IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: AD4LEM9027DIM010UNVNRRCC

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang
Report Number:	RKS180131081-10-2
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:	AD4LEM9027DIM010UNVNRRCC
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

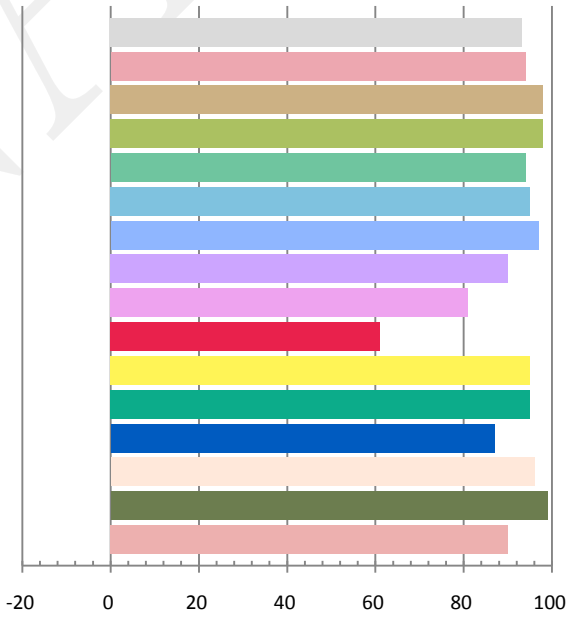
Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.2631	31.44	0.9961	2510.8	79.86

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
8.892	2750	-0.00188	0.4527	0.4039	0.2609	0.5237

Color Rendering Index

Ra
93.3

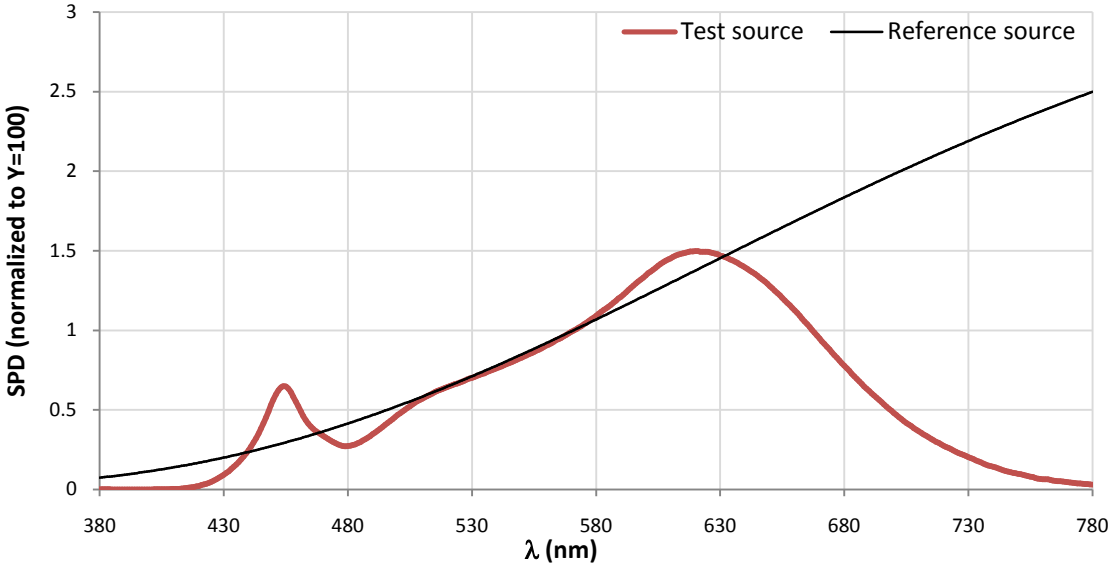
R1	R2	R3	R4
94	98	98	94
R5	R6	R7	R8
95	97	90	81
R9	R10	R11	R12
61	95	95	87
R13	R14	R15	
96	99	90	



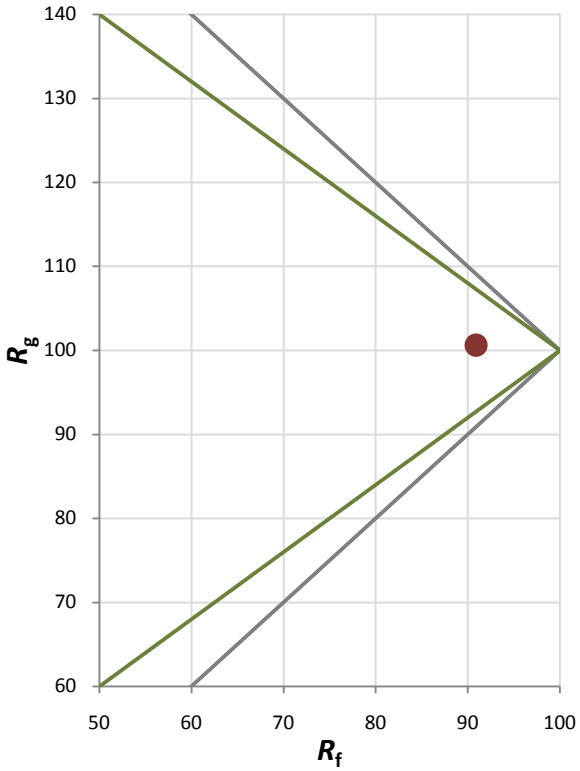
Fidelity Index and Gamut Index

Fidelity Index R_f	91
Gamut Index R_g	101

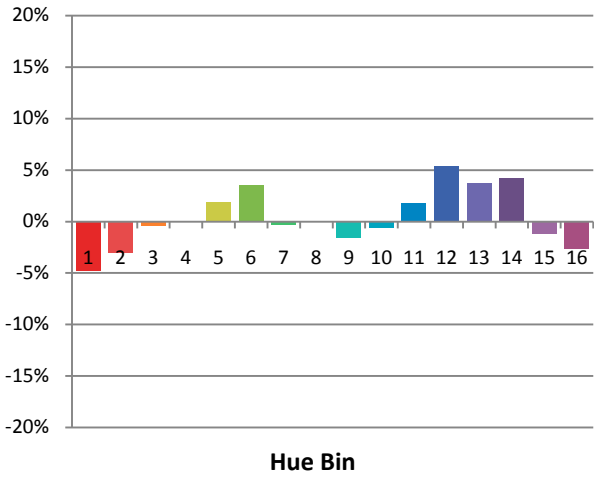
Spectral Power Distribution Comparison



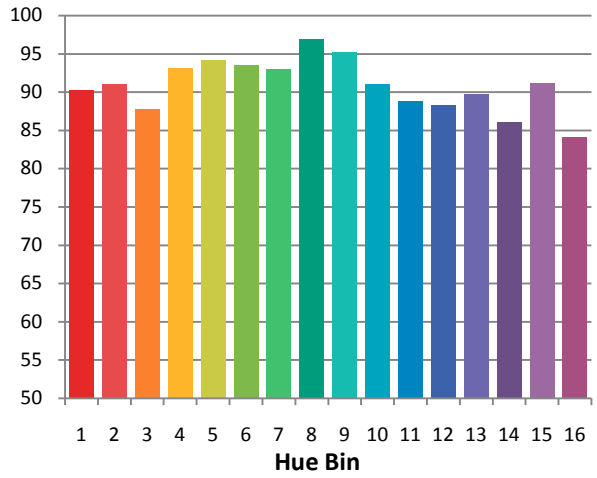
Plot of R_g versus R_f



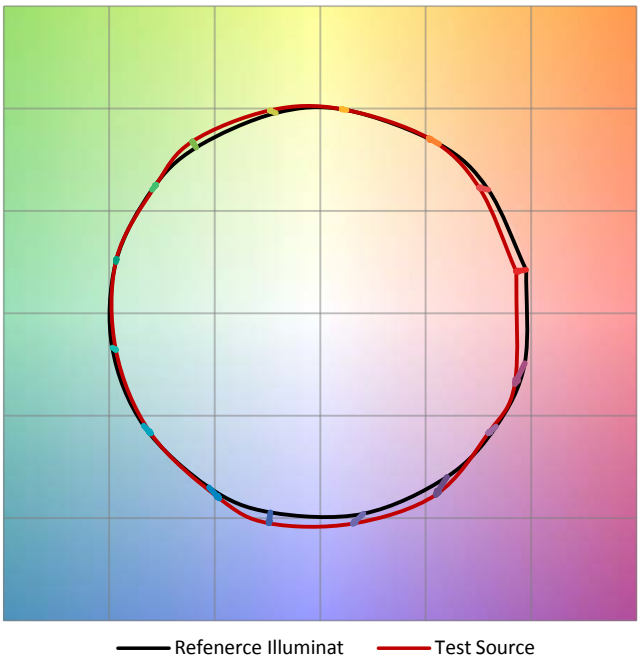
Chroma Shift by Hue

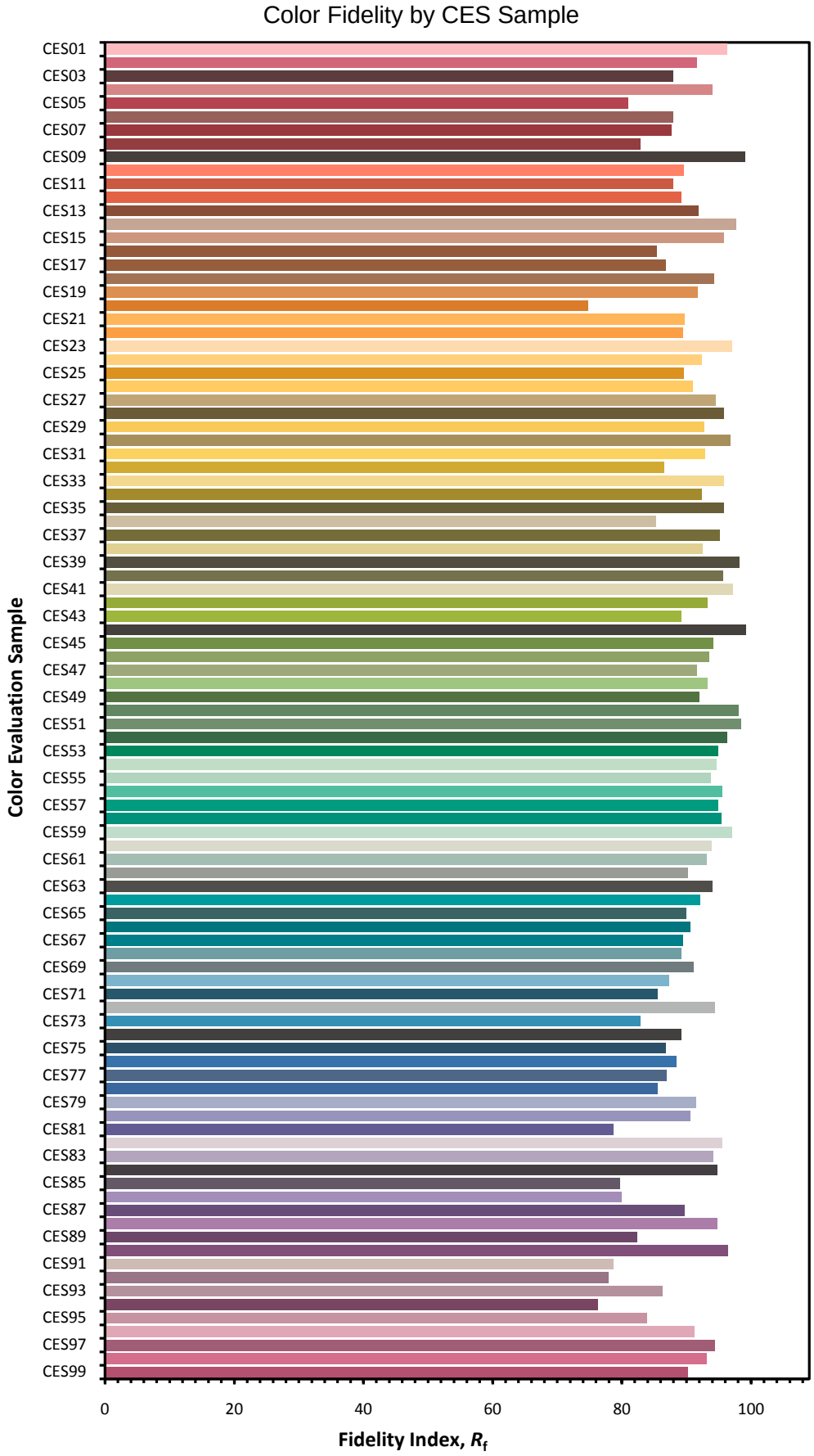


R_f by Hue



Color Vector Graphic




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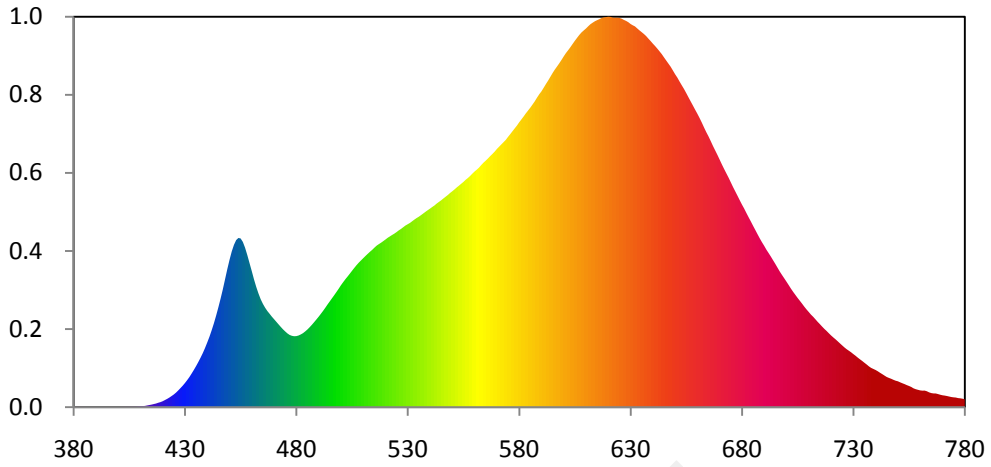
CES97
CES99
0
20
40
60
80
100
Fidelity Index, R_f

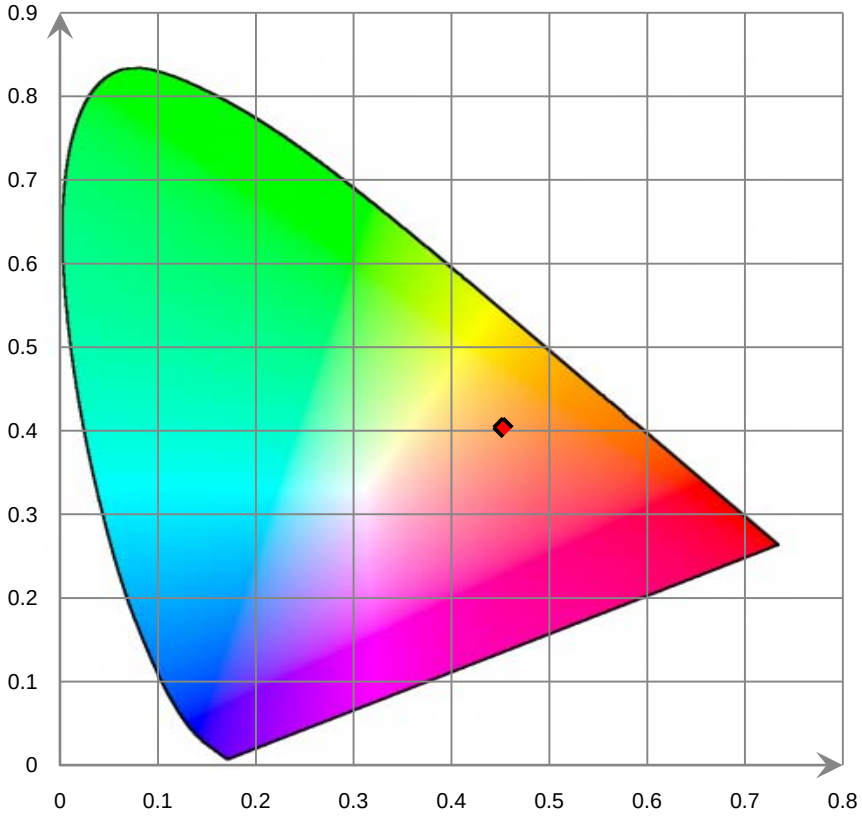
Relative Spectral Power Distribution



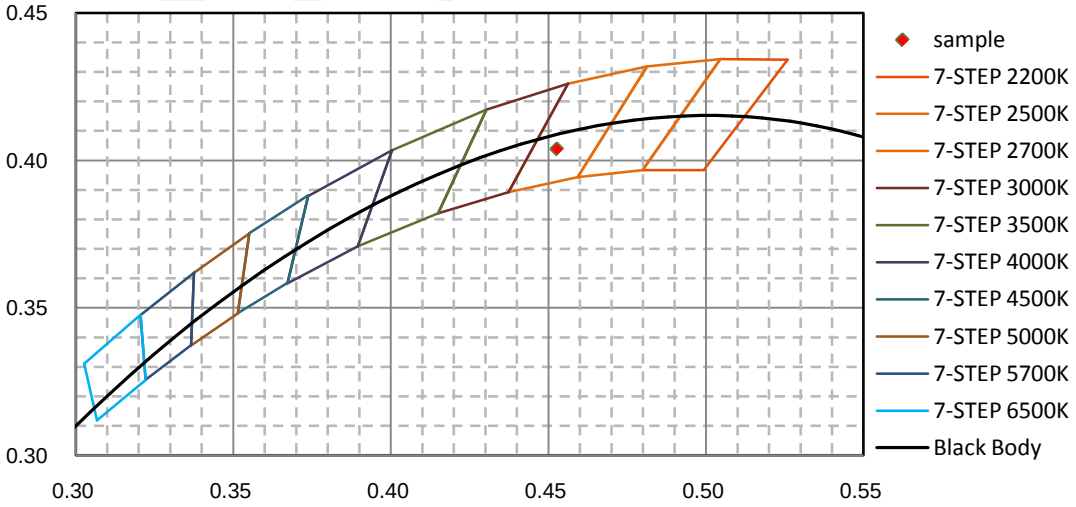
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.070E-02	421	1.001E+00	462	1.697E+01	503	1.842E+01	544	2.894E+01
381	3.680E-02	422	1.165E+00	463	1.604E+01	504	1.882E+01	545	2.917E+01
382	3.250E-02	423	1.355E+00	464	1.522E+01	505	1.923E+01	546	2.943E+01
383	3.620E-02	424	1.569E+00	465	1.457E+01	506	1.963E+01	547	2.967E+01
384	3.390E-02	425	1.787E+00	466	1.402E+01	507	2.002E+01	548	2.992E+01
385	1.920E-02	426	2.054E+00	467	1.355E+01	508	2.037E+01	549	3.020E+01
386	1.780E-02	427	2.361E+00	468	1.317E+01	509	2.068E+01	550	3.045E+01
387	1.500E-02	428	2.694E+00	469	1.277E+01	510	2.100E+01	551	3.070E+01
388	1.240E-02	429	3.027E+00	470	1.241E+01	511	2.131E+01	552	3.098E+01
389	2.140E-02	430	3.405E+00	471	1.204E+01	512	2.161E+01	553	3.124E+01
390	2.190E-02	431	3.808E+00	472	1.168E+01	513	2.190E+01	554	3.150E+01
391	1.050E-02	432	4.245E+00	473	1.133E+01	514	2.217E+01	555	3.176E+01
392	7.700E-03	433	4.741E+00	474	1.099E+01	515	2.248E+01	556	3.206E+01
393	1.570E-02	434	5.254E+00	475	1.068E+01	516	2.277E+01	557	3.231E+01
394	1.580E-02	435	5.791E+00	476	1.040E+01	517	2.298E+01	558	3.260E+01
395	2.000E-02	436	6.363E+00	477	1.019E+01	518	2.318E+01	559	3.293E+01
396	1.150E-02	437	6.971E+00	478	1.007E+01	519	2.341E+01	560	3.323E+01
397	1.020E-02	438	7.617E+00	479	1.000E+01	520	2.364E+01	561	3.350E+01
398	4.100E-03	439	8.328E+00	480	1.002E+01	521	2.388E+01	562	3.378E+01
399	2.400E-03	440	9.114E+00	481	1.011E+01	522	2.408E+01	563	3.414E+01
400	2.010E-02	441	9.927E+00	482	1.026E+01	523	2.428E+01	564	3.448E+01
401	2.640E-02	442	1.084E+01	483	1.044E+01	524	2.447E+01	565	3.476E+01
402	3.370E-02	443	1.182E+01	484	1.069E+01	525	2.469E+01	566	3.506E+01
403	4.670E-02	444	1.291E+01	485	1.096E+01	526	2.493E+01	567	3.539E+01
404	4.980E-02	445	1.407E+01	486	1.128E+01	527	2.514E+01	568	3.570E+01
405	6.140E-02	446	1.530E+01	487	1.162E+01	528	2.538E+01	569	3.603E+01
406	5.900E-02	447	1.660E+01	488	1.199E+01	529	2.562E+01	570	3.640E+01
407	6.520E-02	448	1.802E+01	489	1.236E+01	530	2.580E+01	571	3.672E+01
408	6.740E-02	449	1.944E+01	490	1.275E+01	531	2.598E+01	572	3.704E+01
409	1.168E-01	450	2.076E+01	491	1.316E+01	532	2.622E+01	573	3.737E+01
410	1.506E-01	451	2.195E+01	492	1.358E+01	533	2.645E+01	574	3.768E+01
411	1.580E-01	452	2.289E+01	493	1.402E+01	534	2.667E+01	575	3.810E+01
412	1.740E-01	453	2.356E+01	494	1.448E+01	535	2.686E+01	576	3.850E+01
413	2.426E-01	454	2.386E+01	495	1.491E+01	536	2.708E+01	577	3.890E+01
414	3.048E-01	455	2.379E+01	496	1.535E+01	537	2.732E+01	578	3.930E+01
415	3.638E-01	456	2.330E+01	497	1.579E+01	538	2.756E+01	579	3.970E+01
416	4.416E-01	457	2.248E+01	498	1.624E+01	539	2.778E+01	580	4.015E+01
417	5.138E-01	458	2.144E+01	499	1.670E+01	540	2.799E+01	581	4.056E+01
418	6.225E-01	459	2.031E+01	500	1.718E+01	541	2.822E+01	582	4.098E+01
419	7.114E-01	460	1.919E+01	501	1.762E+01	542	2.844E+01	583	4.142E+01
420	8.385E-01	461	1.802E+01	502	1.803E+01	543	2.871E+01	584	4.182E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.223E+01	626	5.478E+01	667	3.684E+01	708	1.417E+01	749	3.734E+00
586	4.267E+01	627	5.461E+01	668	3.620E+01	709	1.378E+01	750	3.648E+00
587	4.312E+01	628	5.446E+01	669	3.557E+01	710	1.342E+01	751	3.509E+00
588	4.363E+01	629	5.428E+01	670	3.491E+01	711	1.305E+01	752	3.377E+00
589	4.411E+01	630	5.403E+01	671	3.423E+01	712	1.274E+01	753	3.256E+00
590	4.452E+01	631	5.385E+01	672	3.360E+01	713	1.239E+01	754	3.108E+00
591	4.503E+01	632	5.369E+01	673	3.298E+01	714	1.203E+01	755	2.987E+00
592	4.555E+01	633	5.341E+01	674	3.236E+01	715	1.170E+01	756	2.849E+00
593	4.604E+01	634	5.313E+01	675	3.171E+01	716	1.136E+01	757	2.661E+00
594	4.657E+01	635	5.288E+01	676	3.105E+01	717	1.104E+01	758	2.539E+00
595	4.710E+01	636	5.262E+01	677	3.044E+01	718	1.075E+01	759	2.451E+00
596	4.760E+01	637	5.233E+01	678	2.982E+01	719	1.043E+01	760	2.370E+00
597	4.803E+01	638	5.197E+01	679	2.919E+01	720	1.012E+01	761	2.331E+00
598	4.848E+01	639	5.163E+01	680	2.858E+01	721	9.838E+00	762	2.337E+00
599	4.895E+01	640	5.127E+01	681	2.801E+01	722	9.576E+00	763	2.244E+00
600	4.945E+01	641	5.093E+01	682	2.739E+01	723	9.288E+00	764	2.092E+00
601	4.993E+01	642	5.057E+01	683	2.678E+01	724	8.995E+00	765	1.986E+00
602	5.033E+01	643	5.018E+01	684	2.619E+01	725	8.708E+00	766	1.935E+00
603	5.076E+01	644	4.979E+01	685	2.558E+01	726	8.430E+00	767	1.932E+00
604	5.121E+01	645	4.933E+01	686	2.499E+01	727	8.175E+00	768	1.848E+00
605	5.166E+01	646	4.889E+01	687	2.439E+01	728	7.961E+00	769	1.756E+00
606	5.208E+01	647	4.845E+01	688	2.381E+01	729	7.743E+00	770	1.677E+00
607	5.248E+01	648	4.801E+01	689	2.325E+01	730	7.489E+00	771	1.636E+00
608	5.284E+01	649	4.748E+01	690	2.275E+01	731	7.250E+00	772	1.576E+00
609	5.312E+01	650	4.695E+01	691	2.220E+01	732	6.988E+00	773	1.504E+00
610	5.339E+01	651	4.648E+01	692	2.172E+01	733	6.746E+00	774	1.429E+00
611	5.371E+01	652	4.592E+01	693	2.123E+01	734	6.516E+00	775	1.390E+00
612	5.400E+01	653	4.538E+01	694	2.070E+01	735	6.261E+00	776	1.361E+00
613	5.421E+01	654	4.487E+01	695	2.019E+01	736	6.016E+00	777	1.283E+00
614	5.441E+01	655	4.429E+01	696	1.966E+01	737	5.755E+00	778	1.250E+00
615	5.457E+01	656	4.370E+01	697	1.912E+01	738	5.537E+00	779	1.194E+00
616	5.471E+01	657	4.311E+01	698	1.864E+01	739	5.391E+00	780	1.113E+00
617	5.487E+01	658	4.253E+01	699	1.817E+01	740	5.243E+00		
618	5.496E+01	659	4.194E+01	700	1.769E+01	741	5.060E+00		
619	5.501E+01	660	4.137E+01	701	1.721E+01	742	4.852E+00		
620	5.505E+01	661	4.077E+01	702	1.671E+01	743	4.658E+00		
621	5.503E+01	662	4.012E+01	703	1.626E+01	744	4.452E+00		
622	5.493E+01	663	3.943E+01	704	1.583E+01	745	4.256E+00		
623	5.491E+01	664	3.878E+01	705	1.540E+01	746	4.121E+00		
624	5.492E+01	665	3.818E+01	706	1.500E+01	747	4.002E+00		
625	5.489E+01	666	3.752E+01	707	1.459E+01	748	3.860E+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**

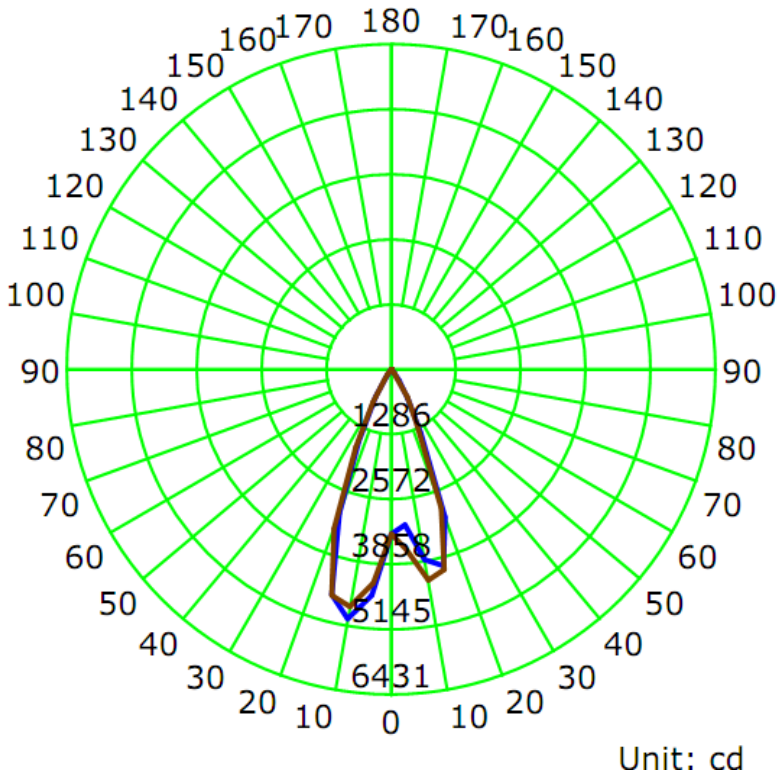
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2630	31.44	0.9960

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2512.3	79.96	5145.2	0.85	0.85

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	43.6	44.0	44.5	44.3	44.0
Field Angle (10% I_{max}):	63.7	64.3	64.7	64.5	64.3

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	3256	3256	3256	3256	3256	3256	3256	3256
5.0°	3090	2883	2906	3158	3575	3931	4206	4449
10.0°	3821	3606	3590	3811	4237	4645	4938	5145
15.0°	4018	3816	3768	3885	4090	4323	4555	4716
20.0°	3113	2976	2888	2894	2928	2983	3076	3143
25.0°	1391	1274	1145	1171	1221	1351	1450	1591
30.0°	674	663	642	629	632	636	638	664
35.0°	266	245	223	214	204	214	218	217
40.0°	111	112	105	107	103	108	110	111
45.0°	41	47	49	45	36	46	52	39
50.0°	0	0	0	0	0	0	0	0
55.0°	0	0	0	0	0	0	0	0
60.0°	0	0	0	0	0	0	0	0
65.0°	0	0	0	0	0	0	0	0
70.0°	0	0	0	0	0	0	0	0
75.0°	0	0	0	0	0	0	0	0
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°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

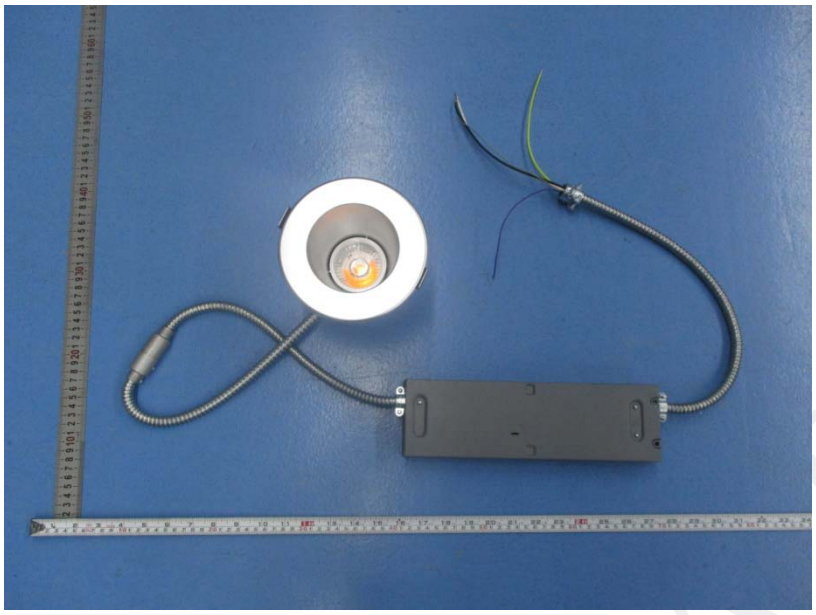
C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	3256	3256	3256	3256	3256	3256	3256	3256
5.0°	4476	4459	4379	4335	4236	4031	3774	3501
10.0°	5007	4956	4830	4707	4757	4738	4576	4287
15.0°	4605	4653	4603	4618	4616	4569	4468	4259
20.0°	3030	3164	3287	3382	3346	3319	3283	3198
25.0°	1554	1645	1664	1704	1689	1675	1590	1467
30.0°	634	684	712	721	732	734	724	705
35.0°	198	213	237	260	285	295	305	277
40.0°	101	112	111	121	124	130	132	119
45.0°	40	44	59	60	60	62	60	51
50.0°	0	0	0	15	11	17	11	0
55.0°	0	0	0	0	0	0	0	0
60.0°	0	0	0	0	0	0	0	0
65.0°	0	0	0	0	0	0	0	0
70.0°	0	0	0	0	0	0	0	0
75.0°	0	0	0	0	0	0	0	0
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°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

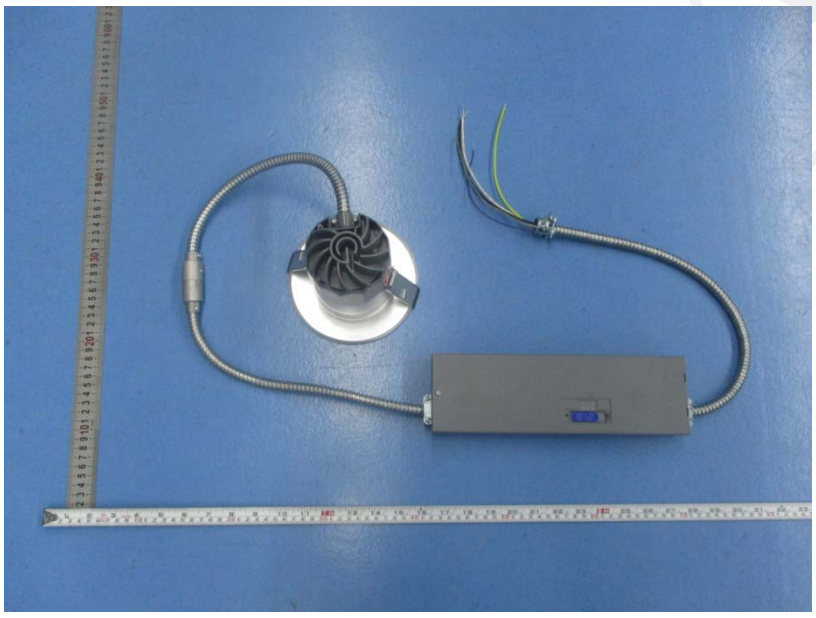
Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	84.8	3.38
5-10	297.5	11.84
10-15	523.5	20.84
15-20	615.9	24.52
20-25	482.4	19.20
25-30	272.1	10.83
30-35	135.2	5.38
35-40	59.3	2.36
40-45	30.2	1.20
45-50	10.7	0.43
50-55	0.7	0.03
55-60	0.0	0.00
60-65	0.0	0.00
65-70	0.0	0.00
70-75	0.0	0.00
75-80	0.0	0.00
80-85	0.0	0.00
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	0.0	0.00
145-150	0.0	0.00
150-155	0.0	0.00
155-160	0.0	0.00
160-165	0.0	0.00
165-170	0.0	0.00
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	84.8	3.38
0-10	382.2	15.21
0-15	905.8	36.05
0-20	1521.7	60.57
0-25	2004.1	79.77
0-30	2276.2	90.60
0-35	2411.4	95.98
0-40	2470.7	98.34
0-45	2500.9	99.55
0-50	2511.5	99.97
0-55	2512.3	100.00
0-60	2512.3	100.00
0-65	2512.3	100.00
0-70	2512.3	100.00
0-75	2512.3	100.00
0-80	2512.3	100.00
0-85	2512.3	100.00
0-90	2512.3	100.00
0-95	2512.3	100.00
0-100	2512.3	100.00
0-105	2512.3	100.00
0-110	2512.3	100.00
0-115	2512.3	100.00
0-120	2512.3	100.00
0-125	2512.3	100.00
0-130	2512.3	100.00
0-135	2512.3	100.00
0-140	2512.3	100.00
0-145	2512.3	100.00
0-150	2512.3	100.00
0-155	2512.3	100.00
0-160	2512.3	100.00
0-165	2512.3	100.00
0-170	2512.3	100.00
0-175	2512.3	100.00
0-180	2512.3	100.00

6. Product Photo





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