

ELECTRICAL INSTRUMENTATION CALIBRATION REPORT

This document states that the instrument described below meets or exceeds all manufacturer specifications. The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). ILT is Accredited to ISO/IEC 17025:2017. Calibration conforms to ANSI/NCSL Z540.1-1994 and ANSI/NCSL Z540.3-2006. subclause 5.3

Date:	21-N	lov-22	Certificate #:	2211210416E	SO#:	178365
Temp:	22	Degrees C	Humidity: 1	6 %	Procedure:	TP-0135 REV D
Rendere	ed To:	Quantum Des	ign GmBH			
Instrum	entMo	del-S/N: IL	T2500 #00168			
Calibrat	ion/Re	pair Remarks:	New Instrument			
Parts (If	Neede	ed):				11

As Found Tolerance In Out	As Found Readings	As Found Permissible Error	Applied Current	Adjusted Readings	Permissible Adjustment Error	As Left Tolerance In Out
		+/-1.0%	1.000E-3	1.000E-03	+/- 0.5%	
		+/-1.0%	1.000E-4	1.000E-04	+/- 0.5%	
		+/-1.0%	1.000E-5	9.998E-06	+/- 0.5%	
		+/-1.0%	1.000E-6	9.996E-07	+/- 0.5%	V
The m		+/-1.0%	1.000E-7	1.000E-07	+/- 0.5%	
		+/-1.0%	1.000E-8	9.999E-09	+/- 0.5%	
置置		+/-1.0%	1.000E-9	9.987E-10	+/- 0.5%	V
		+/-1.0%	1.000E-10	1.000E-10	+/- 0.5%	
器 20		+/-2.0%	1.000E-11	9.967E-12	+/- 1,0%	
		+/-10.0%	5.000E-12	4.839E-12	+/- 5.0%	

Tolerance after repair and/or calibration: In Out Measurement Uncertainty: 1mA=±0.04%, 100uA=±0.03%, 10uA=±0.1%, 1uA=±0.11%, 100nA=±0.11%, 10nA=±0.11%, 10nA=±0.1

The above Instrument was compared to the Keithley Current Calibrator/Source Model 6430 S/N 4080572 calibrated on 1/13/2022 Calibration Due: 1/13/2023

Calibrated By:

Electrical Calibration Tech. Chris Kucy

This certificate applies only to the item identified and shall not be reproduced other than in full, without the specific written approval by International Light Technologies, Inc.

Form F-094E Rev A







OPTICAL CALIBRATION CERTIFICATE

International Light Technologies certifies that the calibration results published in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). ILT is Accredited to ISO/IEC 17025:2017. Calibration conforms to ANSI/NCSL Z540.1-1994 and ANSI/NCSL Z540.3-2006.subclause 5.3

Rendered-to: QUANTUM DESIGN GMBH	
Detector: SED240 #11525	Input Optic: W #17207
Filter: <u>ACT5 #28399</u>	Misc.: N/A #
Calibrated With: ILT2500 #00168	+5V Bias On
(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR	TOR AS CALIBRATED ON: 22-Nov-2022
1.45E-4 (A)(cm2)(eff W-1) assuming monoch	promatic irradiance at 270nm
Unit will read directly in effective watts per square centimeter w	when used with the sensitivity factor above.
REFERENCE PLANE: Groove ONE formed by filter or diffus	er elements and next element, counted from front surface of assembly.
PRIMARY STANDARD: U.S. National Institute of Standards a I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 D204 - December 2, 2015 - NIST Test No. 685/287304-15/1	Calibration Due: December 3, 2025
INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TR	ANSFER STANDARDS:
U1023 U522 N/A	
	Uncertainty of: <u>+/- 1.77%</u> Confidence Level of Uncertainty is 95% (k=2)
LIGHT SOURCE: SpectroPro1500/1000W Xe	LAMP OUTPUT: 1.067E-6 W/cm2
INSTRUMENTATION: SED240 #3355	PROCEDURE: OP-0018
TEMPERATURE: 22.8 degrees C	HUMIDITY:48%
CALIBRATED BY: 9 - Noya	
Calibration Technician: Jon Hoyt	
THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND S WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL L	HALL NOT BE REPRODUCED EXCEPT IN FULL, LIGHT TECHNOLOGIES, INC.
Calibration Date: <u>11/22/2022</u> Certificate No: <u>211223307</u>	Sales Order #: 178365
	66765

Form F-074 (Rev L)



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Rendered-to: QUANTUM DESIGN GmbH		
Detector: SED240 #11526	Input Optic: W #17211	
Filter: SCS280 #28904	Misc.: N/A #	
Calibrated With: ILT2500 #00168	+5V Bias On	
	8.	
(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FAC	CTOR AS CALIBRATED ON: 22-Nov-2022	
3.84E-4 (A)(cm2)(W-1) assuming monochrom (A)(cm2)(mW-1) assuming monochrom		
Unit will read directly in watts per square centimeter or milliWabove.	Watts per square centimeter when used with the sensitivity factor	
REFERENCE PLANE: Groove ONE formed by filter or diffu	user elements and next element, counted from front surface of assembly.	
PRIMARY STANDARD: U.S. National Institute of Standards I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 D204 - December 2, 2015 - NIST Test No. 685/287304-15/	2 Calibration Due: December 3, 2025	
INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY T	TRANSFER STANDARDS:	
U522 U1023 N/A		
	Uncertainty of: <u>+/- 1.25%</u> Confidence Level of Uncertainty is 95% (kg	=2)
LIGHT SOURCE: 19s Hg-Xe	LAMP OUTPUT:7.51E-4 W/cm2	
INSTRUMENTATION: #1029/SCS280/W	PROCEDURE: OP-0007	
TEMPERATURE: 22.8 degrees C	HUMIDITY: 48%	
CALIBRATED BY: 9 - North	1002	
Calibration Technician: Jon Hoyt		
THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL	SHALL NOT BE REPRODUCED EXCEPT IN FULL, L LIGHT TECHNOLOGIES, INC.	
Calibration Date: 11/22/2022 Certificate No: 211223312		
	Schedules Cardination According to the School of the Schoo	

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Rendered-to: QUANTUM DESIGN GMBH		
Detector: SED033 #11151	Input Optic:_	W #17213
Filter: <u>UVA #29449</u>	Misc.:	N/A #
Calibrated With: ILT2500 #000168	_	+5V Bias Off
(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR (PIR) PEAK IRRADIANCE	atic irradianc	te at 360nm
Unit will read directly in watts per square centimeter or milliWat above.	tts per square c	centimeter when used with the sensitivity factor
REFERENCE PLANE: Groove ONE formed by filter or diffuse	r elements and	next element, counted from front surface of assembly,
PRIMARY STANDARD: U.S. National Institute of Standards at I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 C D204 - December 2, 2015 - NIST Test No. 685/287304-15/1	alibration Due	: December 3, 2025
INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRA	ANSFER STAI	NDARDS:
SED400 #139 SED400 #1490 IL #0)1	
LT Transfer Uncertainty to Customer = <u>+/- 4.5%</u> plus NIST U ₁	ncertainty of:	+/- 1.16% Confidence Level of Uncertainty is 95% (k=2)
LIGHT SOURCE: 19s Hg-Xe	LAMP OUT	ΓΡUT: _2.66E-3 W/cm2
INSTRUMENTATION: SED033 #4544/UVA/W	PROCEDU:	RE: <u>OP-0007</u>
TEMPERATURE: 22.8 degrees C	HUMIDITY	Y: 48%
CALIBRATED BY:		
Calibration Technician: Jon Hoyt		
THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND SH WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL LI	IALL NOT BE RE	EPRODUCED EXCEPT IN FULL, DGIES, INC.
Calibration Date: 11/22/2022 Certificate No: 211223308	Sales (Order #: 178365
		Calibration Accreditations 66765

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Rendered-to:	QUANTUM DESIGN GMBH				
Detector: SED03	33 #11152	Input Optic:_	W #1	7209	
Filter:F #30	034	Misc.:	N/A	\ #	•
Calibrated With	: <u>ILT2500 #00168</u>	7 7 84		sias Off	
			<u></u>	-	
(PIR) PEAK IRRADIA	NCE RESPONSE SENSITIVITY FACT	OR AS CALIF	BRATE	D ON: 22-Nov-2022	
	A)(cm2)(W-1) assuming monochrom A)(cm2)(mW-1) assuming monochromati				
Unit will read directly i above.	n watts per square centimeter or milliWat	its per square c	entimet	er when used with the s	ensitivity factor
REFERENCE PLANE:	Groove ONE formed by filter or diffuse	r elements and	next el	ement, counted from fro	ont surface of assembly.
I219 - December 3, 2	D: U.S. National Institute of Standards at 2015 - NIST Test No. 685/287304-15/2 C 2015 - NIST Test No. 685/287304-15/1	alibration Due	: Decen	nber 3, 2025	
INTERNATIONAL LI	GHT TECHNOLOGIES PRIMARY TRA	ANSFER STA	NDARI	OS:	
IL #01	IL #02 SED033 #3275				
ILT Transfer Uncertainty	to Customer = $\frac{+/-3\%}{}$ plus NIST U	ncertainty of:	+/- 0.3	1% Confidence Level	of Uncertainty is 95% (k=2)
LIGHT SOURCE: 17				3.24E-5 W/cm2	, and the same of
INSTRUMENTATION		PROCEDU		OP-0029	
TEMPERATURE:	22.8 degrees C	HUMIDITY		48%	
CALIBRATED BY:	J. Hoya				
	Calibration Technician: Jon Hoyt				
THIS CERTIFICATE APPLI	ES ONLY TO THE ITEMS IDENTIFIED AND SH WRITTEN APPROVAL BY INTERNATIONAL LI	HALL NOT BE RE	PRODU	CED EXCEPT IN FULL,	THE PARTY AND A STATE OF THE PARTY AND A STATE
Calibration Date: <u>11/22</u>				: <u>178365</u>	PJIA Calibration Accreditations 66765

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Rendered-to: QUANTUM DESIGN GMBH			
Detector: SED033 #11155	Input Optic:	R #01429	
Filter:F #30035	Misc.:	N/A #	
Calibrated With: ILT2500 #00168		+5V Bias <u>Off</u>	
(PRR) PEAK RADIANCE RESPONSE SENSITIVITY FACTO	R AS CALIB	RATED ON: 22-Nov-202	2
(A)(cm2)(sr)(W-1) assuming monochr	romatic radia	ance at 600nm	
Unit will read directly in watts per square centimeter per steradia	n when used	with the sensitivity factor a	bove.
REFERENCE PLANE: Average F.O.V. +/-0.75 Degrees			
PRIMARY STANDARD: U.S. National Institute of Standards ar I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 C D204 - December 2, 2015 - NIST Test No. 685/287304-15/1	alibration Du	e: December 3, 2025	
INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRA			
** #04			
IL#01 IL#02 SED033 #3275 ILT Transfer Uncertainty to Customer =+/- 3% plus NIST U1	ncertainty of:	+/- 0.31% Confidence L	evel of Uncertainty is 95% (k=2)
LIGHT SOURCE: 1T 1000W QTH/Reflectance Tablet			
INSTRUMENTATION: SED033 #6400	PROCEDU		Si .
TEMPERATURE: 22.8 degrees C	HUMIDIT		
CALIBRATED BY: 9 - Troys		1070	
Calibration Technician: Jon Hoyt			
THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND SH WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL LI	IALL NOT BE R	EPRODUCED EXCEPT IN FUL OGIES, INC.	.L, Julius Page
Calibration Date: <u>11/22/2022</u> Certificate No: <u>211223313</u>	Sales	Order #: <u>178365</u>	IIAC MRA PJLA Calibration
			Accreditation# 66765

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Rendered-to: QUANTUM DESIGN GMBH			
Detector: SED033 #11153	Input Optic:_	W #17210	
Filter:Y4 #01044	Misc.:	N/A #	
Calibrated With: ILT2500 #00168	- 1.5	+5V Bias Off	 -
(YIS)PHOTOPIC ILLUMINANCE RESPONSE SENSITIVITY 2.36E-8 (A)(ft2)(lm-1) assuming 3215 K Colo 2.192E-09 (A)(lux-1) assuming 3215 K Color Temper	r Temperatur		·-2022
Unit will read directly in lumens per square foot (footcandles) or	lux when used	with the sensitivity factor ab	ove.
REFERENCE PLANE: Groove ONE formed by filter or diffuse	er elements and	next element, counted from f	ront surface of assembly.
PRIMARY STANDARD: U.S. National Institute of Standards a SED033 #4528 / Y #16218 - November 5, 2015 - NIST Test 1	nd Technology No.: 685/28726	Detector Response 1-15/1 - Calibration Due: No	vember 5, 2025
LT Transfer Uncertainty to Customer = +/- 4.3% plus NIST U	ncertainty of:	+/- 0.5% Confidence Leve	l of Uncertainty is 95% (k=2)
LIGHT SOURCE: 1T 1000W QTH	LAMP OUT	TPUT: 251 lm/ft2	
INSTRUMENTATION: #6400/Y	PROCEDU	RE: <u>OP-0070</u>	
TEMPERATURE: 22.8 degrees C	HUMIDITY	48%	
CALIBRATED BY: Calibration Technician: Jon Hoyt			
THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND SE	HALL NOT BE RE	PRODUCED EXCEPT IN FULL,	antiffice.
WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL LI Calibration Date: 11/22/2022 Certificate No: 211223310	IGHT TECHNOLO	OGIES, INC. Order #: <u>178365</u>	PJLA Calibration Accreditations 66765

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Rendered-to: QUANTUM DESIGN GMBH			
Detector: SED033 #11154	Input Optic:_	R #01428	
Filter: Y4 #01046	Misc.:	N/A#	
Calibrated With: ILT2500 #00168		+5V Bias Off	
(YLS) PHOTOPIC LUMINANCE RESPONSE SENSITIVITY	TEACTOD AS	CALIDDATED ON ACAN	
(125) THO FOLIO EDIMINANCE RESI ONSE SENSITIVITY	ractur as	CALIBRATED ON: 22-No	ov-2022
(A)(fL-1) assuming 3215 K Color Te (A)(m2)(cd-1) assuming 3215 K Color Te			
Unit will read directly in foot-Lamberts when used with the sen	sitivity factor al	oove	
REFERENCE PLANE: Average F.O.V. +/-0.75 Degrees			
PRIMARY STANDARD: U.S. National Institute of Standards a SED033#4528/Y#16218 - November 5, 2015 - NIST Test No	and Technology o.: 685/287261-	Detector Response 15/1 - Calibration Due: No	ovember 5, 2025
(LT Transfer Uncertainty to Customer = +/-4.3% plus NIST U	Incertainty of:	+/- 0.5% Confidence Le	evel of Uncertainty is 95% (k=2)
LIGHT SOURCE: 1T 1000W QTH/Reflectance Tablet			
INSTRUMENTATION: #6400/Y	PROCEDU		
TEMPERATURE: 22.8 degrees C	HUMIDITY		
CALIBRATED BY: 9 - Noya			
Calibration Technician: Jon Hoyt			
THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND S WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL L	HALL NOT BE RE	PRODUCED EXCEPT IN FULL OGIES, INC.	
Calibration Date: <u>11/22/2022</u> Certificate No: <u>211223311</u>		Order #: <u>178365</u>	PJLA Calibration Accorditation Accorditation

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