



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: 15T8/4F/8CCTS/HYB/C

Laboratory: Lea ding Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ24010056a

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

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April Zou

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Feb. 06, 2024



Manager: April Zou
Feb. 06, 2024

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	15T8/4F/8CCTS/HY	15T8/4F/8CCTS/HY	15T8/4F/8CCTS/HY
	B/C 3000K Setting	B/C 3500K Setting	B/C 4000K Setting
Luminous Efficacy (Lumens /Watt)	132.7	137.6	141.6
Total Luminous Flux (Lumens)	2284.9	2346.9	2398.5
Power (Watts)/2	17.22	17.06	16.94
Power Factor	0.9962	0.9960	0.9960
CCT (K)	3027	3496	3966
CRI	82.3	84.6	85.6
Stabilization Time (Light & Power)	50 mins	50 mins	50 mins
Note	3000K	3500K	4000K

Tested Model	15T8/4F/8CCTS/HY	15T8/4F/8CCTS/HY
	B/C 5000K Setting	B/C 6500K Setting
Luminous Efficacy (Lumens /Watt)	143.8	141.0
Total Luminous Flux (Lumens)	2432.3	2414.5
Power (Watts)/2	16.92	17.12
Power Factor	0.9960	0.9960
CCT (K)	5068	6400
CRI	85.7	84.0
Stabilization Time (Light & Power)	50 mins	50 mins
Note	5000K	6500K

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Jan. 31, 2024
Date of Test : Feb. 02, 2024
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

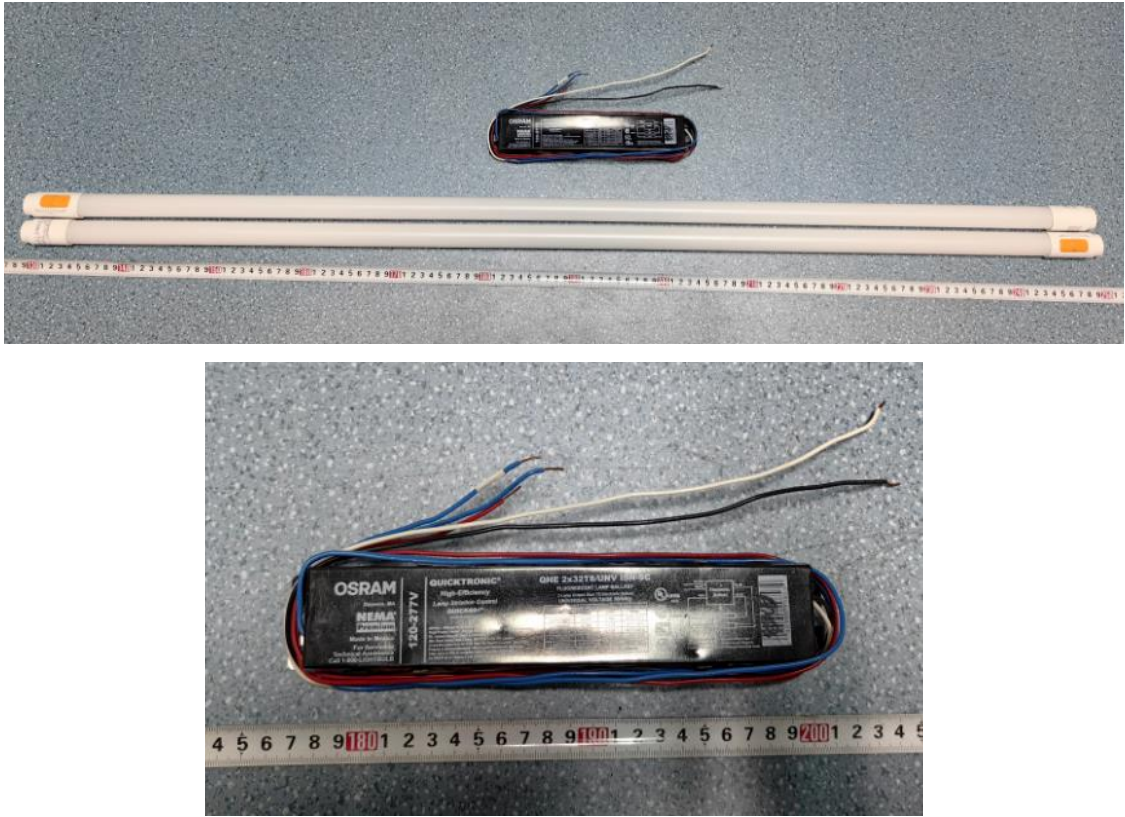


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 15T8/4F/8CCTS/HYB/C
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: Color- Tunable 3000K/3500K/4000K/5000K/6500K LED Tubes supplied by a high frequency fluorescent lamp ballast: QHE 2x32T8/UNV ISN-SC
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
Voltage frequency (Hz)	60	60
Test Current (A)	0.288	0.128
Power Factor	0.9962	0.9678
Test Power (W)/2	17.22	17.14
THD A%	6.44	10.65
Luminous Efficacy (lm/W)	132.7	133.3
Total Luminous Flux (lm)	2284.9	2284.7
Color Rendering Index (CRI)	82.3	
R9	6	
Correlated Color Temperature (CCT)(K)	3027	
Chromaticity Chroma x	0.4354	
Chromaticity Chroma y	0.4044	
Chromaticity Chroma u	0.2494	
Chromaticity Chroma v	0.3475	
Duv	0.0004	
Chromaticity Chroma u'	0.2494	
Chromaticity Chroma v'	0.5213	

Special Color Rendering Indices	
R1	80.3
R2	89.9
R3	96.8
R4	80.7
R5	80.5
R6	87.6
R7	83.2
R8	59.1
R9	6
R10	77.3
R11	80.2
R12	69.6
R13	82.5
R14	98.7

Table 2: Test data per Sphere-Spectroradiometer Method

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

Spectral Power Distribution - Sphere Spectroradiometer Method

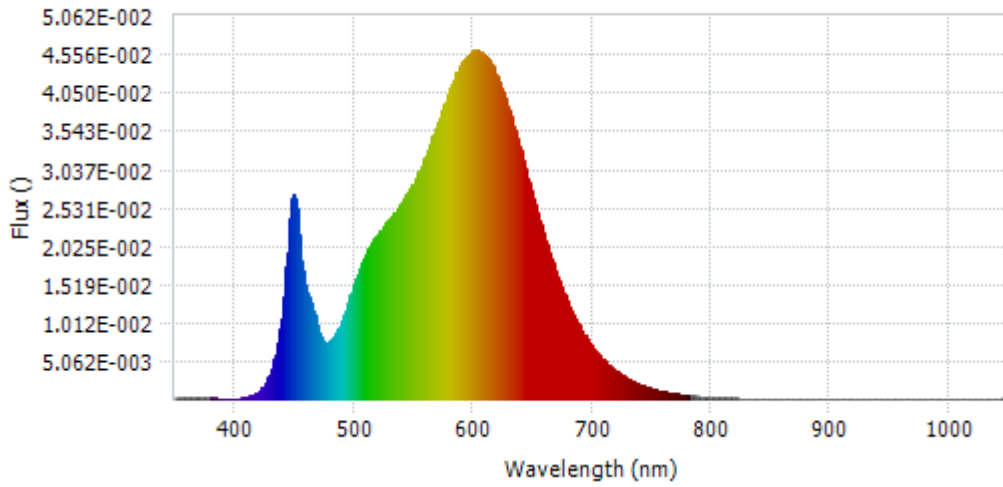
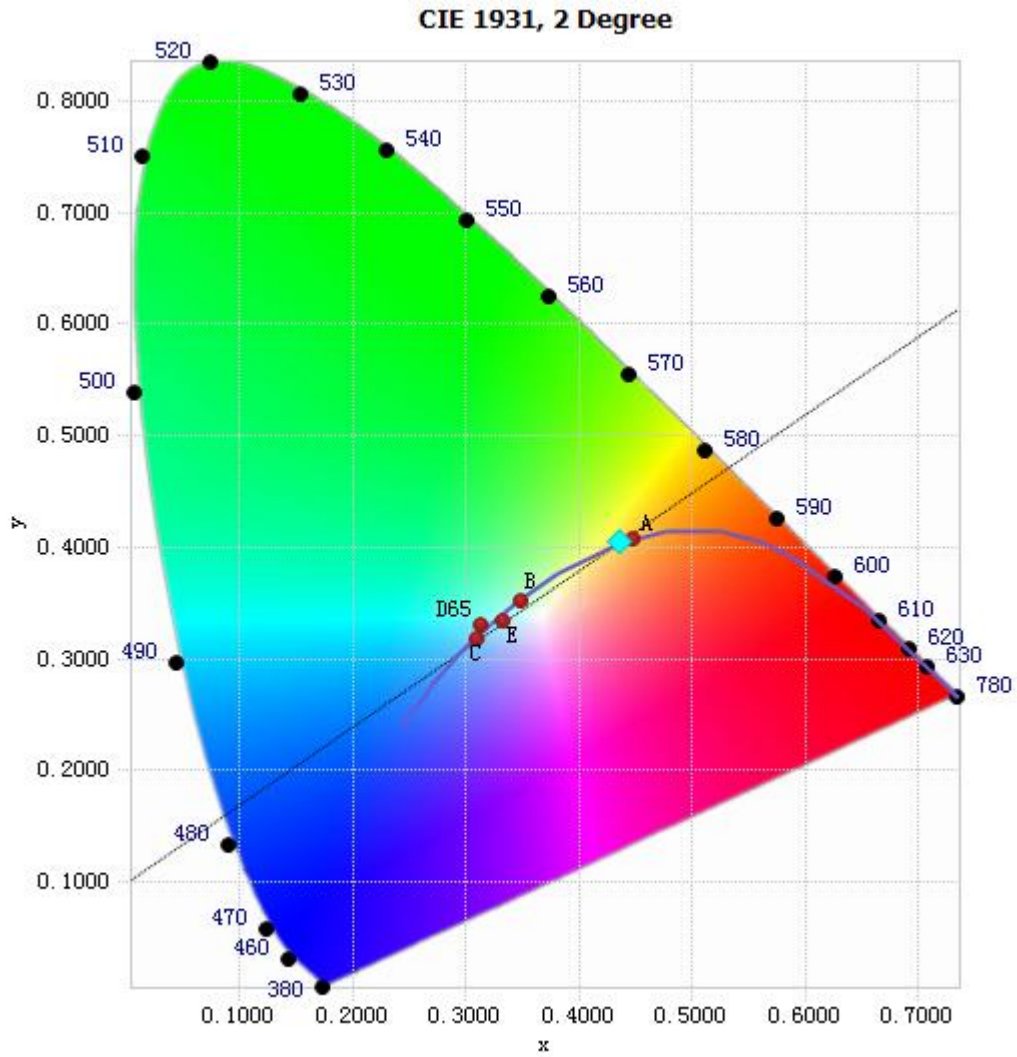


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.87E-04	485	8.67E-03	590	4.43E-02	695	8.14E-03
385	1.43E-04	490	1.03E-02	595	4.53E-02	700	6.96E-03
390	1.42E-04	495	1.27E-02	600	4.60E-02	705	5.96E-03
395	1.55E-04	500	1.51E-02	605	4.59E-02	710	5.09E-03
400	1.22E-04	505	1.73E-02	610	4.54E-02	715	4.34E-03
405	1.61E-04	510	1.92E-02	615	4.44E-02	720	3.71E-03
410	2.83E-04	515	2.08E-02	620	4.26E-02	725	3.17E-03
415	5.44E-04	520	2.18E-02	625	4.07E-02	730	2.72E-03
420	1.02E-03	525	2.29E-02	630	3.82E-02	735	2.29E-03
425	1.96E-03	530	2.39E-02	635	3.56E-02	740	1.96E-03
430	3.67E-03	535	2.48E-02	640	3.28E-02	745	1.67E-03
435	6.60E-03	540	2.59E-02	645	2.99E-02	750	1.42E-03
440	1.20E-02	545	2.72E-02	650	2.70E-02	755	1.22E-03
445	2.16E-02	550	2.85E-02	655	2.42E-02	760	1.03E-03
450	2.72E-02	555	3.02E-02	660	2.15E-02	765	8.86E-04
455	1.99E-02	560	3.20E-02	665	1.90E-02	770	7.57E-04
460	1.46E-02	565	3.41E-02	670	1.66E-02	775	6.51E-04
465	1.23E-02	570	3.63E-02	675	1.45E-02	780	5.53E-04
470	9.18E-03	575	3.84E-02	680	1.26E-02		
475	7.52E-03	580	4.07E-02	685	1.09E-02		
480	7.75E-03	585	4.28E-02	690	9.47E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4354, 0.4044)

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

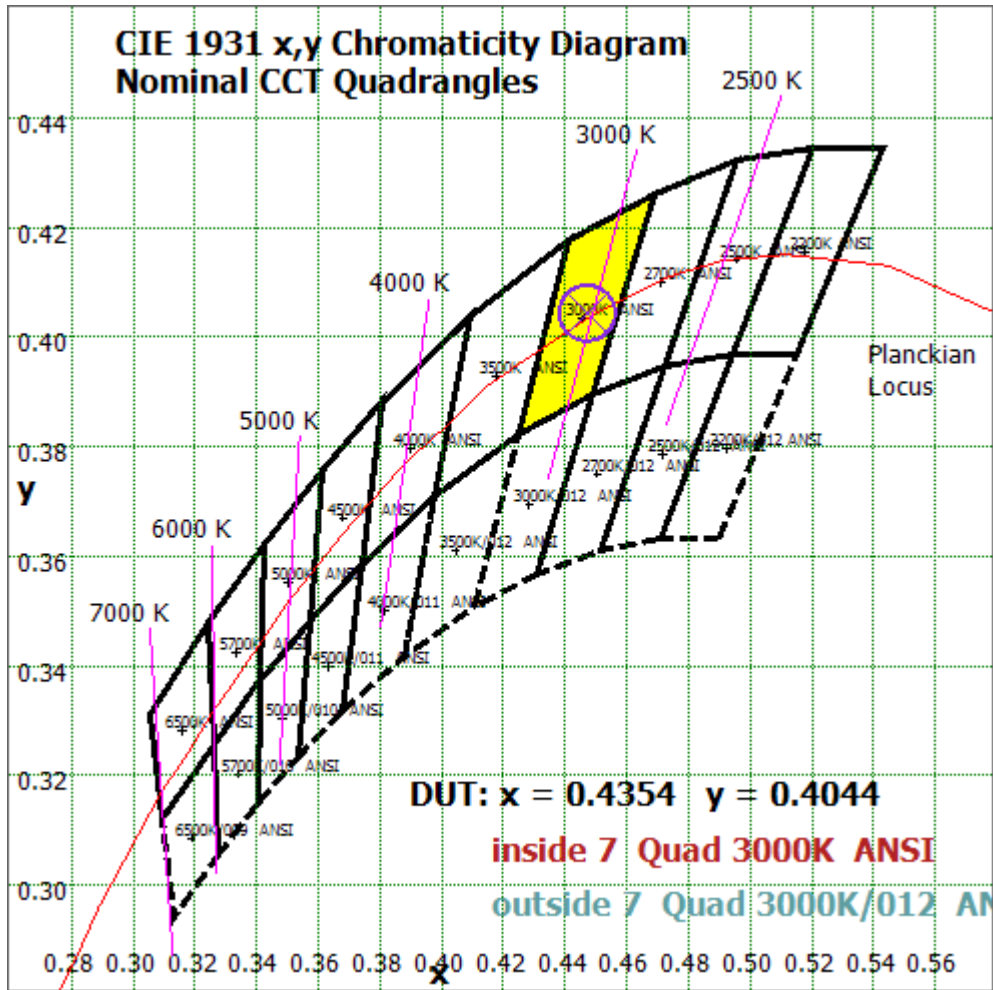


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

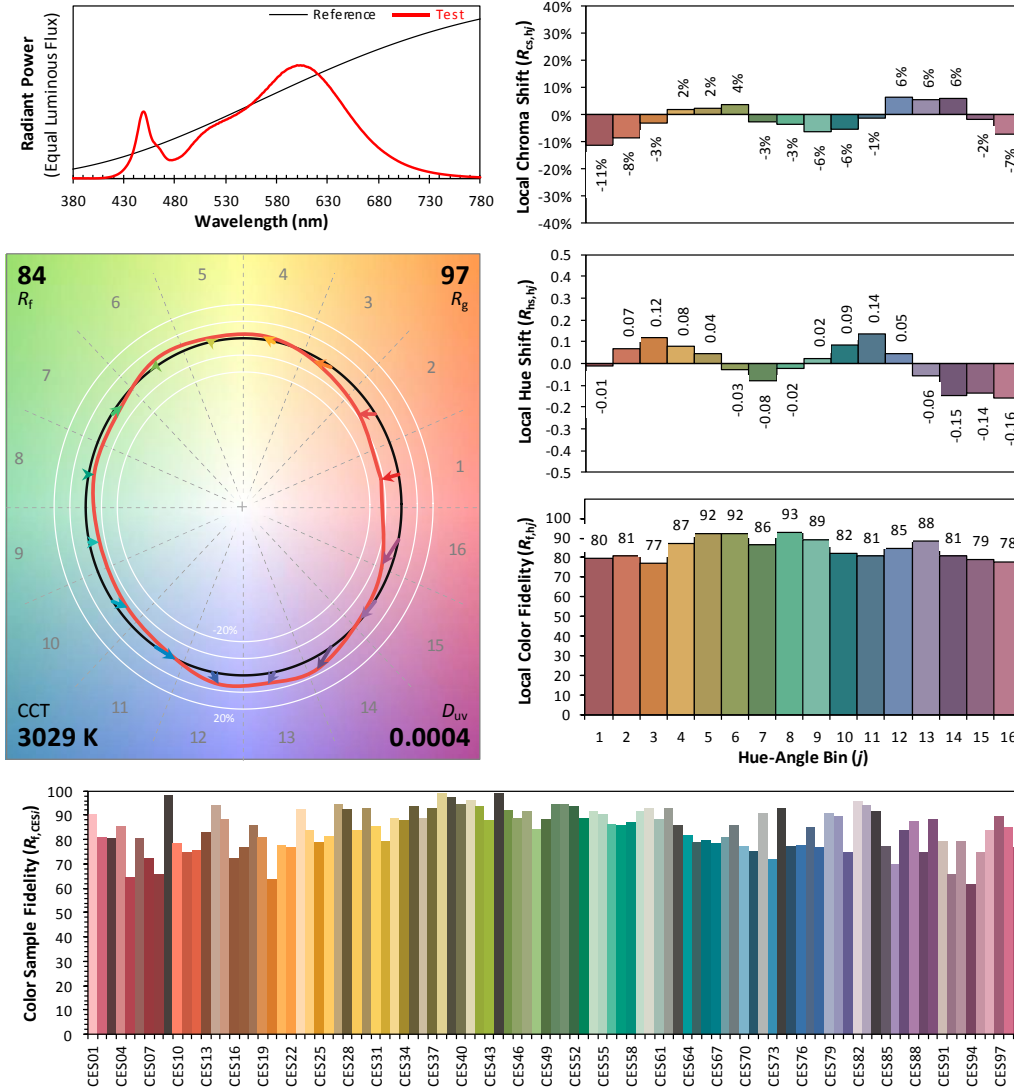
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2024/02/02

Model: 15T8/4F/8CCTS/HYB/C



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

x 0.4354
 y 0.4044
 u' 0.2494
 v' 0.5213

CIE 13.3-1995 (CRI)	
R_a	82
R_g	6

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)	0.288
Power Factor	0.9967
Power (W)/2	17.25
Luminous Efficacy (lm/W)	133.6
Total Luminous Flux (lm)	2304.9
Beam Angle (°)	113.4 (0°-180°) / 219.0 (90°-270°)
Center Beam Candle Power (cd)	393
Maximum Beam Candle Power (cd)	394.2 (At: C=260.0, Gamma=7.0)
Spacing Criteria	1.28 (0°-180°) / 1.45 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.10%
Zonal Lumens in the 60 °-90 °Zone	27.63%
Zonal Lumens in the 90 °-120 °Zone	17.63%
Zonal Lumens in the 120 °-180 °Zone	10.64%

Table 4: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	37.318	1.62%
10- 20	108.309	4.70%
20- 30	168.924	7.33%
30- 40	214.012	9.29%
40- 50	240.455	10.43%
50- 60	247.51	10.74%
60- 70	237.221	10.29%
70- 80	214.18	9.29%
80- 90	185.42	8.04%
90-100	158.812	6.89%
100-110	134.981	5.86%
110-120	112.505	4.88%
120-130	90.279	3.92%
130-140	67.955	2.95%
140-150	46.974	2.04%
150-160	28.398	1.23%
160-170	10.376	0.45%
170-180	1.238	0.05%
Total	2304.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1016.53	44.10%
60- 90	636.821	27.63%
0-90	1653.35	71.73%
90- 180	651.518	28.27%
0- 180	2304.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

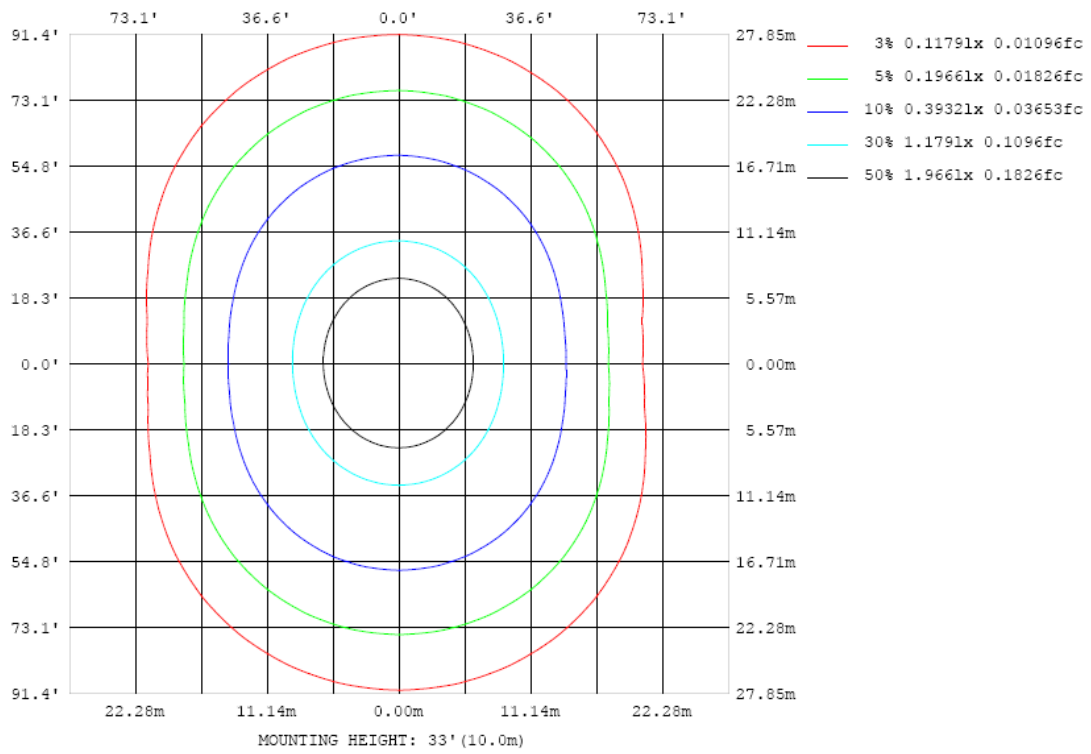


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

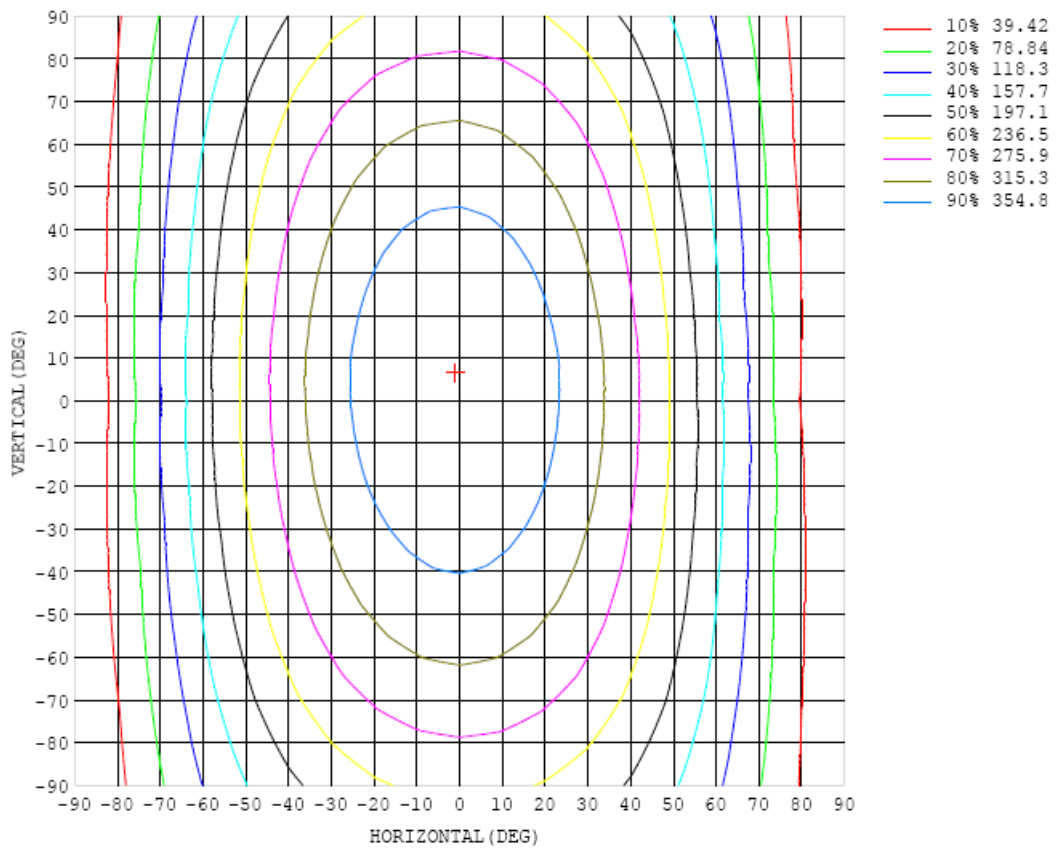


Chart 6: Isocandela Plot

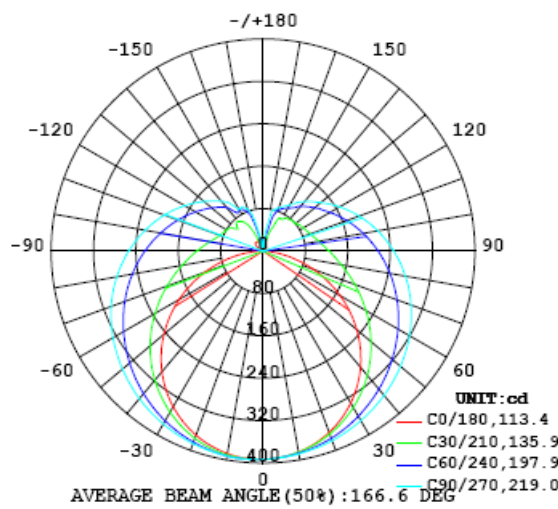


Chart 7: Polar Candela Distribution

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	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393
5	391	391	390	391	391	391	391	391	391	391	391	391	392	392	392	392	392	392	392
10	385	385	385	385	386	386	387	388	388	389	389	389	389	388	388	388	388	388	388
15	376	376	377	378	379	381	382	384	385	385	385	385	384	383	382	381	380	380	380
20	364	364	365	368	370	373	376	378	380	381	381	380	378	376	374	372	370	370	370
25	349	349	352	355	360	364	368	372	374	375	375	373	371	367	364	360	357	356	356
30	331	332	335	341	347	354	360	365	368	369	369	366	362	357	352	346	342	340	339
35	310	311	317	324	333	342	350	357	361	363	362	358	353	346	338	331	324	320	320
40	286	288	296	306	318	330	340	348	353	355	354	350	342	333	323	313	304	298	297
45	260	263	273	287	302	317	329	339	345	347	346	340	331	320	307	293	282	274	272
50	231	236	249	266	285	303	318	329	336	339	337	330	320	306	289	273	258	248	244
55	200	207	223	245	268	289	306	319	327	329	327	319	307	291	272	251	232	219	215
60	168	177	198	224	251	275	294	308	316	319	316	308	295	276	254	229	206	189	183
65	135	146	172	204	234	261	282	297	306	309	306	296	282	261	236	207	179	158	150
70	101	117	148	184	218	247	269	285	294	297	294	284	268	246	218	186	153	128	117
75	67.9	88.5	127	166	203	233	256	273	282	285	282	272	255	231	201	166	130	97.2	83.5
80	36.8	64.1	108	150	188	219	243	260	270	273	269	258	241	217	185	148	108	69.3	51.8
85	11.0	46.2	92.5	136	174	206	230	247	257	260	256	245	227	202	170	133	89.3	46.1	22.5
90	2.42	36.2	81.0	125	162	193	217	234	244	247	243	232	214	189	157	119	75.1	30.9	1.95
95	5.07	32.6	73.6	115	151	181	205	221	231	233	229	218	201	176	144	108	65.4	24.2	0.36
100	7.90	32.7	68.7	107	141	170	192	208	217	220	216	205	188	164	134	98.5	59.4	23.6	0.50
105	9.87	35.2	65.9	100	133	159	180	195	204	207	202	192	175	152	125	91.3	56.1	26.1	0.77
110	6.56	39.0	64.7	95.0	124	148	168	182	191	193	189	179	164	142	116	85.8	54.9	30.2	1.56
115	4.16	43.5	64.7	90.9	117	139	157	170	178	180	176	167	152	133	109	81.6	55.2	35.0	4.55
120	4.63	48.2	65.5	87.6	110	131	146	158	165	167	163	155	141	124	102	78.8	56.5	40.1	9.03
125	4.92	51.7	66.7	85.2	104	122	136	146	153	154	151	143	132	116	96.9	76.7	57.4	44.3	14.1
130	5.55	49.1	66.0	80.7	99.6	115	127	136	141	142	139	133	123	109	92.6	72.2	58.7	35.5	18.2
135	7.06	41.6	67.9	80.2	93.0	108	119	126	131	132	130	124	114	102	86.2	73.2	60.6	30.3	21.1
140	8.32	32.9	68.8	78.2	88.1	99.2	111	117	121	122	120	114	107	93.8	83.1	72.8	64.6	17.4	20.8
145	8.21	18.0	70.3	76.0	85.9	92.6	99.9	106	111	112	110	103	96.5	89.0	81.2	71.7	65.7	9.53	19.8
150	8.53	9.67	51.1	69.4	81.8	89.2	94.0	97.3	100.0	100	98.8	95.7	91.1	85.6	79.3	73.3	49.3	13.2	21.7
155	12.7	18.9	37.6	66.7	72.9	83.9	88.2	91.4	92.9	93.3	92.2	90.0	86.8	82.6	77.5	73.5	39.4	17.7	23.1
160	10.5	3.69	10.1	42.2	62.6	70.7	82.0	84.1	86.4	87.2	86.6	85.2	82.3	79.8	77.9	55.3	20.8	14.3	22.3
165	8.71	7.50	10.7	10.3	33.6	42.9	61.6	75.1	80.5	80.6	79.5	79.8	79.1	72.1	53.3	34.4	9.65	8.99	20.4
170	12.1	6.44	9.90	11.0	6.36	15.2	25.7	34.4	44.3	50.9	51.0	49.7	45.5	37.4	23.0	9.20	11.4	13.3	11.5
175	15.1	6.61	5.34	9.51	12.9	15.1	13.2	9.02	6.30	5.15	6.26	6.46	9.19	14.2	16.5	13.1	10.4	6.81	5.38
180	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51

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	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393		
5	392	393	393	393	394	394	394	394	394	394	393	393	393	392	392	392	391	391	
10	388	389	390	391	392	393	393	393	393	393	392	391	390	389	388	386	386		
15	381	383	385	386	388	389	390	390	390	389	388	387	385	383	381	379	377		
20	371	374	376	379	381	384	386	387	387	385	383	381	377	374	371	368	365		
25	358	361	365	369	373	377	380	382	382	381	378	373	368	363	358	354	350		
30	342	346	351	357	364	370	374	376	377	375	371	365	358	350	343	337	333		
35	323	328	335	344	353	361	367	370	370	368	363	355	346	336	326	318	312		
40	301	308	318	330	341	351	358	363	363	361	354	345	333	320	307	296	289		
45	277	285	299	314	328	340	349	354	355	352	344	333	319	303	286	272	263		
50	250	262	278	297	314	329	339	345	347	343	334	321	304	285	265	247	235		
55	221	236	257	279	300	317	329	336	337	333	324	309	290	267	242	220	205		
60	191	210	236	262	285	304	318	325	327	323	312	296	274	248	220	193	174		
65	160	184	214	244	270	291	306	315	317	312	301	283	260	230	198	166	141		
70	129	158	193	226	255	278	294	303	305	300	289	270	245	213	177	140	110		
75	99.3	134	173	210	240	264	281	291	293	288	276	257	230	197	158	116	79.8		
80	72.3	113	155	194	226	251	268	278	280	276	263	243	216	182	141	96.2	54.5		
85	50.9	94.6	139	179	212	237	255	265	267	263	250	230	203	168	126	80.3	35.3		
90	35.9	80.5	125	165	198	223	241	251	254	249	237	217	190	155	113	67.8	23.2		
95	24.3	68.6	113	152	184	210	227	237	240	236	223	204	177	143	102	58.8	16.4		
100	20.7	59.4	102	140	172	196	214	223	226	222	210	191	165	132	93.3	52.3	17.7		
105	20.9	55.4	93.1	130	160	184	200	210	212	208	196	178	153	122	86.0	50.5	15.9		
110	23.1	54.1	87.2	120	149	171	187	196	198	194	183	166	143	114	81.5	50.9	22.7		
115	28.6	53.7	82.9	112	138	159	174	182	185	181	171	155	133	107	78.8	51.1	27.8		
120	31.8	46.0	79.4	106	129	148	161	169	171	168	158	144	124	102	76.7	47.0	28.5		
125	27.3	52.9	76.5	99.8	120	137	149	156	158	155	147	134	117	96.7	73.9	52.6	24.9		
130	5.51	55.3	65.5	93.6	112	127	137	144	146	143	136	125	110	91.8	67.3	53.9	5.62		
135	1.63	53.7	70.5	82.4	104	117	127	132	134	132	126	116	103	83.4	68.0	54.9	1.67		
140	9.85	50.9	73.1	79.2	90.2	108	116	121	123	121	116	107	91.3	76.7	71.4	50.3	3.05		
145	12.0	36.2	68.3	82.6	85.6	89.4	100	107	110	108	101	90.7	83.5	82.2	68.0	35.2	10.9		
150	7.22	6.69	56.6	77.4	86.8	89.5	90.2	90.9	91.1	91.3	89.4	88.1	86.9	77.8	55.0	9.87	8.01		
155	11.4	6.96	31.1	65.6	80.1	84.4	89.9	92.0	92.5	92.3	90.0	84.4	80.2	62.4	31.4	1.52	4.43		
160	26.3	20.4	6.16	29.8	57.4	73.6	79.2	82.6	84.0	83.0	79.5	71.2	54.7	30.3	6.92	9.00	4.49		
165	15.1	4.87	16.7	14.9	10.7	26.4	43.8	49.7	53.1	51.7	44.6	31.8	10.4	6.87	8.55	6.15	9.55		
170	14.0	15.4	15.4	7.83	15.1	17.0	13.2	7.72	5.97	5.81	4.18	7.42	10.8	9.45	7.32	9.49	11.6		
175	18.5	26.1	14.4	7.77	14.5	18.7	9.76	15.4	12.4	4.07	6.37	8.48	11.0	13.4	8.65	9.98	16.5		
180	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51		

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		Special Color Rendering Indices	
Test Voltage (V)	120.0	277.0	R1	83.6
Voltage frequency (Hz)	60	60	R2	92.2
Test Current (A)	0.286	0.127	R3	96.1
Power Factor	0.9960	0.9673	R4	82.7
Test Power (W)/2	17.06	17.00	R5	83.8
THD A%	7.02	10.76	R6	89.2
Luminous Efficacy (lm/W)	137.6	138.1	R7	84.6
Total Luminous Flux (lm)	2346.9	2347.3	R8	64.3
Color Rendering Index (CRI)	84.6		R9	15.7
R9	15.7		R10	81.5
Correlated Color Temperature (CCT)(K)	3496		R11	82.3
Chromaticity Chroma x	0.4033		R12	68.1
Chromaticity Chroma y	0.3851		R13	86
Chromaticity Chroma u	0.2367		R14	98.6
Chromaticity Chroma v	0.3391			
Duv	-0.0021			
Chromaticity Chroma u'	0.2367			
Chromaticity Chroma v'	0.5086			

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

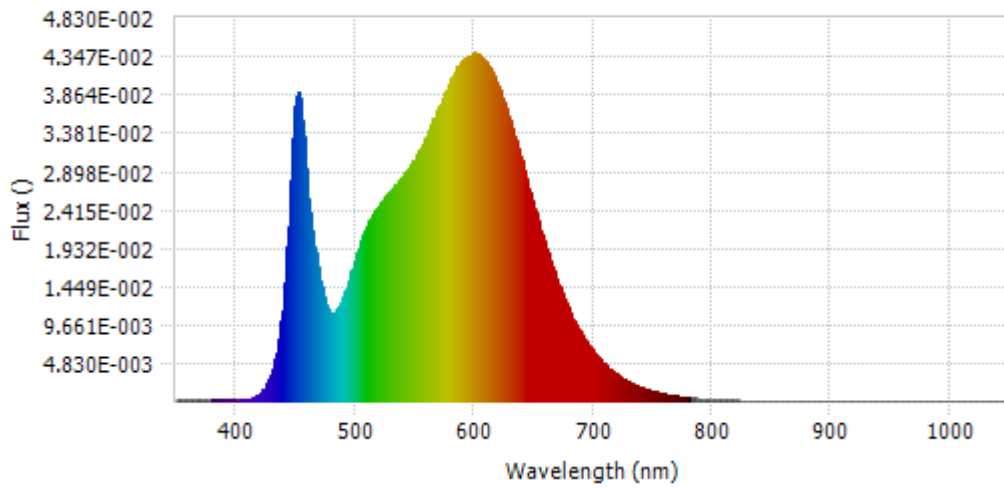
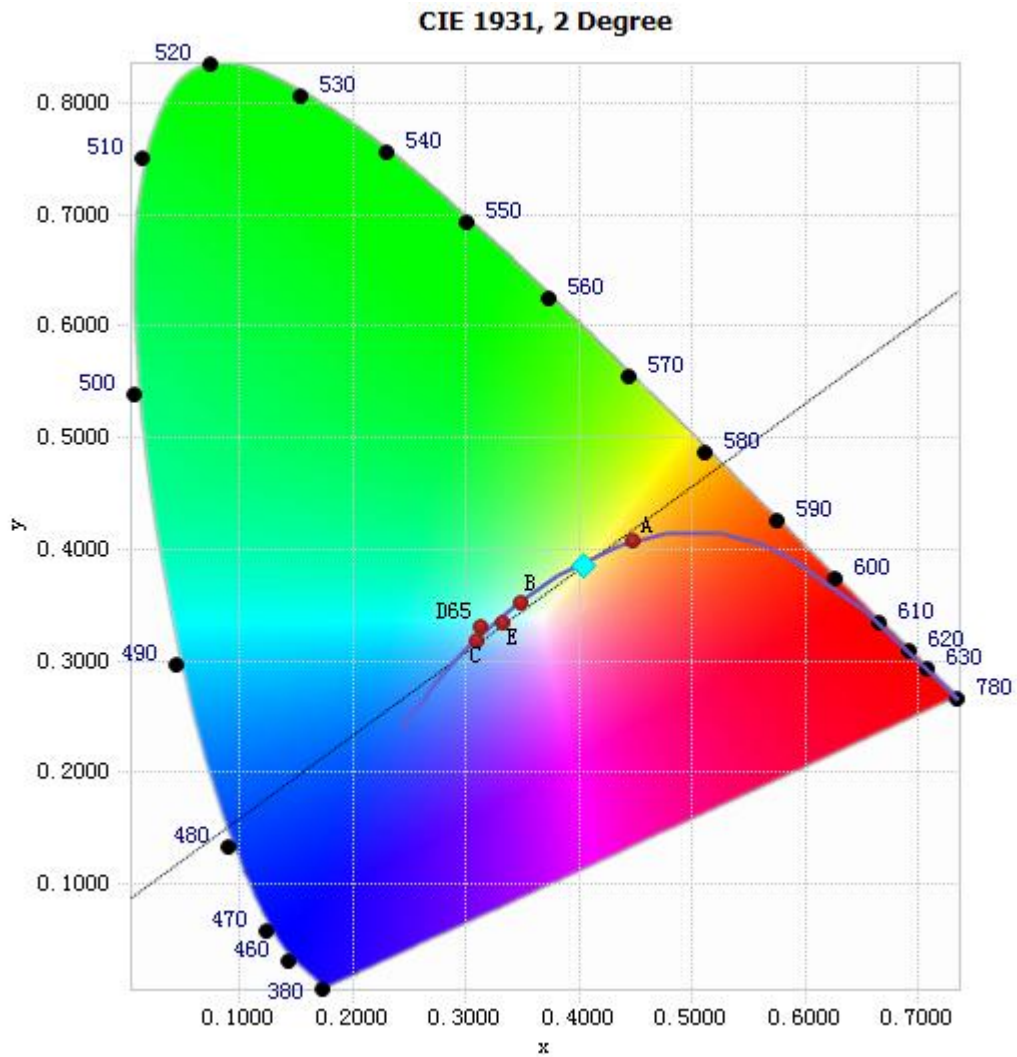


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.03E-04	485	1.16E-02	590	4.30E-02	695	7.39E-03
385	1.96E-04	490	1.31E-02	595	4.35E-02	700	6.31E-03
390	1.84E-04	495	1.53E-02	600	4.39E-02	705	5.40E-03
395	1.78E-04	500	1.78E-02	605	4.35E-02	710	4.60E-03
400	1.49E-04	505	2.01E-02	610	4.28E-02	715	3.93E-03
405	1.85E-04	510	2.20E-02	615	4.16E-02	720	3.36E-03
410	2.79E-04	515	2.37E-02	620	3.98E-02	725	2.87E-03
415	5.17E-04	520	2.47E-02	625	3.78E-02	730	2.44E-03
420	9.90E-04	525	2.57E-02	630	3.54E-02	735	2.09E-03
425	1.91E-03	530	2.66E-02	635	3.29E-02	740	1.77E-03
430	3.69E-03	535	2.74E-02	640	3.03E-02	745	1.51E-03
435	6.91E-03	540	2.83E-02	645	2.75E-02	750	1.29E-03
440	1.32E-02	545	2.95E-02	650	2.47E-02	755	1.10E-03
445	2.47E-02	550	3.05E-02	655	2.21E-02	760	9.36E-04
450	3.72E-02	555	3.19E-02	660	1.97E-02	765	8.03E-04
455	3.70E-02	560	3.34E-02	665	1.73E-02	770	6.85E-04
460	2.75E-02	565	3.51E-02	670	1.51E-02	775	5.93E-04
465	2.03E-02	570	3.69E-02	675	1.32E-02	780	5.04E-04
470	1.61E-02	575	3.86E-02	680	1.15E-02		
475	1.25E-02	580	4.03E-02	685	9.95E-03		
480	1.11E-02	585	4.19E-02	690	8.61E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4033, 0.3851)

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

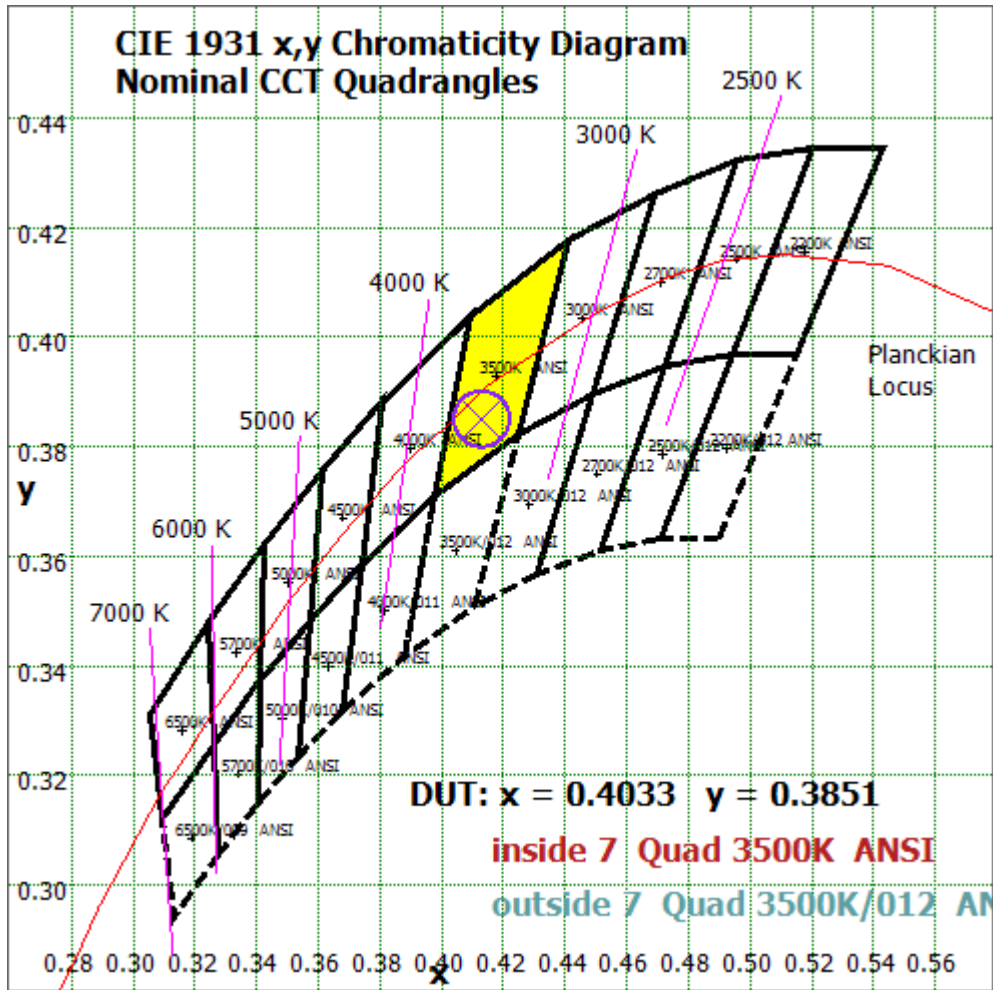


Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

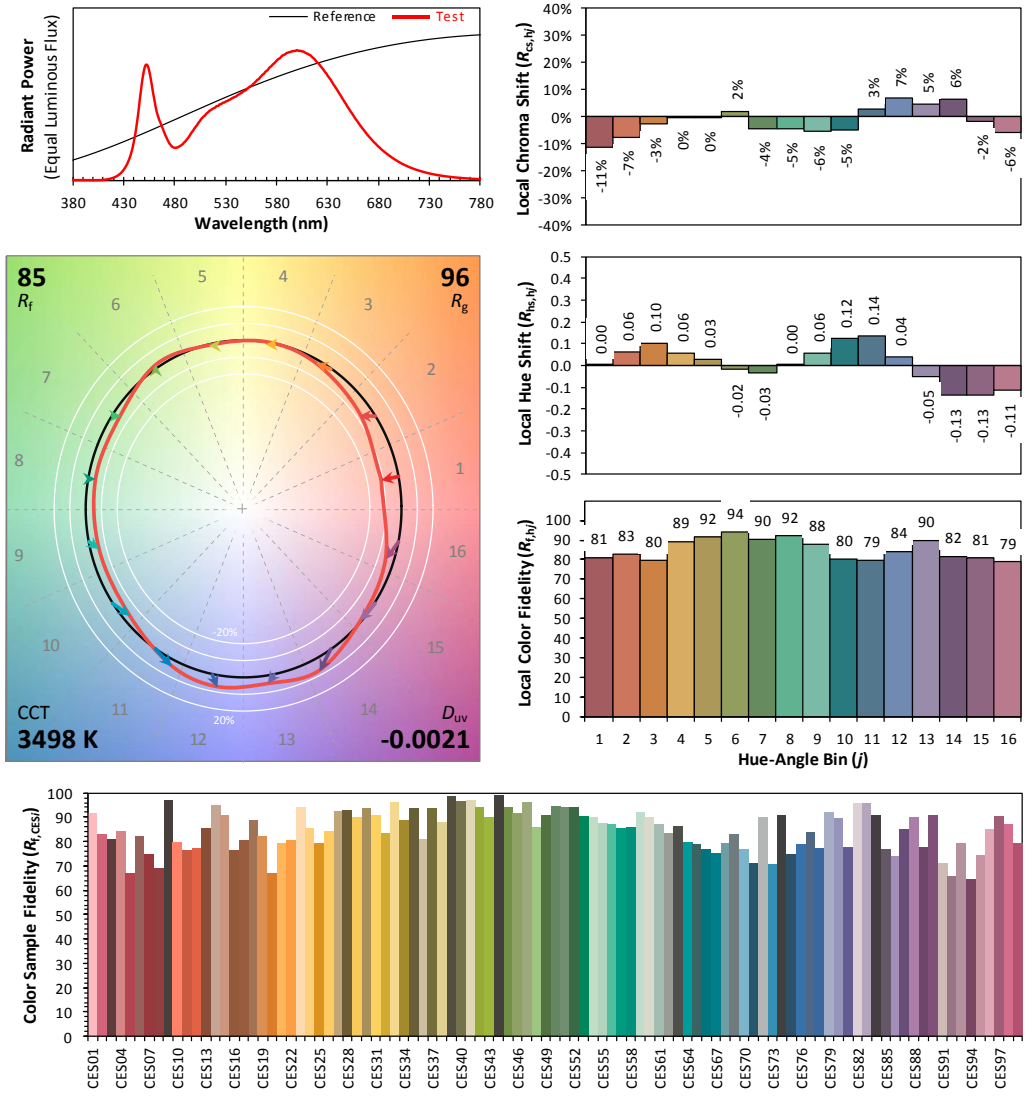
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2024/02/02

Model: 15T8/4F/8CCTS/HYB/C



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.4033	CIE 13.3-1995 (CRI) R_a 85 R_g 16
	y	0.3851	
	u'	0.2367	
	v'	0.5086	

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
Voltage frequency (Hz)	60	60
Test Current (A)	0.283	0.126
Power Factor	0.9960	0.9669
Test Power (W)/2	16.94	16.87
THD A%	6.57	10.93
Luminous Efficacy (lm/W)	141.6	142.2
Total Luminous Flux (lm)	2398.5	2398.9
Color Rendering Index (CRI)	85.6	
R9	20.9	
Correlated Color Temperature (CCT)(K)	3966	
Chromaticity Chroma x	0.3800	
Chromaticity Chroma y	0.3711	
Chromaticity Chroma u	0.2271	
Chromaticity Chroma v	0.3327	
Duv	-0.0026	
Chromaticity Chroma u'	0.2271	
Chromaticity Chroma v'	0.4990	

Special Color Rendering Indices	
R1	85.1
R2	93
R3	95.9
R4	83.6
R5	84.9
R6	89
R7	85.9
R8	67.8
R9	20.9
R10	82.6
R11	83.2
R12	64.7
R13	87.6
R14	98.5

Table 10: Test data per Sphere-Spectroradiometer Method

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

Spectral Power Distribution - Sphere Spectroradiometer Method

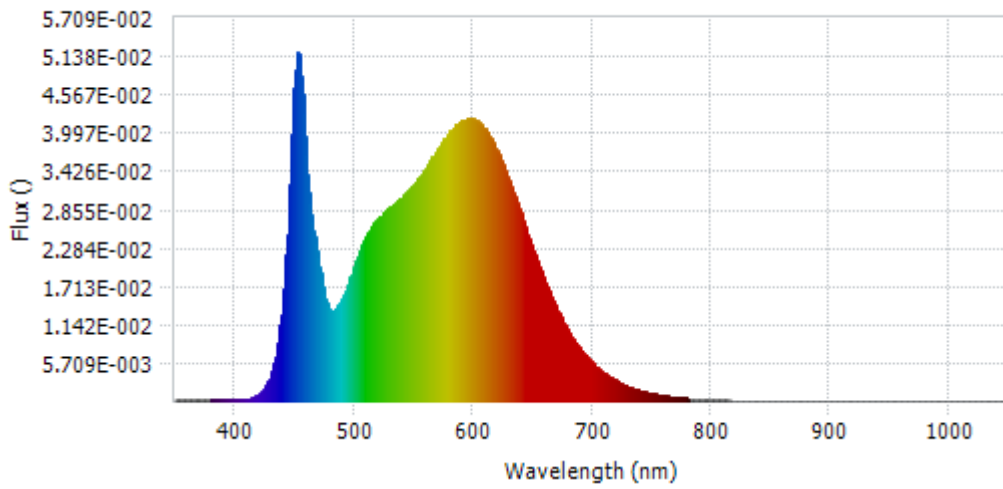
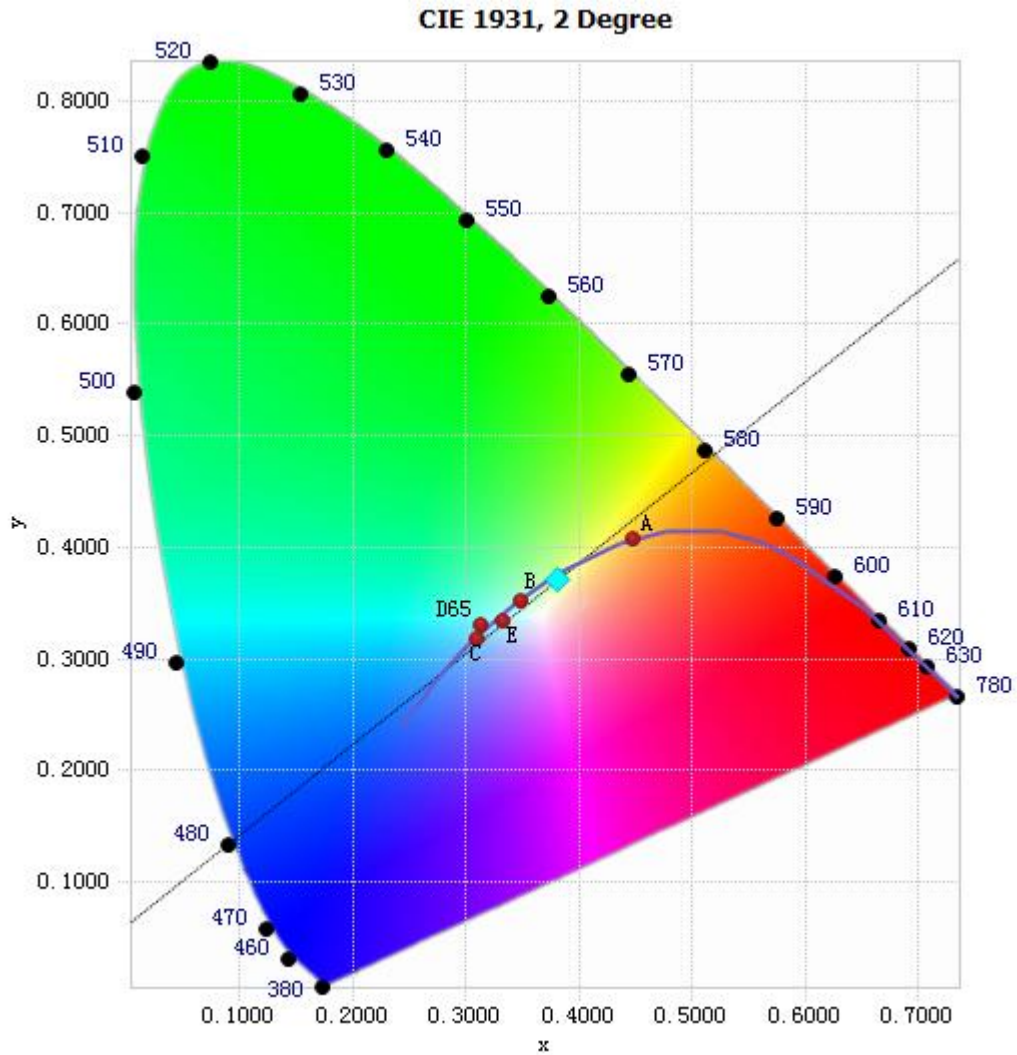


Chart 12: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.39E-04	485	1.39E-02	590	4.19E-02	695	6.75E-03
385	2.27E-04	490	1.52E-02	595	4.20E-02	700	5.78E-03
390	2.28E-04	495	1.74E-02	600	4.21E-02	705	4.94E-03
395	2.14E-04	500	2.00E-02	605	4.14E-02	710	4.21E-03
400	1.86E-04	505	2.25E-02	610	4.05E-02	715	3.60E-03
405	1.91E-04	510	2.45E-02	615	3.92E-02	720	3.07E-03
410	2.92E-04	515	2.61E-02	620	3.73E-02	725	2.62E-03
415	5.30E-04	520	2.71E-02	625	3.54E-02	730	2.24E-03
420	1.02E-03	525	2.81E-02	630	3.30E-02	735	1.90E-03
425	1.99E-03	530	2.89E-02	635	3.06E-02	740	1.62E-03
430	3.91E-03	535	2.95E-02	640	2.81E-02	745	1.39E-03
435	7.54E-03	540	3.04E-02	645	2.54E-02	750	1.18E-03
440	1.47E-02	545	3.13E-02	650	2.29E-02	755	1.01E-03
445	2.83E-02	550	3.22E-02	655	2.04E-02	760	8.63E-04
450	4.66E-02	555	3.34E-02	660	1.81E-02	765	7.34E-04
455	5.06E-02	560	3.47E-02	665	1.59E-02	770	6.31E-04
460	3.66E-02	565	3.60E-02	670	1.39E-02	775	5.40E-04
465	2.65E-02	570	3.74E-02	675	1.21E-02	780	4.63E-04
470	2.13E-02	575	3.87E-02	680	1.05E-02		
475	1.60E-02	580	4.00E-02	685	9.10E-03		
480	1.36E-02	585	4.12E-02	690	7.86E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3800, 0.3711)

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

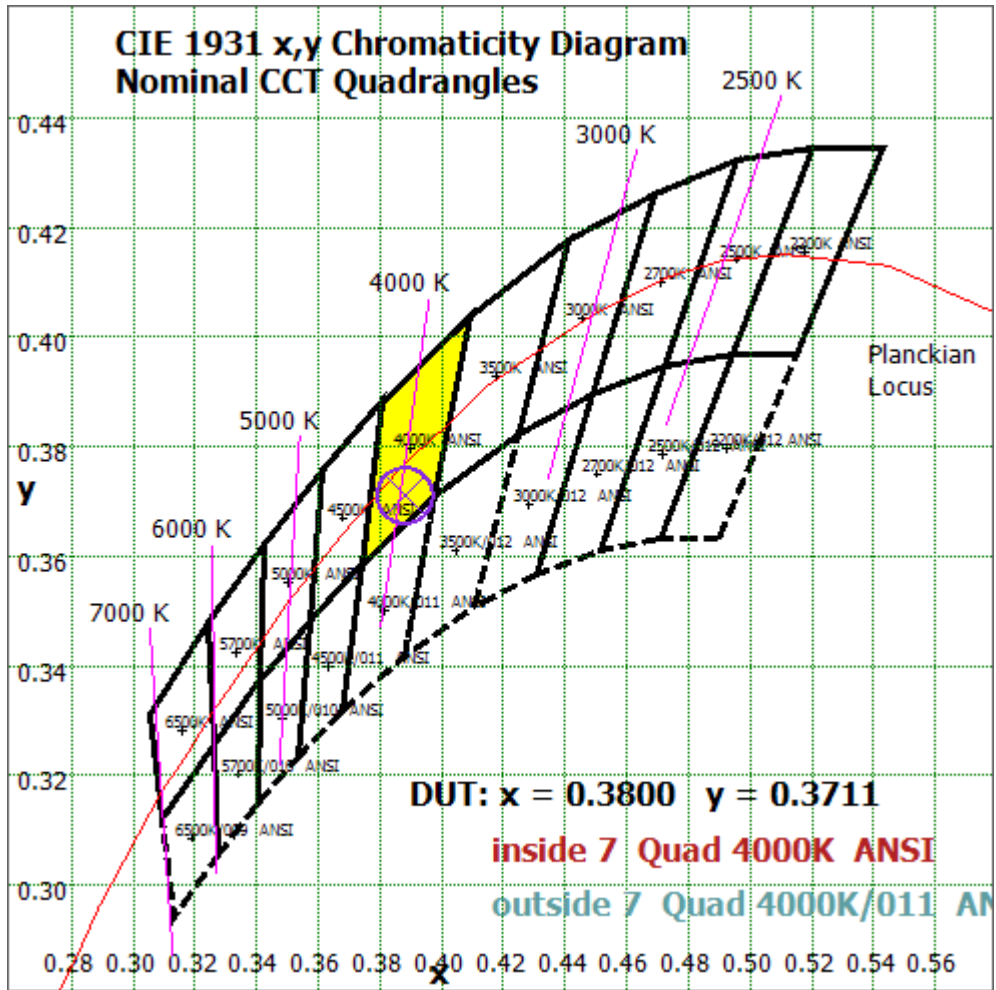


Chart14: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

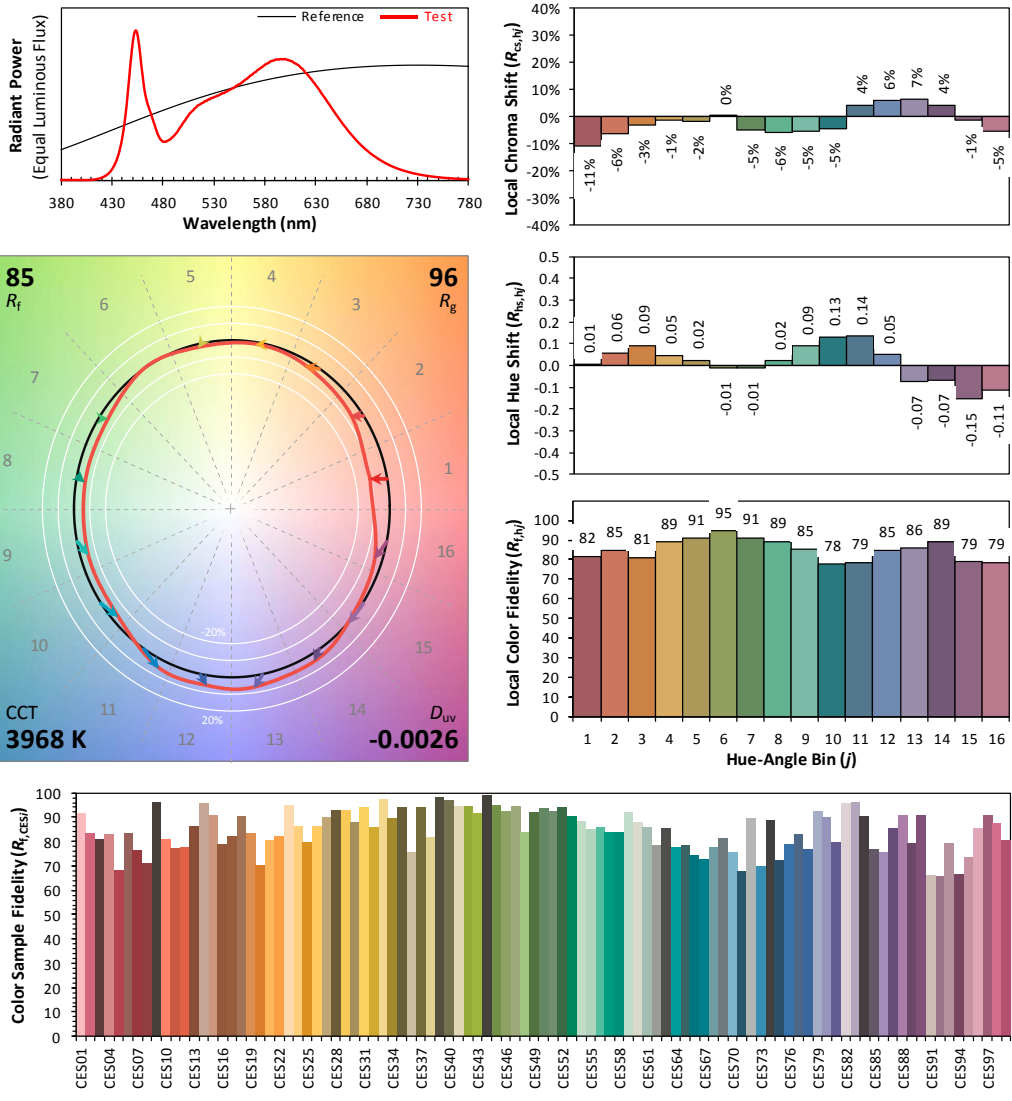
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2024/02/02

Model: 15T8/4F/8CCTS/HYB/C



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.3800	CIE 13.3-1995 (CRI) R_a 86 R_g 21
	y	0.3711	
	u'	0.2271	
	v'	0.4990	

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
Voltage frequency (Hz)	60	60
Test Current (A)	0.283	0.126
Power Factor	0.9960	0.9669
Test Power (W)/2	16.92	16.85
THD A%	7.04	10.92
Luminous Efficacy (lm/W)	143.8	144.4
Total Luminous Flux (lm)	2432.3	2432.5
Color Rendering Index (CRI)	85.7	
R9	19.8	
Correlated Color Temperature (CCT)(K)	5068	
Chromaticity Chroma x	0.3430	
Chromaticity Chroma y	0.3489	
Chromaticity Chroma u	0.2111	
Chromaticity Chroma v	0.3220	
Duv	-0.0005	
Chromaticity Chroma u'	0.2111	
Chromaticity Chroma v'	0.4830	

Special Color Rendering Indices	
R1	85.2
R2	92.5
R3	94.8
R4	84.1
R5	85.1
R6	87.2
R7	86.8
R8	69.9
R9	19.8
R10	80.9
R11	83.9
R12	62.6
R13	87.7
R14	97.8

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

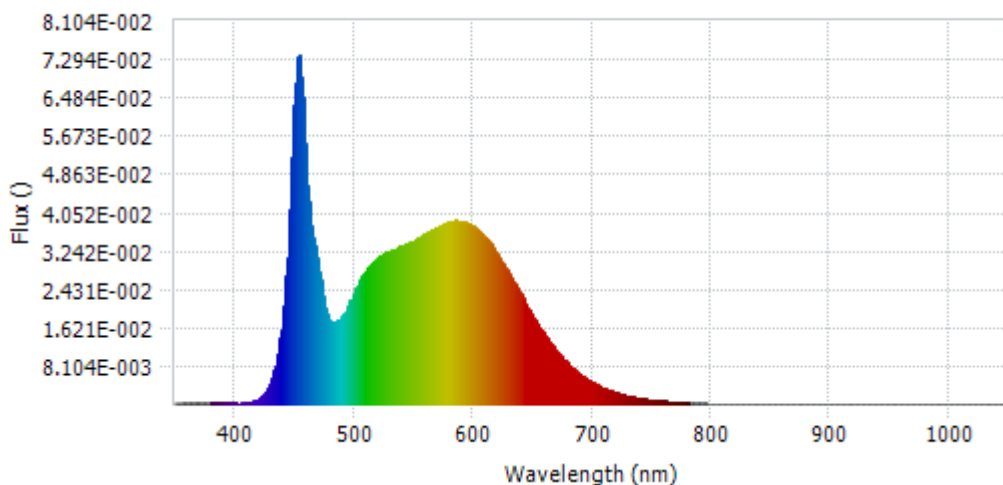
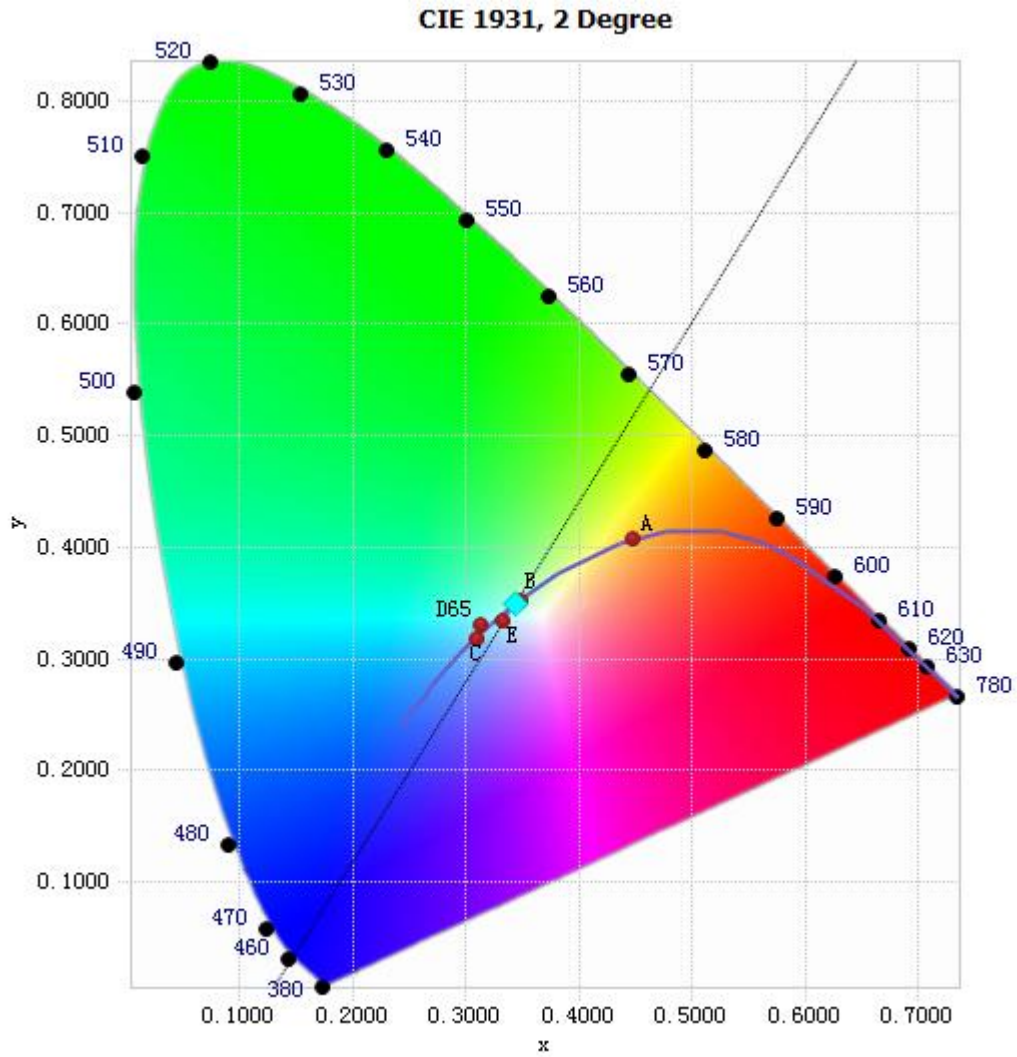


Chart16: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.14E-04	485	1.75E-02	590	3.88E-02	695	5.44E-03
385	2.79E-04	490	1.86E-02	595	3.83E-02	700	4.65E-03
390	2.90E-04	495	2.07E-02	600	3.78E-02	705	3.97E-03
395	2.64E-04	500	2.35E-02	605	3.66E-02	710	3.40E-03
400	2.40E-04	505	2.61E-02	610	3.54E-02	715	2.89E-03
405	2.37E-04	510	2.82E-02	615	3.38E-02	720	2.48E-03
410	3.32E-04	515	2.99E-02	620	3.19E-02	725	2.12E-03
415	6.03E-04	520	3.08E-02	625	2.99E-02	730	1.80E-03
420	1.17E-03	525	3.18E-02	630	2.77E-02	735	1.54E-03
425	2.36E-03	530	3.24E-02	635	2.55E-02	740	1.31E-03
430	4.72E-03	535	3.28E-02	640	2.32E-02	745	1.12E-03
435	9.40E-03	540	3.34E-02	645	2.10E-02	750	9.62E-04
440	1.82E-02	545	3.41E-02	650	1.87E-02	755	8.23E-04
445	3.57E-02	550	3.45E-02	655	1.67E-02	760	7.05E-04
450	6.32E-02	555	3.53E-02	660	1.47E-02	765	6.06E-04
455	7.22E-02	560	3.61E-02	665	1.29E-02	770	5.21E-04
460	5.09E-02	565	3.68E-02	670	1.13E-02	775	4.47E-04
465	3.62E-02	570	3.75E-02	675	9.80E-03	780	3.85E-04
470	2.94E-02	575	3.80E-02	680	8.48E-03		
475	2.15E-02	580	3.86E-02	685	7.35E-03		
480	1.75E-02	585	3.89E-02	690	6.33E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3430, 0.3489)

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

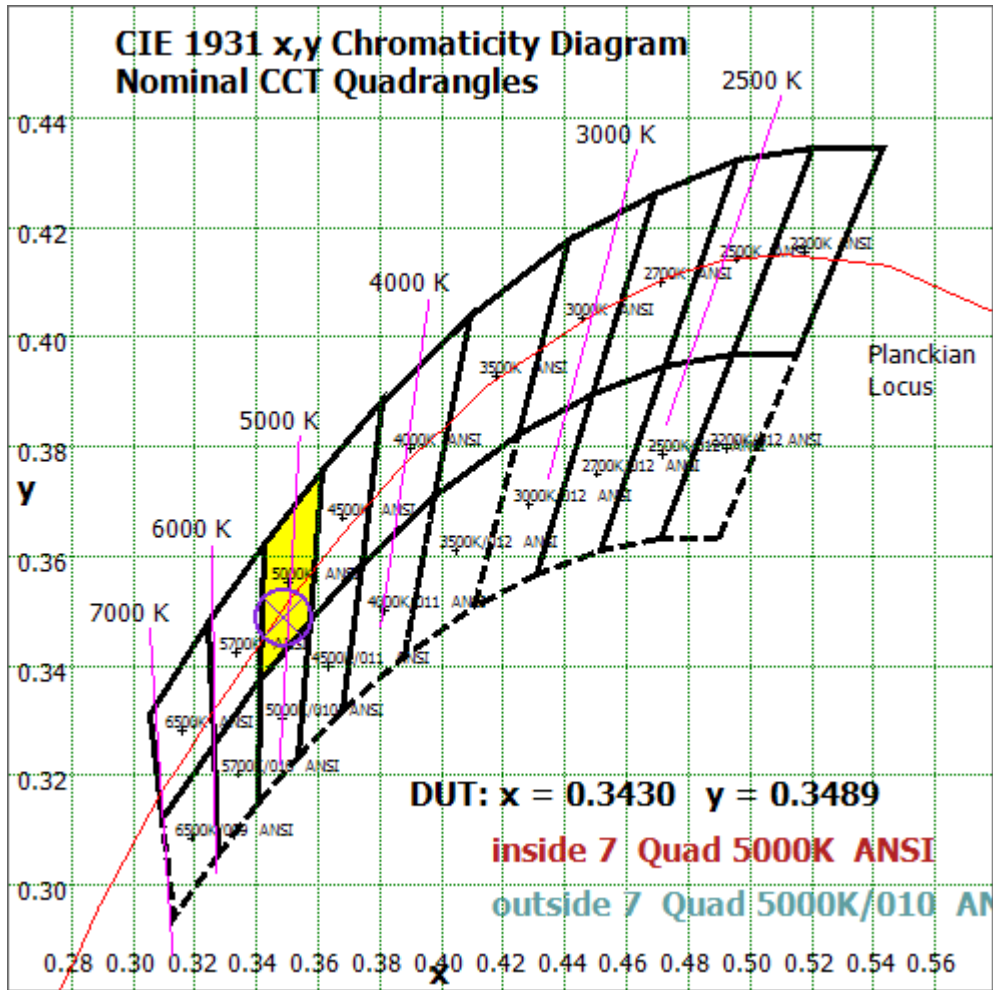


Chart 18: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

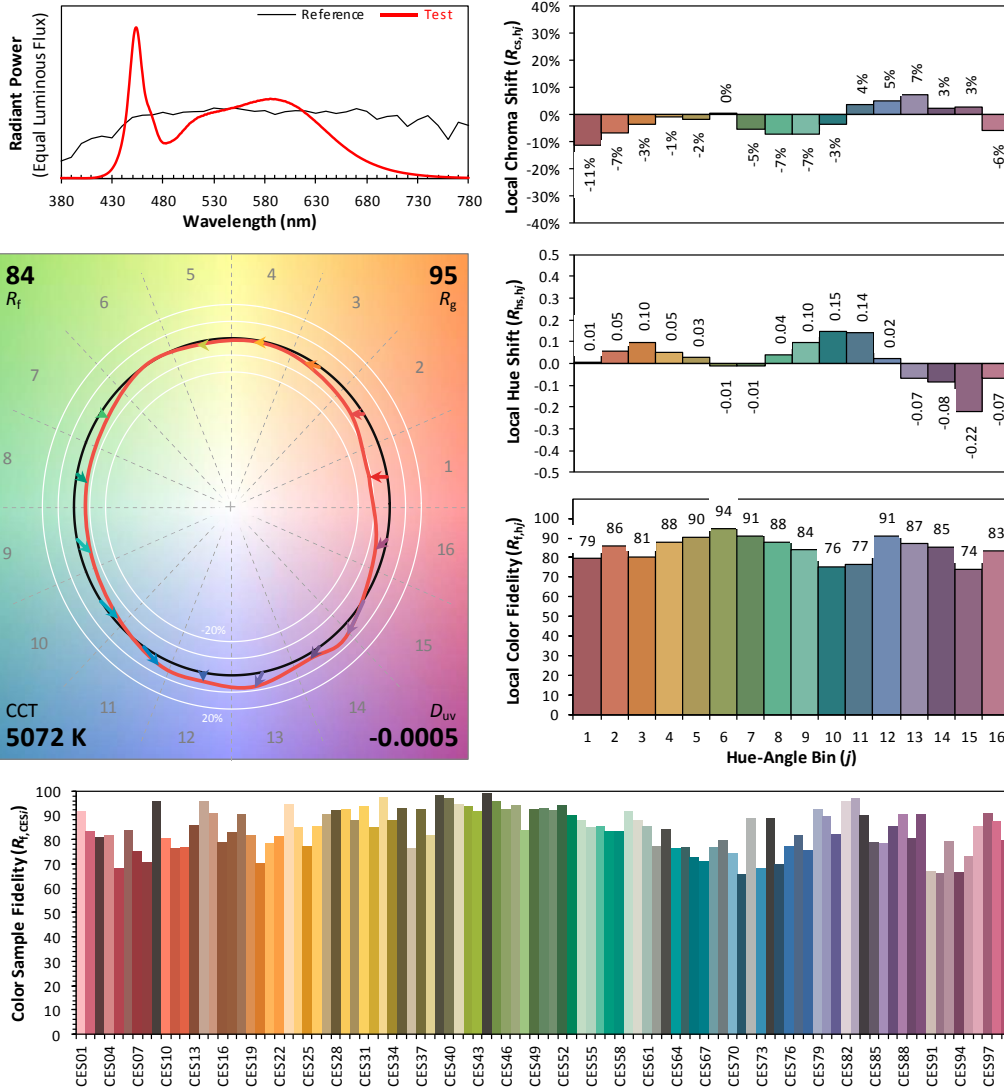
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2024/02/02

Model: 15T8/4F/8CCTS/HYB/C



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

x **0.3430**
 y **0.3489**
 u' **0.2111**
 v' **0.4830**

CIE 13.3-1995	
(CRI)	
R_a	86
R_g	20

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

Chart 19: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 12 due to rounding.

TEST RESULTS (6500K Setting)

Test ambient temperature was 26.0 °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
Voltage frequency (Hz)	60	60
Test Current (A)	0.287	0.127
Power Factor	0.9960	0.9675
Test Power (W)/2	17.12	17.05
THD A%	7.11	10.64
Luminous Efficacy (lm/W)	141.0	141.7
Total Luminous Flux (lm)	2414.5	2414.6
Color Rendering Index (CRI)	84.0	
R9	10.3	
Correlated Color Temperature (CCT)(K)	6400	
Chromaticity Chroma x	0.3142	
Chromaticity Chroma y	0.3319	
Chromaticity Chroma u	0.1978	
Chromaticity Chroma v	0.3134	
Duv	0.0039	
Chromaticity Chroma u'	0.1978	
Chromaticity Chroma v'	0.4701	

Special Color Rendering Indices	
R1	82.4
R2	90.7
R3	93.6
R4	81.3
R5	82.1
R6	84.7
R7	87.6
R8	69.4
R9	10.3
R10	76.5
R11	80.8
R12	55.6
R13	85.4
R14	97.1

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

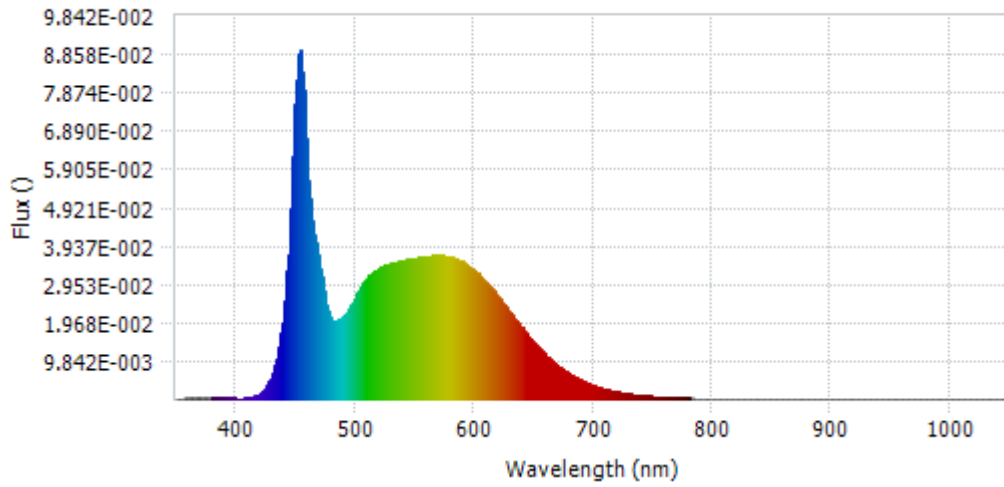
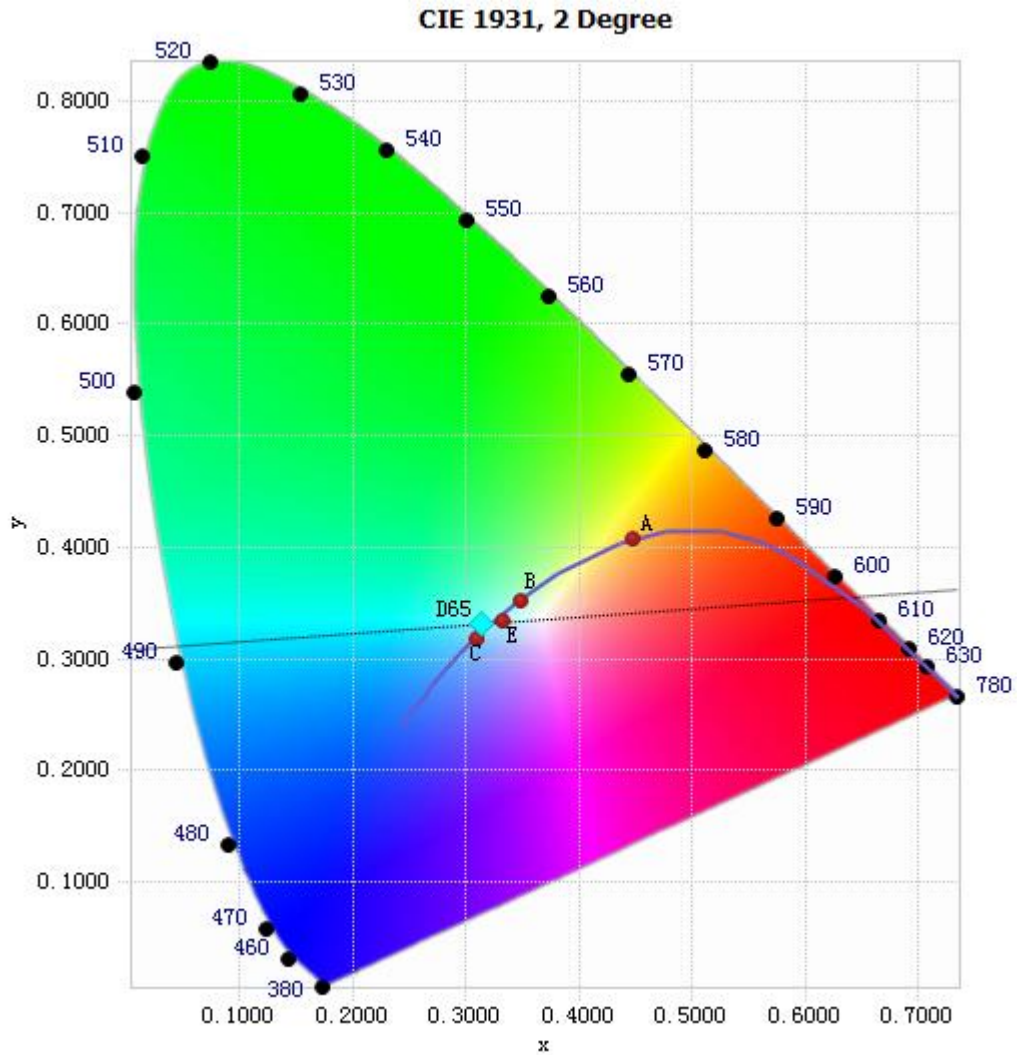


Chart 20: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.30E-04	485	2.02E-02	590	3.54E-02	695	4.16E-03
385	3.24E-04	490	2.11E-02	595	3.43E-02	700	3.55E-03
390	3.14E-04	495	2.32E-02	600	3.31E-02	705	3.04E-03
395	3.03E-04	500	2.60E-02	605	3.16E-02	710	2.59E-03
400	2.64E-04	505	2.88E-02	610	3.00E-02	715	2.23E-03
405	2.74E-04	510	3.09E-02	615	2.83E-02	720	1.90E-03
410	4.07E-04	515	3.27E-02	620	2.63E-02	725	1.63E-03
415	7.58E-04	520	3.35E-02	625	2.44E-02	730	1.39E-03
420	1.45E-03	525	3.44E-02	630	2.24E-02	735	1.18E-03
425	2.95E-03	530	3.49E-02	635	2.04E-02	740	1.02E-03
430	5.89E-03	535	3.51E-02	640	1.84E-02	745	8.77E-04
435	1.16E-02	540	3.55E-02	645	1.65E-02	750	7.46E-04
440	2.23E-02	545	3.59E-02	650	1.47E-02	755	6.44E-04
445	4.27E-02	550	3.60E-02	655	1.30E-02	760	5.55E-04
450	7.59E-02	555	3.64E-02	660	1.14E-02	765	4.77E-04
455	8.78E-02	560	3.67E-02	665	9.98E-03	770	4.13E-04
460	6.18E-02	565	3.69E-02	670	8.66E-03	775	3.51E-04
465	4.36E-02	570	3.69E-02	675	7.52E-03	780	3.04E-04
470	3.54E-02	575	3.68E-02	680	6.50E-03		
475	2.57E-02	580	3.65E-02	685	5.62E-03		
480	2.05E-02	585	3.62E-02	690	4.85E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3142, 0.3319)

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

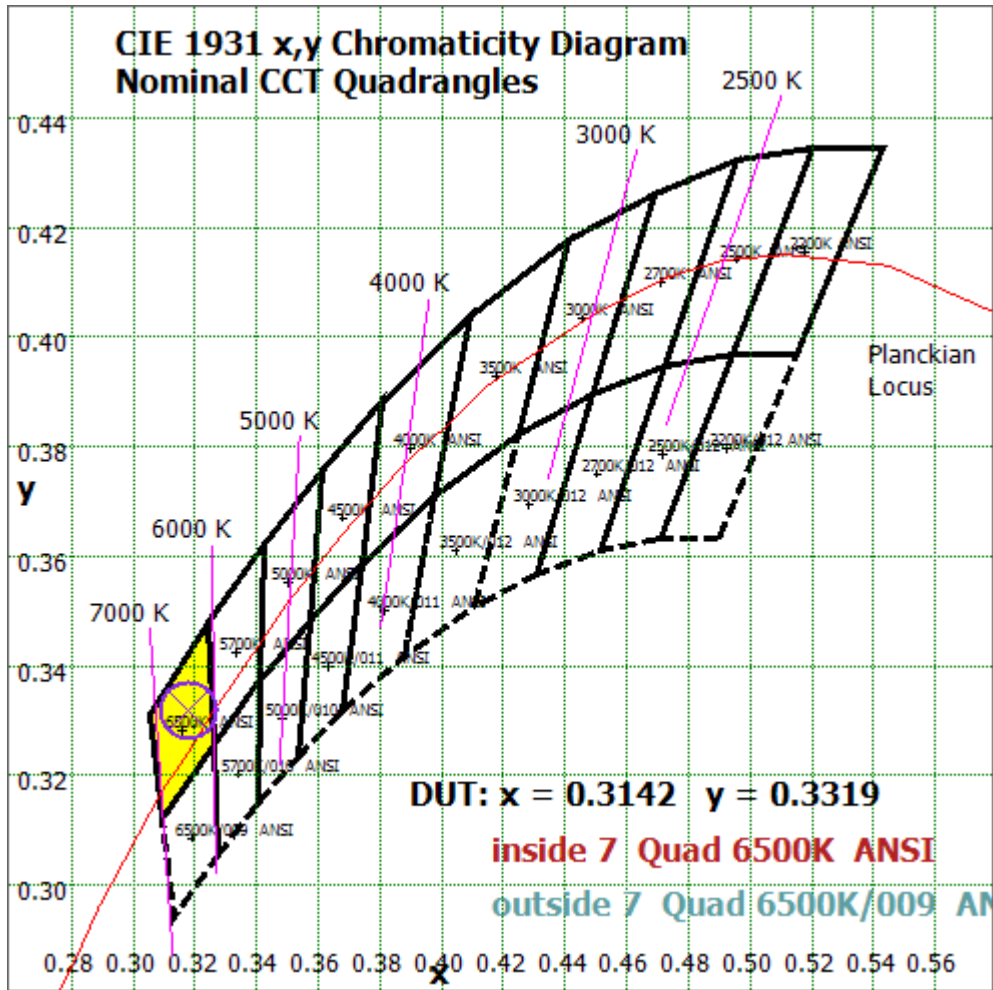


Chart 22: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

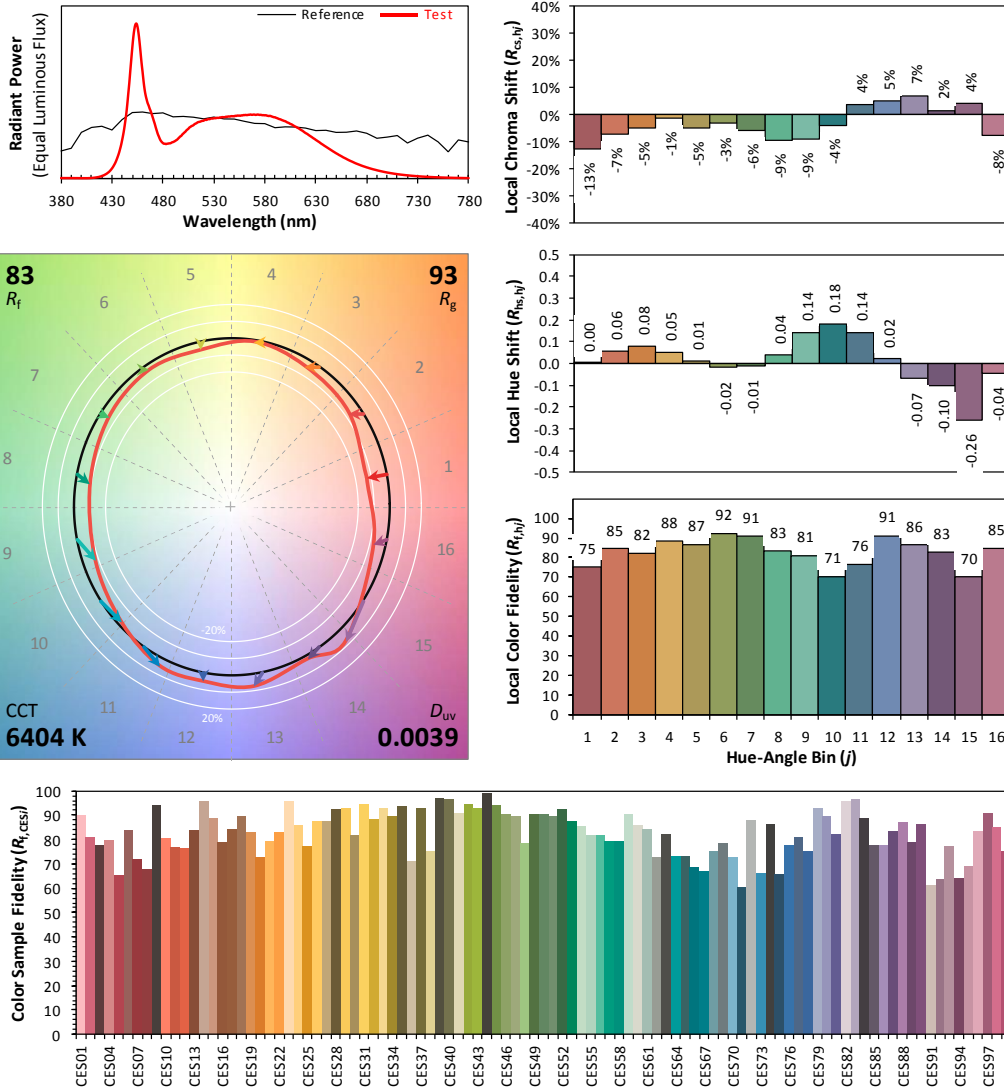
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2024/02/02

Model: 15T8/4F/8CCTS/HYB/C



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

x **0.3142**
 y **0.3319**
 u' **0.1978**
 v' **0.4701**

CIE 13.3-1995 (CRI)	
R_a	84
R_9	10

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

Chart 23: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 14 due to rounding.

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jun. 05, 2023	-
Digital Power Meter	PF2010A	HZTE028-01	Aug. 01, 2023	Jul. 31, 2024
AC Power Supply	DPS1060	HZTE001-06	Aug. 01, 2023	Jul. 31, 2024
DC Power Supply	WY12010	HZTE004-03	Aug. 01, 2023	Jul. 31, 2024
Temperature recorder	JM624U	HZTE018-08	Aug. 04, 2023	Aug. 03, 2024
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 04, 2023	Aug. 03, 2024
Standard source	D908	HZTE012-01	Aug. 14, 2018	-
Integrate Sphere system	3M	HZTE015-04	Jul. 24, 2023	-
Digital Power Meter	WT210	HZTE008-01	Aug. 01, 2023	Jul. 31, 2024
AC Power Supply	PCR 500L	HZTE001-07	Aug. 01, 2023	Jul.31, 2024
DC Power Supply	IT6154	HZTE004-04	Aug. 01, 2023	Jul. 31, 2024
Standard source	SCL-1400	HZTE012-06	Nov. 04, 2021	-
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 04, 2023	Aug. 03, 2024
Temperature Meter	TES1310	HZTE017-01	Aug. 04, 2023	Aug. 03, 2024
Goniophotometer system	GO-R5000	HZTE011-01	Jun. 05, 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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