

Photometric Test Report

Relevant Standards

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

Prepared For

RAB Lighting Inc.

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DLF2207110

Report Number

DLF2207110-8a

Test Date

2022/7/30

Issue Date

2022/7/31

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		2478
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		1239
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	135.4
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		18.3
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	5.98%
		20.00%	277V	8.75%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.998
		0.9	277V	0.976
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	5029±355	5130
		4 step	5029±220	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥80		81
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥0		-2
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥70		83
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥89		94
Minimum IES Rcs,h1 (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	-12%≤IES Rcs,h1≤+23%		-14%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	≥40%		48.90%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		23.8
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		0.068
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.149
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		18.3
(Goniophotometer - Section 4.2)		Non-Wrost Case		17.8

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/7/30	TOMO-2/18W/5000K	H1
2	Goniophotometer Test	2022/7/30	TOMO-2/18W/5000K	H1
3	THD and PF Test	2022/7/30	TOMO-2/18W/5000K	H1

Remark(If any)

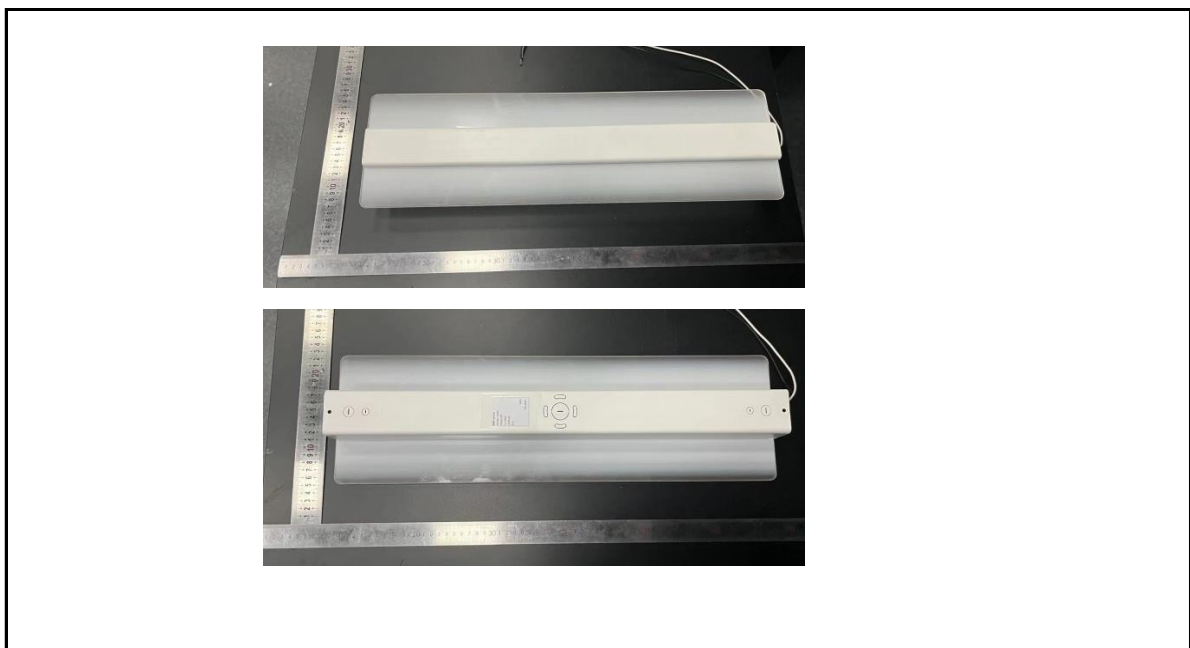
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3.0 Production Description

Luminaire Description: TOMO-2/18W/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.	TOMO-2/18W/5000K	Sample ID.	H1
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
119.98	60	0.148	17.7	0.998
277.05	60	0.067	18.1	0.976

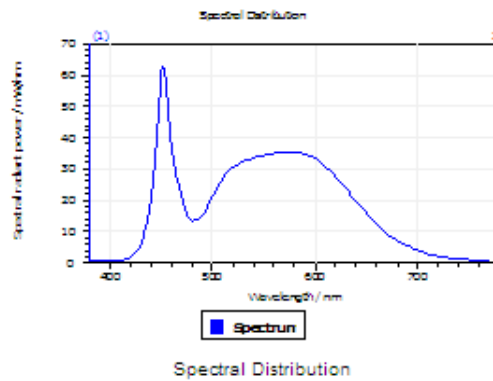
Test Result

CCT (K)	CRI	R9	Duv
5130	81	-2	0.006

Rf	Rg	IES Rcs,h1
83	94	-14%

4.1 Integrating Sphere Test

Results

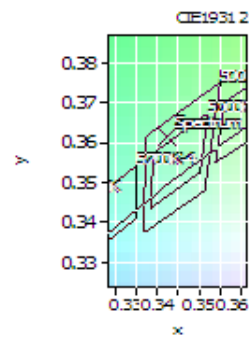


Spectral values

DominantWavelength 565.78 nm
Purity 0.112
PeakWavelength 452.03 nm
Radiant Power 6.948 W
Width50%:

Color Coordinates

Correlated Color Temperat 5130 K
x: 0.3424 u: 0.2058 u': 0.2058
y: 0.3615 v: 0.3280 v': 0.4890
CRI01 78.3 CRI09 -2.3
CRI02 86.4 CRI10 67.7
CRI03 92.1 CRI11 78.4
CRI04 79.7 CRI12 55.3
CRI05 78.6 CRI13 80.4
CRI06 80.9 CRI14 95.9
CRI07 86.6 CRI15 71.6
CRI08 64.3 CRI16 70.1
ResultsCRI 80.9



PlanckDistance 6.0E-003

4.1 Integrating Sphere Test

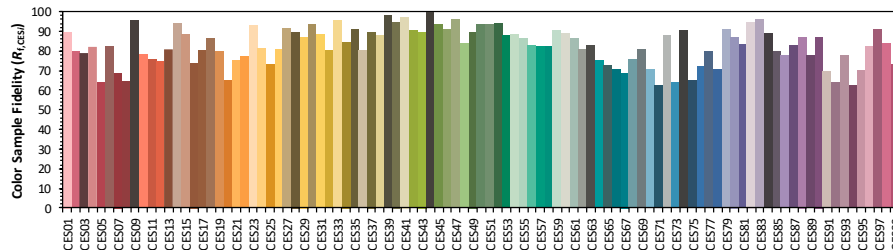
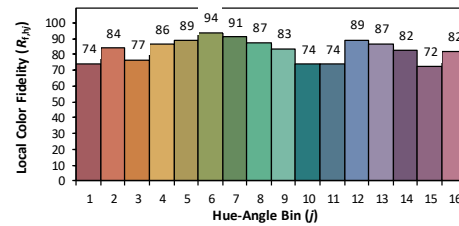
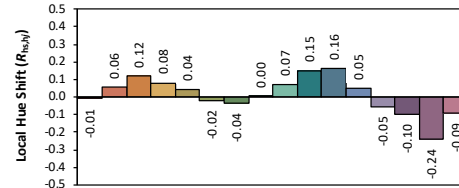
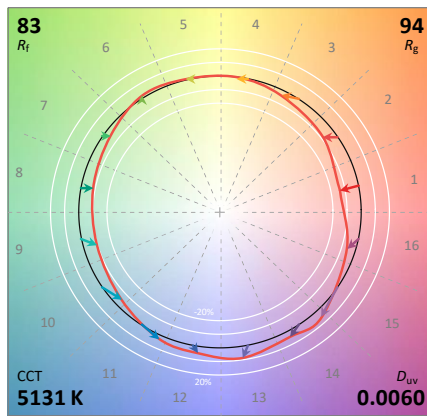
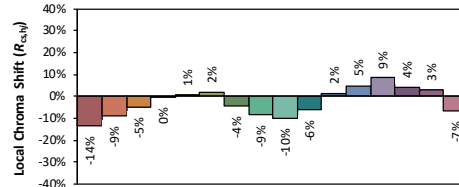
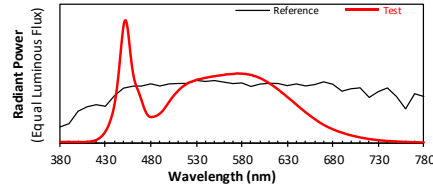
IES TM-30-18 Color Rendition Report

Source: DLF2207110-8a

Manufacturer: RAB Lighting Inc.

Date: 2022/7/30

Model: TOMO-2/18W/5000K



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

x **0.3424**
 y **0.3615**
 u' **0.2058**
 v' **0.4890**

CIE 13.3-1995
(CRI)
 R_a 81
 R_g -1

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-2/18W/5000K	Sample ID.	H1
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
WROST CASE	276.98	60	0.068	18.3	0.974
NON-WROST CASE	120.02	60	0.149	17.8	0.997

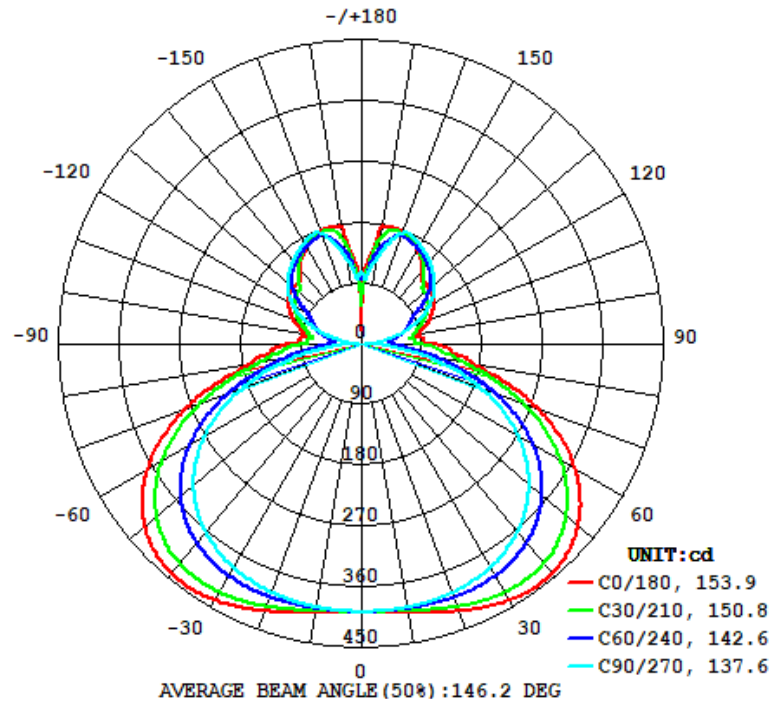
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
2478	358.1	360.0	153.9	137.6	135.4

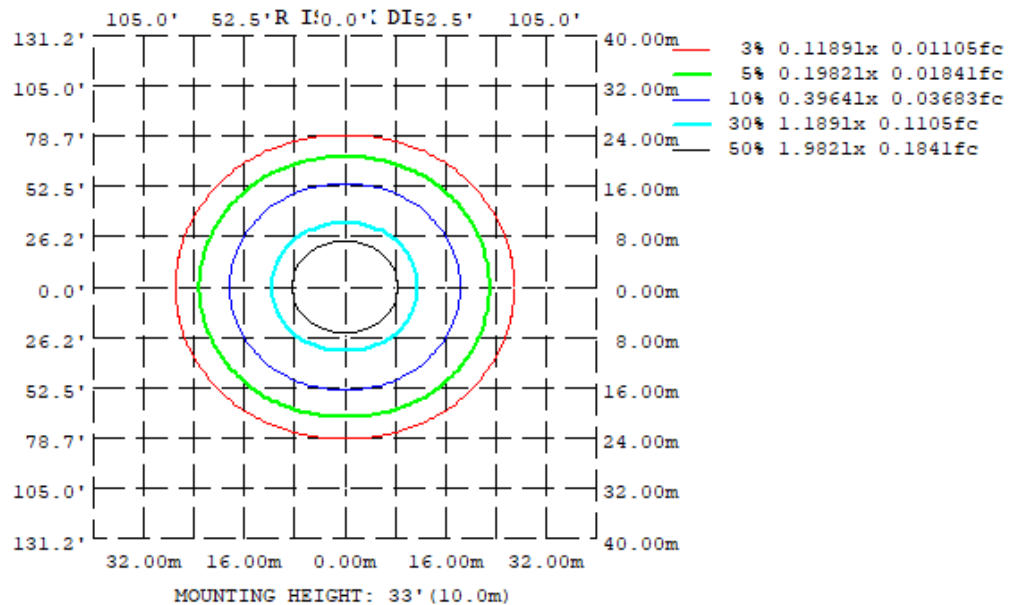
Zonal Lumen Requirement (0° - 60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
48.90%	23.8	2.00	1239

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	403.8	399.3	395.3	399.3	403.8	399.3	395.3	399.3
20	420.5	406.4	391.9	406.4	420.5	406.4	391.9	406.4
30	438.2	410.7	382.4	410.7	438.2	410.7	382.4	410.7
40	442.2	402.9	362.2	402.9	442.2	402.9	362.2	402.9
50	420.7	375.1	326.1	375.1	420.7	375.1	326.1	375.1
60	366.9	318.4	268.7	318.4	366.9	318.4	268.7	318.4
70	277.6	233.1	187.1	233.1	277.6	233.1	187.1	233.1
80	167.5	134.5	87.18	134.5	167.5	134.5	87.18	134.5
90	104.4	67.74	6.225	67.74	104.4	67.74	6.225	67.74
100	87.17	66.19	32.15	66.19	87.17	66.19	32.15	66.19
110	108.5	86.06	78.96	86.06	108.5	86.06	78.96	86.06
120	125.4	104.4	118.8	104.4	125.4	104.4	118.8	104.4
130	132.6	121.0	143.8	121.0	132.6	121.0	143.8	121.0
140	140.2	152.4	160.2	152.4	140.2	152.4	160.2	152.4
150	166.1	168.0	172.9	168.0	166.1	168.0	172.9	168.0
160	178.6	175.8	175.0	175.8	178.6	175.8	175.0	175.8
170	176.1	146.8	127.9	146.8	176.1	146.8	127.9	146.8
180	20.67	83.92	107.2	83.92	20.67	83.92	107.2	83.92
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											
X=2H Y=2H	UGR Viewed Crosswise					UGR Viewed Endwise					
	15.8	17.0	16.5	17.8	18.7	17.4	18.6	18.1	19.4	20.3	
3H	17.9	19.0	18.7	19.8	20.8	19.9	21.0	20.7	21.8	22.7	
4H	18.8	19.8	19.5	20.6	21.5	21.0	22.0	21.8	22.8	23.8	
6H	19.4	20.4	20.2	21.1	22.1	22.0	22.9	22.7	23.7	24.7	
8H	19.6	20.5	20.4	21.3	22.3	22.5	23.4	23.3	24.2	25.2	
12H	19.7	20.6	20.5	21.4	22.4	23.1	23.9	23.8	24.7	25.7	
4H	2H	16.8	17.9	17.6	18.6	19.6	18.0	19.0	18.8	19.8	20.8
	3H	19.1	20.0	19.9	20.8	21.8	20.7	21.6	21.5	22.5	23.4
	4H	20.1	20.9	20.8	21.7	22.7	22.0	22.8	22.8	23.6	24.6
	6H	20.8	21.5	21.6	22.4	23.4	23.2	23.9	24.0	24.7	25.7
	8H	21.1	21.7	21.9	22.6	23.6	23.8	24.5	24.6	25.3	26.3
	12H	21.2	21.8	22.1	22.7	23.7	24.5	25.1	25.3	26.0	27.0
8H	4H	20.7	21.4	21.5	22.2	23.2	22.3	23.0	23.1	23.8	24.8
	6H	21.6	22.2	22.5	23.1	24.1	23.7	24.3	24.5	25.1	26.1
	8H	22.0	22.5	22.8	23.4	24.4	24.5	25.0	25.4	25.9	26.9
	12H	22.2	22.7	23.1	23.6	24.6	25.4	25.9	26.3	26.7	27.8
12H	4H	20.8	21.4	21.7	22.3	23.3	22.3	22.9	23.2	23.8	24.8
	6H	21.9	22.4	22.7	23.2	24.3	23.8	24.3	24.6	25.1	26.2
	8H	22.3	22.8	23.2	23.6	24.7	24.7	25.1	25.5	26.0	27.1

Maximum UGR = 27.8

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

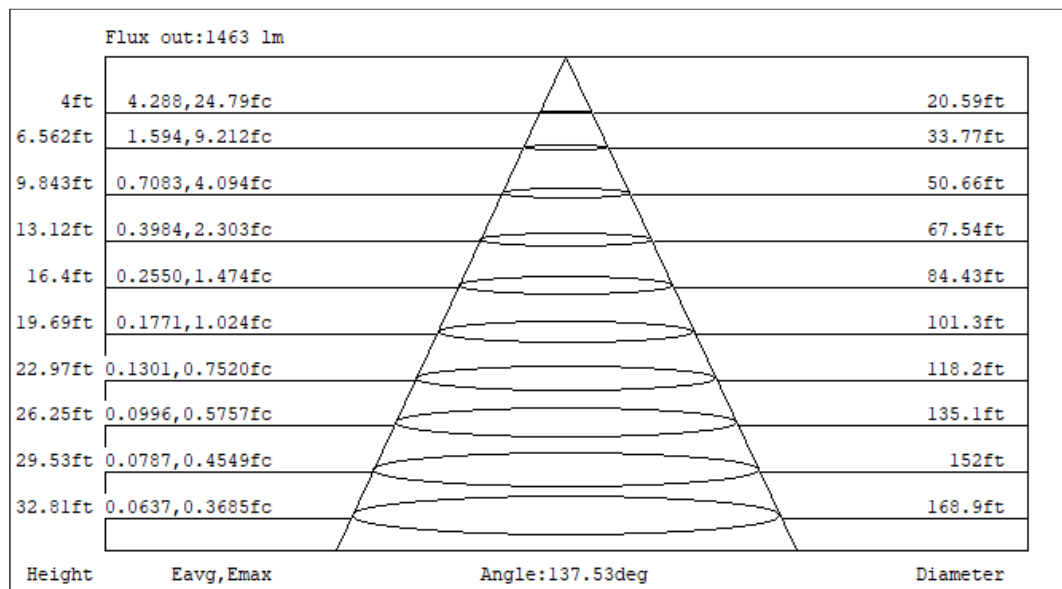
	Zonal (lm)		Total (lm)	Percent
0-10	37.97	0 - 10	37.97	1.53%
10-20	114.27	0 - 20	152.24	6.14%
20-30	189.26	0 - 30	341.50	13.78%
30-40	256.00	0 - 40	597.50	24.11%
40-50	302.04	0 - 50	899.54	36.30%
50-60	312.38	0 - 60	1211.92	48.90%
60-70	275.32	0 - 70	1487.24	60.01%
70-80	190.90	0 - 80	1678.14	67.71%
80-90	101.55	0 - 90	1779.69	71.81%
90-100	64.29	0 - 100	1843.98	74.40%
100-110	78.11	0 - 110	1922.09	77.56%
110-120	99.58	0 - 120	2021.67	81.57%
120-130	109.62	0 - 130	2131.29	86.00%
130-140	108.25	0 - 140	2239.54	90.37%
140-150	100.01	0 - 150	2339.55	94.40%
150-160	79.53	0 - 160	2419.08	97.61%
160-170	47.41	0 - 170	2466.49	99.52%
170-180	11.82	0 - 180	2478.31	100.00%

4.2 Goniophotometer Test

COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

RC	80				70				50			30			10			0
R/W	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	112	112	112	112	106	106	106	106	95	95	95	85	85	85	76	76	76	72
1	101	95	90	86	95	90	86	82	81	77	74	72	69	67	64	62	60	56
2	90	82	74	68	85	77	71	65	69	64	59	62	57	54	55	51	48	45
3	82	71	62	55	77	67	59	53	60	54	48	53	48	44	47	43	40	36
4	74	62	53	46	70	59	50	44	52	46	40	47	41	37	42	37	33	30
5	68	55	45	39	64	52	43	37	46	39	34	42	36	31	37	32	28	25
6	62	49	40	33	58	46	38	32	42	34	29	37	31	27	33	28	24	22
7	57	44	35	29	54	42	33	28	37	30	25	34	28	23	30	25	21	19
8	53	40	31	25	50	38	30	24	34	27	22	31	25	21	27	22	19	17
9	49	36	28	22	47	34	27	21	31	24	20	28	22	18	25	20	17	15
10	46	33	25	20	44	31	24	19	29	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-2/18W/5000K	Sample ID.	H1
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
119.98	60	0.148	17.7	0.998	5.98%
277.05	60	0.067	18.1	0.976	8.75%

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*****