



LM-79-08 Test Report

For

ELEC-TECH INTERNATIONAL CO LTD

No.1 Jinfeng Road, Tangjiawan Town, Xiangzhou District, Zhuhai City, Guangdong Province, P.R. China 519085

LED Ceiling Light

Model name(s):

544375##

544373##

Representative (Tested) Model: 54437511

Model Difference: All models are identical to each, except model name. ##=11-30 intends CCT 3000K, 4000K and 5000K. (The product is color tunable luminaire, tunable from 3000K, 4000K and 5000K).

Prepare By:

laston

Engineer: Leo Liu Date: 2017-07-11

Review By:

incer Tven

Technical Lead: Vincent Yuan Date: 2017-07-12

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Laboratory: Dongguan New Testing Centre Co., Ltd Page 1/11 Address: 3F, No. 1 the 1st North Industry Road, Songshan Lake Science & Technology Park, Dongguan, Guangdong, China Tel: 86-755-2344 3526 Website: http://www.ntc-cert.com



R NVLAP LAB CODE 600150-0

Client Name: ELEC-TECH INTERNATIONAL CO LTD Brand Name: ETI Model Number: 544373##, 544375## (##=11-30) Product type: LED Light Engine Rating Input: AC120V, 60Hz, 24W Declared CCT: 3000K Declared Light output: 1600lm LED Manufacturer: Samsung LED Quantity: 60 pcs Forward current of LED Chip: 100 mA Date of Receipt Samples: 2017-06-18 Quantity of Receipt Samples: 3 Sample Number: 170618007-S1 Laboratory Information: Dongguan New Testing Centre Co., Ltd Laboratory Address: 3F, No. 1 the 1st North Industry Road, Songshan Lake Science &
Model Number:544373##, 544375## (##=11-30)Product type:LED Light EngineRating Input:AC120V, 60Hz, 24WDeclared CCT:3000KDeclared Light output:1600lmLED Manufacturer:SamsungLED Model:SPMWHX229ALED Quantity:60 pcsForward current of LED Chip:100 mADate of Receipt Samples:2017-06-18Quantity of Receipt Samples:3Sample Number:170618007-S1Laboratory Information:Test Laboratory:Dongguan New Testing Centre Co., Ltd
Product type: LED Light Engine Rating Input: AC120V, 60Hz, 24W Declared CCT: 3000K Declared Light output: 1600lm LED Manufacturer: Samsung LED Model: SPMWHX229A LED Quantity: 60 pcs Forward current of LED Chip: 100 mA Date of Receipt Samples: 2017-06-18 Quantity of Receipt Samples: 3 Sample Number: 170618007-S1 Laboratory Information: Test Laboratory:
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Sample Number: 170618007-S1 Laboratory Information:
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Test Laboratory: Dongguan New Testing Centre Co., Ltd
Laboratory Address: 3F, No. 1 the 1st North Industry Road, Songshan Lake Science &
Technology Park, Dongguan, Guangdong, China
Laboratory Contact Name: Neil Zhong
Laboratory Contact E-mail: Neil_ntc@163.com
Report Information
Issued Date of Test Report: 2017-07-12
Revised Date of Test Report: N/A
Test Report No.: NTCR17060059
Remark (If applicable) N/A





Test Specifications:	
Date of Test	2017-06-25
Test item	1. Total Luminous Flux
	2. Luminous Distribution Intensity
	3. Luminous Efficacy
	4. Correlated Color Temperature
	5. Color Rendering Index
	6. Chromaticity Coordinate
Reference Standard	IES LM-79-2008 Electrical and Photometric Measurements of Solid-State
	Lighting Products
	ANSI C78.377-2008 Specifications for the Chromaticity of Solid State
	Lighting Products
	CIE 13.3-1995 Method of Measuring and Specifying Color Rendering
	Properties of Light Sources
	CIE 15-2004 Technical Report Colorimetry

Test Methods

1. Photometric and Electrical measurements – Light Distribution Method:

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at 25° C $\pm 1^{\circ}$ C, measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1° vertical intervals and 22.5° Vertical intervals.

2. Photometric and Electrical Measurements – Integrating Sphere Method:

Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25° C \pm 1° C. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at least 5 nm intervals over the range of 380 to 780 nm.





Integrating Sphere Test Results

Test Condition:									
Test Ambient	Test Humidity	Orientation	Stabilization Time	Test Time					
25.0 °C	50 %	Face Down	90 mins	25 mins					
Electrical Data:									

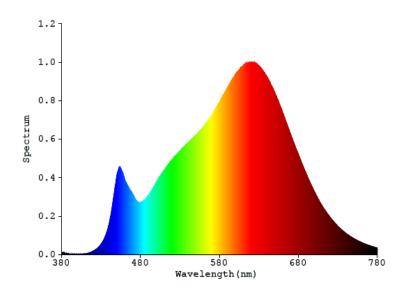
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.0	60	0.1961	22.98	0.9770

Color Data:

Parameter	Result
CCT(K)	2955
Color Rendering Index (CRI)	93.2
R9	59
Chromaticity, x	0.4402
Chromaticity, y	0.4053
Chromaticity u'	0.2522
Chromaticity v'	0.5224
Duv	0.00004

Special Color Rendering									
R1	94	R9	59						
R2	98	R10	94						
R3	98	R11	94						
R4	93	R12	83						
R5	93	R13	95						
R6	97	R14	100						
R7	91	R15	89						
R8	81	-	-						

Spectrum Diagram:





NVLAP LAB CODE 600150-0

Report No: NTCR17060059 Report Version: V1.1

Goniophotemeter Test Results:

Test Condition:											
Test Ambient	Test Humidity	Orientation	Stabilization Time	Test Time							
25.6 °C	51 %	Face Down	90 mins	25 mins							
Electric	Electrical Data:										

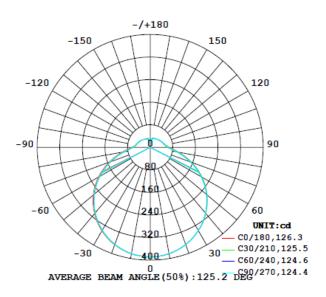
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.0	60	0.1961	22.98	0.9770

Goniophotometer Data:

Parameter	Result
Total Luminous (lm)	1610.9
Total Luminous per foot (lm/ft)	N/A
Luminous Efficacy (lm/w)	70.11
Zonal Lumens Distribution (0-90°)	82.9%
Beam Angle (°)	125.2
Center Beam Candle Power (cd)	389

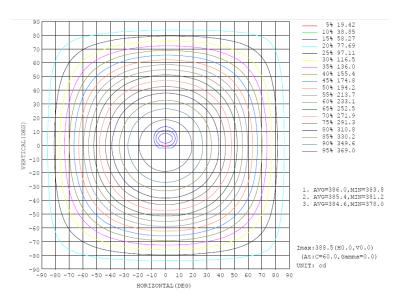
Luminous Intensity Distribution Diagram:

LUMINOUS INTENSITY DISTRIBUTION DIAGRAM













ZONAL FLUX DIAGRAM:

Y	CO	C45	C90	C135	C180	C225	C270	C315	γ	∳ zone	Φ total	%lum,lam
10	382.2	383.0	382.8	382.9	383.1	382.6	382.9	382.4	0- 10	36.79	36.79	2.28,2.28
20	366.1	366.9	367.0	367.3	368.0	366.0	365.8	366.5	10- 20	106.2	143.0	8.88,8.88
30	340.4	341.1	340.2	341.4	342.0	339.1	339.1	339.8	20- 30	163.7	306.7	19,19
40	305.5	305.9	304.4	306.0	307.0	302.8	302.5	304.3	30-40	202.7	509.4	31.6,31.6
50	262.0	262.2	259.3	261.2	263.3	257.6	257.8	260.2	40- 50	218.9	728.3	45.2,45.2
60	211.6	210.9	207.5	209.6	212.0	206.0	205.8	209.2	50- 60	210.6	938.9	58.3,58.3
70	156.0	154.2	150.5	152.2	155.2	148.7	148.9	153.1	60- 70	179.2	1118	69.4,69.4
80	102.8	98.94	95.13	97.12	101.3	93.93	93.91	98.78	70- 80	131.4	1249	77.6,77.6
90	66.60	62.58	59.95	62.42	65.18	60.29	59.65	63.69	80- 90	84.72	1334	82.8,82.8
100	50.56	53.68	51.93	53.92	49.87	52.35	51.84	55.01	90-100	61.67	1396	86.7,86.7
110	47.05	48.07	48.25	48.25	46.34	46.81	48.00	49.13	100-110	52.75	1449	89.9,89.9
120	43.41	43.70	44.60	43.96	42.96	42.68	44.15	44.41	110-120	45.29	1494	92.7,92.7
130	40.01	40.16	40.70	40.35	39.70	39.40	40.14	40.62	120-130	37.62	1532	95.1,95.1
140	37.08	37.26	37.12	37.36	36.58	36.39	36.66	37.40	130-140	29.87	1561	96.9,96.9
150	35.42	35.30	34.61	34.91	34.17	34.03	34.20	35.06	140-150	22.47	1584	98.3,98.3
160	34.53	34.82	34.06	33.69	32.49	31.07	33.81	32.67	150-160	15.75	1600	99.3,99.3
170	28.82	29.69	29.58	30.38	30.01	26.74	30.51	27.13	160-170	8.992	1609	99.9,99.9
180	18.58	17.75	21.11	19.09	18.57	17.76	21.13	19.07	170-180	2.316	1611	100,100
DEG		LUM	INOUS INTE	NSITY:cd	Less than	35% Percen	t = 19.2 %			UNI	T:lm	



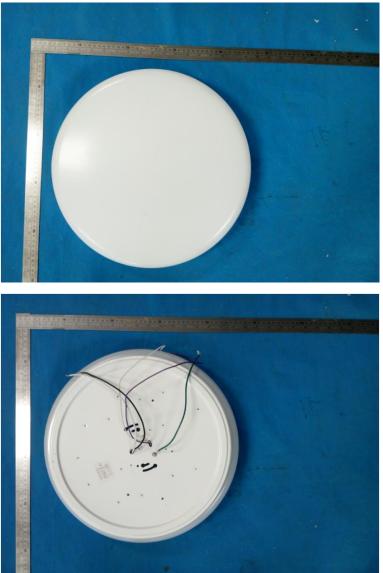


Luminous Distribution Intensity Data:

																UNI	T: cd		
C (DEG)	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270
y (DEG)	388		388	388	389	388	388	388	388	388	389	389	388	388	388	388	389	388	388
5	387	387	387	386	387	387	387	387	387	387	387	387	387	387	387	387	386	387	387
10	382	383	383	383	383	383	383	383	383	383	383	383	383	383	383	383	383	382	383
15	376	377	376	376	376	376	376	376	376	377	376	376	377	376	376	375	375	375	376
20	366	368	367	367	367	367	367	368	367	367	367	368	368	366	367	366	366	366	366
25	355	356	355	355	355	355	355	355	355	355	356	356	356	355	355	354	354	353	354
30	340	342	341	341	341	341	340	341	341	341	341	341	342	340	340	339	339	339	339
35	324	326	325	325	324	323	323	324	324	325	324	325	326	324	324	322	322	322	322
40	305	307	285	306	305	305	304	305	305	306 285	305	306	307	305	305	303 282	303	302	302
45	285	261	265	285	284	284	283	284 260	283 260	265	284 261	285	286 263	283	283	282	281 258	281 257	281 258
55	238	240	238	237	235	236	234	236	235	236	236	237	238	235	235	233	233	232	232
60	212		212	211	208	209	208	208	208	210	209	211	212	208	208	206	206	205	206
65	184	186	184	183	181	180	179	180	180	181	181	182	184	180	179	178	177	177	177
70	156	157	156	154	152	152	150	151	151	152	152	154	155	152	151	149	148	148	149
75	128	130	128	126	123	123	122	122	122	124	124	126	127	124	123	120	120	119	120
80	103	104	101	98.9	96.6	96.2	95.1	95.9	95.7	97.1	97.9	99.8	101	98.2	96.2	93.9	93.4	92.8	93.9
85	82.2	82.2	78.8	76.9	74.7	74.3	73.5	74.1	74.2	75.8	76.5	79.1	80.3	77.3	75.0	72.8	72.1	71.6	72.6
90	66.6					60.3	60.0		61.0		63.5	64.9	65.2	63.8		60.3		58.9	59.6
95	59.5	_					54.4		55.5			54.1	55.3	53.4				53.9	54.4
100	50.6					51.8						49.5	49.9						51.8
105	48.9					50.1	50.2	50.6	51.3		49.2	48.0	48.2	47.4	48.2	49.5	49.7	49.5	49.9
110	47.0					48.2			48.6		46.9	46.5	46.3	45.8	46.0		47.4	47.5	48.0
115	45.2	-		-	-	46.2			46.4	_			44.7	_	_	_		45.5	46.1
120	41.7						42.6		42.5			41.4	41.3					41.7	42.1
130	40.0					40.6	40.7		40.7				39.7	39.4	39.2		<u> </u>	40.0	40.1
135	38.5		+		38.6		38.7			38.8			38.2	<u> </u>		37.8	<u> </u>	38.3	38.3
140	37.1					37.1		37.6	37.3		36.9	36.9	36.6	36.4	36.4		36.6	36.7	36.7
145	36.0	36.2	36.0	36.1	35.7	35.7	35.8	36.2	36.0	36.0	35.8	35.5	35.3	34.9	35.0	35.1	35.2	35.1	35.3
150	35.4	35.5	35.6	35.3	34.9	34.8	34.6	34.8	34.9	34.9	34.6	34.4	34.2	33.6	33.6	34.0	34.0	34.0	34.2
155	34.5	35.3	35.2	35.1	34.3	34.7	33.9	34.1	33.1	34.0	33.8	33.7	33.0	32.7	32.5	33.1	33.0	33.2	33.7
160	34.5	35.1	35.1			32.6	34.1	32.2	33.0	33.7	33.6	33.7	32.5	30.8		31.1	32.8	33.3	33.8
165	33.4					30.8	27.0	28.8	33.0	33.6	33.2	33.1	32.9	27.7	26.9	28.7	32.6	33.0	33.4
170	28.8					30.6			30.2			30.6	30.0	28.9					30.5
175					21.0			21.9					22.6						22.4
Table2 C(DEG)			- 1							- 1					_	UNI	T: cd		
y (DEG)		300	316	220	245								- 1						
	285	300	315	330	345			_					_	_					
0	388	388	388	389	389							_		_					
5	388 386	388 387	388 387	389 387	389 387									_					
5 10	388 386 382	388 387 382	388 387 382	389 387 383	389 387 383	_								_					
5	388 386	388 387	388 387	389 387	389 387														
5 10 15	388 386 382 375	388 387 382 376	388 387 382 376	389 387 383 376	389 387 383 376														
5 10 15 20 25 30	388 386 382 375 365 353 339	388 387 382 376 366 354 340	388 387 382 376 366 354 340	389 387 383 376 367 355 341	389 387 383 376 367 355 341														
5 10 15 20 25 30 35	388 386 382 375 365 353 339 322	388 387 382 376 366 354 340 323	388 387 382 376 366 354 340 323	389 387 383 376 367 355 341 325	389 387 383 376 367 355 341 324														
5 10 15 20 25 30 35 40	388 386 382 375 365 353 339 322 303	388 387 382 376 366 354 340 323 304	388 387 382 376 366 354 340 323 304	389 387 383 376 367 355 341 325 306	389 387 383 376 367 355 341 324 306														
5 10 15 20 25 30 35 40 45	388 386 382 375 365 353 339 322 303 281	388 387 382 376 366 354 340 323 304 283	388 387 382 376 366 354 340 323 304 283	389 387 383 376 367 355 341 325 306 285	389 387 383 376 367 355 341 324 306 285														
5 10 15 20 25 30 35 40 45 50	388 386 382 375 365 353 339 322 303 281 258	388 387 382 376 366 354 340 323 304 283 260	388 387 382 376 366 354 340 323 304 283 260	389 387 383 376 367 355 341 325 306 285 262	389 387 383 376 367 355 341 324 306 285 263														
5 10 15 20 25 30 35 40 45 50 55	388 386 382 375 365 353 339 322 303 281 258 233	388 387 382 376 366 354 340 323 304 283 260 235	388 387 382 376 366 354 340 323 304 283 260 236	389 387 383 376 367 355 341 325 306 285 262 238	389 387 383 376 367 355 341 324 306 285 263 238														
5 10 15 20 25 30 35 40 45 50 55 60	388 386 382 375 365 353 339 322 303 281 258 233 206	388 387 382 376 366 354 340 323 304 283 260 235 209	388 387 382 376 366 354 340 323 304 283 260 236 209	389 387 383 376 367 355 341 325 306 285 262 238 212	389 387 383 376 367 355 341 324 306 285 263 238 238 212														
5 10 15 20 25 30 35 40 45 50 55	388 386 382 375 365 353 339 322 303 281 258 233	388 387 382 376 366 354 340 323 304 283 260 235	388 387 382 376 366 354 340 323 304 283 260 236	389 387 383 376 367 355 341 325 306 285 262 238	389 387 383 376 367 355 341 324 306 285 263 238														
5 10 15 20 25 30 35 40 45 50 55 60 65	388 386 382 375 365 353 339 322 303 281 258 233 206 178	388 387 382 376 366 354 340 323 304 283 260 235 209 180	388 387 382 376 366 354 340 323 304 283 260 236 209 181	389 387 383 376 367 355 341 325 306 285 262 238 212 184	389 387 383 376 367 355 341 324 306 285 263 238 212 185														
5 10 15 20 25 30 35 40 45 50 55 60 65 60 65 70 75	388 386 382 375 365 353 339 322 303 281 258 233 206 178 149	388 387 382 376 366 354 340 323 304 283 260 235 209 180 152	388 387 382 376 366 354 340 323 304 283 260 236 209 181 153	389 387 383 376 367 355 341 325 306 285 262 238 212 184 156	389 387 383 376 367 355 341 324 306 285 263 238 212 185 157														
5 10 20 25 30 40 45 50 55 60 65 70 75 80	388 386 382 375 365 353 339 322 303 281 258 233 206 178 149 121	388 387 382 376 366 354 340 323 304 283 260 235 209 180 152 123	388 387 382 376 366 354 340 323 304 283 260 236 209 181 153 125 98.8	389 387 383 376 367 355 341 325 306 285 262 238 212 184 156 128	389 387 383 376 367 355 341 324 306 285 263 238 212 185 157 129														
5 10 15 20 25 30 35 50 40 45 55 55 55 55 60 65 70 75 80 85	388 386 382 375 365 353 339 322 303 228 233 206 178 149 121 94.7	388 387 382 376 366 354 340 323 304 283 260 235 209 180 152 123 97.0	388 387 382 376 366 354 323 304 283 260 236 209 181 153 125 98.8 77.1	389 387 383 376 367 355 341 325 306 285 262 238 212 184 156 128 102	389 387 383 376 367 355 341 324 306 285 263 238 212 185 157 129 104														
5 10 22 25 30 40 45 55 55 60 65 55 60 65 70 75 80 85 85 90	388 386 382 375 365 353 339 322 303 228 233 206 178 149 121 94.7 73.3	388 387 382 376 366 354 340 323 304 283 260 235 209 180 152 123 97.0 75.5 62.1 56.4	388 387 382 376 354 323 304 223 260 236 209 181 153 125 98.8 77.1 63.7	389 387 383 376 367 355 341 325 262 238 212 238 212 184 156 128 102 80.0	389 387 383 376 367 355 341 324 306 285 263 238 212 185 157 129 104 82.6														
5 10 20 25 30 40 45 50 55 60 55 60 65 70 75 80 85 90 95 100	388 386 382 375 365 353 339 322 303 281 258 206 178 149 121 94.7 73.3 60.4 55.0 52.5	388 387 382 376 366 354 340 323 304 283 260 235 209 180 152 123 97.0 75.5 62.1 56.4 53.8	388 387 382 376 366 354 323 304 223 209 181 153 125 98.8 77.1 63.7 57.9 55.0	389 387 383 376 355 341 325 262 238 285 262 238 212 238 212 238 212 238 212 238 212 238 212 238 212 238 25 55 55.4	389 389 383 376 355 341 324 205 263 238 212 185 157 129 104 82.6 67.5 59.9 50.9														
5 10 20 25 30 35 40 55 55 55 60 65 70 75 80 85 90 95 100 105	388 386 382 375 365 353 339 322 303 281 258 206 178 149 121 94.7 73.3 60.4 55.0 52.5 50.6	388 387 382 376 366 354 323 203 203 203 203 209 180 152 123 97.0 55.5 62.1 55.4 53.8 52.0	388 387 382 376 366 354 323 203 203 203 203 203 203 203 203 203	389 387 383 376 355 341 325 262 238 212 238 212 238 212 184 156 128 102 80.0 66.0 59.5 55.4 50.9	389 389 383 376 355 341 324 324 205 263 238 212 185 157 129 104 82.6 67.5 59.9 50.9 49.2														
5 10 15 20 25 30 30 35 40 45 55 50 55 50 65 70 75 80 85 90 95 100 110	388 386 382 375 365 353 339 322 303 281 238 238 238 238 206 178 149 121 94.7 73.3 60.4 55.0 55.0 6 48.5	388 387 382 376 366 354 323 304 283 260 235 209 180 152 123 97.0 75.5 62.1 53.8 52.0 49.2	388 387 382 376 366 354 340 323 304 283 260 236 209 181 153 125 98.8 77.1 63.7 55.0 55.0 55.0	389 387 383 376 367 355 341 325 285 262 238 212 184 156 128 102 80.0 66.0 59.5 55.4 50.9	389 389 383 376 367 355 341 306 285 263 238 238 238 238 212 185 157 129 104 82.6 67.5 9.9 50.9 49.2 49.2														
5 10 20 25 30 35 50 55 55 55 55 55 55 55 55 5	388 386 382 375 365 353 339 322 303 281 2258 233 206 178 149 121 94.7 73.3 60.4 55.0 52.5 50.6 48.5	388 387 382 376 354 354 323 304 283 220 209 235 209 180 152 123 97.0 75.5 62.1 55.4 53.8 53.8 52.0 49.2 46.9	388 387 382 376 366 354 323 304 283 260 236 209 181 153 125 98.8 77.1 63.7 57.9 95.0 55.0 55.2	389 387 383 376 355 341 285 262 238 212 238 212 238 212 238 212 238 212 238 212 238 212 238 212 238 212 255 255 255 48 156 55.4 55.54 48.1 46.0	389 387 383 376 367 355 341 324 306 285 263 223 212 185 157 129 104 82.6 67.5 59.9 50.9 50.9 50.9 49.2 47.4 45.6														
5 10 15 20 25 30 35 40 45 50 55 60 65 65 65 65 65 80 85 90 95 100 105 115 120	388 386 382 375 365 333 281 258 233 206 178 121 94.7 73.3 60.4 55.0 52.5 50.6 48.5 46.4 44.4	388 387 382 376 354 354 323 304 283 260 283 209 180 152 123 97.0 75.5 62.1 56.4 53.8 52.0 49.2 46.9	388 387 382 376 354 354 323 304 223 260 209 181 153 125 98.8 77.1 63.7 57.9 55.0 52.1 46.6 49.4	389 387 383 376 355 341 285 262 238 212 238 212 238 212 238 212 238 212 238 212 238 212 238 212 238 212 238 212 255 555 484 156 55.4 55.5 48.1 46.0 44.1	389 387 383 376 367 355 341 324 306 285 263 212 185 157 129 104 82.6 67.5 59.9 50.9 49.2 47.4 45.6 43.8														
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120	388 386 382 375 365 353 322 201 228 233 206 178 233 206 178 233 206 178 233 206 178 53 50.6 52.5 50.6 55.0 55.0 55.0 55.0 50.4 48.5 50.4 44.4 44.4	388 387 382 376 354 354 323 304 283 260 235 209 180 152 123 97.0 155.5 56.4 52.0 49.2 46.9 44.8	388 387 382 376 354 354 323 304 283 260 236 209 181 153 125 98.8 77.1 63.7 57.9 55.0 52.1 49.1 46.6 44.4 42.4	389 387 383 376 355 306 285 262 238 212 184 156 128 102 80.0 66.0 59.5 55.4 50.9 48.1 46.0 44.1 46.2	389 387 383 376 355 341 324 306 285 263 212 185 157 129 104 82.6 67.5 59.9 50.9 49.2 47.4 45.6 43.8 42.1														
5 10 15 20 25 30 35 40 45 50 55 50 60 85 70 75 80 85 90 95 100 105 110 115 120 125 130	388 386 382 375 365 353 322 303 281 258 206 149 121 94.7 73.3 50.6 60.4 55.0 55.0 60.4 48.5 50.6 48.5	388 387 382 376 366 354 340 323 304 283 209 180 2250 235 209 180 235 209 182 123 97.0 75.5 62.1 123 97.0 75.5 62.1 123 97.0 49.2 46.9 44.8 42.6 40.7	388 387 382 376 366 354 340 323 304 223 209 236 209 236 209 181 153 125 98.8 77.1 63.7 57.9 98.8 77.1 49.1 44.4 442.4 40.6	389 387 383 376 367 355 306 285 262 238 212 212 184 156 128 102 80.0 66.0 55.4 55.4 50.9 55.4 48.1 46.0 44.1 46.0	389 387 383 376 355 341 324 263 263 238 212 185 157 129 104 82.6 67.5 59.9 50.9 50.9 50.9 50.9 49.2 47.4 45.6 43.8 42.1 40.3														
5 10 15 20 25 30 35 40 45 50 55 50 65 70 75 80 85 90 95 100 105 110 115 120 135	388 386 382 375 365 333 322 303 228 128 228 223 206 178 121 94.7 73.3 60.4 55.0 52.5 50.6 48.5 46.4 44.4 42.4 42.4 38.5	388 387 382 376 354 340 323 283 283 283 283 283 283 283 283 297 0 152 123 97.0 55.5 56.1 55.6 4 53.8 52.0 97.5 54.4 53.8 52.0 49.2 46.9 44.8 42.6 93.8 8 283 283 283 283 283 283 283 283 283	388 387 382 376 354 340 323 260 236 209 236 209 236 209 236 209 236 209 236 209 236 203 250 250 57.9 55.0 52.1 46.6 44.4 42.4 40.4 40.4 38.9 38.9 38.9 39.9	389 387 383 376 367 325 306 285 285 285 228 212 184 156 62.0 66.0 66.0 66.0 66.0 66.0 66.0 66.	389 387 383 376 367 355 341 324 265 263 238 228 238 238 238 238 212 185 157 129 104 82.6 67.5 59.9 50.9 49.2 50.9 49.2 49.4 45.6 43.8 42.1 45.6 43.8 43.8 43.8 43.8 45.7 45.6 45.6 45.8 45.6 45.8 45.6 45.8 45.														
5 10 10 20 25 20 30 35 50 55 55 55 55 55 55 55 55 5	388 388 386 382 375 353 339 322 303 281 258 233 206 178 149 94.7 73.3 60.4 55.0 50.6 48.5 50.6 48.5 50.6 44.4 44.4 40.4 38.5 36.9	388 387 382 376 366 354 340 323 304 283 209 180 2250 235 209 180 235 209 182 123 97.0 75.5 62.1 123 97.0 75.5 62.1 123 97.0 49.2 46.9 44.8 42.6 40.7	388 387 382 376 366 354 340 323 260 233 260 233 260 233 260 233 263 263 77.1 153 125 98.8 77.1 153 153 155.0 55.0 55.0 55.0 152.1 49.1 46.6 44.4 42.4 40.4 38.9 37.4	389 387 383 376 367 355 341 325 285 285 285 282 238 212 238 212 238 212 238 212 238 212 238 205 55.4 55.4 50.9 55.5 48.1 46.0 44.1 42.3 38.9 37.4	389 387 383 376 355 351 324 306 285 263 228 228 228 228 228 228 228 228 228 22														
5 10 20 25 20 33 35 40 45 55 55 55 55 55 55 55 55 55	388 388 386 382 375 365 333 281 228 281 228 281 228 281 228 281 228 206 178 528 506 50.0 52.5 50.6 48.5 50.6 48.5 50.6 48.4 44.4 40.4 38.5 35.5	388 387 382 376 356 354 363 363 363 363 323 209 180 152 123 209 180 152 123 52.0 75.5 62.1 56.4 3.8 52.0 49.2 46.9 209 180 152 123 56.6 40.0 323 209 180 152 123 56.6 40.0 323 209 180 152 123 56.6 40.0 323 209 180 152 123 56.6 40.0 323 209 180 152 123 56.6 40.0 353 40.0 152 123 56.6 40.0 152 123 56.6 40.0 152 123 56.6 40.0 152 123 56.6 40.0 152 123 56.6 40.0 152 123 56.6 40.0 152 123 56.6 40.0 152 123 56.4 40.0 152 123 56.4 40.0 152 123 56.4 40.0 152 123 56.4 40.0 152 123 56.4 40.0 152 123 56.4 40.0 152 103 153.8 154.8 154	388 387 382 376 354 354 354 323 304 283 260 236 209 181 153 125 209 181 153 125 5.0 55.0 55.0 55.0 15.0 140.1 49.1 40.4 40.4 40.4 40.4 37.4 36.0 37.4 36.0 37.4 36.0 37.4 36.0 37.4 36.0 37.4 36.0 37.4 36.0 37.4 37.4 36.0 37.4 36.0 37.4 37.4 36.0 37.4 37.4 37.4 37.4 36.0 37.4 37	389 387 383 376 367 355 341 325 285 228 228 228 228 228 228 212 238 126 212 238 202 202 202 202 202 202 202 202 202 20	389 387 383 376 355 341 324 324 326 285 263 238 238 238 238 247 129 129 129 104 82.6 67.5 59.9 49.2 47.4 45.6 43.8 42.1 40.3 38.7 37.7 38.7 38.7 38.7 38.7 39														
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 100 105 110 115 120 135 140 145 150 150 150 150 150 150 150 15	388 386 385 365 353 353 322 205 233 206 178 249 149 121 94.7 73.3 60.4 94.7 73.3 50.6 48.5 50.6 48.5 50.6 48.5 36.9 46.4 44.4 40.4 38.5 36.5 35.9 35	388 387 382 376 365 354 340 323 260 223 209 283 260 2235 209 180 152 123 97.0 75.5 52.0 40.2 52.4 52.4 42.6 44.8 42.6 40.3 8.8 8 38.8 37.4	388 387 382 376 354 366 354 363 363 363 363 323 260 236 209 181 153 125 98.8 77.1 63.7 57.9 55.0 49.1 46.6 44.4 42.4 42.4 40.6 38.9 37.4 36.6 37.4	389 387 383 376 355 341 325 285 285 285 285 212 184 156 128 102 80.0 66.0 59.5 55.4 48.1 46.0 44.1 46.5 38.9 37.4 36.1 35.2	389 387 383 376 367 355 3341 324 306 225 263 224 306 285 212 185 157 129 104 82.6 67.5 59.9 50.9 49.2 445.6 43.8 42.1 40.3 38.7 37.3 36.0 35.5														
5 10 15 20 25 30 35 40 45 50 55 50 60 55 50 60 85 70 85 80 85 100 105 110 115 120 125 130 145 145 150 155 155 155 150 155 155 15	388 386 386 375 353 365 353 303 281 281 281 281 283 206 149 121 77 94.7 7.3.3 60.4 55.0 50.6 46.4 42.4 42.4 42.4 44.4 42.4 40.4 38.5 36.9 35.5 35.2 35.2 36.2 37.2	388 387 382 376 354 354 323 283 283 283 283 283 293 180 152 123 97.0 152 123 97.0 56.4 53.8 52.0 49.2 46.9 49.2 46.9 42.6 40.7 38.8 37.1 35.5	388 387 382 376 354 354 323 304 283 209 181 153 236 209 181 153 98.8 77.1 63.7 55.0 55.1 55.9 55.1 49.14 49.14 49.4 40.6 49.4 40.6 37.4 35.1 35.1 35.1 35.1	389 387 383 376 355 341 325 285 285 285 285 285 286 298 298 298 298 298 298 298 298	389 387 383 376 367 355 341 324 285 2263 2283 228 228 228 228 228 228 228 228 2														
5 10 10 20 25 30 35 40 45 50 55 60 65 65 65 65 75 80 80 85 90 95 100 110 110 120 135 130 145 155 155 160 145 155 155 155 155 155 155 155	388 386 382 375 353 339 222 303 281 258 233 206 178 149 121 94.7 73.3 60.4 45.0 50.6 50.6 50.6 50.6 50.6 46.4 42.4 42.4 42.4 42.4 42.4 42.4 438.5 338.5 33.5 33.5 33.5	388 387 382 376 356 354 323 203 223 209 180 152 209 180 152 209 180 75.5 62.1 123 97.0 75.5 62.1 123 97.0 75.5 62.4 49.2 44.8 42.6 40.7 38.8 37.1 35.5 34.4 33.4	388 387 382 376 366 354 323 304 283 304 283 209 236 209 181 153 125 98.8 77.1 63.7 77.1 63.7 75.9 95.0 55.0 55.0 55.2 149.1 49.1 40.4 40.4 40.4 40.4 40.4 40.4 40.4 40.4 38.9 38.9 38.9 38.9 39.9 38.9 39.9	389 387 383 376 355 341 225 306 285 262 238 212 184 156 282 202 238 212 184 156 50.9 55.4 50.9 55.4 46.0 44.1 42.3 38.9 37.4 36.1 35.2 35.0 34.2	389 387 387 387 387 387 387 387 387														
5 10 15 20 25 30 35 60 65 60 85 90 105 100 105 100 105 120 121 130 135 140 145 150 155 160	388 386 382 375 353 365 353 322 281 283 281 283 206 178 149 121 94.7 73.3 60.4 455.0 55.5 50.6 48.5 46.4 42.4 40.4 38.5 34.2 33.6 33.8 33.	388 387 382 376 366 354 323 223 220 225 2209 180 235 2209 180 235 2209 180 235 2209 180 235 2209 180 235 2209 180 235 220 240 235 209 180 235 209 180 235 209 180 235 209 180 24 25 209 25 209 260 25 209 280 280 280 280 280 280 280 280 280 280	388 387 382 376 354 354 340 283 304 283 304 283 260 209 181 153 125 98.8 77.1 153 125 98.8 77.1 153 125 98.8 42.4 40.6 38.9 125 125 125 135 125 125 125 135 135 135 135 135 135 135 13	389 387 383 376 355 341 325 306 285 262 238 212 184 102 238 202 238 212 184 102 59.5 55.4 46.0 44.1 46.0 44.1 46.0 59.5 55.9 9 7.4 46.3 80.9 57.4 36.1 35.2 35.2 35.2 35.2 35.2 35.2 27.1	389 387 383 383 376 367 355 341 324 324 228 228 228 228 228 228 228 228 238 238														
5 10 15 20 25 30 35 40 45 50 55 60 85 70 75 80 90 95 100 115 120 135 140 145 155 160 165 170	388 386 382 375 353 339 281 258 206 178 206 178 206 178 206 178 206 52.5 50.6 55.0 55.0 55.0 55.0 55.0 55.0 55	388 387 382 376 354 323 304 283 229 285 209 180 235 229 180 235 229 180 235 229 180 235 209 180 235 209 180 235 209 180 235 209 180 235 209 180 235 209 180 235 209 180 235 209 180 209 209 180 209 209 180 209 209 180 209 209 209 209 209 209 209 209 209 20	388 387 382 376 366 354 304 233 226 236 236 236 236 236 236	389 387 383 376 355 341 285 282 282 212 184 156 128 102 80.0 59.5 55.4 50.9 55.4 50.9 55.5 40.1 46.0 59.5 55.4 38.9 37.4 38.9 37.4 35.2 38.9 37.4 35.2 37.1 27.1 27.1 27.1	389 387 383 376 387 387 387 387 387 387 324 306 228 265 263 238 104 82.6 105 1.29 104 82.6 50.9 50.9 50.9 9.2 47.4 45.6 42.1 40.3 42.1 38.7 37.3 36.0 35.5 35.5 35.5 35.5 32.0 1.2 28.7 35.5														











NVLAP LAB CODE 600150-0

Report No: NTCR17060059 Report Version: V1.1

Equipment ID	Equipment Name	Last Cal.	Due Cal.
NTC-F01-001	Goniophotometer System	2016-12-03	2017-12-02
NTC-F01-006	2.0 meter Integrating Sphere	2016-12-03	2017-12-02
NTC-F01-013	Standard Lamp	2016-12-27	2017-12-26
NTC-F01-031	Digital Power Meter	2016-12-05	2017-12-04
NTC-F01-019	Temperature & Humidity Meter	2016-11-28	2017-11-27





*****END OF DATASHEET****