

LM-79-19 TEST REPORT

for

GREEN CREATIVE LTD

Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL,
Hong Kong

LED Lamp

Model: 24HID/8CCTS/277V/E26/DIM/SD

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ24010037b

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

Review by:

Wei Fei

Approved



April Zou

Engineer: Wei Fei
Feb. 27, 2024

Manager: April Zou
Feb. 27, 2024

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	24HID/8CCTS/277V/ E26/DIM/SD 3000K Setting	24HID/8CCTS/277V/ E26/DIM/SD 4000K Setting	24HID/8CCTS/277V/ E26/DIM/SD 5000K Setting
Luminous Efficacy (Lumens /Watt)	138.8	147.9	142.3
Total Luminous Flux (Lumens)	3565.3	3770.6	3695.9
Power (Watts)	25.68	25.50	25.98
Power Factor	0.9971	0.9971	0.9972
CCT (K)	3057	4178	4876
CRI	81.9	84.6	83.7
Stabilization Time(Light & Power)	50	50	50
Note	3000K	4000K	5000K

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Jan. 25, 2024
Date of Test : Feb. 23, 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: 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

LM-79-19 TEST REPORT.....	1
TEST SUMMARY.....	2
SAMPLE PHOTO.....	5
TEST RESULTS (3000K Setting)	6
Sphere-Spectroradiometer Method.....	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Color Rendition Report – Sphere Spectroradiometer Method	10
Goniophotometer Method	11
Zonal Lumen Tabulation- Goniophotometer Method	12
Illuminance Plots- Goniophotometer Method	13
Luminous Intensity Distribution Plots- Goniophotometer Method.....	14
Luminous Intensity Data- Goniophotometer Method	15
TEST RESULTS (4000K Setting)	16
Sphere-Spectroradiometer Method.....	16
Spectral Power Distribution - Sphere Spectroradiometer Method	17
Chromaticity Diagram - Sphere Spectroradiometer Method.....	18
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	19
Color Rendition Report – Sphere Spectroradiometer Method	20
TEST RESULTS (5000K Setting)	21
Sphere-Spectroradiometer Method.....	21
Spectral Power Distribution - Sphere Spectroradiometer Method	22
Chromaticity Diagram - Sphere Spectroradiometer Method.....	23
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	24
Color Rendition Report – Sphere Spectroradiometer Method	25
EQUIPMENT LIST	26

TEST METHODS	26
Seasoning of SSL Product.....	26
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	26
Goniophotometer Method	27
Photometric and Electrical Measurements	27
Color Characteristics Measurements.....	27

SAMPLE PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Lamp
Model	: 24HID/8CCTS/277V/E26/DIM/SD
Electrical Ratings	: 120-277V, 50/60Hz, 24W
Product Description	: Color- Tunable 3000K/4000K/5000K
Manufacturer	: GREEN CREATIVE LTD
Address	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

TEST RESULTS (3000K Setting)

Test ambient temperature was 26.0 °C.

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
Voltage frequency (Hz)	60	60
Test Current (A)	0.215	0.092
Power Factor	0.9971	0.9275
Test Power (W)	25.68	23.46
THD A%	3.37	17.48
Luminous Efficacy (lm/W)	138.8	142.9
Total Luminous Flux (lm)	3565.3	3351.9
Color Rendering Index (CRI)	81.9	
R9	5.7	
Correlated Color Temperature (CCT)(K)	3057	
Chromaticity Chroma x	0.4306	
Chromaticity Chroma y	0.3980	
Chromaticity Chroma u	0.2491	
Chromaticity Chroma v	0.3453	
Duv	-0.0016	
Chromaticity Chroma u'	0.2491	
Chromaticity Chroma v'	0.5180	

Special Color Rendering Indices	
R1	80.2
R2	89.5
R3	96.2
R4	80.3
R5	80.3
R6	86.7
R7	82.8
R8	59
R9	5.7
R10	75.9
R11	79.7
R12	69.4
R13	82.3
R14	98.2

Table 2: Test data per Sphere-Spectroradiometer Method

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

Spectral Power Distribution - Sphere Spectroradiometer Method

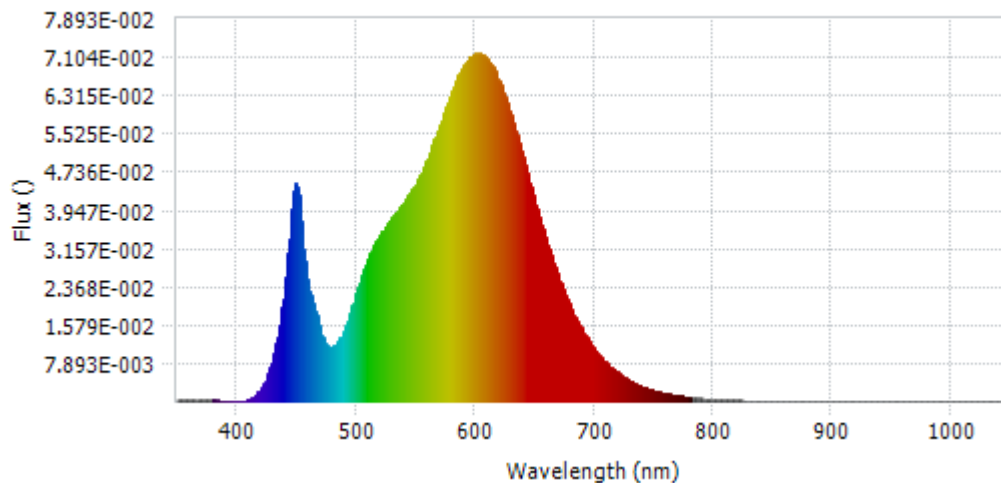
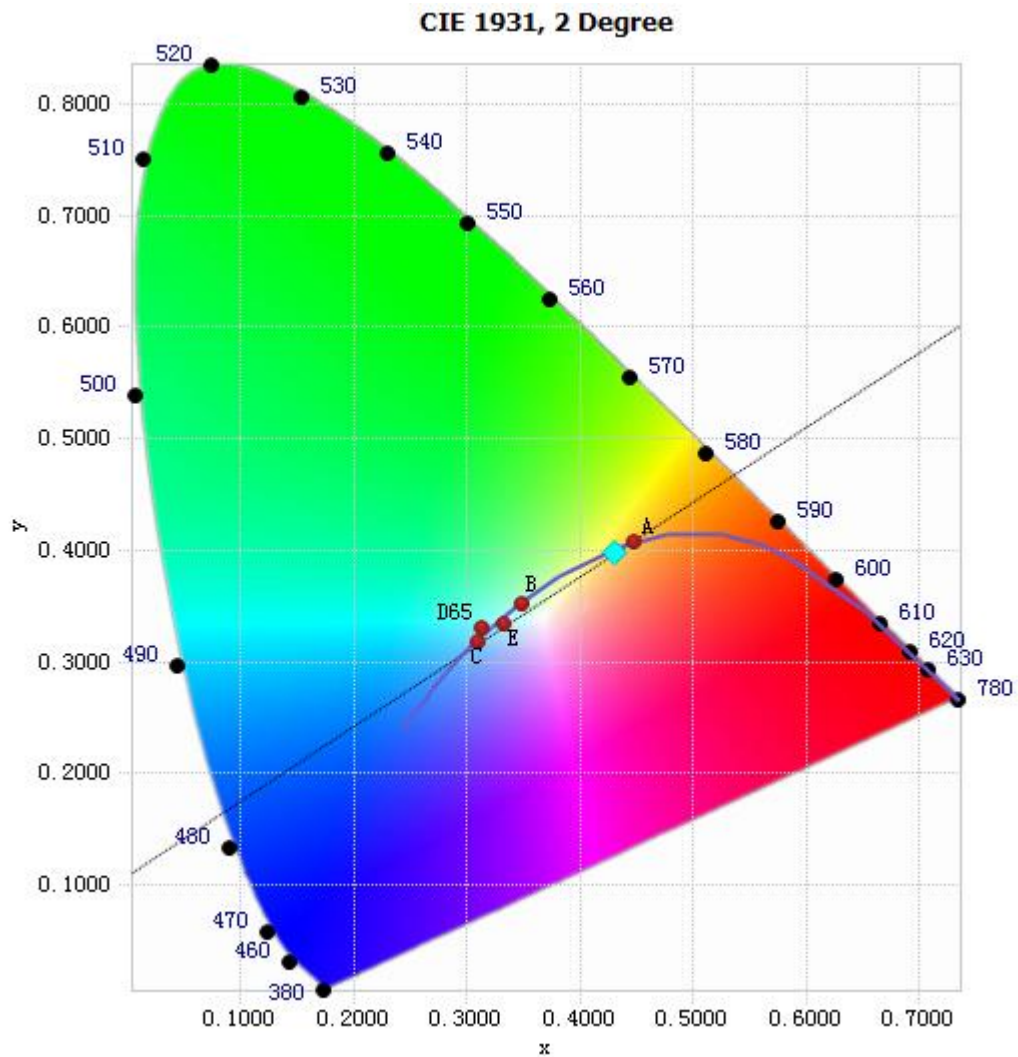


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.58E-04	485	1.24E-02	590	6.92E-02	695	1.27E-02
385	2.29E-04	490	1.46E-02	595	7.09E-02	700	1.09E-02
390	2.14E-04	495	1.82E-02	600	7.18E-02	705	9.29E-03
395	1.81E-04	500	2.22E-02	605	7.16E-02	710	7.95E-03
400	1.54E-04	505	2.60E-02	610	7.07E-02	715	6.83E-03
405	1.85E-04	510	2.93E-02	615	6.89E-02	720	5.88E-03
410	4.00E-04	515	3.22E-02	620	6.62E-02	725	5.02E-03
415	1.13E-03	520	3.42E-02	625	6.29E-02	730	4.29E-03
420	2.62E-03	525	3.61E-02	630	5.91E-02	735	3.65E-03
425	5.03E-03	530	3.79E-02	635	5.49E-02	740	3.11E-03
430	8.86E-03	535	3.92E-02	640	5.06E-02	745	2.66E-03
435	1.46E-02	540	4.10E-02	645	4.61E-02	750	2.28E-03
440	2.31E-02	545	4.29E-02	650	4.15E-02	755	1.95E-03
445	3.66E-02	550	4.48E-02	655	3.73E-02	760	1.66E-03
450	4.49E-02	555	4.72E-02	660	3.31E-02	765	1.43E-03
455	3.41E-02	560	5.00E-02	665	2.93E-02	770	1.22E-03
460	2.40E-02	565	5.32E-02	670	2.56E-02	775	1.03E-03
465	1.96E-02	570	5.66E-02	675	2.24E-02	780	8.93E-04
470	1.47E-02	575	5.99E-02	680	1.96E-02		
475	1.16E-02	580	6.35E-02	685	1.70E-02		
480	1.13E-02	585	6.68E-02	690	1.47E-02		

Table 3: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4306, 0.3980)

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

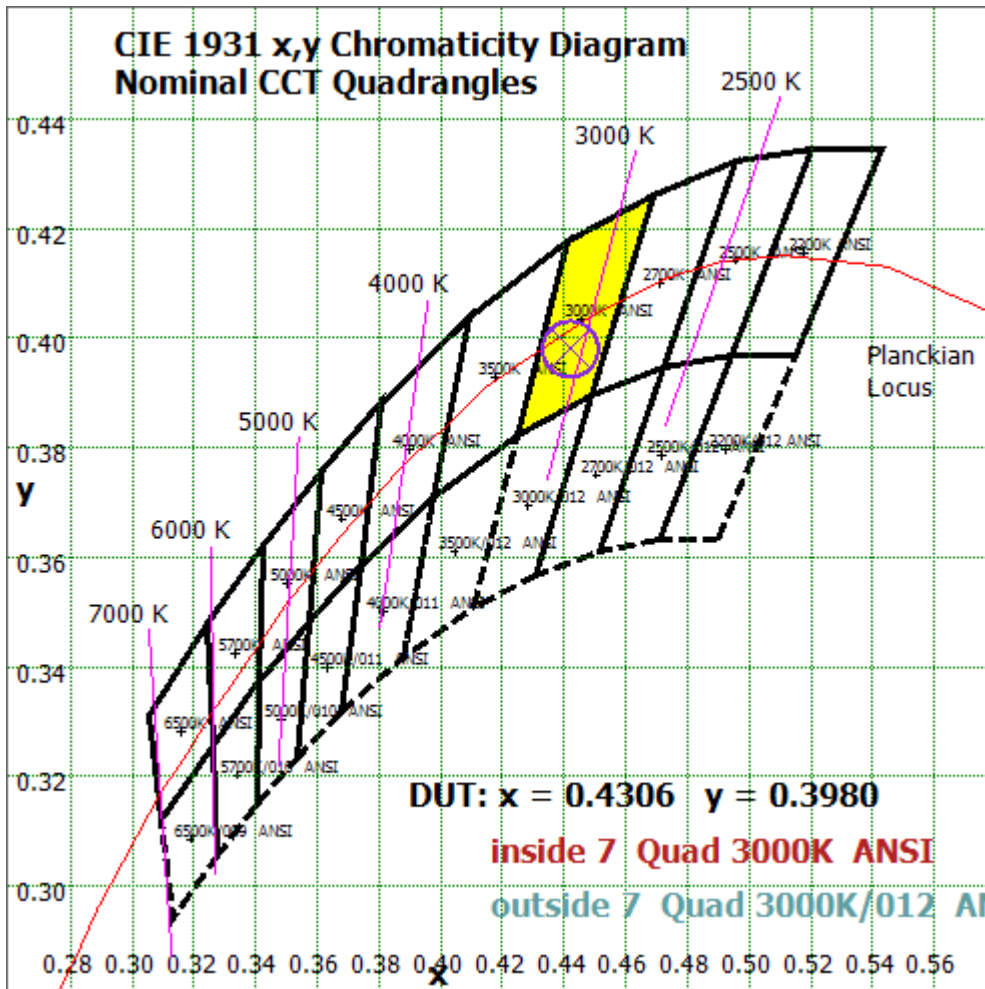


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

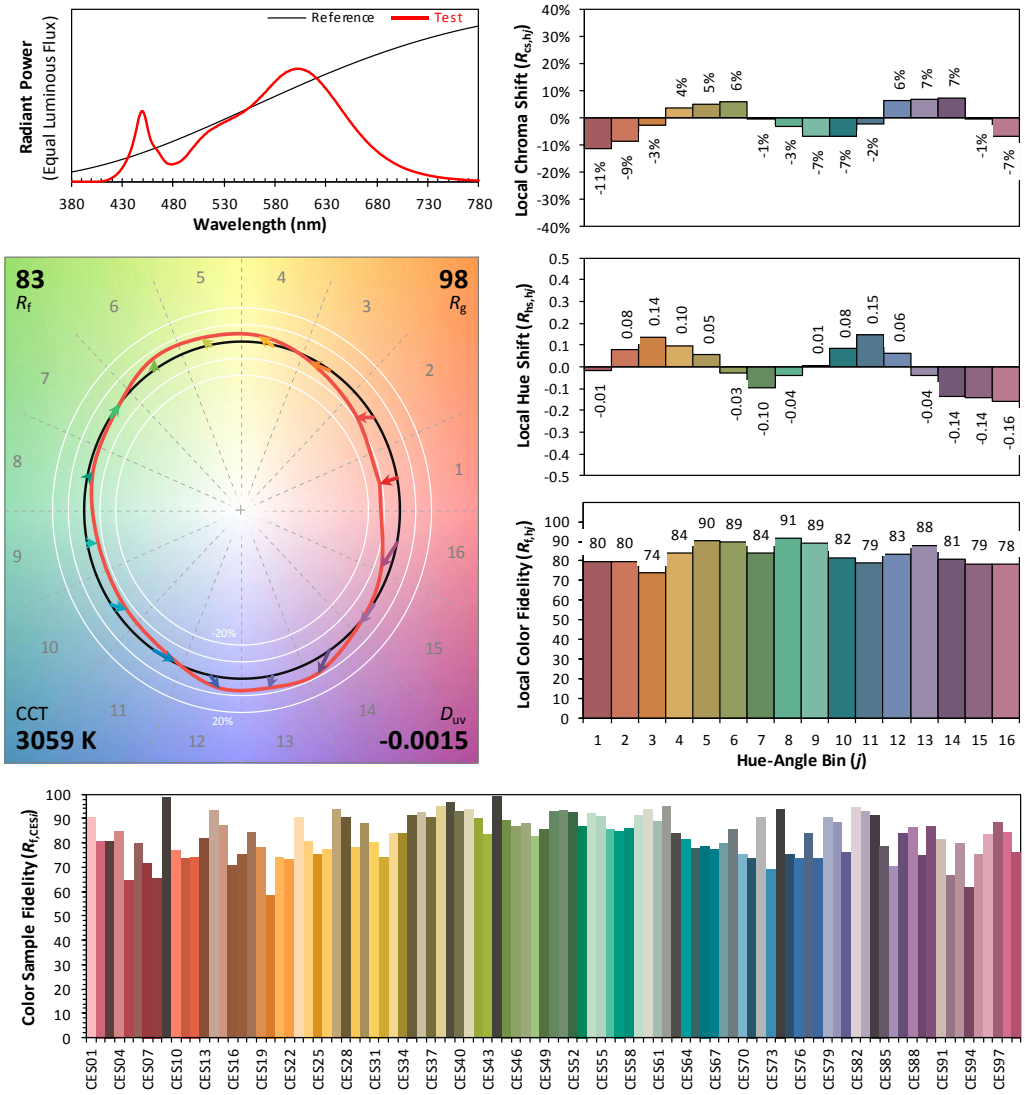
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2024/02/23

Model: 24HID/8CCTS/277V/E26/DIM/SD



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

x 0.4306
 y 0.3980
 u' 0.2491
 v' 0.5180

CIE 13.3-1995 (CRI)	
R_a	82
R_g	6

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.

Goniophotometer Method

Test ambient temperature was 25.0 °C.

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)	0.216
Power Factor	0.9938
Power (W)	25.73
Luminous Efficacy (lm/W)	139.8
Total Luminous Flux (lm)	3596.7
Beam Angle (°)	219.9 (0°-180°) / 219.2 (90°-270°)
Center Beam Candle Power (cd)	451
Maximum Beam Candle Power (cd)	457.7 (At: C=292.5, Gamma=22.5)
Spacing Criteria	1.49 (0°-180°) / 1.54 (90°-270°)
Zonal Lumens in the 0°-60° Zone	37.60%
Zonal Lumens in the 60°-90° Zone	30.91%
Zonal Lumens in the 90°-120° Zone	21.65%
Zonal Lumens in the 120°-180° Zone	9.83%

Table 4: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	43.042	1.20%
10- 20	127.476	3.54%
20- 30	206.799	5.75%
30- 40	276.466	7.69%
40- 50	331.291	9.21%
50- 60	367.295	10.21%
60- 70	382.541	10.64%
70- 80	377.017	10.48%
80- 90	352.343	9.80%
90-100	312.023	8.68%
100-110	261.094	7.26%
110-120	205.558	5.72%
120-130	150.801	4.19%
130-140	101.254	2.82%
140-150	60.03	1.67%
150-160	29.765	0.83%
160-170	10.532	0.29%
170-180	1.339	0.04%
Total	3596.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0-130	3393.75	94.36%
130-180	202.92	5.64%
0-180	3596.7	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

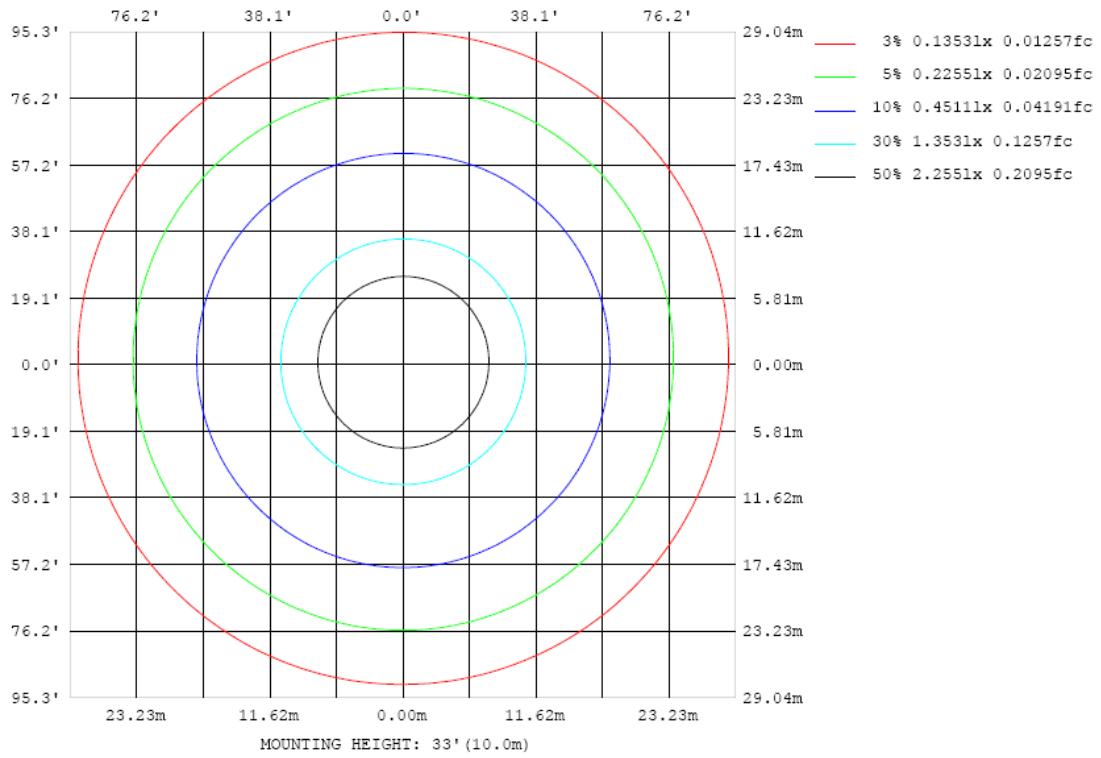


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

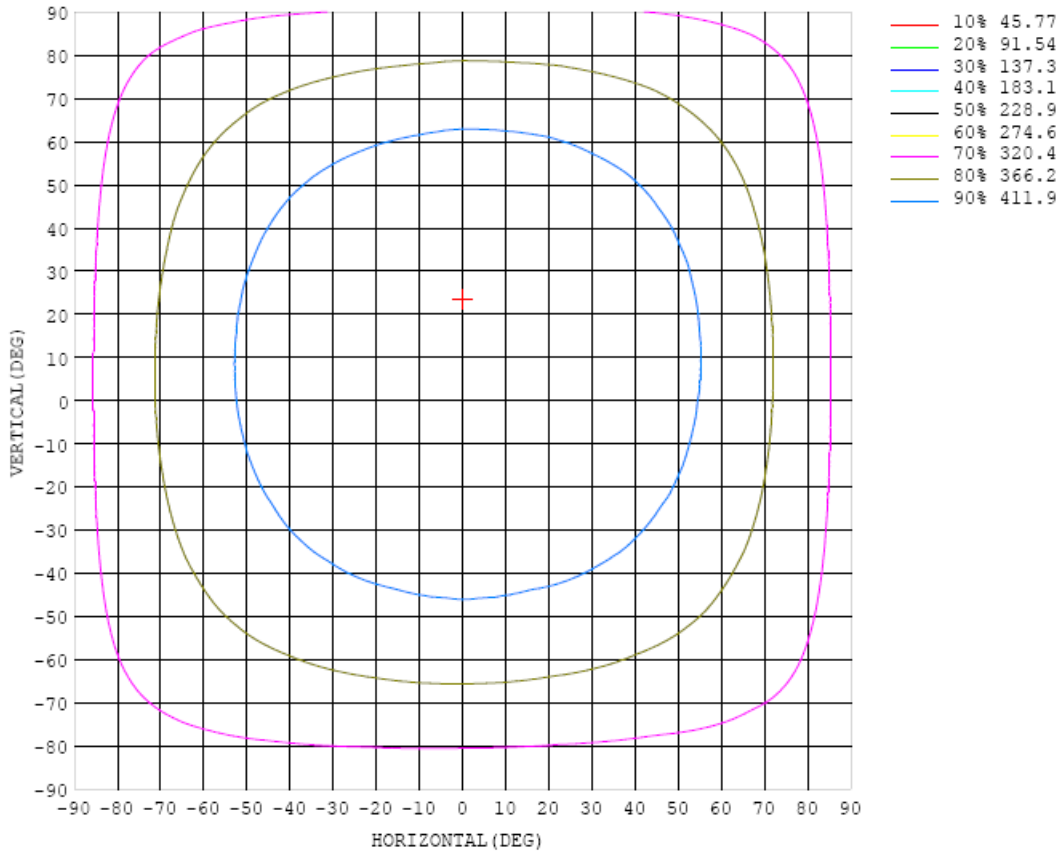


Chart 6: Isocandela Plot

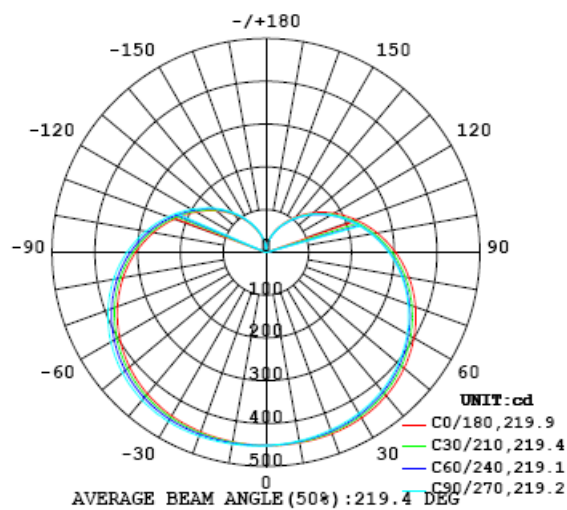


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

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	451	451	451	451	451	451	451	451	451	451	451	451	451	451	451	451			
5	452	450	450	450	450	449	449	450	450	451	452	453	453	453	453	452			
10	452	450	449	447	447	447	447	448	449	451	453	453	455	455	454	453			
15	452	449	447	445	444	444	444	446	448	450	453	455	456	456	455	454			
20	451	447	445	443	442	441	442	443	446	450	452	455	457	457	456	454			
25	450	446	442	439	438	438	439	441	444	448	452	455	457	457	456	453			
30	447	442	438	435	434	433	435	437	441	445	450	454	456	457	455	452			
35	443	437	432	429	428	428	430	432	437	442	448	451	455	455	453	448			
40	437	431	426	423	422	422	423	427	432	437	443	448	450	451	449	444			
45	430	423	417	414	414	414	416	419	425	431	437	442	445	445	443	437			
50	421	413	408	404	404	404	406	410	416	423	430	434	438	439	435	429			
55	411	403	397	394	394	394	396	401	407	413	421	426	429	429	426	420			
60	399	390	384	381	381	382	384	389	396	403	410	415	419	419	415	408			
65	387	377	371	368	368	369	372	376	383	390	398	403	407	406	403	396			
70	372	363	357	354	353	355	357	362	370	377	384	389	393	393	389	382			
75	356	347	341	338	338	339	343	348	355	362	369	374	378	378	374	366			
80	339	331	325	322	322	324	327	332	339	346	353	358	362	361	357	349			
85	322	313	307	305	305	307	310	316	323	329	336	341	344	343	339	331			
90	303	295	289	287	288	289	293	298	305	311	317	322	326	324	320	312			
95	284	275	270	268	269	271	275	280	287	293	299	303	306	305	300	293			
100	264	256	251	249	251	252	256	261	267	273	279	283	285	284	280	272			
105	244	236	232	230	231	234	237	242	248	253	259	263	265	263	259	252			
110	224	217	212	211	213	215	218	223	228	233	238	242	244	243	238	231			
115	204	197	193	192	194	196	199	203	209	213	217	221	223	221	217	211			
120	184	177	174	173	175	177	180	184	189	193	197	200	202	200	196	190			
125	164	158	155	155	156	158	161	165	171	173	177	180	181	179	176	171			
130	145	139	137	136	138	140	143	147	152	155	158	161	162	160	157	152			
135	126	122	119	119	120	122	125	128	133	136	139	141	142	140	137	133			
140	108	104	102	102	103	105	108	111	115	118	120	122	122	121	118	114			
145	91.0	87.6	85.8	85.6	86.8	88.3	90.7	93.7	97.9	100.0	102	103	104	102	99.8	96.2			
150	74.6	72.4	71.0	70.9	72.1	73.4	75.1	77.2	81.4	83.1	84.7	86.1	86.5	85.1	82.6	79.3			
155	60.3	57.9	56.7	56.5	57.3	58.6	60.4	62.6	65.6	67.5	68.8	70.0	70.1	68.9	66.5	63.5			
160	46.4	44.5	43.5	42.9	44.0	44.9	46.3	48.4	51.0	52.5	53.9	55.1	55.2	54.0	52.0	49.4			
165	34.1	32.6	31.4	28.8	31.6	30.8	33.3	35.7	37.9	38.9	40.2	41.3	40.8	40.5	38.7	36.5			
170	22.4	21.7	19.9	16.2	10.5	17.4	21.0	23.3	26.0	25.7	23.4	26.9	25.2	25.0	26.9	21.9			
175	8.69	6.52	5.98	6.67	6.06	7.26	9.00	12.6	14.2	14.1	13.4	14.1	13.9	11.0	8.12	9.11			
180	0.55	0.52	0.55	0.57	0.53	0.50	0.26	0.04	0.60	0.59	0.59	0.59	0.59	0.59	0.59	0.59			

Table 6: Luminous Intensity Data

TEST RESULTS (4000K Setting)

Test ambient temperature was 26.0 °C.

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
Voltage frequency (Hz)	60	60
Test Current (A)	0.214	0.092
Power Factor	0.9971	0.9266
Test Power (W)	25.50	23.27
THD A%	3.27	17.45
Luminous Efficacy (lm/W)	147.9	152.3
Total Luminous Flux (lm)	3770.6	3544.9
Color Rendering Index (CRI)	84.6	
R9	17.5	
Correlated Color Temperature (CCT)(K)	4178	
Chromaticity Chroma x	0.3721	
Chromaticity Chroma y	0.3688	
Chromaticity Chroma u	0.2228	
Chromaticity Chroma v	0.3312	
Duv	-0.0012	
Chromaticity Chroma u'	0.2228	
Chromaticity Chroma v'	0.4968	

Special Color Rendering Indices	
R1	83.6
R2	90.6
R3	94.7
R4	83.5
R5	83.4
R6	86.1
R7	87
R8	68.1
R9	17.5
R10	76.9
R11	82.7
R12	62.3
R13	85.5
R14	97.3

Table 7: Test data per Sphere-Spectroradiometer Method

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

Spectral Power Distribution - Sphere Spectroradiometer Method

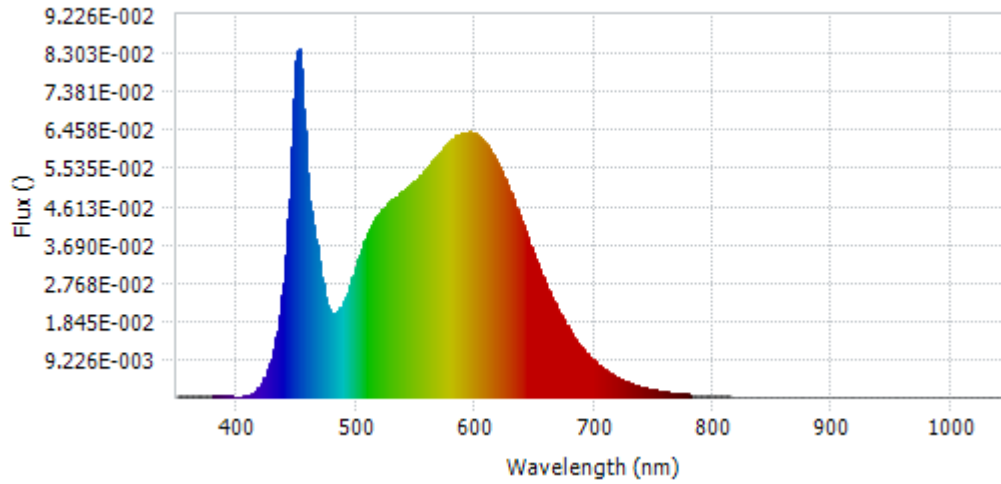
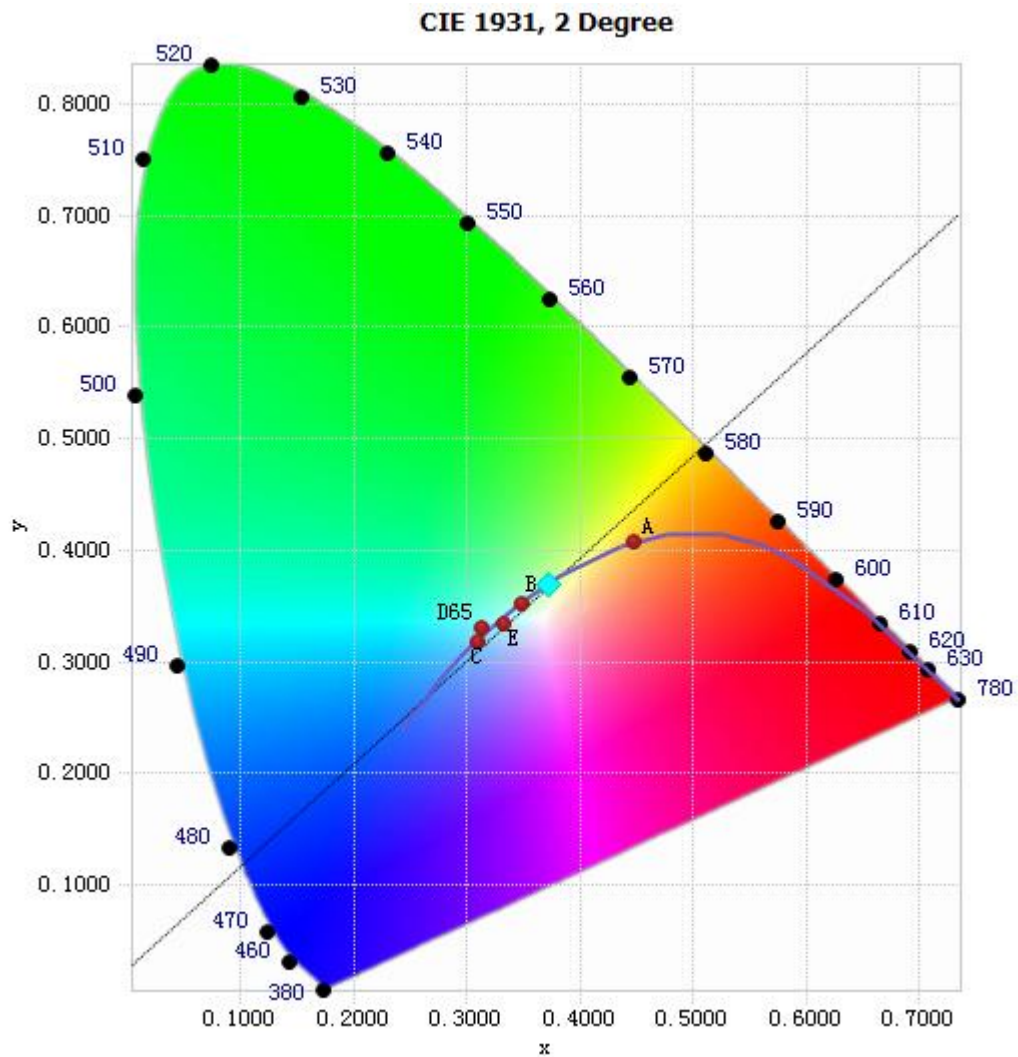


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.65E-04	485	2.10E-02	590	6.39E-02	695	1.02E-02
385	3.46E-04	490	2.30E-02	595	6.41E-02	700	8.79E-03
390	3.35E-04	495	2.69E-02	600	6.36E-02	705	7.52E-03
395	3.01E-04	500	3.15E-02	605	6.24E-02	710	6.43E-03
400	2.55E-04	505	3.58E-02	610	6.08E-02	715	5.51E-03
405	2.32E-04	510	3.95E-02	615	5.86E-02	720	4.75E-03
410	4.87E-04	515	4.26E-02	620	5.58E-02	725	4.06E-03
415	1.32E-03	520	4.43E-02	625	5.26E-02	730	3.46E-03
420	3.06E-03	525	4.62E-02	630	4.92E-02	735	2.96E-03
425	5.89E-03	530	4.77E-02	635	4.54E-02	740	2.52E-03
430	1.05E-02	535	4.85E-02	640	4.17E-02	745	2.16E-03
435	1.81E-02	540	4.99E-02	645	3.78E-02	750	1.85E-03
440	3.07E-02	545	5.12E-02	650	3.39E-02	755	1.59E-03
445	5.40E-02	550	5.23E-02	655	3.04E-02	760	1.36E-03
450	8.10E-02	555	5.39E-02	660	2.70E-02	765	1.16E-03
455	7.47E-02	560	5.54E-02	665	2.38E-02	770	9.95E-04
460	5.07E-02	565	5.71E-02	670	2.07E-02	775	8.54E-04
465	3.99E-02	570	5.88E-02	675	1.82E-02	780	7.26E-04
470	3.10E-02	575	6.04E-02	680	1.58E-02		
475	2.29E-02	580	6.20E-02	685	1.37E-02		
480	2.04E-02	585	6.35E-02	690	1.19E-02		

Table 8: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3721, 0.3688)

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

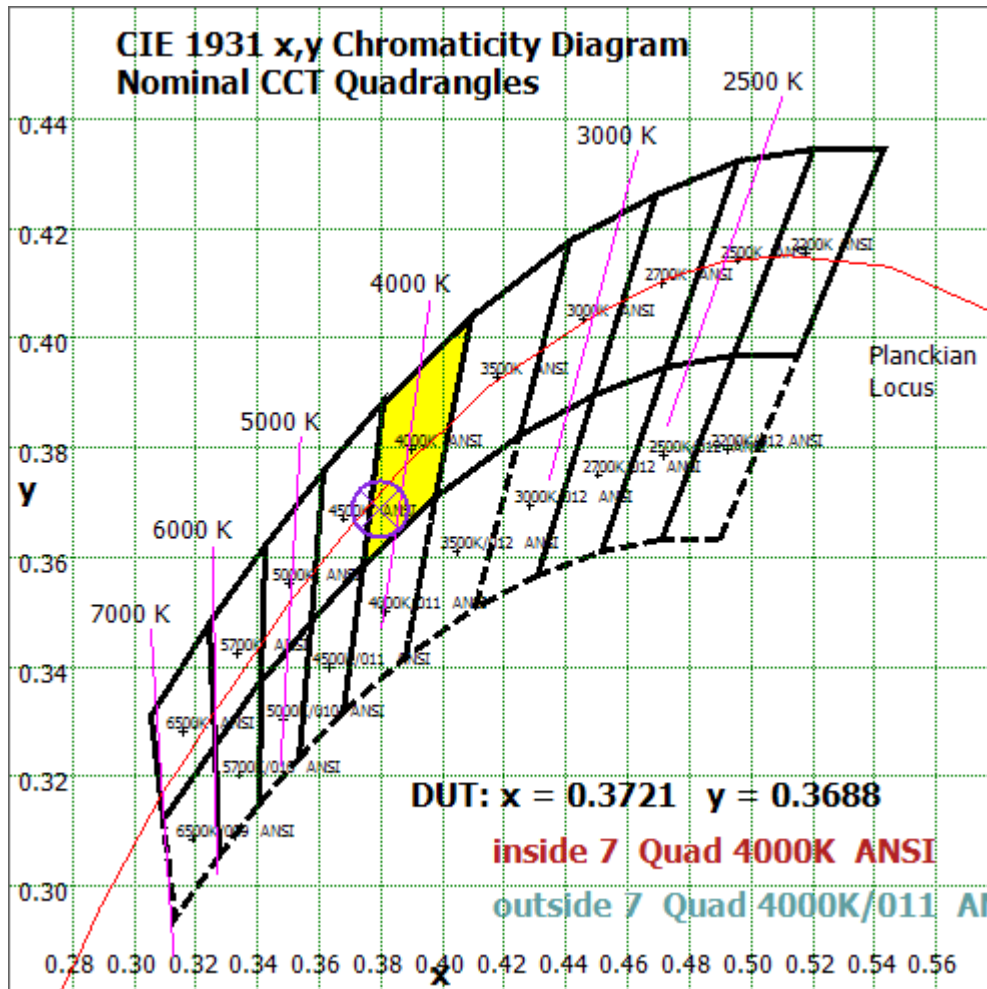


Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

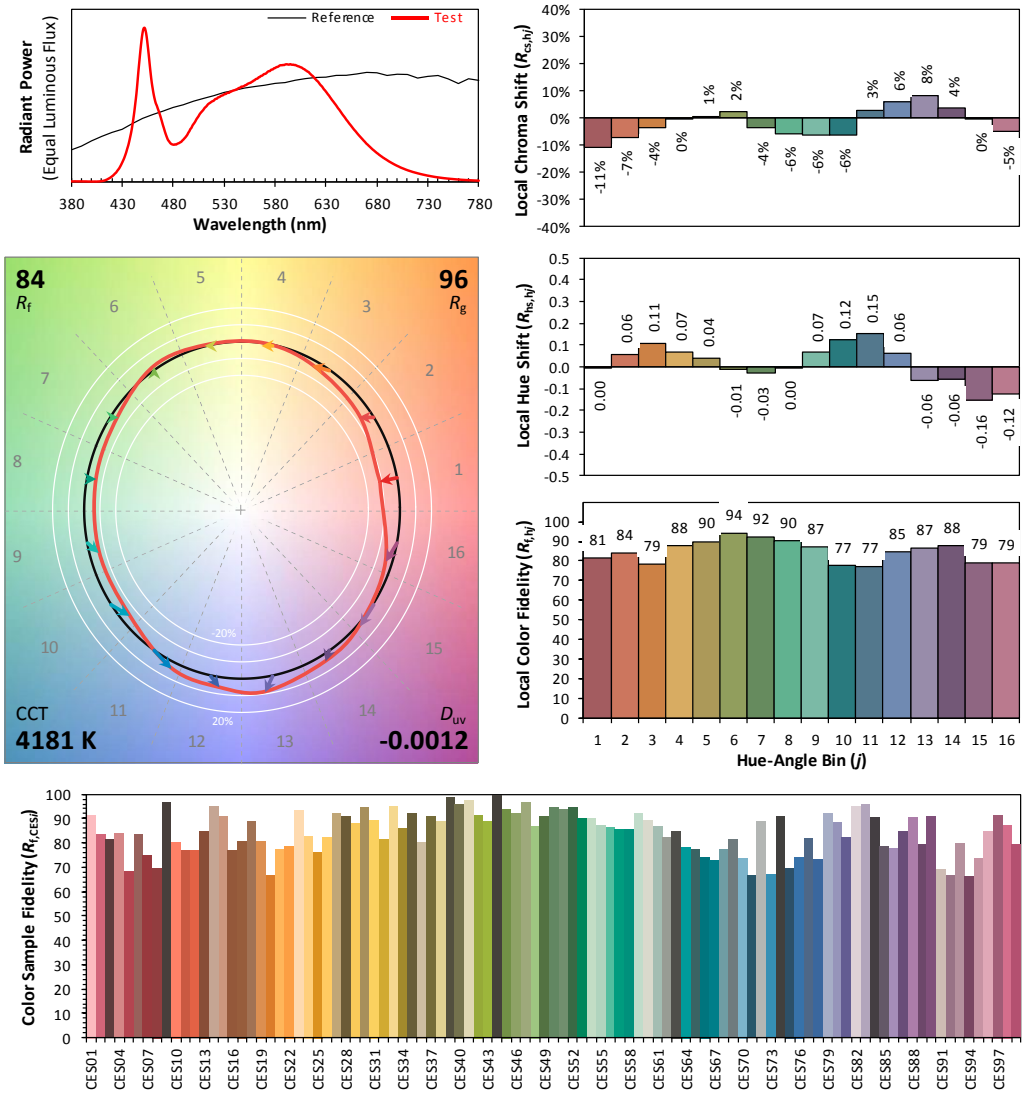
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2024/02/23

Model: 24HID/8CCTS/277V/E26/DIM/SD



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

x 0.3721
 y 0.3688
 u' 0.2228
 v' 0.4968

CIE 13.3-1995 (CRI)	
R_a	85
R_g	18

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 7 due to rounding.

TEST RESULTS (5000K Setting)

Test ambient temperature was 26.0 °C.

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
Voltage frequency (Hz)	60	60
Test Current (A)	0.218	0.093
Power Factor	0.9972	0.9286
Test Power (W)	25.98	23.58
THD A%	3.36	19.21
Luminous Efficacy (lm/W)	142.3	147.0
Total Luminous Flux (lm)	3695.9	3465.9
Color Rendering Index (CRI)	83.7	
R9	13.2	
Correlated Color Temperature (CCT)(K)	4876	
Chromaticity Chroma x	0.3489	
Chromaticity Chroma y	0.3573	
Chromaticity Chroma u	0.2118	
Chromaticity Chroma v	0.3253	
Duv	0.0013	
Chromaticity Chroma u'	0.2118	
Chromaticity Chroma v'	0.4880	

Special Color Rendering Indices	
R1	82
R2	89.1
R3	93.3
R4	82.5
R5	81.8
R6	83.8
R7	88.1
R8	68.8
R9	13.2
R10	73.3
R11	81.3
R12	57.5
R13	84
R14	96.5

Table 9: Test data per Sphere-Spectroradiometer Method

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

Spectral Power Distribution - Sphere Spectroradiometer Method

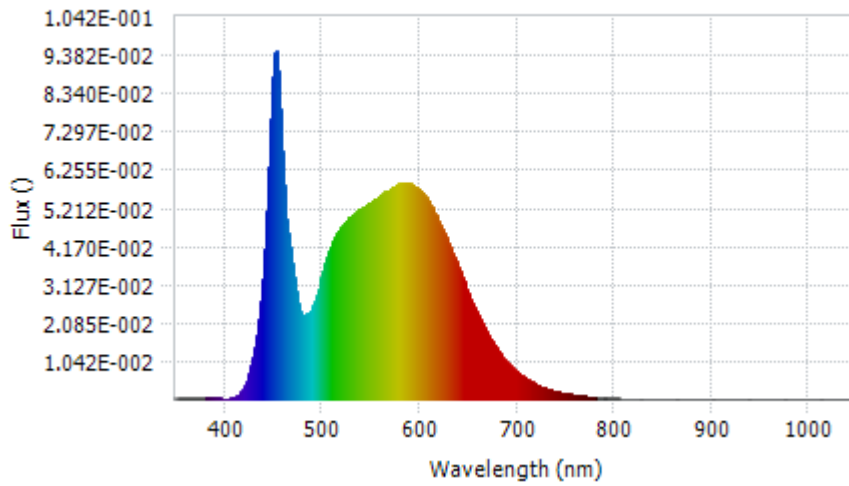
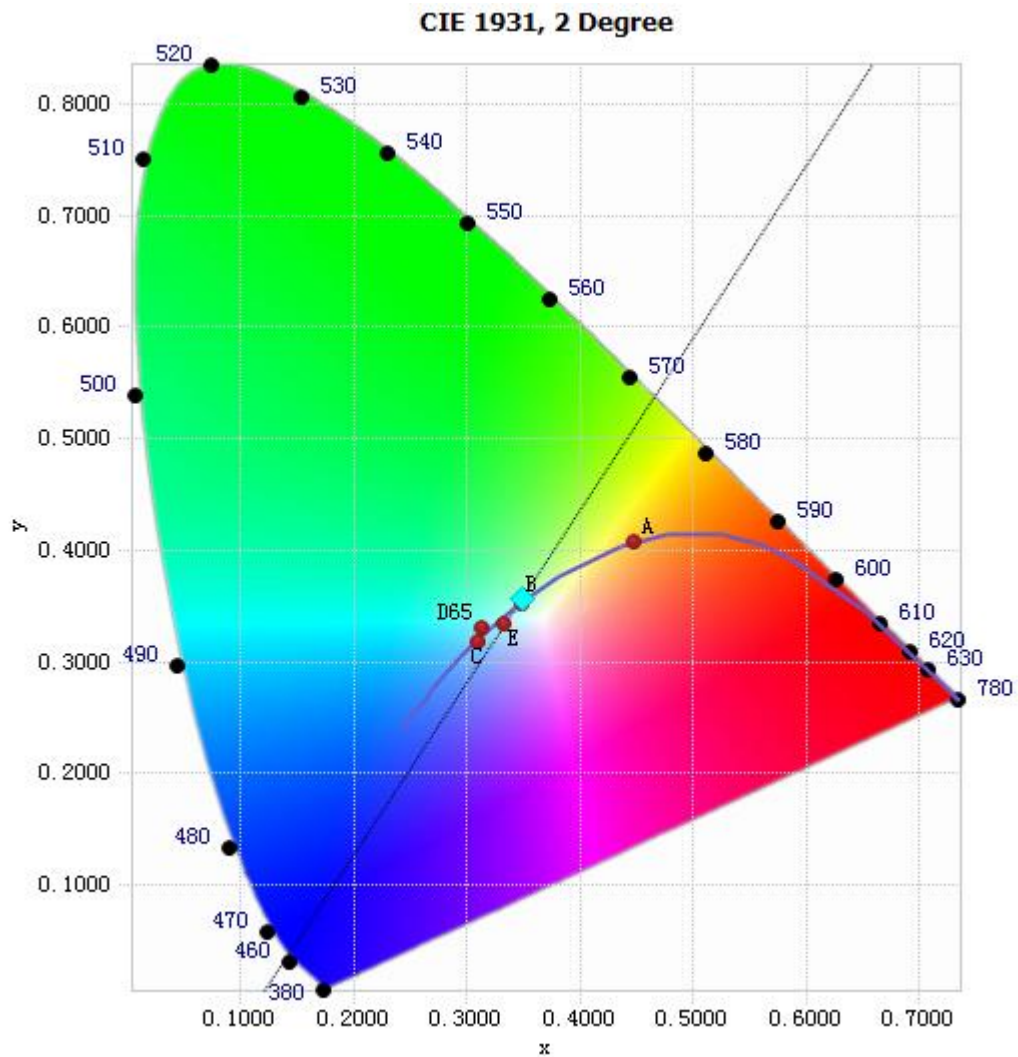


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.78E-04	485	2.35E-02	590	5.87E-02	695	8.65E-03
385	3.57E-04	490	2.55E-02	595	5.81E-02	700	7.41E-03
390	3.55E-04	495	2.94E-02	600	5.70E-02	705	6.35E-03
395	3.26E-04	500	3.42E-02	605	5.53E-02	710	5.45E-03
400	2.59E-04	505	3.87E-02	610	5.33E-02	715	4.68E-03
405	2.92E-04	510	4.23E-02	615	5.11E-02	720	4.03E-03
410	5.91E-04	515	4.54E-02	620	4.83E-02	725	3.47E-03
415	1.69E-03	520	4.70E-02	625	4.52E-02	730	2.96E-03
420	3.84E-03	525	4.88E-02	630	4.20E-02	735	2.51E-03
425	7.37E-03	530	5.02E-02	635	3.87E-02	740	2.16E-03
430	1.30E-02	535	5.08E-02	640	3.55E-02	745	1.85E-03
435	2.19E-02	540	5.19E-02	645	3.20E-02	750	1.58E-03
440	3.67E-02	545	5.29E-02	650	2.87E-02	755	1.37E-03
445	6.35E-02	550	5.36E-02	655	2.57E-02	760	1.16E-03
450	9.21E-02	555	5.46E-02	660	2.28E-02	765	1.00E-03
455	8.46E-02	560	5.55E-02	665	2.01E-02	770	8.60E-04
460	5.83E-02	565	5.65E-02	670	1.75E-02	775	7.37E-04
465	4.54E-02	570	5.74E-02	675	1.53E-02	780	6.33E-04
470	3.52E-02	575	5.80E-02	680	1.33E-02		
475	2.61E-02	580	5.86E-02	685	1.16E-02		
480	2.30E-02	585	5.92E-02	690	1.00E-02		

Table 10: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3489, 0.3573)

Chart 13: 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

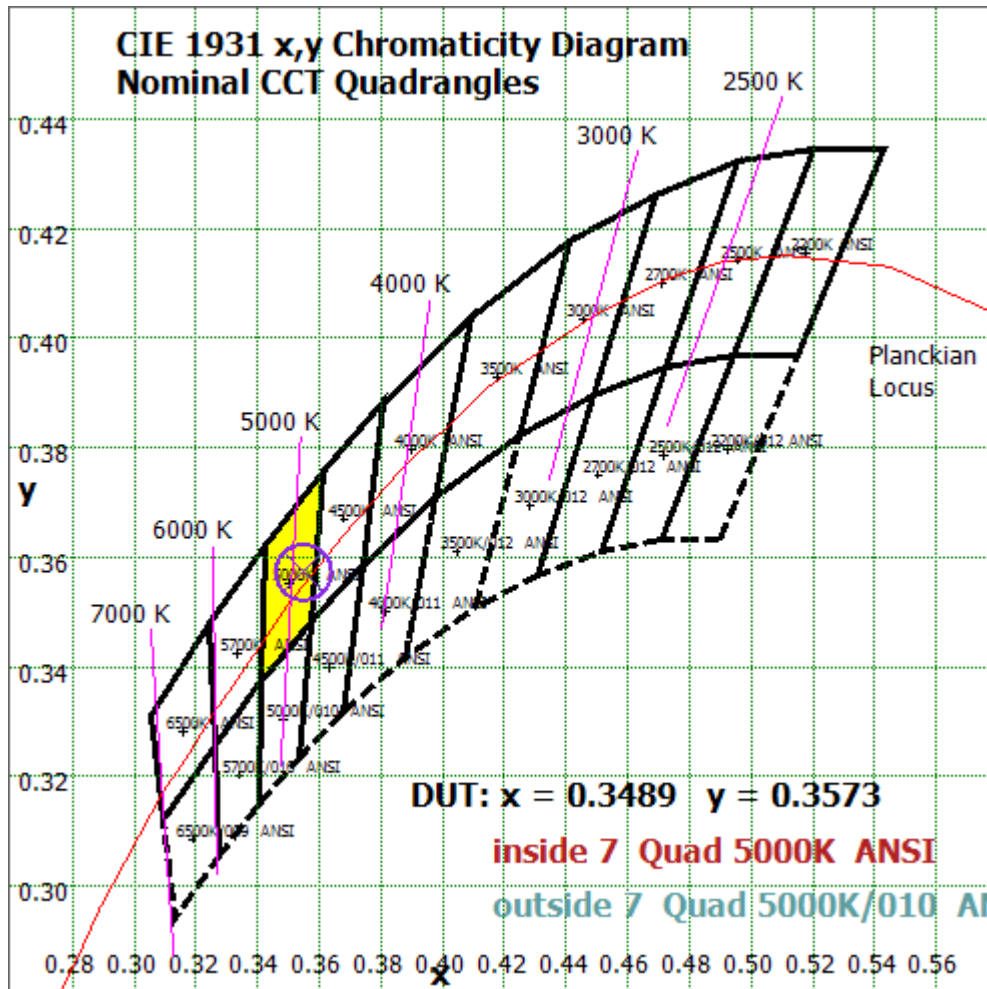


Chart 14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

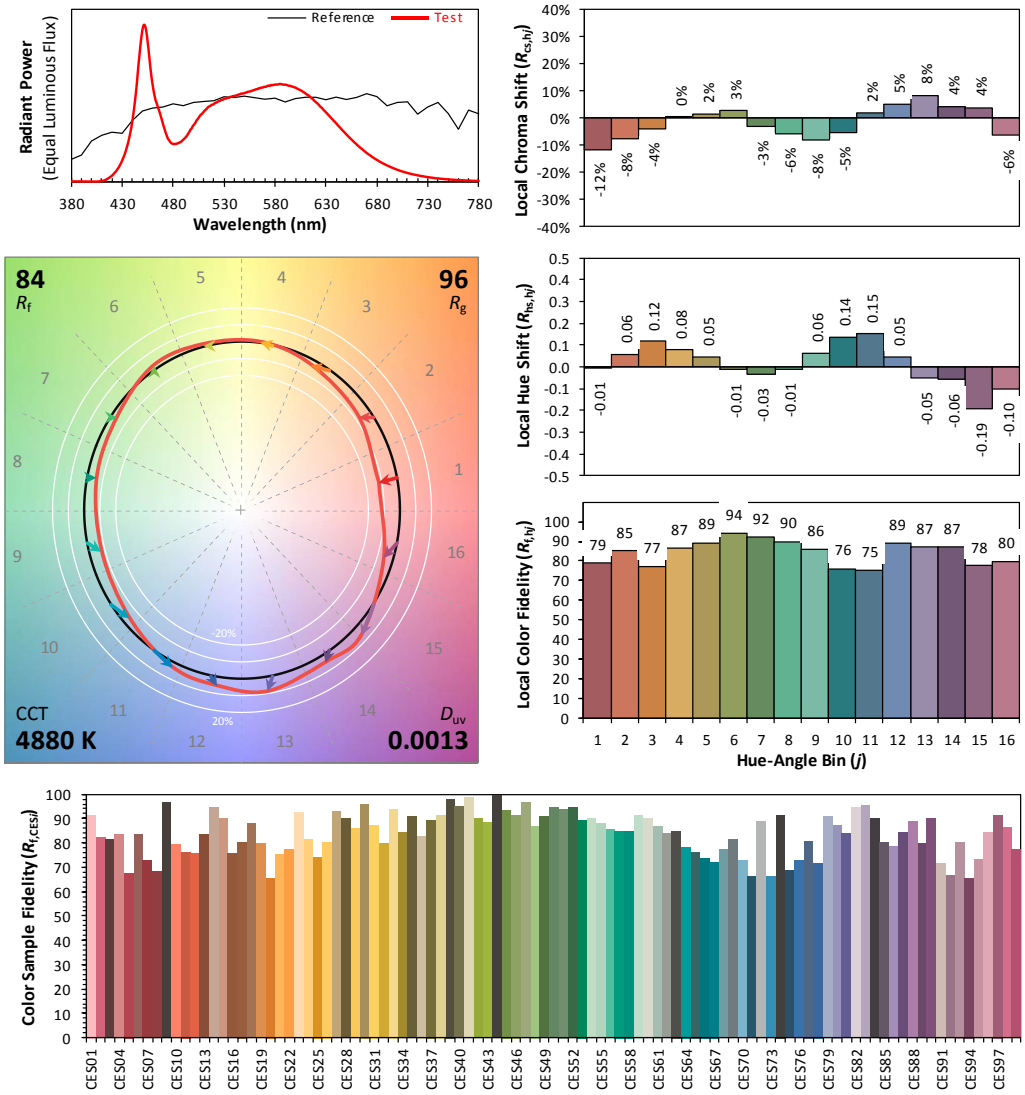
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2024/02/23

Model: 24HID/8CCTS/277V/E26/DIM/SD



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

x 0.3489
 y 0.3573
 u' 0.2118
 v' 0.4880

CIE 13.3-1995 (CRI)	
R_a	84
R_g	13

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

Chart 15: 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 10 due to rounding.

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 11: 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 expanded 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 expanded 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 ***

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