

## 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/A2**

### Laboratory: Lea ding Testing Laboratories

**NVLAP CODE: 200960-0**

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,  
Hangzhou, Zhejiang Province, China 311100

Tel: +86571 86376106

[www.ltlqa.com](http://www.ltlqa.com)

Report No.: HZ23060027a

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

Review by:

*Wei Fei*

Engineer: Wei Fei  
Jul. 07, 2023

Approved by:



*April Zou*

Manager: April Zou  
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/A2 3000K Setting	9.5T8/2F/8CCTS/EX T/SD/A2 3500K Setting	9.5T8/2F/8CCTS/E XT/SD/A2 4000K Setting
Luminous Efficacy (Lumens /Watt)	130.6	136.4	140.3
Total Luminous Flux (Lumens)	1509.6	1558.9	1587.9
Power (Watts)/2	11.56	11.43	11.32
Power Factor	0.9908	0.9907	0.9903
CCT (K)	3091	3513	3943
CRI	82.2	84.4	85.5
Stabilization Time (Light & Power)	50 mins	50 mins	50 mins
Note	3000K	3500K	4000K

Tested Model	9.5T8/2F/8CCTS/EX T/SD/A2 5000K Setting	9.5T8/2F/8CCTS/EX T/SD/A2 6500K Setting
Luminous Efficacy (Lumens /Watt)	140.9	135.0
Total Luminous Flux (Lumens)	1600.9	1554.3
Power (Watts)/2	11.36	11.51
Power Factor	0.9903	0.9908
CCT (K)	4972	6318
CRI	85.6	83.8
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

## 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 (3500K Setting) .....	17
Sphere-Spectroradiometer Method.....	17
Spectral Power Distribution - Sphere Spectroradiometer Method .....	18
Chromaticity Diagram - Sphere Spectroradiometer Method.....	19
Nominal CCT Quadrangles – Sphere Spectroradiometer Method .....	20
Color Rendition Report – Sphere Spectroradiometer Method .....	21
TEST RESULTS (4000K Setting) .....	22
Sphere-Spectroradiometer Method.....	22
Spectral Power Distribution - Sphere Spectroradiometer Method .....	23
Chromaticity Diagram - Sphere Spectroradiometer Method.....	24
Nominal CCT Quadrangles – Sphere Spectroradiometer Method .....	25
Color Rendition Report – Sphere Spectroradiometer Method .....	26
TEST RESULTS (5000K Setting) .....	27

Sphere-Spectroradiometer Method.....	27
Spectral Power Distribution - Sphere Spectroradiometer Method .....	28
Chromaticity Diagram - Sphere Spectroradiometer Method.....	29
Nominal CCT Quadrangles – Sphere Spectroradiometer Method .....	30
Color Rendition Report – Sphere Spectroradiometer Method .....	31
TEST RESULTS (6500K Setting) .....	32
Sphere-Spectroradiometer Method.....	32
Spectral Power Distribution - Sphere Spectroradiometer Method .....	33
Chromaticity Diagram - Sphere Spectroradiometer Method.....	34
Nominal CCT Quadrangles – Sphere Spectroradiometer Method .....	35
Color Rendition Report – Sphere Spectroradiometer Method .....	36
EQUIPMENT LIST .....	37
TEST METHODS .....	37
Seasoning of SSL Product.....	37
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	37
Goniophotometer Method .....	38
Photometric and Electrical Measurements .....	38
Color Characteristics Measurements.....	38

## SAMPLE PHOTO

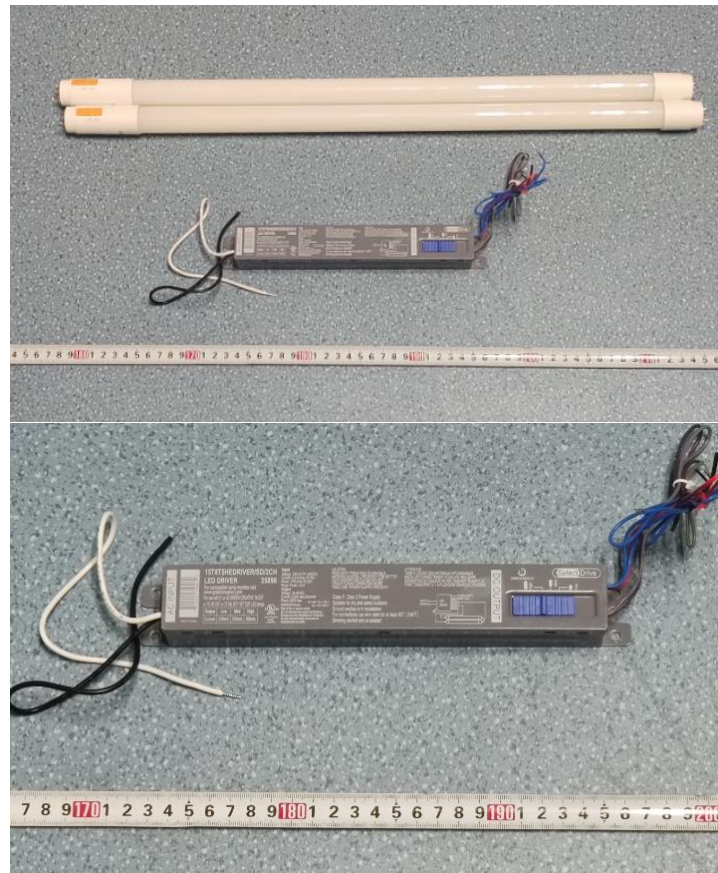


Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 9.5T8/2F/8CCTS/EXT/SD/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)	0.194	0.093
Power Factor	0.9908	0.9041
Test Power (W)/2	11.56	11.63
THD A%	4.98	9.87
Luminous Efficacy (lm/W)	130.6	129.6
Total Luminous Flux (lm)	1509.6	1507.8
Color Rendering Index (CRI)	82.2	
R9	4.4	
Correlated Color Temperature (CCT)(K)	3091	
Chromaticity Chroma x	0.4302	
Chromaticity Chroma y	0.4011	
Chromaticity Chroma u	0.2475	
Chromaticity Chroma v	0.3461	
Duv	-0.0002	
Chromaticity Chroma u'	0.2475	
Chromaticity Chroma v'	0.5192	

Special Color Rendering Indices	
R1	80.8
R2	92.1
R3	94.6
R4	79.4
R5	81.3
R6	90.5
R7	81.5
R8	57.5
R9	4.4
R10	82.1
R11	78.7
R12	72.1
R13	83.7
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

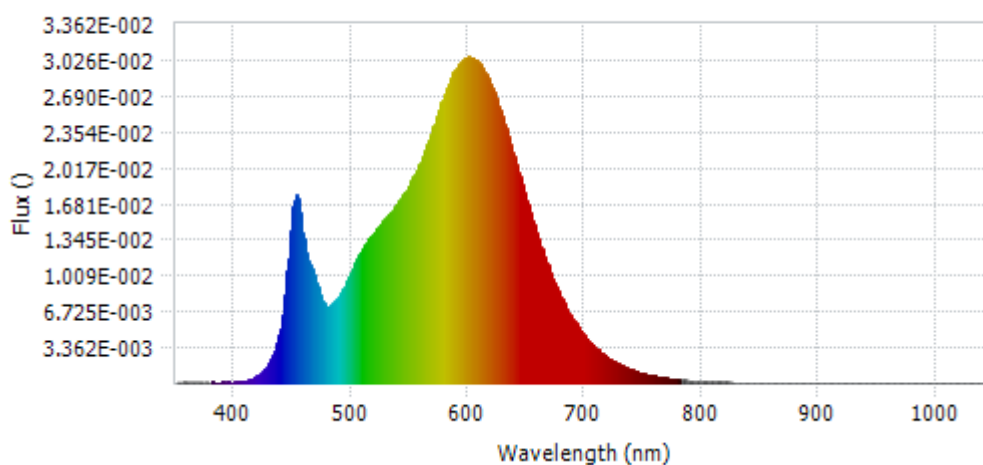


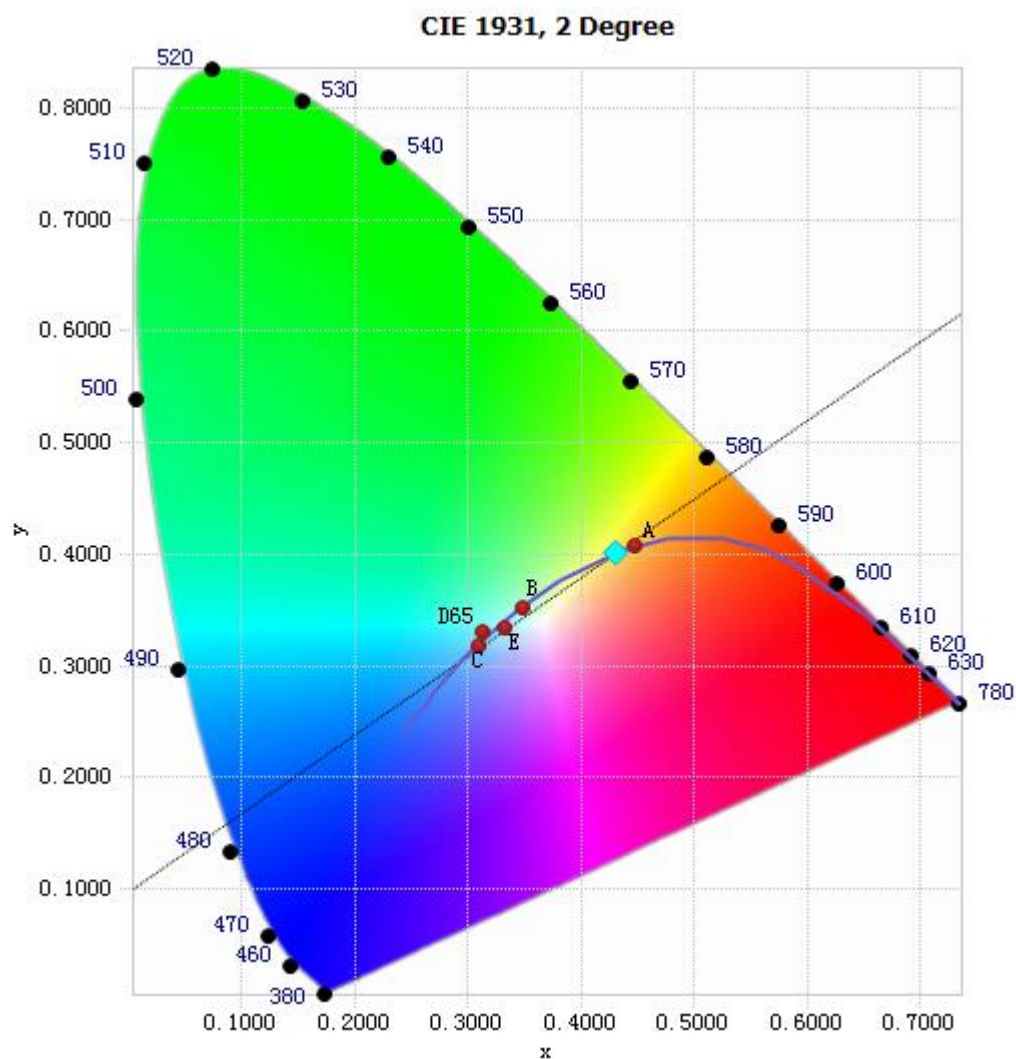
Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.14E-04	485	7.59E-03	590	2.96E-02	695	5.08E-03
385	9.59E-05	490	8.29E-03	595	3.02E-02	700	4.36E-03
390	1.02E-04	495	9.29E-03	600	3.06E-02	705	3.73E-03
395	1.05E-04	500	1.05E-02	605	3.03E-02	710	3.20E-03
400	9.40E-05	505	1.17E-02	610	2.98E-02	715	2.74E-03
405	1.24E-04	510	1.26E-02	615	2.89E-02	720	2.35E-03
410	2.21E-04	515	1.36E-02	620	2.77E-02	725	2.00E-03
415	4.21E-04	520	1.42E-02	625	2.63E-02	730	1.71E-03
420	7.37E-04	525	1.48E-02	630	2.46E-02	735	1.46E-03
425	1.23E-03	530	1.55E-02	635	2.28E-02	740	1.24E-03
430	2.03E-03	535	1.61E-02	640	2.09E-02	745	1.05E-03
435	3.36E-03	540	1.69E-02	645	1.90E-02	750	8.96E-04
440	5.75E-03	545	1.78E-02	650	1.70E-02	755	7.67E-04
445	1.05E-02	550	1.86E-02	655	1.53E-02	760	6.65E-04
450	1.65E-02	555	1.97E-02	660	1.35E-02	765	5.65E-04
455	1.67E-02	560	2.10E-02	665	1.19E-02	770	4.83E-04
460	1.27E-02	565	2.24E-02	670	1.04E-02	775	4.17E-04
465	1.09E-02	570	2.40E-02	675	9.10E-03	780	3.54E-04
470	9.42E-03	575	2.56E-02	680	7.90E-03		
475	7.64E-03	580	2.71E-02	685	6.85E-03		
480	7.18E-03	585	2.86E-02	690	5.91E-03		

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



## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4302, 0.4011)

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

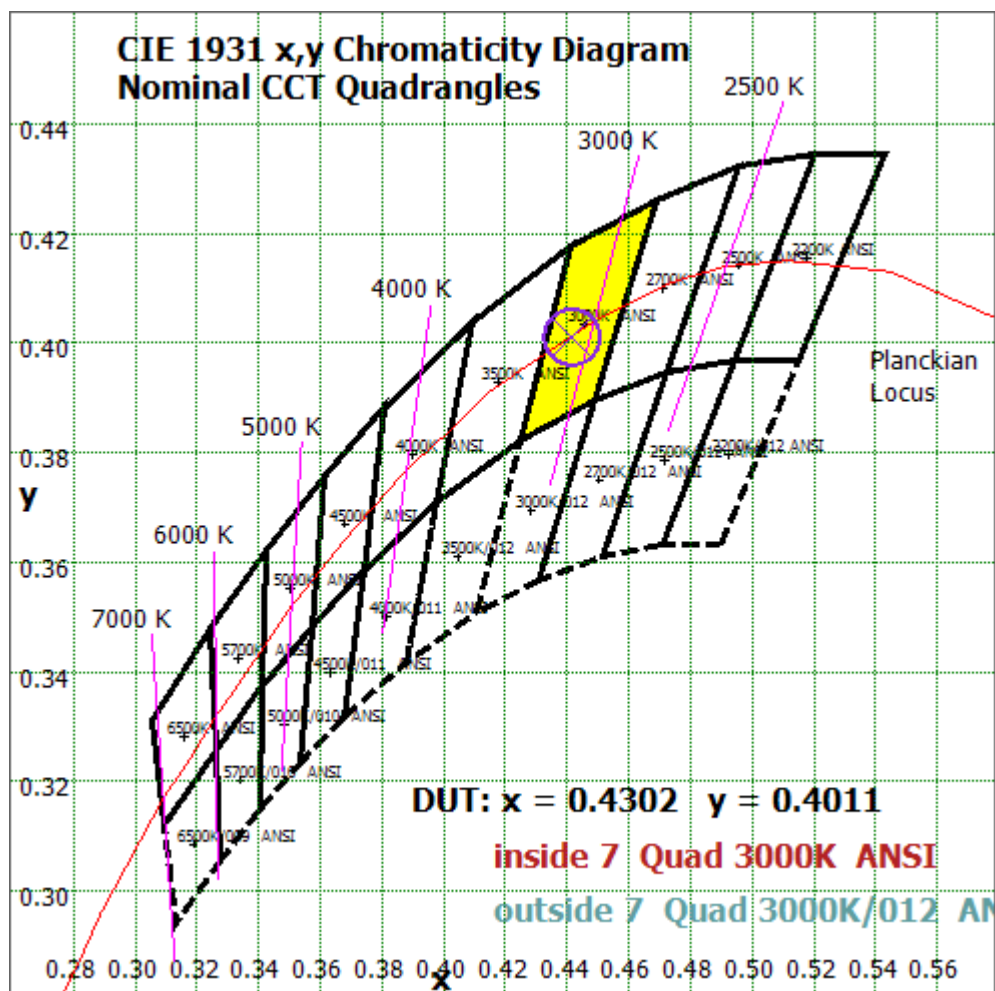


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

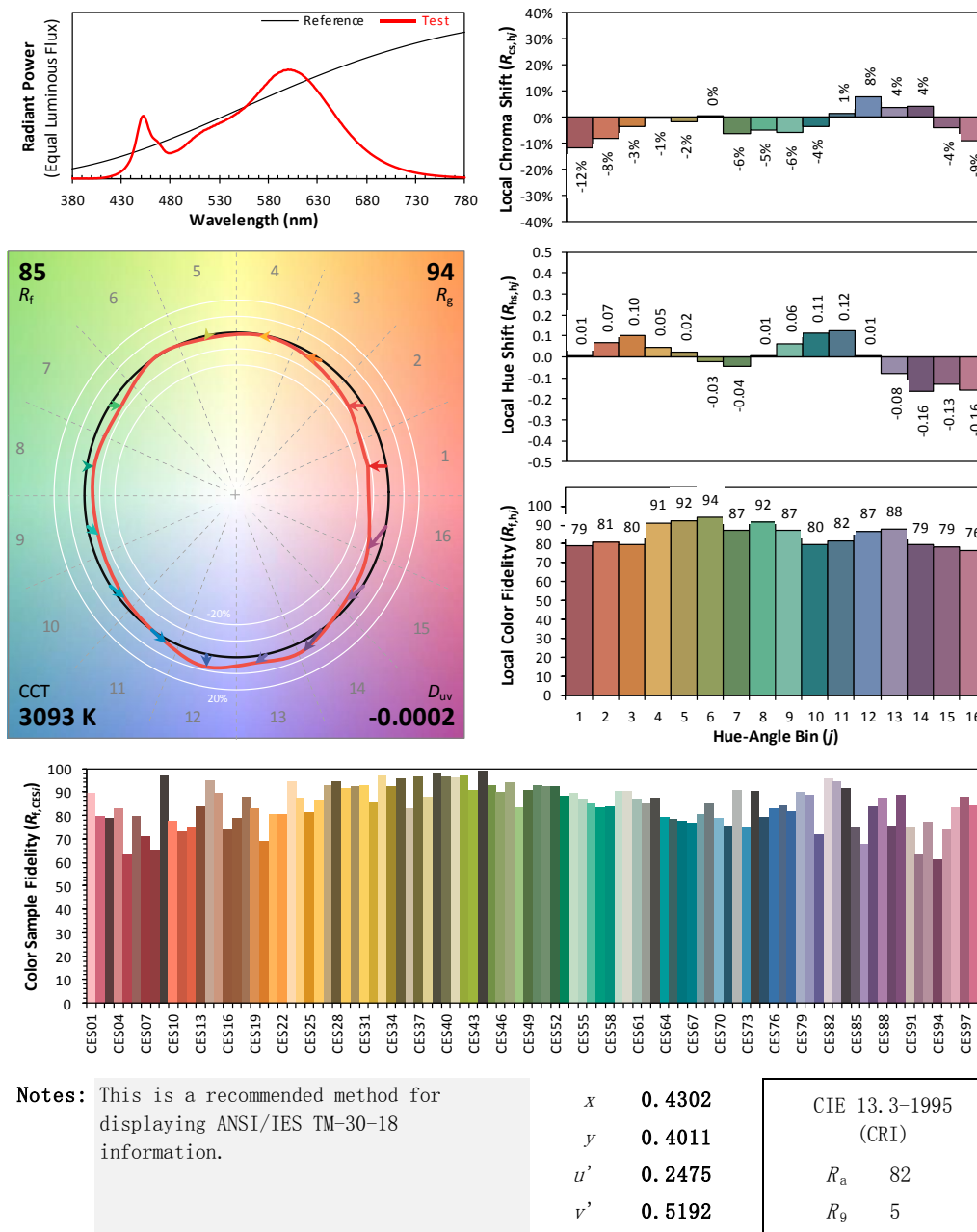
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 9.5T8/2F/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)	0.195
Power Factor	0.9901
Power (W)/2	11.58
Luminous Efficacy (lm/W)	131.1
Total Luminous Flux (lm)	1518.4
Beam Angle (°)	112.1 (0°-180°) / 250.2 (90°-270°)
Center Beam Candle Power (cd)	239
Maximum Beam Candle Power (cd)	239.3 (At: C=260.0, Gamma=4.5)
Spacing Criteria	1.27 (0°-180°) / 1.46 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	41.15%
Zonal Lumens in the 60 °-90 °Zone	27.03%
Zonal Lumens in the 90 °-120 °Zone	18.83%
Zonal Lumens in the 120 °-180 °Zone	12.99%

Table 4: Test data per Goniophotometer Method

### Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	22.665	1.49%
10- 20	65.795	4.33%
20- 30	102.904	6.78%
30- 40	130.984	8.63%
40- 50	148.275	9.77%
50- 60	154.164	10.15%
60- 70	149.741	9.86%
70- 80	137.847	9.08%
80- 90	122.781	8.09%
90-100	108.963	7.18%
100-110	95.525	6.29%
110-120	81.452	5.36%
120-130	68.242	4.49%
130-140	54.763	3.61%
140-150	39.886	2.63%
150-160	23.861	1.57%
160-170	9.495	0.63%
170-180	1.045	0.07%
Total	1518.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	624.787	41.15%
60- 90	410.369	27.03%
0-90	1035.16	68.17%
90- 180	483.232	31.83%
0- 180	1518.4	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

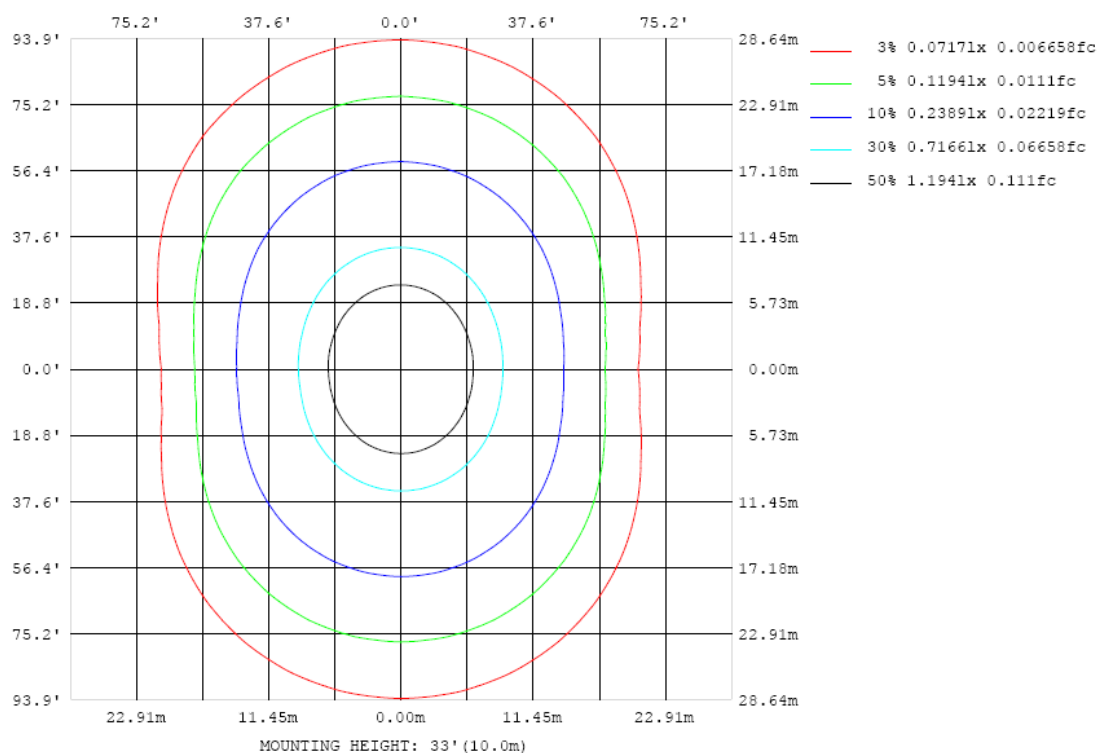


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

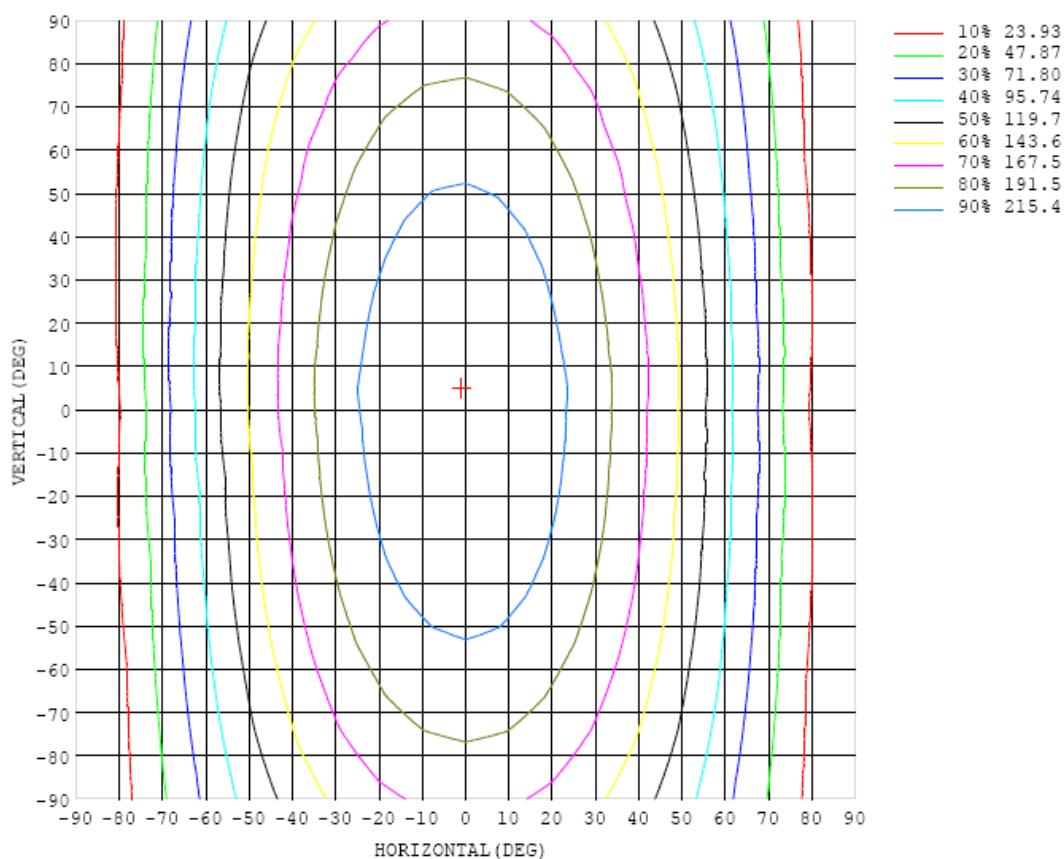


Chart 6: Isocandela Plot

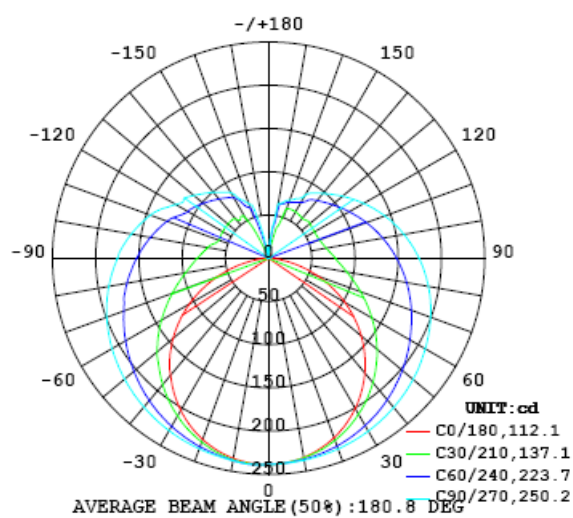


Chart 7: Polar Candela Distribution

## 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	239	239	239	239	239	239	239	239	239	239	239	239	239	239	239	239	239	239	239
5	237	237	237	237	237	238	238	238	238	238	238	238	238	238	238	238	238	238	238
10	234	234	234	234	235	236	236	237	237	237	237	237	237	236	236	235	235	235	235
15	228	228	229	230	231	233	234	235	236	236	236	235	234	233	232	231	230	230	230
20	221	221	222	224	226	229	231	233	234	235	234	233	232	230	227	225	224	223	223
25	212	212	214	217	220	224	228	230	232	233	232	231	228	225	222	218	216	214	214
30	201	201	204	208	213	219	223	227	230	231	230	228	224	220	215	210	206	203	203
35	188	189	193	199	205	212	219	224	227	228	227	224	219	213	207	200	194	191	191
40	173	175	180	188	197	206	213	220	224	225	224	220	214	206	198	189	182	177	177
45	157	159	166	176	187	198	208	215	220	222	220	216	208	199	188	177	168	162	162
50	140	143	151	164	177	190	202	211	216	218	216	211	202	191	178	165	153	145	144
55	121	125	136	151	167	182	195	206	212	214	212	206	196	182	167	151	137	127	126
60	102	107	120	138	157	174	189	200	207	209	207	200	189	174	157	138	121	108	106
65	81.3	87.7	104	125	147	166	182	195	202	205	202	195	182	166	147	125	105	88.7	85.0
70	61.2	69.6	89.0	113	137	158	176	189	197	199	197	189	175	158	136	113	88.7	69.9	63.8
75	40.6	51.5	75.5	102	128	150	169	183	191	194	191	183	169	150	127	101	74.6	51.2	42.7
80	21.7	35.5	63.2	92.0	119	143	162	176	185	188	185	176	162	143	119	91.0	61.8	34.5	23.2
85	6.96	23.5	53.5	83.6	112	136	155	169	178	181	178	169	155	135	111	82.5	52.0	21.8	7.73
90	0.47	17.0	46.8	77.4	105	129	148	163	171	174	171	162	148	128	104	76.4	45.3	15.3	1.18
95	1.26	15.5	42.6	72.0	98.4	122	141	155	164	167	164	155	141	122	97.8	71.0	41.3	14.0	0.48
100	3.08	16.8	40.6	67.8	92.9	116	134	148	156	159	156	148	134	115	92.4	66.9	39.5	15.6	0.43
105	5.51	19.8	40.2	64.8	88.1	110	127	140	149	151	148	141	127	109	87.8	64.1	39.4	18.7	0.37
110	7.72	23.9	41.1	62.7	83.9	104	120	133	141	143	141	133	120	104	83.8	62.3	40.6	22.8	0.28
115	4.97	28.5	42.9	61.6	80.5	98.6	114	125	133	135	133	126	114	98.7	80.4	61.5	42.7	27.2	0.30
120	0.64	33.4	45.5	61.3	78.5	93.8	108	118	125	127	125	118	108	94.2	78.6	61.4	45.4	30.1	0.30
125	0.57	38.4	48.4	61.6	76.3	89.6	102	111	117	119	117	112	102	90.0	76.6	61.9	48.4	30.7	0.33
130	1.63	42.9	51.6	62.3	74.6	85.8	96.4	105	110	112	110	105	96.9	86.4	75.0	62.7	51.6	32.3	0.71
135	2.89	46.1	54.7	61.9	73.4	82.6	91.5	98.5	103	105	103	98.9	92.0	83.2	73.9	63.8	54.4	37.4	0.95
140	4.07	33.4	56.3	60.5	67.5	80.0	87.1	92.9	96.7	98.0	96.7	93.3	87.7	80.5	73.2	64.7	56.1	28.8	1.14
145	4.90	28.7	55.3	61.4	66.8	72.4	82.6	87.9	90.8	91.9	91.3	88.3	83.3	79.0	72.5	65.9	56.6	27.7	1.41
150	5.30	15.3	56.3	62.2	66.4	70.5	74.5	78.3	81.8	84.0	82.4	77.6	73.9	71.5	68.8	64.7	56.3	20.8	1.70
155	5.38	7.61	40.8	62.1	66.1	68.8	71.4	73.2	75.1	76.3	75.7	73.5	71.4	68.7	64.9	58.7	48.1	11.7	2.01
160	5.25	5.04	33.0	61.2	64.6	67.3	69.1	70.4	71.3	71.8	71.5	70.6	68.8	66.3	61.9	57.5	32.6	4.25	2.26
165	5.06	13.1	12.1	37.4	58.7	64.6	65.3	66.0	66.8	67.2	67.3	66.4	65.2	63.1	57.3	32.5	17.0	4.00	2.74
170	4.71	11.1	5.99	9.41	27.9	38.7	42.3	54.4	63.1	63.9	63.5	57.7	42.0	30.0	23.9	13.9	3.40	10.6	3.00
175	3.84	7.40	9.89	12.9	7.69	7.32	8.44	9.35	13.4	12.6	8.76	8.52	7.03	5.20	1.81	3.41	7.75	7.05	3.28
180	4.63	4.44	3.99	4.31	5.37	3.56	2.74	1.67	0.00	2.37	0.00	8.66	17.6	17.5	15.7	6.53	8.86	6.54	4.45

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	239	239	239	239	239	239	239	239	239	239	239	239	239	239	239	239	239		
5	238	238	239	239	239	239	239	239	239	239	239	239	239	238	238	238	237		
10	235	236	237	237	237	238	238	238	238	238	237	237	237	236	236	235	234		
15	231	232	232	233	234	235	236	236	236	236	235	234	233	232	231	230	229		
20	224	225	226	228	230	232	233	234	235	234	233	231	229	226	224	223	222		
25	216	217	219	222	226	229	231	232	233	232	230	227	224	220	217	215	213		
30	205	207	211	215	220	224	228	230	230	229	226	223	218	213	208	204	202		
35	193	196	201	208	214	220	224	227	228	226	223	218	211	205	198	193	190		
40	179	183	191	199	207	215	220	224	225	223	219	212	204	196	187	180	176		
45	165	171	179	190	200	209	216	220	221	219	214	206	197	186	176	167	161		
50	148	156	168	180	193	203	212	216	217	215	209	200	189	176	164	152	144		
55	130	141	156	172	185	197	207	212	213	211	204	194	181	167	151	136	126		
60	112	125	143	162	177	191	201	207	209	206	199	187	173	156	138	120	107		
65	92.4	110	131	152	171	185	196	203	204	201	193	181	166	146	125	104	88.3		
70	73.4	94.3	119	142	163	178	190	197	199	196	188	175	158	136	112	88.5	69.0		
75	55.2	80.2	108	133	155	173	184	192	194	190	181	169	150	127	101	73.9	50.5		
80	39.3	68.0	97.8	125	148	166	178	186	188	184	175	162	143	119	91.0	61.3	34.1		
85	27.4	58.4	89.4	117	141	160	173	179	181	178	170	155	135	111	82.5	51.5	21.7		
90	20.7	51.5	82.5	110	134	153	166	173	175	172	163	148	128	104	75.4	44.3	14.6		
95	16.0	46.3	76.6	104	127	146	159	167	169	165	156	141	122	97.8	69.1	37.1	6.88		
100	12.9	41.0	71.6	98.2	121	139	152	159	161	158	149	135	116	92.5	63.9	28.9	7.17		
105	14.7	36.8	65.5	93.1	115	132	144	152	154	150	142	128	110	86.9	55.0	30.7	8.38		
110	16.4	38.3	61.4	86.0	108	125	137	144	146	142	134	120	100	76.0	56.1	33.1	9.94		
115	9.46	39.9	61.3	81.6	100	116	127	134	136	131	122	108	89.7	77.3	57.0	34.7	11.7		
120	16.6	41.7	61.4	79.3	95.3	108	117	123	124	120	111	101	92.2	76.7	57.4	36.8	13.6		
125	14.7	42.2	61.7	77.6	92.1	104	113	118	120	118	111	102	89.3	75.2	57.8	38.9	11.0		
130	2.48	34.9	61.5	76.0	88.5	99.0	107	111	113	111	105	96.8	86.2	73.9	58.6	40.6	2.27		
135	2.44	41.7	61.4	74.6	85.1	94.0	101	105	106	104	99.7	92.5	83.3	72.8	54.8	41.5	4.25		
140	10.5	41.0	58.9	72.9	82.1	89.5	95.0	98.4	99.5	98.4	94.3	88.2	80.7	69.4	55.4	34.1	6.45		
145	2.55	23.6	56.5	71.7	78.7	85.4	89.9	92.6	93.4	92.3	89.4	84.5	75.0	65.0	55.5	21.1	4.57		
150	1.12	8.24	53.0	66.8	76.1	80.7	83.4	86.6	87.6	86.2	82.3	74.0	68.5	62.5	48.0	6.82	3.17		
155	3.30	15.0	18.6	56.8	64.7	68.6	71.4	73.4	74.2	73.8	72.3	68.6	64.9	57.8	25.9	11.8	5.57		
160	3.08	2.30	7.93	15.4	41.5	62.2	64.5	66.2	66.9	66.9	65.4	64.0	52.6	31.6	8.33	12.0	7.45		
165	4.27	2.72	1.95	8.46	8.27	15.9	31.9	40.7	43.8	43.3	39.5	30.5	17.8	9.26	19.2	5.56	10.4		
170	2.24	5.60	2.02	2.47	1.55	9.14	15.2	6.77	7.71	7.87	9.72	15.7	12.7	9.52	4.33	5.42	10.6		
175	3.25	1.95	5.20	4.55	2.08	1.05	1.65	2.44	2.42	2.29	2.34	3.16	5.32	8.29	9.05	5.76	2.66		
180	4.45	4.35	4.34	4.19	4.01	3.32	3.09	2.40	2.30	0.68	2.49	2.71	4.17	5.17	6.32	7.03	7.39		

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)	0.192	0.092
Power Factor	0.9907	0.9029
Test Power (W)/2	11.43	11.52
THD A%	5.07	9.88
Luminous Efficacy (lm/W)	136.4	135.4
Total Luminous Flux (lm)	1558.9	1559.7
Color Rendering Index (CRI)	84.4	
R9	13.3	
Correlated Color Temperature (CCT)(K)	3513	
Chromaticity Chroma x	0.4020	
Chromaticity Chroma y	0.3836	
Chromaticity Chroma u	0.2365	
Chromaticity Chroma v	0.3385	
Duv	-0.0024	
Chromaticity Chroma u'	0.2365	
Chromaticity Chroma v'	0.5078	

Special Color Rendering Indices	
R1	83.6
R2	93.1
R3	95.3
R4	82.1
R5	84
R6	90.4
R7	83.5
R8	62.9
R9	13.3
R10	83.7
R11	81.8
R12	71
R13	86.3
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

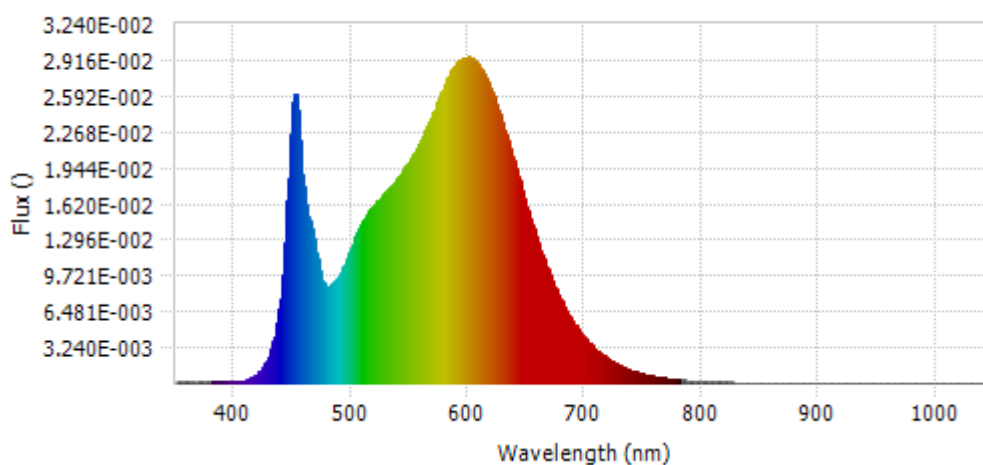
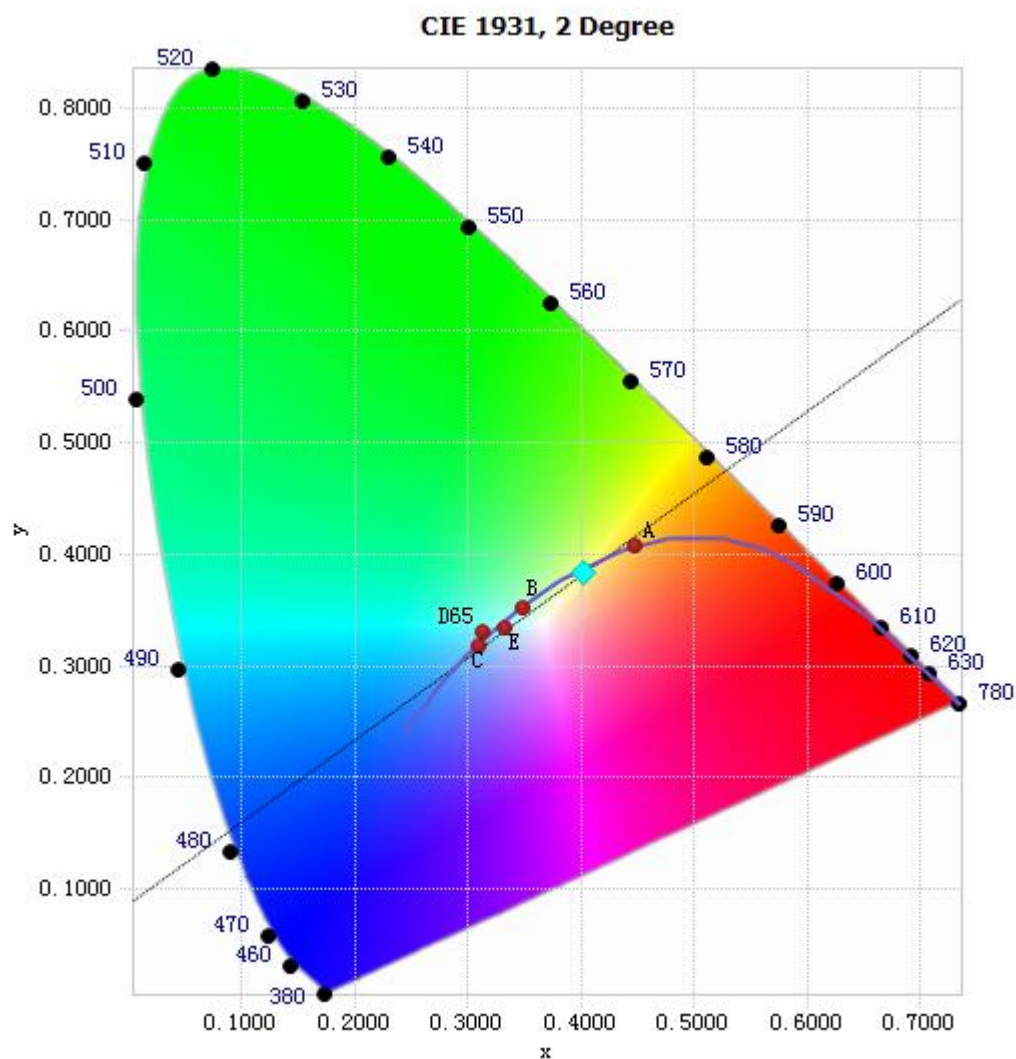


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.19E-04	485	9.12E-03	590	2.89E-02	695	4.73E-03
385	1.16E-04	490	9.81E-03	595	2.93E-02	700	4.05E-03
390	1.28E-04	495	1.09E-02	600	2.95E-02	705	3.47E-03
395	1.19E-04	500	1.23E-02	605	2.91E-02	710	2.96E-03
400	1.29E-04	505	1.36E-02	610	2.85E-02	715	2.54E-03
405	1.71E-04	510	1.46E-02	615	2.76E-02	720	2.18E-03
410	2.86E-04	515	1.56E-02	620	2.63E-02	725	1.86E-03
415	5.15E-04	520	1.61E-02	625	2.49E-02	730	1.58E-03
420	8.97E-04	525	1.67E-02	630	2.32E-02	735	1.34E-03
425	1.57E-03	530	1.74E-02	635	2.15E-02	740	1.15E-03
430	2.71E-03	535	1.79E-02	640	1.97E-02	745	9.79E-04
435	4.77E-03	540	1.86E-02	645	1.78E-02	750	8.32E-04
440	8.61E-03	545	1.93E-02	650	1.60E-02	755	7.19E-04
445	1.64E-02	550	2.00E-02	655	1.43E-02	760	6.08E-04
450	2.54E-02	555	2.10E-02	660	1.26E-02	765	5.18E-04
455	2.33E-02	560	2.21E-02	665	1.11E-02	770	4.52E-04
460	1.69E-02	565	2.32E-02	670	9.71E-03	775	3.83E-04
465	1.44E-02	570	2.45E-02	675	8.49E-03	780	3.35E-04
470	1.18E-02	575	2.58E-02	680	7.35E-03		
475	9.27E-03	580	2.70E-02	685	6.37E-03		
480	8.72E-03	585	2.82E-02	690	5.50E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4020, 0.3836)

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

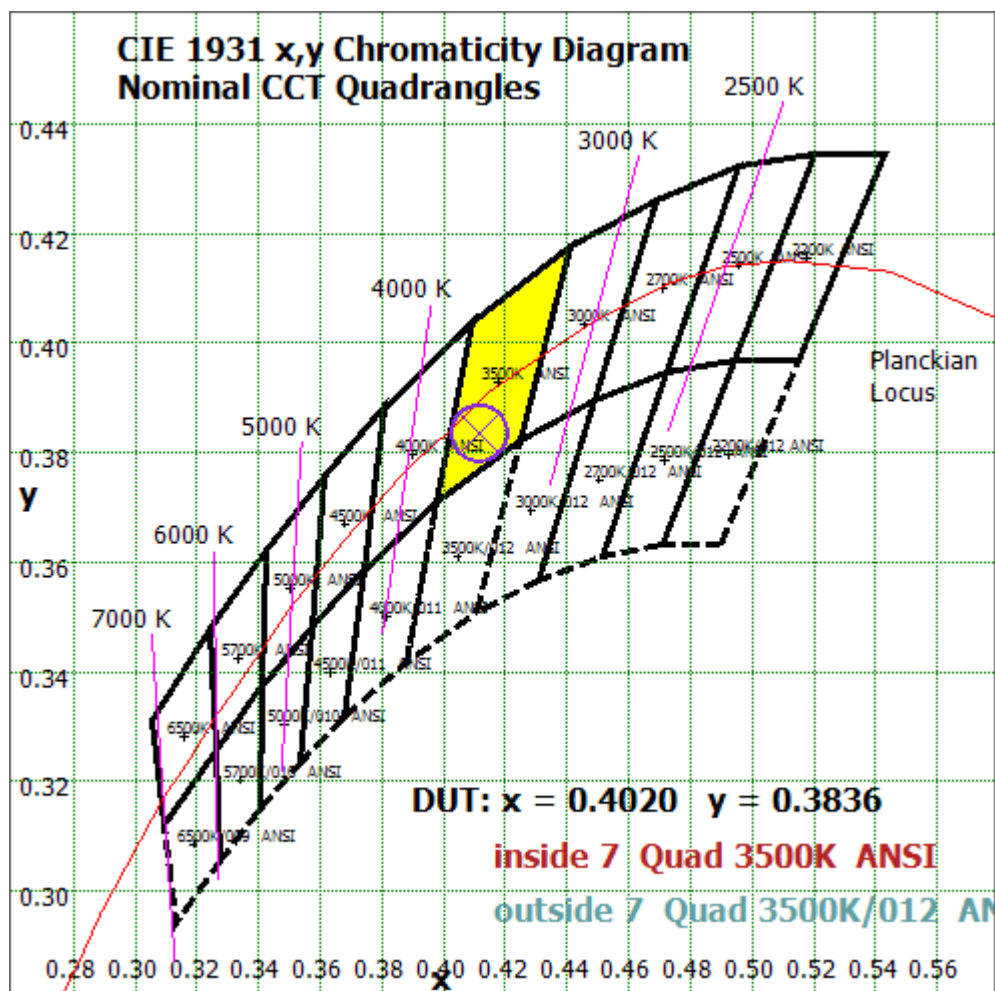


Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

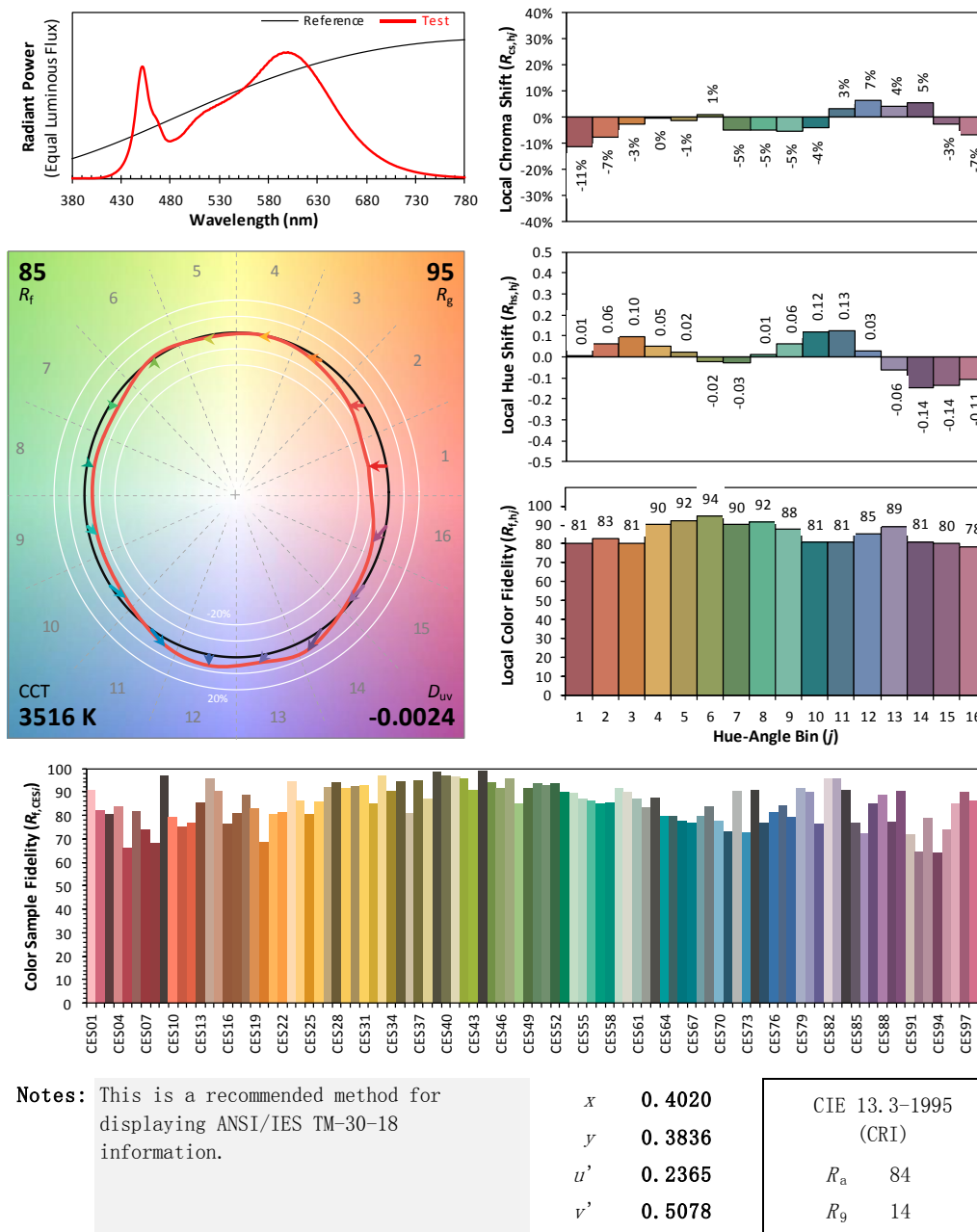
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 9.5T8/2F/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)	0.191	0.091
Power Factor	0.9903	0.9012
Test Power (W)/2	11.32	11.40
THD A%	5.29	10.01
Luminous Efficacy (lm/W)	140.3	139.8
Total Luminous Flux (lm)	1587.9	1593.3
Color Rendering Index (CRI)	85.5	
R9	18.3	
Correlated Color Temperature (CCT)(K)	3943	
Chromaticity Chroma x	0.3807	
Chromaticity Chroma y	0.3706	
Chromaticity Chroma u	0.2278	
Chromaticity Chroma v	0.3326	
Duv	-0.0030	
Chromaticity Chroma u'	0.2278	
Chromaticity Chroma v'	0.4989	

Special Color Rendering Indices	
R1	84.9
R2	93.1
R3	95.8
R4	83.8
R5	85.2
R6	89.4
R7	85.3
R8	66.7
R9	18.3
R10	83.1
R11	83.5
R12	68.6
R13	87.3
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

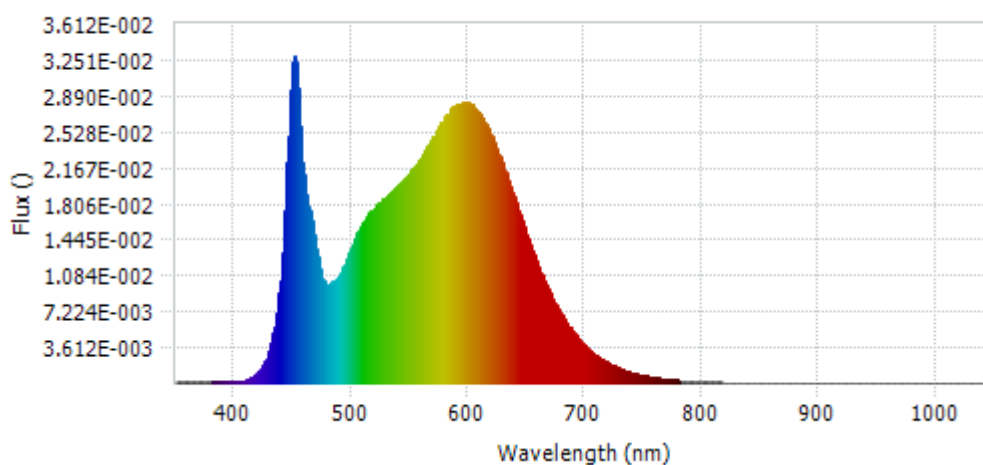
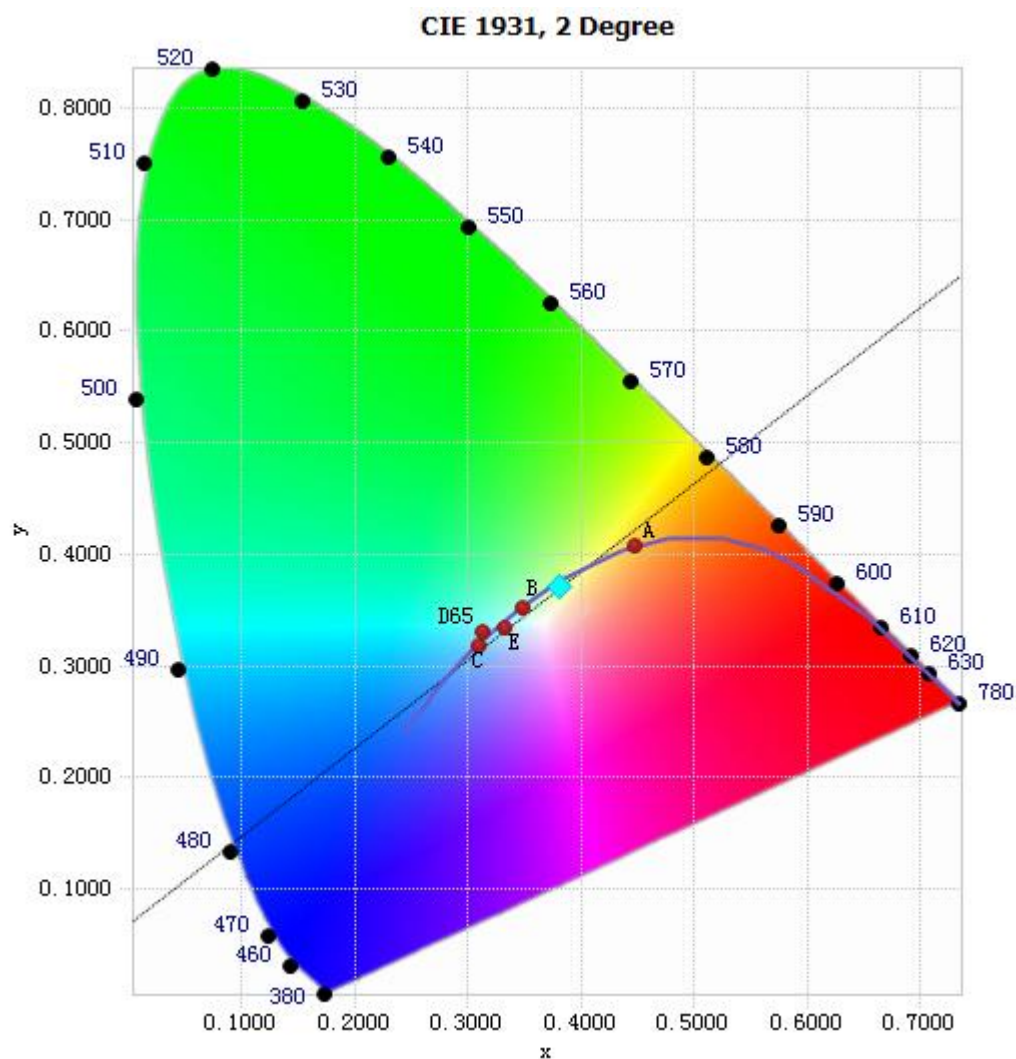


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.56E-04	485	1.03E-02	590	2.81E-02	695	4.38E-03
385	1.46E-04	490	1.10E-02	595	2.83E-02	700	3.76E-03
390	1.51E-04	495	1.23E-02	600	2.82E-02	705	3.20E-03
395	1.41E-04	500	1.38E-02	605	2.77E-02	710	2.75E-03
400	1.36E-04	505	1.51E-02	610	2.70E-02	715	2.35E-03
405	1.70E-04	510	1.61E-02	615	2.60E-02	720	2.01E-03
410	3.22E-04	515	1.71E-02	620	2.48E-02	725	1.72E-03
415	6.25E-04	520	1.76E-02	625	2.34E-02	730	1.45E-03
420	1.12E-03	525	1.83E-02	630	2.17E-02	735	1.26E-03
425	2.02E-03	530	1.89E-02	635	2.02E-02	740	1.06E-03
430	3.63E-03	535	1.93E-02	640	1.84E-02	745	9.05E-04
435	6.39E-03	540	1.99E-02	645	1.66E-02	750	7.72E-04
440	1.17E-02	545	2.05E-02	650	1.49E-02	755	6.70E-04
445	2.23E-02	550	2.11E-02	655	1.33E-02	760	5.66E-04
450	3.24E-02	555	2.19E-02	660	1.18E-02	765	4.84E-04
455	2.78E-02	560	2.27E-02	665	1.03E-02	770	4.16E-04
460	1.99E-02	565	2.37E-02	670	8.99E-03	775	3.58E-04
465	1.69E-02	570	2.48E-02	675	7.87E-03	780	3.07E-04
470	1.34E-02	575	2.57E-02	680	6.84E-03		
475	1.05E-02	580	2.68E-02	685	5.92E-03		
480	9.89E-03	585	2.76E-02	690	5.10E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3807, 0.3706)

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

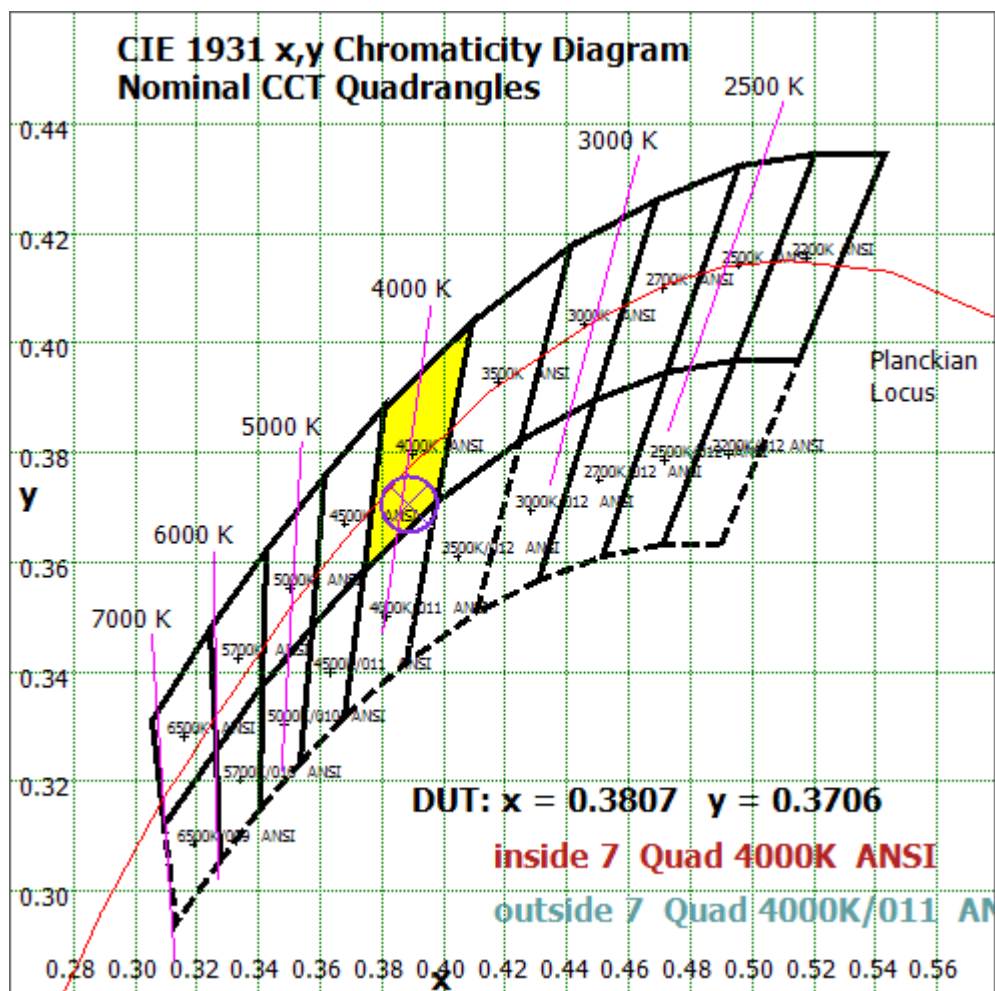


Chart14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

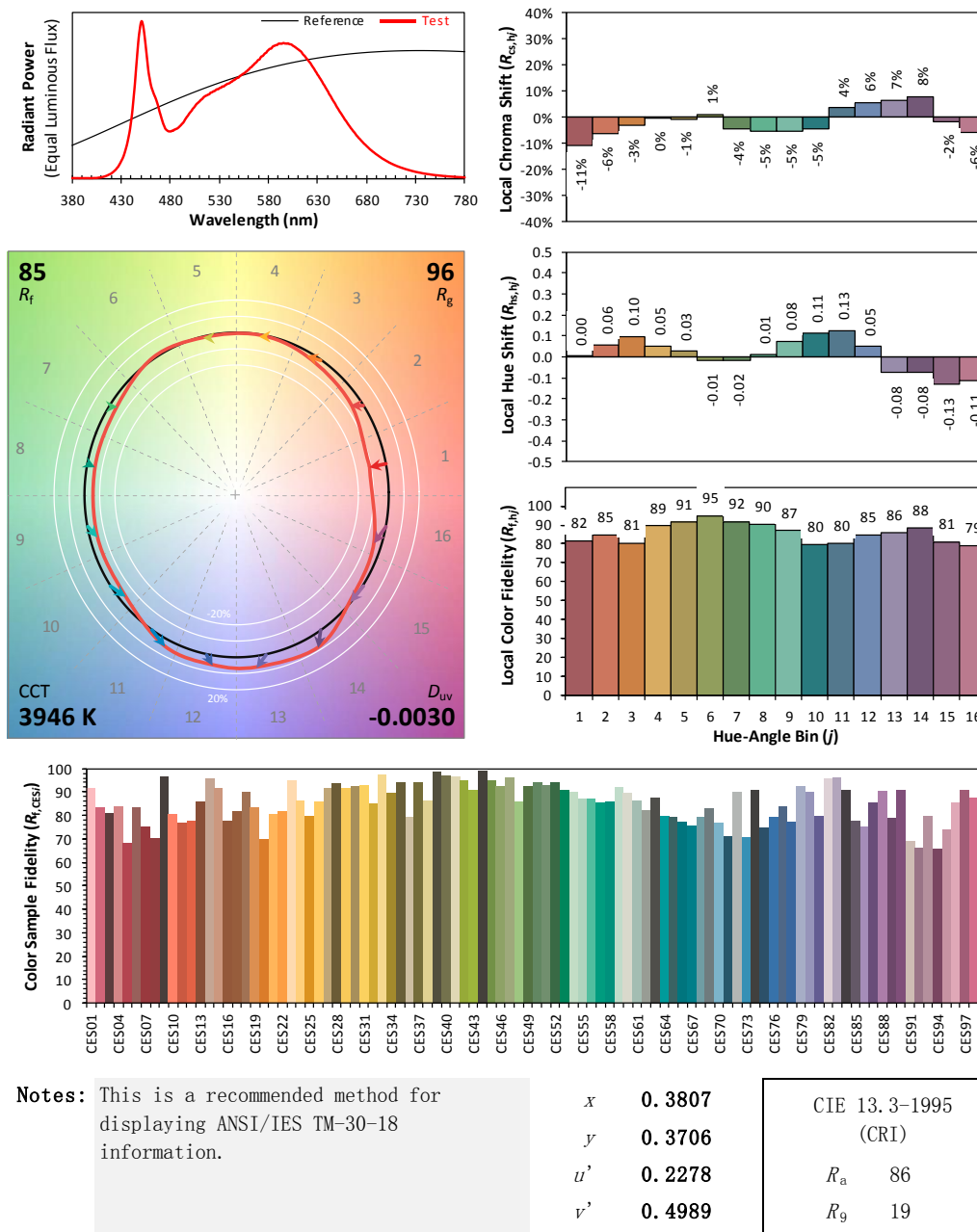
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 9.5T8/2F/8CCTS/EXT/SD/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)	0.191	0.092
Power Factor	0.9903	0.9017
Test Power (W)/2	11.36	11.44
THD A%	5.16	9.93
Luminous Efficacy (lm/W)	140.9	140.2
Total Luminous Flux (lm)	1600.9	1603.6
Color Rendering Index (CRI)	85.6	
R9	19.4	
Correlated Color Temperature (CCT)(K)	4972	
Chromaticity Chroma x	0.3455	
Chromaticity Chroma y	0.3493	
Chromaticity Chroma u	0.2126	
Chromaticity Chroma v	0.3224	
Duv	-0.0013	
Chromaticity Chroma u'	0.2126	
Chromaticity Chroma v'	0.4836	

Special Color Rendering Indices	
R1	84.5
R2	91.4
R3	94.7
R4	84.5
R5	84.6
R6	86.4
R7	87.9
R8	70.5
R9	19.4
R10	78.6
R11	84
R12	62.7
R13	86.7
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

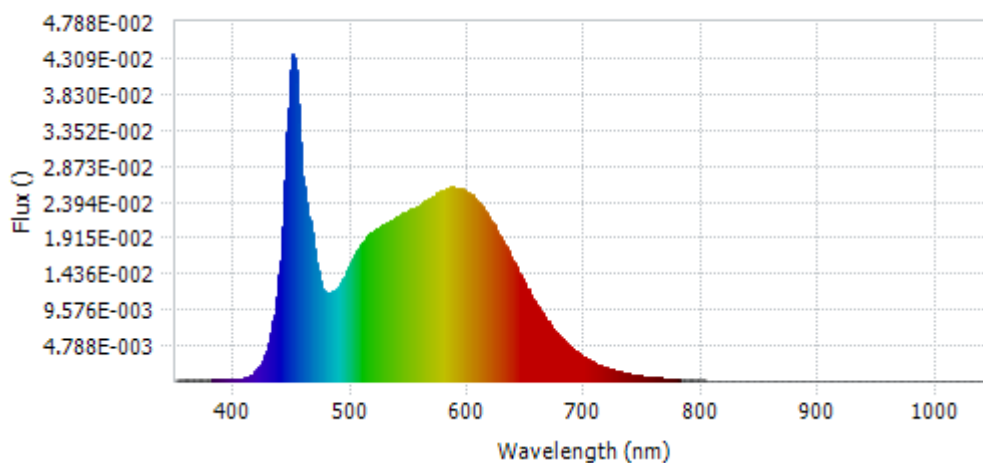


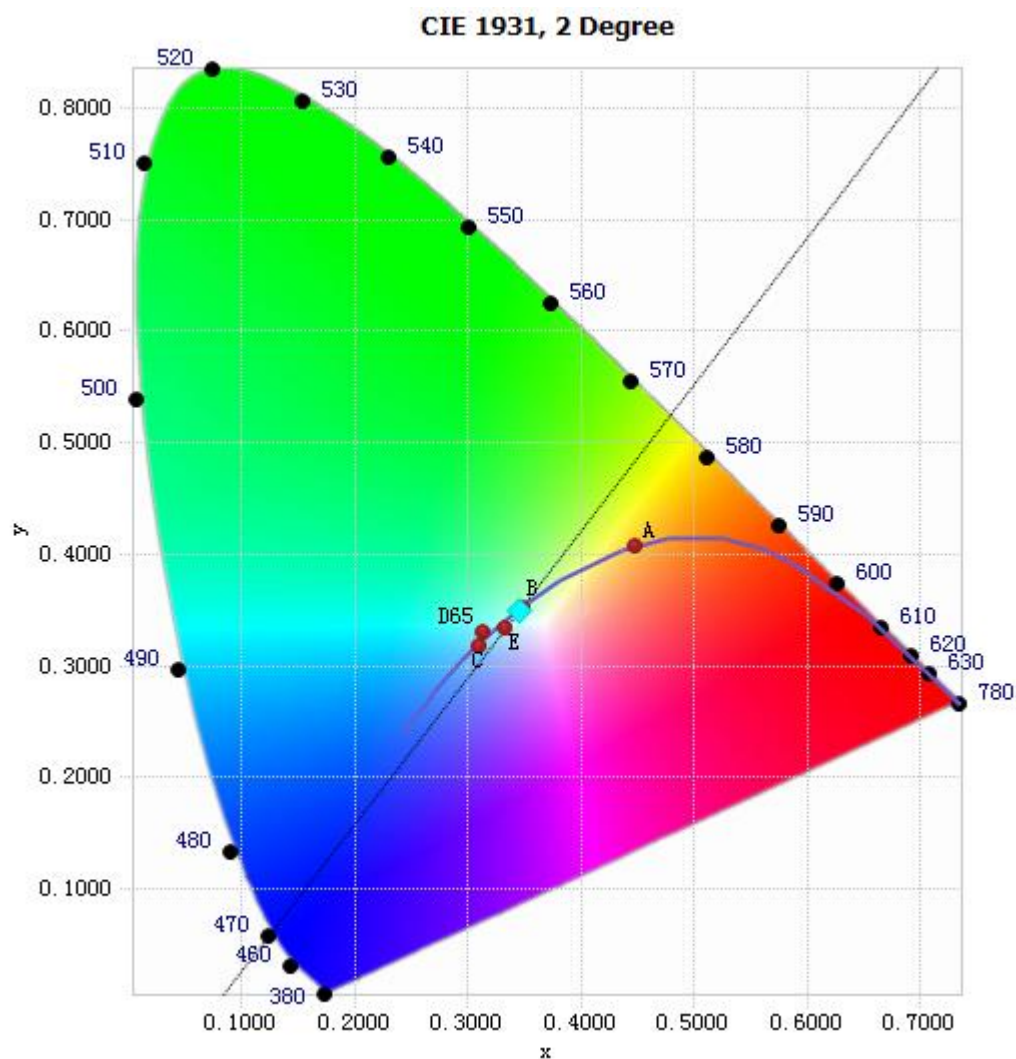
Chart16: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.93E-04	485	1.20E-02	590	2.58E-02	695	3.63E-03
385	1.87E-04	490	1.29E-02	595	2.56E-02	700	3.12E-03
390	1.81E-04	495	1.44E-02	600	2.51E-02	705	2.65E-03
395	1.65E-04	500	1.61E-02	605	2.44E-02	710	2.27E-03
400	1.70E-04	505	1.75E-02	610	2.36E-02	715	1.94E-03
405	2.49E-04	510	1.86E-02	615	2.25E-02	720	1.67E-03
410	4.89E-04	515	1.96E-02	620	2.12E-02	725	1.43E-03
415	9.21E-04	520	2.01E-02	625	1.99E-02	730	1.21E-03
420	1.75E-03	525	2.06E-02	630	1.84E-02	735	1.04E-03
425	3.19E-03	530	2.11E-02	635	1.70E-02	740	8.89E-04
430	5.67E-03	535	2.15E-02	640	1.55E-02	745	7.64E-04
435	9.98E-03	540	2.19E-02	645	1.39E-02	750	6.55E-04
440	1.83E-02	545	2.24E-02	650	1.24E-02	755	5.57E-04
445	3.33E-02	550	2.27E-02	655	1.11E-02	760	4.84E-04
450	4.35E-02	555	2.31E-02	660	9.78E-03	765	4.15E-04
455	3.43E-02	560	2.36E-02	665	8.58E-03	770	3.51E-04
460	2.47E-02	565	2.41E-02	670	7.48E-03	775	3.08E-04
465	2.05E-02	570	2.47E-02	675	6.50E-03	780	2.59E-04
470	1.57E-02	575	2.51E-02	680	5.64E-03		
475	1.24E-02	580	2.55E-02	685	4.88E-03		
480	1.17E-02	585	2.59E-02	690	4.22E-03		

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



# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3455, 0.3493)

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

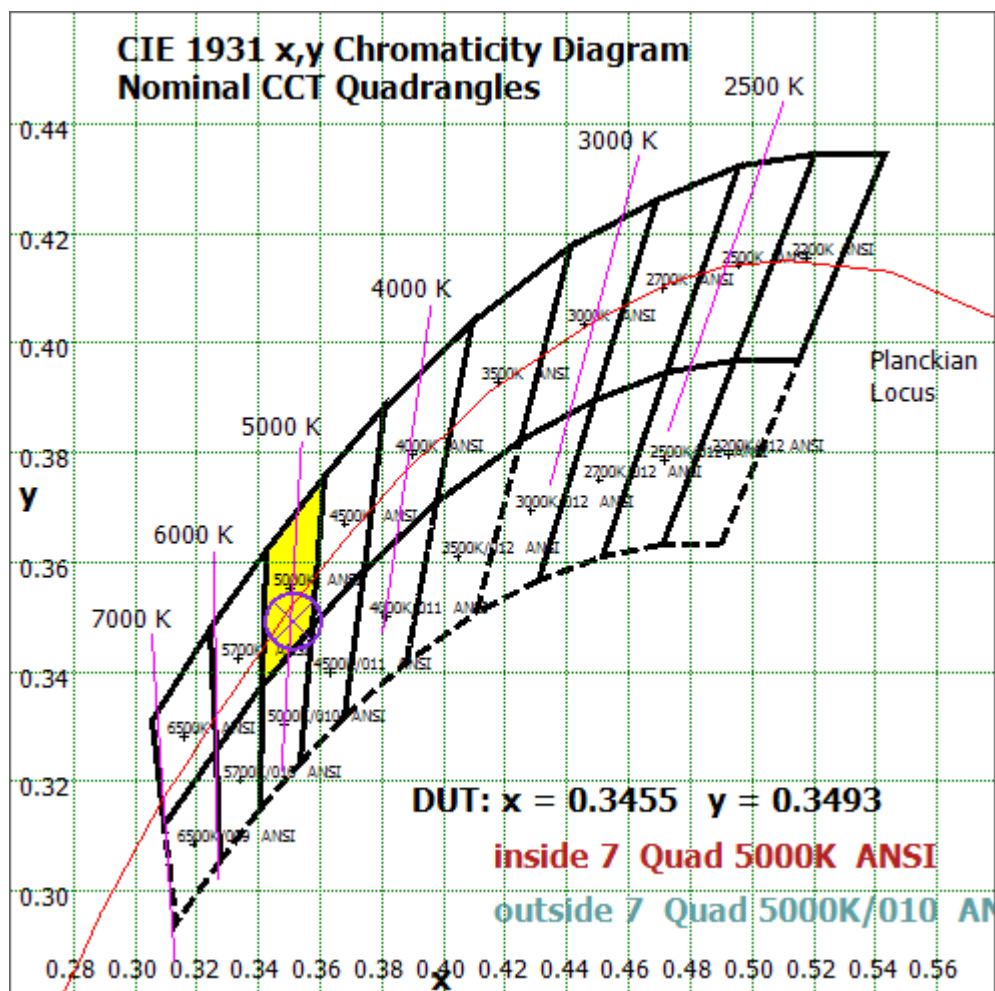


Chart 18: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

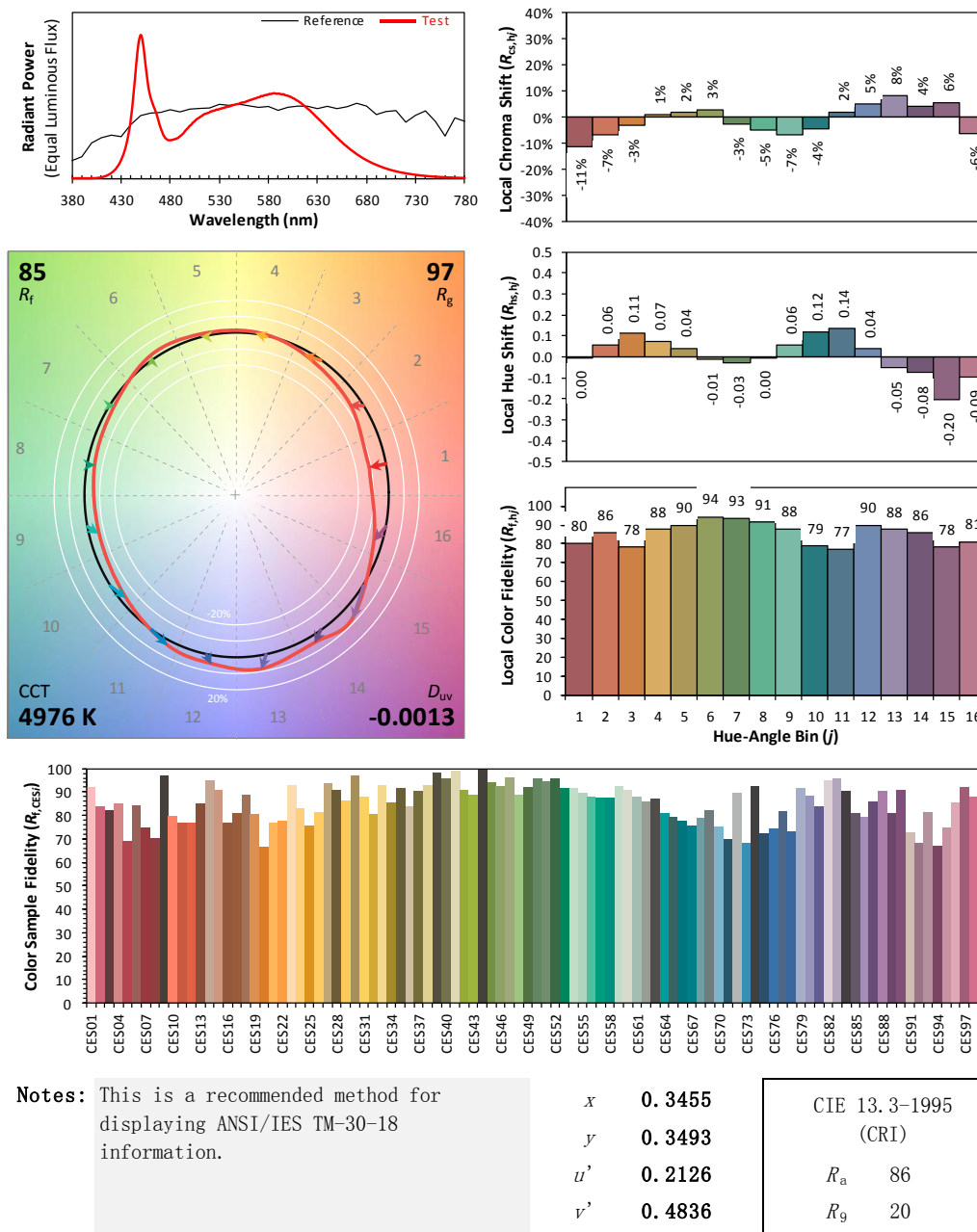
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 9.5T8/2F/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)	0.194	0.093
Power Factor	0.9908	0.9038
Test Power (W)/2	11.51	11.59
THD A%	5.02	9.96
Luminous Efficacy (lm/W)	135.0	134.0
Total Luminous Flux (lm)	1554.3	1553.6
Color Rendering Index (CRI)	83.8	
R9	9.8	
Correlated Color Temperature (CCT)(K)	6318	
Chromaticity Chroma x	0.3158	
Chromaticity Chroma y	0.3315	
Chromaticity Chroma u	0.1990	
Chromaticity Chroma v	0.3134	
Duv	0.0030	
Chromaticity Chroma u'	0.1990	
Chromaticity Chroma v'	0.4701	

Special Color Rendering Indices	
R1	82
R2	88.1
R3	91.5
R4	83.9
R5	83
R6	82.9
R7	88.2
R8	70.6
R9	9.8
R10	71.3
R11	83.5
R12	61.5
R13	83.8
R14	95.6

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

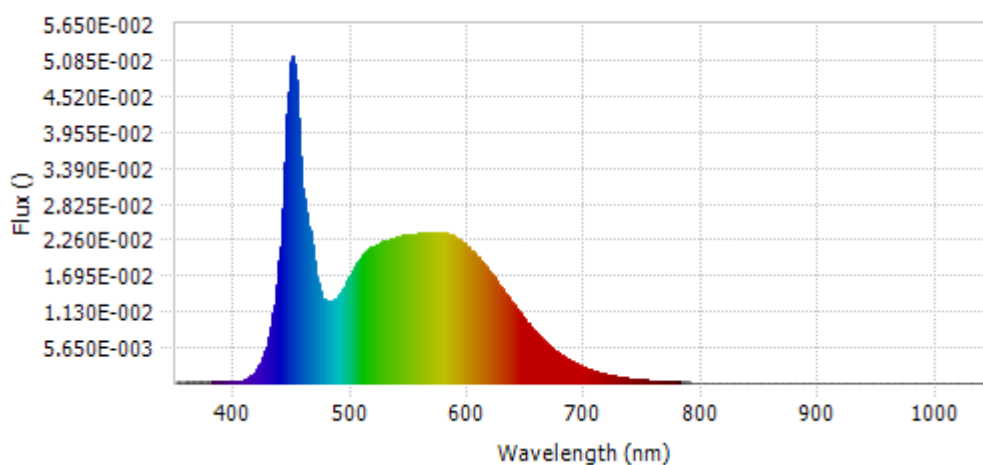


Chart 20: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.96E-04	485	1.31E-02	590	2.28E-02	695	2.80E-03
385	1.96E-04	490	1.41E-02	595	2.21E-02	700	2.41E-03
390	2.00E-04	495	1.58E-02	600	2.14E-02	705	2.05E-03
395	1.63E-04	500	1.75E-02	605	2.04E-02	710	1.76E-03
400	1.90E-04	505	1.90E-02	610	1.94E-02	715	1.51E-03
405	3.12E-04	510	2.01E-02	615	1.83E-02	720	1.30E-03
410	6.45E-04	515	2.11E-02	620	1.71E-02	725	1.13E-03
415	1.32E-03	520	2.16E-02	625	1.59E-02	730	9.58E-04
420	2.48E-03	525	2.20E-02	630	1.45E-02	735	8.21E-04
425	4.56E-03	530	2.25E-02	635	1.33E-02	740	7.03E-04
430	7.95E-03	535	2.27E-02	640	1.20E-02	745	6.05E-04
435	1.37E-02	540	2.29E-02	645	1.08E-02	750	5.13E-04
440	2.44E-02	545	2.32E-02	650	9.61E-03	755	4.47E-04
445	4.23E-02	550	2.33E-02	655	8.53E-03	760	3.86E-04
450	5.13E-02	555	2.35E-02	660	7.51E-03	765	3.30E-04
455	3.83E-02	560	2.37E-02	665	6.59E-03	770	2.83E-04
460	2.78E-02	565	2.37E-02	670	5.74E-03	775	2.42E-04
465	2.27E-02	570	2.37E-02	675	5.02E-03	780	2.13E-04
470	1.69E-02	575	2.37E-02	680	4.33E-03		
475	1.34E-02	580	2.35E-02	685	3.76E-03		
480	1.28E-02	585	2.33E-02	690	3.24E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method

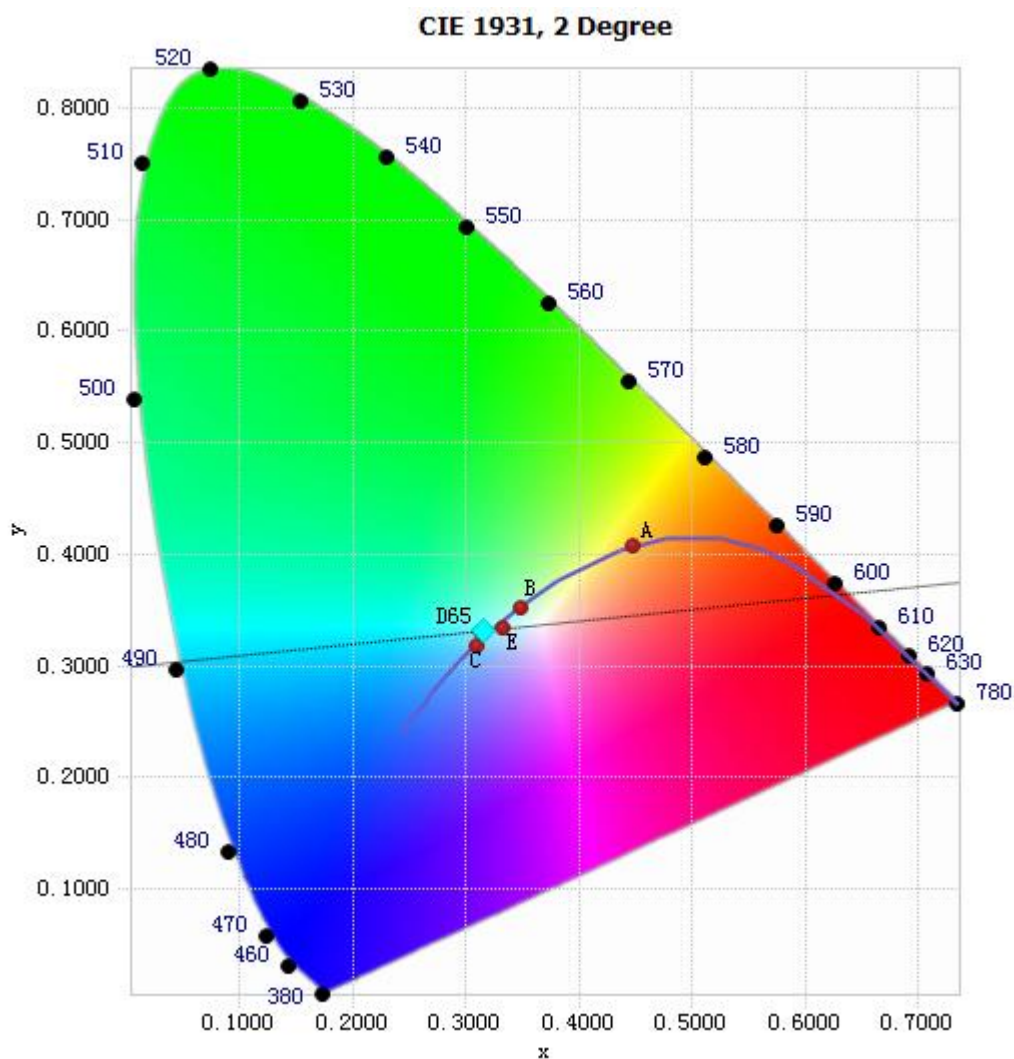


Chart 21: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

# Nominal CCT Quadrangles – Sphere Spectroradiometer Method

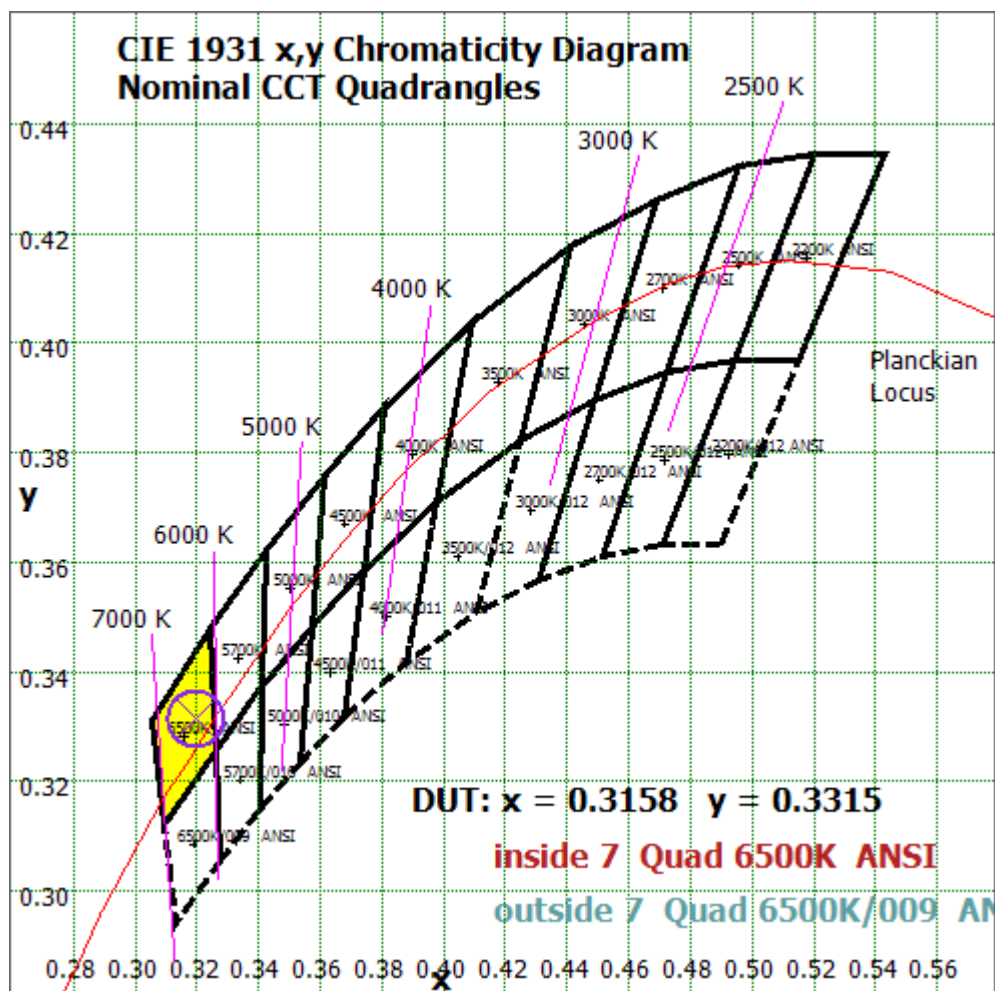


Chart 22: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

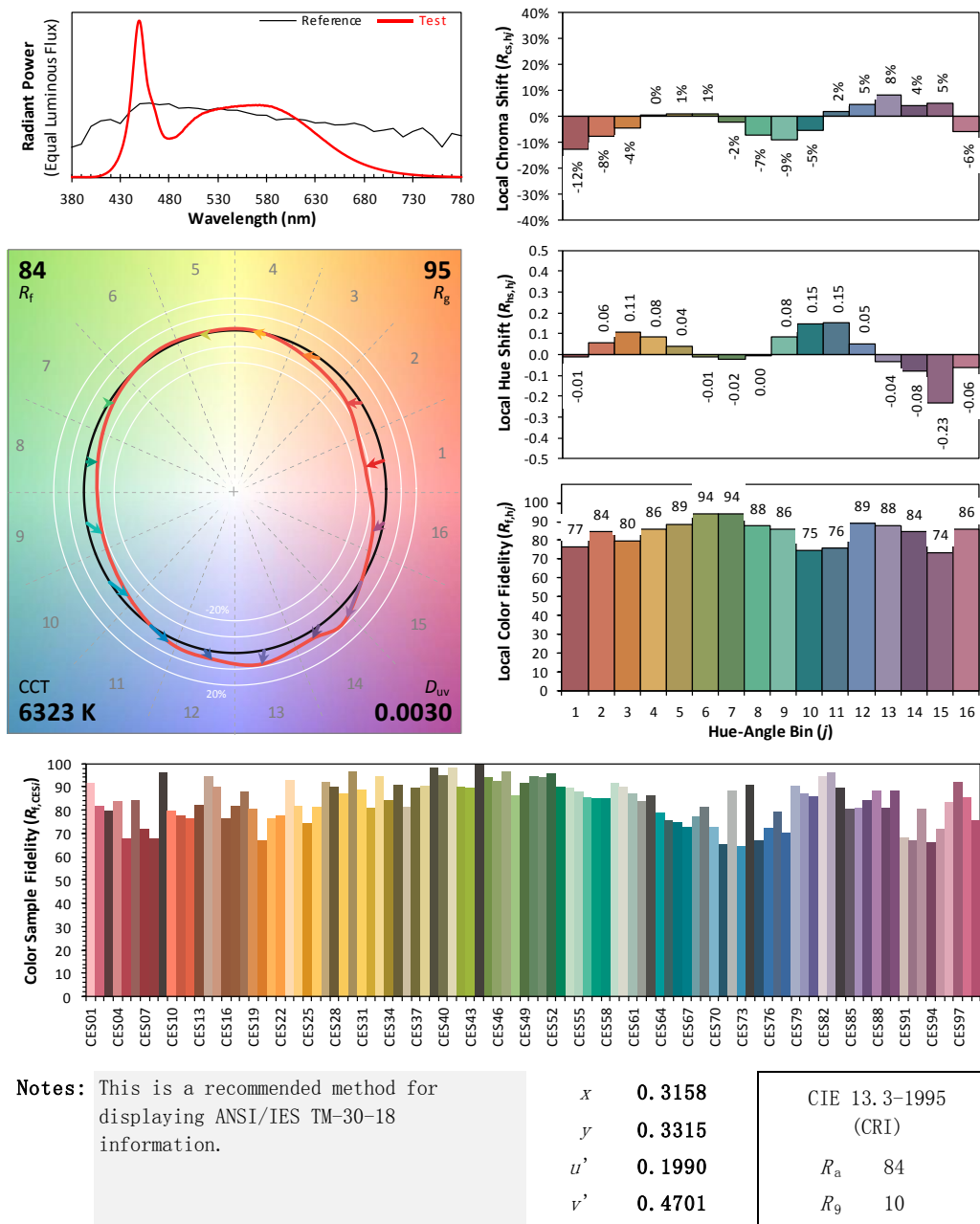
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/28

Model: 9.5T8/2F/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.