

**Report Number:** PL17111-001A  
**Model:** C-TR-D-FP22-S50L-SCCT-UC-xx-xx (HIGH 4000K)  
**Date:** 11/29/2022

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

**Prepared For:**

Eduardo Torices

Cree Lighting

9201 Washington Avenue

Racine, WI 53406

**Prepared By:**



Meranda Hubbard, Photometric Test Technician

**Approved By:**



Jonathan Vollers, Technical Manager

### Product Information

<b>Manufacturer</b>	Cree Lighting
<b>Model Number (SKU)</b>	C-TR-D-FP22-S50L-SCCT-UC-xx-xx (HIGH 4000K)
<b>Serial Number</b>	17111
<b>LED Type</b>	SAMSUNG SPMWHR22

### Product Description

2'x2' Flat Panel luminaire with power select and CCT select switches integrated set to HIGH power at 4000K CCT

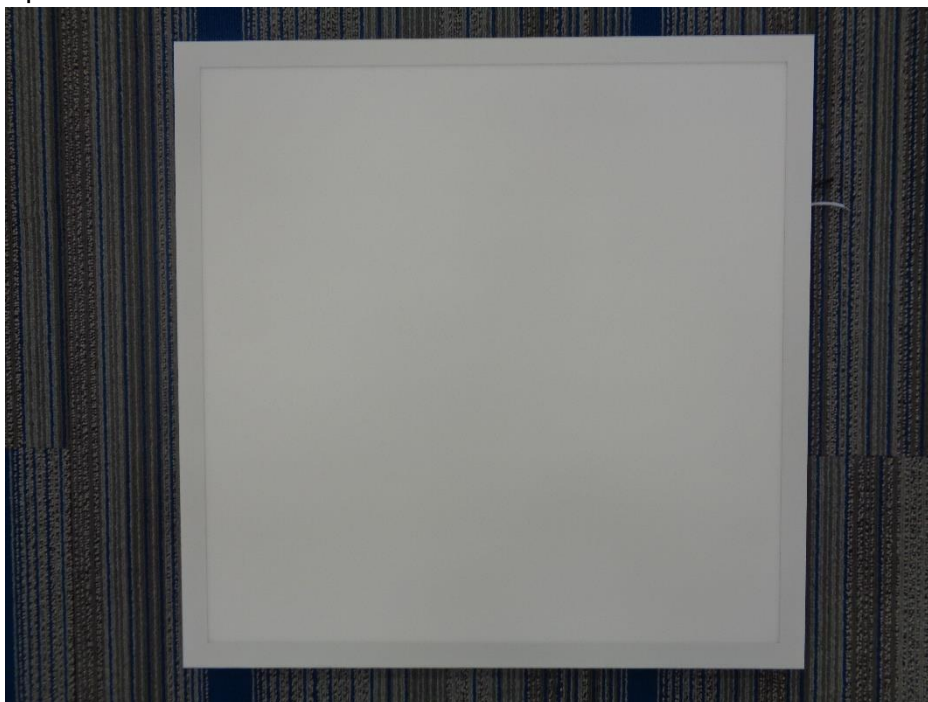
### Driver Information (Where Applicable)

Shenzhen Wise Power Technology WSP-Z45FH-0421000-CW

Length	Width	Height
23.81"	23.81"	1.8"

### Sample

The following sample was submitted for evaluation



Key Photometric Data	Sphere Output	Goniophotometer	
Luminous Flux	5840.8	5723	lm
Efficacy	144.97	143.72	lm/W
Correlated Color Temperature (CCT)	4069	K	
Color Rendering Index (CRI)	85		
R <sub>9</sub>	16		
Duv	-0.0010		
S/P Ratio*	1.73		
CIE Type	Direct		

Electrical Measurements	Sphere		Goniophotometer		
	120V	347V	120V	347V	
Input Wattage	40.29	-	39.82	39.66	W
Input Current	0.337	-	0.333	0.121	A
Input Voltage	120.14	-	120.25	347.42	V
Power Factor	0.995	-	0.996	0.941	
Off-State Power	0	-	0	0	W
Total Harmonic Distortion (Voltage)	0.07	-	0.05	0.34	%
Total Harmonic Distortion (Amperage)	7.20	-	7.39	18.52	%

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

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	41	30	min
Total Operating Time (Stabilization + Test)	51	50	min
Ambient Temperature	24.24	25.2	°C

### Spacing Criteria

Spacing Criterion (0 - 180)	1.28
Spacing Criterion (90 - 270)	1.28
Spacing Criterion (Diagonal)	1.40

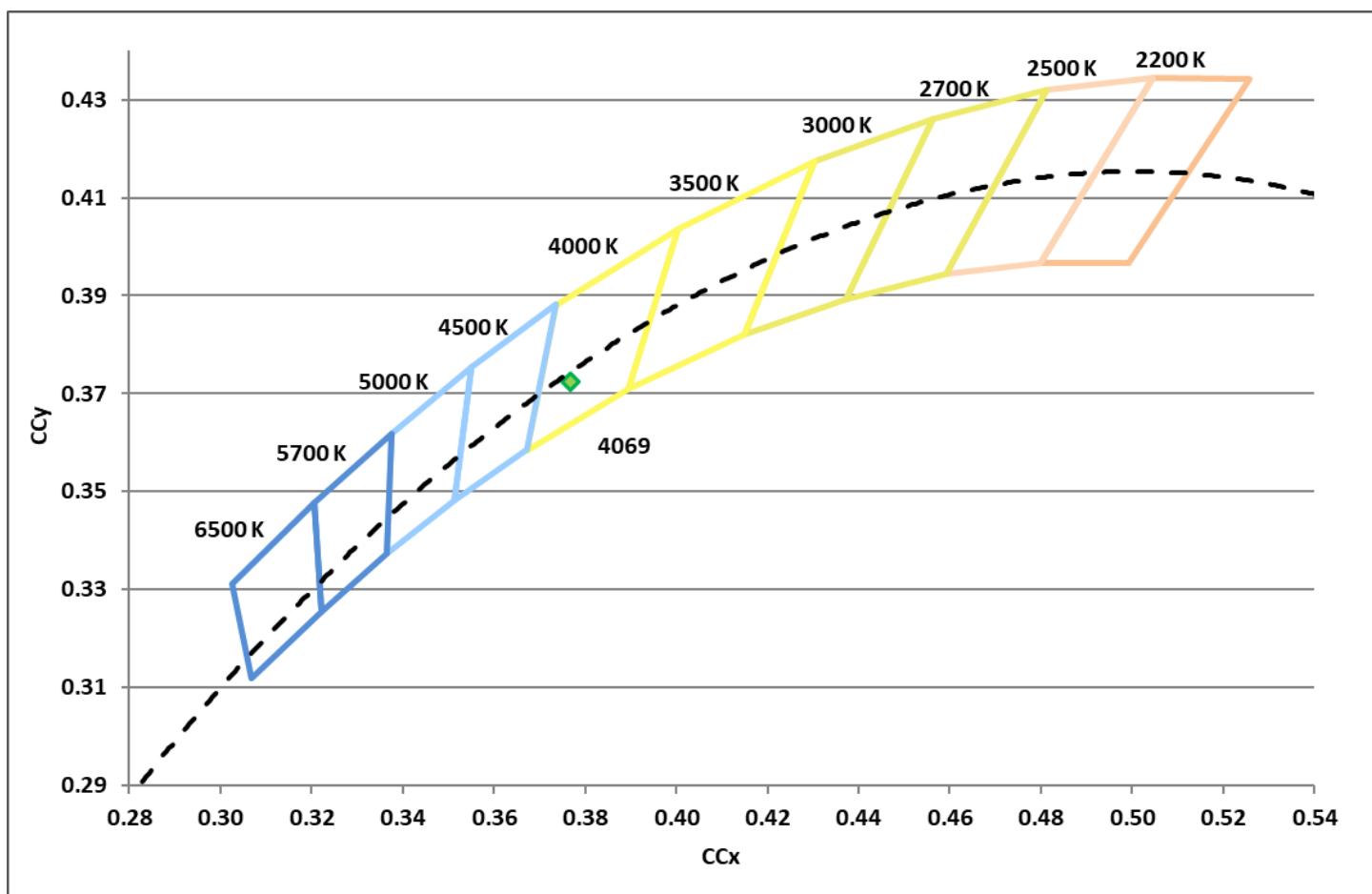
### Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.3768	0.3724	0.2245	0.3327	0.2245	0.4991	-0.0010

### Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
85	84	91	95	84	84	87	87	67	16	78	83	62	86	98

### Chromaticity Diagram



**Spectral Distribution**

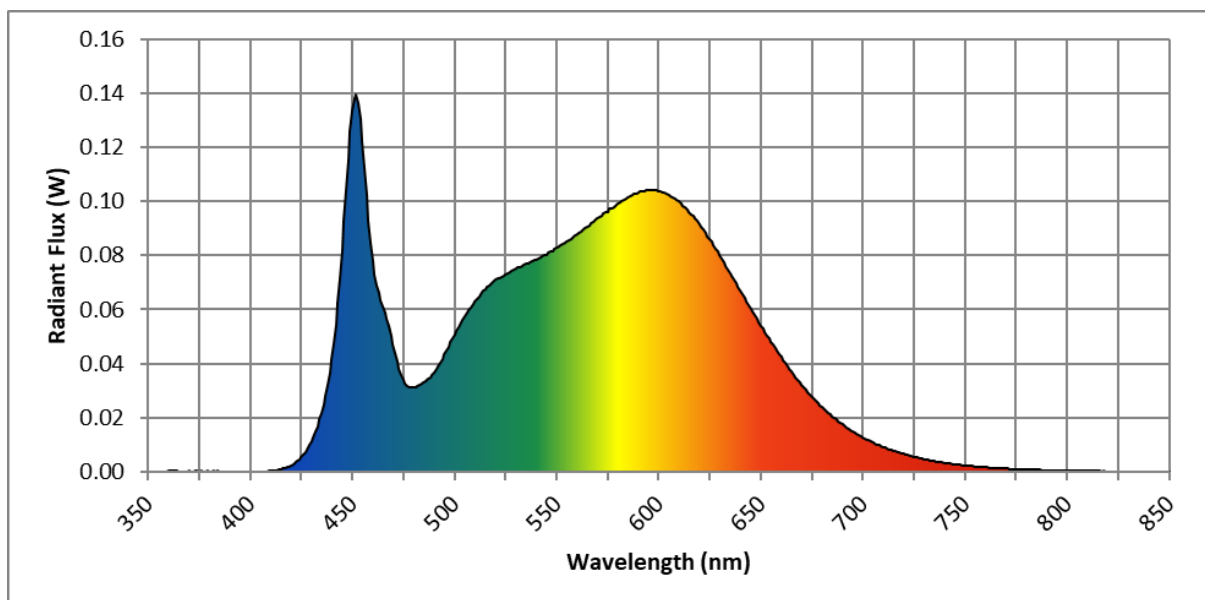
$\lambda(\text{nm})$	W/nm
360	0.000239
370	0.000309
380	0.000018
390	0.000137
400	0.000050
410	0.000278
420	0.002386
430	0.011210
440	0.041417
450	0.133384
460	0.077790
470	0.047172
480	0.031006
490	0.036848
500	0.050745
510	0.062986
520	0.070894

$\lambda(\text{nm})$	W/nm
530	0.075125
540	0.078486
550	0.082740
560	0.087662
570	0.093613
580	0.098992
590	0.103307
600	0.103767
610	0.099865
620	0.091666
630	0.080021
640	0.066978
650	0.054020
660	0.042358
670	0.032108
680	0.023871
690	0.017537

$\lambda(\text{nm})$	W/nm
700	0.012730
710	0.009184
720	0.006611
730	0.004692
740	0.003304
750	0.002336
760	0.001681
770	0.001197
780	0.000825
790	0.000587
800	0.000409
810	0.000349
820	0.000189
830	0.000121

<b>Dominant Wavelength</b>	579	nm
<b>Peak Wavelength</b>	452	nm

**Spectral Power Distribution (W/nm)**



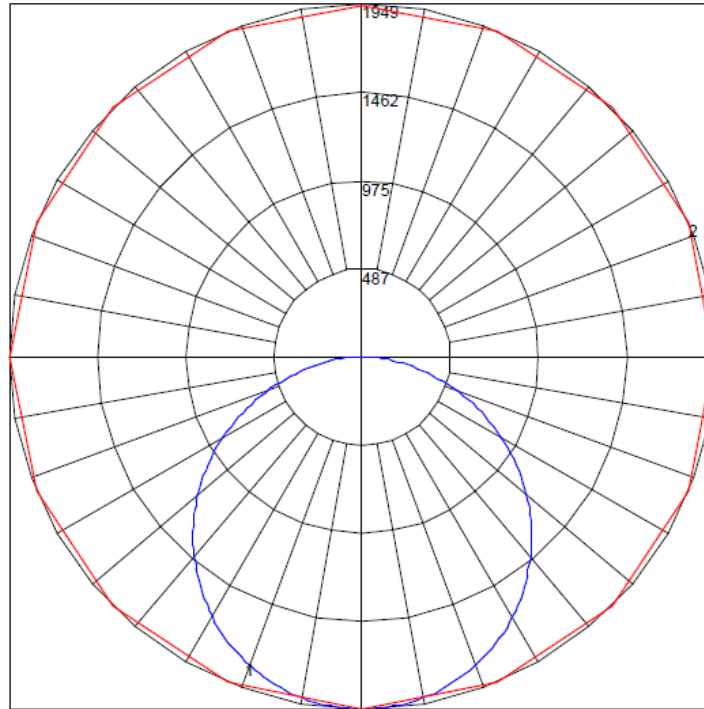
**Zonal Lumen Summary**

Zone	Lumens	% of Total	Zone	Lumens
0-20	713.4	12.5	0-10	184.4
0-30	1517.9	26.5	10-20	529.0
0-40	2491.9	43.5	20-30	804.5
0-60	4436.4	77.5	30-40	974.0
0-80	5589.7	97.7	40-50	1016.7
0-90	5723.1	100.0	50-60	927.7
10-90	5538.7	96.8	60-70	719.1
20-40	1778.5	31.1	70-80	434.3
20-50	2795.2	48.8	80-90	133.4
40-70	2663.5	46.5	90-100	0
60-80	1153.4	20.2	100-110	0
70-80	434.3	7.6	110-120	0
80-90	133.4	2.3	120-130	0
90-110	0	0	130-140	0
90-120	0	0	140-150	0
90-130	0	0	150-160	0
90-150	0	0	160-170	0
90-180	0	0	170-180	0
110-180	0	0		
<b>Total</b>	<b>5723.12</b>	<b>100</b>		

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

Average in Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	6142	6104	6079
55	5992	5932	5905
65	5743	5613	5585
75	5331	5135	5109
85	4742	4333	4385

### Candela Plots



Maximum Candela = 1949.045 Located At Horizontal Angle = 135, Vertical Angle = 1  
# 1 - Vertical Plane Through Horizontal Angles (135 - 315) (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	108	103	99	95	106	101	97	93	97	94	90	93	90	88	89	87	85	83
2	98	90	83	77	96	88	81	76	84	79	74	81	77	73	78	74	71	69
3	89	79	70	64	87	77	69	63	74	67	62	71	66	61	69	64	60	58
4	82	70	61	54	80	68	60	53	66	58	53	63	57	52	61	56	51	49
5	75	62	53	46	73	61	52	46	59	51	45	57	50	45	55	49	44	42
6	69	56	47	40	67	55	46	40	53	45	40	51	45	39	50	44	39	37
7	64	51	42	35	63	50	41	35	48	41	35	47	40	35	45	39	35	33
8	60	46	38	32	58	45	37	31	44	37	31	43	36	31	42	35	31	29
9	56	42	34	28	54	42	34	28	41	33	28	39	33	28	38	32	28	26
10	52	39	31	26	51	39	31	26	37	30	26	37	30	25	36	30	25	24

### Candela Tabulations

	0	22.5	45	67.5	90	112.5	135	157.5	180
0	1948.2	1948.2	1948.2	1948.2	1948.2	1948.2	1948.2	1948.2	1948.2
1	1945.3	1948.0	1949.0	1948.0	1945.8	1948.1	1949.0	1948.2	1945.2
2	1945.8	1947.4	1948.1	1946.7	1944.8	1946.7	1947.9	1947.8	1944.1
3	1944.0	1945.7	1946.2	1944.8	1942.8	1944.1	1946.2	1945.3	1941.5
4	1940.3	1942.6	1943.0	1942.2	1939.4	1941.1	1942.0	1942.3	1937.7
5	1938.9	1940.1	1941.2	1939.1	1937.7	1939.7	1939.8	1939.2	1935.5
6	1936.3	1938.4	1938.3	1936.5	1935.1	1936.3	1937.3	1936.2	1932.5
7	1934.4	1934.1	1933.7	1933.1	1931.2	1932.4	1934.4	1933.7	1928.6
8	1928.1	1928.4	1928.3	1926.9	1925.7	1927.3	1928.4	1927.4	1922.8
9	1921.6	1921.5	1922.1	1920.7	1918.8	1921.9	1922.7	1921.8	1916.1
10	1916.6	1916.6	1916.8	1915.5	1913.2	1914.8	1916.1	1915.3	1910.5
11	1911.2	1910.3	1910.5	1909.2	1906.9	1908.8	1909.5	1908.6	1903.7
12	1904.5	1902.8	1903.7	1901.6	1899.3	1901.0	1901.8	1902.0	1895.1
13	1895.2	1894.9	1894.7	1893.1	1890.9	1893.1	1893.6	1893.4	1886.5
14	1887.1	1885.5	1885.7	1884.2	1882.2	1884.3	1885.1	1884.0	1878.1
15	1878.8	1876.1	1876.5	1874.9	1873.3	1874.7	1875.8	1875.0	1867.9
16	1867.9	1865.6	1866.0	1863.9	1862.6	1863.5	1865.6	1864.0	1855.2
17	1857.6	1854.4	1854.3	1852.2	1851.4	1852.0	1852.8	1852.1	1843.8
18	1845.3	1842.4	1843.5	1840.6	1839.3	1840.5	1841.0	1839.7	1831.9
19	1834.4	1831.1	1831.1	1829.0	1827.9	1828.7	1830.2	1829.7	1820.2
20	1824.1	1819.0	1819.3	1817.1	1815.9	1816.5	1819.2	1817.3	1807.4
21	1810.9	1805.7	1805.5	1803.7	1802.3	1803.8	1804.6	1804.4	1793.9
22	1797.6	1791.1	1790.9	1789.3	1788.5	1789.7	1791.1	1790.9	1778.9
23	1782.7	1777.2	1776.5	1774.4	1773.5	1775.3	1776.4	1775.8	1764.2
24	1768.9	1762.9	1763.0	1760.5	1758.5	1760.9	1761.4	1761.3	1749.5
25	1753.3	1747.7	1748.0	1744.8	1742.8	1746.0	1746.4	1745.6	1734.4
26	1737.8	1731.7	1731.6	1728.8	1727.1	1729.6	1729.7	1729.6	1717.3
27	1720.8	1715.5	1715.3	1712.5	1711.1	1712.7	1713.8	1713.0	1701.6
28	1703.5	1698.1	1697.6	1695.2	1693.5	1696.0	1697.1	1696.0	1683.5
29	1685.3	1680.2	1679.7	1677.4	1676.0	1677.3	1679.4	1678.1	1665.1
30	1665.7	1660.6	1660.4	1657.6	1655.9	1657.9	1659.9	1658.7	1645.4
31	1645.8	1640.6	1640.2	1636.2	1636.1	1637.4	1639.0	1638.2	1625.3
32	1627.5	1621.0	1620.6	1617.3	1616.5	1618.1	1619.7	1619.1	1606.7
33	1607.7	1600.9	1601.4	1598.1	1595.8	1598.9	1600.0	1599.5	1586.1
34	1587.8	1579.7	1580.2	1577.4	1575.1	1578.1	1579.3	1579.2	1565.3
35	1566.5	1558.3	1558.6	1555.9	1553.6	1556.9	1557.3	1557.9	1544.2
36	1544.8	1536.4	1536.1	1534.3	1531.7	1535.0	1535.8	1537.1	1522.9

**Candela Tabulations (Continued)**

	0	22.5	45	67.5	90	112.5	135	157.5	180
37	1523.9	1514.4	1514.0	1512.4	1510.0	1513.7	1514.1	1515.6	1500.6
38	1501.5	1492.2	1491.3	1490.0	1487.4	1491.5	1491.2	1492.5	1477.6
39	1478.2	1469.4	1468.1	1466.3	1464.5	1467.7	1468.7	1469.5	1454.7
40	1454.6	1446.2	1445.5	1443.3	1440.9	1444.2	1445.3	1445.4	1430.8
41	1429.5	1422.0	1421.7	1418.8	1416.8	1419.6	1421.9	1421.9	1407.1
42	1404.5	1398.3	1397.5	1393.7	1393.1	1395.9	1398.0	1397.1	1383.0
43	1379.0	1371.7	1371.7	1367.8	1367.3	1369.4	1371.9	1371.2	1356.9
44	1353.4	1345.4	1345.7	1341.5	1341.5	1342.6	1346.4	1345.6	1331.5
45	1327.6	1318.7	1319.2	1314.9	1313.8	1316.1	1318.7	1319.1	1304.5
46	1302.5	1292.9	1292.9	1289.1	1287.9	1290.6	1293.4	1293.7	1279.1
47	1277.8	1266.1	1266.7	1262.8	1261.7	1264.2	1266.8	1267.9	1253.0
48	1251.8	1238.4	1238.8	1235.5	1234.3	1237.6	1239.7	1241.2	1226.0
49	1225.2	1210.6	1211.2	1208.7	1206.2	1210.3	1212.9	1214.1	1198.1
50	1197.5	1183.7	1183.2	1181.5	1178.7	1183.1	1185.7	1187.2	1171.4
51	1169.5	1155.5	1155.3	1153.9	1150.3	1155.0	1157.6	1159.6	1143.3
52	1140.7	1127.6	1126.9	1124.8	1122.1	1126.6	1129.3	1130.9	1114.3
53	1110.7	1098.3	1097.7	1095.4	1093.1	1097.3	1100.8	1101.5	1085.1
54	1080.5	1069.6	1068.9	1066.6	1064.9	1068.8	1071.7	1072.7	1056.9
55	1050.6	1040.3	1040.0	1036.6	1035.3	1039.4	1041.7	1042.9	1027.3
56	1020.1	1009.8	1009.1	1006.5	1005.4	1008.5	1012.2	1013.1	997.4
57	988.6	978.9	978.0	975.0	974.6	977.4	981.1	981.9	967.2
58	958.0	947.6	946.7	942.6	943.0	946.3	950.2	950.7	937.4
59	927.6	916.6	915.5	911.2	911.9	914.9	917.8	919.7	904.8
60	895.7	882.3	881.1	877.7	877.8	881.6	884.7	886.8	873.3
61	864.6	850.6	850.0	846.8	846.8	850.4	854.0	856.2	842.5
62	834.1	819.5	818.4	815.5	815.2	819.3	823.2	825.3	812.1
63	803.6	788.3	787.5	785.0	784.2	788.6	792.8	794.8	781.5
64	773.5	757.5	756.4	754.4	753.1	757.9	762.2	764.6	751.0
65	741.8	725.9	725.0	723.3	721.4	726.2	731.0	733.3	719.9
66	709.5	695.0	693.5	691.4	690.8	694.5	699.7	702.0	688.4
67	676.8	663.7	662.7	660.1	659.3	663.1	668.2	670.5	657.8
68	643.8	632.3	631.0	628.2	627.8	631.4	636.8	639.1	626.0
69	612.0	600.9	599.3	596.5	596.1	599.8	604.9	607.6	595.0
70	578.9	568.5	567.0	563.5	564.1	567.5	572.9	575.8	563.0
71	546.4	536.0	534.2	530.9	531.8	535.3	540.4	543.8	531.9
72	514.5	503.7	501.8	498.4	499.2	503.2	508.2	512.1	500.5
73	483.2	472.1	470.2	466.8	467.4	471.7	476.8	480.8	469.5

**Candela Tabulations (Continued)**

	0	22.5	45	67.5	90	112.5	135	157.5	180
74	452.4	439.9	437.8	435.2	435.7	440.4	445.4	449.6	438.5
75	421.8	408.6	406.2	404.1	404.2	409.1	414.3	418.5	407.4
76	391.7	377.9	375.2	373.7	373.1	378.6	383.9	388.3	376.7
77	362.0	348.0	344.8	344.3	342.7	348.6	353.6	358.2	347.2
78	331.8	317.8	314.6	314.3	312.9	318.6	323.9	328.1	317.1
79	301.7	288.4	284.9	285.0	283.4	289.3	294.3	298.5	287.3
80	271.8	259.2	256.1	255.9	254.8	260.4	265.0	269.0	258.6
81	241.7	230.0	227.3	227.0	226.5	231.6	235.8	240.0	229.8
82	212.4	201.4	198.9	198.6	198.6	203.3	207.2	211.2	201.2
83	183.1	172.9	171.0	170.5	171.1	175.3	178.8	182.7	172.7
84	154.5	144.4	143.0	142.2	143.7	147.1	150.4	154.3	144.9
85	126.3	116.5	115.4	114.9	116.8	119.7	122.9	126.5	117.7
86	99.1	89.3	88.4	88.3	90.3	93.0	96.3	99.3	90.9
87	72.3	62.7	62.4	62.7	64.4	67.2	70.3	72.6	64.6
88	47.4	37.6	37.5	38.4	39.7	42.5	45.4	47.3	39.5
89	23.5	15.5	15.8	17.0	17.8	20.4	22.9	24.3	17.4
90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

**Integrating Sphere Equipment List**

Description	Manufacturer	Model	Serial Number
3M Sphere	Labsphere	ILLUMIA PLUS 3020-300 4PI	1115184557
CCD Array Spectrometer	Labsphere	MC-9801:3683L	98010844
Programmable AC Source	Chroma	61602	62012PF01504
Power Analyzer	Xitron	XT2640	2641AD2006002

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

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

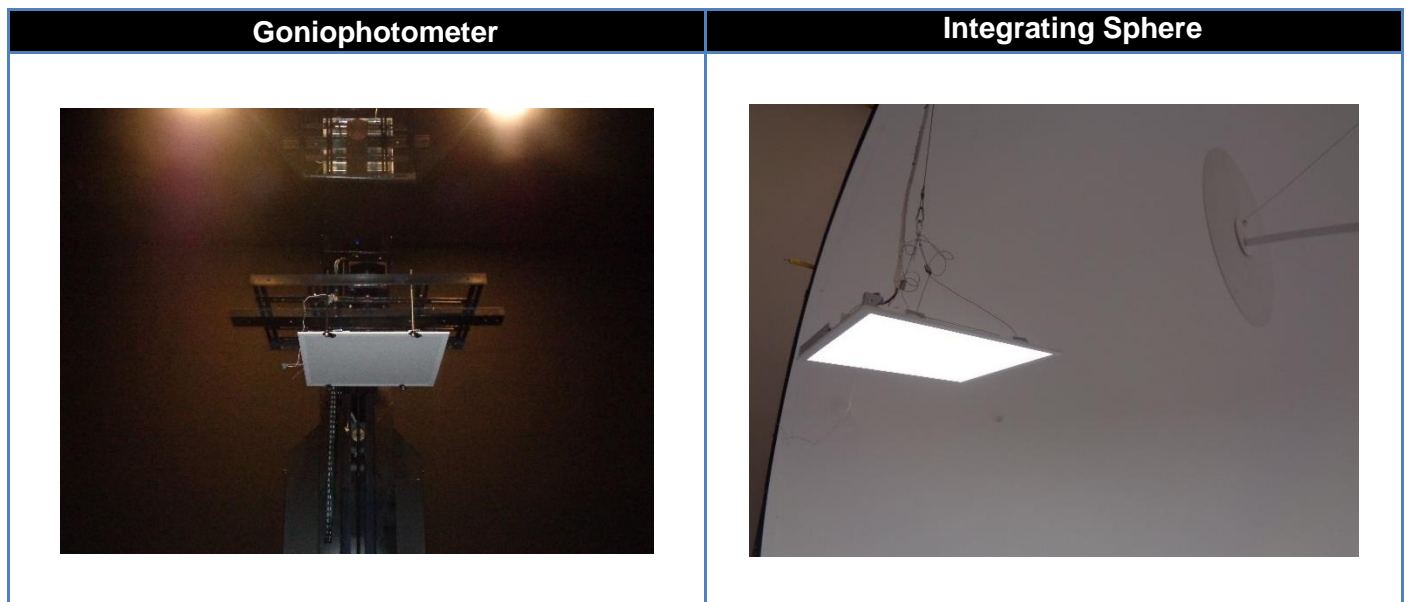
In the event that the recorded temperature is outside of  $25 \pm 1^{\circ}\text{C}$ , this is considered a non-standard condition.

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
11/29/2022	A	DMS	Origination	M. Hubbard	J. Vollers