



LM-79-08 Test Report

for

Philips (China) Investment Co., Ltd.

Building 9, Lane 888, Tianlin Road
Shanghai, China

InstantFit LED tube

Model: 9290002883(2 lamps+ballast ICN-2P32-N)

Laboratory: Leading Testing Laboratories

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Report No.: HZ14040022d

Review by:

April Zou

Engineer: April Zou
Apr. 17, 2014

Approved by:



Manager: Jim Zhang
Apr. 17 2014

Test Summary

Sample Tested: 9290002883(2 lamps+ballast ICN-2P32-N)

Photometric and Electrical Measurements for two lamps

Voltage (V AC)	Current (A)	Test power (W) (ballast + 2 tubes)	Power Factor	Total Luminous Flux (lm)	Luminous Efficacy (lm/W)	Total Harmonic Distortion
120.0	0.316	37.8	0.9974	4475.0	118.4	5.89

Photometric and Colorimetric Measurements for each lamp

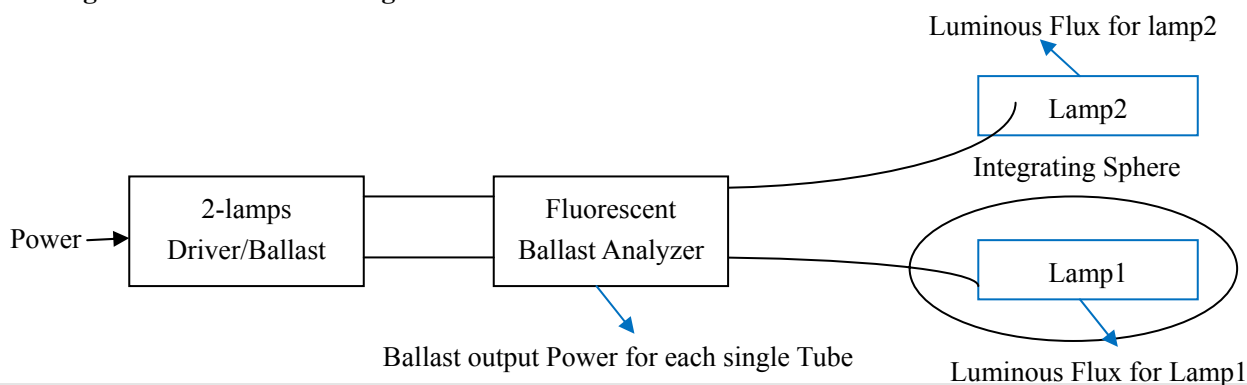
Sample Number	Luminous Flux(lm)	Test power (W)(bare tube)	Efficiency for single Tube (lm/W)	Correlated Color Temperature (K)
1#	2232.0	15.1	147.8	4905
2#	2243.0	15.9	141.1	4911
Sample Number	Color Rendering Index Ra	Color Rendering Index R9	Chromaticity Coordinate x	Chromaticity Coordinate y
1#	81.8	5.5	0.3482	0.3586
2#	81.8	5.0	0.3481	0.3591

Table 1: Executive Data Summary

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

Luminous Efficacy=(Luminous Flux for lamp1+ Luminous Flux for lamp2)/Power

Test figure is shown as following:



Test specifications:

Date of Receipt : Apr. 15, 2014

Date of Test : Apr. 15, 2014

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

The Ballast output Power for single Tube was tested using the Fluorescent Ballast Analyzer as per Client's requirement.

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Sample Photos

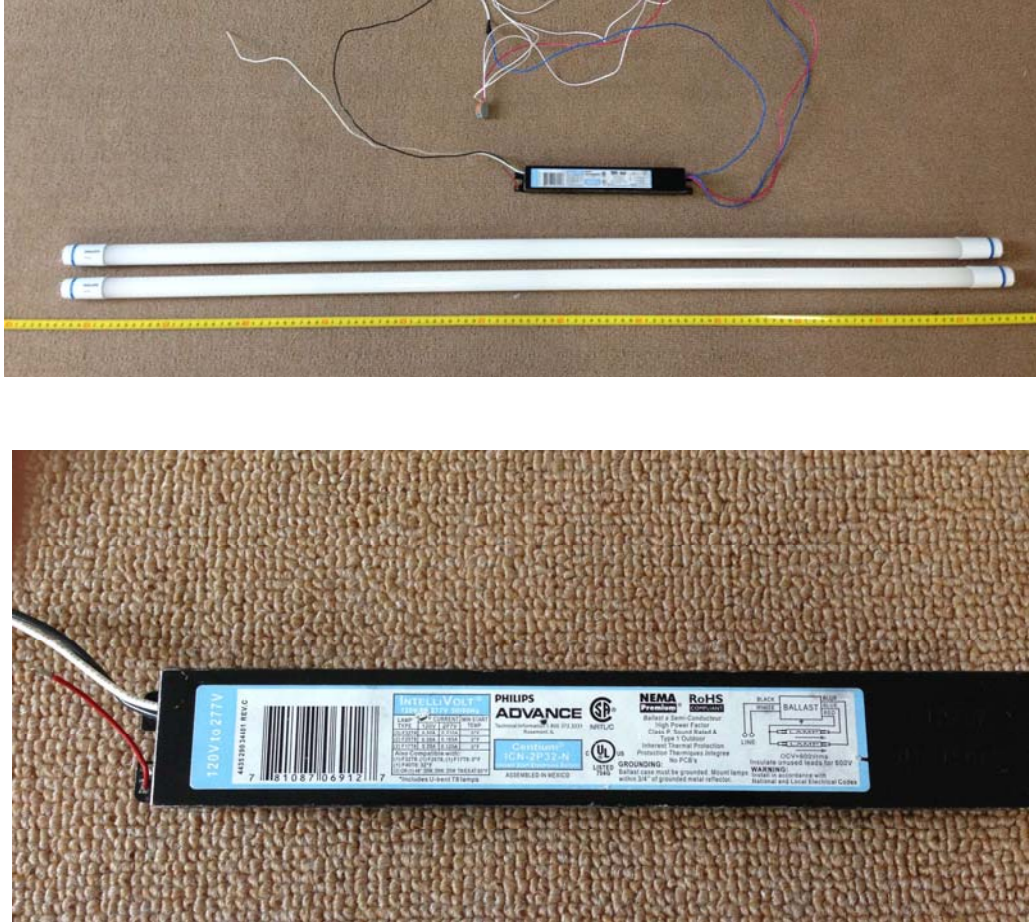


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: InstantFit LED tube
Model	: 9290002883(2 lamps+ballast ICN-2P32-N)
Electrical Ratings	: 12V AC, 50Hz, 16.5W
Product Description	: G13 base, 4 foot fixed ends tube, 16.5T8/48-5000 IF 10/1 LED tubes supplied by a high frequency fluorescent lamp ballast: PHILIPS ICN-2P32-N
Manufacturer	: Philips (China) Investment Co., Ltd.
Address	: Building 9, Lane 888, Tianlin Road Shanghai, China

TEST RESULTS

Test ambient temperature was 25.2°C

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

The stabilization time of the sample was 75 minutes, and the total operating time including stabilization was 110 minutes.

Sphere-Spectroradiometer Method

Parameter	Result			Special Color Rendering Indices		
	1#	2#	1#		1#	2#
Test Voltage (V)	120.0		277.0			
Voltage frequency (Hz)	60		60	R1	79.6	79.4
Test Current (A)	0.316		0.137	R2	86.2	86.2
Power Factor	0.9974		0.9818	R3	91.4	91.4
Test Power (W) (ballast + 2 tubes)	37.8		37.2	R4	81.9	81.8
Luminous Efficacy (lm/W)	118.4		/	R5	80.2	80.1
THD A%	5.89		9.87	R6	81	81
Total Luminous Flux (lm)	1997.0	2043.0		R7	87.2	87.3
Test power (W) (bare tube)	15.1	15.9		R8	67.1	67
Efficiency for single Tube (lm/W)	147.8	141.1		R9	5.5	5
Color Rendering Index (CRI)	81.8	81.8		R10	67.6	67.5
R9	5.5	5.0		R11	80.7	80.6
Correlated Color Temperature (CCT) (K)	4905	4911		R12	59.7	59.5
Chromaticity (Chroma x, Chroma y)	(0.3482, 0.386)	(0.3481, 0.3591)		R13	81	80.9
Chromaticity (Chroma u, Chroma v)	(0.2108, 0.3257)	(0.2106, 0.3258)		R14	95.4	95.4
Chromaticity (Chroma u', Chroma v')	(0.2108, 0.4885)	(0.2106, 0.4887)				
Duv	0.0022	0.0024				

Table 2: Test data per Sphere-Spectroradiometer Method

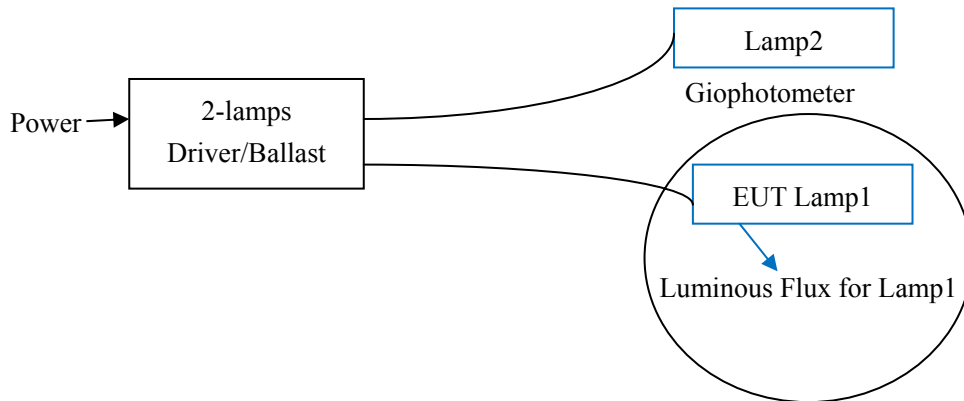
Note: According to CIE 1976 (u',v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Goniophotometer Method

The photometric distance is 2.475m.

Luminous data was taken at 0.5° vertical intervals and 5° horizontal intervals.

Test figure is shown as following:



Note: One lamp was tested in Giophotometer system. The total electrical input data was recorded before the ballast and divided by 2 in table below to be used as the input data of the tested one lamp.

Parameter	Result
Test Voltage (V)	120.1
Voltage frequency (Hz)	60
Test Current (A)	0.321
Power Factor	0.9973
Test power (W) (ballast + 2 tubes)/2	19.2
Luminous Efficacy (lm/W)	116.4
Total Luminous Flux (lm) (Single tube)	2234.0
Test power (W) (bare tube)	15.1
Luminous Efficacy (lm/W) (bare tube)	147.9
Beam Angle ($^\circ$)	115.3 (0° - 180°)/ 164.3 (90° - 270°)
Center Beam Candle Power (cd)	495
Maximum Beam Candle Power (cd)	495.1 (At: C=290.0, Gamma=0.5)
Spacing Criteria	1.28 (0° - 180°)/ 1.39 (90° - 270°)
Zonal Lumens in the 0° - 60° Zone	55.59%
Zonal Lumens in the 60° - 90° Zone	29.25%
Zonal Lumens in the 90° - 120° Zone	12.18%
Zonal Lumens in the 120° - 180° Zone	2.98%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution of 1# tube - Sphere Spectroradiometer Method

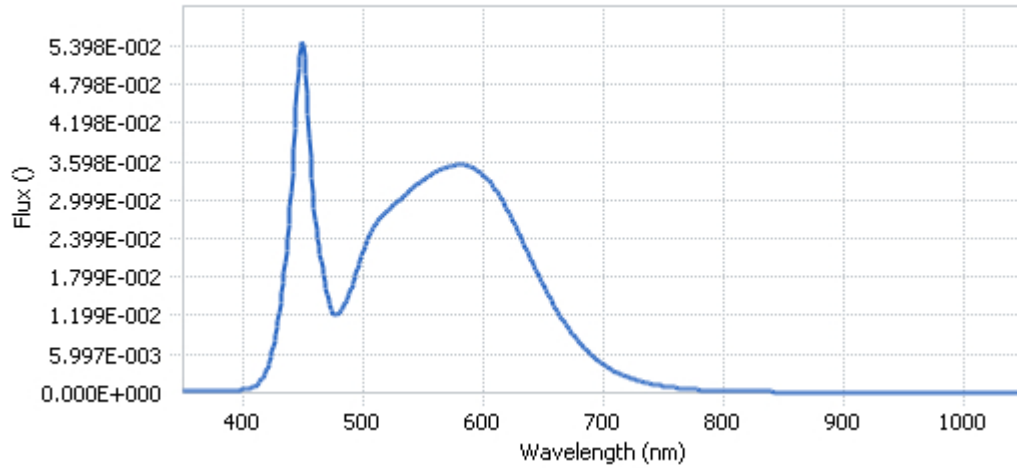
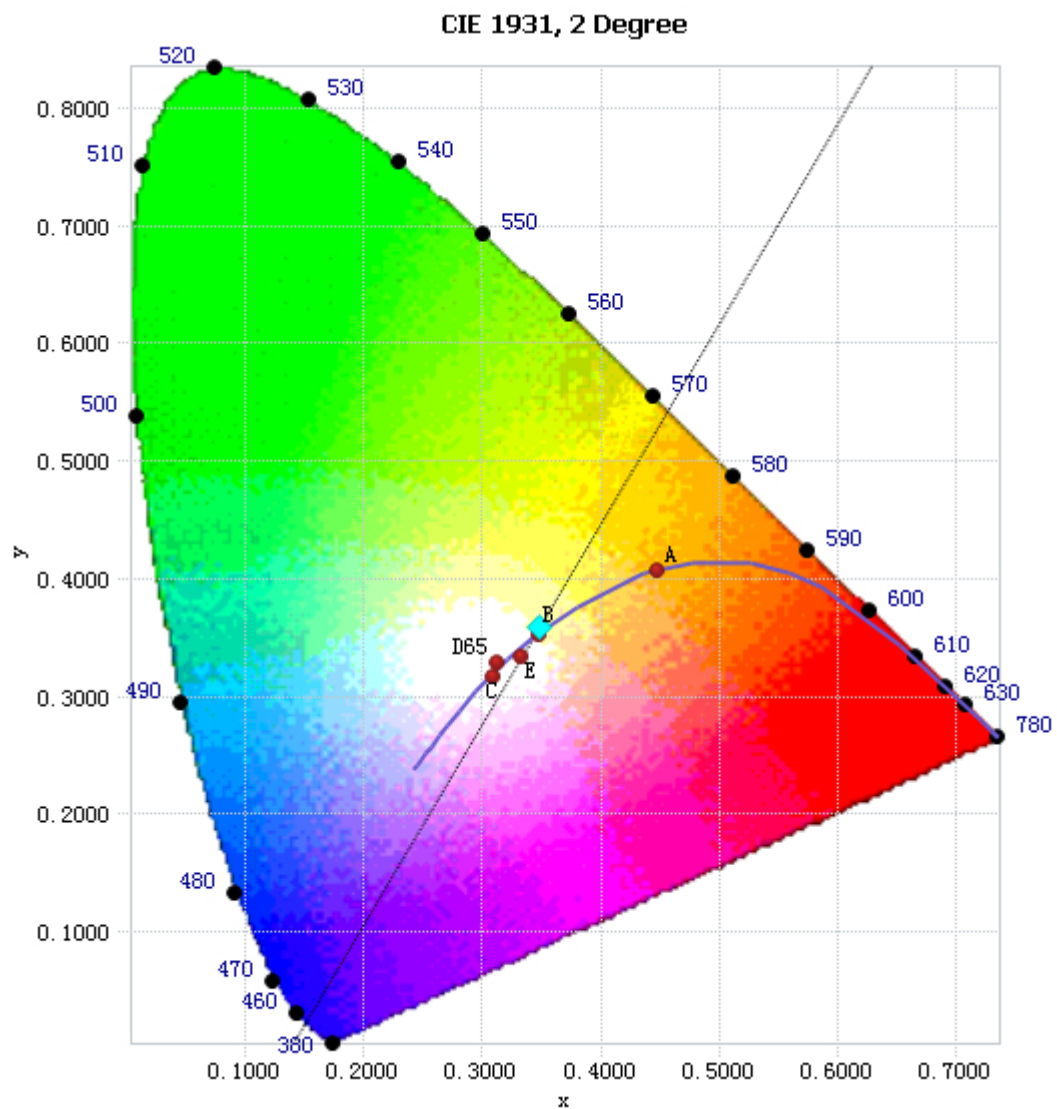


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.56E-04	485	1.39E-02	590	3.51E-02	695	5.04E-03
385	2.55E-04	490	1.63E-02	595	3.46E-02	700	4.35E-03
390	2.96E-04	495	1.93E-02	600	3.38E-02	705	3.73E-03
395	3.05E-04	500	2.22E-02	605	3.29E-02	710	3.20E-03
400	4.14E-04	505	2.45E-02	610	3.16E-02	715	2.77E-03
405	5.82E-04	510	2.61E-02	615	3.01E-02	720	2.39E-03
410	9.90E-04	515	2.74E-02	620	2.84E-02	725	2.05E-03
415	1.96E-03	520	2.82E-02	625	2.65E-02	730	1.76E-03
420	3.77E-03	525	2.91E-02	630	2.45E-02	735	1.51E-03
425	7.20E-03	530	2.99E-02	635	2.26E-02	740	1.29E-03
430	1.26E-02	535	3.07E-02	640	2.06E-02	745	1.11E-03
435	2.03E-02	540	3.17E-02	645	1.86E-02	750	9.66E-04
440	3.13E-02	545	3.25E-02	650	1.67E-02	755	8.23E-04
445	4.79E-02	550	3.31E-02	655	1.49E-02	760	7.13E-04
450	5.41E-02	555	3.38E-02	660	1.31E-02	765	6.03E-04
455	3.97E-02	560	3.43E-02	665	1.16E-02	770	5.29E-04
460	2.69E-02	565	3.48E-02	670	1.02E-02	775	4.59E-04
465	2.05E-02	570	3.51E-02	675	8.89E-03	780	3.89E-04
470	1.51E-02	575	3.53E-02	680	7.75E-03		
475	1.22E-02	580	3.55E-02	685	6.73E-03		
480	1.24E-02	585	3.54E-02	690	5.83E-03		

Table 3: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram of 1# tube - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3482, 0.3586)

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 of 1# tube – Sphere Spectroradiometer Method

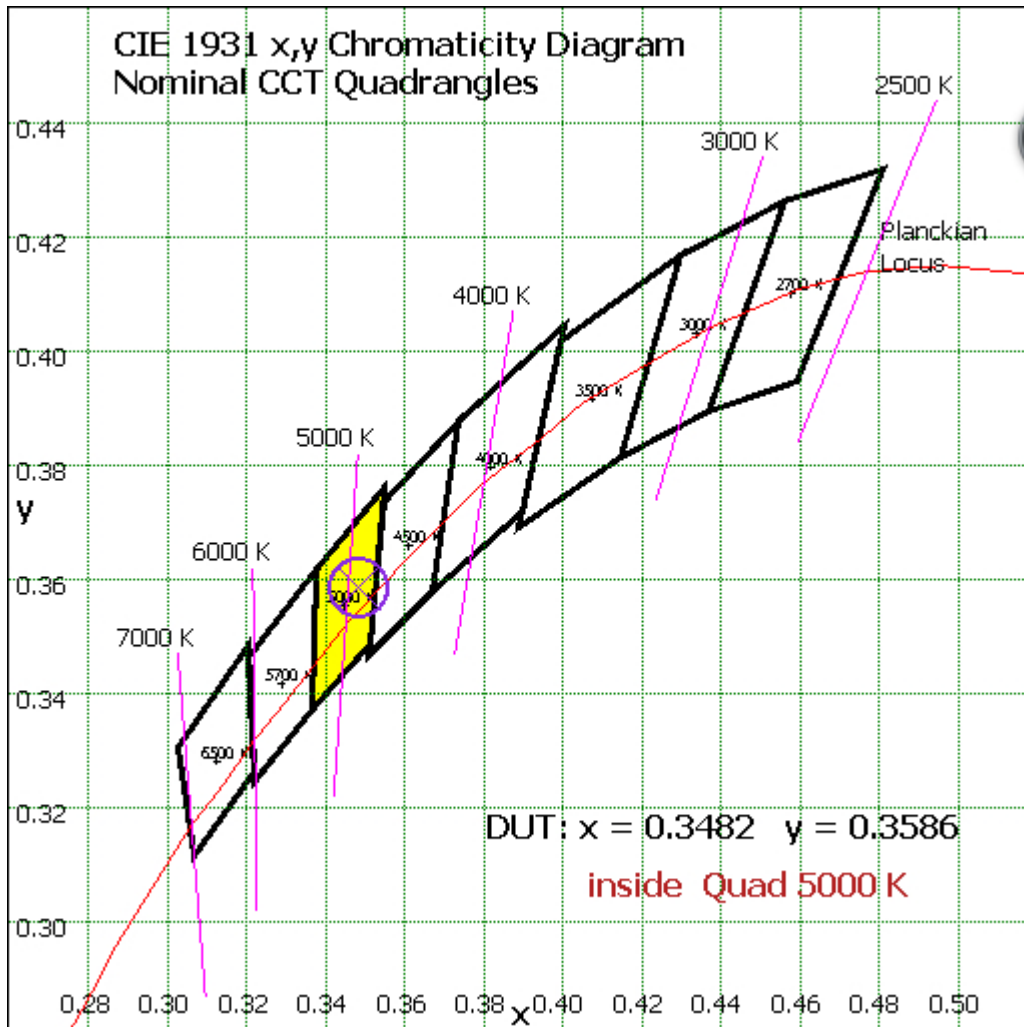


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	46.92	2.10%
10- 20	135.968	6.09%
20- 30	211.107	9.45%
30- 40	264.756	11.85%
40- 50	291.986	13.07%
50- 60	291.14	13.03%
60- 70	264.544	11.84%
70- 80	219.703	9.83%
80- 90	169.203	7.57%
90-100	125.332	5.61%
100-110	88.397	3.96%
110-120	58.396	2.61%
120-130	35.173	1.57%
130-140	18.448	0.83%
140-150	8.572	0.38%
150-160	3.308	0.15%
160-170	0.899	0.04%
170-180	0.138	0.01%
Total	2234.0	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1241.877	55.59%
60- 90	653.45	29.25%
0-90	1895.327	84.84%
90- 180	338.663	15.16%
0- 180	2234.0	100%

Table 4: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method

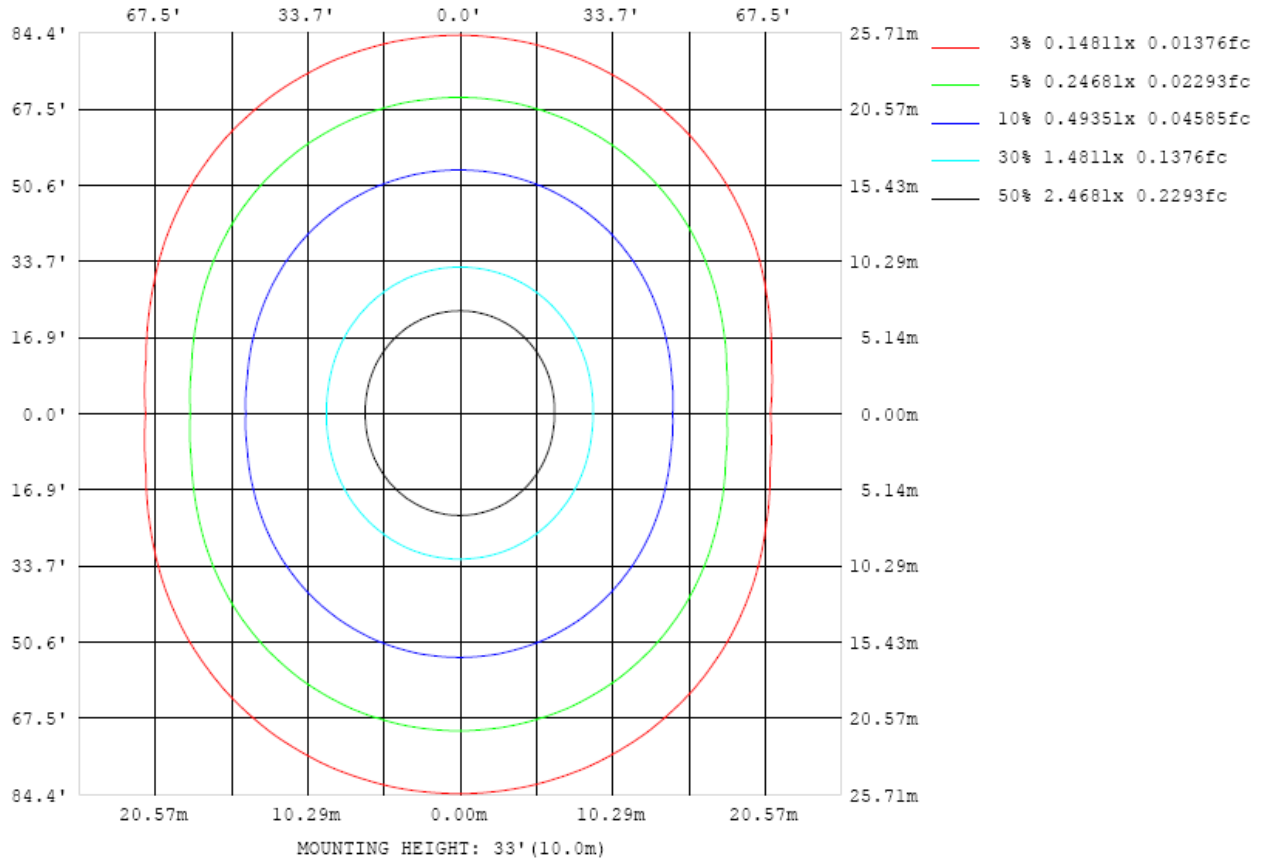


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

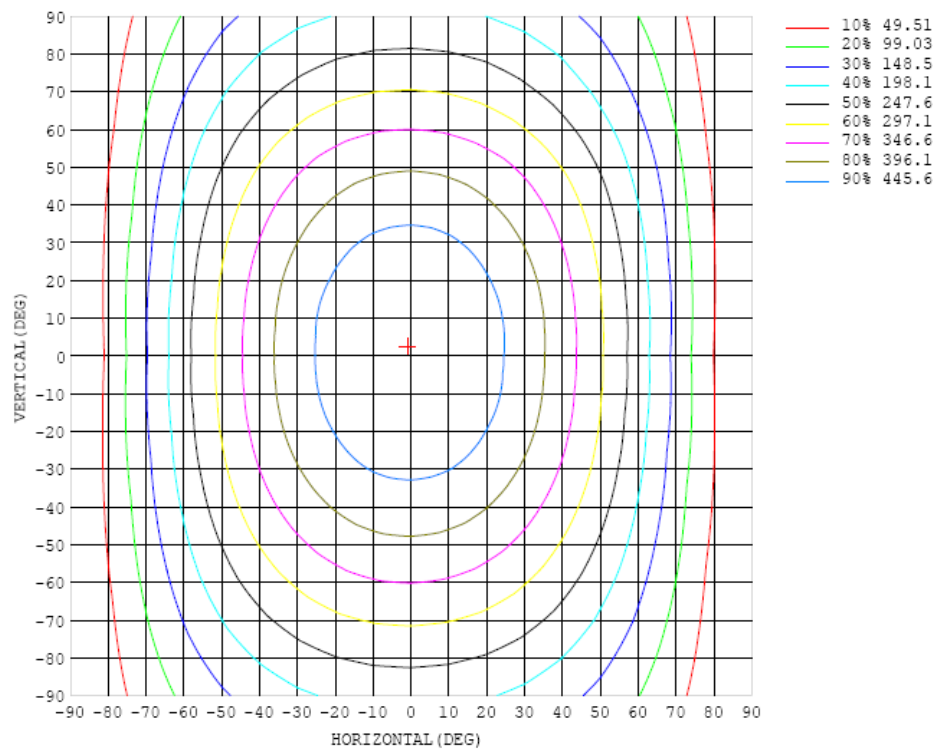


Chart 5: Isocandela Plot

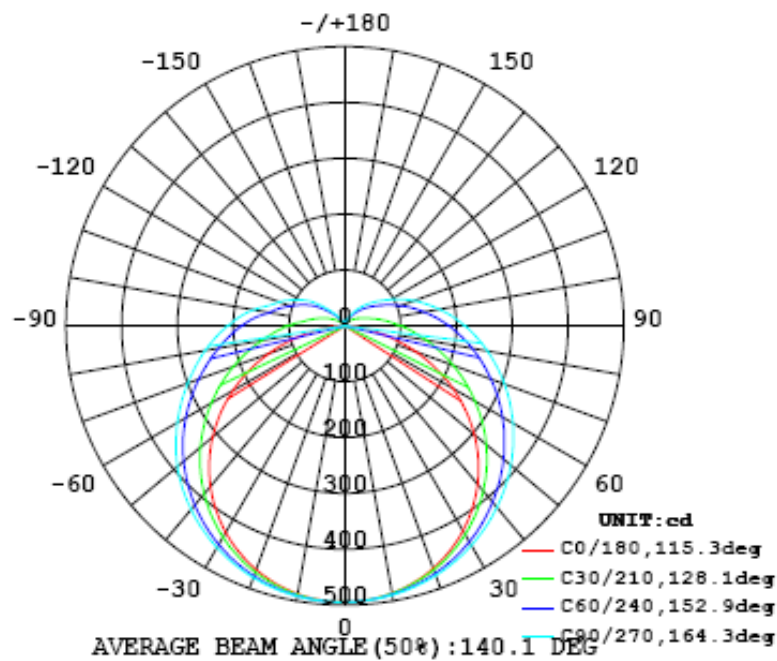


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	495	495	495	495	495	495	495	495	495	495	495	495	495	495	495	495	495	495	495
5	492	492	492	492	492	493	493	493	493	493	493	493	493	493	493	493	493	493	493
10	486	486	486	487	487	488	488	489	489	489	489	489	489	488	488	488	487	487	487
15	476	476	477	477	479	480	481	482	483	484	484	483	482	481	480	479	478	478	478
20	462	462	464	465	468	470	472	474	475	476	476	475	473	471	469	467	465	465	465
25	445	445	447	450	453	457	460	463	465	466	465	464	462	459	456	452	450	448	448
30	424	424	427	431	437	442	446	450	453	454	453	451	448	444	439	434	430	428	427
35	398	400	404	410	417	424	430	435	438	440	439	437	432	427	420	414	408	404	403
40	370	372	378	386	395	404	412	418	422	424	423	420	414	407	399	390	382	377	375
45	338	341	348	359	371	383	392	400	405	407	406	402	395	386	376	365	354	346	344
50	303	307	317	331	346	360	371	380	386	388	387	382	374	364	351	337	323	313	309
55	265	270	283	301	319	335	349	359	366	368	367	362	352	340	324	307	290	277	272
60	223	230	248	269	291	310	326	338	345	348	346	340	330	315	297	277	256	239	232
65	180	189	212	238	263	285	303	315	323	326	325	318	306	290	269	246	221	199	190
70	135	147	175	206	235	260	279	293	301	304	302	295	283	265	242	215	185	158	145
75	89.9	106	141	176	208	235	255	270	278	282	280	272	259	240	215	185	151	118	100
80	48.4	69.7	109	148	182	210	232	247	256	260	257	249	236	216	189	157	120	81.2	57.6
85	14.8	39.9	82.4	123	158	187	208	224	234	237	235	227	213	192	165	131	91.9	50.5	22.4
90	0.56	21.0	60.9	100	136	165	187	202	212	215	213	205	190	170	142	109	69.9	29.2	2.52
95	0.48	11.3	44.2	81.6	115	143	165	181	190	194	192	183	169	148	122	89.0	52.1	16.7	0.86
100	0.54	7.15	32.1	65.2	96.2	123	144	159	169	172	170	162	148	128	103	72.4	38.2	9.78	0.69
105	0.53	5.22	23.9	51.4	80.4	105	125	139	148	152	149	142	129	110	85.7	57.3	28.1	7.26	0.59
110	0.60	4.42	19.1	40.8	65.1	88.1	106	120	129	132	130	123	110	91.7	70.2	45.1	22.2	5.00	0.59
115	0.72	3.87	15.5	33.3	53.1	72.5	89.1	102	110	113	111	104	92.3	76.2	56.7	36.4	17.9	3.76	0.58
120	0.77	3.59	12.1	27.3	43.9	60.2	74.1	85.4	91.5	94.5	93.0	86.7	76.5	62.9	46.5	29.8	14.5	3.19	0.59
125	0.86	3.15	10.3	22.5	36.2	49.8	61.6	70.8	76.5	78.9	77.6	72.5	63.7	52.3	38.5	24.7	11.8	2.70	0.65
130	0.97	2.87	8.68	16.7	29.5	40.9	51.1	58.6	63.7	65.9	64.6	60.2	52.6	42.8	31.6	20.1	8.84	2.36	0.67
135	1.05	2.60	6.96	14.7	23.1	32.9	41.3	48.0	52.4	54.1	52.9	49.0	42.7	34.7	25.7	16.0	6.58	1.97	0.71
140	1.15	2.47	5.84	11.8	18.4	25.5	33.0	38.2	41.8	43.2	42.4	39.3	34.4	27.8	20.3	11.8	5.35	1.87	0.75
145	1.20	2.28	4.72	8.97	14.5	19.8	24.1	29.7	32.7	33.8	33.0	30.6	26.7	21.3	14.8	8.50	4.27	1.80	0.78
150	1.23	2.02	3.86	7.00	10.8	15.1	19.1	21.9	23.4	24.5	24.0	22.5	19.4	15.2	10.4	6.35	3.18	1.43	0.76
155	1.26	1.78	3.18	5.05	7.80	10.5	13.3	15.6	17.2	17.7	17.2	15.7	13.3	10.0	6.40	3.96	2.09	1.19	0.74
160	1.29	1.61	2.43	3.72	5.40	7.00	8.69	10.1	11.0	11.3	11.0	10.1	8.25	5.80	3.95	2.28	1.56	0.97	0.72
165	1.29	1.54	1.95	2.60	3.69	4.41	5.39	6.15	6.63	6.76	6.66	5.99	4.08	2.71	2.05	1.80	1.24	0.86	0.74
170	1.29	1.37	1.58	1.85	2.28	2.69	3.07	3.39	3.57	3.61	3.30	2.22	1.74	1.84	1.67	1.39	1.14	0.92	0.89
175	1.28	1.32	1.35	1.41	1.50	1.59	1.71	1.82	1.90	1.86	0.92	1.07	1.27	1.31	1.24	1.22	1.13	1.08	1.07
180	1.15	1.15	1.14	1.14	1.12	1.09	1.08	0.99	0.86	0.62	0.97	1.03	1.07	1.11	1.10	1.11	1.11	1.10	1.15

Table 5: 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	495	495	495	495	495	495	495	495	495	495	495	495	495	495	495	495	495		
5	493	493	493	494	494	494	494	494	494	494	494	494	493	493	493	493	492		
10	487	488	489	490	490	491	491	492	492	491	491	490	490	488	488	487	486		
15	478	479	481	482	484	485	486	487	487	486	486	484	483	481	479	478	476		
20	465	467	469	472	474	477	478	480	480	479	478	476	473	470	467	465	463		
25	449	451	455	459	462	466	468	470	470	469	467	464	461	456	452	449	446		
30	429	432	437	442	448	452	456	458	459	457	455	451	446	440	434	429	425		
35	405	410	416	424	430	436	441	444	445	443	440	435	428	421	413	406	401		
40	378	384	392	402	411	418	424	428	429	427	423	417	409	399	389	380	373		
45	347	355	366	378	389	399	406	410	412	410	405	397	387	375	363	351	342		
50	314	324	338	353	366	377	386	391	392	390	384	376	364	349	334	320	308		
55	278	291	308	326	341	354	363	369	370	368	362	352	339	322	304	286	272		
60	239	256	277	297	315	329	339	346	347	344	337	327	312	294	273	251	233		
65	199	220	244	268	288	304	315	322	323	320	313	300	284	264	241	215	192		
70	157	184	212	239	261	279	291	298	300	296	288	275	256	233	207	179	151		
75	116	148	181	210	235	254	267	275	277	273	264	249	229	204	175	143	110		
80	77.4	115	152	184	210	230	244	252	254	251	242	226	205	178	145	109	72.7		
85	45.4	85.8	125	160	187	207	221	230	232	228	219	204	183	155	121	81.0	40.7		
90	24.0	63.2	102	137	164	185	200	208	210	206	198	183	161	133	99.0	60.4	21.9		
95	13.1	43.4	80.0	114	142	163	178	187	189	186	177	162	140	113	80.7	45.0	12.6		
100	7.73	33.6	64.5	94.6	119	138	152	162	167	164	156	142	121	95.5	65.4	33.3	3.67		
105	5.21	25.4	52.0	79.3	103	122	134	140	142	141	135	123	104	79.6	51.8	17.5	2.15		
110	3.53	18.6	41.8	65.9	87.4	105	117	124	126	120	113	103	86.0	64.1	34.1	9.28	1.58		
115	2.83	12.9	32.4	54.0	73.3	89.0	101	107	109	106	96.3	85.1	70.0	46.0	20.6	5.71	1.75		
120	2.47	9.54	23.7	42.1	60.3	74.6	85.0	91.3	93.2	90.7	82.8	70.3	51.5	29.8	13.0	4.09	1.82		
125	1.93	6.99	17.1	30.5	45.7	59.8	69.9	75.8	77.4	74.5	66.0	51.2	34.6	19.8	9.28	3.71	1.68		
130	1.67	5.50	12.5	22.6	33.1	43.5	52.0	57.1	57.9	54.2	46.3	35.3	23.6	13.6	6.74	3.42	1.62		
135	1.60	4.57	9.09	16.1	24.1	31.1	36.9	40.3	40.6	37.6	31.9	24.5	16.6	9.67	5.38	3.20	1.54		
140	1.48	3.63	6.87	11.5	16.8	22.1	26.0	28.2	28.2	26.0	22.1	16.8	11.3	7.27	4.74	2.84	1.47		
145	1.39	2.77	5.36	8.19	11.7	15.0	17.7	19.3	19.2	17.6	14.8	11.3	8.27	6.08	4.03	2.48	1.43		
150	1.12	2.08	3.87	6.26	8.11	9.98	11.7	12.6	12.5	11.6	10.0	8.19	6.75	4.98	3.37	2.16	1.32		
155	0.92	1.48	2.60	4.10	5.90	7.17	7.91	8.37	8.39	8.01	7.38	6.48	5.26	3.95	2.77	1.89	1.21		
160	0.77	1.02	1.56	2.26	3.35	4.62	5.42	5.85	5.96	5.78	5.35	4.71	3.96	3.10	2.32	1.67	1.19		
165	0.74	0.86	1.16	1.48	1.75	2.14	3.00	3.64	3.76	3.75	3.57	3.29	2.82	2.32	1.84	1.47	1.21		
170	0.89	0.88	1.03	1.17	1.38	1.38	1.37	1.76	2.26	2.28	2.24	2.07	1.87	1.63	1.47	1.32	1.24		
175	1.07	1.08	1.08	1.12	1.13	1.16	1.08	0.88	0.83	1.27	1.26	1.26	1.32	1.31	1.27	1.23	1.23		
180	1.15	1.15	1.14	1.14	1.13	1.10	1.08	1.02	0.85	0.60	0.96	1.03	1.07	1.10	1.10	1.11	1.12		

Table 6: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 18, 2013	Sep. 17, 2014
Digital Power Meter	PF2010A	HZTE028-01	Sep. 18, 2013	Sep. 17, 2014
AC Power Supply	PCR 500L	HZTE001-08	Sep. 18, 2013	Sep. 17, 2014
DC Power Supply	WY12010	HZTE004-03	Sep. 18, 2013	Sep. 17, 2014
Temperature Meter	TES1310	HZTE017-01	Sep. 18, 2013	Sep. 17, 2014
Standard source	D908	HZTE012-01	Sep. 18, 2013	Sep. 17, 2014
Integrate Sphere system	2M	HZTE015-01	Sep. 18, 2013	Sep. 17, 2014
Digital Power Meter	WT210	HZTE008-01	Sep. 18, 2013	Sep. 17, 2014
AC Power Supply	PCR 500L	HZTE001-07	Sep. 18, 2013	Sep. 17, 2014
DC Power Supply	6154	HZTE004-04	Sep. 18, 2013	Sep. 17, 2014
Temperature and humidity recorder	JR900	HZTE018-01	Sep. 18, 2013	Sep. 17, 2014
Standard source	SCL-1400	HZTE012-02	Sep. 18, 2013	Sep. 17, 2014
Fluorescent Ballast Analyzer	HB-6B	HZTE002-01	Sep. 18, 2013	Sep. 17, 2014

Table 7: 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 4π . 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 expended uncertainty is 1.06% 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 1.94% with a coverage factor $k=2$.

Color Characteristics Measurements

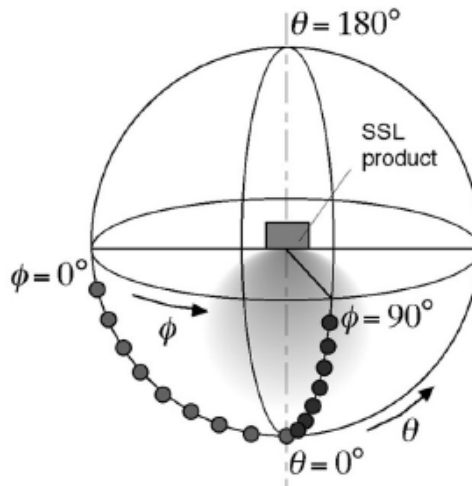
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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° 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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