

Test Report of ANSI/IES LM-79-19

Approved Method for Optical and Electrical Measurements of Solid-State Lighting Products

Report Number..... : N02A23090735L00601

Client..... : Blackjack Lighting LLC

Address..... : 1547 Barclay Blvd Buffalo Grove, IL 60089

Test Model..... : COM-48P-XX- 27U-XXX

Brand Name..... : Blackjack Lighting

Testing Laboratory... : Guangdong Meide Testing Technology Co., Ltd.

Address..... : 1st floor, B Area, Jinbaisheng Industrial Park, Headquarters 2 Road, Songshan
Lake Hi-tech Industrial Development Zone, Dongguan City, Guangdong Pr., China.

Testing Location..... : As above

Date of Receipt..... : Dec. 15, 2023

Date of Test : Dec. 19, 2023 - Dec. 21, 2023

Date of Report..... : Dec. 22, 2023

Tested by:

Jarvis Zhang

Jarvis Zhang/ Test Engineer

Checked by:

Sandy Chen

Sandy Chen/ Project Engineer

Approved by:

Jessie Li

Jessie Li/ Technical Manager

Note 1: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or use in part without prior written consent from Guangdong Meide Testing Technology Co., Ltd. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Note 2: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

1. Product Description for Equipment under Test (EUT)

Representative (Tested) Model: COM-48P-XX- 27U-XXX
Manufacturer: Blackjack Lighting LLC
Address: 1547 Barclay Blvd Buffalo Grove, IL 60089
Product Type: RING PENDANT
Rated Voltage/Frequency: 100-277VAC, 50/60Hz
Rated Power: 60W±10%
Rated Luminous Flux: 3300lm±10%
Nominal CCT: 2700K/3000K/3500K/4000K

2. Standards Used

- ANSI/IES LM-79-19:APPROVED METHOD:OPTICAL AND ELECTRICAL MEASUREMENTS OF SOLID-STATE LIGHTING PRODUCTS
- IES TM-30-18 IES Method for Evaluating Light Source Color Rendition (This Method is not in Nvlap accreditation scope)

3. Test Equipment List

Test Equipment	Serial No.	Model No.	Calibration Due Date
Full-field Speed Goniophotometer	MD-E028	GO-R5000	2024/09/16
Digital Power Meter	MD-E001	PF2010	2024/09/16
AC Testing Power Source	MD-E002	DPS1060	2024/09/16
Total Spectral Radiant Flux Standard Lamp	MD-E007	D908S	2024/09/25
Integrating Sphere System	MD-E029	2M	2024/09/16
High Accuracy Array Spectroradio Meter	MD-E011	HAAS-3000	2024/09/16
Digital Power Meter	MD-E008	PF310	2024/09/16
AC Testing Power Source	MD-E010	DPS1010	2024/09/16
Standard Lamp	MD-E036	D204	2024/09/25

Statement of Traceability: Guangdong Meide Testing Technology Co., Ltd. attested that all calibration has been performed using suitable standards traceable to national primary standards and International System of Unit(SI).

4. Test Method

Requirements of Ambient Condition

Product was tested with no seasoning. All stabilization and measurements were made in compliance with ANSI/IES LM-79-19. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C} \pm 1.2^{\circ}\text{C}$ during measurement. And relative humidity between 10% and 65%.

Goniophotometer System

The sample was tested according to the ANSI/IES LM-79-19.

Photometric parameters were measured using a type C goniophotometer and software. The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, Luminous efficacy, zonal flux 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.

Integrating Sphere System

The sample was tested according to the ANSI/IES LM-79-19.

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 1 nm intervals over the range of 380 to 780 nm.

Fidelity Index (R_f) and Gamut Index (R_g) Calculation

The R_f , R_g was calculated according to IES TM-30-18 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

5. Integrating Sphere Test Results

5.1 Test Data

Test Ambient Temperature (Integrating Sphere Internal Temperature)	25.3℃	Test Orientation	Downward
Operate Time(Min.)	60	Stabilization Time(Min.)	30

Optical and Electrical Measurement Result

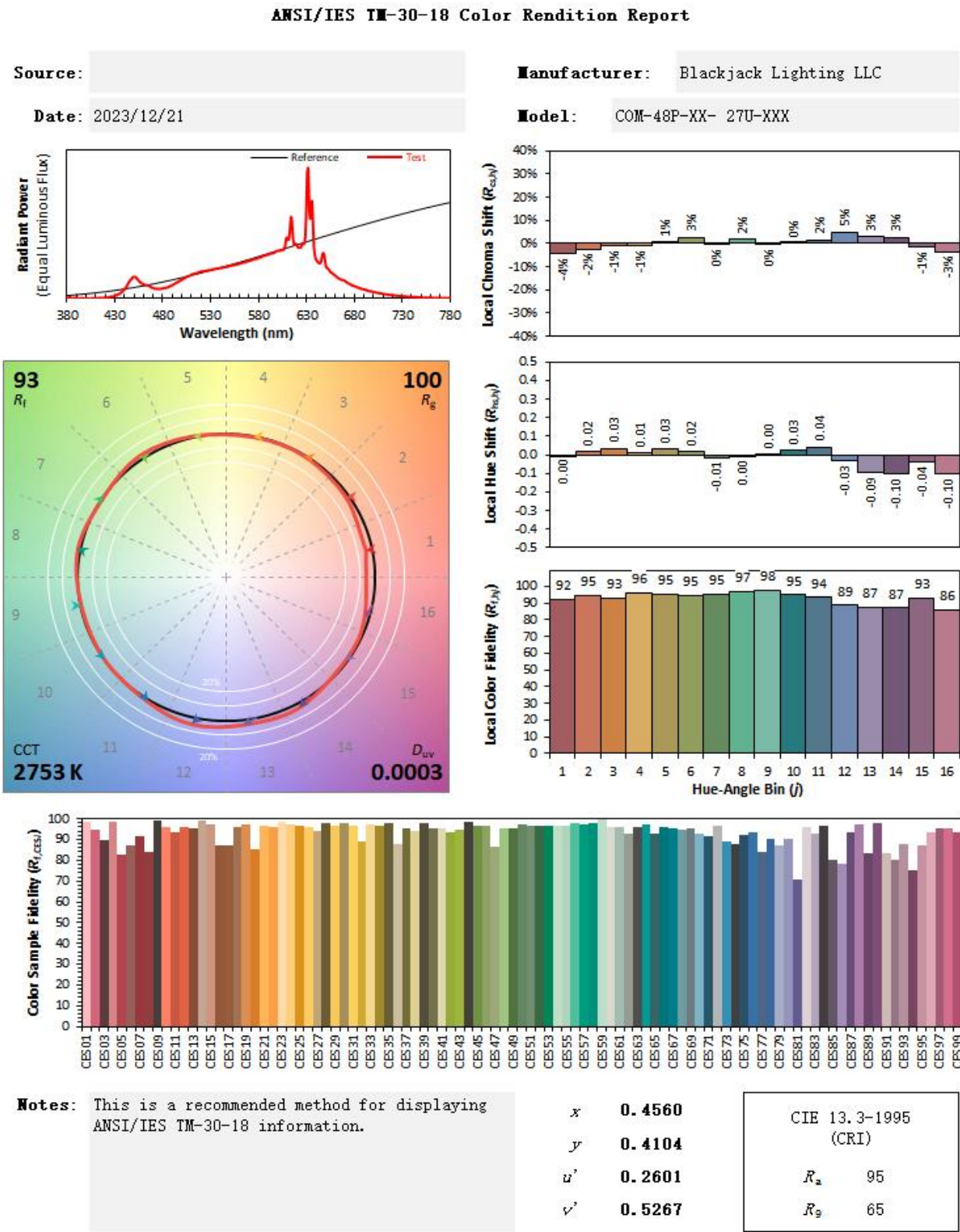
Mode	Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
2700K	120.13	60	0.5131	61.28	0.9929	3346.6	54.61
3000K	120.13	60	0.5048	60.3	0.9933	3412	56.58
3500K	120.13	60	0.5044	60.26	0.9933	3437.6	57.05
4000K	120.13	60	0.5123	61.19	0.9929	3385.7	55.33

Mode	CCT (K)	Ra	R9	x	y	u'	v'	Duv
2700K	2754	95.4	65	0.456	0.4105	0.26	0.5267	3.09E-04
3000K	3020	96.6	74	0.4336	0.3996	0.2503	0.5191	-1.34E-03
3500K	3621	97.2	84	0.3977	0.3842	0.2334	0.5074	-1.15E-03
4000K	4058	97.2	83	0.3785	0.3773	0.2236	0.5015	8.24E-04

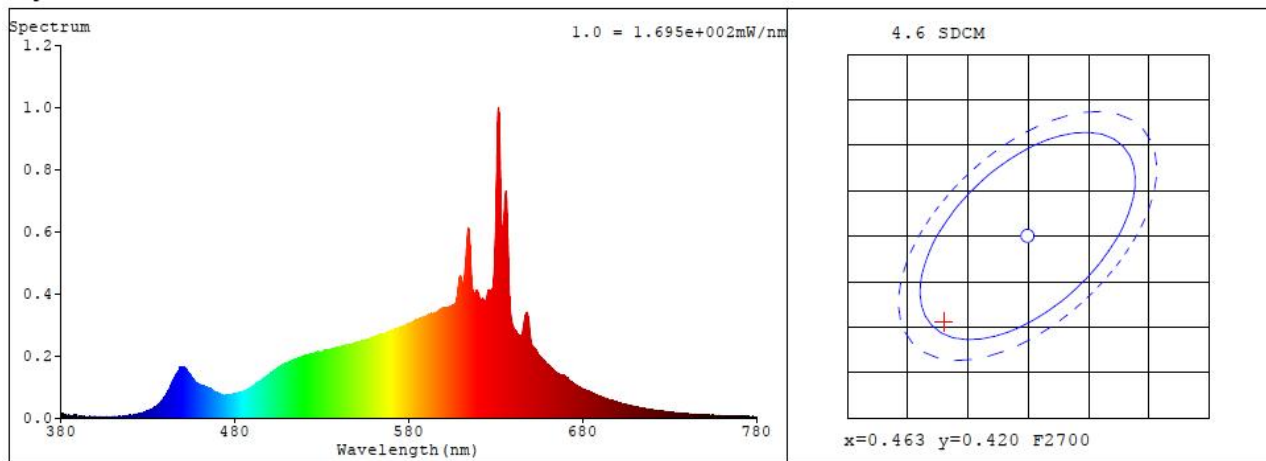
5.2 Color Rendering Index of 2700K Mode

Ra				
95.4				
R1	R2	R3	R4	R5
97	98	98	98	97
R6	R7	R8	R9	R10
97	93	85	65	94
R11	R12	R13	R14	R15
97	89	98	97	92

*5.3 ANSI/IES TM-30-18 Color Rendition Report of 2700K Mode



5.4 Relative Spectral Power Distribution of 2700K Mode



nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	0.0071	414	0.0055	448	0.154	482	0.0805	516	0.1902
381	0.0066	415	0.0053	449	0.162	483	0.0813	517	0.1955
382	0.01	416	0.0052	450	0.1626	484	0.0831	518	0.196
383	0.0124	417	0.0061	451	0.163	485	0.0827	519	0.199
384	0.0063	418	0.0074	452	0.1598	486	0.0889	520	0.2035
385	0.0043	419	0.0087	453	0.1487	487	0.0909	521	0.2018
386	0.0002	420	0.0089	454	0.1431	488	0.095	522	0.2029
387	0.0034	421	0.0092	455	0.1335	489	0.0973	523	0.2069
388	0.005	422	0.0087	456	0.1251	490	0.1008	524	0.2053
389	0.0077	423	0.011	457	0.1179	491	0.1051	525	0.207
390	0.0021	424	0.0121	458	0.1146	492	0.1098	526	0.208
391	0.0039	425	0.0149	459	0.1101	493	0.1133	527	0.2114
392	0.0009	426	0.0157	460	0.1074	494	0.1188	528	0.212
393	0	427	0.0164	461	0.103	495	0.1206	529	0.2122
394	0.0037	428	0.017	462	0.1027	496	0.1239	530	0.2131
395	0.0036	429	0.0188	463	0.102	497	0.1323	531	0.2139
396	0.0025	430	0.0225	464	0.1001	498	0.1337	532	0.2176
397	0.0044	431	0.0252	465	0.0979	499	0.137	533	0.2187
398	0.0007	432	0.0286	466	0.095	500	0.1411	534	0.2188
399	0.0014	433	0.0318	467	0.0893	501	0.1462	535	0.2229
400	0.0025	434	0.0345	468	0.0857	502	0.1499	536	0.2215
401	0.0022	435	0.0381	469	0.082	503	0.1559	537	0.2233
402	0.0017	436	0.0437	470	0.0813	504	0.1573	538	0.2254
403	0.003	437	0.0485	471	0.0779	505	0.1627	539	0.2257
404	0.0025	438	0.057	472	0.0751	506	0.1638	540	0.2288
405	0.002	439	0.0632	473	0.0744	507	0.1681	541	0.2288
406	0.0032	440	0.0698	474	0.0732	508	0.1709	542	0.2276
407	0.0022	441	0.0788	475	0.0733	509	0.1752	543	0.2323
408	0.0047	442	0.0906	476	0.0745	510	0.1789	544	0.235
409	0.0039	443	0.1013	477	0.073	511	0.1818	545	0.2344
410	0.0035	444	0.1171	478	0.0743	512	0.1838	546	0.2354
411	0.0036	445	0.1273	479	0.075	513	0.186	547	0.2368
412	0.0032	446	0.1386	480	0.0775	514	0.1886	548	0.2397
413	0.0054	447	0.1442	481	0.0789	515	0.1891	549	0.2414

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
550	0.2442	599	0.3543	648	0.3397	697	0.0556	746	0.0115
551	0.2449	600	0.3557	649	0.3162	698	0.0535	747	0.0113
552	0.2461	601	0.3552	650	0.2654	699	0.0531	748	0.0111
553	0.2476	602	0.3552	651	0.2343	700	0.0509	749	0.0106
554	0.249	603	0.357	652	0.2279	701	0.0488	750	0.0104
555	0.2504	604	0.3606	653	0.2227	702	0.0486	751	0.0097
556	0.2536	605	0.3635	654	0.2109	703	0.0467	752	0.0102
557	0.254	606	0.3637	655	0.2017	704	0.0447	753	0.0094
558	0.2555	607	0.3693	656	0.1955	705	0.0433	754	0.0091
559	0.2601	608	0.3987	657	0.192	706	0.0424	755	0.0094
560	0.2595	609	0.447	658	0.1839	707	0.0401	756	0.0086
561	0.261	610	0.4539	659	0.1795	708	0.0395	757	0.0083
562	0.2639	611	0.4357	660	0.1728	709	0.0393	758	0.0079
563	0.267	612	0.4479	661	0.1688	710	0.0365	759	0.0081
564	0.2677	613	0.5239	662	0.1613	711	0.0354	760	0.0072
565	0.2711	614	0.6075	663	0.1549	712	0.0339	761	0.0072
566	0.2718	615	0.5757	664	0.1518	713	0.0335	762	0.0076
567	0.2725	616	0.4616	665	0.1474	714	0.0326	763	0.0073
568	0.2781	617	0.4074	666	0.1442	715	0.0317	764	0.0065
569	0.2791	618	0.3999	667	0.1391	716	0.031	765	0.0069
570	0.2816	619	0.4093	668	0.1387	717	0.0297	766	0.0062
571	0.2815	620	0.401	669	0.1389	718	0.0284	767	0.006
572	0.284	621	0.3851	670	0.1345	719	0.0276	768	0.0062
573	0.2879	622	0.3793	671	0.1297	720	0.0274	769	0.0061
574	0.2908	623	0.3801	672	0.1238	721	0.0263	770	0.0059
575	0.2933	624	0.3778	673	0.1193	722	0.0256	771	0.0057
576	0.2956	625	0.3927	674	0.1145	723	0.0233	772	0.0057
577	0.2942	626	0.4098	675	0.111	724	0.0233	773	0.0048
578	0.2971	627	0.4065	676	0.1076	725	0.0228	774	0.0051
579	0.2993	628	0.4122	677	0.104	726	0.0217	775	0.005
580	0.3036	629	0.4609	678	0.0982	727	0.0212	776	0.0052
581	0.3065	630	0.6462	679	0.0988	728	0.0199	777	0.0046
582	0.308	631	0.9312	680	0.0931	729	0.0201	778	0.0046
583	0.3088	632	0.9692	681	0.0928	730	0.0197	779	0.0052
584	0.3168	633	0.7136	682	0.0898	731	0.0183	780	0.0052
585	0.3158	634	0.5943	683	0.0854	732	0.0182		
586	0.3197	635	0.6718	684	0.0833	733	0.0176		
587	0.3206	636	0.7247	685	0.0817	734	0.0173		
588	0.3245	637	0.5786	686	0.078	735	0.0168		
589	0.3254	638	0.3888	687	0.0771	736	0.0157		
590	0.3262	639	0.3229	688	0.0722	737	0.0156		
591	0.3302	640	0.297	689	0.0716	738	0.0147		
592	0.3339	641	0.2845	690	0.0699	739	0.0139		
593	0.3368	642	0.2729	691	0.0683	740	0.014		
594	0.3368	643	0.266	692	0.066	741	0.0138		
595	0.3389	644	0.263	693	0.0635	742	0.0139		
596	0.3389	645	0.2673	694	0.0612	743	0.0129		
597	0.3436	646	0.2958	695	0.059	744	0.0123		
598	0.3499	647	0.3292	696	0.0577	745	0.0125		

6. Goniophotometer Test Results of 2700K Mode

6.1 Test Data

Test Ambient Temperature	25.2°C	Test Orientation	Downward
Operate Time(Min.)	90	Stabilization Time(Min.)	60

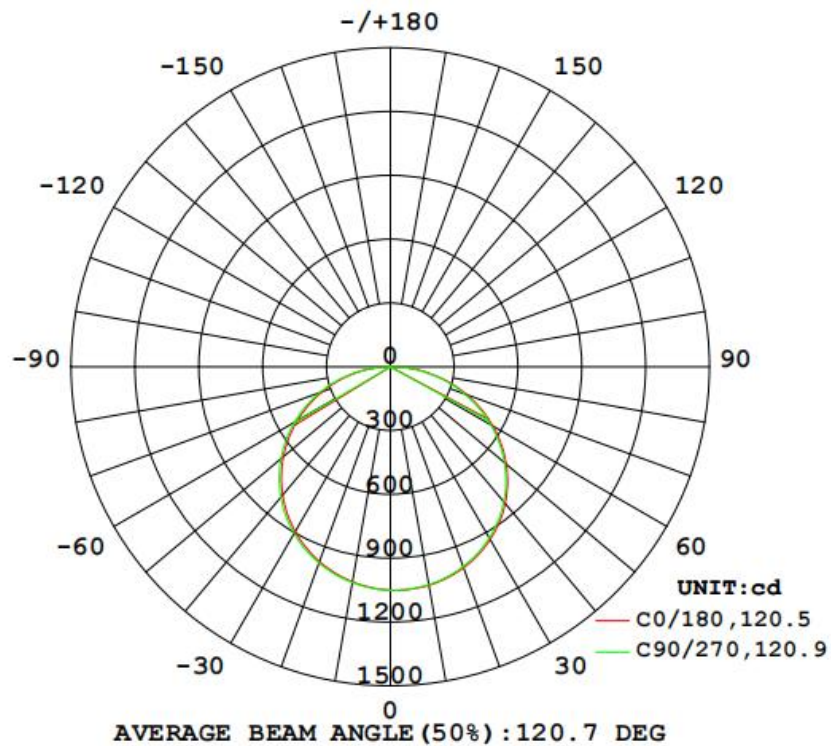
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current(A)	Power Factor	Power(W)
120	60	0.5142	0.9925	61.26

Optical Measurement

Luminous Flux (lm)	Efficacy(lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
3332.87	54.41	1051	1.27	1.28

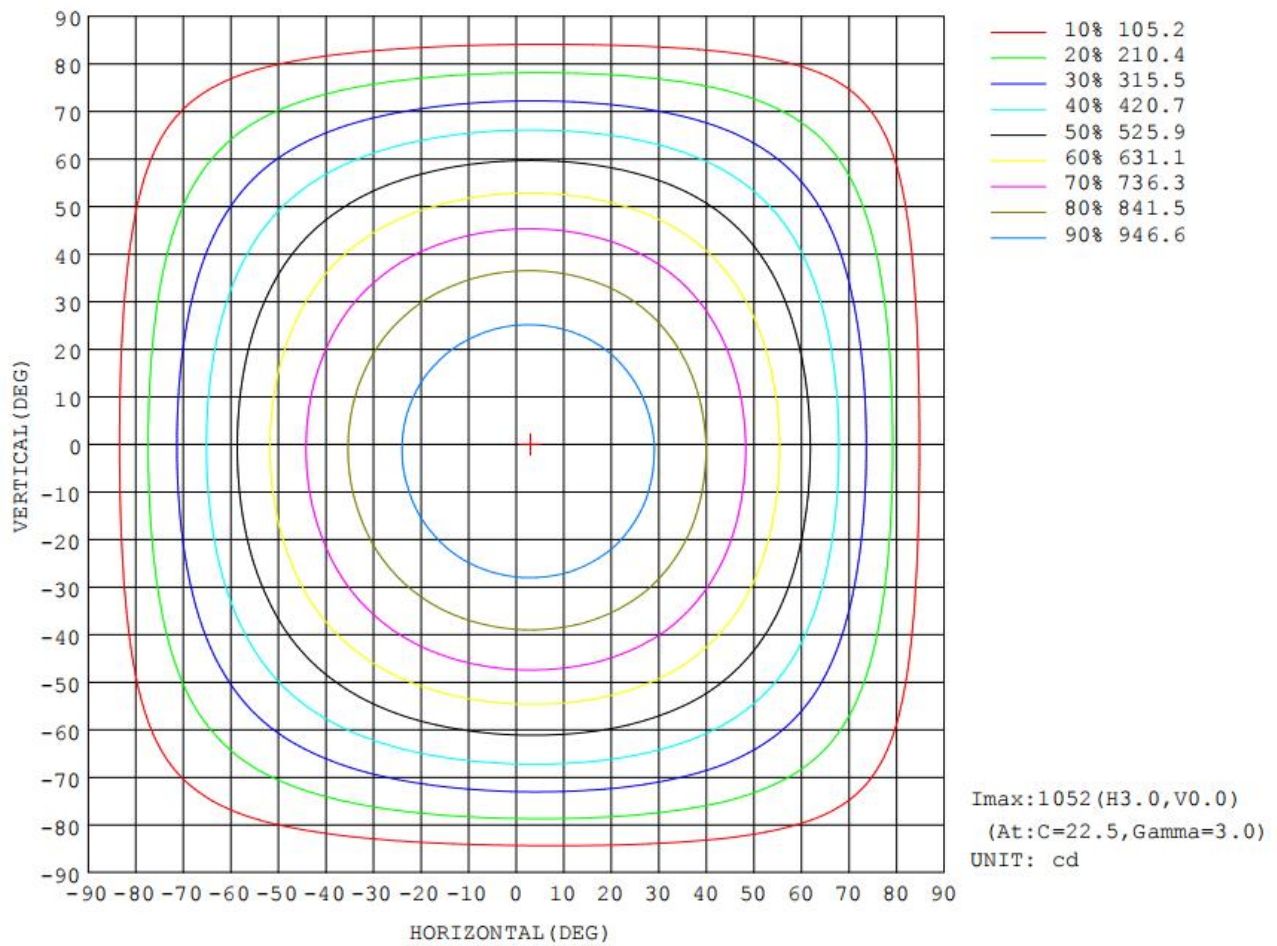
6.2 Luminous Intensity Distribution



6.3 Zonal Flux Diagram

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	Φ zone	Φ total	%lum, lamp
10	1043	1044	1040	1032	1027	1026	1030	1037	0- 10	99.49	99.49	2.99,2.99
20	1005	1008	999.6	985.0	974.6	973.2	981.6	994.7	10- 20	287.0	386.5	11.6,11.6
30	937.6	942.0	929.5	908.9	894.5	893.2	905.2	923.3	20- 30	441.4	828.0	24.8,24.8
40	839.7	844.3	829.2	803.7	787.7	786.5	801.3	822.3	30- 40	543.9	1372	41.2,41.2
50	711.3	716.6	699.9	672.5	656.0	655.4	671.3	693.5	40- 50	580.7	1953	58.6,58.6
60	556.7	561.3	544.7	518.5	503.9	504.6	520.2	540.7	50- 60	545.6	2498	75,75
70	382.0	385.6	370.9	348.5	338.3	339.7	353.5	370.4	60- 70	442.9	2941	88.2,88.2
80	193.1	197.6	185.8	170.9	165.1	165.5	177.3	189.7	70- 80	286.4	3228	96.8,96.8
90	19.50	19.90	15.09	10.39	6.299	7.746	10.88	14.27	80- 90	99.96	3328	99.8,99.8
100	0.2897	0.3788	0.2892	0.3893	0.4653	0.5660	0.4565	0.5416	90-100	1.655	3329	99.9,99.9
110	0.3935	0.4086	0.4212	0.4254	0.5117	0.5556	0.5379	0.5181	100-110	0.4714	3330	99.9,99.9
120	0.4953	0.5031	0.5872	0.5480	0.5201	0.5629	0.5623	0.5134	110-120	0.4990	3330	99.9,99.9
130	0.6379	0.6699	0.7587	0.7122	0.6626	0.6951	0.7124	0.6550	120-130	0.5472	3331	99.9,99.9
140	0.7732	0.8063	0.8592	0.8376	0.9293	0.9592	0.9427	0.9197	130-140	0.6065	3331	100,100
150	0.8699	0.8651	0.9114	0.8925	1.147	1.198	1.160	1.153	140-150	0.6000	3332	100,100
160	0.8808	1.018	1.048	1.015	1.214	1.301	1.356	1.366	150-160	0.5026	3332	100,100
170	1.015	1.081	1.134	1.150	1.203	1.216	1.352	1.379	160-170	0.3311	3333	100,100
180	1.121	1.162	1.261	1.264	1.135	1.110	1.214	1.275	170-180	0.1141	3333	100,100
DEG	LUMINOUS INTENSITY:cd									UNIT:lm		

6.4 Isocandela Diagram



6.5 Luminous Distribution Intensity Data

Table--1

UNIT: cd

C (DEG) y (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5			
0	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050			
5	1050	1051	1051	1050	1048	1047	1044	1043	1042	1041	1041	1042	1044	1046	1047	1049			
10	1043	1044	1044	1042	1040	1036	1032	1029	1027	1026	1026	1027	1030	1033	1037	1041			
15	1028	1030	1030	1028	1023	1018	1012	1008	1004	1003	1003	1005	1010	1014	1020	1024			
20	1005	1008	1008	1005	1000	993	985	979	975	973	973	976	982	988	995	1001			
25	976	979	979	976	968	960	950	943	938	936	937	941	947	954	963	970			
30	938	942	942	938	929	920	909	900	895	892	893	898	905	914	923	932			
35	893	897	897	892	883	872	860	850	844	842	843	848	857	866	876	886			
40	840	845	844	839	829	817	804	794	788	785	786	792	801	811	822	833			
45	779	784	784	779	768	755	741	731	725	722	724	730	739	750	761	772			
50	711	717	717	711	700	687	672	662	656	653	655	662	671	682	694	704			
55	637	642	642	636	625	612	598	587	582	580	582	589	598	609	620	630			
60	557	562	561	556	545	532	518	509	504	502	505	511	520	530	541	550			
65	471	476	475	470	459	447	435	426	423	421	423	430	438	447	457	466			
70	382	386	386	380	371	360	348	341	338	337	340	346	353	362	370	378			
75	290	293	292	288	279	270	260	254	252	252	254	259	265	272	281	287			
80	193	198	198	193	186	179	171	165	165	165	165	171	177	183	190	195			
85	101	103	102	98.7	92.8	87.3	80.9	76.9	77.6	77.9	80.1	83.8	88.6	92.8	97.9	101			
90	19.5	20.2	19.9	17.8	15.1	10.1	10.4	9.50	6.30	6.73	7.75	9.26	10.9	12.3	14.3	15.3			
95	0.25	0.33	0.26	0.45	0.29	0.40	0.25	0.27	0.42	0.45	0.42	0.56	0.43	0.57	0.43	0.43			
100	0.29	0.28	0.38	0.31	0.29	0.31	0.39	0.29	0.47	0.47	0.57	0.50	0.46	0.48	0.54	0.44			
105	0.36	0.38	0.38	0.38	0.36	0.37	0.39	0.37	0.51	0.52	0.56	0.57	0.52	0.52	0.53	0.51			
110	0.39	0.42	0.41	0.43	0.42	0.42	0.43	0.43	0.51	0.53	0.56	0.56	0.54	0.52	0.52	0.50			
115	0.44	0.46	0.45	0.49	0.50	0.48	0.48	0.50	0.52	0.54	0.54	0.56	0.54	0.52	0.51	0.50			
120	0.50	0.52	0.50	0.56	0.59	0.56	0.55	0.57	0.52	0.55	0.56	0.57	0.56	0.54	0.51	0.50			
125	0.57	0.57	0.59	0.66	0.68	0.66	0.64	0.63	0.57	0.61	0.61	0.63	0.62	0.61	0.57	0.54			
130	0.64	0.64	0.67	0.74	0.76	0.74	0.71	0.72	0.66	0.71	0.70	0.71	0.71	0.70	0.66	0.63			
135	0.72	0.70	0.73	0.79	0.82	0.80	0.76	0.78	0.81	0.84	0.82	0.83	0.83	0.81	0.78	0.77			
140	0.77	0.75	0.81	0.83	0.86	0.85	0.84	0.81	0.93	0.96	0.96	0.95	0.94	0.93	0.92	0.90			
145	0.85	0.82	0.85	0.87	0.89	0.91	0.87	0.86	1.06	1.07	1.09	1.06	1.05	1.05	1.05	1.04			
150	0.87	0.83	0.87	0.88	0.91	0.95	0.89	0.87	1.15	1.18	1.20	1.19	1.16	1.16	1.15	1.14			
155	0.87	0.86	0.93	0.96	0.97	1.01	0.95	0.90	1.21	1.23	1.27	1.32	1.27	1.23	1.27	1.24			
160	0.88	0.92	1.02	1.02	1.05	1.05	1.02	0.94	1.21	1.22	1.30	1.36	1.36	1.34	1.37	1.32			
165	0.93	0.96	1.07	1.04	1.07	1.10	1.06	0.97	1.22	1.20	1.29	1.36	1.36	1.35	1.35	1.40			
170	1.02	0.99	1.08	1.11	1.13	1.17	1.15	1.01	1.20	1.20	1.22	1.32	1.35	1.35	1.38	1.38			
175	1.07	1.05	1.15	1.16	1.21	1.23	1.23	1.11	1.16	1.16	1.18	1.29	1.30	1.33	1.35	1.35			
180	1.12	1.10	1.16	1.21	1.26	1.28	1.26	1.19	1.14	1.14	1.11	1.17	1.21	1.26	1.28	1.26			

7. Photo of Sample

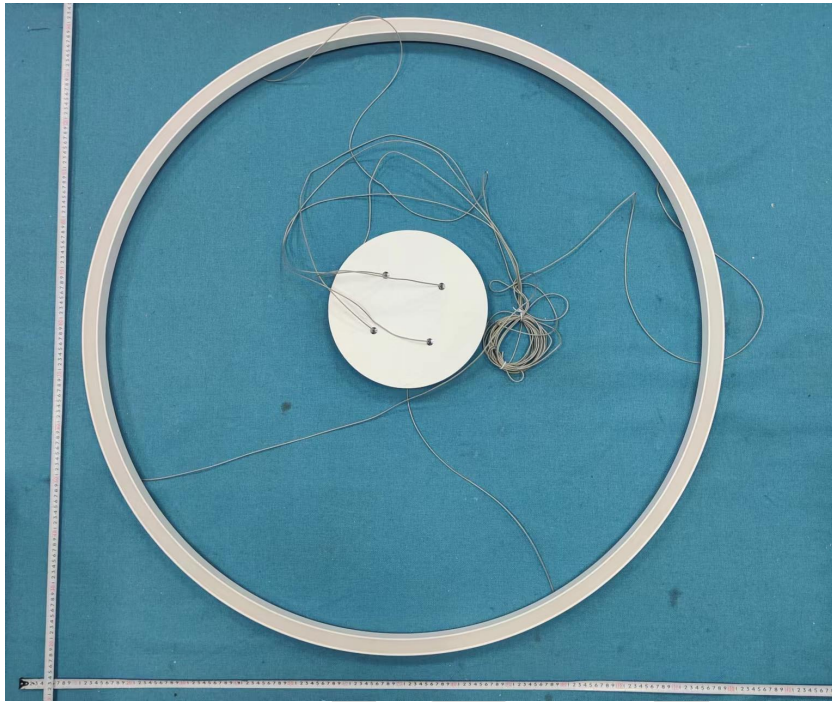


Figure 1 Overview

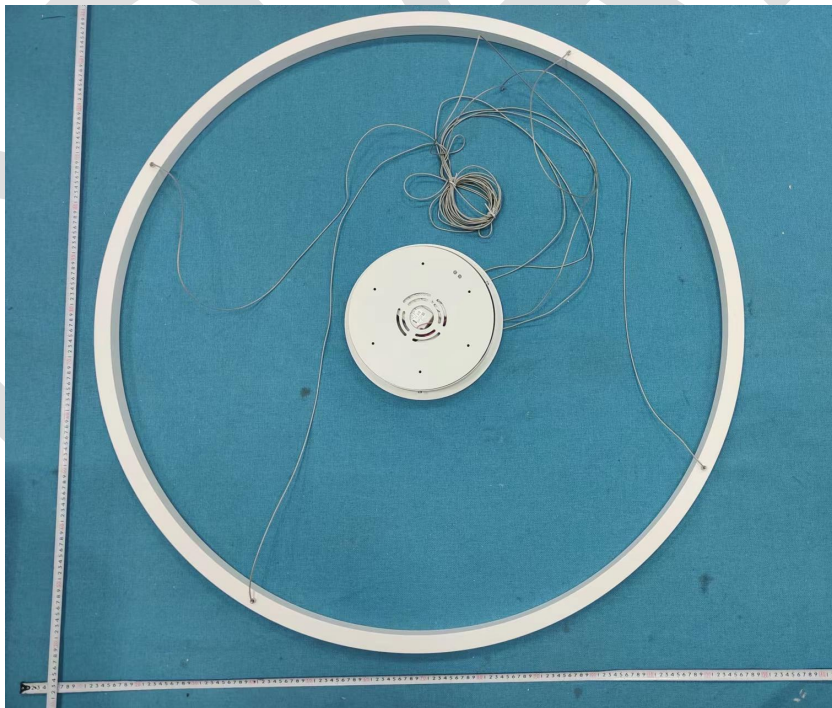


Figure 2 Overview

---End of Report---