

Photometric Test Report

Relevant Standards

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

Prepared For RAB Lighting Inc.

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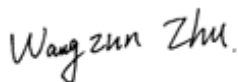
Test Date

2018/4/16

Issue Date

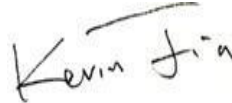
2018/4/16

Prepared By



Wangzun Zhu

Approved By



Kevin Jia

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

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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	1583	P
Zonal Lumen Requirement (0°-90°)	IES LM-79-2008	≥85%	100.00%	P
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	90	102.0	P
Allowable CCTs* (K)	IES LM-79-2008	5700	3001	P
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	65	70.3	P
Power Factor	ANSI C82.77:2014	0.873	0.942	F
Total Harmonic Distortion (A%)	ANSI C82.77:2014	25.00%	8.91%	P

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2018/4/16	HNLED13Y	U1
2	Goniophotometer Test	2018/4/16	HNLED13Y	U1
3	THD and PF Test	2018/4/16	HNLED13Y	U1

Remark(If any)

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3.0 Production Description

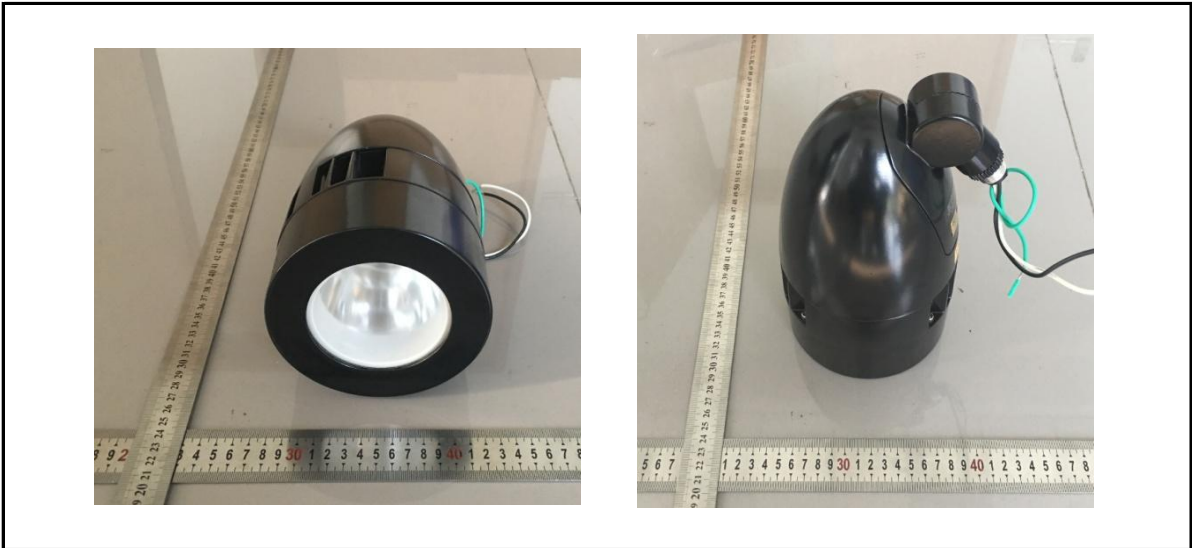
Luminaire Description:

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.	HNLED13Y	Sample ID.	U1
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 ± 0.2 percent under load.

The sample was measured using 4π 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	276.98	60	0.060	15.56	0.942

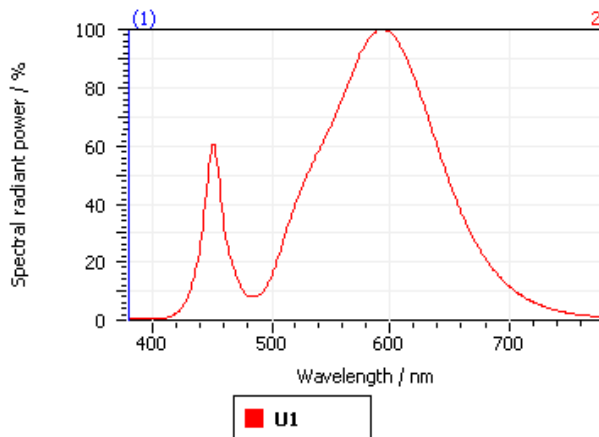
Test Result

CCT (K)	CRI (Ra)	Duv
3001	70.3	1.6E-03

4.1 Integrating Sphere Test

Spectroradiometric Parameters

Results



Spectral values

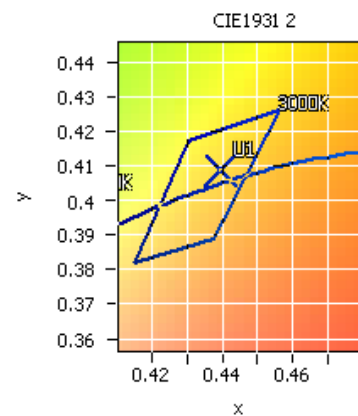
DominantWavelength	582.28 nm
Purity	0.545
PeakWavelength	593.62 nm
Width50%:	117.58 nm

Color Coordinates

Correlated Color Temperature 3001 K

x: 0.4392 u: 0.2500 u': 0.2500
y: 0.4088 v: 0.3490 v': 0.5236

ResultsCRICRI01	66.4	ResultsCRICRI09	-33.3
ResultsCRICRI02	80.1	ResultsCRICRI10	53.3
ResultsCRICRI03	91.5	ResultsCRICRI11	58.8
ResultsCRICRI04	66.0	ResultsCRICRI12	40.2
ResultsCRICRI05	64.8	ResultsCRICRI13	68.7
ResultsCRICRI06	71.3	ResultsCRICRI14	95.0
ResultsCRICRI07	78.5	ResultsCRICRI15	59.3
ResultsCRICRI08	44.0	ResultsCRICRI16	58.9
ResultsCRI	70.3		



Nominal CCT: 3000K

PlanckDistance 1.6E-003

4.0 LM-79 Measurement and Test Results

4.3 Goniophotometer Test

Model No.	HNLED13Y	Sample ID.	U1
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 ± 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° vertical intervals and 10° horizontal intervals.

Test Conditions

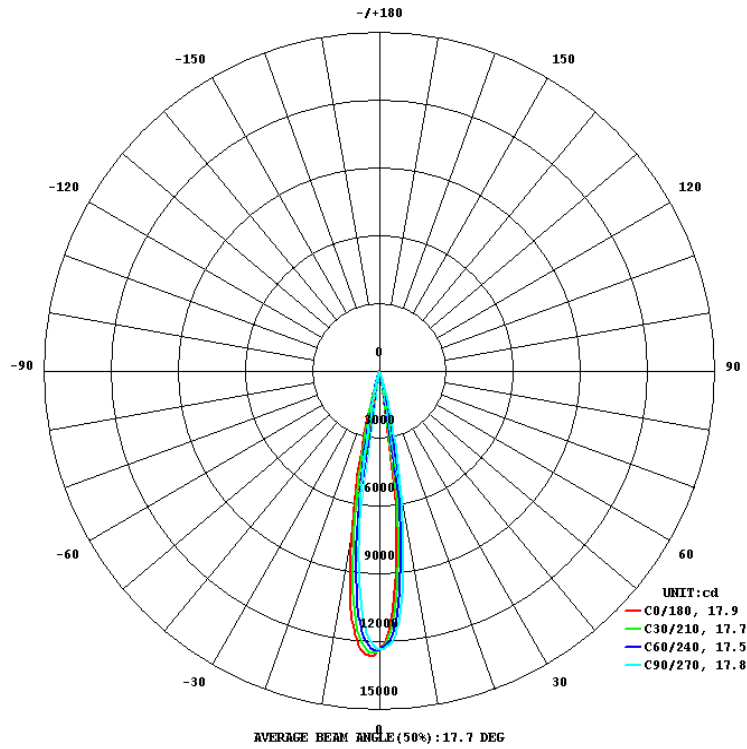
Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.1	277.00	60	0.059	15.52	0.946	Light Down

Test Result

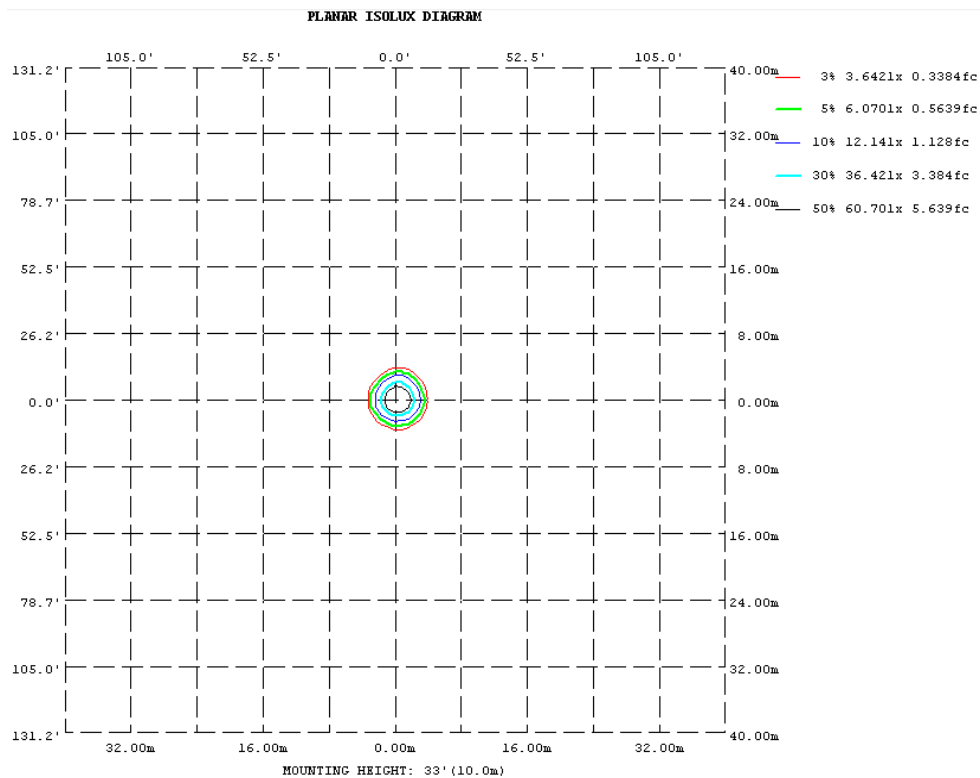
Flux(lm)	Zonal Lumen Requirement (0° - 90°)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
1583	100.00%	30.4	30.5	17.8	17.9	102.0

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	730.9	578.4	438.7	378.4	320.4	416.0	557.9	660.1
20	58.53	48.88	35.52	32.19	30.68	34.68	49.78	60.48
30	14.64	14.30	13.29	12.51	11.77	12.53	13.97	14.78
40	8.679	7.735	7.602	7.238	6.984	7.602	7.751	7.938
50	6.135	5.646	5.547	5.333	5.164	5.559	5.662	5.814
60	4.234	4.078	3.832	3.659	3.681	3.896	3.975	4.067
70	2.412	2.217	1.908	1.757	1.674	1.863	2.081	2.202
80	0.6258	0.5133	0.3411	0.3169	0.2662	0.3316	0.4059	0.5185
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: *10cd less than 35% Percent = 2.1 %							

4.3 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0 - 10	800.05	0 - 10	800.05	50.54%
10 - 20	480.40	0 - 20	1280.45	80.89%
20 - 30	106.14	0 - 30	1386.59	87.59%
30 - 40	62.10	0 - 40	1448.69	91.51%
40 - 50	50.10	0 - 50	1498.79	94.68%
50 - 60	41.22	0 - 60	1540.02	97.28%
60 - 70	29.14	0 - 70	1569.15	99.12%
70 - 80	12.24	0 - 80	1581.39	99.90%
80 - 90	1.65	0 - 90	1583.05	100.00%
90 - 100	0.00	0 - 100	1583.05	100.00%
100 - 110	0.00	0 - 110	1583.05	100.00%
110 - 120	0.00	0 - 120	1583.05	100.00%
120 - 130	0.00	0 - 130	1583.05	100.00%
130 - 140	0.00	0 - 140	1583.05	100.00%
140 - 150	0.00	0 - 150	1583.05	100.00%
150 - 160	0.00	0 - 160	1583.05	100.00%
160 - 170	0.00	0 - 170	1583.05	100.00%
170 - 180	0.00	0 - 180	1583.05	100.00%

4.3 Goniophotometer Test

Axial Candela

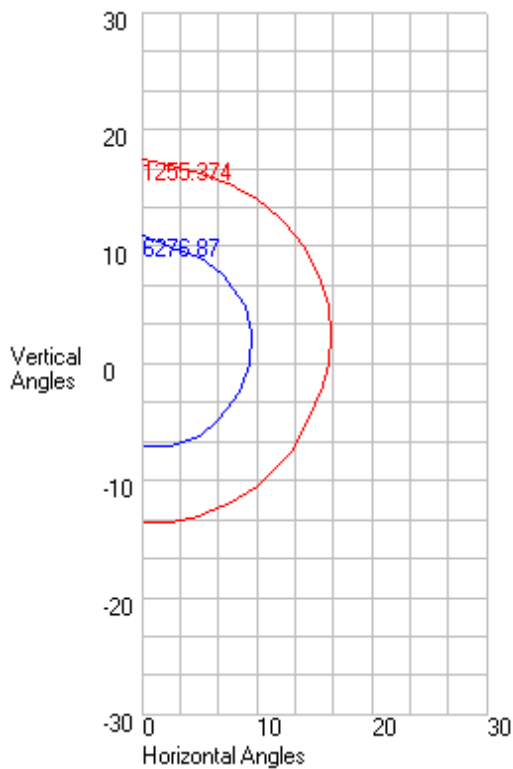
DEG.	HOR.	DEG.	VERT.
90	0	90	0.01
85	0.26	85	1.49
75	11.27	75	13.93
65	31.5	65	34.78
55	46.95	55	50.78
47.5	61.34	47.5	66.96
42.5	71.16	42.5	78.88
37.5	85.81	37.5	97.58
33	114.84	33	124.52
29	149.35	29	156.86
25.5	212.3	25.5	238.07
22.5	328.27	22.5	358.36
19.5	549.21	19.5	665.37
17	946.22	17	1339.16
15	1684.12	15	2422.63
13	2865.02	13	4141.04
11	4593.31	11	6160.89
9	6663.15	9	8551.84
7	8891.35	7	10675.3
5	10795.82	5	11985.3
3	11944.94	3	12553.74
1	12264.81	1	12511.15
0	12324.38	0	12324.38
-1	12235.29	-1	12059.17
-3	11614.02	-3	10763.44
-5	10158.84	-5	8679.24
-7	7840.63	-7	6319.23
-9	5447.62	-9	4183.73
-11	3327.19	-11	2356.51
-13	1762.34	-13	1382.66
-15	972.01	-15	766.72
-17	607.92	-17	497.98
-19.5	383.02	-19.5	327.71
-22.5	258.74	-22.5	222.51
-25.5	182.21	-25.5	159.71
-29	141.11	-29	125.04
-33	110.73	-33	96.54
-37.5	84.11	-37.5	76.37
-42.5	70.09	-42.5	64.86
-47.5	60.36	-47.5	56.23
-55	45.18	-55	43.01
-65	29.48	-65	27.12
-75	9.99	-75	8.33
-85	0.16	-85	0.17
-90	0	-90	0

4.3 Goniophotometer Test

Characteristics

NEMA Type	3 H x 3 V
Maximum Candela	12553.74
Maximum Candela Angle	0 H 3 V
Horizontal Beam Angle (50%)	17.8
Vertical Beam Angle (50%)	17.9
Horizontal Field Angle (10%)	30.6
Vertical Field Angle (10%)	30.7
Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Beam Lumens	719
Beam Efficiency	N.A.
Field Lumens	1168
Field Efficiency	N.A.
Spill Lumens	415
Luminaire Lumens	1583
Total Efficiency	N.A.
Total Luminaire Watts	15.5231
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	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
85	1.49	1.46	1.39	1.32	1.26	1.19	1.12	0.99	0.91	0.89	0.86	0.81	0.76	0.7	0.59	0.47	0.33	0.2	0.07	0.01	0	0	0
75	13.93	13.83	13.62	13.41	12.99	12.65	12.28	11.88	11.54	11.27	10.93	10.5	10.02	9.4	8.56	7.59	6.44	5.19	3.35	1.26	0.1	0	0
65	34.78	34.61	34.28	33.74	33.21	32.62	31.95	31.22	30.66	30.15	29.48	28.42	27.37	25.66	23.66	21.17	18.23	15.19	10.66	5.03	1.06	0.01	0
55	50.78	50.59	50.22	49.53	48.87	48.13	47.3	46.55	45.96	45.34	44.52	43.46	42.32	40.86	38.93	36.22	32.4	27.78	20.13	10.36	2.82	0.01	0
47.5	66.96	66.77	66.4	65.57	64.77	63.83	62.76	61.7	60.54	59.31	57.72	55.62	53.53	50.92	47.74	44.3	40.32	36.16	27.6	14.8	4.44	0.03	0
42.5	78.88	78.62	78.1	76.99	75.93	74.72	73.43	72.31	70.74	68.74	66.75	64.23	61.61	58.5	54.8	49.92	44.72	40.12	32.16	17.69	5.55	0.05	0
37.5	97.58	97.01	95.4	93.46	91.43	88.77	86.71	84.45	82.08	79.86	77.13	72.77	69.67	65.79	61.12	55.67	49.32	43.63	35.86	20.55	6.66	0.08	0
33	124.52	123.74	121.48	118.72	115.36	112.5	109.74	105.42	100.88	96.13	89.69	82.94	77.6	72.06	66.4	60.32	53.45	46.72	38.43	22.93	7.62	0.11	0
29	156.86	155.46	151.27	146.34	140.87	138.08	134.9	131.11	125.54	119.28	109.92	98.33	87.3	78.91	71.08	64.13	56.89	49.63	40.19	24.87	8.43	0.14	0
25.5	238.07	234.69	223.01	207.57	192.25	184.24	174.38	164.28	153.55	143.92	130.57	115.72	100.79	86.26	75.62	67.16	59.67	52.02	41.51	26.55	9.07	0.16	0
22.5	358.36	353.24	333.58	309.69	291.5	275.21	254.26	228.54	200.26	176.25	153.46	132.65	114.09	95.78	80.11	70.02	61.93	53.9	42.55	27.59	9.55	0.18	0
19.5	665.37	648.04	583.6	508.57	472	430.76	383.86	330.62	281.74	237.97	190.75	152.71	127.41	105.49	85.62	73.16	63.73	55.57	43.53	28.61	9.99	0.2	0
17	1339.16	1299.68	1123.19	931.74	810.62	689.02	569.87	464.75	379.15	308.37	237.7	175.71	141.42	113.89	90.88	75.38	65.19	56.79	44.29	29.29	10.31	0.22	0
15	2422.63	2305.28	1939.84	1666.53	1433.7	1125.2	825.94	632.59	494.76	378.45	281.84	200.35	152.25	120.46	95.4	77.33	66.41	57.72	44.84	29.81	10.57	0.23	0
13	4141.04	3918.74	3199.07	2751.49	2266.01	1742.08	1316.77	883.44	633.04	466.45	331.99	229.01	164.28	127.4	100.03	79.24	67.45	58.55	45.38	30.25	10.74	0.24	0
11	6160.89	5843.67	4872.89	4417.31	3608.96	2704.57	1861.24	1318.93	831.71	574.51	384.67	257.08	177.55	134.24	104.78	81.11	68.25	59.27	45.8	30.63	10.91	0.27	0
9	8551.84	8088.78	6947.09	6204.69	5134.09	3946.08	2714.65	1746.35	1137.53	698.39	442.31	282.67	190.84	140.28	108.2	82.74	69.09	59.89	46.19	30.94	11.04	0.27	0
7	10675.3	10156.9	9133.2	8208 *	6723.72	5141.67	3640.55	2281.95	1430.98	824.11	494.16	306.23	203.21	144.73	110.57	84.2	69.81	60.41	46.51	31.18	11.15	0.27	0
5	11985.3	11530.3	10827.5	9750.55	8112.67	6157.43	4408.1	2747.32	1650.09	934.17	538.79	323.66	210.95	147.74	112.73	84.99	70.4	60.82	46.74	31.35	11.32	0.26	0
3	12553.7	12071.1	11762.5	10655.7	8853.42	6768.45	4801.62	3034.91	1760.2	1002.78	560.66	331.49	214.88	149.37	114.14	85.6	71.02	61.26	46.99	31.54	11.3	0.26	0
1	12511.1	12414.7	11972.9	10983.7	9108.11	6893.19	4787.69	3011.33	1747.35	992.86	561.29	332.42	214.71	149.83	114.9	85.87	71.11	61.31	46.96	31.51	11.28	0.26	0
0	12324.3	12264.8	11944.9	10795.8	8891.35	6663.15	4593.31	2865.02	1684.12	946.22	549.21	328.27	212.3	149.35	114.84	85.81	71.16	61.34	46.95	31.5	11.27	0.26	0
-1	12059.1	12098.7	11643.6	10524.3	8614.35	6406.62	4385.83	2718.21	1605.64	909.66	533.86	322.14	209.47	148.6	114.62	85.77	71.17	61.34	46.91	31.48	11.26	0.26	0
-3	10763.4	10851.5	10428.5	9204.5	7406.88	5417.3	3619.77	2202.04	1342.39	791.52	483.4	301.92	199.79	145.8	113.3	85.31	71.2	61.34	46.82	31.45	11.24	0.26	0
-5	8679.24	8902.47	8403.49	7398.12	5937.43	4278.72	2869.09	1731.45	1035.88	663.2	424.85	277.92	187.65	142.11	111.32	84.58	70.72	60.95	46.46	31.2	11.22	0.26	0
-7	6319.23	6478.93	6096.77	5413.69	4274.22	3067.2	1990.7	1308.06	796.1	545.95	369.08	249.35	174.56	137.52	108.53	83.72	70.26	60.58	46.11	30.96	11.01	0.26	0
-9	4183.73	4318.82	4098.54	3526.11	2749.56	1968.81	1405.95	876	599.73	439.39	316.37	220.54	161.83	132	105.4	82.26	69.69	60.09	45.68	30.65	10.86	0.26	0
-11	2356.51	2449.46	2315.62	2036.96	1649.07	1261.9	866.38	632.28	470.65	357.41	268.36	191.67	151.01	125.66	100.93	80.74	68.97	59.48	45.18	30.27	10.68	0.26	0
-13	1382.66	1419.78	1362.2	1193.93	951.58	770.63	602.34	468.33	369.28	297.38	227.94	166.99	141.32	119.76	95.61	79.02	68.25	58.74	44.64	29.82	10.48	0.22	0
-15	766.72	782.69	762.64	706.15	625.03	529.33	439.73	359.1	300.21	247.71	192.2	151.52	131.8	113.13	91.3	77.25	67.23	57.87	44	29.3	10.28	0.21	0
-17	497.98	506.51	498.86	472.55	431.97	382.65	332.87	286.37	243.26	202.8	165.6	141.9	123.75	106.23	87.58	75.48	65.9	56.86	43.36	28.72	9.98	0.2	0
-19.5	327.71	331.48	328.92	317.81	299.9	276.26	248.09	216.6	186.99	164.48	146.58	129.56	115	97.21	83.42	73.48	64.3	55.41	42.54	27.94	9.62	0.18	0
-22.5	222.51	224.08	221.56	214.95	203.68	190.11	176.03	162.97	151.34	141.43	129.08	116.47	102.84	89.26	78.92	70.61	62.28	53.32	41.6	26.78	9.14	0.16	0
-25.5	159.71	160.42	159.74	157.43	153.66	148.7	142.96	136.4	129	121.77	113.52	101.96	91.33	82.36	74.81	67.83	59.66	51.03	40.7	25.63	8.61	0.14	0
-29	125.04	125.5	125.34	124.33	122.41	119.51	115.95	112.22	106.67	100.68	93.73	87.79	81.82	76.23	70.44	64.27	56.33	48.07	39.57	23.8	7.93	0.12	0
-33	96.54	96.81	96.54	95.6	94	92.32	90.24	87.66	85.45	83.22	80.29	76.84	73.73	70.13	65.39	59.46	52.04	44.67	37.78	21.72	7.09	0.09	0
-37.5	76.37	76.59	76.73	76.63	76.42	75.76	75.01	74.09	73.09	72	70.72	68.58	66.33	63.53	59.3	53.58	46.79	41.87	34.84	19.2	6.11	0.07	0
-42.5	64.86	65.06	65.47	65.43	65.42	65.27	64.95	64.6	63.95	63.03	61.91	60.39	58.24	55.38	51.46	46.43	42.22	39.13	30.53	16.26	4.99	0.04	0
-47.5	56.23	56.39	56.7	56.66	56.62	56.47	56.2	55.7	55.03	54.21	52.98	51.22	49.22	46.64	43.79	41.55	38.94	34.62	25.54	13.35	3.89	0.02	0
-55	43.01	43.06	43.16	43.05	42.94	42.76	42.53	42.25	41.89	41.53	41.04	40.43	39.7	38.58	36.72	33.83	29.71	25.04	17.74	8.94	2.33	0.01	0
-65	27.12	27.17	27.27	27.14	27.03	26.84	26.59	26.28	25.9	25.46	24.87	23.91	22.97	21.44	19.69	17.54	15.03	12.46	8.58	3.92	0.72	0.01	0
-75	8.33	8.35	8.4	8.44	8.33	8.27	8.18	8.07	7.96	7.78	7.56	7.25	6.9	6.43	5.87	5.17	4.32	3.43	2.11	0.68	0.04	0	0
-85	0.17	0.17	0.18	0.18	0.19	0.19	0.2	0.18	0.18	0.18	0.17	0.16	0.14	0.12	0.09	0.06	0.03	0.01	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	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	0.1	0.1	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	
75		0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0	0	0	
65		0.1	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0	0	
55		0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.2	0.1	0	0	
47.5		0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0	0	
42.5		0.1	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0	0	
37.5		0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.1	0	0	
33		0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.1	0	0	
29		0.2	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0	0	
25.5		0.3	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0	0	
22.5		0.5	0.9	0.8	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0	0	
19.5		0.8	1.4	1.2	1	0.9	0.7	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0	0	
17		1.12 *	2.05 *	1.72 *	1.4	1.1	0.9	0.7	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0	0	0	
15		1.96 *	3.54 *	2.95 *	2.36 *	1.79 *	1.3	1	0.7	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0	0	0	
13		3.08 *	5.61 *	4.77 *	3.85 *	2.83 *	1.96 *	1.34 *	0.9	0.6	0.6	0.5	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0	0	0	
11		4.40 *	8.07 *	6.97 *	5.71 *	4.24 *	2.88 *	1.86 *	1.21 *	0.8	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0	0	0	
9		5.76 *	10.68 *	9.34 *	7.70 *	5.79 *	3.96 *	2.50 *	1.54 *	1	0.8	0.6	0.4	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0	0	0	
7		6.81 *	12.87 *	11.52 *	9.59 *	7.24 *	5.01 *	3.15 *	1.87 *	1.1	0.9	0.6	0.4	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0	0	0	
5		7.38 *	14.18 *	12.97 *	10.91 *	8.31 *	5.78 *	3.65 *	2.12 *	1.24 *	0.9	0.7	0.4	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0	0	0	
3		7.57 *	14.70 *	13.60 *	11.53 *	8.82 *	6.13 *	3.86 *	2.23 *	1.28 *	0.9	0.7	0.4	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0	0	0	
1		3.77 *	7.36 *	6.81 *	5.78 *	4.41 *	3.06 *	1.91 *	1.10 *	0.63 *	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	
0																								

-1	3.71 *	7.24 *	6.68 *	5.64 *	4.29 *	2.96 *	1.83 *	1.05 *	0.61 *	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	
-3	6.98 *	13.63 *	12.44 *	10.39 *	7.85 *	5.36 *	3.28 *	1.90 *	1.1	0.8	0.6	0.4	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0	0	0	
-5	6.01 *	11.78 *	10.59 *	8.74 *	6.53 *	4.40 *	2.67 *	1.55 *	1	0.7	0.6	0.4	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0	0	0	
-7	4.67 *	9.19 *	8.24 *	6.77 *	4.98 *	3.30 *	2.03 *	1.2	0.8	0.6	0.5	0.3	0.3	0.3	0.2	0.2	0.1	0.2	0.1	0	0	0	
-9	3.27 *	6.50 *	5.82 *	4.69 *	3.41 *	2.27 *	1.45 *	0.9	0.6	0.6	0.5	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0	0	0	
-11	2.04 *	4.12 *	3.69 *	2.92 *	2.14 *	1.49 *	1	0.7	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0	0	0	
-13	1.17 *	2.35 *	2.13 *	1.72 *	1.3	1	0.7	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0	0	0	
-15	0.7	1.3	1.2	1	0.9	0.7	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0	0	0	
-17	0.4	0.8	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0	0	0	
-20	0.3	0.6	0.6	0.6	0.5	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0	0	
-23	0.3	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0	0	
-26	0.2	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0	0	
-29	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0	0	
-33	0.1	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0	0	
-38	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.1	0	0	
-43	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.1	0	0	
-48	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0	0	
-55	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0	0	
-65	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0	0	0	
-75	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	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	75	144	130	109	84	60	40	27	19	17	15	12	11	10	9.5	8.5	6.8	7.4	5.5	1.8	0.2	0	791.4

5.0 THD and PF Test

Model No.	HNLED13Y	Sample ID.	U1
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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	276.98	60	0.060	15.56	0.942	8.91%
25.1	120.08	60	0.122	14.55	0.995	5.83%

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*****