


	<p style="text-align: center;">INDIAN INSTITUTE OF TECHNOLOGY MADRAS Chennai 600 036</p> <p>Telephone: [044] 2257 9798/9723 FAX: [044] 2257 4855 E-mail: arpp@iitm.ac.in</p>	
---	---	---

V. Sathyanarayanan
Senior Manager (Project Purchase)

Ref: PHY/JKRA/009/2018
Date: 05.11.2018

Open Tender No: PHY/JKRA/009/2018

Due Date: 26th November 2018, 2pm

Pre-Bid meeting: - Not required.

Technical Bid opening meeting on 26th November 2018, 4:00 PM at Department of Physics, IIT-Madras.

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, offers are invited for the supply of **"PV-IV Tester"** conforming to the specifications given in Annexure I.

Vendor who can supply and integrate the above equipment alone need to respond to the tender please.

Instructions to the Bidder

- I. **Preparation of Bids:** - The tenders should be submitted under two-bid system (i.e.) Technical bid and Financial bid.
- II. **Delivery of the tender:** - The tender shall be sent to the addresses mentioned below, either by post or by courier so as to reach our office before the due date and time specified in our schedule. The offer/bid can also be dropped in the tender box on or before the due date and time specified in the schedule.
The tender box is kept in the office of the:

**Senior Manager,
Project Purchase,
IC & SR Building 2nd floor,
I.I.T. Madras,
Chennai - 600 036.**
- III. **Opening of the tender:** - The offer/bids will be opened by a committee duly constituted for this purpose. The technical bids will be opened first and will be examined by a technical committee which will decide the suitability of the bids as per our specifications and requirements. All bidders will be invited for opening of the technical bids. With respect to opening the financial bid, only technically qualified bidders will be called.
- IV. **Prices:** - The price should be quoted in net per unit (after breakup) and must include all packing and delivery charges to the **Department of Physics**. The offer/bid should be exclusive of taxes and duties. The percentage of tax & duties should be clearly indicated separately. Kindly note that IIT Madras is eligible for concessional GST and relevant certificate will be issued.

In case of import supply, the price should be quoted without custom duty. IIT Madras is exempted from levy of IGST on Imports and eligible for concessional custom duty (not exceeding 5%) and the price should be quoted on EX-WORKS and CIP basis indicating the mode of shipment.

- V. Agency Commission:** - Agency commission, if any, will be paid to the Indian agents in rupees after receipt of the equipment and its satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in the tender document even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent. The foreign Principal should indicate the percentage of payment and it should be included in the basic price quoted originally (if any)..
- VI. Terms of Delivery:** - The item should be supplied to the **Department of Physics, IIT Madras** as per the Purchase Order. In case of import supply, the item should be delivered at the cost of the supplier to our Institution. The Installation/Commissioning should be completed as specified in our important conditions.
- VII. Technical Bid Opening:** The technical bid will be on 26th November 2018, 4:00 PM at the **Department of Physics, IIT-Madras**. The financial bids of those tenders who are technically qualified will be opened at a later date under intimation to them.
- VIII. IIT Madras** reserves the full right to accept / reject any tender at any stage without assigning any reason.

Yours sincerely,

V. Sathyanarayanan
Senior Manager (Project Purchase)
IC&SR Building, I.I.T. Madras,
Chennai - 600 036.

SCHEDULE

Important Conditions of the tender

1. The due date for the submission of the tender is **26.11.2018, 2 pm.**

The offers / bids should be submitted in two bids systems (i.e.) Technical bid and financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, guarantee, payment terms, pricing terms etc. The Technical bid and financial bid should be put in separate covers and sealed. Both the sealed covers should be put in a bigger cover. The Open Tender for supply of "**PV-IV Tester**" should be written on the left side of the Outer bigger cover and sealed.

2. **EMD: - The EMD in the form of account payee DD for 2% value of the item in favor of Registrar IIT Madras should be enclosed in the cover containing financial bid.** Any offer not accompanied with the EMD shall be rejected summarily as non-responsive.

The EMD of the unsuccessful bidders shall be returned within 30 days of the end of the bid validity period. The same shall be forfeited, if the tenderers withdraw their offer after the opening during the bid validity period. The Institute shall not be liable for payment of any interest on EMD. EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME).

When no local agent, the foreign vendor can submit demand draft equal to 2% or wire transfer the amount to our account as detailed in the attachment (Annexure II) and enclose the proof with the financial bid.

3. **Performance Security: -** The successful bidder should submit Performance Security for an amount of 5% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt from the commercial bank, Bank Guarantee from any nationalized bank in India. **The performance security should be furnished within 21 days from the delivery of the purchase order.**

Performance Security in the form of Bank Guarantee:- In case the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed through the Beneficiary Bank to the end user bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee from a Nationalized Bank of India.

The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.

4. **Indian agent:** If an Indian agent is involved, the following documents must be enclosed:

Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.

- ✓ Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.

5. The offer/bids should be sent only for a machine that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted.
6. Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid. No prices should ever be included in the Technical bid.

7. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.
8. **Validity:** Validity of Quotation not less than 90 days from the due date of tender.
9. **Delivery Schedule:** - The tenderer should indicate clearly the time required for delivery of the item (subjected to the executive committee-IITMadras approval). In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.
If there is delay, the penalty will be @1% per week of delay subject to a max of 10% of the value of purchase order and if the delay is more than accepted time frame by IITM, the PO would be cancelled and liquidated damages will be enforced.
10. **Risk Purchase Clause:-** In the 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 other sources on the total risk of the supplier under risk purchase clause.
11. **Payment:-**
 - (i) No Advance payment will be made for Indigenous purchase. However 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved. In case of import supplies the payment will be made only through 100% Letter of Credit i.e. (90% payment will be released against shipping documents and 10% after successful installation wherever the installation is being done).
 - (ii) **Advance Payment:** No advance payment is generally admissible. In case of specific percentage of advance payment is required, the Foreign Vendor has to submit a Bank Guarantee equal to the amount of advance payment and it should be routed through the Beneficiary Bank to the end user Bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee through a Nationalized Bank of India.
12. **On-site Installation:** - The equipment or machinery has to be installed or commissioned by the successful bidder within 15 to 20 days from the date of receipt of the item at site of IIT Madras.
13. **Warranty/Guarantee:** - As specified in the tender document.
14. **Late offer:** - The offers received after the due date and time will not be considered. The Institute shall not be responsible for the late receipt of Tender on account of Postal, Courier or any other delay.
15. **Acceptance and Rejection:** - I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.
16. **Do not quote the optional items or additional items unless otherwise mentioned in the Tender documents / Specifications.**

17. **Disputes and Jurisdiction:**

Settlement of Disputes: Any dispute, controversy or claim arising out of or in connection with this PO including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails or no decision is reached within 30 days whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of three arbitrators. In that event, the supplier will nominate one arbitrator and the Project Coordinator of IITM shall nominate an arbitrator. The Dean IC&SR will nominate the Presiding Arbitrator of the arbitral tribunal. The arbitration proceeding shall be carried out in English language. The cost of arbitration

and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at IC&SR IIT Madras, Chennai.

- a. **The Applicable Law:** This Purchase Order shall be construed, Interpreted and governed by the Laws of India, Court at Chennai shall have exclusive jurisdiction subject to the arbitration clause.
- b. 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 the city of Chennai in Tamil Nadu.

20. All Amendments, time extension, clarifications etc., will be uploaded on the website only and will not be published in newspapers. Bidders should regularly visit the above website to keep themselves updated. No extension in the bid due date/ time shall be considered on account of delay in receipt of any document by mail.

Acknowledgement: - It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

**SIGNATURE OF TENDERER
ALONG WITH SEAL OF THE
COMPANY WITH DATE**

Tender for PV-IV Tester

The system to be purchased should provide complete I-V measurement solutions for photovoltaic cells. Should work with general solar simulators of 10cm x 10cm light area. Should be easy to use LabVIEW based I-V characterization software. Viewing of multiple IV measurement results simultaneously. Should have the ability to load previously stored data from the disk.

Input Workpiece Dimensions:

- 1) Material : Mono-crystalline Silicon (Homo and heterojunction)
silicon wafer based solar cells and thin films single junction and tandem solar cells
- 2) Maximum Size : 10cm x 10cm

I-V tester comprising of following components

S.NO	items	
1	I-V test station (1A and 5A)	one system max 1A + one system max 5A
2	Cell Holder with Temperature control and vacuum positioning for 2x2 thru 6x6	Precise positioning of the device under the test,
3	Probe Kit, PVIV and QE Systems,	Electrical probing, Single point
4	Circulating Water Bath chiller	Standard
5	Vacuum Pump, Oil Free, Cool Air Output, 220 VAC	Rotary pump
6	Ref cell and meter	

(1) Technical Specs For 5 Ampere IV Charecterization system:

- (i) The IV charecterization system should be able to do IV measurement of SHJ (silicon heterojunction) wafer based solar cell and tandem solar cells of dimension from 1cmx1cm to 10 cmx10cm.
- (ii) It should able to perform Dark & Light IV on pin type, nip type, wafer based, glass substrate based, and flexible substrate based solar cells. Max current range should be 5 Ampere.
- (iii) The system should have Keithley based source meter with IV software and cell connections to do IV measurement.
- (iv) System should run I-V measurements and calculates critical parameters such as short circuit current (I_{sc}), current density (J_{sc}), open circuit voltage (V_{oc}), fill factor (ff), maximum output power (P_{max}), cell efficiency (η), and other standard photovoltaic cell parameters R_{sc} , R_{oc} , R_{shunt} , cell temperature, exposure duration, date and time.

It should moreover meet following specifications.

- **Electrical Interface** : 4-Wire
- **Output Power** : 50 W
- **Communication Interface** : GPIB - USB

- **Current Accuracy** <0.12% across all ranges
- **Current Range** 10uA - 5A
- **Current Resolution** 100pA - 10uA
- **Duration of IV Measurement** 0.6 - 58s
- **Number of Measurement Points** 2 - 1,000
- **Operating System** Windows 10 (32 or 64 bit); Windows 7 (32 or 64 bit); Windows XP SP2,3 (32bit)
- **Software** LabView based application
- **Thermister Temperature Accuracy** $\pm 0.25^{\circ}\text{C}$ at 25°C
- **Voltage Accuracy** 0.02% across all voltage ranges
- **Voltage Range** 200mV - 40V
- **Voltage Resolution** 1uV - 1mV

(2) Technical Specs For 1 Ampere IV Charecterization system:

- (i) The IV charecterization system should be able to do IV measurement of SHJ (Silicon heterojunction) wafer based solar cells and tandem solar cell of dimension from 0.4x0.4cm to 2 cmx2cm.
- (ii) It should be able to perform Dark & Light IV on pin type nip type, wafer based, glass substrate based, and flexible substrate based solar cells. Max current range should be 1 Ampere.
- (iii)The system should have Keithley based source meter with IV software and cell connections to do IV measurement.
- (iv)System should runs I-V measurements and calculates critical parameters such as short circuit current (Isc), current density (Jsc), open circuit voltage (Voc), fill factor (ff), maximum output power (Pmax), cell efficiency (η), and other standard photovoltaic cell parameters R_{sc} , R_{oc} , R_{shunt} , cell temperature, exposure duration, date and time.

It should moreover meet following specifications.

- **Electrical Interface** 4-Wire
- **Output Power** 20 W
- **Communication Interface** GPIB - USB
- **Current Accuracy** <0.25% across all ranges
- **Current Range** 1uA - 1A
- **Current Resolution** 10pA - 10uA

- **Duration of IV Measurement** 0.6 - 58s
- **Number of Measurement Points** 2 - 1,000
- **Operating System** Windows 10 (32 or 64 bit); Windows 7 (32 or 64 bit); Windows XP SP2,3 (32bit)
- **Software** LabView based application
- **Thermister Temperature Accuracy** $\pm 0.25^{\circ}\text{C}$ at 25°C
- **Voltage Accuracy** 0.02% across all voltage ranges
- **Voltage Range** 200mV - 200V
- **Voltage Resolution** 1uV - 1mV
-

(3) Cell Holder Accessories:

- Cell holder should hold Sample Size of maximum 6 inch x 6inch square .
- Temp Sensing Range -20°C to 120°C , $\pm 1^{\circ}\text{C}$
- Temperature Holding $< 0.50\text{C}$ per minute with exposure to 1 SUN
- Sample Temperature Sensing Tolerance 0.250 C or better.
- Holder should be Vacuum Plate Material Nickel plated aluminium or better option.
- Vacuum Requirement 150 mm Hg minimum
- Should have proper tubes for water circulation for cell cooling.
- Should come with CE certified Chiller having Operating Range 10 C – 40 Deg C and Control Accuracy $\pm 2^{\circ}\text{C}$ Precision 0.10 C with constant load
- Chiller Cooling Capacity atleast 150 W at 20 Deg C and chiller Modes can be Cool or heat cycle
- Two Probes with magnetic base and XY Joystick and Z adjustment knob and should able to use with max 3 Amp current on each probe.
- Oil free vacuum pump should be quoted.
- Pump should be oil free type and should create 650 mm Hg vacuum pressure for holding cells. Flow rate can be 16 lpm to 2 lpm.

(4) Technical Specs for Ref cell and meter:

- **Range** 0-3.000 Sun $\text{k}\Omega$
- **Resolution** 0.0001 Sun @ 0 – 1.9500 Sun (Low Display Range)
0.001 Sun @ 1.900 – 3.500 Sun (High Display Range) μm
- **Sampling Rate** 2 Readings or higher/ second
- **Operating Temperature Range** 10 to 40°C
- **Autoranging** Switches to higher display range above 1.950 Sun, lower range below 1.900 Sun

- **Operating Humidity** 0-85% RH Non-Condensing
- **Settling Time** <1 sec. for <0.25%

(5) Specification for chiller with pump

technical Specs

- **Power Requirements** 13.5 VDC, 15 A - AC Adaptor included
- **Weight** 8.1 lbs. [3.7 kg]
- **Operating Temperature Range** 2 to 45°C
- **Operating Mode** Cool, Heat, Cycle
- **Communication Interface** Top panel or RS232
- **Dimensions** 7.5 inch x 5 inch x 7 inch [190 mm x 127 mm x 178 mm]
- **Noise** <65 dB at 3 ft.
- **Precision** < 0.1 °C with a constant load
- **Connection** 1/8 in. CPC with shut-off valves
- **Coolant** 25% propylene glycol/water preferred, ethylene glycol/water or water acceptable
- **Cooling Capacity** 160 W at 20°C (20°C ambient)
- **Pump** 0.5 lpm gear pump at 10 psi, with a magnetically-coupled brushless DC motor (10,000 hr MTBF)
- **Tank Volume** 75 ml, additional coolant needed to fill hoses and cold plate.

(6) Other requirements

- **Warranty** : ≥ 1 year after installation
- **Electrical supply**: Indian standard ~220V, 50Hz
- **Service engineer** : At least 5 (five) factory trained Service engineers in india for IV Tester
- **Background** : (i) At least 15 years in business in India
(ii) Equipment at least in 4 labs working for > 10 years.

Acceptance test :

- (i) Acceptable (Noise free) light I-V and dark I-V measurement (curve) of one standard solar cell from the vendor and one provided by the customer.
A temperature dependent I-V measurement will be shown.



CENTRE FOR INDUSTRIAL CONSULTANCY & SPONSORED RESEARCH (IC&SR)
INDIAN INSTITUTE OF TECHNOLOGY MADRAS
CHENNAI 600 036



B NAGARAJAN
JOINT REGISTRAR (IC & SR)

Project Accounts
July 22, 2016

TO WHOMSOEVER IT MAY CONCERN

In connection with project, **US currency may be transferred to CANARA BANK, IIT - MADRAS Branch** with the following details.

FOR TRANSFER OF CURRENCY US DOLLAR

Please Credit in USD

(THROUGH)

JP MORGAN CHASE, NEW YORK
SWIFT CODE: CHASUS33

For Credit to

USD ACCOUNT No: 001-1395969, of CANARA BANK INTERNATIONAL DIVISION
MUMBAI

For Further Credit to

ACCOUNT NO: **2722101001741** of IIT Chennai – Swift Code: **CNRBINBBIIT**
OF THE REGISTRAR, IIT, MADRAS


JOINT REGISTRAR (IC & SR) i/c

संयुक्त कुलसचिव (आई.सी. एवं एस.आर.)
JOINT REGISTRAR (IC & SR)

आई.आई.टी. मद्रास

This is to certify that the particulars furnished are correct.

For Canara Bank

Senior Manager
Canara Bank - IIT Madras branch



एस. अरवींदन
S. ARAVINDAN
सीनियर प्रबंधक Senior Manager
प.अ.सं. S.P.No. 31649