NVLAP LAB CODE 200707-0

Bay Area Compliance Labs Corp.

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

P.Q.L., Inc.

2285 Ward Avenue o Simi Valley, CA 93065

Test Model: 83675

Report Type:	Electrical and Photometric tests including: Luminous Flux, Color, Luminous Intensity Distribution
Test Engineer:	Daniel Duan
Report Number:	R2KS151229053-10
Test Date:	2016-01-05 to 2016-01-06
Report Date:	2016-01-11
Reviewed By:	Jeanne Han/Safety Manager
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.

1. Product Description

General Information:

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

Model Tested:	83675
Manufacturer:	P.Q.L., Inc.
Brand Name:	P.Q.L., Inc.
Product Designation:	Linear Retrofit Kit
Burning Time Before Test:	0hour(For New Products)

Rated Values:

Rated Voltage/Frequency:	120 V AC 60Hz
Rated Power:	40 W
Nominal CCT:	4000 K
Nominal Lumen Output:	4500 lm(For Linear Retrofit Kit)

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	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	25～50℃	2015-03-25	2016-03-24
Spectral photometer	SENSING	SPR3000	90902027	350nm～800nm	2015-03-25	2016-03-24
Power Meter	YOKOGAWA	WT-210	91j926132	15/30/60/150/300/600 V	2015-03-05	2016-03-04
AC Power Supply	ALL Power	APW-105N	970663	220V±10% 50HZ	2015-03-05	2016-03-04
Standard Light Source	EVERFINE	D204	01331191	24V/100W	2015-08-27	2016-08-26
Thermal Meter	SENSING	N/A	N/A	25、50℃	2015-03-05	2016-03-04
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	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℃~50℃;-20℃~60℃	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°C±1°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=32K (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: **Downward**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
119.95	60	0.3717	44.16	0.99

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
4312.41	12.932	97.654	4026	0.00158

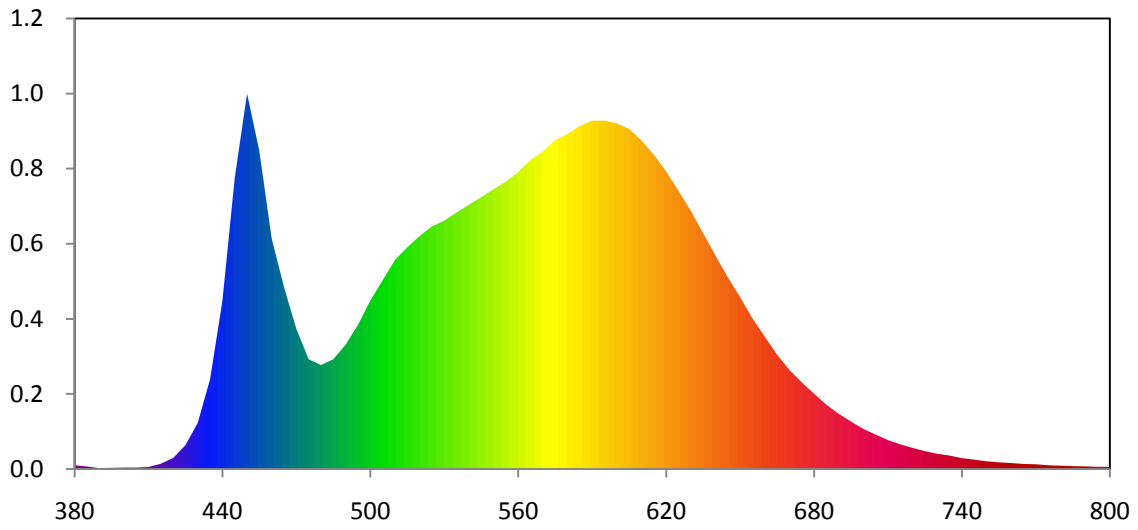
Chromaticity Coordinate

x	y	u	v	u'	v'
0.3804	0.3801	0.2237	0.3354	0.2237	0.5031

Color Rendering Index

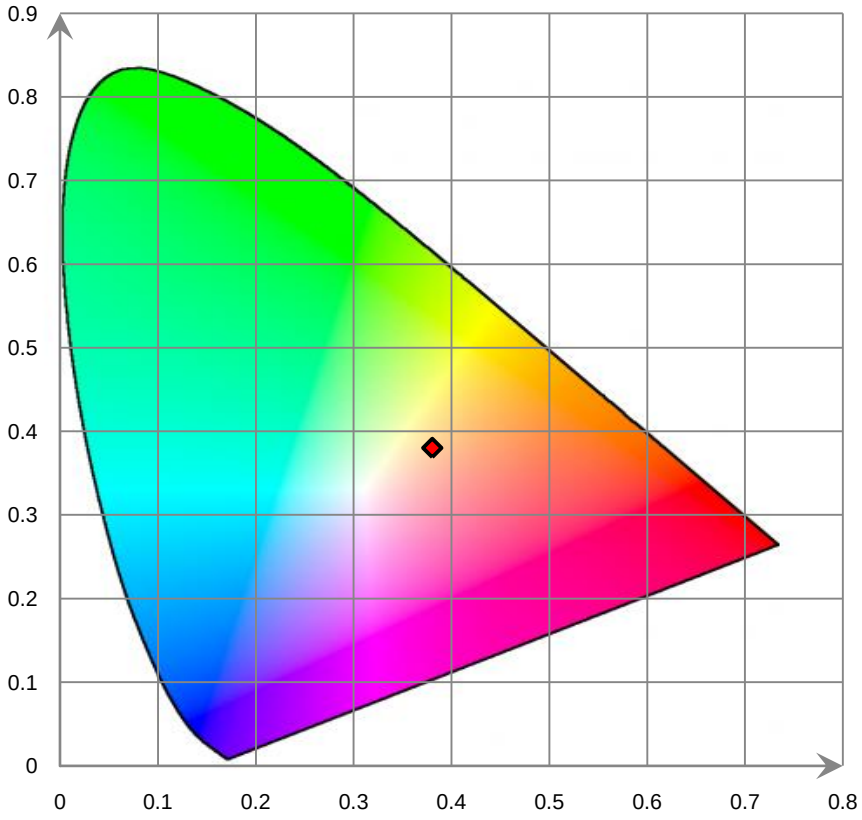
Ra			
82.5			
R1	R2	R3	R4
81	89	95	81
R5	R6	R7	R8
81	84	86	63
R9	R10	R11	R12
5	74	80	61
R13	R14	R15	
83	97	74	

Relative Spectral Power Distribution

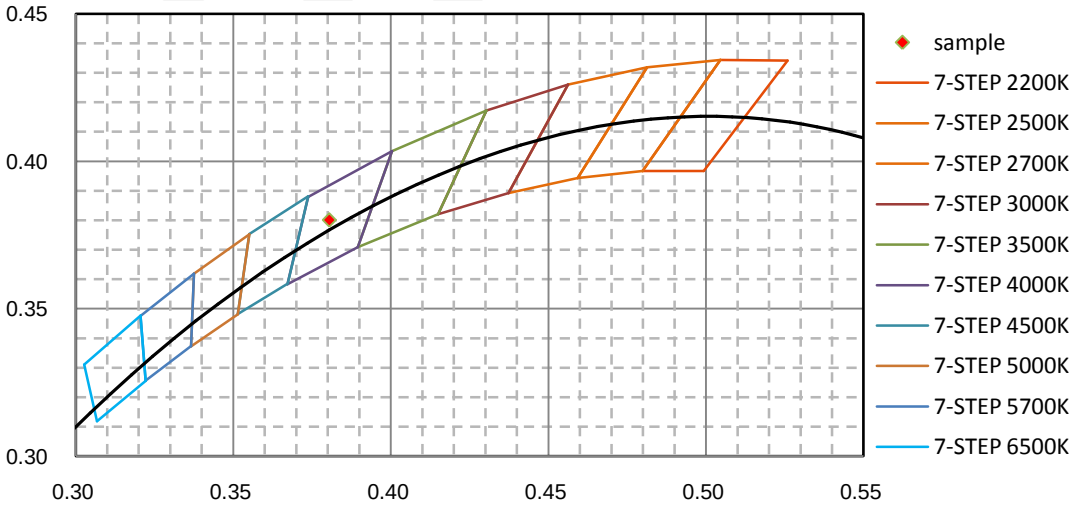


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.920E-03	465	8.956E-02	550	1.376E-01	635	1.161E-01	720	1.044E-02
385	1.333E-03	470	6.892E-02	555	1.414E-01	640	1.051E-01	725	8.862E-03
390	5.244E-04	475	5.404E-02	560	1.460E-01	645	9.447E-02	730	7.575E-03
395	6.432E-04	480	5.118E-02	565	1.521E-01	650	8.468E-02	735	6.686E-03
400	7.877E-04	485	5.407E-02	570	1.562E-01	655	7.420E-02	740	5.434E-03
405	7.956E-04	490	6.125E-02	575	1.618E-01	660	6.526E-02	745	4.699E-03
410	1.079E-03	495	7.094E-02	580	1.648E-01	665	5.635E-02	750	3.879E-03
415	2.655E-03	500	8.292E-02	585	1.687E-01	670	4.884E-02	755	3.378E-03
420	5.502E-03	505	9.286E-02	590	1.713E-01	675	4.277E-02	760	3.014E-03
425	1.180E-02	510	1.028E-01	595	1.714E-01	680	3.719E-02	765	2.563E-03
430	2.278E-02	515	1.091E-01	600	1.700E-01	685	3.173E-02	770	2.404E-03
435	4.430E-02	520	1.146E-01	605	1.673E-01	690	2.726E-02	775	1.937E-03
440	8.280E-02	525	1.194E-01	610	1.616E-01	695	2.343E-02	780	1.706E-03
445	1.433E-01	530	1.222E-01	615	1.547E-01	700	1.981E-02		
450	1.846E-01	535	1.262E-01	620	1.464E-01	705	1.701E-02		
455	1.563E-01	540	1.300E-01	625	1.369E-01	710	1.431E-02		
460	1.133E-01	545	1.338E-01	630	1.271E-01	715	1.221E-02		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

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

Test orientation: **Downward**

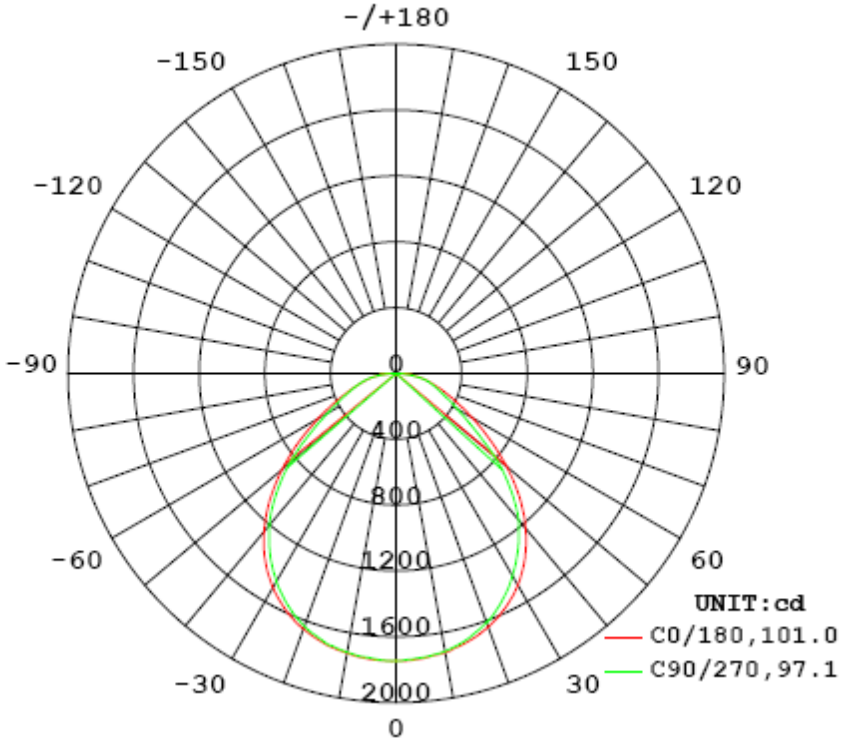
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.04	60	0.3779	43.8	0.9655

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
4317.86	98.58	1768	1.26	1.22

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% Imax):	101.0	99.0	96.7	99.6	99.1
Field Angle (10% Imax):	156.9	152.3	157.0	152.4	154.7

Luminous Intensity (cd) Distribution Data

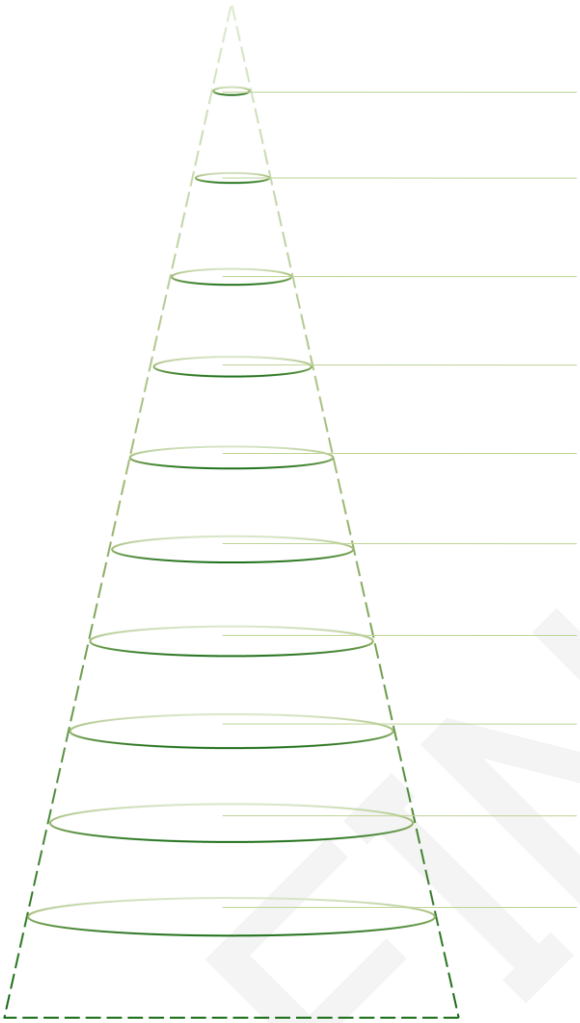
C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1766	1766	1766	1766	1766	1766	1766	1766
5.0°	1759	1760	1760	1760	1760	1759	1760	1760
10.0°	1740	1744	1740	1739	1739	1739	1742	1742
15.0°	1710	1710	1707	1703	1701	1704	1706	1712
20.0°	1665	1663	1658	1645	1644	1649	1658	1665
25.0°	1601	1599	1586	1570	1564	1573	1589	1600
30.0°	1514	1511	1494	1471	1463	1472	1493	1512
35.0°	1403	1399	1375	1353	1342	1351	1374	1395
40.0°	1263	1259	1237	1215	1202	1208	1229	1252
45.0°	1097	1093	1072	1047	1033	1037	1061	1083
50.0°	914	906	886	854	842	858	880	897
55.0°	725	718	697	657	648	674	702	716
60.0°	554	539	511	485	485	504	532	544
65.0°	410	385	361	363	373	380	386	400
70.0°	302	278	255	282	292	295	279	298
75.0°	222	206	190	222	230	228	204	222
80.0°	158	148	145	164	168	162	147	154
85.0°	86	85	85	89	83	82	80	83
90.0°	12	11	7	4	3	3	4	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	1	0	0	0	0	0	0
105.0°	1	1	1	0	0	0	1	1
110.0°	0	1	1	0	0	1	1	1
115.0°	0	1	1	1	1	1	1	1
120.0°	1	1	1	1	1	1	1	1
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1766	1766	1766	1766	1766	1766	1766	1766
5.0°	1761	1760	1761	1760	1758	1759	1763	1760
10.0°	1739	1741	1739	1737	1739	1738	1738	1742
15.0°	1708	1708	1704	1702	1701	1703	1707	1707
20.0°	1661	1657	1651	1645	1639	1645	1654	1659
25.0°	1595	1590	1576	1558	1552	1561	1581	1593
30.0°	1502	1496	1472	1452	1446	1458	1484	1505
35.0°	1386	1374	1345	1325	1323	1339	1363	1388
40.0°	1242	1226	1199	1176	1181	1198	1221	1246
45.0°	1079	1059	1030	1003	998	1024	1056	1083
50.0°	893	875	848	812	784	820	870	897
55.0°	708	689	663	605	578	599	675	707
60.0°	546	516	483	451	435	440	479	530
65.0°	410	377	347	345	338	332	336	378
70.0°	307	278	251	270	268	258	238	272
75.0°	225	203	186	208	211	203	177	202
80.0°	157	139	130	140	142	142	131	142
85.0°	79	69	57	54	51	57	66	76
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	1	0	0	0	0	0
110.0°	0	0	1	1	1	0	0	0
115.0°	0	1	1	1	1	1	1	0
120.0°	1	1	1	1	1	1	1	0
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Average Area Illumination Figure

Angle:99.1°. Flux out:3037.0 lm



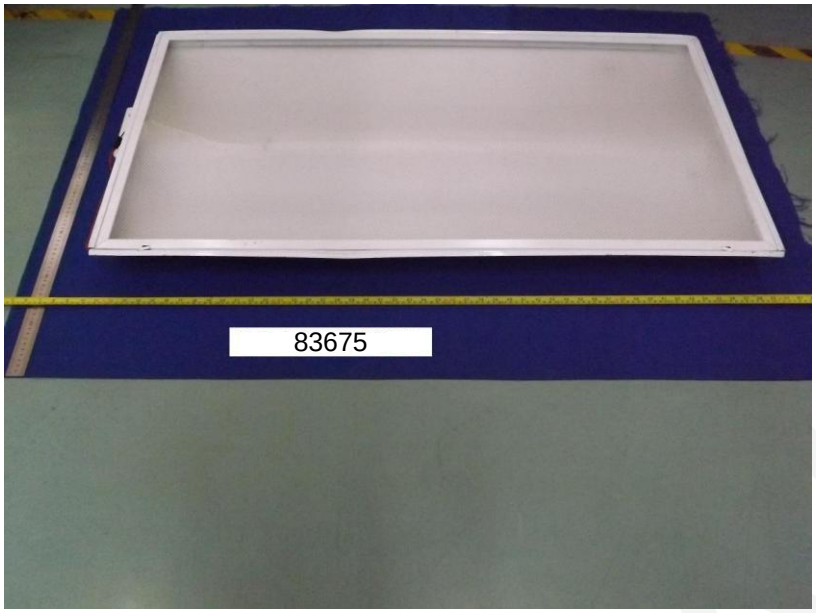
Height (m)	Diameter (cm)	E_{avg}(lx)	E_{max}(lx)
0.5	117.29	2722.0	7073.0
1.0	234.58	680.6	1768.0
1.5	351.88	302.5	785.9
2.0	469.17	170.1	442.1
2.5	586.46	108.9	282.9
3.0	703.75	75.6	196.5
3.5	821.04	55.6	144.4
4.0	938.34	42.5	110.5
4.5	1055.63	33.6	87.3
5.0	1172.92	27.2	70.7

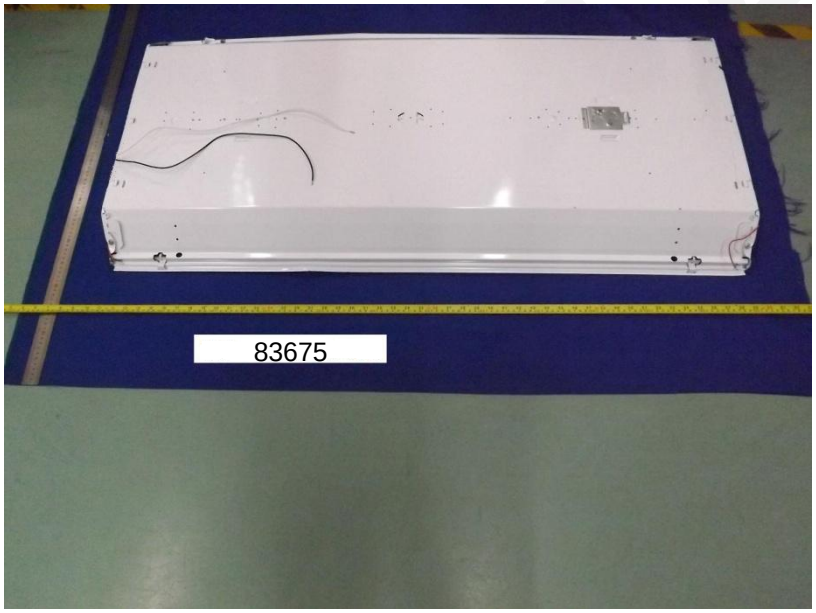
Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	42.1	0.98
5-10	125.2	2.90
10-15	204.4	4.73
15-20	277.0	6.41
20-25	339.3	7.86
25-30	387.9	8.98
30-35	419.7	9.72
35-40	431.8	10.00
40-45	421.8	9.77
45-50	387.5	8.98
50-55	333.5	7.72
55-60	270.1	6.26
60-65	210.2	4.86
65-70	162.3	3.76
70-75	126.0	2.92
75-80	95.6	2.21
80-85	61.3	1.42
85-90	18.0	0.42
90-95	0.4	0.01
95-100	0.2	0.00
100-105	0.2	0.01
105-110	0.3	0.00
110-115	0.3	0.01
115-120	0.3	0.01
120-125	0.3	0.00
125-130	0.3	0.01
130-135	0.3	0.01
135-140	0.3	0.00
140-145	0.3	0.01
145-150	0.3	0.01
150-155	0.3	0.00
155-160	0.3	0.01
160-165	0.2	0.00
165-170	0.1	0.01
170-175	0.1	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	42.1	0.98
0-10	167.3	3.88
0-15	371.7	8.61
0-20	648.7	15.02
0-25	987.9	22.88
0-30	1375.8	31.86
0-35	1795.5	41.58
0-40	2227.3	51.58
0-45	2649.1	61.35
0-50	3036.6	70.33
0-55	3370.1	78.05
0-60	3640.2	84.31
0-65	3850.4	89.17
0-70	4012.6	92.93
0-75	4138.6	95.85
0-80	4234.2	98.06
0-85	4295.5	99.48
0-90	4313.5	99.90
0-95	4313.9	99.91
0-100	4314.1	99.91
0-105	4314.3	99.92
0-110	4314.6	99.92
0-115	4314.8	99.93
0-120	4315.1	99.94
0-125	4315.4	99.94
0-130	4315.7	99.95
0-135	4315.9	99.96
0-140	4316.3	99.96
0-145	4316.6	99.97
0-150	4316.9	99.98
0-155	4317.2	99.98
0-160	4317.4	99.99
0-165	4317.6	99.99
0-170	4317.7	100.00
0-175	4317.8	100.00
0-180	4317.9	100.00

6. Product Photo





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