Pl.A1/Phy/2505-2/2021

Department of Physics, University of Kerala, Kariavattom,

Thiruvananthapuram, Kerala, India – 695 581, Ph: 91 471 2308920

Date: 20/12/2021

E-Tender Notice (Re-Tender)

Department of Physics, University of Kerala, Thiruvananthapuram invites open tenders through e-Procurement (in two bid system) for the purchase of External Quantum Efficiency & Solar Simulator.

Last date and time for submission of tender online	: 29/12/2021 5 pm
Date and time of opening of tender	: 01/01/2022 11 am
Hard copies of the sealed tenders to be submitted to the office of	**The Head, Department of Physics, University of Kerala, Kariavattom, Thiruvananthapuram, Kerala – 695 581.** **e-mail: sibi@keralauniversity.ac.in**
For technical details contact	**Dr. R. Jayakrishnan, Associate Professor, Department of Physics, University of Kerala, Thiruvananthapuram, Ph. No. 9447242210.**

For further details logon to www.etenders.kerala.gov.in

TECHNICAL SPECIFICATIONS

A) Quantum Efficiency Measurement system

System should have the following specifications.

A. The system should be designed in accordance with IEC Standard
B. It should be able to process the following perovskite, thin film & Si wafer Solar Cell samples
C. It should be a one box compact system with shielding enclosure. All power supplies, controllers, Monochromator, Lock-in should be housed within this enclosure.
D. Wavelength range should be from 300-1100nm
E. The system should measure external quantum efficiency and reflectivity.
F. It should include highly stable Xe lamp system having intensity variation less than 1% within 48 hours.
G. The system should offer a quick measurement from 300 to 1100nm (the interval is 10nm) within 5 minutes or less.
H. The measurement repeatability in spectral range from 300 to 1100 should be 99% or better
I. Repeatability of short-circuit current density is ≧ ±99%.
J. The system should have a double beam path design as NIST and PTB standards wherein the light intensity is monitored simultaneously while acquiring the signal from sample to ensure high measurement result accuracy.

The specifications of the individual components are as below:

Light Source System

- 75W high stable Xe lamp or higher with power supply
- Spectral range: 300-1100nm continuous light
- Equipped with three-axis adjustment knob
- The deviation less than 1% within 48 hours

Monochromator

- Focal Length: 110mm or more
- Resolution: ≦1 nm
- Scanning interval: variable between 0.1 nm - 50 nm

Optical System

- Spot size: 2mm x 2mm or better
- Reflectivity >70% in full wavelength range.
- Vertical light path
- Efficient working distance: ≧10 cm

Filter Wheel

- Manually and computer controlled.
- LED display to indicate the present filter setting position
- Equipped with 4 filters

Chopper

- Frequency: 10-450 Hz or more.
- Computer controlled
- Resolution: 0.01Hz, stability: < ±0.05 Hz
- Stable time to change the frequency < 3 seconds

Lock-in Amplifier

Dual-channel DSP locking-in amplifier with individual preamplifier modules. One DSP lock-in amplifier should be used for Device under test and the other one for reference cell/ monitor cell measurements.

- Maximum acquisition speed < 25 us (signal)
- Two DSP simultaneous working mode speed < 50us,
- Maximum gain: 107
- Maximum sensitivity: 1nA
- Maximum input voltage: 10V
- Automatic channel switch function

Oscilloscope

- Oscillography display window
- Time domain signal and frequency domain signal analysis and displaying
- Signal monitoring function: should monitor the photo current variation of test sample
- 4 to 1 automatic multi-channel switcher
- Two independent channels for EQE, IQE
- Analog input resolution: 14 Bits (ADC: Analog Digital Converter)
- Maximum resolution of sample rating: 48 KS/s
- Maximum voltage: ±10V, accuracy 7.73 mV
- Minimum read current: 1 nA

Reference Detector:

- Si Detector Range: 300 to 1100nm,
- Active area: 10mm x 10mm
- BNC connector
- With NIST traceable report

Monitor Module:

System should include signal monitor detector which can simultaneously monitor the signal to assure the measurement result accuracy during the long time measurement process.

- Monitoring Silicon range：300-1100nm
- Lock-in amplifier for circuit feedback signal
- Two independent DSP lock-in input

Computer with necessary Quantum Efficiency & Spectral Response Measurement System software:

- PC with Windows OS and LCD Monitor
- Software control through USB interface preferred.
- Software should be able to perform following operations:
- Light intensity calibration
- Spectral responsivity measurement
- External quantum efficiency measurement （EQE）
- Auto and immediate short-circuit current density calculation
- Automatic short-circuit current calculation for single wavelength
- Device short-circuit density current calculation
- Mismatch factor calculation
- Data collection and analysis function
- TXT data saved

Optional

a) calibration set with standard silicon solar cells

b) Multifunction Sample Stage -System should be supplied with multifunction thin film stage and IC clips (2 nos) for DSSC, OPV & thin film sample measurements.

c) System should be upgradable in future to IQE measurement using 2" Integrating sphere with average measurement repeatability ≧ ±99%

B) Class AAA Solar Simulator

System should have the following specifications.

- Compliance with latest IEC 60904-9 3rd Edition (2020)
- Active Illuminating area: 50mmx 50mm
- Wavelength range: 300-1200nm
- Working Distance: 250mm or more
- Spectral Mis-match: AM 1.5G, 0.875 - 1.125 (IEC Class A+)
- Spectral Non-uniformity: < 2% (IEC Class A)
- Temporal Instability: < 1% (IEC Class A+)
- Max Irradiance intensity: 1500W/m2 @ AM1.5G
- Lamp: 300W Xenon ozone free lamp
- Lamp life: atleast 1000 hours
- Continuous intensity variation from 0% to 100%. Intensity variation should not change the spectral & temporal performance. i.e Spectral match, non-uniformity and temporal instability Class should remain unchanged.
- Illumination from Bottom, top and side wise must be possible
- Power supply with stability better than 1%
- 3.5" Color Touch panel display & control: Digital Lamp Voltage, Lamp Current & Lamp operation hour display/lamp power control, Iris Control and shutter control.
- Over voltage/ over current/ over temperature warning.
- Safety lock warning and light source auto shutdown

Warranty: The equipment must have warranty for 5 years. If standard warranty is less, vendor must separately indicate additional charges for 5 years warranty. Vendor should be able to provide non-comprehensive AMC after the warranty period. The charges may be indicated separately.

General Conditions:

1. Every tenderer should submit Tender fee of **Rs. 2,500/-**

2. Every tenderer should submit Earnest Money Deposit (EMD) of **Rs. 30,000/-**
3. The tender shall be submitted in the two bids viz. Technical Bid and Financial Bid. Only those qualified in technical bid will be eligible for participating in financial bid. A presentation regarding the technical specification and item to be supplied shall be done before the technical evaluation committee if requested.
4. The bidder should be a manufacturer or their dealer specifically authorized by the manufacturer to quote on their behalf for this tender as per Manufacturer Authorization From and Indian agents of foreign principals, if any, who must have designed, manufactured, tested and supplied the equipment(s) similar to the type specified in the "Technical Specification". Such equipment must be of the most recent series/models incorporating the latest improvements in design. The models should be in successful operation for at least one year as on date of Bid Opening.
5. **Compliance Statement**: Along with the technical details provide a tabular column indicating whether the equipment quoted by you meets the specifications by indicating 'YES' or 'NO'. If 'YES', support the claim by providing original brochures. **Vendors should provide clear brochures/data sheets about the equipment and its working. Also include adequate proof for the claim regarding the performance.**
6. **Reference:** Names of Institutes with contact person and telephone/ email where similar equipment supplied by you in India [Preferably South India] shall be mentioned in the bid.
7. Incomplete & conditional tenders and tenders received after the due date will be summarily rejected without assigning any reasons thereof.
8. The price should be inclusive of all taxes, duties, transportation, insurance, installation etc. Nothing extra will be paid in addition to the quoted rate. Any amount in Indian rupees for installation, commission, labour, spares, service etc shall be entered in item 2 of BoQ.
9. Payment Terms: 90% payment shall be made through irrevocable LC on presentation of complete and clear shipping documents and balance 10% of the amount shall be released after the receipt, installation commissioning and acceptance of the equipment.
10. Validity of tender: Tender submitted shall remain valid at least for 120 days from the date of opening the tender. Validity beyond 120 days, from the date of opening of the tender shall be by mutual consent.
11. Delivery and installation: Proposed delivery schedule should be mentioned clearly. Delivery and installation and training (one week) should be made at the Department of Physics, University of

Kerala, Kariavattom campus, Trivandrum without extra cost (inclusive of documentation, demurrage, customs duty, clearance and transportation charges). University of Kerala will provide customs duty exemption certificates if required.

12. Service facility: Supplier should mention their details of service setup and manpower in Thiruvananthapuram who are responsible for after sales support.
13. The model number, make, and a printed literature of the product shall submit positively
14. In case of any dispute, the decision of the University authority shall be final and binding on the bidders.
15. The undersigned reserves the right to reject any or all of the tenders received without assigning any reason thereof.
16. The quoted item should be under **comprehensive warranty for 5 years** or more.
17. If any component is found to be defective during the warranty period, the vendor has to replace the defective item immediately at their own cost.
18. For any queries please contact, Dr. R. Jayakrishnan, Associate Professor, Department of Physics, University of Kerala, Thiruvananthapuram, Ph. No. 9447242210.

Documents to be Uploaded

1 Signed Compliance Matrix
2. Detailed Technical Brochure
3. Under taking of support for next 10 Years
4. BoQ
5. Detailed Financial Bid
6. Hard copy of Bank Guarantee if opted