

IES LM-79-08
MEASUREMENT AND TEST REPORT
For

P.Q.L., Inc.

Test Model: 90969

Report Type:	Electrical and Photometric tests including: Luminous Flux, Color, Luminous Intensity Distribution
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	R2KS151229050-10
Test Date:	2016-01-03 to 2016-01-04
Report Date:	2016-01-06
Reviewed By:	Jeanne Han/Safety Manager <i>Jeanne Han</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008
Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
Accreditation:	The NVLAP Lab Code is 200707-0.



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1. Product Description

General Information:

One sample was received on 2015-12-29 and used for testing.

Model Tested: 90969
 Manufacturer: P.Q.L., Inc.
 Product Designation: A19 GU24 BASE
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120 V AC 60Hz
 Rated Power: 9W
 Nominal CCT: 2700K
 Nominal Lumen Output: 800 lm

2. Standards Used

- IESNA LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting

3. Description of Test Equipment

Device	Manufacturer	Model No	Serial No	Test Range	Calibration date	Calibration due date
2.0m integrating sphere	EVERFINE	R98	11010018	R98	2015-11-09	2016-11-08
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2015-03-25	2016-03-24
Digital Power Meter	EVERFINE	PF2010A	1011004	600V/20A	2015-07-24	2016-07-23
Digital CC&CV DC Power Supply	EVERFINE	WY305-V1	1101047	30V/5A	2015-07-27	2016-07-26
Temperature/humidity/clock	Victor	VC230	EE209	0~40°C 0~90%	2015-03-24	2016-03-23
Standard Light Source	SENSING	N/A	LSD090808	N/A	2015-09-25	2016-09-24
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	30V/5A	2015-03-05	2016-03-04
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2015-03-05	2016-03-04
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2015-03-05	2016-03-04
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2015-03-05	2016-03-04
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2015-04-21	2016-04-20
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;-20°C~60°C	2015-03-23	2016-03-22
Standard Light Source	EVERFINE	D908	1012003	N/A	2015-09-08	2016-09-07

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

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$ during measurement. And relative humidity is less than 65%.

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.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=32\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.1$ ($K=2$), at the 95% confidence level.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

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 uncertainty of the luminous intensity is $U=2.82\%$ ($K=2$), at the 95% confidence level.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Base up**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.0	59.98	0.07591	8.95	0.9829

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
840.86	2.6213	93.95	2757	-7.00E-04

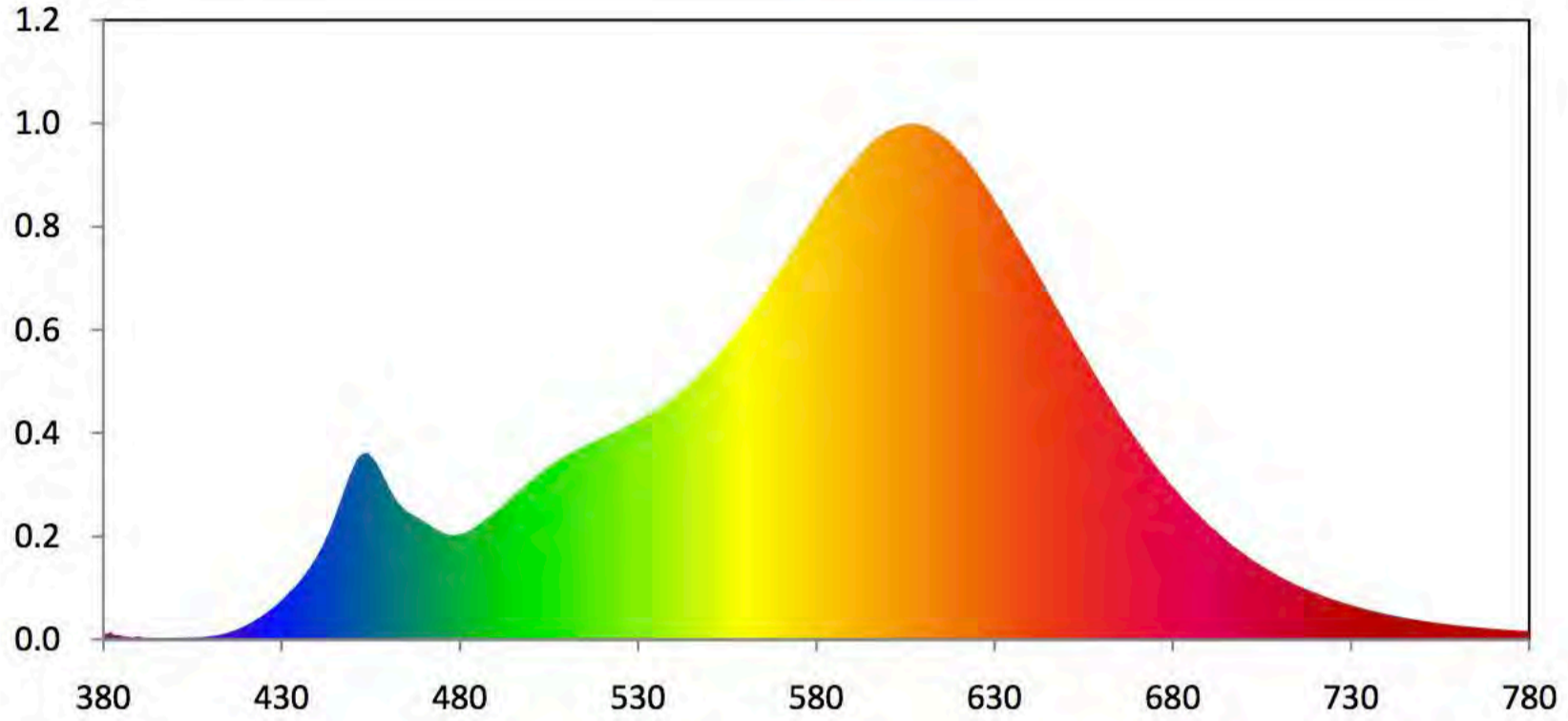
Chromaticity Coordinate

x	y	u	v	u'	v'
0.4541	0.4074	0.2602	0.3502	0.2602	0.5252

Color Rendering Index

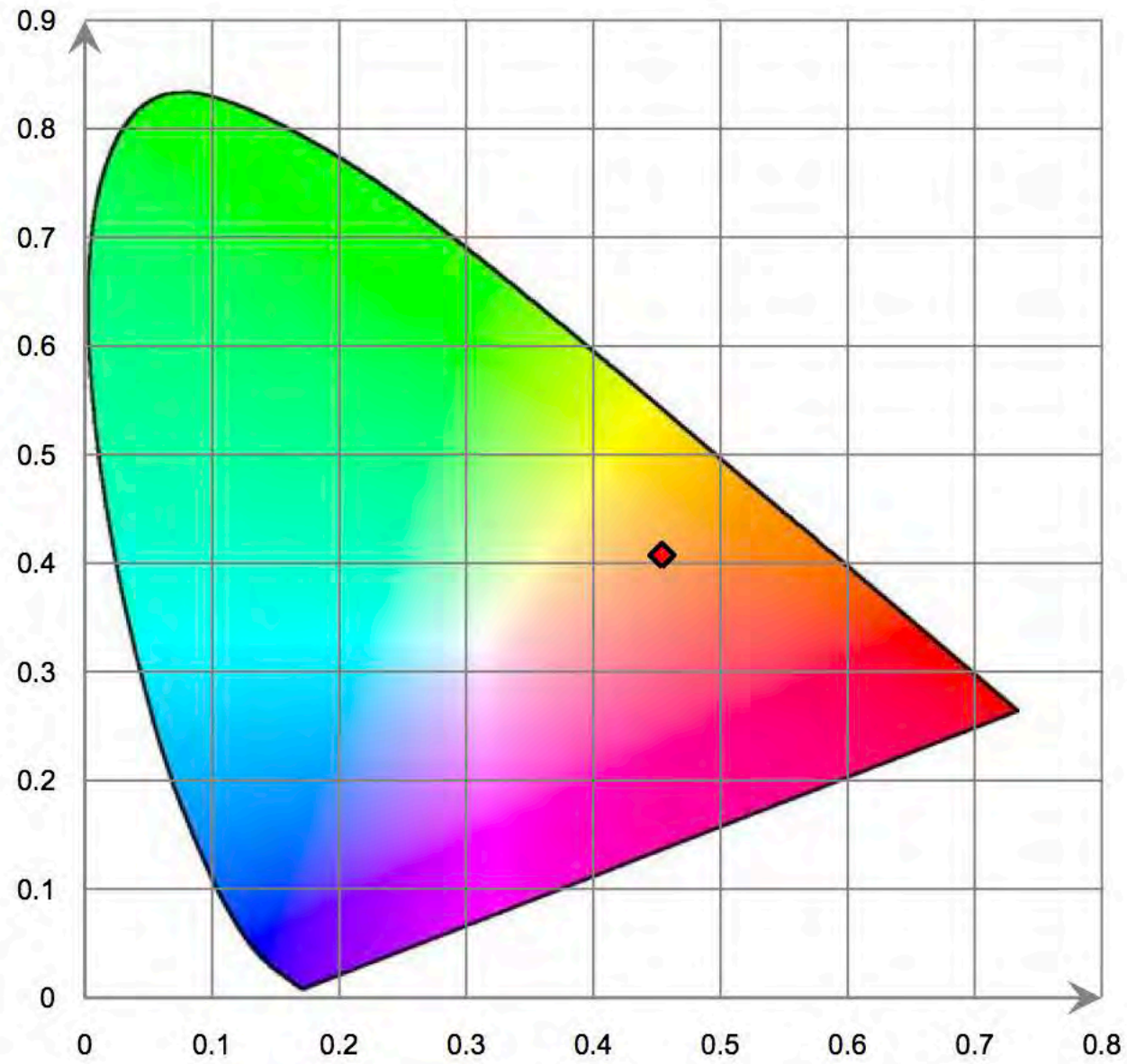
Ra			
83			
R1	R2	R3	R4
82	93	93	80
R5	R6	R7	R8
83	94	81	57
R9	R10	R11	R12
9	86	80	82
R13	R14	R15	
85	97	74	

Relative Spectral Power Distribution

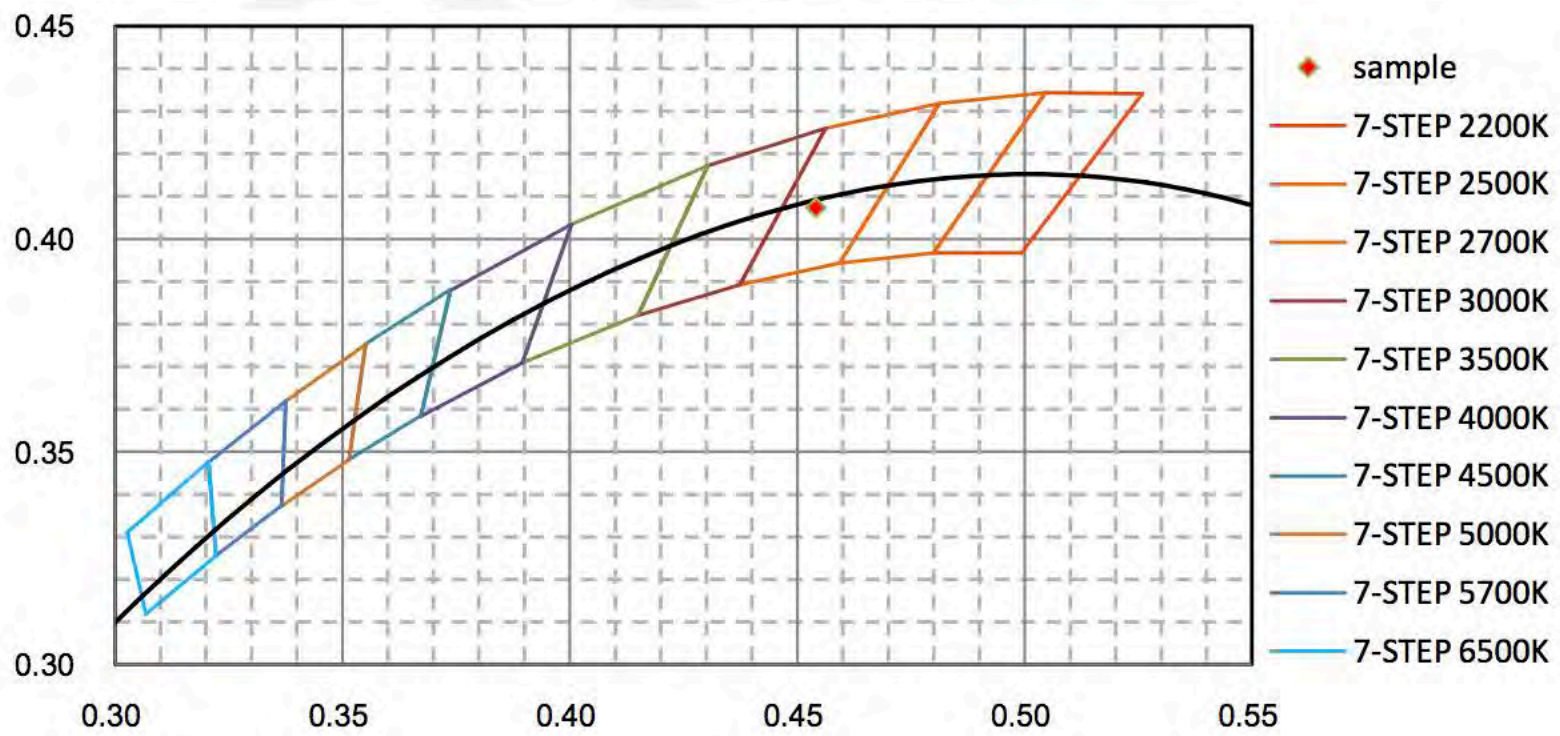


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.240E-02	465	2.488E-01	550	5.335E-01	635	7.955E-01	720	9.060E-02
385	8.500E-03	470	2.288E-01	555	5.753E-01	640	7.372E-01	725	7.760E-02
390	5.800E-03	475	2.089E-01	560	6.182E-01	645	6.739E-01	730	6.640E-02
395	3.200E-03	480	2.047E-01	565	6.662E-01	650	6.125E-01	735	5.720E-02
400	3.400E-03	485	2.212E-01	570	7.184E-01	655	5.536E-01	740	4.910E-02
405	3.700E-03	490	2.482E-01	575	7.723E-01	660	4.933E-01	745	4.220E-02
410	6.800E-03	495	2.797E-01	580	8.278E-01	665	4.370E-01	750	3.660E-02
415	1.380E-02	500	3.088E-01	585	8.780E-01	670	3.863E-01	755	3.150E-02
420	2.750E-02	505	3.362E-01	590	9.217E-01	675	3.395E-01	760	2.710E-02
425	4.810E-02	510	3.573E-01	595	9.598E-01	680	2.961E-01	765	2.380E-02
430	7.600E-02	515	3.755E-01	600	9.867E-01	685	2.583E-01	770	2.070E-02
435	1.132E-01	520	3.912E-01	605	9.979E-01	690	2.231E-01	775	1.830E-02
440	1.619E-01	525	4.058E-01	610	9.961E-01	695	1.932E-01	780	1.700E-02
445	2.390E-01	530	4.250E-01	615	9.785E-01	700	1.667E-01		
450	3.312E-01	535	4.462E-01	620	9.470E-01	705	1.430E-01		
455	3.562E-01	540	4.704E-01	625	9.043E-01	710	1.227E-01		
460	2.971E-01	545	4.993E-01	630	8.514E-01	715	1.053E-01		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hours**

Test orientation: **Base up**

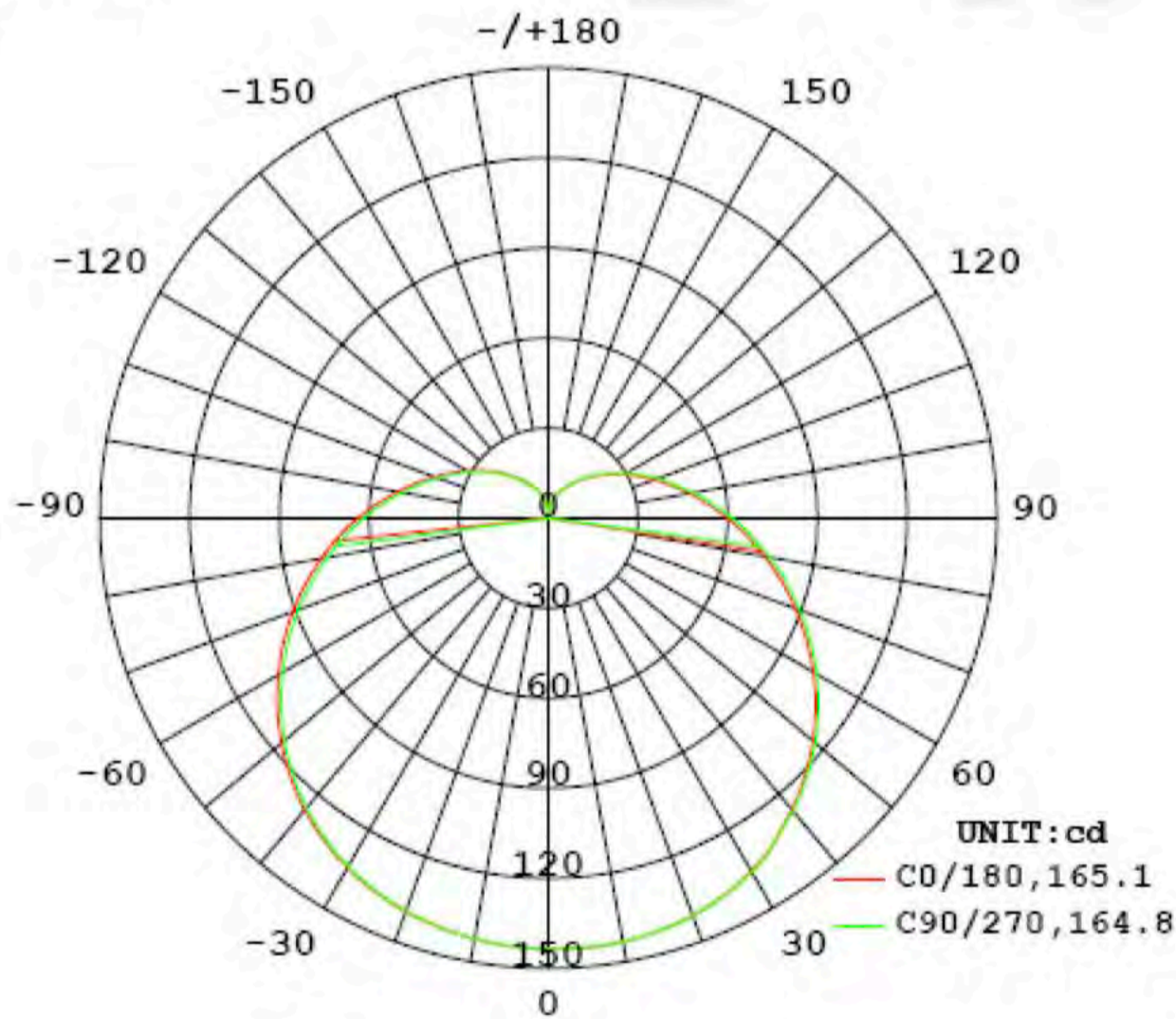
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.02	60	0.0758	8.96	0.9849

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
847.941	94.64	143.8	1.42	1.42

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	165.1	164.6	164.8	165.3	165.0
Field Angle (10% I _{max}):	292.7	292.6	292.5	292.5	292.6

Luminous Intensity (cd) Distribution Data

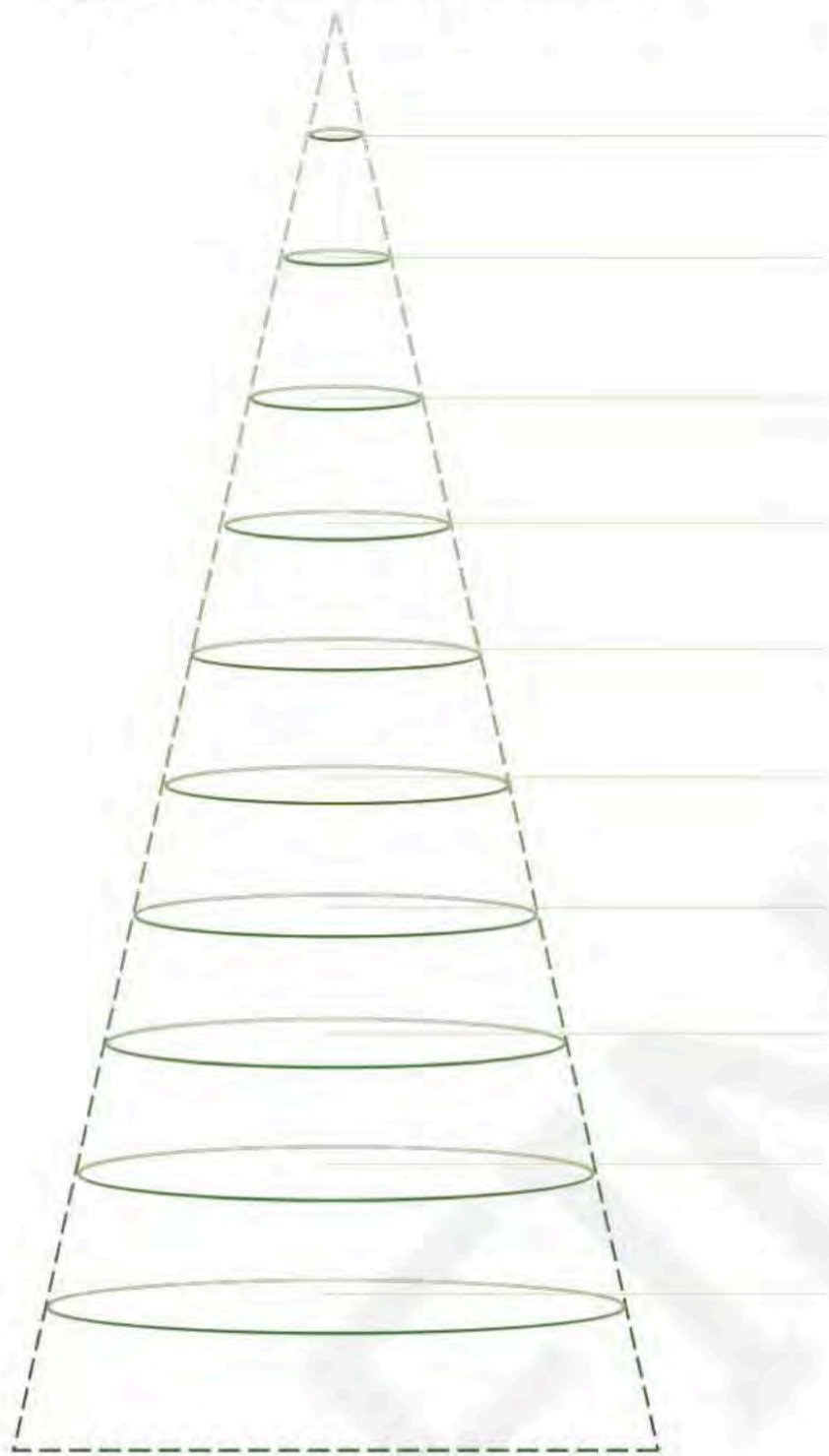
$\gamma \backslash C$	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	144	144	144	144	144	144	144	144
5.0°	143	143	143	143	143	143	143	144
10.0°	142	142	142	142	142	142	143	143
15.0°	141	141	141	141	141	141	142	142
20.0°	139	139	139	139	139	140	140	141
25.0°	137	137	137	137	137	137	138	138
30.0°	135	134	134	134	134	134	135	136
35.0°	131	130	130	130	130	131	131	132
40.0°	127	126	126	126	126	126	126	127
45.0°	122	121	121	121	121	121	122	122
50.0°	117	116	116	115	115	115	116	116
55.0°	111	110	110	109	109	109	109	110
60.0°	104	104	103	103	103	103	103	103
65.0°	98	97	97	96	96	96	96	96
70.0°	91	90	90	89	89	89	89	89
75.0°	84	83	83	82	82	82	82	82
80.0°	77	77	76	76	75	75	75	75
85.0°	70	70	69	69	69	68	68	68
90.0°	64	63	63	62	62	62	61	61
95.0°	57	57	56	56	55	55	55	54
100.0°	51	51	51	50	50	49	49	48
105.0°	46	46	45	45	44	44	43	43
110.0°	41	41	40	40	39	39	39	38
115.0°	36	36	36	35	35	34	34	34
120.0°	32	32	32	31	31	30	30	30
125.0°	28	28	28	27	27	27	26	26
130.0°	24	24	24	24	24	23	23	23
135.0°	21	21	21	21	20	20	20	20
140.0°	18	18	18	18	18	17	17	17
145.0°	16	16	16	15	15	15	15	15
150.0°	13	13	13	13	13	13	13	12
155.0°	11	11	11	11	11	11	11	11
160.0°	10	10	10	9	9	9	9	9
165.0°	8	8	8	8	8	7	7	7
170.0°	6	6	6	6	6	5	5	5
175.0°	2	2	2	2	1	1	1	1
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	144	144	144	144	144	144	144	144
5.0°	144	144	144	144	144	143	143	143
10.0°	143	143	144	143	143	143	143	143
15.0°	142	143	143	143	142	142	142	141
20.0°	141	141	141	141	141	141	140	140
25.0°	139	139	139	139	139	139	138	138
30.0°	136	136	136	136	136	136	136	135
35.0°	132	132	132	132	132	131	131	131
40.0°	127	127	127	127	127	127	127	126
45.0°	121	122	122	122	122	122	122	122
50.0°	115	116	116	116	116	116	116	116
55.0°	109	109	110	110	110	110	110	110
60.0°	102	103	103	103	104	104	104	104
65.0°	95	95	96	96	97	97	97	97
70.0°	88	88	89	89	89	90	90	90
75.0°	81	81	81	82	82	83	83	83
80.0°	74	74	74	74	75	76	76	76
85.0°	67	67	67	67	68	69	69	70
90.0°	60	60	60	61	61	62	63	63
95.0°	54	54	54	54	55	56	56	57
100.0°	48	48	48	49	49	50	50	51
105.0°	43	43	43	43	44	44	45	45
110.0°	38	38	38	38	39	39	40	40
115.0°	33	33	33	34	34	35	35	36
120.0°	29	29	29	30	30	31	31	31
125.0°	26	26	26	26	26	27	27	28
130.0°	22	22	22	23	23	23	24	24
135.0°	19	19	19	20	20	20	21	21
140.0°	17	17	17	17	17	17	18	18
145.0°	14	14	14	14	15	15	15	15
150.0°	12	12	12	12	13	13	13	13
155.0°	10	10	10	10	11	11	11	11
160.0°	9	9	9	9	9	9	9	9
165.0°	7	7	7	7	7	7	8	8
170.0°	5	5	5	5	5	5	5	5
175.0°	1	1	1	1	1	1	1	1
180.0°	0	0	0	0	0	0	0	0

Average Area Illumination Figure

Angle:165.0°. Flux out:598.4lm



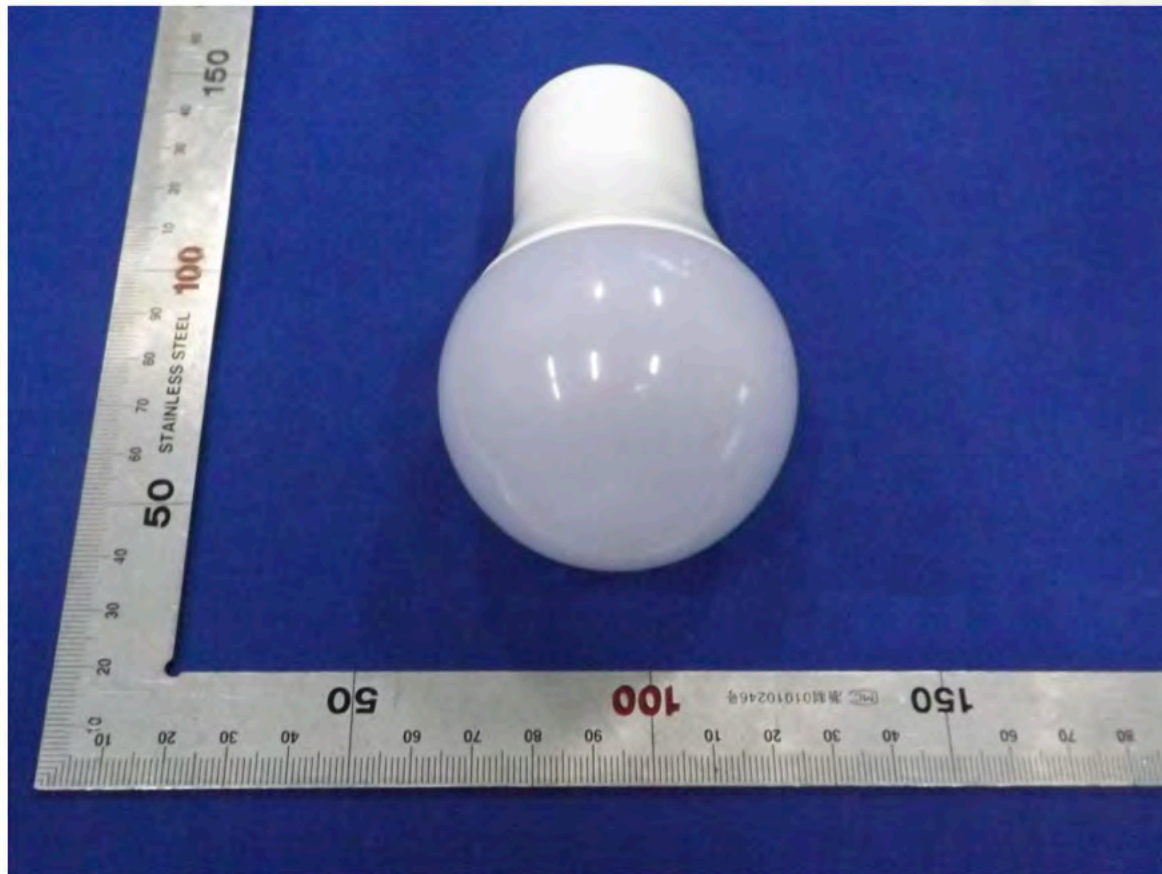
Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	759.58	11.5	579.3
1.0	1519.15	2.9	144.8
1.5	2278.73	1.3	64.4
2.0	3038.30	0.7	36.2
2.5	3797.88	0.5	23.2
3.0	4557.45	0.3	16.1
3.5	5317.03	0.2	11.8
4.0	6076.60	0.2	9.1
4.5	6836.18	0.1	7.2
5.0	7595.75	0.1	5.8

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	3.4	0.40
5-10	10.2	1.21
10-15	16.9	1.99
15-20	23.2	2.74
20-25	29.2	3.44
25-30	34.6	4.08
30-35	39.2	4.63
35-40	43.0	5.07
40-45	46.0	5.42
45-50	48.0	5.66
50-55	49.1	5.79
55-60	49.2	5.81
60-65	48.5	5.72
65-70	47.0	5.54
70-75	44.8	5.29
75-80	42.1	4.97
80-85	39.0	4.60
85-90	35.6	4.21
90-95	32.1	3.78
95-100	28.5	3.36
100-105	25.0	2.95
105-110	21.8	2.56
110-115	18.7	2.21
115-120	15.8	1.86
120-125	13.2	1.56
125-130	10.9	1.28
130-135	8.8	1.04
135-140	7.0	0.82
140-145	5.4	0.64
145-150	4.1	0.48
150-155	3.0	0.36
155-160	2.1	0.24
160-165	1.4	0.16
165-170	0.8	0.10
170-175	0.3	0.03
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	3.4	0.40
0-10	13.7	1.61
0-15	30.5	3.60
0-20	53.8	6.34
0-25	83.0	9.78
0-30	117.5	13.86
0-35	156.7	18.49
0-40	199.7	23.56
0-45	245.7	28.98
0-50	293.7	34.64
0-55	342.8	40.43
0-60	392.1	46.24
0-65	440.6	51.96
0-70	487.6	57.50
0-75	532.5	62.79
0-80	574.6	67.76
0-85	613.6	72.36
0-90	649.2	76.57
0-95	681.3	80.35
0-100	709.8	83.71
0-105	734.8	86.66
0-110	756.6	89.22
0-115	775.2	91.43
0-120	791.1	93.29
0-125	804.3	94.85
0-130	815.2	96.13
0-135	824.0	97.17
0-140	830.9	97.99
0-145	836.3	98.63
0-150	840.4	99.11
0-155	843.4	99.47
0-160	845.5	99.71
0-165	846.9	99.87
0-170	847.7	99.97
0-175	847.9	100.00
0-180	847.9	100.00

6. Product Photo



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