



IES LM-79-08

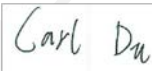

MEASUREMENT AND TEST REPORT

For

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

**Test Model:
83754**

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Carl Du 
Report Number:	R2XM161128058-10
Test Date:	2016-11-30 to 2016-12-01
Report Date:	2016-12-02
Reviewed By:	Blake Zhang / EE Engineer 
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China. Tel: +86-0769-86858888 Fax: +86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.



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 used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

1. Product Description

General Information:

One sample was received on 2016-11-28 and used for testing.

Model Tested: 83754
 Manufacturer: P.Q.L., Inc.
 Brand Name: Superior Life®
 Product Designation: LED Ceiling light
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120 V AC 50/60Hz
 Rated Power: 16 W
 Nominal CCT: 4000K
 Nominal Lumen Output: 1100 lm

2. Standards Used

- IES 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
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition (This method is not in IAS accreditation scope)

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°C	2016-03-10	2017-03-09
High Accuracy Array spectroradiometer	EVERFINE	HAAS-2000	M112048CA1361125	380-780nm	2016-07-08	2017-07-07
Power meter	YOKOGAWA	WT310	C20E17024V	2kV/20A	2016-07-08	2017-07-07
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2016-03-04	2017-03-03
Thermal Meter	SENSING	N/A	N/A	25、50°C	2016-03-10	2017-03-09
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-09-24	2017-09-23
AC Power Supply	ALL Power	APW-105N	970613	220V±10% 50Hz	2016-03-04	2017-03-03
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2016-03-04	2017-03-03
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2016-03-04	2017-03-03
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2016-03-04	2017-03-03
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2016-03-10	2017-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;- 20°C~60°C	2016-03-21	2017-03-20

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-09-07	2017-09-06

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) 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, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum 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 vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

The uncertainty of the luminous intensity is $U=1.6\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f , R_g was calculated according to IES TM-30-15 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

5. Test Result

[Integrating Sphere System]

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

Test orientation: **Downward**

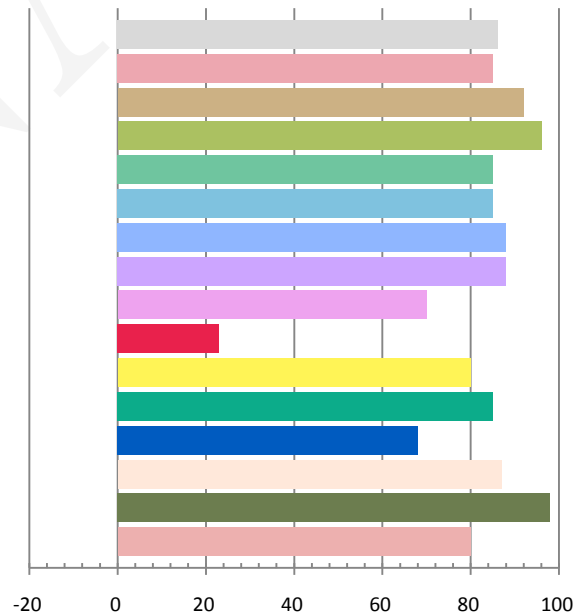
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1569	17.2	0.9136	1238.1	71.99

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.889	4092	-0.000684	0.3760	0.3725	0.2239	0.4990

Color Rendering Index

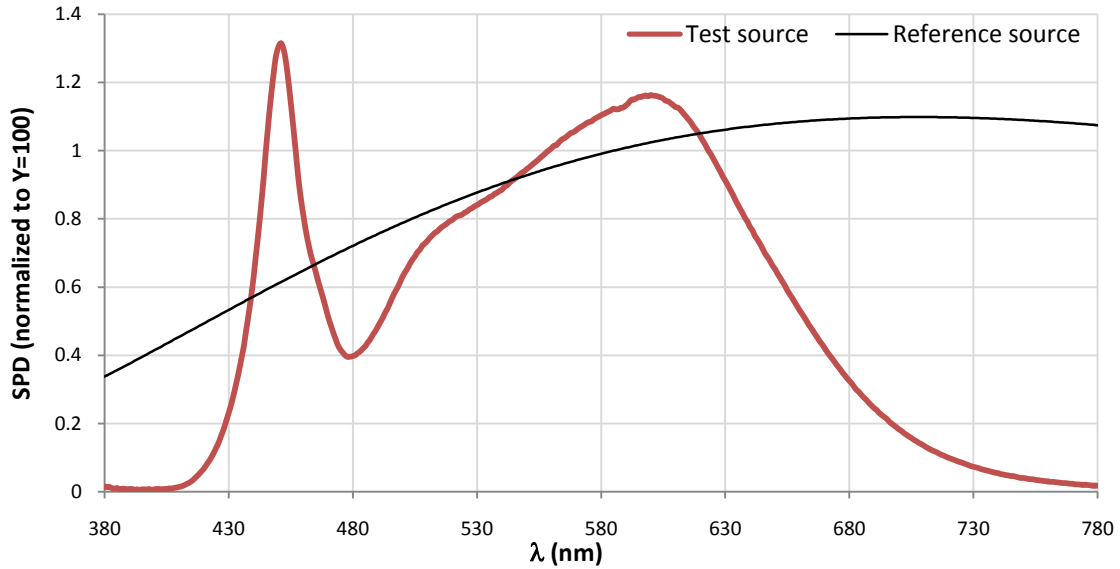
Ra			
86.2			
R1	R2	R3	R4
85	92	96	85
R5	R6	R7	R8
85	88	88	70
R9	R10	R11	R12
23	80	85	68
R13	R14	R15	
87	98	80	



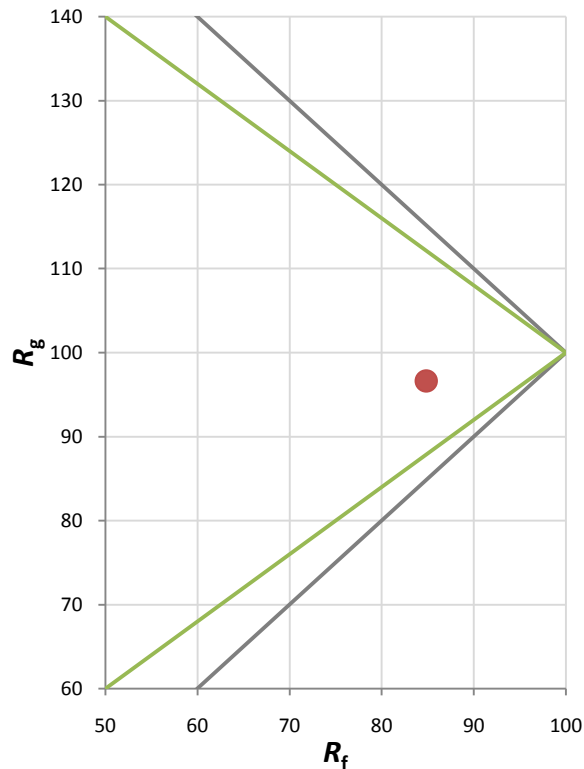
Fidelity Index and Gamut Index

Fidelity Index R_f	85
Gamut Index R_g	97

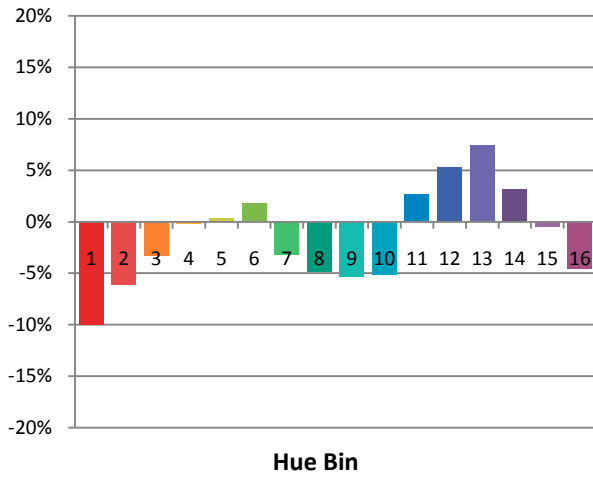
Spectral Power Distribution Comparison



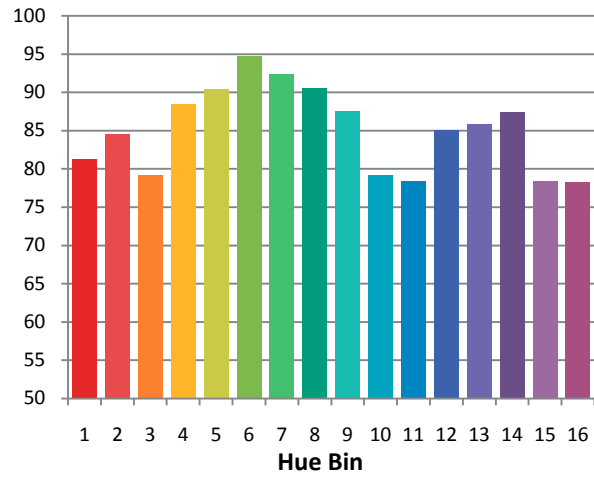
Plot of R_g versus R_f



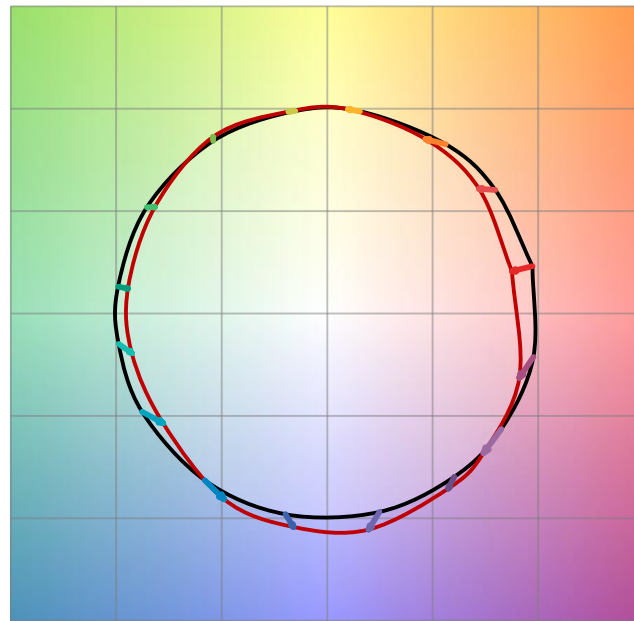
Chroma Shift by Hue



R_f by Hue

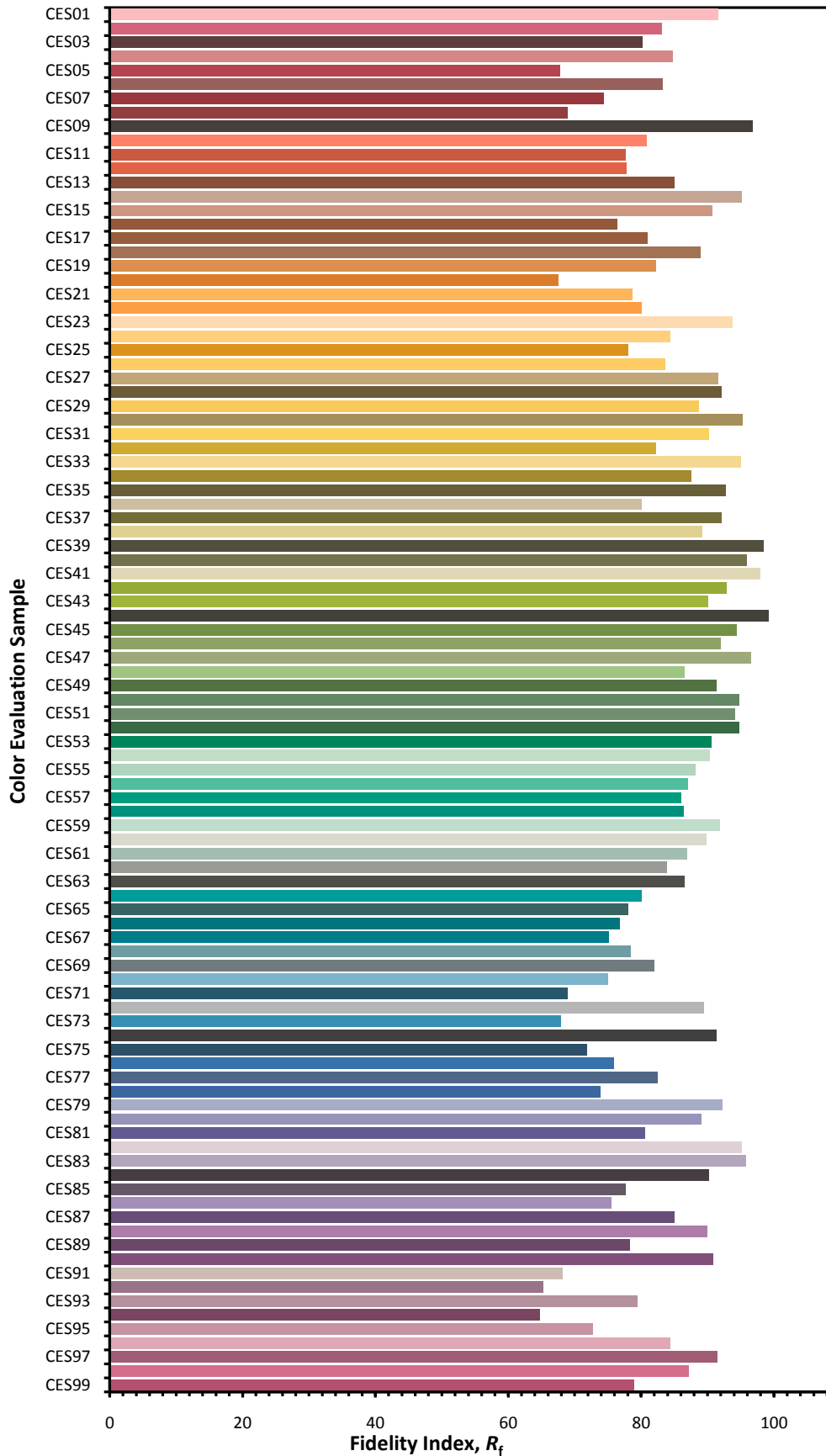


Color Vector Graphic

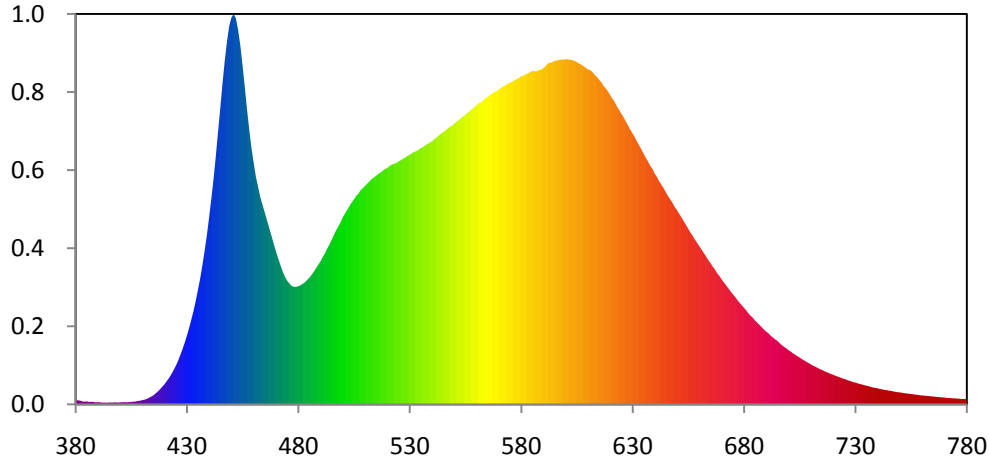


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



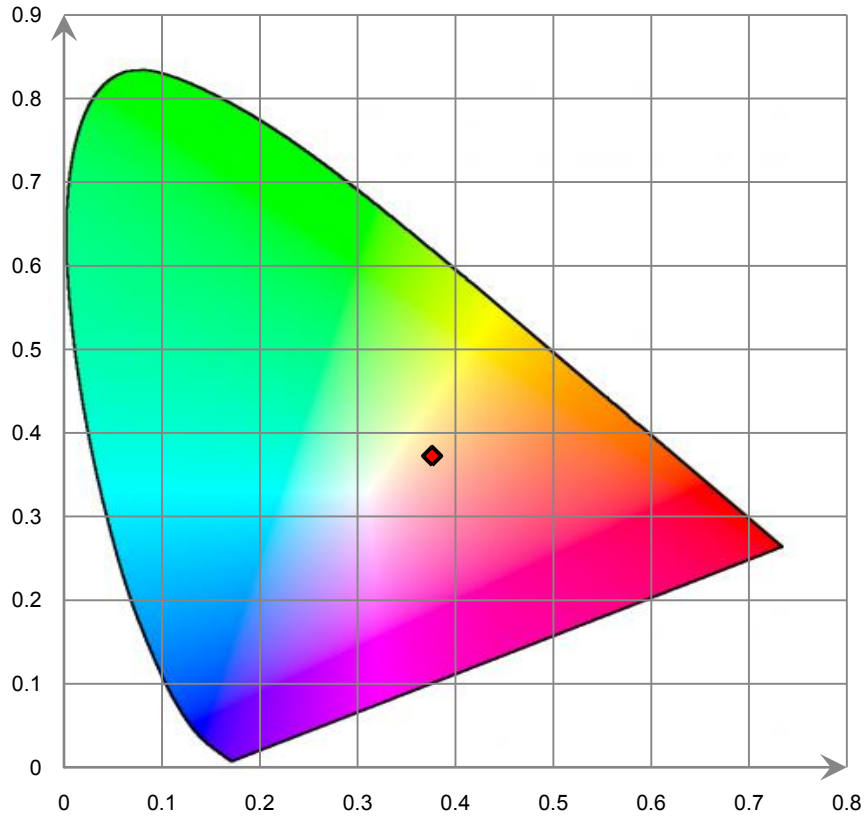
Relative Spectral Power Distribution



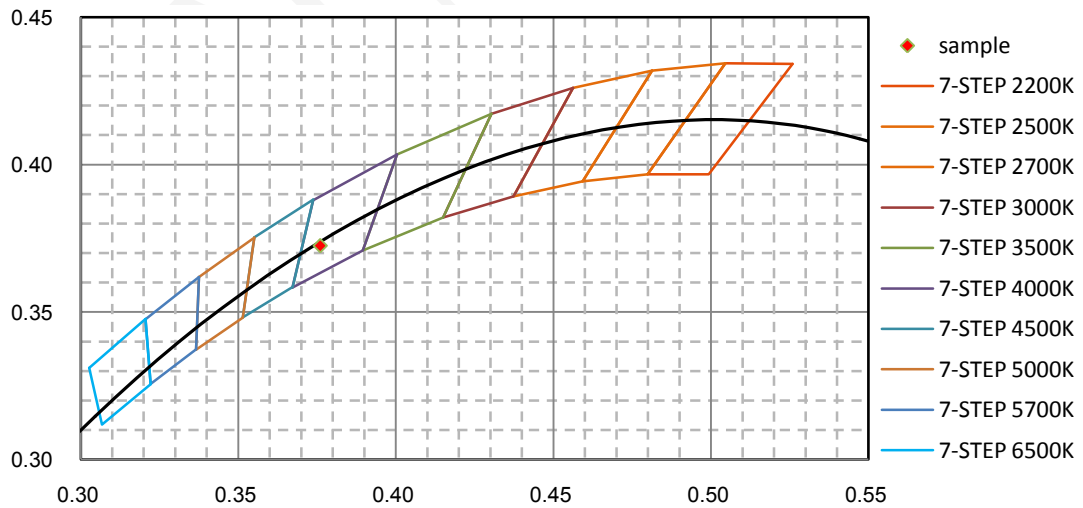
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.702E-01	421	1.433E+00	462	1.324E+01	503	1.211E+01	544	1.652E+01
381	2.462E-01	422	1.618E+00	463	1.261E+01	504	1.233E+01	545	1.661E+01
382	2.361E-01	423	1.842E+00	464	1.215E+01	505	1.251E+01	546	1.671E+01
383	1.810E-01	424	2.088E+00	465	1.167E+01	506	1.273E+01	547	1.683E+01
384	1.626E-01	425	2.348E+00	466	1.120E+01	507	1.286E+01	548	1.694E+01
385	1.850E-01	426	2.642E+00	467	1.074E+01	508	1.308E+01	549	1.702E+01
386	1.473E-01	427	3.004E+00	468	1.027E+01	509	1.320E+01	550	1.714E+01
387	1.579E-01	428	3.360E+00	469	9.777E+00	510	1.334E+01	551	1.725E+01
388	1.557E-01	429	3.763E+00	470	9.325E+00	511	1.349E+01	552	1.735E+01
389	1.216E-01	430	4.196E+00	471	8.892E+00	512	1.362E+01	553	1.746E+01
390	1.339E-01	431	4.664E+00	472	8.481E+00	513	1.376E+01	554	1.757E+01
391	1.280E-01	432	5.195E+00	473	8.104E+00	514	1.385E+01	555	1.769E+01
392	1.022E-01	433	5.722E+00	474	7.784E+00	515	1.397E+01	556	1.780E+01
393	1.112E-01	434	6.346E+00	475	7.544E+00	516	1.408E+01	557	1.790E+01
394	9.676E-02	435	7.023E+00	476	7.378E+00	517	1.417E+01	558	1.804E+01
395	1.148E-01	436	7.728E+00	477	7.235E+00	518	1.427E+01	559	1.815E+01
396	1.108E-01	437	8.530E+00	478	7.170E+00	519	1.437E+01	560	1.825E+01
397	1.114E-01	438	9.427E+00	479	7.182E+00	520	1.443E+01	561	1.839E+01
398	1.261E-01	439	1.037E+01	480	7.207E+00	521	1.455E+01	562	1.842E+01
399	1.088E-01	440	1.146E+01	481	7.269E+00	522	1.464E+01	563	1.857E+01
400	1.246E-01	441	1.260E+01	482	7.362E+00	523	1.468E+01	564	1.869E+01
401	1.276E-01	442	1.382E+01	483	7.458E+00	524	1.473E+01	565	1.877E+01
402	1.354E-01	443	1.521E+01	484	7.601E+00	525	1.483E+01	566	1.886E+01
403	1.257E-01	444	1.667E+01	485	7.740E+00	526	1.490E+01	567	1.898E+01
404	1.400E-01	445	1.814E+01	486	7.918E+00	527	1.500E+01	568	1.906E+01
405	1.502E-01	446	1.963E+01	487	8.099E+00	528	1.506E+01	569	1.912E+01
406	1.671E-01	447	2.100E+01	488	8.324E+00	529	1.517E+01	570	1.921E+01
407	1.747E-01	448	2.217E+01	489	8.532E+00	530	1.523E+01	571	1.932E+01
408	2.066E-01	449	2.311E+01	490	8.739E+00	531	1.533E+01	572	1.940E+01
409	2.245E-01	450	2.362E+01	491	9.000E+00	532	1.540E+01	573	1.947E+01
410	2.606E-01	451	2.383E+01	492	9.233E+00	533	1.547E+01	574	1.957E+01
411	2.894E-01	452	2.354E+01	493	9.516E+00	534	1.555E+01	575	1.964E+01
412	3.378E-01	453	2.283E+01	494	9.769E+00	535	1.566E+01	576	1.968E+01
413	4.043E-01	454	2.187E+01	495	1.005E+01	536	1.570E+01	577	1.978E+01
414	4.751E-01	455	2.065E+01	496	1.035E+01	537	1.582E+01	578	1.986E+01
415	5.590E-01	456	1.933E+01	497	1.063E+01	538	1.589E+01	579	1.993E+01
416	6.751E-01	457	1.797E+01	498	1.087E+01	539	1.599E+01	580	2.002E+01
417	7.947E-01	458	1.673E+01	499	1.112E+01	540	1.604E+01	581	2.006E+01
418	9.333E-01	459	1.561E+01	500	1.142E+01	541	1.619E+01	582	2.014E+01
419	1.087E+00	460	1.471E+01	501	1.166E+01	542	1.628E+01	583	2.020E+01
420	1.242E+00	461	1.386E+01	502	1.188E+01	543	1.641E+01	584	2.027E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.035E+01	626	1.752E+01	667	8.225E+00	708	2.600E+00	749	7.377E-01
586	2.033E+01	627	1.726E+01	668	8.002E+00	709	2.527E+00	750	7.330E-01
587	2.033E+01	628	1.702E+01	669	7.834E+00	710	2.446E+00	751	7.081E-01
588	2.040E+01	629	1.675E+01	670	7.630E+00	711	2.365E+00	752	6.869E-01
589	2.042E+01	630	1.654E+01	671	7.443E+00	712	2.303E+00	753	6.620E-01
590	2.053E+01	631	1.631E+01	672	7.266E+00	713	2.233E+00	754	6.543E-01
591	2.065E+01	632	1.605E+01	673	7.085E+00	714	2.157E+00	755	6.327E-01
592	2.081E+01	633	1.580E+01	674	6.896E+00	715	2.106E+00	756	6.180E-01
593	2.084E+01	634	1.555E+01	675	6.730E+00	716	2.032E+00	757	5.939E-01
594	2.089E+01	635	1.529E+01	676	6.567E+00	717	1.975E+00	758	5.813E-01
595	2.097E+01	636	1.504E+01	677	6.379E+00	718	1.914E+00	759	5.528E-01
596	2.098E+01	637	1.480E+01	678	6.211E+00	719	1.861E+00	760	5.474E-01
597	2.102E+01	638	1.455E+01	679	6.058E+00	720	1.808E+00	761	5.292E-01
598	2.105E+01	639	1.435E+01	680	5.899E+00	721	1.750E+00	762	5.205E-01
599	2.103E+01	640	1.407E+01	681	5.743E+00	722	1.701E+00	763	5.050E-01
600	2.107E+01	641	1.387E+01	682	5.559E+00	723	1.654E+00	764	4.909E-01
601	2.105E+01	642	1.361E+01	683	5.411E+00	724	1.601E+00	765	4.810E-01
602	2.104E+01	643	1.340E+01	684	5.286E+00	725	1.557E+00	766	4.640E-01
603	2.100E+01	644	1.318E+01	685	5.119E+00	726	1.509E+00	767	4.514E-01
604	2.096E+01	645	1.293E+01	686	4.982E+00	727	1.453E+00	768	4.410E-01
605	2.090E+01	646	1.269E+01	687	4.847E+00	728	1.409E+00	769	4.250E-01
606	2.079E+01	647	1.249E+01	688	4.711E+00	729	1.362E+00	770	4.227E-01
607	2.074E+01	648	1.228E+01	689	4.566E+00	730	1.332E+00	771	3.944E-01
608	2.064E+01	649	1.203E+01	690	4.445E+00	731	1.285E+00	772	3.909E-01
609	2.054E+01	650	1.184E+01	691	4.341E+00	732	1.252E+00	773	3.760E-01
610	2.044E+01	651	1.162E+01	692	4.192E+00	733	1.210E+00	774	3.658E-01
611	2.040E+01	652	1.140E+01	693	4.084E+00	734	1.173E+00	775	3.677E-01
612	2.028E+01	653	1.118E+01	694	3.972E+00	735	1.136E+00	776	3.499E-01
613	2.011E+01	654	1.095E+01	695	3.875E+00	736	1.105E+00	777	3.405E-01
614	1.999E+01	655	1.071E+01	696	3.745E+00	737	1.066E+00	778	3.278E-01
615	1.981E+01	656	1.049E+01	697	3.618E+00	738	1.030E+00	779	3.273E-01
616	1.966E+01	657	1.029E+01	698	3.511E+00	739	1.008E+00	780	3.279E-01
617	1.944E+01	658	1.006E+01	699	3.422E+00	740	9.789E-01		
618	1.928E+01	659	9.855E+00	700	3.312E+00	741	9.420E-01		
619	1.910E+01	660	9.650E+00	701	3.224E+00	742	9.167E-01		
620	1.888E+01	661	9.445E+00	702	3.115E+00	743	8.867E-01		
621	1.864E+01	662	9.238E+00	703	3.031E+00	744	8.715E-01		
622	1.845E+01	663	9.031E+00	704	2.943E+00	745	8.384E-01		
623	1.818E+01	664	8.810E+00	705	2.861E+00	746	8.260E-01		
624	1.797E+01	665	8.618E+00	706	2.761E+00	747	7.904E-01		
625	1.773E+01	666	8.404E+00	707	2.684E+00	748	7.669E-01		

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**

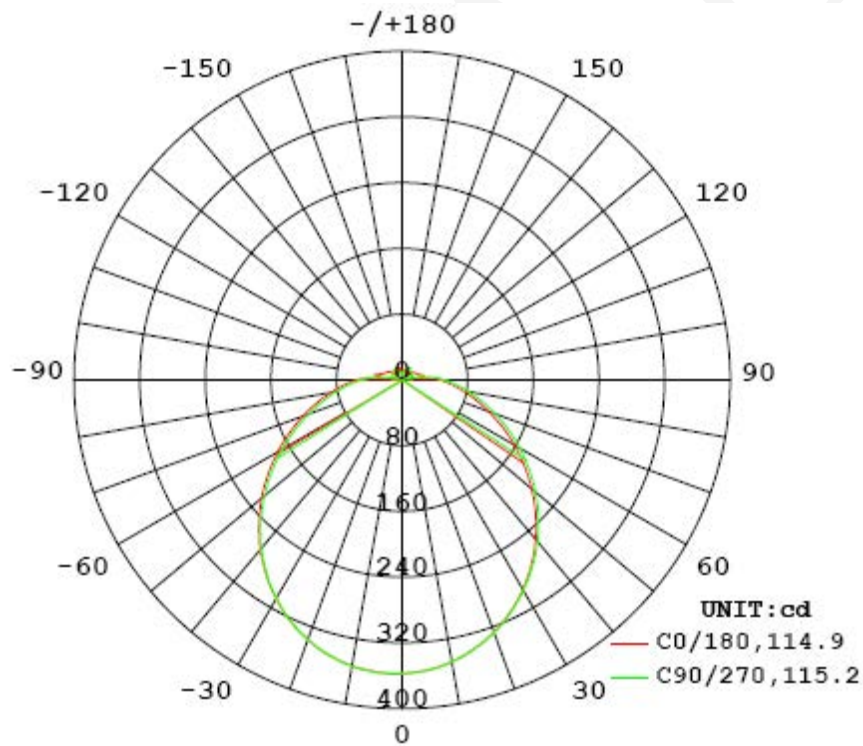
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1564	17.26	0.9199

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1243.42	72.04	357.9	1.23	1.24

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	114.9	115.0	115.2	114.9	115.0
Field Angle (10% I _{max}):	187.0	189.0	191.7	189.3	189.3

Luminous Intensity (cd) Distribution Data

C \ Y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	357	357	357	357	357	357	357	357
5.0°	357	357	357	357	357	356	356	354
10.0°	353	354	355	354	354	352	350	349
15.0°	346	348	348	348	347	344	342	340
20.0°	336	338	339	338	336	334	330	328
25.0°	323	325	326	325	323	320	316	313
30.0°	308	309	310	309	307	303	299	295
35.0°	289	291	292	291	288	284	279	275
40.0°	269	271	271	270	267	262	258	254
45.0°	247	249	249	247	244	239	234	230
50.0°	224	225	224	223	219	215	210	206
55.0°	200	200	200	197	194	189	185	181
60.0°	175	175	174	172	169	165	160	157
65.0°	151	151	150	147	145	140	136	133
70.0°	129	128	126	124	121	118	114	112
75.0°	107	107	105	103	100	97	94	92
80.0°	88	87	85	83	81	79	76	74
85.0°	71	70	68	67	65	63	61	59
90.0°	56	56	54	52	50	49	47	46
95.0°	14	5	30	36	37	36	31	9
100.0°	35	34	10	12	15	12	7	29
105.0°	28	27	26	9	5	6	20	23
110.0°	24	23	21	17	12	13	18	20
115.0°	21	20	18	15	13	13	16	18
120.0°	20	19	17	14	14	13	15	17
125.0°	12	16	17	14	14	13	15	15
130.0°	16	15	17	15	14	13	15	14
135.0°	16	15	17	16	15	13	15	13
140.0°	13	14	15	17	16	13	15	9
145.0°	9	13	14	17	16	13	14	13
150.0°	16	14	13	16	15	11	14	12
155.0°	16	12	13	15	12	11	13	12
160.0°	15	15	14	14	10	12	11	13
165.0°	14	14	12	12	10	9	7	11
170.0°	13	15	14	13	8	9	11	12
175.0°	8	8	9	9	8	8	9	10
180.0°	5	1	1	2	2	4	2	6

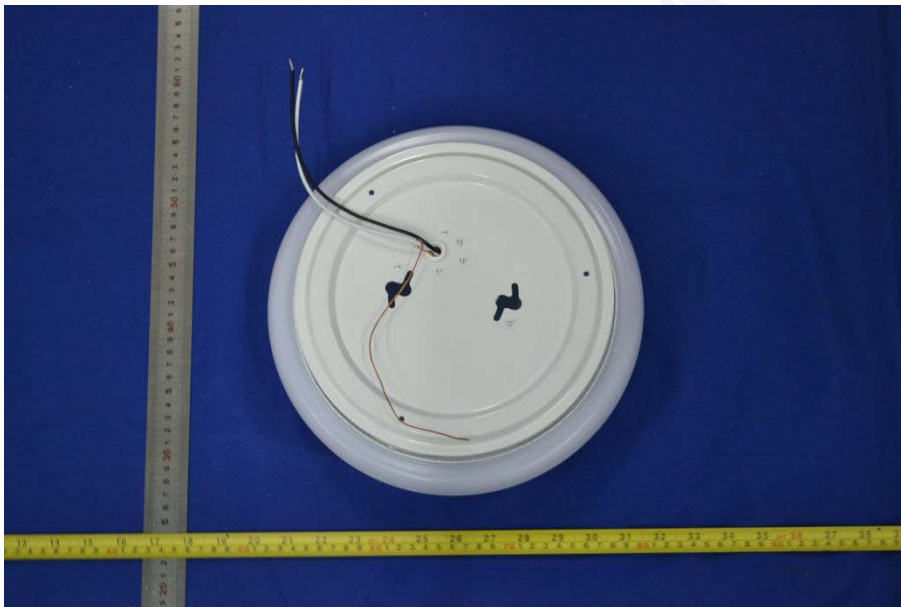
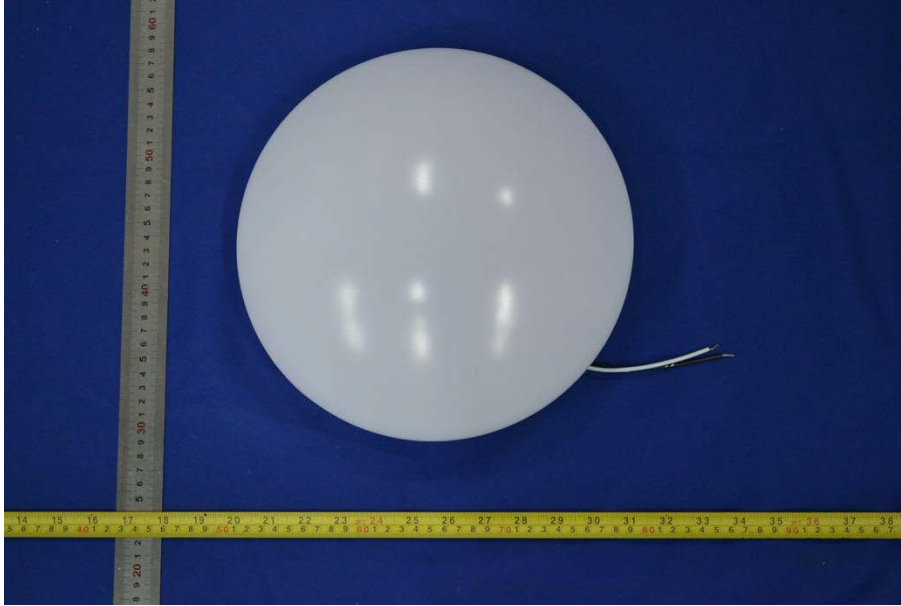
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	357	357	357	357	357	357	357	357
5.0°	354	354	354	354	354	355	356	356
10.0°	348	347	347	347	348	349	351	353
15.0°	339	338	337	338	339	341	343	345
20.0°	327	325	325	325	327	329	332	335
25.0°	312	310	310	310	312	315	319	321
30.0°	294	293	292	293	295	299	302	306
35.0°	275	273	273	274	277	280	284	288
40.0°	253	252	252	254	256	260	264	268
45.0°	230	229	230	232	235	238	243	246
50.0°	206	206	207	209	212	216	219	223
55.0°	182	182	184	186	189	192	196	199
60.0°	158	158	160	163	165	169	172	175
65.0°	135	135	137	140	143	146	149	152
70.0°	112	113	115	118	120	123	126	129
75.0°	92	93	95	98	100	103	105	107
80.0°	75	76	77	80	82	84	86	88
85.0°	60	60	62	64	66	68	70	71
90.0°	47	48	49	50	52	54	56	57
95.0°	27	22	35	39	40	41	37	16
100.0°	26	29	10	16	19	17	8	35
105.0°	24	24	19	5	6	7	24	28
110.0°	21	20	19	13	12	16	22	24
115.0°	19	18	16	14	14	15	19	21
120.0°	18	17	15	13	14	15	17	20
125.0°	13	15	15	14	15	15	17	17
130.0°	14	14	15	14	15	15	17	16
135.0°	14	13	16	15	16	16	17	15
140.0°	9	9	15	16	16	17	17	13
145.0°	9	10	13	16	17	18	16	12
150.0°	14	11	14	15	17	17	16	15
155.0°	15	14	14	13	16	16	15	13
160.0°	15	14	11	12	15	15	16	12
165.0°	11	11	10	8	11	14	14	12
170.0°	12	12	12	10	8	7	12	14
175.0°	9	9	10	9	8	8	9	10
180.0°	2	2	2	3	3	2	1	1

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	8.5	0.69	0-5	8.5	0.69
5-10	25.3	2.03	0-10	33.8	2.72
10-15	41.1	3.31	0-15	74.9	6.03
15-20	55.6	4.46	0-20	130.5	10.49
20-25	68.1	5.48	0-25	198.6	15.97
25-30	78.3	6.29	0-30	276.8	22.26
30-35	85.9	6.91	0-35	362.7	29.17
35-40	90.7	7.29	0-40	453.3	36.46
40-45	92.6	7.44	0-45	545.9	43.90
45-50	91.7	7.38	0-50	637.6	51.28
50-55	88.3	7.10	0-55	725.9	58.38
55-60	82.6	6.65	0-60	808.6	65.03
60-65	75.3	6.05	0-65	883.8	71.08
65-70	66.7	5.36	0-70	950.5	76.44
70-75	57.5	4.62	0-75	1008.0	81.06
75-80	48.4	3.89	0-80	1056.3	84.95
80-85	39.7	3.20	0-85	1096.1	88.15
85-90	31.8	2.56	0-90	1127.9	90.71
90-95	23.2	1.86	0-95	1151.1	92.57
95-100	11.9	0.96	0-100	1163.0	93.53
100-105	9.4	0.76	0-105	1172.4	94.29
105-110	9.6	0.76	0-110	1181.9	95.05
110-115	9.0	0.73	0-115	1190.9	95.78
115-120	8.0	0.64	0-120	1198.9	96.42
120-125	7.2	0.58	0-125	1206.2	97.00
125-130	6.3	0.51	0-130	1212.5	97.51
130-135	6.1	0.49	0-135	1218.5	98.00
135-140	5.5	0.44	0-140	1224.0	98.44
140-145	4.5	0.36	0-145	1228.5	98.80
145-150	4.2	0.34	0-150	1232.7	99.14
150-155	3.6	0.29	0-155	1236.3	99.43
155-160	2.8	0.23	0-160	1239.2	99.66
160-165	2.0	0.16	0-165	1241.2	99.82
165-170	1.3	0.11	0-170	1242.5	99.93
170-175	0.8	0.06	0-175	1243.3	99.99
175-180	0.2	0.01	0-180	1243.4	100.00

Product Photo



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