

Photometric Test Report

Relevant Standards

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

Prepared For

RAB Lighting Inc.

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Issue Date: 2023-11-15

Revised Date: N/A

1.0 Test Summary

DLC Technical Requirements V5.1

Outdoor Non-Cutoff and Semi-Cutoff Wall-Mounted Area Luminaires				
Requirement Category	Test Method	Requirements		Test Value
Luminaire Output (lm) (Goniophotometer – Section 4.2) (0°-180° zones)	IES LM-79-2008	N/A		3648
Minimum Luminaire Efficacy (lm/W) (Goniophotometer – Section 4.2) (0°-180° zones)	IES LM-79-2008	N/A		137.7
Luminaire Output (lm) (Goniophotometer – Section 4.2) (0°-90° zones)	IES LM-79-2008	300		3588
Minimum Luminaire Efficacy (lm/W) (Goniophotometer – Section 4.2) (0°-90° zones)	IES LM-79-2008	Standard	Premium	135.4
		105	120	
Power (Input Wattage) (W) (Goniophotometer – Section 4.2)	IES LM-79-2008	Worst Case		26.5
Total Harmonic Distortion (A%) (THD & PF – Section 4.3)	ANSI C82.77:2014	20.00%	120V	3.12
			277V	11.79
Power Factor (THD & PF – Section 4.3)	ANSI C82.77:2014	0.9	120V	0.996
			277V	0.908
Allowable CCTs* (K) (Integrating Sphere – Section 4.1)	IES LM-79-2008	7 steps	3045±175	3101
		4 steps	3045±100	
Minimum CRI (Integrating Sphere – Section 4.1)	IES LM-79-2008 CIE13.3-1995	≥70		81.8
Minimum R9 (Integrating Sphere – Section 4.1)	IES LM-79-2008 CIE13.3-1995	N/A		7
Minimum Rf (Integrating Sphere – Section 4.1)	ANSI/IES TM-30-18	≥70		84
Minimum Rg (Integrating Sphere – Section 4.1)	ANSI/IES TM-30-18	≥89		95
IES Rcs,h1 (Integrating Sphere – Section 4.1)	ANSI/IES TM-30-18	-18%≤IES Rcs,h1≤+23%		-12%
Zonal Lumen Requirement (80°-90°) (Goniophotometer – Section 4.2)	IES LM-79-2008	≤10%		2.1%
Input Voltage (V)				
(Goniophotometer – Section 4.2)	IES LM-79-2008	Worst Cast		277.0
(Goniophotometer – Section 4.2)		Non-Worst Case		120.0
Input Current (A)				
(Goniophotometer – Section 4.2)	IES LM-79-2008	Worst Case		0.105
(Goniophotometer – Section 4.2)		Non-Worst Case		0.216
Power (Input Wattage – W)				
(Goniophotometer – Section 4.2)	IES LM-79-2008	Worst Case		26.5
(Goniophotometer – Section 4.2)		Non-Worst Case		25.8

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2023-11-02	WPX1 @ 20W / 3000K	231101002-S1
2	Goniophotometer Test	2023-11-02	WPX1 @ 20W / 3000K	231101002-S1
3	THD and PF Test	2023-11-02	WPX1 @ 20W / 3000K	231101002-S1

Remark (If any)

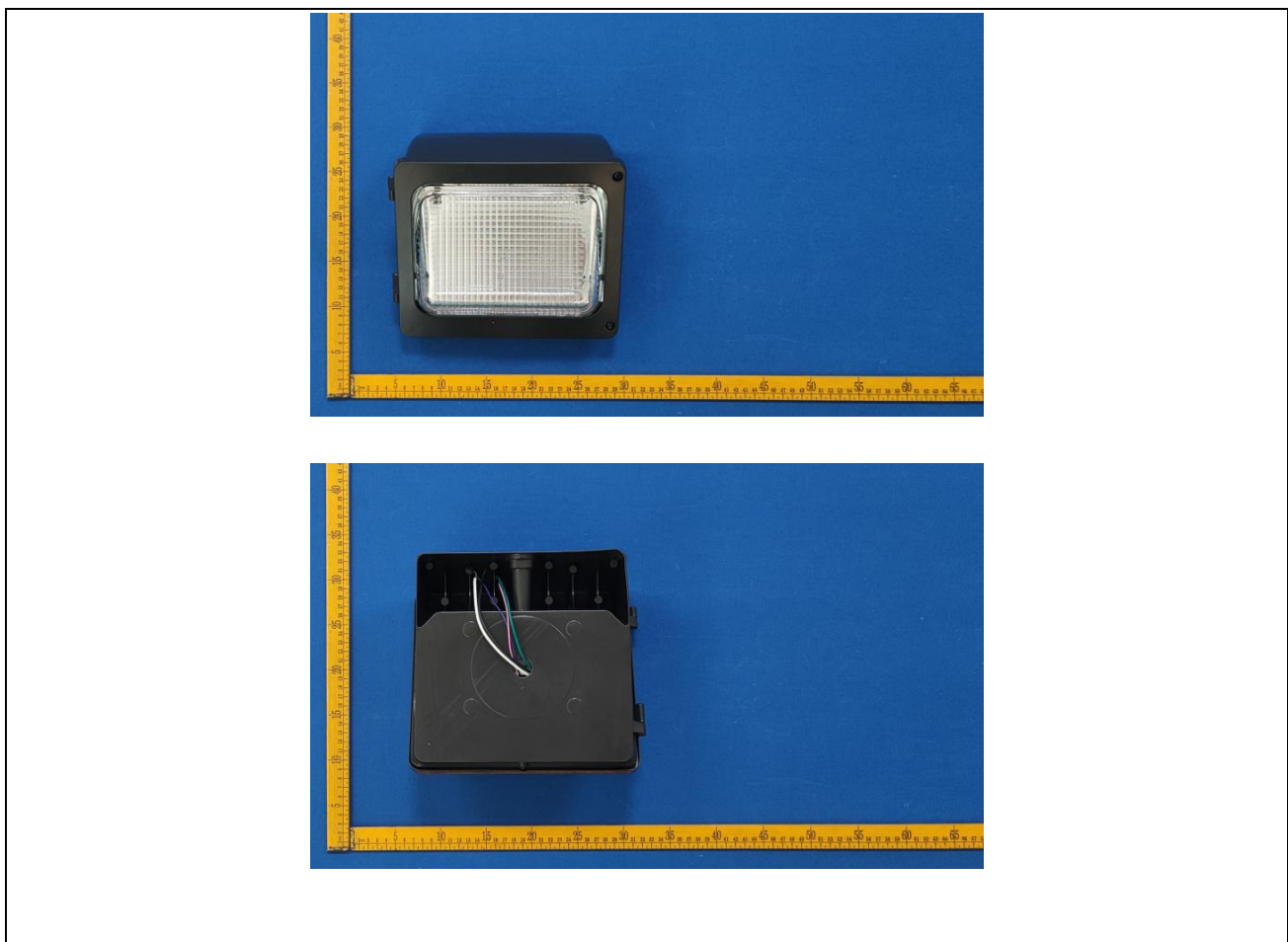
1. The results contained in this report pertain only to the tested samples.
2. This report shall not be reproduced, no limited part or full, without approval of Dongguan New Testing Centre Co., Ltd.
3. This report does not imply product certification, approval, or endorsement by NVLAP, or any agency of the Federal Government.

3.0 Product Description

Luminaire Description: Model No. WPX1 @ 20W / 3000K, color tunable from 3000K, 4000K and 5000K.

Electrical Specification: 120-277Vac, 50/60Hz

Photos of Luminaire Characteristics



4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test

Model No.	WPX1 @ 20W / 3000K	Sample ID	231101002-S1
Operate time (Min.)	10	Stabilization time (Min.)	60
Temperature (°C)	25.4	Humidity (%RH)	41.0

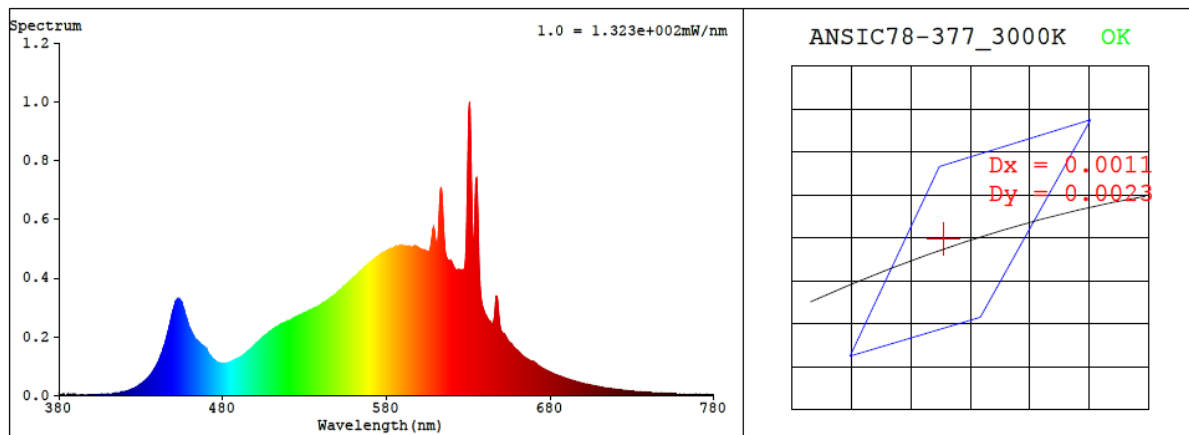
Test Method
<p>The Samples were tested according to the IES LM-79-2008.</p> <p>Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25±1°C.</p> <p>The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere.</p> <p>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.</p> <p>The sample was measured using 4π geometry and operated at rated voltage and was stabilized before measurement.</p> <p>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 780nm.</p>

Test Result

Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.0	60	0.216	25.8	0.996
277.0	60	0.105	26.5	0.908

CCT (K)	CRI	R9	Duv	Rf	Rg	IES Rcs,h1
3101	81.8	7	0.0008	84	95	-12%

4.1 Integrating Sphere Test



Colorimetric Parameters

Chromaticity Coordinate: $x = 0.4310$ $y = 0.4039$ / $u' = 0.2468$ $v' = 0.5204$ ($duv=7.78e-04$)

CCT= 3101K Prcp WL: $L_d=582.1nm$ Purity=50.6%

Peak WL: $L_p=631nm$ FWHM: $=8.2nm$ Ratio:R=22.2% G=75.2% B=2.6%

Render Index: $R_a = 81.8$ AvgR = 75.6 TM30:Rf=83 Rg=95

EEL: 0.10018 A++ Highest

R1 =80 R2 =90 R3 =97 R4 =79 R5 =80 R6 =87 R7 =83
R8 =60 R9 =7 R10=76 R11=77 R12=66 R13=82 R14=99 R15=73

4.1 Integrating Sphere Test

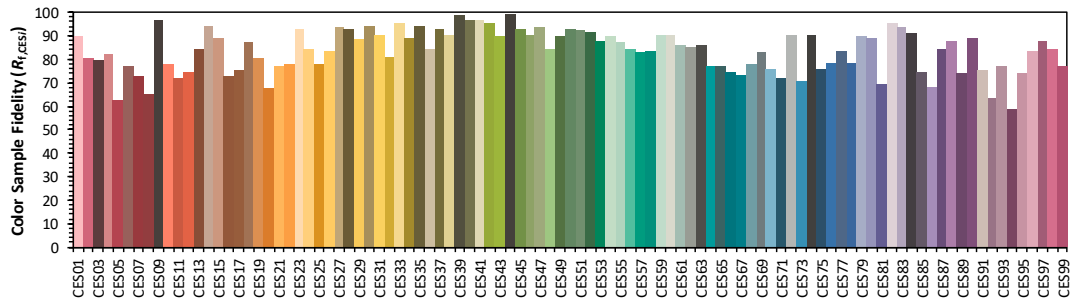
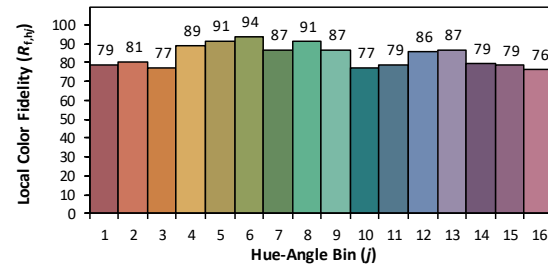
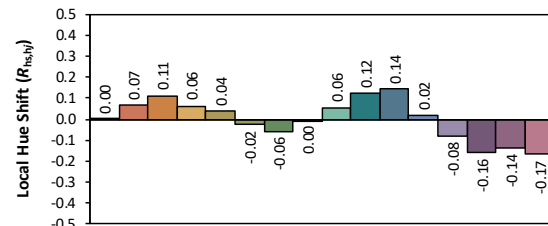
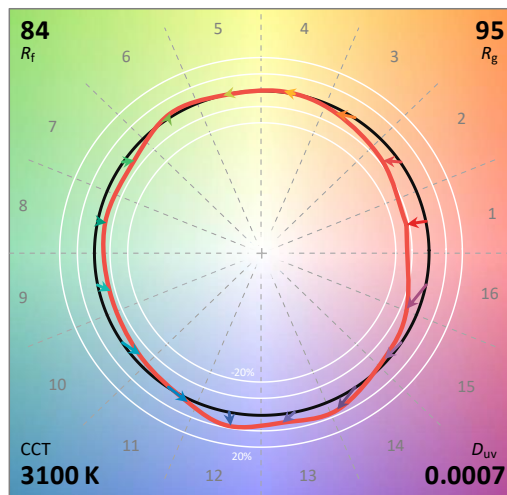
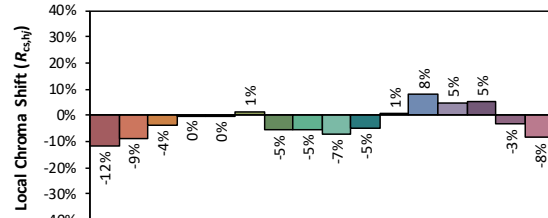
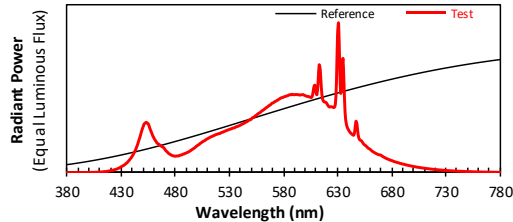
ANSI/IES TM-30-18 Color Rendition Report

Source: 1 CIE F1

Manufacturer: RAB Lighting Inc.

Date: 2023/11/15

Model: WPX1 @ 20W / 3000K



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

x 0.4310
 y 0.4038
 u' 0.2469
 v' 0.5204

CIE 13.3-1995
(CRI)

R_a 82
 R_g 7

4.1 Integrating Sphere Test

Spectral Distribution over Visible Wavelength											
WL (nm)	Radiant (W/nm)	WL (nm)	Radiant (W/nm)	WL (nm)	Radiant (W/nm)	WL (nm)	Radiant (W/nm)	WL (nm)	Radiant (W/nm)	WL (nm)	Radiant (W/nm)
380	3.80E-06	447	2.27E-04	514	2.36E-04	581	4.94E-04	648	3.15E-04	715	2.57E-05
381	2.00E-07	448	2.52E-04	515	2.41E-04	582	4.96E-04	649	2.51E-04	716	2.49E-05
382	1.30E-06	449	2.77E-04	516	2.43E-04	583	5.00E-04	650	2.21E-04	717	2.38E-05
383	2.00E-06	450	2.96E-04	517	2.47E-04	584	5.01E-04	651	2.12E-04	718	2.30E-05
384	0.00E+00	451	3.16E-04	518	2.49E-04	585	5.05E-04	652	2.08E-04	719	2.25E-05
385	1.20E-06	452	3.22E-04	519	2.51E-04	586	5.07E-04	653	1.99E-04	720	2.15E-05
386	1.80E-06	453	3.28E-04	520	2.54E-04	587	5.06E-04	654	1.89E-04	721	2.10E-05
387	1.50E-06	454	3.22E-04	521	2.55E-04	588	5.10E-04	655	1.82E-04	722	2.02E-05
388	1.60E-06	455	3.16E-04	522	2.59E-04	589	5.07E-04	656	1.77E-04	723	1.96E-05
389	1.40E-06	456	2.97E-04	523	2.63E-04	590	5.07E-04	657	1.70E-04	724	1.90E-05
390	9.00E-07	457	2.77E-04	524	2.64E-04	591	5.08E-04	658	1.63E-04	725	1.81E-05
391	1.70E-06	458	2.60E-04	525	2.68E-04	592	5.09E-04	659	1.57E-04	726	1.80E-05
392	1.80E-06	459	2.41E-04	526	2.71E-04	593	5.07E-04	660	1.54E-04	727	1.72E-05
393	1.90E-06	460	2.28E-04	527	2.73E-04	594	5.08E-04	661	1.47E-04	728	1.62E-05
394	2.40E-06	461	2.15E-04	528	2.77E-04	595	5.05E-04	662	1.41E-04	729	1.60E-05
395	1.10E-06	462	2.05E-04	529	2.79E-04	596	5.06E-04	663	1.36E-04	730	1.54E-05
396	1.50E-06	463	1.94E-04	530	2.82E-04	597	5.07E-04	664	1.32E-04	731	1.50E-05
397	1.40E-06	464	1.89E-04	531	2.84E-04	598	5.08E-04	665	1.28E-04	732	1.45E-05
398	2.00E-06	465	1.84E-04	532	2.86E-04	599	5.05E-04	666	1.24E-04	733	1.43E-05
399	2.10E-06	466	1.78E-04	533	2.90E-04	600	5.01E-04	667	1.21E-04	734	1.37E-05
400	2.00E-06	467	1.73E-04	534	2.92E-04	601	4.98E-04	668	1.18E-04	735	1.30E-05
401	1.50E-06	468	1.68E-04	535	2.93E-04	602	4.96E-04	669	1.17E-04	736	1.25E-05
402	3.00E-06	469	1.64E-04	536	2.99E-04	603	4.95E-04	670	1.15E-04	737	1.24E-05
403	3.00E-06	470	1.56E-04	537	3.00E-04	604	4.93E-04	671	1.10E-04	738	1.19E-05
404	2.70E-06	471	1.45E-04	538	3.03E-04	605	4.90E-04	672	1.05E-04	739	1.15E-05
405	2.80E-06	472	1.39E-04	539	3.06E-04	606	4.90E-04	673	1.01E-04	740	1.13E-05
406	4.00E-06	473	1.31E-04	540	3.09E-04	607	5.08E-04	674	9.76E-05	741	1.07E-05
407	3.20E-06	474	1.24E-04	541	3.13E-04	608	5.52E-04	675	9.35E-05	742	1.04E-05
408	4.10E-06	475	1.20E-04	542	3.17E-04	609	5.69E-04	676	9.07E-05	743	1.03E-05
409	4.10E-06	476	1.16E-04	543	3.20E-04	610	5.25E-04	677	8.78E-05	744	9.90E-06
410	5.10E-06	477	1.12E-04	544	3.24E-04	611	5.09E-04	678	8.44E-05	745	9.50E-06
411	5.30E-06	478	1.10E-04	545	3.29E-04	612	5.87E-04	679	8.22E-05	746	9.40E-06
412	5.80E-06	479	1.09E-04	546	3.32E-04	613	7.00E-04	680	7.95E-05	747	9.00E-06
413	6.70E-06	480	1.08E-04	547	3.36E-04	614	6.68E-04	681	7.74E-05	748	8.40E-06
414	7.90E-06	481	1.09E-04	548	3.41E-04	615	5.54E-04	682	7.39E-05	749	8.30E-06
415	7.90E-06	482	1.10E-04	549	3.44E-04	616	4.86E-04	683	7.17E-05	750	8.10E-06
416	9.40E-06	483	1.10E-04	550	3.47E-04	617	4.65E-04	684	6.98E-05	751	7.60E-06
417	9.20E-06	484	1.13E-04	551	3.56E-04	618	4.60E-04	685	6.76E-05	752	7.50E-06
418	1.15E-05	485	1.15E-04	552	3.59E-04	619	4.58E-04	686	6.56E-05	753	7.60E-06
419	1.25E-05	486	1.17E-04	553	3.64E-04	620	4.51E-04	687	6.37E-05	754	7.20E-06
420	1.35E-05	487	1.21E-04	554	3.70E-04	621	4.39E-04	688	6.12E-05	755	7.00E-06
421	1.54E-05	488	1.23E-04	555	3.75E-04	622	4.29E-04	689	5.95E-05	756	6.70E-06
422	1.66E-05	489	1.26E-04	556	3.81E-04	623	4.28E-04	690	5.72E-05	757	6.30E-06
423	1.86E-05	490	1.28E-04	557	3.86E-04	624	4.29E-04	691	5.59E-05	758	6.20E-06
424	2.05E-05	491	1.32E-04	558	3.90E-04	625	4.27E-04	692	5.39E-05	759	6.20E-06
425	2.32E-05	492	1.35E-04	559	3.95E-04	626	4.25E-04	693	5.22E-05	760	5.80E-06
426	2.51E-05	493	1.39E-04	560	4.02E-04	627	4.25E-04	694	5.06E-05	761	5.80E-06
427	2.85E-05	494	1.44E-04	561	4.06E-04	628	4.46E-04	695	4.90E-05	762	5.50E-06
428	3.15E-05	495	1.49E-04	562	4.11E-04	629	5.85E-04	696	4.73E-05	763	5.30E-06
429	3.57E-05	496	1.54E-04	563	4.16E-04	630	8.92E-04	697	4.57E-05	764	5.30E-06
430	3.99E-05	497	1.59E-04	564	4.23E-04	631	9.70E-04	698	4.46E-05	765	5.40E-06
431	4.37E-05	498	1.64E-04	565	4.27E-04	632	6.98E-04	699	4.27E-05	766	4.80E-06
432	4.78E-05	499	1.70E-04	566	4.33E-04	633	5.15E-04	700	4.15E-05	767	4.80E-06
433	5.22E-05	500	1.75E-04	567	4.38E-04	634	6.29E-04	701	4.01E-05	768	4.60E-06
434	5.84E-05	501	1.80E-04	568	4.42E-04	635	7.43E-04	702	3.92E-05	769	4.60E-06
435	6.41E-05	502	1.85E-04	569	4.49E-04	636	5.70E-04	703	3.74E-05	770	4.50E-06
436	7.11E-05	503	1.91E-04	570	4.53E-04	637	3.90E-04	704	3.64E-05	771	4.10E-06
437	7.92E-05	504	1.95E-04	571	4.57E-04	638	3.23E-04	705	3.53E-05	772	4.10E-06
438	8.83E-05	505	2.01E-04	572	4.62E-04	639	2.96E-04	706	3.42E-05	773	4.10E-06
439	9.66E-05	506	2.05E-04	573	4.65E-04	640	2.81E-04	707	3.31E-05	774	3.90E-06
440	1.08E-04	507	2.09E-04	574	4.70E-04	641	2.69E-04	708	3.22E-05	775	3.80E-06
441	1.19E-04	508	2.14E-04	575	4.73E-04	642	2.59E-04	709	3.11E-05	776	3.60E-06
442	1.33E-04	509	2.19E-04	576	4.79E-04	643	2.53E-04	710	2.99E-05	777	3.50E-06
443	1.47E-04	510	2.22E-04	577	4.83E-04	644	2.47E-04	711	2.92E-05	778	3.40E-06
444	1.65E-04	511	2.26E-04	578	4.87E-04	645	2.45E-04	712	2.84E-05	779	3.40E-06
445	1.83E-04	512	2.30E-04	579	4.88E-04	646	2.73E-04	713	2.71E-05	780	3.40E-06
446	2.06E-04	513	2.34E-04	580	4.92E-04	647	3.34E-04	714	2.63E-05	N/A	N/A

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	WPX1 @ 20W / 3000K	Sample ID	231101002-S1
Operate time (Min.)	30	Stabilization time (Min.)	60
Temperature (°C)	24.8	Humidity (%RH)	42.9

Test Method
<p>The Samples were tested according to the IES LM-79-2008.</p> <p>Photometric parameters were measured using a type C goniophotometer and software.</p> <p>The ambient temperature shall be maintained at $25 \pm 1^{\circ}\text{C}$, measured at a point not more than 1 m from the sample and at the same height as the sample.</p> <p>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.</p> <p>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 1.0° vertical intervals and 15° horizontal intervals.</p>

Test Conditions

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WORST CASE	277.0	60	0.105	26.5	0.908
NON-WORST CASE	120.0	60	0.216	25.8	0.996

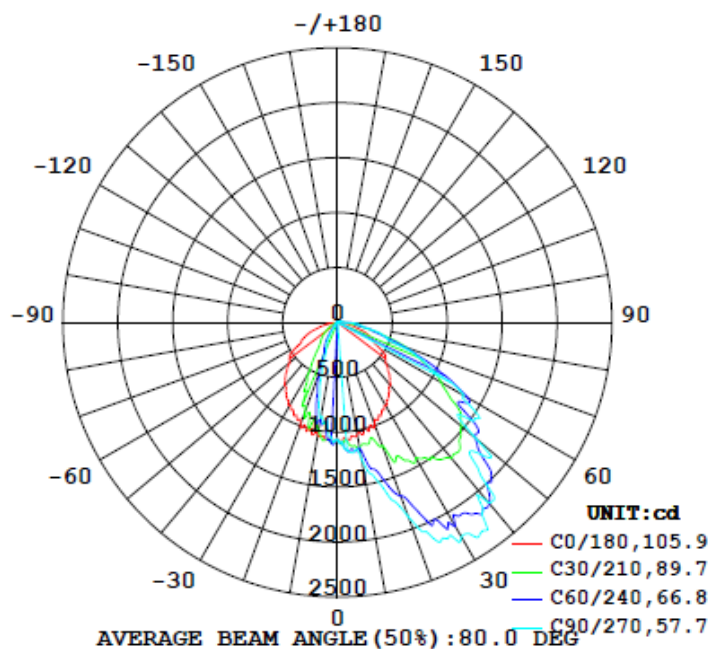
Test Result

Result Type	Flux (lm)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)	Zonal Lumen Requirement	BUG
		C0-180	C90-270	C0-180	C90-270		(80°-90°)	
0°-180° zones	3648	108.9	146.7	56.4	97.5	137.7	2.0%	B1-U2-G1
0°-90° zones	3588	108.9	146.7	56.4	97.5	135.4	2.1%	B1-U2-G1

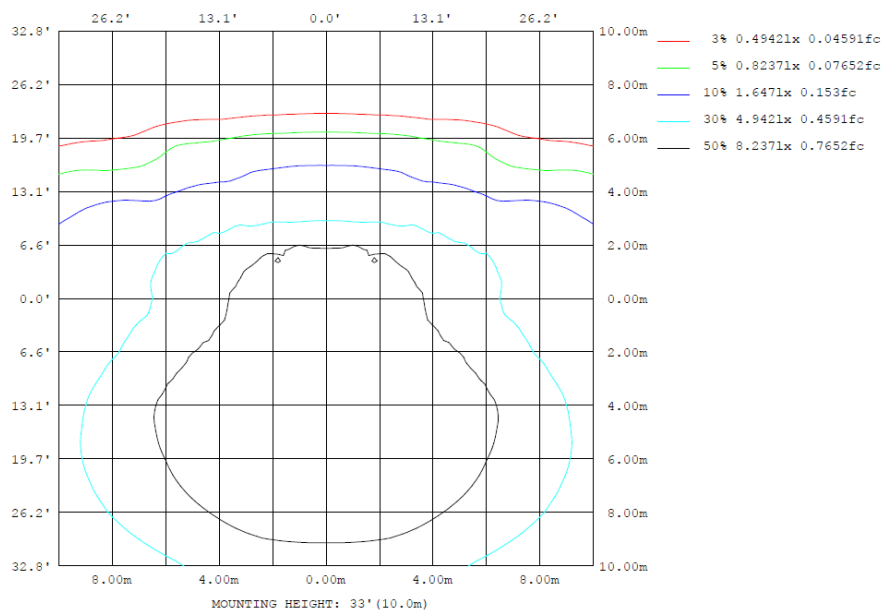
4.2 Goniophotometer Test

Lighting Distribution Curve

LUMINOUS INTENSITY DISTRIBUTION DIAGRAM



Isolux Plot



4.2 Goniophotometer Test

Zonal Lumen Summary

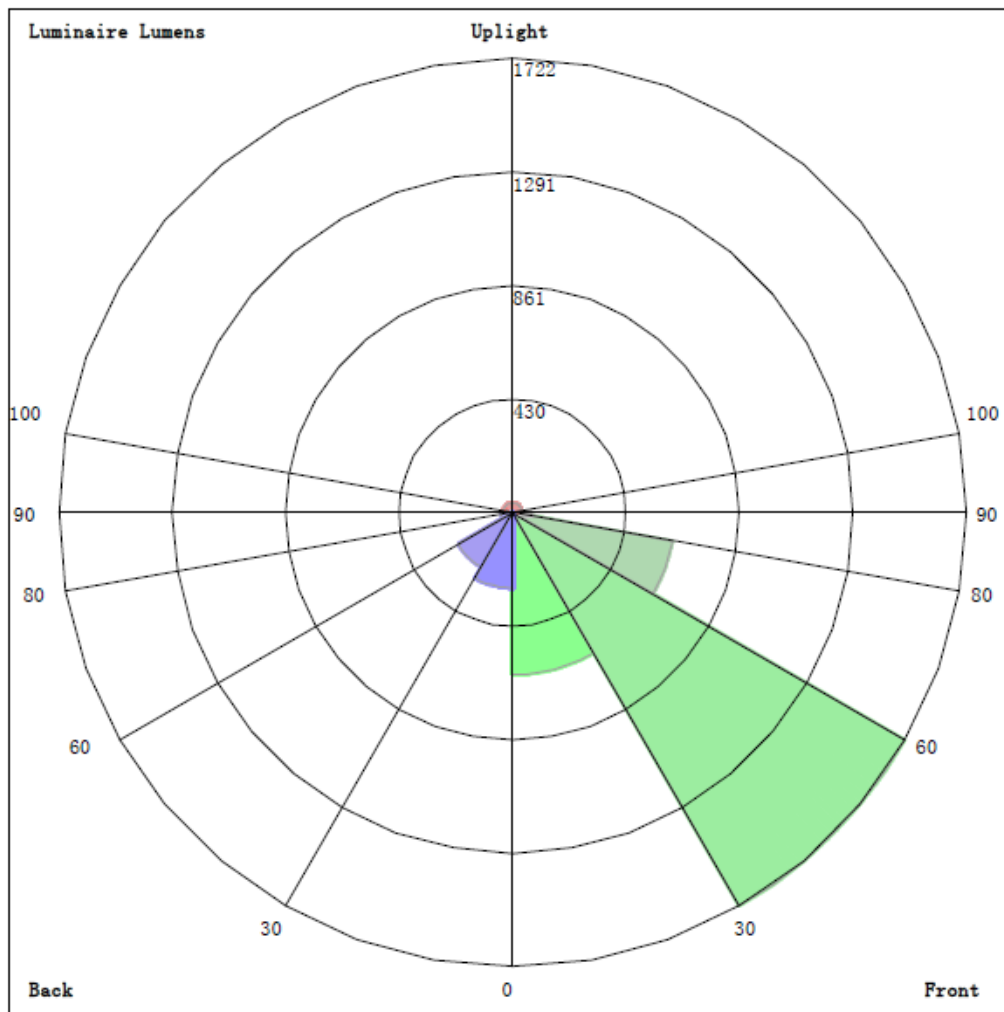
ZONAL FLUX DIAGRAM:

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	zone	total	%lum, lamp
10	1040	1176	1262	1176	1040	931.3	883.3	931.3	0- 10	102.9	102.9	2.82,2.82
20	992.1	1457	1878	1457	992.1	648.3	339.8	648.3	10- 20	301.7	404.6	11.1,11.1
30	872.1	1833	2253	1833	872.1	276.8	172.7	276.8	20- 30	496.2	900.9	24.7,24.7
40	744.2	1871	2142	1871	744.2	155.5	49.68	155.5	30- 40	648.0	1549	42.5,42.5
50	572.1	1664	1649	1664	572.1	52.80	22.78	52.80	40- 50	692.8	2242	61.5,61.5
60	400.4	1185	1328	1185	400.4	20.15	0.4492	20.15	50- 60	618.2	2860	78.4,78.4
70	267.1	668.1	548.7	668.1	267.1	3.567	0.6509	3.567	60- 70	447.1	3307	90.7,90.7
80	91.01	230.8	236.2	230.8	91.01	1.560	0.6668	1.560	70- 80	206.9	3514	96.3,96.3
90	12.07	85.02	80.16	85.02	12.07	1.020	0.7988	1.020	80- 90	74.39	3588	98.4,98.4
100	8.493	27.80	41.78	27.80	8.493	1.099	1.100	1.099	90-100	23.10	3611	99.99
110	7.984	10.47	32.09	10.47	7.984	0.9950	1.148	0.9950	100-110	10.97	3622	99.3,99.3
120	6.363	21.86	11.99	21.86	6.363	0.9546	1.217	0.9546	110-120	7.773	3630	99.5,99.5
130	2.597	17.66	19.29	17.66	2.597	1.034	1.462	1.034	120-130	8.087	3638	99.7,99.7
140	0.6603	10.75	15.41	10.75	0.6603	1.147	1.525	1.147	130-140	5.424	3644	99.9,99.9
150	0.6116	5.172	7.235	5.172	0.6116	1.289	1.488	1.289	140-150	2.722	3646	100,100
160	0.7243	0.5769	2.474	0.5769	0.7243	1.371	1.325	1.371	150-160	0.9125	3647	100,100
170	0.8760	0.8501	0.6922	0.8501	0.8760	1.152	1.007	1.152	160-170	0.3030	3648	100,100
180	1.013	0.9742	0.8241	0.9742	1.013	0.9343	0.8754	0.9343	170-180	0.0933	3648	100,100
DEG	LUMINOUS INTENSITY:cd									UNIT:lm		

	Zonal (lm)		Total (lm)	Percent
0-10	102.91	0-10	102.91	2.82%
10-20	301.72	0-20	404.63	11.09%
20-30	496.24	0-30	900.87	24.70%
30-40	647.99	0-40	1548.86	42.46%
40-50	692.81	0-50	2241.67	61.46%
50-60	618.22	0-60	2859.89	78.41%
60-70	447.08	0-70	3306.97	90.66%
70-80	206.86	0-80	3513.83	96.34%
80-90	74.39	0-90	3588.22	98.37%
90-100	23.10	0-100	3611.32	99.01%
100-110	10.97	0-110	3622.29	99.31%
110-120	7.77	0-120	3630.06	99.52%
120-130	8.09	0-130	3638.15	99.74%
130-140	5.42	0-140	3643.57	99.89%
140-150	2.72	0-150	3646.29	99.97%
150-160	0.91	0-160	3647.20	99.99%
160-170	0.30	0-170	3647.50	100.00%
170-180	0.09	0-180	3647.59	100.00%

4.2 Goniophotometer Test

LCS/BUG

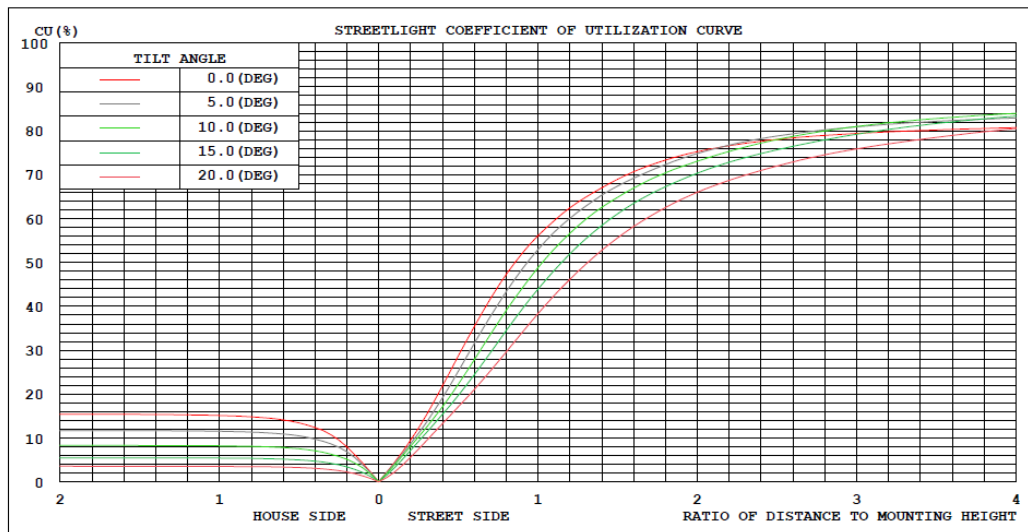


LUMINAIRE CLASSIFICATION SYSTEM (LCS)

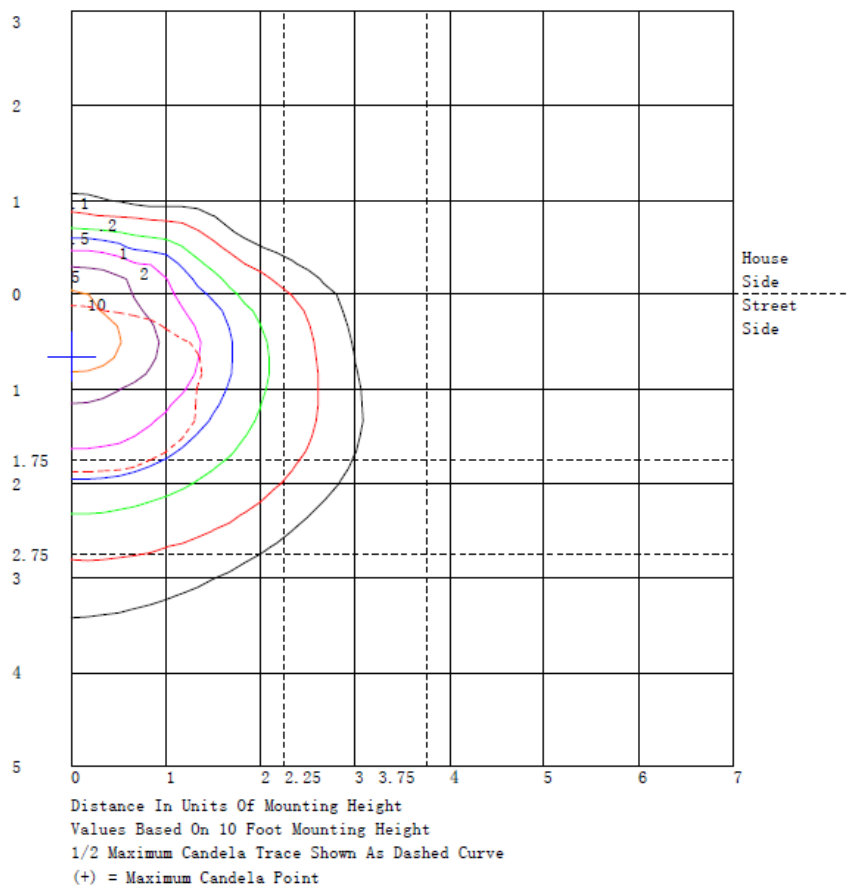
	Lumens	% Lamp	% Luminaire
FL - Front-Low (0-30)	615.0	N.A.	16.9
FM - Front-Medium (30-60)	1721.8	N.A.	47.2
FH - Front-High (60-80)	615.8	N.A.	16.9
FVH - Front-Very High (80-90)	70.9	N.A.	1.9
BL - Back-Low (0-30)	285.9	N.A.	7.8
BM - Back-Medium (30-60)	237.2	N.A.	6.5
BH - Back-High (60-80)	38.1	N.A.	1.0
BVH - Back-Very High (80-90)	3.5	N.A.	0.1
UL - Uplight-Low (90-100)	23.1	N.A.	0.6
UH - Uplight-High (100-180)	36.3	N.A.	1.0
Total	3647.6	N.A.	100.0
BUG Rating	B1-U2-G1		

4.2 Goniophotometer Test

Coefficients of Utilization



Isolines



4.2 Goniophotometer Test

Luminous Distribution Intensity Data

Table--1

UNIT: cd

C (DEG) y	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
0	1062	1062	1063	1063	1063	1064	1064	1064	1065	1065	1065	1065	1066	1066	1066	1066	1066	1066	1066
5	1071	1081	1089	1095	1097	1099	1103	1116	1130	1146	1161	1173	1183	1183	1182	1179	1179	1180	1182
10	1040	1050	1064	1082	1110	1138	1162	1172	1176	1176	1169	1163	1163	1184	1210	1235	1249	1258	1262
15	995	1028	1056	1080	1093	1107	1127	1172	1224	1279	1324	1366	1407	1449	1487	1516	1530	1535	1531
20	992	1016	1044	1075	1105	1143	1193	1274	1364	1457	1538	1613	1683	1750	1808	1854	1874	1881	1878
25	938	933	957	1012	1111	1229	1354	1456	1558	1663	1798	1928	2042	2107	2150	2177	2197	2207	2209
30	872	882	924	1000	1123	1268	1423	1565	1703	1833	1953	2059	2146	2203	2241	2261	2267	2262	2253
35	817	872	951	1052	1188	1337	1492	1635	1770	1891	1986	2066	2135	2206	2265	2309	2323	2323	2313
40	744	822	927	1059	1243	1435	1614	1717	1799	1871	1979	2076	2149	2142	2114	2083	2101	2124	2142
45	670	756	868	1006	1197	1394	1576	1687	1771	1834	1903	1952	1975	1941	1886	1822	1770	1729	1706
50	572	680	804	946	1129	1311	1474	1569	1630	1664	1659	1646	1639	1701	1766	1812	1764	1702	1649
55	539	682	821	955	1096	1223	1325	1367	1384	1388	1394	1400	1410	1439	1470	1499	1514	1522	1523
60	400	561	703	827	934	1022	1092	1129	1157	1185	1252	1317	1368	1359	1335	1308	1313	1321	1328
65	343	465	573	668	748	815	871	922	963	992	1006	1008	999	969	935	904	897	896	897
70	267	318	375	438	521	600	664	681	680	668	658	644	630	619	608	596	579	562	549
75	168	207	247	288	338	383	415	412	397	379	374	371	373	381	390	400	407	411	412
80	91.0	119	143	165	184	199	212	221	227	231	230	228	225	226	227	229	232	235	236
85	33.0	45.3	57.8	70.5	84.1	97.4	110	120	129	138	147	157	165	171	175	179	183	186	187
90	12.1	17.7	24.6	32.7	43.1	53.9	64.3	72.7	79.6	85.0	88.3	89.9	89.9	87.5	84.3	81.2	80.3	80.0	80.2
95	9.06	14.0	19.0	24.0	29.6	34.8	38.8	40.0	40.1	39.8	39.9	40.3	41.1	43.2	45.7	48.0	49.8	51.0	51.5
100	8.49	9.10	9.75	10.4	10.6	11.2	12.7	17.5	22.7	27.8	30.2	31.8	33.2	35.5	37.7	39.6	40.8	41.5	41.8
105	1.49	3.53	5.35	6.95	8.16	9.27	10.4	11.8	13.3	14.9	16.9	18.9	20.9	22.8	24.5	26.1	27.9	29.3	30.1
110	7.98	6.91	6.95	8.12	11.8	15.6	18.4	15.8	12.7	10.5	14.2	19.2	24.3	26.8	28.5	29.7	30.9	31.7	32.1
115	7.16	5.69	5.46	6.44	9.59	13.3	16.8	18.8	19.7	19.2	14.9	10.1	6.20	7.31	9.57	12.0	12.2	11.8	11.2
120	6.36	4.84	4.45	5.19	7.64	10.8	14.2	17.0	19.6	21.9	24.3	26.0	26.6	24.3	21.1	17.7	14.7	12.7	12.0
125	4.69	3.56	3.36	4.07	6.06	8.70	11.7	14.6	17.5	20.3	22.8	25.0	26.7	27.7	28.0	27.4	24.7	21.9	20.1
130	2.60	1.97	2.05	2.84	4.57	6.84	9.46	12.1	14.9	17.7	20.5	23.0	25.0	25.7	25.7	25.0	22.8	20.6	19.3
135	0.85	0.00	0.00	0.46	2.42	4.94	7.72	10.0	12.3	14.7	17.5	20.1	22.1	22.6	22.5	21.7	20.3	19.0	18.1
140	0.66	1.67	2.65	3.58	4.36	5.18	6.15	7.46	9.00	10.8	13.1	15.4	17.3	17.9	18.0	17.7	16.8	15.9	15.4
145	0.62	1.13	1.70	2.30	2.92	3.61	4.39	5.33	6.38	7.56	9.13	10.6	11.8	12.2	12.2	11.9	11.5	11.2	11.0
150	0.61	0.97	1.17	1.22	0.78	0.45	0.47	1.83	3.50	5.17	6.11	6.78	7.22	7.42	7.47	7.42	7.34	7.26	7.23
155	0.65	0.65	0.66	0.68	0.64	0.68	0.86	1.47	2.18	2.89	3.34	3.69	3.95	4.09	4.16	4.20	4.26	4.32	4.36
160	0.72	0.72	0.71	0.70	0.69	0.67	0.65	0.56	0.52	0.58	0.92	1.34	1.76	2.01	2.20	2.34	2.41	2.45	2.47
165	0.79	0.80	0.80	0.80	0.79	0.77	0.75	0.72	0.70	0.70	0.75	0.81	0.84	0.79	0.73	0.66	0.63	0.61	0.62
170	0.88	0.89	0.90	0.90	0.90	0.90	0.89	0.88	0.87	0.85	0.84	0.83	0.82	0.81	0.79	0.78	0.74	0.71	0.69
175	0.94	0.95	0.95	0.95	0.96	0.96	0.96	0.95	0.95	0.94	0.94	0.93	0.91	0.87	0.83	0.79	0.76	0.75	0.75
180	1.01	1.02	1.02	1.02	1.02	1.01	1.00	0.99	0.98	0.97	0.96	0.94	0.92	0.91	0.89	0.88	0.86	0.84	0.82

C (DEG)																	UNIT: cd		
γ	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185
0	1066	1066	1066	1066	1066	1066	1065	1065	1065	1065	1064	1064	1064	1063	1063	1063	1062	1062	1062
5	1180	1179	1179	1182	1183	1183	1173	1161	1146	1130	1116	1103	1099	1097	1095	1089	1081	1071	1081
10	1258	1249	1235	1210	1184	1163	1163	1169	1176	1176	1172	1162	1138	1110	1082	1064	1050	1040	1060
15	1535	1530	1516	1487	1449	1407	1366	1324	1279	1224	1172	1127	1107	1093	1080	1056	1028	995	996
20	1881	1874	1854	1808	1750	1683	1613	1538	1457	1364	1274	1193	1143	1105	1075	1044	1016	992	985
25	2207	2197	2177	2150	2107	2042	1928	1798	1663	1558	1456	1354	1229	1111	1012	957	933	938	912
30	2262	2267	2261	2241	2203	2146	2059	1953	1833	1703	1565	1423	1268	1123	1000	924	882	872	890
35	2323	2323	2309	2265	2206	2135	2066	1986	1891	1770	1635	1492	1337	1188	1052	951	872	817	838
40	2124	2101	2083	2114	2142	2149	2076	1979	1871	1799	1717	1614	1435	1243	1059	927	822	744	776
45	1729	1770	1822	1886	1941	1975	1952	1903	1834	1771	1687	1576	1394	1197	1006	868	756	670	742
50	1702	1764	1812	1766	1701	1639	1646	1659	1664	1630	1569	1474	1311	1129	946	804	680	572	509
55	1522	1514	1499	1470	1439	1410	1400	1394	1388	1384	1367	1325	1223	1096	955	821	682	539	419
60	1321	1313	1308	1335	1359	1368	1317	1252	1185	1157	1129	1092	1022	934	827	703	561	400	296
65	896	897	904	935	969	999	1008	1006	992	963	922	871	815	748	668	573	465	343	244
70	562	579	596	608	619	630	644	658	668	680	681	664	600	521	438	375	318	267	189
75	411	407	400	390	381	373	371	374	379	397	412	415	383	338	288	247	207	168	118
80	235	232	229	227	226	225	228	230	231	227	221	212	199	184	165	143	119	91	63.5
85	186	183	179	175	171	165	157	147	138	129	120	110	97.4	84.1	70.5	57.8	45.3	33.0	24.8
90	80.0	80.3	81.2	84.3	87.5	89.9	89.9	88.3	85.0	79.6	72.7	64.3	53.9	43.1	32.7	24.6	17.7	12.1	10.0
95	51.0	49.8	48.0	45.7	43.2	41.1	40.3	39.9	39.8	40.1	40.0	38.8	34.8	29.6	24.0	19.0	14.0	9.06	7.32
100	41.5	40.8	39.6	37.7	35.5	33.2	31.8	30.2	27.8	22.7	17.5	12.7	11.2	10.6	10.4	9.75	9.10	8.49	6.61
105	29.3	27.9	26.1	24.5	22.8	20.9	18.9	16.9	14.9	13.3	11.8	10.4	9.27	8.16	6.95	5.35	3.53	1.49	1.20
110	31.7	30.9	29.7	28.5	26.8	24.3	19.2	14.2	10.5	12.7	15.8	18.4	15.6	11.8	8.12	6.95	6.91	7.98	5.03
115	11.8	12.2	12.0	9.57	7.31	6.20	10.1	14.9	19.2	19.7	18.8	16.8	13.3	9.59	6.44	5.46	5.69	7.16	4.55
120	12.7	14.7	17.7	21.1	24.3	26.6	26.0	24.3	21.9	19.6	17.0	14.2	10.8	7.64	5.19	4.45	4.84	6.36	4.12
125	21.9	24.7	27.4	28.0	27.7	26.7	25.0	22.8	20.3	17.5	14.6	11.7	8.70	6.06	4.07	3.36	3.56	4.69	3.23
130	20.6	22.8	25.0	25.7	25.7	25.0	23.0	20.5	17.7	14.9	12.1	9.46	6.84	4.57	2.84	2.05	1.97	2.60	2.00
135	19.0	20.3	21.7	22.5	22.6	22.1	20.1	17.5	14.7	12.3	10.0	7.72	4.94	2.42	0.46	0.00	0.00	0.85	1.01
140	15.9	16.8	17.7	18.0	17.9	17.3	15.4	13.1	10.8	9.00	7.46	6.15	5.18	4.36	3.58	2.65	1.67	0.66	0.84
145	11.2	11.5	11.9	12.2	12.2	11.8	10.6	9.13	7.56	6.38	5.33	4.39	3.61	2.92	2.30	1.70	1.13	0.62	0.87
150	7.26	7.34	7.42	7.47	7.42	7.22	6.78	6.11	5.17	3.50	1.83	0.47	0.45	0.78	1.22	1.17	0.97	0.61	0.84
155	4.32	4.26	4.20	4.16	4.09	3.95	3.69	3.34	2.89	2.18	1.47	0.86	0.68	0.64	0.68	0.66	0.65	0.65	0.93
160	2.45	2.41	2.34	2.20	2.01	1.76	1.34	0.92	0.58	0.52	0.56	0.65	0.67	0.69	0.70	0.71	0.72	0.72	1.03
165	0.61	0.63	0.66	0.73	0.79	0.84	0.81	0.75	0.70	0.70	0.72	0.75	0.77	0.79	0.80	0.80	0.80	0.79	1.11
170	0.71	0.74	0.78	0.79	0.81	0.82	0.83	0.74	0.85	0.87	0.88	0.89	0.90	0.90	0.90	0.90	0.89	0.88	1.11
175	0.75	0.76	0.79	0.83	0.87	0.91	0.93	0.94	0.94	0.95	0.95	0.96	0.96	0.96	0.95	0.95	0.95	0.94	1.05
180	0.84	0.86	0.88	0.89	0.91	0.92	0.94	0.96	0.97	0.98	0.99	1.00	1.01	1.02	1.02	1.02	1.02	1.01	1.04

Table--3

UNIT: °C

C (DEG) γ (DEG)	190	195	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280
0	1063	1064	1064	1065	1065	1065	1065	1065	1065	1065	1065	1065	1065	1065	1065	1066	1066	1066	1065
5	1087	1090	1087	1081	1073	1057	1044	1035	1046	1060	1072	1066	1055	1041	1026	1014	1006	1014	1026
10	1079	1079	1059	1030	998	973	951	931	917	907	899	895	892	890	887	884	883	884	887
15	998	999	1007	1011	1003	964	915	864	824	786	751	711	676	648	637	633	634	633	637
20	974	958	942	917	879	808	728	648	588	535	489	449	414	386	363	347	340	347	363
25	880	840	795	742	681	600	517	438	375	325	286	268	260	258	253	249	247	249	253
30	878	835	744	636	522	427	343	277	248	233	227	212	199	188	180	175	173	175	180
35	820	763	634	490	353	289	247	220	190	165	144	125	108	95.9	89.0	85.6	85.1	85.6	89.0
40	762	702	557	396	246	193	167	155	124	96.0	72.5	60.5	53.7	50.8	49.1	49.0	49.7	49.0	49.1
45	594	526	420	309	206	152	115	90.6	68.5	53.0	43.1	38.6	37.3	37.7	36.5	35.6	35.1	35.6	36.5
50	443	376	300	226	159	113	77.9	52.8	38.3	30.7	27.5	24.5	23.2	23.0	22.7	22.7	22.8	22.7	22.7
55	320	239	185	144	114	81.1	53.8	33.0	22.6	17.4	15.7	13.8	13.0	13.0	12.8	12.7	12.8	12.7	12.8
60	212	148	111	89.2	75.0	53.7	35.1	20.2	12.4	7.99	5.81	3.49	2.03	1.22	0.68	0.46	0.45	0.46	0.68
65	165	105	71.8	52.7	42.3	28.1	17.0	8.83	4.10	1.55	0.55	0.09	0.24	0.69	0.66	0.60	0.53	0.60	0.66
70	126	77.8	50.7	34.9	26.3	15.9	8.49	3.57	1.20	0.41	0.59	0.45	0.55	0.74	0.73	0.70	0.65	0.70	0.73
75	78.4	48.1	30.8	20.7	15.2	9.13	4.91	2.27	0.94	0.50	0.63	0.57	0.64	0.76	0.75	0.71	0.66	0.71	0.75
80	41.4	24.9	15.8	10.8	8.34	5.18	2.97	1.56	0.85	0.62	0.67	0.63	0.66	0.71	0.71	0.69	0.67	0.69	0.71
85	18.0	12.6	9.02	6.57	4.88	3.23	2.00	1.16	0.76	0.63	0.66	0.64	0.66	0.70	0.71	0.71	0.70	0.71	0.71
90	8.22	6.65	5.37	4.28	3.34	2.40	1.62	1.02	0.79	0.73	0.75	0.74	0.74	0.75	0.77	0.78	0.80	0.78	0.77
95	5.85	4.65	3.81	3.17	2.65	2.02	1.48	1.06	0.90	0.85	0.87	0.84	0.84	0.84	0.86	0.88	0.92	0.88	0.86
100	5.07	3.85	3.08	2.55	2.18	1.73	1.37	1.10	1.00	0.98	1.00	0.99	0.99	1.00	1.02	1.05	1.10	1.05	1.02
105	0.99	0.86	0.84	0.86	0.92	0.97	1.01	1.05	1.06	1.06	1.05	1.06	1.08	1.10	1.13	1.16	1.18	1.16	1.13
110	2.83	1.36	0.99	1.10	1.42	1.28	1.13	0.99	0.99	1.02	1.07	1.09	1.11	1.13	1.14	1.14	1.15	1.14	1.14
115	2.58	1.25	0.85	0.88	1.11	1.05	0.99	0.96	0.98	1.02	1.06	1.08	1.10	1.11	1.13	1.15	1.17	1.15	1.13
120	2.41	1.24	0.83	0.78	0.93	0.91	0.92	0.95	0.99	1.04	1.09	1.11	1.14	1.16	1.18	1.21	1.22	1.21	1.18
125	2.11	1.31	0.96	0.85	0.88	0.88	0.92	0.98	1.04	1.11	1.17	1.21	1.23	1.25	1.29	1.31	1.33	1.31	1.29
130	1.52	1.18	0.99	0.91	0.90	0.92	0.97	1.03	1.09	1.15	1.21	1.27	1.33	1.38	1.42	1.45	1.46	1.45	1.42
135	1.11	1.15	1.10	1.03	0.96	0.98	1.02	1.09	1.15	1.21	1.28	1.33	1.39	1.43	1.46	1.49	1.50	1.49	1.46
140	0.97	1.06	1.07	1.05	1.03	1.06	1.10	1.15	1.19	1.24	1.29	1.34	1.40	1.45	1.48	1.51	1.53	1.51	1.48
145	0.96	1.07	1.11	1.12	1.11	1.14	1.18	1.22	1.27	1.32	1.37	1.41	1.44	1.47	1.50	1.52	1.53	1.52	1.50
150	1.01	1.13	1.18	1.19	1.19	1.22	1.25	1.29	1.32	1.35	1.37	1.39	1.42	1.44	1.46	1.47	1.49	1.47	1.46
155	1.14	1.28	1.34	1.35	1.33	1.31	1.29	1.28	1.30	1.33	1.36	1.39	1.40	1.42	1.41	1.40	1.40	1.40	1.41
160	1.27	1.43	1.48	1.49	1.46	1.43	1.40	1.37	1.36	1.36	1.35	1.32	1.29	1.27	1.28	1.30	1.33	1.30	1.28
165	1.34	1.49	1.52	1.50	1.45	1.43	1.41	1.39	1.37	1.34	1.31	1.24	1.18	1.13	1.13	1.16	1.18	1.16	1.13
170	1.28	1.38	1.41	1.38	1.33	1.27	1.21	1.15	1.13	1.12	1.10	1.06	1.01	0.98	0.98	0.99	1.01	0.99	0.98
175	1.20	1.26	1.28	1.26	1.22	1.15	1.09	1.02	0.99	0.97	0.95	0.92	0.90	0.88	0.90	0.92	0.95	0.92	0.90
180	0.99	0.99	0.99	0.98	0.98	0.97	0.95	0.93	0.91	0.89	0.87	0.85	0.84	0.84	0.84	0.86	0.88	0.86	0.84

C (DEG) γ (DEG)	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355				
0	1065	1065	1065	1065	1065	1065	1065	1065	1065	1065	1065	1064	1064	1063	1062				
5	1041	1055	1066	1072	1060	1046	1035	1044	1057	1073	1081	1087	1090	1087	1081				
10	890	892	895	899	907	917	931	951	973	998	1030	1059	1079	1079	1066				
15	648	676	711	751	786	824	864	915	964	1003	1011	1007	999	998	996				
20	386	414	449	489	535	588	648	728	808	879	917	942	958	974	985				
25	258	260	268	286	325	375	438	517	600	681	742	795	840	880	912				
30	188	199	212	227	233	248	277	343	427	522	636	744	835	878	890				
35	95.9	108	125	144	165	190	220	247	289	353	490	634	763	820	838				
40	50.8	53.7	60.5	72.5	96.0	124	155	167	193	246	396	557	702	762	776				
45	37.7	37.3	38.6	43.1	53.0	68.5	90.6	115	152	206	309	420	526	594	642				
50	23.0	23.2	24.5	27.5	30.7	38.3	52.8	77.9	113	159	226	300	376	443	509				
55	13.0	13.0	13.8	15.7	17.4	22.6	33.0	53.8	81.1	114	144	185	239	320	419				
60	1.22	2.03	3.49	5.81	7.99	12.4	20.2	35.1	53.7	75.0	89.2	111	148	212	296				
65	0.69	0.24	0.09	0.55	1.55	4.10	8.83	17.0	28.1	42.3	52.7	71.8	105	165	244				
70	0.74	0.55	0.45	0.59	0.41	1.20	3.57	8.49	15.9	26.3	34.9	50.7	77.8	126	189				
75	0.76	0.64	0.57	0.63	0.50	0.94	2.27	4.91	9.13	15.2	20.7	30.8	48.1	78.4	118				
80	0.71	0.66	0.63	0.67	0.62	0.85	1.56	2.97	5.18	8.34	10.8	15.8	24.9	41.4	63.5				
85	0.70	0.66	0.64	0.66	0.63	0.76	1.16	2.00	3.23	4.88	6.57	9.02	12.6	18.0	24.8				
90	0.75	0.74	0.74	0.75	0.73	0.79	1.02	1.62	2.40	3.34	4.28	5.37	6.65	8.22	10.0				
95	0.84	0.84	0.84	0.87	0.85	0.90	1.06	1.48	2.02	2.65	3.17	3.81	4.65	5.85	7.32				
100	1.00	0.99	0.99	1.00	0.98	1.00	1.10	1.37	1.73	2.18	2.55	3.08	3.85	5.07	6.61				
105	1.10	1.08	1.06	1.05	1.06	1.06	1.05	1.01	0.97	0.92	0.86	0.84	0.86	0.99	1.20				
110	1.13	1.11	1.09	1.07	1.02	0.99	0.99	1.13	1.28	1.42	1.10	0.99	1.36	2.83	5.03				
115	1.11	1.10	1.08	1.06	1.02	0.98	0.96	0.99	1.05	1.11	0.88	0.85	1.25	2.58	4.55				
120	1.16	1.14	1.11	1.09	1.04	0.99	0.95	0.92	0.91	0.93	0.78	0.83	1.24	2.41	4.12				
125	1.25	1.23	1.21	1.17	1.11	1.04	0.98	0.92	0.88	0.88	0.85	0.96	1.31	2.11	3.23				
130	1.38	1.33	1.27	1.21	1.15	1.09	1.03	0.97	0.92	0.90	0.91	0.99	1.18	1.52	2.00				
135	1.43	1.39	1.33	1.28	1.21	1.15	1.09	1.02	0.98	0.96	1.03	1.10	1.15	1.11	1.01				
140	1.45	1.40	1.34	1.29	1.24	1.19	1.15	1.10	1.06	1.03	1.05	1.07	1.06	0.97	0.84				
145	1.47	1.44	1.41	1.37	1.32	1.27	1.22	1.18	1.14	1.11	1.12	1.11	1.07	0.96	0.81				
150	1.44	1.42	1.39	1.37	1.35	1.32	1.29	1.25	1.22	1.19	1.19	1.18	1.13	1.01	0.84				
155	1.42	1.40	1.39	1.36	1.33	1.30	1.28	1.29	1.31	1.33	1.35	1.34	1.28	1.14	0.93				
160	1.27	1.29	1.32	1.35	1.36	1.36	1.37	1.40	1.43	1.46	1.49	1.48	1.43	1.27	1.03				
165	1.13	1.18	1.24	1.31	1.34	1.37	1.39	1.41	1.43	1.45	1.50	1.52	1.49	1.34	1.11				
170	0.98	1.01	1.06	1.10	1.12	1.13	1.15	1.21	1.27	1.33	1.38	1.41	1.38	1.28	1.11				
175	0.88	0.90	0.92	0.95	0.97	0.99	1.02	1.09	1.15	1.22	1.26	1.28	1.26	1.20	1.09				
180	0.84	0.84	0.85	0.87	0.89	0.91	0.93	0.95	0.97	0.98	0.98	0.99	0.99	0.99	1.00				

4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	WPX1 @ 20W / 3000K	Sample ID	231101002-S1
Temperature (°C)	25.4	Humidity (%RH)	41.0

Test Method
<p>The samples were tested according to the ANSI C82.77:2014</p> <p>The total harmonic distortion shall be measured to the 40th order.</p> <p>The ambient temperature shall be maintained at 25±1°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 was calculated.</p>

Test Results

Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	iTHD(%)
120.0	60	0.216	25.8	0.996	3.12
277.0	60	0.105	26.5	0.908	11.79

5.0 Equipment List:

Equipment ID	Equipment Name	Last Cal.	Due Cal.
NTC-F01-001	Goniophotometer System	2022-11-09	2023-11-08
NTC-F01-006	2.0 meter Integrating Sphere	2022-11-09	2023-11-08
NTC-F01-012	Standard Lamp	2022-11-09	2023-11-08
NTC-F01-013	Standard Lamp	2022-11-09	2023-11-08
NTC-F01-031	Digital Power Meter	2023-08-25	2024-08-24
NTC-F01-019	Temperature & Humidity Meter	2022-11-12	2023-11-11

*****End of Report*****