

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: 20.5T8/4F/830/BYP/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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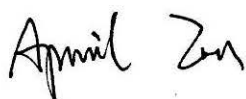
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www.ledtestlab.com

Report No.: HZ22060037a

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

Review by:



Engineer: April Zou

Jun. 30, 2022

Approved by:



Manager: Jim Zhang

Jun. 30, 2022

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

TEST SUMMARY

Sample Tested: 20.5T8/4F/830/BYP/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
145.7	3076.1	21.11	0.9762
CCT (K)	CRI	Stabilization Time (Light & Power)	
3089	84.0	50	

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt : Jun. 15, 2022

Date of Test : Jun. 17, 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

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SAMPLE PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 20.5T8/4F/830/BYP/R
Electrical Ratings	: 120-277V, 60Hz, 20.5W
Product Description	: 3000K

TEST RESULTS

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)	0.180	0.080
Power Factor	0.9762	0.9434
Test Power (W)	21.11	20.86
THD A%	21.15	20.14
Luminous Efficacy (lm/W)	145.7	146.8
Total Luminous Flux (lm)	3076.1	3062.2
Color Rendering Index (CRI)	84.0	
R9	11.7	
Correlated Color Temperature (CCT)(K)	3089	
Chromaticity Chroma x	0.4278	
Chromaticity Chroma y	0.3957	
Chromaticity Chroma u	0.2482	
Chromaticity Chroma v	0.3445	
Duv	-0.0021	
Chromaticity Chroma u'	0.2482	
Chromaticity Chroma v'	0.5167	

Special Color Rendering Indices	
R1	83.1
R2	92.8
R3	95.3
R4	82.2
R5	83.7
R6	91.3
R7	82.5
R8	60.6
R9	11.7
R10	83.6
R11	82.4
R12	75.3
R13	85.7
R14	98.2

Table 2: Test data per Sphere-Spectroradiometer Method

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

Goniophotometer Method

Test ambient temperature was 24.8°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)	0.182
Power Factor	0.9765
Power (W)	21.39
Luminous Efficacy (lm/W)	142.7
Total Luminous Flux (lm)	3052.1
Beam Angle (°)	115.2 (0°-180°) / 252.2 (90°-270°)
Center Beam Candle Power (cd)	450
Maximum Beam Candle Power (cd)	451.4 (At: C=300.0, Gamma=4.0)
Spacing Criteria	1.26 (0°-180°) / 1.47 (90°-270°)
Zonal Lumens in the 0°-60°Zone	39.17%
Zonal Lumens in the 60°-90°Zone	26.15%
Zonal Lumens in the 90°-120°Zone	18.91%
Zonal Lumens in the 120°-180°Zone	15.76%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

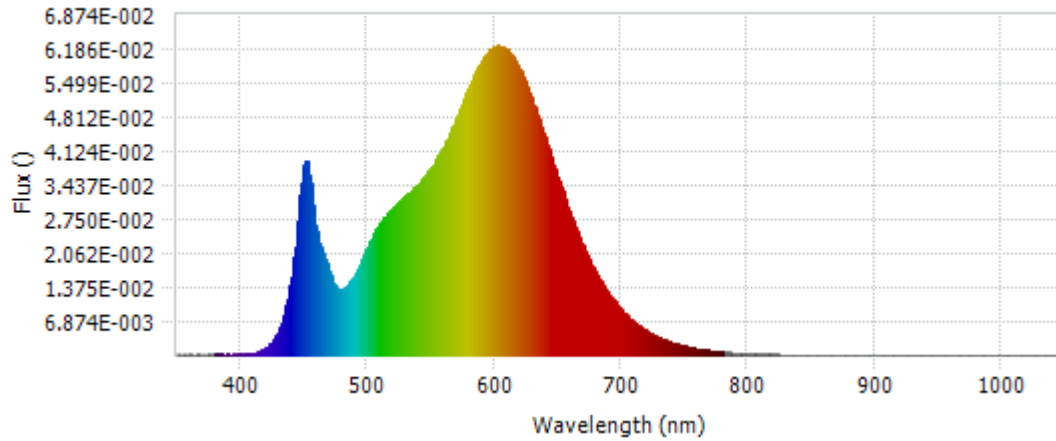
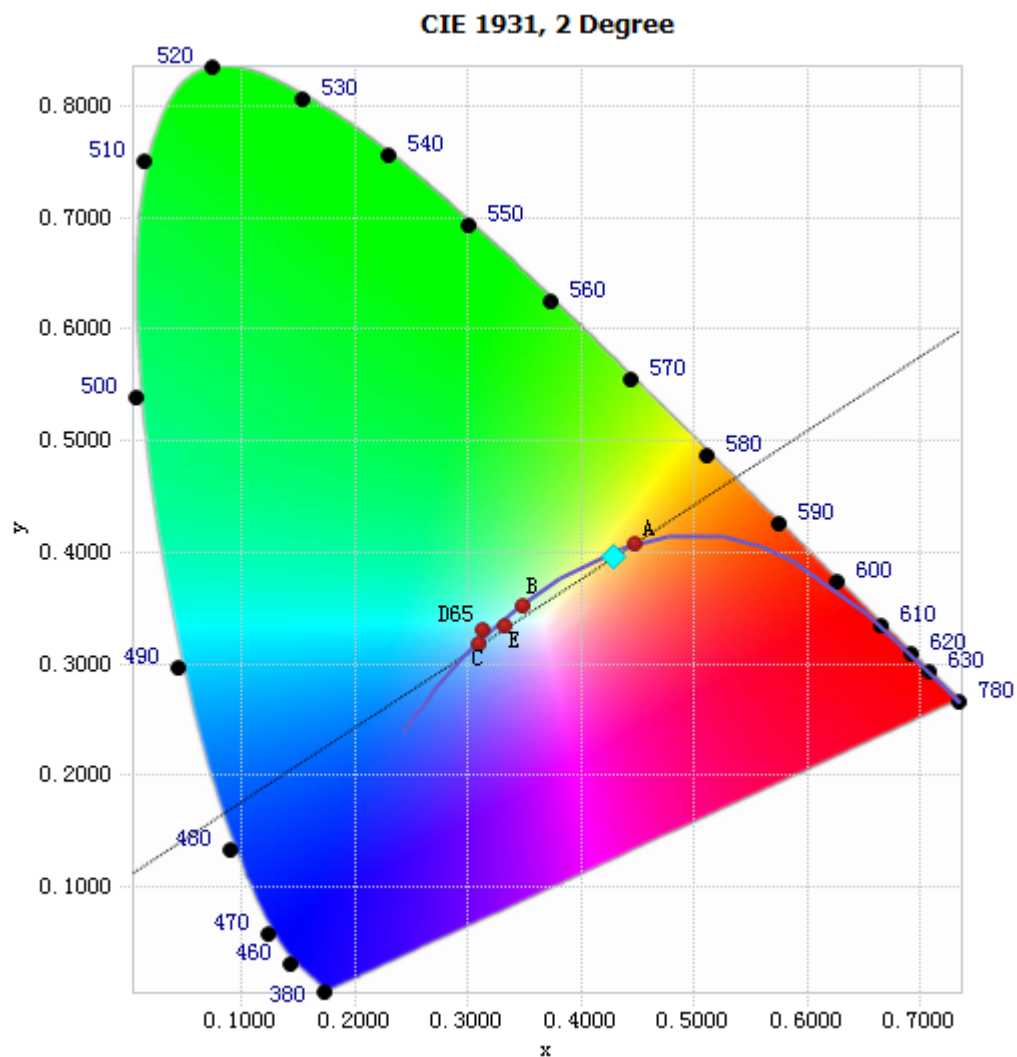


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.82E-04	485	1.44E-02	590	5.93E-02	695	1.08E-02
385	2.18E-04	490	1.63E-02	595	6.11E-02	700	9.24E-03
390	2.35E-04	495	1.90E-02	600	6.22E-02	705	7.91E-03
395	1.79E-04	500	2.19E-02	605	6.23E-02	710	6.77E-03
400	2.07E-04	505	2.45E-02	610	6.18E-02	715	5.74E-03
405	2.34E-04	510	2.66E-02	615	6.01E-02	720	4.92E-03
410	4.26E-04	515	2.85E-02	620	5.77E-02	725	4.21E-03
415	8.38E-04	520	2.99E-02	625	5.49E-02	730	3.58E-03
420	1.55E-03	525	3.10E-02	630	5.14E-02	735	3.04E-03
425	2.89E-03	530	3.22E-02	635	4.78E-02	740	2.60E-03
430	5.19E-03	535	3.33E-02	640	4.41E-02	745	2.22E-03
435	9.08E-03	540	3.45E-02	645	4.00E-02	750	1.88E-03
440	1.58E-02	545	3.60E-02	650	3.60E-02	755	1.61E-03
445	2.70E-02	550	3.79E-02	655	3.23E-02	760	1.39E-03
450	3.84E-02	555	4.00E-02	660	2.86E-02	765	1.17E-03
455	3.47E-02	560	4.22E-02	665	2.52E-02	770	9.99E-04
460	2.49E-02	565	4.51E-02	670	2.21E-02	775	8.49E-04
465	2.07E-02	570	4.79E-02	675	1.93E-02	780	7.43E-04
470	1.69E-02	575	5.10E-02	680	1.68E-02		
475	1.37E-02	580	5.42E-02	685	1.45E-02		
480	1.33E-02	585	5.70E-02	690	1.26E-02		

Table 4: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4278, 0.3957)

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

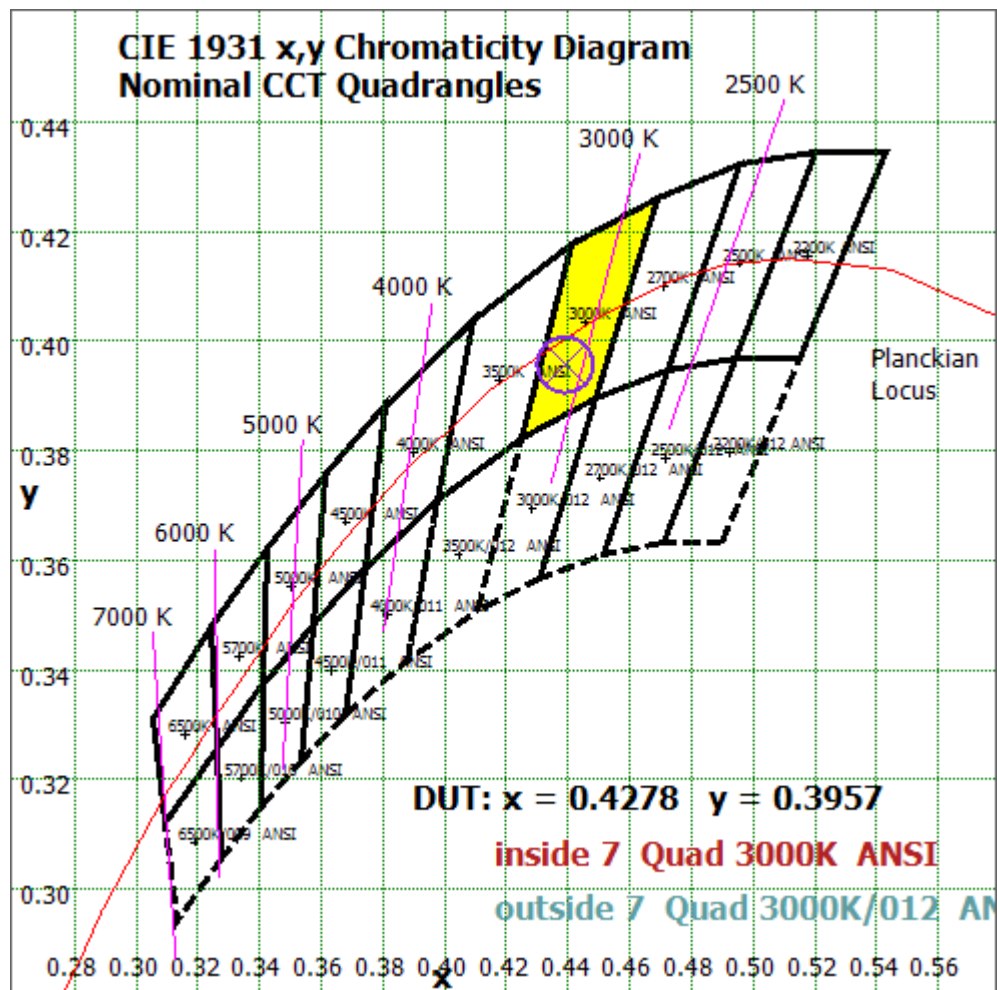


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

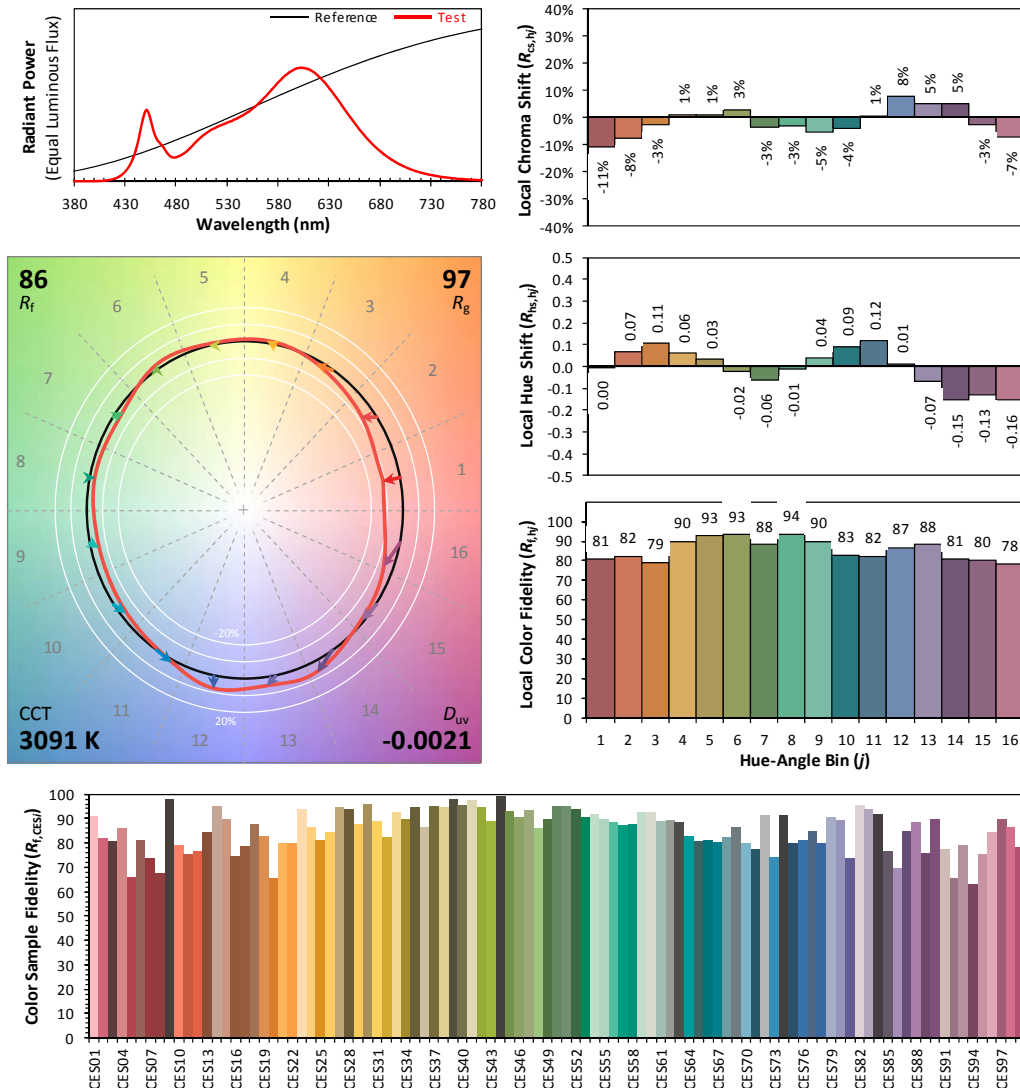
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/06/17

Model: 20.5T8/4F/830/BYP/R



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

x 0.4278
 y 0.3957
 u' 0.2482
 v' 0.5167

CIE 13.3-1995
(CRI)
 R_a 84
 R_9 12

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.

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	42.744	1.40%
10- 20	124.544	4.08%
20- 30	195.714	6.41%
30- 40	250.424	8.20%
40- 50	284.812	9.33%
50- 60	297.281	9.74%
60- 70	289.849	9.50%
70- 80	267.893	8.78%
80- 90	240.473	7.88%
90-100	215.963	7.08%
100-110	192.387	6.30%
110-120	168.939	5.54%
120-130	145.547	4.77%
130-140	121.612	3.98%
140-150	96.367	3.16%
150-160	68.632	2.25%
160-170	37.924	1.24%
170-180	10.991	0.36%
Total	3052.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1195.52	39.17%
60- 90	798.215	26.15%
0-90	1993.73	65.32%
90- 180	1058.36	34.68%
0- 180	3052.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

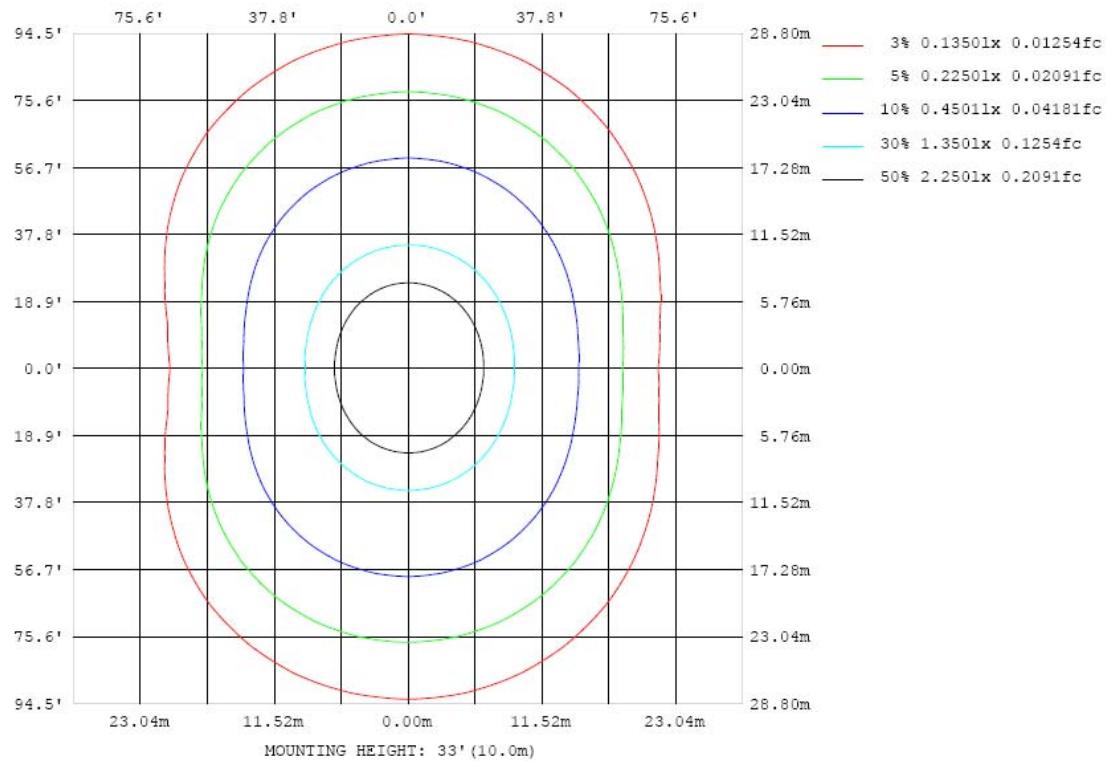


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

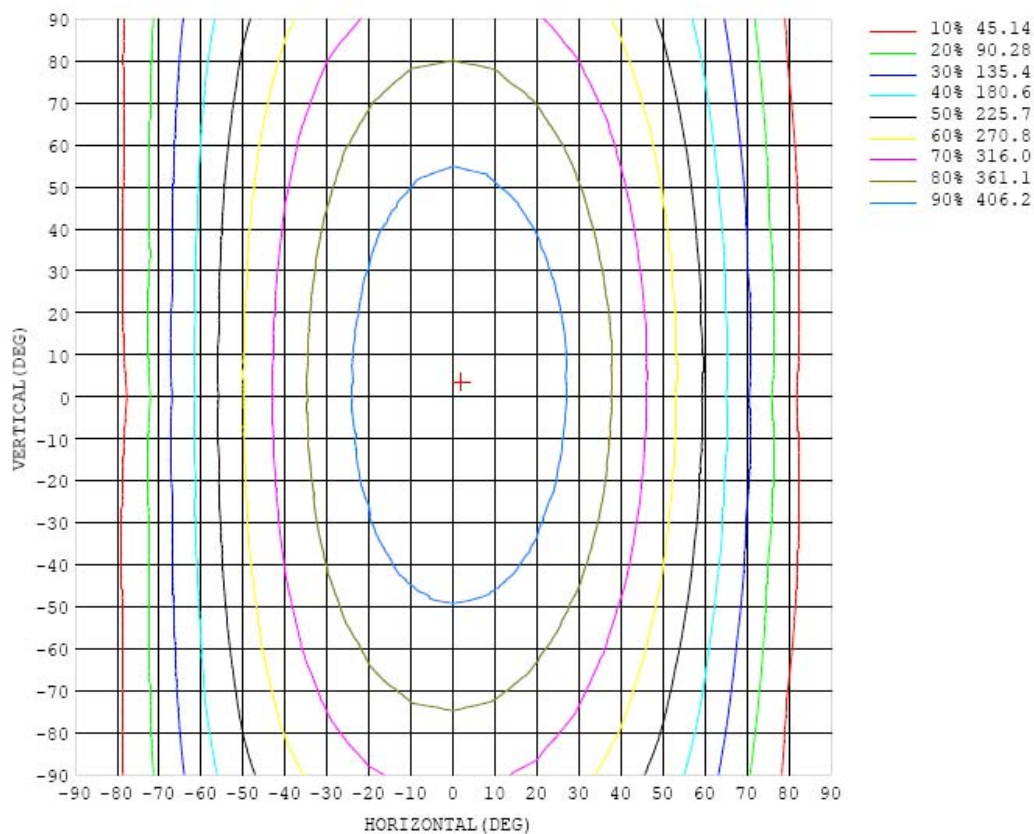


Chart 6: Isocandela Plot

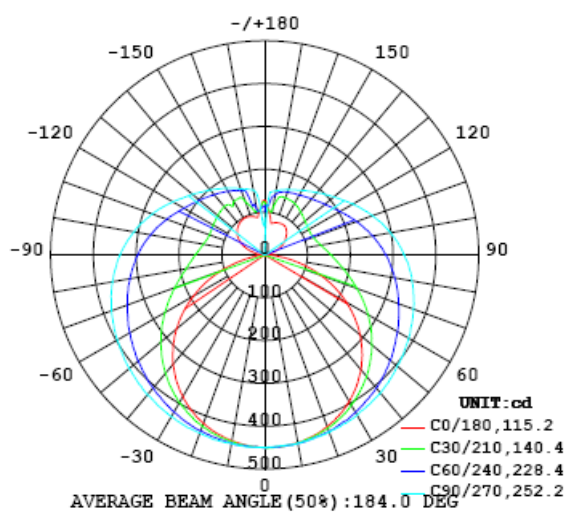


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
5	449	450	449	449	450	450	448	450	449	448	448	448	448	447	448	448	448	448	447
10	445	446	445	445	447	448	447	448	447	447	447	445	445	443	443	443	442	440	441
15	437	438	439	440	442	442	443	444	444	444	443	443	441	439	436	435	434	431	431
20	427	428	429	431	434	437	439	440	441	440	440	437	436	431	428	424	422	419	418
25	412	413	415	420	424	428	431	435	437	435	436	432	428	421	417	412	406	404	402
30	395	396	399	404	413	419	424	429	431	432	431	426	420	412	404	396	389	384	382
35	374	376	380	388	399	407	415	422	425	426	424	419	412	401	389	379	369	362	359
40	349	353	359	370	383	395	405	414	418	421	418	410	402	388	374	359	346	336	333
45	322	325	335	349	366	381	395	405	411	413	410	403	391	374	357	338	320	307	302
50	291	295	309	327	347	367	383	396	402	404	402	393	380	362	339	315	292	275	269
55	257	263	279	304	329	351	370	385	394	397	393	383	369	347	321	292	263	240	232
60	220	228	250	279	309	335	358	376	385	389	385	375	357	332	302	267	232	204	192
65	181	191	219	254	289	321	345	365	375	379	376	365	347	318	283	244	202	166	151
70	140	153	188	229	270	306	333	354	366	370	367	355	335	305	268	222	172	127	108
75	98.3	116	158	206	252	291	321	343	356	360	358	346	324	293	251	202	145	91.9	65.6
80	58.8	81.1	131	186	237	277	309	332	345	349	347	334	312	280	238	185	124	62.7	28.5
85	24.3	53.0	110	169	221	263	296	320	333	339	336	323	301	268	225	171	109	43.9	4.32
90	3.65	35.2	94.9	155	208	250	283	307	321	326	324	311	288	256	213	160	98.5	36.8	2.01
95	2.18	28.7	84.9	143	195	237	270	294	308	313	310	298	276	244	202	151	92.4	37.1	9.21
100	7.78	30.0	78.8	133	183	224	256	279	293	298	296	284	262	232	191	143	90.0	43.7	20.2
105	16.9	36.5	76.9	126	172	211	242	265	278	284	281	269	249	220	181	138	92.0	53.3	32.9
110	27.3	46.1	79.2	121	163	199	228	250	263	268	266	255	236	208	174	135	96.0	63.6	45.5
115	38.4	57.2	83.4	119	155	188	216	236	248	253	251	240	223	197	168	135	102	75.9	57.9
120	48.6	70.8	89.7	119	150	179	203	221	233	238	236	226	211	189	164	136	109	89.0	69.1
125	57.2	81.5	97.0	121	147	172	193	209	219	223	221	214	201	183	161	138	115	98.6	77.7
130	65.2	89.7	104	123	145	166	184	198	208	211	210	203	192	177	159	139	120	107	84.4
135	72.4	97.6	114	127	144	162	177	189	197	200	199	194	185	172	157	142	128	113	89.6
140	78.2	106	121	131	145	159	171	181	187	190	190	186	178	168	156	143	132	119	93.7
145	82.4	113	126	136	146	156	166	174	179	181	181	178	173	164	154	147	136	127	96.3
150	83.0	119	129	139	147	155	162	168	172	174	174	171	168	161	154	141	139	134	97.9
155	81.8	112	133	141	149	154	159	163	166	168	168	166	163	159	154	148	137	130	97.8
160	80.0	96.4	136	142	148	153	156	159	161	163	163	162	160	157	140	138	127	117	95.5
165	77.2	84.1	109	141	144	149	152	156	157	157	158	158	154	128	127	117	113	104	92.1
170	81.9	79.9	86.1	110	134	140	142	150	151	152	153	141	118	106	112	110	107	94.1	91.6
175	107	106	103	105	114	114	118	125	143	148	103	81.6	99.0	110	109	115	111	113	113
180	127	127	124	121	116	105	102	103	95.3	0.00	50.9	99.2	97.5	112	114	122	125	128	127

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	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450		
5	448	448	448	449	448	449	449	450	450	450	450	451	450	450	449	450	450		
10	442	443	443	445	446	447	448	447	447	449	448	449	447	447	447	447	446		
15	432	434	435	439	442	443	445	446	447	447	446	445	444	443	442	440	439		
20	420	423	425	430	434	437	441	443	443	444	444	442	439	436	433	430	428		
25	405	408	413	420	426	432	436	439	440	441	439	436	430	427	422	418	414		
30	385	390	398	407	416	424	431	435	436	436	433	429	421	415	409	402	397		
35	363	370	380	393	405	415	425	429	431	431	427	421	412	402	392	384	377		
40	337	347	360	378	392	406	417	423	426	425	420	412	400	387	375	363	353		
45	308	321	339	361	379	395	409	416	420	418	412	402	386	371	354	339	327		
50	276	293	317	343	367	386	401	409	413	411	403	391	373	353	332	313	297		
55	241	264	293	325	352	375	392	402	406	403	394	379	359	335	309	284	265		
60	204	233	269	306	338	363	383	394	398	394	384	369	345	316	285	254	230		
65	166	202	246	288	324	353	374	386	389	386	375	356	329	297	261	224	194		
70	128	172	223	271	311	342	364	376	381	377	365	344	315	279	238	194	157		
75	91.5	146	204	256	298	331	354	367	372	366	354	333	301	261	215	165	120		
80	61.3	124	187	241	286	320	344	357	361	356	342	321	288	246	196	138	85.2		
85	41.9	109	173	230	274	309	332	346	349	346	331	308	274	231	178	117	57.1		
90	34.8	99.0	162	219	263	296	321	334	338	334	319	296	262	218	164	102	39.3		
95	35.8	93.1	153	207	251	284	308	321	324	321	306	283	250	206	153	92.3	32.7		
100	42.9	91.1	145	197	238	271	294	307	310	307	293	268	236	194	143	86.0	33.3		
105	53.7	93.5	140	187	226	257	280	292	295	291	277	255	223	183	135	83.3	39.9		
110	66.2	98.4	137	178	215	244	264	277	280	276	262	241	210	173	129	85.1	50.2		
115	77.6	105	138	173	204	230	249	261	264	260	247	227	199	165	127	89.0	59.3		
120	88.7	112	139	169	196	218	235	246	248	244	233	214	189	159	126	95.1	70.3		
125	99.5	119	141	166	189	208	222	231	233	229	219	203	180	155	127	102	81.6		
130	109	124	143	164	183	198	211	218	220	217	207	193	174	153	130	107	91.6		
135	116	126	145	162	178	191	201	207	208	205	197	185	169	152	133	113	100		
140	123	132	147	161	173	184	192	197	198	195	188	178	165	151	134	119	108		
145	129	138	143	159	170	178	184	188	188	186	180	173	162	149	136	127	115		
150	133	142	145	157	166	172	177	180	180	179	174	167	158	149	139	132	120		
155	128	140	145	142	161	166	170	172	172	171	167	162	155	147	142	136	115		
160	109	127	133	137	148	158	162	165	164	164	161	157	153	149	145	140	105		
165	95.8	106	112	119	128	135	159	159	159	158	157	156	153	148	144	136	89.9		
170	91.7	93.6	103	109	109	108	104	141	154	155	154	151	143	142	134	105	83.9		
175	113	112	109	113	107	108	97.0	82.6	104	141	135	122	114	109	111	104	104		
180	127	126	124	121	116	110	104	97.5	85.2	8.43	86.0	98.5	105	110	116	121	123		

Table 7: 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 8: 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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