TESTING
NVLAP LAB CODE:600177-0

TEST REPORT OF ANSI/IES LM-79-19

APPROVED METHOD FOR OPTICAL AND ELECTRICAL MEASUREMENTS OF SOLID-STATE LIGHTING PRODUCTS

Client.....	:	Blackjack Lighting LLC
Address.....	:	1547 Barclay Blvd Buffalo Grove, IL 60089
Test Model.....	:	VEC-36V-XX-12T-XXK
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
Report No......	:	N02A21120889L00201
Date of receipt.....	:	Jan. 04, 2022
Date of test	:	Jan. 10, 2022
Date of report.....	:	Jan. 12, 2022

Tested by:	**Checked by:**	**Approved by:**
Brooke Zheng/ Test Engineer	Sandy Chen/ Project Engineer	Jessie Li/ Technical Manager

Guangdong Meide Testing Technology Co., Ltd. * CERTIFICATE *

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.
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Note 3: This report contains data that are not covered by the NVLAP accreditation. It is marked * in the title.

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1. Product Description for Equipment under Test(EUT)

Model No.:	VEC-36V-XX-12T-XXK
Manufacturer:	Blackjack Lighting LLC
Product Type:	Vector Vanity
Rated Voltage/Frequency:	120V AC, 60Hz
Rated Power:	20W
Rated luminous flux:	1381lm
Nominal CCT:	2700K, 3000K, 3500K, 4000K
LED Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
LED Model No.:	HL-AM-2835DW-S1-08-HR5

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	2022/09/17
Digital Power Meter	MD-E001	PF2010	2022/09/17
AC Testing Power Source	MD-E002	DPS1060	2022/09/17
Total Spectral Radiant Flux Standard Lamp	MD-E007	D908S	2022/10/13
Integrating Sphere System	MD-E029	2M	2022/09/17
High Accuracy Array Spectroradio Meter	MD-E011	HAAS-3000	2022/09/17
Digital Power Meter	MD-E008	PF310	2022/09/17
AC Testing Power Source	MD-E010	DPS1010	2022/09/17
Standard Lamp	MD-E036	D204	2022/10/13

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°C±1.2°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 paramters 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.)	75	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	120.03	60	0.1735	20.44	0.9814	1240.5	60.69
3000K	120.02	60	0.1754	20.36	0.9674	1322.5	64.95
3500K	120.05	60	0.1767	20.62	0.9723	1363.8	66.13
4000K	120.03	60	0.1819	21.22	0.9721	1362	64.17

Mode	CCT (K)	Ra	R9	x	y	u'	v'
2700K	2762	93.3	51	0.455	0.4097	0.2598	0.5263
3000K	2899	94.7	56	0.4436	0.4052	0.2544	0.5228
3500K	3310	95.1	63	0.4152	0.393	0.2412	0.5137
4000K	3740	94.2	63	0.3927	0.3843	0.2301	0.5067

Color Rendering Index (Mode: 2700K)

Ra
93.3

R1	R2	R3	R4	R5
97	100	97	96	97

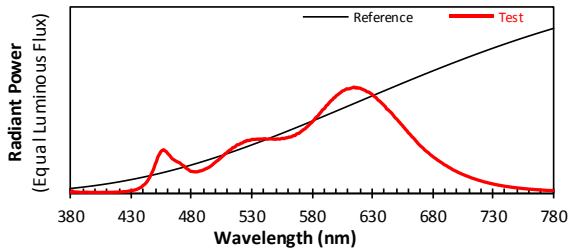
R6	R7	R8	R9	R10
94	88	77	51	99

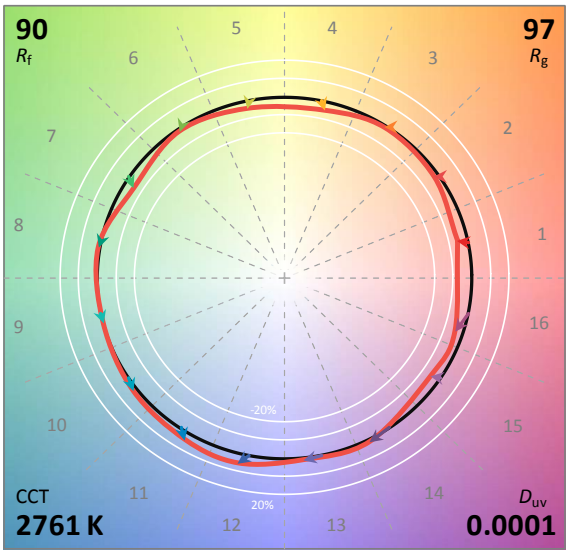
R11	R12	R13	R14	R15
98	84	99	99	89

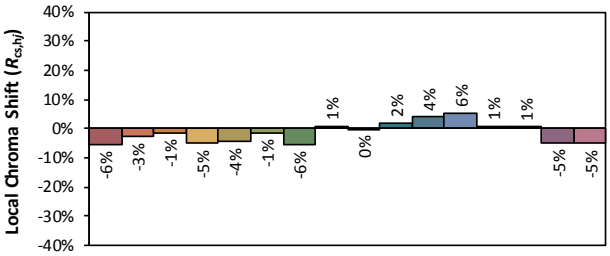
*ANSI/IES TM-30-18 Color Rendition Report (Mode: 2700K)

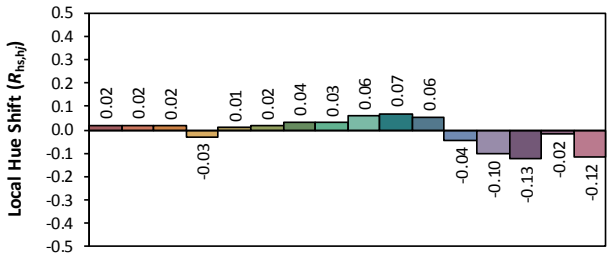
ANSI/IES TM-30-18 Color Rendition Report

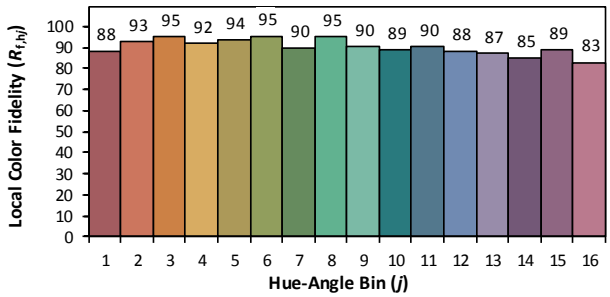
Source:	HL-AM-2835DW-S1-08-HR5	**Manufacturer:**	Blackjack Lighting LLC
Date:	2022/1/10	**Model:**	VEC-36V-XX-12T-XXK

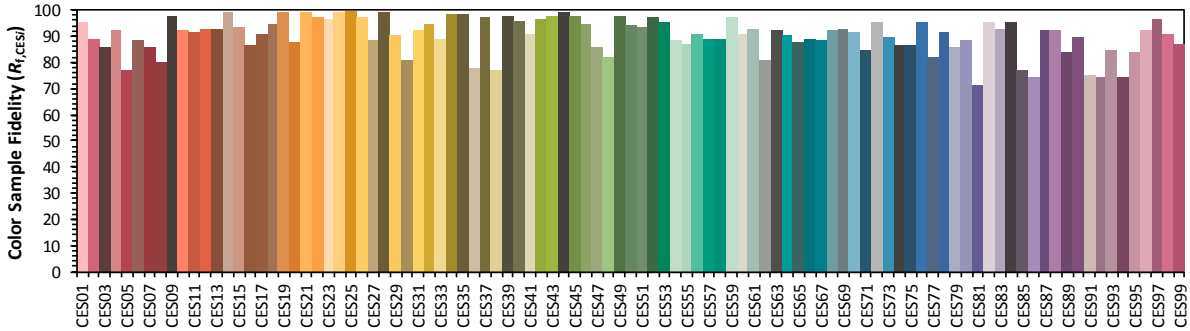












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

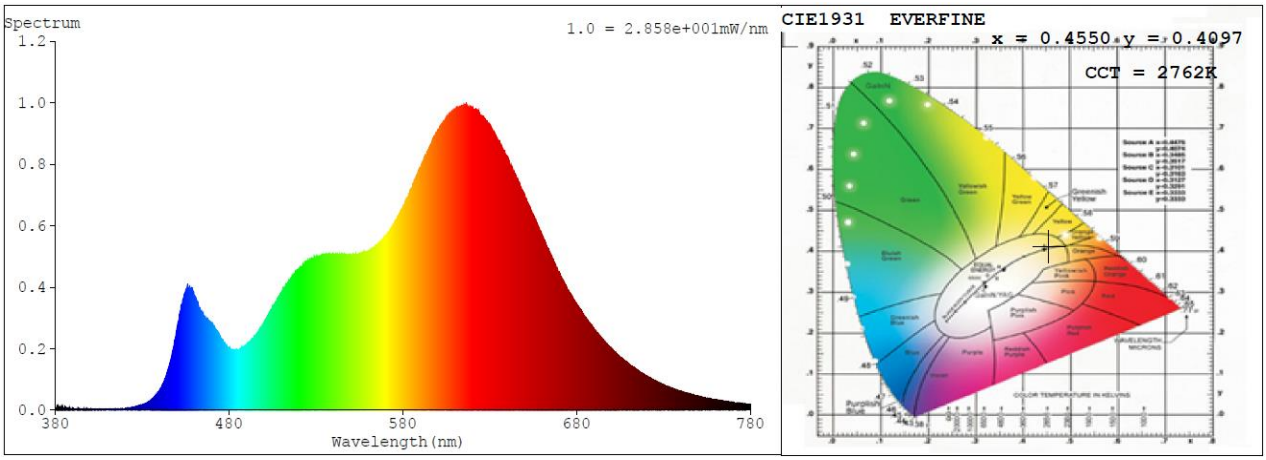
x	0.4550
y	0.4096
u'	0.2598
v'	0.5262

CIE 13.3-1995 (CRI)

R_a	93
R_9	51

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

Relative Spectral Power Distribution (Mode: 2700K)



nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	0.0019	414	0.0038	448	0.2072	482	0.1973	516	0.431
381	0.017	415	0.004	449	0.2376	483	0.1963	517	0.4409
382	0.0035	416	0.0052	450	0.2725	484	0.1959	518	0.4516
383	0.0063	417	0.004	451	0.2959	485	0.1978	519	0.4519
384	0.0071	418	0.0057	452	0.3342	486	0.2009	520	0.4571
385	0.0051	419	0.0059	453	0.3544	487	0.2055	521	0.4647
386	0.0062	420	0.0052	454	0.375	488	0.2054	522	0.467
387	0.0037	421	0.0062	455	0.3926	489	0.2105	523	0.4741
388	0.002	422	0.0081	456	0.3995	490	0.2143	524	0.4823
389	0.0035	423	0.0078	457	0.4046	491	0.2213	525	0.4824
390	0.0006	424	0.0096	458	0.3934	492	0.2253	526	0.492
391	0.0046	425	0.0099	459	0.3874	493	0.2302	527	0.4907
392	0.0042	426	0.0112	460	0.3729	494	0.2359	528	0.4929
393	0.0052	427	0.0129	461	0.3605	495	0.2422	529	0.4941
394	0.0042	428	0.0155	462	0.3493	496	0.2509	530	0.5014
395	0.0034	429	0.0171	463	0.3335	497	0.2581	531	0.5014
396	0.0023	430	0.0184	464	0.32	498	0.2695	532	0.5016
397	0.0026	431	0.0206	465	0.3128	499	0.279	533	0.5019
398	0.0036	432	0.0233	466	0.3048	500	0.2883	534	0.5034
399	0.0027	433	0.0257	467	0.2986	501	0.2978	535	0.5051
400	0.0025	434	0.0294	468	0.2913	502	0.3054	536	0.502
401	0.0034	435	0.0336	469	0.2875	503	0.3148	537	0.5066
402	0.0021	436	0.0386	470	0.2822	504	0.3248	538	0.5037
403	0.0024	437	0.045	471	0.2737	505	0.3351	539	0.5061
404	0.0022	438	0.0497	472	0.2622	506	0.345	540	0.5075
405	0.0031	439	0.0595	473	0.2565	507	0.3546	541	0.5083
406	0.0029	440	0.07	474	0.2489	508	0.3671	542	0.5062
407	0.0034	441	0.0775	475	0.2362	509	0.3732	543	0.5043
408	0.003	442	0.0891	476	0.2273	510	0.3856	544	0.5047
409	0.004	443	0.1027	477	0.2204	511	0.394	545	0.5071
410	0.0035	444	0.12	478	0.213	512	0.4026	546	0.5065
411	0.0039	445	0.1389	479	0.2024	513	0.4082	547	0.5059
412	0.0031	446	0.1602	480	0.2014	514	0.4221	548	0.5042
413	0.0033	447	0.1848	481	0.1989	515	0.4261	549	0.5041

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
550	0.5025	599	0.8962	648	0.722	697	0.2152	746	0.051
551	0.5066	600	0.9109	649	0.7071	698	0.2116	747	0.0493
552	0.5061	601	0.9192	650	0.6967	699	0.2047	748	0.0481
553	0.5045	602	0.9271	651	0.6862	700	0.2007	749	0.0473
554	0.5065	603	0.9367	652	0.6709	701	0.1937	750	0.0455
555	0.5108	604	0.9441	653	0.6605	702	0.1882	751	0.0447
556	0.5112	605	0.9557	654	0.6451	703	0.1834	752	0.0433
557	0.5096	606	0.9602	655	0.6351	704	0.1784	753	0.0421
558	0.5152	607	0.9652	656	0.6192	705	0.1731	754	0.0406
559	0.5165	608	0.9723	657	0.6079	706	0.1686	755	0.0395
560	0.5194	609	0.9783	658	0.5927	707	0.1637	756	0.0385
561	0.5238	610	0.9765	659	0.5819	708	0.1601	757	0.0371
562	0.5232	611	0.9787	660	0.5652	709	0.1543	758	0.0362
563	0.5273	612	0.9819	661	0.5548	710	0.1513	759	0.035
564	0.5332	613	0.9865	662	0.5432	711	0.1459	760	0.0342
565	0.5381	614	0.9893	663	0.5275	712	0.1415	761	0.0331
566	0.5377	615	0.9948	664	0.5187	713	0.1371	762	0.032
567	0.5504	616	0.9859	665	0.5062	714	0.1336	763	0.0316
568	0.5564	617	0.9911	666	0.4923	715	0.1302	764	0.0304
569	0.5581	618	0.9839	667	0.4792	716	0.126	765	0.0295
570	0.566	619	0.986	668	0.4656	717	0.1226	766	0.0284
571	0.5765	620	0.9844	669	0.4529	718	0.1187	767	0.028
572	0.5841	621	0.9779	670	0.4418	719	0.1151	768	0.027
573	0.5944	622	0.974	671	0.4318	720	0.1122	769	0.0261
574	0.5996	623	0.9681	672	0.4225	721	0.1088	770	0.0258
575	0.6097	624	0.9644	673	0.4108	722	0.1053	771	0.0247
576	0.6207	625	0.9563	674	0.3984	723	0.1019	772	0.024
577	0.6307	626	0.9492	675	0.39	724	0.099	773	0.0232
578	0.6426	627	0.9481	676	0.3807	725	0.0968	774	0.0223
579	0.6541	628	0.9408	677	0.3735	726	0.0934	775	0.022
580	0.6625	629	0.9322	678	0.3606	727	0.0904	776	0.0214
581	0.676	630	0.9257	679	0.3536	728	0.088	777	0.0211
582	0.6879	631	0.9149	680	0.3428	729	0.0853	778	0.0204
583	0.7043	632	0.9038	681	0.3349	730	0.0829	779	0.0202
584	0.715	633	0.8979	682	0.326	731	0.0802	780	0.0202
585	0.7231	634	0.8846	683	0.3198	732	0.0775		
586	0.7397	635	0.8715	684	0.3093	733	0.0751		
587	0.7522	636	0.864	685	0.3022	734	0.0733		
588	0.7666	637	0.8547	686	0.295	735	0.0708		
589	0.7819	638	0.8423	687	0.2869	736	0.0687		
590	0.7883	639	0.8329	688	0.2802	737	0.067		
591	0.8017	640	0.8198	689	0.2713	738	0.065		
592	0.8204	641	0.8102	690	0.2628	739	0.0631		
593	0.8268	642	0.7881	691	0.2585	740	0.061		
594	0.8427	643	0.7839	692	0.2516	741	0.0589		
595	0.8549	644	0.7712	693	0.2439	742	0.0579		
596	0.868	645	0.762	694	0.2371	743	0.0564		
597	0.8749	646	0.751	695	0.2311	744	0.0543		
598	0.8913	647	0.7378	696	0.2241	745	0.0528		

6. Goniophotometer Test results (Mode: 2700K)

6.1 Test Data

Test Ambient Temperature	25.1℃	Test orientation	Downward
Operate time(Min.)	90	stabilization time(Min.)	30

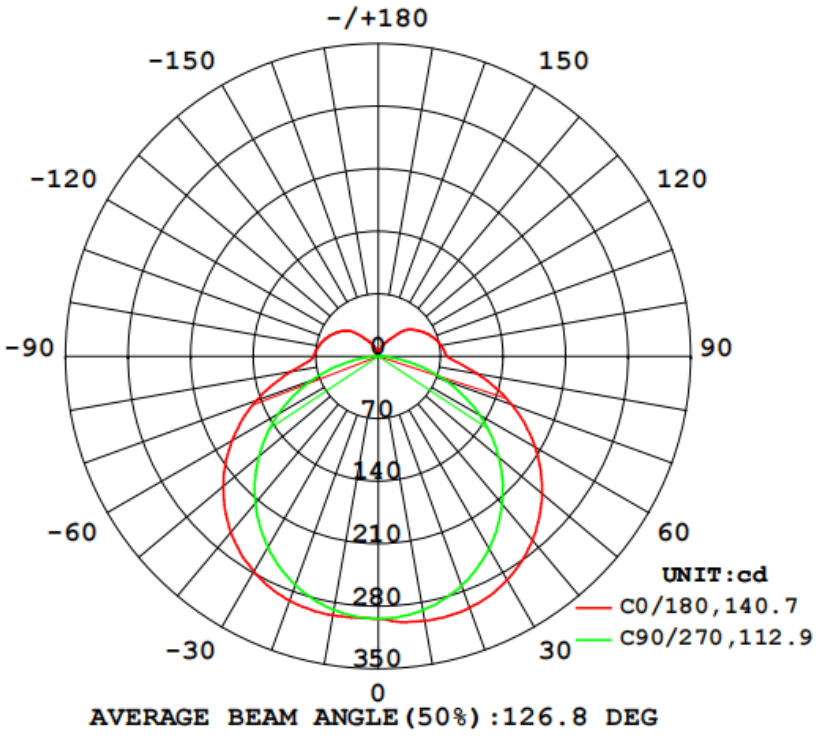
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current(A)	Power Factor	Power(W)
120.1	60	0.1732	0.9855	20.5

Optical Measurement

Luminous Flux (lm)	Efficacy(lm/W)	Imax(cd)	Spacing Criteria (C0/180°)	Spacing Criteria (C90/270°)
1233.3	60.16	301.3	1.41	1.25

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	300.4	296.5	288.5	291.4	294.5	290.7	288.3	296.3	0- 10	28.05	28.05	2.27,2.27
20	299.6	290.0	273.3	283.8	291.1	282.7	272.3	290.3	10- 20	82.14	110.2	8.93,8.93
30	289.1	274.8	248.6	267.6	278.5	265.8	247.3	275.2	20- 30	128.4	238.5	19.3,19.3
40	268.6	251.3	215.7	242.4	257.1	240.8	214.4	251.5	30- 40	160.9	399.4	32.4,32.4
50	239.4	218.9	176.5	209.7	226.8	207.5	174.9	219.2	40- 50	175.5	574.9	46.6,46.6
60	202.7	178.8	131.0	169.8	189.2	166.7	129.6	179.5	50- 60	170.1	745.0	60.4,60.4
70	159.4	132.8	80.79	124.0	145.5	120.9	79.88	133.8	60- 70	145.3	890.3	72.2,72.2
80	111.9	84.81	30.48	77.15	99.52	74.39	29.83	85.54	70- 80	104.6	994.9	80.7,80.7
90	77.19	51.18	0.0140	49.75	72.37	47.03	0	51.67	80- 90	61.88	1057	85.7,85.7
100	71.39	47.21	0	45.92	67.69	43.91	0	47.45	90-100	46.91	1104	89.5,89.5
110	64.50	42.55	0	41.42	61.52	39.60	0	42.78	100-110	41.65	1145	92.9,92.9
120	56.05	36.96	0	36.20	54.10	34.64	0.3704	36.83	110-120	33.97	1179	95.6,95.6
130	46.86	26.61	0.1804	25.20	45.16	23.18	0.5556	26.91	120-130	25.38	1205	97.7,97.7
140	31.91	17.62	0.2778	17.05	29.18	16.03	0.6482	16.22	130-140	15.86	1221	99,99
150	19.39	10.47	0.3704	11.28	18.00	11.92	0.6482	9.053	140-150	8.156	1229	99.6,99.6
160	10.57	4.958	0.3728	5.778	9.815	7.218	0.6482	1.739	150-160	3.582	1232	99.9,99.9
170	2.774	1.284	0.3704	1.284	2.017	1.463	0.7408	0.5497	160-170	0.9136	1233	100,100
180	0.7259	0.3667	0.3704	0.3665	0.2755	0.5500	0.7408	0.5497	170-180	0.0674	1233	100,100
DEG	LUMINOUS INTENSITY:cd									UNIT:lm		

6.4 Luminous Distribution Intensity (cd) Data

Table--1 UNIT: cd

γ (DEG) \ C(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	294	294	294	294	294	294	294	294	294	294	294	294	294	294	294	294			
5	299	298	296	293	293	292	293	293	294	293	293	292	293	293	296	297			
10	300	299	296	292	288	289	291	293	294	293	291	289	288	292	296	299			
15	301	299	295	288	282	284	289	292	294	291	288	283	282	289	295	299			
20	300	297	290	281	273	277	284	288	291	288	283	275	272	282	290	296			
25	296	292	284	272	262	267	277	282	286	283	275	266	261	272	284	292			
30	289	285	275	261	249	256	268	275	278	274	266	254	247	261	275	285			
35	280	275	264	248	233	243	256	264	269	264	254	240	232	248	265	276			
40	269	263	251	232	216	228	242	252	257	252	241	225	214	233	252	264			
45	255	250	236	215	197	211	227	238	243	237	225	208	195	216	236	250			
50	239	234	219	196	176	192	210	221	227	220	207	189	175	197	219	234			
55	222	216	200	176	154	172	190	203	209	202	188	168	153	177	200	216			
60	203	196	179	154	131	150	170	183	189	182	167	146	130	155	179	196			
65	182	175	157	130	106	127	147	161	168	161	144	123	105	132	158	175			
70	159	152	133	106	80.8	102	124	139	145	138	121	98.6	79.9	107	134	152			
75	136	128	109	80.7	55.1	77.3	100	115	122	115	97.3	73.6	54.5	81.9	109	128			
80	112	104	84.8	56.2	30.5	53.4	77.1	92.9	99.5	91.9	74.4	49.7	29.8	57.3	85.5	104			
85	90.5	83.5	63.7	35.3	10.01	33.5	58.1	74.7	80.7	73.3	55.4	30.1	9.02	36.4	64.4	83.6			
90	77.2	70.2	51.2	23.7	0.01	24.4	49.8	67.0	72.4	65.2	47.0	20.9	0.00	24.9	51.7	69.9			
95	74.3	67.5	48.9	22.2	0.00	23.0	47.8	64.5	70.7	63.4	45.6	19.7	0.00	23.9	49.6	67.0			
100	71.4	64.6	47.2	21.1	0.00	21.9	45.9	62.2	67.7	61.1	43.9	19.2	0.00	22.3	47.4	64.2			
105	68.2	62.0	44.9	19.9	0.00	20.7	43.8	59.6	64.9	58.8	41.8	17.7	0.00	20.9	45.3	61.6			
110	64.5	59.0	42.6	18.6	0.00	19.1	41.4	56.5	61.5	55.5	39.6	15.7	0.00	19.4	42.8	58.6			
115	60.5	55.4	39.9	14.5	0.00	15.0	38.9	53.3	57.8	52.3	37.1	11.8	0.09	14.8	39.9	54.6			
120	56.0	51.4	37.0	11.2	0.00	12.3	36.2	49.8	54.1	48.5	34.6	10.4	0.37	12.0	36.8	50.9			
125	51.6	47.2	33.2	10.2	0.00	10.7	31.7	45.7	49.7	44.7	29.3	8.72	0.46	10.3	33.6	46.9			
130	46.9	42.8	26.6	8.91	0.18	9.37	25.2	41.3	45.2	40.4	23.2	7.53	0.56	8.91	26.9	41.9			
135	41.2	35.7	20.6	7.72	0.37	8.09	20.0	33.3	37.9	32.2	18.9	6.15	0.65	7.34	19.1	34.9			
140	31.9	27.4	17.6	6.43	0.28	6.80	17.0	25.4	29.2	24.7	16.0	5.69	0.65	5.86	16.2	26.2			
145	23.8	21.6	14.1	5.23	0.28	5.33	14.2	20.7	22.7	20.3	13.8	4.77	0.65	3.48	13.1	20.2			
150	19.4	17.5	10.5	3.68	0.37	3.95	11.3	17.0	18.0	16.8	11.9	4.68	0.65	1.47	9.05	15.2			
155	15.0	13.3	8.16	2.30	0.37	2.76	8.53	13.0	13.8	13.1	9.44	4.22	0.65	0.46	4.75	11.3			
160	10.6	9.38	4.96	1.29	0.37	1.75	5.78	9.28	9.81	9.35	7.22	3.03	0.65	0.37	1.74	5.94			
165	6.52	5.61	2.75	0.92	0.37	0.92	3.21	5.70	5.68	5.59	4.38	1.84	0.74	0.37	0.55	2.10			
170	2.77	2.02	1.28	0.73	0.37	0.55	1.28	2.48	2.02	2.01	1.46	0.37	0.74	0.37	0.55	0.37			
175	0.64	0.55	0.46	0.73	0.37	0.55	0.37	0.55	0.37	0.37	0.55	0.37	0.74	0.37	0.55	0.37			
180	0.73	0.55	0.37	0.73	0.37	0.55	0.37	0.55	0.28	0.55	0.55	0.37	0.74	0.37	0.55	0.37			

7. Photo of sample

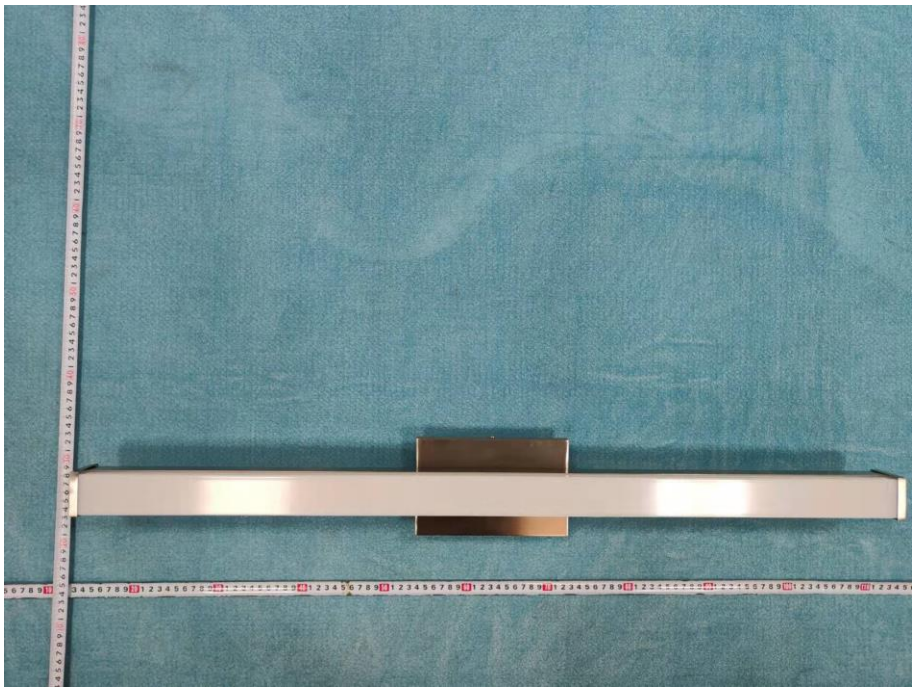


Figure 1 Overview

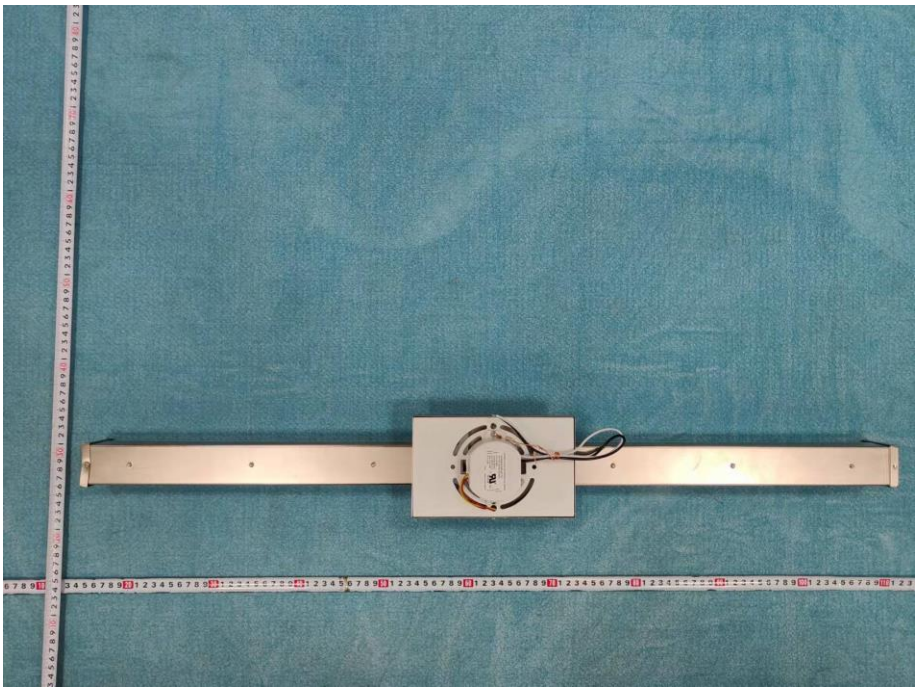


Figure 2 Overview

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