LM-79-19 TEST REPORT

for

RAB LIGHTING INC

408 W 14th St New York, NY 10014 United States

LED Lamp

Model: FHID-85S-EX39-850

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ25040039f

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Review by: Wei Fei

Engineer: Wei Fei
May 14, 2025

Approve by:

Manager: April Zou
May 14, 2025

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

TEST SUMMARY

Tested Model	FHID-85S-EX39-850 Lamp in Philips Lighting C52	FHID-85S-EX39-850
Luminous Efficacy (Lumens /Watt)	131.6	193.1
Total Luminous Flux (Lumens)	11158.9	16429.6
Power (Watts)	84.79	85.08
Power Factor	0.9927	0.9937
CCT (K)	4857	4875
CRI	83.5	83.2
Stabilization Time (Light & Power)	50 mins	50 mins
Note	5000K	5000K

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt : Mar. 29, 2024

Date of Test : Apr. 02, 2024

Test item : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters

Reference Standard : IESNA LM-79-2019 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

TABLE OF CONTENT

SAMPLE PHOTO

Figure 1- Overview of the sample

Sample in Philips Lighting C52

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: FHID-85S-EX39-850
Electrical Ratings	: 120-277V, 50/60Hz, Field-Adjustable 85W/68W/60W Field-Adjustable 85W/73W/63W
Product Description	: 5000K

TEST RESULTS (Lamp in Philips Lighting C52)

Test ambient temperature was 26.0 ℃.

Base orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 50 minutes, and the total operating time including stabilization was 55 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.712	0.314
Power Factor	0.9927	0.9039
Test Power (W)	84.79	78.72
THD A%	7.72	14.12
Luminous Efficacy (lm/W)	131.6	135.9
Total Luminous Flux (lm)	11158.9	10700.2
Color Rendering Index (CRI)	83.5	
R9	14.3	
Correlated Color Temperature (CCT)(K)	4857	
Chromaticity Chroma x	0.3494	
Chromaticity Chroma y	0.3575	
Chromaticity Chroma u	0.2121	
Chromaticity Chroma v	0.3254	
Duv	0.0012	
Chromaticity Chroma u ’	0.2121	
Chromaticity Chroma v’	0.4881	

Special Color Rendering Indices	
R1	81.9
R2	89.6
R3	93.6
R4	81.1
R5	81.3
R6	84.1
R7	87.9
R8	68.8
R9	14.3
R10	73.7
R11	78.9
R12	58.3
R13	84.1
R14	96.6

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u’,v’) diagram, u’ = u = 4x/(-2x+12y+3), v’ = 3v/2 = 9y/(-2x+12y+3).

Goniophotometer Method

Test ambient temperature was 25.1 ℃.

The photometric distance is 30 m.

Luminous data was taken at 0.5 °vertical intervals and 10 °horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.712
Power Factor	0.9921
Power (W)	84.76
Luminous Efficacy (lm/W)	131.9
Total Luminous Flux (lm)	11182.6
Beam Angle (°)	331.1 (0^o-180^o) / 331.4 (90^o-270^o)
Center Beam Candle Power (cd)	18.7
Maximum Beam Candle Power (cd)	3347 (At: C=50.0, Gamma=60.5)
Spacing Criteria	8.45 (0^o-180^o) / 0.01 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	36.83%
Zonal Lumens in the 60 °-90 °Zone	52.12%
Zonal Lumens in the 90 °-120 °Zone	7.88%
Zonal Lumens in the 120 °-180 °Zone	3.17%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

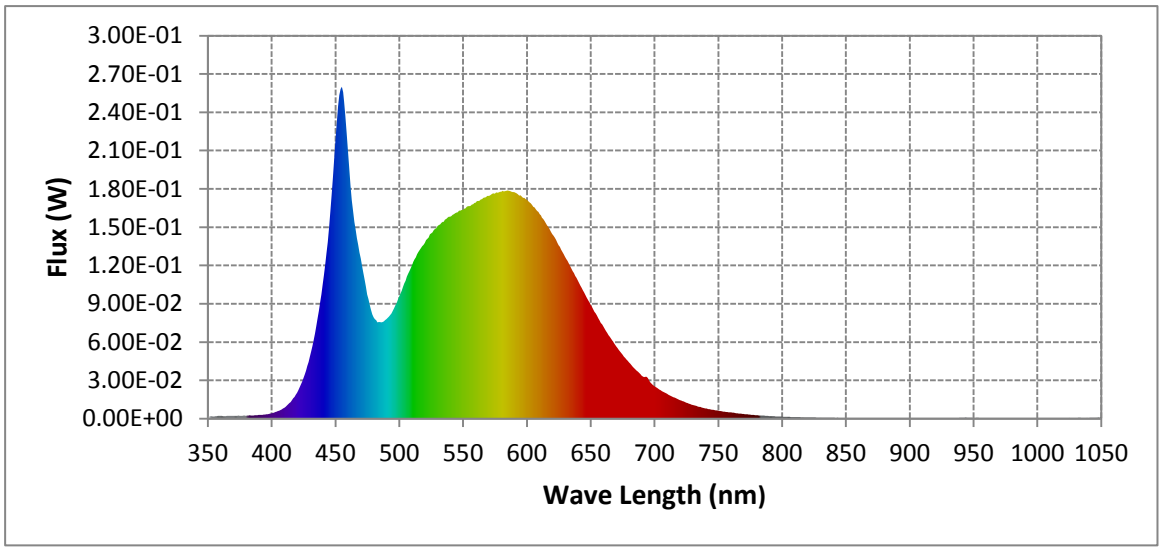
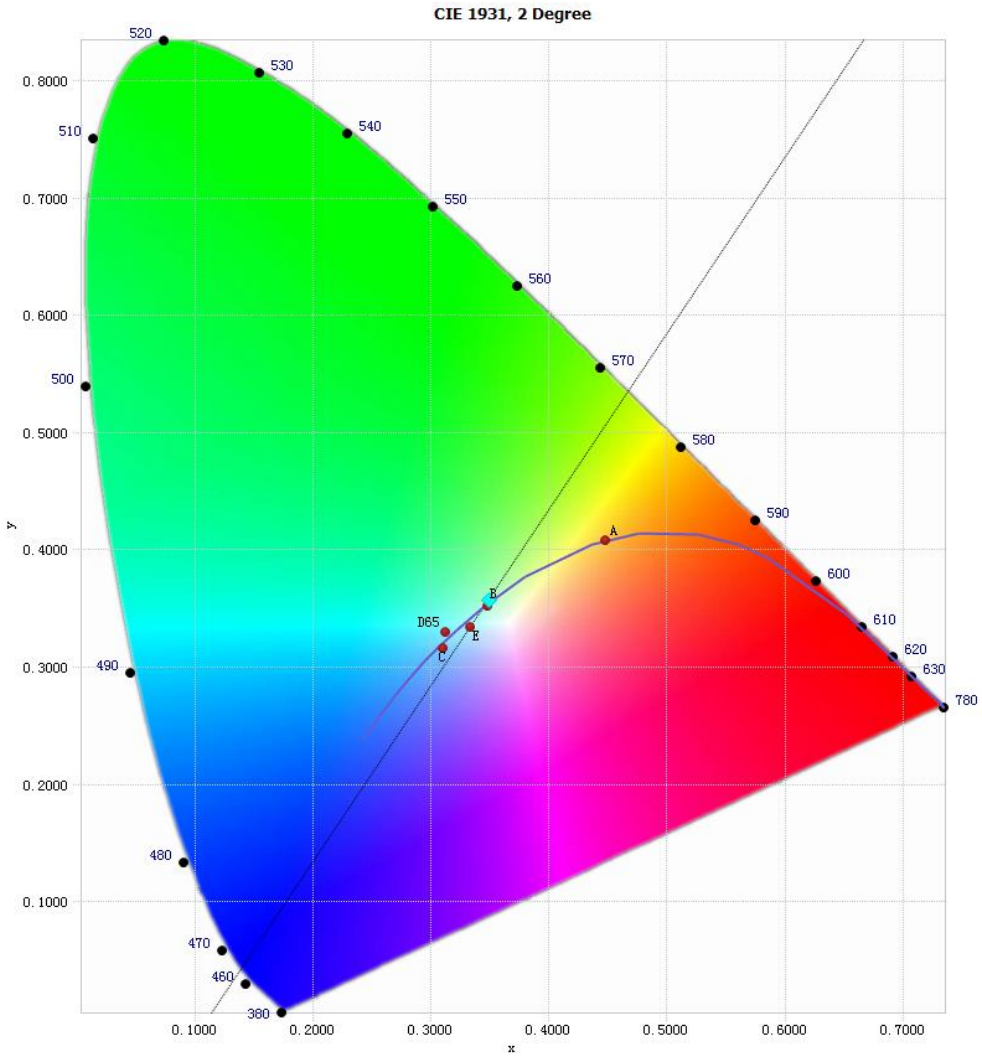


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.34E-03	485	7.57E-02	590	1.78E-01	695	3.17E-02
385	2.42E-03	490	7.79E-02	595	1.75E-01	700	2.56E-02
390	2.86E-03	495	8.46E-02	600	1.71E-01	705	2.23E-02
395	3.31E-03	500	9.58E-02	605	1.66E-01	710	1.94E-02
400	4.16E-03	505	1.08E-01	610	1.60E-01	715	1.69E-02
405	5.88E-03	510	1.20E-01	615	1.53E-01	720	1.45E-02
410	8.51E-03	515	1.31E-01	620	1.45E-01	725	1.25E-02
415	1.30E-02	520	1.38E-01	625	1.36E-01	730	1.09E-02
420	2.04E-02	525	1.45E-01	630	1.27E-01	735	9.33E-03
425	3.18E-02	530	1.51E-01	635	1.18E-01	740	8.05E-03
430	4.85E-02	535	1.54E-01	640	1.08E-01	745	7.08E-03
435	7.24E-02	540	1.58E-01	645	9.87E-02	750	6.29E-03
440	1.05E-01	545	1.62E-01	650	8.93E-02	755	5.44E-03
445	1.50E-01	550	1.64E-01	655	8.07E-02	760	4.92E-03
450	2.18E-01	555	1.66E-01	660	7.21E-02	765	4.26E-03
455	2.60E-01	560	1.69E-01	665	6.41E-02	770	3.62E-03
460	2.10E-01	565	1.72E-01	670	5.67E-02	775	3.16E-03
465	1.54E-01	570	1.74E-01	675	5.00E-02	780	2.76E-03
470	1.26E-01	575	1.76E-01	680	4.40E-02		
475	9.73E-02	580	1.78E-01	685	3.86E-02		
480	7.94E-02	585	1.79E-01	690	3.39E-02		

Table 4: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3494, 0.3575)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

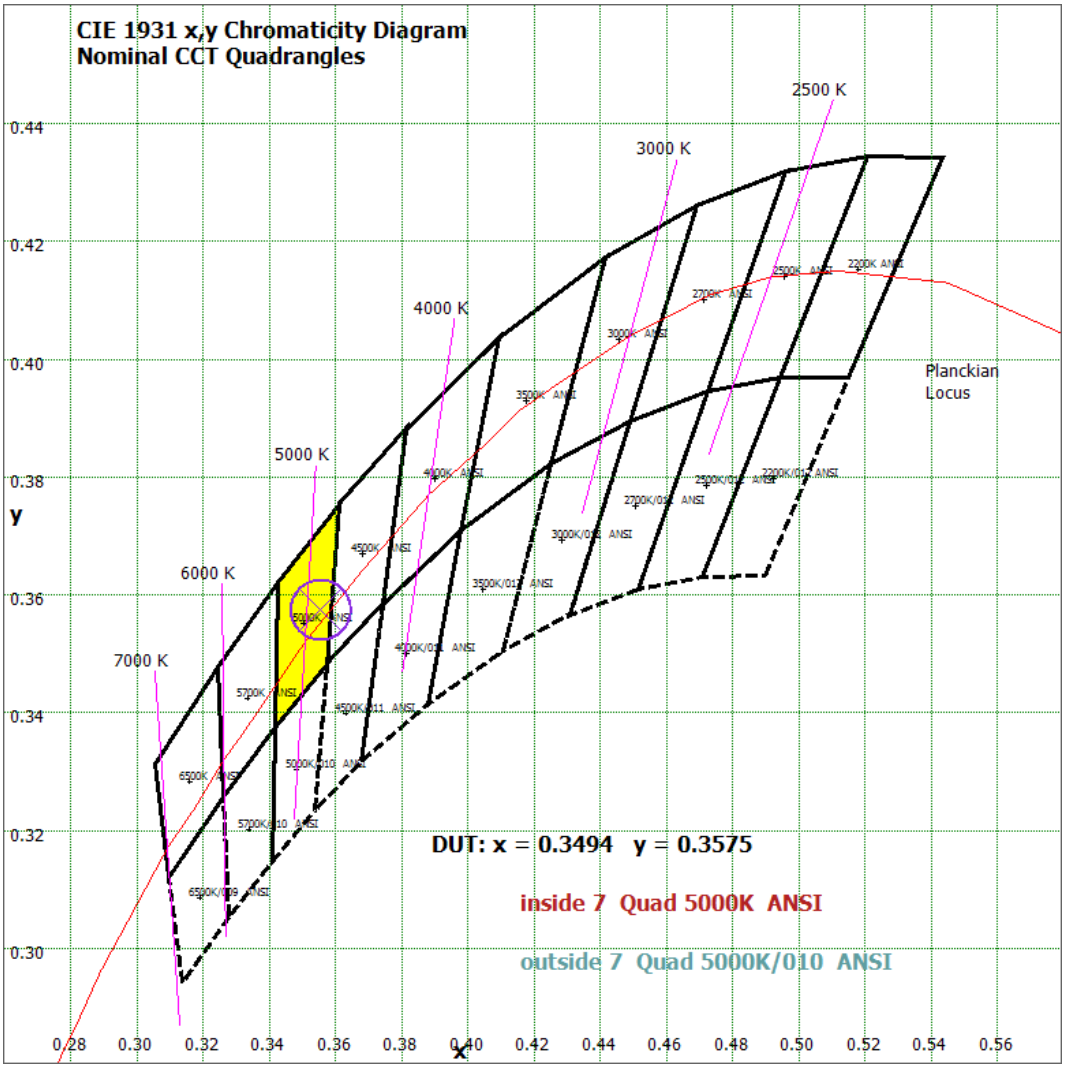


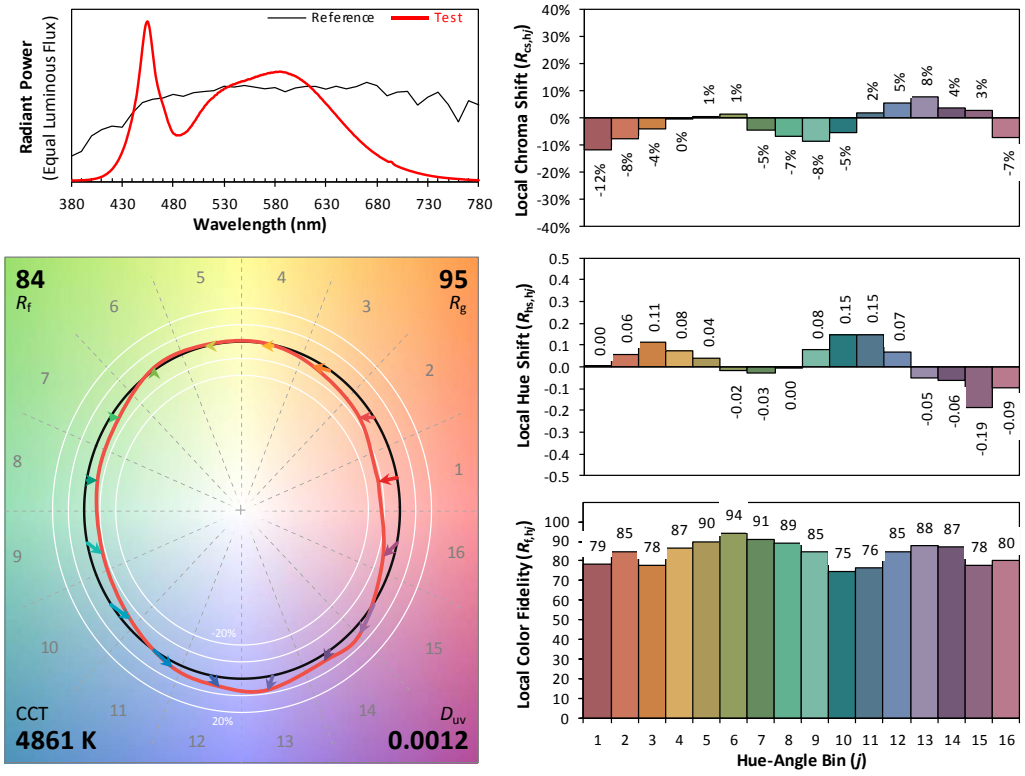
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** RAB LIGHTING INC

Date: 2024/04/02 **Model:** FHID-85S-EX39-850



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

x	0.3494
y	0.3575
u'	0.2121
v'	0.4882

CIE 13.3-1995 (CRI)

R_a	84
R_9	14

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

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	6.352	0.06%
10- 20	38.506	0.34%
20- 30	109.721	0.98%
30- 40	317.799	2.84%
40- 50	1127.103	10.08%
50- 60	2519.231	22.53%
60- 70	2880.853	25.76%
70- 80	2094.332	18.73%
80- 90	852.862	7.63%
90-100	413.618	3.70%
100-110	272.032	2.43%
110-120	195.284	1.75%
120-130	162.478	1.45%
130-140	109.788	0.98%
140-150	56.888	0.51%
150-160	21.722	0.19%
160-170	3.859	0.03%
170-180	0.165	0.00%
Total	11182.6	100%

γ(°)	Lumens	% Total
0- 60	4118.71	36.83%
60- 90	5828.05	52.12%
0-90	9946.76	88.95%
90- 180	1235.83	11.05%
0- 180	11182.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

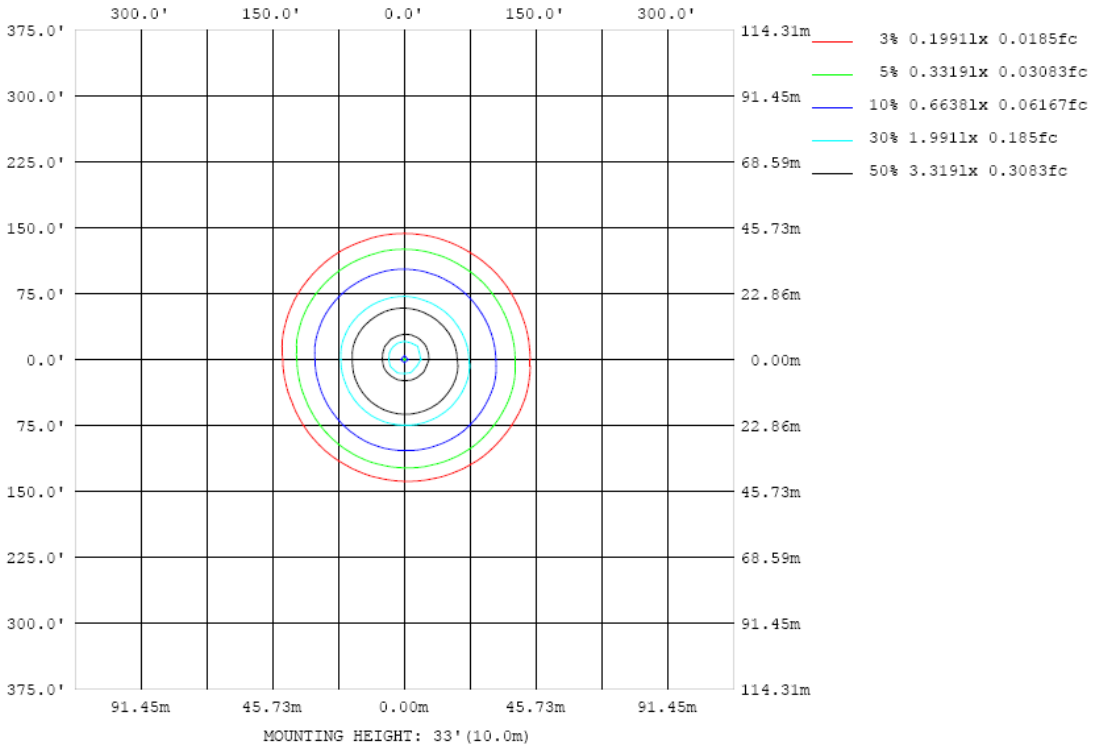


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

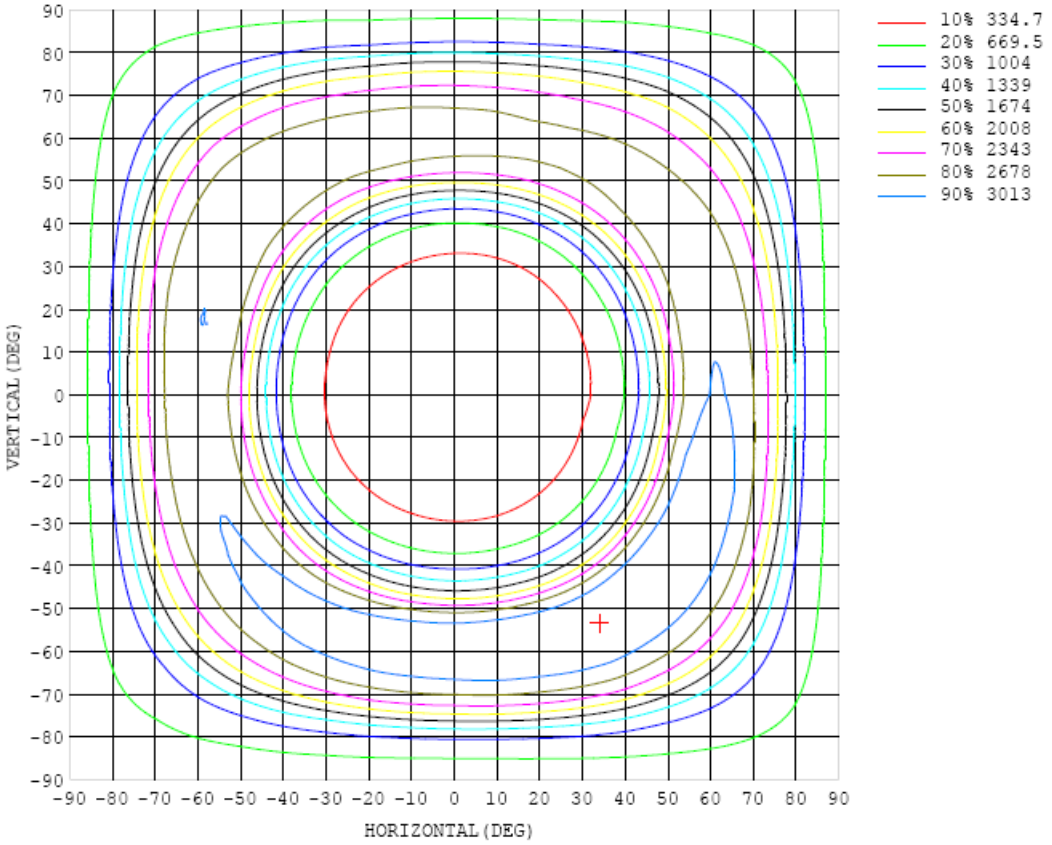


Chart 6: Isocandela Plot

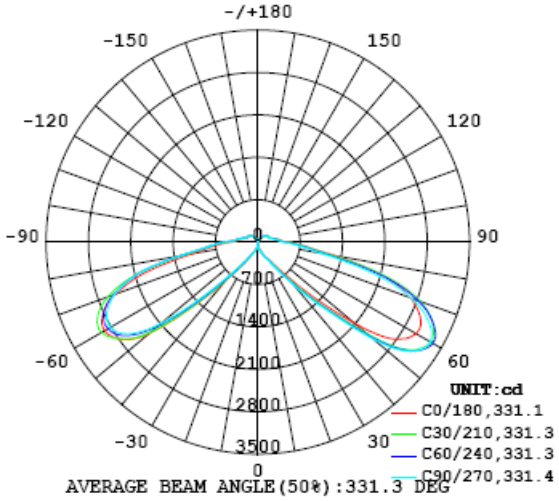


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7
5	44.2	50.4	54.6	58.5	61.6	64.2	66.2	66.7	66.2	67.0	68.0	67.7	66.1	64.6	63.0	61.4	59.7	57.5	57.0
10	85.9	98.4	101	103	105	105	105	110	113	112	108	110	110	109	107	105	102	96.3	94.6
15	127	139	141	144	146	144	146	146	148	148	147	146	144	142	139	136	133	129	127
20	171	185	187	190	193	194	195	194	195	193	192	190	188	186	182	178	175	170	167
25	231	250	253	258	262	261	261	260	257	253	249	245	242	238	234	229	225	220	215
30	304	326	326	328	330	332	335	337	343	347	351	354	353	350	345	339	333	327	321
35	431	474	483	489	500	509	519	533	541	545	548	553	551	544	537	527	516	507	499
40	683	753	776	799	824	846	859	885	910	914	917	914	911	904	885	868	842	825	815
45	1240	1355	1387	1419	1441	1469	1485	1515	1531	1537	1545	1554	1558	1547	1547	1532	1507	1491	1469
50	2080	2244	2291	2346	2358	2380	2419	2462	2477	2492	2505	2487	2474	2456	2449	2452	2395	2358	2341
55	2788	2985	3039	3104	3133	3127	3129	3158	3170	3139	3123	3094	3053	3018	2982	2928	2891	2843	2792
60	3019	3219	3263	3309	3325	3337	3344	3325	3316	3283	3273	3237	3199	3171	3113	3063	3015	2962	2924
65	2963	3136	3189	3190	3213	3227	3197	3172	3162	3115	3094	3075	3035	2998	2944	2892	2855	2838	2828
70	2682	2817	2853	2850	2846	2854	2820	2771	2743	2691	2682	2657	2630	2587	2532	2499	2475	2483	2494
75	2136	2224	2230	2192	2155	2160	2101	2043	1998	1945	1930	1917	1894	1880	1864	1846	1844	1886	1908
80	1288	1279	1276	1246	1201	1195	1158	1121	1090	1078	1064	1061	1054	1062	1055	1060	1047	1086	1101
85	779	791	778	758	743	731	715	699	683	674	674	680	678	680	672	680	679	708	714
90	510	507	495	482	473	463	452	441	429	421	419	423	421	425	422	427	427	444	454
95	365	377	373	369	367	364	362	358	352	348	349	350	349	350	345	346	344	348	347
100	308	318	314	309	304	302	298	295	290	287	287	290	289	291	289	291	290	297	296
105	254	260	258	254	250	246	243	240	237	234	235	236	235	236	235	236	236	240	241
110	212	218	216	212	208	206	205	203	201	201	202	201	199	198	197	198	198	198	197
115	199	206	204	200	198	198	196	194	194	193	192	191	189	187	185	186	185	185	184
120	189	195	194	193	193	193	192	192	191	190	190	189	187	186	185	186	185	186	185
125	180	186	185	185	184	183	183	182	182	181	181	181	180	180	178	177	176	177	178
130	159	163	163	163	162	161	160	160	158	157	157	157	157	157	157	157	157	158	161
135	138	142	142	142	141	140	140	139	138	137	137	137	137	138	138	138	138	139	140
140	113	115	114	113	112	111	110	109	108	107	107	108	109	109	110	111	111	111	113
145	85.0	86.4	85.6	85.2	84.7	84.1	83.6	83.1	82.5	82.2	82.1	82.9	82.7	83.5	83.7	84.6	85.1	85.5	86.5
150	64.7	64.7	63.2	62.8	61.8	61.6	60.6	60.2	59.9	59.6	59.8	60.4	60.2	60.4	60.7	61.0	62.0	62.5	63.0
155	44.3	44.6	43.5	42.5	41.6	40.8	40.6	40.6	40.6	40.5	40.1	40.0	40.1	40.4	40.5	40.9	41.4	42.0	43.1
160	26.9	26.1	25.1	24.2	23.4	22.7	22.1	21.7	21.5	21.2	21.0	21.1	21.7	22.0	22.1	22.2	22.5	22.8	23.6
165	11.9	11.2	10.6	10.2	9.73	9.34	8.93	8.58	8.27	8.04	8.04	8.07	8.15	8.25	8.45	8.52	8.64	8.79	9.12
170	3.82	3.50	3.35	3.18	2.98	2.75	2.53	2.27	2.04	1.85	1.68	1.53	1.45	1.41	1.38	1.36	1.34	1.33	1.37
175	1.47	1.48	1.48	1.49	1.48	1.47	1.47	1.46	1.45	1.44	1.42	1.41	1.39	1.37	1.36	1.34	1.32	1.31	1.29
180	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7		
5	54.5	52.1	51.6	50.1	47.7	46.7	45.2	42.2	38.9	36.5	35.2	33.6	32.5	34.3	35.4	37.4	40.4		
10	95.8	94.3	90.0	87.7	85.7	87.1	86.2	85.1	83.9	81.3	77.1	77.4	78.9	77.9	78.2	76.9	81.3		
15	126	125	121	119	116	118	118	118	118	118	118	118	119	121	120	120	123		
20	166	163	158	156	154	153	153	153	153	154	156	157	159	161	162	165	168		
25	217	212	208	205	203	202	201	202	203	206	208	210	214	218	220	224	228		
30	320	313	301	291	283	273	265	261	259	260	265	271	279	287	292	298	304		
35	496	486	475	461	446	431	418	409	402	398	394	395	402	410	415	422	426		
40	808	797	781	759	737	714	689	671	659	653	645	644	648	656	663	661	671		
45	1461	1451	1419	1388	1355	1311	1279	1238	1212	1204	1187	1179	1188	1200	1208	1219	1228		
50	2389	2358	2294	2251	2203	2140	2107	2093	2073	2054	2036	2029	2036	2041	2038	2042	2070		
55	2890	2835	2783	2771	2724	2691	2693	2656	2638	2613	2587	2584	2610	2651	2683	2712	2767		
60	3011	2992	2985	2962	2901	2859	2871	2842	2814	2787	2755	2754	2778	2818	2859	2904	2978		
65	2923	2928	2922	2868	2830	2816	2791	2771	2760	2728	2690	2696	2721	2743	2780	2841	2907		
70	2602	2619	2639	2593	2576	2546	2524	2536	2524	2500	2477	2468	2482	2493	2515	2567	2619		
75	2038	2079	2096	2086	2081	2074	2062	2080	2078	2060	2055	2042	2054	2065	2059	2080	2106		
80	1193	1231	1273	1280	1308	1321	1302	1324	1328	1316	1308	1310	1335	1326	1301	1294	1288		
85	762	785	797	802	812	821	811	821	830	825	817	816	819	804	793	794	794		
90	501	524	534	546	558	565	561	572	576	576	570	568	565	551	538	533	522		
95	367	375	376	378	381	385	387	390	390	388	387	386	386	380	375	372	368		
100	315	321	323	324	326	328	329	333	334	334	333	333	333	328	322	319	314		
105	257	262	265	268	270	273	273	275	276	276	274	273	272	268	264	261	257		
110	209	212	216	218	219	222	223	225	227	226	225	225	225	222	219	216	215		
115	190	190	191	192	193	195	195	197	200	200	200	200	201	200	199	200	200		
120	193	192	191	190	190	190	190	192	194	193	192	193	192	191	191	192	192		
125	185	186	188	188	188	187	186	187	188	186	186	185	184	181	181	182	182		
130	170	171	172	173	172	171	172	171	171	170	168	168	166	164	163	162	161		
135	150	151	152	152	151	150	150	148	147	145	143	142	141	140	139	139	138		
140	122	123	124	126	126	125	125	124	123	122	120	119	118	118	116	115	114		
145	94.2	95.1	96.4	97.5	97.9	97.5	97.2	96.3	95.4	93.9	92.9	91.9	91.1	90.2	88.6	86.7	85.8		
150	69.6	70.9	72.5	74.1	75.1	75.2	75.3	75.4	74.9	74.1	73.2	72.3	71.3	70.6	68.9	67.2	65.9		
155	47.3	48.5	49.5	50.9	51.6	52.2	52.3	52.7	52.1	51.5	51.0	50.3	49.7	48.7	47.6	46.1	45.0		
160	26.8	28.0	28.9	30.0	31.0	31.7	32.5	32.8	32.6	32.5	32.2	31.8	31.4	31.0	30.2	29.1	28.0		
165	10.3	10.9	11.6	12.4	12.9	13.5	14.1	14.5	14.9	15.2	15.1	15.0	14.8	14.5	14.0	13.4	12.8		
170	1.74	2.01	2.30	2.60	2.93	3.24	3.52	3.73	3.89	4.02	4.06	4.13	4.24	4.25	4.22	4.13	3.99		
175	1.28	1.28	1.27	1.28	1.28	1.29	1.31	1.33	1.35	1.36	1.38	1.40	1.42	1.43	1.44	1.45	1.46		
180	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38		

Table 7: Luminous Intensity Data

TEST RESULTS (Bare Lamp)

Test ambient temperature was 26.0 ℃.

Base orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 50 minutes, and the total operating time including stabilization was 55 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.713	0.312
Power Factor	0.9937	0.9119
Test Power (W)	85.08	78.94
THD A%	7.87	12.72
Luminous Efficacy (lm/W)	193.1	197.8
Total Luminous Flux (lm)	16429.6	15611.3
Color Rendering Index (CRI)	83.2	
R9	11.3	
Correlated Color Temperature (CCT)(K)	4875	
Chromaticity Chroma x	0.3487	
Chromaticity Chroma y	0.3551	
Chromaticity Chroma u	0.2125	
Chromaticity Chroma v	0.3246	
Duv	0.0004	
Chromaticity Chroma u ’	0.2125	
Chromaticity Chroma v’	0.4869	

Special Color Rendering Indices	
R1	81.6
R2	89.3
R3	93.2
R4	81.1
R5	81.2
R6	83.6
R7	87.4
R8	67.8
R9	11.3
R10	73
R11	79.2
R12	57.8
R13	83.8
R14	96.4

Table 8: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u’,v’) diagram, u’ = u = 4x/(-2x+12y+3), v’ = 3v/2 = 9y/(-2x+12y+3).

Goniophotometer Method

Test ambient temperature was 25.1 ℃.

The photometric distance is 2.47 m.

Luminous data was taken at 0.5 °vertical intervals and 10 °horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.713
Power Factor	0.9928
Power (W)	84.95
Luminous Efficacy (lm/W)	195.0
Total Luminous Flux (lm)	16564.9
Beam Angle (°)	348.5 (0^o-180^o) / 349.4 (90^o-270^o)
Center Beam Candle Power (cd)	126
Maximum Beam Candle Power (cd)	1692 (At: C=135.0, Gamma=84.5)
Spacing Criteria	5.06 (0^o-180^o) / 5.03 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	21.32%
Zonal Lumens in the 60 °-90 °Zone	30.62%
Zonal Lumens in the 90 °-120 °Zone	29.72%
Zonal Lumens in the 120 °-180 °Zone	18.33%

Table 9: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

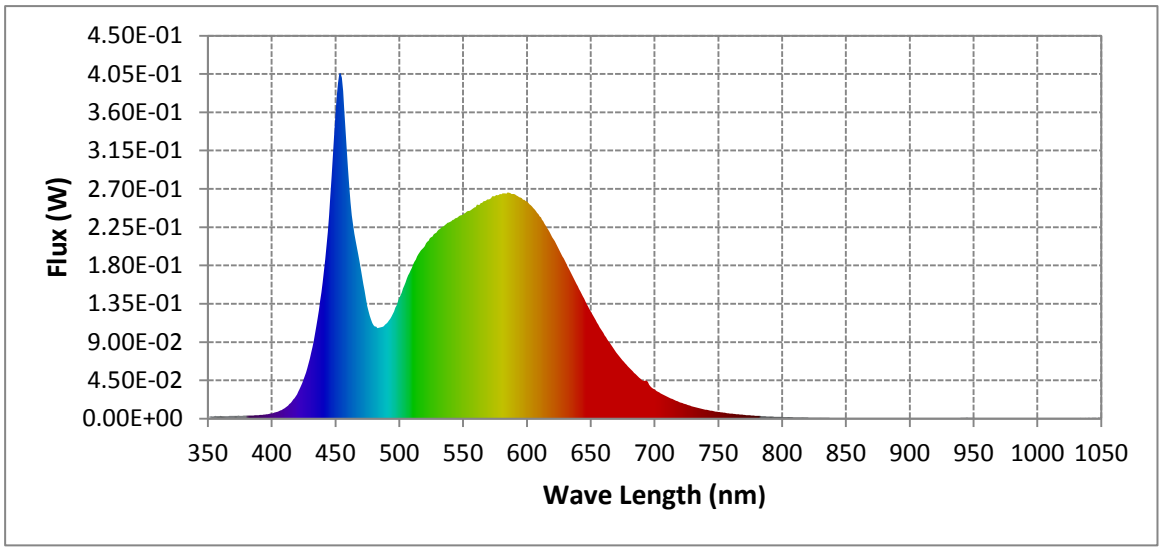
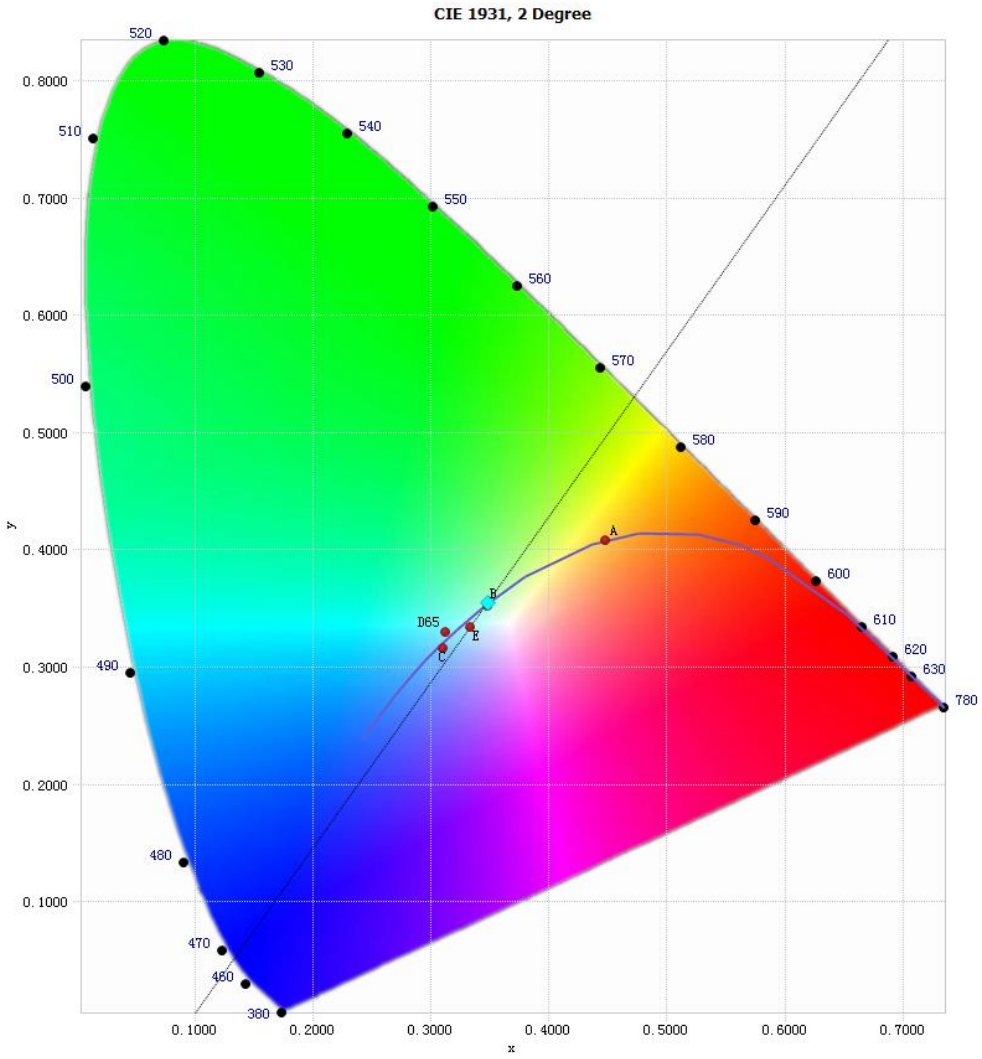


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.61E-03	485	1.07E-01	590	2.64E-01	695	4.31E-02
385	3.63E-03	490	1.12E-01	595	2.60E-01	700	3.45E-02
390	4.26E-03	495	1.23E-01	600	2.55E-01	705	2.99E-02
395	4.87E-03	500	1.42E-01	605	2.47E-01	710	2.59E-02
400	6.17E-03	505	1.60E-01	610	2.38E-01	715	2.25E-02
405	8.20E-03	510	1.78E-01	615	2.27E-01	720	1.93E-02
410	1.22E-02	515	1.93E-01	620	2.13E-01	725	1.67E-02
415	1.85E-02	520	2.03E-01	625	2.00E-01	730	1.44E-02
420	2.86E-02	525	2.13E-01	630	1.85E-01	735	1.24E-02
425	4.59E-02	530	2.21E-01	635	1.70E-01	740	1.07E-02
430	7.08E-02	535	2.26E-01	640	1.55E-01	745	9.20E-03
435	1.08E-01	540	2.31E-01	645	1.41E-01	750	8.01E-03
440	1.60E-01	545	2.36E-01	650	1.26E-01	755	6.93E-03
445	2.39E-01	550	2.39E-01	655	1.13E-01	760	6.08E-03
450	3.58E-01	555	2.44E-01	660	1.01E-01	765	5.22E-03
455	4.00E-01	560	2.49E-01	665	8.89E-02	770	4.55E-03
460	2.95E-01	565	2.54E-01	670	7.80E-02	775	3.95E-03
465	2.17E-01	570	2.58E-01	675	6.86E-02	780	3.48E-03
470	1.76E-01	575	2.61E-01	680	6.00E-02		
475	1.33E-01	580	2.64E-01	685	5.25E-02		
480	1.10E-01	585	2.66E-01	690	4.58E-02		

Table10: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3487, 0.3551)

Chart 9: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

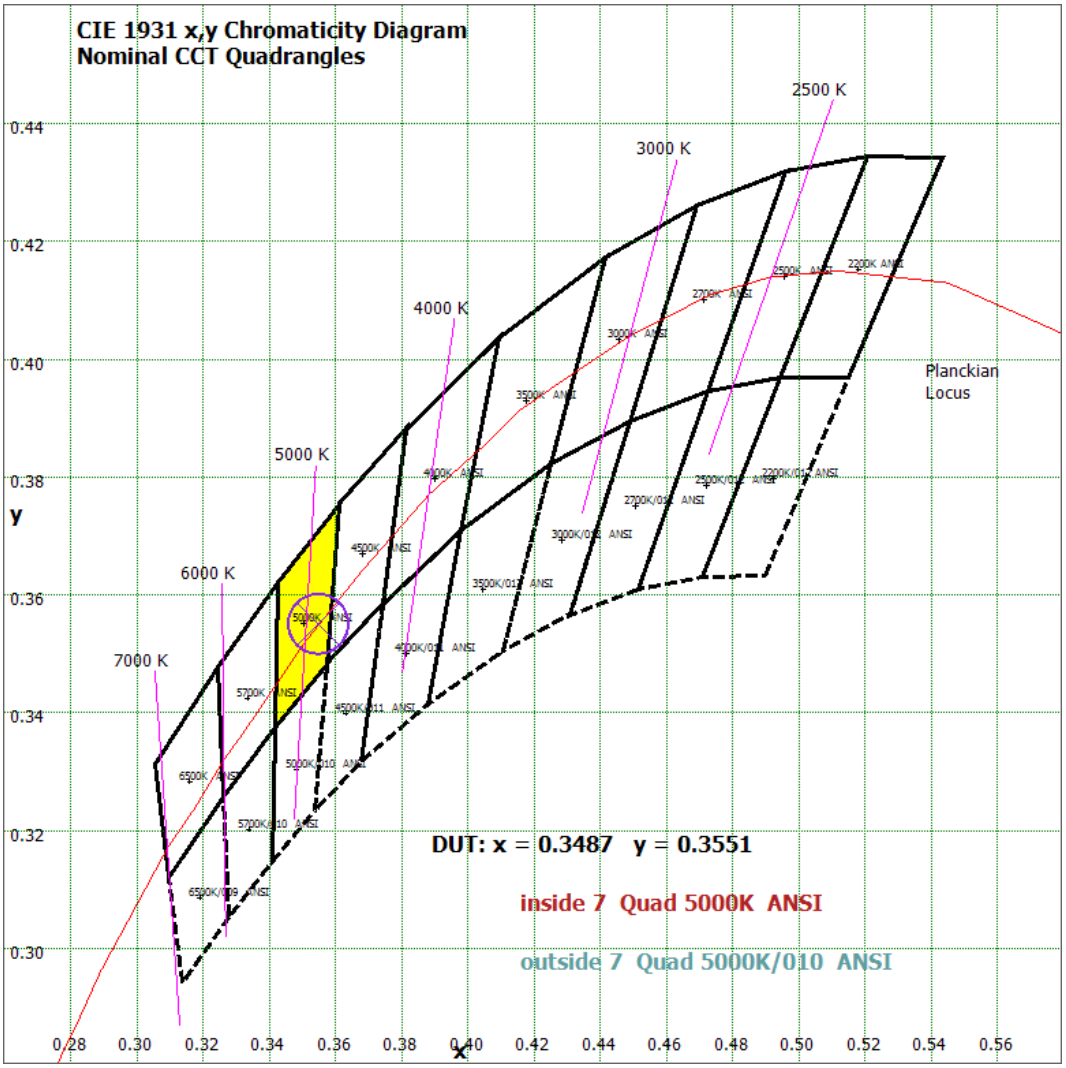


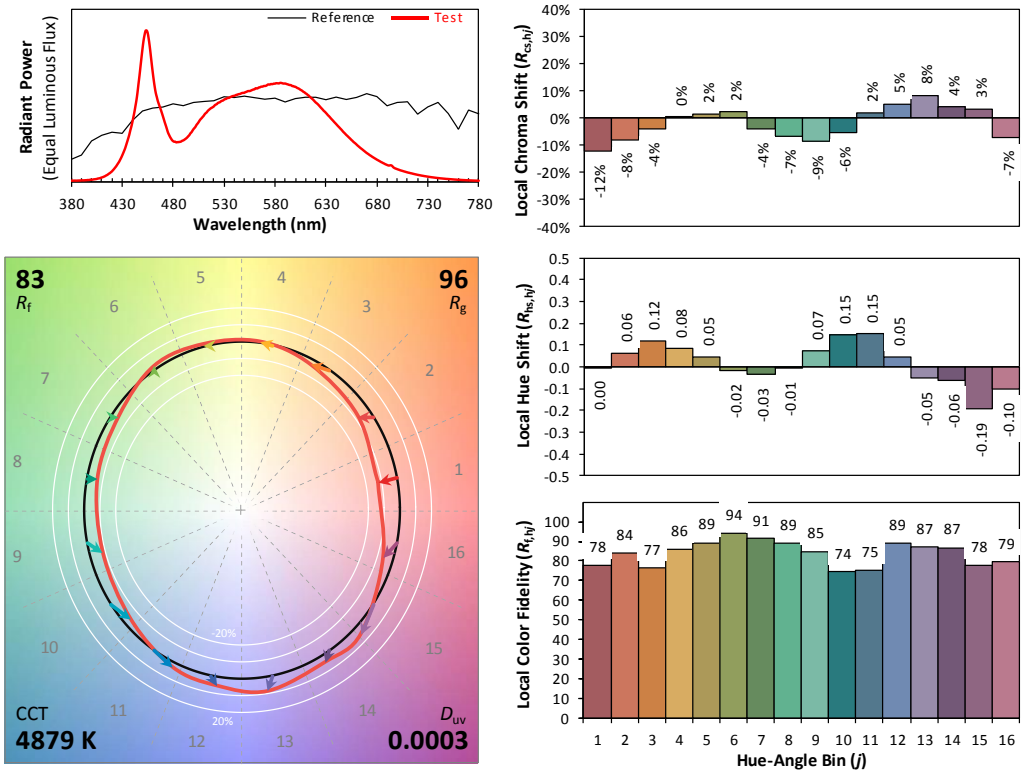
Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** RAB LIGHTING INC

Date: 2024/04/07 **Model:** FHID-85S-EX39-850



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

x	0.3487
y	0.3551
u'	0.2125
v'	0.4869

CIE 13.3-1995 (CRI)

R_a	83
R_9	11

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

Chart 11: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 8 due to rounding.

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	22.943	0.14%
10- 20	139.719	0.84%
20- 30	371.737	2.24%
30- 40	678.023	4.09%
40- 50	1005.021	6.07%
50- 60	1314.278	7.93%
60- 70	1561.469	9.43%
70- 80	1720.912	10.39%
80- 90	1789.925	10.81%
90-100	1773.53	10.71%
100-110	1671.498	10.09%
110-120	1478.834	8.93%
120-130	1214.984	7.33%
130-140	900.347	5.44%
140-150	567.386	3.43%
150-160	263.212	1.59%
160-170	82.083	0.50%
170-180	8.965	0.05%
Total	16564.9	100%

γ(°)	Lumens	% Total
0-130	14742.9	89.00%
130-180	1821.99	11.00%
0-180	16564.9	100%

Table 11: Zonal Lumen

Illuminance Plots- Goniophotometer Method

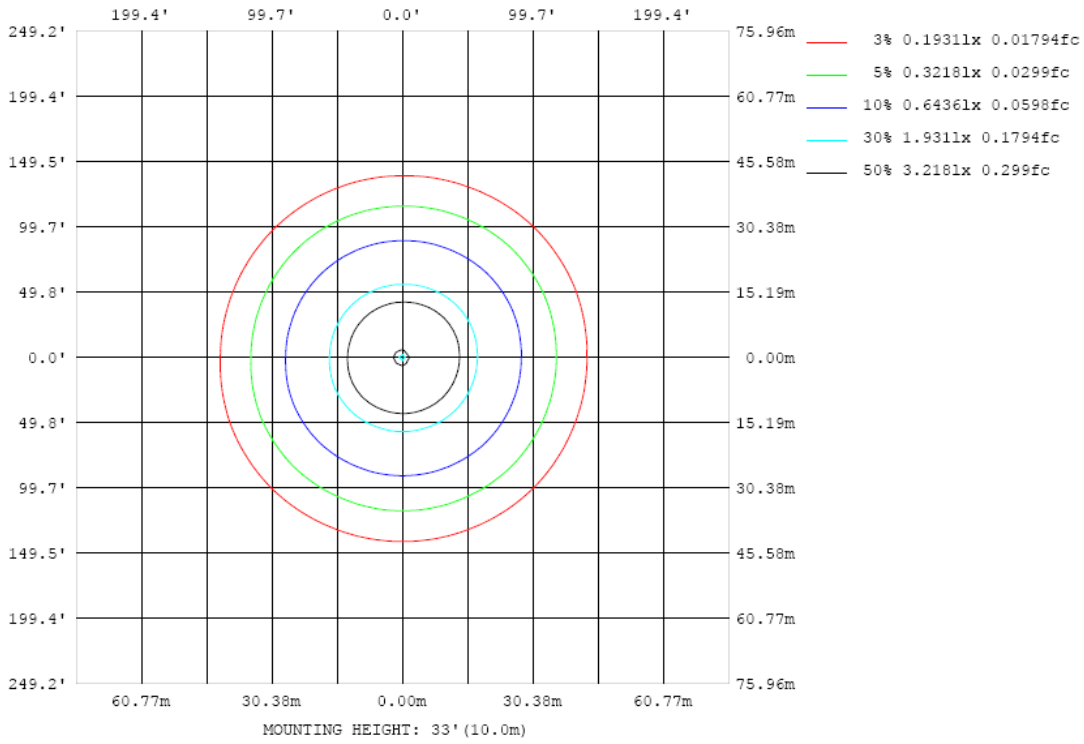


Chart 12: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

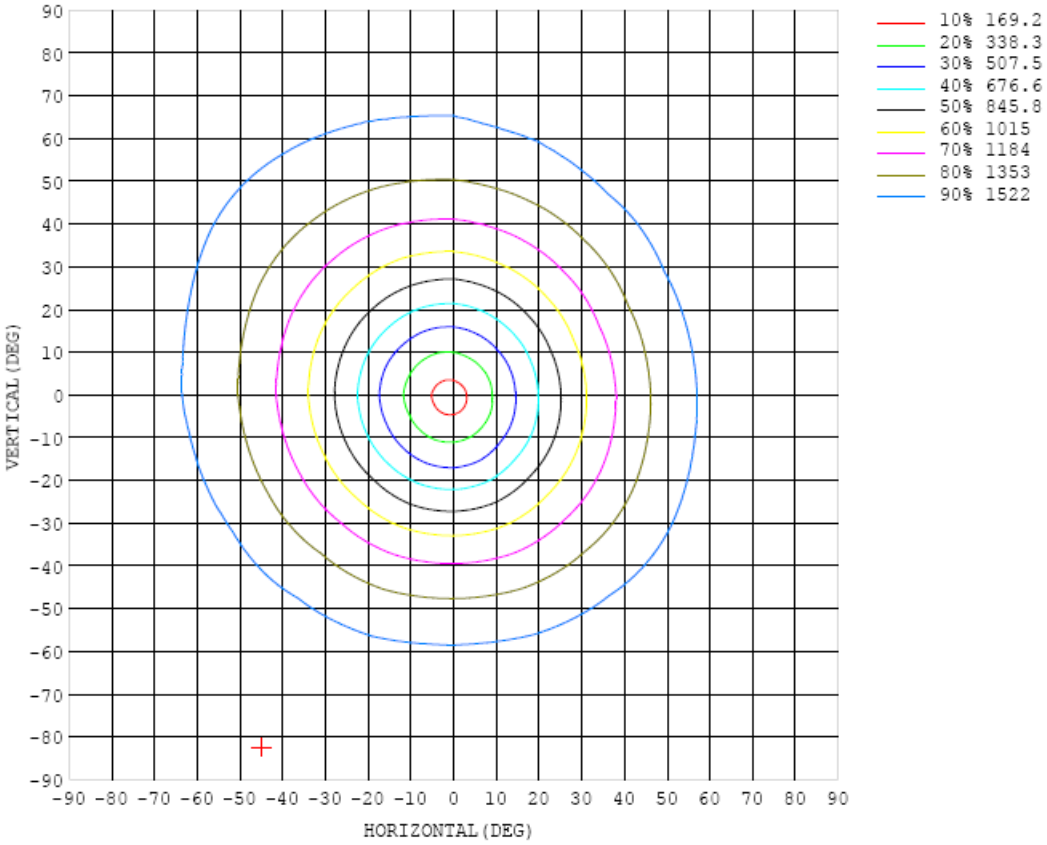


Chart 13 Isocandela Plot

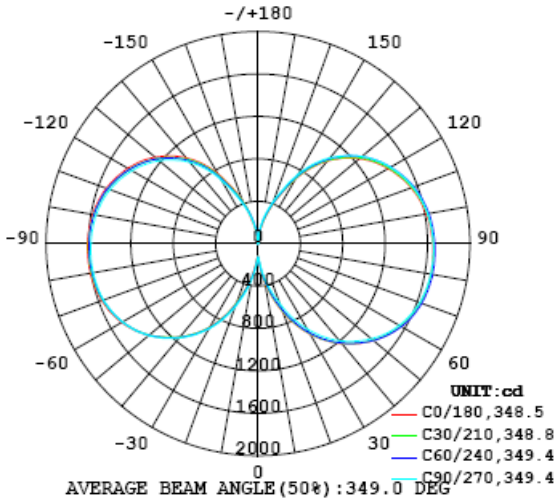


Chart 14: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) / γ (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	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126			
5	220	212	201	189	178	170	167	167	164	176	189	198	208	218	222	222			
10	367	352	340	324	309	301	299	299	291	302	316	325	341	358	367	369			
15	524	509	491	464	446	439	441	442	435	444	458	469	484	503	519	525			
20	685	667	654	621	602	601	605	603	593	600	617	623	633	661	682	690			
25	843	830	818	787	774	770	779	770	757	763	775	776	787	812	838	852			
30	985	977	969	942	929	926	937	924	906	911	920	918	927	957	983	997			
35	1114	1108	1104	1079	1070	1069	1080	1063	1038	1036	1045	1041	1052	1084	1114	1130			
40	1229	1223	1222	1201	1195	1195	1205	1185	1151	1148	1154	1151	1162	1196	1232	1248			
45	1330	1326	1327	1307	1300	1299	1315	1292	1252	1247	1255	1250	1259	1296	1334	1353			
50	1420	1418	1421	1402	1395	1397	1411	1392	1344	1340	1343	1341	1348	1382	1428	1443			
55	1495	1494	1500	1482	1476	1475	1493	1476	1424	1416	1418	1411	1422	1454	1501	1520			
60	1556	1556	1564	1544	1541	1540	1559	1544	1486	1477	1477	1473	1477	1510	1563	1580			
65	1601	1601	1611	1595	1589	1590	1609	1593	1534	1526	1523	1517	1521	1554	1607	1627			
70	1628	1633	1646	1625	1623	1624	1647	1634	1569	1559	1557	1547	1552	1581	1639	1658			
75	1650	1651	1662	1648	1645	1647	1671	1654	1593	1583	1577	1569	1569	1599	1658	1675			
80	1656	1662	1673	1655	1656	1658	1686	1671	1605	1595	1590	1578	1580	1605	1665	1684			
85	1654	1661	1674	1658	1659	1662	1692	1677	1611	1599	1595	1585	1582	1606	1665	1682			
90	1650	1655	1668	1655	1655	1659	1689	1675	1609	1599	1596	1583	1579	1598	1657	1676			
95	1633	1644	1657	1640	1645	1648	1679	1667	1602	1589	1588	1575	1569	1586	1645	1659			
100	1616	1624	1638	1625	1625	1633	1664	1650	1584	1574	1572	1560	1553	1565	1626	1639			
105	1580	1592	1608	1595	1596	1606	1640	1628	1561	1545	1550	1535	1525	1540	1595	1607			
110	1540	1549	1566	1554	1558	1570	1605	1592	1523	1510	1512	1500	1489	1500	1553	1565			
115	1485	1495	1510	1502	1505	1520	1556	1543	1476	1457	1462	1449	1438	1448	1498	1509			
120	1417	1427	1445	1437	1444	1459	1495	1484	1419	1401	1401	1388	1376	1387	1433	1442			
125	1343	1352	1369	1362	1368	1389	1423	1412	1352	1332	1328	1314	1303	1314	1357	1363			
130	1248	1261	1278	1271	1279	1302	1334	1322	1267	1246	1243	1230	1218	1227	1265	1271			
135	1142	1151	1171	1164	1174	1200	1229	1219	1170	1147	1141	1128	1115	1126	1156	1159			
140	1019	1028	1043	1040	1057	1082	1109	1100	1056	1037	1023	1007	1001	1005	1029	1030			
145	871	884	901	902	920	943	967	961	921	901	886	871	862	864	882	883			
150	703	715	735	736	755	777	800	790	761	736	719	701	690	691	707	715			
155	524	536	550	555	571	598	612	594	587	564	541	525	520	516	524	531			
160	379	389	404	409	424	445	449	398	424	422	400	383	378	367	373	379			
165	258	264	281	288	303	309	285	302	232	284	284	269	261	248	249	254			
170	143	157	173	182	194	191	176	188	144	148	172	162	149	136	135	141			
175	46.5	50.4	56.3	63.4	73.3	68.6	73.9	76.3	61.5	58.5	59.3	55.4	49.9	46.2	45.8	47.8			
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	1.26	1.21	1.15	1.10	1.15	1.23	1.26			

Table 12: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Feb. 18, 2024	-
Digital Power Meter	PF2010A	HZTE028-01	Aug. 01, 2023	Jul. 31, 2024
AC Power Supply	DPS1060	HZTE001-06	Aug. 01, 2023	Jul. 31, 2024
DC Power Supply	WY12010	HZTE004-03	Aug. 01, 2023	Jul. 31, 2024
Temperature recorder	JM624U	HZTE018-08	Aug. 04, 2023	Aug. 03, 2024
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 04, 2023	Aug. 03, 2024
Standard source	D908	HZTE012-01	Aug. 14, 2018	-
Integrate Sphere system	3M	HZTE015-04	Feb. 18, 2024	-
Digital Power Meter	WT210	HZTE008-01	Aug. 01, 2023	Jul. 31, 2024
AC Power Supply	PCR 500L	HZTE001-07	Aug. 01, 2023	Jul.31, 2024
DC Power Supply	IT6154	HZTE004-04	Aug. 01, 2023	Jul. 31, 2024
Standard source	SCL-1400	HZTE012-06	Nov. 04, 2021	-
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 04, 2023	Aug. 03, 2024
Temperature Meter	TES1310	HZTE017-01	Aug. 04, 2023	Aug. 03, 2024

Table 13: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning.
Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and 3 Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π. Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.
Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.
The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 20 min, taken 10 minutes apart, is less than 0.5 %.
Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.
The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

The uncertainty of integrating sphere system reported in this document is expended uncertainty is 2.1% with a coverage factor k=2.

Goniophotometer Method

Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.
Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.
The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 20 min, taken 10 minutes apart, is less than 0.5 %.
Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.
Some graphics were created with Photometric Plus software.
The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.
The uncertainty of goniophotometer system reported in this document is expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

*** End of Report ***