



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Overdrive Electronics Pvt Ltd

C-121,Hosiery Complex,Phase-IIExtn.,Noida-201305,UP,INdia

Test Model: L20H80/30K

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution, THD
Test Engineer:	Carl Du <i>Carl Du</i>
Report Number:	PSZ2Q161227002-10
Test Date:	2016-12-28
Report Date:	2017-01-03
Reviewed By:	Blake Zhang / EE Engineer <i>Blake Zhang</i>
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Accreditation:	The IAS Accreditation Number TL-460.

Note: 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 used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

1. Product Description

General Information:

One sample was received on 2016-12-27 and used for testing.

Model Tested: L20H80/30K
 Manufacturer: Overdrive Electronics Pvt Ltd
 Brand Name: OVERDRIVE
 Product Designation: 20W LED H80 Lamp Warm White
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277V 60Hz
 Rated Power: 20 W
 Nominal CCT: 3000K
 Nominal Lumen Output: 2300 lm

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition (This method is not in IAS accreditation scope)

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	25~50°C	2016-03-10	2017-03-09
High Accuracy Array spectroradiometer	EVERFINE	HAAS-2000	M112048CA13 61125	380-780nm	2016-07-08	2017-07-07
Power meter	YOKOGAWA	WT310	C20E17024V	2kV/20A	2016-07-08	2017-07-07
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2016-03-04	2017-03-03
Thermal Meter	SENSING	N/A	N/A	25、50°C	2016-03-10	2017-03-09
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-12-05	2017-12-04
AC Power Supply	ALL Power	APW-105N	970613	220V±10% 50Hz	2016-03-04	2017-03-03
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2016-03-04	2017-03-03
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2016-03-04	2017-03-03
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/ 300/600 V	2016-03-04	2017-03-03
Goniophotometer	EVERFINE	GO-R5000	YG108492N10 120001	1600mm, 3000W/10A	2016-03-10	2017-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C; -20°C~60°C	2016-03-21	2017-03-20
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-09-07	2017-09-06

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$ during measurement. And relative humidity is less than 65%.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is $U=1.8\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=20\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=1.8(K=2)$, at the 95% confidence level.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

The uncertainty of the luminous intensity is $U=1.6\%$ ($K=2$), at the 95% confidence level.

Additional Test

The Additional Test item may not be covered by IESNA LM-79-2008. Additional test including power factor, off-state power and THD, was measured by Digital Power Meter after stabilized at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$. Test voltage for THD and power factor test would be equal to rated voltage or, in case of a voltage range, maximum value of that range.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f , R_g was calculated according to IES TM-30-15 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. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Base up**

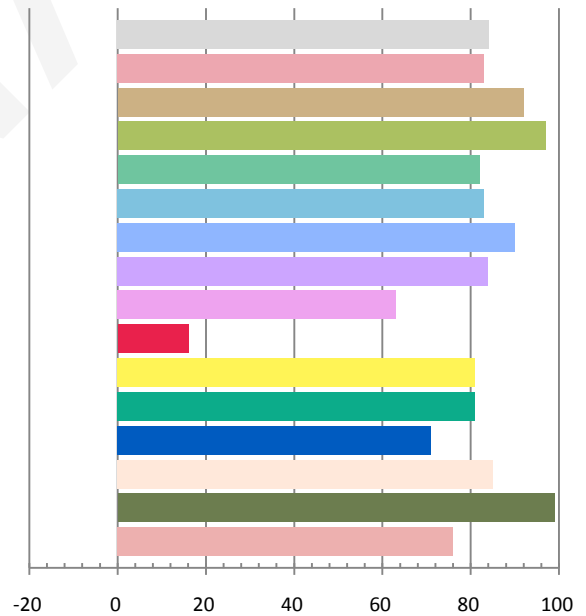
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.1679	19.64	0.9744	2271.7	115.66

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.0301	3000	0.000188	0.4372	0.4046	0.2505	0.5217

Color Rendering Index

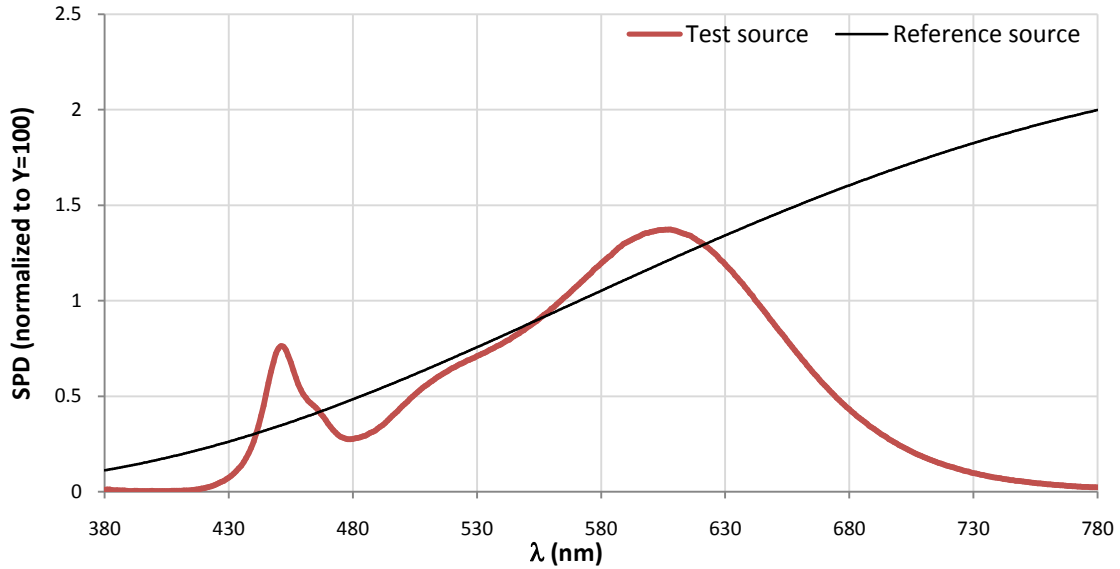
Ra			
84.2			
R1	R2	R3	R4
83	92	97	82
R5	R6	R7	R8
83	90	84	63
R9	R10	R11	R12
16	81	81	71
R13	R14	R15	
85	99	76	



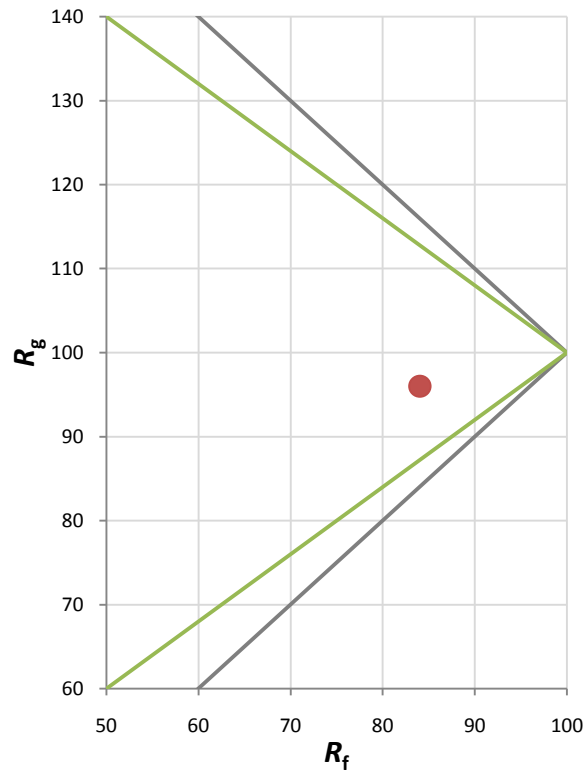
Fidelity Index and Gamut Index

Fidelity Index R_f	84
Gamut Index R_g	96

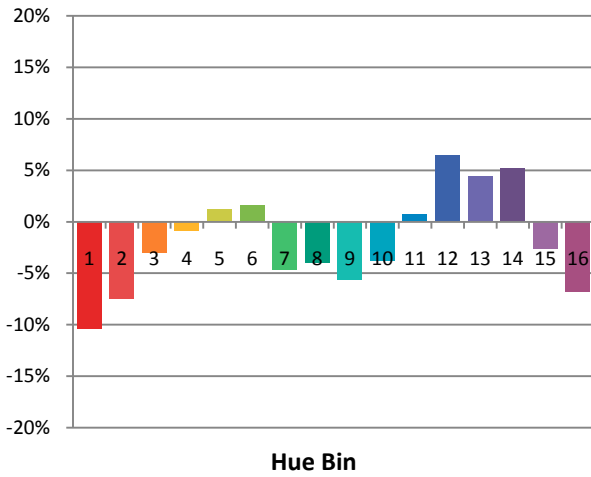
Spectral Power Distribution Comparison



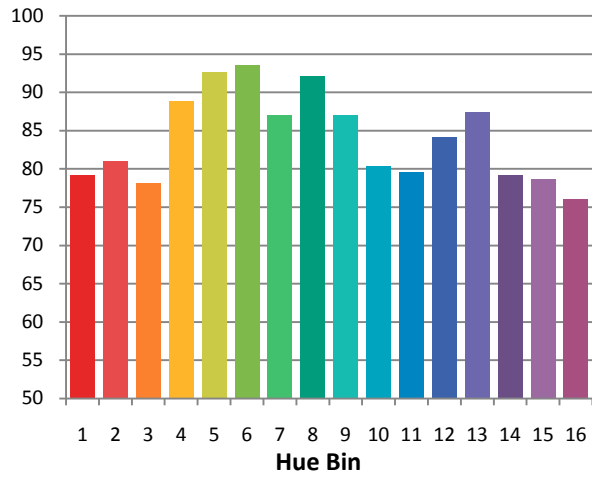
Plot of R_g versus R_f



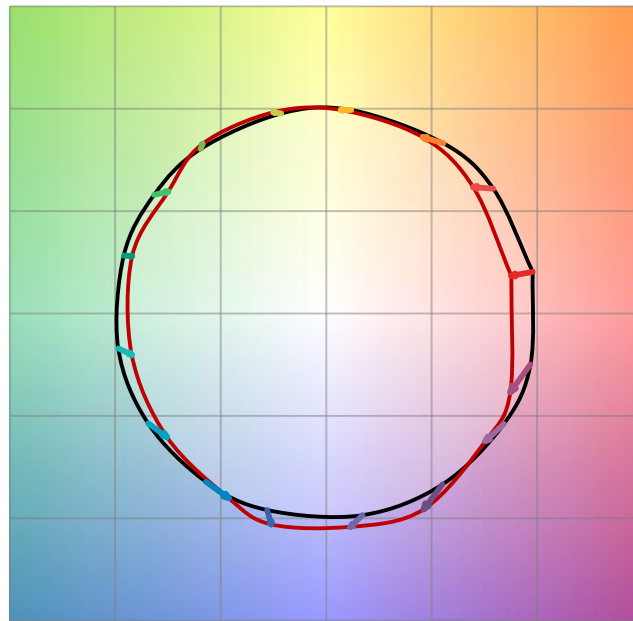
Chroma Shift by Hue



R_f by Hue

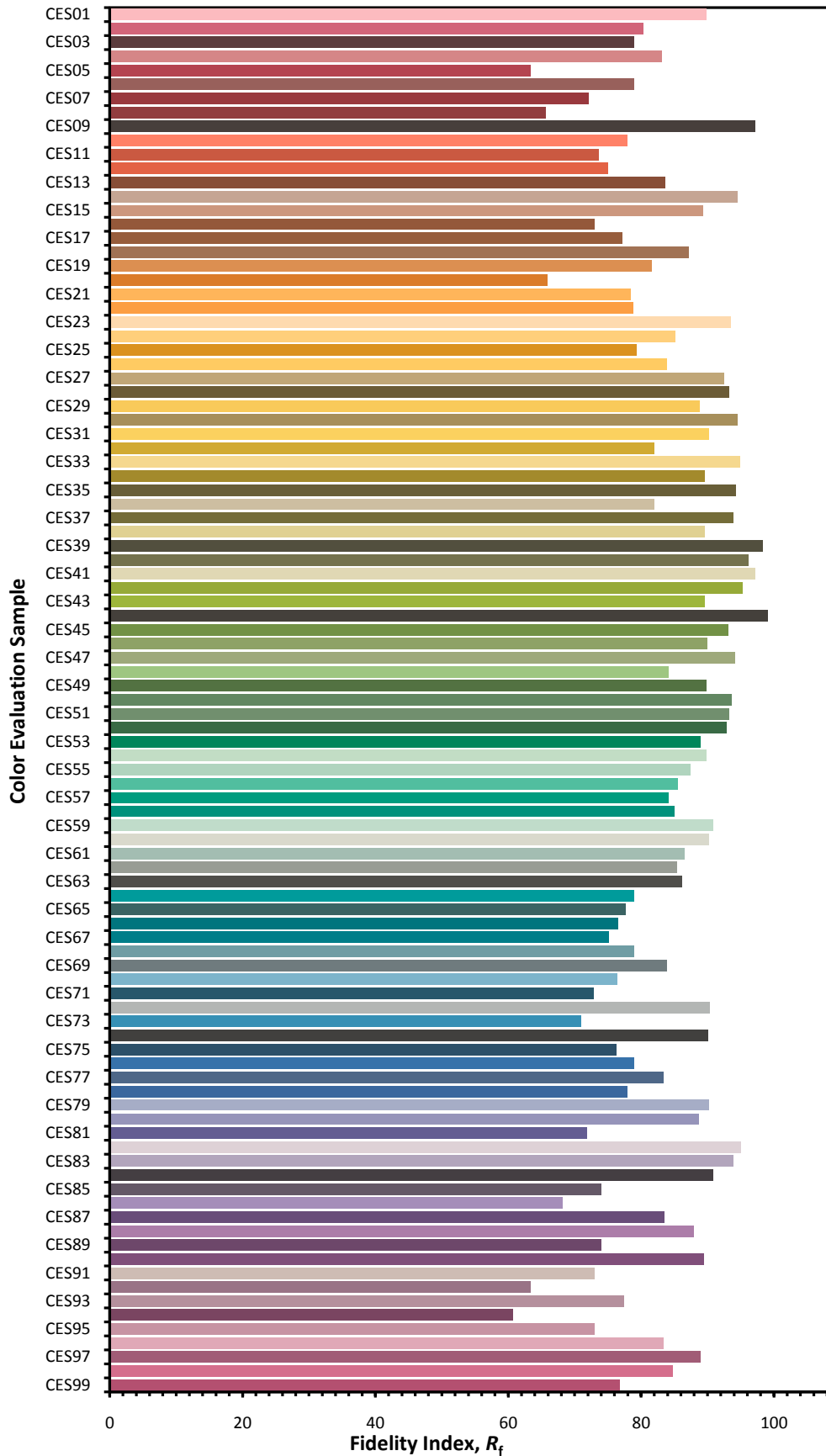


Color Vector Graphic

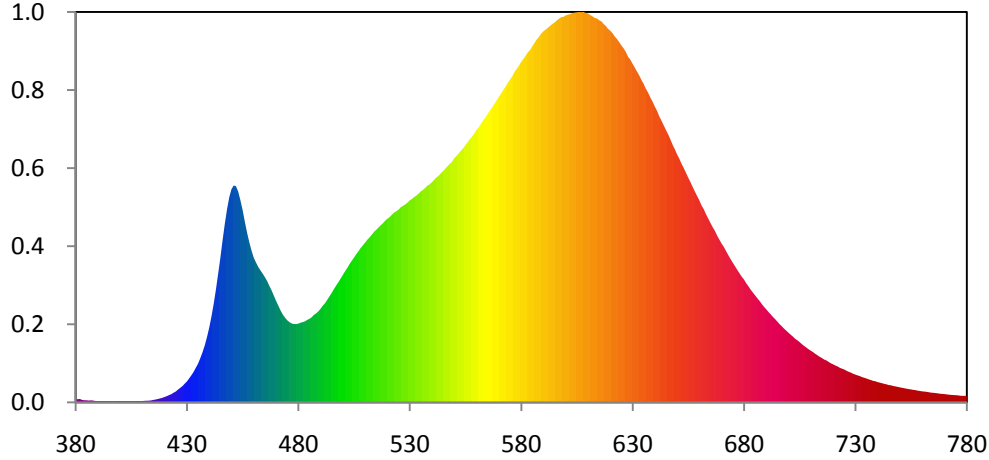


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



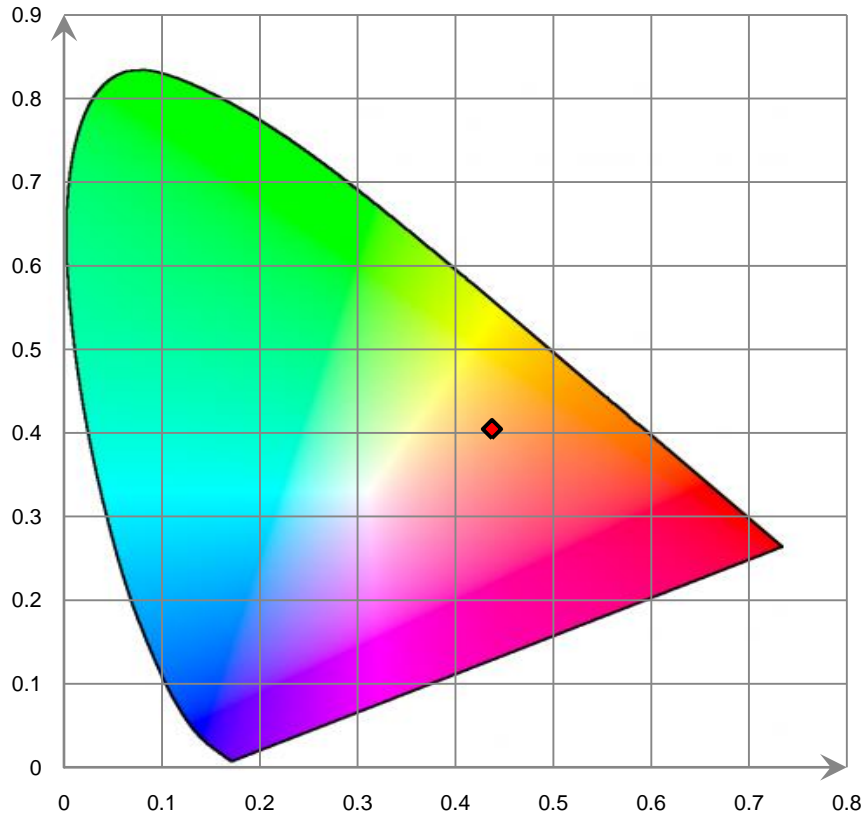
Relative Spectral Power Distribution



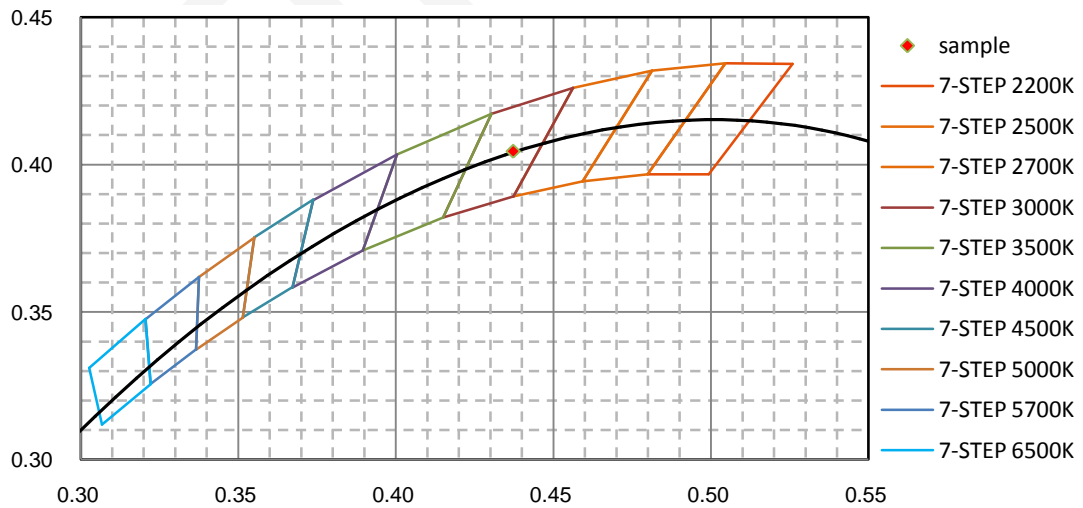
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.204E-01	421	7.355E-01	462	1.584E+01	503	1.618E+01	544	2.678E+01
381	3.820E-01	422	8.541E-01	463	1.543E+01	504	1.656E+01	545	2.705E+01
382	3.907E-01	423	9.639E-01	464	1.505E+01	505	1.694E+01	546	2.733E+01
383	2.814E-01	424	1.127E+00	465	1.463E+01	506	1.732E+01	547	2.760E+01
384	2.461E-01	425	1.275E+00	466	1.419E+01	507	1.768E+01	548	2.789E+01
385	2.483E-01	426	1.495E+00	467	1.362E+01	508	1.806E+01	549	2.814E+01
386	2.111E-01	427	1.696E+00	468	1.310E+01	509	1.837E+01	550	2.854E+01
387	2.397E-01	428	1.903E+00	469	1.248E+01	510	1.869E+01	551	2.881E+01
388	2.047E-01	429	2.185E+00	470	1.188E+01	511	1.902E+01	552	2.911E+01
389	1.630E-01	430	2.447E+00	471	1.132E+01	512	1.929E+01	553	2.942E+01
390	1.344E-01	431	2.800E+00	472	1.075E+01	513	1.960E+01	554	2.972E+01
391	1.292E-01	432	3.173E+00	473	1.028E+01	514	1.995E+01	555	3.009E+01
392	1.523E-01	433	3.569E+00	474	9.916E+00	515	2.018E+01	556	3.041E+01
393	1.401E-01	434	4.050E+00	475	9.604E+00	516	2.045E+01	557	3.079E+01
394	1.233E-01	435	4.529E+00	476	9.386E+00	517	2.071E+01	558	3.107E+01
395	1.256E-01	436	5.172E+00	477	9.228E+00	518	2.095E+01	559	3.145E+01
396	1.293E-01	437	5.855E+00	478	9.159E+00	519	2.124E+01	560	3.186E+01
397	1.110E-01	438	6.665E+00	479	9.151E+00	520	2.148E+01	561	3.215E+01
398	1.317E-01	439	7.624E+00	480	9.205E+00	521	2.167E+01	562	3.260E+01
399	1.447E-01	440	8.734E+00	481	9.311E+00	522	2.193E+01	563	3.298E+01
400	1.310E-01	441	1.002E+01	482	9.384E+00	523	2.218E+01	564	3.332E+01
401	1.282E-01	442	1.150E+01	483	9.480E+00	524	2.235E+01	565	3.374E+01
402	1.232E-01	443	1.318E+01	484	9.645E+00	525	2.254E+01	566	3.412E+01
403	1.229E-01	444	1.500E+01	485	9.770E+00	526	2.282E+01	567	3.448E+01
404	1.258E-01	445	1.690E+01	486	9.950E+00	527	2.298E+01	568	3.488E+01
405	1.309E-01	446	1.895E+01	487	1.023E+01	528	2.315E+01	569	3.531E+01
406	1.089E-01	447	2.087E+01	488	1.040E+01	529	2.335E+01	570	3.572E+01
407	1.413E-01	448	2.258E+01	489	1.064E+01	530	2.361E+01	571	3.609E+01
408	1.511E-01	449	2.399E+01	490	1.095E+01	531	2.379E+01	572	3.653E+01
409	1.499E-01	450	2.493E+01	491	1.131E+01	532	2.400E+01	573	3.691E+01
410	1.544E-01	451	2.536E+01	492	1.160E+01	533	2.419E+01	574	3.733E+01
411	1.846E-01	452	2.526E+01	493	1.200E+01	534	2.440E+01	575	3.774E+01
412	1.918E-01	453	2.465E+01	494	1.241E+01	535	2.467E+01	576	3.810E+01
413	2.030E-01	454	2.362E+01	495	1.281E+01	536	2.484E+01	577	3.861E+01
414	2.388E-01	455	2.249E+01	496	1.326E+01	537	2.509E+01	578	3.898E+01
415	2.906E-01	456	2.110E+01	497	1.366E+01	538	2.534E+01	579	3.936E+01
416	3.391E-01	457	1.984E+01	498	1.405E+01	539	2.550E+01	580	3.979E+01
417	4.020E-01	458	1.872E+01	499	1.449E+01	540	2.574E+01	581	4.014E+01
418	4.682E-01	459	1.775E+01	500	1.491E+01	541	2.602E+01	582	4.052E+01
419	5.404E-01	460	1.691E+01	501	1.533E+01	542	2.632E+01	583	4.092E+01
420	6.361E-01	461	1.636E+01	502	1.573E+01	543	2.649E+01	584	4.120E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.162E+01	626	4.139E+01	667	2.003E+01	708	6.415E+00	749	1.813E+00
586	4.201E+01	627	4.096E+01	668	1.948E+01	709	6.214E+00	750	1.753E+00
587	4.243E+01	628	4.040E+01	669	1.901E+01	710	6.041E+00	751	1.706E+00
588	4.274E+01	629	4.008E+01	670	1.856E+01	711	5.874E+00	752	1.653E+00
589	4.311E+01	630	3.960E+01	671	1.817E+01	712	5.680E+00	753	1.601E+00
590	4.337E+01	631	3.914E+01	672	1.768E+01	713	5.506E+00	754	1.553E+00
591	4.359E+01	632	3.868E+01	673	1.721E+01	714	5.333E+00	755	1.517E+00
592	4.379E+01	633	3.823E+01	674	1.675E+01	715	5.185E+00	756	1.463E+00
593	4.402E+01	634	3.769E+01	675	1.633E+01	716	5.014E+00	757	1.428E+00
594	4.424E+01	635	3.723E+01	676	1.592E+01	717	4.907E+00	758	1.370E+00
595	4.441E+01	636	3.665E+01	677	1.550E+01	718	4.735E+00	759	1.332E+00
596	4.465E+01	637	3.620E+01	678	1.509E+01	719	4.576E+00	760	1.289E+00
597	4.486E+01	638	3.564E+01	679	1.470E+01	720	4.452E+00	761	1.264E+00
598	4.503E+01	639	3.516E+01	680	1.437E+01	721	4.318E+00	762	1.231E+00
599	4.507E+01	640	3.457E+01	681	1.394E+01	722	4.204E+00	763	1.187E+00
600	4.525E+01	641	3.409E+01	682	1.358E+01	723	4.052E+00	764	1.141E+00
601	4.532E+01	642	3.343E+01	683	1.319E+01	724	3.942E+00	765	1.121E+00
602	4.540E+01	643	3.294E+01	684	1.285E+01	725	3.848E+00	766	1.089E+00
603	4.550E+01	644	3.239E+01	685	1.251E+01	726	3.701E+00	767	1.055E+00
604	4.556E+01	645	3.184E+01	686	1.218E+01	727	3.575E+00	768	1.015E+00
605	4.560E+01	646	3.133E+01	687	1.186E+01	728	3.484E+00	769	9.952E-01
606	4.563E+01	647	3.074E+01	688	1.150E+01	729	3.344E+00	770	9.665E-01
607	4.562E+01	648	3.011E+01	689	1.118E+01	730	3.248E+00	771	9.352E-01
608	4.565E+01	649	2.959E+01	690	1.089E+01	731	3.154E+00	772	9.022E-01
609	4.553E+01	650	2.898E+01	691	1.057E+01	732	3.076E+00	773	8.762E-01
610	4.546E+01	651	2.849E+01	692	1.030E+01	733	2.955E+00	774	8.587E-01
611	4.528E+01	652	2.789E+01	693	9.990E+00	734	2.880E+00	775	8.418E-01
612	4.513E+01	653	2.739E+01	694	9.734E+00	735	2.795E+00	776	8.251E-01
613	4.495E+01	654	2.684E+01	695	9.448E+00	736	2.695E+00	777	7.814E-01
614	4.488E+01	655	2.627E+01	696	9.146E+00	737	2.612E+00	778	7.635E-01
615	4.468E+01	656	2.575E+01	697	8.894E+00	738	2.514E+00	779	7.629E-01
616	4.455E+01	657	2.519E+01	698	8.620E+00	739	2.468E+00	780	7.644E-01
617	4.424E+01	658	2.463E+01	699	8.391E+00	740	2.370E+00		
618	4.401E+01	659	2.412E+01	700	8.139E+00	741	2.312E+00		
619	4.366E+01	660	2.361E+01	701	7.910E+00	742	2.240E+00		
620	4.346E+01	661	2.302E+01	702	7.682E+00	743	2.165E+00		
621	4.316E+01	662	2.257E+01	703	7.437E+00	744	2.109E+00		
622	4.279E+01	663	2.198E+01	704	7.258E+00	745	2.021E+00		
623	4.249E+01	664	2.149E+01	705	7.043E+00	746	1.994E+00		
624	4.212E+01	665	2.097E+01	706	6.808E+00	747	1.917E+00		
625	4.173E+01	666	2.047E+01	707	6.599E+00	748	1.869E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Base up**

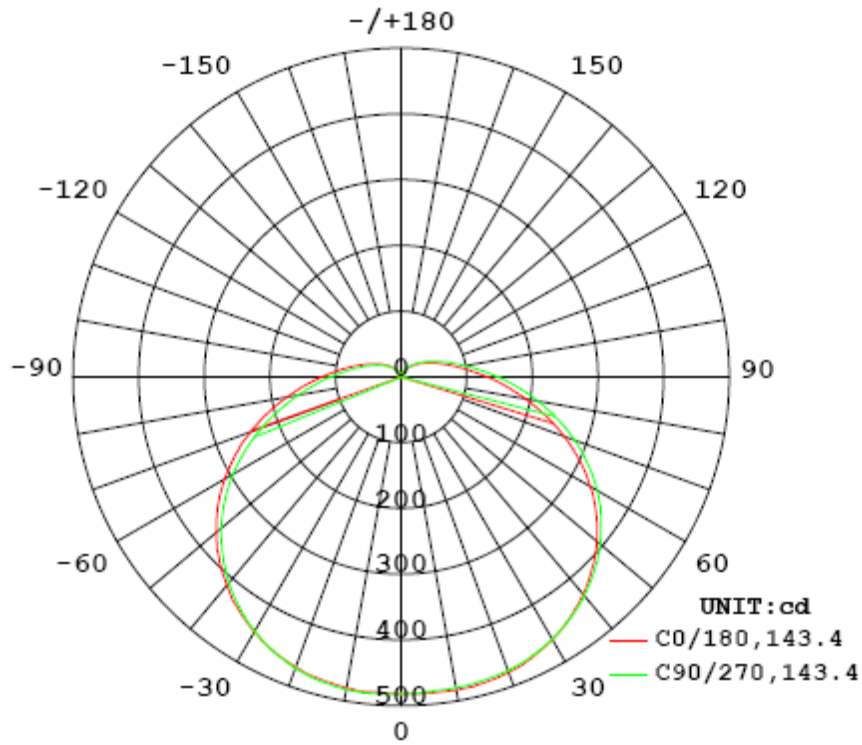
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1680	19.63	0.9740

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2284.62	116.38	485.6	1.43	1.43

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	143.4	142.7	143.4	143.7	143.3
Field Angle (10% I _{max}):	230.8	230.2	230.6	230.9	230.6

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	482	482	482	482	482	482	482	482
5.0°	481	482	481	483	483	484	483	484
10.0°	480	481	481	482	483	483	484	484
15.0°	476	478	475	477	479	481	482	482
20.0°	470	469	469	470	472	473	476	478
25.0°	460	460	457	459	460	464	467	470
30.0°	448	446	445	445	447	450	455	459
35.0°	432	431	426	427	429	434	439	445
40.0°	414	410	407	406	409	413	421	427
45.0°	392	388	382	383	384	391	399	406
50.0°	368	363	357	356	359	364	373	382
55.0°	341	334	327	326	328	335	344	355
60.0°	311	303	295	293	296	303	313	323
65.0°	279	269	260	258	261	269	278	289
70.0°	244	234	225	222	226	233	242	252
75.0°	210	199	190	188	191	198	206	216
80.0°	177	167	157	156	159	165	172	181
85.0°	147	138	130	128	131	136	142	150
90.0°	121	113	106	105	108	112	117	123
95.0°	100	93	88	87	89	92	96	101
100.0°	82	77	73	72	73	76	79	83
105.0°	68	64	61	60	61	63	66	69
110.0°	57	54	51	50	51	52	55	57
115.0°	47	45	43	42	43	44	46	48
120.0°	40	38	36	35	36	37	38	40
125.0°	33	31	30	29	30	31	32	33
130.0°	27	26	25	24	25	25	26	28
135.0°	23	21	20	20	20	21	22	23
140.0°	18	17	16	16	16	17	18	19
145.0°	15	14	13	13	13	13	14	15
150.0°	11	11	10	10	10	10	11	12
155.0°	9	8	7	7	7	7	8	9
160.0°	6	5	5	5	5	5	6	6
165.0°	4	3	3	3	3	3	4	4
170.0°	2	2	2	1	1	2	2	2
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	0	0

Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	482	482	482	482	482	482	482	482
5.0°	483	483	480	481	480	481	481	482
10.0°	484	482	481	480	480	480	480	480
15.0°	482	482	478	480	478	479	477	478
20.0°	478	478	477	476	475	474	473	472
25.0°	471	473	469	471	469	468	466	464
30.0°	461	463	462	462	460	458	455	453
35.0°	448	451	449	450	449	446	443	438
40.0°	432	434	435	435	434	431	426	422
45.0°	411	416	415	418	417	413	408	401
50.0°	389	394	394	397	396	392	386	378
55.0°	363	369	370	373	372	367	361	352
60.0°	332	340	342	345	344	340	332	323
65.0°	300	307	310	314	314	309	301	291
70.0°	264	272	277	282	281	276	268	257
75.0°	228	237	241	247	247	242	233	223
80.0°	192	201	206	212	212	207	199	189
85.0°	160	168	173	178	178	173	166	158
90.0°	132	139	144	148	148	144	138	131
95.0°	107	113	117	121	121	118	113	107
100.0°	88	93	96	99	99	97	93	88
105.0°	73	77	80	82	82	80	77	73
110.0°	61	64	66	68	68	66	64	61
115.0°	51	53	55	57	56	55	53	51
120.0°	43	45	46	47	47	46	44	42
125.0°	36	38	39	40	39	39	37	35
130.0°	30	31	32	33	33	32	31	29
135.0°	25	26	27	27	27	27	26	24
140.0°	20	21	22	22	22	22	21	20
145.0°	16	17	18	18	18	18	17	16
150.0°	13	13	14	14	14	14	13	13
155.0°	10	10	11	11	11	11	10	10
160.0°	7	7	8	8	8	8	8	7
165.0°	5	5	5	6	6	6	5	5
170.0°	3	3	3	3	4	3	3	3
175.0°	1	2	2	2	2	2	2	2
180.0°	1	1	1	1	1	1	1	1

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	11.5	0.50	0-5	11.5	0.50
5-10	34.5	1.51	0-10	46.0	2.01
10-15	57.0	2.50	0-15	103.0	4.51
15-20	78.5	3.43	0-20	181.5	7.94
20-25	98.5	4.32	0-25	280.0	12.26
25-30	116.4	5.09	0-30	396.4	17.35
30-35	131.6	5.76	0-35	528.0	23.11
35-40	143.8	6.30	0-40	671.8	29.41
40-45	152.5	6.67	0-45	824.4	36.08
45-50	157.5	6.90	0-50	981.9	42.98
50-55	158.5	6.94	0-55	1140.4	49.92
55-60	155.4	6.80	0-60	1295.8	56.72
60-65	148.1	6.48	0-65	1443.8	63.20
65-70	137.1	6.00	0-70	1581.0	69.20
70-75	123.3	5.40	0-75	1704.2	74.60
75-80	107.7	4.71	0-80	1811.9	79.31
80-85	91.7	4.01	0-85	1903.6	83.32
85-90	76.6	3.35	0-90	1980.2	86.67
90-95	63.0	2.76	0-95	2043.1	89.43
95-100	51.3	2.25	0-100	2094.5	91.68
100-105	41.8	1.82	0-105	2136.2	93.50
105-110	33.9	1.49	0-110	2170.1	94.99
110-115	27.3	1.19	0-115	2197.4	96.18
115-120	22.0	0.96	0-120	2219.4	97.14
120-125	17.5	0.77	0-125	2236.9	97.91
125-130	13.7	0.60	0-130	2250.6	98.51
130-135	10.6	0.46	0-135	2261.1	98.97
135-140	7.9	0.35	0-140	2269.1	99.32
140-145	5.8	0.25	0-145	2274.8	99.57
145-150	4.0	0.18	0-150	2278.9	99.75
150-155	2.7	0.12	0-155	2281.5	99.87
155-160	1.6	0.07	0-160	2283.2	99.94
160-165	0.9	0.04	0-165	2284.1	99.98
165-170	0.4	0.01	0-170	2284.5	99.99
170-175	0.1	0.01	0-175	2284.6	100.00
175-180	0.0	0.00	0-180	2284.6	100.00

[Additional Test]

Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Total Harmonic Distortion:	120.0	60	21.62%

6. Product Photo



*****END OF REPORT*****