

# Photometric Test Report

## Relevant Standards

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

## Prepared For

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## Project Number

**DLF1804109**

## Report Number

**DLF20180416001-10a**

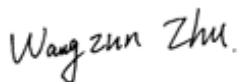
## Test Date

**2018/4/16**

## Issue Date

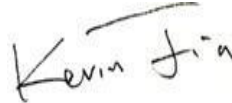
**2018/4/16**

## 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	2465	P
Zonal Lumen Requirement (0°-90°)	IES LM-79-2008	≥85%	100.00%	P
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	110	117.9	P
Allowable CCTs* (K)	IES LM-79-2008	5700	3044	P
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	70	70.7	P
Power Factor	ANSI C82.77:2014	0.873	0.912	P
Total Harmonic Distortion (A%)	ANSI C82.77:2014	25.00%	12.42%	P

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2018/4/16	HBLED18Y/D10	J1
2	Goniophotometer Test	2018/4/16	HBLED18Y/D10	J1
3	THD and PF Test	2018/4/16	HBLED18Y/D10	J1

### 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

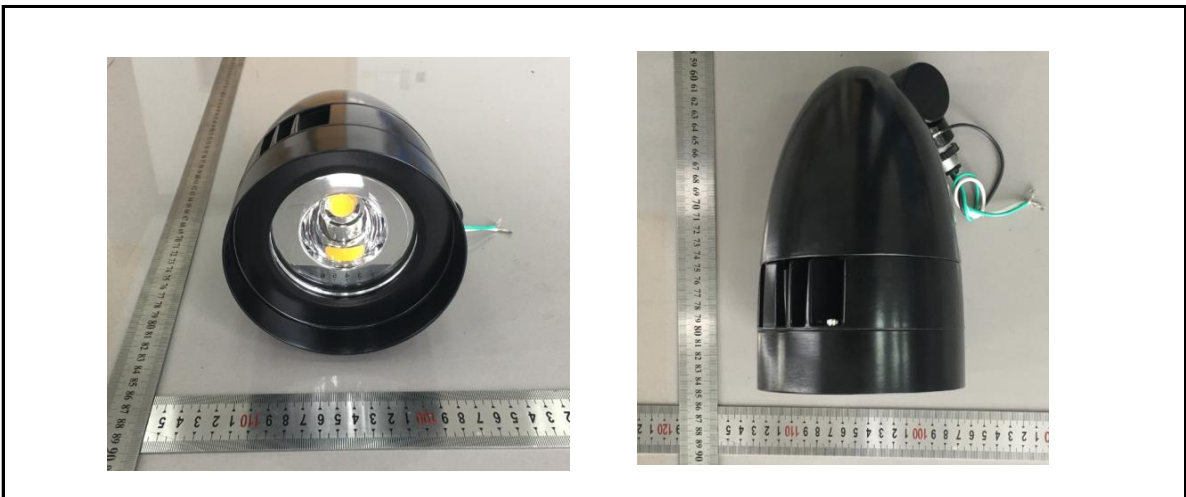
**Luminaire Description:**

**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.	HBLED18Y/D10	Sample ID.	J1
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	277.03	60	0.083	21.00	0.912

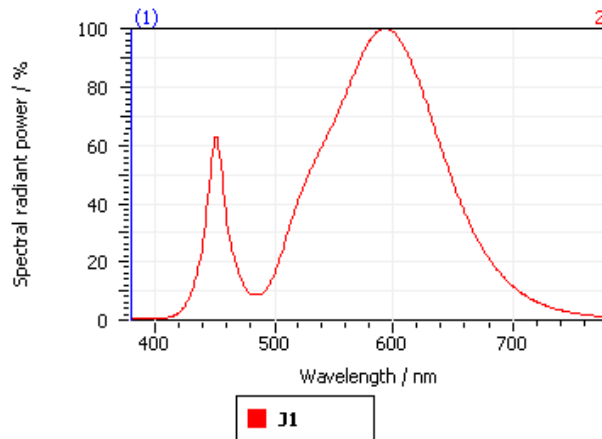
#### Test Result

CCT (K)	CRI (Ra)	Duv
3044	70.7	1.5E-03

## 4.1 Integrating Sphere Test

### Spectroradiometric Parameters

#### Results



#### Spectral values

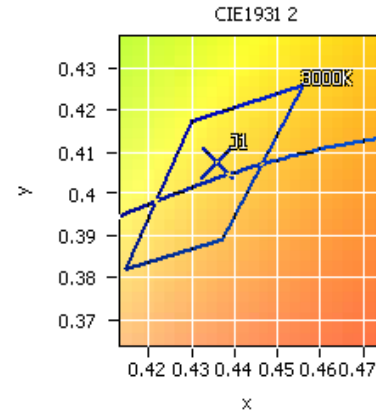
DominantWavelength	582.13 nm
Purity	0.531
PeakWavelength	593.57 nm
Width50%:	118.60 nm

#### Color Coordinates

Correlated Color Temperature 3044 K

x: 0.4359 u: 0.2485 u': 0.2485  
y: 0.4074 v: 0.3483 v': 0.5225

ResultsCRICRI01	67.1	ResultsCRICRI09	-32.0
ResultsCRICRI02	80.3	ResultsCRICRI10	53.5
ResultsCRICRI03	91.3	ResultsCRICRI11	59.3
ResultsCRICRI04	66.3	ResultsCRICRI12	40.2
ResultsCRICRI05	65.1	ResultsCRICRI13	69.3
ResultsCRICRI06	71.2	ResultsCRICRI14	94.8
ResultsCRICRI07	79.2	ResultsCRICRI15	60.1
ResultsCRICRI08	45.2	ResultsCRICRI16	59.7
ResultsCRI	70.7		



Nominal CCT: 3000K

PlanckDistance 1.5E-003

## 4.0 LM-79 Measurement and Test Results

### 4.3 Goniophotometer Test

Model No.	HBLED18Y/D10	Sample ID.	J1
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

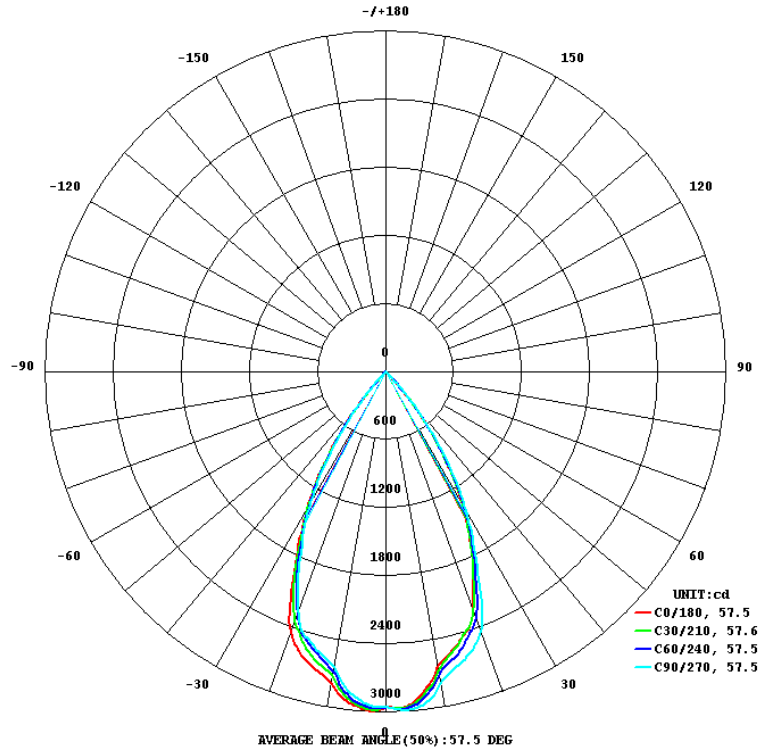
Temperature ( $^{\circ}\text{C}$ )	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.1	277.03	60	0.083	20.90	0.913	Light Down

#### Test Result

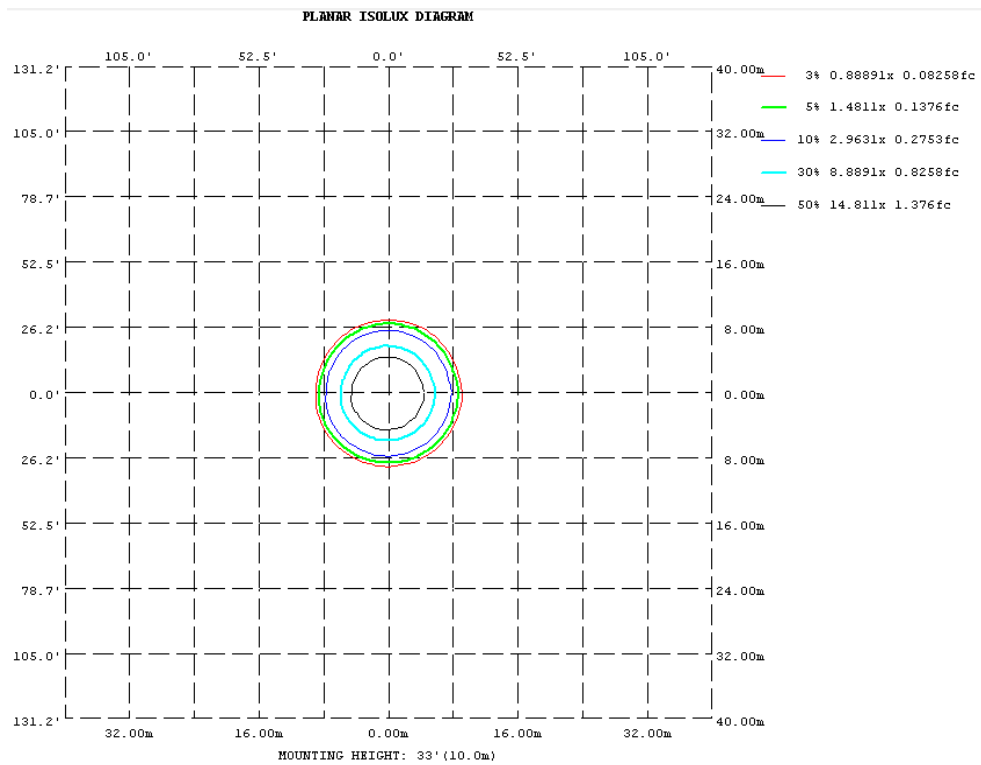
Flux(lm)	Zonal Lumen Requirement ( $0^{\circ}$ - $90^{\circ}$ )	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
2465	100.00%	81.6	81.8	57.5	57.5	117.9

### 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	2646	2686	2783	2834	2787	2701	2649	2589
20	2258	2277	2455	2509	2456	2295	2256	2181
30	1364	1391	1424	1484	1394	1369	1328	1285
40	385.8	385.1	391.0	432.0	358.5	352.2	340.6	325.9
50	8.777	8.502	7.579	9.360	7.487	7.082	6.834	8.593
60	1.109	1.130	1.050	1.005	0.9653	1.019	1.074	1.029
70	0.6386	0.6043	0.2245	0.6200	0.5796	0.5681	0.2931	0.5864
80	0.0227	0.0260	0.0659	0.0277	0.0158	0.0275	0.1175	0.0297
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 = 3.5 %							



### 4.3 Goniophotometer Test

#### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0 - 10	272.30	0 - 10	272.30	11.05%
10 - 20	713.08	0 - 20	985.38	39.97%
20 - 30	847.04	0 - 30	1832.42	74.34%
30 - 40	533.39	0 - 40	2365.81	95.97%
40 - 50	94.54	0 - 50	2460.35	99.81%
50 - 60	3.64	0 - 60	2463.99	99.96%
60 - 70	0.85	0 - 70	2464.84	99.99%
70 - 80	0.19	0 - 80	2465.03	100.00%
80 - 90	0.03	0 - 90	2465.06	100.00%
90 - 100	0.00	0 - 100	2465.06	100.00%
100 - 110	0.00	0 - 110	2465.06	100.00%
110 - 120	0.00	0 - 120	2465.06	100.00%
120 - 130	0.00	0 - 130	2465.06	100.00%
130 - 140	0.00	0 - 140	2465.06	100.00%
140 - 150	0.00	0 - 150	2465.06	100.00%
150 - 160	0.00	0 - 160	2465.06	100.00%
160 - 170	0.00	0 - 170	2465.06	100.00%
170 - 180	0.00	0 - 180	2465.06	100.00%

### 4.3 Goniophotometer Test

#### Axial Candela

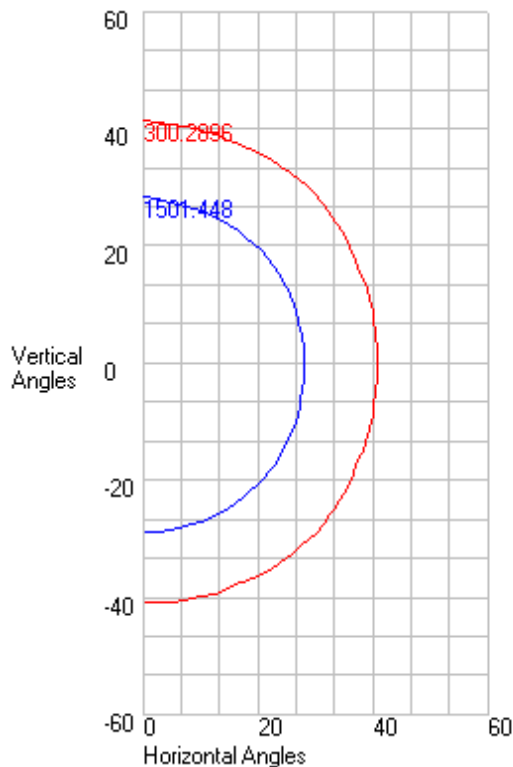
DEG.	HOR.	DEG.	VERT.
90	0	90	0
85	0.09	85	0.01
75	0.16	75	0.11
65	0.81	65	1.06
55	2.22	55	2.66
47.5	15.85	47.5	20.06
42.5	164.57	42.5	199.81
37.5	554.42	37.5	616.48
33	1022.08	33	1067.01
29	1423.51	29	1460.51
25.5	1737.07	25.5	1778.35
22.5	2012.39	22.5	2023.81
19.5	2296.97	19.5	2293.45
17	2437.57	17	2406.3
15	2493.84	15	2474.37
13	2549.85	13	2540.08
11	2612.12	11	2604.36
9	2698.91	9	2728.11
7	2821.44	7	2826.75
5	2887.72	5	2915.39
3	2942.66	3	2962.49
1	2959.6	1	2959.6
0	2959.218	0	2959.218
-1	2962.71	-1	2974.26
-3	2985.4	-3	2991.82
-5	2975.09	-5	2960.9
-7	2935.44	-7	2918.71
-9	2861.19	-9	2844.05
-11	2740.45	-11	2751.83
-13	2683.96	-13	2706.82
-15	2637.49	-15	2659.94
-17	2577.55	-17	2598.71
-19.5	2480.12	-19.5	2482.93
-22.5	2235.47	-22.5	2203.77
-25.5	1865.69	-25.5	1845.33
-29	1522.71	-29	1488.7
-33	1122.99	-33	1084.67
-37.5	635.23	-37.5	603.55
-42.5	171.7	-42.5	167.7
-47.5	26.97	-47.5	17.64
-55	2.7	-55	1.97
-65	0.74	-65	1.02
-75	0.09	-75	0.04
-85	0.05	-85	0
-90	0	-90	0

### 4.3 Goniophotometer Test

#### Characteristics

NEMA Type	5 H x 5 V
Maximum Candela	3002.896
Maximum Candela Angle	-3 H -3 V
Horizontal Beam Angle (50%)	57.2
Vertical Beam Angle (50%)	57.5
Horizontal Field Angle (10%)	81.9
Vertical Field Angle (10%)	82.4
Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Beam Lumens	1745
Beam Efficiency	N.A.
Field Lumens	2397
Field Efficiency	N.A.
Spill Lumens	68
Luminaire Lumens	2465
Total Efficiency	N.A.
Total Luminaire Watts	20.9015
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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.013	0.023	0.032	0.006	0	0
75	0.11	0.107	0.1	0.093	0.079	0.069	0.058	0.048	0.04	0.041	0.041	0.04	0.04	0.04	0.033	0.036	0.03	0.033	0.035	0.044	0.061	0.006	0
65	1.06	1.057	1.051	1.043	1.033	1.023	1.01	0.992	0.974	0.934	0.87	0.79	0.77	0.676	0.624	0.553	0.173	0.133	0.067	0.062	0.069	0.039	0
55	2.66	2.566	2.377	2.047	1.78	1.541	1.4	1.33	1.296	1.257	1.212	1.158	1.107	1.044	1.007	0.976	0.955	0.733	0.204	0.094	0.077	0.08	0
47.5	20.06	19.752	19.136	17.484	15.968	14.276	12.357	10.834	9.563	8.526	7.532	6.517	4.463	3.036	1.447	1.197	1.022	0.977	0.662	0.121	0.09	0.083	0
42.5	199.81	195.873	188.011	165.807	144.798	120.38	97.287	83.48	64.027	42.793	24.848	19.384	14.125	8.724	5.678	2.699	1.217	1.018	0.833	0.165	0.103	0.083	0
37.5	616.48	609.102	584.925	553.518	518.901	466.124	425.79	381.308	330.597	275.655	211.66	139.094	77.821	26.805	13.902	6.748	2.688	1.159	0.964	0.24	0.112	0.084	0
33	1067.01	1057.2	1024.65	982.889	932.111	886.671	837.409	769.299	700.472	625.983	525.354	395.563	264.457	144.544	45.058	13.875	5.648	1.515	1.001	0.268	0.118	0.085	0
29	1460.51	1448.89	1412.27	1366.19	1310.16	1260.55	1204.90	1143.91	1056.33	968.049	848.557	697.797	515.952	327.667	148.185	28.134	8.155	3.098	1.032	0.301	0.122	0.085	0
25.5	1778.35	1763.89	1719.40	1667.46	1616.60	1574.70	1513.08	1430.00	1343.86	1252.20	1122.74	944.825	757.349	518.472	269.152	80.979	13.406	4.488	1.076	0.373	0.132	0.086	0
22.5	2023.81	2012.41	1974.27	1934.18	1891.99	1835.63	1762.32	1681.14	1598.50	1491.62	1338.07	1153.07	947.619	702.389	399.111	149.118	19.072	6.184	1.12	0.535	0.134	0.086	0
19.5	2293.45	2278.32	2231.54	2169.39	2117.96	2052.67	1980.48	1914.04	1822.77	1704.48	1560.62	1343.36	1127.29	853.028	530.861	219.007	26.535	6.88	1.171	0.667	0.138	0.087	0
17	2406.3	2394.55	2361.96	2324.90	2291.56	2238.12	2166.47	2067.47	1967.97	1876.55	1705.45	1500.30	1262.09	977.867	636.144	283.581	47.785	7.541	1.22	0.714	0.143	0.087	0
15	2474.37	2464.97	2434.52	2399.99	2370.09	2334.41	2283.86	2199.09	2097.93	1972.52	1827.03	1605.08	1362.02	1070.55	712.474	337.044	71.876	8.226	1.26	0.746	0.147	0.087	0
13	2540.08	2529.38	2499.64	2466.92	2427.09	2394.00	2357.79	2298.80	2204.42	2077.78	1925.73	1689.24	1457.77	1159.98	781.565	386.565	91.046	9.598	1.304	0.759	0.149	0.088	0
11	2604.36	2587.83	2546.02	2513.70	2475.67	2441.74	2406.11	2365.66	2293.47	2181.67	1997.96	1781.12	1539.44	1226.76	852.42	432.234	108.113	11.417	1.366	0.77	0.15	0.088	0
9	2728.11	2687.85	2610.2	2571.83	2525.69	2487.09	2454.30	2413.83	2354.45	2259.50	2080.24	1864.29	1603.77	1287.58	903.478	471.891	125.97	12.954	1.442	0.781	0.152	0.088	0
7	2826.75	2798.79	2740.61	2677.32	2593.92	2541.11	2501.26	2459.22	2401.90	2323.47	2160.91	1925.65	1651.35	1337.33	941.651	507.943	141.086	14.163	1.75	0.79	0.154	0.089	0
5	2915.39	2885.79	2828.23	2770.35	2696.64	2587.99	2547.25	2501.78	2434.93	2371.43	2218.93	1962.71	1686.34	1376.44	978.653	527.876	152.737	15.045	1.979	0.798	0.156	0.089	0
3	2962.49	2939.22	2899.26	2846.48	2757.72	2638.25	2573.35	2533.95	2465.87	2405.45	2260.03	1989.32	1716.31	1404.36	1005.13	544.569	165.405	15.954	2.214	0.806	0.157	0.089	0
1	2959.6	2956.59	2933.50	2887.46	2809.75	2688.31	2601.98	2547.23	2488.27	2429.42	2290.20	2009.42	1735.35	1421.67	1021.05	554.185	164.849	15.885	2.218	0.809	0.159	0.09	0
0	2959.21	2959.6	2942.66	2887.72	2821.44	2698.91	2612.12	2549.85	2493.84	2437.57	2296.97	2012.39	1737.07	1423.51	1022.08	554.42	164.57	15.85	2.22	0.81	0.16	0.09	0
-1	2974.26	2971.32	2950.27	2899.83	2827.85	2705.17	2617.05	2558.87	2501.68	2441.11	2299.14	2013.56	1738.92	1424.73	1023.61	555.141	164.563	15.87	2.229	0.809	0.159	0.09	0
-3	2991.82	2982.16	2951.33	2905.28	2819.33	2688.79	2615.94	2568.02	2506.33	2439.76	2285.95	1999.39	1725.46	1413.79	1013.00	547.38	164.548	15.91	2.248	0.806	0.158	0.089	0
-5	2960.9	2954.99	2925.23	2872.83	2791.30	2671.51	2608.65	2556.79	2494.16	2427.86	2259.84	1973.15	1697.06	1392.92	992.323	532.39	150.811	14.975	2.042	0.798	0.156	0.089	0
-7	2918.71	2913.55	2874.04	2816.95	2707.01	2641.11	2582.51	2532.53	2470.10	2397.16	2214.12	1940.11	1660.34	1360.26	960.359	513.971	137.733	14.068	1.845	0.789	0.155	0.089	0
-9	2844.05	2837.91	2780.54	2711.78	2660.01	2605.22	2552.97	2496.87	2442.49	2341.54	2147.71	1895.06	1618.40	1315.84	924.489	477.567	120.826	12.839	1.579	0.779	0.153	0.088	0
-11	2751.83	2740.02	2708.28	2675.76	2631.72	2574.49	2505.26	2451.20	2390.28	2266.01	2064.38	1828.77	1565.11	1260.83	875.082	436.703	102.995	11.289	1.455	0.767	0.151	0.088	0
-13	2706.82	2698.06	2674.20	2640.94	2592.35	2531.11	2462.20	2395.38	2306.59	2180.29	1981.65	1734.00	1497.58	1200.36	804.281	389.502	91	9.43	1.304	0.755	0.149	0.088	0
-15	2659.94	2653.27	2631.61	2595.05	2538.91	2472.75	2406.9	2321.10	2222.44	2071.84	1898.07	1642.42	1415.06	1116.41	734.934	340.901	74.112	7.96	1.246	0.741	0.147	0.087	0
-17	2598.71	2590.82	2564.39	2524.66	2464.16	2396.29	2319.02	2219.00	2090.60	1967.75	1768.58	1552.28	1321.68	1021.14	658.354	286.198	51.831	6.973	1.197	0.706	0.143	0.087	0
-19.5	2482.93	2473.33	2440.64	2394.08	2328.17	2246.72	2145.07	2042.50	1928.86	1779.93	1617.80	1414.88	1192.03	893.223	551.169	222.033	28.059	5.961	1.149	0.65	0.138	0.087	0
-22.5	2203.77	2196.75	2160.37	2112.58	2054.93	1986.94	1889.28	1777.80	1675.63	1569.39	1423.08	1228.05	1002.02	736.314	416.38	145.891	19.231	5.383	1.11	0.434	0.134	0.086	0
-25.5	1845.33	1843.31	1820.16	1782.46	1738.69	1683.93	1614.26	1530.73	1442.26	1344.24	1203.61	1008.20	797.506	549.256	277.431	83.602	12.506	3.963	1.068	0.312	0.132	0.086	0
-29	1488.7	1488.14	1472.76	1446.38	1409.59	1360.87	1299.37	1231.72	1143.85	1045.11	909.392	744.876	554.712	350.335	151.028	27.604	6.562	3.123	1.026	0.298	0.122	0.085	0
-33	1084.67	1084.22	1068.98	1043.30	1006.71	966.909	913.654	836.754	762.098	681.063	570.382	426.969	284.244	153.132	42.69	12.958	5.053	1.693	0.997	0.282	0.118	0.085	0
-37.5	603.55	603.044	591.886	573.163	551.284	512.327	469.018	417.571	360.961	301.012	234.002	151.054	74.336	26.178	13.456	5.77	2.88	1.102	0.954	0.243	0.112	0.084	0
-42.5	167.7	167.66	167.579	152.71	137.996	118.059	96.743	80.842	62.132	40.76	25.537	19.501	13.281	7.524	5.049	2.876	1.149	1	0.8	0.15	0.103	0.083	0
-47.5	17.64	17.57	17.431	16.344	15.278	13.893	12.185	10.372	8.883	7.843	6.633	5.823	4.084	3.081	1.501	1.118	1.009	0.985	0.62	0.117	0.091	0.083	0
-55	1.97	1.972	1.977	1.807	1.654	1.46	1.372	1.261	1.233	1.203	1.164	1.118	1.061	1.017	1.009	1.033	0.976	0.723	0.185	0.091	0.078	0.079	0
-65	1.02	1.02	1.02	1.007	0.994	0.978	0.959	0.941	0.92	0.887	0.834	0.79	0.76	0.663	0.619	0.518	0.153	0.114	0.059	0.065	0.073	0.031	0
-75	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.039	0.038	0.032	0.033	0.034	0.029	0.033	0.035	0.045	0.061	0.006	0
-85	0	0.001	0.002	0.003	0.005	0.006	0.007	0.006	0.007	0.006	0.006	0.006	0.007	0.009	0.01	0.01	0.01	0.013	0.022	0.022	0.006	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
47.5		0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0	
42.5		0.62 *	1.22 *	1.16 *	1.09 *	1.00 *	0.9	0.8	0.7	0.6	0.6	0.5	0.3	0.2	0.1	0	0	0	0	0	0	0	0	
37.5		1.15 *	2.27 *	2.20 *	2.10 *	1.99 *	1.86 *	1.71 *	1.54 *	1.35 *	1.43 *	1.32 *	0.9	0.6	0.3	0.1	0	0	0	0	0	0	0	
33		1.54 *	3.04 *	2.96 *	2.86 *	2.74 *	2.61 *	2.45 *	2.26 *	2.05 *	2.25 *	2.22 *	1.67 *	1.29 *	0.8	0.3	0.1	0	0	0	0	0	0	
29		1.72 *	3.41 *	3.33 *	3.23 *	3.12 *	3.00 *	2.85 *	2.67 *	2.46 *	2.76 *	2.82 *	2.23 *	1.87 *	1.25 *	0.6	0.2	0	0	0	0	0	0	
25.5		1.73 *	3.43 *	3.36 *	3.28 *	3.18 *	3.07 *	2.92 *	2.76 *	2.57 *	2.92 *	3.04 *	2.49 *	2.18 *	1.58 *	0.8	0.3	0.1	0	0	0	0	0	
22.5		1.97 *	3.90 *	3.83 *	3.74 *	3.64 *	3.50 *	3.34 *	3.17 *	2.97 *	3.40 *	3.57 *	2.98 *	2.70 *	2.06 *	1.17 *	0.4	0.1	0	0	0	0	0	
19.5		1.79 *	3.55 *	3.50 *	3.43 *	3.34 *	3.23 *	3.09 *	2.93 *	2.76 *	3.17 *	3.35 *	2.83 *	2.61 *	2.06 *	1.25 *	0.5	0.1	0	0	0	0	0	
17		1.49 *	2.96 *	2.92 *	2.88 *	2.82 *	2.75 *	2.65 *	2.52 *	2.37 *	2.73 *	2.90 *	2.47 *	2.30 *	1.86 *	1.17 *	0.5	0.1	0	0	0	0	0	
15		1.53 *	3.04 *	3.01 *	2.96 *	2.91 *	2.85 *	2.76 *	2.66 *	2.51 *	2.90 *	3.08 *	2.63 *	2.48 *	2.03 *	1.32 *	0.6	0.1	0	0	0	0	0	
13		1.57 *	3.11 *	3.08 *	3.03 *	2.98 *	2.91 *	2.84 *	2.76 *	2.63 *	3.05 *	3.25 *	2.78 *	2.64 *	2.19 *	1.45 *	0.7	0.1	0	0	0	0	0	
11		1.62 *	3.21 *	3.16 *	3.10 *	3.04 *	2.98 *	2.91 *	2.83 *	2.72 *	3.18 *	3.41 *	2.91 *	2.77 *	2.32 *	1.58 *	0.7	0.2	0	0	0	0	0	
9		1.69 *	3.34 *	3.28 *	3.20 *	3.12 *	3.05 *	2.98 *	2.90 *	2.80 *	3.30 *	3.54 *	3.02 *	2.87 *	2.43 *	1.67 *	0.78 *	0.2	0	0	0	0	0	
7		1.75 *	3.46 *	3.40 *	3.32 *	3.21 *	3.11 *	3.04 *	2.96 *	2.86 *	3.39 *	3.66 *	3.12 *	2.96 *	2.52 *	1.75 *	0.83 *	0.2	0	0	0	0	0	
5		1.79 *	3.55 *	3.49 *	3.41 *	3.29 *	3.18 *	3.09 *	3.01 *	2.91 *	3.46 *	3.75 *	3.19 *	3.03 *	2.59 *	1.81 *	0.87 *	0.2	0	0	0	0	0	
3		1.80 *	3.59 *	3.55 *	3.48 *	3.37 *	3.23 *	3.13 *	3.04 *	2.95 *	3.51 *	3.81 *	3.25 *	3.08 *	2.64 *	1.85 *	0.89 *	0.2	0	0	0	0	0	
1		0.90 *	1.80 *	1.79 *	1.76 *	1.70 *	1.63 *	1.57 *	1.53 *	1.48 *	1.77 *	1.92 *	1.64 *	1.55 *	1.33 *	0.93 *	0.45 *	0.1	0	0	0	0	0	
0																								

-1	0.90 *	1.81 *	1.79 *	1.76 *	1.71 *	1.64 *	1.58 *	1.53 *	1.49 *	1.77 *	1.93 *	1.64 *	1.55 *	1.33 *	0.93 *	0.45 *	0.1	0	0	0	0	0	
-3	1.82 *	3.62 *	3.60 *	3.53 *	3.42 *	3.28 *	3.17 *	3.08 *	2.98 *	3.55 *	3.85 *	3.27 *	3.10 *	2.65 *	1.86 *	0.89 *	0.2	0	0	0	0	0	
-5	1.81 *	3.62 *	3.58 *	3.51 *	3.39 *	3.27 *	3.17 *	3.08 *	2.98 *	3.54 *	3.82 *	3.24 *	3.07 *	2.62 *	1.83 *	0.87 *	0.2	0	0	0	0	0	
-7	1.79 *	3.58 *	3.54 *	3.45 *	3.34 *	3.23 *	3.15 *	3.06 *	2.96 *	3.51 *	3.77 *	3.19 *	3.01 *	2.56 *	1.78 *	0.84 *	0.2	0	0	0	0	0	
-9	1.76 *	3.50 *	3.45 *	3.37 *	3.27 *	3.19 *	3.11 *	3.03 *	2.92 *	3.45 *	3.69 *	3.11 *	2.94 *	2.49 *	1.71 *	0.79 *	0.2	0	0	0	0	0	
-11	1.71 *	3.41 *	3.36 *	3.30 *	3.23 *	3.15 *	3.06 *	2.98 *	2.87 *	3.36 *	3.57 *	3.01 *	2.84 *	2.39 *	1.62 *	0.7	0.2	0	0	0	0	0	
-13	1.66 *	3.33 *	3.30 *	3.25 *	3.18 *	3.10 *	3.01 *	2.93 *	2.80 *	3.25 *	3.43 *	2.89 *	2.73 *	2.27 *	1.50 *	0.7	0.1	0	0	0	0	0	
-15	1.64 *	3.27 *	3.25 *	3.20 *	3.13 *	3.05 *	2.96 *	2.85 *	2.71 *	3.11 *	3.25 *	2.74 *	2.59 *	2.12 *	1.36 *	0.6	0.1	0	0	0	0	0	
-17	1.60 *	3.20 *	3.18 *	3.13 *	3.06 *	2.98 *	2.88 *	2.75 *	2.58 *	2.94 *	3.06 *	2.58 *	2.42 *	1.95 *	1.22 *	0.5	0.1	0	0	0	0	0	
-20	1.94 *	3.87 *	3.84 *	3.78 *	3.69 *	3.56 *	3.41 *	3.22 *	2.99 *	3.38 *	3.54 *	2.98 *	2.75 *	2.17 *	1.31 *	0.5	0.1	0	0	0	0	0	
-23	2.14 *	4.28 *	4.25 *	4.18 *	4.05 *	3.88 *	3.67 *	3.44 *	3.19 *	3.61 *	3.79 *	3.17 *	2.87 *	2.18 *	1.23 *	0.4	0.1	0	0	0	0	0	
-26	1.85 *	3.71 *	3.68 *	3.61 *	3.50 *	3.35 *	3.17 *	2.96 *	2.75 *	3.13 *	3.25 *	2.66 *	2.33 *	1.68 *	0.9	0.3	0	0	0	0	0	0	
-29	1.78 *	3.57 *	3.54 *	3.48 *	3.38 *	3.24 *	3.07 *	2.88 *	2.66 *	2.98 *	3.04 *	2.41 *	2.01 *	1.34 *	0.6	0.2	0	0	0	0	0	0	
-33	1.57 *	3.15 *	3.12 *	3.06 *	2.97 *	2.84 *	2.67 *	2.47 *	2.24 *	2.46 *	2.42 *	1.82 *	1.40 *	0.8	0.3	0.1	0	0	0	0	0	0	
-38	1.16 *	2.32 *	2.30 *	2.25 *	2.17 *	2.06 *	1.89 *	1.70 *	1.50 *	1.58 *	1.46 *	1	0.7	0.3	0.1	0	0	0	0	0	0	0	
-43	0.59 *	1.19 *	1.17 *	1.13 *	1.08 *	1	0.9	0.8	0.6	0.6	0.5	0.3	0.2	0.1	0	0	0	0	0	0	0	0	
-48	0.1	0.3	0.3	0.3	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	0	
-55	0	0.1	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	
-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	51	101	100	98	95	91	87	83	79	90	95	79	72	57	36	15	3.3	0.6	0.1	0	0	0	1232

## 5.0 THD and PF Test

Model No.	HBLED18Y/D10	Sample ID.	J1
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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	0.173	20.60	0.990	9.60%
25.1	277.03	60	0.083	21.00	0.912	12.42%

## 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\*\*\*\*\*