

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

DLF2211104-16a

Test Date

2022/11/23

Issue Date

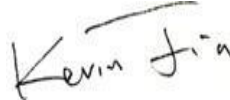
2022/11/29

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	-		636
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥ 375		486
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	-		70.7
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		9.0
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%		5.80%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9		0.997
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	2725 \pm 145	2692
		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		67
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥ 70		93
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥ 89		98
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	$\geq 40\%$		79.39%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		25.4

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/11/23	KNOOKFA16 / 9W / 2700K	P1
2	Goniophotometer Test	2022/11/23	KNOOKFA16 / 9W / 2700K	P1
3	THD and PF Test	2022/11/23	KNOOKFA16 / 9W / 2700K	P1

Remark(If any)

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3.0 Production Description

Luminaire Description: KNOOKFA16 / 9W / 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 / 9W / 2700K	Sample ID.	P1
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	0.074	8.9	0.997

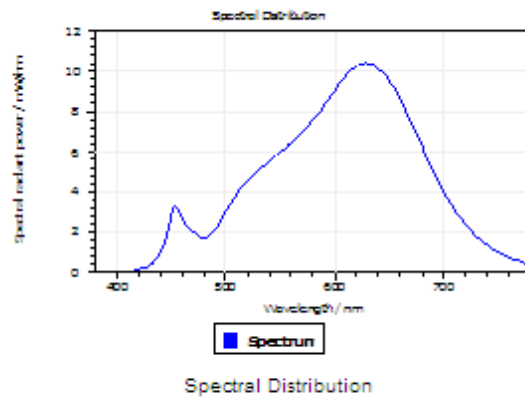
Test Result

CCT (K)	CRI	R9	Duv
2692	94	67	0.0028

Rf	Rg	IES Rcs,h1
93	98	-4%

4.1 Integrating Sphere Test

Results

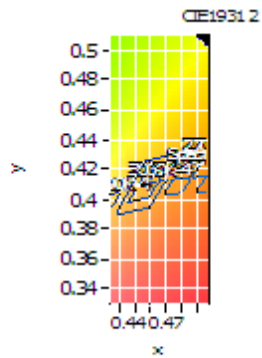


Spectral values

DominantWavelength 583.38 nm
Purity 0.657
PeakWavelength 628.56 nm
Radiant Power 1.722 W
Width50%:

Color Coordinates

Correlated Color Temperat 2692 K
x: 0.4655 u: 0.2621 u': 0.2621
y: 0.4197 v: 0.3544 v': 0.5316
CRI01 93.7 CRI09 66.6
CRI02 95.5 CRI10 88.5
CRI03 96.2 CRI11 95.8
CRI04 94.9 CRI12 79.8
CRI05 92.9 CRI13 94.0
CRI06 95.0 CRI14 96.8
CRI07 95.1 CRI15 89.9
CRI08 85.9 CRI16 89.4
ResultsCRI 93.6



PlanckDistance 2.8E-003

4.1 Integrating Sphere Test

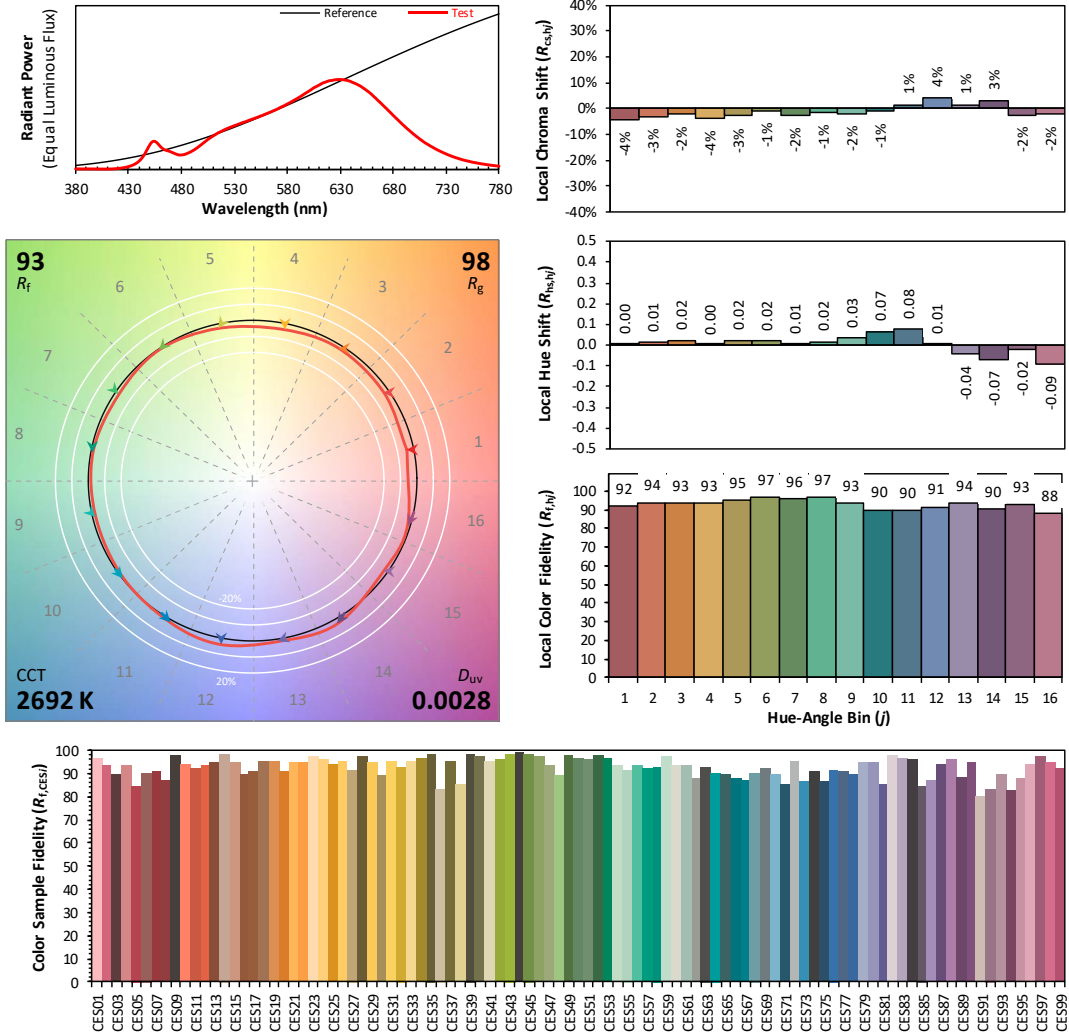
IES TM-30-18 Color Rendition Report

Source: DLF2211104-16a

Manufacturer: RAB Lighting Inc.

Date: 2022/11/23

Model: KNOOKFA16 / 9W / 2700K



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

x 0.4655
 y 0.4197
 u' 0.2621
 v' 0.5316

CIE 13.3-1995
(CRI)

R_a 94
 R_g 68

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	KNOOKFA16 / 9W / 2700K	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	120.07	60	0.075	9.0	0.996

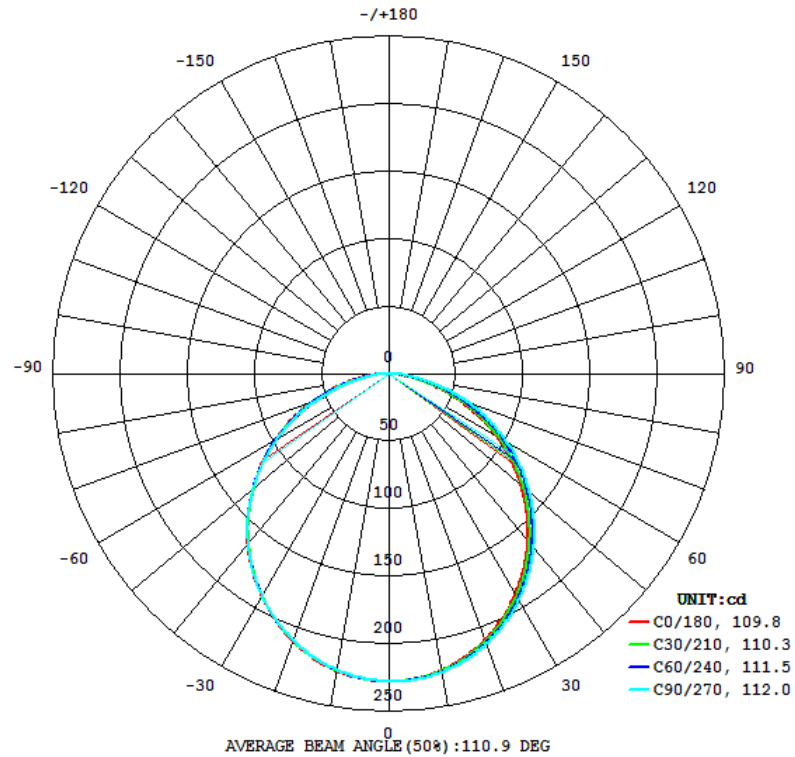
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
636	159.2	160.2	109.8	112.0	70.7

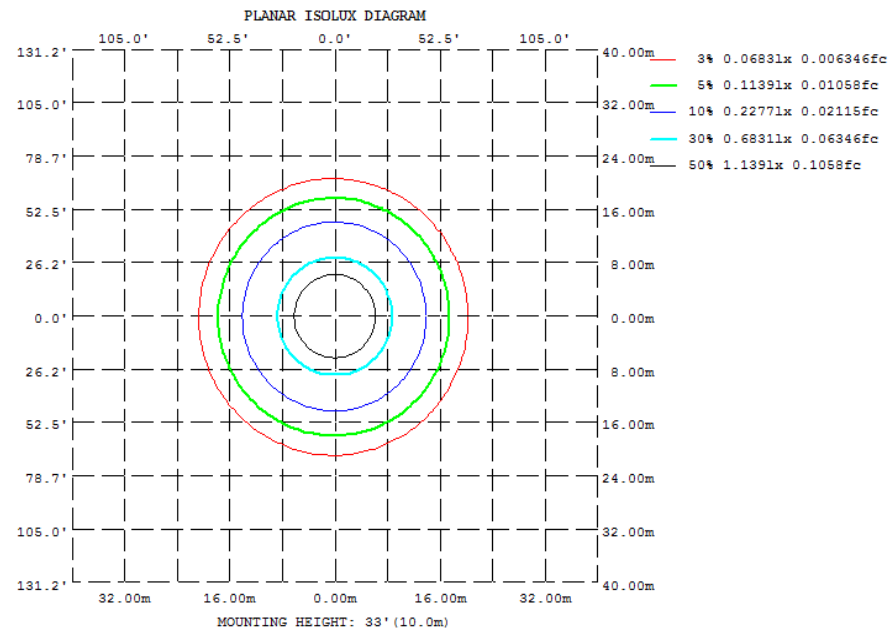
Zonal Lumen Requirement (0° - 60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
79.39%	25.4	1.31	486

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	222.9	223.6	224.4	223.9	223.3	222.8	222.7	222.5
20	209.5	211.2	212.6	211.8	210.4	209.7	209.8	209.1
30	188.5	191.2	193.5	192.3	190.0	189.4	189.5	188.6
40	161.3	164.8	168.1	166.4	163.7	163.1	163.4	161.8
50	128.9	133.3	137.3	135.8	132.5	132.0	132.0	129.7
60	92.64	97.36	102.2	101.3	98.23	97.45	96.82	93.87
70	53.90	58.39	63.37	63.69	61.71	60.37	58.70	55.09
80	16.98	20.59	25.09	26.47	25.85	23.84	21.37	18.20
90	0.0648	0.2498	0.4744	1.061	0.7937	0.3294	0.2123	0.2418
100	0.0583	0.1543	0.2629	0.1671	0.0755	0.1545	0.2518	0.1648
110	0.0785	0.0956	0.1842	0.0978	0.1079	0.1196	0.1899	0.1104
120	0.1056	0.1096	0.1214	0.1084	0.1318	0.1383	0.1406	0.1329
130	0.1322	0.1339	0.1318	0.1352	0.1733	0.1782	0.1767	0.1775
140	0.1566	0.1563	0.1561	0.1590	0.2217	0.2181	0.2224	0.2245
150	0.1738	0.1743	0.1735	0.1752	0.2263	0.2258	0.2241	0.2258
160	0.1881	0.1880	0.1855	0.1884	0.2254	0.2257	0.2216	0.2240
170	0.1996	0.2008	0.1992	0.2000	0.2247	0.2271	0.2232	0.2253
180	0.2265	0.2219	0.2192	0.2242	0.2258	0.2242	0.2205	0.2204
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				
3H	21.2	22.8	21.6	23.2	23.5	21.0	22.6	21.4	23.0	23.3
4H	23.0	24.5	23.4	24.8	25.2	22.8	24.3	23.2	24.6	25.0
6H	23.7	25.1	24.1	25.4	25.8	23.5	24.9	23.9	25.2	25.6
8H	24.2	25.5	24.6	25.8	26.2	24.0	25.3	24.4	25.7	26.0
12H	24.3	25.5	24.7	25.9	26.3	24.2	25.4	24.6	25.8	26.2
	24.4	25.5	24.8	25.9	26.4	24.2	25.4	24.7	25.8	26.2
4H 2H	21.8	23.2	22.2	23.6	23.9	21.7	23.1	22.1	23.4	23.8
3H	23.9	25.0	24.3	25.4	25.8	23.7	24.9	24.1	25.3	25.7
4H	24.7	25.7	25.1	26.1	26.6	24.5	25.6	24.9	26.0	26.4
6H	25.2	26.2	25.7	26.6	27.1	25.1	26.1	25.6	26.5	26.9
8H	25.4	26.3	25.9	26.7	27.2	25.3	26.2	25.8	26.6	27.1
12H	25.5	26.3	26.0	26.8	27.2	25.5	26.2	26.0	26.7	27.2
8H 4H	24.9	25.8	25.4	26.2	26.7	24.8	25.7	25.3	26.1	26.6
6H	25.6	26.3	26.1	26.8	27.3	25.5	26.3	26.0	26.8	27.2
8H	25.8	26.5	26.4	27.0	27.5	25.8	26.5	26.3	27.0	27.5
12H	26.0	26.6	26.5	27.1	27.6	26.0	26.6	26.6	27.1	27.7
12H 4H	25.0	25.7	25.4	26.2	26.7	24.9	25.6	25.3	26.1	26.6
6H	25.7	26.3	26.2	26.8	27.3	25.6	26.3	26.1	26.7	27.3
8H	25.9	26.5	26.4	27.0	27.6	25.9	26.5	26.4	27.0	27.6
Maximum UGR = 27.7										

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	21.53	0 - 10	21.53	3.38%
10-20	61.48	0 - 20	83.01	13.05%
20-30	92.75	0 - 30	175.76	27.62%
30-40	111.29	0 - 40	287.05	45.12%
40-50	114.86	0 - 50	401.91	63.17%
50-60	103.19	0 - 60	505.10	79.39%
60-70	77.76	0 - 70	582.86	91.61%
70-80	42.64	0 - 80	625.50	98.31%
80-90	9.75	0 - 90	635.25	99.84%
90-100	0.20	0 - 100	635.45	99.87%
100-110	0.14	0 - 110	635.59	99.90%
110-120	0.12	0 - 120	635.71	99.92%
120-130	0.12	0 - 130	635.83	99.93%
130-140	0.13	0 - 140	635.96	99.95%
140-150	0.12	0 - 150	636.08	99.97%
150-160	0.09	0 - 160	636.17	99.99%
160-170	0.06	0 - 170	636.23	100.00%
170-180	0.02	0 - 180	636.25	100.00%

4.2 Goniophotometer Test

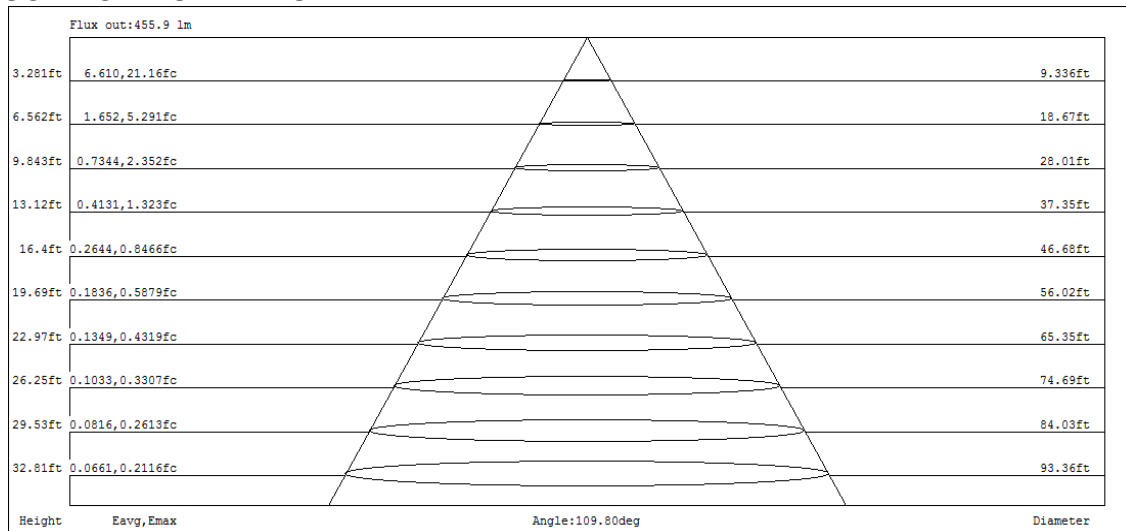
COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	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	54	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	43	35	29	41	34	29	40	34	29	39	33	29	27
10	53	40	32	27	52	39	32	27	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 / 9W / 2700K	Sample ID.	P1
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	0.074	8.9	0.997	5.80%

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*****