

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

Test Model: 55587

Report Type:	Electrical and Photometric tests including: Input Current, Power, Power Factor, Luminous Flux, Luminous Efficacy, CRI, CCT, Chromaticity Coordinate, Spectral Power Distribution, THD
Test Engineer:	Hexy He
Report Number:	P2DG180104052-10-2
Test Date:	2018-01-09
Report Date:	2018-01-12
Reviewed By:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.

1. Product Description

General Information:

One sample was received on 2018-01-04 and used for testing.

Model Tested:	55587
Manufacturer:	P.Q.L., Inc.
Brand Name:	Superior Life®
Product Designation:	2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces
Burning Time Before Test:	0hour(For New Products)
Driver Model:	SLP 50-I1400 120-277 W D1 P

Rated Values:

Rated Voltage/Frequency:	AC 120-277V 50/ 60Hz
Rated Power:	50 W
Nominal Light Output:	6250lm
Nominal CCT:	4000K, 5000K

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition (This method is not in IAS accreditation scope)

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
1.5m temperature integrating sphere	SENSING	SPR-600	S09008	2017-07-11	2018-07-11
High-precision rapid spectral analysis system	EVERFINE	HAAS-2000	M112048CA1361 125	2017-07-11	2018-07-11
Digital power meter	YOKOGAWA	WT310	13398	2017-12-14	2018-12-14
Programmable Precision DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	2017-03-03	2018-03-03
thermometer	SENSING	NA	NA	2017-03-09	2018-03-09
Standard Light Source	SENSING	NA	LSD090808	2017-12-05	2018-12-05
Precision frequency power supply	ALL Power	APW-105N	970613	2017-03-03	2018-03-03
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2017-03-03	2018-03-03
Digital power meter	YOKOGAWA	WT-210	91j926132	2017-03-03	2018-03-03
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N1012 0001	2017-03-09	2018-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	2017-03-20	2018-03-20
Standard Light Source	EVERFINE	D908	1012003	2017-12-17	2018-12-17

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) 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 $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=25\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.1(K=2)$, at the 95% confidence level.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.17\%$ of rdg, Power $U=0.48\%$ ($K=2$), 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 intensity is $U=2.82\%$ ($K=2$), at the 95% confidence level.

Additional Test

The Additional Test item may not be covered by IESNA LM-79-2008. Additional test including power factor, off-state power and THD, was measured by Digital Power Meter after stabilized at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$. Test voltage for THD and power factor test would be equal to rated voltage or, in case of a voltage range, maximum value of that range.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.46\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f , R_g was calculated according to IES TM-30-15 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

5. Test Result - 55587-40K

[Integrating Sphere System]

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

Test orientation: **Downward**

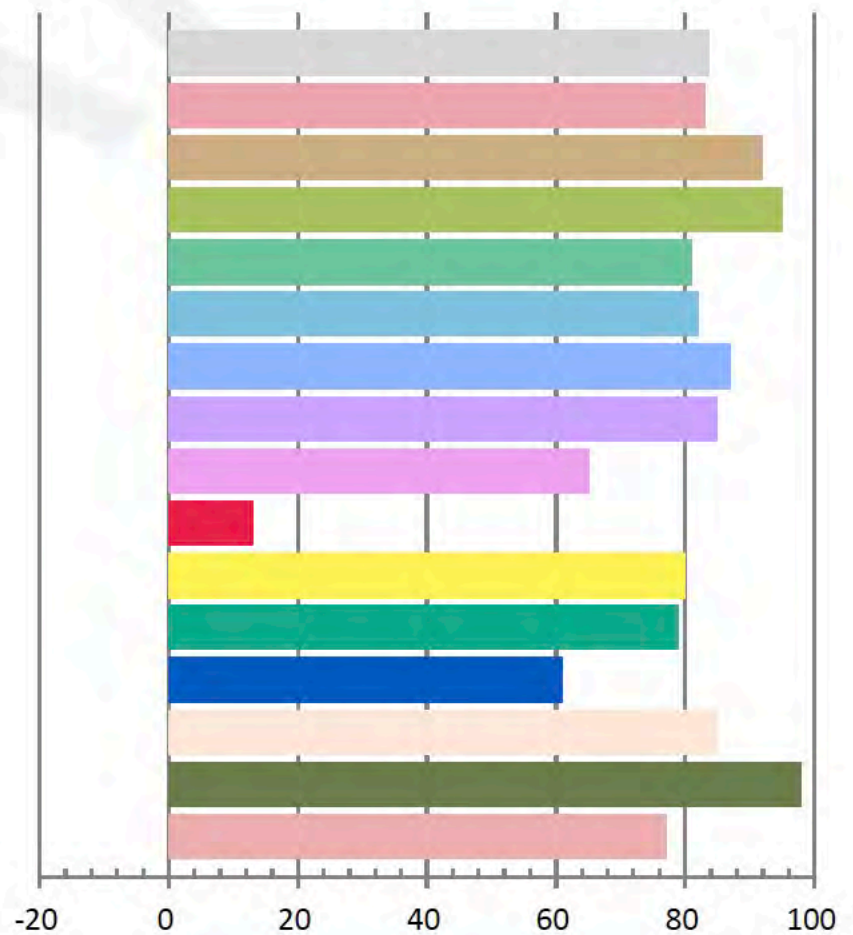
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.4216	50.37	0.9956	6339.6	125.86

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
19.508	4119	-0.00136	0.3745	0.3701	0.2238	0.4977

Color Rendering Index

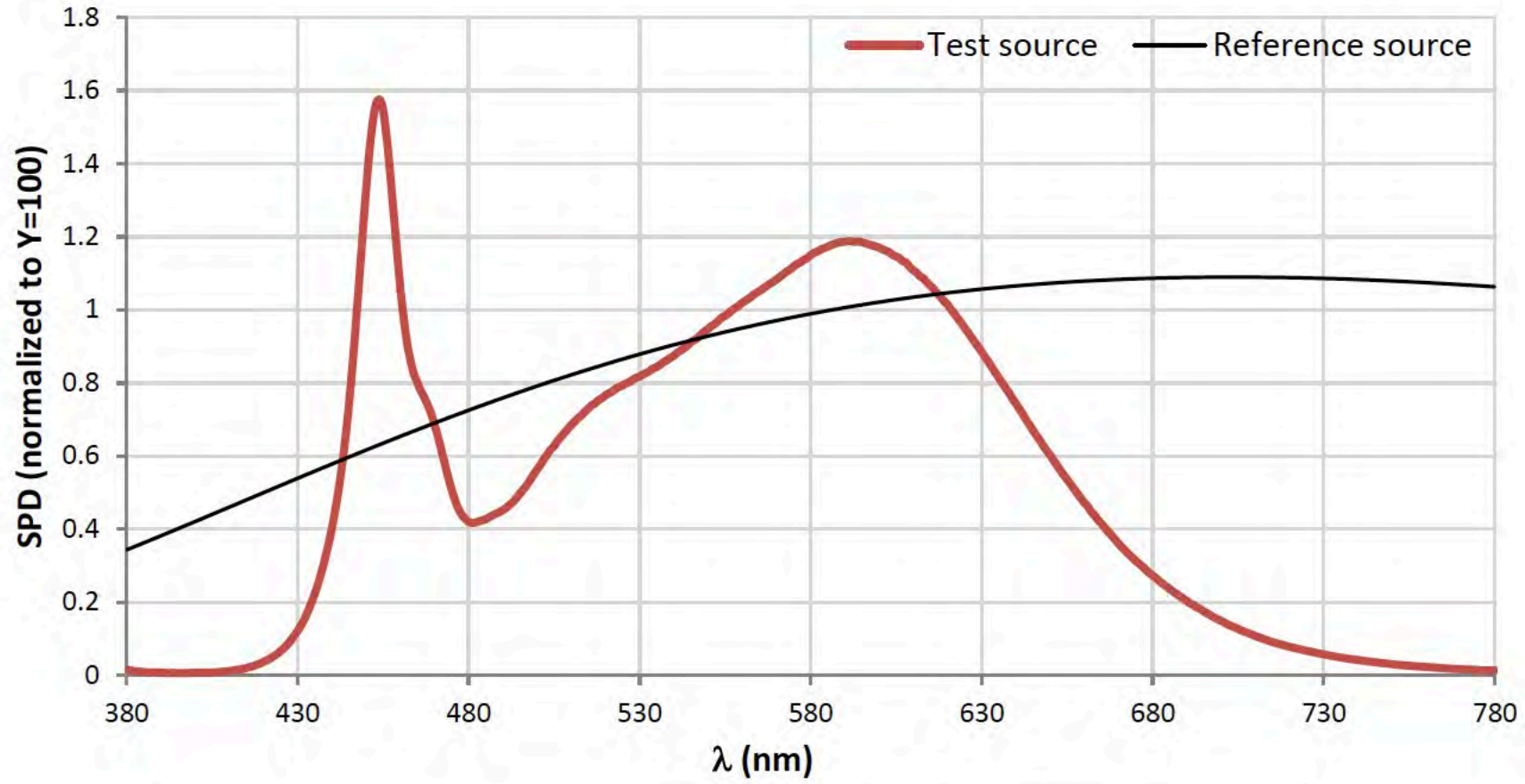
Ra			
83.8			
R1	R2	R3	R4
83	92	95	81
R5	R6	R7	R8
82	87	85	65
R9	R10	R11	R12
13	80	79	61
R13	R14	R15	
85	98	77	



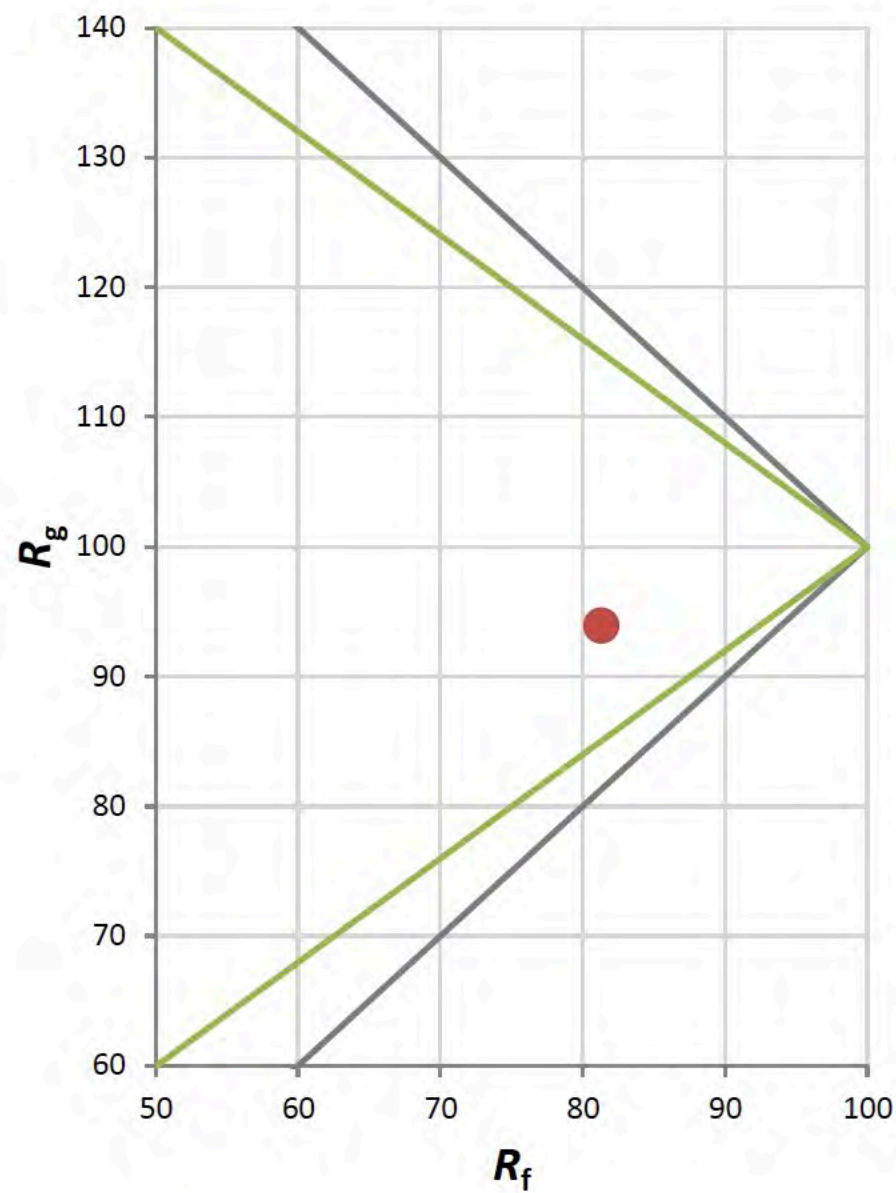
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	94

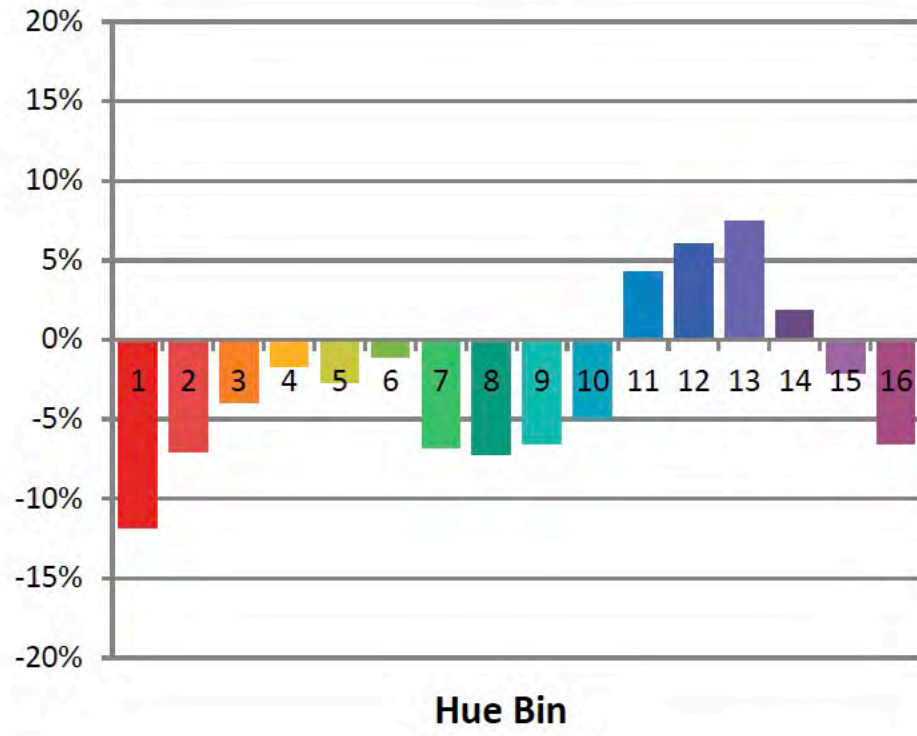
Spectral Power Distribution Comparison



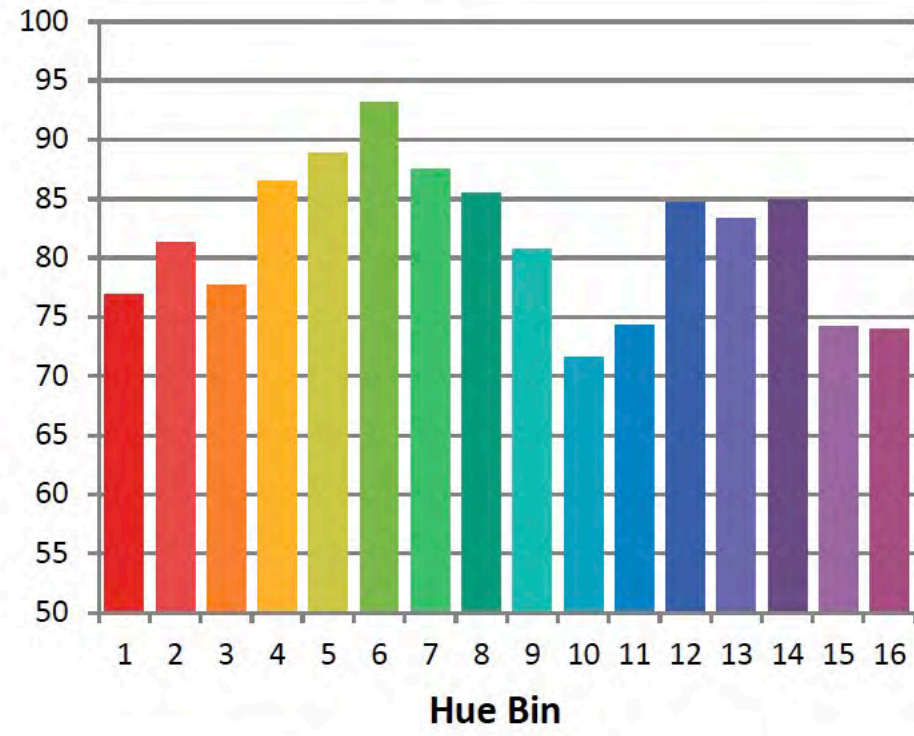
Plot of R_g versus R_f



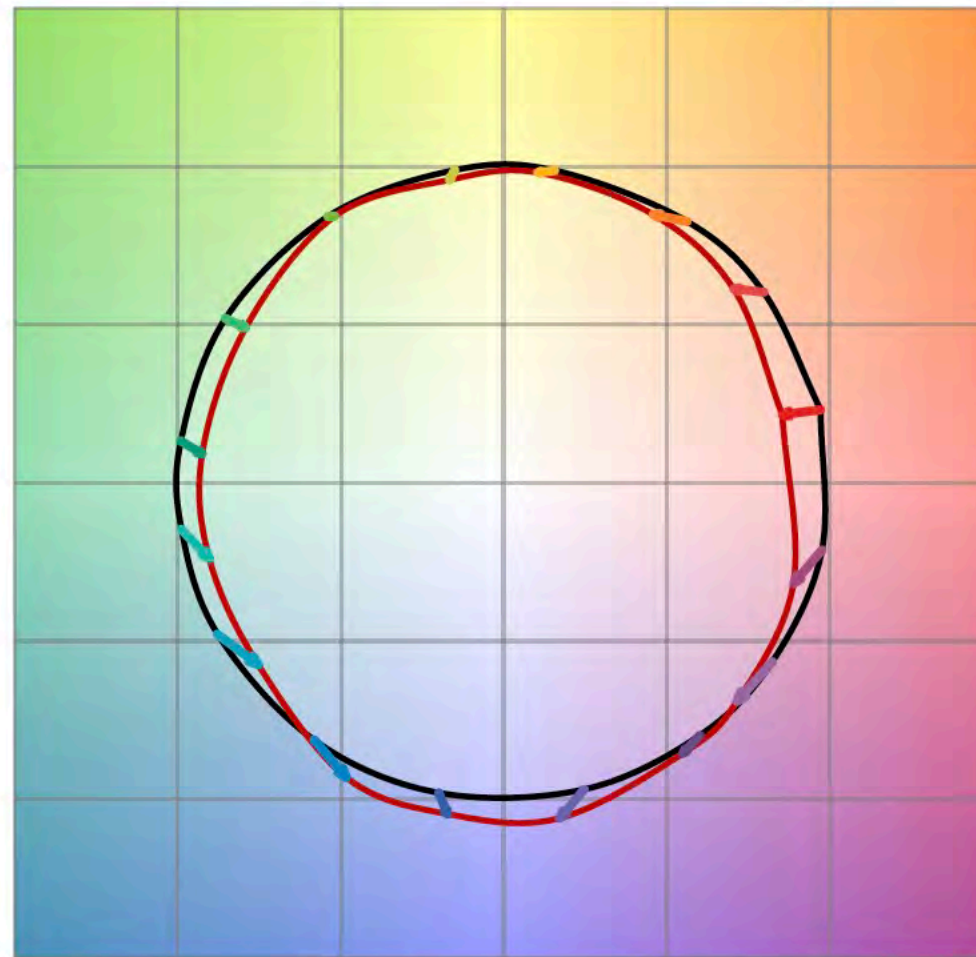
Chroma Shift by Hue



R_f by Hue

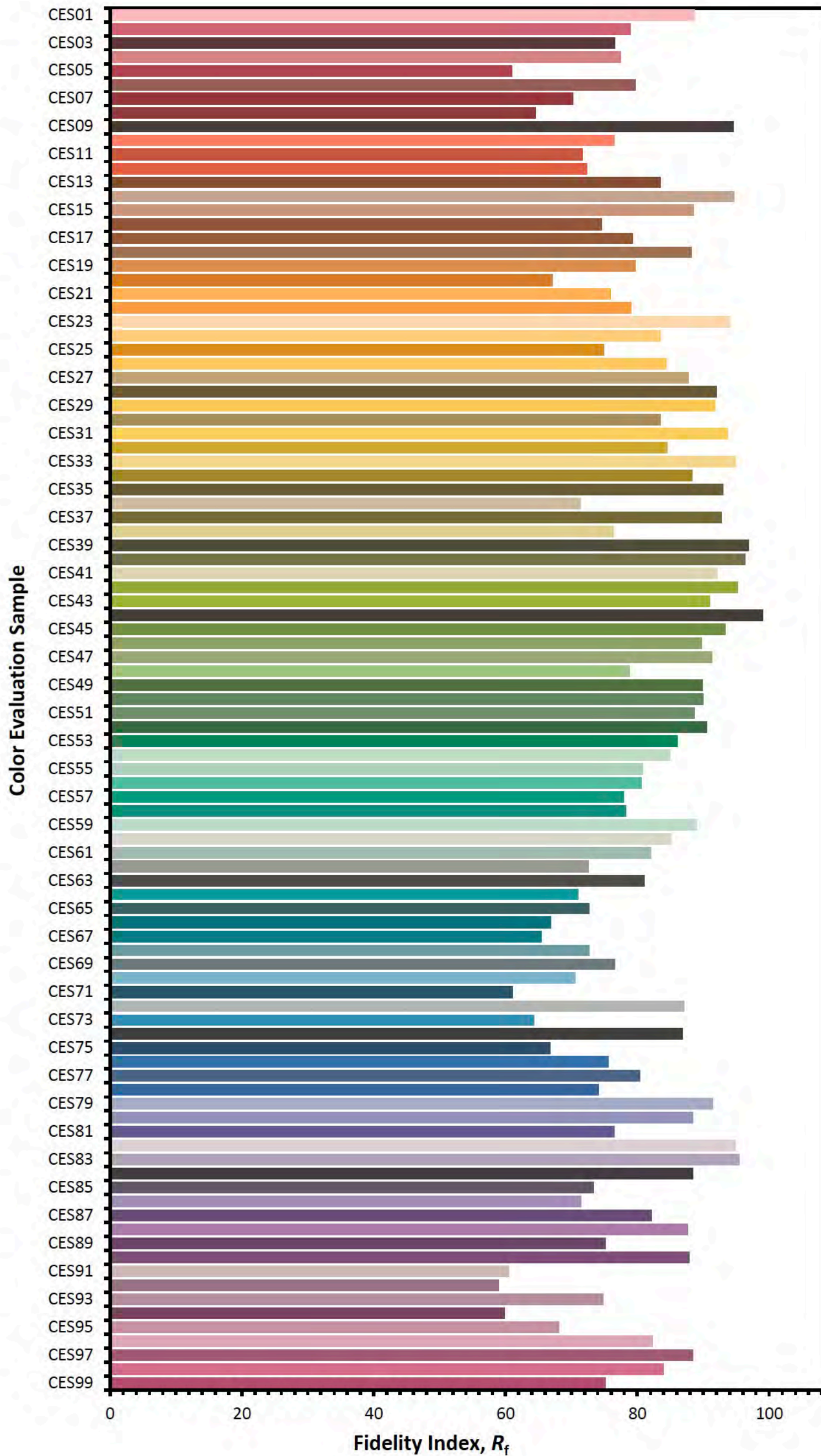


Color Vector Graphic

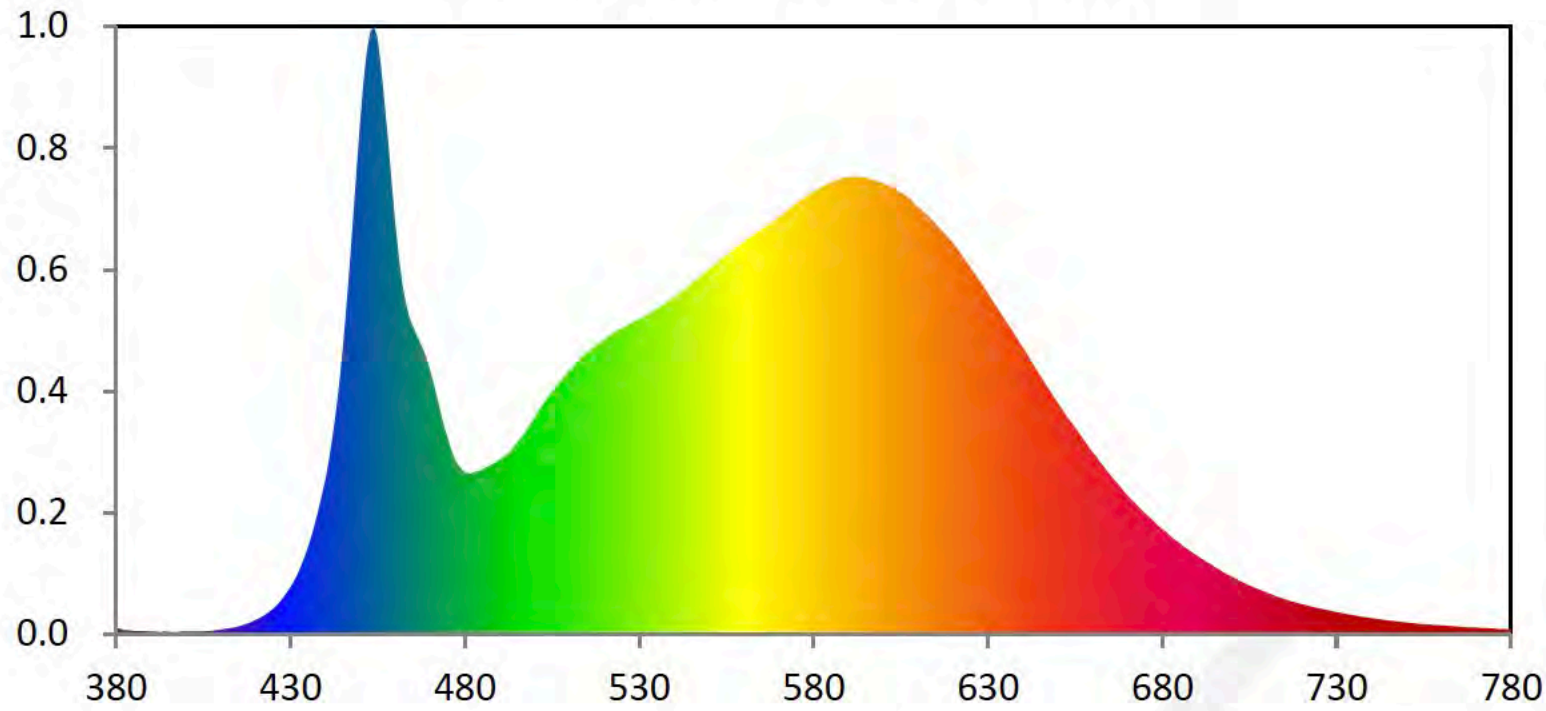


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



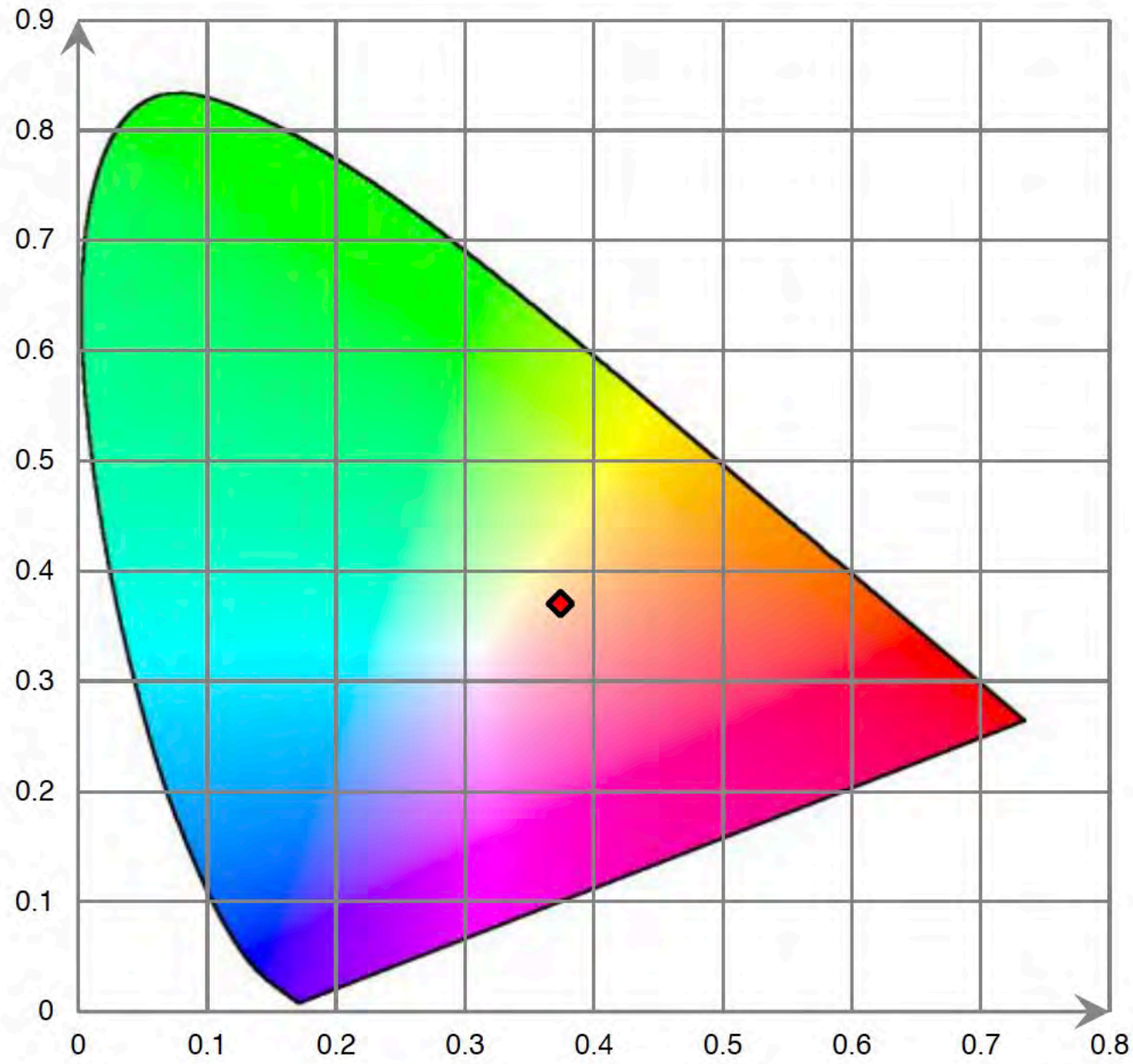
Relative Spectral Power Distribution



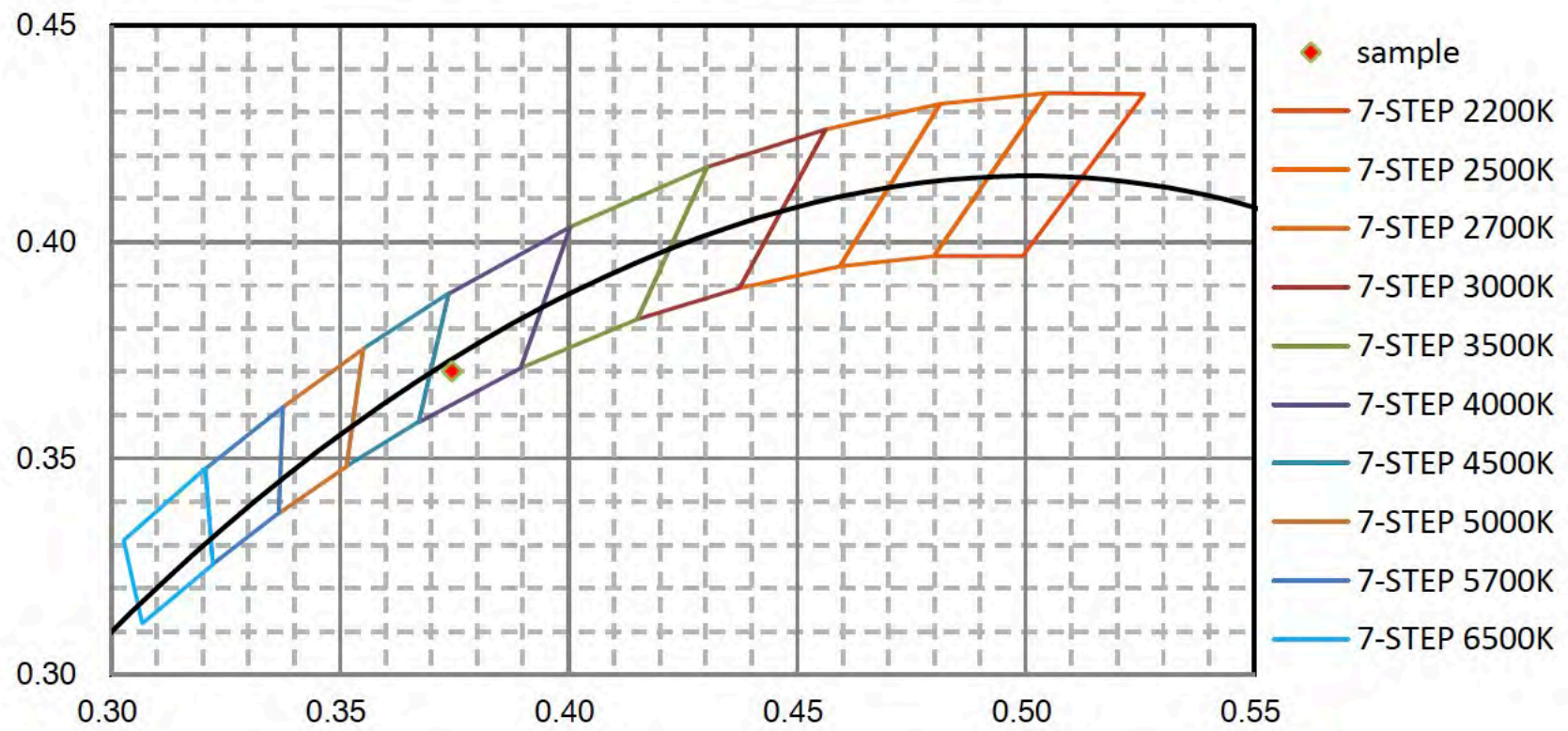
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.397E+00	421	3.827E+00	462	8.460E+01	503	5.609E+01	544	8.378E+01
381	1.387E+00	422	4.333E+00	463	8.006E+01	504	5.732E+01	545	8.463E+01
382	1.066E+00	423	4.879E+00	464	7.657E+01	505	5.825E+01	546	8.515E+01
383	1.049E+00	424	5.422E+00	465	7.446E+01	506	5.952E+01	547	8.574E+01
384	9.586E-01	425	6.192E+00	466	7.236E+01	507	6.053E+01	548	8.663E+01
385	8.315E-01	426	6.908E+00	467	7.072E+01	508	6.159E+01	549	8.737E+01
386	7.980E-01	427	7.826E+00	468	6.877E+01	509	6.259E+01	550	8.792E+01
387	7.571E-01	428	8.896E+00	469	6.670E+01	510	6.359E+01	551	8.871E+01
388	8.044E-01	429	1.006E+01	470	6.384E+01	511	6.446E+01	552	8.926E+01
389	7.456E-01	430	1.130E+01	471	6.083E+01	512	6.533E+01	553	9.005E+01
390	6.721E-01	431	1.269E+01	472	5.742E+01	513	6.604E+01	554	9.086E+01
391	6.879E-01	432	1.428E+01	473	5.397E+01	514	6.698E+01	555	9.131E+01
392	6.182E-01	433	1.625E+01	474	5.053E+01	515	6.778E+01	556	9.198E+01
393	6.212E-01	434	1.831E+01	475	4.740E+01	516	6.861E+01	557	9.270E+01
394	6.914E-01	435	2.067E+01	476	4.462E+01	517	6.910E+01	558	9.334E+01
395	5.726E-01	436	2.331E+01	477	4.242E+01	518	6.992E+01	559	9.390E+01
396	5.671E-01	437	2.626E+01	478	4.081E+01	519	7.044E+01	560	9.464E+01
397	6.033E-01	438	2.951E+01	479	3.982E+01	520	7.111E+01	561	9.518E+01
398	6.221E-01	439	3.319E+01	480	3.902E+01	521	7.168E+01	562	9.579E+01
399	6.648E-01	440	3.722E+01	481	3.876E+01	522	7.211E+01	563	9.641E+01
400	6.722E-01	441	4.182E+01	482	3.880E+01	523	7.281E+01	564	9.708E+01
401	6.461E-01	442	4.721E+01	483	3.911E+01	524	7.330E+01	565	9.758E+01
402	6.700E-01	443	5.323E+01	484	3.941E+01	525	7.362E+01	566	9.814E+01
403	7.436E-01	444	6.035E+01	485	3.966E+01	526	7.417E+01	567	9.881E+01
404	7.037E-01	445	6.842E+01	486	4.018E+01	527	7.447E+01	568	9.943E+01
405	7.407E-01	446	7.808E+01	487	4.063E+01	528	7.510E+01	569	9.992E+01
406	8.052E-01	447	8.869E+01	488	4.107E+01	529	7.563E+01	570	1.006E+02
407	8.447E-01	448	9.999E+01	489	4.146E+01	530	7.589E+01	571	1.012E+02
408	9.604E-01	449	1.117E+02	490	4.198E+01	531	7.643E+01	572	1.019E+02
409	1.026E+00	450	1.229E+02	491	4.258E+01	532	7.689E+01	573	1.026E+02
410	1.112E+00	451	1.330E+02	492	4.331E+01	533	7.733E+01	574	1.031E+02
411	1.249E+00	452	1.406E+02	493	4.406E+01	534	7.804E+01	575	1.038E+02
412	1.421E+00	453	1.453E+02	494	4.506E+01	535	7.831E+01	576	1.045E+02
413	1.506E+00	454	1.463E+02	495	4.615E+01	536	7.891E+01	577	1.049E+02
414	1.662E+00	455	1.438E+02	496	4.721E+01	537	7.957E+01	578	1.055E+02
415	1.875E+00	456	1.371E+02	497	4.829E+01	538	8.006E+01	579	1.060E+02
416	2.157E+00	457	1.283E+02	498	4.961E+01	539	8.067E+01	580	1.067E+02
417	2.344E+00	458	1.184E+02	499	5.097E+01	540	8.116E+01	581	1.073E+02
418	2.701E+00	459	1.085E+02	500	5.226E+01	541	8.198E+01	582	1.077E+02
419	3.008E+00	460	9.902E+01	501	5.347E+01	542	8.248E+01	583	1.082E+02
420	3.406E+00	461	9.114E+01	502	5.487E+01	543	8.314E+01	584	1.085E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.089E+02	626	8.716E+01	667	3.648E+01	708	1.072E+01	749	2.972E+00
586	1.093E+02	627	8.591E+01	668	3.558E+01	709	1.041E+01	750	2.855E+00
587	1.096E+02	628	8.470E+01	669	3.456E+01	710	1.003E+01	751	2.738E+00
588	1.099E+02	629	8.349E+01	670	3.358E+01	711	9.699E+00	752	2.660E+00
589	1.101E+02	630	8.223E+01	671	3.255E+01	712	9.420E+00	753	2.601E+00
590	1.101E+02	631	8.087E+01	672	3.172E+01	713	9.076E+00	754	2.501E+00
591	1.103E+02	632	7.967E+01	673	3.081E+01	714	8.761E+00	755	2.473E+00
592	1.103E+02	633	7.831E+01	674	3.000E+01	715	8.525E+00	756	2.390E+00
593	1.101E+02	634	7.698E+01	675	2.919E+01	716	8.239E+00	757	2.328E+00
594	1.102E+02	635	7.570E+01	676	2.844E+01	717	7.982E+00	758	2.253E+00
595	1.100E+02	636	7.437E+01	677	2.769E+01	718	7.759E+00	759	2.226E+00
596	1.098E+02	637	7.304E+01	678	2.684E+01	719	7.530E+00	760	2.135E+00
597	1.095E+02	638	7.183E+01	679	2.609E+01	720	7.287E+00	761	2.105E+00
598	1.092E+02	639	7.037E+01	680	2.540E+01	721	7.073E+00	762	2.052E+00
599	1.090E+02	640	6.914E+01	681	2.473E+01	722	6.898E+00	763	1.987E+00
600	1.087E+02	641	6.780E+01	682	2.394E+01	723	6.676E+00	764	1.913E+00
601	1.082E+02	642	6.646E+01	683	2.325E+01	724	6.448E+00	765	1.859E+00
602	1.079E+02	643	6.499E+01	684	2.261E+01	725	6.252E+00	766	1.805E+00
603	1.075E+02	644	6.366E+01	685	2.199E+01	726	6.080E+00	767	1.736E+00
604	1.068E+02	645	6.233E+01	686	2.131E+01	727	5.900E+00	768	1.667E+00
605	1.064E+02	646	6.103E+01	687	2.072E+01	728	5.689E+00	769	1.635E+00
606	1.060E+02	647	5.975E+01	688	2.010E+01	729	5.524E+00	770	1.613E+00
607	1.052E+02	648	5.842E+01	689	1.953E+01	730	5.382E+00	771	1.552E+00
608	1.048E+02	649	5.719E+01	690	1.894E+01	731	5.195E+00	772	1.482E+00
609	1.037E+02	650	5.601E+01	691	1.830E+01	732	5.004E+00	773	1.501E+00
610	1.029E+02	651	5.469E+01	692	1.785E+01	733	4.859E+00	774	1.461E+00
611	1.023E+02	652	5.343E+01	693	1.724E+01	734	4.700E+00	775	1.384E+00
612	1.014E+02	653	5.215E+01	694	1.686E+01	735	4.575E+00	776	1.311E+00
613	1.008E+02	654	5.095E+01	695	1.624E+01	736	4.418E+00	777	1.317E+00
614	9.987E+01	655	4.977E+01	696	1.577E+01	737	4.243E+00	778	1.314E+00
615	9.897E+01	656	4.863E+01	697	1.525E+01	738	4.162E+00	779	1.317E+00
616	9.812E+01	657	4.743E+01	698	1.476E+01	739	4.062E+00	780	1.319E+00
617	9.711E+01	658	4.625E+01	699	1.431E+01	740	3.936E+00		
618	9.617E+01	659	4.505E+01	700	1.389E+01	741	3.803E+00		
619	9.509E+01	660	4.394E+01	701	1.345E+01	742	3.696E+00		
620	9.426E+01	661	4.297E+01	702	1.295E+01	743	3.538E+00		
621	9.306E+01	662	4.168E+01	703	1.257E+01	744	3.460E+00		
622	9.193E+01	663	4.069E+01	704	1.222E+01	745	3.348E+00		
623	9.076E+01	664	3.954E+01	705	1.182E+01	746	3.268E+00		
624	8.960E+01	665	3.862E+01	706	1.140E+01	747	3.138E+00		
625	8.835E+01	666	3.754E+01	707	1.108E+01	748	3.066E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

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

Test orientation: **Downward**

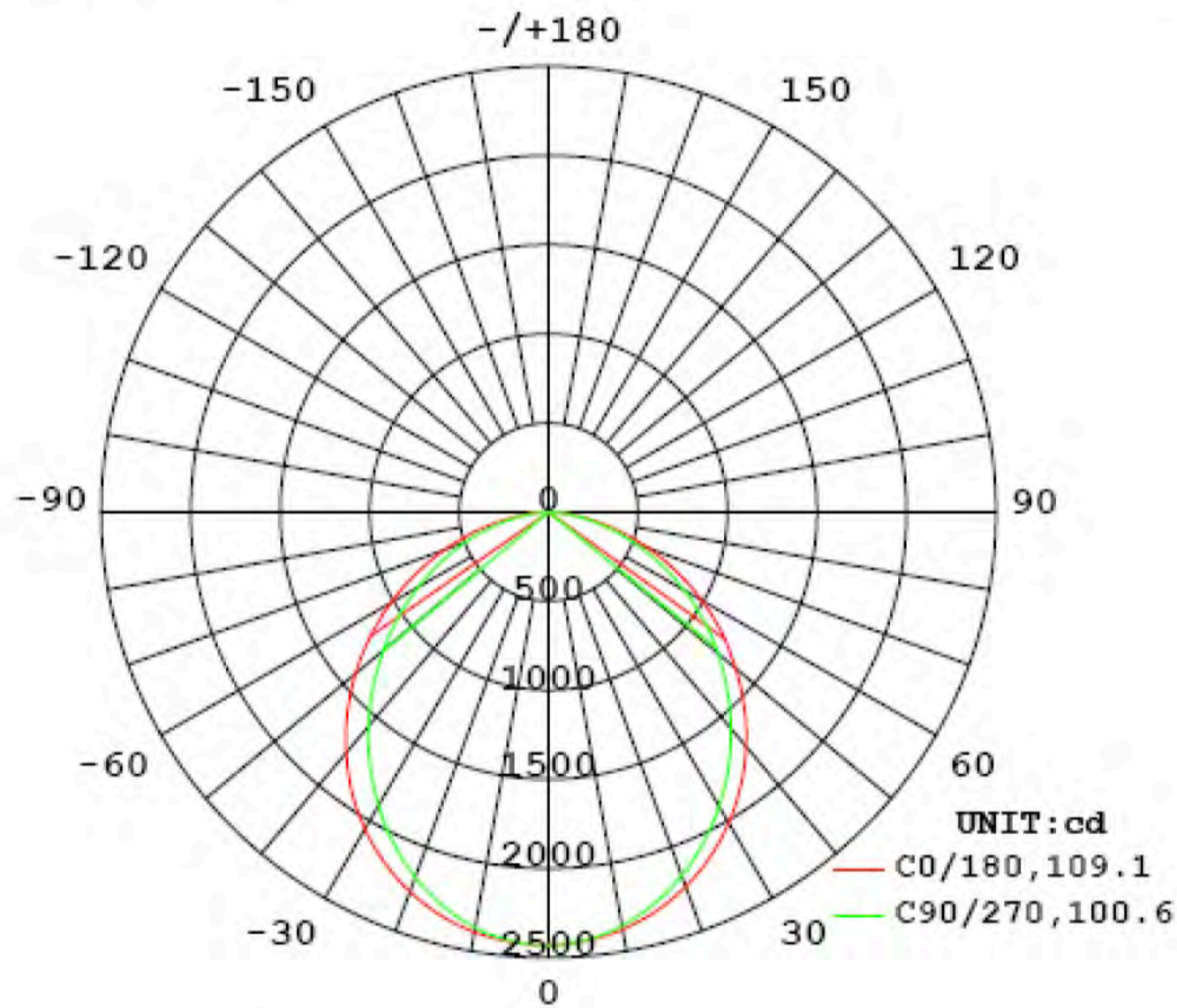
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.4217	50.32	0.9941

Photometric Measurement

Luminous Flux (lm)(total)	Efficacy (lm/W)(total)	Luminous Flux (lm)(0-90° zone)	Efficacy (lm/W)(0-90° zone)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
6340.7	126.01	6335.9	125.9	2429.0	1.24	1.18

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	109.1	104.3	100.6	104.2	104.6
Field Angle (10% I _{max}):	159.8	158.0	156.2	158.0	158.0

Luminous Intensity (cd) Distribution Data

C \ y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	2429	2429	2429	2429	2429	2429	2429	2429
5.0°	2422	2422	2420	2417	2415	2414	2414	2414
10.0°	2392	2391	2383	2373	2367	2366	2371	2376
15.0°	2341	2336	2319	2299	2287	2289	2301	2314
20.0°	2267	2258	2228	2197	2180	2184	2204	2227
25.0°	2171	2156	2114	2073	2050	2057	2086	2119
30.0°	2054	2033	1980	1928	1902	1911	1948	1991
35.0°	1917	1891	1828	1769	1739	1750	1793	1844
40.0°	1762	1732	1662	1598	1567	1578	1625	1682
45.0°	1592	1559	1485	1420	1388	1399	1448	1508
50.0°	1409	1374	1302	1238	1207	1218	1264	1323
55.0°	1217	1183	1114	1054	1024	1034	1078	1133
60.0°	1019	987	925	870	843	852	891	939
65.0°	818	791	737	690	666	673	705	746
70.0°	618	606	554	516	496	501	527	558
75.0°	427	410	379	349	333	337	355	376
80.0°	249	239	219	199	187	189	200	211
85.0°	100	95	85	68	61	61	68	76
90.0°	7	4	12	1	0	0	1	4
95.0°	0	0	0	0	0	0	0	0
100.0°	1	0	0	0	0	0	1	1
105.0°	1	1	1	1	1	1	1	1
110.0°	1	1	1	1	1	1	1	1
115.0°	1	1	1	1	1	1	1	1
120.0°	1	1	1	1	1	1	1	1
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	2	2	2	2	1	1
150.0°	1	2	2	2	2	2	2	1
155.0°	1	2	2	2	2	2	2	2
160.0°	2	2	2	2	2	2	2	2
165.0°	2	2	2	2	2	2	2	2
170.0°	2	2	2	2	2	2	2	2
175.0°	2	2	2	2	2	2	2	2
180.0°	2	2	1	1	1	1	2	2

Luminous Intensity (cd) Distribution Data (cont.)

$\gamma \backslash C$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	2429	2429	2429	2429	2429	2429	2429	2429
5.0°	2414	2412	2410	2408	2409	2411	2416	2420
10.0°	2377	2372	2364	2357	2357	2363	2375	2387
15.0°	2318	2307	2291	2278	2277	2287	2308	2330
20.0°	2236	2221	2196	2176	2172	2187	2217	2250
25.0°	2134	2114	2080	2052	2047	2066	2104	2149
30.0°	2013	1987	1945	1913	1906	1928	1974	2026
35.0°	1872	1843	1796	1759	1750	1775	1826	1887
40.0°	1715	1684	1633	1594	1585	1611	1665	1730
45.0°	1545	1513	1461	1421	1411	1438	1494	1560
50.0°	1363	1333	1282	1246	1239	1262	1315	1379
55.0°	1183	1153	1105	1068	1058	1084	1138	1200
60.0°	986	959	916	881	873	898	947	1005
65.0°	787	764	727	697	689	712	757	807
70.0°	590	572	543	517	511	531	569	611
75.0°	402	388	366	347	343	359	390	422
80.0°	231	222	208	195	192	205	227	249
85.0°	87	83	73	63	63	69	89	103
90.0°	0	0	0	0	0	0	0	1
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°	1	1	1	1	0	0	0	0
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	2
170.0°	2	2	1	1	1	1	1	2
175.0°	2	2	2	1	1	1	1	2
180.0°	2	2	2	1	1	1	1	2

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	57.9	0.91	0-5	57.9	0.91
5-10	171.3	2.70	0-10	229.2	3.61
10-15	277.5	4.38	0-15	506.7	7.99
15-20	372.3	5.87	0-20	878.9	13.86
20-25	452.1	7.13	0-25	1331.0	20.99
25-30	514.1	8.11	0-30	1845.1	29.10
30-35	556.5	8.78	0-35	2401.6	37.88
35-40	578.2	9.11	0-40	2979.8	46.99
40-45	579.2	9.14	0-45	3559.0	56.13
45-50	560.3	8.84	0-50	4119.3	64.97
50-55	524.1	8.26	0-55	4643.4	73.23
55-60	470.8	7.43	0-60	5114.2	80.66
60-65	403.1	6.35	0-65	5517.3	87.01
65-70	325.0	5.13	0-70	5842.3	92.14
70-75	241.1	3.80	0-75	6083.4	95.94
75-80	156.2	2.47	0-80	6239.6	98.41
80-85	77.8	1.22	0-85	6317.4	99.63
85-90	18.5	0.29	0-90	6335.9	99.92
90-95	0.3	0.01	0-95	6336.2	99.93
95-100	0.2	0.00	0-100	6336.4	99.93
100-105	0.2	0.01	0-105	6336.6	99.94
105-110	0.2	0.00	0-110	6336.9	99.94
110-115	0.2	0.00	0-115	6337.1	99.94
115-120	0.3	0.01	0-120	6337.4	99.95
120-125	0.3	0.00	0-125	6337.6	99.95
125-130	0.3	0.01	0-130	6337.9	99.96
130-135	0.3	0.00	0-135	6338.3	99.96
135-140	0.4	0.01	0-140	6338.6	99.97
140-145	0.4	0.00	0-145	6339.0	99.97
145-150	0.4	0.01	0-150	6339.4	99.98
150-155	0.4	0.01	0-155	6339.8	99.99
155-160	0.3	0.00	0-160	6340.1	99.99
160-165	0.3	0.00	0-165	6340.4	99.99
165-170	0.2	0.01	0-170	6340.5	100.00
170-175	0.1	0.00	0-175	6340.7	100.00
175-180	0.0	0.00	0-180	6340.7	100.00

5. Test Result - 55587-50K

[Integrating Sphere System]

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

Test orientation: **Downward**

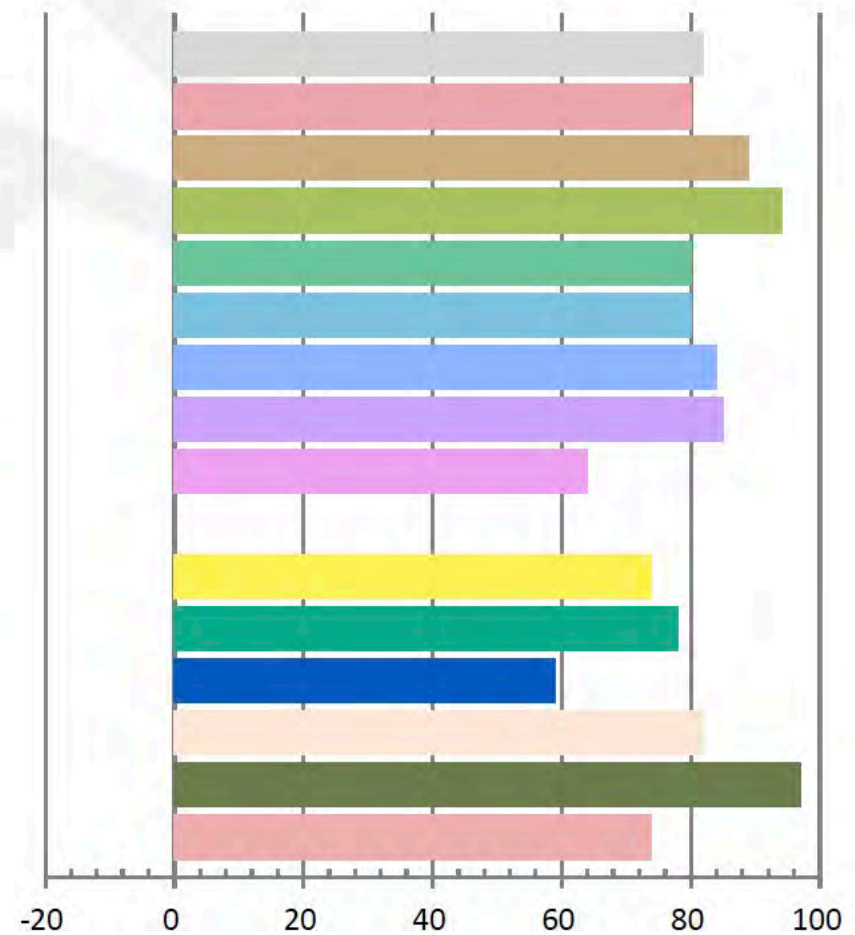
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.4258	50.89	0.9962	6564.3	128.98

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
20.142	5075	0.00383	0.3437	0.3582	0.2080	0.4876

Color Rendering Index

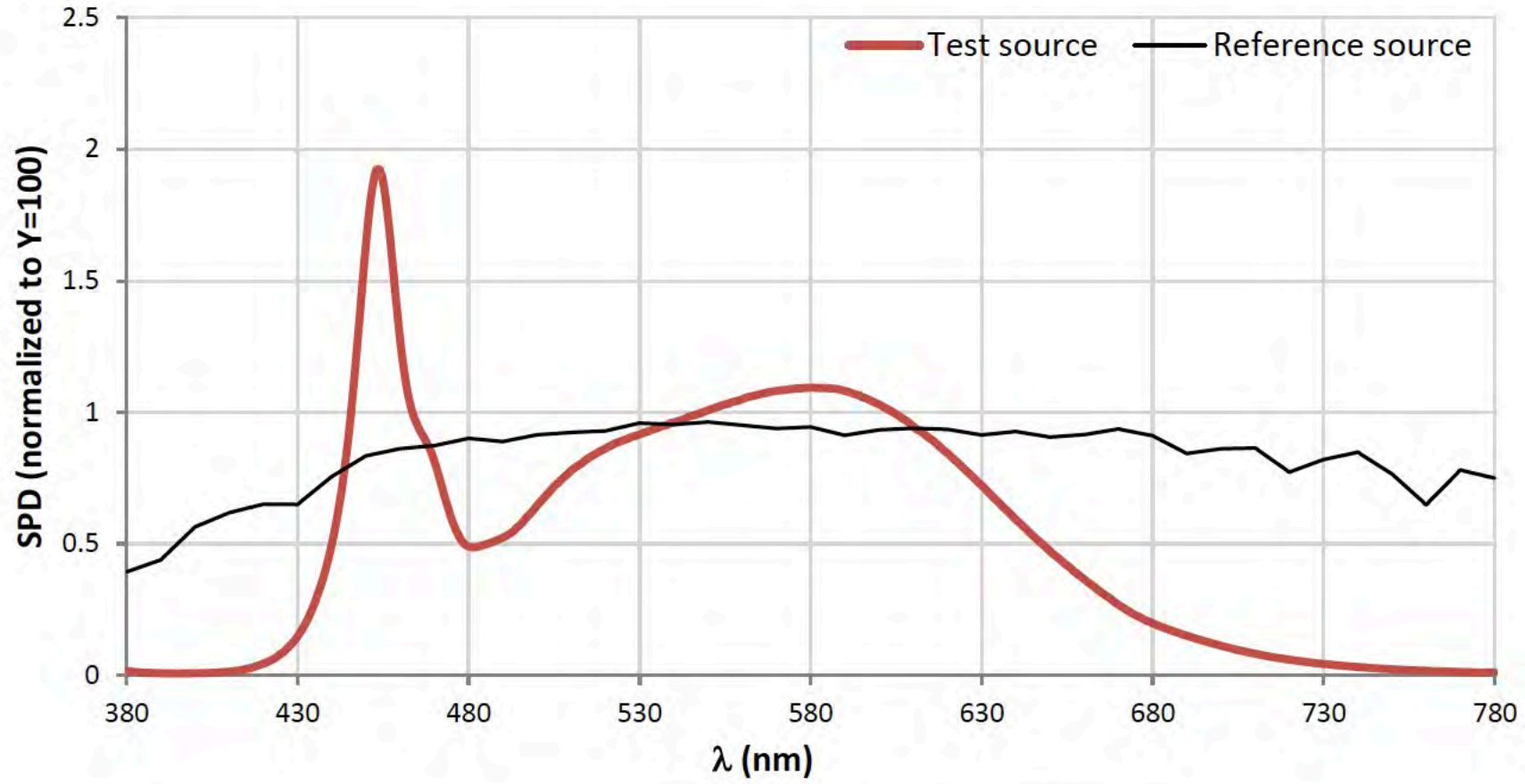
Ra			
82.0			
R1	R2	R3	R4
80	89	94	80
R5	R6	R7	R8
80	84	85	64
R9	R10	R11	R12
0	74	78	59
R13	R14	R15	
82	97	74	



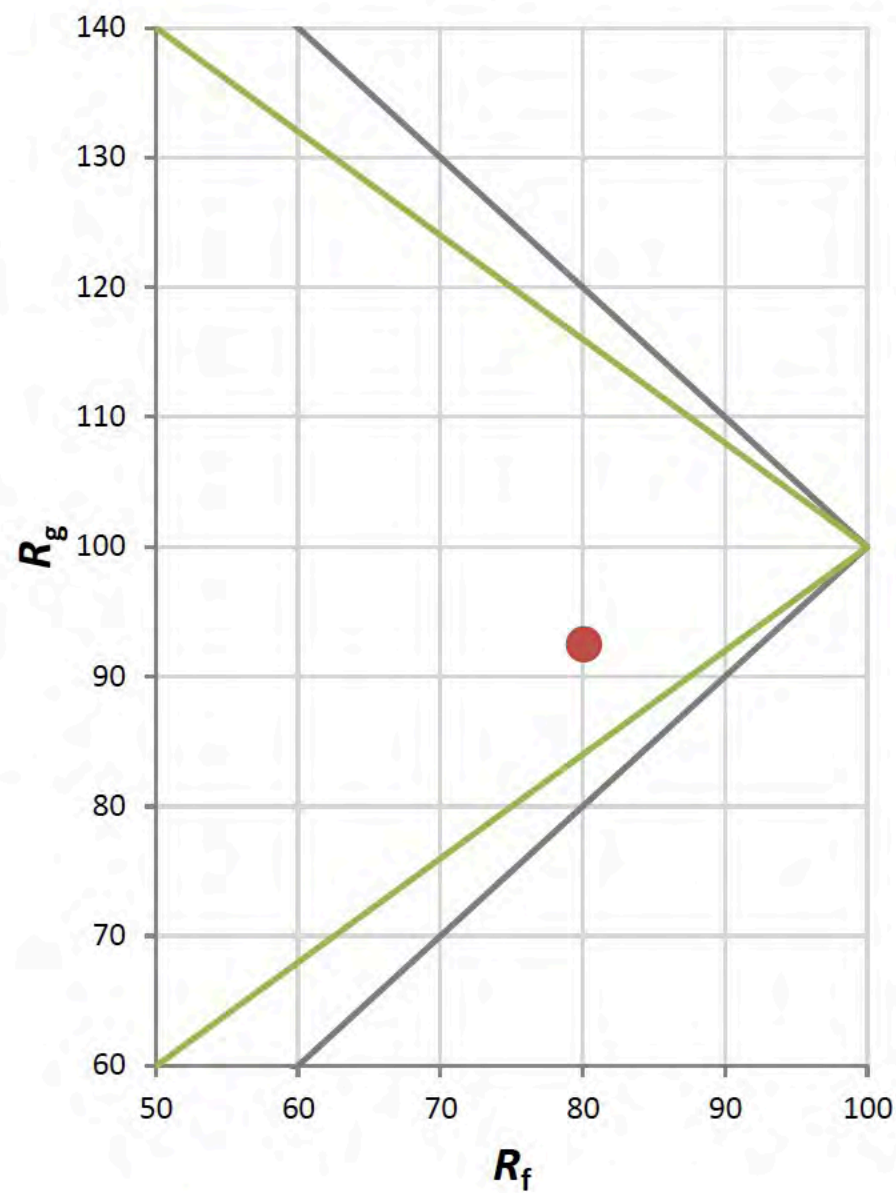
Fidelity Index and Gamut Index

Fidelity Index R_f	80
Gamut Index R_g	92

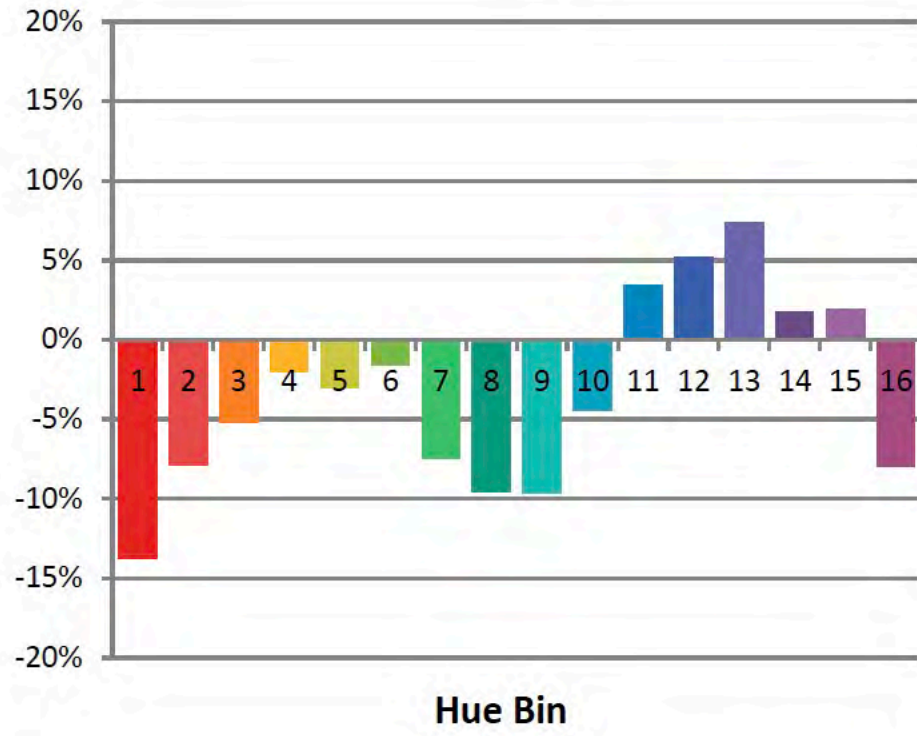
Spectral Power Distribution Comparison



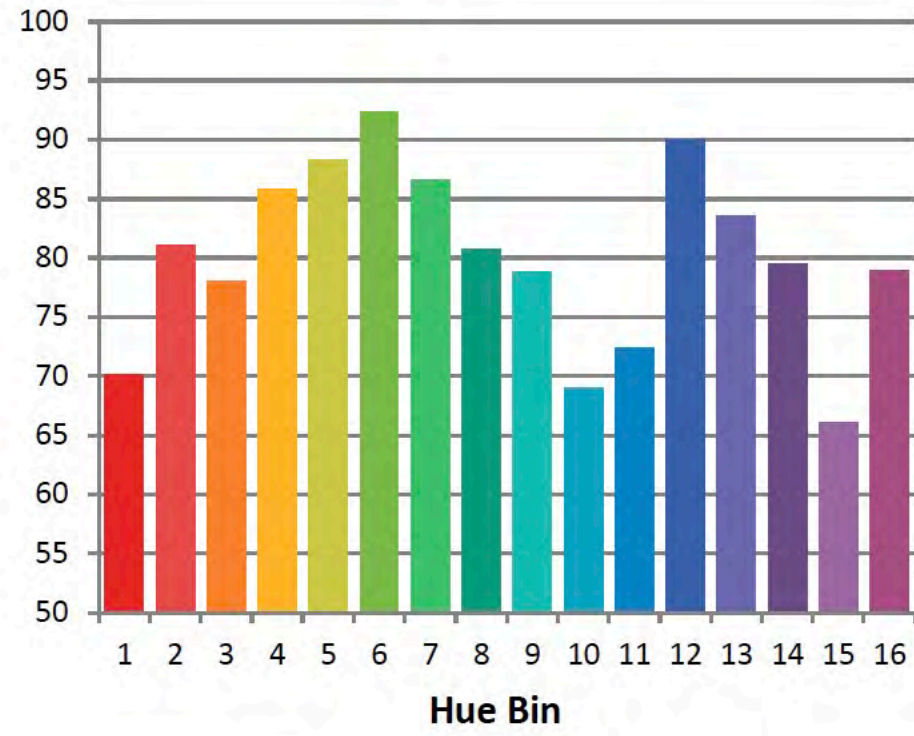
Plot of R_g versus R_f



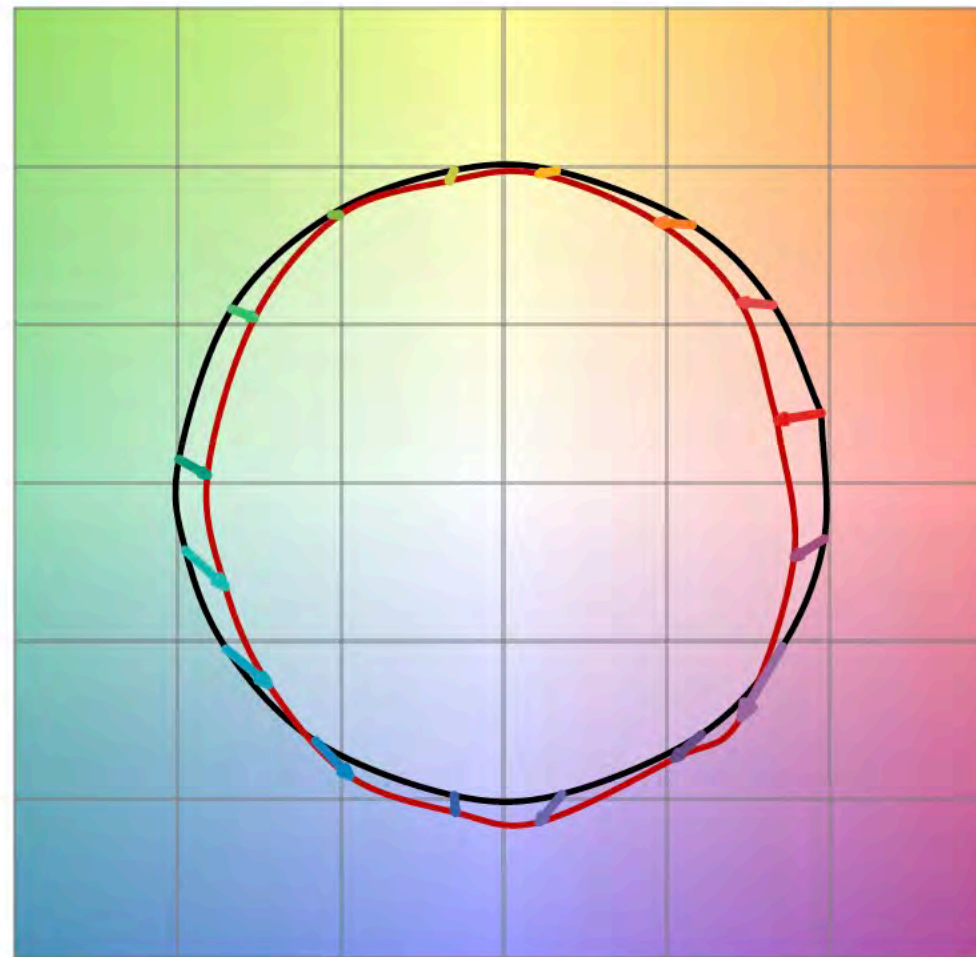
Chroma Shift by Hue



R_f by Hue

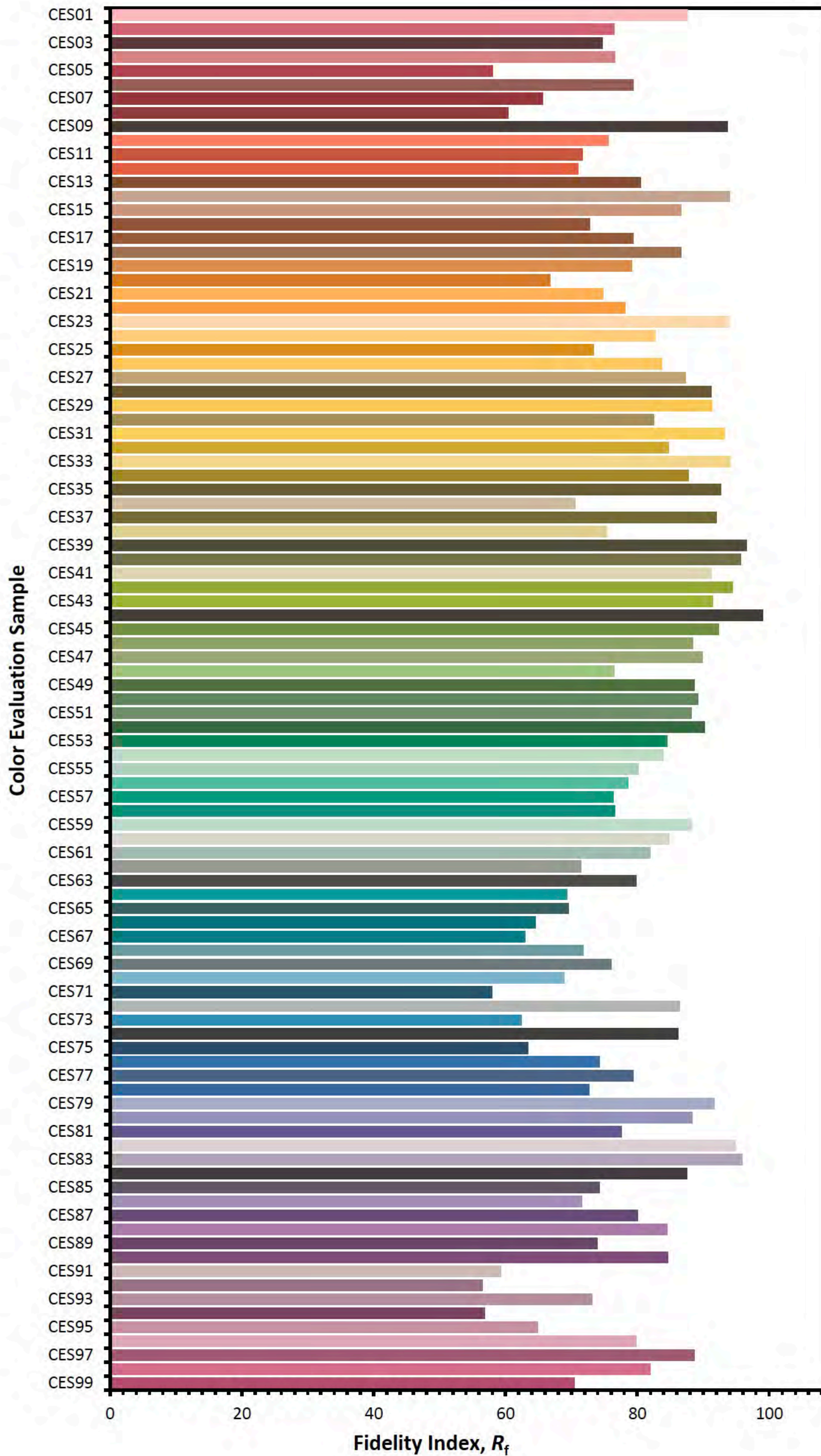


Color Vector Graphic

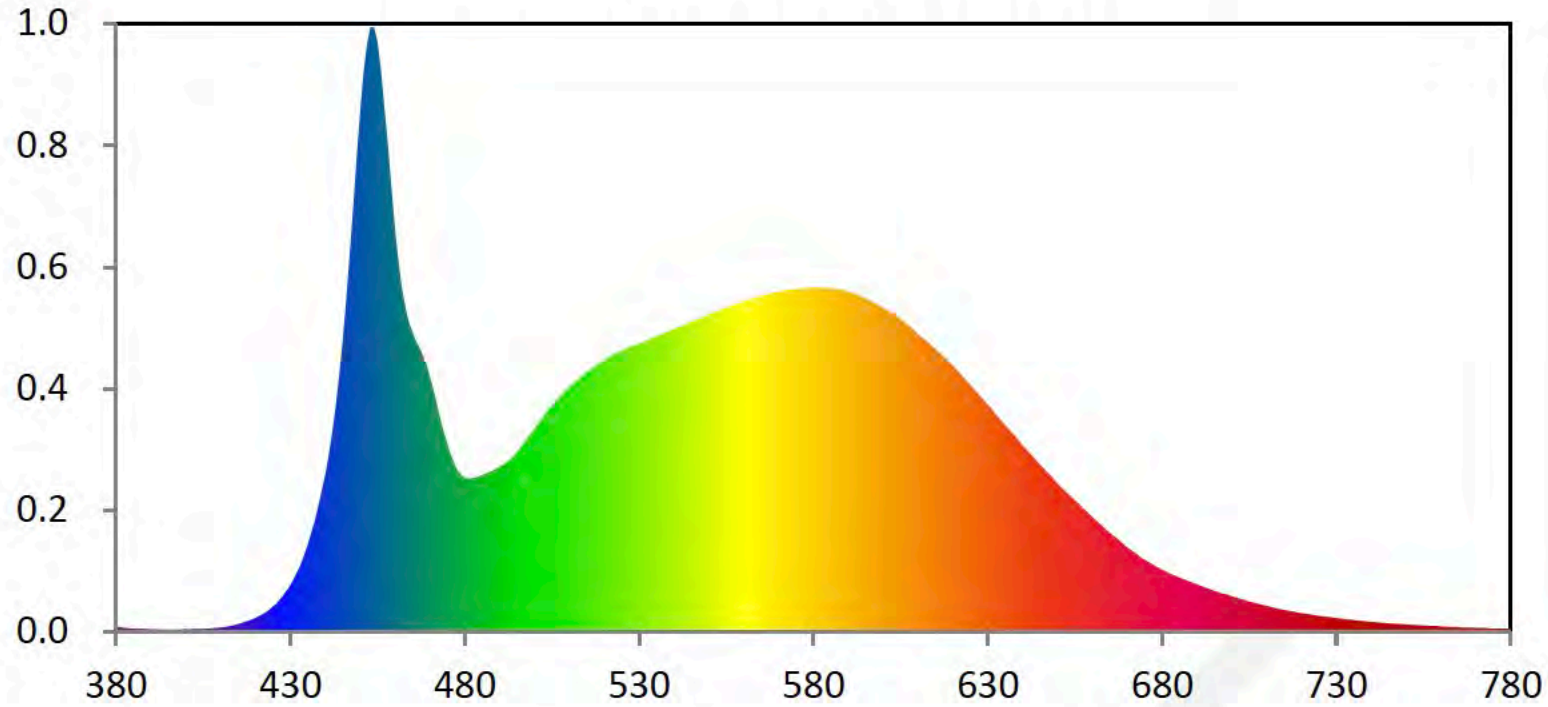


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



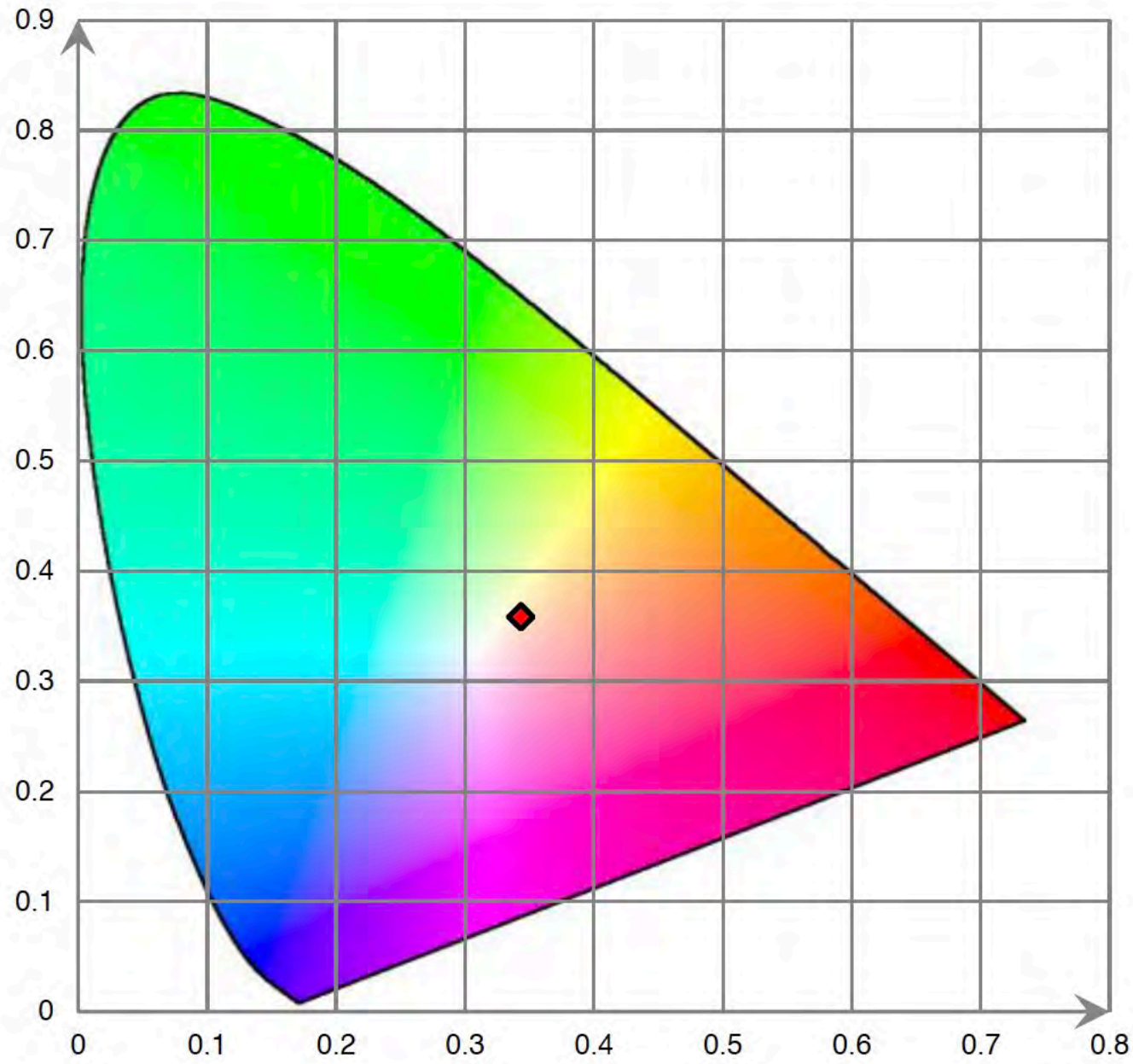
Relative Spectral Power Distribution



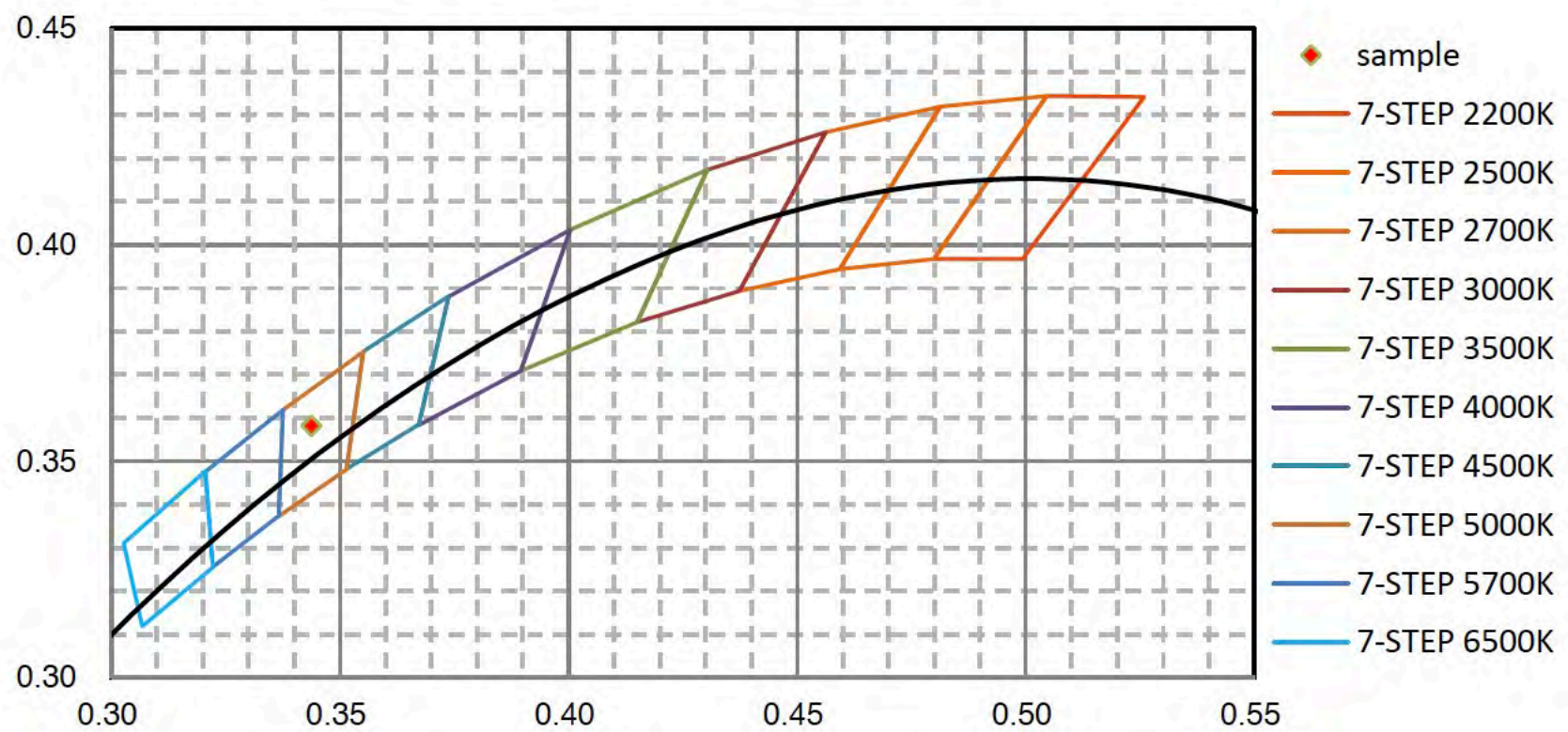
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.512E+00	421	4.809E+00	462	1.046E+02	503	6.618E+01	544	9.426E+01
381	1.511E+00	422	5.382E+00	463	9.879E+01	504	6.760E+01	545	9.480E+01
382	1.227E+00	423	5.992E+00	464	9.451E+01	505	6.899E+01	546	9.498E+01
383	1.244E+00	424	6.825E+00	465	9.160E+01	506	7.011E+01	547	9.547E+01
384	1.061E+00	425	7.794E+00	466	8.888E+01	507	7.132E+01	548	9.586E+01
385	9.669E-01	426	8.652E+00	467	8.685E+01	508	7.257E+01	549	9.637E+01
386	8.862E-01	427	9.924E+00	468	8.434E+01	509	7.360E+01	550	9.685E+01
387	9.588E-01	428	1.116E+01	469	8.186E+01	510	7.478E+01	551	9.725E+01
388	8.768E-01	429	1.259E+01	470	7.820E+01	511	7.575E+01	552	9.776E+01
389	8.777E-01	430	1.425E+01	471	7.424E+01	512	7.662E+01	553	9.811E+01
390	7.542E-01	431	1.615E+01	472	6.985E+01	513	7.735E+01	554	9.866E+01
391	8.183E-01	432	1.824E+01	473	6.536E+01	514	7.846E+01	555	9.901E+01
392	7.591E-01	433	2.058E+01	474	6.126E+01	515	7.932E+01	556	9.922E+01
393	7.115E-01	434	2.338E+01	475	5.727E+01	516	8.010E+01	557	9.985E+01
394	7.400E-01	435	2.642E+01	476	5.397E+01	517	8.081E+01	558	1.001E+02
395	6.797E-01	436	3.002E+01	477	5.135E+01	518	8.156E+01	559	1.004E+02
396	7.499E-01	437	3.351E+01	478	4.919E+01	519	8.226E+01	560	1.009E+02
397	7.859E-01	438	3.779E+01	479	4.779E+01	520	8.283E+01	561	1.014E+02
398	7.503E-01	439	4.256E+01	480	4.712E+01	521	8.360E+01	562	1.018E+02
399	8.022E-01	440	4.794E+01	481	4.678E+01	522	8.411E+01	563	1.020E+02
400	8.287E-01	441	5.384E+01	482	4.684E+01	523	8.490E+01	564	1.023E+02
401	8.053E-01	442	6.083E+01	483	4.701E+01	524	8.526E+01	565	1.026E+02
402	8.276E-01	443	6.860E+01	484	4.748E+01	525	8.572E+01	566	1.030E+02
403	9.122E-01	444	7.801E+01	485	4.787E+01	526	8.625E+01	567	1.031E+02
404	9.058E-01	445	8.829E+01	486	4.824E+01	527	8.668E+01	568	1.036E+02
405	9.561E-01	446	1.006E+02	487	4.874E+01	528	8.733E+01	569	1.037E+02
406	1.024E+00	447	1.141E+02	488	4.921E+01	529	8.756E+01	570	1.039E+02
407	1.071E+00	448	1.285E+02	489	4.978E+01	530	8.801E+01	571	1.041E+02
408	1.188E+00	449	1.436E+02	490	5.033E+01	531	8.845E+01	572	1.042E+02
409	1.265E+00	450	1.575E+02	491	5.094E+01	532	8.902E+01	573	1.043E+02
410	1.346E+00	451	1.700E+02	492	5.175E+01	533	8.929E+01	574	1.046E+02
411	1.510E+00	452	1.790E+02	493	5.257E+01	534	8.997E+01	575	1.046E+02
412	1.694E+00	453	1.845E+02	494	5.384E+01	535	9.021E+01	576	1.049E+02
413	1.847E+00	454	1.847E+02	495	5.484E+01	536	9.076E+01	577	1.048E+02
414	2.069E+00	455	1.805E+02	496	5.622E+01	537	9.114E+01	578	1.050E+02
415	2.374E+00	456	1.720E+02	497	5.777E+01	538	9.148E+01	579	1.050E+02
416	2.632E+00	457	1.606E+02	498	5.907E+01	539	9.217E+01	580	1.051E+02
417	2.991E+00	458	1.476E+02	499	6.046E+01	540	9.242E+01	581	1.051E+02
418	3.415E+00	459	1.347E+02	500	6.198E+01	541	9.276E+01	582	1.050E+02
419	3.813E+00	460	1.225E+02	501	6.342E+01	542	9.321E+01	583	1.049E+02
420	4.277E+00	461	1.127E+02	502	6.482E+01	543	9.363E+01	584	1.050E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.049E+02	626	7.418E+01	667	2.864E+01	708	8.397E+00	749	2.331E+00
586	1.048E+02	627	7.303E+01	668	2.769E+01	709	8.162E+00	750	2.265E+00
587	1.047E+02	628	7.183E+01	669	2.677E+01	710	7.904E+00	751	2.196E+00
588	1.046E+02	629	7.056E+01	670	2.579E+01	711	7.688E+00	752	2.108E+00
589	1.043E+02	630	6.947E+01	671	2.503E+01	712	7.400E+00	753	2.059E+00
590	1.039E+02	631	6.830E+01	672	2.426E+01	713	7.150E+00	754	1.986E+00
591	1.036E+02	632	6.685E+01	673	2.352E+01	714	6.947E+00	755	1.921E+00
592	1.032E+02	633	6.562E+01	674	2.268E+01	715	6.727E+00	756	1.902E+00
593	1.027E+02	634	6.439E+01	675	2.203E+01	716	6.465E+00	757	1.808E+00
594	1.024E+02	635	6.322E+01	676	2.141E+01	717	6.311E+00	758	1.779E+00
595	1.017E+02	636	6.189E+01	677	2.078E+01	718	6.138E+00	759	1.766E+00
596	1.013E+02	637	6.071E+01	678	2.010E+01	719	5.896E+00	760	1.688E+00
597	1.008E+02	638	5.960E+01	679	1.965E+01	720	5.746E+00	761	1.659E+00
598	1.001E+02	639	5.826E+01	680	1.904E+01	721	5.605E+00	762	1.562E+00
599	9.954E+01	640	5.693E+01	681	1.851E+01	722	5.387E+00	763	1.546E+00
600	9.904E+01	641	5.586E+01	682	1.799E+01	723	5.232E+00	764	1.519E+00
601	9.830E+01	642	5.467E+01	683	1.752E+01	724	5.111E+00	765	1.455E+00
602	9.760E+01	643	5.351E+01	684	1.708E+01	725	4.884E+00	766	1.380E+00
603	9.694E+01	644	5.221E+01	685	1.665E+01	726	4.765E+00	767	1.365E+00
604	9.619E+01	645	5.107E+01	686	1.616E+01	727	4.584E+00	768	1.334E+00
605	9.547E+01	646	4.990E+01	687	1.579E+01	728	4.433E+00	769	1.289E+00
606	9.466E+01	647	4.877E+01	688	1.535E+01	729	4.327E+00	770	1.270E+00
607	9.373E+01	648	4.775E+01	689	1.487E+01	730	4.175E+00	771	1.210E+00
608	9.302E+01	649	4.656E+01	690	1.454E+01	731	4.061E+00	772	1.190E+00
609	9.207E+01	650	4.546E+01	691	1.406E+01	732	3.986E+00	773	1.156E+00
610	9.099E+01	651	4.425E+01	692	1.373E+01	733	3.796E+00	774	1.118E+00
611	8.999E+01	652	4.333E+01	693	1.332E+01	734	3.702E+00	775	1.086E+00
612	8.926E+01	653	4.227E+01	694	1.299E+01	735	3.587E+00	776	1.029E+00
613	8.839E+01	654	4.117E+01	695	1.257E+01	736	3.473E+00	777	1.061E+00
614	8.734E+01	655	4.017E+01	696	1.225E+01	737	3.365E+00	778	1.046E+00
615	8.641E+01	656	3.922E+01	697	1.183E+01	738	3.236E+00	779	1.048E+00
616	8.558E+01	657	3.806E+01	698	1.153E+01	739	3.163E+00	780	1.050E+00
617	8.448E+01	658	3.712E+01	699	1.124E+01	740	3.063E+00		
618	8.336E+01	659	3.611E+01	700	1.081E+01	741	2.988E+00		
619	8.219E+01	660	3.517E+01	701	1.050E+01	742	2.914E+00		
620	8.125E+01	661	3.413E+01	702	1.020E+01	743	2.802E+00		
621	8.002E+01	662	3.323E+01	703	9.930E+00	744	2.692E+00		
622	7.889E+01	663	3.227E+01	704	9.575E+00	745	2.602E+00		
623	7.776E+01	664	3.125E+01	705	9.216E+00	746	2.595E+00		
624	7.654E+01	665	3.033E+01	706	9.053E+00	747	2.437E+00		
625	7.539E+01	666	2.941E+01	707	8.727E+00	748	2.371E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Additional Test]

Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Total Harmonic Distortion:	120.0	60	8.60%
Total Harmonic Distortion:	277.0	60	8.94%
Power Factor:	277.0	60	0.954

6. Product Photo





7. Product Test orientation in the Goniophotometer



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