INDIAN INSTITUTE OF TECHNOLOGY MADRAS
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Ref: PHY/13-14/284/DSTX/SUDA **Date: 09.10.2013**

Tender No.: PHY/SUDA/019/2013

Due Date: 29.10.2013, 3:30pm

N.E. Nagaraj
Special Officer (Project Purchase)
IC&SR, I.I.T. Madras

Dear Sirs,

On behalf of the Indian Institute of Technology Madras, offers are invited for the supply of various Scientific Instruments "(i) Solar simulator with I-V testing, (ii) Solar cell spectral response/QE/IPCE measurement system and (iii) RF sputter deposition unit" conforming to the specifications given in Annexure.

I) 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 below-mentioned addresses 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 "Special Officer, 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 it will be examined by a technical committee which will decide the suitability of the bid as per our specifications and requirements. The financial offer/bid will be opened only for the offer/bids which technically meet all our requirements as per the specification. The bidders, if interested, may be present on the financial tender opening Day which will be communicated to you.

(iv) **Prices:-** The price should be quoted in nett per unit (after breakup) and must include all packing and delivery charges to Various Institutions. The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. However the percentage of tax & duties should be clearly indicated.

The price should be quoted without custom duty and excise duty, since I.I.T. Madras is exempt from payment of excise duty, and the custom duty will be paid at concessional rate against duty exemption certificate.

In case of import supply, the price should be quoted on FOB and CIF basis indicating the mode of shipment.

(v) **Agency Commission**:- Agency commission, if any, will be paid to the Indian agents 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 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 about the percentage of payment and it should be included in the originally quoted basic price, if any.

(vi) **Terms of Delivery**:- The item should be supplied to our Various Institutions as per 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) IIT Madras reserves the full right to accept / reject any tender at stage without assigning any reason.

Yours faithfully,

N.E. Nagaraj
Special Officer (Project Purchase)
IC&SR, I.I.T. Madras.

SCHEDULE

I) Important Conditions of the tender

1. The due date for the submission of the tender is **29.10.2013, 3:30pm.**

2. 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 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 Limited Tender / Open Tender for supply of "_____" should be written on the left side of the Outer bigger cover.

3. (i) EMD should be at 2% (Two percent) of the tender value quoted by the company. The EMD should be included in the Financial bid which will not be opened for Technical evaluation. **Enclosing the EMD in the Technical bid will automatically disqualify the tenderer.** EMD should be in the form of DD in favour of "The Registrar, Indian Institute of Technology Madras" and payable at Chennai. The tender without EMD would be considered as UNRESPONSIVE and REJECTED. Photo/FAX copies of the Demand Draft/Banker's pay orders will not be accepted. No interest will be paid for the EMD and the EMD (Bid Security) will be refunded to the Successful bidder on receipt of Performance Security.

   (ii) The Successful bidder should submit Performance Security of an amount of 5% of the value of the contract. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt from the commercial bank, Bank Guarantee from commercial bank will be an acceptable.

   (iii) The Performance Security 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. If an Indian agent is involved, the following documents must be enclosed:

   i) 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.
   ii) Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.
   iii) The enlistment of the Indian agent with Director General of Supplies & Disposals under the Compulsory Registration Scheme of Ministry of Finance.

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. Documentary proof for the claimed position and repetition accuracies must be obtained from the principals and submitted along with the relevant pages of the standards.

8. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.

9. **Validity:** Validity of Quotation not less than 90 days.

10. **Delivery Schedule**:- The tenderer should indicate clearly the time required for delivery of the item. 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.

11. **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.

12. **Payment**:- No Advance payment will be made for Indigenous purchase. However 90% Payment against Delivery and 10% after installation is agreed to wherever the installation is involved. In case of import supplies the payment will be made only through Letter of Credit and 90% payment will be released against delivery and 10% after installation wherever the installation is being done.

13. **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 Institution of IIT Madras.

14. **Warranty/Guarantee**:- The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Any extended warranty offered for the same has to be mentioned separately.

15. **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 or any other delay.

16. **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.

17. **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 the city of Chennai in Tamil Nadu.

18. **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.

Following items (Part A, Part B and Part C) are required for the solar cell I-V testing and quantum efficiency (QE) measurement system for **dye-sensitized and quantum dot sensitized solar cells**. The essential specifications are given. Any other important parts not mentioned in the essential specifications can be quoted as optional accessories. Parts A and B can be quoted separately or together. Part C should be quoted separately. Please provide technical bid and price bid separately along with the compliance statement.

Part A: SOLAR CELL I-V TESTING SYSTEM WITH SOLAR SIMULATOR

Essential specifications

Solar cell I-V curve measurement system should include

- Class AAA solar simulator (for all the spectral match, non-uniformity of irradiation and temporal instability of irradiance) certified by all the standards, viz. IEC, ASTM and JIS suitable for solar cell testing system.
- The system should have illumination housing, black finish to reduce stray light, integrated shutter and power supply, irradiance monitoring, temperature sensors and safety interlocks
- AM 1.5 sun global spectral filtering
- Area of illumination 2 inch x 2 inch
- Power output 100 mW/cm^2
- Working distance ~ 12 inch
- Lamp power 400 to 500 W with a line regulation 0.01 %
- One spare lamp
- Spectral range 400 to 1800 nm
- I-V testing system with a current range of ~ 1 μA to 1 A with 0.5 % accuracy, voltage range ~ 1 nV to 20 V with 0.05 % accuracy
- Computer with appropriate software to measure open circuit voltage V_{OC}, short circuit current I_{SC}, V_{max}, I_{max}, P_{max}, efficiency, fill factor, R_{SC}, R_{OC}, R_{shunt}
- The software should generate I-V curves as tab delimited data and report I-V curve plot for fast data overview
- Vacuum test fixture for I-V measurement on substrates of size 2 inch x 2 inch, electrical contact probe kits with X-Y joysticks and additional probe tips. The test fixture should include a provision to mount an irradiance monitor.
- NIST/NREL certified 2 cm x 2 cm Si based photovoltaic reference cell for calibration with meter to read 0 to 3.5 sun, suitable temperature sensors and adapter cables for reference cell
- Warranty for 3 years
- Onsite Training
- Service center/technical support should be in India
- Installation of a similar/equivalent model in last five years in India
- Price should be inclusive of shipping CIF to Chennai

Optional specifications/ Accessories

- temperature control for vacuum test fixture

Part B: SOLAR CELL SPECTRAL RESPONSE EXTERNAL AND INTERNAL QUANTUM EFFICIENCY MEASURING SYSTEM

The essential specifications for quantum efficiency measurement system are given below. Any other important parts not mentioned in the essential specifications can be quoted as optional accessories. Please provide technical bid and price bid separately along with the compliance statement.

Essential specifications

Fast, accurate and repeatable, IQE, EQE should be measurable using single system**.** This system should include

- AC and DC mode systems to cover all the cell types, especially for dye-sensitized and quantum dot sensitized solar cells along with spectral responsivity, specular and diffuse reflectance with integrating sphere, J_{SC}
- Should be compliant to ASTM E1021-12 standard test method
- Should be able to acquire data from all channels in single pass
- Wavelength range 300 to 1800 nm
- White bias light up to 5sun irradiance
- Lamp with dual grating monochromators, order sorting and stray light filters (one spare lamp)
- Probe light chopping frequency in the range 4 to 200 Hz
- Working distance in the range 50 to 80 mm
- Spot size in the range 1 to 2 mm
- Adjustable spectral resolution in the range 5 to 10 nm
- Wavelength accuracy in the range ~ 0.5 nm
- Repeatability over the whole wavelength range should be $< \pm 0.6$ %
- Monochromator path length around 1/8 m
- Vacuum test fixture for substrates including joy stick micro manipulator probe
- Standard calibration photodiode for the QE measurement system
- Computer with user-friendly software for fast report generation
- Warranty for 3 years
- Onsite Training
- Service center/technical support should be in India
- Installation of a similar/equivalent model in last five years in India
- Price should be inclusive of shipping CIF to Chennai

PART C: SPUTTER DEPOSITION UNIT

Essential specifications for a DC and RF magnetron sputtering system suitable for depositing both conductive and non-conductive thin films are given below.

Essential specifications

- Sputtering chamber should be made of SS 304 can be box type/cylindrical/D-shaped of capacity 40 to 50 *l* with view ports and sample loading port. The chamber should be able to accommodate four numbers of 2 inch magnetrons. Should reach vacuum of the order of 10^{-7} torr. The chamber should have necessary ports to fix cathode anode plates, heater supply, thermocouple, shutter fixing, vacuum pumping ports, etc. The chamber should be bakeable to 120 ^{o}C. Two sputtering targets of size 2 inch dia each. The magnetron cathode should preferably be on the top plate of the chamber and substrate on the bottom. Shutter mechanism to isolate the substrate from the target

- Turbo molecular pump (300 *l*/s) with controller for high vacuum and rotational speed of 40,000 to 60,000 rpm to easily achieve 10^{-7} to 10^{-8} torr chamber base pressure. Roughing pump, preferably a dry pump, for creating a base pressure (10^{-2} to 10^{-3} torr)

- Manually operated gate valve as a high vacuum valve for full isolation. Suitable valves for backing, motorized Butterfly valve for throttling and pressure controlling purpose. Taking input from Capacitance manometer 0-10Mbar for controlling the pressure inside the chamber

- Vacuum measuring gauges (one digital pirani – penning gauge or any better pressure measuring gauges suitable for sputtering chamber). Penning gauge should be able to read vacuum better than 10^{-8} Torr. Capacitance manometer 0-10Mbar to be provided for controlling the butterfly valve.

- One DC Power supply (1000 W) adjustable power supply and Second RF Power supply (600 W) along with auto matching network.

- Two sputtering Guns of size 2 inch dia each

- Substrate holder should have rotating module .Magnetic coupling to be used for rotation. "O" ring seal for dynamic moving part not acceptable. Substrate heater should reach a maximum temperature of 700 ^{o}C and stable under sputtering conditions including high vacuum, reactive oxygen and nitrogen gases. The controller for the heater should be included. The temperature should be controlled by PID coupled with thermocouple. The whole substrate rotation and heating mechanism to be mounted on a flange and bellow assembly to be provided between the flange and the chamber for adjusting the distance between target and substrate up to 50mm. Distance between the substrate and the target should be adjustable

- Mass flow controller gas mixing system (3-channel) with digital display unit (4-channel) to enable sputtering in Ar and in O_2 / N_2 ambient, with shut off valves used for feeding three different gases calibrated in the range of 0 – 100 sccm for Ar and 0-50 sccm for O_2 and N_2. Gas feeding line (SS line) with Swagelok coupling should be provided. Ar gas fed into the chamber with isolation valve for sputtering purposes. All mass flow controllers to be connected through a good swagelok valve for isolation of the mass flow controller and vacuum chamber.

- Control console to house all the measuring and monitoring equipments (Power supplies, power drives, temperature controllers, mass flow controllers, vacuum measuring gauges, throttle valve controllers)

and switch gears for smooth operation of the system. Standard system precaution and interlocks, specifically turbo interlock with rotary pump, should be provided for the safety of the machine and the users.

- Warranty for 3 years
- Onsite Training
- Service center/technical support should be in India
- Installation of a similar/equivalent model in last five years in India
- Price should be inclusive of shipping CIF to Chennai