

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

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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		3818
Minimum Luminaire Efficacy (lm/W) (Goniophotometer – Section 4.2) (0°-180° zones)	IES LM-79-2008	N/A		146.8
Luminaire Output (lm) (Goniophotometer – Section 4.2) (0°-90° zones)	IES LM-79-2008	300		3756
Minimum Luminaire Efficacy (lm/W) (Goniophotometer – Section 4.2) (0°-90° zones)	IES LM-79-2008	Standard	Premium	144.5
		105	120	
Power (Input Wattage) (W) (Goniophotometer – Section 4.2)	IES LM-79-2008	Worst Case		26.0
Total Harmonic Distortion (A%) (THD & PF – Section 4.3)	ANSI C82.77:2014	20.00%	120V	3.16
			277V	11.85
Power Factor (THD & PF – Section 4.3)	ANSI C82.77:2014	0.9	120V	0.996
			277V	0.902
Allowable CCTs* (K) (Integrating Sphere – Section 4.1)	IES LM-79-2008	7 steps	3985±275	3902
		4 steps	3985±154	
Minimum CRI (Integrating Sphere – Section 4.1)	IES LM-79-2008 CIE13.3-1995	≥70		83.8
Minimum R9 (Integrating Sphere – Section 4.1)	IES LM-79-2008 CIE13.3-1995	N/A		14
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		96
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		0.104
(Goniophotometer – Section 4.2)		Non-Worst Case		0.211
Power (Input Wattage – W)				
(Goniophotometer – Section 4.2)	IES LM-79-2008	Worst Case		26.0
(Goniophotometer – Section 4.2)		Non-Worst Case		25.2

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2023-11-02	WPX1 @ 20W / 4000K	231101002-S1
2	Goniophotometer Test	2023-11-02	WPX1 @ 20W / 4000K	231101002-S1
3	THD and PF Test	2023-11-02	WPX1 @ 20W / 4000K	231101002-S1

Remark (If any)

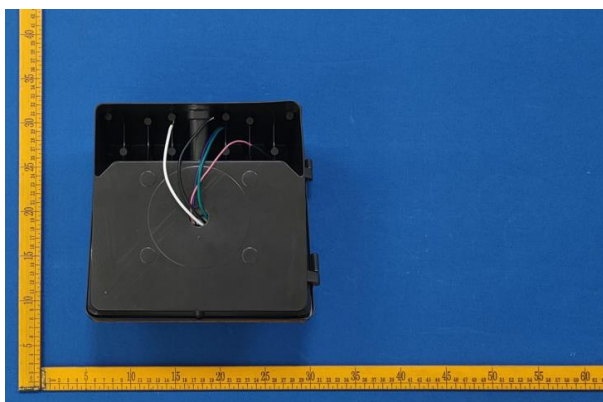
1. The results contained in this report pertain only to the tested samples.
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3. This report does not imply product certification, approval, or endorsement by NVLAP, or any agency of the Federal Government.

3.0 Product Description

Luminaire Description: Model No. WPX1 @ 20W / 4000K, 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 / 4000K	Sample ID	231101002-S1
Operate time (Min.)	10	Stabilization time (Min.)	60
Temperature (°C)	25.4	Humidity (%RH)	41.0

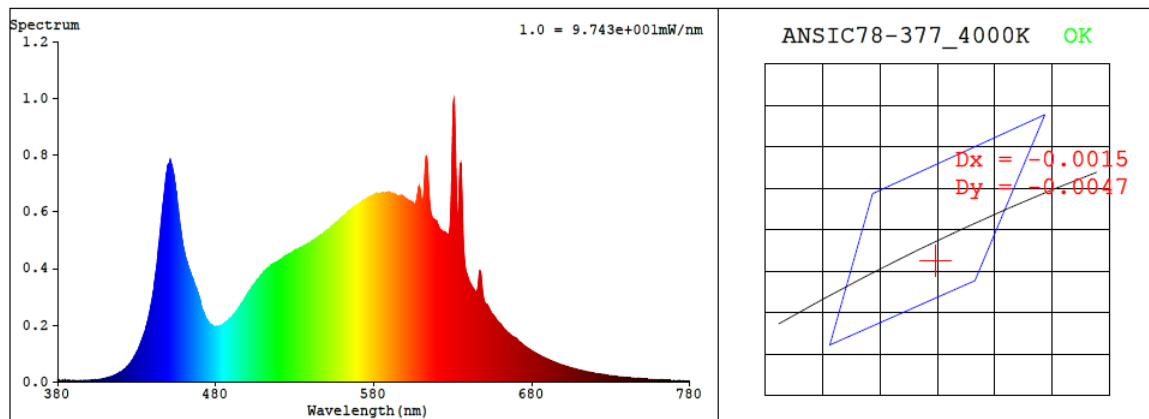
Test Method
<p>The Samples were tested according to the IES LM-79-2008.</p> <p>Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25±1°C.</p> <p>The sample measurements were made using 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. 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	0.211	25.2	0.996
277.0	60	0.104	26.0	0.902

CCT (K)	CRI	R9	Duv	Rf	Rg	IES Rcs,h1
3902	83.8	14	-0.0018	84	96	-12%

4.1 Integrating Sphere Test



Colorimetric Parameters

Chromaticity Coordinate: $x = 0.3834$ $y = 0.3748$ / $u' = 0.2279$ $v' = 0.5012$ ($duv = -1.78e-03$)

CCT= 3902K Prcp WL: $L_d = 580.4\text{nm}$ Purity=27.5%

Peak WL: $L_p = 631\text{nm}$ FWHM: $= 99.6\text{nm}$ Ratio: R=18.9% G=77.5% B=3.6%

Render Index: $R_a = 83.8$ AvgR = 77.7 TM30: $R_f = 84$ $R_g = 96$

EEL: 0.09373 A++ Highest

R1 =83 R2 =90 R3 =95 R4 =82 R5 =82 R6 =86 R7 =86

R8 =66 R9 =14 R10=76 R11=81 R12=64 R13=84 R14=97 R15=77

4.1 Integrating Sphere Test

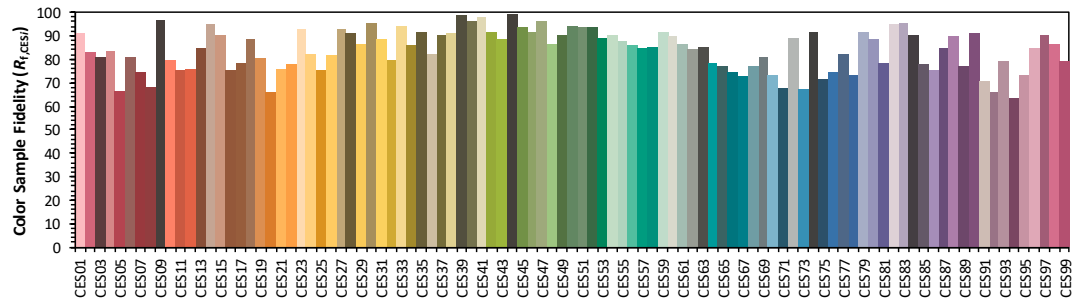
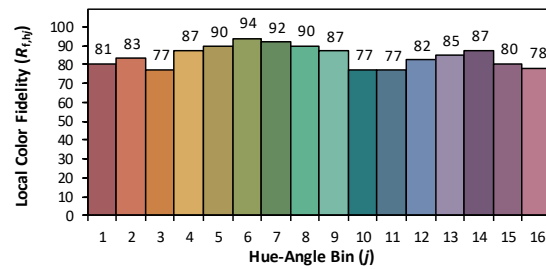
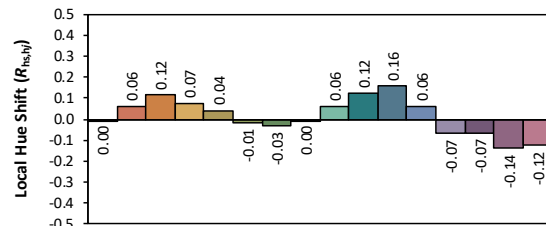
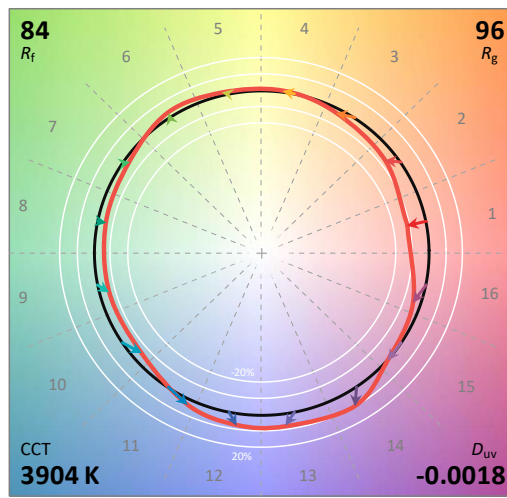
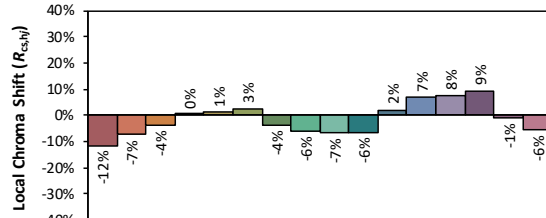
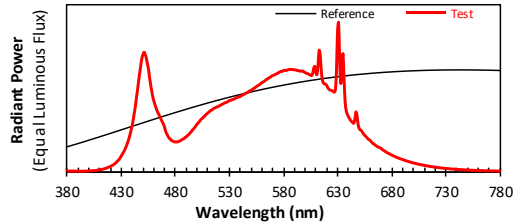
ANSI/IES TM-30-18 Color Rendition Report

Source: 1 CIE F1

Manufacturer: RAB Lighting Inc.

Date: 2023/11/15

Model: WPX1 @ 20W / 4000K



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

x 0.3834
 y 0.3746
 u' 0.2279
 v' 0.5011

CIE 13.3-1995
(CRI)

R_a 84
 R_g 15

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	7.80E-06	447	6.45E-04	514	4.03E-04	581	6.61E-04	648	3.68E-04	715	3.57E-05
381	5.10E-06	448	6.95E-04	515	4.10E-04	582	6.60E-04	649	3.11E-04	716	3.42E-05
382	2.70E-06	449	7.40E-04	516	4.14E-04	583	6.61E-04	650	2.83E-04	717	3.35E-05
383	5.60E-06	450	7.63E-04	517	4.17E-04	584	6.63E-04	651	2.74E-04	718	3.24E-05
384	2.90E-06	451	7.79E-04	518	4.21E-04	585	6.66E-04	652	2.69E-04	719	3.13E-05
385	5.70E-06	452	7.64E-04	519	4.23E-04	586	6.68E-04	653	2.58E-04	720	3.03E-05
386	2.80E-06	453	7.44E-04	520	4.27E-04	587	6.65E-04	654	2.47E-04	721	2.94E-05
387	5.20E-06	454	7.07E-04	521	4.31E-04	588	6.67E-04	655	2.38E-04	722	2.85E-05
388	3.60E-06	455	6.74E-04	522	4.34E-04	589	6.65E-04	656	2.32E-04	723	2.74E-05
389	3.80E-06	456	6.19E-04	523	4.39E-04	590	6.64E-04	657	2.24E-04	724	2.68E-05
390	4.40E-06	457	5.71E-04	524	4.41E-04	591	6.64E-04	658	2.16E-04	725	2.59E-05
391	4.00E-06	458	5.31E-04	525	4.46E-04	592	6.62E-04	659	2.10E-04	726	2.51E-05
392	3.20E-06	459	4.92E-04	526	4.50E-04	593	6.59E-04	660	2.05E-04	727	2.41E-05
393	3.90E-06	460	4.63E-04	527	4.51E-04	594	6.60E-04	661	1.98E-04	728	2.33E-05
394	3.60E-06	461	4.39E-04	528	4.55E-04	595	6.56E-04	662	1.90E-04	729	2.24E-05
395	4.70E-06	462	4.18E-04	529	4.59E-04	596	6.56E-04	663	1.84E-04	730	2.22E-05
396	4.60E-06	463	3.99E-04	530	4.64E-04	597	6.55E-04	664	1.79E-04	731	2.12E-05
397	3.90E-06	464	3.83E-04	531	4.66E-04	598	6.56E-04	665	1.73E-04	732	2.07E-05
398	4.60E-06	465	3.68E-04	532	4.68E-04	599	6.51E-04	666	1.69E-04	733	1.99E-05
399	5.10E-06	466	3.54E-04	533	4.71E-04	600	6.46E-04	667	1.64E-04	734	1.91E-05
400	4.90E-06	467	3.37E-04	534	4.73E-04	601	6.43E-04	668	1.60E-04	735	1.86E-05
401	6.00E-06	468	3.24E-04	535	4.76E-04	602	6.40E-04	669	1.57E-04	736	1.79E-05
402	6.20E-06	469	3.08E-04	536	4.81E-04	603	6.37E-04	670	1.54E-04	737	1.73E-05
403	6.70E-06	470	2.89E-04	537	4.83E-04	604	6.33E-04	671	1.48E-04	738	1.68E-05
404	7.60E-06	471	2.63E-04	538	4.86E-04	605	6.30E-04	672	1.42E-04	739	1.61E-05
405	7.00E-06	472	2.47E-04	539	4.88E-04	606	6.26E-04	673	1.38E-04	740	1.60E-05
406	8.10E-06	473	2.34E-04	540	4.90E-04	607	6.40E-04	674	1.33E-04	741	1.53E-05
407	9.70E-06	474	2.21E-04	541	4.95E-04	608	6.75E-04	675	1.28E-04	742	1.49E-05
408	1.03E-05	475	2.15E-04	542	4.99E-04	609	6.86E-04	676	1.24E-04	743	1.43E-05
409	1.12E-05	476	2.06E-04	543	5.03E-04	610	6.46E-04	677	1.20E-04	744	1.40E-05
410	1.21E-05	477	2.02E-04	544	5.07E-04	611	6.34E-04	678	1.17E-04	745	1.33E-05
411	1.43E-05	478	1.99E-04	545	5.11E-04	612	6.98E-04	679	1.13E-04	746	1.31E-05
412	1.55E-05	479	1.94E-04	546	5.14E-04	613	7.91E-04	680	1.09E-04	747	1.27E-05
413	1.74E-05	480	1.94E-04	547	5.18E-04	614	7.56E-04	681	1.06E-04	748	1.25E-05
414	1.92E-05	481	1.95E-04	548	5.22E-04	615	6.57E-04	682	1.03E-04	749	1.18E-05
415	2.10E-05	482	1.95E-04	549	5.28E-04	616	5.99E-04	683	9.97E-05	750	1.14E-05
416	2.29E-05	483	1.97E-04	550	5.29E-04	617	5.78E-04	684	9.63E-05	751	1.11E-05
417	2.62E-05	484	2.01E-04	551	5.35E-04	618	5.72E-04	685	9.32E-05	752	1.05E-05
418	2.89E-05	485	2.04E-04	552	5.40E-04	619	5.70E-04	686	9.02E-05	753	1.05E-05
419	3.29E-05	486	2.09E-04	553	5.44E-04	620	5.62E-04	687	8.74E-05	754	1.01E-05
420	3.50E-05	487	2.13E-04	554	5.50E-04	621	5.48E-04	688	8.52E-05	755	9.90E-06
421	3.92E-05	488	2.16E-04	555	5.55E-04	622	5.38E-04	689	8.23E-05	756	9.50E-06
422	4.32E-05	489	2.24E-04	556	5.61E-04	623	5.33E-04	690	8.00E-05	757	9.10E-06
423	4.69E-05	490	2.27E-04	557	5.64E-04	624	5.31E-04	691	7.71E-05	758	8.80E-06
424	5.31E-05	491	2.35E-04	558	5.68E-04	625	5.28E-04	692	7.50E-05	759	8.70E-06
425	5.90E-05	492	2.40E-04	559	5.75E-04	626	5.22E-04	693	7.29E-05	760	8.20E-06
426	6.59E-05	493	2.48E-04	560	5.80E-04	627	5.19E-04	694	7.04E-05	761	8.30E-06
427	7.42E-05	494	2.57E-04	561	5.84E-04	628	5.34E-04	695	6.79E-05	762	8.10E-06
428	8.13E-05	495	2.63E-04	562	5.88E-04	629	6.53E-04	696	6.60E-05	763	7.60E-06
429	9.20E-05	496	2.74E-04	563	5.94E-04	630	9.15E-04	697	6.37E-05	764	7.50E-06
430	1.04E-04	497	2.81E-04	564	6.00E-04	631	9.71E-04	698	6.15E-05	765	7.10E-06
431	1.16E-04	498	2.90E-04	565	6.04E-04	632	7.28E-04	699	5.98E-05	766	6.90E-06
432	1.28E-04	499	3.00E-04	566	6.09E-04	633	5.75E-04	700	5.79E-05	767	6.50E-06
433	1.41E-04	500	3.10E-04	567	6.13E-04	634	6.76E-04	701	5.61E-05	768	6.50E-06
434	1.57E-04	501	3.18E-04	568	6.18E-04	635	7.70E-04	702	5.48E-05	769	6.50E-06
435	1.74E-04	502	3.25E-04	569	6.23E-04	636	6.13E-04	703	5.26E-05	770	6.00E-06
436	1.94E-04	503	3.36E-04	570	6.26E-04	637	4.58E-04	704	5.10E-05	771	5.80E-06
437	2.16E-04	504	3.42E-04	571	6.29E-04	638	4.00E-04	705	4.95E-05	772	5.80E-06
438	2.42E-04	505	3.49E-04	572	6.33E-04	639	3.76E-04	706	4.77E-05	773	5.40E-06
439	2.71E-04	506	3.57E-04	573	6.36E-04	640	3.60E-04	707	4.63E-05	774	5.30E-06
440	3.01E-04	507	3.63E-04	574	6.40E-04	641	3.47E-04	708	4.50E-05	775	5.30E-06
441	3.40E-04	508	3.70E-04	575	6.43E-04	642	3.36E-04	709	4.35E-05	776	5.10E-06
442	3.83E-04	509	3.77E-04	576	6.49E-04	643	3.28E-04	710	4.18E-05	777	5.00E-06
443	4.27E-04	510	3.83E-04	577	6.52E-04	644	3.20E-04	711	4.08E-05	778	4.80E-06
444	4.85E-04	511	3.89E-04	578	6.54E-04	645	3.16E-04	712	3.94E-05	779	4.80E-06
445	5.35E-04	512	3.95E-04	579	6.54E-04	646	3.40E-04	713	3.80E-05	780	4.80E-06
446	5.93E-04	513	4.01E-04	580	6.59E-04	647	3.89E-04	714	3.67E-05	N/A	N/A

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	WPX1 @ 20W / 4000K	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	0.104	26.0	0.902
NON-WORST CASE	120.0	60	0.211	25.2	0.996

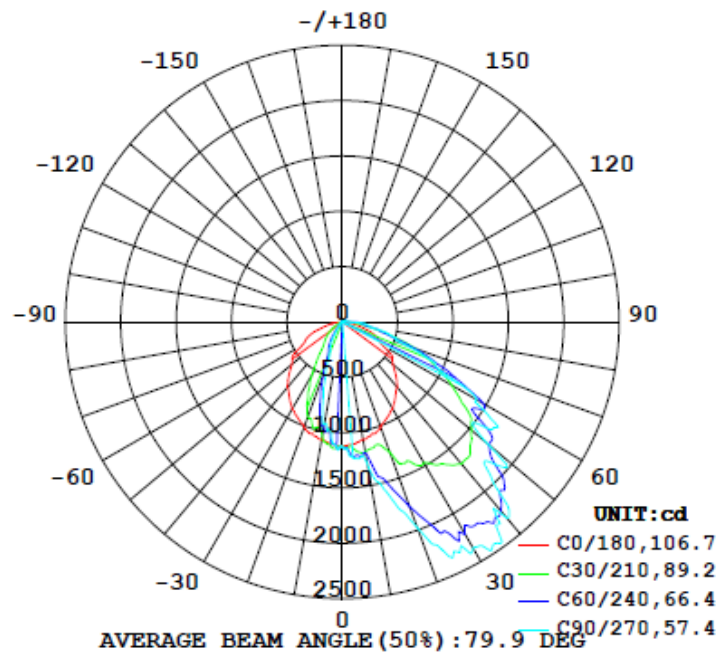
Test Result

Result Type	Flux (lm)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)	Zonal Lumen Requirement (80°-90°)	BUG
		C0-180	C90-270	C0-180	C90-270			
0°-180° zones	3818	109.1	146.7	56.2	96.7	146.8	2.1%	B1-U2-G1
0°-90° zones	3756	109.1	146.7	56.2	96.7	144.5	2.1%	B1-U2-G1

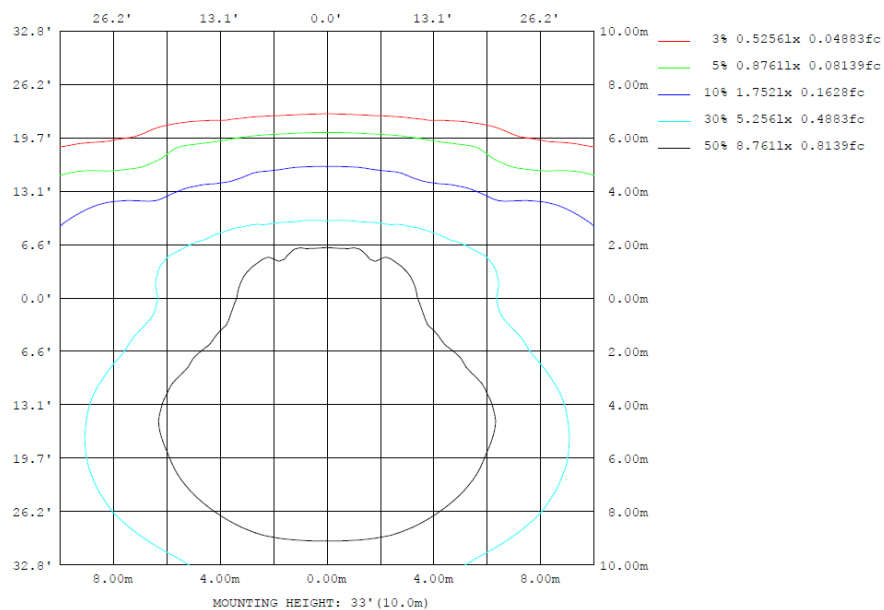
4.2 Goniophotometer Test

Lighting Distribution Curve

LUMINOUS INTENSITY DISTRIBUTION DIAGRAM



Isolux Plot



4.2 Goniophotometer Test

Zonal Lumen Summary

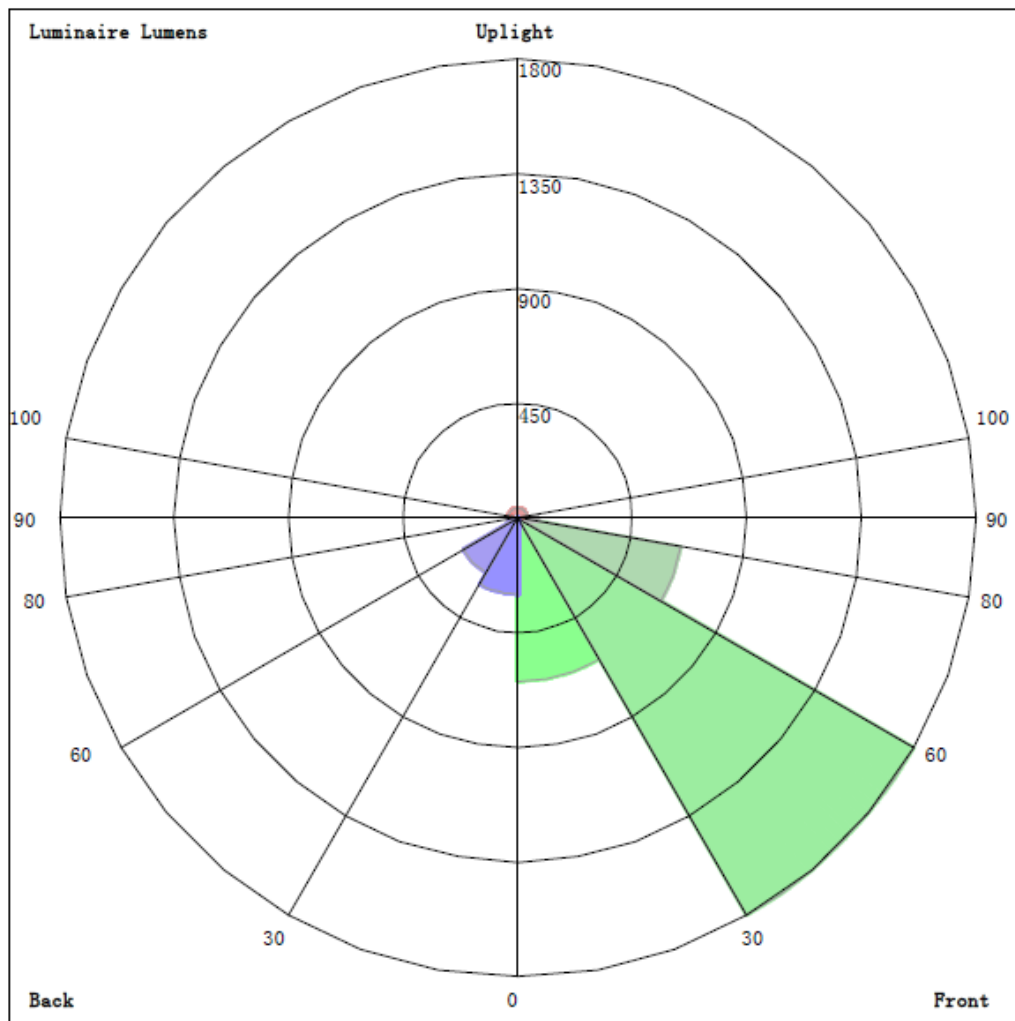
ZONAL FLUX DIAGRAM:

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	φ zone	φ total	Σlum, lamp
10	1077	1223	1306	1223	1077	972.3	941.0	972.3	0- 10	107.1	107.1	2.81, 2.81
20	1010	1550	1978	1550	1010	677.5	360.5	677.5	10- 20	314.6	421.7	11, 11
30	906.5	1942	2357	1942	906.5	292.4	180.1	292.4	20- 30	516.8	938.5	24.6, 24.6
40	770.0	1943	2314	1943	770.0	160.0	52.07	160.0	30- 40	675.4	1614	42.3, 42.3
50	597.1	1739	1708	1739	597.1	54.45	23.97	54.45	40- 50	722.6	2337	61.2, 61.2
60	415.7	1264	1403	1264	415.7	20.87	0.4847	20.87	50- 60	649.2	2986	78.2, 78.2
70	279.6	700.4	585.6	700.4	279.6	3.685	0.7024	3.685	60- 70	470.5	3456	90.5, 90.5
80	97.32	241.4	254.6	241.4	97.32	1.637	0.7151	1.637	70- 80	219.1	3675	96.3, 96.3
90	12.94	92.54	85.86	92.54	12.94	1.082	0.8564	1.082	80- 90	80.20	3756	98.4, 98.4
100	8.941	29.57	45.33	29.57	8.941	1.179	1.177	1.179	90-100	24.53	3780	99, 99
110	8.399	11.14	33.72	11.14	8.399	1.072	1.224	1.072	100-110	11.49	3792	99.3, 99.3
120	6.695	22.79	12.63	22.79	6.695	1.025	1.291	1.025	110-120	8.119	3800	99.5, 99.5
130	2.703	18.17	20.33	18.17	2.703	1.105	1.544	1.105	120-130	8.453	3808	99.7, 99.7
140	0.6999	11.10	16.21	11.10	0.6999	1.222	1.603	1.222	130-140	5.648	3814	99.9, 99.9
150	0.6494	5.427	7.648	5.427	0.6494	1.363	1.558	1.363	140-150	2.854	3817	100, 100
160	0.7641	0.6075	2.619	0.6075	0.7641	1.445	1.388	1.445	150-160	0.9635	3818	100, 100
170	0.9223	0.8926	0.7263	0.8926	0.9223	1.211	1.058	1.211	160-170	0.3189	3818	100, 100
180	1.063	1.024	0.8634	1.024	1.063	0.9816	0.9210	0.9816	170-180	0.0981	3818	100, 100
DEG	LUMINOUS INTENSITY:cd									UNIT:lm		

	Zonal (lm)		Total (lm)	Percent
0-10	107.14	0-10	107.14	2.81%
10-20	314.57	0-20	421.71	11.05%
20-30	516.84	0-30	938.55	24.58%
30-40	675.45	0-40	1614.00	42.27%
40-50	722.56	0-50	2336.56	61.20%
50-60	649.17	0-60	2985.73	78.20%
60-70	470.47	0-70	3456.20	90.53%
70-80	219.15	0-80	3675.35	96.27%
80-90	80.20	0-90	3755.55	98.37%
90-100	24.53	0-100	3780.08	99.01%
100-110	11.49	0-110	3791.57	99.31%
110-120	8.12	0-120	3799.69	99.52%
120-130	8.45	0-130	3808.14	99.74%
130-140	5.65	0-140	3813.79	99.89%
140-150	2.85	0-150	3816.64	99.97%
150-160	0.96	0-160	3817.60	99.99%
160-170	0.32	0-170	3817.92	100.00%
170-180	0.10	0-180	3818.02	100.00%

4.2 Goniophotometer Test

LCS/BUG

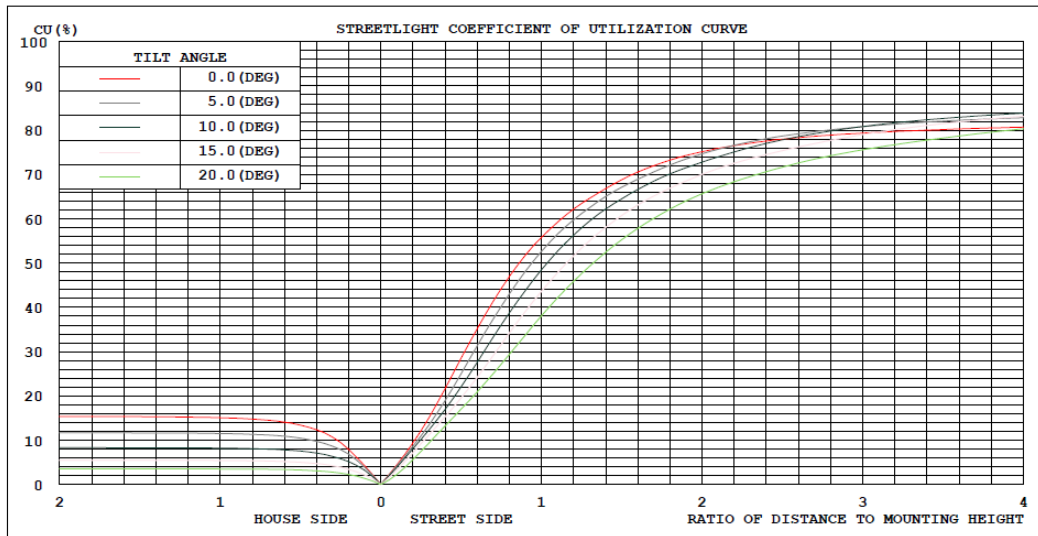


LUMINAIRE CLASSIFICATION SYSTEM (LCS)

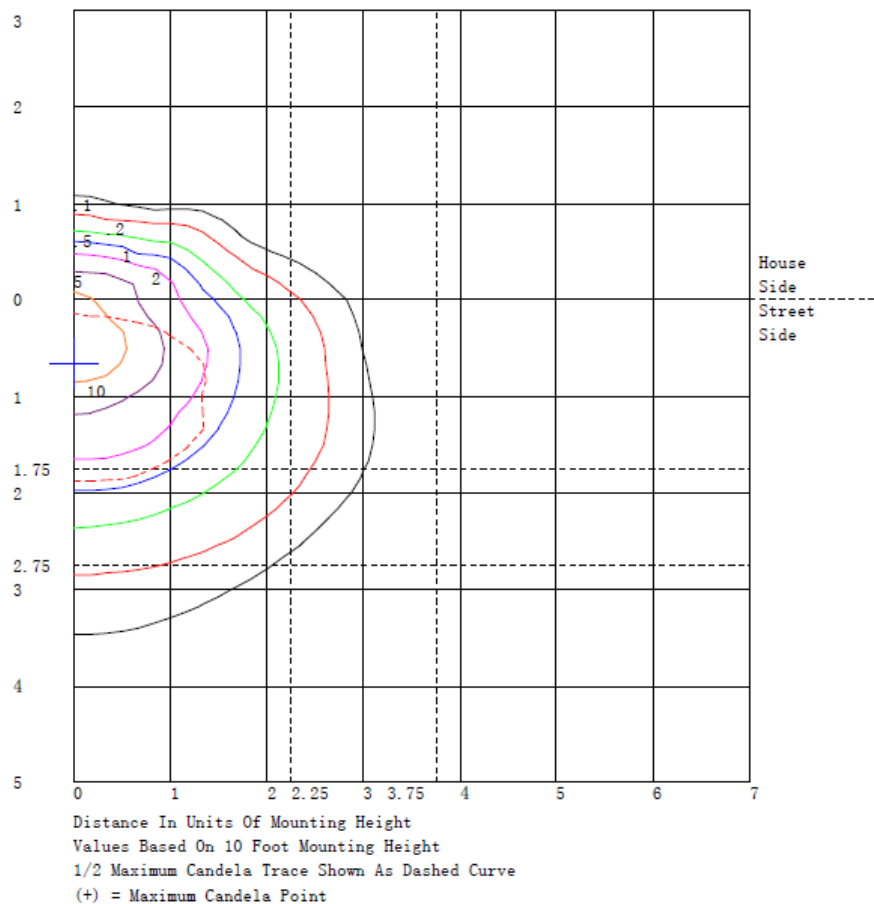
	Lumens	% Lamp	% Luminaire
FL - Front-Low (0-30)	639.9	N.A.	16.8
FM - Front-Medium (30-60)	1800.3	N.A.	47.2
FH - Front-High (60-80)	650.0	N.A.	17.0
FVH - Front-Very High (80-90)	76.4	N.A.	2.0
BL - Back-Low (0-30)	298.6	N.A.	7.8
BM - Back-Medium (30-60)	246.9	N.A.	6.5
BH - Back-High (60-80)	39.6	N.A.	1.0
BVH - Back-Very High (80-90)	3.8	N.A.	0.1
UL - Uplight-Low (90-100)	24.5	N.A.	0.6
UH - Uplight-High (100-180)	37.9	N.A.	1.0
Total	3817.9	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) γ (DEG)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
0	1125	1126	1126	1126	1126	1126	1127	1127	1128	1128	1128	1128	1128	1128	1129	1129	1129	1129	1129
5	1104	1113	1122	1130	1135	1141	1148	1165	1182	1199	1209	1216	1221	1221	1220	1219	1226	1233	1239
10	1077	1088	1103	1120	1144	1168	1191	1206	1217	1223	1214	1206	1202	1221	1245	1270	1287	1299	1306
15	1042	1080	1110	1133	1136	1140	1153	1204	1265	1330	1383	1432	1478	1525	1565	1597	1611	1615	1611
20	1010	1034	1064	1101	1141	1190	1253	1346	1448	1550	1631	1705	1772	1838	1896	1942	1967	1979	1978
25	956	965	999	1058	1150	1261	1383	1503	1626	1750	1879	2000	2109	2187	2247	2292	2326	2346	2353
30	906	914	956	1033	1158	1306	1470	1635	1795	1942	2053	2144	2216	2272	2314	2342	2355	2359	2357
35	835	890	972	1080	1230	1395	1564	1714	1854	1978	2072	2152	2222	2298	2364	2416	2437	2443	2438
40	770	842	946	1081	1277	1483	1675	1783	1868	1943	2051	2149	2225	2225	2208	2191	2234	2280	2314
45	685	784	906	1052	1247	1448	1633	1750	1840	1910	1986	2042	2068	2026	1963	1894	1854	1826	1813
50	597	704	830	975	1165	1354	1525	1629	1699	1739	1740	1730	1726	1789	1853	1897	1839	1767	1708
55	554	710	859	999	1141	1267	1369	1419	1446	1457	1462	1466	1476	1517	1563	1608	1637	1656	1665
60	416	578	724	854	968	1064	1143	1189	1227	1264	1341	1413	1466	1446	1408	1368	1375	1389	1403
65	359	490	606	706	786	853	911	972	1022	1059	1072	1069	1054	1022	986	952	936	928	925
70	280	334	394	461	549	632	699	715	713	700	697	690	680	665	647	628	611	597	586
75	177	220	262	304	354	398	430	428	415	399	395	395	399	408	420	431	438	442	442
80	97.3	127	153	175	195	211	223	232	238	241	243	244	244	244	245	246	250	253	255
85	35.5	48.8	62.3	76.2	91.1	106	119	130	140	149	161	171	181	188	193	197	200	202	202
90	12.9	19.4	27.0	35.8	46.7	58.0	69.0	78.9	86.9	92.5	92.5	90.6	87.8	87.2	86.8	86.6	86.5	86.3	85.9
95	9.93	14.9	20.1	25.4	31.7	37.5	42.1	42.9	42.7	41.9	42.1	42.7	43.7	45.7	48.1	50.4	52.5	54.1	55.0
100	8.94	9.56	10.2	10.9	11.1	11.7	13.4	18.5	24.2	29.6	32.0	33.6	35.0	37.2	39.4	41.5	43.3	44.6	45.3
105	1.55	3.84	5.82	7.47	8.56	9.51	10.5	11.9	13.6	15.4	17.4	19.5	21.6	23.6	25.4	27.2	29.1	30.7	31.7
110	8.40	7.29	7.36	8.59	12.4	16.4	19.3	16.7	13.4	11.1	14.8	19.8	25.0	27.7	29.8	31.2	32.5	33.3	33.7
115	7.53	5.99	5.73	6.75	10.0	13.9	17.5	19.6	20.5	20.0	15.8	11.1	6.86	6.55	7.40	8.89	10.1	11.1	11.9
120	6.69	5.12	4.72	5.48	8.01	11.3	14.8	17.7	20.4	22.8	25.1	26.7	27.4	26.0	23.6	20.7	17.1	14.1	12.6
125	4.90	3.75	3.54	4.28	6.34	9.06	12.2	15.1	18.1	20.9	23.5	25.7	27.4	28.6	29.2	28.9	26.0	23.1	21.2
130	2.70	2.07	2.17	3.00	4.80	7.15	9.84	12.6	15.4	18.2	21.1	23.7	25.7	26.6	26.8	26.2	23.9	21.7	20.3
135	0.89	0.00	0.00	0.47	2.51	5.13	8.00	10.3	12.7	15.1	18.0	20.7	22.9	23.5	23.4	22.8	21.3	19.9	19.1
140	0.70	1.76	2.78	3.75	4.55	5.40	6.39	7.72	9.29	11.1	13.6	16.0	18.0	18.7	18.8	18.5	17.6	16.7	16.2
145	0.66	1.20	1.79	2.43	3.07	3.77	4.58	5.54	6.63	7.86	9.52	11.1	12.4	12.8	12.8	12.6	12.2	11.8	11.6
150	0.65	1.02	1.23	1.28	0.82	0.47	0.49	1.92	3.67	5.43	6.40	7.10	7.56	7.80	7.89	7.87	7.78	7.69	7.65
155	0.69	0.68	0.69	0.72	0.67	0.71	0.90	1.54	2.29	3.04	3.52	3.89	4.16	4.32	4.41	4.46	4.53	4.58	4.62
160	0.76	0.76	0.75	0.74	0.72	0.70	0.68	0.59	0.55	0.61	0.98	1.42	1.87	2.14	2.34	2.48	2.56	2.60	2.62
165	0.84	0.84	0.85	0.84	0.83	0.81	0.79	0.76	0.74	0.74	0.79	0.85	0.89	0.84	0.77	0.69	0.66	0.65	0.65
170	0.92	0.94	0.95	0.95	0.95	0.95	0.94	0.92	0.91	0.89	0.88	0.87	0.86	0.85	0.83	0.82	0.78	0.75	0.73
175	0.99	1.00	1.00	1.00	1.00	1.01	1.01	1.00	1.00	0.99	0.99	0.97	0.96	0.91	0.87	0.83	0.80	0.79	0.79
180	1.06	1.07	1.07	1.07	1.07	1.06	1.05	1.04	1.03	1.02	1.01	0.99	0.97	0.95	0.94	0.93	0.90	0.88	0.86

UNIT: cd																			
γ (DEG)	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185
0	1129	1129	1129	1129	1128	1128	1128	1128	1128	1128	1127	1127	1126	1126	1126	1126	1126	1125	1126
5	1233	1226	1219	1220	1221	1221	1216	1209	1199	1182	1165	1148	1141	1135	1130	1122	1113	1104	1116
10	1299	1287	1270	1245	1221	1202	1206	1214	1223	1217	1206	1191	1168	1144	1120	1103	1088	1077	1095
15	1615	1611	1597	1565	1525	1478	1432	1383	1330	1265	1204	1153	1140	1136	1133	1110	1080	1042	1055
20	1979	1967	1942	1896	1838	1772	1705	1631	1550	1448	1346	1253	1190	1141	1101	1064	1034	1010	998
25	2346	2326	2292	2247	2187	2109	2000	1879	1750	1626	1503	1383	1261	1150	1058	999	965	956	953
30	2359	2355	2342	2314	2272	2216	2144	2053	1942	1795	1635	1470	1306	1158	1033	956	914	906	928
35	2443	2437	2416	2364	2298	2222	2152	2072	1978	1854	1714	1564	1395	1230	1080	972	890	835	864
40	2280	2234	2191	2208	2225	2225	2149	2051	1943	1868	1783	1675	1483	1277	1081	946	842	770	802
45	1826	1854	1894	1963	2026	2068	2042	1986	1910	1840	1750	1633	1448	1247	1052	906	784	685	665
50	1767	1839	1897	1853	1789	1726	1730	1740	1739	1699	1629	1525	1354	1165	975	830	704	597	532
55	1656	1637	1608	1563	1517	1476	1466	1462	1457	1446	1419	1369	1267	1141	999	859	710	554	436
60	1389	1375	1368	1408	1446	1466	1413	1341	1264	1227	1189	1143	1064	968	854	724	578	416	308
65	928	936	952	986	1022	1054	1069	1072	1059	1022	972	911	853	786	706	606	490	359	255
70	597	611	628	647	665	680	690	697	700	713	715	699	632	549	461	394	334	280	197
75	442	438	431	420	408	399	395	395	399	415	428	430	398	354	304	262	220	177	125
80	253	250	246	245	244	244	244	243	241	238	232	223	211	195	175	153	127	97.3	67.7
85	202	200	197	193	188	181	171	161	149	140	130	119	106	91.1	76.2	62.3	48.8	35.5	26.6
90	86.3	86.5	86.6	86.8	87.2	87.8	90.6	92.5	92.5	86.9	78.9	69.0	58.0	46.7	35.8	27.0	19.4	12.9	10.7
95	54.1	52.5	50.4	48.1	45.7	43.7	42.7	42.1	41.9	42.7	42.9	42.1	37.5	31.7	25.4	20.1	14.9	9.93	7.96
100	44.6	43.3	41.5	39.4	37.2	35.0	33.6	32.0	29.6	24.2	18.5	13.4	11.7	11.1	10.9	10.2	9.56	8.94	6.98
105	30.7	29.1	27.2	25.4	23.6	21.6	19.5	17.4	15.4	13.6	11.9	10.5	9.51	8.56	7.47	5.82	3.84	1.55	1.27
110	33.3	32.5	31.2	29.8	27.7	25.0	19.8	14.8	11.1	13.4	16.7	19.3	16.4	12.4	8.59	7.36	7.29	8.40	5.31
115	11.1	10.1	8.89	7.40	6.55	6.86	11.1	15.8	20.0	20.5	19.6	17.5	13.9	10.0	6.75	5.73	5.99	7.53	4.80
120	14.1	17.1	20.7	23.6	26.0	27.4	26.7	25.1	22.8	20.4	17.7	14.8	11.3	8.01	5.48	4.72	5.12	6.69	4.35
125	23.1	26.0	28.9	29.2	28.6	27.4	25.7	23.5	20.9	18.1	15.1	12.2	9.06	6.34	4.28	3.54	3.75	4.90	3.39
130	21.7	23.9	26.2	26.8	26.6	25.7	23.7	21.1	18.2	15.4	12.6	9.84	7.15	4.80	3.00	2.17	2.07	2.70	2.09
135	19.9	21.3	22.8	23.4	23.5	22.9	20.7	18.0	15.1	12.7	10.3	8.00	5.13	2.51	0.47	0.00	0.00	0.89	1.06
140	16.7	17.6	18.5	18.8	18.7	18.0	16.0	13.6	11.1	9.29	7.72	6.39	4.50	4.55	3.75	2.78	1.76	0.70	0.85
145	11.8	12.2	12.6	12.8	12.8	12.4	11.1	9.52	7.86	6.63	5.54	4.58	3.77	3.07	2.43	1.79	1.20	0.66	0.85
150	7.69	7.78	7.87	7.89	7.80	7.56	7.10	6.40	5.43	3.67	1.92	0.49	0.47	0.82	1.28	1.23	1.02	0.65	0.85
155	4.58	4.53	4.46	4.41	4.32	4.16	3.89	3.52	3.04	2.29	1.54	0.90	0.71	0.67	0.72	0.69	0.68	0.69	0.90
160	2.60	2.56	2.48	2.34	2.14	1.87	1.42	0.98	0.61	0.55	0.59	0.68	0.70	0.72	0.74	0.75	0.76	0.76	1.05
165	0.65	0.66	0.69	0.77	0.84	0.89	0.85	0.79	0.74	0.74	0.76	0.79	0.81	0.83	0.84	0.85	0.84	0.84	1.17
170	0.75	0.78	0.82	0.83	0.85	0.86	0.87	0.88	0.89	0.91	0.92	0.94	0.95	0.95	0.95	0.95	0.94	0.94	1.32
175	0.79	0.80	0.83	0.87	0.91	0.96	0.97	0.99	0.99	1.00	1.00	1.01	1.01	1.00	1.00	1.00	1.00	1.00	1.19
180	0.88	0.90	0.93	0.94	0.95	0.97	0.99	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.07	1.07	1.07	1.06	1.05

Table--3

UNIT: °C

C (DEG)	190	195	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280
0	1126	1127	1127	1127	1127	1127	1128	1128	1128	1129	1129	1129	1129	1129	1129	1129	1129	1129	1129
5	1126	1132	1138	1140	1137	1125	1111	1099	1103	1108	1113	1103	1092	1080	1076	1075	1075	1075	1076
10	1103	1102	1087	1066	1041	1016	993	972	962	956	952	944	937	932	934	938	941	938	934
15	1061	1057	1043	1023	999	976	950	919	878	835	791	753	719	691	676	668	666	668	676
20	985	969	958	939	907	838	759	678	612	554	504	468	439	415	390	370	361	370	390
25	936	906	860	802	732	643	551	464	396	342	300	281	272	269	264	261	259	261	264
30	916	872	777	663	544	446	360	292	261	244	236	221	207	196	188	182	180	182	188
35	850	794	662	512	370	304	261	233	200	173	150	129	112	99.6	92.6	89.3	89.0	89.3	92.6
40	788	726	578	413	259	202	174	160	128	98.9	75.1	62.7	55.7	52.7	51.1	51.1	52.1	51.1	51.1
45	621	554	443	325	215	157	119	93.4	70.5	54.5	39.9	38.7	39.3	38.2	37.4	37.0	37.4	38.2	
50	465	394	314	237	167	118	80.8	54.5	39.4	31.5	28.4	25.4	24.1	24.0	23.8	23.8	24.0	23.8	23.8
55	336	254	196	152	117	83.1	55.2	34.1	23.3	18.0	16.2	14.2	13.5	13.6	13.4	13.4	13.4	13.4	13.4
60	220	154	116	92.3	77.2	55.1	36.1	20.9	12.9	8.31	6.03	3.63	2.12	1.28	0.72	0.49	0.48	0.49	0.72
65	171	108	73.2	53.7	43.4	28.8	17.5	9.17	4.30	1.64	0.59	0.11	0.28	0.74	0.71	0.65	0.57	0.65	0.71
70	131	80.8	52.4	35.8	26.9	16.2	8.65	3.69	1.26	0.45	0.63	0.50	0.59	0.79	0.79	0.76	0.70	0.76	0.79
75	82.3	50.3	32.1	21.5	15.8	9.47	5.09	2.36	0.97	0.53	0.67	0.62	0.69	0.82	0.80	0.76	0.71	0.76	0.80
80	44.0	26.2	16.6	11.3	8.72	5.42	3.11	1.64	0.90	0.66	0.71	0.68	0.71	0.77	0.76	0.75	0.72	0.75	0.76
85	19.2	13.3	9.53	6.90	5.10	3.37	2.08	1.21	0.81	0.68	0.71	0.69	0.72	0.75	0.76	0.76	0.75	0.76	0.76
90	8.75	7.05	5.66	4.49	3.50	2.52	1.70	1.08	0.85	0.78	0.81	0.79	0.80	0.81	0.82	0.84	0.86	0.84	0.82
95	6.30	4.95	4.03	3.33	2.78	2.13	1.56	1.13	0.96	0.91	0.93	0.91	0.90	0.90	0.92	0.95	0.98	0.95	0.92
100	5.37	4.09	3.27	2.70	2.30	1.83	1.46	1.18	1.08	1.05	1.07	1.06	1.06	1.07	1.09	1.13	1.18	1.13	1.09
105	1.06	0.92	0.90	0.93	0.99	1.04	1.09	1.14	1.14	1.14	1.13	1.14	1.16	1.18	1.21	1.24	1.26	1.24	1.21
110	3.00	1.46	1.07	1.18	1.51	1.37	1.21	1.07	1.07	1.10	1.16	1.18	1.20	1.21	1.22	1.22	1.22	1.22	1.22
115	2.74	1.34	0.92	0.94	1.19	1.12	1.07	1.03	1.05	1.09	1.14	1.16	1.18	1.19	1.21	1.23	1.24	1.23	1.21
120	2.56	1.33	0.89	0.84	1.00	0.98	0.99	1.03	1.07	1.12	1.16	1.19	1.21	1.23	1.26	1.28	1.29	1.28	1.26
125	2.23	1.40	1.03	0.91	0.94	0.94	0.98	1.05	1.12	1.19	1.25	1.29	1.31	1.33	1.37	1.39	1.41	1.39	1.37
130	1.61	1.25	1.06	0.98	0.97	0.99	1.04	1.10	1.16	1.23	1.29	1.35	1.41	1.46	1.50	1.53	1.54	1.53	1.50
135	1.17	1.23	1.17	1.10	1.02	1.04	1.09	1.16	1.22	1.29	1.36	1.42	1.47	1.51	1.55	1.57	1.58	1.57	1.55
140	1.04	1.13	1.14	1.12	1.10	1.13	1.17	1.22	1.27	1.31	1.36	1.42	1.48	1.53	1.56	1.59	1.60	1.59	1.56
145	1.03	1.14	1.18	1.19	1.18	1.21	1.25	1.29	1.34	1.40	1.45	1.49	1.52	1.55	1.58	1.59	1.61	1.59	1.58
150	1.07	1.20	1.25	1.26	1.26	1.29	1.33	1.36	1.39	1.42	1.45	1.47	1.49	1.51	1.53	1.55	1.56	1.55	1.53
155	1.20	1.36	1.41	1.42	1.40	1.38	1.36	1.35	1.37	1.40	1.43	1.46	1.47	1.49	1.48	1.47	1.46	1.47	1.48
160	1.34	1.51	1.57	1.57	1.53	1.51	1.48	1.44	1.43	1.43	1.42	1.38	1.35	1.33	1.34	1.37	1.39	1.37	1.34
165	1.41	1.57	1.61	1.58	1.53	1.50	1.48	1.46	1.44	1.41	1.38	1.31	1.24	1.18	1.19	1.21	1.24	1.21	1.19
170	1.34	1.46	1.48	1.46	1.40	1.34	1.27	1.21	1.19	1.18	1.16	1.11	1.07	1.03	1.03	1.04	1.06	1.04	1.03
175	1.26	1.32	1.34	1.32	1.28	1.21	1.14	1.08	1.04	1.02	1.00	0.97	0.94	0.93	0.94	0.97	1.00	0.97	0.94
180	1.04	1.04	1.04	1.04	1.03	1.02	1.00	0.98	0.96	0.94	0.92	0.90	0.88	0.88	0.89	0.90	0.92	0.90	0.89

																UNIT: °C			
y	C (DEG)																		
		285	290	295	300	305	310	315	320	325	330	335	340	345	350	355			
0	1129	1129	1129	1129	1129	1128	1128	1128	1128	1127	1127	1127	1127	1127	1126	1126			
5	1080	1092	1103	1113	1108	1103	1099	1111	1125	1137	1140	1138	1132	1126	1116				
10	932	937	944	952	956	962	972	993	1016	1041	1066	1087	1102	1103	1095				
15	691	719	753	791	835	878	919	950	976	999	1023	1043	1057	1061	1055				
20	415	439	468	504	554	612	678	759	838	907	939	958	969	985	998				
25	269	272	281	300	342	396	464	551	643	732	802	860	906	936	953				
30	196	207	221	236	244	261	292	360	446	544	663	777	872	916	928				
35	99.6	112	129	150	173	200	233	261	304	370	512	662	794	850	864				
40	52.7	55.7	62.7	75.1	98.9	128	160	174	202	259	413	578	726	788	802				
45	39.3	38.7	39.9	44.5	54.5	70.5	93.4	119	157	215	325	443	554	621	665				
50	24.0	24.1	25.4	28.4	31.5	39.4	54.5	80.8	118	167	237	314	394	465	532				
55	13.6	13.5	14.2	16.2	18.0	23.3	34.1	55.2	83.1	117	152	196	254	336	436				
60	1.28	2.12	3.63	6.03	8.31	12.9	20.9	36.1	55.1	77.2	92.3	116	154	220	308				
65	0.74	0.28	0.11	0.59	1.64	4.30	9.17	17.5	28.8	43.4	53.7	73.2	108	171	255				
70	0.79	0.59	0.50	0.63	0.45	1.26	3.69	8.65	16.2	26.9	35.8	52.4	80.8	131	197				
75	0.82	0.69	0.62	0.67	0.53	0.97	2.36	5.09	9.47	15.8	21.5	32.1	50.3	82.3	125				
80	0.77	0.71	0.68	0.71	0.66	0.90	1.64	3.11	5.42	8.72	11.3	16.6	26.2	44.0	67.7				
85	0.75	0.72	0.69	0.71	0.68	0.81	1.21	2.08	3.37	5.10	6.90	9.53	13.3	19.2	26.6				
90	0.81	0.80	0.79	0.81	0.78	0.85	1.08	1.70	2.52	3.50	4.49	5.66	7.05	8.75	10.7				
95	0.90	0.90	0.91	0.93	0.91	0.96	1.13	1.56	2.13	2.78	3.33	4.03	4.95	6.30	7.96				
100	1.07	1.06	1.06	1.07	1.05	1.08	1.18	1.46	1.83	2.30	2.70	3.27	4.09	5.37	6.98				
105	1.18	1.16	1.14	1.13	1.14	1.14	1.14	1.09	1.04	0.99	0.93	0.90	0.92	1.06	1.27				
110	1.21	1.20	1.18	1.16	1.10	1.07	1.07	1.21	1.37	1.51	1.18	1.07	1.46	3.00	5.31				
115	1.19	1.18	1.16	1.14	1.09	1.05	1.03	1.07	1.12	1.19	0.94	0.92	1.34	2.74	4.80				
120	1.23	1.21	1.19	1.16	1.12	1.07	1.03	0.99	0.98	1.00	0.84	0.89	1.33	2.56	4.35				
125	1.33	1.31	1.29	1.25	1.19	1.12	1.05	0.98	0.94	0.94	0.91	1.03	1.40	2.23	3.39				
130	1.46	1.41	1.35	1.29	1.23	1.16	1.10	1.04	0.99	0.97	0.98	1.06	1.25	1.61	2.09				
135	1.51	1.47	1.42	1.36	1.29	1.22	1.16	1.09	1.04	1.02	1.10	1.17	1.23	1.17	1.06				
140	1.53	1.48	1.42	1.36	1.31	1.27	1.22	1.17	1.13	1.10	1.12	1.14	1.13	1.04	0.89				
145	1.55	1.52	1.49	1.45	1.40	1.34	1.29	1.25	1.21	1.18	1.19	1.18	1.14	1.03	0.86				
150	1.51	1.49	1.47	1.45	1.42	1.39	1.36	1.33	1.29	1.26	1.26	1.25	1.20	1.07	0.89				
155	1.49	1.47	1.46	1.43	1.40	1.37	1.35	1.36	1.38	1.40	1.42	1.41	1.36	1.20	0.98				
160	1.33	1.35	1.38	1.42	1.43	1.43	1.44	1.48	1.51	1.53	1.57	1.57	1.51	1.34	1.09				
165	1.18	1.24	1.31	1.38	1.41	1.44	1.46	1.48	1.50	1.53	1.58	1.61	1.57	1.41	1.17				
170	1.03	1.07	1.11	1.16	1.18	1.19	1.21	1.27	1.34	1.40	1.46	1.48	1.46	1.34	1.17				
175	0.93	0.94	0.97	1.00	1.02	1.04	1.08	1.14	1.21	1.28	1.32	1.34	1.32	1.26	1.15				
180	0.88	0.88	0.90	0.92	0.94	0.96	0.98	1.00	1.02	1.03	1.04	1.04	1.04	1.04	1.05				

4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	WPX1 @ 20W / 4000K	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 $25 \pm 1^{\circ}\text{C}$. 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 was calculated.</p>

Test Results

Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	iTHD(%)
120.0	60	0.211	25.2	0.996	3.16
277.0	60	0.104	26.0	0.902	11.85

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*****