

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai, China

Test Model: AD6LEM9040DIM010UNVWDRCW

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	RKS180131081-10-10
Test Date:	2018-06-03 to 2018-06-04
Report Date:	2018-06-04
Reviewed By:	Ray Gao/EE Engineer <i>Ray Gao</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan). No.248 Chenghu Road, Kunshan, Jiangsu province, China. Tel: +86-0512-86175000 Fax: +86-0512-88934268
Test Facility:	Test facility was located at No.248 Chenghu Road, Kunshan, Jiangsu province, China.
Accreditation:	The IAS Accreditation Number TL-749.

1. Product Description

General Information:

One sample was received on 2018- 05-31 and used for testing.

Model Tested: AD6LEM9040DIM010UNVWDRCW
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: LED Downlight
 Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277VAC, 50/60Hz
 Rated Power: 31.5W
 Nominal CCT: 4000K
 Nominal Lumen Output: 2650lm

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-10-2014: Harmonic Emission Limits – Related Power Quality Requirements for Lighting Equipment
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Integrating Sphere	INVENTFINE	Dia 1.5m	JWWCV090112	2018-01-24	2019-01-24
Power Meter	INVENTFINE	WT500	GSJWQ20009	2018-03-23	2019-03-22
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2018-01-24	2019-01-24
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2018-03-23	2019-03-22
Standard Light Source	INVENTFINE	N/A	JWWCR020106	2018-01-24	2019-01-24
Thermal Meter	KEJIAN	TA298	N/A	2017-11-14	2018-11-14
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	2018-03-23	2019-03-22
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2018-03-23	2019-03-22
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2018-03-23	2019-03-22
Power Meter	INVENTFINE	WT500	GSDSQ200007	2018-03-23	2019-03-22
Goniophotometer	INVENTFINE	GPM-1900	YWGCF120001	2018-01-24	2019-01-24
Wireless Weather Station	ZHONGXING	KG218	N/A	2017-11-14	2018-11-14
Standard Light Source	INVENTFINE	N/A	JWBYR040007	2018-01-24	2019-01-24

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Kunshan) 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 $U=2.6\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=24\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.5$ ($K=2$), at the 95% confidence level.

The uncertainty of power meter AC current $U=0.16\%$ of rdg, AC Voltage $U=0.18\%$ of rdg, Power $U=0.14\%$ ($K=2$), 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 flux is $U=2.6\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_i , 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 hour**

Test orientation: **Downward**

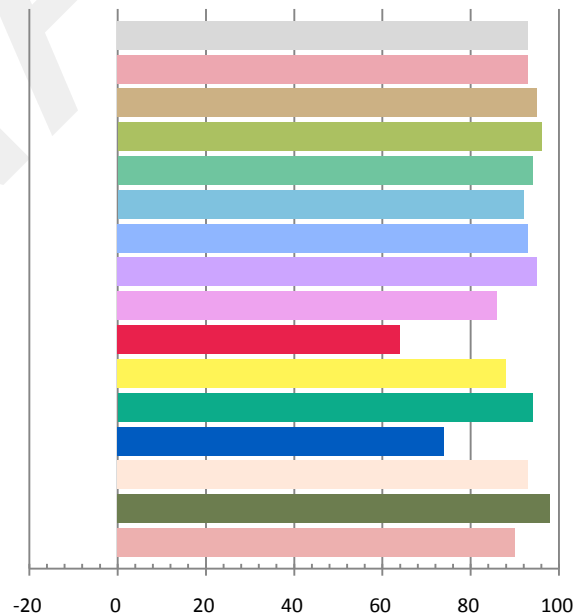
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.2568	30.57	0.9919	2851.6	93.28

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
9.581	3897	0.00272	0.3872	0.3868	0.2255	0.5069

Color Rendering Index

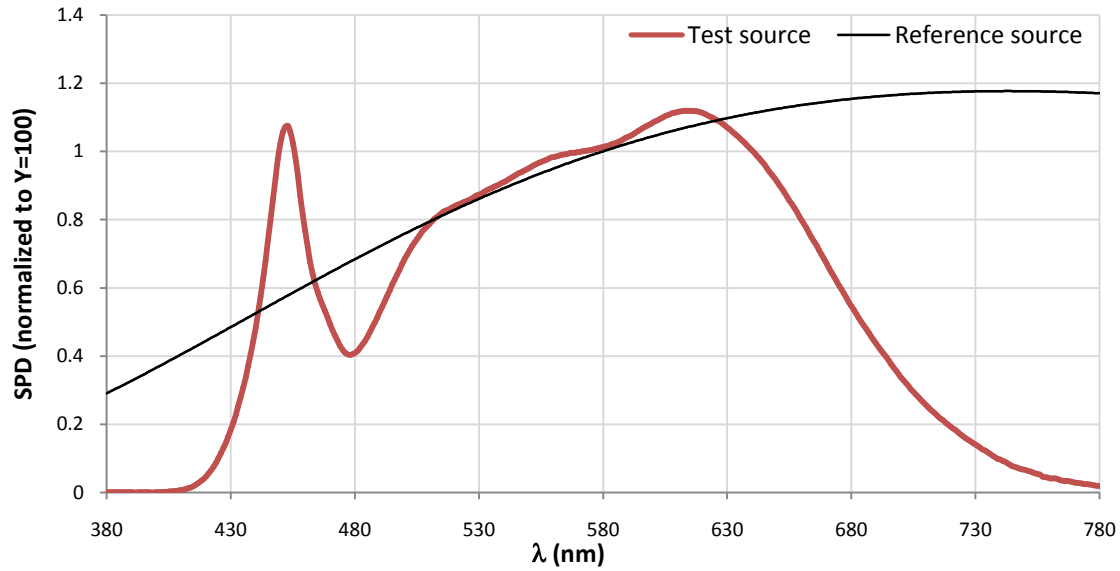
Ra 93.0			
R1 93	R2 95	R3 96	R4 94
R5 92	R6 93	R7 95	R8 86
R9 64	R10 88	R11 94	R12 74
R13 93	R14 98	R15 90	



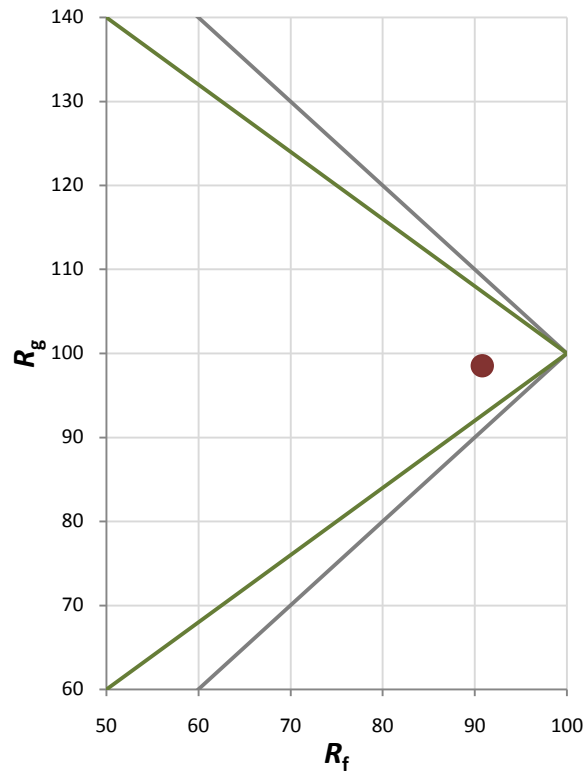
Fidelity Index and Gamut Index

Fidelity Index R_f	91
Gamut Index R_g	99

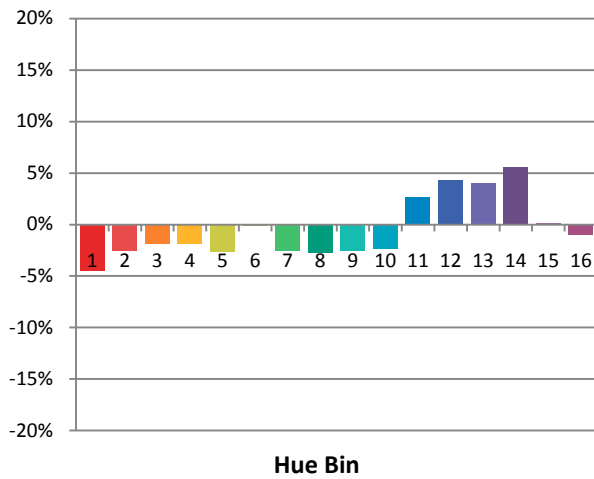
Spectral Power Distribution Comparison



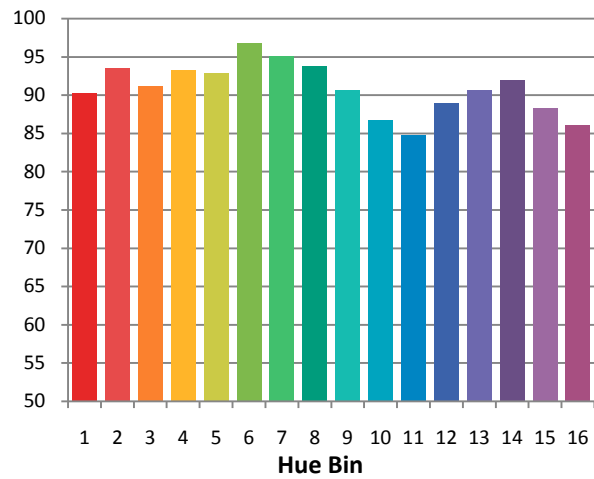
Plot of R_g versus R_f



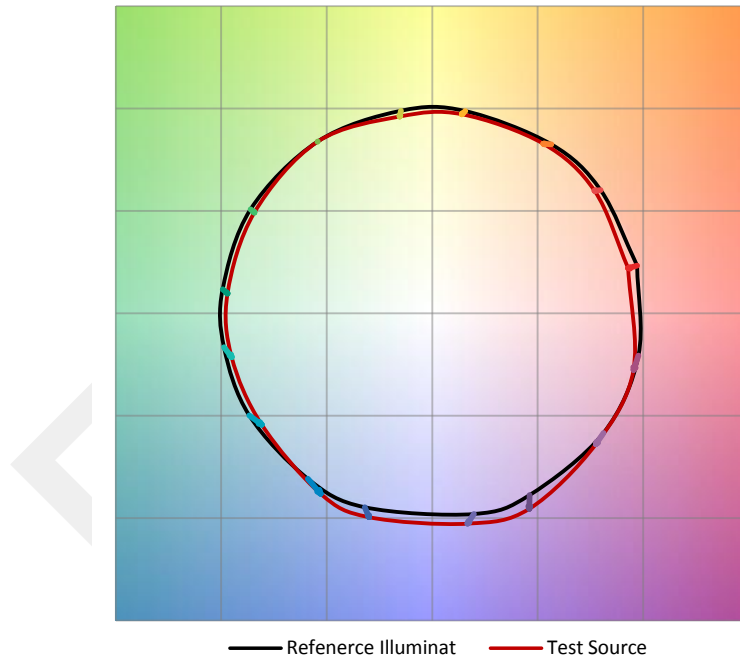
Chroma Shift by Hue



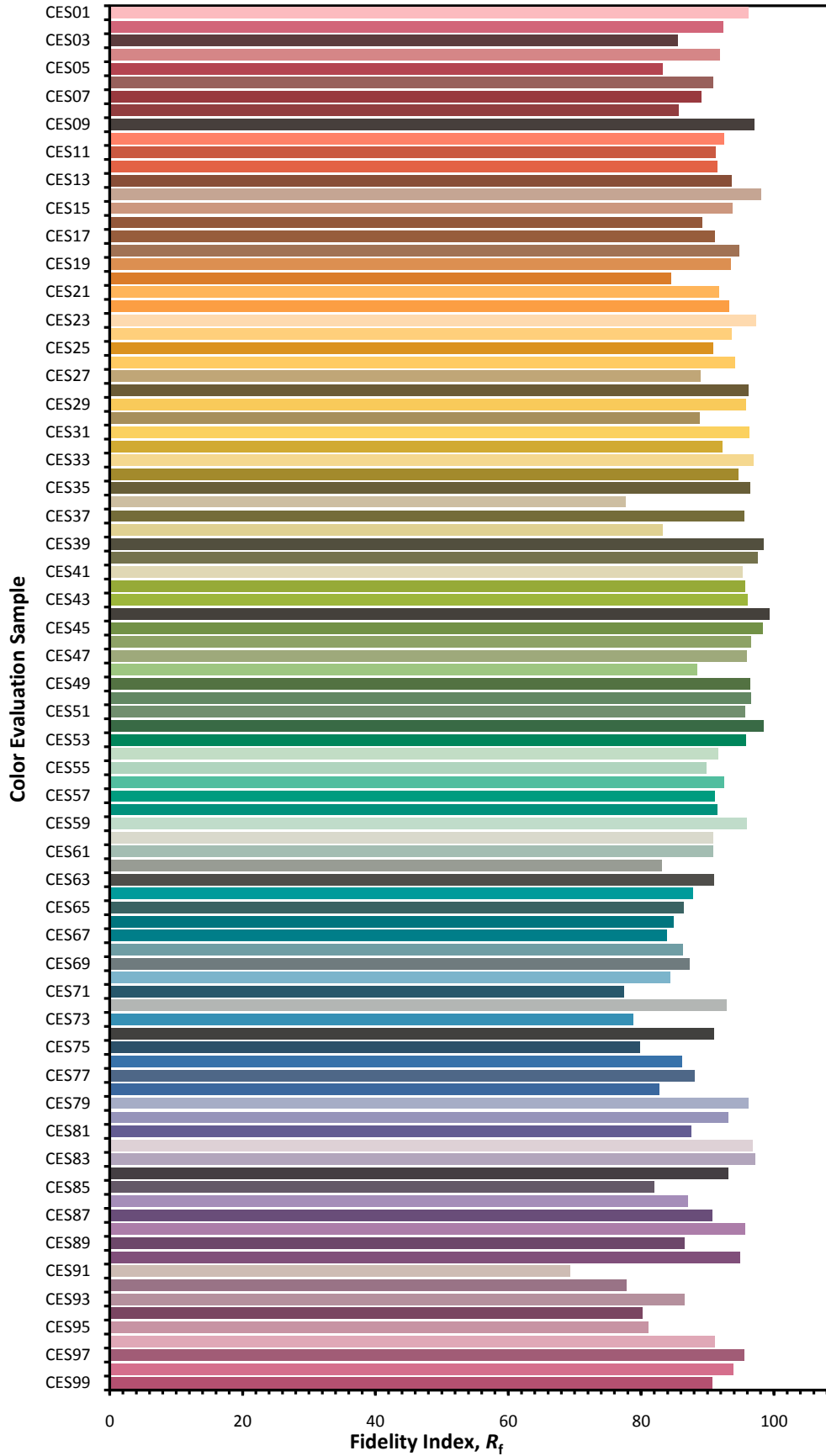
R_f by Hue



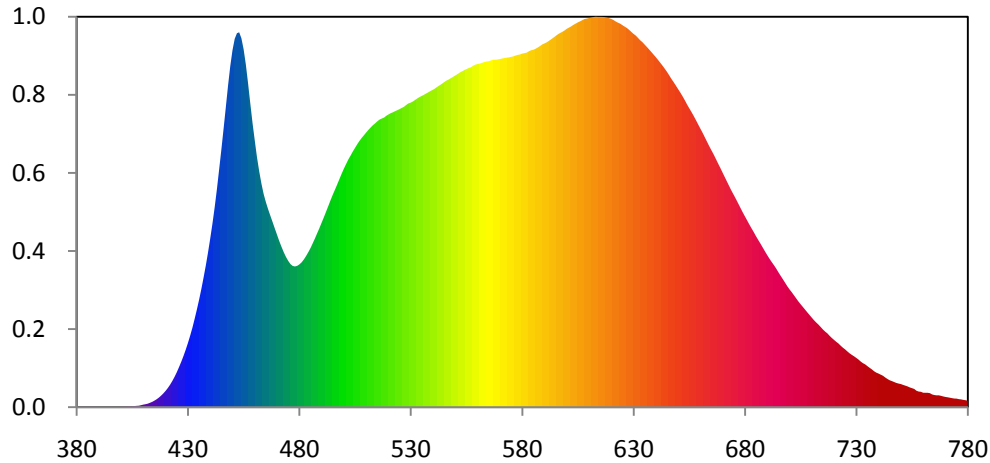
Color Vector Graphic



Color Fidelity by CES Sample



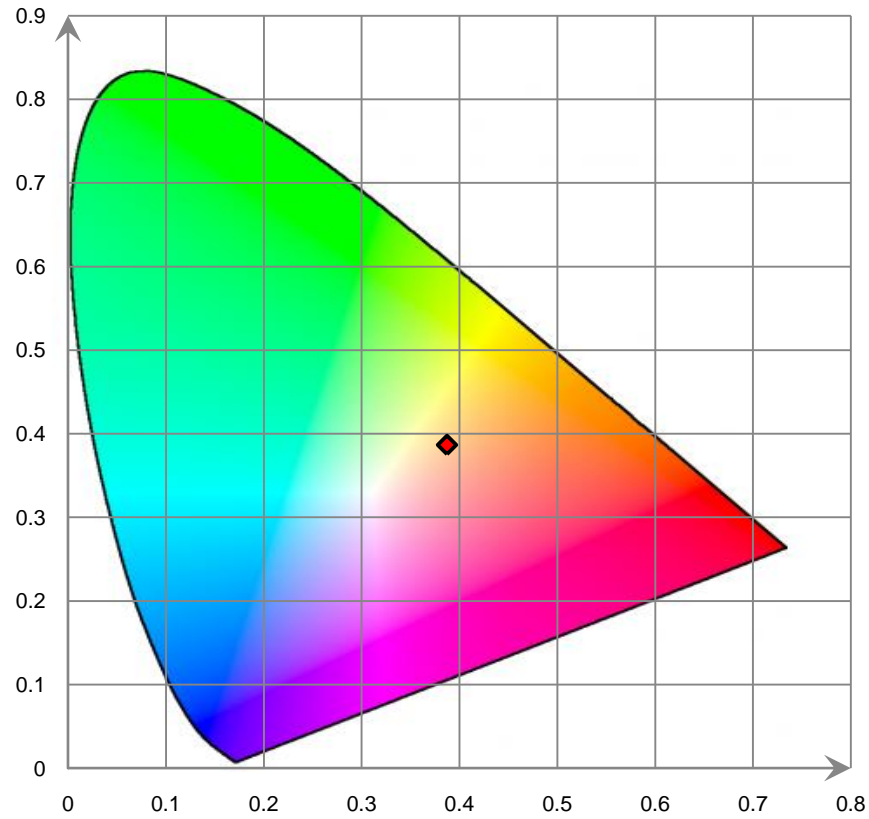
Relative Spectral Power Distribution



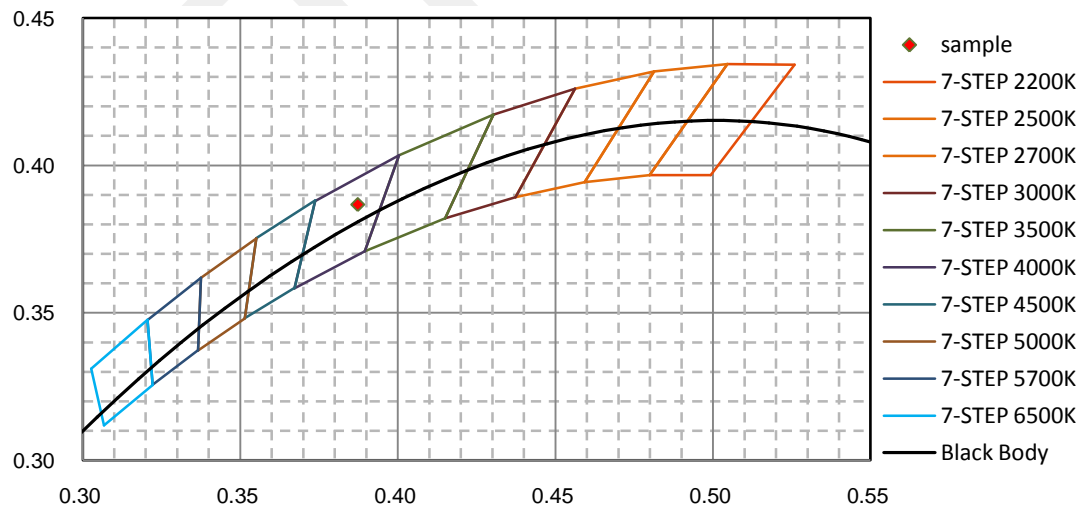
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.370E-02	421	2.305E+00	462	2.821E+01	503	3.011E+01	544	3.870E+01
381	3.170E-02	422	2.693E+00	463	2.674E+01	504	3.059E+01	545	3.890E+01
382	2.760E-02	423	3.139E+00	464	2.550E+01	505	3.104E+01	546	3.908E+01
383	4.180E-02	424	3.631E+00	465	2.452E+01	506	3.147E+01	547	3.921E+01
384	4.440E-02	425	4.182E+00	466	2.368E+01	507	3.187E+01	548	3.937E+01
385	2.520E-02	426	4.794E+00	467	2.291E+01	508	3.223E+01	549	3.954E+01
386	3.490E-02	427	5.434E+00	468	2.216E+01	509	3.255E+01	550	3.969E+01
387	3.860E-02	428	6.121E+00	469	2.138E+01	510	3.287E+01	551	3.986E+01
388	3.090E-02	429	6.872E+00	470	2.063E+01	511	3.319E+01	552	4.004E+01
389	3.730E-02	430	7.678E+00	471	1.988E+01	512	3.347E+01	553	4.019E+01
390	3.510E-02	431	8.556E+00	472	1.919E+01	513	3.374E+01	554	4.033E+01
391	1.600E-02	432	9.505E+00	473	1.855E+01	514	3.397E+01	555	4.046E+01
392	1.540E-02	433	1.056E+01	474	1.798E+01	515	3.420E+01	556	4.058E+01
393	2.670E-02	434	1.167E+01	475	1.751E+01	516	3.442E+01	557	4.068E+01
394	2.990E-02	435	1.285E+01	476	1.713E+01	517	3.454E+01	558	4.086E+01
395	3.230E-02	436	1.411E+01	477	1.691E+01	518	3.465E+01	559	4.100E+01
396	2.540E-02	437	1.548E+01	478	1.684E+01	519	3.486E+01	560	4.107E+01
397	1.820E-02	438	1.692E+01	479	1.691E+01	520	3.503E+01	561	4.112E+01
398	1.200E-02	439	1.848E+01	480	1.708E+01	521	3.518E+01	562	4.121E+01
399	5.700E-03	440	2.017E+01	481	1.732E+01	522	3.529E+01	563	4.131E+01
400	2.800E-02	441	2.194E+01	482	1.766E+01	523	3.543E+01	564	4.137E+01
401	4.510E-02	442	2.391E+01	483	1.808E+01	524	3.555E+01	565	4.141E+01
402	5.370E-02	443	2.608E+01	484	1.854E+01	525	3.567E+01	566	4.149E+01
403	6.620E-02	444	2.842E+01	485	1.903E+01	526	3.581E+01	567	4.158E+01
404	8.600E-02	445	3.082E+01	486	1.960E+01	527	3.595E+01	568	4.158E+01
405	1.033E-01	446	3.331E+01	487	2.019E+01	528	3.617E+01	569	4.161E+01
406	1.368E-01	447	3.588E+01	488	2.081E+01	529	3.635E+01	570	4.167E+01
407	1.612E-01	448	3.847E+01	489	2.143E+01	530	3.645E+01	571	4.172E+01
408	1.781E-01	449	4.081E+01	490	2.207E+01	531	3.659E+01	572	4.178E+01
409	2.414E-01	450	4.270E+01	491	2.272E+01	532	3.677E+01	573	4.183E+01
410	3.105E-01	451	4.409E+01	492	2.339E+01	533	3.696E+01	574	4.185E+01
411	3.593E-01	452	4.476E+01	493	2.408E+01	534	3.712E+01	575	4.192E+01
412	4.260E-01	453	4.486E+01	494	2.476E+01	535	3.726E+01	576	4.198E+01
413	5.267E-01	454	4.415E+01	495	2.542E+01	536	3.740E+01	577	4.207E+01
414	6.424E-01	455	4.283E+01	496	2.604E+01	537	3.755E+01	578	4.216E+01
415	7.903E-01	456	4.099E+01	497	2.666E+01	538	3.770E+01	579	4.221E+01
416	9.591E-01	457	3.875E+01	498	2.731E+01	539	3.786E+01	580	4.231E+01
417	1.153E+00	458	3.633E+01	499	2.794E+01	540	3.798E+01	581	4.237E+01
418	1.390E+00	459	3.401E+01	500	2.855E+01	541	3.816E+01	582	4.242E+01
419	1.656E+00	460	3.191E+01	501	2.910E+01	542	3.835E+01	583	4.259E+01
420	1.960E+00	461	2.992E+01	502	2.965E+01	543	3.852E+01	584	4.271E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.277E+01	626	4.555E+01	667	2.969E+01	708	1.135E+01	749	2.825E+00
586	4.288E+01	627	4.538E+01	668	2.914E+01	709	1.103E+01	750	2.768E+00
587	4.304E+01	628	4.516E+01	669	2.861E+01	710	1.072E+01	751	2.664E+00
588	4.321E+01	629	4.492E+01	670	2.806E+01	711	1.041E+01	752	2.581E+00
589	4.341E+01	630	4.468E+01	671	2.751E+01	712	1.014E+01	753	2.485E+00
590	4.353E+01	631	4.448E+01	672	2.697E+01	713	9.881E+00	754	2.365E+00
591	4.366E+01	632	4.420E+01	673	2.642E+01	714	9.599E+00	755	2.277E+00
592	4.384E+01	633	4.391E+01	674	2.589E+01	715	9.300E+00	756	2.181E+00
593	4.402E+01	634	4.368E+01	675	2.540E+01	716	9.050E+00	757	1.966E+00
594	4.421E+01	635	4.339E+01	676	2.490E+01	717	8.832E+00	758	1.868E+00
595	4.441E+01	636	4.310E+01	677	2.438E+01	718	8.543E+00	759	1.842E+00
596	4.462E+01	637	4.281E+01	678	2.385E+01	719	8.284E+00	760	1.727E+00
597	4.477E+01	638	4.250E+01	679	2.332E+01	720	8.052E+00	761	1.724E+00
598	4.491E+01	639	4.220E+01	680	2.283E+01	721	7.824E+00	762	1.726E+00
599	4.508E+01	640	4.188E+01	681	2.235E+01	722	7.617E+00	763	1.677E+00
600	4.528E+01	641	4.157E+01	682	2.185E+01	723	7.356E+00	764	1.530E+00
601	4.542E+01	642	4.122E+01	683	2.139E+01	724	7.110E+00	765	1.453E+00
602	4.557E+01	643	4.088E+01	684	2.093E+01	725	6.909E+00	766	1.416E+00
603	4.575E+01	644	4.051E+01	685	2.045E+01	726	6.667E+00	767	1.420E+00
604	4.590E+01	645	4.014E+01	686	2.000E+01	727	6.442E+00	768	1.361E+00
605	4.605E+01	646	3.972E+01	687	1.956E+01	728	6.257E+00	769	1.286E+00
606	4.617E+01	647	3.928E+01	688	1.910E+01	729	6.086E+00	770	1.223E+00
607	4.632E+01	648	3.890E+01	689	1.864E+01	730	5.891E+00	771	1.182E+00
608	4.645E+01	649	3.849E+01	690	1.820E+01	731	5.693E+00	772	1.130E+00
609	4.650E+01	650	3.807E+01	691	1.777E+01	732	5.458E+00	773	1.081E+00
610	4.657E+01	651	3.765E+01	692	1.738E+01	733	5.263E+00	774	1.033E+00
611	4.663E+01	652	3.721E+01	693	1.701E+01	734	5.116E+00	775	1.022E+00
612	4.669E+01	653	3.674E+01	694	1.660E+01	735	4.906E+00	776	9.645E-01
613	4.673E+01	654	3.624E+01	695	1.616E+01	736	4.712E+00	777	9.283E-01
614	4.671E+01	655	3.577E+01	696	1.574E+01	737	4.517E+00	778	8.767E-01
615	4.671E+01	656	3.534E+01	697	1.533E+01	738	4.301E+00	779	8.334E-01
616	4.671E+01	657	3.485E+01	698	1.490E+01	739	4.130E+00	780	7.721E-01
617	4.668E+01	658	3.435E+01	699	1.448E+01	740	4.018E+00		
618	4.663E+01	659	3.385E+01	700	1.410E+01	741	3.888E+00		
619	4.656E+01	660	3.334E+01	701	1.376E+01	742	3.753E+00		
620	4.646E+01	661	3.284E+01	702	1.339E+01	743	3.553E+00		
621	4.633E+01	662	3.230E+01	703	1.303E+01	744	3.369E+00		
622	4.616E+01	663	3.176E+01	704	1.266E+01	745	3.219E+00		
623	4.602E+01	664	3.123E+01	705	1.232E+01	746	3.116E+00		
624	4.590E+01	665	3.073E+01	706	1.200E+01	747	3.011E+00		
625	4.572E+01	666	3.023E+01	707	1.168E+01	748	2.896E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

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

Test orientation: **Downward**

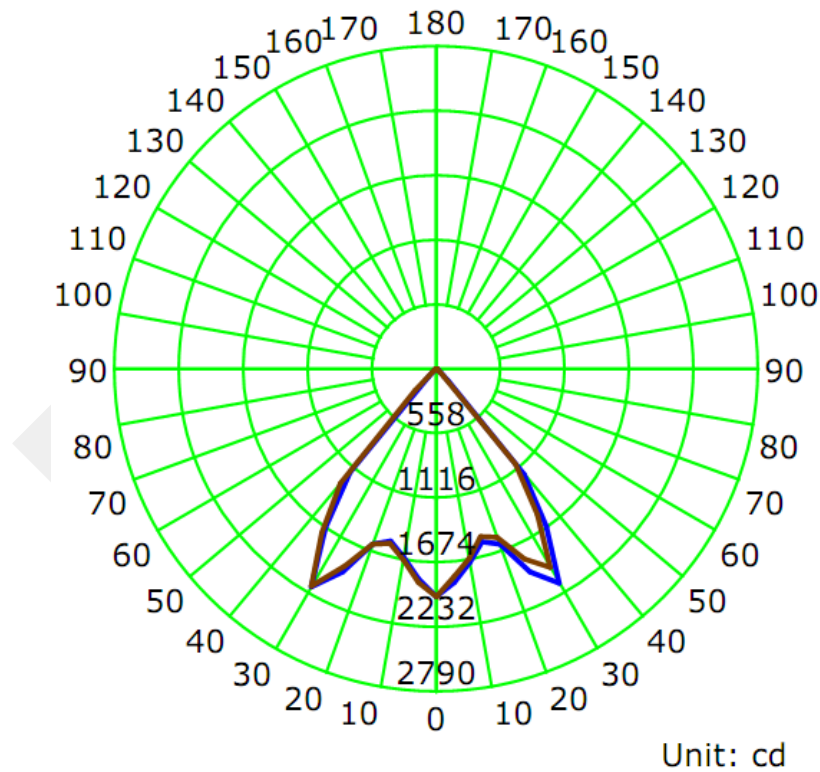
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2560	30.56	0.9950

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2853.2	93.41	2232.1	1.36	1.35

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	80.8	81.4	80.9	80.7	81.0
Field Angle (10% I _{max}):	89.2	89.8	90.4	89.4	89.7

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1971	1971	1971	1971	1971	1971	1971	1971
5.0°	1852	1838	1828	1814	1803	1800	1808	1818
10.0°	1699	1684	1673	1667	1661	1660	1665	1670
15.0°	1547	1534	1522	1512	1500	1492	1494	1495
20.0°	1615	1588	1564	1573	1550	1559	1559	1572
25.0°	1934	1880	1840	1841	1812	1822	1861	1891
30.0°	2138	2062	2015	1984	1983	2008	2047	2105
35.0°	1666	1633	1609	1577	1538	1561	1582	1632
40.0°	1186	1157	1134	1101	1077	1076	1101	1150
45.0°	156	127	105	97	93	93	95	114
50.0°	56	58	55	51	49	48	47	49
55.0°	31	32	31	28	26	26	26	27
60.0°	17	18	17	15	15	14	14	15
65.0°	10	10	10	9	8	7	8	8
70.0°	5	6	5	5	5	4	4	4
75.0°	3	3	3	2	2	2	1	2
80.0°	0	0	0	0	0	0	0	0
85.0°	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	1	1	1	2	1	1	1	1
150.0°	2	2	2	3	2	2	2	2
155.0°	3	3	3	3	4	3	3	3
160.0°	4	4	3	4	4	4	4	4
165.0°	4	4	4	4	4	4	5	5
170.0°	4	4	4	5	4	4	5	5
175.0°	4	4	4	5	4	4	4	4
180.0°	0	0	0	0	0	0	0	0

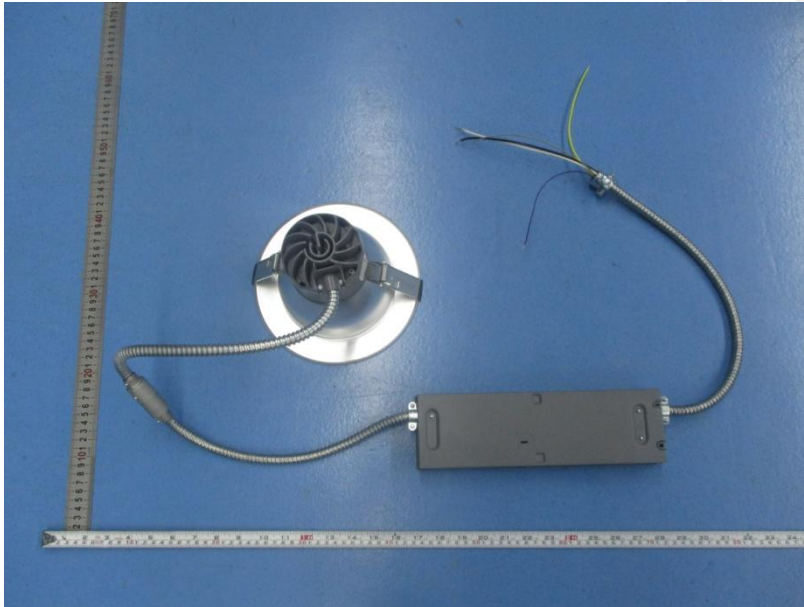
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1971	1971	1971	1971	1971	1971	1971	1971
5.0°	1822	1833	1841	1847	1851	1846	1844	1836
10.0°	1649	1655	1663	1669	1674	1673	1674	1671
15.0°	1539	1550	1555	1558	1560	1556	1555	1551
20.0°	1615	1610	1618	1625	1614	1628	1670	1685
25.0°	1933	1902	1892	1905	1878	1902	1949	1975
30.0°	2179	2153	2139	2162	2169	2155	2185	2232
35.0°	1677	1696	1719	1727	1731	1720	1689	1696
40.0°	1167	1229	1312	1319	1296	1283	1219	1174
45.0°	104	159	226	252	261	255	214	147
50.0°	49	55	57	57	57	57	55	52
55.0°	28	31	33	32	31	31	30	29
60.0°	15	18	19	17	17	17	16	16
65.0°	8	9	10	10	10	9	9	9
70.0°	4	5	5	5	5	5	5	5
75.0°	2	3	3	2	2	2	3	2
80.0°	0	1	0	0	0	0	1	0
85.0°	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	0	1	1	0	1	1	0	1
150.0°	2	2	1	2	2	2	1	2
155.0°	2	3	3	3	3	3	3	3
160.0°	3	3	4	4	4	4	4	4
165.0°	4	4	4	4	4	4	4	4
170.0°	4	4	4	5	5	5	5	4
175.0°	4	4	4	4	5	5	4	5
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	45.4	1.59	0-5	45.4	1.59
5-10	125.2	4.39	0-10	170.6	5.98
10-15	189.9	6.66	0-15	360.5	12.64
15-20	258.4	9.06	0-20	618.9	21.69
20-25	366.2	12.83	0-25	985.1	34.53
25-30	505.7	17.72	0-30	1490.8	52.25
30-35	553.8	19.41	0-35	2044.5	71.66
35-40	473.8	16.61	0-40	2518.3	88.27
40-45	248.5	8.71	0-45	2766.9	96.98
45-50	42.3	1.48	0-50	2809.2	98.46
50-55	18.0	0.63	0-55	2827.2	99.09
55-60	10.6	0.37	0-60	2837.7	99.46
60-65	6.1	0.21	0-65	2843.9	99.67
65-70	3.5	0.12	0-70	2847.4	99.80
70-75	1.8	0.06	0-75	2849.2	99.86
75-80	0.6	0.02	0-80	2849.8	99.88
80-85	0.0	0.00	0-85	2849.8	99.88
85-90	0.0	0.00	0-90	2849.8	99.88
90-95	0.0	0.00	0-95	2849.8	99.88
95-100	0.0	0.00	0-100	2849.8	99.88
100-105	0.0	0.00	0-105	2849.8	99.88
105-110	0.0	0.00	0-110	2849.8	99.88
110-115	0.0	0.00	0-115	2849.8	99.88
115-120	0.0	0.00	0-120	2849.8	99.88
120-125	0.0	0.00	0-125	2849.8	99.88
125-130	0.0	0.00	0-130	2849.8	99.88
130-135	0.0	0.00	0-135	2849.8	99.88
135-140	0.0	0.00	0-140	2849.8	99.88
140-145	0.1	0.00	0-145	2850.0	99.89
145-150	0.4	0.01	0-150	2850.4	99.90
150-155	0.6	0.02	0-155	2851.0	99.92
155-160	0.7	0.02	0-160	2851.6	99.95
160-165	0.6	0.02	0-165	2852.3	99.97
165-170	0.5	0.02	0-170	2852.8	99.99
170-175	0.3	0.01	0-175	2853.1	100.00
175-180	0.1	0.00	0-180	2853.2	100.00

6. Product Photo



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