

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

**P.Q.L., Inc.**

2285 Ward Avenue / Simi Valley, CA 93065

**Test Model: 93710, 93712**

<b>Report Type:</b>	Electrical and Photometric tests including: Input Current, Power, Power Factor, Luminous Flux, Luminous Efficacy, CRI, CCT, Chromaticity Coordinate, Spectral Power Distribution
<b>Test Engineer:</b>	George Yang
<b>Report Number:</b>	RKS170803052-10A2
<b>Test Date:</b>	2017-08-14
<b>Report Date:</b>	2017-08-14
<b>Reviewed By:</b>	Ray Gao/EE Engineer
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Kunshan). No.248 Chenghu Road, Kunshan, Jiangsu province, China. Tel: +86-0512-86175000 Fax:+86-0512-88934268
<b>Test Facility:</b>	Test facility was located at No.248 Chenghu Road, Kunshan, Jiangsu province, China.
<b>Accreditation:</b>	The IAS Accreditation Number TL-749.

**Note:** The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Kunshan).

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## 1. Product Description

### General Information:

One sample was received on 2017-08-09 and used for testing.

Model Tested: 93710, 93712  
 Manufacturer: P.Q.L., Inc.  
 Brand Name: SUPERIOR LIFE  
 Product Designation: Linear Retrofit Kits for 2x4 Luminaires  
 Aging Time Before Test: 0hour(For New Products)  
 Auxiliary Equipment: Lithonia 2GT8 lensed 2X4

### Rated Values:

Rated Voltage/Frequency: 100-277VAC, 50/60Hz  
 Rated Power: 50W  
 Nominal CCT: 5000K  
 Nominal Lumen Output: 7250 lm (For Linear Retrofit Kit)

## 2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition

## 3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	INVENTFINE	Dia 1.5m	JWWCV090112	Dia 1.5m	2017-01-25	2018-01-25
Power Meter	INVENTFINE	WT500	GSJWQ20009	20/40/80/150/300/600V	2017-03-23	2018-03-22
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	380nm~780nm	2017-01-25	2018-01-25
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	0~150V 4.2A/0~300V 2.1A	2017-03-23	2018-03-22
Standard Light Source	INVENTFINE	N/A	JWWCR020106	24V/50W	2017-01-26	2018-01-26
Thermal Meter	KEJIAN	TA298	N/A	0~60°C	2016-10-17	2017-10-17
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	30V/5A	2017-03-23	2018-03-22

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Kunshan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).



## 4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at  $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$  during measurement. And relative humidity is less than 65%.

### **Integrating Sphere System**

The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement.

$4\pi$  geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is  $U=2.6\%$  ( $K=2$ ), 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.

### **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

### [Integrating Sphere System]

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

Test orientation: **Downward**

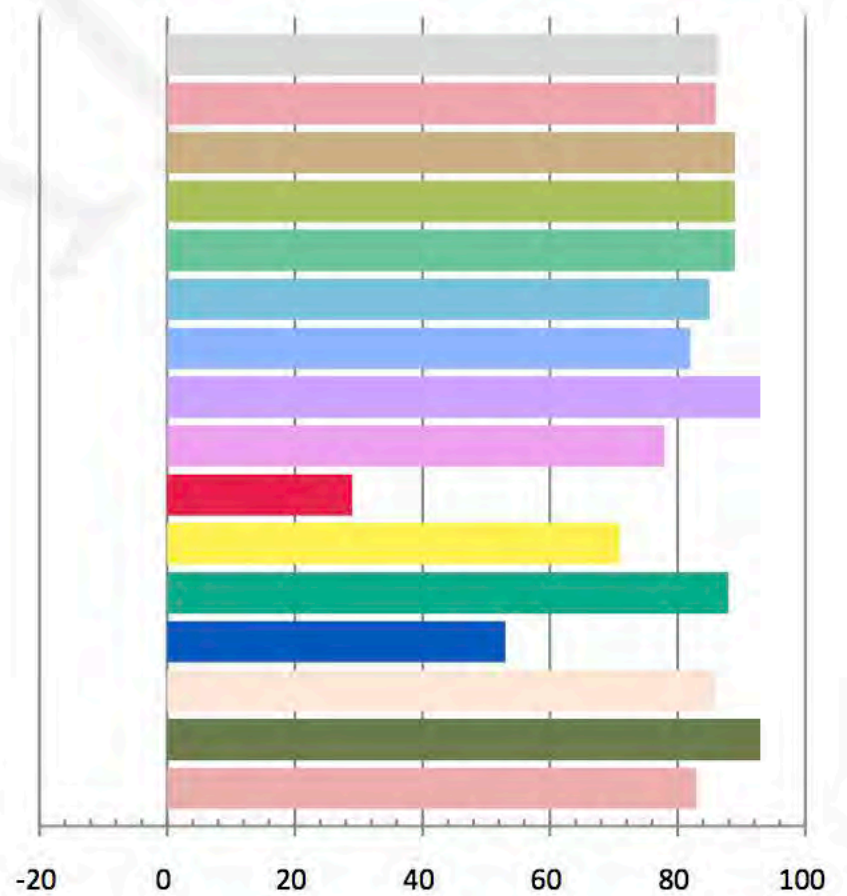
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.4486	53.09	0.9863	5941	111.9

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
18.499	5096	0.00333	0.3430	0.3566	0.2081	0.4868

### Color Rendering Index

<b>Ra</b>			
<b>86.4</b>			
<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
86	89	89	89
<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>
85	82	93	78
<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>
29	71	88	53
<b>R13</b>	<b>R14</b>	<b>R15</b>	
86	93	83	

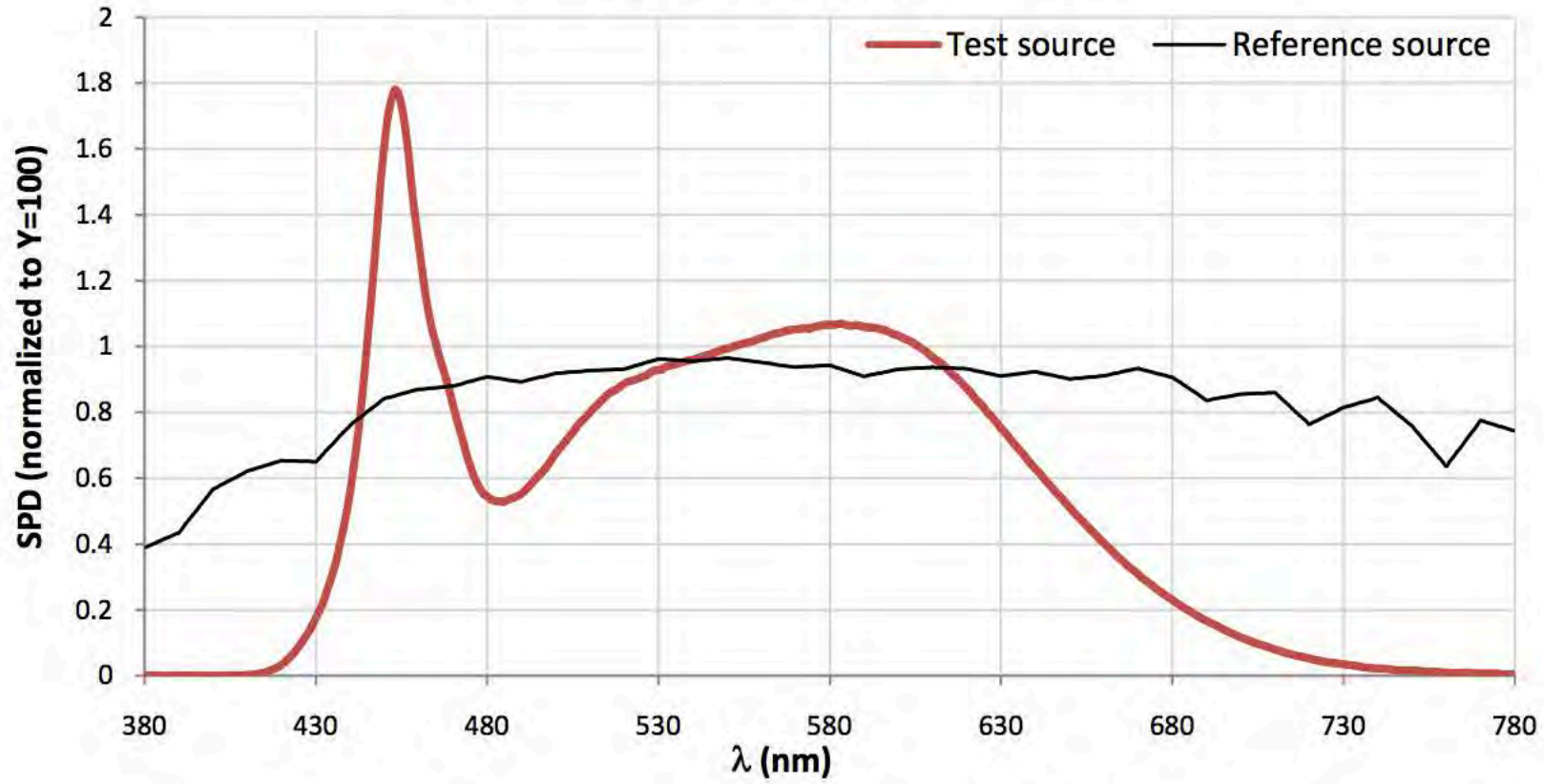




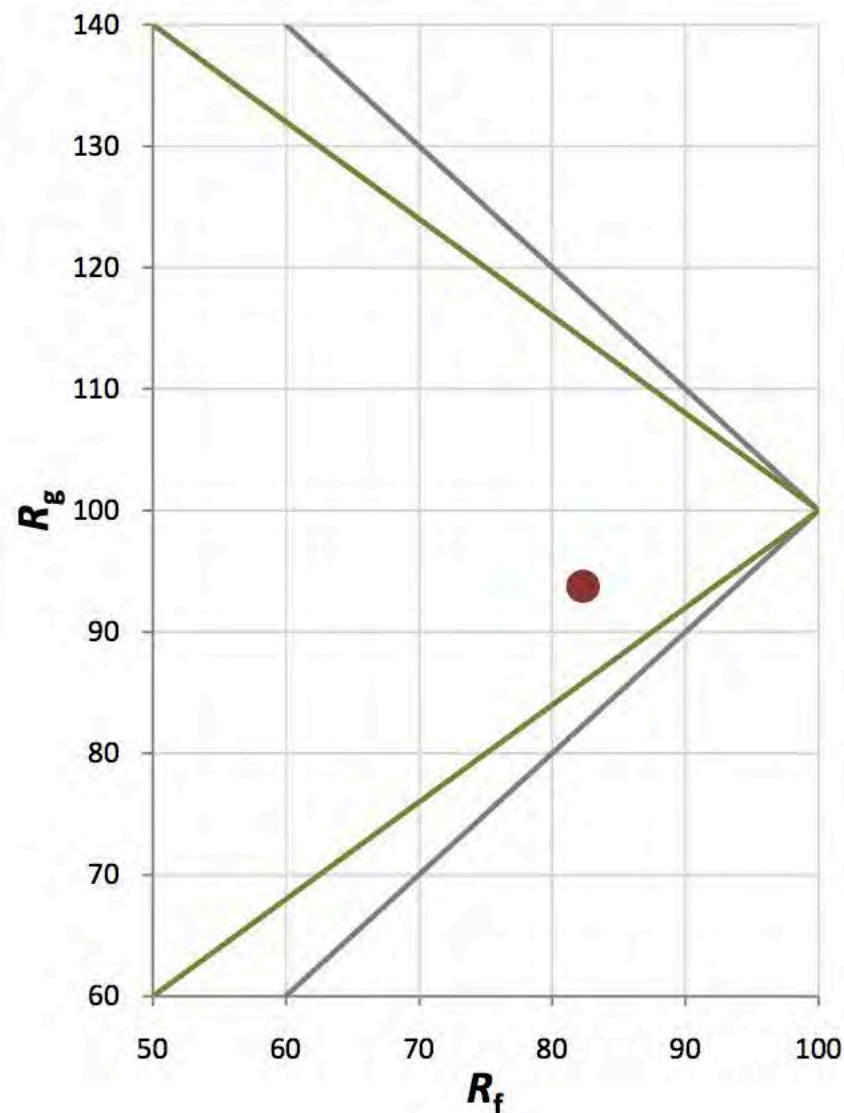
Fidelity Index and Gamut Index

Fidelity Index $R_f$	82
Gamut Index $R_g$	94

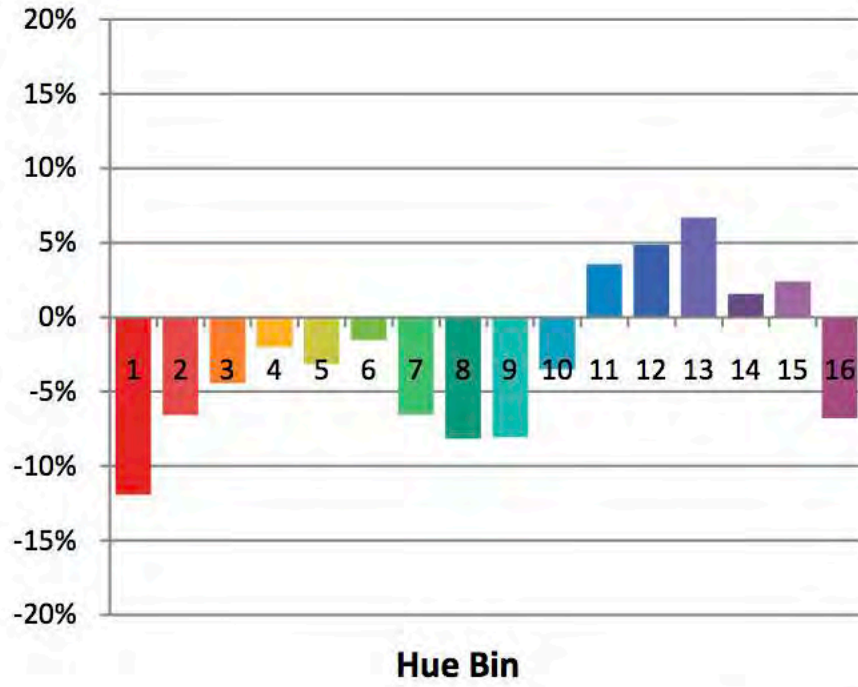
Spectral Power Distribution Comparison



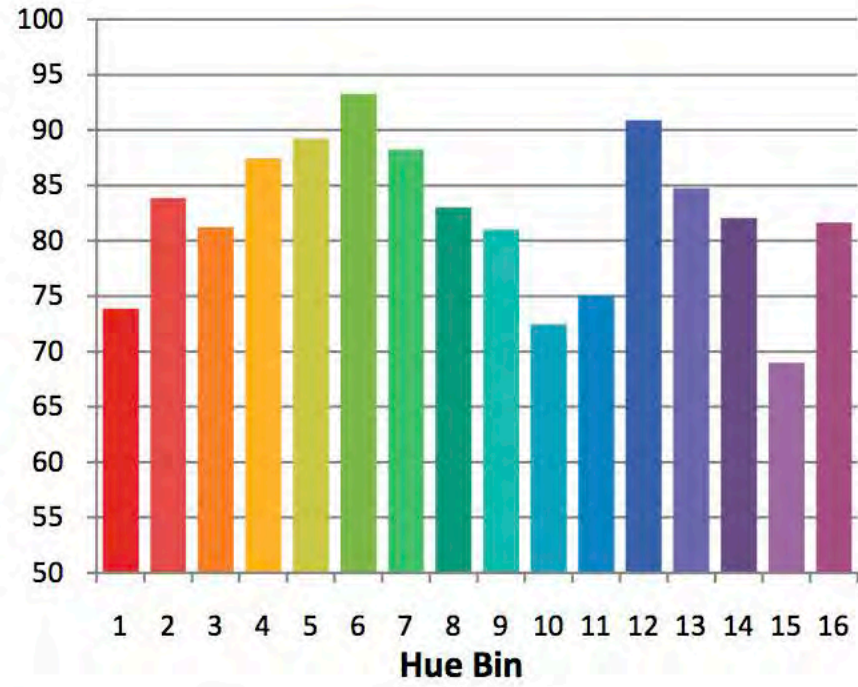
Plot of  $R_g$  versus  $R_f$



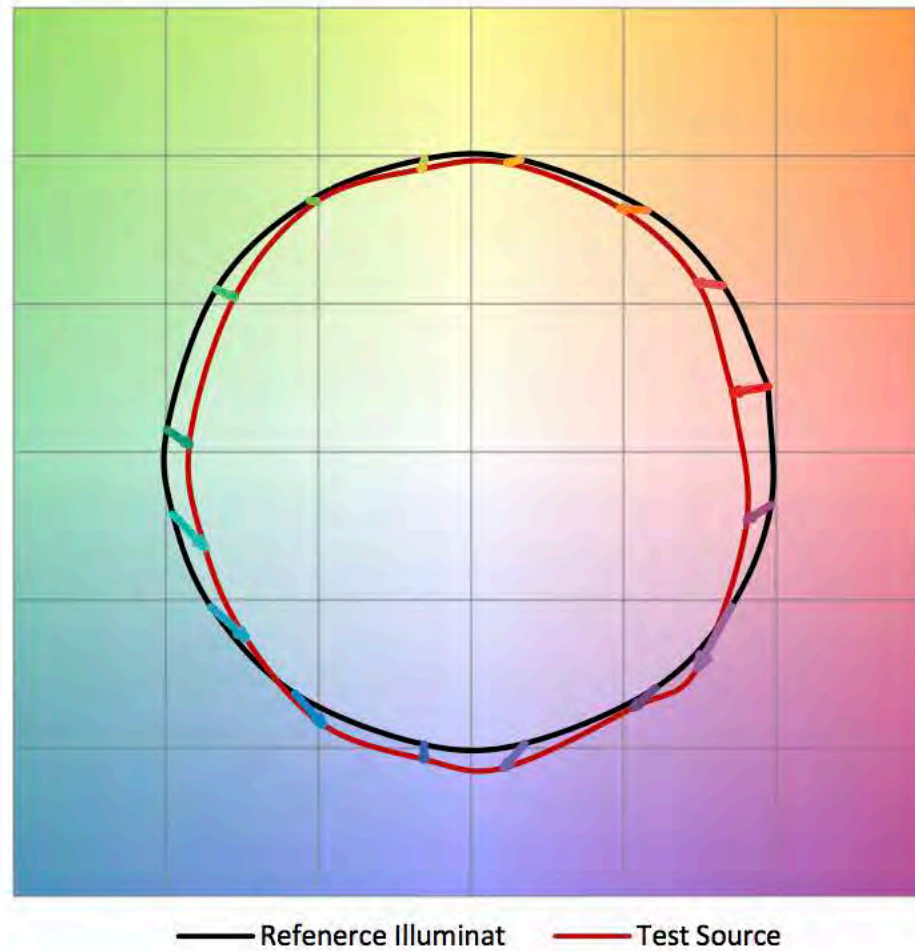
Chroma Shift by Hue



$R_f$  by Hue

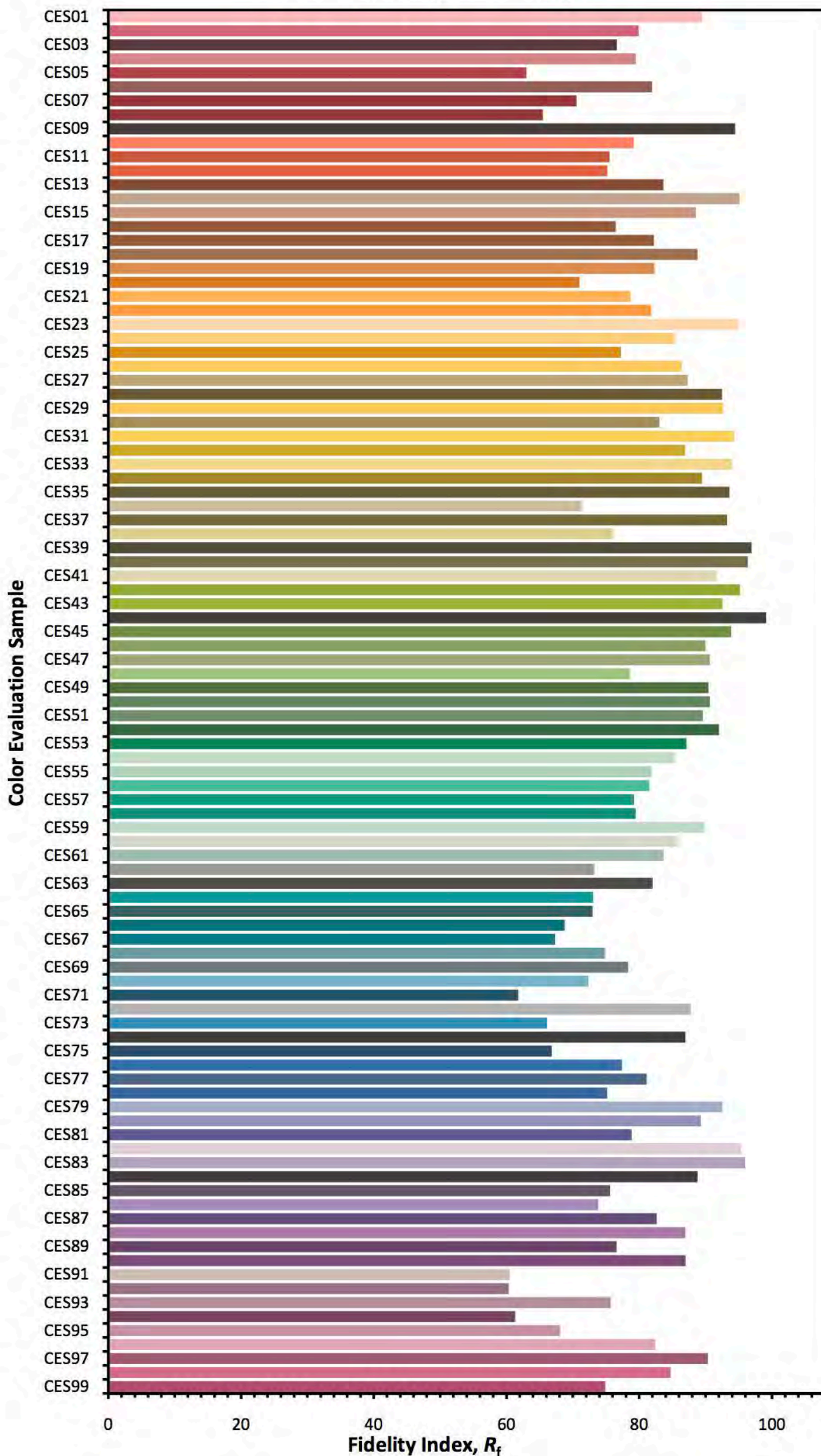


Color Vector Graphic



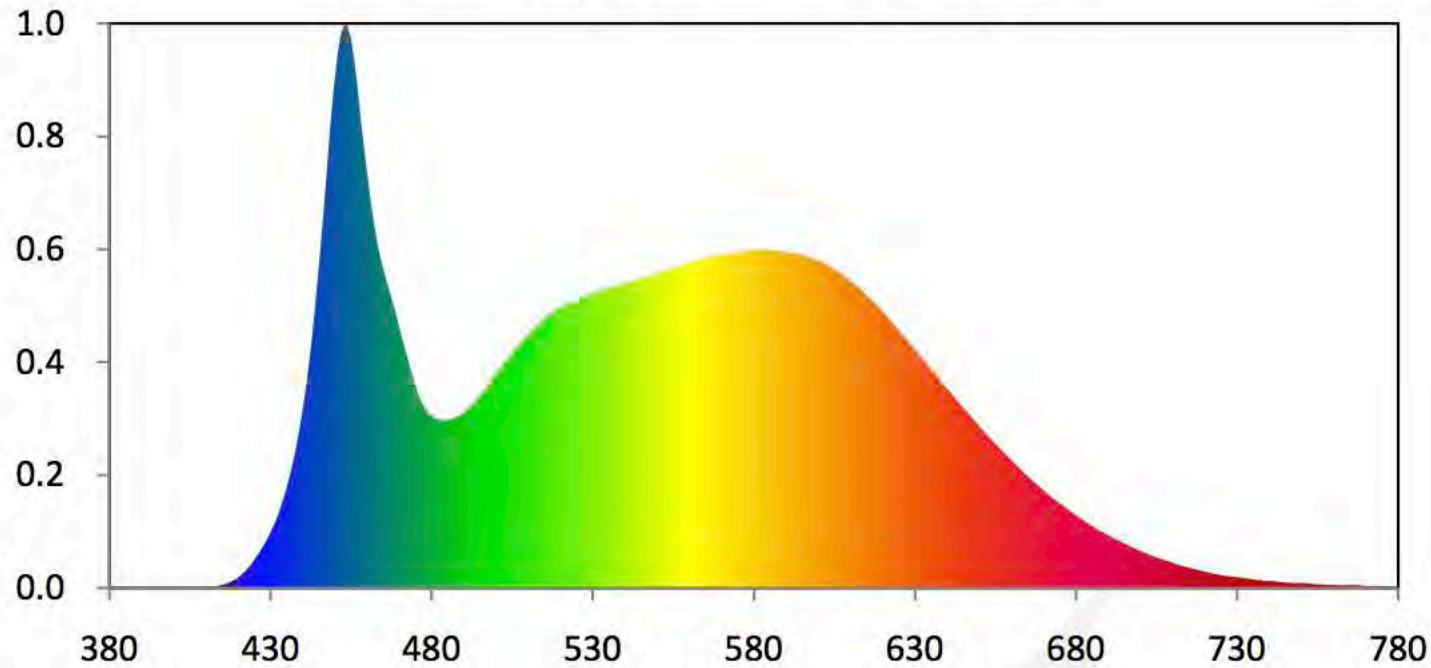


**Color Fidelity by CES Sample**





Relative Spectral Power Distribution



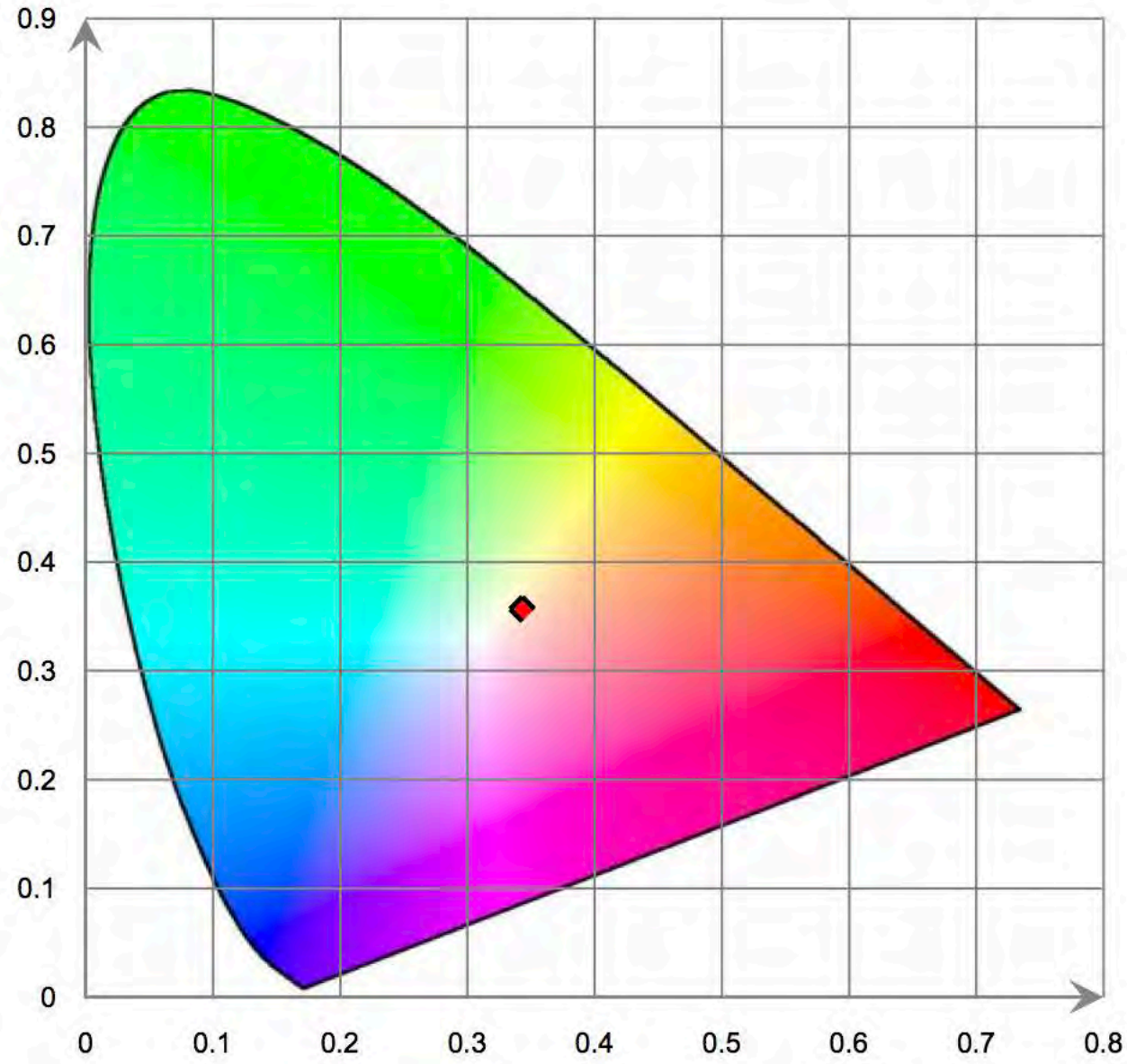
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	6.500E-02	421	3.622E+00	462	1.008E+02	503	6.203E+01	544	8.465E+01
381	4.250E-02	422	4.486E+00	463	9.561E+01	504	6.321E+01	545	8.487E+01
382	5.990E-02	423	5.433E+00	464	9.107E+01	505	6.434E+01	546	8.521E+01
383	7.190E-02	424	6.502E+00	465	8.762E+01	506	6.557E+01	547	8.554E+01
384	6.470E-02	425	7.684E+00	466	8.449E+01	507	6.664E+01	548	8.589E+01
385	4.750E-02	426	8.999E+00	467	8.134E+01	508	6.759E+01	549	8.621E+01
386	4.420E-02	427	1.036E+01	468	7.830E+01	509	6.858E+01	550	8.636E+01
387	4.070E-02	428	1.180E+01	469	7.497E+01	510	6.961E+01	551	8.660E+01
388	4.300E-02	429	1.339E+01	470	7.166E+01	511	7.051E+01	552	8.697E+01
389	5.160E-02	430	1.522E+01	471	6.814E+01	512	7.139E+01	553	8.729E+01
390	7.770E-02	431	1.716E+01	472	6.485E+01	513	7.237E+01	554	8.754E+01
391	5.850E-02	432	1.920E+01	473	6.163E+01	514	7.316E+01	555	8.773E+01
392	4.850E-02	433	2.171E+01	474	5.845E+01	515	7.408E+01	556	8.801E+01
393	6.610E-02	434	2.445E+01	475	5.564E+01	516	7.487E+01	557	8.811E+01
394	8.540E-02	435	2.738E+01	476	5.291E+01	517	7.529E+01	558	8.852E+01
395	7.740E-02	436	3.071E+01	477	5.078E+01	518	7.576E+01	559	8.899E+01
396	5.760E-02	437	3.450E+01	478	4.929E+01	519	7.641E+01	560	8.917E+01
397	3.220E-02	438	3.859E+01	479	4.806E+01	520	7.705E+01	561	8.936E+01
398	2.620E-02	439	4.334E+01	480	4.727E+01	521	7.759E+01	562	8.974E+01
399	1.950E-02	440	4.882E+01	481	4.668E+01	522	7.785E+01	563	9.016E+01
400	3.570E-02	441	5.470E+01	482	4.629E+01	523	7.811E+01	564	9.038E+01
401	4.250E-02	442	6.152E+01	483	4.607E+01	524	7.844E+01	565	9.044E+01
402	4.320E-02	443	6.942E+01	484	4.600E+01	525	7.880E+01	566	9.064E+01
403	4.550E-02	444	7.844E+01	485	4.596E+01	526	7.916E+01	567	9.103E+01
404	6.930E-02	445	8.780E+01	486	4.634E+01	527	7.956E+01	568	9.122E+01
405	9.270E-02	446	9.783E+01	487	4.674E+01	528	8.022E+01	569	9.135E+01
406	8.570E-02	447	1.086E+02	488	4.712E+01	529	8.072E+01	570	9.149E+01
407	8.260E-02	448	1.200E+02	489	4.754E+01	530	8.073E+01	571	9.156E+01
408	9.700E-02	449	1.310E+02	490	4.808E+01	531	8.092E+01	572	9.175E+01
409	1.486E-01	450	1.399E+02	491	4.885E+01	532	8.146E+01	573	9.185E+01
410	2.129E-01	451	1.475E+02	492	4.977E+01	533	8.188E+01	574	9.168E+01
411	2.750E-01	452	1.521E+02	493	5.078E+01	534	8.206E+01	575	9.194E+01
412	3.530E-01	453	1.547E+02	494	5.186E+01	535	8.230E+01	576	9.224E+01
413	4.792E-01	454	1.539E+02	495	5.284E+01	536	8.258E+01	577	9.245E+01
414	6.347E-01	455	1.507E+02	496	5.379E+01	537	8.280E+01	578	9.262E+01
415	8.462E-01	456	1.450E+02	497	5.484E+01	538	8.307E+01	579	9.262E+01
416	1.130E+00	457	1.375E+02	498	5.607E+01	539	8.335E+01	580	9.272E+01
417	1.459E+00	458	1.291E+02	499	5.738E+01	540	8.351E+01	581	9.271E+01
418	1.856E+00	459	1.211E+02	500	5.869E+01	541	8.370E+01	582	9.276E+01
419	2.340E+00	460	1.140E+02	501	5.984E+01	542	8.401E+01	583	9.295E+01
420	2.918E+00	461	1.069E+02	502	6.100E+01	543	8.440E+01	584	9.286E+01



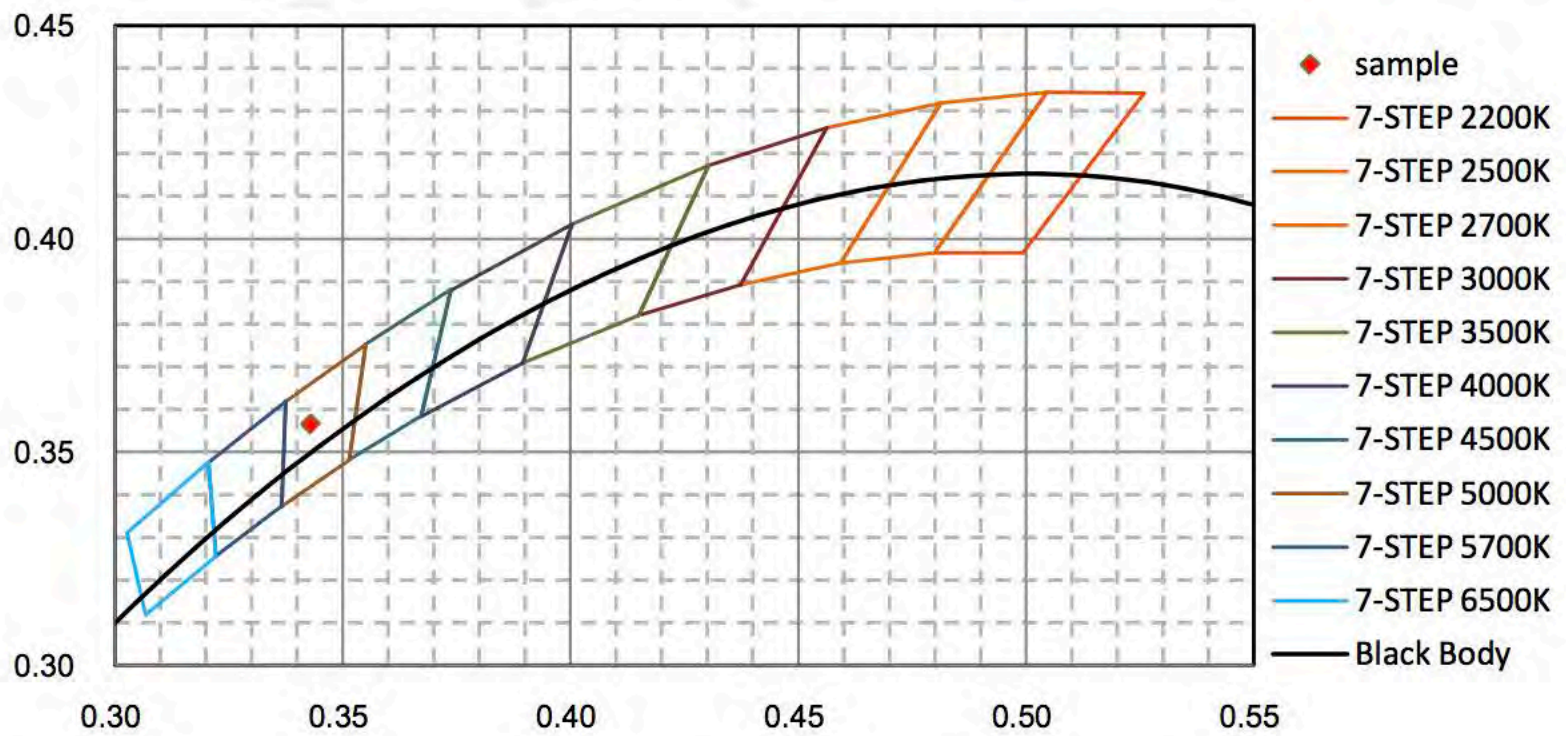
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	9.261E+01	626	6.965E+01	667	2.907E+01	708	7.533E+00	749	1.391E+00
586	9.249E+01	627	6.863E+01	668	2.838E+01	709	7.229E+00	750	1.420E+00
587	9.255E+01	628	6.755E+01	669	2.758E+01	710	6.925E+00	751	1.343E+00
588	9.258E+01	629	6.642E+01	670	2.677E+01	711	6.637E+00	752	1.264E+00
589	9.243E+01	630	6.537E+01	671	2.600E+01	712	6.352E+00	753	1.159E+00
590	9.209E+01	631	6.442E+01	672	2.529E+01	713	6.063E+00	754	1.062E+00
591	9.195E+01	632	6.335E+01	673	2.460E+01	714	5.817E+00	755	1.003E+00
592	9.195E+01	633	6.214E+01	674	2.390E+01	715	5.574E+00	756	1.013E+00
593	9.188E+01	634	6.110E+01	675	2.322E+01	716	5.345E+00	757	9.658E-01
594	9.173E+01	635	6.002E+01	676	2.253E+01	717	5.152E+00	758	8.923E-01
595	9.153E+01	636	5.894E+01	677	2.187E+01	718	4.972E+00	759	8.497E-01
596	9.128E+01	637	5.791E+01	678	2.126E+01	719	4.775E+00	760	8.588E-01
597	9.092E+01	638	5.681E+01	679	2.066E+01	720	4.510E+00	761	7.765E-01
598	9.046E+01	639	5.574E+01	680	2.002E+01	721	4.313E+00	762	7.437E-01
599	9.006E+01	640	5.466E+01	681	1.939E+01	722	4.130E+00	763	7.607E-01
600	8.987E+01	641	5.373E+01	682	1.875E+01	723	3.907E+00	764	7.675E-01
601	8.946E+01	642	5.268E+01	683	1.815E+01	724	3.738E+00	765	7.896E-01
602	8.895E+01	643	5.159E+01	684	1.760E+01	725	3.574E+00	766	8.164E-01
603	8.855E+01	644	5.058E+01	685	1.708E+01	726	3.415E+00	767	7.980E-01
604	8.811E+01	645	4.950E+01	686	1.654E+01	727	3.316E+00	768	7.353E-01
605	8.756E+01	646	4.850E+01	687	1.596E+01	728	3.217E+00	769	6.122E-01
606	8.692E+01	647	4.754E+01	688	1.544E+01	729	3.088E+00	770	5.352E-01
607	8.631E+01	648	4.657E+01	689	1.496E+01	730	2.977E+00	771	5.581E-01
608	8.572E+01	649	4.548E+01	690	1.450E+01	731	2.866E+00	772	5.902E-01
609	8.491E+01	650	4.439E+01	691	1.403E+01	732	2.747E+00	773	5.981E-01
610	8.415E+01	651	4.343E+01	692	1.357E+01	733	2.629E+00	774	5.714E-01
611	8.352E+01	652	4.245E+01	693	1.314E+01	734	2.503E+00	775	5.952E-01
612	8.291E+01	653	4.151E+01	694	1.265E+01	735	2.380E+00	776	5.077E-01
613	8.214E+01	654	4.058E+01	695	1.217E+01	736	2.242E+00	777	3.929E-01
614	8.127E+01	655	3.959E+01	696	1.176E+01	737	2.092E+00	778	3.796E-01
615	8.037E+01	656	3.866E+01	697	1.136E+01	738	2.014E+00	779	3.783E-01
616	7.943E+01	657	3.781E+01	698	1.094E+01	739	1.974E+00	780	4.038E-01
617	7.867E+01	658	3.685E+01	699	1.054E+01	740	1.902E+00		
618	7.782E+01	659	3.591E+01	700	1.019E+01	741	1.883E+00		
619	7.684E+01	660	3.508E+01	701	9.843E+00	742	1.821E+00		
620	7.591E+01	661	3.420E+01	702	9.492E+00	743	1.732E+00		
621	7.495E+01	662	3.329E+01	703	9.141E+00	744	1.654E+00		
622	7.373E+01	663	3.241E+01	704	8.742E+00	745	1.506E+00		
623	7.273E+01	664	3.152E+01	705	8.377E+00	746	1.404E+00		
624	7.181E+01	665	3.069E+01	706	8.106E+00	747	1.372E+00		
625	7.072E+01	666	2.986E+01	707	7.838E+00	748	1.354E+00		



**CIE 1931 x y Chromaticity Diagram**

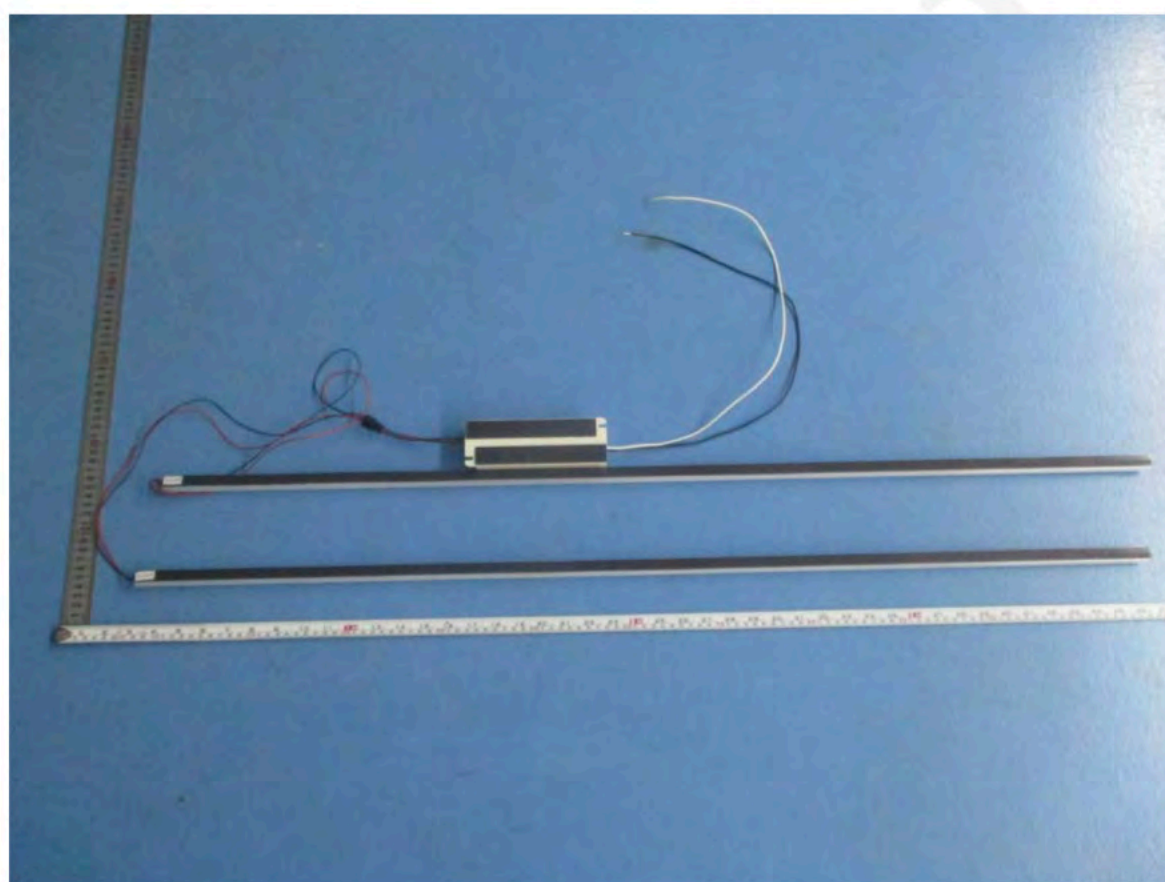
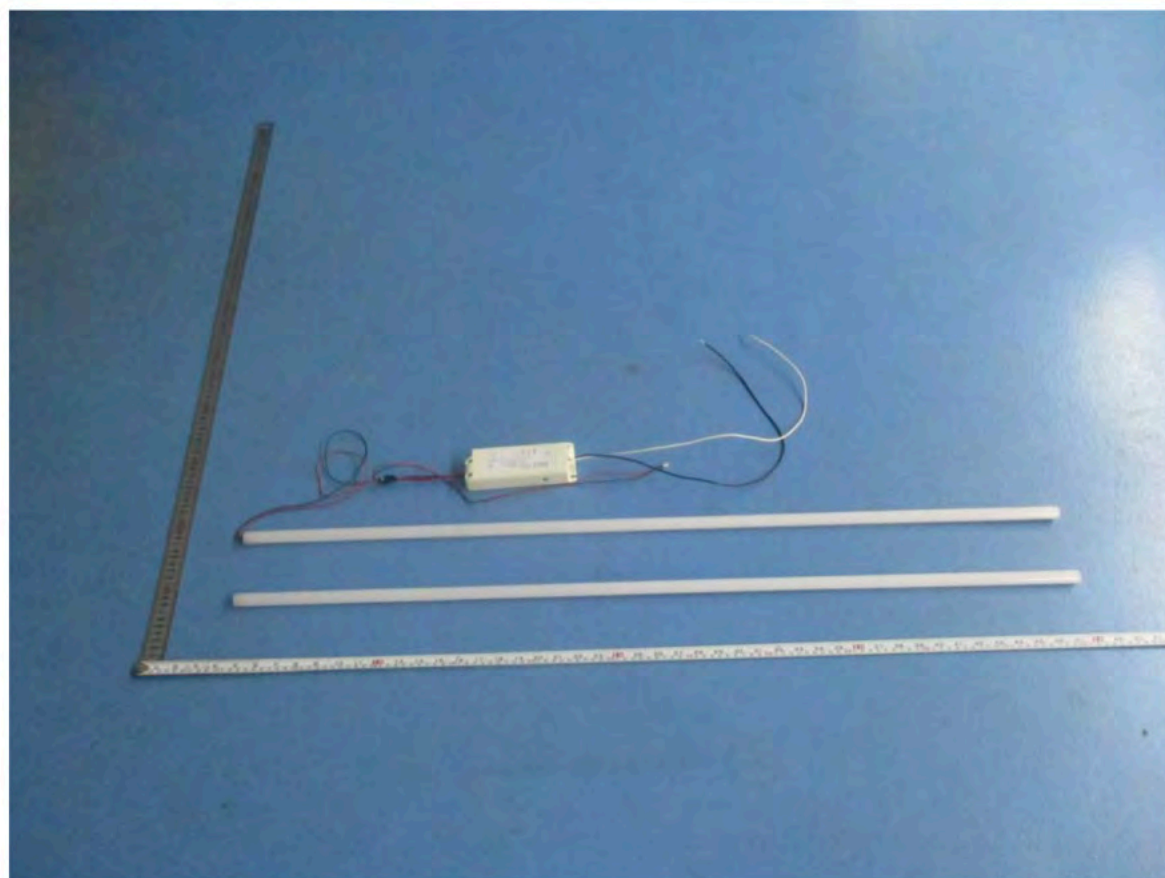


**7-Step Chromaticity Quadrangles**





## 6. Product Photo





Auxiliary Equipment (Recessed Troffer)



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