NVLAP Lab Code 500089-0

Report Number:	PL16736-001A
Model:	CDR10-B-ALS-9ACK-10V5-xx-UNV (4000K)
Date:	03/21/2022

Cree Racine Engineering Services Testing Laboratory (RESTL) Photometric Testing and Evaluation Report

Prepared For:

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Cree Lighting

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Prepared By:

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Approved By:

Jonathan Vollers, Technical Manager

This report contains data that are not covered by the NVLAP accreditation.

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Product Information	
Manufacturer	Cree Lighting
Model Number (SKU)	CDR10-B-ALS-9ACK-10V5-xx-UNV (4000K)
Serial Number	16736
LED Type	Smalite SL-ID2835FTA-31KAG

Product Description
CDR 10" Downlight luminare, white painted reflector, selectable CCT at full power and 4000K CCT

Driver Information (Where Applicable)
Integral

Length	Width	Height
11.25”	11.25”	6.5”

Sample

The following sample was submitted for evaluation

CREE LIGHTING
A COMPANY OF IDEAL INDUSTRIES, INC.

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Key Photometric Data	Sphere Output	Goniophotometer	
Luminous Flux	4349.4	4370	lm
Efficacy	102.45	103.87	lm/W
Correlated Color Temperature (CCT)	4036	K	
Color Rendering Index (CRI)	93		
R_9	72		
Duv	0.0025		
S/P Ratio**	1.81		
CIE Type	Direct		

	Sphere		Goniophotometer		
Electrical Measurements	**120V**	**277V**	**120V**	**277V**	
Input Wattage	42.45	42.98	42.07	41.20	W
Input Current	0.354	0.160	0.351	0.154	A
Input Voltage	120.18	277.07	120.19	277.30	V
Power Factor	0.997	0.968	0.996	0.965	
Off-State Power	0	0	0	0	W
Total Harmonic Distortion (Voltage)	0.06	0.10	0.05	0.09	%
Total Harmonic Distortion (Amperage)	5.97	13.70	6.08	14.35	%

Note: All photometric measurements taken at 120VAC.

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	58	30	min
Total Operating Time (Stabilization + Test)	68	50	min
Ambient Temperature	24.37	25.2	˚C

Spacing Criteria

Spacing Criterion (0 - 180)	1.20
Spacing Criterion (90 - 270)	1.20
Spacing Criterion (Diagonal)	1.26

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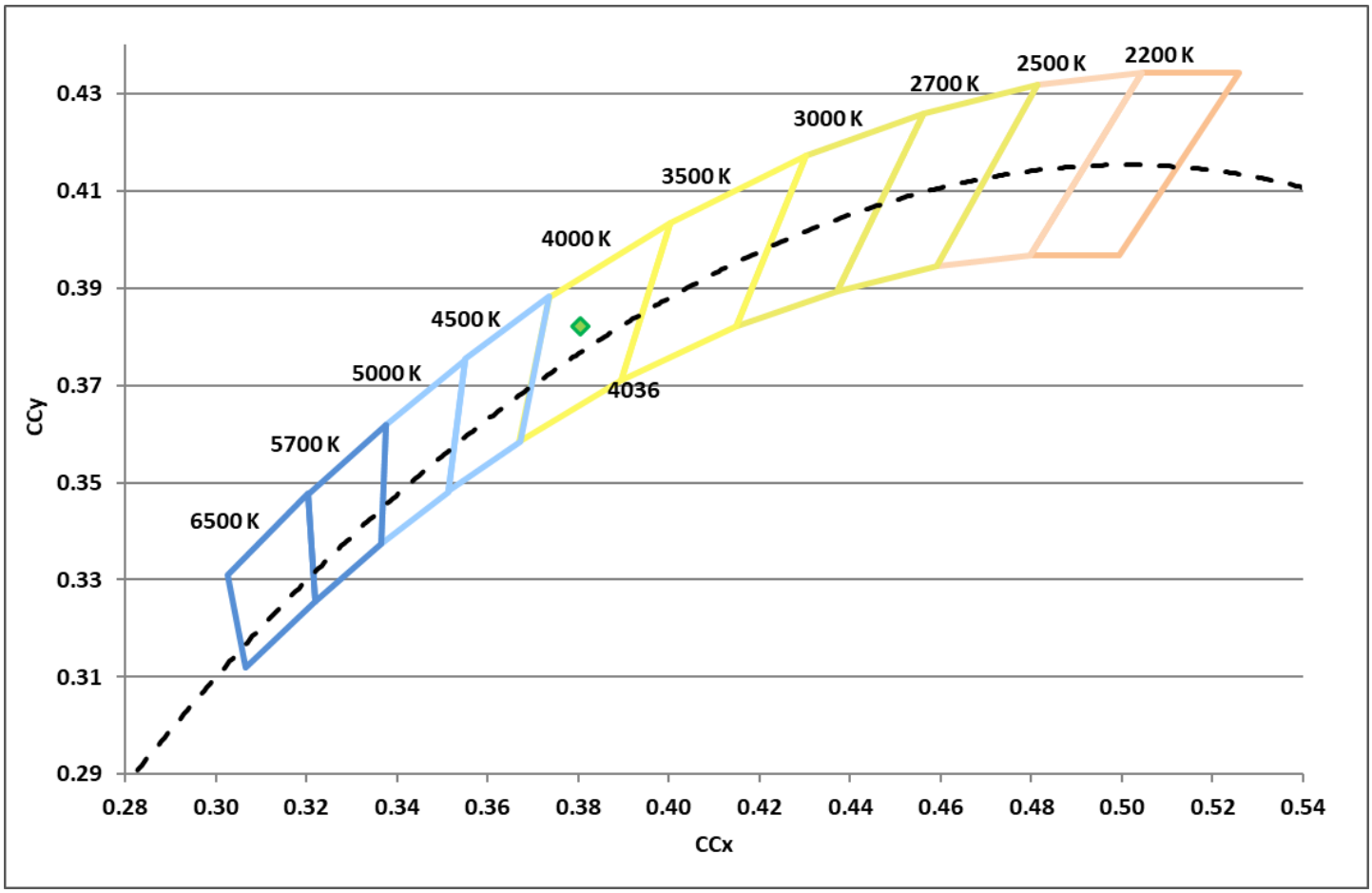
Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.3806	0.3821	0.2231	0.3360	0.2231	0.5040	0.0025

Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
93	94	96	97	92	92	93	95	89	72	90	92	68	95	98

Chromaticity Diagram



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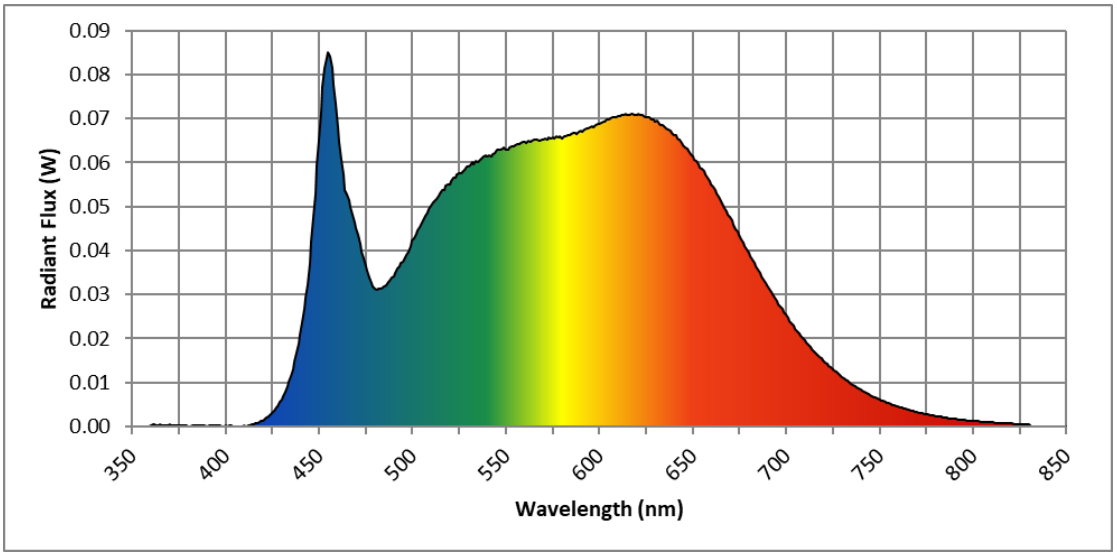
Spectral Distribution

λ(nm)	W/nm	λ(nm)	W/nm	λ(nm)	W/nm
360	0.000251	530	0.059096	700	0.025461
370	0.000627	540	0.061480	710	0.019551
380	0.000048	550	0.062994	720	0.015048
390	0.000030	560	0.064707	730	0.011304
400	0.000230	570	0.065333	740	0.008309
410	0.000153	580	0.065587	750	0.006103
420	0.001335	590	0.067159	760	0.004475
430	0.006199	600	0.068787	770	0.003272
440	0.020963	610	0.070511	780	0.002373
450	0.065153	620	0.070831	790	0.001720
460	0.067932	630	0.069403	800	0.001260
470	0.045191	640	0.066274	810	0.000924
480	0.031220	650	0.061381	820	0.000669
490	0.034182	660	0.055105	830	0.000491
500	0.042195	670	0.047597		
510	0.050059	680	0.039411		
520	0.055015	690	0.032067		

Dominant Wavelength	577	nm
Peak Wavelength	455	nm

Spectral Power Distribution (W/nm)



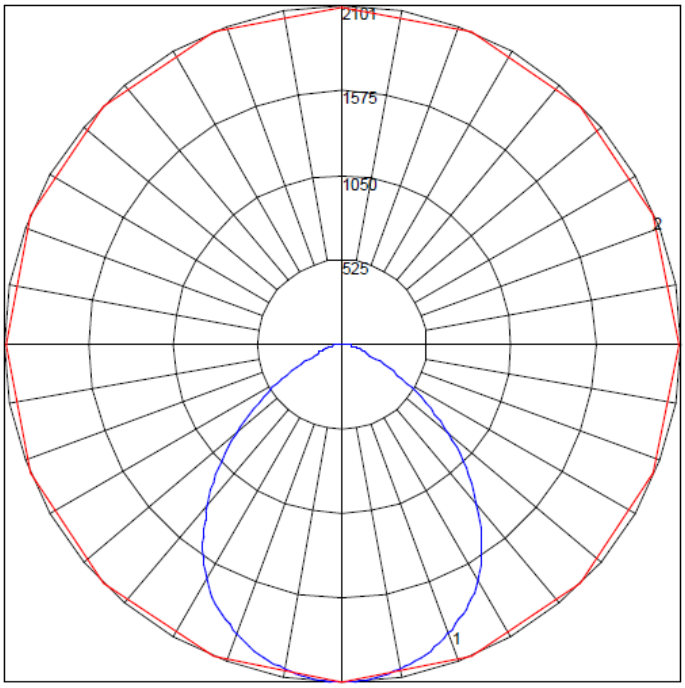
Zonal Lumen Summary

Zone	Lumens	% of Total	Zone	Lumens
0-20	760.46	17.4	0-10	197.97
0-30	1595.96	36.5	10-20	562.49
0-40	2536.46	58	20-30	835.5
0-60	3940.71	90.2	30-40	940.51
0-80	4329.45	99.1	40-50	835.91
0-90	4369.76	100	50-60	568.34
10-90	4171.79	95.5	60-70	264.97
20-40	1776.00	40.6	70-80	123.77
20-50	2611.91	59.8	80-90	40.31
40-70	1669.22	38.2	90-100	0.0
60-80	388.74	8.9	100-110	0.0
70-80	123.77	2.8	110-120	0.0
80-90	40.31	0.9	120-130	0.0
90-110	0.0	0.0	130-140	0.0
90-120	0.0	0.0	140-150	0.0
90-130	0.0	0.0	150-160	0.0
90-150	0.0	0.0	160-170	0.0
90-180	0.0	0.0	170-180	0.0
110-180	0.0	0.0		
Total	**4369.76**	**100**		

Luminance Data (Cd./Sq.M)

Average in Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	32914	33034	33045
55	23601	23745	23779
65	13039	13061	13098
75	9709	9731	9783
85	8973	9013	9063

Candela Plots



Maximum Candela = 2100.645 Located At Horizontal Angle = 67.5, Vertical Angle = 1
1 - Vertical Plane Through Horizontal Angles (67.5 - 247.5) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (1) (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	107	103	100	108	104	101	98	100	98	95	96	94	92	93	91	90	88
2	102	95	89	85	100	93	88	84	90	86	82	87	83	80	84	81	78	76
3	94	85	78	73	92	84	77	72	81	75	71	78	74	70	76	72	68	66
4	87	77	69	63	85	75	68	63	73	67	62	71	65	61	69	64	60	58
5	81	69	61	55	79	68	61	55	66	60	55	64	59	54	63	58	54	52
6	75	63	55	49	73	62	55	49	60	54	49	59	53	48	57	52	48	46
7	70	58	50	44	68	57	49	44	55	49	44	54	48	43	53	47	43	41
8	65	53	45	40	64	52	45	40	51	44	39	50	44	39	49	43	39	37
9	61	49	41	36	60	48	41	36	47	41	36	46	40	36	45	40	35	34
10	58	45	38	33	56	45	38	33	44	37	33	43	37	33	42	37	32	31

Candela Tabulations

	0	22.5	45	67.5	90
0	2097.4	2097.4	2097.4	2097.4	2097.4
1	2093.4	2096.7	2098.3	2100.6	2097.5
2	2093.3	2093.5	2096.0	2098.7	2097.2
3	2089.9	2090.3	2093.7	2093.4	2098.8
4	2087.4	2088.4	2088.2	2092.4	2092.2
5	2079.8	2085.0	2086.4	2086.7	2085.9
6	2076.9	2078.6	2080.7	2081.1	2082.0
7	2071.0	2073.1	2073.5	2076.1	2076.5
8	2063.0	2066.2	2068.9	2067.4	2068.2
9	2056.5	2059.3	2061.7	2060.2	2061.9
10	2047.8	2049.3	2051.7	2054.0	2055.8
11	2038.4	2039.3	2041.3	2042.0	2042.7
12	2027.0	2030.9	2031.8	2033.7	2032.9
13	2019.2	2017.8	2022.4	2021.5	2019.9
14	2004.6	2005.7	2009.9	2009.5	2009.4
15	1992.0	1992.0	1995.5	2000.8	1996.5
16	1979.8	1981.9	1982.1	1983.2	1982.6
17	1961.4	1965.7	1966.5	1968.2	1968.1
18	1948.3	1949.2	1951.6	1952.0	1955.7
19	1929.0	1933.7	1935.1	1938.3	1935.0
20	1914.3	1914.6	1917.3	1918.3	1919.5
21	1892.2	1894.8	1897.3	1899.2	1901.3
22	1873.6	1877.6	1878.4	1879.5	1881.2
23	1857.0	1857.6	1861.4	1859.6	1862.1
24	1835.4	1836.9	1839.4	1841.0	1841.7
25	1814.4	1815.1	1818.5	1819.0	1820.3
26	1791.5	1795.9	1796.2	1796.4	1799.0
27	1766.7	1770.3	1773.7	1773.3	1774.3
28	1740.3	1742.6	1745.3	1745.5	1744.7
29	1712.5	1715.2	1715.8	1717.4	1714.9
30	1682.6	1684.7	1686.6	1689.3	1689.7
31	1649.5	1653.9	1653.2	1656.6	1655.3
32	1615.5	1618.3	1618.7	1621.0	1621.5
33	1580.5	1584.3	1584.2	1587.6	1586.4
34	1546.6	1548.1	1550.3	1551.5	1549.7
35	1503.9	1507.9	1510.1	1511.2	1512.5
36	1467.1	1469.1	1471.8	1470.4	1473.6

Candela Tabulations (Continued)

	0	22.5	45	67.5	90
37	1427.7	1430.0	1432.3	1431.1	1434.1
38	1386.5	1389.2	1391.0	1389.4	1390.9
39	1343.5	1346.0	1348.8	1346.3	1348.5
40	1301.9	1304.1	1305.7	1304.4	1306.2
41	1259.1	1261.1	1262.1	1260.4	1262.4
42	1215.3	1217.7	1218.8	1218.4	1218.2
43	1170.1	1174.3	1175.1	1174.0	1175.5
44	1128.0	1131.3	1131.5	1131.7	1132.5
45	1084.8	1087.9	1088.8	1087.5	1089.2
46	1038.6	1042.1	1042.2	1044.2	1043.7
47	996.4	996.9	997.1	1001.0	999.3
48	950.6	953.2	956.5	955.0	954.3
49	906.0	906.2	908.3	908.6	909.3
50	859.3	859.5	861.0	861.9	861.3
51	812.2	814.1	818.1	816.1	816.9
52	765.2	767.8	771.2	769.9	770.0
53	719.8	721.7	723.8	721.3	722.2
54	674.3	676.2	678.6	677.0	678.0
55	631.0	633.4	634.9	634.5	635.8
56	587.6	589.6	591.6	590.9	592.2
57	545.6	548.0	548.2	549.7	550.5
58	505.5	508.2	508.5	510.3	510.5
59	465.9	467.5	467.9	469.9	470.2
60	426.7	427.6	427.6	430.4	431.1
61	390.8	390.7	391.7	393.2	393.5
62	353.6	354.5	356.2	357.6	357.4
63	319.1	318.9	320.3	321.6	321.7
64	286.9	285.7	287.0	288.1	288.5
65	256.9	255.4	257.3	258.0	258.0
66	227.8	226.8	228.4	228.5	229.3
67	203.3	202.4	203.6	203.9	204.3
68	183.3	182.6	183.8	184.2	184.2
69	168.3	167.0	168.1	168.9	169.0
70	156.6	156.4	157.0	157.5	157.6
71	147.9	148.4	148.7	148.9	149.3
72	140.2	140.6	141.0	141.3	141.3
73	132.1	132.6	132.9	133.0	133.3

Candela Tabulations (Continued)

	0	22.5	45	67.5	90
74	125.0	125.0	125.2	125.4	125.6
75	117.1	117.3	117.4	117.7	118.0
76	109.1	109.4	109.5	109.5	109.9
77	101.4	101.5	101.7	101.7	101.9
78	93.5	93.8	93.8	93.9	94.1
79	85.5	85.6	85.7	85.7	85.9
80	77.6	77.5	77.5	77.6	77.8
81	69.2	69.7	69.4	69.5	69.6
82	60.8	61.2	61.3	61.3	61.3
83	52.7	53.0	53.0	53.2	53.1
84	44.7	44.9	44.8	44.9	44.9
85	36.5	36.7	36.6	36.8	36.8
86	28.2	28.6	28.5	28.4	28.4
87	20.1	20.4	20.5	20.4	20.6
88	11.7	12.0	12.2	12.3	12.2
89	5.8	5.1	5.2	5.7	5.9
90	0	0	0	0	0

Integrating Sphere Equipment List

Description	Manufacturer	Model	Serial Number
3M Sphere	Labsphere	ILLUMIA PLUS 3020-300 4PI	1109184535
CCD Array Spectrometer	Labsphere	MC-9801:3683L	98011077
Programmable AC Source	Chroma	61602	616020003699
Power Analyzer	Xitron	XT2640	264AD2006001

Goniophotometer Equipment List

Description	Manufacturer	Model	Serial Number
AC Power Source	Chroma	61602	616020002300
Type C Goniophotometer	LSI / UL	6440T	6440PN2028
Spectroradiometer	Gooch & Housego	770VIS/NIR	12415189
Spectrometer	Inphora, Inc	PDET 31	130627
Power Meter	Xitron	XT2640	M20140823

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 35W Calibration Lamp, Serial Number E4
Type C Goniophotometer and Spectrometer	Tungsten Halogen Omni-Directional 500W Calibration Lamp, Serial Numbers 16C293. 16C294, 16C295. For color calibration of spectrometer, 13C074.

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In the event that the recorded temperature is outside of 25 ± 1˚C, this is considered a non-standard condition.

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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.

Goniophotometer	Integrating Sphere

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
03/21/2022	A	DMS	Origination	M. Hubbard	J. Vollers