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/A3

Laboratory: Lea ding Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ23060027b

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/EXT/SD/A3 3000K Setting	9.5T8/2F/8CCTS/EXT/SD/A3 3500K Setting	9.5T8/2F/8CCTS/EXT/SD/A3 4000K Setting
Luminous Efficacy (Lumens /Watt)	131.6	137.3	141.5
Total Luminous Flux (Lumens)	1489.5	1538.8	1570.2
Power (Watts)/3	11.32	11.21	11.10
Power Factor	0.9904	0.9902	0.9902
CCT (K)	3094	3519	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/EXT/SD/A3 5000K Setting	9.5T8/2F/8CCTS/EXT/SD/A3 6500K Setting
Luminous Efficacy (Lumens /Watt)	142.1	136.2
Total Luminous Flux (Lumens)	1580.1	1535.9
Power (Watts)/3	11.12	11.28
Power Factor	0.9902	0.9904
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

TABLE OF CONTENT

SAMPLE PHOTO

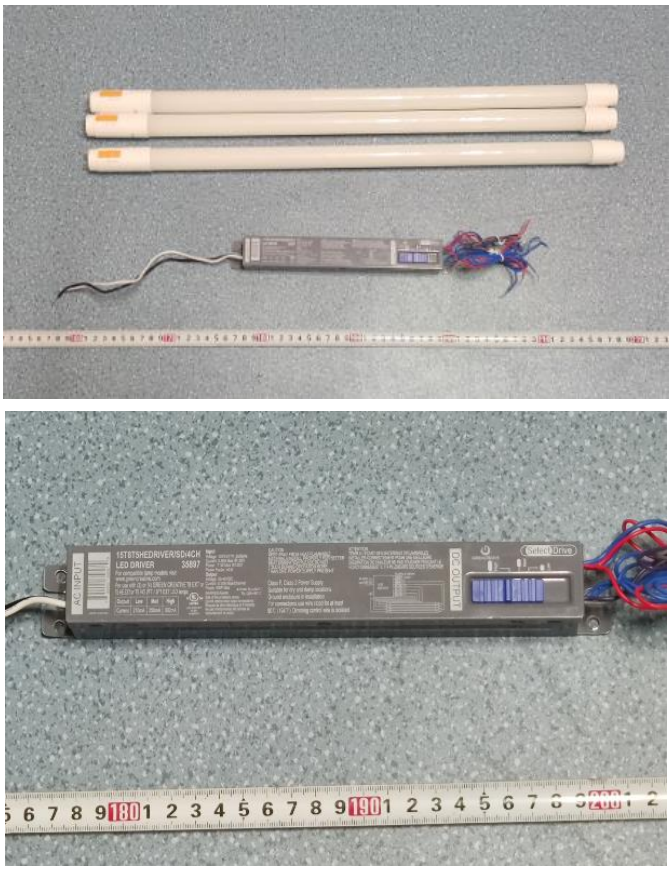


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Tube
Model	: 9.5T8/2F/8CCTS/EXT/SD/A3
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: Color- Tunable 3000K/3500K/4000K/5000K/6500K LED Tube supplied by a LED driver: 15T8T5HEDRIVER/SD/4CH
Manufacturer	: GREEN CREATIVE LTD
Address	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

TEST RESULTS (3000K Setting)

Test ambient temperature was 26.0 ℃.

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)	0.286	0.136
Power Factor	0.9904	0.9003
Test Power (W)/3	11.32	11.31
THD A%	5.23	9.72
Luminous Efficacy (lm/W)	131.6	131.6
Total Luminous Flux (lm)	1489.5	1488.8
Color Rendering Index (CRI)	82.3	
R9	4.6	
Correlated Color Temperature (CCT)(K)	3094	
Chromaticity Chroma x	0.4299	
Chromaticity Chroma y	0.4009	
Chromaticity Chroma u	0.2474	
Chromaticity Chroma v	0.3460	
Duv	-0.0003	
Chromaticity Chroma u ’	0.2474	
Chromaticity Chroma v’	0.5191	

Special Color Rendering Indices	
R1	80.9
R2	92.1
R3	94.6
R4	79.4
R5	81.4
R6	90.5
R7	81.5
R8	57.6
R9	4.6
R10	82.2
R11	78.8
R12	72.2
R13	83.8
R14	97.6

Table 2: Test data per Sphere-Spectroradiometer Method

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

Spectral Power Distribution - Sphere Spectroradiometer Method

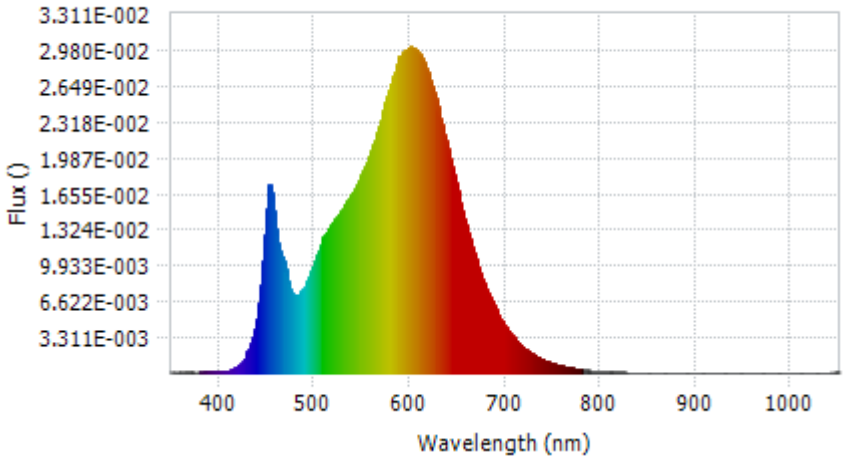
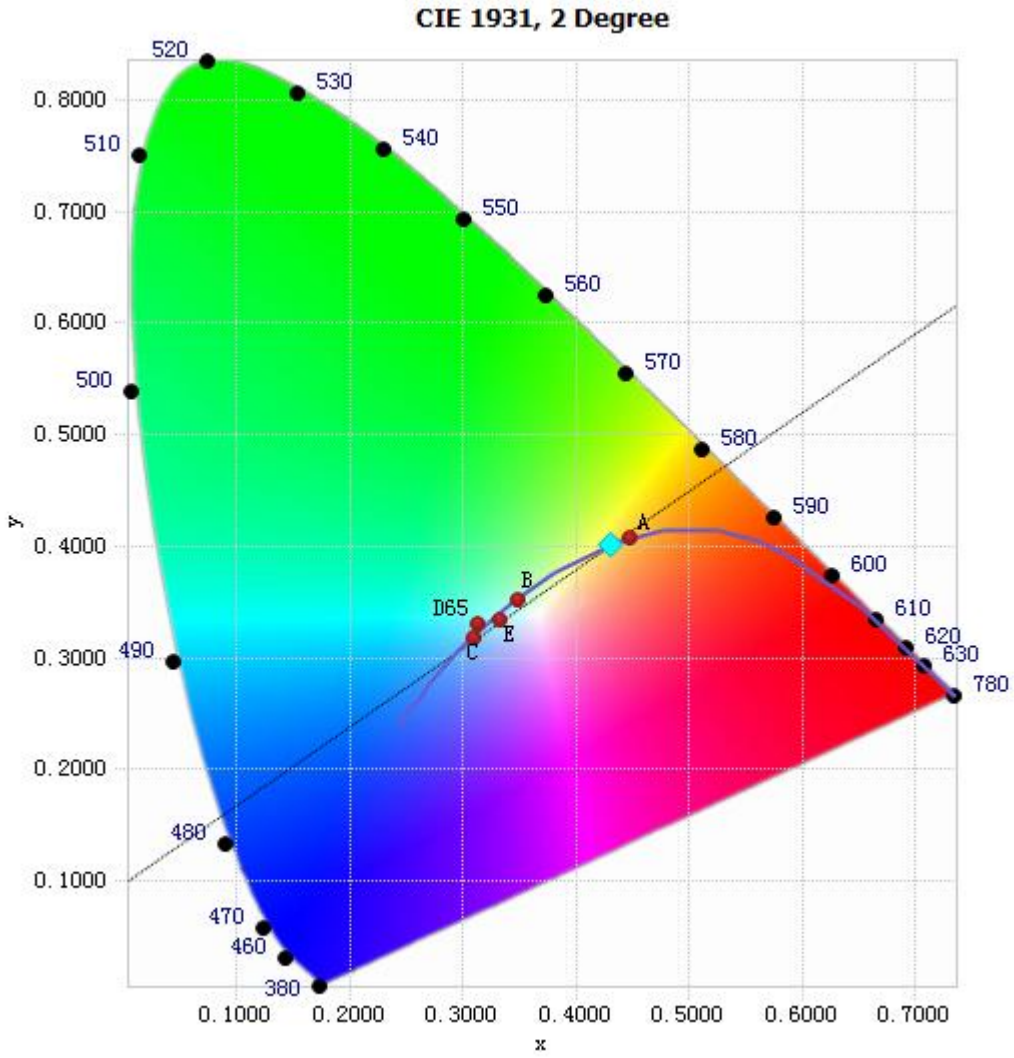


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.31E-04	485	7.54E-03	590	2.92E-02	695	5.05E-03
385	9.67E-05	490	8.17E-03	595	2.98E-02	700	4.32E-03
390	1.12E-04	495	9.21E-03	600	3.01E-02	705	3.70E-03
395	1.00E-04	500	1.04E-02	605	2.98E-02	710	3.15E-03
400	9.78E-05	505	1.15E-02	610	2.94E-02	715	2.70E-03
405	1.22E-04	510	1.25E-02	615	2.86E-02	720	2.31E-03
410	2.52E-04	515	1.34E-02	620	2.73E-02	725	1.98E-03
415	4.18E-04	520	1.40E-02	625	2.59E-02	730	1.68E-03
420	7.29E-04	525	1.47E-02	630	2.42E-02	735	1.44E-03
425	1.24E-03	530	1.54E-02	635	2.25E-02	740	1.23E-03
430	1.99E-03	535	1.59E-02	640	2.06E-02	745	1.05E-03
435	3.32E-03	540	1.67E-02	645	1.87E-02	750	8.96E-04
440	5.69E-03	545	1.75E-02	650	1.68E-02	755	7.63E-04
445	1.03E-02	550	1.84E-02	655	1.50E-02	760	6.59E-04
450	1.62E-02	555	1.95E-02	660	1.33E-02	765	5.65E-04
455	1.67E-02	560	2.07E-02	665	1.17E-02	770	4.79E-04
460	1.26E-02	565	2.21E-02	670	1.02E-02	775	4.12E-04
465	1.07E-02	570	2.37E-02	675	8.97E-03	780	3.46E-04
470	9.29E-03	575	2.52E-02	680	7.78E-03		
475	7.60E-03	580	2.67E-02	685	6.78E-03		
480	7.12E-03	585	2.83E-02	690	5.84E-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

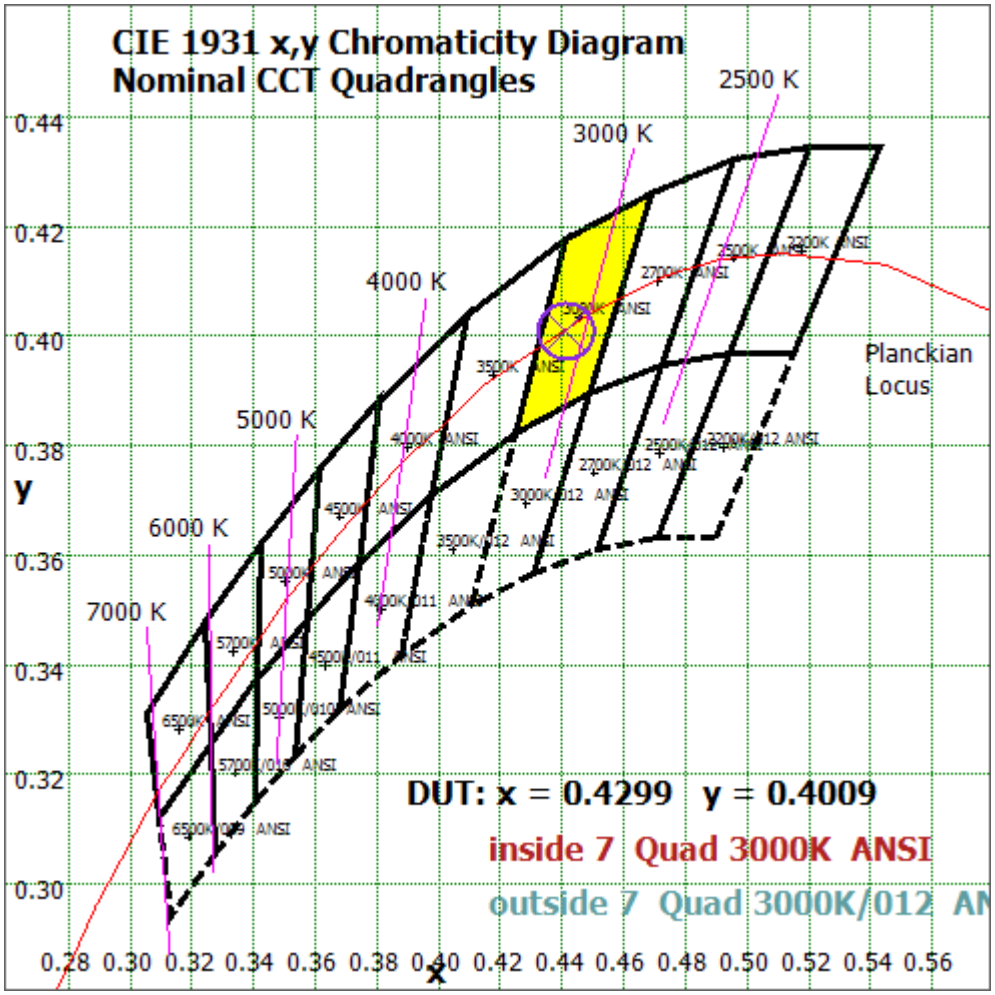


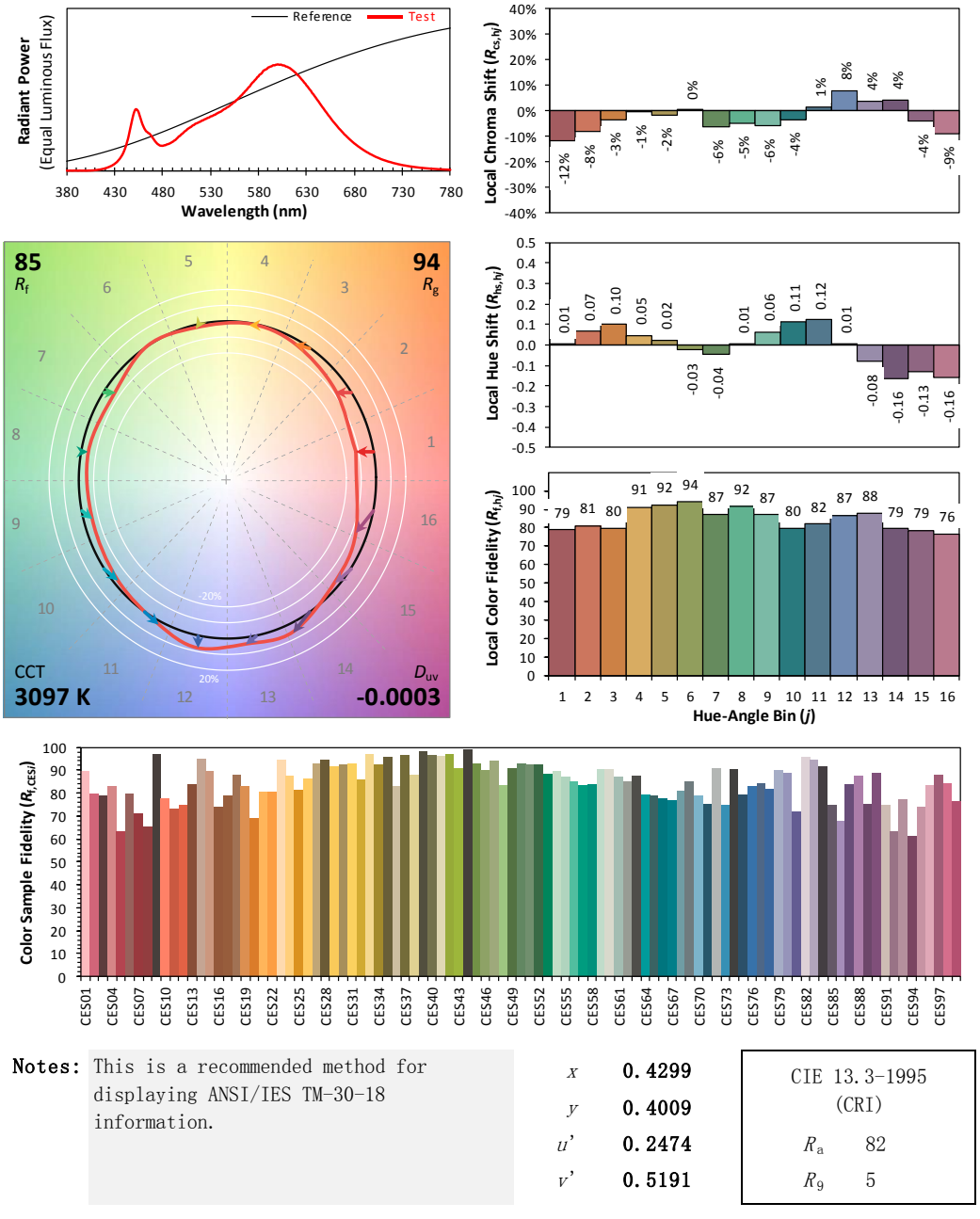
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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/A3



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

x	0.4299
y	0.4009
u'	0.2474
v'	0.5191

CIE 13.3-1995 (CRI)

R_a	82
R_9	5

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 ℃.

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)	0.287
Power Factor	0.9894
Power (W)/3	11.35
Luminous Efficacy (lm/W)	132.2
Total Luminous Flux (lm)	1501.1
Beam Angle (°)	112.1 (0^o-180^o) / 250.2 (90^o-270^o)
Center Beam Candle Power (cd)	237
Maximum Beam Candle Power (cd)	236.8 (At: C=110.0, Gamma=2.0)
Spacing Criteria	1.26 (0^o-180^o) / 1.47 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	41.16%
Zonal Lumens in the 60 °-90 °Zone	27.00%
Zonal Lumens in the 90 °-120 °Zone	18.88%
Zonal Lumens in the 120 °-180 °Zone	12.95%

Table 4: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	22.437	1.49%
10- 20	65.095	4.34%
20- 30	101.793	6.78%
30- 40	129.539	8.63%
40- 50	146.584	9.77%
50- 60	152.368	10.15%
60- 70	147.976	9.86%
70- 80	136.145	9.07%
80- 90	121.225	8.08%
90-100	107.596	7.17%
100-110	94.583	6.30%
110-120	81.285	5.42%
120-130	67.697	4.51%
130-140	53.492	3.56%
140-150	39.084	2.60%
150-160	22.859	1.52%
160-170	9.29	0.62%
170-180	2.043	0.14%
Total	1501.1	100%

γ(°)	Lumens	% Total
0- 60	617.816	41.16%
60- 90	405.346	27.00%
0-90	1023.16	68.16%
90- 180	477.929	31.84%
0- 180	1501.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

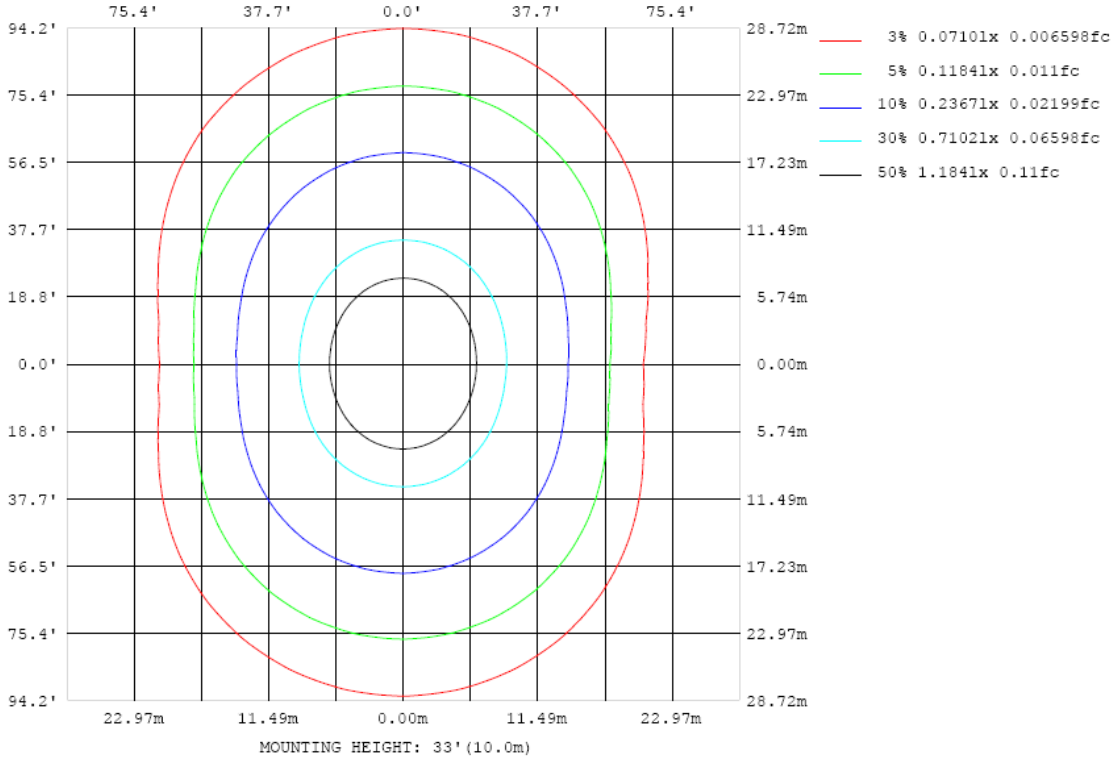


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

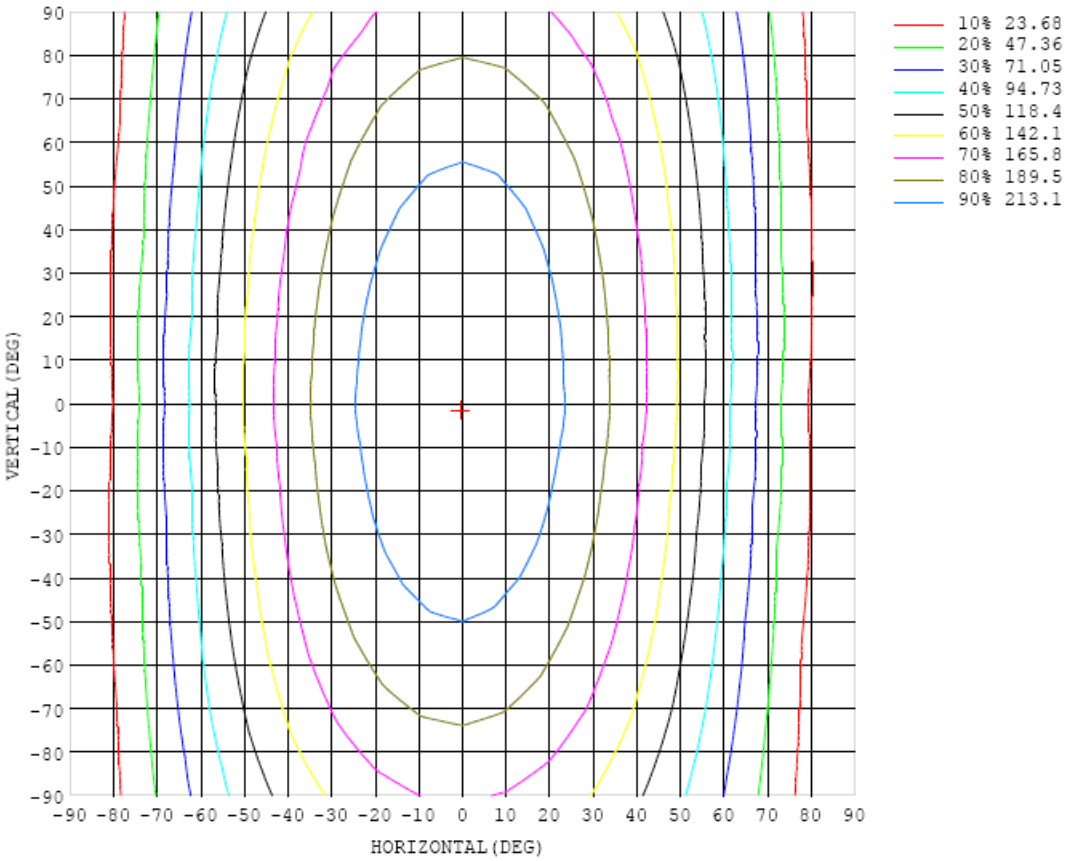


Chart 6: Isocandela Plot

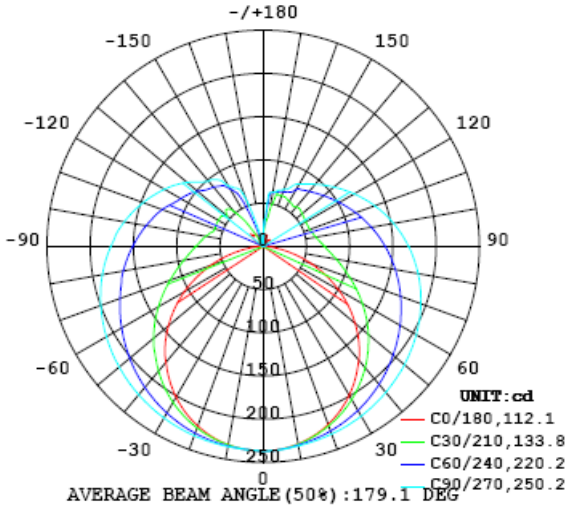


Chart 7: Polar Candela Distribution

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	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236
10	232	232	232	233	233	233	233	234	234	234	234	234	234	234	233	233	233	233	233
15	227	227	227	228	228	229	231	232	232	233	233	232	232	231	230	229	228	228	228
20	219	220	220	221	223	225	227	229	230	231	231	230	229	227	225	223	222	221	221
25	210	210	211	214	217	220	224	226	228	229	229	227	225	222	219	216	213	212	212
30	199	199	201	205	209	214	219	223	226	227	226	224	221	217	212	207	204	202	201
35	186	187	189	195	201	208	214	219	222	224	223	220	216	211	204	198	193	190	189
40	172	172	176	183	192	201	208	215	219	221	219	216	211	204	195	187	180	176	175
45	156	157	162	171	182	193	202	210	215	217	216	212	205	196	186	176	167	161	160
50	139	140	147	159	172	185	196	205	211	213	212	207	199	188	176	164	152	145	143
55	120	122	132	146	161	176	189	200	206	209	207	202	193	180	166	151	137	127	125
60	100	103	115	132	151	168	183	194	201	204	203	196	186	172	156	138	122	109	105
65	80.1	84.2	99.2	119	140	160	176	188	196	199	197	191	180	165	146	126	106	90.3	85.0
70	59.7	65.9	83.6	107	130	152	169	182	191	194	192	185	173	157	137	114	90.8	72.1	64.3
75	39.5	47.5	69.3	95.5	121	144	162	176	185	188	186	179	166	149	128	103	77.2	54.3	44.9
80	21.2	31.4	57.2	85.8	113	136	155	169	178	182	180	172	159	141	119	93.1	65.4	38.3	24.6
85	7.52	19.6	47.5	77.3	105	129	148	162	172	175	173	165	152	134	111	84.6	55.6	26.1	9.20
90	1.83	13.6	41.0	70.9	98.0	122	141	155	165	168	166	158	145	127	104	78.1	48.7	19.1	1.88
95	0.90	12.5	37.3	65.8	91.9	115	134	148	157	161	158	151	138	120	97.7	72.3	44.1	16.9	0.95
100	1.92	14.0	35.8	61.8	86.6	109	127	141	150	153	151	143	131	113	92.0	67.8	41.6	17.9	1.79
105	4.21	17.1	35.9	59.1	82.0	103	120	134	142	145	143	136	124	107	87.1	64.5	40.8	20.6	3.02
110	6.39	21.3	37.3	57.5	78.0	97.5	114	126	134	137	135	128	117	101	83.2	62.4	41.3	24.5	4.96
115	5.83	26.0	39.6	56.9	75.6	92.6	107	119	126	129	127	121	111	96.2	79.6	61.1	42.9	28.6	8.01
120	6.14	31.2	42.5	57.0	73.3	88.3	102	112	119	122	120	114	104	91.4	76.6	60.6	45.3	32.2	9.74
125	7.66	36.5	45.6	57.7	71.5	84.4	96.3	106	112	114	112	107	98.7	87.3	74.4	60.7	48.3	35.3	12.0
130	10.0	41.8	48.9	58.9	70.3	81.2	91.3	99.4	105	107	105	101	93.4	83.7	72.8	61.3	51.4	39.8	16.7
135	9.66	39.2	52.5	60.3	69.8	78.9	86.9	93.8	98.2	100.0	98.8	94.9	88.7	81.0	71.9	62.3	54.2	43.7	19.4
140	10.2	37.5	55.8	59.5	68.7	76.8	83.0	88.6	92.3	93.8	92.8	89.6	84.5	78.4	71.1	63.5	57.2	44.1	15.9
145	5.23	34.1	56.9	58.5	64.8	74.5	79.7	84.1	87.0	88.2	87.4	84.9	80.7	76.1	70.6	64.7	59.4	47.5	16.3
150	3.96	38.2	58.0	60.4	64.0	68.5	75.8	80.1	82.4	83.3	82.7	80.8	77.1	72.0	68.7	65.0	60.3	51.0	15.5
155	2.88	26.3	53.9	62.1	64.3	67.0	69.5	71.5	74.3	75.7	74.6	72.2	69.4	66.7	64.0	60.1	56.3	42.1	11.7
160	13.2	24.8	56.8	62.5	63.8	65.7	67.3	68.3	69.4	70.2	69.6	68.5	67.2	65.6	62.5	59.4	57.8	39.2	12.4
165	7.58	18.0	42.0	63.1	63.5	64.2	65.0	65.9	66.7	67.1	67.0	65.9	64.3	63.3	62.1	60.7	49.2	24.0	11.8
170	8.52	13.4	28.1	39.6	57.2	63.1	63.2	63.3	63.4	63.5	63.7	63.7	63.2	62.5	60.4	50.8	29.3	18.4	8.95
175	8.20	9.63	18.5	24.8	28.9	31.9	34.3	38.0	41.9	44.2	43.9	41.0	36.1	31.1	27.1	21.9	16.2	11.8	8.63
180	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63

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	236	236	236	236	236	236	236	236	236	236	236	235	235	235	235	235		
10	233	233	233	234	234	235	235	235	235	235	235	234	234	233	232	232	232		
15	228	228	229	230	232	233	234	234	234	234	233	232	231	230	228	227	227		
20	221	222	224	226	228	230	232	233	233	233	231	230	227	225	223	221	219		
25	213	214	217	220	224	227	229	231	231	231	229	226	223	219	216	213	210		
30	202	205	209	213	218	223	226	229	229	228	226	222	217	212	207	203	200		
35	190	194	199	206	212	218	223	226	227	226	223	218	212	204	198	192	187		
40	176	181	188	197	205	213	219	223	224	223	219	213	205	196	187	179	174		
45	162	168	177	187	198	207	215	219	221	219	215	207	198	187	176	167	160		
50	146	154	166	178	190	202	210	216	217	216	210	202	190	178	165	152	143		
55	128	139	153	169	182	195	205	211	214	212	205	196	183	168	152	137	126		
60	110	122	140	158	175	189	200	207	209	207	200	189	176	159	140	121	107		
65	90.7	106	127	148	168	183	195	202	205	202	195	183	168	149	127	106	88.2		
70	71.4	90.7	115	138	160	176	189	197	200	197	190	177	161	140	115	90.4	69.4		
75	52.8	76.0	103	129	152	170	183	192	195	192	184	172	154	131	105	76.6	51.5		
80	36.2	63.3	93.2	121	145	164	177	186	189	186	178	165	147	123	95.0	64.7	35.8		
85	23.4	53.3	84.8	113	138	158	171	180	183	180	173	159	140	115	87.0	55.6	24.3		
90	16.4	46.4	77.9	107	131	151	165	173	176	174	166	152	133	109	80.3	48.8	17.7		
95	12.1	40.9	72.2	101	125	144	159	167	170	168	160	146	127	103	74.7	43.0	12.0		
100	8.88	36.6	67.5	95.3	119	138	152	160	163	161	152	139	120	97.7	70.3	39.0	10.7		
105	9.96	33.5	62.4	90.2	113	131	144	153	156	153	145	132	115	93.1	67.0	36.1	12.0		
110	10.4	35.0	59.6	84.0	106	124	137	145	148	145	138	126	109	89.0	63.4	34.1	13.1		
115	3.17	30.8	60.1	80.6	99.6	116	129	137	140	138	131	119	104	83.8	58.8	37.9	14.8		
120	7.62	35.7	59.9	78.9	95.7	110	122	129	132	130	123	113	97.0	77.8	58.3	39.0	15.8		
125	5.76	33.0	60.0	77.4	92.5	105	115	122	124	122	115	104	89.7	74.4	61.6	39.7	12.2		
130	0.00	16.2	54.5	75.8	88.0	99.2	108	113	115	113	106	95.6	85.7	76.2	61.1	37.1	1.07		
135	0.00	16.5	60.4	73.6	84.4	92.7	99.5	104	105	103	98.2	91.9	85.9	73.6	56.3	34.7	0.02		
140	1.73	16.9	52.3	68.5	82.1	89.5	94.8	97.2	98.2	97.5	95.8	90.3	81.1	67.8	54.4	28.2	3.54		
145	3.67	9.32	30.5	70.0	78.8	85.4	89.8	92.9	94.3	93.7	89.9	82.1	73.7	68.0	45.2	14.9	0.95		
150	3.84	1.29	8.15	50.7	72.7	77.1	78.5	79.4	80.8	80.0	77.8	74.4	71.0	59.8	23.3	2.86	2.69		
155	3.10	1.99	11.4	10.6	40.6	62.3	71.5	73.2	74.6	74.6	73.0	69.9	59.7	33.8	13.5	3.86	2.20		
160	2.85	2.53	2.03	9.02	8.02	17.5	30.2	51.2	56.3	57.1	53.1	42.9	24.8	10.3	13.8	3.00	5.21		
165	8.49	2.94	4.50	2.67	2.56	6.97	12.2	7.65	7.46	8.37	8.97	11.3	14.4	9.78	5.71	3.50	8.98		
170	3.36	6.54	2.63	1.86	4.66	2.54	1.94	2.29	1.62	3.39	3.46	2.97	4.53	9.83	5.79	7.61	11.6		
175	5.05	3.49	6.02	6.52	5.36	5.23	5.45	4.43	2.55	3.79	3.51	3.59	4.30	6.22	8.09	10.6	9.38		
180	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63		

Table 7: Luminous Intensity Data

TEST RESULTS (3500K Setting)

Test ambient temperature was 26.0 ℃.

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

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

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.283	0.135
Power Factor	0.9902	0.9008
Test Power (W)/3	11.21	11.19
THD A%	5.32	9.68
Luminous Efficacy (lm/W)	137.3	137.6
Total Luminous Flux (lm)	1538.8	1539.2
Color Rendering Index (CRI)	84.4	
R9	13.5	
Correlated Color Temperature (CCT)(K)	3519	
Chromaticity Chroma x	0.4016	
Chromaticity Chroma y	0.3833	
Chromaticity Chroma u	0.2363	
Chromaticity Chroma v	0.3384	
Duv	-0.0025	
Chromaticity Chroma u ’	0.2363	
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

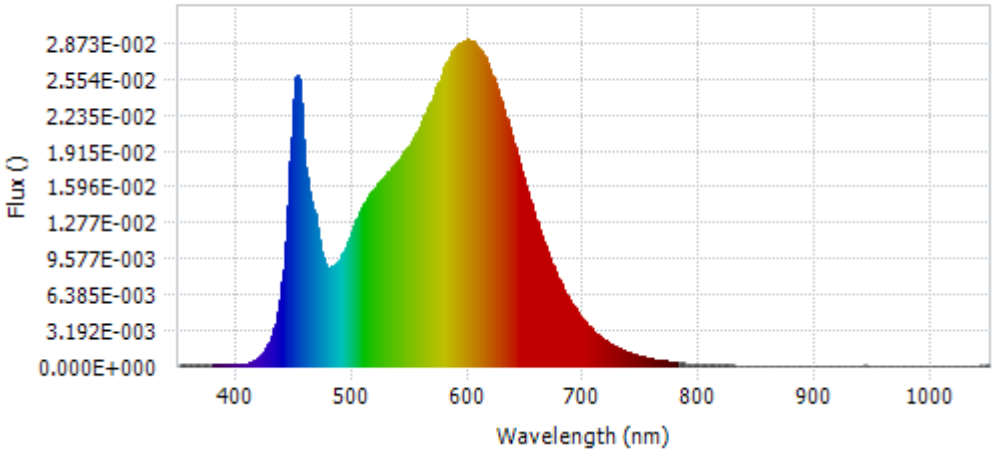
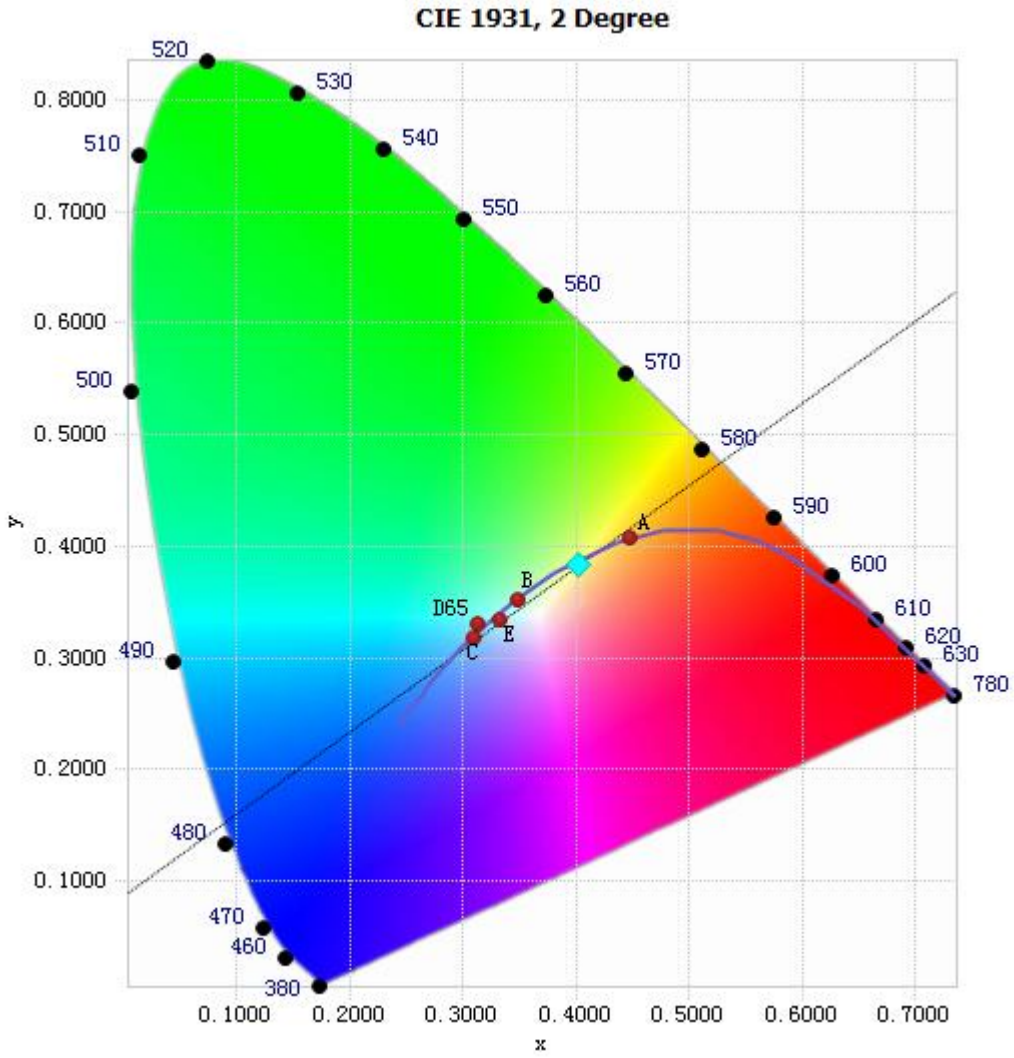


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.43E-04	485	9.03E-03	590	2.85E-02	695	4.69E-03
385	1.34E-04	490	9.72E-03	595	2.89E-02	700	4.00E-03
390	1.34E-04	495	1.09E-02	600	2.90E-02	705	3.41E-03
395	1.16E-04	500	1.22E-02	605	2.87E-02	710	2.93E-03
400	1.25E-04	505	1.34E-02	610	2.81E-02	715	2.52E-03
405	1.64E-04	510	1.44E-02	615	2.72E-02	720	2.16E-03
410	2.89E-04	515	1.54E-02	620	2.59E-02	725	1.84E-03
415	4.92E-04	520	1.59E-02	625	2.45E-02	730	1.55E-03
420	9.40E-04	525	1.66E-02	630	2.28E-02	735	1.34E-03
425	1.58E-03	530	1.72E-02	635	2.12E-02	740	1.13E-03
430	2.69E-03	535	1.77E-02	640	1.94E-02	745	9.65E-04
435	4.73E-03	540	1.83E-02	645	1.76E-02	750	8.27E-04
440	8.49E-03	545	1.91E-02	650	1.57E-02	755	7.10E-04
445	1.62E-02	550	1.98E-02	655	1.41E-02	760	6.06E-04
450	2.50E-02	555	2.07E-02	660	1.25E-02	765	5.20E-04
455	2.33E-02	560	2.18E-02	665	1.10E-02	770	4.44E-04
460	1.68E-02	565	2.29E-02	670	9.60E-03	775	3.84E-04
465	1.43E-02	570	2.41E-02	675	8.37E-03	780	3.27E-04
470	1.17E-02	575	2.54E-02	680	7.24E-03		
475	9.23E-03	580	2.67E-02	685	6.32E-03		
480	8.66E-03	585	2.79E-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): (0.4016, 0.3833)

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

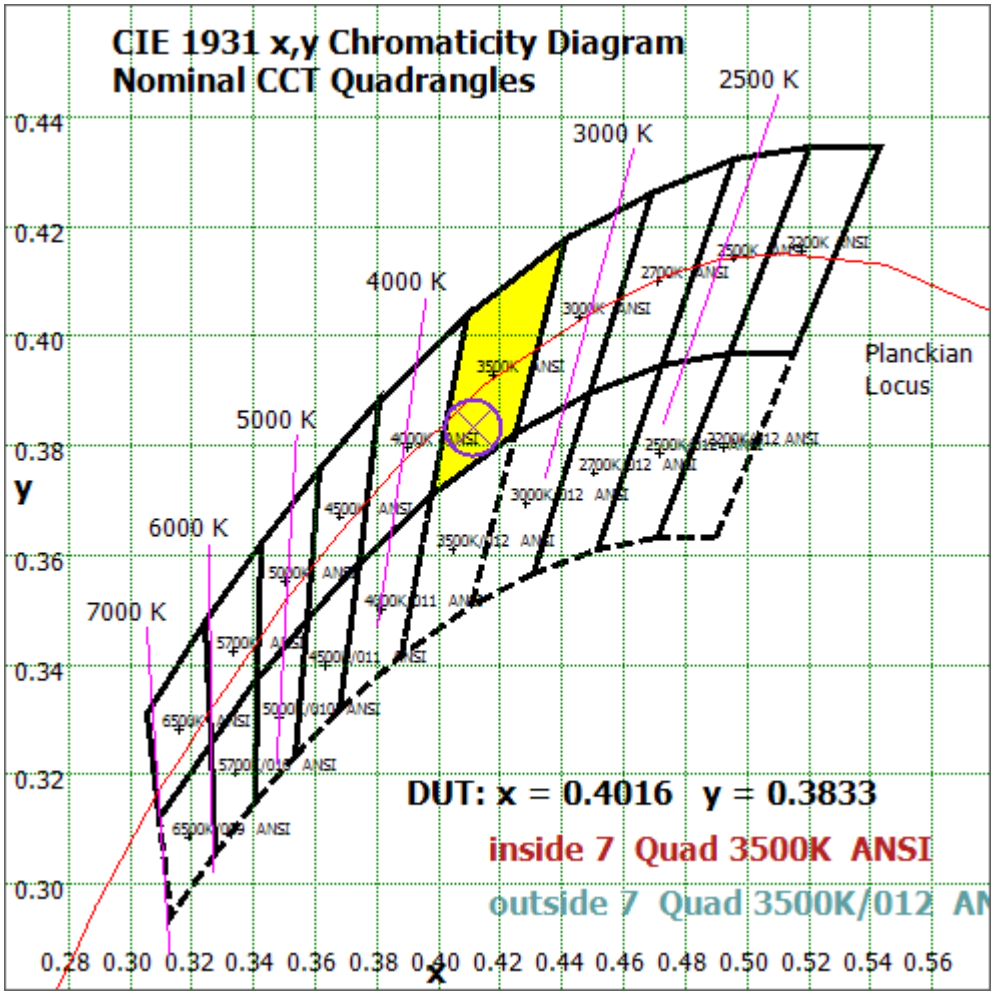


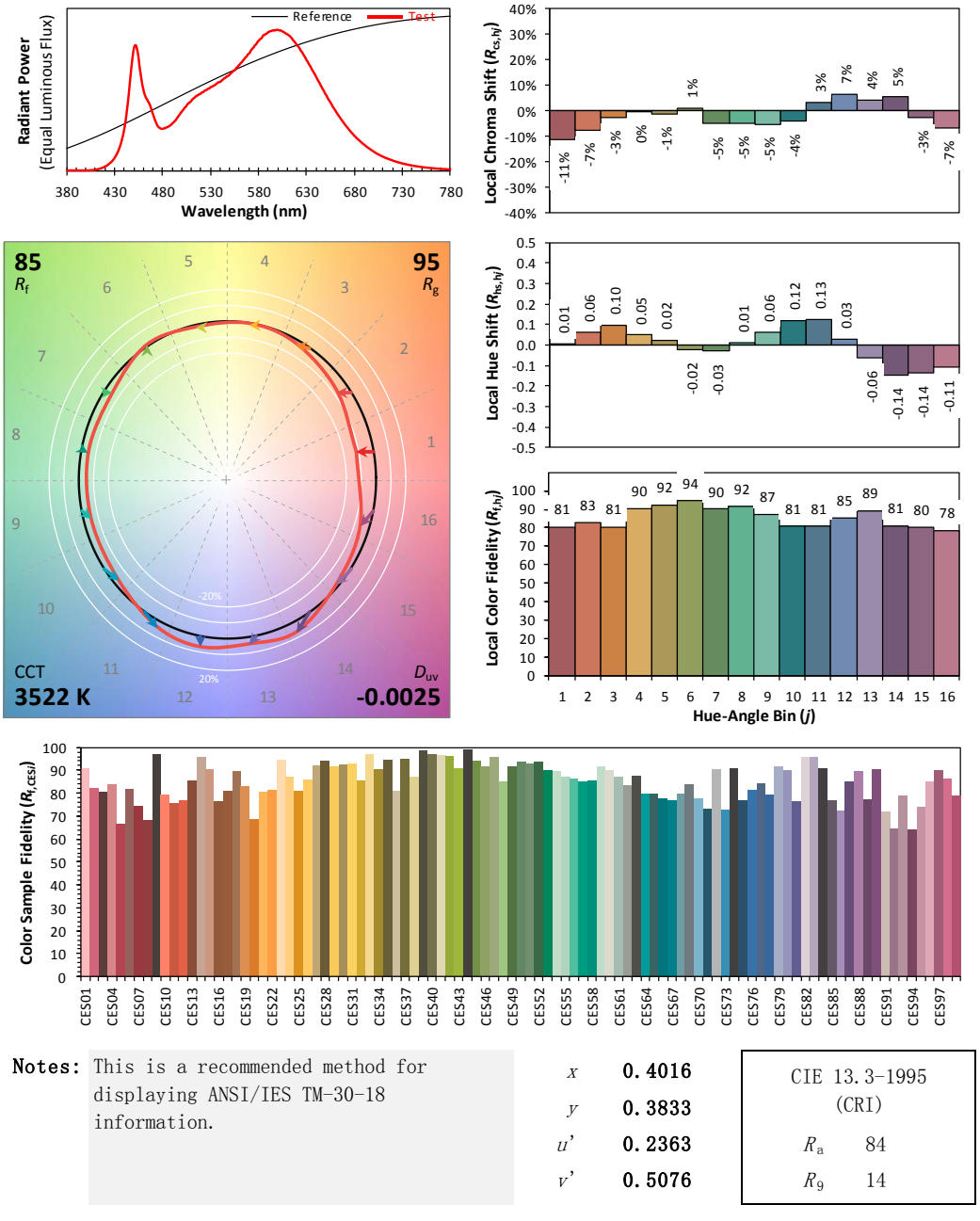
Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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/A3



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

x	0.4016
y	0.3833
u'	0.2363
v'	0.5076

CIE 13.3-1995 (CRI)	
R_a	84
R_9	14

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

Chart 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 ℃.

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)	0.281	0.133
Power Factor	0.9902	0.9006
Test Power (W)/3	11.10	11.08
THD A%	5.42	9.92
Luminous Efficacy (lm/W)	141.5	141.7
Total Luminous Flux (lm)	1570.2	1570.4
Color Rendering Index (CRI)	85.6	
R9	18.6	
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	18.6
R10	83.3
R11	83.5
R12	68.7
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

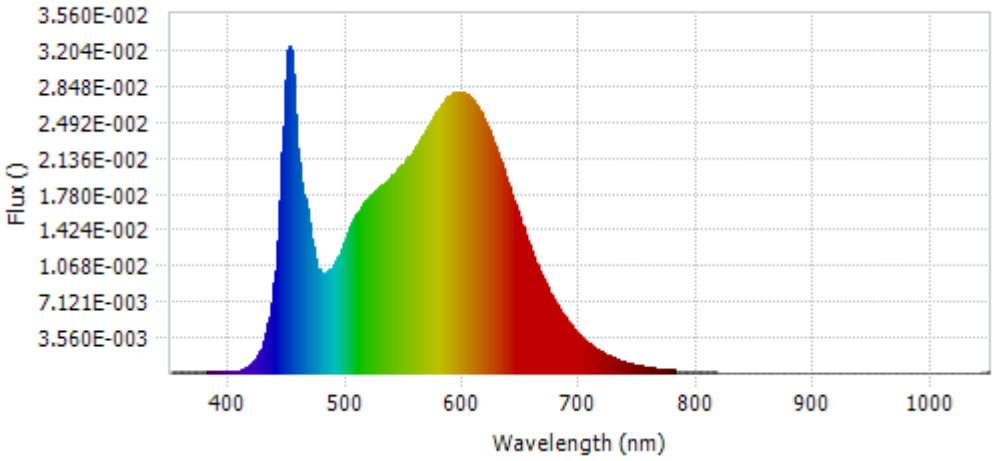
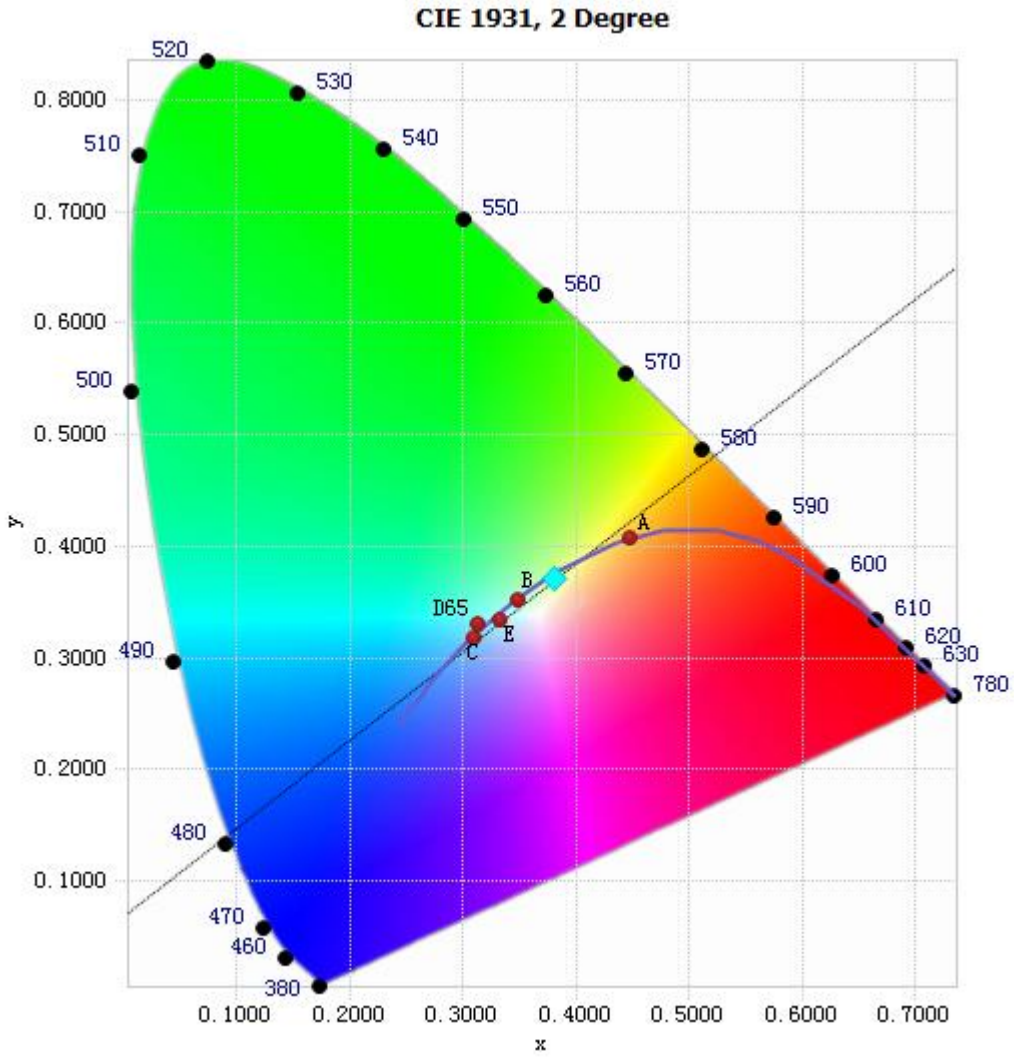


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.42E-04	485	1.02E-02	590	2.77E-02	695	4.34E-03
385	1.51E-04	490	1.09E-02	595	2.79E-02	700	3.72E-03
390	1.40E-04	495	1.21E-02	600	2.79E-02	705	3.19E-03
395	1.30E-04	500	1.36E-02	605	2.74E-02	710	2.72E-03
400	1.24E-04	505	1.49E-02	610	2.67E-02	715	2.33E-03
405	1.77E-04	510	1.59E-02	615	2.58E-02	720	2.00E-03
410	3.13E-04	515	1.69E-02	620	2.45E-02	725	1.71E-03
415	6.01E-04	520	1.75E-02	625	2.31E-02	730	1.44E-03
420	1.12E-03	525	1.81E-02	630	2.15E-02	735	1.23E-03
425	1.99E-03	530	1.87E-02	635	1.99E-02	740	1.05E-03
430	3.52E-03	535	1.91E-02	640	1.82E-02	745	8.95E-04
435	6.29E-03	540	1.97E-02	645	1.64E-02	750	7.75E-04
440	1.15E-02	545	2.03E-02	650	1.47E-02	755	6.59E-04
445	2.19E-02	550	2.09E-02	655	1.32E-02	760	5.63E-04
450	3.20E-02	555	2.17E-02	660	1.16E-02	765	4.82E-04
455	2.78E-02	560	2.25E-02	665	1.02E-02	770	4.16E-04
460	1.98E-02	565	2.34E-02	670	8.92E-03	775	3.44E-04
465	1.68E-02	570	2.45E-02	675	7.78E-03	780	3.07E-04
470	1.33E-02	575	2.54E-02	680	6.76E-03		
475	1.04E-02	580	2.64E-02	685	5.88E-03		
480	9.81E-03	585	2.73E-02	690	5.05E-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

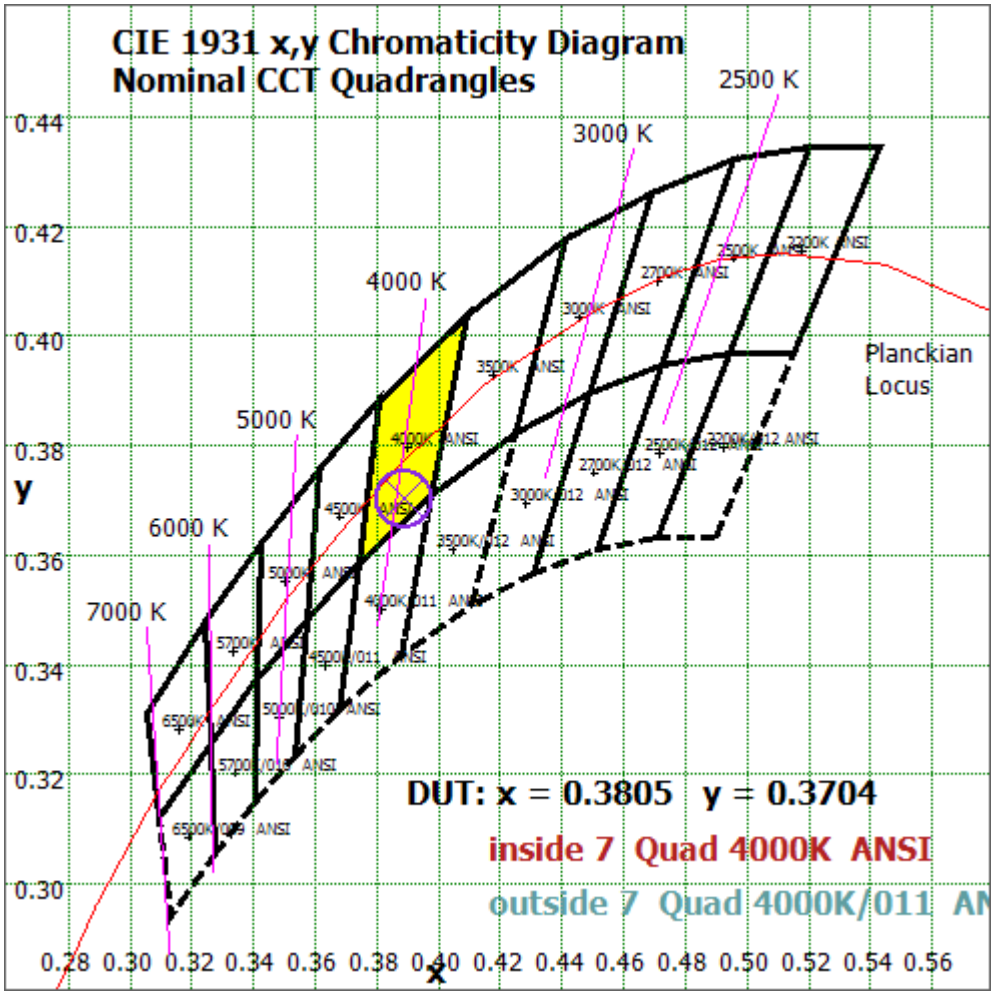


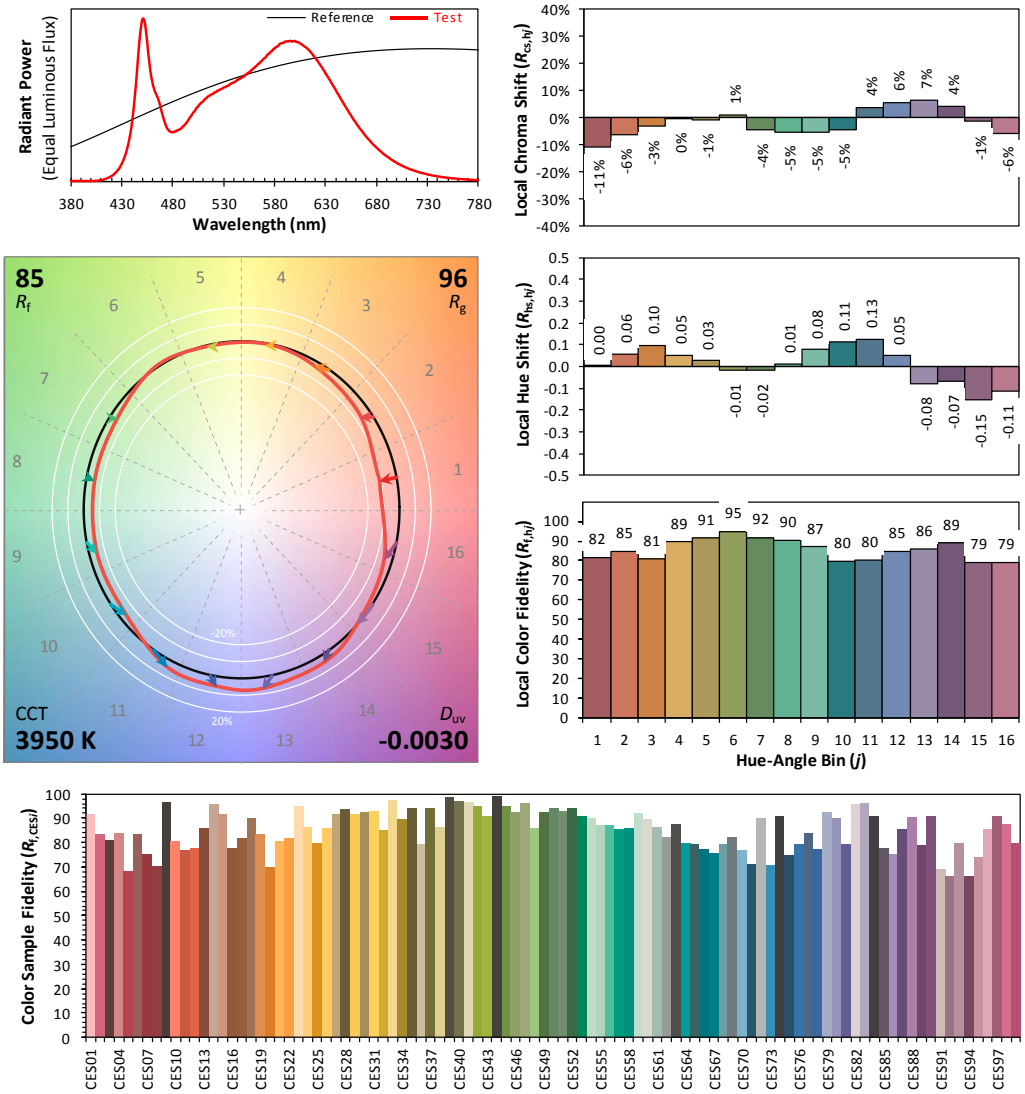
Chart14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** GREEN CREATIVE LTD

Date: 2023/06/29 **Model:** 9.5T8/2F/8CCTS/EXT/SD/A3



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

x	0.3805
y	0.3704
u'	0.2277
v'	0.4988

CIE 13.3-1995 (CRI)

R_a	86
R_9	19

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 ℃.

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)	0.281	0.134
Power Factor	0.9902	0.9003
Test Power (W)/3	11.12	11.10
THD A%	5.41	9.87
Luminous Efficacy (lm/W)	142.1	142.4
Total Luminous Flux (lm)	1580.1	1580.2
Color Rendering Index (CRI)	85.6	
R9	19.7	
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	84.6
R2	91.5
R3	94.7
R4	84.5
R5	84.7
R6	86.4
R7	87.9
R8	70.6
R9	19.7
R10	78.8
R11	84
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

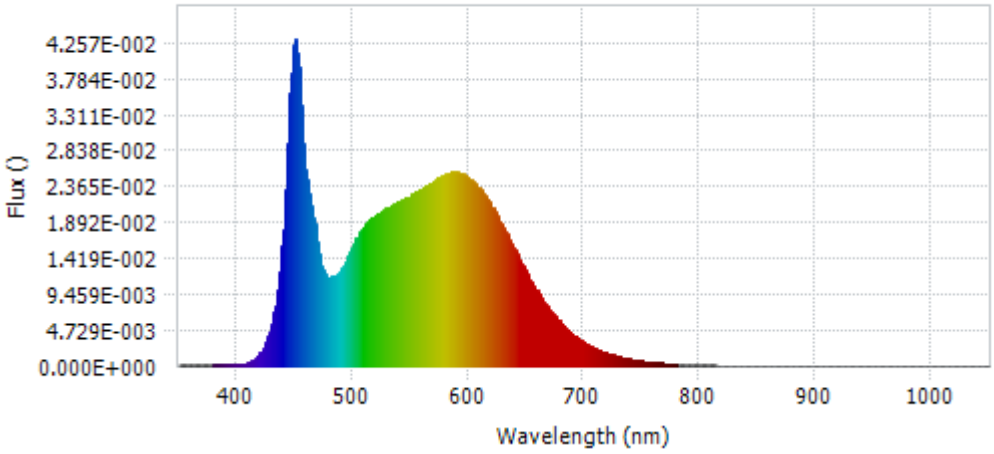
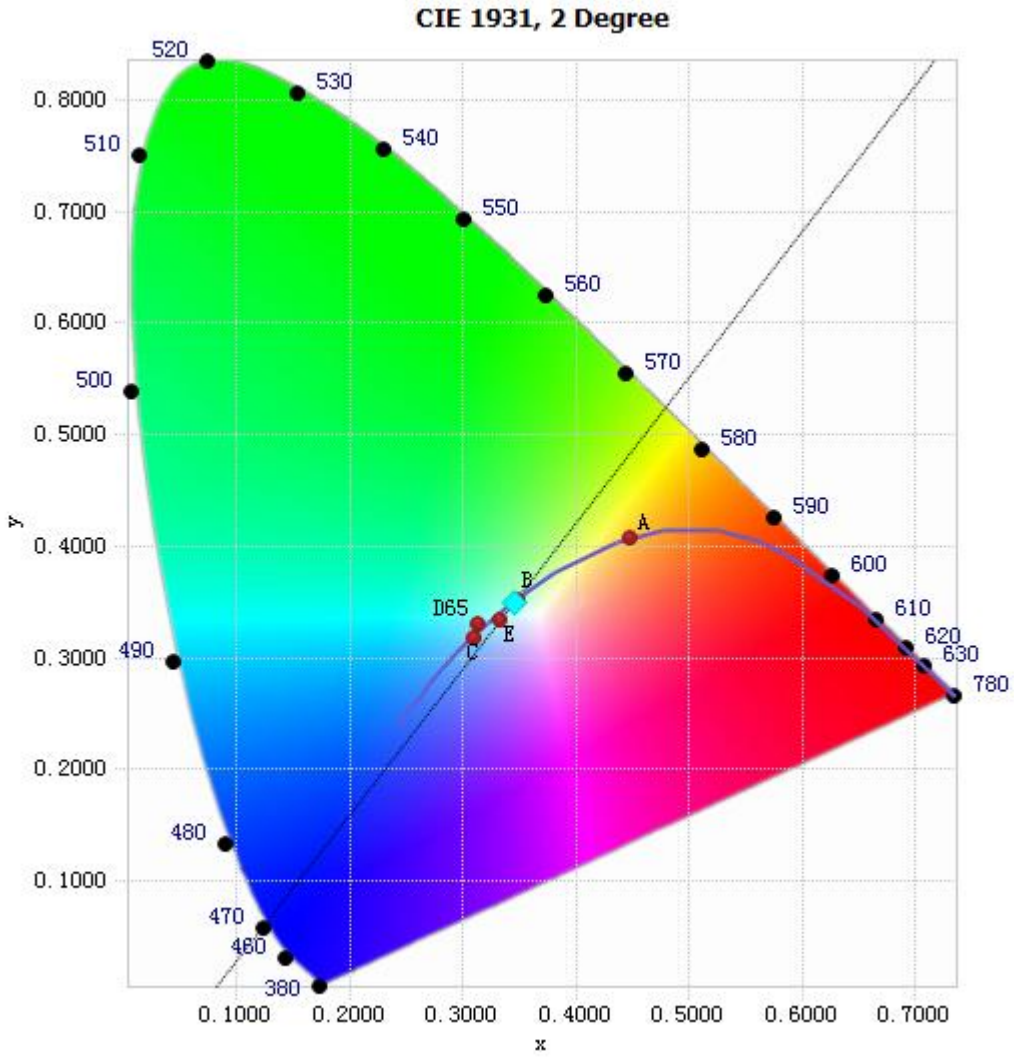


Chart16: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.89E-04	485	1.19E-02	590	2.55E-02	695	3.59E-03
385	1.76E-04	490	1.27E-02	595	2.52E-02	700	3.08E-03
390	1.82E-04	495	1.42E-02	600	2.48E-02	705	2.63E-03
395	1.47E-04	500	1.58E-02	605	2.41E-02	710	2.25E-03
400	1.52E-04	505	1.72E-02	610	2.33E-02	715	1.92E-03
405	2.24E-04	510	1.83E-02	615	2.22E-02	720	1.65E-03
410	4.52E-04	515	1.93E-02	620	2.10E-02	725	1.42E-03
415	8.82E-04	520	1.98E-02	625	1.97E-02	730	1.21E-03
420	1.71E-03	525	2.04E-02	630	1.82E-02	735	1.02E-03
425	3.15E-03	530	2.09E-02	635	1.67E-02	740	8.80E-04
430	5.55E-03	535	2.12E-02	640	1.53E-02	745	7.46E-04
435	9.90E-03	540	2.16E-02	645	1.37E-02	750	6.42E-04
440	1.79E-02	545	2.21E-02	650	1.23E-02	755	5.52E-04
445	3.26E-02	550	2.24E-02	655	1.09E-02	760	4.72E-04
450	4.30E-02	555	2.28E-02	660	9.67E-03	765	4.02E-04
455	3.43E-02	560	2.33E-02	665	8.47E-03	770	3.51E-04
460	2.46E-02	565	2.39E-02	670	7.38E-03	775	2.95E-04
465	2.03E-02	570	2.43E-02	675	6.45E-03	780	2.57E-04
470	1.55E-02	575	2.48E-02	680	5.57E-03		
475	1.22E-02	580	2.51E-02	685	4.85E-03		
480	1.16E-02	585	2.55E-02	690	4.18E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3454, 0.3491)

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

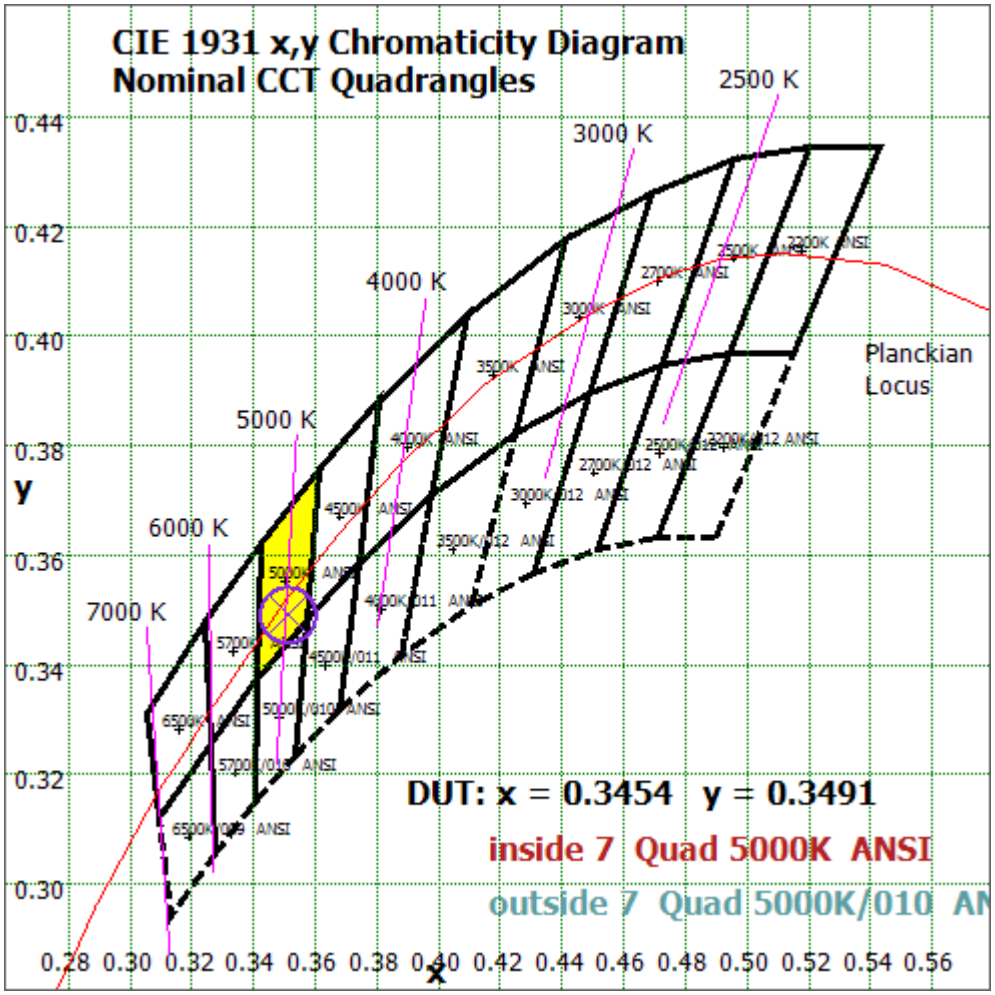


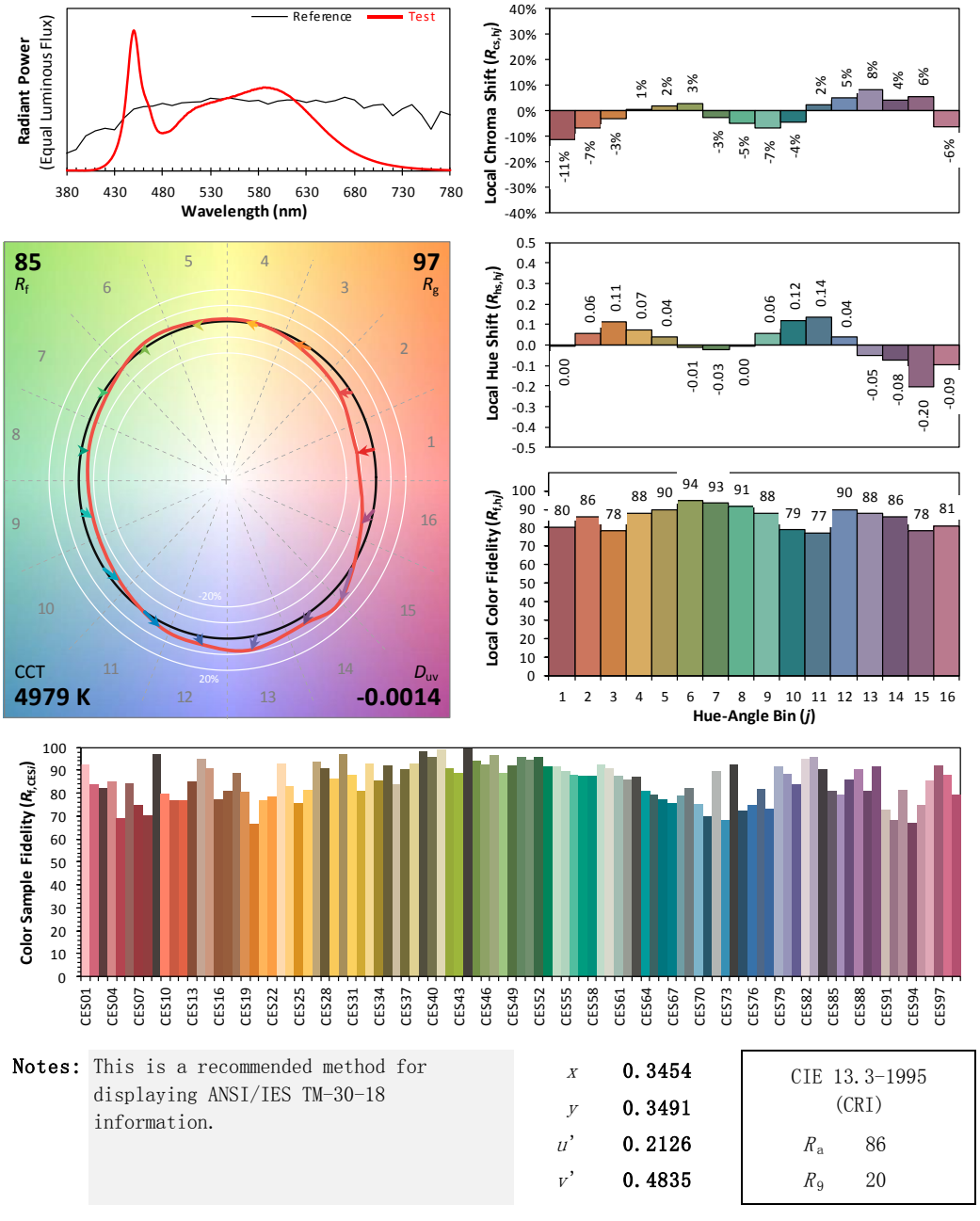
Chart 18: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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/A3



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

x	0.3454
y	0.3491
u'	0.2126
v'	0.4835

CIE 13.3-1995 (CRI)

R_a	86
R_9	20

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 ℃.

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)	0.285	0.135
Power Factor	0.9904	0.9001
Test Power (W)/3	11.28	11.26
THD A%	5.36	9.74
Luminous Efficacy (lm/W)	136.2	136.3
Total Luminous Flux (lm)	1535.9	1535.2
Color Rendering Index (CRI)	83.9	
R9	10.1	
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	10.1
R10	71.5
R11	83.5
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

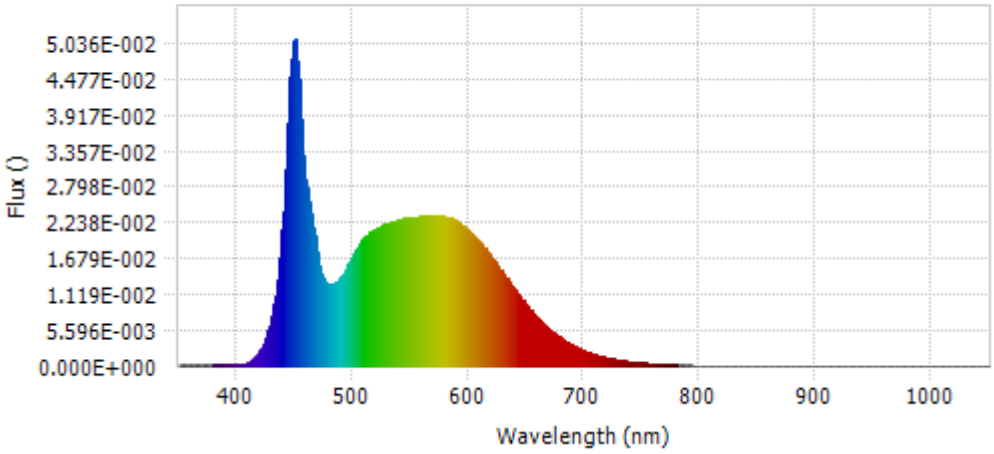
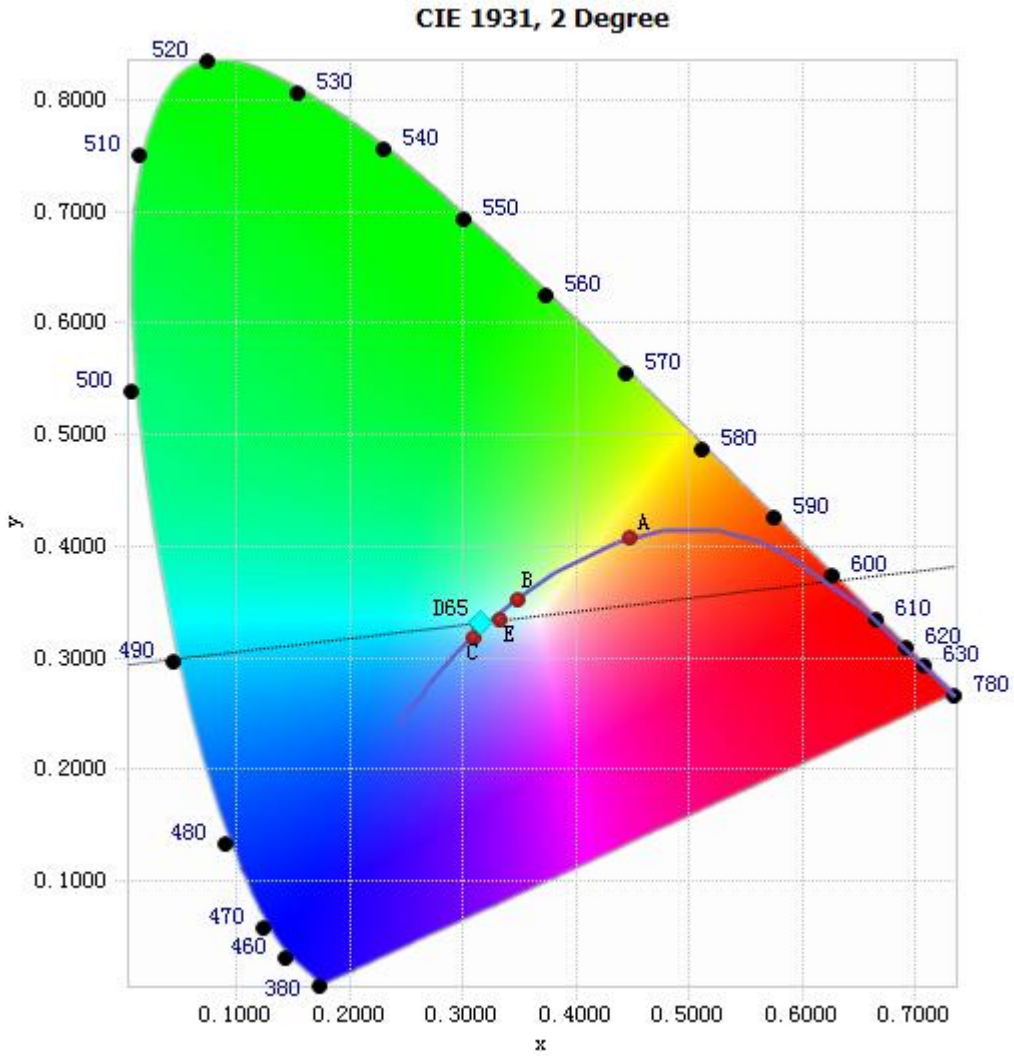


Chart 20: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.30E-04	485	1.30E-02	590	2.26E-02	695	2.77E-03
385	2.12E-04	490	1.40E-02	595	2.19E-02	700	2.37E-03
390	2.03E-04	495	1.56E-02	600	2.11E-02	705	2.03E-03
395	1.55E-04	500	1.73E-02	605	2.01E-02	710	1.75E-03
400	1.88E-04	505	1.87E-02	610	1.91E-02	715	1.50E-03
405	2.92E-04	510	1.99E-02	615	1.81E-02	720	1.28E-03
410	6.41E-04	515	2.08E-02	620	1.69E-02	725	1.11E-03
415	1.31E-03	520	2.13E-02	625	1.56E-02	730	9.47E-04
420	2.50E-03	525	2.19E-02	630	1.44E-02	735	8.09E-04
425	4.50E-03	530	2.23E-02	635	1.31E-02	740	6.92E-04
430	7.84E-03	535	2.24E-02	640	1.19E-02	745	5.94E-04
435	1.36E-02	540	2.27E-02	645	1.07E-02	750	5.18E-04
440	2.41E-02	545	2.30E-02	650	9.51E-03	755	4.42E-04
445	4.17E-02	550	2.30E-02	655	8.44E-03	760	3.77E-04
450	5.09E-02	555	2.32E-02	660	7.43E-03	765	3.28E-04
455	3.84E-02	560	2.33E-02	665	6.54E-03	770	2.83E-04
460	2.78E-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	2.15E-04
470	1.68E-02	575	2.34E-02	680	4.30E-03		
475	1.33E-02	580	2.33E-02	685	3.73E-03		
480	1.27E-02	585	2.30E-02	690	3.21E-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

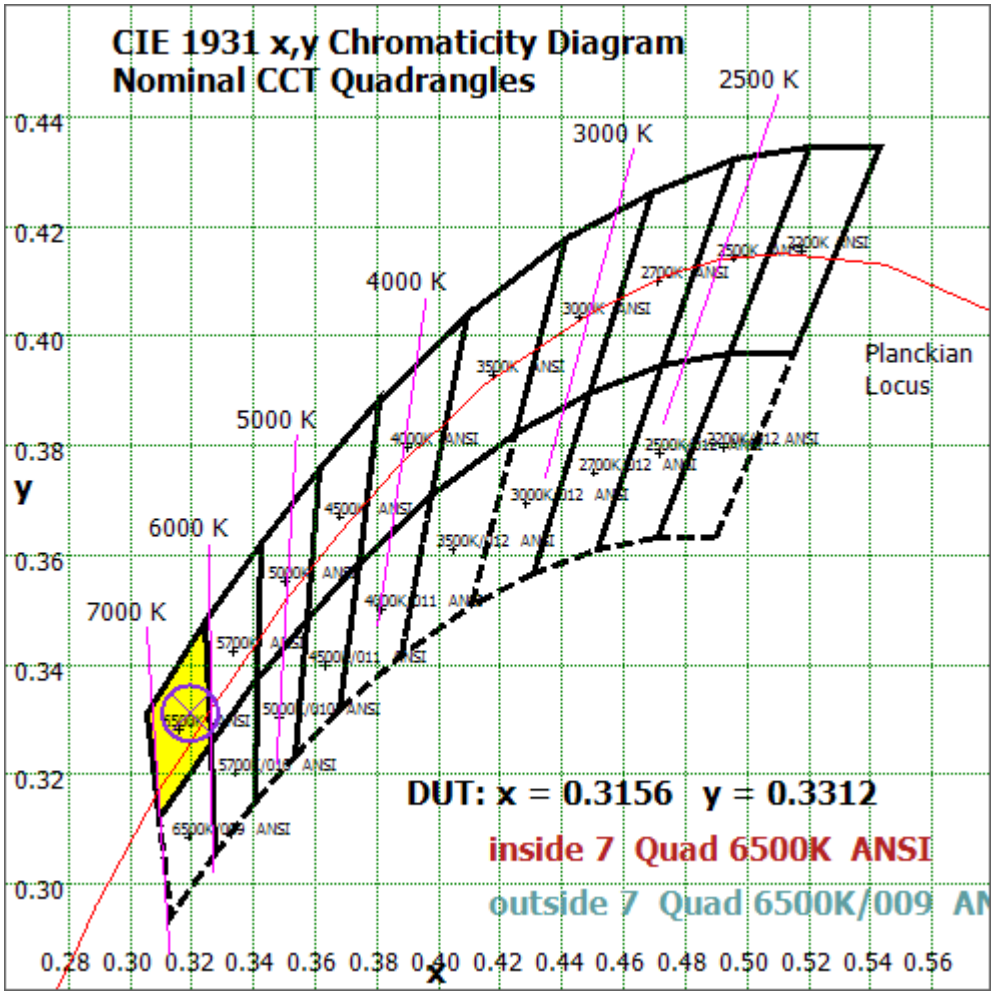


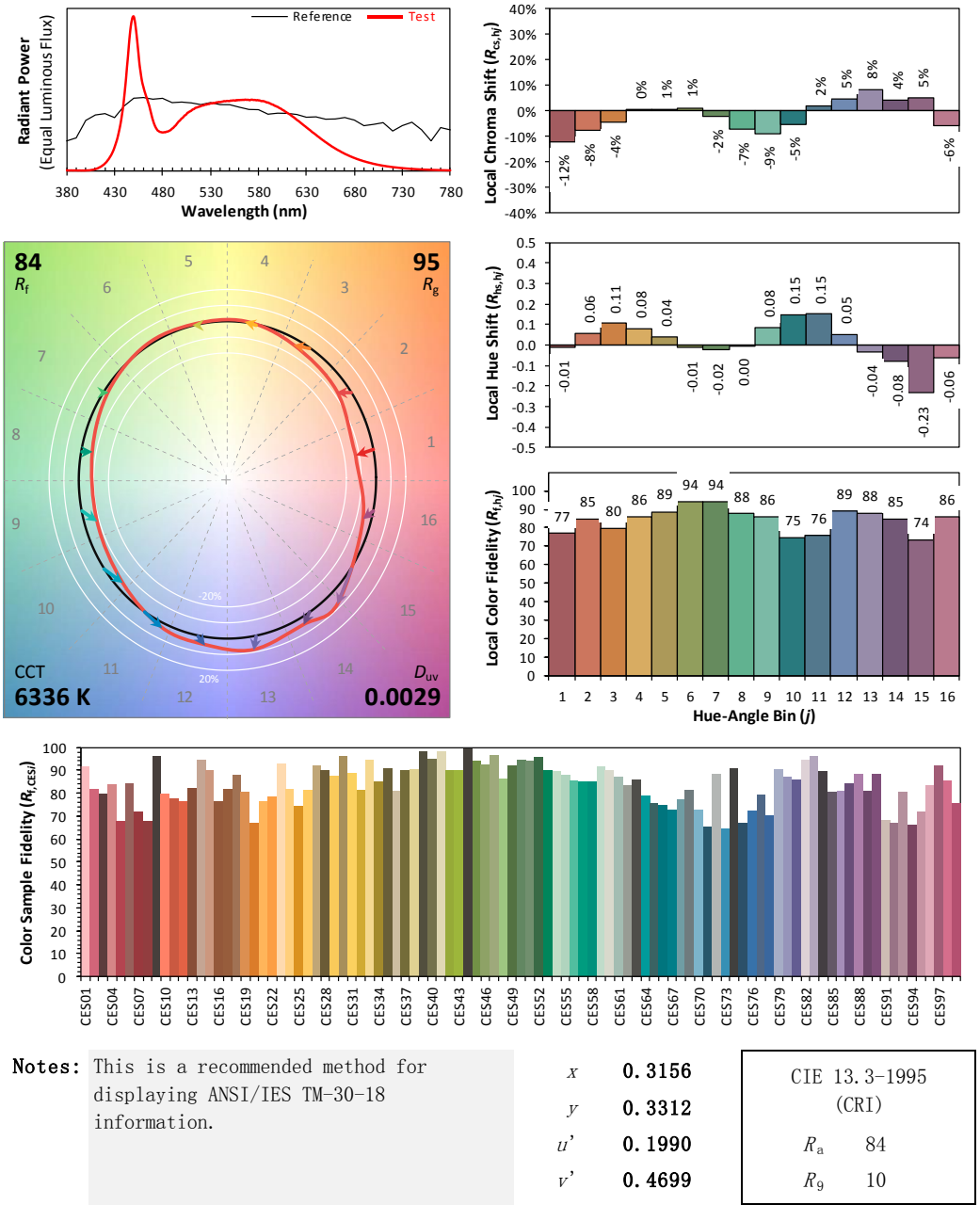
Chart 22: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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/A3



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

x	0.3156
y	0.3312
u'	0.1990
v'	0.4699

CIE 13.3-1995 (CRI)	
R_a	84
R_9	10

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 4π. Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 20 min, taken 10 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

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

Goniophotometer Method

Photometric and Electrical Measurements

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

Color Characteristics Measurements

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

*** End of Report ***