

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: SLFT9.5/80CCT2750/DIM010UNV**

<b>Report Type:</b>	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
<b>Test Engineer:</b>	George Yang <i>George Yang</i>
<b>Report Number:</b>	PKS190130080-10
<b>Test Date:</b>	2019-01-31
<b>Report Date:</b>	2019-02-19
<b>Reviewed By:</b>	Ray Gao/EE Engineer <i>Ry Gao</i>
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Kunshan). No.248 Chenghu Road, Kunshan, Jiangsu province, China. Tel: +86-0512-86175000 Fax: +86-0512-88934268
<b>Test Facility:</b>	Test facility was located at No.248 Chenghu Road, Kunshan, Jiangsu province, China.
<b>Accreditation:</b>	The IAS Accreditation Number TL-749.

**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. (Kunshan). 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 2019-01-30 and used for testing.

Model Tested: SLFT9.5/80CCT2750/DIM010UNV  
 Manufacturer: GREEN CREATIVE LTD  
 Brand Name: GREEN CREATIVE  
 Product Designation: LED Downlight  
 Dimming: Dimmable  
 Connectable: None  
 Color Tunable: White-tunable  
 CCT Range: 2700K/5000K  
 Aging Time Before Test: 0hour(For New Products)

### Rated Values:

Rated Voltage/Frequency: 120-277VAC, 50/60Hz  
 Rated Power: 30W  
 Nominal Lumen Output: 3050/3142lm

## 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	2019-01-23	2020-01-23
Power Meter	INVENTFINE	WT500	GSJWQ20009	2018-04-08	2019-04-08
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2019-01-23	2020-01-23
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2018-04-08	2019-04-08
Standard Light Source	INVENTFINE	N/A	JWWCR020106	2018-12-24	2019-12-24
Thermal Meter	KEJIAN	TA298	N/A	2018-12-01	2019-12-01
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	2018-04-08	2019-04-08
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2018-04-08	2019-04-08
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2018-04-08	2019-04-08
Power Meter	INVENTFINE	WT500	GSDSQ200007	2018-04-08	2019-04-08
Goniophotometer	INVENTFINE	GPM-1900	YWGCF120001	2019-01-24	2020-01-24
Wireless Weather Station	ZHONGXING	KG218	N/A	2018-12-01	2019-12-01

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Standard Light Source	INVENTFINE	N/A	JWBYR040008	2019-01-24	2020-01-24

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.

$4\pi$  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  $U_{\text{rel}}=2.61\%$  ( $k=2$ ), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is  $U=34\text{K}$  ( $k=2$ ), 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  $U_{\text{rel}}=0.48\%$  of rdg, AC Voltage  $U_{\text{rel}}=0.25\%$  of rdg, Power  $U_{\text{rel}}=0.44\%$ , ( $k=2$ ), 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 ( $\gamma$ ) 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  $U_{\text{rel}}=2.6\%$  ( $k=2$ ), 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]

#### Test CCT Setting: 2700K

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

Test orientation: **Downward**

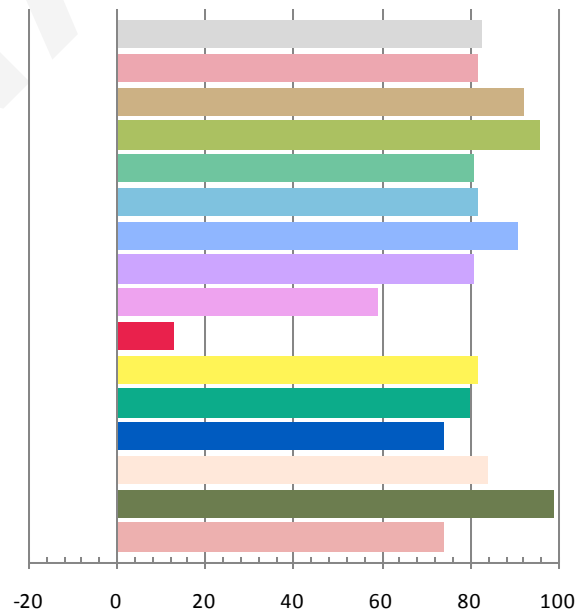
#### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.2444	29.3	0.999	3055.18	104.27

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
9.603	2655	-0.00061	0.4625	0.4095	0.2647	0.5273

#### Color Rendering Index

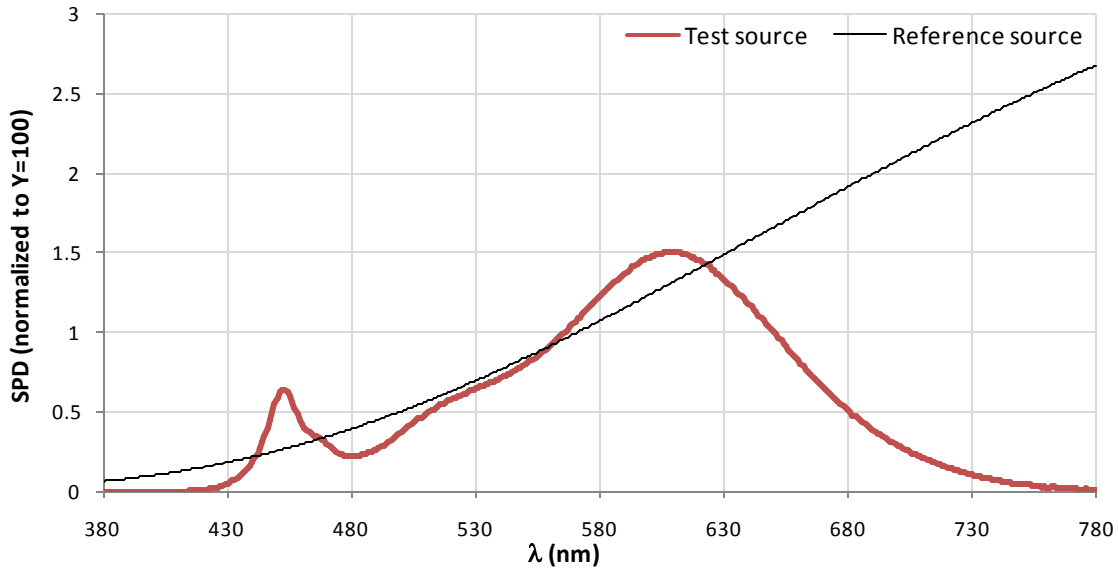
Ra			
82.9			
R1	R2	R3	R4
82	92	96	81
R5	R6	R7	R8
82	91	81	59
R9	R10	R11	R12
13	82	80	74
R13	R14	R15	
84	99	74	



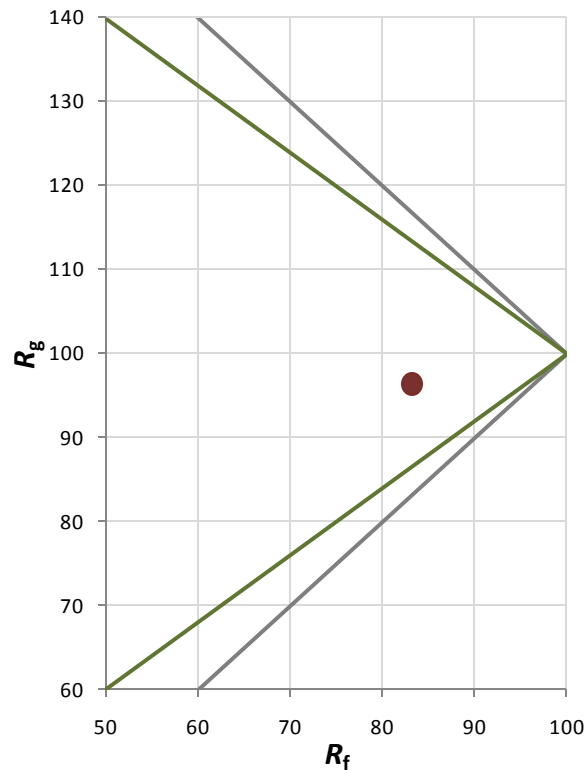
### Fidelity Index and Gamut Index

Fidelity Index $R_f$	83
Gamut Index $R_g$	96

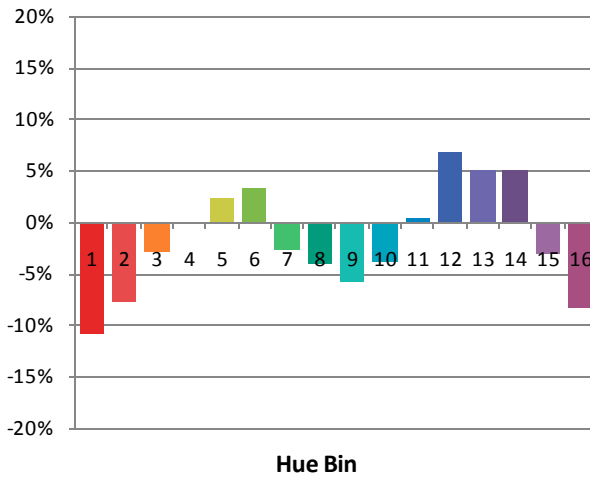
### Spectral Power Distribution Comparison



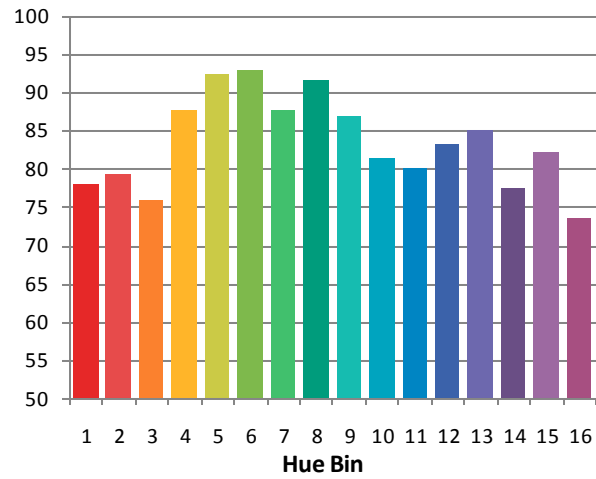
### Plot of $R_g$ versus $R_f$



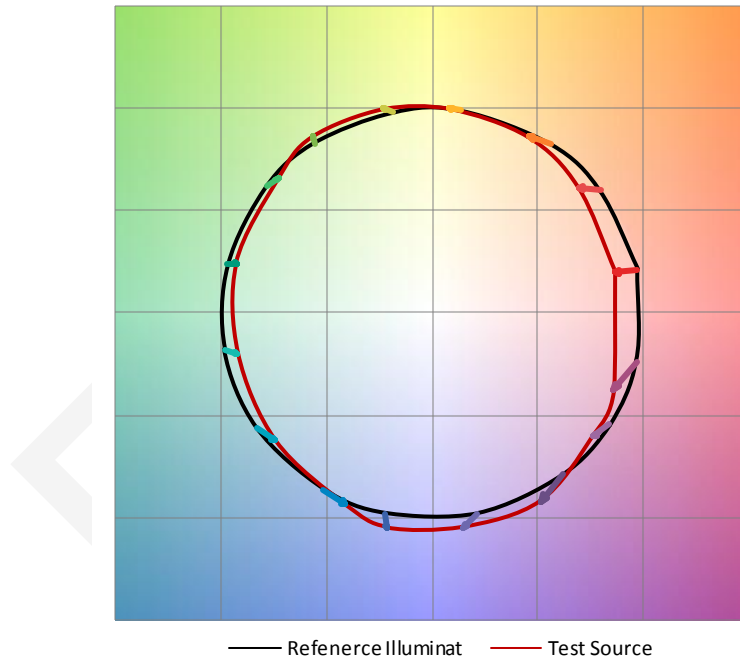
Chroma Shift by Hue



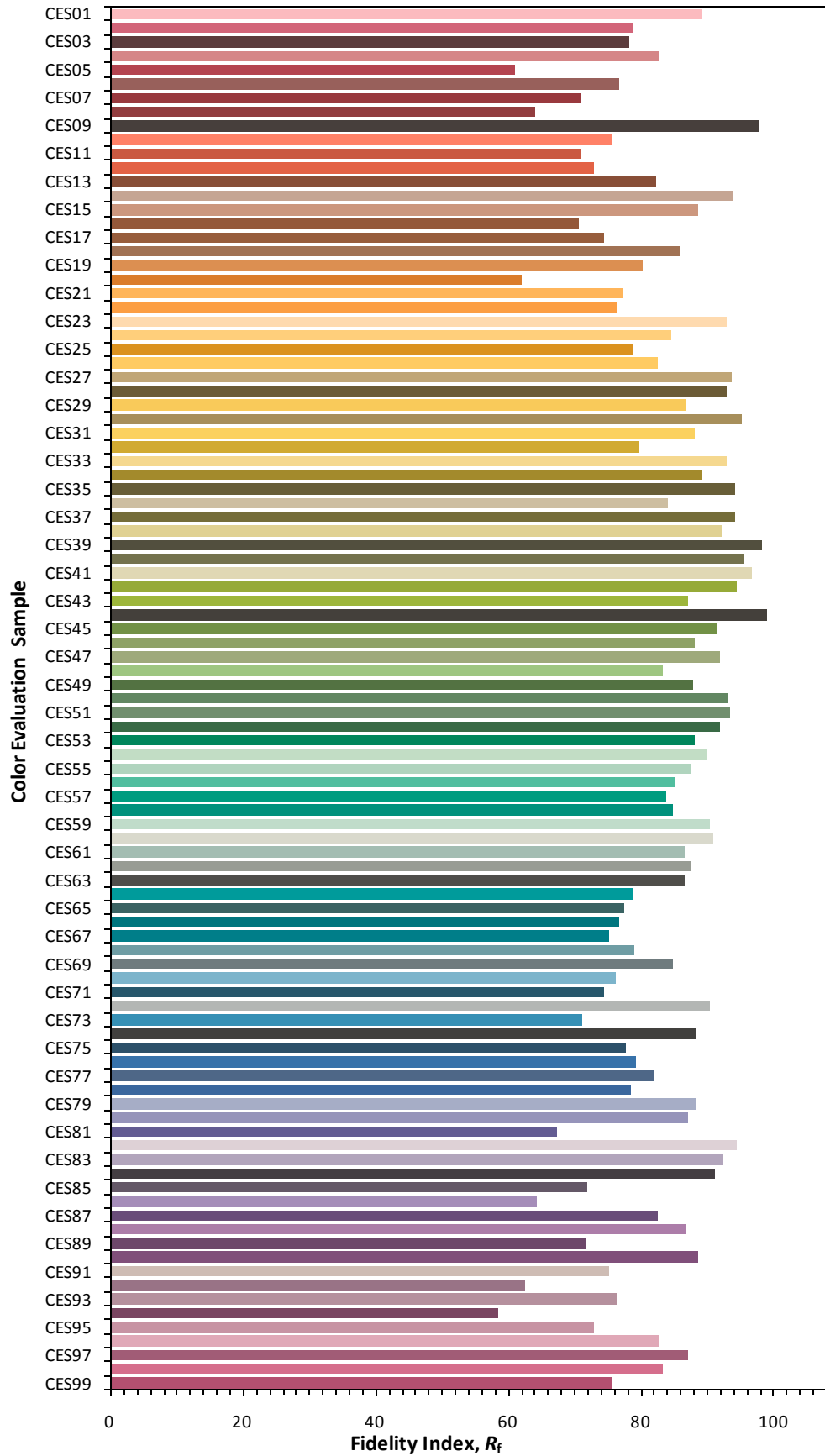
$R_t$  by Hue



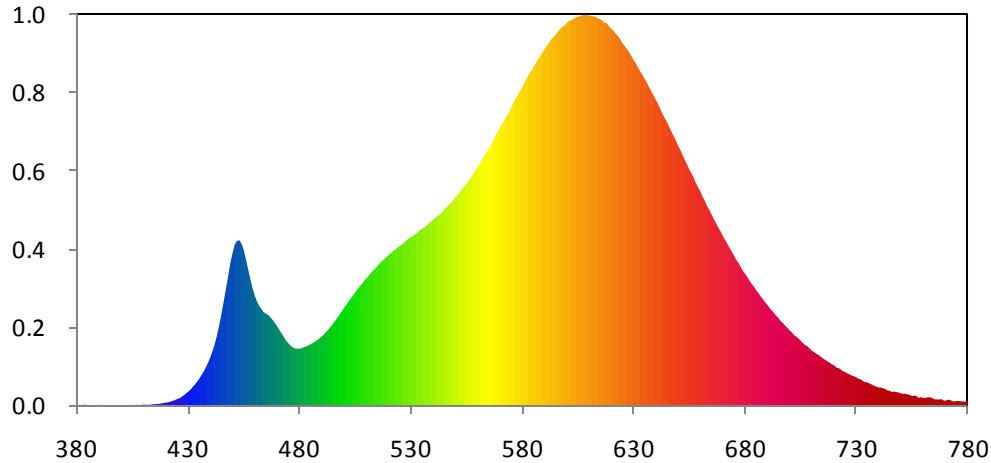
Color Vector Graphic



### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

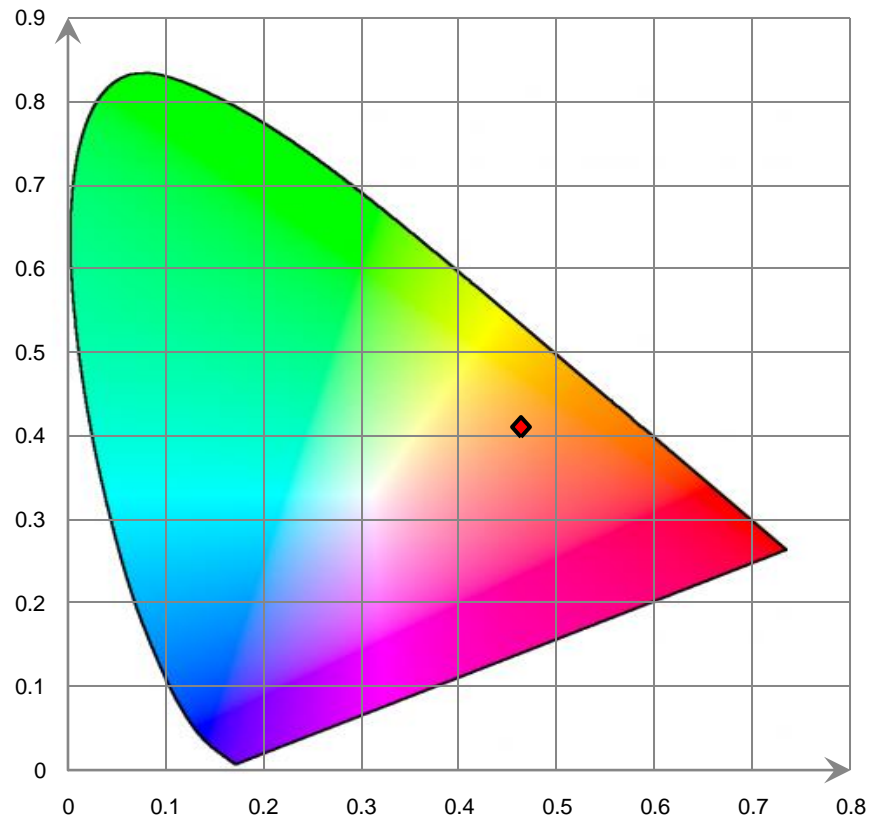


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.220E-02	421	4.951E-01	462	1.713E+01	503	1.838E+01	544	3.327E+01
381	3.130E-02	422	5.872E-01	463	1.655E+01	504	1.883E+01	545	3.370E+01
382	3.460E-02	423	7.347E-01	464	1.606E+01	505	1.944E+01	546	3.413E+01
383	5.210E-02	424	8.498E-01	465	1.578E+01	506	1.995E+01	547	3.452E+01
384	8.910E-02	425	1.037E+00	466	1.555E+01	507	2.041E+01	548	3.487E+01
385	1.530E-02	426	1.181E+00	467	1.517E+01	508	2.088E+01	549	3.527E+01
386	1.000E-03	427	1.393E+00	468	1.473E+01	509	2.138E+01	550	3.581E+01
387	4.230E-02	428	1.667E+00	469	1.422E+01	510	2.185E+01	551	3.624E+01
388	1.990E-02	429	1.979E+00	470	1.363E+01	511	2.226E+01	552	3.673E+01
389	7.500E-03	430	2.286E+00	471	1.304E+01	512	2.273E+01	553	3.719E+01
390	6.290E-02	431	2.628E+00	472	1.238E+01	513	2.315E+01	554	3.769E+01
391	1.810E-02	432	3.088E+00	473	1.179E+01	514	2.358E+01	555	3.825E+01
392	1.340E-02	433	3.494E+00	474	1.118E+01	515	2.394E+01	556	3.869E+01
393	2.430E-02	434	3.996E+00	475	1.073E+01	516	2.440E+01	557	3.930E+01
394	1.030E-02	435	4.504E+00	476	1.028E+01	517	2.481E+01	558	3.986E+01
395	1.800E-02	436	5.140E+00	477	9.998E+00	518	2.513E+01	559	4.050E+01
396	1.040E-02	437	5.760E+00	478	9.799E+00	519	2.549E+01	560	4.109E+01
397	4.500E-03	438	6.490E+00	479	9.736E+00	520	2.588E+01	561	4.170E+01
398	4.200E-03	439	7.294E+00	480	9.752E+00	521	2.620E+01	562	4.233E+01
399	1.980E-02	440	8.203E+00	481	9.812E+00	522	2.655E+01	563	4.295E+01
400	6.400E-03	441	9.289E+00	482	9.992E+00	523	2.680E+01	564	4.361E+01
401	1.610E-02	442	1.048E+01	483	1.011E+01	524	2.712E+01	565	4.419E+01
402	3.060E-02	443	1.198E+01	484	1.030E+01	525	2.744E+01	566	4.481E+01
403	4.900E-03	444	1.371E+01	485	1.048E+01	526	2.767E+01	567	4.564E+01
404	1.330E-02	445	1.565E+01	486	1.070E+01	527	2.801E+01	568	4.641E+01
405	2.950E-02	446	1.774E+01	487	1.096E+01	528	2.835E+01	569	4.714E+01
406	2.540E-02	447	1.992E+01	488	1.123E+01	529	2.868E+01	570	4.776E+01
407	7.050E-02	448	2.213E+01	489	1.152E+01	530	2.897E+01	571	4.851E+01
408	1.420E-02	449	2.449E+01	490	1.183E+01	531	2.918E+01	572	4.904E+01
409	4.950E-02	450	2.615E+01	491	1.221E+01	532	2.947E+01	573	4.981E+01
410	8.520E-02	451	2.770E+01	492	1.260E+01	533	2.977E+01	574	5.041E+01
411	7.390E-02	452	2.833E+01	493	1.301E+01	534	3.010E+01	575	5.130E+01
412	7.440E-02	453	2.846E+01	494	1.348E+01	535	3.041E+01	576	5.208E+01
413	6.520E-02	454	2.791E+01	495	1.401E+01	536	3.062E+01	577	5.276E+01
414	1.446E-01	455	2.686E+01	496	1.451E+01	537	3.093E+01	578	5.352E+01
415	1.675E-01	456	2.521E+01	497	1.504E+01	538	3.126E+01	579	5.415E+01
416	1.804E-01	457	2.350E+01	498	1.555E+01	539	3.160E+01	580	5.481E+01
417	2.291E-01	458	2.179E+01	499	1.617E+01	540	3.197E+01	581	5.557E+01
418	2.887E-01	459	2.019E+01	500	1.675E+01	541	3.226E+01	582	5.630E+01
419	3.687E-01	460	1.891E+01	501	1.728E+01	542	3.263E+01	583	5.701E+01
420	4.449E-01	461	1.790E+01	502	1.785E+01	543	3.288E+01	584	5.767E+01

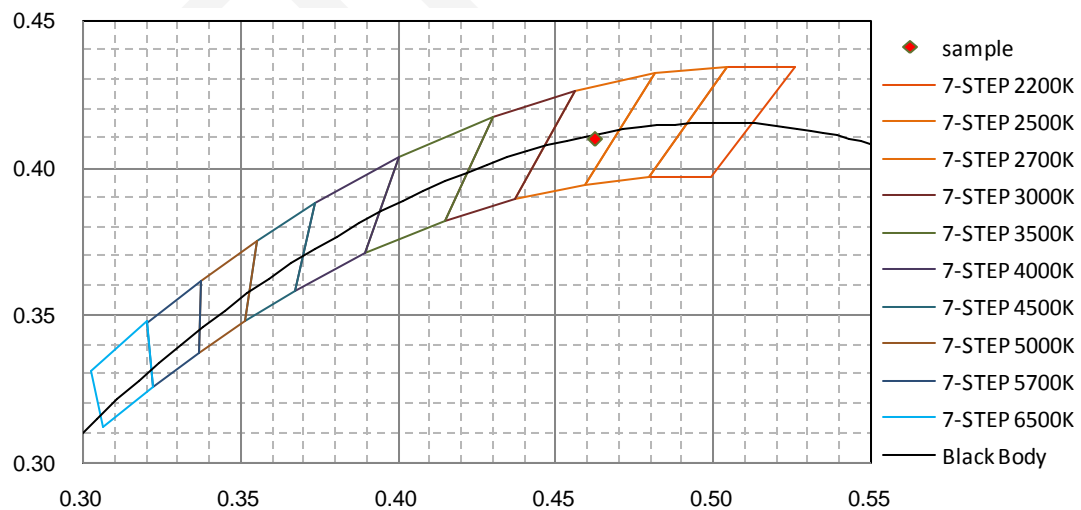


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	5.818E+01	626	6.199E+01	667	3.144E+01	708	1.016E+01	749	2.183E+00
586	5.889E+01	627	6.140E+01	668	3.065E+01	709	9.769E+00	750	2.038E+00
587	5.955E+01	628	6.090E+01	669	3.001E+01	710	9.417E+00	751	1.956E+00
588	6.010E+01	629	6.023E+01	670	2.924E+01	711	9.164E+00	752	1.979E+00
589	6.072E+01	630	5.954E+01	671	2.854E+01	712	8.875E+00	753	1.862E+00
590	6.135E+01	631	5.896E+01	672	2.789E+01	713	8.682E+00	754	1.787E+00
591	6.197E+01	632	5.827E+01	673	2.721E+01	714	8.358E+00	755	1.567E+00
592	6.246E+01	633	5.755E+01	674	2.650E+01	715	8.073E+00	756	1.668E+00
593	6.311E+01	634	5.697E+01	675	2.590E+01	716	7.816E+00	757	1.552E+00
594	6.346E+01	635	5.626E+01	676	2.512E+01	717	7.554E+00	758	1.266E+00
595	6.394E+01	636	5.562E+01	677	2.461E+01	718	7.336E+00	759	1.377E+00
596	6.438E+01	637	5.481E+01	678	2.388E+01	719	7.039E+00	760	1.265E+00
597	6.488E+01	638	5.412E+01	679	2.323E+01	720	6.881E+00	761	1.229E+00
598	6.527E+01	639	5.338E+01	680	2.269E+01	721	6.512E+00	762	1.374E+00
599	6.550E+01	640	5.265E+01	681	2.216E+01	722	6.409E+00	763	1.354E+00
600	6.588E+01	641	5.197E+01	682	2.150E+01	723	6.155E+00	764	1.262E+00
601	6.628E+01	642	5.107E+01	683	2.095E+01	724	5.841E+00	765	1.011E+00
602	6.636E+01	643	5.024E+01	684	2.046E+01	725	5.721E+00	766	1.006E+00
603	6.662E+01	644	4.951E+01	685	1.987E+01	726	5.474E+00	767	9.611E-01
604	6.687E+01	645	4.885E+01	686	1.939E+01	727	5.296E+00	768	1.060E+00
605	6.699E+01	646	4.799E+01	687	1.877E+01	728	5.113E+00	769	8.416E-01
606	6.712E+01	647	4.715E+01	688	1.833E+01	729	4.969E+00	770	7.733E-01
607	6.724E+01	648	4.641E+01	689	1.780E+01	730	4.798E+00	771	9.079E-01
608	6.734E+01	649	4.564E+01	690	1.735E+01	731	4.553E+00	772	9.431E-01
609	6.726E+01	650	4.472E+01	691	1.681E+01	732	4.456E+00	773	7.076E-01
610	6.720E+01	651	4.406E+01	692	1.633E+01	733	4.142E+00	774	6.610E-01
611	6.711E+01	652	4.315E+01	693	1.593E+01	734	3.984E+00	775	7.040E-01
612	6.706E+01	653	4.232E+01	694	1.543E+01	735	3.941E+00	776	7.308E-01
613	6.700E+01	654	4.153E+01	695	1.504E+01	736	3.708E+00	777	6.404E-01
614	6.670E+01	655	4.067E+01	696	1.450E+01	737	3.547E+00	778	6.314E-01
615	6.657E+01	656	3.999E+01	697	1.419E+01	738	3.331E+00	779	6.144E-01
616	6.629E+01	657	3.922E+01	698	1.371E+01	739	3.202E+00	780	6.103E-01
617	6.591E+01	658	3.830E+01	699	1.337E+01	740	3.034E+00		
618	6.586E+01	659	3.759E+01	700	1.292E+01	741	3.043E+00		
619	6.533E+01	660	3.685E+01	701	1.256E+01	742	2.923E+00		
620	6.494E+01	661	3.597E+01	702	1.212E+01	743	2.797E+00		
621	6.457E+01	662	3.523E+01	703	1.183E+01	744	2.536E+00		
622	6.406E+01	663	3.436E+01	704	1.152E+01	745	2.468E+00		
623	6.367E+01	664	3.369E+01	705	1.112E+01	746	2.257E+00		
624	6.314E+01	665	3.291E+01	706	1.071E+01	747	2.359E+00		
625	6.241E+01	666	3.211E+01	707	1.038E+01	748	2.259E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



## Test CCT Setting: 5000K

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

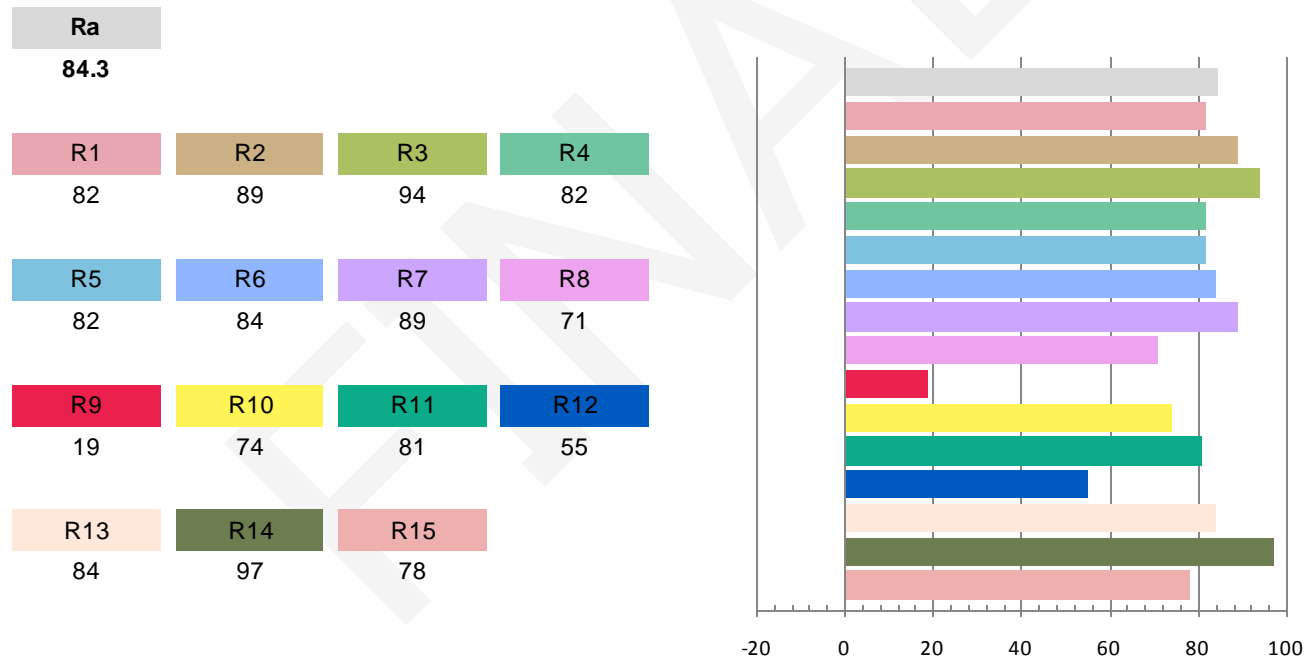
Test orientation: **Downward**

## Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.2447	29.34	0.9992	3150.1	107.37

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
9.872	4993	0.00363	0.3460	0.3597	0.2090	0.4887

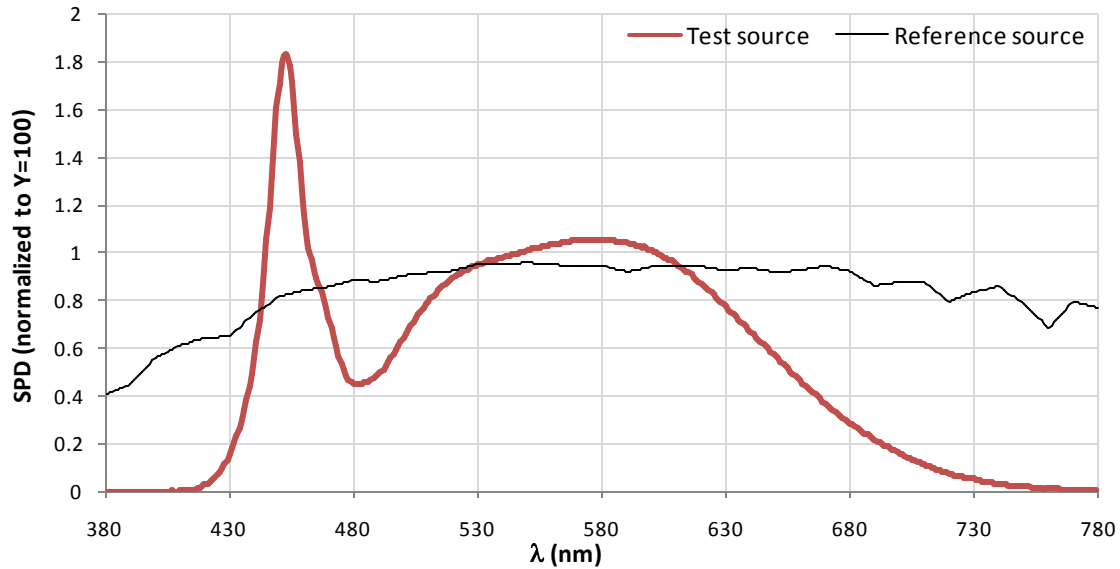
## Color Rendering Index



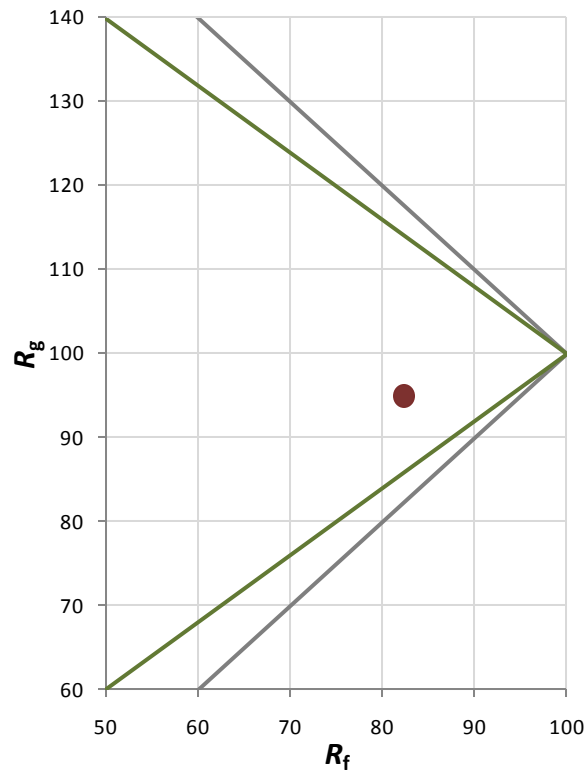
### Fidelity Index and Gamut Index

Fidelity Index $R_f$	82
Gamut Index $R_g$	95

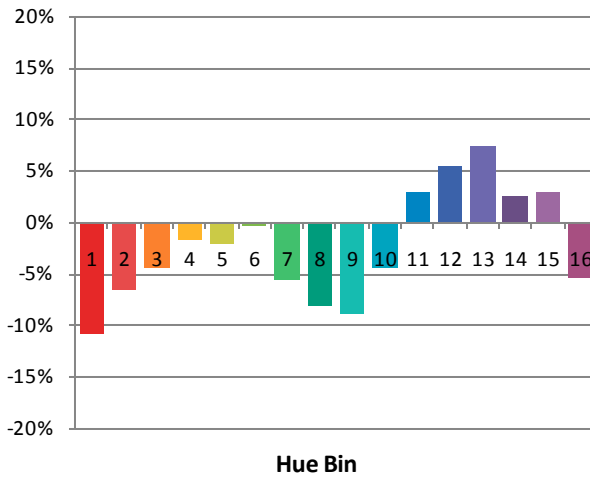
### Spectral Power Distribution Comparison



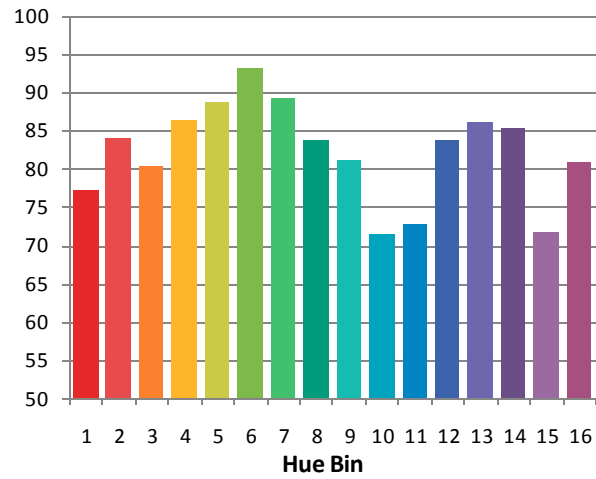
### Plot of $R_g$ versus $R_f$



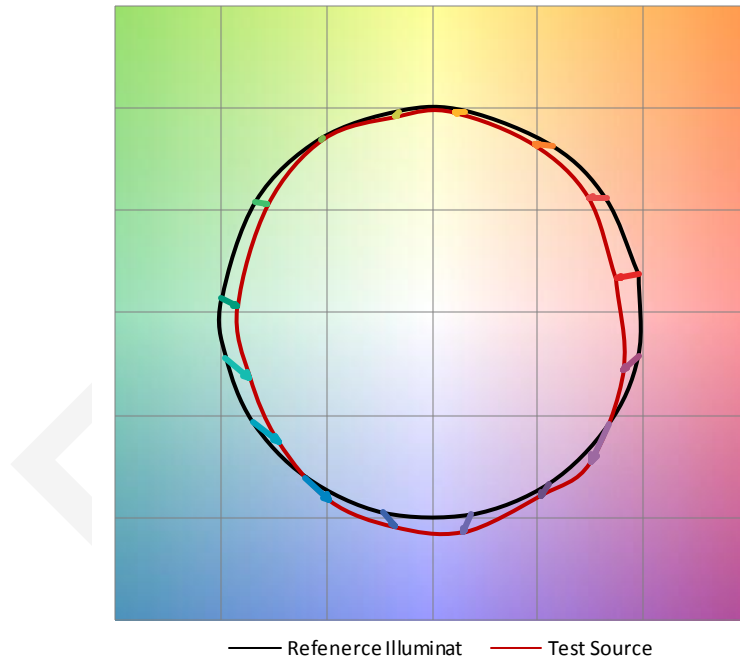
Chroma Shift by Hue



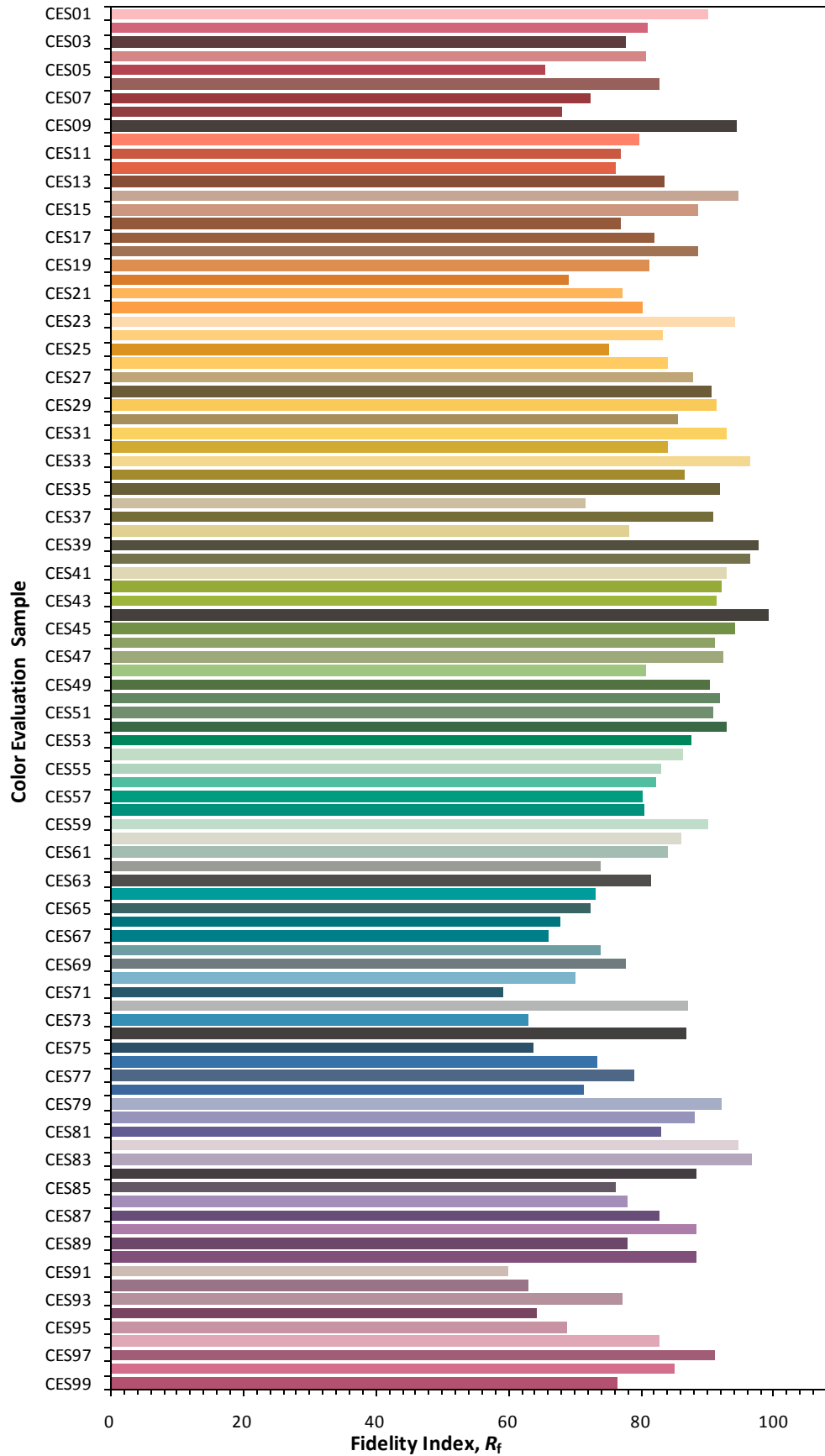
$R_t$  by Hue



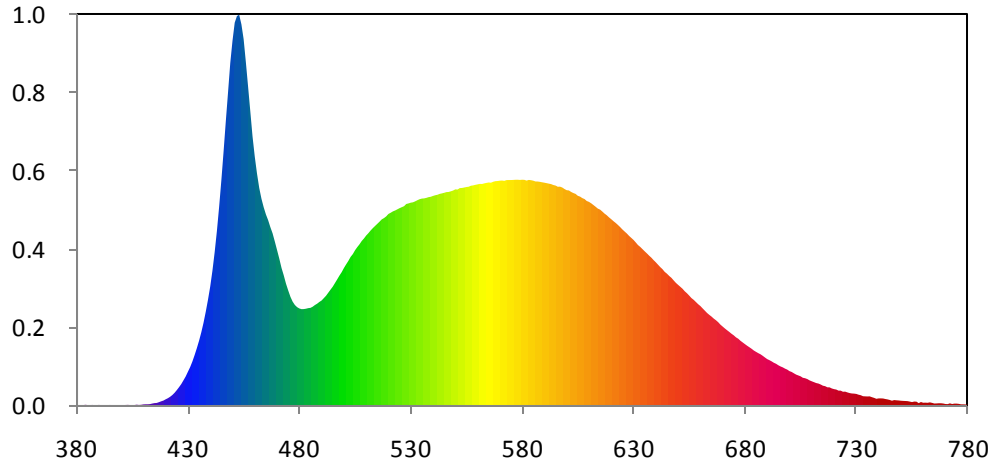
Color Vector Graphic



### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

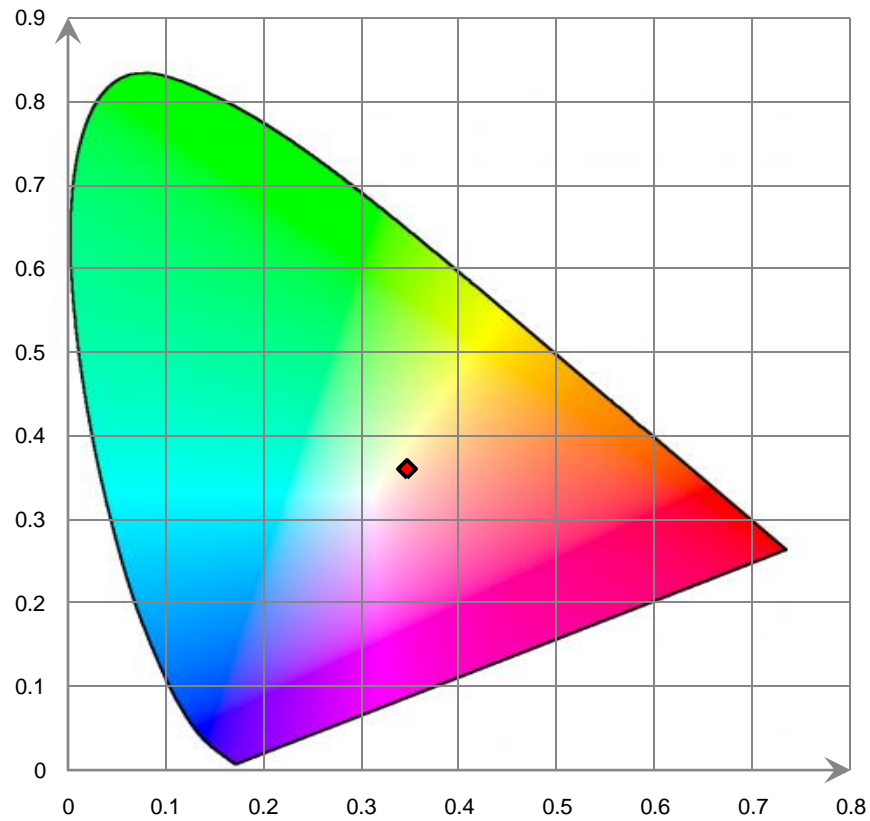


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.950E-02	421	1.510E+00	462	4.698E+01	503	3.206E+01	544	4.580E+01
381	1.820E-02	422	1.812E+00	463	4.463E+01	504	3.265E+01	545	4.592E+01
382	3.070E-02	423	2.198E+00	464	4.281E+01	505	3.350E+01	546	4.607E+01
383	1.670E-02	424	2.674E+00	465	4.125E+01	506	3.417E+01	547	4.611E+01
384	8.450E-02	425	3.259E+00	466	4.000E+01	507	3.478E+01	548	4.624E+01
385	2.690E-02	426	3.881E+00	467	3.849E+01	508	3.549E+01	549	4.641E+01
386	4.200E-03	427	4.557E+00	468	3.716E+01	509	3.604E+01	550	4.667E+01
387	5.500E-02	428	5.380E+00	469	3.538E+01	510	3.667E+01	551	4.663E+01
388	1.220E-02	429	6.216E+00	470	3.356E+01	511	3.720E+01	552	4.694E+01
389	1.350E-02	430	7.225E+00	471	3.169E+01	512	3.777E+01	553	4.697E+01
390	6.110E-02	431	8.242E+00	472	2.968E+01	513	3.829E+01	554	4.706E+01
391	2.230E-02	432	9.445E+00	473	2.809E+01	514	3.876E+01	555	4.717E+01
392	5.400E-03	433	1.083E+01	474	2.629E+01	515	3.922E+01	556	4.724E+01
393	5.800E-03	434	1.233E+01	475	2.482E+01	516	3.968E+01	557	4.745E+01
394	6.700E-03	435	1.394E+01	476	2.344E+01	517	4.018E+01	558	4.753E+01
395	5.360E-02	436	1.576E+01	477	2.239E+01	518	4.046E+01	559	4.764E+01
396	7.900E-03	437	1.782E+01	478	2.166E+01	519	4.082E+01	560	4.774E+01
397	7.500E-03	438	2.020E+01	479	2.120E+01	520	4.135E+01	561	4.784E+01
398	3.100E-03	439	2.278E+01	480	2.091E+01	521	4.161E+01	562	4.783E+01
399	1.310E-02	440	2.565E+01	481	2.076E+01	522	4.190E+01	563	4.796E+01
400	1.700E-02	441	2.906E+01	482	2.078E+01	523	4.210E+01	564	4.807E+01
401	2.880E-02	442	3.308E+01	483	2.086E+01	524	4.235E+01	565	4.815E+01
402	4.060E-02	443	3.767E+01	484	2.098E+01	525	4.261E+01	566	4.811E+01
403	7.000E-02	444	4.286E+01	485	2.105E+01	526	4.282E+01	567	4.831E+01
404	3.370E-02	445	4.864E+01	486	2.129E+01	527	4.303E+01	568	4.844E+01
405	3.150E-02	446	5.481E+01	487	2.165E+01	528	4.350E+01	569	4.847E+01
406	3.350E-02	447	6.139E+01	488	2.194E+01	529	4.363E+01	570	4.855E+01
407	1.084E-01	448	6.760E+01	489	2.233E+01	530	4.379E+01	571	4.857E+01
408	4.900E-02	449	7.399E+01	490	2.264E+01	531	4.387E+01	572	4.851E+01
409	8.230E-02	450	7.876E+01	491	2.315E+01	532	4.408E+01	573	4.867E+01
410	1.674E-01	451	8.271E+01	492	2.366E+01	533	4.432E+01	574	4.868E+01
411	1.914E-01	452	8.415E+01	493	2.432E+01	534	4.455E+01	575	4.868E+01
412	1.905E-01	453	8.443E+01	494	2.498E+01	535	4.467E+01	576	4.871E+01
413	2.381E-01	454	8.235E+01	495	2.562E+01	536	4.471E+01	577	4.874E+01
414	3.507E-01	455	7.916E+01	496	2.642E+01	537	4.483E+01	578	4.875E+01
415	4.449E-01	456	7.417E+01	497	2.720E+01	538	4.498E+01	579	4.871E+01
416	4.847E-01	457	6.891E+01	498	2.802E+01	539	4.507E+01	580	4.875E+01
417	6.533E-01	458	6.351E+01	499	2.876E+01	540	4.524E+01	581	4.873E+01
418	8.369E-01	459	5.812E+01	500	2.965E+01	541	4.539E+01	582	4.857E+01
419	9.990E-01	460	5.375E+01	501	3.044E+01	542	4.550E+01	583	4.870E+01
420	1.265E+00	461	5.011E+01	502	3.120E+01	543	4.569E+01	584	4.865E+01

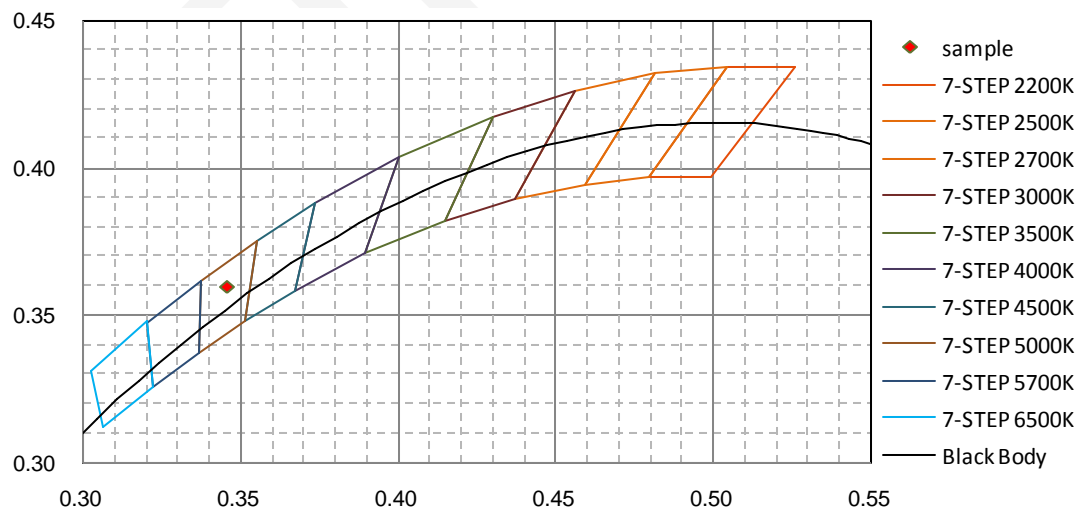
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.854E+01	626	3.755E+01	667	1.836E+01	708	5.649E+00	749	1.020E+00
586	4.837E+01	627	3.711E+01	668	1.794E+01	709	5.370E+00	750	9.584E-01
587	4.836E+01	628	3.661E+01	669	1.742E+01	710	5.171E+00	751	9.315E-01
588	4.829E+01	629	3.617E+01	670	1.700E+01	711	4.975E+00	752	9.020E-01
589	4.820E+01	630	3.573E+01	671	1.659E+01	712	4.785E+00	753	8.751E-01
590	4.811E+01	631	3.519E+01	672	1.621E+01	713	4.680E+00	754	7.745E-01
591	4.801E+01	632	3.462E+01	673	1.583E+01	714	4.478E+00	755	6.676E-01
592	4.791E+01	633	3.423E+01	674	1.544E+01	715	4.211E+00	756	7.881E-01
593	4.781E+01	634	3.375E+01	675	1.509E+01	716	4.115E+00	757	7.621E-01
594	4.761E+01	635	3.327E+01	676	1.467E+01	717	3.868E+00	758	4.373E-01
595	4.749E+01	636	3.281E+01	677	1.437E+01	718	3.854E+00	759	6.845E-01
596	4.723E+01	637	3.233E+01	678	1.392E+01	719	3.614E+00	760	5.303E-01
597	4.725E+01	638	3.190E+01	679	1.357E+01	720	3.473E+00	761	5.481E-01
598	4.707E+01	639	3.138E+01	680	1.321E+01	721	3.378E+00	762	5.118E-01
599	4.675E+01	640	3.089E+01	681	1.285E+01	722	3.153E+00	763	6.042E-01
600	4.649E+01	641	3.038E+01	682	1.253E+01	723	3.144E+00	764	5.000E-01
601	4.643E+01	642	2.985E+01	683	1.220E+01	724	2.903E+00	765	3.595E-01
602	4.610E+01	643	2.940E+01	684	1.182E+01	725	2.928E+00	766	3.798E-01
603	4.587E+01	644	2.883E+01	685	1.153E+01	726	2.761E+00	767	4.167E-01
604	4.568E+01	645	2.843E+01	686	1.124E+01	727	2.618E+00	768	4.115E-01
605	4.527E+01	646	2.795E+01	687	1.100E+01	728	2.533E+00	769	3.605E-01
606	4.510E+01	647	2.754E+01	688	1.068E+01	729	2.500E+00	770	2.551E-01
607	4.478E+01	648	2.700E+01	689	1.031E+01	730	2.427E+00	771	2.301E-01
608	4.457E+01	649	2.645E+01	690	9.965E+00	731	2.261E+00	772	3.978E-01
609	4.415E+01	650	2.602E+01	691	9.733E+00	732	2.154E+00	773	2.554E-01
610	4.397E+01	651	2.560E+01	692	9.475E+00	733	1.930E+00	774	3.381E-01
611	4.365E+01	652	2.517E+01	693	9.170E+00	734	1.912E+00	775	3.407E-01
612	4.328E+01	653	2.463E+01	694	8.953E+00	735	1.884E+00	776	2.905E-01
613	4.290E+01	654	2.420E+01	695	8.632E+00	736	1.906E+00	777	1.753E-01
614	4.250E+01	655	2.369E+01	696	8.374E+00	737	1.733E+00	778	1.782E-01
615	4.228E+01	656	2.316E+01	697	8.171E+00	738	1.583E+00	779	1.510E-01
616	4.187E+01	657	2.278E+01	698	7.902E+00	739	1.388E+00	780	9.890E-02
617	4.142E+01	658	2.231E+01	699	7.695E+00	740	1.460E+00		
618	4.106E+01	659	2.184E+01	700	7.361E+00	741	1.466E+00		
619	4.061E+01	660	2.144E+01	701	7.178E+00	742	1.447E+00		
620	4.022E+01	661	2.093E+01	702	6.883E+00	743	1.333E+00		
621	3.979E+01	662	2.044E+01	703	6.609E+00	744	1.251E+00		
622	3.940E+01	663	1.994E+01	704	6.423E+00	745	1.134E+00		
623	3.898E+01	664	1.954E+01	705	6.238E+00	746	9.661E-01		
624	3.851E+01	665	1.917E+01	706	5.930E+00	747	1.107E+00		
625	3.800E+01	666	1.873E+01	707	5.828E+00	748	1.054E+00		



CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



## [Goniophotometer System]

### Test CCT Setting: 2700K

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

Test orientation: **Downward**

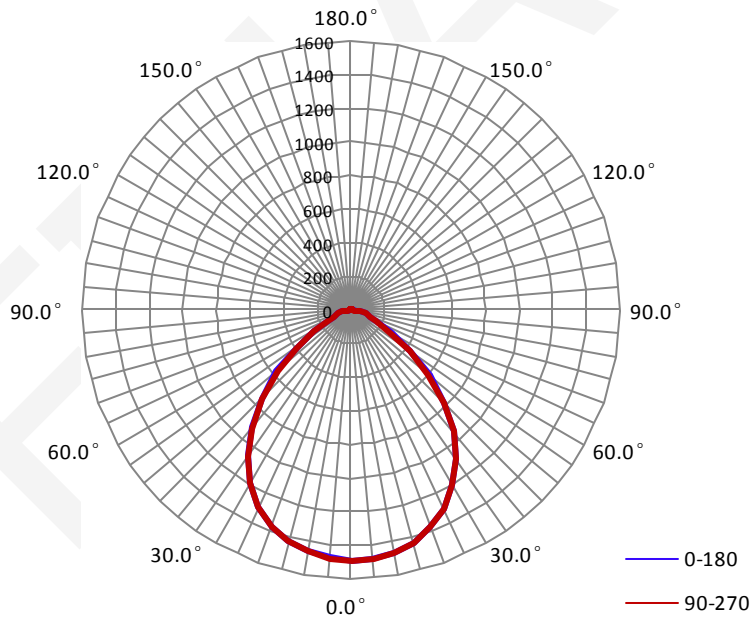
### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.245	29.41	1

### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	$I_{max}$ (cd)	S/MH (C0/180)	S/MH (C90/270)
3058.4	104.04	1493.6	1.19	1.19

### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% $I_{max}$ ):	90.9	91.2	91.1	91.1	91.1
Field Angle (10% $I_{max}$ ):	132.0	132.1	132.1	132.1	132.1

**Luminous Intensity (cd) Distribution Data**

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1493.6	1493.6	1493.6	1493.6	1493.6	1493.6	1493.6	1493.6
5.0°	1485.0	1487.6	1488.7	1489.8	1487.4	1486.3	1483.9	1486.4
10.0°	1465.0	1465.6	1468.9	1463.8	1464.3	1466.5	1462.6	1466.1
15.0°	1429.8	1428.4	1431.2	1427.8	1429.6	1431.5	1427.4	1428.2
20.0°	1378.6	1380.6	1383.3	1380.8	1379.2	1380.7	1372.4	1376.5
25.0°	1303.2	1307.1	1307.0	1305.1	1304.1	1305.5	1296.2	1301.3
30.0°	1203.9	1204.2	1204.1	1208.8	1201.7	1204.8	1195.5	1197.4
35.0°	1081.0	1084.3	1088.3	1084.0	1083.4	1085.4	1076.3	1073.7
40.0°	940.0	944.5	948.8	947.4	942.5	940.2	933.9	933.3
45.0°	779.7	784.8	786.4	780.9	780.4	776.4	770.4	770.2
50.0°	602.8	605.9	608.1	605.0	601.1	596.6	592.7	590.4
55.0°	430.4	431.3	432.3	428.7	421.3	418.1	416.3	414.7
60.0°	274.7	275.3	273.4	271.6	267.8	264.1	263.5	261.6
65.0°	166.4	168.0	167.6	164.4	164.7	162.9	160.8	161.0
70.0°	115.9	116.8	117.5	116.4	116.4	116.4	114.9	114.2
75.0°	87.5	87.8	88.3	87.9	87.7	86.7	86.3	86.0
80.0°	56.6	57.0	56.7	56.5	55.7	54.8	55.0	54.6
85.0°	24.9	24.9	23.9	23.1	22.6	21.2	21.7	21.9
90.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140.0°	0.0	0.0	0.0	0.0	0.9	0.7	0.7	0.7
145.0°	0.0	1.0	1.7	1.5	1.5	1.7	1.4	1.1
150.0°	1.9	2.0	2.4	2.1	2.3	2.5	2.2	2.3
155.0°	1.9	3.1	3.1	2.9	3.3	3.3	2.9	3.2
160.0°	2.7	3.3	3.6	3.8	3.6	4.3	3.3	3.8
165.0°	2.9	4.0	4.5	4.1	4.3	4.1	4.1	4.2
170.0°	3.6	4.7	4.2	4.8	4.9	4.7	4.1	4.6
175.0°	4.5	4.9	4.6	4.5	5.6	5.4	4.7	5.5
180.0°	0.0	0.0	0.0	0.0	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°	1493.6	1493.6	1493.6	1493.6	1493.6	1493.6	1493.6	1493.6
5.0°	1477.7	1481.4	1488.2	1483.1	1486.2	1486.6	1484.4	1490.0
10.0°	1461.2	1461.6	1464.3	1461.4	1461.4	1465.5	1462.6	1466.8
15.0°	1421.3	1422.5	1424.1	1421.7	1423.7	1428.7	1427.7	1433.8
20.0°	1373.9	1368.0	1370.2	1367.3	1369.9	1377.9	1375.2	1378.3
25.0°	1290.1	1287.7	1290.6	1290.1	1292.6	1294.5	1295.9	1306.4
30.0°	1183.5	1183.4	1186.8	1182.7	1190.7	1195.8	1193.0	1200.6
35.0°	1060.5	1057.0	1061.0	1062.3	1065.5	1068.1	1070.9	1077.2
40.0°	915.1	909.3	914.2	915.0	917.3	925.1	924.6	935.4
45.0°	744.2	747.2	749.7	748.0	751.4	758.9	763.8	770.1
50.0°	571.4	568.6	566.1	567.6	573.1	580.6	582.2	590.5
55.0°	397.5	395.7	393.4	394.2	397.4	404.3	407.1	416.8
60.0°	248.2	245.3	245.2	245.8	247.7	250.9	255.5	262.5
65.0°	151.6	150.3	151.2	151.6	153.2	154.0	156.4	159.1
70.0°	109.8	110.0	111.2	110.6	111.7	112.4	113.7	114.2
75.0°	80.5	80.8	81.3	81.5	82.2	83.8	83.7	85.1
80.0°	49.9	49.6	50.7	50.6	51.9	52.4	53.1	53.7
85.0°	18.0	19.0	18.6	18.7	19.5	19.3	20.4	21.2
90.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145.0°	0.0	0.0	0.9	1.3	1.0	1.0	0.8	0.7
150.0°	1.0	1.3	1.6	2.0	1.6	2.3	1.9	2.1
155.0°	1.9	2.1	2.4	2.2	2.7	2.6	2.9	2.5
160.0°	2.6	2.7	3.4	3.3	3.3	3.7	3.9	3.7
165.0°	3.2	3.1	4.2	4.2	3.2	4.4	4.0	4.0
170.0°	3.0	4.0	4.5	4.9	4.0	4.8	4.8	4.5
175.0°	3.8	4.3	5.1	5.3	4.8	5.5	5.1	4.9
180.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

### Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	35.6	1.16	0-5	35.6	1.16
5-10	105.5	3.45	0-10	141.1	4.62
10-15	171.5	5.61	0-15	312.7	10.22
15-20	231.0	7.55	0-20	543.7	17.78
20-25	280.5	9.17	0-25	824.2	26.95
25-30	315.7	10.32	0-30	1139.9	37.27
30-35	334.2	10.93	0-35	1474.1	48.20
35-40	334.4	10.93	0-40	1808.5	59.13
40-45	314.2	10.27	0-45	2122.7	69.40
45-50	273.6	8.95	0-50	2396.3	78.35
50-55	217.5	7.11	0-55	2613.7	85.46
55-60	155.3	5.08	0-60	2769.1	90.54
60-65	101.7	3.33	0-65	2870.8	93.87
65-70	69.1	2.26	0-70	2939.9	96.12
70-75	51.9	1.70	0-75	2991.8	97.82
75-80	37.1	1.21	0-80	3028.9	99.03
80-85	20.3	0.67	0-85	3049.2	99.70
85-90	5.8	0.19	0-90	3055.0	99.89
90-95	0.0	0.00	0-95	3055.0	99.89
95-100	0.0	0.00	0-100	3055.0	99.89
100-105	0.0	0.00	0-105	3055.0	99.89
105-110	0.0	0.00	0-110	3055.0	99.89
110-115	0.0	0.00	0-115	3055.0	99.89
115-120	0.0	0.00	0-120	3055.0	99.89
120-125	0.0	0.00	0-125	3055.0	99.89
125-130	0.0	0.00	0-130	3055.0	99.89
130-135	0.0	0.00	0-135	3055.0	99.89
135-140	0.0	0.00	0-140	3055.1	99.89
140-145	0.2	0.01	0-145	3055.3	99.90
145-150	0.4	0.01	0-150	3055.7	99.91
150-155	0.6	0.02	0-155	3056.3	99.93
155-160	0.6	0.02	0-160	3056.9	99.95
160-165	0.6	0.02	0-165	3057.6	99.97
165-170	0.5	0.02	0-170	3058.0	99.99
170-175	0.3	0.01	0-175	3058.4	100.00
175-180	0.1	0.00	0-180	3058.4	100.00

## Test CCT Setting: 5000K

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

Test orientation: **Downward**

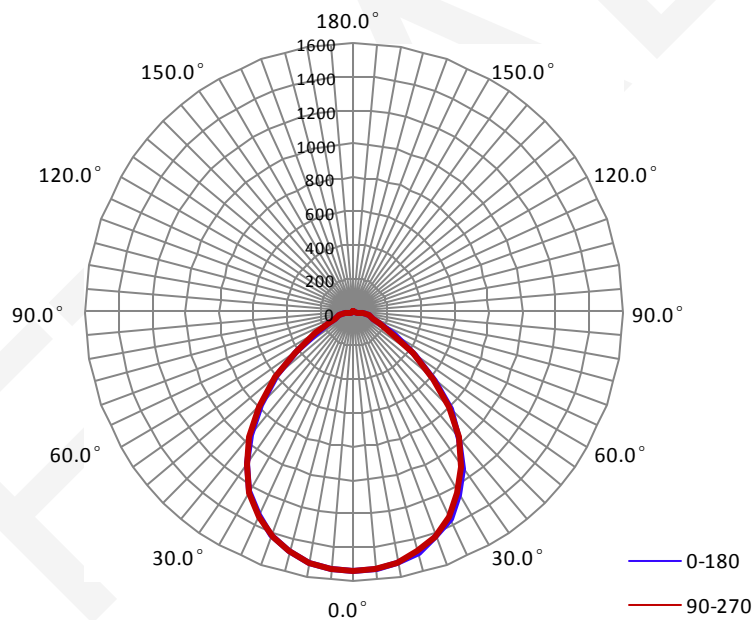
## Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.245	29.46	1

## Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	$I_{max}$ (cd)	S/MH (C0/180)	S/MH (C90/270)
3167.3	107.56	1538.7	1.20	1.20

## Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% $I_{max}$ ):	91.6	91.4	91.5	91.7	91.6
Field Angle (10% $I_{max}$ ):	131.9	132.1	131.9	132.0	132.0

**Luminous Intensity (cd) Distribution Data**

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1538.7	1538.7	1538.7	1538.7	1538.7	1538.7	1538.7	1538.7
5.0°	1535.1	1534.5	1528.5	1536.3	1529.7	1531.2	1535.2	1531.4
10.0°	1513.2	1514.8	1509.0	1508.7	1509.4	1506.1	1509.4	1508.0
15.0°	1480.1	1473.9	1472.7	1472.1	1472.8	1470.2	1473.0	1466.7
20.0°	1428.8	1424.4	1423.8	1421.1	1422.9	1418.0	1417.3	1421.2
25.0°	1355.1	1350.9	1347.2	1346.0	1345.2	1336.2	1339.0	1337.0
30.0°	1250.1	1246.7	1243.1	1243.5	1242.2	1235.7	1235.9	1236.0
35.0°	1132.8	1127.4	1123.0	1125.8	1118.3	1110.3	1113.6	1108.2
40.0°	983.1	982.1	977.2	974.3	972.9	968.4	967.9	963.8
45.0°	818.5	819.8	808.6	808.0	803.7	799.1	800.4	794.7
50.0°	630.5	630.8	622.5	618.1	614.8	609.7	607.8	605.2
55.0°	443.6	445.6	441.5	436.5	428.9	426.6	422.5	418.3
60.0°	278.8	281.0	279.9	276.4	271.2	267.3	263.5	261.0
65.0°	170.3	169.8	170.8	169.8	166.9	164.4	163.8	162.3
70.0°	120.2	120.6	120.7	119.6	119.5	118.8	117.7	116.9
75.0°	90.7	91.8	91.2	90.7	89.4	89.1	88.8	88.2
80.0°	58.5	59.9	59.3	57.9	57.5	57.0	56.7	56.3
85.0°	25.4	26.0	24.9	23.9	23.0	22.6	22.9	23.2
90.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140.0°	0.0	0.0	1.0	0.8	0.7	1.0	0.9	0.7
145.0°	1.2	1.8	1.8	2.2	1.7	1.9	2.0	1.8
150.0°	2.0	2.4	2.6	2.8	2.8	2.5	3.0	3.0
155.0°	3.0	3.4	3.7	3.7	3.9	3.5	3.9	4.0
160.0°	3.4	3.9	4.3	3.8	4.0	4.3	4.7	4.3
165.0°	3.9	4.4	4.6	4.6	4.5	4.7	4.4	4.4
170.0°	4.5	4.9	5.0	5.1	5.2	4.9	4.9	5.3
175.0°	4.9	5.4	5.8	5.8	5.7	5.9	5.8	5.5
180.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Luminous Intensity (cd) Distribution Data (cont.)

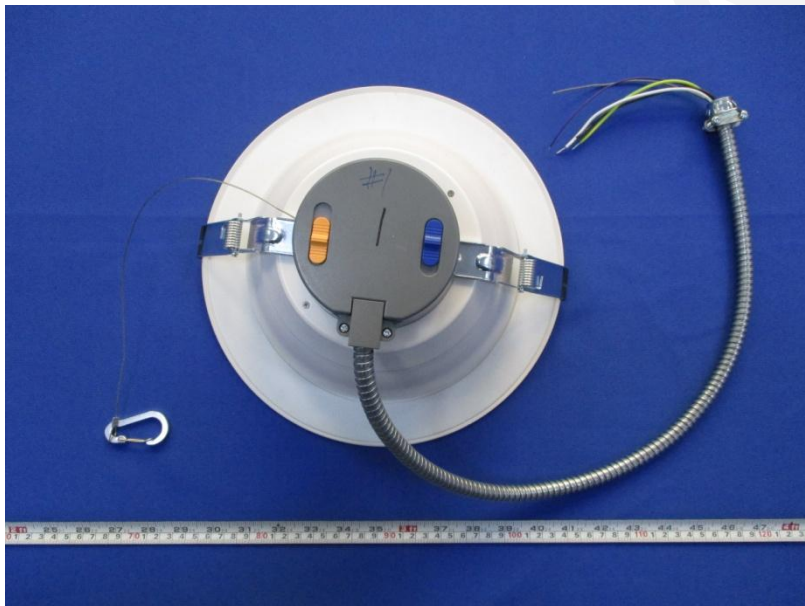
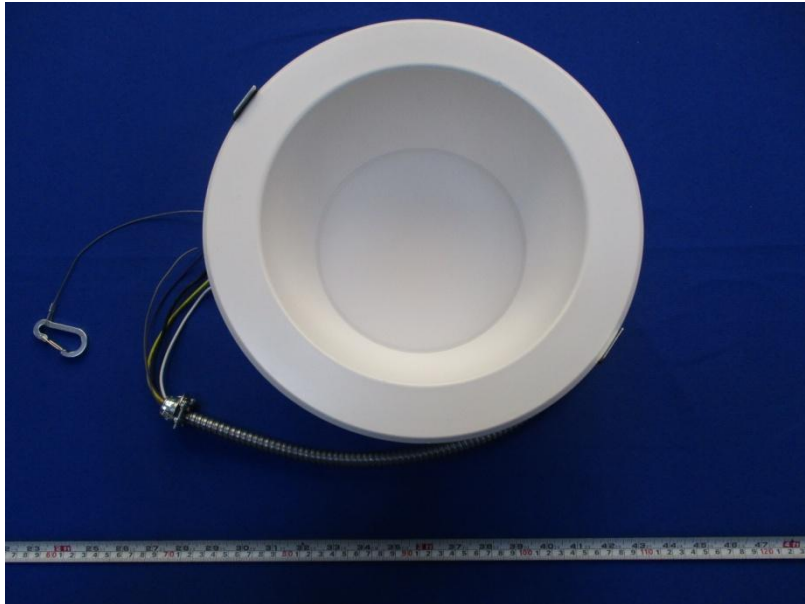
$\begin{matrix} C \\ \backslash \\ y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1538.7	1538.7	1538.7	1538.7	1538.7	1538.7	1538.7	1538.7
5.0°	1530.4	1531.2	1531.4	1530.2	1532.7	1533.4	1536.2	1533.3
10.0°	1510.6	1507.0	1506.0	1505.2	1512.1	1508.0	1513.4	1509.6
15.0°	1473.6	1471.1	1464.8	1469.7	1470.2	1472.0	1479.2	1476.4
20.0°	1416.2	1414.8	1413.1	1420.4	1417.3	1421.0	1423.7	1423.4
25.0°	1334.8	1334.9	1333.6	1335.4	1340.6	1342.7	1348.1	1348.4
30.0°	1234.3	1231.2	1225.6	1229.5	1238.1	1237.3	1243.9	1246.9
35.0°	1102.2	1101.0	1102.9	1108.4	1110.0	1114.1	1121.8	1121.3
40.0°	953.2	953.2	956.3	958.4	963.6	968.5	975.1	973.5
45.0°	779.6	780.2	781.5	784.8	792.8	795.2	802.0	806.9
50.0°	592.6	593.8	593.9	600.2	606.0	607.7	613.4	618.0
55.0°	407.9	411.6	413.0	417.2	421.1	422.8	428.7	432.9
60.0°	253.8	254.0	255.8	257.1	259.5	263.3	266.5	267.6
65.0°	155.8	155.5	157.0	158.2	158.6	160.5	162.4	163.2
70.0°	114.0	114.2	114.7	115.6	116.6	117.3	117.9	118.6
75.0°	83.3	83.4	84.3	85.2	86.4	86.6	87.9	88.2
80.0°	51.7	51.9	52.5	52.5	53.7	54.4	55.5	55.8
85.0°	18.6	19.3	20.0	20.2	19.9	20.7	21.8	22.3
90.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145.0°	0.0	0.8	0.9	1.3	1.3	1.2	0.9	0.8
150.0°	1.4	1.7	1.7	2.2	2.3	2.8	2.3	2.2
155.0°	2.1	2.6	2.3	3.1	3.2	3.3	2.8	3.1
160.0°	2.9	3.3	3.6	4.1	4.1	3.6	3.6	4.1
165.0°	3.1	4.1	4.5	4.3	4.4	4.6	4.5	4.6
170.0°	4.5	4.7	4.8	5.1	5.4	4.9	5.2	5.2
175.0°	4.7	4.7	5.2	5.7	5.4	5.4	5.4	5.7
180.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



### Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	36.7	1.16	0-5	36.7	1.16
5-10	108.8	3.44	0-10	145.5	4.59
10-15	176.9	5.58	0-15	322.4	10.18
15-20	238.4	7.53	0-20	560.8	17.71
20-25	289.8	9.15	0-25	850.6	26.85
25-30	326.6	10.31	0-30	1177.2	37.17
30-35	346.6	10.94	0-35	1523.8	48.11
35-40	347.6	10.97	0-40	1871.4	59.08
40-45	327.1	10.33	0-45	2198.5	69.41
45-50	284.7	8.99	0-50	2483.2	78.40
50-55	225.4	7.12	0-55	2708.6	85.52
55-60	160.0	5.05	0-60	2868.6	90.57
60-65	104.3	3.29	0-65	2972.9	93.86
65-70	71.1	2.24	0-70	3044.0	96.11
70-75	53.7	1.70	0-75	3097.7	97.80
75-80	38.4	1.21	0-80	3136.1	99.01
80-85	21.2	0.67	0-85	3157.3	99.68
85-90	6.1	0.19	0-90	3163.3	99.87
90-95	0.0	0.00	0-95	3163.3	99.87
95-100	0.0	0.00	0-100	3163.3	99.87
100-105	0.0	0.00	0-105	3163.3	99.87
105-110	0.0	0.00	0-110	3163.3	99.87
110-115	0.0	0.00	0-115	3163.3	99.87
115-120	0.0	0.00	0-120	3163.3	99.87
120-125	0.0	0.00	0-125	3163.3	99.87
125-130	0.0	0.00	0-130	3163.3	99.87
130-135	0.0	0.00	0-135	3163.3	99.87
135-140	0.1	0.00	0-140	3163.4	99.88
140-145	0.3	0.01	0-145	3163.7	99.88
145-150	0.5	0.02	0-150	3164.2	99.90
150-155	0.7	0.02	0-155	3164.9	99.92
155-160	0.7	0.02	0-160	3165.7	99.95
160-165	0.7	0.02	0-165	3166.3	99.97
165-170	0.6	0.02	0-170	3166.9	99.99
170-175	0.4	0.01	0-175	3167.3	100.00
175-180	0.1	0.00	0-180	3167.3	100.00

## 6. Product Photo



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