

# Photometric Test Report

## Relevant Standards

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

## Prepared For

**RAB Lighting Inc.**

Room 6A33, No.1388, Wuzhong road, Shanghai, China

Xiao Xiang, 15921313292, gary@rabweb.com

## Prepared By

**Deliver Co., Ltd.**

Block 11, 78 Keling Road, SSTP, Suzhou, China

0512-66801950, kevin.jia@szdeliver.com

## Project Number

**DLF1804109**

## Report Number

**DLF20180416001-9a**

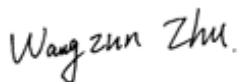
## Test Date

**2018/4/16**

## Issue Date

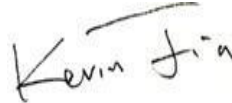
**2018/4/16**

## Prepared By



Wangzun Zhu

## Approved By



Kevin Jia

The results contained in this report pertain only to the tested sample.

This report shall not be reproduced, except in full, without written approval of Deliver Co., Ltd.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP.

## 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	2447	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	3087	P
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	70	70.4	P
Power Factor	ANSI C82.77:2014	0.873	0.918	P
Total Harmonic Distortion (A%)	ANSI C82.77:2014	25.00%	18.61%	P

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2018/4/16	HBLED18Y	I1
2	Goniophotometer Test	2018/4/16	HBLED18Y	I1
3	THD and PF Test	2018/4/16	HBLED18Y	I1

### Remark(If any)

- 1、 This report shall not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the US government.
- 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

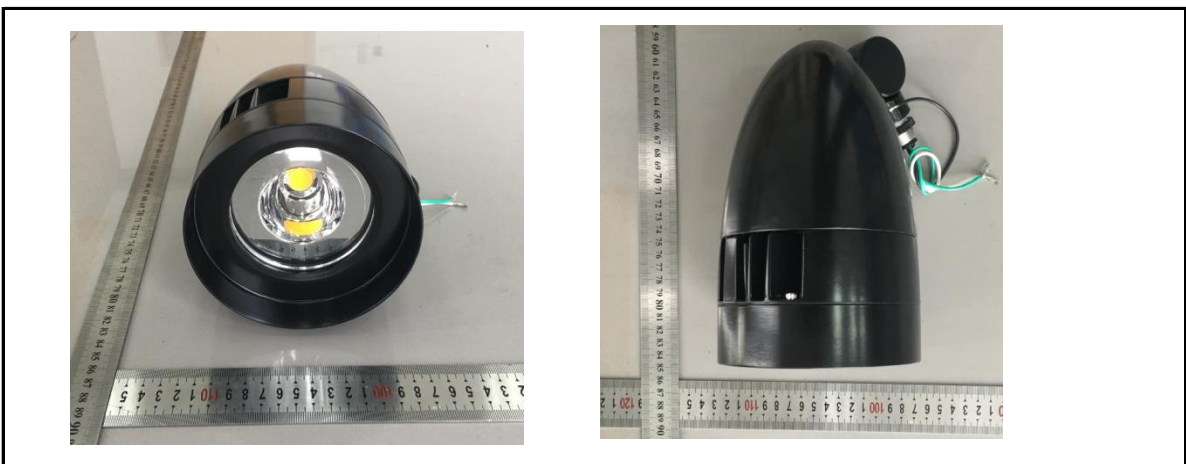
**Luminaire Description:**

**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	Sample ID.	I1
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	276.99	60	0.081	20.67	0.918

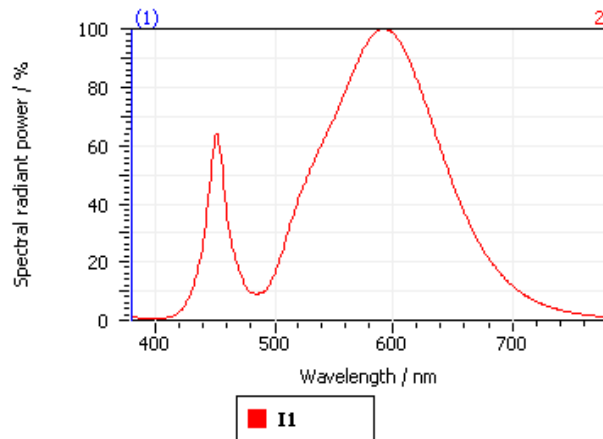
#### Test Result

CCT (K)	CRI (Ra)	Duv
3087	70.4	1.7E-03

## 4.1 Integrating Sphere Test

### Spectroradiometric Parameters

#### Results



#### Spectral values

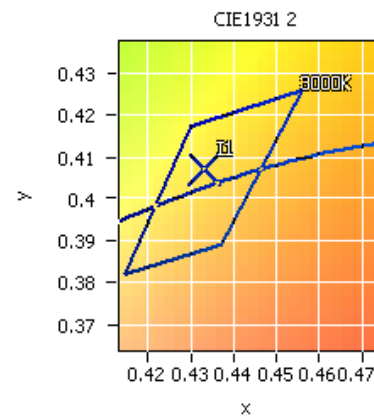
DominantWavelength	581.85 nm
Purity	0.523
PeakWavelength	592.28 nm
Width50%:	118.74 nm

#### Color Coordinates

Correlated Color Temperature 3087 K

x: 0.4333 u: 0.2469 u': 0.2469  
y: 0.4071 v: 0.3480 v': 0.5220

ResultsCRICRI01	66.5	ResultsCRICRI09	-32.6
ResultsCRICRI02	79.8	ResultsCRICRI10	52.2
ResultsCRICRI03	90.6	ResultsCRICRI11	58.9
ResultsCRICRI04	66.3	ResultsCRICRI12	39.2
ResultsCRICRI05	65.0	ResultsCRICRI13	68.6
ResultsCRICRI06	70.7	ResultsCRICRI14	94.4
ResultsCRICRI07	79.3	ResultsCRICRI15	59.7
ResultsCRICRI08	45.3	ResultsCRICRI16	59.5
ResultsCRI	70.4		



Nominal CCT: 3000K

PlanckDistance 1.7E-003

## 4.0 LM-79 Measurement and Test Results

### 4.3 Goniophotometer Test

Model No.	HBLED18Y	Sample ID.	I1
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

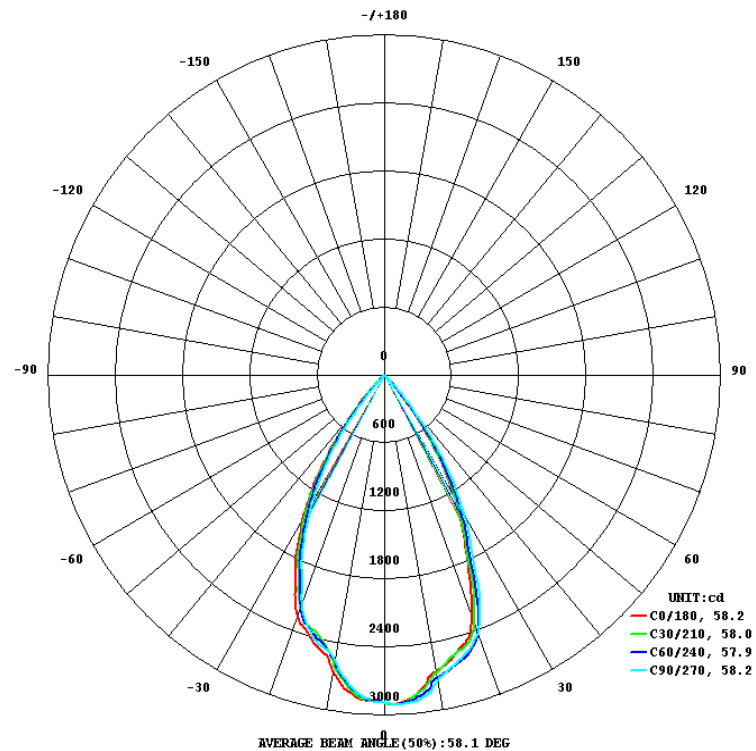
Temperature ( $^{\circ}\text{C}$ )	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.1	277.05	60	0.082	20.76	0.913	Light Down

#### Test Result

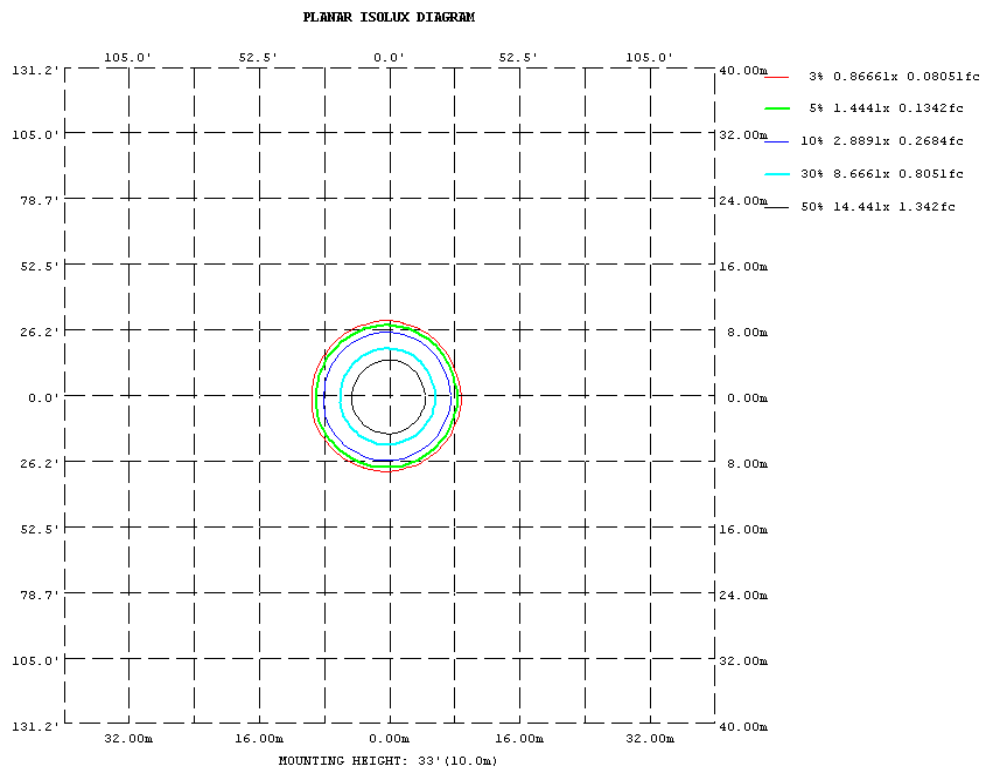
Flux(lm)	Zonal Lumen Requirement ( $0^{\circ}$ - $90^{\circ}$ )	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
2447	100.00%	82.5	82.6	58.2	58.2	117.9

### 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	2651	2682	2738	2748	2658	2579	2550	2568
20	2295	2396	2428	2394	2274	2183	2159	2141
30	1262	1305	1433	1537	1463	1400	1302	1219
40	295.1	330.2	435.5	551.5	503.9	456.1	361.3	276.8
50	6.209	7.384	9.710	15.62	14.54	13.86	7.643	7.297
60	0.9546	0.9683	1.072	0.9689	0.9577	0.9337	0.8376	0.8901
70	0.5531	0.5762	0.2298	0.7524	0.7058	0.6652	0.2167	0.4823
80	0.0193	0.0259	0.0695	0.0377	0.0268	0.0305	0.0479	0.0199
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	264.42	0 - 10	264.42	10.81%
10 - 20	694.58	0 - 20	959.00	39.19%
20 - 30	830.49	0 - 30	1789.49	73.13%
30 - 40	540.83	0 - 40	2330.31	95.23%
40 - 50	110.72	0 - 50	2441.03	99.76%
50 - 60	4.82	0 - 60	2445.85	99.95%
60 - 70	0.90	0 - 70	2446.75	99.99%
70 - 80	0.21	0 - 80	2446.96	100.00%
80 - 90	0.02	0 - 90	2446.98	100.00%
90 - 100	0.00	0 - 100	2446.98	100.00%
100 - 110	0.00	0 - 110	2446.98	100.00%
110 - 120	0.00	0 - 120	2446.98	100.00%
120 - 130	0.00	0 - 130	2446.98	100.00%
130 - 140	0.00	0 - 140	2446.98	100.00%
140 - 150	0.00	0 - 150	2446.98	100.00%
150 - 160	0.00	0 - 160	2446.98	100.00%
160 - 170	0.00	0 - 170	2446.98	100.00%
170 - 180	0.00	0 - 180	2446.98	100.00%

### 4.3 Goniophotometer Test

#### Axial Candela

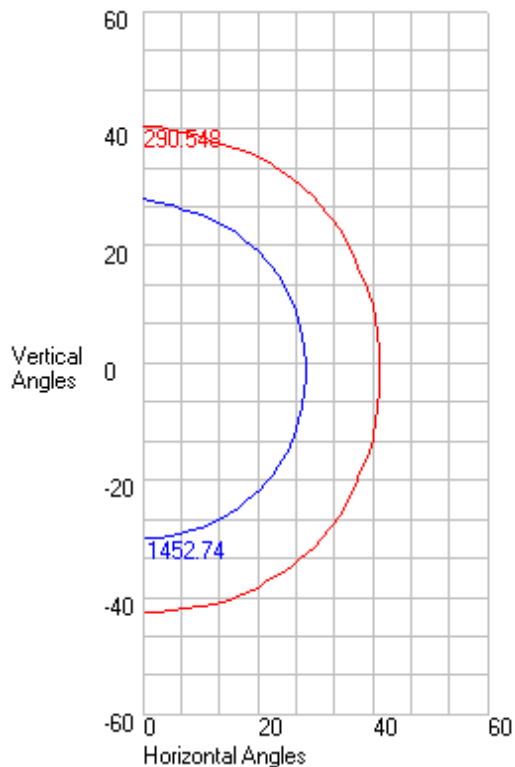
DEG.	HOR.	DEG.	VERT.
90	0	90	0
85	0.03	85	0.01
75	0.08	75	0.04
65	0.69	65	1.09
55	2.52	55	1.93
47.5	18.76	47.5	15.5
42.5	190.1	42.5	132.03
37.5	582.64	37.5	520.45
33	1023.64	33	957.73
29	1395.33	29	1356.14
25.5	1699.68	25.5	1685
22.5	1919.45	22.5	2019.83
19.5	2197.16	19.5	2336.22
17	2334.99	17	2468.82
15	2415.13	15	2521.61
13	2461.11	13	2583.52
11	2509.62	11	2629.48
9	2627.05	9	2676.74
7	2720.77	7	2782.1
5	2814.47	5	2851.48
3	2862.61	3	2888.09
1	2882.75	1	2899.03
0	2887.899	0	2887.899
-1	2897.13	-1	2873.81
-3	2905.48	-3	2876.85
-5	2892.12	-5	2851.75
-7	2860.16	-7	2800.53
-9	2803.35	-9	2708.63
-11	2699.6	-11	2585.49
-13	2647.03	-13	2496.54
-15	2597.8	-15	2448.1
-17	2548.07	-17	2372.35
-19.5	2451.82	-19.5	2298.52
-22.5	2239.09	-22.5	2092.86
-25.5	1877.09	-25.5	1854.18
-29	1531.86	-29	1545.44
-33	1139.28	-33	1189.84
-37.5	674.67	-37.5	736.54
-42.5	223.1	-42.5	296.9
-47.5	39.76	-47.5	43.39
-55	3.23	-55	3.49
-65	0.94	-65	0.96
-75	0.1	-75	0.13
-85	0.04	-85	0.01
-90	0	-90	0

### 4.3 Goniophotometer Test

#### Characteristics

NEMA Type	5 H x 5 V
Maximum Candela	2905.48
Maximum Candela Angle	-3 H 0 V
Horizontal Beam Angle (50%)	58.1
Vertical Beam Angle (50%)	58.1
Horizontal Field Angle (10%)	83
Vertical Field Angle (10%)	83.4
Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Beam Lumens	1714
Beam Efficiency	N.A.
Field Lumens	2377
Field Efficiency	N.A.
Spill Lumens	71
Luminaire Lumens	2447
Total Efficiency	N.A.
Total Luminaire Watts	20.7627
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	0.009	0.008	0.007	0.005	0.004	0.003	0.001	0	0	0	0	0	0	0	0	0	0	0	0.003	0.006	0	0
75	0.04	0.039	0.038	0.037	0.035	0.034	0.032	0.031	0.03	0.031	0.031	0.03	0.03	0.03	0.03	0.026	0.02	0.02	0.011	0.014	0.01	0.006	0
65	1.09	1.081	1.064	1.036	1.004	0.961	0.904	0.857	0.822	0.792	0.763	0.677	0.636	0.607	0.546	0.229	0.14	0.116	0.04	0.031	0.021	0.017	0
55	1.93	1.885	1.796	1.659	1.536	1.415	1.323	1.256	1.206	1.151	1.075	1.007	0.95	0.919	0.918	0.903	0.901	0.654	0.168	0.052	0.024	0.017	0
47.5	15.5	15.218	14.654	13.227	11.855	10.231	8.442	7.834	7.212	6.68	6.131	4.432	3.837	2.483	1.221	0.978	0.875	0.85	0.635	0.082	0.036	0.018	0
42.5	132.03	128.209	120.577	103.561	87.807	71.06	55.282	43.606	29.697	23.256	19.064	15.092	10.155	7.269	4.594	2.16	1.017	0.857	0.784	0.153	0.043	0.018	0
37.5	520.45	512.48	487.456	455.742	421.364	369.87	332.948	292.096	248.441	207.093	159.047	88.488	39.77	20.215	10.854	6.263	2.356	0.957	0.817	0.183	0.048	0.018	0
33	957.73	948.275	918.061	879.515	830.77	786.142	741.397	680.036	615.554	544.769	448.477	327.955	214.438	100.934	27.206	11.818	5.128	1.303	0.838	0.206	0.055	0.018	0
29	1356.14	1345.08	1309.83	1265.30	1211.05	1165.96	1112.82	1050.99	965.644	884.204	769.553	624.356	459.977	284.173	114.531	22.134	8.179	2.867	0.82	0.38	0.06	0.018	0
25.5	1685 *	1671.72	1631.42	1580.52	1522.37	1472.55	1409.10	1340.81	1263.16	1177.72	1050.50	878.608	691.41	473.8 *	236.874	62.734	12.95	4.447	0.841	0.597	0.061	0.019	0
22.5	2019.83	1999.55	1938.59	1869.02	1800.75	1727.50	1658.72	1588.53	1498.98	1395.51	1265.62	1094.73	891.618	651.982	371.311	129.543	18.796	6.028	0.87	0.623	0.065	0.021	0
19.5	2336.22	2316.97	2258.33	2179.27	2102.27	2015.42	1931.67	1836.91	1716.73	1615.40	1467.62	1280.81	1078 *	807.736	503.097	207.806	28.321	7.002	0.932	0.642	0.067	0.023	0
17	2468.82	2454.15	2415.45	2371.22	2321.04	2243.63	2141.95	2024.11	1919.45	1791.58	1625.18	1426.82	1216.25	937.793	611.685	269.465	48.413	8.036	0.99	0.651	0.067	0.024	0
15	2521.61	2507.67	2470.97	2438.35	2408.32	2358.83	2279.96	2166.84	2049.57	1920.31	1744.29	1541.39	1311.46	1030.90	690.687	327.467	71.144	9.411	1.044	0.657	0.067	0.025	0
13	2583.52	2566.73	2524.11	2490.71	2455.98	2414.83	2358.79	2272.93	2158.94	2023.34	1859.40	1627.40	1399.78	1123.33	764.742	381.442	92.763	11.511	1.141	0.662	0.069	0.026	0
11	2629.48	2613.04	2572.92	2545.05	2505.05	2450.11	2397.54	2337.49	2246.79	2121.49	1935.16	1714.40	1483.63	1189.73	838.465	431.447	114.695	13.409	1.549	0.667	0.072	0.029	0
9	2676.74	2658.30	2615.62	2577.96	2539.57	2488.98	2426.07	2364.68	2298.12	2195.89	2011.88	1797.28	1552.08	1248.83	892.89	475.686	136.999	15.032	1.936	0.675	0.074	0.029	0
7	2782.1	2750.27	2673.17	2624.71	2571.72	2519.11	2461.83	2389.31	2332.36	2247.17	2079.78	1856.98	1603.04	1299.30	932.889	518.171	155.512	16.377	2.143	0.681	0.076	0.029	0
5	2851.48	2822.68	2777.21	2724.18	2612.76	2538.25	2491.81	2427.35	2362.58	2276.95	2131.29	1888.14	1643.10	1340.07	970.979	543.146	170.157	17.434	2.305	0.685	0.078	0.029	0
3	2888.09	2859.49	2832.15	2758.80	2676.21	2566.86	2500.21	2451.08	2390.77	2306.38	2168.86	1908.37	1675.24	1370.55	999.85	565.085	185.14	18.54	2.47	0.689	0.079	0.03	0
1	2899.03	2884.85	2852.72	2802.83	2715.39	2610.90	2509.95	2460.81	2410.53	2329.02	2193.32	1919.89	1696.50	1391.43	1019.85	579.926	188.444	18.687	2.503	0.69	0.08	0.03	0
0	2887.89	2882.75	2862.61	2814.47	2720.77	2627.05	2509.62	2461.11	2415.13	2334.99	2197.16	1919.45	1699.68	1395.33	1023.64	582.64	190.1	18.76	2.52	0.69	0.08	0.03	0
-1	2873.81	2873.21	2863.85	2817.72	2725.28	2627.16	2509.65	2460.16	2415.27	2336.25	2201.78	1921.85	1704.57	1399.95	1028.16	585.656	191.492	18.956	2.534	0.692	0.08	0.03	0
-3	2876.85	2873.53	2846.95	2783.93	2704.56	2590.22	2497.44	2452.95	2405.59	2328.93	2193.32	1912.98	1698.49	1396.20	1024.51	582.252	194.269	19.348	2.563	0.696	0.08	0.03	0
-5	2851.75	2846.11	2805.63	2741.89	2670.82	2547.74	2476.67	2431.46	2383.94	2314.09	2169.32	1892.41	1679.07	1383.07	1011.29	571.678	185.454	18.729	2.468	0.696	0.08	0.03	0
-7	2800.53	2792.64	2745.02	2682.84	2587.45	2497.08	2438.32	2398.15	2351.43	2287.06	2126.32	1864.99	1646.32	1359.47	986.547	557.939	177.006	18.122	2.38	0.696	0.078	0.03	0
-9	2708.63	2699.77	2656.06	2583.06	2495.46	2444.25	2404.12	2363.65	2316.84	2243.96	2067.91	1839.69	1604.56	1324.35	956.212	526.91	164.766	17.156	2.256	0.695	0.076	0.029	0
-11	2585.49	2575.47	2534.18	2479.42	2427.91	2394.82	2363.1	2315.34	2271.63	2177.38	1986.61	1799.32	1555.55	1276.89	910.972	494.194	148.744	15.825	2.001	0.691	0.074	0.029	0
-13	2496.54	2488.71	2461.90	2417.64	2367.65	2343.08	2309.63	2266.06	2201.46	2092.59	1902.25	1730.43	1500.18	1224.79	847.261	455.699	132.91	14.121	1.755	0.682	0.072	0.027	0
-15	2448.1	2435.18	2399.35	2362.86	2334.33	2307.74	2267.47	2201.25	2116.49	1986.71	1837.56	1640.4	1431.71	1155.32	785.903	410.592	110.627	12.039	1.355	0.671	0.07	0.026	0
-17	2372.35	2365.23	2344.61	2322.50	2292.30	2246.76	2182.57	2101.78	1998.79	1879.61	1764.86	1552.09	1349.20	1074.00	716.9 *	360.074	88.579	9.573	1.106	0.663	0.07	0.025	0
-19.5	2298.52	2289.71	2260.54	2220.14	2169.89	2109.22	2033.65	1937.50	1851.66	1778.85	1620.97	1438.18	1232.81	952.939	620.174	298.666	61.91	7.728	1.003	0.66	0.07	0.024	0
-22.5	2092.86	2085.85	2054.45	2011.80	1951.12	1892.90	1844.37	1789.74	1694.38	1580.50	1450.72	1271.40	1068.89	805.114	501.12	207.476	34.121	6.881	0.93	0.65	0.069	0.022	0
-25.5	1854.18	1851.81	1835.64	1811.24	1772.12	1709.72	1633.48	1556.85	1478.49	1388.12	1257.77	1082.50	878.13	633.89	372.139	141.088	19.502	6.141	0.884	0.635	0.066	0.02	0
-29	1545.44	1543.19	1527.34	1503.16	1468.19	1421.25	1363.40	1299.20	1217.09	1128.69	999.664	835.289	650.616	450.131	223.484	76.176	11.807	4.342	0.84	0.54	0.065	0.02	0
-33	1189.84	1187.96	1173.00	1149.56	1115.25	1075.91	1021.17	947.551	871.833	789.962	682.45	535.906	391.213	232.348	110.233	21.922	6.638	2.929	0.826	0.254	0.06	0.02	0
-37.5	736.54	735.804	724.535	706.275	685.445	646.228	599.58	546.164	489.093	425.388	349.334	241.233	166.053	93.328	24.22	8.273	4.121	1.065	0.84	0.225	0.054	0.02	0
-42.5	296.9 *	295.943	294.032	274.592	256.17	234.718	211.364	191.608	165.861	133.003	100.007	63.27	26.153	14.899	6.942	4.021	1.509	0.857	0.847	0.184	0.05	0.02	0
-47.5	43.39	43.47	43.629	38.426	33.426	28.297	23.367	20.468	18.196	15.812	12.118	7.863	6.213	4.86	3.222	1.218	0.893	0.85	0.721	0.109	0.044	0.019	0
-55	3.49	3.502	3.527	3.485	3.427	3.325	3.154	2.967	2.707	2.331	1.631	1.064	1.011	0.942	0.89	0.878	0.921	0.841	0.308	0.066	0.032	0.017	0
-65	0.96	0.958	0.953	0.955	0.957	0.96	0.965	0.968	0.974	0.98	0.99	0.99	0.934	0.845	0.77	0.654	0.574	0.155	0.067	0.041	0.021	0.017	0
-75	0.13	0.13	0.13	0.13	0.128	0.126	0.124	0.122	0.12	0.118	0.113	0.102	0.083	0.055	0.05	0.04	0.03	0.03	0.021	0.014	0.02	0.006	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	0.004	0.002	0.005	0.003	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
47.5		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
42.5	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	0	
37.5	0.49 *	0.97 *	0.92 *	0.9	0.8	0.7	0.6	0.5	0.4	0.4	0.4	0.2	0.1	0.1	0	0	0	0	0	0	0	0	0	
33	1.01 *	1.99 *	1.92 *	1.83 *	1.72 *	1.60 *	1.47 *	1.31 *	1.15 *	1.20 *	1.1	0.7	0.5	0.3	0.1	0	0	0	0	0	0	0	0	
29	1.41 *	2.78 *	2.71 *	2.61 *	2.50 *	2.38 *	2.23 *	2.05 *	1.85 *	2.02 *	1.97 *	1.46 *	1.1	0.6	0.3	0.1	0	0	0	0	0	0	0	
25.5	1.62 *	3.20 *	3.13 *	3.04 *	2.93 *	2.81 *	2.66 *	2.48 *	2.28 *	2.55 *	2.59 *	2.05 *	1.69 *	1.1	0.5	0.2	0	0	0	0	0	0	0	
22.5	1.69 *	3.34 *	3.27 *	3.17 *	3.06 *	2.92 *	2.77 *	2.61 *	2.43 *	2.75 *	2.85 *	2.32 *	2.03 *	1.46 *	0.8	0.2	0.1	0	0	0	0	0	0	
19.5	1.99 *	3.93 *	3.85 *	3.74 *	3.60 *	3.44 *	3.26 *	3.06 *	2.84 *	3.23 *	3.39 *	2.83 *	2.55 *	1.94 *	1.10 *	0.4	0.1	0	0	0	0	0	0	
17	1.83 *	3.62 *	3.56 *	3.49 *	3.39 *	3.26 *	3.10 *	2.91 *	2.69 *	3.05 *	3.21 *	2.71 *	2.49 *	1.97 *	1.20 *	0.5	0.1	0	0	0	0	0	0	
15	1.52 *	3.01 *	2.98 *	2.94 *	2.89 *	2.81 *	2.69 *	2.55 *	2.38 *	2.68 *	2.81 *	2.38 *	2.22 *	1.80 *	1.14 *	0.5	0.1	0	0	0	0	0	0	
13	1.55 *	3.08 *	3.04 *	3.01 *	2.97 *	2.91 *	2.83 *	2.70 *	2.54 *	2.89 *	3.02 *	2.54 *	2.40 *	1.98 *	1.29 *	0.6	0.1	0	0	0	0	0	0	
11	1.58 *	3.14 *	3.11 *	3.07 *	3.02 *	2.97 *	2.90 *	2.81 *	2.66 *	3.06 *	3.21 *	2.70 *	2.56 *	2.14 *	1.44 *	0.7	0.1	0	0	0	0	0	0	
9	1.61 *	3.20 *	3.17 *	3.13 *	3.08 *	3.02 *	2.95 *	2.87 *	2.76 *	3.20 *	3.38 *	2.85 *	2.70 *	2.28 *	1.57 *	0.7	0.2	0	0	0	0	0	0	
7	1.66 *	3.29 *	3.24 *	3.18 *	3.13 *	3.07 *	2.99 *	2.91 *	2.81 *	3.30 *	3.53 *	2.98 *	2.81 *	2.39 *	1.68 *	0.81 *	0.2	0	0	0	0	0	0	
5	1.71 *	3.39 *	3.33 *	3.26 *	3.18 *	3.11 *	3.03 *	2.94 *	2.85 *	3.37 *	3.64 *	3.08 *	2.91 *	2.49 *	1.76 *	0.87 *	0.2	0	0	0	0	0	0	
3	1.74 *	3.46 *	3.41 *	3.34 *	3.23 *	3.14 *	3.06 *	2.97 *	2.87 *	3.41 *	3.70 *	3.16 *	2.99 *	2.57 *	1.83 *	0.92 *	0.2	0	0	0	0	0	0	
1	1.76 *	3.50 *	3.46 *	3.39 *	3.28 *	3.17 *	3.07 *	2.99 *	2.89 *	3.44 *	3.74 *	3.20 *	3.05 *	2.62 *	1.88 *	0.96 *	0.3	0.1	0	0	0	0	0	
0	0.88 *	1.76 *	1.74 *	1.71 *	1.66 *	1.59 *	1.54 *	1.50 *	1.45 *	1.72 *	1.88 *	1.61 *	1.54 *	1.33 *	0.95 *	0.49 *	0.1	0	0	0	0	0	0	

-1	0.88 *	1.76 *	1.74 *	1.71 *	1.66 *	1.60 *	1.54 *	1.49 *	1.45 *	1.72 *	1.88 *	1.62 *	1.54 *	1.33 *	0.96 *	0.49 *	0.1	0	0	0	0	0	
-3	1.75 *	3.50 *	3.48 *	3.41 *	3.31 *	3.18 *	3.06 *	2.98 *	2.89 *	3.43 *	3.75 *	3.23 *	3.09 *	2.66 *	1.92 *	0.98 *	0.3	0.1	0	0	0	0	
-5	1.74 *	3.48 *	3.45 *	3.38 *	3.27 *	3.14 *	3.04 *	2.96 *	2.86 *	3.41 *	3.71 *	3.20 *	3.07 *	2.65 *	1.90 *	0.97 *	0.3	0	0	0	0	0	
-7	1.72 *	3.43 *	3.39 *	3.32 *	3.21 *	3.09 *	3.00 *	2.92 *	2.83 *	3.36 *	3.66 *	3.16 *	3.03 *	2.61 *	1.87 *	0.95 *	0.2	0	0	0	0	0	
-9	1.68 *	3.35 *	3.30 *	3.22 *	3.12 *	3.03 *	2.95 *	2.87 *	2.78 *	3.30 *	3.59 *	3.09 *	2.96 *	2.55 *	1.82 *	0.91 *	0.2	0	0	0	0	0	
-11	1.61 *	3.23 *	3.19 *	3.11 *	3.04 *	2.98 *	2.91 *	2.83 *	2.73 *	3.22 *	3.49 *	3.00 *	2.87 *	2.47 *	1.74 *	0.85 *	0.2	0	0	0	0	0	
-13	1.55 *	3.10 *	3.07 *	3.02 *	2.97 *	2.92 *	2.86 *	2.78 *	2.67 *	3.12 *	3.36 *	2.89 *	2.77 *	2.36 *	1.64 *	0.78 *	0.2	0	0	0	0	0	
-15	1.51 *	3.01 *	2.99 *	2.96 *	2.92 *	2.87 *	2.80 *	2.71 *	2.59 *	3.00 *	3.21 *	2.76 *	2.64 *	2.23 *	1.52 *	0.7	0.2	0	0	0	0	0	
-17	1.47 *	2.93 *	2.92 *	2.90 *	2.86 *	2.80 *	2.72 *	2.62 *	2.47 *	2.86 *	3.05 *	2.62 *	2.50 *	2.08 *	1.38 *	0.6	0.1	0	0	0	0	0	
-20	1.78 *	3.56 *	3.55 *	3.51 *	3.45 *	3.36 *	3.24 *	3.08 *	2.90 *	3.35 *	3.56 *	3.05 *	2.88 *	2.35 *	1.52 *	0.7	0.1	0	0	0	0	0	
-23	2.01 *	4.02 *	3.99 *	3.94 *	3.84 *	3.71 *	3.56 *	3.38 *	3.17 *	3.65 *	3.88 *	3.30 *	3.06 *	2.43 *	1.50 *	0.6	0.1	0	0	0	0	0	
-26	1.81 *	3.61 *	3.59 *	3.53 *	3.44 *	3.31 *	3.16 *	3.00 *	2.81 *	3.22 *	3.40 *	2.85 *	2.57 *	1.97 *	1.13 *	0.4	0.1	0	0	0	0	0	
-29	1.81 *	3.63 *	3.60 *	3.56 *	3.47 *	3.33 *	3.17 *	2.99 *	2.79 *	3.17 *	3.29 *	2.69 *	2.34 *	1.69 *	0.9	0.3	0.1	0	0	0	0	0	
-33	1.67 *	3.34 *	3.31 *	3.26 *	3.18 *	3.06 *	2.89 *	2.69 *	2.47 *	2.76 *	2.78 *	2.18 *	1.80 *	1.2	0.5	0.2	0	0	0	0	0	0	
-38	1.32 *	2.65 *	2.62 *	2.58 *	2.50 *	2.38 *	2.21 *	2.02 *	1.82 *	1.98 *	1.90 *	1.39 *	1	0.6	0.2	0.1	0	0	0	0	0	0	
-43	0.79 *	1.59 *	1.57 *	1.53 *	1.47 *	1.37 *	1.26 *	1.12 *	0.98 *	1	0.9	0.6	0.4	0.2	0.1	0	0	0	0	0	0	0	
-48	0.3	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.1	0.1	0	0	0	0	0	0	0	0	0	
-55	0.1	0.1	0.1	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	
-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	50	99	98	96	93	90	86	82	78	89	94	79	72	58	38	17	4	0.8	0.2	0	0	0	1224

## 5.0 THD and PF Test

Model No.	HBLED18Y	Sample ID.	I1
-----------	----------	------------	----

### 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	119.99	60	0.170	20.21	0.993	9.32%
25.1	276.99	60	0.081	20.67	0.918	18.61%

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