type: none">Specialized cables, connectors, and components for delivering electrical pulses to the device under testBias-Tee (for combining DC and RF signals) with voltage handling capability of 200V, max. RF power of at least 150 W, and operating frequency in the range of 0.7-8 GHz3 channels Modular System power SuppliesDigital Multimeter: Enabling setting quiescent and non-quiescent voltages for DC operating point
Calibration	Specialized calibration kits, standards, protocols, and documentation enabling proper calibration of the pulsed IV system
Pulsed RF option	Pulsed RF system enabling pulsed S-parameter measurements and integration with VNA
System Rack	Required size for the system



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Power Supply	The power supply adapters and cables required for powering the pulsed IV system must be provided
Software Specifications:	
Software control with PC	<p>Guided User Interface software control for system management, setting pulse parameters, data acquisition, data processing and analysis.</p> <p>Pulse parameters such as: Rise time/fall time, Pulse width, Duty cycle, Repetition Rate, Voltage pulse amplitude (base value and peak value), pulse polarity should be user controllable through the GUI software</p> <p>Also, the time delay between the two channels should be user adjustable</p> <p>Data acquisition and analysis: The measurement window and the resolution for measuring current and voltage should be user adjustable. The GUI software must also allow the user for- (1) observing the current/voltage transients, and (2) data analysis at desired time window.</p>
PC for the control software	PC with accessories such as high-definition display monitor, keyboard, and mouse etc.
System Integration Requirements:	
Response to external trigger	The pulsed IV system should be capable of accepting and responding to external trigger signal (0-5V TTL signal) i.e. The PIV should generate/measure user-define voltage/current pulses upon acceptance of external trigger signal
Integration with Probe Station	Customized adapter required for on-wafer measurements of devices using DC probe tips and micro-manipulators
Integration with external system-thermal imager	Integration of the pulsed IV system with the thermal imager (Microsanj NT 220C Thermoreflectance Imaging Tool) should be demonstrated at the time of on-site installation of the system. Integration includes capability of the pulsed IV system to accept external trigger signal and synchronize with the thermal imager by generating desired pulses at desired timings.
Performance Parameters:	
Maximum pulsed voltage supply for drain head (Channel 1)	≥ 600 V
Maximum current supply for drain head (Channel 1)	≥ 5 A (pulsed) ≥ 1 A (DC)
Maximum pulsed voltage for gate head (Channel 2)	Magnitude ≥ 100 V



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	Polarity: +/- 100 V
Maximum current supply for gate head (Channel 2)	≥ 2 A (pulsed) ≥ 0.1 A (DC)
Maximum deliverable power for drain head (Channel 1)	≥ 1000 W
Maximum deliverable power for gate head (Channel 2)	≥ 40 W
Measurement Capability for drain head (Channel 1)	Voltage: Capturing voltage transient with fast sampling capability Current: Capturing current transient with fast sampling capability Minimum measurable currents: ≤ 0.01 % of the maximum current that can be supplied
Measurement Capability for gate head (Channel 2)	Voltage: Capturing voltage transient with fast sampling capability Current: Capturing current transient with fast sampling capability Minimum measurable currents: ≤ 0.01 % of the maximum current that can be supplied
Pulse width for drain head (Channel 1)	Minimum: ≤ 200 ns Maximum: DC
Pulse width for gate head (Channel 2)	Minimum: ≤ 200 ns Maximum: DC
Minimum output rise/fall time for drain head (Channel 1)	≤ 60 ns, Rise/fall time should be user controllable
Minimum output rise/fall time for gate head (Channel 2)	≤ 30 ns, Rise/fall time should be user controllable
Repetition Rate for Channel 1	Atleast 80 KHz at 200 V Should be user controllable
Repetition Rate for Channel 2	Atleast 250 KHz at 20 V Should be user controllable
Timing parameters between channels 1 and 2	The delay between the pulses from channels 1 and 2 must be user adjustable
Response to external trigger signal (0-5V TTL)	Response delay to external trigger should be ≤ 160 ns The variability should not be significant (≤ 5 ns)
Capability to characterize on-wafer devices	Customized adapter required for on-wafer measurements of devices



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II. Mandatory Requirement: The vendor must have more than 5 years of history of manufacturing above stated equipment and selling it to industries and universities all around the world. The vendor must provide detailed evidence of this (example: list of groups using this equipment, equipment picture, company history, etc.). The vendor must also have a distributor in India who should be well trained to operate and maintain this equipment.

III. Additional Items (Must be added to compliance certificate as well):

1. **Support:** Please provide details of support provided within the warranty period
2. **Shipping:** The quote must be in CIP, Bangalore.
3. **Installation:** Please list a set of acceptance tests for on-site (vendor) inspection and after installation at IISc Bangalore.
4. **Other Options:** Necessary spare parts should be quoted as an option.
5. Please include any other options currently available that can be added on in the future.
6. **Training:** Please highlight the extent of training provided as part of this purchase and for how many days.
7. **Commissioning:** Provide a list of tests that the vendor will perform on-site for commissioning the equipment.

IV. Optional Items:

Please provide a separate letter indicating annual maintenance charges (AMC) post warranty/guarantee period.

All of the above-mentioned technical specifications are highly desired. However, lower technical specifications may be considered if the above-mentioned specifications are found to be unsuitable in financial terms. The Institute reserves the right to go for lower specifications taking into consideration its technical preferences and financial constraints. Vendor is encouraged to highlight the advantages of their tools over comparable tools from the competitors.

PI Terms and conditions specific to this purchase (should be included in compliance certificate):

1. In principle onsite installation should be free of cost.
2. Software upgrade, if any, must be free of cost for next 5 years.
3. The vendor must assure that there are no bugs and glitches with the integration and characterization software. In case of glitches or bugs, vendor must fix the issues in less than 7 days.
4. In case of software issues or support, vendor should be able to provide required solution within two days.
5. All equipment must be well calibrated. Calibration capability must be available in India.
6. Additional quote for an annual maintenance contract should be included for the next 5 years.
7. The vendor should have a good track record of delivering such equipment at universities/research institutions (please furnish the details).
8. Please provide list of customers who have procured your equipment in last 5 years.
9. The vendor should be able to repair, maintain and upgrade the equipment, once it is installed in India. No travel claims must be made by vendor for servicing during the warranty/guarantee time.
10. The lead time for the delivery of the equipment should not be more than 8 week from the date of receipt of our purchase order. The smallest lead time will be appreciated. Our expectation is shipment immediately after PO and payment post installation.
11. On all systems the payment terms will be specified in the commercial proposal and is subject to negotiation.
12. The validity period of the quotation should be 90 days at least.
13. Please provide details of the number of trained personnel in India, number in the southern region or in Bangalore who can service the machine.



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14. In case of proprietary system, please give a certificate.
15. See other Terms & Conditions in enclosed document in the next pages.

Sincerely,

Prof. Mayank Shrivastava
Associate Professor
Department of Electronic Systems Engineering
Indian Institute of Science
Bangalore, Karnataka 560012, India
Secretary (Ms. Rekha's) Contact: 9972525771
(On Behalf of Purchase Committee)
Email: msdlab.esse@iisc.ac.in (for tender related queries)

Enclosures / Annexures

Annexure 1 – Terms and Conditions:

A) Submission of Tender:

1. All documentations in the tender should be in English.
2. Tender should be submitted in two envelopes (two bid system).
 - a. Technical Bid (Part-A) – Technical bid consisting of all technical details and check list for conformance to technical specifications.

The technical proposal should contain a technical compliance table with 5 columns.

- i. The first column must list the technical requirements, in the order that they are given in the technical requirement below.
- ii. The second column should provide specifications of the instrument/product against the requirement. Please provide quantitative responses wherever possible.
- iii. The third column should describe your compliance with a “Yes” or “No” only. Ensure that the entries in column 2 and column 3 are consistent.
- iv. The fourth column should state the reasons/explanations/context for deviations, if any.
- v. The fifth column can contain additional remarks from the OEM. You can use this opportunity to highlight technical features, qualify response of previous columns, or provide additional details, compare your solution with that of your competitors or provide details as requested in the technical requirements table below.

- b. Commercial Bid (Part-B) – Indicating item-wise price for the items mentioned in the technical bid, as per the format of quotation provided in tender, and other commercial terms and conditions.

3. The technical bid and price bid should each be placed in separate sealed covers, superscripting on both the envelopes the tender no. and the due date. Both these sealed covers are to be placed in a bigger cover which should also be sealed and duly superscripted with the Tender No, Tender Description & Due Date.
4. The SEALED COVER superscripting tender number / due date & should reach **Chairman Office, Department of Electronic Systems Engineering, Indian Institute of Science, Bangalore – 560012, India** on or before due date mentioned in the tender

notice. In case due date happens to be holiday the tender will be accepted and opened on the next working day. If the quotation cover is not sealed, it will be rejected.

5. All queries are to be addressed to the person identified in “Section 1 – Bid Schedule” of the tender notice.

8. If price is not quoted in Commercial Bid as per the format provided in tender document the bid is liable to be rejected.

9. The Institute reserves the right to accept or reject any bid and to annul the bidding process and reject all bids at any time prior to the award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders.

10. Incomplete bids will be summarily rejected.

B) Cancellation of Tender:

Notwithstanding anything specified in this tender document, IISc Bangalore, in its sole discretion, unconditionally and without having to assign any reason, reserves the rights:

- a. To accept OR reject lowest tender or any other tender or all the tenders.
- b. To accept any tender in full or in part.
- c. To reject the tender, offer not confirming to the tender terms.

C) Validity of the Offer:

The offer shall be valid 90 Days from the date of opening of the commercial bid.

D) Evaluation of Offer:

1. The technical bid (Part A) will be opened first and evaluated.
2. Bidders meeting the required eligibility criteria as stated in Section 2 of this Document shall only be considered for Commercial Bid (Part B) opening. Further, Agencies not furnishing the documentary evidence as required will not be considered.
3. Pre- qualification of the bidders shall not imply final acceptance of the Commercial Bid. The agency may be rejected at any point during technical evaluation or during commercial evaluation. The decision in regard to acceptance and/or rejection of any offer in part or full shall be the sole discretion of IISc Bangalore, and the decision in this regard shall be binding on the bidders.
4. The award of contract will be subject to acceptance of the terms and conditions stated in this tender.

5. Any offer which deviates from the vital conditions (as illustrated below) of the tender is liable to be rejected:

- a. Non-submission of complete offers.
- b. Receipt of bids after due date and time and or by email / fax (unless specified otherwise).
- c. Receipt of bids in open conditions.

6. In case any BIDDER is silent on any clauses mentioned in these tender documents, IISc Bangalore shall construe that the BIDDER had accepted the clauses as of the tender and no further claim will be entertained.

7. No revision in the terms and conditions quoted in the offer will be entertained after the last date and time fixed for receipt of tenders.

8. Lowest bid will be calculated based on the total price of all items tendered for Basic equipment along with accessories selected for installation, operation, pre-processing and post-processing, optional items, recommended spares, warranty, annual maintenance contract.

E) Pre-requisites:

The bidder will provide the prerequisite installation requirement of the equipment along with the technical bid.

F) Warranty:

The complete system is to be under warranty period of minimum 1-3 years (year wise breakup value should be shown in the commercial bid) including free supply of consumables, spare parts and data analysis software from the date of functional installation. If the instrument is found to be defective, it has to be replaced or rectified at the cost of the bidder within 30 days from the date of receipt of written communications from IISc, Bangalore. If there is any delay in replacement or rectification, the warranty period should be correspondingly extended.

G) Annual Maintenance Contract:

An annual maintenance contract for a period of at least 2 years post-warranty if the warranty is for 1 year, should be provided on completion of warranty period. The AMC costs will not be considered towards classifying the domestic nature (class 1 or class 2) of the vendor (see eligibility criteria in section 2). AMC for 1 year is sought for warranty of 2 years, and AMC will be optional for 3 year warranty.

H) Purchase Order:

1. The order will be placed on the bidder whose bid is accepted by IISc based on the terms & conditions mentioned in the tender document.
2. The quantity of the items in tender is only indicative. IISc, Bangalore reserves the right to increase /decrease the quantity of the items depending on the requirement.
3. If the quality of the product and service provided is not found satisfactory, IISc, Bangalore reserves the right to cancel or amend the contract.

I) Delivery, Installation and Training:

The bidder shall provide the lead time to delivery, installation and made functional at IISc, Bangalore from the date of receipt of purchase order. The system should be delivered, installed and made functional within 90 days from the date of receipt of purchase order. The supply of the items will be considered as effected only on satisfactory installation and inspection of the system and inspection of all the items and features/capabilities tested by the IISc, Bangalore. After successful installation and inspection, the date of taking over of entire system by the IISc, Bangalore shall be taken as the start of the warranty period. No partial shipment is allowed. The bidder should also arrange for technical training to the local facility technologists and users.

J) Payment Terms:

We prefer net 30 days.

K) General:

1. All amendments, time extension, clarifications etc., within the period of submission of the tender will be communicated electronically. No extension in the bid due date/time shall be considered on account of delay in receipt of any document(s) by mail.
2. The bidder may furnish any additional information, which is necessary to establish capabilities to successfully complete the envisaged work. It is, however, advised not to furnish superfluous information.
3. Any information furnished by the bidder found to be incorrect, either immediately or at a later date, would render the bidder liable to be debarred from tendering/taking up of work in IISc, Bangalore.

Annexure – 2:

Declaration for acceptance of terms and conditions

To,

The Chairman,

Department of Electronic Systems Engineering

Indian Institute of Science,

Bangalore – 560012, India

Ref: Tender No: XXXXXX

Dated: XXXX

Supply and/or installation of <Item Name> at Prof. Mayank Shrivastava's Lab, Department of ESE, IISc Bangalore

Sir,

I've carefully gone through the Terms & Conditions as mentioned in the above referred tender document. I declare that all the provisions of this tender document are acceptable to my company. I further certify that I'm an authorized signatory of my company and am, therefore, competent to make this declaration.

Yours faithfully,

(Signature of the Bidder)

Name

Designation, Seal

Date: