NVLAP LAB CODE 200960-0

LM-79-08 Test Report

for

IGT Lighting, Inc.

3755 Lincoln St. Suite B, Riverside, CA 92503

100W LED LINEAR HIGH BAY WITH PIR & PHOTECELL SENSOR

Model: IGTLHB-1610050-PIRP

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ16060019f

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

Reviewed by:

Engineer: April Zou

Jul. 01, 2016

Approved by:

Manager: Jim Zhang

Jul. 01, 2016

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: **IGTLHB-1610050-PIRP**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
130.1	12820.0	98.54	0.9940

CCT (K)	CRI	Stabilization Time (Light & Power)
4989	77.4	60

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Jun. 20, 2016

Date of Test : Jun. 30, 2016

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

TABLE OF CONTENT

Sample Photo

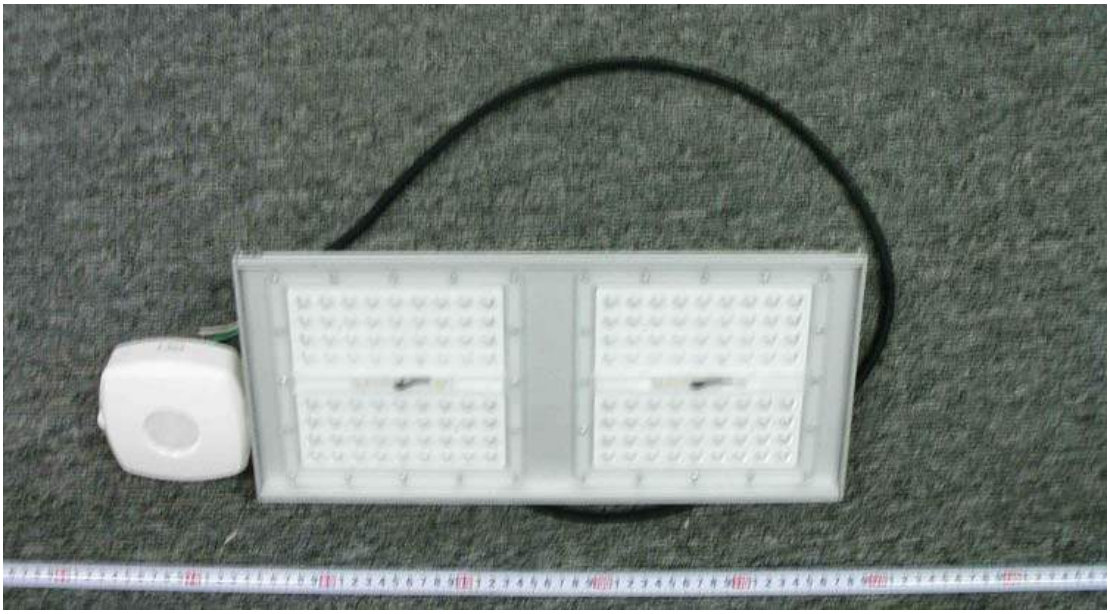


Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: 100W LED LINEAR HIGH BAY WITH PIR & PHOTECELL SENSOR
Model	: IGTLHB-1610050-PIRP
Electrical Ratings	: 100~277Vac, 50/60Hz, 100W
Product Description	: 5000K, Plastic Lens, Aluminum Enclosure
Manufacturer	: IGT Lighting, Inc.
Address	: 1900 Compton Ave., Building 101, Corona, CA 92881, USA

TEST RESULTS

Test ambient temperature was 24.4℃.

Base orientation was Light down. 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 85 minutes.

The photometric distance of Goniophotometer is 30 m.

Luminous data was taken at 0.5° vertical intervals and 10.0°horizontal intervals.

Parameter	Result		
Test Voltage (V)	120.0	100.0	277.0
Voltage frequency (Hz)	60	60	60
Test Current (A)	0.826	0.997	0.380
Power Factor	0.9940	0.9958	0.9321
Test Power (W)	98.54	99.27	98.24
THD A%	7.74	7.32	15.01
Luminous Efficacy (lm/W)	130.1		
Total Luminous Flux (lm)	12820.0		
Color Rendering Index (CRI)	77.4		
R9	-9		
Correlated Color Temperature (CCT) (K)	4989		
Chromaticity (Chroma x, Chroma y)	(0.3454, 0.3525)		
Chromaticity (Chroma u, Chroma v)	(0.2113, 0.3235)		
Chromaticity (Chroma u', Chroma v')	(0.2113, 0.4852)		
Duv	0.0003		
Average Beam Angle (°)	44.6		
Center Beam Candle Power (cd)	13610		
Spacing Criteria	0.99 (0°-180°)/ 0.44 (90°-270°)		
Zonal Lumens in the 0°-60°Zone	93.82%		
Zonal Lumens in the 60°-90°Zone	6.00%		
Zonal Lumens in the 90°-120°Zone	0.10%		
Zonal Lumens in the 120°-180°Zone	0.07%		

Special Color Rendering Indices	
R1	75
R2	85
R3	89
R4	74
R5	74
R6	76
R7	85
R8	61
R9	-9
R10	60
R11	69
R12	46
R13	78
R14	94

Table 2: Test data per Goniophotometer Method

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

Spectral Power Distribution

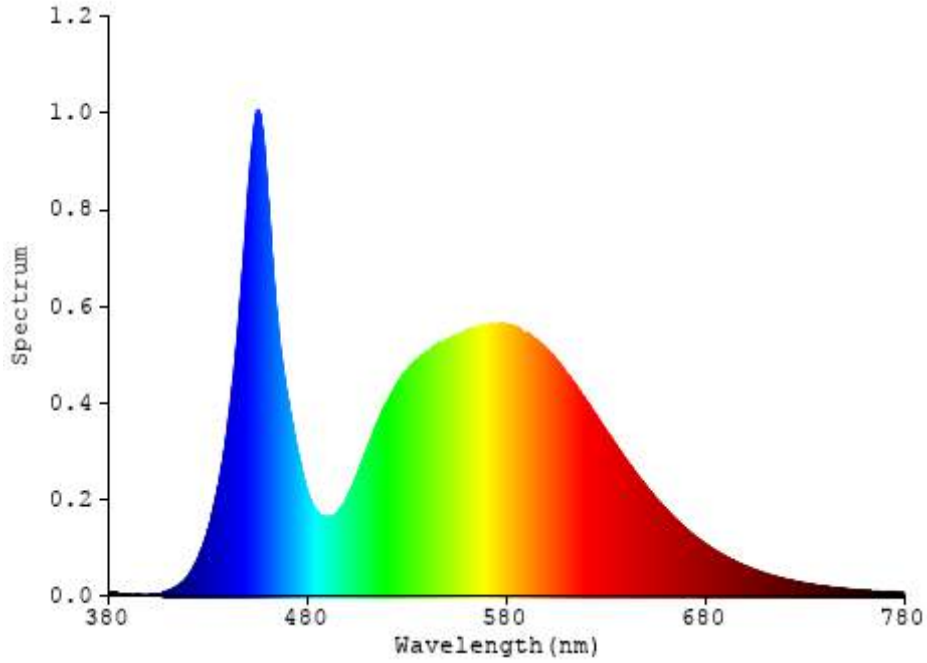


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

γ(°)	Lumens	% Total
0- 10	1140.164	8.89%
10- 20	2425.798	18.92%
20- 30	2674.17	20.86%
30- 40	2535.545	19.78%
40- 50	2076.94	16.20%
50- 60	1175.797	9.17%
60- 70	477.88	3.73%
70- 80	245.316	1.91%
80- 90	45.858	0.36%
90-100	7.099	0.06%
100-110	3.691	0.03%
110-120	2.437	0.02%
120-130	2.182	0.02%
130-140	2.203	0.02%
140-150	2.097	0.02%
150-160	1.682	0.01%
160-170	1.005	0.01%
170-180	0.324	0.00%
Total	12820.2	100%

γ(°)	Lumens	% Total
0- 60	12028.414	93.82%
60- 90	769.054	6.00%
0-90	12797.468	99.82%
90- 180	22.72	0.18%
0- 180	12820.2	100%

Table 3: Zonal Lumen Data

Note: The Flux in this table might be a little different from the total flux in Table 2 due to rounding.

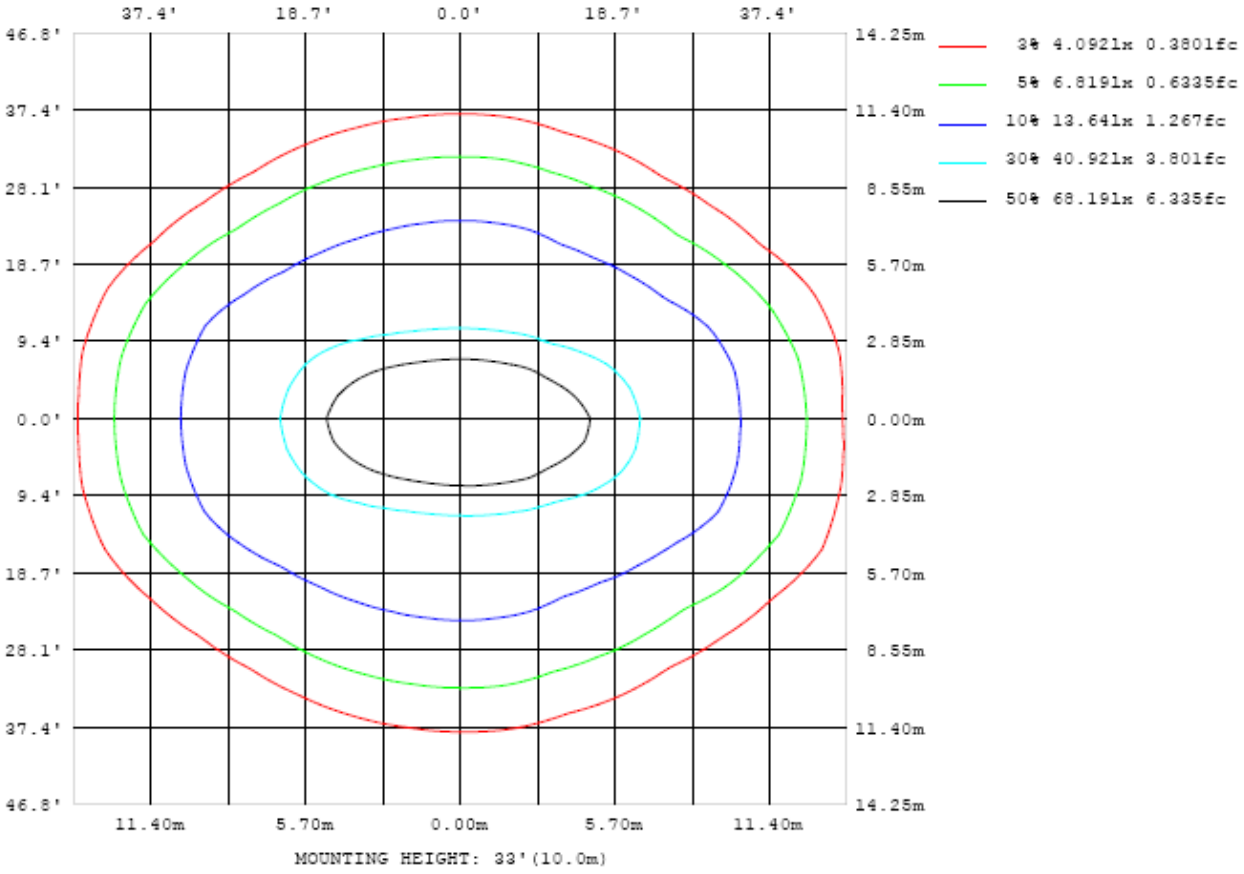


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

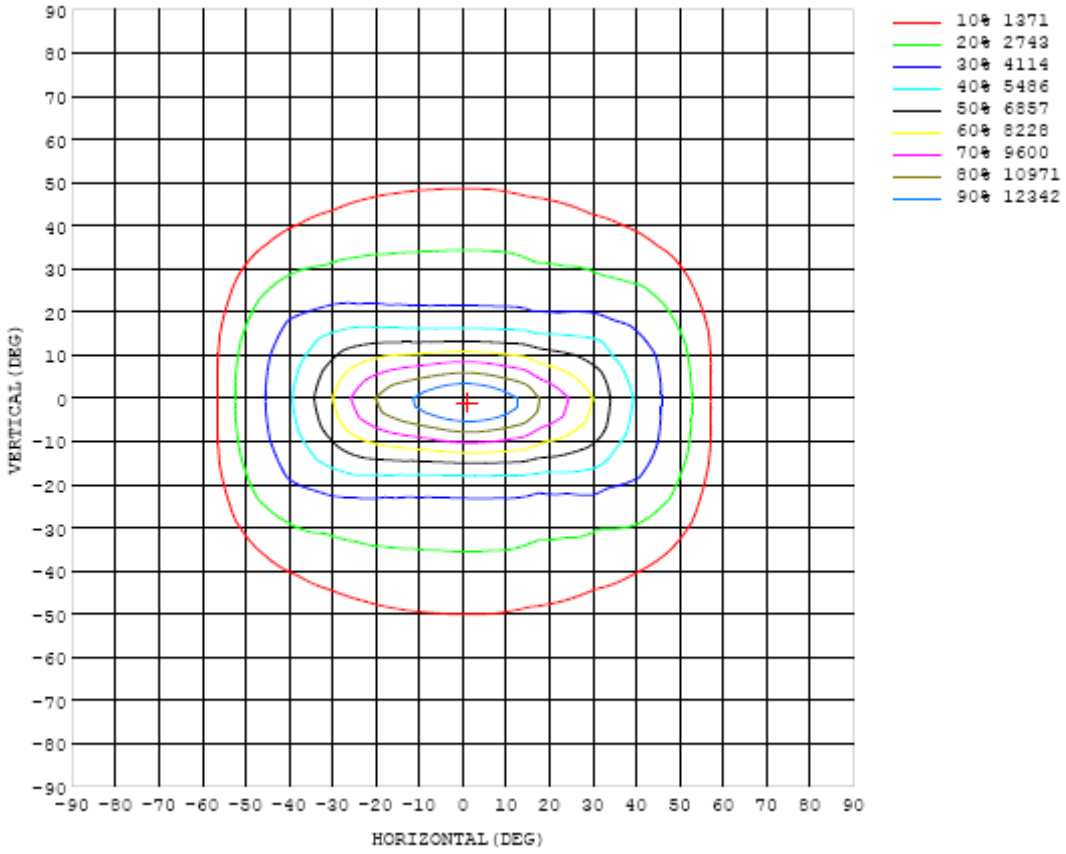


Chart 3: Isocandela Plot

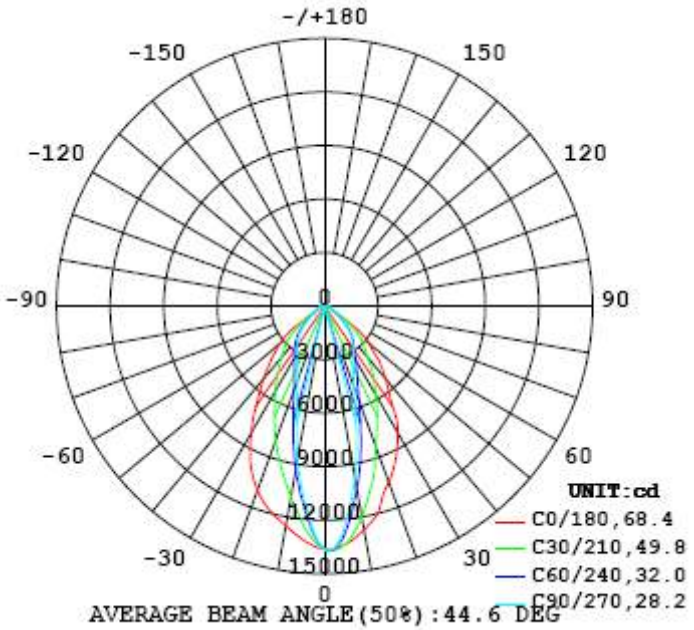


Chart 4: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: ×10cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361
5	1341	1350	1349	1338	1322	1304	1284	1268	1257	1252	1252	1258	1270	1285	1301	1316	1325	1327	1318
10	1272	1280	1251	1197	1137	1083	1041	1008	986	976	977	992	1018	1057	1108	1166	1222	1254	1251
15	1181	1183	1120	1029	942	861	789	733	698	685	691	718	769	838	918	1005	1100	1175	1185
20	1050	1037	941	837	746	646	564	516	491	482	487	509	555	634	744	858	969	1072	1099
25	944	920	816	698	563	473	432	401	386	380	383	397	428	486	587	719	837	943	980
30	820	792	699	576	448	376	349	334	324	321	322	332	354	395	472	593	702	784	822
35	647	629	583	476	370	316	288	287	280	278	279	286	303	333	386	480	579	635	661
40	530	517	472	375	311	269	247	244	240	238	239	245	259	280	318	391	478	519	532
45	432	428	397	313	245	222	202	191	193	190	191	198	210	224	256	322	392	417	422
50	325	324	303	246	189	158	149	139	140	138	138	143	149	162	190	240	302	325	329
55	197	213	210	156	117	102	94.1	89.0	92.9	94.7	92.6	91.6	93.8	103	118	151	195	208	196
60	73.2	93.3	100	78.8	69.0	62.2	61.9	65.5	68.3	70.0	69.4	68.1	65.0	65.9	71.6	79.2	93.0	81.3	61.7
65	36.4	39.6	47.1	45.6	45.4	46.1	48.2	49.9	47.1	48.9	47.7	51.1	50.5	48.7	48.2	49.1	48.8	42.1	39.8
70	25.3	26.2	30.4	32.2	31.9	34.1	37.1	36.4	32.6	34.1	33.7	37.4	38.9	36.0	32.8	34.6	33.4	29.1	28.1
75	17.6	18.3	21.0	21.7	20.5	22.1	26.7	25.8	25.2	28.0	26.6	27.1	27.8	23.6	22.1	22.9	22.4	19.4	18.6
80	9.06	10.1	12.0	12.0	12.8	12.9	14.4	16.5	19.1	30.8	20.1	17.5	15.1	13.7	13.7	13.5	13.6	12.3	11.6
85	2.04	2.15	2.26	2.32	2.33	2.82	2.30	0.81	0.67	0.43	0.80	2.48	3.36	4.76	4.74	4.26	3.98	3.84	3.95
90	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02
95	0.11	0.28	0.72	0.94	1.09	1.09	0.87	0.59	0.30	0.17	0.69	1.32	1.87	2.19	2.15	1.59	0.85	0.10	0.10
100	0.14	0.20	0.32	0.46	0.63	0.65	0.59	0.45	0.27	0.20	0.43	0.70	0.86	0.87	0.76	0.53	0.41	0.12	0.15
105	0.16	0.19	0.24	0.33	0.42	0.44	0.40	0.32	0.21	0.18	0.26	0.37	0.44	0.45	0.42	0.40	0.35	0.13	0.18
110	0.17	0.18	0.21	0.26	0.31	0.32	0.31	0.27	0.19	0.17	0.20	0.27	0.32	0.35	0.37	0.36	0.29	0.14	0.20
115	0.10	0.17	0.21	0.22	0.25	0.26	0.25	0.22	0.18	0.17	0.19	0.25	0.30	0.34	0.35	0.33	0.26	0.14	0.13
120	0.19	0.20	0.20	0.21	0.22	0.23	0.22	0.19	0.18	0.17	0.20	0.25	0.29	0.32	0.32	0.29	0.25	0.12	0.23
125	0.11	0.14	0.20	0.21	0.21	0.21	0.20	0.18	0.18	0.19	0.21	0.24	0.28	0.30	0.29	0.28	0.25	0.12	0.21
130	0.23	0.15	0.23	0.22	0.22	0.21	0.19	0.18	0.18	0.20	0.22	0.24	0.26	0.29	0.29	0.27	0.27	0.18	0.30
135	0.25	0.20	0.24	0.24	0.23	0.22	0.21	0.19	0.19	0.20	0.22	0.25	0.27	0.29	0.29	0.30	0.28	0.23	0.36
140	0.20	0.19	0.25	0.26	0.25	0.24	0.23	0.22	0.23	0.23	0.24	0.26	0.28	0.29	0.30	0.30	0.27	0.27	0.39
145	0.28	0.26	0.22	0.28	0.28	0.26	0.25	0.25	0.25	0.25	0.26	0.28	0.29	0.31	0.31	0.30	0.23	0.26	0.40
150	0.28	0.28	0.22	0.27	0.28	0.28	0.27	0.27	0.26	0.27	0.28	0.30	0.30	0.31	0.30	0.29	0.22	0.22	0.36
155	0.28	0.28	0.26	0.24	0.29	0.28	0.28	0.28	0.29	0.28	0.30	0.31	0.32	0.31	0.30	0.25	0.24	0.23	0.36
160	0.28	0.28	0.28	0.26	0.25	0.27	0.29	0.29	0.29	0.28	0.32	0.32	0.32	0.31	0.27	0.24	0.26	0.27	0.41
165	0.27	0.29	0.29	0.29	0.28	0.26	0.26	0.28	0.28	0.28	0.31	0.32	0.29	0.28	0.27	0.28	0.28	0.28	0.40
170	0.27	0.27	0.27	0.28	0.28	0.27	0.27	0.28	0.29	0.29	0.29	0.31	0.30	0.30	0.29	0.28	0.27	0.25	0.37
175	0.31	0.31	0.30	0.31	0.31	0.30	0.32	0.32	0.32	0.31	0.33	0.34	0.33	0.33	0.32	0.31	0.31	0.30	0.35
180	0.35	0.36	0.35	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.34	0.35	0.34	0.35	0.35	0.35	0.36	0.36	0.35

Table 4: Luminous Intensity Data

Table--2 UNIT: ×10cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361	1361		
5	1302	1279	1251	1221	1195	1173	1158	1148	1147	1151	1161	1179	1203	1231	1262	1294	1321		
10	1215	1154	1086	1025	974	930	897	877	871	878	899	933	976	1028	1090	1160	1227		
15	1129	1034	938	845	756	682	632	605	597	605	631	678	748	835	927	1020	1115		
20	1028	917	800	674	570	503	464	446	441	446	463	497	557	642	740	851	964		
25	907	798	667	536	450	402	376	363	360	363	374	397	425	488	606	738	852		
30	764	678	554	440	375	340	320	311	309	311	319	330	348	400	501	634	738		
35	626	564	456	370	321	294	278	270	269	271	277	276	298	339	420	531	596		
40	512	465	376	309	273	250	234	226	224	226	232	234	254	288	336	433	498		
45	416	388	311	247	217	198	184	176	174	175	174	185	204	224	280	365	417		
50	324	295	232	181	152	140	130	123	122	123	123	132	140	166	213	274	316		
55	206	187	139	109	93.9	87.5	86.2	88.7	89.3	90.0	84.1	84.6	92.9	104	133	183	208		
60	77.9	85.7	71.5	65.4	62.2	62.9	65.9	64.2	65.1	64.1	65.8	62.2	61.6	67.6	74.6	92.4	97.7		
65	41.7	47.6	47.8	47.6	48.3	50.3	50.1	43.8	44.2	43.4	47.1	48.4	46.5	45.6	46.7	48.3	43.0		
70	29.1	33.7	35.1	32.0	35.2	39.2	37.4	32.2	32.6	31.0	33.3	36.2	33.4	29.6	31.9	31.0	27.3		
75	19.3	22.7	23.1	21.7	23.3	27.6	26.6	25.5	27.5	24.3	23.7	24.7	21.1	19.4	20.3	20.9	18.7		
80	12.4	13.5	13.0	13.0	12.7	14.6	16.2	16.4	22.8	15.3	15.0	13.0	11.6	11.9	11.1	10.9	10.2		
85	3.83	3.55	3.66	3.74	2.57	1.93	1.04	0.54	0.21	0.31	0.55	0.91	2.34	2.28	2.04	2.08	2.10		
90	0.02	0.02	0.19	0.48	0.49	0.37	0.06	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02		
95	0.13	0.97	1.87	2.22	2.25	2.00	1.52	0.90	0.44	0.45	0.64	0.83	0.95	0.97	0.81	0.56	0.07		
100	0.10	0.24	0.62	0.95	1.14	1.14	0.97	0.67	0.44	0.42	0.40	0.48	0.51	0.48	0.33	0.23	0.08		
105	0.12	0.17	0.28	0.47	0.60	0.66	0.61	0.48	0.38	0.37	0.33	0.33	0.34	0.32	0.26	0.20	0.11		
110	0.17	0.16	0.21	0.29	0.37	0.42	0.42	0.38	0.34	0.34	0.34	0.26	0.26	0.25	0.22	0.19	0.15		
115	0.14	0.17	0.20	0.24	0.28	0.31	0.32	0.32	0.32	0.31	0.30	0.28	0.23	0.22	0.21	0.19	0.14		
120	0.21	0.18	0.20	0.24	0.25	0.27	0.28	0.30	0.31	0.32	0.33	0.33	0.25	0.21	0.21	0.22	0.20		
125	0.19	0.23	0.21	0.23	0.25	0.27	0.27	0.29	0.30	0.32	0.35	0.35	0.30	0.24	0.23	0.22	0.18		
130	0.25	0.30	0.27	0.26	0.27	0.27	0.28	0.31	0.32	0.32	0.35	0.35	0.34	0.31	0.29	0.30	0.28		
135	0.29	0.35	0.34	0.31	0.32	0.31	0.31	0.32	0.32	0.32	0.35	0.37	0.39	0.34	0.33	0.34	0.35		
140	0.36	0.39	0.40	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.38	0.38	0.39	0.39	0.38	0.32	0.32		
145	0.37	0.36	0.40	0.43	0.43	0.42	0.41	0.40	0.40	0.40	0.41	0.42	0.44	0.44	0.43	0.36	0.40		
150	0.37	0.39	0.44	0.45	0.48	0.47	0.46	0.45	0.43	0.44	0.45	0.47	0.48	0.47	0.43	0.41	0.43		
155	0.38	0.41	0.41	0.45	0.49	0.49	0.49	0.49	0.48	0.48	0.47	0.48	0.48	0.46	0.42	0.43	0.43		
160	0.39	0.39	0.40	0.41	0.45	0.48	0.49	0.50	0.49	0.48	0.48	0.47	0.44	0.43	0.43	0.44	0.44		
165	0.40	0.41	0.39	0.40	0.42	0.43	0.45	0.45	0.46	0.44	0.44	0.43	0.43	0.43	0.43	0.42	0.41		
170	0.37	0.36	0.37	0.39	0.40	0.41	0.43	0.42	0.42	0.43	0.42	0.41	0.40	0.41	0.41	0.40	0.39		
175	0.35	0.35	0.35	0.36	0.36	0.38	0.38	0.39	0.38	0.38	0.38	0.38	0.37	0.37	0.37	0.37	0.37		
180	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.36	0.35	0.36	0.34	0.34	0.34	0.35	0.35	0.35	0.36		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 17, 2015	Jul. 16, 2016
Digital Power Meter	PF2010A	HZTE028-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-08	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	WY12010	HZTE004-03	Jul. 17, 2015	Jul. 16, 2016
Temperature Meter	TES1310	HZTE017-01	Jul. 17, 2015	Jul. 16, 2016
Standard Source	D908	HZTE012-01	Jul. 23, 2015	Jul. 22, 2016
Standard source	SCL-1400	HZTE012-02	Oct. 21, 2015	Oct. 20, 2016

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

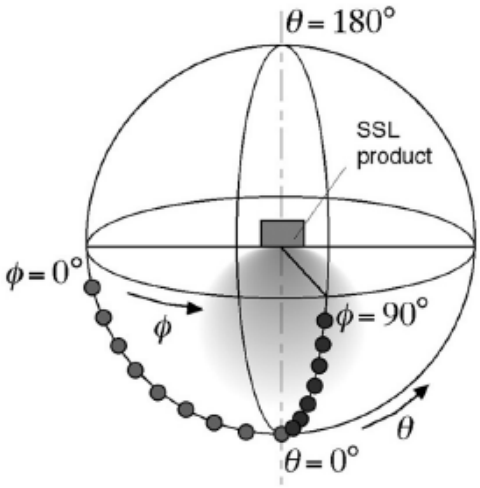
An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.
Ambient temperature was measured 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 expended 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°/180° and C=90°/270°) 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, Δu'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 ***