



## LM-79-08 Test Report

for

**Maxlite Inc.**

10 York Ave West Caldwell, NJ 07006 United States

**Outdoor Pole/Arm-mounted Area and Roadway Luminaires**

**Model: AR-MAL100UT5-40X**

**Laboratory: Leading Testing Laboratories**

**NVLAP CODE: 200960-0**

Tel: +86-571-56680806

[www.ledtestlab.com](http://www.ledtestlab.com)

Report No.: HZ17010004y

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

### Test specifications:

**Date of Receipt** : Jan. 04, 2017

**Date of Test** : Jan. 09, 2017

**Test item** : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters

**Reference Standard** : IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

Reviewed by:

Engineer: April Zou  
Jan. 19, 2017

Approved by



Manager: Jim Zhang  
Jan. 19, 2017

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

**Test Summary**

Sample Tested: AR-MAL100UT5-40X

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
130.6	12490.0	95.63	0.9967
CCT (K)	CRI	Stabilization Time (Light & Power)	
3893	76.2	60	
IES Classification		Longitudinal Classification	
Type VS		Very Short	

Table 1: Executive Data Summary

**Sample Photo**



Figure 1- Overview of the sample

**Equipment Under Test (EUT)**

**Name** : Outdoor Pole/Arm-mounted Area and Roadway Luminaires  
**Model** : AR-MAL100UT5-40X  
**Electrical Ratings** : 100~277Vac, 60Hz, 100W  
**Product Description** : 4000K, Outdoor Pole/Arm- Mounted Area and Roadway Luminaires  
 Manufacturer of light source: Nichia Corporation  
 Model of light source: NF2L757GRT-V1  
**Manufacturer** : Maxlite Inc.  
**Address** : 10 York Ave West Caldwell, NJ 07006 United States

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**TEST RESULTS**

Test ambient temperature was 24.6°C.

Sample orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 95 minutes.

**Goniophotometer Method**

The photometric distance is 30m.

Luminous data was taken at 0.5°vertical intervals and 5°horizontal intervals.

Parameter	Result			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	73
Voltage frequency (Hz)	60	60	60	R2	85
Test Current (A)	0.800	0.972	0.356	R3	94
Power Factor	0.9967	0.9979	0.9508	R4	72
Test Power (W)	95.63	96.99	93.70	R5	73
THD A%	5.48	5.23	14.61	R6	79
Luminous Efficacy (lm/W)	130.6	128.7	133.5	R7	81
Total Luminous Flux (lm)	12490.0	12483.0	12509.0	R8	52
Color Rendering Index (CRI)	76.2			R9	-24
R9	-24			R10	65
Correlated Color Temperature (CCT) (K)	3893			R11	69
Chromaticity (Chroma x, Chroma y)	(0.3859, 0.3819)			R12	51
Chromaticity (Chroma u, Chroma v)	(0.2266, 0.3364)			R13	76
Chromaticity (Chroma u', Chroma v')	(0.2266, 0.5046)			R14	97
Duv	0.0008				
Average Beam Angle (°)	131.2				
Center Beam Candle Power (cd)	2250				
Spacing Criteria	2.29 (0°-180°)/ 2.20 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	84.41%				
Zonal Lumens in the 60°-90°Zone	15.59%				
Zonal Lumens in the 90°-120°Zone	0.00%				
Zonal Lumens in the 120°-180°Zone	0.00%				

Table 2: Test data per Goniophotometer Method

Note: According to CIE 1976 (u',v') diagram,  $u' = u = 4x/(-2x+12y+3)$ ,  $v' = 3v/2 = 9y/(-2x+12y+3)$ .

### Spectral Power Distribution

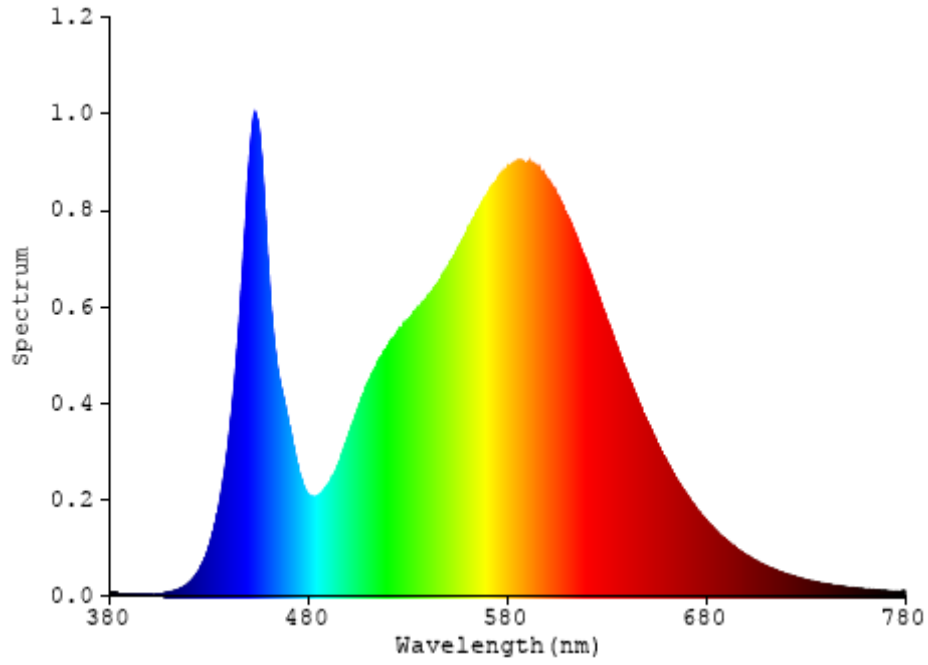


Chart 1: Spectral Power Distribution

**IESNA Luminaire Flux Distribution Table**

Zone	Lumens	Luminaire %
FL - Front-Low (0-30)	1062.9	8.5
FM - Front-Medium (30-60)	4259.6	34.1
FH - Front-High (60-80)	777.4	6.2
FVH - Front-Very High (80-90)	29.1	0.2
Total Forward Light	6129.0	49.0

BL - Back-Low (0-30)	1016.9	8.1
BM - Back-Medium (30-60)	4203.6	33.7
BH - Back-High (60-80)	1081.2	8.7
BVH - Back-Very High (80-90)	58.8	0.5
Total Back Light	6360.5	51.0

UL - Uplight-Low (90-100)	0	0
UH - Uplight-High (100-180)	0	0
Total Up Light	0	0

BUG (Back, Up, Glare) Rating	B3-U0-G1
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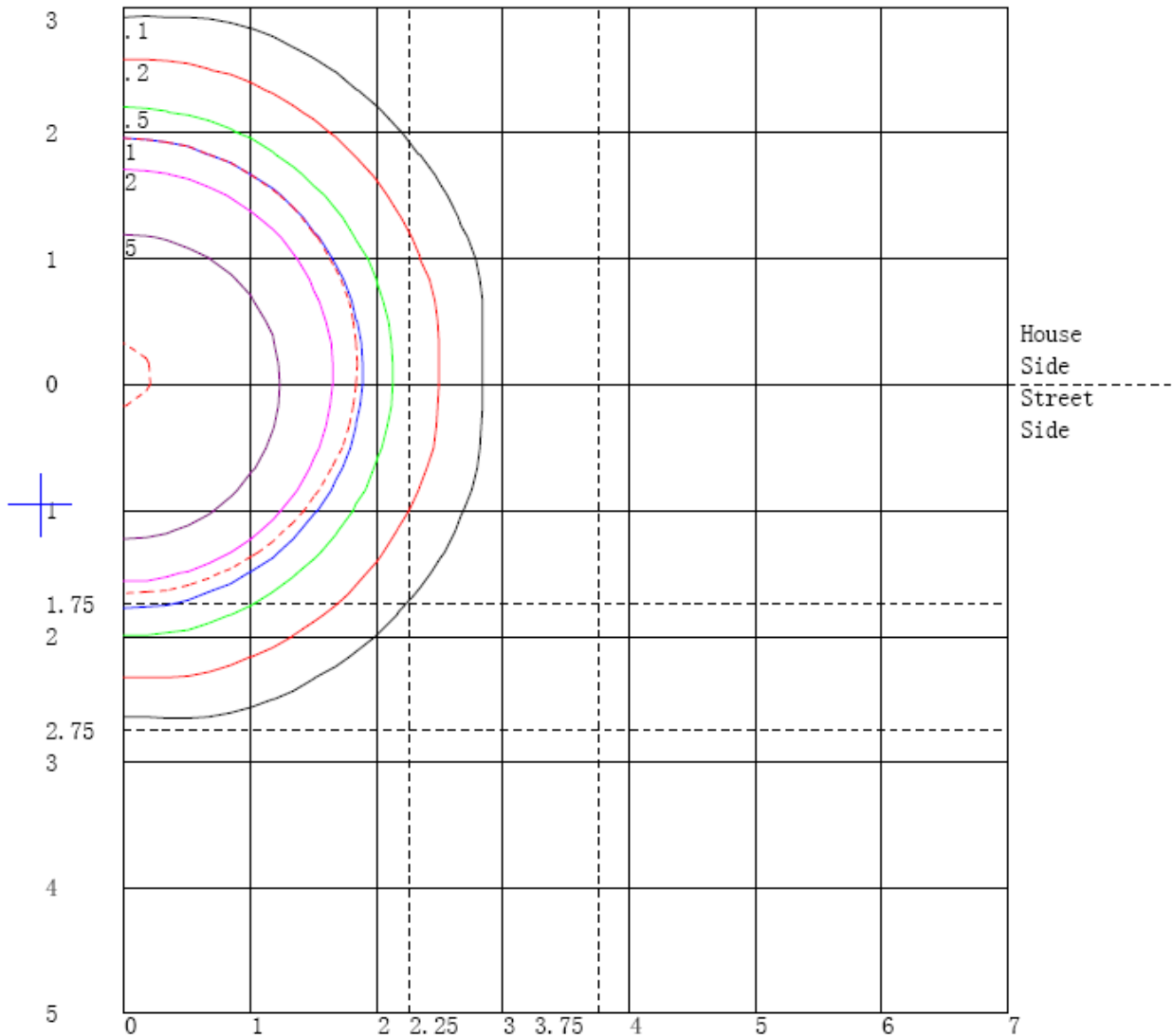
Table 3: Flux Distribution Data

Zone	Downward Lumens	Upward Lumens	Total Lumens
House Side	6360.5	0	6360.5
Street Side	6129.0	0	6129.0

Table 4: Flux Distribution Table

Note: The Flux in this table might be a little different from the total flux in Table 2 due to rounding.

### Isoilluminance Plots of Horizontal Illuminance



Distance In Units Of Mounting Height  
 Values Based On 15 Foot Mounting Height  
 1/2 Maximum Candela Trace Shown As Dashed Curve  
 (+) = Maximum Candela Point

Chart 2: Illuminance Plot (Footcandles)

### Luminous Intensity Distribution Plots

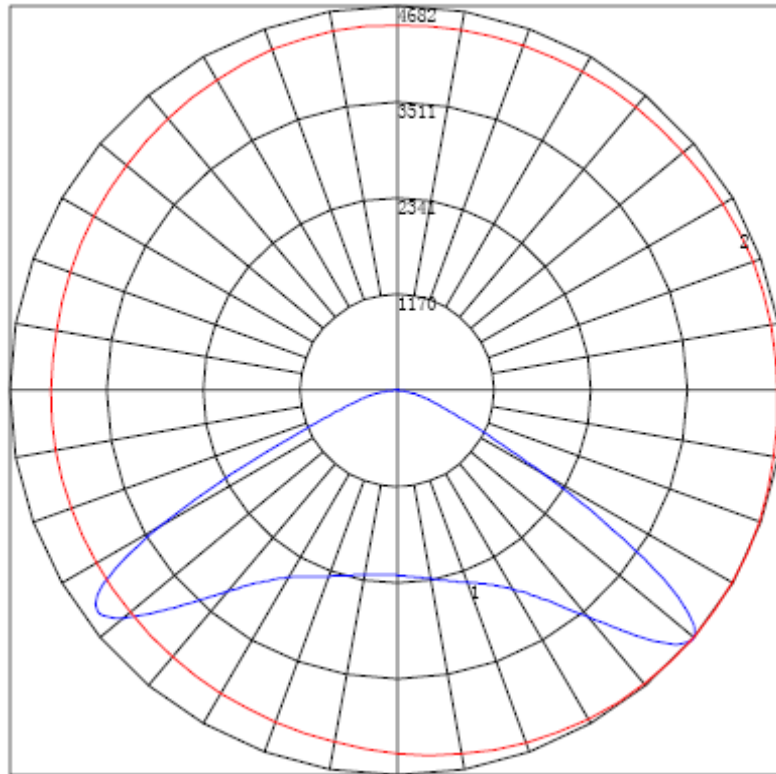


Chart 3: Maximum Plane and Cone Plots of Candela

Maximum Candela = 4681.9 Located At Horizontal Angle = 325, Vertical Angle = 49.5

# 1 - Vertical Plane Through Horizontal Angles (325 - 145) (Through Max. Cd.)

# 2 - Horizontal Cone Through Vertical Angle (49.5) (Through Max. Cd.)

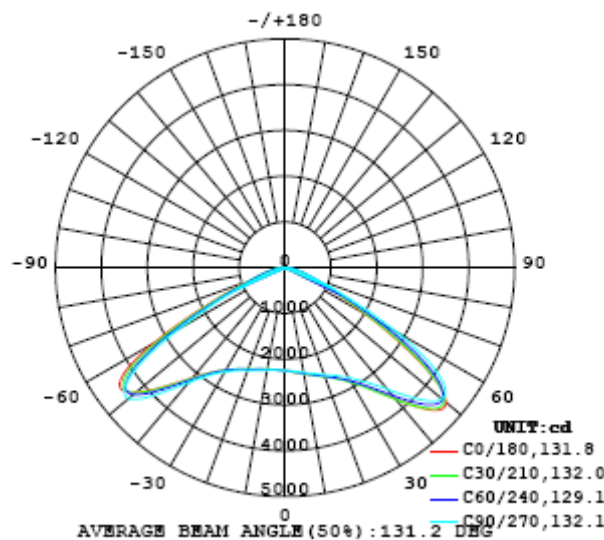


Chart 4: Polar Candela Distribution



**Luminous Intensity Data**

Table--1 UNIT: cd

C (DEG) y (DEG)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
0	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250
5	2289	2290	2290	2290	2291	2291	2291	2290	2290	2288	2288	2286	2285	2282	2282	2280	2278	2275	2273
10	2348	2350	2351	2352	2352	2353	2353	2353	2351	2350	2348	2346	2344	2341	2339	2335	2332	2327	2323
15	2425	2428	2430	2431	2432	2433	2434	2433	2432	2431	2428	2426	2423	2419	2415	2411	2406	2400	2395
20	2526	2529	2531	2534	2535	2537	2538	2537	2536	2533	2532	2527	2523	2518	2513	2506	2500	2492	2486
25	2658	2664	2667	2671	2675	2677	2677	2676	2673	2671	2667	2661	2656	2648	2641	2631	2622	2610	2601
30	2870	2878	2882	2888	2895	2897	2896	2894	2889	2883	2875	2866	2857	2847	2835	2822	2806	2790	2776
35	3215	3223	3230	3237	3242	3244	3242	3236	3227	3217	3205	3189	3173	3158	3138	3116	3093	3070	3048
40	3740	3749	3754	3761	3765	3760	3753	3740	3724	3709	3688	3667	3642	3619	3593	3565	3535	3501	3471
45	4374	4375	4374	4376	4370	4356	4339	4320	4296	4275	4254	4232	4209	4183	4159	4134	4106	4075	4045
50	4580	4567	4560	4562	4554	4542	4528	4510	4498	4486	4483	4479	4474	4468	4467	4465	4463	4459	4461
55	3588	3589	3599	3620	3637	3651	3665	3683	3708	3742	3776	3813	3848	3885	3923	3963	4005	4047	4096
60	2012	2024	2038	2056	2078	2099	2125	2157	2197	2243	2293	2346	2405	2464	2523	2587	2649	2715	2781
65	972	980	992	1007	1026	1036	1049	1064	1083	1107	1129	1152	1181	1210	1241	1271	1305	1338	1374
70	447	462	498	543	559	574	584	596	611	628	631	645	664	664	676	684	673	652	646
75	230	237	253	280	313	334	346	359	365	373	386	401	408	410	405	383	359	348	346
80	95.0	99.6	110	127	149	168	180	176	168	169	180	207	226	233	221	197	182	174	173
85	8.44	10.1	13.6	18.5	25.8	31.6	36.1	38.1	38.9	41.9	48.0	57.8	67.0	73.9	79.4	78.6	74.0	68.0	66.2
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5: Luminous Intensity Data

Table--2 UNIT: cd

C (DEG) y (DEG)	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185
0	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250
5	2271	2269	2267	2264	2262	2261	2256	2256	2253	2251	2249	2247	2245	2243	2242	2240	2240	2238	2238
10	2320	2315	2311	2307	2303	2299	2295	2291	2286	2282	2279	2276	2272	2268	2266	2262	2260	2259	2257
15	2389	2383	2377	2371	2366	2360	2353	2349	2343	2337	2333	2328	2321	2316	2313	2309	2305	2303	2302
20	2478	2470	2464	2456	2450	2441	2433	2428	2421	2412	2407	2401	2394	2387	2381	2376	2372	2369	2367
25	2590	2579	2570	2560	2551	2540	2530	2522	2512	2503	2496	2488	2480	2474	2467	2461	2457	2453	2451
30	2761	2746	2732	2718	2706	2691	2675	2662	2650	2638	2629	2621	2611	2602	2594	2588	2584	2580	2579
35	3026	3005	2986	2967	2948	2928	2909	2893	2878	2861	2848	2837	2825	2814	2806	2798	2794	2792	2791
40	3439	3410	3382	3355	3328	3300	3275	3256	3235	3215	3198	3184	3170	3159	3149	3142	3138	3139	3141
45	4013	3981	3949	3913	3876	3841	3808	3781	3756	3731	3712	3695	3679	3665	3659	3651	3650	3653	3656
50	4462	4464	4459	4447	4428	4405	4380	4361	4340	4321	4306	4293	4274	4258	4249	4241	4239	4240	4243
55	4152	4204	4256	4301	4341	4370	4395	4417	4434	4438	4445	4446	4440	4433	4425	4417	4412	4396	4390
60	2854	2924	2987	3042	3092	3136	3182	3218	3250	3279	3300	3318	3328	3340	3339	3343	3342	3317	3308
65	1411	1449	1481	1510	1536	1559	1583	1605	1623	1639	1656	1667	1679	1690	1697	1705	1708	1700	1694
70	659	708	753	769	779	787	795	803	810	817	824	830	837	842	845	825	784	761	781
75	356	380	412	448	468	478	484	486	488	492	497	500	498	489	463	428	403	397	405
80	181	196	220	250	276	287	292	287	282	293	308	310	306	286	256	231	216	213	217
85	72.6	84.0	96.1	111	122	127	119	110	108	114	127	146	151	139	121	107	94.2	89.7	94.8
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 6: Luminous Intensity Data

Table--3 UNIT: cd

C (DEG) y (DEG)	190	195	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280
0	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250
5	2236	2235	2235	2235	2235	2235	2235	2236	2237	2238	2240	2241	2243	2245	2247	2248	2251	2254	2255
10	2255	2253	2252	2252	2251	2250	2251	2251	2253	2254	2257	2259	2262	2265	2269	2273	2278	2282	2287
15	2298	2297	2295	2295	2294	2294	2294	2294	2295	2296	2298	2302	2305	2309	2314	2319	2325	2331	2338
20	2364	2362	2361	2361	2361	2359	2360	2360	2361	2362	2364	2366	2370	2373	2380	2385	2393	2401	2409
25	2449	2448	2446	2446	2446	2445	2445	2445	2447	2448	2449	2453	2456	2459	2464	2471	2481	2491	2503
30	2577	2576	2576	2579	2580	2578	2581	2583	2585	2587	2590	2593	2597	2601	2607	2614	2627	2641	2657
35	2791	2791	2793	2799	2801	2804	2808	2811	2815	2819	2823	2829	2832	2836	2844	2854	2870	2888	2911
40	3142	3144	3148	3155	3161	3166	3173	3180	3187	3195	3203	3210	3219	3225	3239	3256	3279	3306	3336
45	3658	3666	3671	3678	3688	3695	3705	3714	3730	3742	3757	3772	3789	3813	3833	3861	3892	3933	3968
50	4243	4245	4244	4251	4253	4251	4255	4262	4272	4278	4302	4320	4337	4359	4379	4409	4446	4482	4521
55	4378	4367	4349	4321	4298	4262	4247	4224	4204	4180	4169	4150	4136	4122	4106	4095	4098	4095	4095
60	3284	3264	3225	3187	3141	3106	3053	3018	2978	2943	2908	2872	2835	2794	2757	2708	2673	2629	2574
65	1685	1669	1644	1645	1621	1593	1564	1541	1522	1495	1457	1439	1410	1380	1334	1310	1279	1231	1205
70	823	845	841	832	825	816	805	791	777	764	751	736	719	687	628	582	562	568	596
75	428	464	494	504	505	501	493	488	480	473	462	445	416	372	338	315	304	306	315
80	230	255	286	307	310	300	272	259	259	271	270	255	224	193	170	155	148	150	157
85	106	118	130	134	128	113	99.2	92.9	93.3	97.8	98.0	93.1	85.1	74.1	63.1	53.3	47.5	49.7	54.4
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 7: Luminous Intensity Data

Table--4 UNIT: cd

C (DEG) y (DEG)	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355				
0	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250				
5	2259	2261	2265	2267	2269	2272	2274	2275	2279	2281	2282	2284	2286	2285	2288				
10	2292	2297	2303	2308	2311	2317	2321	2325	2329	2332	2335	2339	2341	2343	2346				
15	2347	2353	2361	2368	2374	2382	2388	2393	2399	2404	2408	2412	2415	2419	2422				
20	2420	2429	2439	2448	2456	2464	2473	2481	2488	2495	2501	2507	2512	2516	2521				
25	2517	2529	2542	2552	2563	2575	2585	2595	2607	2617	2625	2634	2641	2646	2654				
30	2674	2690	2705	2719	2734	2749	2766	2780	2795	2810	2824	2834	2845	2853	2863				
35	2935	2957	2979	3000	3023	3046	3068	3088	3109	3129	3146	3163	3181	3191	3203				
40	3366	3393	3426	3455	3488	3521	3549	3580	3609	3636	3655	3679	3699	3714	3730				
45	4009	4041	4078	4118	4154	4188	4218	4253	4284	4304	4326	4343	4357	4364	4368				
50	4558	4584	4612	4636	4656	4667	4676	4680	4680	4675	4662	4650	4627	4609	4589				
55	4092	4077	4060	4031	3989	3948	3899	3847	3790	3744	3697	3662	3627	3602	3590				
60	2514	2455	2396	2334	2270	2217	2169	2127	2087	2059	2032	2019	2008	2006	2002				
65	1171	1142	1114	1087	1064	1047	1028	1015	1003	994	992	987	972	970	969				
70	617	616	608	600	591	582	575	565	557	550	544	538	519	484	456				
75	339	361	370	369	362	349	342	337	331	324	315	295	267	246	236				
80	172	190	196	190	171	153	143	144	155	159	151	135	118	105	98.6				
85	56.0	54.6	49.3	43.5	37.2	30.5	26.6	25.2	24.7	23.9	20.3	18.7	16.4	14.8	10.6				
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				

Table 8: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	PF2010A	HZTE028-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-08	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	WY12010	HZTE004-03	Jul. 27, 2016	Jul. 26, 2017
Temperature Meter	TES1310	HZTE017-01	Jul. 27, 2016	Jul. 26, 2017
Standard Source	D908	HZTE012-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	SCL-1400	HZTE012-02	Jul. 27, 2016	Jul. 26, 2017

Table 9: Test Equipment List

## TEST METHODS

### Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

### Goniophotometer Method

#### Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.

Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.

Some graphics were created with Photometric Plus software.

The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.

The uncertainty of goniophotometer system reported in this document is expanded uncertainty is 1.8% with a coverage factor  $k=2$ .

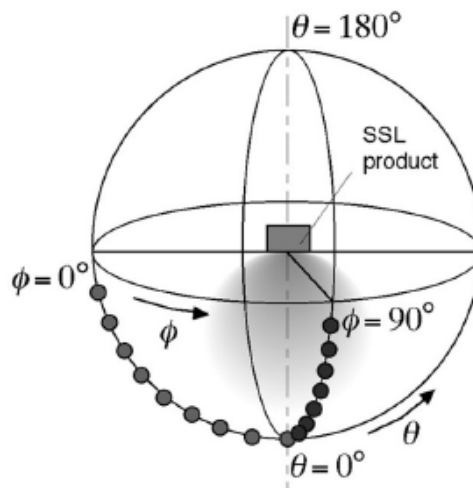
## Color Characteristics Measurements

The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

## Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ( $C=0^\circ/180^\circ$  and  $C=90^\circ/270^\circ$ ) and at  $10^\circ$  or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate was calculated from these points. The data was then analyzed to check for delta color differences of the  $u'$ ,  $v'$  chromaticity coordinates. The spatial non-uniformity of chromaticity,  $\Delta u'v'$ , is determined as the maximum deviation (distance on the CIE ( $u'$ ,  $v'$ ) diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



\*\*\* End of Report \*\*\*

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