



# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

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

2285 Ward Avenue ? Simi Valley, CA 93065

**Test Model: 93679**

<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>	Daniel Duan <i>Daniel Duan</i>
<b>Report Number:</b>	RKS160716004-10A2
<b>Test Date:</b>	2016-07-22
<b>Report Date:</b>	2016-07-28
<b>Reviewed By:</b>	Jeanne Han/EE Manager <i>Jeanne Han</i>
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Dongguan). Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China. Tel: +86-0769-86858888 Fax: +86-0769-86858588
<b>Test Facility:</b>	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
<b>Accreditation:</b>	The IAS Accreditation Number TL-460.

**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. (Dongguan). 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 2016-07-16 and used for testing.

Model Tested: 93679  
 Manufacturer: P.Q.L., Inc.  
 Brand Name: Superior Life®  
 Product Designation: Linear Retrofit Kits for 2x4 Luminaires  
 Dimmable: Non- Dimmable  
 Burning Time Before Test: 0hour(For New Products)  
 Auxiliary Equipment: Lithonia 2PM3N 12 cell 2x4 parabolic

### Rated Values:

Rated Voltage/Frequency: 100-277VAC, 50/60Hz  
 Rated Power: 50W  
 Nominal CCT: 5000K  
 Nominal Lumen Output: 6600 lm (For Linear Retrofit Kit)  
 Nominal CRI: 80

## 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	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	25~50°C	2016-03-10	2017-03-09
Spectral photometer	SENSING	SPR3000	90902027	350nm~800nm	2016-03-10	2017-03-09
Power Meter	YOKOGAWA	WT-210	91j926132	15/30/60/150/300/600 V	2016-03-04	2017-03-03
AC Power Supply	ALL Power	APW-105N	970663	220V±10% 50HZ	2016-03-04	2017-03-03
Standard Light Source	EVERFINE	D204	01331191	24V/100W	2015-08-27	2016-08-26
Thermal Meter	SENSING	N/A	N/A	25、50°C	2016-03-10	2017-03-09
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2016-03-04	2017-03-03

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°C±1°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=2.1% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=32K (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=0.15% of rdg, Power U=0.20%) (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.

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## 5. Test Result

### [Integrating Sphere System]

Total operating time for integrating sphere test: **0.5 hour**

Test orientation: **Downward**

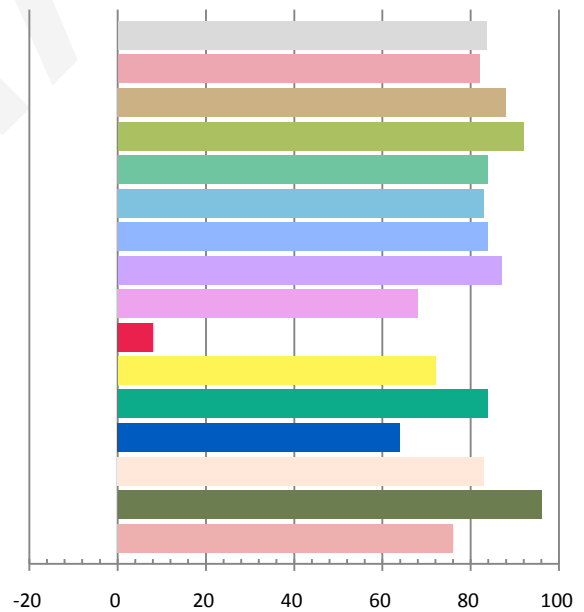
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.4622	54.94	0.99	5843.4	106.34

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
18.250	5267	0.002310	0.3382	0.3506	0.2072	0.4831

### Color Rendering Index

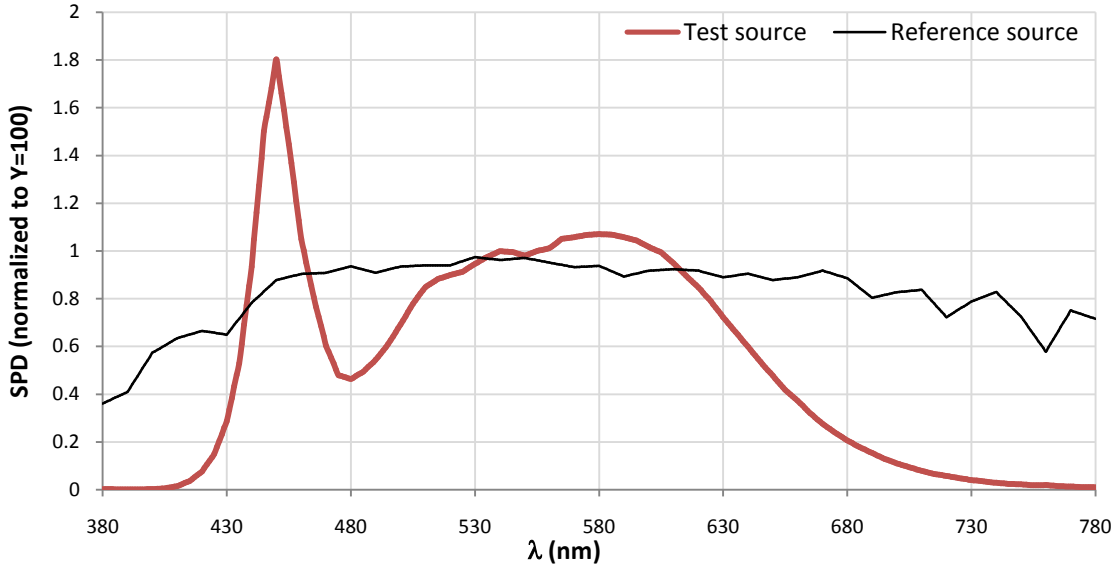
Ra			
<b>83.6</b>			
R1	R2	R3	R4
82	88	92	84
R5	R6	R7	R8
83	84	87	68
R9	R10	R11	R12
8	72	84	64
R13	R14	R15	
83	96	76	



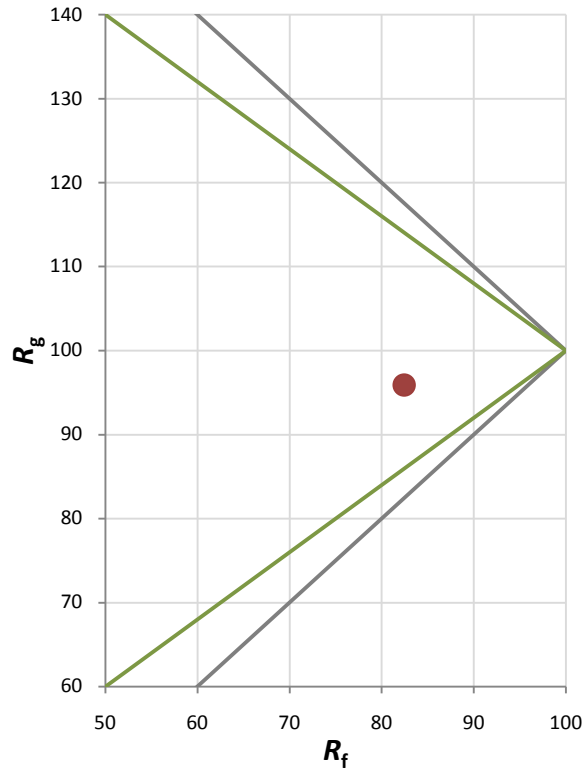
Fidelity Index and Gamut Index

Fidelity Index $R_f$	82
Gamut Index $R_g$	96

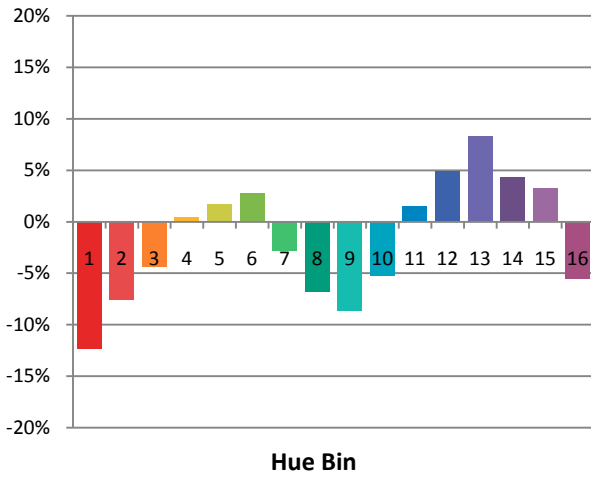
Spectral Power Distribution Comparison



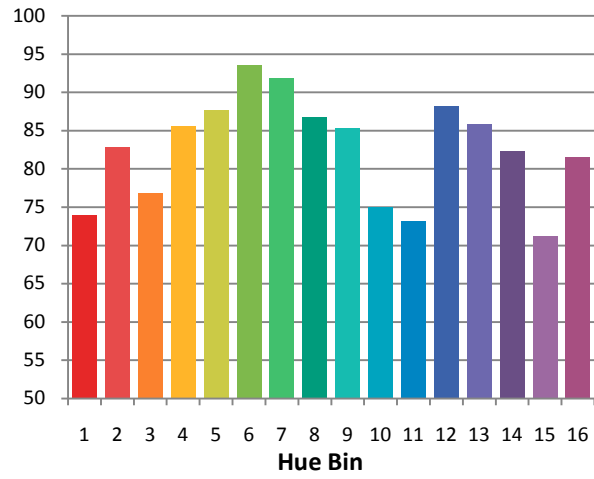
Plot of  $R_g$  versus  $R_f$



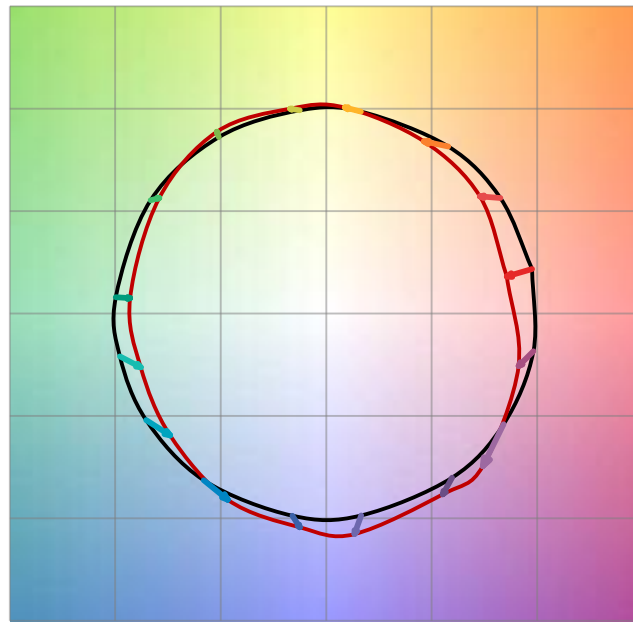
Chroma Shift by Hue



$R_f$  by Hue

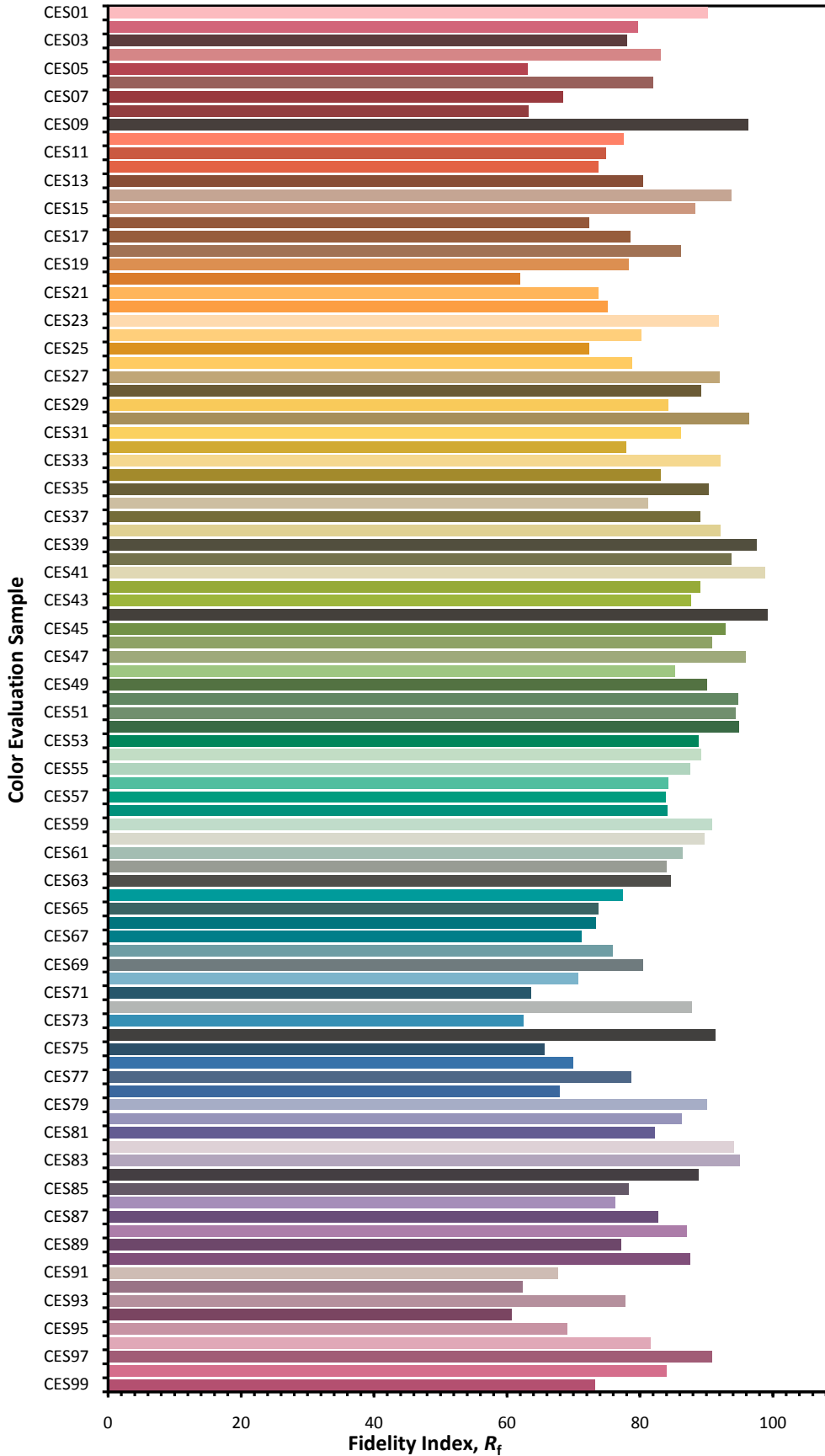


Color Vector Graphic

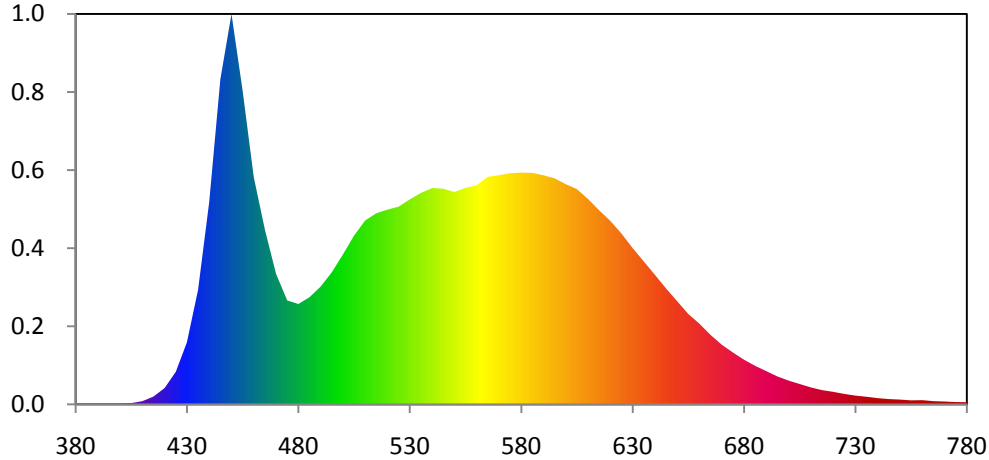


— Reference Illuminat    — Test Source

**Color Fidelity by CES Sample**



**Relative Spectral Power Distribution**

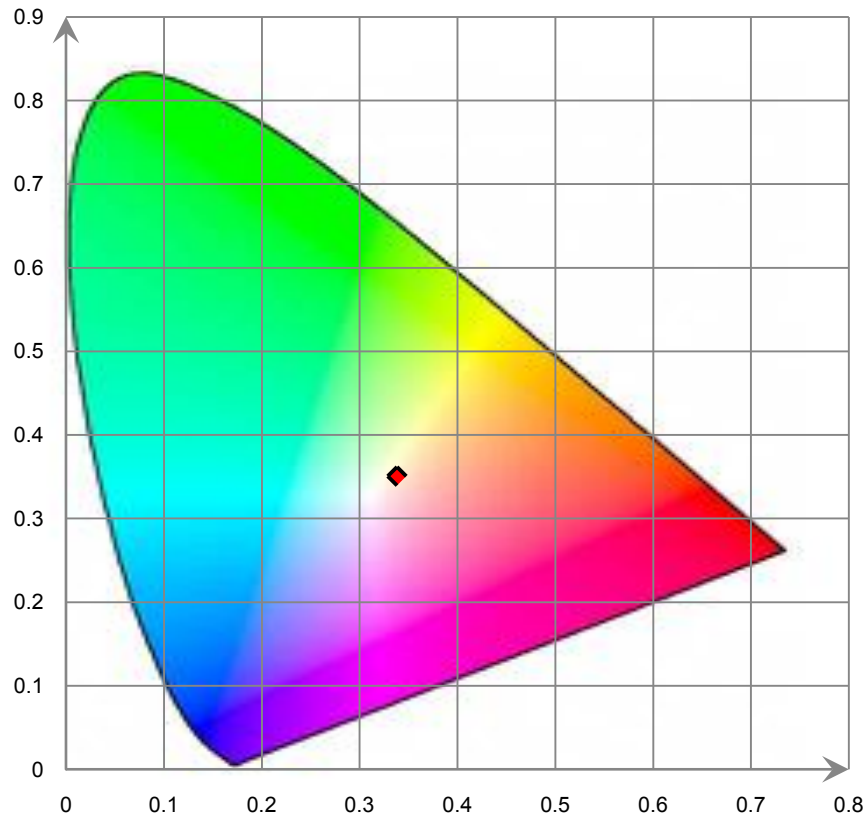


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.566E-01	421	7.759E+00	462	8.144E+01	503	6.366E+01	544	8.524E+01
381	2.369E-01	422	9.037E+00	463	7.729E+01	504	6.515E+01	545	8.519E+01
382	2.171E-01	423	1.031E+01	464	7.314E+01	505	6.664E+01	546	8.493E+01
383	1.973E-01	424	1.159E+01	465	6.899E+01	506	6.784E+01	547	8.467E+01
384	1.776E-01	425	1.287E+01	466	6.551E+01	507	6.904E+01	548	8.441E+01
385	1.578E-01	426	1.520E+01	467	6.203E+01	508	7.023E+01	549	8.415E+01
386	1.512E-01	427	1.754E+01	468	5.854E+01	509	7.143E+01	550	8.389E+01
387	1.447E-01	428	1.987E+01	469	5.506E+01	510	7.263E+01	551	8.421E+01
388	1.381E-01	429	2.221E+01	470	5.158E+01	511	7.320E+01	552	8.453E+01
389	1.316E-01	430	2.454E+01	471	4.947E+01	512	7.377E+01	553	8.486E+01
390	1.250E-01	431	2.869E+01	472	4.737E+01	513	7.434E+01	554	8.518E+01
391	1.257E-01	432	3.283E+01	473	4.527E+01	514	7.491E+01	555	8.551E+01
392	1.263E-01	433	3.697E+01	474	4.316E+01	515	7.548E+01	556	8.571E+01
393	1.270E-01	434	4.112E+01	475	4.106E+01	516	7.577E+01	557	8.591E+01
394	1.276E-01	435	4.526E+01	476	4.078E+01	517	7.605E+01	558	8.612E+01
395	1.283E-01	436	5.219E+01	477	4.050E+01	518	7.634E+01	559	8.632E+01
396	1.453E-01	437	5.912E+01	478	4.021E+01	519	7.662E+01	560	8.653E+01
397	1.624E-01	438	6.605E+01	479	3.993E+01	520	7.691E+01	561	8.719E+01
398	1.795E-01	439	7.299E+01	480	3.965E+01	521	7.714E+01	562	8.786E+01
399	1.966E-01	440	7.992E+01	481	4.018E+01	522	7.737E+01	563	8.853E+01
400	2.137E-01	441	8.961E+01	482	4.071E+01	523	7.761E+01	564	8.919E+01
401	2.718E-01	442	9.930E+01	483	4.124E+01	524	7.784E+01	565	8.986E+01
402	3.298E-01	443	1.090E+02	484	4.178E+01	525	7.808E+01	566	8.999E+01
403	3.879E-01	444	1.187E+02	485	4.231E+01	526	7.865E+01	567	9.012E+01
404	4.460E-01	445	1.284E+02	486	4.315E+01	527	7.922E+01	568	9.025E+01
405	5.041E-01	446	1.335E+02	487	4.399E+01	528	7.980E+01	569	9.037E+01
406	6.555E-01	447	1.387E+02	488	4.483E+01	529	8.037E+01	570	9.050E+01
407	8.069E-01	448	1.439E+02	489	4.567E+01	530	8.095E+01	571	9.065E+01
408	9.583E-01	449	1.490E+02	490	4.651E+01	531	8.145E+01	572	9.081E+01
409	1.110E+00	450	1.542E+02	491	4.763E+01	532	8.196E+01	573	9.096E+01
410	1.261E+00	451	1.481E+02	492	4.876E+01	533	8.247E+01	574	9.112E+01
411	1.627E+00	452	1.421E+02	493	4.988E+01	534	8.298E+01	575	9.127E+01
412	1.994E+00	453	1.360E+02	494	5.101E+01	535	8.348E+01	576	9.133E+01
413	2.360E+00	454	1.299E+02	495	5.213E+01	536	8.387E+01	577	9.138E+01
414	2.726E+00	455	1.239E+02	496	5.354E+01	537	8.426E+01	578	9.144E+01
415	3.093E+00	456	1.170E+02	497	5.495E+01	538	8.465E+01	579	9.150E+01
416	3.771E+00	457	1.102E+02	498	5.636E+01	539	8.503E+01	580	9.156E+01
417	4.448E+00	458	1.034E+02	499	5.777E+01	540	8.542E+01	581	9.153E+01
418	5.126E+00	459	9.657E+01	500	5.918E+01	541	8.538E+01	582	9.150E+01
419	5.804E+00	460	8.974E+01	501	6.068E+01	542	8.533E+01	583	9.147E+01
420	6.482E+00	461	8.559E+01	502	6.217E+01	543	8.528E+01	584	9.144E+01

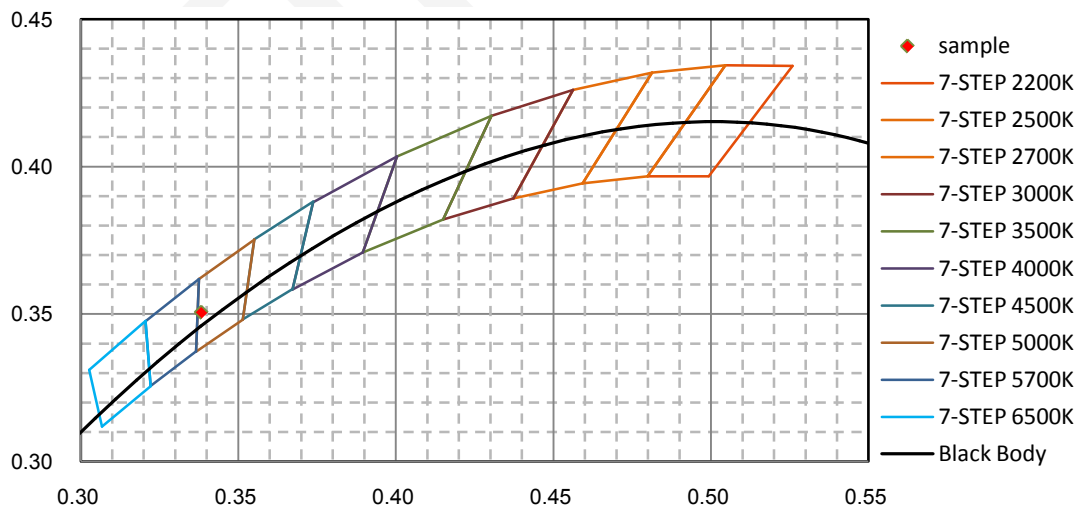


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	9.141E+01	626	6.637E+01	667	2.591E+01	708	7.247E+00	749	1.941E+00
586	9.122E+01	627	6.522E+01	668	2.515E+01	709	6.979E+00	750	1.901E+00
587	9.104E+01	628	6.407E+01	669	2.438E+01	710	6.711E+00	751	1.839E+00
588	9.085E+01	629	6.293E+01	670	2.361E+01	711	6.497E+00	752	1.777E+00
589	9.067E+01	630	6.178E+01	671	2.300E+01	712	6.282E+00	753	1.715E+00
590	9.049E+01	631	6.073E+01	672	2.238E+01	713	6.067E+00	754	1.653E+00
591	9.024E+01	632	5.967E+01	673	2.176E+01	714	5.852E+00	755	1.591E+00
592	9.000E+01	633	5.861E+01	674	2.115E+01	715	5.637E+00	756	1.604E+00
593	8.975E+01	634	5.755E+01	675	2.053E+01	716	5.501E+00	757	1.618E+00
594	8.951E+01	635	5.650E+01	676	1.996E+01	717	5.366E+00	758	1.632E+00
595	8.926E+01	636	5.544E+01	677	1.938E+01	718	5.230E+00	759	1.645E+00
596	8.881E+01	637	5.439E+01	678	1.881E+01	719	5.094E+00	760	1.659E+00
597	8.835E+01	638	5.334E+01	679	1.824E+01	720	4.958E+00	761	1.581E+00
598	8.790E+01	639	5.228E+01	680	1.767E+01	721	4.795E+00	762	1.504E+00
599	8.744E+01	640	5.123E+01	681	1.718E+01	722	4.631E+00	763	1.427E+00
600	8.699E+01	641	5.015E+01	682	1.669E+01	723	4.468E+00	764	1.349E+00
601	8.659E+01	642	4.907E+01	683	1.620E+01	724	4.305E+00	765	1.272E+00
602	8.620E+01	643	4.799E+01	684	1.572E+01	725	4.142E+00	766	1.244E+00
603	8.581E+01	644	4.691E+01	685	1.523E+01	726	4.007E+00	767	1.217E+00
604	8.542E+01	645	4.583E+01	686	1.481E+01	727	3.872E+00	768	1.189E+00
605	8.502E+01	646	4.483E+01	687	1.440E+01	728	3.737E+00	769	1.162E+00
606	8.425E+01	647	4.382E+01	688	1.398E+01	729	3.603E+00	770	1.134E+00
607	8.347E+01	648	4.281E+01	689	1.356E+01	730	3.468E+00	771	1.092E+00
608	8.270E+01	649	4.180E+01	690	1.315E+01	731	3.375E+00	772	1.049E+00
609	8.192E+01	650	4.079E+01	691	1.273E+01	732	3.282E+00	773	1.007E+00
610	8.115E+01	651	3.977E+01	692	1.231E+01	733	3.189E+00	774	9.647E-01
611	8.025E+01	652	3.876E+01	693	1.189E+01	734	3.096E+00	775	9.224E-01
612	7.936E+01	653	3.775E+01	694	1.147E+01	735	3.003E+00	776	9.114E-01
613	7.846E+01	654	3.673E+01	695	1.105E+01	736	2.895E+00	777	9.004E-01
614	7.757E+01	655	3.572E+01	696	1.072E+01	737	2.787E+00	778	8.894E-01
615	7.667E+01	656	3.495E+01	697	1.039E+01	738	2.679E+00	779	8.784E-01
616	7.584E+01	657	3.418E+01	698	1.006E+01	739	2.571E+00	780	8.674E-01
617	7.500E+01	658	3.342E+01	699	9.729E+00	740	2.463E+00		
618	7.417E+01	659	3.265E+01	700	9.399E+00	741	2.391E+00		
619	7.333E+01	660	3.188E+01	701	9.129E+00	742	2.318E+00		
620	7.249E+01	661	3.099E+01	702	8.860E+00	743	2.246E+00		
621	7.150E+01	662	3.011E+01	703	8.590E+00	744	2.174E+00		
622	7.050E+01	663	2.922E+01	704	8.321E+00	745	2.101E+00		
623	6.951E+01	664	2.834E+01	705	8.051E+00	746	2.061E+00		
624	6.851E+01	665	2.745E+01	706	7.783E+00	747	2.021E+00		
625	6.751E+01	666	2.668E+01	707	7.515E+00	748	1.981E+00		

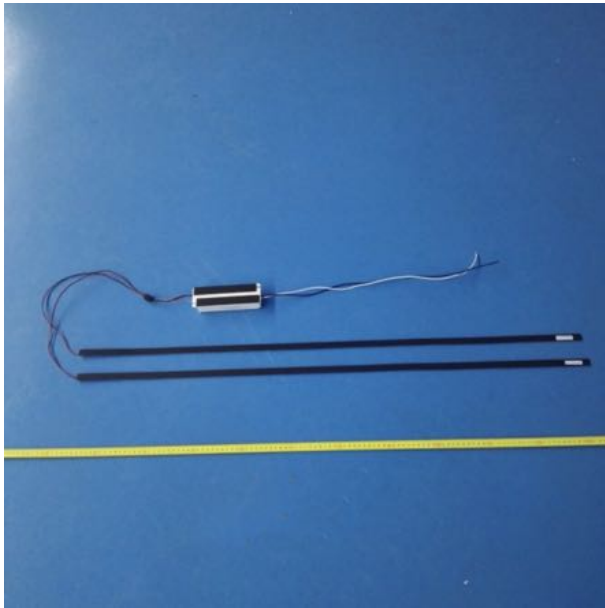
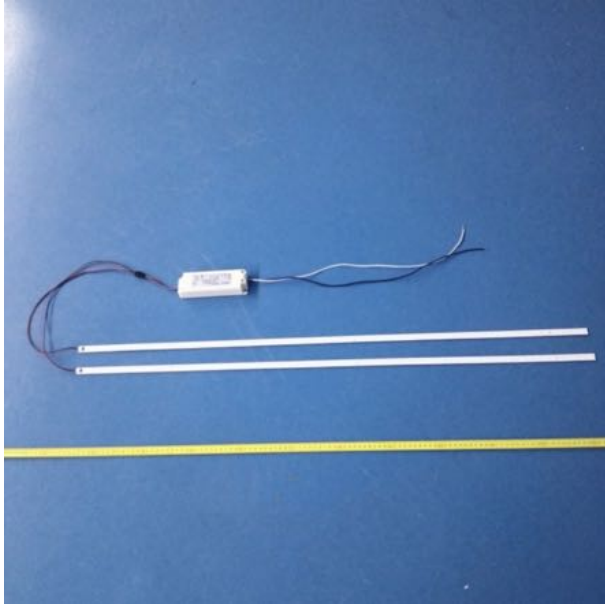
**CIE 1931 x y Chromaticity Diagram**



**7-Step Chromaticity Quadrangles**



**6. Product Photo**



Auxiliary Equipment (Recessed Troffer)



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