



LM-79-08 Test Report

for

Philips (China) Investment Co., Ltd.

Building 9, Lane 888, Tianlin Road
Shanghai, China

InstantFit LEDtube

Model: 9290002842

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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www.ledtestlab.com

Report No.: HZ13100018a

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

Review by:

April Zou

Engineer: April Zou
Oct. 21, 2013

Approved by:



Jim Zhang

Manager: Jim Zhang
Oct. 21, 2013

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: 9290002842

Photometric and Electrical Measurements for two lamps

Voltage (V AC)	Current (A)	Power (W)	Power Factor	Total Luminous Flux (lm)	Luminous Efficacy (lm/W)	Total Harmonic Distortion
120.0	0.287	34.3	0.9972	3300	96.2	6.21

Photometric and Colorimetric Measurements for each lamp

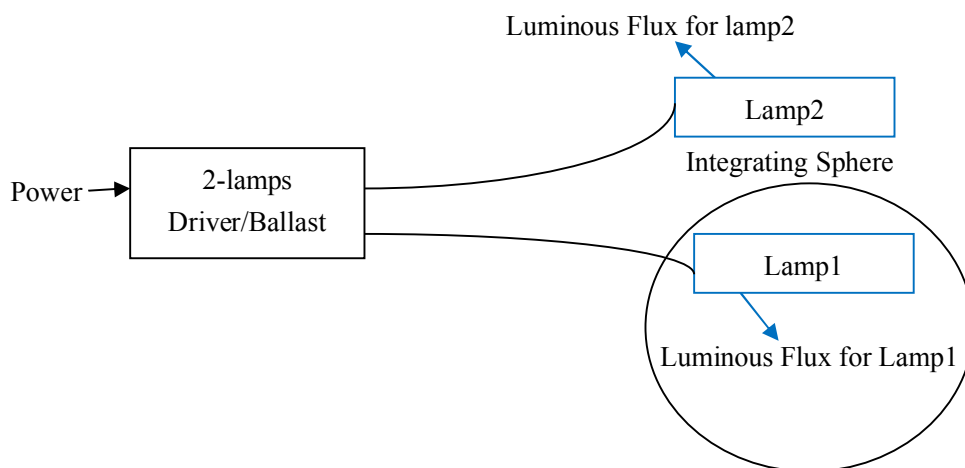
Sample Number	Luminous Flux(lm)	Correlated Color Temperature (K)	Color Rendering Index Ra
S13100018-01	1657	4998	81.9
S13100018-02	1643	4995	81.9
Sample Number	Color Rendering Index R9	Chromaticity Coordinate x	Chromaticity Coordinate y
S13100018-01	2.3	0.3454	0.3552
S13100018-02	2.2	0.3455	0.3555

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 : Oct. 18, 2013

Date of Test : Oct. 18, 2013

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 Photos

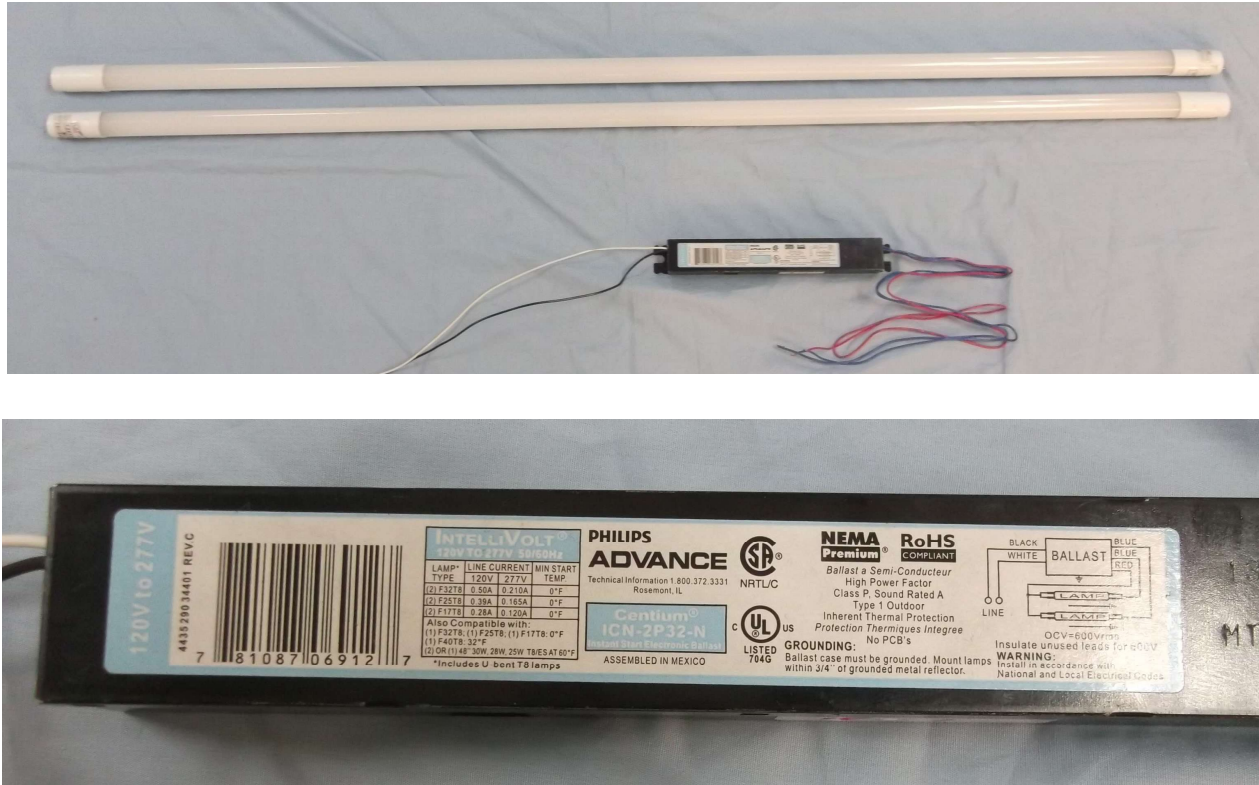


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: InstantFit LEDtube
Model	: 9290002842
Electrical Ratings	: 120V AC, 60Hz, 17.5W
Product Description	: G13 base, 5000K, T8 TUBE, Frosted lens The tubes used directly after a fluorescent ballast: 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 base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 70 minutes, and the total operating time including stabilization was 105 minutes.

Sphere-Spectroradiometer Method

Parameter	Result		Special Color Rendering Indices		
	1#	2#		1#	2#
Test Voltage (V)	120.0				
Voltage frequency (Hz)	60		R1	79.7	79.6
Test Current (A)	0.287		R2	87.8	87.8
Power Factor	0.9972		R3	93.1	93
Test Power (W)	34.3		R4	80.5	80.6
Luminous Efficacy (lm/W)	96.2		R5	80	80
THD A%	6.21		R6	82.3	82.2
Total Luminous Flux (lm)	1657	1643	R7	86.8	86.8
Color Rendering Index (CRI)	81.9	81.9	R8	65.4	65.4
R9	2.3	2.2	R9	2.3	2.2
Correlated Color Temperature (CCT) (K)	4998	4995	R10	70.7	70.6
Chromaticity (Chroma x, Chroma y)	(0.3454, 0.3552)	(0.3455, 0.3555)	R11	79.1	79.1
Chromaticity (Chroma u, Chroma v)	(0.2102, 0.3243)	(0.2102, 0.3244)	R12	56.7	56.8
Chromaticity (Chroma u', Chroma v')	(0.2102, 0.4864)	(0.2102, 0.4866)	R13	81.9	81.8
Duv	0.0017	0.0018	R14	96.4	96.4

Table 2: Test data per Sphere-Spectroradiometer Method

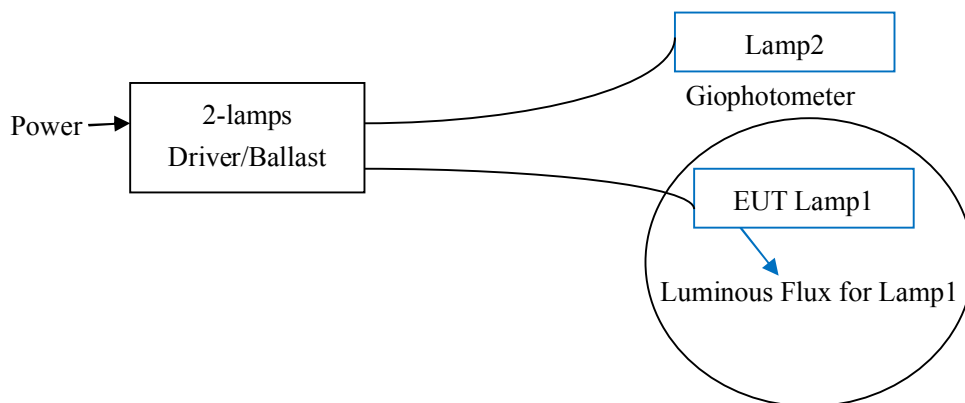
Note: According to CIE 1976 (u',v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Goniophotometer Method

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)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.146
Power Factor	0.9971
Test Power (W)	17.2
Luminous Efficacy (lm/W)	96.1
Total Luminous Flux (lm)	1653.2
Beam Angle (°)	140.8
Center Beam Candle Power (cd)	368
Maximum Beam Candle Power (cd)	368.1 (At: C=0.0, Gamma=0.0)
Spacing Criteria	1.29 (0°-180°)/ 1.36(90°-270°)
Zonal Lumens in the 0°-60°Zone	55.88%
Zonal Lumens in the 60°-90°Zone	29.58%
Zonal Lumens in the 90°-120°Zone	12.01%
Zonal Lumens in the 120°-180°Zone	2.53%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution of 2# tube - Sphere Spectroradiometer Method

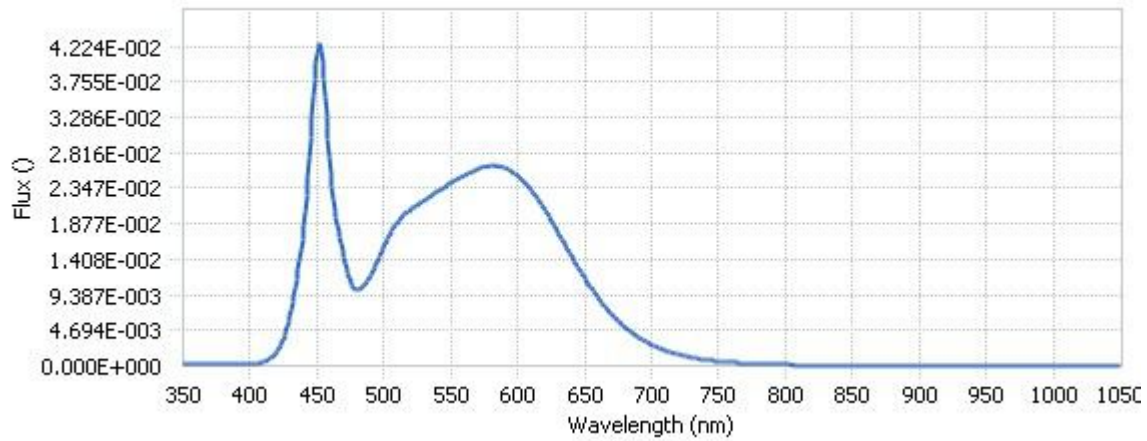
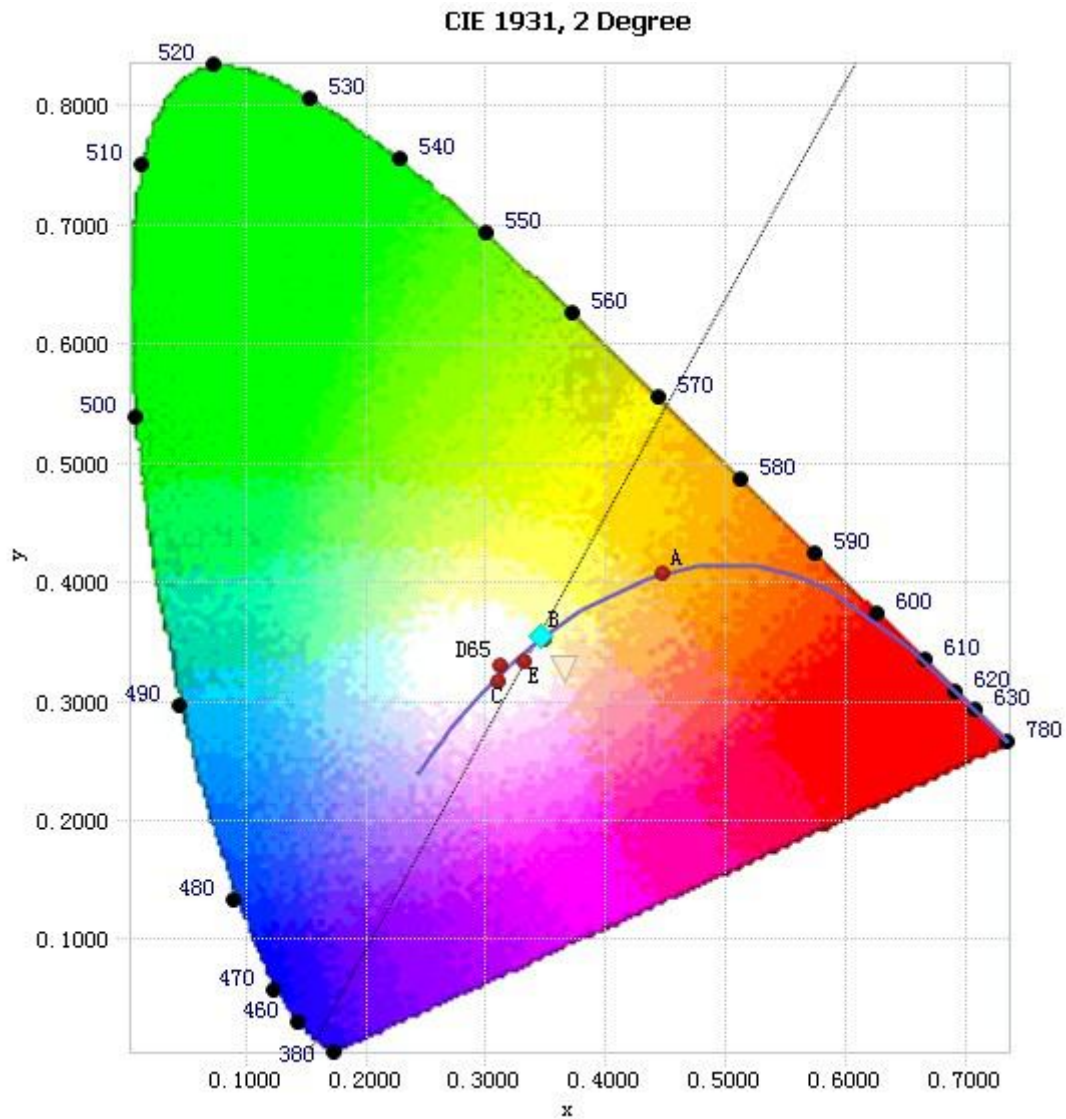


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.88E-04	485	1.06E-02	590	2.62E-02	695	3.25E-03
385	1.68E-04	490	1.20E-02	595	2.58E-02	700	2.77E-03
390	1.76E-04	495	1.39E-02	600	2.52E-02	705	2.38E-03
395	1.91E-04	500	1.58E-02	605	2.43E-02	710	2.03E-03
400	2.19E-04	505	1.77E-02	610	2.33E-02	715	1.74E-03
405	3.10E-04	510	1.89E-02	615	2.21E-02	720	1.49E-03
410	4.89E-04	515	2.01E-02	620	2.07E-02	725	1.28E-03
415	9.21E-04	520	2.08E-02	625	1.92E-02	730	1.09E-03
420	1.83E-03	525	2.13E-02	630	1.76E-02	735	9.35E-04
425	3.56E-03	530	2.18E-02	635	1.61E-02	740	8.06E-04
430	6.71E-03	535	2.24E-02	640	1.45E-02	745	6.83E-04
435	1.15E-02	540	2.30E-02	645	1.30E-02	750	5.92E-04
440	1.85E-02	545	2.36E-02	650	1.16E-02	755	5.10E-04
445	3.01E-02	550	2.42E-02	655	1.02E-02	760	4.38E-04
450	4.15E-02	555	2.47E-02	660	8.96E-03	765	3.80E-04
455	3.80E-02	560	2.52E-02	665	7.83E-03	770	3.23E-04
460	2.52E-02	565	2.56E-02	670	6.79E-03	775	2.80E-04
465	1.86E-02	570	2.59E-02	675	5.91E-03	780	2.40E-04
470	1.44E-02	575	2.63E-02	680	5.10E-03		
475	1.11E-02	580	2.64E-02	685	4.39E-03		
480	1.01E-02	585	2.64E-02	690	3.78E-03		

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

Chromaticity Diagram of 2# tube - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3455, 0.3555)

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 2# tube – Sphere Spectroradiometer Method

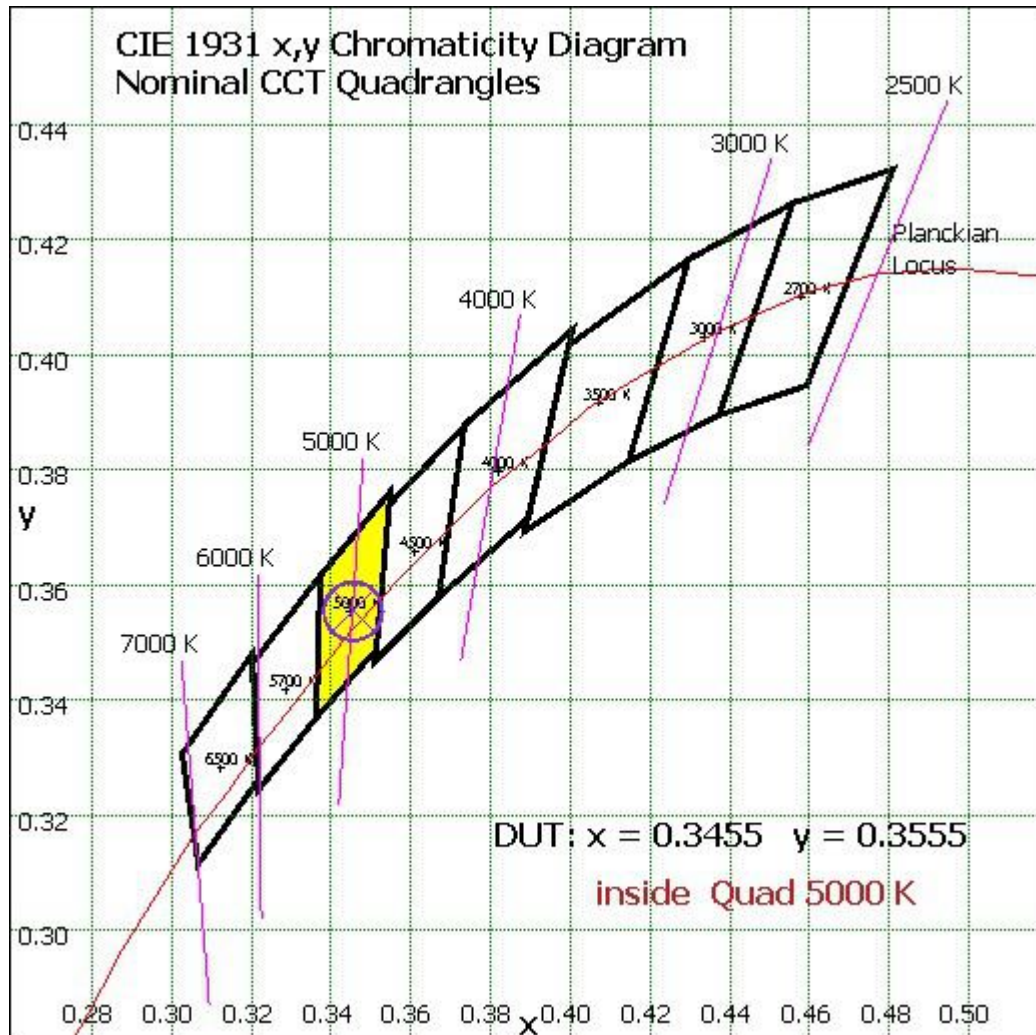


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

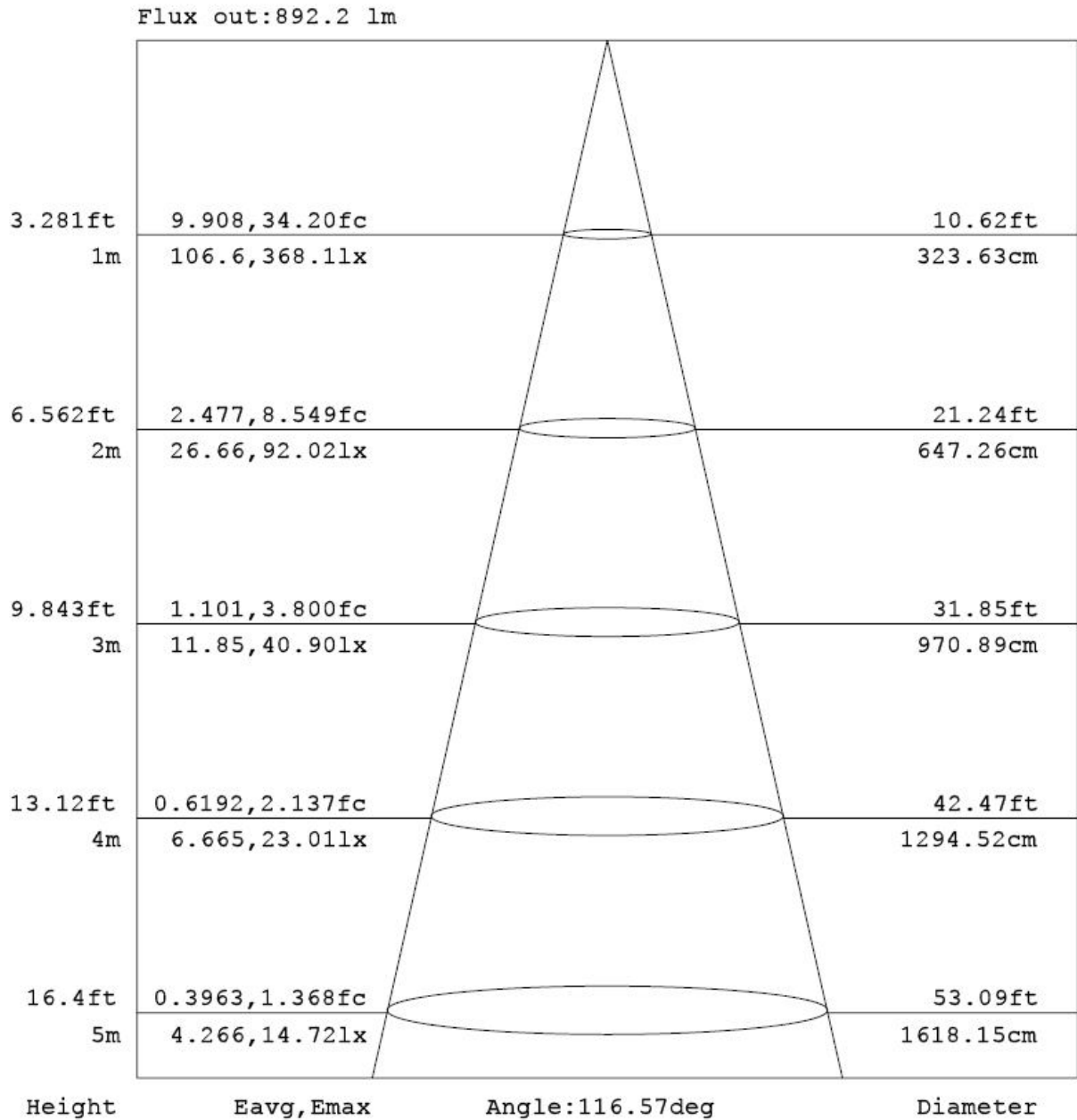
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	34.912	2.11%
10- 20	101.145	6.12%
20- 30	156.895	9.49%
30- 40	196.815	11.90%
40- 50	217.235	13.14%
50- 60	216.903	13.12%
60- 70	197.825	11.97%
70- 80	164.726	9.96%
80- 90	126.438	7.65%
90-100	92.484	5.59%
100-110	64.518	3.90%
110-120	41.474	2.51%
120-130	23.289	1.41%
130-140	11.149	0.67%
140-150	4.867	0.29%
150-160	1.826	0.11%
160-170	0.594	0.04%
170-180	0.147	0.01%
Total	1653.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	923.905	55.88%
60- 90	488.989	29.58%
0-90	1412.894	85.46%
90- 180	240.348	14.54%
0- 180	1653.2	100%

Table 5: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method



Note: The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

Chart 4: Beam Angle

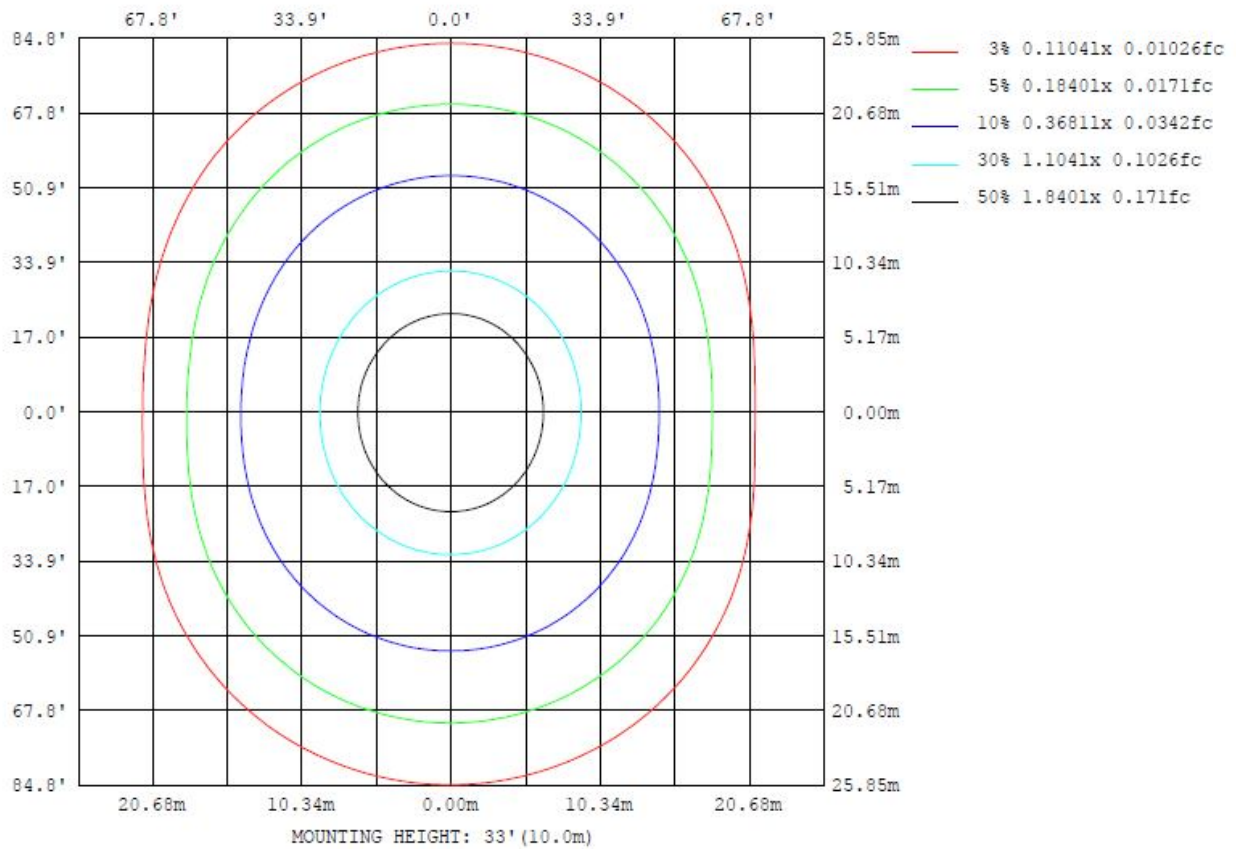


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

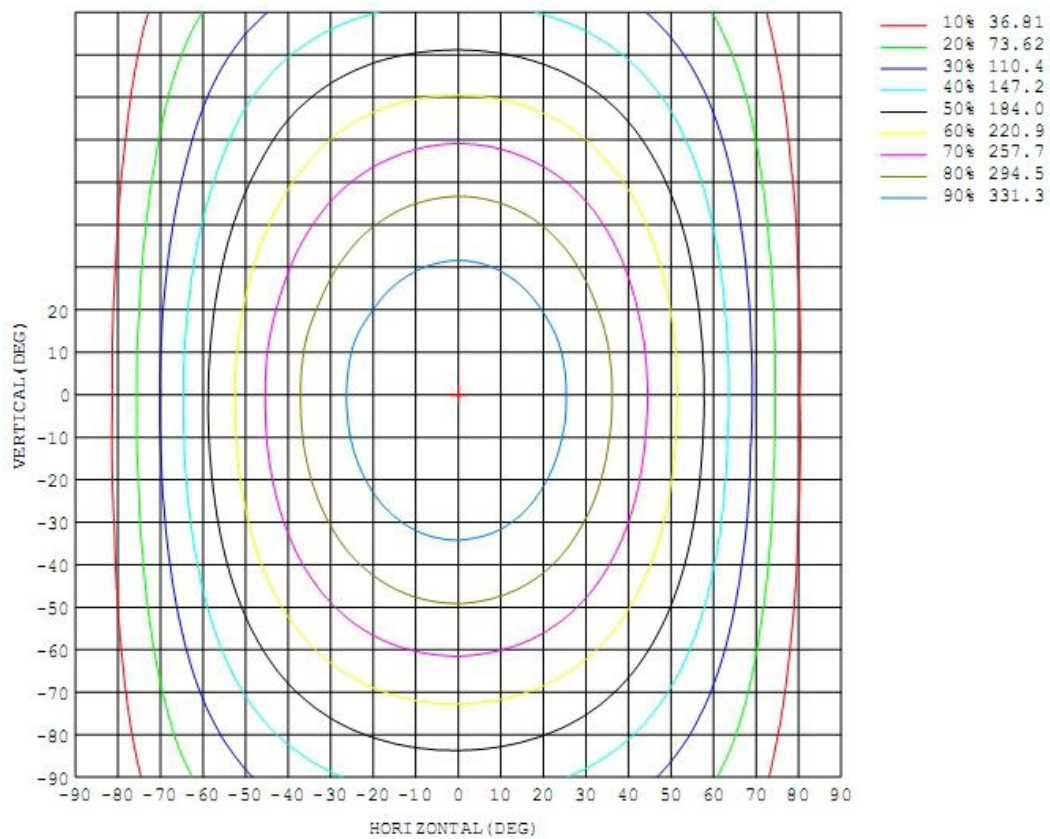


Chart 6: Isocandela Plot

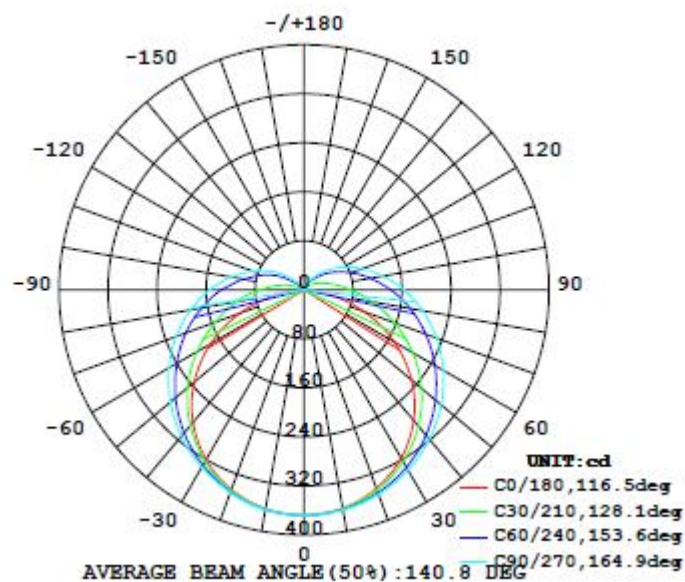


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
0	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368
5	366	366	366	366	366	366	367	367	367	367	367	367	367	367	367	367	367	367	367
10	362	362	362	362	362	363	363	363	363	363	364	364	364	364	364	365	365	365	365
15	355	355	355	355	356	356	356	357	357	358	358	359	359	360	360	360	361	361	361
20	345	345	345	346	346	347	348	348	349	350	351	352	352	353	354	355	355	355	356
25	332	333	333	334	335	335	337	338	339	341	342	343	344	345	346	347	348	348	348
30	317	317	318	319	320	322	323	325	327	329	331	333	334	336	337	338	339	339	340
35	299	300	300	302	303	306	308	311	313	316	318	321	323	325	326	328	329	329	330
40	278	279	280	282	284	287	291	294	297	301	304	307	310	312	314	316	317	318	318
45	255	256	257	260	263	267	271	276	280	284	288	292	296	298	301	303	304	305	306
50	229	230	232	235	240	245	250	256	261	266	271	276	280	284	286	289	290	292	292
55	201	202	204	209	215	221	228	235	241	247	253	259	264	268	271	274	276	277	278
60	170	171	175	181	189	196	205	213	220	228	235	241	247	251	255	258	260	262	262
65	138	139	145	152	161	171	181	190	200	208	216	223	229	234	239	242	244	246	247
70	104	106	113	123	134	146	157	168	179	188	197	205	211	217	222	225	228	230	230
75	70.3	72.9	82.4	94.0	107	121	134	147	158	169	178	186	194	200	205	208	211	213	214
80	38.5	43.4	54.7	67.9	83.0	98.4	113	126	139	150	160	168	176	182	187	191	194	196	197
85	12.5	19.4	31.5	46.5	62.9	78.3	93.3	107	120	132	142	151	158	165	170	174	177	179	180
90	0.17	6.21	16.4	30.5	46.4	61.6	76.2	90.0	103	114	125	134	141	148	153	158	160	162	163
95	0.16	2.47	9.01	20.3	34.1	48.2	62.2	75.1	87.3	98.5	109	118	125	132	137	141	144	146	147
100	0.00	0.97	5.69	14.3	25.3	37.5	50.1	62.2	73.5	84.2	93.9	102	110	116	121	125	128	130	131
105	0.00	0.76	4.14	10.4	19.1	29.4	40.4	51.3	61.8	71.4	80.2	88.4	95.4	101	106	110	113	115	116
110	0.00	0.73	3.20	7.62	14.4	23.1	32.4	41.9	51.3	60.2	68.3	75.5	81.9	87.5	92.1	95.8	98.5	100	101
115	0.07	0.82	2.65	5.90	11.0	17.7	25.6	34.0	42.2	50.0	57.4	63.9	69.5	74.6	79.0	82.4	84.8	86.4	86.9
120	0.24	0.84	2.25	4.80	8.73	13.8	19.9	26.8	34.0	41.0	47.4	53.3	58.7	63.3	67.0	69.8	71.8	73.2	73.8
125	0.40	0.88	1.93	3.93	6.99	10.9	15.7	20.9	26.6	32.5	38.3	43.7	48.4	52.4	55.8	58.5	60.4	61.7	62.2
130	0.59	0.92	1.73	3.30	5.62	8.68	12.4	16.5	20.8	25.3	29.8	34.3	38.4	42.2	45.3	47.7	49.5	50.6	51.0
135	0.70	0.97	1.58	2.72	4.49	6.85	9.67	12.8	16.2	19.7	23.2	26.5	29.7	32.6	35.1	37.1	38.6	39.6	40.0
140	0.76	0.99	1.47	2.29	3.55	5.33	7.50	9.89	12.5	15.1	17.8	20.4	22.8	24.9	26.7	28.2	29.4	30.1	30.4
145	0.84	1.01	1.40	2.01	2.85	4.04	5.65	7.45	9.37	11.4	13.3	15.2	17.0	18.7	20.1	21.2	22.0	22.6	22.8
150	0.95	1.12	1.39	1.82	2.43	3.22	4.24	5.49	6.86	8.27	9.68	11.0	12.3	13.5	14.5	15.4	16.0	16.4	16.6
155	1.08	1.16	1.35	1.65	2.05	2.59	3.20	3.88	4.75	5.77	6.77	7.71	8.57	9.36	10.1	10.6	11.1	11.4	11.5
160	1.14	1.22	1.37	1.57	1.81	2.11	2.48	2.93	3.40	3.87	4.34	4.88	5.46	6.04	6.53	6.92	7.20	7.37	7.44
165	1.23	1.28	1.37	1.49	1.64	1.81	2.00	2.21	2.46	2.72	3.00	3.28	3.53	3.75	3.93	4.07	4.19	4.27	4.30
170	1.30	1.34	1.38	1.44	1.52	1.60	1.70	1.80	1.89	1.99	2.10	2.20	2.30	2.40	2.49	2.57	2.62	2.66	2.69
175	1.37	1.40	1.42	1.44	1.46	1.48	1.51	1.54	1.58	1.61	1.64	1.68	1.71	1.73	1.75	1.77	1.79	1.80	1.81
180	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) y (DEG)	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185
0	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368
5	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367	367
10	365	365	365	365	365	364	364	364	364	364	364	363	363	363	363	363	363	363	363
15	361	361	361	361	360	360	360	359	359	358	358	358	357	357	356	356	356	356	356
20	355	355	355	355	354	353	353	352	352	351	350	349	349	348	348	347	347	347	347
25	348	348	348	347	346	346	344	343	342	341	340	339	338	337	336	335	335	335	335
30	340	339	339	338	337	336	334	333	331	329	328	326	325	323	322	321	320	320	320
35	330	329	328	327	326	324	322	320	318	316	313	311	309	307	305	304	303	303	303
40	318	318	317	315	314	311	309	306	303	300	297	294	291	288	286	284	283	282	283
45	306	305	304	302	300	297	294	291	287	283	279	275	271	267	264	262	260	259	260
50	292	291	289	288	285	282	278	274	269	264	259	254	249	245	241	237	235	234	235
55	278	276	275	272	269	266	261	256	251	245	239	232	226	220	215	211	208	206	207
60	262	261	259	256	253	249	244	238	231	224	217	209	202	194	187	182	178	176	177
65	246	245	243	240	236	231	226	219	212	204	195	186	176	167	158	151	147	145	146
70	230	229	226	223	219	214	207	200	192	183	173	162	151	140	129	120	114	111	113
75	213	212	209	206	201	196	189	181	172	162	151	139	127	113	101	89.2	80.5	77.1	79.3
80	196	195	192	189	184	178	171	163	153	143	131	118	104	89.1	74.3	60.8	49.4	44.4	47.7
85	179	178	175	172	167	161	153	145	135	124	112	98.3	83.6	68.2	52.6	37.0	23.6	17.1	21.5
90	163	161	159	155	150	144	136	128	118	107	94.3	80.9	66.5	51.4	35.5	20.8	7.70	1.45	6.95
95	146	145	142	138	133	127	120	111	102	91.0	78.9	66.3	52.5	38.3	24.1	11.8	3.56	0.75	1.96
100	130	129	126	123	118	112	105	96.5	87.2	76.8	65.6	53.8	41.1	28.5	16.7	7.16	1.93	0.73	0.41
105	115	114	111	108	103	97.3	90.5	82.7	74.2	64.7	54.3	43.3	32.1	21.5	12.1	5.05	1.45	0.83	0.51
110	100	99.1	96.7	93.3	88.9	83.7	77.3	70.3	62.4	53.7	44.2	34.7	25.1	16.0	8.56	3.71	1.11	0.74	0.96
115	86.6	85.3	83.1	79.9	75.9	71.1	65.5	59.0	51.8	44.0	35.9	27.4	19.2	12.1	6.68	3.18	1.33	0.98	1.13
120	73.5	72.3	70.4	67.7	64.2	59.8	54.7	48.9	42.6	35.7	28.4	21.2	14.8	9.51	5.38	2.83	1.59	1.17	1.10
125	61.9	60.9	59.0	56.5	53.2	49.4	44.9	39.6	33.8	27.7	21.8	16.5	11.7	7.62	4.41	2.39	1.58	1.34	1.19
130	50.8	49.9	48.2	45.9	42.9	39.4	35.2	30.7	26.0	21.5	17.2	13.1	9.32	6.15	3.69	2.19	1.67	1.51	1.32
135	39.8	38.9	37.5	35.5	33.1	30.2	27.0	23.7	20.3	16.8	13.5	10.3	7.39	4.98	3.28	2.19	1.72	1.60	1.46
140	30.2	29.5	28.4	27.0	25.2	23.1	20.8	18.3	15.6	13.0	10.4	8.00	5.75	3.87	2.68	2.05	1.74	1.65	1.60
145	22.7	22.2	21.4	20.3	19.0	17.4	15.7	13.8	11.8	9.82	7.90	6.13	4.56	3.34	2.56	2.04	1.74	1.66	1.65
150	16.5	16.2	15.6	14.8	13.8	12.7	11.4	10.0	8.65	7.26	5.86	4.57	3.54	2.85	2.32	1.94	1.75	1.66	1.66
155	11.4	11.2	10.8	10.2	9.58	8.82	7.98	7.07	6.07	5.03	4.11	3.48	2.96	2.50	2.13	1.87	1.72	1.66	1.64
160	7.41	7.27	7.04	6.70	6.24	5.69	5.08	4.51	4.03	3.62	3.22	2.82	2.47	2.18	1.96	1.79	1.66	1.62	1.61
165	4.28	4.22	4.13	4.00	3.84	3.66	3.45	3.20	2.95	2.70	2.47	2.26	2.09	1.94	1.80	1.70	1.64	1.59	1.56
170	2.69	2.67	2.63	2.57	2.50	2.42	2.33	2.24	2.15	2.06	1.97	1.90	1.82	1.75	1.69	1.64	1.59	1.54	1.53
175	1.81	1.81	1.81	1.80	1.78	1.77	1.75	1.73	1.71	1.68	1.66	1.63	1.61	1.59	1.57	1.55	1.54	1.52	1.51
180	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46

Table 7: 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

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 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

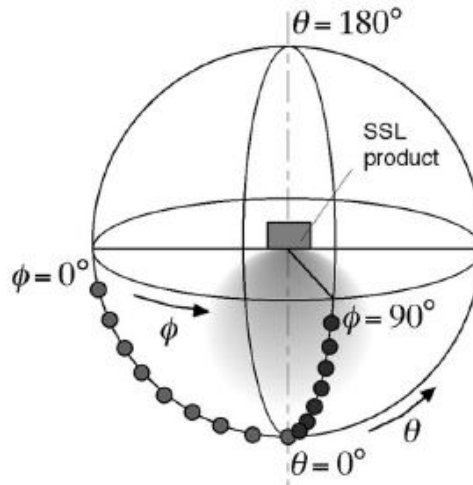
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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