



Shenzhen Belling Efficiency Testing Lab



Report No.:BL180403004-9

Date of issue 2018-04-04  
Version 1.0  
Total pages 14

**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:**

Mogul Screw-Base (E39) Replacements for HID Lamps -- Replacement Lamps for Outdoor Pole/Arm-Mounted Decorative Luminaires (UL Type B)

**Model No.:**

91693, 91579, 9169X-45-57K were selected as the representative models.  
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.

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Complied by: Ike Li

Review by: Jason Zhou

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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

<b>Manufacturer</b>	P.Q.L., Inc.
<b>Manufacturer Address</b>	2285 Ward Avenue / Simi Valley, CA 93065
<b>Brand Name</b>	Superior Life®
<b>Luminaire Type</b>	Replacement Lamps for Outdoor Pole/Arm-Mounted Decorative Luminaires (UL Type B)
<b>Model Number</b>	91693, 91579, 9169X-45-57K
<b>Rated Inputs</b>	AC 100-277V 50/60Hz
<b>Rated Power</b>	45W
<b>Nominal CCT</b>	3000K / 5700K
<b>Date of Receipt Samples</b>	2018-03-07
<b>Date of Test</b>	2018-03-08 to 2018-03-30

## 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  $\pm 0.2$  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.  $4\pi$  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 (Test in fixture Holophane GV Luminaires

#### Washington PostLite)

##### 3.1.1 Electrical data

Model Number	Input Voltage(V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
91693	120.07	60	0.376	44.81	0.993
9169X-45-57K	120.04	60	0.379	45.12	0.993

##### 3.1.2 Photometric data

Model Number	Luminous Flux (lm)	Efficacy (lm/W)	CCT (K)	CRI	R9
91693	5184.52	115.7	2903	82.3	6
9169X-45-57K	5432.45	120.4	5460	81.3	-4

##### 3.1.3 Chromaticity Coordinate

Model Number	Duv	x	y	u'	v'
91693	-0.00052	0.4432	0.4048	0.2543	0.5226
9169X-45-57K	0.00317	0.3335	0.3482	0.2048	0.4813



## 3.2 Goniophotometer System (Test in fixture Holophane GV Luminaires Washington PostLite)

### 3.2.1 Electrical data

Model Number	Input Voltage(V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
91693	119.98	60	0.3704	44.134	0.9931

### 3.2.2 Photometric data

Luminous Flux (lm)	Efficacy (lm/W)	Zonal Lumen in 0-90°(%lm)
5105.38	115.68	76.261

## 3.3 Additional Test

Model Number	Test Item	Test Voltage (V)	Frequency(Hz)	Test Result
91693	Power Factor	277	60	0.929
	THD	277	60	12.5%



## 4 Test Data

91693

### Test Condition

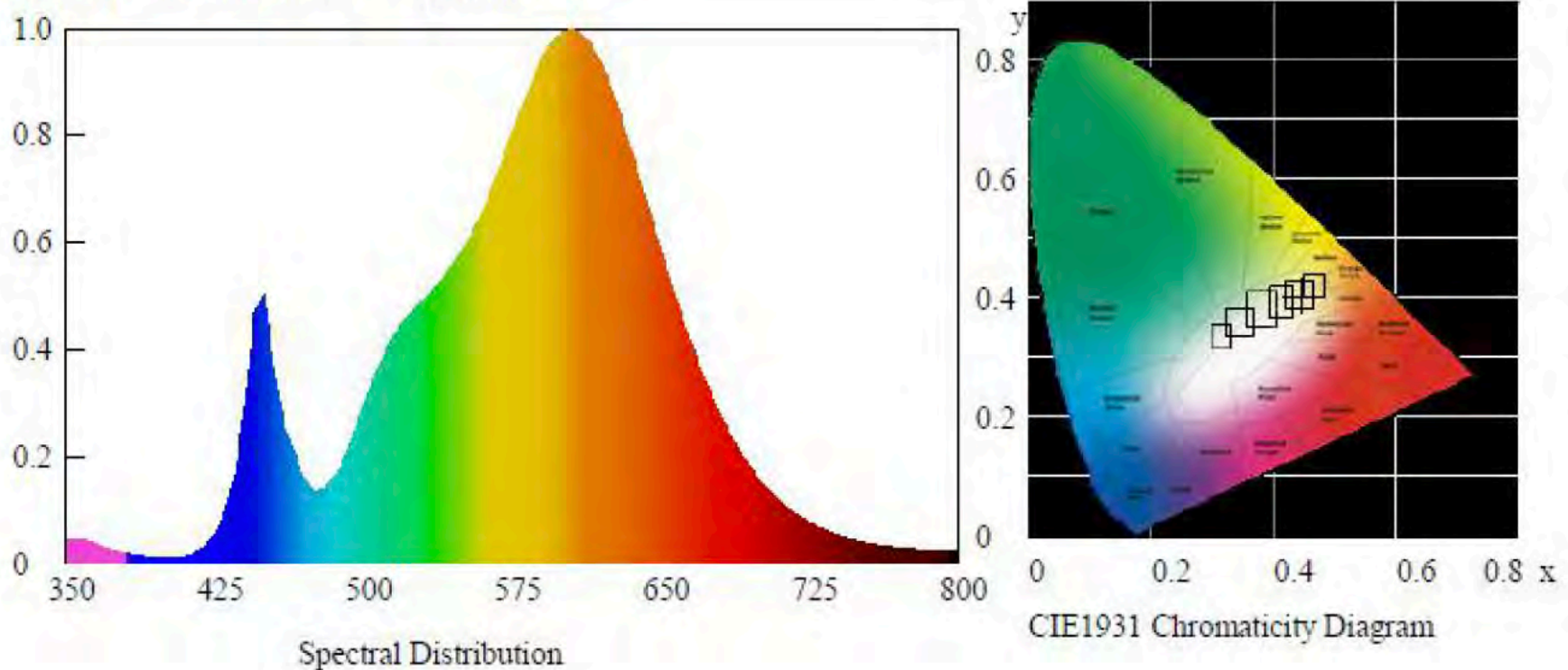
Temperature: 25°C

RH: 58%

Spectrum Range: 350-800 nm

Scan Step: 5 nm

### Spectroradiometric Parameters

Chromaticity Coordinates:  $x=0.4432$   $y=0.4048$   $u'=0.2543$   $v'=0.5226$ 

Correlated Color Temperature: 2903 K

Dominant Wavelength: 582.0 nm(E)

Colour Fidelity Index:  $R_f=81$ Gamut Index:  $R_g=97$ 

Luminous Flux: 5184.52 lm

Purity: 0.5472

Chromaticity Difference: -0.00052Duv

Peak Wavelength: 605.0 nm

Color Ratio:  $K_r=45.8\%$   $K_g=47.4\%$   $K_b=6.9\%$ 

Bandwidth: 125.2nm

Radiant Flux: 17.311 W

Photosynthetically Active Radiation(PAR): 16.53W

Photosynthetic Photon Flux(PPF): 80.52 $\mu$ mol/sRendering Index:  $R_a=82.3$ 

R1=81 R2=90 R3=97 R4=81 R5=81 R6=88 R7=83 R8=59

R9=6 R10=77 R11=81 R12=72 R13=83 R14=99 R15=73 Re=77

### Electric Parameters

Voltage: 120.07 V

Current: 0.376 A

Power Factor: 0.993

Power: 44.81 W

Luminous Efficacy: 115.7 lm/W

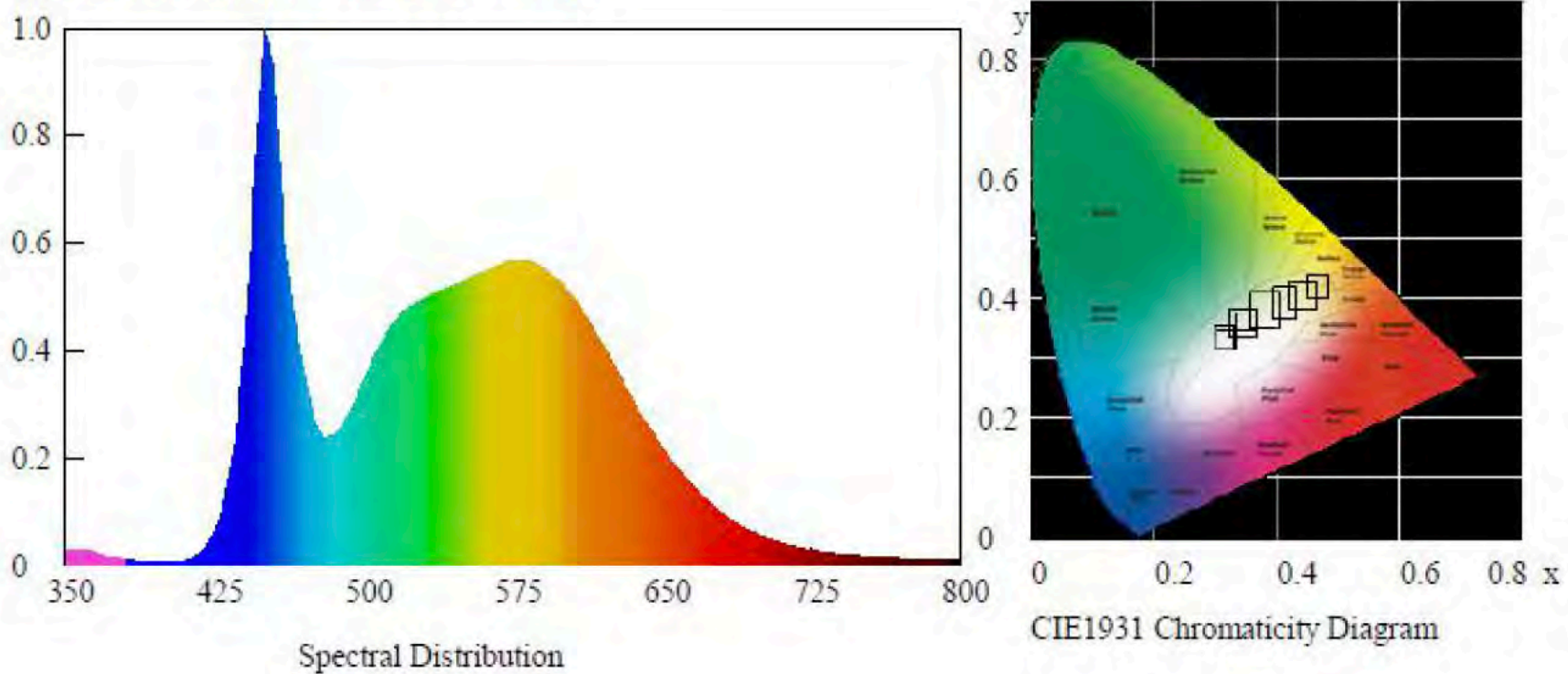
**9169X-45-57K****Test Condition**

Temperature: 25°C

RH: 58%

Spectrum Range: 350-800 nm

Scan Step: 5 nm

**Spectroradiometric Parameters**Chromaticity Coordinates:  $x=0.3335$   $y=0.3482$   $u'=0.2048$   $v'=0.4813$ 

Correlated Color Temperature: 5460 K

Dominant Wavelength: 554.0 nm(E)

Colour Fidelity Index:  $R_f=79$ Gamut Index:  $R_g=94$ 

Luminous Flux: 5432.45 lm

Purity: 0.0458

Chromaticity Difference: +0.00317Duv

Peak Wavelength: 450.0 nm

Color Ratio:  $K_r=32.6\%$   $K_g=55.7\%$   $K_b=11.7\%$ 

Bandwidth: 19.3nm

Radiant Flux: 19.66 W

Photosynthetically Active Radiation(PAR): 19.14W

Photosynthetic Photon Flux(PPF):87.53 $\mu\text{mol/s}$ Rendering Index:  $R_a=81.3$  $R_1=79$   $R_2=87$   $R_3=92$   $R_4=81$   $R_5=80$   $R_6=82$   $R_7=86$   $R_8=64$  $R_9=-4$   $R_{10}=69$   $R_{11}=80$   $R_{12}=58$   $R_{13}=82$   $R_{14}=96$   $R_{15}=73$   $R_e=74$ **Electric Parameters**

Voltage: 120.04 V

Current: 0.379 A

Power Factor: 0.993

Power: 45.12 W

Luminous Efficacy: 120.4 lm/W





## Zonal Flux Diagram

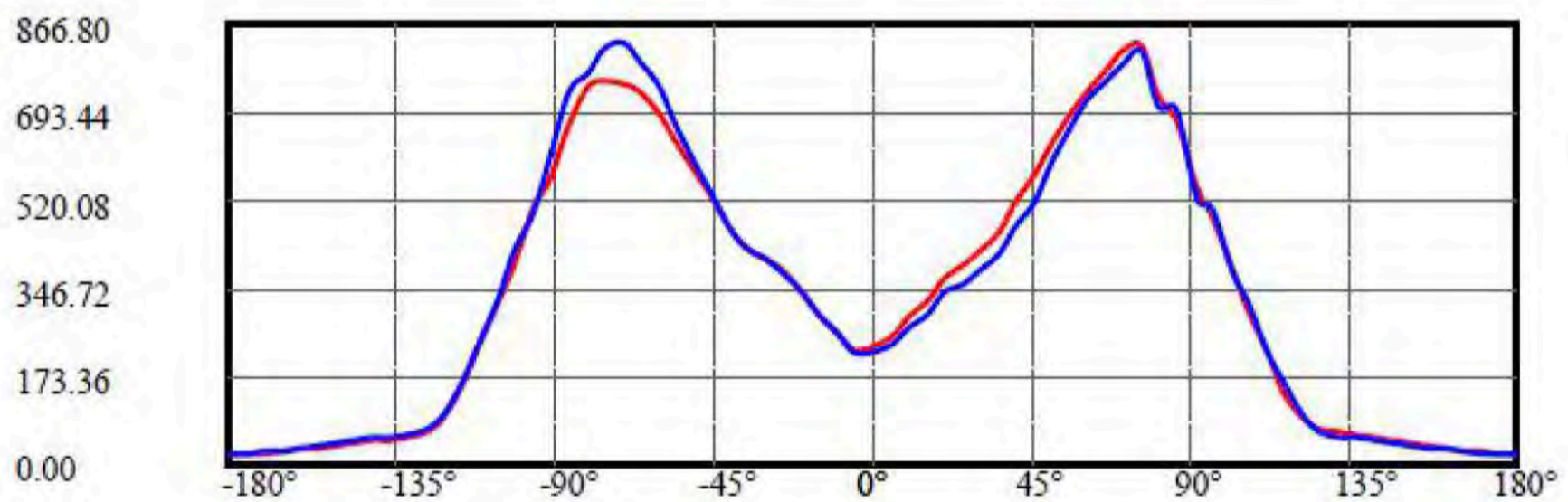
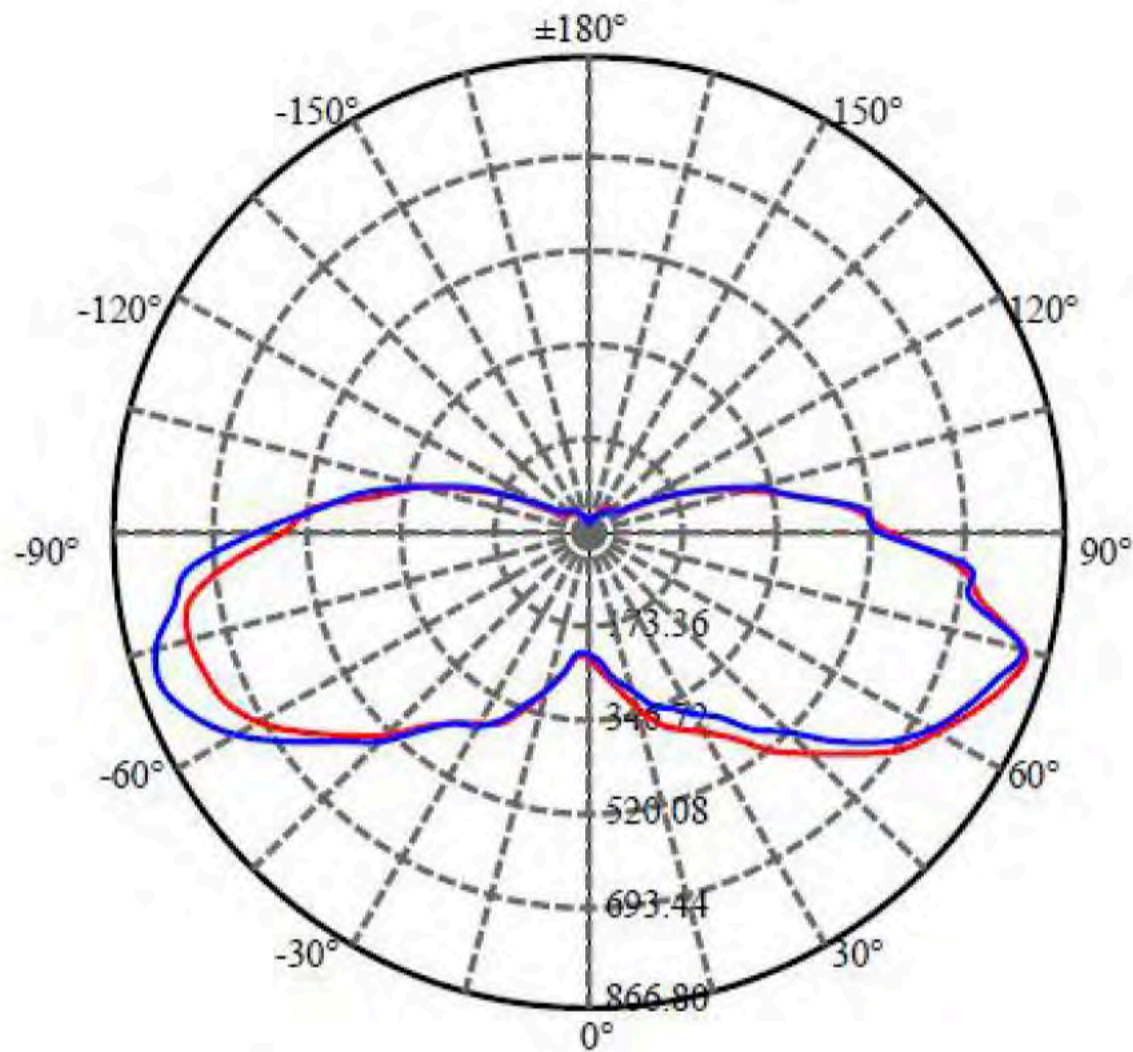
Zonal flux distribution table

$\gamma(^{\circ})$	Average I(cd)	Zonal F(lm)	Sum F(lm)	Eff Flux(%)	Eff Sum(%)
0.0	221.041	.000	.000	.000%	.000%
5.0	232.447	5.421	5.421	.106%	.106%
10.0	265.059	17.797	23.219	.349%	.455%
15.0	300.991	33.578	56.796	.658%	1.112%
20.0	339.986	52.826	109.622	1.035%	2.147%
25.0	371.918	74.666	184.288	1.462%	3.610%
30.0	395.150	97.073	281.361	1.901%	5.511%
35.0	421.184	120.211	401.571	2.355%	7.866%
40.0	465.703	147.970	549.542	2.898%	10.764%
45.0	524.868	183.412	732.954	3.593%	14.357%
50.0	587.840	224.839	957.793	4.404%	18.760%
55.0	660.694	271.473	1229.266	5.317%	24.078%
60.0	722.629	319.751	1549.017	6.263%	30.341%
65.0	768.866	362.585	1911.602	7.102%	37.443%
70.0	803.778	398.203	2309.805	7.800%	45.243%
75.0	808.411	421.400	2731.206	8.254%	53.497%
80.0	759.016	419.400	3150.606	8.215%	61.711%
85.0	692.042	394.287	3544.893	7.723%	69.434%
90.0	580.874	348.534	3893.427	6.827%	76.261%
95.0	507.015	297.872	4191.300	5.834%	82.096%
100.0	408.369	248.732	4440.032	4.872%	86.968%
105.0	322.020	195.432	4635.463	3.828%	90.796%
110.0	234.699	145.517	4780.980	2.850%	93.646%
115.0	159.463	99.804	4880.785	1.955%	95.601%
120.0	95.600	62.006	4942.791	1.215%	96.815%
125.0	67.832	37.777	4980.568	.740%	97.555%
130.0	58.614	27.494	5008.062	.539%	98.094%
135.0	53.608	22.676	5030.738	.444%	98.538%
140.0	49.542	19.099	5049.837	.374%	98.912%
145.0	45.783	15.904	5065.741	.312%	99.224%
150.0	41.441	12.844	5078.585	.252%	99.475%
155.0	36.160	9.820	5088.406	.192%	99.668%
160.0	31.203	7.065	5095.471	.138%	99.806%
165.0	27.006	4.797	5100.268	.094%	99.900%
170.0	23.831	3.016	5103.284	.059%	99.959%
175.0	20.672	1.592	5104.875	.031%	99.990%
180.0	21.644	.506	5105.381	.010%	100.000%



### Luminous Intensity Distribution Diagram

Light Distribution Curve [Unit:cd]



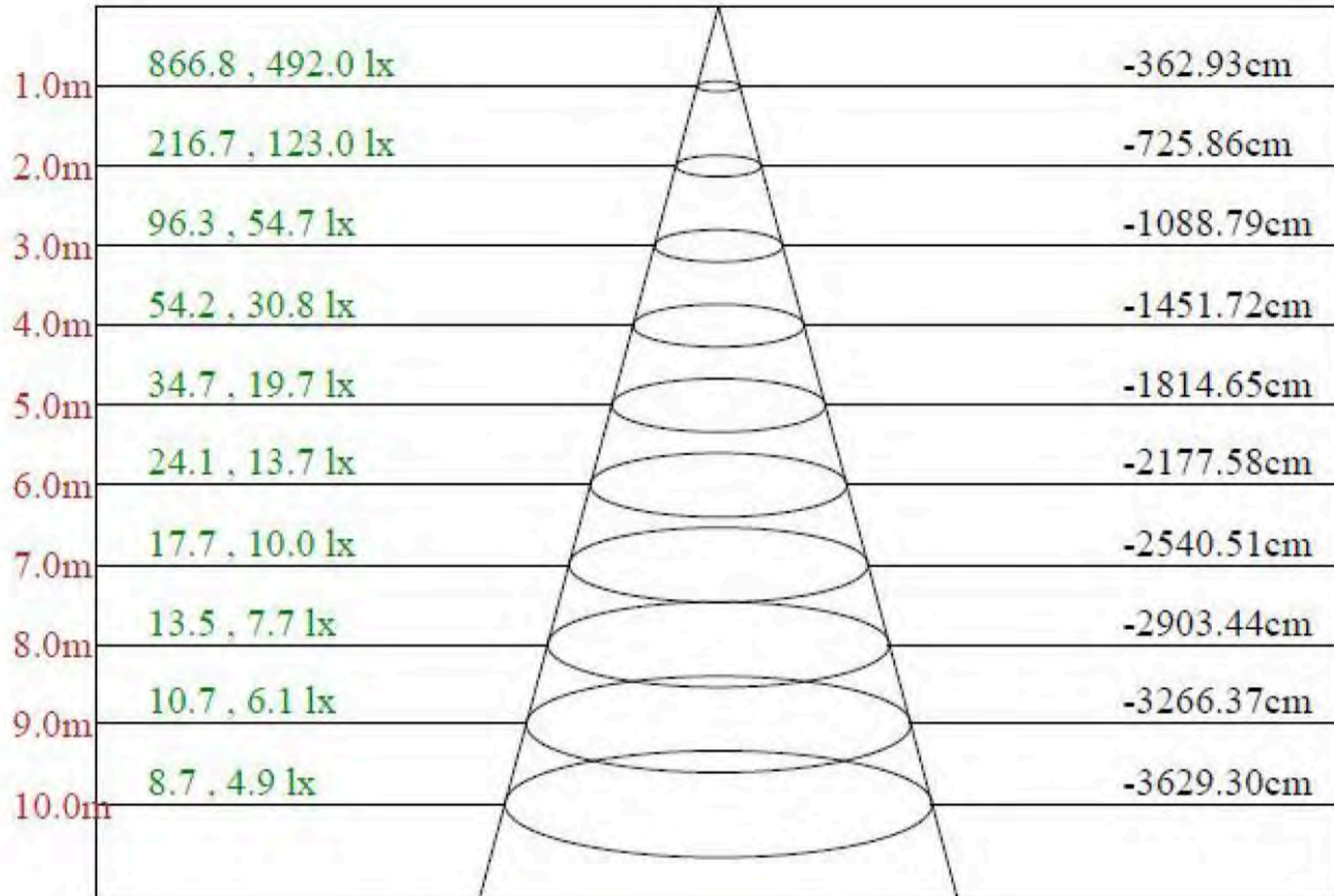
C0/C180: —  
C90/C270: —

Field angle(10%Imax):C0/180Left:196.9 Right:47.3  
:C90/270Left:52.7 Right:192.0

Beam Angle(50%Imax):C0/180Left:174.2 Right:23.7  
:C90/270Left:30.4 Right:168.6



Lux distance Curve



Max , Ave

Beam angle of C337.5plane237.74

**Luminous Intensity Distribution Data**

<i>C/γ</i> (°)	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0
0.0	228.88	254.80	288.24	324.53	368.34	393.22	418.37	458.02	519.20
22.5	225.51	252.21	285.13	320.12	360.30	380.78	408.26	441.95	502.09
45.0	223.70	247.55	279.17	314.94	348.38	367.56	395.30	420.70	475.39
67.5	221.37	243.92	273.47	306.39	340.86	360.56	388.04	414.74	466.32
90.0	219.55	238.99	268.54	298.61	336.97	354.34	382.08	413.96	466.58
112.5	217.74	233.29	260.77	291.61	329.20	354.08	371.97	403.33	449.21
135.0	215.92	225.77	254.54	288.76	326.09	358.75	371.71	395.81	437.81
157.5	215.66	219.03	249.10	284.61	322.20	360.04	377.15	397.89	434.18
180.0	228.88	227.07	258.95	298.09	339.05	381.04	404.63	425.10	462.43
202.5	225.51	220.07	251.69	294.98	334.38	378.19	401.00	415.00	444.80
225.0	223.70	217.22	251.69	294.20	329.97	376.37	401.52	420.70	449.99
247.5	221.37	217.74	254.29	292.65	331.53	377.15	403.85	427.18	462.95
270.0	219.55	222.14	258.95	295.76	336.71	379.48	405.66	426.40	465.54
292.5	217.74	228.11	265.17	300.42	341.64	378.19	402.55	424.33	463.99
315.0	215.92	233.81	269.58	303.54	346.05	376.11	396.07	424.85	471.50
337.5	215.66	237.44	271.65	306.65	348.12	374.82	394.26	428.99	479.28
360.0	228.88	254.80	288.24	324.53	368.34	393.22	418.37	458.02	519.20
<i>C/γ</i> (°)	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0
0.0	569.48	628.84	688.98	732.01	775.56	811.33	825.58	726.57	675.24
22.5	554.19	621.85	699.61	746.53	801.22	811.85	818.07	733.05	644.92
45.0	533.45	599.55	679.39	728.64	796.55	820.66	799.15	750.41	677.58
67.5	518.42	579.33	652.43	710.24	772.71	791.11	804.07	721.64	679.13
90.0	517.38	593.33	664.36	717.49	755.86	786.70	815.22	704.53	693.39
112.5	509.09	575.97	651.91	715.16	758.97	823.51	799.66	763.37	672.13
135.0	498.98	560.67	632.73	697.79	730.20	770.37	787.48	753.52	659.17
157.5	491.20	560.93	637.40	718.27	766.23	829.21	806.14	744.71	726.31
180.0	525.68	578.56	636.36	690.80	732.01	747.30	754.82	740.82	667.47
202.5	501.05	561.19	627.03	696.24	750.41	774.00	800.70	789.55	695.46
225.0	518.68	581.93	662.02	734.08	791.63	813.92	847.62	841.91	749.64
247.5	529.31	591.26	670.06	742.64	795.26	803.55	815.99	813.40	751.19
270.0	535.53	593.33	666.69	742.64	792.41	827.66	817.81	767.78	730.71
292.5	531.64	591.00	669.02	736.16	756.12	811.85	828.44	752.75	670.58
315.0	529.57	585.30	644.92	707.64	730.97	770.63	769.85	755.86	643.88
337.5	534.23	602.40	688.20	745.75	795.78	866.80	843.99	784.37	735.90
360.0	569.48	628.84	688.98	732.01	775.56	811.33	825.58	726.57	675.24
<i>C/γ</i> (°)	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0
0.0	548.23	482.39	387.26	299.91	221.63	141.79	91.76	71.80	64.28
22.5	552.90	470.47	383.89	303.02	222.14	148.27	92.54	70.76	62.73
45.0	563.26	496.91	393.48	324.79	233.29	162.01	100.31	71.54	61.17
67.5	544.34	506.24	385.45	322.72	227.85	164.60	99.28	68.69	59.10
90.0	527.75	498.98	381.04	315.20	222.40	159.16	94.87	65.32	56.51
112.5	599.81	482.13	407.74	311.57	227.07	153.19	86.32	61.69	54.69
135.0	597.22	475.13	416.03	308.20	233.03	158.38	89.95	61.95	53.14
157.5	572.85	503.13	410.59	316.76	232.51	153.45	85.02	60.66	52.88
180.0	558.34	503.65	394.78	315.98	231.48	158.12	92.80	65.32	55.21
202.5	608.63	547.19	425.88	338.53	249.36	170.30	100.57	67.14	56.25
225.0	640.25	583.48	462.43	357.19	259.73	180.67	103.43	67.40	56.77
247.5	600.85	530.34	435.99	329.72	242.10	164.60	95.65	68.95	58.84
270.0	605.00	494.31	420.70	324.79	234.33	159.16	98.24	69.99	60.40
292.5	606.29	494.05	412.92	324.27	233.81	157.08	100.06	72.06	61.95
315.0	576.22	493.80	388.82	315.20	230.70	154.49	95.13	69.21	61.69
337.5	592.04	550.04	426.92	344.49	253.77	166.15	103.68	72.84	62.21
360.0	548.23	482.39	387.26	299.91	221.63	141.79	91.76	71.80	64.28



$C/\gamma(^{\circ})$	135.0	140.0	145.0	150.0	155.0	160.0	165.0	170.0	175.0
0.0	58.84	54.43	50.03	45.10	38.88	32.92	28.77	25.66	21.77
22.5	57.29	53.14	48.73	43.03	37.07	31.88	27.74	24.63	21.26
45.0	55.73	51.32	46.92	41.99	36.03	31.36	27.22	24.11	20.48
67.5	53.66	49.25	45.10	40.44	35.51	30.59	26.70	23.33	19.96
90.0	51.58	46.92	43.55	39.66	34.48	30.33	25.92	23.07	19.18
112.5	49.77	46.40	43.03	38.88	34.22	29.29	25.40	22.29	18.40
135.0	48.73	45.10	41.21	37.85	33.44	29.03	24.88	22.03	19.18
157.5	48.47	44.58	41.47	37.59	33.18	29.03	25.14	22.03	19.44
180.0	50.29	46.14	43.29	38.88	34.99	30.33	26.44	23.07	19.96
202.5	51.32	47.44	43.81	40.18	34.99	30.85	26.44	23.33	20.22
225.0	52.36	48.73	45.10	40.96	36.29	31.62	27.22	24.11	20.48
247.5	53.92	50.03	46.92	43.03	37.33	32.14	27.48	24.63	21.26
270.0	55.73	52.10	47.95	43.81	37.85	32.66	28.25	24.37	22.29
292.5	56.77	52.88	48.47	43.81	38.36	32.66	28.00	24.63	22.55
315.0	56.25	51.58	47.95	43.55	38.10	32.14	28.25	24.88	22.03
337.5	57.03	52.62	48.99	44.33	37.85	32.40	28.25	25.14	22.29
360.0	58.84	54.43	50.03	45.10	38.88	32.92	28.77	25.66	21.77
$C/\gamma(^{\circ})$	180.0								
0.0	21.51								
22.5	22.55								
45.0	21.51								
67.5	21.00								
90.0	21.77								
112.5	21.77								
135.0	21.77								
157.5	21.26								
180.0	21.51								
202.5	22.55								
225.0	21.51								
247.5	21.00								
270.0	21.77								
292.5	21.77								
315.0	21.77								
337.5	21.26								
360.0	21.51								



## Photo Document



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