TS-SPACE SYSTEMS

UNISIM
Solar Simulator

TS-SPACE SYSTEMS ™ CLOSE MATCH TECHNOLOGY

TS-Space Systems designed and built the first close-match solar simulator in 1997* and has been a leader in the field ever since.

Many of our customers have found the approximation of the sunlight spectrum in standard 'Class A' solar simulators to be unsatisfactory when accurate measurements are required.

For applications where spectral match and control is critical, such as multi-junction solar cell testing, our close-match technology is invaluable.

* Wilkinson, V. A.; Goodbody, C.; Williams, W. G., "Measurement of multijunction cells under close-match conditions," Photovoltaic Specialists Conference, 1997

BEYOND 'CLASS A'

Because our instruments surpass the criteria defined by the international standards for 'Class A' solar simulators, we coined the term 'close match' to distinguish our spectral match from the basic 'class a' of other solar simulators.

- Close spectral match for AM0 and AM1.5 spectra (320-2200nm)
- High temporal stability (+/- 0.5%)
- Adjustable spectrum
- Available with 2,3 or 4 spectral 'zones'

FULL SPECTRUM CONTROL

Our Unisim solar simulators can be built with 2,3 or 4 spectral "zones" of control.

Each "zone" can be controlled independently with minimal overlap of adjacent zones, allowing for rapid and accurate calibration using reference junctions.

TS-Space Systems 4 Zone Metal Halide Simulator
Demonstration of Zonal Spectral Control
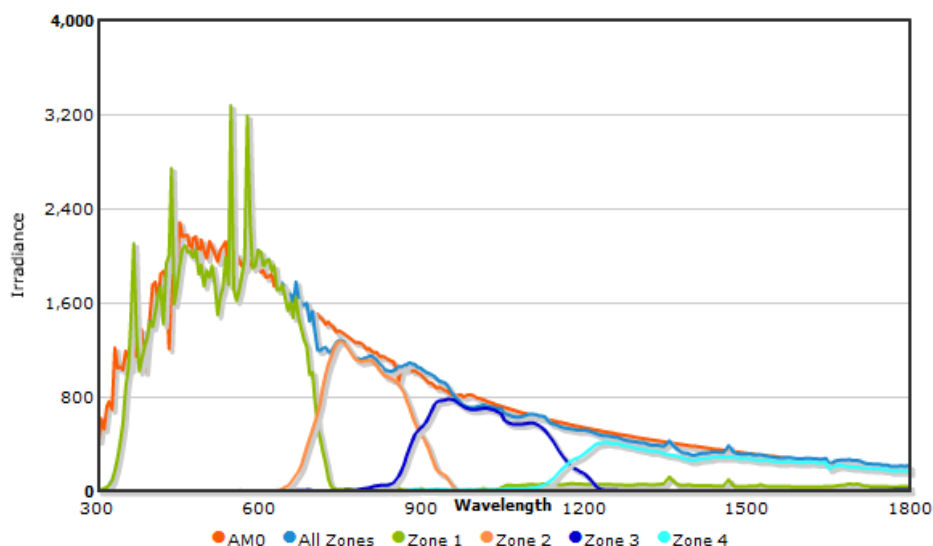
TWO SIMULATORS IN ONE

A set of drop-in filters is available for all Unisim solar simulators which allow simple and rapid switching from AM0 to AM1.5 close-match spectra.

Because the Unisim is so versatile, further spectral adjustments can be made to achieve close-match spectra for AM1 and AM2 spectra.

Intensities can also be reduced for applications such as 'LILT' testing or for simulation of other planetary atmospheres.
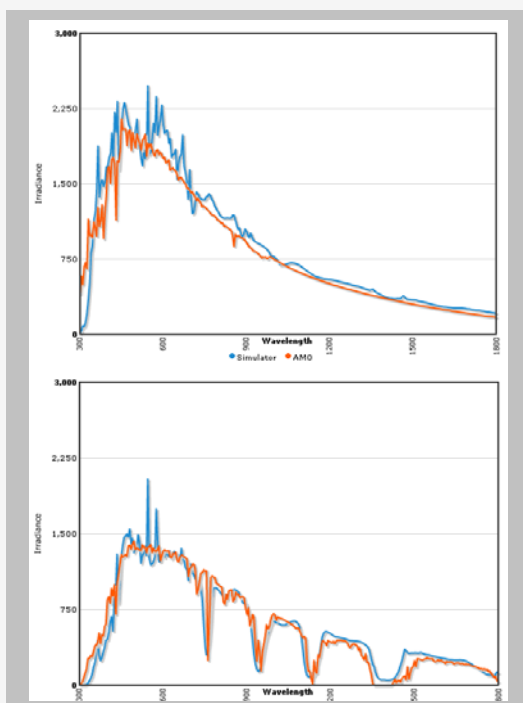
TRUE STABILITY

In multi-source solar simulators the arc-lamp is the largest source of temporal instability. The Unisim uses a metal halide (HMI) arc lamp for the visible range (320-700nm).

We pioneered the use of these sources for close-match solar simulation due to their increased stability, reduced cost and ease of use when compared to commonly used xenon sources

To counter the instability of xenon lamps, many simulator manufacturers use a feedback loop to correct for temporal shifts in intensity.

The graph below shows the measured parameters of ten consecutive IV sweeps conducted on a 'Unisim 60' within five seconds of one another. No filtering, averaging or corrections have been applied.

We consider this to represent the true stability of the simulator.

Test	A	B	C	D	E	F	G	H	I	J	Mean	%Min	%Max
Isc:	69.9	69.88	69.86	69.86	69.81	69.9	69.74	69.73	69.88	69.83	69.839	0.15	0.15
Voc:	471.3	471.17	471.3	471.35	471.67	471.59	471.59	471.78	471.8	471.6	471.515	0.073	0.056
Iop:	69.8	69.72	69.7	69.71	69.67	69.71	69.63	69.6	69.71	69.66	69.691	0.13	0.04
Vop:	200	200	200	200	200	200	200	200	200	200	200	0	0
Ipmax:	64.25	64.24	64.28	64.24	64.32	64.23	64.24	64.28	64.26	64.3	64.264	0.037	0.087
Vpmax:	376	376	376	376	376	376	376	376	376	376	376	0	0
Pmax:	24.16	24.15	24.17	24.15	24.18	24.15	24.15	24.17	24.16	24.18	24.162	0.05	0.07
FF%:	73.33	73.36	73.4	73.35	73.44	73.27	73.44	73.47	73.28	73.42	73.376	0.14	0.13
Eff%:	4.46	4.46	4.47	4.46	4.47	4.46	4.46	4.47	4.46	4.47	4.464	0.09	0.1

I-V Data. Metal Halide Based Simulator

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TS-SPACESYSTEMS
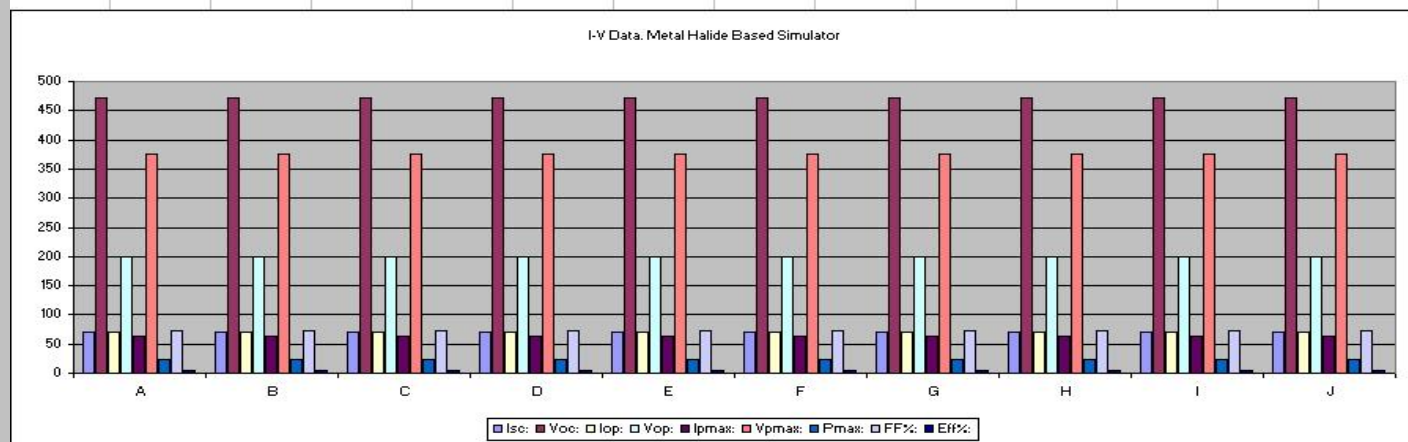
A RANGE TO SUIT YOUR APPLICATION

Unisim solar simulators are available in a range of illumination spot sizes shown below.

Systems can be built as horizontal or vertical orientation at time of order. Capacity to add additional spectral zones as a later upgrade can be included by request.

All simulators can be fitted with 'boost' zones which can supply up to 30% above AM0 irradiance across a specific spectral zone upon request at order.

Our extensive experience in vacuum and thermal test applications means we can design any of our solar simulators to fit existing chambers, or we can help you design and build an entire chamber/simulator system from scratch.

Please contact us to discuss or visit our website for more information.

*	Spectrum Available	Zones	Spectral Match (ASTM/IEC/JIS)	Temporal Stability (ASTM/IEC/JIS) *	Spatial Uniformity (ASTM/IEC/JIS)	Collimation (half-angle)	Nominal Beam diameter
Unisim 60	AM0 AM1 AM2 AM1.5	2,3 or 4	A/A/A (CLOSE MATCH)	A/A/A ~(+/- 0.15%)	A/A/A (+/- 2%)	2-3°	60mm
Unisim 100	AM0 AM1 AM2 AM1.5	2,3 or 4	A/A/A (CLOSE MATCH)	A/A/A ~(+/- 0.2%)	A/A/A (+/- 2%)	2-3°	100mm
Unisim 200	AM0 AM1 AM2 AM1.5	2,3 or 4	A/A/A (CLOSE MATCH)	A/A/A ~(+/- 0.5%)	A/A/A (+/- 2%)	2-3°	200mm
Unisim 300	AM0 AM1 AM2 AM1.5	2,3 or 4	A/A/A (CLOSE MATCH)	A/A/A ~(+/- 0.6%)	A/A/A (+/- 2%)	2-3°	300mm

* Final values may vary and are dependent on a quality electricity supply