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 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 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?

For applications which don't require the highest level of uniformity of illumination, a Class ABB system is an excellent option. Class ABB systems still provide the highest spectral match performance (ClassA) as defined by the most recent standards from the IEC, JIS and ASTM. Although the uniformity is Class B, 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 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. An optional digital exposure system can be purchased to further stabilize lamp fluctuations over time.

Defining Class ABB Performance Standards

PV standards from the IEC, JIS and ASTM define the requirements and test methodolgy 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 methodolgy 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 ABB products from 2"x2" 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 ABB Standards and Specifications

	Organization		
Performance Parameter	**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)	2%(STI) < 5% (LTI)	<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.

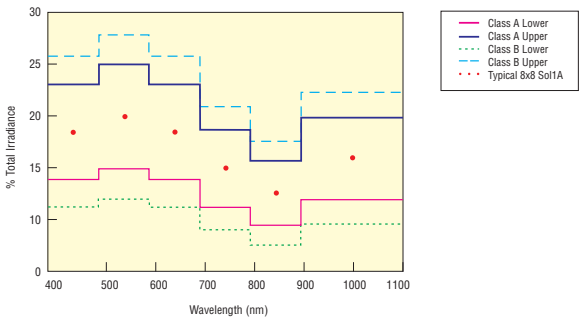
To ensure that the Oriel Sol1A Class ABB Solar Simulator falls easily and reliably within this range, we designed a proprietary, highly stable spectral correction filter. The proprietary filter can withstand the very high intensity from the lamp without changing spectral properties. The result is the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

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

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

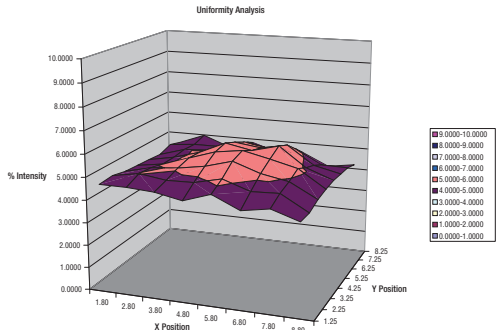


Oriel Sol1A Spectral Match with AM 1.5G spectral correction filter meets IEC, JIS, ASTM Class A requirements to for spectral match.

Spatial 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 ABB solar simulators have been optically designed to minimize the impact of hot spots and meet or exceed the Class B requirements for uniformity per the standards shown in Table 1.

Figure 2 Non-Uniformity of Irradiance

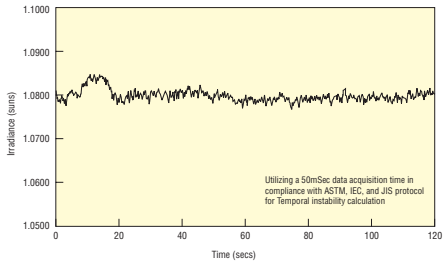


Measured Uniformity of a 8x8" Oriel Sol1A Solar Simulator.

Temporal Instability

Temporal instability 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 meets Class B stability for all three standards and can be further improved with our optional Digital Exposure system, which substantially reduces lamp output fluctuation to values that may be significantly better than the Class B standard. Figure 3 demonstrates a typical temporal instability response curve for the Sol1A.

Figure 3



Typical Output Variation of a 1.6 kW Oriel Sol1A Solar Simulator Over Time.

Oriel Sol1A Class ABB 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 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. Each system is certified with the lamp which is shipped with the unit to ensure the performance stated has been achieved. 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 an 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 formore information if operating outside the suggested range.

Maintaining An Oriel Sol1A Class ABB Solar Simulator

Oriel Sol1A 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 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 performedby a qualified engineer. Extended warranties and installation service are also available. Please contact a Sales Engineer for details.

Ordering Information

Oriel Sol1A Class ABB Solar Simulators

Model	Description	Nominal Lamp Electric Power (W)[1]	Illumination Area (in.) [mm]	Maximum Angle of Incidence (°)	Nominal Working Distance (in.) [mm]
94021A	Class ABB Solar Simulator per IEC, JIS, ASTM methods	450	2 x 2 [50x50]	<6°	2.0 [50]
94041A	Class ABB Solar Simulator per IEC, JIS, ASTM methods	450	4 x 4 [100x100]	<4°	6.0 [150]
94061A	Class ABB Solar Simulator per IEC, JIS, ASTM methods	1000	6 x 6 [150x150]	<4°	7.0 [180]
94081A	Class ABB 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

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
6272	Replacement Lamp, 1000 Watt Xenon Short Arc, Ozone Free
6276	Replacement Lamp, 1600 Watt Xenon Short Arc, Ozone Free
81388, 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.

Related Products

91150V Solar Reference Cell

PVIV Test Solutions

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