

# 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

**DLF2207103**

## Report Number

**DLF2207103-4a**

## Test Date

**2022/7/11**

## Issue Date

**2022/7/15**

### 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

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		3223
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		806
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	137.7
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		23.4
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	7.92%
		20.00%	277V	9.83%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.992
		0.9	277V	0.925
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	5029±355	5132
		4 step	5029±220	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥80		82
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%		-13%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	≥40%		48.04%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		21.6
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		0.092
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.192
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		23.4
(Goniophotometer - Section 4.2)		Non-Wrost Case		22.7

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/7/11	TOMO-4/24W/5000K	D1
2	Goniophotometer Test	2022/7/11	TOMO-4/24W/5000K	D1
3	THD and PF Test	2022/7/11	TOMO-4/24W/5000K	D1

### Remark(If any)

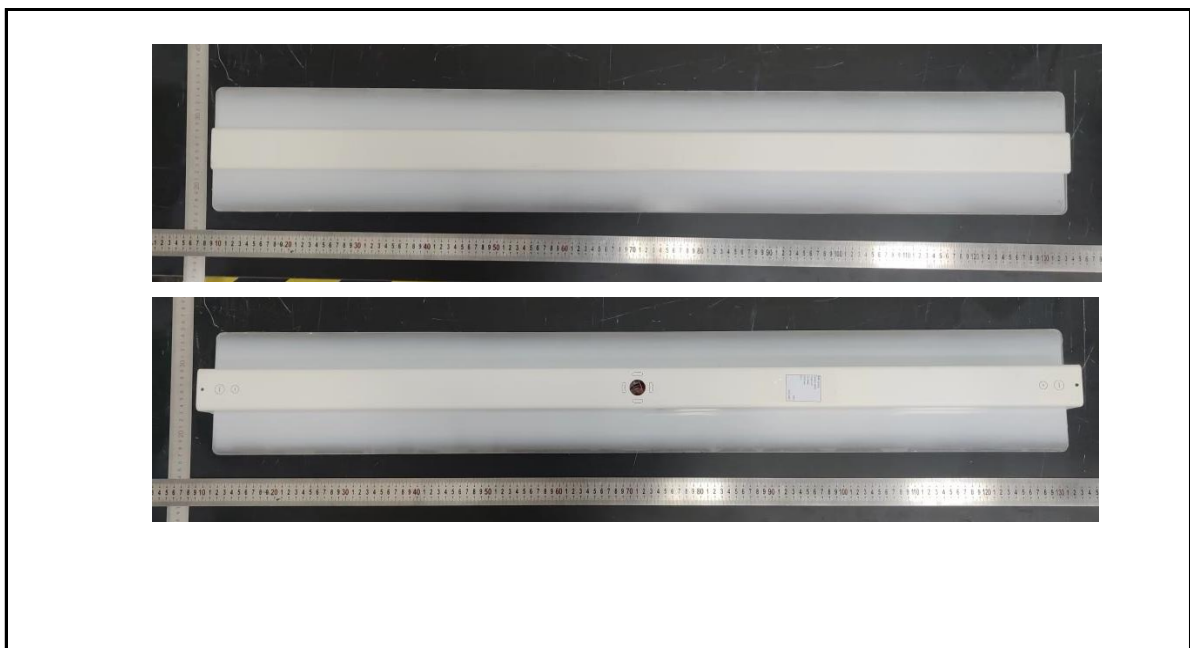
- 1、 This report shall not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the US government.
- 2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without 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:** TOMO-4/24W/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-4/24W/5000K	Sample ID.	D1
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  $\pm 0.2$  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 Result

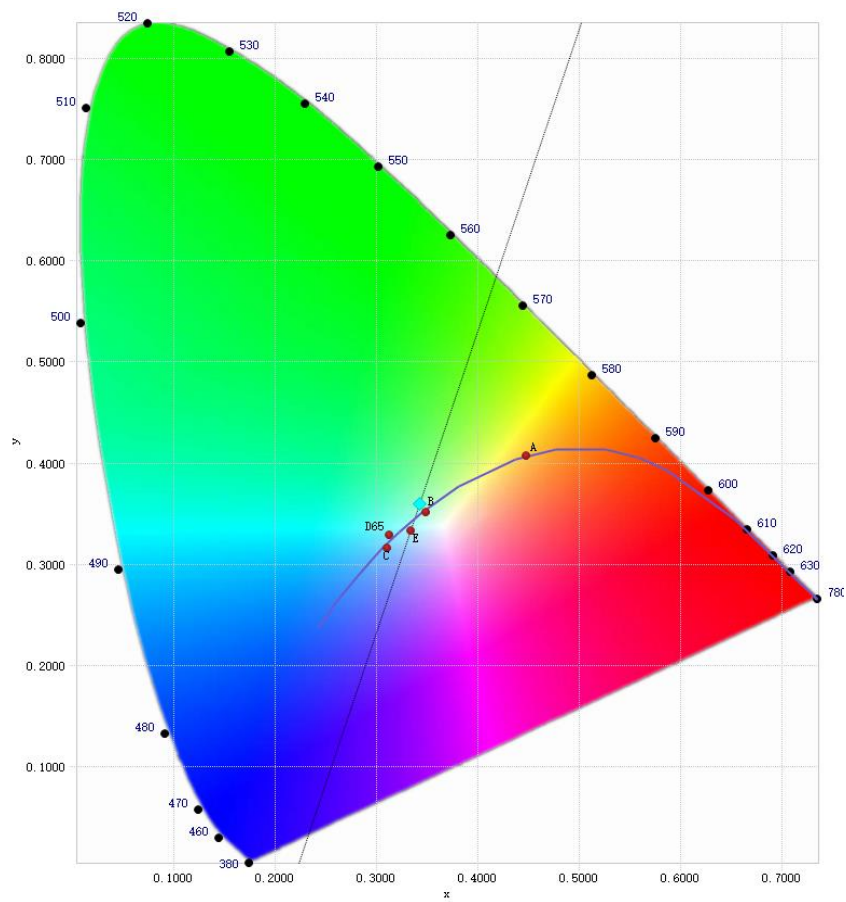
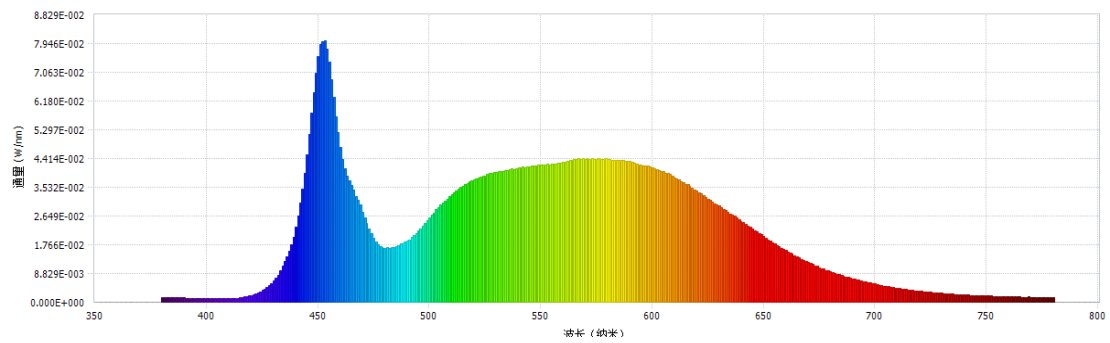
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.04	60	0.189	22.5	0.992
277.06	60	0.091	23.2	0.925

#### Test Result

CCT (K)	CRI	R9	Duv
5132	82	2	0.0053

Rf	Rg	IES Rcs,h1
83	94	-13%

## 4.1 Integrating Sphere Test



## 4.1 Integrating Sphere Test

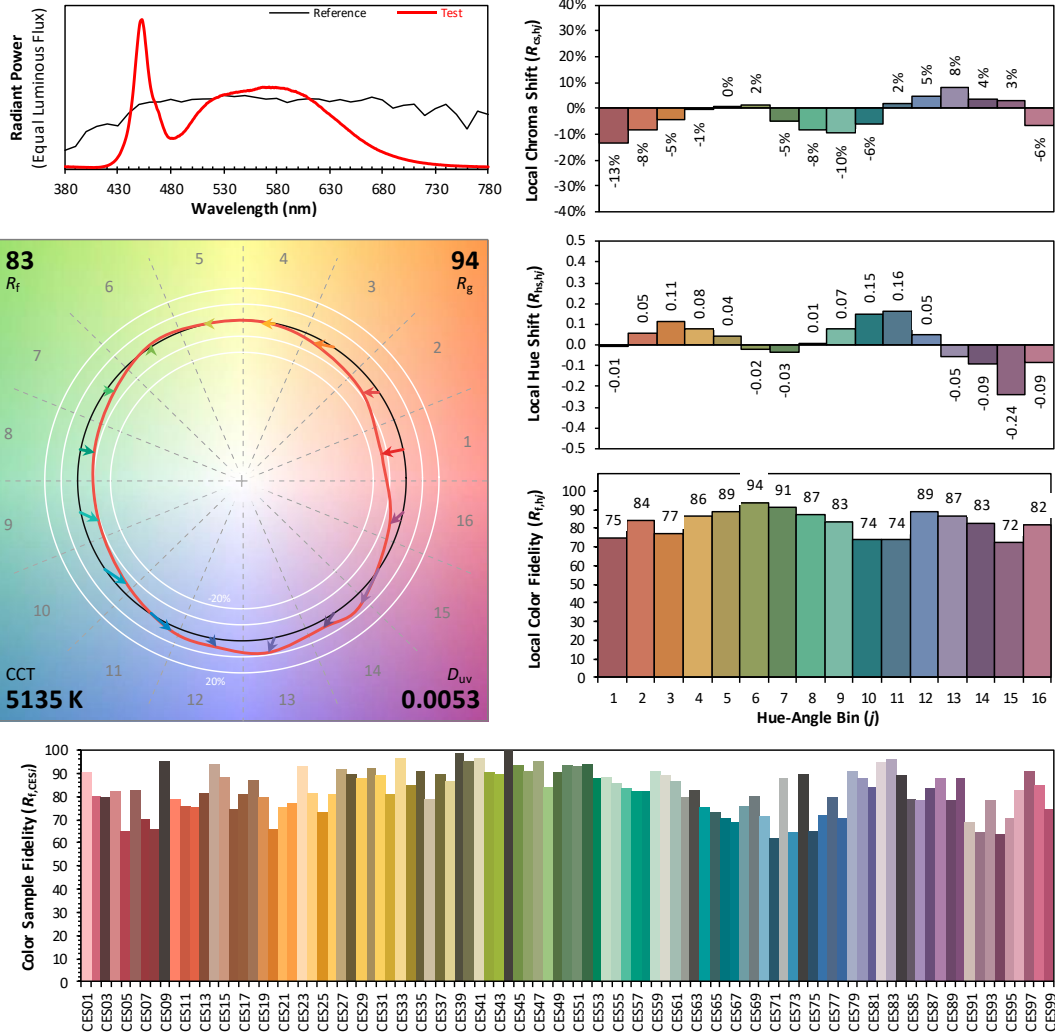
### IES TM-30-18 Color Rendition Report

Source: DLF2207103-4a

Manufacturer: RAB Lighting Inc.

Date: 2022/7/11

Model: TOMO-4/24W/5000K



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

$x$  0.3422  
 $y$  0.3598  
 $u'$  0.2063  
 $v'$  0.4882

CIE 13.3-1995  
(CRI)

$R_a$  82  
 $R_g$  9

## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	TOMO-4/24W/5000K	Sample ID.	D1
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  $\pm 0.2$  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

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WROST CASE	276.98	60	0.092	23.4	0.920
NON-WROST CASE	120.02	60	0.192	22.7	0.987

#### Test Result

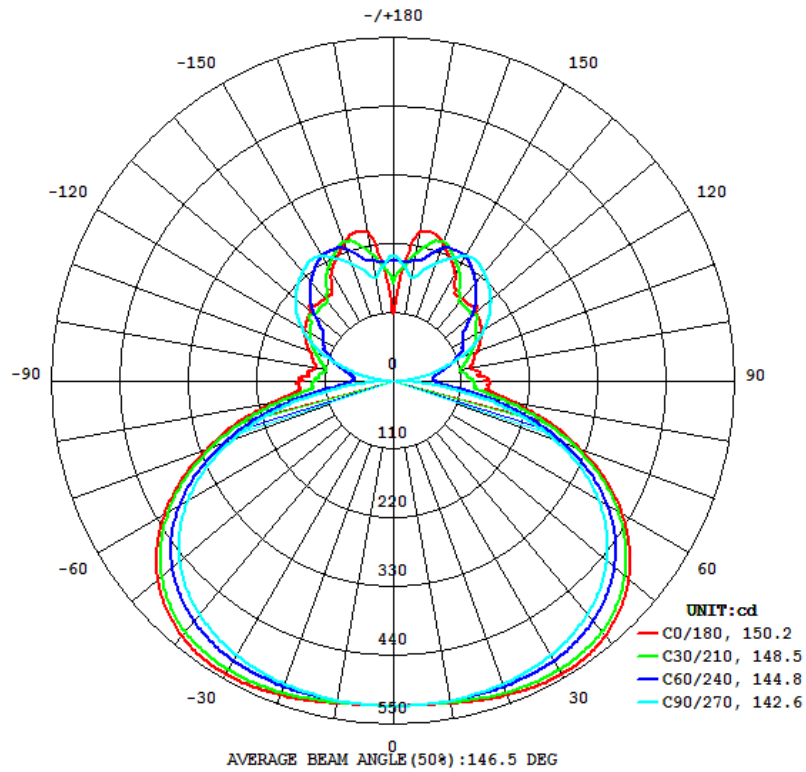
Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
3223	360.0	360.0	150.2	142.6	137.7

Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
48.04%	21.6	4.00	806

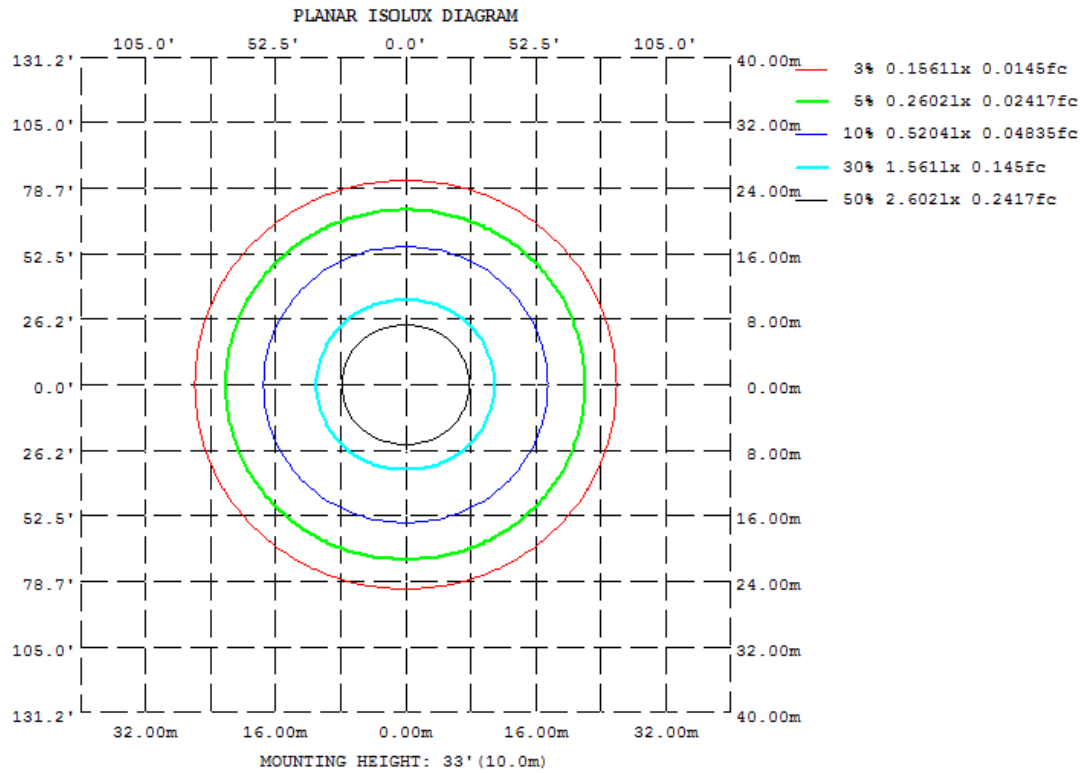


## 4.2 Goniophotometer Test

### Light Distrubtion Curve



### Isolux Plot





## 4.2 Goniophotometer Test

### Zonal Lumen Summary

$\gamma$	C0	C45	C90	C135	C180	C225	C270	C315
10	524.2	521.8	519.7	521.8	524.2	521.8	519.7	521.8
20	535.6	526.0	516.0	526.0	535.6	526.0	516.0	526.0
30	541.7	525.9	507.6	525.9	541.7	525.9	507.6	525.9
40	531.3	513.0	487.4	513.0	531.3	513.0	487.4	513.0
50	494.8	477.9	449.5	477.9	494.8	477.9	449.5	477.9
60	425.9	409.2	383.2	409.2	425.9	409.2	383.2	409.2
70	321.9	303.9	277.5	303.9	321.9	303.9	277.5	303.9
80	195.3	169.5	133.7	169.5	195.3	169.5	133.7	169.5
90	150.6	103.4	6.152	103.4	150.6	103.4	6.152	103.4
100	128.7	93.89	46.05	93.89	128.7	93.89	46.05	93.89
110	144.4	121.6	114.2	121.6	144.4	121.6	114.2	121.6
120	165.0	146.0	170.0	146.0	165.0	146.0	170.0	146.0
130	174.0	157.1	206.3	157.1	174.0	157.1	206.3	157.1
140	173.6	186.2	228.7	186.2	173.6	186.2	228.7	186.2
150	200.9	221.5	231.2	221.5	200.9	221.5	231.2	221.5
160	236.3	231.4	200.9	231.4	236.3	231.4	200.9	231.4
170	243.7	201.7	170.0	201.7	243.7	201.7	170.0	201.7
180	110.7	181.0	201.2	181.0	110.7	181.0	201.2	181.0
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	14.7	15.9	15.4	16.7	17.6	15.3	16.5	16.0	17.2	18.2
	3H	17.0	18.1	17.7	18.9	19.8	17.7	18.8	18.4	19.6	20.5
	4H	17.9	18.9	18.7	19.7	20.7	18.8	19.8	19.5	20.6	21.6
	6H	18.6	19.6	19.4	20.4	21.3	19.8	20.7	20.5	21.5	22.5
	8H	18.8	19.7	19.6	20.6	21.6	20.2	21.1	21.0	21.9	22.9
	12H	19.0	19.8	19.8	20.7	21.7	20.7	21.6	21.5	22.4	23.4
4H	2H	15.6	16.6	16.3	17.4	18.4	16.0	17.0	16.7	17.8	18.8
	3H	18.1	18.9	18.8	19.8	20.8	18.7	19.5	19.4	20.3	21.3
	4H	19.1	19.9	19.9	20.7	21.7	19.9	20.7	20.7	21.5	22.5
	6H	19.9	20.6	20.7	21.5	22.5	21.0	21.7	21.8	22.6	23.6
	8H	20.2	20.9	21.0	21.7	22.8	21.6	22.2	22.4	23.1	24.1
	12H	20.4	21.0	21.2	21.9	22.9	22.2	22.8	23.0	23.7	24.7
8H	4H	19.6	20.3	20.4	21.1	22.2	20.3	20.9	21.1	21.8	22.8
	6H	20.6	21.2	21.5	22.1	23.1	21.6	22.2	22.5	23.1	24.1
	8H	21.0	21.5	21.9	22.4	23.4	22.3	22.8	23.2	23.7	24.7
	12H	21.3	21.7	22.2	22.6	23.7	23.1	23.6	24.0	24.4	25.5
12H	4H	19.7	20.3	20.6	21.2	22.2	20.3	20.9	21.2	21.8	22.8
	6H	20.8	21.3	21.7	22.2	23.2	21.7	22.2	22.6	23.1	24.2
	8H	21.3	21.7	22.1	22.6	23.7	22.5	22.9	23.4	23.8	24.9

Maximum UGR = 25.5

## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	49.73	0 - 10	49.73	1.54%
10-20	148.54	0 - 20	198.27	6.15%
20-30	243.38	0 - 30	441.65	13.70%
30-40	326.08	0 - 40	767.73	23.82%
40-50	382.98	0 - 50	1150.71	35.70%
50-60	397.64	0 - 60	1548.35	48.04%
60-70	354.21	0 - 70	1902.56	59.03%
70-80	248.99	0 - 80	2151.55	66.75%
80-90	126.29	0 - 90	2277.84	70.67%
90-100	97.30	0 - 100	2375.14	73.69%
100-110	110.60	0 - 110	2485.74	77.12%
110-120	135.71	0 - 120	2621.45	81.33%
120-130	147.24	0 - 130	2768.69	85.90%
130-140	142.21	0 - 140	2910.90	90.31%
140-150	128.59	0 - 150	3039.49	94.30%
150-160	103.73	0 - 160	3143.22	97.52%
160-170	61.73	0 - 170	3204.95	99.43%
170-180	18.29	0 - 180	3223.24	100.00%

## 4.2 Goniophotometer Test

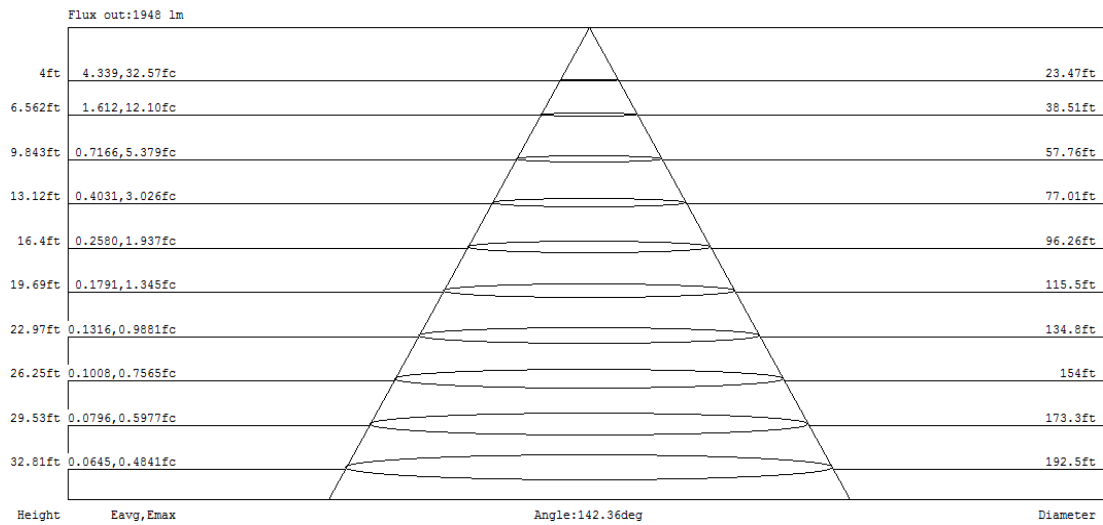
### COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

#### Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

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	75	75	75	71
1	100	95	90	86	95	90	86	82	80	77	74	71	69	66	63	61	59	55
2	90	81	74	68	85	77	70	65	69	63	59	61	57	53	54	51	48	44
3	82	70	62	55	77	67	59	53	59	53	48	53	48	44	47	43	39	36
4	74	62	53	46	69	58	50	44	52	45	40	46	41	36	41	37	33	30
5	68	55	45	39	63	52	43	37	46	39	34	41	35	31	36	32	28	25
6	62	49	40	33	58	46	38	32	41	34	29	37	31	27	33	28	24	21
7	57	44	35	29	54	41	33	28	37	30	25	33	28	23	30	25	21	19
8	53	40	31	25	50	38	30	24	34	27	22	30	25	20	27	22	19	16
9	49	36	28	22	46	34	27	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-4/24W/5000K	Sample ID.	D1
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
120.04	60	0.189	22.5	0.992	7.92%
277.06	60	0.091	23.2	0.925	9.83%

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