

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: SLFT9.5/80CCTS/DIM010UNV

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	RKSB190117008-10-1
Test Date:	2019-01-21 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: SLFT9.5/80CCTS/DIM010UNV
 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: 120-277VAC, 50-60Hz
 Nominal CCT: 3000K
 Nominal Lumen Output: 3050/3200/3050lm

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**

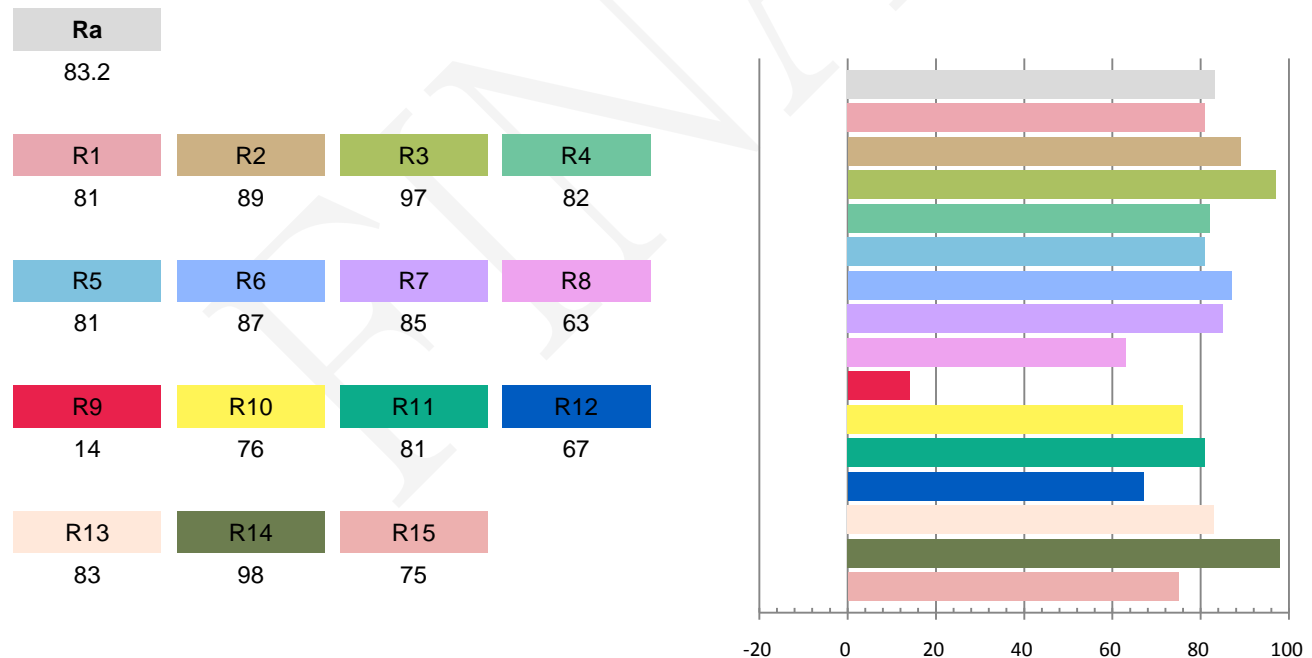
Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.2529	29.89	0.9849	3232.79	108.17

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
9.936	3001	0.00118	0.4386	0.4076	0.2501	0.5230

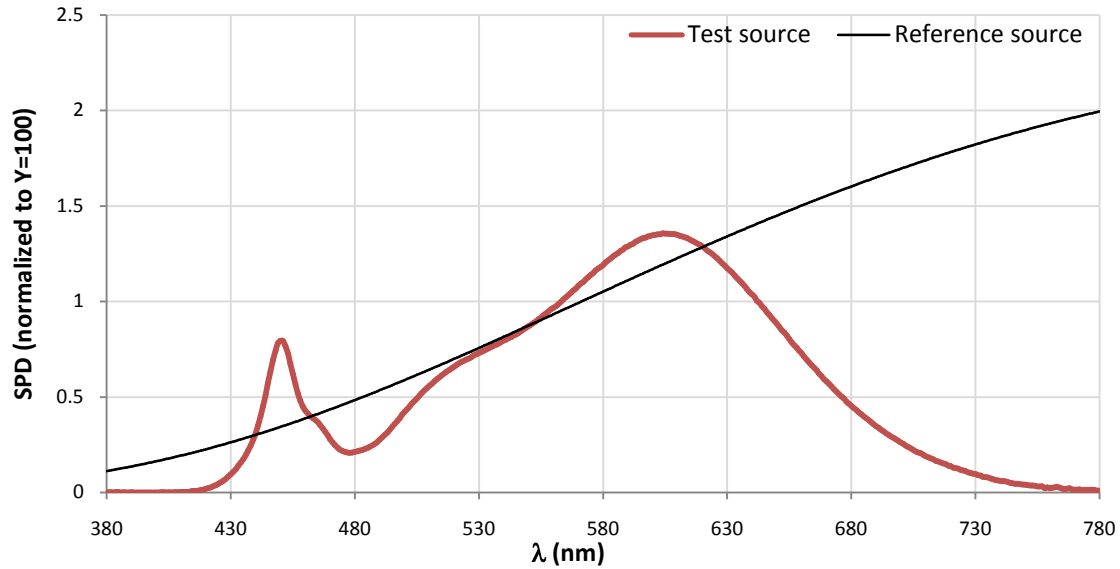
Color Rendering Index



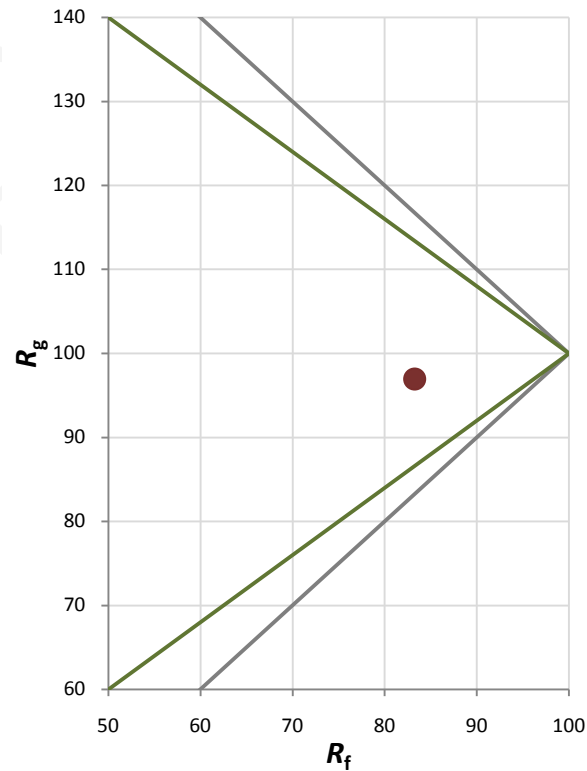
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	97

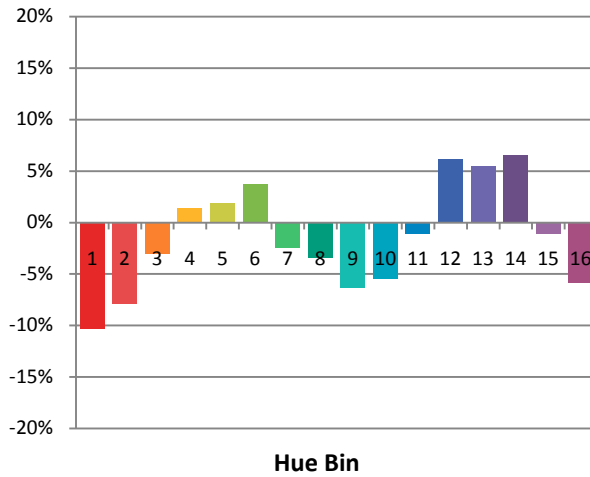
Spectral Power Distribution Comparison



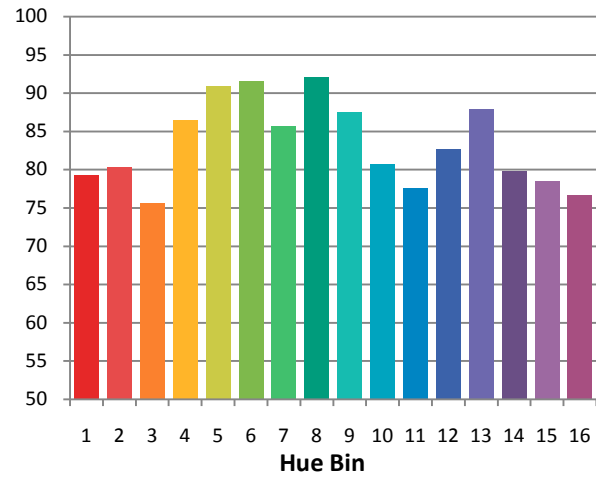
Plot of R_g versus R_f



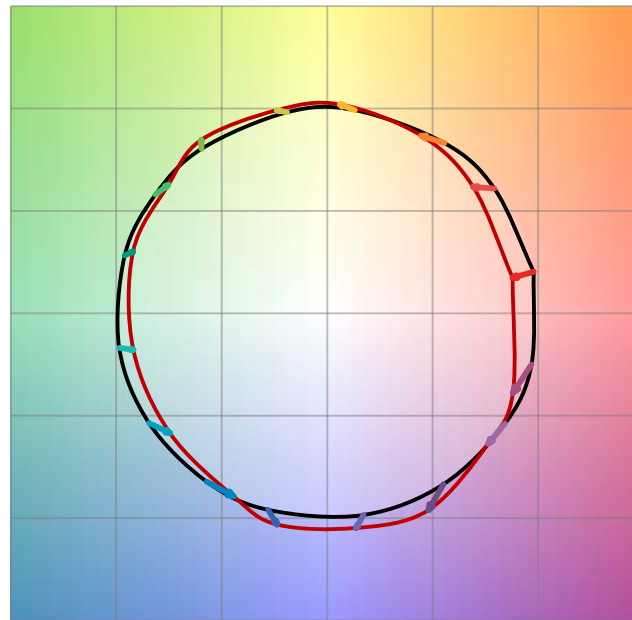
Chroma Shift by Hue



R_t by Hue

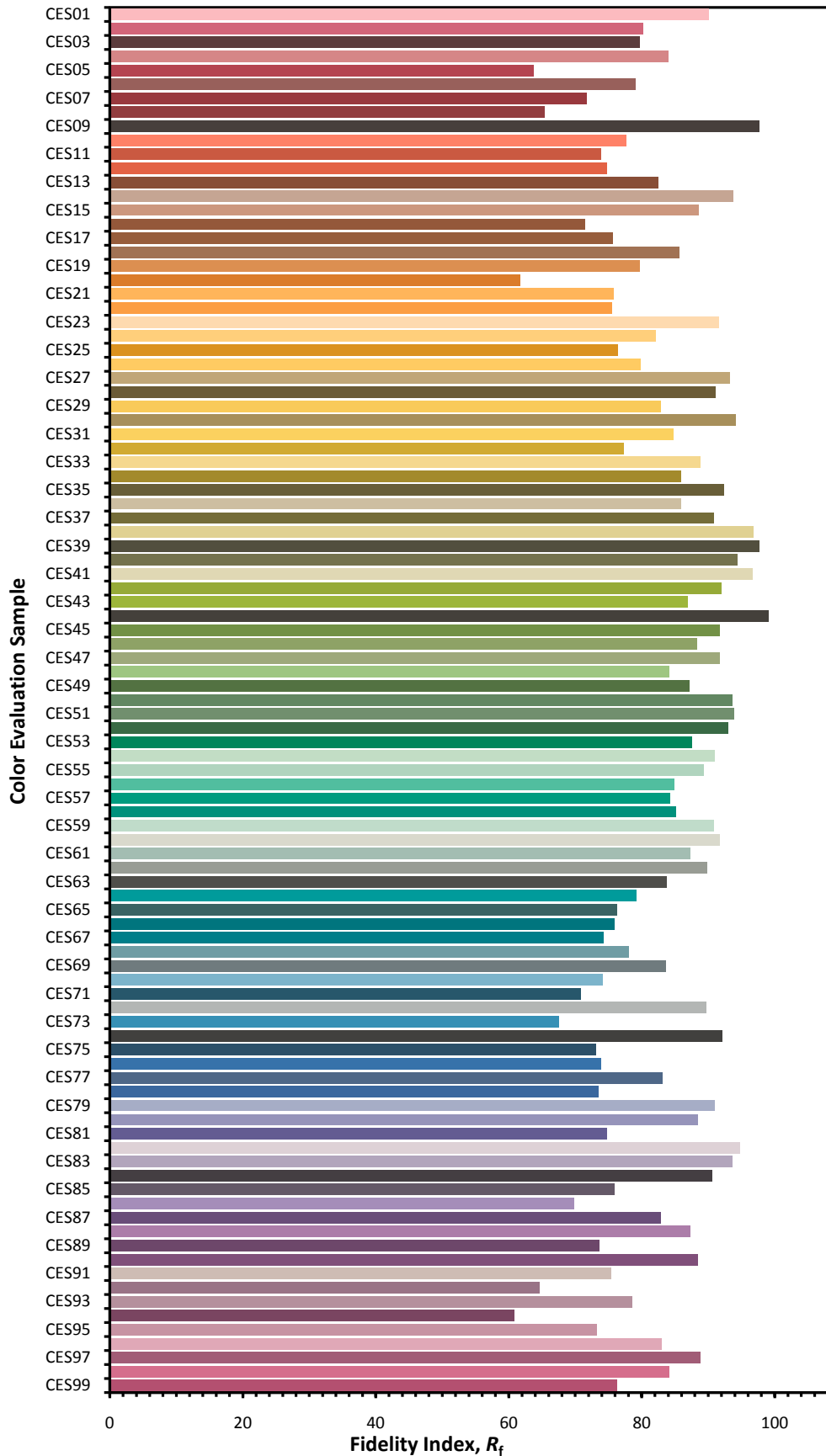


Color Vector Graphic

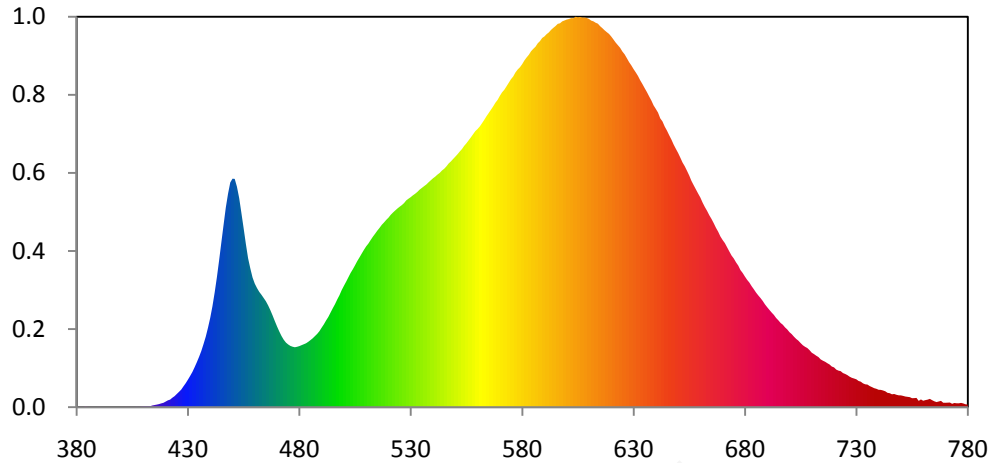


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



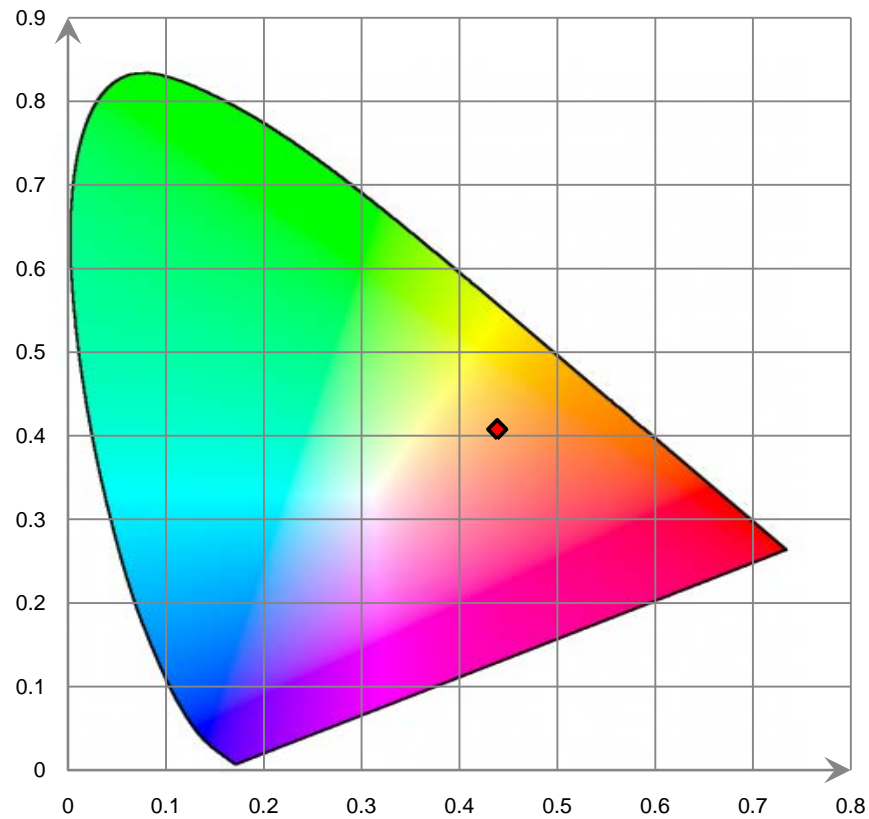
Relative Spectral Power Distribution



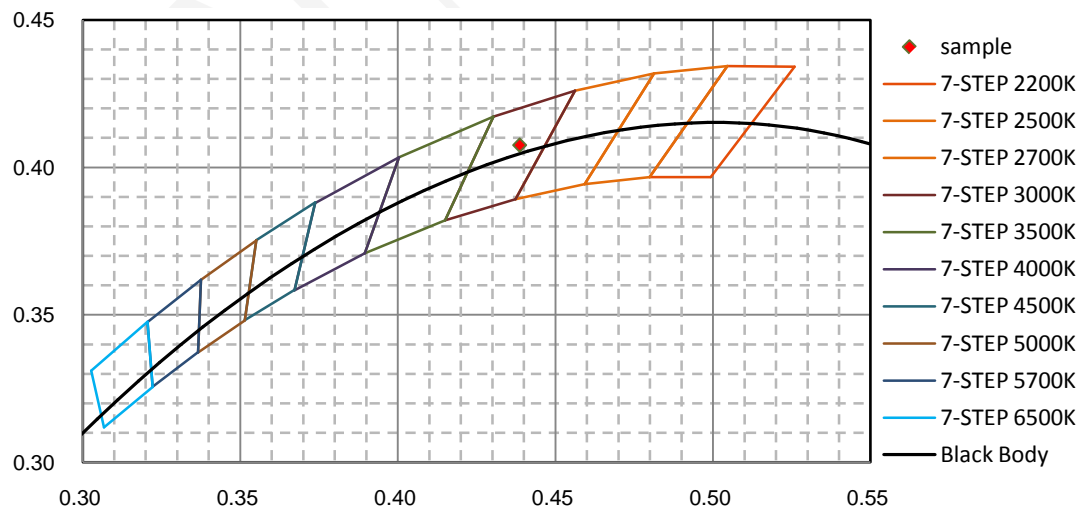
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.560E-02	421	1.126E+00	462	1.897E+01	503	2.207E+01	544	3.892E+01
381	4.080E-02	422	1.248E+00	463	1.849E+01	504	2.268E+01	545	3.920E+01
382	5.160E-02	423	1.553E+00	464	1.796E+01	505	2.333E+01	546	3.959E+01
383	2.000E-03	424	1.811E+00	465	1.742E+01	506	2.403E+01	547	4.007E+01
384	1.544E-01	425	2.172E+00	466	1.673E+01	507	2.463E+01	548	4.041E+01
385	5.470E-02	426	2.521E+00	467	1.595E+01	508	2.526E+01	549	4.081E+01
386	3.900E-03	427	2.897E+00	468	1.508E+01	509	2.588E+01	550	4.120E+01
387	5.020E-02	428	3.430E+00	469	1.416E+01	510	2.645E+01	551	4.160E+01
388	2.350E-02	429	3.941E+00	470	1.327E+01	511	2.691E+01	552	4.205E+01
389	3.020E-02	430	4.528E+00	471	1.245E+01	512	2.748E+01	553	4.245E+01
390	6.880E-02	431	5.145E+00	472	1.171E+01	513	2.803E+01	554	4.298E+01
391	2.810E-02	432	5.792E+00	473	1.109E+01	514	2.852E+01	555	4.340E+01
392	7.300E-03	433	6.569E+00	474	1.062E+01	515	2.903E+01	556	4.389E+01
393	5.200E-03	434	7.397E+00	475	1.031E+01	516	2.949E+01	557	4.438E+01
394	3.000E-04	435	8.280E+00	476	1.008E+01	517	2.999E+01	558	4.490E+01
395	2.430E-02	436	9.235E+00	477	9.939E+00	518	3.037E+01	559	4.541E+01
396	1.310E-02	437	1.038E+01	478	9.859E+00	519	3.080E+01	560	4.575E+01
397	1.200E-02	438	1.160E+01	479	9.934E+00	520	3.116E+01	561	4.617E+01
398	1.380E-02	439	1.306E+01	480	1.004E+01	521	3.163E+01	562	4.670E+01
399	1.450E-02	440	1.468E+01	481	1.020E+01	522	3.200E+01	563	4.725E+01
400	2.050E-02	441	1.660E+01	482	1.035E+01	523	3.234E+01	564	4.785E+01
401	2.160E-02	442	1.886E+01	483	1.050E+01	524	3.266E+01	565	4.838E+01
402	6.420E-02	443	2.137E+01	484	1.075E+01	525	3.296E+01	566	4.892E+01
403	5.750E-02	444	2.417E+01	485	1.103E+01	526	3.323E+01	567	4.946E+01
404	2.890E-02	445	2.710E+01	486	1.133E+01	527	3.357E+01	568	5.007E+01
405	5.340E-02	446	3.000E+01	487	1.169E+01	528	3.402E+01	569	5.054E+01
406	2.600E-02	447	3.283E+01	488	1.205E+01	529	3.429E+01	570	5.120E+01
407	1.028E-01	448	3.510E+01	489	1.249E+01	530	3.455E+01	571	5.178E+01
408	3.900E-02	449	3.696E+01	490	1.306E+01	531	3.485E+01	572	5.220E+01
409	1.015E-01	450	3.758E+01	491	1.362E+01	532	3.510E+01	573	5.277E+01
410	1.556E-01	451	3.755E+01	492	1.426E+01	533	3.542E+01	574	5.335E+01
411	1.705E-01	452	3.625E+01	493	1.483E+01	534	3.578E+01	575	5.394E+01
412	1.812E-01	453	3.440E+01	494	1.555E+01	535	3.606E+01	576	5.439E+01
413	1.499E-01	454	3.194E+01	495	1.627E+01	536	3.635E+01	577	5.505E+01
414	2.855E-01	455	2.944E+01	496	1.693E+01	537	3.662E+01	578	5.553E+01
415	3.535E-01	456	2.686E+01	497	1.770E+01	538	3.698E+01	579	5.590E+01
416	4.228E-01	457	2.451E+01	498	1.841E+01	539	3.732E+01	580	5.640E+01
417	5.060E-01	458	2.283E+01	499	1.924E+01	540	3.764E+01	581	5.702E+01
418	6.257E-01	459	2.133E+01	500	1.995E+01	541	3.792E+01	582	5.751E+01
419	7.219E-01	460	2.032E+01	501	2.063E+01	542	3.826E+01	583	5.795E+01
420	9.207E-01	461	1.959E+01	502	2.135E+01	543	3.853E+01	584	5.853E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	5.893E+01	626	5.803E+01	667	2.950E+01	708	9.726E+00	749	1.953E+00
586	5.928E+01	627	5.740E+01	668	2.885E+01	709	9.380E+00	750	1.940E+00
587	5.984E+01	628	5.675E+01	669	2.807E+01	710	8.960E+00	751	1.856E+00
588	6.020E+01	629	5.622E+01	670	2.749E+01	711	8.735E+00	752	1.756E+00
589	6.072E+01	630	5.561E+01	671	2.698E+01	712	8.472E+00	753	1.703E+00
590	6.097E+01	631	5.507E+01	672	2.630E+01	713	8.245E+00	754	1.649E+00
591	6.135E+01	632	5.447E+01	673	2.561E+01	714	7.863E+00	755	1.479E+00
592	6.164E+01	633	5.376E+01	674	2.494E+01	715	7.651E+00	756	1.491E+00
593	6.206E+01	634	5.314E+01	675	2.445E+01	716	7.471E+00	757	1.527E+00
594	6.238E+01	635	5.247E+01	676	2.382E+01	717	7.227E+00	758	1.034E+00
595	6.269E+01	636	5.183E+01	677	2.329E+01	718	7.019E+00	759	1.277E+00
596	6.305E+01	637	5.111E+01	678	2.255E+01	719	6.683E+00	760	1.062E+00
597	6.313E+01	638	5.044E+01	679	2.207E+01	720	6.545E+00	761	1.164E+00
598	6.345E+01	639	4.964E+01	680	2.148E+01	721	6.179E+00	762	1.237E+00
599	6.360E+01	640	4.905E+01	681	2.094E+01	722	6.009E+00	763	1.369E+00
600	6.375E+01	641	4.844E+01	682	2.049E+01	723	5.918E+00	764	1.153E+00
601	6.383E+01	642	4.750E+01	683	1.991E+01	724	5.612E+00	765	9.677E-01
602	6.398E+01	643	4.700E+01	684	1.939E+01	725	5.466E+00	766	8.408E-01
603	6.397E+01	644	4.615E+01	685	1.885E+01	726	5.273E+00	767	9.375E-01
604	6.421E+01	645	4.549E+01	686	1.838E+01	727	5.014E+00	768	1.042E+00
605	6.412E+01	646	4.473E+01	687	1.795E+01	728	4.829E+00	769	7.315E-01
606	6.418E+01	647	4.402E+01	688	1.747E+01	729	4.711E+00	770	7.238E-01
607	6.408E+01	648	4.320E+01	689	1.691E+01	730	4.586E+00	771	7.441E-01
608	6.409E+01	649	4.249E+01	690	1.644E+01	731	4.313E+00	772	7.653E-01
609	6.401E+01	650	4.182E+01	691	1.600E+01	732	4.195E+00	773	5.577E-01
610	6.385E+01	651	4.105E+01	692	1.557E+01	733	3.917E+00	774	6.883E-01
611	6.358E+01	652	4.024E+01	693	1.517E+01	734	3.764E+00	775	6.402E-01
612	6.346E+01	653	3.962E+01	694	1.467E+01	735	3.717E+00	776	6.386E-01
613	6.323E+01	654	3.888E+01	695	1.429E+01	736	3.474E+00	777	7.042E-01
614	6.307E+01	655	3.810E+01	696	1.386E+01	737	3.309E+00	778	6.176E-01
615	6.266E+01	656	3.721E+01	697	1.356E+01	738	3.126E+00	779	4.779E-01
616	6.234E+01	657	3.650E+01	698	1.313E+01	739	3.022E+00	780	4.394E-01
617	6.199E+01	658	3.582E+01	699	1.278E+01	740	2.863E+00		
618	6.168E+01	659	3.513E+01	700	1.234E+01	741	2.848E+00		
619	6.139E+01	660	3.447E+01	701	1.201E+01	742	2.748E+00		
620	6.096E+01	661	3.365E+01	702	1.160E+01	743	2.616E+00		
621	6.047E+01	662	3.293E+01	703	1.123E+01	744	2.363E+00		
622	5.996E+01	663	3.229E+01	704	1.094E+01	745	2.298E+00		
623	5.953E+01	664	3.158E+01	705	1.054E+01	746	2.118E+00		
624	5.910E+01	665	3.096E+01	706	1.018E+01	747	2.168E+00		
625	5.849E+01	666	3.025E+01	707	9.927E+00	748	2.039E+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**

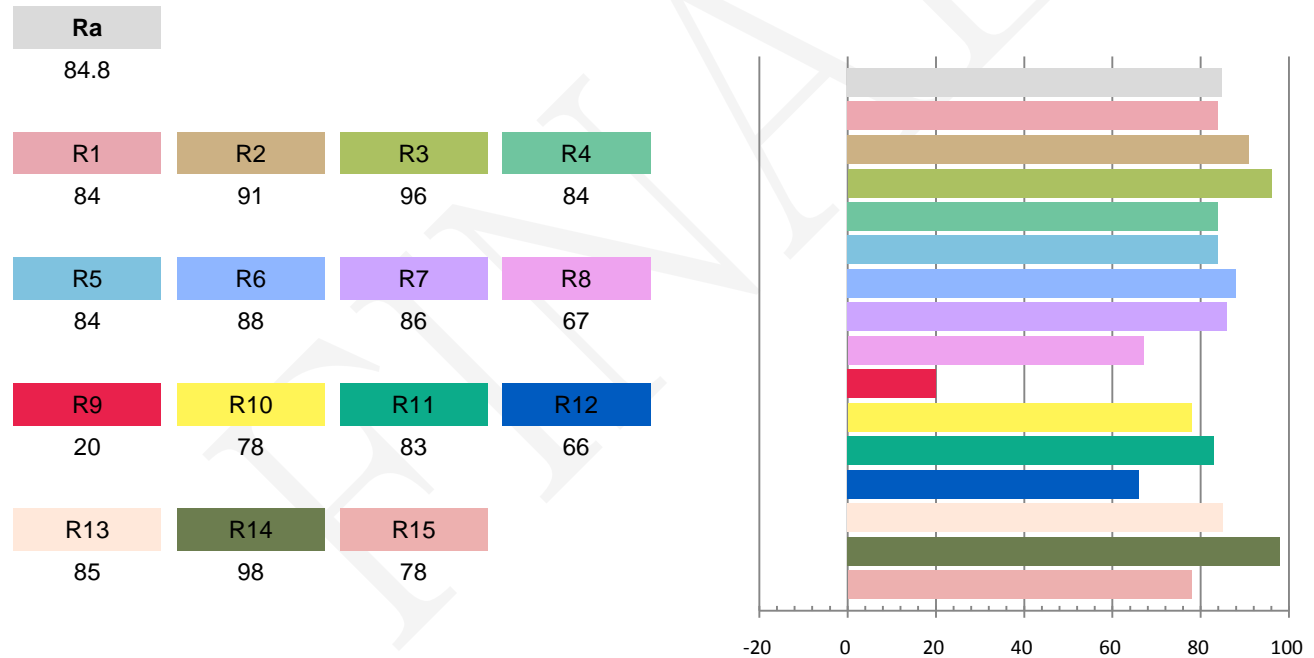
Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.2499	29.95	0.9987	3441.85	114.92

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
10.591	3460	-0.00013	0.4074	0.3915	0.2368	0.5119

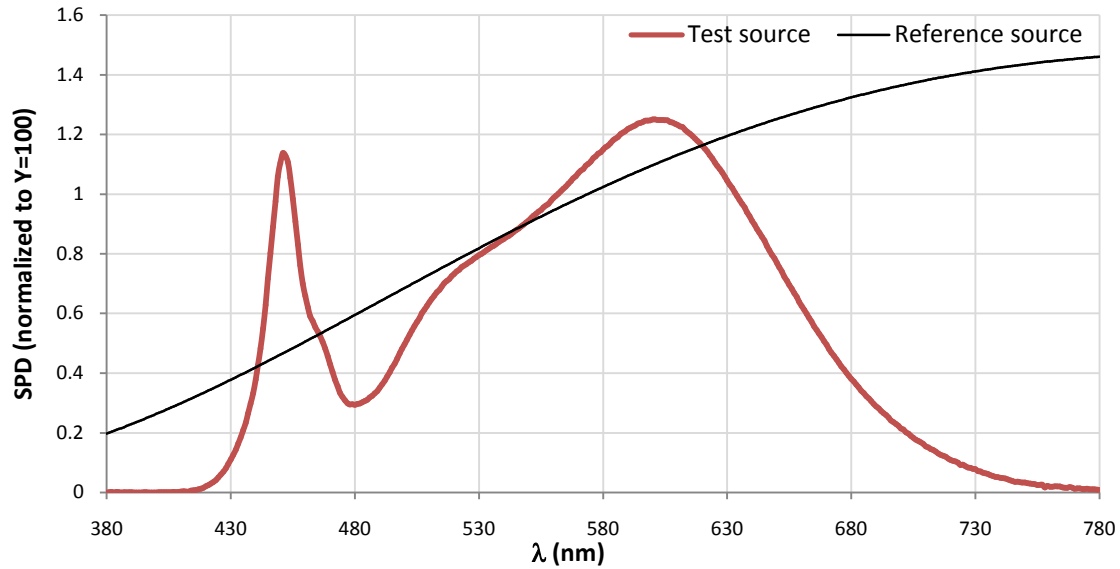
Color Rendering Index



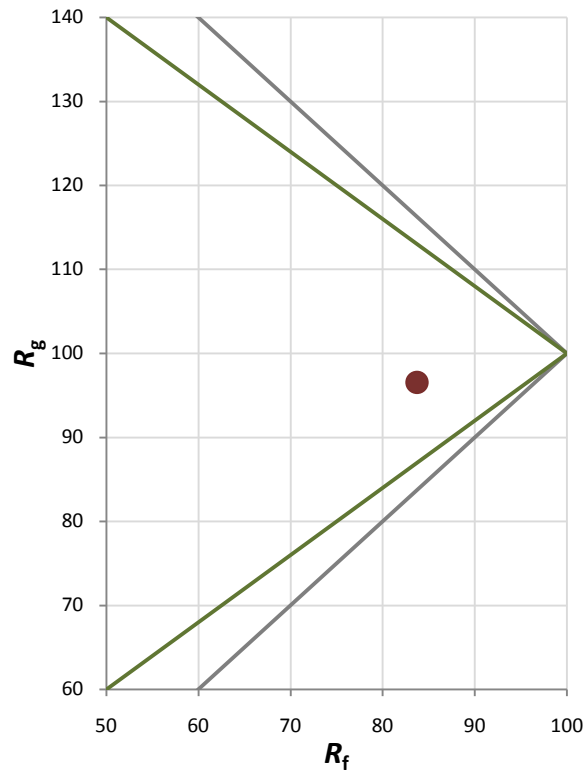
Fidelity Index and Gamut Index

Fidelity Index R_f	84
Gamut Index R_g	97

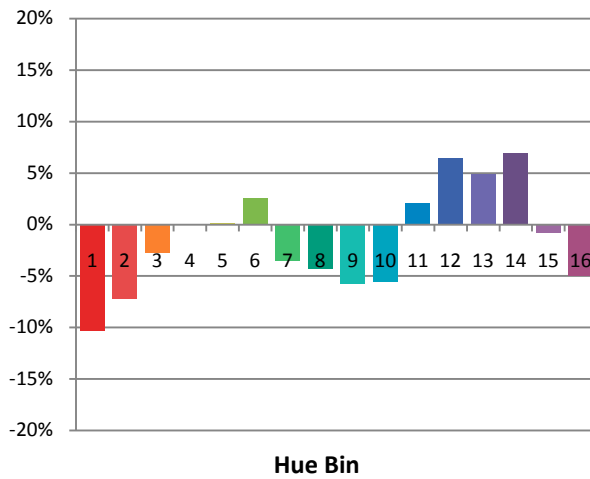
Spectral Power Distribution Comparison



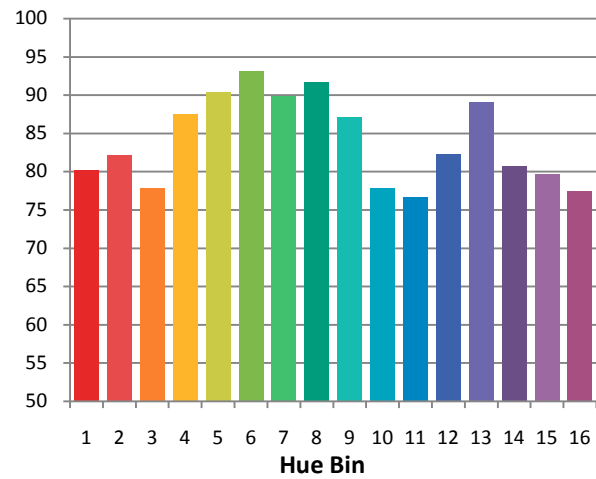
Plot of R_g versus R_f



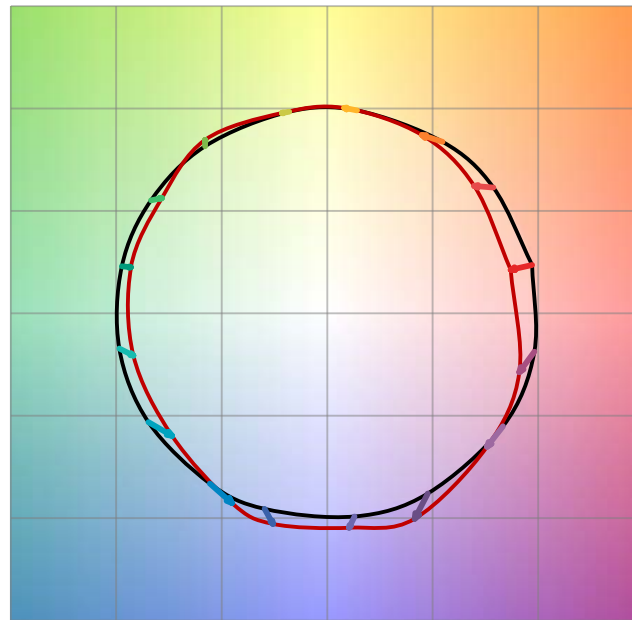
Chroma Shift by Hue



R_t by Hue

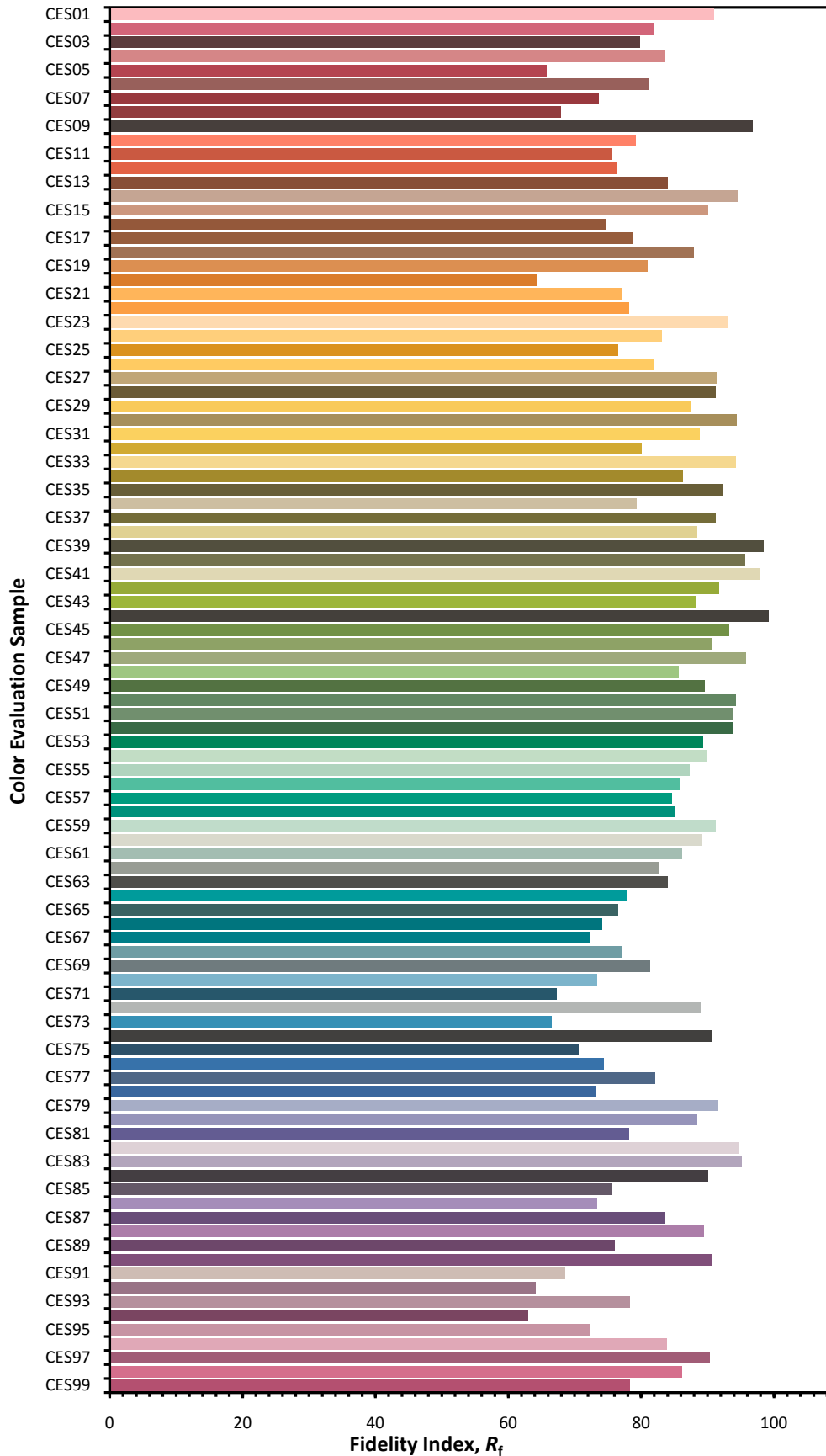


Color Vector Graphic

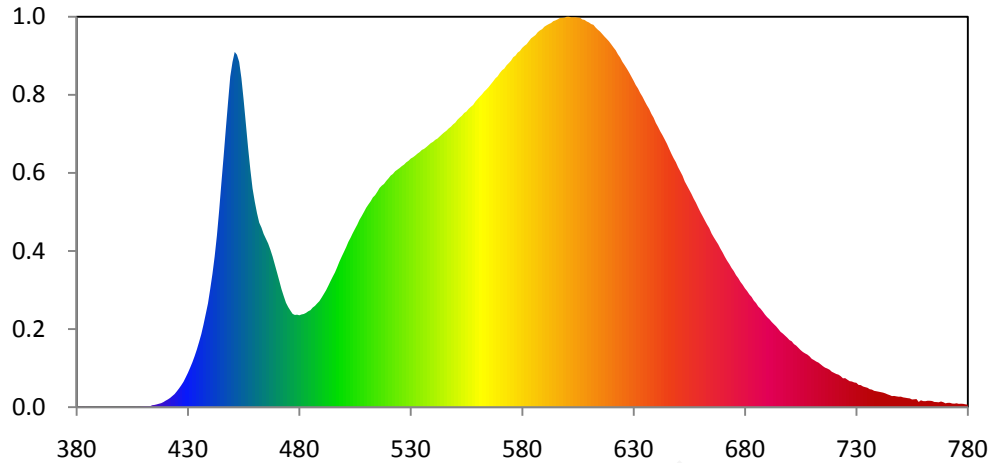


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



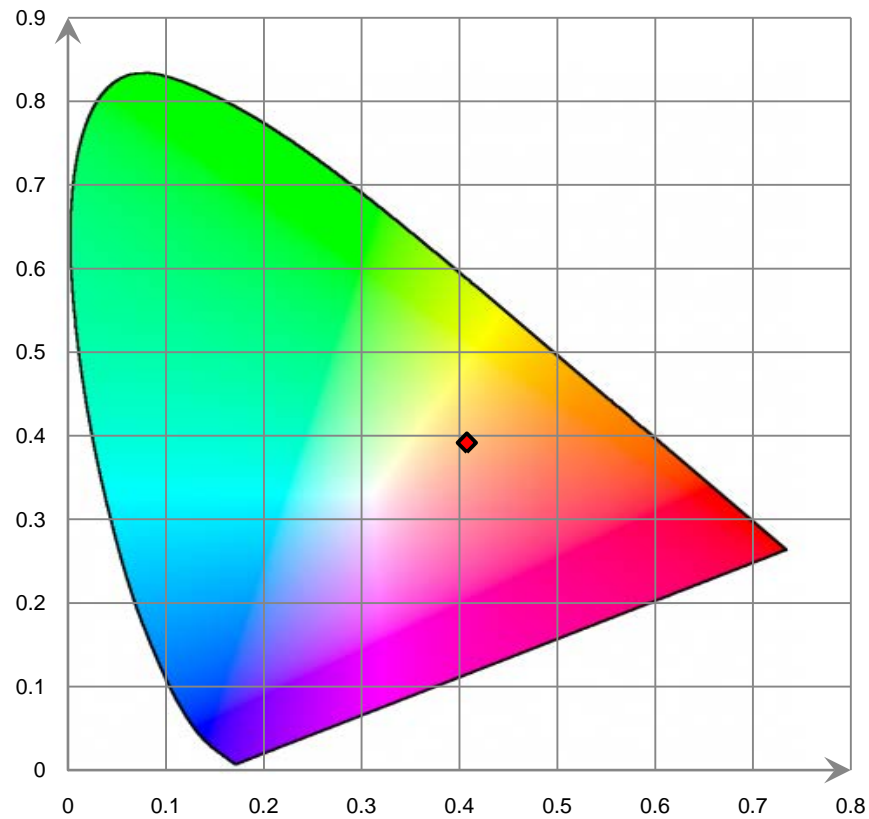
Relative Spectral Power Distribution



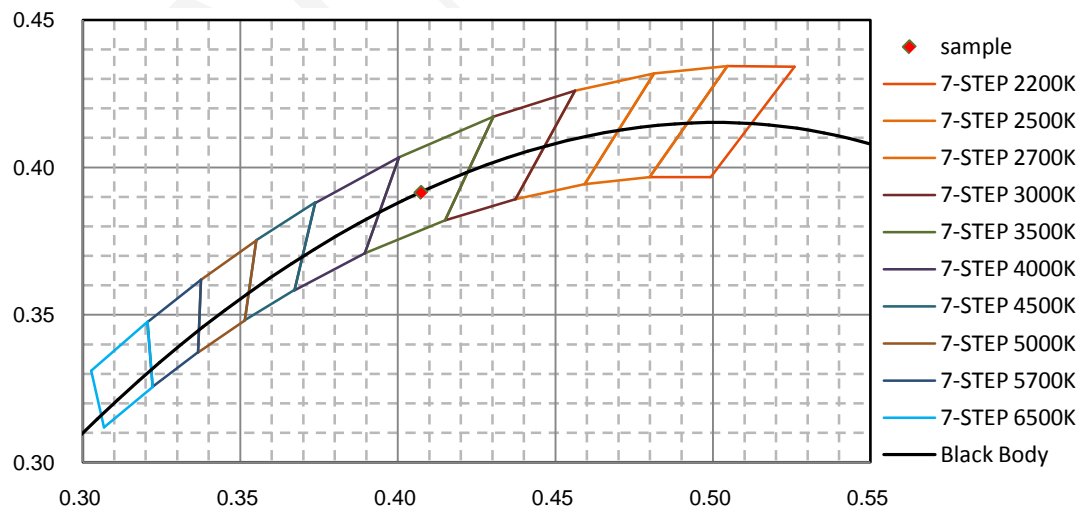
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	7.100E-03	421	1.253E+00	462	2.977E+01	503	2.733E+01	544	4.401E+01
381	3.880E-02	422	1.491E+00	463	2.897E+01	504	2.808E+01	545	4.433E+01
382	8.030E-02	423	1.803E+00	464	2.794E+01	505	2.877E+01	546	4.459E+01
383	1.220E-02	424	2.112E+00	465	2.717E+01	506	2.945E+01	547	4.496E+01
384	9.560E-02	425	2.549E+00	466	2.641E+01	507	3.023E+01	548	4.523E+01
385	4.220E-02	426	3.026E+00	467	2.542E+01	508	3.084E+01	549	4.561E+01
386	3.200E-03	427	3.533E+00	468	2.431E+01	509	3.149E+01	550	4.590E+01
387	5.480E-02	428	4.091E+00	469	2.301E+01	510	3.216E+01	551	4.638E+01
388	2.370E-02	429	4.805E+00	470	2.171E+01	511	3.270E+01	552	4.672E+01
389	4.110E-02	430	5.541E+00	471	2.039E+01	512	3.321E+01	553	4.703E+01
390	4.260E-02	431	6.375E+00	472	1.904E+01	513	3.384E+01	554	4.746E+01
391	2.050E-02	432	7.244E+00	473	1.791E+01	514	3.420E+01	555	4.769E+01
392	9.000E-04	433	8.226E+00	474	1.685E+01	515	3.474E+01	556	4.813E+01
393	0.000E+00	434	9.301E+00	475	1.615E+01	516	3.536E+01	557	4.846E+01
394	9.700E-03	435	1.052E+01	476	1.557E+01	517	3.574E+01	558	4.875E+01
395	4.810E-02	436	1.179E+01	477	1.505E+01	518	3.601E+01	559	4.929E+01
396	4.090E-02	437	1.334E+01	478	1.488E+01	519	3.650E+01	560	4.970E+01
397	1.890E-02	438	1.504E+01	479	1.492E+01	520	3.691E+01	561	5.010E+01
398	3.500E-03	439	1.675E+01	480	1.483E+01	521	3.735E+01	562	5.047E+01
399	1.330E-02	440	1.905E+01	481	1.496E+01	522	3.763E+01	563	5.092E+01
400	1.100E-03	441	2.150E+01	482	1.504E+01	523	3.806E+01	564	5.127E+01
401	2.630E-02	442	2.432E+01	483	1.521E+01	524	3.831E+01	565	5.166E+01
402	6.530E-02	443	2.766E+01	484	1.547E+01	525	3.858E+01	566	5.211E+01
403	6.070E-02	444	3.166E+01	485	1.566E+01	526	3.889E+01	567	5.256E+01
404	2.950E-02	445	3.610E+01	486	1.607E+01	527	3.913E+01	568	5.304E+01
405	2.960E-02	446	4.039E+01	487	1.634E+01	528	3.950E+01	569	5.337E+01
406	4.470E-02	447	4.486E+01	488	1.674E+01	529	3.974E+01	570	5.391E+01
407	9.990E-02	448	4.917E+01	489	1.711E+01	530	4.010E+01	571	5.435E+01
408	2.890E-02	449	5.334E+01	490	1.767E+01	531	4.031E+01	572	5.462E+01
409	8.860E-02	450	5.567E+01	491	1.826E+01	532	4.058E+01	573	5.514E+01
410	1.465E-01	451	5.731E+01	492	1.887E+01	533	4.090E+01	574	5.550E+01
411	1.894E-01	452	5.686E+01	493	1.958E+01	534	4.115E+01	575	5.589E+01
412	1.715E-01	453	5.570E+01	494	2.034E+01	535	4.150E+01	576	5.646E+01
413	1.539E-01	454	5.309E+01	495	2.106E+01	536	4.167E+01	577	5.671E+01
414	3.187E-01	455	4.959E+01	496	2.174E+01	537	4.195E+01	578	5.719E+01
415	3.652E-01	456	4.574E+01	497	2.259E+01	538	4.228E+01	579	5.745E+01
416	4.520E-01	457	4.187E+01	498	2.349E+01	539	4.260E+01	580	5.794E+01
417	5.519E-01	458	3.838E+01	499	2.428E+01	540	4.280E+01	581	5.828E+01
418	6.467E-01	459	3.530E+01	500	2.503E+01	541	4.313E+01	582	5.855E+01
419	8.266E-01	460	3.315E+01	501	2.580E+01	542	4.334E+01	583	5.902E+01
420	1.053E+00	461	3.130E+01	502	2.666E+01	543	4.367E+01	584	5.949E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	5.976E+01	626	5.517E+01	667	2.684E+01	708	8.488E+00	749	1.689E+00
586	6.003E+01	627	5.461E+01	668	2.627E+01	709	8.201E+00	750	1.698E+00
587	6.049E+01	628	5.400E+01	669	2.557E+01	710	7.798E+00	751	1.580E+00
588	6.078E+01	629	5.334E+01	670	2.496E+01	711	7.593E+00	752	1.522E+00
589	6.099E+01	630	5.268E+01	671	2.425E+01	712	7.362E+00	753	1.459E+00
590	6.138E+01	631	5.197E+01	672	2.363E+01	713	7.195E+00	754	1.417E+00
591	6.161E+01	632	5.141E+01	673	2.309E+01	714	6.912E+00	755	1.246E+00
592	6.181E+01	633	5.068E+01	674	2.246E+01	715	6.613E+00	756	1.270E+00
593	6.197E+01	634	5.009E+01	675	2.195E+01	716	6.372E+00	757	1.312E+00
594	6.227E+01	635	4.938E+01	676	2.130E+01	717	6.232E+00	758	8.428E-01
595	6.240E+01	636	4.871E+01	677	2.082E+01	718	6.041E+00	759	1.114E+00
596	6.258E+01	637	4.812E+01	678	2.021E+01	719	5.716E+00	760	9.823E-01
597	6.279E+01	638	4.733E+01	679	1.974E+01	720	5.534E+00	761	9.726E-01
598	6.280E+01	639	4.671E+01	680	1.917E+01	721	5.351E+00	762	1.042E+00
599	6.285E+01	640	4.587E+01	681	1.873E+01	722	5.246E+00	763	1.030E+00
600	6.298E+01	641	4.522E+01	682	1.818E+01	723	4.998E+00	764	9.963E-01
601	6.299E+01	642	4.450E+01	683	1.779E+01	724	4.657E+00	765	8.471E-01
602	6.290E+01	643	4.388E+01	684	1.719E+01	725	4.688E+00	766	8.241E-01
603	6.290E+01	644	4.319E+01	685	1.679E+01	726	4.437E+00	767	7.870E-01
604	6.290E+01	645	4.249E+01	686	1.624E+01	727	4.194E+00	768	9.196E-01
605	6.286E+01	646	4.167E+01	687	1.589E+01	728	4.147E+00	769	8.090E-01
606	6.282E+01	647	4.088E+01	688	1.544E+01	729	3.992E+00	770	6.206E-01
607	6.254E+01	648	4.016E+01	689	1.494E+01	730	3.938E+00	771	6.986E-01
608	6.248E+01	649	3.952E+01	690	1.452E+01	731	3.597E+00	772	7.025E-01
609	6.222E+01	650	3.871E+01	691	1.418E+01	732	3.556E+00	773	5.914E-01
610	6.206E+01	651	3.803E+01	692	1.376E+01	733	3.335E+00	774	5.691E-01
611	6.180E+01	652	3.734E+01	693	1.339E+01	734	3.230E+00	775	6.291E-01
612	6.168E+01	653	3.642E+01	694	1.305E+01	735	3.131E+00	776	5.344E-01
613	6.124E+01	654	3.575E+01	695	1.262E+01	736	2.904E+00	777	5.633E-01
614	6.089E+01	655	3.507E+01	696	1.215E+01	737	2.833E+00	778	5.331E-01
615	6.059E+01	656	3.440E+01	697	1.188E+01	738	2.639E+00	779	4.599E-01
616	6.018E+01	657	3.365E+01	698	1.154E+01	739	2.571E+00	780	4.076E-01
617	5.978E+01	658	3.299E+01	699	1.121E+01	740	2.500E+00		
618	5.940E+01	659	3.223E+01	700	1.082E+01	741	2.423E+00		
619	5.901E+01	660	3.149E+01	701	1.062E+01	742	2.350E+00		
620	5.853E+01	661	3.083E+01	702	1.018E+01	743	2.227E+00		
621	5.803E+01	662	3.014E+01	703	9.936E+00	744	2.071E+00		
622	5.758E+01	663	2.947E+01	704	9.574E+00	745	1.945E+00		
623	5.692E+01	664	2.887E+01	705	9.211E+00	746	1.791E+00		
624	5.640E+01	665	2.804E+01	706	8.907E+00	747	1.817E+00		
625	5.571E+01	666	2.742E+01	707	8.678E+00	748	1.747E+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**

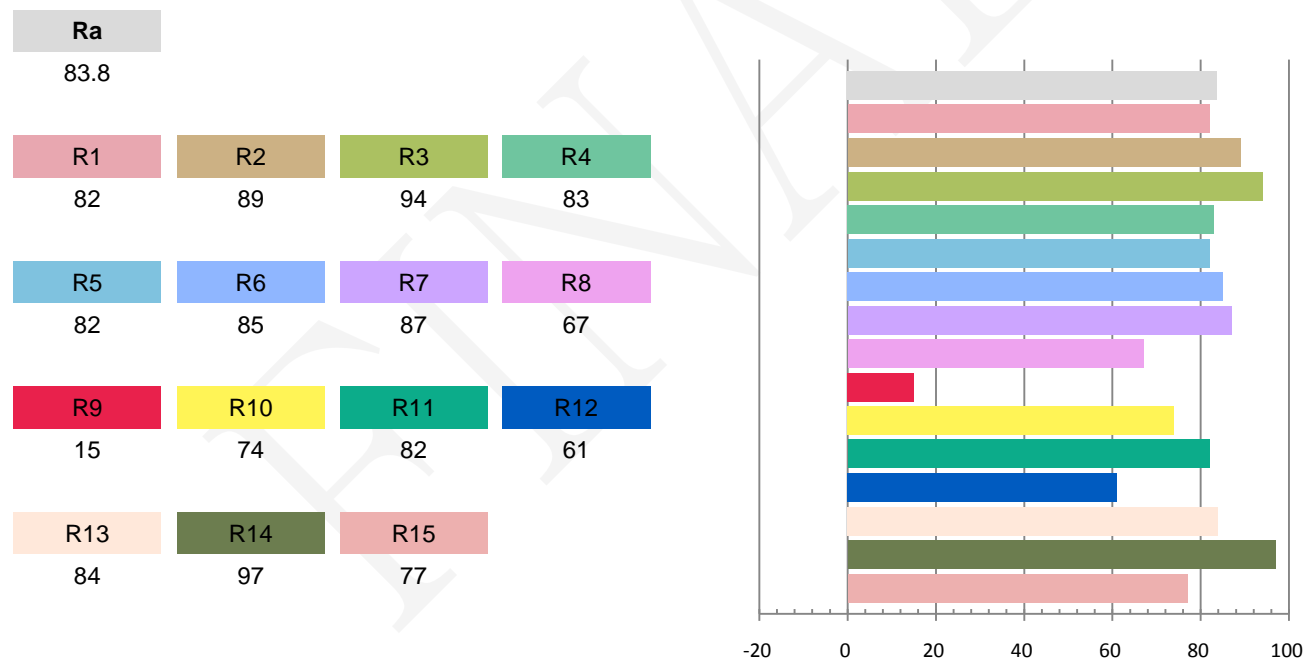
Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.2503	30	0.9988	3348.95	111.63

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
10.180	3978	0.00129	0.3824	0.3807	0.2248	0.5036

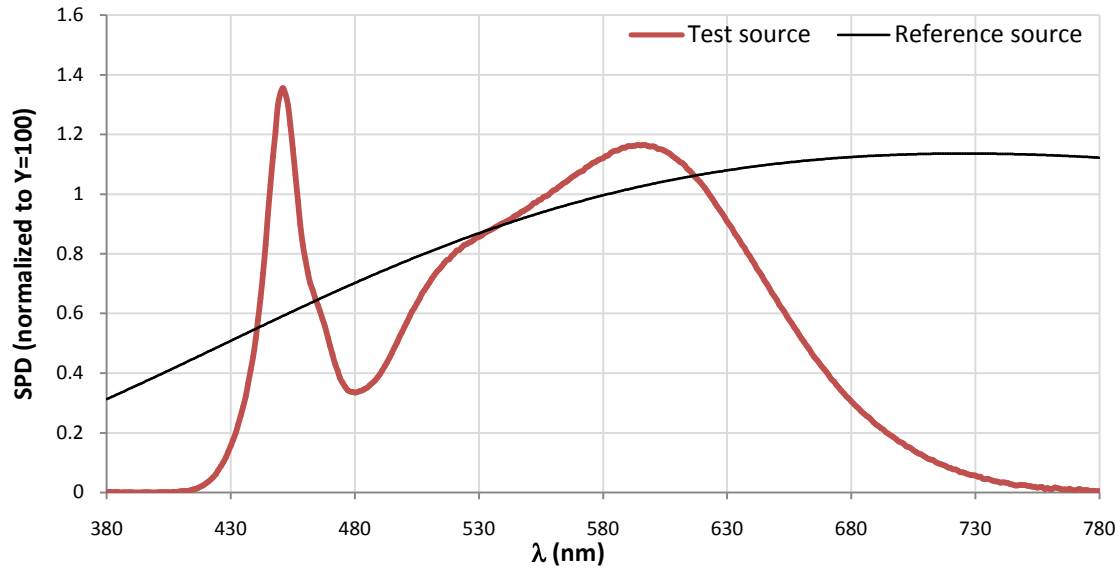
Color Rendering Index



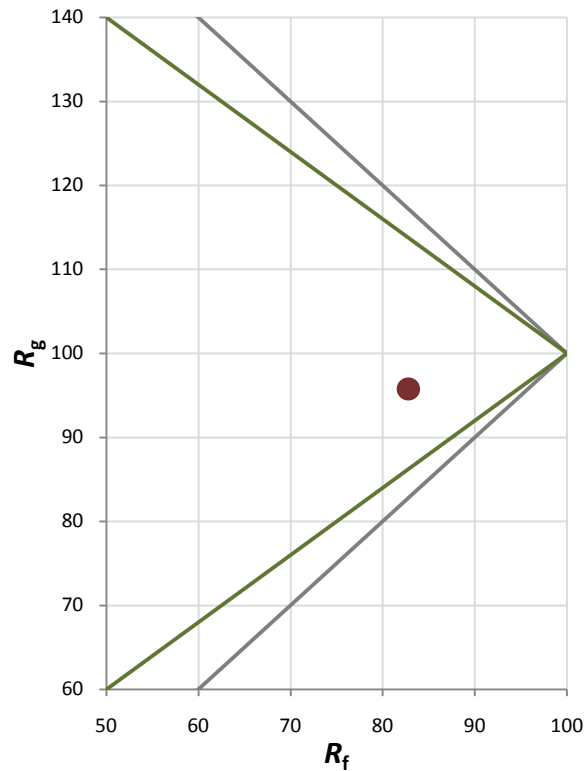
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	96

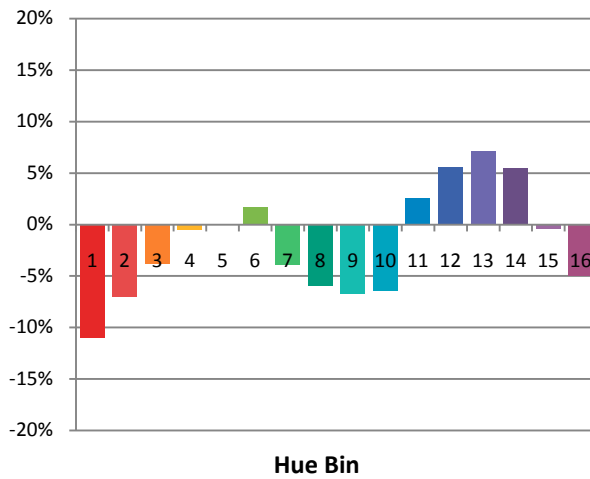
Spectral Power Distribution Comparison



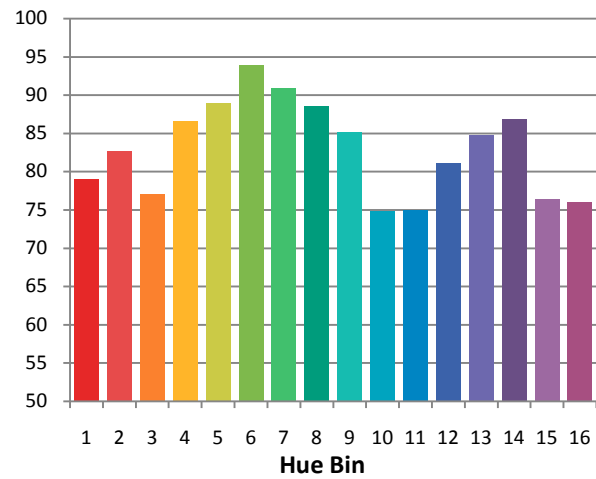
Plot of R_g versus R_f



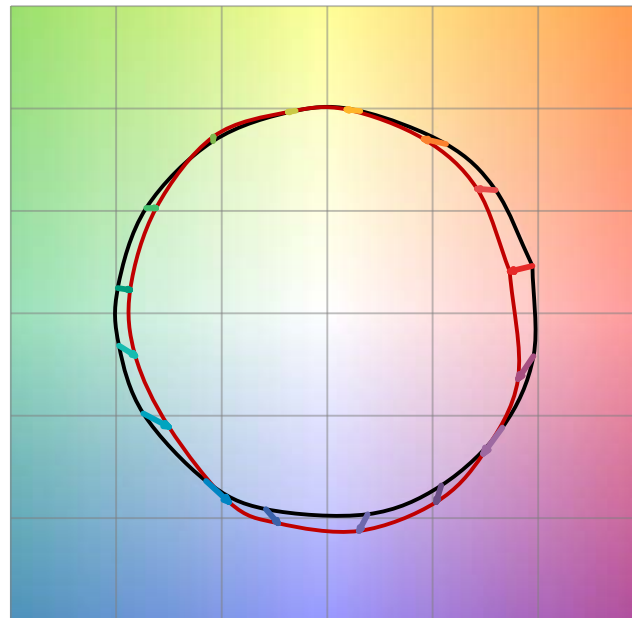
Chroma Shift by Hue



R_t by Hue

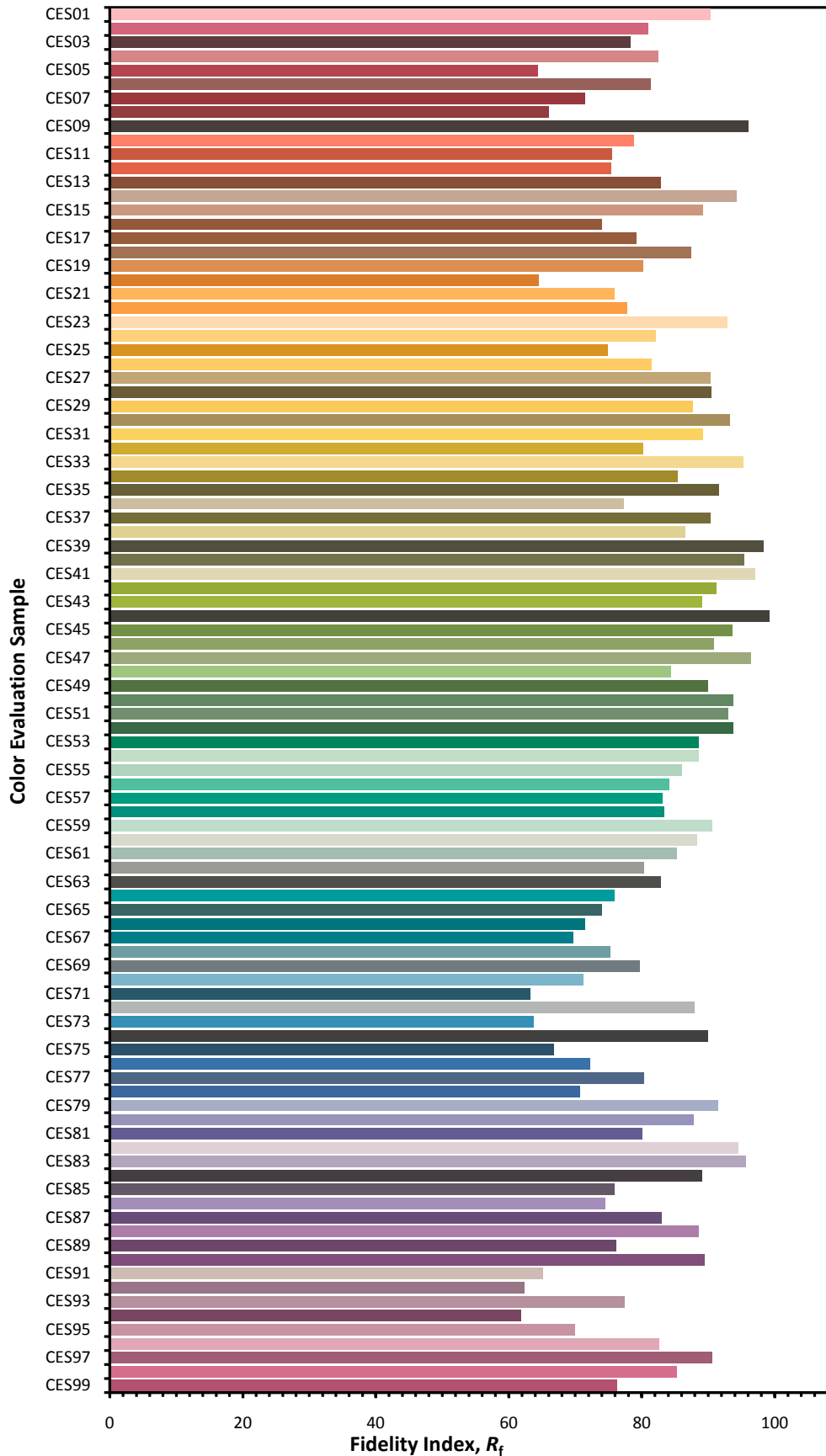


Color Vector Graphic

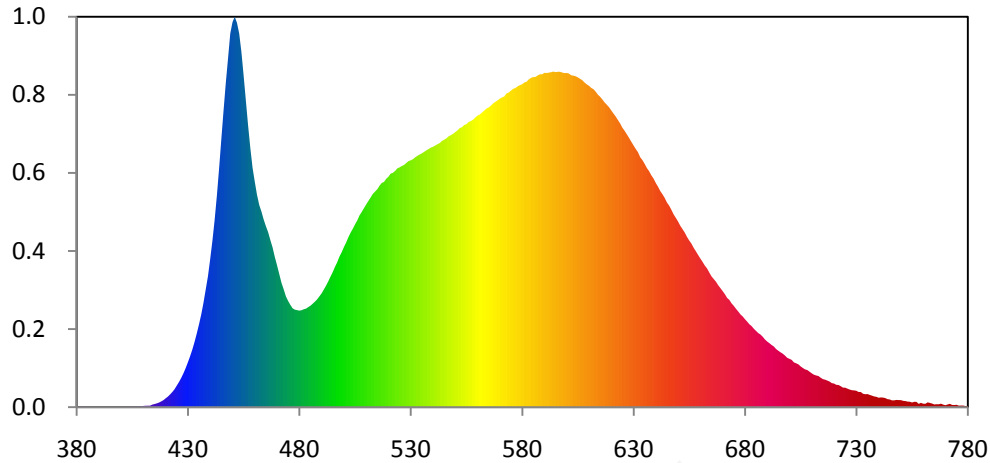


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



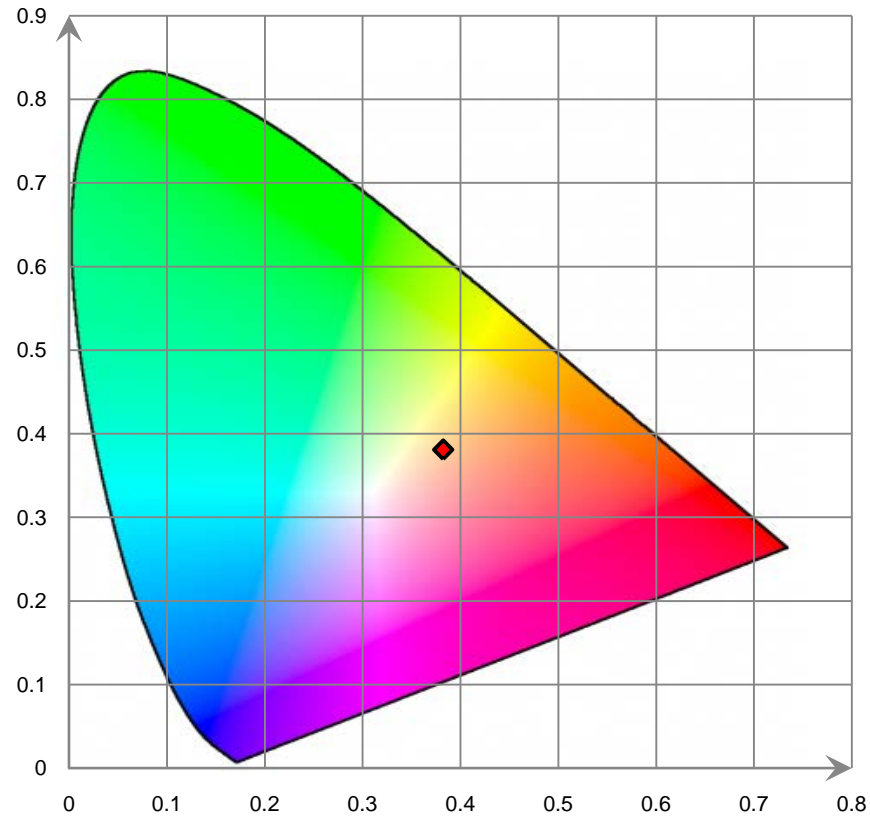
Relative Spectral Power Distribution



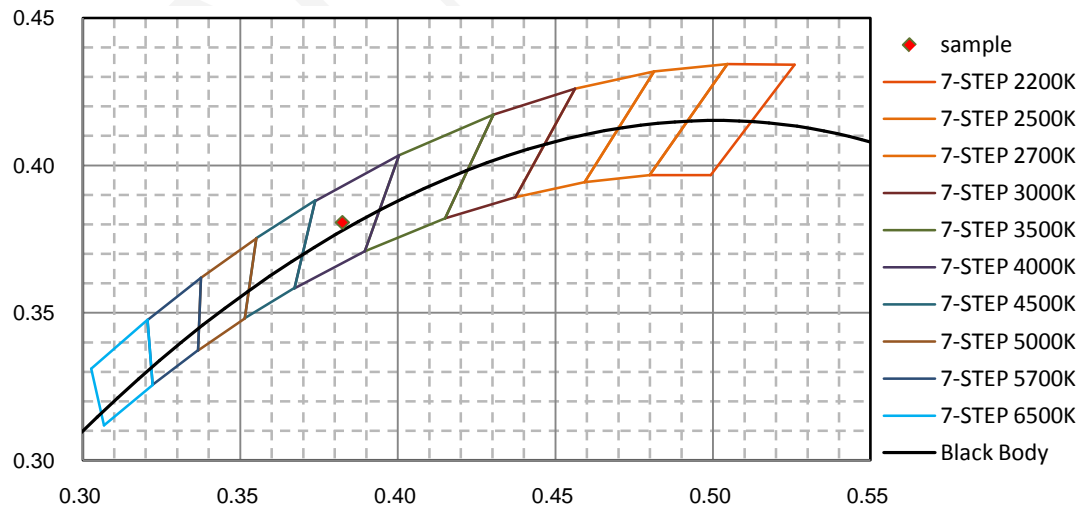
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.530E-02	421	1.803E+00	462	3.441E+01	503	2.968E+01	544	4.530E+01
381	8.700E-02	422	2.170E+00	463	3.328E+01	504	3.036E+01	545	4.551E+01
382	5.490E-02	423	2.585E+00	464	3.193E+01	505	3.110E+01	546	4.574E+01
383	2.880E-02	424	3.061E+00	465	3.079E+01	506	3.178E+01	547	4.609E+01
384	7.420E-02	425	3.684E+00	466	2.977E+01	507	3.263E+01	548	4.628E+01
385	3.870E-02	426	4.291E+00	467	2.843E+01	508	3.321E+01	549	4.651E+01
386	9.800E-03	427	4.992E+00	468	2.718E+01	509	3.386E+01	550	4.681E+01
387	6.110E-02	428	5.777E+00	469	2.555E+01	510	3.449E+01	551	4.710E+01
388	2.360E-02	429	6.674E+00	470	2.414E+01	511	3.510E+01	552	4.750E+01
389	3.220E-02	430	7.651E+00	471	2.264E+01	512	3.568E+01	553	4.764E+01
390	6.600E-02	431	8.699E+00	472	2.114E+01	513	3.630E+01	554	4.801E+01
391	1.980E-02	432	9.840E+00	473	2.004E+01	514	3.669E+01	555	4.815E+01
392	8.500E-03	433	1.114E+01	474	1.883E+01	515	3.709E+01	556	4.853E+01
393	1.040E-02	434	1.259E+01	475	1.806E+01	516	3.769E+01	557	4.869E+01
394	2.800E-03	435	1.415E+01	476	1.739E+01	517	3.815E+01	558	4.892E+01
395	4.710E-02	436	1.582E+01	477	1.682E+01	518	3.833E+01	559	4.929E+01
396	4.170E-02	437	1.781E+01	478	1.659E+01	519	3.887E+01	560	4.961E+01
397	3.140E-02	438	2.006E+01	479	1.651E+01	520	3.922E+01	561	4.980E+01
398	1.410E-02	439	2.231E+01	480	1.643E+01	521	3.975E+01	562	5.013E+01
399	8.000E-04	440	2.522E+01	481	1.650E+01	522	3.987E+01	563	5.047E+01
400	4.400E-03	441	2.835E+01	482	1.666E+01	523	4.021E+01	564	5.080E+01
401	3.160E-02	442	3.191E+01	483	1.677E+01	524	4.064E+01	565	5.100E+01
402	6.000E-02	443	3.603E+01	484	1.703E+01	525	4.081E+01	566	5.132E+01
403	5.510E-02	444	4.067E+01	485	1.726E+01	526	4.104E+01	567	5.170E+01
404	3.220E-02	445	4.565E+01	486	1.760E+01	527	4.122E+01	568	5.196E+01
405	6.980E-02	446	5.052E+01	487	1.796E+01	528	4.154E+01	569	5.221E+01
406	2.590E-02	447	5.518E+01	488	1.835E+01	529	4.187E+01	570	5.251E+01
407	1.198E-01	448	5.934E+01	489	1.885E+01	530	4.201E+01	571	5.271E+01
408	5.170E-02	449	6.358E+01	490	1.937E+01	531	4.219E+01	572	5.288E+01
409	1.351E-01	450	6.551E+01	491	2.002E+01	532	4.251E+01	573	5.338E+01
410	2.156E-01	451	6.644E+01	492	2.069E+01	533	4.278E+01	574	5.355E+01
411	2.434E-01	452	6.541E+01	493	2.143E+01	534	4.299E+01	575	5.386E+01
412	2.535E-01	453	6.361E+01	494	2.223E+01	535	4.319E+01	576	5.418E+01
413	2.596E-01	454	6.046E+01	495	2.299E+01	536	4.344E+01	577	5.431E+01
414	4.400E-01	455	5.644E+01	496	2.388E+01	537	4.370E+01	578	5.460E+01
415	5.379E-01	456	5.219E+01	497	2.465E+01	538	4.392E+01	579	5.479E+01
416	6.472E-01	457	4.796E+01	498	2.563E+01	539	4.416E+01	580	5.495E+01
417	7.843E-01	458	4.413E+01	499	2.636E+01	540	4.431E+01	581	5.525E+01
418	9.778E-01	459	4.076E+01	500	2.724E+01	541	4.452E+01	582	5.538E+01
419	1.195E+00	460	3.837E+01	501	2.802E+01	542	4.474E+01	583	5.578E+01
420	1.507E+00	461	3.614E+01	502	2.891E+01	543	4.494E+01	584	5.604E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	5.617E+01	626	4.702E+01	667	2.136E+01	708	6.315E+00	749	1.211E+00
586	5.619E+01	627	4.643E+01	668	2.075E+01	709	6.036E+00	750	1.205E+00
587	5.645E+01	628	4.582E+01	669	2.027E+01	710	5.762E+00	751	1.084E+00
588	5.665E+01	629	4.516E+01	670	1.975E+01	711	5.522E+00	752	1.040E+00
589	5.665E+01	630	4.455E+01	671	1.923E+01	712	5.396E+00	753	9.503E-01
590	5.689E+01	631	4.393E+01	672	1.859E+01	713	5.302E+00	754	9.329E-01
591	5.686E+01	632	4.339E+01	673	1.826E+01	714	5.016E+00	755	7.965E-01
592	5.692E+01	633	4.254E+01	674	1.767E+01	715	4.778E+00	756	9.136E-01
593	5.700E+01	634	4.204E+01	675	1.724E+01	716	4.677E+00	757	9.068E-01
594	5.710E+01	635	4.140E+01	676	1.674E+01	717	4.523E+00	758	5.667E-01
595	5.701E+01	636	4.069E+01	677	1.628E+01	718	4.360E+00	759	7.454E-01
596	5.707E+01	637	4.015E+01	678	1.578E+01	719	4.090E+00	760	5.943E-01
597	5.707E+01	638	3.945E+01	679	1.544E+01	720	4.019E+00	761	5.791E-01
598	5.694E+01	639	3.889E+01	680	1.498E+01	721	3.805E+00	762	8.151E-01
599	5.685E+01	640	3.814E+01	681	1.456E+01	722	3.770E+00	763	7.291E-01
600	5.686E+01	641	3.751E+01	682	1.411E+01	723	3.573E+00	764	6.206E-01
601	5.677E+01	642	3.678E+01	683	1.380E+01	724	3.326E+00	765	4.647E-01
602	5.648E+01	643	3.623E+01	684	1.335E+01	725	3.320E+00	766	5.035E-01
603	5.641E+01	644	3.560E+01	685	1.297E+01	726	3.157E+00	767	4.891E-01
604	5.631E+01	645	3.482E+01	686	1.261E+01	727	3.003E+00	768	5.958E-01
605	5.612E+01	646	3.429E+01	687	1.236E+01	728	2.887E+00	769	4.398E-01
606	5.588E+01	647	3.358E+01	688	1.198E+01	729	2.855E+00	770	3.350E-01
607	5.564E+01	648	3.281E+01	689	1.152E+01	730	2.800E+00	771	4.650E-01
608	5.525E+01	649	3.221E+01	690	1.117E+01	731	2.584E+00	772	5.683E-01
609	5.493E+01	650	3.158E+01	691	1.089E+01	732	2.586E+00	773	3.849E-01
610	5.469E+01	651	3.086E+01	692	1.057E+01	733	2.283E+00	774	3.709E-01
611	5.433E+01	652	3.029E+01	693	1.032E+01	734	2.207E+00	775	4.026E-01
612	5.411E+01	653	2.971E+01	694	9.896E+00	735	2.232E+00	776	2.681E-01
613	5.370E+01	654	2.897E+01	695	9.604E+00	736	2.092E+00	777	2.813E-01
614	5.317E+01	655	2.836E+01	696	9.338E+00	737	1.968E+00	778	2.790E-01
615	5.282E+01	656	2.783E+01	697	9.093E+00	738	1.824E+00	779	1.929E-01
616	5.237E+01	657	2.712E+01	698	8.779E+00	739	1.764E+00	780	2.340E-01
617	5.186E+01	658	2.652E+01	699	8.399E+00	740	1.608E+00		
618	5.146E+01	659	2.590E+01	700	8.225E+00	741	1.662E+00		
619	5.105E+01	660	2.529E+01	701	8.047E+00	742	1.636E+00		
620	5.050E+01	661	2.472E+01	702	7.622E+00	743	1.549E+00		
621	4.997E+01	662	2.410E+01	703	7.469E+00	744	1.367E+00		
622	4.946E+01	663	2.362E+01	704	7.288E+00	745	1.313E+00		
623	4.886E+01	664	2.292E+01	705	6.942E+00	746	1.153E+00		
624	4.827E+01	665	2.226E+01	706	6.669E+00	747	1.162E+00		
625	4.755E+01	666	2.180E+01	707	6.432E+00	748	1.233E+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**

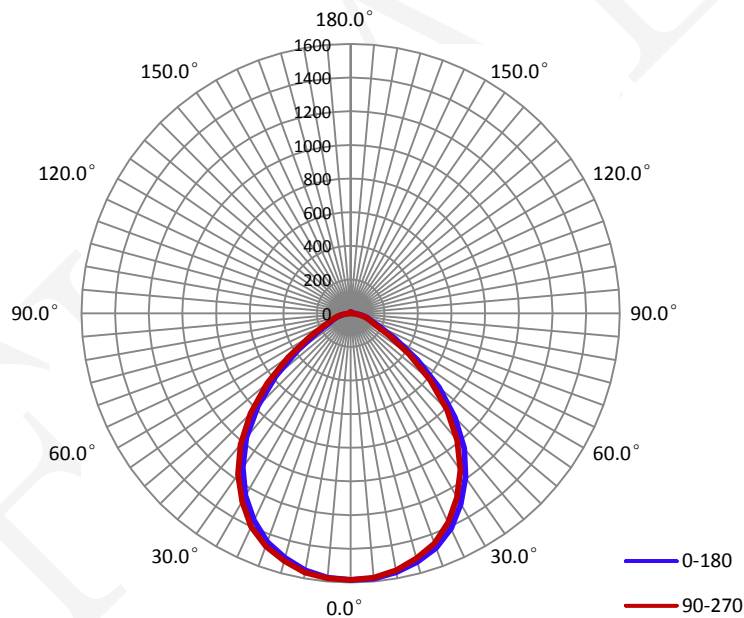
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2550	30.2	0.9880

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
3271	108.36	1585.1	1.20	1.20

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	91.8	91.8	91.8	91.9	91.8
Field Angle (10% I_{max}):	131.8	131.7	131.9	131.9	131.8

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1585	1585	1585	1585	1585	1585	1585	1585
5.0°	1583	1580	1577	1577	1577	1576	1572	1572
10.0°	1563	1559	1555	1553	1552	1551	1543	1544
15.0°	1530	1527	1520	1513	1509	1509	1504	1501
20.0°	1484	1478	1470	1459	1457	1456	1443	1446
25.0°	1412	1401	1392	1380	1372	1368	1356	1356
30.0°	1309	1301	1292	1279	1265	1262	1247	1249
35.0°	1191	1182	1166	1148	1138	1129	1119	1121
40.0°	1050	1036	1020	1001	986	976	968	968
45.0°	877	868	848	829	810	800	790	788
50.0°	686	669	654	631	617	602	595	591
55.0°	486	471	454	440	423	409	400	397
60.0°	309	300	287	275	261	248	239	240
65.0°	191	185	177	169	162	156	152	150
70.0°	128	127	126	123	120	116	115	114
75.0°	100	99	96	93	90	86	84	83
80.0°	68	66	64	61	56	53	51	50
85.0°	32	30	28	25	21	18	16	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	1	0	1	0
135.0°	0	1	1	1	1	1	2	1
140.0°	2	2	2	2	2	2	2	2
145.0°	3	3	3	3	3	3	3	3
150.0°	3	4	4	4	4	4	4	4
155.0°	4	5	5	5	5	5	5	5
160.0°	5	5	5	5	6	5	5	5
165.0°	5	5	6	6	6	6	6	6
170.0°	6	6	7	6	6	6	6	6
175.0°	7	7	7	7	7	7	7	7
180.0°	6	7	7	7	7	7	7	7

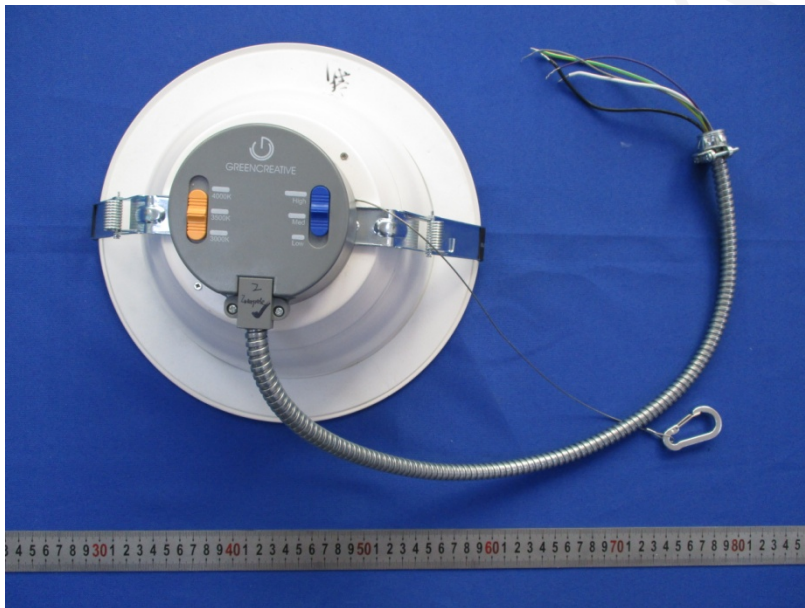
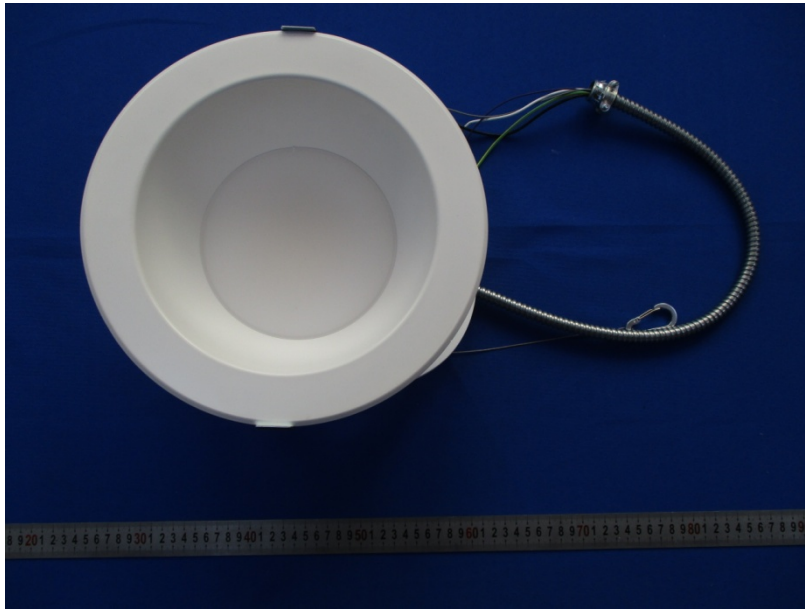
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1585	1585	1585	1585	1585	1585	1585	1585
5.0°	1577	1573	1575	1576	1581	1585	1581	1585
10.0°	1550	1552	1553	1555	1564	1564	1566	1563
15.0°	1505	1508	1511	1518	1524	1531	1528	1534
20.0°	1447	1453	1460	1464	1474	1485	1482	1483
25.0°	1359	1366	1375	1384	1399	1406	1408	1411
30.0°	1250	1258	1268	1277	1293	1309	1308	1312
35.0°	1117	1128	1135	1153	1169	1182	1184	1190
40.0°	965	974	984	999	1019	1034	1041	1041
45.0°	777	791	807	825	843	859	870	872
50.0°	581	594	613	628	648	665	677	675
55.0°	385	398	417	435	454	470	477	474
60.0°	231	240	251	268	284	297	301	301
65.0°	146	150	155	163	173	181	184	185
70.0°	110	112	116	120	122	125	126	127
75.0°	78	81	85	89	92	96	98	98
80.0°	46	49	51	55	59	63	65	65
85.0°	12	14	18	19	23	27	29	30
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	1	1	1	1	1	1
140.0°	1	1	2	2	2	1	1	2
145.0°	2	2	2	3	3	2	3	2
150.0°	3	3	3	3	3	3	3	3
155.0°	4	4	4	4	4	5	4	4
160.0°	4	5	5	5	6	5	5	5
165.0°	5	5	5	6	6	6	5	6
170.0°	5	6	6	6	6	7	6	6
175.0°	6	6	7	7	7	7	7	7
180.0°	6	6	7	7	7	7	7	7

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	37.8	1.16	0-5	37.8	1.16
5-10	112.1	3.43	0-10	149.9	4.58
10-15	182.3	5.57	0-15	332.2	10.15
15-20	245.8	7.51	0-20	577.9	17.67
20-25	298.8	9.13	0-25	876.7	26.80
25-30	337.1	10.31	0-30	1213.8	37.11
30-35	358.3	10.95	0-35	1572.1	48.06
35-40	359.9	11.00	0-40	1932.1	59.07
40-45	339.3	10.37	0-45	2271.3	69.44
45-50	295.3	9.03	0-50	2566.6	78.46
50-55	232.6	7.11	0-55	2799.2	85.57
55-60	163.5	5.00	0-60	2962.7	90.57
60-65	106.5	3.26	0-65	3069.2	93.83
65-70	72.9	2.23	0-70	3142.1	96.06
70-75	55.1	1.68	0-75	3197.2	97.74
75-80	39.6	1.21	0-80	3236.8	98.95
80-85	21.7	0.66	0-85	3258.4	99.61
85-90	6.1	0.19	0-90	3264.5	99.80
90-95	0.0	0.00	0-95	3264.5	99.80
95-100	0.0	0.00	0-100	3264.5	99.80
100-105	0.0	0.00	0-105	3264.5	99.80
105-110	0.0	0.00	0-110	3264.5	99.80
110-115	0.0	0.00	0-115	3264.5	99.80
115-120	0.0	0.00	0-120	3264.5	99.80
120-125	0.0	0.00	0-125	3264.5	99.80
125-130	0.0	0.00	0-130	3264.5	99.80
130-135	0.2	0.01	0-135	3264.7	99.81
135-140	0.5	0.01	0-140	3265.2	99.82
140-145	0.7	0.02	0-145	3265.9	99.84
145-150	0.9	0.03	0-150	3266.8	99.87
150-155	1.0	0.03	0-155	3267.8	99.90
155-160	1.0	0.03	0-160	3268.8	99.93
160-165	0.9	0.03	0-165	3269.7	99.96
165-170	0.7	0.02	0-170	3270.4	99.98
170-175	0.5	0.01	0-175	3270.9	100.00
175-180	0.2	0.00	0-180	3271.0	100.00

6. Product Photo



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