

## 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: 10.5T8/3F/8CCTS/EXT/SD/A2**

### Laboratory: Lea ding Testing Laboratories

**NVLAP CODE: 200960-0**

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Report No.: HZ23060027d

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

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Jul. 07, 2023

Approved by:



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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	10.5T8/3F/8CCTS/E XT/SD/A2 3000K Setting	10.5T8/3F/8CCTS/E XT/SD/A2 3500K Setting	10.5T8/3F/8CCTS/ EXT/SD/A2 4000K Setting
Luminous Efficacy (Lumens /Watt)	135.0	138.7	141.7
Total Luminous Flux (Lumens)	1655.9	1687.7	1710.0
Power (Watts)/2	12.27	12.17	12.07
Power Factor	0.9928	0.9926	0.9923
CCT (K)	3046	3464	3916
CRI	82.5	84.4	85.4
Stabilization Time (Light & Power)	50 mins	50 mins	50 mins
Note	3000K	3500K	4000K

Tested Model	10.5T8/3F/8CCTS/E XT/SD/A2 5000K Setting	10.5T8/3F/8CCTS/E XT/SD/A2 6500K Setting
Luminous Efficacy (Lumens /Watt)	142.1	139.0
Total Luminous Flux (Lumens)	1720.3	1708.6
Power (Watts)/2	12.11	12.29
Power Factor	0.9924	0.9928
CCT (K)	5083	6503
CRI	85.9	84.3
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. 28, 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

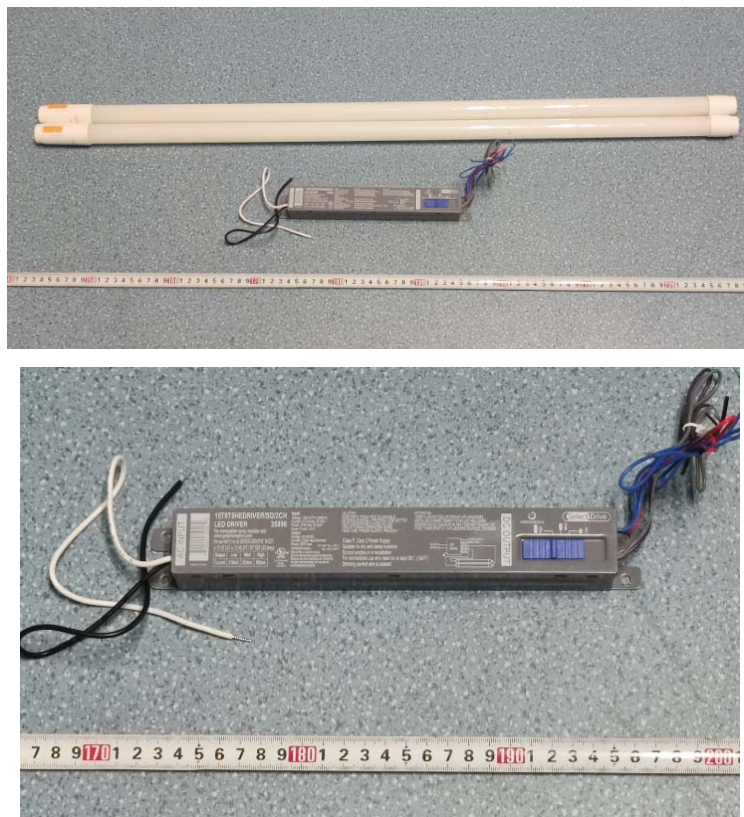


Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 10.5T8/3F/8CCTS/EXT/SD/A2
<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/2CH
<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)	0.206	0.099
Power Factor	0.9928	0.9041
Test Power (W)/2	12.27	12.34
THD A%	4.81	9.28
Luminous Efficacy (lm/W)	135.0	134.2
Total Luminous Flux (lm)	1655.9	1656.6
Color Rendering Index (CRI)	82.5	
R9	7.1	
Correlated Color Temperature (CCT)(K)	3046	
Chromaticity Chroma x	0.4326	
Chromaticity Chroma y	0.4010	
Chromaticity Chroma u	0.2491	
Chromaticity Chroma v	0.3464	
Duv	-0.0006	
Chromaticity Chroma u'	0.2491	
Chromaticity Chroma v'	0.5195	

Special Color Rendering Indices	
R1	82.1
R2	94.4
R3	91.9
R4	78.6
R5	82.6
R6	93.2
R7	80
R8	57.3
R9	7.1
R10	87.2
R11	78.1
R12	73.1
R13	85.6
R14	96.1

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

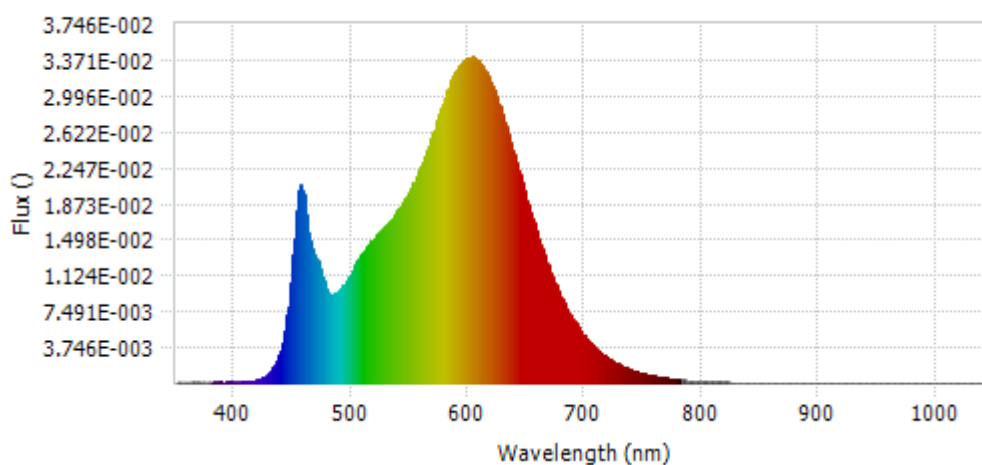


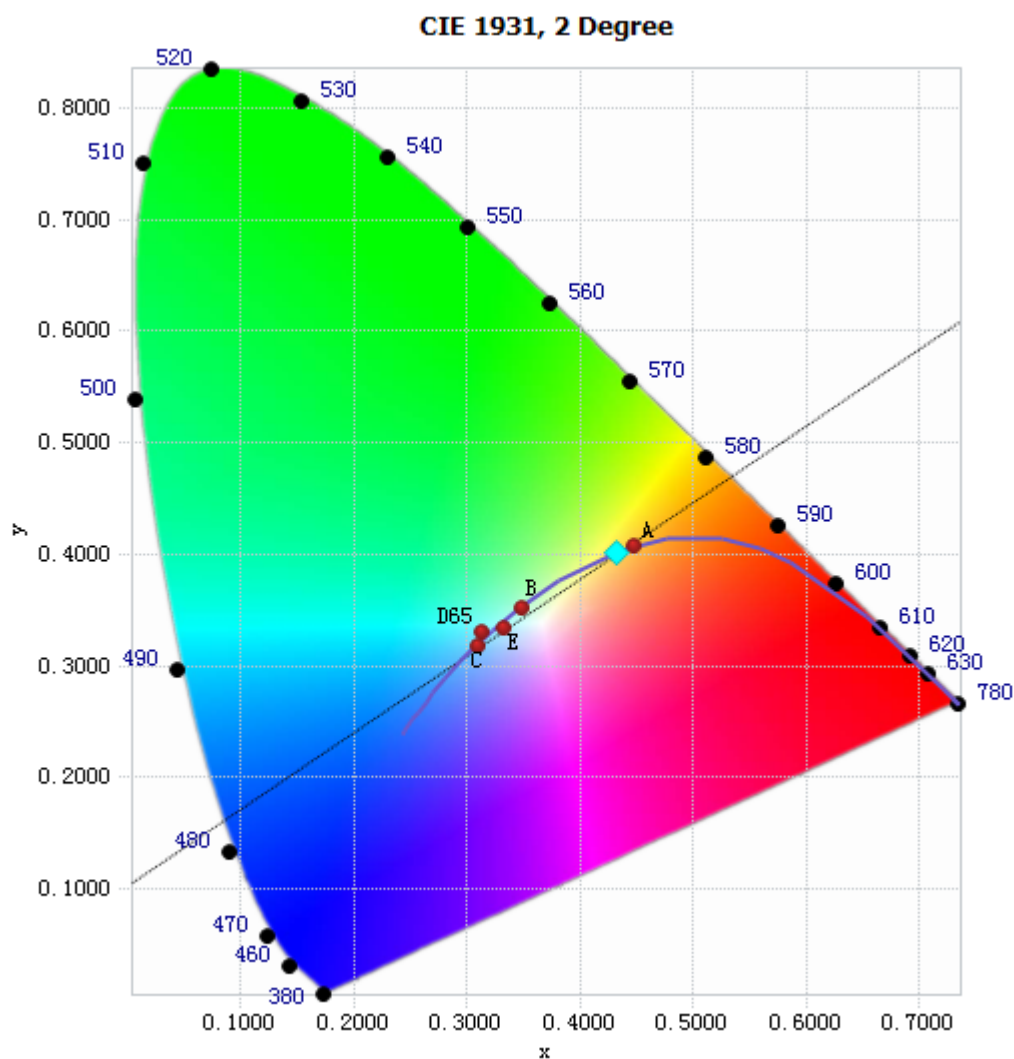
Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	9.06E-05	485	9.25E-03	590	3.27E-02	695	5.68E-03
385	8.84E-05	490	9.79E-03	595	3.35E-02	700	4.85E-03
390	1.08E-04	495	1.05E-02	600	3.40E-02	705	4.12E-03
395	1.28E-04	500	1.15E-02	605	3.38E-02	710	3.53E-03
400	1.12E-04	505	1.27E-02	610	3.33E-02	715	3.01E-03
405	1.28E-04	510	1.36E-02	615	3.24E-02	720	2.58E-03
410	1.63E-04	515	1.45E-02	620	3.11E-02	725	2.20E-03
415	2.22E-04	520	1.51E-02	625	2.94E-02	730	1.89E-03
420	3.62E-04	525	1.59E-02	630	2.75E-02	735	1.59E-03
425	6.57E-04	530	1.66E-02	635	2.56E-02	740	1.36E-03
430	1.14E-03	535	1.72E-02	640	2.35E-02	745	1.16E-03
435	2.05E-03	540	1.81E-02	645	2.13E-02	750	9.98E-04
440	3.76E-03	545	1.90E-02	650	1.91E-02	755	8.48E-04
445	7.03E-03	550	2.00E-02	655	1.71E-02	760	7.18E-04
450	1.35E-02	555	2.13E-02	660	1.51E-02	765	6.16E-04
455	2.01E-02	560	2.27E-02	665	1.33E-02	770	5.32E-04
460	1.86E-02	565	2.44E-02	670	1.16E-02	775	4.54E-04
465	1.44E-02	570	2.62E-02	675	1.02E-02	780	3.92E-04
470	1.29E-02	575	2.80E-02	680	8.84E-03		
475	1.11E-02	580	2.98E-02	685	7.64E-03		
480	9.40E-03	585	3.16E-02	690	6.57E-03		

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



# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4326, 0.4010)

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

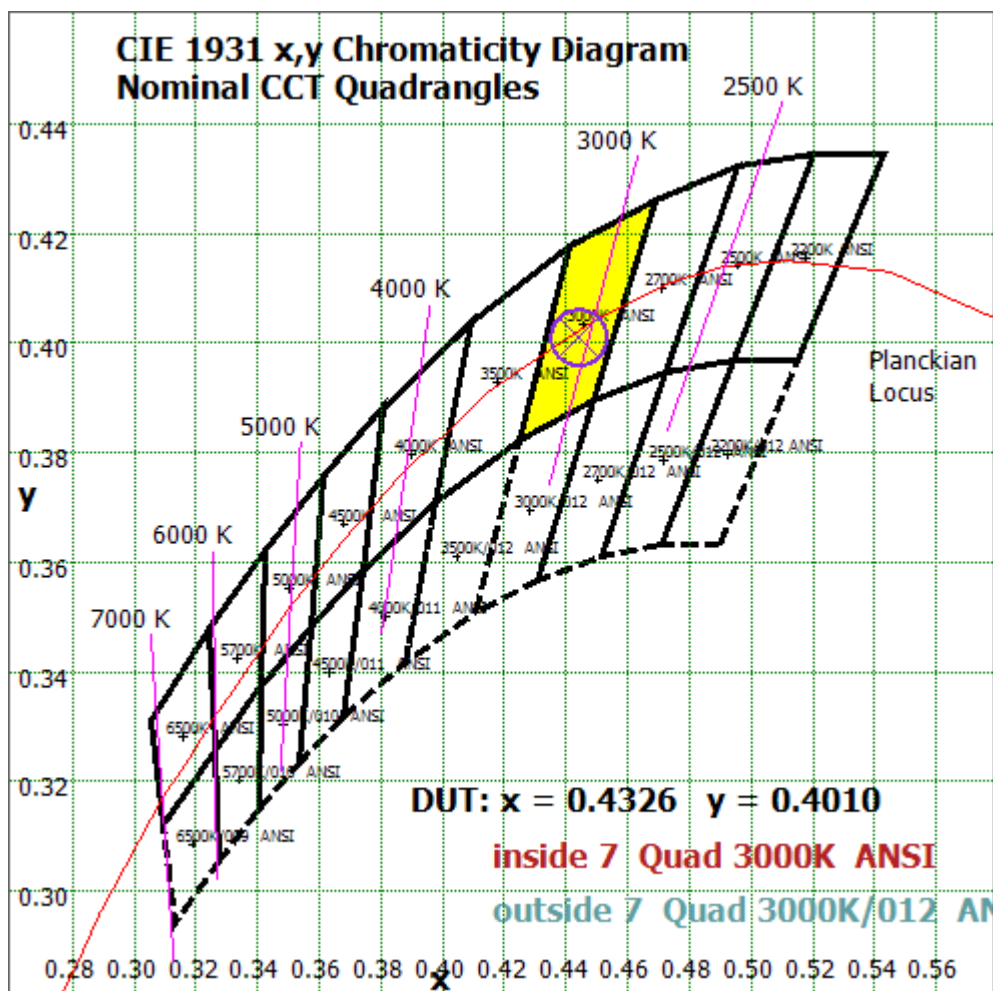


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

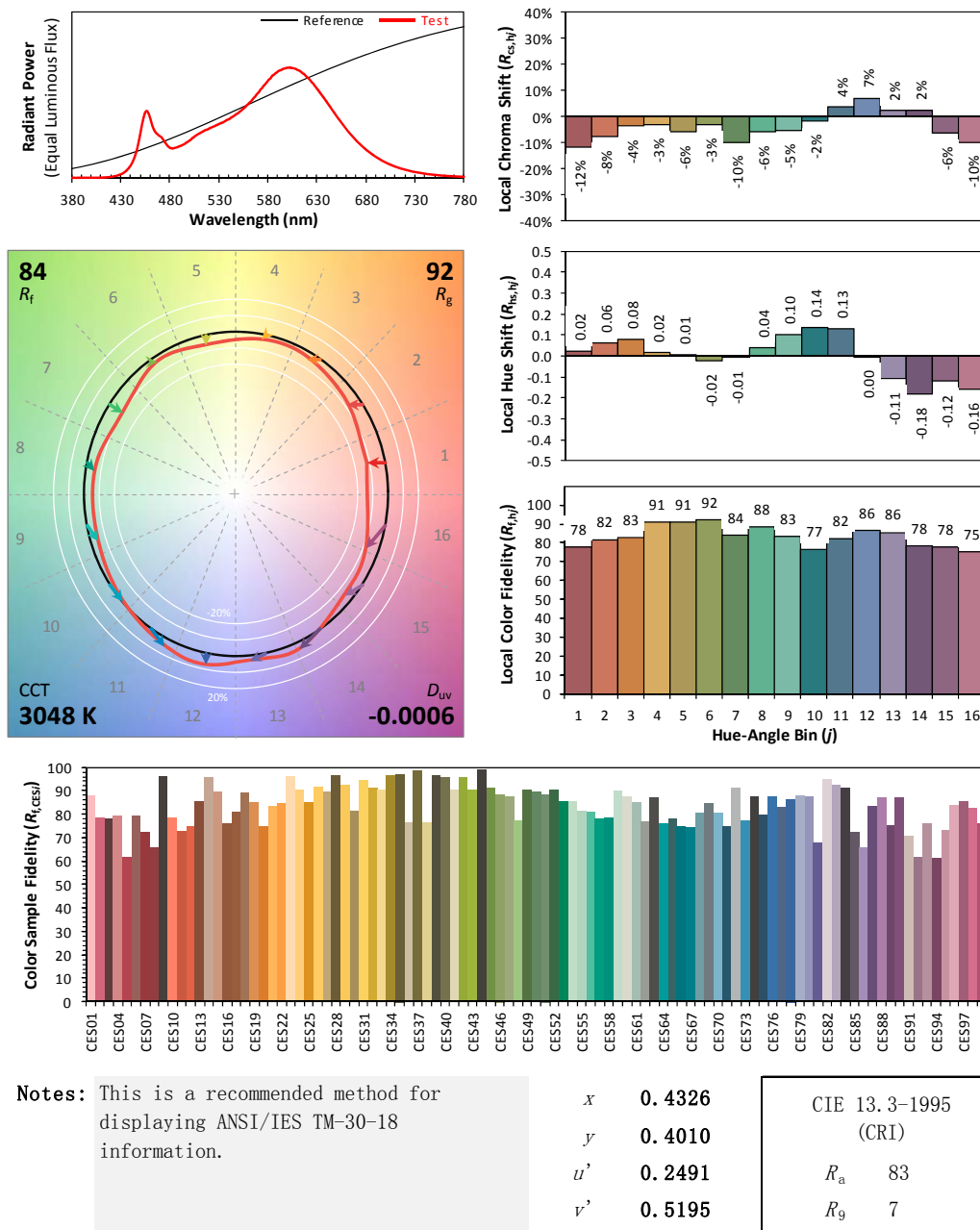
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 10.5T8/3F/8CCTS/EXT/SD/A2



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)	0.207
Power Factor	0.9909
Power (W)/2	12.30
Luminous Efficacy (lm/W)	135.6
Total Luminous Flux (lm)	1667.6
Beam Angle (°)	114.1 (0°-180°) / 248.8(90°-270°)
Center Beam Candle Power (cd)	261
Maximum Beam Candle Power (cd)	262.2 (At: C=340.0, Gamma=4.5)
Spacing Criteria	1.23 (0°-180°) / 1.47 (90°-270°)
Zonal Lumens in the 0°-60°Zone	41.09%
Zonal Lumens in the 60°-90°Zone	27.03%
Zonal Lumens in the 90°-120°Zone	18.90%
Zonal Lumens in the 120°-180°Zone	12.98%

Table 4: Test data per Goniophotometer Method

### Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	24.782	1.49%
10- 20	71.97	4.32%
20- 30	112.682	6.76%
30- 40	143.618	8.61%
40- 50	162.705	9.76%
50- 60	169.401	10.16%
60- 70	164.685	9.88%
70- 80	151.484	9.08%
80- 90	134.649	8.07%
90-100	119.284	7.15%
100-110	105.306	6.31%
110-120	90.649	5.44%
120-130	74.904	4.49%
130-140	59.693	3.58%
140-150	43.366	2.60%
150-160	26.668	1.60%
160-170	10.322	0.62%
170-180	1.431	0.09%
Total	1667.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	685.158	41.09%
60- 90	450.818	27.03%
0-90	1135.98	68.12%
90- 180	531.623	31.88%
0- 180	1667.6	100%

Table 5: Zonal Lumen

### Illuminance Plots- Goniophotometer Method

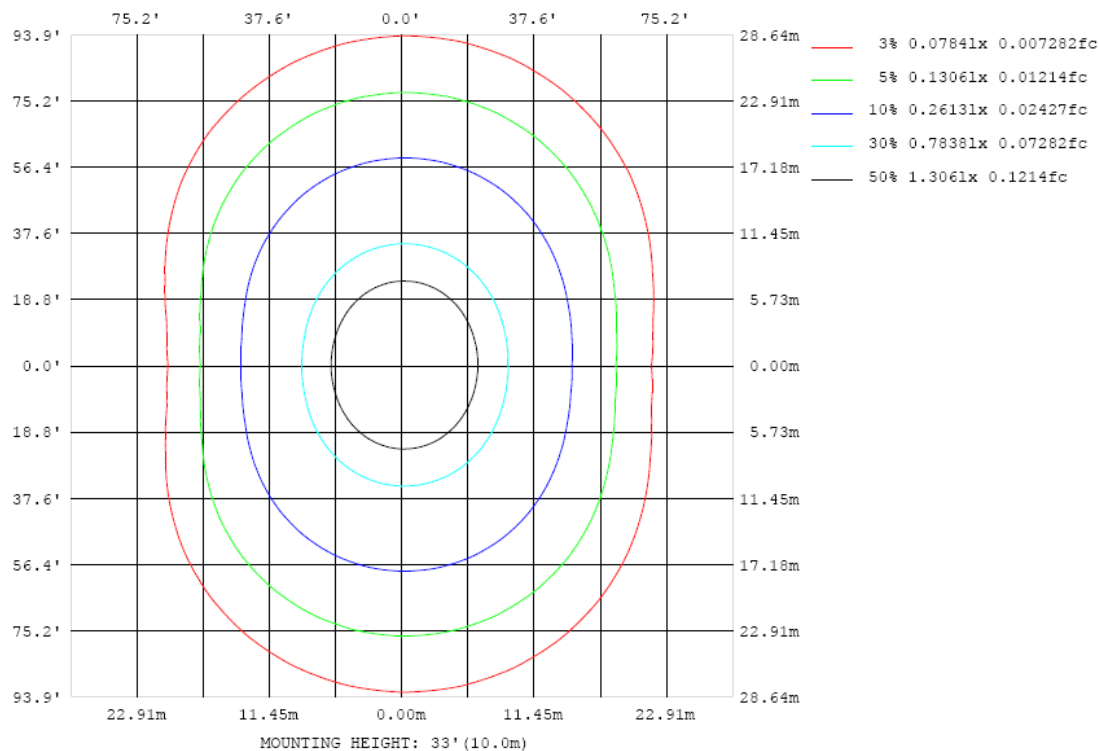


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

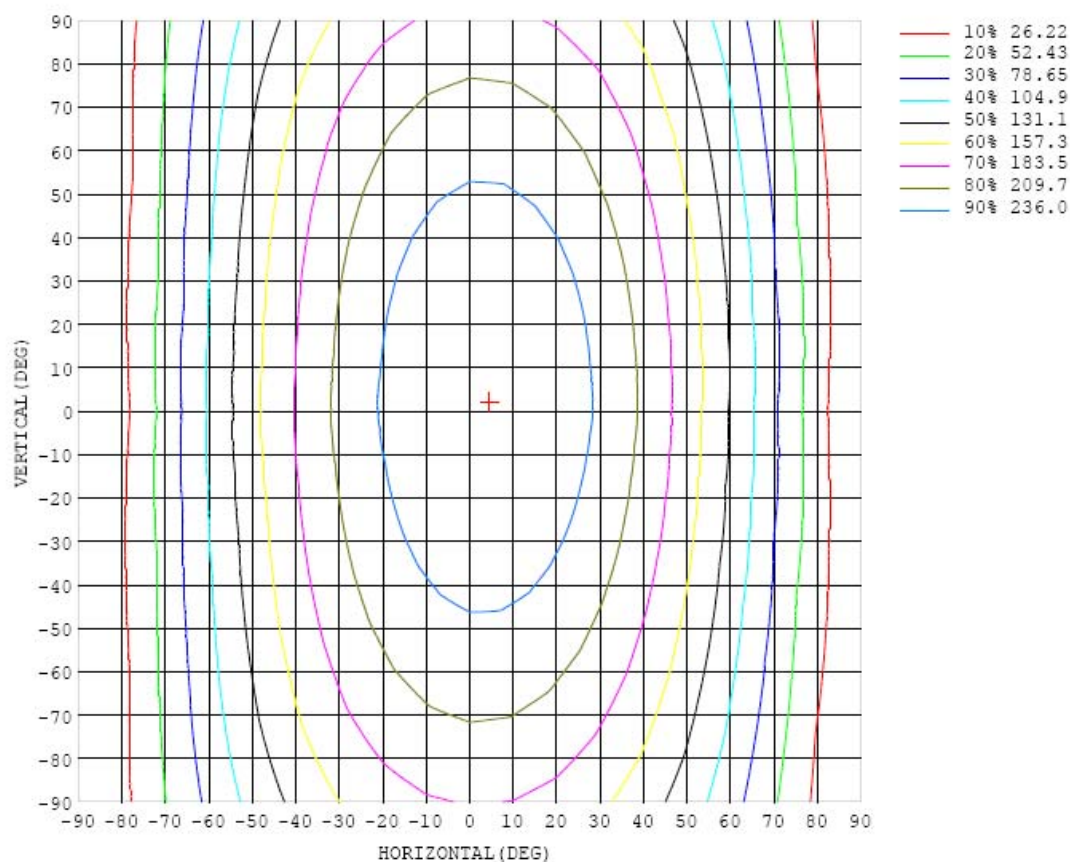


Chart 6: Isocandela Plot

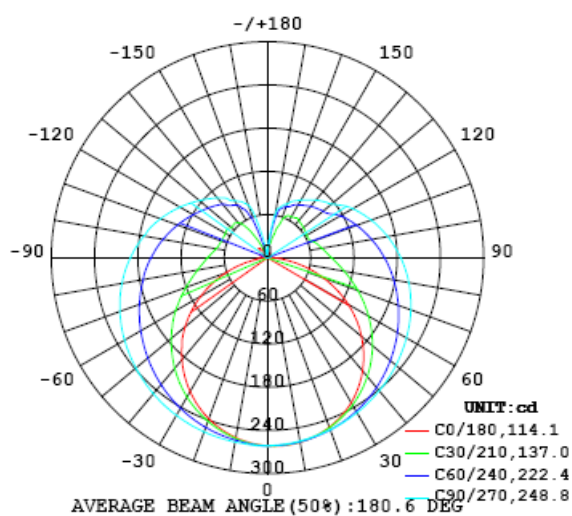


Chart 7: Polar Candela Distribution

## Luminous Intensity Data- Goniophotometer Method

Table--1		UNIT: cd																	
C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261
5	262	262	261	261	261	261	261	261	261	260	260	260	259	259	259	258	258	258	259
10	260	260	260	260	260	260	260	259	259	259	258	257	256	256	255	254	254	253	254
15	257	256	256	256	257	257	257	257	257	257	256	254	253	251	249	248	247	247	247
20	251	250	251	251	252	254	254	255	255	254	253	251	248	246	243	241	239	238	238
25	243	242	243	244	247	249	251	252	252	252	250	247	244	240	235	232	229	228	227
30	232	232	233	236	240	243	246	248	249	249	246	243	238	233	227	222	218	215	215
35	220	220	222	226	232	237	241	244	246	245	242	238	232	225	218	211	205	202	201
40	205	206	209	215	223	229	235	240	242	241	238	233	226	217	208	199	191	186	185
45	189	190	195	203	213	221	229	234	237	237	234	228	219	209	197	186	175	170	168
50	170	172	180	190	202	213	222	229	232	233	229	222	213	200	187	172	159	152	149
55	151	153	163	176	191	204	215	223	227	228	224	217	206	192	176	159	143	132	129
60	129	133	145	162	179	195	208	217	222	223	219	211	199	183	165	145	126	112	107
65	106	112	127	148	168	186	201	211	216	217	213	205	192	175	155	132	109	91.2	84.4
70	83.0	89.9	109	134	157	177	193	204	211	212	208	199	185	167	145	119	92.9	70.8	61.5
75	59.9	69.0	92.3	120	146	168	186	198	204	206	202	193	178	159	136	108	78.8	52.5	39.4
80	36.6	48.9	77.7	108	136	160	178	190	198	199	195	186	171	152	127	98.4	66.7	35.9	19.5
85	16.5	31.9	64.9	97.8	127	152	170	183	190	192	188	179	164	145	120	90.6	58.2	24.5	5.36
90	3.84	20.7	55.4	88.9	119	143	162	176	183	185	181	172	157	138	113	84.0	52.2	19.8	1.41
95	1.55	16.0	49.3	82.5	111	136	155	168	175	177	174	165	150	131	107	78.9	48.7	19.5	2.78
100	2.51	12.6	44.7	76.6	105	128	147	160	167	169	166	157	144	125	102	75.0	47.2	21.3	6.35
105	6.12	12.8	40.1	72.0	98.7	121	139	152	159	161	158	150	137	119	97.2	73.0	46.3	24.9	10.3
110	9.11	14.9	38.6	66.6	93.7	115	132	144	151	153	150	142	130	113	93.1	70.8	47.8	29.1	11.9
115	7.93	16.0	41.3	62.9	87.2	109	124	136	143	145	142	135	123	108	89.1	69.2	50.3	34.2	11.0
120	2.86	16.2	44.6	63.2	81.6	100	117	128	134	136	134	127	117	102	85.6	69.0	52.7	39.0	10.1
125	1.05	20.5	47.6	64.2	79.9	93.0	106	118	125	127	125	119	109	97.3	83.5	69.6	55.5	44.1	10.2
130	1.27	26.1	50.2	65.2	79.0	90.6	101	108	114	116	115	111	103	93.5	81.8	70.0	56.5	47.6	13.2
135	1.74	27.1	51.9	66.2	77.9	88.2	97.1	104	108	110	110	106	99.0	90.3	80.8	70.7	59.1	48.4	17.5
140	4.42	17.8	52.2	67.8	76.6	85.3	93.2	99.2	103	105	104	100	94.6	87.6	79.8	69.6	59.8	44.3	16.8
145	4.32	11.9	51.6	67.9	76.3	82.5	88.8	93.9	97.1	98.4	97.6	95.0	90.6	84.5	78.0	69.8	62.1	43.1	13.2
150	6.24	14.3	47.7	65.9	73.1	79.9	84.9	88.7	91.4	92.6	92.0	89.7	86.3	81.7	75.1	68.7	60.6	42.7	13.3
155	7.63	12.2	33.5	64.5	71.4	74.9	80.2	84.3	86.4	87.2	86.9	85.1	80.8	76.7	72.9	67.1	56.9	31.0	10.8
160	7.45	11.9	24.1	50.1	68.6	72.9	75.4	77.4	78.6	79.2	78.4	77.8	76.8	73.6	69.1	63.3	48.4	22.2	9.68
165	7.13	10.9	15.8	31.6	52.3	66.1	70.7	72.1	73.1	73.7	73.4	72.7	71.3	68.7	61.4	49.0	30.9	14.6	8.12
170	6.61	10.0	16.1	19.6	27.5	39.2	48.0	55.4	59.7	61.2	60.9	58.7	54.4	48.2	37.1	23.9	15.4	10.4	7.51
175	7.26	7.92	10.5	15.0	17.5	18.7	19.4	20.2	20.9	21.3	21.4	21.0	20.6	19.1	15.5	12.4	9.99	8.07	7.55
180	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85

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	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261		
5	259	259	259	260	260	260	260	261	261	261	262	262	262	262	262	262	262		
10	254	255	255	256	256	257	258	259	260	260	261	261	261	261	261	261	261		
15	248	248	249	251	253	254	256	258	259	259	260	259	259	258	258	257	257		
20	239	240	242	245	248	251	254	256	257	258	258	257	256	255	253	252	251		
25	228	230	233	238	242	247	250	254	255	256	256	254	252	249	247	244	243		
30	216	219	224	229	236	242	247	251	253	254	253	250	247	243	239	235	233		
35	202	206	213	220	229	236	243	247	250	251	249	246	241	235	230	224	221		
40	186	192	201	211	221	230	238	243	247	247	245	241	234	227	219	212	207		
45	170	177	188	200	213	224	233	239	243	243	240	235	227	217	207	198	191		
50	152	162	175	189	204	217	227	235	239	239	235	228	218	206	194	182	174		
55	133	145	161	179	195	210	222	230	234	234	229	221	210	195	180	167	156		
60	112	127	147	168	186	203	216	225	229	229	224	214	201	184	167	149	136		
65	91.1	110	134	157	178	196	210	219	224	223	217	207	192	173	152	131	114		
70	70.1	92.8	120	148	171	189	204	214	218	217	211	199	183	163	138	113	92.2		
75	50.2	77.6	109	138	163	182	198	208	212	211	204	192	174	152	124	95.3	70.5		
80	33.1	65.0	98.6	129	155	175	191	201	205	204	197	184	166	142	112	79.6	50.2		
85	21.4	55.5	90.1	121	148	169	183	194	198	197	189	176	158	132	101	66.5	33.4		
90	15.1	48.8	83.2	114	141	162	176	186	190	189	181	168	149	123	92.0	56.6	22.4		
95	11.3	43.1	77.2	108	134	155	170	178	182	181	173	161	141	115	84.5	50.1	18.1		
100	12.1	40.1	72.6	102	127	147	162	171	174	173	166	152	133	108	78.6	46.5	18.1		
105	14.3	40.2	69.7	97.4	121	140	154	163	167	165	157	144	126	102	74.2	45.1	20.6		
110	16.1	41.2	68.2	93.4	115	133	146	155	158	156	149	136	119	96.4	71.1	45.5	24.7		
115	16.5	42.9	67.6	90.1	110	126	138	146	149	147	140	128	112	91.8	69.2	47.4	28.8		
120	13.9	44.0	67.9	87.3	105	119	131	138	140	139	132	121	106	88.0	68.2	50.5	30.3		
125	4.33	43.2	68.8	85.1	100	113	123	129	132	130	124	114	101	85.0	68.0	54.2	29.4		
130	1.98	40.1	65.8	82.5	96.6	108	116	122	124	122	117	108	96.3	82.7	68.5	58.1	25.4		
135	0.27	35.2	66.4	79.4	92.2	102	110	114	116	114	110	102	92.3	80.6	69.6	60.2	21.6		
140	2.18	27.2	63.3	76.9	86.3	96.6	103	107	108	107	103	97.0	85.8	76.5	67.8	56.1	17.1		
145	3.74	17.9	51.8	75.9	82.7	88.6	94.0	99.4	101	99.6	94.6	87.6	82.0	75.4	66.2	44.4	11.7		
150	5.07	10.3	31.6	67.2	77.5	84.6	88.2	90.5	91.5	90.7	88.3	84.7	79.7	73.3	58.8	25.1	8.16		
155	5.58	6.68	13.0	34.2	64.6	72.8	81.6	84.9	85.9	85.4	83.6	80.7	76.3	67.0	40.0	14.0	8.43		
160	6.14	6.16	8.08	8.90	19.9	41.4	59.3	71.8	77.2	77.7	76.7	73.2	63.5	43.8	17.9	10.1	6.31		
165	4.30	5.31	5.82	5.97	9.16	8.09	10.6	26.9	42.0	47.2	45.7	38.4	27.5	15.8	8.64	8.10	5.78		
170	6.46	3.30	4.42	6.98	8.24	5.89	7.15	8.59	8.82	10.5	9.32	8.35	10.3	10.8	6.47	6.27	6.88		
175	7.70	7.99	7.10	5.88	4.91	4.13	3.73	3.15	1.76	4.73	4.61	4.12	4.30	5.76	7.39	6.96	6.59		
180	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85	7.85		

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)	0.204	0.098
Power Factor	0.9926	0.9025
Test Power (W)/2	12.17	12.23
THD A%	4.87	9.25
Luminous Efficacy (lm/W)	138.7	138.0
Total Luminous Flux (lm)	1687.7	1688.1
Color Rendering Index (CRI)	84.4	
R9	16.4	
Correlated Color Temperature (CCT)(K)	3464	
Chromaticity Chroma x	0.4039	
Chromaticity Chroma y	0.3831	
Chromaticity Chroma u	0.2380	
Chromaticity Chroma v	0.3385	
Duv	-0.0031	
Chromaticity Chroma u'	0.2380	
Chromaticity Chroma v'	0.5078	

Special Color Rendering Indices	
R1	85.3
R2	96.7
R3	91.2
R4	80.2
R5	85.4
R6	93.3
R7	80.8
R8	62
R9	16.4
R10	91.6
R11	80.1
R12	71.1
R13	89
R14	95.9

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

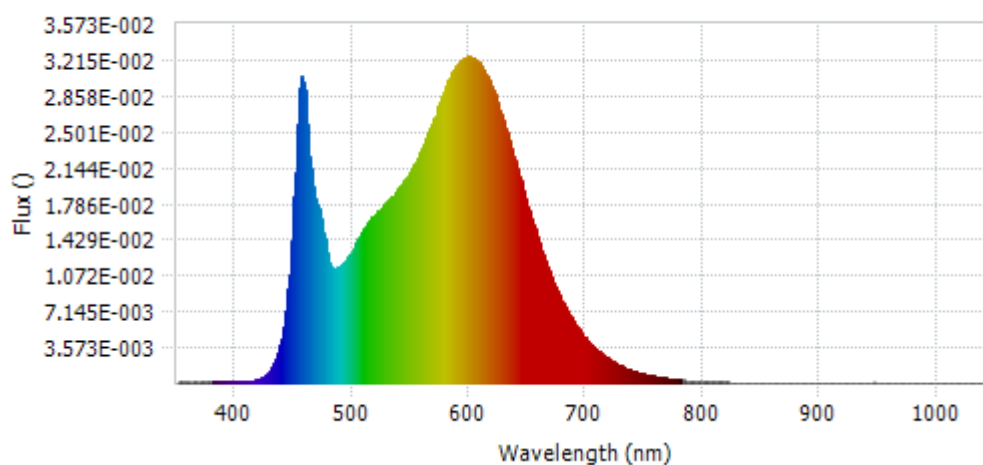


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.33E-04	485	1.14E-02	590	3.17E-02	695	5.16E-03
385	1.25E-04	490	1.18E-02	595	3.23E-02	700	4.40E-03
390	1.45E-04	495	1.23E-02	600	3.25E-02	705	3.78E-03
395	1.43E-04	500	1.32E-02	605	3.22E-02	710	3.22E-03
400	1.34E-04	505	1.44E-02	610	3.15E-02	715	2.74E-03
405	1.33E-04	510	1.53E-02	615	3.05E-02	720	2.35E-03
410	1.73E-04	515	1.62E-02	620	2.92E-02	725	2.00E-03
415	2.65E-04	520	1.68E-02	625	2.75E-02	730	1.71E-03
420	4.25E-04	525	1.74E-02	630	2.57E-02	735	1.46E-03
425	7.53E-04	530	1.81E-02	635	2.38E-02	740	1.24E-03
430	1.38E-03	535	1.87E-02	640	2.18E-02	745	1.06E-03
435	2.63E-03	540	1.95E-02	645	1.97E-02	750	8.97E-04
440	4.94E-03	545	2.02E-02	650	1.76E-02	755	7.64E-04
445	9.40E-03	550	2.11E-02	655	1.57E-02	760	6.46E-04
450	1.86E-02	555	2.23E-02	660	1.39E-02	765	5.66E-04
455	2.93E-02	560	2.36E-02	665	1.22E-02	770	4.88E-04
460	2.76E-02	565	2.49E-02	670	1.06E-02	775	4.15E-04
465	2.02E-02	570	2.64E-02	675	9.28E-03	780	3.58E-04
470	1.78E-02	575	2.80E-02	680	8.05E-03		
475	1.50E-02	580	2.95E-02	685	6.97E-03		
480	1.21E-02	585	3.09E-02	690	6.00E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method

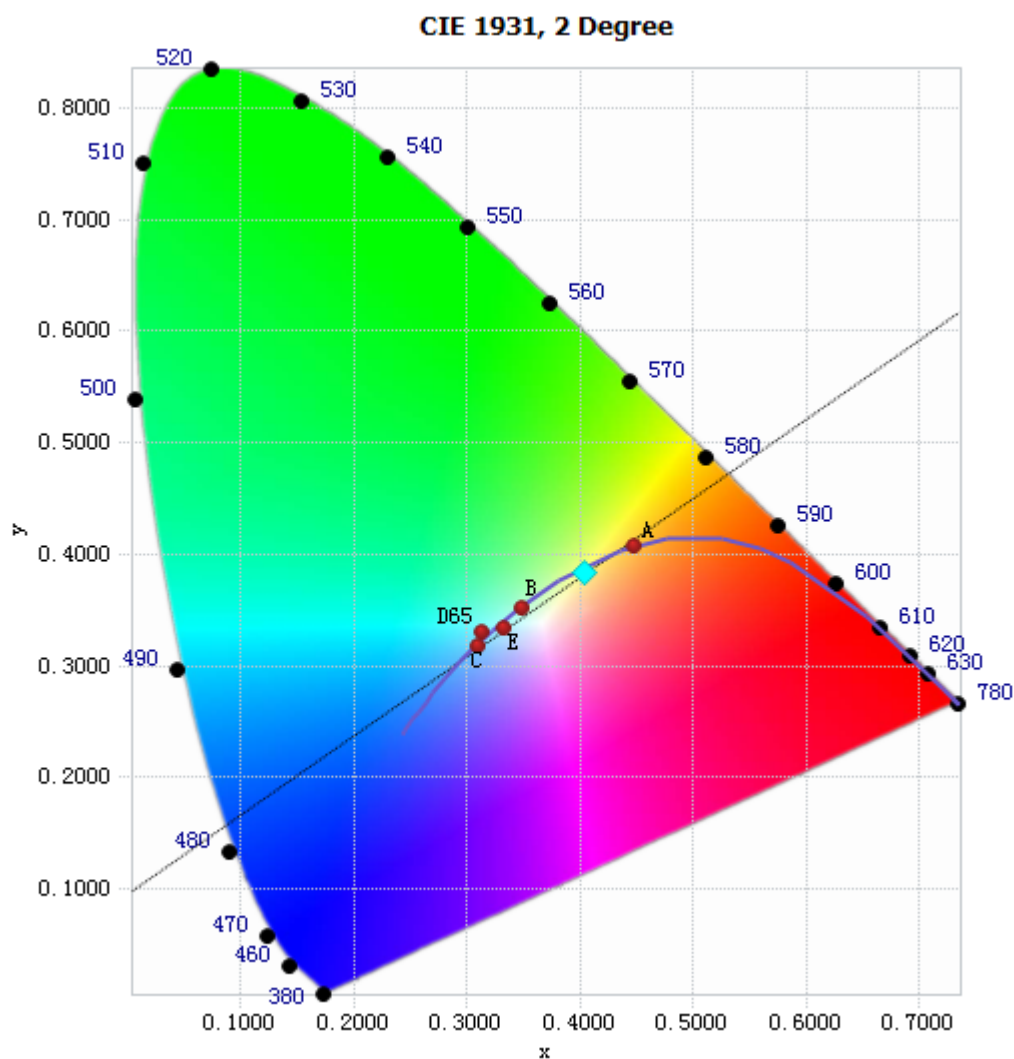


Chart 9: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

# Nominal CCT Quadrangles – Sphere Spectroradiometer Method

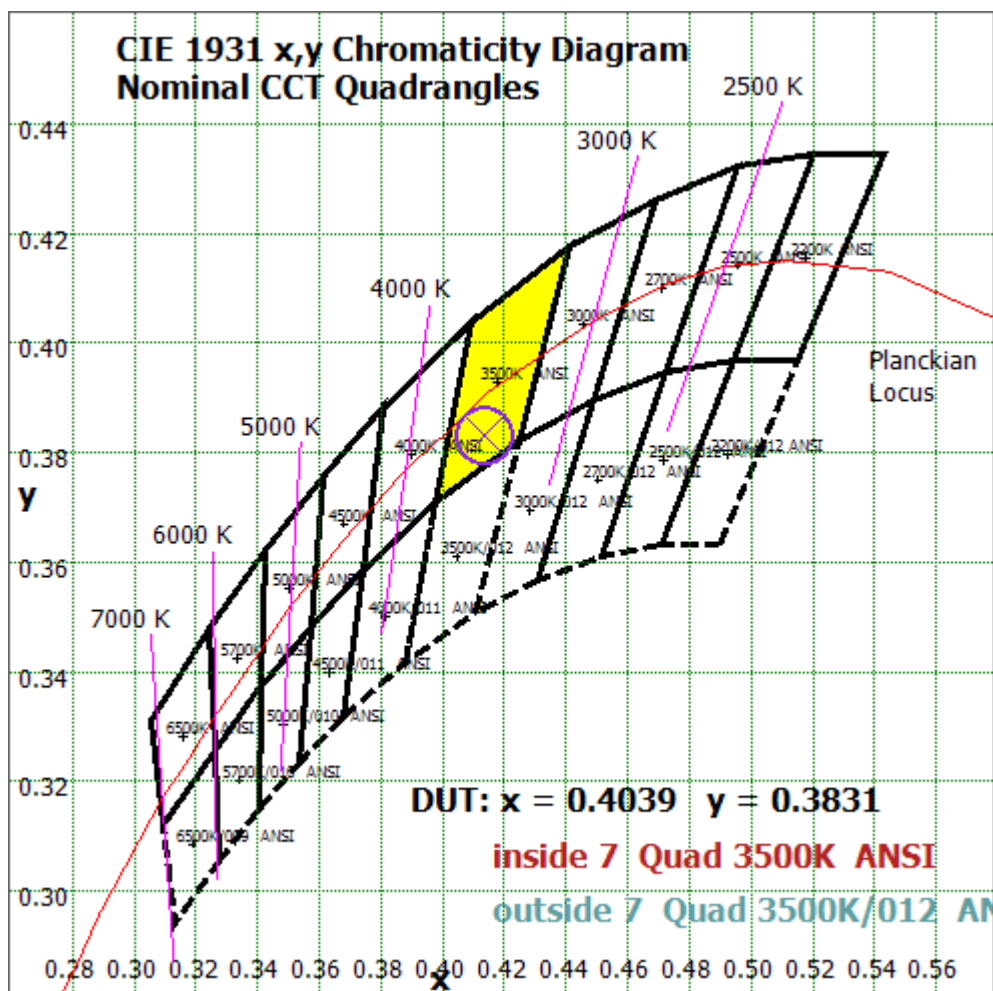


Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

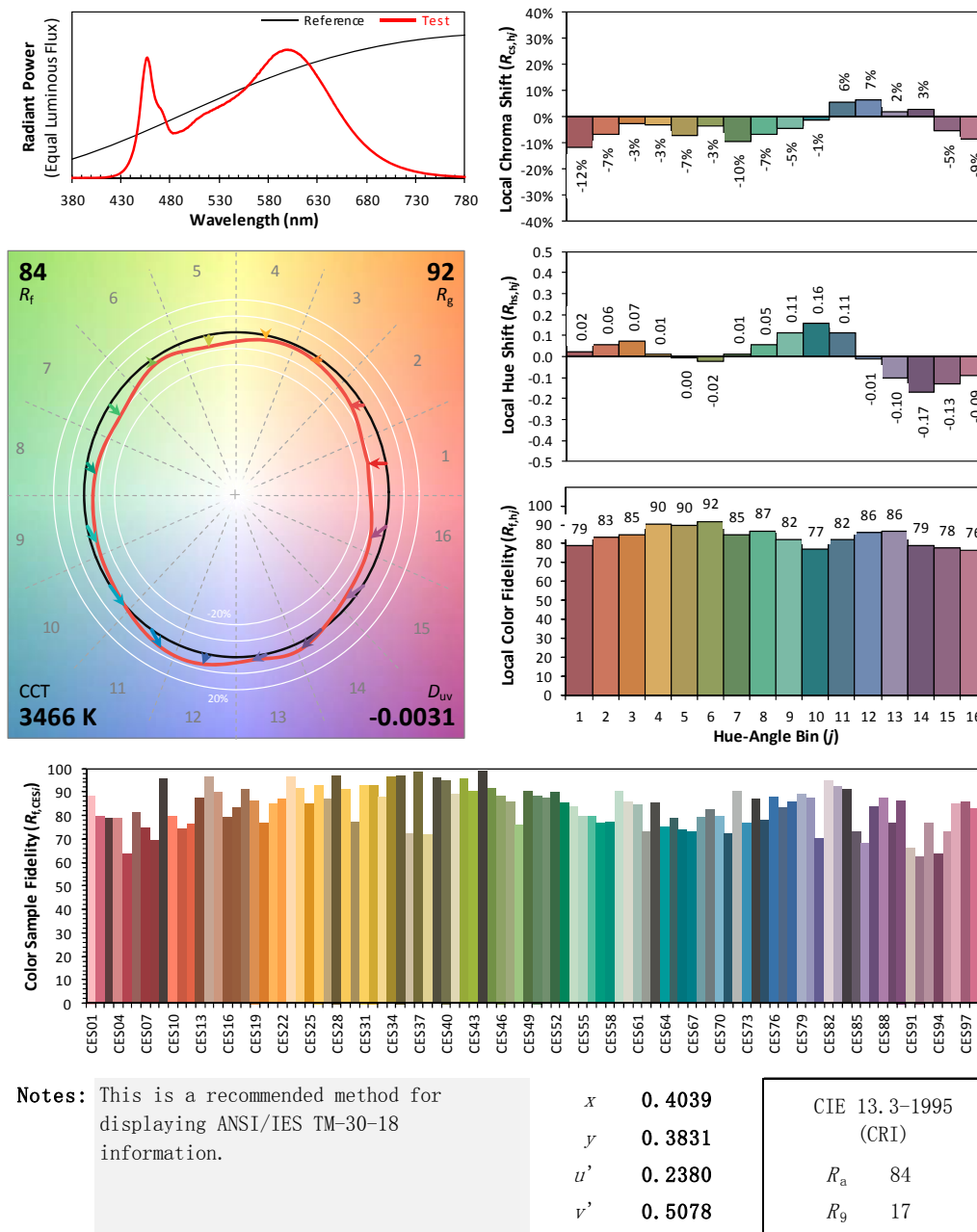
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 10.5T8/3F/8CCTS/EXT/SD/A2



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)	0.203	0.097
Power Factor	0.9923	0.9011
Test Power (W)/2	12.07	12.13
THD A%	4.93	9.45
Luminous Efficacy (lm/W)	141.7	140.9
Total Luminous Flux (lm)	1710.0	1708.7
Color Rendering Index (CRI)	85.4	
R9	22.2	
Correlated Color Temperature (CCT)(K)	3916	
Chromaticity Chroma x	0.3813	
Chromaticity Chroma y	0.3693	
Chromaticity Chroma u	0.2287	
Chromaticity Chroma v	0.3322	
Duv	-0.0038	
Chromaticity Chroma u'	0.2287	
Chromaticity Chroma v'	0.4984	

Special Color Rendering Indices	
R1	86.9
R2	97.5
R3	91.6
R4	81
R5	86.4
R6	92.5
R7	81.9
R8	65.5
R9	22.2
R10	93
R11	81.1
R12	67.8
R13	90.8
R14	96.3

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

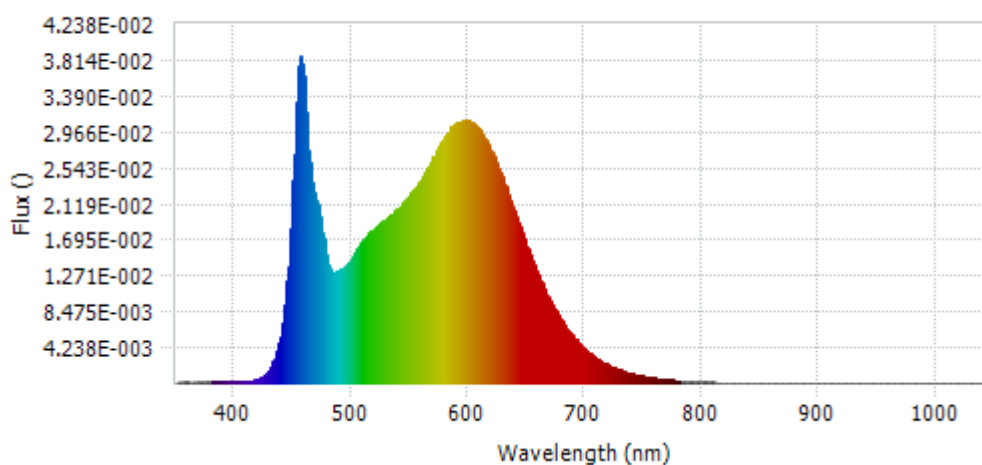
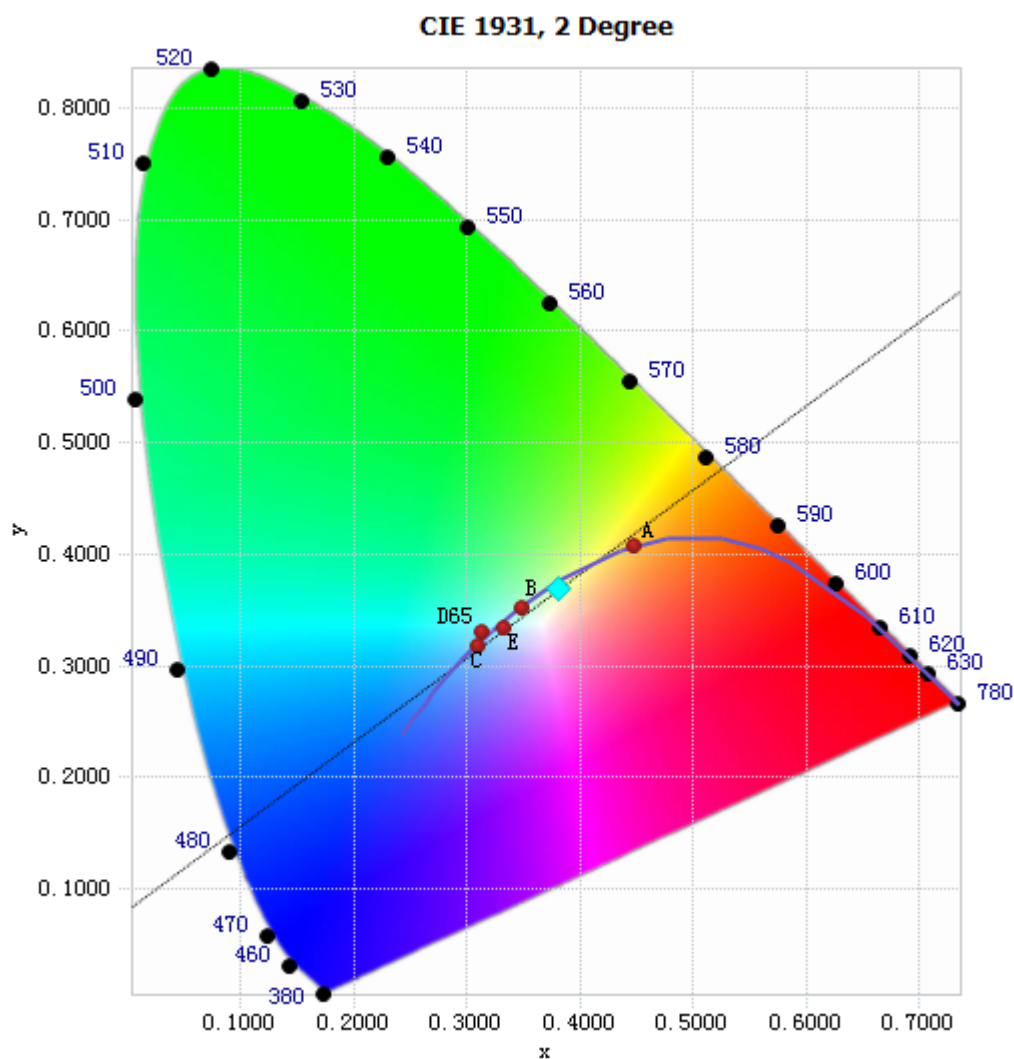


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.61E-04	485	1.31E-02	590	3.08E-02	695	4.70E-03
385	1.49E-04	490	1.34E-02	595	3.10E-02	700	4.00E-03
390	1.60E-04	495	1.38E-02	600	3.10E-02	705	3.41E-03
395	1.56E-04	500	1.47E-02	605	3.05E-02	710	2.90E-03
400	1.57E-04	505	1.59E-02	610	2.98E-02	715	2.49E-03
405	1.72E-04	510	1.68E-02	615	2.87E-02	720	2.14E-03
410	2.19E-04	515	1.77E-02	620	2.73E-02	725	1.83E-03
415	3.07E-04	520	1.82E-02	625	2.57E-02	730	1.55E-03
420	5.33E-04	525	1.88E-02	630	2.38E-02	735	1.31E-03
425	9.38E-04	530	1.95E-02	635	2.20E-02	740	1.12E-03
430	1.75E-03	535	2.00E-02	640	2.01E-02	745	9.56E-04
435	3.28E-03	540	2.06E-02	645	1.81E-02	750	8.19E-04
440	6.34E-03	545	2.14E-02	650	1.62E-02	755	7.02E-04
445	1.20E-02	550	2.21E-02	655	1.44E-02	760	6.00E-04
450	2.39E-02	555	2.31E-02	660	1.27E-02	765	5.18E-04
455	3.73E-02	560	2.41E-02	665	1.12E-02	770	4.35E-04
460	3.43E-02	565	2.54E-02	670	9.72E-03	775	3.72E-04
465	2.47E-02	570	2.67E-02	675	8.45E-03	780	3.25E-04
470	2.15E-02	575	2.78E-02	680	7.31E-03		
475	1.78E-02	580	2.91E-02	685	6.28E-03		
480	1.40E-02	585	3.02E-02	690	5.46E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3813, 0.3693)

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

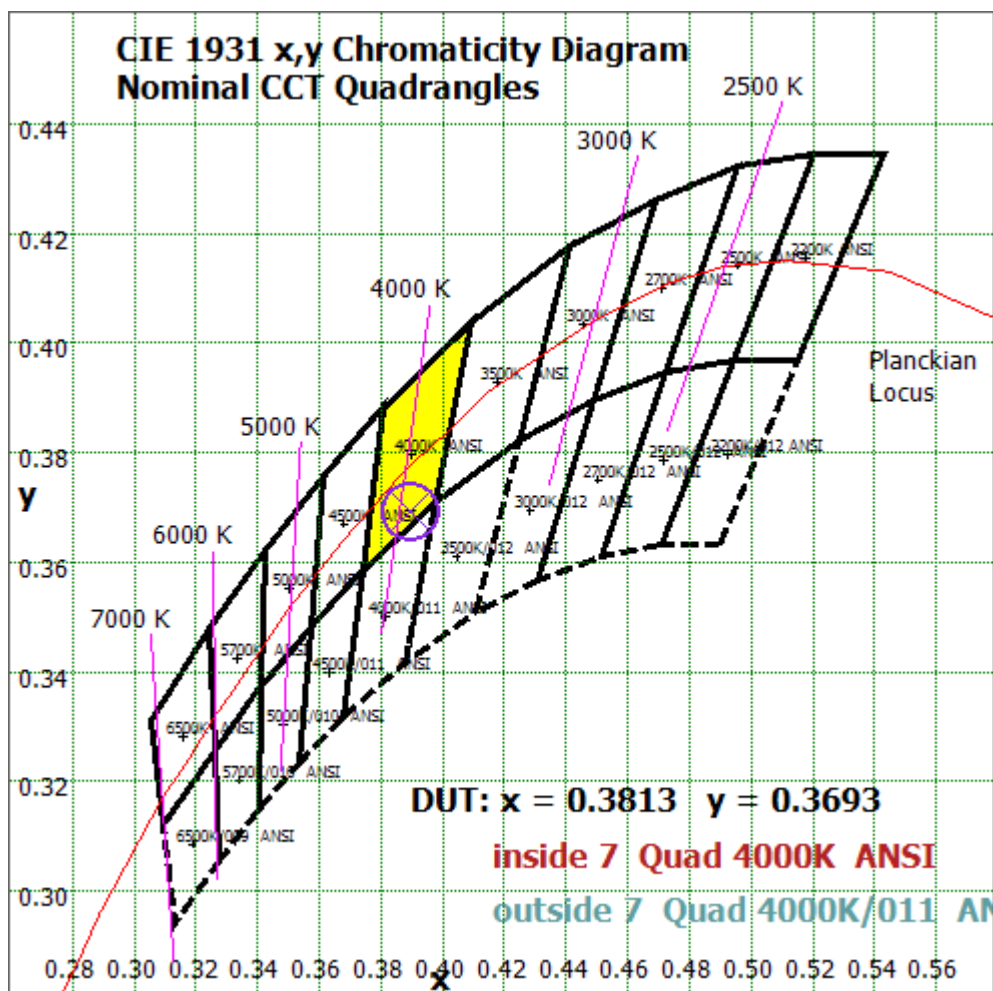


Chart14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

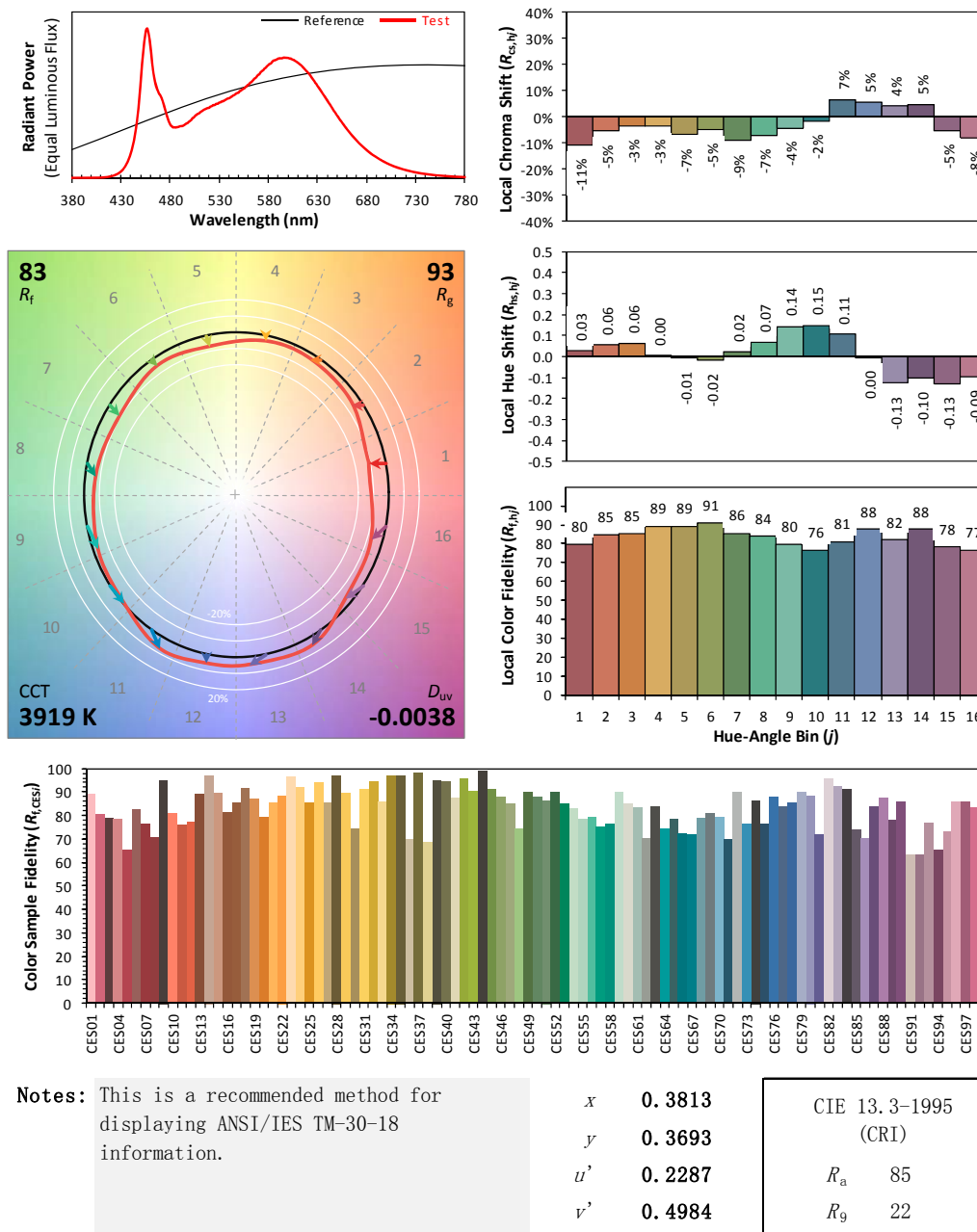
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 10.5T8/3F/8CCTS/EXT/SD/A2



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)	0.203	0.098
Power Factor	0.9924	0.9019
Test Power (W)/2	12.11	12.19
THD A%	4.92	9.52
Luminous Efficacy (lm/W)	142.1	141.3
Total Luminous Flux (lm)	1720.3	1722.4
Color Rendering Index (CRI)	85.9	
R9	22.2	
Correlated Color Temperature (CCT)(K)	5083	
Chromaticity Chroma x	0.3424	
Chromaticity Chroma y	0.3459	
Chromaticity Chroma u	0.2118	
Chromaticity Chroma v	0.3210	
Duv	-0.0018	
Chromaticity Chroma u'	0.2118	
Chromaticity Chroma v'	0.4815	

Special Color Rendering Indices	
R1	87.1
R2	96.9
R3	92.8
R4	81.8
R5	86.4
R6	90.7
R7	83.5
R8	68.3
R9	22.2
R10	91.3
R11	82.1
R12	66.3
R13	91.2
R14	97

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

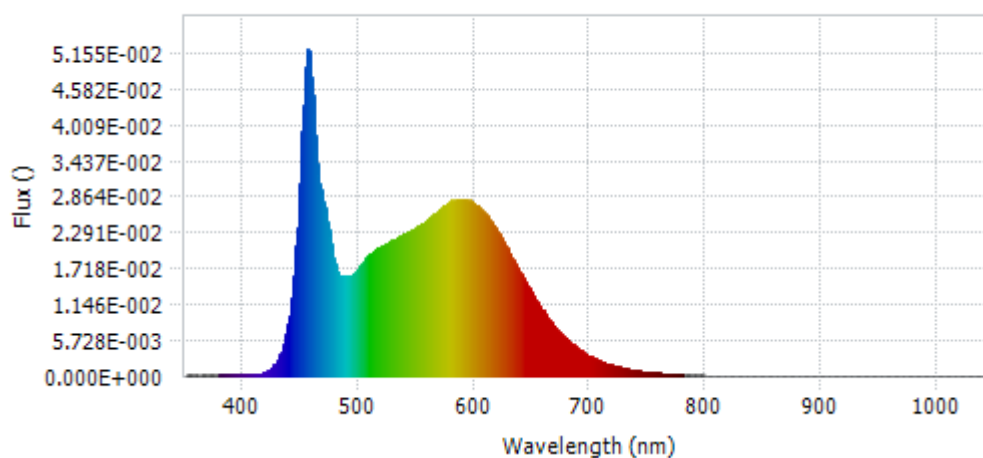
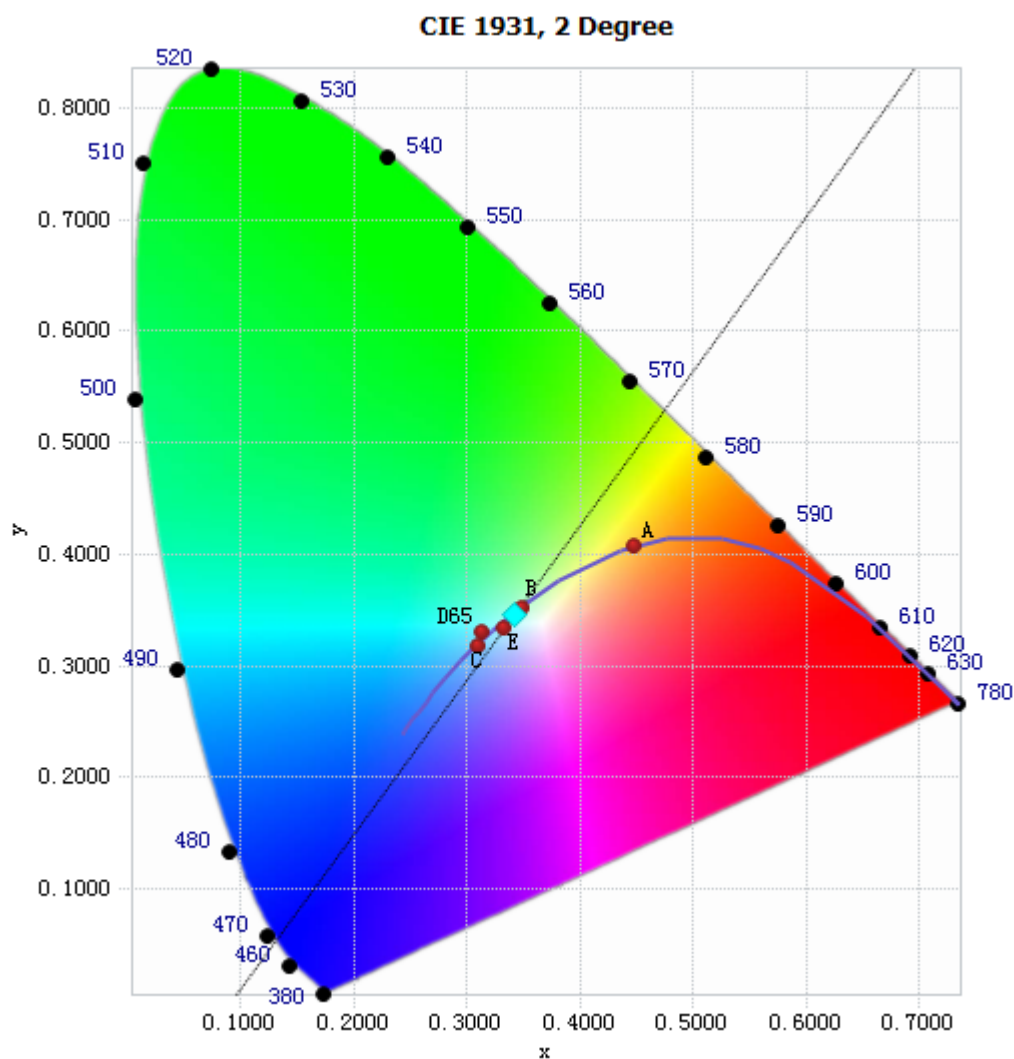


Chart16: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.94E-04	485	1.60E-02	590	2.83E-02	695	3.66E-03
385	1.84E-04	490	1.61E-02	595	2.80E-02	700	3.13E-03
390	2.09E-04	495	1.63E-02	600	2.75E-02	705	2.67E-03
395	2.14E-04	500	1.72E-02	605	2.66E-02	710	2.28E-03
400	1.97E-04	505	1.85E-02	610	2.56E-02	715	1.94E-03
405	1.99E-04	510	1.94E-02	615	2.44E-02	720	1.67E-03
410	2.72E-04	515	2.02E-02	620	2.30E-02	725	1.43E-03
415	4.34E-04	520	2.07E-02	625	2.13E-02	730	1.22E-03
420	7.49E-04	525	2.12E-02	630	1.97E-02	735	1.03E-03
425	1.40E-03	530	2.18E-02	635	1.80E-02	740	8.85E-04
430	2.62E-03	535	2.21E-02	640	1.63E-02	745	7.52E-04
435	5.07E-03	540	2.26E-02	645	1.46E-02	750	6.49E-04
440	9.61E-03	545	2.32E-02	650	1.30E-02	755	5.57E-04
445	1.81E-02	550	2.37E-02	655	1.15E-02	760	4.76E-04
450	3.49E-02	555	2.43E-02	660	1.01E-02	765	4.09E-04
455	5.13E-02	560	2.50E-02	665	8.84E-03	770	3.50E-04
460	4.49E-02	565	2.58E-02	670	7.66E-03	775	3.01E-04
465	3.20E-02	570	2.66E-02	675	6.65E-03	780	2.53E-04
470	2.75E-02	575	2.72E-02	680	5.75E-03		
475	2.22E-02	580	2.79E-02	685	4.96E-03		
480	1.73E-02	585	2.83E-02	690	4.27E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3424, 0.3459)

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

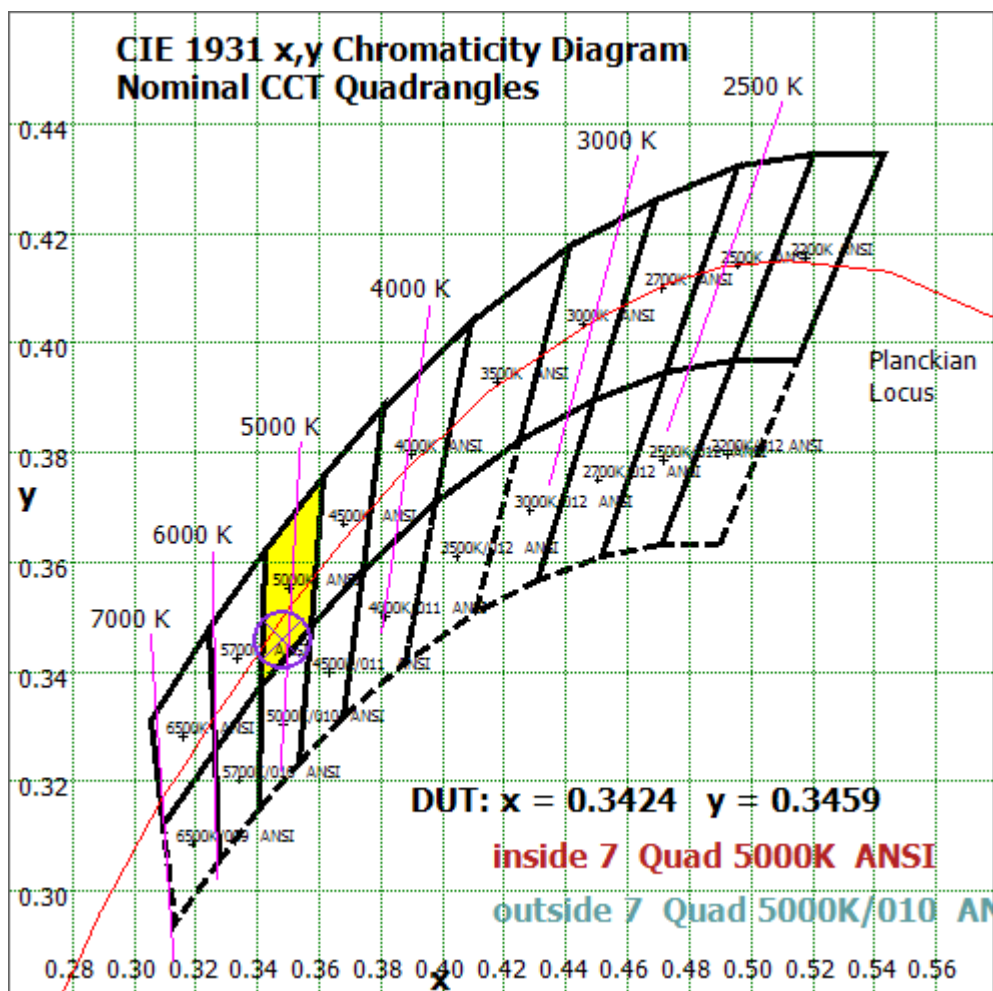


Chart 18: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

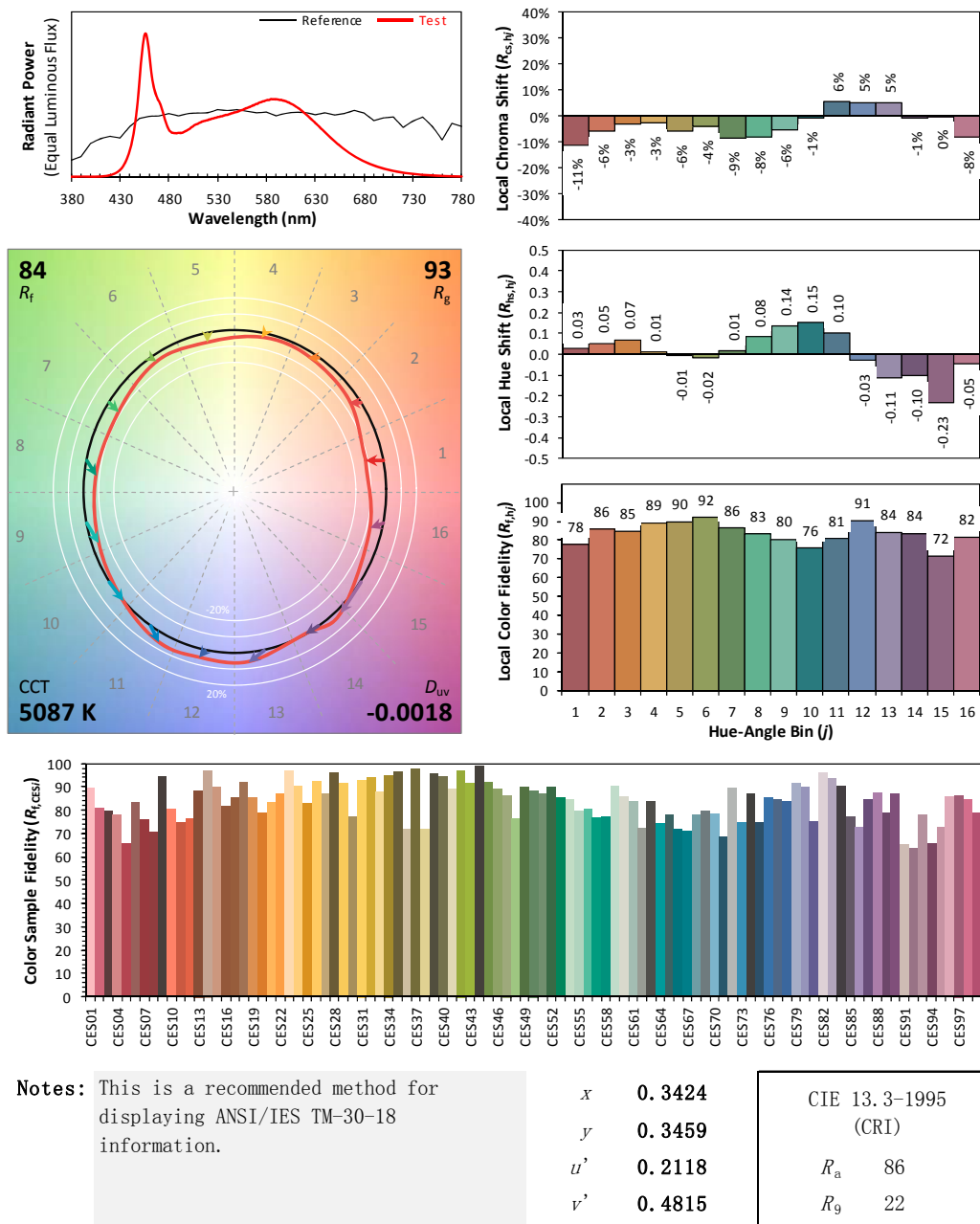
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 10.5T8/3F/8CCTS/EXT/SD/A2



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)	0.206	0.099
Power Factor	0.9928	0.9041
Test Power (W)/2	12.29	12.34
THD A%	4.75	9.32
Luminous Efficacy (lm/W)	139.0	138.4
Total Luminous Flux (lm)	1708.6	1707.5
Color Rendering Index (CRI)	84.3	
R9	11.7	
Correlated Color Temperature (CCT)(K)	6503	
Chromaticity Chroma x	0.3127	
Chromaticity Chroma y	0.3286	
Chromaticity Chroma u	0.1980	
Chromaticity Chroma v	0.3121	
Duv	0.0030	
Chromaticity Chroma u'	0.1980	
Chromaticity Chroma v'	0.4681	

Special Color Rendering Indices	
R1	84.1
R2	95
R3	93.3
R4	78.5
R5	83
R6	88.7
R7	84.3
R8	67.6
R9	11.7
R10	86.2
R11	78.8
R12	59.1
R13	88.6
R14	97

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

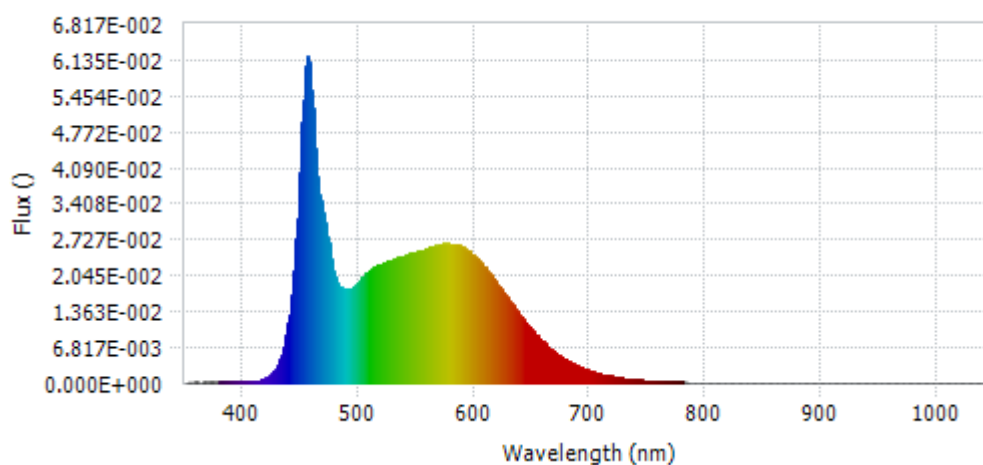
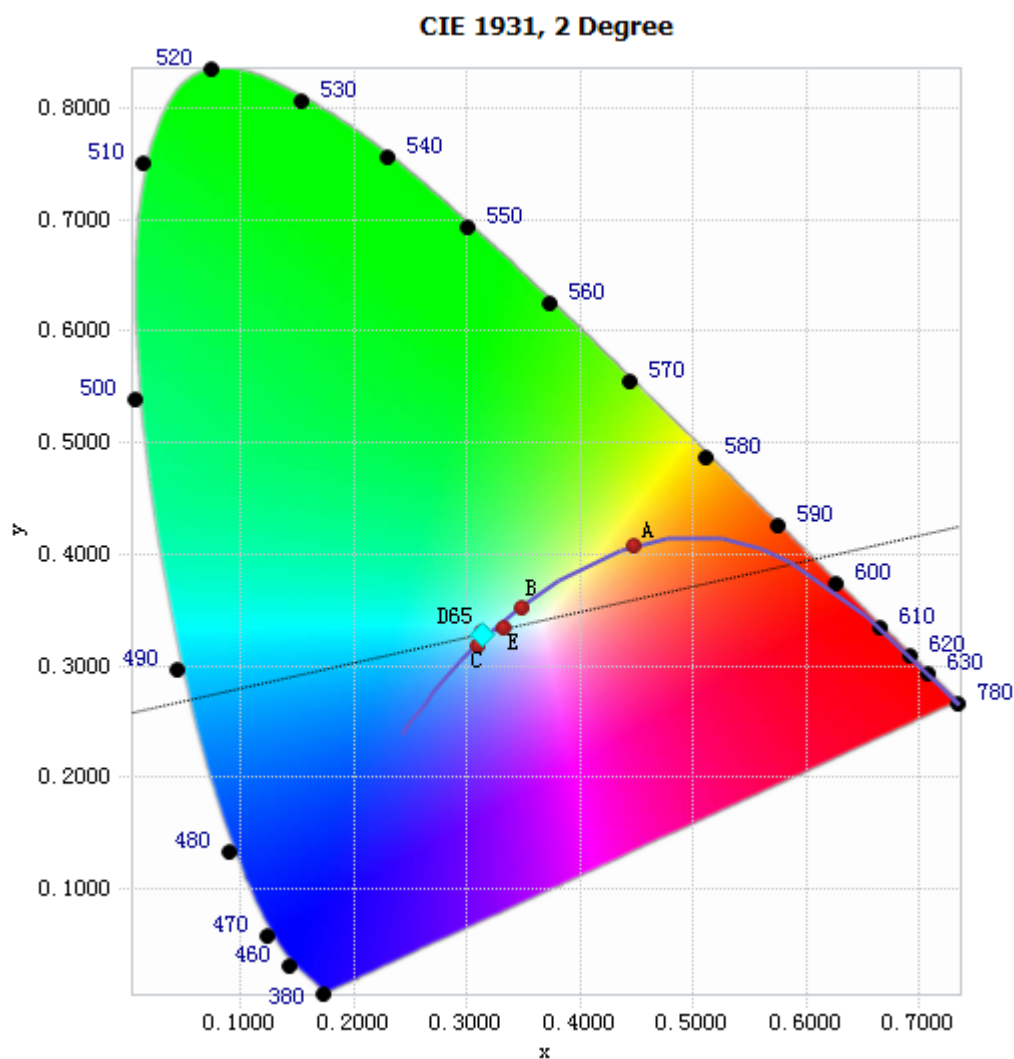


Chart 20: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.27E-04	485	1.82E-02	590	2.58E-02	695	2.73E-03
385	2.13E-04	490	1.79E-02	595	2.50E-02	700	2.33E-03
390	2.36E-04	495	1.82E-02	600	2.41E-02	705	2.00E-03
395	2.38E-04	500	1.92E-02	605	2.29E-02	710	1.69E-03
400	2.27E-04	505	2.05E-02	610	2.17E-02	715	1.44E-03
405	2.49E-04	510	2.14E-02	615	2.02E-02	720	1.24E-03
410	3.27E-04	515	2.23E-02	620	1.87E-02	725	1.06E-03
415	5.70E-04	520	2.26E-02	625	1.72E-02	730	9.04E-04
420	1.00E-03	525	2.31E-02	630	1.57E-02	735	7.75E-04
425	1.93E-03	530	2.36E-02	635	1.42E-02	740	6.64E-04
430	3.61E-03	535	2.38E-02	640	1.27E-02	745	5.67E-04
435	6.95E-03	540	2.42E-02	645	1.13E-02	750	4.88E-04
440	1.30E-02	545	2.46E-02	650	9.97E-03	755	4.25E-04
445	2.41E-02	550	2.48E-02	655	8.80E-03	760	3.63E-04
450	4.46E-02	555	2.52E-02	660	7.67E-03	765	3.10E-04
455	6.18E-02	560	2.56E-02	665	6.65E-03	770	2.66E-04
460	5.20E-02	565	2.59E-02	670	5.74E-03	775	2.36E-04
465	3.72E-02	570	2.62E-02	675	4.97E-03	780	2.05E-04
470	3.17E-02	575	2.63E-02	680	4.29E-03		
475	2.50E-02	580	2.64E-02	685	3.70E-03		
480	1.96E-02	585	2.64E-02	690	3.19E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3127, 0.3286)

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

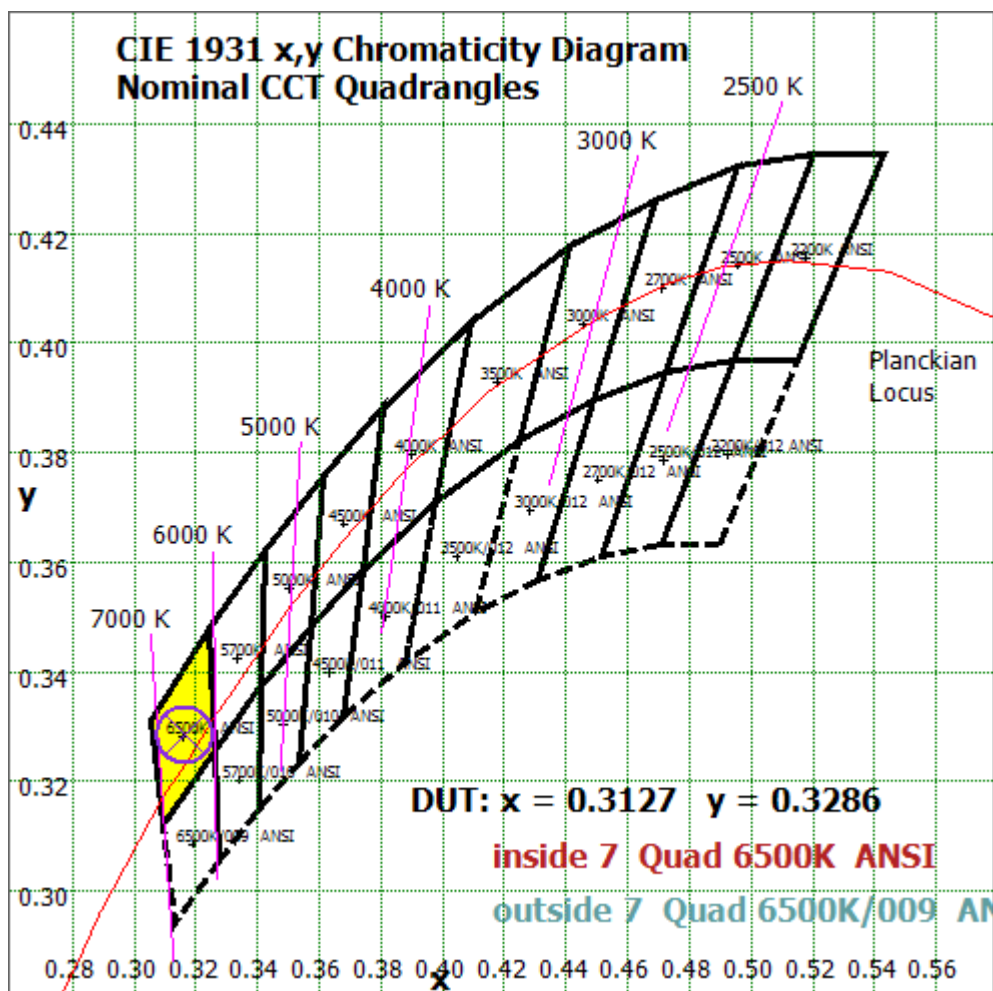


Chart 22: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

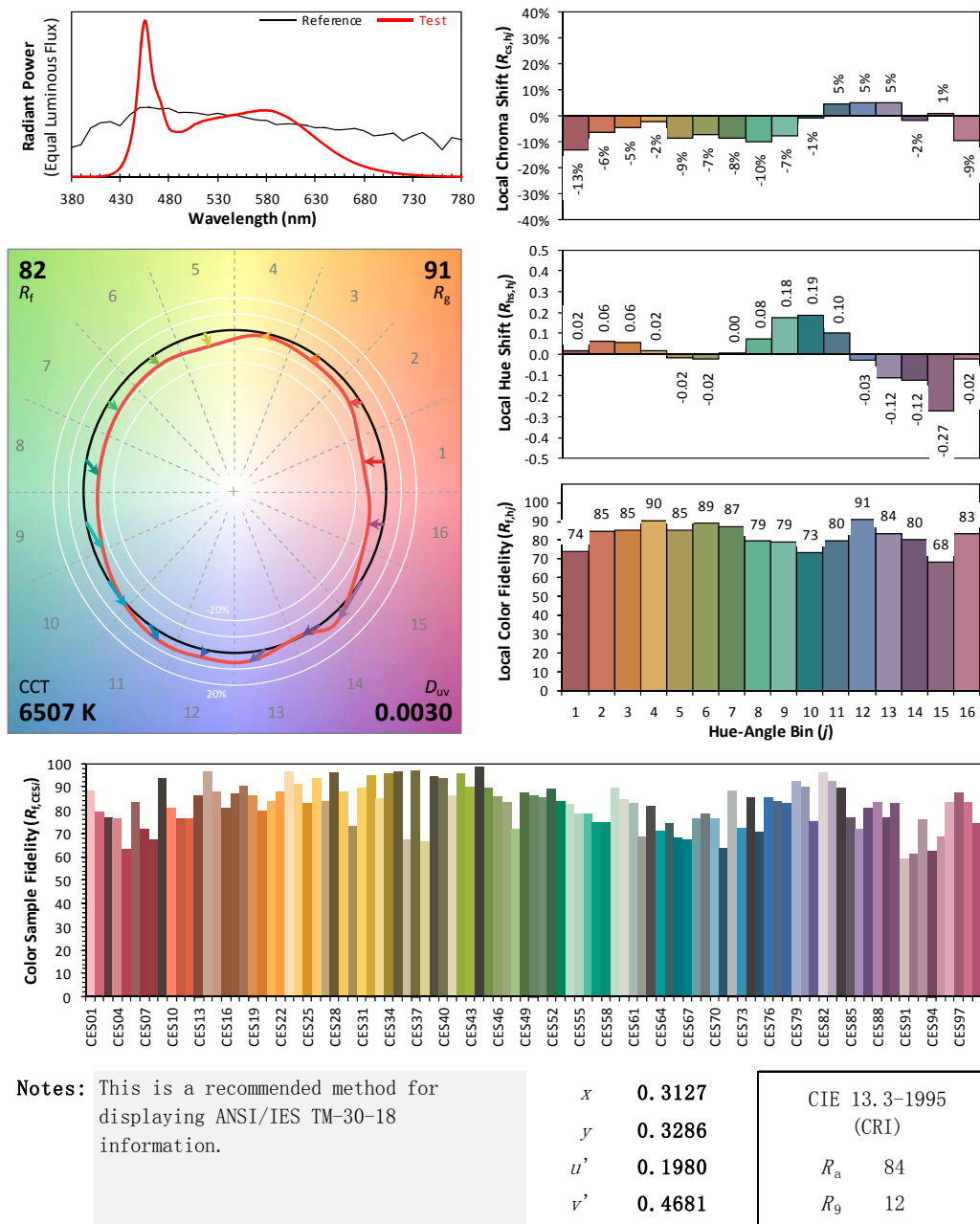
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 10.5T8/3F/8CCTS/EXT/SD/A2



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.