TEST REPORT

For

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

Model Number:	5535X - 30K 55352 - 40K 55353 - 50K	
Report Type:	Electrical, Photometric and ISTMT tests according to the following standards and show the compliance to DLC Program SSL Technical Requirements V5.1	
Standards:	IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products ANSI C82.77-10-2014: Harmonic Emission Limits – Related Power Quality Requirements for Lighting ANSI/UL 1598-2008: Standard for Safety of Luminaires CIE 190:2010 Calculation and presentation of unified glare rating tables for indoor lighting luminaires IES TM-30-18: IES Method for Evaluating Light Source Color Rendition	
Project Engineer:	Bay Wang	Bay Wang
Report Number:	RKSB201028001-10-2	
Sample Size:	Two samples were received on 2020-10-28 and used for testing.	
Test Date:	2020-10-28 to 2020-10-30	
Report Date:	2021-09-10	
Reviewed By:	Seven Xia / EE Engineer	Seven Xia
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan). No. 248 Chenghu Road, Kunshan, Jiangsu Province, People's Republic of China Tel: +86-0512-86175000 Fax: +86-0512-88934268	

1. Product Information and Description#

Product Primary Use:	Direct Linear Ambient Luminaires
Voltage and Frequency:	120-277VAC, 50/60Hz
LED Source Manufacturer:	Seoul Semiconductor Co., LTD
LED Source Model:	STW8A2PD-XX
Driver Model:	SIE46-I0850-42 120-277 W D1 B
Luminaire length:	4ft
Auxiliary Ballast Model:	NA
Auxiliary Housing Model:	NA
White Tunable:	No
Field-Adjustable Light Output:	No

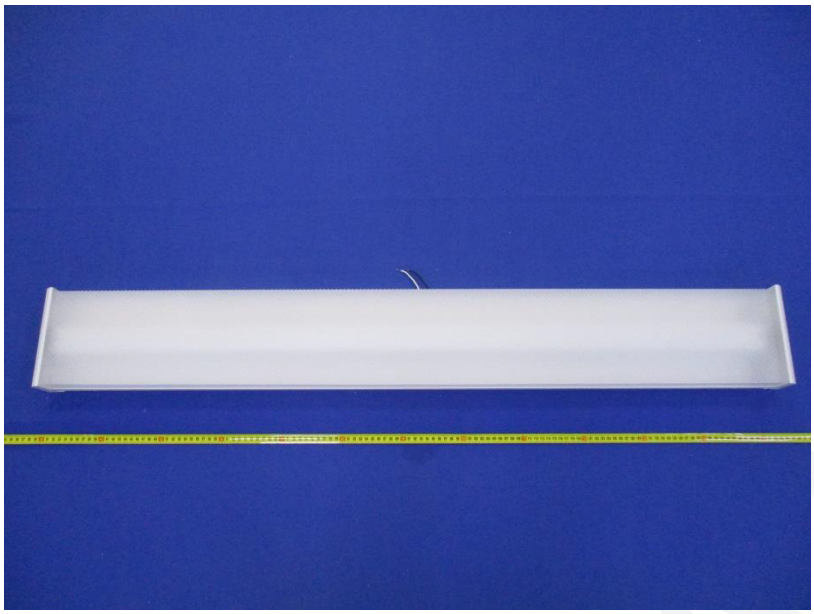
2. Product Rated Values

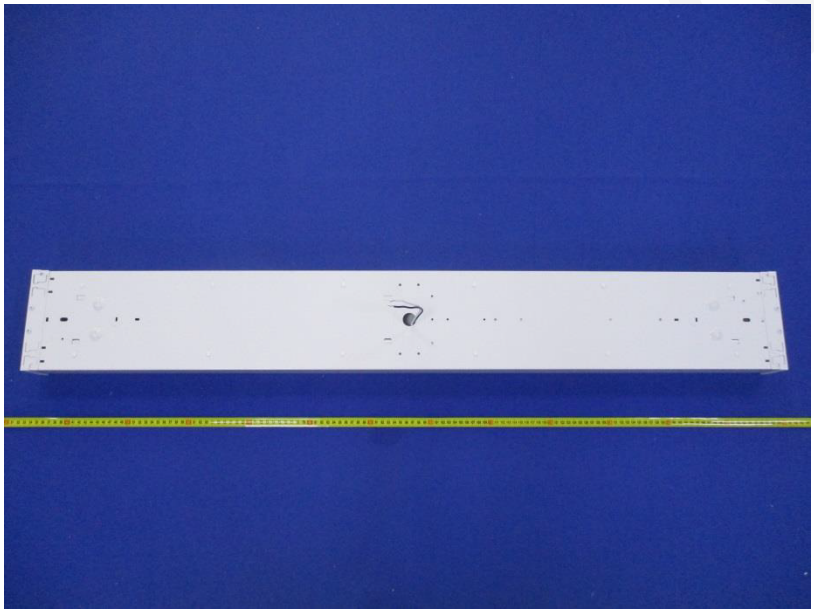
Test Model	CCT(K)	Light Output (lm)	Power(W)	Luminous Efficacy (lm/W)
5535X-30K	3500	5054	38	133
55352	4000	5092	38	134
55353	5000	5130	38	135

3. Test List

Test Model	Test Item			
	Goniophotometer Test	Integrating Sphere Test	THDi and PF Test	In-Situ Temperature Measurement Test
5535X-30K	Yes	Yes	Yes	Yes
55353	NA	Yes	Yes	NA

4. Product Photo





LED Driver Photo

5. Test Result

Test Model: 5535X-30K

Integrating Sphere Test; Orientation: Downward; Test Voltage: 120V 60Hz;

Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances only)	Conclusion
Light Output(lm)	5101.41	≥2000	≥1800	Pass
Power(W)	37.46	None.	None.	N/A
Total Efficacy(lm/W)	136.18	≥115	≥111.55	Pass
CCT(K)	3432	3220~3710	No tolerances	Pass
Duv	-0.00001	-0.0055~0.0065	No tolerances	Pass
IES R_f	83	70	69	Pass
IES R_g	97	89	88	
IES Rcs,h1	-12%	-12%~23%	-13%~24%	
R_a	81.6	≥80	≥79	
R9	6	≥0	≥-1	

Goniophotometer Test; Orientation: Downward; Test Voltage: 120V 60Hz;

Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances only)	Conclusion
Light Output(lm)	5111.3	≥2000	≥1800	Pass
Power(W)	37.53	None.	None.	N/A
Total Efficacy(lm/W)	136.24	≥115	≥111.55	Pass
Zonal Lumen Distribution(0-60°)	72.16%	90-150°≥35%	90-150°≥32%	Pass

Goniophotometer THDi、PF Test; Orientation: Downward;

Test Voltage	Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
120	Power Factor	0.9995	≥0.9	≥0.87	Pass
120	THDi	5.52%	≤20%	≤25%	Pass
277	Power Factor	0.9833	≥0.9	≥0.87	Pass
277	THDi	17.65%	≤20%	≤25%	Pass

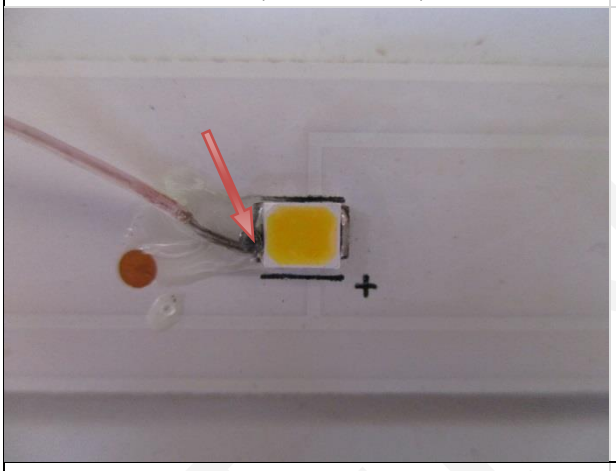
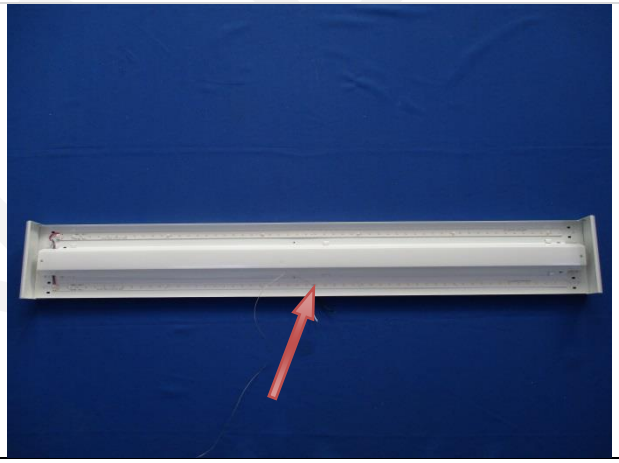
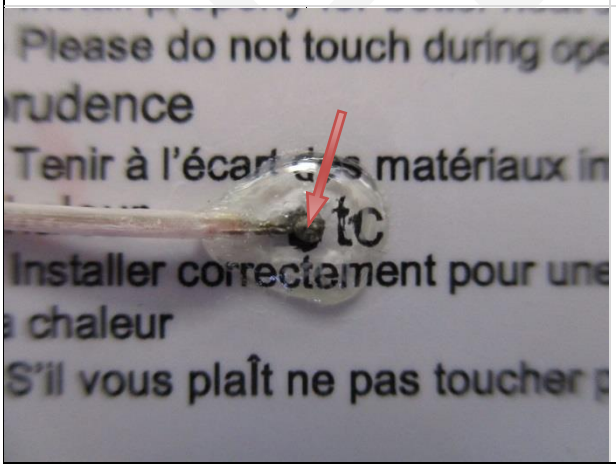
Integrating Sphere THDi、PF Test; Orientation: Downward;

Test Voltage	Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
120	Power Factor	0.9982	≥0.9	≥0.87	Pass
120	THDi	5.65%	≤20%	≤25%	Pass
277	Power Factor	0.9825	≥0.9	≥0.87	Pass
277	THDi	17.97%	≤20%	≤25%	Pass

In-Situ Temperature Measurement Test: Test Voltage: 120V 60Hz;

Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
TMP_{LED}(°C)	37.3	≤105	With tolerance of ≤ 1.1°C or 0.4%, whichever is greater due to thermocouple tolerance	Pass
TMP_c(°C)	50.4	≤90	With tolerance of ≤ 1.1°C or 0.4%, whichever is greater due to thermocouple tolerance	Pass
Drive Current/Individual LED source(mA)	104.5	≤200	With +5% tolerance	Pass
L_{70} Lumen Maintenance Life (Hours)	>54000	≥50000	None.	Pass
Color Maintenance	0.0018	≤0.004	≤0.0044	Pass

Note:
1. The test results were measured directly from the test equipment.
2. The DLC requirements were listed according to DLC Technical Requirements V5.1.
3. The conclusion is for reference only. Test report that indicate product performance meets DLC Technical Requirements do not represent official DLC product qualification. All decisions regarding product qualification are made by the DLC.

TMP_{LED}(Zoomed-in View)	TMP_{LED}(Bird's-eye View)
	
TMP_c(Zoomed-in View)	TMP_c (Bird's-eye View)
	

Test Data

[Integrating Sphere System]

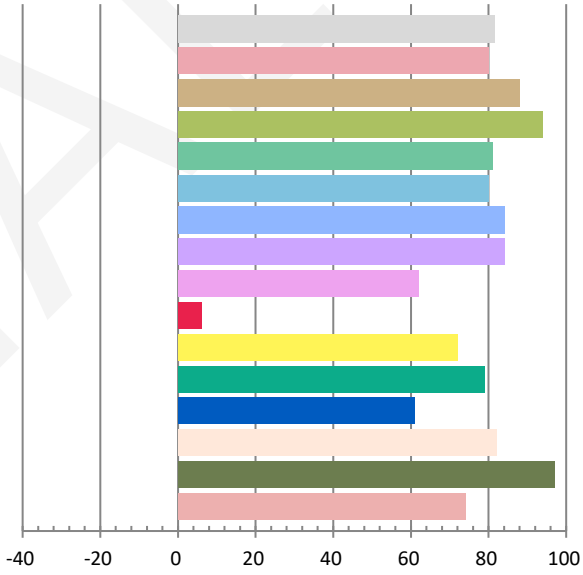
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.3127	37.46	0.9982	5101.41	136.18

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
15.194	3432	-0.00001	0.4092	0.3926	0.2374	0.5126

Color Rendering Index

Ra			
81.6			
R1	R2	R3	R4
80	88	94	81
R5	R6	R7	R8
80	84	84	62
R9	R10	R11	R12
6	72	79	61
R13	R14	R15	
82	97	74	



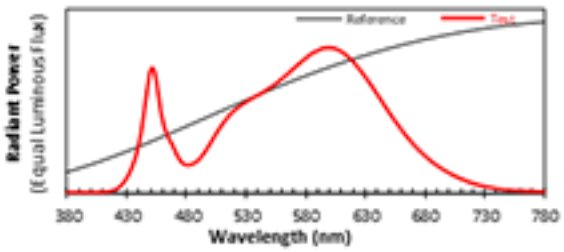
ANSI/IES TM-30-18 Color Rendition Report

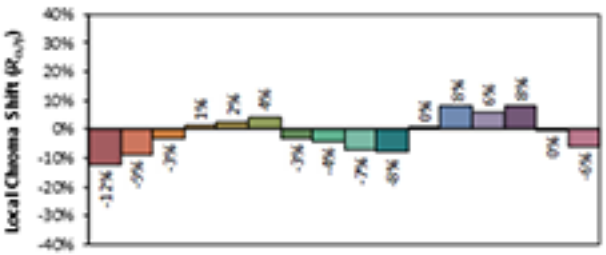
Source: User SPD

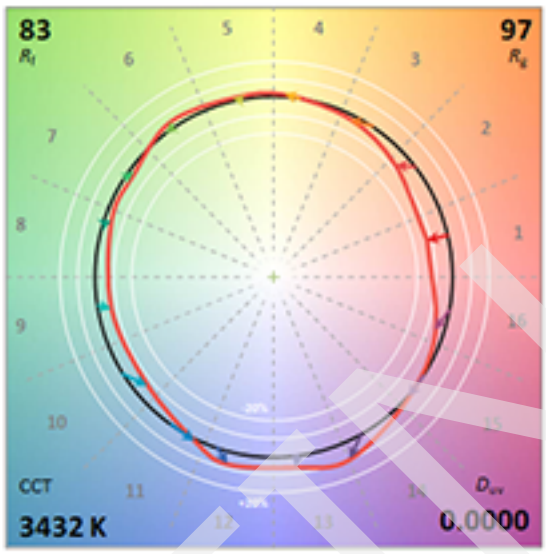
Manufacturer: P.Q.L., Inc.

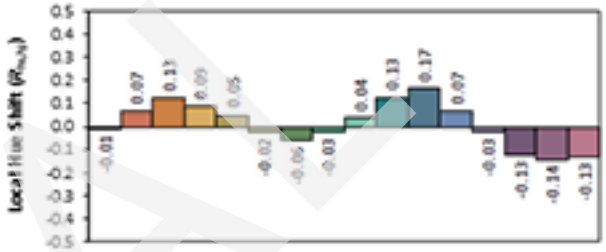
Date: 2020/10/29

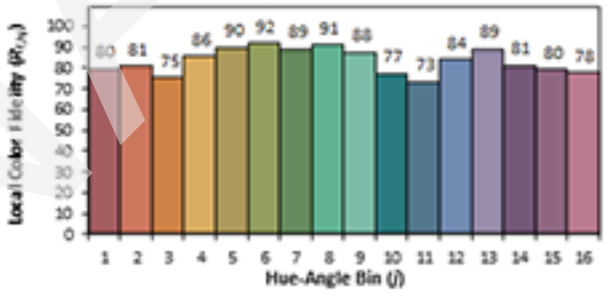
Model: 5535K-30K

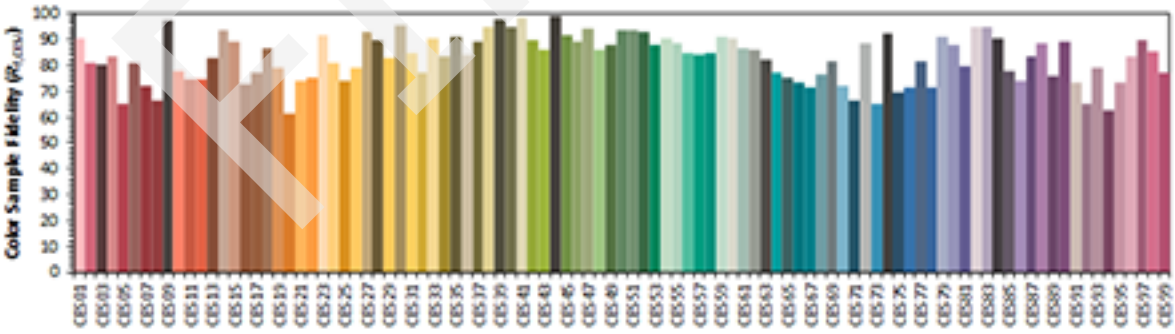












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

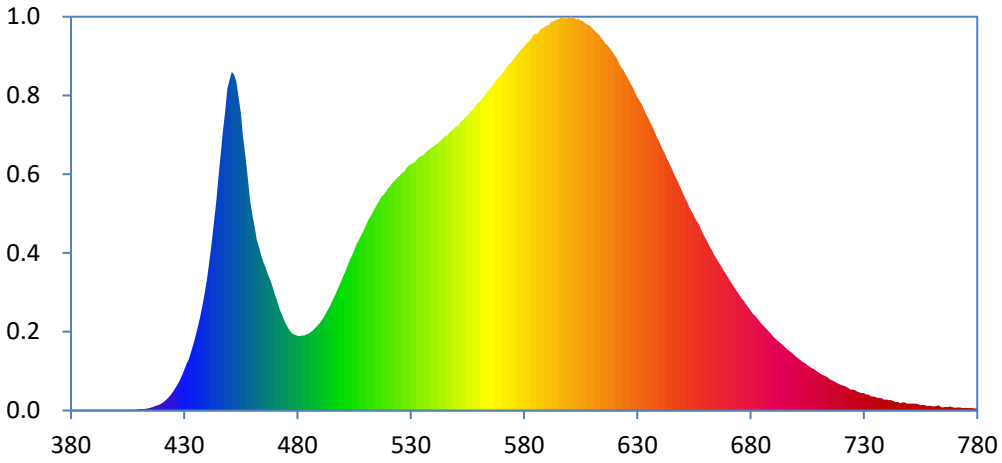
x	0.4092
y	0.3926
u'	0.2374
v'	0.5126

CIE 13.3-1995 (CRI)

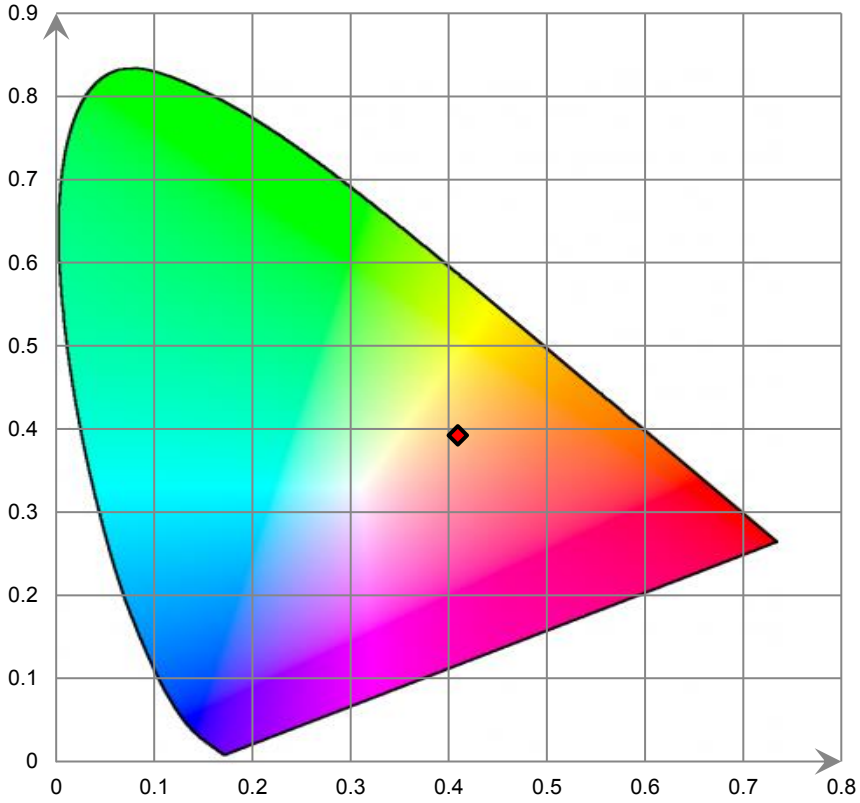
R_a	82
R_9	7

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

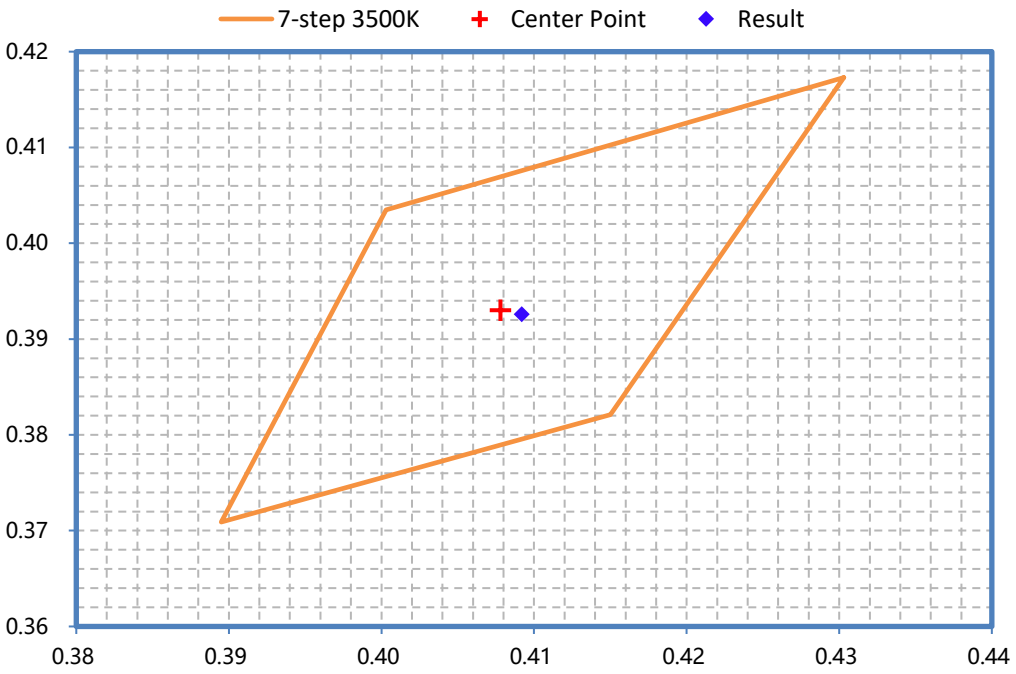
Relative Spectral Power Distribution



CIE 1931 x y Chromaticity Diagram



ANSI C78.377-2017 Chromaticity Quadrangles



[Goniophotometer System]

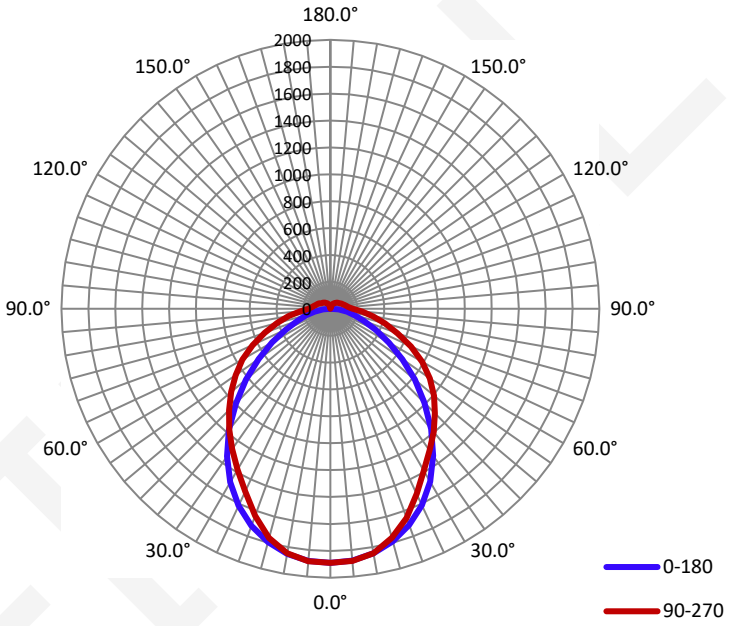
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.313	37.53	0.999

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
5111.3	136.24	1889.3	1.17	1.11

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	92.8	94.2	103.9	94.5	96.4
Field Angle (10% I_{max}):	149.7	170.9	176.5	171.4	167.1

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1889.2	1889.2	1889.2	1889.2	1889.2	1889.2	1889.2	1889.2
5.0°	1879.9	1877.5	1881.1	1880.5	1882.3	1880.9	1881.4	1882.8
10.0°	1846.7	1846.0	1848.0	1845.9	1845.4	1848.5	1852.5	1855.0
15.0°	1791.5	1791.3	1785.5	1771.6	1763.9	1777.1	1790.2	1803.3
20.0°	1712.5	1711.8	1694.1	1669.4	1655.0	1674.1	1700.7	1724.3
25.0°	1610.4	1605.6	1572.1	1536.8	1517.6	1542.8	1582.4	1619.9
30.0°	1484.0	1477.5	1431.5	1398.9	1389.6	1405.4	1442.3	1492.6
35.0°	1331.8	1326.1	1277.2	1276.8	1286.2	1288.9	1291.7	1342.8
40.0°	1167.4	1164.9	1131.0	1173.7	1196.2	1185.3	1150.0	1183.1
45.0°	990.5	996.2	999.6	1067.3	1098.5	1080.9	1017.8	1012.5
50.0°	819.5	829.7	875.4	965.7	1006.0	976.2	896.8	846.9
55.0°	653.5	680.5	758.6	860.8	902.2	872.4	780.0	694.5
60.0°	502.5	545.3	646.7	753.4	787.6	765.4	666.8	556.9
65.0°	371.6	431.1	544.4	641.5	662.2	649.5	560.4	438.5
70.0°	267.4	336.3	448.0	526.7	532.3	530.0	462.4	344.0
75.0°	188.8	258.8	360.1	417.1	420.3	419.0	371.7	265.4
80.0°	124.6	190.3	277.9	318.8	324.3	322.0	285.7	195.6
85.0°	62.3	125.9	199.5	234.9	238.6	237.4	205.5	128.9
90.0°	0.0	65.3	132.3	164.0	166.1	164.3	134.5	69.2
95.0°	0.0	55.5	108.8	133.8	136.4	133.9	109.9	56.6
100.0°	0.0	50.7	95.9	117.3	120.5	117.1	96.6	51.5
105.0°	0.0	45.6	85.7	105.6	109.0	105.3	86.2	46.2
110.0°	0.0	38.0	77.3	96.5	99.5	95.4	77.8	38.8
115.0°	0.0	35.1	65.5	88.2	91.5	87.1	65.3	34.5
120.0°	0.0	32.3	59.5	78.1	82.7	77.1	59.0	32.2
125.0°	0.0	29.8	54.7	70.2	74.7	70.0	54.2	29.4
130.0°	0.0	27.4	50.0	64.6	68.9	64.1	50.0	27.3
135.0°	1.0	25.4	45.8	59.0	63.3	58.7	44.7	24.9
140.0°	2.5	24.3	41.8	54.0	57.2	52.9	40.1	22.9
145.0°	4.7	24.1	39.1	49.0	51.5	46.8	35.4	19.8
150.0°	6.8	23.1	35.8	43.4	44.9	40.8	29.5	17.3
155.0°	8.9	22.4	32.4	38.4	39.2	34.8	22.9	15.3
160.0°	10.2	20.7	28.2	32.7	32.3	26.0	17.9	13.2
165.0°	10.9	18.0	23.6	26.0	25.4	18.1	13.7	11.4
170.0°	10.0	14.2	18.2	19.8	18.3	14.2	10.1	8.8
175.0°	8.6	10.5	12.2	13.2	10.9	9.6	7.7	6.8
180.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1889.2	1889.2	1889.2	1889.2	1889.2	1889.2	1889.2	1889.2
5.0°	1880.7	1884.9	1885.7	1885.9	1883.6	1884.2	1882.8	1879.2
10.0°	1849.8	1856.9	1856.8	1852.7	1845.0	1848.2	1850.1	1848.5
15.0°	1795.9	1804.8	1796.3	1779.0	1763.9	1772.9	1785.5	1793.3
20.0°	1716.5	1725.1	1704.3	1670.6	1637.9	1659.1	1690.9	1711.1
25.0°	1615.4	1620.7	1580.8	1525.9	1499.9	1517.2	1560.6	1600.3
30.0°	1488.7	1489.9	1431.0	1397.6	1382.4	1390.4	1408.4	1465.9
35.0°	1340.1	1341.9	1280.9	1276.4	1272.8	1269.5	1257.7	1314.2
40.0°	1173.8	1170.5	1135.7	1163.5	1171.9	1158.5	1116.7	1140.3
45.0°	994.3	990.8	997.9	1050.7	1065.4	1045.7	982.4	965.7
50.0°	819.9	824.2	866.7	937.4	963.2	933.7	856.6	798.7
55.0°	651.6	667.6	741.2	830.0	861.0	827.2	734.8	650.5
60.0°	499.6	532.4	623.5	723.3	755.0	721.7	622.0	521.3
65.0°	368.9	417.5	520.2	616.9	638.6	614.5	521.5	411.4
70.0°	262.3	324.7	426.9	509.8	519.2	506.0	431.0	323.3
75.0°	184.1	249.9	342.9	407.9	411.7	404.3	347.4	249.0
80.0°	119.3	182.7	264.9	313.4	317.2	312.0	268.2	183.4
85.0°	56.0	119.3	191.0	228.6	229.4	228.0	191.6	119.8
90.0°	0.0	62.3	129.0	160.7	162.8	160.6	129.8	66.5
95.0°	0.0	55.1	109.1	134.7	138.3	134.9	110.7	58.2
100.0°	0.0	50.0	96.3	119.2	123.4	119.2	98.0	53.2
105.0°	0.0	44.9	85.9	108.1	112.2	108.2	87.6	47.7
110.0°	0.0	37.4	75.4	98.2	101.8	98.4	78.0	40.0
115.0°	0.0	33.8	64.4	88.3	93.5	89.0	66.4	36.4
120.0°	0.0	31.1	59.1	78.2	83.5	78.5	61.0	33.5
125.0°	0.0	28.3	54.4	71.6	76.7	71.7	55.9	30.5
130.0°	0.8	25.9	49.2	65.4	70.5	66.0	51.5	28.0
135.0°	1.3	23.3	44.6	59.4	64.7	60.2	46.6	25.4
140.0°	1.6	20.9	40.6	53.8	58.3	54.1	42.4	23.3
145.0°	2.4	18.3	36.5	47.8	52.9	48.6	38.3	22.0
150.0°	3.5	16.7	31.4	42.0	45.7	42.7	34.6	20.1
155.0°	4.0	14.6	26.0	36.6	39.3	37.4	29.8	17.9
160.0°	4.9	12.6	21.6	30.2	33.0	30.5	25.0	16.0
165.0°	5.1	11.0	16.6	23.3	25.9	24.9	20.6	13.8
170.0°	5.3	8.5	12.8	16.5	19.5	18.2	15.6	11.3
175.0°	5.2	7.2	8.8	9.9	12.6	12.0	10.5	8.4
180.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Test Model: 55353

Integrating Sphere Test; Orientation: Downward; Test Voltage: 120V 60Hz;

Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances only)	Conclusion
Light Output(lm)	5167.85	≥2000	≥1800	Pass
Power(W)	37.49	None.	None.	N/A
Total Efficacy(lm/W)	137.85	≥115	≥111.55	Pass
CCT(K)	4952	4746~5312	No tolerances	Pass
Duv	0.00362	-0.004~0.008	No tolerances	Pass
IES R_f	81	70	69	Pass
IES R_g	97	89	88	
IES Rcs,h1	-12%	-12%~23%	-13%~24%	
R_a	80.5	≥80	≥79	
R9	5	≥0	≥-1	

THDi、PF Test; Orientation: Downward;

Test Voltage	Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
120	Power Factor	0.9995	≥0.9	≥0.87	Pass
120	THDi	5.22%	≤20%	≤25%	Pass
277	Power Factor	0.9832	≥0.9	≥0.87	Pass
277	THDi	17.51%	≤20%	≤25%	Pass

Note:
1. The test results were measured directly from the test equipment.
2. The DLC requirements were listed according to DLC Technical Requirements V5.1.
3. The conclusion is for reference only. Test report that indicate product performance meets DLC Technical Requirements do not represent official DLC product qualification. All decisions regarding product qualification are made by the DLC.

Test Data

[Integrating Sphere System]

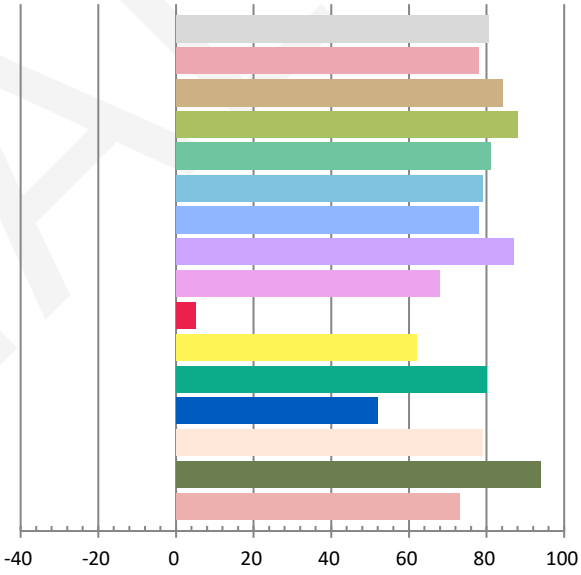
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.3131	37.49	0.9982	5167.85	137.85

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
15.727	4952	0.00362	0.3473	0.3606	0.2094	0.4893

Color Rendering Index

Ra			
80.5			
R1	R2	R3	R4
78	84	88	81
R5	R6	R7	R8
79	78	87	68
R9	R10	R11	R12
5	62	80	52
R13	R14	R15	
79	94	73	



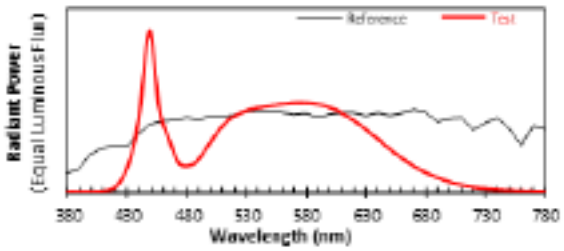
ANSI/IES TM-30-18 Color Rendition Report

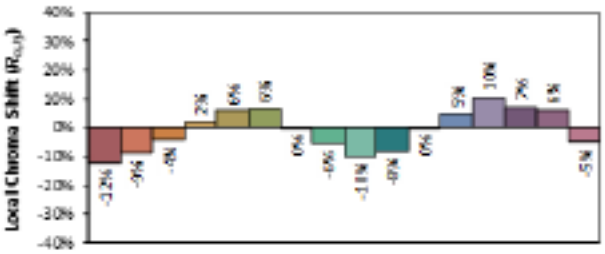
Source: User SPD

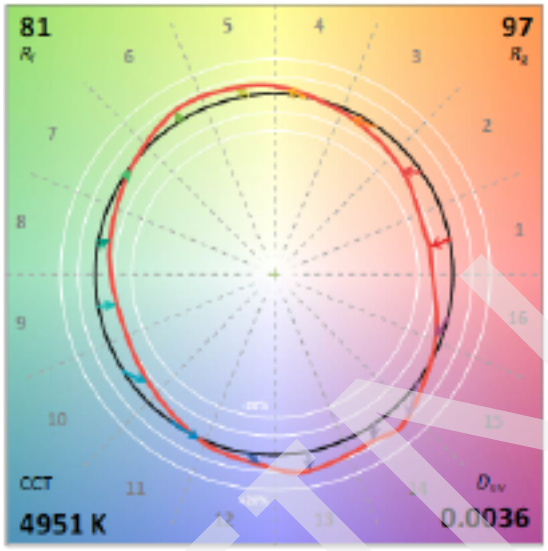
Manufacturer: P.Q.L., Inc.

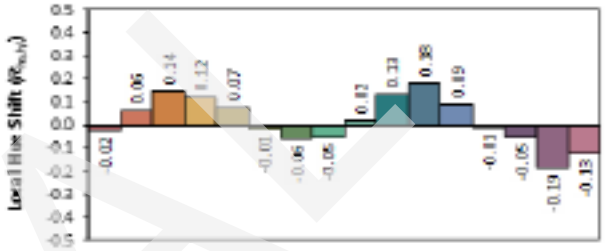
Date: 2020/10/29

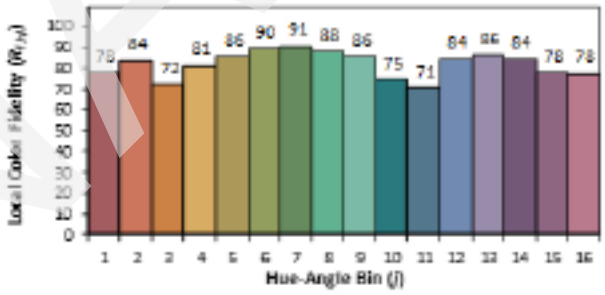
Model: 55353

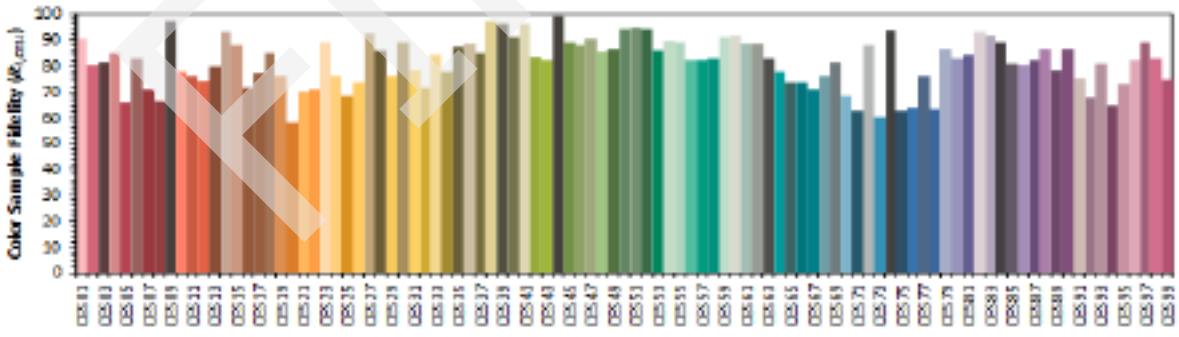












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

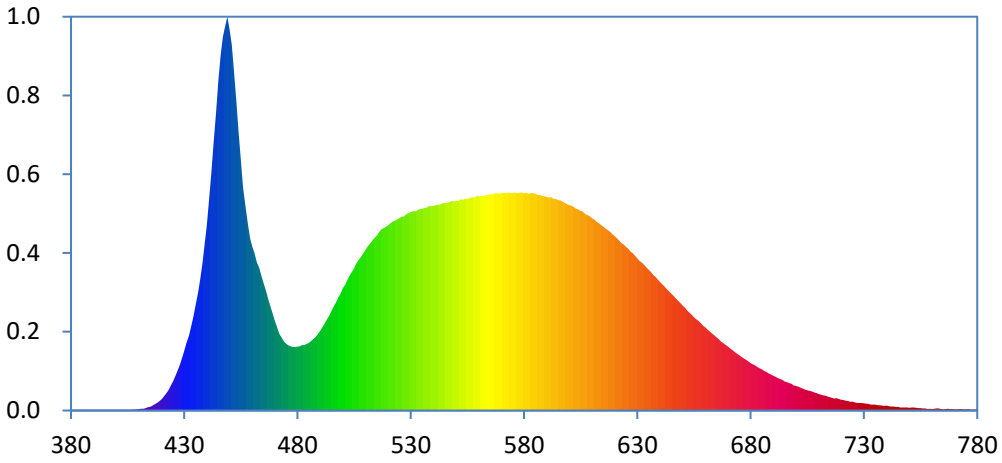
x	0.3473
y	0.3606
u'	0.2094
v'	0.4893

CIE 13.3-1995 (CRI)

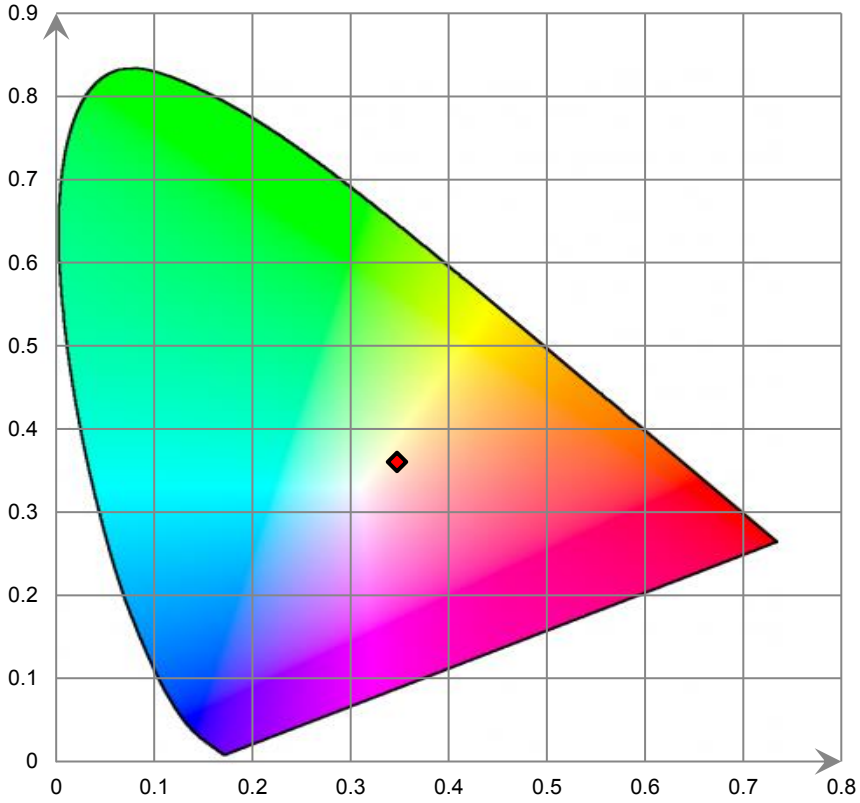
R_a	80
R_9	3

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

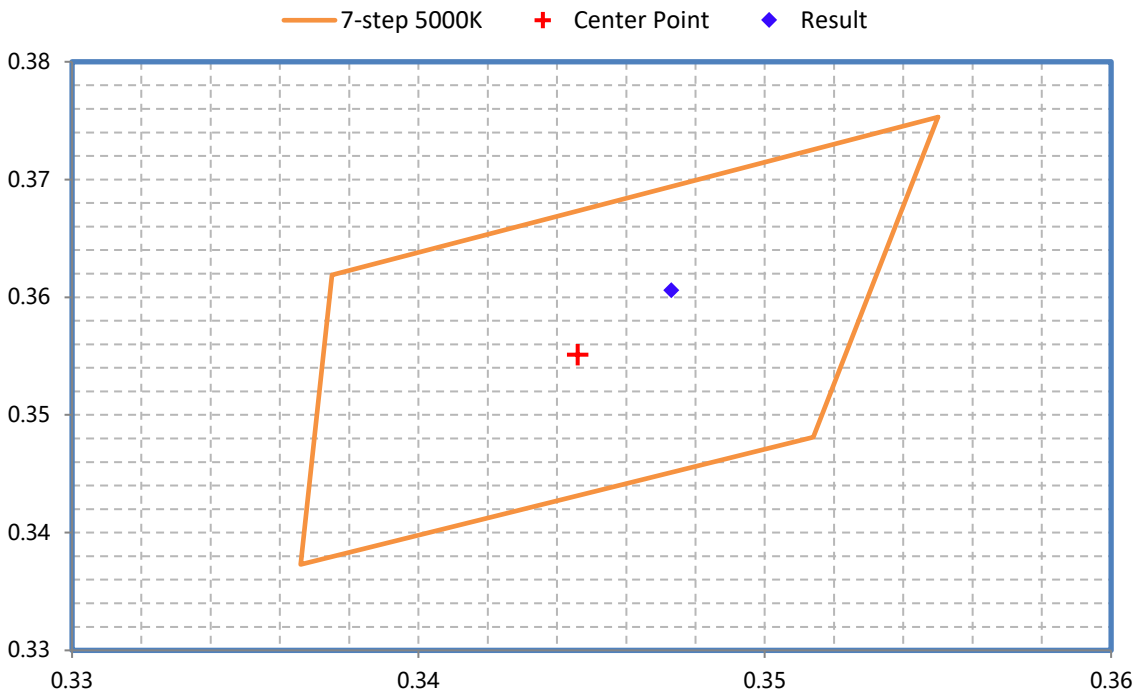
Relative Spectral Power Distribution



CIE 1931 x y Chromaticity Diagram



ANSI C78.377-2017 Chromaticity Quadrangles



6. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Integrating Sphere	INVENTFINE	Dia 1.5m	JWWCV090112	2020-01-22	2021-01-21
Power Meter	INVENTFINE	WT500	GSJWQ20009	2020-04-02	2021-04-01
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2020-01-22	2021-01-21
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2020-04-02	2021-04-01
Standard Light Source	INVENTFINE	N/A	JWWCR020104	2019-11-19	2020-11-18
Thermal Meter	KEJIAN	TA298	N/A	2019-12-02	2020-12-01
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	2019-12-20	2020-12-19
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2020-04-02	2021-04-01
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2019-12-20	2020-12-19
Power Meter	INVENTFINE	WT500	GSDSQ200007	2020-04-02	2021-04-01
Goniophotometer	INVENTFINE	GPM-1900	YWGCF120001	2020-01-22	2021-01-21
Wireless Weather Station	ZHONGXING	KG218	N/A	2019-12-02	2020-12-01
Standard Light Source	INVENTFINE	N/A	JWBYR040008	2020-03-19	2021-03-18
Digital Multimeter	FLUKE	115C	37840512WS	2020-10-08	2021-10-07
Hybrid Recorder	YOKOGAWA	DR230	4TJH0903	2020-04-02	2021-04-01
Power Supply	SC	SC/BP-11003	1608110030553	2019-12-14	2020-12-13

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Kunshan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

7. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The ambient temperature of the sample was maintained at 25°C±1°C during measurement. And relative humidity is less than 65%.The product was operated in its intended orientation in application during all testing.

Integrating Sphere System
The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement. 4π geometry was used during measurement.

Goniophotometer System
Type C goniophotometer was used for measuring luminous intensity distribution. The vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

ISTMT Test
The LED which has the highest temperature was measured at the location of LED case which is specified by LED source manufacturer and detailed by LM-80 report. The drive current of LED package/module/ array was calculated as the total output current of the driver measured by multimeter, divided by the number of branches in parallel of LEDs.

Directions

1. The information marked "superscript #" is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
5. This report cannot be reproduced except in full, without prior written approval of the Company.
6. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

**********END OF REPORT**********