Test Report Of ANSI/IES LM-79-19

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

Report Number…… :	N02A23080353L00701
Client…… :	IKIO LED LIGHTING
Address……	8470 Allison Pointe Blvd, Suite 128 Indianapolis, IN 46250
Test Model……:	IK-HBAX-0150-50-DY-RLHV02BI
Brand Name……:	IKIO
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……:	Aug. 14, 2023
Date of test ……. :	Aug. 30, 2023 – Sep. 08, 2023
Date of report……... :	Sep. 08, 2023

Tested by:	**Checked by:**	**Approved by:**
Jarvis Zhang/ Test Engineer	Sandy Chen/ Project Engineer	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.
Note 3: This report contains data that are not covered by the NVLAP accreditation. It is marked * in the title.

1. Product Description for Equipment under Test(EUT)

Representative (Tested) Model:	IK-HBAX-0150-50-DY-RLHV02BI
Manufacturer:	IKIO LED LIGHTING
Product Type:	High Bay Luminaires (Commercial and Industrial)
Rated Voltage/Frequency:	277-480V AC, 50/60Hz
Rated Power:	150W
Rated luminous flux:	21000lm
Nominal CCT:	5000K
LED Manufacturer:	Bridgelux Inc.
LED Model No.:	BXEN-50E-11M-3CA

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)
- ANSI C82.77-10:2014 Harmonic Emission Limits – Related Power Quality Requirements for Lighting Equipment-Solid State

3.Test equipment list

Test Equipment	Serial No.	Model No.	Calibration due date
Full-field Speed Goniophotometer	MD-E028	GO-R5000	2023/09/17
Digital Power Meter	MD-E001	PF2010	2023/09/17
AC Testing Power Source	MD-E002	DPS1060	2023/09/17
Total Spectral Radiant Flux Standard Lamp	MD-E007	D908S	2023/10/13
Integrating Sphere System	MD-E029	2M	2023/09/17
High Accuracy Array Spectroradio Meter	MD-E011	HAAS-3000	2023/09/17
Digital Power Meter	MD-E008	PF310	2023/09/17
AC Testing Power Source	MD-E010	DPS1010	2023/09/17
Standard Lamp	MD-E036	D204	2023/10/13

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.

THD and PF Test

The sample was tested according to the ANSI C82.77-10:2014.

The sample was operated at rated voltage and was stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

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

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)	CCT (K)
277.01	60	0.5416	149.7	0.9982	21933	146.47	4867

Ra	R9	Rf	Rg	x	y	u'	v'	Duv
84.1	23	84	99	0.3491	0.356	0.2124	0.4874	6.28E-04

5.2 Color Rendering Index

Ra
84.1

R1	R2	R3	R4	R5
83	87	90	85	83

R6	R7	R8	R9	R10
82	89	73	23	69

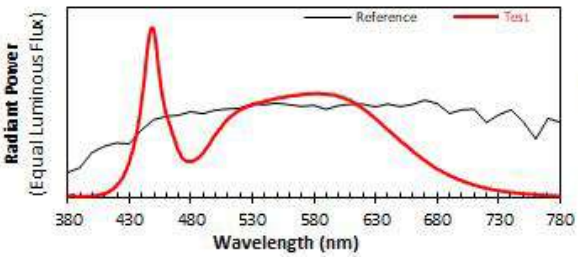
R11	R12	R13	R14	R15
84	61	84	94	79

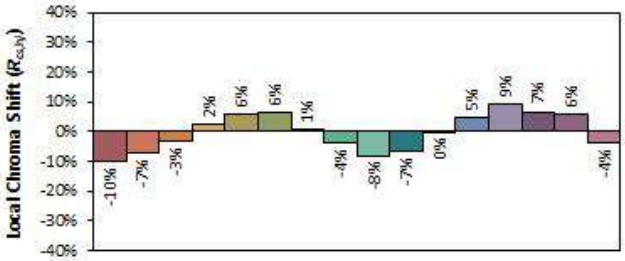
***5.3 ANSI/IES TM-30-18 Color Rendition Report**

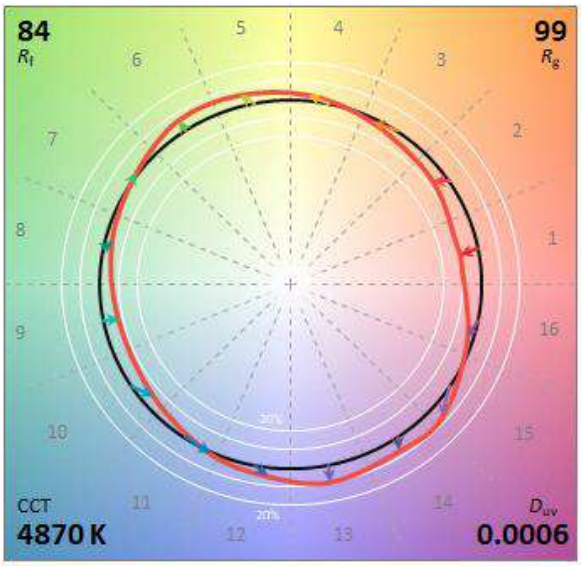
ANSI/IES TM-30-18 Color Rendition Report

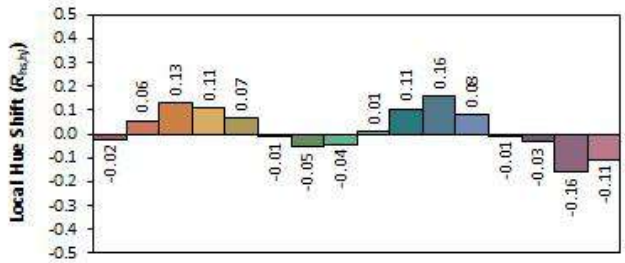
Source: BXEN-50E-11M-3CA **Manufacturer:** IKIO LED LIGHTING

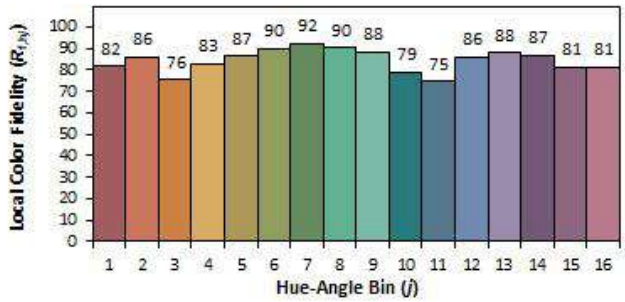
Date: 2023/9/7 **Model:** IK-HBAX-0150-50-DY-RLHV02BI

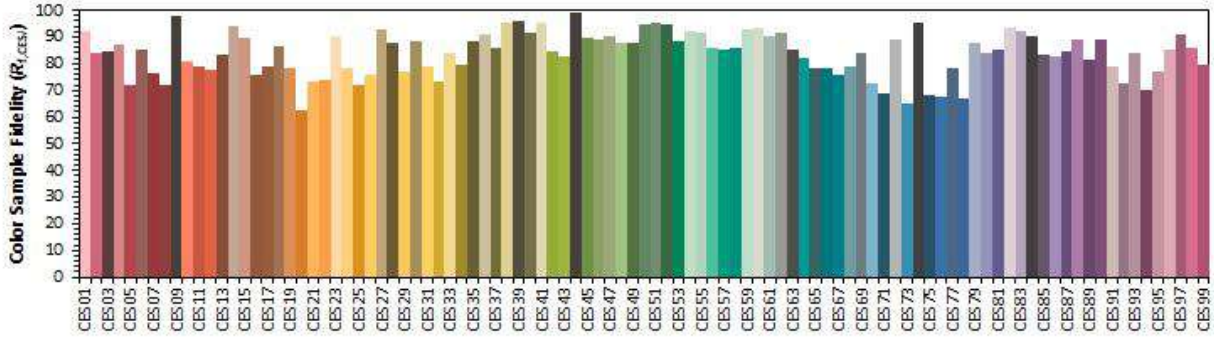












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

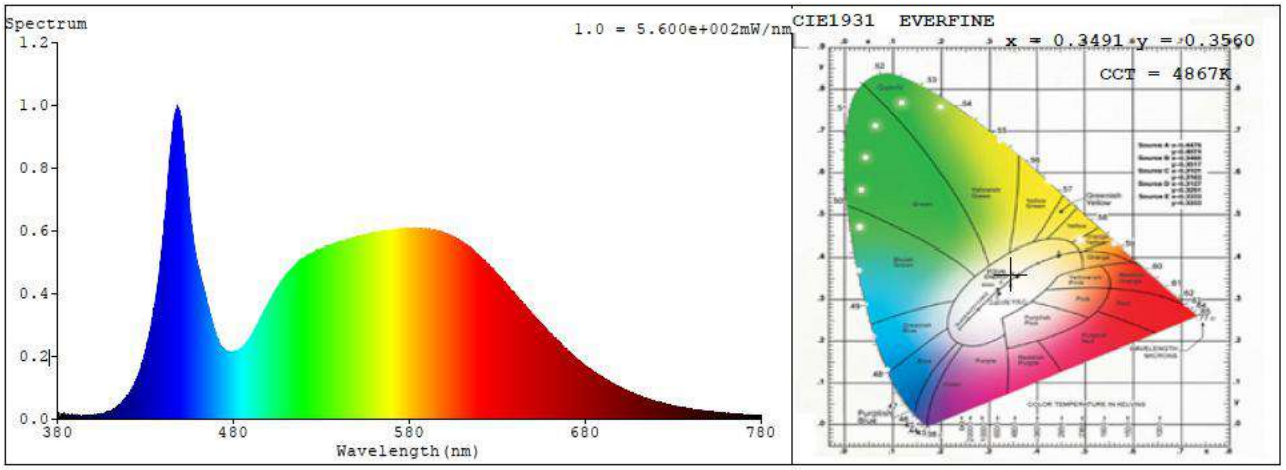
x	0.3490
y	0.3558
u'	0.2124
v'	0.4873

CIE 13.3-1995 (CRI)

R_a	84
R_9	23

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

5.4 Relative Spectral Power Distribution



nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	0.013	414	0.0399	448	0.9872	482	0.2166	516	0.4907
381	0.0065	415	0.0433	449	0.9912	483	0.2166	517	0.5013
382	0.0113	416	0.0495	450	0.965	484	0.2256	518	0.5045
383	0.0152	417	0.0539	451	0.9185	485	0.2297	519	0.5069
384	0.0155	418	0.0605	452	0.8578	486	0.2316	520	0.5117
385	0.013	419	0.0695	453	0.7941	487	0.239	521	0.5137
386	0.0063	420	0.0763	454	0.7247	488	0.247	522	0.5208
387	0.0063	421	0.0832	455	0.6739	489	0.2523	523	0.5227
388	0.0091	422	0.0926	456	0.6216	490	0.2637	524	0.5262
389	0.0046	423	0.1046	457	0.5785	491	0.2727	525	0.5292
390	0.013	424	0.1134	458	0.543	492	0.2824	526	0.5303
391	0.01	425	0.1237	459	0.5088	493	0.2945	527	0.5363
392	0.0054	426	0.1433	460	0.4814	494	0.3017	528	0.5338
393	0.007	427	0.1571	461	0.4623	495	0.3137	529	0.5394
394	0.0091	428	0.1751	462	0.4371	496	0.3268	530	0.5426
395	0.0067	429	0.1934	463	0.4163	497	0.3368	531	0.5446
396	0.0098	430	0.2146	464	0.3941	498	0.351	532	0.5478
397	0.0091	431	0.2436	465	0.3682	499	0.3592	533	0.5502
398	0.0105	432	0.2641	466	0.3525	500	0.3689	534	0.5513
399	0.0096	433	0.2892	467	0.3293	501	0.3779	535	0.5536
400	0.0114	434	0.3223	468	0.3079	502	0.3881	536	0.5531
401	0.0133	435	0.3511	469	0.2857	503	0.3988	537	0.5517
402	0.0104	436	0.388	470	0.2682	504	0.4033	538	0.5579
403	0.0143	437	0.4259	471	0.2569	505	0.4143	539	0.5588
404	0.0122	438	0.4711	472	0.2409	506	0.4263	540	0.5636
405	0.0165	439	0.5203	473	0.23	507	0.4355	541	0.5636
406	0.0164	440	0.5826	474	0.2235	508	0.4433	542	0.5609
407	0.0207	441	0.6352	475	0.2191	509	0.4509	543	0.5672
408	0.0208	442	0.6926	476	0.2121	510	0.4575	544	0.5688
409	0.0231	443	0.7691	477	0.2124	511	0.4668	545	0.5681
410	0.0232	444	0.8414	478	0.2126	512	0.4716	546	0.5716
411	0.0279	445	0.8948	479	0.2111	513	0.4769	547	0.5726
412	0.0319	446	0.944	480	0.2113	514	0.4819	548	0.5763
413	0.0335	447	0.9764	481	0.2117	515	0.489	549	0.5784

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
550	0.5772	599	0.5907	648	0.347	697	0.1074	746	0.0263
551	0.5825	600	0.5899	649	0.3402	698	0.107	747	0.0261
552	0.5816	601	0.5907	650	0.333	699	0.1018	748	0.025
553	0.5813	602	0.5858	651	0.3265	700	0.1009	749	0.0242
554	0.5833	603	0.5827	652	0.3215	701	0.0976	750	0.0238
555	0.5856	604	0.5821	653	0.3147	702	0.0945	751	0.0224
556	0.5844	605	0.5813	654	0.3103	703	0.092	752	0.0226
557	0.587	606	0.5777	655	0.3056	704	0.0894	753	0.0215
558	0.5925	607	0.5691	656	0.2992	705	0.0871	754	0.021
559	0.5891	608	0.5721	657	0.2913	706	0.0841	755	0.0209
560	0.5921	609	0.5677	658	0.2864	707	0.082	756	0.0202
561	0.5926	610	0.565	659	0.2812	708	0.0793	757	0.0198
562	0.5925	611	0.5594	660	0.2728	709	0.077	758	0.0191
563	0.593	612	0.5552	661	0.2665	710	0.0743	759	0.0186
564	0.5967	613	0.5539	662	0.2616	711	0.0732	760	0.0175
565	0.5962	614	0.5469	663	0.2557	712	0.0713	761	0.0179
566	0.5973	615	0.5413	664	0.2505	713	0.0688	762	0.018
567	0.5988	616	0.536	665	0.2458	714	0.0671	763	0.0168
568	0.5968	617	0.533	666	0.2405	715	0.0653	764	0.0158
569	0.6011	618	0.5271	667	0.2342	716	0.0626	765	0.0158
570	0.6011	619	0.5241	668	0.2265	717	0.0612	766	0.0157
571	0.603	620	0.5178	669	0.2242	718	0.0589	767	0.0146
572	0.6013	621	0.5135	670	0.2174	719	0.0578	768	0.0142
573	0.6041	622	0.5078	671	0.2137	720	0.0552	769	0.0144
574	0.6052	623	0.5034	672	0.2083	721	0.0539	770	0.0141
575	0.606	624	0.4988	673	0.2025	722	0.0531	771	0.0135
576	0.6041	625	0.4913	674	0.1981	723	0.0523	772	0.0128
577	0.6037	626	0.4827	675	0.1922	724	0.05	773	0.0129
578	0.6054	627	0.4804	676	0.1882	725	0.048	774	0.0125
579	0.605	628	0.4742	677	0.1827	726	0.0464	775	0.0117
580	0.6068	629	0.4669	678	0.1772	727	0.0452	776	0.0117
581	0.6072	630	0.4624	679	0.1733	728	0.0447	777	0.0118
582	0.6048	631	0.4544	680	0.1683	729	0.0431	778	0.0108
583	0.6093	632	0.4495	681	0.1646	730	0.042	779	0.0104
584	0.606	633	0.4443	682	0.1622	731	0.0405	780	0.0104
585	0.6057	634	0.4353	683	0.1579	732	0.0391		
586	0.6056	635	0.4302	684	0.1539	733	0.0383		
587	0.6046	636	0.4231	685	0.1495	734	0.0366		
588	0.6045	637	0.4161	686	0.1465	735	0.0366		
589	0.6025	638	0.4085	687	0.1422	736	0.0349		
590	0.6023	639	0.4035	688	0.1388	737	0.0345		
591	0.6031	640	0.3975	689	0.1345	738	0.0338		
592	0.5998	641	0.3896	690	0.1315	739	0.0326		
593	0.6	642	0.3861	691	0.1288	740	0.0313		
594	0.6023	643	0.3776	692	0.125	741	0.0305		
595	0.5982	644	0.3743	693	0.1216	742	0.0296		
596	0.5998	645	0.3648	694	0.1186	743	0.0291		
597	0.5995	646	0.3591	695	0.1139	744	0.0284		
598	0.5978	647	0.3524	696	0.1115	745	0.0273		

6. Goniophotometer Test results

6.1 Test Data

Test Ambient Temperature	25.2℃	Test orientation	Downward
Operate time(Min.)	90	stabilization time(Min.)	30

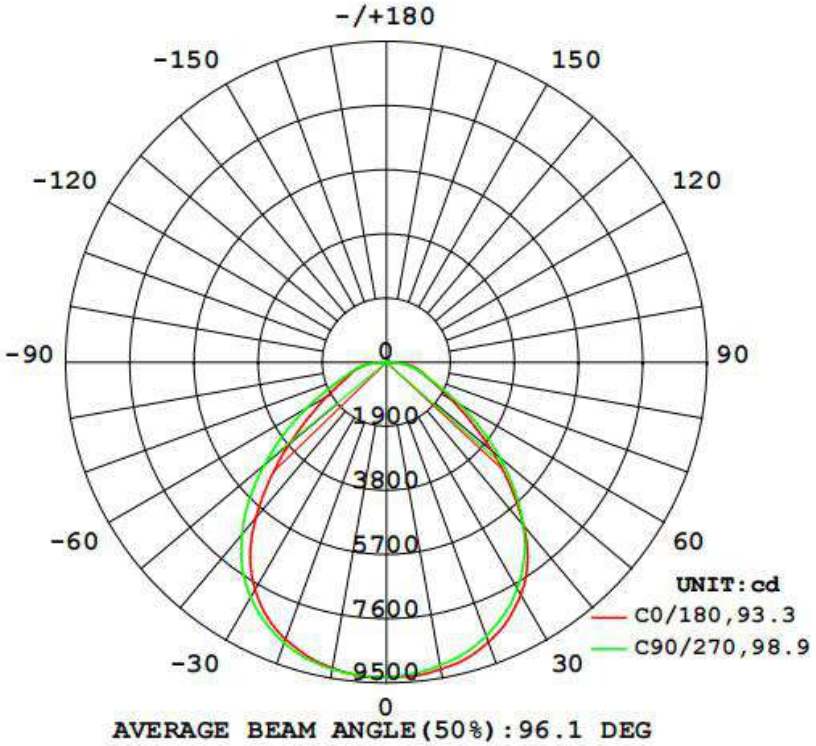
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current(A)	Power Factor	Power(W)
277	60	0.5418	0.9987	149.9

Optical Measurement

Luminous Flux (lm)	Efficacy(lm/W)	Imax (cd)	ZL (20-50°)
21904.9	146.16	9341	56.6%

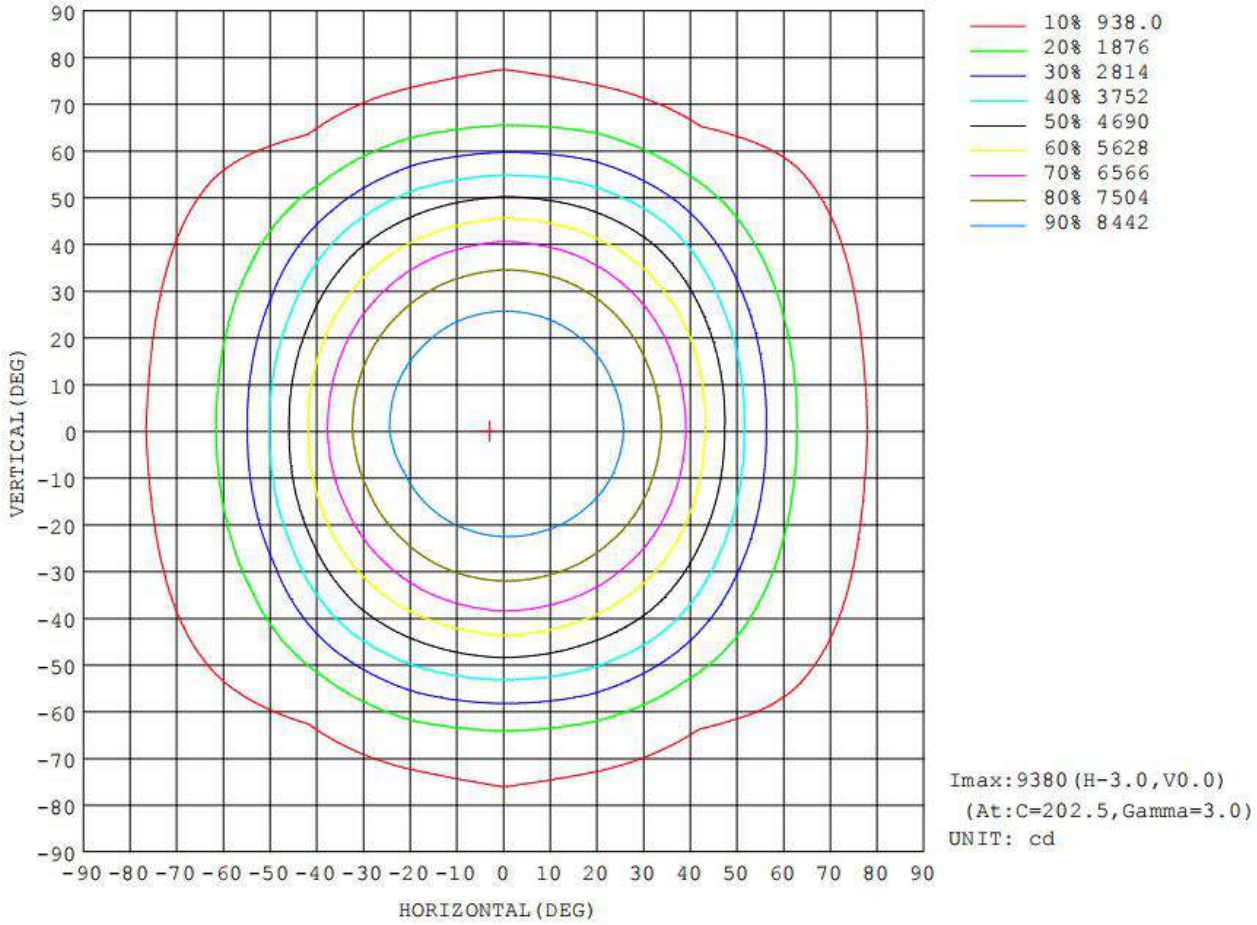
6.2 Luminous Intensity Distribution



6.3 Zonal Flux Diagram

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	Φ zone	Φ total	%lum,lamp
10	9236	9185	9121	9170	9192	9230	9235	9259	0- 10	885.0	885.0	4.04,4.04
20	8819	8732	8638	8662	8734	8799	8850	8871	10- 20	2549	3434	15.7,15.7
30	7966	7819	7755	7692	7788	7906	8045	8038	20- 30	3858	7292	33.3,33.3
40	6332	6214	6310	6069	6022	6279	6673	6523	30- 40	4476	11768	53.7,53.7
50	4086	4294	4392	4152	3750	4286	4727	4605	40- 50	4078	15846	72.3,72.3
60	2228	2287	2516	2156	2049	2253	2761	2542	50- 60	2923	18769	85.7,85.7
70	1289	991.6	1278	938.9	1206	975.6	1381	1085	60- 70	1663	20431	93.3,93.3
80	823.7	609.4	720.3	571.5	754.2	600.4	782.7	653.0	70- 80	954.3	21386	97.6,97.6
90	71.45	72.69	63.03	1.171	1.471	1.250	53.52	64.29	80- 90	397.4	21783	99.4,99.4
100	46.55	19.60	3.469	21.11	53.43	23.60	3.605	21.85	90-100	14.07	21797	99.5,99.5
110	37.82	21.77	5.939	18.46	37.93	20.57	5.855	23.01	100-110	24.40	21822	99.6,99.6
120	36.85	22.49	7.412	18.61	29.03	19.35	7.469	23.50	110-120	21.60	21843	99.7,99.7
130	31.09	22.20	9.956	19.32	24.48	19.60	9.261	23.06	120-130	18.51	21862	99.8,99.8
140	27.78	22.33	10.78	20.19	24.23	21.00	11.80	24.04	130-140	15.97	21878	99.9,99.9
150	23.24	22.62	15.32	19.57	23.58	21.91	15.45	24.48	140-150	12.86	21891	99.9,99.9
160	20.25	18.71	15.67	13.36	21.18	20.06	14.89	13.40	150-160	8.621	21899	100,100
170	10.81	12.92	13.43	13.32	14.43	13.84	15.68	16.38	160-170	4.411	21904	100,100
180	16.31	15.20	15.50	15.16	16.04	13.54	15.27	15.33	170-180	1.355	21905	100,100
DEG	LUMINOUS INTENSITY:cd									UNIT:lm		

6.4 Isocandela Diagram



6.5 Luminous Distribution Intensity 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	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323	9323			
5	9320	9308	9283	9265	9258	9279	9298	9314	9320	9327	9331	9325	9309	9309	9312	9320			
10	9236	9215	9185	9151	9121	9149	9170	9179	9192	9212	9230	9247	9235	9240	9259	9255			
15	9094	9058	8993	8958	8927	8942	8955	8998	9021	9060	9073	9071	9090	9094	9119	9109			
20	8819	8762	8732	8648	8638	8633	8662	8686	8734	8762	8799	8817	8850	8853	8871	8858			
25	8470	8415	8322	8272	8253	8233	8243	8293	8344	8393	8415	8471	8505	8516	8522	8514			
30	7966	7886	7819	7770	7755	7731	7692	7725	7788	7849	7906	7983	8045	8056	8038	8016			
35	7290	7189	7110	7102	7117	7048	6966	6961	7049	7107	7195	7334	7446	7449	7388	7332			
40	6332	6245	6214	6263	6310	6186	6069	6026	6022	6114	6279	6503	6673	6636	6523	6449			
45	5202	5182	5260	5297	5374	5243	5125	4963	4876	5018	5294	5531	5747	5680	5583	5424			
50	4086	4100	4294	4339	4392	4294	4152	3836	3750	3896	4286	4544	4727	4708	4605	4293			
55	3038	3065	3272	3412	3418	3351	3131	2795	2780	2879	3222	3577	3710	3728	3569	3191			
60	2228	2207	2287	2504	2516	2458	2156	1994	2049	2085	2253	2630	2761	2790	2542	2308			
65	1656	1564	1506	1716	1764	1690	1407	1423	1532	1493	1479	1799	1944	1947	1673	1651			
70	1289	1172	992	1199	1278	1177	939	1085	1206	1138	976	1237	1381	1319	1085	1223			
75	1059	921	758	867	988	840	736	857	997	895	757	897	1057	931	802	964			
80	824	690	609	615	720	587	572	642	754	665	600	636	783	661	653	733			
85	522	437	343	352	369	323	298	378	453	400	321	360	418	391	388	488			
90	71.4	70.0	72.7	0.89	63.0	57.1	1.17	25.8	1.47	1.35	1.25	1.85	53.5	63.3	64.3	86.1			
95	1.20	1.40	1.80	5.29	1.95	5.54	18.9	1.79	16.3	2.18	14.3	6.85	2.29	5.64	2.16	1.86			
100	46.5	36.0	19.6	8.50	3.47	8.55	21.1	40.8	53.4	43.8	23.6	9.99	3.61	9.60	21.8	37.9			
105	39.8	35.5	20.6	10.00	4.77	9.65	19.3	36.6	43.9	39.1	21.9	11.2	4.93	11.2	22.2	36.5			
110	37.8	34.6	21.8	11.2	5.94	10.5	18.5	32.7	37.9	33.9	20.6	11.6	5.85	12.3	23.0	35.1			
115	37.6	35.1	22.5	12.5	5.38	11.5	18.5	29.7	33.4	30.1	19.9	12.2	5.64	13.4	23.6	35.6			
120	36.8	34.3	22.5	13.6	7.41	12.0	18.6	27.1	29.0	27.1	19.3	12.3	7.47	14.4	23.5	34.8			
125	33.7	32.4	22.0	14.3	8.67	12.4	18.8	25.6	25.7	25.4	19.0	12.1	7.40	15.1	22.9	32.5			
130	31.1	30.5	22.2	15.3	9.96	12.5	19.3	24.9	24.5	24.5	19.6	12.9	9.26	16.4	23.1	30.8			
135	29.2	28.9	23.5	16.5	9.79	12.8	21.1	24.4	24.0	24.4	21.4	13.4	11.0	17.0	24.7	29.8			
140	27.8	27.6	22.3	17.4	10.8	12.8	20.2	23.9	24.2	24.7	21.0	14.4	11.8	17.7	24.0	29.2			
145	25.7	25.2	22.0	18.0	14.9	11.9	20.0	22.3	24.3	24.2	21.9	16.1	14.9	18.0	25.3	27.5			
150	23.2	23.2	22.6	14.5	15.3	7.99	19.6	21.1	23.6	23.8	21.9	14.7	15.4	12.0	24.5	26.6			
155	22.2	23.1	21.5	9.93	12.3	12.3	17.2	20.6	23.5	23.6	22.4	14.3	16.6	17.5	20.2	25.8			
160	20.3	20.8	18.7	11.5	15.7	13.6	13.4	17.0	21.2	20.6	20.1	15.0	14.9	15.8	13.4	22.6			
165	17.0	17.4	10.9	15.2	13.8	14.2	12.4	12.6	16.4	16.2	15.2	15.3	16.7	17.2	16.3	14.5			
170	10.8	11.0	12.9	13.8	13.4	14.1	13.3	12.7	14.4	14.4	13.8	15.1	15.7	15.4	16.4	13.5			
175	15.0	15.2	14.1	14.0	13.5	14.6	13.1	13.3	13.6	13.6	14.5	14.2	14.3	14.4	14.9	15.7			
180	16.3	13.3	15.2	15.3	15.5	15.4	15.2	13.8	16.0	15.8	13.5	15.2	15.3	15.4	15.3	15.2			

7. THD and PF Test

Model Number	Voltage (V AC)	Frequency (Hz)	Power Factor	THD (%)
IK-HBAX-0150-50-DY-RLHV02BI	277.0	60	0.998	4.57
	480.0	60	0.973	6.72

8. Photo of sample

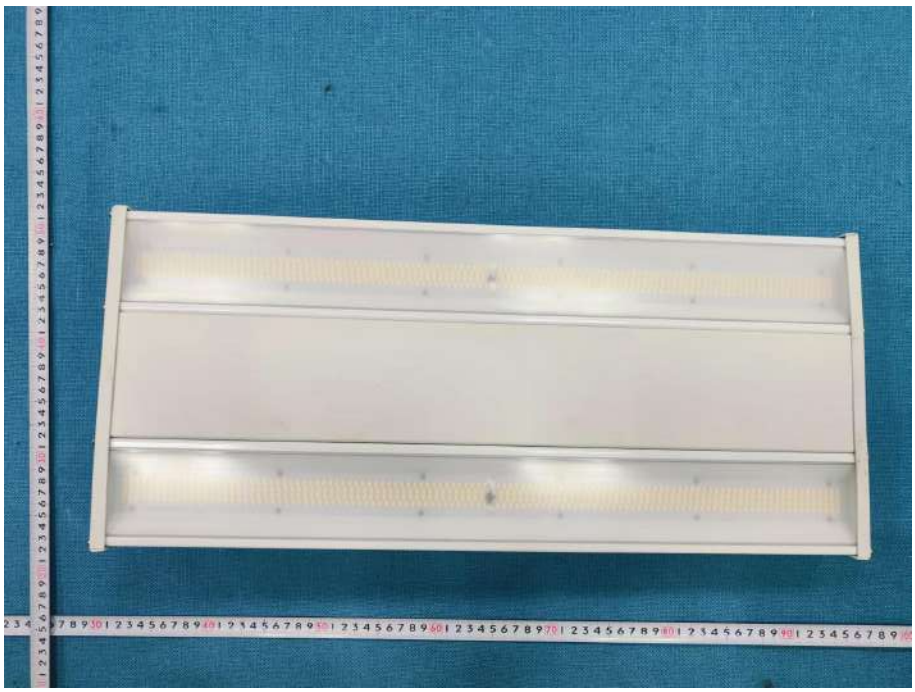


Figure 1

Figure 2

---End of Report---