LM-79-19 TEST REPORT

for

RAB Lighting Inc

170 Ludlow Ave. Northvale, NJ 07647

LED Tube

Model: T10370(T8-12-48G-8CCT-HYB)

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86571 86376106
www.ledtestlab.com

Report No.: HZ22060039a

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

Review by: April Zou — Engineer: April Zou — Jun. 29, 2022

Approved by: Jim Zhang — Manager: Jim Zhang — Jun. 29, 2022

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	T10370(T8-12-48G-8 CCT-HYB) 3000K (TYPE B)	T10370(T8-12-48G-8 CCT-HYB) 3000K (TYPE A)	T10370(T8-12-48G-8 CCT-HYB) 5000K (TYPE A)	T10370(T8-12-48G-8 CCT-HYB) 6500K (TYPE A)
Luminous Efficacy (Lumens /Watt)	143.9	121.3	126.6	121.9
Total Luminous Flux (Lumens)	1628.7	1562.7	1628.6	1569.3
Power (Watts)	11.32	12.88	12.87	12.88
Power Factor	0.9773	0.9936	0.9935	0.9934
CCT (K)	3068	3069	5176	6569
CRI	82.6	82.8	85.8	83.7
Stabilization Time (Light & Power)	50 mins	50 mins	50 mins	50 mins
Note	3000K	3000K	5000K	6500K

Table 1: Executive Data Summary

Note 1: Power of Type A Mode = System Power/2

Note 2: The above results are recorded/ derived from measurements of 120V/60Hz made using an Integrating Sphere.

Test specifications:

Date of Receipt : May 18, 2022

Date of Test : May 25, 2022

Test item : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters

Reference Standard : IESNA LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

TABLE OF CONTENT

SAMPLE PHOTO

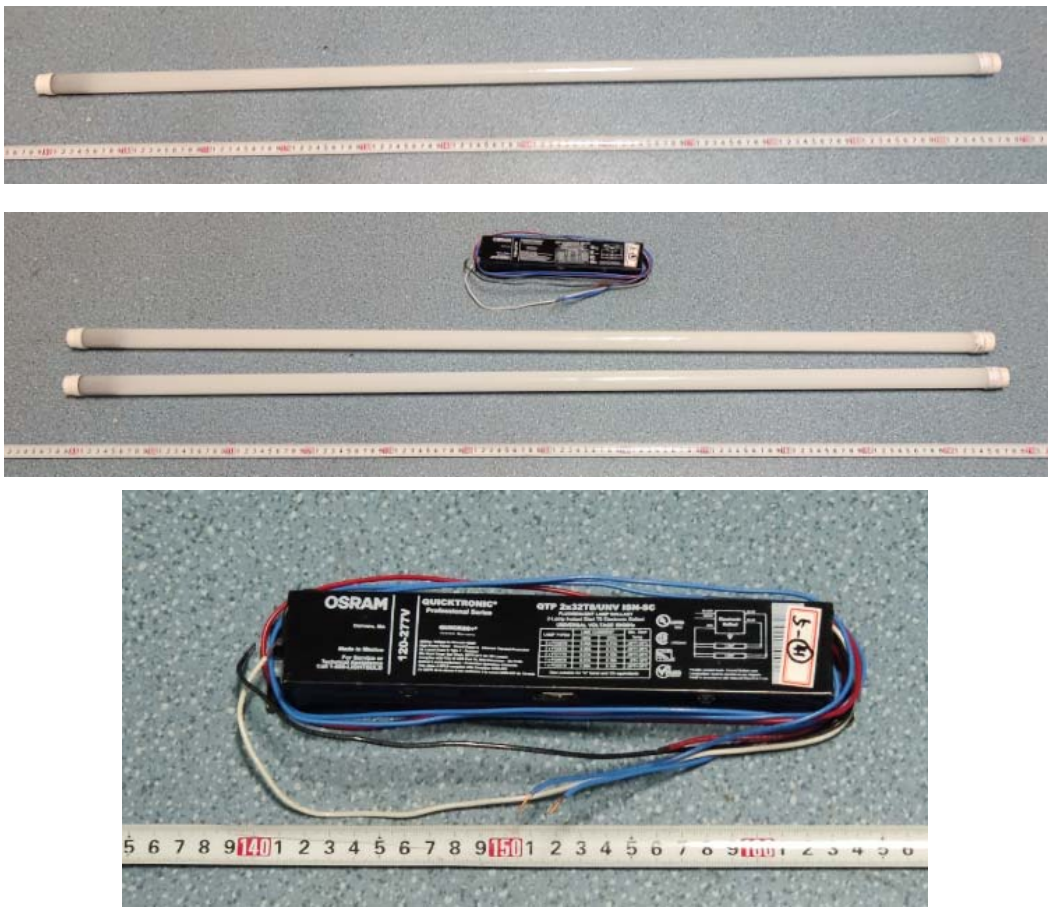


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Tube
Model	: T10370(T8-12-48G-8CCT-HYB) LED Tubes supplied by a high frequency fluorescent lamp ballast: QTP 2x32T8/UNV ISN-SC
Electrical Ratings	: 120-277V, 50/60Hz, 12W
Product Description	: Manufacturer of light source: Lumileds Holding B.V. Model of LED light source: L128-XX80RA35003S4

TEST RESULTS of Model T10370(T8-12-48G-8CCT-HYB) 3000K (TYPE B)

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)	0.097	0.045
Power Factor	0.9773	0.9282
Test Power (W)	11.32	11.62
THD A%	20.62	20.83
Luminous Efficacy (lm/W)	143.9	141.1
Total Luminous Flux (lm)	1628.7	1640.0
Color Rendering Index (CRI)	82.6	
R9	6.3	
Correlated Color Temperature (CCT)(K)	3068	
Chromaticity Chroma x	0.4352	
Chromaticity Chroma y	0.4090	
Chromaticity Chroma u	0.2473	
Chromaticity Chroma v	0.3487	
Duv	0.0022	
Chromaticity Chroma u ’	0.2473	
Chromaticity Chroma v’	0.5231	

Special Color Rendering Indices	
R1	80.8
R2	90.5
R3	97
R4	80.5
R5	80.6
R6	88.4
R7	83.6
R8	59.4
R9	6.3
R10	78.2
R11	79.8
R12	66.4
R13	83.1
R14	98.9

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

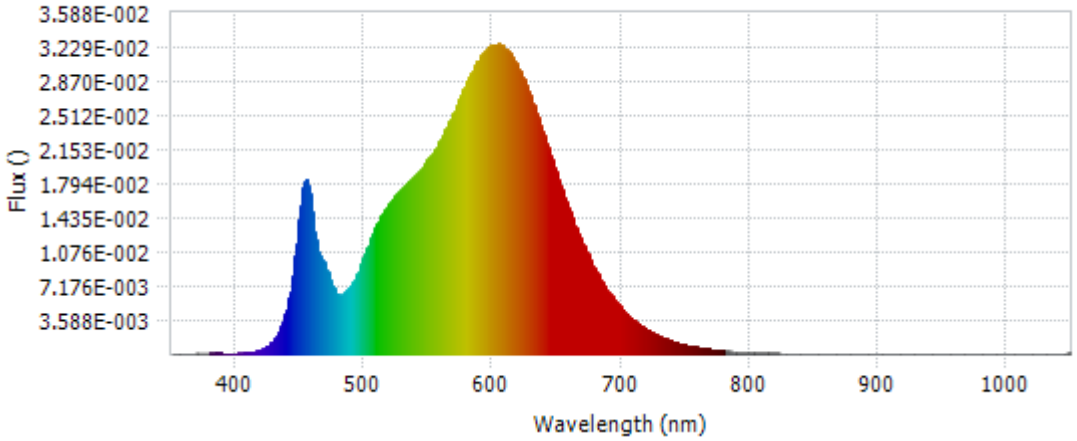
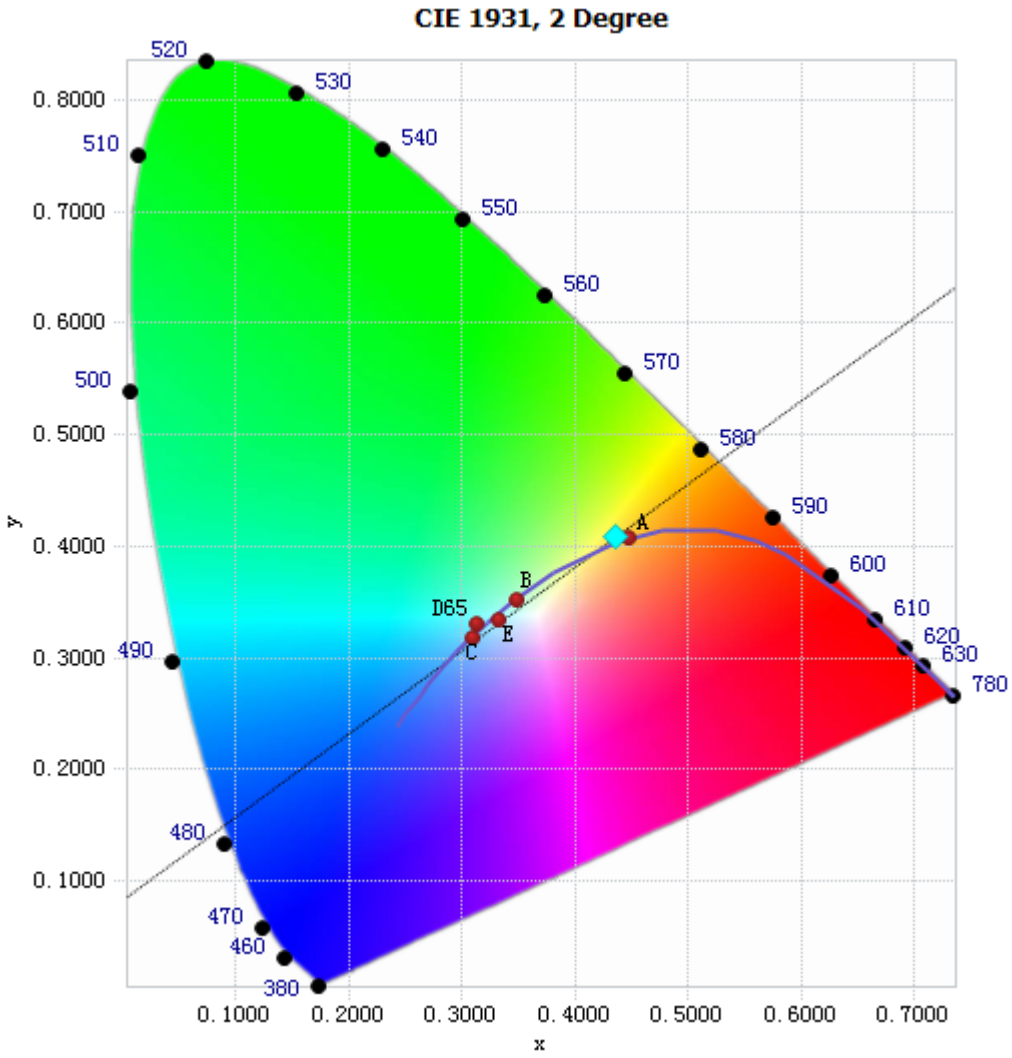


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.29E-04	485	6.50E-03	590	3.12E-02	695	5.70E-03
385	1.14E-04	490	7.40E-03	595	3.20E-02	700	4.87E-03
390	9.40E-05	495	8.75E-03	600	3.25E-02	705	4.15E-03
395	1.07E-04	500	1.05E-02	605	3.25E-02	710	3.55E-03
400	9.71E-05	505	1.22E-02	610	3.21E-02	715	3.03E-03
405	1.12E-04	510	1.37E-02	615	3.13E-02	720	2.60E-03
410	1.62E-04	515	1.50E-02	620	3.00E-02	725	2.22E-03
415	2.85E-04	520	1.61E-02	625	2.85E-02	730	1.89E-03
420	4.84E-04	525	1.68E-02	630	2.68E-02	735	1.59E-03
425	9.36E-04	530	1.75E-02	635	2.50E-02	740	1.36E-03
430	1.69E-03	535	1.82E-02	640	2.29E-02	745	1.16E-03
435	3.05E-03	540	1.88E-02	645	2.10E-02	750	9.80E-04
440	5.24E-03	545	1.96E-02	650	1.89E-02	755	8.43E-04
445	9.31E-03	550	2.06E-02	655	1.69E-02	760	7.18E-04
450	1.55E-02	555	2.16E-02	660	1.51E-02	765	6.15E-04
455	1.83E-02	560	2.28E-02	665	1.33E-02	770	5.24E-04
460	1.39E-02	565	2.42E-02	670	1.17E-02	775	4.52E-04
465	1.04E-02	570	2.56E-02	675	1.02E-02	780	3.81E-04
470	8.97E-03	575	2.72E-02	680	8.89E-03		
475	7.21E-03	580	2.87E-02	685	7.66E-03		
480	6.18E-03	585	3.01E-02	690	6.64E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4352, 0.4090)

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

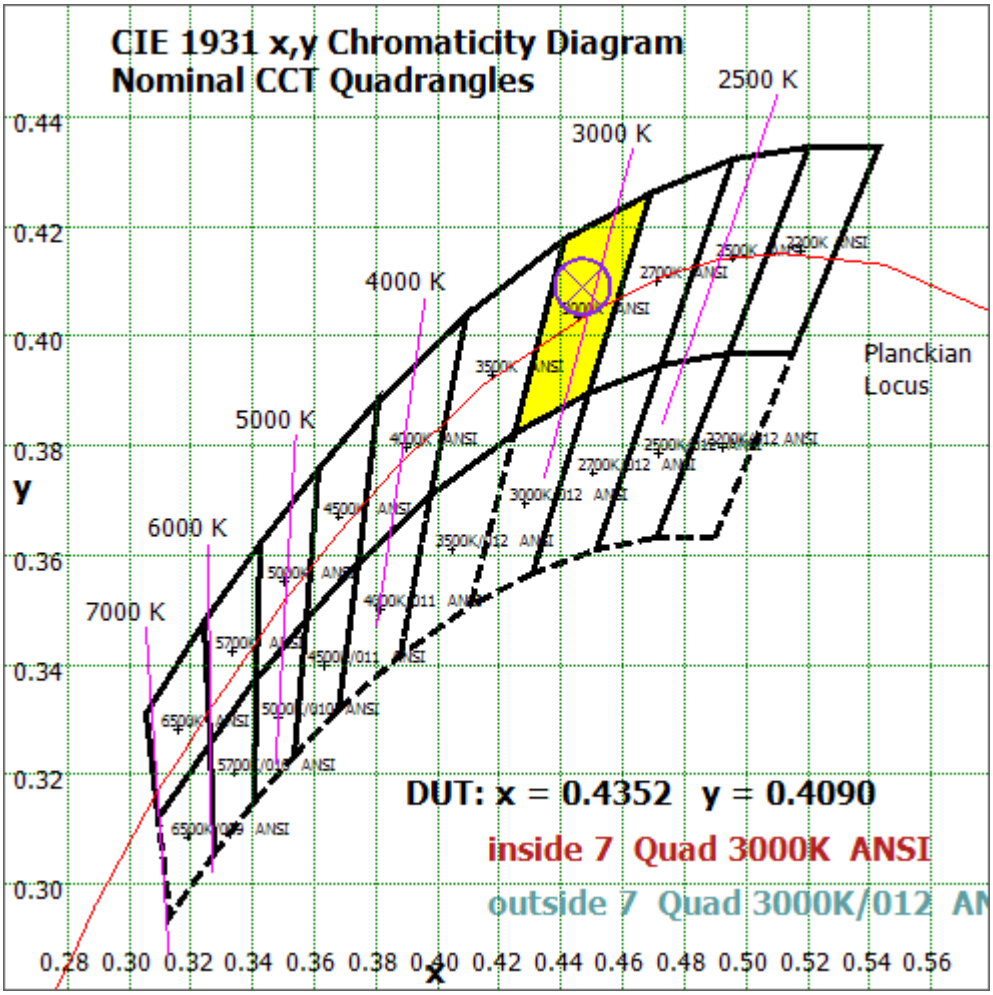


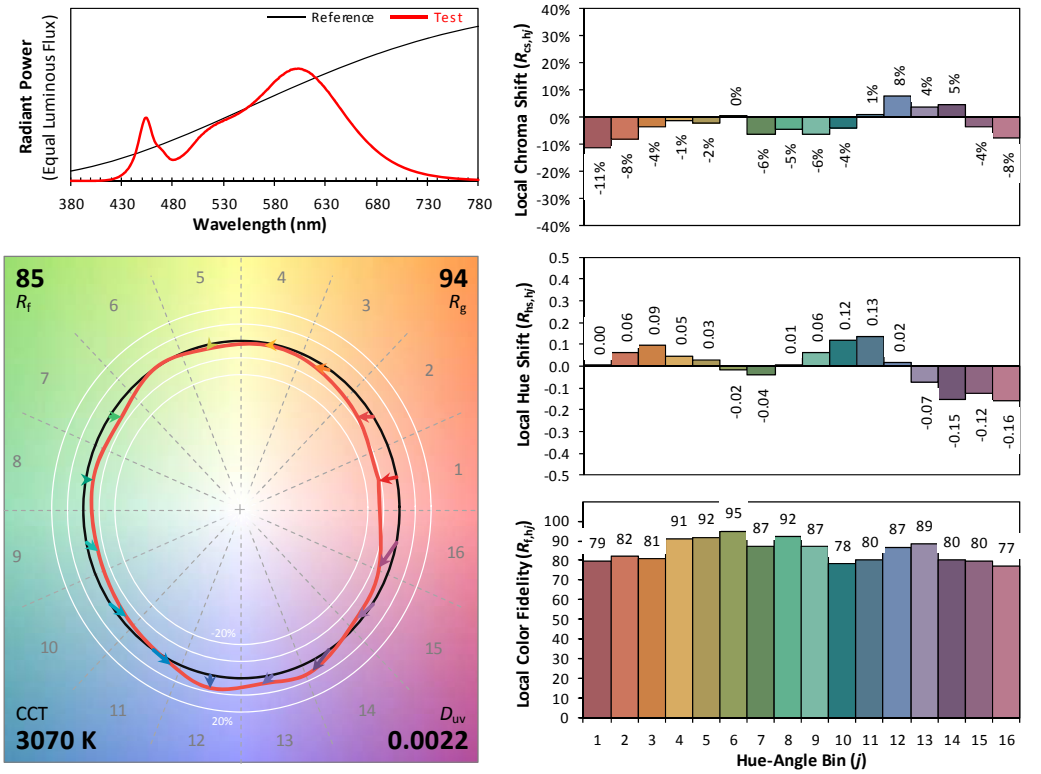
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** RAB Lighting Inc

Date: 2022/05/25 **Model:** T10370(T8-12-48G-8CCT-HYB) 3000K (TYPE B)



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.4352	CIE 13.3-1995 (CRI)
	y	0.4090	
	u'	0.2473	R_a 83
	v'	0.5231	R_9 7

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

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

Goniophotometer Method

Test ambient temperature was 25.1°C.

The photometric distance is 30 m.

Luminous data was taken at 0.5°vertical intervals and 10°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.097
Power Factor	0.9725
Power (W)	11.36
Luminous Efficacy (lm/W)	142.0
Total Luminous Flux (lm)	1613.5
Beam Angle (°)	109.4 (0^o-180^o) / 179.7 (90^o-270^o)
Center Beam Candle Power (cd)	311
Maximum Beam Candle Power (cd)	311.1 (At: C=250.0, Gamma=1.0)
Spacing Criteria	1.25 (0^o-180^o) / 1.39 (90^o-270^o)
Zonal Lumens in the 0°-60°Zone	47.49%
Zonal Lumens in the 60°-90°Zone	26.42%
Zonal Lumens in the 90°-120°Zone	15.46%
Zonal Lumens in the 120°-180°Zone	10.63%

Table 4: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	29.476	1.83%
10- 20	85.06	5.27%
20- 30	131.101	8.13%
30- 40	163.127	10.11%
40- 50	178.85	11.08%
50- 60	178.611	11.07%
60- 70	165.086	10.23%
70- 80	142.893	8.86%
80- 90	118.237	7.33%
90-100	98.361	6.10%
100-110	82.485	5.11%
110-120	68.668	4.26%
120-130	56.167	3.48%
130-140	44.207	2.74%
140-150	32.075	1.99%
150-160	21.233	1.32%
160-170	13.325	0.83%
170-180	4.575	0.28%
Total	1613.5	100%

γ(°)	Lumens	% Total
0- 60	766.225	47.49%
60- 90	426.216	26.42%
0-90	1192.44	73.90%
90- 180	421.096	26.10%
0- 180	1613.5	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

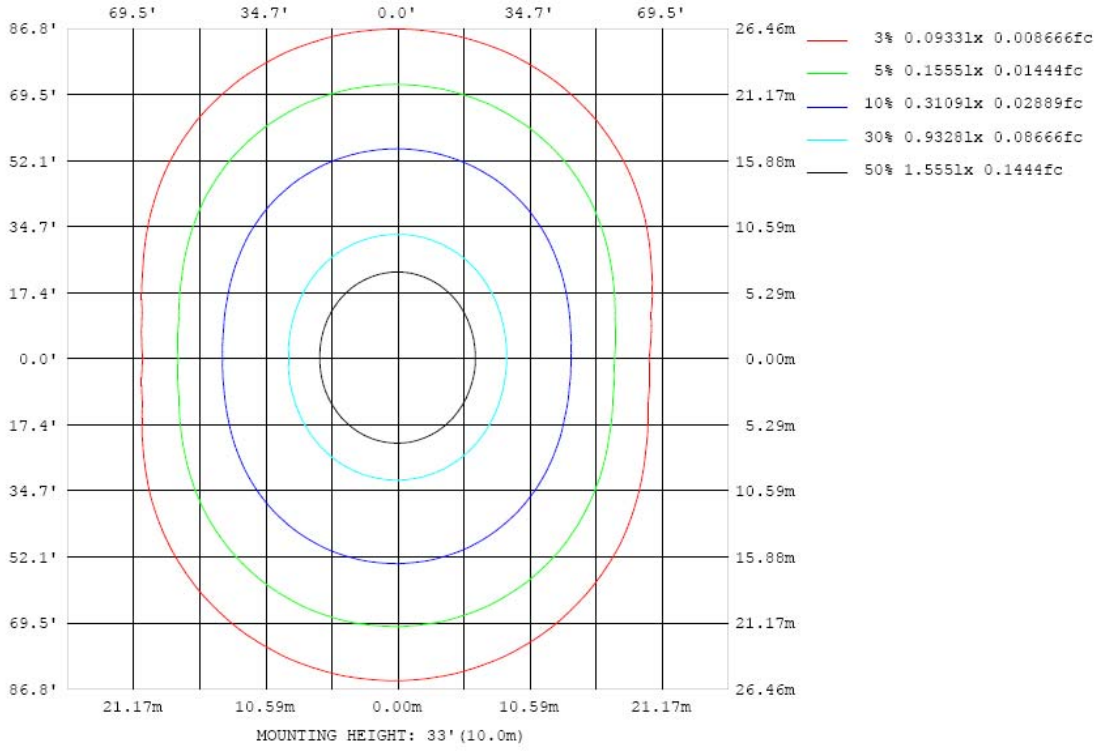


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

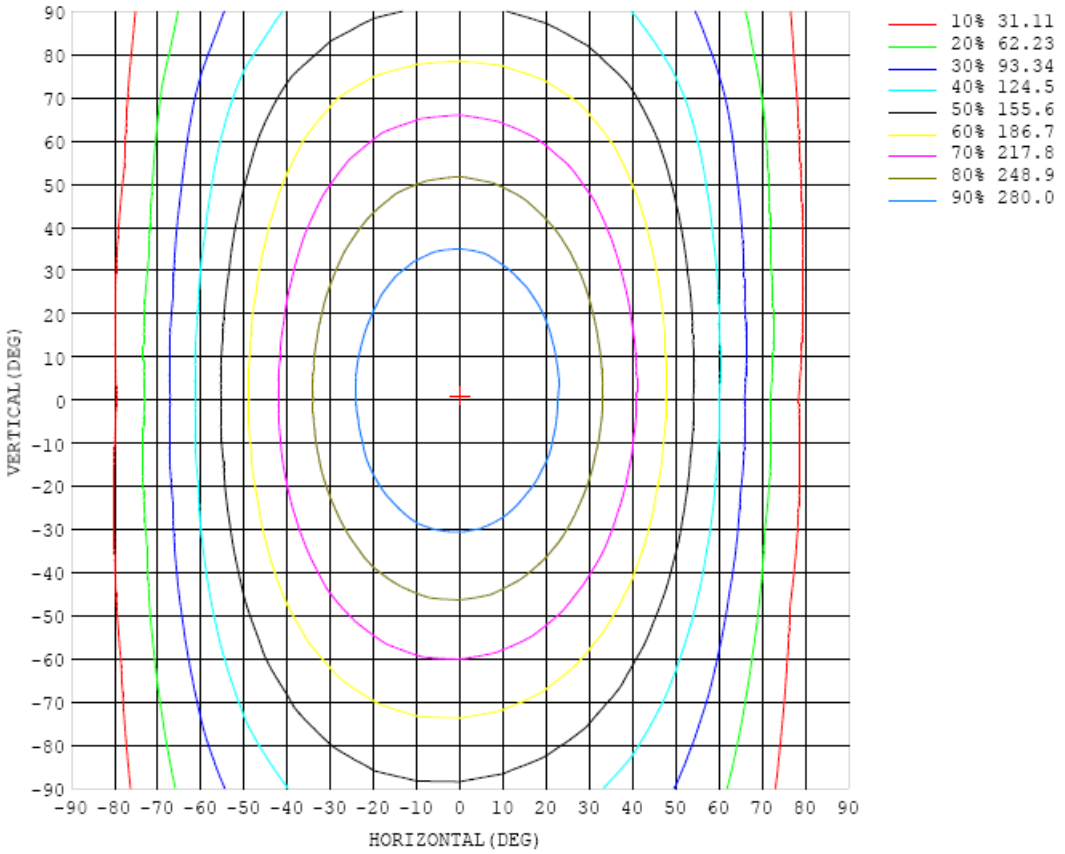


Chart 6: Isocandela Plot

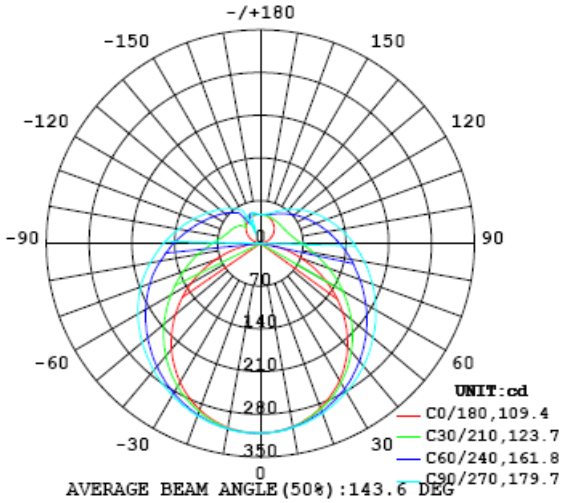


Chart 7: Polar Candela Distribution

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	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311
5	309	309	309	310	309	309	309	309	310	310	310	310	310	310	310	310	310	310	310
10	305	305	305	305	305	306	306	306	306	306	307	307	307	307	306	307	306	306	306
15	297	297	298	298	299	299	301	302	302	303	303	303	302	301	301	300	300	299	299
20	287	287	287	289	290	292	294	295	296	297	297	296	295	294	292	291	290	290	290
25	274	275	276	278	280	283	285	287	289	290	289	288	287	285	283	281	278	278	277
30	259	260	261	264	268	271	275	278	280	281	281	280	278	274	271	268	265	263	262
35	242	242	244	248	254	259	264	268	271	272	272	270	267	263	258	253	249	246	245
40	222	222	226	231	238	246	252	257	261	262	262	260	256	250	243	237	231	228	226
45	200	200	205	213	222	231	239	246	250	252	252	249	244	237	228	220	212	207	205
50	176	177	184	194	206	216	226	234	239	241	240	237	231	223	213	202	191	184	181
55	151	153	162	175	189	201	213	221	227	229	229	225	218	209	197	183	170	160	157
60	125	128	140	156	171	186	199	209	215	218	218	214	206	195	181	165	149	136	131
65	98.0	103	118	137	155	172	186	197	203	206	206	202	193	181	166	148	128	111	104
70	71.7	77.6	96.2	119	140	158	173	184	192	195	195	190	181	168	152	131	108	86.7	77.7
75	47.1	54.4	76.8	102	126	146	161	173	180	184	183	179	169	156	138	115	88.9	64.4	52.6
80	24.5	34.2	60.3	88.2	113	134	151	162	169	173	172	168	159	145	126	101	72.5	45.0	28.9
85	7.48	19.7	47.8	76.6	102	123	140	152	158	162	162	157	149	134	115	89.4	59.5	29.4	9.76
90	0.69	12.5	39.5	67.6	92.4	113	130	142	149	153	153	148	139	124	104	79.6	50.1	19.9	0.70
95	2.01	10.9	34.7	60.6	84.3	104	120	132	139	143	143	138	129	115	95.7	72.0	44.0	16.5	1.97
100	4.61	11.6	32.1	55.4	77.5	96.6	112	123	130	134	133	129	120	106	88.1	65.7	40.2	16.3	4.98
105	8.22	13.9	31.0	51.8	71.9	89.7	104	115	121	125	124	120	112	98.5	81.5	60.9	38.2	17.9	8.46
110	12.6	16.9	30.9	49.1	67.2	83.3	96.6	107	113	116	116	112	104	91.6	75.7	57.2	37.3	20.3	12.5
115	16.7	19.9	31.6	47.1	63.3	77.9	90.0	99.2	105	108	108	104	96.3	85.2	70.8	54.3	37.3	23.2	17.4
120	21.0	23.0	32.8	45.8	59.9	72.9	83.8	92.2	97.5	100	99.8	96.3	89.3	79.4	66.6	52.1	37.8	25.8	22.0
125	25.3	26.5	34.3	45.0	57.1	68.4	78.1	85.6	90.5	92.8	92.5	89.2	83.0	74.1	62.9	50.5	38.7	29.0	26.1
130	28.9	29.7	35.5	44.6	54.6	64.3	72.8	79.5	83.7	85.8	85.4	82.4	77.0	69.2	59.7	49.3	39.4	31.9	29.6
135	31.9	33.0	37.3	44.6	52.5	60.7	67.9	73.6	77.3	79.1	78.7	76.1	71.5	64.9	56.8	48.5	40.4	35.2	33.1
140	35.4	35.9	38.6	44.5	51.0	57.5	63.4	68.1	71.3	72.8	72.5	70.4	66.4	61.0	54.5	47.9	41.6	37.6	36.1
145	38.1	38.5	40.5	44.8	49.9	54.8	59.4	63.2	65.7	66.9	66.7	65.0	61.9	57.5	52.6	47.3	43.1	39.9	39.3
150	40.3	40.5	42.1	44.9	49.0	52.7	56.1	58.9	60.8	61.7	61.6	60.2	57.9	54.7	50.8	47.2	44.3	41.8	41.4
155	42.6	42.6	43.6	45.6	47.9	50.9	53.3	55.3	56.7	57.5	57.3	56.3	54.3	52.1	49.5	47.2	45.1	43.6	43.6
160	44.4	44.4	45.0	46.3	47.8	49.0	50.7	52.3	53.3	53.8	53.6	52.8	51.6	49.9	48.7	47.3	45.8	44.9	45.3
165	46.1	45.9	46.1	46.7	47.6	48.5	49.2	49.8	50.2	50.4	50.4	50.2	49.8	49.1	48.2	47.3	46.4	46.2	46.6
170	47.2	47.1	46.8	47.0	47.3	47.6	48.1	48.4	48.7	48.8	48.8	48.6	48.4	48.0	47.6	47.3	46.9	47.3	47.5
175	47.8	47.8	47.6	47.5	47.4	47.3	47.4	47.4	47.5	47.5	47.5	47.4	47.4	47.3	47.3	47.4	47.6	47.7	47.8
180	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8

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	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311		
5	310	310	310	310	310	310	311	311	311	311	311	310	310	310	310	309	309		
10	307	307	307	308	308	308	308	308	308	308	308	308	307	307	306	305	305		
15	300	301	301	302	304	304	305	305	305	305	304	303	302	300	300	299	298		
20	291	292	293	295	297	299	300	301	301	300	299	297	295	293	291	289	288		
25	279	281	283	286	289	292	293	295	295	294	292	290	287	284	280	277	275		
30	264	267	271	275	279	284	286	287	288	287	284	281	277	272	268	263	260		
35	247	251	257	263	268	274	277	280	280	279	276	271	266	260	253	247	243		
40	228	234	241	249	257	263	268	271	271	270	266	261	254	245	237	229	224		
45	207	214	224	234	244	252	258	261	262	260	256	249	241	230	219	210	203		
50	185	193	206	219	231	240	248	251	252	250	245	238	228	215	201	189	180		
55	161	172	187	203	217	229	237	241	242	240	234	225	214	199	183	168	157		
60	136	151	169	188	204	217	225	230	232	229	223	213	200	184	165	147	132		
65	111	129	151	172	191	204	214	219	220	217	211	201	187	169	148	126	108		
70	86.3	108	134	158	177	192	202	207	208	206	199	189	174	155	132	107	83.7		
75	62.2	88.9	118	144	165	179	189	195	196	194	187	176	161	141	117	88.9	61.7		
80	40.8	72.8	104	130	151	166	176	181	183	180	174	163	148	128	103	74.5	42.9		
85	24.9	58.5	89.3	116	138	153	163	169	170	168	161	150	135	115	89.7	60.7	29.6		
90	15.7	47.6	78.8	106	127	142	152	157	158	156	149	139	124	104	79.9	51.2	20.7		
95	13.0	40.5	70.0	95.2	116	131	141	146	147	144	138	128	113	94.5	71.3	44.1	17.4		
100	13.1	37.3	62.8	86.5	106	120	130	135	136	134	127	118	104	86.4	64.3	40.4	16.2		
105	14.7	36.0	58.1	79.2	97.4	111	120	125	126	124	118	109	95.9	78.9	59.2	38.3	17.0		
110	15.9	35.4	55.2	73.5	90.0	103	111	116	117	115	109	100	87.8	72.9	55.9	37.2	18.3		
115	18.6	34.5	53.1	69.2	83.5	95.1	103	107	108	106	101	92.6	81.8	68.8	53.8	35.5	20.5		
120	23.4	32.9	50.4	65.9	78.1	88.5	95.5	99.2	100.0	98.1	93.8	86.5	77.0	65.4	52.2	33.5	23.1		
125	28.5	30.0	47.8	62.0	73.4	82.4	88.7	92.3	93.1	91.5	87.5	81.0	72.7	62.1	50.5	30.8	26.9		
130	32.8	31.2	45.1	58.6	69.1	77.0	82.6	85.8	86.6	85.2	81.9	76.2	68.9	58.4	45.0	29.7	31.1		
135	36.1	37.5	39.8	55.8	63.4	70.8	76.4	80.0	80.6	79.5	76.3	69.3	62.3	55.6	36.4	33.2	34.1		
140	38.4	42.3	36.9	51.7	59.6	65.3	70.6	74.1	75.0	74.4	67.6	60.0	58.9	48.5	32.0	39.4	36.1		
145	40.7	44.6	46.0	37.3	51.2	60.2	65.4	68.4	69.0	57.7	50.5	47.8	47.9	31.0	41.3	41.6	38.4		
150	42.7	45.3	48.6	45.6	36.9	41.2	46.0	56.3	63.4	43.3	42.7	35.8	28.9	34.5	43.8	42.1	39.1		
155	44.4	46.3	48.7	50.4	46.7	36.1	38.1	46.7	19.3	44.1	35.2	28.0	31.7	38.7	43.8	42.6	42.3		
160	45.6	46.7	48.3	49.9	51.6	51.5	48.9	45.1	24.3	38.0	35.5	34.8	34.7	39.2	41.1	41.7	44.7		
165	46.8	47.2	48.2	49.2	50.2	51.1	52.3	52.7	52.8	39.1	33.8	35.0	38.6	40.3	46.9	46.9	46.3		
170	47.6	47.7	48.0	48.5	48.9	49.3	49.8	50.1	50.1	50.2	50.0	49.6	49.0	48.7	47.8	47.2	47.1		
175	47.9	47.8	47.8	47.8	47.9	48.0	48.1	48.3	48.3	48.3	48.2	48.1	47.9	47.9	47.9	47.8	47.8		
180	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8	47.8		

Table 7: Luminous Intensity Data

TEST RESULTS of Model T10370(T8-12-48G-8CCT-HYB) 3000K (TYPE A)

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)	0.216	0.099
Power Factor	0.9936	0.9497
Test Power (W)/2	12.88	12.99
THD A%	10.11	12.53
Luminous Efficacy (lm/W)	121.3	120.2
Total Luminous Flux (lm)	1562.7	1561.1
Color Rendering Index (CRI)	82.8	
R9	7	
Correlated Color Temperature (CCT)(K)	3069	
Chromaticity Chroma x	0.4349	
Chromaticity Chroma y	0.4086	
Chromaticity Chroma u	0.2473	
Chromaticity Chroma v	0.3486	
Duv	0.0021	
Chromaticity Chroma u ’	0.2473	
Chromaticity Chroma v’	0.5229	

Special Color Rendering Indices	
R1	81
R2	90.7
R3	97
R4	80.7
R5	80.8
R6	88.6
R7	83.7
R8	59.6
R9	7
R10	78.6
R11	80.1
R12	66.7
R13	83.3
R14	98.9

Table 8: Test data per Sphere-Spectroradiometer Method

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

Spectral Power Distribution - Sphere Spectroradiometer Method

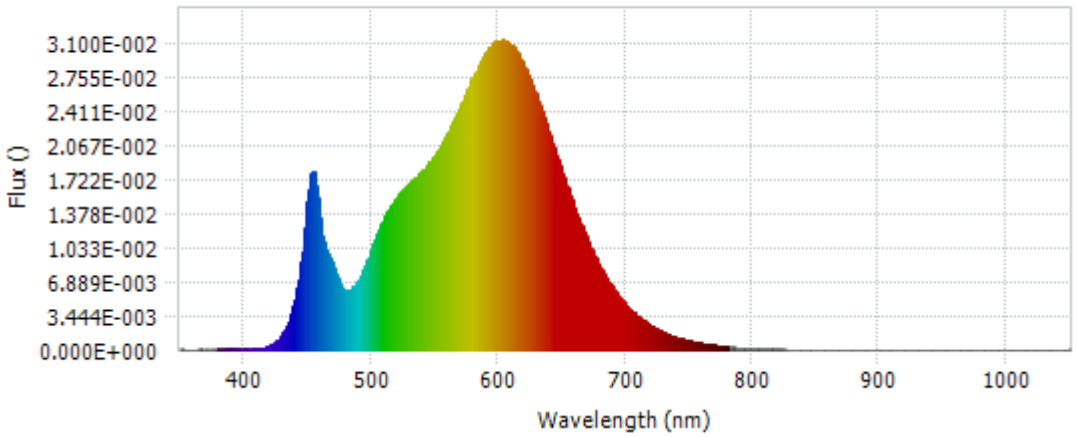
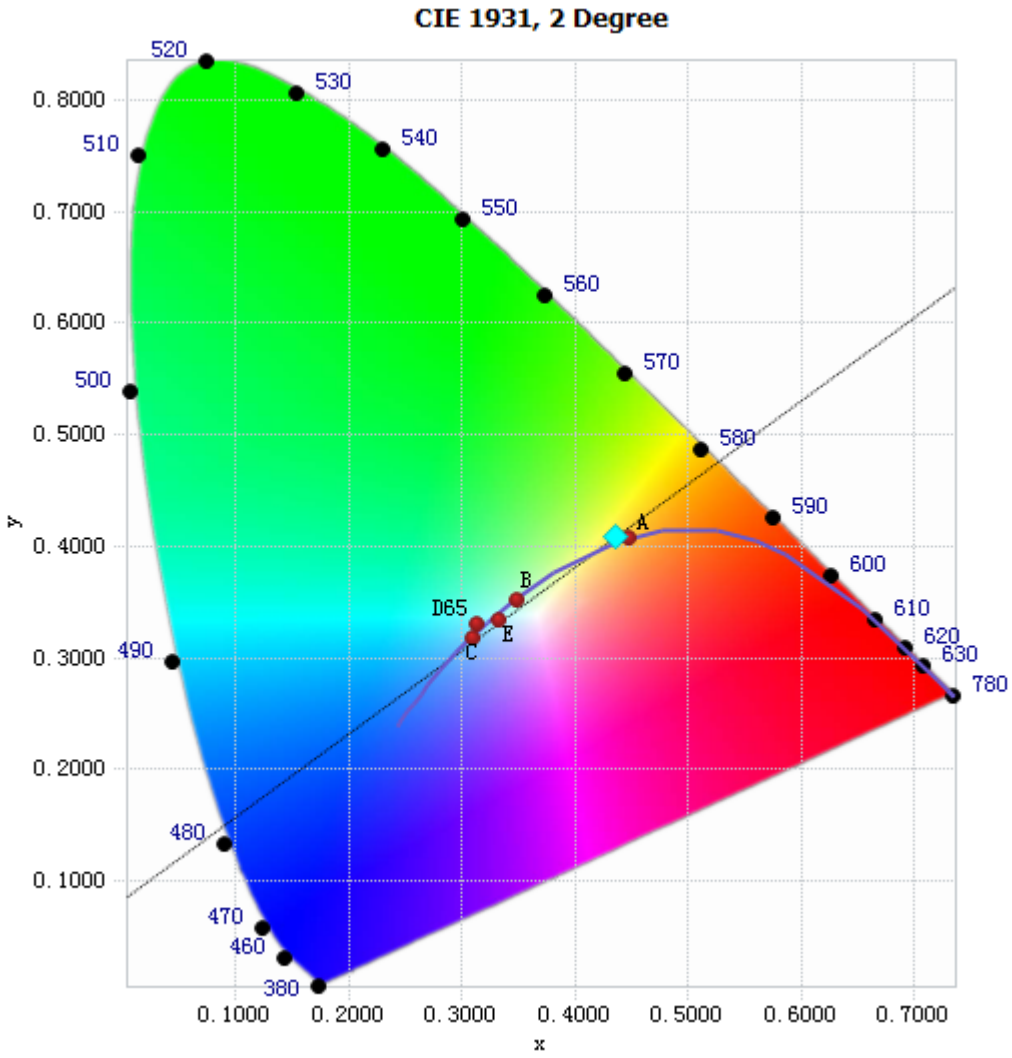


Chart 8: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.14E-04	485	6.25E-03	590	2.99E-02	695	5.47E-03
385	9.51E-05	490	7.12E-03	595	3.07E-02	700	4.68E-03
390	1.02E-04	495	8.43E-03	600	3.12E-02	705	4.01E-03
395	9.28E-05	500	1.01E-02	605	3.12E-02	710	3.43E-03
400	9.73E-05	505	1.17E-02	610	3.08E-02	715	2.93E-03
405	8.81E-05	510	1.32E-02	615	3.00E-02	720	2.49E-03
410	1.48E-04	515	1.45E-02	620	2.89E-02	725	2.14E-03
415	2.56E-04	520	1.54E-02	625	2.74E-02	730	1.81E-03
420	4.67E-04	525	1.61E-02	630	2.58E-02	735	1.53E-03
425	8.61E-04	530	1.68E-02	635	2.40E-02	740	1.30E-03
430	1.60E-03	535	1.74E-02	640	2.21E-02	745	1.11E-03
435	2.83E-03	540	1.81E-02	645	2.01E-02	750	9.42E-04
440	5.01E-03	545	1.88E-02	650	1.82E-02	755	8.07E-04
445	8.85E-03	550	1.97E-02	655	1.63E-02	760	6.89E-04
450	1.50E-02	555	2.07E-02	660	1.45E-02	765	5.86E-04
455	1.80E-02	560	2.18E-02	665	1.28E-02	770	5.03E-04
460	1.34E-02	565	2.32E-02	670	1.12E-02	775	4.24E-04
465	1.01E-02	570	2.46E-02	675	9.84E-03	780	3.67E-04
470	8.70E-03	575	2.60E-02	680	8.56E-03		
475	6.89E-03	580	2.75E-02	685	7.38E-03		
480	5.92E-03	585	2.88E-02	690	6.39E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4349, 0.4086)

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

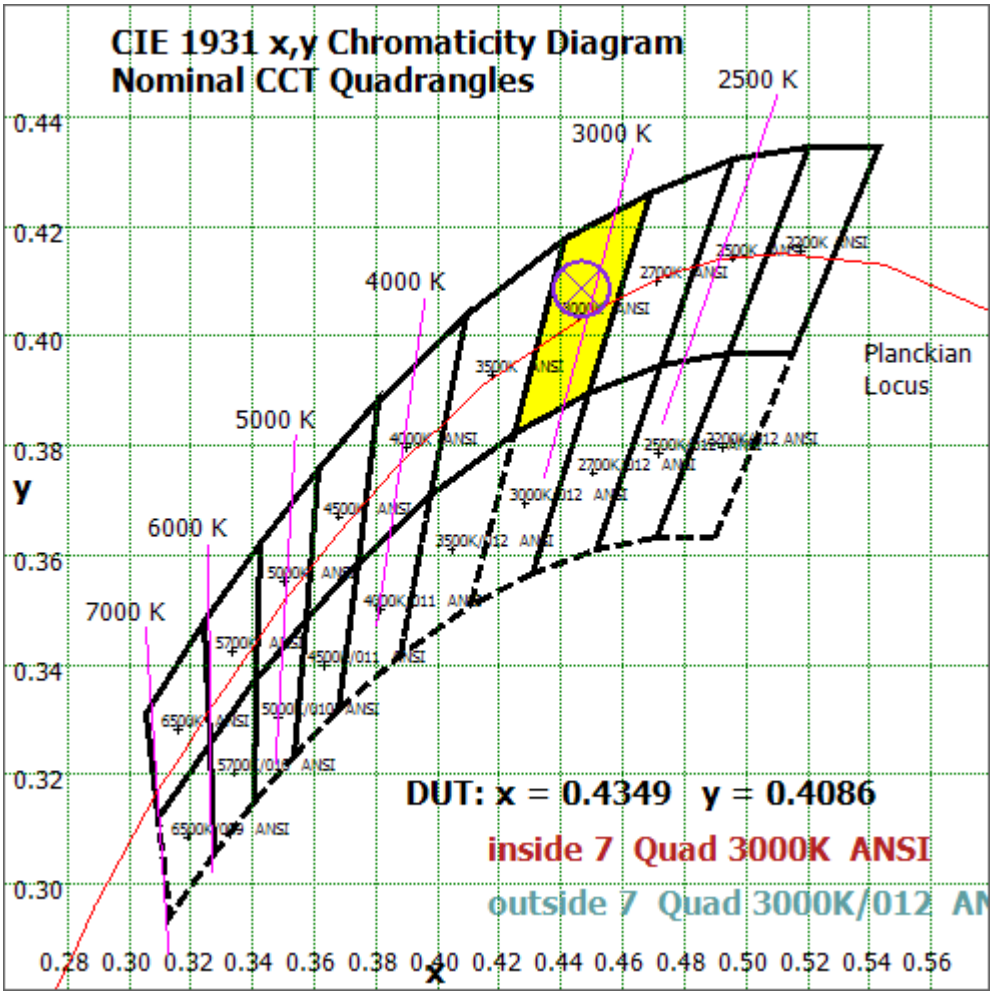


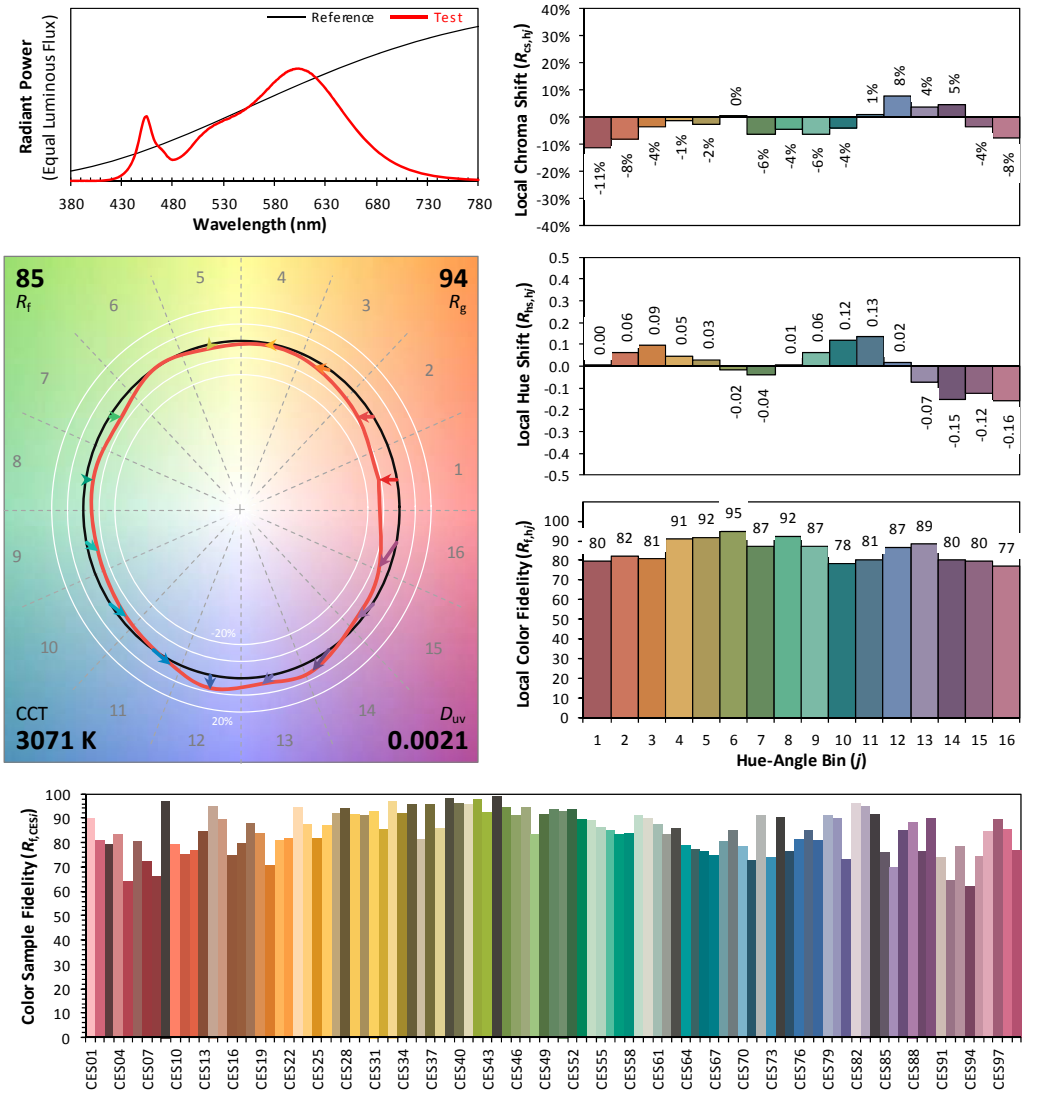
Chart 10: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** RAB Lighting Inc

Date: 2022/05/25 **Model:** T10370(T8-12-48G-8CCT-HYB) 3000K (TYPE A)



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.4349	CIE 13.3-1995 (CRI)
	y	0.4086	
	u'	0.2473	R_a 83
	v'	0.5229	R_9 7

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.

Goniophotometer Method

Test ambient temperature was 24.9°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)	0.217
Power Factor	0.9938
Power (W)/2	12.91
Luminous Efficacy (lm/W)	119.6
Total Luminous Flux (lm)	1544.5
Beam Angle (°)	109.1 (0^o-180^o) / 180.8 (90^o-270^o)
Center Beam Candle Power (cd)	297
Maximum Beam Candle Power (cd)	297.5 (At: C=250.0, Gamma=3.0)
Spacing Criteria	1.26 (0^o-180^o) / 1.41 (90^o-270^o)
Zonal Lumens in the 0°-60°Zone	47.38%
Zonal Lumens in the 60°-90°Zone	26.48%
Zonal Lumens in the 90°-120°Zone	15.56%
Zonal Lumens in the 120°-180°Zone	10.58%

Table 10: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	28.155	1.82%
10- 20	81.23	5.26%
20- 30	125.211	8.11%
30- 40	155.785	10.09%
40- 50	170.807	11.06%
50- 60	170.574	11.04%
60- 70	157.789	10.22%
70- 80	136.967	8.87%
80- 90	114.25	7.40%
90-100	94.994	6.15%
100-110	79.496	5.15%
110-120	65.854	4.26%
120-130	53.557	3.47%
130-140	42.257	2.74%
140-150	31.501	2.04%
150-160	20.743	1.34%
160-170	11.37	0.74%
170-180	3.959	0.26%
Total	1544.5	100%

γ(°)	Lumens	% Total
0- 60	731.762	47.38%
60- 90	409.006	26.48%
0-90	1140.77	73.86%
90- 180	403.731	26.14%
0- 180	1544.5	100%

Table 11: Zonal Lumen

Illuminance Plots- Goniophotometer Method

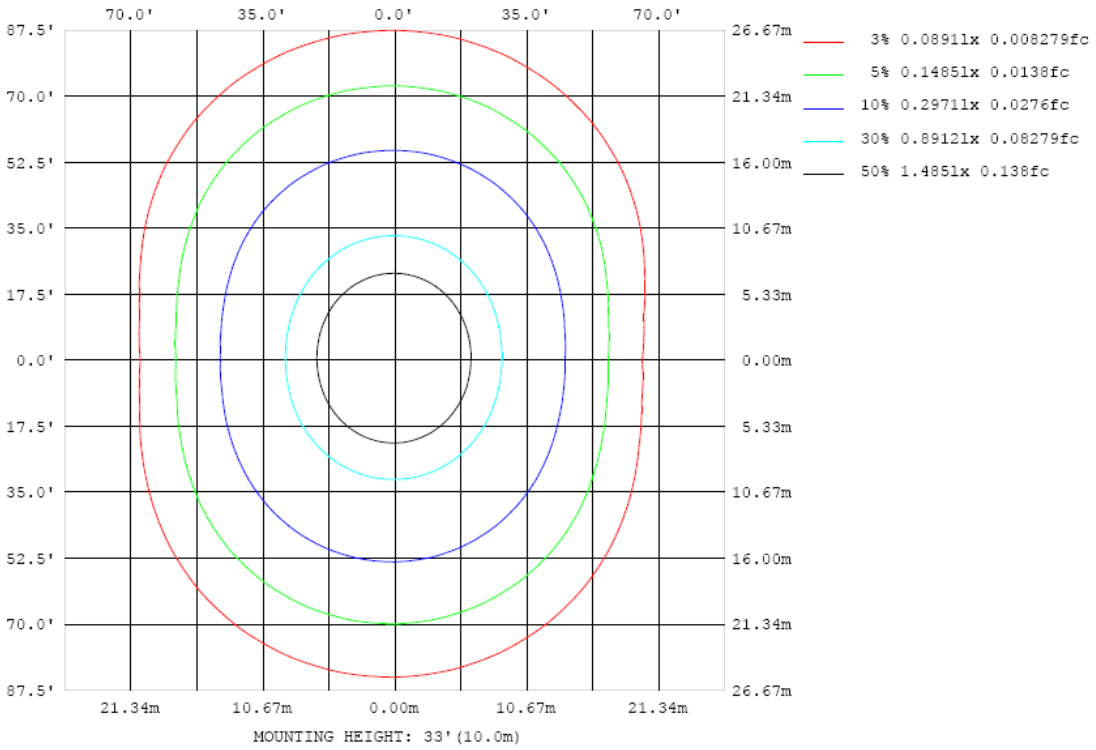


Chart 12: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

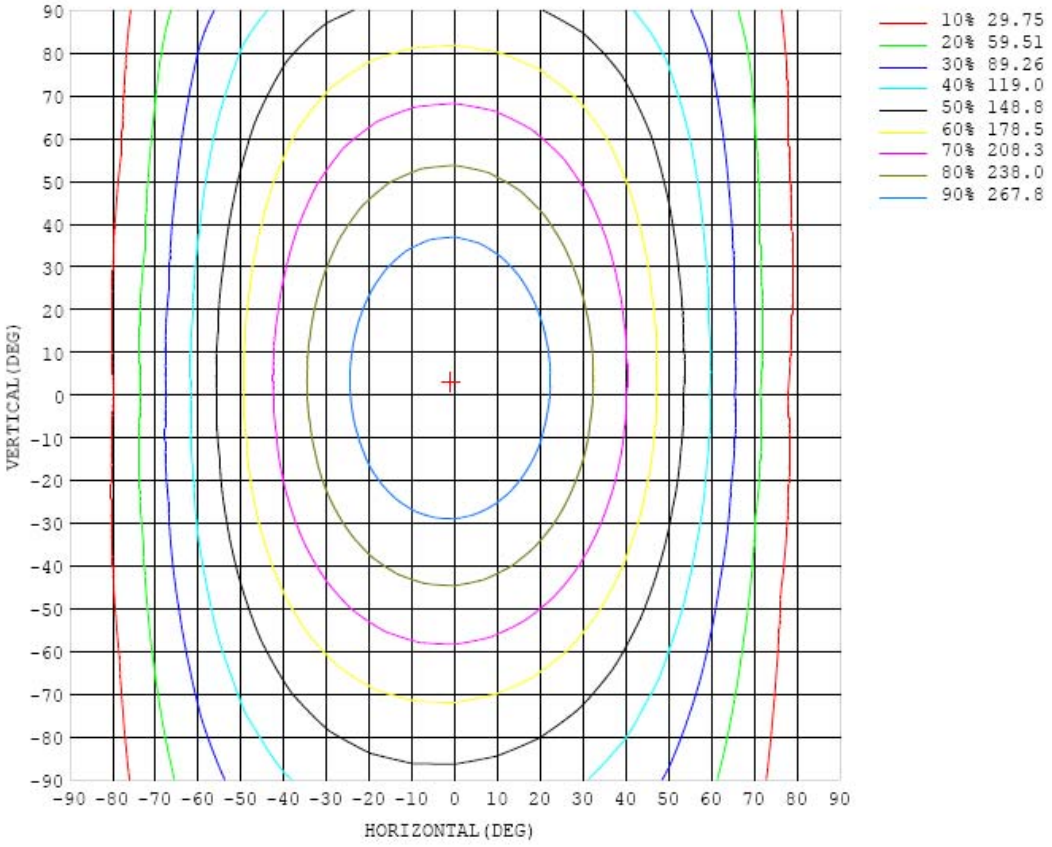


Chart 13: Isocandela Plot

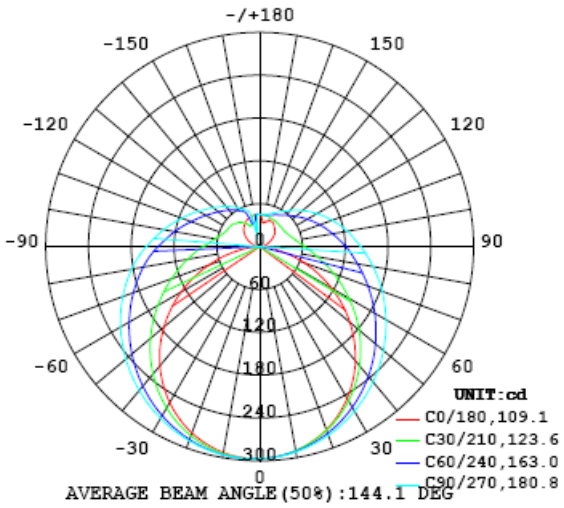


Chart 14: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297
5	295	295	295	295	295	295	295	295	295	295	295	295	296	296	296	296	296	296	296
10	290	290	290	290	290	291	291	291	292	292	292	292	292	292	292	292	292	293	293
15	283	283	283	283	284	285	285	286	287	287	287	288	287	287	286	286	286	286	287
20	273	273	273	274	275	277	278	280	281	281	281	281	281	280	279	278	277	277	278
25	260	260	261	263	265	267	270	272	273	274	274	274	273	271	270	268	266	266	266
30	245	245	247	249	253	256	260	263	265	266	266	265	264	261	258	256	253	252	252
35	228	228	231	234	239	244	249	253	256	257	257	256	253	250	246	242	238	236	236
40	209	210	213	218	224	231	237	242	246	247	247	246	242	238	232	227	222	218	218
45	188	189	193	200	209	217	225	231	235	237	237	235	231	225	217	210	203	198	197
50	165	167	173	182	193	203	212	219	224	227	226	224	219	211	202	193	184	177	175
55	141	144	152	163	176	189	199	207	213	216	215	212	206	198	187	175	164	155	152
60	117	121	131	145	160	174	186	195	202	205	204	201	194	184	172	157	143	132	127
65	91.4	96.3	110	127	145	161	174	184	190	194	193	190	182	171	157	140	124	109	102
70	66.4	72.4	89.4	111	130	148	162	172	179	183	182	179	171	159	143	124	104	85.5	76.4
75	42.5	50.2	71.2	95.3	118	136	150	161	168	172	172	168	160	147	130	109	85.4	63.3	52.5
80	21.2	31.3	56.0	82.3	106	125	139	150	158	162	161	157	149	136	119	95.9	69.4	43.7	29.0
85	5.69	17.9	44.5	71.6	95.3	115	130	140	148	151	151	147	139	126	108	84.4	56.6	28.0	10.1
90	0.64	11.7	36.9	63.1	86.3	106	121	131	138	142	142	137	130	117	98.1	74.8	47.2	18.6	0.75
95	2.03	10.1	32.3	56.6	78.7	97.3	112	123	130	133	132	129	121	108	89.6	67.1	40.9	14.9	1.51
100	4.54	10.7	29.7	51.7	72.4	89.9	104	114	121	125	124	120	112	99.4	82.2	61.0	37.0	14.3	4.01
105	7.95	12.8	28.2	47.9	66.9	83.4	96.6	107	113	116	116	112	104	91.9	75.8	56.1	34.6	15.6	7.38
110	11.4	15.7	27.9	45.0	62.1	77.3	89.7	99.0	105	108	108	104	96.4	85.1	70.1	52.2	33.4	17.8	11.1
115	15.2	18.8	28.6	42.9	58.0	71.7	83.1	91.8	97.6	100	99.9	96.2	89.1	78.6	65.0	49.2	33.3	20.6	15.3
120	19.0	21.9	29.9	41.4	54.5	66.7	77.0	84.9	90.2	92.7	92.2	88.8	82.3	72.8	60.7	47.0	33.8	23.9	19.8
125	23.1	25.3	31.4	40.7	51.6	62.2	71.3	78.4	83.2	85.4	84.9	81.8	75.9	67.5	56.9	45.4	34.6	26.8	24.0
130	27.4	27.8	33.2	40.6	49.3	58.2	66.2	72.4	76.6	78.5	78.1	75.2	70.1	62.8	53.9	44.6	36.0	29.5	28.0
135	30.4	30.9	34.9	40.8	47.8	54.8	61.4	66.7	70.4	72.0	71.6	69.1	64.7	58.6	51.6	44.1	37.2	32.6	31.7
140	32.8	33.2	36.6	41.2	46.5	52.2	57.4	61.6	64.6	66.0	65.6	63.6	60.1	55.3	49.6	44.0	38.5	35.4	34.6
145	35.3	35.8	37.8	41.6	45.8	50.1	54.0	57.5	59.8	60.8	60.5	59.0	56.2	52.5	48.4	43.8	39.6	37.7	37.4
150	38.1	37.4	39.6	42.0	45.2	48.4	51.4	53.8	55.5	56.3	56.1	54.9	53.0	50.4	47.2	43.8	41.1	40.0	39.6
155	39.1	39.0	40.9	42.5	44.7	46.9	49.1	51.0	52.2	52.8	52.7	51.8	50.4	48.4	46.2	43.9	42.4	41.8	41.6
160	40.2	39.0	42.1	42.9	44.1	45.8	47.2	48.4	49.3	49.7	49.6	49.0	48.0	46.8	45.4	44.2	43.7	43.2	42.9
165	36.6	39.4	43.2	44.0	44.2	44.7	45.6	46.4	46.9	47.2	47.2	46.8	46.3	45.6	45.1	44.9	44.8	44.4	44.2
170	34.3	38.1	42.7	44.4	44.6	44.9	45.3	45.5	45.6	45.6	45.7	45.7	45.7	45.5	45.4	45.4	45.3	45.1	45.1
175	38.5	41.7	44.0	44.9	45.1	45.0	45.1	45.2	45.3	45.3	45.4	45.4	45.4	45.4	45.4	45.4	45.4	45.3	45.4
180	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3

Table 12: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297	297		
5	296	297	297	297	297	297	297	297	297	297	297	297	296	296	296	296	295		
10	293	294	294	295	295	296	296	296	296	296	295	295	294	293	292	291	291		
15	287	288	289	290	292	292	293	293	293	293	292	291	289	288	286	285	284		
20	279	280	282	284	286	288	289	289	289	289	287	285	283	280	278	276	274		
25	268	270	272	275	279	281	283	284	284	283	281	278	275	271	267	264	262		
30	254	257	261	265	270	273	276	278	278	277	274	270	265	260	255	251	247		
35	238	242	248	254	260	265	268	270	271	269	266	261	255	248	241	235	231		
40	220	226	233	241	249	255	260	262	263	261	257	251	243	235	226	218	212		
45	201	207	217	227	237	245	250	254	254	252	247	240	231	220	209	199	191		
50	179	188	200	213	224	234	241	244	245	243	237	229	218	206	192	179	170		
55	157	168	182	198	212	223	230	235	235	233	227	218	205	191	175	159	147		
60	133	147	165	183	199	211	220	224	225	223	216	206	193	176	157	139	123		
65	109	126	148	169	186	200	209	214	215	212	205	195	180	162	141	119	99.7		
70	84.7	106	131	155	174	188	198	203	204	201	194	183	168	148	125	100.0	76.9		
75	61.7	87.7	116	142	162	177	187	192	193	190	183	172	156	136	111	83.3	56.5		
80	41.2	71.5	103	129	150	166	176	181	182	179	172	161	145	124	98.8	69.2	39.0		
85	25.3	59.0	90.8	118	139	155	165	170	171	168	161	150	134	114	88.1	58.8	26.7		
90	16.3	48.2	79.2	106	127	142	152	158	159	156	149	138	123	102	77.4	48.8	19.0		
95	13.1	41.3	70.5	95.7	116	131	141	146	147	145	138	127	112	93.3	69.7	43.0	16.6		
100	13.1	37.2	63.5	87.4	107	121	131	136	137	134	128	118	103	85.1	63.0	39.3	16.1		
105	16.0	35.2	58.0	79.7	97.9	111	120	125	126	124	118	108	94.8	77.9	58.1	37.0	18.1		
110	18.7	35.3	54.3	73.4	90.0	102	111	115	116	114	109	99.7	87.5	71.9	54.1	36.9	20.2		
115	20.9	35.8	52.2	68.4	83.2	94.6	102	107	108	106	100	92.0	80.6	66.8	52.2	37.4	22.2		
120	22.4	36.7	51.0	64.8	77.3	87.4	94.3	98.1	99.1	97.1	92.2	84.8	75.1	63.9	51.3	36.9	23.2		
125	23.3	37.3	50.2	62.1	72.4	81.3	87.4	90.8	91.5	89.8	85.6	79.2	70.8	61.3	50.5	36.3	23.6		
130	24.9	37.4	49.2	59.7	68.3	76.0	81.3	84.2	85.0	83.5	79.9	74.3	67.0	59.1	49.4	37.7	23.9		
135	28.2	36.6	46.0	57.2	64.7	71.2	75.7	78.3	79.0	77.8	74.8	70.0	63.8	56.8	47.3	35.7	25.7		
140	31.9	35.8	44.5	54.4	61.3	66.8	70.6	72.9	73.5	72.5	70.0	66.0	60.8	53.8	44.9	32.9	28.1		
145	36.1	32.2	40.8	51.8	57.5	62.7	65.8	67.8	68.3	67.6	65.5	62.3	56.4	50.6	43.5	29.2	32.2		
150	39.5	32.8	37.2	48.2	54.4	57.8	60.7	62.6	63.2	62.6	60.8	53.6	49.0	43.0	33.3	27.6	38.2		
155	42.0	38.3	31.3	38.3	47.8	54.0	57.0	57.9	57.5	57.6	46.9	42.2	36.6	31.0	25.9	30.9	37.8		
160	43.4	40.9	33.7	31.2	31.7	40.7	49.1	53.4	54.0	36.1	33.0	32.6	26.1	24.7	24.9	29.6	34.6		
165	44.5	44.9	41.0	31.6	30.5	34.6	37.2	41.6	33.9	38.5	36.6	32.0	27.3	24.4	26.4	29.4	32.1		
170	45.3	45.1	44.8	43.4	40.0	36.7	37.9	38.5	17.6	38.5	36.9	33.4	31.7	30.5	31.5	30.6	31.9		
175	45.4	45.6	45.7	45.8	45.9	45.9	46.0	45.6	42.6	33.7	29.6	27.9	28.1	29.1	29.8	32.6	36.0		
180	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3		

Table 13: Luminous Intensity Data

TEST RESULTS of Model T10370(T8-12-48G-8CCT-HYB) 5000K (TYPE A)

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)	0.216	0.099
Power Factor	0.9935	0.9495
Test Power (W)/2	12.87	12.95
THD A%	10.12	13.20
Luminous Efficacy (lm/W)	126.6	125.9
Total Luminous Flux (lm)	1628.6	1630.1
Color Rendering Index (CRI)	85.8	
R9	20.9	
Correlated Color Temperature (CCT)(K)	5176	
Chromaticity Chroma x	0.3404	
Chromaticity Chroma y	0.3496	
Chromaticity Chroma u	0.2090	
Chromaticity Chroma v	0.3220	
Duv	0.0009	
Chromaticity Chroma u ’	0.2090	
Chromaticity Chroma v’	0.4830	

Special Color Rendering Indices	
R1	85.1
R2	92.2
R3	94.7
R4	84.1
R5	84.7
R6	87
R7	87.5
R8	70.7
R9	20.9
R10	80
R11	83.6
R12	61.2
R13	87.7
R14	97.6

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

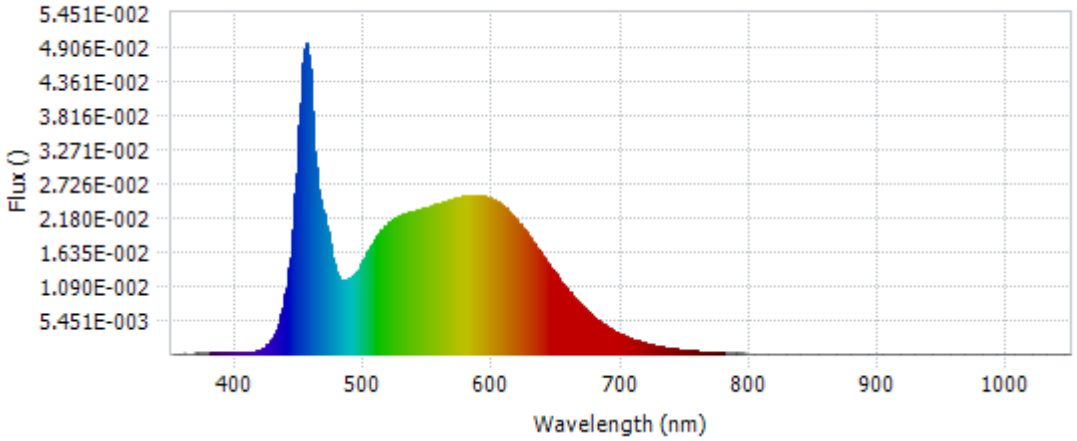
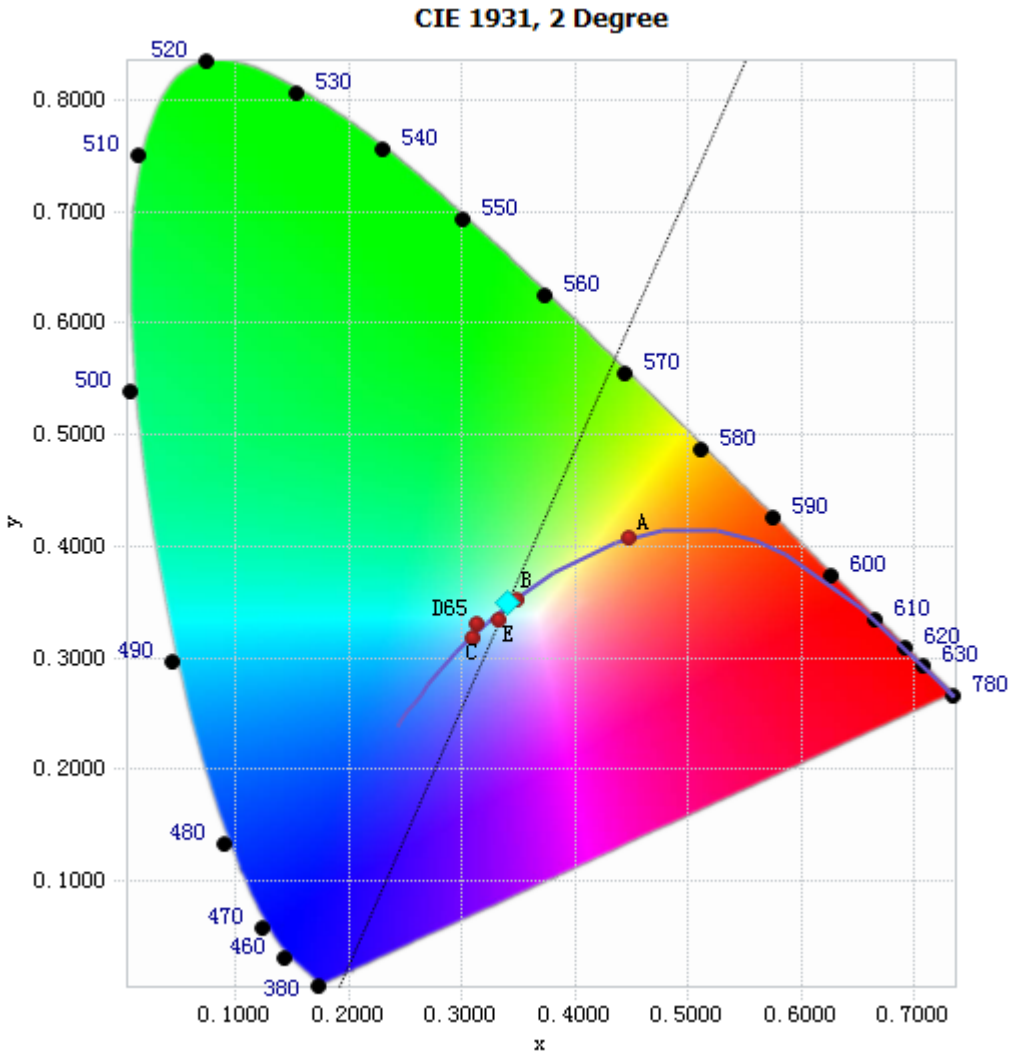


Chart 15: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.88E-04	485	1.18E-02	590	2.53E-02	695	3.68E-03
385	1.71E-04	490	1.24E-02	595	2.51E-02	700	3.15E-03
390	1.84E-04	495	1.36E-02	600	2.47E-02	705	2.69E-03
395	1.90E-04	500	1.55E-02	605	2.41E-02	710	2.30E-03
400	1.71E-04	505	1.74E-02	610	2.33E-02	715	1.97E-03
405	1.77E-04	510	1.91E-02	615	2.22E-02	720	1.68E-03
410	2.42E-04	515	2.03E-02	620	2.10E-02	725	1.44E-03
415	4.51E-04	520	2.13E-02	625	1.97E-02	730	1.24E-03
420	8.16E-04	525	2.18E-02	630	1.83E-02	735	1.05E-03
425	1.66E-03	530	2.24E-02	635	1.68E-02	740	8.91E-04
430	3.26E-03	535	2.26E-02	640	1.54E-02	745	7.65E-04
435	6.43E-03	540	2.29E-02	645	1.39E-02	750	6.51E-04
440	1.21E-02	545	2.33E-02	650	1.25E-02	755	5.56E-04
445	2.24E-02	550	2.35E-02	655	1.11E-02	760	4.76E-04
450	4.01E-02	555	2.39E-02	660	9.84E-03	765	4.06E-04
455	4.96E-02	560	2.41E-02	665	8.67E-03	770	3.52E-04
460	3.56E-02	565	2.45E-02	670	7.59E-03	775	2.98E-04
465	2.48E-02	570	2.49E-02	675	6.62E-03	780	2.55E-04
470	2.07E-02	575	2.51E-02	680	5.75E-03		
475	1.54E-02	580	2.54E-02	685	4.97E-03		
480	1.21E-02	585	2.54E-02	690	4.28E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3404, 0.3496)

Chart 16: 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

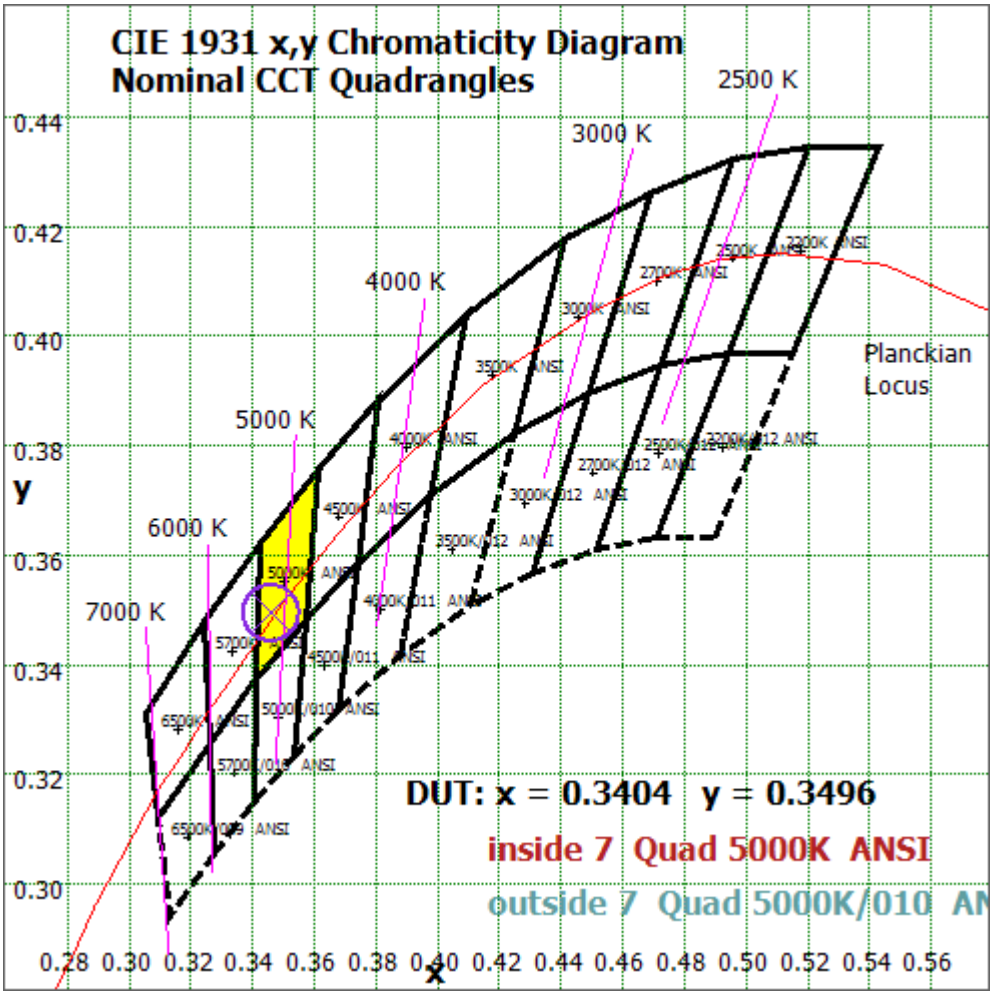


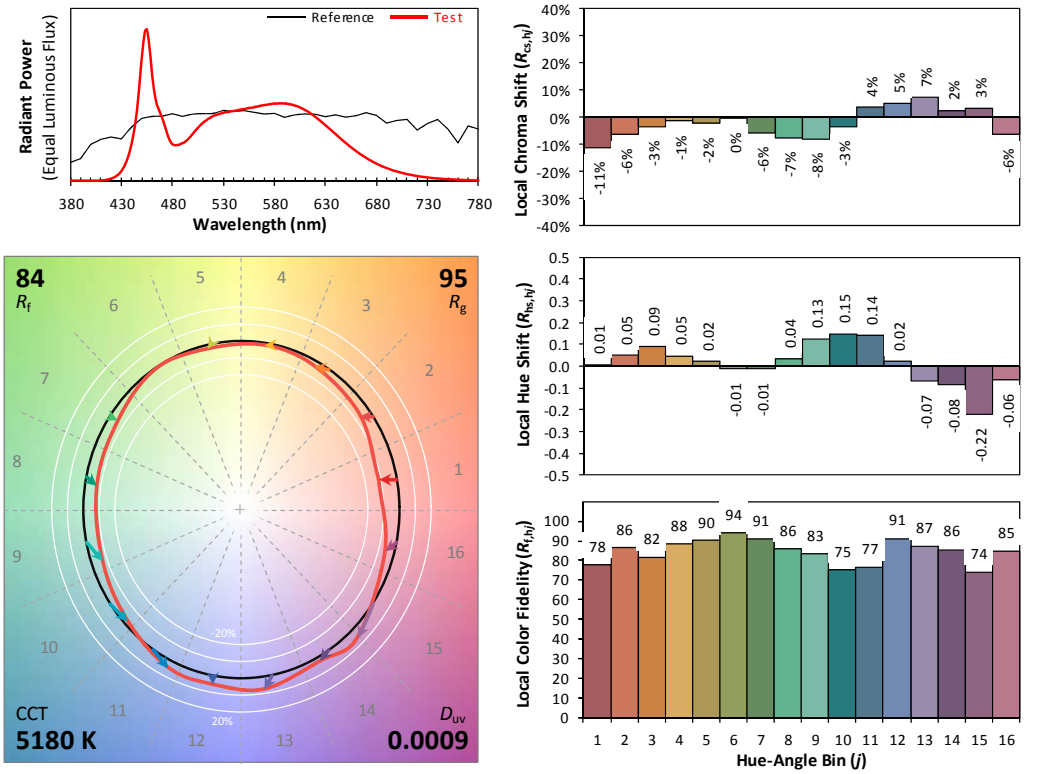
Chart17: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** RAB Lighting Inc

Date: 2022/05/25 **Model:** T10370(T8-12-48G-8CCT-HYB) 5000K (TYPE A)



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.3404	CIE 13.3-1995 (CRI)
	y	0.3496	
	u'	0.2090	R_a 86
	v'	0.4830	R_9 21

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

Chart 18: 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.

Goniophotometer Method

Test ambient temperature was 24.9°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)	0.216
Power Factor	0.9937
Power (W)/2	12.88
Luminous Efficacy (lm/W)	124.7
Total Luminous Flux (lm)	1605.6
Beam Angle (°)	109.9 (0^o-180^o) / 184.4 (90^o-270^o)
Center Beam Candle Power (cd)	304
Maximum Beam Candle Power (cd)	305.0 (At: C=260.0, Gamma=7.0)
Spacing Criteria	1.26 (0^o-180^o) / 1.43 (90^o-270^o)
Zonal Lumens in the 0°-60°Zone	47.06%
Zonal Lumens in the 60°-90°Zone	26.59%
Zonal Lumens in the 90°-120°Zone	15.68%
Zonal Lumens in the 120°-180°Zone	10.66%

Table 16: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	28.779	1.79%
10- 20	83.185	5.18%
20- 30	128.64	8.01%
30- 40	160.704	10.01%
40- 50	176.95	11.02%
50- 60	177.371	11.05%
60- 70	164.492	10.24%
70- 80	143.08	8.91%
80- 90	119.408	7.44%
90-100	99.353	6.19%
100-110	83.247	5.18%
110-120	69.233	4.31%
120-130	56.314	3.51%
130-140	44.229	2.75%
140-150	32.55	2.03%
150-160	21.071	1.31%
160-170	12.531	0.78%
170-180	4.496	0.28%
Total	1605.6	100%

γ(°)	Lumens	% Total
0- 60	755.629	47.06%
60- 90	426.98	26.59%
0-90	1182.61	73.65%
90- 180	423.024	26.35%
0- 180	1605.6	100%

Table 17: Zonal Lumen

Illuminance Plots- Goniophotometer Method

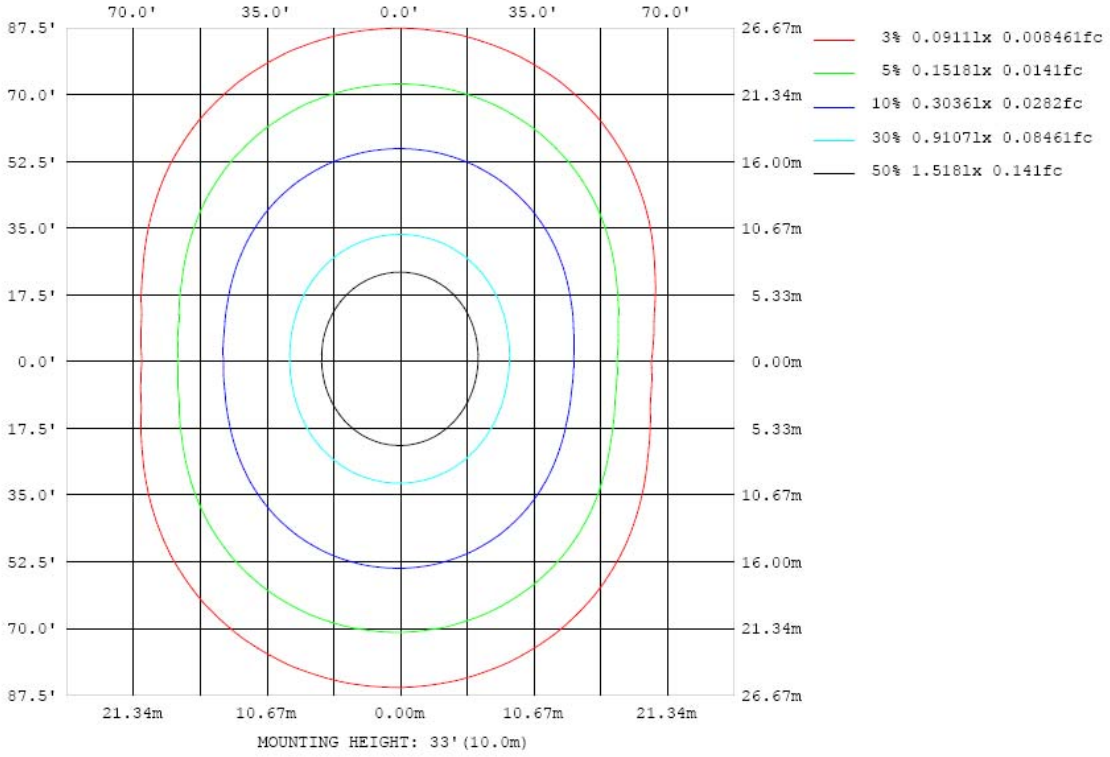


Chart 19: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

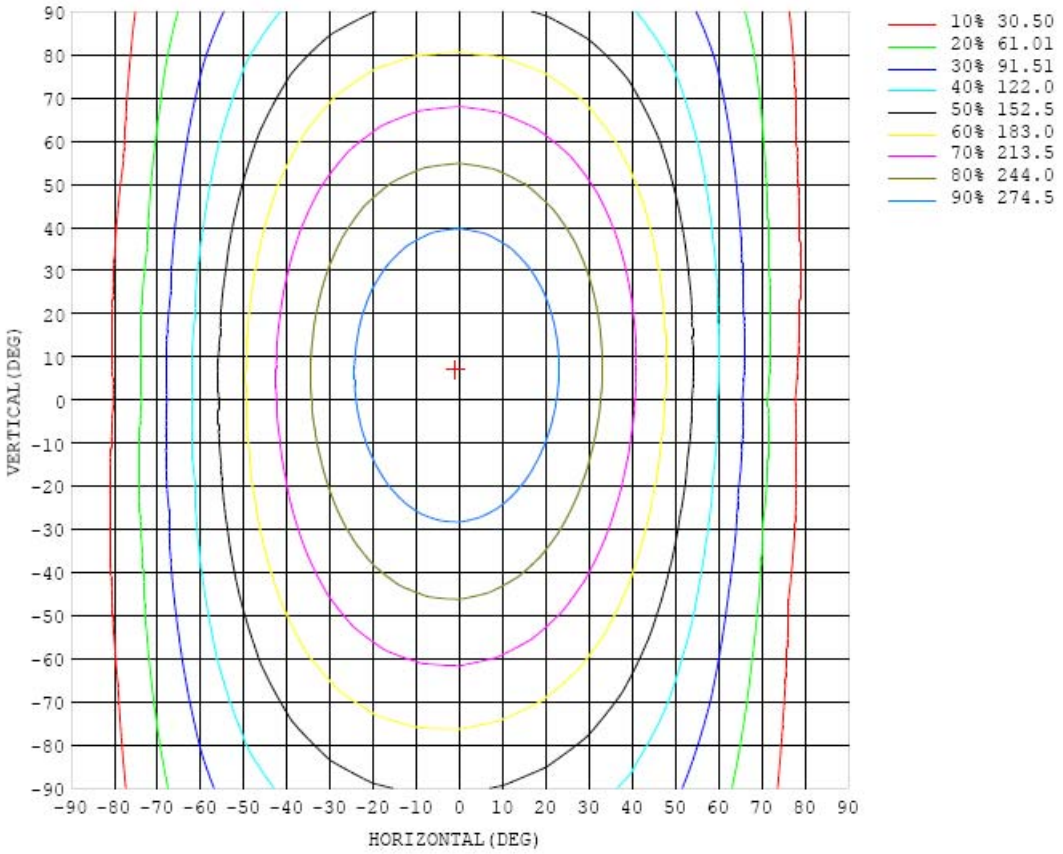


Chart 20: Isocandela Plot

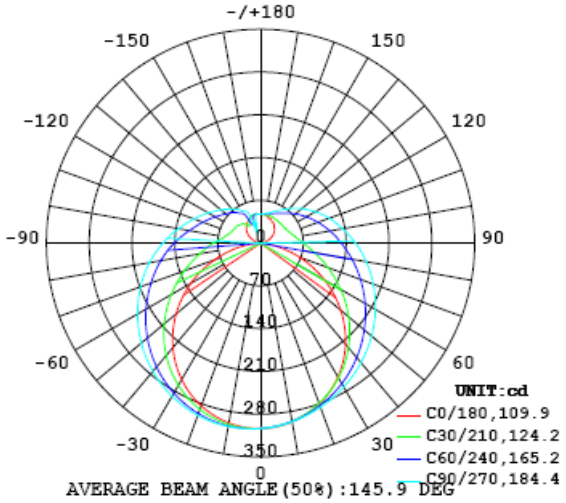


Chart 21: Polar Candela Distribution

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	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304
5	302	301	301	301	301	301	301	301	301	301	301	301	301	301	301	302	302	302	303
10	297	297	296	296	296	296	296	297	297	297	297	297	297	297	297	297	298	298	299
15	290	289	289	289	289	290	290	291	292	292	292	292	292	292	291	291	291	292	292
20	280	279	279	279	280	282	283	284	285	286	286	286	285	284	283	283	282	283	283
25	268	267	267	268	270	272	275	277	278	279	279	279	277	276	274	272	271	271	272
30	253	252	252	255	258	262	266	269	271	272	272	271	269	266	263	260	258	257	258
35	235	235	236	240	245	250	255	259	262	264	264	262	259	255	251	246	243	241	242
40	216	215	218	224	230	238	244	250	253	255	255	253	249	244	238	232	226	223	223
45	194	194	198	206	215	225	233	240	244	246	246	244	239	232	224	216	208	203	202
50	171	171	178	188	200	211	221	229	234	237	237	234	228	220	210	199	189	182	180
55	146	148	156	169	184	198	209	218	224	227	227	223	217	207	195	182	169	160	157
60	120	123	134	151	168	184	197	207	214	217	217	213	206	195	181	165	149	136	132
65	94.1	98.5	114	133	153	171	185	196	203	207	206	202	194	183	167	148	129	113	106
70	67.9	74.1	93.6	118	139	159	174	185	192	196	196	192	183	171	153	133	111	89.9	80.0
75	43.0	51.2	75.3	103	127	147	163	174	182	186	185	181	172	159	141	118	92.5	67.9	54.9
80	21.1	32.1	60.0	89.5	115	136	152	164	172	175	175	171	162	148	129	105	76.5	48.3	31.5
85	5.42	18.7	48.5	78.6	105	125	141	153	161	165	165	160	151	137	119	93.6	63.4	32.3	11.7
90	0.75	12.7	40.8	70.0	95.5	117	132	144	151	155	155	151	141	128	109	83.7	53.7	22.1	1.12
95	2.53	11.5	36.2	63.2	87.6	108	124	134	142	146	145	141	132	119	99.9	75.6	46.9	17.8	1.74
100	5.45	12.5	33.7	58.1	80.8	100	115	126	133	136	136	132	124	110	92.0	68.9	42.5	17.0	4.31
105	9.02	14.9	32.3	54.2	75.0	92.9	107	118	125	127	127	124	115	102	85.0	63.6	39.9	18.0	7.45
110	12.7	18.0	32.1	51.2	70.0	86.5	99.9	110	116	120	119	115	107	94.9	78.9	59.4	38.3	19.9	11.7
115	16.6	21.4	32.8	48.8	65.7	80.7	92.9	102	108	111	111	107	99.3	88.1	73.4	56.0	37.7	22.8	16.4
120	21.3	24.9	34.1	47.2	61.8	75.3	86.4	94.9	101	103	103	99.0	92.0	81.7	68.5	53.2	37.7	25.1	21.0
125	25.7	28.2	35.7	46.2	58.4	70.3	80.2	87.9	93.0	95.4	94.9	91.5	85.1	75.9	64.3	50.9	38.4	28.4	25.4
130	29.4	30.9	37.3	45.9	55.6	65.6	74.4	81.3	85.8	87.9	87.4	84.3	78.6	70.5	60.3	49.5	39.0	31.6	29.6
135	32.2	34.1	39.0	45.8	53.7	61.4	68.9	74.9	78.8	80.7	80.2	77.5	72.5	65.4	57.1	48.5	39.8	34.7	33.0
140	34.9	36.8	40.4	45.8	52.1	58.3	63.9	68.7	72.1	73.8	73.3	70.9	66.7	61.2	54.7	47.6	41.2	37.5	36.1
145	38.0	39.1	42.1	46.0	50.8	55.7	60.1	63.7	66.2	67.4	67.1	65.3	62.1	57.7	52.6	47.0	42.8	40.1	38.9
150	39.2	41.2	43.5	46.2	49.6	53.4	56.7	59.5	61.4	62.3	62.0	60.6	58.1	54.7	50.7	46.7	44.2	42.1	41.3
155	41.6	43.1	44.5	46.7	48.7	51.2	53.8	55.8	57.2	57.8	57.6	56.5	54.6	52.0	49.2	47.3	45.4	43.9	43.3
160	43.9	44.6	45.4	47.0	48.4	49.9	51.1	52.4	53.4	53.9	53.7	52.8	51.4	50.2	49.0	47.6	46.4	45.4	45.2
165	45.1	46.2	46.4	47.2	48.1	49.0	49.8	50.5	50.9	51.1	51.1	50.7	50.1	49.4	48.6	47.8	47.1	46.5	46.5
170	46.4	46.7	47.0	47.4	47.9	48.3	48.7	49.0	49.2	49.3	49.3	49.2	48.9	48.6	48.3	47.7	47.4	47.3	47.3
175	47.3	47.3	47.4	47.5	47.7	47.8	47.9	48.1	48.1	48.2	48.2	48.1	48.0	47.9	47.8	47.7	47.7	47.7	47.7
180	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7

Table 18: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304	304		
5	303	303	304	304	304	305	305	305	305	305	305	304	304	303	303	303	302		
10	300	300	301	302	303	304	304	305	305	304	304	303	302	301	300	299	298		
15	294	295	297	298	300	301	302	303	303	303	302	300	299	297	295	293	291		
20	285	287	290	292	295	297	299	300	300	299	298	296	293	290	287	284	282		
25	274	277	280	284	288	291	294	295	295	295	293	290	286	282	277	273	270		
30	260	264	269	274	279	284	287	289	289	288	286	282	277	271	265	260	256		
35	244	249	255	262	269	275	279	282	282	281	278	273	267	259	252	245	239		
40	226	232	240	249	257	265	270	273	274	272	269	263	255	246	236	227	220		
45	206	214	223	234	245	253	260	264	265	263	258	251	242	231	219	208	199		
50	184	194	206	219	231	241	249	253	254	253	247	239	228	215	201	188	177		
55	161	173	187	203	217	229	237	242	244	241	236	227	214	199	183	167	153		
60	137	151	169	187	203	216	226	231	232	230	224	214	200	183	164	145	129		
65	112	129	150	171	189	203	213	219	221	218	211	201	186	168	146	124	104		
70	87.2	108	132	156	175	191	201	207	209	206	199	188	173	153	129	104	80.3		
75	63.8	88.0	116	141	162	178	189	195	197	194	187	176	160	139	114	86.0	58.5		
80	41.7	70.7	101	128	149	166	177	183	184	182	175	163	147	126	101	70.9	40.1		
85	24.9	57.3	88.5	116	137	153	164	170	172	169	162	151	135	114	88.9	59.2	27.4		
90	15.4	46.4	77.1	104	125	141	152	158	160	157	150	139	124	103	78.4	49.8	19.5		
95	11.9	38.2	67.3	92.8	114	130	140	146	148	145	139	128	113	93.1	69.4	42.6	17.2		
100	11.9	34.7	59.9	83.7	103	118	129	135	136	134	128	118	103	84.7	63.6	39.6	16.8		
105	14.0	33.3	55.2	76.9	95.0	109	118	124	126	124	118	108	95.0	78.4	58.4	37.9	17.8		
110	16.2	33.3	51.9	70.7	87.5	101	110	115	116	114	109	100	88.1	72.3	54.8	37.3	19.6		
115	17.7	33.8	50.0	66.1	81.1	92.9	101	106	107	106	101	92.7	81.2	67.2	52.6	37.5	21.2		
120	19.9	33.9	48.8	62.4	75.4	86.0	93.4	97.9	99.2	97.6	92.9	85.2	75.4	63.8	51.2	36.0	22.6		
125	24.0	33.3	48.1	59.9	70.7	80.0	86.4	90.2	91.3	89.8	85.8	79.4	71.0	61.3	49.5	33.4	25.1		
130	29.0	32.6	46.3	56.9	66.9	74.7	80.4	83.7	84.6	83.4	80.0	74.5	67.4	58.8	48.6	32.6	28.2		
135	33.2	30.7	43.8	52.8	63.5	70.0	74.9	77.8	78.6	77.7	74.8	70.2	64.1	53.7	46.2	30.0	32.0		
140	36.7	33.0	41.0	50.1	58.3	66.0	69.9	72.3	73.1	72.4	70.1	65.5	57.4	51.3	41.4	30.1	34.8		
145	39.9	38.6	34.2	44.3	54.9	59.9	64.1	66.7	67.6	67.0	64.7	54.9	51.8	47.0	32.8	35.6	38.3		
150	42.2	43.5	38.0	35.3	46.8	55.7	59.2	61.3	60.7	58.2	45.9	42.1	38.9	32.0	31.7	41.7	40.9		
155	43.7	44.5	42.8	35.0	33.3	33.6	46.5	54.5	57.8	34.4	37.4	30.3	27.6	27.2	33.8	39.7	41.9		
160	45.4	46.3	47.3	44.1	33.5	32.1	38.0	41.9	29.3	42.9	35.9	28.9	26.0	30.6	35.3	40.3	42.1		
165	46.6	47.0	47.8	48.1	47.3	44.9	40.6	39.9	20.4	38.5	35.6	33.2	32.5	31.5	35.2	40.2	42.8		
170	47.4	47.5	47.9	48.3	48.6	49.0	49.1	49.0	48.0	35.1	30.5	30.3	33.6	34.7	39.4	43.2	45.8		
175	47.7	47.8	47.7	47.8	47.9	47.9	48.0	48.1	48.1	48.3	48.2	47.8	47.7	47.8	47.6	47.5	47.3		
180	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7		

Table 19: Luminous Intensity Data

TEST RESULTS of Model T10370(T8-12-48G-8CCT-HYB) 6500K (TYPE A)

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)	0.216	0.099
Power Factor	0.9934	0.9494
Test Power (W)/2	12.88	12.97
THD A%	10.06	13.29
Luminous Efficacy (lm/W)	121.9	121.0
Total Luminous Flux (lm)	1569.3	1569.0
Color Rendering Index (CRI)	83.7	
R9	10.2	
Correlated Color Temperature (CCT)(K)	6569	
Chromaticity Chroma x	0.3111	
Chromaticity Chroma y	0.3313	
Chromaticity Chroma u	0.1958	
Chromaticity Chroma v	0.3129	
Duv	0.0052	
Chromaticity Chroma u ’	0.1958	
Chromaticity Chroma v’	0.4693	

Special Color Rendering Indices	
R1	81.8
R2	89.6
R3	92.8
R4	81.2
R5	81.6
R6	83.8
R7	88.4
R8	70.1
R9	10.2
R10	74
R11	80.3
R12	54.6
R13	84.5
R14	96.5

Table 20: 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

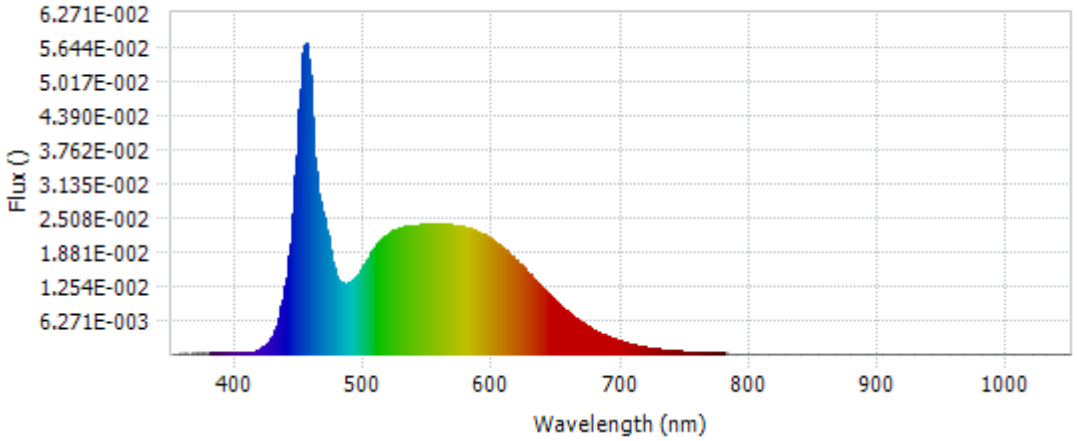
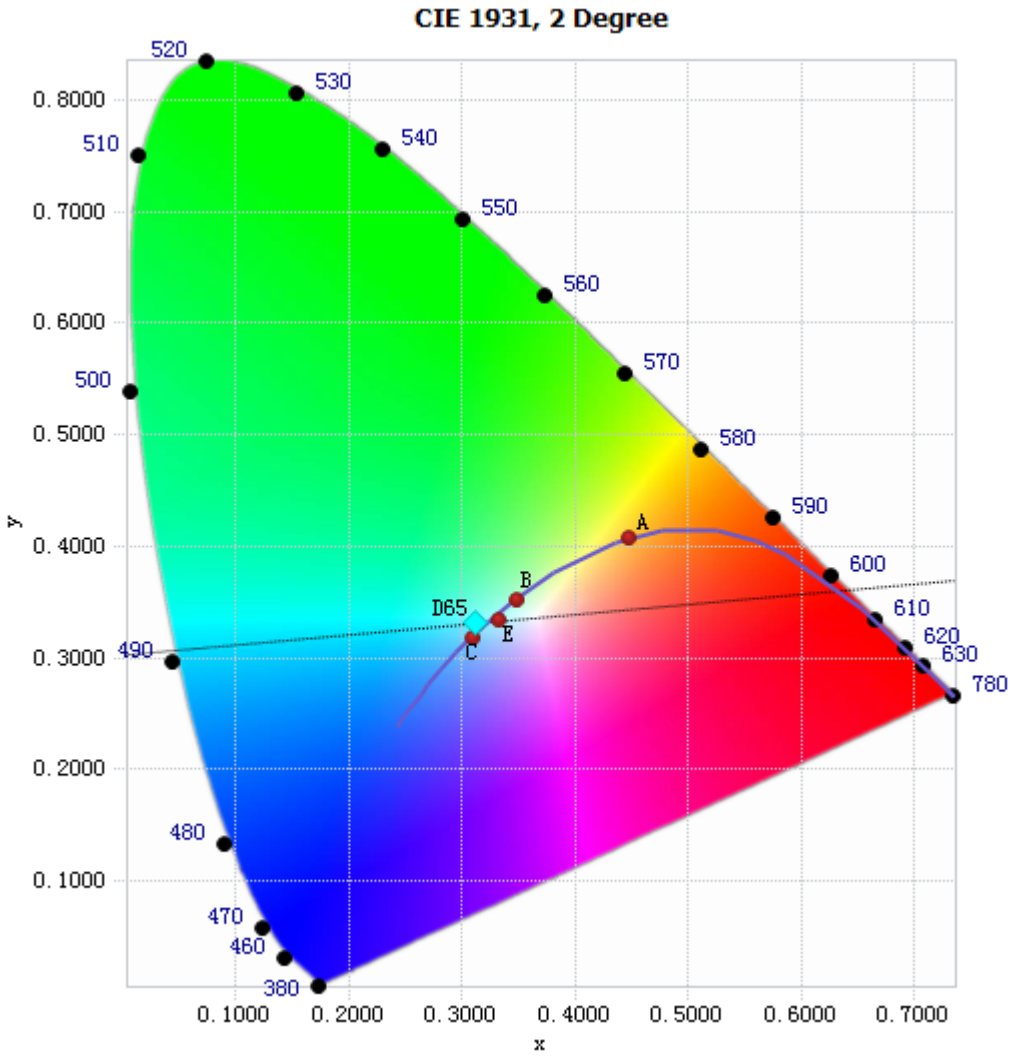


Chart 22: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.98E-04	485	1.30E-02	590	2.23E-02	695	2.78E-03
385	1.93E-04	490	1.35E-02	595	2.17E-02	700	2.38E-03
390	2.24E-04	495	1.48E-02	600	2.09E-02	705	2.03E-03
395	2.06E-04	500	1.67E-02	605	2.00E-02	710	1.75E-03
400	1.91E-04	505	1.87E-02	610	1.90E-02	715	1.51E-03
405	2.08E-04	510	2.03E-02	615	1.80E-02	720	1.28E-03
410	3.13E-04	515	2.16E-02	620	1.68E-02	725	1.10E-03
415	5.68E-04	520	2.24E-02	625	1.56E-02	730	9.53E-04
420	1.13E-03	525	2.30E-02	630	1.43E-02	735	8.17E-04
425	2.30E-03	530	2.33E-02	635	1.31E-02	740	6.83E-04
430	4.48E-03	535	2.35E-02	640	1.18E-02	745	5.90E-04
435	8.68E-03	540	2.37E-02	645	1.07E-02	750	5.06E-04
440	1.60E-02	545	2.39E-02	650	9.54E-03	755	4.33E-04
445	2.89E-02	550	2.39E-02	655	8.47E-03	760	3.74E-04
450	4.89E-02	555	2.39E-02	660	7.46E-03	765	3.26E-04
455	5.65E-02	560	2.38E-02	665	6.55E-03	770	2.72E-04
460	3.99E-02	565	2.38E-02	670	5.75E-03	775	2.32E-04
465	2.81E-02	570	2.37E-02	675	5.00E-03	780	2.09E-04
470	2.30E-02	575	2.35E-02	680	4.34E-03		
475	1.70E-02	580	2.33E-02	685	3.74E-03		
480	1.34E-02	585	2.28E-02	690	3.25E-03		

Table 21: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3111, 0.3313)

Chart 23: 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

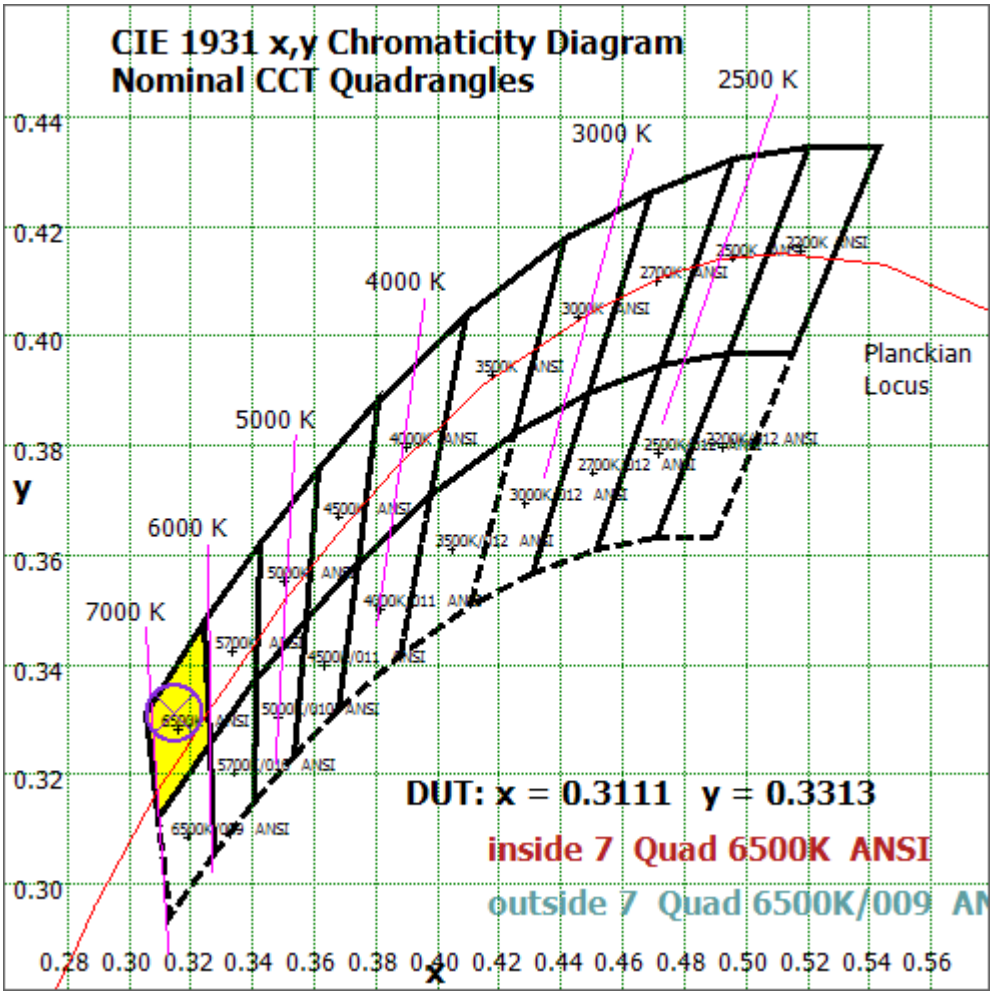


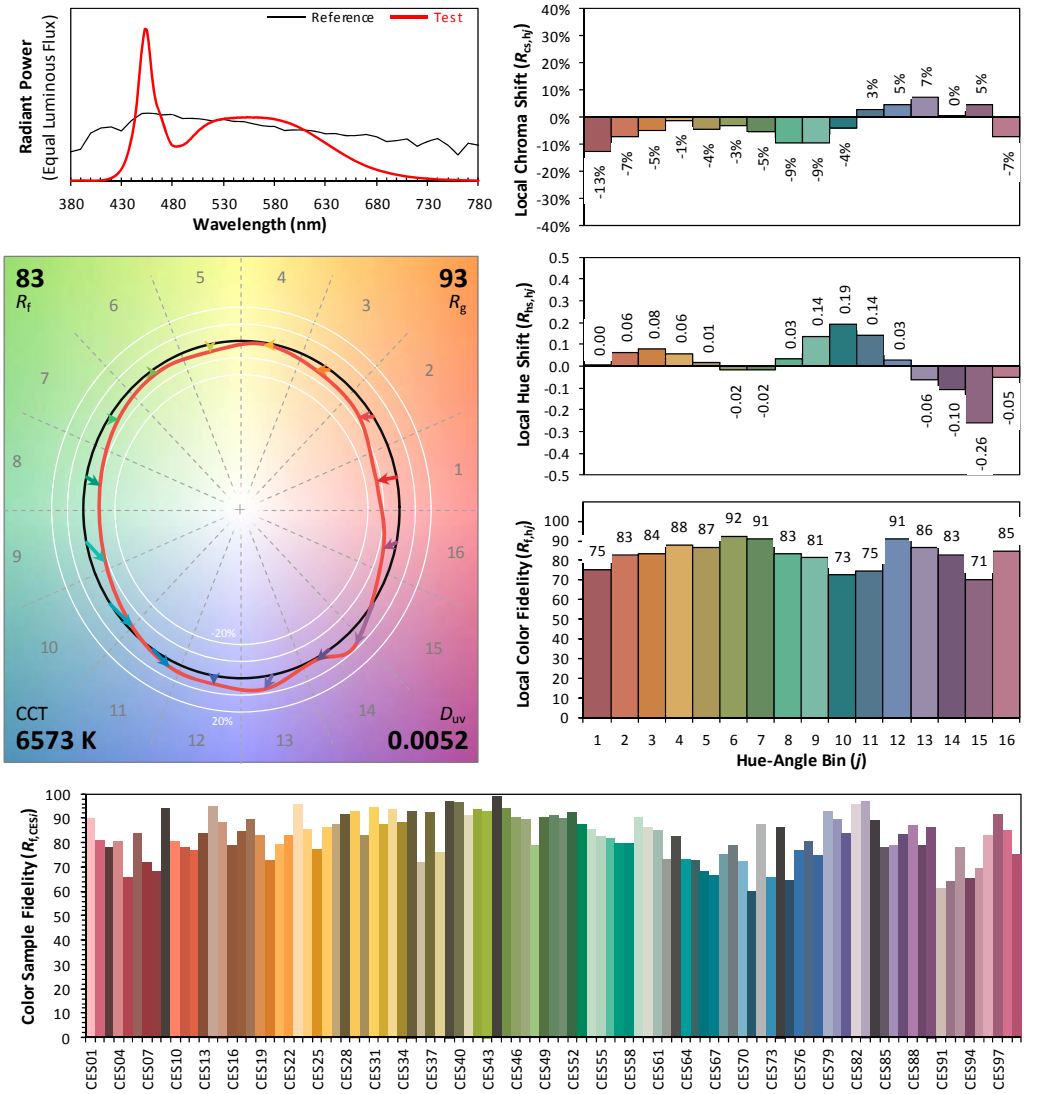
Chart 24: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** RAB Lighting Inc

Date: 2022/05/25 **Model:** T10370(T8-12-48G-8CCT-HYB) 6500K (TYPE A)



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

x	0.3111
y	0.3313
u'	0.1958
v'	0.4693

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 25: 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 20 due to rounding.

Goniophotometer Method

Test ambient temperature was 25.8°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)	0.216
Power Factor	0.9937
Power (W)/2	12.90
Luminous Efficacy (lm/W)	121.2
Total Luminous Flux (lm)	1563.0
Beam Angle (°)	110.1 (0^o-180^o) / 187.0 (90^o-270^o)
Center Beam Candle Power (cd)	293
Maximum Beam Candle Power (cd)	295.2 (At: C=270.0, Gamma=9.0)
Spacing Criteria	1.26 (0^o-180^o) / 1.44 (90^o-270^o)
Zonal Lumens in the 0°-60°Zone	46.89%
Zonal Lumens in the 60°-90°Zone	26.65%
Zonal Lumens in the 90°-120°Zone	15.82%
Zonal Lumens in the 120°-180°Zone	10.64%

Table 22: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	27.789	1.78%
10- 20	80.4	5.14%
20- 30	124.515	7.97%
30- 40	155.811	9.97%
40- 50	171.852	11.00%
50- 60	172.518	11.04%
60- 70	160.232	10.25%
70- 80	139.482	8.92%
80- 90	116.863	7.48%
90-100	97.953	6.27%
100-110	81.868	5.24%
110-120	67.458	4.32%
120-130	54.518	3.49%
130-140	42.863	2.74%
140-150	32.055	2.05%
150-160	21.777	1.39%
160-170	11.51	0.74%
170-180	3.535	0.23%
Total	1563.0	100%

γ(°)	Lumens	% Total
0- 60	732.885	46.89%
60- 90	416.577	26.65%
0-90	1149.46	73.54%
90- 180	413.537	26.46%
0- 180	1563.0	100%

Table 23: Zonal Lumen

Illuminance Plots- Goniophotometer Method

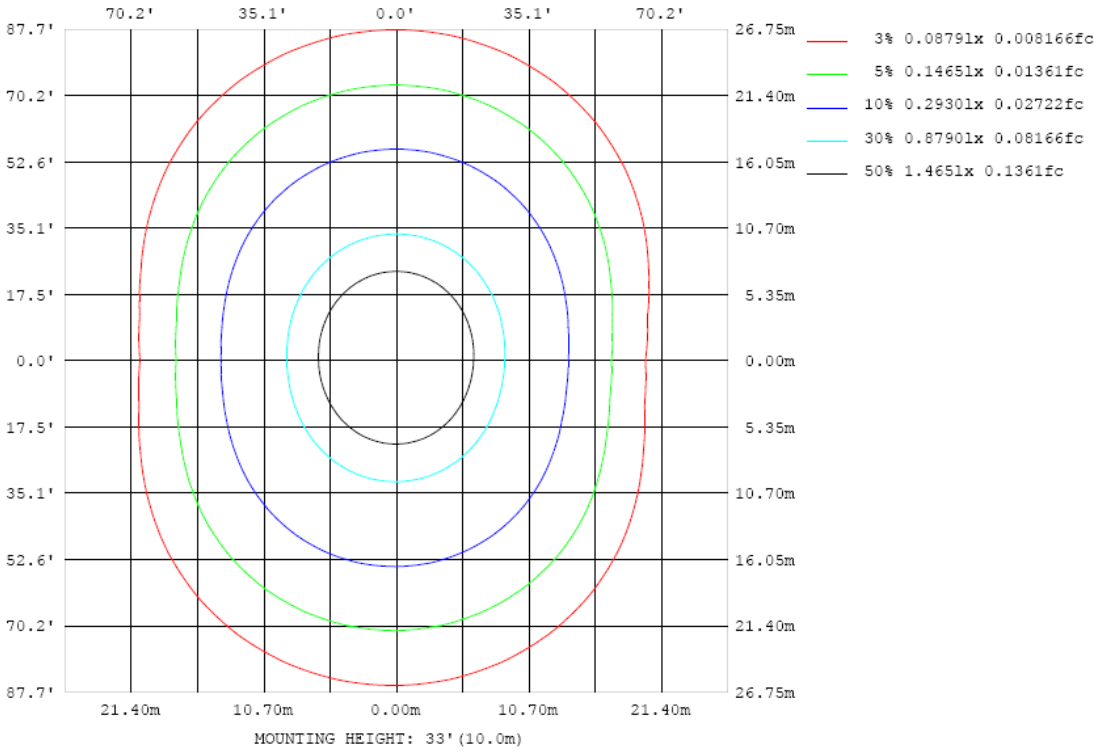


Chart 26: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

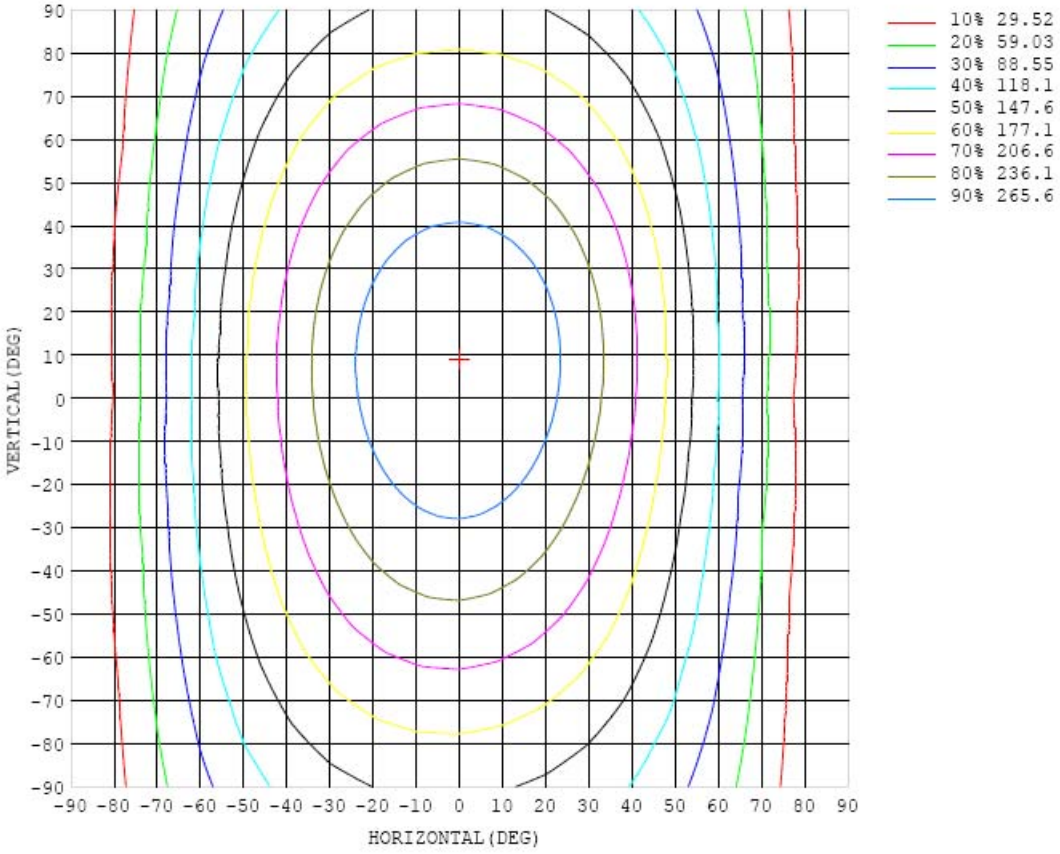


Chart 27: Isocandela Plot

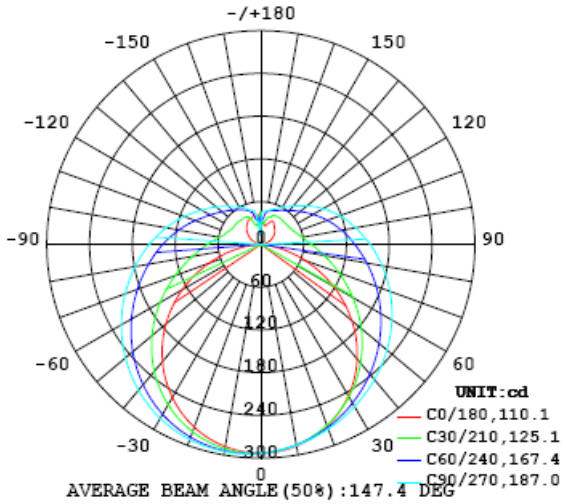


Chart 28: Polar Candela Distribution

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	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293
5	292	291	291	291	290	290	290	290	290	290	290	290	290	290	291	291	291	291	292
10	287	287	286	286	286	286	286	286	286	286	286	286	286	286	286	287	287	287	288
15	281	280	279	279	279	280	280	281	281	281	281	281	281	281	280	280	280	281	282
20	271	270	270	270	271	272	273	275	275	276	276	275	275	274	273	272	272	272	273
25	260	258	258	259	261	263	266	268	269	270	269	269	267	265	263	262	261	261	262
30	245	244	245	247	250	254	257	260	262	263	263	261	259	256	253	250	248	247	248
35	229	228	229	233	238	243	248	251	254	255	255	253	250	246	241	237	234	232	232
40	210	209	212	217	224	231	238	243	246	248	247	245	241	235	229	223	218	215	215
45	189	189	193	201	210	219	227	233	237	239	239	236	231	224	216	208	200	196	195
50	166	167	173	184	195	207	216	224	228	231	230	227	221	213	202	192	182	175	174
55	142	144	153	166	181	194	205	214	219	221	221	217	210	201	189	176	163	154	151
60	117	121	132	149	166	181	194	203	209	212	211	207	200	189	175	159	144	132	127
65	91.4	96.1	112	132	152	169	183	193	199	202	202	197	189	177	162	144	125	110	103
70	65.4	72.2	92.7	117	139	157	172	183	190	193	192	187	179	166	149	129	107	87.5	77.7
75	40.6	50.2	75.3	103	126	146	161	172	179	183	182	177	169	155	137	115	89.7	65.8	53.3
80	18.8	31.7	60.6	90.1	116	135	151	162	169	173	172	167	158	145	126	102	74.3	46.4	30.5
85	3.90	19.2	49.5	79.6	105	126	141	152	160	163	162	158	148	134	116	91.1	61.6	30.8	11.6
90	0.65	13.5	42.0	71.0	96.3	117	131	143	150	153	153	148	139	126	106	81.5	52.0	21.0	1.18
95	2.37	11.9	37.2	64.3	88.4	108	123	133	140	144	143	138	130	117	97.5	73.4	45.2	16.7	1.22
100	4.98	13.1	34.2	58.8	81.5	100	115	126	131	135	134	130	121	108	89.7	66.8	40.7	15.5	3.43
105	8.39	15.3	32.6	54.4	75.2	92.9	107	117	124	127	126	121	113	100.0	82.6	61.2	37.6	15.7	6.44
110	12.0	18.5	32.5	50.9	69.6	86.0	99.1	109	115	118	117	113	105	92.3	76.1	56.6	35.5	18.1	10.0
115	15.8	21.8	33.2	48.5	64.8	79.6	91.6	101	106	109	108	104	96.4	85.1	70.2	52.8	34.3	21.1	13.9
120	19.0	24.2	34.2	46.9	60.6	73.7	84.6	92.8	98.2	101	99.9	95.9	88.7	78.4	65.0	49.6	34.1	24.3	17.5
125	22.3	28.2	35.6	46.0	57.4	68.4	78.0	85.4	90.2	92.4	91.7	88.0	81.5	72.2	60.3	47.1	35.4	27.4	20.9
130	25.3	31.5	37.1	45.5	54.9	64.0	72.0	78.4	82.7	84.6	83.9	80.6	74.6	66.5	56.5	45.6	36.9	30.8	24.7
135	27.5	34.2	38.6	45.2	52.8	60.2	66.9	72.1	75.6	77.1	76.4	73.5	68.6	61.7	53.2	45.3	38.6	33.7	28.4
140	30.0	35.4	39.7	45.4	51.2	57.0	62.3	66.6	69.4	70.6	70.0	67.4	63.2	57.5	51.4	45.6	40.1	35.8	31.2
145	32.4	37.9	41.3	45.5	49.9	54.5	58.4	61.6	63.8	64.7	64.1	62.0	58.5	54.7	50.4	45.8	41.4	38.1	34.2
150	35.7	40.4	40.5	45.1	49.0	52.2	55.4	57.8	59.1	59.7	59.2	57.9	55.8	52.8	49.4	45.9	42.6	40.3	37.0
155	36.3	40.6	42.2	45.5	48.5	50.6	52.6	54.4	55.6	56.1	55.8	54.7	53.1	51.1	48.6	46.1	43.5	42.0	39.1
160	31.4	37.3	41.7	41.2	47.0	49.5	50.7	51.8	52.5	52.8	52.7	52.1	51.0	49.6	47.9	45.8	44.7	43.9	38.8
165	28.7	31.8	36.3	39.3	42.4	47.5	48.7	49.5	50.1	50.4	50.3	49.9	49.2	48.1	47.0	46.3	45.7	45.2	41.6
170	26.9	29.8	31.2	33.3	35.1	39.4	46.4	47.8	47.9	48.0	48.0	47.8	47.5	47.3	47.1	46.7	45.6	44.3	41.4
175	31.1	31.5	30.4	29.1	29.1	31.8	37.1	42.6	45.5	46.7	47.0	46.7	46.6	46.6	46.5	45.8	44.4	43.1	41.3
180	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9

Table 24: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350
0	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293
5	292	293	293	294	294	294	295	295	295	295	295	294	294	293	293	292	292
10	289	290	291	292	293	294	295	295	295	295	294	294	293	292	291	289	288
15	283	285	287	288	290	292	293	294	294	294	293	292	290	288	286	284	282
20	275	277	280	283	286	288	290	291	291	291	290	288	285	282	279	276	273
25	264	267	271	275	279	283	285	287	287	287	285	282	278	274	270	266	262
30	251	255	260	265	271	275	279	281	282	281	279	275	270	264	259	253	248
35	235	241	247	254	261	267	271	274	275	274	271	266	260	253	245	238	232
40	218	224	232	241	250	257	263	266	267	266	262	256	249	240	230	222	214
45	199	206	216	227	237	246	253	257	258	256	252	245	236	225	214	203	194
50	178	187	199	212	224	234	242	247	248	246	241	234	223	210	196	183	172
55	156	167	181	196	210	222	231	236	237	235	230	221	209	194	178	162	149
60	133	146	163	181	196	209	219	224	226	224	218	208	195	178	160	141	125
65	109	125	145	165	183	197	207	212	214	212	206	195	181	163	142	120	101
70	85.0	104	128	150	169	184	195	201	202	200	194	183	168	148	125	100	76.9
75	62.0	85.4	112	136	156	172	183	189	191	188	182	170	155	134	110	82.2	55.6
80	41.7	68.6	97.4	123	144	160	171	177	179	176	170	159	143	122	96.7	67.3	37.6
85	25.2	55.6	85.1	111	132	148	160	166	168	165	158	147	131	111	85.5	56.5	25.1
90	15.5	45.6	74.9	101	122	138	149	155	156	154	148	137	121	101	76.3	48.2	18.6
95	11.3	38.4	66.3	91.3	112	127	138	144	146	143	137	126	111	91.9	68.3	41.8	16.0
100	11.5	32.9	58.8	82.5	102	117	127	133	135	133	126	116	102	83.6	61.3	37.8	16.5
105	13.2	31.7	53.1	74.4	92.9	107	117	123	125	122	117	107	93.5	76.0	56.4	36.5	17.7
110	16.5	31.1	50.2	67.9	84.4	97.9	107	113	115	113	107	98.3	85.5	70.6	53.9	35.9	20.3
115	19.8	31.3	47.5	63.6	78.0	89.4	98.1	103	105	104	98.4	90.0	79.2	66.0	51.3	35.7	23.2
120	22.3	33.0	46.0	59.6	72.4	82.8	90.4	94.9	96.3	94.9	90.5	83.4	73.8	62.2	49.6	36.6	25.5
125	24.4	34.3	45.4	56.6	67.5	76.7	83.4	87.5	88.7	87.6	83.7	77.6	69.1	58.9	48.1	37.4	26.2
130	27.4	36.3	45.2	54.8	63.7	71.4	77.3	80.8	81.9	80.9	77.7	72.3	64.7	55.9	47.8	38.4	27.2
135	28.8	37.1	45.0	53.1	60.3	66.7	71.7	74.7	75.7	74.9	72.0	67.1	61.0	54.7	47.4	39.7	29.0
140	29.7	37.2	44.5	51.7	57.4	62.6	66.6	69.0	69.8	69.0	66.6	62.9	58.3	53.4	46.0	39.7	29.2
145	29.7	36.5	43.9	50.5	55.5	59.2	62.1	64.2	64.9	64.3	62.4	59.7	56.3	51.8	44.8	39.9	28.7
150	28.8	34.6	44.1	48.7	53.4	56.5	58.5	59.9	60.4	60.0	58.9	57.0	53.9	48.6	44.7	38.9	27.2
155	29.6	31.4	42.7	47.0	50.7	53.6	55.5	56.7	57.1	56.9	55.9	54.1	46.8	44.3	39.3	30.0	26.1
160	31.2	28.0	35.7	44.2	48.2	50.7	51.6	52.1	52.3	52.3	51.2	41.5	40.9	35.2	30.4	23.5	25.7
165	30.8	28.1	28.1	31.0	41.7	46.5	48.3	49.3	49.6	48.2	35.9	32.1	31.5	26.5	22.7	23.3	24.6
170	34.9	28.5	29.9	30.8	31.9	34.4	36.7	39.7	45.9	22.5	30.7	31.1	30.2	28.5	26.9	25.7	24.7
175	38.2	35.7	35.9	35.3	34.9	36.8	38.8	39.5	25.8	39.0	38.5	37.1	35.5	34.0	32.6	32.1	31.4
180	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9

Table 25: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2021	Aug. 04, 2022
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2021	Aug. 04, 2022
Standard source	D908	HZTE012-01	Aug. 05, 2021	Aug. 04, 2022
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2021	Aug. 04, 2022
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2021	Aug. 04, 2022
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2021	Aug. 04, 2022

Table 26: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning.
Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and 3 Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π. Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.
Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.
The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 20 min, taken 10 minutes apart, is less than 0.5 %.
Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.
The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.
The uncertainty of integrating sphere system reported in this document is expended uncertainty is 2.1% with a

coverage factor k=2.

Goniophotometer Method

Photometric and Electrical Measurements

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

Color Characteristics Measurements

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

ISTMT Measurements

The luminaire was installed to simulate intended usage, in accordance with the manufacturer's instructions.

Temperatures were measured after they stabilized, when the test was run for a minimum of 7.5 h.

The tests were conducted in an ambient temperature of 25 ± 5 °C. Ambient temperature variations above or below 25°C were respectively subtracted from or added to temperatures recorded at points on the luminaire.

Temperatures recorded at points on a luminaire were measured by means of thermocouples.

The thermocouples had conductors no larger than No. 24 AWG (0.21mm^2) and no smaller than No. 30 AWG (0.05mm^2). Thermocouples complied with the requirements specified in ASTM MNL 12 and thermocouples as listed in the table of the limits of error specified in NIST ITS 90, or ISA MC96.1.

The luminaire was installed in the test box in the configuration that resulted in the highest operating temperatures, considering different trim and maximum lamp wattage combinations, lamp holder adjustment heights, and the like.

The test box was constructed of 12mm thick plywood as described below:
The test box was rectangular and had four sides and a bottom.
The four sides of the test box for a ceiling-mounted luminaire were a minimum distance of 8.5 in (215mm) from the nearest part of the lamp housing or heat-producing parts. The top edge of the sides of the test box were a minimum of 8.5 in (215mm) above the highest point of any permanently attached part of the lamp housing.
Thermal insulation of the loose-fill type was poured into the test box through the open top, until level with the top, without applying any compacting procedure.
The thermal insulation was conditioned to the density specified by the insulation manufacturer to obtain a required rated thermal resistance of Rsi 0.56 to 0.678 (R3.2 to R3.85).
All spaces around the luminaire and between it and the sides of the box were filled with the thermal insulation.

*** End of Report ***