

Photometric Test Report

Relevant Standards

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

Prepared For

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2022/7/30

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Prepared By



Wangzun Zhu

Approved By



Kevin Jia

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1.0 Test Summary

DLC Technical Requirements v5.1

Indoor - Linear Ambient - Direct Linear Ambient Luminaires				
Requirement Category	Test Method	Requirements		Test value
Luminaire Output (lm) (Goniophotometer - Section 4.2)	IES LM-79-2008	1500		1617
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		808
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	129.3
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		12.5
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	7.61%
		20.00%	277V	6.08%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.996
		0.9	277V	0.936
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3465±245	3682
		4 step	3465±124	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥80		84
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥0		12
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥70		84
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	-12%≤IES Rcs,h1≤+23%		-11%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	≥40%		48.66%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		23.0
Input Voltage (V)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		277
(Goniophotometer - Section 4.2)		Non-Wrost Case		120
Input Current (A)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		0.048
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.097
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		12.5
(Goniophotometer - Section 4.2)		Non-Wrost Case		11.6

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/7/30	TOMO-2/12W/3500K	B1
2	Goniophotometer Test	2022/7/30	TOMO-2/12W/3500K	B1
3	THD and PF Test	2022/7/30	TOMO-2/12W/3500K	B1

Remark(If any)

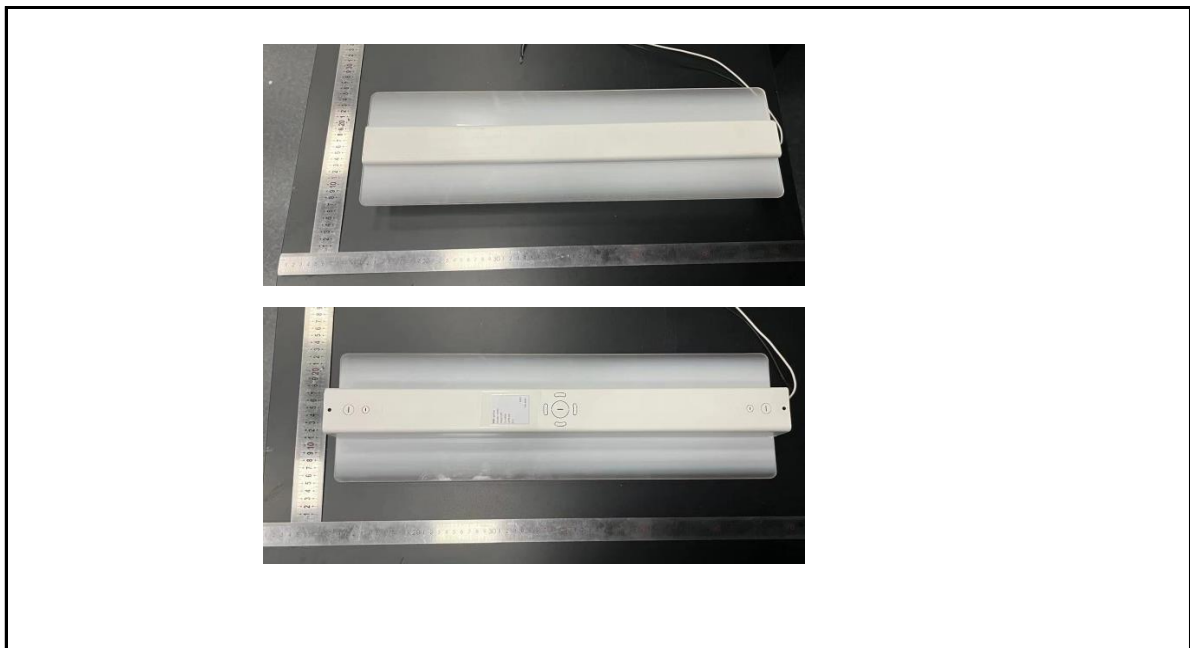
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3.0 Production Description

Luminaire Description: TOMO-2/12W/3500K

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.	TOMO-2/12W/3500K	Sample ID.	B1
Operate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.3	Humidity (%RH)	56.0

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
119.99	60	0.097	11.6	0.996
277.01	60	0.048	12.4	0.936

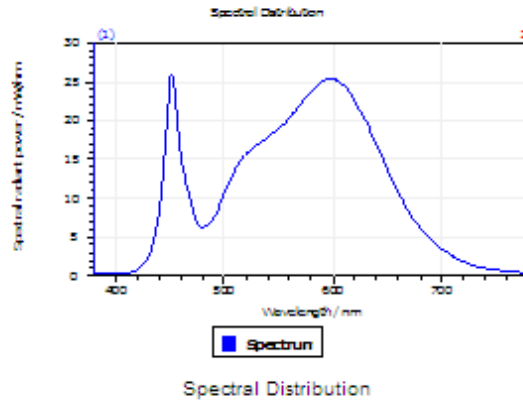
Test Result

CCT (K)	CRI	R9	Duv
3682	84	12	0.00023

Rf	Rg	IES Rcs,h1
84	96	-11%

4.1 Integrating Sphere Test

Results

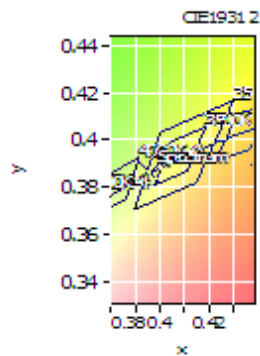


Spectral values

DominantWavelength 580.12 nm
Purity 0.347
PeakWavelength 451.82 nm
Radiant Power 4.245 W
Width50%:

Color Coordinates

Correlated Color Temperat 3682 K
x: 0.3958 u: 0.2313 u': 0.2313
y: 0.3862 v: 0.3386 v': 0.5080
CRI01 82.3 CRI09 12.4
CRI02 89.9 CRI10 75.9
CRI03 95.4 CRI11 82.2
CRI04 83.0 CRI12 62.0
CRI05 82.4 CRI13 84.1
CRI06 86.3 CRI14 97.6
CRI07 86.1 CRI15 76.0
CRI08 64.9 CRI16 73.6
ResultsCRI 83.8



PlanckDistance 2.3E-004

4.1 Integrating Sphere Test

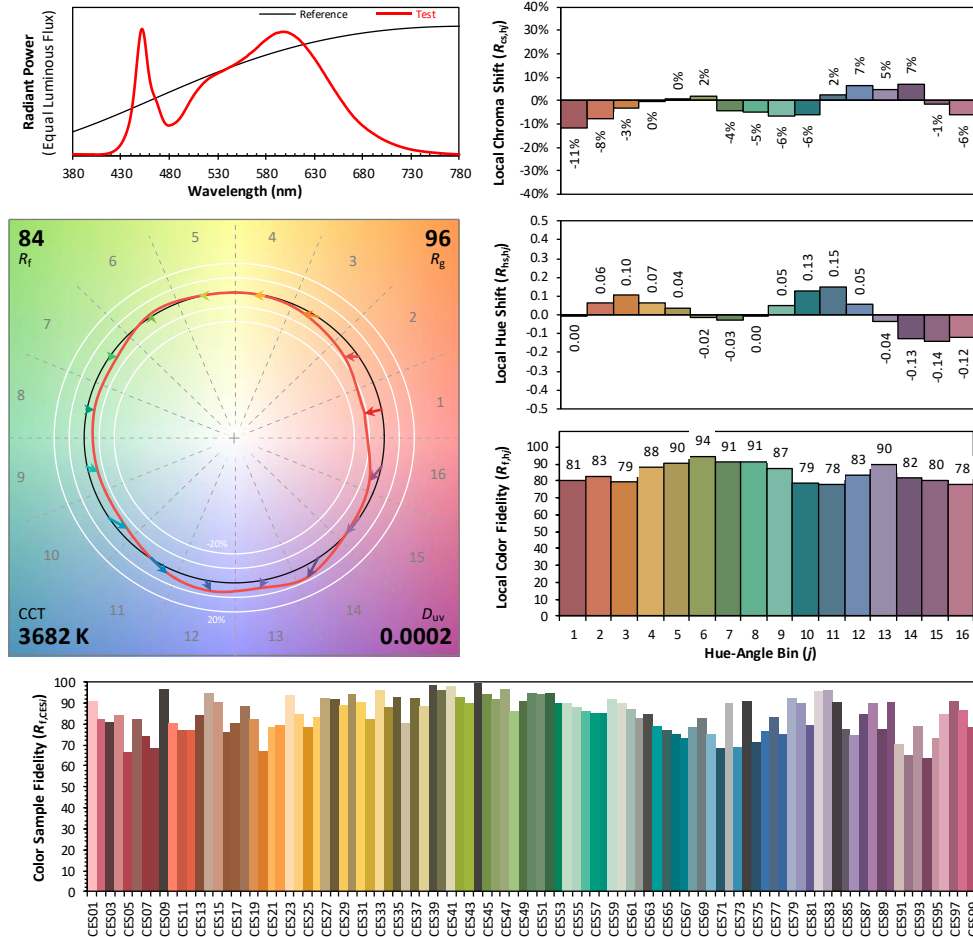
IES TM-30-18 Color Rendition Report

Source: DLF2207110-2a

Manufacturer: RAB Lighting Inc.

Date: 2022/7/30

Model: TOMO-2/12W/3500K



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

x 0.3957
 y 0.3862
 u' 0.2313
 v' 0.5080

CIE 13.3-1995
(CRI)

R_a 84
 R_g 11

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.	TOMO-2/12W/3500K	Sample ID.	B1
Opreate 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 paramters were measured using a type C goniophotometer and software.

The ambient temperature shall be maintained at 25° C ± 1° 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
WROST CASE	276.93	60	0.048	12.5	0.934
NON-WROST CASE	120.02	60	0.097	11.6	0.997

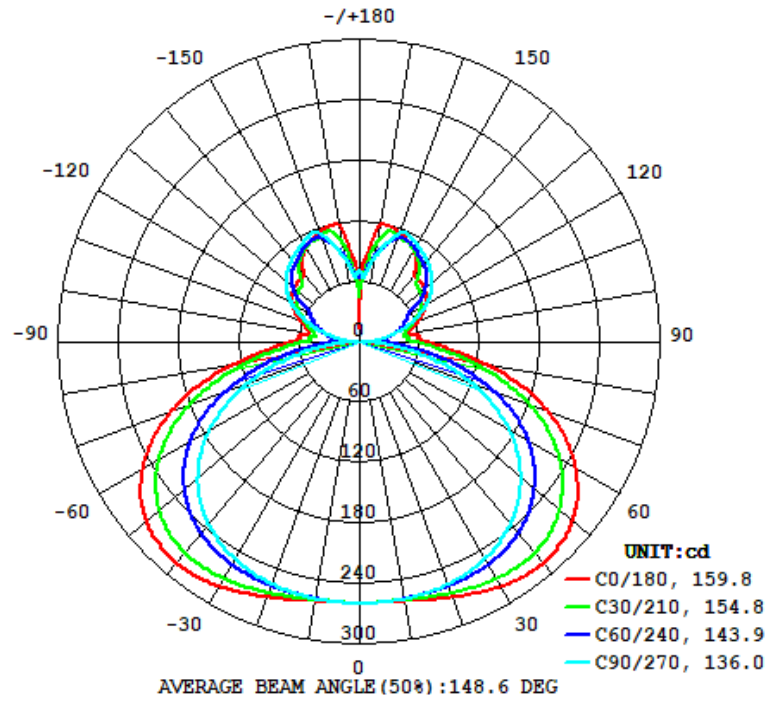
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
1617	358.3	360.0	159.8	136.0	129.3

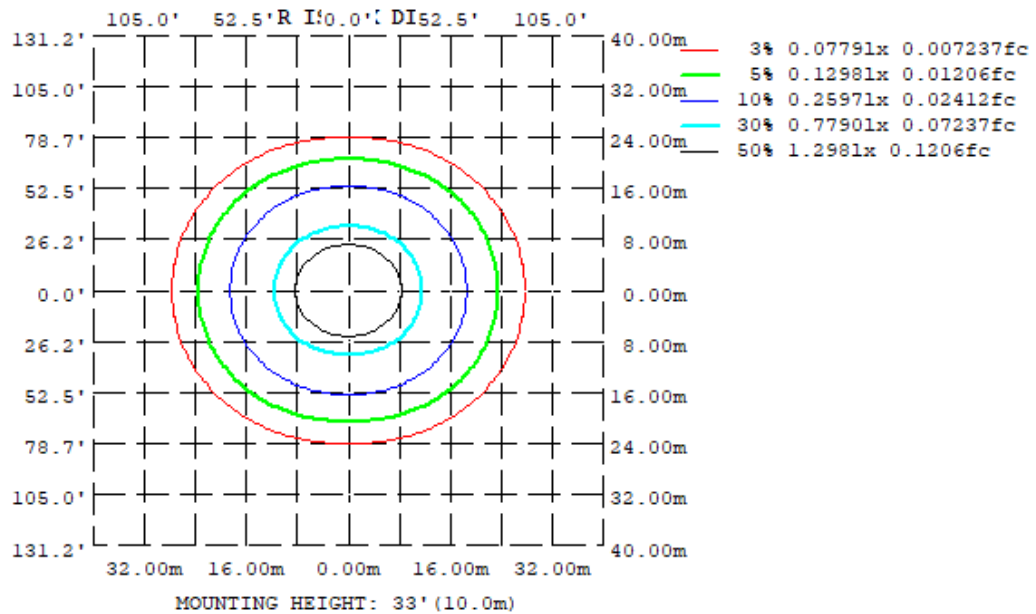
Zonal Lumen Requirement (0°-60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
48.66%	23.0	2.00	808

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	261.0	258.8	259.0	258.8	261.0	258.8	259.0	258.8
20	269.5	261.5	256.1	261.5	269.5	261.5	256.1	261.5
30	280.5	263.2	249.1	263.2	280.5	263.2	249.1	263.2
40	285.5	259.5	235.1	259.5	285.5	259.5	235.1	259.5
50	277.2	244.5	210.7	244.5	277.2	244.5	210.7	244.5
60	249.0	212.3	172.3	212.3	249.0	212.3	172.3	212.3
70	199.6	161.2	118.1	161.2	199.6	161.2	118.1	161.2
80	129.0	95.65	52.92	95.65	129.0	95.65	52.92	95.65
90	66.59	40.86	3.422	40.86	66.59	40.86	3.422	40.86
100	51.06	38.60	21.96	38.60	51.06	38.60	21.96	38.60
110	62.69	51.28	52.67	51.28	62.69	51.28	52.67	51.28
120	76.99	65.55	78.96	65.55	76.99	65.55	78.96	65.55
130	85.38	73.54	95.99	73.54	85.38	73.54	95.99	73.54
140	86.39	98.54	106.2	98.54	86.39	98.54	106.2	98.54
150	108.1	107.8	114.3	107.8	108.1	107.8	114.3	107.8
160	117.3	116.2	114.3	116.2	117.3	116.2	114.3	116.2
170	119.3	91.03	84.04	91.03	119.3	91.03	84.04	91.03
180	15.02	56.74	70.99	56.74	15.02	56.74	70.99	56.74
DEG	LUMINOUS INTENSITY:cd							

UGR Table - Corrected

UGR Table - Corrected

Reflectances											
Ceiling Cavity		70	70	50	50	30	70	70	50	50	30
Walls		50	30	50	30	30	50	30	50	30	30
Floor Cavity		20	20	20	20	20	20	20	20	20	20
Room Size		UGR Viewed Crosswise					UGR Viewed Endwise				
X=2H	Y=2H	14.3	15.6	15.0	16.3	17.2	16.1	17.3	16.8	18.1	19.0
	3H	16.4	17.6	17.2	18.3	19.2	18.8	19.9	19.5	20.7	21.6
	4H	17.2	18.3	18.0	19.1	20.0	20.0	21.1	20.8	21.9	22.8
	6H	17.8	18.8	18.6	19.6	20.6	21.2	22.2	21.9	22.9	23.9
	8H	18.0	19.0	18.8	19.8	20.7	21.7	22.7	22.5	23.5	24.4
	12H	18.1	19.0	18.9	19.8	20.8	22.2	23.1	23.0	23.9	24.9
4H	2H	15.4	16.5	16.1	17.2	18.2	16.7	17.8	17.5	18.5	19.5
	3H	17.7	18.6	18.5	19.4	20.4	19.7	20.6	20.4	21.4	22.3
	4H	18.6	19.5	19.4	20.3	21.3	21.0	21.9	21.8	22.7	23.7
	6H	19.4	20.1	20.2	20.9	21.9	22.4	23.1	23.2	24.0	24.9
	8H	19.6	20.3	20.4	21.1	22.1	23.0	23.7	23.8	24.5	25.5
	12H	19.7	20.4	20.6	21.2	22.2	23.7	24.3	24.5	25.1	26.1
8H	4H	19.4	20.1	20.2	20.9	21.9	21.4	22.1	22.2	22.9	23.9
	6H	20.3	20.9	21.1	21.7	22.7	22.9	23.5	23.8	24.4	25.4
	8H	20.6	21.2	21.5	22.0	23.0	23.7	24.3	24.6	25.1	26.1
	12H	20.9	21.3	21.7	22.2	23.2	24.6	25.0	25.4	25.9	26.9
12H	4H	19.6	20.2	20.4	21.0	22.0	21.4	22.0	22.2	22.9	23.9
	6H	20.6	21.1	21.4	22.0	23.0	23.0	23.5	23.9	24.4	25.4
	8H	21.0	21.5	21.9	22.3	23.4	23.9	24.4	24.7	25.2	26.3

Maximum UGR = 26.9

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

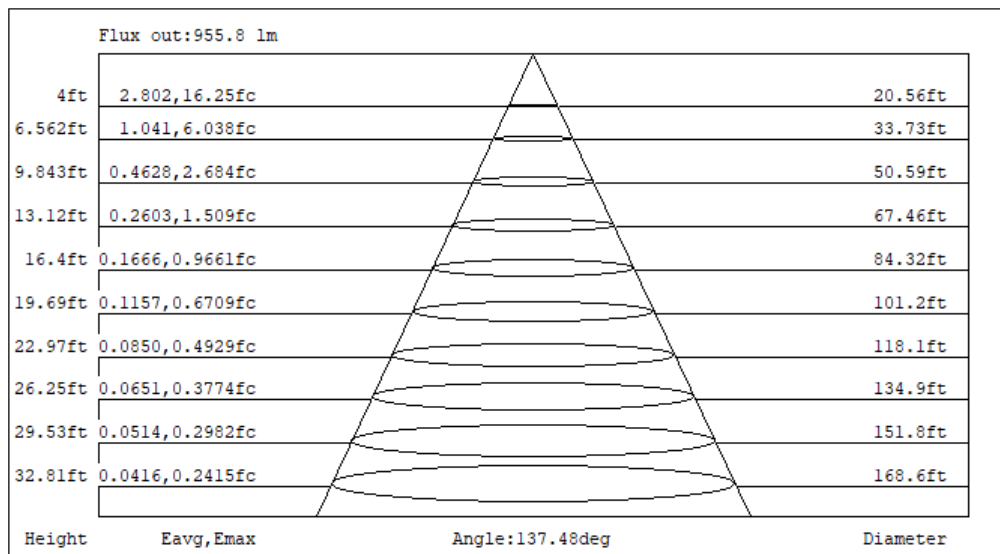
	Zonal (lm)		Total (lm)	Percent
0-10	24.75	0 - 10	24.75	1.53%
10-20	73.91	0 - 20	98.66	6.10%
20-30	121.77	0 - 30	220.43	13.64%
30-40	164.79	0 - 40	385.22	23.83%
40-50	195.82	0 - 50	581.04	35.94%
50-60	205.59	0 - 60	786.63	48.66%
60-70	185.95	0 - 70	972.58	60.16%
70-80	134.63	0 - 80	1107.21	68.49%
80-90	66.96	0 - 90	1174.17	72.63%
90-100	39.57	0 - 100	1213.74	75.08%
100-110	46.03	0 - 110	1259.77	77.93%
110-120	61.65	0 - 120	1321.42	81.74%
120-130	69.98	0 - 130	1391.40	86.07%
130-140	70.04	0 - 140	1461.44	90.40%
140-150	64.97	0 - 150	1526.41	94.42%
150-160	51.86	0 - 160	1578.27	97.63%
160-170	30.69	0 - 170	1608.96	99.53%
170-180	7.66	0 - 180	1616.62	100.00%

4.2 Goniophotometer Test

COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

RC	80				70				50			30			10			0
Rw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	113	113	113	113	107	107	107	107	96	96	96	86	86	86	77	77	77	73
1	101	95	90	86	95	90	86	82	81	77	74	72	70	67	64	62	61	57
2	90	81	74	68	85	77	70	65	69	64	59	62	57	54	55	52	49	45
3	82	70	62	55	77	67	59	52	60	53	48	53	48	44	47	43	40	36
4	74	61	52	45	70	58	50	43	52	45	40	47	41	36	42	37	33	30
5	68	54	45	38	64	52	43	37	46	39	34	41	36	31	37	32	28	25
6	62	48	39	33	58	46	38	31	41	34	29	37	31	27	33	28	24	22
7	57	43	35	28	54	41	33	27	37	30	25	34	28	23	30	25	21	19
8	53	39	31	25	50	37	29	24	34	27	22	30	25	20	27	22	19	16
9	49	36	27	22	46	34	26	21	31	24	20	28	22	18	25	20	17	14
10	46	33	25	20	43	31	24	19	28	22	18	26	20	16	23	18	15	13

CONE OF LIGHT DIAGRAM



4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	TOMO-2/12W/3500K	Sample ID.	B1
Temperature (°C)	25.3	Humidity (%RH)	56.0

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
119.99	60	0.097	11.6	0.996	7.61%
277.01	60	0.048	12.4	0.936	6.08%

5.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last Calibration Date	Calibration Due Date
DLF107	Integrating Sphere System	2021/12/26	2022/12/25
DLF108	Auxiliary Lamp	2021/12/26	2022/12/25
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional	2021/12/26	2022/12/25
DLF116	AC Power Source	2021/12/26	2022/12/25
DLF113	Power Meter	2021/12/26	2022/12/25
DLF112	Temperature Recorder	2021/12/26	2022/12/25
DLF114	Temperature & Humidity Datalogger	2021/12/26	2022/12/25
DLF101	Goniophotometer	2021/12/26	2022/12/25
DLF125	Standard Lamp Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional	2021/12/26	2022/12/25
DLF104	AC Power Source	2021/12/26	2022/12/25
DLF507	DC Power Source	2021/12/26	2022/12/25
DLF102	Power Meter	2021/12/26	2022/12/25
DLF111	Temperature & Humidity Datalogger	2021/12/26	2022/12/25
DLF119	Power Meter	2021/12/26	2022/12/25
DLF031	Temperature data logger	2021/12/26	2022/12/25
DLF022	Digital power meter	2021/12/26	2022/12/25
DLF003	Temperature & Humidity Datalogger	2021/12/26	2022/12/25

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