

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

DLF2211104

Report Number

DLF2211104-11a

Test Date

2022/11/23

Issue Date

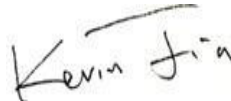
2022/11/29

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	-		351
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥ 375		268
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	-		70.2
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		5.0
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%		6.16%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9		0.994
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	2725 \pm 145	2688
		4 step	2725 \pm 83	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥ 80		94
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥ 0		69
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥ 70		92
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥ 89		97
Minimum IES Rcs,h1 (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	-12% \leq IES Rcs,h1 \leq +23%		-4%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	$\geq 40\%$		79.36%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		23.4

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/11/23	KNOOKFA16 / 5W / 2700K	K1
2	Goniophotometer Test	2022/11/23	KNOOKFA16 / 5W / 2700K	K1
3	THD and PF Test	2022/11/23	KNOOKFA16 / 5W / 2700K	K1

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: KNOOKFA16 / 5W / 2700K

Electrical Specification: 120V,50/60HZ

Photos of Luminaire Characteristics



4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test

Model No.	KNOOKFA16 / 5W / 2700K	Sample ID.	K1
Operate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.3	Humidity (%RH)	55.4

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
119.97	60	0.041	4.9	0.994

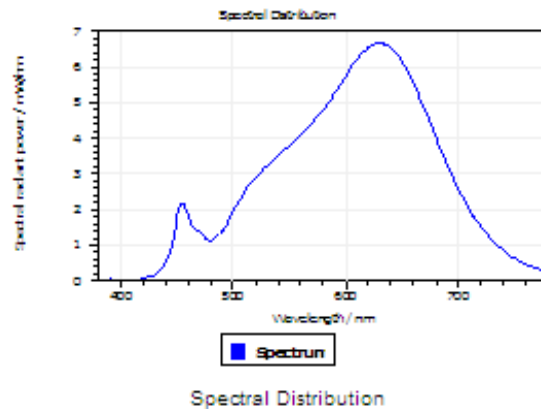
Test Result

CCT (K)	CRI	R9	Duv
2688	94	69	0.0029

Rf	Rg	IES Rcs,h1
92	97	-4%

4.1 Integrating Sphere Test

Results

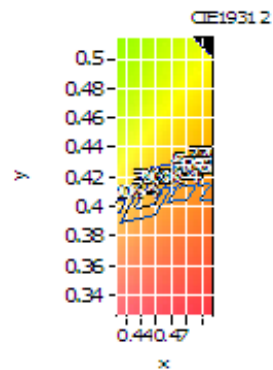


Spectral values

DominantWavelength 583.37 nm
Purity 0.660
PeakWavelength 629.37 nm
Radiant Power 1.099 W
Width50%:

Color Coordinates

Correlated Color Temperatur 2688 K
x: 0.4660 u: 0.2622 u': 0.2622
y: 0.4200 v: 0.3546 v': 0.5318
CRI01 94.3 CRI09 68.5
CRI02 95.9 CRI10 89.4
CRI03 96.4 CRI11 96.2
CRI04 95.1 CRI12 79.4
CRI05 93.4 CRI13 94.6
CRI06 95.5 CRI14 96.9
CRI07 95.2 CRI15 90.5
CRI08 86.7 CRI16 89.8
ResultsCRI 94.1



PlanckDistance 2.9E-003

4.1 Integrating Sphere Test

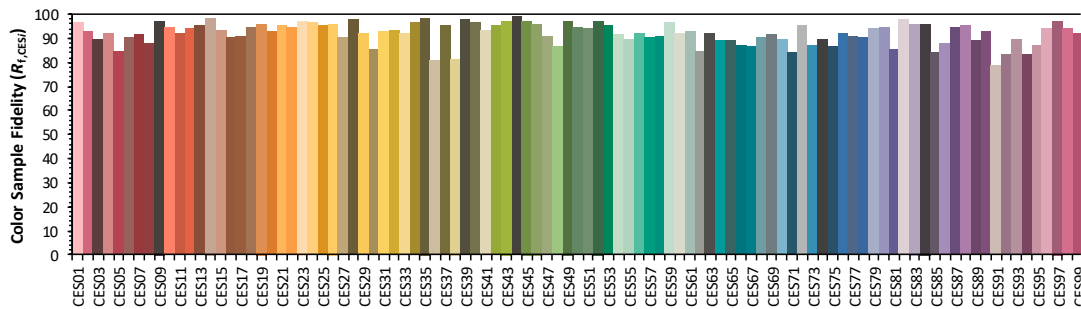
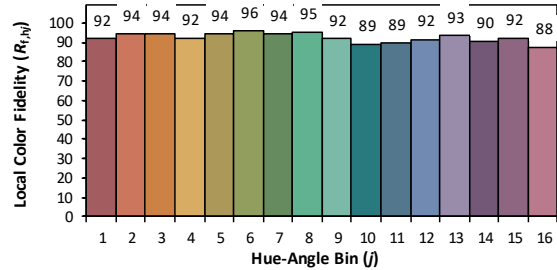
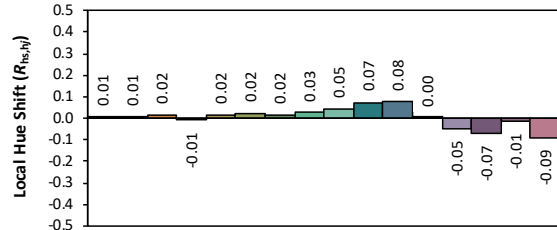
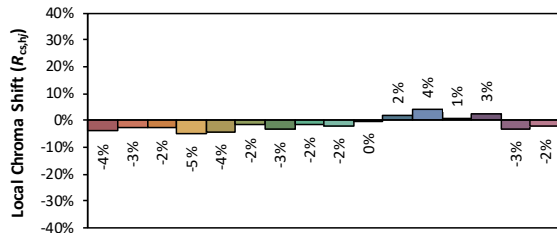
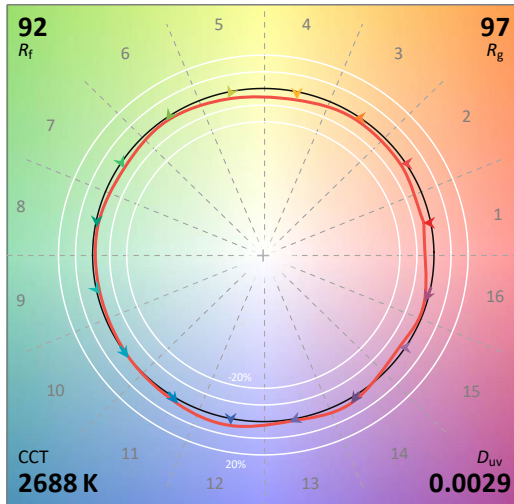
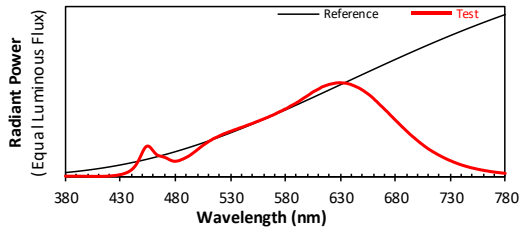
IES TM-30-18 Color Rendition Report

Source: DLF2211104-11a

Manufacturer: RAB Lighting Inc.

Date: 2022/11/23

Model: KNOOKFA16 / 5W / 2700K



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

x 0.4660
 y 0.4200
 u' 0.2622
 v' 0.5318

CIE 13.3-1995
(CRI)

R_a 94
 R_g 69

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	KNOOKFA16 / 5W / 2700K	Sample ID.	K1
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	120.05	60	0.042	5.0	0.994

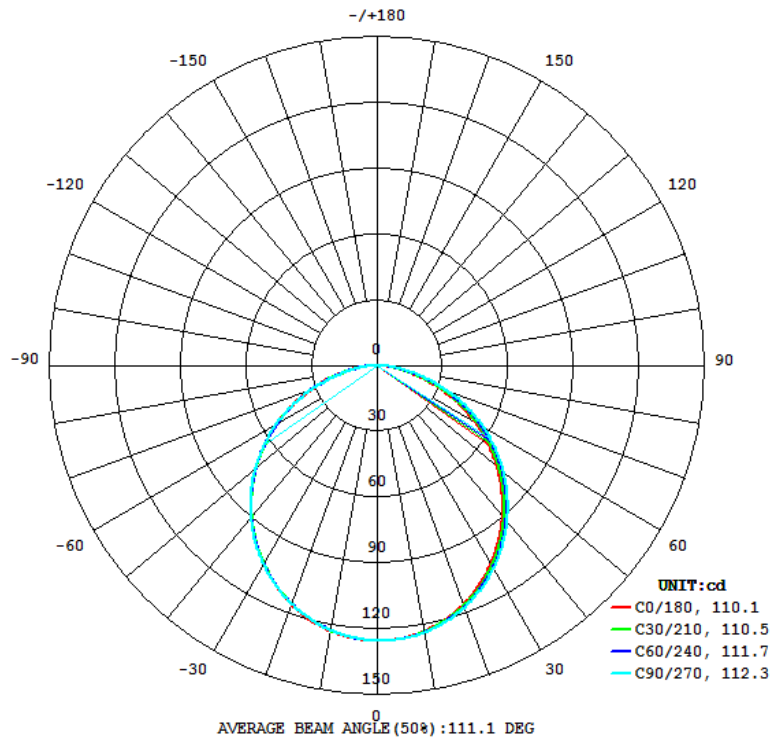
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
351	159.2	160.4	110.1	112.3	70.2

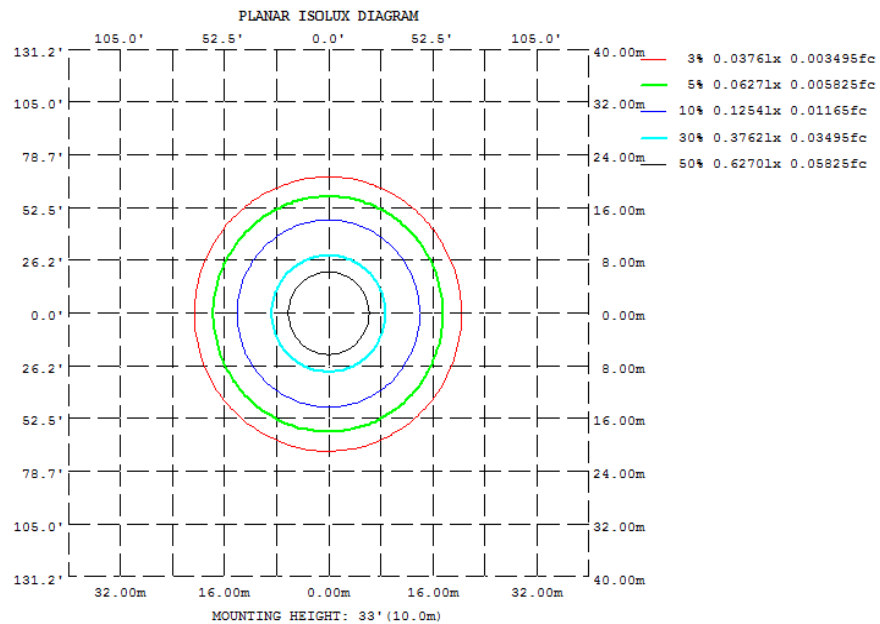
Zonal Lumen Requirement (0° - 60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
79.36%	23.4	1.31	268

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	123.0	123.4	123.6	123.3	122.9	122.6	122.7	122.8
20	115.8	116.7	117.2	116.5	115.7	115.3	115.5	115.5
30	104.4	105.8	106.8	105.8	104.3	104.0	104.4	104.2
40	89.61	91.52	92.86	91.47	89.81	89.52	90.01	89.70
50	71.99	74.21	75.97	74.53	72.65	72.37	72.90	72.27
60	52.19	54.54	56.50	55.37	53.52	53.23	53.56	52.63
70	30.91	33.06	35.17	34.58	33.11	32.60	32.48	31.41
80	10.43	12.12	13.89	14.12	13.27	12.53	11.92	10.90
90	0.0251	0.0887	0.1984	0.2871	0.1698	0.1036	0.1091	0.0858
100	0.0266	0.0493	0.0654	0.0410	0.0212	0.0596	0.1087	0.0719
110	0.0414	0.0541	0.0705	0.0450	0.0374	0.0439	0.0771	0.0459
120	0.0554	0.0654	0.0747	0.0541	0.0530	0.0548	0.0581	0.0551
130	0.0701	0.0754	0.0830	0.0676	0.0759	0.0790	0.0799	0.0817
140	0.0830	0.0843	0.0898	0.0814	0.1078	0.1078	0.1094	0.1125
150	0.0923	0.0936	0.0942	0.0914	0.1187	0.1194	0.1191	0.1207
160	0.1003	0.1018	0.1000	0.0989	0.1200	0.1207	0.1196	0.1224
170	0.1083	0.1091	0.1085	0.1067	0.1214	0.1230	0.1218	0.1240
180	0.1233	0.1204	0.1193	0.1204	0.1238	0.1218	0.1191	0.1196
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	19.2	20.9	19.6	21.2	21.5	18.9	20.5	19.3	20.9	21.2
	3H	21.0	22.5	21.4	22.8	23.2	20.7	22.2	21.1	22.5	22.9
	4H	21.7	23.1	22.1	23.5	23.8	21.4	22.7	21.8	23.1	23.5
	6H	22.2	23.5	22.6	23.8	24.2	21.8	23.1	22.2	23.5	23.9
	8H	22.3	23.5	22.7	23.9	24.3	21.9	23.2	22.4	23.6	24.0
	12H	22.4	23.6	22.8	23.9	24.4	22.0	23.2	22.4	23.6	24.0
4H	2H	19.8	21.2	20.2	21.6	21.9	19.6	21.0	20.0	21.3	21.7
	3H	21.9	23.0	22.3	23.4	23.8	21.6	22.7	22.0	23.1	23.5
	4H	22.7	23.7	23.1	24.1	24.6	22.3	23.4	22.8	23.8	24.3
	6H	23.2	24.2	23.7	24.6	25.1	22.9	23.8	23.4	24.3	24.7
	8H	23.4	24.3	23.9	24.7	25.2	23.1	24.0	23.5	24.4	24.9
	12H	23.5	24.3	24.0	24.8	25.2	23.2	24.0	23.7	24.5	24.9
8H	4H	22.9	23.8	23.4	24.2	24.7	22.6	23.5	23.1	24.0	24.4
	6H	23.6	24.3	24.1	24.8	25.3	23.3	24.1	23.8	24.5	25.0
	8H	23.9	24.5	24.4	25.0	25.5	23.6	24.2	24.1	24.7	25.2
	12H	24.0	24.6	24.5	25.1	25.6	23.7	24.3	24.2	24.8	25.4
12H	4H	23.0	23.7	23.4	24.2	24.7	22.7	23.5	23.2	23.9	24.4
	6H	23.7	24.3	24.2	24.8	25.3	23.4	24.0	23.9	24.5	25.0
	8H	23.9	24.5	24.4	25.0	25.6	23.7	24.2	24.2	24.7	25.3

Maximum UGR = 25.6

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	11.86	0 - 10	11.86	3.38%
10-20	33.88	0 - 20	45.74	13.02%
20-30	51.13	0 - 30	96.87	27.58%
30-40	61.39	0 - 40	158.26	45.06%
40-50	63.43	0 - 50	221.69	63.12%
50-60	57.06	0 - 60	278.75	79.36%
60-70	43.04	0 - 70	321.79	91.62%
70-80	23.66	0 - 80	345.45	98.35%
80-90	5.34	0 - 90	350.79	99.87%
90-100	0.07	0 - 100	350.86	99.89%
100-110	0.05	0 - 110	350.91	99.91%
110-120	0.05	0 - 120	350.96	99.92%
120-130	0.06	0 - 130	351.02	99.94%
130-140	0.07	0 - 140	351.09	99.96%
140-150	0.06	0 - 150	351.15	99.97%
150-160	0.05	0 - 160	351.20	99.99%
160-170	0.03	0 - 170	351.23	100.00%
170-180	0.01	0 - 180	351.24	100.00%

4.2 Goniophotometer Test

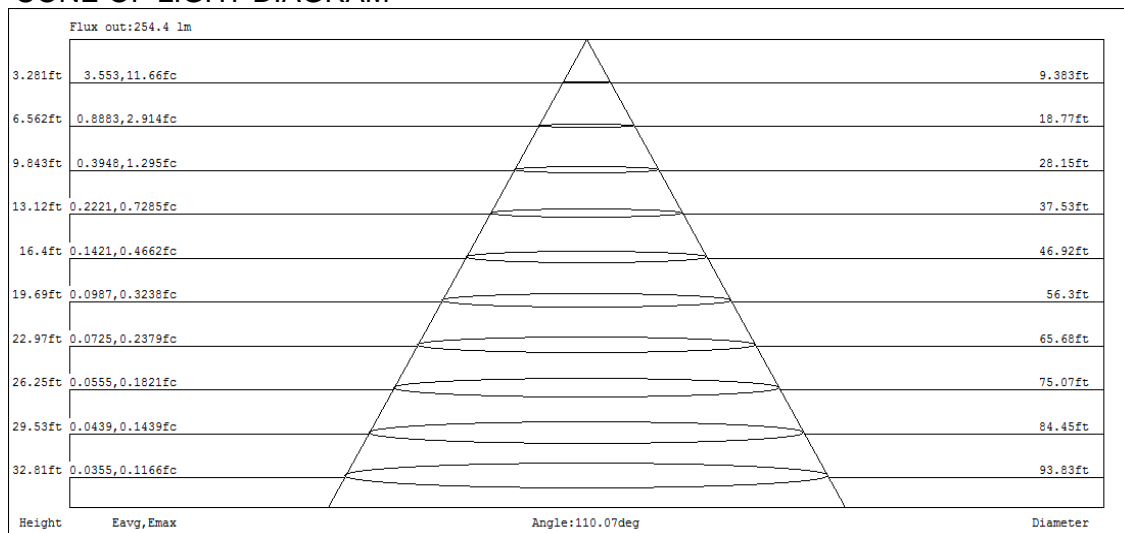
COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	109	104	100	96	106	102	98	95	98	94	92	94	91	89	90	88	86	84
2	99	91	84	78	96	89	83	77	85	80	76	82	78	74	79	75	72	70
3	90	80	72	65	88	78	71	64	75	69	63	72	67	62	70	65	61	59
4	83	71	62	55	80	69	61	55	67	60	54	64	58	53	62	57	52	50
5	76	63	54	47	74	62	53	47	60	52	47	58	51	46	56	50	46	43
6	70	57	48	41	68	56	47	41	54	46	41	52	46	40	51	45	40	38
7	65	51	43	37	63	51	42	36	49	42	36	48	41	36	46	40	36	34
8	61	47	38	33	59	46	38	32	45	38	32	44	37	32	42	36	32	30
9	57	43	35	29	55	42	35	29	41	34	29	40	34	29	39	33	29	27
10	53	40	32	27	52	39	32	26	38	31	26	37	31	26	36	30	26	24

CONE OF LIGHT DIAGRAM



4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	KNOOKFA16 / 5W / 2700K	Sample ID.	K1
Temperature (°C)	25.3	Humidity (%RH)	55.4

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
119.97	60	0.041	4.9	0.994	6.16%

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*****