

Report Number: PL16962-001A
Model: C-TR-D-FP22-S37L-SCCT-UL-xx-xx (HIGH 4000K)
Date: 10/31/2022

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

Prepared For:

Eduardo Torices

Cree Lighting

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Prepared By:



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Approved By:



Jonathan Vollers, Technical Manager

Product Information

Manufacturer	Cree Lighting
Model Number (SKU)	C-TR-D-FP22-S37L-SCCT-UL-xx-xx (HIGH 4000K)
Serial Number	16962
LED Type	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)

TOSPO EAC-032S080DNPRE 900320

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	4147.2	4049	lm
Efficacy	139.57	138.3	lm/W
Correlated Color Temperature (CCT)	4134	K	
Color Rendering Index (CRI)	85		
R ₉	15		
Duv	0.0005		
S/P Ratio*	1.76		
CIE Type	Direct		

	Sphere		Goniophotometer		
Electrical Measurements	120V	277V	120V	277V	
Input Wattage	29.71	-	29.28	28.97	W
Input Current	0.250	-	0.246	0.112	A
Input Voltage	120.15	-	120.25	277.44	V
Power Factor	0.989	-	0.989	0.931	
Off-State Power	0	-	0	0	W
Total Harmonic Distortion (Voltage)	0.05	-	0.07	0.07	%
Total Harmonic Distortion (Amperage)	10.55	-	10.73	14.13	%

Note: All photometric measurements taken at 120VAC.

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	43	31	min
Total Operating Time (Stabilization + Test)	53	51	min
Ambient Temperature	24.16	25.1	°C

Spacing Criteria

Spacing Criterion (0 - 180)	1.28
Spacing Criterion (90 - 270)	1.26
Spacing Criterion (Diagonal)	1.40

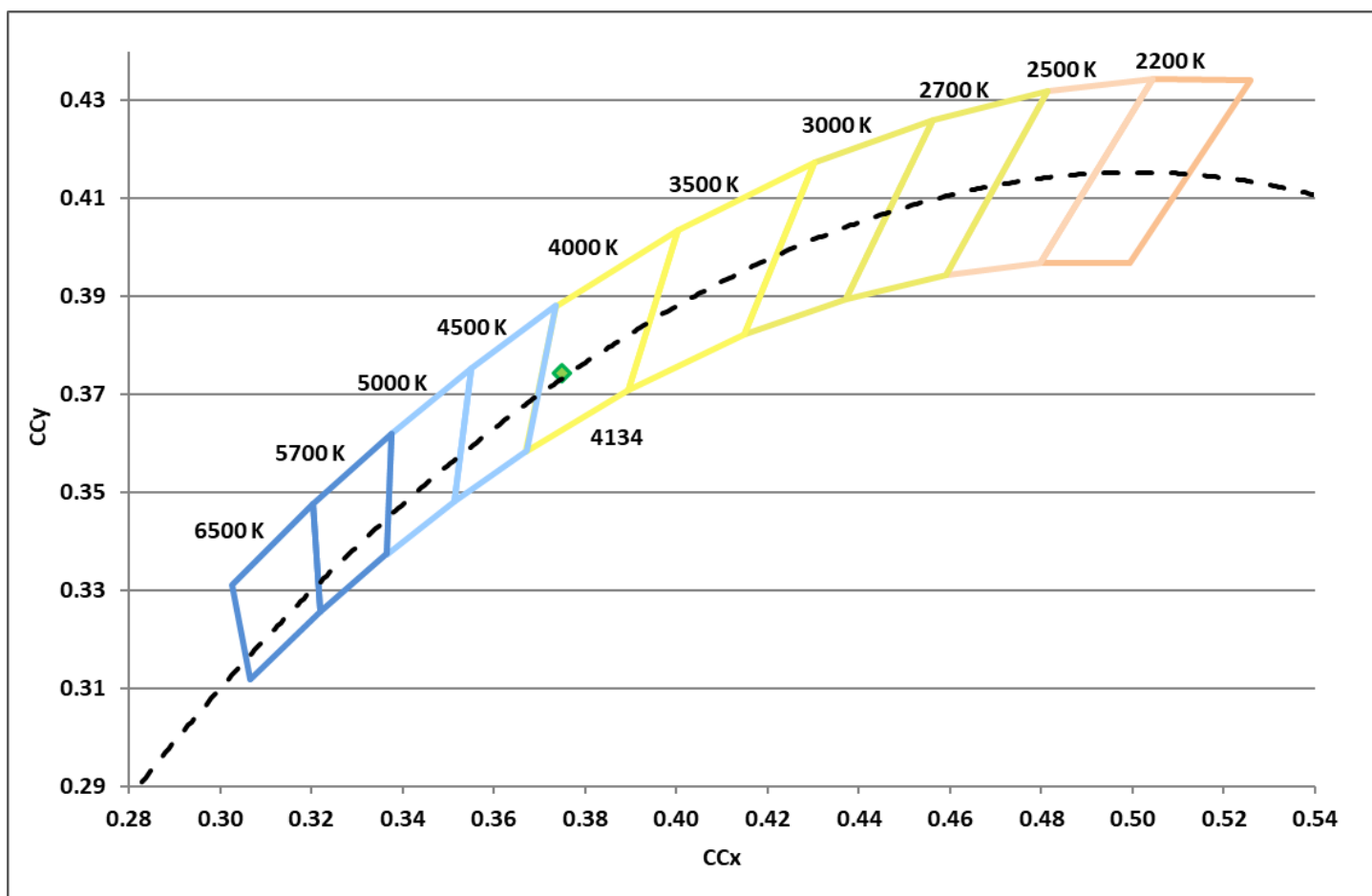
Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.3750	0.3744	0.2225	0.3332	0.2225	0.4997	0.0005

Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
85	83	92	96	82	83	87	86	66	15	79	82	59	86	98

Chromaticity Diagram



Spectral Distribution

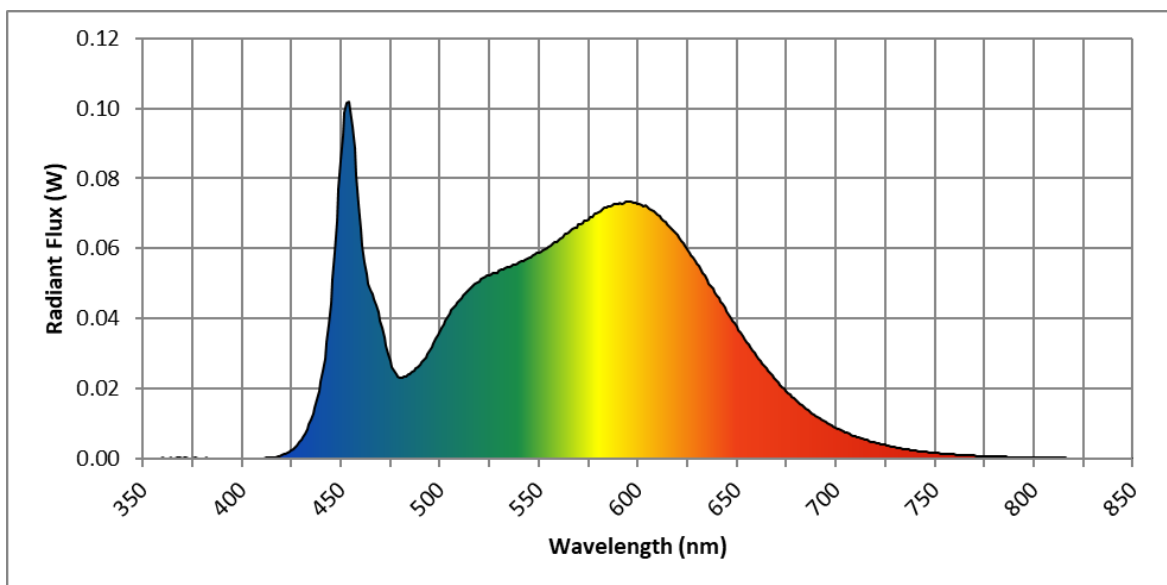
$\lambda(\text{nm})$	W/nm
360	0.000170
370	0.000138
380	0.000060
390	0.000093
400	0.000063
410	0.000077
420	0.000970
430	0.005342
440	0.021942
450	0.085339
460	0.065421
470	0.039442
480	0.023177
490	0.026793
500	0.035999
510	0.045105
520	0.050496

$\lambda(\text{nm})$	W/nm
530	0.053597
540	0.056080
550	0.058768
560	0.062619
570	0.066836
580	0.070264
590	0.072752
600	0.072735
610	0.069764
620	0.063763
630	0.055688
640	0.046603
650	0.037640
660	0.029479
670	0.022392
680	0.016613
690	0.012208

$\lambda(\text{nm})$	W/nm
700	0.008883
710	0.006399
720	0.004630
730	0.003292
740	0.002325
750	0.001653
760	0.001187
770	0.000840
780	0.000591
790	0.000414
800	0.000298
810	0.000208
820	0.000152
830	0.000097

Dominant Wavelength	578	nm
Peak Wavelength	454	nm

Spectral Power Distribution (W/nm)



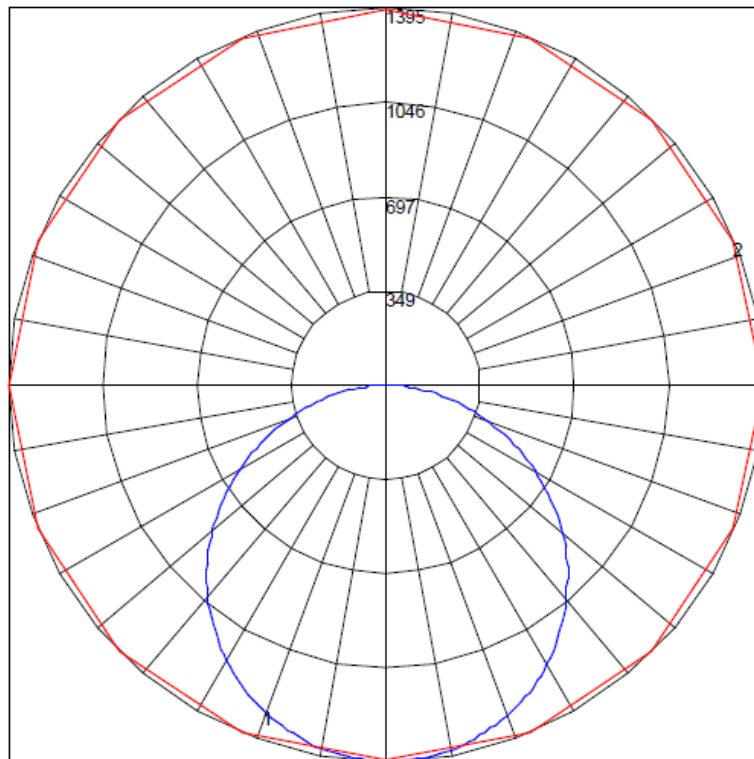
Zonal Lumen Summary

Zone	Lumens	% of Total	Zone	Lumens
0-20	509.9	12.6	0-10	131.9
0-30	1084.2	26.8	10-20	378.1
0-40	1778.6	43.9	20-30	574.3
0-60	3158.3	78.0	30-40	694.5
0-80	3961.2	97.8	40-50	723.5
0-90	4048.5	100.0	50-60	656.1
10-90	3916.7	96.7	60-70	504.9
20-40	1268.7	31.3	70-80	298.0
20-50	1992.2	49.2	80-90	87.4
40-70	1884.5	46.5	90-100	0
60-80	802.9	19.8	100-110	0
70-80	298.0	7.4	110-120	0
80-90	87.4	2.2	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		
Total	4048.5	100		

Luminance Data (Cd./Sq.M)

Average in Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	4389	4342	4320
55	4243	4186	4155
65	4057	3945	3910
75	3695	3529	3475
85	3130	2785	2735

Candela Plots



Maximum Candela = 1394.52 Located At Horizontal Angle = 180, Vertical Angle = 2
1 - Vertical Plane Through Horizontal Angles (180 - 0) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (2) (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	104	99	95	106	101	97	94	97	94	91	93	90	88	90	87	85	83
2	98	90	83	77	96	88	82	76	85	79	75	81	77	73	78	75	71	69
3	90	79	71	64	87	77	70	63	74	68	62	72	66	61	69	64	60	58
4	82	70	61	54	80	68	60	54	66	59	53	64	57	52	61	56	52	49
5	75	62	53	46	73	61	53	46	59	51	46	57	50	45	55	49	45	43
6	70	56	47	41	68	55	47	40	53	46	40	52	45	40	50	44	39	37
7	64	51	42	36	63	50	42	36	48	41	35	47	40	35	46	39	35	33
8	60	46	38	32	58	46	37	32	44	37	32	43	36	31	42	36	31	29
9	56	43	34	29	55	42	34	29	41	33	28	40	33	28	39	33	28	26
10	53	39	31	26	51	39	31	26	38	31	26	37	30	26	36	30	25	24

Candela Tabulations

	0	22.5	45	67.5	90	112.5	135	157.5	180
0	1392.5	1392.5	1392.5	1392.5	1392.5	1392.5	1392.5	1392.5	1392.5
1	1392.9	1391.5	1393.4	1393.6	1390.8	1391.5	1393.8	1393.1	1392.5
2	1393.7	1392.2	1393.1	1391.8	1390.4	1391.7	1392.5	1393.1	1394.5
3	1393.0	1390.8	1391.2	1389.5	1391.0	1392.2	1391.9	1391.3	1390.6
4	1389.3	1389.0	1390.3	1389.1	1388.4	1388.1	1388.9	1389.3	1387.7
5	1388.5	1386.9	1388.8	1388.5	1386.0	1384.6	1387.3	1387.9	1386.3
6	1387.0	1384.5	1386.8	1384.8	1383.3	1383.5	1385.5	1386.0	1385.2
7	1382.8	1381.0	1382.3	1380.0	1380.1	1383.2	1381.6	1379.8	1380.2
8	1379.1	1378.7	1377.9	1376.7	1378.6	1379.9	1377.1	1376.3	1373.3
9	1374.7	1373.2	1375.0	1374.1	1372.1	1373.8	1375.2	1375.2	1371.1
10	1373.9	1368.5	1372.1	1369.1	1366.7	1367.6	1370.3	1370.6	1369.6
11	1369.9	1365.0	1366.0	1364.6	1364.3	1362.8	1363.3	1364.1	1365.2
12	1361.8	1360.0	1361.3	1359.7	1359.1	1358.6	1358.5	1357.6	1357.6
13	1357.9	1353.3	1354.2	1352.1	1350.3	1352.6	1353.7	1353.4	1351.1
14	1351.9	1349.2	1345.7	1347.5	1344.3	1345.5	1346.9	1346.6	1343.5
15	1342.6	1339.7	1340.7	1339.8	1337.3	1339.0	1339.6	1340.5	1335.5
16	1336.2	1332.5	1334.1	1329.9	1330.7	1332.3	1331.8	1332.3	1330.3
17	1328.3	1327.2	1326.0	1322.6	1322.7	1321.7	1324.0	1324.0	1321.6
18	1322.2	1318.0	1317.8	1315.3	1313.6	1314.7	1316.8	1317.5	1310.5
19	1314.7	1308.5	1307.8	1308.0	1304.6	1307.0	1307.3	1307.7	1304.1
20	1302.5	1298.9	1296.8	1298.8	1295.3	1297.0	1296.8	1297.3	1293.3
21	1295.1	1290.3	1288.4	1286.2	1287.4	1286.2	1288.1	1288.9	1282.3
22	1286.2	1278.9	1279.6	1276.4	1275.5	1278.1	1278.7	1277.5	1274.5
23	1275.0	1268.6	1268.6	1264.5	1265.1	1268.4	1267.8	1268.0	1264.1
24	1265.4	1258.9	1258.8	1254.8	1254.8	1256.0	1256.1	1258.4	1253.3
25	1256.7	1248.4	1248.0	1245.7	1244.1	1244.7	1245.5	1246.8	1242.2
26	1243.3	1235.6	1236.0	1233.1	1231.7	1233.8	1236.0	1235.5	1231.3
27	1230.4	1224.1	1223.9	1220.5	1219.3	1221.0	1222.1	1223.0	1220.0
28	1219.8	1211.1	1210.4	1207.6	1207.8	1208.2	1208.2	1210.8	1206.2
29	1206.4	1198.0	1196.1	1196.6	1194.6	1195.7	1196.6	1198.3	1192.1
30	1192.1	1184.5	1183.5	1182.3	1181.0	1181.9	1183.3	1185.2	1179.4
31	1178.0	1172.1	1170.7	1165.9	1165.5	1167.6	1168.3	1171.0	1167.1
32	1165.5	1158.1	1155.7	1152.1	1150.7	1152.3	1154.2	1156.5	1153.1
33	1150.8	1142.6	1140.4	1139.5	1137.8	1138.6	1141.1	1141.5	1135.7
34	1134.0	1127.5	1126.0	1124.1	1122.4	1123.1	1125.3	1125.7	1119.4
35	1117.5	1112.4	1111.2	1107.7	1105.0	1107.9	1109.3	1111.3	1106.3
36	1105.4	1097.7	1095.0	1090.9	1090.7	1093.4	1094.9	1096.6	1091.3

Candela Tabulations (Continued)

	0	22.5	45	67.5	90	112.5	135	157.5	180
37	1091.1	1080.6	1078.9	1076.7	1075.6	1077.8	1080.3	1079.7	1074.0
38	1072.4	1065.2	1062.9	1060.5	1058.7	1060.1	1061.8	1063.3	1056.8
39	1055.9	1048.6	1046.2	1042.5	1040.4	1042.7	1044.5	1047.3	1042.7
40	1041.5	1031.1	1030.2	1025.6	1024.1	1026.2	1028.8	1030.9	1026.0
41	1020.3	1013.1	1012.5	1010.1	1007.0	1009.5	1012.3	1013.7	1008.3
42	1001.0	995.9	993.2	991.9	987.5	990.3	994.9	995.8	989.2
43	984.0	977.3	974.2	971.4	970.0	972.6	976.9	977.0	971.6
44	967.4	959.8	956.4	952.9	953.0	954.4	957.2	958.7	955.5
45	948.5	940.5	938.4	936.0	933.7	936.9	938.0	940.7	934.8
46	928.8	921.9	919.2	917.1	913.8	916.5	919.7	921.4	915.2
47	911.3	903.9	899.7	897.2	896.7	897.2	900.9	901.4	897.5
48	893.8	883.2	879.6	877.7	876.6	878.0	880.6	881.7	874.9
49	873.4	862.3	861.2	857.2	855.8	859.2	860.4	864.3	856.9
50	852.8	843.3	840.9	836.9	835.9	839.3	842.1	844.5	837.6
51	832.8	823.9	820.2	815.7	814.8	818.2	823.0	823.8	817.3
52	812.8	802.6	799.8	795.1	793.8	797.5	801.0	804.1	796.6
53	791.9	781.8	779.2	774.3	773.3	776.0	779.0	783.6	775.5
54	767.2	759.0	754.9	751.4	749.6	753.0	757.3	760.2	751.7
55	743.8	736.4	733.8	729.8	728.4	731.1	734.8	737.5	731.2
56	722.6	713.9	711.4	708.1	706.8	708.8	712.5	715.9	710.4
57	700.9	691.6	688.4	686.0	684.7	687.2	690.9	694.6	688.2
58	679.1	670.8	666.7	663.9	662.6	664.9	670.3	672.3	665.0
59	656.7	648.1	645.4	641.1	640.3	642.7	647.2	649.8	643.6
60	635.3	624.8	623.0	619.3	617.8	619.3	624.0	627.6	622.4
61	614.5	601.9	600.0	597.1	595.9	597.3	602.1	605.2	599.8
62	591.1	580.3	577.5	573.8	573.7	575.1	580.1	583.2	576.9
63	568.9	557.6	555.8	550.9	551.0	552.3	557.5	560.1	555.1
64	547.1	534.9	533.0	528.4	528.6	529.9	534.5	538.6	533.2
65	524.1	512.3	509.6	505.2	505.0	507.0	512.6	517.2	509.9
66	500.7	489.4	487.2	482.3	482.0	484.9	489.8	494.1	487.0
67	476.3	466.3	464.3	459.7	459.3	462.4	466.2	470.7	465.1
68	452.9	443.5	440.1	436.6	435.9	438.8	442.7	447.7	442.4
69	429.9	420.3	416.5	413.6	412.2	415.8	419.9	425.0	418.6
70	406.3	397.2	393.4	390.1	388.9	393.2	397.3	401.7	395.3
71	382.6	374.0	370.0	366.4	365.2	369.5	373.9	377.8	373.5
72	359.8	350.7	346.7	343.8	342.3	345.8	351.0	355.1	351.1
73	337.5	328.1	324.0	320.7	319.6	323.1	328.8	332.5	328.0

Candela Tabulations (Continued)

	0	22.5	45	67.5	90	112.5	135	157.5	180
74	314.9	305.3	301.8	297.6	297.1	300.6	305.8	310.3	306.3
75	292.3	282.1	279.2	275.3	274.9	277.9	283.1	287.7	283.8
76	270.9	259.9	256.9	253.7	253.1	256.1	261.3	266.1	261.8
77	249.6	238.7	235.1	231.9	231.7	235.1	240.1	244.9	240.0
78	227.6	217.2	214.0	210.4	210.5	214.0	218.5	223.5	218.5
79	206.3	196.0	192.8	189.8	190.0	192.9	197.5	202.8	197.8
80	184.9	175.4	172.1	169.4	169.4	172.4	177.2	182.2	177.0
81	163.9	155.0	151.7	149.3	149.1	152.6	156.7	161.6	156.1
82	142.8	135.1	131.8	129.9	129.3	133.0	136.5	141.3	136.1
83	122.3	115.6	112.0	110.6	110.1	113.5	116.8	121.3	116.8
84	102.7	95.9	92.8	91.5	91.2	94.5	97.6	101.7	97.8
85	83.4	76.8	74.2	73.1	72.9	76.3	79.0	82.5	79.0
86	64.5	58.6	56.4	55.7	55.6	58.6	61.0	64.0	61.0
87	46.7	40.8	39.3	39.0	39.1	41.6	43.8	46.2	43.5
88	30.1	24.4	23.8	23.5	23.9	26.0	27.9	29.6	27.4
89	14.7	10.4	10.2	10.2	10.8	12.2	13.8	14.8	12.6
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.

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

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

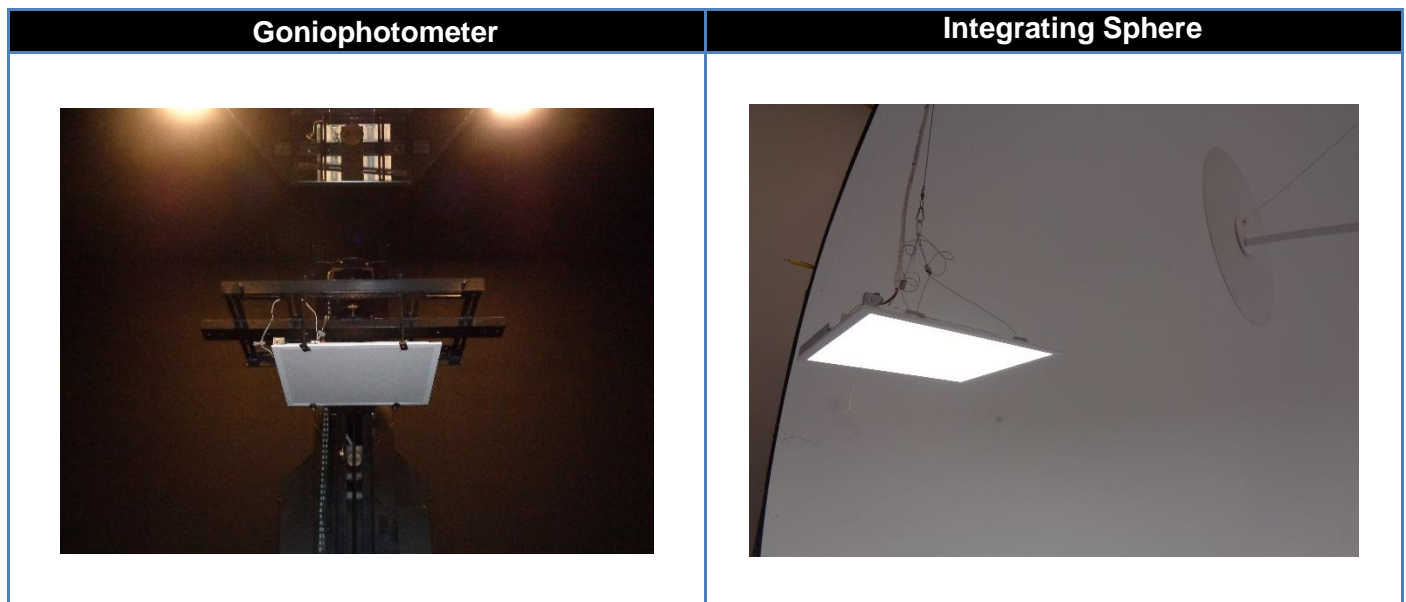
In the event that the recorded temperature is outside of $25 \pm 1^{\circ}\text{C}$, this is considered a non-standard condition.

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
10/31/2022	A	DMS	Origination	M. Hubbard	J. Vollers