MAHATMA GANDHI UNIVERSITY

SCHOOL OF CHEMICAL SCIENCES

Tender No. 837/2017/HEDN Date: 14/2/2018

NOTICE INVITING E-TENDER

The Registrar, Mahatma Gandhi University, Kottayam for and on behalf of **Principal Investigator, School of Chemical Sciences, Mahatma Gandhi University**, invites online bid (technical and financial bid) for the purchase of **Solar Cell Tester and other measurement options** from reputed firms.

1	**Name of the scientific equipment**	**Solar Cell Tester and other measurement options**
2	Earnest money deposit (EMD)	Rs. 69,000/-
3	Tender submission fee	2500
4	Period of supply and installation	Within 120 days
5	Mode of submission of Bid	Online
6	Tender Documents	Can be downloaded from the website www.etenders.kerala.gov.in
7	Last date and Time of submission of tender by online	06.03.2018 12pm
8	Last date and Time of submission of relevant documents by speed post	07.03.2018 2 pm
9	Date and time of opening of technical bid	08.03.2018 4 pm

General tender documents and tender schedule can be downloaded in A4plain size paper free of cost from the website www.etenders.kerala.gov.in.

Duly filled up and signed tender schedule along with relevant documents should also be sent to
Prof. Dr. Sabu Thomas,
Principal Investigator,
School of Chemical Sciences,
Mahatma Gandhi University Kottayam,
Kerala Pin-686560, by speed post so as to reach before the date and time specified. The cover containing the documents should super scribe the name of the scientific equipment, tender number, and last date of submission of tender.

Documents to be submitted along with bid through online/speed post.

Sl.No	Sl.No Through online	Through speed post
1.	Scanned copy of dealership certificate	Copy of valid dealership certificate
2.	Scanned copy of duly filled e-payment form	Duly filled e-payment requisition.
3.	Scanned copy of other certificates required, if any, for tender acceptance	Copy of other certificates required, if any, for tender acceptance.
4.	Scanned Copy of duly filled preliminary Agreement in stamp paper of Rs.200/-	Preliminary Agreement in original
5.	BOQ	Not Required

Specification of Solar Cell Tester, CT50AAA: Solar simulator SS50AAA, a class AAA Solar Simulator with IV system CC-1

A. Specification of Cell testers

- ✓ It should be fully integrated and automated systems available.
- ✓ It should be high quality Solar Simulator with computer control.
- ✓ Solar Simulator should have intensity measurement and feedback control for long term stability.
- ✓ Flexible cell test fixture configurations, including optional cell temperature control (10°C to 70°C ±0.5°C or better).
- ✓ There should a true four-probe cell contacting technique.
- ✓ There should be availability of temperature controlled chuck with vacuum hold.
- ✓ There should be facilitated with multiple cell contacting probes for larger cells.
- ✓ Systems should be equipped with advance I-V software.

B. SS150AAA-TP Touch Panel System Features

- ✓ Light intensity feedback for stable output intensity
- ✓ Computer based Controller
- ✓ Manual / automatic shutter control
- ✓ External lamp alignment with lamp on
- ✓ Manual/Automatic/External/Remote shutter control
- ✓ Forced air cooling
- ✓ Lamp life display
- ✓ Lamp Current Meter
- ✓ Selectable and adjustable constant intensity or constant lamp current or constant power mode
- ✓ Safety Interlock override warning LED
- ✓ Over Temperature Warning LED
- ✓ Shutter Status Indicator
- ✓ Lamp status indicator
- ✓ Remote Trouble Shooting via Internet

C. **SS150AAA-TP (Touch Panel) Technical Specifications**

- ✓ **Type of lamp**: Xenon Short Arc
- ✓ **Lamp Power**: 1000 W
- ✓ **Max. Illuminated area**: 150mm X 150mm
- ✓ **Light Source**: Steady State
- ✓ **Air Mass**: AM1.5G Standard
- ✓ **Lamp lifetime**: 1,500 Hours
- ✓ **Adjustment Range of light intensity**: 1000 W/cm² ± 15%
- ✓ **Simulator Class**: AAA
- ✓ **Spectral Match to all intervals**: ±25% or better
- ✓ **Spatial Non-uniformity of irradiance**: ≤ 2% or better
- ✓ **Short Term Temporal Instability (STI)**: ≤ 0.5% or better
- ✓ **Long Term Temporal Instability (LTI)**: ≤ 2% or better
- ✓ **Dimensions (Height x Width x Depth)**: 69.1″ (1755mm) x 16.4″ (416mm) x 24.3″ (618mm)
- ✓ **Weight**: 154 Lbs. (70 Kg)
- ✓ **Optimum Working Distance**: 5.8" (147mm)
- ✓ **Phase/Voltage/Frequency**: Single Phase/220AC Volts/50-60Hz
- ✓ **Max. Power Consumption (W)**: 1250 W

D. **CC Series I-V Measurement System (CC-5) Description & Features**

- ✓ Fixture for holding cells for testing should accommodate cells from small to up to ≥ 100mm x 100mm.
- ✓ There should be a adjustable cell stops in X & Y axis.
- ✓ All voltage and current probes should gold plated.
- ✓ Temperature controller should measure and monitor the temperature of plate automatically with accuracy of <±0.5°C during cell measurement.
- ✓ Direct display of I_{SC}, V_{OC}, V_{MAX}, P_{MAX}.
- ✓ Computer, Monitor, Keyboard, and Mouse.
- ✓ Rack Mount Console to House I-V ELECTRONICS.
- ✓ Cables, Safety and Adjustment tool and operating manual should provide.

E. **I-V Measurement System (CC-5) Technical Specifications**

- ✓ **Maximum Current Range (A)**: ±5A
- ✓ **Available Current Ranges**: ±5A. ±1A, ±100Ma
- ✓ **Maximum Voltage Range (V)**: ± 40V
- ✓ **Available Voltage ranges**: ±60V, ±20V, ±2V, ±200Mv
- ✓ **Maximum Power(W)**: 50W
- ✓ **Measurement Resolution**: 16 Bit
- ✓ **Measurement Accuracy**: Better than 0.5%
- ✓ **Measurement Mode**: Fixed or Auto
- ✓ **Measurement Time(Light)**: <500ms for stable light (Up to 4s if filtering for light fluctuations required)
- ✓ **Measurement Time (Dark)**: 100-1000ms
- ✓ **Maximum points per Curve**: 100-1000
- ✓ **Maximum Data Acquisition Speed**: 100kHz
- ✓ **Maximum Cell Throughput**: 1200/Hour
- ✓ **Phase/Voltage/Frequency**: Single Phase/220AC Volts/50-60Hz
- ✓ **Max. Power Consumption (W):** 40W (Up to Peltier Cells)
- ✓ **Curve Correction to STC**: IEC 60891, Anderson or Blaessar
- ✓ **Advance Fitting of I-V Curves**: SEM, DEM and VDEM Models (17 Different Weight Functions)
- ✓ **Thermal Coefficients of V_{OC} and P_M**: Standard on All Systems (With Optional Temperature Control
- ✓ **Irradiance Monitoring & Correction**: Standard on All Systems

F. **Advance Software feature for IV measurement system:**

- ✓ Easy to use MS Windows environment and user friendly software.
- ✓ Software should handles measurement of both P type and N type cells without any cell connection changes.
- ✓ Advanced noise filtering feature to enable measurement of good quality I-V curves even under fluctuating intensity conditions.
- ✓ Light Intensity & Temperature monitoring and control, 5-60°C Standard.
- ✓ Calculation of cell series resistance according to IEC 60891 standard and ASTM E948-09 Annex A1.
- ✓ Procedures for fitting of measured I-V Curve to either equivalent diode models, i.e. SEM-Single Exponential, DEM-Double Exponential and

VDEM-Variable Double Exponential with seventeen (17) weight functions.

- ✓ Procedures for curve correction to Standard Test Conditions (STC) to IEC 60891, Anderson's and Blaessar's or user defined conditions. User has the ability to perform automatic correction of measured I-V curve to STC (Standard Test Conditions), i.e. light intensity and temperature or other conditions specified by the user.
- ✓ Computes solar cell parameters including I_{SC}, V_{OC}, F_F, I_{MAX}, V_{MAX}, P_{MAX}, E_{ff}, Rs and Rsh and saves them automatically on hard disk drive. In addition cell's temperature and irradiance level is measured and stored for future analysis.
- ✓ Calculate Thermal Coefficients of I_{SC} (α), V_{OC} (β) & P_M (γ).
- ✓ Dark saturation current, R_S and R_{SH} determination.
- ✓ Provides printable test reports and test data in text files for easy exchange between programs.
- ✓ Software features include cell sorting in various categories. This cell sorting can be performed in production or in virtual binning modes specified by the user.
- ✓ Solar Simulator shutter control.

G. **Calibrated Reference Cells (NREL Traceable)**

- ➢ **Product Description**

- ✓ It could be designed for use with any Solar Simulator
- ✓ Cell should be protected by quartz window and temperature sensor (100 Ω Platinum Resistance Temperature Detector).
- ✓ Solar Reference Cell consists of a 20mm x 20mm Monocrystalline Silicon Photovoltaic Cell.
- ✓ Encased in a rugged metal enclosure and it should be lightweight
- ✓ Certificate of calibration.
- ✓ Certified parameters: I_{SC}, I_{MAX}, V_{OC}, V_{MAX}, P_{MAX}, Area, Fill Factor (FF) and Efficiency.
- ✓ Certification is traceable to National Renewable Energy Laboratory (NREL).
- ✓ Compatible set of connecting cables with four 4-point measurements of both current and temperature.

- **Product Specifications**

- ✓ **Window Material:** Quartz (other window material optional).
- ✓ **Temperature Sensor:** 100 Ω Pt. RTD (Type K thermocouple optional).
- ✓ **Connectors (Current & Temperature):** LEMO ERA.0S.304.CLT.
- **Cable Set:**
  - → Compatible with LEMO Plug.
  - → Banana Plugs on the other end of cables.
  - → 4-point measurements.
- ✓ **Photovoltaic Material:** Monocrystalline Silicon.
- ✓ **Photovoltaic Device Dimensions:** 20mm x 20mm.
- ✓ **Calibration Irradiance:** 1000 W/m² (1 Sun).
- ✓ **Operating Current:** Less than 175mA.
- ✓ **Operating Temperature:** 10°C to 30°C.
- ✓ **Enclosure Material:** Anodized Aluminum.
- ✓ **Enclosure Dimensions:** 89mm x 70mm x 19mm.
- ✓ **Mounting Hole Pattern:** 62mm x 62mm, Compatible with WPVS reference cell guidelines.

H. **Temperature Controller**

- ✓ Temperature controller should measure and monitor the temperature of plate automatically with accuracy of <±0.5°C during cell measurement.
- ✓ Temperature Control 5 – 75 °C.
- ✓ Automated through software for thermal coefficients.
- ✓ Peltier cooler bring the required temp (cooling/heating) on the sample and shutter opens for light measurements at predetermined temperatures.

I. **Micro-Processor-Based Touch-Panel Controller.**

- ✓ Lamp's turn on-and-off and lamp's life.
- ✓ Shutter Panel & External Control.
- ✓ Intensity control; Setting the Intensity, Calibrating the Intensity.
- ✓ Keeping Record of lamp's Life.
- ✓ Constant Power of Constant Intensity Control.
- ✓ System Calibration.

- ✓ Over Temperature Alarm.
- ✓ Door Open Safety Alarm.

J. **Contacts**

- ✓ Spring loaded contacts with 24 pins for multi crystalline Silicon solar cells

K. Auto Probe Silicon

- ✓ Upgrade manual Probe contacts with motorized control with user set pressure for contacts on the cell

L. **Special Conditions**

1. Laboratory floor space, electric power requirement, earthing, room temperature/humidity requirement etc. should be mentioned appropriately. Power requirements: Single/ Three phase 230V/420V Power will be provided (Frequency 46-52 Hz)
2. Operation and service manual in English (electronic and hard copy) should be provided with the equipment.
3. Installation and commissioning at MG University, Kottayam will be without any additional cost.
4. Warranty: Standard 1year plus extended warranty for 2nd and 3rdyear on-site after the successful installation and acceptance by M. G University. There should have frequent visit from both service engineer and application scientist.
5. All other accessories should be provided with the instrument within warranty period by vendor.
6. A good record in supply and service to other research institutes will be considered as a positive point for a particular company. User list of similar equipment supplied recently in India should be provided with above mentioned specifications.
7. Mode of purchase are Subject to the conditions stipulated by Mahatma Gandhi University, Kerala
8. The Delivery Schedule, Payment Terms & Warranty/Guarantee etc must be clearly indicated in the technical bid.
9. There should be at least one service engineer and one application scientist based in India with onsite training facility on the same quoted instrument. Training should include operation, software applications, analysis, handling and maintenance of system.

The undersigned reserves the right to reject any or all the tender without assigning any reason whatsoever.

Registrar