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.:

91691, 91577, 9169X-27-57K 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.

Ike.li

Jasonzhou

Complied by: Ike Li **Review by: Jason zhou**

Project Engineer **Technical Manager**

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	91691, 91577, 9169X-27-57K
Rated Inputs	AC 100-277V 50/60Hz
Rated Power	27W
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
Goniophotometeric 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°C ±1°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
91691	120.02	60	0.224	26.58	0.987
9169X-27-57K	120.01	60	0.227	26.97	0.990

3.1.2 Photometric data

Model Number	Luminous Flux (lm)	Efficacy (lm/W)	CCT (K)	CRI	R9
91691	3077.96	115.8	2903	82.2	6
9169X-27-57K	3241.79	120.2	5456	81.2	-4

3.1.3 Chromaticity Coordinate

Model Number	Duv	x	y	u'	v'
91691	-0.00049	0.4433	0.4049	0.2543	0.5227
9169X-27-57K	0.00286	0.3336	0.3477	0.2051	0.4810

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
91691	120.12	60	0.2233	26.504	0.9879

3.2.2 Photometric data

Luminous Flux (lm)	Efficacy (lm/W)	Zonal Lumen in 0-90°(%lm)
3064.27	115.62	84.745

3.3 Additional Test

Model Number	Test Item	Test Voltage (V)	Frequency(Hz)	Test Result
91691	Power Factor	277	60	0.927
	THD	277	60	12.2%

4 Test Data

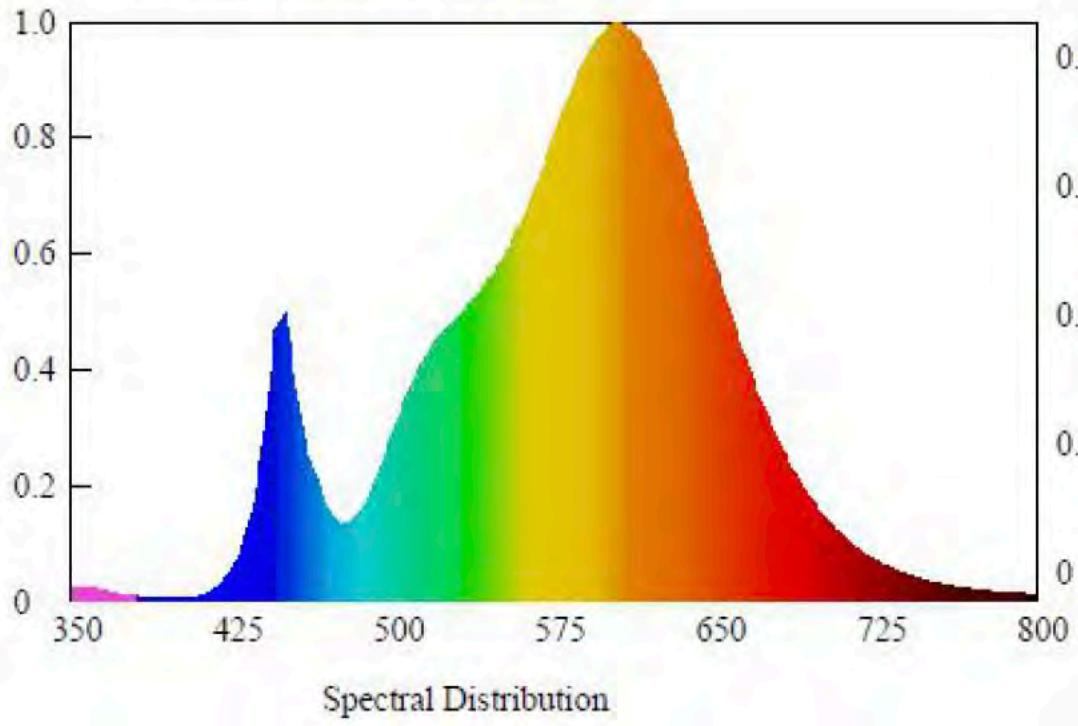
91691

Test Condition

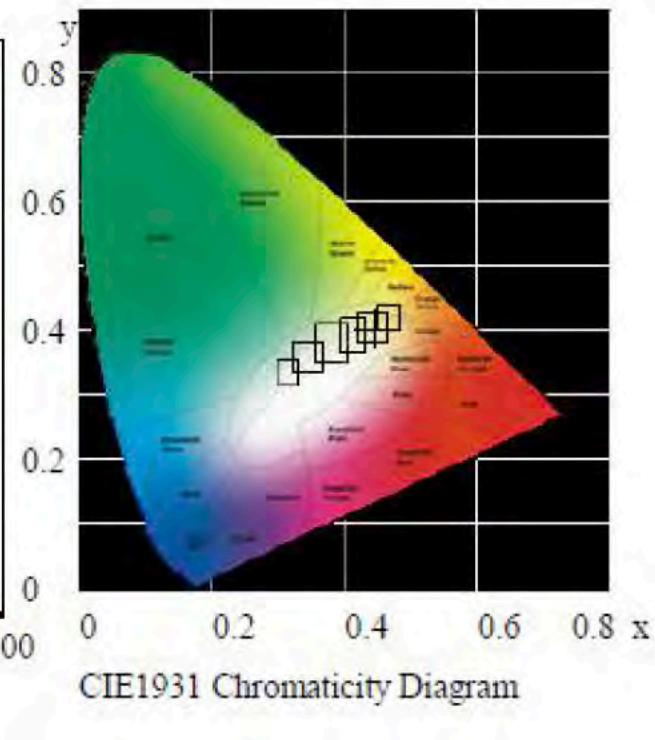
Temperature: 25°C RH: 58%

Spectrum Range: 350-800 nm Scan Step: 5 nm

Spectroradiometric Parameters



Spectral Distribution



CIE1931 Chromaticity Diagram

Chromaticity Coordinates: x=0.4433 y=0.4049 u'=0.2543 v'=0.5227

Correlated Color Temperature: 2903 K Dominant Wavelength: 582.0 nm(E)

Colour Fidelity Index: Rf=81 Gamut Index: Rg=97

Luminous Flux: 3077.96 lm Purity: 0.5478

Chromaticity Difference: -0.00049Duv Peak Wavelength: 605.0 nm

Color Ratio: Kr=45.8% Kg=47.4% Kb=6.8%

Bandwidth: 125.3nm Radiant Flux: 10.085 W

Photosynthetically Active Radiation(PAR): 9.72W Photosynthetic Photon Flux(PPF):47.34μmol/s

Rendering Index: Ra=82.2

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: 120.02 V Current: 0.224 A

Power Factor: 0.987 Power: 26.58 W

Luminous Efficacy: 115.8 lm/W

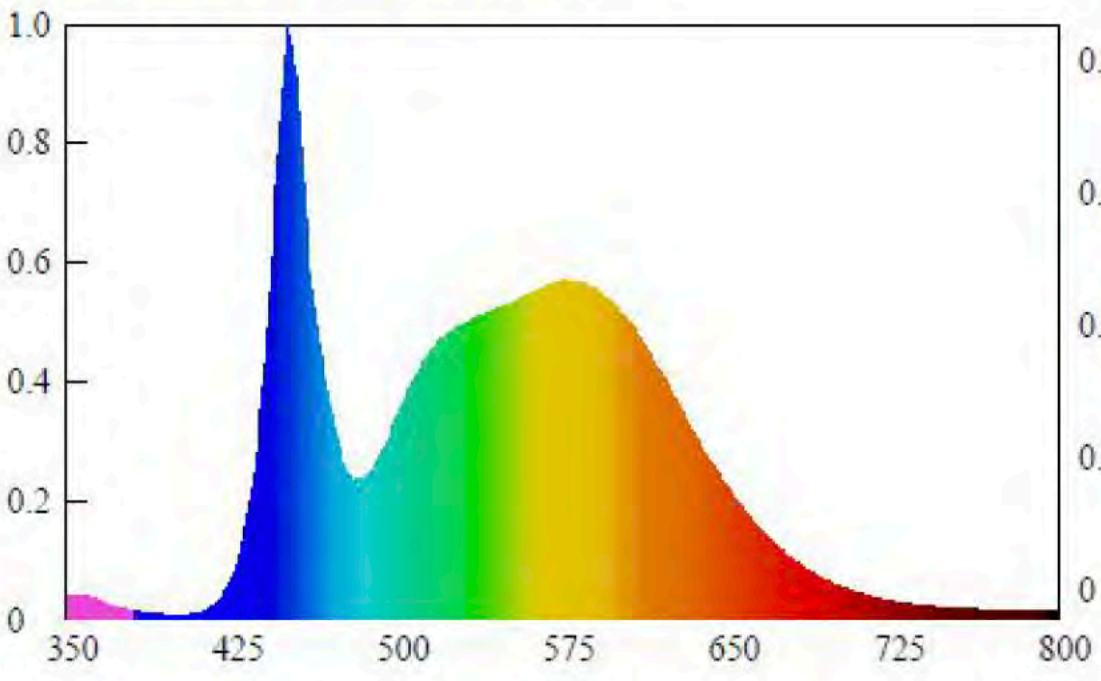
9169X-27-57K

Test Condition

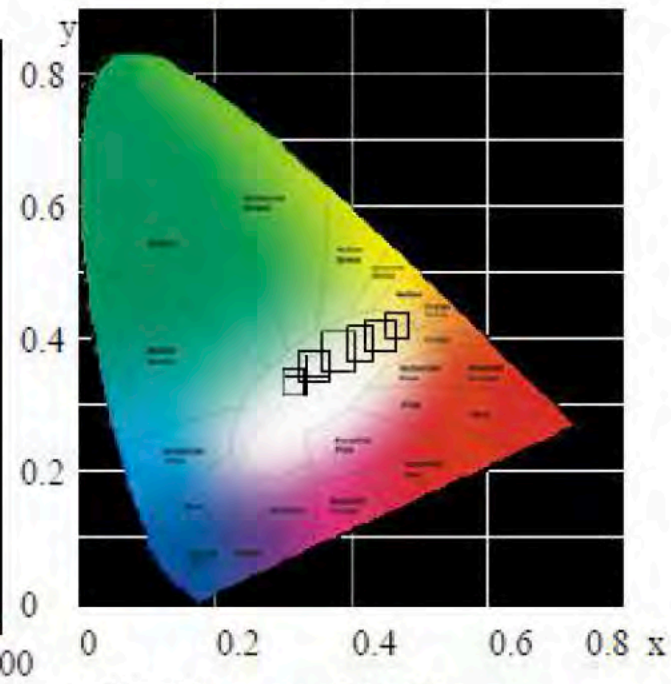
Temperature: 25°C RH: 58%

Spectrum Range: 350-800 nm Scan Step: 5 nm

Spectroradiometric Parameters



Spectral Distribution



CIE1931 Chromaticity Diagram

Chromaticity Coordinates: x=0.3336 y=0.3477 u'=0.2051 v'=0.481

Correlated Color Temperature: 5456 K Dominant Wavelength: 554.0 nm(E)

Colour Fidelity Index: Rf=79 Gamut Index: Rg=94

Luminous Flux: 3241.79 lm Purity: 0.0442

Chromaticity Difference: +0.00286Duv Peak Wavelength: 450.0 nm

Color Ratio: Kr=32.6% Kg=55.8% Kb=11.6%

Bandwidth: 20nm Radiant Flux: 11.352 W

Photosynthetically Active Radiation(PAR): 10.99W Photosynthetic Photon Flux(PPF):50.27μmol/s

Rendering Index: Ra=81.2

R1=79	R2=87	R3=92	R4=81	R5=80	R6=81	R7=86	R8=64
R9=-4	R10=68	R11=80	R12=58	R13=82	R14=95	R15=73	Re=73

Electric Parameters

Voltage: 120.01 V Current: 0.227 A

Power Factor: 0.990 Power: 26.97 W

Luminous Efficacy: 120.2 lm/W

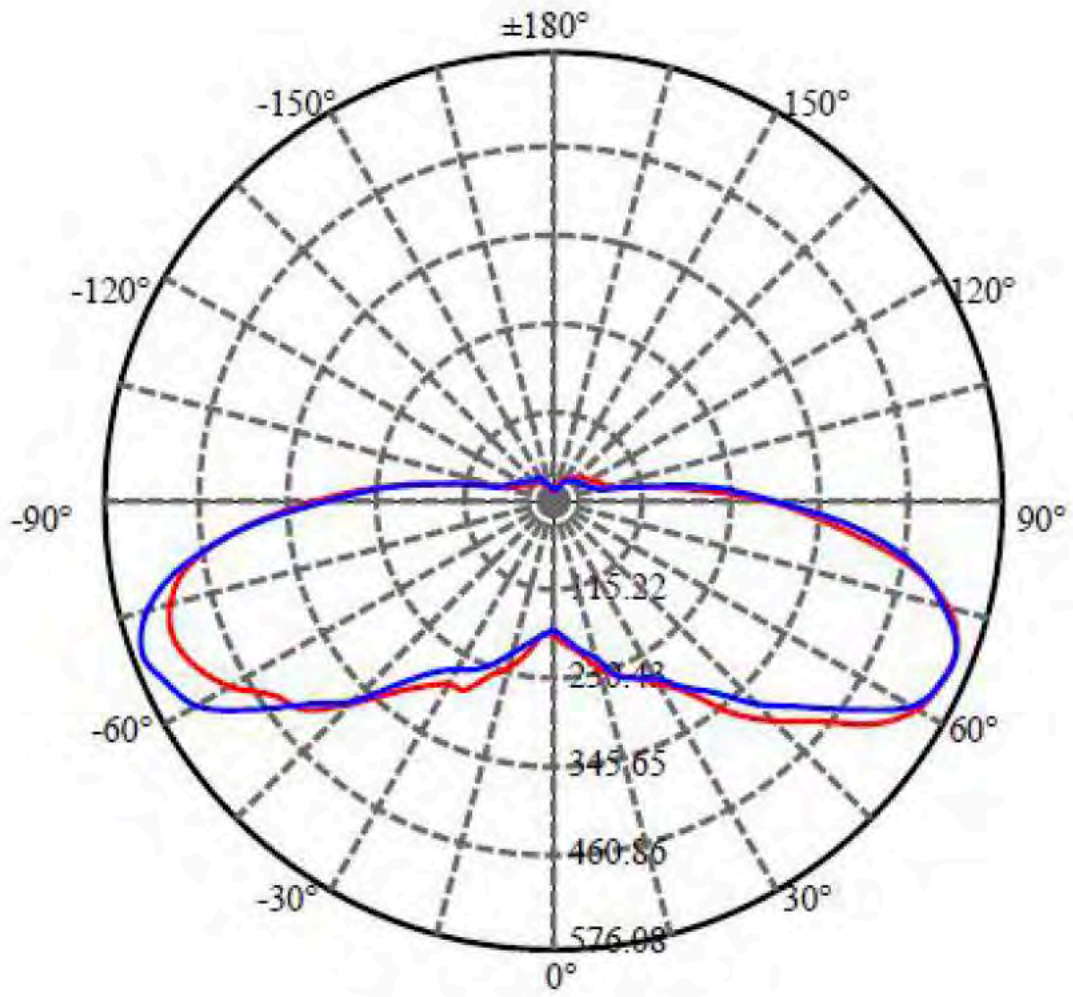
Zonal Flux Diagram

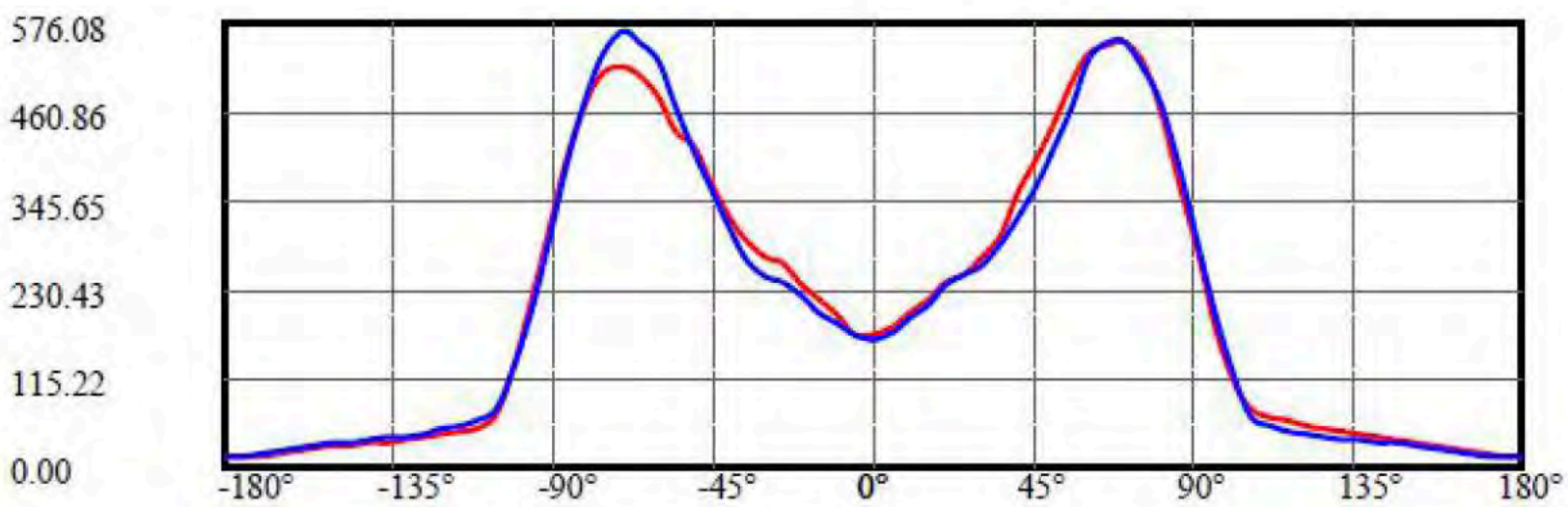
Zonal flux distribution table

γ(°)	Average I(cd)	Zonal F(lm)	Sum F(lm)	Eff Flux(%)	Eff Sum(%)
0.0	167.118	.000	.000	.000%	.000%
5.0	173.312	4.070	4.070	.133%	.133%
10.0	191.198	13.040	17.109	.426%	.558%
15.0	209.763	23.785	40.894	.776%	1.335%
20.0	230.791	36.308	77.202	1.185%	2.519%
25.0	248.160	50.233	127.435	1.639%	4.159%
30.0	258.923	64.172	191.607	2.094%	6.253%
35.0	281.862	79.634	271.241	2.599%	8.852%
40.0	317.598	100.015	371.256	3.264%	12.116%
45.0	367.223	126.800	498.057	4.138%	16.254%
50.0	414.795	158.018	656.075	5.157%	21.410%
55.0	469.739	192.327	848.402	6.276%	27.687%
60.0	521.988	229.235	1077.637	7.481%	35.168%
65.0	544.462	259.256	1336.893	8.461%	43.628%
70.0	552.298	277.707	1614.600	9.063%	52.691%
75.0	530.503	283.027	1897.626	9.236%	61.928%
80.0	480.949	270.636	2168.263	8.832%	70.760%
85.0	398.622	239.001	2407.264	7.800%	78.559%
90.0	293.643	189.548	2596.811	6.186%	84.745%
95.0	205.014	136.536	2733.347	4.456%	89.201%
100.0	120.563	88.467	2821.815	2.887%	92.088%
105.0	71.474	51.384	2873.198	1.677%	93.765%
110.0	56.604	33.478	2906.676	1.093%	94.857%
115.0	51.356	27.336	2934.012	.892%	95.749%
120.0	46.733	23.846	2957.858	.778%	96.527%
125.0	42.306	20.581	2978.439	.672%	97.199%
130.0	39.361	17.757	2996.196	.579%	97.778%
135.0	36.951	15.420	3011.616	.503%	98.282%
140.0	34.737	13.274	3024.890	.433%	98.715%
145.0	32.310	11.186	3036.076	.365%	99.080%
150.0	29.293	9.071	3045.147	.296%	99.376%
155.0	25.794	6.971	3052.119	.228%	99.603%
160.0	22.403	5.055	3057.174	.165%	99.768%
165.0	19.386	3.444	3060.617	.112%	99.881%
170.0	17.065	2.162	3062.780	.071%	99.951%
175.0	14.655	1.135	3063.915	.037%	99.988%
180.0	15.209	.357	3064.271	.012%	100.000%

Luminous Intensity Distribution Diagram

Light Distribution Curve [Unit:cd]





C0/C180:

C90/C270:

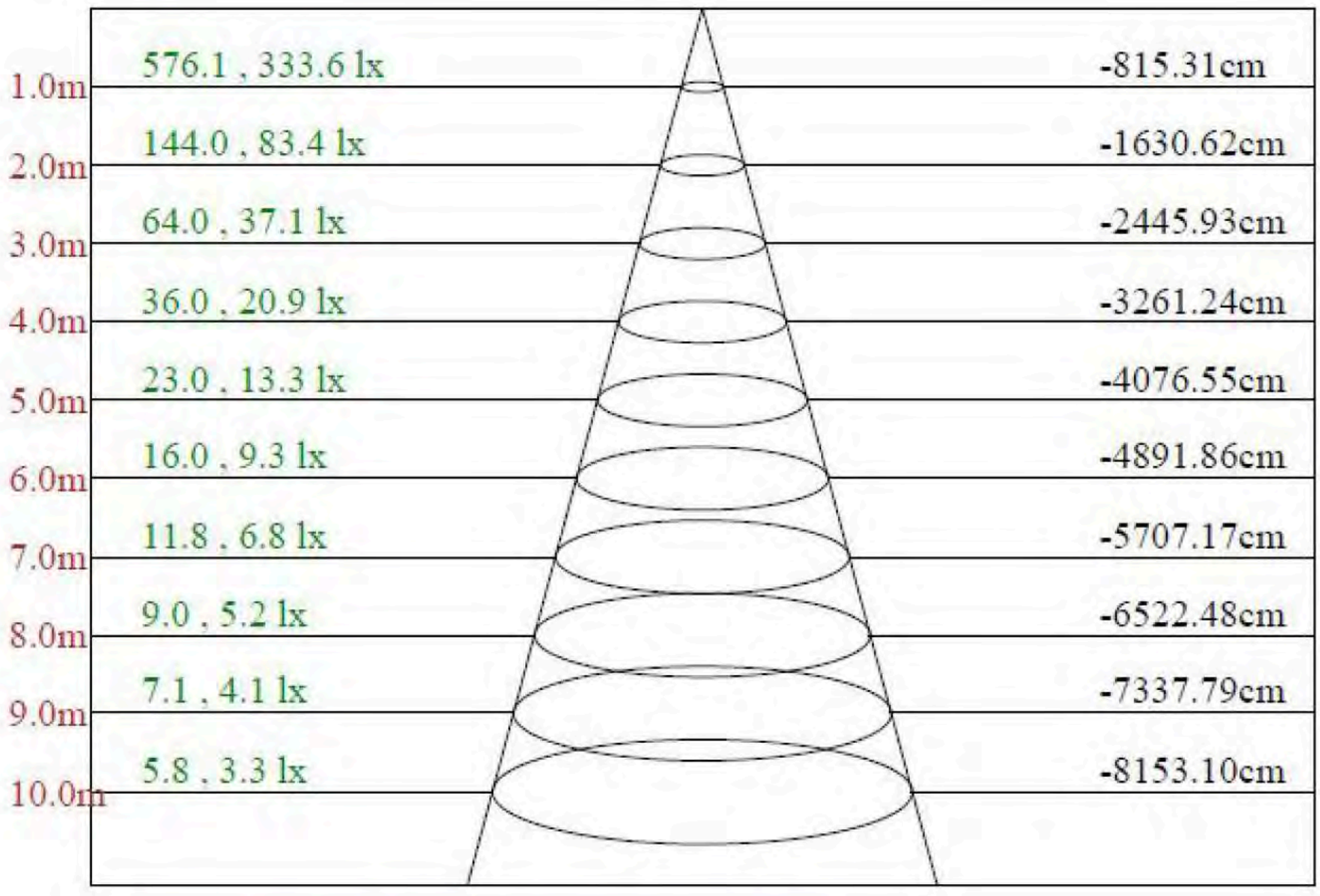
Field angle(10%Imax):C0/180Left:179.0 Right:49.0

:C90/270Left:43.2 Right:178.1

Beam Angle(50%Imax):C0/180Left:161.7 Right:19.9

:C90/270Left:20.5 Right:160.0

Lux distance Curve



Max . Ave Beam angle of C337.5plane207.80

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	172.79	182.79	198.79	218.49	238.20	250.48	270.47	300.46	353.01
22.5	170.22	181.65	197.07	217.35	236.77	250.77	270.19	301.32	346.73
45.0	168.22	179.93	195.64	217.06	238.77	245.63	265.05	289.04	328.45
67.5	166.80	177.94	193.93	213.64	239.91	245.34	262.19	286.75	319.03
90.0	165.65	175.08	193.07	210.78	237.34	251.05	260.76	289.32	320.45
112.5	165.08	172.79	191.07	209.35	231.06	251.91	257.34	281.04	314.17
135.0	164.23	166.80	189.93	209.35	228.77	255.05	259.62	277.90	304.75
157.5	163.94	164.23	187.65	207.92	227.63	254.76	260.76	275.61	304.75
180.0	172.79	171.37	195.93	218.49	237.91	266.19	272.76	292.18	321.31
202.5	170.22	168.80	191.93	214.21	232.77	261.62	264.48	279.61	305.89
225.0	168.22	169.94	189.65	207.92	227.35	253.62	255.34	276.19	305.32
247.5	166.80	170.22	187.36	204.21	223.92	244.77	253.05	276.47	306.17
270.0	165.65	171.37	187.36	200.78	223.06	240.20	248.48	269.33	307.60
292.5	165.08	173.08	186.50	199.93	223.06	233.92	244.20	268.19	308.74
315.0	164.23	173.37	185.93	201.93	222.49	231.34	247.34	270.76	313.60
337.5	163.94	173.65	187.36	204.78	223.63	233.92	250.77	275.61	321.60
360.0	172.79	182.79	198.79	218.49	238.20	250.48	270.47	300.46	353.01

C/γ(°)	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0
0.0	400.71	442.12	500.96	536.66	548.66	549.51	523.52	460.98	364.44
22.5	383.57	428.42	498.96	540.95	554.66	554.94	527.24	461.83	363.30
45.0	375.58	435.27	520.95	556.94	556.37	558.65	532.95	471.54	386.72
67.5	364.44	411.56	482.68	527.52	541.80	545.23	514.67	457.83	379.29
90.0	366.44	409.85	466.97	528.09	550.37	552.37	516.38	470.69	385.00
112.5	365.87	415.56	458.12	522.10	555.80	561.51	534.95	487.25	403.57
135.0	357.87	409.28	448.69	508.67	555.80	564.65	536.66	499.25	417.85
157.5	357.30	409.57	454.69	520.38	552.94	557.23	541.52	507.82	420.13
180.0	368.72	414.99	437.84	480.11	507.24	517.53	510.10	475.54	404.42
202.5	353.30	403.00	430.70	490.39	533.23	550.09	544.09	508.39	438.13
225.0	363.87	415.28	456.98	524.38	560.37	567.51	554.08	515.53	446.41
247.5	361.58	412.42	463.26	522.95	552.94	560.08	541.23	495.82	415.85
270.0	363.01	406.42	468.12	524.95	550.94	564.08	537.52	483.25	395.86
292.5	364.44	404.42	464.97	510.96	515.81	532.95	513.81	457.55	379.01
315.0	355.58	389.57	456.69	505.82	510.67	524.38	509.81	452.41	371.86
337.5	373.29	428.99	505.24	550.94	563.79	576.08	549.51	489.54	406.14
360.0	400.71	442.12	500.96	536.66	548.66	549.51	523.52	460.98	364.44

C/γ(°)	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0
0.0	273.61	179.93	108.53	76.26	65.12	59.69	53.70	48.84	45.41
22.5	260.48	164.23	95.97	67.98	61.12	56.27	51.12	46.55	43.70
45.0	285.61	193.64	118.24	73.12	58.84	52.84	47.98	43.98	41.41
67.5	274.47	192.50	113.67	68.55	55.69	50.27	45.70	41.99	39.13
90.0	281.61	198.21	113.39	63.12	52.27	47.41	43.41	39.41	37.42
112.5	281.61	190.22	103.39	57.98	50.27	45.70	41.70	38.27	35.42
135.0	301.03	209.07	111.96	62.55	49.41	45.41	41.41	37.42	34.56
157.5	307.32	211.35	107.39	59.12	48.84	44.27	40.56	36.56	34.27
180.0	303.32	217.06	124.81	67.98	51.70	46.84	42.84	38.84	35.42
202.5	338.73	244.48	144.52	79.11	53.98	47.98	43.70	39.70	36.84
225.0	341.30	249.05	150.80	84.26	55.98	49.13	44.56	40.56	37.42
247.5	306.75	217.64	130.24	73.97	57.12	51.41	47.41	42.27	38.84
270.0	290.18	205.64	126.81	76.54	59.69	54.55	49.41	44.27	41.13
292.5	277.90	204.78	126.24	77.97	61.12	55.98	50.84	45.41	42.27
315.0	269.90	191.93	120.81	72.26	61.69	56.55	51.70	46.55	43.13
337.5	304.46	210.50	132.24	82.83	62.83	57.41	51.70	46.27	43.41
360.0	273.61	179.93	108.53	76.26	65.12	59.69	53.70	48.84	45.41

C/γ(°)	135.0	140.0	145.0	150.0	155.0	160.0	165.0	170.0	175.0
0.0	42.84	40.27	37.13	33.13	28.85	25.42	21.99	19.42	15.99
22.5	41.13	38.27	35.42	31.13	27.13	23.42	20.85	18.28	15.14
45.0	38.84	36.27	33.70	30.28	25.99	22.56	19.42	17.14	14.57
67.5	36.56	34.27	31.99	28.56	25.13	21.71	18.85	16.85	14.00
90.0	34.84	32.56	30.56	27.70	24.28	20.85	18.28	15.99	13.14
112.5	33.13	31.70	29.42	26.85	23.42	20.28	17.14	15.14	12.57
135.0	32.56	30.85	28.56	25.99	22.85	19.71	16.85	15.14	12.85
157.5	32.27	30.28	28.28	25.71	22.85	19.99	17.42	15.14	13.71
180.0	33.42	31.42	29.42	26.85	23.99	21.14	18.57	15.99	13.71
202.5	34.27	32.27	29.99	27.70	24.56	21.42	18.85	16.28	14.57
225.0	35.42	33.42	31.13	28.56	25.42	21.99	19.42	17.14	14.57
247.5	36.84	34.84	32.56	29.99	26.28	23.13	19.71	17.71	15.14
270.0	38.56	36.56	33.99	31.13	27.70	23.99	20.28	17.99	15.99
292.5	39.70	37.13	34.56	31.70	27.99	24.28	20.85	18.28	15.99
315.0	39.99	37.42	34.84	31.42	27.99	24.28	20.85	18.28	16.28
337.5	40.84	38.27	35.42	31.99	28.28	24.28	20.85	18.28	16.28
360.0	42.84	40.27	37.13	33.13	28.85	25.42	21.99	19.42	15.99

C/γ(°)	180.0
0.0	15.42
22.5	15.71
45.0	15.14
67.5	14.85
90.0	14.85
112.5	15.42
135.0	15.14
157.5	15.14
180.0	15.42
202.5	15.71
225.0	15.14
247.5	14.85
270.0	14.85
292.5	15.42
315.0	15.14
337.5	15.14
360.0	15.42

Photo Document

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