

**Report Number:** PL10270-004B  
**Model:** ARE-EDG-2M-xx-06-E-UL-xx-525-xxxx-40K  
**Date:** 06/06/2017

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

**Prepared For:**

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**Approved By:**

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### Product Information

Manufacturer	Cree, Inc.
Model Number (SKU)	ARE-EDG-2M-xx-06-E-UL-xx-525-xxxx-40K
Serial Number	PL10270-004
LED Type	XP-G2

### Product Description

Cast brown street light with 3 sections of 2x10 polymeric optics, 60 optics total, 1 covering each LED

### Driver Information (Where Applicable)

Phillips LED-INTA-05630C-280DO

Length	Width	Height
27.5"	14"	4"

### Sample

The following sample was submitted for evaluation



Key Photometric Data	Sphere Output	Goniophotometer	
Luminous Flux	10292.0	10053.7	lm
Efficacy	101.84	99.55	lm/W
Correlated Color Temperature (CCT)	3945	K	
Color Rendering Index (CRI)	76		
R <sub>9</sub>	-12		
Duv	0.00242100		
S/P Ratio*	1.54		

Electrical Measurements	Sphere		Goniophotometer		
	120V	277V	120V	277V	
Input Wattage	101.06	100.07	100.99	99.96	W
Input Current	0.84	0.37	0.84	0.37	A
Input Voltage	120.06	277.14	120.18	276.99	V
Power Factor	0.998	0.979	0.996	0.974	
Off-State Power	0	0	0	0	W
Total Harmonic Distortion (Voltage)	0.04	0.05	0.09	0.07	%
Total Harmonic Distortion (Amperage)	4.68	6.23	5.32	7.65	%

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

Luminous Intensity Distribution	Goniophotometer	
Max Candela	4851.9	Cd
Angle of Max Candela (Horizontal)	90	°
Angle of Max Candela (Vertical)	62.5	°

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	75	125.8	min
Total Operating Time (Stabilization + Test)	80	145.8	min
Ambient Temperature	25.6	24.4	°C

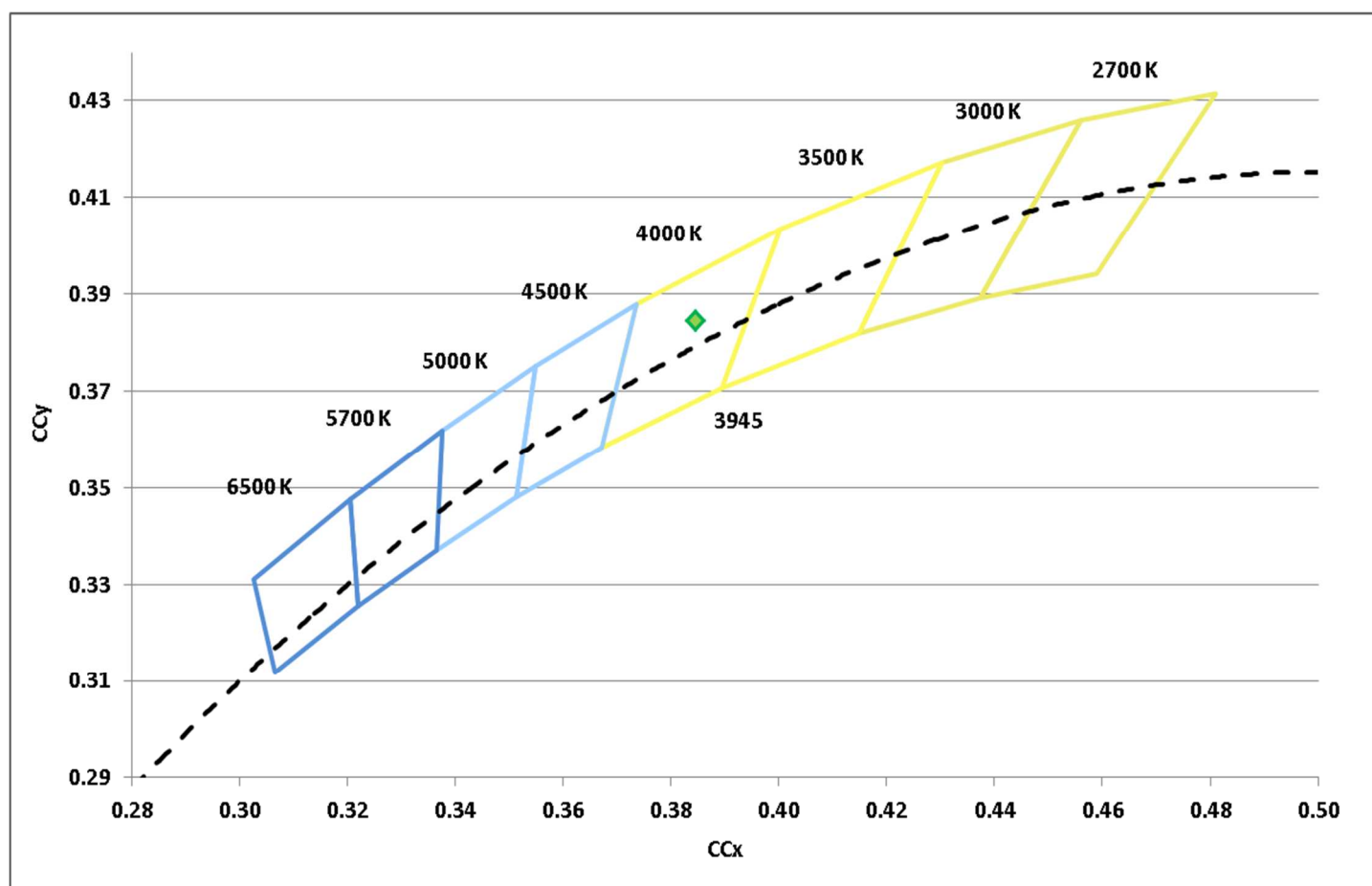
### Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.3846	0.3845	0.2247	0.3371	0.2247	0.5056	0.002421

### Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
76	73	81	87	75	72	73	84	59	-12	54	71	46	74	92

### Chromaticity Diagram



## Spectral Distribution

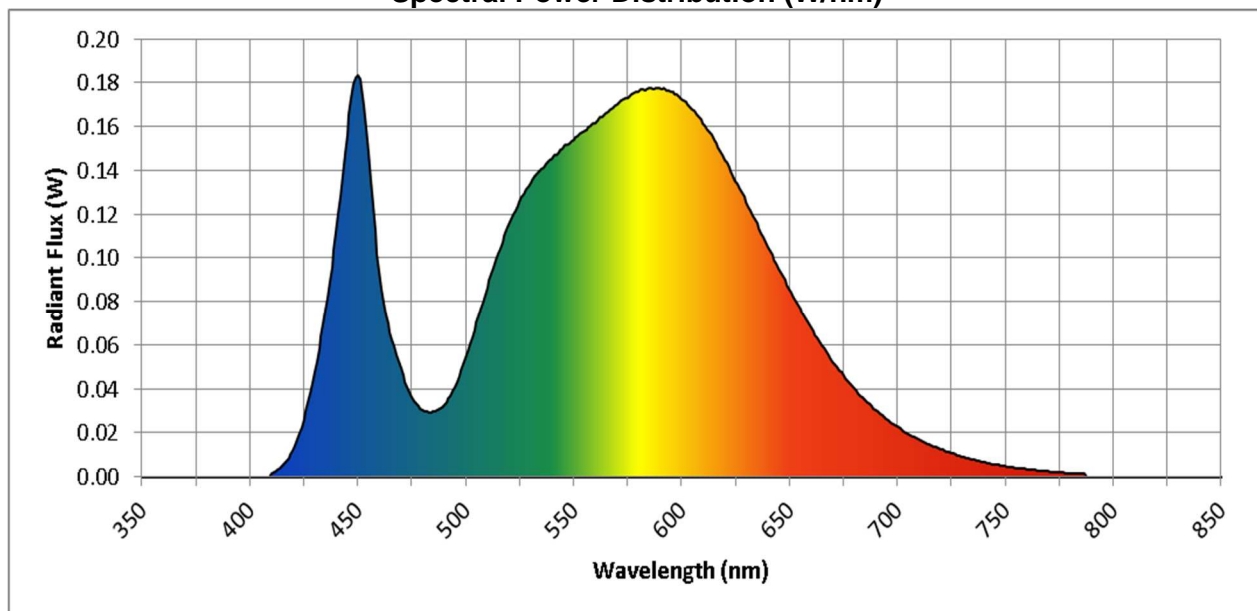
$\lambda(\text{nm})$	W/nm
360	0.000026
370	0.000021
380	0.000018
390	0.000014
400	0.000070
410	0.001942
420	0.012636
430	0.047829
440	0.111995
450	0.183364
460	0.094042
470	0.049545
480	0.030524
490	0.033118
500	0.054303
510	0.086756
520	0.115288

$\lambda(\text{nm})$	W/nm
530	0.134459
540	0.145399
550	0.154175
560	0.161621
570	0.170290
580	0.175949
590	0.177780
600	0.172459
610	0.161436
620	0.144844
630	0.125622
640	0.105018
650	0.085847
660	0.068285
670	0.052908
680	0.040544
690	0.030758

$\lambda(\text{nm})$	W/nm
700	0.023175
710	0.017402
720	0.013060
730	0.009703
740	0.007145
750	0.005323
760	0.003910
770	0.002902
780	0.002109
790	0.001528
800	0.001147
810	0.000776
820	0.000565
830	0.000368

<b>Dominant Wavelength</b>	578	nm
<b>Peak Wavelength</b>	450	nm

## Spectral Power Distribution (W/nm)

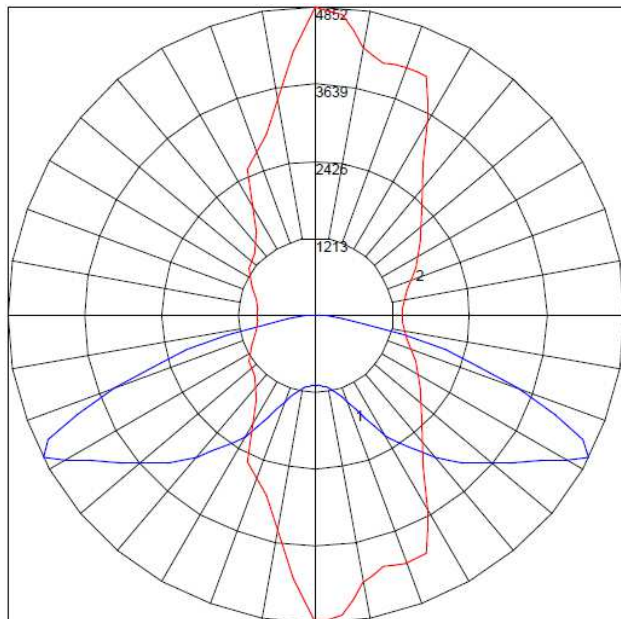




**Zonal Lumen Summary**

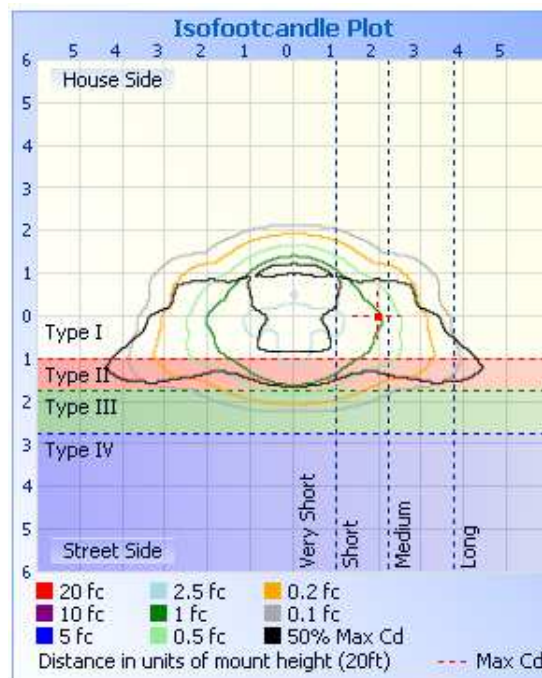
<b>Zone</b>	<b>Lumens</b>	<b>% of Total</b>	<b>Zone</b>	<b>Lumens</b>	<b>% of Total</b>
0-5	26.1	0.30%	90-95	0	0%
5-10	79.2	0.80%	95-100	0	0%
10-15	140.2	1.40%	100-105	0	0%
15-20	211.4	2.10%	105-110	0	0%
20-25	293.7	2.90%	110-115	0	0%
25-30	394.4	3.90%	115-120	0	0%
30-35	513.6	5.10%	120-125	0	0%
35-40	662	6.60%	125-130	0	0%
40-45	862.3	8.60%	130-135	0	0%
45-50	1,113.10	11.10%	135-140	0	0%
50-55	1,315.40	13.10%	140-145	0	0%
55-60	1,328.60	13.20%	145-150	0	0%
60-65	1,130.70	11.20%	150-155	0	0%
65-70	863.6	8.60%	155-160	0	0%
70-75	607.1	6.00%	160-165	0	0%
75-80	364.3	3.60%	165-170	0	0%
80-85	133.1	1.30%	170-175	0	0%
85-90	14.6	0.10%	175-180	0	0%
			<b>Total</b>	<b>10053.7 lm</b>	<b>100%</b>

## **Candela Plot**

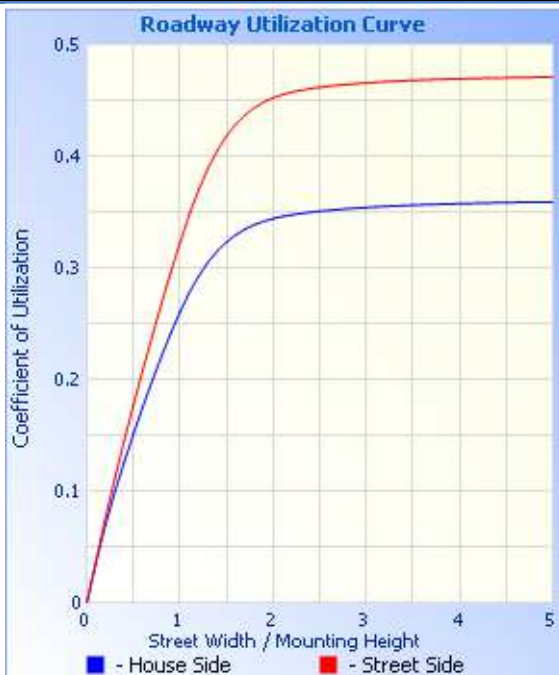


Maximum Candela = 4851.9 Located At Horizontal Angle = 90, Vertical Angle = 62.5  
# 1 - Vertical Plane Through Horizontal Angles (90 - 270) (Through Max. Cd.)  
# 2 - Horizontal Cone Through Vertical Angle (62.5) (Through Max. Cd.)

## **Illuminance Plot**



## **Roadway Utilization**

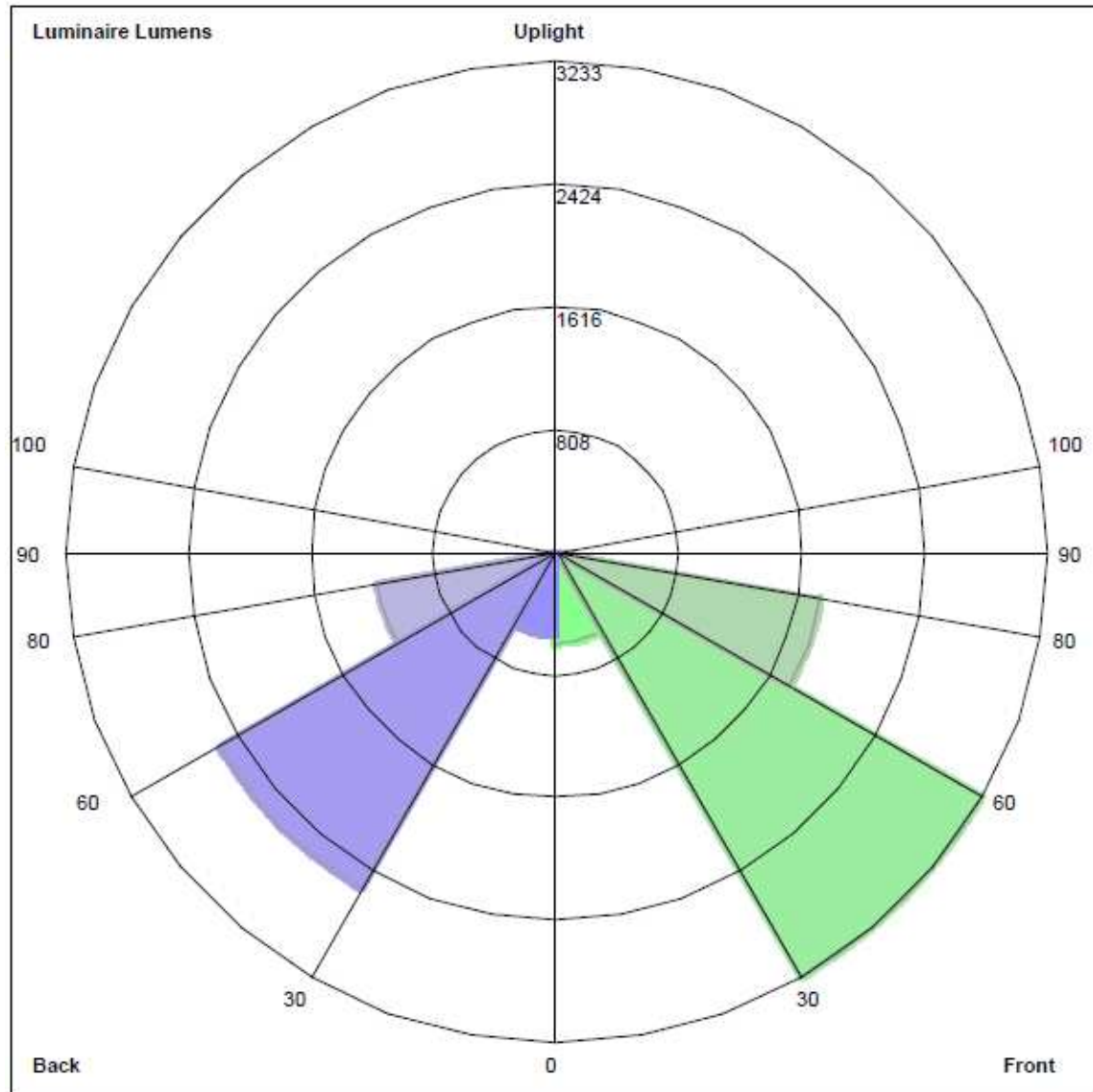


## **Roadway Summary**

	Lumens	% Lamp
Distribution	TYPE II, SHORT	
Downward Street Side	5701.8	56.7%
Downward House Side	4351.1	43.3%
Downward Total	10052.9	100%
Upward Street Side	0.0	0.0%
Upward House Side	0.0	0.0%
Upward Total	0.0	0.0%
<b>Total Lumens</b>	<b>10052.9</b>	<b>100.0%</b>



**Luminaire Classification System**



Luminaire Lumens:  
Front: Low=600.8, Medium=3232.7, High= 1770.0, Very High=98.0  
Back: Low=543.6, Medium=2560.9, High=1196.7, Very High=49.8  
Uplight: Low=0.0, High=0.0  
BUG Rating : B3-U0-G3





NVLAP Lab Code 500089-0

### Candela Tabulations

	0	5	15	25	35	45	55	60	62.5	65	67.5	70	72.5	75	77.5	80	82.5	85	87.5	90	95	105	115	125	135	145	155	165	175	180
0	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108
2.5	1110	1108	1111	1114	1118	1119	1120	1121	1120	1119	1118	1118	1118	1117	1117	1116	1114	1113	1112	1109	1102	1093	1086	1077	1072	1066	1062	1061	1061	1061
5	1081	1082	1086	1093	1104	1115	1126	1132	1132	1133	1133	1133	1134	1135	1134	1133	1131	1129	1126	1124	1118	1102	1083	1064	1047	1036	1028	1022	1020	1022
7.5	1105	1108	1107	1108	1115	1123	1140	1150	1153	1157	1158	1159	1160	1161	1160	1158	1155	1152	1148	1144	1135	1116	1088	1064	1047	1040	1038	1038	1037	1041
10	1175	1178	1174	1162	1154	1156	1168	1180	1186	1192	1195	1198	1198	1199	1196	1194	1189	1184	1179	1174	1164	1143	1110	1087	1075	1076	1076	1072	1068	1071
12.5	1187	1192	1205	1224	1226	1206	1215	1225	1233	1240	1246	1252	1254	1256	1252	1248	1240	1233	1226	1219	1210	1189	1152	1130	1124	1116	1098	1087	1082	1087
15	1209	1216	1227	1246	1275	1280	1268	1284	1292	1300	1309	1318	1322	1327	1323	1319	1308	1297	1289	1281	1273	1250	1207	1180	1168	1146	1131	1123	1120	1127
17.5	1277	1284	1286	1295	1320	1349	1325	1337	1349	1361	1374	1388	1398	1407	1404	1401	1389	1378	1369	1361	1355	1325	1259	1227	1204	1185	1169	1163	1159	1167
20	1335	1344	1345	1349	1368	1395	1392	1383	1398	1412	1433	1454	1475	1496	1497	1498	1489	1479	1472	1464	1455	1405	1299	1267	1237	1214	1193	1186	1184	1193
22.5	1419	1431	1422	1406	1405	1435	1458	1439	1452	1464	1492	1519	1554	1590	1604	1619	1615	1610	1605	1600	1584	1480	1337	1297	1252	1223	1225	1238	1247	1258
25	1529	1543	1522	1486	1452	1456	1516	1507	1515	1523	1558	1593	1645	1697	1730	1764	1774	1783	1780	1776	1747	1560	1369	1312	1250	1254	1289	1320	1337	1352
27.5	1664	1673	1641	1580	1519	1485	1544	1571	1580	1589	1638	1687	1763	1839	1893	1947	1970	1992	1990	1987	1928	1644	1399	1310	1269	1314	1370	1418	1439	1458
30	1803	1809	1769	1686	1597	1531	1563	1618	1639	1659	1732	1804	1900	1995	2067	2138	2172	2205	2203	2201	2113	1715	1413	1310	1315	1384	1458	1517	1543	1565
32.5	1943	1950	1901	1800	1684	1592	1585	1659	1704	1749	1832	1915	2027	2139	2229	2319	2361	2403	2397	2392	2286	1801	1429	1327	1371	1457	1546	1612	1646	1669
35	2084	2095	2042	1924	1781	1665	1634	1724	1795	1866	1950	2033	2163	2294	2392	2490	2533	2576	2564	2552	2432	1896	1461	1374	1434	1535	1638	1716	1758	1783
37.5	2279	2292	2228	2078	1904	1771	1737	1845	1935	2025	2119	2213	2350	2488	2591	2695	2727	2760	2740	2719	2574	1982	1550	1458	1524	1635	1756	1848	1890	1922
40	2499	2507	2439	2270	2063	1906	1896	2029	2134	2239	2336	2434	2567	2699	2815	2931	2949	2967	2941	2916	2734	2059	1699	1578	1638	1765	1894	1989	2025	2062
42.5	2709	2719	2649	2475	2247	2052	2097	2276	2389	2502	2598	2693	2795	2896	3014	3132	3146	3159	3132	3105	2904	2172	1905	1729	1769	1916	2053	2153	2191	2229
45	2980	2996	2919	2734	2467	2213	2298	2587	2726	2866	2971	3076	3131	3186	3270	3354	3358	3362	3327	3291	3088	2363	2147	1877	1909	2094	2267	2361	2383	2420
47.5	3252	3272	3239	3101	2797	2433	2444	2823	2993	3162	3274	3386	3412	3438	3487	3537	3547	3557	3510	3463	3263	2570	2367	2024	2085	2309	2480	2527	2513	2550
50	3396	3412	3427	3379	3173	2759	2629	3048	3242	3436	3548	3661	3676	3692	3703	3714	3732	3751	3694	3636	3432	2775	2580	2201	2286	2473	2564	2539	2488	2518
52.5	3300	3314	3373	3426	3370	3087	2894	3294	3492	3690	3805	3919	3922	3924	3905	3887	3914	3940	3883	3825	3612	2972	2789	2383	2421	2468	2453	2394	2341	2367
55	3040	3055	3141	3245	3309	3243	3177	3544	3720	3896	3992	4088	4086	4085	4061	4037	4072	4107	4061	4014	3793	3073	2934	2494	2389	2303	2234	2174	2123	2153
57.5	2657	2654	2729	2864	3016	3130	3341	3726	3877	4027	4066	4106	4104	4101	4105	4109	4197	4284	4264	4243	3968	3011	2837	2415	2176	2034	1922	1862	1824	1850
60	2107	2093	2176	2354	2557	2817	3258	3743	3919	4094	4086	4077	4060	4044	4105	4166	4342	4518	4542	4566	4073	2945	2631	2060	1857	1684	1533	1450	1432	1445
62.5	1377	1364	1485	1728	2008	2352	2947	3540	3841	4142	4151	4160	4134	4108	4196	4285	4519	4753	4802	4852	4176	2962	2542	1625	1364	1279	1106	970	916	908
65	605	620	780	1081	1418	1834	2501	3331	3766	4200	4358	4514	4436	4358	4346	4335	4498	4661	4655	4650	3947	2956	2387	1305	1010	890	729	602	531	522
67.5	337	347	432	632	923	1371	1966	3032	3524	4017	4320	4622	4560	4499	4303	4107	4132	4156	4115	4074	3327	2877	2155	998	786	604	524	440	390	389
70	249	256	308	430	621	961	1426	2525	3027	3529	3869	4209	4270	4331	4020	3709	3608	3508	3444	3381	2629	2527	1844	744	582	480	438	374	330	328
72.5	207	218	272	360	496	628	962	1852	2393	2934	3257	3580	3722	3864	3543	3221	3034	2848	2775	2703	2111	2114	1485	518	425	432	408	354	304	300
75	188	198	245	314	427	411	612	1218	1775	2331	2624	2918	3080	3243	2978	2714	2475	2236	2175	2114	1555	1748	1113	351	323	392	373	338	300	296
77.5	179	185	207	252	342	269	389	763	1242	1721	1994	2268	2386	2505	2295	2084	1843	1602	1511	1420	1069	1318	789	236	243	325	315	306	298	298
80	158	159	157	174	226	157	238	424	722	1021	1261	1502	1580	1659	1512	1364	1186	1008	898	788	598	782	500	144	131	195	206	229	248	252
82.5	61	57	59	79	110	64	144	236	425	613	805	997	1042	1087	980	873	746	619	520	420	304	427	216	70	44	72	60	52	52	52
85	8	8	12	30	45	24	70	99	182	264	359	454	470	485	440	394	333	273	224	175	98	140	57	24	12	21	15	7	5	5
87.5	1	1	2	7	9	3	10	9	15	20	31	42	46	50	45	40	36	30	24	17	7	6	5	4	2	2	3	1	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



NVLAP Lab Code 500089-0

### Candela Tabulations (Continued)

	0	5	15	25	35	45	55	60	62.5	65	67.5	70	72.5	75	77.5	80	82.5	85	87.5	90	95	105	115	125	135	145	155	165	175	180
92.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
117.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
127.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
137.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
142.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
147.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
152.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
157.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
162.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
167.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
172.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
177.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0	0	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
2M Sphere	Everfine	2M	1004156T
CCD Array Spectrometer	Otsuka	MC-9801	98010360
Programmable AC Source	Adaptive	FC200	2280220
Power Analyzer	Chroma	66202	66202 0005018

### 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
Power Meter	Yokogawa	WT210	91M945458

### 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
2m Sphere	Tungsten Halogen Omni-Directional 75W Calibration Lamp, Serial Number F119
Type C Goniophotometer and Spectrometer	Tungsten Halogen Omni-Directional 500W Calibration Lamp, Serial Numbers 13C069, 13C070, 13C071. 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.

\*\* In the event that testing is subcontracted, test results in this report marked with the symbol \*\*, or noted as "Sphere" or "Integrating Sphere", were performed by the subcontracted laboratory identified in the footer on the first page of this report. Subcontracted testing is strictly integrating sphere based. All other tests are performed using a Type C goniophotometer.

The integrating sphere information in the equipment list, report items marked with \*\*, or results specifically identified as "Sphere" or "Integrating Sphere", are the actual equipment used, and test results produced, by the subcontracted laboratory when subcontracting is indicated on the cover page.

#### Additional Comments:

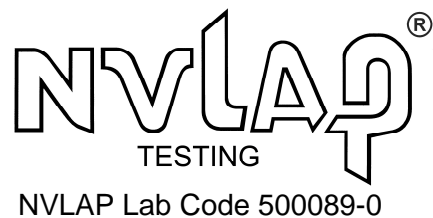
The photos below are intended to show the orientation and fixturing/set-up of the units under test. These are critical to understanding the results of the test given the sensitivity of many products and measurement systems to orientation and set-up considerations, and also for reproducing the conditions of the test.

Goniophotometer



Integrating Sphere





### Document Revision History:

Each subsequent revision of this report replaces the preceding report.

Date	Rev	DCN #	Change Details	By	Approval
02/20/17	A	DMS	Origination	B. Kuebler	C. McLaurin
06/06/17	A	DMS	ADD: Driver information, Changed from "Integral" to "Phillips LED-INTA-05630C-280DO"	R. Wieland	B. Kuebler