

## Class ABA Solar Simulators

With over 40 years of proven performance and rugged durability built into our solar simulator product family, Newport Corporation's Oriel® Sol2A™ Class ABA systems take solar simulation to the next level. Certified to IEC 60904-9 2007 Edition, JIS 8904-9 2017, and ASTM E 927-10 standards, these large area sources use a xenon lamp and proprietary filter to meet, efficiently and reliably, Class ABA 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 ABA?

For applications which don't require a high level of uniformity of illumination, a Class ABA system is a great solution. Class ABA 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, these Class ABA 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 ABA systems provide a cost effective option for durable Oriel

Solar Simulators, the trusted name for 40 years as a quality supplier who is backing their products by utilizing the worldwide Newport network of resources.

### Defining Class ABA 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 Sol2A Class ABA 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 8904-9 2017, Solar Simulators for Crystalline Solar Cells and Modules
- ASTM E 927-10 (2010) Specification for Solar Simulation for Terrestrial PV Testing



### Product Features

- Complete line of Class ABA products from 4"x4" to 8"x8" output beam sizes
- Factory certified CW systems per IEC 60904-9 2007 Edition, JIS 8904-9 2017, and ASTM E 927-10
- 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

**Table 1 Class ABA 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 Short Term	0.5%	0.5%	2%
Temporal Instability Long Term	2%	2%	N/A

**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 ABA, this range is 0.75 to 1.25 times the ideal percentage.

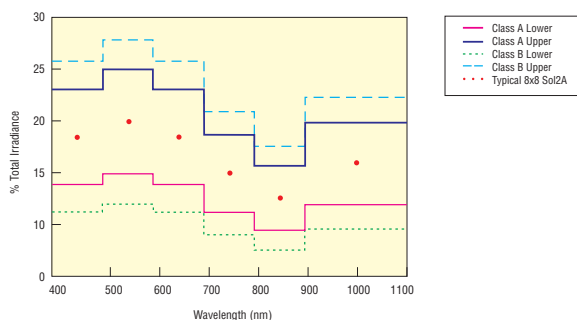
To ensure that the Oriel Sol2A Class ABA Solar Simulator falls easily and reliably within this range, we designed a proprietary, highly stable, spectral correction filter. The proprietary filter can withstand the very high intensity from the lamp without changing spectral properties. The result is the spectral output shown in Figure 1.

The filter was also designed to maintain Class B ABA performance over the full life of the lamp.

**Table 2 Ideal Spectral Match Defined by IEC Standards for Class A Spectral match**

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**

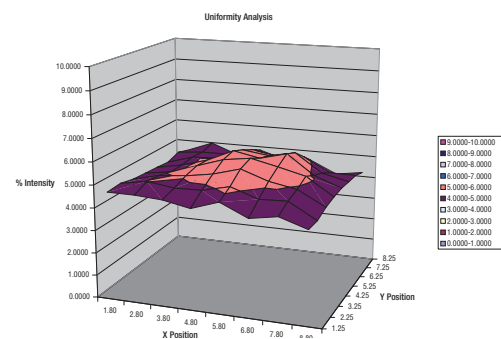


Oriel Sol2A Spectral Match with AM 1.5G spectral correction filter meets IEC, JIS, ASTM Class A requirements to for spectral match.

**Spatial Non-Uniformity of Irradiance**

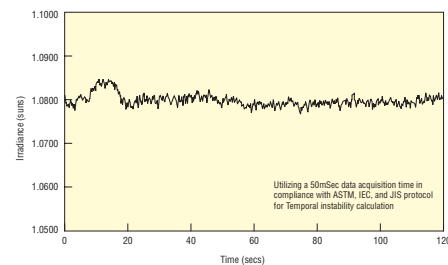
The irradiance uniformity over the working area is the most difficult requirement to achieve and maintain. Hot spots can lead to significant errors in measured cell efficiency and can cause inaccurate binning of cells. The Class ABA solar simulators have been optically designed to minimize the impact of hot spots and meet or exceed the Class B requirements for uniformity as defined in Table 1.

**Figure 2 Non-Uniformity of Irradiance**



Measured Uniformity of a 8x8” Oriel Sol2A Solar Simulator.

**Figure 3**



Typical Output Variation of a 1.6 kW Oriel Sol2A Solar Simulator Over Time.

**Temporal Instability**

Temporal instability is the third performance parameter of Class ABA 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 Sol2A meets Class A stability for all three standards without the need for an optional Digital Exposure system. Although this can be used to substantially reduce lamp output fluctuation to values that are significantly better for the most stringent applications.

## Oriel Sol2A Class ABA Solar Simulator

### Key Components

#### Illuminator Housing

The Sol2A housing provides a safe enclosure for the lamp. It is equipped with safety interlock systems to ensure operator and system safety. Fans and filter blowers provide forced air-cooling to maintain optimal lamp, optics, and housing temperature. A lamp hour indicator has also been integrated into the housing for easy monitoring of lamp usage.

#### Integrated Shutter

The Oriel Sol2A Class ABA Solar Simulator includes a shutter that is a rugged, single-blade 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 Sol2A Class ABA 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. Each system is certified with the lamp which is shipped with the unit to ensure the performance stated has been met. 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.

#### Air Mass1.5G Filter

The combination of lamp and air mass filter produces the characteristic Class A spectra. Our Air Mass 1.5G Filter retains its optical properties throughout 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 cannot 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 Solar Simulators are designed to operate in a typical laboratory environment (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 Sol2A Class ABA Solar Simulator

Oriel Sol2A Class ABA Solar Simulators maintain Class ABA standards during the specified lifetime of the lamp. When the lamp is replaced, the instrument may fall outside of Class ABA performance. Spatial non-uniformity is the most difficult requirement to meet and maintain. In order to facilitate the measurements and adjustments necessary to maintain spatial uniformity, Oriel offers a field recertification service performed by a qualified engineer. Extended warranties and installation service are also available. Please contact a Sales Engineer for details.

## Ordering Information

### Oriel Sol2A Class ABA Solar Simulators

Model	Description	Nominal Lamp Electric Power (W) <sup>1</sup>	Illumination Area (in.) [mm]	Maximum Angle of Incidence (°)	Nominal Working Distance (in.) [mm]
94042A	Class ABA Solar Simulator per IEC, JIS, ASTM methods	450	4 x 4 [100 x 100]	<4°	6.0 [50]
94062A	Class ABA Solar Simulator per IEC, JIS, ASTM methods	1000	6 x 6 [150x150]	<3°	7.0 [180]
94082A	Class ABA Solar Simulator per IEC, JIS, ASTM methods	1600	8 x 8 [200x200]	<2°	15.0 [380]

Note 1: The lamp power can be adjusted to match 1 SUN while maintaining Class A requirements throughout the life of the lamp.

## Replacement Lamps and Filter

Model	Description
6280NS	Replacement Lamp, 450 Watt Xenon Short Arc, Ozone Free
6272	Replacement 1000 Watt Xenon Short Arc Lamp, Ozone Free
62726	Replacement Lamp, 1600 Watt Xenon, Ozone Free
81388	Air Mass Filter, 1.5 G

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

## Related Products



91150V Solar Reference Cell



PVIV Test Solutions



Class ABA LED Solar Simulators