



Shenzhen Belling Efficiency Testing Lab



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Total pages 15

Test report of

IES LM-79-08

**Approved Method: Electrical and Photometric
Measurements of Solid-State Lighting Products**

Applicant:

P.Q.L., Inc.

Address:

2285 Ward Avenue
Simi Valley, CA 93065

For Product:

Architectural Flood and Spot Luminaires

Model No.:

84092, 841XX - 1250 - 57K was selected as the representative model.
All measurements are the same except CCT.

Test laboratory: Shenzhen Belling Efficiency Testing Lab., 1/F., Building 1, 1F, No.1 building, Meibaohe industrial park, Dalang street, Shenzhen, Guangdong Prov.518101, China.

Complied by: Zac Kuang

Review by: Jason Zhou

Project Engineer

Technical Manager

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or use in part without prior written consent from Shenzhen Belling Efficiency Testing Lab. This report must not be used by the customer to claim product certification, approval, or endorsement By NVLAP, NIST, or any agency of the U.S. Government.



1 General

1.1 Product Information

Manufacturer	P.Q.L., Inc.
Manufacturer Address	2285 Ward Avenue Simi Valley, CA 93065
Brand Name	Superior Life®
Luminaire Type	Architectural Flood and Spot Luminaires
Model Number	84092, 841XX-1250-57K
Rated Inputs	AC 200-480V 50/60Hz
Rated Power	1250 W
Nominal CCT	3000K / 5700K
Date of Receipt Samples	2018-01-30
Date of Test	2018-02-01 to 2018-02-28

1.2 Standards or methods

- ANSI C78.377-2015: Specifications for the Chromaticity of Solid State Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits-Related Power Quality Requirements for Lighting Equipment
- CIE Publication No.13.3-1995: Method of Measuring and Specifying Color Rendering of Light Sources
- IESNA LM-79-08 Approved Method: Electric & Photometric Measurement of Solid-state Lighting Products



1.3 Equipment list

Device	Manufacture	Model No.	Serial No.	Calibration due date
Goniophotometric System	SENSING	GMS-3000	N.A	2018-09-20
AC Power Source	ALL POWER	APW-110N	992257	2018-08-26
Total Luminous Flux Standard Lamp	SENSING	110V/100W	S13100234	2018-09-14
Digital Power Meter	YOKOGAWA	WT310	C2QM02030V	2018-08-28
Integral Sphere	SENSING	SPR-600M	N.A	2018-08-26
Digital Power Meter	YOKOGAWA	WT210	91L929742	2018-08-28
Optical Color and Electrical Measurement System	SENSING	SPR-3000	N.A	2018-08-26
Temperature/humidity/clock	VICTOR	VC230	57636	2018-09-12
Digital Anemometer	TECMAN	TD8901	026141	2018-09-12

Statement of Traceability: Shenzhen Belling Efficiency Testing Lab attests that all calibration has been performed using suitable standards traceable to national primary standards and International System of Unit (SI).



2 Test conducted and method

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, the air flow around the sample(s) being tested did not affect the performance.

2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (60 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within ± 0.2 percent under load.

2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

2.4 Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, spectrophotometer, and integrating sphere. The integrating sphere system is calibrated by standard light source before measurement. The system and standard light source has been calibrated regularly and traceable to the National Primary Standards. 4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

2.5 Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement. The standard light source has been calibrated regularly and traceable to the National Primary Standards.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The method according to IESNA LM-79-08 following chapter.



3 Test Result Summary

3.1 Integrating Sphere System

3.1.1 Electrical data

Model Number	Input Voltage(V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
84092	277.01	60	4.546	1251.70	0.994
841XX-1250-57K	277.02	60	4.543	1251.00	0.994

3.1.2 Photometric data

Model Number	Luminous Flux (lm)	Efficacy (lm/W)	CCT (K)	CRI	R9
84092	148701.96	118.8	2954	70.0	-39
841XX-1250-57K	162254.70	129.7	5358	71.4	-31

3.1.3 Chromaticity Coordinate

Model Number	Duv	x	y	u'	v'
84092	-0.00022	0.4399	0.4045	0.2523	0.5220
841XX-1250-57K	0.00511	0.3361	0.3544	0.2043	0.4847

3.2 Goniophotometer System

3.2.1 Electrical data

Model Number	Input Voltage(V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
84092	277.27	60	4.5436	1251.10	0.9931

3.2.2 Photometric data

Luminous Flux (lm)	Efficacy (lm/W)	Zonal Lumen in 0-90°(%lm)
147808.70	118.14	99.886



3.3 Additional Test

Model Number	Test Item	Test Voltage (V)	Frequency(Hz)	Test Result
84092	Power Factor	480	60	0.939
	THD	480	60	13.5%



4 Test Data

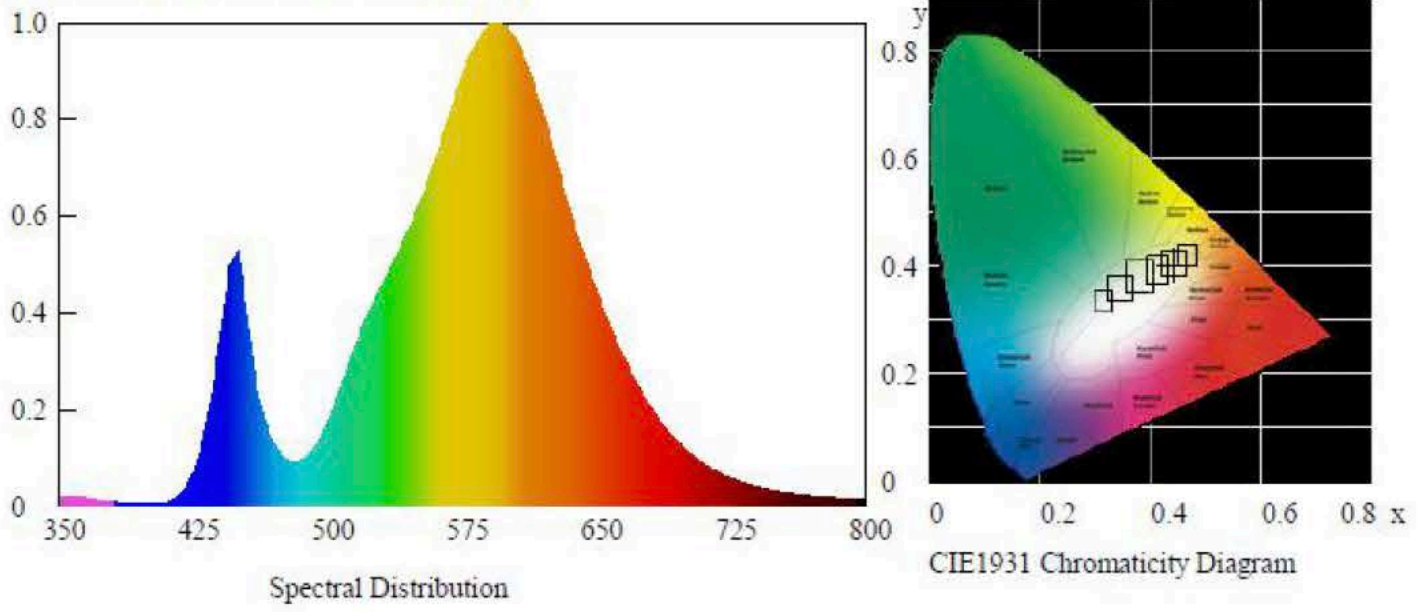
84092

Test Condition

Temperature: 25°C
Spectrum Range: 350-800 nm

RH: 58%
Scan Step: 5 nm

Spectroradiometric Parameters



Chromaticity Coordinates: $x=0.4399$ $y=0.4045$ $u'=0.2523$ $v'=0.522$

Correlated Color Temperature: 2954 K

Dominant Wavelength: 582.0 nm(E)

Colour Fidelity Index: $R_f=69$

Gamut Index: $R_g=93$

Luminous Flux: 148701.96 lm

Purity: 0.5350

Chromaticity Difference: $-0.00022Duv$

Peak Wavelength: 595.0 nm

Color Ratio: $K_r=45.2\%$ $K_g=49.7\%$ $K_b=5.0\%$

Bandwidth: 114.2nm

Radiant Flux: 283.452 W

Photosynthetically Active Radiation(PAR): 273.70W

Photosynthetic Photon Flux(PPF):1324.65 μ mol/s

Rendering Index: $R_a=70.0$

$R_1=66$ $R_2=81$ $R_3=93$ $R_4=65$ $R_5=65$ $R_6=73$ $R_7=76$ $R_8=41$

$R_9=-39$ $R_{10}=56$ $R_{11}=59$ $R_{12}=47$ $R_{13}=69$ $R_{14}=96$ $R_{15}=58$ $R_e=60$

Electric Parameters

Voltage: 277.01 V

Current: 4.546 A

Power Factor: 0.994

Power: 1251.70 W

Luminous Efficacy: 118.8 lm/W



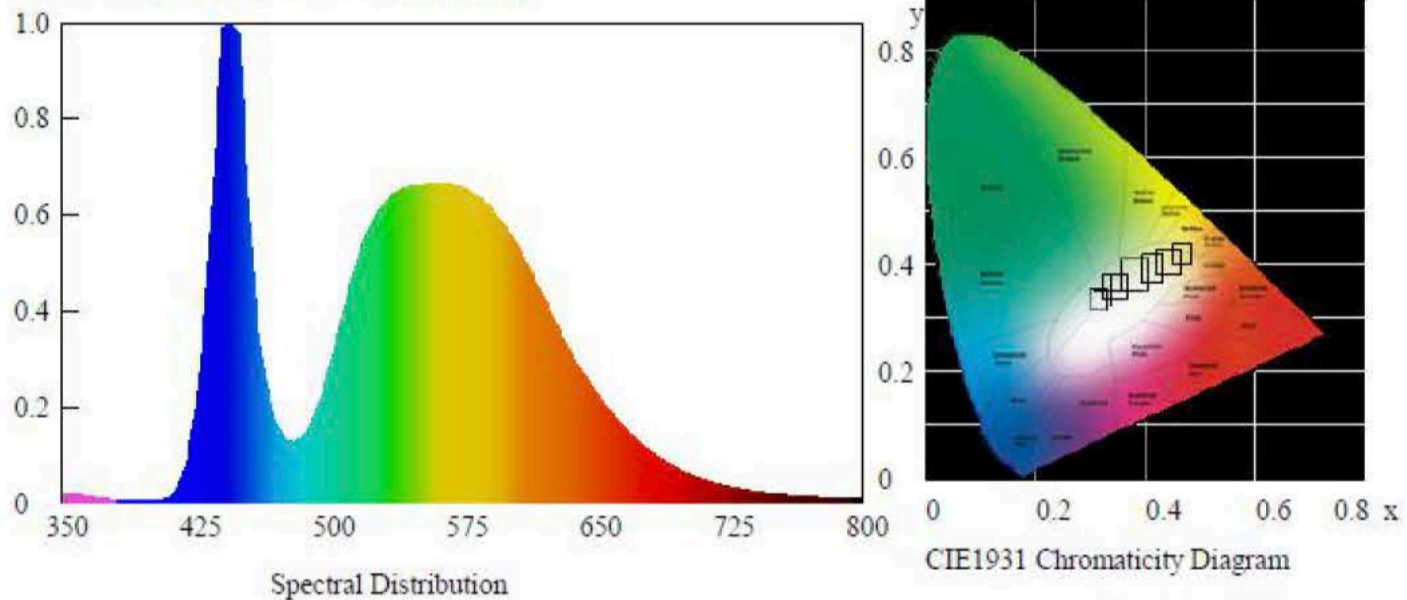
841XX-1250-57K

Test Condition

Temperature: 25°C
Spectrum Range: 350-800 nm

RH: 58%
Scan Step: 5 nm

Spectroradiometric Parameters



Chromaticity Coordinates: $x=0.3361$ $y=0.3544$ $u'=0.2043$ $v'=0.4847$

Correlated Color Temperature: 5358 K

Dominant Wavelength: 558.0 nm(E)

Colour Fidelity Index: $R_f=70$

Gamut Index: $R_g=95$

Luminous Flux: 162254.70 lm

Purity: 0.0710

Chromaticity Difference: +0.00511Duv

Peak Wavelength: 445.0 nm

Color Ratio: $K_r=31.2\%$ $K_g=59.6\%$ $K_b=9.2\%$

Bandwidth: 25.5nm

Radiant Flux: 370.906 W

Photosynthetically Active Radiation(PAR): 361.89W

Photosynthetic Photon Flux(PPF):1651.97 μ mol/s

Rendering Index: $R_a=71.4$

$R_1=70$ $R_2=75$ $R_3=79$ $R_4=73$ $R_5=71$ $R_6=67$ $R_7=79$ $R_8=58$

$R_9=-31$ $R_{10}=41$ $R_{11}=72$ $R_{12}=46$ $R_{13}=70$ $R_{14}=88$ $R_{15}=63$ $R_e=61$

Electric Parameters

Voltage: 277.02 V

Current: 4.543 A

Power Factor: 0.994

Power: 1251.00 W

Luminous Efficacy: 129.7 lm/W



Zonal Flux Diagram

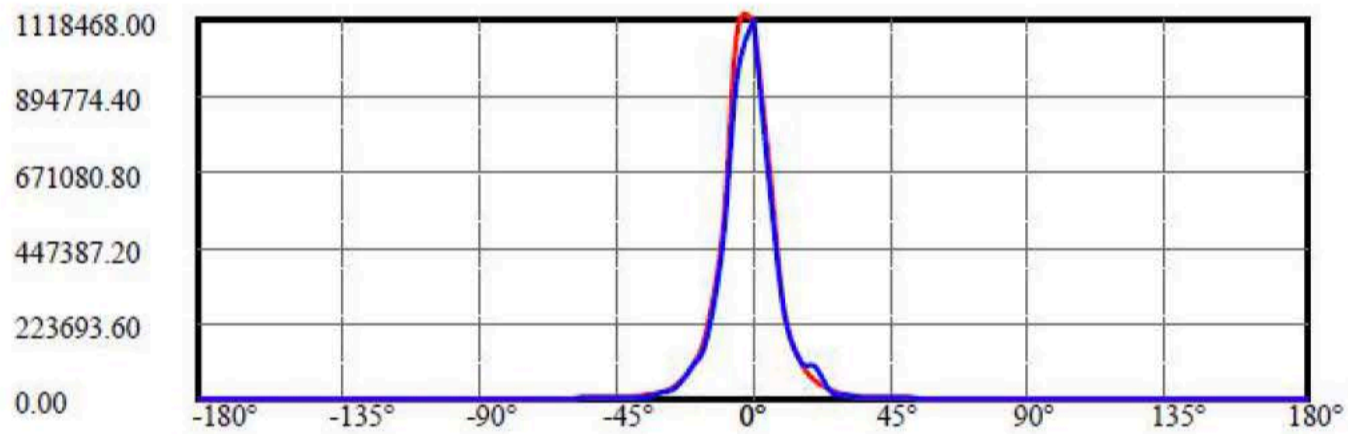
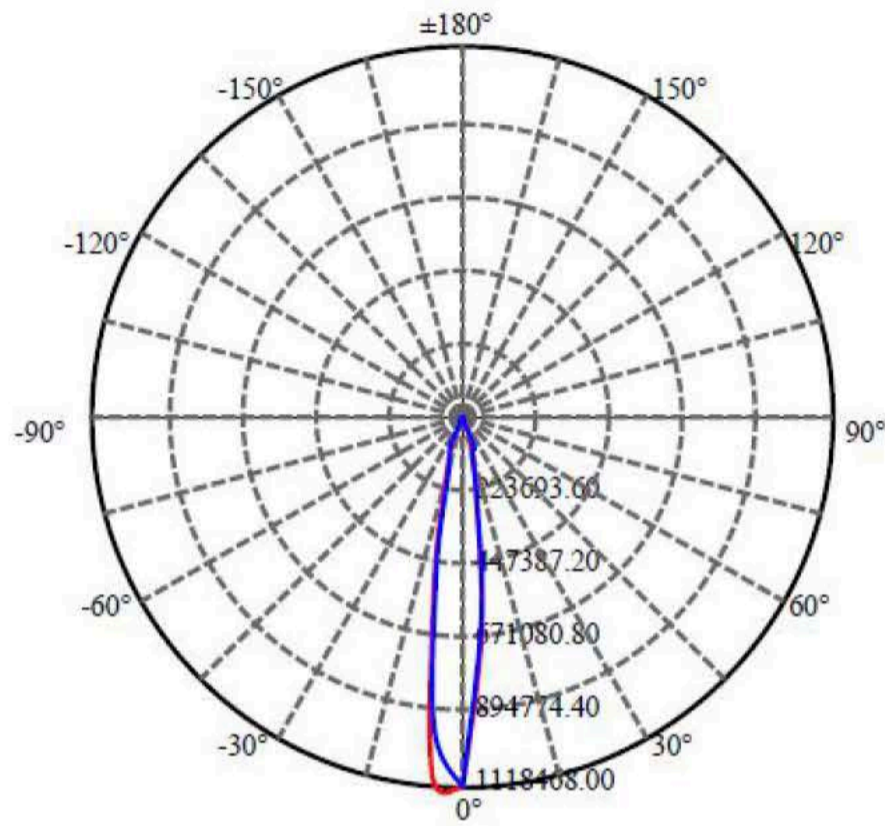
Zonal flux distribution table

$\gamma(^{\circ})$	Average I(cd)	Zonal F(lm)	Sum F(lm)	Eff Flux(%)	Eff Sum(%)
0.0	1118468.000	.000	.000	.000%	.000%
5.0	791865.200	22837.490	22837.490	15.451%	15.451%
10.0	359461.700	41186.590	64024.080	27.865%	43.316%
15.0	145826.600	29973.360	93997.440	20.278%	63.594%
20.0	83952.630	18937.040	112934.500	12.812%	76.406%
25.0	30780.710	12033.410	124967.900	8.141%	84.547%
30.0	15614.240	5871.319	130839.200	3.972%	88.519%
35.0	9023.563	3628.089	134467.300	2.455%	90.974%
40.0	6392.140	2571.994	137039.300	1.740%	92.714%
45.0	5118.762	2131.337	139170.600	1.442%	94.156%
50.0	4187.200	1880.406	141051.000	1.272%	95.428%
55.0	3463.196	1663.451	142714.500	1.125%	96.554%
60.0	2803.557	1448.542	144163.000	.980%	97.534%
65.0	2157.474	1206.036	145369.100	.816%	98.349%
70.0	1544.716	937.419	146306.500	.634%	98.984%
75.0	991.553	662.940	146969.400	.449%	99.432%
80.0	536.998	408.998	147378.400	.277%	99.709%
85.0	198.599	199.879	147578.300	.135%	99.844%
90.0	26.454	61.621	147639.900	.042%	99.886%
95.0	3.293	8.145	147648.100	.006%	99.891%
100.0	3.268	1.783	147649.900	.001%	99.893%
105.0	3.380	1.779	147651.600	.001%	99.894%
110.0	4.026	1.936	147653.600	.001%	99.895%
115.0	4.722	2.215	147655.800	.001%	99.897%
120.0	5.579	2.504	147658.300	.002%	99.898%
125.0	6.747	2.849	147661.100	.002%	99.900%
130.0	8.922	3.407	147664.500	.002%	99.902%
135.0	12.774	4.384	147668.900	.003%	99.905%
140.0	20.713	6.200	147675.100	.004%	99.910%
145.0	37.066	9.640	147684.800	.007%	99.916%
150.0	68.378	15.527	147700.300	.011%	99.927%
155.0	115.260	23.240	147723.500	.016%	99.942%
160.0	155.494	28.397	147751.900	.019%	99.962%
165.0	163.832	26.317	147778.300	.018%	99.979%
170.0	144.100	18.266	147796.500	.012%	99.992%
175.0	119.684	9.436	147806.000	.006%	99.998%
180.0	110.082	2.747	147808.700	.002%	100.000%



Luminous Intensity Distribution Diagram

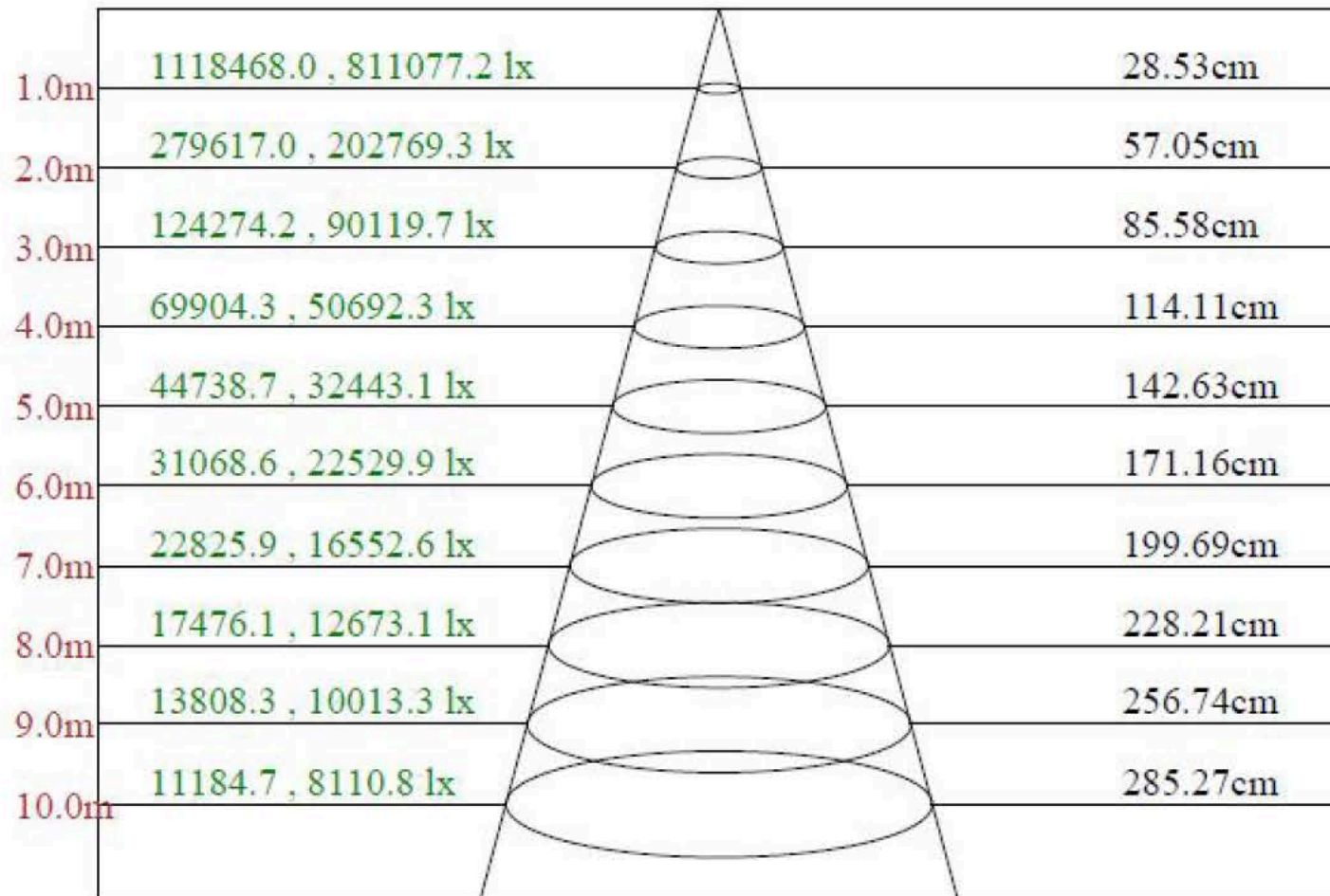
Light Distribution Curve [Unit:cd]



C0/C180: —
C90/C270: —
Field angle(10%Imax):C0/180Left:19.4 Right:15.1
:C90/270Left:19.0 Right:14.9
Beam Angle(50%Imax):C0/180Left:9.5 Right:6.3
:C90/270Left:9.0 Right:5.8



Lux distance Curve



Max , Ave Beam angle of C0plane16.22

**Luminous Intensity Distribution Data**

C/γ(°)	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0
0.0	1118468.00665695.40	256200.50	113057.30	52857.62	24400.35	12895.21	7960.75	5859.33	
22.5	1118468.00649591.80	260296.00	109319.70	51644.88	24269.13	12829.61	7819.60	5799.69	
45.0	1118468.00634482.30	258606.10	107689.40	51386.43	24873.52	12982.69	7849.42	5787.76	
67.5	1118468.00628319.10	256478.80	107252.00	52440.11	22929.16	11996.59	7491.56	5674.44	
90.0	1118468.00613806.00	256419.20	108106.90	98007.38	21473.87	11662.59	7439.87	5610.82	
112.5	1118468.00604263.10	261309.90	110075.10	97967.61	21485.79	11907.13	7577.05	5807.64	
135.0	1118468.00590545.30	259799.00	109279.90	86496.27	23630.96	12431.99	7889.18	5930.90	
157.5	1118468.00584779.80	256697.50	108743.10	98683.33	22613.05	12014.49	7652.60	5913.01	
180.0	1118468.001079022.00	502870.00	198293.10	99683.34	41008.54	19258.73	10670.13	7076.05	
202.5	1118468.001048007.00	491736.70	188153.80	97894.05	40233.18	19775.63	10530.97	7093.94	
225.0	1118468.001010233.00	467481.80	184575.20	98689.29	40471.75	20829.32	11127.40	7233.11	
247.5	1118468.00976435.50	456547.30	177815.70	94866.18	39099.96	19199.08	10511.08	7006.46	
270.0	1118468.00942637.80	460523.50	177020.40	94567.96	37310.68	17986.34	9894.77	6789.76	
292.5	1118468.00904665.10	442630.60	176424.00	94369.15	36952.82	17966.46	9914.66	6861.33	
315.0	1118468.00872855.40	438256.80	178014.50	93872.13	36416.03	18622.53	10212.87	7000.50	
337.5	1118468.00864505.40	425532.90	179406.20	79816.26	35322.57	17469.44	9835.13	6829.52	
360.0	1118468.00665695.40	256200.50	113057.30	52857.62	24400.35	12895.21	7960.75	5859.33	

C/γ(°)	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0
0.0	4849.37	3958.31	3407.60	2687.51	1993.07	1382.53	839.18	401.60	104.57
22.5	4809.61	3961.49	3290.70	2601.03	2012.16	1393.26	851.50	396.23	114.32
45.0	4773.83	3942.20	3239.21	2563.06	1963.65	1378.35	846.93	412.33	116.90
67.5	4622.73	3793.10	3140.40	2523.30	1937.40	1355.09	845.14	406.37	114.71
90.0	4575.02	3788.33	3183.94	2548.55	1881.94	1305.98	804.78	396.63	112.92
112.5	4664.48	3825.70	3168.44	2541.19	1933.43	1353.70	833.21	407.16	124.26
135.0	4811.60	3913.58	3221.12	2575.19	1973.59	1373.18	849.91	419.89	125.45
157.5	4734.06	3852.54	3183.55	2565.05	1956.09	1366.82	833.81	403.58	120.68
180.0	5487.55	4539.23	3795.68	3121.72	2439.80	1765.83	1191.27	703.79	302.59
202.5	5471.65	4525.31	3726.10	3064.06	2402.02	1787.70	1179.34	703.39	298.41
225.0	5596.90	4626.71	3777.79	3075.99	2384.13	1755.89	1173.38	685.70	292.05
247.5	5515.39	4503.44	3696.28	3020.32	2364.25	1757.88	1163.44	664.03	281.32
270.0	5384.17	4439.83	3694.29	3022.31	2310.57	1638.59	1081.92	624.26	259.05
292.5	5481.59	4439.83	3628.68	2988.51	2322.50	1700.22	1117.71	643.35	265.81
315.0	5606.84	4505.43	3656.51	3004.42	2326.48	1698.24	1125.66	663.63	271.77
337.5	5515.39	4380.18	3600.85	2954.72	2318.52	1702.21	1127.65	660.05	272.77
360.0	4849.37	3958.31	3407.60	2687.51	1993.07	1382.53	839.18	401.60	104.57

C/γ(°)	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0
0.0	4.57	3.58	3.78	3.58	4.37	5.37	6.16	7.75	10.74
22.5	3.58	2.98	3.18	3.18	4.57	4.97	5.96	7.56	10.54
45.0	3.78	2.98	3.38	3.18	4.18	4.97	5.77	7.16	10.14
67.5	3.58	3.18	2.98	3.58	3.98	4.97	5.77	7.36	9.94
90.0	3.58	3.38	3.58	3.58	4.57	4.97	5.96	7.36	9.54
112.5	3.98	3.38	2.78	3.98	4.18	4.97	5.77	7.56	9.94
135.0	3.78	3.58	3.38	3.58	4.37	5.17	6.16	7.56	10.14
157.5	3.78	3.38	3.38	3.98	4.57	5.17	6.16	7.75	10.14
180.0	58.25	3.38	3.58	3.38	3.78	4.37	5.17	5.96	8.15
202.5	55.07	2.98	3.18	3.18	3.58	4.37	5.17	5.96	7.75
225.0	51.89	3.18	3.18	3.18	3.58	4.18	5.17	5.96	7.75
247.5	49.31	3.18	3.18	3.18	3.58	4.37	5.17	5.96	7.75
270.0	46.72	3.18	2.78	3.18	3.38	4.37	4.97	5.77	7.36
292.5	43.34	3.18	3.18	3.38	3.78	4.37	5.57	5.96	7.36
315.0	43.74	3.58	3.38	2.59	3.98	4.37	4.97	5.96	7.75
337.5	44.34	3.58	3.38	3.38	3.98	4.57	5.37	6.36	7.75
360.0	4.57	3.58	3.78	3.58	4.37	5.37	6.16	7.75	10.74



$C/\gamma(^{\circ})$	135.0	140.0	145.0	150.0	155.0	160.0	165.0	170.0	175.0
0.0	16.10	27.04	48.91	88.47	139.17	163.02	148.51	127.64	116.50
22.5	15.71	25.85	46.72	84.49	133.40	160.24	150.70	125.85	112.13
45.0	14.71	24.65	45.73	84.10	135.39	169.39	166.21	136.78	114.32
67.5	14.71	24.65	46.32	84.69	135.59	175.35	176.74	145.13	115.71
90.0	15.11	24.65	45.73	84.49	135.59	176.74	180.92	150.30	117.50
112.5	14.71	25.45	45.73	82.90	134.00	172.17	175.95	148.71	116.50
135.0	14.91	24.85	44.73	81.91	129.43	162.43	162.43	138.17	112.92
157.5	14.91	25.05	44.73	80.12	123.66	148.91	145.13	123.66	109.74
180.0	11.13	17.30	29.23	54.67	99.21	145.93	156.46	136.98	117.30
202.5	10.74	16.70	28.43	53.68	99.01	145.73	160.64	144.14	119.49
225.0	10.34	16.10	28.23	53.08	99.60	149.31	171.97	158.85	129.23
247.5	10.54	16.30	28.03	53.48	99.60	151.89	177.74	167.80	136.19
270.0	10.34	15.91	28.03	53.08	98.21	150.10	177.14	167.60	134.79
292.5	9.74	15.51	27.83	52.09	96.62	145.93	169.59	158.65	128.43
315.0	10.34	15.71	27.24	51.29	93.64	139.17	157.66	145.13	121.67
337.5	10.34	15.71	27.44	51.49	92.05	131.61	143.54	130.22	112.53
360.0	16.10	27.04	48.91	88.47	139.17	163.02	148.51	127.64	116.50
$C/\gamma(^{\circ})$	180.0								
0.0	110.08								
22.5	110.08								
45.0	110.08								
67.5	110.08								
90.0	110.08								
112.5	110.08								
135.0	110.08								
157.5	110.08								
180.0	110.08								
202.5	110.08								
225.0	110.08								
247.5	110.08								
270.0	110.08								
292.5	110.08								
315.0	110.08								
337.5	110.08								
360.0	110.08								



5 Performance Assessment

Model name	CCT(K)	Total Luminous(lm)	Power(W)	Luminous Efficacy(lm/W)
84092	3000K	148701.96	1251.70	118.8
841XX-1250-35K	3500K	151412.51 * ¹	1251.35 * ²	121.0 * ³
841XX-1250-40K	4000K	154123.06 * ¹	1251.35 * ²	123.2 * ³
841XX-1250-45K	4500K	156833.60 * ¹	1251.35 * ²	125.3 * ³
84113	5000K	159544.15 * ¹	1251.35 * ²	127.5 * ³
841XX-1250-57K	5700K	162254.70	1251.00	129.7

*1: This value is calculated and the calculation formula is as below:

$$151412.51=(162254.70-148701.96) /5+148701.96$$

$$154123.06=(162254.70-148701.96) /5+151412.51$$

$$156833.60=(162254.70-148701.96) /5+154123.06$$

$$159544.15=(162254.70-148701.96) /5+156833.60$$

*2: This value is calculated and the calculation formula is as below:

$$1251.35 =(1251.70+1251.00)/2$$

*3: This value is calculated and the calculation formula is as below:

$$121.0 =151412.51 /1251.35$$

$$123.2=154123.06 /1251.35$$

$$125.3=156833.60 /1251.35$$

$$127.5=159544.15 /1251.35$$



Photo Document



****End of test report****