

Photometric Test Report

Relevant Standards

- ☒ IES LM-79-2008
- ☒ ANSI C82.77:2017

Prepared For

RAB Lighting Inc.

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

Xiao Xiang, 15921313292, Gary.Xiao@rabweb.com

Prepared By

Deliver Co., Ltd.

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

0512-66801950, kevin.jia@szdeliver.com

Project Number

DLF2110111

Report Number

DLF2110111-16a

Test Date

2021/10/28

Issue Date

2021/11/1

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 v5.1

Outdoor - Architectural Flood and Spot Luminaires				
Requirement Category	Test Method	Requirements		Test value
Luminaire Output (lm) (Goniophotometer - Section 4.2)	IES LM-79-2008	1000		38662
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 105	Premium 120	149.1
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		259.3
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	2.34%
		20.00%	277V	5.38%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.999
		0.9	277V	0.964
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	5029±355	5058
		4 step	5029±220	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥70		82
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥-40		2
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥70		82
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥89		96
Minimum IES Rcs,h1 (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	-18%≤IES Rcs,h1≤+23%		-13%
Zonal Lumen Requirement (0°-90°) (Goniophotometer - Section 4.2)	IES LM-79-2008	85%		99.89%
Input Voltage (V)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		120
(Goniophotometer - Section 4.2)		Non-Worst Case		277
Input Current (A)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		2.164
(Goniophotometer - Section 4.2)		Non-Worst Case		0.941
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		259.3
(Goniophotometer - Section 4.2)		Non-Worst Case		251.4

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2021/10/28	FFLEDL @ 230W / 5000K	P1
2	Goniophotometer Test	2021/10/28	FFLEDL @ 230W / 5000K	P1
3	THD and PF Test	2021/10/28	FFLEDL @ 230W / 5000K	P1

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: FFLEDL @ 230W / 5000K

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

Photos of Luminaire Characteristics



4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test

Model No.	FFLEDL @ 230W / 5000K	Sample ID.	P1
Operate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.4	Humidity (%RH)	54.0

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 Result

Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.00	60	2.163	259.3	0.999
276.95	60	0.937	250.3	0.964

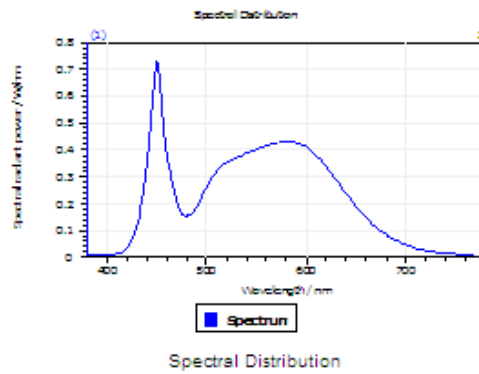
Test Result

CCT (K)	CRI	R9	Duv
5058	82	2	0.0025

Rf	Rg	IES Rcs,h1
82	96	-13%

4.1 Integrating Sphere Test

Results



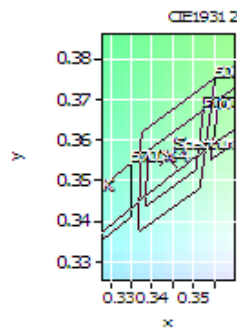
Spectral values

DominantWavelength 569.49 nm
Purity 0.099
PeakWavelength 450.32 nm
Radiant Power 83.75 W
Width50%:

Color Coordinates

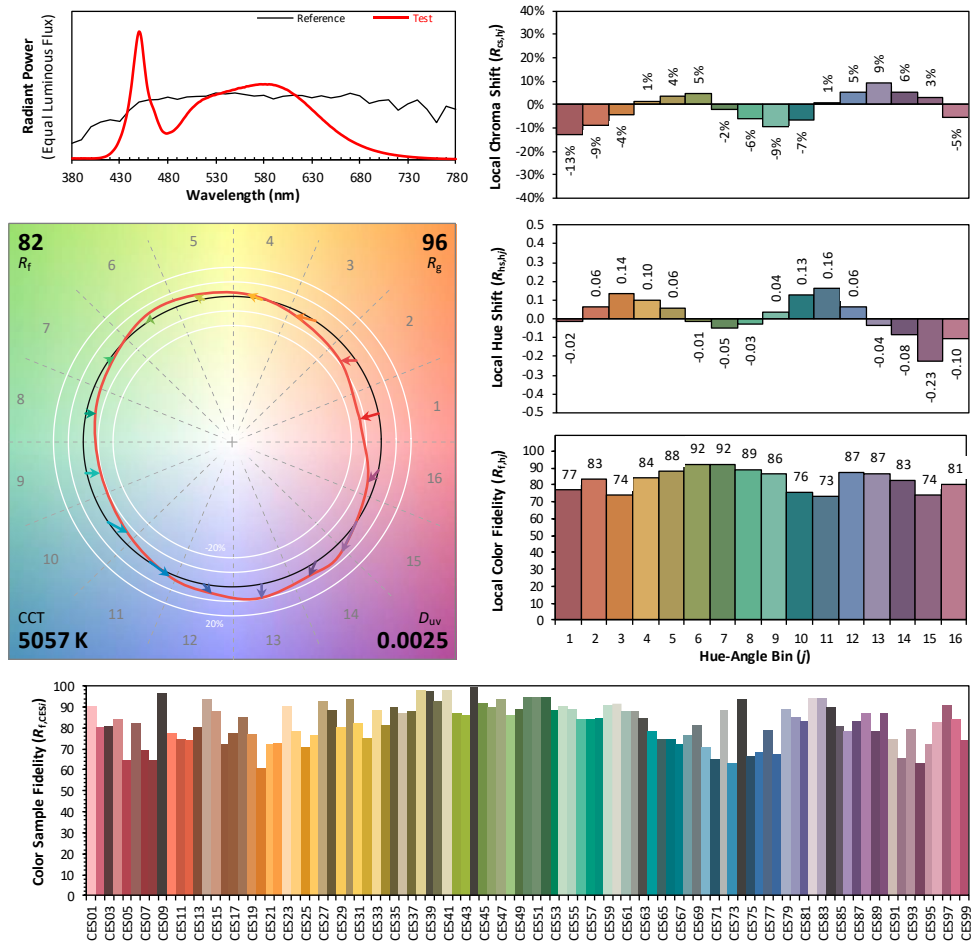
Correlated Color Temperatur 5058 K
x: 0.3439 u: 0.2091 u': 0.2091
y: 0.3557 v: 0.3243 v': 0.4865

CRI01	79.8	CRI09	1.7
CRI02	86.2	CRI10	67.1
CRI03	90.8	CRI11	81.8
CRI04	82.3	CRI12	59.9
CRI05	80.7	CRI13	81.2
CRI06	80.8	CRI14	95.0
CRI07	86.3	CRI15	73.9
CRI08	66.1	CRI16	73.1
ResultsCRI	81.6		



PlankDistance 2.5E-003

4.1 Integrating Sphere Test



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0.3439
 y 0.3557
 u' 0.2091
 v' 0.4865

CIE 13.3-1995
(CRI)

R_a 81
 R_9 0

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.0

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	FFLEDL @ 230W / 5000K	Sample ID.	P1
Operate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.3	Humidity (%RH)	54.0

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

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WORST CASE	119.96	60	2.164	259.3	0.999
NON-WORST CASE	277.01	60	0.941	251.4	0.964

Test Result

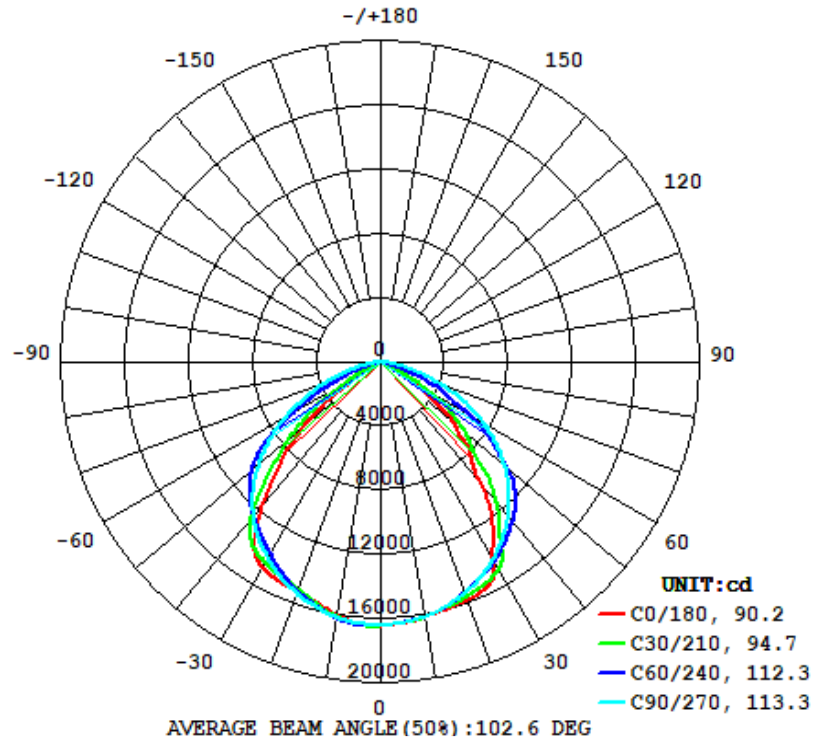
Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
38662	118.8	153.0	90.2	113.3	149.1

Zonal Lumen Requirement (0° - 90°)

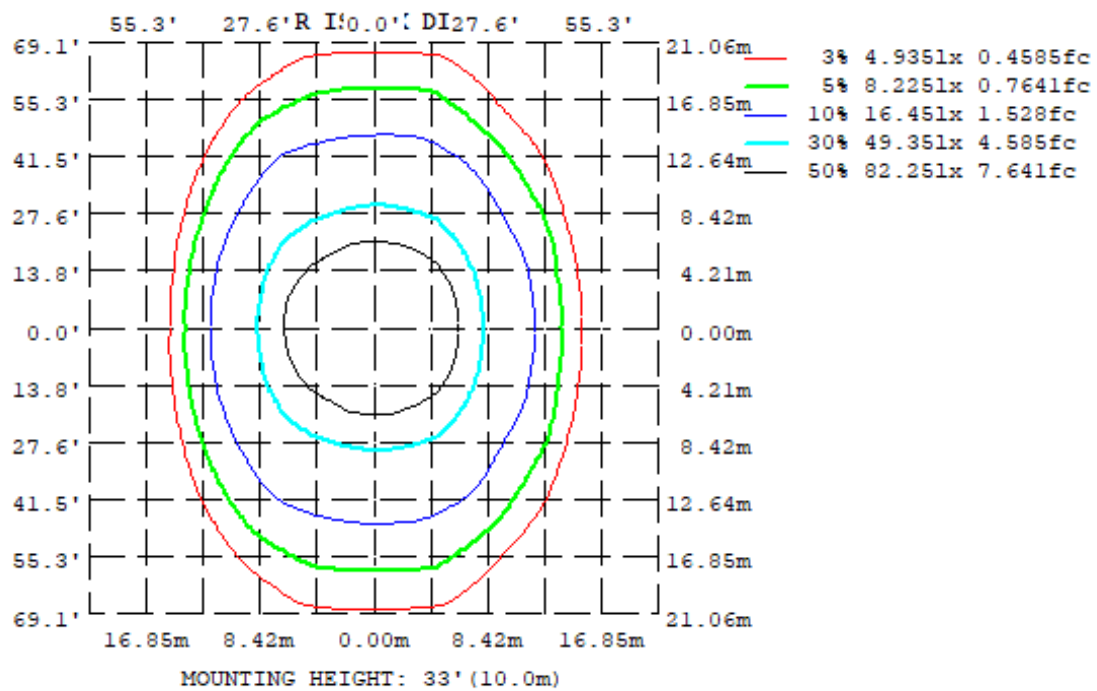
99.89%

4.2 Goniophotometer Test

Light Distrubtion Curve



Isolux Plot



4.2 Goniophotometer Test

Zonal Lumen Summary

γ	C0	C45	C90	C135	C180	C225	C270	C315
10	1613	1613	1610	1602	1605	1612	1616	1614
20	1579	1543	1535	1501	1522	1508	1537	1541
30	1417	1463	1417	1410	1481	1409	1412	1461
40	952.1	1247	1249	1300	1142	1299	1241	1210
50	614.7	834.7	1026	936.9	648.6	931.5	998.9	768.1
60	155.5	456.0	729.6	471.4	130.3	444.5	691.1	434.5
70	5.969	56.96	393.8	52.44	20.72	43.30	355.2	37.87
80	0.1595	0.4135	86.66	11.36	2.927	8.844	57.65	0.1701
90	0.0997	0.2075	0.2344	0.4572	0.2493	0.3500	0.1089	0.0884
100	0.1267	0.2554	0.3063	0.3840	0.6449	0.3362	0.3016	0.1733
110	0.2713	0.4145	0.5313	0.4047	0.2256	0.3902	0.5080	0.3301
120	0.4888	0.5741	0.6784	0.5431	0.3665	0.5063	0.6389	0.4678
130	0.7678	0.7379	0.8603	0.7397	0.6192	0.6889	0.8467	0.6753
140	0.9932	0.9486	0.9928	0.9313	0.9532	1.002	1.053	0.9805
150	1.164	1.152	1.042	1.100	1.125	1.155	1.204	1.196
160	1.280	1.213	1.118	1.170	1.349	1.264	1.234	1.296
170	1.290	1.207	1.134	1.186	1.245	1.240	1.155	1.163
180	1.447	1.330	1.215	1.342	1.401	1.368	1.280	1.318
DEG	LUMINOUS INTENSITY: *10cd							

	Zonal (lm)		Total (lm)	Percent
0-10	1553.70	0 - 10	1553.70	4.02%
10-20	4454.52	0 - 20	6008.23	15.54%
20-30	6896.29	0 - 30	12904.52	33.38%
30-40	8363.93	0 - 40	21268.45	55.01%
40-50	7974.21	0 - 50	29242.66	75.64%
50-60	5869.59	0 - 60	35112.25	90.82%
60-70	2740.98	0 - 70	37853.24	97.91%
70-80	721.04	0 - 80	38574.28	99.77%
80-90	46.33	0 - 90	38620.61	99.89%
90-100	4.14	0 - 100	38624.74	99.90%
100-110	3.33	0 - 110	38628.08	99.91%
110-120	4.43	0 - 120	38632.50	99.92%
120-130	5.64	0 - 130	38638.14	99.94%
130-140	6.70	0 - 140	38644.84	99.96%
140-150	6.70	0 - 150	38651.54	99.97%
150-160	5.57	0 - 160	38657.11	99.99%
160-170	3.48	0 - 170	38660.59	100.00%
170-180	1.19	0 - 180	38661.78	100.00%

4.2 Goniophotometer Test

Axial Candela

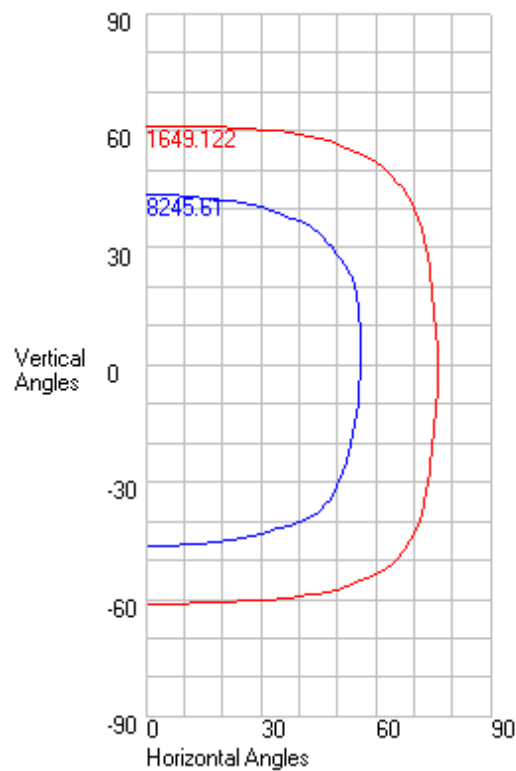
DEG.	HOR.	DEG.	VERT.
90	1.091	90	1.002
85	30.1	85	1.55
75	1886.68	75	4.6
65	5231.12	65	258.39
55	8540	55	3800.68
47.5	10653.835	47.5	6891.905
42.5	11869.83	42.5	8603.555
37.5	12911.575	37.5	11312.04
33	13669.03	33	13130.86
29	14277.63	29	14840.44
25.5	14760.425	25.5	15517.865
22.5	15116.925	22.5	15708.785
19.5	15418.825	19.5	15807.505
17	15645.33	17	15881.26
15	15814.67	15	15941.7
13	15968.02	13	15988.73
11	16099.67	11	16062.34
9	16209.3	9	16197.73
7	16295.68	7	16294.44
5	16356.41	5	16336.43
3	16385.801	3	16363.89
1	16394.801	1	16415.98
0	16394.83	0	16394.83
-1	16376.87	-1	16476.279
-3	16345.42	-3	16491.221
-5	16296.3	-5	16406.99
-7	16231	-7	16247.6
-9	16149.86	-9	16108.26
-11	16049.63	-11	15961.93
-13	15921.48	-13	15730.98
-15	15774.48	-15	15537.42
-17	15619.56	-17	15386.74
-19.5	15395.765	-19.5	15244.625
-22.5	15096.96	-22.5	15169.725
-25.5	14761.195	-25.5	15081.865
-29	14315.34	-29	14890.17
-33	13719.81	-33	14356.02
-37.5	12954.175	-37.5	12757.665
-42.5	11980.81	-42.5	10049.485
-47.5	10865.03	-47.5	7741.47
-55	8868.29	-55	3661.58
-65	5648.6	-65	336.01
-75	2296.63	-75	117.55
-85	54.73	-85	26.06
-90	2.344	-90	2.48

4.2 Goniophotometer Test

Characteristics

NEMA Type	7 H x 6 V
Maximum Candela	16491.221
Maximum Candela Angle	0 H -3 V
Horizontal Beam Angle (50%)	112.9
Vertical Beam Angle (50%)	90
Horizontal Field Angle (10%)	154.1
Vertical Field Angle (10%)	122.1
Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Beam Lumens	30437
Beam Efficiency	N.A.
Field Lumens	38063
Field Efficiency	N.A.
Spill Lumens	599
Luminaire Lumens	38662
Total Efficiency	N.A.
Total Luminaire Watts	259.283
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	1.002	0.986	0.952	0.919	0.886	0.852	0.819	0.786	0.752	0.756	0.761	0.767	0.773	0.78	0.802	0.832	0.865	0.895	0.935	0.951	0.93	1.037	1.09
85	1.55	1.539	1.518	1.496	1.475	1.454	1.432	1.406	1.383	1.38	1.376	1.372	1.367	1.361	1.376	1.401	1.412	1.435	1.495	1.374	1.05	1.085	1.09
75	4.6	4.635	4.704	4.773	4.893	4.955	4.887	4.323	4.099	4.183	5.693	5.779	5.292	3.435	6.991	7.731	2.774	8.925	7.794	10.728	1.408	1.228	1.09
65	258.39	266.549	282.863	289.078	294.652	295.655	291.605	282.045	285.936	297.182	302.386	286.373	260.716	267.12	287.869	255.305	213.967	282.341	181.083	184.399	30.047	1.46	1.091
55	3800.68 *	3821.204 *	3862.228 *	3840.835 *	3822.222 *	3784.12 *	3726.82 *	3704.591 *	3716.338 *	3675.072 *	3568.515 *	3430.328 *	3293.372 *	3243.356 *	3097.786 *	2714.901 *	2406.242 *	2118.752 *	1512.133	833.295	160.613	1.702	1.091
47.5	6891.905 *	6919.433 *	6949.411 *	6941.001 *	6888.482 *	6811.594 *	6707.59 *	6669.523 *	6684.24 *	6710.732 *	6598.143 *	6257.173 *	6086.175 *	6009.955 *	5801.628 *	5181.924 *	4720.041 *	4074.876 *	3189.021 *	1615.075	384.58	2.129	1.091
42.5	8603.555 *	8615.62 *	8622.898 *	8606.313 *	8564.342 *	8505.438 *	8468.044 *	8455.578 *	8358.372 *	8236.92 *	8064.542 *	7998.916 *	7983.033 *	7533.338 *	6993.28 *	6871.147 *	6251.787 *	5200.514 *	4270.244 *	2339.638 *	568.736	2.459	1.091
37.5	11312.04 *	11334.949 *	11351.12 *	11329.848 *	11296.147 *	11163.582 *	11093.138 *	10946.103 *	10792.136 *	10649.139 *	10542.357 *	10167.026 *	9765.514 *	9616.192 *	9111.923 *	8263.509 *	7799.3 *	6805.666 *	5341.958 *	3057.139 *	804.045	2.814	1.091
33	13130.86 *	13144.74 *	13133.165 *	13094.501 *	13027.798 *	12978.151 *	12855.711 *	12715.232 *	12581.632 *	12442.458 *	12333.533 *	11982.637 *	11610.827 *	11253.027 *	10767.299 *	10107.617 *	9088.258 *	7920.168 *	6173.131 *	3625.174 *	995.005	7.336	1.091
29	14840.44 *	14852.12 *	14796.381 *	14708.406 *	14605.478 *	14466.842 *	14336.932 *	14278.373 *	14154.767 *	13815.955 *	13515.791 *	13407.782 *	13211.194 *	12310.934 *	11869.164 *	11403.201 *	9972.236 *	8749.116 *	6902.631 *	4019.719 *	1155.418	11.725	1.091
25.5	15517.865 *	15500.807 *	15457.539 *	15403.124 *	15327.112 *	15231.314 *	15118.603 *	14998.591 *	14853.015 *	14674.44 *	14432.599 *	14132.518 *	13783.628 *	13253.109 *	12565.539 *	12071.387 *	10756.681 *	9331.566 *	7533.379 *	4316.677 *	1295.69	15.267	1.091
22.5	15708.785 *	15690.488 *	15648.56 *	15600.585 *	15525.258 *	15435.369 *	15336.676 *	15219.622 *	15070.193 *	14911.149 *	14697.423 *	14399.228 *	14021.199 *	13569.016 *	13027.673 *	12278.856 *	11173.793 *	9738.594 *	8017.39 *	4542.381 *	1404.585	18.061	1.091
19.5	15807.505 *	15789.344 *	15748.812 *	15702.332 *	15632.479 *	15550.094 *	15455.591 *	15330.734 *	15188.61 *	15031.626 *	14826.682 *	14527.403 *	14165.923 *	13709.908 *	13197.297 *	12424.966 *	11371.231 *	10074.859 *	8185.007 *	4762.404 *	1503.484	20.614	1.091
17	15881.26 *	15865.505 *	15825.917 *	15777.529 *	15713.389 *	15635.765 *	15530.782 *	15405.868 *	15266.418 *	15110.33 *	14901.911 *	14609.985 *	14249.912 *	13809.467 *	13280.187 *	12517.047 *	11491.213 *	10305.465 *	8305.123 *	4915.985 *	1578.782	22.543	1.091
15	15941.7 *	15923.934 *	15881.042 *	15834.412 *	15777.744 *	15700.48 *	15591.412 *	15465.553 *	15332.518 *	15172.881 *	14957.293 *	14661.431 *	14325.042 *	13888.364 *	13337.278 *	12571.075 *	11555.124 *	10400.148 *	8385.415 *	5013.406 *	1633.808	23.951	1.091
13	15988.73 *	15969.13 *	15923.27 *	15885.16 *	15834.801 *	15757.514 *	15646.456 *	15525.063 *	15397.379 *	15233.719 *	15006.672 *	14734.414 *	14418.2 *	13962.636 *	13393.152 *	12607.264 *	11644.293 *	10482.159 *	8458.309 *	5089.694 *	1684.062 *	25.231	1.091
11	16062.34 *	16043.76 *	15988.497 *	15969.62 *	15913.984 *	15839.106 *	15721.924 *	15616.131 *	15480.453 *	15303.352 *	15077.268 *	14828.736 *	14503.48 *	14031.268 *	13436.388 *	12661.605 *	11705.738 *	10549.514 *	8502.747 *	5150.364 *	1729.425 *	28.744	1.091
9	16197.73 *	16174.067 *	16118.269 *	16095.639 *	16041.898 *	15961.398 *	15851.881 *	15729.322 *	15575.087 *	15399.484 *	15180.839 *	14911.734 *	14579.661 *	14087.229 *	13502.984 *	12742.797 *	11769.398 *	10602.168 *	8540.965 *	5195.949 *	1769.787 *	28.988	1.091
7	16294.44 *	16263.412 *	16224.395 *	16197.901 *	16148.968 *	16058.079 *	15961.375 *	15827.299 *	15660.94 *	15489.401 *	15271.036 *	14992.776 *	14647.068 *	14155.497 *	13558.624 *	12818.47 *	11817.895 *	10640.158 *	8565.85 *	5227.026 *	1805.032 *	29.234	1.091
5	16336.43 *	16282.002 *	16263.416 *	16239.511 *	16183.609 *	16105.573 *	16006.93 *	15866.939 *	15713.335 *	15552.044 *	15340.229 *	15057.843 *	14704.408 *	14213.635 *	13609.905 *	12857.462 *	11851.86 *	10663.812 *	8576.834 *	5244.236 *	1852.174 *	29.481	1.091
3	16363.89 *	16271.766 *	16279.021 *	16258.07 *	16210.843 *	16125.628 *	16014.338 *	15895.805 *	15757.509 *	15601.092 *	15383.829 *	15092.222 *	14740.659 *	14253.428 *	13645.591 *	12891.374 *	11871.185 *	10672.068 *	8590.69 *	5261.417 *	1865.957 *	29.728	1.091
1	16415.98 *	16330.78 *	16340.995 *	16320.971 *	16266.314 *	16182.71 *	16078.939 *	15951.593 *	15803.003 *	15637.709 *	15411.601 *	15113.005 *	14758.476 *	14276.754 *	13667.317 *	12909.141 *	11874.542 *	10664.121 *	8556.91 *	5241.225 *	1879.769 *	30.1	1.091
0	16394.83 *	16394.801 *	16385.801 *	16356.41 *	16295.68 *	16209.3 *	16099.67 *	15968.02 *	15814.67 *	15645.33 *	15418.825 *	15116.925 *	14760.425 *	14277.63 *	13669.03 *	12911.575 *	11869.83 *	10653.835 *	8540 *	5231.12 *	1886.68 *	30.1	1.091
-1	16476.279 *	16448.974 *	16426.262 *	16390.172 *	16325.466 *	16238.464 *	16124.081 *	15988.093 *	15832.036 *	15657.776 *	15422.258 *	15112.873 *	14751.464 *	14268.914 *	13660.534 *	12899.387 *	11856.348 *	10644.013 *	8540.479 *	5242.482 *	1885.921 *	30.125	1.091
-3	16491.221 *	16484.401 *	16453.184 *	16415.79 *	16344.126 *	16253.294 *	16147.375 *	16001.51 *	15840.88 *	15659.339 *	15412.998 *	15089.8 *	14719.046 *	14229.73 *	13625.363 *	12861.457 *	11816.031 *	10611.617 *	8541.437 *	5265.185 *	1884.404 *	30.174	1.091
-5	16406.99 *	16416.767 *	16391.961 *	16360.527 *	16280.832 *	16191.848 *	16070.502 *	15926.098 *	15786.513 *	15629.582 *	15381.286 *	15047.64 *	14666.505 *	14173.643 *	13576.559 *	12805.43 *	11758.042 *	10562.648 *	8495.23 *	5252.823 *	1882.89 *	30.224	1.091
-7	16247.6 *	16257.495 *	16238.819 *	16204.027 *	16135.356 *	16057.697 *	15943.96 *	15797.909 *	15659.202 *	15508.451 *	15282.336 *	14962.576 *	14591.595 *	14098.495 *	13512.695 *	12742.092 *	11682.615 *	10497.673 *	8452.347 *	5242.126 *	1847.349 *	30.273	1.091
-9	16108.26 *	16114.075 *	16101.799 *	16071.155 *	16009.52 *	15924.322 *	15808.868 *	15664.556 *	15515.875 *	15366.574 *	15144.608 *	14823.956 *	14461.933 *	13999.315 *	13445.07 *	12641.594 *	11593.872 *	10418.274 *	8396.297 *	5220.605 *	1823.57 *	30.322	1.091
-11	15961.93 *	15971.784 *	15952.398 *	15929.018 *	15856.363 *	15760.022 *	15653.231 *	15501.519 *	15354.67 *	15203.518 *	14983.086 *	14657.864 *	14306.571 *	13864.145 *	13325.697 *	12534.156 *	11489.853 *	10324.574 *	8327.842 *	5188.442 *	1794.213 *	30.371	1.091
-13	15730.98 *	15742.41 *	15726.489 *	15693.589 *	15629.175 *	15549.387 *	15443.65 *	15297.082 *	15162.147 *	15024.747 *	14808.907 *	14473.382 *	14139.23 *	13715.047 *	13199.007 *	12422.14 *	11387.975 *	10216.074 *	8254.149 *	5145.846 *	1759.294 *	27.083	1.091
-15	15537.42 *	15542.955 *	15528.836 *	15493.276 *	15430.329 *	15345.393 *	15247.811 *	15111.1 *	14973.638 *	14839.993 *	14633.711 *	14309.654 *	13957.63 *	13558.61 *	13062.114 *	12316.961 *	11257.524 *	10090.385 *	8160.304 *	5093.032 *	1718.832 *	26.057	1.091
-17	15386.74 *	15387.58 *	15370.634 *	15334.754 *	15271.222 *	15182.426 *	15081.23 *	14960.743 *	14815.519 *	14662.359 *	14471.816 *	14181.757 *	13813.208 *	13400.143 *	12917.74 *	12213.452 *	11183.801 *	9948.967 *	8062.575 *	5030.309 *	1672.857 *	24.89	1.091
-19.5	15244.625 *	15238.193 *	15217.341 *	15184.397 *	15117.632 *	15029.633 *	14921.967 *	14814.975 *	14681.895 *	14515.643 *	14303.284 *	14044.387 *	13705.325 *	13244.144 *	12739.067 *	12077.464 *	11079.484 *	9859.829 *	7918.67 *	4936.986 *	1607.702	23.241	1.092
-22.5	15169.725 *	15156.049 *	15126.01 *	15091.464 *	15026.559 *	14933.134 *	14829.665 *	14716.847 *	14578.234 *	14410.981 *	14188.122 *	13914.497 *	13587.285 *	13148.424 *	12561.489 *	11904.059 *	10947.782 *	9719.745 *	7715.895 *	4808.898 *	1520.474	20.991	1.092
-25.5	15081.865 *	15068.026 *	15035.61 *	14996.464 *	14940.853 *	14844.323 *	14734.775 *	14616.771 *	14474.719 *	14306.516 *	14082.528 *	13791.393 *	13469.21 *	13023.373 *	12438.289 *	11726.261 *	10755.619 *	9524.488 *	7437.981 *	4634.175 *	1422.824	18.458	1.092
-29	14890.17 *	14878.264 *	14843.886 *	14802.212 *	14752.969 *	14656.22 *	14539.896 *	14413.911 *	14284.076 *	14123.168 *	13884.993 *	13596.142 *	13299.963 *	12844.185 *	12161.684 *	11401.863 *	10517.071 *	9209.484 *	7023.745 *	4404.771 *	1293.819	15.164	1.092
-33	14356.02 *	14357.801 *	14334.427 *	14292.938 *	14233.057 *	14162.495 *	14024.593 *	13897.928 *	13763.956 *	13624.462 *	13370.26 *	13031.293 *	12702.411 *	12352.995 *	11559.845 *	10685.341 *	10004.071 *	8675.979 *	6417.538 *	4098.277 *	1128.471	10.975	1.092
-37.5	12757.665 *	12781.192 *	12795.89 *	12771.332 *	12736.132 *	12590.918 *	12502.315 *	12404.567 *	12296.386 *	12157.137 *	11931.855 *	11573.266 *	11278.121 *	10979.832 *	10291.734 *	9458.598 *	8781.32 *	7775.726 *	5616.831 *	3559.893 *	924.995	6.615	1.092
-42.5	10049.485 *	10076.944 *	10102.031 *	10085.179 *	10024.034 *	9933.968 *	9861.982 *	9880.564 *	9779.574 *														

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																								
85	0	0	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	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0
65	0.4	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.2	1.4	1.3	1.4	1.7	1.9	1.7	1.7	2.3	2.1	0.9	0.1	0	0	0
55	6.21 *	12.55 *	12.62 *	12.56 *	12.45 *	12.26 *	12.06 *	11.97 *	11.94 *	14.66 *	16.74 *	15.66 *	17.37 *	18.92 *	19	18	15	17	12	4	0.4	0	0	0
47.5	12.25 *	24.64 *	24.68 *	24.54 *	24.28 *	23.87 *	23.46 *	23.24 *	23.09 *	28.35 *	32.51 *	30.54 *	33.78 *	36.38 *	36.62 *	34.62 *	28.40 *	31.30 *	22.79 *	7.1	0.8	0	0	0
42.5	11.82 *	23.69 *	23.68 *	23.55 *	23.30 *	22.99 *	22.72 *	22.45 *	22.09 *	26.97 *	31.24 *	30.03 *	33.31 *	35.04 *	35.53 *	34.79 *	28.63 *	31.62 *	23.55 *	7.5	0.9	0	0	0
37.5	15.18 *	30.39 *	30.34 *	30.17 *	29.85 *	29.49 *	29.16 *	28.68 *	28.03 *	34.13 *	39.62 *	38.01 *	42.10 *	44.34 *	44.64 *	43.77 *	36.58 *	40.48 *	30.40 *	9.96 *	1.1	0	0	0
33	16.77 *	33.55 *	33.45 *	33.25 *	32.94 *	32.54 *	32.03 *	31.42 *	30.77 *	37.64 *	43.69 *	41.44 *	45.62 *	48.61 *	49.16 *	47.39 *	39.46 *	43.66 *	32.83 *	11.04 *	1.3	0	0	0
29	17.05 *	34.07 *	33.91 *	33.65 *	33.31 *	32.86 *	32.36 *	31.87 *	31.20 *	37.91 *	44.02 *	42.27 *	46.31 *	48.74 *	49.99 *	48.31 *	39.52 *	43.72 *	33.15 *	11.26 *	1.4	0	0	0
25.5	16.18 *	32.31 *	32.14 *	31.90 *	31.55 *	31.11 *	30.68 *	30.23 *	29.59 *	35.86 *	41.57 *	40.02 *	43.88 *	45.96 *	47.14 *	45.75 *	37.35 *	41.57 *	31.71 *	10.77 *	1.3	0	0	0
22.5	14.26 *	28.46 *	28.33 *	28.14 *	27.87 *	27.53 *	27.15 *	26.70 *	26.17 *	31.89 *	36.96 *	35.36 *	38.94 *	41.14 *	42.01 *	40.76 *	33.54 *	37.74 *	28.94 *	9.81 *	1.2	0	0	0
19.5	14.39 *	28.72 *	28.59 *	28.40 *	28.14 *	27.82 *	27.43 *	26.98 *	26.46 *	32.27 *	37.42 *	35.80 *	39.49 *	41.94 *	42.79 *	41.48 *	34.52 *	39.16 *	30.09 *	10.30 *	1.3	0	0	0
17	12.06 *	24.07 *	23.96 *	23.81 *	23.59 *	23.33 *	23.00 *	22.62 *	22.19 *	27.07 *	31.40 *	30.05 *	33.18 *	35.27 *	35.98 *	34.93 *	29.30 *	33.35 *	25.66 *	8.91 *	1.2	0	0	0
15	9.69 *	19.34 *	19.25 *	19.13 *	18.96 *	18.74 *	18.48 *	18.18 *	17.83 *	21.75 *	25.22 *	24.16 *	26.70 *	28.39 *	28.95 *	28.13 *	23.68 *	27.04 *	20.86 *	7.32 *	1	0	0	0
13	9.72 *	19.40 *	19.31 *	19.19 *	19.03 *	18.81 *	18.55 *	18.25 *	17.91 *	21.83 *	25.32 *	24.28 *	26.85 *	28.53 *	29.07 *	28.25 *	23.85 *	27.28 *	21.10 *	7.45 *	1	0	0	0
11	9.76 *	19.47 *	19.39 *	19.27 *	19.11 *	18.89 *	18.63 *	18.34 *	17.99 *	21.92 *	25.44 *	24.42 *	27.00 *	28.66 *	29.17 *	28.39 *	24.02 *	27.48 *	21.28 *	7.56 *	1	0	0	0
9	9.82 *	19.60 *	19.51 *	19.40 *	19.23 *	19.01 *	18.75 *	18.45 *	18.09 *	22.05 *	25.59 *	24.56 *	27.14 *	28.79 *	29.31 *	28.55 *	24.16 *	27.63 *	21.41 *	7.65 *	1.1	0	0	0
7	9.89 *	19.73 *	19.65 *	19.53 *	19.36 *	19.14 *	18.87 *	18.56 *	18.19 *	22.18 *	25.73 *	24.68 *	27.27 *	28.92 *	29.48 *	28.72 *	24.28 *	27.75 *	21.51 *	7.73 *	1.1	0	0	0
5	9.93 *	19.81 *	19.73 *	19.61 *	19.44 *	19.22 *	18.96 *	18.63 *	18.27 *	22.29 *	25.86 *	24.78 *	27.38 *	29.05 *	29.61 *	28.85 *	24.36 *	27.83 *	21.57 *	7.79 *	1.1	0	0	0
3	9.95 *	19.84 *	19.76 *	19.65 *	19.48 *	19.26 *	18.99 *	18.67 *	18.33 *	22.36 *	25.95 *	24.86 *	27.46 *	29.14 *	29.71 *	28.93 *	24.41 *	27.87 *	21.61 *	7.84 *	1.1	0	0	0
1	9.97 *	19.87 *	19.80 *	19.69 *	19.52 *	19.30 *	19.03 *	18.72 *	18.37 *	22.42 *	26.00 *	24.91 *	27.52 *	29.20 *	29.77 *	28.98 *	24.43 *	27.87 *	21.59 *	7.85 *	1.1	0	0	0
0	4.99 *	9.96 *	9.92 *	9.86 *	9.78 *	9.67 *	9.54 *	9.38 *	9.20 *	11.22 *	13.01 *	12.46 *	13.77 *	14.61 *	14.90 *	14.50 *	12.21 *	13.91 *	10.77 *	3.92 *	0.6	0	0	0
	5.00 *	9.98 *	9.94 *	9.88 *	9.79 *	9.68 *	9.55 *	9.39 *	9.21 *	11.22 *	13.01 *	12.46 *	13.76 *	14.61 *	14.89 *	14.49 *	12.20 *	13.90 *	10.76 *	3.92 *	0.6	0	0	0

-1	10.02	*	19.97	*	19.90	*	19.78	*	19.60	*	19.38	*	19.11	*	18.78	*	18.41	*	22.44	*	26.00	*	24.89	*	27.48	*	29.16	*	29.72	*	28.91	*	24.35	*	27.77	*	21.56	*	7.86	*	1.1	0	0	
-3	10.01	*	19.95	*	19.87	*	19.74	*	19.57	*	19.34	*	19.07	*	18.74	*	18.38	*	22.41	*	25.94	*	24.81	*	27.38	*	29.06	*	29.61	*	28.79	*	24.25	*	27.68	*	21.53	*	7.86	*	1.1	0	0	
-5	9.94	*	19.82	*	19.74	*	19.62	*	19.44	*	19.22	*	18.95	*	18.63	*	18.29	*	22.30	*	25.83	*	24.70	*	27.26	*	28.92	*	29.47	*	28.63	*	24.11	*	27.54	*	21.46	*	7.83	*	1.1	0	0	
-7	9.85	*	19.65	*	19.57	*	19.45	*	19.29	*	19.07	*	18.79	*	18.48	*	18.14	*	22.12	*	25.63	*	24.52	*	27.07	*	28.75	*	29.29	*	28.43	*	23.94	*	27.37	*	21.36	*	7.79	*	1.1	0	0	
-9	9.77	*	19.48	*	19.40	*	19.28	*	19.11	*	18.89	*	18.62	*	18.30	*	17.96	*	21.91	*	25.37	*	24.28	*	26.83	*	28.53	*	29.06	*	28.19	*	23.74	*	27.16	*	21.24	*	7.73	*	1.1	0	0	
-11	9.65	*	19.25	*	19.16	*	19.05	*	18.88	*	18.67	*	18.39	*	18.08	*	17.75	*	21.66	*	25.08	*	24.00	*	26.55	*	28.25	*	28.80	*	27.94	*	23.52	*	26.91	*	21.08	*	7.66	*	1.1	0	0	
-13	9.52	*	19.00	*	18.91	*	18.79	*	18.62	*	18.42	*	18.16	*	17.85	*	17.53	*	21.40	*	24.79	*	23.72	*	26.24	*	27.96	*	28.55	*	27.69	*	23.27	*	26.63	*	20.89	*	7.57	*	1	0	0	
-15	9.42	*	18.79	*	18.70	*	18.58	*	18.41	*	18.21	*	17.95	*	17.66	*	17.33	*	21.16	*	24.54	*	23.47	*	25.95	*	27.66	*	28.29	*	27.47	*	23.04	*	26.31	*	20.65	*	7.47	*	1	0	0	
-17	11.66	*	23.26	*	23.15	*	22.99	*	22.79	*	22.53	*	22.22	*	21.86	*	21.45	*	26.17	*	30.37	*	29.09	*	32.11	*	34.17	*	35.00	*	34.06	*	28.54	*	32.49	*	25.44	*	9.15	*	1.2	0	0	
-20	13.89	*	27.70	*	27.57	*	27.38	*	27.13	*	26.82	*	26.46	*	26.03	*	25.53	*	31.13	*	36.12	*	34.62	*	38.20	*	40.56	*	41.48	*	40.42	*	33.88	*	38.39	*	29.88	*	10.67	*	1.4	0	0	
-23	13.81	*	27.55	*	27.42	*	27.23	*	26.97	*	26.65	*	26.29	*	25.86	*	25.35	*	30.90	*	35.83	*	34.32	*	37.88	*	40.16	*	40.96	*	39.87	*	33.37	*	37.52	*	28.99	*	10.27	*	1.3	0	0	
-26	15.97	*	31.85	*	31.68	*	31.47	*	31.17	*	30.79	*	30.35	*	29.85	*	29.28	*	35.67	*	41.33	*	39.57	*	43.68	*	46.19	*	46.90	*	45.58	*	38.05	*	42.26	*	32.35	*	11.40	*	1.4	0	0	
-29	17.81	*	35.53	*	35.35	*	35.10	*	34.76	*	34.32	*	33.80	*	33.24	*	32.62	*	39.73	*	45.92	*	43.90	*	48.53	*	51.15	*	51.44	*	50.00	*	41.75	*	45.61	*	34.59	*	12.13	*	1.5	0	0	
-33	18.59	*	37.13	*	36.98	*	36.71	*	36.32	*	35.82	*	35.29	*	34.71	*	34.06	*	41.47	*	47.81	*	45.59	*	50.45	*	53.15	*	53.08	*	51.42	*	43.11	*	46.74	*	35.02	*	12.18	*	1.4	0	0	
-38	17.38	*	34.79	*	34.69	*	34.45	*	34.03	*	33.53	*	33.14	*	32.67	*	32.05	*	38.98	*	44.97	*	42.97	*	47.57	*	50.11	*	50.20	*	48.69	*	40.84	*	44.41	*	32.94	*	11.18	*	1.3	0	0	
-43	13.56	*	27.17	*	27.11	*	26.91	*	26.59	*	26.18	*	25.86	*	25.53	*	25.05	*	30.46	*	35.16	*	33.66	*	37.21	*	39.20	*	39.57	*	38.38	*	31.89	*	34.94	*	25.85	*	8.5	1	0	0		
-48	13.06	*	26.25	*	26.26	*	26.08	*	25.77	*	25.30	*	24.84	*	24.50	*	24.12	*	29.43	*	33.96	*	32.23	*	35.47	*	37.66	*	38.10	*	36.43	*	30.20	*	33.58	*	25.11	*	8.3	0.9	0	0		
-55	6.12	*	12.41	*	12.49	*	12.41	*	12.27	*	12.02	*	11.75	*	11.58	*	11.49	*	14.14	*	16.37	*	15.36	*	16.88	*	18.34	*	19	18	15	18	14	5.1	0.6	0	0							
-65	0.7	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.7	2	1.9	2.2	2.6	2.8	2.7	2.8	3.8	3.5	1.5	0.2	0	0													
-75	0.2	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.8	0.9	0.8	1	0.8	0.3	0.1	0	0													
-85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	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	0.1	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	0	0	0	0	0	0	0				
Total	446	892	889	883	875	864	851	838	822	1003	1161	1110	1226	1300	1322	1281	1072	1206	925	323	41.5	0.11	1933																					

4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	FFLEDL @ 230W / 5000K	Sample ID.	P1
Temperature (°C)	25.4	Humidity (%RH)	54.0

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

Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD
120.00	60	2.163	259.3	0.999	2.34%
276.95	60	0.937	250.3	0.964	5.38%

5.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last Calibration Date	Calibration Due Date
DLF107	Integrating Sphere System	2020/12/26	2021/12/25
DLF108	Auxiliary Lamp	2020/12/26	2021/12/25
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional	2020/12/26	2021/12/25
DLF116	AC Power Source	2020/12/26	2021/12/25
DLF113	Power Meter	2020/12/26	2021/12/25
DLF112	Temperature Recorder	2020/12/26	2021/12/25
DLF114	Temperature & Humidity Datalogger	2020/12/26	2021/12/25
DLF101	Goniophotometer	2020/12/26	2021/12/25
DLF125	Standard Lamp Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional	2020/12/26	2021/12/25
DLF104	AC Power Source	2020/12/26	2021/12/25
DLF507	DC Power Source	2020/12/26	2021/12/25
DLF102	Power Meter	2020/12/26	2021/12/25
DLF111	Temperature & Humidity Datalogger	2020/12/26	2021/12/25
DLF119	Power Meter	2020/12/26	2021/12/25
DLF031	Temperature data logger	2020/12/26	2021/12/25
DLF022	Digital power meter	2020/12/26	2021/12/25
DLF003	Temperature & Humidity Datalogger	2020/12/26	2021/12/25

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