

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 20SMPS9DIM/940/277V

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS171229083-10-1
Test Date:	2018-01-03
Report Date:	2018-01-04
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 2018-01-02 and used for testing.

Model Tested: 20SMPS9DIM/940/277V
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: 120-277 VAC 60Hz
Rated Power: 20W
Nominal CCT: 4000K
Nominal Lumen Output: 1250lm

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

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	INVENTFINE	Dia 1.5m	JWWCV090112	Dia 1.5m	2017-01-25	2018-01-25
Power Meter	INVENTFINE	WT500	GSJWQ20009	20/40/80/150/300/600V	2017-03-23	2018-03-22
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	380nm~780nm	2017-01-25	2018-01-25
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	0~150V 4.2A/0~300V 2.1A	2017-03-23	2018-03-22
Standard Light Source	INVENTFINE	N/A	JWWCR020106	24V/50W	2017-01-26	2018-01-26
Thermal Meter	KEJIAN	TA298	N/A	0~60℃	2017-10-17	2018-10-17
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	30V/5A	2017-03-23	2018-03-22
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	0-150V, 0-300V, 5KVA	2017-03-23	2018-03-22
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	30V/10A	2017-03-23	2018-03-22
Power Meter	INVENTFINE	WT500	GSDSQ200007	20/40/80/150/300/600V	2017-03-23	2018-03-22
Goniophotometer	INVENTFINE	GPM-1900	YWGCF120001	0.001lx-99999lx	2017-01-25	2018-01-25
Wireless Weather Station	ZHONGXING	KG218	N/A	-40~65℃, 20%~99%RH	2017-10-17	2018-10-17
Standard Light Source	INVENTFINE	N/A	JWBYR040007	24V/150W	2017-01-25	2018-01-25

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: **1.0 hour**

Test orientation: **Downward**

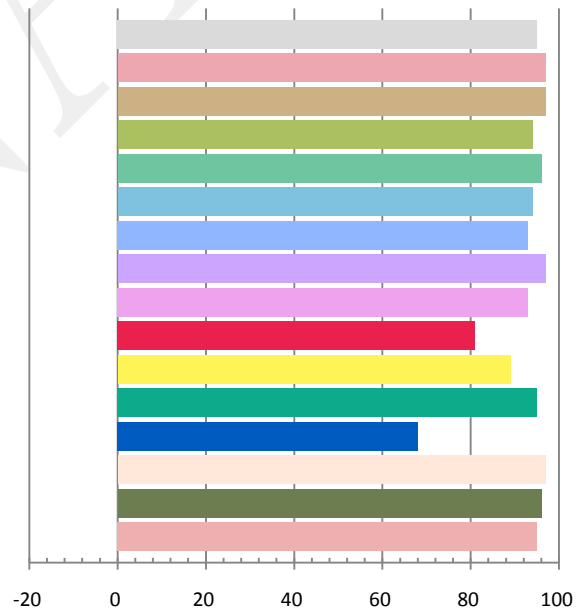
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1589	18.93	0.993	1516.5	80.09

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
5.201	3964	0.00065	0.3825	0.3794	0.2254	0.5031

Color Rendering Index

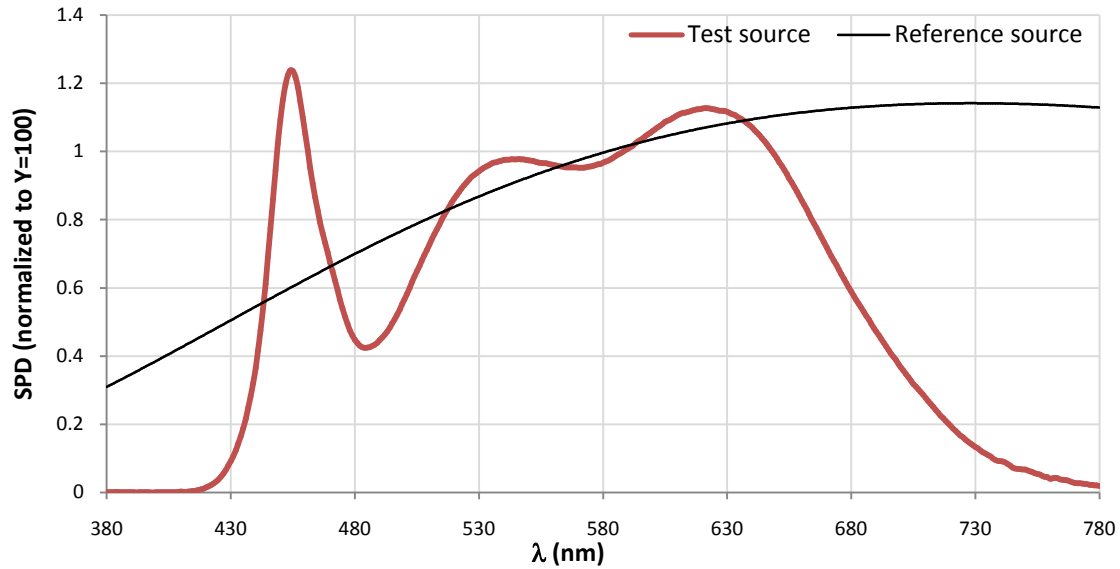
Ra 95.0			
R1 97	R2 97	R3 94	R4 96
R5 94	R6 93	R7 97	R8 93
R9 81	R10 89	R11 95	R12 68
R13 97	R14 96	R15 95	



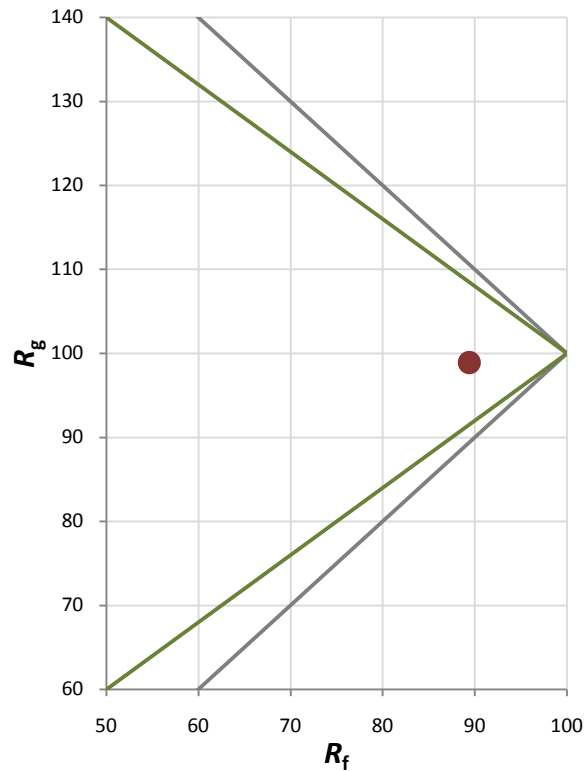
Fidelity Index and Gamut Index

Fidelity Index R_f	89
Gamut Index R_g	99

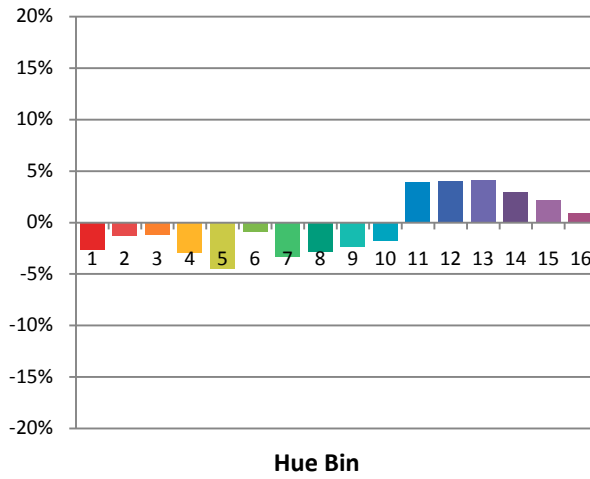
Spectral Power Distribution Comparison



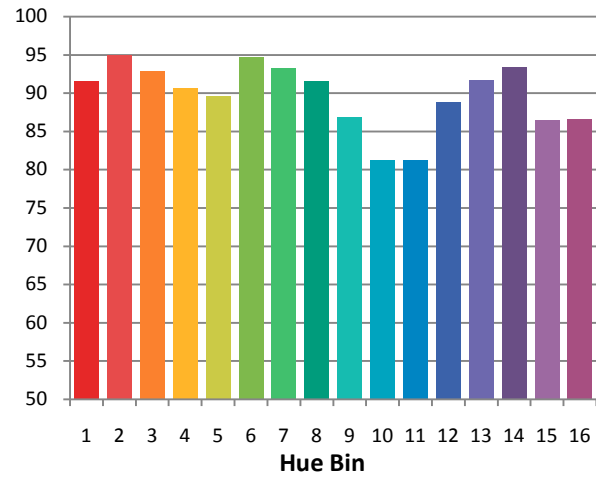
Plot of R_g versus R_f



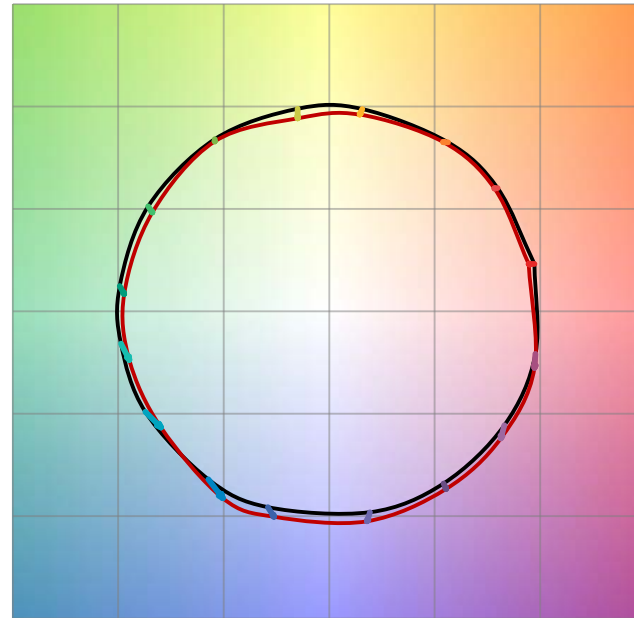
Chroma Shift by Hue



R_t by Hue

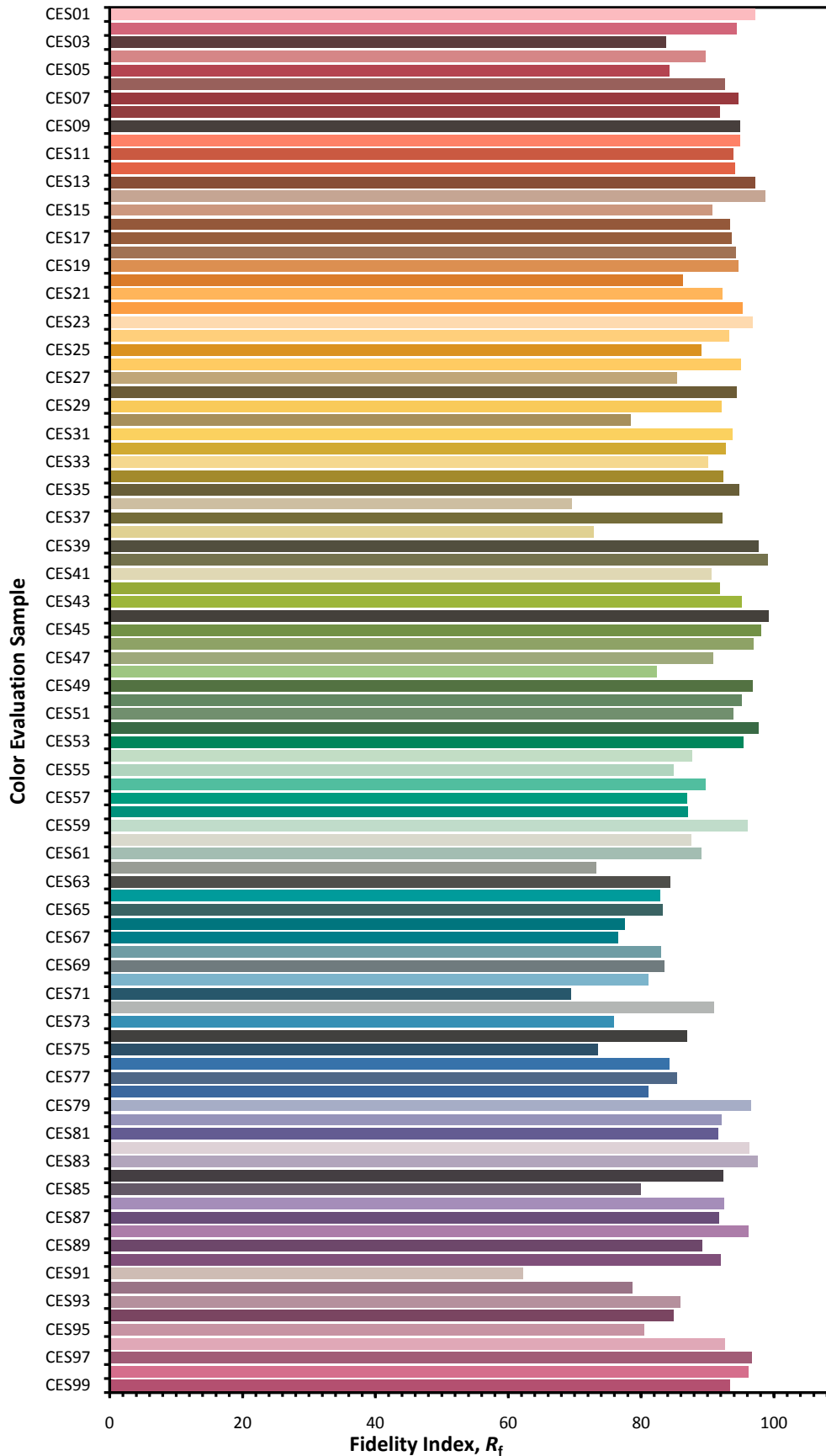


Color Vector Graphic

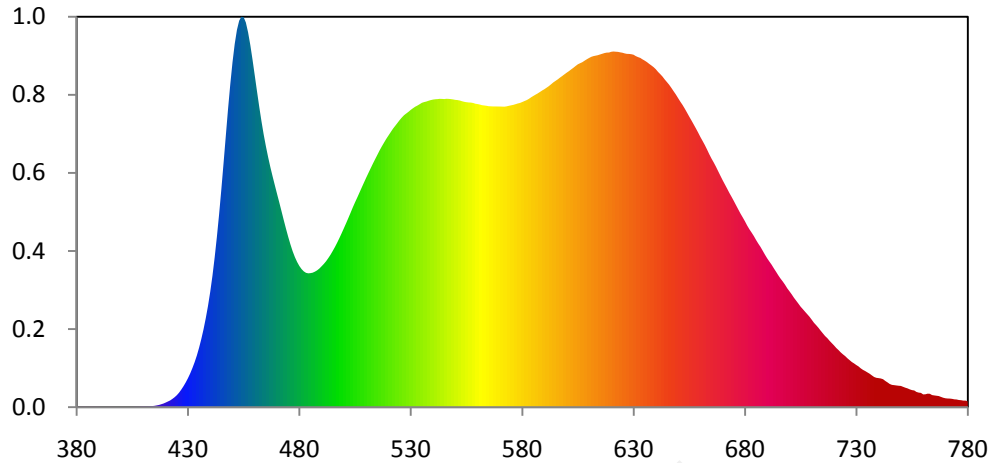


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



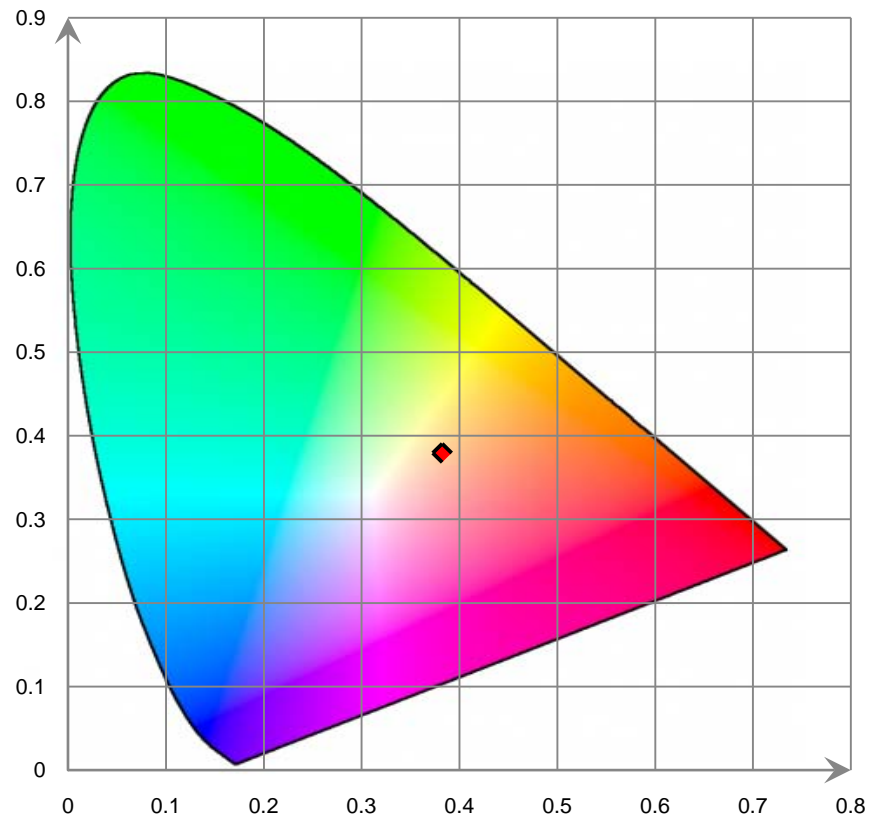
Relative Spectral Power Distribution



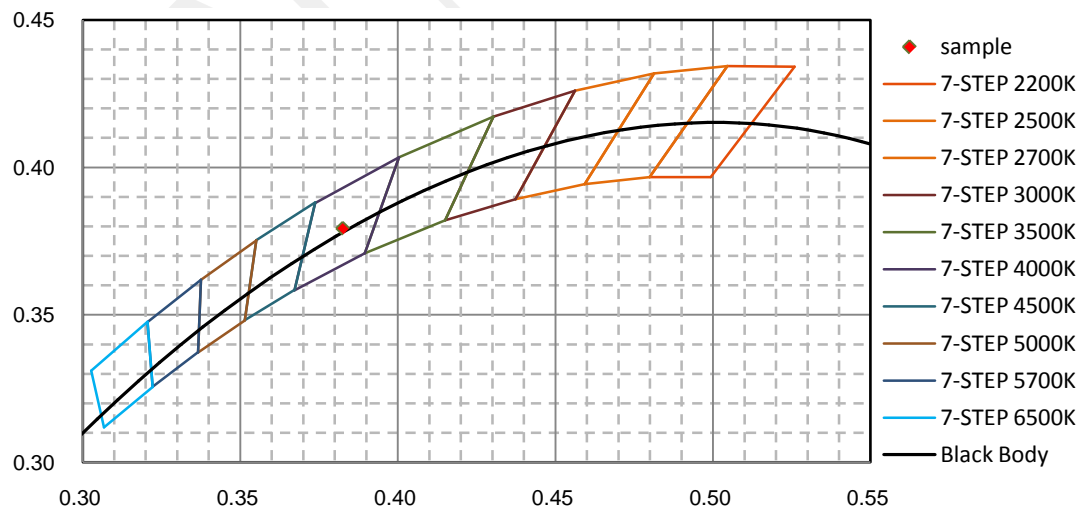
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.640E-02	421	3.992E-01	462	2.114E+01	503	1.368E+01	544	2.169E+01
381	2.350E-02	422	4.713E-01	463	2.012E+01	504	1.406E+01	545	2.168E+01
382	2.000E-02	423	5.796E-01	464	1.919E+01	505	1.441E+01	546	2.169E+01
383	2.630E-02	424	6.975E-01	465	1.835E+01	506	1.475E+01	547	2.169E+01
384	2.990E-02	425	8.406E-01	466	1.759E+01	507	1.510E+01	548	2.167E+01
385	1.860E-02	426	1.017E+00	467	1.689E+01	508	1.545E+01	549	2.165E+01
386	2.730E-02	427	1.235E+00	468	1.624E+01	509	1.580E+01	550	2.162E+01
387	2.950E-02	428	1.472E+00	469	1.562E+01	510	1.614E+01	551	2.161E+01
388	2.580E-02	429	1.740E+00	470	1.501E+01	511	1.647E+01	552	2.157E+01
389	2.910E-02	430	2.034E+00	471	1.440E+01	512	1.680E+01	553	2.152E+01
390	2.860E-02	431	2.369E+00	472	1.379E+01	513	1.713E+01	554	2.148E+01
391	1.240E-02	432	2.748E+00	473	1.317E+01	514	1.744E+01	555	2.146E+01
392	8.000E-03	433	3.162E+00	474	1.256E+01	515	1.774E+01	556	2.144E+01
393	1.360E-02	434	3.634E+00	475	1.199E+01	516	1.805E+01	557	2.143E+01
394	1.900E-02	435	4.181E+00	476	1.145E+01	517	1.834E+01	558	2.140E+01
395	2.170E-02	436	4.793E+00	477	1.097E+01	518	1.861E+01	559	2.135E+01
396	1.730E-02	437	5.476E+00	478	1.056E+01	519	1.887E+01	560	2.132E+01
397	9.800E-03	438	6.254E+00	479	1.022E+01	520	1.911E+01	561	2.129E+01
398	6.400E-03	439	7.118E+00	480	9.936E+00	521	1.935E+01	562	2.124E+01
399	3.100E-03	440	8.106E+00	481	9.717E+00	522	1.958E+01	563	2.122E+01
400	1.140E-02	441	9.235E+00	482	9.554E+00	523	1.979E+01	564	2.120E+01
401	1.540E-02	442	1.053E+01	483	9.451E+00	524	1.999E+01	565	2.117E+01
402	1.380E-02	443	1.199E+01	484	9.418E+00	525	2.019E+01	566	2.117E+01
403	1.190E-02	444	1.358E+01	485	9.429E+00	526	2.038E+01	567	2.116E+01
404	1.050E-02	445	1.533E+01	486	9.464E+00	527	2.054E+01	568	2.116E+01
405	1.160E-02	446	1.718E+01	487	9.536E+00	528	2.066E+01	569	2.115E+01
406	2.340E-02	447	1.908E+01	488	9.629E+00	529	2.078E+01	570	2.115E+01
407	2.890E-02	448	2.097E+01	489	9.754E+00	530	2.092E+01	571	2.114E+01
408	2.680E-02	449	2.270E+01	490	9.914E+00	531	2.103E+01	572	2.114E+01
409	4.450E-02	450	2.425E+01	491	1.008E+01	532	2.114E+01	573	2.116E+01
410	5.750E-02	451	2.555E+01	492	1.027E+01	533	2.122E+01	574	2.120E+01
411	4.510E-02	452	2.654E+01	493	1.049E+01	534	2.131E+01	575	2.123E+01
412	5.000E-02	453	2.719E+01	494	1.073E+01	535	2.141E+01	576	2.127E+01
413	6.180E-02	454	2.747E+01	495	1.099E+01	536	2.147E+01	577	2.131E+01
414	7.630E-02	455	2.744E+01	496	1.127E+01	537	2.150E+01	578	2.136E+01
415	9.600E-02	456	2.706E+01	497	1.158E+01	538	2.156E+01	579	2.140E+01
416	1.274E-01	457	2.637E+01	498	1.190E+01	539	2.161E+01	580	2.147E+01
417	1.563E-01	458	2.548E+01	499	1.224E+01	540	2.164E+01	581	2.153E+01
418	2.064E-01	459	2.444E+01	500	1.259E+01	541	2.166E+01	582	2.160E+01
419	2.544E-01	460	2.333E+01	501	1.294E+01	542	2.167E+01	583	2.169E+01
420	3.246E-01	461	2.222E+01	502	1.331E+01	543	2.169E+01	584	2.180E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.189E+01	626	2.489E+01	667	1.692E+01	708	6.539E+00	749	1.507E+00
586	2.199E+01	627	2.486E+01	668	1.660E+01	709	6.358E+00	750	1.495E+00
587	2.207E+01	628	2.485E+01	669	1.628E+01	710	6.151E+00	751	1.431E+00
588	2.218E+01	629	2.483E+01	670	1.597E+01	711	5.936E+00	752	1.372E+00
589	2.228E+01	630	2.480E+01	671	1.567E+01	712	5.767E+00	753	1.322E+00
590	2.237E+01	631	2.470E+01	672	1.538E+01	713	5.583E+00	754	1.254E+00
591	2.248E+01	632	2.463E+01	673	1.508E+01	714	5.380E+00	755	1.200E+00
592	2.259E+01	633	2.457E+01	674	1.480E+01	715	5.188E+00	756	1.175E+00
593	2.272E+01	634	2.447E+01	675	1.451E+01	716	5.001E+00	757	1.072E+00
594	2.285E+01	635	2.438E+01	676	1.421E+01	717	4.854E+00	758	1.025E+00
595	2.296E+01	636	2.428E+01	677	1.391E+01	718	4.671E+00	759	1.006E+00
596	2.306E+01	637	2.416E+01	678	1.362E+01	719	4.504E+00	760	8.973E-01
597	2.319E+01	638	2.404E+01	679	1.336E+01	720	4.343E+00	761	9.070E-01
598	2.330E+01	639	2.392E+01	680	1.308E+01	721	4.165E+00	762	9.495E-01
599	2.342E+01	640	2.377E+01	681	1.278E+01	722	4.020E+00	763	9.418E-01
600	2.353E+01	641	2.359E+01	682	1.252E+01	723	3.853E+00	764	8.513E-01
601	2.364E+01	642	2.343E+01	683	1.228E+01	724	3.716E+00	765	8.273E-01
602	2.376E+01	643	2.326E+01	684	1.204E+01	725	3.594E+00	766	8.055E-01
603	2.388E+01	644	2.305E+01	685	1.176E+01	726	3.438E+00	767	7.820E-01
604	2.400E+01	645	2.287E+01	686	1.151E+01	727	3.309E+00	768	7.235E-01
605	2.412E+01	646	2.268E+01	687	1.127E+01	728	3.176E+00	769	6.640E-01
606	2.420E+01	647	2.246E+01	688	1.100E+01	729	3.075E+00	770	6.255E-01
607	2.427E+01	648	2.222E+01	689	1.073E+01	730	2.965E+00	771	6.106E-01
608	2.437E+01	649	2.200E+01	690	1.047E+01	731	2.864E+00	772	6.043E-01
609	2.447E+01	650	2.175E+01	691	1.024E+01	732	2.730E+00	773	5.847E-01
610	2.456E+01	651	2.150E+01	692	1.002E+01	733	2.622E+00	774	5.516E-01
611	2.465E+01	652	2.126E+01	693	9.764E+00	734	2.540E+00	775	5.418E-01
612	2.470E+01	653	2.100E+01	694	9.522E+00	735	2.445E+00	776	5.055E-01
613	2.473E+01	654	2.072E+01	695	9.270E+00	736	2.351E+00	777	4.916E-01
614	2.476E+01	655	2.044E+01	696	9.043E+00	737	2.233E+00	778	4.618E-01
615	2.482E+01	656	2.017E+01	697	8.840E+00	738	2.123E+00	779	4.612E-01
616	2.486E+01	657	1.989E+01	698	8.614E+00	739	2.066E+00	780	4.084E-01
617	2.492E+01	658	1.961E+01	699	8.360E+00	740	2.043E+00		
618	2.494E+01	659	1.932E+01	700	8.153E+00	741	2.018E+00		
619	2.495E+01	660	1.901E+01	701	7.935E+00	742	1.967E+00		
620	2.500E+01	661	1.873E+01	702	7.699E+00	743	1.846E+00		
621	2.502E+01	662	1.844E+01	703	7.493E+00	744	1.744E+00		
622	2.501E+01	663	1.813E+01	704	7.285E+00	745	1.631E+00		
623	2.500E+01	664	1.780E+01	705	7.070E+00	746	1.568E+00		
624	2.496E+01	665	1.749E+01	706	6.894E+00	747	1.549E+00		
625	2.494E+01	666	1.722E+01	707	6.714E+00	748	1.528E+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**

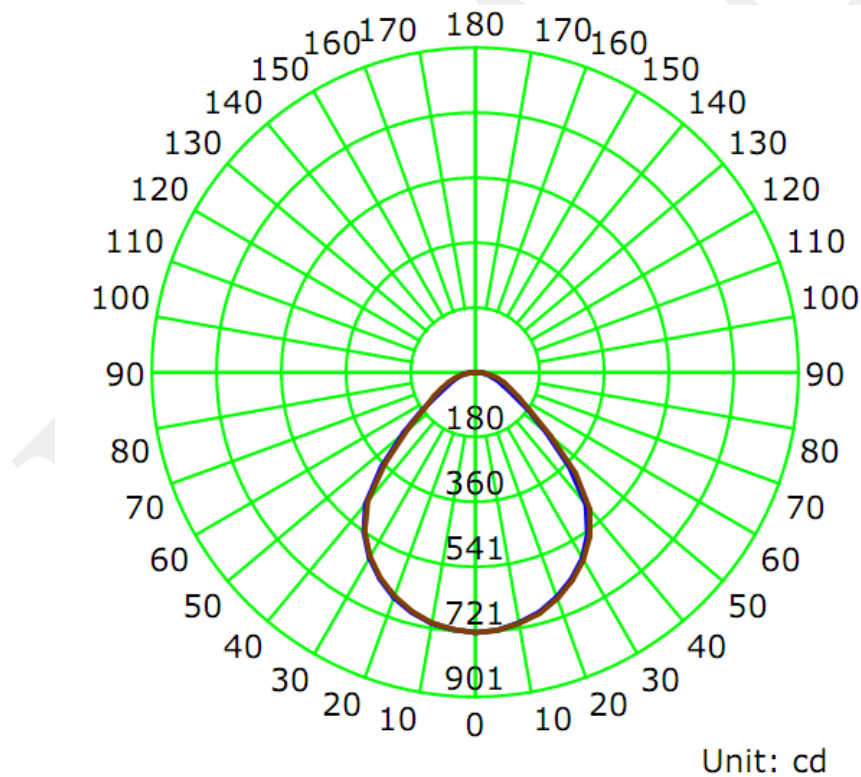
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1590	19.02	0.9950

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1523.7	80.16	721.4	1.22	1.23

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	91.0	91.1	91.3	91.1	91.1
Field Angle (10% I_{max}):	137.1	141.9	145.3	140.8	141.3

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	721	721	721	721	721	721	721	721
5.0°	718	718	718	718	719	719	718	718
10.0°	707	707	708	708	708	709	709	709
15.0°	689	690	690	691	693	693	692	692
20.0°	665	666	666	668	669	670	669	669
25.0°	635	635	636	638	640	641	640	639
30.0°	596	597	599	601	603	603	602	600
35.0°	548	550	552	555	557	558	555	552
40.0°	481	484	489	493	497	497	493	488
45.0°	372	378	384	389	396	396	392	387
50.0°	258	264	268	271	275	278	276	273
55.0°	178	184	187	188	191	192	191	190
60.0°	122	133	133	129	142	132	134	138
65.0°	87	101	99	92	109	94	98	106
70.0°	65	78	77	69	86	72	76	83
75.0°	50	58	57	54	64	56	58	62
80.0°	34	37	38	37	42	39	39	40
85.0°	15	16	17	18	20	19	18	18
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

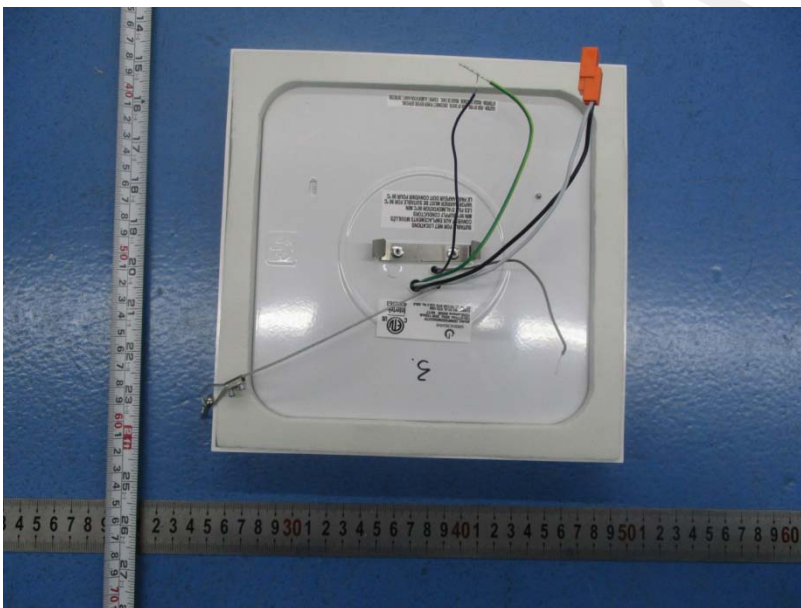
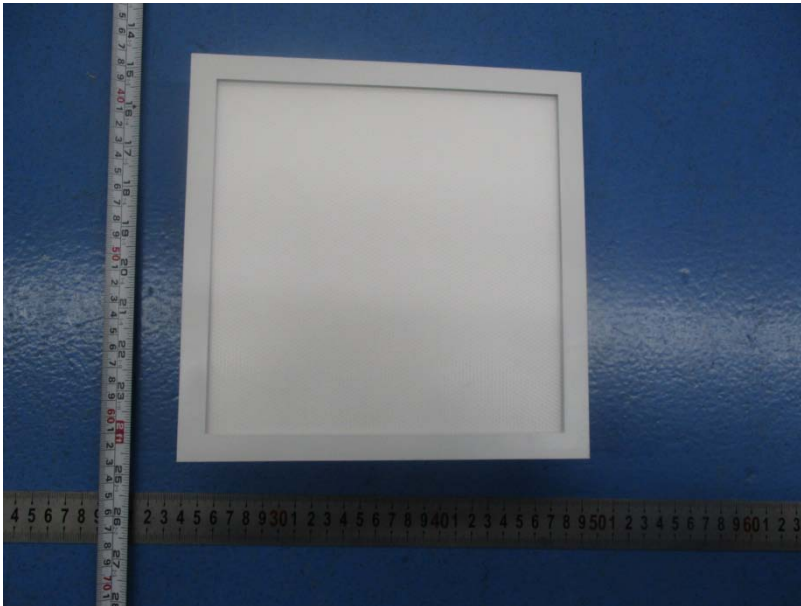
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	721	721	721	721	721	721	721	721
5.0°	718	717	718	717	717	717	716	716
10.0°	707	706	706	705	705	706	705	705
15.0°	690	689	688	687	688	687	686	687
20.0°	666	665	663	663	662	662	661	662
25.0°	634	633	632	631	630	630	629	630
30.0°	594	593	593	591	590	590	589	590
35.0°	545	543	543	541	540	539	539	540
40.0°	477	474	470	469	468	466	467	469
45.0°	371	367	363	361	356	354	355	357
50.0°	260	258	253	252	248	247	246	247
55.0°	180	180	175	173	176	171	171	173
60.0°	123	131	126	120	134	120	121	129
65.0°	88	101	95	88	105	88	90	100
70.0°	67	79	75	69	82	69	71	78
75.0°	51	58	57	53	60	53	53	56
80.0°	35	36	36	34	37	35	33	34
85.0°	14	14	14	12	13	12	12	12
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)	%	Deg	Flux (lm)	%
0-5	17.2	1.13	0-5	17.2	1.13
5-10	51.0	3.34	0-10	68.2	4.47
10-15	82.8	5.44	0-15	151.0	9.91
15-20	111.6	7.33	0-20	262.6	17.24
20-25	136.3	8.95	0-25	398.9	26.18
25-30	155.7	10.22	0-30	554.6	36.40
30-35	168.3	11.05	0-35	722.9	47.45
35-40	171.4	11.25	0-40	894.4	58.70
40-45	158.1	10.37	0-45	1052.4	69.07
45-50	128.2	8.41	0-50	1180.6	77.48
50-55	96.1	6.31	0-55	1276.8	83.79
55-60	71.8	4.71	0-60	1348.5	88.50
60-65	54.8	3.60	0-65	1403.3	92.10
65-70	43.3	2.84	0-70	1446.6	94.94
70-75	34.2	2.24	0-75	1480.8	97.18
75-80	24.8	1.63	0-80	1505.6	98.81
80-85	14.0	0.92	0-85	1519.6	99.73
85-90	4.1	0.27	0-90	1523.7	100.00
90-95	0.0	0.00	0-95	1523.7	100.00
95-100	0.0	0.00	0-100	1523.7	100.00
100-105	0.0	0.00	0-105	1523.7	100.00
105-110	0.0	0.00	0-110	1523.7	100.00
110-115	0.0	0.00	0-115	1523.7	100.00
115-120	0.0	0.00	0-120	1523.7	100.00
120-125	0.0	0.00	0-125	1523.7	100.00
125-130	0.0	0.00	0-130	1523.7	100.00
130-135	0.0	0.00	0-135	1523.7	100.00
135-140	0.0	0.00	0-140	1523.7	100.00
140-145	0.0	0.00	0-145	1523.7	100.00
145-150	0.0	0.00	0-150	1523.7	100.00
150-155	0.0	0.00	0-155	1523.7	100.00
155-160	0.0	0.00	0-160	1523.7	100.00
160-165	0.0	0.00	0-165	1523.7	100.00
165-170	0.0	0.00	0-170	1523.7	100.00
170-175	0.0	0.00	0-175	1523.7	100.00
175-180	0.0	0.00	0-180	1523.7	100.00

6. Product Photo



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