COMPLIANCE STATEMENT

Item: Solar Cell Tester

Sl. No.	Item	BHEL Specification	Supplier's Specification	Remark Y= meets spec. N= does not meet Spec.
A1.	Purpose	Testing of the solar cells and printing of I-V curve data.		
B1.	Cell testing	Halogen or xenon lamp fixed on the top and solar cell placed on a copper chuck with vacuum holding at the bottom.		
2.	Light Source	Halogen or pulsed xenon light source closely matching the solar spectrum.		
3.	Uniformity of Illumination	+ / - 4 % (or better) over entire test area (156mm x 156mm) (max.)		
4.	Solar cell coupling (Reference cell)	A single crystal solar cell or single crystal solar cell pyranometer should be coupled to the electronic circuitry to monitor illumination intensity.		
5.	Electronic load	An electronic load with power source and sink		
6.	Data Acquisition	Data acquisition for plotting of I-V curve and data measurement		
7.	Parameter measurements	Range: a) Voltage :0- 1V b) Current : 0-10 A		

Sl. No.		BHEL Specification	Supplier's Specification	Remark
		COMPLIANCE STATEMENT (Contd. Page 2 of 7)		
8.	Resolution	a) Voltage: 0.001V b) Current: 0.01A		
9.	I-V curve	Typical plotting time: 1 to 2 minutes (or less)		
10.	Parameters to be measured and /or to be computed:	a) Open-circuit voltage b) Short-circuit current c) Load current and Power at fixed voltage d) Peak Power e) Current and Voltage at Peak Power f) Fill factor g) Cell efficiency h) Cell temperature and corrected temperature. i) Date and time of measurement j) Solar Insolation (simulated irradiation level W / m^2 or m W / cm^2)		
11.	Temperature compensation	The cell temperature is measured during the testing to allow temperature compensation of Voc, Isc and Peak Power.		
12.	Export of I-V data	The software package should store all the data in Micro Soft Excel		

		for further analysis.		
13.	Operating Systems	MS Windows XP.		
		COMPLIANCE STATEMENT (Contd. Page 3 of 7)		
14.	Test jig Note: 1) Suitable vacuum pump for holding solar cell should be supplied along with the equipment. 2) Suitable water chiller should be supplied along with the equipment. A maximum of 30 cells are to be tested in a day. 3) If electronic / Peltier cooling is provided or if single flash Xenon Light is used then water chiller is not required. 4) Suitable air compressor should be supplied along with the equipment if pneumatic controls are used as	a. Vacuum copper plate with provision for chilled water cooling b. Alignment jig for 50mm x 50mm, 125mm x 125mm, & 156mm x 156mm size solar cells as per sketch enclosed. In case of 156mm sq. size cell the centre to centre spacing between contact bars is 78 mm. c. Probe assembly with adjustable width (spacing) for front contact and back contact with copper chuck. d. Gold plated spring returnable pins e. Pneumatic for Up/Down movement, Vacuum generator, flow controller, Filter & regulator f. Pedestal mounting unit with forced exhaust g. Measurement using remote Kelvin probes.		

		COMPLIANCE STATEMENT (Contd. Page 4 of 7)		
14. Contd.	compressed air supply line is not available in the Laboratory. 5) Separate Teflon Alignment jigs for cells of different sizes may be provided if necessary.			
15.	Temperature controller Note: Temperature controller not required if single flash Xenon Light is used provided cell temperature measurement is done and used for the computation of I – V data at 25 ˚C.	PID based Temperature controller consisting of a. PID temperature controller b. RTD sensor c. Chilled water valve		
16.	Intensity controller	Lamp intensity closed loop control system (with reference cell intensity feedback) consisting of a. Halogen / Xenon lamp with reflector b. PID Controller with SSR.		

		Note: Phase control mode to be used for lamps		
		COMPLIANCE STATEMENT (Contd. Page 5 of 7)		
17.	Personal Computer	PC Intel Original Pentium Core 2 Duo mother board with Intel chipset, 2GHz, 160GB HDD, 1GB RAM and 17" TFT monitor (or better) (warranty for 1 year)		
18.	Laser Printer	A4 size laser printer of reputed make for printing of I-V characteristics (warranty for 1 year)		
19.	UPS	500 VA of reputed make such as APC/SOCOMEC/LIBERT.		
20.	Test bench	Approx. 39"*84" with PC fitting provision. Size to be mentioned.		
21.	Spares	Spares for trouble free operation of the equipment for a period of two years shall be listed and included along with the equipment. Additional spares may be quoted separately as Option 1.		
C1.	Power Input	The complete system should be designed for use with 220 - 240 V A.C.(1 phase) or 415 V + / - 25 V A.C. (3 phase) with a mains frequency of 50 ± 1% Hz.		
D1.	Customers	The vendor should have supplied minimum two such equipments and the addresses of the customers with		

		telephone numbers should be furnished.		
		COMPLIANCE STATEMENT (Contd. Page 6 of 7)		
D2.	Service agency	Should have agents in India to provide after sales service and maintenance.		
D3.	Guarantee	The equipment should be Guaranteed for a period of **2 years** from the date of commissioning.		
D4.	Catalogues	Catalogue related to each and every item should be enclosed.		
D5.	Dimensions	Dimensions of equipment, weight and space requirements to be given.		
D6.	Pre-installation requirements	Pre-installation requirements should be furnished.		
D7.	E&C and training	Installation & commissioning of the equipment to be carried out by supplier at site at Corporate R&D, BHEL, Hyderabad, India. Training to be Provided at Corp. R&D, BHEL, Hyderabad.		
D8.	Commissioning charges	Commissioning charges, if any, to be indicated separately.		

		COMPLIANCE STATEMENT (Contd. Page 7 of 7)		
D9.	Compliance statement	Compliance statement of specification to be submitted along with the offer. Without compliance statement, the offer is liable to be rejected. All tender specifications to be compared with equipment offered line by line and documentary evidence must be enclosed by the supplier along with quotation.		
D10.	Operating manual	Two copies of operating manual to be provided along with the equipment.		
D11.		After the system delivery to BHEL R & D, if the system is installed in existing R & D building and later if it has to be shifted to the new building (Center for Nanotechnology and Applications), this has to be done by the supplier and related expenses should be specified. The shifting will be within 9 months of initial installation.		