



Shenzhen Belling Efficiency Testing Lab



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**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.:

91569, 91581, 915XX-54-57K 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.

Complied by: Ike Li

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	Replacement Lamps for Outdoor Pole/Arm-Mounted Decorative Luminaires (UL Type B)
Model Number	91569, 91581, 915XX-54-57K
Rated Inputs	AC 100-277V 50/60Hz
Rated Power	54W
Nominal CCT	3000K / 5700K
Date of Receipt Samples	2018-03-07
Date of Test	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 ± 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 (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
91569	120.03	60	0.452	53.89	0.994
915XX-54-57K	120.01	60	0.460	54.87	0.994

3.1.2 Photometric data

Model Number	Luminous Flux (lm)	Efficacy (lm/W)	CCT (K)	CRI	R9
91569	6272.80	116.4	2912	82.1	6
915XX-54-57K	6666.71	121.5	5494	81.4	-4

3.1.3 Chromaticity Coordinate

Model Number	Duv	x	y	u'	v'
91569	-0.00038	0.4427	0.4050	0.2539	0.5226
915XX-54-57K	0.00291	0.3326	0.3470	0.2048	0.4805



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
91569	119.96	60	0.4516	53.85	0.994

3.2.2 Photometric data

Luminous Flux (lm)	Efficacy (lm/W)	Zonal Lumen in 0-90°(%lm)
6250.88	116.08	72.349

3.3 Additional Test

Model Number	Test Item	Test Voltage (V)	Frequency(Hz)	Test Result
91569	Power Factor	277	60	0.933
	THD	277	60	12.7%



4 Test Data

91569

Test Condition

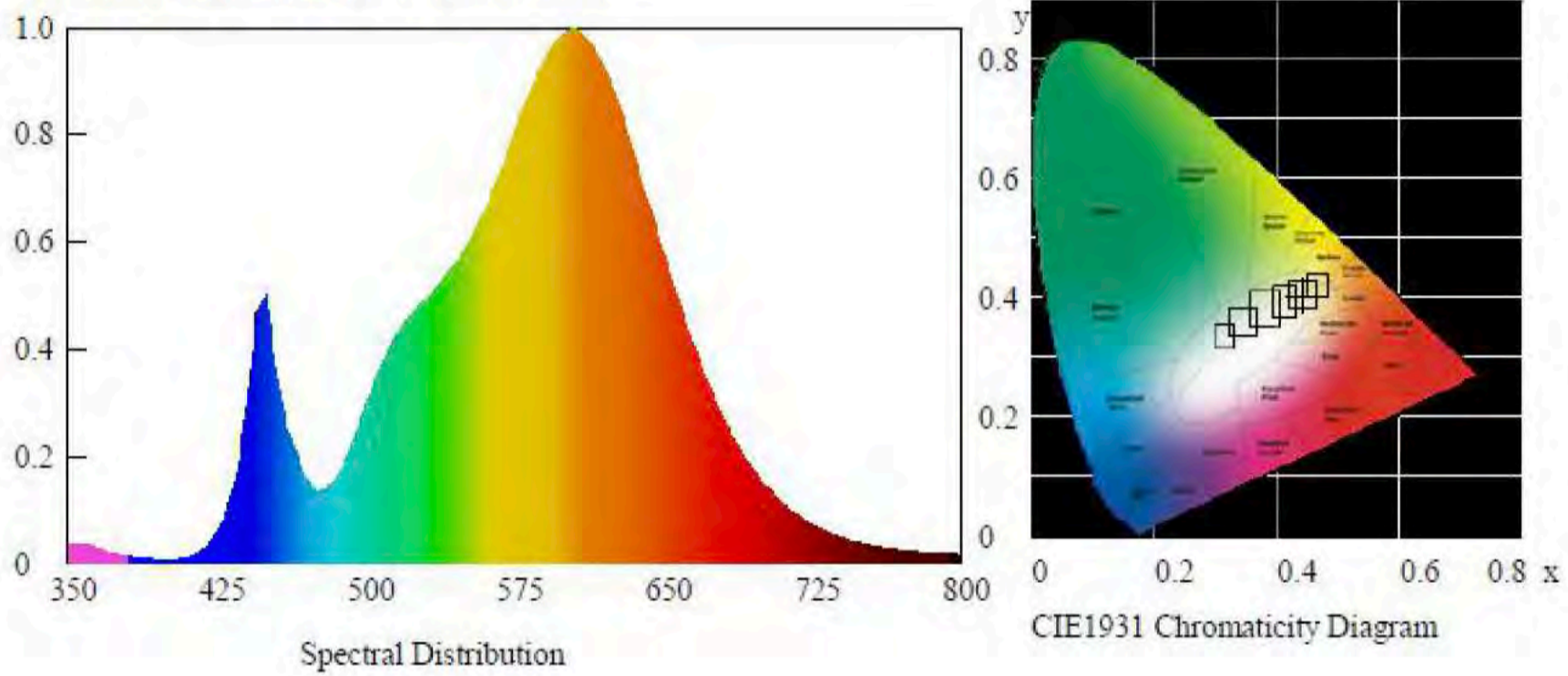
Temperature: 25°C

RH: 58%

Spectrum Range: 350-800 nm

Scan Step: 5 nm

Spectroradiometric Parameters

Chromaticity Coordinates: $x=0.4427$ $y=0.4050$ $u'=0.2539$ $v'=0.5226$

Correlated Color Temperature: 2912 K

Dominant Wavelength: 582.0 nm(E)

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

Luminous Flux: 6272.80 lm

Purity: 0.5459

Chromaticity Difference: -0.00038Duv

Peak Wavelength: 605.0 nm

Color Ratio: $K_r=45.7\%$ $K_g=47.4\%$ $K_b=6.9\%$

Bandwidth: 125.7nm

Radiant Flux: 20.795 W

Photosynthetically Active Radiation(PAR): 19.94W

Photosynthetic Photon Flux(PPF): 97.10 μ mol/sRendering Index: $R_a=82.1$

R1=80 R2=90 R3=97 R4=81 R5=81 R6=88 R7=83 R8=58

R9=6 R10=77 R11=81 R12=71 R13=83 R14=98 R15=73 Re=76

Electric Parameters

Voltage: 120.03 V

Current: 0.452 A

Power Factor: 0.994

Power: 53.89 W

Luminous Efficacy: 116.4 lm/W



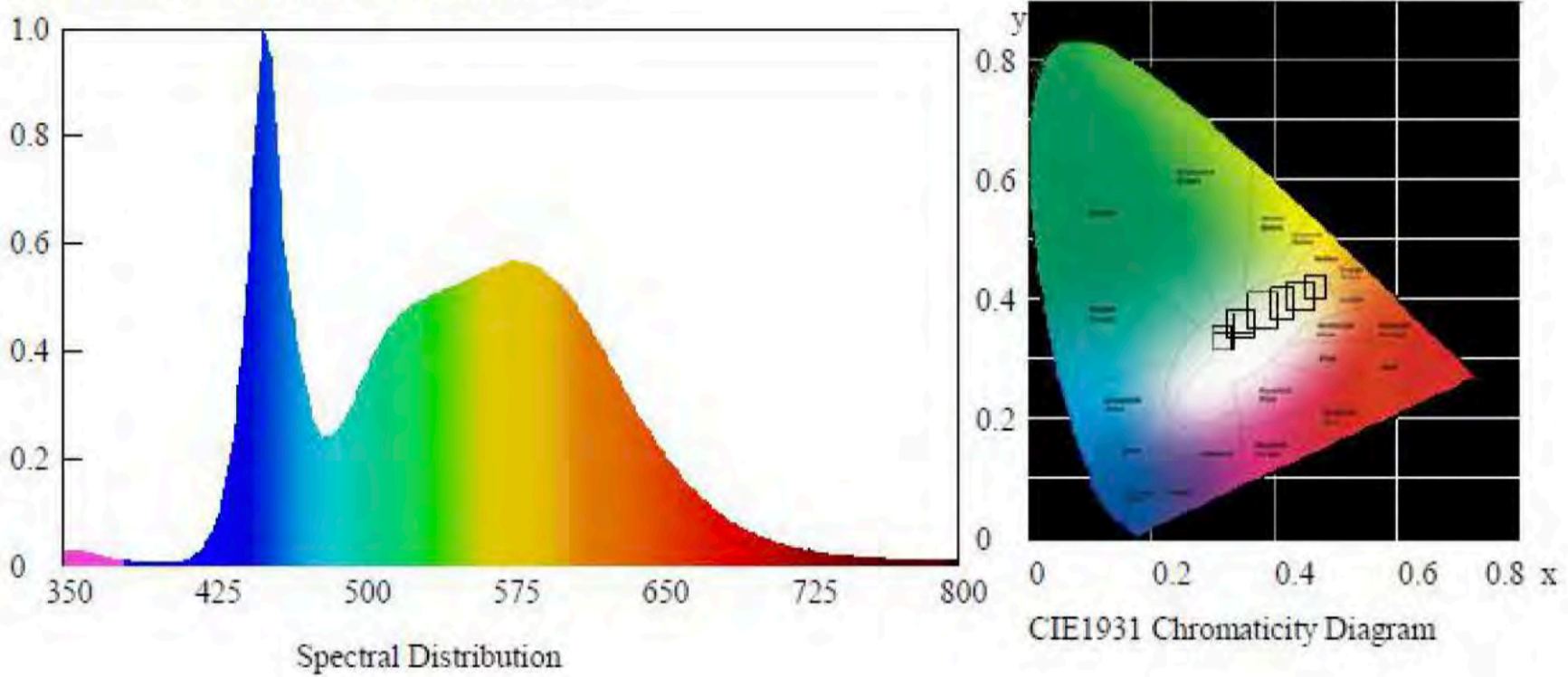
915XX-54-57K

Test Condition

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

RH: 58%
Scan Step: 5 nm

Spectroradiometric Parameters



Chromaticity Coordinates: $x=0.3326$ $y=0.3470$ $u'=0.2048$ $v'=0.4805$
 Correlated Color Temperature: 5494 K
 Colour Fidelity Index: $R_f=79$
 Luminous Flux: 6666.71 lm
 Chromaticity Difference: +0.00291Duv
 Color Ratio: $K_r=32.5\%$ $K_g=55.7\%$ $K_b=11.7\%$
 Bandwidth: 19.1nm
 Photosynthetically Active Radiation(PAR): 23.22W
 Rendering Index: $R_a=81.4$
 $R_1=79$ $R_2=87$ $R_3=92$ $R_4=81$ $R_5=80$ $R_6=82$ $R_7=86$ $R_8=64$
 $R_9=-4$ $R_{10}=69$ $R_{11}=80$ $R_{12}=58$ $R_{13}=82$ $R_{14}=96$ $R_{15}=74$ $R_e=74$

Dominant Wavelength: 551.0 nm(E)
 Gamut Index: $R_g=94$
 Purity: 0.0388
 Peak Wavelength: 450.0 nm
 Radiant Flux: 23.834 W
 Photosynthetic Photon Flux(PPF): 106.18 μ mol/s

Electric Parameters

Voltage: 120.01 V
Power Factor: 0.994
Current: 0.460 A
Power: 54.87 W

Luminous Efficacy: 121.5 lm/W

**Zonal Flux Diagram**

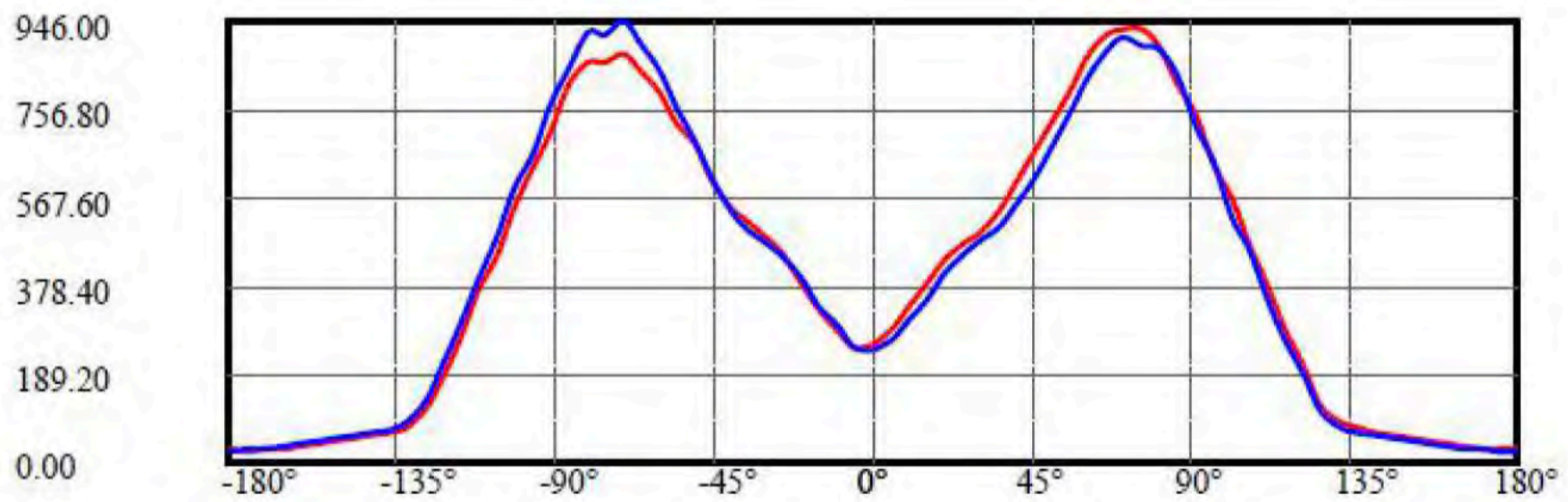
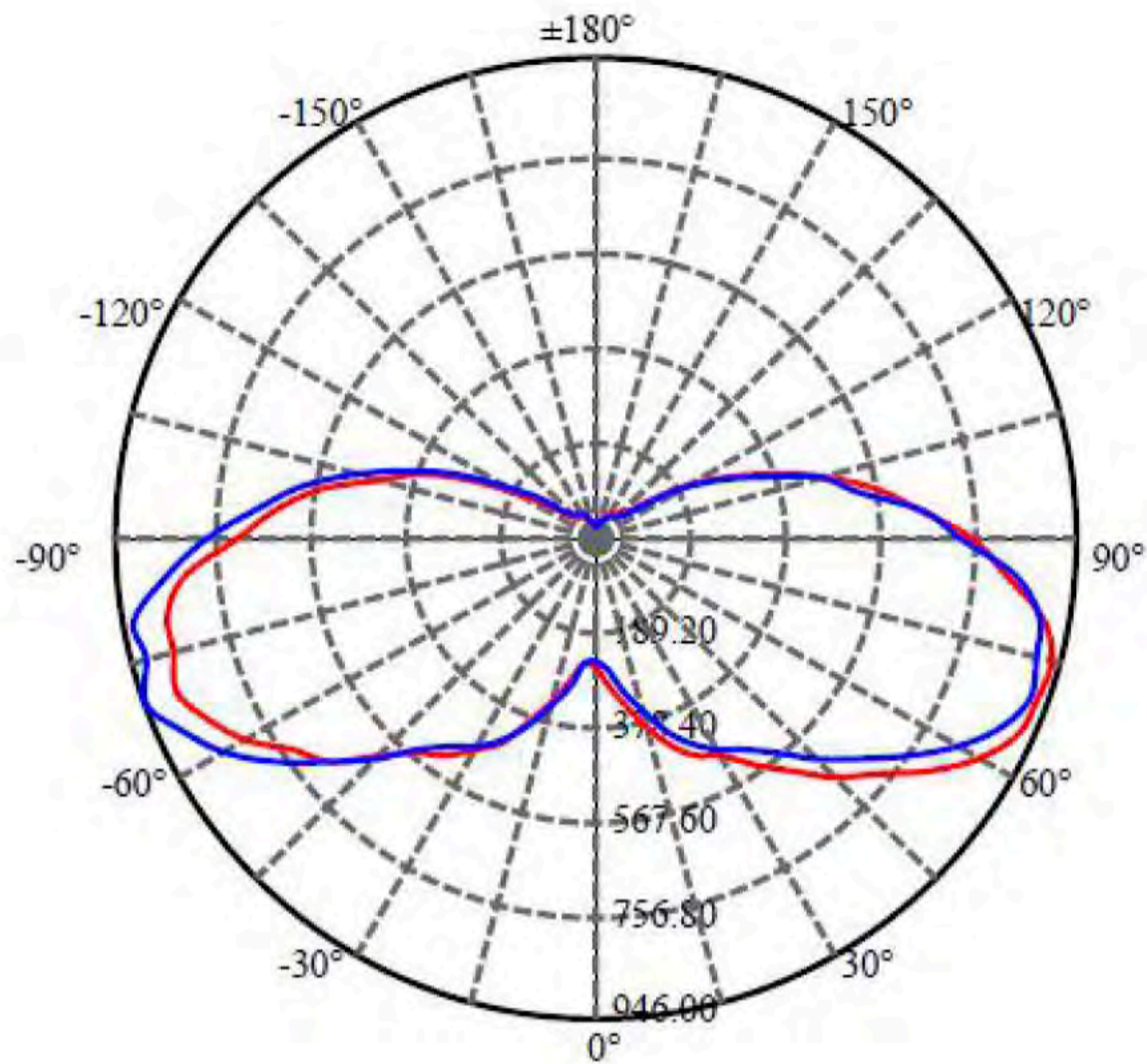
Zonal flux distribution table

$\gamma(^{\circ})$	Average I(cd)	Zonal F(lm)	Sum F(lm)	Eff Flux(%)	Eff Sum(%)
0.0	244.912	.000	.000	.000%	.000%
5.0	258.981	6.024	6.024	.096%	.096%
10.0	299.718	19.986	26.010	.320%	.416%
15.0	347.514	38.393	64.404	.614%	1.030%
20.0	398.325	61.468	125.871	.983%	2.014%
25.0	443.464	88.288	214.159	1.412%	3.426%
30.0	472.985	115.977	330.137	1.855%	5.281%
35.0	508.082	144.469	474.606	2.311%	7.593%
40.0	549.439	176.439	651.045	2.823%	10.415%
45.0	610.700	214.809	865.854	3.436%	13.852%
50.0	680.682	260.943	1126.797	4.174%	18.026%
55.0	750.500	311.187	1437.983	4.978%	23.004%
60.0	823.580	363.844	1801.827	5.821%	28.825%
65.0	881.824	414.587	2216.414	6.632%	35.458%
70.0	911.346	454.042	2670.457	7.264%	42.721%
75.0	904.451	474.620	3145.077	7.593%	50.314%
80.0	890.122	480.178	3625.255	7.682%	57.996%
85.0	831.991	467.939	4093.194	7.486%	65.482%
90.0	735.731	429.255	4522.449	6.867%	72.349%
95.0	648.731	379.077	4901.526	6.064%	78.413%
100.0	559.432	328.287	5229.813	5.252%	83.665%
105.0	467.802	274.859	5504.671	4.397%	88.062%
110.0	375.438	220.409	5725.081	3.526%	91.588%
115.0	285.275	167.297	5892.377	2.676%	94.265%
120.0	198.893	117.702	6010.079	1.883%	96.148%
125.0	123.565	74.535	6084.614	1.192%	97.340%
130.0	82.632	44.834	6129.448	.717%	98.057%
135.0	67.537	30.344	6159.792	.485%	98.543%
140.0	60.706	23.745	6183.537	.380%	98.923%
145.0	55.637	19.411	6202.948	.311%	99.233%
150.0	50.274	15.596	6218.544	.250%	99.483%
155.0	43.623	11.883	6230.427	.190%	99.673%
160.0	37.591	8.518	6238.945	.136%	99.809%
165.0	32.375	5.766	6244.711	.092%	99.901%
170.0	28.707	3.623	6248.334	.058%	99.959%
175.0	25.169	1.927	6250.262	.031%	99.990%
180.0	26.278	.615	6250.877	.010%	100.000%



Luminous Intensity Distribution Diagram

Light Distribution Curve [Unit:cd]



C0/C180: ———

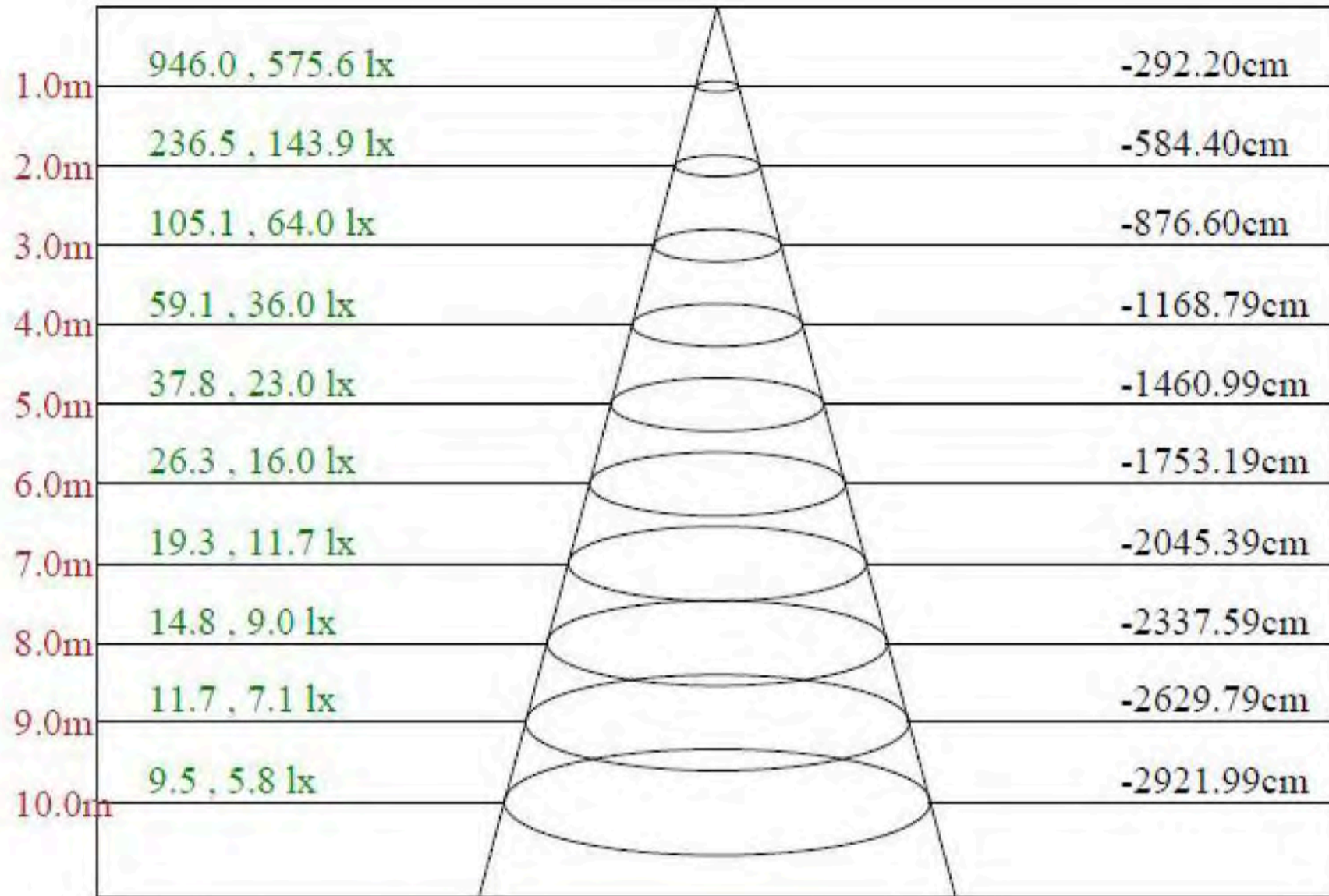
C90/C270: ———

Field angle(10%Imax):C0/180Left:202.9 Right:54.4
:C90/270Left:59.3 Right:197.7

Beam Angle(50%Imax):C0/180Left:179.0 Right:30.2
:C90/270Left:35.7 Right:173.9



Lux distance Curve



Max , Ave Beam angle of C225plane248.79

**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	253.52	289.51	334.37	385.50	435.05	469.22	492.96	541.47	600.67
22.5	249.35	285.08	328.90	379.76	426.97	461.40	488.26	536.25	589.98
45.0	246.48	279.34	321.33	373.76	420.71	453.57	480.70	516.95	565.72
67.5	244.39	272.82	313.77	363.07	412.62	448.62	477.83	511.73	556.33
90.0	242.57	262.91	306.99	350.81	403.75	445.22	478.87	507.04	552.94
112.5	241.52	253.78	293.95	339.85	394.89	440.79	467.92	499.48	537.03
135.0	240.74	244.13	283.25	332.81	384.19	436.62	465.57	497.91	525.82
157.5	240.74	237.09	272.04	321.07	374.54	431.14	462.18	496.35	523.47
180.0	253.52	247.26	282.73	329.94	384.71	447.05	480.17	519.30	548.77
202.5	249.35	242.04	277.52	325.25	376.37	434.79	470.00	503.39	527.38
225.0	246.48	240.74	278.30	325.51	371.41	430.62	464.53	498.95	527.38
247.5	244.39	244.39	284.56	328.38	379.76	432.44	465.57	501.30	538.86
270.0	242.57	249.35	291.08	335.42	392.54	439.49	470.52	498.43	539.90
292.5	241.52	258.21	300.47	346.89	399.58	439.23	470.79	497.91	546.95
315.0	240.74	266.04	308.55	357.85	406.10	441.05	466.35	499.48	551.64
337.5	240.74	271.00	317.68	364.37	410.01	444.18	465.57	503.39	558.16
360.0	253.52	289.51	334.37	385.50	435.05	469.22	492.96	541.47	600.67
C/γ(°)	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0
0.0	667.45	726.39	802.03	866.71	919.40	925.92	931.14	895.66	813.51
22.5	652.58	714.65	782.99	848.98	899.06	911.58	918.88	894.62	816.37
45.0	630.41	701.09	773.34	837.76	895.93	900.36	917.83	890.19	823.68
67.5	610.85	668.75	737.87	807.25	866.97	880.02	900.10	865.15	816.11
90.0	610.33	675.27	750.91	822.63	879.75	912.10	895.40	887.06	825.76
112.5	601.20	670.31	749.08	830.98	881.32	918.36	885.23	876.36	801.51
135.0	586.85	658.58	715.96	796.55	857.58	905.58	883.15	878.45	830.46
157.5	578.24	659.62	730.04	805.94	877.15	924.62	911.31	913.40	870.37
180.0	604.59	680.75	729.78	791.34	842.20	877.41	859.15	855.76	809.59
202.5	574.33	651.27	707.87	782.21	846.89	900.62	890.45	894.10	858.11
225.0	591.02	676.31	748.04	827.85	892.01	946.00	921.75	911.84	881.84
247.5	606.15	684.14	745.17	832.55	895.14	935.83	914.97	912.10	863.06
270.0	611.63	686.22	765.51	841.15	900.62	945.74	917.31	922.01	844.28
292.5	609.80	678.92	755.34	826.55	884.19	911.05	899.32	883.93	807.77
315.0	612.15	664.32	736.04	808.55	859.41	865.67	880.54	845.59	792.90
337.5	623.63	694.31	778.03	850.28	911.58	920.70	944.70	915.75	856.54
360.0	667.45	726.39	802.03	866.71	919.40	925.92	931.14	895.66	813.51
C/γ(°)	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0
0.0	741.52	639.54	565.46	470.00	378.71	287.43	204.75	125.20	88.94
22.5	726.13	625.97	538.08	450.96	356.81	266.82	189.36	116.07	82.94
45.0	723.78	628.32	545.90	464.26	368.80	274.91	199.53	123.63	84.51
67.5	707.09	633.28	531.04	452.53	353.94	273.08	192.75	119.98	80.86
90.0	717.00	645.01	523.21	458.00	347.68	265.52	187.53	114.50	76.94
112.5	727.96	619.45	539.64	447.31	346.37	264.74	178.40	104.59	72.25
135.0	736.82	629.63	557.64	444.44	355.76	266.56	181.01	106.94	73.29
157.5	746.21	658.32	574.33	454.61	380.02	280.38	187.01	105.63	71.73
180.0	706.05	634.58	547.99	444.18	368.28	273.60	184.92	115.54	76.68
202.5	762.65	682.31	597.28	491.39	400.88	296.56	204.22	125.72	80.33
225.0	778.03	702.13	608.76	497.39	412.36	316.38	218.57	137.19	84.77
247.5	766.82	672.92	594.41	484.87	404.28	304.64	208.92	134.06	85.29
270.0	765.51	663.79	585.55	486.43	394.10	302.82	210.22	134.85	88.16
292.5	717.26	636.41	540.16	468.18	371.67	295.77	208.14	136.41	92.59
315.0	691.70	627.54	525.30	459.31	365.41	284.82	202.66	133.02	88.68
337.5	757.17	680.49	576.16	510.95	401.93	310.38	224.31	143.71	94.16
360.0	741.52	639.54	565.46	470.00	378.71	287.43	204.75	125.20	88.94



$C/\gamma(^{\circ})$	135.0	140.0	145.0	150.0	155.0	160.0	165.0	170.0	175.0
0.0	74.33	66.51	61.29	54.51	46.69	40.43	34.69	31.30	26.60
22.5	70.94	64.16	58.16	51.38	44.34	38.08	33.39	29.73	25.56
45.0	69.38	62.34	56.60	50.60	43.04	37.04	32.34	28.95	25.04
67.5	67.03	60.25	54.77	49.04	42.51	36.52	31.56	28.17	24.78
90.0	63.90	57.90	53.21	47.99	41.73	36.25	31.04	27.39	23.74
112.5	62.34	56.86	52.95	47.99	41.21	35.47	30.52	26.87	22.43
135.0	61.82	55.82	51.64	47.21	40.95	35.21	30.00	26.60	23.47
157.5	61.03	55.56	51.12	46.43	40.43	35.21	30.26	26.34	23.74
180.0	63.38	57.12	52.43	47.73	42.25	36.78	32.08	28.43	24.00
202.5	64.68	58.16	53.21	48.77	43.04	37.30	31.82	28.17	24.52
225.0	66.77	59.47	54.77	49.82	43.82	37.56	32.34	28.43	25.04
247.5	68.34	61.29	56.60	51.90	44.86	38.60	32.86	29.21	25.82
270.0	70.94	63.64	58.16	52.95	45.64	39.38	33.65	29.47	27.39
292.5	72.25	64.16	58.16	52.69	46.17	39.38	33.65	29.47	27.13
315.0	70.94	63.64	58.16	52.69	45.64	39.38	33.91	30.26	26.87
337.5	72.51	64.42	58.95	52.69	45.64	38.86	33.91	30.52	26.60
360.0	74.33	66.51	61.29	54.51	46.69	40.43	34.69	31.30	26.60
$C/\gamma(^{\circ})$	180.0								
0.0	26.60								
22.5	26.87								
45.0	26.34								
67.5	25.82								
90.0	26.08								
112.5	26.08								
135.0	26.87								
157.5	25.56								
180.0	26.60								
202.5	26.87								
225.0	26.34								
247.5	25.82								
270.0	26.08								
292.5	26.08								
315.0	26.87								
337.5	25.56								
360.0	26.60								



Photo Document



End of test report