



LM-79-08 Test Report

for

Philips (China) Investment Co., Ltd.

Building 9, Lane 888, Tianlin Road
Shanghai, China

InstantFit LED tube

Model: 9290002882(2 lamps+ballast ICN-2P32-N)

Laboratory: Leading Testing Laboratories

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www.ledtestlab.com

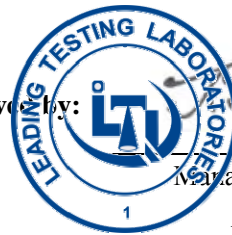
Report No.: HZ14040022c

Review by:

April Zou

Engineer: April Zou
Apr. 16, 2014

Approved by:



Manager: Jim Zhang
Apr. 16, 2014

Test Summary

Sample Tested: 9290002882(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	37.9	0.9974	4216.0	111.2	5.87

Photometric and Colorimetric Measurements for each lamp

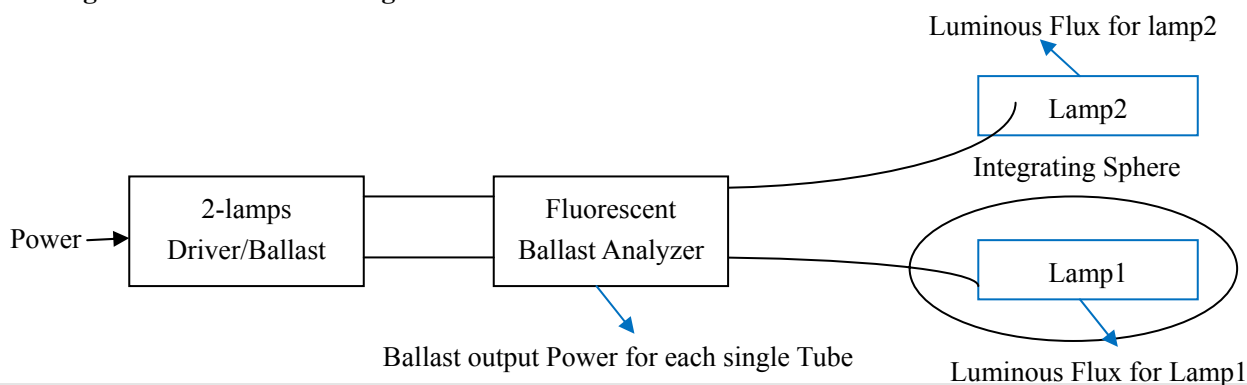
Sample Number	Luminous Flux(lm)	Test power (W)(bare tube)	Efficiency for single Tube (lm/W)	Correlated Color Temperature (K)
1#	2111.0	15.1	139.8	3857
2#	2105.0	15.1	139.4	3867
Sample Number	Color Rendering Index Ra	Color Rendering Index R9	Chromaticity Coordinate x	Chromaticity Coordinate y
1#	81.2	15.2	0.3874	0.3825
2#	81.2	15.4	0.3868	0.3818

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

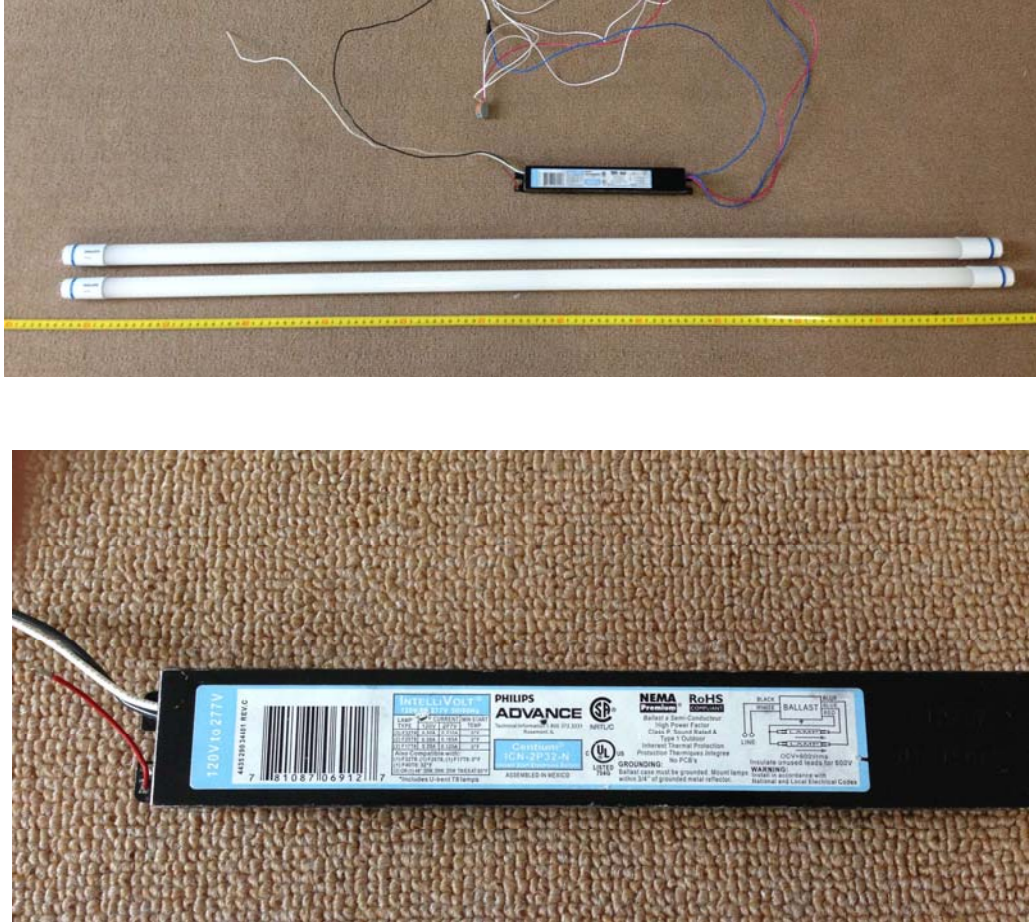


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: InstantFit LED tube
Model	: 9290002882(2 lamps+ballast ICN-2P32-N)
Electrical Ratings	: 12V AC, 50Hz, 16.5W
Product Description	: G13 base, 4 foot fixed ends tube, 16.5T8/48-4000 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 24.5°C

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

The stabilization time of the sample was 80 minutes, and the total operating time including stabilization was 115 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	79.4	79.4
Test Current (A)	0.316		0.137	R2	86	85.9
Power Factor	0.9974		0.9818	R3	90.7	90.6
Test Power (W) (ballast + 2 tubes)	37.9		37.2	R4	80.4	80.5
Luminous Efficacy (lm/W)	111.2		/	R5	78.8	78.8
THD A%	5.87		9.78	R6	79.7	79.7
Total Luminous Flux (lm)	1989.0	1997.0		R7	87.2	87.2
Ballast output Power for single tube (W)	15.1	15.1		R8	67.6	67.7
Test power (W) (bare tube)	139.8	139.4		R9	15.2	15.4
Color Rendering Index (CRI)	81.2	81.2		R10	66.3	66.3
R9	15.2	15.4		R11	77.7	77.8
Correlated Color Temperature (CCT) (K)	3857	3867		R12	56.6	56.7
Chromaticity (Chroma x, Chroma y)	(0.3874, 0.3825)	(0.3868, 0.3818)		R13	80.5	80.5
Chromaticity (Chroma u, Chroma v)	(0.2274, 0.3367)	(0.2273, 0.3365)		R14	94.6	94.5
Chromaticity (Chroma u', Chroma v')	(0.2274, 0.5051)	(0.2273, 0.5047)				
Duv	0.0005	0.0004				

Table 2: Test data per Sphere-Spectroradiometer Method

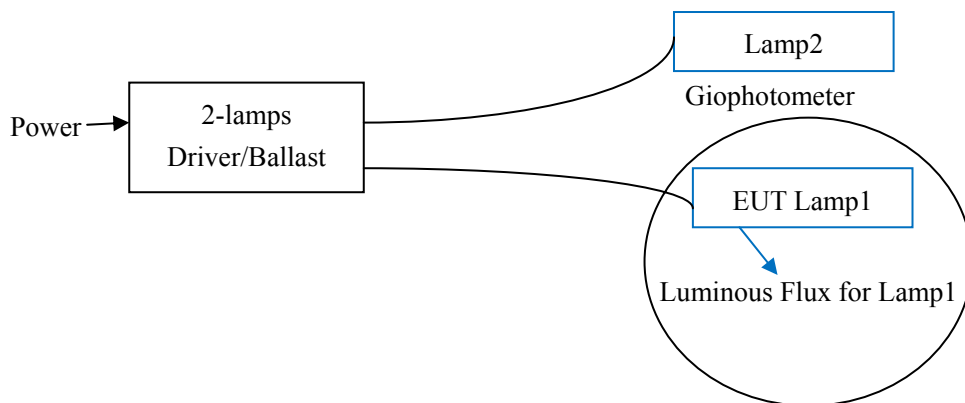
Note: According to CIE 1976 (u',v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

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)	0.322
Power Factor	0.9973
Test Power (W) (ballast + 2 tubes)/2	19.3
Luminous Efficacy (lm/W)	109.3
Total Luminous Flux (lm) (Single tube)	1900.3
Test power (W) (bare tube)	15.1
Luminous Efficacy (lm/W) (bare tube)	125.8
Beam Angle ($^\circ$)	114.5 (0° - 180°)/ 162.5 (90° - 270°)
Center Beam Candle Power (cd)	472
Maximum Beam Candle Power (cd)	472.5 (At: C=70.0, Gamma=3.0)
Spacing Criteria	1.26 (0° - 180°)/ 1.35 (90° - 270°)
Zonal Lumens in the 0° - 60° Zone	55.84%
Zonal Lumens in the 60° - 90° Zone	29.04%
Zonal Lumens in the 90° - 120° Zone	12.14%
Zonal Lumens in the 120° - 180° Zone	2.97%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution of 1# tube - Sphere Spectroradiometer Method

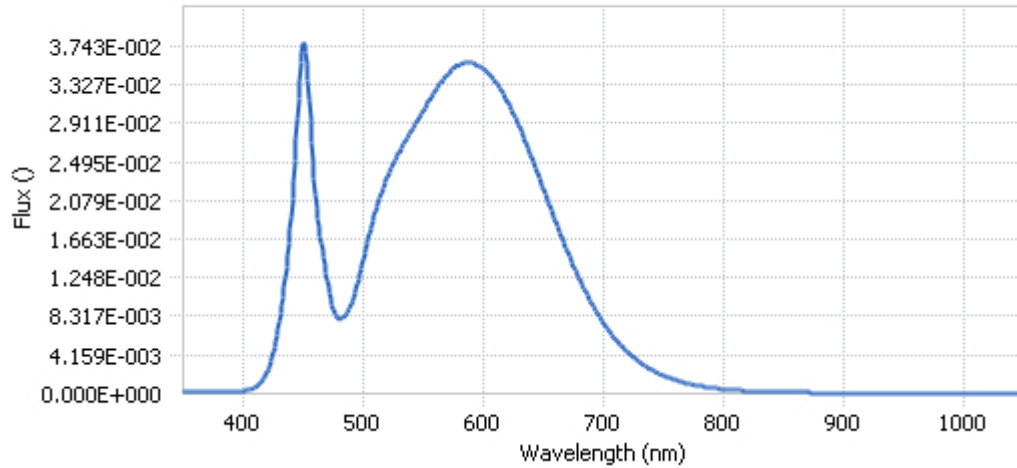
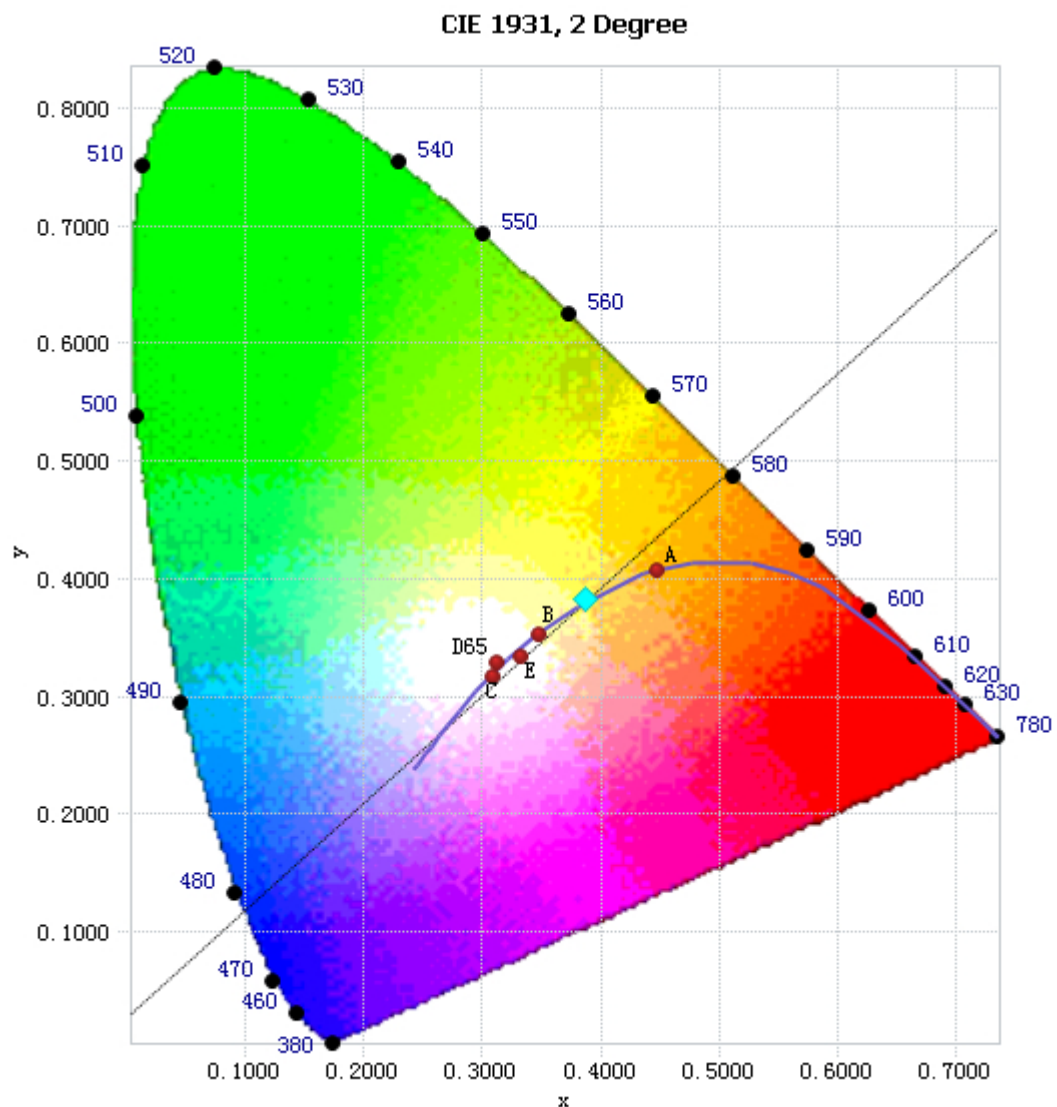


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.83E-04	485	8.45E-03	590	3.56E-02	695	8.62E-03
385	2.08E-04	490	9.65E-03	595	3.54E-02	700	7.59E-03
390	2.23E-04	495	1.18E-02	600	3.50E-02	705	6.66E-03
395	2.36E-04	500	1.45E-02	605	3.44E-02	710	5.82E-03
400	2.82E-04	505	1.72E-02	610	3.36E-02	715	5.10E-03
405	4.08E-04	510	1.96E-02	615	3.26E-02	720	4.47E-03
410	6.63E-04	515	2.17E-02	620	3.15E-02	725	3.89E-03
415	1.23E-03	520	2.34E-02	625	3.02E-02	730	3.38E-03
420	2.34E-03	525	2.48E-02	630	2.87E-02	735	2.91E-03
425	4.41E-03	530	2.61E-02	635	2.71E-02	740	2.53E-03
430	7.71E-03	535	2.72E-02	640	2.55E-02	745	2.18E-03
435	1.25E-02	540	2.84E-02	645	2.38E-02	750	1.88E-03
440	1.91E-02	545	2.95E-02	650	2.21E-02	755	1.64E-03
445	2.97E-02	550	3.06E-02	655	2.04E-02	760	1.43E-03
450	3.78E-02	555	3.17E-02	660	1.85E-02	765	1.23E-03
455	3.15E-02	560	3.26E-02	665	1.69E-02	770	1.06E-03
460	2.14E-02	565	3.36E-02	670	1.53E-02	775	9.12E-04
465	1.62E-02	570	3.44E-02	675	1.37E-02	780	7.93E-04
470	1.21E-02	575	3.50E-02	680	1.23E-02		
475	9.00E-03	580	3.54E-02	685	1.10E-02		
480	8.08E-03	585	3.57E-02	690	9.73E-03		

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

Chromaticity Diagram of 1# tube - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3874, 0.3825)

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

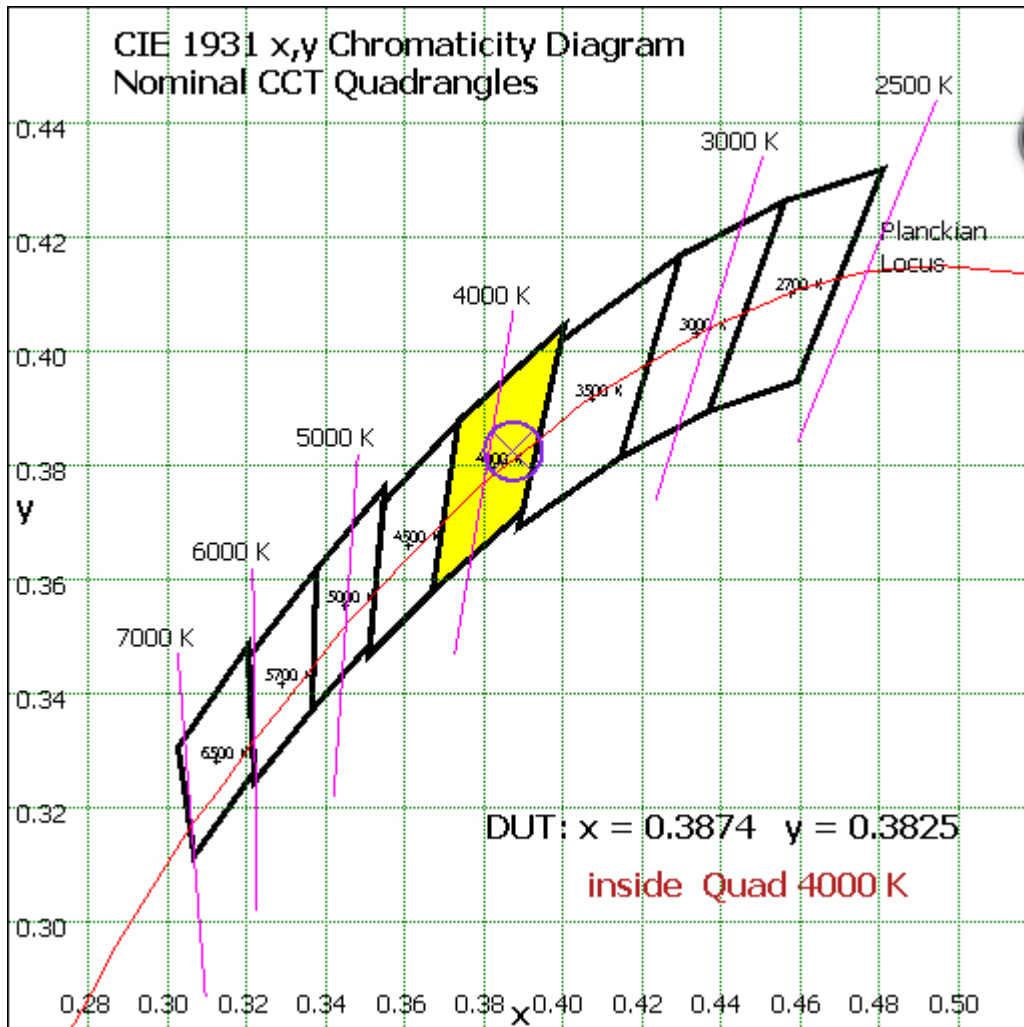


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	44.76	2.12%
10- 20	129.652	6.15%
20- 30	201.102	9.53%
30- 40	251.589	11.93%
40- 50	276.47	13.11%
50- 60	274.481	13.01%
60- 70	248.489	11.78%
70- 80	205.895	9.76%
80- 90	158.223	7.50%
90-100	117.11	5.55%
100-110	83.51	3.96%
110-120	55.574	2.63%
120-130	33.813	1.60%
130-140	17.825	0.84%
140-150	7.63	0.36%
150-160	2.605	0.12%
160-170	0.733	0.03%
170-180	0.128	0.01%
Total	2109.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1178.054	55.84%
60- 90	612.607	29.04%
0-90	1790.661	84.88%
90- 180	318.928	15.12%
0- 180	2109.6	100%

Table 4: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method

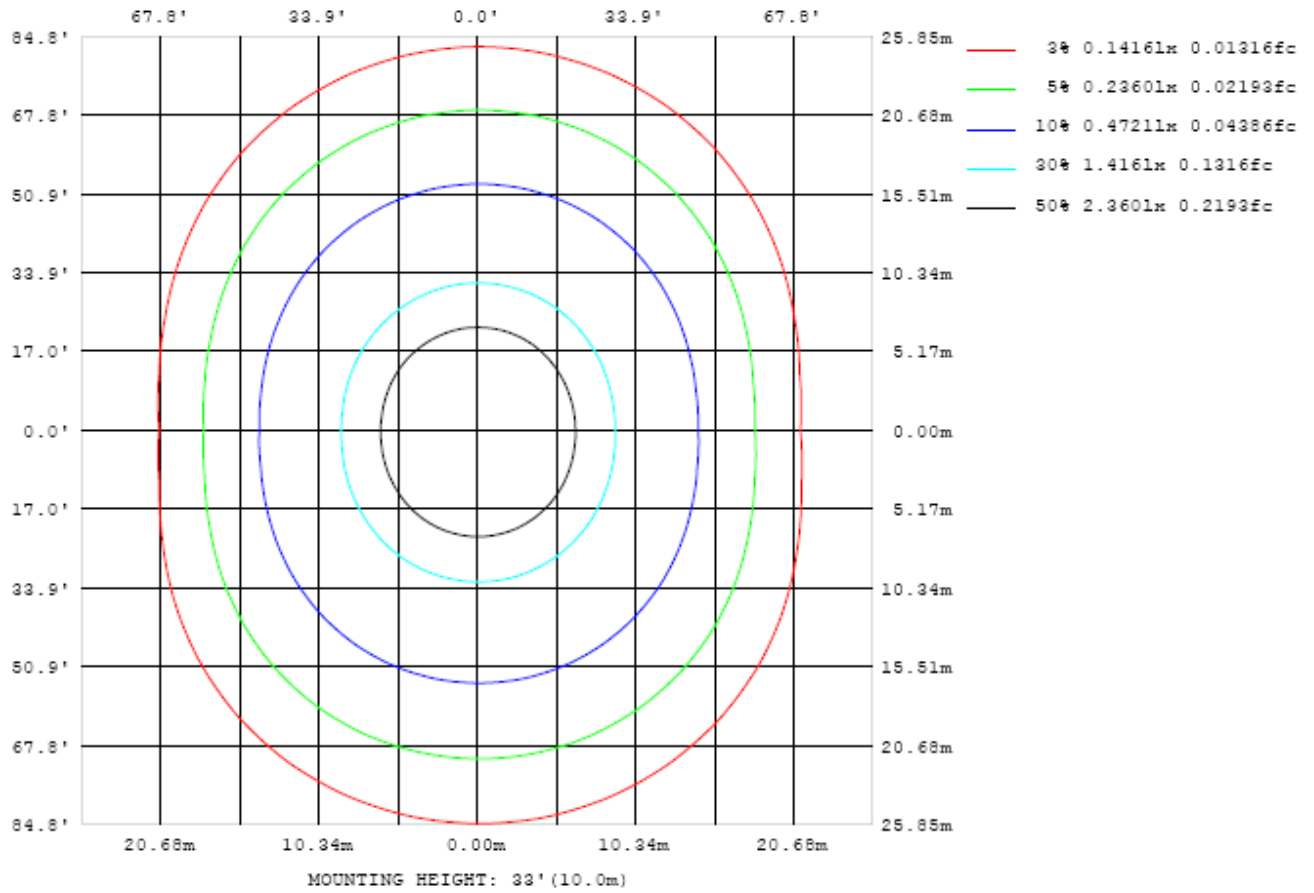


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

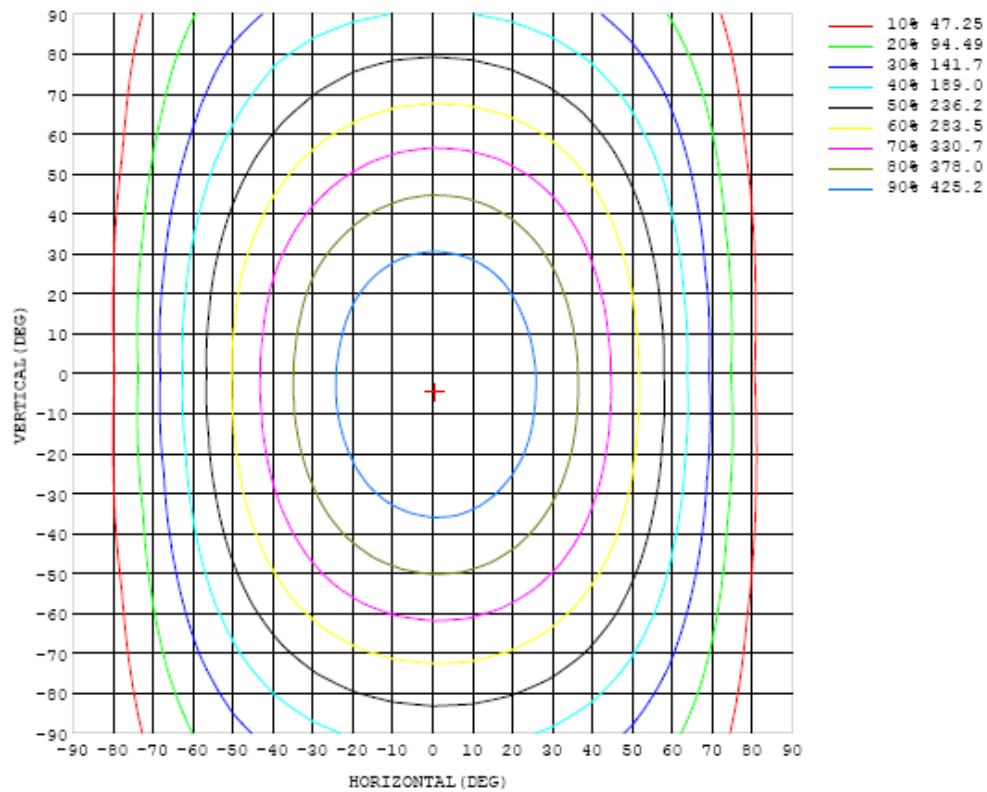


Chart 5: Isocandela Plot

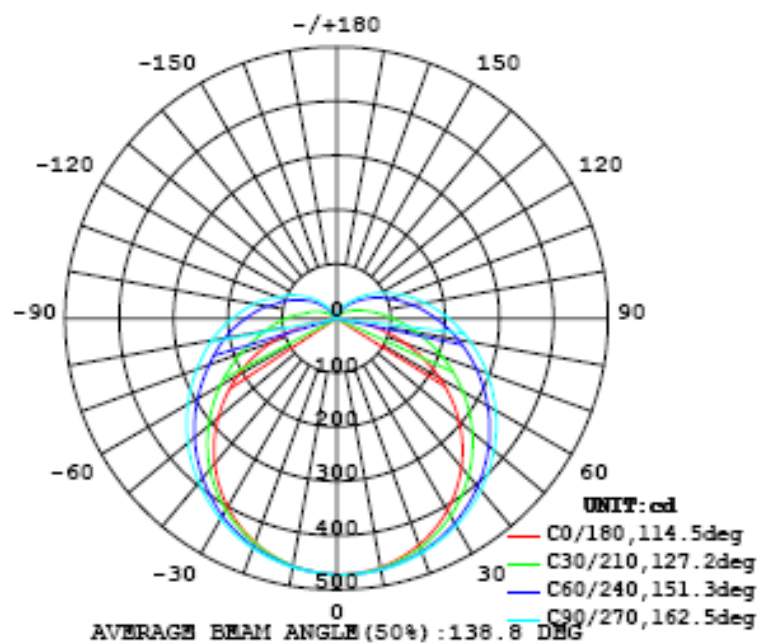


Chart 6: Polar Candela Distribution

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	472	472	472	472	472	472	472	472	472	472	472	472	472	472	472	472	472	472	472
5	470	471	471	471	472	472	472	472	472	472	472	472	472	471	471	470	470	470	469
10	465	466	467	468	468	469	470	470	470	470	470	469	468	467	466	465	464	464	463
15	457	457	459	460	462	463	465	466	466	466	466	465	463	461	459	457	455	454	453
20	444	446	447	450	453	455	457	459	460	460	459	457	455	452	449	446	443	441	439
25	428	430	433	437	441	444	448	450	451	452	450	448	444	440	436	431	427	424	422
30	408	410	415	420	426	431	435	439	441	441	439	436	431	426	420	413	407	403	401
35	385	388	393	400	408	415	421	425	428	428	426	422	416	409	401	393	385	379	377
40	358	362	369	378	388	397	404	410	413	413	411	406	399	390	380	370	360	353	349
45	328	333	342	353	366	377	386	392	396	397	394	389	380	369	357	344	332	323	318
50	294	301	312	327	341	355	366	374	378	379	376	370	360	347	332	316	301	290	285
55	258	266	280	298	316	332	344	353	358	359	356	349	338	323	306	287	269	254	248
60	219	228	247	268	289	307	322	332	337	338	335	327	315	299	279	257	235	216	209
65	178	190	212	238	262	282	298	309	316	317	313	305	292	274	252	227	200	177	168
70	135	150	178	207	235	257	275	287	294	295	291	283	268	249	225	196	165	137	126
75	91.7	111	144	178	208	232	251	264	271	272	269	260	245	224	198	167	132	98.8	83.6
80	51.4	75.1	113	150	182	208	228	241	249	250	247	237	222	201	173	140	102	64.3	44.3
85	17.8	45.3	86.5	125	158	185	205	219	226	228	224	215	200	178	150	116	77.4	36.8	13.6
90	0.93	25.2	64.9	103	136	163	183	197	205	207	203	194	178	157	129	95.0	57.2	19.5	0.92
95	0.52	14.0	48.3	84.5	116	142	162	176	184	186	182	173	158	137	110	77.9	42.2	11.1	0.55
100	0.33	8.74	35.7	68.1	97.9	123	142	156	164	166	162	153	139	118	92.3	62.7	31.6	7.08	0.54
105	0.35	6.22	26.8	54.9	82.0	105	124	136	144	146	143	134	120	101	77.6	50.8	23.9	5.29	0.55
110	0.40	4.74	20.2	43.8	68.3	89.6	106	118	125	127	124	116	103	86.5	64.8	40.6	18.4	4.40	0.57
115	0.47	4.00	16.2	34.8	55.8	75.0	90.2	101	108	110	107	99.7	88.2	72.3	52.9	32.4	15.1	3.88	0.61
120	0.53	3.81	13.2	27.9	45.0	61.5	75.7	85.9	91.6	93.3	91.0	84.8	73.9	59.5	42.9	26.4	12.1	3.45	0.66
125	0.62	3.47	10.5	22.6	36.2	50.1	61.9	70.9	76.5	78.3	76.1	70.1	60.6	48.5	34.9	21.7	10.4	3.22	0.69
130	0.69	2.93	8.90	18.3	29.3	40.2	50.1	57.7	62.4	64.0	62.2	57.3	49.5	39.4	28.6	17.6	8.77	3.00	0.71
135	0.72	2.69	7.45	14.3	23.4	32.3	40.2	46.3	50.4	51.7	50.3	46.3	39.9	32.0	23.0	14.4	7.22	2.76	0.77
140	0.80	2.34	6.17	11.6	17.9	25.5	31.8	36.7	40.0	41.1	39.9	36.8	31.9	25.5	18.4	11.7	6.00	2.47	0.81
145	0.83	2.10	5.18	9.28	14.2	19.1	24.6	28.5	31.1	31.9	31.1	28.6	24.8	19.8	14.2	9.18	5.01	2.30	0.87
150	0.81	1.77	4.05	7.25	10.9	14.7	18.1	20.9	23.1	23.8	23.2	21.3	18.3	14.8	11.0	7.07	3.97	1.99	0.90
155	0.80	1.49	3.11	5.59	8.19	10.8	13.3	15.4	16.6	17.0	16.7	15.5	13.4	10.7	7.65	5.06	2.94	1.74	0.89
160	0.84	1.25	2.53	3.87	5.80	7.55	9.23	10.5	11.3	11.6	11.4	10.6	9.22	6.81	5.15	3.35	2.14	1.58	0.89
165	0.86	1.10	1.73	2.81	3.57	4.67	5.81	6.70	7.21	7.40	7.27	6.74	5.22	3.94	3.04	2.40	1.83	1.41	0.89
170	0.94	1.13	1.37	1.80	2.34	2.88	3.17	3.53	3.87	3.97	3.91	2.97	2.52	2.33	2.25	1.88	1.66	1.30	0.99
175	1.08	1.18	1.27	1.39	1.58	1.68	1.80	1.85	2.04	2.13	1.47	1.54	1.71	1.72	1.60	1.52	1.39	1.31	1.09
180	1.09	1.09	1.08	1.10	1.08	1.07	1.06	1.08	0.88	0.86	1.01	1.16	1.09	1.14	1.14	1.16	1.16	1.19	1.10

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	472	472	472	472	472	472	472	472	472	472	472	472	472	472	472	472	472		
5	469	469	469	469	469	469	469	469	470	470	470	470	470	470	470	470	470		
10	463	463	463	463	464	464	465	465	465	465	466	465	465	465	465	465	465		
15	452	453	453	455	456	457	458	459	459	459	459	459	458	457	457	456	457		
20	439	440	441	443	445	447	449	450	451	451	450	449	448	446	445	444	444		
25	422	423	426	429	432	435	438	439	440	440	439	438	435	433	431	429	428		
30	401	404	408	412	417	420	423	426	427	427	426	424	420	417	413	410	408		
35	377	381	387	393	398	403	407	410	412	412	410	407	403	398	392	388	385		
40	351	356	363	370	377	384	389	393	395	395	393	389	383	377	370	363	359		
45	321	328	337	346	355	363	370	374	377	377	374	369	362	353	344	335	329		
50	288	298	308	320	331	341	349	355	357	357	354	347	339	328	317	305	297		
55	253	265	278	293	307	319	328	334	337	337	333	325	315	302	287	273	262		
60	216	230	247	265	282	295	306	313	316	315	311	302	290	275	257	239	225		
65	178	195	216	238	257	272	284	291	295	294	289	279	265	247	226	205	186		
70	138	161	187	211	232	249	262	270	274	272	266	256	240	220	196	170	146		
75	99.3	128	158	186	210	228	242	250	253	251	245	233	216	194	167	136	107		
80	64.2	97.9	133	165	190	209	222	230	233	231	223	210	193	168	139	105	70.0		
85	37.2	75.8	112	144	169	188	202	210	212	210	202	189	170	144	113	77.6	40.0		
90	21.0	56.7	92.3	123	148	168	181	189	192	189	181	167	148	122	90.5	54.9	20.0		
95	12.0	38.2	74.9	105	130	149	162	170	172	170	161	147	128	103	73.0	39.8	10.5		
100	4.83	30.9	57.5	85.0	109	130	144	152	154	151	143	130	111	87.1	59.1	29.8	6.03		
105	1.99	22.9	47.6	71.6	94.2	111	121	130	135	133	126	113	95.4	73.2	47.7	21.6	4.04		
110	0.82	12.5	37.7	59.5	79.6	96.1	108	114	113	112	107	97.1	80.9	59.9	35.9	15.9	2.48		
115	0.70	6.33	27.4	48.2	65.6	80.8	91.9	98.7	101	96.4	88.6	78.9	64.4	46.3	29.3	10.5	1.08		
120	0.67	3.71	15.9	37.5	53.9	66.6	76.3	82.7	84.9	82.7	75.2	64.3	51.9	37.7	21.6	7.35	0.53		
125	0.64	1.83	8.98	24.5	42.3	54.4	62.8	67.8	69.6	67.8	62.4	53.3	42.4	29.0	14.6	4.45	0.46		
130	0.67	0.84	5.61	14.9	28.4	41.7	50.4	55.1	56.7	55.1	50.7	42.6	31.6	20.3	9.80	2.04	0.47		
135	0.69	0.75	2.74	8.69	17.6	27.3	35.9	41.4	43.3	42.1	37.6	30.3	21.8	12.8	5.55	0.60	0.51		
140	0.70	0.78	1.12	5.00	10.2	16.5	22.6	26.9	28.6	28.0	24.7	19.6	13.6	7.63	2.30	0.62	0.59		
145	0.74	0.73	0.80	2.11	5.61	9.74	12.7	15.7	17.1	16.6	14.4	11.9	7.63	3.33	0.70	0.65	0.66		
150	0.74	0.76	0.81	0.84	2.14	4.37	6.90	8.80	9.73	9.50	7.89	5.63	2.96	0.79	0.71	0.69	0.68		
155	0.75	0.71	0.74	0.77	0.82	1.18	2.25	3.17	3.59	3.45	2.68	1.45	0.77	0.74	0.71	0.73	0.67		
160	0.76	0.68	0.70	0.69	0.75	0.80	0.82	0.82	0.81	0.79	0.80	0.79	0.78	0.75	0.75	0.75	0.67		
165	0.82	0.74	0.68	0.67	0.67	0.74	0.78	0.79	0.78	0.77	0.77	0.78	0.79	0.79	0.78	0.77	0.68		
170	0.96	0.83	0.78	0.73	0.70	0.67	0.67	0.78	0.78	0.78	0.80	0.79	0.80	0.78	0.77	0.77	0.77		
175	1.08	0.99	0.92	0.87	0.83	0.79	0.74	0.68	0.68	0.76	0.74	0.78	0.78	0.85	0.88	0.91	0.98		
180	1.10	1.10	1.10	1.10	1.09	1.08	1.08	1.06	1.02	0.76	0.99	1.09	1.11	1.15	1.15	1.17	1.19		

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 expanded 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

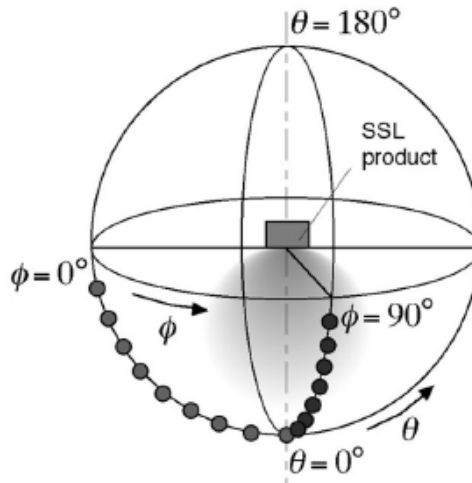
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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