

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/A4

Laboratory: Lea ding Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ230600271

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

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Jul. 07, 2023

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

TEST SUMMARY

Tested Model	14T8/4F/8CCTS/EX T/SD/A4 3000K Setting	14T8/4F/8CCTS/EX T/SD/A4 3500K Setting	14T8/4F/8CCTS/E XT/SD/A4 4000K Setting
Luminous Efficacy (Lumens /Watt)	138.6	144.0	146.7
Total Luminous Flux (Lumens)	2171.4	2232.0	2258.8
Power (Watts)/4	15.67	15.50	15.40
Power Factor	0.9962	0.9962	0.9961
CCT (K)	3056	3592	4029
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/A4 5000K Setting	14T8/4F/8CCTS/EX T/SD/A4 6500K Setting
Luminous Efficacy (Lumens /Watt)	146.7	142.2
Total Luminous Flux (Lumens)	2268.7	2236.6
Power (Watts)/4	15.47	15.73
Power Factor	0.9962	0.9963
CCT (K)	4923	6551
CRI	85.7	84.4
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

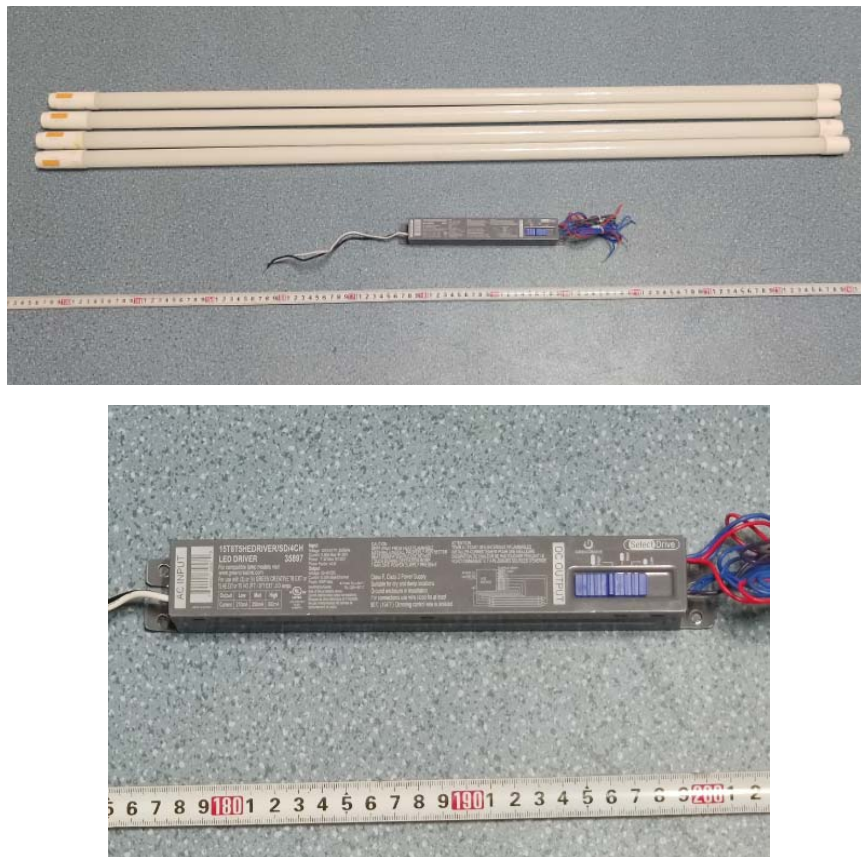


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 14T8/4F/8CCTS/EXT/SD/A4
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)	0.524	0.234
Power Factor	0.9962	0.9501
Test Power (W)/4	15.67	15.39
THD A%	5.24	6.04
Luminous Efficacy (lm/W)	138.6	141.2
Total Luminous Flux (lm)	2171.4	2173.8
Color Rendering Index (CRI)	82.5	
R9	6.8	
Correlated Color Temperature (CCT)(K)	3056	
Chromaticity Chroma x	0.4322	
Chromaticity Chroma y	0.4013	
Chromaticity Chroma u	0.2487	
Chromaticity Chroma v	0.3464	
Duv	-0.0005	
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	82.5
R6	93
R7	80.1
R8	57.3
R9	6.8
R10	86.9
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

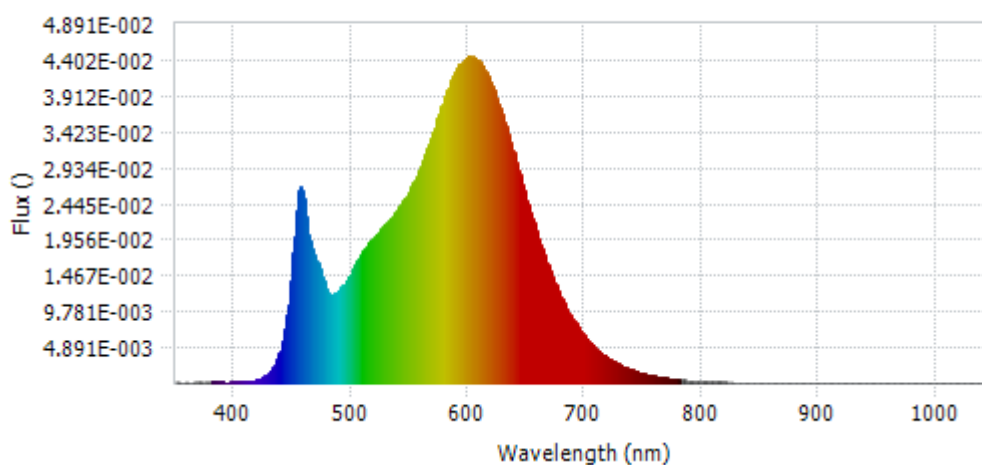
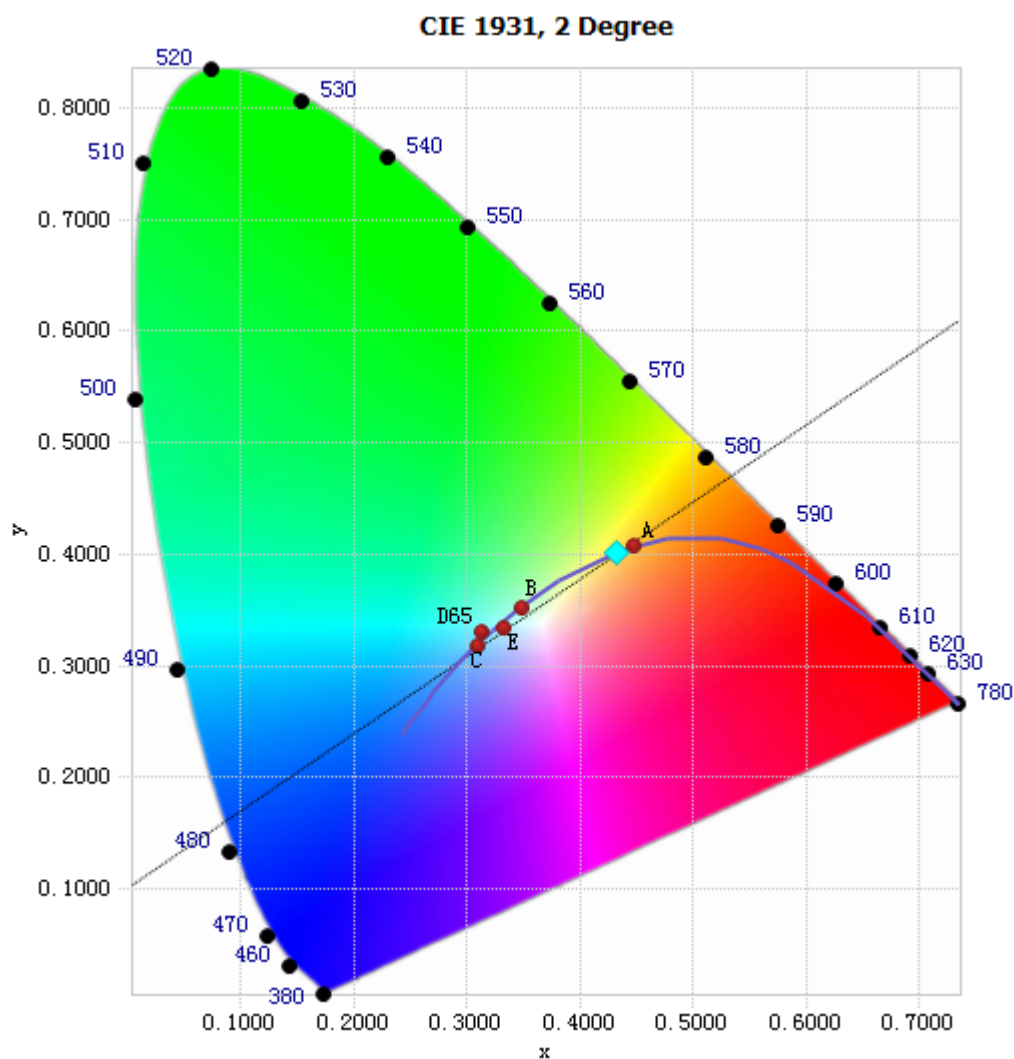


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.57E-04	485	1.21E-02	590	4.29E-02	695	7.42E-03
385	1.62E-04	490	1.29E-02	595	4.39E-02	700	6.35E-03
390	1.62E-04	495	1.38E-02	600	4.44E-02	705	5.44E-03
395	1.44E-04	500	1.52E-02	605	4.43E-02	710	4.62E-03
400	1.53E-04	505	1.67E-02	610	4.36E-02	715	3.95E-03
405	1.71E-04	510	1.79E-02	615	4.23E-02	720	3.41E-03
410	2.27E-04	515	1.91E-02	620	4.05E-02	725	2.91E-03
415	3.20E-04	520	1.99E-02	625	3.85E-02	730	2.47E-03
420	5.25E-04	525	2.10E-02	630	3.60E-02	735	2.11E-03
425	9.02E-04	530	2.19E-02	635	3.34E-02	740	1.80E-03
430	1.55E-03	535	2.28E-02	640	3.07E-02	745	1.53E-03
435	2.80E-03	540	2.38E-02	645	2.78E-02	750	1.31E-03
440	5.13E-03	545	2.50E-02	650	2.49E-02	755	1.12E-03
445	9.42E-03	550	2.63E-02	655	2.23E-02	760	9.55E-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	6.98E-04
460	2.42E-02	565	3.20E-02	670	1.52E-02	775	6.14E-04
465	1.87E-02	570	3.43E-02	675	1.33E-02	780	5.01E-04
470	1.68E-02	575	3.67E-02	680	1.15E-02		
475	1.45E-02	580	3.90E-02	685	9.98E-03		
480	1.22E-02	585	4.14E-02	690	8.61E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4322, 0.4013)

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

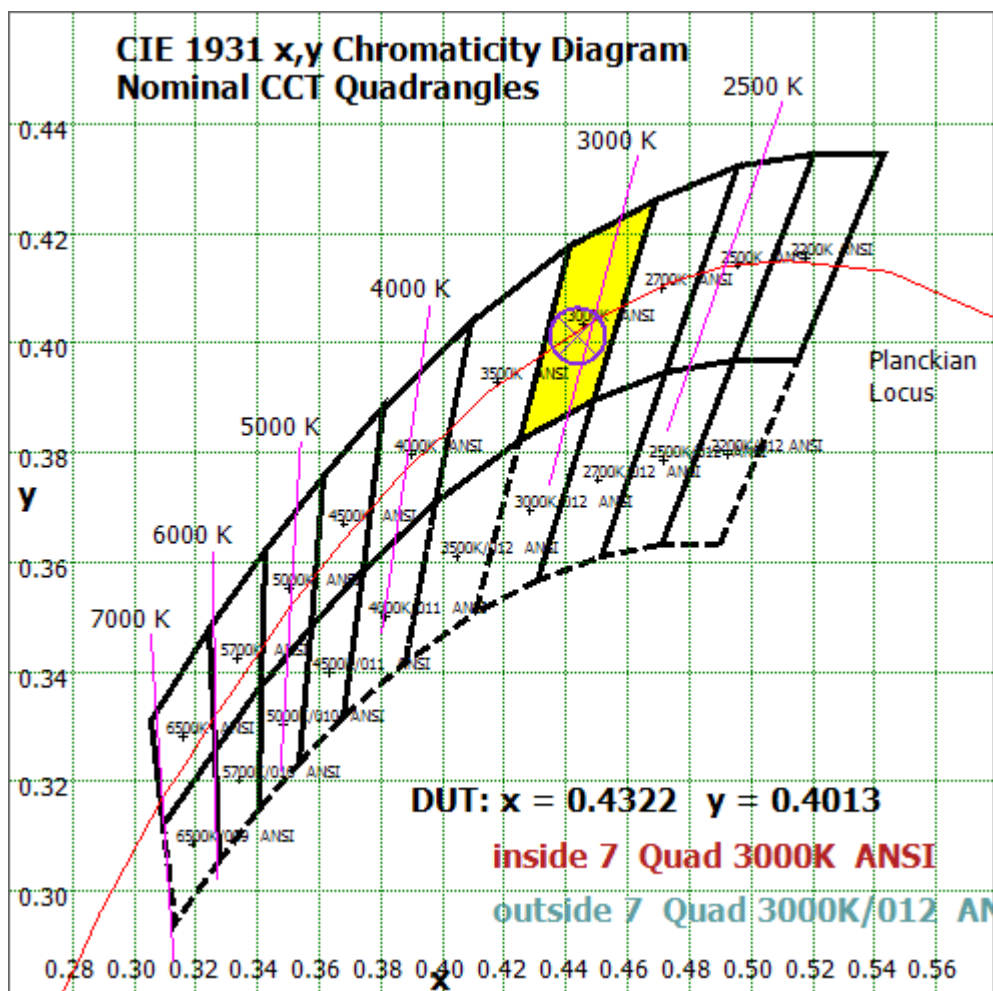


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

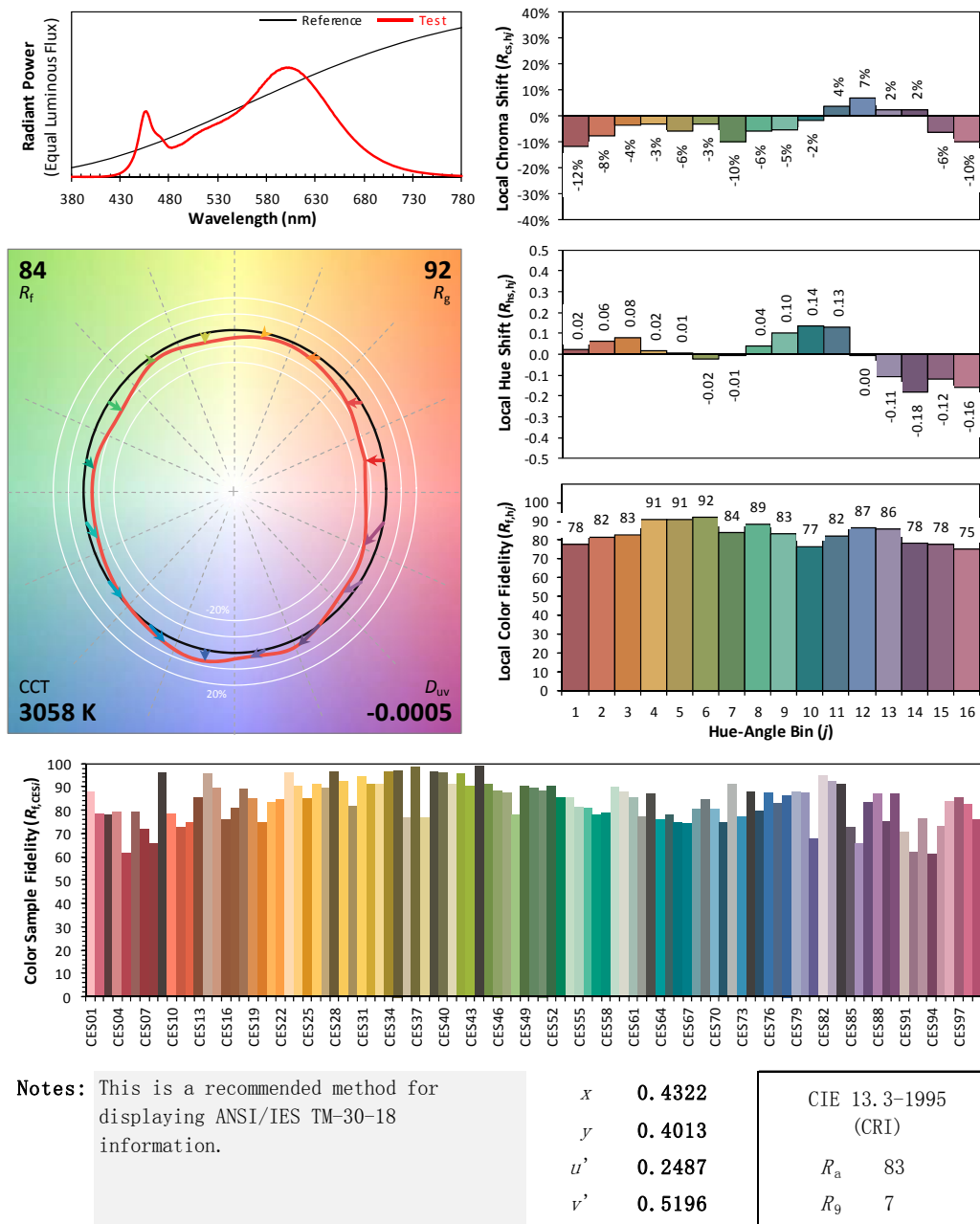
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A4



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)	0.528
Power Factor	0.9923
Power (W)/4	15.70
Luminous Efficacy (lm/W)	139.2
Total Luminous Flux (lm)	2185.1
Beam Angle (°)	117.2 (0°-180°) / 249.3 (90°-270°)
Center Beam Candle Power (cd)	337
Maximum Beam Candle Power (cd)	337.4 (At: C=0.0, Gamma=3.5)
Spacing Criteria	1.26 (0°-180°) / 1.46 (90°-270°)
Zonal Lumens in the 0°-60°Zone	40.92%
Zonal Lumens in the 60°-90°Zone	27.18%
Zonal Lumens in the 90°-120°Zone	18.86%
Zonal Lumens in the 120°-180°Zone	13.04%

Table 4: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	31.978	1.46%
10- 20	93.086	4.26%
20- 30	146.209	6.69%
30- 40	187.171	8.57%
40- 50	213.02	9.75%
50- 60	222.645	10.19%
60- 70	217.058	9.93%
70- 80	199.64	9.14%
80- 90	177.109	8.11%
90-100	155.975	7.14%
100-110	137.183	6.28%
110-120	119.015	5.45%
120-130	99.115	4.54%
130-140	78.938	3.61%
140-150	57.161	2.62%
150-160	34.612	1.58%
160-170	13.273	0.61%
170-180	1.924	0.09%
Total	2185.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	894.109	40.92%
60- 90	593.807	27.18%
0-90	1487.92	68.09%
90- 180	697.196	31.91%
0- 180	2185.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

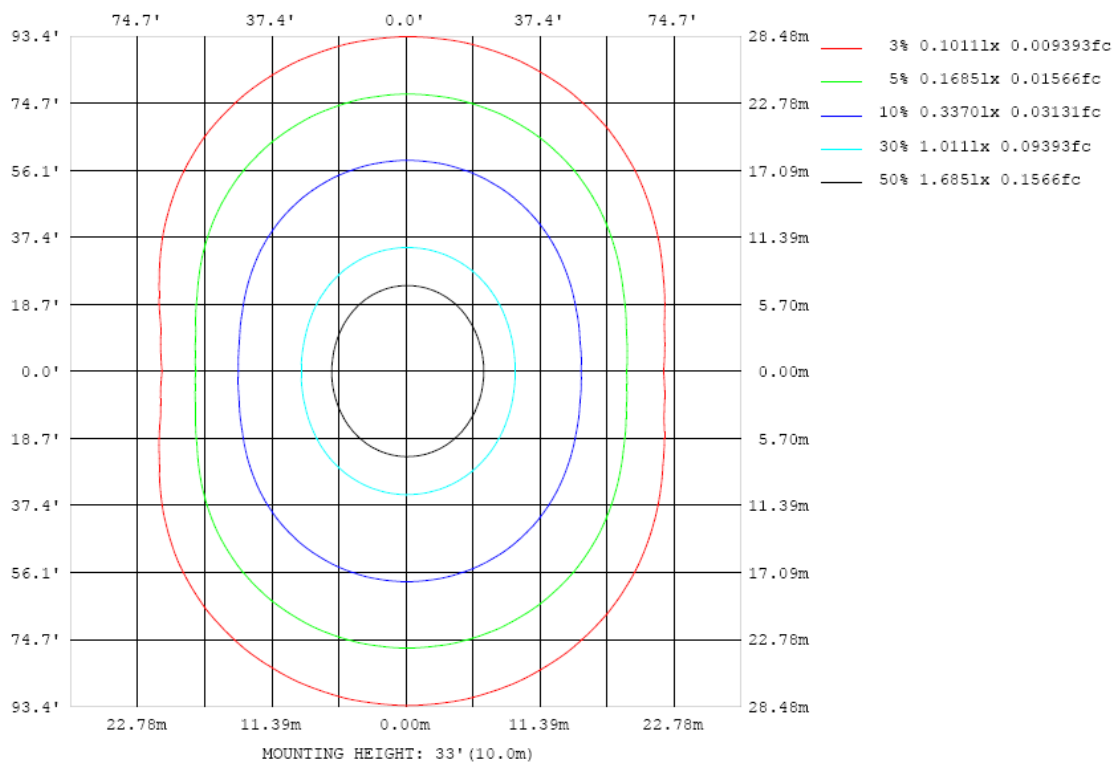


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

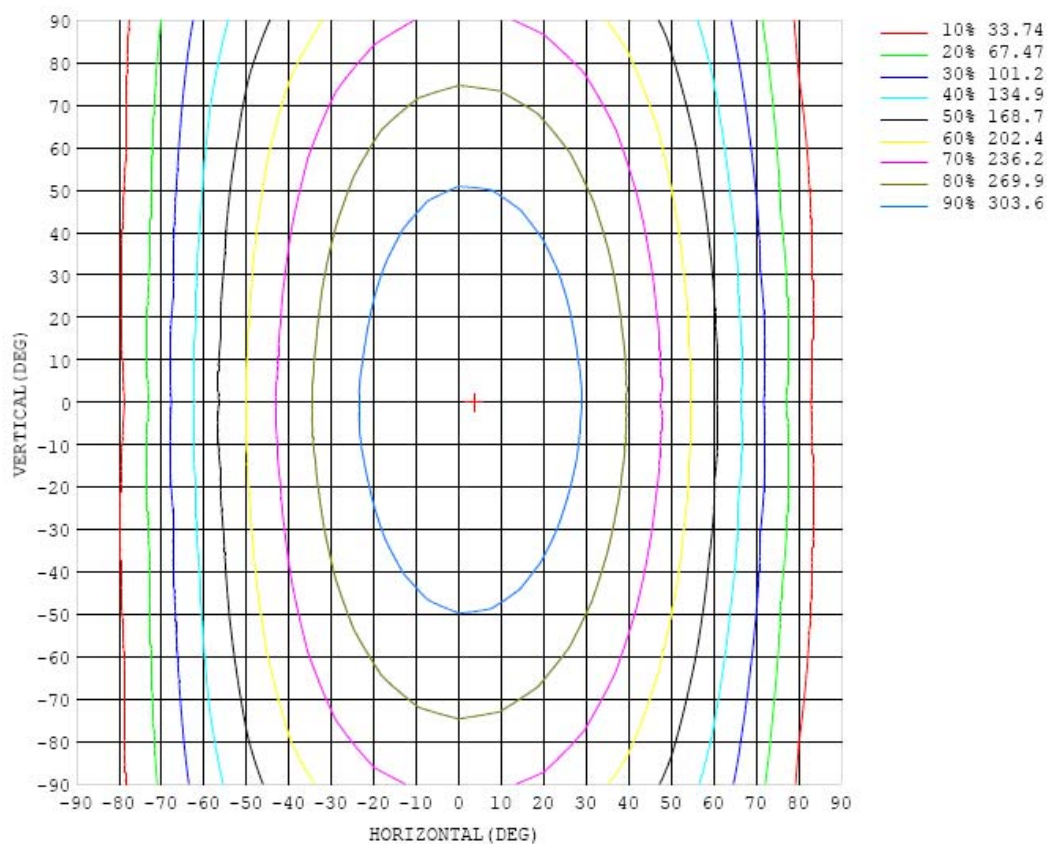


Chart 6: Isocandela Plot

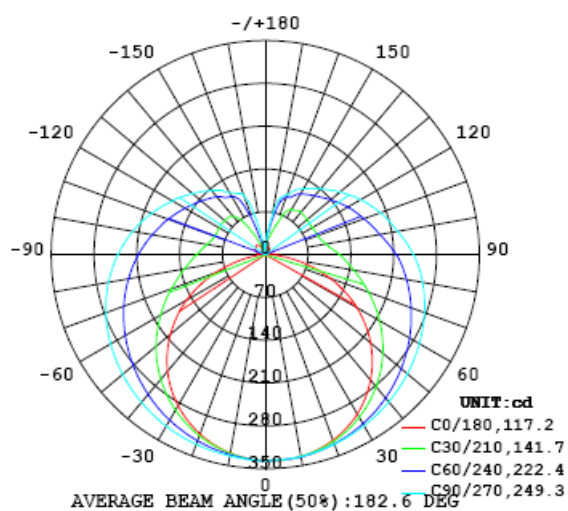


Chart 7: Polar Candela Distribution

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	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337
5	337	337	337	337	337	337	337	337	336	336	336	336	335	335	335	334	334	334	334
10	335	335	335	335	335	336	336	336	336	335	335	334	333	332	331	330	329	329	329
15	330	330	330	331	332	333	333	333	333	332	331	329	327	326	324	323	322	322	322
20	323	323	324	325	327	328	329	330	330	329	327	324	321	319	316	314	312	312	312
25	313	313	315	317	320	322	325	326	327	327	325	322	319	314	310	306	303	301	300
30	301	301	304	307	311	316	319	322	323	323	321	317	312	307	300	294	289	287	285
35	285	287	290	295	301	308	313	317	319	319	317	312	306	298	289	281	274	270	268
40	268	270	275	282	290	299	306	311	314	314	311	306	298	288	277	266	257	251	249
45	247	250	257	267	278	289	298	305	309	309	306	300	290	278	265	251	238	230	227
50	225	229	238	251	265	279	290	298	303	303	300	293	282	268	251	234	217	207	203
55	200	205	217	234	252	268	281	291	296	297	294	286	274	257	238	216	196	182	176
60	173	179	195	216	237	257	272	283	290	291	287	279	265	247	224	199	173	155	149
65	143	151	172	198	223	245	263	275	282	284	280	271	256	236	211	181	151	127	118
70	112	123	148	180	209	234	254	267	275	277	273	263	248	226	198	165	129	98.8	86.5
75	80.7	93.9	126	163	196	223	244	259	267	269	266	256	239	216	186	150	109	71.8	55.3
80	50.3	67.8	106	147	183	212	235	250	259	261	258	247	230	207	175	137	92.5	49.2	27.0
85	22.8	45.0	89.2	133	171	202	225	241	250	253	249	239	221	197	165	126	80.1	33.1	6.82
90	5.76	30.3	77.4	122	160	191	214	230	239	242	239	229	212	188	156	117	72.1	26.8	1.63
95	2.01	21.9	66.5	110	148	179	202	218	228	231	228	218	202	179	148	111	68.5	26.9	3.38
100	4.43	18.7	59.3	101	137	167	190	207	216	220	217	208	193	170	141	105	66.8	30.2	7.90
105	9.02	20.2	56.5	94.4	130	159	181	197	206	210	208	199	184	162	134	102	67.1	35.7	14.7
110	14.3	22.9	57.1	92.2	124	150	172	187	197	200	198	190	175	155	129	99.1	69.1	41.7	16.7
115	15.3	26.3	59.0	89.9	119	144	164	178	187	190	188	180	166	148	124	97.6	71.8	47.4	19.4
120	8.57	24.7	62.7	88.6	115	138	156	169	177	180	178	170	158	141	120	97.1	75.2	50.9	17.8
125	4.89	28.0	66.9	88.4	111	131	147	159	167	170	168	161	150	135	117	97.1	78.1	52.5	17.4
130	3.84	34.5	70.6	89.0	108	125	139	150	157	159	158	152	142	129	114	97.5	77.8	59.8	20.3
135	7.69	34.6	70.3	89.9	106	120	132	141	147	150	148	143	135	124	111	97.4	80.9	58.6	20.8
140	9.55	20.5	64.8	90.8	104	116	126	133	138	140	140	135	129	120	110	93.7	80.7	56.0	20.2
145	12.6	15.9	64.5	87.8	101	112	120	126	130	132	132	128	123	116	104	92.5	77.1	50.4	18.1
150	10.9	17.5	48.0	85.3	96.6	107	115	120	123	124	124	122	117	109	99.5	90.1	74.4	45.4	15.3
155	11.5	16.5	35.1	75.6	94.7	99.8	105	112	115	117	116	113	106	102	95.6	81.7	60.4	37.9	12.9
160	12.3	17.8	29.8	52.2	82.5	94.7	99.7	103	104	104	104	104	101	95.4	85.5	64.9	48.8	27.2	11.2
165	13.2	17.4	24.8	36.3	53.1	71.5	86.1	92.7	94.9	95.3	95.4	94.3	88.9	78.0	66.7	50.6	34.0	20.6	11.8
170	13.5	15.4	18.5	24.7	32.6	39.7	50.3	58.6	62.2	64.0	65.9	64.2	58.2	47.2	39.0	31.5	21.4	18.3	14.7
175	14.8	15.4	16.8	17.8	18.2	20.8	25.2	28.7	30.7	31.7	31.7	30.0	26.2	22.0	18.0	16.2	17.4	17.5	15.0
180	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4

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	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337		
5	334	334	335	335	335	335	336	336	336	336	336	337	337	337	337	337	337		
10	329	330	330	330	331	332	333	334	334	335	335	335	335	335	335	335	335		
15	322	323	323	325	327	328	330	331	332	333	333	333	332	331	331	330	330		
20	312	313	315	318	321	324	327	329	330	331	330	329	328	326	325	323	323		
25	300	302	305	310	314	319	323	326	327	328	327	325	323	320	317	314	313		
30	286	289	294	300	306	313	318	322	324	324	323	320	316	312	307	303	301		
35	269	273	280	289	298	306	313	317	320	320	318	314	309	302	296	290	287		
40	250	256	266	277	288	298	307	312	315	315	312	307	300	291	282	274	270		
45	229	237	250	264	278	290	300	307	310	310	306	300	290	279	268	257	250		
50	206	217	233	251	268	282	293	301	305	304	300	292	280	266	251	238	228		
55	181	195	216	237	257	273	286	295	299	298	292	283	269	253	234	217	204		
60	155	173	197	223	246	265	279	288	292	291	285	274	258	238	216	195	179		
65	127	151	181	209	235	256	271	281	285	284	277	265	247	224	198	172	152		
70	98.1	129	164	196	224	246	263	273	278	276	268	255	235	209	179	149	123		
75	70.9	108	148	184	213	237	254	265	269	267	259	245	224	196	163	126	94.0		
80	47.4	90.7	134	172	203	227	245	256	260	258	250	234	212	182	147	105	66.7		
85	31.1	77.3	123	162	193	217	235	247	251	249	240	224	201	170	132	87.2	43.8		
90	23.0	68.0	113	152	183	208	225	237	241	239	230	214	190	160	120	73.9	28.8		
95	17.9	60.5	104	143	174	198	216	227	231	228	219	203	180	149	110	65.0	22.9		
100	18.6	55.4	96.8	134	165	188	205	216	220	218	208	192	169	140	102	60.1	23.0		
105	21.5	54.3	91.1	126	156	178	195	205	209	206	197	182	161	131	95.8	58.2	26.5		
110	25.1	55.6	88.3	120	147	169	184	194	198	195	186	172	151	124	91.7	58.8	32.2		
115	27.0	57.6	87.1	115	140	160	175	183	186	184	176	163	143	118	89.1	61.4	37.1		
120	20.6	58.2	87.0	111	134	152	165	173	176	174	166	153	135	113	87.9	65.3	41.2		
125	7.86	56.6	87.7	109	128	144	156	163	166	163	156	144	128	109	87.7	70.1	43.1		
130	6.58	56.9	86.1	106	123	137	147	153	155	153	147	136	122	106	87.6	73.6	41.6		
135	6.37	55.0	86.3	103	118	130	139	144	146	144	138	129	118	101	86.9	74.9	36.4		
140	4.60	43.2	80.8	98.3	112	124	131	135	137	135	130	123	111	98.7	88.3	70.8	29.3		
145	5.71	26.0	69.4	98.5	107	114	122	127	128	127	122	113	106	97.9	87.2	58.7	21.2		
150	5.85	11.8	42.0	84.7	102	110	113	116	117	116	113	109	103	96.7	80.1	40.7	13.4		
155	5.94	9.45	17.5	43.7	79.2	97.8	108	110	111	110	108	105	99.7	86.3	58.8	22.9	11.2		
160	6.34	7.22	9.38	16.8	27.2	54.6	74.1	96.9	103	103	99.6	93.8	83.1	63.2	34.2	13.4	11.0		
165	7.82	6.95	8.00	10.8	16.7	21.4	23.9	37.1	61.6	67.9	64.4	58.2	46.6	30.7	15.8	11.1	10.3		
170	13.1	11.5	11.3	11.1	9.36	10.8	13.7	13.5	12.6	23.4	21.2	16.6	15.8	15.0	12.0	10.5	12.8		
175	14.6	17.0	16.7	12.8	9.70	9.17	10.0	12.5	11.2	12.8	11.5	10.4	9.54	9.39	10.4	13.4	15.8		
180	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4		

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)	0.520	0.232
Power Factor	0.9962	0.9489
Test Power (W)/4	15.50	15.23
THD A%	5.11	6.01
Luminous Efficacy (lm/W)	144.0	146.5
Total Luminous Flux (lm)	2232.0	2231.0
Color Rendering Index (CRI)	84.7	
R9	18.1	
Correlated Color Temperature (CCT)(K)	3592	
Chromaticity Chroma x	0.3970	
Chromaticity Chroma y	0.3791	
Chromaticity Chroma u	0.2351	
Chromaticity Chroma v	0.3367	
Duv	-0.0033	
Chromaticity Chroma u'	0.2351	
Chromaticity Chroma v'	0.5051	

Special Color Rendering Indices	
R1	85.8
R2	96.9
R3	91.4
R4	80.6
R5	85.7
R6	93.1
R7	81.3
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

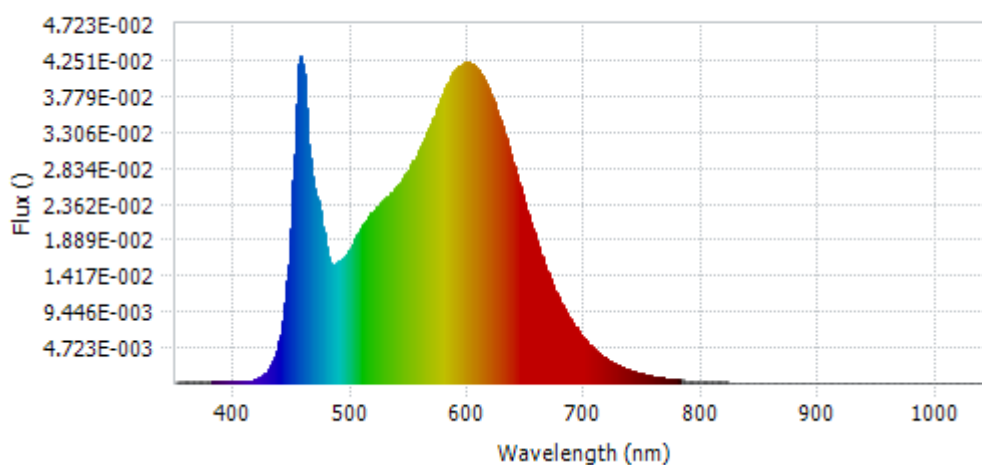
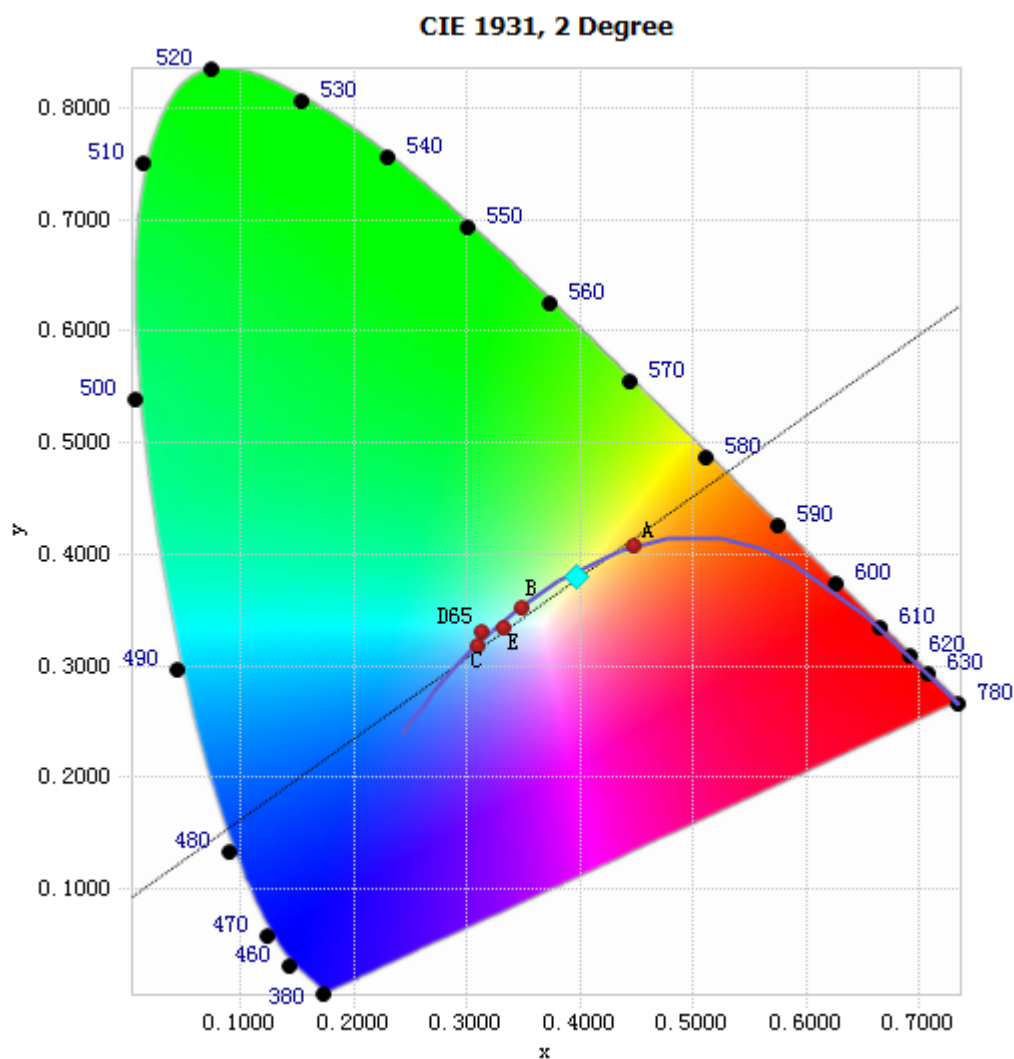


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.33E-04	485	1.57E-02	590	4.15E-02	695	6.63E-03
385	1.86E-04	490	1.61E-02	595	4.21E-02	700	5.68E-03
390	2.21E-04	495	1.68E-02	600	4.22E-02	705	4.82E-03
395	2.15E-04	500	1.81E-02	605	4.17E-02	710	4.13E-03
400	1.94E-04	505	1.95E-02	610	4.08E-02	715	3.53E-03
405	2.22E-04	510	2.08E-02	615	3.94E-02	720	3.03E-03
410	2.61E-04	515	2.20E-02	620	3.76E-02	725	2.59E-03
415	3.89E-04	520	2.27E-02	625	3.55E-02	730	2.20E-03
420	6.32E-04	525	2.36E-02	630	3.31E-02	735	1.88E-03
425	1.14E-03	530	2.45E-02	635	3.06E-02	740	1.59E-03
430	2.02E-03	535	2.52E-02	640	2.80E-02	745	1.37E-03
435	3.81E-03	540	2.61E-02	645	2.54E-02	750	1.17E-03
440	7.22E-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	8.58E-04
450	2.66E-02	555	2.96E-02	660	1.79E-02	765	7.29E-04
455	4.18E-02	560	3.12E-02	665	1.57E-02	770	6.28E-04
460	3.86E-02	565	3.30E-02	670	1.37E-02	775	5.39E-04
465	2.81E-02	570	3.49E-02	675	1.19E-02	780	4.57E-04
470	2.46E-02	575	3.68E-02	680	1.03E-02		
475	2.06E-02	580	3.87E-02	685	8.95E-03		
480	1.65E-02	585	4.04E-02	690	7.71E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3970, 0.3791)

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

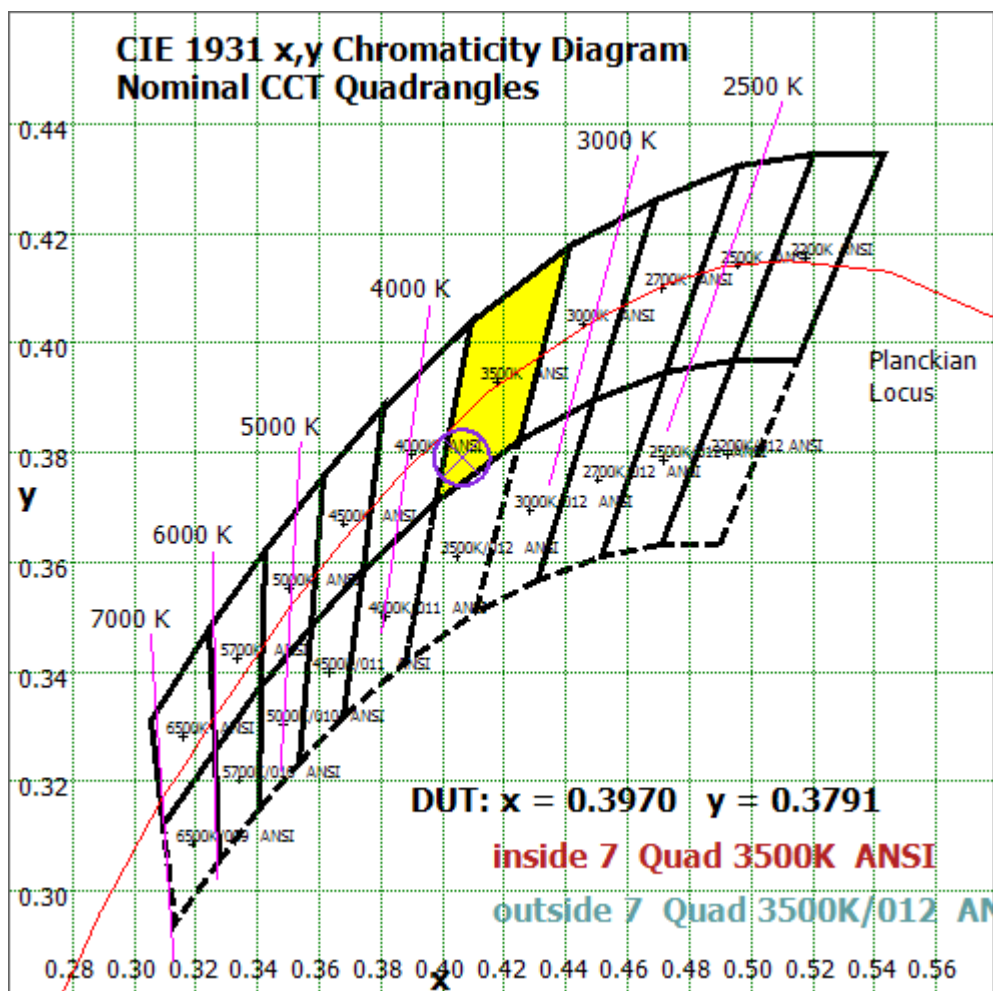


Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

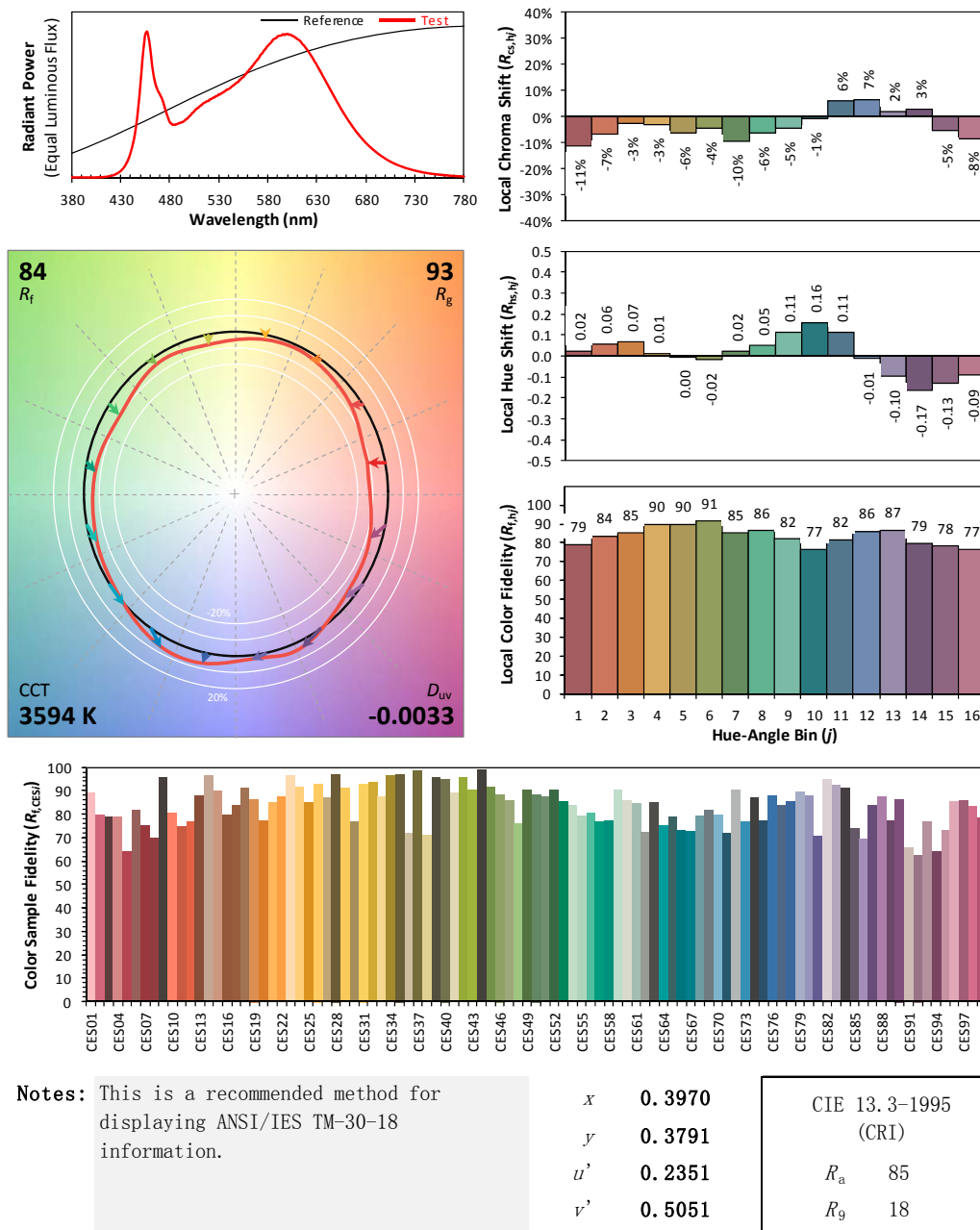
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A4



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)	0.517	0.231
Power Factor	0.9961	0.9481
Test Power (W)/4	15.40	15.14
THD A%	5.00	6.01
Luminous Efficacy (lm/W)	146.7	149.2
Total Luminous Flux (lm)	2258.8	2258.8
Color Rendering Index (CRI)	85.6	
R9	23	
Correlated Color Temperature (CCT)(K)	4029	
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	91.9
R4	81.1
R5	86.4
R6	92.3
R7	82.2
R8	66.1
R9	23
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

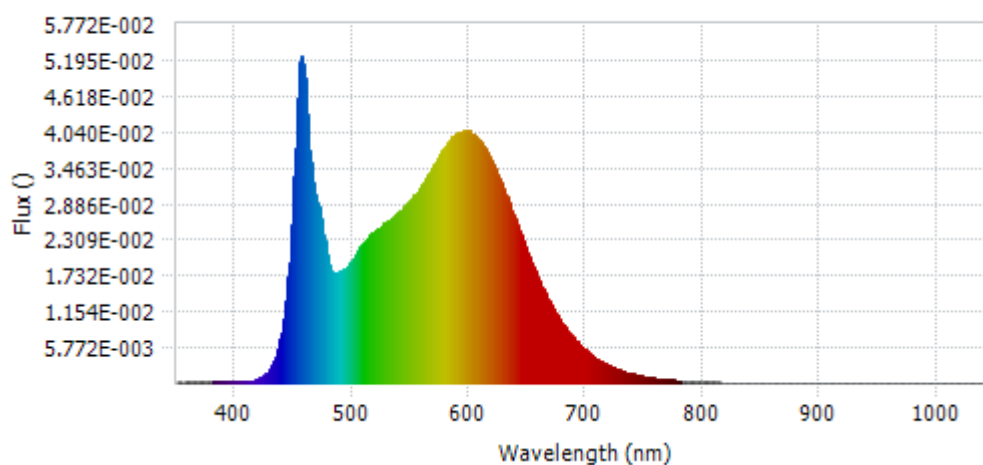


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.20E-04	485	1.78E-02	590	4.03E-02	695	6.06E-03
385	2.22E-04	490	1.81E-02	595	4.05E-02	700	5.17E-03
390	2.32E-04	495	1.86E-02	600	4.05E-02	705	4.42E-03
395	2.39E-04	500	1.99E-02	605	3.98E-02	710	3.77E-03
400	2.52E-04	505	2.13E-02	610	3.86E-02	715	3.23E-03
405	2.32E-04	510	2.26E-02	615	3.72E-02	720	2.76E-03
410	2.95E-04	515	2.37E-02	620	3.52E-02	725	2.36E-03
415	4.60E-04	520	2.44E-02	625	3.32E-02	730	2.00E-03
420	7.83E-04	525	2.53E-02	630	3.09E-02	735	1.69E-03
425	1.37E-03	530	2.61E-02	635	2.85E-02	740	1.46E-03
430	2.49E-03	535	2.67E-02	640	2.60E-02	745	1.24E-03
435	4.76E-03	540	2.75E-02	645	2.34E-02	750	1.07E-03
440	9.03E-03	545	2.85E-02	650	2.09E-02	755	9.07E-04
445	1.70E-02	550	2.94E-02	655	1.86E-02	760	7.89E-04
450	3.33E-02	555	3.06E-02	660	1.65E-02	765	6.65E-04
455	5.16E-02	560	3.20E-02	665	1.44E-02	770	5.75E-04
460	4.65E-02	565	3.35E-02	670	1.25E-02	775	4.91E-04
465	3.35E-02	570	3.51E-02	675	1.10E-02	780	4.28E-04
470	2.91E-02	575	3.67E-02	680	9.48E-03		
475	2.40E-02	580	3.82E-02	685	8.21E-03		
480	1.89E-02	585	3.96E-02	690	7.09E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method

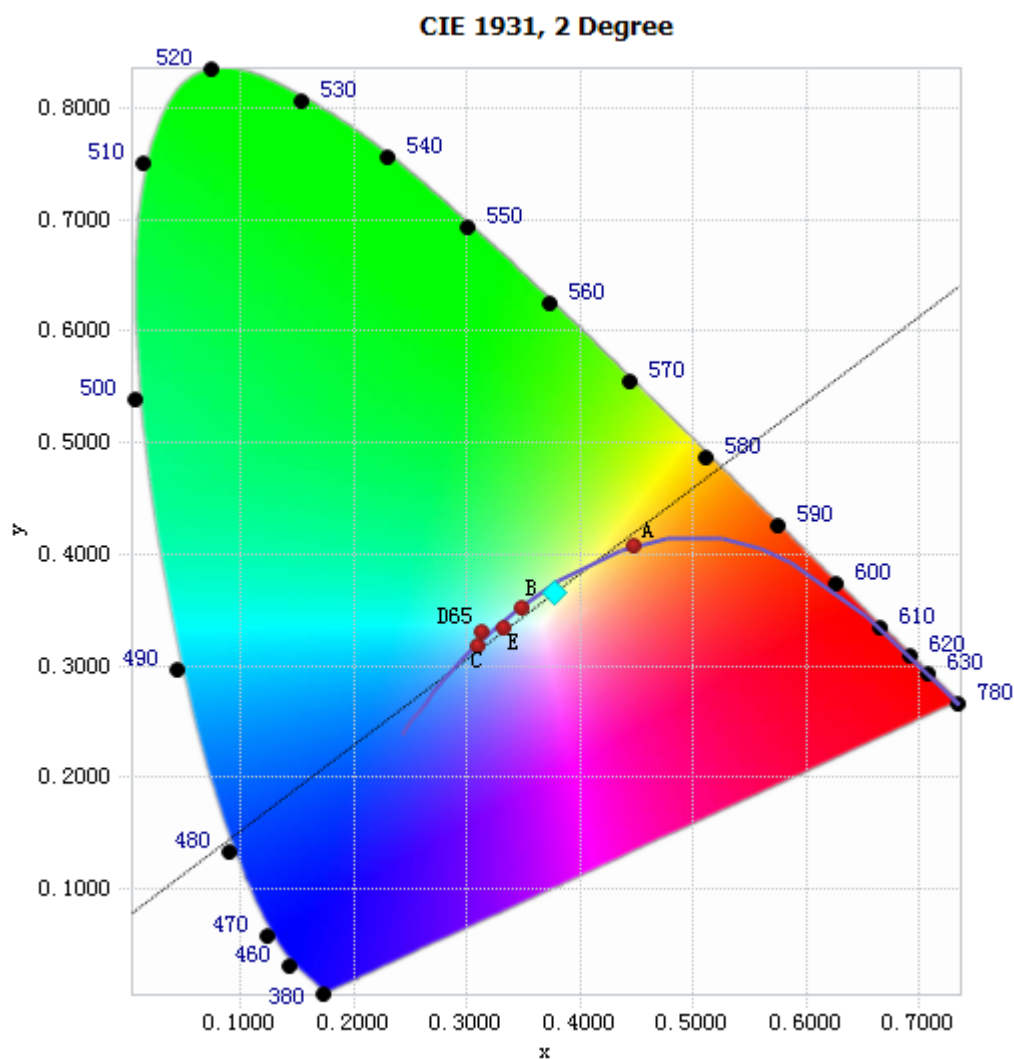


Chart 13: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

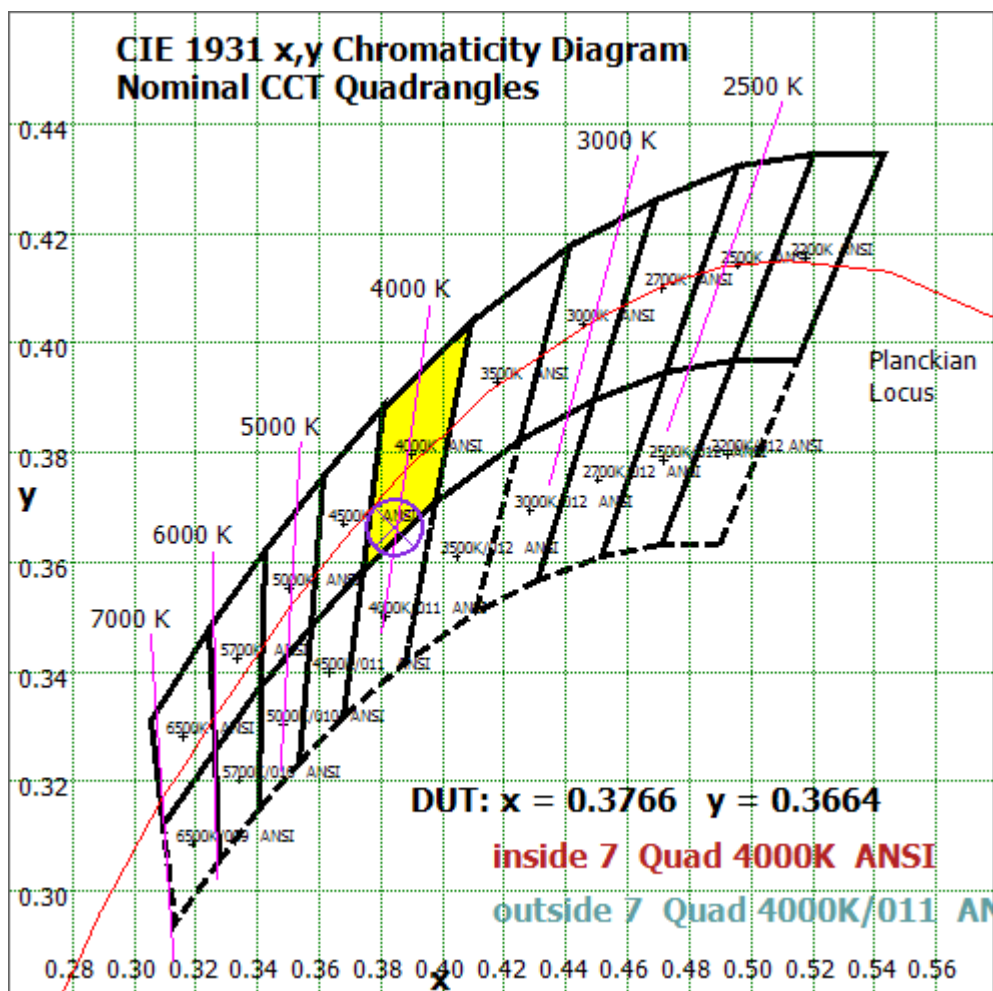


Chart14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

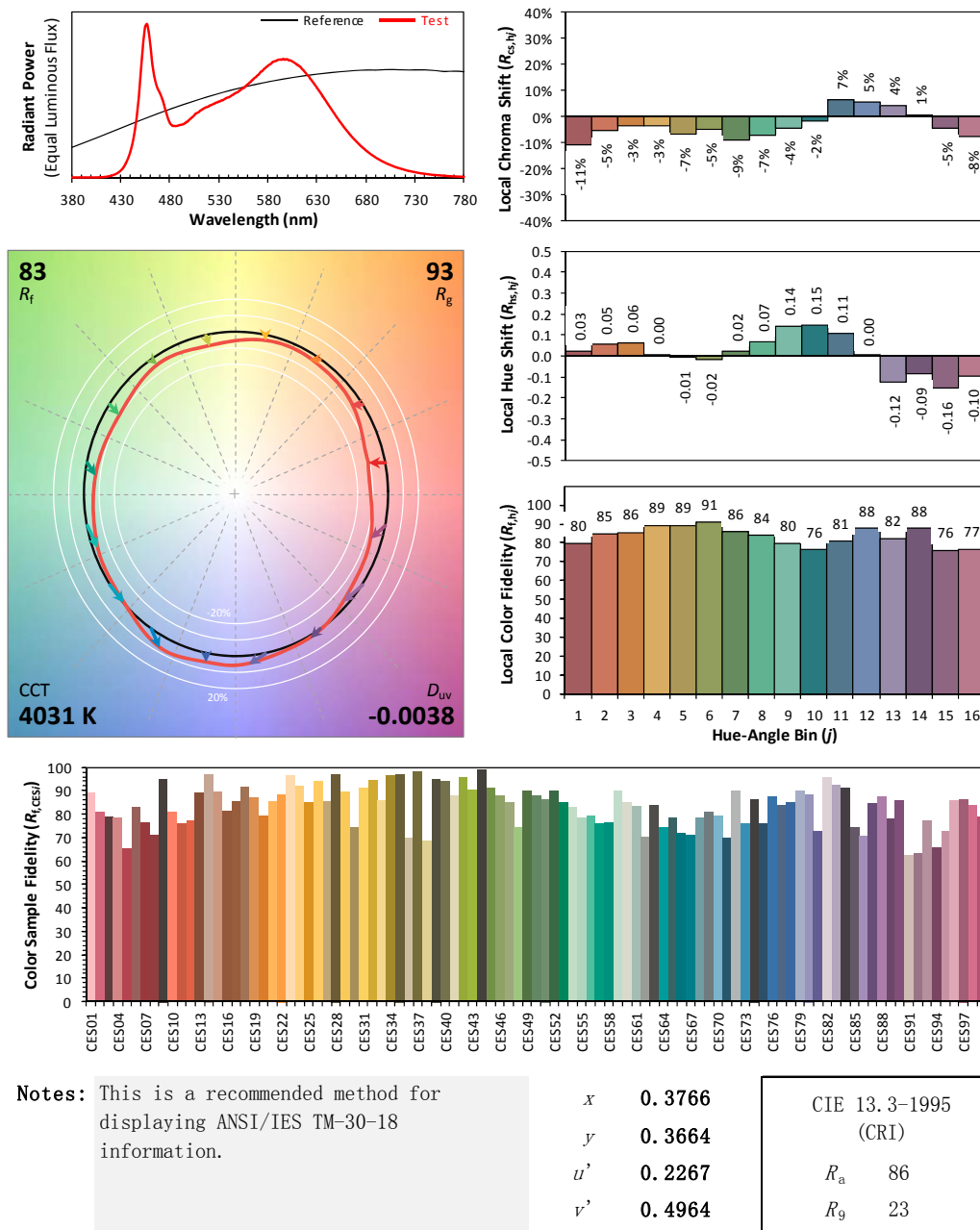
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A4



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)	0.519	0.231
Power Factor	0.9962	0.9486
Test Power (W)/4	15.47	15.20
THD A%	5.05	6.02
Luminous Efficacy (lm/W)	146.7	149.3
Total Luminous Flux (lm)	2268.7	2269.0
Color Rendering Index (CRI)	85.7	
R9	24.4	
Correlated Color Temperature (CCT)(K)	4923	
Chromaticity Chroma x	0.3467	
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	92.8
R4	80.2
R5	85.5
R6	91
R7	83.4
R8	68.6
R9	24.4
R10	91.8
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

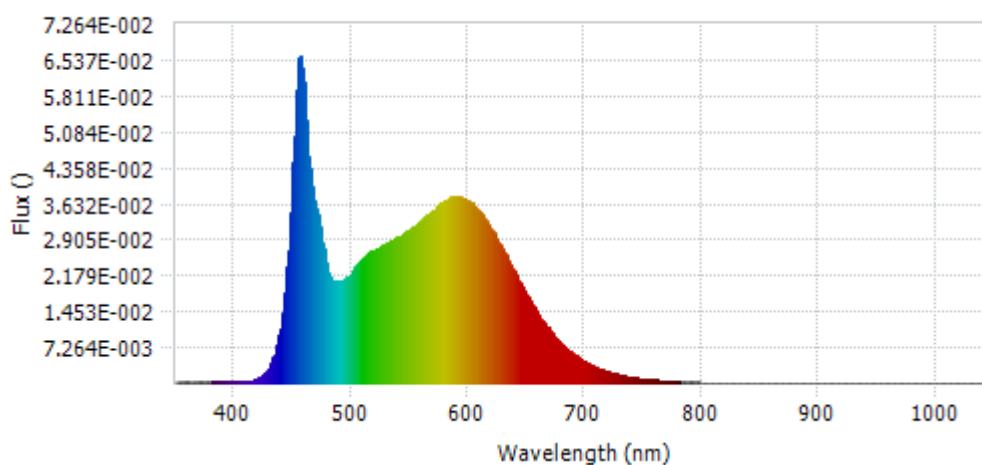


Chart16: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.73E-04	485	2.07E-02	590	3.77E-02	695	5.05E-03
385	2.69E-04	490	2.08E-02	595	3.74E-02	700	4.31E-03
390	2.91E-04	495	2.12E-02	600	3.70E-02	705	3.67E-03
395	2.95E-04	500	2.25E-02	605	3.58E-02	710	3.14E-03
400	2.71E-04	505	2.39E-02	610	3.44E-02	715	2.68E-03
405	2.68E-04	510	2.52E-02	615	3.29E-02	720	2.30E-03
410	3.62E-04	515	2.63E-02	620	3.09E-02	725	1.97E-03
415	5.60E-04	520	2.69E-02	625	2.89E-02	730	1.67E-03
420	1.00E-03	525	2.77E-02	630	2.67E-02	735	1.41E-03
425	1.87E-03	530	2.84E-02	635	2.44E-02	740	1.22E-03
430	3.47E-03	535	2.89E-02	640	2.22E-02	745	1.04E-03
435	6.63E-03	540	2.95E-02	645	1.99E-02	750	8.94E-04
440	1.26E-02	545	3.03E-02	650	1.77E-02	755	7.67E-04
445	2.34E-02	550	3.09E-02	655	1.58E-02	760	6.55E-04
450	4.46E-02	555	3.18E-02	660	1.38E-02	765	5.69E-04
455	6.58E-02	560	3.29E-02	665	1.21E-02	770	4.82E-04
460	5.72E-02	565	3.39E-02	670	1.05E-02	775	4.11E-04
465	4.10E-02	570	3.50E-02	675	9.12E-03	780	3.64E-04
470	3.52E-02	575	3.60E-02	680	7.88E-03		
475	2.85E-02	580	3.69E-02	685	6.84E-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

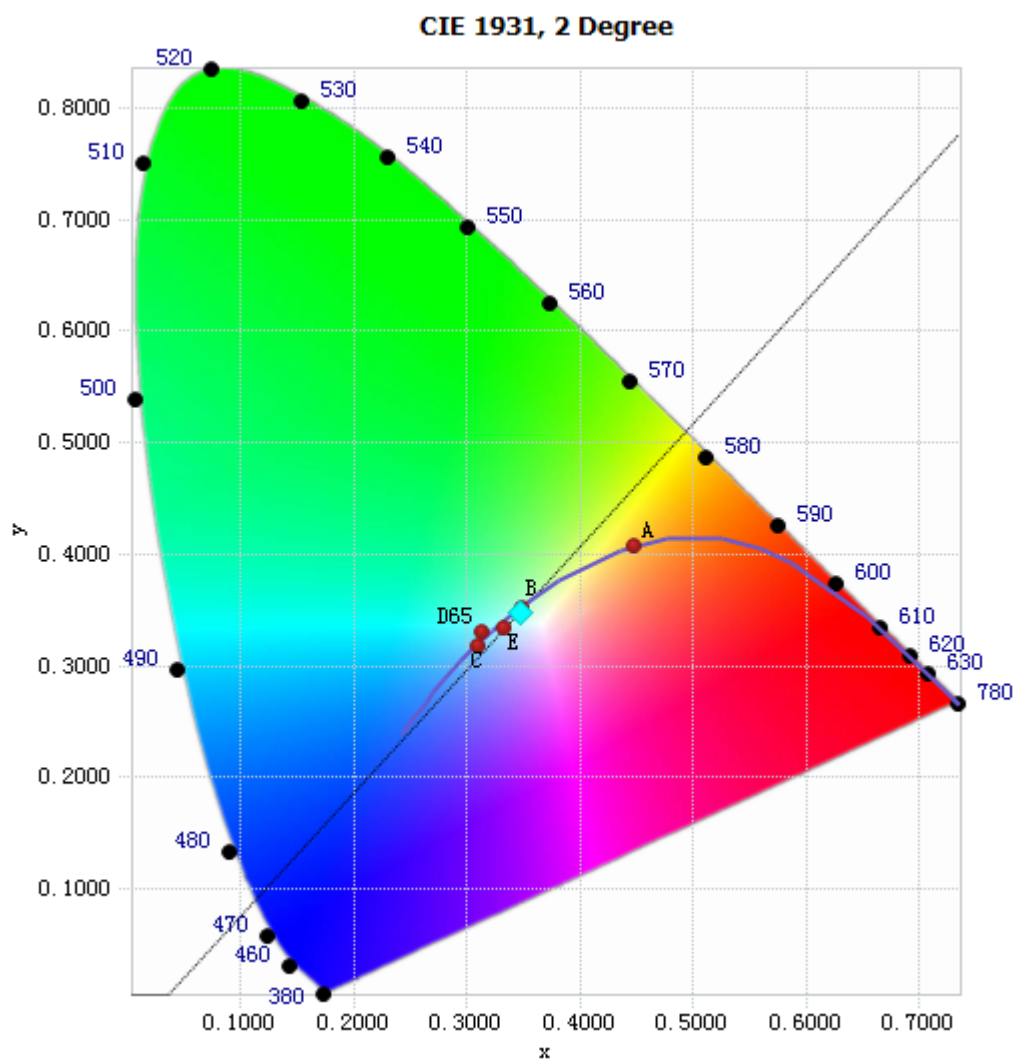


Chart 17: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

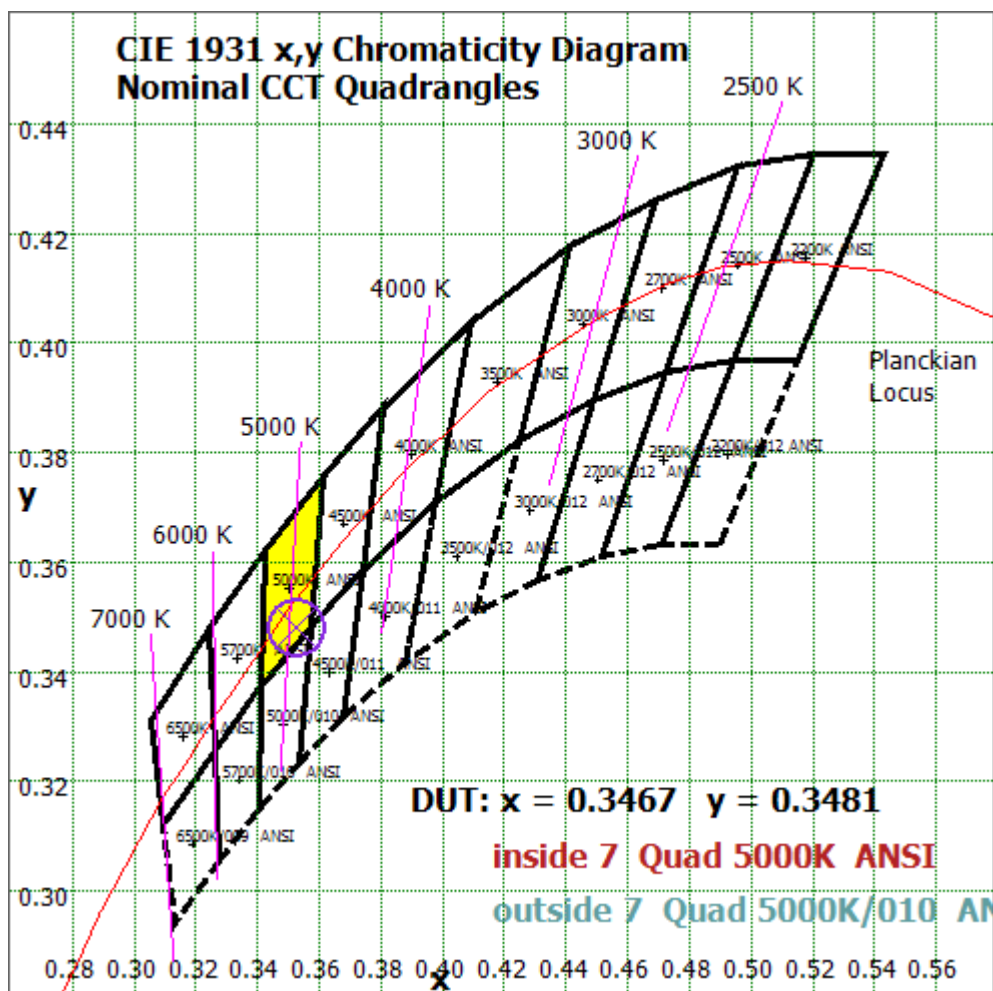


Chart 18: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

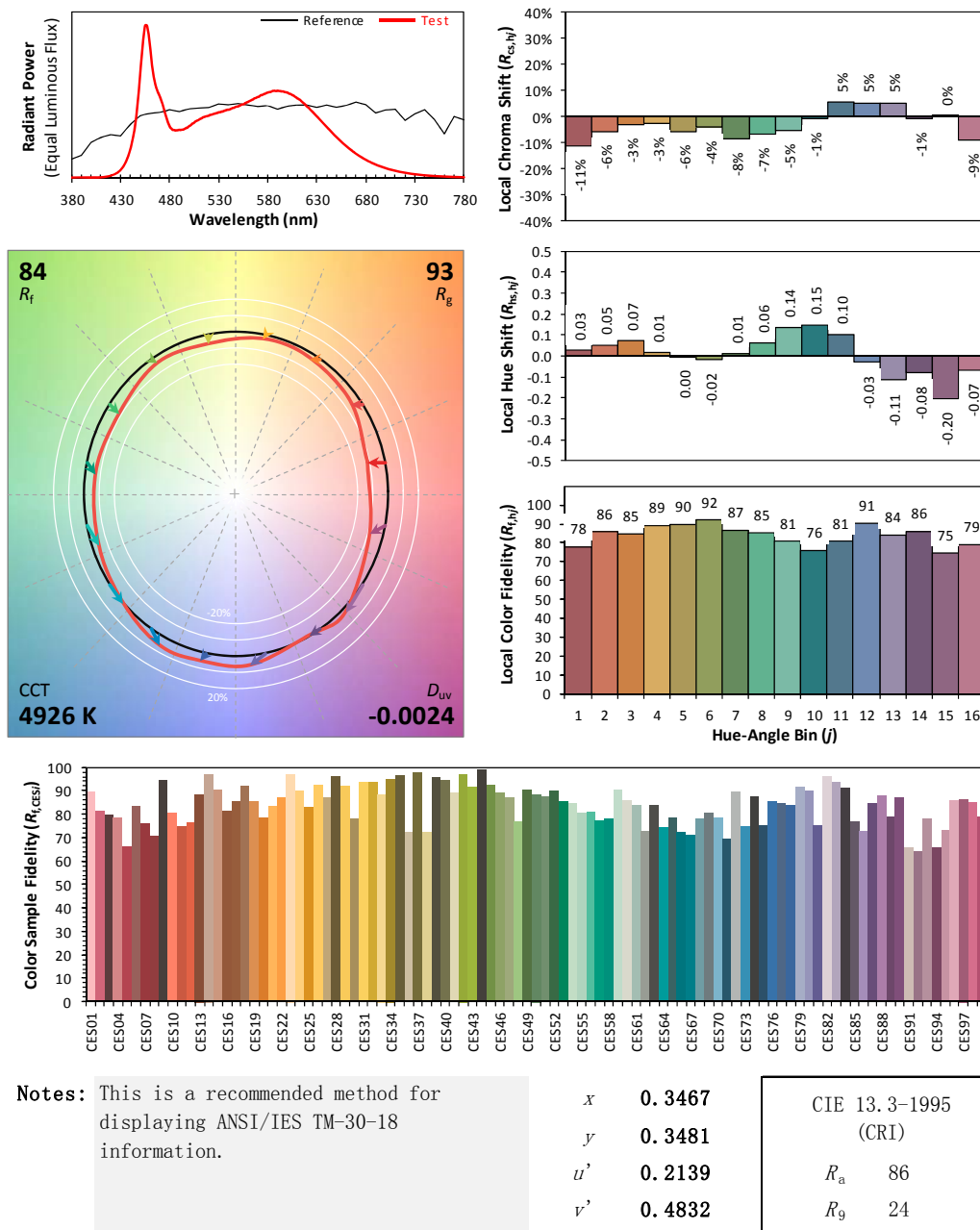
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A4



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)	0.527	0.235
Power Factor	0.9963	0.9501
Test Power (W)/4	15.73	15.45
THD A%	5.27	6.11
Luminous Efficacy (lm/W)	142.2	144.8
Total Luminous Flux (lm)	2236.6	2237.0
Color Rendering Index (CRI)	84.4	
R9	12.3	
Correlated Color Temperature (CCT)(K)	6551	
Chromaticity Chroma x	0.3120	
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'	0.4675	

Special Color Rendering Indices	
R1	84.3
R2	95
R3	93.4
R4	78.7
R5	83.2
R6	88.6
R7	84.5
R8	67.9
R9	12.3
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

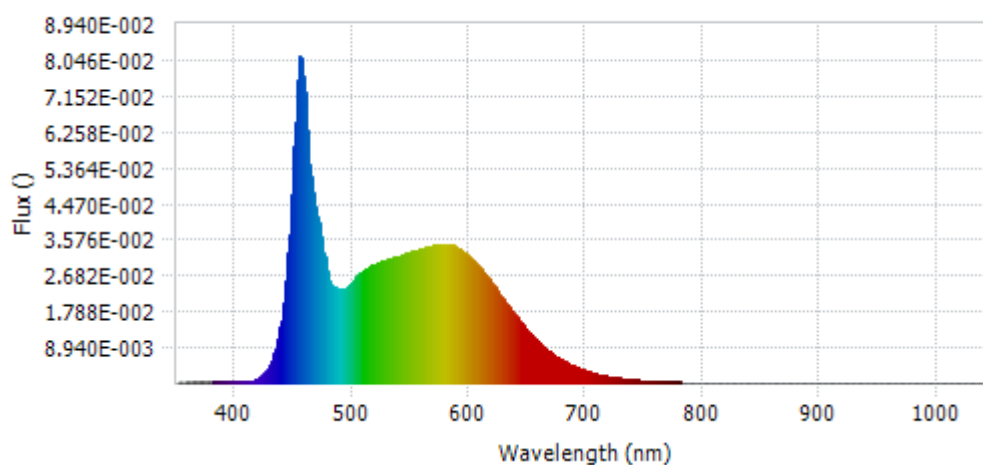
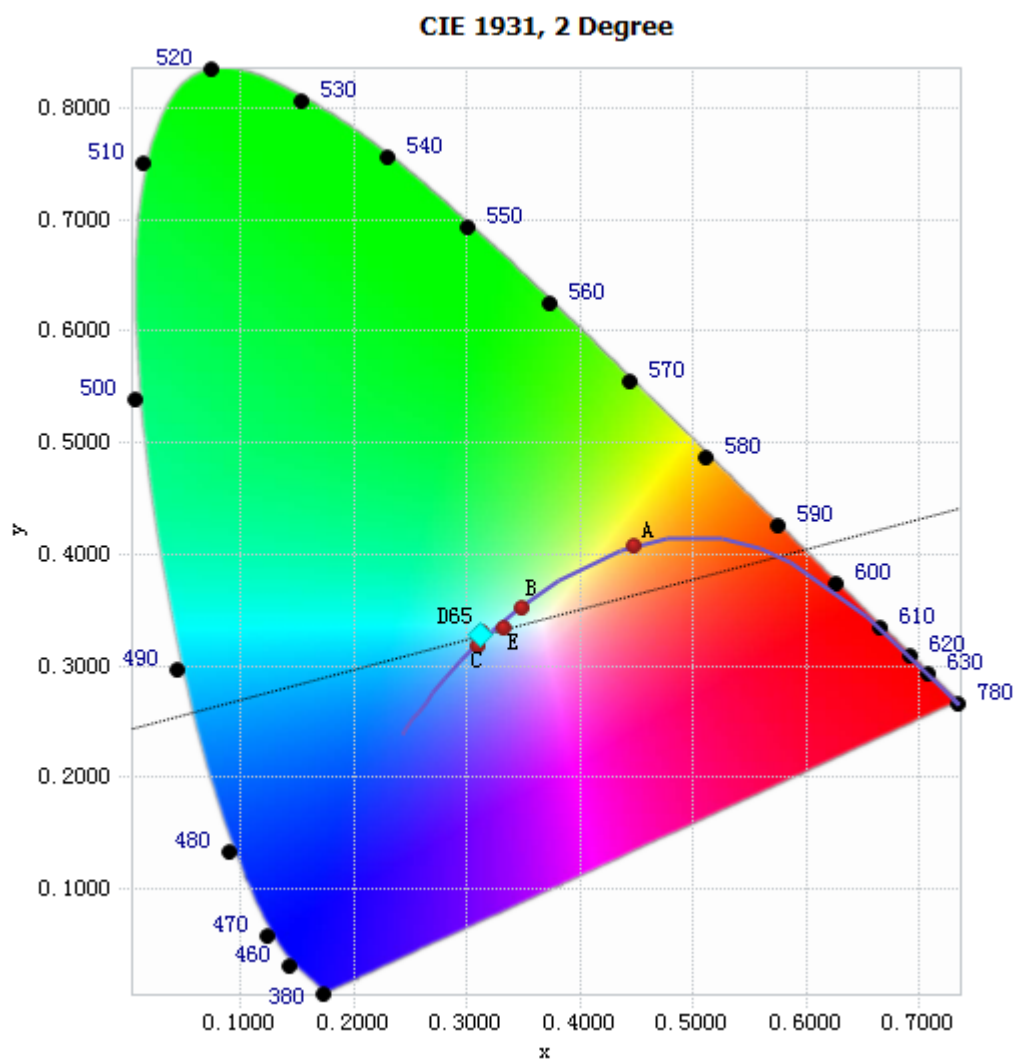


Chart 20: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.35E-04	485	2.38E-02	590	3.37E-02	695	3.58E-03
385	2.85E-04	490	2.37E-02	595	3.27E-02	700	3.06E-03
390	3.08E-04	495	2.39E-02	600	3.15E-02	705	2.61E-03
395	3.23E-04	500	2.52E-02	605	2.99E-02	710	2.24E-03
400	3.13E-04	505	2.68E-02	610	2.83E-02	715	1.90E-03
405	2.93E-04	510	2.81E-02	615	2.64E-02	720	1.63E-03
410	4.59E-04	515	2.91E-02	620	2.45E-02	725	1.41E-03
415	7.55E-04	520	2.96E-02	625	2.25E-02	730	1.21E-03
420	1.39E-03	525	3.04E-02	630	2.05E-02	735	1.03E-03
425	2.65E-03	530	3.09E-02	635	1.86E-02	740	8.79E-04
430	5.00E-03	535	3.13E-02	640	1.67E-02	745	7.59E-04
435	9.61E-03	540	3.17E-02	645	1.48E-02	750	6.50E-04
440	1.78E-02	545	3.22E-02	650	1.30E-02	755	5.53E-04
445	3.24E-02	550	3.25E-02	655	1.15E-02	760	4.82E-04
450	5.90E-02	555	3.29E-02	660	1.00E-02	765	4.13E-04
455	8.13E-02	560	3.35E-02	665	8.71E-03	770	3.54E-04
460	6.79E-02	565	3.39E-02	670	7.54E-03	775	3.03E-04
465	4.91E-02	570	3.43E-02	675	6.55E-03	780	2.64E-04
470	4.14E-02	575	3.45E-02	680	5.61E-03		
475	3.27E-02	580	3.46E-02	685	4.87E-03		
480	2.57E-02	585	3.44E-02	690	4.19E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3120, 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

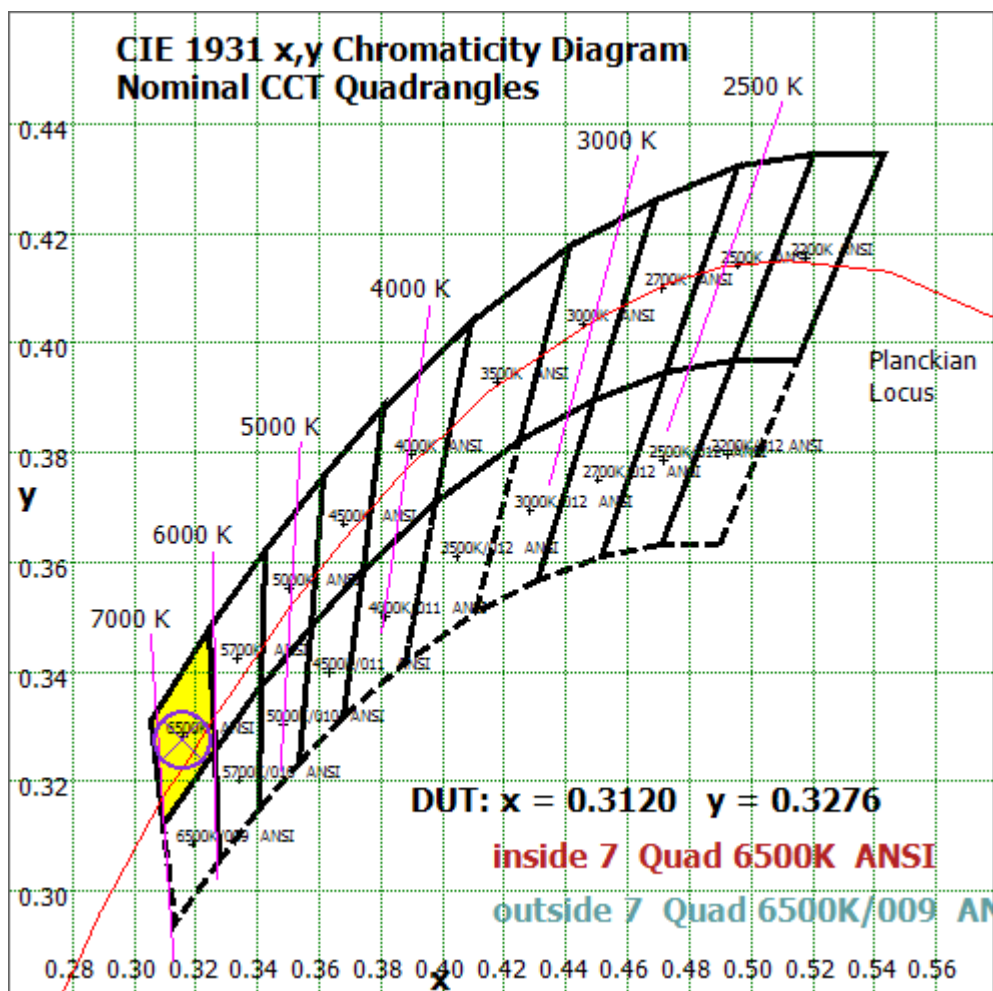


Chart 22: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

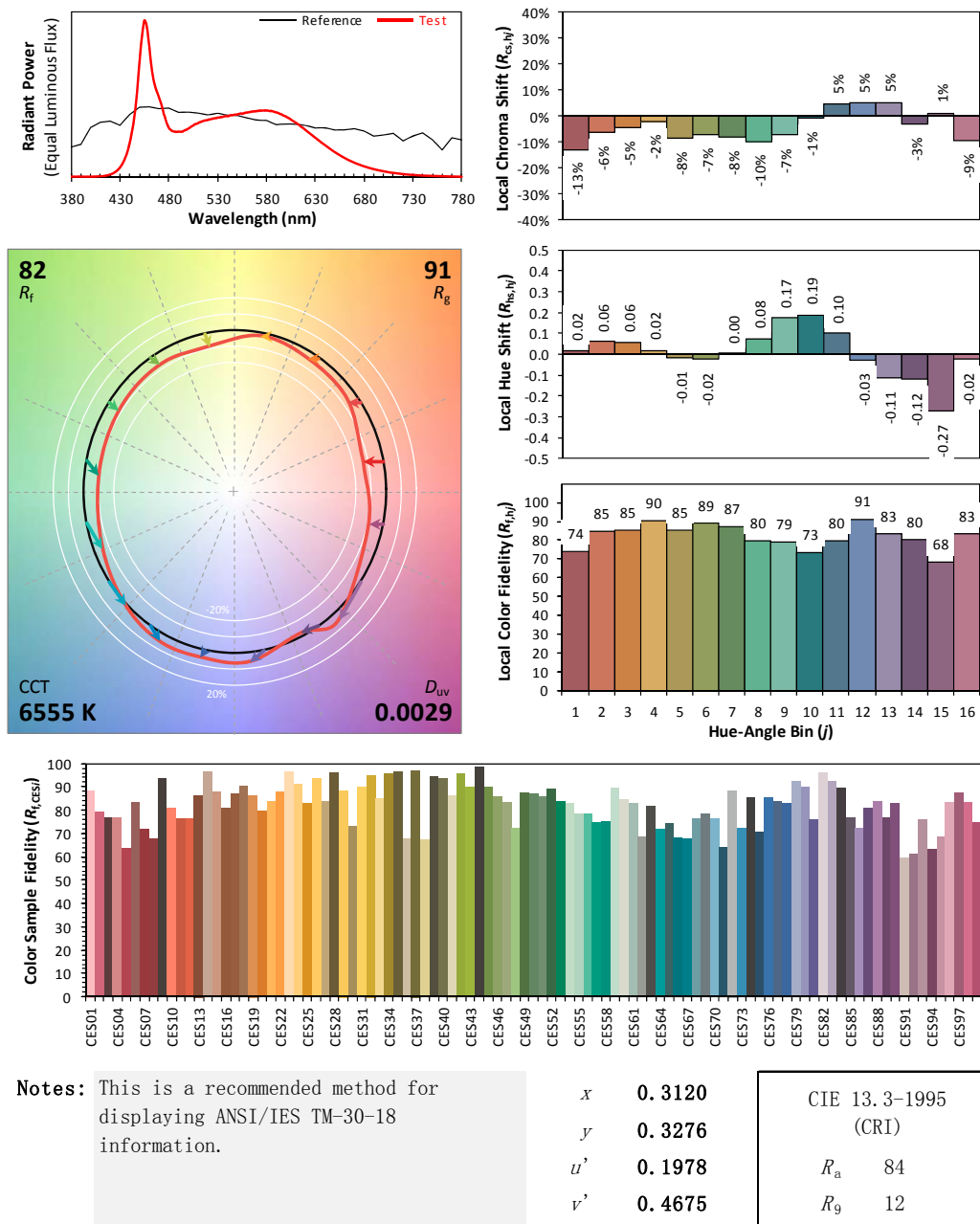
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/06/30

Model: 14T8/4F/8CCTS/EXT/SD/A4



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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