



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

P.Q.L., Inc.

2285 Ward Avenue - Simi Valley, CA 93065

Test Model: 93704

Report Type:	Electrical and Photometric tests including: Input Current, Power, Power Factor, Luminous Flux, Luminous Efficacy, CRI, CCT, Chromaticity Coordinate, Spectral Power Distribution
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	RKS160716003-10A2
Test Date:	2016-07-22
Report Date:	2016-07-28
Reviewed By:	Jeanne Han/EE Manager <i>Jeanne Han</i>
Prepared By:	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
Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
Accreditation:	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: 93704
 Manufacturer: P.Q.L., Inc.
 Brand Name: Superior Life®
 Product Designation: Linear Retrofit Kits for 2x2 Luminaires
 Dimmable: Non- Dimmable
 Burning Time Before Test: 0hour(For New Products)
 Auxiliary Equipment: Lithonia 2PM3 9 cell 2x2 parabolic

Rated Values:

Rated Voltage/Frequency: 100-277VAC, 50/60Hz
 Rated Power: 25W
 Nominal CCT: 5000K
 Nominal Lumen Output: 3400 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 π 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_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.

FINAL

5. Test Result

[Integrating Sphere System]

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

Test orientation: **Downward**

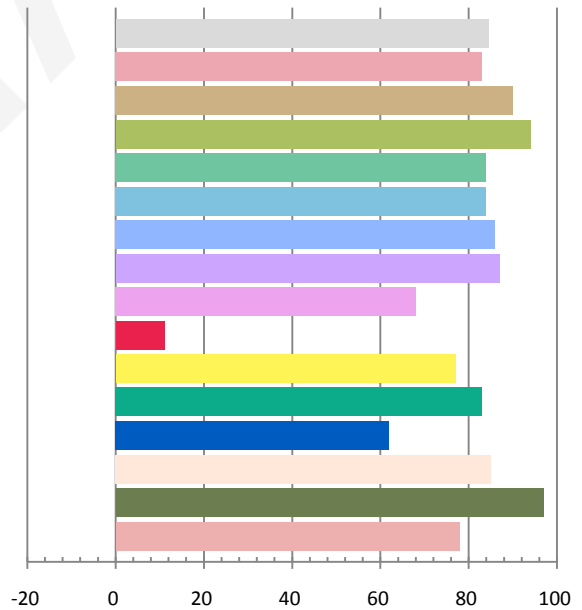
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
119.9	60	0.2104	24.99	0.99	2635	105.43

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
8.252	5287	0.00202	0.3377	0.3495	0.2072	0.4825

Color Rendering Index

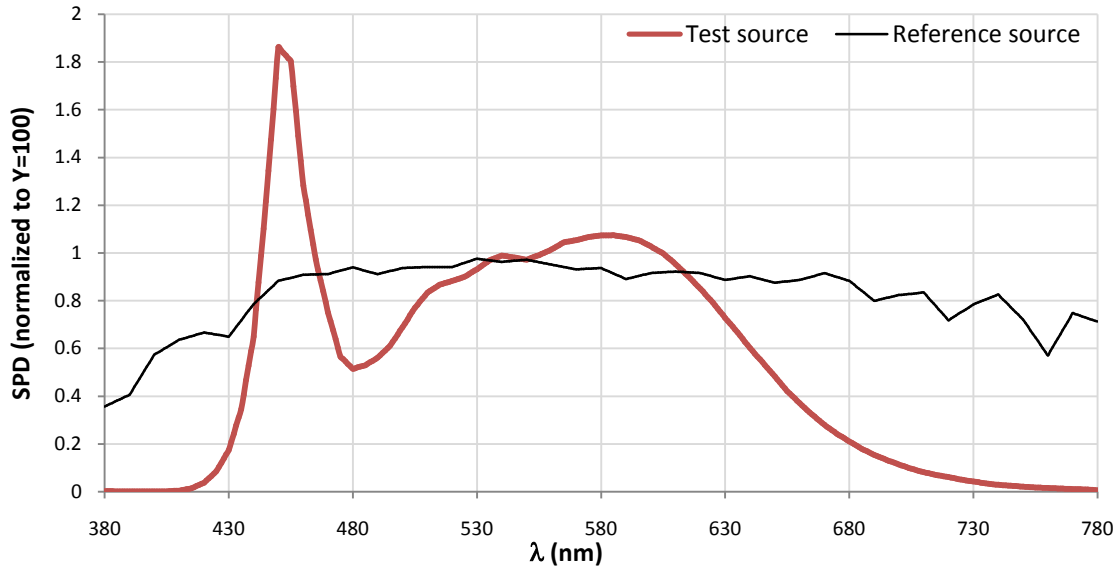
Ra			
84.5			
R1	R2	R3	R4
83	90	94	84
R5	R6	R7	R8
84	86	87	68
R9	R10	R11	R12
11	77	83	62
R13	R14	R15	
85	97	78	



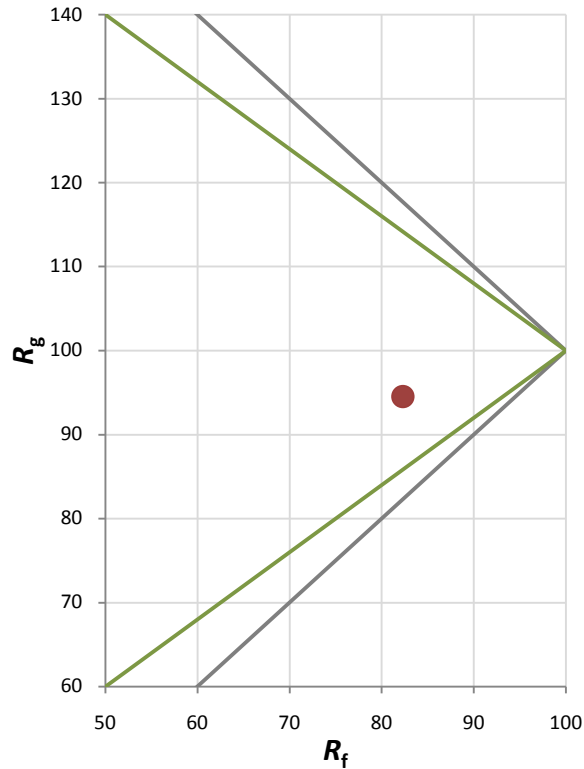
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	95

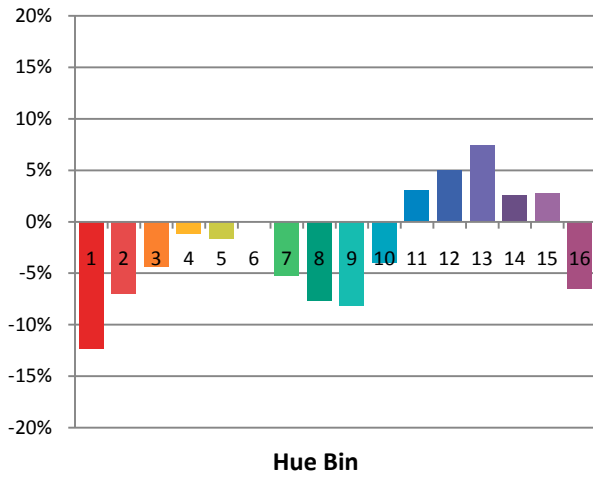
Spectral Power Distribution Comparison



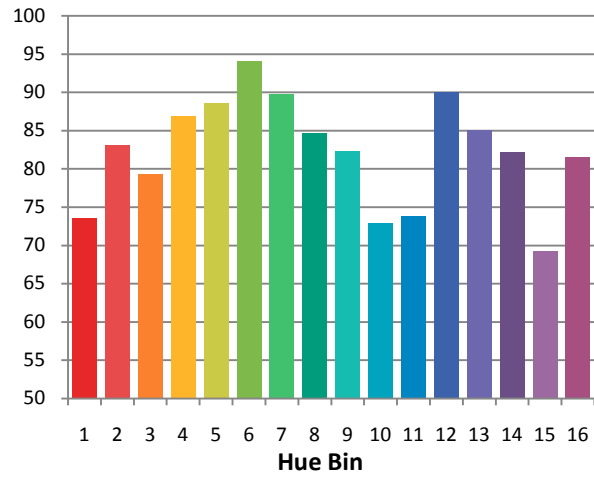
Plot of R_g versus R_f



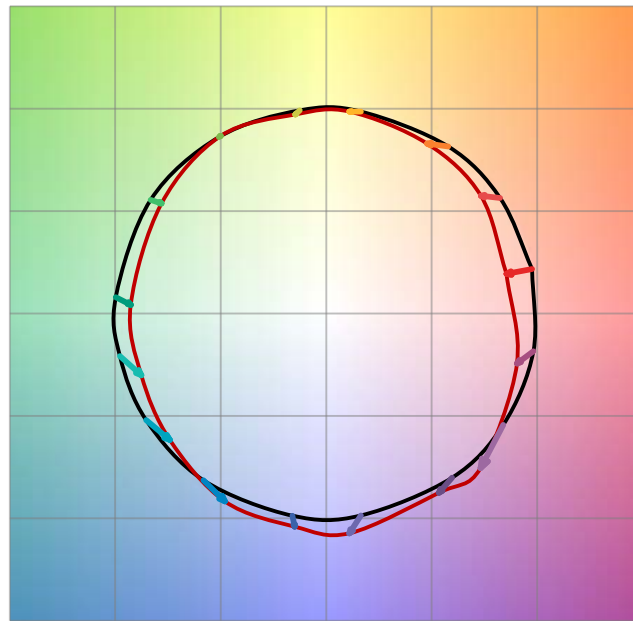
Chroma Shift by Hue



R_f by Hue

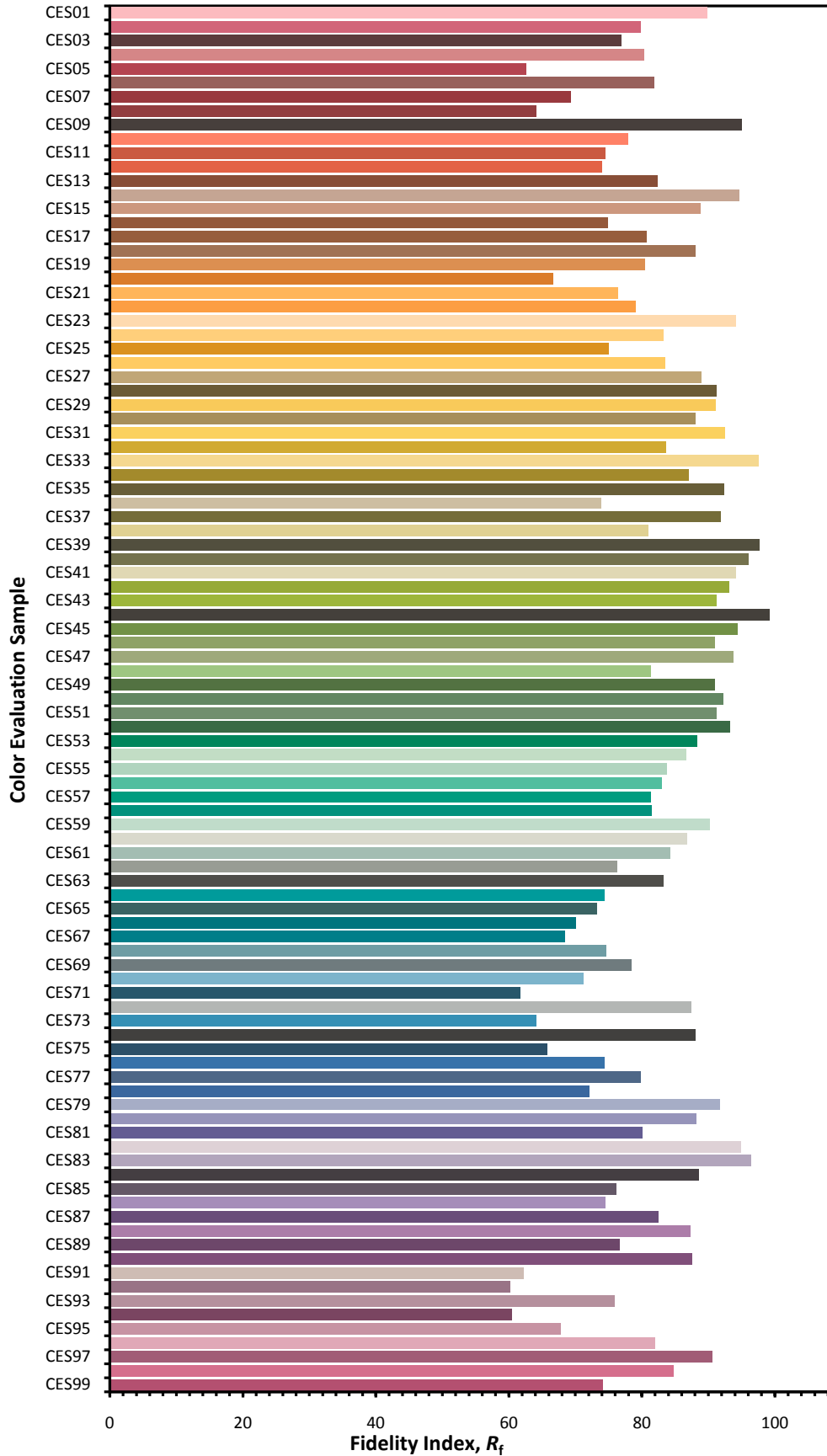


Color Vector Graphic

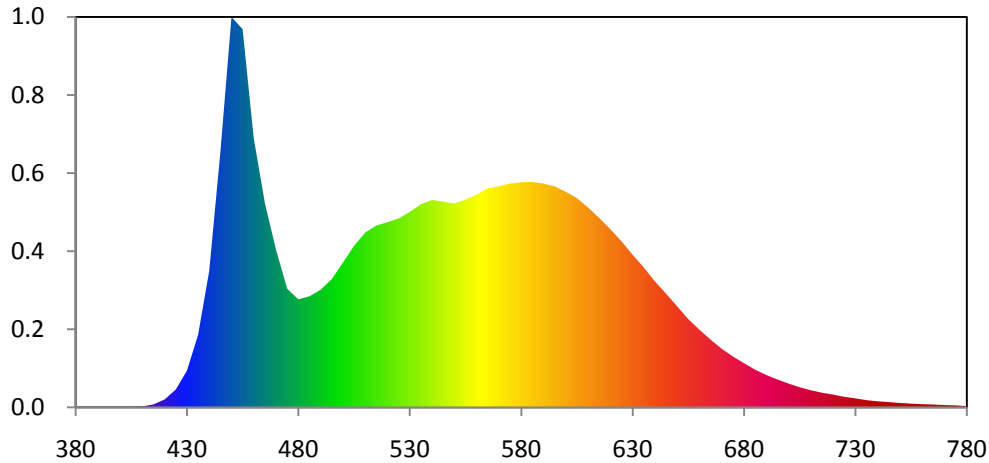


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



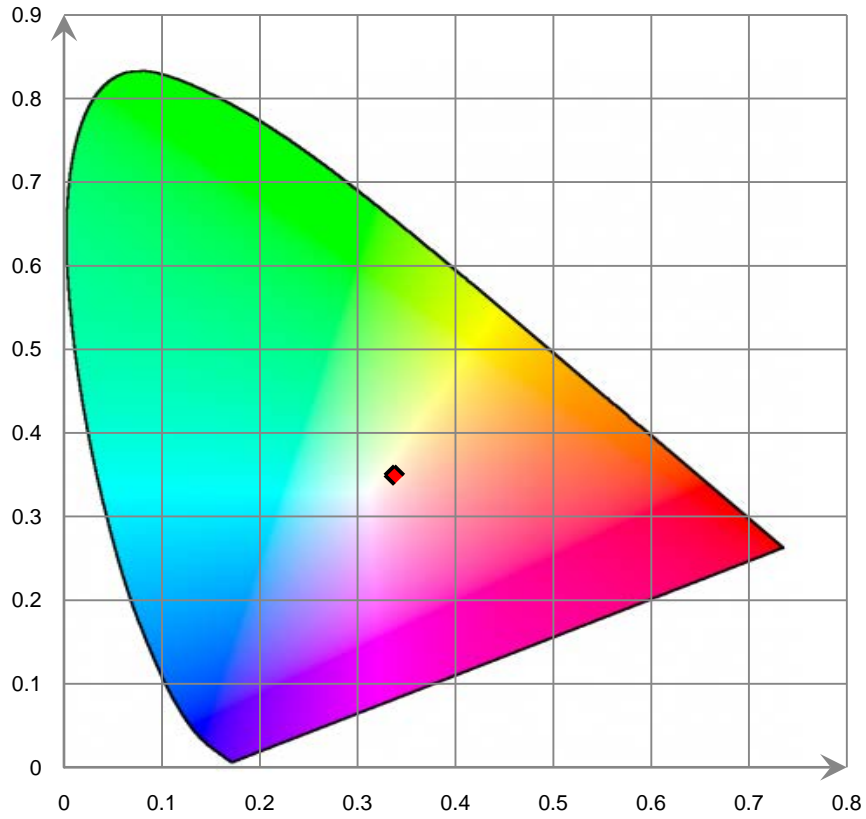
Relative Spectral Power Distribution



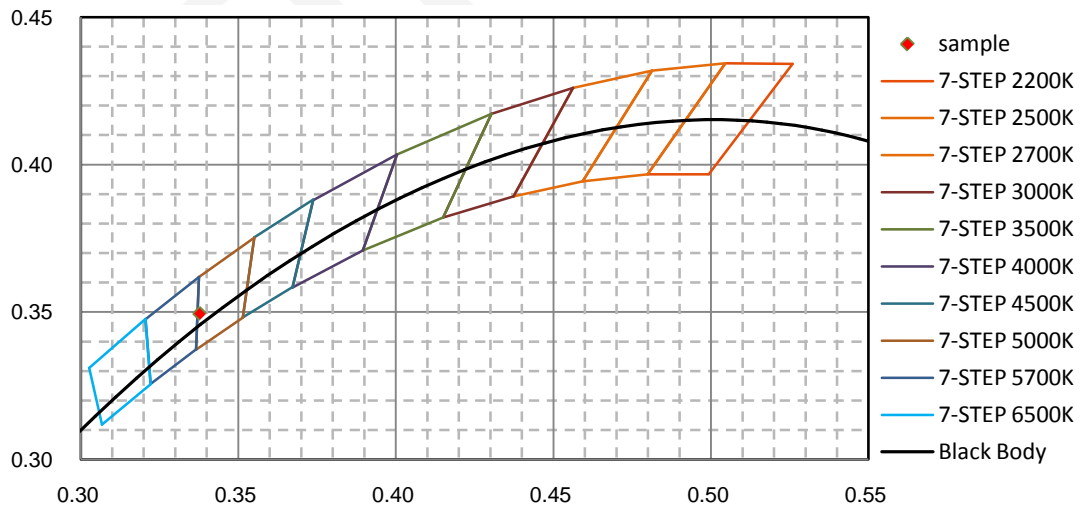
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.038E-01	421	1.822E+00	462	4.470E+01	503	2.847E+01	544	3.792E+01
381	9.403E-02	422	2.189E+00	463	4.232E+01	504	2.909E+01	545	3.786E+01
382	8.421E-02	423	2.556E+00	464	3.994E+01	505	2.972E+01	546	3.779E+01
383	7.440E-02	424	2.923E+00	465	3.755E+01	506	3.020E+01	547	3.771E+01
384	6.459E-02	425	3.290E+00	466	3.583E+01	507	3.069E+01	548	3.763E+01
385	5.478E-02	426	3.980E+00	467	3.412E+01	508	3.118E+01	549	3.756E+01
386	5.395E-02	427	4.671E+00	468	3.240E+01	509	3.166E+01	550	3.748E+01
387	5.312E-02	428	5.362E+00	469	3.068E+01	510	3.215E+01	551	3.763E+01
388	5.229E-02	429	6.053E+00	470	2.896E+01	511	3.240E+01	552	3.778E+01
389	5.146E-02	430	6.743E+00	471	2.754E+01	512	3.266E+01	553	3.793E+01
390	5.063E-02	431	8.057E+00	472	2.611E+01	513	3.292E+01	554	3.808E+01
391	4.840E-02	432	9.371E+00	473	2.468E+01	514	3.318E+01	555	3.823E+01
392	4.617E-02	433	1.068E+01	474	2.326E+01	515	3.344E+01	556	3.841E+01
393	4.394E-02	434	1.200E+01	475	2.183E+01	516	3.356E+01	557	3.858E+01
394	4.171E-02	435	1.331E+01	476	2.143E+01	517	3.369E+01	558	3.876E+01
395	3.948E-02	436	1.567E+01	477	2.104E+01	518	3.381E+01	559	3.894E+01
396	3.958E-02	437	1.802E+01	478	2.065E+01	519	3.393E+01	560	3.912E+01
397	3.968E-02	438	2.038E+01	479	2.026E+01	520	3.406E+01	561	3.935E+01
398	3.978E-02	439	2.274E+01	480	1.986E+01	521	3.419E+01	562	3.959E+01
399	3.988E-02	440	2.509E+01	481	1.998E+01	522	3.432E+01	563	3.982E+01
400	3.997E-02	441	2.945E+01	482	2.009E+01	523	3.446E+01	564	4.006E+01
401	4.376E-02	442	3.381E+01	483	2.020E+01	524	3.459E+01	565	4.030E+01
402	4.755E-02	443	3.816E+01	484	2.032E+01	525	3.472E+01	566	4.037E+01
403	5.134E-02	444	4.252E+01	485	2.043E+01	526	3.497E+01	567	4.044E+01
404	5.513E-02	445	4.688E+01	486	2.067E+01	527	3.522E+01	568	4.051E+01
405	5.892E-02	446	5.186E+01	487	2.091E+01	528	3.546E+01	569	4.058E+01
406	8.166E-02	447	5.685E+01	488	2.116E+01	529	3.571E+01	570	4.065E+01
407	1.044E-01	448	6.184E+01	489	2.140E+01	530	3.595E+01	571	4.075E+01
408	1.271E-01	449	6.682E+01	490	2.164E+01	531	3.623E+01	572	4.086E+01
409	1.499E-01	450	7.181E+01	491	2.203E+01	532	3.651E+01	573	4.096E+01
410	1.726E-01	451	7.136E+01	492	2.242E+01	533	3.680E+01	574	4.107E+01
411	2.486E-01	452	7.090E+01	493	2.281E+01	534	3.708E+01	575	4.117E+01
412	3.245E-01	453	7.045E+01	494	2.320E+01	535	3.736E+01	576	4.122E+01
413	4.004E-01	454	7.000E+01	495	2.359E+01	536	3.751E+01	577	4.127E+01
414	4.764E-01	455	6.954E+01	496	2.419E+01	537	3.767E+01	578	4.131E+01
415	5.523E-01	456	6.553E+01	497	2.479E+01	538	3.783E+01	579	4.136E+01
416	7.329E-01	457	6.151E+01	498	2.539E+01	539	3.798E+01	580	4.140E+01
417	9.136E-01	458	5.750E+01	499	2.599E+01	540	3.814E+01	581	4.141E+01
418	1.094E+00	459	5.348E+01	500	2.659E+01	541	3.808E+01	582	4.142E+01
419	1.275E+00	460	4.947E+01	501	2.721E+01	542	3.803E+01	583	4.143E+01
420	1.455E+00	461	4.709E+01	502	2.784E+01	543	3.797E+01	584	4.144E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.144E+01	626	3.008E+01	667	1.180E+01	708	3.374E+00	749	8.485E-01
586	4.139E+01	627	2.958E+01	668	1.146E+01	709	3.264E+00	750	8.178E-01
587	4.133E+01	628	2.908E+01	669	1.112E+01	710	3.154E+00	751	7.922E-01
588	4.127E+01	629	2.858E+01	670	1.078E+01	711	3.062E+00	752	7.667E-01
589	4.121E+01	630	2.808E+01	671	1.050E+01	712	2.971E+00	753	7.411E-01
590	4.115E+01	631	2.762E+01	672	1.022E+01	713	2.879E+00	754	7.156E-01
591	4.105E+01	632	2.715E+01	673	9.933E+00	714	2.787E+00	755	6.901E-01
592	4.095E+01	633	2.669E+01	674	9.650E+00	715	2.695E+00	756	6.704E-01
593	4.086E+01	634	2.622E+01	675	9.367E+00	716	2.628E+00	757	6.507E-01
594	4.076E+01	635	2.576E+01	676	9.121E+00	717	2.561E+00	758	6.310E-01
595	4.066E+01	636	2.525E+01	677	8.876E+00	718	2.494E+00	759	6.113E-01
596	4.046E+01	637	2.473E+01	678	8.630E+00	719	2.428E+00	760	5.916E-01
597	4.026E+01	638	2.422E+01	679	8.384E+00	720	2.361E+00	761	5.786E-01
598	4.005E+01	639	2.371E+01	680	8.138E+00	721	2.278E+00	762	5.655E-01
599	3.985E+01	640	2.319E+01	681	7.898E+00	722	2.194E+00	763	5.524E-01
600	3.964E+01	641	2.274E+01	682	7.658E+00	723	2.111E+00	764	5.393E-01
601	3.942E+01	642	2.229E+01	683	7.417E+00	724	2.028E+00	765	5.263E-01
602	3.919E+01	643	2.184E+01	684	7.177E+00	725	1.945E+00	766	5.067E-01
603	3.896E+01	644	2.139E+01	685	6.936E+00	726	1.887E+00	767	4.872E-01
604	3.873E+01	645	2.093E+01	686	6.741E+00	727	1.829E+00	768	4.677E-01
605	3.850E+01	646	2.047E+01	687	6.546E+00	728	1.772E+00	769	4.482E-01
606	3.815E+01	647	2.000E+01	688	6.350E+00	729	1.714E+00	770	4.287E-01
607	3.781E+01	648	1.953E+01	689	6.155E+00	730	1.656E+00	771	4.170E-01
608	3.747E+01	649	1.907E+01	690	5.959E+00	731	1.590E+00	772	4.054E-01
609	3.712E+01	650	1.860E+01	691	5.795E+00	732	1.524E+00	773	3.937E-01
610	3.678E+01	651	1.813E+01	692	5.630E+00	733	1.458E+00	774	3.821E-01
611	3.639E+01	652	1.766E+01	693	5.465E+00	734	1.391E+00	775	3.705E-01
612	3.601E+01	653	1.718E+01	694	5.301E+00	735	1.325E+00	776	3.428E-01
613	3.562E+01	654	1.671E+01	695	5.136E+00	736	1.282E+00	777	3.152E-01
614	3.523E+01	655	1.624E+01	696	4.985E+00	737	1.239E+00	778	2.875E-01
615	3.484E+01	656	1.585E+01	697	4.833E+00	738	1.197E+00	779	2.599E-01
616	3.443E+01	657	1.546E+01	698	4.681E+00	739	1.154E+00	780	2.322E-01
617	3.402E+01	658	1.507E+01	699	4.530E+00	740	1.111E+00		
618	3.361E+01	659	1.468E+01	700	4.378E+00	741	1.083E+00		
619	3.320E+01	660	1.429E+01	701	4.243E+00	742	1.055E+00		
620	3.279E+01	661	1.393E+01	702	4.108E+00	743	1.027E+00		
621	3.234E+01	662	1.357E+01	703	3.973E+00	744	9.994E-01		
622	3.190E+01	663	1.320E+01	704	3.838E+00	745	9.714E-01		
623	3.146E+01	664	1.284E+01	705	3.703E+00	746	9.407E-01		
624	3.102E+01	665	1.248E+01	706	3.593E+00	747	9.100E-01		
625	3.057E+01	666	1.214E+01	707	3.483E+00	748	8.792E-01		

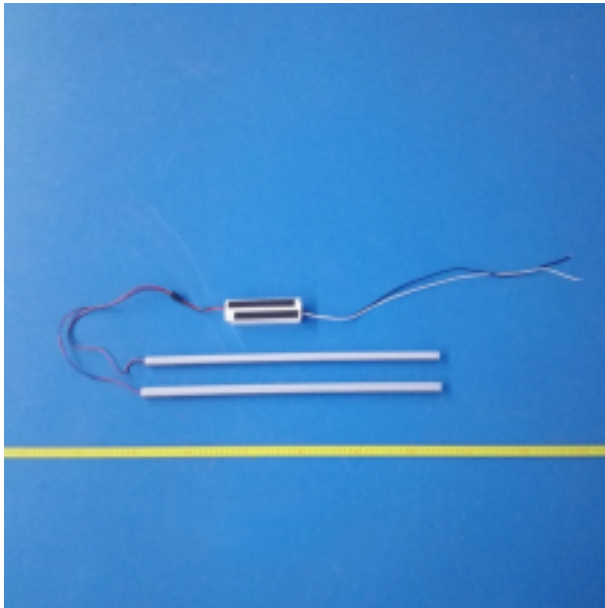
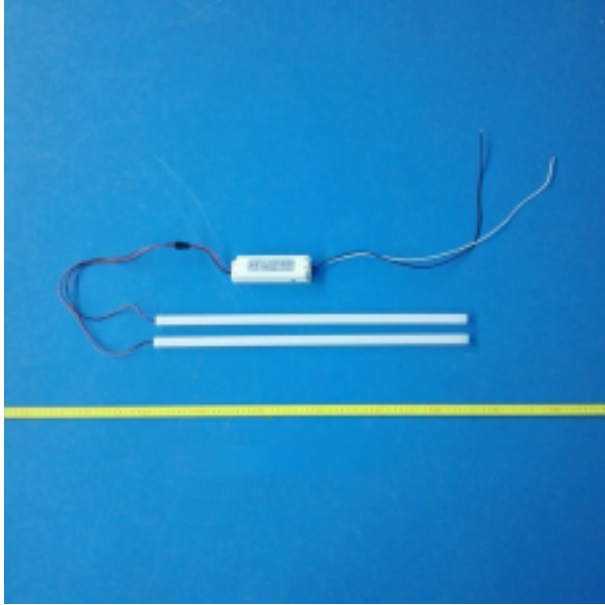
CIE 1931 x y Chromaticity Diagram



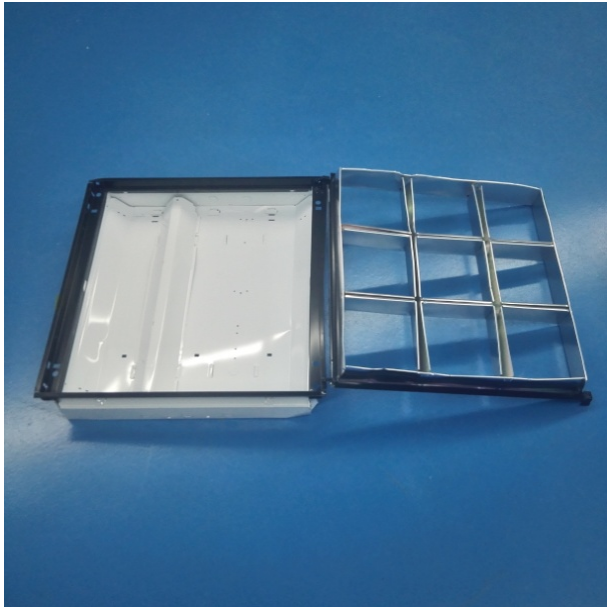
7-Step Chromaticity Quadrangles



6. Product Photo



Auxiliary Equipment (Recessed Troffer)



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