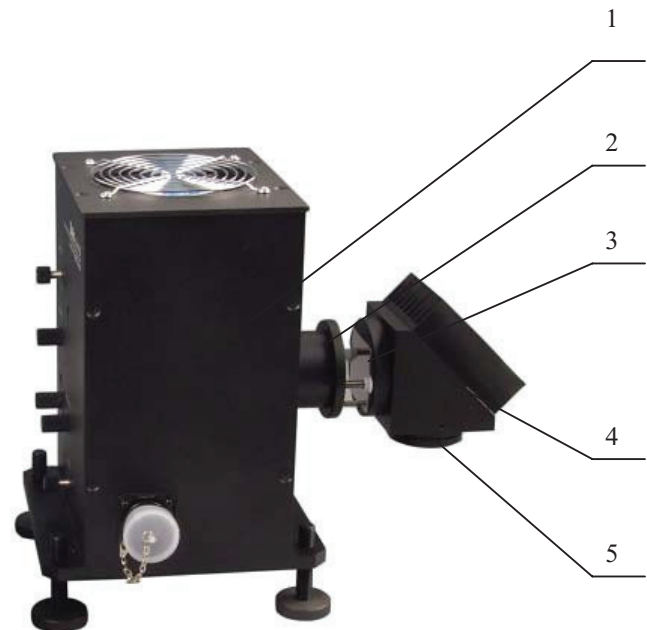# 1. Basic Solar Simulator

Basic Solar Simulator LCSS150

This solar simulator system is used to simulate the sunlight, which is used widely in the photovoltaic devices and QC. The solar simulator can produce the collimation beam, and the light spot is uniform. Spectral Match is class A of the solar simulator system radiation spectrum. This solar simulator system is suit for the monocrystalline silicon, polysilicon, amorphous thin film, dye-sensitized, organic, III-V semiconductors solar cells measurement and so on.
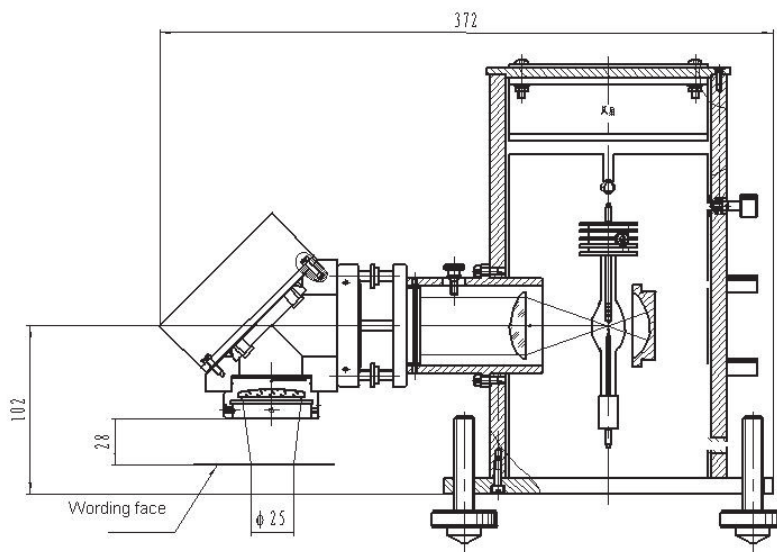
LCSS150 with AM1.5G : System Specifications

Type	
Facula Irradiance	1000W/m2
Facula Size	Φ25mm
Height	38mm-85mm
Lamp	Q150
	XBO150W/CR OFR(Osram)
Spectrum range	0.2-1.8 μm
Color temperature	6000 K
Xenon lamp life time	Ra=94
Parallel light spot dia.	500 h
	1000 h (Osram)

(1) Main body
(2) Filter holder
(3) Filter
(4) Right Angle adapter
(5) Collector lens

Solar Simulator ZSS100/ZSS1000

Solar Simulators are used to simulate "real" solar radiation conditions and are widely used for the photovoltaic device research and QA etc.

Beam collimation and spot uniformity are important properties along with spectral matching are key operational requirements. The ZSS150 and ZSS1000 are suitable for all types of solar cells and well match their optical requirements.

System Features:

- ■ Class A Spectral Match
- ■ Optical Intensity Stability < 0.5%
- ■ Built in Timer, monitoring the bulb operating time
- ■ Automatic Shutter Control
- ■ High performance at a reasonable cost

Solar Simulator Evaluation Standard

| Method		CLASS		
		A	B	C
Spectral Match	Compare the optical intensity within the six wavelength ranges (400- 500- 600- 700- 800- 900- 1100 nm). Solar Simulator / AM1.5G	0.75~1.25	0.6~1.4	0.4~2.0
Spot Uniformity	Test the irradiance in the testing area. Calculate the MaxD of the data.	< 2%	< 5%	< 10%
Stability	Test the fixed point irradiance in the testing area. Calculate the MaxD of the data in 1min.	< 2%	< 5%	< 10%

Specifications

| Model	ZSS150A	ZSS150	ZSS500	ZSS500A	ZSS1000
Spectral Match	0.75~1.25 (AM 1.5 G)	0.75~1.25 (AM 1.5 G)	0.75~1.25 (AM 1.5 G)	0.75~1.25 (AM 1.5 G)	0.75~1.25 (AM 1.5 G)
Spot Irradiance	1000W/m^2	1000W/m^2	1000W/m^2	1000W/m^2	1000W/m^2
Spot Area	40×40mm	50×50mm	100×100mm	75×75mm	150×150mm
Spot Uniformity	< 2%	< 5%	< 5%	< 2%	< 5%
Stability	< 2% (rms)	< 2% (rms)	< 2% (rms)	< 2% (rms)	< 2% (rms)
Beam Parallelism	±4° (semiangle)	±4° (semiangle)	±4° (semiangle)	±4° (semiangle)	±4° (semiangle)

ESS-F5-3A
## AAA 50 x 50 mm^2 Solar Simulator

Class AAA SS-F5-3A Solar Simulator is designed in accordance with the standards of IEC 60904-9 and ASTM E927 to measure the efficiency for solar cells, of which the output beam size is 50 x 50 mm^2. The optical fiber light guide enables the flexible illumination and also can be integrated into a glove box, which can exactly match your research needs. ESS-F5-3A can measure the current values from 0.1 mA to 1 A when equipped with the source meter, it is applicable to any kind of solar cells measurements.
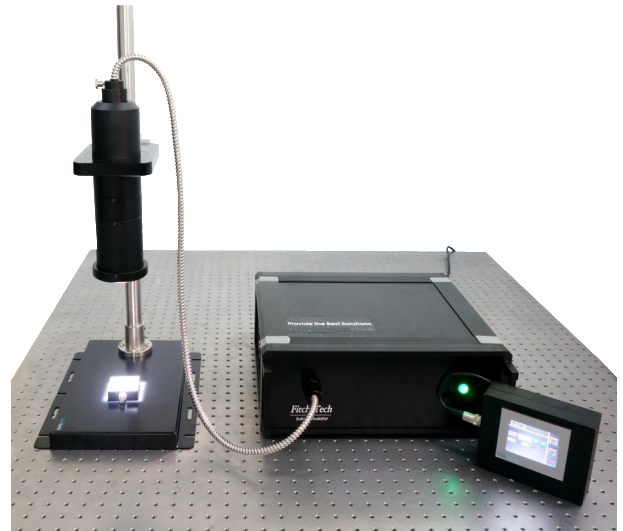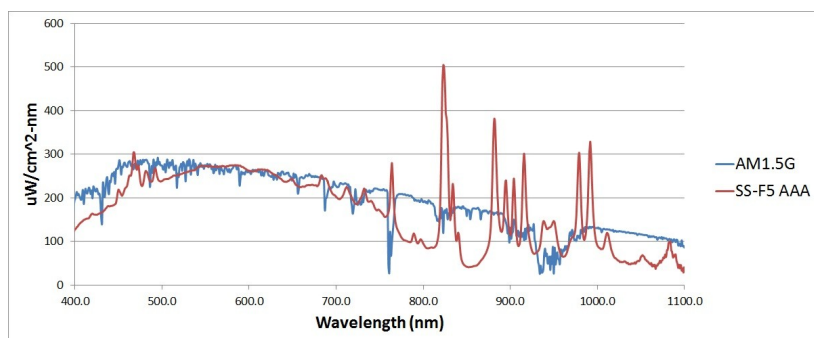
Graph 1. Custom light guide– downward
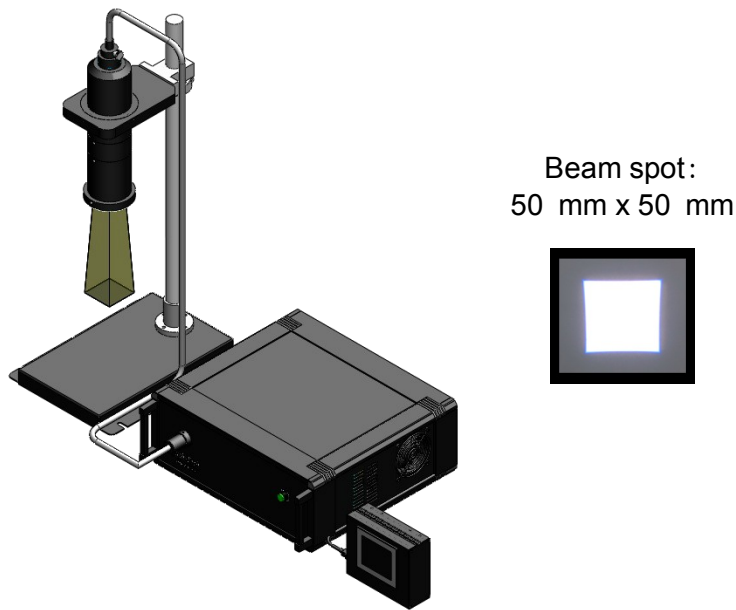
Graph 2. Custom light guide-parallel

Beam spot：
50 mm x 50 mm
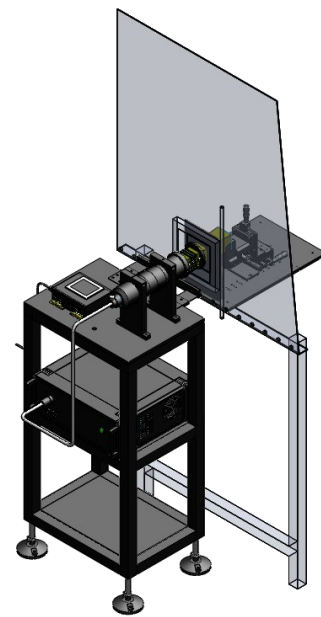
In compliance with IEC60904-9 standards:

IEC60904-9 characteristic	A class	ESS-F5-3A rate
Spectral Match	0.75-1.25	A
Non-Uniformity of Irradiance	2%	A
Temporal Instability	2%	A

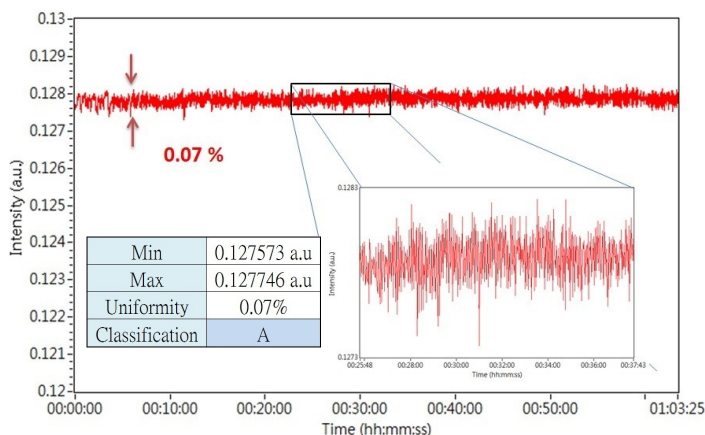## Graph 1. Spectral Match: SS-F5-3A is compliance with IEC60904-9 class A definition

Wavelength	SS-F5 AAA	AM1.5G	Ratio	Classification
400 - 500 nm	16.74%	18.40%	0.91	A
500 - 600 nm	21.69%	19.90%	1.09	A
600 - 700 nm	19.87%	18.40%	1.08	A
700 - 800 nm	13.56%	14.90%	0.91	A
800 - 900 nm	11.63%	12.50%	0.93	A
900 - 1100 nm	16.38%	15.90%	1.03	A

Graph 2. Non-uniformity of irradiance: SS-F5-3A is compliance with IEC60904-9 class A definition

Min	3.487 a.u
Max	3.546 a.u
Uniformity	0.84%
Classification	A
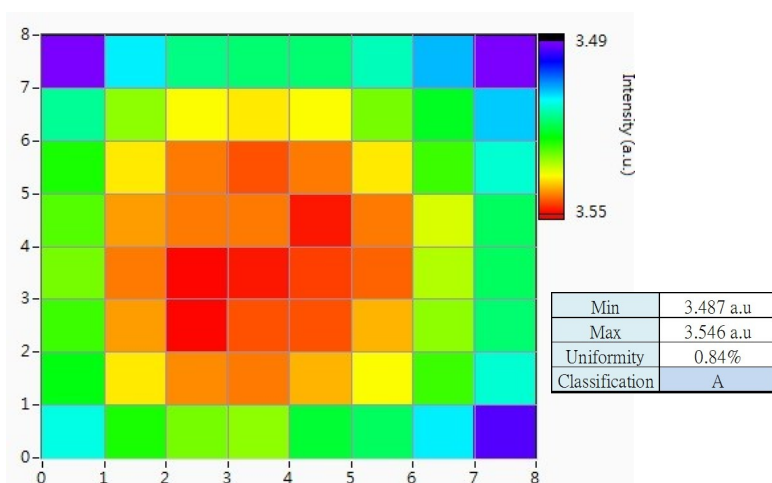
Graph 3. Temporal instability: SS-F5-3A is compliance with IEC 60904-9 class A definition

Min	0.127573 a.u
Max	0.127746 a.u
Uniformity	0.07%
Classification	A

Standard	Specifications
Beam Spot	50 mm x 50 mm
Spectral Match	AM1.5G, < ± 25%, A class
Non-Uniformity of Irradiance	< ± 2%, A class
Temporal Instability	< ± 2%, A class
Optical Fiber Light Guide	Light uniform system and light source system separation design
Light Source	300 W Xenon
Wavelength Range	400 nm ~ 1100 nm
Light Intensity	Up to 1000 W/m^2@AM1.5G （± I0% lamp power control）
Recommended Environment	• Supply Voltage: 100-240V • Temperature: 20 ~ 40 °C • Humidity: < 80%
Others	• Delayed shutdown air cooling system • LCD Touch-screen monitor: lamp hours/ lamp power control (± I0%)/ light source with shutter control • The power supply has a stability better than 1% • Light source with shutter

Recommended Supporting Options

Reference Cell	• 2 cm x 2 cm silicon solar cell • Standard lemon interface • Pt sensor
IV tracer software	• Measurement time-delay setting function • Quick-note function • Semi-log IV display • Reference cell meauremsnt and correction • Mismatch-factor IV correction
Sample Stage	• 4-wire holder • Channel switch design • Light source bracket height adjustable
Source Meter	Keithley 2400 source meter
Glove Box Application	• Upward optical path • Sample stage for glove box
Light Intensity Adjustment	• Adjustable in light intensity from 0 % to 100 % • Weak light measurement
Sealed sample box	• Complete sealing design which can avoid sample attenuation. • Multi-stage switch, standard BNC connector.
Test Report	Third party test report