

LM-79-08 TEST REPORT

for

ETI Solid State Lighting (Zhuhai) Ltd.

No. 1, Zhongzhu Road South, Science & Technology Innovation Coast, High Tech District,
ZHUHAI CTIY Guangdong

LED Tube

Model: 64101163

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19100004b

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

Review by:



Engineer: April Zou
Oct. 29, 2019

Approved by:



Manager: Jim Zhang
Oct. 29, 2019

TEST SUMMARY

Model	64101163
Luminous Efficacy (Lumens /Watt)	150.0
Total Luminous Flux (Lumens)	1850.5
Power (Watts)	12.34
Power Factor	0.9796
Stabilization Time (Light & Power)	70 mins
Note	5000K

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Oct. 09, 2019
Date of Test	: Oct. 10, 2019
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, 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

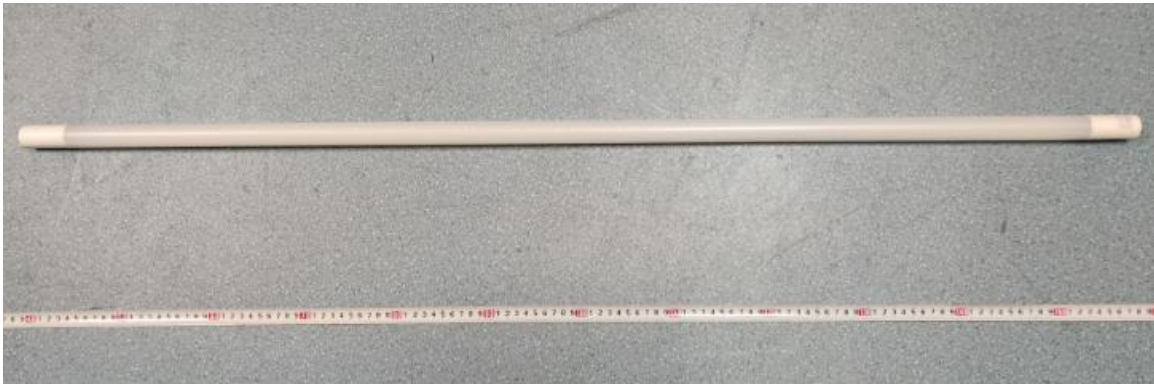


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 64101163
Electrical Ratings	: 120-277V, 50/60Hz, 12W
Product Description	: G13 Base, 5000K
Manufacturer	: ETI Solid State Lighting (Zhuhai) Ltd.
Address	: No. 1, Zhongzhu Road South, Science & Technology Innovation Coast, High Tech District, ZHUHAI CTIY Guangdong

TEST RESULTS

Test ambient temperature was 25.1 °C.

Test orientation was light down. 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 90 minutes.

The photometric distance is 30 m.

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

Parameter	64101163	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.105	0.048
Power Factor	0.9796	0.9174
Test Power (W)	12.34	12.32
THD A%	17.82	20.81
Luminous Efficacy (lm/W)	150.0	148.8
Total Luminous Flux (lm)	1850.5	1834.2
Beam Angle (°)	108.4 (0°-180°)/ 182.5 (90°-270°)	
Center Beam Candle Power (cd)	359	
Maximum Beam Candle Power (cd)	358.9 (At: C=80.0, Gamma=0.5)	
Spacing Criteria	1.23 (0°-180°)/ 1.32 (90°-270°)	
Zonal Lumens in the 0°-60° Zone	46.55%	
Zonal Lumens in the 60°-90° Zone	26.17%	
Zonal Lumens in the 90°-120° Zone	15.91%	
Zonal Lumens in the 120°-180° Zone	11.37%	

Table 2: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method of 120V

$\gamma(^{\circ})$	64101163	
	Lumens	% Total
0- 10	33.959	1.84%
10- 20	97.436	5.27%
20- 30	148.771	8.04%
30- 40	183.176	9.90%
40- 50	199.334	10.77%
50- 60	198.722	10.74%
60- 70	184.795	9.99%
70- 80	162.239	8.77%
80- 90	137.217	7.41%
90-100	115.92	6.26%
100-110	97.469	5.27%
110-120	81.018	4.38%
120-130	66.58	3.60%
130-140	53.663	2.90%
140-150	41.309	2.23%
150-160	28.798	1.56%
160-170	15.675	0.85%
170-180	4.46	0.24%
Total	1850.5	100%
$\gamma(^{\circ})$	Lumens	% Total
0- 60	861.398	46.55%
60- 90	484.251	26.17%
0-90	1345.649	72.72%
90- 180	504.892	27.28%
0- 180	1850.5	100%

Table 3: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method of 120V

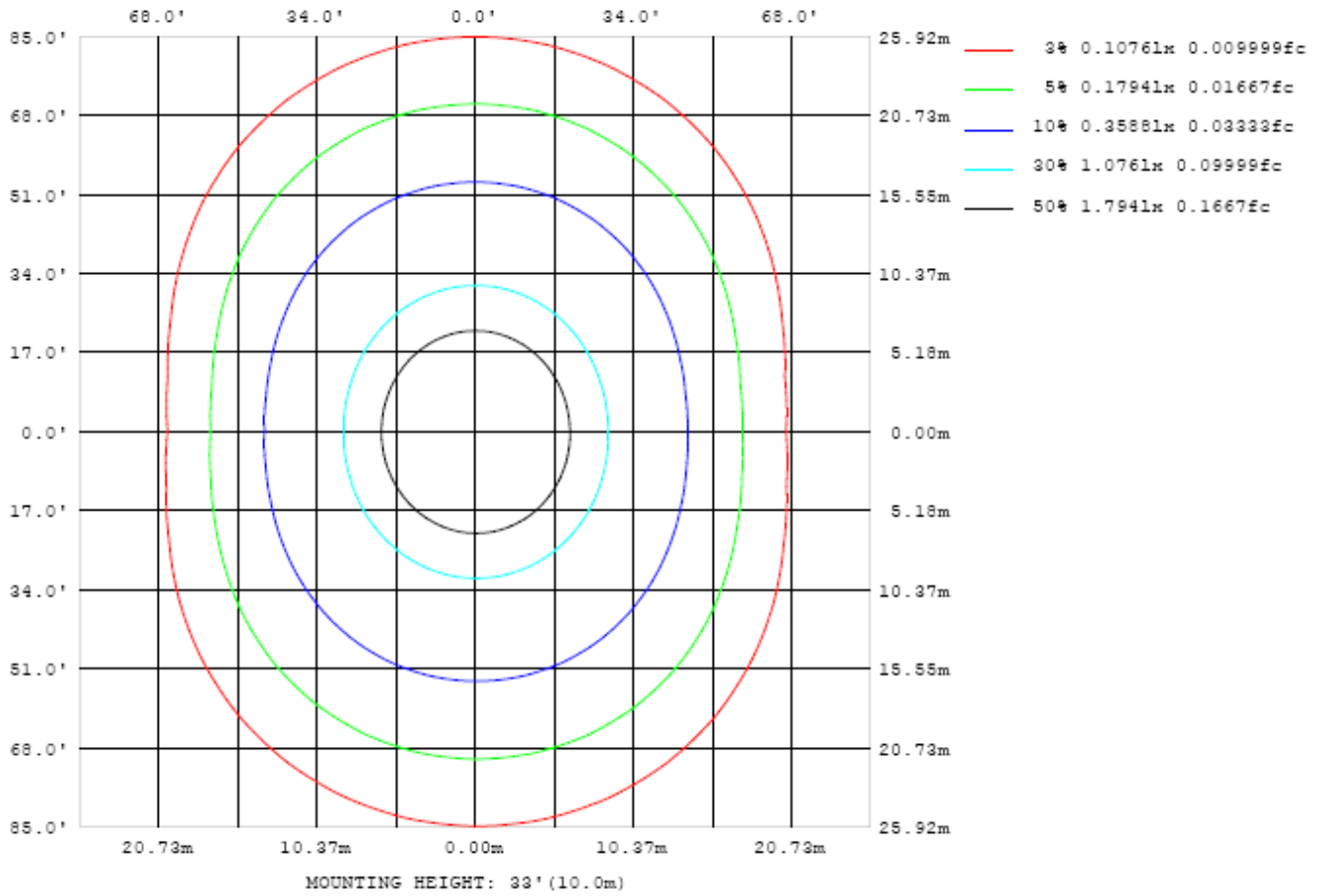


Chart 1: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method of 120V

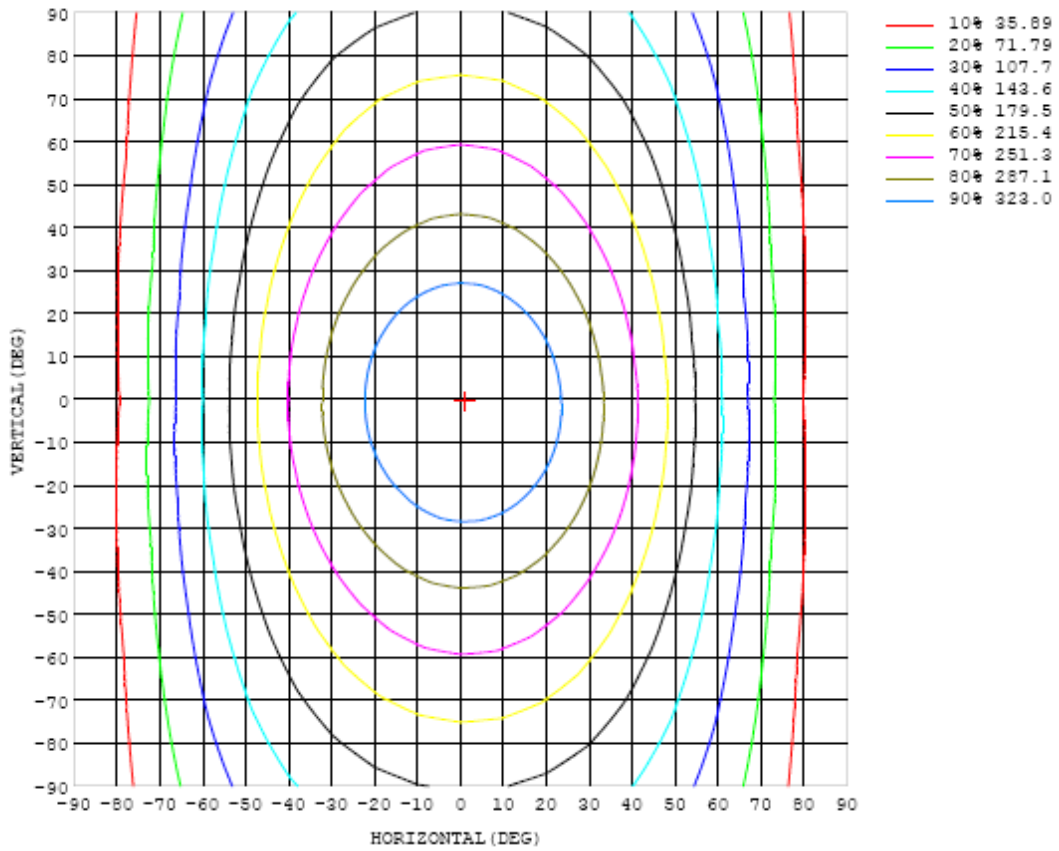


Chart 2: Isocandela Plot

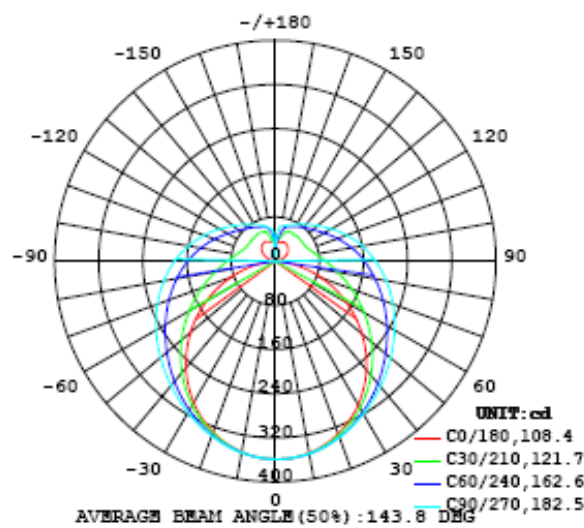


Chart 3: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method of 120V

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	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359
5	358	358	358	358	358	358	358	358	358	358	358	358	357	357	357	357	357	357	357
10	353	353	353	354	354	354	354	354	355	354	354	354	353	353	352	352	351	351	351
15	344	345	346	346	347	347	348	348	348	348	348	347	346	345	344	344	343	342	342
20	333	334	335	336	337	338	339	340	340	340	339	338	337	335	334	332	331	330	330
25	318	319	321	323	325	327	329	330	331	330	329	328	325	323	320	318	316	315	314
30	300	302	304	307	310	313	317	319	320	320	319	316	313	309	305	302	299	297	296
35	280	282	285	289	294	299	303	306	308	308	307	304	299	294	289	284	279	276	275
40	257	259	264	270	277	283	289	294	296	296	295	291	285	278	271	263	255	254	252
45	232	235	241	249	259	267	275	281	284	285	283	278	271	262	253	243	235	230	227
50	205	209	217	228	240	251	261	268	273	273	271	265	257	246	234	222	211	204	200
55	177	182	193	207	222	236	247	256	260	261	259	252	243	230	216	201	187	177	173
60	149	155	168	186	204	220	234	243	249	250	247	240	229	215	199	181	164	151	144
65	119	127	144	166	187	206	221	231	237	238	235	228	216	201	182	162	140	124	115
70	89.7	99.3	121	147	171	192	208	219	226	227	224	216	204	187	166	143	118	97.1	86.4
75	61.0	73.5	100	130	157	178	196	207	214	216	212	204	191	174	153	127	98.2	72.4	59.1
80	35.1	50.9	82.6	115	144	166	184	196	203	204	201	193	180	162	139	112	80.8	50.6	33.3
85	12.1	33.4	68.3	102	131	155	172	184	191	193	190	181	168	151	127	99.2	66.9	33.6	11.5
90	0.28	23.3	57.9	91.5	120	144	162	173	180	182	179	170	158	140	117	88.7	56.5	23.4	0.48
95	2.16	18.8	50.6	82.7	111	134	151	163	169	171	168	160	148	130	107	79.9	49.2	18.6	2.11
100	5.53	18.9	45.7	75.1	102	124	140	152	159	160	157	150	137	120	98.2	72.3	43.9	18.0	5.90
105	9.61	21.4	43.3	69.1	93.4	114	130	141	147	149	146	139	127	111	90.1	66.3	41.2	20.2	10.5
110	14.4	25.5	43.0	64.7	86.3	105	120	130	136	138	135	128	117	102	83.1	61.9	40.6	24.1	15.4
115	19.3	29.8	44.0	62.1	80.4	97.1	111	120	126	127	125	118	108	94.2	77.4	59.1	41.1	28.4	20.3
120	23.8	34.2	45.7	60.6	76.1	90.3	102	111	116	117	115	109	99.8	87.6	73.3	57.8	42.9	32.8	25.0
125	27.6	38.5	47.7	60.0	72.9	85.0	95.0	102	107	108	106	101	92.9	82.4	70.1	57.2	45.3	37.1	28.9
130	30.5	42.6	49.8	59.8	70.5	80.5	89.0	95.3	99.0	100.0	98.3	93.9	87.1	78.2	67.8	57.1	48.0	41.2	32.2
135	32.9	45.9	51.5	60.0	68.6	76.9	83.9	89.2	92.3	93.1	91.7	88.0	82.2	74.8	66.3	57.8	50.5	45.1	35.2
140	34.7	49.1	53.6	60.2	67.2	73.8	79.5	83.8	86.4	87.0	85.8	82.8	78.1	72.0	65.2	58.6	53.0	48.3	37.8
145	36.3	51.5	55.3	58.1	66.1	71.2	75.7	79.1	81.2	81.7	80.7	78.3	74.5	69.8	64.6	59.5	55.3	49.3	38.9
150	37.7	54.0	57.2	59.6	64.7	69.0	72.4	75.1	76.6	77.0	76.3	74.4	71.6	68.0	64.1	60.4	57.5	51.5	40.5
155	38.1	52.9	58.1	59.6	62.1	67.2	69.5	71.5	72.6	72.9	72.5	71.1	69.1	66.6	64.0	61.4	59.7	49.8	39.6
160	36.7	45.3	51.8	57.3	59.8	62.0	67.3	68.4	69.3	69.5	69.3	68.5	67.3	65.7	64.0	62.3	61.8	48.6	38.0
165	34.7	38.7	44.4	48.0	51.5	56.1	61.1	66.1	66.6	66.8	66.7	66.4	65.8	64.9	63.9	63.0	61.1	46.9	36.1
170	34.5	34.9	38.7	43.3	44.4	44.5	48.8	55.7	62.6	64.8	64.8	64.6	64.5	63.2	61.5	59.8	55.1	44.4	35.4
175	44.2	43.4	42.5	44.4	43.6	44.0	41.1	36.8	39.5	53.3	60.0	61.9	59.0	54.6	50.9	46.5	45.0	43.0	35.0
180	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4

Table 4: Luminous Intensity Data

Table--2 UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359		
5	357	357	357	357	357	357	357	357	357	357	357	357	357	357	357	357	357		
10	351	351	351	351	352	352	352	352	352	353	353	353	353	353	353	353	353		
15	342	342	343	343	344	345	345	346	346	346	346	345	345	345	345	344	344		
20	330	330	331	332	334	335	336	337	337	337	337	336	335	334	334	333	332		
25	315	316	317	319	322	324	325	327	327	327	326	325	323	321	320	318	318		
30	297	298	301	304	308	311	314	316	317	316	315	312	309	306	304	301	300		
35	276	279	283	288	293	298	302	304	305	305	303	299	295	290	286	282	280		
40	254	257	264	270	278	284	289	293	294	293	290	285	279	273	266	261	257		
45	229	235	243	252	262	271	277	281	283	282	278	272	264	255	246	238	233		
50	203	211	222	234	246	257	265	270	272	270	265	258	248	237	225	214	207		
55	176	187	201	216	231	243	253	259	261	259	253	245	233	219	204	190	180		
60	149	162	180	199	216	230	241	247	250	248	241	231	218	201	183	166	152		
65	122	139	160	182	202	218	229	236	239	236	230	219	203	185	163	142	125		
70	94.8	116	142	166	188	205	217	225	228	225	218	206	190	169	145	120	97.9		
75	69.8	95.7	125	152	175	193	206	214	216	214	206	194	177	155	128	99.5	72.9		
80	47.9	78.2	110	139	163	181	195	202	205	203	195	182	164	141	114	82.0	51.3		
85	30.6	64.6	97.6	127	151	170	183	191	194	191	184	171	153	130	101	68.6	34.3		
90	20.7	54.5	87.3	116	141	159	172	180	183	180	173	160	142	119	90.6	58.4	24.5		
95	16.6	47.3	78.5	107	130	148	161	169	171	169	162	149	132	109	81.8	51.1	20.0		
100	17.1	42.7	71.5	97.8	120	137	150	157	160	158	150	139	122	100	74.4	46.1	19.9		
105	19.7	40.6	65.9	89.8	111	127	139	146	148	146	139	128	112	92.3	68.8	43.6	22.0		
110	23.3	40.4	61.8	83.0	102	117	128	135	137	136	129	119	104	85.3	64.4	43.3	25.6		
115	27.3	41.2	59.3	77.4	94.4	108	118	125	127	125	119	109	96.1	79.5	61.9	44.2	29.7		
120	31.9	42.9	57.9	73.4	87.8	100	109	115	117	115	110	101	89.4	75.5	60.5	45.8	33.1		
125	34.7	45.1	57.3	70.6	82.7	93.1	101	106	108	106	102	94.2	84.2	72.2	59.8	47.7	37.2		
130	36.8	46.5	57.3	68.3	78.4	87.3	94.0	98.3	99.9	98.7	94.7	88.4	79.8	70.3	59.7	49.8	40.0		
135	38.7	49.4	57.9	66.6	74.8	82.3	87.9	91.5	92.9	91.9	88.5	83.3	76.2	68.5	59.8	51.6	42.9		
140	40.3	51.4	57.6	65.3	72.8	78.0	82.6	85.6	86.7	85.9	83.2	78.9	73.1	67.0	60.1	52.9	45.1		
145	45.2	52.2	58.7	64.1	70.0	74.4	78.0	80.4	81.4	80.7	78.5	75.1	71.0	65.8	60.2	54.3	47.0		
150	47.7	52.5	59.0	63.5	67.3	71.6	74.1	75.9	76.6	76.1	74.4	72.0	68.7	64.8	59.4	52.4	47.7		
155	42.0	51.3	57.8	62.7	65.9	68.2	70.4	71.9	72.5	72.2	71.0	69.3	66.6	62.1	57.0	53.8	46.3		
160	37.3	50.2	57.1	61.1	64.5	66.3	67.6	68.5	68.9	68.7	67.9	65.7	62.2	55.7	51.5	48.4	42.2		
165	33.9	40.3	51.8	58.7	61.3	63.3	64.7	65.2	65.1	64.8	63.2	58.5	50.3	46.6	43.3	40.5	36.7		
170	36.0	34.8	37.4	48.2	55.5	56.7	60.0	61.4	61.5	60.5	50.8	42.9	40.9	41.1	40.9	36.1	33.0		
175	43.4	45.8	45.1	43.6	45.0	44.9	44.2	48.0	51.9	29.4	36.1	43.9	44.4	45.2	42.0	43.7	44.7		
180	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	PF2010A	HZTE028-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	DPS1060	HZTE001-06	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	WY12010	HZTE004-03	Aug. 02, 2019	Aug. 01, 2020
Standard Source	D908	HZTE012-01	Aug. 02, 2019	Aug. 01, 2020
Standard source	SCL-1400	HZTE012-02	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 02, 2019	Aug. 01, 2020
Temperature recorder	JM624U	HZTE018-08	Aug. 02, 2019	Aug. 01, 2020

Table 6: 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.

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 $k=2$.

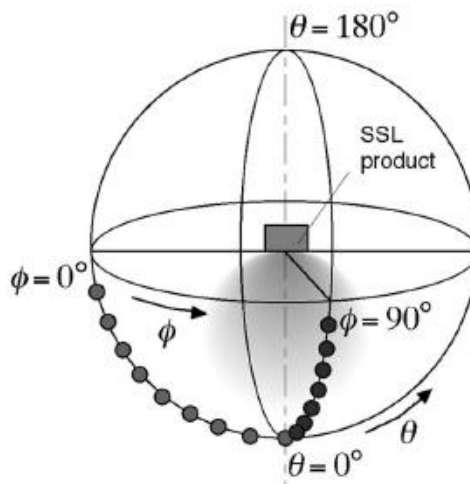
Color Characteristics Measurements

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° 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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