

**Report Number:** PL13016-001A  
**Model:** HXB-C-xx-70L-M-35K-8-UL-xx-xxx W\_HXB-GS30-OPU  
**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-OPU
Serial Number	PL13016-001
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 Clear Upper and White Opaque Lower-Uplight 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	60633.0	59843.0	lm
Efficacy	124.40	123.08	lm/W
Correlated Color Temperature (CCT)	3347		
Color Rendering Index (CRI)	82		
R <sub>9</sub>	9		
Duv	0.000619		
S/P Ratio*	1.44		
CIE Type	Direct		
Color Angular Uniformity	N/A		

	Sphere		Goniophotometer		
Electrical Measurements	120V	277V	120V	277V	
Input Wattage	487.40	481.10	486.20	480.50	W
Input Current	4.08	1.79	4.06	1.79	A
Input Voltage	120.06	276.98	120.03	277.00	V
Power Factor	0.996	0.970	0.997	0.970	
Off-State Power	0	0	0	0	W
Total Harmonic Distortion (Voltage)	0.25	0.11	0.15	0.10	%
Total Harmonic Distortion (Amperage)	6.15	7.44	5.25	6.17	%

**Note:** All photometric measurements taken at 120VAC.

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	71	30	min
Total Operating Time (Stabilization + Test)	91	50	min
Ambient Temperature	24.7	24.6	°C

#### Spacing Criteria

Spacing Criterion (0 - 180)	1.26
Spacing Criterion (90 - 270)	1.26
Spacing Criterion (Diagonal)	1.34

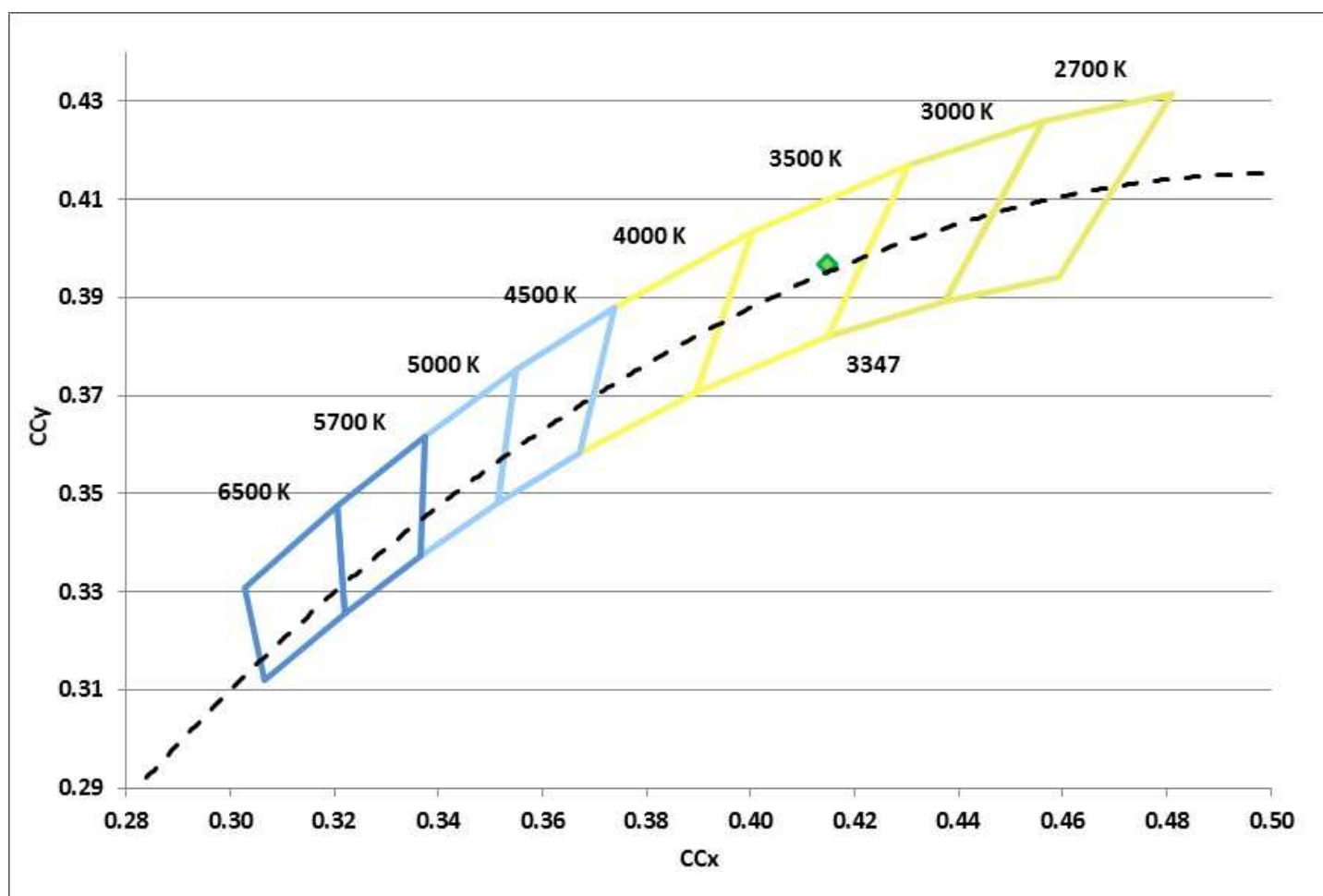
### Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.4148	0.3967	0.2394	0.3434	0.2394	0.5151	0.000619

### Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
82	80	88	94	81	80	84	85	63	9	72	80	64	82	97

### Chromaticity Diagram



## Spectral Distribution

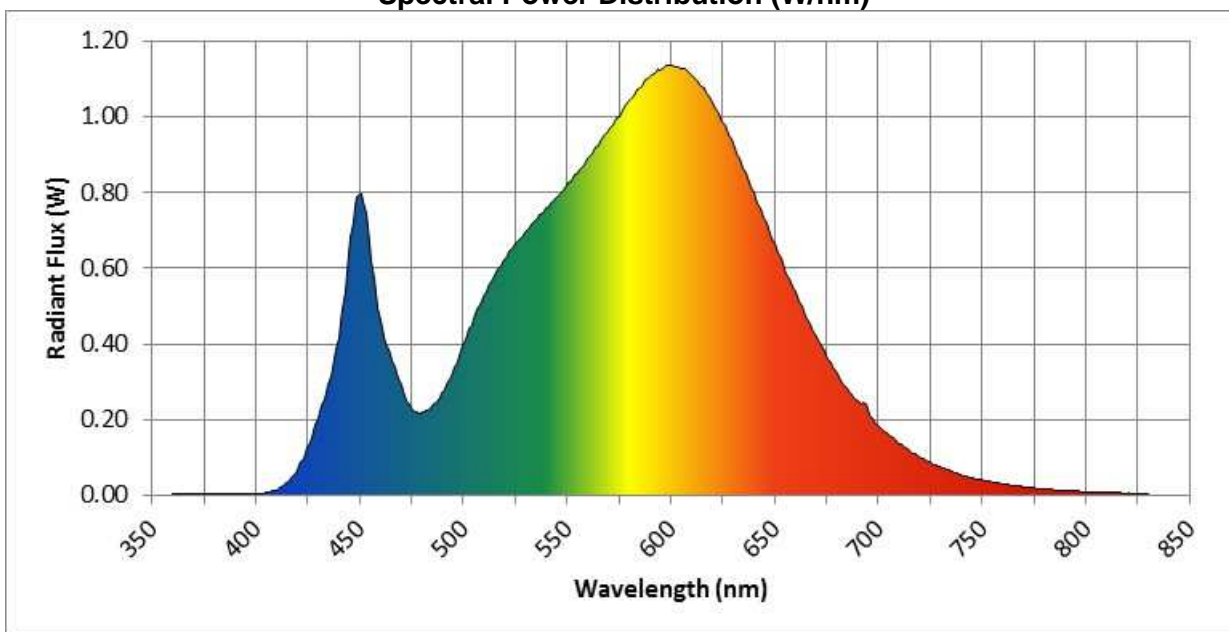
$\lambda(\text{nm})$	W/nm
360	0.002276
370	0.004455
380	0.003285
390	0.003041
400	0.003989
410	0.014380
420	0.067488
430	0.201535
440	0.414917
450	0.796925
460	0.463433
470	0.290600
480	0.218103
490	0.270552
500	0.395323
510	0.525813
520	0.623231

$\lambda(\text{nm})$	W/nm
530	0.694159
540	0.756149
550	0.819006
560	0.887503
570	0.961562
580	1.039792
590	1.106498
600	1.134289
610	1.109819
620	1.037237
630	0.928806
640	0.798282
650	0.664297
660	0.536583
670	0.420092
680	0.322995
690	0.247603

$\lambda(\text{nm})$	W/nm
700	0.184117
710	0.137346
720	0.101938
730	0.075193
740	0.054543
750	0.040305
760	0.030142
770	0.022260
780	0.016275
790	0.012558
800	0.009836
810	0.007954
820	0.005894
830	0.004693

<b>Dominant Wavelength</b>	581	nm
<b>Peak Wavelength</b>	599	nm

## Spectral Power Distribution (W/nm)



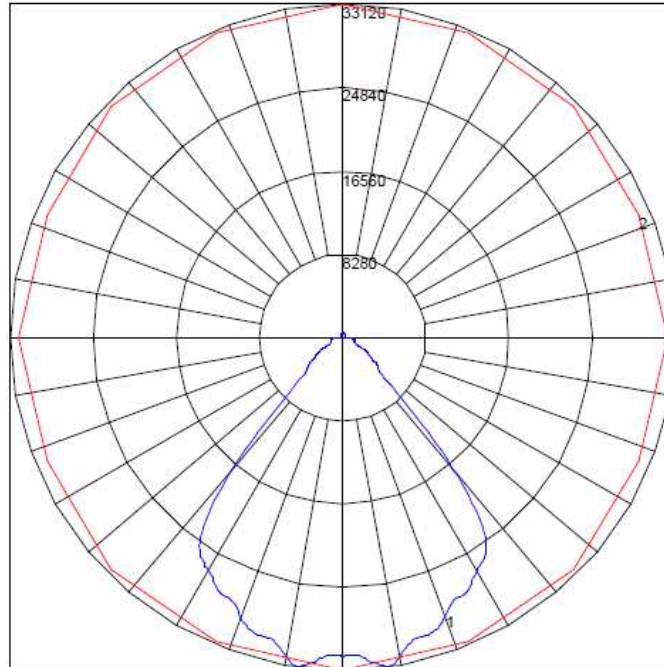
### Zonal Lumen Summary

Zone	Lumens	% of Total	Zone	Lumens
0-20	12008.03	20.1	0-10	3084.81
0-30	25957.16	43.4	10-20	8923.22
0-40	42499.82	71	20-30	13949.13
0-60	54501.8	91.1	30-40	16542.66
0-80	57218.66	95.6	40-50	8865.49
0-90	57902.78	96.8	50-60	3136.49
10-90	54817.97	91.6	60-70	1566.56
20-40	30491.8	51	70-80	1150.3
20-50	39357.29	65.8	80-90	684.12
40-70	13568.54	22.7	90-100	226.31
60-80	2716.85	4.5	100-110	274.67
70-80	1150.3	1.9	110-120	258.15
80-90	684.12	1.1	120-130	253.01
90-110	500.98	0.8	130-140	270.2
90-120	759.12	1.3	140-150	258.29
90-130	1012.14	1.7	150-160	210.62
90-150	1540.63	2.6	160-170	137.52
90-180	1940.2	3.2	170-180	51.43
110-180	1439.23	2.4		
Total	59842.98 lm	100%		

### Luminance Data (Cd./Sq.M)

Average in Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	15938	36350	14527
55	7972	7957	7949
65	3854	3762	3780
75	3768	3105	3808
85	2893	2313	2920

## Candela Plots



Maximum Candela = 33120.3 Located At Horizontal Angle = 90, Vertical Angle = 8  
 # 1 - Vertical Plane Through Horizontal Angles (90 - 270) (Through Max. Cd.)  
 # 2 - Horizontal Cone Through Vertical Angle (8) (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	118	118	118	118	115	115	115	115	109	109	109	104	104	104	99	99	99	97
1	111	107	104	101	108	105	102	99	100	98	95	96	94	92	92	90	89	87
2	103	97	92	88	101	95	90	86	91	87	84	88	84	82	84	82	79	77
3	96	88	82	77	94	87	81	76	83	78	74	80	76	73	78	74	71	69
4	90	80	73	68	88	79	73	68	76	71	66	74	69	65	71	67	64	62
5	84	74	66	61	82	72	66	61	70	64	60	68	63	59	66	62	58	56
6	79	68	60	55	77	67	60	55	65	58	54	63	57	53	61	56	53	51
7	74	62	55	50	72	61	54	49	60	53	49	58	53	48	57	52	48	46
8	69	58	50	45	67	57	50	45	55	49	45	54	48	44	53	48	44	42
9	65	53	46	41	63	53	46	41	51	45	41	50	45	41	49	44	40	39
10	61	50	43	38	60	49	42	38	48	42	38	47	41	37	46	41	37	36

### Candela Tabulations

	0	22.5	45	67.5	90
0	31812.3	31812.3	31812.3	31812.3	31812.3
2.5	32093.2	32048.2	31876.5	31754.1	31687
5	32238.2	32199.3	32242.4	32267.8	32378.4
7.5	32296.2	32010	32493.3	32707.7	33067.9
10	32199.3	31862.8	32505.6	32465.3	32292.1
12.5	31827.2	32145.2	32233.3	31721.5	31094.3
15	31315.2	31951.2	31607.2	31076	30849.2
17.5	30600.2	31700.5	31540	31065.7	30545.5
20	30303.1	31436.7	31771.7	30870.7	29704.2
22.5	29288.6	30959	31963	30066.7	28544.2
25	28666	30243.1	32045.2	29784.5	28282.3
27.5	28119.7	30024.2	32038.8	29791.7	27673.3
30	26929.8	29438.7	31922.8	29029.8	26763.8
32.5	25966.2	28541.7	31498.8	28354.3	26131.2
35	24145.2	26622.8	30472	26924.7	24894.4
37.5	21810.5	23956	28719.5	24726	21752
40	17184.8	20341.1	25506	20459.7	17035.9
42.5	12010.3	14873.8	22449.7	14945	11722.9
45	7545.9	9674.8	17210.1	9373.8	6877.9
47.5	5185.6	6106	11694.8	5572.9	4947.5
50	4430.2	4348.2	7451	4312.9	4446.5
52.5	3995.8	3801.1	4589.4	3851.7	3983.2
55	3478.9	3349	3472.4	3346.4	3468.8
57.5	2965.3	2882.3	2894.5	2854.5	2948.1
60	2505.9	2494.6	2455.9	2415.2	2478.3
62.5	2027.7	1985.9	1964.4	1989.7	1968.7
65	1488	1473.9	1452.3	1478.4	1459.3
67.5	1175.4	1141.8	1099.7	1140.5	1178.8
70	1214.7	1112.7	1038.3	1133.6	1222.4
72.5	1237.9	1116.1	1035.4	1138.3	1246.8
75	1220.9	1086.4	1005.9	1106.5	1233.8
77.5	1175	1036.4	954.9	1053.8	1189.2
80	1077.1	942	864.4	956.8	1092.7
82.5	927.9	805.7	738.2	818.9	941.9
85	729.4	632.5	583	642.2	736.1
87.5	486.7	423.1	399.8	430.4	487.6
90	284.7	252.1	247.2	257.4	279.4



### Candela Tabulations(Continued)

	0	22.5	45	67.5	90
92.5	214.1	205.9	214	209.5	209.2
95	184.3	189.3	202.9	191.6	181.7
97.5	184.4	196.2	211.6	196.2	183.3
100	199.3	215.7	233.9	214.6	198.3
102.5	221.3	240.9	262.9	241.4	221.1
105	245.1	268	288.6	269.7	246.3
107.5	260.3	281.7	297.7	284.3	262.1
110	256.9	277.5	292.7	278.3	258.3
112.5	241	266	284.5	265.6	240.6
115	226.3	255.9	281.3	256.5	225.7
117.5	223.9	254.3	282.8	254.9	223.4
120	232.1	260.2	288	259.6	232.3
122.5	247.9	268.5	292.2	267	249.1
125	265.8	279.1	299.9	277.5	266.9
127.5	284.9	293.4	310.6	291.2	286.4
130	304.4	309.4	324.5	307	306.3
132.5	325.2	327.9	341	324.9	326.9
135	347.2	348.2	358.2	345.7	349.1
137.5	371	369.4	371.5	367.8	373.5
140	394.3	387.6	381.1	387.7	397.6
142.5	414.9	401.7	387.1	402.5	418
145	431.7	412.8	393.1	413	433.8
147.5	442.6	422.8	400.9	423	444.3
150	451.6	433.3	412.6	432.8	452.6
152.5	461	445.5	427.2	445.3	462.1
155	469.9	457.4	441.1	459.3	472.1
157.5	478.7	469.5	452.7	469.8	482.9
160	484.7	479.8	466.3	478.2	489.8
162.5	481.8	485.8	475.6	482.2	490.5
165	477.2	486.6	479	484.3	487
167.5	474.4	489.9	488.6	488.6	484.3
170	501.4	512.3	517.5	517.5	509.1
172.5	531.4	535.6	538.1	540.6	540.1
175	540.9	548.1	552.8	556	553.8
177.5	543.5	548.8	555.2	559.2	558.1
180	552.3	552.3	552.3	552.3	552.3

### 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.

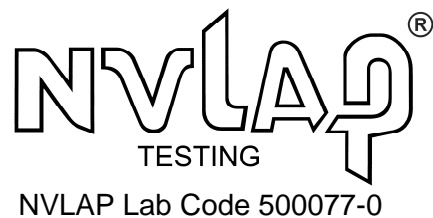
This report may contain data not covered by the NVLAP accreditation, and are identified with \*\*.

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