IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: AD4LEM9027DIM010UNVWDRCC

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang
Report Number:	RKS180131081-10-4
Test Date:	2018-05-23 to 2018-05-24
Report Date:	2018-05-25
Reviewed By:	Ray Gao/EE Engineer
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- 03-10 and used for testing.

Model Tested:	AD4LEM9027DIM010UNVWDRCC
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:	2700K
Nominal Lumen Output:	2500lm

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°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, 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=24K (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_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 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	0.2639	31.47	0.9937	2569.1	81.64

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
9.109	2755	-0.00182	0.4524	0.4040	0.2606	0.5237

Color Rendering Index

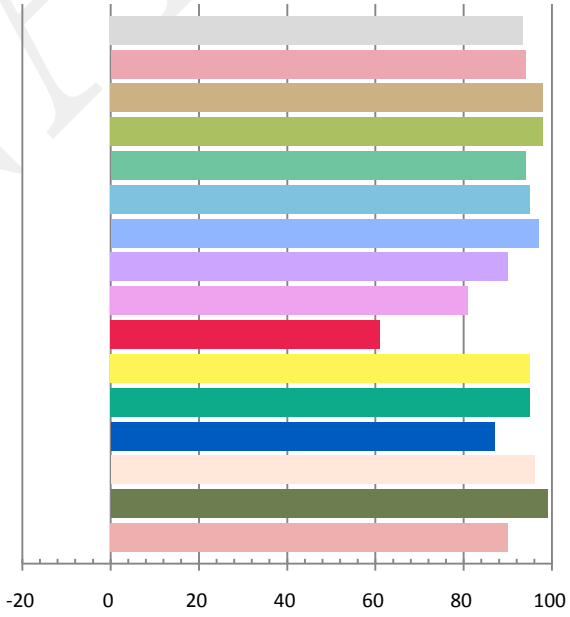
Ra
93.4

R1	R2	R3	R4
94	98	98	94

R5	R6	R7	R8
95	97	90	81

R9	R10	R11	R12
61	95	95	87

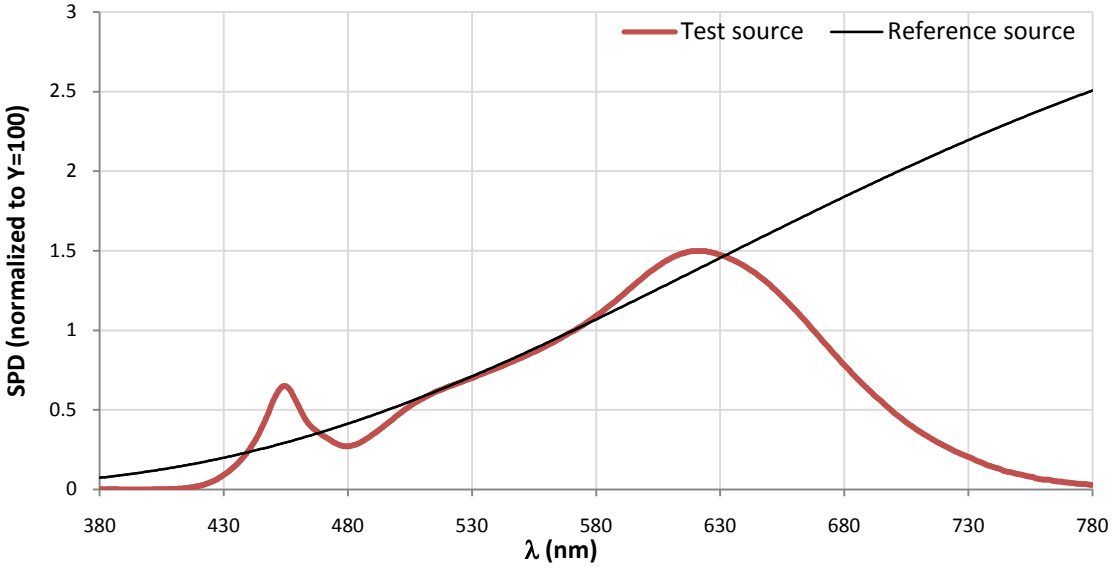
R13	R14	R15
96	99	90



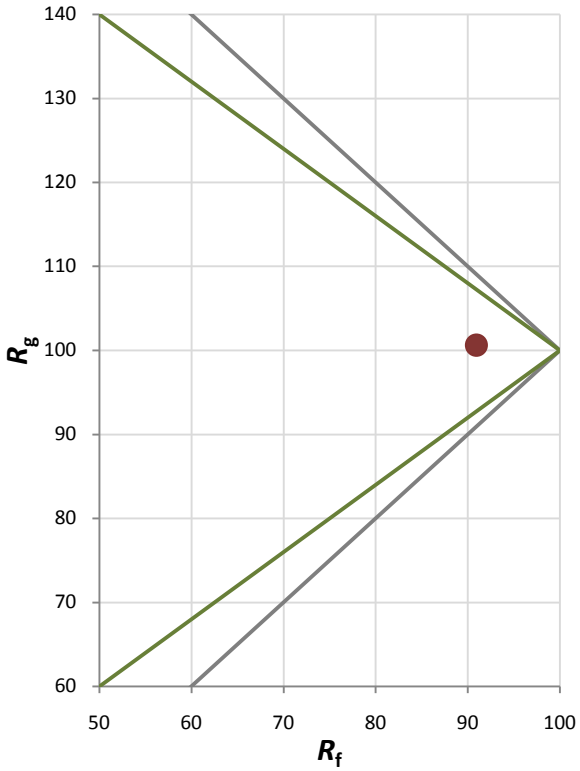
Fidelity Index and Gamut Index

Fidelity Index R_f	91
Gamut Index R_g	101

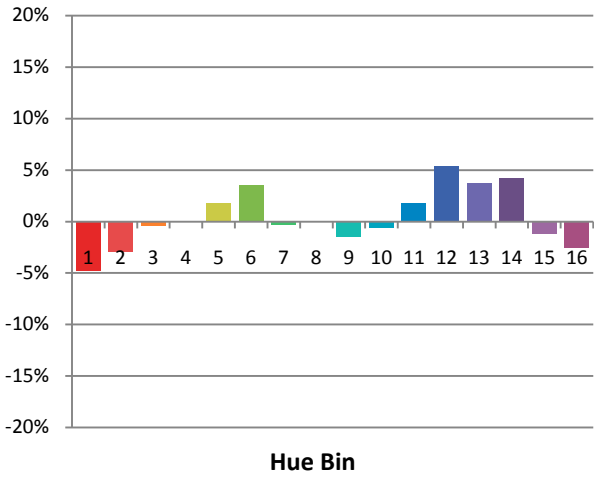
Spectral Power Distribution Comparison



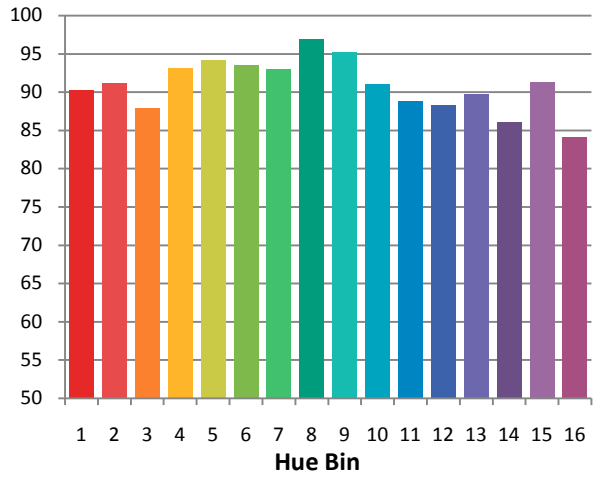
Plot of R_g versus R_f



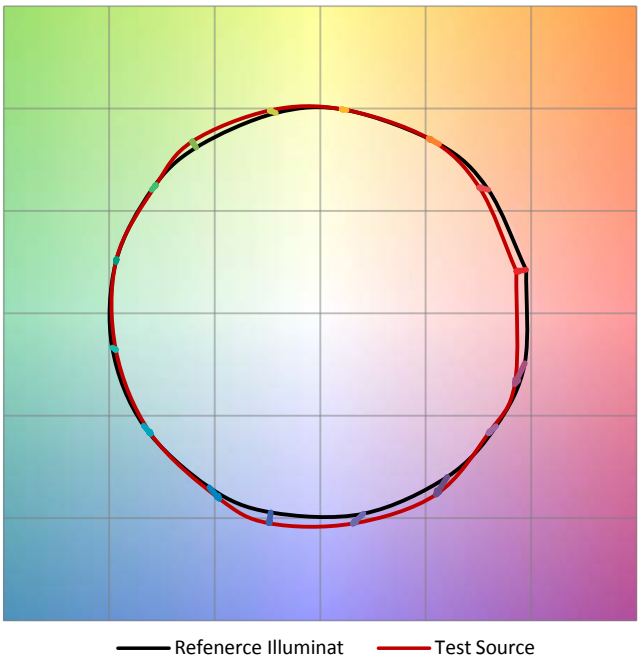
Chroma Shift by Hue

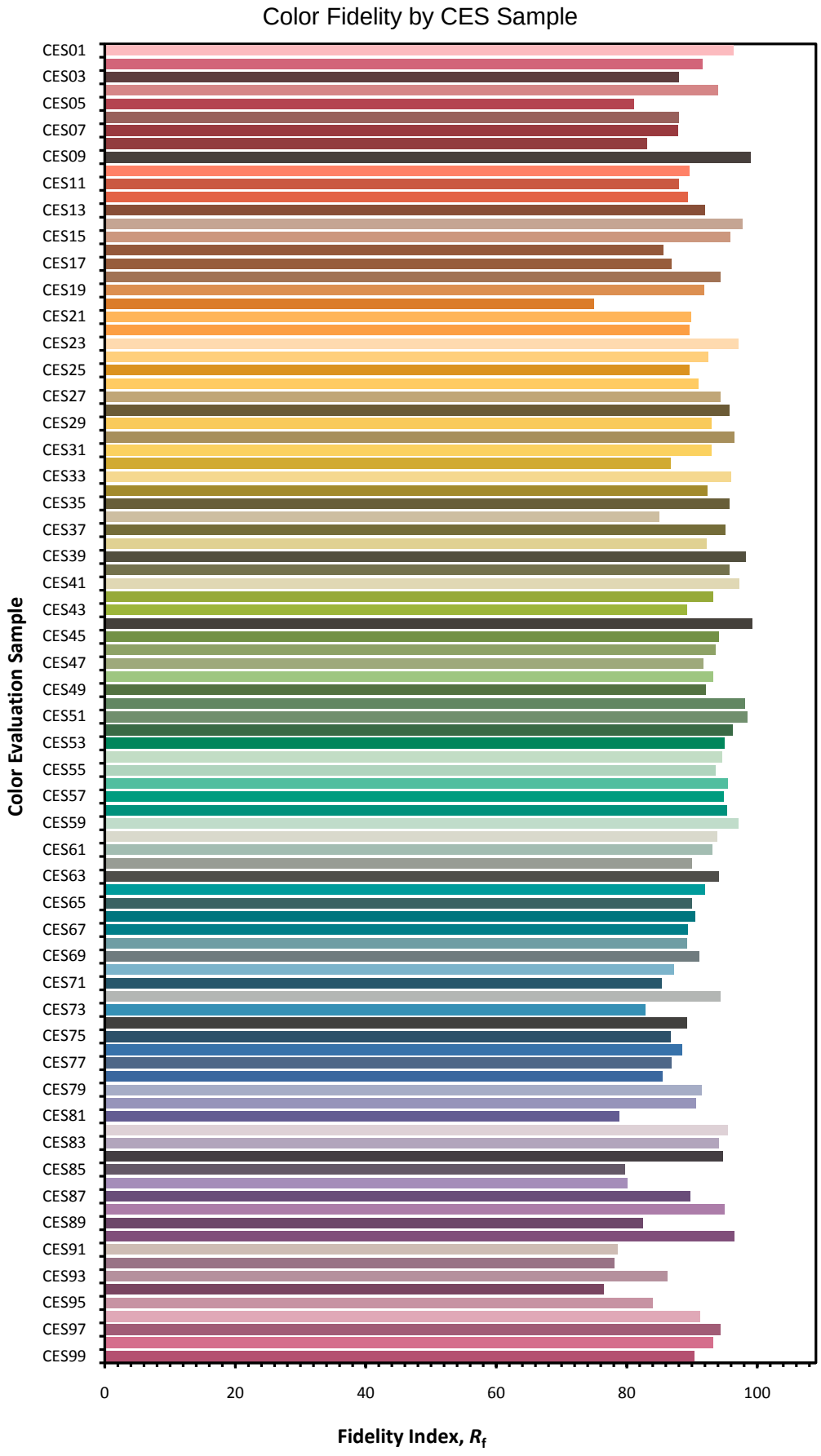


R_f by Hue



Color Vector Graphic




Color Fidelity by CES Sample
Color Evaluation Sample
CES01
CES03
CES05
CES07
CES09
CES11
CES13
CES15
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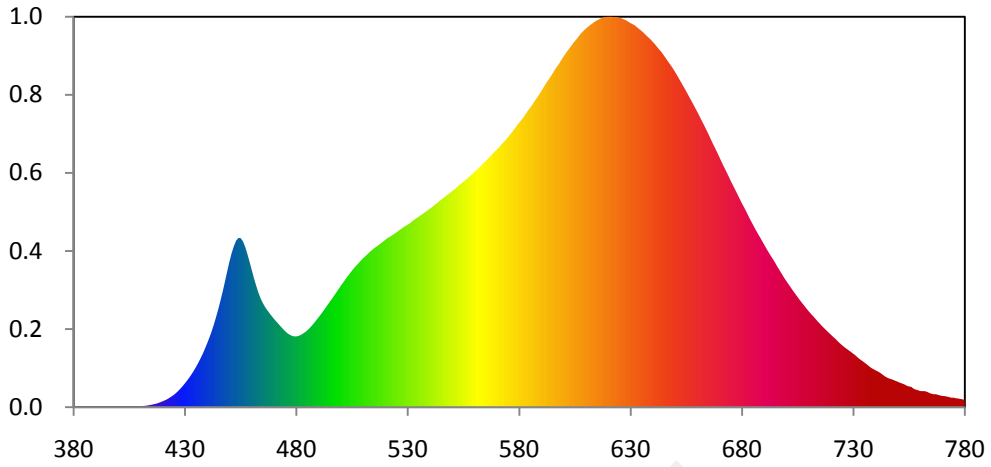
CES95
CES97
CES99
0
20
40
60
80
100
Fidelity Index, R_f

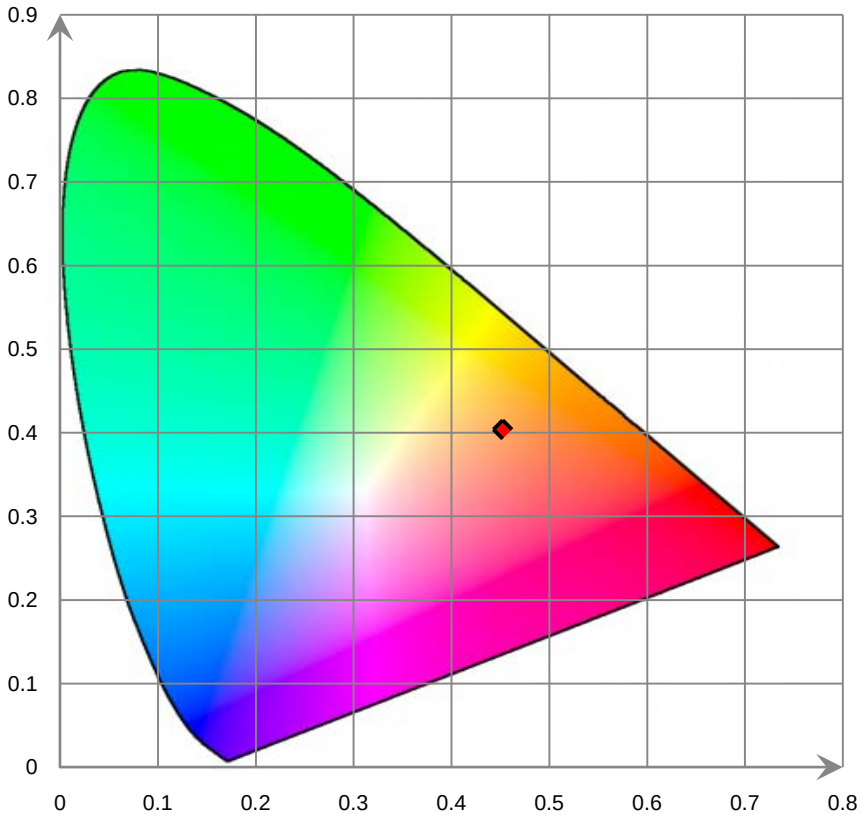
Relative Spectral Power Distribution



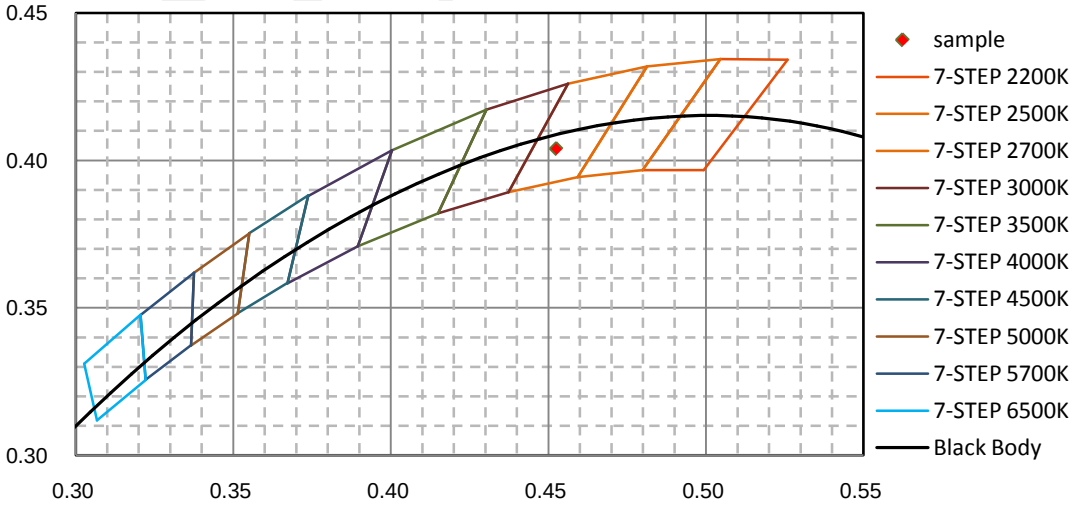
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.720E-02	421	9.936E-01	462	1.750E+01	503	1.887E+01	544	2.967E+01
381	3.510E-02	422	1.143E+00	463	1.651E+01	504	1.929E+01	545	2.992E+01
382	2.820E-02	423	1.343E+00	464	1.567E+01	505	1.971E+01	546	3.019E+01
383	3.960E-02	424	1.548E+00	465	1.500E+01	506	2.011E+01	547	3.043E+01
384	4.960E-02	425	1.775E+00	466	1.444E+01	507	2.045E+01	548	3.067E+01
385	3.730E-02	426	2.043E+00	467	1.397E+01	508	2.080E+01	549	3.093E+01
386	3.850E-02	427	2.352E+00	468	1.355E+01	509	2.116E+01	550	3.119E+01
387	3.650E-02	428	2.684E+00	469	1.313E+01	510	2.150E+01	551	3.142E+01
388	2.600E-02	429	3.050E+00	470	1.273E+01	511	2.180E+01	552	3.170E+01
389	2.950E-02	430	3.436E+00	471	1.236E+01	512	2.210E+01	553	3.200E+01
390	2.750E-02	431	3.845E+00	472	1.200E+01	513	2.241E+01	554	3.229E+01
391	1.330E-02	432	4.285E+00	473	1.164E+01	514	2.268E+01	555	3.252E+01
392	9.000E-03	433	4.760E+00	474	1.129E+01	515	2.295E+01	556	3.277E+01
393	1.550E-02	434	5.266E+00	475	1.096E+01	516	2.318E+01	557	3.305E+01
394	2.670E-02	435	5.824E+00	476	1.067E+01	517	2.341E+01	558	3.335E+01
395	2.930E-02	436	6.403E+00	477	1.045E+01	518	2.366E+01	559	3.365E+01
396	2.420E-02	437	7.035E+00	478	1.030E+01	519	2.391E+01	560	3.396E+01
397	1.620E-02	438	7.707E+00	479	1.021E+01	520	2.416E+01	561	3.425E+01
398	8.000E-03	439	8.443E+00	480	1.021E+01	521	2.442E+01	562	3.455E+01
399	4.600E-03	440	9.232E+00	481	1.028E+01	522	2.460E+01	563	3.488E+01
400	2.150E-02	441	1.005E+01	482	1.043E+01	523	2.479E+01	564	3.520E+01
401	2.890E-02	442	1.094E+01	483	1.062E+01	524	2.501E+01	565	3.551E+01
402	3.650E-02	443	1.195E+01	484	1.084E+01	525	2.523E+01	566	3.583E+01
403	3.800E-02	444	1.303E+01	485	1.110E+01	526	2.548E+01	567	3.618E+01
404	5.240E-02	445	1.419E+01	486	1.142E+01	527	2.570E+01	568	3.652E+01
405	6.110E-02	446	1.544E+01	487	1.178E+01	528	2.593E+01	569	3.686E+01
406	6.990E-02	447	1.676E+01	488	1.215E+01	529	2.616E+01	570	3.717E+01
407	7.440E-02	448	1.817E+01	489	1.256E+01	530	2.632E+01	571	3.750E+01
408	7.440E-02	449	1.964E+01	490	1.297E+01	531	2.655E+01	572	3.787E+01
409	1.241E-01	450	2.103E+01	491	1.339E+01	532	2.682E+01	573	3.824E+01
410	1.649E-01	451	2.226E+01	492	1.383E+01	533	2.706E+01	574	3.856E+01
411	1.725E-01	452	2.327E+01	493	1.428E+01	534	2.728E+01	575	3.895E+01
412	1.868E-01	453	2.404E+01	494	1.474E+01	535	2.750E+01	576	3.937E+01
413	2.355E-01	454	2.442E+01	495	1.519E+01	536	2.772E+01	577	3.976E+01
414	2.928E-01	455	2.439E+01	496	1.565E+01	537	2.795E+01	578	4.019E+01
415	3.524E-01	456	2.396E+01	497	1.611E+01	538	2.818E+01	579	4.061E+01
416	4.215E-01	457	2.317E+01	498	1.658E+01	539	2.841E+01	580	4.104E+01
417	4.969E-01	458	2.214E+01	499	1.706E+01	540	2.865E+01	581	4.143E+01
418	6.036E-01	459	2.099E+01	500	1.754E+01	541	2.890E+01	582	4.184E+01
419	7.172E-01	460	1.979E+01	501	1.797E+01	542	2.915E+01	583	4.234E+01
420	8.527E-01	461	1.859E+01	502	1.843E+01	543	2.942E+01	584	4.281E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.322E+01	626	5.609E+01	667	3.798E+01	708	1.464E+01	749	3.789E+00
586	4.367E+01	627	5.596E+01	668	3.736E+01	709	1.422E+01	750	3.661E+00
587	4.417E+01	628	5.582E+01	669	3.669E+01	710	1.383E+01	751	3.514E+00
588	4.465E+01	629	5.561E+01	670	3.600E+01	711	1.347E+01	752	3.405E+00
589	4.512E+01	630	5.541E+01	671	3.530E+01	712	1.311E+01	753	3.273E+00
590	4.563E+01	631	5.525E+01	672	3.463E+01	713	1.275E+01	754	3.092E+00
591	4.616E+01	632	5.506E+01	673	3.400E+01	714	1.238E+01	755	2.992E+00
592	4.668E+01	633	5.479E+01	674	3.332E+01	715	1.204E+01	756	2.933E+00
593	4.716E+01	634	5.453E+01	675	3.263E+01	716	1.168E+01	757	2.678E+00
594	4.763E+01	635	5.427E+01	676	3.200E+01	717	1.137E+01	758	2.534E+00
595	4.813E+01	636	5.398E+01	677	3.137E+01	718	1.105E+01	759	2.450E+00
596	4.867E+01	637	5.365E+01	678	3.072E+01	719	1.074E+01	760	2.325E+00
597	4.914E+01	638	5.335E+01	679	3.005E+01	720	1.044E+01	761	2.316E+00
598	4.959E+01	639	5.305E+01	680	2.941E+01	721	1.013E+01	762	2.317E+00
599	5.011E+01	640	5.270E+01	681	2.881E+01	722	9.854E+00	763	2.230E+00
600	5.063E+01	641	5.235E+01	682	2.819E+01	723	9.515E+00	764	2.073E+00
601	5.108E+01	642	5.195E+01	683	2.753E+01	724	9.206E+00	765	1.941E+00
602	5.153E+01	643	5.157E+01	684	2.690E+01	725	8.930E+00	766	1.868E+00
603	5.197E+01	644	5.118E+01	685	2.630E+01	726	8.657E+00	767	1.869E+00
604	5.241E+01	645	5.073E+01	686	2.570E+01	727	8.422E+00	768	1.785E+00
605	5.281E+01	646	5.027E+01	687	2.512E+01	728	8.185E+00	769	1.686E+00
606	5.318E+01	647	4.980E+01	688	2.457E+01	729	7.956E+00	770	1.623E+00
607	5.361E+01	648	4.936E+01	689	2.401E+01	730	7.701E+00	771	1.594E+00
608	5.401E+01	649	4.888E+01	690	2.345E+01	731	7.456E+00	772	1.538E+00
609	5.433E+01	650	4.836E+01	691	2.288E+01	732	7.162E+00	773	1.446E+00
610	5.462E+01	651	4.782E+01	692	2.233E+01	733	6.893E+00	774	1.368E+00
611	5.492E+01	652	4.726E+01	693	2.181E+01	734	6.681E+00	775	1.367E+00
612	5.516E+01	653	4.670E+01	694	2.132E+01	735	6.436E+00	776	1.288E+00
613	5.540E+01	654	4.614E+01	695	2.079E+01	736	6.188E+00	777	1.248E+00
614	5.563E+01	655	4.557E+01	696	2.023E+01	737	5.924E+00	778	1.190E+00
615	5.582E+01	656	4.498E+01	697	1.971E+01	738	5.673E+00	779	1.131E+00
616	5.599E+01	657	4.438E+01	698	1.917E+01	739	5.489E+00	780	1.061E+00
617	5.615E+01	658	4.380E+01	699	1.865E+01	740	5.316E+00		
618	5.627E+01	659	4.319E+01	700	1.816E+01	741	5.149E+00		
619	5.631E+01	660	4.259E+01	701	1.771E+01	742	4.973E+00		
620	5.632E+01	661	4.196E+01	702	1.723E+01	743	4.724E+00		
621	5.633E+01	662	4.131E+01	703	1.676E+01	744	4.493E+00		
622	5.630E+01	663	4.070E+01	704	1.632E+01	745	4.292E+00		
623	5.630E+01	664	4.004E+01	705	1.589E+01	746	4.143E+00		
624	5.630E+01	665	3.937E+01	706	1.544E+01	747	4.048E+00		
625	5.622E+01	666	3.867E+01	707	1.503E+01	748	3.928E+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**

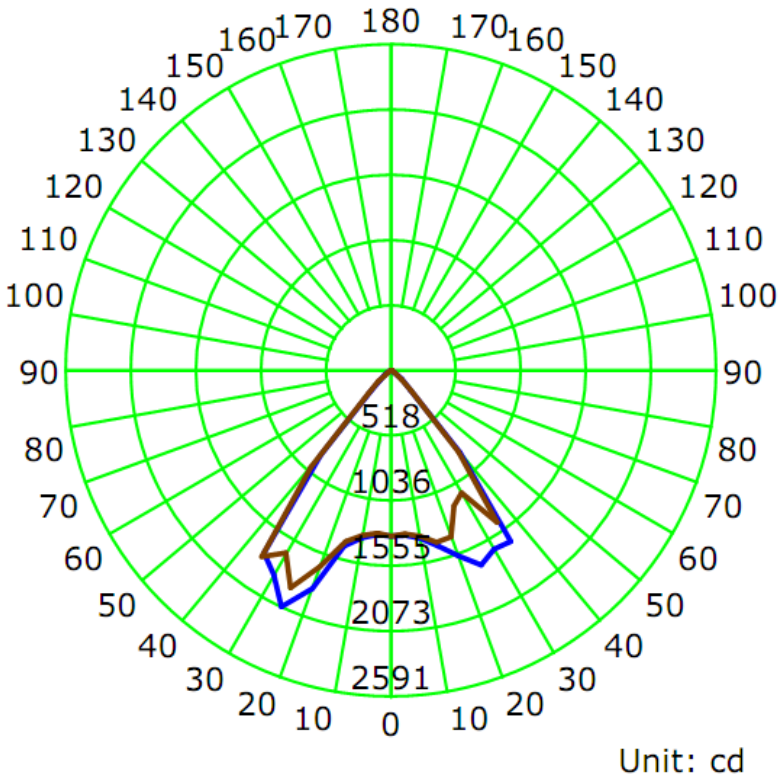
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2630	31.47	0.9960

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2571.5	81.76	2073.5	1.53	1.52

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	78.0	79.1	79.4	80.1	78.7
Field Angle (10% I_{max}):	91.8	92.7	94.5	94.8	93.5

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1316	1316	1316	1316	1316	1316	1316	1316
5.0°	1315	1315	1312	1309	1305	1300	1303	1306
10.0°	1357	1352	1347	1343	1339	1342	1350	1357
15.0°	1447	1436	1427	1418	1414	1417	1431	1443
20.0°	1569	1500	1434	1406	1406	1430	1536	1692
25.0°	1705	1486	1265	1175	1188	1317	1567	1929
30.0°	1641	1448	1253	1137	1121	1216	1437	1741
35.0°	1662	1591	1527	1482	1472	1524	1609	1666
40.0°	855	828	825	844	844	870	905	919
45.0°	217	209	212	223	228	231	239	249
50.0°	111	108	109	113	117	120	125	130
55.0°	56	53	54	56	57	59	62	64
60.0°	29	27	28	29	29	30	31	32
65.0°	16	15	15	15	16	16	17	18
70.0°	7	8	8	8	8	8	8	9
75.0°	4	4	4	4	4	4	4	4
80.0°	1	1	1	1	1	1	1	2
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	1	0
150.0°	1	2	2	2	2	2	1	2
155.0°	2	3	3	3	3	3	3	2
160.0°	3	3	4	4	4	3	3	3
165.0°	3	3	4	4	4	3	3	4
170.0°	3	4	4	4	4	4	4	3
175.0°	4	3	4	4	4	4	4	4
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

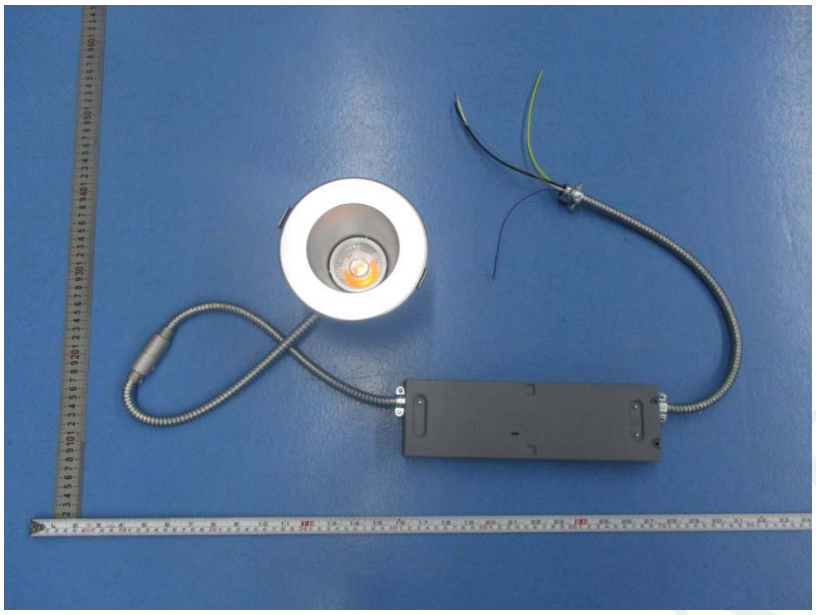
C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1316	1316	1316	1316	1316	1316	1316	1316
5.0°	1307	1309	1306	1302	1297	1294	1298	1301
10.0°	1350	1352	1346	1338	1331	1328	1333	1340
15.0°	1446	1453	1444	1423	1405	1395	1404	1418
20.0°	1841	1818	1766	1726	1659	1608	1619	1654
25.0°	2074	2068	2004	1973	1908	1828	1790	1765
30.0°	1876	1846	1767	1732	1677	1614	1589	1668
35.0°	1770	1854	1890	1847	1804	1791	1711	1674
40.0°	879	956	1053	1070	1001	954	894	826
45.0°	238	245	255	260	262	246	224	218
50.0°	122	124	130	135	135	129	122	116
55.0°	60	60	63	66	66	64	63	59
60.0°	30	30	32	33	33	33	33	31
65.0°	15	16	17	18	17	18	18	17
70.0°	8	8	9	9	10	9	10	9
75.0°	3	4	4	4	5	5	5	5
80.0°	0	1	2	1	2	2	2	1
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	0	0	0	0	0	0	1
150.0°	1	0	1	1	1	1	2	2
155.0°	1	1	2	1	2	2	2	2
160.0°	2	2	3	2	3	3	3	3
165.0°	2	3	2	3	3	3	4	3
170.0°	3	3	3	3	3	4	4	4
175.0°	3	3	4	3	4	4	4	4
180.0°	0	0	0	0	0	0	0	0

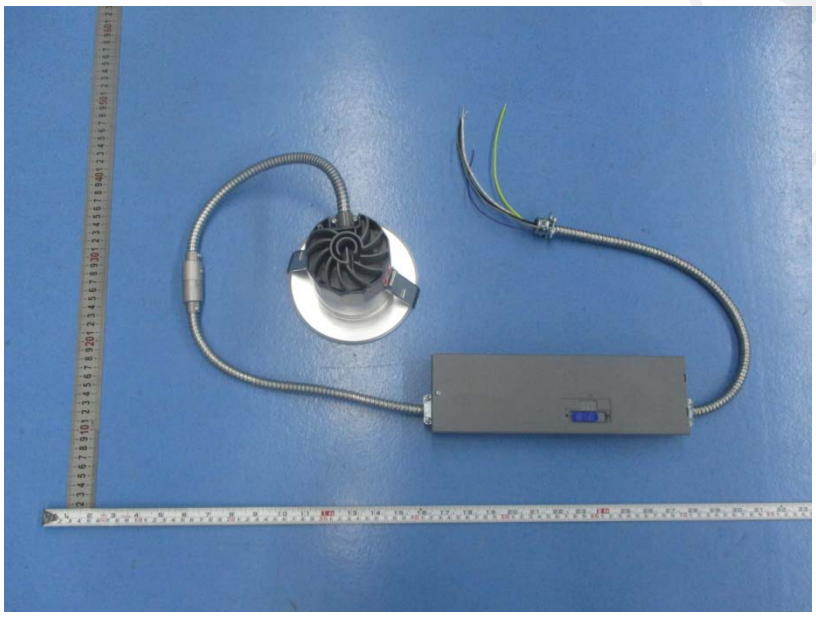
Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	31.3	1.22
5-10	94.8	3.68
10-15	164.3	6.39
15-20	249.7	9.71
20-25	345.5	13.44
25-30	409.7	15.93
30-35	475.2	18.48
35-40	431.6	16.79
40-45	211.5	8.23
45-50	72.0	2.80
50-55	39.5	1.54
55-60	21.0	0.82
60-65	11.4	0.44
65-70	6.3	0.24
70-75	3.3	0.13
75-80	1.4	0.06
80-85	0.3	0.01
85-90	0.0	0.00
90-95	0.0	0.00
95-100	0.0	0.00
100-105	0.0	0.00
105-110	0.0	0.00
110-115	0.0	0.00
115-120	0.0	0.00
120-125	0.0	0.00
125-130	0.0	0.00
130-135	0.0	0.00
135-140	0.0	0.00
140-145	0.1	0.00
145-150	0.3	0.01
150-155	0.5	0.02
155-160	0.5	0.02
160-165	0.5	0.02
165-170	0.4	0.02
170-175	0.3	0.01
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	31.3	1.22
0-10	126.1	4.90
0-15	290.4	11.29
0-20	540.1	21.00
0-25	885.6	34.44
0-30	1295.4	50.37
0-35	1770.6	68.85
0-40	2202.2	85.64
0-45	2413.7	93.87
0-50	2485.7	96.67
0-55	2525.3	98.20
0-60	2546.2	99.02
0-65	2557.6	99.46
0-70	2563.9	99.71
0-75	2567.2	99.83
0-80	2568.7	99.89
0-85	2569.0	99.90
0-90	2569.0	99.90
0-95	2569.0	99.90
0-100	2569.0	99.90
0-105	2569.0	99.90
0-110	2569.0	99.90
0-115	2569.0	99.90
0-120	2569.0	99.90
0-125	2569.0	99.90
0-130	2569.0	99.90
0-135	2569.0	99.90
0-140	2569.0	99.90
0-145	2569.0	99.91
0-150	2569.3	99.92
0-155	2569.8	99.93
0-160	2570.3	99.95
0-165	2570.8	99.97
0-170	2571.2	99.99
0-175	2571.4	100.00
0-180	2571.5	100.00

6. Product Photo





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