

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/A3

Laboratory: Lea ding Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ23060027k

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

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Jul. 07, 2023

Approved by:



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/EX T/SD/A3 3000K Setting	14T8/4F/8CCTS/EX T/SD/A3 3500K Setting	14T8/4F/8CCTS/E XT/SD/A3 4000K Setting
Luminous Efficacy (Lumens /Watt)	139.0	144.0	146.8
Total Luminous Flux (Lumens)	2172.2	2229.9	2259.3
Power (Watts)/3	15.63	15.49	15.39
Power Factor	0.9941	0.9940	0.9940
CCT (K)	3055	3592	4028
CRI	82.5	84.7	85.6
Stabilization Time (Light & Power)	50 mins	50 mins	50 mins
Note	3000K	3500K	4000K

Tested Model	14T8/4F/8CCTS/EX T/SD/A3 5000K Setting	14T8/4F/8CCTS/EX T/SD/A3 6500K Setting
Luminous Efficacy (Lumens /Watt)	146.8	142.2
Total Luminous Flux (Lumens)	2268.9	2236.7
Power (Watts)/3	15.46	15.73
Power Factor	0.9940	0.9942
CCT (K)	4924	6553
CRI	85.7	84.5
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. 30, 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

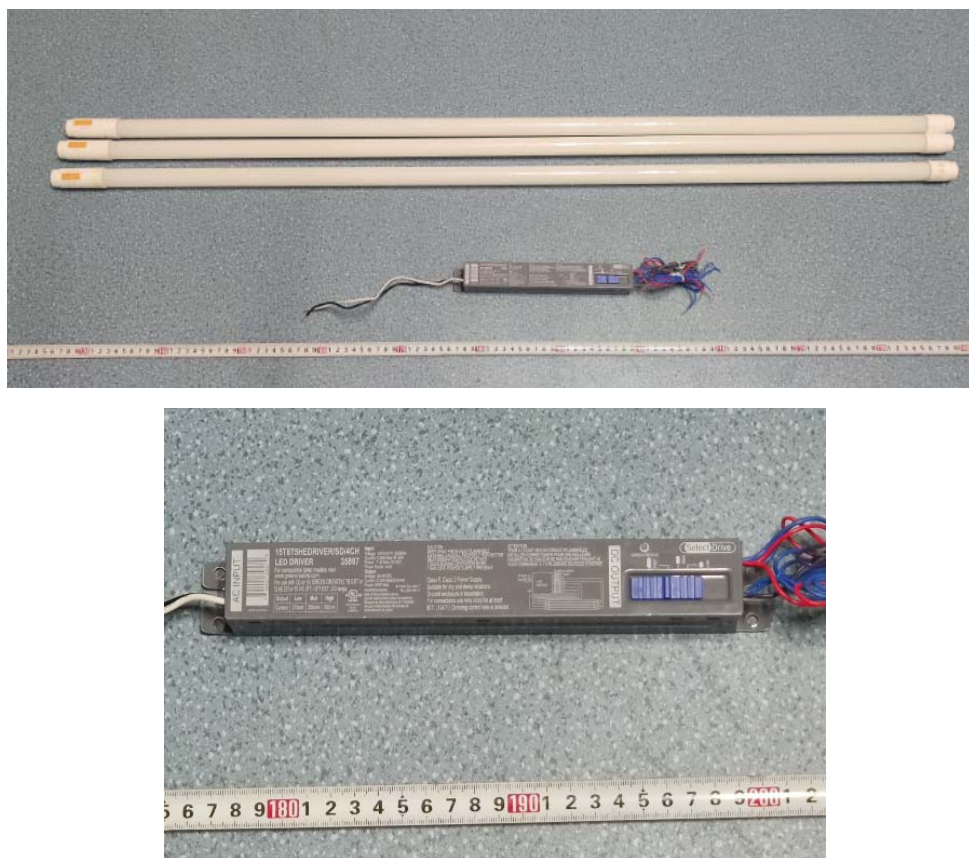


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 14T8/4F/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°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)	0.394	0.181
Power Factor	0.9941	0.9256
Test Power (W)/3	15.63	15.48
THD A%	5.89	7.42
Luminous Efficacy (lm/W)	139.0	140.3
Total Luminous Flux (lm)	2172.2	2171.6
Color Rendering Index (CRI)	82.5	
R9	6.7	
Correlated Color Temperature (CCT)(K)	3055	
Chromaticity Chroma x	0.4323	
Chromaticity Chroma y	0.4013	
Chromaticity Chroma u	0.2487	
Chromaticity Chroma v	0.3464	
Duv	-0.0004	
Chromaticity Chroma u'	0.2487	
Chromaticity Chroma v'	0.5196	

Special Color Rendering Indices	
R1	82
R2	94.2
R3	92.1
R4	78.6
R5	82.4
R6	93
R7	80.1
R8	57.2
R9	6.7
R10	86.8
R11	78.1
R12	73
R13	85.4
R14	96.2

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

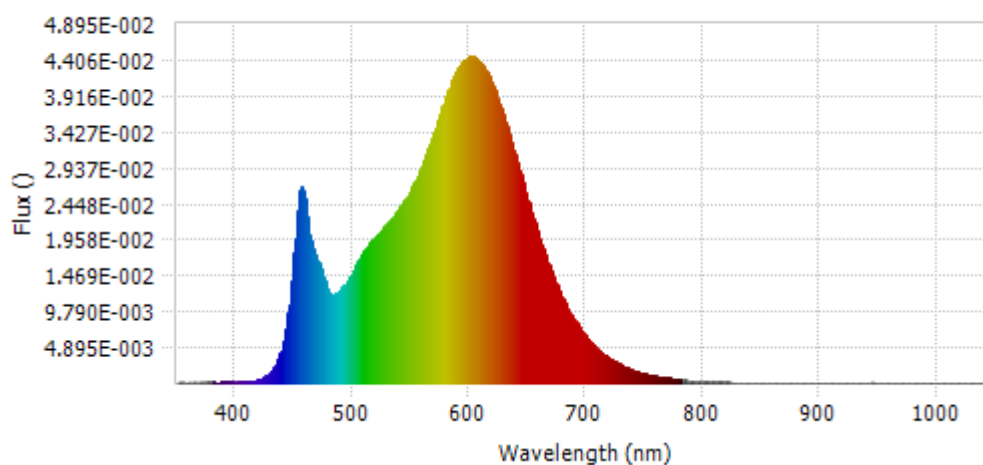


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.63E-04	485	1.21E-02	590	4.29E-02	695	7.41E-03
385	1.41E-04	490	1.29E-02	595	4.39E-02	700	6.35E-03
390	1.60E-04	495	1.38E-02	600	4.45E-02	705	5.41E-03
395	1.47E-04	500	1.52E-02	605	4.42E-02	710	4.65E-03
400	1.24E-04	505	1.66E-02	610	4.36E-02	715	3.96E-03
405	1.61E-04	510	1.79E-02	615	4.24E-02	720	3.42E-03
410	1.84E-04	515	1.91E-02	620	4.06E-02	725	2.91E-03
415	3.16E-04	520	1.99E-02	625	3.85E-02	730	2.48E-03
420	4.96E-04	525	2.09E-02	630	3.60E-02	735	2.11E-03
425	8.92E-04	530	2.19E-02	635	3.35E-02	740	1.79E-03
430	1.57E-03	535	2.27E-02	640	3.07E-02	745	1.51E-03
435	2.81E-03	540	2.38E-02	645	2.78E-02	750	1.31E-03
440	5.10E-03	545	2.50E-02	650	2.50E-02	755	1.11E-03
445	9.47E-03	550	2.63E-02	655	2.23E-02	760	9.66E-04
450	1.78E-02	555	2.79E-02	660	1.98E-02	765	8.11E-04
455	2.63E-02	560	2.99E-02	665	1.74E-02	770	7.01E-04
460	2.41E-02	565	3.20E-02	670	1.52E-02	775	5.97E-04
465	1.86E-02	570	3.43E-02	675	1.33E-02	780	5.12E-04
470	1.68E-02	575	3.67E-02	680	1.15E-02		
475	1.44E-02	580	3.91E-02	685	9.98E-03		
480	1.22E-02	585	4.13E-02	690	8.62E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method

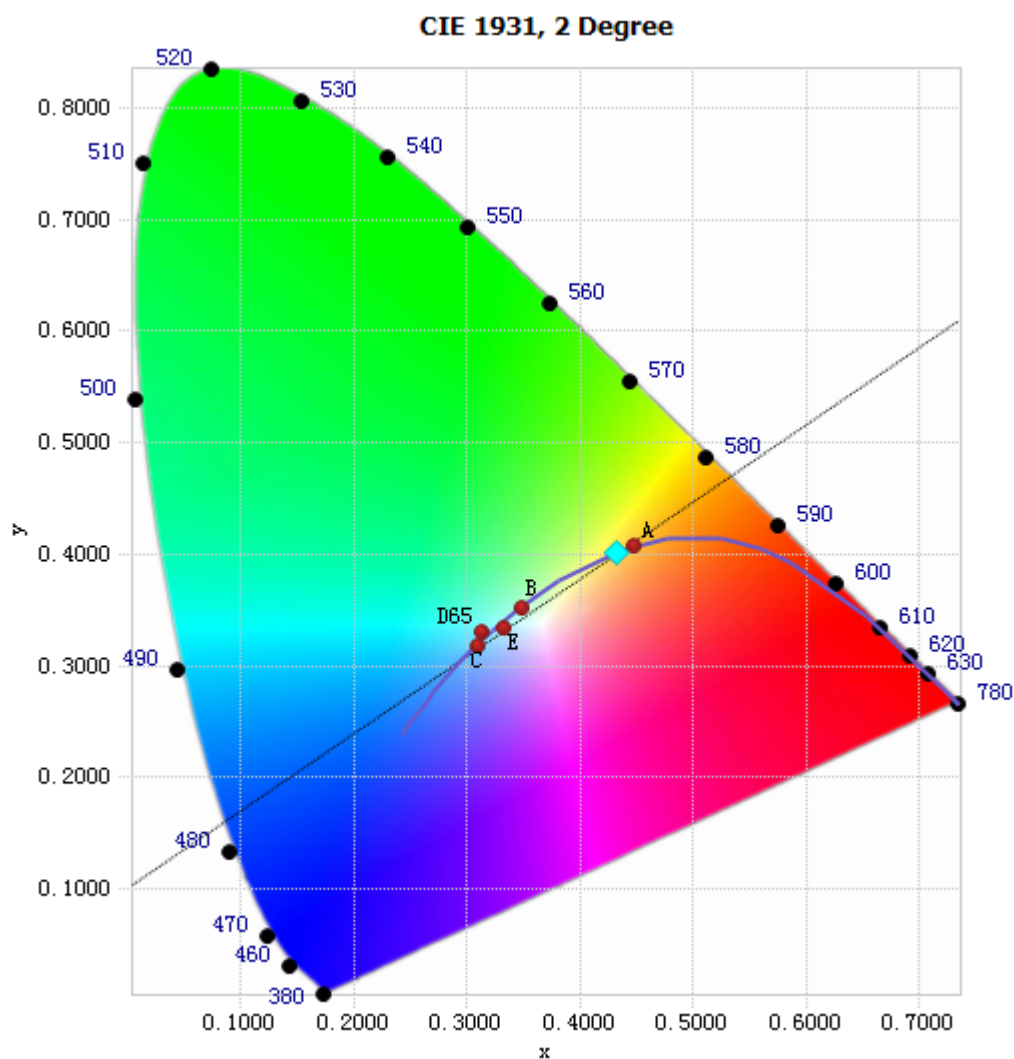


Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

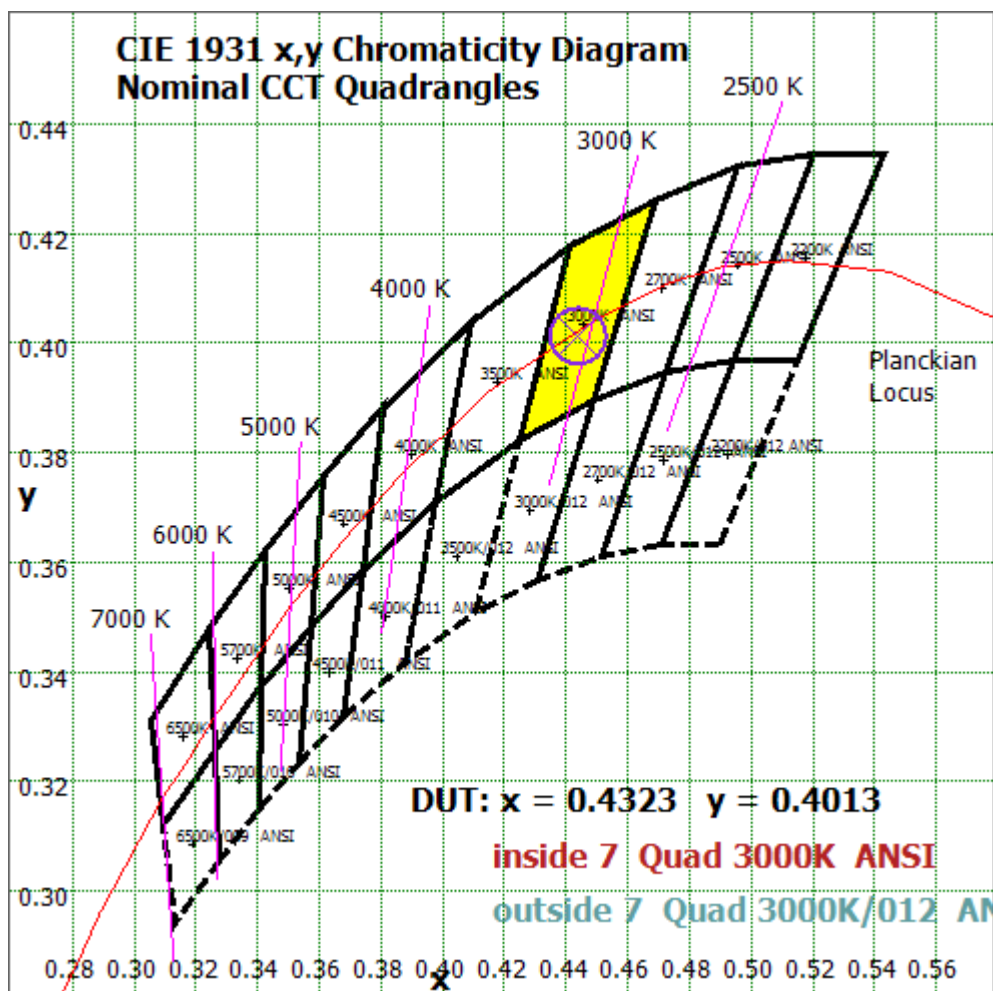


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

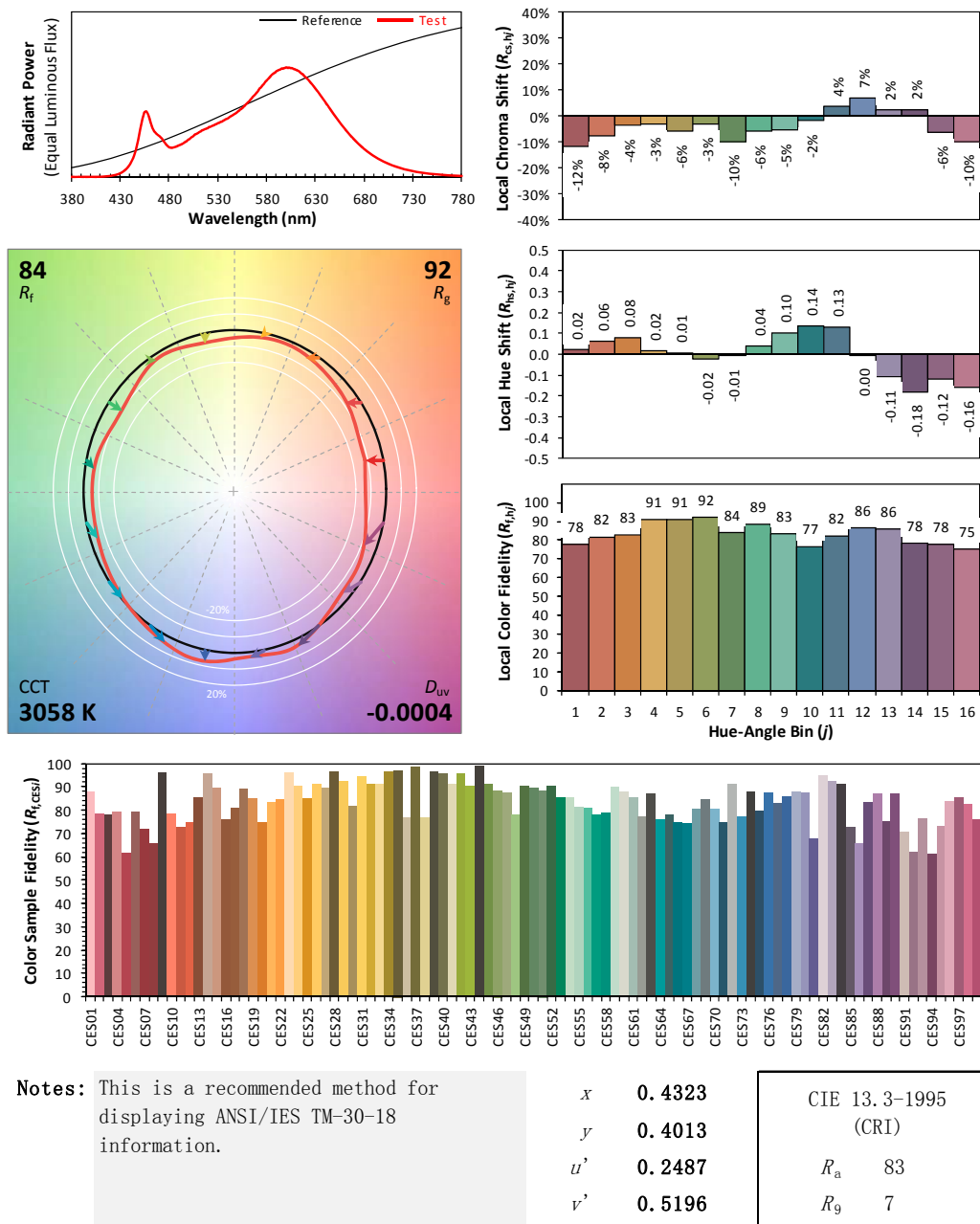
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A3



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)	0.395
Power Factor	0.9909
Power (W)/3	15.67
Luminous Efficacy (lm/W)	139.6
Total Luminous Flux (lm)	2188.2
Beam Angle (°)	117.3 (0°-180°) / 251.2 (90°-270°)
Center Beam Candle Power (cd)	335
Maximum Beam Candle Power (cd)	335.7 (At: C=350.0, Gamma=3.0)
Spacing Criteria	1.26 (0°-180°) / 1.46 (90°-270°)
Zonal Lumens in the 0°-60°Zone	40.75%
Zonal Lumens in the 60°-90°Zone	27.18%
Zonal Lumens in the 90°-120°Zone	18.94%
Zonal Lumens in the 120°-180°Zone	13.14%

Table 4: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	31.83	1.45%
10- 20	92.679	4.24%
20- 30	145.638	6.66%
30- 40	186.57	8.53%
40- 50	212.527	9.71%
50- 60	222.37	10.16%
60- 70	217.078	9.92%
70- 80	199.936	9.14%
80- 90	177.644	8.12%
90-100	156.711	7.16%
100-110	137.941	6.30%
110-120	119.739	5.47%
120-130	99.861	4.56%
130-140	79.621	3.64%
140-150	57.707	2.64%
150-160	34.962	1.60%
160-170	13.402	0.61%
170-180	1.933	0.09%
Total	2188.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	891.614	40.75%
60- 90	594.658	27.18%
0-90	1486.27	67.92%
90- 180	701.877	32.08%
0- 180	2188.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

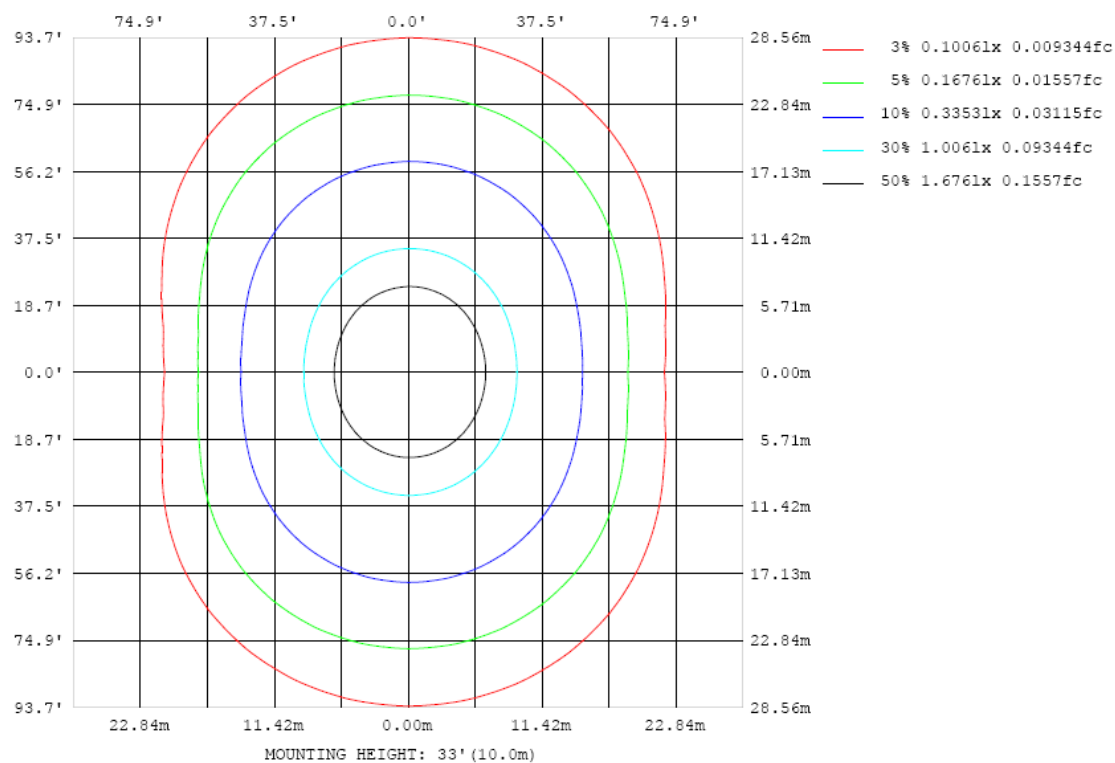


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

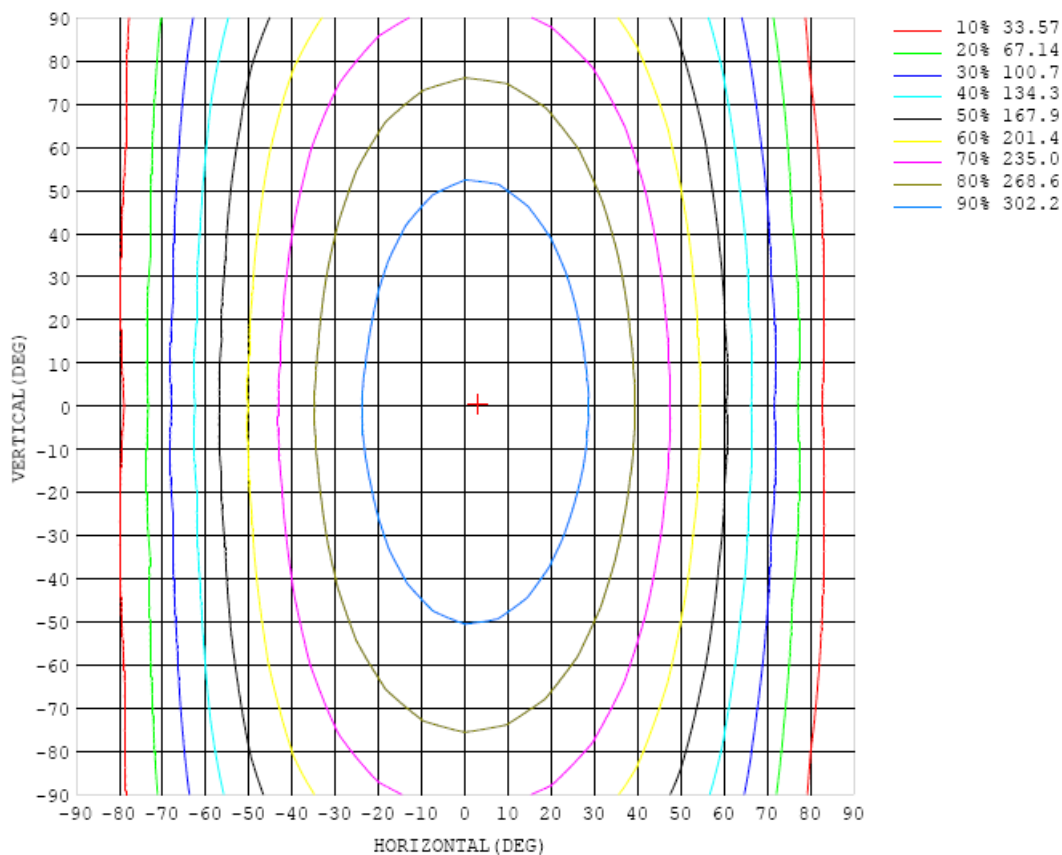


Chart 6: Isocandela Plot

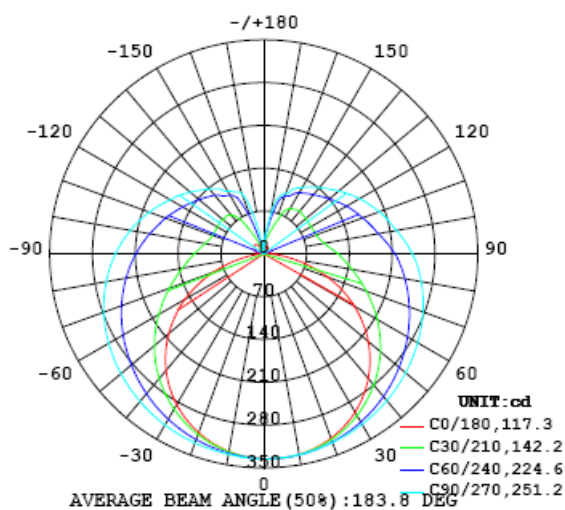


Chart 7: Polar Candela Distribution

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	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335
5	335	335	335	335	335	335	335	335	335	335	334	334	334	333	333	333	333	333	333
10	333	333	333	333	334	334	334	334	334	334	333	332	332	331	330	329	328	328	328
15	328	328	328	329	330	331	331	332	332	331	330	329	328	326	325	323	322	321	321
20	321	321	322	323	325	326	327	328	329	328	327	326	323	320	318	315	313	311	311
25	311	311	313	315	318	320	323	325	326	325	324	321	318	313	309	305	302	300	299
30	299	299	302	305	309	314	318	320	322	322	320	317	312	306	300	293	289	286	285
35	284	285	288	293	299	306	311	316	318	318	316	311	305	297	289	280	274	269	268
40	266	268	273	280	289	297	304	310	313	313	311	306	298	288	277	266	256	251	249
45	246	248	255	265	277	288	297	304	308	308	305	299	290	278	265	251	238	230	227
50	223	227	236	249	264	277	289	297	302	303	300	293	282	268	252	234	218	207	203
55	198	203	215	232	250	267	280	290	296	297	294	286	274	258	238	217	196	182	177
60	171	177	193	214	236	256	272	283	289	291	287	279	266	247	225	199	174	156	149
65	142	150	170	196	222	245	262	275	282	284	281	272	257	237	211	182	151	128	119
70	111	121	147	179	208	234	253	267	275	277	273	264	249	227	199	165	130	99.6	87.4
75	79.3	92.8	125	162	195	223	244	259	267	270	266	256	240	217	187	150	110	72.6	56.3
80	49.2	67.0	105	146	183	212	234	250	259	261	258	248	231	207	176	137	93.1	49.9	27.7
85	21.9	44.6	88.7	133	171	202	225	241	250	253	249	239	222	198	166	127	80.6	33.4	7.13
90	5.05	30.2	77.1	122	160	191	214	231	240	243	240	230	213	189	157	118	72.5	26.8	1.63
95	1.68	21.9	66.3	110	148	179	202	219	229	232	229	219	203	180	149	111	68.9	26.8	3.01
100	4.36	18.7	59.0	101	137	167	190	207	217	221	218	209	194	171	141	106	67.2	30.2	7.55
105	8.99	20.4	56.6	94.3	130	159	181	197	207	211	209	200	185	163	135	102	67.4	35.6	13.8
110	14.2	23.1	56.9	91.4	124	151	172	188	197	201	199	191	176	156	130	99.6	69.4	41.7	16.8
115	14.4	26.3	59.3	90.2	119	144	164	179	188	191	189	181	167	148	125	98.2	72.2	47.3	17.9
120	7.88	24.8	63.1	89.0	115	138	156	170	178	181	179	171	159	142	121	97.8	75.7	51.0	16.4
125	4.96	28.3	67.5	89.0	111	131	148	160	167	170	168	162	151	136	117	97.7	78.8	52.5	17.2
130	4.11	34.6	71.2	89.6	108	126	140	151	158	160	158	153	143	130	115	98.0	78.2	60.2	20.8
135	8.63	33.4	70.3	90.4	106	121	133	142	148	150	149	144	136	125	112	98.2	81.4	58.3	20.8
140	9.71	20.1	65.0	91.6	105	117	127	134	139	141	140	136	130	121	110	94.3	81.1	56.0	19.9
145	12.9	16.0	64.3	88.3	102	113	121	127	131	133	132	129	124	117	105	93.0	77.6	51.1	17.5
150	10.7	17.2	46.3	85.6	97.4	107	116	121	124	125	125	122	118	110	100	90.8	74.7	45.2	15.3
155	11.8	17.2	34.7	74.8	94.8	101	106	113	116	118	117	114	106	103	96.5	82.4	61.6	37.6	13.1
160	12.4	17.6	29.4	51.7	81.8	95.1	100	103	105	105	105	105	101	96.2	85.9	65.8	48.8	27.2	11.1
165	13.0	17.6	24.8	35.7	52.6	71.1	85.9	93.2	95.8	96.4	96.3	94.8	89.0	78.1	67.3	50.5	33.9	20.5	11.7
170	14.0	15.6	18.5	24.5	33.1	39.9	49.7	58.5	63.5	66.1	66.3	64.2	57.9	47.0	39.3	31.3	21.6	18.6	14.7
175	14.7	15.4	17.0	18.0	18.3	20.8	25.2	28.6	30.5	31.5	31.4	29.5	25.8	21.7	18.0	17.0	18.0	17.3	14.9
180	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4

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	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335		
5	333	333	333	333	334	334	334	334	335	335	335	335	335	335	335	335	335		
10	328	328	329	329	330	331	332	332	333	333	333	333	333	333	333	333	333		
15	321	322	322	324	326	327	329	330	331	332	331	331	330	329	329	328	328		
20	312	313	314	317	320	323	326	328	329	329	329	328	326	324	323	322	321		
25	300	301	305	309	314	318	322	325	326	327	326	324	321	318	315	312	311		
30	285	288	293	300	306	312	318	321	323	323	322	319	315	310	305	301	299		
35	269	273	280	289	298	306	312	317	319	319	317	313	307	301	294	288	285		
40	250	256	266	277	288	299	307	312	315	315	312	306	299	290	281	273	268		
45	229	238	250	265	279	291	300	307	310	310	306	299	289	278	266	255	248		
50	206	217	234	251	268	283	294	301	305	304	299	291	279	265	250	236	226		
55	181	196	216	238	258	274	287	295	299	298	293	283	269	251	233	215	203		
60	156	174	198	224	247	266	280	289	293	292	285	274	257	237	215	193	177		
65	128	152	181	210	236	257	272	282	286	284	277	265	246	223	197	171	150		
70	99.1	130	164	197	225	248	264	274	279	277	269	255	235	209	178	148	121		
75	71.9	109	149	184	214	238	255	266	270	269	260	245	223	195	162	125	92.7		
80	48.3	91.5	135	174	204	229	246	257	262	260	251	235	212	182	146	104	65.7		
85	31.7	78.1	124	163	194	219	237	248	252	250	241	225	201	170	132	86.6	43.0		
90	23.6	68.8	114	153	184	209	227	238	243	240	231	214	191	160	120	73.5	28.3		
95	18.3	61.2	105	144	176	199	217	228	232	230	220	204	180	150	110	65.0	22.8		
100	18.8	56.0	97.9	135	166	189	207	218	222	219	210	193	170	140	102	60.3	23.1		
105	21.7	55.0	92.2	128	157	180	196	207	211	208	199	183	162	132	96.4	58.7	26.8		
110	25.3	56.2	89.3	121	149	171	186	196	199	197	188	173	152	125	92.4	59.5	32.4		
115	27.4	58.3	88.0	116	141	162	176	185	188	185	177	164	144	119	89.9	62.3	37.3		
120	21.5	58.9	87.9	113	135	153	167	174	177	175	168	155	136	114	88.8	66.4	41.3		
125	8.46	57.2	88.7	110	129	146	157	165	167	165	158	146	130	110	88.8	71.1	43.2		
130	7.24	57.3	87.1	107	124	138	148	155	157	155	148	138	124	107	88.7	74.7	42.2		
135	7.00	55.4	87.3	104	120	131	140	145	147	145	140	131	119	103	88.1	76.0	38.0		
140	4.82	43.8	81.9	99.4	114	125	132	137	138	137	132	124	112	100.0	89.6	71.8	30.8		
145	5.43	26.8	70.0	99.6	108	116	124	129	130	129	123	115	107	99.2	88.5	60.0	21.9		
150	5.76	12.7	42.9	86.0	103	111	115	117	118	117	114	110	105	98.1	81.5	42.4	13.8		
155	6.19	9.79	19.1	45.3	80.9	99.1	109	111	112	112	110	107	101	87.7	60.0	24.1	11.5		
160	6.66	7.44	9.27	18.0	28.3	56.0	74.8	97.7	104	104	101	94.8	84.5	64.8	35.7	13.9	10.8		
165	8.05	7.03	8.08	11.0	17.0	22.6	25.0	37.8	63.2	69.1	66.0	59.6	48.3	32.2	16.5	11.1	10.3		
170	13.3	11.3	11.8	11.2	9.34	11.3	15.1	14.9	10.1	24.1	21.9	17.6	16.3	15.4	12.3	10.8	12.9		
175	15.2	17.4	16.5	12.3	9.41	9.36	10.8	13.1	9.78	13.3	12.1	10.9	9.87	9.50	10.3	13.2	15.8		
180	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4		

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)	0.390	0.180
Power Factor	0.9940	0.9239
Test Power (W)/3	15.49	15.34
THD A%	5.87	7.36
Luminous Efficacy (lm/W)	144.0	145.3
Total Luminous Flux (lm)	2229.9	2229.2
Color Rendering Index (CRI)	84.7	
R9	18.1	
Correlated Color Temperature (CCT)(K)	3592	
Chromaticity Chroma x	0.3969	
Chromaticity Chroma y	0.3790	
Chromaticity Chroma u	0.2351	
Chromaticity Chroma v	0.3367	
Duv	-0.0033	
Chromaticity Chroma u'	0.2351	
Chromaticity Chroma v'	0.5050	

Special Color Rendering Indices	
R1	85.8
R2	96.9
R3	91.4
R4	80.6
R5	85.7
R6	93.1
R7	81.2
R8	63.1
R9	18.1
R10	91.9
R11	80.5
R12	70.2
R13	89.5
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

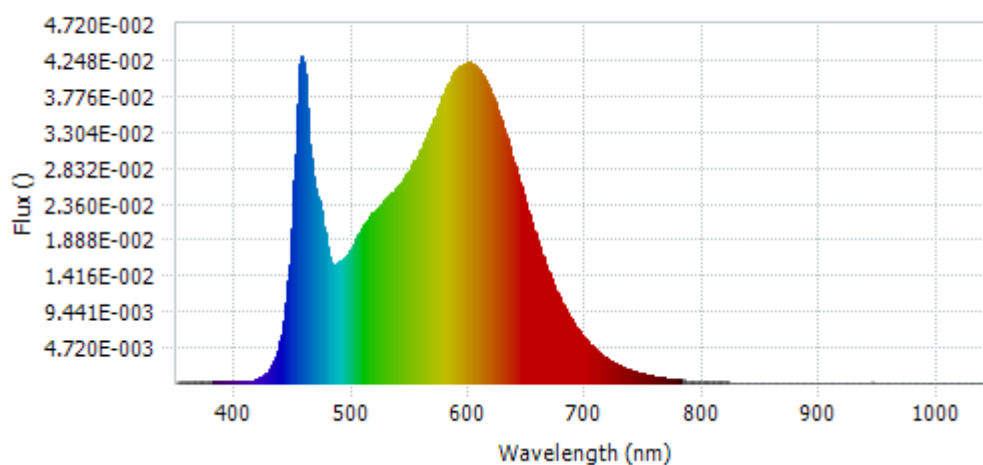
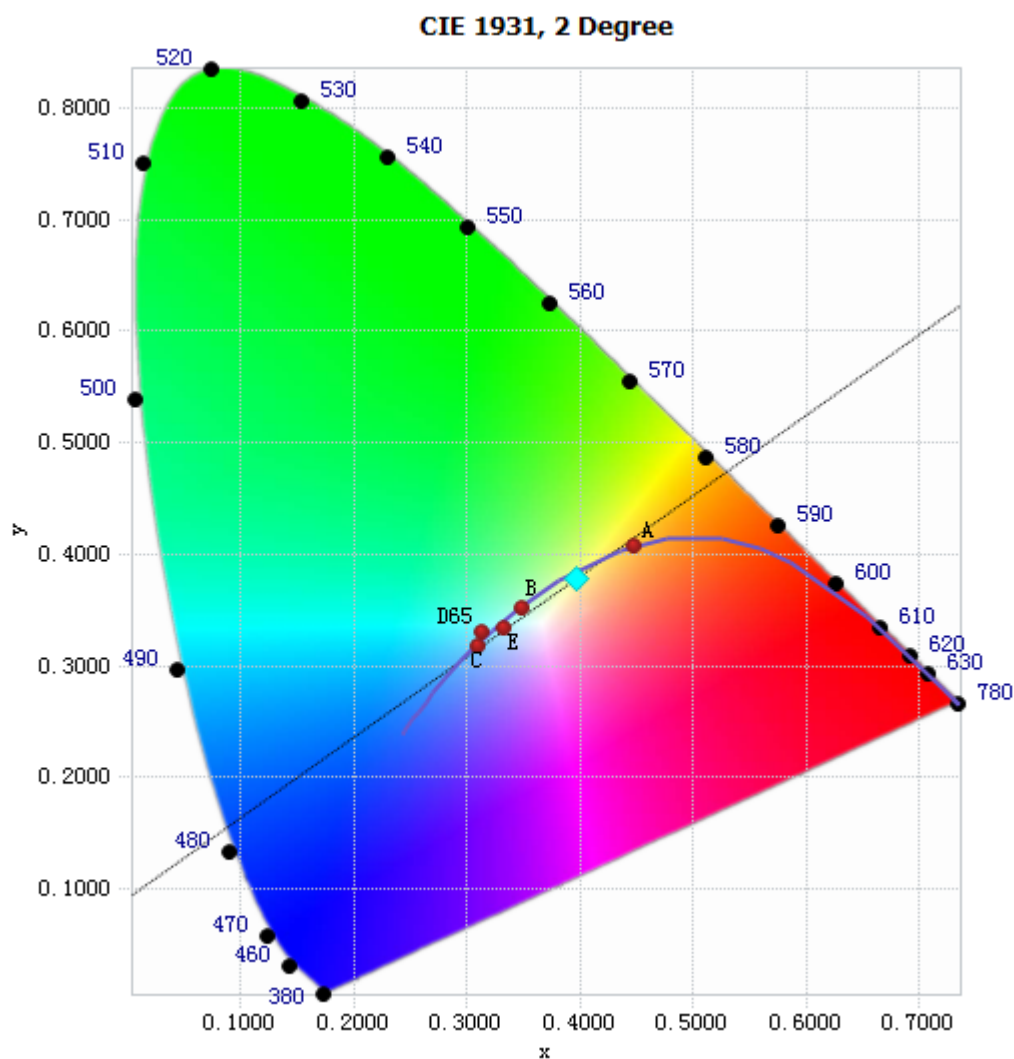


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.40E-04	485	1.57E-02	590	4.15E-02	695	6.64E-03
385	1.96E-04	490	1.62E-02	595	4.20E-02	700	5.69E-03
390	2.07E-04	495	1.68E-02	600	4.23E-02	705	4.83E-03
395	2.06E-04	500	1.81E-02	605	4.17E-02	710	4.13E-03
400	2.03E-04	505	1.95E-02	610	4.07E-02	715	3.53E-03
405	2.03E-04	510	2.08E-02	615	3.94E-02	720	3.01E-03
410	2.59E-04	515	2.19E-02	620	3.76E-02	725	2.58E-03
415	3.81E-04	520	2.27E-02	625	3.55E-02	730	2.21E-03
420	6.74E-04	525	2.36E-02	630	3.31E-02	735	1.87E-03
425	1.14E-03	530	2.45E-02	635	3.06E-02	740	1.60E-03
430	2.05E-03	535	2.52E-02	640	2.80E-02	745	1.37E-03
435	3.81E-03	540	2.61E-02	645	2.52E-02	750	1.17E-03
440	7.24E-03	545	2.71E-02	650	2.26E-02	755	9.93E-04
445	1.36E-02	550	2.82E-02	655	2.02E-02	760	8.53E-04
450	2.66E-02	555	2.96E-02	660	1.78E-02	765	7.29E-04
455	4.18E-02	560	3.12E-02	665	1.57E-02	770	6.27E-04
460	3.85E-02	565	3.29E-02	670	1.37E-02	775	5.39E-04
465	2.81E-02	570	3.48E-02	675	1.19E-02	780	4.63E-04
470	2.47E-02	575	3.68E-02	680	1.03E-02		
475	2.06E-02	580	3.87E-02	685	8.98E-03		
480	1.66E-02	585	4.04E-02	690	7.73E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3969, 0.3790)

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

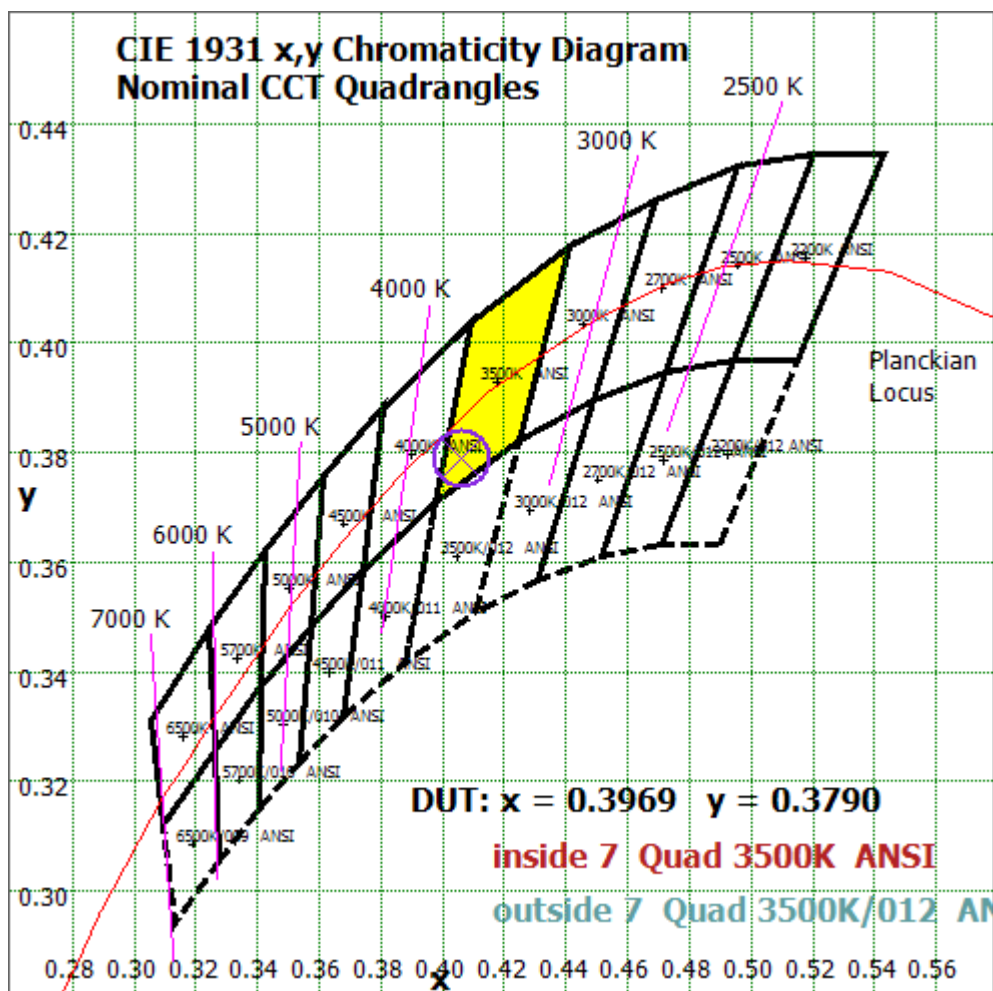


Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

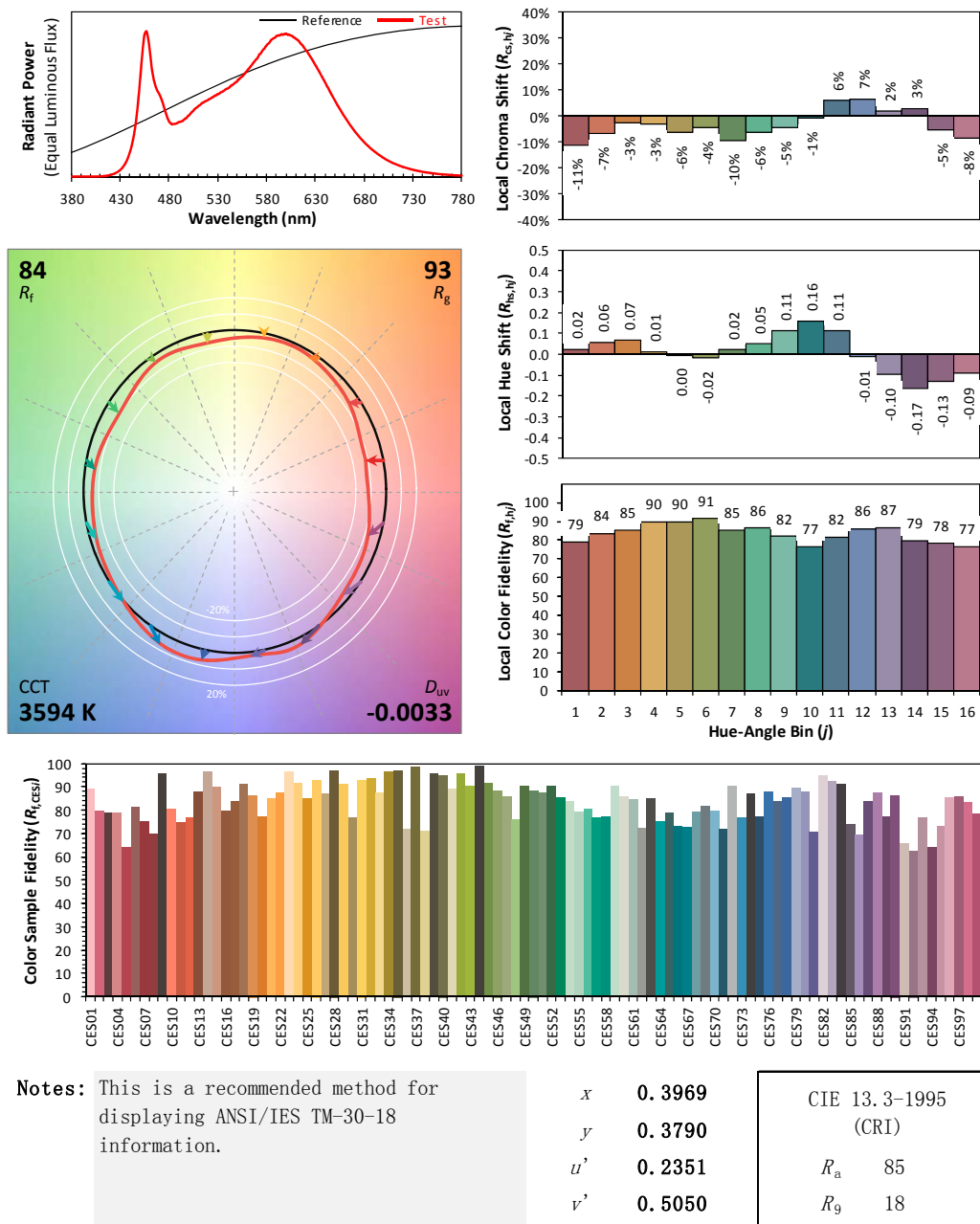
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A3



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)	0.388	0.179
Power Factor	0.9940	0.9230
Test Power (W)/3	15.39	15.25
THD A%	5.71	7.51
Luminous Efficacy (lm/W)	146.8	148.1
Total Luminous Flux (lm)	2259.3	2258.9
Color Rendering Index (CRI)	85.6	
R9	22.9	
Correlated Color Temperature (CCT)(K)	4028	
Chromaticity Chroma x	0.3766	
Chromaticity Chroma y	0.3664	
Chromaticity Chroma u	0.2267	
Chromaticity Chroma v	0.3309	
Duv	-0.0038	
Chromaticity Chroma u'	0.2267	
Chromaticity Chroma v'	0.4964	

Special Color Rendering Indices	
R1	87.1
R2	97.5
R3	91.8
R4	81.1
R5	86.4
R6	92.3
R7	82.2
R8	66.1
R9	22.9
R10	92.9
R11	81.3
R12	67.2
R13	91
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

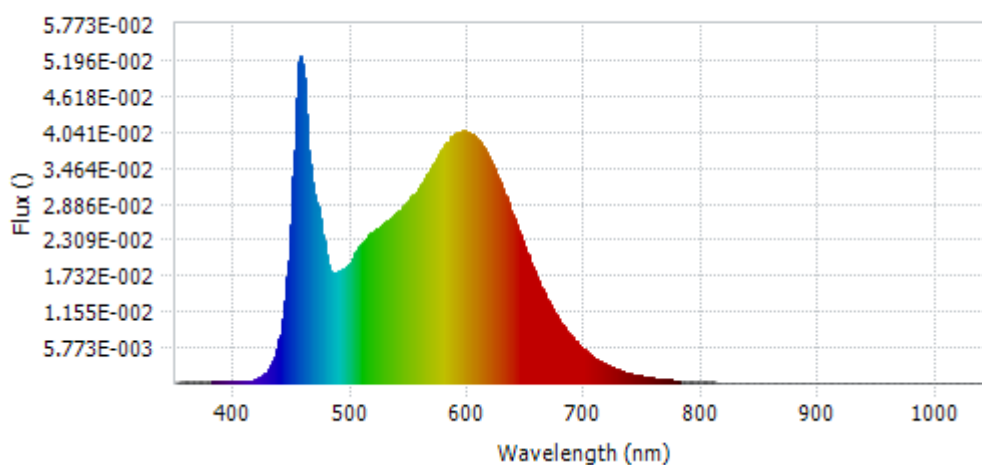


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.53E-04	485	1.78E-02	590	4.03E-02	695	6.08E-03
385	2.14E-04	490	1.81E-02	595	4.05E-02	700	5.18E-03
390	2.42E-04	495	1.86E-02	600	4.05E-02	705	4.42E-03
395	2.57E-04	500	1.99E-02	605	3.97E-02	710	3.77E-03
400	2.39E-04	505	2.13E-02	610	3.86E-02	715	3.22E-03
405	2.32E-04	510	2.27E-02	615	3.72E-02	720	2.77E-03
410	3.07E-04	515	2.38E-02	620	3.53E-02	725	2.36E-03
415	4.65E-04	520	2.44E-02	625	3.32E-02	730	2.00E-03
420	7.52E-04	525	2.53E-02	630	3.09E-02	735	1.70E-03
425	1.39E-03	530	2.61E-02	635	2.85E-02	740	1.46E-03
430	2.51E-03	535	2.67E-02	640	2.59E-02	745	1.25E-03
435	4.78E-03	540	2.75E-02	645	2.34E-02	750	1.07E-03
440	9.06E-03	545	2.85E-02	650	2.09E-02	755	9.07E-04
445	1.71E-02	550	2.94E-02	655	1.86E-02	760	7.85E-04
450	3.33E-02	555	3.06E-02	660	1.64E-02	765	6.79E-04
455	5.16E-02	560	3.20E-02	665	1.44E-02	770	5.82E-04
460	4.64E-02	565	3.35E-02	670	1.26E-02	775	4.88E-04
465	3.35E-02	570	3.51E-02	675	1.09E-02	780	4.23E-04
470	2.91E-02	575	3.67E-02	680	9.45E-03		
475	2.40E-02	580	3.82E-02	685	8.21E-03		
480	1.89E-02	585	3.96E-02	690	7.07E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method

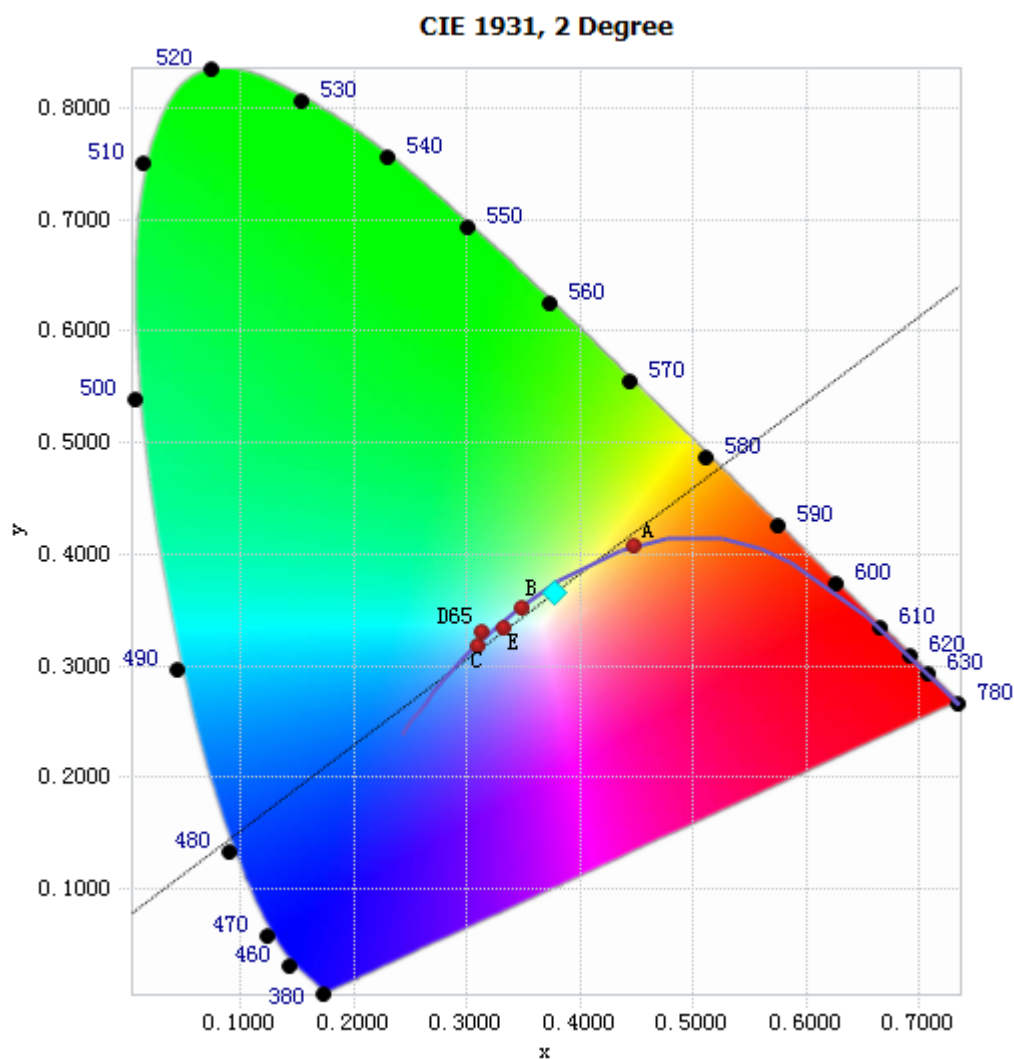


Chart 13: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

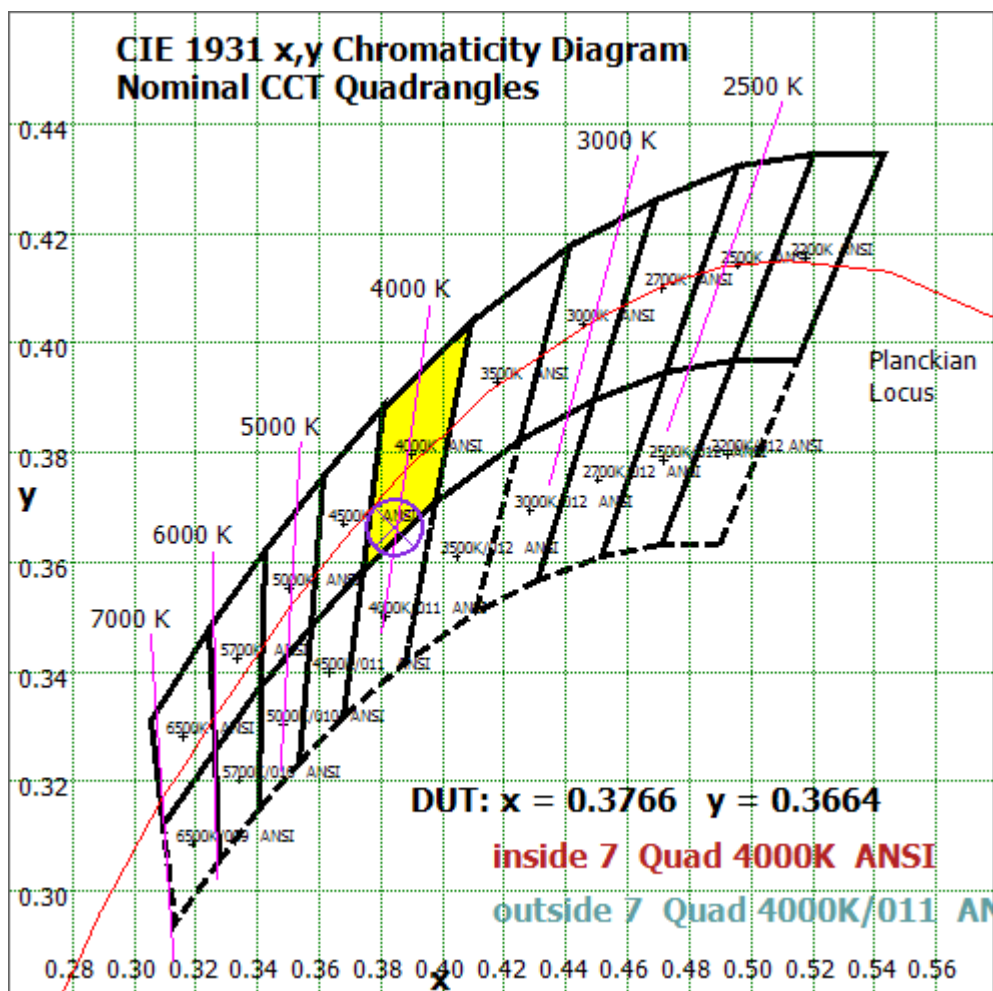


Chart14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

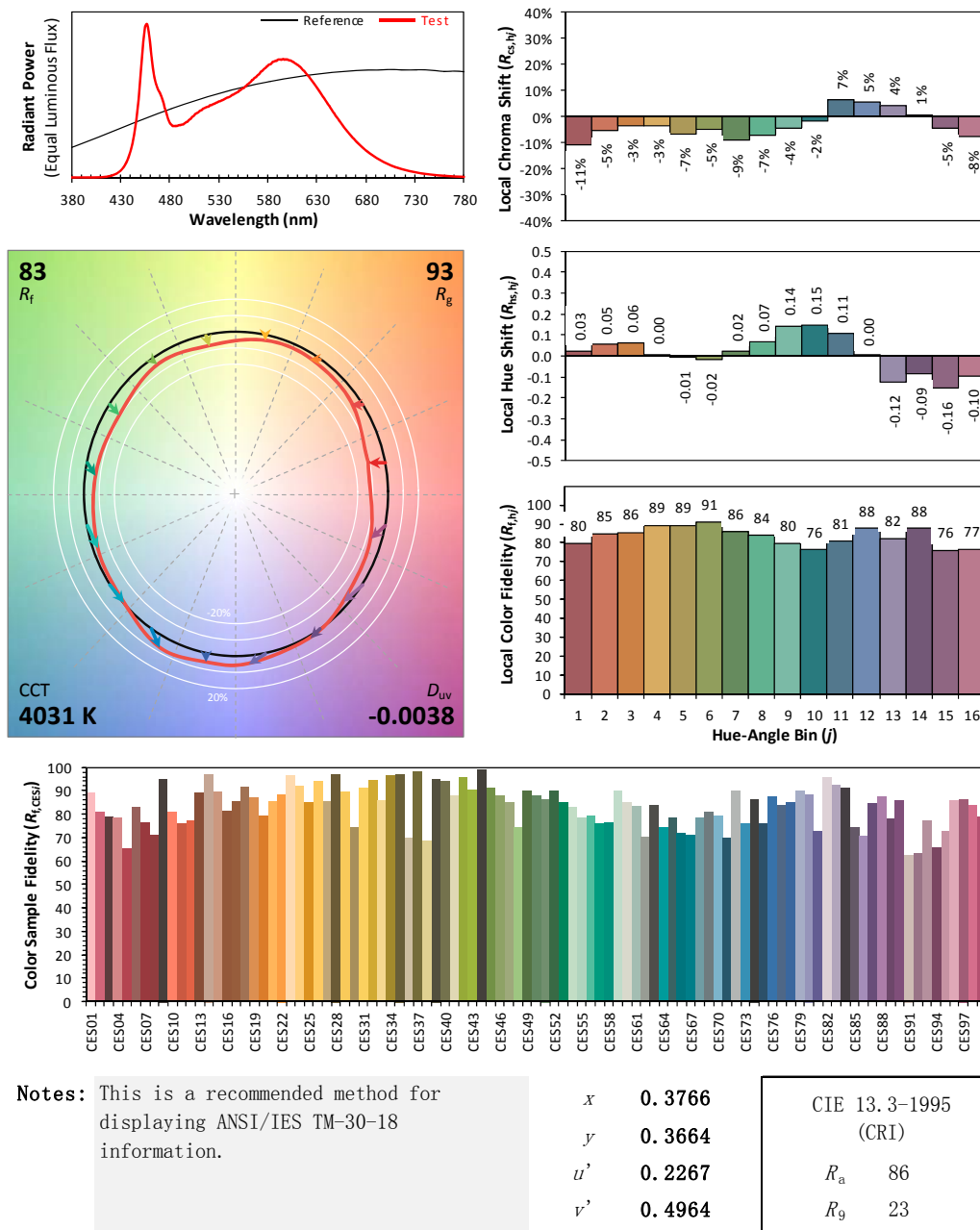
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A3



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)	0.389	0.179
Power Factor	0.9940	0.9234
Test Power (W)/3	15.46	15.31
THD A%	5.67	7.41
Luminous Efficacy (lm/W)	146.8	148.3
Total Luminous Flux (lm)	2268.9	2270.3
Color Rendering Index (CRI)	85.7	
R9	24.3	
Correlated Color Temperature (CCT)(K)	4924	
Chromaticity Chroma x	0.3466	
Chromaticity Chroma y	0.3481	
Chromaticity Chroma u	0.2139	
Chromaticity Chroma v	0.3221	
Duv	-0.0024	
Chromaticity Chroma u'	0.2139	
Chromaticity Chroma v'	0.4832	

Special Color Rendering Indices	
R1	87.1
R2	97.4
R3	92.7
R4	80.2
R5	85.5
R6	91
R7	83.4
R8	68.6
R9	24.3
R10	91.9
R11	80.7
R12	61.5
R13	91.4
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

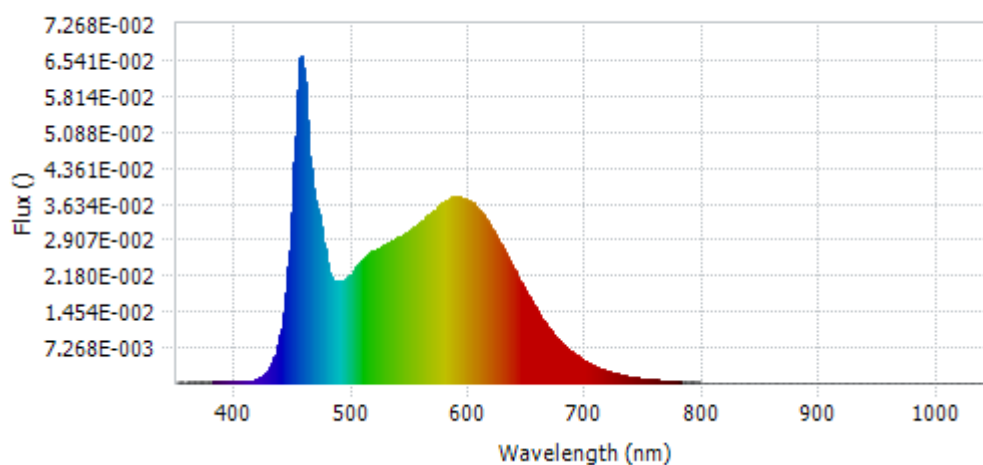
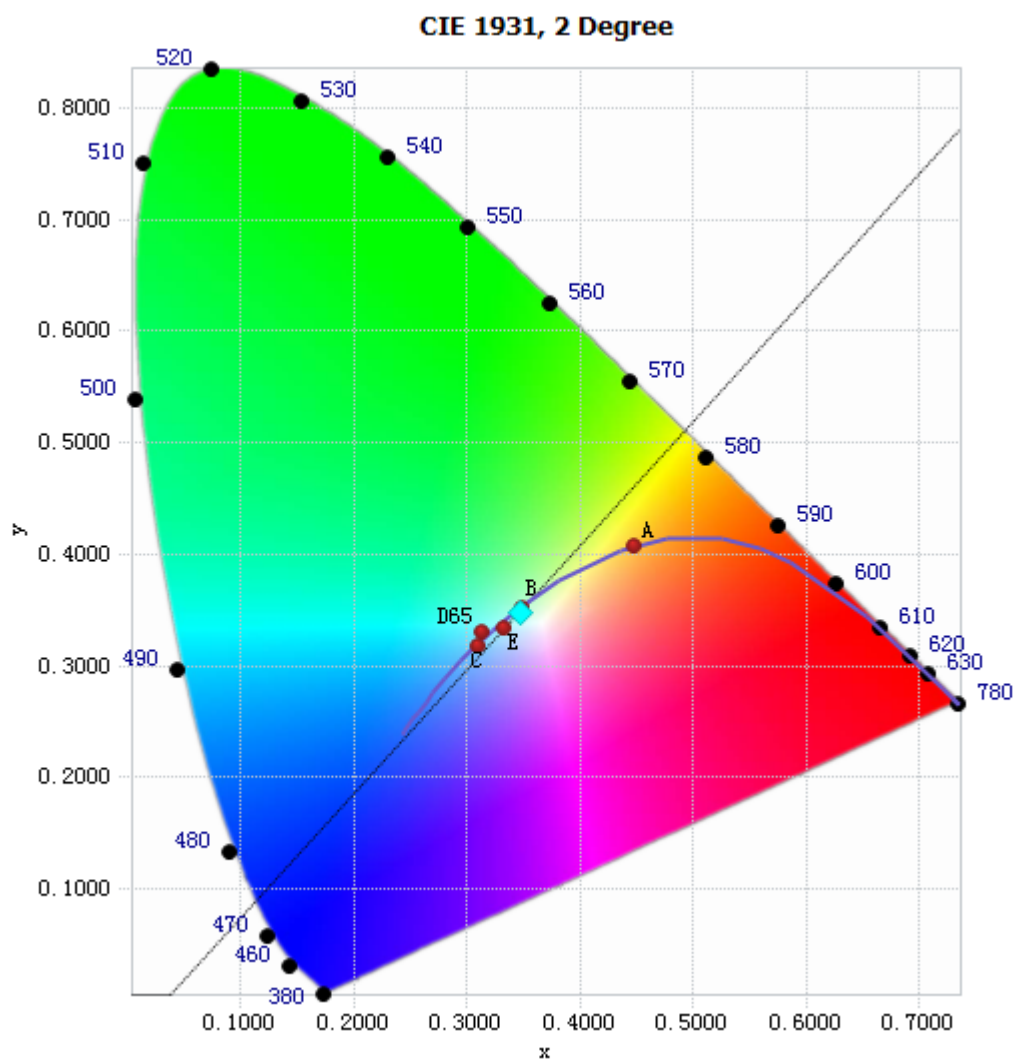


Chart16: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.61E-04	485	2.07E-02	590	3.77E-02	695	5.03E-03
385	2.59E-04	490	2.08E-02	595	3.75E-02	700	4.33E-03
390	2.99E-04	495	2.12E-02	600	3.69E-02	705	3.69E-03
395	2.78E-04	500	2.24E-02	605	3.59E-02	710	3.15E-03
400	2.73E-04	505	2.39E-02	610	3.45E-02	715	2.68E-03
405	2.74E-04	510	2.53E-02	615	3.28E-02	720	2.30E-03
410	3.71E-04	515	2.63E-02	620	3.09E-02	725	1.97E-03
415	5.58E-04	520	2.69E-02	625	2.89E-02	730	1.67E-03
420	1.03E-03	525	2.77E-02	630	2.67E-02	735	1.42E-03
425	1.89E-03	530	2.84E-02	635	2.44E-02	740	1.22E-03
430	3.46E-03	535	2.89E-02	640	2.22E-02	745	1.04E-03
435	6.65E-03	540	2.95E-02	645	1.99E-02	750	8.95E-04
440	1.25E-02	545	3.02E-02	650	1.77E-02	755	7.59E-04
445	2.34E-02	550	3.09E-02	655	1.57E-02	760	6.47E-04
450	4.45E-02	555	3.19E-02	660	1.38E-02	765	5.58E-04
455	6.59E-02	560	3.29E-02	665	1.21E-02	770	4.87E-04
460	5.73E-02	565	3.40E-02	670	1.05E-02	775	4.12E-04
465	4.11E-02	570	3.50E-02	675	9.15E-03	780	3.52E-04
470	3.52E-02	575	3.60E-02	680	7.89E-03		
475	2.85E-02	580	3.69E-02	685	6.86E-03		
480	2.23E-02	585	3.76E-02	690	5.88E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3466, 0.3481)

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

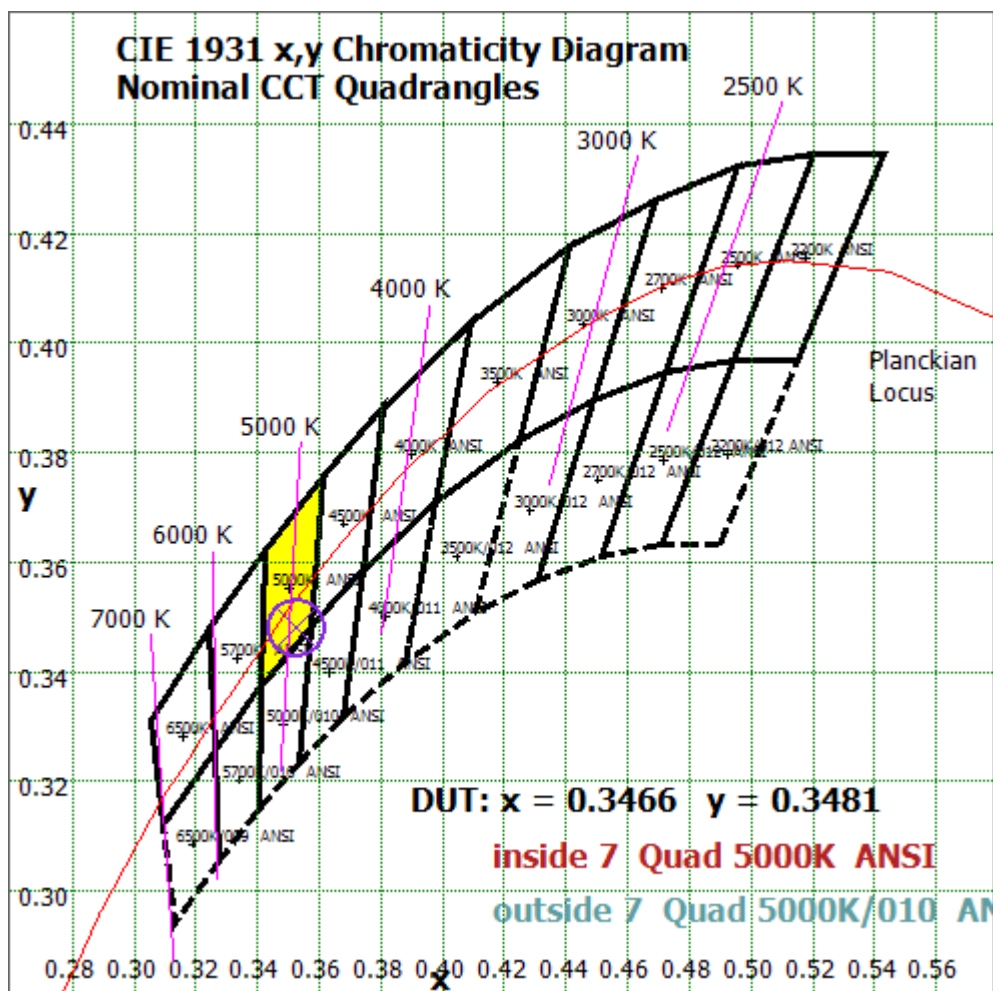


Chart 18: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

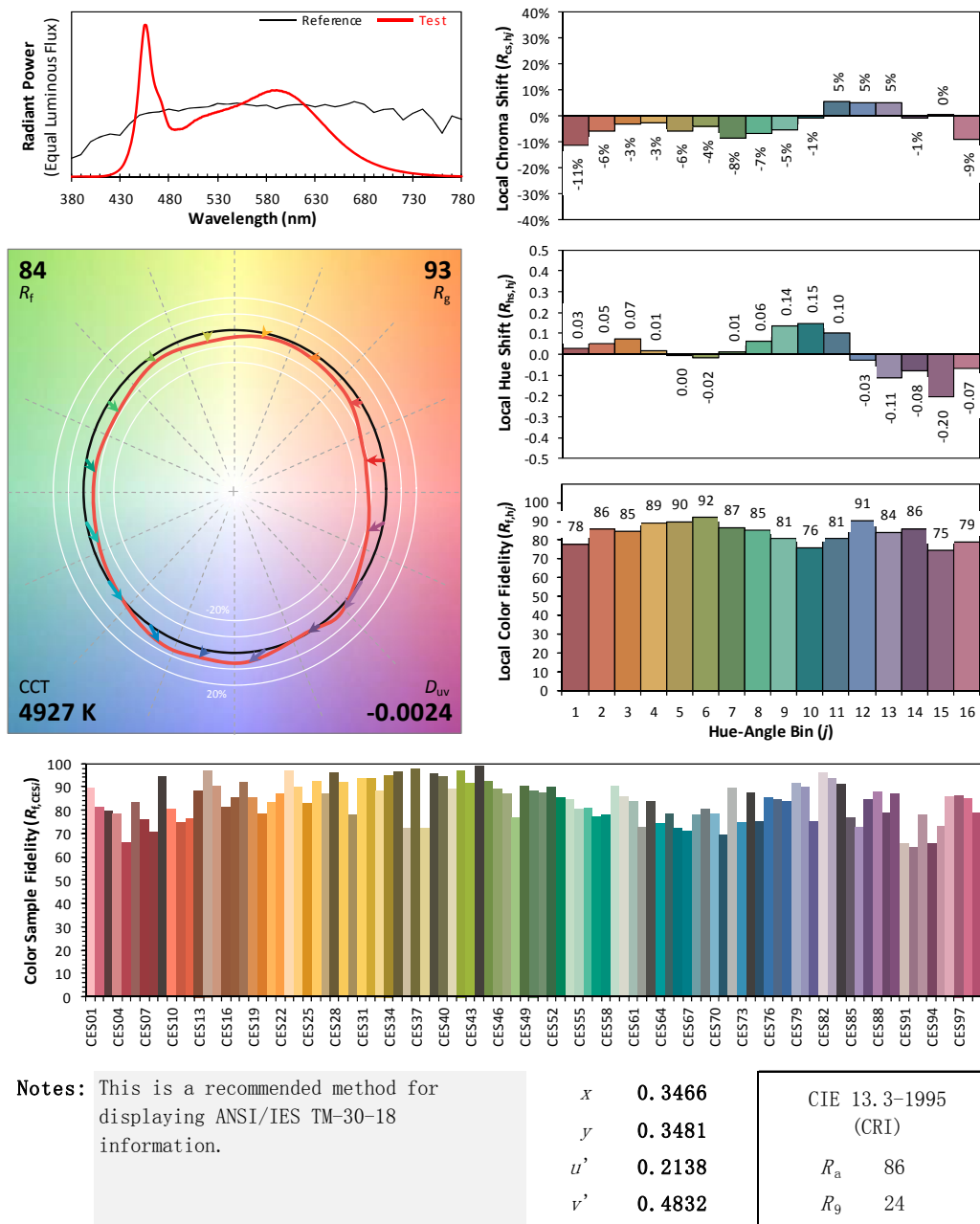
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A3



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)	0.396	0.182
Power Factor	0.9942	0.9258
Test Power (W)/3	15.73	15.57
THD A%	6.11	7.41
Luminous Efficacy (lm/W)	142.2	143.7
Total Luminous Flux (lm)	2236.7	2237.5
Color Rendering Index (CRI)	84.5	
R9	12.4	
Correlated Color Temperature (CCT)(K)	6553	
Chromaticity Chroma x	0.3119	
Chromaticity Chroma y	0.3276	
Chromaticity Chroma u	0.1978	
Chromaticity Chroma v	0.3116	
Duv	0.0029	
Chromaticity Chroma u'	0.1978	
Chromaticity Chroma v'	0.4674	

Special Color Rendering Indices	
R1	84.3
R2	95.1
R3	93.4
R4	78.7
R5	83.2
R6	88.6
R7	84.5
R8	67.9
R9	12.4
R10	86.2
R11	79
R12	59.3
R13	88.7
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

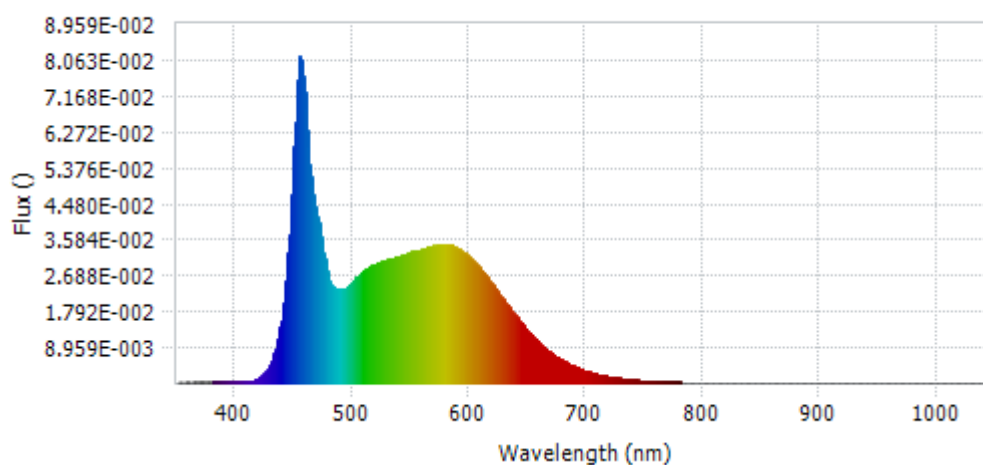
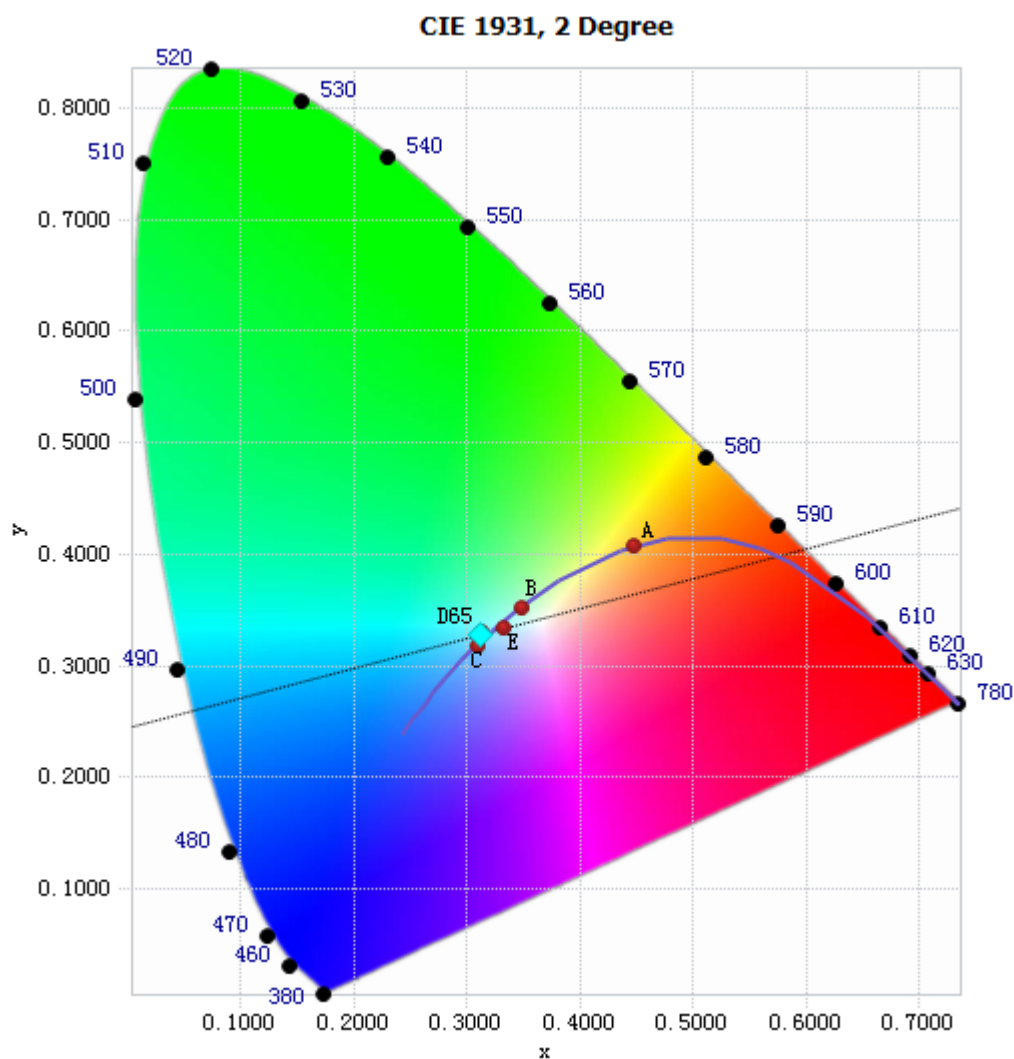


Chart 20: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.46E-04	485	2.38E-02	590	3.37E-02	695	3.58E-03
385	2.92E-04	490	2.37E-02	595	3.26E-02	700	3.05E-03
390	2.95E-04	495	2.39E-02	600	3.15E-02	705	2.62E-03
395	3.00E-04	500	2.53E-02	605	2.99E-02	710	2.23E-03
400	2.97E-04	505	2.68E-02	610	2.82E-02	715	1.92E-03
405	3.16E-04	510	2.81E-02	615	2.64E-02	720	1.64E-03
410	4.41E-04	515	2.91E-02	620	2.44E-02	725	1.41E-03
415	7.58E-04	520	2.97E-02	625	2.25E-02	730	1.18E-03
420	1.41E-03	525	3.04E-02	630	2.05E-02	735	1.02E-03
425	2.63E-03	530	3.10E-02	635	1.86E-02	740	8.78E-04
430	4.98E-03	535	3.12E-02	640	1.67E-02	745	7.54E-04
435	9.51E-03	540	3.17E-02	645	1.48E-02	750	6.49E-04
440	1.78E-02	545	3.22E-02	650	1.30E-02	755	5.52E-04
445	3.24E-02	550	3.25E-02	655	1.15E-02	760	4.79E-04
450	5.91E-02	555	3.30E-02	660	1.00E-02	765	4.21E-04
455	8.15E-02	560	3.35E-02	665	8.72E-03	770	3.53E-04
460	6.80E-02	565	3.40E-02	670	7.54E-03	775	3.06E-04
465	4.90E-02	570	3.43E-02	675	6.54E-03	780	2.66E-04
470	4.14E-02	575	3.45E-02	680	5.63E-03		
475	3.28E-02	580	3.45E-02	685	4.85E-03		
480	2.57E-02	585	3.44E-02	690	4.18E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3119, 0.3276)

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

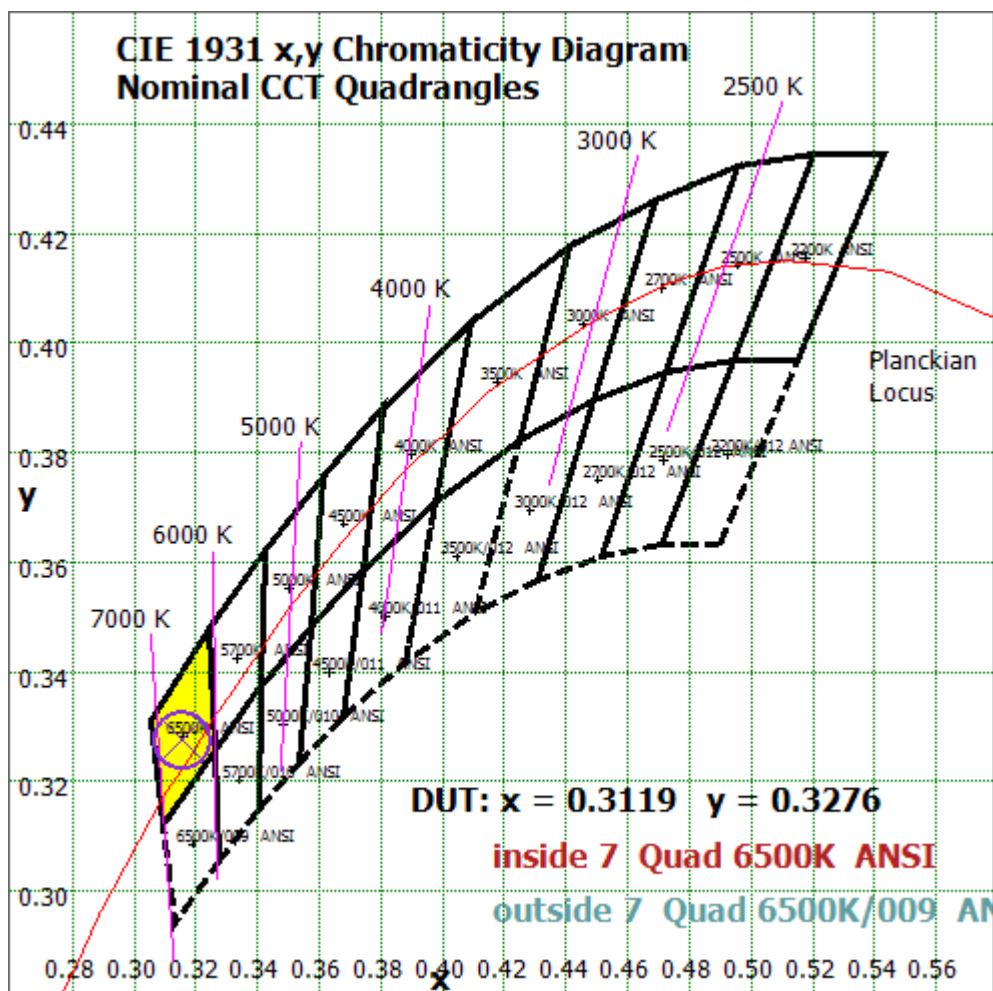


Chart 22: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

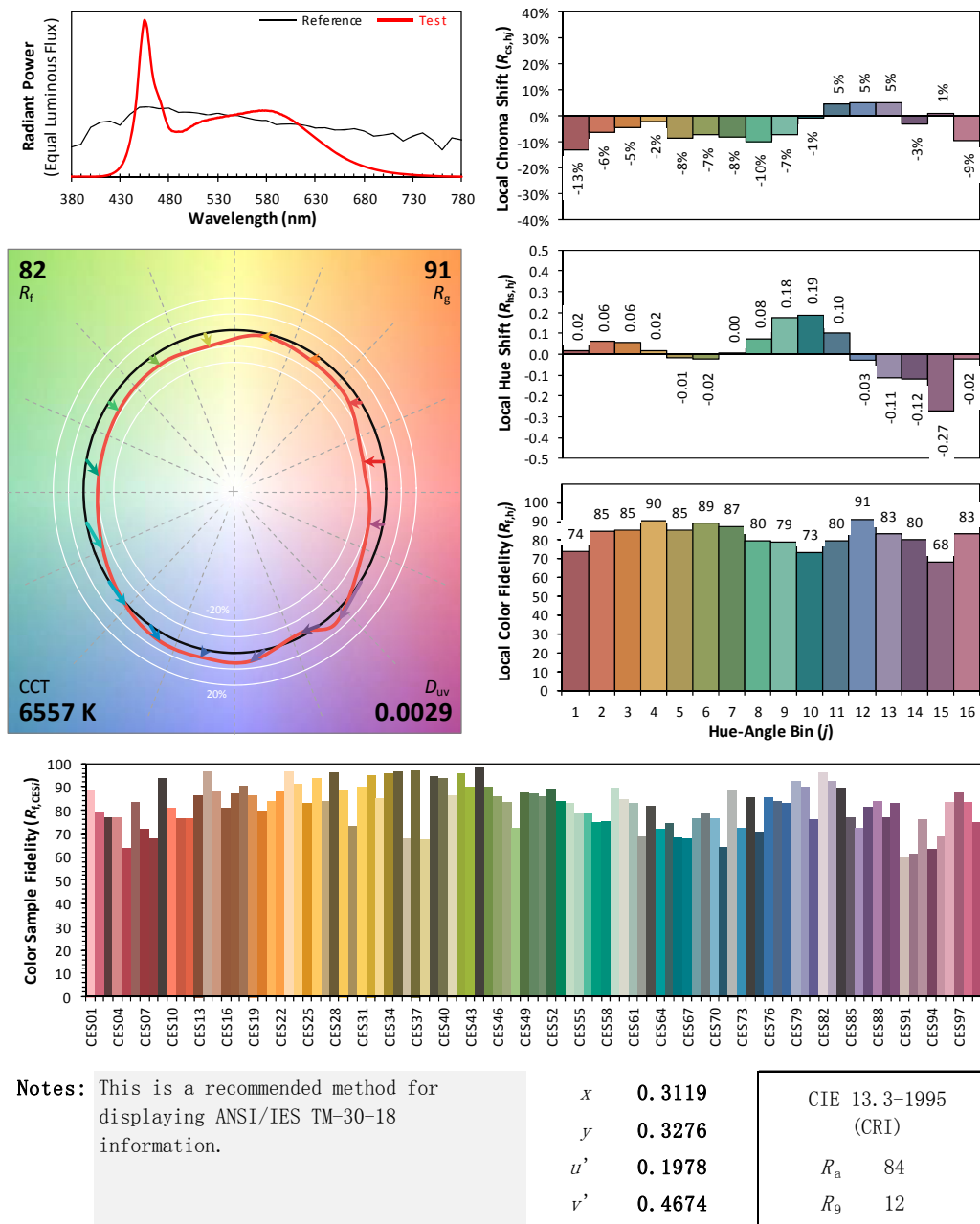
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A3



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 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 ***

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