

Report Number: PL13013-001A
Model: HXB-C-xx-70L-M-35K-8-UL-xx-xxx
Date: 8/30/2018

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
Serial Number	PL13013-001
LED Type	(72) MHD-E

Product Description

Extruded aluminum enclosure with finned aluminum heat sink, white polymeric optical carrier with clear polymeric optical lens covering (72) LEDs

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	62438.0	62108.0	lm
Efficacy	128.21	127.75	lm/W
Correlated Color Temperature (CCT)	3365		
Color Rendering Index (CRI)	82		
R ₉	9		
Duv	0.000220		
S/P Ratio*	1.45		
CIE Type	Direct		
Color Angular Uniformity	N/A		

	Sphere		Goniophotometer		
Electrical Measurements	120V	277V	120V	277V	
Input Wattage	487.00	480.60	486.17	480.80	W
Input Current	4.07	1.79	4.06	1.79	A
Input Voltage	119.98	277.05	120.02	276.99	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	0.11	0.14	0.10	%
Total Harmonic Distortion (Amperage)	6.19	7.48	5.26	6.15	%

Note: All photometric measurements taken at 120VAC.

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	120	55	min
Total Operating Time (Stabilization + Test)	120	75	min
Ambient Temperature	25.0	24.5	°C

Spacing Criteria

Spacing Criterion (0 - 180)	1.28
Spacing Criterion (90 - 270)	1.30
Spacing Criterion (Diagonal)	1.42

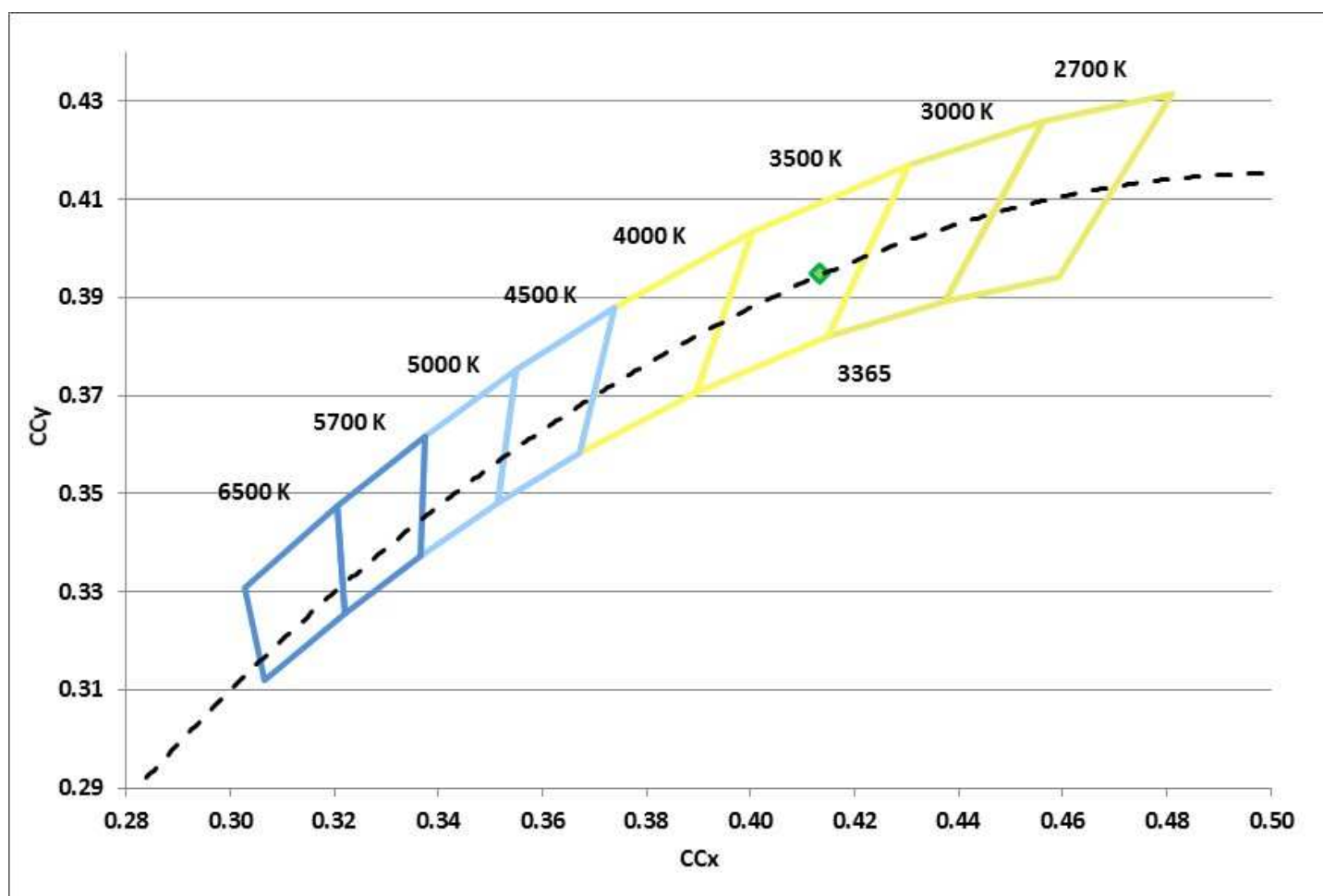
Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.4132	0.3949	0.2391	0.3428	0.2391	0.5142	0.000220

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	65	82	97

Chromaticity Diagram



Spectral Distribution

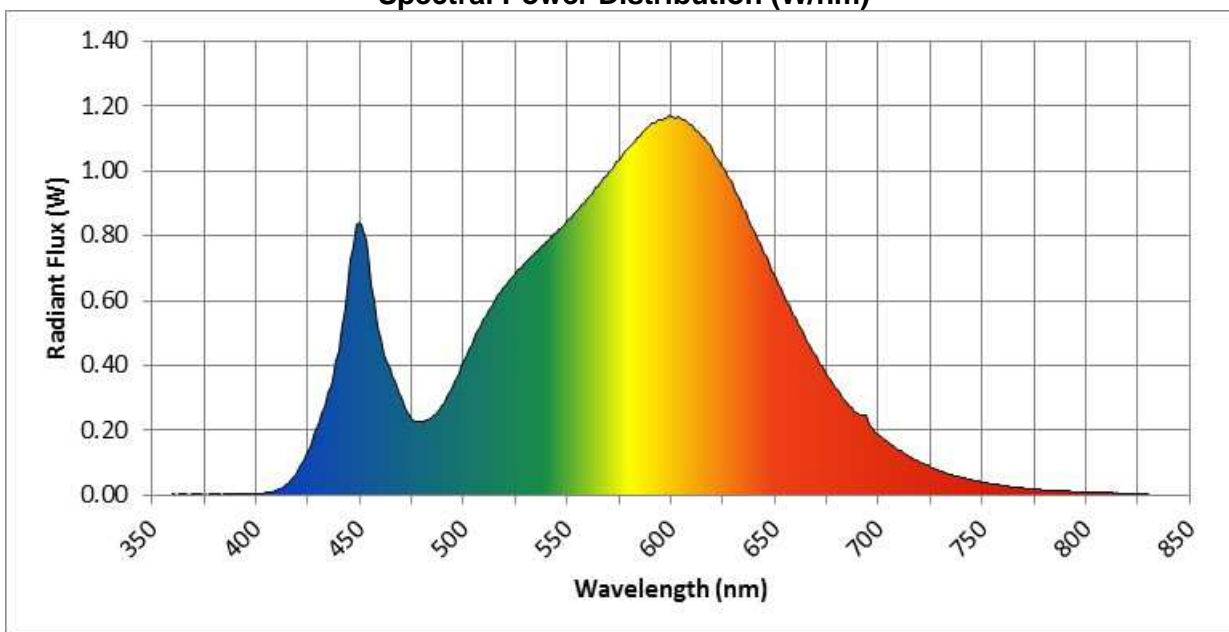
$\lambda(\text{nm})$	W/nm
360	0.006536
370	0.002908
380	0.005022
390	0.002531
400	0.004138
410	0.015630
420	0.073648
430	0.216728
440	0.445673
450	0.839697
460	0.485054
470	0.301083
480	0.225223
490	0.278792
500	0.407123
510	0.541068
520	0.641882

$\lambda(\text{nm})$	W/nm
530	0.715809
540	0.779810
550	0.843567
560	0.913207
570	0.991535
580	1.072860
590	1.139278
600	1.165895
610	1.141076
620	1.064622
630	0.954004
640	0.817439
650	0.678756
660	0.547186
670	0.427622
680	0.327975
690	0.250258

$\lambda(\text{nm})$	W/nm
700	0.187129
710	0.139094
720	0.103855
730	0.075469
740	0.055063
750	0.040764
760	0.030142
770	0.022318
780	0.016607
790	0.012766
800	0.010451
810	0.007633
820	0.005871
830	0.004299

Dominant Wavelength	581	nm
Peak Wavelength	599	nm

Spectral Power Distribution (W/nm)



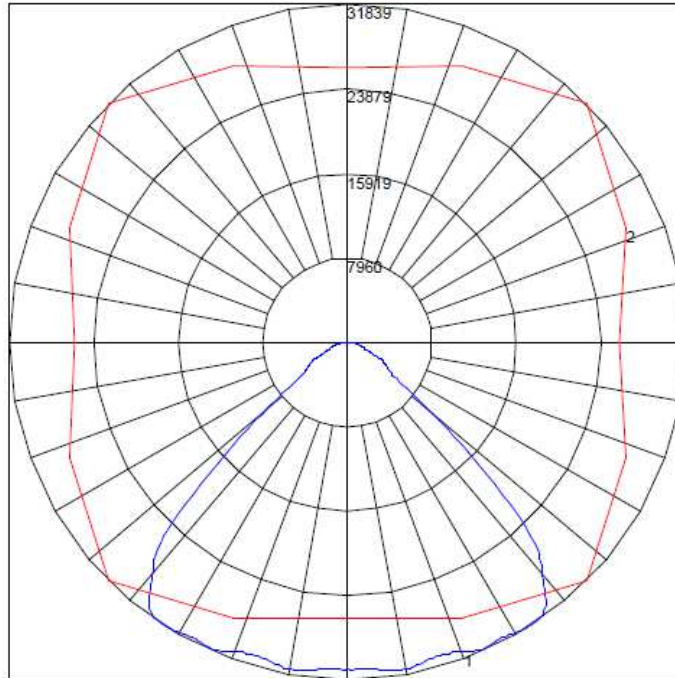
Zonal Lumen Summary

Zone	Lumens	% of Total	Zone	Lumens
0-20	11575.41	18.6	0-10	2952.8
0-30	25205.58	40.6	10-20	8622.61
0-40	42219.31	68	20-30	13630.17
0-60	57200.25	92.1	30-40	17013.73
0-80	61604.27	99.2	40-50	10584.84
0-90	62050.62	99.9	50-60	4396.11
10-90	59097.82	95.2	60-70	2884.83
20-40	30643.9	49.3	70-80	1519.17
20-50	41228.74	66.4	80-90	446.36
40-70	17865.78	28.8	90-100	0.09
60-80	4404.01	7.1	100-110	0
70-80	1519.17	2.4	110-120	0
80-90	446.36	0.7	120-130	0
90-110	0.09	0	130-140	4.37
90-120	0.09	0	140-150	13.44
90-130	0.09	0	150-160	17.85
90-150	17.91	0	160-170	15.38
90-180	57.46	0.1	170-180	6.33
110-180	57.37	0.1		
Total	62108.08 lm	100%		

Luminance Data (Cd./Sq.M)

Average in Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	77328	189295	72391
55	50971	54648	50872
65	44126	41181	41161
75	41043	28669	42458
85	34894	23940	34295

Candela Plots



Maximum Candela = 31838.9 Located At Horizontal Angle = 45, Vertical Angle = 32.5
1 - Vertical Plane Through Horizontal Angles (45 - 225) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (32.5) (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	111	111	111	106	106	106	102	102	102	100
1	111	108	104	101	109	105	102	100	101	99	96	97	95	94	94	92	91	89
2	103	97	91	87	101	95	90	86	92	88	84	89	85	82	86	83	80	78
3	96	88	81	76	94	86	80	75	83	78	74	81	76	73	78	75	71	69
4	89	79	72	67	87	78	71	66	76	70	65	74	69	65	72	67	64	62
5	83	72	65	59	81	71	64	59	69	63	58	68	62	58	66	61	57	55
6	78	66	59	53	76	65	58	53	64	57	52	62	56	52	61	56	52	50
7	73	61	53	48	71	60	53	48	59	52	47	57	51	47	56	51	47	45
8	68	56	49	43	67	55	48	43	54	48	43	53	47	43	52	47	43	41
9	64	52	44	40	62	51	44	39	50	44	39	49	43	39	48	43	39	37
10	60	48	41	36	59	48	41	36	47	40	36	46	40	36	45	40	36	34

Candela Tabulations

	0	22.5	45	67.5	90
0	30834.2	30834.2	30834.2	30834.2	30834.2
2.5	31098.3	30935.5	30855.3	30702.4	30463.3
5	30939.5	30844.9	30944.2	30862.2	30615.4
7.5	30625.8	30621	31198.1	31360.1	31029.7
10	30547.3	30739.8	31301.5	31144.2	30507.7
12.5	30395.7	30931.1	31167.2	30328.8	29591.5
15	30003.8	30972	30858.4	29984.7	29476
17.5	29548.7	30773	30794.7	30119.1	29403.3
20	29194.7	30647.2	31175.7	29953.6	28394.8
22.5	28219.9	30262.4	31564.3	29279	27402.3
25	27787.3	29591.7	31610.5	29152.8	27270.6
27.5	27175.5	29412.2	31497.6	29147	26744.1
30	26272.3	28895.8	31649.8	28500.8	26262.6
32.5	25682.2	28351	31838.9	28212.2	25996.8
35	24344.8	27102	31700.7	27545.5	25227.7
37.5	22557.4	25520.8	30699.8	26138.8	22674.6
40	18416.5	22294	28495.6	22490.3	18663.8
42.5	13387.1	16953.8	26575.8	17180.2	13495.4
45	8899.8	11655.4	21786.1	11270.1	8331.5
47.5	6407.9	7690.7	15629	6956	6137.9
50	5683.7	5609.3	10424	5504.1	5686
52.5	5259.8	5040.2	6534.3	5095.6	5251.6
55	4758.5	4596	5101.8	4590.5	4749.3
57.5	4250.9	4153.5	4481.4	4064.2	4254.8
60	3822.4	3860	4071.3	3713	3760.6
62.5	3382.8	3385	3514.5	3402.6	3241.2
65	3035.3	2885.2	2832.7	2903.7	2831.3
67.5	2678.3	2443	2227.9	2457.7	2500.8
70	2366.3	2064.6	1783.2	2044	2272
72.5	2052.8	1713.1	1468.4	1683	2045.9
75	1729	1374.7	1207.7	1378.8	1788.6
77.5	1373.5	1076.9	971.8	1109.8	1471.3
80	1050.4	818.5	745.4	867.8	1112.5
82.5	776.4	598.3	536.2	628.8	791.1
85	495	389.5	339.6	393.3	486.5
87.5	211.9	168.1	149.9	169	208.8
90	6.4	3.6	0	1.1	9.8

Candela Tabulations(Continued)

	0	22.5	45	67.5	90
92.5	0	0	0	0	0
95	0	0	0	0	0
97.5	0	0	0	0	0
100	0	0	0	0	0
102.5	0	0	0	0	0
105	0	0	0	0	0
107.5	0	0	0	0	0
110	0	0	0	0	0
112.5	0	0	0	0	0
115	0	0	0	0	0
117.5	0	0	0	0	0
120	0	0	0	0	0
122.5	0	0	0	0	0
125	0	0	0	0	0
127.5	0	0	0	0	0
130	0	0	0.3	0	0
132.5	0.6	2.3	3.6	2.2	0.6
135	3.9	5.8	7.1	5.8	3.9
137.5	8.1	9.7	10.8	9.5	8.1
140	11.6	13.4	14	13.3	11.7
142.5	16.6	17.8	18.5	17.5	16.2
145	20.9	21.6	23	21.5	20.6
147.5	25.2	25.9	26.8	25.5	24.7
150	30	30.2	31.1	30.1	29.5
152.5	35.1	34.9	35.4	34.9	34.6
155	38.9	39.2	39.1	39.3	38.8
157.5	43.3	43.4	43.6	43.5	43.1
160	47.4	47.5	47.8	47.5	47.7
162.5	51.7	51.5	51.7	51.4	51.7
165	55	55.2	55.7	55.4	55.3
167.5	58.4	58.5	58.7	58.4	58.7
170	61.1	60.9	61.2	60.7	61.2
172.5	65.7	65.2	65.6	65.5	65.5
175	69.5	69.5	69.3	69.5	69.6
177.5	71.7	71.3	71	71.4	71.6
180	71.8	71.8	71.8	71.8	71.8

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	420120482

*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.

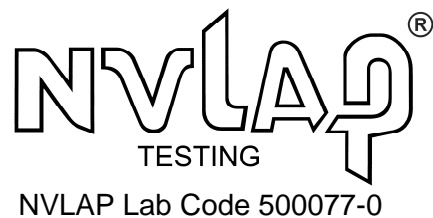
This report may contain data not covered by the NVLAP accreditation, and are identified with **.

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
8/30/2018	A	DMS	Origination	A. Gressel	B. Kuebler