

# Oriel® Sol1A™ Class ABB Solar Simulators



With over 40 years of proven performance and rugged durability built into our solar simulator product family, Newport Corporation's Oriel® Sol1A™ Class ABB systems take solar simulation to the next level. Certified to IEC 60904-9 2007 Edition, JIS C 8912, and ASTM E 927-05 standards, these large area sources use a xenon lamp and proprietary filter to meet, efficiently and reliably, Class ABB performance parameters without compromising the 1 sun output power. The result is a cost-effective system designed for laboratory and/or production environments – all backed by our global service and support network.

## WHY CLASS ABB?

If your application doesn't require the highest level of uniformity of illumination, a Class ABB system may work for you. Class ABB systems still provide the highest spectral match performance (Class A) as defined by the most recent standards from the IEC, JIS and ASTM. Although the uniformity is Class B (based on the IEC testing protocols), these Class ABB systems may have better uniformity than competitive simulators that claim Class A uniformity to only the current ASTM standard, or are measuring it according to the older IEC, JIS and ASTM standards. The Class ABB systems provide a cost effective option that provides you durable Oriel Solar Simulators, the name you have trusted for 40 years as a quality supplier backing their products utilizing the worldwide Newport network of resources. An optional light intensity controller can be purchased to bring stability to Class A if it becomes necessary in the future.

## DEFINING CLASS ABB PERFORMANCE STANDARDS

PV standards from the IEC, JIS and ASTM define the requirements and test methodology to measure and report the performance of a solar simulator. All Oriel Sol1A Class ABB solar simulators are tested following these protocols exactly and ship with a certificate of compliance including the methodology used.

- IEC 60904-9 2007 Edition Photovoltaic Devices – Part 9: Solar Simulator Performance Requirements
- JIS C 8912-1998, Solar Simulators for Crystalline Solar Cells and Modules
- ASTM E 927-05 (2005) Specification for Solar Simulation for Terrestrial PV Testing

- Complete line of Class ABB products from 2x2" to 8x8" output beam sizes
- Factory certified CW systems per IEC 60904-9 2007 Edition, JIS C 8912, and ASTM E 927-05
- Long-lived, highly reliable instruments designed specifically for laboratory and/or production environments
- Temperature sensors and interlocks ensure operator safety
- Convenient user features simplify operation

**Oriel**  
**INSTRUMENTS**  
A Newport Corporation Brand

# Oriel® Sol1A Class ABB Solar Simulators

Table 1 Class ABB Standards and Specifications

Performance Parameter	Organization		
	IEC	JIS	ASTM
Spectral Match (fraction of ideal percentage)	0.75 – 1.25	0.7 – 1.25	0.7 – 1.25
Non-uniformity of irradiance	<5%	±3%	<5%
Temporal Instability	<2% (STI) <5% (LTI)	±3%	<5%

## SPECTRAL MATCH

The standards define the spectral match of a solar simulator as a percentage of the integrated intensity in 6 spectral ranges (listed in Table 2). Any deviation from the specified percentages must then lie within a range that determines the class of the simulator. For Class ABB, this range is 0.75 to 1.25 times the ideal percentage.

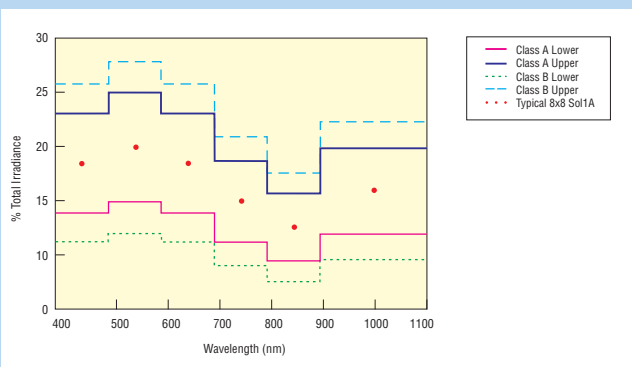
To ensure that the Oriel Sol1A Class ABB Solar Simulator falls easily and reliably within this range, we designed a proprietary, highly stable spectral correction filter. The proprietary filter can withstand the very high intensity from the lamp without changing spectral properties. The result is the spectral output shown in Figure 1.

The filter was also designed to maintain Class ABB performance over the full life of the lamp; see Fig. 3.

Table 2 Ideal Spectral Match Defined by IEC Standards

Spectral Match						
Spectral Range (nm)	400 – 500	500 – 600	600 – 700	700 – 800	800 – 900	900 – 1100
Ideal %	18.5	20.1	18.3	14.8	12.2	16.1

Figure 1 Spectral Match response plot

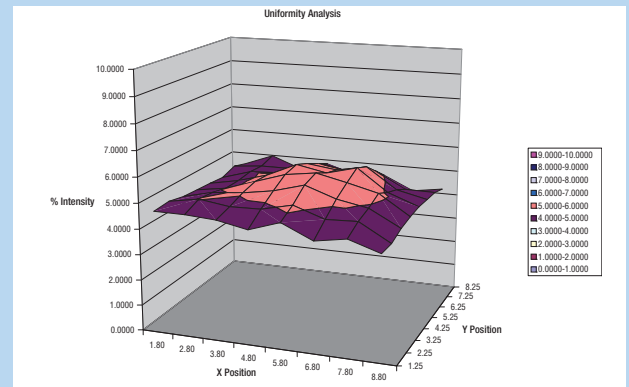


Oriel Sol1A Spectral Match with AM 1.5G spectral correction filter meets IEC, JIS, ASTM Class A requirements to for spectral match.

## SPATIAL UNIFORMITY OF IRRADIANCE

The irradiance uniformity over the work area is the most difficult requirement to achieve and maintain. Hot spots can lead to significant errors in measured cell efficiency and can cause inaccurate binning of cells. The Class ABB spatial uniformity performance standard is designed to minimize the impact of hot spots and meets the Class B requirements for the standards as shown in Table 1.

Figure 2 plots the non-uniformity of irradiance over the illuminated area for a typical 8x8 Class ABB Sol1A

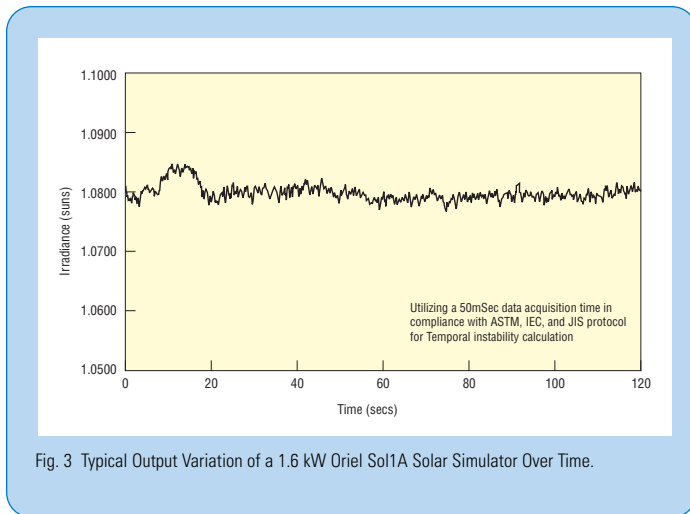


Measured Uniformity of a 2x2" Oriel Class ABB Solar Simulator.

## TEMPORAL STABILITY

Temporal stability is the third performance parameter of Class ABB standards. It requires that the output light be stable over time in order to ensure that the lamp fluctuations do not distort the measurements of solar cell efficiency. The Sol1A Class ABB meets Class B stability standards for all three standards and can be upgraded with our optional Light Intensity Control system, which substantially reduces lamp output fluctuation to values that are significantly better than the Class B standard. Figure 3 demonstrates a typical temporal instability response curve for the Sol1A.

# Oriel® Sol1A Class ABB Solar Simulators



## ORIEL SOL1A CLASS ABB SOLAR SIMULATOR KEY COMPONENTS

### Illuminator Housing

The Sol1A housing provides a safe enclosure for the lamp. It is equipped with safety interlock systems to ensure operator and system safety. An integral fan(s) and filter blower provides forced air-cooling to maintain optimal lamp, optics and housing temperature.

### Integrated Shutter

The Oriel Sol1A Class ABB Solar Simulator includes a shutter that is a rugged, single-blade shutter design specified for 1 million cycles. Real-world performance has exceeded 10 million cycles. The shutter has a minimum exposure time of 200 ms and can be controlled via a contact closure or logic level input, or a convenient push-button switch on the illuminator housing.

### Xenon Arc Lamp

The Oriel Sol1A Class ABB Solar Simulator source is a CW system. This enables testing of all cell materials unlike flashlamp-based systems that are limited by the response time of the material. Regardless of model chosen, the lamp is an ozone-free xenon short arc lamp. Your system is certified with the lamp which is shipped with the unit to insure meeting the performance stated. For continuous production environments, we recommend purchasing replacement lamps when the source is purchased, and certifying each lamp. This will ensure Class A spectral match certification as lamps are replaced.

### 1.5G Air Mass Filter

The combination of lamp and air mass filter produces the characteristic Class A spectra. Our 1.5G Air Mass Filter retains its optical properties through the life of the lamp. Replacement filters are sold separately.

### Power Supply

The highly regulated power supply provides constant electrical power to the Xenon lamp. Lamp usage can be monitored in accumulated hours from the power supply. It is important to replace the lamp at the end of its rated life to maintain the minimum 1 sun output with appropriate spectral match. The lamp's output and spectral match can not be assured with continued use beyond the specified lifetime (@1000 hours).

## POWER SUPPLY SPECIFICATIONS

Line Regulation	0.01 %
Light Ripple	<1 % rms
Input Power, 150 W Systems	95 - 264 VAC/4A, 47 - 63 Hz
Input Power, 450-1000 W Systems	95 - 264 VAC/15A, 47 - 63 Hz
Input Power, 1600 W Systems	190 - 264 VAC/12A, 47 - 63 Hz

Oriel Lamp Housing is designed to operate in a typical laboratory environment (typically 68 to 76 degrees F, up to 45% relative humidity). Temperature and humidity outside of typical laboratory range can contribute to cooling and ignition faults. Cooling issues will cause the over temperature sensor to open, and ignition problems will result from high humidity. Contact Newport technical representative for more information if operating outside the suggested range.

## MAINTAINING AN ORIEL SOL1A CLASS ABB SOLAR SIMULATOR

Oriel Sol1A Class ABB Solar Simulators maintain Class ABB standards during the specified lifetime of the lamp. When the lamp is replaced, the instrument may fall outside of Class ABB performance. Spatial uniformity is the most difficult requirement to meet and maintain. In order to facilitate the measurements and adjustments necessary to maintain spatial uniformity, Oriel has developed a uniformity measurement tool (Sol-UMT) to allow rapid measurement and determination of performance. The use of these tools allows you to maintain the Oriel Sol1A Class ABB Solar Simulator within stated performance specifications. \* Please contact a Sales Engineer for details.

\* Note: the use of these tools does not constitute re-certification of the system to Class ABB standards. For re-certification, we recommend that the entire Sol1A Class ABB Solar Simulator be returned to the factory.

# Oriel® So1A Class ABB Solar Simulators

## Ordering Information

### ORIEL SOL1A CLASS ABB SOLAR SIMULATORS

Model	Description
94021A	Class ABB Solar Simulator per IEC, JIS, ASTM methods, 150 W lamp, 2 x 2 in. area, <math>\lt; 6^\circ</math> Collimated Output, 2.0 +/-0.5 in. working distance
94041A	Class ABB Solar Simulator per IEC, JIS, ASTM methods, 450 W lamp, 4x4 in. area, <math>\lt; 4^\circ</math> Collimated Output, 4.0 +/-0.5 in. working distance
94061A	Class ABB Solar Simulator per IEC, JIS, ASTM methods, 1000 W lamp, 6 x 6 in. area, <math>\lt; 3^\circ</math> Collimated Output, 5.0 +/-0.5 in. working distance
94081A	Class ABB Solar Simulator per IEC, JIS, ASTM methods, 1600 W lamp, 8 x 8 in. area, <math>\pm 2^\circ</math> Collimated Output, 6.0 +/-0.5 in. working distance

\* The lamp supply power can be adjusted to match 1 sun while maintaining Class A spectral requirements throughout the life of the lamp.

## REPLACEMENT LAMPS AND FILTER

We recommend purchasing replacement lamps and certification at the time of purchase of the source. Contact a Sales Engineer for details.

Model	Description
6255	Replacement Lamp, 150 Watt Xenon, Ozone Free
6279NS	Replacement Lamp, 450 Watt Xenon Short Arc, Ozone Free
6271	Replacement Lamp, 1000 Watt Xenon Short Arc, Ozone Free
62711	Replacement Lamp, 1600 Watt Xenon, Ozone Free
81088A	Air Mass Filter, 1.5 G

Contact a Sales Engineer for pricing of optional accessories.

Note: Please check our product web pages for more technical information at [www.newport.com](http://www.newport.com).

## RELATED PRODUCTS



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Newport Corporation, Irvine, California and Franklin, Massachusetts; Evry and Beaune-La-Rolande, France and Wuxi, China have all been certified compliant with ISO 9001 by the British Standards Institution. Santa Clara, California is DNV certified.

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