

# Photometric Test Report

## Relevant Standards

- ☒ IES LM-79-2008
- ☒ ANSI C82.77:2014

## Prepared For

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## Project Number

**DLF1804109**

## Report Number

**DLF20180416001-8a**

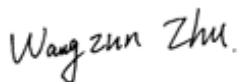
## Test Date

**2018/4/16**

## Issue Date

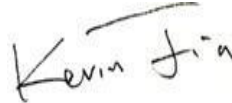
**2018/4/16**

## Prepared By



Wangzun Zhu

## Approved By



Kevin Jia

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## 1.0 Test Summary

DLC Technical Requirements v4.3

Outdoor - Architectural Flood and Spot Luminaires				
Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Lamp Output (lm)	IES LM-79-2008	1000	1714	P
Zonal Lumen Requirement (0°-90°)	IES LM-79-2008	≥85%	100.00%	P
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	110	124.6	P
Allowable CCTs* (K)	IES LM-79-2008	5700	3037	P
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	65	71	P
Power Factor	ANSI C82.77:2014	0.873	0.974	P
Total Harmonic Distortion (A%)	ANSI C82.77:2014	25.00%	14.26%	P

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2018/4/16	HBLED13Y/D10	H1
2	Goniophotometer Test	2018/4/16	HBLED13Y/D10	H1
3	THD and PF Test	2018/4/16	HBLED13Y/D10	H1

### Remark(If any)

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2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.

### 3.0 Production Description

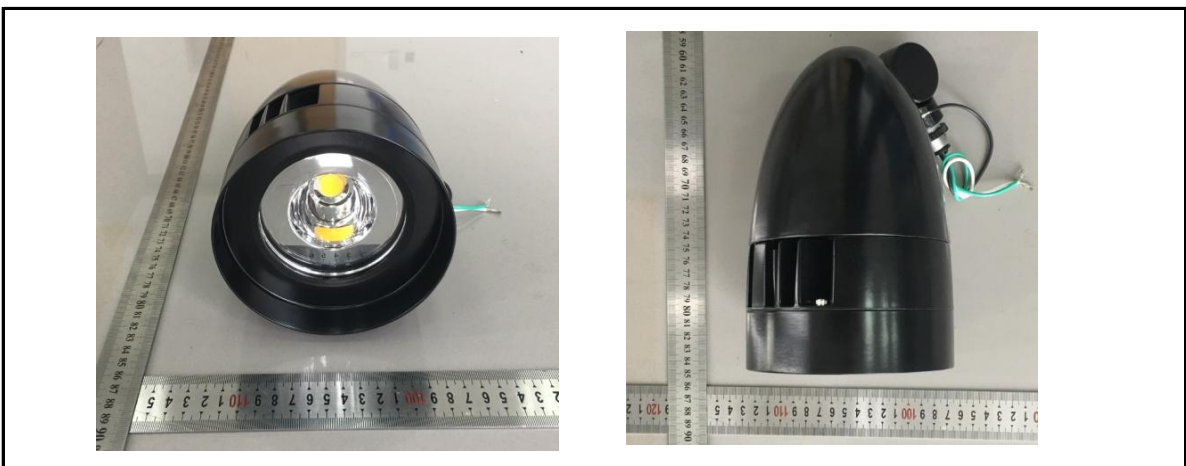
**Luminaire Description:**

**Electrical Specification:** 120V-277V,50/60HZ

**Light source:** LL725F1212-XXC

**Manufacturer Of Light Source:** Lustrous International Technology Company

#### Photos of Luminaire Characteristics



## 4.0 LM-79 Measurement and Test Results

### 4.1 Integrating Sphere Test

Model No.	HBLED13Y/D10	Sample ID.	H1
Operate time (Min.)	90	Stabilization time (Min.)	45

#### Test Method

The samples were tested according to the IES LM-79-2008.

Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ .

The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere.

The voltage of an AC power supply (RMS voltage) or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within  $\pm 0.2$  percent under load.

The sample was measured using  $4\pi$  geometry and operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

#### Test Conditions

Temperature ( $^{\circ}\text{C}$ )	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
25.1	120.03	60	0.118	13.80	0.974

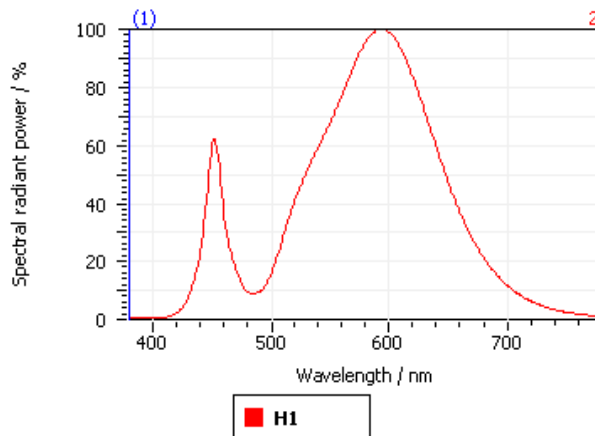
#### Test Result

CCT (K)	CRI (Ra)	Duv
3037	71.0	1.8E-03

## 4.1 Integrating Sphere Test

### Spectroradiometric Parameters

#### Results



#### Spectral values

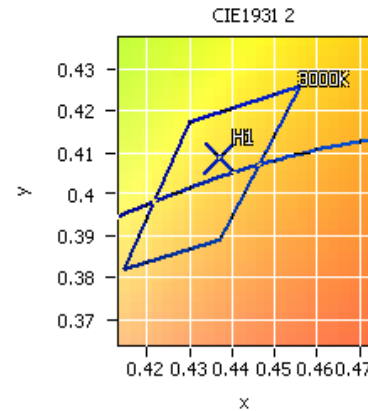
DominantWavelength	582.03 nm
Purity	0.539
PeakWavelength	593.71 nm
Width50%	118.74 nm

#### Color Coordinates

Correlated Color Temperature 3037 K

x: 0.4370 u: 0.2486 u': 0.2486  
y: 0.4087 v: 0.3488 v': 0.5232

ResultsCRICRI01	67.4	ResultsCRICRI09	-31.0
ResultsCRICRI02	80.6	ResultsCRICRI10	54.1
ResultsCRICRI03	91.5	ResultsCRICRI11	59.6
ResultsCRICRI04	66.6	ResultsCRICRI12	40.0
ResultsCRICRI05	65.4	ResultsCRICRI13	69.6
ResultsCRICRI06	71.6	ResultsCRICRI14	95.0
ResultsCRICRI07	79.5	ResultsCRICRI15	60.4
ResultsCRICRI08	45.6	ResultsCRICRI16	59.9
ResultsCRI	71.0		



Nominal CCT: 3000K

PlanckDistance 1.8E-003

## 4.0 LM-79 Measurement and Test Results

### 4.3 Goniophotometer Test

Model No.	HBLED13Y/D10	Sample ID.	H1
Operate time (Min.)	90	Stabilization time (Min.)	45

#### Test Method

The samples were tested according to the IES LM-79-2008.

Photometric parameters were measured using a type C goniophotometer and software.

The ambient temperature shall be maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ , measured at a point not more than 1 m from the sample and at the same height as the sample.

The voltage of an AC power supply (RMS voltage) or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within  $\pm 0.2$  percent under load.

The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at  $0.5^{\circ}$  vertical intervals and  $10^{\circ}$  horizontal intervals.

#### Test Conditions

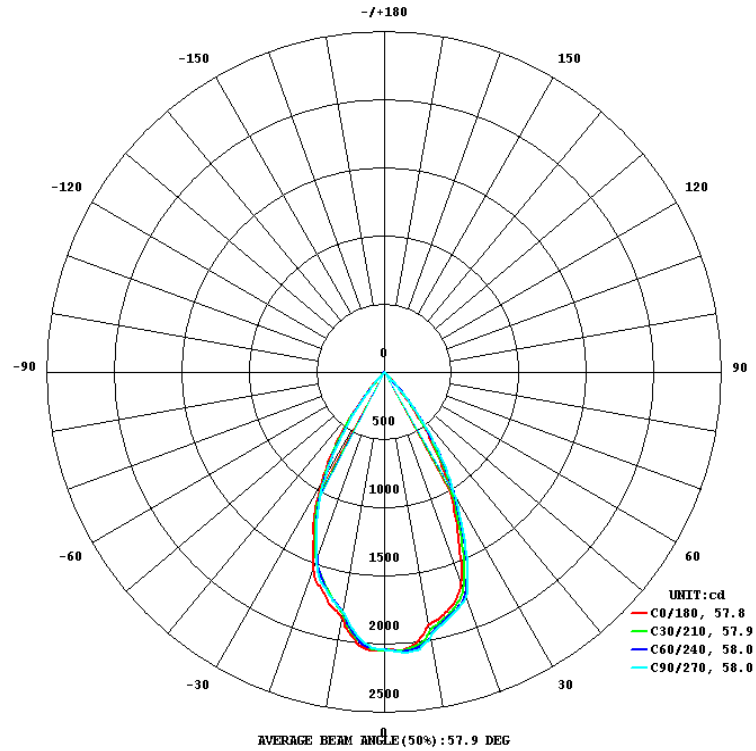
Temperature ( $^{\circ}\text{C}$ )	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.1	120.07	60	0.117	13.76	0.975	Light Down

#### Test Result

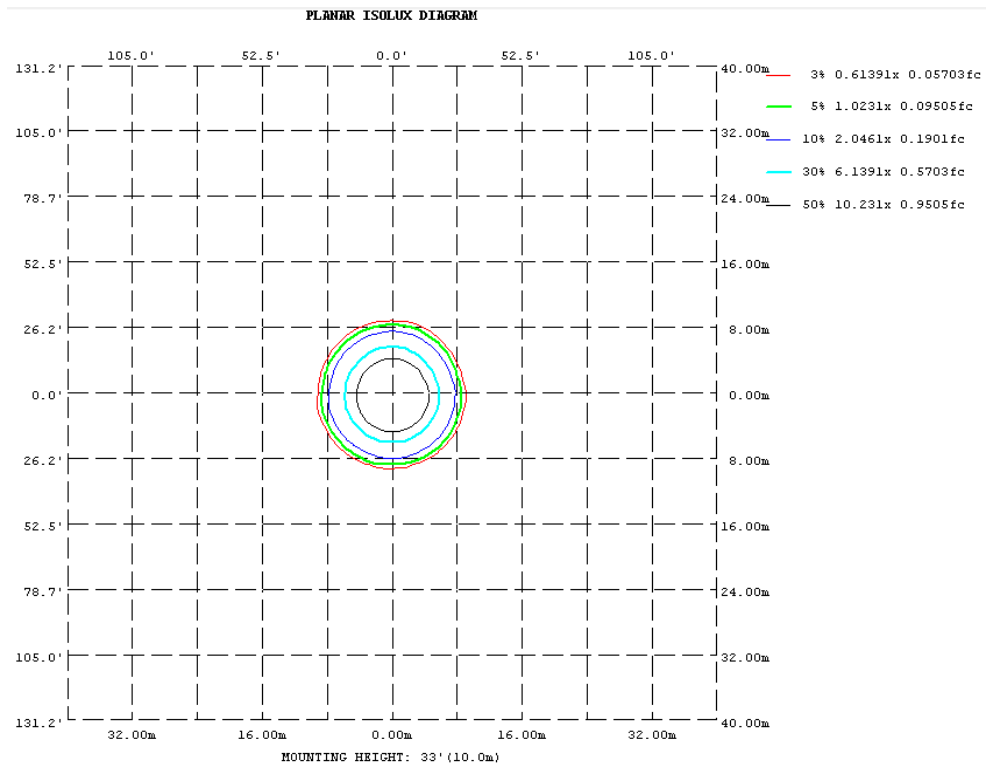
Flux(lm)	Zonal Lumen Requirement ( $0^{\circ}$ - $90^{\circ}$ )	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
1714	100.00%	81.8	82.1	58	57.8	124.6

### 4.3 Goniophotometer Test

#### Light Distrubtion Curve



#### Isolux Plot



### 4.3 Goniophotometer Test

#### Zonal Lumen Summary

°	C0	C45	C90	C135	C180	C225	C270	C315
10	1887	1944	1978	1941	1833	1793	1793	1800
20	1669	1718	1766	1667	1546	1461	1472	1507
30	955.3	1019	1051	1030	946.3	898.3	877.7	858.0
40	257.9	309.0	331.8	326.1	266.9	232.9	215.9	196.1
50	13.39	11.14	9.254	12.45	9.695	10.30	8.697	10.97
60	4.131	2.775	1.930	3.468	3.023	2.959	1.926	3.551
70	0.6746	0.5754	0.2770	0.7185	0.6778	0.6233	0.2378	0.5388
80	0.0121	0.0363	0.0976	0.0261	0.0107	0.0315	0.0869	0.0149
90	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0
DEG	LUMINOUS INTENSITY:cd Less than 35% Percent = 3.6 %							



### 4.3 Goniophotometer Test

#### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0 - 10	187.67	0 - 10	187.67	10.95%
10 - 20	490.23	0 - 20	677.90	39.55%
20 - 30	584.07	0 - 30	1261.97	73.63%
30 - 40	372.35	0 - 40	1634.32	95.35%
40 - 50	71.74	0 - 50	1706.06	99.54%
50 - 60	5.96	0 - 60	1712.01	99.88%
60 - 70	1.73	0 - 70	1713.74	99.98%
70 - 80	0.25	0 - 80	1713.99	100.00%
80 - 90	0.02	0 - 90	1714.01	100.00%
90 - 100	0.00	0 - 100	1714.01	100.00%
100 - 110	0.00	0 - 110	1714.01	100.00%
110 - 120	0.00	0 - 120	1714.01	100.00%
120 - 130	0.00	0 - 130	1714.01	100.00%
130 - 140	0.00	0 - 140	1714.01	100.00%
140 - 150	0.00	0 - 150	1714.01	100.00%
150 - 160	0.00	0 - 160	1714.01	100.00%
160 - 170	0.00	0 - 170	1714.01	100.00%
170 - 180	0.00	0 - 180	1714.01	100.00%

### 4.3 Goniophotometer Test

#### Axial Candela

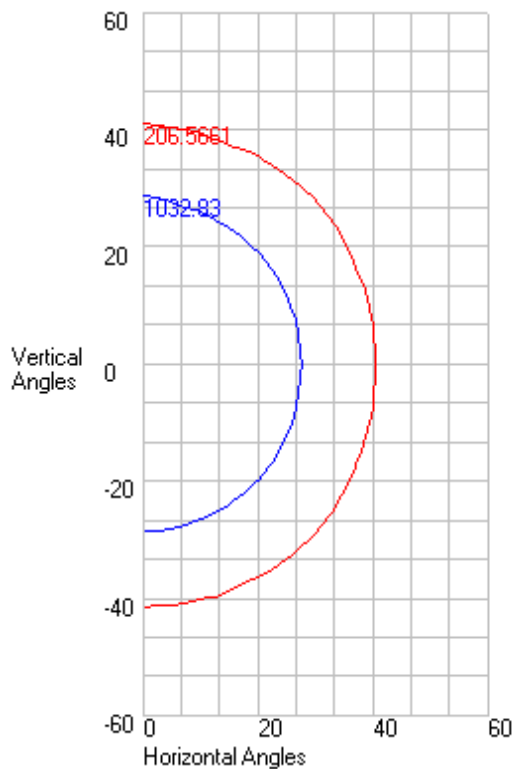
DEG.	HOR.	DEG.	VERT.
90	0	90	0
85	0.07	85	0
75	0.12	75	0.06
65	0.84	65	2.28
55	4.31	55	7.24
47.5	14.93	47.5	22.76
42.5	100.29	42.5	127.72
37.5	358.16	37.5	423.24
33	665.67	33	744.4
29	946.1	29	1023.06
25.5	1161.12	25.5	1260.01
22.5	1308.4	22.5	1494.95
19.5	1501.02	19.5	1692.17
17	1614.55	17	1773.08
15	1663.05	15	1813.55
13	1719.37	13	1847.41
11	1767.28	11	1869.91
9	1825.57	9	1931.38
7	1911.23	7	1993.34
5	1976.53	5	2032.55
3	2020.71	3	2046.11
1	2036.8	1	2039.88
0	2041.671	0	2041.671
-1	2045.55	-1	2045.93
-3	2055.2	-3	2044.69
-5	2064.48	-5	2019.52
-7	2052.55	-7	1960.92
-9	2005.88	-9	1890.04
-11	1940.54	-11	1805.3
-13	1901.5	-13	1762.42
-15	1867.19	-15	1701.16
-17	1827.46	-17	1645.4
-19.5	1778.56	-19.5	1571.47
-22.5	1631.48	-22.5	1378.57
-25.5	1401.37	-25.5	1220.17
-29	1121.21	-29	1013.84
-33	845.91	-33	741.33
-37.5	515.86	-37.5	426.01
-42.5	136.31	-42.5	145.74
-47.5	18.52	-47.5	22.45
-55	4.3	-55	5.22
-65	0.84	-65	1.93
-75	0.14	-75	0.09
-85	0.06	-85	0
-90	0	-90	0

### 4.3 Goniophotometer Test

#### Characteristics

NEMA Type	5 H x 5 V
Maximum Candela	2065.661
Maximum Candela Angle	-5 H -1 V
Horizontal Beam Angle (50%)	57.9
Vertical Beam Angle (50%)	57.6
Horizontal Field Angle (10%)	82.1
Vertical Field Angle (10%)	82.6
Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Beam Lumens	1204
Beam Efficiency	N.A.
Field Lumens	1659
Field Efficiency	N.A.
Spill Lumens	55
Luminaire Lumens	1714
Total Efficiency	N.A.
Total Luminaire Watts	13.7596
Ballast Factor	1

#### ISOCANDELA CURVES



# Axial Candela

	0	1	3	5	7	9	11	13	15	17	19.5	22.5	25.5	29	33	37.5	42.5	47.5	55	65	75	85	90
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0.007	0.017	0.006	0	0
75	0.06	0.058	0.054	0.05	0.043	0.039	0.035	0.031	0.03	0.027	0.025	0.024	0.02	0.02	0.02	0.019	0.019	0.014	0.017	0.028	0.031	0.01	0
65	2.28	2.258	2.214	2.123	2.032	1.922	1.793	1.645	1.518	1.403	1.254	1.083	0.937	0.794	0.667	0.445	0.159	0.082	0.039	0.037	0.043	0.051	0
55	7.24	7.184	7.072	6.833	6.596	6.314	6.051	5.819	5.624	5.422	5.16	4.82	4.442	3.887	3.255	2.541	1.594	0.836	0.158	0.058	0.047	0.052	0
47.5	22.76	22.33	21.47	19.673	18.051	16.527	15.292	14.474	13.564	12.531	11.076	9.86	8.524	7.27	5.691	4.531	3.165	1.92	0.671	0.084	0.06	0.053	0
42.5	127.72	123.724	115.744	99.223	84.72	71.468	60.529	53.016	43.395	32.804	25.337	19.609	15.035	11.615	8.836	6.416	4.361	2.777	1.034	0.118	0.073	0.053	0
37.5	423.24	415.327	392.545	364.799	335.261	295.769	265.759	233.634	200.671	167.254	125.552	77.199	47.467	23.722	14.325	9.421	5.943	3.767	1.483	0.181	0.075	0.054	0
33	744.4 *	734.379	705.551	670.374	628.084	589.683	550.659	500.279	449.917	397.239	326.792	238.745	159.573	81.608	29.979	13.823	8.064	4.502	1.892	0.217	0.083	0.055	0
29	1023.06	1012.48	981.788	944.161	898.89	857.949	812.065	763.996	699.479	633.545	546.263	442.429	321.428	198.404	85.049	22.894	9.611	5.885	2.246	0.257	0.09	0.055	0
25.5	1260.01	1247.16	1209.92	1166.28	1122.33	1080.93	1030.54	972.766	909.025	838.476	741.974	611.844	481.605	326.257	167.674	52.633	13.299	6.87	2.57	0.312	0.093	0.056	0
22.5	1494.95	1475.96	1423.22	1365.29	1313.27	1262.78	1203.92	1140.13	1076.05	1001.50	896.889	762.678	616.629	449.537	247.856	87.679	17.988	8.029	2.83	0.407	0.098	0.058	0
19.5	1692.17	1674.41	1627.17	1568.29	1517.91	1450.17	1376.76	1308.11	1228.70	1146.01	1042.50	900.235	746.568	554.694	338.51	141.72	22.383	8.594	3.127	0.595	0.103	0.06	0
17	1773.08	1759.11	1723.43	1682.38	1641.70	1588.97	1521.01	1431.95	1343.87	1259.45	1144.61	1004.45	845.184	643.361	407.197	180.654	34.743	9.16	3.336	0.662	0.105	0.062	0
15	1813.55	1801.67	1772.14	1737.66	1698.77	1656.20	1606.02	1528.23	1436.60	1335.06	1220.42	1075.00	914.998	708.322	459.971	212.312	50.263	9.751	3.482	0.709	0.107	0.063	0
13	1847.41	1831.45	1795.62	1763.72	1728.46	1693.95	1653.83	1599.28	1515.35	1406.98	1286.69	1133.32	977.537	770.545	508.281	245.89	63.472	10.605	3.625	0.745	0.109	0.065	0
11	1869.91	1857.47	1824.62	1789.88	1752.94	1719.34	1680.67	1641.02	1575.63	1480.35	1335.14	1188.25	1031.04	819.094	557.704	276.546	72.389	11.691	3.734	0.775	0.111	0.067	0
9	1931.38	1906.62	1856.22	1821.47	1780.73	1744.73	1710.49	1668.64	1614.08	1533.07	1386.03	1232.49	1072.50	862.318	593.843	302.988	81.157	12.804	3.837	0.799	0.113	0.068	0
7	1993.34	1970.00	1923.01	1867.32	1802.54	1767.81	1736.16	1692.39	1638.73	1568.42	1434.04	1268.04	1103.53	895.32	618.335	327.845	88.268	13.702	4.017	0.817	0.115	0.068	0
5	2032.55	2015.40	1976.19	1923.72	1850.98	1782.64	1751.35	1706.73	1648.78	1591.26	1470.38	1293.74	1128.83	919.877	641.812	341.028	93.939	14.372	4.158	0.83	0.116	0.069	0
3	2046.11	2038.05	2006.47	1956.83	1888.88	1802.82	1756.28	1716.72	1657.63	1606.62	1491.45	1303.69	1148.47	936.569	657.432	351.948	100.002	15.108	4.314	0.844	0.118	0.069	0
1	2039.88	2039.62	2016.94	1975.94	1909.28	1823.26	1766.03	1721.57	1664.08	1614.47	1502.02	1309.38	1160.36	946.16	665.851	358.106	100.194	14.989	4.311	0.841	0.119	0.07	0
0	2041.67	2036.8	2020.71	1976.53	1911.23	1825.57	1767.28	1719.37	1663.05	1614.55	1501.02	1308.4	1161.12	946.1 *	665.67	358.16	100.29	14.93	4.31	0.84	0.12	0.07	0
-1	2045.93	2038.72	2023.85	1987.41	1913.66	1824.66	1766.49	1720.92	1663.03	1613.30	1500.76	1307.92	1161.43	946.39	666.157	358.347	100.961	15.009	4.335	0.843	0.12	0.07	0
-3	2044.69	2034.59	2016.7	1973.42	1897.69	1806.83	1755.97	1714.73	1654.01	1604.05	1487.32	1298.93	1151.66	937.127	658.589	352.705	102.299	15.168	4.386	0.85	0.119	0.069	0
-5	2019.52	2013.98	1980.99	1934.06	1872.21	1781.17	1738.22	1695.84	1637.76	1586.78	1462.73	1284.80	1134.06	920.424	644.433	342.391	96.926	14.466	4.263	0.841	0.118	0.069	0
-7	1960.92	1955.98	1921.60	1879.38	1797.59	1752.98	1712.89	1667.34	1614.30	1552.48	1421.21	1260.96	1109.62	895.814	622.724	329.921	91.328	13.825	4.145	0.833	0.118	0.069	0
-9	1890.04	1883.22	1838.69	1793.17	1758.11	1721.03	1680.32	1630.17	1580.44	1506.25	1372.86	1231.98	1077.81	863.849	599.405	306.318	83.937	12.949	3.971	0.82	0.117	0.068	0
-11	1805.3	1798.97	1773.57	1746.52	1711.11	1676.49	1630.33	1580.90	1530.99	1450.55	1326.24	1196.06	1038.88	825.631	564.605	280.782	74.74	11.846	3.866	0.802	0.116	0.068	0
-13	1762.42	1752.27	1724.28	1696.04	1658.00	1620.93	1575.28	1527.20	1472.46	1385.24	1279.88	1147.97	990.703	782.066	516.694	251.762	66.102	10.789	3.739	0.779	0.115	0.065	0
-15	1701.16	1694.17	1671.43	1643.87	1608.09	1566.33	1526.25	1475.52	1406.25	1319.72	1226.13	1088.83	933.409	722.314	469.976	222.073	54.522	9.955	3.622	0.75	0.115	0.064	0
-17	1645.4	1639.74	1622.22	1595.40	1556.77	1513.23	1466.10	1398.07	1324.24	1255.82	1166.74	1026.92	866.755	660.227	419.694	191.083	40.75	9.344	3.501	0.71	0.113	0.063	0
-19.5	1571.47	1563.16	1536.03	1501.57	1461.50	1409.44	1349.62	1292.67	1236.80	1173.64	1069.12	932.19	774.399	573.19	352.587	157.393	26.566	8.621	3.33	0.654	0.111	0.062	0
-22.5	1378.57	1374.55	1354.88	1329.67	1299.23	1265.19	1225.62	1175.66	1109.08	1039.05	937.736	799.664	648.257	471.219	270.212	104.449	18.925	8.132	3.09	0.535	0.106	0.06	0
-25.5	1220.17	1218.45	1206.93	1189.79	1159.34	1119.89	1073.76	1018.27	954.868	885.948	786.155	653.941	515.665	354.108	190.615	68.328	14.488	7.162	2.839	0.418	0.101	0.057	0
-29	1013.84	1011.84	998.515	978.416	950.444	913.384	868.024	817.496	753.469	685.052	592.214	486.022	360.197	231.456	110.689	30.084	10.176	6.211	2.51	0.298	0.1	0.057	0
-33	741.33	739.966	728.401	709.981	683.885	654.335	612.176	559.159	508.298	454.054	378.294	282.825	195.92	113.249	47.07	15.314	8.253	4.667	2.127	0.251	0.094	0.056	0
-37.5	426.01	424.67	415.361	401.12	384.839	355.79	323.727	288.07	249.478	210.631	172.183	114.287	76.431	35.623	15.608	8.82	6.003	3.63	1.747	0.216	0.088	0.056	0
-42.5	145.74	145.373	144.64	133.985	124.107	111.705	98.271	88.027	75.715	59.056	41.083	23.751	17.211	10.768	8.045	5.997	3.856	2.833	1.264	0.162	0.079	0.055	0
-47.5	22.45	22.456	22.469	21.362	20.354	19.06	17.511	15.55	13.347	10.984	9.294	8.189	7.361	6.254	5.072	3.715	2.884	2.124	0.777	0.119	0.069	0.054	0
-55	5.22	5.223	5.23	5.193	5.155	5.1	4.84	4.53	4.282	4.076	3.83	3.576	3.349	3.047	2.694	2.308	1.735	0.943	0.222	0.082	0.055	0.052	0
-65	1.93	1.926	1.917	1.891	1.865	1.833	1.795	1.743	1.687	1.617	1.519	1.322	1.134	0.906	0.746	0.587	0.221	0.139	0.068	0.055	0.043	0.051	0
-75	0.09	0.09	0.09	0.09	0.084	0.08	0.074	0.067	0.06	0.054	0.047	0.045	0.048	0.042	0.04	0.036	0.039	0.033	0.027	0.028	0.041	0.012	0
-85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0.005	0.008	0.01	0.012	0.017	0.012	0	0
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

## LUMEN TABULATION

	0	1	3	5	7	9	11	13	15	17	20	23	26	29	33	38	43	48	55	65	75	85	90	Total
90		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
85		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
75		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
65		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
55		0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	
47.5		0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0	
42.5		0.42 *	0.82 *	0.78 *	0.73 *	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0	0	0	0	0	0	0	
37.5		0.80 *	1.57 *	1.52 *	1.45 *	1.37 *	1.28 *	1.17 *	1.06 *	0.93 *	0.99 *	0.9	0.6	0.4	0.2	0.1	0.1	0	0	0	0	0	0	
33		1.07 *	2.12 *	2.07 *	2.00 *	1.91 *	1.82 *	1.71 *	1.58 *	1.43 *	1.57 *	1.55 *	1.17 *	0.9	0.5	0.2	0.1	0	0	0	0	0	0	
29		1.21 *	2.40 *	2.35 *	2.28 *	2.20 *	2.11 *	2.00 *	1.87 *	1.73 *	1.94 *	1.98 *	1.57 *	1.32 *	0.9	0.4	0.1	0	0	0	0	0	0	
25.5		1.26 *	2.48 *	2.43 *	2.35 *	2.27 *	2.18 *	2.07 *	1.95 *	1.81 *	2.06 *	2.14 *	1.75 *	1.55 *	1.13 *	0.6	0.2	0	0	0	0	0	0	
22.5		1.45 *	2.88 *	2.82 *	2.74 *	2.65 *	2.54 *	2.41 *	2.27 *	2.11 *	2.40 *	2.52 *	2.11 *	1.92 *	1.48 *	0.9	0.3	0.1	0	0	0	0	0	
19.5		1.32 *	2.62 *	2.58 *	2.52 *	2.45 *	2.36 *	2.25 *	2.12 *	1.98 *	2.26 *	2.38 *	2.00 *	1.85 *	1.48 *	0.91 *	0.4	0.1	0	0	0	0	0	
17		1.09 *	2.17 *	2.15 *	2.11 *	2.07 *	2.00 *	1.93 *	1.83 *	1.72 *	1.96 *	2.07 *	1.75 *	1.64 *	1.33 *	0.85 *	0.4	0.1	0	0	0	0	0	
15		1.11 *	2.22 *	2.19 *	2.16 *	2.12 *	2.07 *	2.00 *	1.92 *	1.81 *	2.09 *	2.21 *	1.87 *	1.76 *	1.45 *	0.96 *	0.4	0.1	0	0	0	0	0	
13		1.13 *	2.25 *	2.23 *	2.20 *	2.16 *	2.11 *	2.05 *	1.98 *	1.89 *	2.19 *	2.33 *	1.98 *	1.87 *	1.56 *	1.05 *	0.5	0.1	0	0	0	0	0	
11		1.16 *	2.30 *	2.27 *	2.23 *	2.19 *	2.14 *	2.09 *	2.03 *	1.95 *	2.27 *	2.43 *	2.08 *	1.97 *	1.66 *	1.14 *	0.5	0.1	0	0	0	0	0	
9		1.19 *	2.37 *	2.33 *	2.28 *	2.22 *	2.17 *	2.12 *	2.06 *	1.99 *	2.34 *	2.52 *	2.16 *	2.04 *	1.73 *	1.21 *	0.6	0.1	0	0	0	0	0	
7		1.22 *	2.43 *	2.39 *	2.34 *	2.27 *	2.21 *	2.15 *	2.09 *	2.02 *	2.39 *	2.59 *	2.22 *	2.11 *	1.79 *	1.26 *	0.60 *	0.1	0	0	0	0	0	
5		1.24 *	2.47 *	2.43 *	2.38 *	2.31 *	2.23 *	2.17 *	2.10 *	2.03 *	2.42 *	2.63 *	2.26 *	2.15 *	1.83 *	1.30 *	0.63 *	0.1	0	0	0	0	0	
3		1.24 *	2.48 *	2.46 *	2.41 *	2.34 *	2.25 *	2.18 *	2.11 *	2.04 *	2.43 *	2.65 *	2.29 *	2.18 *	1.86 *	1.33 *	0.64 *	0.2	0	0	0	0	0	
1		0.62 *	1.24 *	1.23 *	1.21 *	1.18 *	1.13 *	1.09 *	1.06 *	1.02 *	1.22 *	1.33 *	1.15 *	1.10 *	0.93 *	0.67 *	0.32 *	0.1	0	0	0	0	0	
0																								

-1	0.62 *	1.24 *	1.23 *	1.21 *	1.18 *	1.13 *	1.09 *	1.06 *	1.02 *	1.21 *	1.33 *	1.15 *	1.10 *	0.93 *	0.67 *	0.32 *	0.1	0	0	0	0	0	
-3	1.25 *	2.49 *	2.47 *	2.42 *	2.34 *	2.25 *	2.17 *	2.10 *	2.03 *	2.42 *	2.64 *	2.28 *	2.18 *	1.86 *	1.33 *	0.65 *	0.2	0	0	0	0	0	
-5	1.24 *	2.47 *	2.44 *	2.39 *	2.31 *	2.22 *	2.15 *	2.09 *	2.01 *	2.39 *	2.61 *	2.25 *	2.15 *	1.83 *	1.30 *	0.63 *	0.2	0	0	0	0	0	
-7	1.21 *	2.42 *	2.39 *	2.34 *	2.26 *	2.18 *	2.12 *	2.05 *	1.99 *	2.35 *	2.56 *	2.21 *	2.11 *	1.79 *	1.27 *	0.61 *	0.1	0	0	0	0	0	
-9	1.18 *	2.35 *	2.32 *	2.26 *	2.20 *	2.14 *	2.08 *	2.02 *	1.94 *	2.29 *	2.49 *	2.14 *	2.04 *	1.74 *	1.22 *	0.6	0.1	0	0	0	0	0	
-11	1.13 *	2.26 *	2.23 *	2.19 *	2.14 *	2.09 *	2.04 *	1.97 *	1.89 *	2.22 *	2.40 *	2.07 *	1.96 *	1.67 *	1.15 *	0.5	0.1	0	0	0	0	0	
-13	1.09 *	2.18 *	2.16 *	2.13 *	2.09 *	2.04 *	1.98 *	1.92 *	1.84 *	2.15 *	2.31 *	1.98 *	1.88 *	1.57 *	1.07 *	0.5	0.1	0	0	0	0	0	
-15	1.06 *	2.11 *	2.10 *	2.07 *	2.03 *	1.98 *	1.93 *	1.86 *	1.77 *	2.05 *	2.19 *	1.88 *	1.77 *	1.47 *	0.97 *	0.4	0.1	0	0	0	0	0	
-17	1.02 *	2.04 *	2.03 *	2.01 *	1.97 *	1.92 *	1.86 *	1.78 *	1.68 *	1.94 *	2.07 *	1.76 *	1.66 *	1.35 *	0.87 *	0.4	0.1	0	0	0	0	0	
-20	1.23 *	2.45 *	2.44 *	2.41 *	2.35 *	2.28 *	2.19 *	2.08 *	1.96 *	2.25 *	2.39 *	2.03 *	1.88 *	1.50 *	0.94 *	0.4	0.1	0	0	0	0	0	
-23	1.35 *	2.70 *	2.69 *	2.65 *	2.58 *	2.49 *	2.38 *	2.26 *	2.12 *	2.43 *	2.56 *	2.15 *	1.96 *	1.52 *	0.91 *	0.3	0.1	0	0	0	0	0	
-26	1.19 *	2.38 *	2.37 *	2.34 *	2.28 *	2.20 *	2.10 *	1.98 *	1.85 *	2.11 *	2.20 *	1.80 *	1.60 *	1.19 *	0.7	0.2	0.1	0	0	0	0	0	
-29	1.19 *	2.39 *	2.37 *	2.34 *	2.27 *	2.18 *	2.07 *	1.94 *	1.79 *	2.01 *	2.06 *	1.65 *	1.40 *	0.97 *	0.5	0.2	0	0	0	0	0	0	
-33	1.07 *	2.14 *	2.12 *	2.08 *	2.02 *	1.93 *	1.81 *	1.68 *	1.52 *	1.68 *	1.66 *	1.27 *	1.01 *	0.6	0.3	0.1	0	0	0	0	0	0	
-38	0.80 *	1.61 *	1.59 *	1.56 *	1.51 *	1.42 *	1.31 *	1.18 *	1.05 *	1.12 *	1.05 *	0.7	0.5	0.3	0.1	0.1	0	0	0	0	0	0	
-43	0.44 *	0.88 *	0.87 *	0.84 *	0.81 *	0.75 *	0.7	0.6	0.5	0.5	0.5	0.3	0.2	0.1	0.1	0	0	0	0	0	0	0	
-48	0.1	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	
-55	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	35	70	69	67	65	63	60	57	54	62	66	55	51	41	26	12	2.7	0.8	0.3	0	0	0	857.1

## 5.0 THD and PF Test

Model No.	HBLED13Y/D10	Sample ID.	H1
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### Test Method

The samples were tested according to the ANSI C82.77:2002.

The total harmonic distortion shall be measured to the 40th order.

The ambient temperature condition was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . The sample measurements were made using a digital power meter and power supply. The sample was operated at rated voltage and was stabilized before measurement. The total harmonic distortion were calculated.

### Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD
25.1	120.03	60	0.118	13.80	0.974	14.26%

## 6.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last	Calibration Due
DLF107	Integrating Sphere System	2017/12/28	2018/12/27
DLF108	Auxiliary Lamp	2017/12/28	2018/12/27
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional	2017/12/28	2018/12/27
DLF116	AC Power Source	2017/12/28	2018/12/27
DLF113	Power Meter	2017/12/28	2018/12/27
DLF112	Temperature Recorder	2017/12/28	2018/12/27
DLF114	Temperature & Humidity Datalogger	2017/12/28	2018/12/27
DLF101	Goniophotometer	2017/12/28	2018/12/27
DLF125	Standard Lamp Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional	2017/12/28	2018/12/27
DLF104	AC Power Source	2017/12/28	2018/12/27
DLF507	DC Power Source	2017/12/28	2018/12/27
DLF102	Power Meter	2017/12/28	2018/12/27
DLF111	Temperature & Humidity Datalogger	2017/12/28	2018/12/27
DLF119	Power Meter	2017/12/28	2018/12/27
DLF031	Temperature data logger	2017/12/28	2018/12/27
DLF022	Digital power meter	2017/12/28	2018/12/27
DLF003	Temperature & Humidity Datalogger	2017/12/28	2018/12/27

\*\*\*\*\* End of Test Report\*\*\*\*\*