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: 14T8/4F/8CCTS/EXT/SD/A2

Laboratory: Lea ding Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ23060027j

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

Review by: Wei Fei

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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	14T8/4F/8CCTS/EXT/SD/A2 3000K Setting	14T8/4F/8CCTS/EXT/SD/A2 3500K Setting	14T8/4F/8CCTS/EXT/SD/A2 4000K Setting
Luminous Efficacy (Lumens /Watt)	138.4	144.6	147.4
Total Luminous Flux (Lumens)	2212.4	2283.1	2307.2
Power (Watts)/2	15.99	15.79	15.65
Power Factor	0.9942	0.9939	0.9938
CCT (K)	3054	3581	4016
CRI	82.4	84.6	85.5
Stabilization Time (Light & Power)	50 mins	50 mins	50 mins
Note	3000K	3500K	4000K

Tested Model	14T8/4F/8CCTS/EXT/SD/A2 5000K Setting	14T8/4F/8CCTS/EXT/SD/A2 6500K Setting
Luminous Efficacy (Lumens /Watt)	148.2	142.3
Total Luminous Flux (Lumens)	2329.6	2277.4
Power (Watts)/2	15.72	16.00
Power Factor	0.9939	0.9942
CCT (K)	4903	6512
CRI	85.6	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

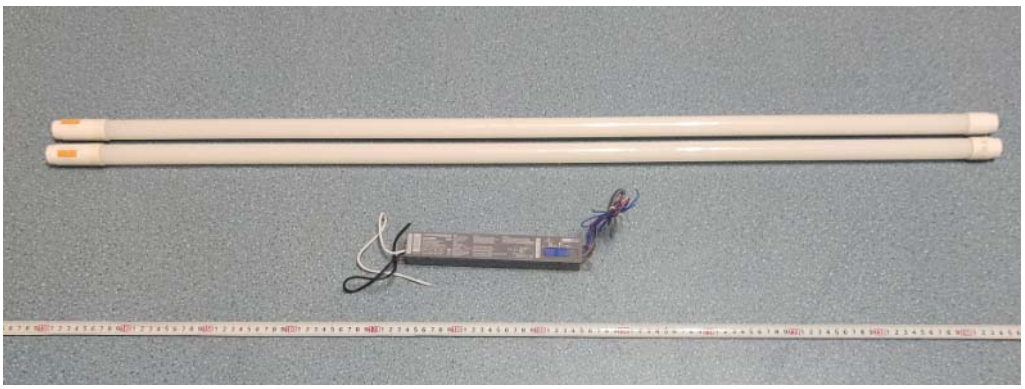


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Tube
Model	: 14T8/4F/8CCTS/EXT/SD/A2
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: Color- Tunable 3000K/3500K/4000K/5000K/6500K LED Tube supplied by a LED driver: 15T8T5HEDRIVER/SD/2CH
Manufacturer	: GREEN CREATIVE LTD
Address	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

TEST RESULTS (3000K Setting)

Test ambient temperature was 26.0°C.

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

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

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.268	0.124
Power Factor	0.9942	0.9279
Test Power (W)/2	15.99	15.92
THD A%	5.59	7.35
Luminous Efficacy (lm/W)	138.4	139.1
Total Luminous Flux (lm)	2212.4	2214.1
Color Rendering Index (CRI)	82.4	
R9	6.3	
Correlated Color Temperature (CCT)(K)	3054	
Chromaticity Chroma x	0.4326	
Chromaticity Chroma y	0.4018	
Chromaticity Chroma u	0.2488	
Chromaticity Chroma v	0.3465	
Duv	-0.0003	
Chromaticity Chroma u ’	0.2488	
Chromaticity Chroma v’	0.5198	

Special Color Rendering Indices	
R1	81.9
R2	94.1
R3	92.2
R4	78.5
R5	82.3
R6	92.9
R7	80.1
R8	57.1
R9	6.3
R10	86.6
R11	78
R12	72.8
R13	85.2
R14	96.3

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

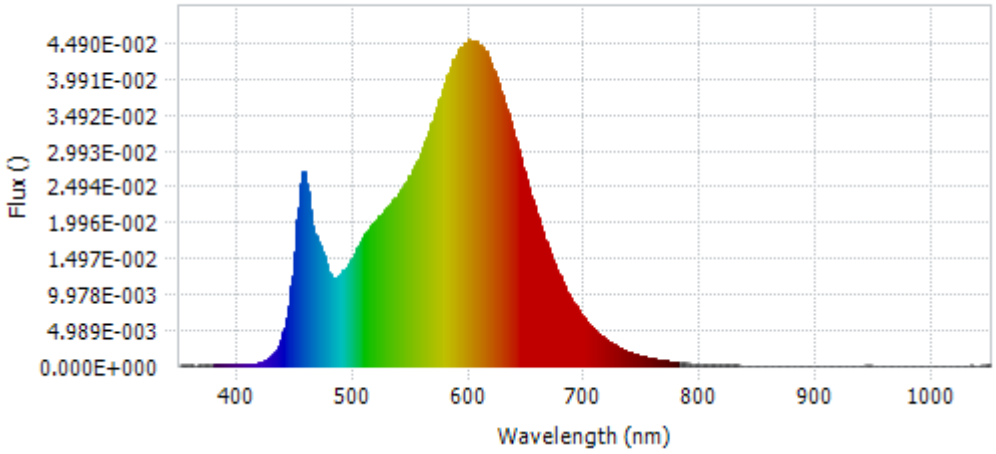
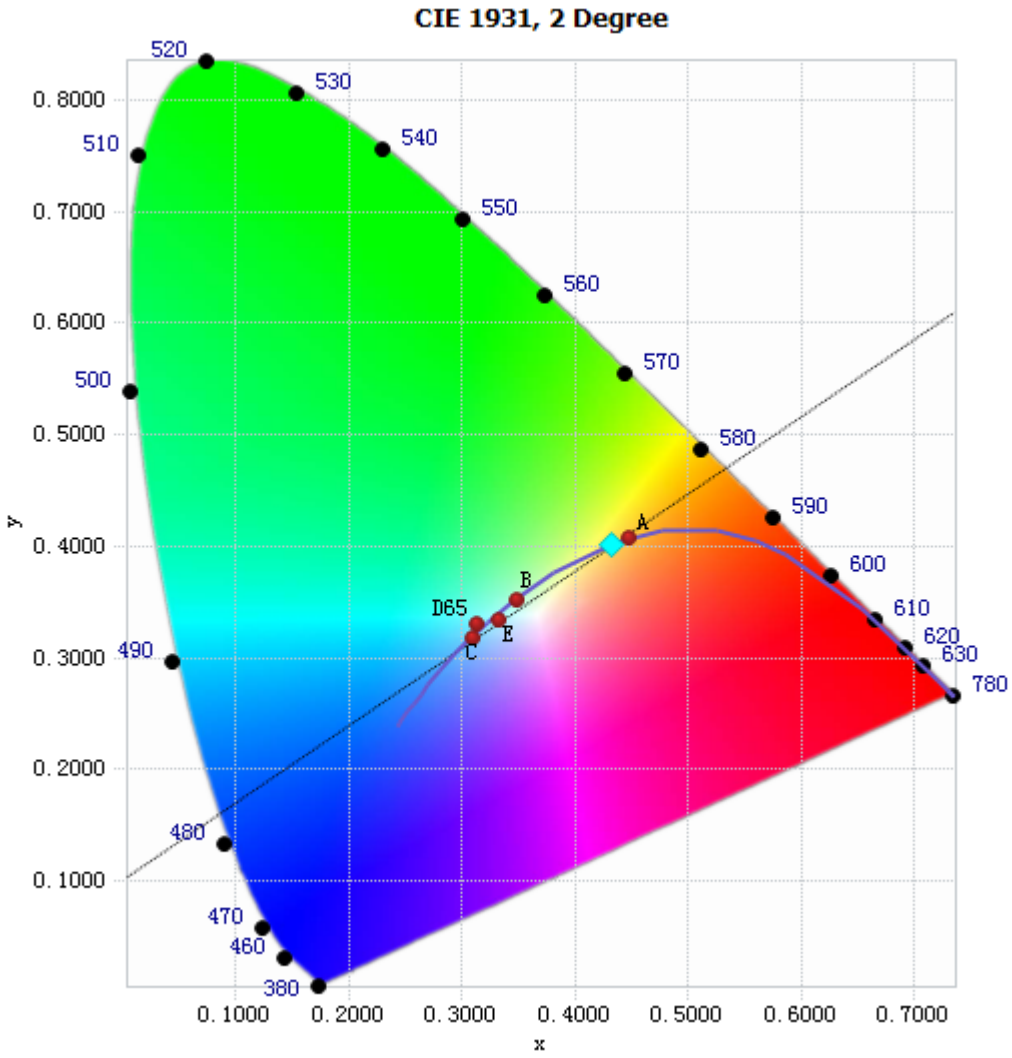


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.86E-04	485	1.23E-02	590	4.37E-02	695	7.55E-03
385	1.58E-04	490	1.30E-02	595	4.47E-02	700	6.43E-03
390	1.36E-04	495	1.40E-02	600	4.53E-02	705	5.49E-03
395	1.72E-04	500	1.54E-02	605	4.50E-02	710	4.69E-03
400	1.29E-04	505	1.70E-02	610	4.44E-02	715	4.03E-03
405	1.44E-04	510	1.83E-02	615	4.32E-02	720	3.45E-03
410	2.07E-04	515	1.94E-02	620	4.13E-02	725	2.93E-03
415	3.23E-04	520	2.04E-02	625	3.92E-02	730	2.50E-03
420	5.50E-04	525	2.13E-02	630	3.66E-02	735	2.12E-03
425	9.10E-04	530	2.22E-02	635	3.39E-02	740	1.82E-03
430	1.61E-03	535	2.31E-02	640	3.11E-02	745	1.55E-03
435	2.87E-03	540	2.42E-02	645	2.83E-02	750	1.32E-03
440	5.20E-03	545	2.55E-02	650	2.54E-02	755	1.13E-03
445	9.61E-03	550	2.68E-02	655	2.27E-02	760	9.72E-04
450	1.81E-02	555	2.85E-02	660	2.01E-02	765	8.27E-04
455	2.65E-02	560	3.04E-02	665	1.77E-02	770	7.13E-04
460	2.43E-02	565	3.26E-02	670	1.55E-02	775	6.13E-04
465	1.88E-02	570	3.50E-02	675	1.35E-02	780	5.23E-04
470	1.69E-02	575	3.74E-02	680	1.17E-02		
475	1.46E-02	580	3.98E-02	685	1.01E-02		
480	1.24E-02	585	4.22E-02	690	8.76E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4326, 0.4018)

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

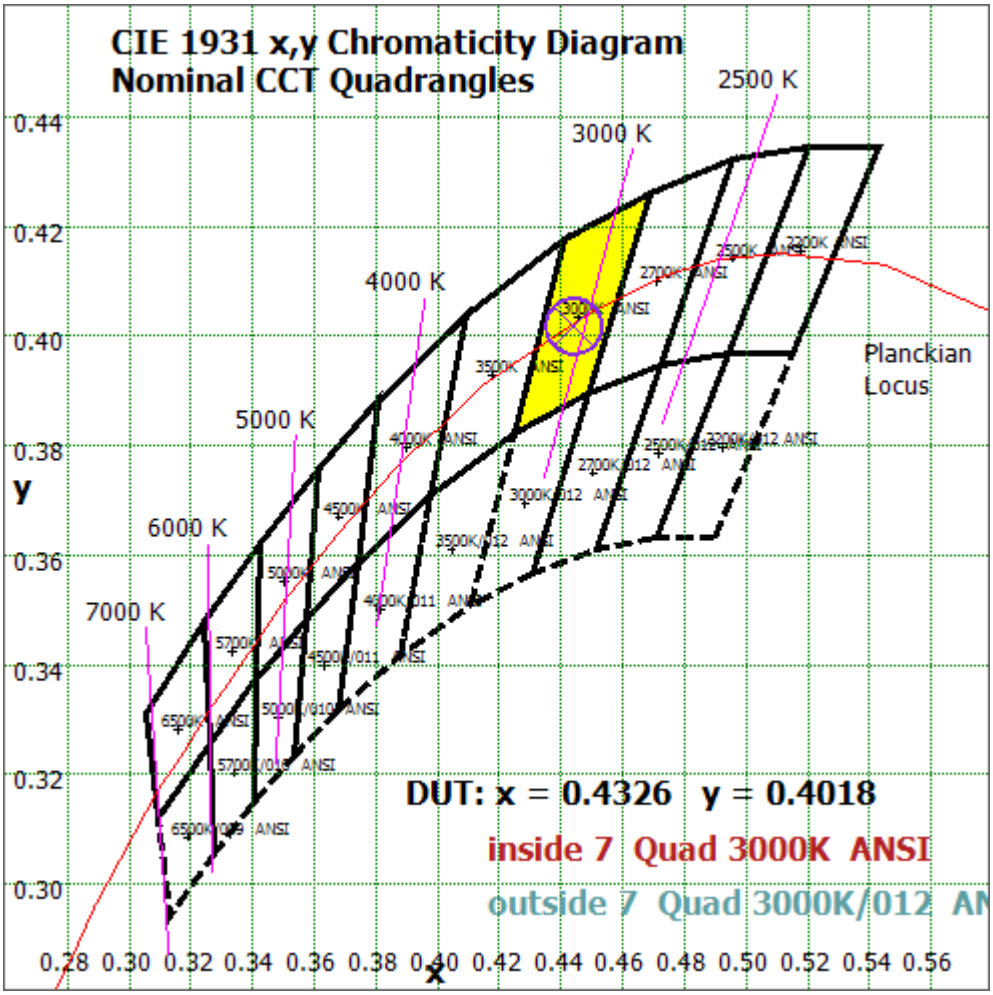


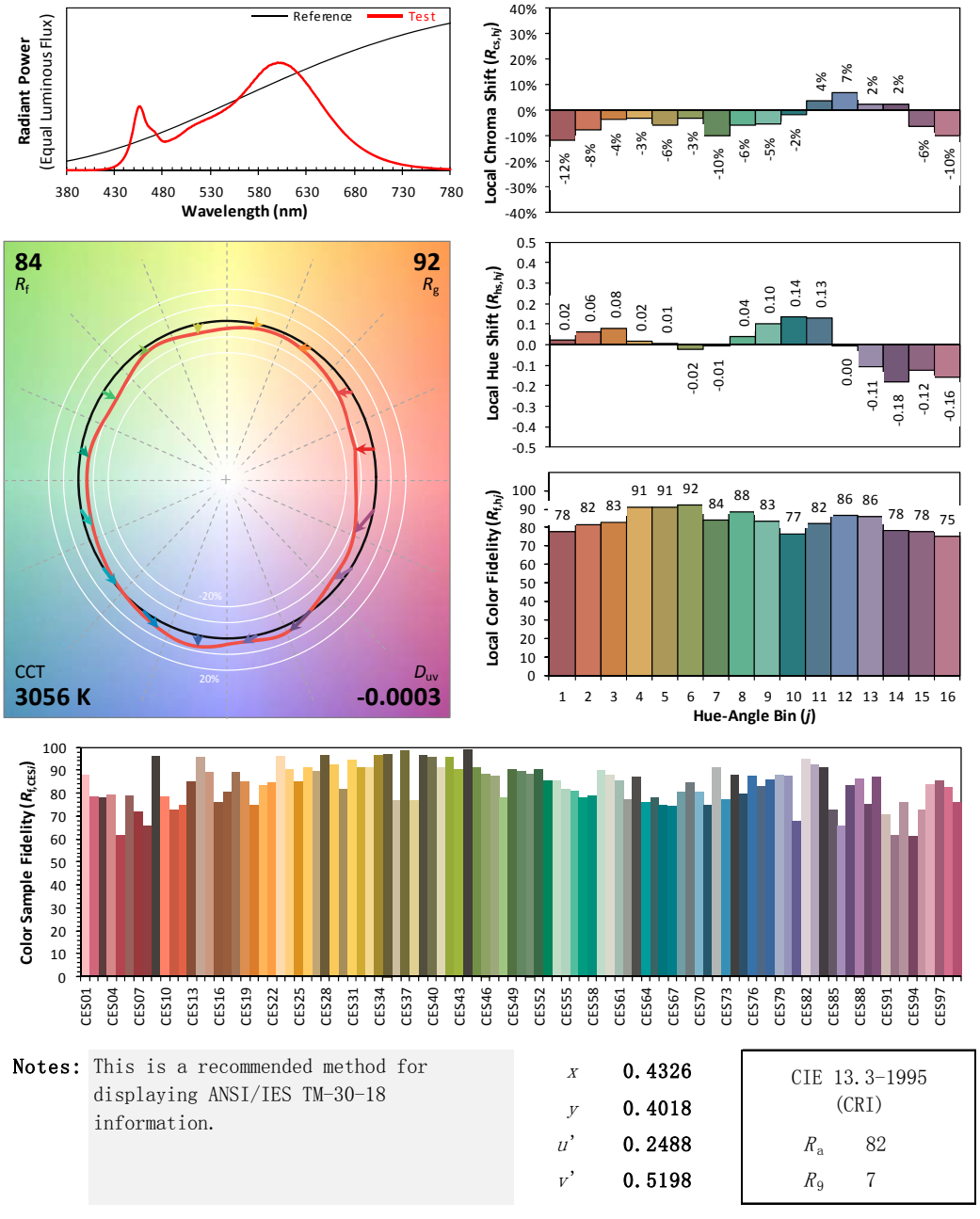
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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:** 14T8/4F/8CCTS/EXT/SD/A2



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

x	0.4326
y	0.4018
u'	0.2488
v'	0.5198

CIE 13.3-1995 (CRI)

R_a	82
R_9	7

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)	0.269
Power Factor	0.9927
Power (W)/2	16.04
Luminous Efficacy (lm/W)	139.1
Total Luminous Flux (lm)	2230.8
Beam Angle (°)	117.3 (0^o-180^o) / 251.3 (90^o-270^o)
Center Beam Candle Power (cd)	342
Maximum Beam Candle Power (cd)	341.9 (At: C=0.0, Gamma=3.5)
Spacing Criteria	1.26 (0^o-180^o) / 1.46 (90^o-270^o)
Zonal Lumens in the 0°-60°Zone	40.72%
Zonal Lumens in the 60°-90°Zone	27.18%
Zonal Lumens in the 90°-120°Zone	18.95%
Zonal Lumens in the 120°-180°Zone	13.14%

Table 4: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	32.418	1.45%
10- 20	94.395	4.23%
20- 30	148.353	6.65%
30- 40	190.076	8.52%
40- 50	216.551	9.71%
50- 60	226.631	10.16%
60- 70	221.284	9.92%
70- 80	203.877	9.14%
80- 90	181.211	8.12%
90-100	159.89	7.17%
100-110	140.721	6.31%
110-120	122.143	5.48%
120-130	101.863	4.57%
130-140	81.198	3.64%
140-150	58.86	2.64%
150-160	35.657	1.60%
160-170	13.688	0.61%
170-180	1.969	0.09%
Total	2230.8	100%

γ(°)	Lumens	% Total
0- 60	908.424	40.72%
60- 90	606.372	27.18%
0-90	1514.8	67.90%
90- 180	715.989	32.10%
0- 180	2230.8	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

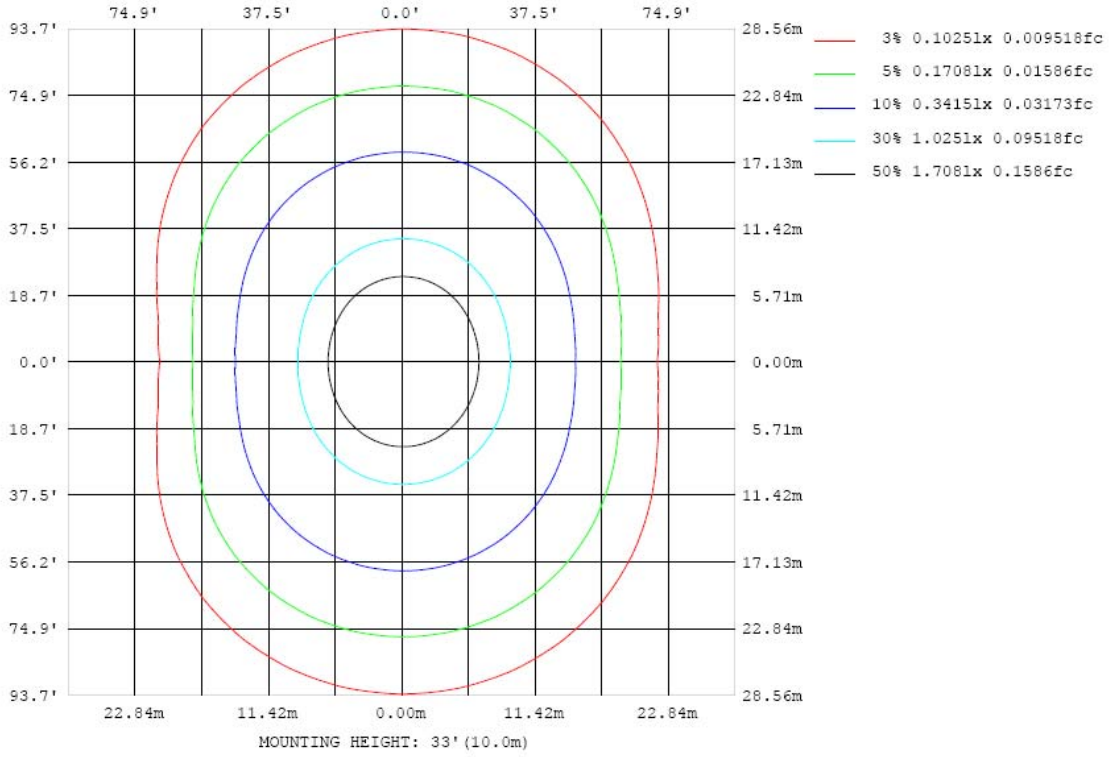


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

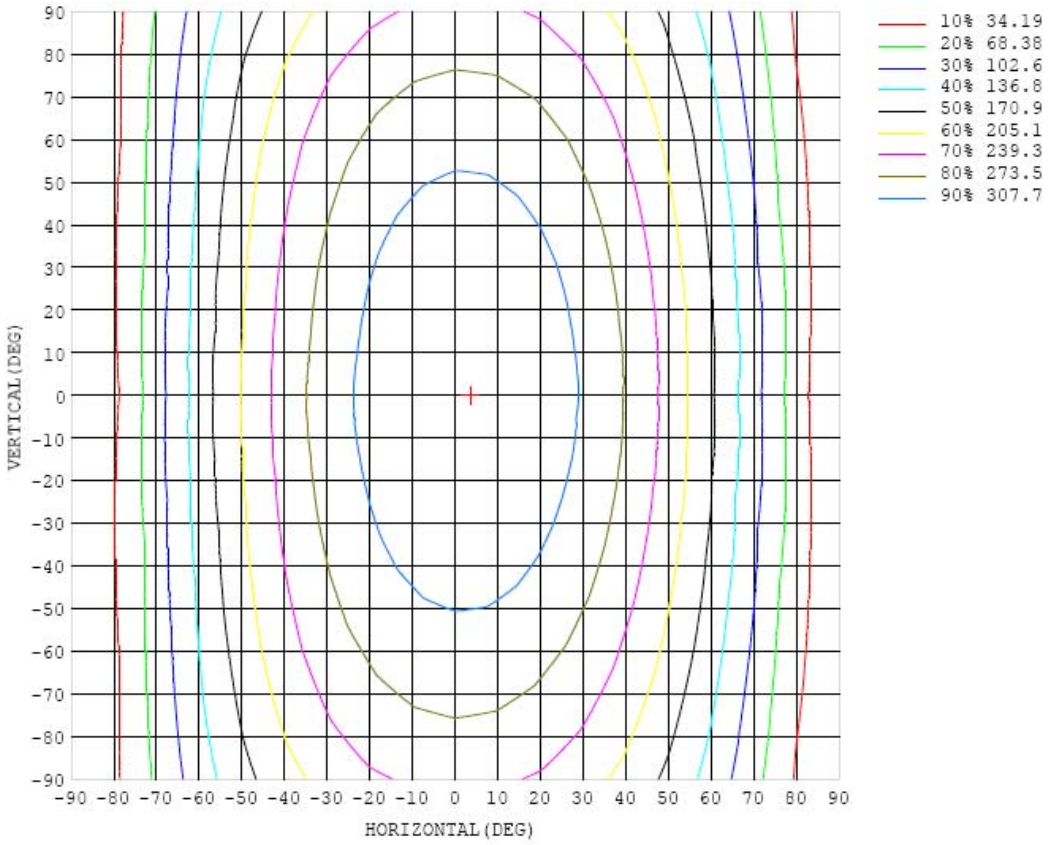


Chart 6: Isocandela Plot

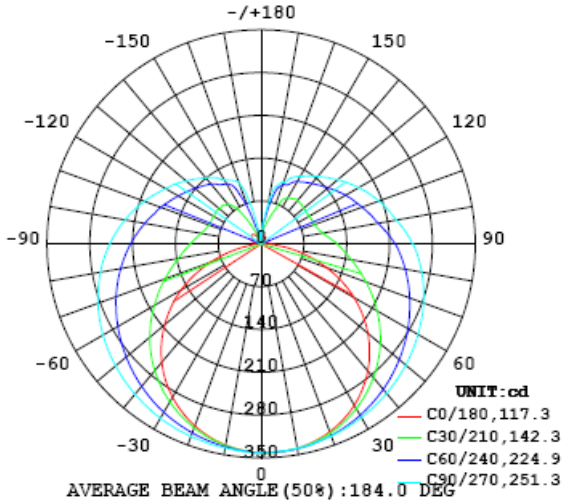


Chart 7: Polar Candela Distribution

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	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342
5	342	342	341	341	341	341	341	341	341	341	340	340	340	339	339	339	339	339	339
10	339	339	339	339	340	340	340	340	340	340	339	339	338	337	336	335	334	334	334
15	335	334	334	336	336	337	338	338	338	337	336	335	334	332	330	329	327	327	327
20	327	327	328	330	331	332	334	335	335	334	333	331	329	326	323	321	318	317	317
25	317	317	319	321	324	327	329	331	332	331	330	327	323	319	315	310	307	305	304
30	305	305	308	311	315	320	324	327	328	328	326	322	317	311	305	298	294	291	290
35	289	290	294	299	305	312	317	322	324	324	321	317	311	303	294	285	278	274	273
40	271	273	278	286	294	303	310	316	319	319	316	311	303	293	282	271	261	255	253
45	251	254	260	270	282	293	303	310	314	314	311	305	295	283	269	255	241	234	231
50	228	232	241	254	269	283	295	303	308	308	305	298	287	273	256	238	221	210	206
55	202	207	220	237	255	272	286	296	301	302	299	291	279	262	242	220	199	185	179
60	175	181	197	219	241	261	277	288	295	296	293	284	270	252	228	202	176	158	151
65	145	153	174	201	227	250	268	281	288	289	286	277	262	241	215	185	154	129	120
70	114	124	151	183	213	238	258	272	280	282	279	269	253	231	202	168	131	100	88.0
75	81.8	95.4	128	165	199	227	249	264	272	275	271	261	244	221	190	153	111	73.1	56.4
80	51.1	69.1	108	150	186	216	239	255	264	266	263	253	235	211	179	140	94.4	50.1	27.3
85	23.0	46.1	90.9	136	175	206	229	246	255	258	254	244	227	202	169	129	81.9	33.7	6.61
90	5.48	31.1	79.1	124	164	195	219	235	245	248	244	234	217	193	160	120	73.7	27.4	1.39
95	1.81	22.5	68.1	112	151	183	207	223	233	236	233	223	207	183	152	113	70.2	27.5	3.07
100	4.32	19.1	60.4	103	140	170	194	211	221	225	222	213	197	174	144	108	68.6	30.9	7.80
105	9.02	20.7	57.7	96.2	133	162	185	201	211	215	213	204	188	166	138	104	68.8	36.6	14.1
110	14.3	23.4	57.9	93.0	126	154	176	192	201	205	203	194	179	159	132	102	70.9	42.8	17.3
115	15.0	26.8	60.3	91.9	122	147	167	182	191	195	192	184	171	151	127	100	73.8	48.5	18.1
120	8.20	25.2	64.1	90.7	117	141	159	173	181	184	182	175	162	144	123	99.7	77.4	52.2	16.7
125	4.76	28.7	68.5	90.5	113	134	151	163	171	173	172	165	154	138	120	99.7	80.4	53.6	17.7
130	3.73	35.2	72.3	91.2	110	128	143	154	161	163	162	156	146	133	117	100	79.8	61.8	21.2
135	8.18	34.7	71.7	92.1	108	123	135	145	151	153	152	147	139	128	114	100	82.8	59.5	21.0
140	9.83	20.3	66.3	93.2	107	119	129	137	142	144	143	139	132	123	113	96.1	82.8	56.9	20.1
145	13.0	16.1	65.6	89.8	103	115	123	130	134	136	135	132	126	119	107	94.7	79.3	52.2	17.7
150	10.8	17.4	47.3	87.1	99.1	109	118	123	126	128	127	125	121	111	102	92.7	75.8	45.7	15.6
155	12.0	17.5	35.1	76.4	97.1	103	108	115	119	120	119	116	108	105	98.7	84.4	63.1	38.0	13.2
160	12.5	17.9	30.0	52.5	83.3	96.9	102	105	107	107	107	107	103	98.0	87.8	66.6	49.4	27.5	11.2
165	13.3	17.9	25.2	36.5	53.6	72.4	87.5	95.0	97.7	98.3	98.2	96.7	90.7	79.7	68.9	51.0	34.2	20.6	12.1
170	14.1	15.8	18.9	24.7	33.4	40.4	50.5	59.3	64.5	67.1	67.4	65.2	58.9	47.5	39.8	31.6	21.6	18.8	15.1
175	15.4	15.8	17.3	18.5	18.8	20.9	25.3	28.9	30.8	31.8	31.9	30.2	26.5	22.2	18.4	17.3	18.2	17.6	15.2
180	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C(DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342		
5	339	339	339	339	340	340	340	340	341	341	341	341	341	341	341	342	342		
10	334	334	335	335	336	337	338	339	339	339	340	340	339	339	339	339	339		
15	327	327	328	330	332	333	335	336	337	338	338	337	336	336	335	335	335		
20	317	318	320	323	326	329	332	334	335	336	335	334	333	331	329	328	327		
25	305	307	310	315	319	324	328	331	332	333	332	330	327	324	321	319	317		
30	290	293	298	305	312	318	323	327	329	330	328	325	321	316	311	307	305		
35	273	278	285	294	303	311	318	323	325	326	323	319	314	307	300	294	291		
40	254	261	271	282	294	304	312	318	321	321	318	312	305	296	287	278	273		
45	233	242	255	269	284	296	306	313	316	316	312	305	295	284	272	261	254		
50	209	221	238	256	273	288	299	307	311	310	305	297	285	271	255	241	232		
55	184	199	220	242	262	279	292	301	305	304	298	288	274	257	238	220	207		
60	158	177	202	228	251	271	285	294	298	297	291	279	263	243	220	198	181		
65	129	154	185	214	240	262	277	287	292	290	283	270	252	228	201	175	154		
70	100	131	167	200	229	252	269	280	284	282	275	260	240	214	183	151	125		
75	72.5	111	151	188	219	243	260	271	276	274	265	250	228	200	166	128	95.5		
80	48.6	92.9	138	177	208	233	251	262	267	265	256	240	217	186	150	107	67.8		
85	32.0	79.5	126	166	198	223	242	253	257	255	246	229	205	174	135	88.9	44.4		
90	23.8	70.1	116	156	188	213	232	243	247	245	236	219	195	163	123	75.4	29.2		
95	18.6	62.5	107	147	179	203	222	233	237	235	225	208	184	153	113	66.5	23.3		
100	19.3	57.3	99.9	138	170	193	211	222	226	224	214	197	174	143	105	61.7	23.5		
105	22.3	56.3	94.2	130	161	183	200	211	215	212	203	187	165	135	98.5	59.9	27.2		
110	26.1	57.5	91.3	124	152	175	190	200	203	201	192	177	156	127	94.3	60.6	32.8		
115	27.8	59.7	90.1	119	145	165	179	189	192	189	181	168	147	121	91.8	63.4	37.8		
120	21.6	60.2	89.9	115	138	157	170	178	180	178	171	158	139	116	90.6	67.5	42.0		
125	8.44	58.7	90.8	112	132	149	161	168	171	169	161	149	132	112	90.5	72.4	43.9		
130	7.40	59.1	89.1	109	127	141	152	158	160	158	151	141	126	109	90.5	76.2	42.6		
135	6.63	57.2	89.1	107	122	134	143	149	150	148	143	133	121	105	89.7	77.6	37.3		
140	4.77	45.4	84.4	102	116	128	135	140	141	140	135	127	114	102	91.3	73.6	30.5		
145	5.67	26.7	71.6	102	110	118	126	131	133	131	126	117	109	101	90.3	61.7	22.1		
150	5.87	13.2	44.3	87.9	105	113	117	120	121	120	117	112	107	100	83.2	43.8	13.9		
155	6.38	9.82	19.2	46.0	82.3	101	111	114	114	114	112	109	103	89.5	61.7	25.0	11.5		
160	6.84	7.63	9.65	18.2	29.6	57.1	76.4	99.9	106	107	103	96.9	86.4	66.8	36.6	14.4	11.0		
165	8.36	7.39	8.16	11.6	18.1	23.1	25.3	39.9	65.2	71.1	67.8	61.3	49.9	33.2	16.9	11.4	10.5		
170	13.7	11.5	12.1	11.5	9.51	11.6	15.4	14.4	13.6	24.9	22.4	17.9	16.6	15.7	12.4	11.1	13.0		
175	15.6	17.8	16.8	12.4	9.67	9.69	10.6	13.1	11.6	13.5	12.3	11.1	10.2	9.73	10.3	13.3	16.0		
180	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1		

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)	0.265	0.123
Power Factor	0.9939	0.9277
Test Power (W)/2	15.79	15.75
THD A%	5.68	7.26
Luminous Efficacy (lm/W)	144.6	145.1
Total Luminous Flux (lm)	2283.1	2284.8
Color Rendering Index (CRI)	84.6	
R9	17.5	
Correlated Color Temperature (CCT)(K)	3581	
Chromaticity Chroma x	0.3977	
Chromaticity Chroma y	0.3798	
Chromaticity Chroma u	0.2352	
Chromaticity Chroma v	0.3370	
Duv	-0.0032	
Chromaticity Chroma u ’	0.2352	
Chromaticity Chroma v’	0.5055	

Special Color Rendering Indices	
R1	85.6
R2	96.8
R3	91.5
R4	80.5
R5	85.6
R6	93.1
R7	81.2
R8	62.9
R9	17.5
R10	91.6
R11	80.4
R12	70.1
R13	89.3
R14	96.1

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

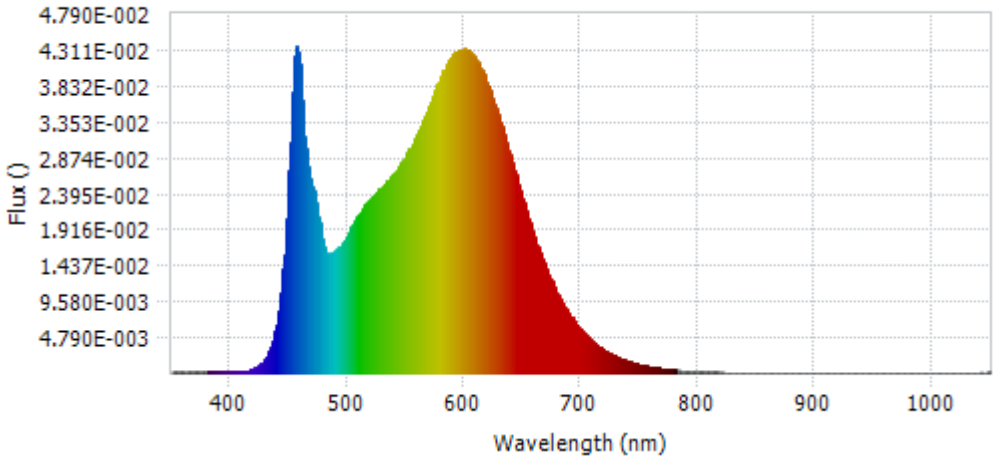
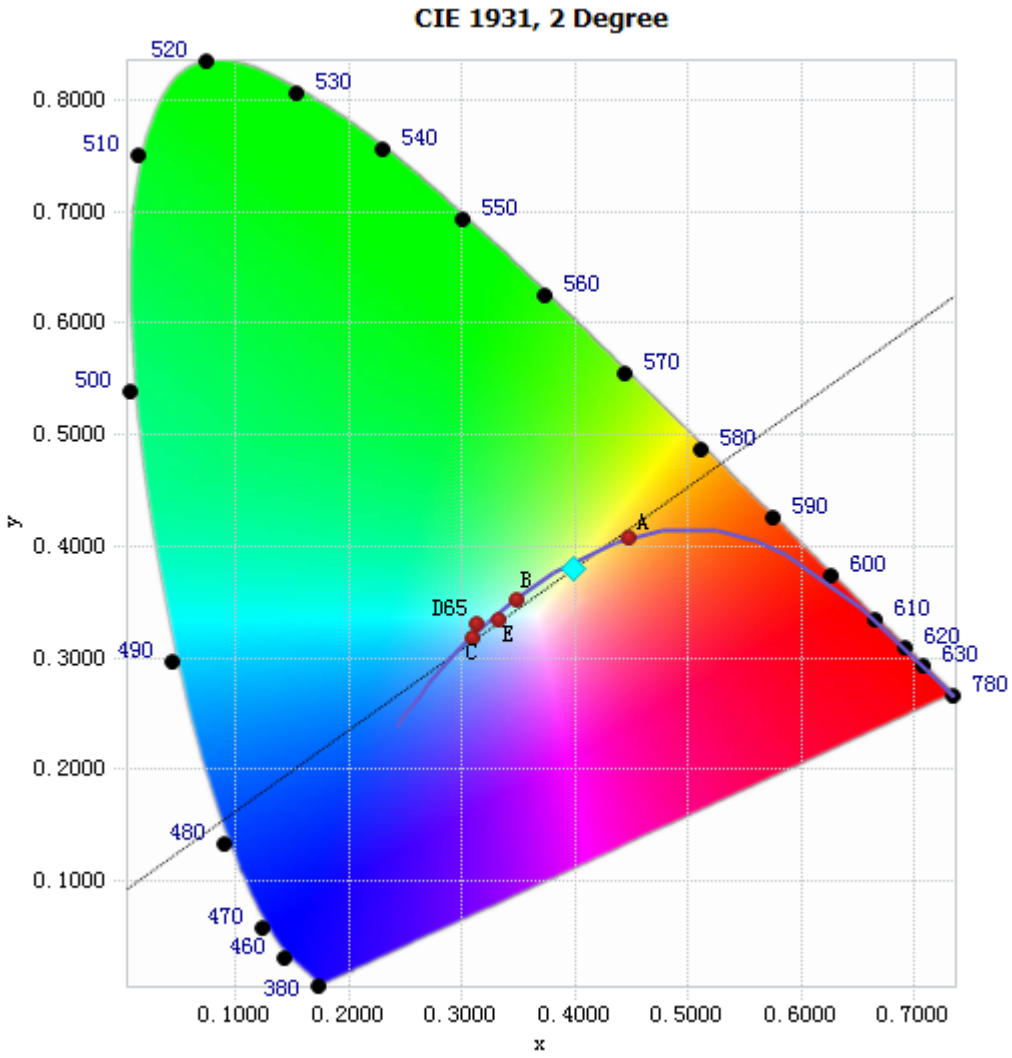


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.91E-04	485	1.59E-02	590	4.25E-02	695	6.76E-03
385	1.83E-04	490	1.64E-02	595	4.30E-02	700	5.78E-03
390	2.06E-04	495	1.71E-02	600	4.32E-02	705	4.89E-03
395	2.15E-04	500	1.83E-02	605	4.27E-02	710	4.20E-03
400	2.00E-04	505	1.99E-02	610	4.18E-02	715	3.62E-03
405	2.03E-04	510	2.12E-02	615	4.04E-02	720	3.06E-03
410	2.72E-04	515	2.24E-02	620	3.84E-02	725	2.64E-03
415	4.04E-04	520	2.32E-02	625	3.63E-02	730	2.24E-03
420	6.36E-04	525	2.41E-02	630	3.38E-02	735	1.89E-03
425	1.13E-03	530	2.50E-02	635	3.12E-02	740	1.62E-03
430	2.03E-03	535	2.58E-02	640	2.86E-02	745	1.38E-03
435	3.83E-03	540	2.66E-02	645	2.59E-02	750	1.17E-03
440	7.30E-03	545	2.77E-02	650	2.32E-02	755	1.01E-03
445	1.39E-02	550	2.89E-02	655	2.06E-02	760	8.68E-04
450	2.71E-02	555	3.04E-02	660	1.83E-02	765	7.45E-04
455	4.22E-02	560	3.20E-02	665	1.60E-02	770	6.35E-04
460	3.91E-02	565	3.38E-02	670	1.39E-02	775	5.41E-04
465	2.84E-02	570	3.57E-02	675	1.22E-02	780	4.67E-04
470	2.49E-02	575	3.77E-02	680	1.05E-02		
475	2.09E-02	580	3.97E-02	685	9.14E-03		
480	1.68E-02	585	4.14E-02	690	7.87E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3977, 0.3798)

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

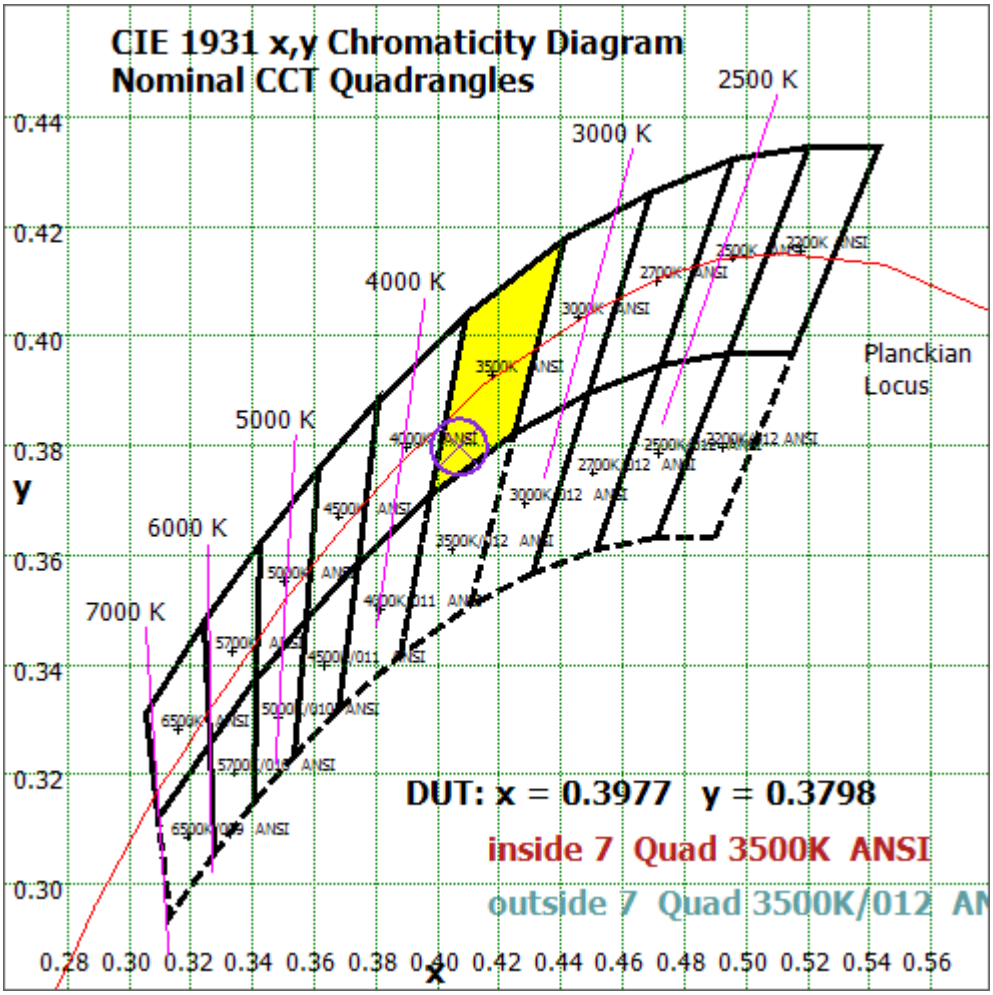


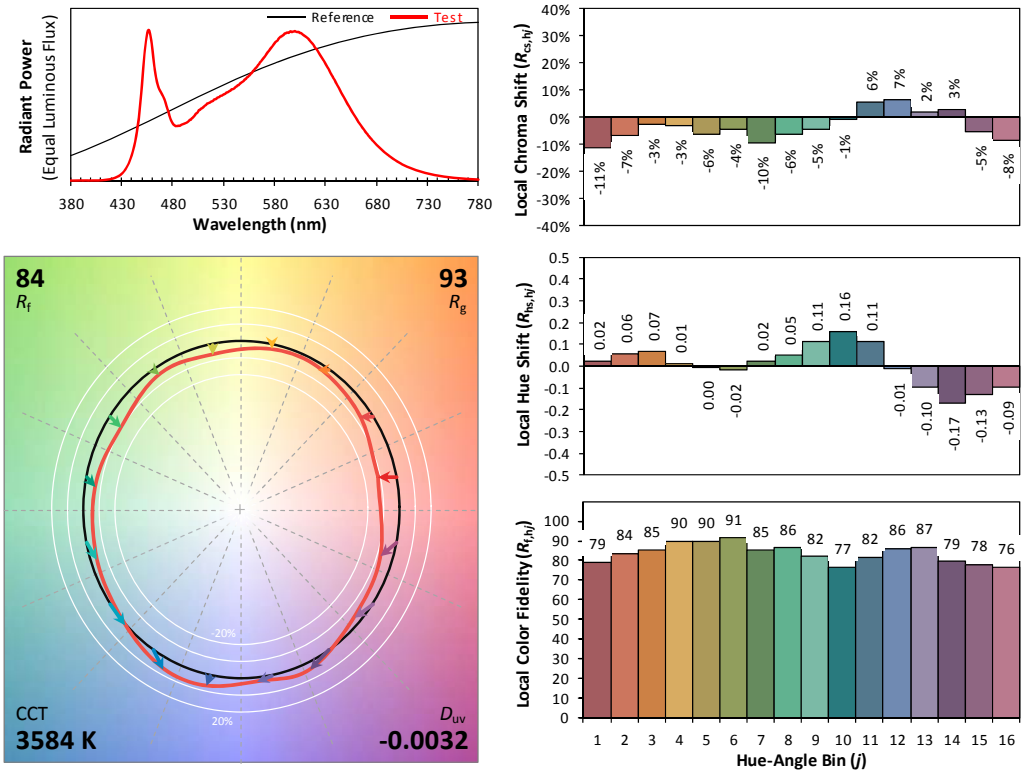
Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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:** 14T8/4F/8CCTS/EXT/SD/A2



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

x	0.3977
y	0.3798
u'	0.2352
v'	0.5055

CIE 13.3-1995 (CRI)

R_a	85
R_9	18

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

Chart 11: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 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)	0.262	0.122
Power Factor	0.9938	0.9267
Test Power (W)/2	15.65	15.60
THD A%	5.76	7.27
Luminous Efficacy (lm/W)	147.4	148.3
Total Luminous Flux (lm)	2307.2	2312.9
Color Rendering Index (CRI)	85.5	
R9	22.2	
Correlated Color Temperature (CCT)(K)	4016	
Chromaticity Chroma x	0.3772	
Chromaticity Chroma y	0.3672	
Chromaticity Chroma u	0.2268	
Chromaticity Chroma v	0.3312	
Duv	-0.0036	
Chromaticity Chroma u ’	0.2268	
Chromaticity Chroma v’	0.4968	

Special Color Rendering Indices	
R1	86.9
R2	97.4
R3	92
R4	81.1
R5	86.2
R6	92.3
R7	82.2
R8	65.9
R9	22.2
R10	92.6
R11	81.2
R12	67.1
R13	90.8
R14	96.4

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

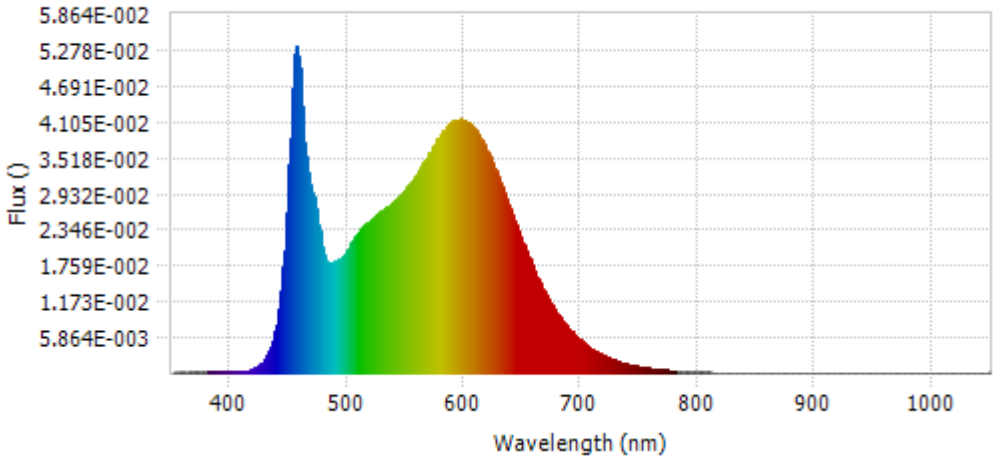
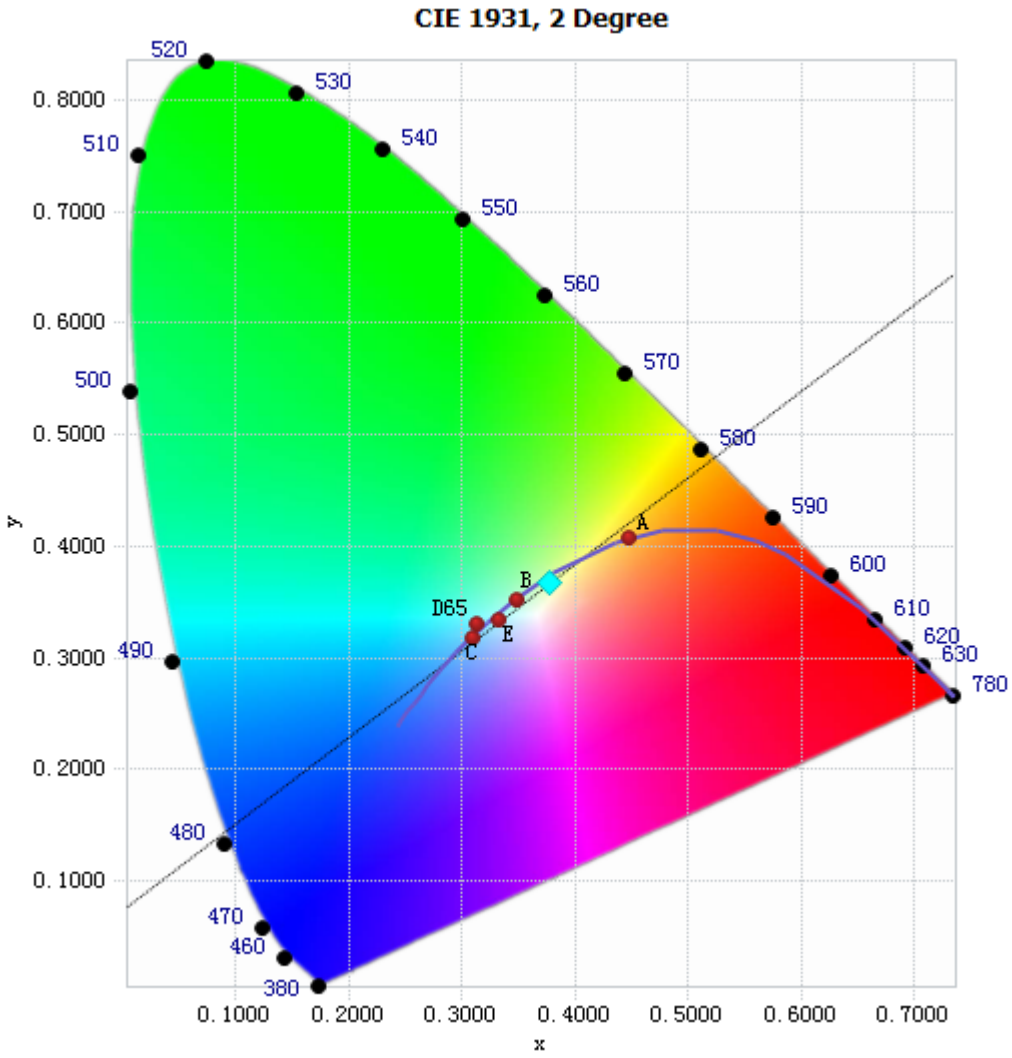


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.34E-04	485	1.80E-02	590	4.11E-02	695	6.16E-03
385	1.91E-04	490	1.83E-02	595	4.14E-02	700	5.26E-03
390	2.19E-04	495	1.89E-02	600	4.13E-02	705	4.51E-03
395	2.25E-04	500	2.02E-02	605	4.06E-02	710	3.84E-03
400	2.33E-04	505	2.17E-02	610	3.95E-02	715	3.26E-03
405	2.49E-04	510	2.31E-02	615	3.81E-02	720	2.81E-03
410	3.20E-04	515	2.42E-02	620	3.61E-02	725	2.39E-03
415	4.66E-04	520	2.49E-02	625	3.39E-02	730	2.03E-03
420	7.57E-04	525	2.58E-02	630	3.15E-02	735	1.73E-03
425	1.39E-03	530	2.66E-02	635	2.90E-02	740	1.47E-03
430	2.51E-03	535	2.73E-02	640	2.65E-02	745	1.26E-03
435	4.79E-03	540	2.80E-02	645	2.39E-02	750	1.07E-03
440	9.12E-03	545	2.91E-02	650	2.14E-02	755	9.18E-04
445	1.73E-02	550	3.01E-02	655	1.89E-02	760	7.92E-04
450	3.40E-02	555	3.14E-02	660	1.68E-02	765	6.72E-04
455	5.21E-02	560	3.28E-02	665	1.47E-02	770	5.82E-04
460	4.71E-02	565	3.43E-02	670	1.28E-02	775	4.89E-04
465	3.36E-02	570	3.59E-02	675	1.11E-02	780	4.20E-04
470	2.94E-02	575	3.75E-02	680	9.60E-03		
475	2.43E-02	580	3.90E-02	685	8.32E-03		
480	1.92E-02	585	4.05E-02	690	7.18E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3772, 0.3672)

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

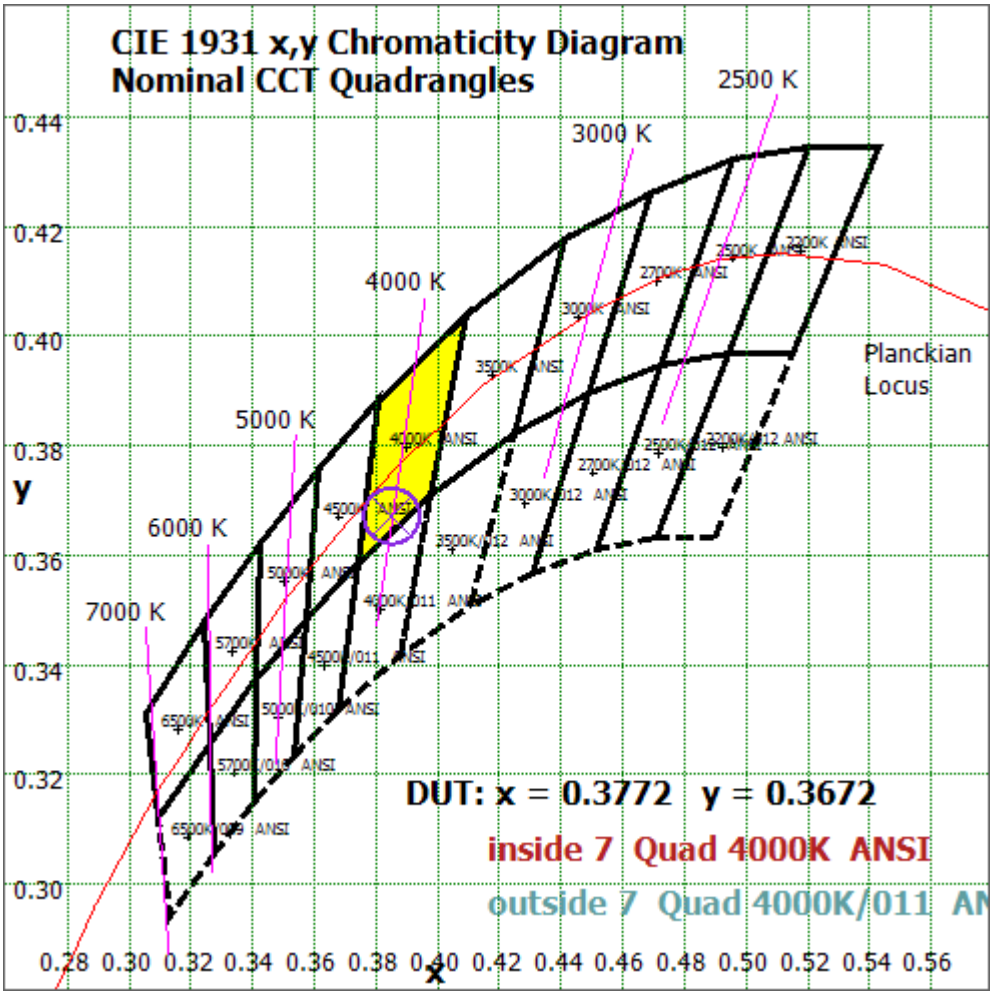


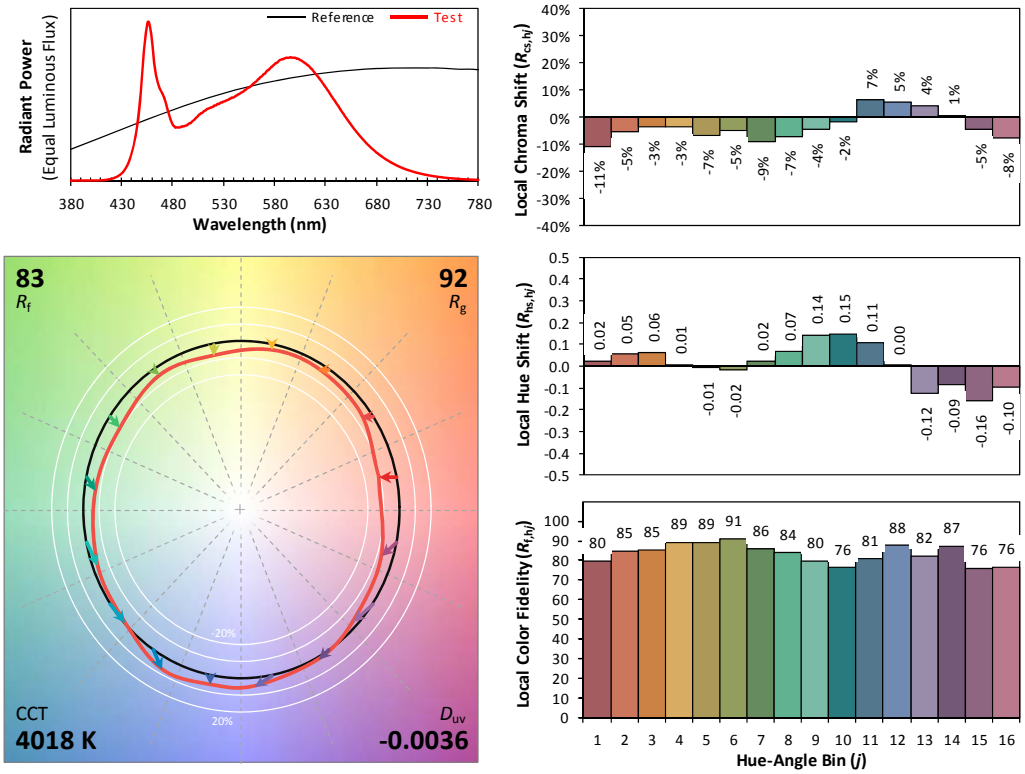
Chart14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

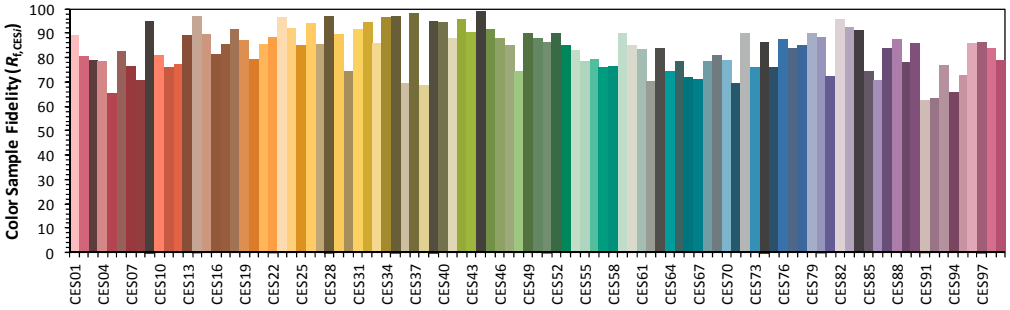
Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

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

Date: 2023/06/28 **Model:** 14T8/4F/8CCTS/EXT/SD/A2





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

x	0.3772
y	0.3672
u'	0.2268
v'	0.4968

CIE 13.3-1995 (CRI)

R_a	86
R_9	22

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)	0.264	0.122
Power Factor	0.9939	0.9275
Test Power (W)/2	15.72	15.68
THD A%	5.68	7.31
Luminous Efficacy (lm/W)	148.2	148.3
Total Luminous Flux (lm)	2329.6	2324.9
Color Rendering Index (CRI)	85.6	
R9	23.4	
Correlated Color Temperature (CCT)(K)	4903	
Chromaticity Chroma x	0.3473	
Chromaticity Chroma y	0.3490	
Chromaticity Chroma u	0.2139	
Chromaticity Chroma v	0.3225	
Duv	-0.0022	
Chromaticity Chroma u ’	0.2139	
Chromaticity Chroma v’	0.4837	

Special Color Rendering Indices	
R1	86.8
R2	97.2
R3	92.9
R4	80.1
R5	85.3
R6	90.9
R7	83.4
R8	68.3
R9	23.4
R10	91.3
R11	80.5
R12	61.3
R13	91.1
R14	96.9

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

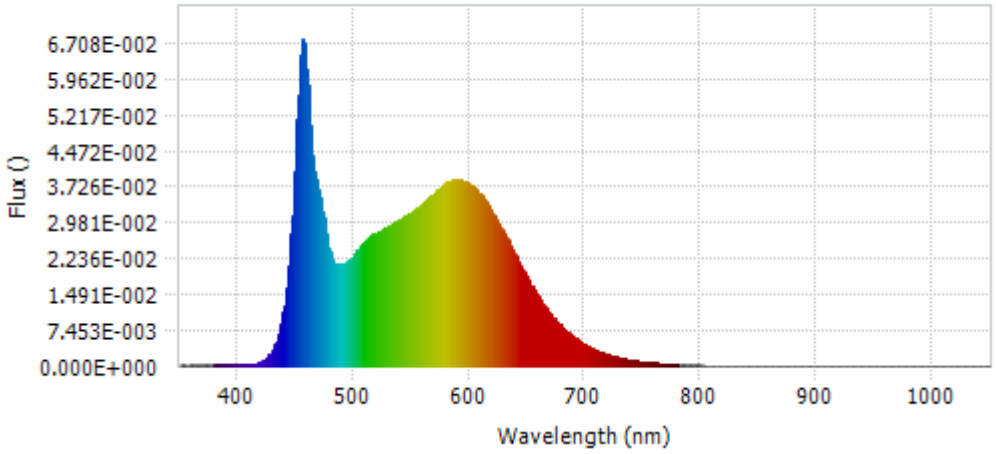
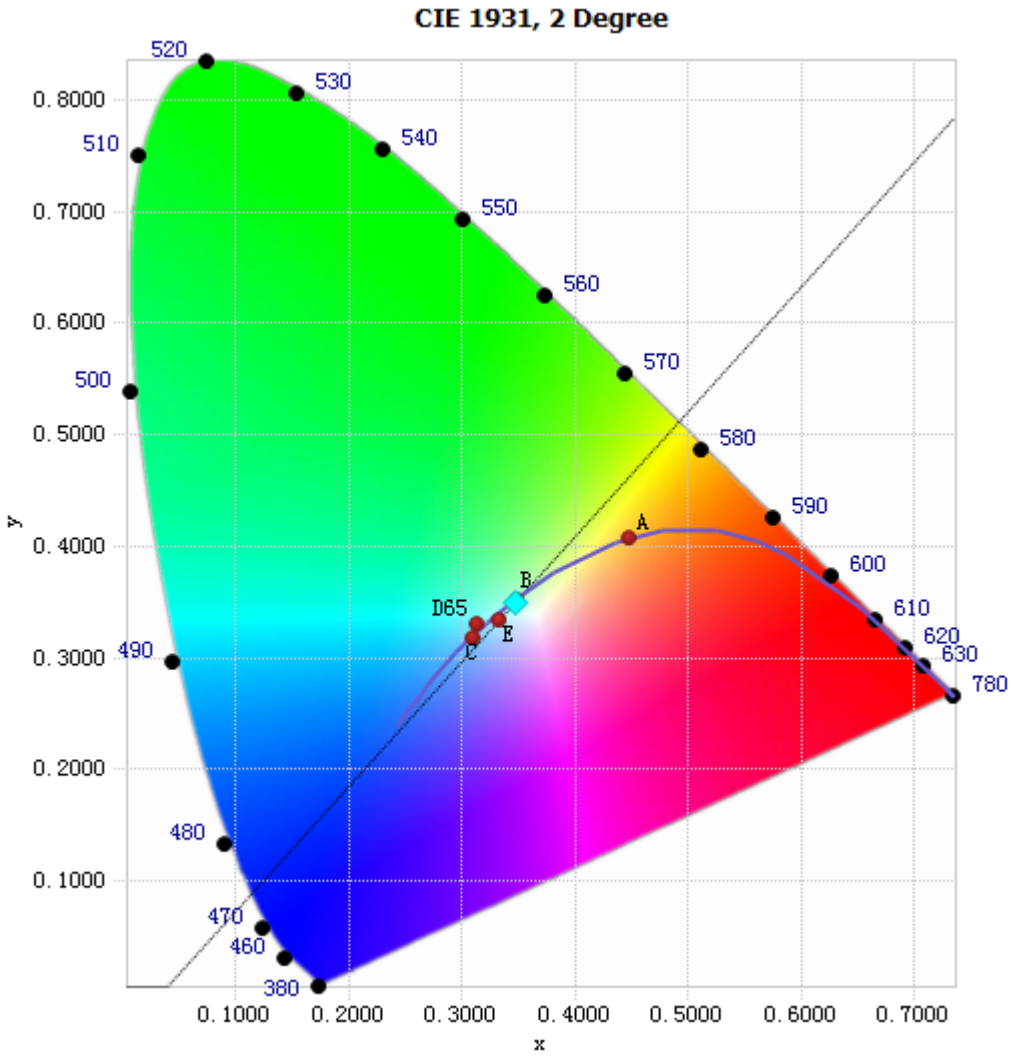


Chart16: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.71E-04	485	2.11E-02	590	3.87E-02	695	5.13E-03
385	2.49E-04	490	2.12E-02	595	3.84E-02	700	4.38E-03
390	2.75E-04	495	2.16E-02	600	3.79E-02	705	3.75E-03
395	2.85E-04	500	2.29E-02	605	3.68E-02	710	3.19E-03
400	2.87E-04	505	2.45E-02	610	3.54E-02	715	2.73E-03
405	2.69E-04	510	2.59E-02	615	3.38E-02	720	2.34E-03
410	3.46E-04	515	2.70E-02	620	3.18E-02	725	1.99E-03
415	5.29E-04	520	2.77E-02	625	2.97E-02	730	1.70E-03
420	9.45E-04	525	2.84E-02	630	2.74E-02	735	1.45E-03
425	1.82E-03	530	2.91E-02	635	2.50E-02	740	1.23E-03
430	3.46E-03	535	2.96E-02	640	2.27E-02	745	1.06E-03
435	6.64E-03	540	3.03E-02	645	2.04E-02	750	9.03E-04
440	1.27E-02	545	3.11E-02	650	1.81E-02	755	7.72E-04
445	2.39E-02	550	3.19E-02	655	1.61E-02	760	6.59E-04
450	4.59E-02	555	3.28E-02	660	1.41E-02	765	5.75E-04
455	6.71E-02	560	3.38E-02	665	1.24E-02	770	4.94E-04
460	5.83E-02	565	3.49E-02	670	1.07E-02	775	4.26E-04
465	4.15E-02	570	3.60E-02	675	9.32E-03	780	3.63E-04
470	3.58E-02	575	3.70E-02	680	8.05E-03		
475	2.89E-02	580	3.79E-02	685	6.96E-03		
480	2.27E-02	585	3.86E-02	690	5.96E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3473, 0.3490)

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

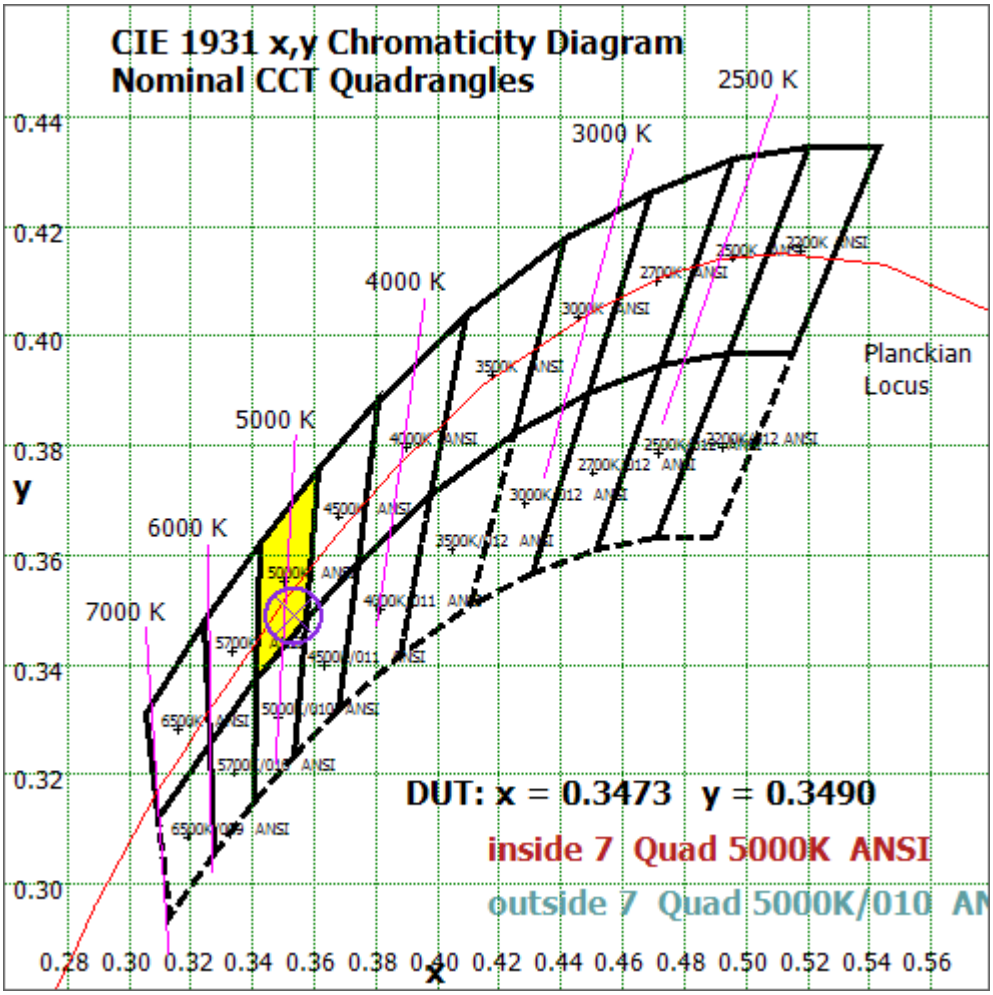


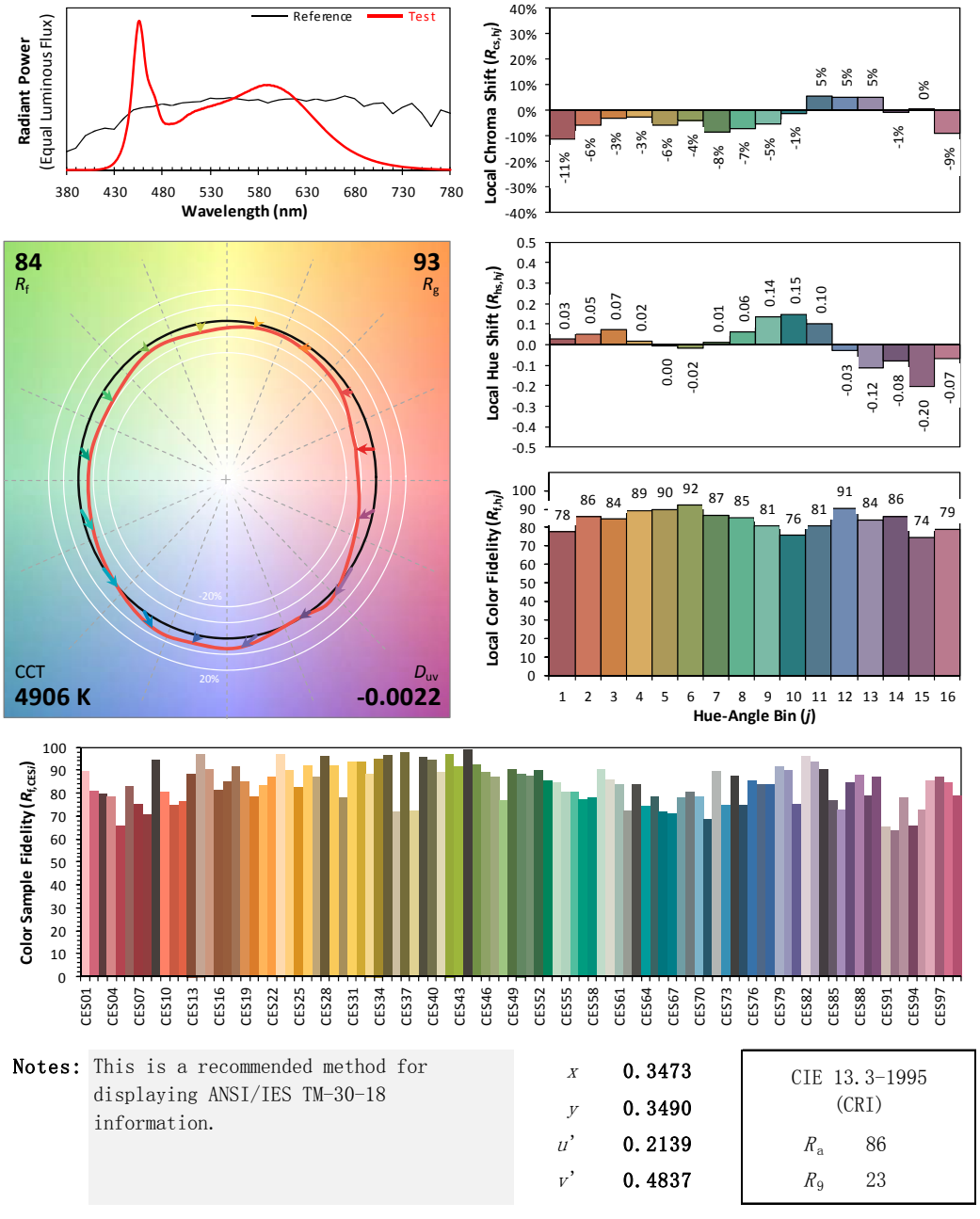
Chart 18: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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:** 14T8/4F/8CCTS/EXT/SD/A2



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

x	0.3473
y	0.3490
u'	0.2139
v'	0.4837

CIE 13.3-1995 (CRI)

R_a	86
R_9	23

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)	0.268	0.124
Power Factor	0.9942	0.9282
Test Power (W)/2	16.00	15.95
THD A%	5.57	7.24
Luminous Efficacy (lm/W)	142.3	142.6
Total Luminous Flux (lm)	2277.4	2274.6
Color Rendering Index (CRI)	84.3	
R9	11.3	
Correlated Color Temperature (CCT)(K)	6512	
Chromaticity Chroma x	0.3125	
Chromaticity Chroma y	0.3285	
Chromaticity Chroma u	0.1979	
Chromaticity Chroma v	0.3120	
Duv	0.0031	
Chromaticity Chroma u ’	0.1979	
Chromaticity Chroma v’	0.4681	

Special Color Rendering Indices	
R1	84
R2	94.8
R3	93.4
R4	78.6
R5	83
R6	88.5
R7	84.5
R8	67.6
R9	11.3
R10	85.7
R11	78.9
R12	59.2
R13	88.4
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

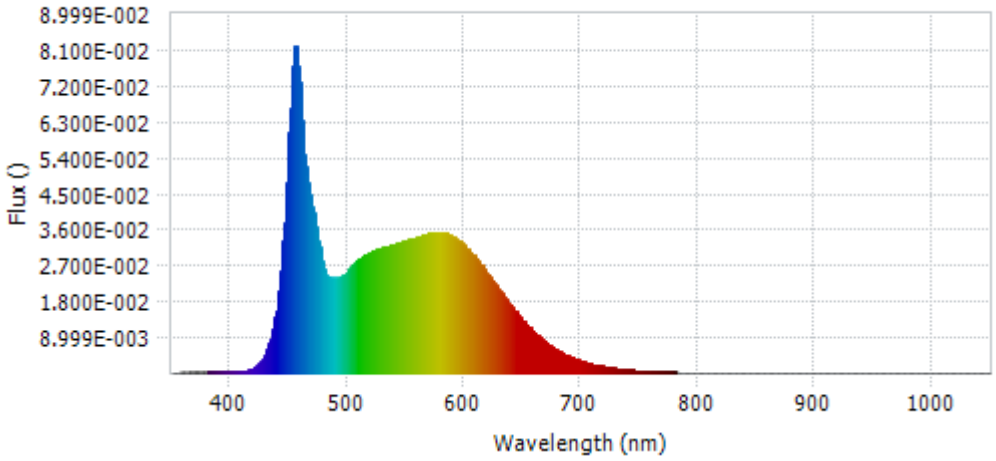
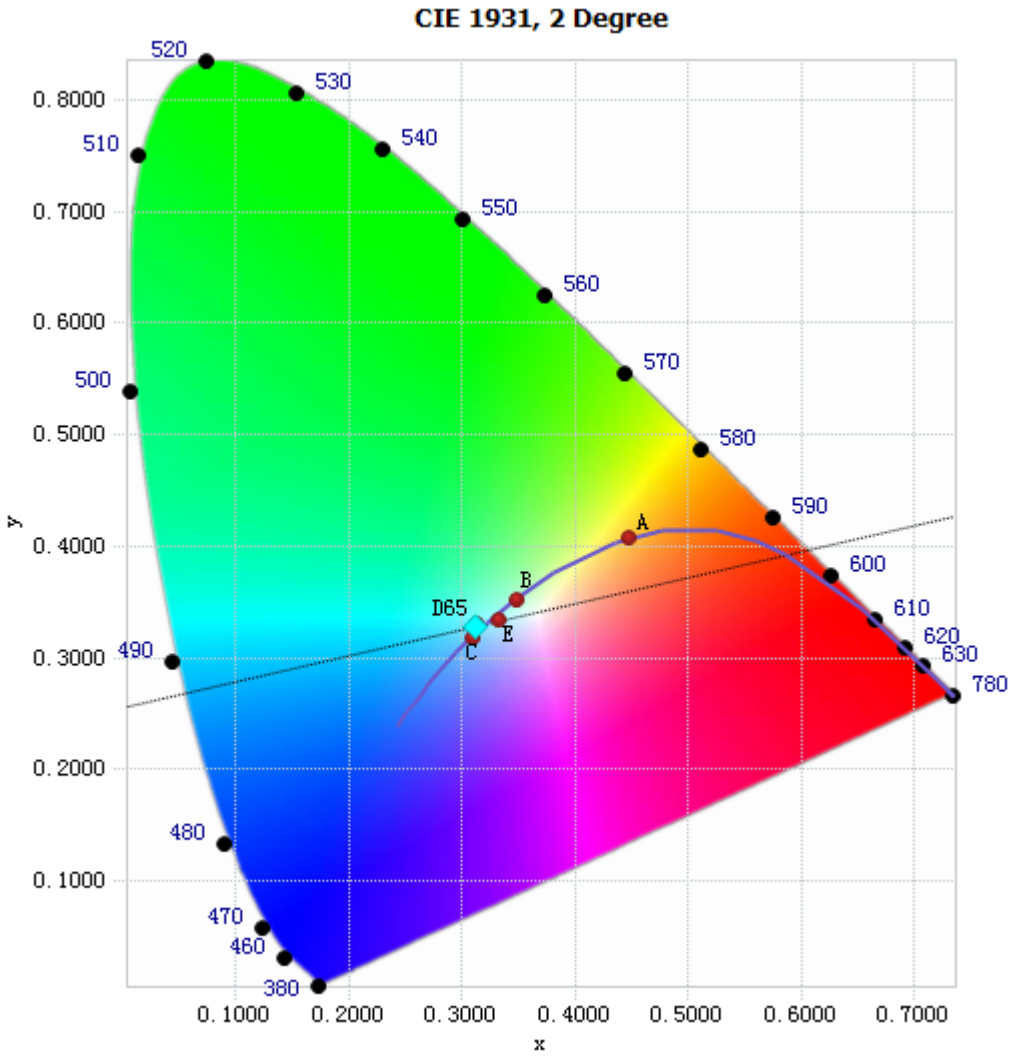


Chart 20: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.13E-04	485	2.40E-02	590	3.43E-02	695	3.64E-03
385	2.98E-04	490	2.38E-02	595	3.33E-02	700	3.10E-03
390	3.27E-04	495	2.43E-02	600	3.21E-02	705	2.66E-03
395	3.42E-04	500	2.56E-02	605	3.04E-02	710	2.25E-03
400	2.94E-04	505	2.73E-02	610	2.88E-02	715	1.92E-03
405	3.54E-04	510	2.86E-02	615	2.69E-02	720	1.66E-03
410	4.45E-04	515	2.97E-02	620	2.48E-02	725	1.43E-03
415	7.84E-04	520	3.02E-02	625	2.29E-02	730	1.20E-03
420	1.43E-03	525	3.09E-02	630	2.08E-02	735	1.03E-03
425	2.71E-03	530	3.15E-02	635	1.89E-02	740	8.85E-04
430	5.04E-03	535	3.18E-02	640	1.69E-02	745	7.61E-04
435	9.67E-03	540	3.22E-02	645	1.51E-02	750	6.46E-04
440	1.80E-02	545	3.28E-02	650	1.33E-02	755	5.58E-04
445	3.31E-02	550	3.31E-02	655	1.16E-02	760	4.84E-04
450	6.02E-02	555	3.37E-02	660	1.02E-02	765	4.18E-04
455	8.18E-02	560	3.41E-02	665	8.87E-03	770	3.58E-04
460	6.84E-02	565	3.46E-02	670	7.65E-03	775	3.10E-04
465	4.92E-02	570	3.50E-02	675	6.65E-03	780	2.69E-04
470	4.17E-02	575	3.52E-02	680	5.73E-03		
475	3.30E-02	580	3.52E-02	685	4.93E-03		
480	2.59E-02	585	3.50E-02	690	4.23E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3125, 0.3285)

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

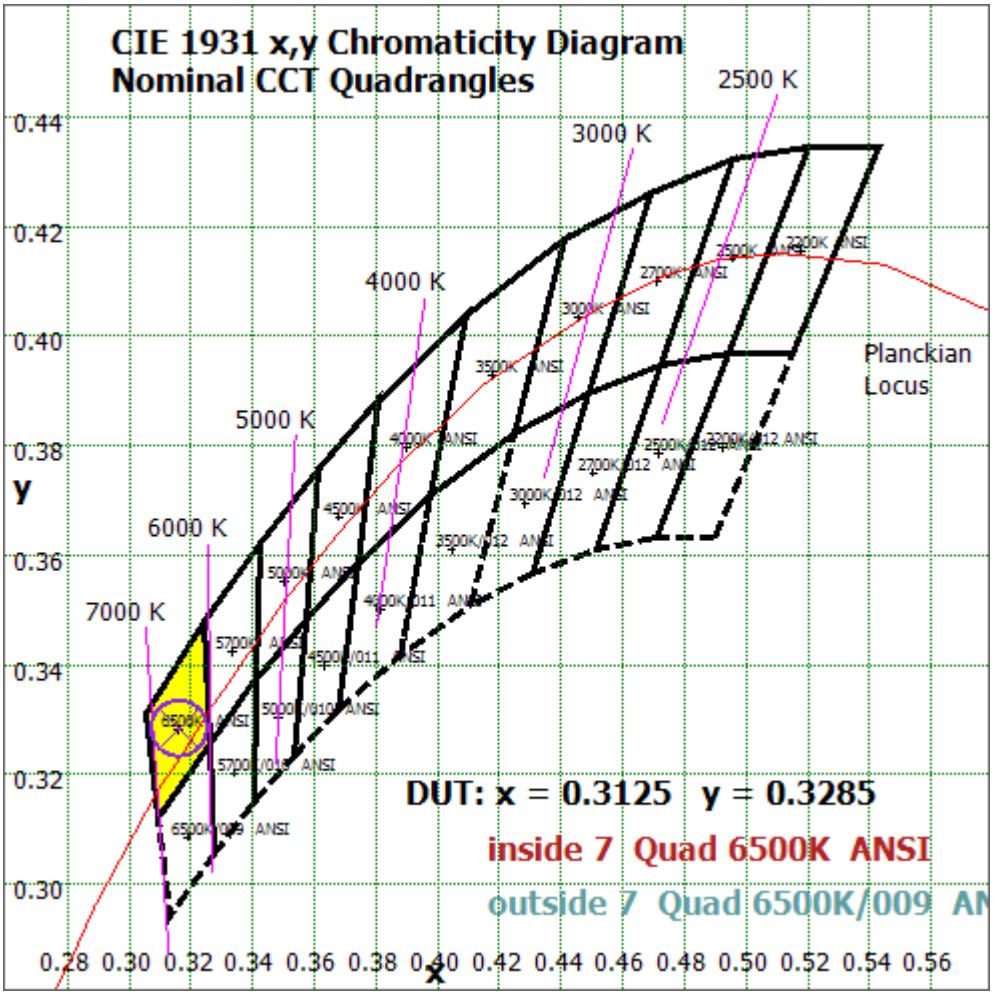


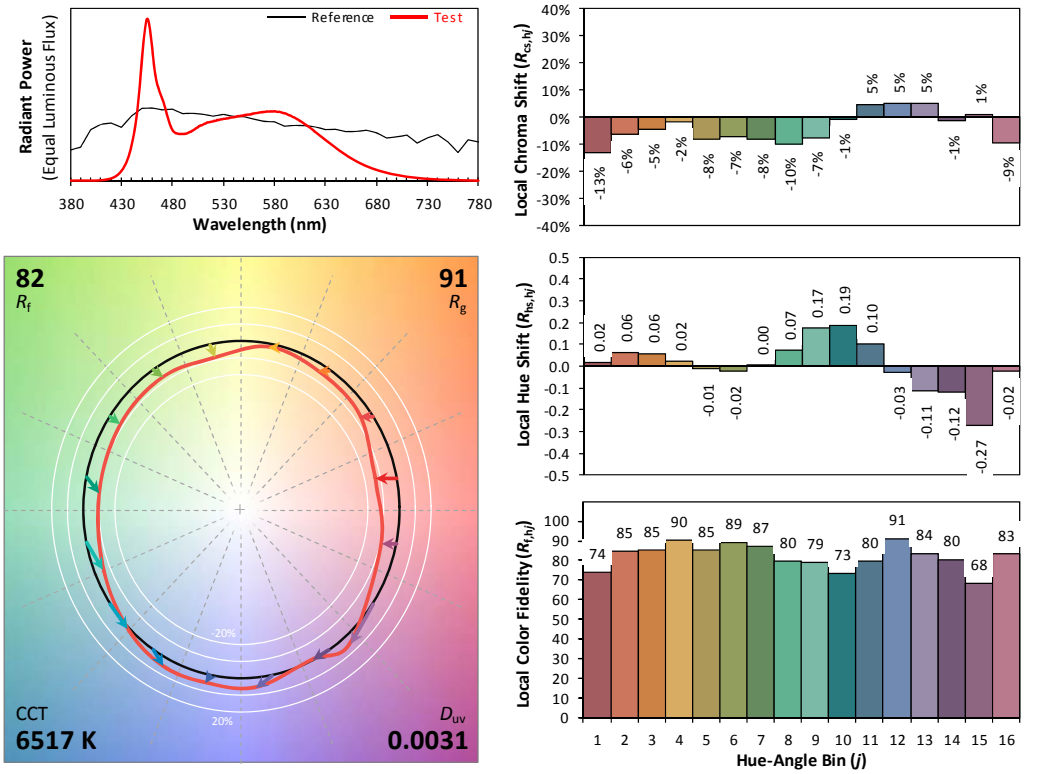
Chart 22: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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:** 14T8/4F/8CCTS/EXT/SD/A2



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

x	0.3125
y	0.3285
u'	0.1979
v'	0.4681

CIE 13.3-1995 (CRI)

R_a	84
R_9	11

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 ***

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