
Luzchem Solar Simulator SolSim2

Updated Dec 2023

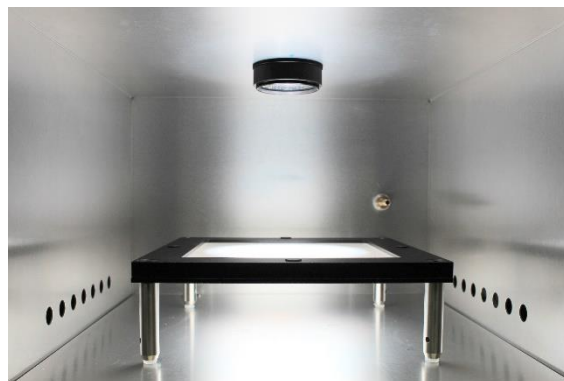
Luzchem's SolSim2 provides solar simulating radiation based on a powerful 300W ceramic xenon lamp with built-in mirrors for exceptional luminous output. Enclosed in a standard photoreactor cabinet, the unit produces a circular irradiation area approximately 6.0" (15.2 cm) in diameter. Includes filters for matching the AM1.5 solar spectrum across the UVA and Visible regions. The filtered xenon lamp cuts out wavelengths below 310 nm, significantly eliminating the production of ozone.

The closed-chamber design prevents ambient light from influencing experiments and protects those in the lab from exposure to UV light. The unit includes a safety interlock which closes the shutter if the door is opened. A digital count-down timer, a pre-shipment calibration, an AM1.5-referenced power meter, and the filters required for solar simulation complete the package.



Configuration:

The SolSim2 is designed with a 300 Watt Xenon lamp located at the top of the photoreactor chamber along with a custom filter assembly. The solar simulation filters are incorporated into a stand 3" above the chamber floor, with samples beneath the filter stand.



For a more details see the diagram in Appendix 1.

Unit Specifications:

Dimensions:	<i>External:</i> 18" wide, 13.75" deep and 26" high (46 x 35 x 66 cm) <i>Internal:</i> 12" wide, 12" deep and 8.5" high (30 x 30 x 22 cm)
Weight:	31 lbs. / 14 kg
Power Rating:	110 or 220 VAC, 50/60 Hz cycle, 6 Amps
Housing Material:	<i>External:</i> Stainless Steel <i>Internal (chamber):</i> Aluminum alloy (highly reflective)
Ambient Temperature:	Must be between 0°C and 45°C
Chamber Temperature:	Maintained to 6-8 °C above room temperature
Humidity:	Must be between 0% and 95% (non-condensing)

Lamps: The unit uses a filtered (ozone-free) 300W ceramic xenon lamp. A dimmer switch is included so that power output can be optimized to match AM 1.5 intensity. The lamp irradiates from approximately 320 nm into the near IR region and eliminates the need to safely exhaust ozone from the chamber, as no significant amount of ozone is generated.

Luzchem lamp replacement part number: XE300B-10F

Lamp description: 300W filtered (ozone-free) focused xenon lamp

See lamp manufacturer's specification sheet for detailed information.

Filters: For solar simulation, Luzchem SolSim proprietary filters are used:

- One 2" circular filter placed at the top of the chamber (in the filter holder)
- One 6" x 6" square filter assembly incorporated into a stand 3" above the chamber floor.

The filter combination simulates the AM1.5 solar spectrum to within 1% total power difference between 300-800 nm. For details of power distribution, see representative spectral graph and total power comparison table.

Lenses: The filter adapter accepts lenses 2" in diameter. This can be used to expand or contract the beam with corresponding changes to output intensity. Adding such lenses would be a user-supplied option and may change the spectral distribution of the light depending on the material used to make the lenses.

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Features Included:

Feature	Specifications
Safe exhaust	<ul style="list-style-type: none"> • Material: ABS • Built-in fan: 3100 RPM, Airflow: 110 CFM • Exhaust tube provided: 4" diameter, max length: ~ 8'
UV protecting goggles	<ul style="list-style-type: none"> • Safety goggles, with 420 nm cut-off
Shutter	<ul style="list-style-type: none"> • Material: reflective aluminum • Manual operation • Automatic operation with use of the digital timer
Safety Interlock	<ul style="list-style-type: none"> • Safety interlock closes the shutter when the door is opened • Can be overridden with interlock key
Digital countdown timer	<ul style="list-style-type: none"> • Factory preset • Allows unattended shutter closure or lamp shut down for exposure times from 1 minute to 99 hours, 99 minutes
Variable Power	<ul style="list-style-type: none"> • Range of 175 to 305 Watts
Gas inlet	<ul style="list-style-type: none"> • Rear mounted bulkhead gas connector • Only recommended for non-flammable, non-toxic gases • Gas should not dissipate in the chamber, should be used with environmental chamber only.
Power Meter	<ul style="list-style-type: none"> • Calibrated relative to AM1.5 spectrum
Pop out	<ul style="list-style-type: none"> • A ¾ of an inch hole in the back of the chamber to introduce cables etc in the chamber.
Accelerated Aging Possible	<ul style="list-style-type: none"> • With a new lamp, unit will typically exceed 1.5 (times) AM1.5 • Variations between units and lamp aging effects can occur • Power is continuously adjustable to match AM1.5
Hour Meter	<ul style="list-style-type: none"> • Built-in to the unit • Keeps track of the number of hours the unit has been in operation

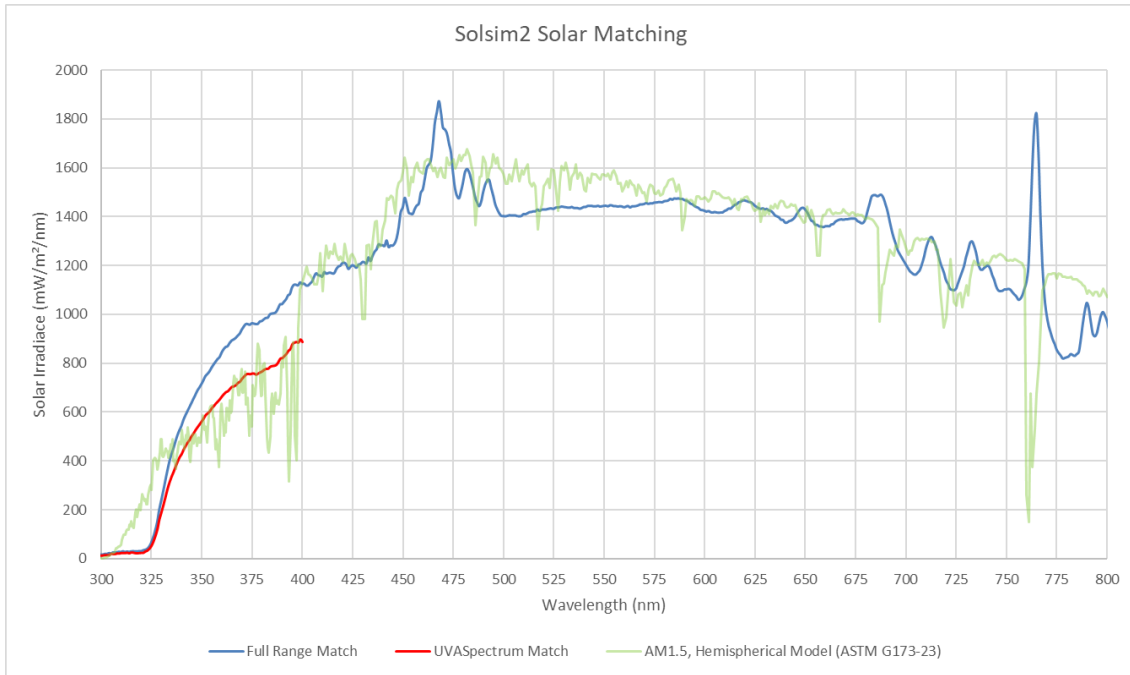
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Typical Calibrated Spectral Graph:



Representative Total power (mW/m²) comparison			
Region (nm)	AM1.5	SolSim2	% Difference
280-800	595,408	593,000	<1%
280-315	769	660	14
315-400	46,090	57,700	25.0
400-500	142,914	138,000	-3.4
500-600	153,029	144,000	-5.9
600-700	140,085	140,000	-0.0
700-800	112,450	111,000	1.2

The data shown above are representative of the spectrum and power distribution measured when the lamp intensity is adjusted for the best AM1.5 total power match in the 300-800 nm range.

Each SolSim is individually calibrated and includes an AM1.5-referenced SunMeter which can be used to optimize the output of that unit for best power match across the 300-800 nm region or for best power match in the UV region.

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Adjustable Power

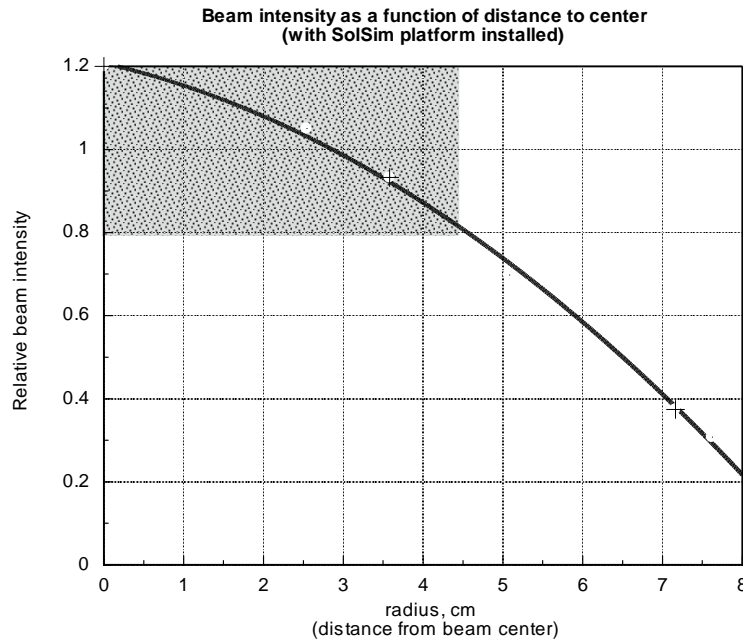
Luzchem SolSim2 has easily controllable lamp power. This allows users to compensate for lamp aging and achieve AM1.5 simulation as the lamp intensity naturally decays with time. Unlike other systems where power output decreases with the age of the lamp, adjustable power allows for consistent, stable power output over time. Set and verify output power using the AM1.5-referenced calibrated power meter provided.

The following values are given for reference only, since each SolSim2 system may vary as much as 10% relative to these. Users should also anticipate variations in this range when they replace the xenon lamp. These values correspond to the AM1.5 units achievable within the power adjustment range provided:

- Power at minimum: $\approx 30\%$ of AM1.5
- To achieve AM1.5 power setting $\approx 77\%$
- Maximum achievable (new lamp, center) ≈ 1.5 times AM1.5

Beam Homogeneity

The following graph shows the variation of the beam intensity as a function of distance from the beam center in the sample area at the floor of the chamber. The gray area shows the region with $\leq \pm 20\%$ variation from the normalization value and corresponds to a circle of 8.8 cm diameter with a surface area of 61 cm². Similarly, variations of only $\pm 10\%$ can be obtained in a region of 3.0 cm diameter, corresponding to a surface area of 28 cm². Points identified with a + marker correspond to distances in a diagonal line that crosses the center of the filter stand.



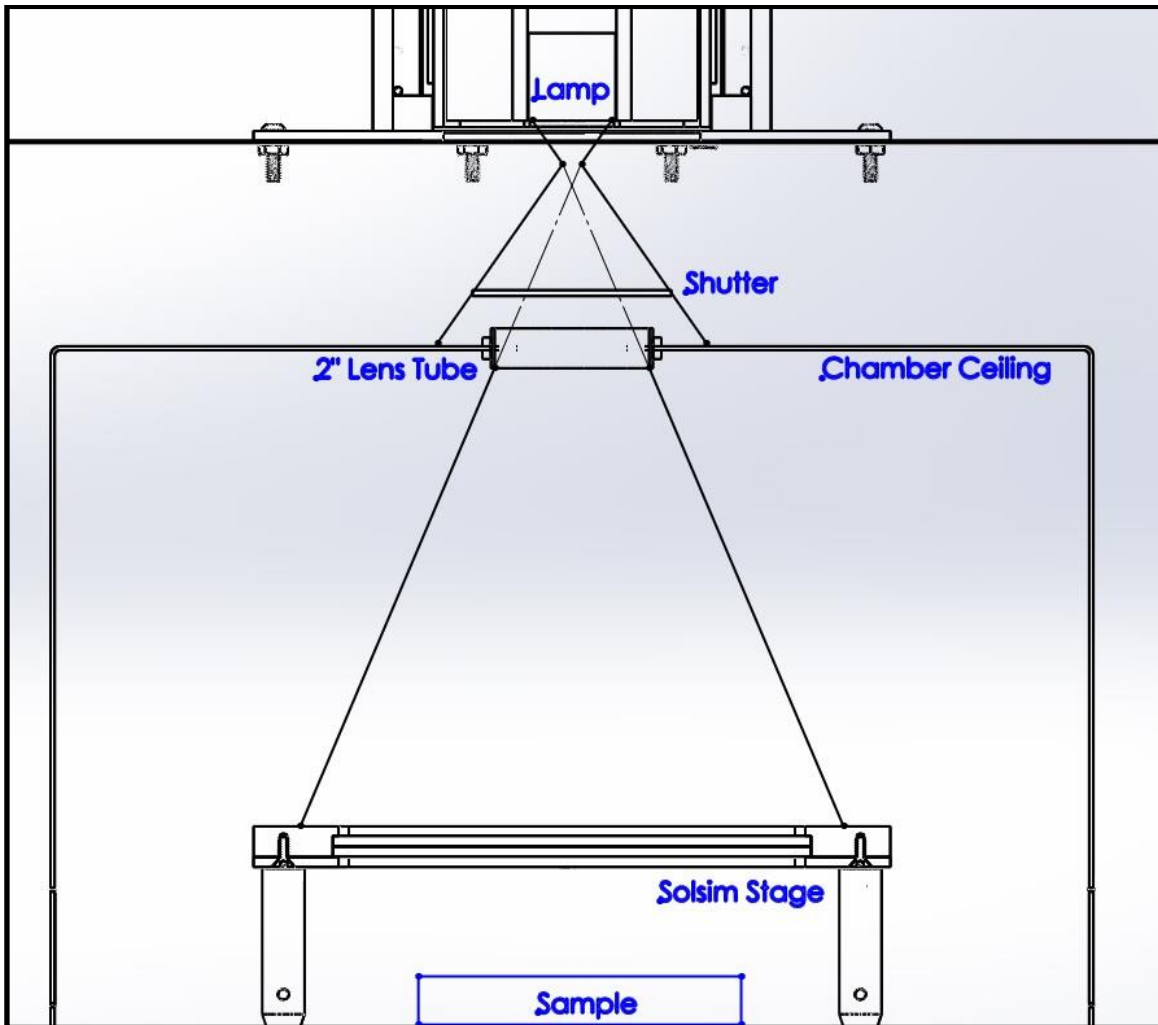
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Appendix 1: System diagram



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