

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: SLFT8/80CCTS/DIM120V

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	RKSB190117003-10-1
Test Date:	2019-01-19 to 2019-02-25
Report Date:	2019-02-26
Reviewed By:	Ray Gao/EE Engineer <i>Ry 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.

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 2019-01-17 and used for testing.

Model Tested: SLFT8/80CCTS/DIM120V
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: LED Downlight
 Dimming: Dimmable
 Connectable: None
 Color Tunable: White-tunable
 CCT Range: 3000K/3500K/4000K
 Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120VAC, 60Hz
 Nominal CCT: 3000K
 Nominal Lumen Output: 1900/2000/1900lm

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	2019-01-24	2020-01-24
Power Meter	INVENTFINE	WT500	GSJWQ20009	2019-01-25	2019-04-08
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2018-01-24	2020-01-24
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2018-04-08	2019-04-08
Standard Light Source	INVENTFINE	N/A	JWWCR020106	2019-01-24	2020-01-24
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.

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]

Test CCT Setting: 3000K

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

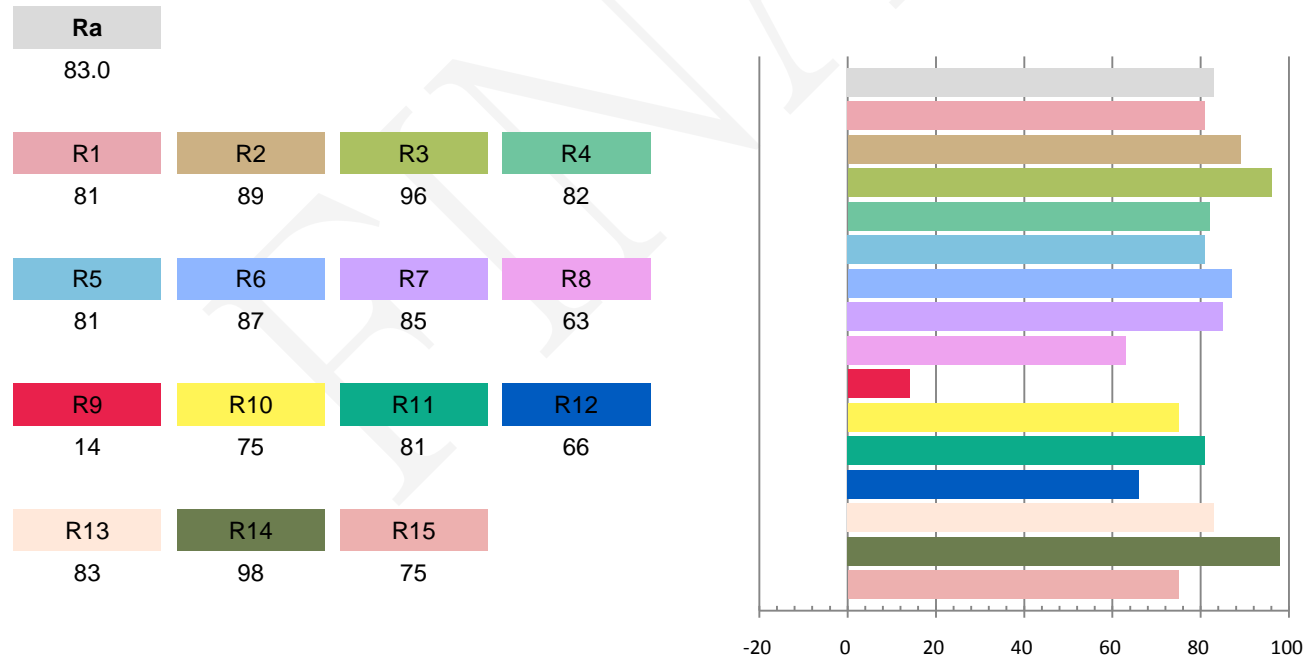
Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.1626	19	0.9738	2075.22	109.22

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
6.365	3004	0.00133	0.4386	0.4080	0.2499	0.5232

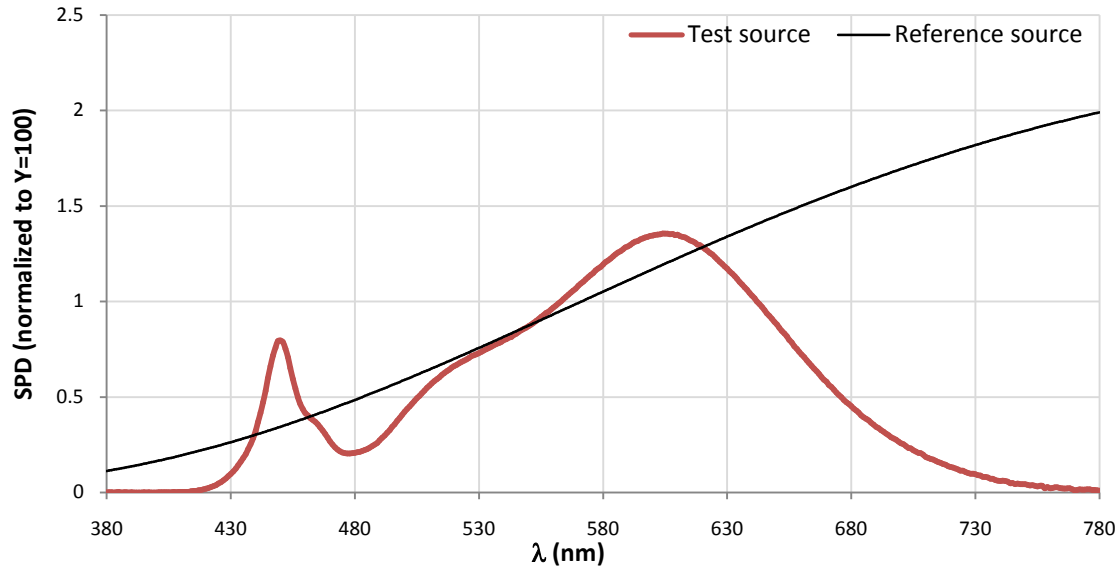
Color Rendering Index



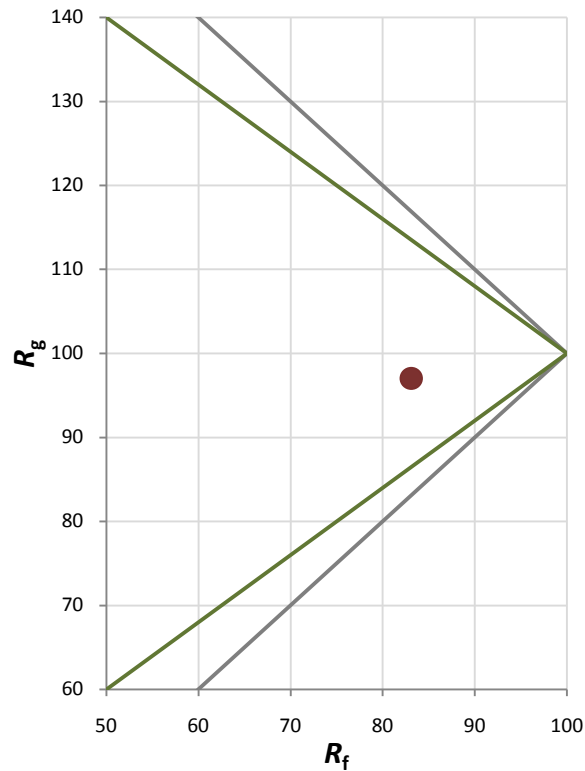
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	97

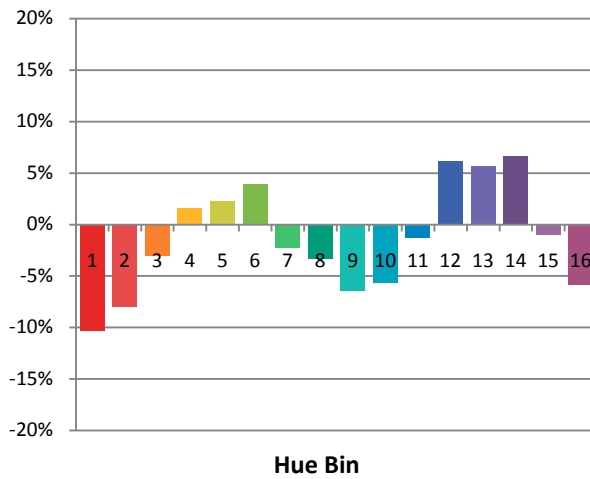
Spectral Power Distribution Comparison



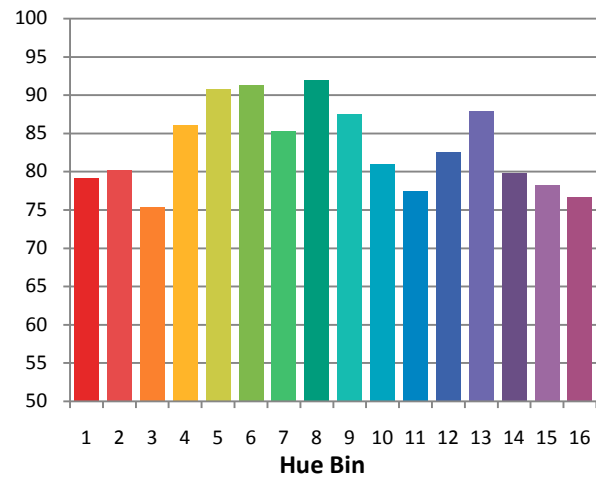
Plot of R_g versus R_f



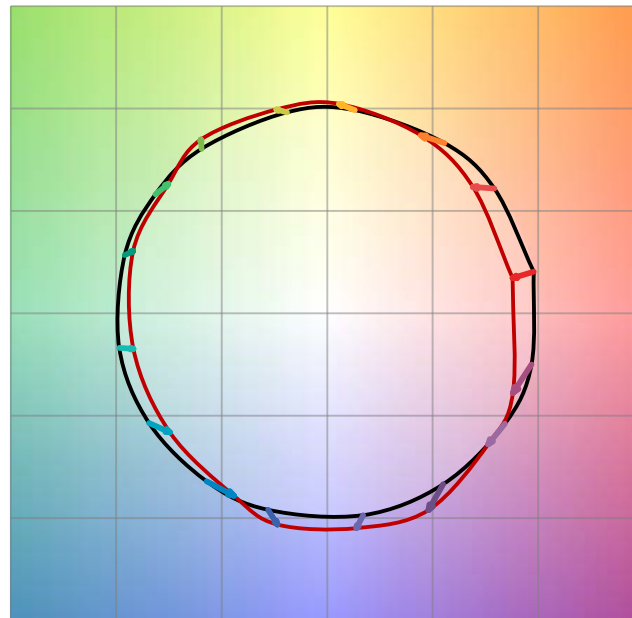
Chroma Shift by Hue



R_t by Hue

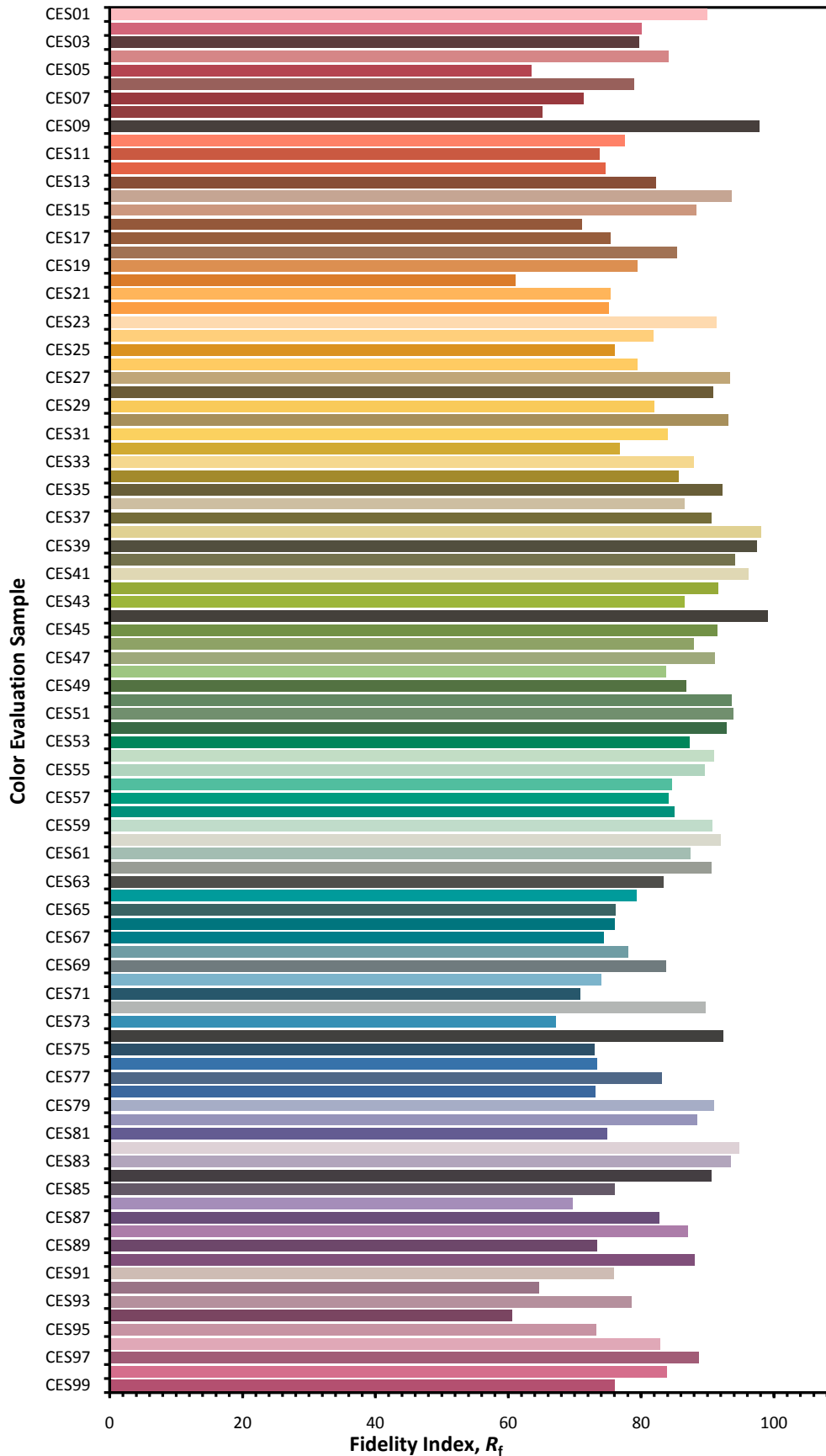


Color Vector Graphic

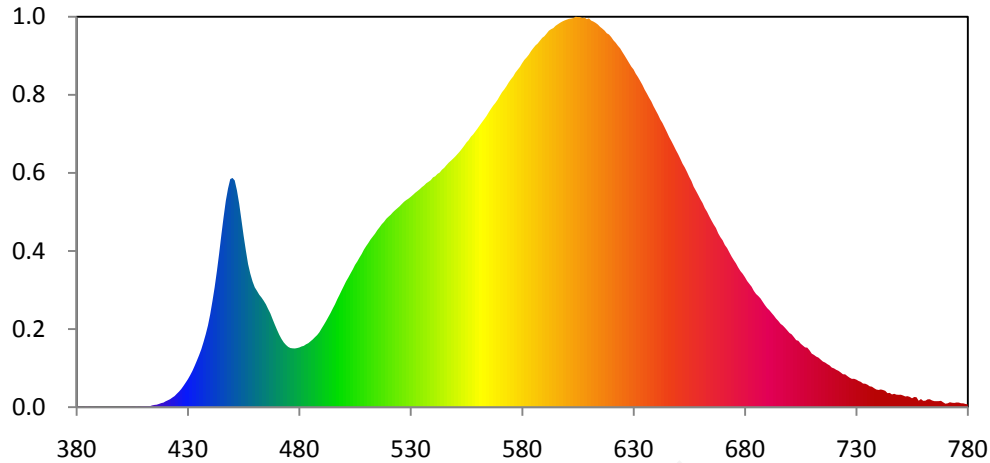


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



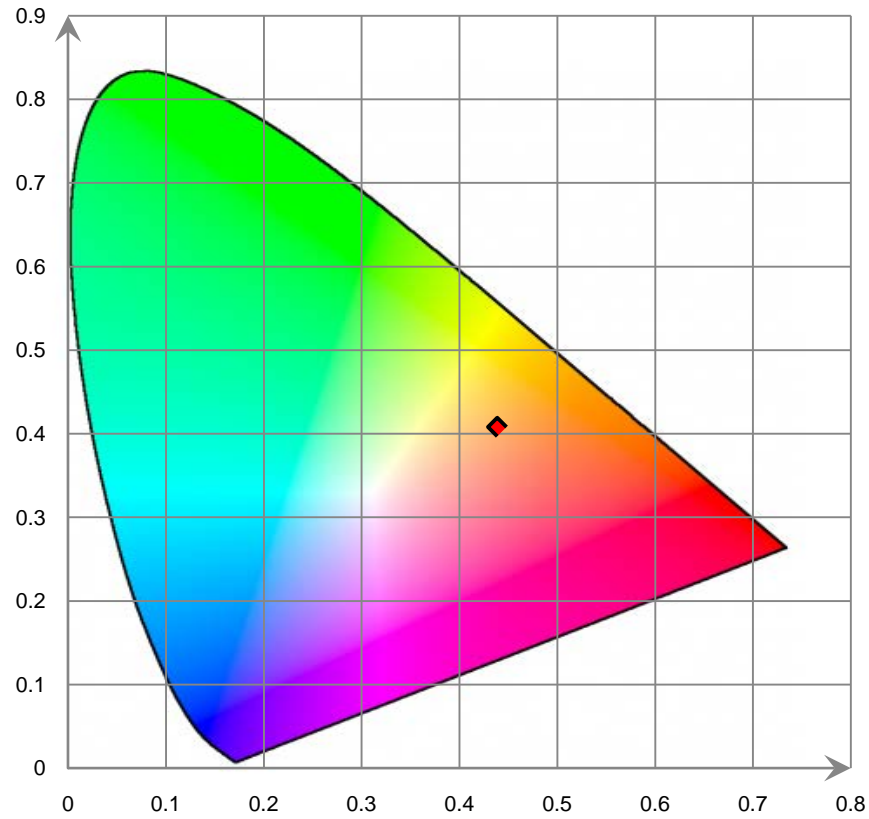
Relative Spectral Power Distribution



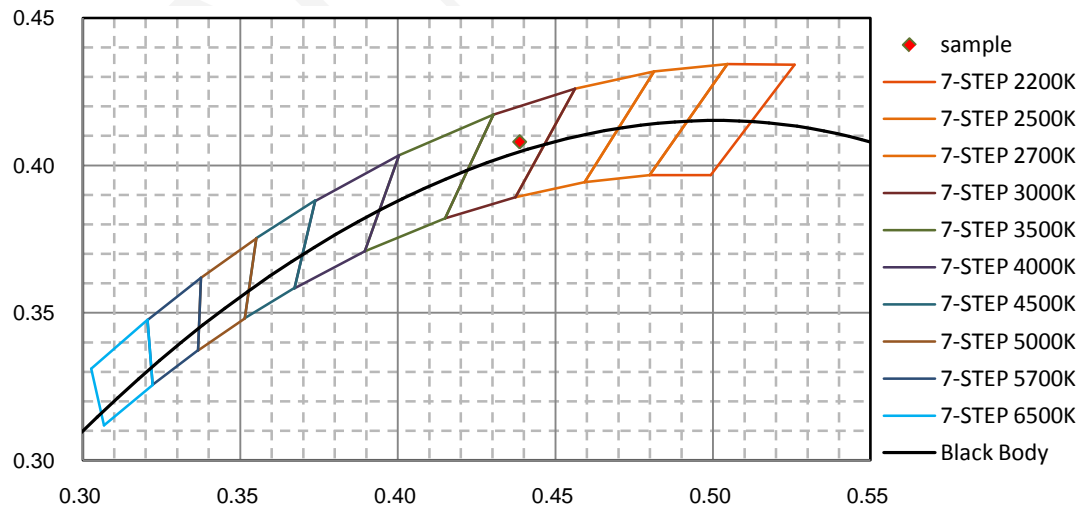
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.880E-02	421	7.308E-01	462	1.187E+01	503	1.412E+01	544	2.505E+01
381	5.730E-02	422	8.438E-01	463	1.158E+01	504	1.454E+01	545	2.525E+01
382	3.760E-02	423	1.014E+00	464	1.123E+01	505	1.501E+01	546	2.553E+01
383	1.040E-02	424	1.171E+00	465	1.085E+01	506	1.537E+01	547	2.579E+01
384	7.020E-02	425	1.411E+00	466	1.036E+01	507	1.578E+01	548	2.600E+01
385	7.740E-02	426	1.644E+00	467	9.891E+00	508	1.617E+01	549	2.622E+01
386	7.600E-03	427	1.915E+00	468	9.288E+00	509	1.663E+01	550	2.646E+01
387	5.570E-02	428	2.243E+00	469	8.710E+00	510	1.699E+01	551	2.671E+01
388	3.230E-02	429	2.596E+00	470	8.157E+00	511	1.734E+01	552	2.698E+01
389	9.500E-03	430	2.955E+00	471	7.634E+00	512	1.771E+01	553	2.728E+01
390	3.990E-02	431	3.372E+00	472	7.199E+00	513	1.801E+01	554	2.759E+01
391	1.550E-02	432	3.819E+00	473	6.834E+00	514	1.832E+01	555	2.792E+01
392	4.000E-03	433	4.348E+00	474	6.572E+00	515	1.868E+01	556	2.818E+01
393	5.400E-03	434	4.907E+00	475	6.362E+00	516	1.898E+01	557	2.854E+01
394	1.370E-02	435	5.483E+00	476	6.242E+00	517	1.931E+01	558	2.878E+01
395	4.200E-02	436	6.111E+00	477	6.207E+00	518	1.955E+01	559	2.910E+01
396	1.840E-02	437	6.876E+00	478	6.196E+00	519	1.987E+01	560	2.941E+01
397	2.990E-02	438	7.703E+00	479	6.239E+00	520	2.010E+01	561	2.975E+01
398	6.200E-03	439	8.637E+00	480	6.301E+00	521	2.030E+01	562	3.007E+01
399	7.200E-03	440	9.805E+00	481	6.406E+00	522	2.056E+01	563	3.039E+01
400	2.000E-04	441	1.119E+01	482	6.473E+00	523	2.079E+01	564	3.072E+01
401	2.460E-02	442	1.267E+01	483	6.631E+00	524	2.099E+01	565	3.111E+01
402	4.060E-02	443	1.436E+01	484	6.747E+00	525	2.120E+01	566	3.148E+01
403	4.270E-02	444	1.619E+01	485	6.944E+00	526	2.144E+01	567	3.182E+01
404	5.990E-02	445	1.817E+01	486	7.145E+00	527	2.168E+01	568	3.210E+01
405	3.540E-02	446	2.004E+01	487	7.384E+00	528	2.186E+01	569	3.244E+01
406	2.790E-02	447	2.177E+01	488	7.609E+00	529	2.201E+01	570	3.286E+01
407	1.031E-01	448	2.308E+01	489	7.908E+00	530	2.220E+01	571	3.324E+01
408	3.550E-02	449	2.407E+01	490	8.304E+00	531	2.240E+01	572	3.354E+01
409	7.990E-02	450	2.419E+01	491	8.683E+00	532	2.262E+01	573	3.388E+01
410	1.087E-01	451	2.392E+01	492	9.082E+00	533	2.280E+01	574	3.427E+01
411	1.097E-01	452	2.287E+01	493	9.507E+00	534	2.299E+01	575	3.461E+01
412	1.064E-01	453	2.148E+01	494	9.935E+00	535	2.322E+01	576	3.490E+01
413	1.099E-01	454	1.979E+01	495	1.041E+01	536	2.340E+01	577	3.530E+01
414	1.937E-01	455	1.808E+01	496	1.085E+01	537	2.363E+01	578	3.560E+01
415	2.391E-01	456	1.653E+01	497	1.137E+01	538	2.379E+01	579	3.591E+01
416	2.651E-01	457	1.510E+01	498	1.184E+01	539	2.396E+01	580	3.630E+01
417	3.433E-01	458	1.409E+01	499	1.233E+01	540	2.425E+01	581	3.664E+01
418	4.277E-01	459	1.327E+01	500	1.281E+01	541	2.437E+01	582	3.690E+01
419	4.816E-01	460	1.265E+01	501	1.329E+01	542	2.462E+01	583	3.719E+01
420	6.221E-01	461	1.227E+01	502	1.368E+01	543	2.476E+01	584	3.757E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.788E+01	626	3.710E+01	667	1.890E+01	708	6.278E+00	749	1.308E+00
586	3.817E+01	627	3.672E+01	668	1.835E+01	709	6.000E+00	750	1.315E+00
587	3.838E+01	628	3.632E+01	669	1.794E+01	710	5.648E+00	751	1.231E+00
588	3.867E+01	629	3.594E+01	670	1.760E+01	711	5.518E+00	752	1.130E+00
589	3.897E+01	630	3.564E+01	671	1.711E+01	712	5.340E+00	753	1.163E+00
590	3.914E+01	631	3.519E+01	672	1.679E+01	713	5.232E+00	754	1.082E+00
591	3.942E+01	632	3.483E+01	673	1.634E+01	714	5.021E+00	755	9.397E-01
592	3.972E+01	633	3.442E+01	674	1.590E+01	715	4.815E+00	756	1.076E+00
593	3.988E+01	634	3.400E+01	675	1.552E+01	716	4.708E+00	757	1.053E+00
594	4.000E+01	635	3.350E+01	676	1.516E+01	717	4.545E+00	758	6.754E-01
595	4.024E+01	636	3.309E+01	677	1.473E+01	718	4.407E+00	759	8.645E-01
596	4.040E+01	637	3.265E+01	678	1.436E+01	719	4.176E+00	760	6.706E-01
597	4.056E+01	638	3.225E+01	679	1.407E+01	720	4.089E+00	761	6.845E-01
598	4.069E+01	639	3.175E+01	680	1.372E+01	721	3.942E+00	762	8.284E-01
599	4.080E+01	640	3.131E+01	681	1.331E+01	722	3.835E+00	763	8.351E-01
600	4.089E+01	641	3.087E+01	682	1.301E+01	723	3.662E+00	764	7.084E-01
601	4.097E+01	642	3.037E+01	683	1.271E+01	724	3.473E+00	765	6.398E-01
602	4.101E+01	643	2.998E+01	684	1.227E+01	725	3.464E+00	766	6.336E-01
603	4.106E+01	644	2.950E+01	685	1.194E+01	726	3.279E+00	767	6.371E-01
604	4.120E+01	645	2.902E+01	686	1.173E+01	727	3.112E+00	768	6.706E-01
605	4.117E+01	646	2.851E+01	687	1.147E+01	728	2.987E+00	769	5.124E-01
606	4.116E+01	647	2.807E+01	688	1.112E+01	729	2.996E+00	770	3.685E-01
607	4.106E+01	648	2.762E+01	689	1.077E+01	730	2.910E+00	771	4.066E-01
608	4.112E+01	649	2.714E+01	690	1.046E+01	731	2.767E+00	772	5.179E-01
609	4.095E+01	650	2.671E+01	691	1.022E+01	732	2.672E+00	773	4.692E-01
610	4.102E+01	651	2.621E+01	692	9.936E+00	733	2.493E+00	774	4.501E-01
611	4.079E+01	652	2.569E+01	693	9.660E+00	734	2.476E+00	775	4.963E-01
612	4.069E+01	653	2.529E+01	694	9.349E+00	735	2.374E+00	776	4.855E-01
613	4.055E+01	654	2.482E+01	695	9.097E+00	736	2.202E+00	777	4.133E-01
614	4.038E+01	655	2.430E+01	696	8.794E+00	737	2.163E+00	778	4.095E-01
615	4.013E+01	656	2.386E+01	697	8.617E+00	738	2.003E+00	779	3.364E-01
616	3.994E+01	657	2.326E+01	698	8.372E+00	739	1.860E+00	780	2.992E-01
617	3.974E+01	658	2.284E+01	699	8.102E+00	740	1.816E+00		
618	3.945E+01	659	2.241E+01	700	7.833E+00	741	1.870E+00		
619	3.932E+01	660	2.195E+01	701	7.678E+00	742	1.813E+00		
620	3.905E+01	661	2.154E+01	702	7.385E+00	743	1.720E+00		
621	3.871E+01	662	2.101E+01	703	7.078E+00	744	1.480E+00		
622	3.846E+01	663	2.062E+01	704	6.999E+00	745	1.509E+00		
623	3.814E+01	664	2.014E+01	705	6.707E+00	746	1.342E+00		
624	3.787E+01	665	1.969E+01	706	6.503E+00	747	1.413E+00		
625	3.748E+01	666	1.927E+01	707	6.312E+00	748	1.323E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



Test CCT Setting: 3500K

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

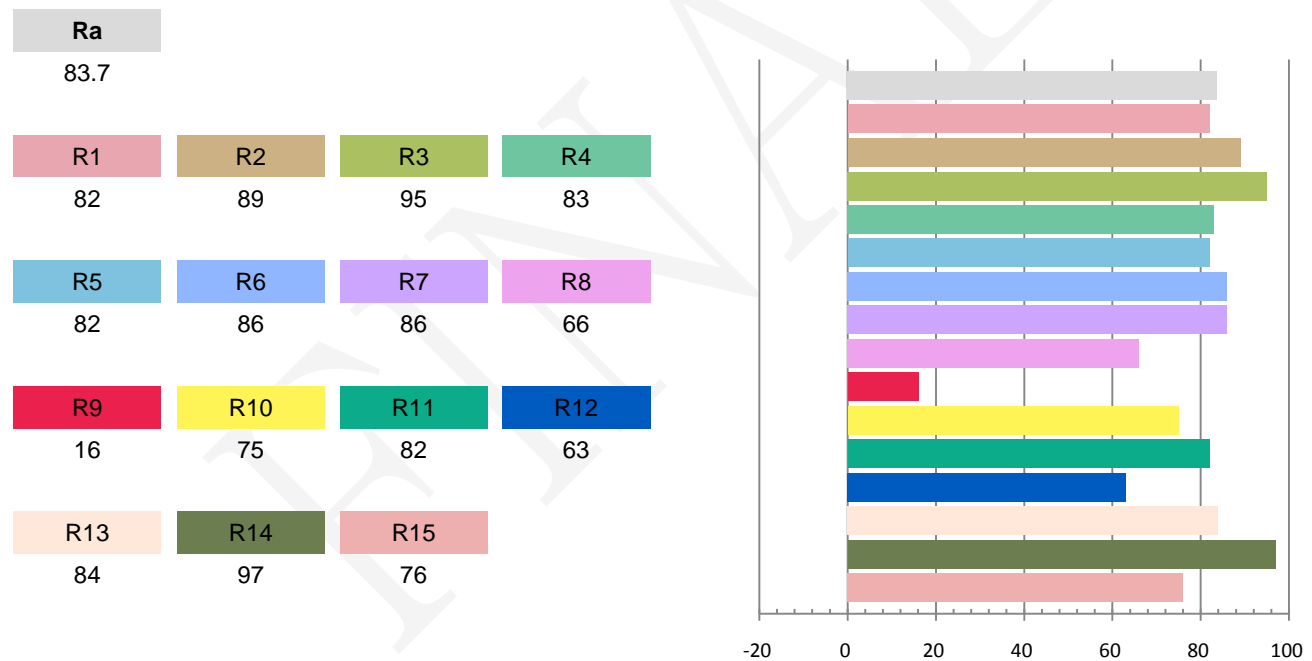
Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.1625	18.96	0.9723	2225.71	117.39

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
6.784	3405	0.00132	0.4123	0.3972	0.2376	0.5149

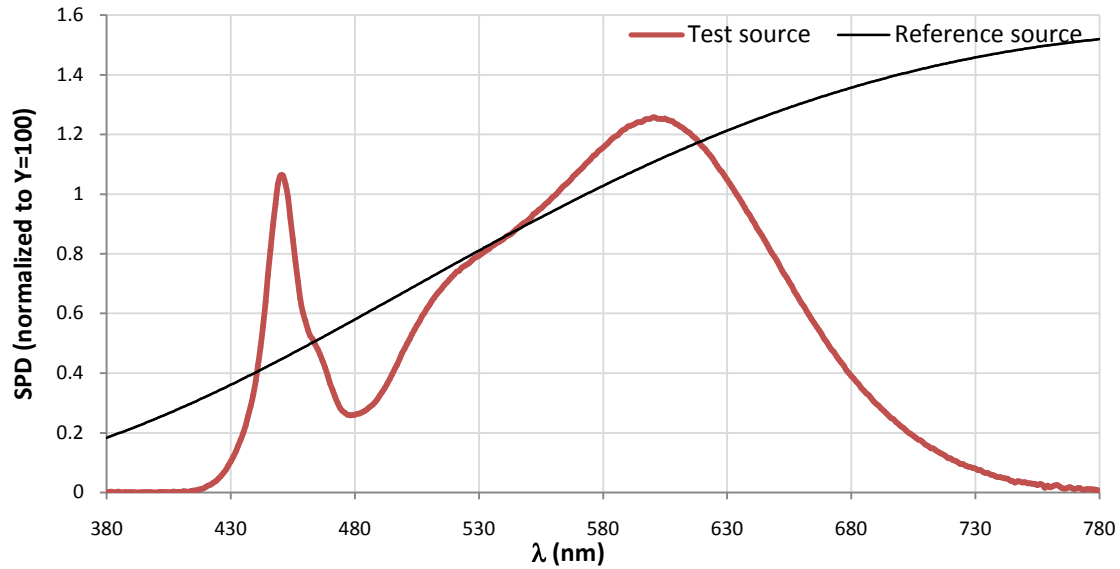
Color Rendering Index



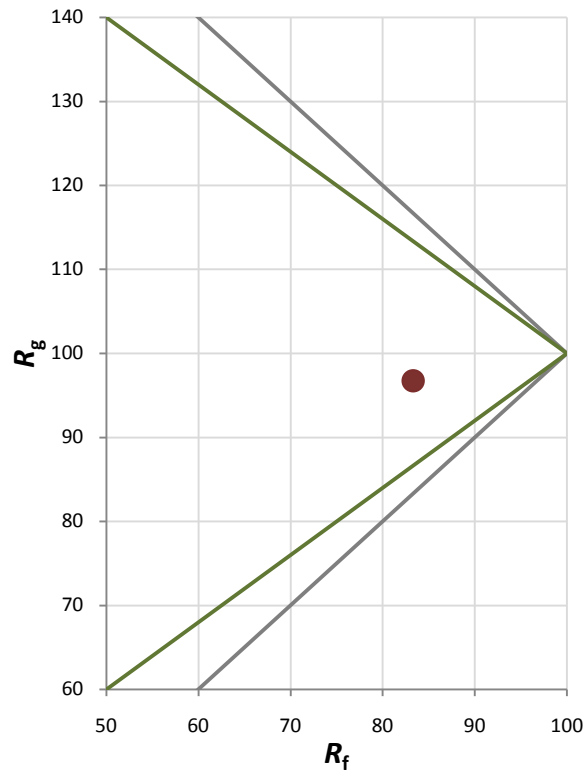
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	97

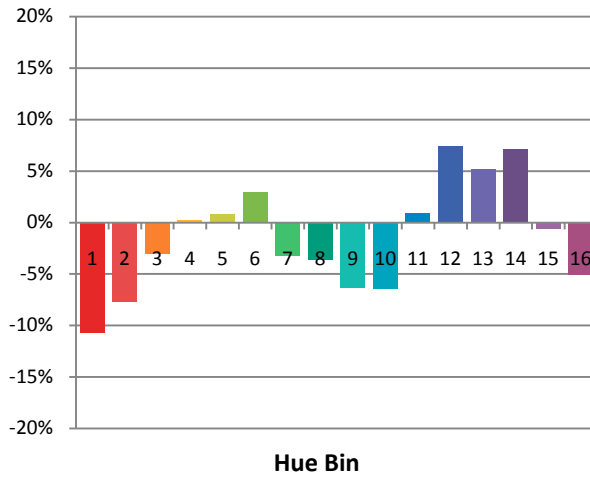
Spectral Power Distribution Comparison



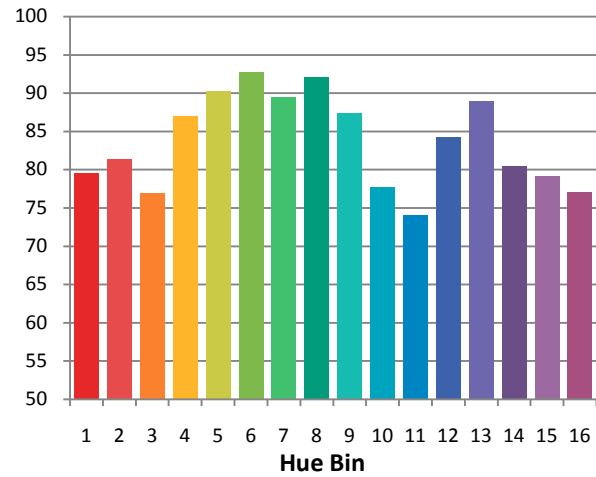
Plot of R_g versus R_f



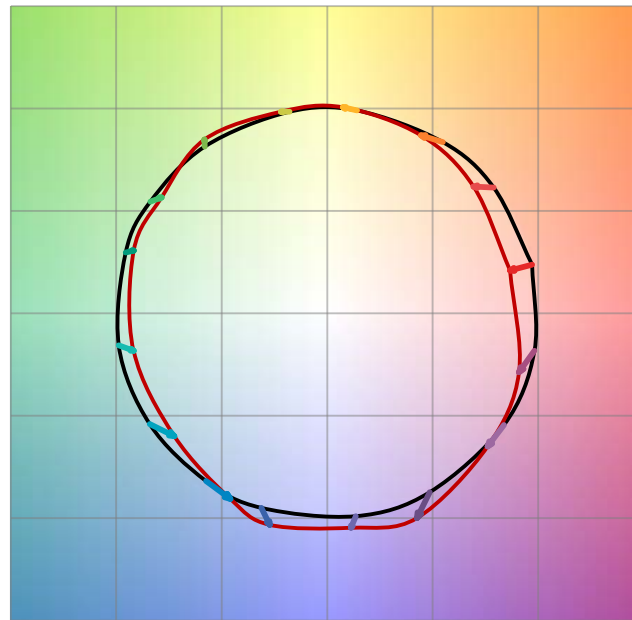
Chroma Shift by Hue



R_t by Hue

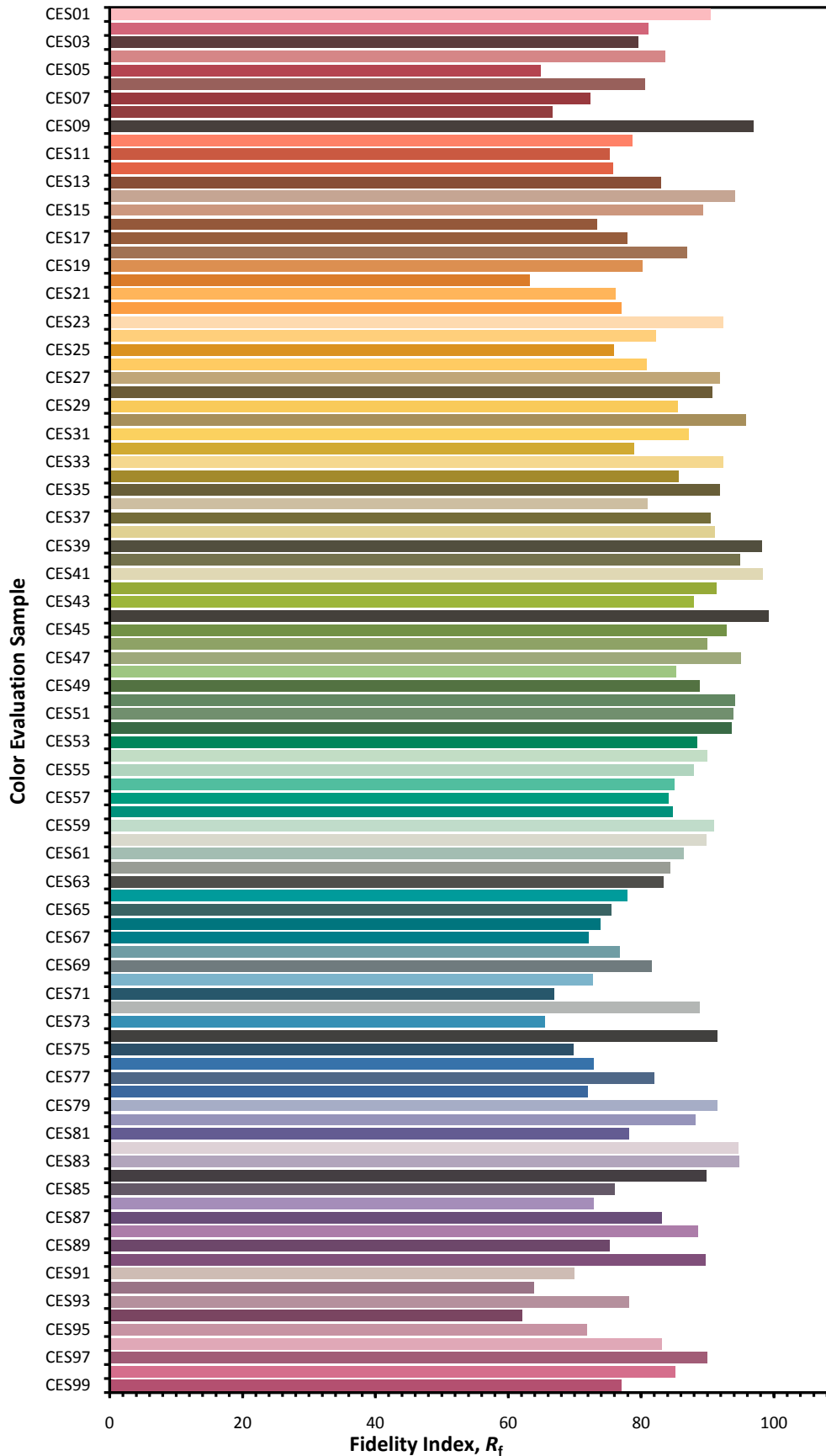


Color Vector Graphic

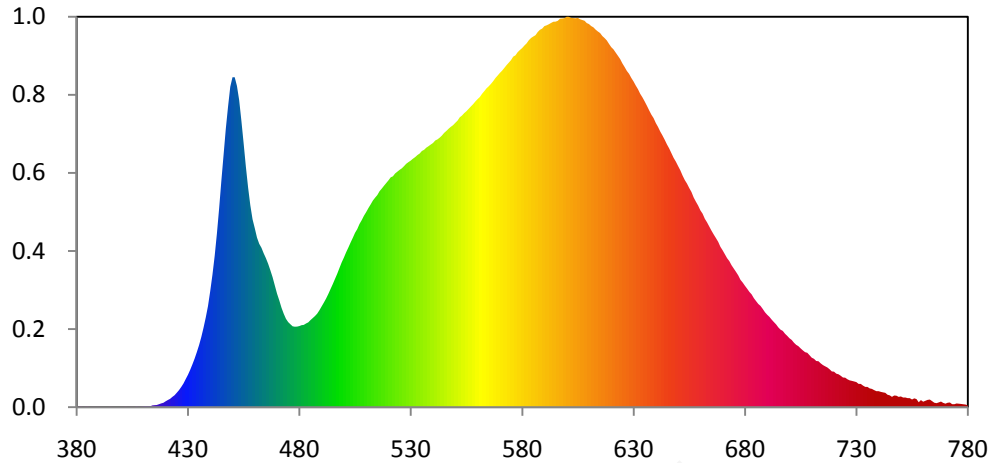


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



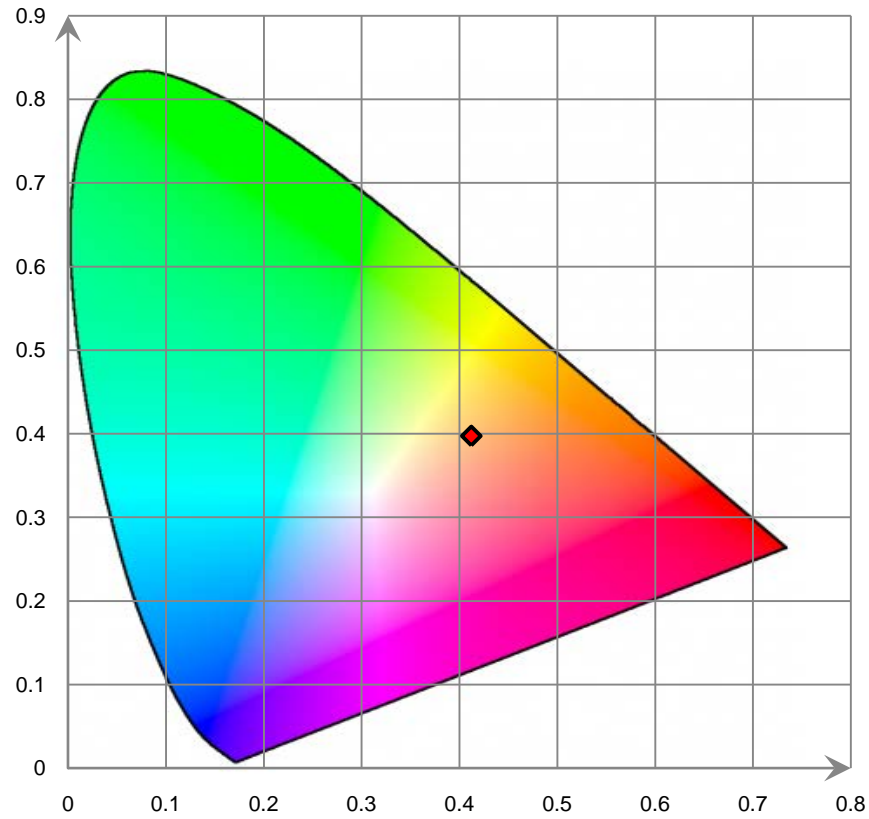
Relative Spectral Power Distribution



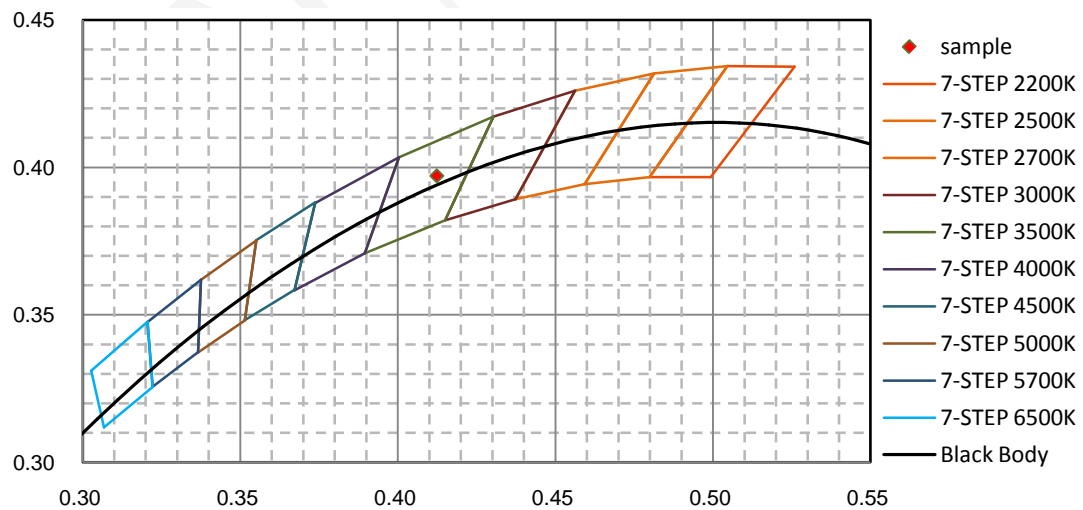
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.800E-03	421	7.554E-01	462	1.713E+01	503	1.726E+01	544	2.849E+01
381	5.870E-02	422	8.778E-01	463	1.672E+01	504	1.776E+01	545	2.877E+01
382	7.930E-02	423	1.076E+00	464	1.614E+01	505	1.828E+01	546	2.897E+01
383	1.340E-02	424	1.254E+00	465	1.563E+01	506	1.868E+01	547	2.920E+01
384	5.970E-02	425	1.516E+00	466	1.504E+01	507	1.921E+01	548	2.940E+01
385	7.990E-02	426	1.790E+00	467	1.436E+01	508	1.961E+01	549	2.957E+01
386	6.300E-03	427	2.120E+00	468	1.363E+01	509	2.008E+01	550	2.982E+01
387	3.110E-02	428	2.486E+00	469	1.277E+01	510	2.046E+01	551	3.005E+01
388	3.430E-02	429	2.943E+00	470	1.190E+01	511	2.088E+01	552	3.040E+01
389	3.190E-02	430	3.390E+00	471	1.120E+01	512	2.126E+01	553	3.058E+01
390	4.290E-02	431	3.911E+00	472	1.043E+01	513	2.166E+01	554	3.084E+01
391	2.230E-02	432	4.484E+00	473	9.798E+00	514	2.197E+01	555	3.104E+01
392	9.000E-04	433	5.094E+00	474	9.267E+00	515	2.224E+01	556	3.129E+01
393	0.000E+00	434	5.776E+00	475	8.921E+00	516	2.265E+01	557	3.154E+01
394	2.610E-02	435	6.509E+00	476	8.694E+00	517	2.292E+01	558	3.177E+01
395	4.950E-02	436	7.357E+00	477	8.482E+00	518	2.322E+01	559	3.206E+01
396	2.440E-02	437	8.332E+00	478	8.438E+00	519	2.350E+01	560	3.230E+01
397	1.990E-02	438	9.407E+00	479	8.451E+00	520	2.379E+01	561	3.253E+01
398	1.630E-02	439	1.060E+01	480	8.504E+00	521	2.410E+01	562	3.286E+01
399	8.000E-04	440	1.216E+01	481	8.597E+00	522	2.421E+01	563	3.314E+01
400	0.000E+00	441	1.389E+01	482	8.632E+00	523	2.451E+01	564	3.343E+01
401	2.000E-02	442	1.585E+01	483	8.776E+00	524	2.470E+01	565	3.365E+01
402	6.410E-02	443	1.819E+01	484	8.894E+00	525	2.489E+01	566	3.390E+01
403	2.150E-02	444	2.083E+01	485	9.130E+00	526	2.505E+01	567	3.418E+01
404	3.880E-02	445	2.373E+01	486	9.340E+00	527	2.528E+01	568	3.451E+01
405	3.550E-02	446	2.646E+01	487	9.551E+00	528	2.553E+01	569	3.478E+01
406	1.780E-02	447	2.919E+01	488	9.802E+00	529	2.570E+01	570	3.505E+01
407	9.520E-02	448	3.151E+01	489	1.016E+01	530	2.586E+01	571	3.529E+01
408	2.690E-02	449	3.360E+01	490	1.057E+01	531	2.606E+01	572	3.557E+01
409	5.460E-02	450	3.460E+01	491	1.096E+01	532	2.623E+01	573	3.587E+01
410	8.270E-02	451	3.460E+01	492	1.139E+01	533	2.644E+01	574	3.613E+01
411	1.206E-01	452	3.369E+01	493	1.186E+01	534	2.660E+01	575	3.639E+01
412	1.006E-01	453	3.220E+01	494	1.238E+01	535	2.687E+01	576	3.676E+01
413	7.800E-02	454	3.002E+01	495	1.290E+01	536	2.699E+01	577	3.690E+01
414	1.871E-01	455	2.768E+01	496	1.345E+01	537	2.722E+01	578	3.723E+01
415	2.130E-01	456	2.524E+01	497	1.399E+01	538	2.737E+01	579	3.746E+01
416	2.306E-01	457	2.306E+01	498	1.459E+01	539	2.754E+01	580	3.766E+01
417	3.123E-01	458	2.118E+01	499	1.518E+01	540	2.771E+01	581	3.792E+01
418	3.957E-01	459	1.971E+01	500	1.569E+01	541	2.797E+01	582	3.815E+01
419	4.611E-01	460	1.877E+01	501	1.624E+01	542	2.809E+01	583	3.848E+01
420	6.167E-01	461	1.778E+01	502	1.674E+01	543	2.826E+01	584	3.871E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.887E+01	626	3.567E+01	667	1.773E+01	708	5.704E+00	749	1.083E+00
586	3.901E+01	627	3.526E+01	668	1.734E+01	709	5.448E+00	750	1.125E+00
587	3.934E+01	628	3.496E+01	669	1.682E+01	710	5.187E+00	751	1.011E+00
588	3.958E+01	629	3.453E+01	670	1.645E+01	711	5.073E+00	752	1.016E+00
589	3.970E+01	630	3.416E+01	671	1.604E+01	712	4.844E+00	753	9.487E-01
590	3.996E+01	631	3.373E+01	672	1.563E+01	713	4.819E+00	754	9.440E-01
591	4.005E+01	632	3.334E+01	673	1.532E+01	714	4.599E+00	755	8.077E-01
592	4.016E+01	633	3.286E+01	674	1.488E+01	715	4.419E+00	756	9.269E-01
593	4.030E+01	634	3.249E+01	675	1.453E+01	716	4.286E+00	757	8.516E-01
594	4.042E+01	635	3.207E+01	676	1.419E+01	717	4.165E+00	758	5.149E-01
595	4.043E+01	636	3.161E+01	677	1.382E+01	718	3.977E+00	759	7.442E-01
596	4.052E+01	637	3.113E+01	678	1.336E+01	719	3.753E+00	760	5.715E-01
597	4.074E+01	638	3.068E+01	679	1.307E+01	720	3.722E+00	761	6.716E-01
598	4.076E+01	639	3.032E+01	680	1.273E+01	721	3.517E+00	762	7.643E-01
599	4.080E+01	640	2.980E+01	681	1.242E+01	722	3.452E+00	763	7.995E-01
600	4.095E+01	641	2.939E+01	682	1.209E+01	723	3.294E+00	764	6.350E-01
601	4.094E+01	642	2.890E+01	683	1.183E+01	724	3.111E+00	765	4.675E-01
602	4.082E+01	643	2.849E+01	684	1.144E+01	725	3.097E+00	766	4.236E-01
603	4.080E+01	644	2.804E+01	685	1.113E+01	726	2.927E+00	767	4.982E-01
604	4.078E+01	645	2.756E+01	686	1.083E+01	727	2.814E+00	768	5.899E-01
605	4.083E+01	646	2.714E+01	687	1.062E+01	728	2.761E+00	769	4.489E-01
606	4.068E+01	647	2.664E+01	688	1.030E+01	729	2.698E+00	770	3.672E-01
607	4.060E+01	648	2.614E+01	689	9.954E+00	730	2.633E+00	771	4.681E-01
608	4.052E+01	649	2.575E+01	690	9.691E+00	731	2.446E+00	772	4.932E-01
609	4.028E+01	650	2.529E+01	691	9.471E+00	732	2.439E+00	773	3.161E-01
610	4.018E+01	651	2.484E+01	692	9.185E+00	733	2.262E+00	774	3.093E-01
611	3.997E+01	652	2.430E+01	693	8.928E+00	734	2.128E+00	775	3.897E-01
612	3.983E+01	653	2.382E+01	694	8.680E+00	735	2.127E+00	776	3.638E-01
613	3.959E+01	654	2.345E+01	695	8.366E+00	736	1.971E+00	777	3.394E-01
614	3.940E+01	655	2.298E+01	696	8.128E+00	737	1.915E+00	778	3.052E-01
615	3.923E+01	656	2.257E+01	697	7.996E+00	738	1.790E+00	779	2.783E-01
616	3.892E+01	657	2.199E+01	698	7.702E+00	739	1.678E+00	780	1.868E-01
617	3.871E+01	658	2.155E+01	699	7.476E+00	740	1.677E+00		
618	3.846E+01	659	2.114E+01	700	7.226E+00	741	1.605E+00		
619	3.810E+01	660	2.065E+01	701	7.051E+00	742	1.551E+00		
620	3.776E+01	661	2.029E+01	702	6.764E+00	743	1.506E+00		
621	3.752E+01	662	1.976E+01	703	6.538E+00	744	1.305E+00		
622	3.718E+01	663	1.938E+01	704	6.394E+00	745	1.243E+00		
623	3.685E+01	664	1.894E+01	705	6.167E+00	746	1.085E+00		
624	3.651E+01	665	1.851E+01	706	5.958E+00	747	1.224E+00		
625	3.605E+01	666	1.811E+01	707	5.770E+00	748	1.203E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



Test CCT Setting: 4000K

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

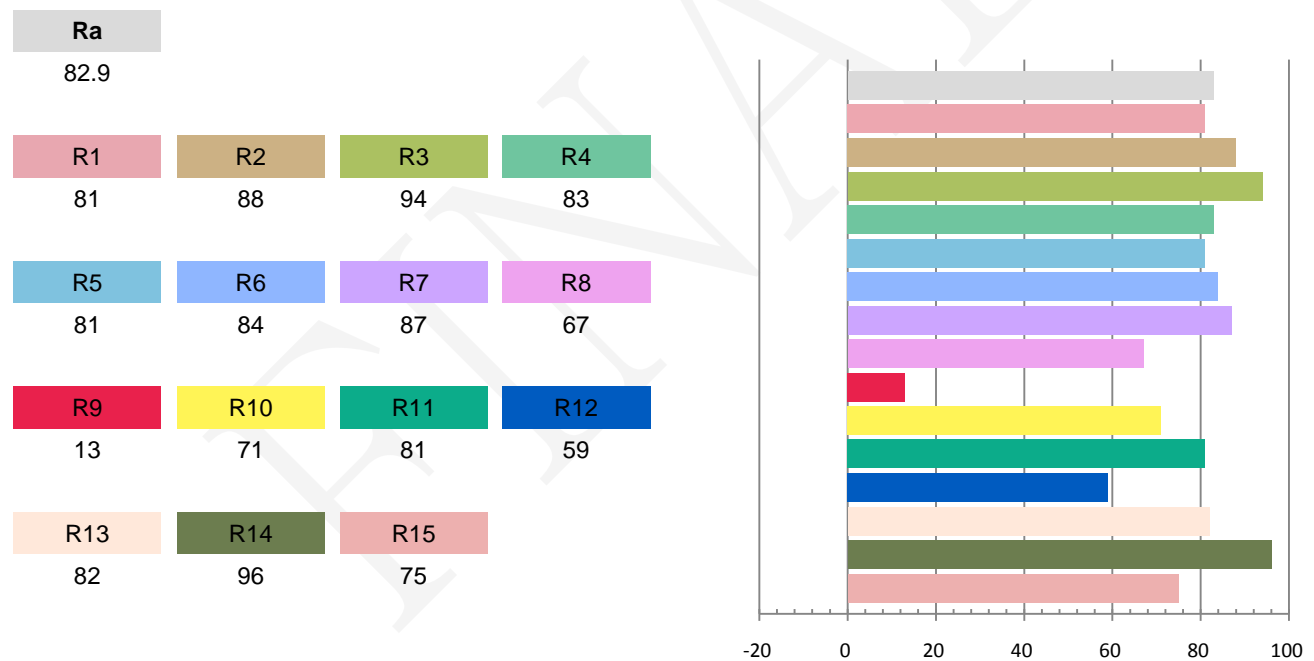
Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.1623	18.97	0.974	2208.74	116.43

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
6.680	3870	0.00288	0.3886	0.3880	0.2260	0.5077

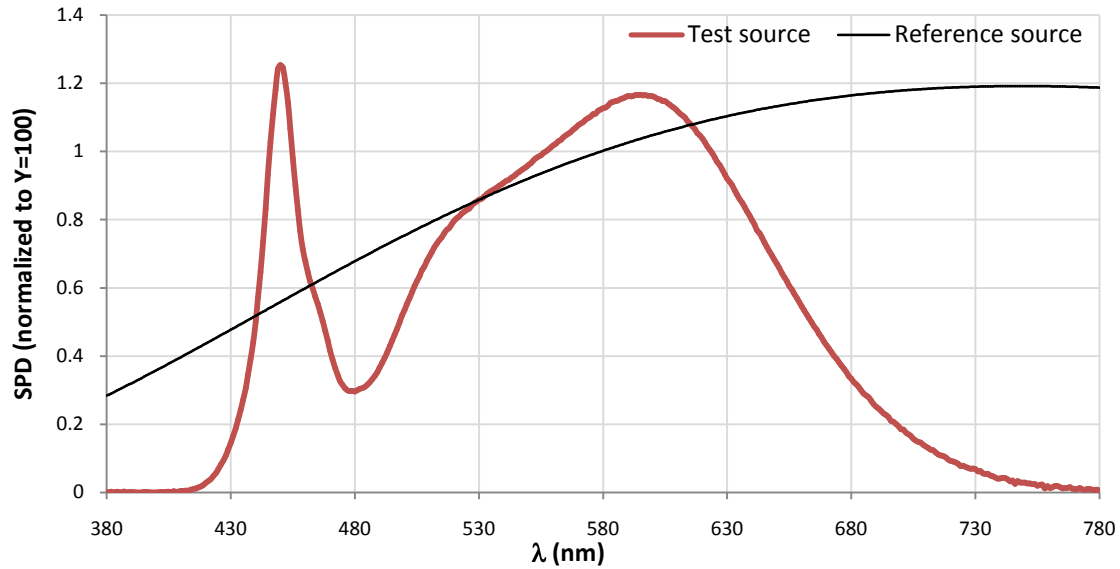
Color Rendering Index



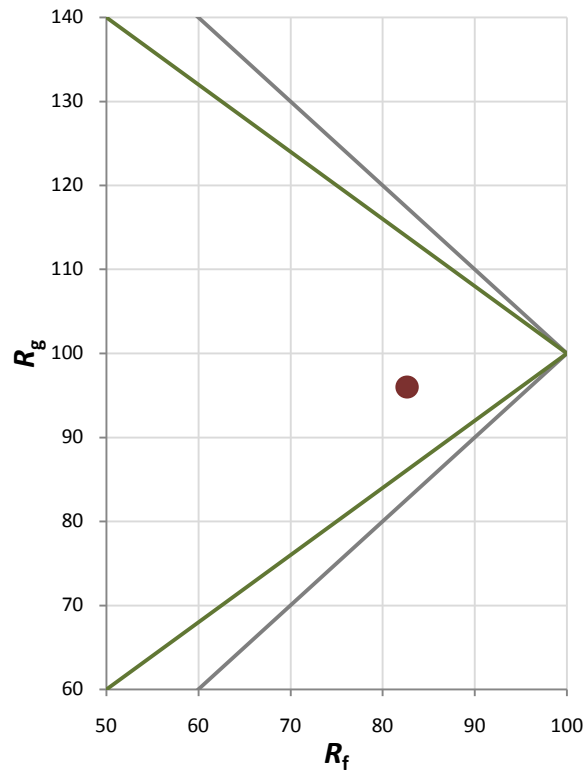
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	96

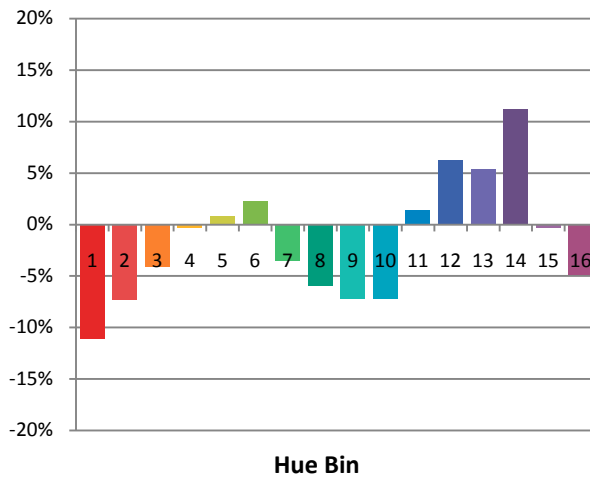
Spectral Power Distribution Comparison



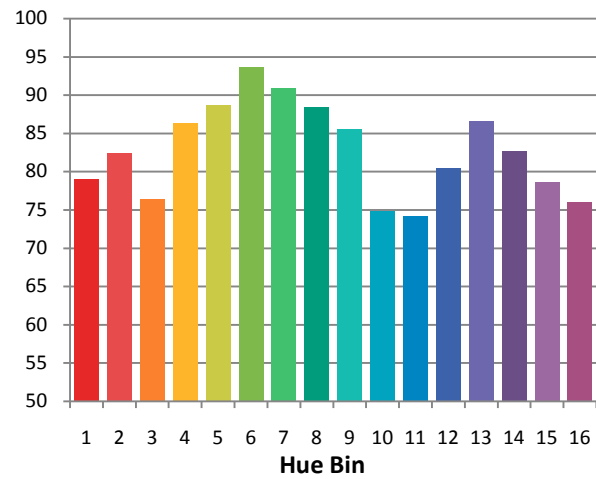
Plot of R_g versus R_f



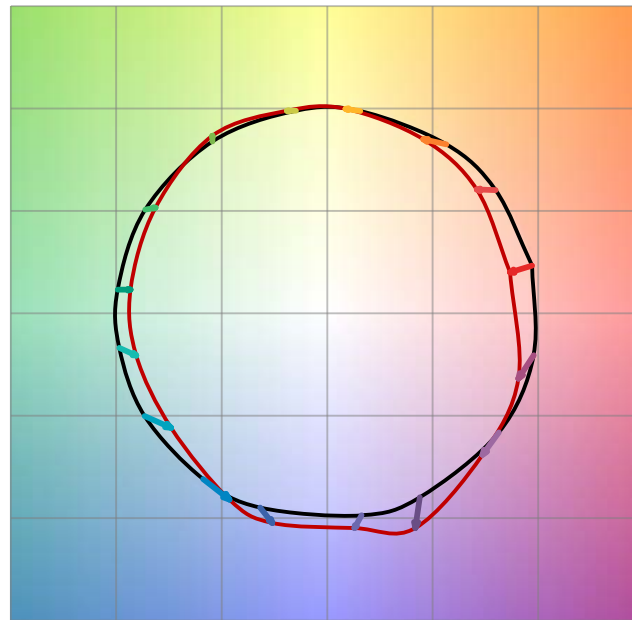
Chroma Shift by Hue



R_t by Hue

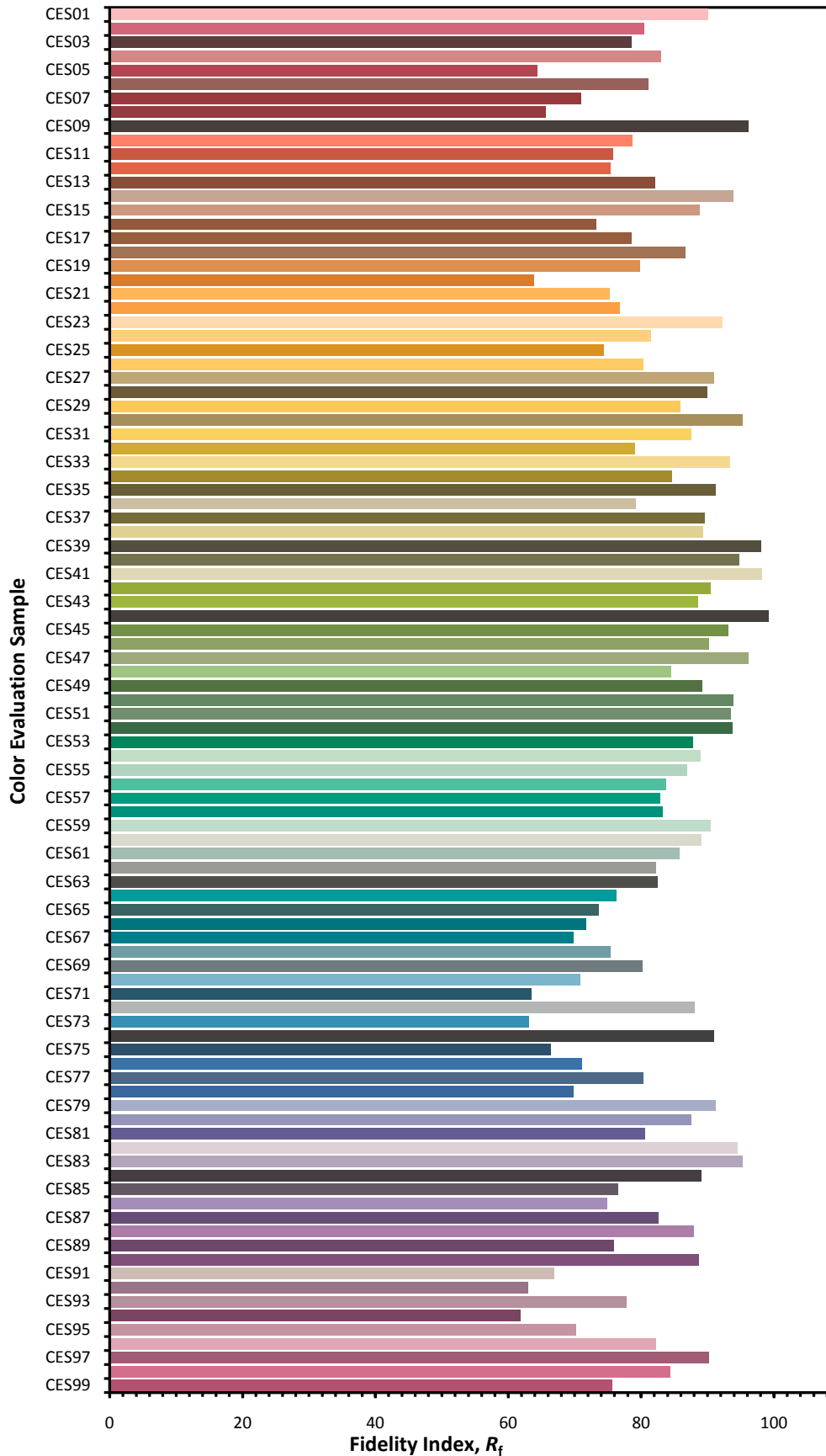


Color Vector Graphic

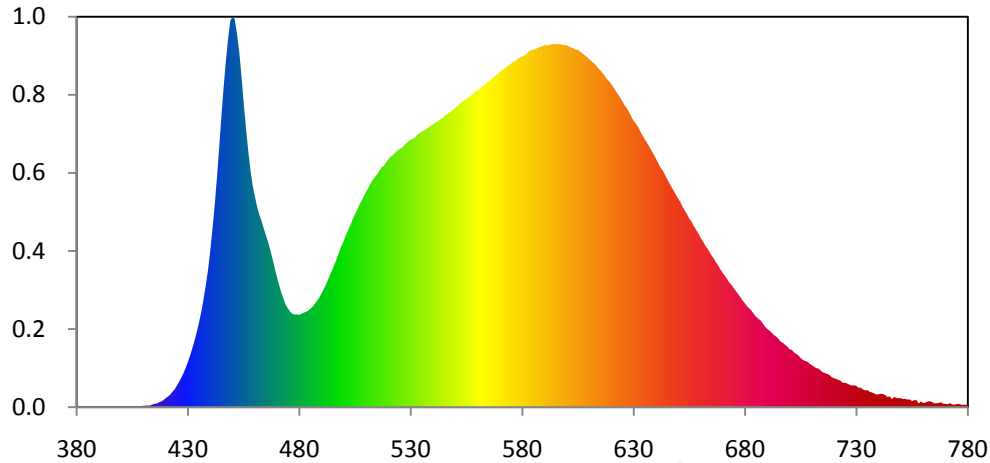


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



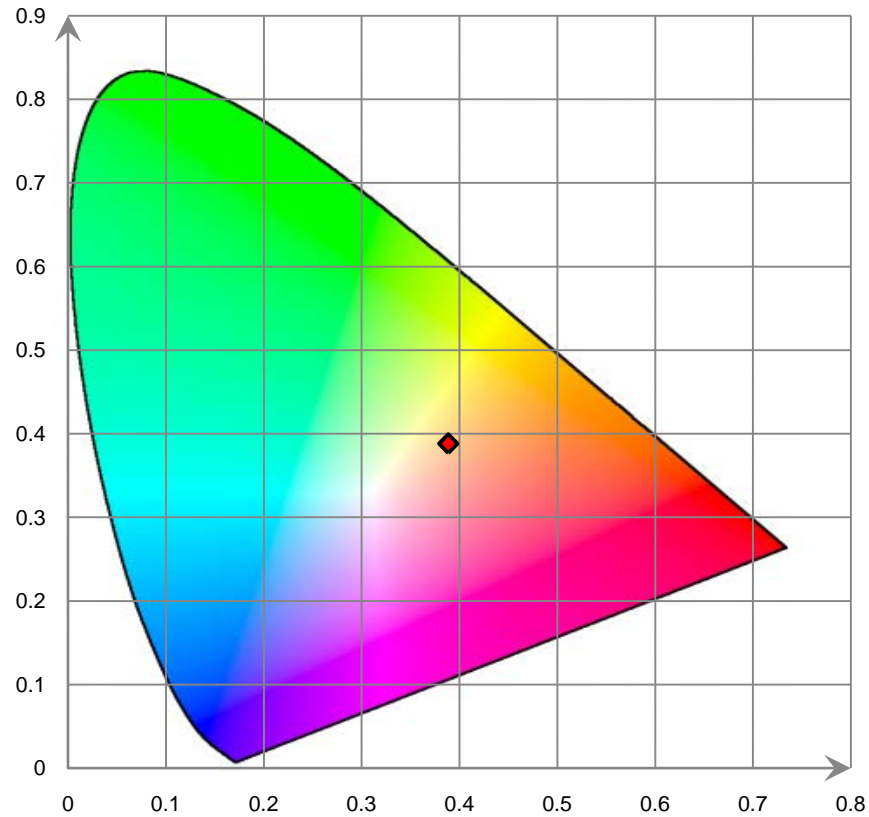
Relative Spectral Power Distribution



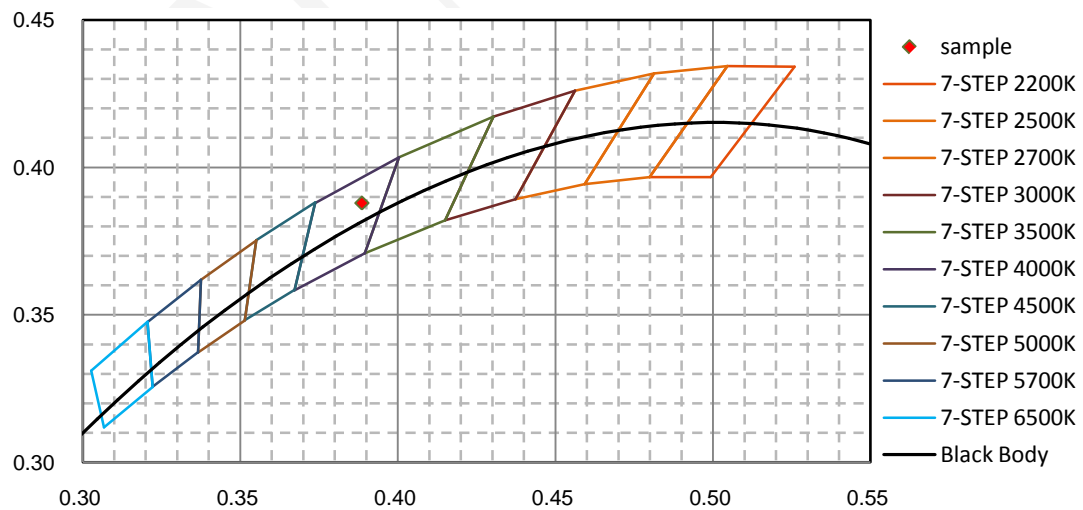
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.090E-02	421	1.099E+00	462	2.001E+01	503	1.895E+01	544	2.998E+01
381	3.810E-02	422	1.287E+00	463	1.935E+01	504	1.952E+01	545	3.020E+01
382	7.000E-02	423	1.584E+00	464	1.856E+01	505	2.004E+01	546	3.036E+01
383	4.100E-03	424	1.850E+00	465	1.786E+01	506	2.051E+01	547	3.055E+01
384	7.290E-02	425	2.215E+00	466	1.714E+01	507	2.105E+01	548	3.069E+01
385	4.090E-02	426	2.629E+00	467	1.629E+01	508	2.142E+01	549	3.086E+01
386	1.830E-02	427	3.039E+00	468	1.536E+01	509	2.196E+01	550	3.105E+01
387	9.050E-02	428	3.528E+00	469	1.441E+01	510	2.238E+01	551	3.126E+01
388	2.240E-02	429	4.088E+00	470	1.346E+01	511	2.277E+01	552	3.150E+01
389	3.200E-02	430	4.694E+00	471	1.263E+01	512	2.324E+01	553	3.170E+01
390	4.270E-02	431	5.392E+00	472	1.184E+01	513	2.361E+01	554	3.184E+01
391	1.750E-02	432	6.139E+00	473	1.117E+01	514	2.394E+01	555	3.199E+01
392	7.000E-04	433	6.930E+00	474	1.058E+01	515	2.418E+01	556	3.219E+01
393	1.500E-03	434	7.837E+00	475	1.021E+01	516	2.459E+01	557	3.234E+01
394	1.170E-02	435	8.823E+00	476	9.890E+00	517	2.490E+01	558	3.253E+01
395	4.580E-02	436	9.884E+00	477	9.669E+00	518	2.508E+01	559	3.274E+01
396	4.640E-02	437	1.120E+01	478	9.620E+00	519	2.542E+01	560	3.291E+01
397	1.620E-02	438	1.265E+01	479	9.636E+00	520	2.575E+01	561	3.307E+01
398	9.000E-04	439	1.420E+01	480	9.578E+00	521	2.601E+01	562	3.332E+01
399	2.000E-03	440	1.618E+01	481	9.693E+00	522	2.617E+01	563	3.345E+01
400	3.000E-04	441	1.848E+01	482	9.816E+00	523	2.643E+01	564	3.367E+01
401	1.550E-02	442	2.090E+01	483	9.893E+00	524	2.661E+01	565	3.385E+01
402	4.840E-02	443	2.378E+01	484	1.001E+01	525	2.680E+01	566	3.402E+01
403	2.460E-02	444	2.687E+01	485	1.023E+01	526	2.691E+01	567	3.418E+01
404	5.430E-02	445	3.013E+01	486	1.044E+01	527	2.717E+01	568	3.440E+01
405	7.330E-02	446	3.315E+01	487	1.075E+01	528	2.741E+01	569	3.459E+01
406	2.420E-02	447	3.584E+01	488	1.106E+01	529	2.759E+01	570	3.483E+01
407	1.178E-01	448	3.817E+01	489	1.141E+01	530	2.776E+01	571	3.499E+01
408	3.280E-02	449	4.011E+01	490	1.183E+01	531	2.786E+01	572	3.514E+01
409	8.600E-02	450	4.053E+01	491	1.228E+01	532	2.802E+01	573	3.536E+01
410	1.483E-01	451	4.027E+01	492	1.278E+01	533	2.829E+01	574	3.549E+01
411	1.628E-01	452	3.880E+01	493	1.330E+01	534	2.845E+01	575	3.566E+01
412	1.679E-01	453	3.696E+01	494	1.386E+01	535	2.861E+01	576	3.589E+01
413	1.681E-01	454	3.448E+01	495	1.437E+01	536	2.872E+01	577	3.592E+01
414	2.750E-01	455	3.168E+01	496	1.495E+01	537	2.889E+01	578	3.618E+01
415	3.428E-01	456	2.912E+01	497	1.555E+01	538	2.905E+01	579	3.631E+01
416	3.902E-01	457	2.676E+01	498	1.617E+01	539	2.922E+01	580	3.642E+01
417	4.985E-01	458	2.476E+01	499	1.676E+01	540	2.936E+01	581	3.650E+01
418	5.883E-01	459	2.308E+01	500	1.730E+01	541	2.954E+01	582	3.667E+01
419	7.269E-01	460	2.194E+01	501	1.790E+01	542	2.963E+01	583	3.695E+01
420	9.307E-01	461	2.087E+01	502	1.843E+01	543	2.985E+01	584	3.704E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.710E+01	626	3.134E+01	667	1.505E+01	708	4.724E+00	749	9.414E-01
586	3.717E+01	627	3.103E+01	668	1.471E+01	709	4.517E+00	750	9.263E-01
587	3.729E+01	628	3.062E+01	669	1.430E+01	710	4.363E+00	751	8.517E-01
588	3.739E+01	629	3.016E+01	670	1.395E+01	711	4.201E+00	752	8.581E-01
589	3.747E+01	630	2.975E+01	671	1.366E+01	712	4.055E+00	753	7.927E-01
590	3.759E+01	631	2.945E+01	672	1.330E+01	713	4.012E+00	754	8.006E-01
591	3.756E+01	632	2.911E+01	673	1.294E+01	714	3.804E+00	755	6.393E-01
592	3.758E+01	633	2.864E+01	674	1.267E+01	715	3.609E+00	756	7.189E-01
593	3.767E+01	634	2.825E+01	675	1.237E+01	716	3.528E+00	757	7.422E-01
594	3.768E+01	635	2.783E+01	676	1.203E+01	717	3.449E+00	758	3.844E-01
595	3.771E+01	636	2.747E+01	677	1.173E+01	718	3.333E+00	759	5.990E-01
596	3.766E+01	637	2.707E+01	678	1.141E+01	719	3.108E+00	760	4.318E-01
597	3.769E+01	638	2.666E+01	679	1.106E+01	720	3.005E+00	761	4.779E-01
598	3.761E+01	639	2.626E+01	680	1.078E+01	721	2.935E+00	762	5.916E-01
599	3.761E+01	640	2.582E+01	681	1.046E+01	722	2.835E+00	763	6.116E-01
600	3.754E+01	641	2.539E+01	682	1.024E+01	723	2.721E+00	764	5.268E-01
601	3.746E+01	642	2.489E+01	683	1.001E+01	724	2.530E+00	765	3.947E-01
602	3.733E+01	643	2.462E+01	684	9.679E+00	725	2.538E+00	766	4.113E-01
603	3.725E+01	644	2.419E+01	685	9.388E+00	726	2.440E+00	767	4.376E-01
604	3.712E+01	645	2.370E+01	686	9.185E+00	727	2.327E+00	768	5.046E-01
605	3.710E+01	646	2.330E+01	687	9.011E+00	728	2.244E+00	769	3.619E-01
606	3.691E+01	647	2.287E+01	688	8.715E+00	729	2.270E+00	770	3.393E-01
607	3.675E+01	648	2.248E+01	689	8.366E+00	730	2.217E+00	771	3.040E-01
608	3.654E+01	649	2.206E+01	690	8.127E+00	731	2.004E+00	772	4.226E-01
609	3.637E+01	650	2.167E+01	691	7.955E+00	732	2.040E+00	773	2.988E-01
610	3.615E+01	651	2.130E+01	692	7.738E+00	733	1.824E+00	774	2.549E-01
611	3.592E+01	652	2.081E+01	693	7.495E+00	734	1.753E+00	775	3.206E-01
612	3.574E+01	653	2.041E+01	694	7.327E+00	735	1.765E+00	776	3.373E-01
613	3.552E+01	654	2.004E+01	695	7.113E+00	736	1.594E+00	777	2.657E-01
614	3.524E+01	655	1.959E+01	696	6.801E+00	737	1.531E+00	778	2.444E-01
615	3.497E+01	656	1.928E+01	697	6.689E+00	738	1.427E+00	779	2.719E-01
616	3.470E+01	657	1.883E+01	698	6.485E+00	739	1.314E+00	780	1.877E-01
617	3.443E+01	658	1.845E+01	699	6.288E+00	740	1.332E+00		
618	3.406E+01	659	1.807E+01	700	6.012E+00	741	1.392E+00		
619	3.385E+01	660	1.765E+01	701	5.960E+00	742	1.353E+00		
620	3.354E+01	661	1.727E+01	702	5.683E+00	743	1.254E+00		
621	3.319E+01	662	1.688E+01	703	5.532E+00	744	1.052E+00		
622	3.282E+01	663	1.653E+01	704	5.366E+00	745	1.133E+00		
623	3.248E+01	664	1.615E+01	705	5.108E+00	746	8.306E-01		
624	3.215E+01	665	1.576E+01	706	4.918E+00	747	1.081E+00		
625	3.174E+01	666	1.545E+01	707	4.802E+00	748	9.520E-01		

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**

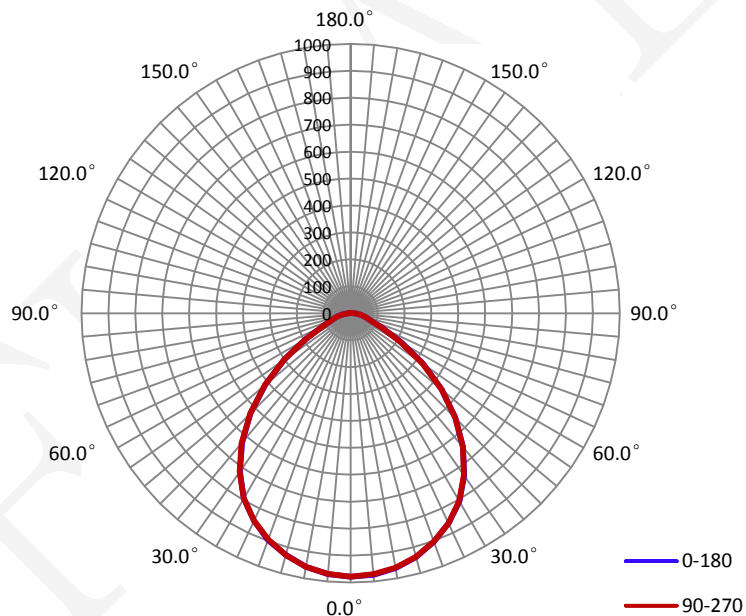
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1690	19.85	0.9790

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2097.9	105.74	978.5	1.21	1.21

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	94.4	94.5	94.5	94.5	94.5
Field Angle (10% I _{max}):	134.5	134.3	134.4	134.5	134.4

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	979	979	979	979	979	979	979	979
5.0°	975	975	976	974	973	975	975	973
10.0°	961	960	961	961	960	960	960	959
15.0°	938	937	938	936	937	937	936	936
20.0°	904	905	904	902	902	904	902	901
25.0°	861	860	861	859	861	860	859	857
30.0°	808	808	809	808	807	807	805	803
35.0°	735	736	736	737	734	735	730	727
40.0°	649	651	652	651	649	648	643	640
45.0°	550	550	554	552	550	549	544	540
50.0°	441	442	444	442	441	437	434	430
55.0°	327	328	327	327	325	322	320	315
60.0°	216	216	218	216	213	210	209	205
65.0°	127	126	126	126	124	122	120	120
70.0°	76	76	76	76	75	74	73	73
75.0°	57	57	57	57	56	56	55	54
80.0°	38	38	38	37	38	37	36	36
85.0°	16	16	15	15	17	16	17	16
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

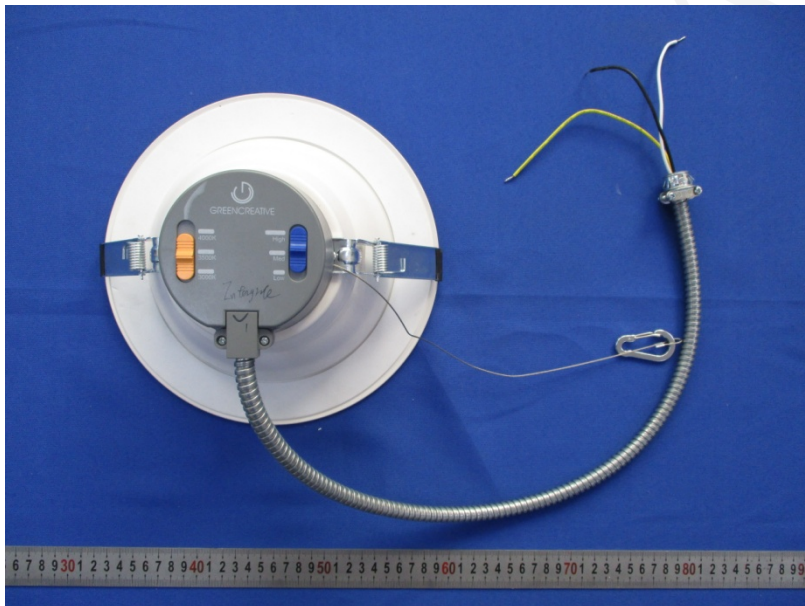
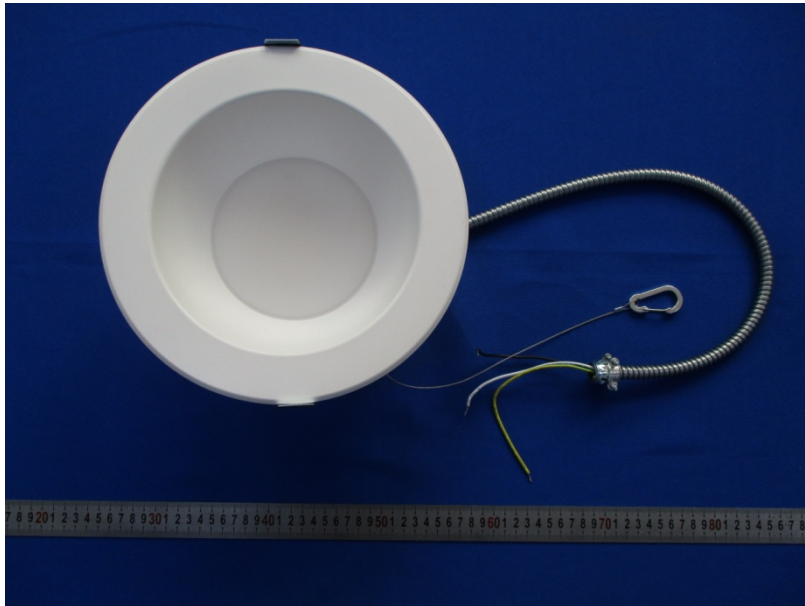
Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	979	979	979	979	979	979	979	979
5.0°	972	972	973	972	971	975	972	972
10.0°	957	955	958	956	956	958	959	956
15.0°	929	931	931	929	930	933	933	933
20.0°	897	894	895	895	895	897	899	896
25.0°	850	849	851	850	850	853	854	852
30.0°	794	792	794	793	793	798	796	798
35.0°	718	717	718	718	720	723	724	724
40.0°	628	628	627	628	630	634	636	636
45.0°	526	524	526	526	528	533	533	535
50.0°	413	413	412	414	416	420	423	425
55.0°	299	298	299	299	302	306	309	311
60.0°	192	192	192	192	194	198	201	202
65.0°	111	111	111	112	112	116	117	118
70.0°	71	70	70	70	71	71	72	72
75.0°	52	53	52	51	52	52	53	55
80.0°	34	34	33	32	32	33	34	35
85.0°	13	13	12	11	12	12	13	14
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	23.3	1.11	0-5	23.3	1.11
5-10	69.1	3.29	0-10	92.4	4.41
10-15	112.3	5.35	0-15	204.7	9.76
15-20	151.1	7.20	0-20	355.8	16.96
20-25	184.1	8.77	0-25	539.9	25.73
25-30	209.6	9.99	0-30	749.5	35.72
30-35	225.0	10.72	0-35	974.4	46.45
35-40	227.9	10.87	0-40	1202.4	57.31
40-45	218.1	10.40	0-45	1420.5	67.71
45-50	195.3	9.31	0-50	1615.8	77.02
50-55	161.1	7.68	0-55	1777.0	84.70
55-60	119.6	5.70	0-60	1896.5	90.40
60-65	78.4	3.74	0-65	1975.0	94.14
65-70	48.5	2.31	0-70	2023.4	96.45
70-75	33.2	1.58	0-75	2056.6	98.03
75-80	24.0	1.14	0-80	2080.6	99.17
80-85	13.4	0.64	0-85	2094.0	99.82
85-90	3.9	0.18	0-90	2097.9	100.00
90-95	0.0	0.00	0-95	2097.9	100.00
95-100	0.0	0.00	0-100	2097.9	100.00
100-105	0.0	0.00	0-105	2097.9	100.00
105-110	0.0	0.00	0-110	2097.9	100.00
110-115	0.0	0.00	0-115	2097.9	100.00
115-120	0.0	0.00	0-120	2097.9	100.00
120-125	0.0	0.00	0-125	2097.9	100.00
125-130	0.0	0.00	0-130	2097.9	100.00
130-135	0.0	0.00	0-135	2097.9	100.00
135-140	0.0	0.00	0-140	2097.9	100.00
140-145	0.0	0.00	0-145	2097.9	100.00
145-150	0.0	0.00	0-150	2097.9	100.00
150-155	0.0	0.00	0-155	2097.9	100.00
155-160	0.0	0.00	0-160	2097.9	100.00
160-165	0.0	0.00	0-165	2097.9	100.00
165-170	0.0	0.00	0-170	2097.9	100.00
170-175	0.0	0.00	0-175	2097.9	100.00
175-180	0.0	0.00	0-180	2097.9	100.00

6. Product Photo



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