

Report Number: PL13014-001A
Model: HXB-C-xx-70L-M-35K-8-UL-xx-xxx w_HXB-GS30-WH
Date: 8/30/18

Cree Engineering Services Testing Laboratory (CESTL) Photometric Testing and Evaluation Report

Prepared For:

Jon Vollers
Cree, Inc.
4600 Silicon Dr
Durham, NC 27703

Prepared By:

April Gressel, Test Technician

Approved By:

Becky Kuebler, Manager Test Engineering

Product Information

Manufacturer	Cree Inc
Model Number (SKU)	HXB-C-xx-70L-M-35K-8-UL-xx-xxx w_HXB-GS30-WH
Serial Number	PL13014-001
LED Type	MHD-E

Product Description

Extruded aluminum enclosure with finned aluminum heat sink, gray polymeric housing, white polymeric reflector, and clear polymeric optical lens covering LEDs with a Clear Translucent Glare Shield

Driver Information (Where Applicable)

Philips XI300C150V300BSR1

Length	Width	Height
18.5"	18.5"	26"

Sample

The following sample was submitted for evaluation



Key Photometric Data	Sphere Output	Goniophotometer	
Luminous Flux	60699.0	60101.0	lm
Efficacy	124.61	123.59	lm/W
Correlated Color Temperature (CCT)	3375		
Color Rendering Index (CRI)	82		
R ₉	11		
Duv	0.000151		
S/P Ratio*	1.45		
CIE Type	Direct		
Color Angular Uniformity	N/A		

	Sphere		Goniophotometer		
Electrical Measurements	120V	277V	120V	277V	
Input Wattage	487.10	480.70	486.30	480.50	W
Input Current	4.08	1.79	4.07	1.79	A
Input Voltage	119.98	277.00	119.98	277.08	V
Power Factor	0.996	0.969	0.997	0.970	
Off-State Power	0	0	0	0	W
Total Harmonic Distortion (Voltage)	0.24	0.10	0.16	0.10	%
Total Harmonic Distortion (Amperage)	6.17	7.47	5.26	6.16	%

Note: All photometric measurements taken at 120VAC.

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	80	30	min
Total Operating Time (Stabilization + Test)	100	50	min
Ambient Temperature	24.6	24.6	°C

Spacing Criteria

Spacing Criterion (0 - 180)	1.20
Spacing Criterion (90 - 270)	1.20
Spacing Criterion (Diagonal)	1.34

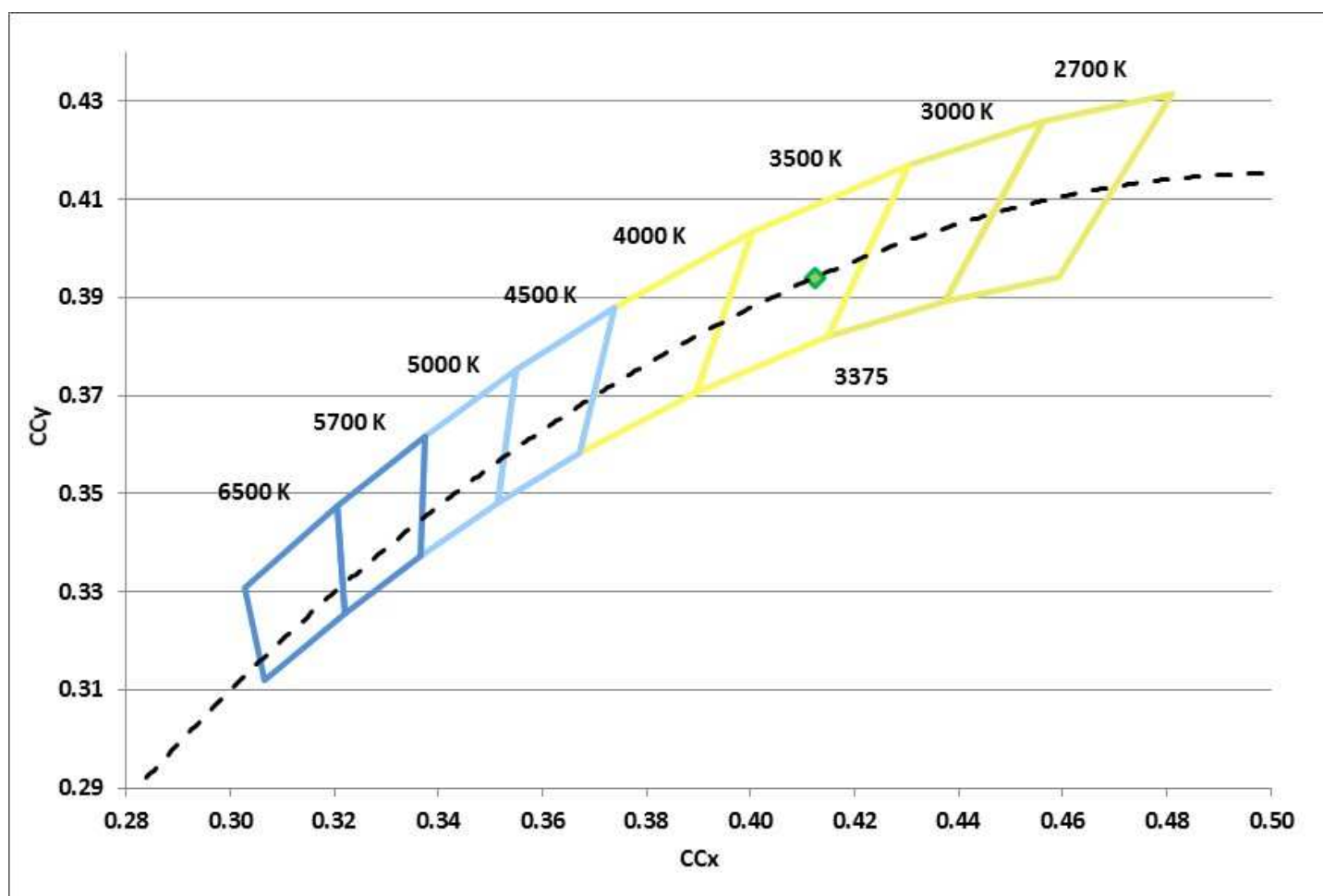
Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.4124	0.3941	0.2389	0.3425	0.2389	0.5137	0.000151

Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
82	81	88	94	82	80	84	85	64	11	72	80	65	82	97

Chromaticity Diagram



Spectral Distribution

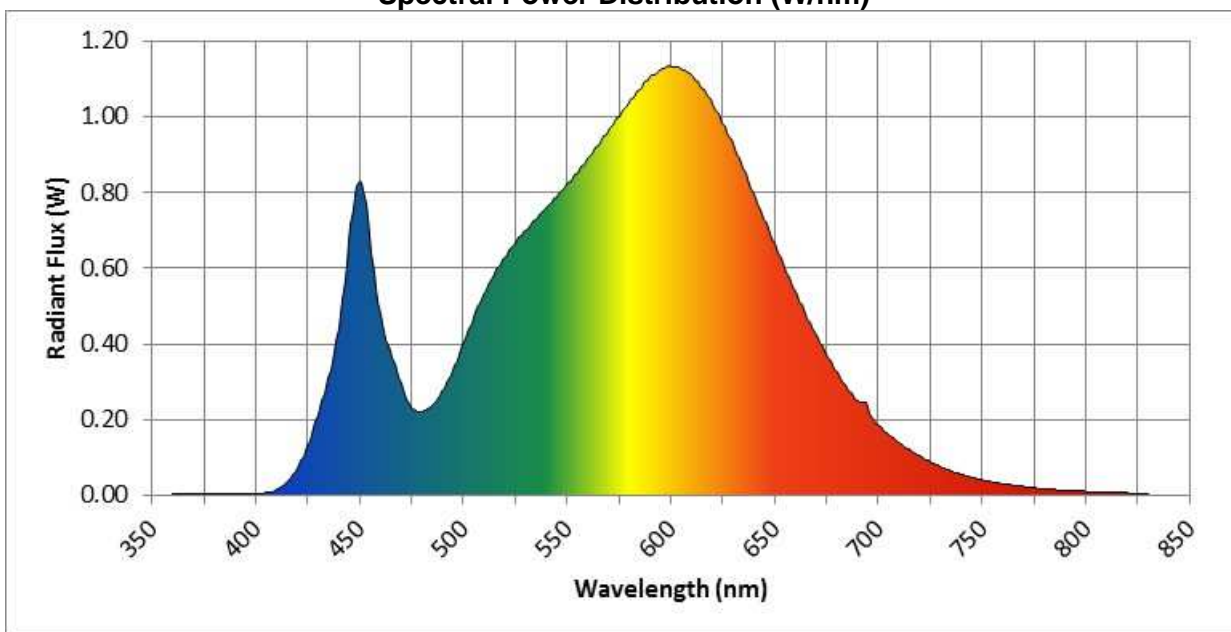
$\lambda(\text{nm})$	W/nm
360	0.004383
370	0.003846
380	0.003284
390	0.003636
400	0.003837
410	0.014594
420	0.071406
430	0.212798
440	0.438498
450	0.827993
460	0.476897
470	0.296038
480	0.221643
490	0.273291
500	0.399096
510	0.530677
520	0.626902

$\lambda(\text{nm})$	W/nm
530	0.698421
540	0.758399
550	0.819889
560	0.889749
570	0.962006
580	1.038516
590	1.103738
600	1.132089
610	1.108738
620	1.034850
630	0.926376
640	0.796422
650	0.665565
660	0.538802
670	0.423626
680	0.326724
690	0.249689

$\lambda(\text{nm})$	W/nm
700	0.186401
710	0.139059
720	0.103917
730	0.076172
740	0.055394
750	0.041077
760	0.030746
770	0.023052
780	0.017224
790	0.012956
800	0.010149
810	0.007899
820	0.006705
830	0.004653

Dominant Wavelength	581	nm
Peak Wavelength	599	nm

Spectral Power Distribution (W/nm)



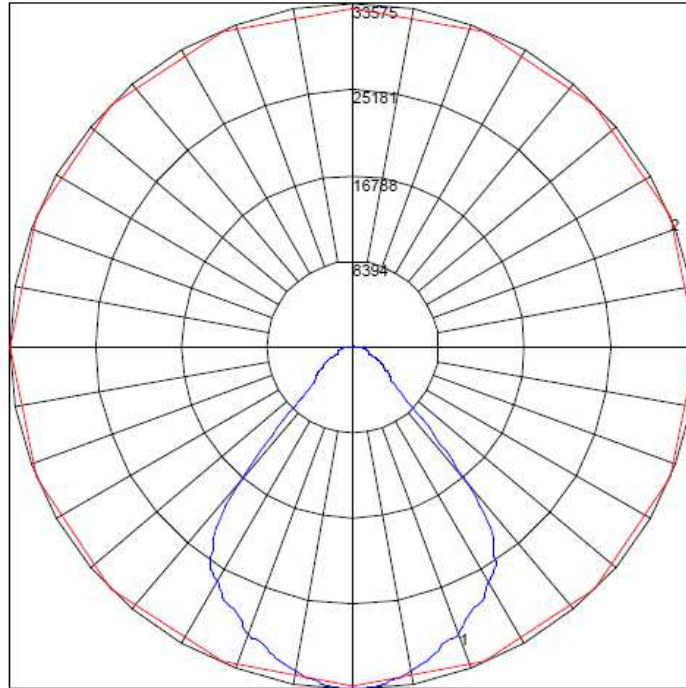
Zonal Lumen Summary

Zone	Lumens	% of Total	Zone	Lumens
0-20	12018.2	20	0-10	3148.03
0-30	25763.91	42.9	10-20	8870.17
0-40	42187.67	70.2	20-30	13745.71
0-60	55180.61	91.8	30-40	16423.76
0-80	58622.55	97.5	40-50	9190.15
0-90	59241.27	98.6	50-60	3802.79
10-90	56093.23	93.3	60-70	2151.8
20-40	30169.47	50.2	70-80	1290.15
20-50	39359.62	65.5	80-90	618.71
40-70	15144.74	25.2	90-100	178.79
60-80	3441.95	5.7	100-110	117.42
70-80	1290.15	2.1	110-120	141.58
80-90	618.71	1	120-130	130.37
90-110	296.21	0.5	130-140	110.86
90-120	437.79	0.7	140-150	86.75
90-130	568.16	0.9	150-160	51.31
90-150	765.77	1.3	160-170	31.41
90-180	860.06	1.4	170-180	11.57
110-180	563.85	0.9		
Total	60101.33 lm	100%		

Luminance Data (Cd./Sq.M)

Average in Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	15878	38299	15127
55	9069	10431	9569
65	5407	5420	5573
75	4343	3368	4355
85	2793	1878	2568

Candela Plots



Maximum Candela = 33575 Located At Horizontal Angle = 0, Vertical Angle = .5
1 - Vertical Plane Through Horizontal Angles (0 - 180) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (.5) (Through Max. Cd.)

Coefficients of Utilization

RC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	110	110	110	105	105	105	101	101	101	99
1	111	107	104	101	108	105	102	99	101	98	96	97	95	93	93	91	90	88
2	104	97	92	87	101	95	90	86	92	88	84	88	85	82	85	82	80	78
3	96	88	82	76	94	87	81	76	84	78	74	81	76	73	78	75	72	70
4	90	80	73	68	88	79	72	67	76	71	66	74	69	65	72	68	64	62
5	84	73	66	60	82	72	65	60	70	64	59	68	63	59	66	62	58	56
6	78	67	60	54	77	66	59	54	64	58	54	63	57	53	61	56	53	51
7	73	62	54	49	72	61	54	49	60	53	49	58	52	48	57	52	48	46
8	69	57	50	45	67	56	49	45	55	49	44	54	48	44	53	48	44	42
9	65	53	46	41	63	52	45	41	51	45	41	50	44	40	49	44	40	38
10	61	49	42	38	60	49	42	37	48	42	37	47	41	37	46	41	37	35

Candela Tabulations

	0	22.5	45	67.5	90	112.5	135.0	157.5	180.0
0	33478.5	33478.5	33478.5	33478.5	33478.5	33478.5	33478.5	33478.5	33478.5
2.5	33505.8	33322.2	33105.4	32976.3	32992.2	33505.8	33322.2	33105.4	32976.3
5	33249.9	33286.7	33058.9	33148.1	33466.1	33249.9	33286.7	33058.9	33148.1
7.5	32783.3	32615.5	33002.6	33304.6	33401.8	32783.3	32615.5	33002.6	33304.6
10	32270.5	32107.5	32642.9	32602	32288.9	32270.5	32107.5	32642.9	32602
12.5	31757.5	32221	32239.3	31652.5	30912.5	31757.5	32221	32239.3	31652.5
15	31168.7	31876.2	31414.9	30864.8	30567	31168.7	31876.2	31414.9	30864.8
17.5	30262	31405.3	31190.4	30788.2	30209.2	30262	31405.3	31190.4	30788.2
20	30010.2	31081.8	31298	30550.2	29378.3	30010.2	31081.8	31298	30550.2
22.5	28905.5	30541.5	31468.5	29640.2	28160.7	28905.5	30541.5	31468.5	29640.2
25	28217.5	29782.8	31536	29335.2	27884.2	28217.5	29782.8	31536	29335.2
27.5	27647.3	29564.2	31567.9	29319.6	27237.9	27647.3	29564.2	31567.9	29319.6
30	26542.5	29008.9	31517.9	28644.4	26411.5	26542.5	29008.9	31517.9	28644.4
32.5	25807.5	28177	31193	27975.8	26010.2	25807.5	28177	31193	27975.8
35	23976	26384	30299	26665.1	24742.5	23976	26384	30299	26665.1
37.5	21527.1	23918.5	28729.4	24700.5	21434	21527.1	23918.5	28729.4	24700.5
40	16996.5	20310.8	25741.5	20401.3	16837.5	16996.5	20310.8	25741.5	20401.3
42.5	11828.4	15118.1	23004.7	14984.2	11779.1	11828.4	15118.1	23004.7	14984.2
45	7517.4	10030.1	18133.2	9754.6	7162.1	7517.4	10030.1	18133.2	9754.6
47.5	5316.8	6575.4	12832.8	6186.4	5356.3	5316.8	6575.4	12832.8	6186.4
50	4706.1	4895.8	8708.1	5025.6	4988.5	4706.1	4895.8	8708.1	5025.6
52.5	4379.9	4402.2	5798.7	4599.8	4620.8	4379.9	4402.2	5798.7	4599.8
55	3957.5	3968.8	4552	4091.5	4176	3957.5	3968.8	4552	4091.5
57.5	3502.1	3502.1	3826.3	3571.7	3693.9	3502.1	3502.1	3826.3	3571.7
60	3082.2	3105.8	3261.1	3092.2	3227.3	3082.2	3105.8	3261.1	3092.2
62.5	2623.9	2587.6	2671.1	2615.2	2696.9	2623.9	2587.6	2671.1	2615.2
65	2087.4	2061.9	2092.4	2040.5	2151.5	2087.4	2061.9	2092.4	2040.5
67.5	1719.7	1660	1656.8	1649.8	1809	1719.7	1660	1656.8	1649.8
70	1663.3	1518.2	1466.4	1524.6	1720	1663.3	1518.2	1466.4	1524.6
72.5	1557	1381.5	1290.1	1373.4	1581.6	1557	1381.5	1290.1	1373.4
75	1407.2	1209.9	1091.3	1185.1	1410.9	1407.2	1209.9	1091.3	1185.1
77.5	1240.1	1038.7	905.2	1005.2	1226.2	1240.1	1038.7	905.2	1005.2
80	1064.9	872.1	740.7	834.2	1033.2	1064.9	872.1	740.7	834.2
82.5	887.4	715.3	597.3	675	838.3	887.4	715.3	597.3	675
85	704	566.7	473.5	528.2	647.3	704	566.7	473.5	528.2
87.5	516.3	423.3	364.1	395.1	470.7	516.3	423.3	364.1	395.1
90	344.8	294	265.7	277.6	316.4	344.8	294	265.7	277.6

Candela Tabulations(Continued)

	0	22.5	45	67.5	90	112.5	135.0	157.5	180.0
92.5	223.4	201.5	193.3	194.1	208.9	223.4	201.5	193.3	194.1
95	152.3	144.1	144.2	142	146.7	152.3	144.1	144.2	142
97.5	118.2	115.7	118.7	117.2	118.5	118.2	115.7	118.7	117.2
100	102.5	103.2	108.2	108	106.6	102.5	103.2	108.2	108
102.5	98.3	101.5	108.7	107.9	104.9	98.3	101.5	108.7	107.9
105	99.1	104.5	114.1	113.1	107.4	99.1	104.5	114.1	113.1
107.5	103.6	110.7	122.6	121.6	113.1	103.6	110.7	122.6	121.6
110	109.9	119.5	134.6	133.1	122.1	109.9	119.5	134.6	133.1
112.5	116.3	128.3	147.3	143.6	131.9	116.3	128.3	147.3	143.6
115	123.3	136.9	160.4	150.4	139.3	123.3	136.9	160.4	150.4
117.5	128.8	143.9	170.8	153.7	141.5	128.8	143.9	170.8	153.7
120	131.7	146.4	175.6	152.3	140.5	131.7	146.4	175.6	152.3
122.5	131.4	144.4	174.1	148.1	137.6	131.4	144.4	174.1	148.1
125	129.6	138.8	167.1	140.9	134.2	129.6	138.8	167.1	140.9
127.5	127.8	133.8	161.8	135.3	131.2	127.8	133.8	161.8	135.3
130	126.8	130.4	159.9	132.8	129.3	126.8	130.4	159.9	132.8
132.5	126.9	130.9	161.2	134.2	130.4	126.9	130.9	161.2	134.2
135	129.5	133.8	163.7	140.6	135.6	129.5	133.8	163.7	140.6
137.5	136	140.3	162	148.4	145.7	136	140.3	162	148.4
140	144.3	147.1	154	151.8	153.2	144.3	147.1	154	151.8
142.5	152.3	148.1	141.6	146.3	153.8	152.3	148.1	141.6	146.3
145	154.3	143.2	128.3	135.3	145.5	154.3	143.2	128.3	135.3
147.5	146.1	132.7	117.2	123.4	131.8	146.1	132.7	117.2	123.4
150	135	122.8	110.3	114	119.3	135	122.8	110.3	114
152.5	124.2	115.7	106.8	108.7	112	124.2	115.7	106.8	108.7
155	116.1	111.5	105.5	106.9	108.5	116.1	111.5	105.5	106.9
157.5	111.8	109.6	106	106.8	108	111.8	109.6	106	106.8
160	110.4	109	107.9	107.7	108.5	110.4	109	107.9	107.7
162.5	110.1	109.9	109.3	108.5	110.1	110.1	109.9	109.3	108.5
165	110.6	109.9	110.3	110.1	110.4	110.6	109.9	110.3	110.1
167.5	111.6	112.3	113.2	112.2	112	111.6	112.3	113.2	112.2
170	117.3	116.5	116.1	117.1	117.9	117.3	116.5	116.1	117.1
172.5	120.7	120.2	120	120.4	120.6	120.7	120.2	120	120.4
175	124	124	124.6	124.1	124	124	124	124.6	124.1
177.5	125	125	125.5	125.1	124.7	125	125	125.5	125.1
180	125.3	125.3	125.3	125.3	125.3	125.3	125.3	125.3	125.3

Integrating Sphere Equipment List

Description	Manufacturer	Model	Serial Number
3M Sphere	Labsphere	CSTM-CSLMS-3M98-HDS	82456
CCD Array Spectrometer	Otsuka	MC-9801	98010165
Programmable AC Source	Chroma	61603	616030000761
Single Channel Power Analyzer	Xitron	2801	28011110008
Aux Lamp Power Supply	Labsphere	LPS-100-0833	1027119144

*Goniophotometer Equipment List (Cree Durham Technology Center, NVLAP Lab Code 500070-0)

Description	Manufacturer	Model	Serial Number
AC Power Source	Adaptive	FC200	2300230
DC Power Source	Sorensen	XHR 150-7	1424A01504
DC Power Source	GW	GPR-30H 10D	EF810483
Type C Goniophotometer	LSI / UL	6440T	6440TE0192T
Spectroradiometer	Gooch & Housego	770VIS/NIR	11414155
Power Meter	Yokogawa	WT210	91L220953

Test Methods Used:

Title	Description
ANSI C82.77:2002	Harmonic Emission Limits- Related Power Quality Reqt's for Lighting Equipment
CIE Pub. 13.3:1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. 15:2004	Colorimetry
IES LM-58:1994	Spectroradiometric Measurements
IES LM-79:2008	Electrical and Photometric Measurements of Solid-State Lighting Products

Reference Standard Used:

Equipment	Description
3m Sphere	Tungsten Halogen Omni-Directional 75W Calibration Lamp, Serial Number F132
*Type C Goniophotometer and Spectrometer (Cree Durham Technology Center, NVLAP Lab Code 500070-0)	Tungsten Halogen Omni-Directional 500W Calibration Flux Lamp, Serial Number 97A. For color calibration of spectroradiometer, Serial Numbers 12C066, 12C067, 12C068.

Disclaimers:

This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the federal government.

The results contained in this report pertain only to the tested sample.

This report shall not be reproduced, except in full, without written approval of the CESTL.

*Items marked with a single asterisk are not covered by the NVLAP accreditation.

In the event that the recorded temperature is outside of $25 \pm 1^\circ\text{C}$, this is considered a non-standard condition.

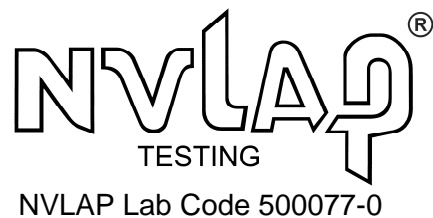
This report may contain data not covered by the NVLAP accreditation, and are identified with **.

In the event that testing is subcontracted, or subcontracted equipment was used, test results in this report marked with the symbol *, or noted as “Sphere” or “Integrating Sphere” or “Goniophotometer”, were performed by the subcontracted laboratory identified in the equipment list of this report.

Additional Comments:

The photos below are intended to show the orientation and fixturing/set-up of the units under test. These are critical to understanding the results of the test given the sensitivity of many products and measurement systems to orientation and set-up considerations, and also for reproducing the conditions of the test.





Document Revision History:

Each subsequent revision of this report replaces the preceding report.

Date	Rev	DCN #	Change at the time of this test	By	Approval
8/30/18	A	DMS	Origination	A. Gressel	B. Kuebler