sunbrick.™ Product Line Specifications

The Class AAA Sunbrick LED large-area solar simulator provides world-class sunlight replication, complete with software-controlled spectra and traceable calibration—all with no fragile bulbs or moving parts.

The Sunbrick has a superior warm-up time compared to more common bulbs and can replicate the standard AM1.5G or AM0 solar spectra with the click of a button, allowing you to quickly start any experiment.

With its excellent 2% Class A spatial non-uniformity, low 5% spectral mismatch, and 0.1% short-term temporal instability, all certified within a 20 cm x 20 cm square illumination area, the Sunbrick can accommodate a wide range of applications.

And with its modular design, Sunbrick arrays can be mounted together in a grid pattern to provide its Class AAA quality solar replication over arbitrarily large areas.

Finally, Sunbrick provides the ability to customize spectra through the individual adjustment of up to 36 LED channels, allowing you to tune the spectrum as needed for your work.

Features and Benefits

- Rated Class AAA according to IEC60904-9:2020, ASTM E927-19, JIS 8904-9:2017 standards
- Spectral Mismatch <5% in all spectral bins, exceeding Class A standard
- Temporal instability of <0.5%, exceeding Class A standard
- Class A spatial non-uniformity in 20 cm x 20 cm square area for single unit and between tiled units
- Fast turn on time, minimal warmup time
- Guaranteed 10,000-hour solar simulator lifetime (with LED lifetime ranging from 10,000 – 100,000 hours)
- Variable output from 0% to 110% and individual control of up to 36 LED channels through software.
- Includes LabView DLL and Python API for automation and integration
- Modular design allows tiling up to arbitrary sizes (for example, a 4-Sunbrick array (2x2) provides a 40 cm x 40 cm Class A area)

Sunbrick Solar Simulator

Parameter	Value	Units	Notes
Type of Solar Simulator	Steady-State	N/A	Uses Continuous-Wave light emitting diodes (LEDs)
Mounting Configuration	Single or Tiled, mounted vertically in stand	N/A	
Spectral Mismatch [1]	≤ 5	%	Exceeds Class A
Short-term Temporal Instability (STI) [2]	≤ 0.5	%	Exceeds Class A
Long-term Temporal Instability (LTI) [3]	≤ 2	%	Exceeds Class A
Spatial Non-Uniformity [4]	≤ 2	%	Class A in 20 cm x 20 cm square centered in beam [4]
Angle of Emission	≤ 30	degrees	Measured from surface normal
Working Distance	50	cm	Co-planar with bottom edge of support stand mirrors
Intensity Adjustment Range	0 - 110	%	0.1 to 1.1 suns AM1.5G along with full off
Available Spectral Presets	0.1 to 1.1 suns AM1.5G in 0.1 sun increments	N/A	AM0 and custom spectra available upon request
Warm-up Time	10	Minutes	
Stabilization Time Between Adjustments	10	Minutes	For changing from 1.0 to 0.1 suns. Stabilization time depends on magnitude of step change.
Standard Compliance	Class AAA to IEC60904-9:2020, ASTM E927-19, JIS C 8904-9:2017	N/A	1.0 sun AM1.5G
Calibrated Operating Temperature	18 - 32	°C	Temperature range for calibrated behaviour
Safe Operating Temperature	15 – 40	°C	Temperature range beyond which the instrument may be damaged or lose calibration
Ambient % Relative Humidity	30 – 60	%	Humidity range beyond which the instrument may be damaged or lose calibration
Size	25 x 25 x 39	cm	Does not include support stand
Weight	10	kg	Does not include support stand
Unit Lifetime	10,000	Hours	LED lifetime ranges from 10,000 – 100,000 hours
Warranty	2	Years	Optional extension available
Automation Capability	Through included Python API and/or LabView DLL	N/A	
Software Compatibility	Windows 7 or later	N/A	
I/O Comm / Control Protocol	Serial	N/A	
I/O Comm Connector	Micro-USB B	N/A	
Network Connector	DB9, male	N/A	For forming Sunbrick arrays

[1] Spectral Mismatch measured at 1.0 sun AM1.5G using calibrated spectroradiometer centered in illumination field, according to ASTM E927-19 spectral bins.

[2] STI measured for 100 seconds at 1 Hz, at 1.0 sun AM1.5G using 22 mm x 7 mm monocrystalline silicon cell in single-device configuration centered in illumination field. Room temperature recorded for each measurement, and temperature coefficients are available. STI calculated using Equation (1) from ASTM E927-19 Section 7.1.7.

[3] LTI measured for 1000 hours at 1 sample/day at 1.0 sun AM1.5G using same silicon cell as in STI measurement, centered in illumination field. Room temperature recorded for each measurement, and temperature coefficients are available. LTI calculated using Equation (1) from ASTM E927-19 Section 7.1.7.

[4] Spatial Non-uniformity measured at 1.0 sun AM1.5G using a 12mm-aperture broadband thermopile with IR filter. Detector is moved in 64 square-grid measurements across the illumination plane, a 20 cm x 20 cm square area. Non-uniformity calculated using Equation (2) from ASTM E927-19 Section 7.2.9.

Included Hardware	Windows laptop with software, cabling and power supply	N/A	

Parameters that vary with Product Model

Parameter	Product Model				Units	Notes
Product Name	BASE	BASE-UV	BASE-NIR	BASE-NIR+		
Product SKU	SBRK-LMN	SBRK-KLMN+	SBRK-LMNO	SBRK-LMNO+		
Calibrated Output Irradiance [5]	75.9	82.3	84.7	84.7 ± 4.2	mW/cm²	1.0 sun AM1.5G target irradiance
Spectral Range	400 – 1100	350-1200	400 - 1500	400 – 1500	nm	
Irradiance Control Range	7.6 – 83.5	8.2 - 90.5	8.5 – 93.1	8.5 – 93.1	mW/cm²	0.1 – 1.1 suns AM1.5G
Wavelength Channels	34	35	29	36	N/A	

Sunbrick Power Supply

Parameter	Value	Units	Notes
Input voltage (AC)	90 – 250	V	AC
Input current	2.5 – 6.9	A	Varies with input voltage
Inrush current (max.)	70	A	Cold start, varies with input voltage
Input Power	625	W	
AC Phase	1	N/A	
AC Frequency	47 – 63	Hz	
Input AC Receptacle	IEC320-C14	N/A	UL 94-V2 or better
Output Power	600	W	
Output Voltage	48	V	
Output DC Receptacle	DB15	N/A	
Ambient operating temperature	0 – 40	°C	
Case Flammability	UL94-V0	N/A	
Size	36 x 20 x 17	cm	
Weight	2.5	kg	
Power Connector	DB15, male	N/A	

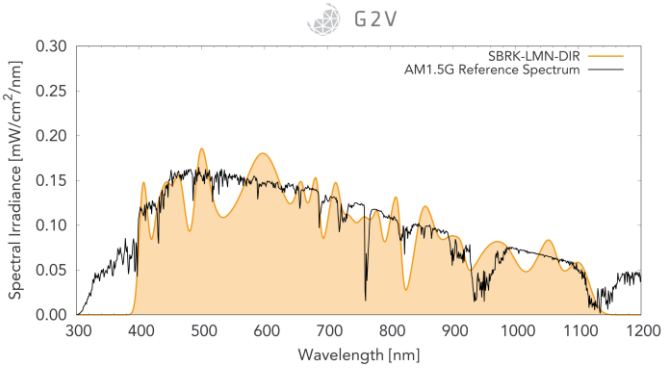
Single Sunbrick Support Stand

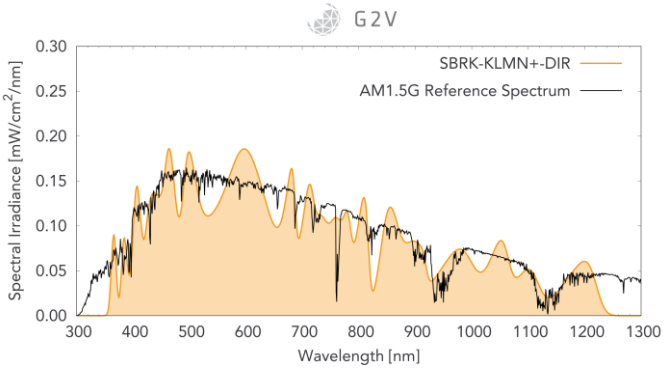
Parameter	Value		
Size	34 x 44 x 102	cm	
Weight	16.3	kg	
Materials	Powder-coated aluminium, brushed aluminium	N/A	

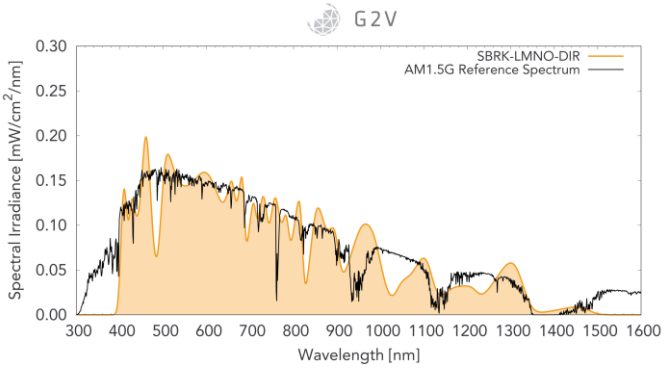
[5] These values are equivalent to the often-quoted 100 mW/cm² standard value for 1-sun solar simulators. For more information, see our article explaining calibrated spectral irradiance.

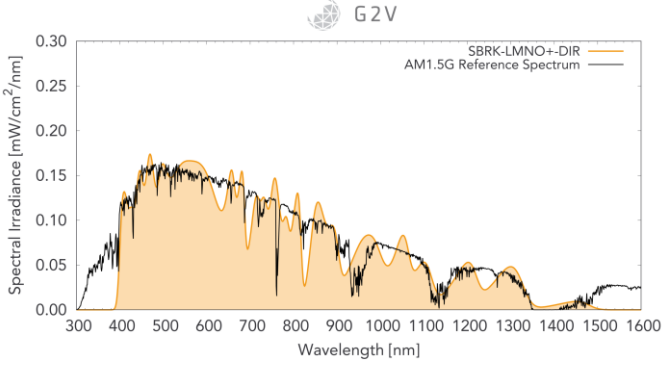
Spectra by Product Model

AM1.5G

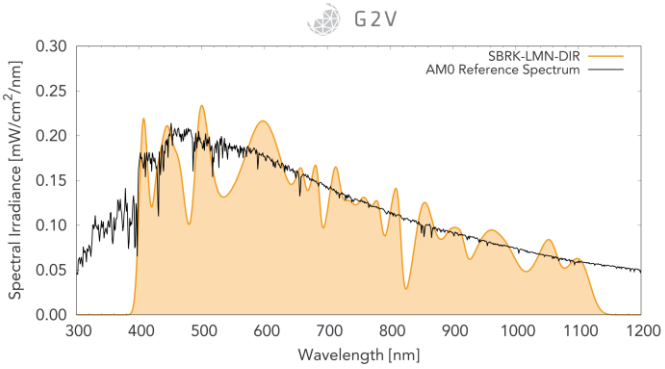


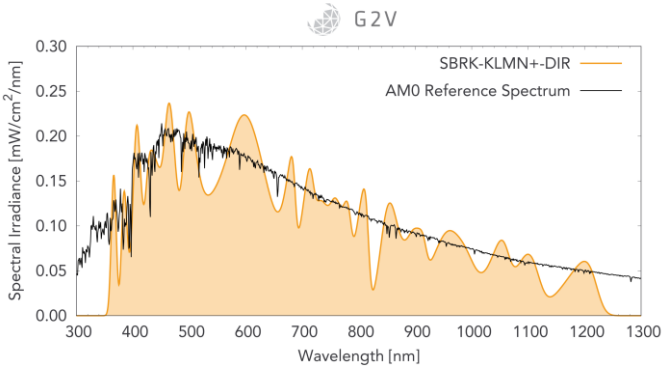


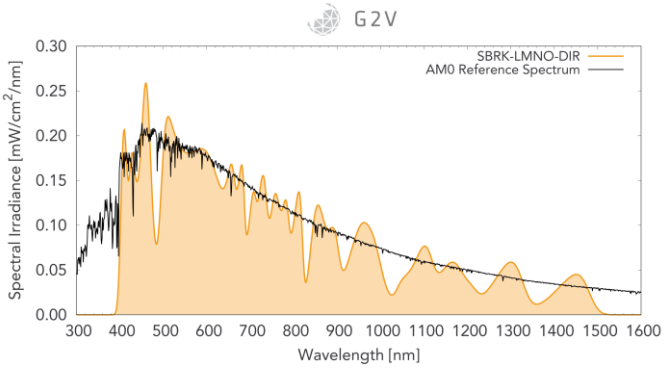


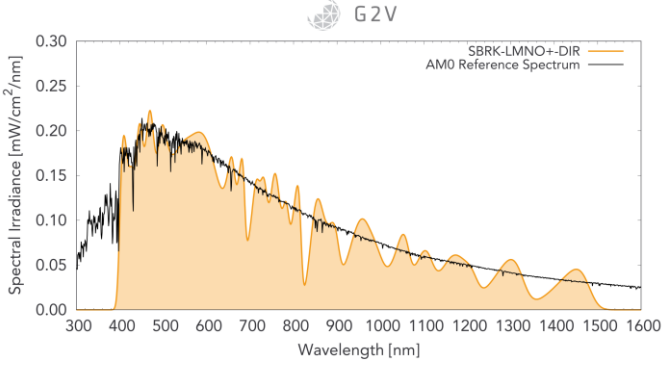


AM0

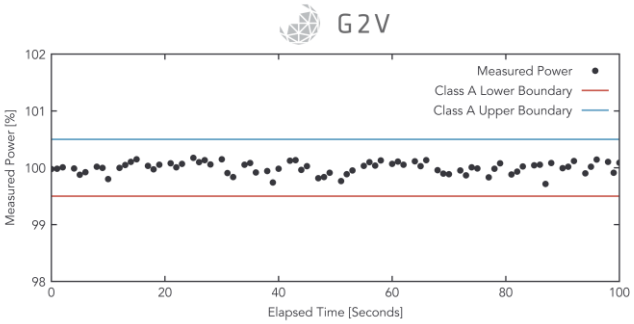






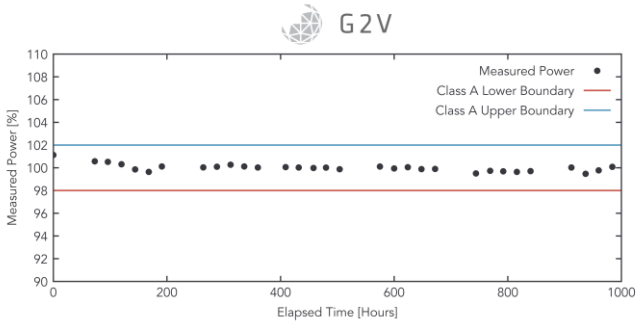


Short-Term Temporal Instability (STI)



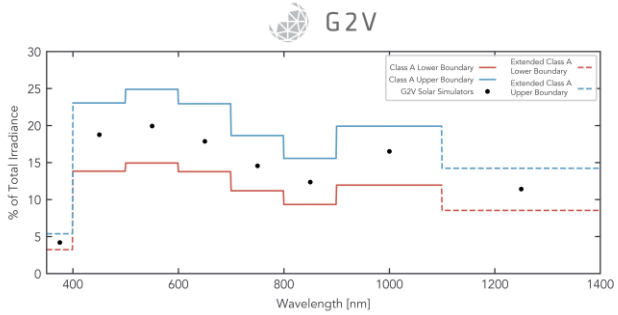
STI measured for 100 seconds at ~1 Hz, at 1.0 sun AM1.5G using 22 mm x 7 mm monocrystalline silicon cell in single-device configuration, centered in illumination field. Room temperature recorded for each measurement, and temperature coefficients are available. STI calculated using Equation (1) from ASTM E927-19 Section 7.1.7.

Long-Term Temporal Instability (LTI)

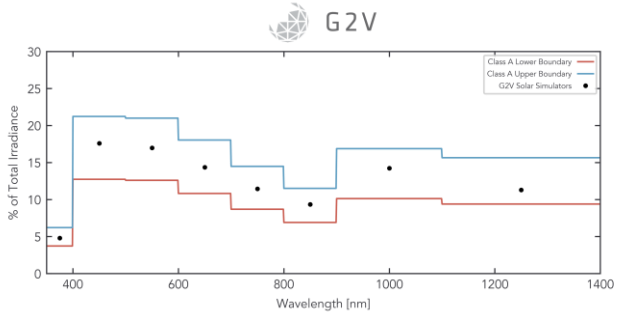


LTI measured for 1000 hours at ~1 sample/day at 1.0 sun AM1.5G using 22 mm x 7 mm monocrystalline silicon cell in single-device configuration, centered in illumination field. Room temperature recorded for each measurement, and temperature coefficients are available. LTI calculated using Equation (1) from ASTM E927-19 Section 7.1.7.

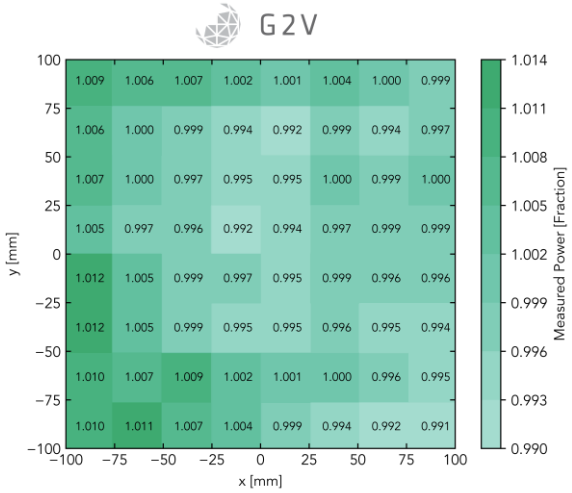
AM1.5G Spectral Mismatch



AM0 Spectral Mismatch



Spatial Non-Uniformity



Typical spatial non-uniformity measured at 1.0 sun AM1.5G using a 12mm-aperture broadband thermopile with IR filter. Detector is moved in 64 square-grid measurements across the illumination plane, a 20 cm x 20 cm square area. Non-uniformity calculated using Equation (2) from ASTM E927-19 Section 7.2.9.