

## 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 Tube

**Model: 9.5T8/2F/8CCTS/EXT/SD/A4**

### Laboratory: Lea ding Testing Laboratories

**NVLAP CODE: 200960-0**

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Report No.: HZ23060027c

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

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Jul. 07, 2023

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Jul. 07, 2023

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	9.5T8/2F/8CCTS/EX T/SD/A4 3000K Setting	9.5T8/2F/8CCTS/EX T/SD/A4 3500K Setting	9.5T8/2F/8CCTS/E XT/SD/A4 4000K Setting
Luminous Efficacy (Lumens /Watt)	131.6	137.6	141.6
Total Luminous Flux (Lumens)	1491.0	1540.8	1568.9
Power (Watts)/4	11.33	11.20	11.09
Power Factor	0.9943	0.9945	0.9946
CCT (K)	3095	3518	3947
CRI	82.3	84.4	85.6
Stabilization Time (Light & Power)	50 mins	50 mins	50 mins
Note	3000K	3500K	4000K

Tested Model	9.5T8/2F/8CCTS/EX T/SD/A4 5000K Setting	9.5T8/2F/8CCTS/EX T/SD/A4 6500K Setting
Luminous Efficacy (Lumens /Watt)	141.9	136.1
Total Luminous Flux (Lumens)	1579.9	1535.0
Power (Watts)/4	11.13	11.29
Power Factor	0.9946	0.9943
CCT (K)	4975	6331
CRI	85.6	83.9
Stabilization Time (Light & Power)	50 mins	50 mins
Note	5000K	6500K

Table 1: Executive Data Summary

### Test specifications:

Date of Receipt	: Jun. 27, 2023
Date of Test	: Jun. 29, 2023
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

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## SAMPLE PHOTO

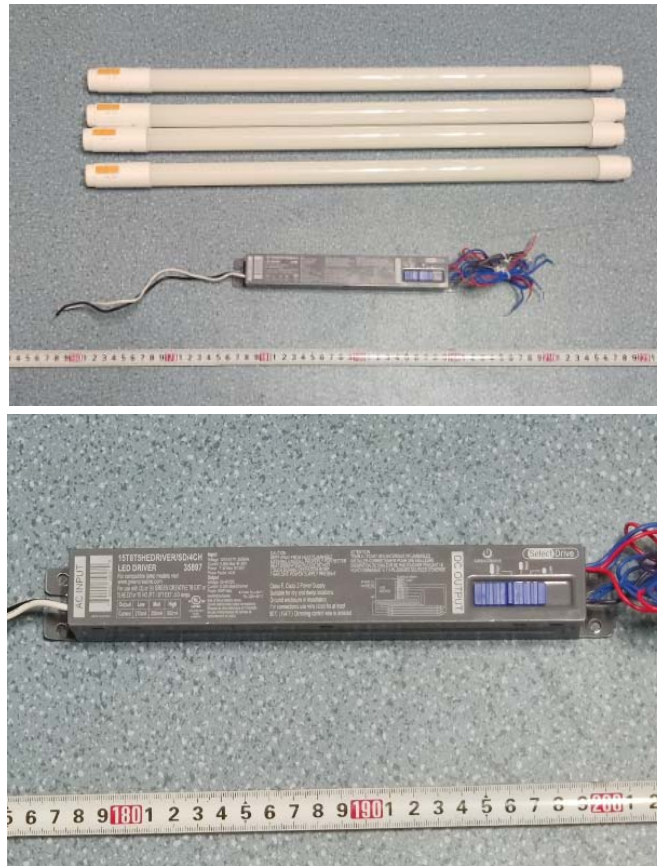


Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 9.5T8/2F/8CCTS/EXT/SD/A4
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz
<b>Product Description</b>	: Color- Tunable 3000K/3500K/4000K/5000K/6500K LED Tube supplied by a LED driver: 15T8T5HEDRIVER/SD/4CH
<b>Manufacturer</b>	: GREEN CREATIVE LTD
<b>Address</b>	: 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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.378	0.176
Power Factor	0.9943	0.9202
Test Power (W)/4	11.33	11.23
THD A%	5.25	7.86
Luminous Efficacy (lm/W)	131.6	132.7
Total Luminous Flux (lm)	1491.0	1490.6
Color Rendering Index (CRI)	82.3	
R9	4.7	
Correlated Color Temperature (CCT)(K)	3095	
Chromaticity Chroma x	0.4299	
Chromaticity Chroma y	0.4009	
Chromaticity Chroma u	0.2474	
Chromaticity Chroma v	0.3461	
Duv	-0.0002	
Chromaticity Chroma u'	0.2474	
Chromaticity Chroma v'	0.5191	

Special Color Rendering Indices	
R1	80.9
R2	92.1
R3	94.6
R4	79.5
R5	81.4
R6	90.5
R7	81.6
R8	57.6
R9	4.7
R10	82.2
R11	78.8
R12	72.1
R13	83.8
R14	97.7

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

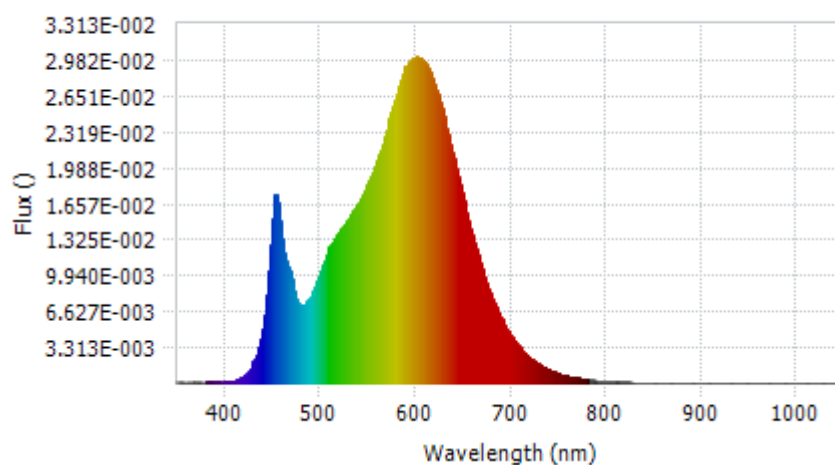


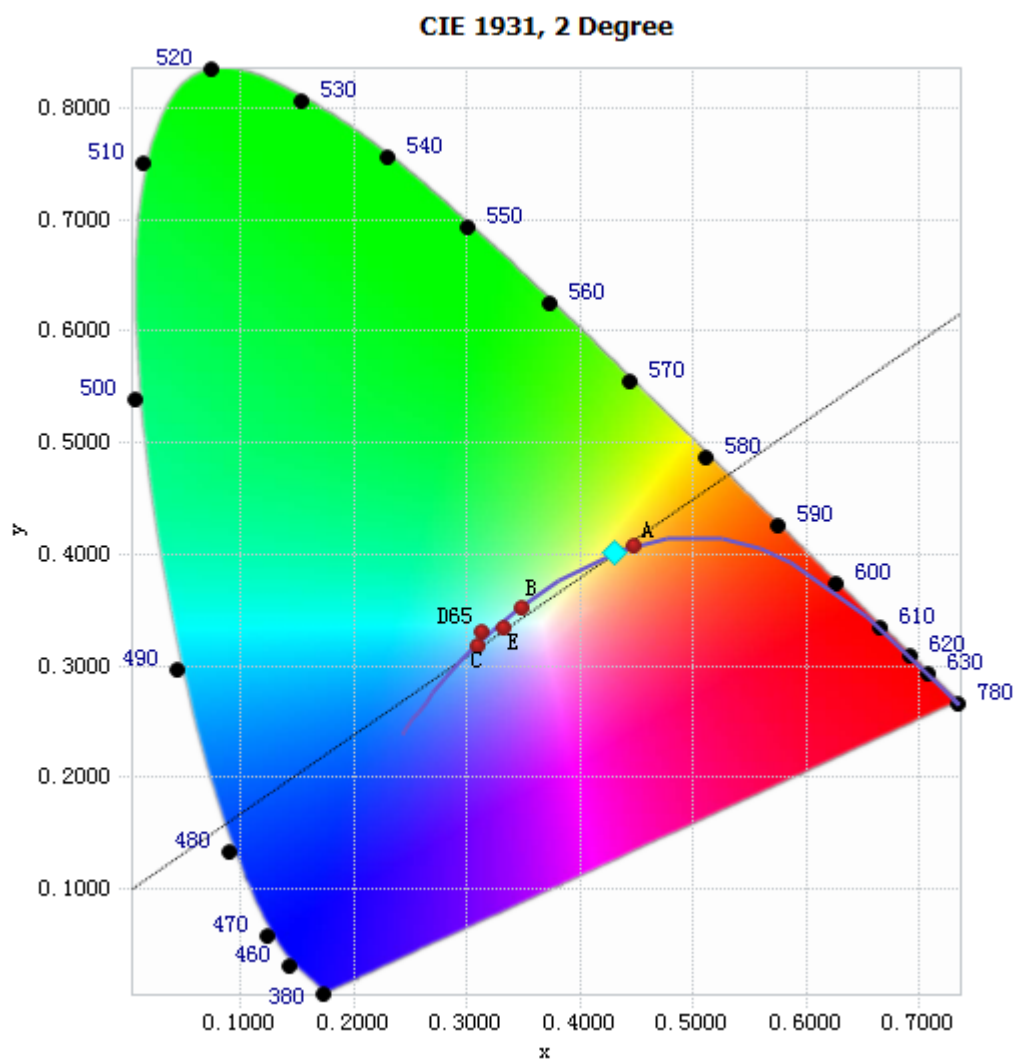
Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.10E-04	485	7.55E-03	590	2.92E-02	695	5.05E-03
385	1.00E-04	490	8.22E-03	595	2.99E-02	700	4.32E-03
390	1.02E-04	495	9.21E-03	600	3.01E-02	705	3.68E-03
395	9.73E-05	500	1.04E-02	605	2.99E-02	710	3.15E-03
400	9.94E-05	505	1.16E-02	610	2.95E-02	715	2.70E-03
405	1.26E-04	510	1.25E-02	615	2.87E-02	720	2.31E-03
410	2.41E-04	515	1.34E-02	620	2.73E-02	725	1.98E-03
415	4.14E-04	520	1.40E-02	625	2.59E-02	730	1.69E-03
420	7.23E-04	525	1.47E-02	630	2.42E-02	735	1.43E-03
425	1.22E-03	530	1.54E-02	635	2.25E-02	740	1.23E-03
430	1.98E-03	535	1.60E-02	640	2.07E-02	745	1.04E-03
435	3.33E-03	540	1.66E-02	645	1.88E-02	750	8.95E-04
440	5.68E-03	545	1.76E-02	650	1.69E-02	755	7.62E-04
445	1.03E-02	550	1.84E-02	655	1.51E-02	760	6.52E-04
450	1.63E-02	555	1.95E-02	660	1.33E-02	765	5.56E-04
455	1.67E-02	560	2.08E-02	665	1.18E-02	770	4.81E-04
460	1.26E-02	565	2.21E-02	670	1.03E-02	775	4.15E-04
465	1.08E-02	570	2.36E-02	675	8.96E-03	780	3.52E-04
470	9.30E-03	575	2.52E-02	680	7.80E-03		
475	7.58E-03	580	2.67E-02	685	6.77E-03		
480	7.15E-03	585	2.82E-02	690	5.86E-03		

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



# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4299, 0.4009)

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

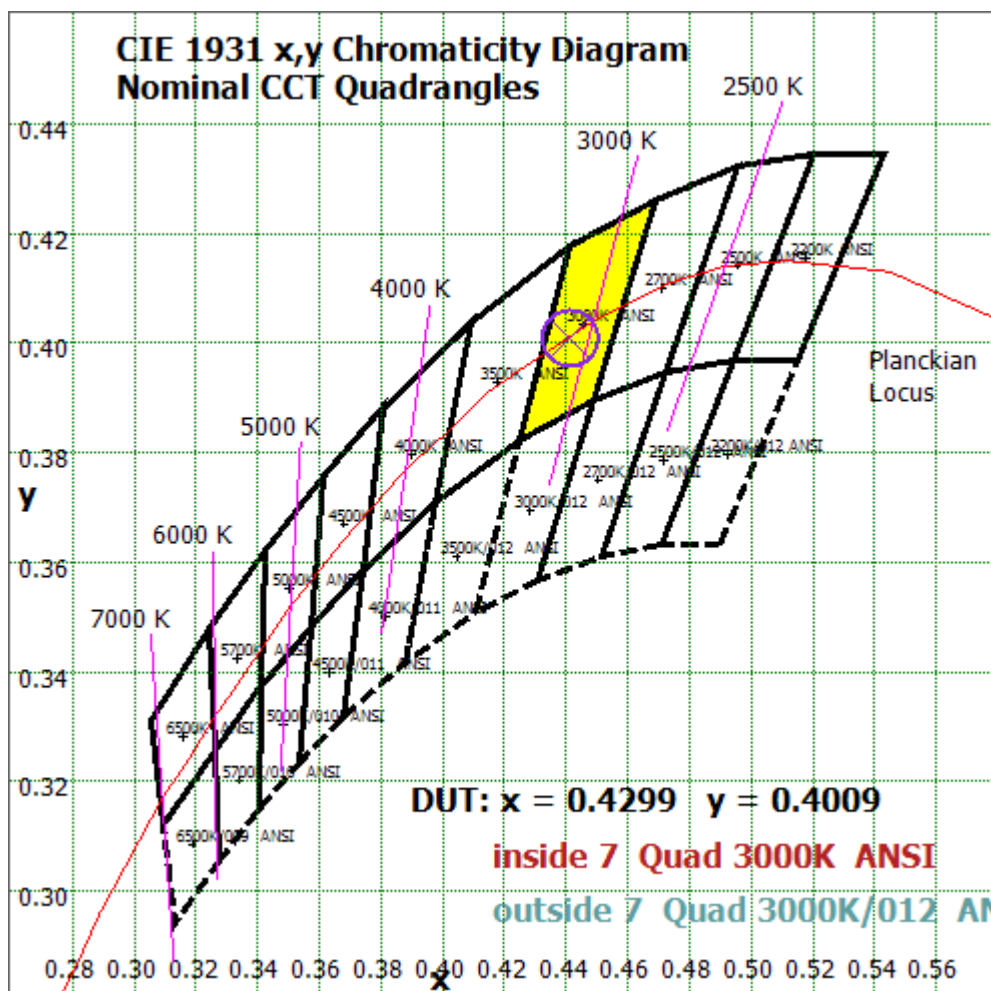


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

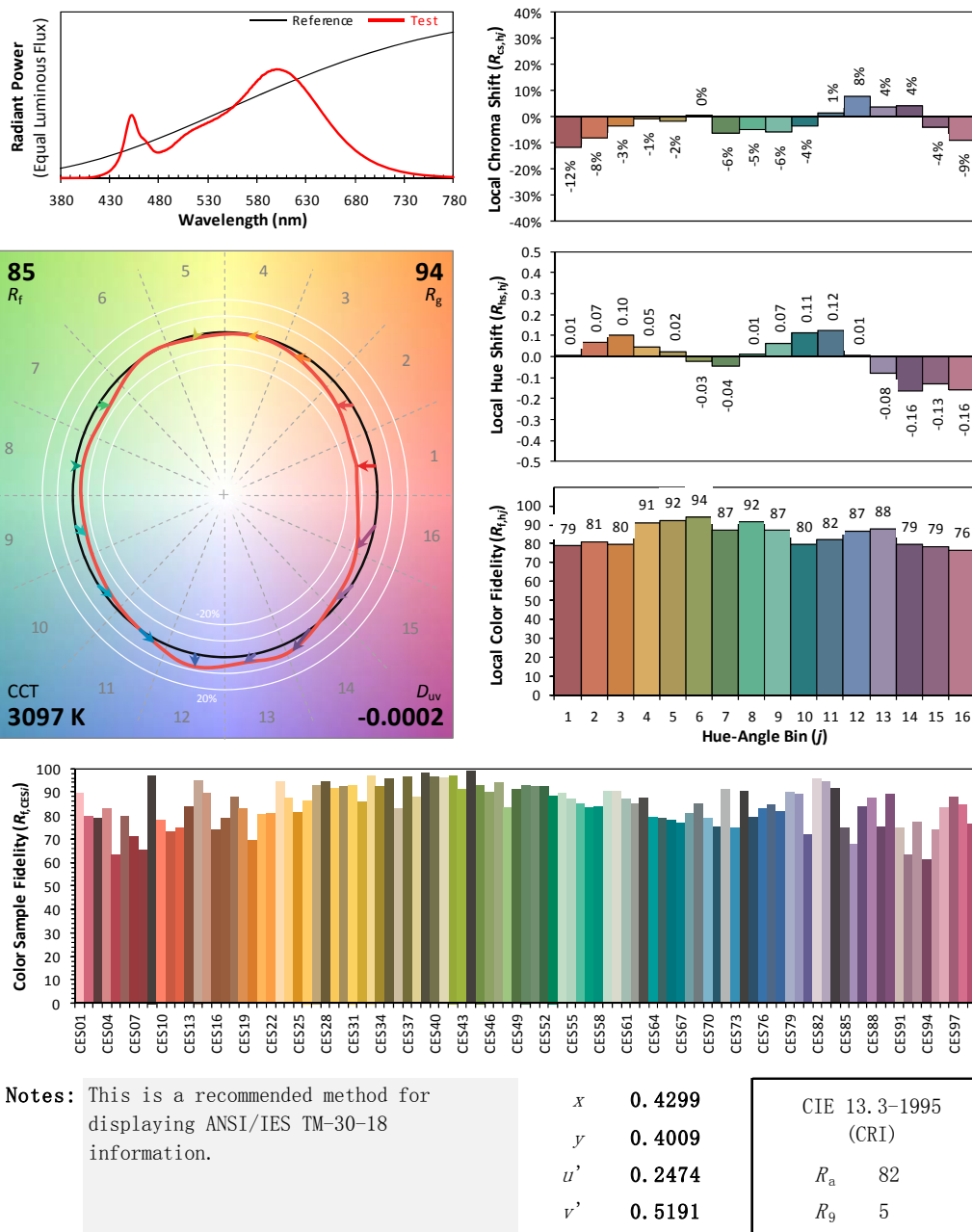
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/29

Model: 9.5T8/2F/8CCTS/EXT/SD/A4



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 25.1°C.

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)	0.382
Power Factor	0.9917
Power (W)/4	11.36
Luminous Efficacy (lm/W)	131.9
Total Luminous Flux (lm)	1498.3
Beam Angle (°)	112.2 (0°-180°) / 249.7 (90°-270°)
Center Beam Candle Power (cd)	237
Maximum Beam Candle Power (cd)	236.8 (At: C=100.0, Gamma=2.5)
Spacing Criteria	1.26 (0°-180°) / 1.47 (90°-270°)
Zonal Lumens in the 0°-60°Zone	41.21%
Zonal Lumens in the 60°-90°Zone	27.01%
Zonal Lumens in the 90°-120°Zone	18.86%
Zonal Lumens in the 120°-180°Zone	12.93%

Table 4: Test data per Goniophotometer Method

### Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	22.43	1.50%
10- 20	65.083	4.34%
20- 30	101.753	6.79%
30- 40	129.462	8.64%
40- 50	146.474	9.78%
50- 60	152.207	10.16%
60- 70	147.769	9.86%
70- 80	135.91	9.07%
80- 90	120.969	8.07%
90-100	107.313	7.16%
100-110	94.263	6.29%
110-120	80.986	5.41%
120-130	67.389	4.50%
130-140	53.284	3.56%
140-150	38.748	2.59%
150-160	22.515	1.50%
160-170	9.383	0.63%
170-180	2.365	0.16%
Total	1498.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	617.409	41.21%
60- 90	404.648	27.01%
0-90	1022.06	68.21%
90- 180	476.246	31.79%
0- 180	1498.3	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

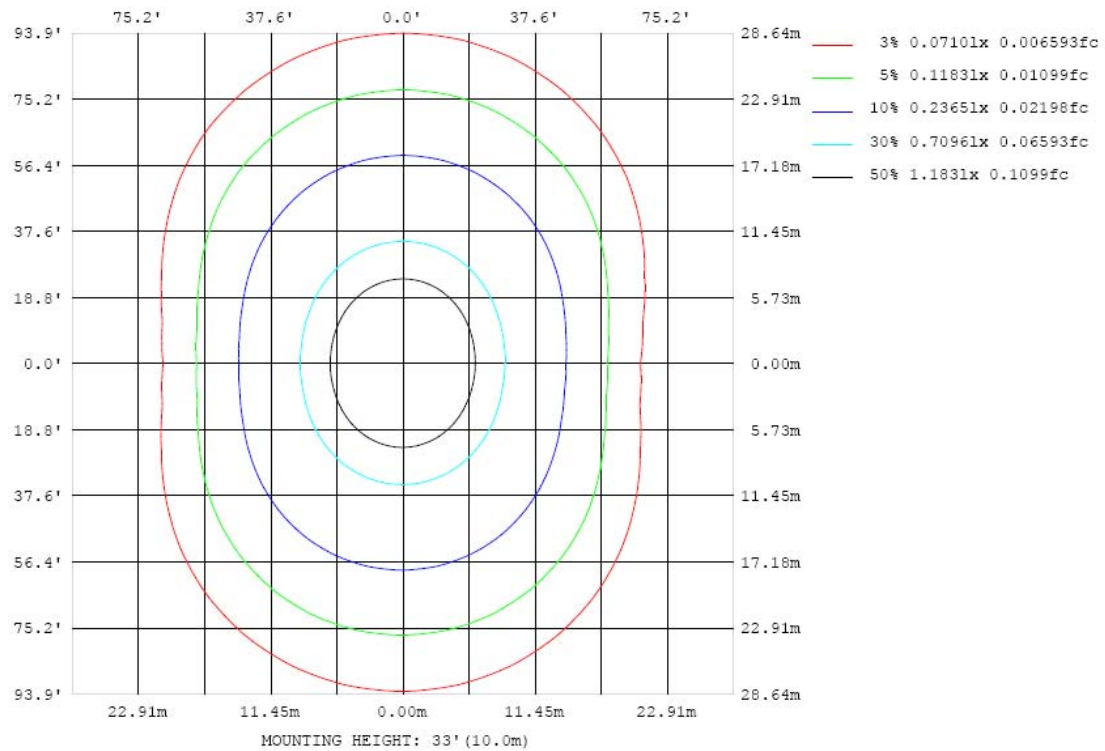


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

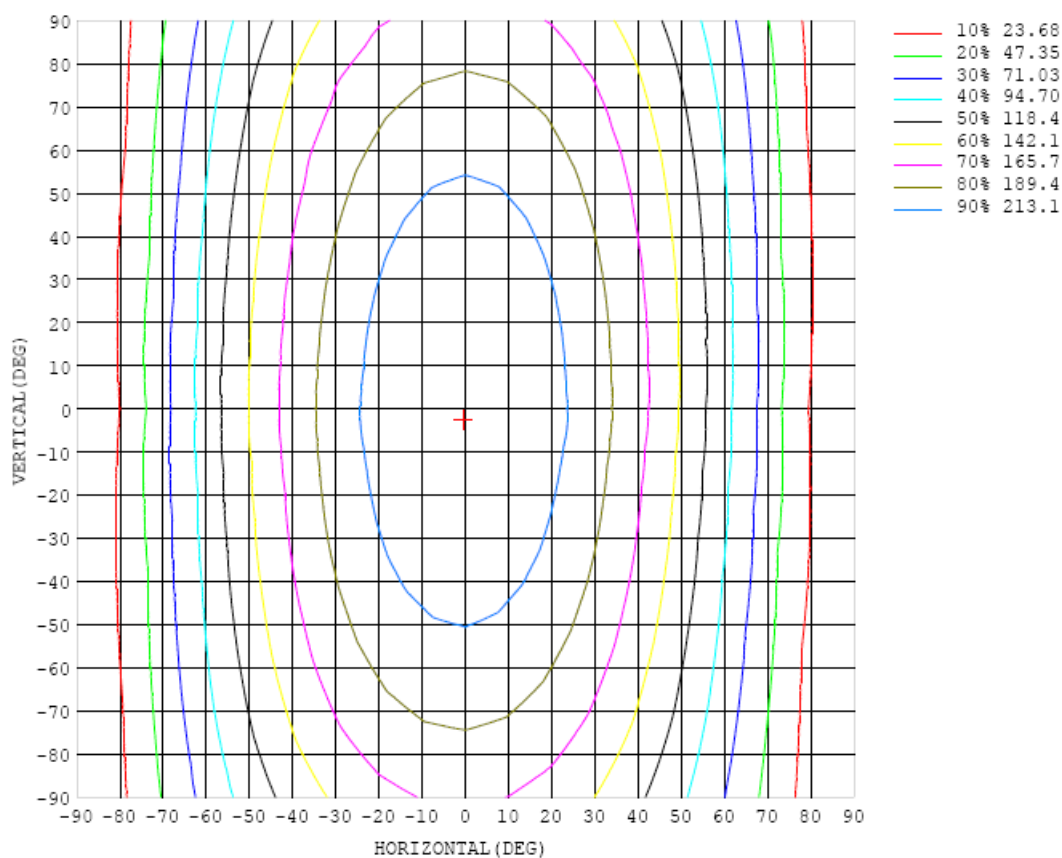


Chart 6: Isocandela Plot

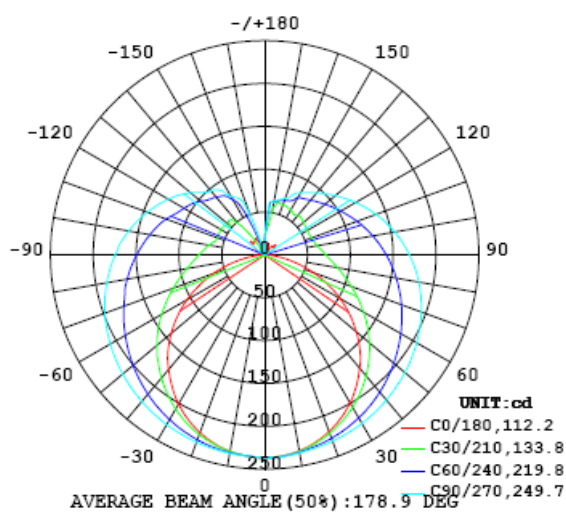


Chart 7: Polar Candela Distribution

## Luminous Intensity Data- Goniophotometer Method

Table--1																UNIT: cd			
C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237
5	235	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236
10	232	232	233	233	233	233	234	234	234	235	235	234	234	234	234	233	233	233	233
15	227	227	228	228	229	230	231	232	233	233	233	232	232	231	230	229	228	228	228
20	219	220	220	222	224	226	228	229	231	231	231	230	229	227	225	223	222	221	221
25	210	211	212	214	217	221	224	227	229	229	229	228	225	222	219	216	213	212	212
30	199	200	202	205	210	215	220	223	226	227	226	224	221	217	212	207	203	202	201
35	187	187	190	195	202	208	215	220	223	224	223	221	216	211	204	198	192	189	188
40	172	173	177	184	193	201	209	215	219	221	220	217	211	204	195	187	180	175	174
45	157	157	163	172	183	194	203	210	215	217	216	212	205	196	186	176	166	161	160
50	140	141	148	160	173	185	197	205	211	213	212	207	199	189	176	163	152	144	143
55	121	123	132	146	162	177	190	200	207	209	208	202	193	181	166	151	137	127	124
60	101	104	116	133	151	169	183	195	202	205	203	197	187	173	156	138	121	108	105
65	81.1	85.0	99.9	120	141	160	177	189	197	200	198	191	180	165	146	126	106	89.6	84.2
70	60.6	66.7	84.3	108	131	152	170	183	191	195	193	185	173	157	137	114	90.4	71.5	63.5
75	40.3	48.3	69.6	96.3	122	144	163	177	185	189	187	179	167	149	128	103	76.8	53.7	44.3
80	21.9	32.0	57.8	86.5	113	137	156	170	179	183	180	173	160	142	119	93.2	65.2	37.8	24.0
85	7.96	20.0	48.0	78.1	106	129	149	163	173	176	174	166	153	135	112	84.8	55.5	25.8	8.86
90	1.89	13.8	41.4	71.4	98.7	123	142	156	165	169	167	159	146	128	105	78.5	48.8	19.0	1.96
95	0.99	12.6	37.6	66.4	92.6	116	135	149	158	162	159	152	139	121	98.3	72.9	44.4	17.1	1.09
100	2.05	14.1	36.1	62.5	87.3	110	128	142	151	154	152	144	132	114	92.8	68.4	42.1	18.2	2.05
105	4.45	17.2	36.2	59.7	82.6	104	121	135	143	146	144	137	125	108	87.9	65.2	41.4	21.0	3.49
110	6.93	21.4	37.6	58.0	78.7	98.2	115	127	135	138	136	130	118	103	84.1	63.2	42.0	25.0	5.78
115	7.07	26.2	39.8	57.4	76.3	93.4	108	120	128	130	129	122	112	97.3	80.5	62.0	43.6	29.2	9.21
120	8.30	31.5	42.6	57.4	73.8	89.0	103	113	120	122	121	115	106	92.6	77.6	61.5	46.0	33.0	11.3
125	11.2	37.0	45.8	58.1	72.0	85.0	97.0	106	112	115	114	108	99.8	88.4	75.3	61.6	48.9	36.4	14.1
130	15.7	42.2	49.0	59.2	70.7	81.6	92.0	100	106	108	106	102	94.5	84.6	73.6	62.1	52.0	41.0	19.2
135	14.2	41.9	52.4	60.5	70.1	79.3	87.5	94.4	99.0	101	99.8	95.9	89.7	81.8	72.8	63.0	54.8	45.2	21.8
140	13.6	40.4	55.6	60.5	69.3	77.1	83.5	89.2	93.1	94.5	93.6	90.6	85.4	79.0	71.9	64.2	57.8	46.7	18.9
145	6.88	39.6	56.8	58.4	65.8	75.2	80.1	84.5	87.6	88.8	88.1	85.7	81.6	76.8	71.3	65.3	60.0	50.8	20.1
150	6.86	44.1	57.9	60.5	63.9	69.7	77.2	80.6	82.8	83.7	83.3	81.4	78.3	74.0	69.6	65.7	61.0	54.8	20.9
155	5.77	32.7	56.5	61.8	64.3	67.0	69.6	72.4	75.9	77.6	76.9	73.9	70.0	67.0	64.6	61.0	57.3	47.1	17.1
160	13.7	33.6	60.0	62.3	63.9	65.9	67.3	68.6	69.8	70.6	70.5	69.2	67.6	66.0	63.5	60.0	58.4	46.9	18.5
165	8.63	25.2	50.3	63.6	63.4	64.2	65.3	66.4	67.0	67.3	67.2	66.8	65.5	63.6	62.4	61.2	55.6	32.7	14.9
170	8.80	22.6	34.9	53.2	63.2	62.8	63.0	63.2	63.4	63.5	63.6	63.6	63.4	63.0	61.8	58.8	42.4	23.5	14.5
175	11.3	19.9	25.5	30.3	33.3	38.5	47.0	54.6	58.7	59.9	59.7	57.9	52.9	43.7	34.2	28.2	23.1	17.1	12.3
180	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0

Table 6: Luminous Intensity Data



Table--2		UNIT: cd																	
C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237		
5	236	235	235	235	235	235	236	236	236	236	235	235	235	235	235	235	235		
10	232	233	233	233	234	234	235	235	235	235	234	234	233	233	232	232	232		
15	227	228	229	230	231	232	233	234	234	234	233	232	231	229	228	227	227		
20	221	221	223	225	228	230	231	232	233	232	231	229	227	225	222	221	219		
25	212	213	216	220	223	226	229	230	231	230	228	226	222	219	216	213	211		
30	201	204	208	213	218	222	226	228	229	228	225	222	217	212	207	203	200		
35	189	193	198	205	211	217	222	225	226	225	222	217	211	204	198	192	188		
40	176	180	187	196	204	212	218	222	223	222	218	212	204	196	187	179	174		
45	162	168	176	186	197	206	214	218	220	218	214	207	197	186	176	167	160		
50	145	153	164	177	189	200	209	214	216	215	209	201	189	177	165	152	144		
55	127	138	152	167	181	194	204	210	212	210	204	195	182	167	152	137	126		
60	109	122	139	157	173	188	199	206	208	206	199	188	175	158	139	121	108		
65	89.8	105	126	147	167	181	193	201	203	201	194	182	167	148	127	106	88.8		
70	70.6	89.7	114	137	159	175	188	196	199	196	188	176	160	139	115	90.6	70.0		
75	52.0	75.1	102	128	151	169	182	190	193	191	182	170	153	130	104	76.6	52.0		
80	35.5	62.5	92.3	120	144	163	176	184	187	185	176	164	145	122	94.6	64.6	36.2		
85	22.8	52.6	83.8	112	137	156	170	178	181	178	171	158	138	114	86.4	55.3	24.5		
90	16.0	45.6	76.9	105	130	150	164	172	174	172	165	151	132	108	79.5	48.2	17.7		
95	11.6	40.0	71.2	99.3	123	143	157	166	169	166	158	144	125	102	73.8	42.2	11.8		
100	8.54	35.3	66.0	94.2	117	136	150	158	161	159	151	137	119	96.3	69.2	38.1	10.3		
105	9.40	32.9	60.7	88.4	112	130	143	151	154	151	143	130	113	91.6	65.7	35.0	11.4		
110	9.52	34.2	58.6	82.2	104	122	135	143	146	143	136	124	107	87.4	61.7	33.0	12.5		
115	2.24	29.5	59.1	79.5	98.3	114	127	135	138	136	129	117	102	81.6	57.1	36.7	13.8		
120	6.37	34.2	58.8	77.8	94.6	109	120	128	130	128	121	111	94.6	75.8	57.0	37.5	14.6		
125	4.26	29.5	58.3	76.2	91.1	104	113	120	122	119	113	102	87.4	73.4	60.3	37.4	10.8		
130	0.03	13.0	52.7	74.4	86.5	97.4	106	111	113	110	104	93.2	84.6	74.4	59.4	33.0	0.00		
135	0.64	12.7	57.5	72.3	83.4	91.7	97.6	102	103	101	96.8	90.5	84.3	71.4	55.0	29.6	0.00		
140	2.49	13.3	47.3	67.2	80.8	88.2	94.0	96.8	97.7	97.5	94.4	88.4	78.7	66.6	51.1	23.7	2.52		
145	4.20	6.71	22.7	66.3	77.6	84.3	88.1	91.0	92.4	91.6	87.2	78.7	72.4	66.6	38.1	11.3	0.69		
150	4.32	1.49	3.07	40.4	68.2	74.6	76.0	77.6	78.7	78.4	76.5	73.2	69.2	53.7	14.5	3.20	1.99		
155	2.80	2.25	8.58	7.28	29.3	53.9	68.9	72.0	72.8	72.9	71.1	66.6	52.1	25.3	10.6	3.26	1.14		
160	4.04	2.67	2.46	5.24	7.99	11.2	19.3	39.5	47.4	48.5	43.9	32.7	15.5	10.4	11.1	1.74	8.28		
165	9.26	5.50	3.12	3.36	3.38	1.79	8.27	12.9	11.2	11.1	11.6	12.9	13.4	5.84	5.54	5.19	9.24		
170	5.70	4.75	5.30	1.77	2.81	4.56	2.07	1.00	1.21	2.11	2.87	5.20	8.78	9.22	5.42	10.5	10.3		
175	9.30	5.55	2.77	4.78	7.04	6.79	5.80	4.76	2.18	3.71	4.73	6.11	7.49	8.93	11.0	9.14	8.26		
180	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0		

Table 7: Luminous Intensity Data

## TEST RESULTS (3500K 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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.375	0.175
Power Factor	0.9945	0.9187
Test Power (W)/4	11.20	11.11
THD A%	5.03	7.78
Luminous Efficacy (lm/W)	137.6	138.6
Total Luminous Flux (lm)	1540.8	1539.4
Color Rendering Index (CRI)	84.4	
R9	13.5	
Correlated Color Temperature (CCT)(K)	3518	
Chromaticity Chroma x	0.4017	
Chromaticity Chroma y	0.3834	
Chromaticity Chroma u	0.2364	
Chromaticity Chroma v	0.3384	
Duv	-0.0024	
Chromaticity Chroma u'	0.2364	
Chromaticity Chroma v'	0.5076	

Special Color Rendering Indices	
R1	83.7
R2	93.2
R3	95.3
R4	82.2
R5	84.1
R6	90.5
R7	83.5
R8	63
R9	13.5
R10	83.9
R11	81.8
R12	71
R13	86.4
R14	98.2

Table 8: Test data per Sphere-Spectroradiometer Method

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

### Spectral Power Distribution - Sphere Spectroradiometer Method

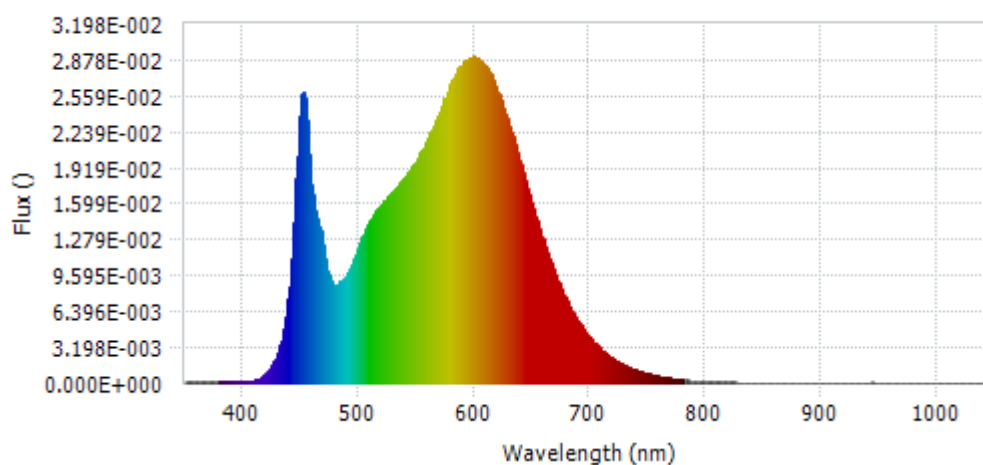
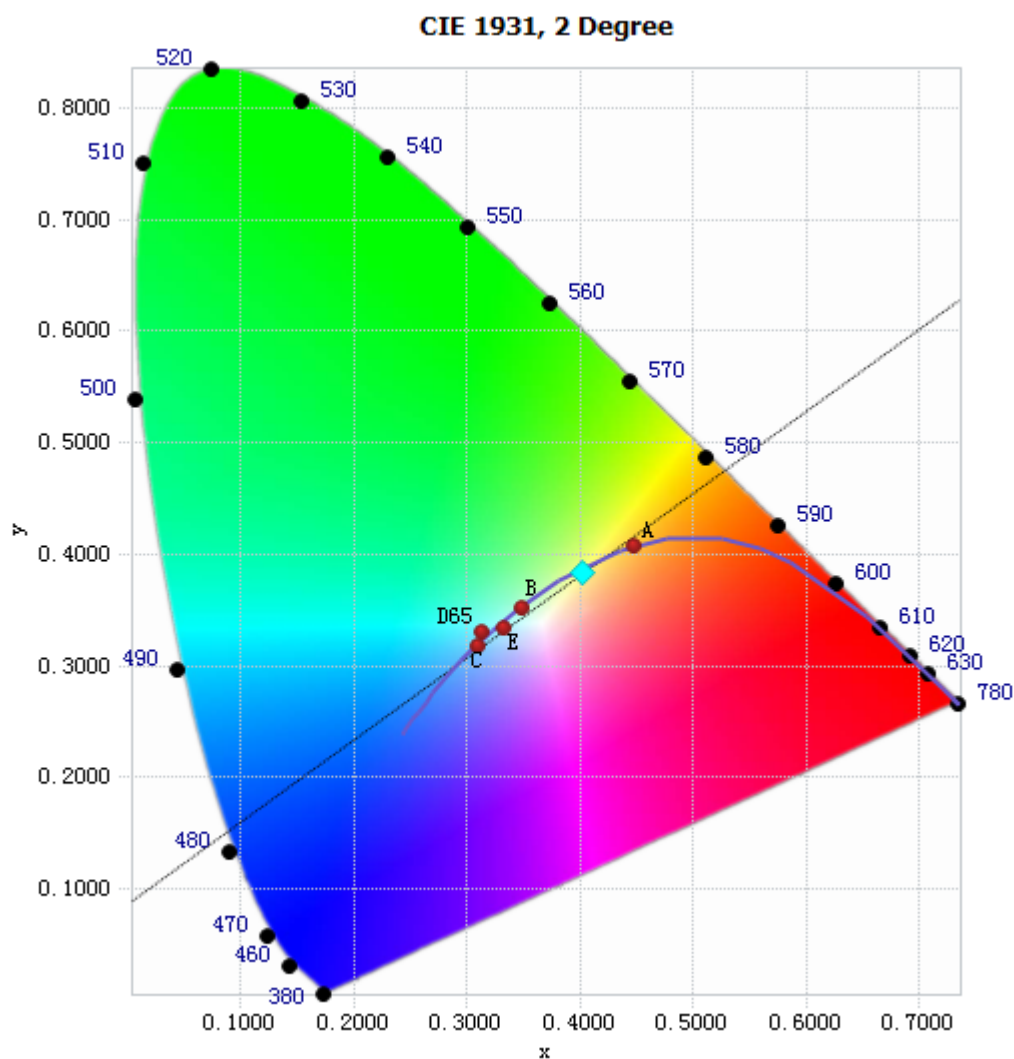


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.49E-04	485	9.06E-03	590	2.86E-02	695	4.68E-03
385	1.40E-04	490	9.74E-03	595	2.89E-02	700	4.02E-03
390	1.27E-04	495	1.08E-02	600	2.91E-02	705	3.41E-03
395	1.33E-04	500	1.22E-02	605	2.86E-02	710	2.95E-03
400	1.10E-04	505	1.34E-02	610	2.82E-02	715	2.51E-03
405	1.63E-04	510	1.44E-02	615	2.72E-02	720	2.15E-03
410	2.86E-04	515	1.54E-02	620	2.59E-02	725	1.84E-03
415	4.85E-04	520	1.59E-02	625	2.45E-02	730	1.56E-03
420	9.13E-04	525	1.66E-02	630	2.29E-02	735	1.33E-03
425	1.58E-03	530	1.72E-02	635	2.12E-02	740	1.13E-03
430	2.66E-03	535	1.77E-02	640	1.95E-02	745	9.65E-04
435	4.74E-03	540	1.83E-02	645	1.76E-02	750	8.28E-04
440	8.50E-03	545	1.91E-02	650	1.58E-02	755	7.11E-04
445	1.62E-02	550	1.98E-02	655	1.41E-02	760	6.04E-04
450	2.51E-02	555	2.08E-02	660	1.25E-02	765	5.17E-04
455	2.33E-02	560	2.18E-02	665	1.10E-02	770	4.40E-04
460	1.68E-02	565	2.30E-02	670	9.59E-03	775	3.82E-04
465	1.43E-02	570	2.42E-02	675	8.38E-03	780	3.31E-04
470	1.17E-02	575	2.54E-02	680	7.27E-03		
475	9.28E-03	580	2.67E-02	685	6.33E-03		
480	8.63E-03	585	2.78E-02	690	5.45E-03		

Table 9: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4017, 0.3834)

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

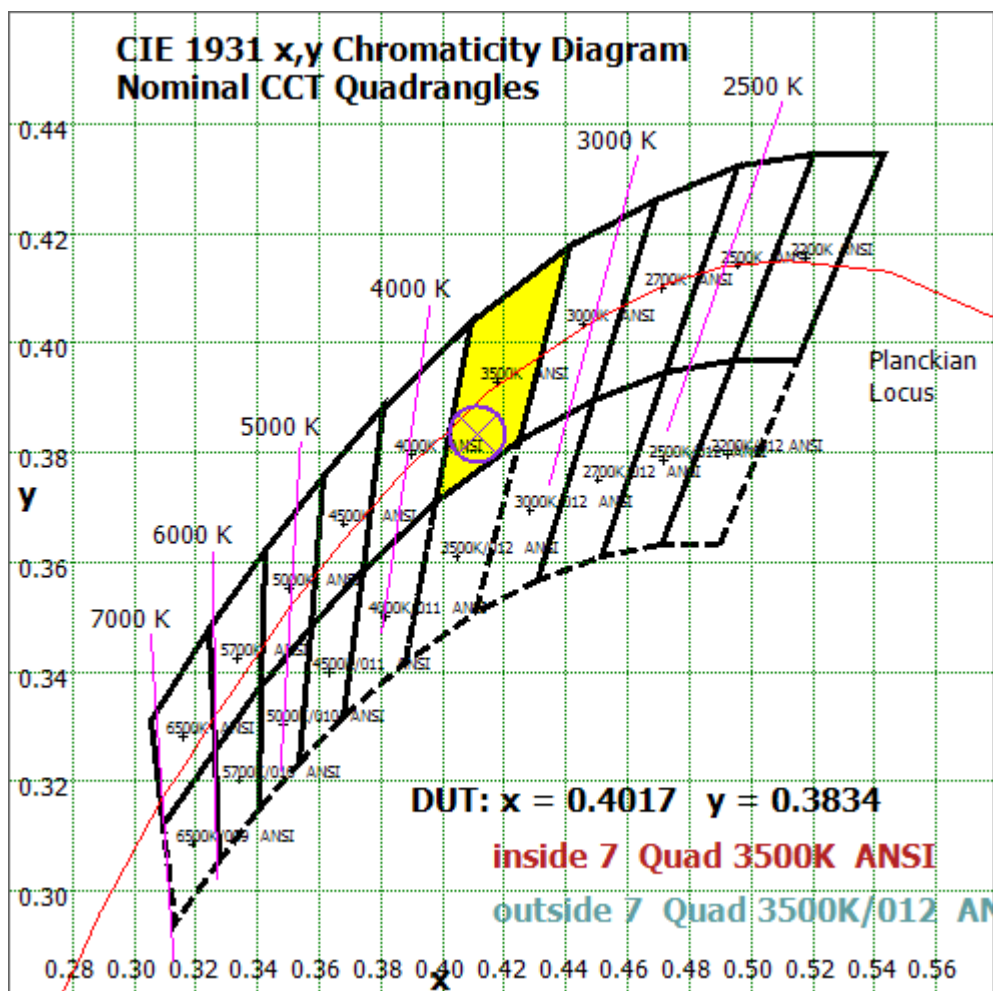


Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

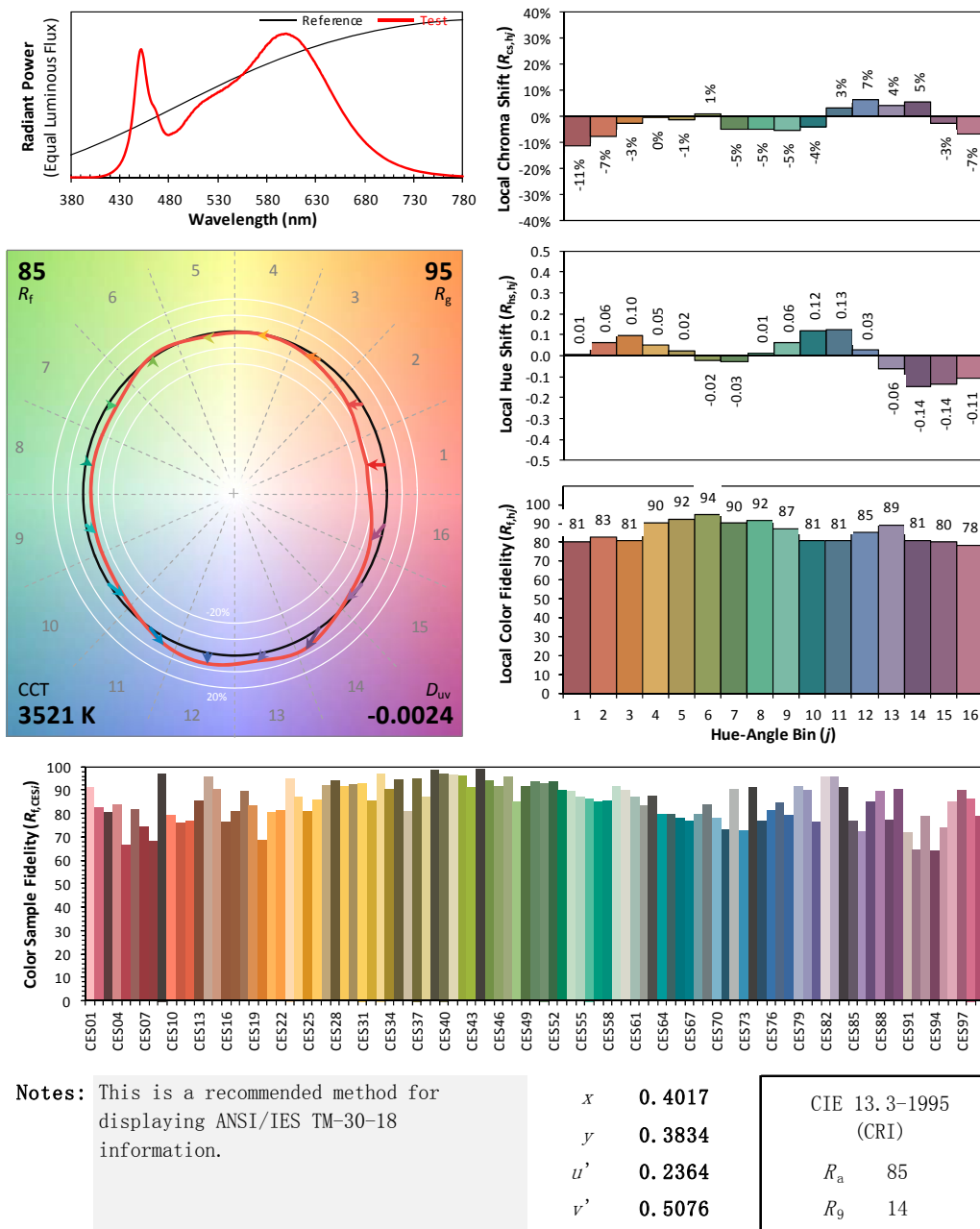
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/29

Model: 9.5T8/2F/8CCTS/EXT/SD/A4



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.

## 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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.372	0.173
Power Factor	0.9946	0.9164
Test Power (W)/4	11.09	11.00
THD A%	5.16	7.98
Luminous Efficacy (lm/W)	141.5	142.7
Total Luminous Flux (lm)	1568.9	1569.7
Color Rendering Index (CRI)	85.6	
R9	18.5	
Correlated Color Temperature (CCT)(K)	3947	
Chromaticity Chroma x	0.3805	
Chromaticity Chroma y	0.3704	
Chromaticity Chroma u	0.2277	
Chromaticity Chroma v	0.3325	
Duv	-0.0030	
Chromaticity Chroma u'	0.2277	
Chromaticity Chroma v'	0.4988	

Special Color Rendering Indices	
R1	84.9
R2	93.2
R3	95.8
R4	83.8
R5	85.2
R6	89.5
R7	85.3
R8	66.7
R9	18.5
R10	83.2
R11	83.5
R12	68.6
R13	87.4
R14	98.5

Table 10: 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

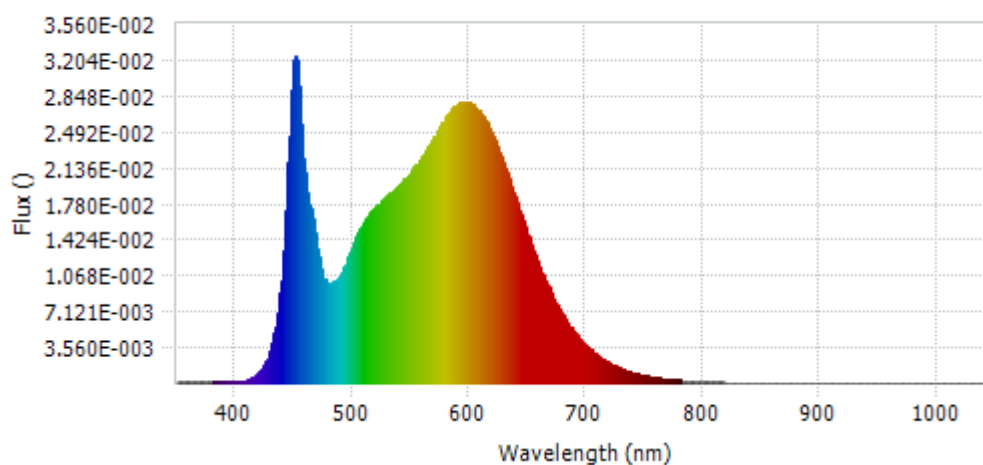
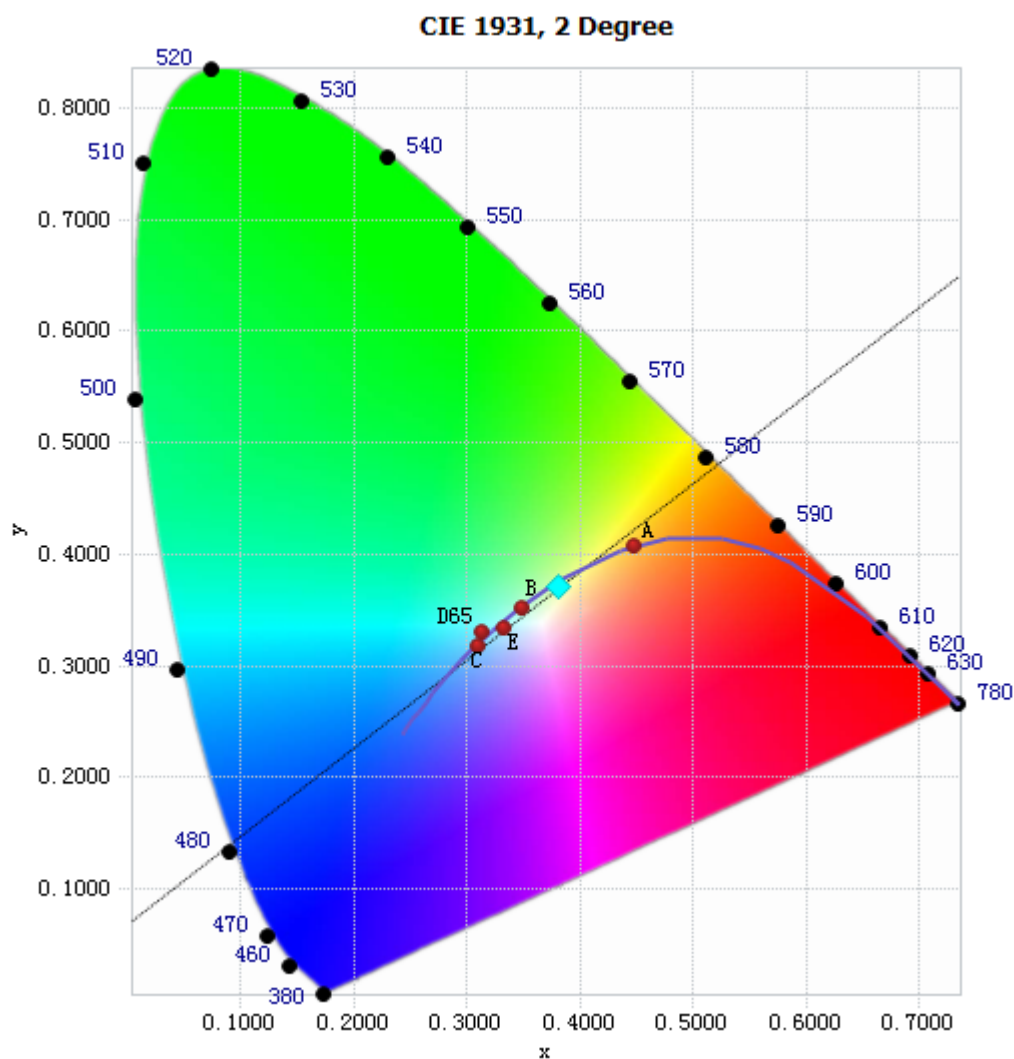


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.40E-04	485	1.02E-02	590	2.77E-02	695	4.35E-03
385	1.56E-04	490	1.09E-02	595	2.79E-02	700	3.73E-03
390	1.32E-04	495	1.22E-02	600	2.79E-02	705	3.18E-03
395	1.36E-04	500	1.36E-02	605	2.74E-02	710	2.71E-03
400	1.45E-04	505	1.49E-02	610	2.67E-02	715	2.32E-03
405	1.49E-04	510	1.59E-02	615	2.58E-02	720	2.00E-03
410	3.13E-04	515	1.69E-02	620	2.44E-02	725	1.70E-03
415	6.02E-04	520	1.75E-02	625	2.31E-02	730	1.46E-03
420	1.13E-03	525	1.81E-02	630	2.15E-02	735	1.23E-03
425	2.00E-03	530	1.87E-02	635	1.99E-02	740	1.06E-03
430	3.53E-03	535	1.91E-02	640	1.82E-02	745	9.07E-04
435	6.32E-03	540	1.96E-02	645	1.64E-02	750	7.57E-04
440	1.15E-02	545	2.03E-02	650	1.47E-02	755	6.56E-04
445	2.19E-02	550	2.09E-02	655	1.31E-02	760	5.63E-04
450	3.20E-02	555	2.17E-02	660	1.16E-02	765	4.81E-04
455	2.78E-02	560	2.25E-02	665	1.02E-02	770	4.14E-04
460	1.99E-02	565	2.35E-02	670	8.91E-03	775	3.58E-04
465	1.67E-02	570	2.44E-02	675	7.79E-03	780	3.06E-04
470	1.33E-02	575	2.54E-02	680	6.73E-03		
475	1.04E-02	580	2.64E-02	685	5.86E-03		
480	9.81E-03	585	2.73E-02	690	5.07E-03		

Table 11: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

### Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3805, 0.3704)

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

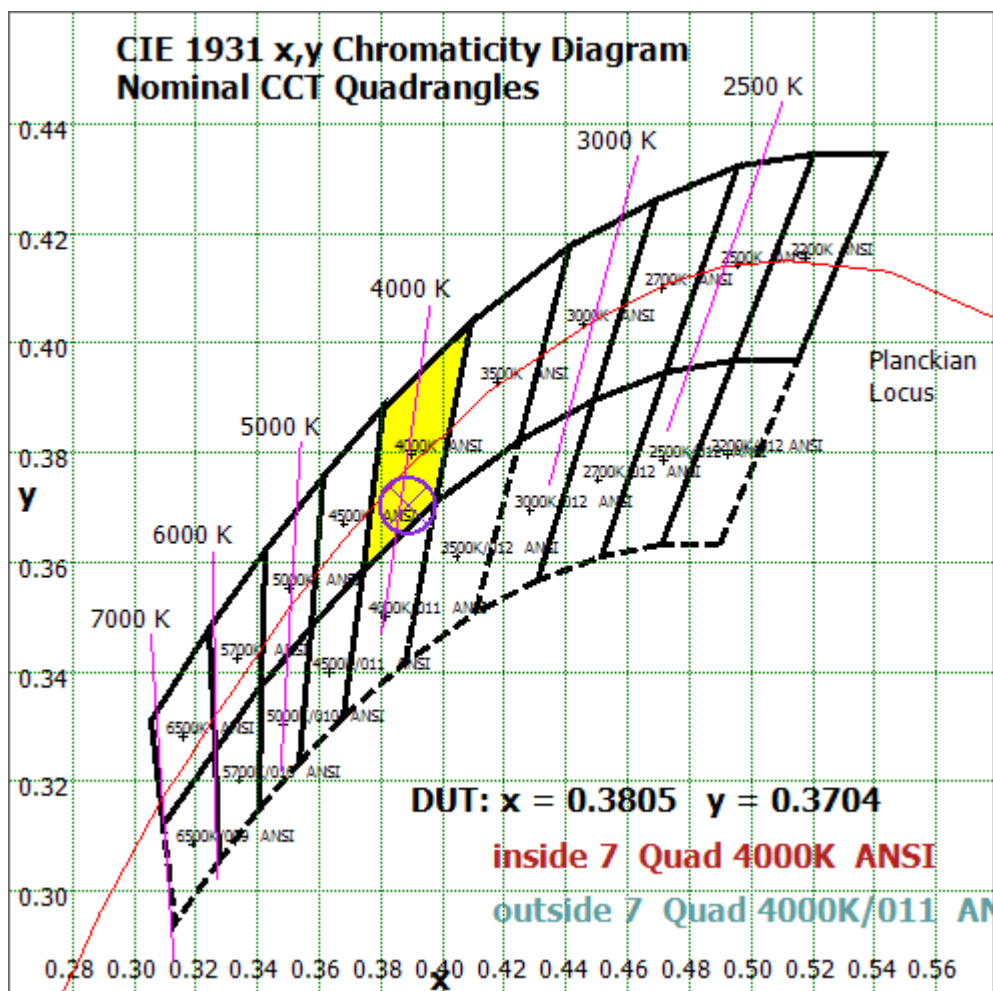


Chart14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

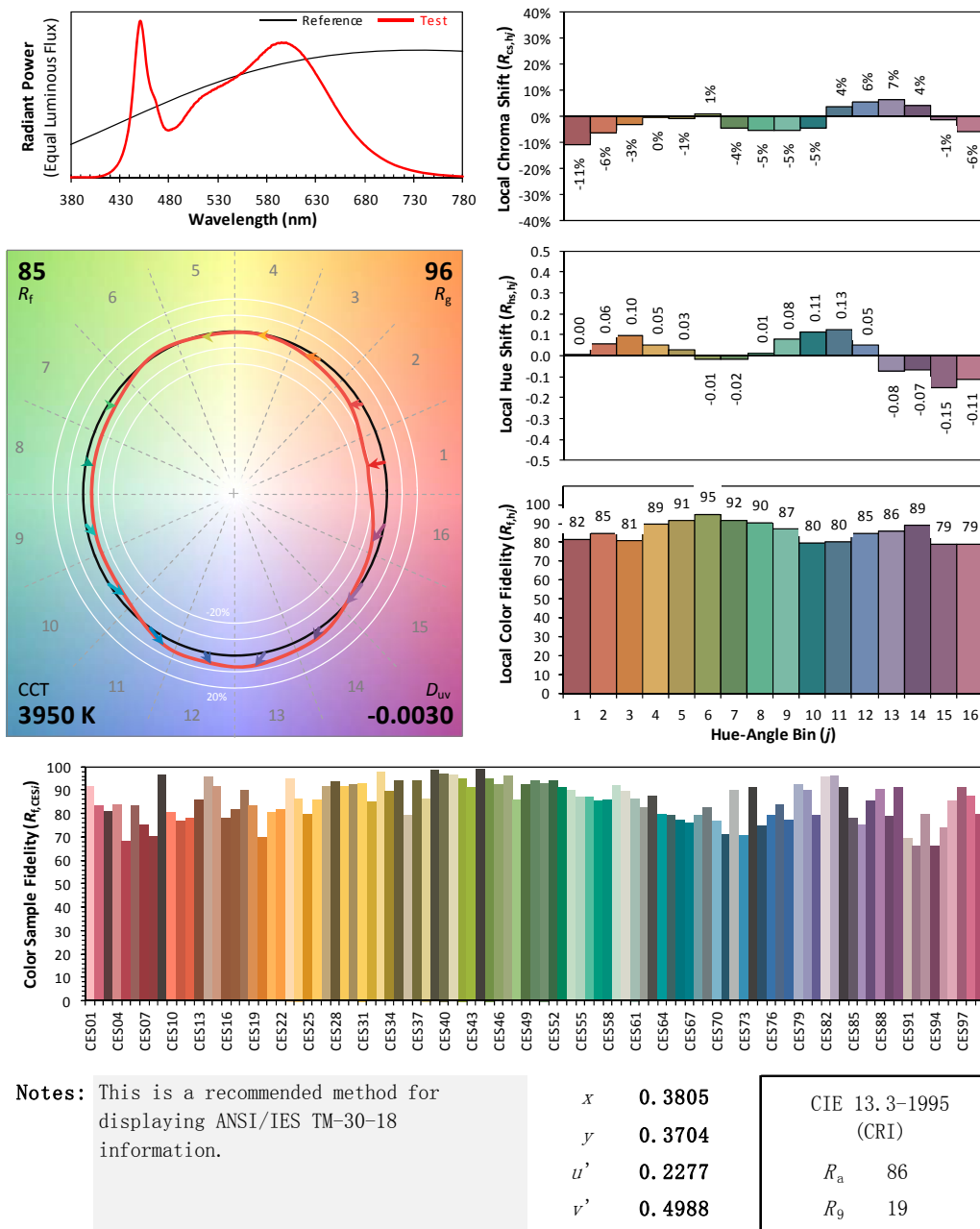
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 9.5T8/2F/8CCTS/EXT/SD/A4



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.

## 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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.373	0.174
Power Factor	0.9946	0.9171
Test Power (W)/4	11.13	11.03
THD A%	5.06	7.57
Luminous Efficacy (lm/W)	142.0	143.4
Total Luminous Flux (lm)	1579.9	1581.3
Color Rendering Index (CRI)	85.6	
R9	19.8	
Correlated Color Temperature (CCT)(K)	4975	
Chromaticity Chroma x	0.3454	
Chromaticity Chroma y	0.3491	
Chromaticity Chroma u	0.2126	
Chromaticity Chroma v	0.3223	
Duv	-0.0014	
Chromaticity Chroma u'	0.2126	
Chromaticity Chroma v'	0.4835	

Special Color Rendering Indices	
R1	84.7
R2	91.5
R3	94.7
R4	84.6
R5	84.7
R6	86.4
R7	87.9
R8	70.6
R9	19.8
R10	78.8
R11	84.1
R12	62.7
R13	86.8
R14	97.5

Table 12: 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

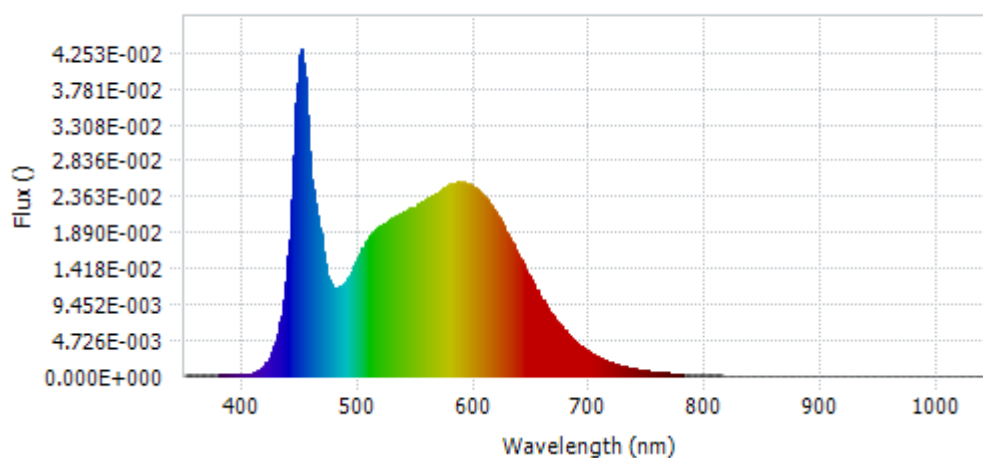


Chart16: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.84E-04	485	1.19E-02	590	2.55E-02	695	3.58E-03
385	1.62E-04	490	1.27E-02	595	2.52E-02	700	3.07E-03
390	1.67E-04	495	1.42E-02	600	2.48E-02	705	2.64E-03
395	1.41E-04	500	1.58E-02	605	2.41E-02	710	2.24E-03
400	1.51E-04	505	1.72E-02	610	2.33E-02	715	1.93E-03
405	2.16E-04	510	1.83E-02	615	2.22E-02	720	1.66E-03
410	4.58E-04	515	1.93E-02	620	2.10E-02	725	1.41E-03
415	8.99E-04	520	1.98E-02	625	1.97E-02	730	1.21E-03
420	1.69E-03	525	2.04E-02	630	1.82E-02	735	1.03E-03
425	3.15E-03	530	2.09E-02	635	1.67E-02	740	8.78E-04
430	5.55E-03	535	2.11E-02	640	1.53E-02	745	7.50E-04
435	9.89E-03	540	2.16E-02	645	1.37E-02	750	6.44E-04
440	1.80E-02	545	2.21E-02	650	1.23E-02	755	5.51E-04
445	3.25E-02	550	2.23E-02	655	1.10E-02	760	4.81E-04
450	4.29E-02	555	2.28E-02	660	9.66E-03	765	4.08E-04
455	3.44E-02	560	2.34E-02	665	8.50E-03	770	3.50E-04
460	2.46E-02	565	2.38E-02	670	7.38E-03	775	3.02E-04
465	2.03E-02	570	2.43E-02	675	6.44E-03	780	2.57E-04
470	1.56E-02	575	2.48E-02	680	5.56E-03		
475	1.22E-02	580	2.52E-02	685	4.84E-03		
480	1.15E-02	585	2.55E-02	690	4.17E-03		

Table 13: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

# Chromaticity Diagram - Sphere Spectroradiometer Method

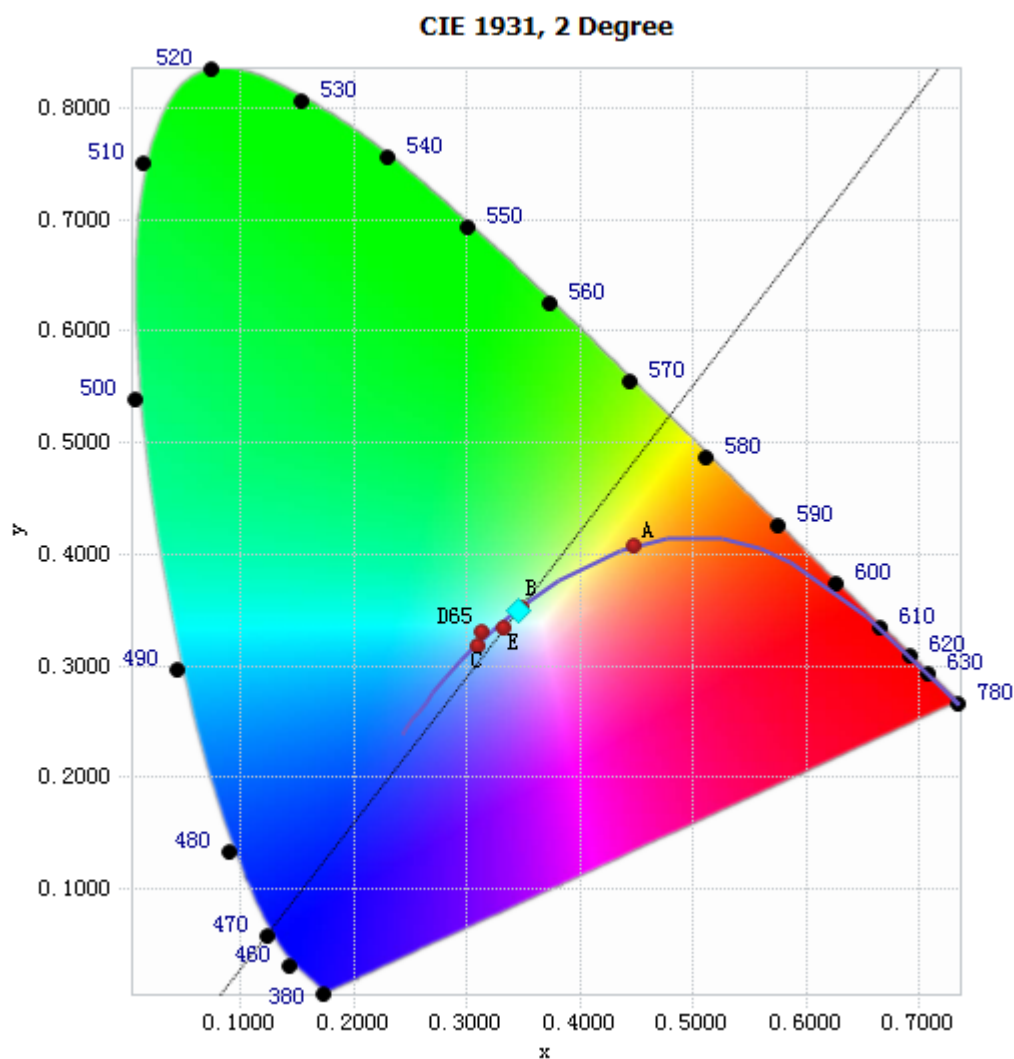


Chart 17: Chromaticity Diagram per Sphere - Spectroradiometer Method

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



# Nominal CCT Quadrangles – Sphere Spectroradiometer Method

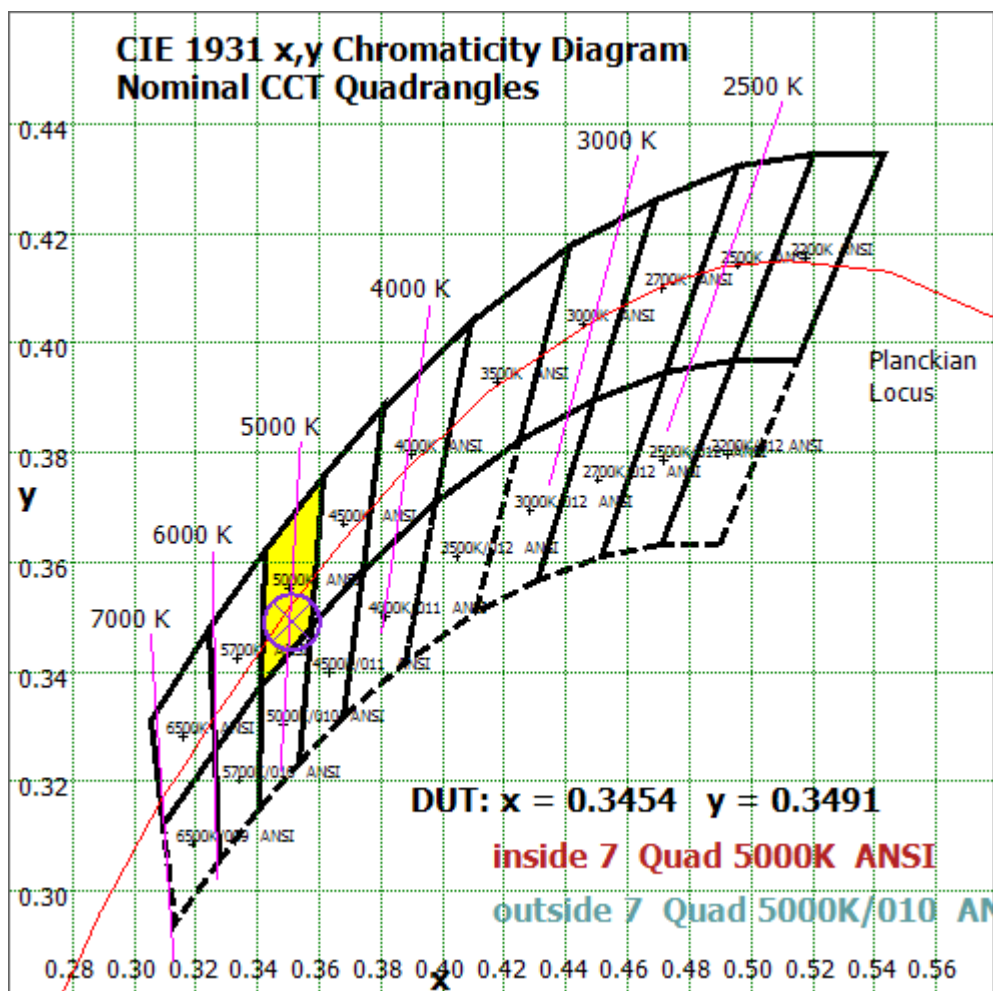


Chart 18: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

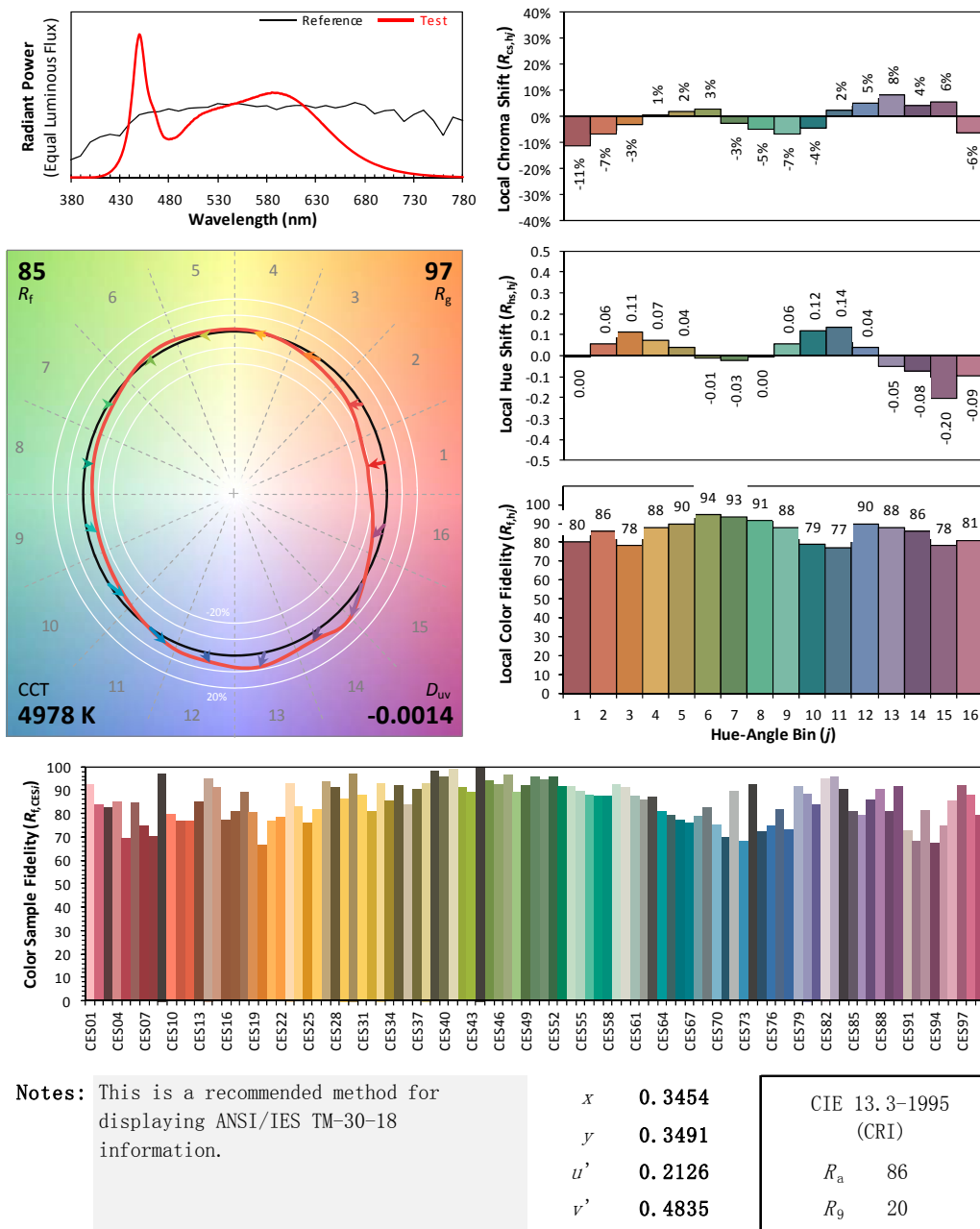
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/29

Model: 9.5T8/2F/8CCTS/EXT/SD/A4



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

Chart 19: 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 12 due to rounding.

## TEST RESULTS (6500K 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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.379	0.176
Power Factor	0.9943	0.9200
Test Power (W)/4	11.29	11.19
THD A%	5.16	7.72
Luminous Efficacy (lm/W)	136.0	137.3
Total Luminous Flux (lm)	1535.0	1536.2
Color Rendering Index (CRI)	83.9	
R9	10.2	
Correlated Color Temperature (CCT)(K)	6331	
Chromaticity Chroma x	0.3156	
Chromaticity Chroma y	0.3312	
Chromaticity Chroma u	0.1990	
Chromaticity Chroma v	0.3133	
Duv	0.0029	
Chromaticity Chroma u'	0.1990	
Chromaticity Chroma v'	0.4699	

Special Color Rendering Indices	
R1	82.1
R2	88.2
R3	91.6
R4	84
R5	83.1
R6	83
R7	88.2
R8	70.7
R9	10.2
R10	71.5
R11	83.6
R12	61.6
R13	83.9
R14	95.7

Table 14: 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

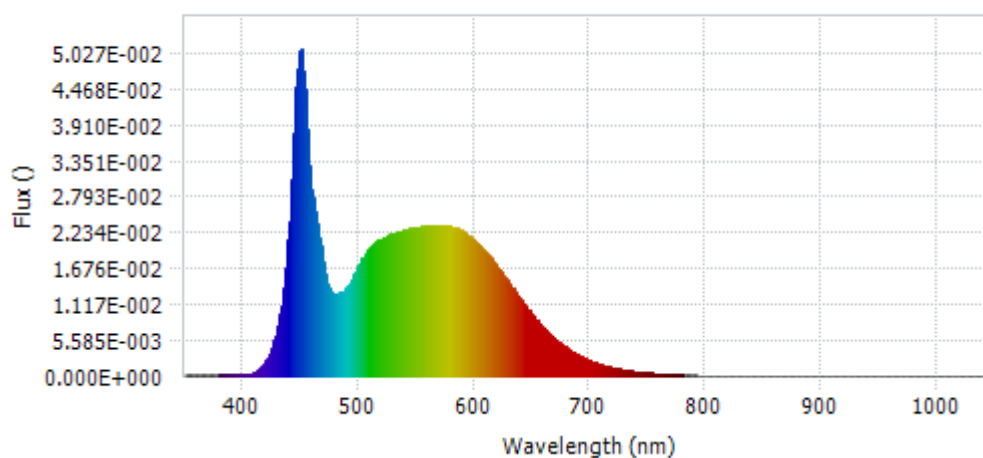
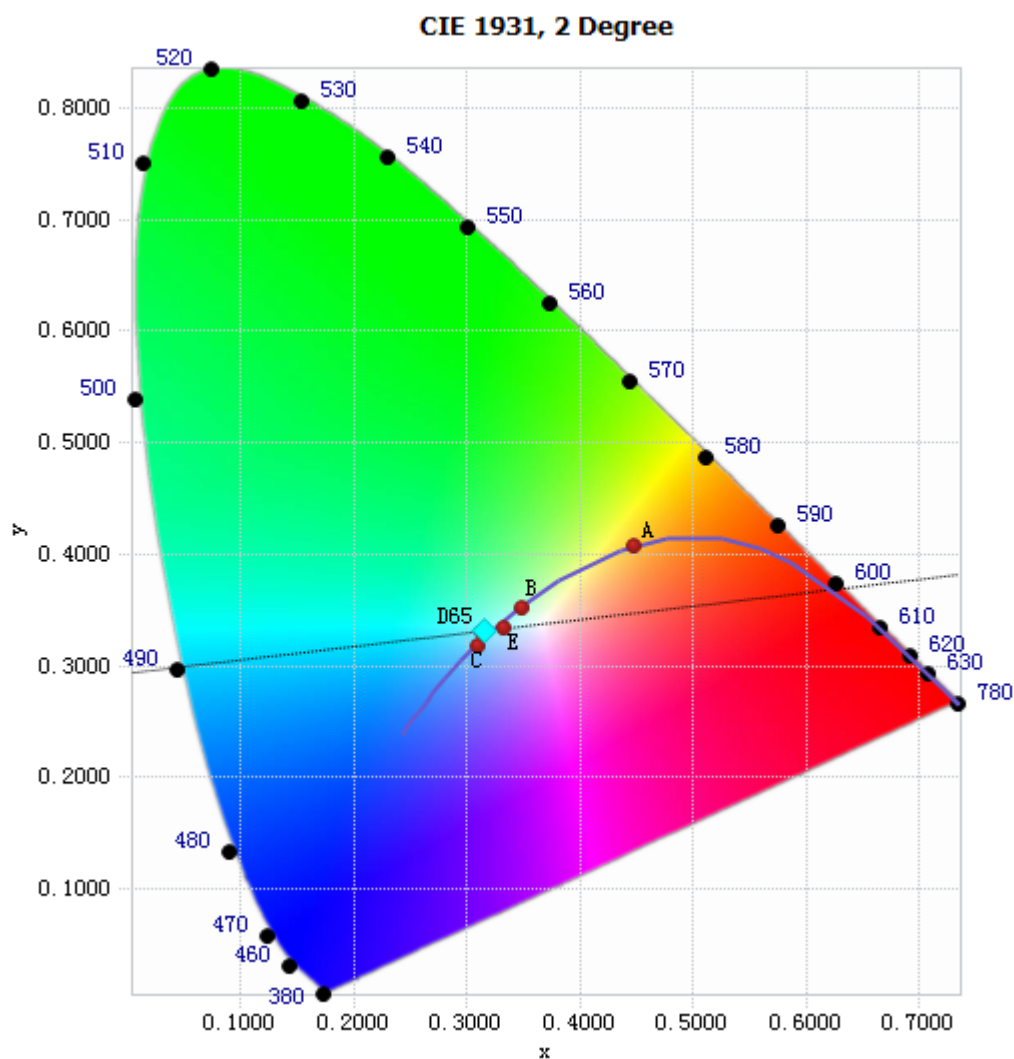


Chart 20: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.25E-04	485	1.30E-02	590	2.25E-02	695	2.77E-03
385	1.90E-04	490	1.40E-02	595	2.18E-02	700	2.38E-03
390	1.90E-04	495	1.56E-02	600	2.11E-02	705	2.04E-03
395	1.65E-04	500	1.73E-02	605	2.01E-02	710	1.75E-03
400	1.87E-04	505	1.87E-02	610	1.92E-02	715	1.50E-03
405	2.86E-04	510	1.99E-02	615	1.81E-02	720	1.30E-03
410	6.57E-04	515	2.08E-02	620	1.68E-02	725	1.11E-03
415	1.30E-03	520	2.14E-02	625	1.57E-02	730	9.43E-04
420	2.49E-03	525	2.18E-02	630	1.44E-02	735	8.04E-04
425	4.48E-03	530	2.22E-02	635	1.31E-02	740	6.99E-04
430	7.79E-03	535	2.24E-02	640	1.19E-02	745	6.00E-04
435	1.36E-02	540	2.27E-02	645	1.06E-02	750	5.14E-04
440	2.41E-02	545	2.29E-02	650	9.51E-03	755	4.40E-04
445	4.16E-02	550	2.30E-02	655	8.44E-03	760	3.81E-04
450	5.08E-02	555	2.32E-02	660	7.43E-03	765	3.31E-04
455	3.84E-02	560	2.33E-02	665	6.52E-03	770	2.84E-04
460	2.77E-02	565	2.34E-02	670	5.68E-03	775	2.43E-04
465	2.26E-02	570	2.34E-02	675	4.95E-03	780	2.08E-04
470	1.67E-02	575	2.34E-02	680	4.29E-03		
475	1.33E-02	580	2.32E-02	685	3.73E-03		
480	1.26E-02	585	2.30E-02	690	3.22E-03		

Table 15: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3156, 0.3312)

Chart 21: 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

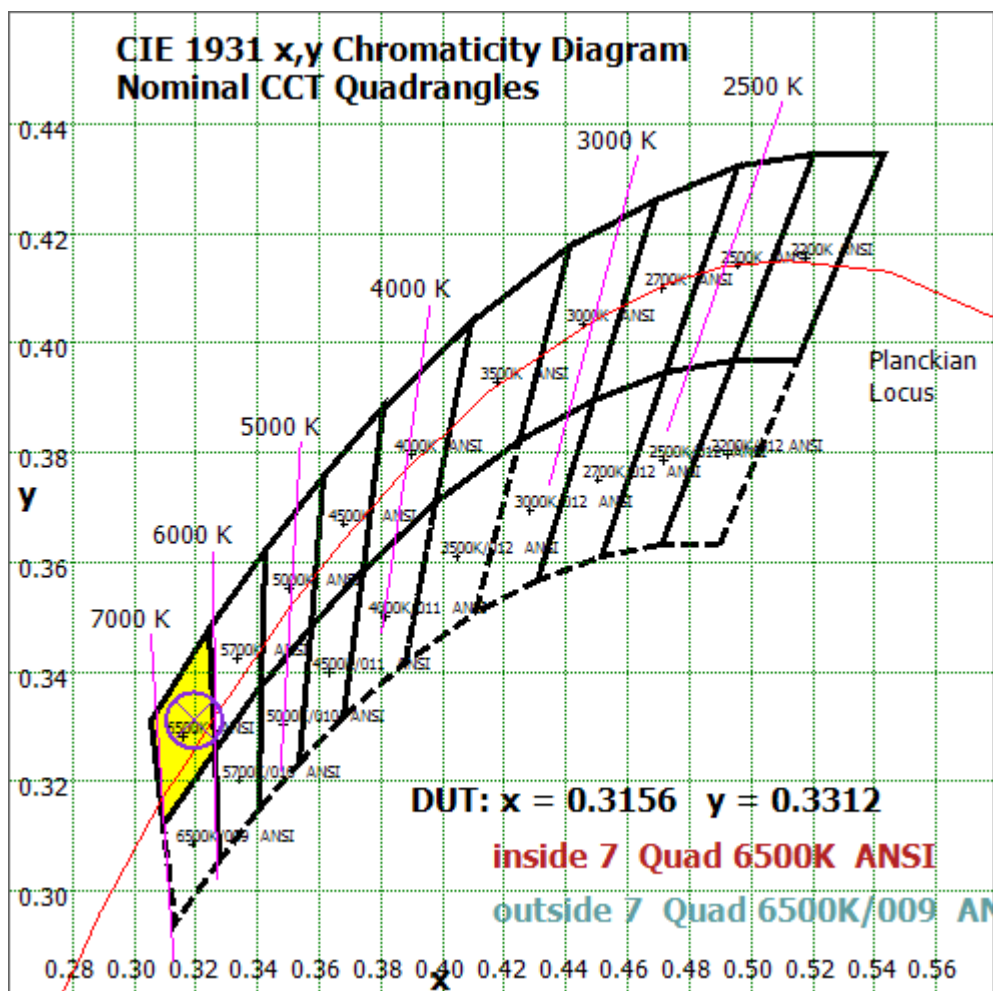


Chart 22: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

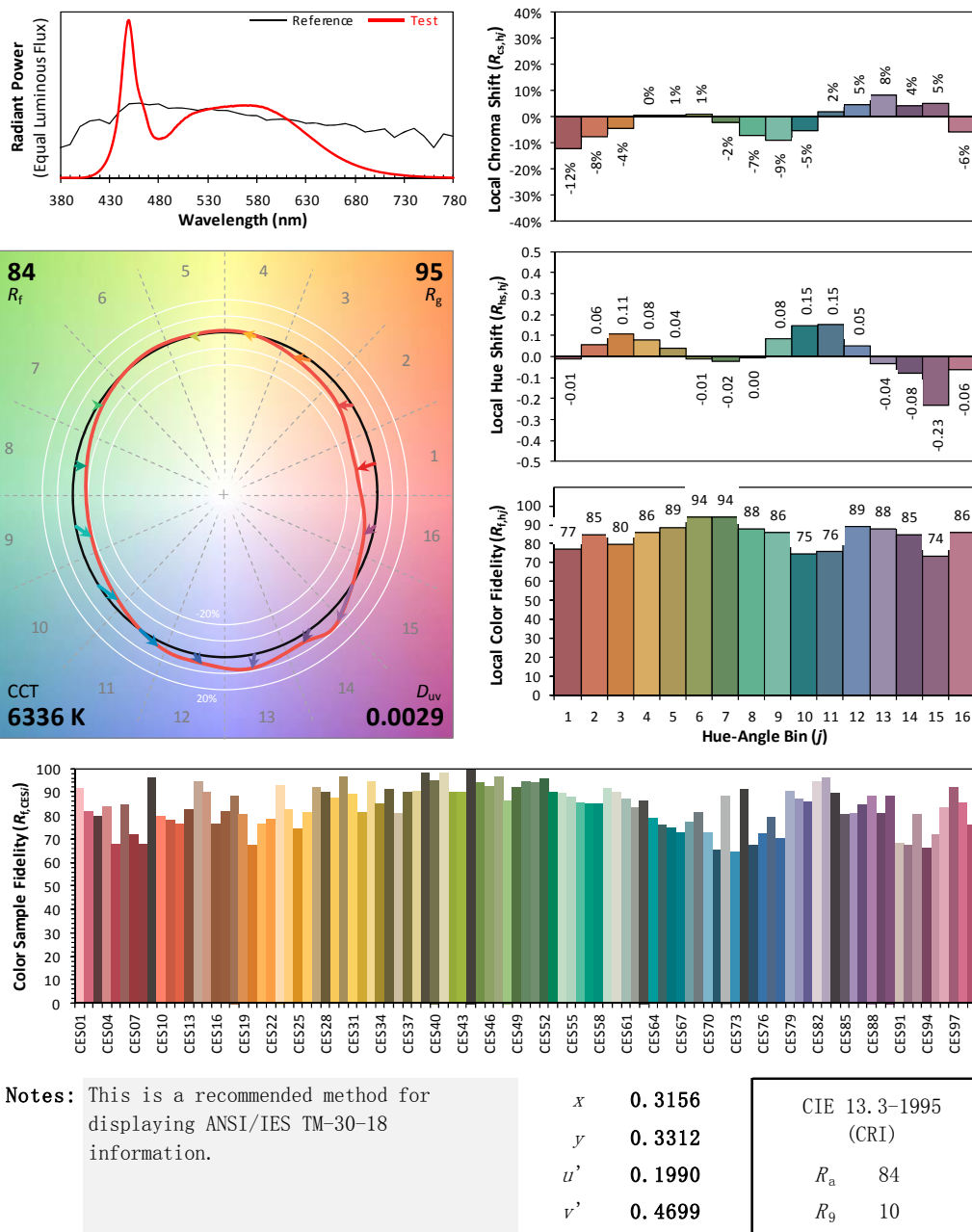
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/29

Model: 9.5T8/2F/8CCTS/EXT/SD/A4



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

Chart 23: 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 14 due to rounding.



## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 05, 2022	Aug. 04, 2023
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2022	Aug. 04, 2023
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2022	Aug. 04, 2023
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2022	Aug. 04, 2023
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2022	Aug. 04, 2023
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2022	Aug. 04, 2023
Standard source	D908	HZTE012-01	Aug. 05, 2022	Aug. 04, 2023
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2022	Aug. 04, 2023
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2022	Aug. 04, 2023
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2022	Aug. 04, 2023
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2022	Aug. 04, 2023
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2022	Aug. 04, 2023
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2022	Aug. 04, 2023
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2022	Aug. 04, 2023
Multi-Meter	FLUKE15B	HZTE020-01	Aug. 05, 2022	Aug. 04, 2023

Table 16: 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  $4\pi$ . 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 \*\*\*

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.