



## LM-79-08 Test Report

for

### Revolution Lighting Technologies, Inc.

2280 Ward Ave. Simi Valley, CA 93065

### LED Tube

Model: 203100-112

### Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,  
Hangzhou, Zhejiang Province, China 311100

Tel: +86 571 86376106

www.ledtestlab.com

Report No.: HZ18110016f

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Review by:

Engineer: April Zou  
Nov. 21, 2018

Approved by:



Manager: Jim Zhang  
Nov. 21, 2018

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

## Test Summary

Sample Tested: 203100-112

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
127.0	1490.0	11.73	0.9801
CCT (K)	CRI	Stabilization Time (Light & Power)	
3445	81.6	60	

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

### Test specifications:

**Date of Receipt** : Nov. 12, 2018

**Date of Test** : Nov. 13, 2018

**Test item** : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters

**Reference Standard** : IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

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## Sample Photo



Figure 1- Overview of the sample

### Equipment Under Test (EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 203100-112
<b>Electrical Ratings</b>	: 120-277V, 60Hz
<b>Product Description</b>	: 3500K
<b>Manufacturer</b>	: Revolution Lighting Technologies, Inc.
<b>Address</b>	: 2280 Ward Ave. Simi Valley, CA 93065

## TEST RESULTS

Test ambient temperature was 24.9°C.

Base orientation was Horizontal. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 65 minutes.

### Sphere-Spectroradiometer Method

Parameter	Result	
	Test Voltage (V)	120.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.100	0.046
Power Factor	0.9801	0.9453
Test Power (W)	11.73	12.18
THD A%	18.33	23.02
Luminous Efficacy (lm/W)	127.0	122.8
Total Luminous Flux (lm)	1490.0	1496.0
Color Rendering Index (CRI)	81.6	
R9	0.1	
Correlated Color Temperature (CCT)(K)	3445	
Chromaticity Chroma x	0.4088	
Chromaticity Chroma y	0.3936	
Chromaticity Chroma u	0.2368	
Chromaticity Chroma v	0.3420	
Duv	0.0002	
Chromaticity Chroma u'	0.2368	
Chromaticity Chroma v'	0.5130	

Special Color Rendering Indices	
R1	79.6
R2	89.8
R3	96.1
R4	79.4
R5	79.9
R6	86.6
R7	83.1
R8	58.5
R9	0.1
R10	76.3
R11	78.3
R12	65.8
R13	82.1
R14	98.4

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u',v') diagram,  $u' = u = 4x/(-2x+12y+3)$ ,  $v' = 3v/2 = 9y/(-2x+12y+3)$ .

### Goniophotometer Method

Test ambient temperature was 24.7 °C.

The photometric distance is 30 m.

Luminous data was taken at 0.5° vertical intervals and 10° horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.100
Power Factor	0.9810
Power (W)	11.76
Luminous Efficacy (lm/W)	125.0
Total Luminous Flux (lm)	1470.4
Beam Angle (°)	104.3 (0°-180°) /127.1(90°-270°)
Center Beam Candle Power (cd)	421
Maximum Beam Candle Power (cd)	421.6 (At: C=20.0, Gamma=1.5)
Spacing Criteria	1.21 (0°-180°) /1.29 (90°-270°)
Zonal Lumens in the 0°-60°Zone	64.95%
Zonal Lumens in the 60°-90°Zone	25.30%
Zonal Lumens in the 90°-120°Zone	7.37%
Zonal Lumens in the 120°-180°Zone	2.38%

Table 3: Test data per Goniophotometer Method

### Spectral Power Distribution - Sphere Spectroradiometer Method

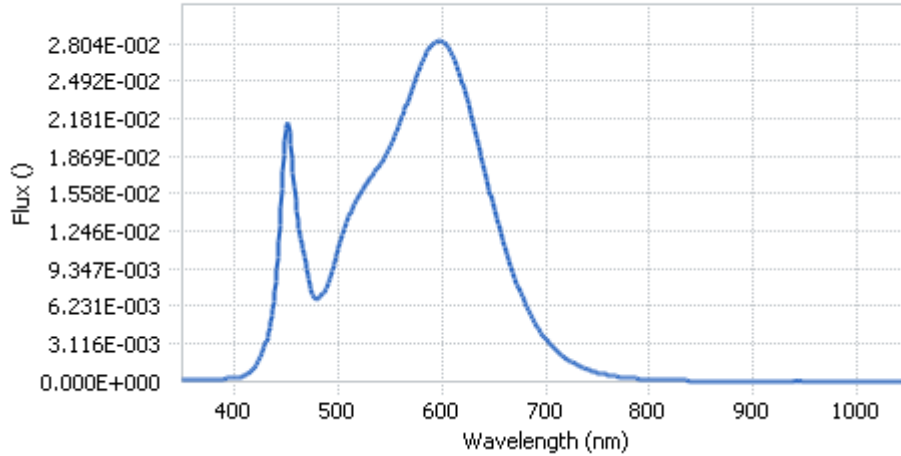
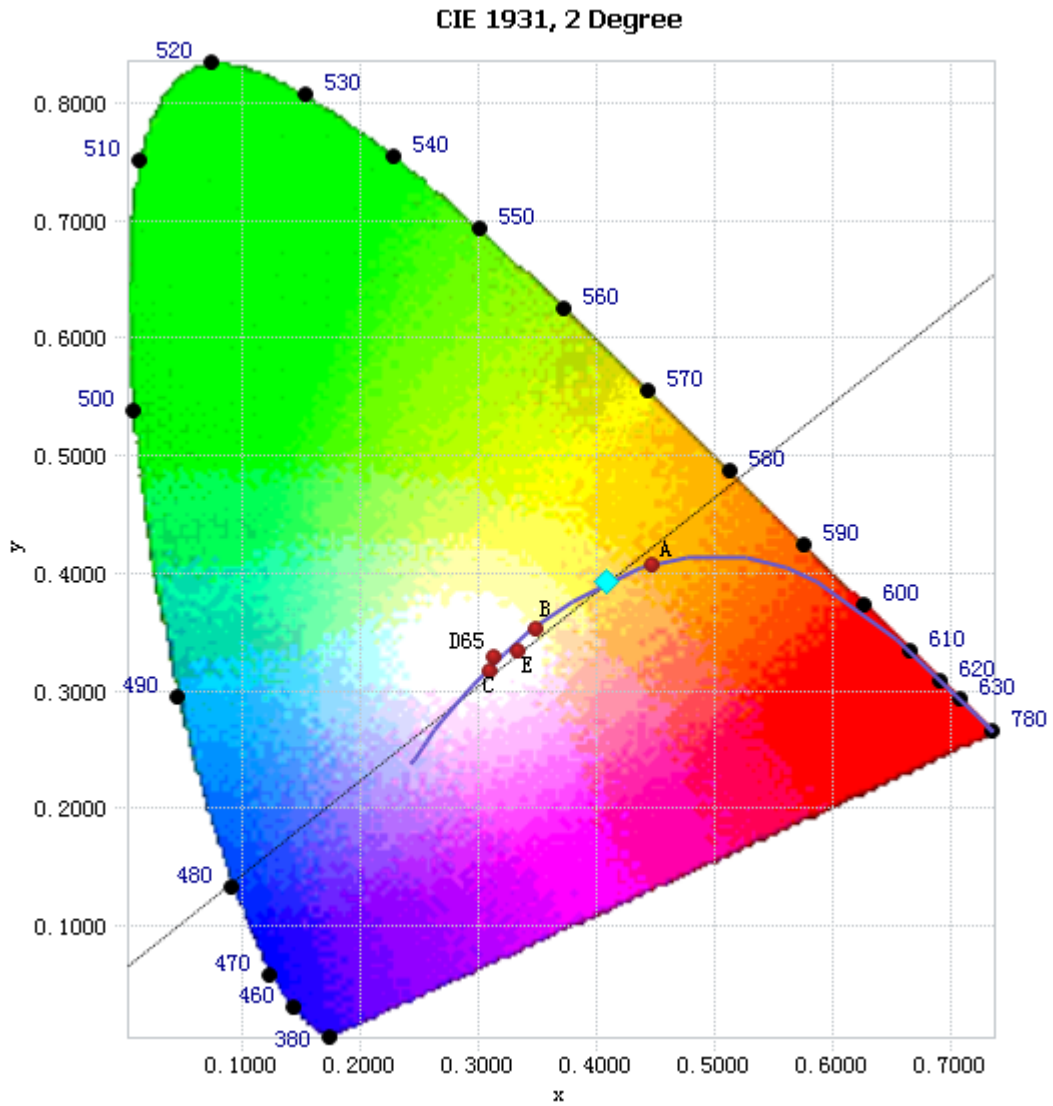


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.05E-04	485	7.24E-03	590	2.78E-02	695	4.13E-03
385	2.08E-04	490	8.06E-03	595	2.82E-02	700	3.55E-03
390	2.13E-04	495	9.39E-03	600	2.82E-02	705	3.03E-03
395	2.49E-04	500	1.09E-02	605	2.79E-02	710	2.59E-03
400	2.74E-04	505	1.23E-02	610	2.72E-02	715	2.21E-03
405	3.37E-04	510	1.36E-02	615	2.61E-02	720	1.89E-03
410	4.86E-04	515	1.46E-02	620	2.47E-02	725	1.62E-03
415	7.37E-04	520	1.54E-02	625	2.33E-02	730	1.38E-03
420	1.22E-03	525	1.60E-02	630	2.15E-02	735	1.17E-03
425	1.97E-03	530	1.67E-02	635	1.98E-02	740	9.91E-04
430	3.08E-03	535	1.73E-02	640	1.80E-02	745	8.56E-04
435	4.96E-03	540	1.80E-02	645	1.62E-02	750	7.25E-04
440	8.31E-03	545	1.86E-02	650	1.45E-02	755	6.24E-04
445	1.44E-02	550	1.95E-02	655	1.29E-02	760	5.40E-04
450	2.09E-02	555	2.04E-02	660	1.13E-02	765	4.62E-04
455	1.97E-02	560	2.15E-02	665	9.96E-03	770	3.96E-04
460	1.41E-02	565	2.27E-02	670	8.66E-03	775	3.36E-04
465	1.14E-02	570	2.40E-02	675	7.54E-03	780	2.95E-04
470	9.31E-03	575	2.52E-02	680	6.54E-03		
475	7.38E-03	580	2.63E-02	685	5.63E-03		
480	6.83E-03	585	2.72E-02	690	4.83E-03		

Table 4: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

### Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4088, 0.3936)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.



### Nominal CCT Quadrangles – Sphere Spectroradiometer Method

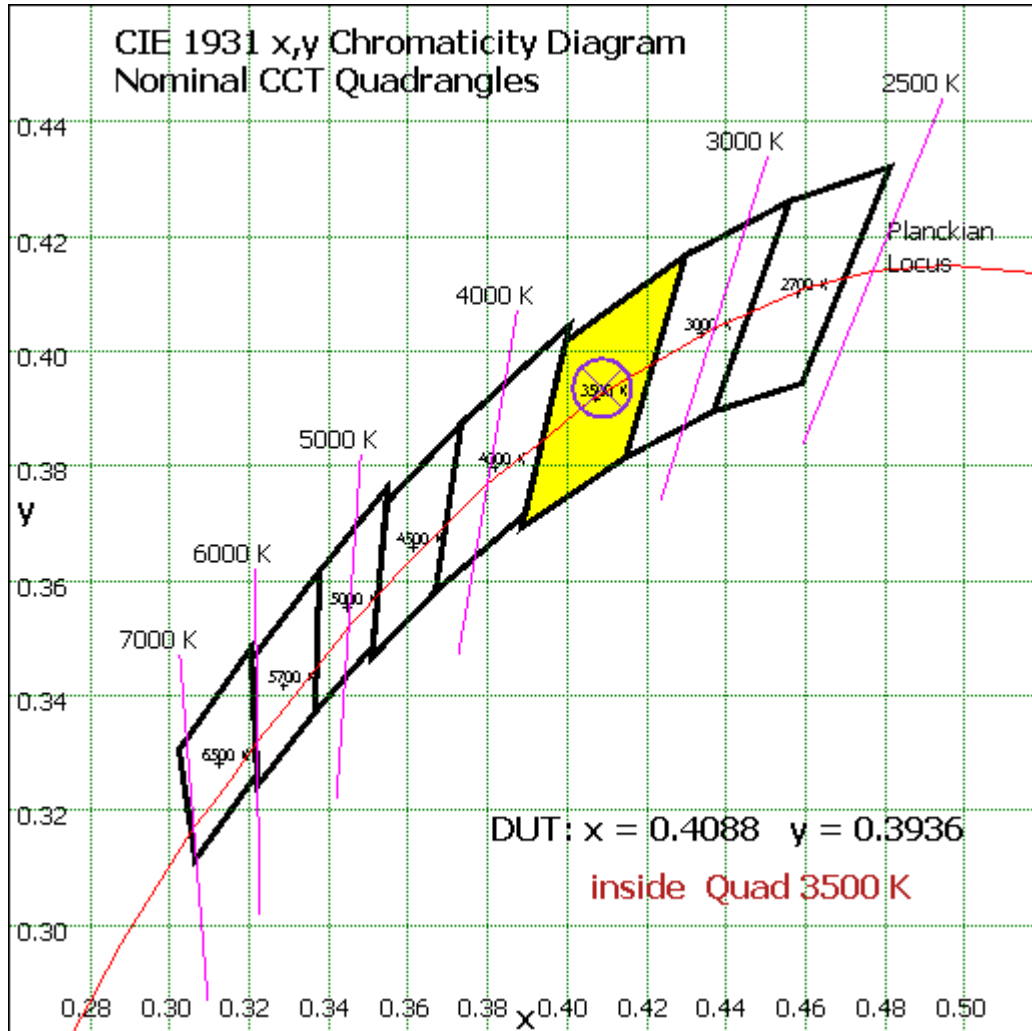


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

**Zonal Lumen Tabulation- Goniophotometer Method**

$\gamma(^{\circ})$	Lumens	% Total
0- 10	39.81	2.71%
10- 20	113.941	7.75%
20- 30	172.607	11.74%
30- 40	208.508	14.18%
40- 50	217.995	14.83%
50- 60	202.195	13.75%
60- 70	167.331	11.38%
70- 80	123.142	8.37%
80- 90	81.49	5.54%
90-100	52.527	3.57%
100-110	34.169	2.32%
110-120	21.738	1.48%
120-130	14.082	0.96%
130-140	9.206	0.63%
140-150	5.886	0.40%
150-160	3.558	0.24%
160-170	1.783	0.12%
170-180	0.444	0.03%
Total	1470.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	955.056	64.95%
60- 90	371.963	25.30%
0-90	1327.019	90.25%
90- 180	143.393	9.75%
0- 180	1470.4	100%

Table 5: Zonal Lumen Data

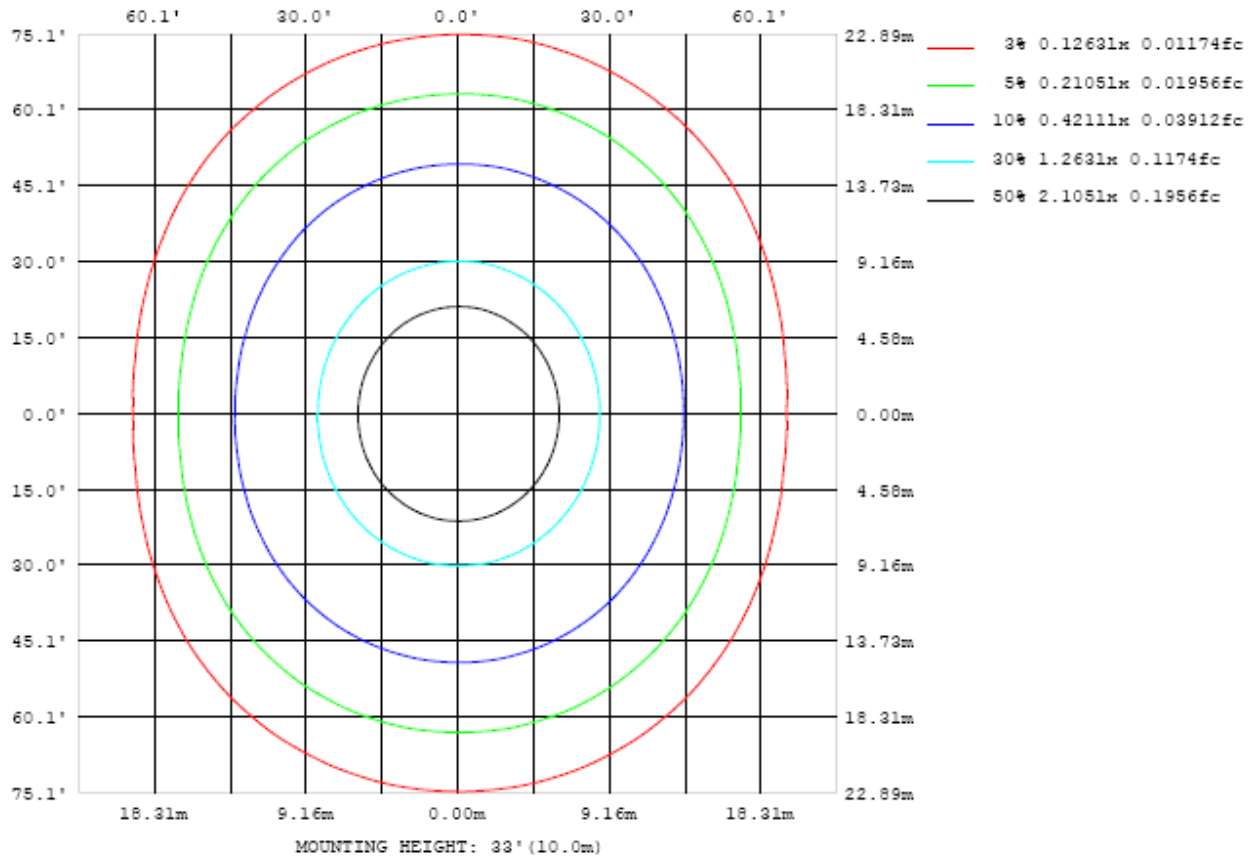


Chart 4: Beam Angle

### Luminous Intensity Distribution Plots- Goniophotometer Method

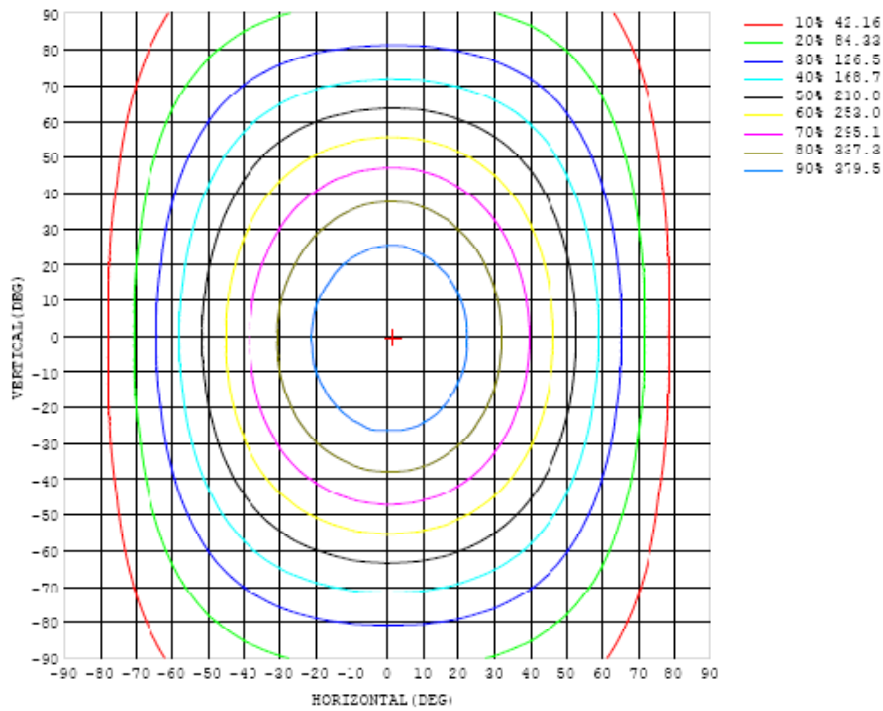


Chart 5: Illuminance Plot (Footcandles)

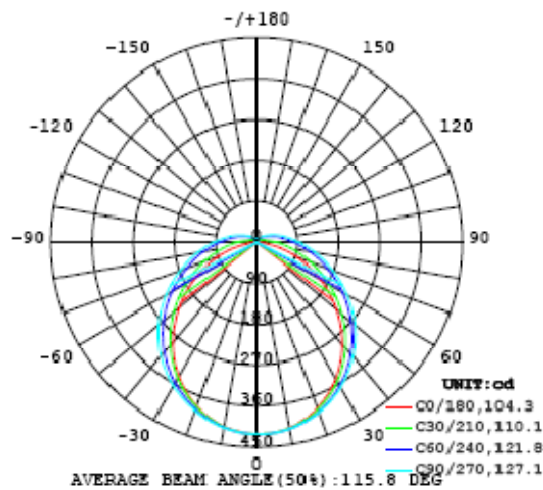


Chart 6: Polar Candela Distribution

**Luminous Intensity Data- Goniophotometer Method**

Table--1 UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421
5	419	420	420	420	420	420	419	420	421	420	420	419	418	418	419	418	418	417	417
10	413	413	414	414	415	416	415	416	416	415	416	415	414	413	412	411	411	411	410
15	402	402	403	404	405	407	408	408	409	408	409	406	405	405	403	402	401	399	399
20	388	388	390	391	393	395	396	398	399	398	398	395	394	392	389	387	386	384	384
25	369	370	372	374	376	379	382	384	384	384	384	382	379	376	373	370	367	365	364
30	347	348	350	353	357	361	365	367	369	369	368	365	361	357	353	348	345	342	340
35	320	322	325	329	335	340	344	347	350	349	349	345	342	336	331	325	320	316	315
40	292	294	297	303	310	316	322	326	328	328	328	324	318	312	306	298	292	287	286
45	261	263	268	275	282	291	297	302	306	306	304	300	294	287	279	268	262	256	254
50	228	230	236	244	254	263	272	277	280	281	280	275	268	260	251	239	231	224	221
55	195	197	204	213	224	236	244	250	254	255	254	249	242	232	222	209	198	191	188
60	161	163	171	183	196	208	217	224	228	229	228	222	215	205	193	179	167	158	155
65	127	130	140	153	167	180	190	198	202	203	201	196	189	178	165	151	137	125	122
70	94.0	98.0	110	125	141	154	165	172	176	177	176	171	163	153	139	123	107	94.0	88.9
75	62.6	67.9	82.5	99.7	116	130	141	148	152	153	152	147	140	129	115	98.8	81.2	65.2	58.0
80	34.2	41.7	59.3	77.6	94.3	108	119	126	129	130	129	125	118	108	94.0	77.3	59.1	40.5	30.1
85	11.4	21.0	40.2	59.3	75.6	89.0	99.0	106	110	110	110	106	99.0	89.2	75.8	59.7	41.0	21.5	8.77
90	0.47	8.77	26.3	44.4	60.3	73.2	82.7	89.1	92.8	93.7	92.9	89.0	82.8	73.5	61.2	45.5	27.8	10.2	0.14
95	0.27	3.71	17.2	33.3	48.1	60.3	68.9	75.1	78.2	79.3	78.5	74.9	69.2	60.7	49.2	34.7	19.0	4.98	0.30
100	0.42	2.45	11.4	25.0	38.2	49.4	57.8	63.7	66.4	67.3	66.3	63.5	58.2	50.1	39.4	26.6	13.1	3.49	0.50
105	0.64	2.15	8.37	18.6	30.2	40.4	48.2	53.6	56.5	57.5	56.7	53.7	48.7	41.2	31.5	20.1	9.89	2.98	0.83
110	0.92	2.29	6.77	14.4	23.5	32.5	39.8	44.9	47.7	48.7	47.8	45.1	40.4	33.5	24.9	16.1	8.20	3.03	1.21
115	1.29	2.63	5.88	11.9	19.0	25.9	32.1	36.9	39.7	40.6	40.0	37.2	32.9	27.2	20.4	13.3	7.21	3.27	1.61
120	1.67	3.00	5.48	10.2	15.9	21.6	26.5	30.2	32.6	33.4	32.9	30.8	27.3	22.6	17.1	11.5	6.61	3.56	2.02
125	2.04	3.26	5.38	8.99	13.6	18.2	22.3	25.5	27.4	28.1	27.6	25.8	23.0	19.1	14.7	10.1	6.32	3.78	2.44
130	2.42	3.78	5.41	8.16	11.8	15.5	18.8	21.4	23.1	23.6	23.3	21.9	19.5	16.3	12.7	9.18	6.16	3.76	2.82
135	2.71	4.10	5.49	7.64	10.4	13.4	16.1	18.2	19.5	20.0	19.7	18.5	16.6	14.1	11.2	8.48	6.10	4.26	3.05
140	2.99	4.41	5.57	7.29	9.36	11.6	13.7	15.4	16.5	16.9	16.6	15.7	14.2	12.2	10.00	7.87	5.91	4.77	3.29
145	3.19	4.66	5.63	6.96	8.55	10.2	11.8	13.1	14.0	14.3	14.1	13.3	12.2	10.7	9.08	7.46	5.73	5.11	3.48
150	3.34	4.79	5.84	6.71	7.94	9.13	10.3	11.2	11.9	12.1	12.0	11.4	10.6	9.49	8.31	6.95	5.53	5.28	3.62
155	3.43	5.08	5.89	6.44	7.37	8.25	9.03	9.71	10.1	10.3	10.2	9.87	9.28	8.53	7.61	6.32	5.99	5.48	3.70
160	3.48	4.75	5.89	6.45	6.74	7.49	8.05	8.50	8.79	8.89	8.84	8.61	8.22	7.65	6.82	6.28	6.02	5.50	3.71
165	3.50	4.12	4.83	6.33	6.63	6.90	7.28	7.57	7.75	7.83	7.80	7.62	7.35	6.72	6.24	5.55	5.11	4.55	3.66
170	3.46	3.67	3.75	4.61	6.02	6.46	6.57	6.80	6.91	6.95	6.97	6.90	6.16	5.15	4.77	4.45	4.16	3.82	3.60
175	4.03	4.00	3.89	3.85	4.26	4.22	4.57	5.60	6.06	6.21	5.39	3.73	3.57	3.86	3.80	4.08	3.85	3.89	3.97
180	2.22	2.22	2.22	2.22	2.22	2.22	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

C (DEG) Y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421		
5	417	419	418	418	417	419	419	419	419	419	418	419	418	419	419	419	419		
10	410	411	411	412	412	412	414	414	414	414	413	413	413	414	413	413	413		
15	399	400	400	400	402	403	403	405	405	406	405	404	404	404	404	404	403		
20	384	385	385	385	389	390	393	393	393	394	392	393	392	391	390	389	388		
25	364	365	366	369	372	375	378	379	380	381	379	377	375	374	372	369	369		
30	341	343	346	349	353	357	360	363	365	365	363	360	358	354	351	349	347		
35	315	318	321	326	332	337	342	345	347	348	345	341	336	333	328	324	322		
40	286	290	294	302	309	316	322	325	326	327	324	320	314	308	302	297	293		
45	255	260	266	275	284	292	299	303	304	305	302	296	290	282	274	267	263		
50	223	229	237	247	258	267	274	279	281	281	277	271	264	255	245	236	231		
55	190	197	207	219	231	241	249	254	256	256	251	246	237	227	215	205	197		
60	157	166	178	191	204	214	223	227	230	230	226	219	210	199	185	173	164		
65	125	136	149	164	177	188	196	201	203	204	200	193	183	171	156	143	133		
70	94.0	107	123	139	152	163	171	176	178	178	174	167	157	145	130	114	101		
75	64.8	80.4	98.1	115	129	140	147	152	154	154	150	144	134	121	104	86.8	70.9		
80	39.0	57.3	76.2	93.4	107	118	126	130	132	131	128	121	112	98.7	82.0	63.2	44.9		
85	19.8	39.1	58.3	75.0	88.8	98.8	106	110	112	112	108	102	92.4	79.7	63.1	43.9	24.3		
90	8.46	25.8	43.9	59.8	72.6	82.4	88.9	92.8	94.4	93.9	90.6	84.8	75.8	63.4	47.8	29.6	11.3		
95	3.82	17.0	32.9	47.4	59.5	68.6	74.6	78.2	79.7	79.2	75.9	70.5	62.2	50.5	36.0	19.7	5.26		
100	2.50	11.3	24.4	37.5	48.5	57.0	62.8	66.0	67.4	66.8	63.8	58.7	50.8	40.1	26.9	13.0	3.16		
105	2.33	8.37	18.3	29.0	39.2	47.1	52.6	55.6	56.9	56.3	53.5	48.6	41.0	31.2	19.9	9.41	2.63		
110	2.54	6.93	14.4	23.0	31.1	38.0	43.2	46.2	47.4	46.7	44.0	39.2	32.4	24.2	15.4	7.34	2.64		
115	2.82	6.16	11.9	18.8	25.4	31.0	35.1	37.6	38.5	38.0	35.6	31.7	26.2	19.6	12.4	6.30	2.86		
120	3.17	5.82	10.2	15.7	21.2	25.8	29.3	31.4	32.2	31.6	29.6	26.3	21.7	16.3	10.4	5.84	3.13		
125	3.55	5.66	9.07	13.3	17.8	21.7	24.6	26.3	27.0	26.6	24.8	22.0	18.2	13.6	9.10	5.67	3.39		
130	3.90	5.60	8.29	11.6	15.2	18.3	20.7	22.3	22.8	22.4	20.9	18.5	15.4	11.7	8.28	5.63	3.72		
135	4.17	5.58	7.66	10.2	13.0	15.6	17.5	18.8	19.3	19.0	17.7	15.8	13.1	10.4	7.74	5.65	4.12		
140	4.46	5.68	7.27	9.24	11.3	13.3	14.9	16.0	16.3	16.0	15.0	13.4	11.4	9.34	7.34	5.68	4.35		
145	4.71	5.71	6.91	8.45	10.0	11.5	12.7	13.4	13.7	13.5	12.7	11.5	10.1	8.53	7.04	5.72	4.76		
150	4.91	5.78	6.62	7.74	8.95	10.0	10.9	11.4	11.6	11.5	10.9	10.0	9.02	7.89	6.74	5.86	5.08		
155	5.20	5.84	6.45	7.06	8.05	8.77	9.39	9.78	9.94	9.87	9.46	8.89	8.18	7.36	6.60	5.95	5.34		
160	4.48	5.74	6.28	6.61	7.01	7.76	8.20	8.48	8.59	8.56	8.33	7.99	7.48	7.02	6.54	6.01	5.31		
165	3.73	4.71	5.20	5.68	6.36	6.69	7.03	7.45	7.52	7.54	7.41	7.24	6.98	6.74	6.32	5.94	4.50		
170	3.61	3.71	3.97	4.27	4.52	4.92	5.88	6.03	6.73	6.82	6.74	6.64	6.45	6.30	5.79	4.32	3.70		
175	3.96	3.92	3.80	4.02	3.75	3.85	3.48	3.48	4.33	5.46	5.63	5.37	4.55	4.23	4.25	3.83	3.84		
180	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.22	2.22	2.22	2.22	2.22		

Table 7: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 14, 2018	Aug. 13, 2019
Digital Power Meter	PF2010A	HZTE028-01	Sep. 12, 2018	Sep. 11, 2019
AC Power Supply	DPS1060	HZTE001-06	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	WY12010	HZTE004-03	Aug. 09, 2018	Aug. 08, 2019
Temperature recorder	JM624U	HZTE018-08	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 09, 2018	Aug. 08, 2019
Standard source	D908	HZTE012-01	Aug. 14, 2018	Aug. 13, 2019
Integrate Sphere system	2M	HZTE015-01	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Standard source	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

Table 8: Test Equipment List

## TEST METHODS

### Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

### Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and Two Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is  $4\pi$ . Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

The uncertainty of integrating sphere system reported in this document is expanded uncertainty is 2.1% with a coverage factor  $k=2$ .

## **Goniophotometer Method**

### **Photometric and Electrical Measurements**

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.

Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.

Some graphics were created with Photometric Plus software.

The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.

The uncertainty of goniophotometer system reported in this document is expanded uncertainty is 2.3% with a coverage factor  $k=2$ .

### **Color Characteristics Measurements**

The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

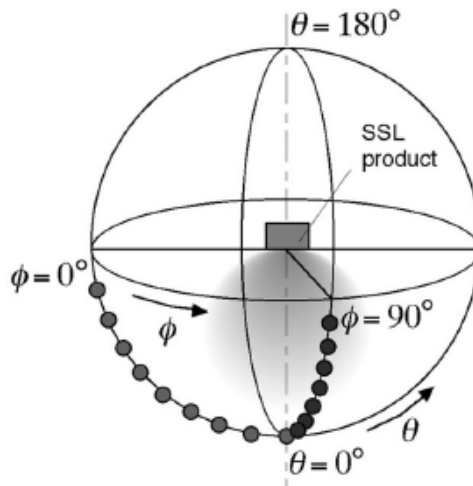
### **Color Spatial Uniformity**

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ( $C=0^\circ/180^\circ$  and  $C=90^\circ/270^\circ$ ) and at  $10^\circ$  or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate



was calculated from these points. The data was then analyzed to check for delta color differences of the  $u'$ ,  $v'$  chromaticity coordinates. The spatial non-uniformity of chromaticity,  $\Delta u'v'$ , is determined as the maximum deviation (distance on the CIE ( $u'$ ,  $v'$ ) diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



\*\*\* End of Report \*\*\*

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