

Class A+A+A+
Large Area Solar Simulator

LumiSun-220™



*Patent Pending

Features

- Illumination area 220 x 220mm
- High uniformity
- IEC Class A+A+A+ compliant
- 600mm working distance
- Efficient low cost
- Irradiance 0.1 to 1.2 Suns
- Long LED Lifetime > 20,000 hours
- Spectral range 350nm-1250nm
- 36 λ individually controlled
- Spectral deviation
 - < 9% 400nm - 1100nm
 - < 12% 350nm - 1250nm
 - < 15% 300nm - 1200nm
- AM0 and AM1.5G superior spectral matching
- User-friendly GUI allows individual control of each λ
- RS485 & USB computer connection (Modbus RTU)
- Pre-programmed & user-defined adjustable spectra
- TEC for superior spectral intensity stability
- Steady state or pulsed modes
- LED current closed loop control

The LumiSun-220™ is a cost-effective LED solar simulator delivering Class A+A+A+ performance over a 220 mm × 220 mm area at a 600 mm working distance. It features 37 individually controlled wavelengths from 350 nm to 1350 nm with minimal spectral deviation. Irradiance is adjustable from 0.1 to 1.2 Suns in steady-state or pulsed modes. TEC cooling and closed-loop current control ensure excellent temporal stability and long-term reliability.

Applications

- PV Cell & Module Testing
 - Large area solar cells, multi-cell coupons, mini-modules
 - Evaluate degradation or light soaking performance (e.g. perovskite research)
- Materials Testing
 - Accelerated aging
 - Intensity controlled studies
 - Space weathering
- Solar Product Development
 - Batch testing of solar watches, calculators, sensors, lights
 - Sun Exposure for Biological Systems
- Test Photoreactive Materials
 - Photodegradation
 - Water/air purification systems

LumiSun-220™ leverages the same IOI intellectual property as our OEM solar simulators sold in the thousands to leading PV manufacturers. Patent-pending light collection optics and thermal management deliver uniform, stable output across the full spectrum and individual wavelengths. With LED lifetime exceeding 20,000 hours, it is a durable and flexible tool for advanced solar simulation.

LumiSun-220™ Solar Simulator Pre-programmed Spectrum

LumiSun Solar Simulator Spectrum vs. AM1.5G Solar Reference

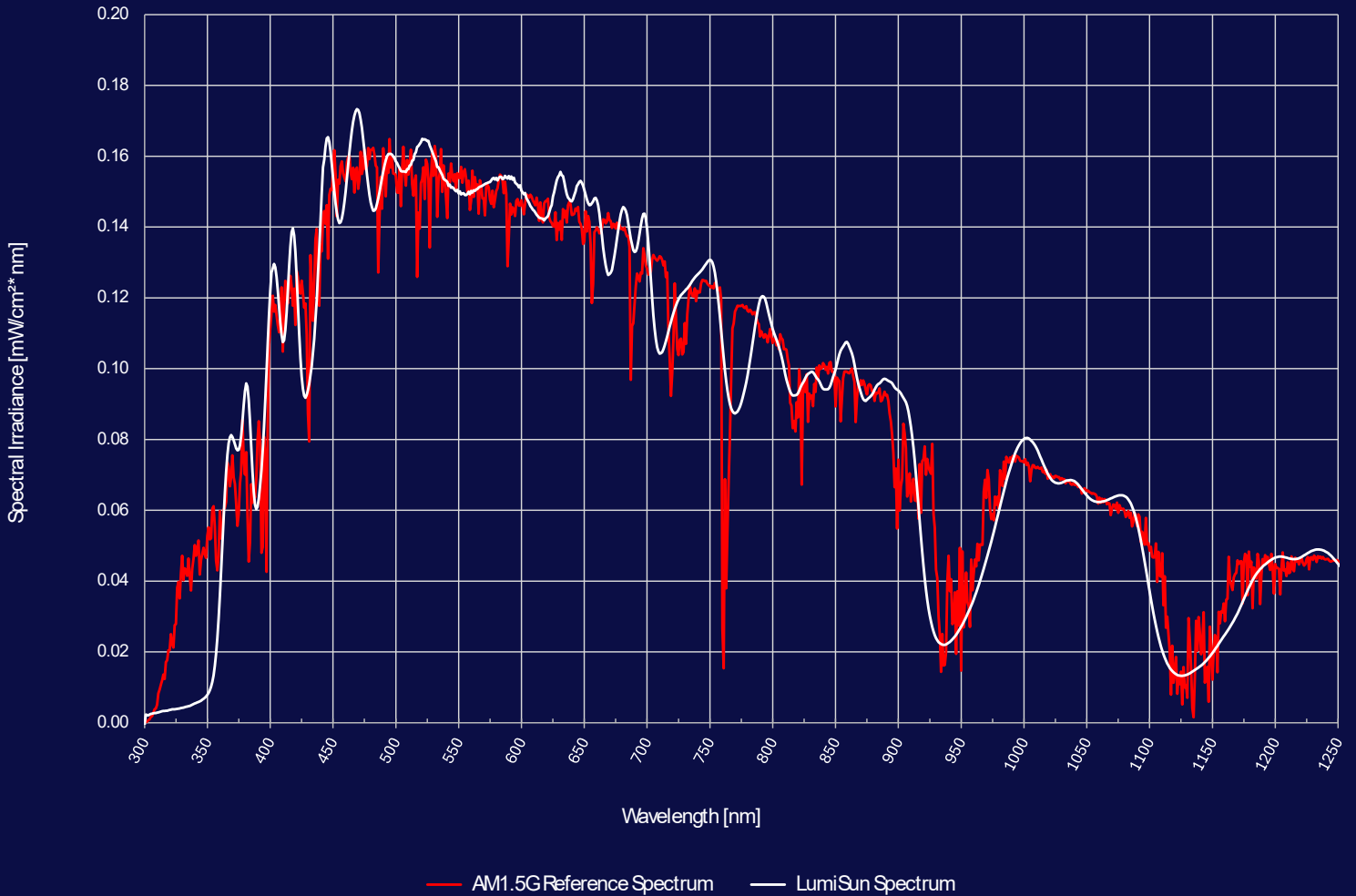


Table 1: Spectral Match Values

Wavelength Range (nm)	Percentage of Total Irradiance (%)	Spectral Match to Spectral Bins (%)
300 - 470	16.61	87.5 - 112.5
4710- 561	16.74	87.5 - 112.5
561 - 657	16.67	87.5 - 112.5
657 - 772	16.63	87.5 - 112.5
772 - 919	16.66	87.5 - 112.5
919 - 1200	16.69	87.5 - 112.5

LumiSun-220™ Uniformity

0.995	0.997	0.998	0.999	0.999	0.998	0.998	0.993
0.996	0.997	0.997	0.998	0.998	0.998	0.998	0.997
0.998	0.997	0.997	0.996	0.996	0.997	0.997	0.998
0.999	0.998	0.996	0.995	0.996	0.996	0.997	0.998
0.999	0.998	0.997	0.995	0.995	0.996	0.998	1
0.999	0.997	0.996	0.996	0.996	0.997	0.998	0.999
0.997	0.997	0.997	0.997	0.997	0.997	0.996	0.997
0.995	0.997	0.998	0.999	0.999	0.998	0.997	0.996

Class A+ non-uniformity over entire illumination field

Also excellent for each wavelength independently

LumiSun-220™ Specifications

NOTE: Unless otherwise specified, measurement methods are according to IEC 60904-9 edition 3

Description	Value	Units	Comments
Illumination Area	22 x 22	cm	
Spectral Active Area	350 - 1350	nm	Future expansion to 1600nm
Spectral Match (IEC binning, Class A+)	See Table 1		
Spectral Deviation ¹ , 350 - 1350nm	<13	%	
Spectral Deviation ¹ , 400 - 1100nm	<9	%	
Spectral Deviation ¹ , 300 - 1200nm	<15	%	
Spectral Deviation ¹ , 730 - 800nm	<12	%	Perovskite bandgap
Spectral Deviation ¹ , 800 - 855nm	<12	%	Cadmium-Telluride bandgap
Spectral Deviation ¹ , 1000 - 1100nm	<12	%	Silicon bandgap
Minimum Intensity	0.1	Suns ²	On the Coupon
Maximum Intensity	1.2	Suns ²	On the Coupon
Spectral Coverage ³ , 350 - 1350nm	>95	%	For Reference
Non-Uniformity 220x220mm	<1	%	Class A+
Instability (16 hours @ 1 Sun ²) ⁴	<1	%	Class A+
Temporal Instability (STI) ⁴	<0.1	%	50Hz sampling over 3s; Exceeds A+
Temporal Instability (LTI, 1000hrs) ⁴	<1	%	Class A+
LED PCB Lifetime	>36,000	Hrs	
Depth of Focus	+/-1mm	mm	0.5% change in intensity
Working Distance	~600	mm	Lens Output to Image Plane
Operating Temperature Range	20-30	°C	Local temp at illuminator module
Temperature Control of Light Source	YES		With TEC module
Electrical Input Voltage	48	V	+/-5%
PC Communication	RS485 and USB		
RS485 Communication Protocol	Modbus RTU		19.2kBd - 230.4kBd
RS485 Connector	Dual RJ45		1 GRN, 1 YEL LED each
USB Communication Protocol	Modbus RTU		Via COM port redirection
USB Connector	USB Type C		
Over Temp Response			Controlled by software
Maximum on-pulse duration	Continuous		
Minimum on-pulse duration	<200	µs	
Maximum trigger frequency	>10	kHz	
Maximum rise time	<100	µs	Time to stable output from trigger
Maximum Time to Stable Output	<10	ms	With changes to intensity set point
Maximum Noise Level	<65	dBA	

LumiSun-220™ Specifications

1. Spectral deviation relative to AM1.5 calculated according to formulas stated in IEC 60904-9 edition 3, section 3.13, and process in section 5.6, replacing wavelength range for that in specification description. $\Delta\lambda$ to be 1nm for these calculations
2. Intensity value in suns calculated according IEC 60904-3 ed. 4 solar AM1.5 Global spectral intensity integrated over the relevant spectral band as defined by specification #2, with 1 sun having an equivalent total integrated power over that spectral band to the reference solar spectrum
3. Spectral Coverage relative to AM1.5 calculated according to formulas stated in IEC 60904-9 edition 3, section 3.12, and process in section 5.5, replacing wavelength range for that in specification description. $\Delta\lambda$ to be 1nm for these calculations
4. Instability calculated based on IEC 60904-9 ed. 3 formula as $(\max - \min) / (\max + \min)$

