

Photometric Test Report

Relevant Standards

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

Prepared For RAB Lighting Inc.

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DLF2211104

Report Number

DLF2211104-26a

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	-		970
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥ 375		485
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	-		74.0
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		13.1
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%		5.22%
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	2681
		4 step	2725 \pm 83	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥ 80		93
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥ 0		66
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	$\geq 40\%$		78.95%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		25.7

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/11/23	KNOOKFA24 / 13W / 2700K	Z1
2	Goniophotometer Test	2022/11/23	KNOOKFA24 / 13W / 2700K	Z1
3	THD and PF Test	2022/11/23	KNOOKFA24 / 13W / 2700K	Z1

Remark(If any)

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3.0 Production Description

Luminaire Description: KNOOKFA24 / 13W / 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.	KNOOKFA24 / 13W / 2700K	Sample ID.	Z1
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
119.99	60	0.108	12.9	0.997

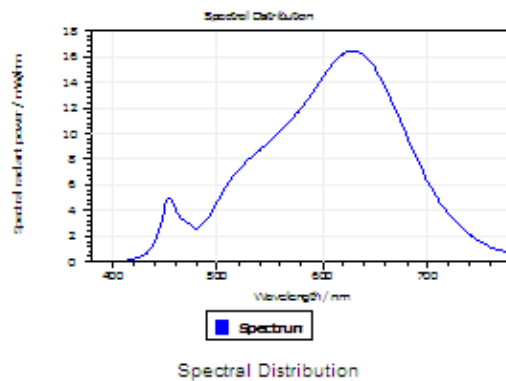
Test Result

CCT (K)	CRI	R9	Duv
2681	93	66	0.0031

Rf	Rg	IES Rcs,h1
92	97	-4%

4.1 Integrating Sphere Test

Results



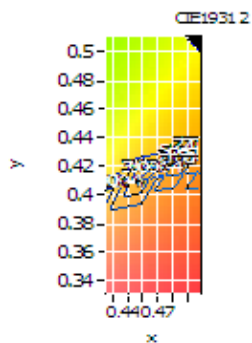
Spectral values

DominantWavelength 583.35 nm
Purity 0.665
PeakWavelength 628.15 nm
Radiant Power 2.71 W
Width50%:

Color Coordinates

Correlated Color Temperat 2681 K
x: 0.4669 u: 0.2625 u': 0.2625
y: 0.4208 v: 0.3548 v': 0.5322

CRI01	93.4	CRI09	65.8
CRI02	95.1	CRI10	87.5
CRI03	95.6	CRI11	95.6
CRI04	94.8	CRI12	78.8
CRI05	92.6	CRI13	93.6
CRI06	94.4	CRI14	96.5
CRI07	95.3	CRI15	89.7
CRI08	85.8	CRI16	89.3
ResultsCRI	93.4		



PlanckDistance 3.1E-003

4.1 Integrating Sphere Test

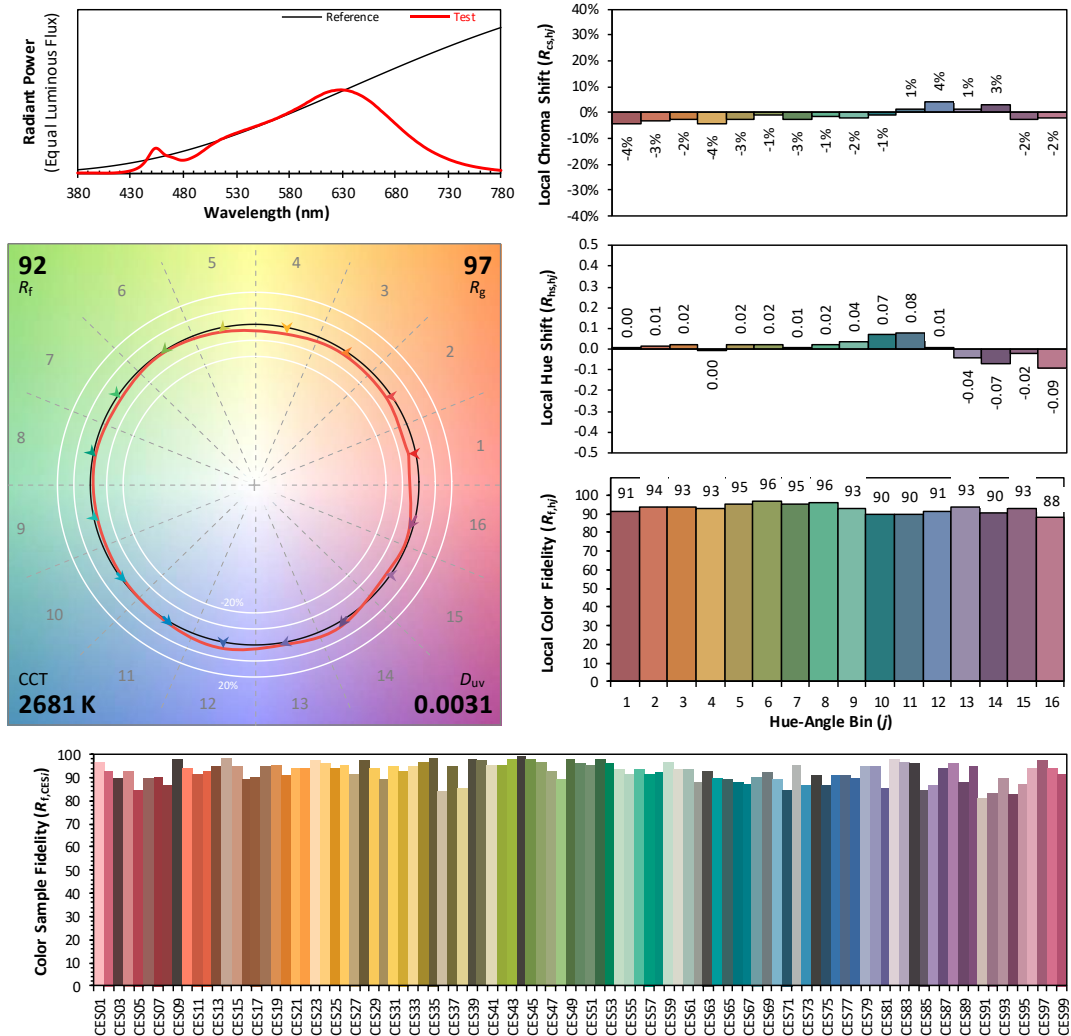
IES TM-30-18 Color Rendition Report

Source: DLF2211104-26a

Manufacturer: RAB Lighting Inc.

Date: 2022/11/23

Model: KNOOKFA24 / 13W / 2700K



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

x 0.4669
 y 0.4208
 u' 0.2625
 v' 0.5322

CIE 13.3-1995
(CRI)

R_a 93
 R_g 66

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	KNOOKFA24 / 13W / 2700K	Sample ID.	Z1
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
WORST CASE	120.02	60	0.109	13.1	0.997

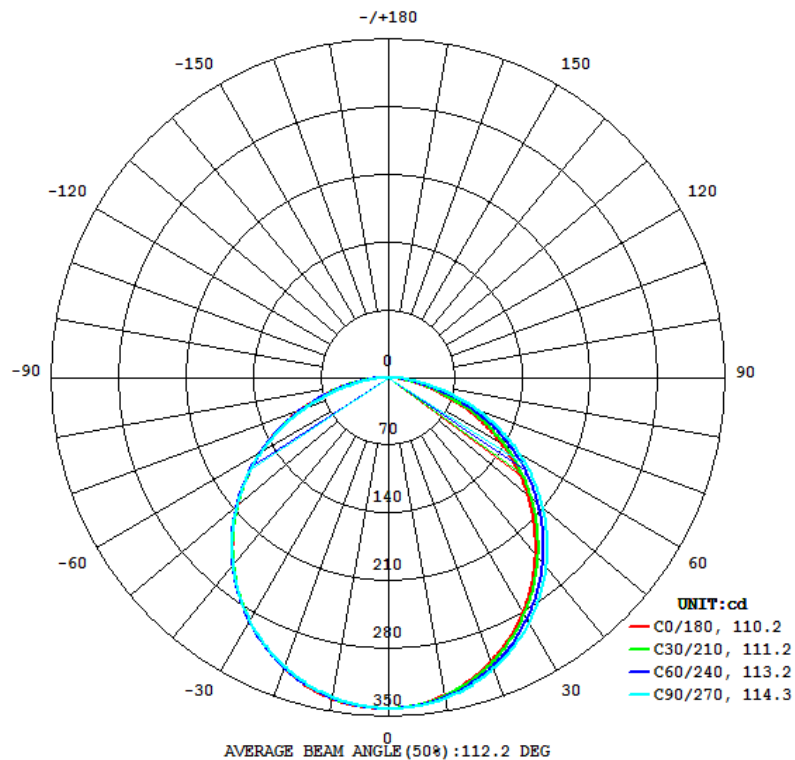
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
970	159.6	161.5	110.2	114.3	74.0

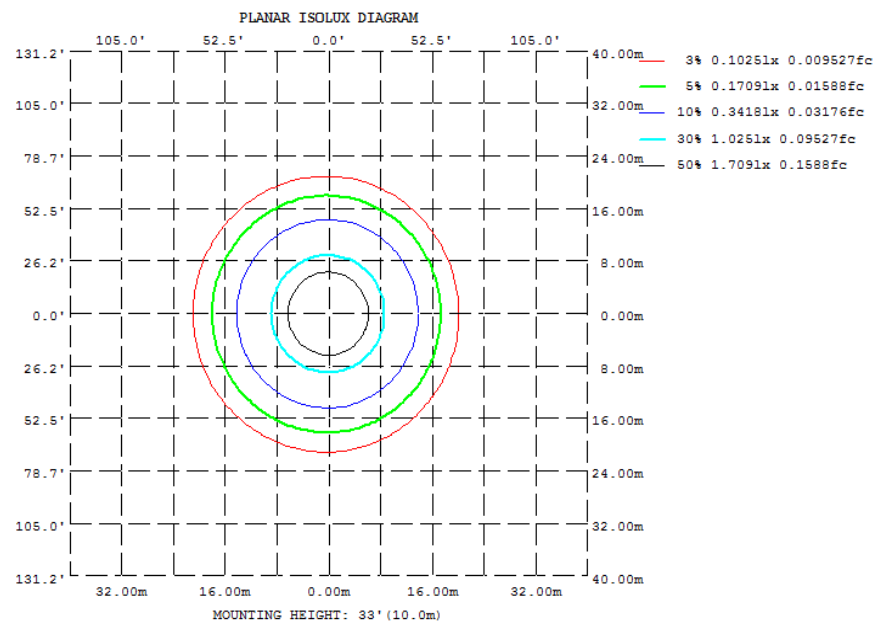
Zonal Lumen Requirement (0°-60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
78.95%	25.7	2.00	485

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	333.2	334.5	336.4	337.0	336.8	336.2	335.1	333.7
20	311.8	315.3	319.6	319.8	318.7	318.4	317.3	313.8
30	279.6	285.2	292.3	291.6	289.2	289.6	289.0	283.2
40	238.3	245.9	255.4	254.0	250.5	251.3	251.3	243.4
50	189.8	198.9	210.3	208.8	204.6	205.6	205.6	195.9
60	135.7	145.3	157.8	156.9	153.3	153.7	152.5	141.6
70	77.71	86.95	99.53	100.6	97.75	97.02	93.88	83.06
80	23.80	30.63	40.61	44.00	42.97	41.09	35.90	27.35
90	0.0812	0.3010	0.9511	2.586	2.013	1.026	0.3590	0.2709
100	0.0842	0.0918	0.1763	0.0753	0.0578	0.0623	0.0662	0.0861
110	0.1228	0.1261	0.1112	0.1021	0.1007	0.1058	0.1112	0.1261
120	0.1622	0.1663	0.1538	0.1407	0.1402	0.1460	0.1536	0.1596
130	0.2019	0.2082	0.1962	0.1839	0.2024	0.2091	0.2186	0.2310
140	0.2385	0.2406	0.2304	0.2232	0.2887	0.2837	0.2934	0.3082
150	0.2638	0.2645	0.2555	0.2509	0.3256	0.3234	0.3246	0.3344
160	0.2844	0.2832	0.2761	0.2735	0.3355	0.3340	0.3288	0.3348
170	0.3044	0.3022	0.2954	0.2942	0.3350	0.3395	0.3343	0.3368
180	0.3444	0.3341	0.3261	0.3312	0.3439	0.3377	0.3280	0.3281
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	21.3	23.0	21.7	23.3	23.6	21.2	22.8	21.5	23.1	23.5
4H	23.2	24.7	23.6	25.0	25.4	23.1	24.6	23.4	24.9	25.2
6H	23.9	25.3	24.3	25.6	26.0	23.8	25.2	24.2	25.5	25.9
8H	24.4	25.7	24.8	26.0	26.4	24.3	25.6	24.8	26.0	26.4
12H	24.5	25.8	24.9	26.2	26.6	24.5	25.8	24.9	26.1	26.5
	24.6	25.8	25.0	26.2	26.6	24.6	25.8	25.1	26.2	26.6
4H 2H	21.9	23.3	22.3	23.7	24.1	21.9	23.3	22.3	23.6	24.0
4H 3H	24.0	25.2	24.4	25.6	26.0	24.0	25.2	24.4	25.6	25.9
4H 4H	24.8	25.9	25.3	26.3	26.8	24.8	25.9	25.3	26.3	26.7
4H 6H	25.5	26.4	25.9	26.8	27.3	25.5	26.4	26.0	26.9	27.3
4H 8H	25.6	26.5	26.1	27.0	27.4	25.7	26.6	26.2	27.0	27.5
4H 12H	25.8	26.6	26.3	27.0	27.5	25.9	26.7	26.4	27.2	27.6
8H 4H	25.1	26.0	25.6	26.4	26.9	25.2	26.0	25.6	26.5	26.9
8H 6H	25.8	26.6	26.3	27.1	27.5	26.0	26.7	26.5	27.2	27.6
8H 8H	26.1	26.8	26.6	27.3	27.7	26.3	26.9	26.8	27.4	27.9
8H 12H	26.3	26.9	26.8	27.4	27.9	26.5	27.1	27.0	27.6	28.1
12H 4H	25.1	25.9	25.6	26.4	26.9	25.2	26.0	25.7	26.5	26.9
12H 6H	25.9	26.6	26.4	27.0	27.5	26.0	26.7	26.5	27.1	27.7
12H 8H	26.2	26.8	26.7	27.3	27.8	26.4	27.0	26.9	27.5	28.0
Maximum UGR = 28.1										

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	32.31	0 - 10	32.31	3.33%
10-20	92.43	0 - 20	124.74	12.87%
20-30	139.83	0 - 30	264.57	27.29%
30-40	168.38	0 - 40	432.95	44.65%
40-50	174.65	0 - 50	607.60	62.67%
50-60	157.86	0 - 60	765.46	78.95%
60-70	119.75	0 - 70	885.21	91.30%
70-80	66.78	0 - 80	951.99	98.18%
80-90	16.38	0 - 90	968.37	99.87%
90-100	0.22	0 - 100	968.59	99.90%
100-110	0.10	0 - 110	968.69	99.91%
110-120	0.13	0 - 120	968.82	99.92%
120-130	0.16	0 - 130	968.98	99.94%
130-140	0.18	0 - 140	969.16	99.95%
140-150	0.18	0 - 150	969.34	99.97%
150-160	0.14	0 - 160	969.48	99.99%
160-170	0.09	0 - 170	969.57	100.00%
170-180	0.03	0 - 180	969.60	100.00%

4.2 Goniophotometer Test

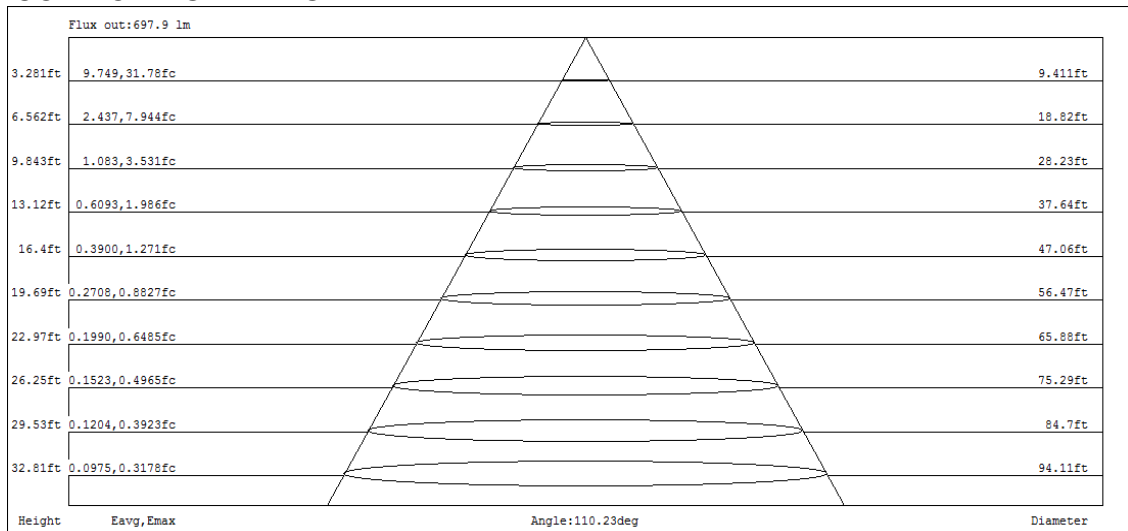
COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	94	97	94	91	93	91	88	90	88	86	84
2	99	91	84	78	96	89	82	77	85	80	75	82	77	73	79	75	72	70
3	90	79	71	65	88	78	70	64	75	68	63	72	66	62	69	65	61	59
4	82	70	61	55	80	69	61	54	66	59	54	64	58	53	62	57	52	50
5	76	63	54	47	74	62	53	47	60	52	46	58	51	46	56	50	45	43
6	70	56	48	41	68	56	47	41	54	46	40	52	45	40	50	44	40	38
7	65	51	42	36	63	50	42	36	49	41	36	47	41	36	46	40	35	33
8	60	47	38	32	59	46	38	32	45	37	32	43	37	32	42	36	32	30
9	56	43	35	29	55	42	34	29	41	34	29	40	33	29	39	33	28	27
10	53	40	32	26	52	39	31	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.	KNOOKFA24 / 13W / 2700K	Sample ID.	Z1
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
119.99	60	0.108	12.9	0.997	5.22%

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*****