Photometric Test Report

Relevant Standards

☑ IES LM-79-2008
☑ ANSI C82.77-10-2014
☑ UL1598-2008

Prepared For

Beyond LED Technology

Test Laboratory: UL Verification Services (Guangzhou) Co., Ltd.

Catalog Number
ZPS-MB421-120W.V1-T1-E11-P3

Project Number
4790039592
Report Number
4790039592-4a

Test Date
12/28/2021
Issue Date
4/14/2022
Revision Date
N/A

Prepared By	Approved By
Becky Fan	Susie Shao

1.0 Test List

Sample Received Date: 2021-12-17

Test No.	Test Item	Sample ID	Model Number	Test Conducted By
1	Integrating Sphere Test	**4588611**	**ZPS-MB421-120W.V1-T1-E11-P3**	**Lily Chen**
2	Goniophotometer Test	**4588611**	**ZPS-MB421-120W.V1-T1-E11-P3**	**Lily Chen**
3	THD and PF Test	**4588611**	**ZPS-MB421-120W.V1-T1-E11-P3**	**Lily Chen**
4	In-Situ Temperature Measurement Test	**4588611**	**ZPS-MB421-120W.V1-T1-E11-P3**	**Lily Chen**

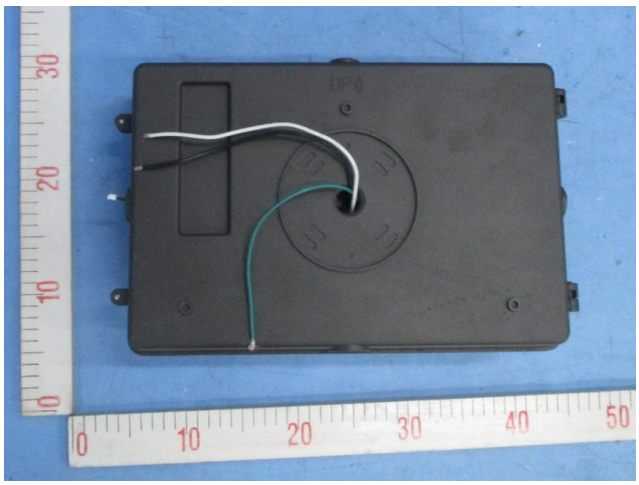
Remark (if any)

[X] 1. UL test equipment information is recorded on Meter Use in UL's Aurora database.
[X] 2. At the temperature measurement point of LED is referred to the LM-80 test report, which is provided by the customer.
[X] 3. At the temperature measurement point for the hottest location on the driver case is provided by the driver manufacturer or the customer.

2.0 Product Description

Luminaire Description: Outdoor Non-Cutoff and Semi-Cutoff Wall-Mounted Area Luminaires
Model Number: ZPS-MB421-120W.V1-T1-E11-P3
Electrical Ratings and CCT: 120-277 Vac, 50/60 Hz, 120 W max, 3000K/4000K/5000K
Driver Model Number: BQE108-1050-107-PVF-PS
LED Package: L128-xx80RC3500xxx
Family Model and Variation: ZPS-MB421-120W.V1-T1-E11-P3 (Blank means without photocontrol switch; P3 means with photocontrol switch.)

Photos of Luminaire Characteristics



3.0 LM-79 Measurement and Test Results

3.1 Integrating Sphere Test for 3000K

Model No.	ZPS-MB421-120W.V1-T1-E11-P3	Sample ID.	4588611
Operate time (Min.)	55	Stabilization time (Min.)	50

Test Method

1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.The reference standard lamp is power 100W omni-directional Incandescent lamp and was calibrated by National Institute of Metrology, China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%.Photometric measurement conditions was using 4π geometry.The self-absorption factor is applied in the final test result.The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 5 nm intervals over the range of 380 to 780 nm.

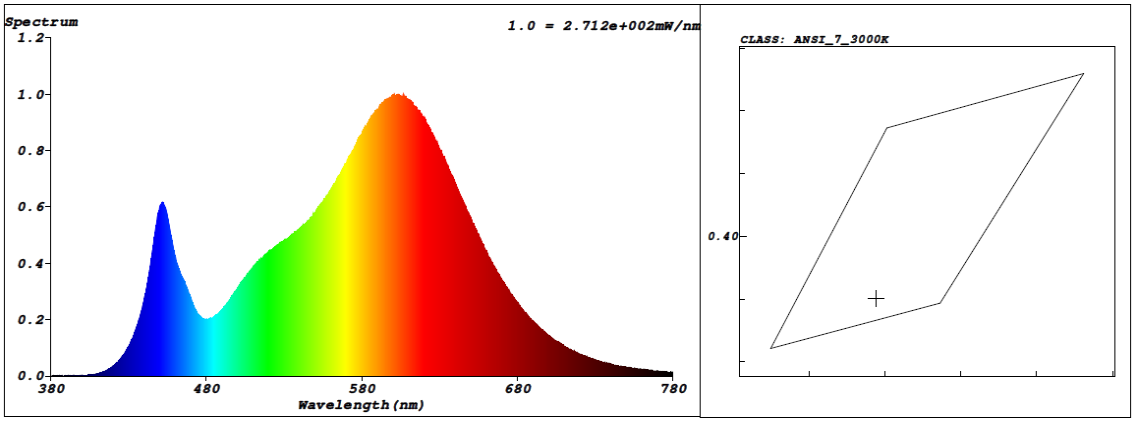
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.3	119.9	60	0.969	115.5	0.9935	straight down

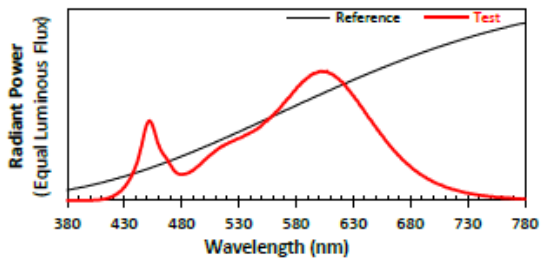
Test Results

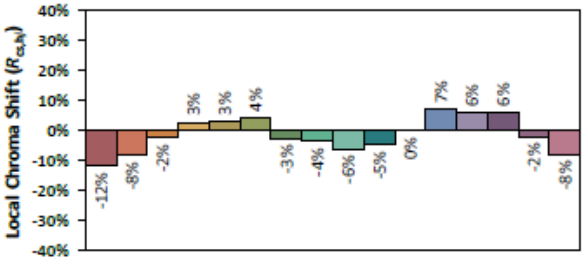
CCT (K)	CRI (Ra)	R9	Rf	Rg	Luminous Flux (lm)	Luminous Efficacy (lm/W)
3021	82	7	84	97	13241.64	114.65

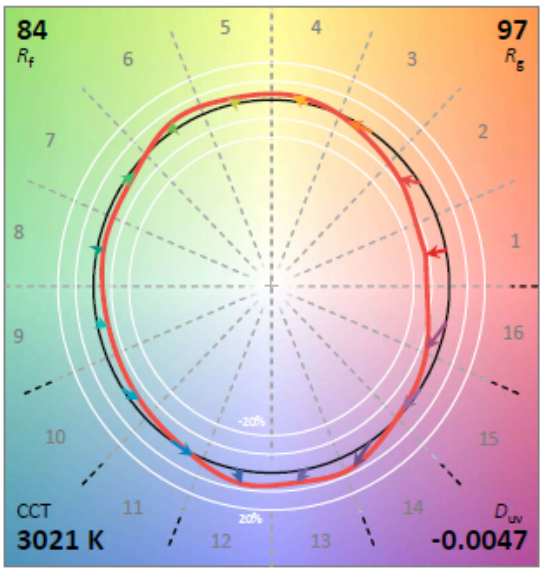
Spectrum

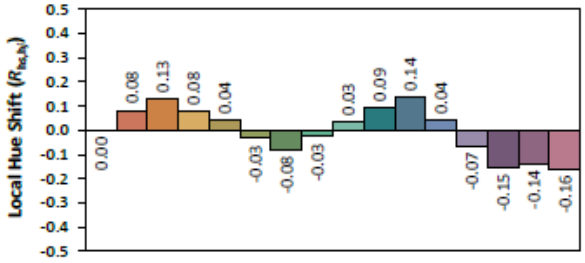


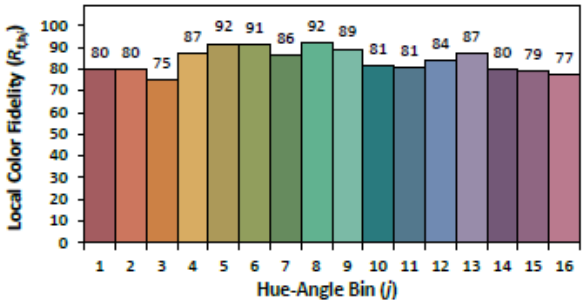
ANSI/IES TM-30-18 Color Rendition Report

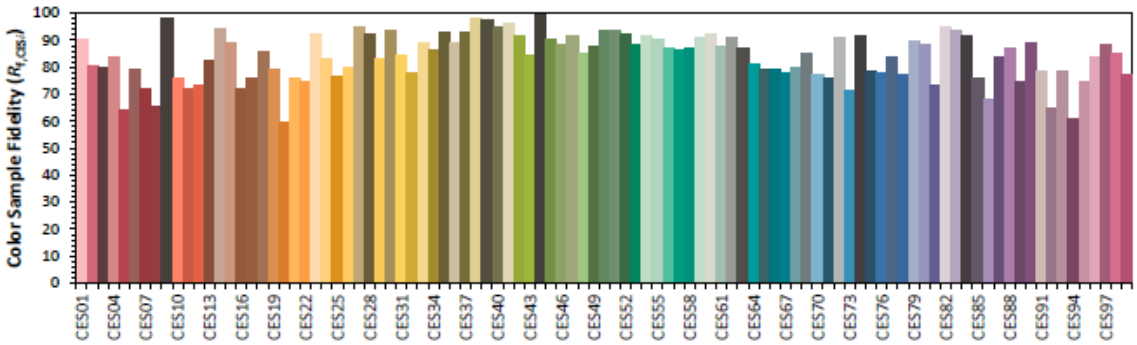












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.4289
y	0.3899
u'	0.2515
v'	0.5144

CIE 13.3-1995 (CRI)

R_a	82
R_9	7

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

3.0 LM-79 Measurement and Test Results

3.1 Integrating Sphere Test for 4000K

Model No.	ZPS-MB421-120W.V1-T1-E11-P3	Sample ID.	4588611
Operate time (Min.)	55	Stabilization time (Min.)	50

Test Method

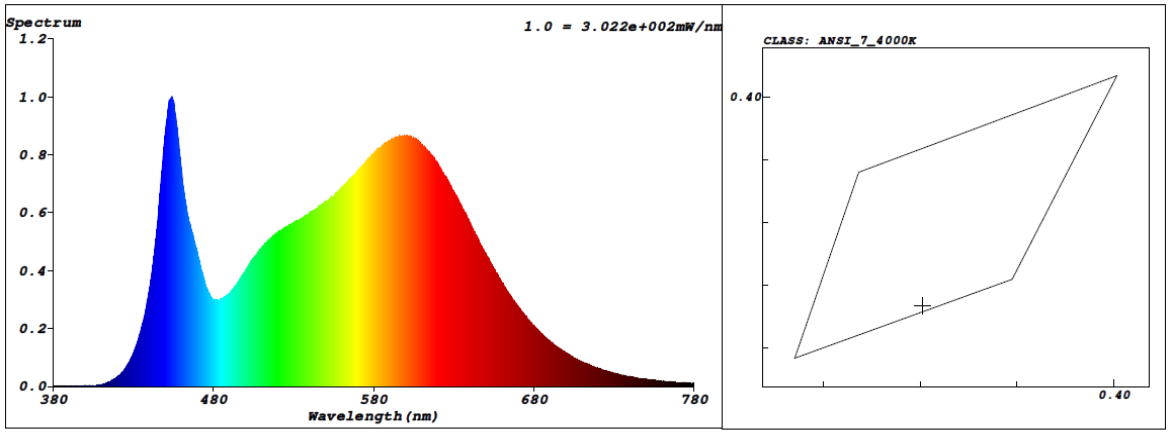
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.The reference standard lamp is power 100W omni-directional Incandescent lamp and was calibrated by National Institute of Metrology, China..
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%.Photometric measurement conditions was using 4π geometry.The self-absorption factor is applied in the final test result.The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 5 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

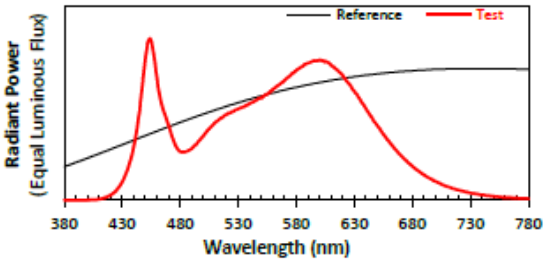
Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.3	120	60	0.935	111.4	0.9928	straight down

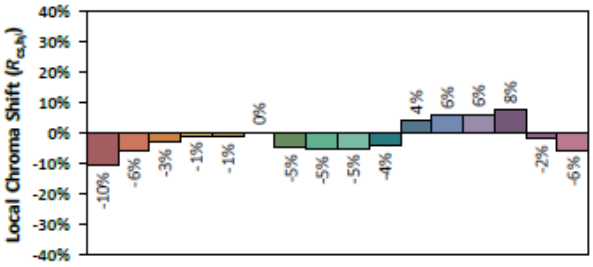
Test Results

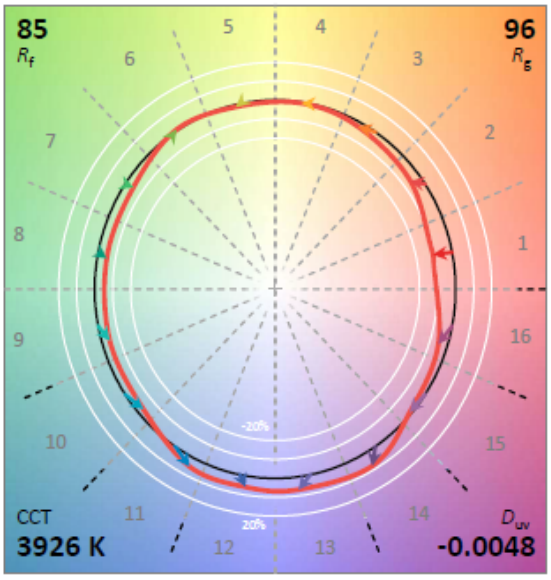
CCT (K)	CRI (Ra)	R9	Rf	Rg	Luminous Flux (lm)	Luminous Efficacy (lm/W)
3926	86	23	85	96	14501	130.17

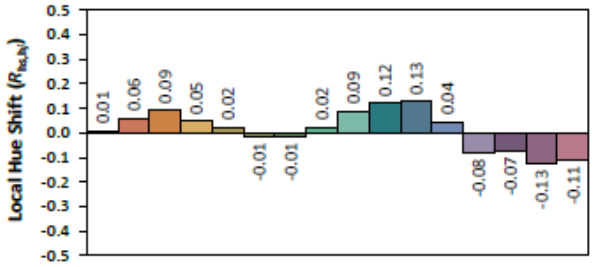


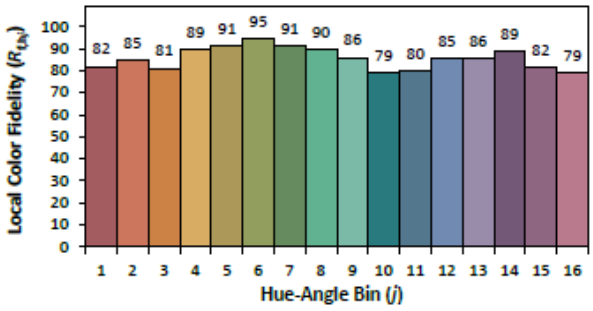
ANSI/IES TM-30-18 Color Rendition Report

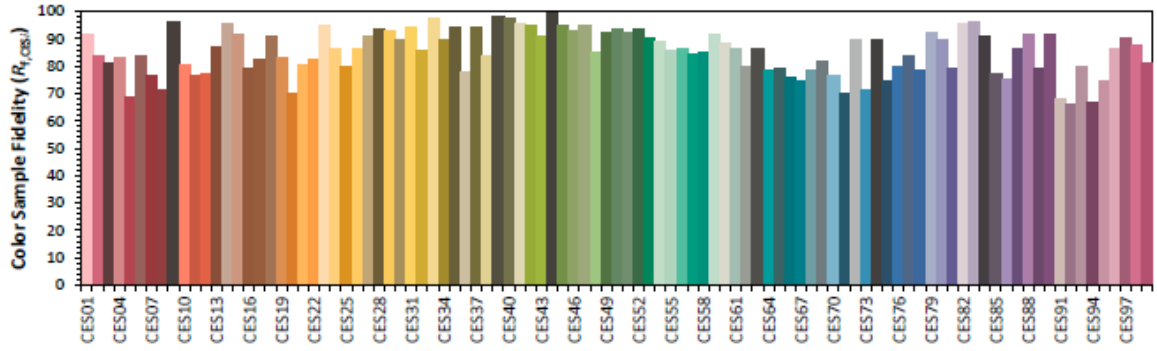












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3802
y	0.3665
u'	0.2292
v'	0.4969

CIE 13.3-1995 (CRI)

R_a	86
R_9	23

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

3.0 LM-79 Measurement and Test Results

3.1 Integrating Sphere Test for 5000K

Model No.	ZPS-MB421-120W.V1-T1-E11-P3	Sample ID.	4588611
Operate time (Min.)	55	Stabilization time (Min.)	50

Test Method

1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.The reference standard lamp is power 100W omni-directional Incandescent lamp and was calibrated by National Institute of Metrology, China..
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%.Photometric measurement conditions was using 4π geometry.The self-absorption factor is applied in the final test result.The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 5 nm intervals over the range of 380 to 780 nm.

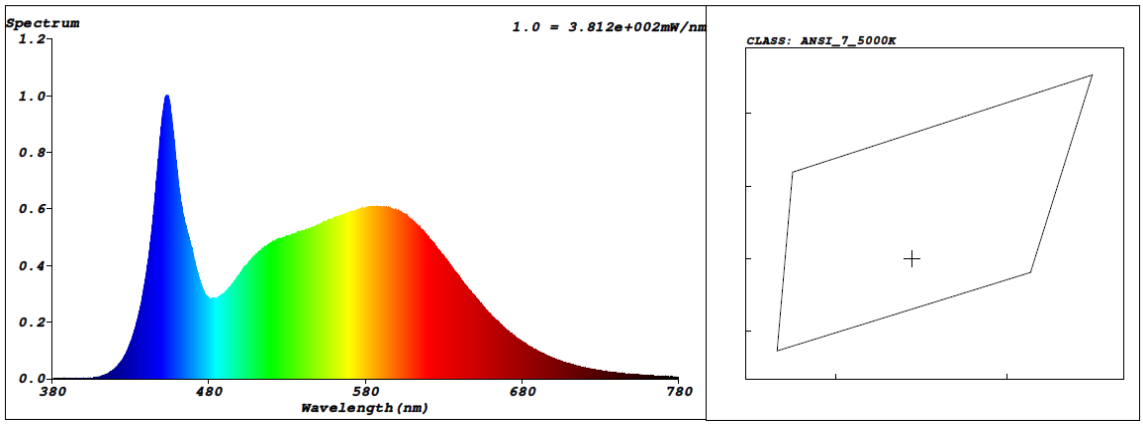
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.3	120	60	0.976	116.3	0.9932	straight down

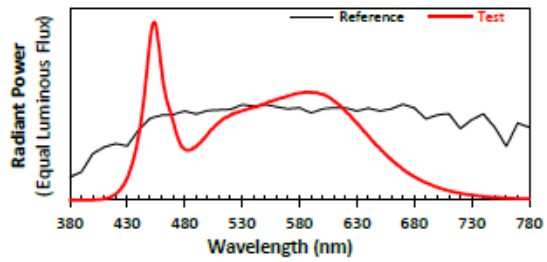
Test Results

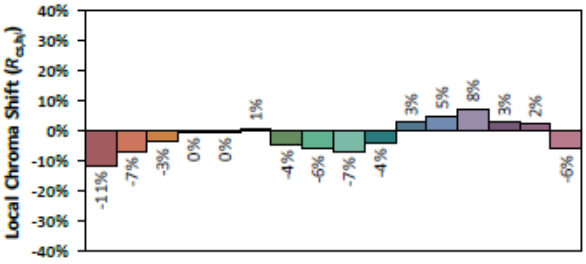
CCT (K)	CRI (Ra)	R9	Rf	Rg	Luminous Flux (lm)	Luminous Efficacy (lm/W)
5021	86	17	85	96	14505	124.72

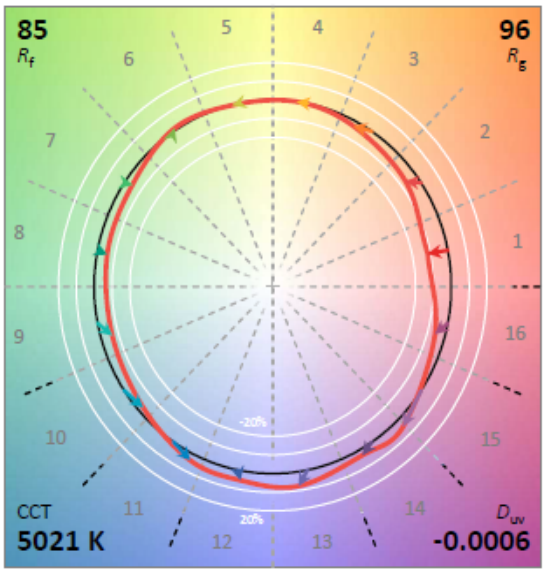
Spectrum

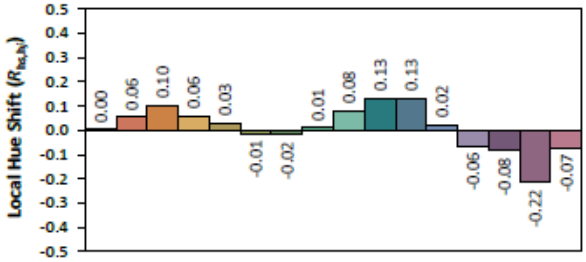


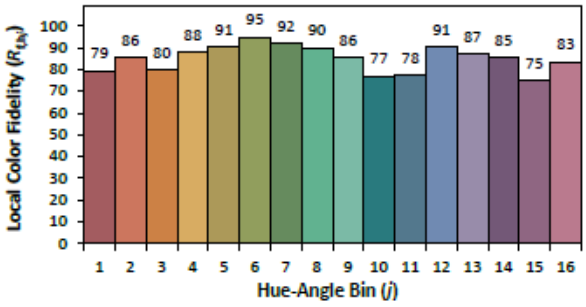
ANSI/IES TM-30-18 Color Rendition Report

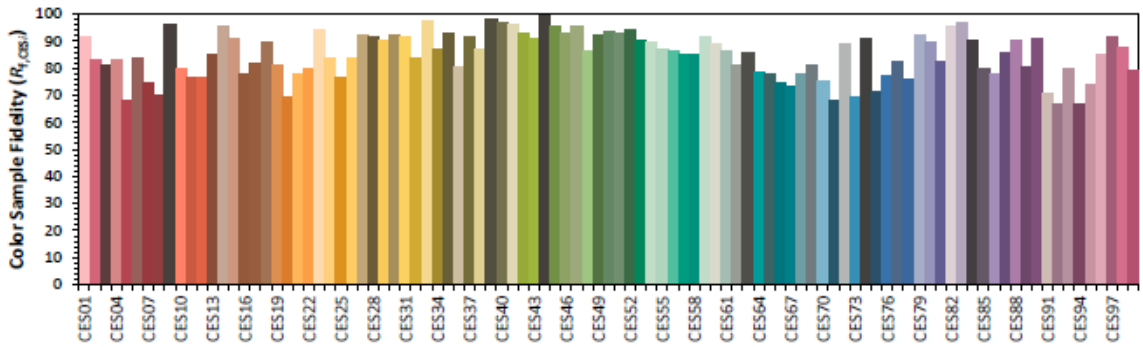












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3444
y	0.3498
u'	0.2116
v'	0.4837

CIE 13.3-1995 (CRI)

R_a	86
R_9	17

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

3.0 LM-79 Measurement and Test Results

3.2 Goniophotometer Test - 3000K

Model No.	ZPS-MB421-120W.V1-T1-E11-P3	Sample ID.	4588611
Operate time (Min.)	60	Stabilization time (Min.)	50

Test Method

1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric paramters were measured using a type C goniophotometer and software.
3.The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. The reference standard lamp is power 1000W omni-directional Incandescent lamp and was calibrated by National Institute of Metrology, China.
4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.01	60	0.981	116.95	0.9935	straight down

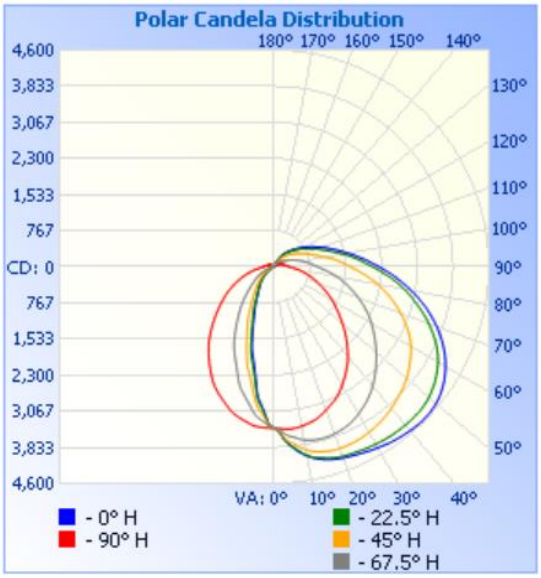
Test Result

Zone Light Distribution (ZLD)		Beam Angle (50%)		Flux (lm)	Luminous Efficacy (lm/W)	0~90° Zone Luminous Efficacy (lm/W)
0~90°	80°~90°	Horizontal Spread	Vertical Spread			
85.3%	7.4%	106.2	100.1	13328.6	113.97	97.22

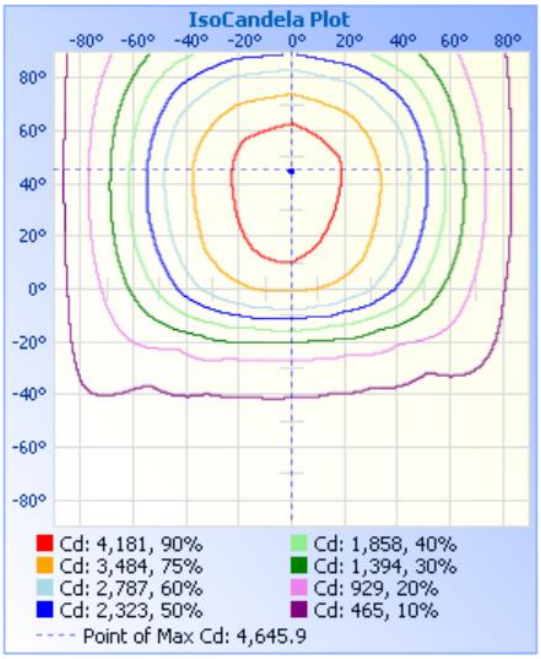
BUG Ratings		
Backlight	Uplight	Glare
B2	U5	G5

3.2 Goniophotometer Test (Cont'd)

Light Distribution Curve



IsoCandela Plot



3.2 Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	2,529.5	19%
0-40	4,092.0	30.7%
0-60	7,501.7	56.3%
60-90	3,868.4	29%
70-100	3,003.3	22.5%
90-120	1,528.7	11.5%
0-90	11,370.1	85.3%
90-180	1,958.5	14.7%
0-180	13,328.6	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	328.7	2.5%	90-100	707.4	5.3%
10-20	899.1	6.7%	100-110	490.8	3.7%
20-30	1,301.7	9.8%	110-120	330.4	2.5%
30-40	1,562.5	11.7%	120-130	212.0	1.6%
40-50	1,702.5	12.8%	130-140	126.9	1%
50-60	1,707.2	12.8%	140-150	63.6	0.5%
60-70	1,572.5	11.8%	150-160	21.6	0.2%
70-80	1,306.9	9.8%	160-170	4.6	0%
80-90	989.1	7.4%	170-180	1.2	0%

3.2 Goniophotometer Test (Cont'd)

Intensity Data(cd)

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	3488	3488	3488	3488	3488	3488	3488	3488	3488	3488	3488	3488	3488	3488	3488	3488	3488
1	3518	3549	3535	3519	3503	3486	3476	3463	3447	3457	3461	3472	3495	3485	3489	3495	3496
2	3602	3577	3558	3529	3503	3476	3454	3434	3416	3427	3442	3461	3492	3495	3510	3524	3527
3	3712	3714	3667	3591	3513	3436	3368	3311	3277	3299	3346	3409	3492	3548	3609	3654	3670
4	3795	3812	3752	3643	3522	3402	3283	3193	3146	3178	3251	3361	3489	3587	3687	3748	3773
5	3868	3881	3804	3676	3523	3369	3216	3095	3037	3077	3178	3324	3486	3618	3736	3816	3843
6	3941	3928	3844	3701	3525	3340	3157	3019	2950	3000	3115	3290	3480	3638	3772	3860	3890
7	4006	3974	3880	3725	3520	3307	3097	2936	2865	2914	3051	3255	3474	3655	3805	3895	3934
8	4060	4037	3934	3755	3518	3256	3000	2809	2719	2784	2951	3198	3459	3674	3844	3953	3994
9	4111	4099	3984	3786	3510	3197	2883	2638	2529	2609	2830	3124	3437	3692	3888	4014	4062
10	4157	4148	4024	3806	3499	3138	2775	2488	2381	2461	2715	3055	3420	3706	3921	4058	4109
11	4201	4186	4059	3824	3486	3081	2663	2362	2250	2333	2596	2989	3396	3714	3950	4094	4151
12	4235	4218	4084	3835	3475	3028	2563	2255	2137	2224	2489	2929	3375	3719	3969	4122	4182
13	4264	4241	4106	3845	3460	2981	2474	2158	2041	2128	2400	2871	3356	3722	3986	4143	4207
14	4295	4262	4122	3853	3447	2933	2400	2076	1957	2044	2324	2818	3335	3723	4000	4162	4229
15	4319	4284	4137	3858	3431	2884	2324	1996	1874	1961	2250	2767	3314	3722	4008	4180	4249
16	4341	4306	4153	3861	3412	2822	2236	1904	1767	1865	2162	2707	3291	3722	4021	4197	4269
17	4360	4322	4166	3862	3385	2753	2138	1789	1651	1746	2061	2632	3257	3716	4025	4213	4290
18	4375	4340	4176	3861	3359	2680	2038	1671	1540	1627	1958	2550	3218	3708	4033	4228	4310
19	4389	4354	4181	3854	3328	2603	1944	1570	1442	1528	1862	2464	3181	3696	4034	4238	4326
20	4405	4367	4186	3849	3301	2529	1860	1480	1352	1439	1770	2383	3144	3678	4035	4250	4337
25	4460	4398	4177	3791	3160	2225	1491	1122	1004	1080	1392	2058	2965	3593	4011	4276	4391
30	4524	4434	4138	3682	2962	1904	1160	835	748	799	1062	1733	2739	3458	3955	4298	4453
35	4583	4460	4075	3535	2742	1598	896	647	586	616	811	1401	2482	3274	3869	4314	4513
40	4628	4466	3990	3354	2504	1312	708	524	475	497	637	1136	2234	3079	3772	4310	4554
45	4646	4461	3886	3137	2229	1044	557	415	369	388	499	888	1959	2852	3659	4296	4573
50	4613	4410	3772	2910	1960	820	443	317	273	290	387	687	1690	2617	3527	4232	4532
55	4502	4295	3620	2678	1704	648	345	230	190	203	291	530	1446	2385	3364	4108	4422
60	4323	4134	3449	2457	1472	511	260	157	121	131	208	409	1230	2163	3177	3935	4252
65	4081	3895	3220	2215	1239	389	178	90	61	66	130	300	1018	1924	2944	3695	4010
70	3783	3594	2946	1959	1020	283	108	36	18	19	65	203	818	1672	2663	3394	3706
75	3438	3257	2645	1701	826	197	57	14	11	9	29	128	637	1421	2362	3063	3366
80	3059	2911	2332	1447	649	129	38	14	12	9	28	78	475	1180	2059	2723	3011
85	2674	2534	1990	1182	473	85	38	15	12	10	28	67	327	949	1738	2348	2618
90	2295	2155	1672	948	336	78	37	15	12	9	26	61	248	780	1469	2005	2244
95	1961	1841	1422	794	267	73	36	14	12	9	25	57	205	663	1261	1721	1927
100	1666	1559	1175	669	224	69	35	14	12	10	24	52	171	561	1070	1459	1632
105	1414	1294	960	538	190	65	34	15	12	10	22	49	147	477	912	1242	1384
110	1205	1096	809	421	156	62	33	15	13	11	21	46	126	407	784	1066	1186
115	1024	924	678	332	129	58	32	15	13	10	20	42	105	341	666	908	1007
120	863	785	569	264	103	55	30	15	12	10	18	37	86	282	565	773	857
125	726	665	488	204	79	50	28	14	12	9	16	32	69	227	474	652	724
130	606	552	408	189	63	46	27	14	11	9	14	28	54	179	391	548	609
135	502	462	333	172	52	41	26	14	11	9	13	24	42	137	314	452	504
140	408	373	263	133	43	37	24	14	11	9	12	20	32	100	243	364	411
145	320	291	195	97	36	33	22	13	11	9	10	17	25	69	167	281	323
150	234	210	124	66	33	30	21	13	10	9	9	14	19	43	106	187	236
155	153	125	75	43	30	26	19	13	10	8	8	11	14	24	59	96	154
160	48	49	40	28	26	22	18	13	10	8	8	9	11	15	27	39	46
165	10	20	22	22	23	20	17	13	10	8	8	8	9	10	13	15	10
170	9	11	16	19	21	20	18	13	10	9	9	8	8	9	10	9	9
175	9	12	16	19	21	20	18	14	10	9	10	9	9	9	9	9	10
180	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13

4.0 THD and PF Test

Model No.	ZPS-MB421-120W.V1-T1-E11-P3	Sample ID.	4588611

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25° C ± 1° C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from thedigital power meter.

Test Results

CCT Range	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
0%-3000K	120	60	0.981	116.95	0.9935	9.98%
	277	60	0.429	115.92	0.9743	14.82%
50%-4000K	120	60	0.935	111.43	0.9926	10.21%
	277	60	0.411	110.74	0.9722	14.75%
100%-5000K	120	60	0.976	116.37	0.9931	10.32%
	277	60	0.428	115.51	0.9741	14.81%

5.0 In-Situ Temperature Measurement Test

Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008.
2. The testing was conducted in a room with ambient temperature of 25°C ± 5°C. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocpuples were placed on the LED package in the locations indicated by LM-80 report. Thermocpuples were placed on the LED driver case in the locations specified by the manufacture if necessary. The temperature was recorded after the lamp was operated by 3.5 hours in stability or by 7.5 hours.

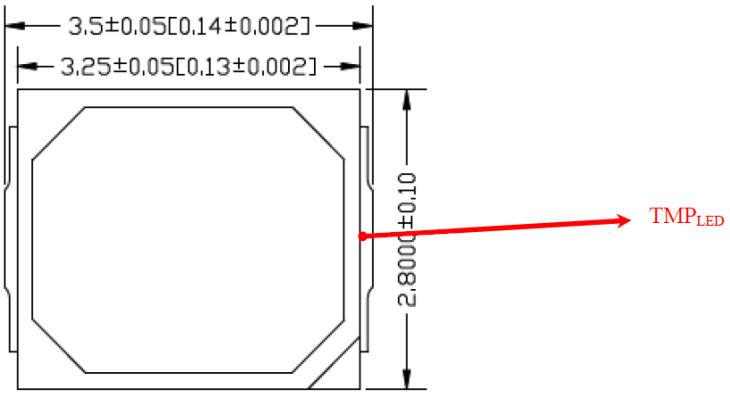
In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
26.5	120	60	0.981	116.95	0.9935	straight down

Test Results(LED)

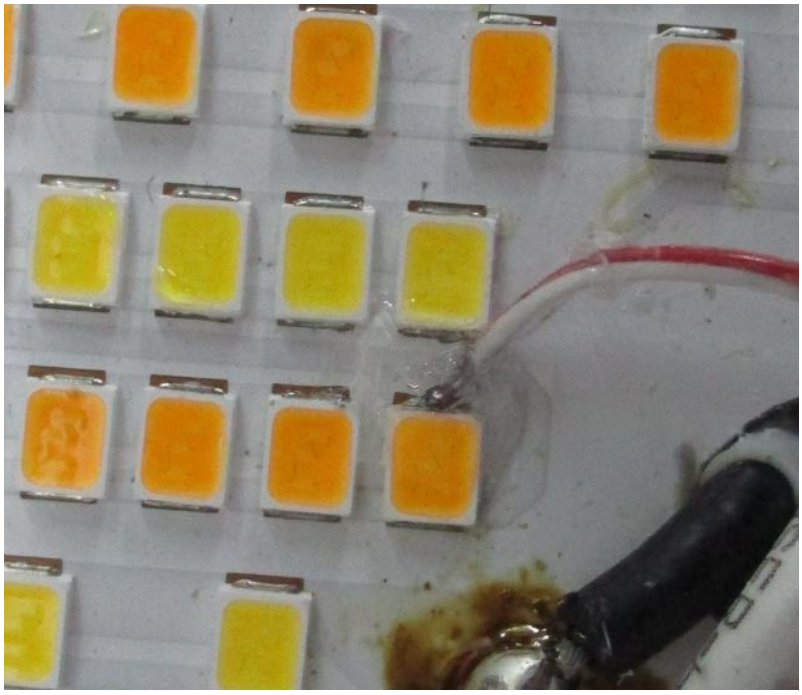
Thermocouple Location	Manufacturer Declared Current (mA)	Temperature for Lighting source (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result (Correct to 25 °C)			
TMP of LEDs	100	84.9	83.4	L128-xx80RC3500xxx	100	105
Ambient temperature	N/A	26.5	25.0			

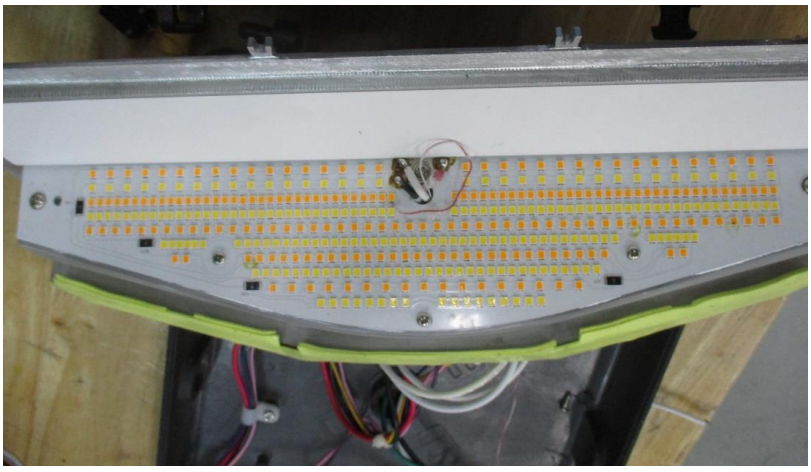
TMP point in LM-80 report



5.0 In-Situ Temperature Measurement Test (Cont'd)

Test Photos for TMP of LED Packages





TESTING
NVLAP LAB CODE 200952-0

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