

LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

LED Lamp

Model: 9PLO/827/HYBM

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19120026i

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

Review by:



Engineer: April Zou
Dec. 27, 2019

Approved by:



Manager: Jim Zhang
Dec. 27, 2019

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: **9PLO/827/HYBM**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
136.5	1216.5	8.91	0.9789
CCT (K)	CRI	Stabilization Time (Light & Power)	
2690	82.0	60	

Table 1: Executive Data Summary

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

Test specifications:

Date of Receipt	: Dec. 19, 2019
Date of Test	: Dec. 25, 2019
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	: IESNA LM-79-2008 Approved Method for the 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 Lamp
Model	: 9PLO/827/HYBM
Electrical Ratings	: 120-277V, 50/60Hz, 9W
Product Description	: 2700K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 26.0 °C.

Base orientation was light down. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 65 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.076	0.037
Power Factor	0.9789	0.9008
Test Power (W)	8.91	9.13
THD A%	17.48	18.19
Luminous Efficacy (lm/W)	136.5	133.2
Total Luminous Flux (lm)	1216.5	1216.5
Color Rendering Index (CRI)	82.0	
R9	4	
Correlated Color Temperature (CCT)(K)	2690	
Chromaticity Chroma x	0.4612	
Chromaticity Chroma y	0.4118	
Chromaticity Chroma u	0.2628	
Chromaticity Chroma v	0.3520	
Duv	0.0004	
Chromaticity Chroma u'	0.2628	
Chromaticity Chroma v'	0.5280	

Special Color Rendering Indices	
R1	80.3
R2	91
R3	95.7
R4	80.5
R5	80.9
R6	90.6
R7	81.2
R8	55.9
R9	4
R10	80.7
R11	81
R12	77.2
R13	82.8
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 24.9 °C.

The photometric distance is 2.47 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)	0.076
Power Factor	0.9795
Power (W)	8.89
Luminous Efficacy (lm/W)	137.5
Total Luminous Flux (lm)	1222.0
Beam Angle (°)	335.5 (0°-180°) / 335.7 (90°-270°)
Center Beam Candle Power (cd)	8.58
Maximum Beam Candle Power (cd)	137.1 (At: C=220.0, Gamma=86.0)
Spacing Criteria	5.39 (0°-180°) / 5.39 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	19.13%
Zonal Lumens in the 60 °-90 °Zone	32.65%
Zonal Lumens in the 90 °-120 °Zone	31.71%
Zonal Lumens in the 120 °-180 °Zone	16.51%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

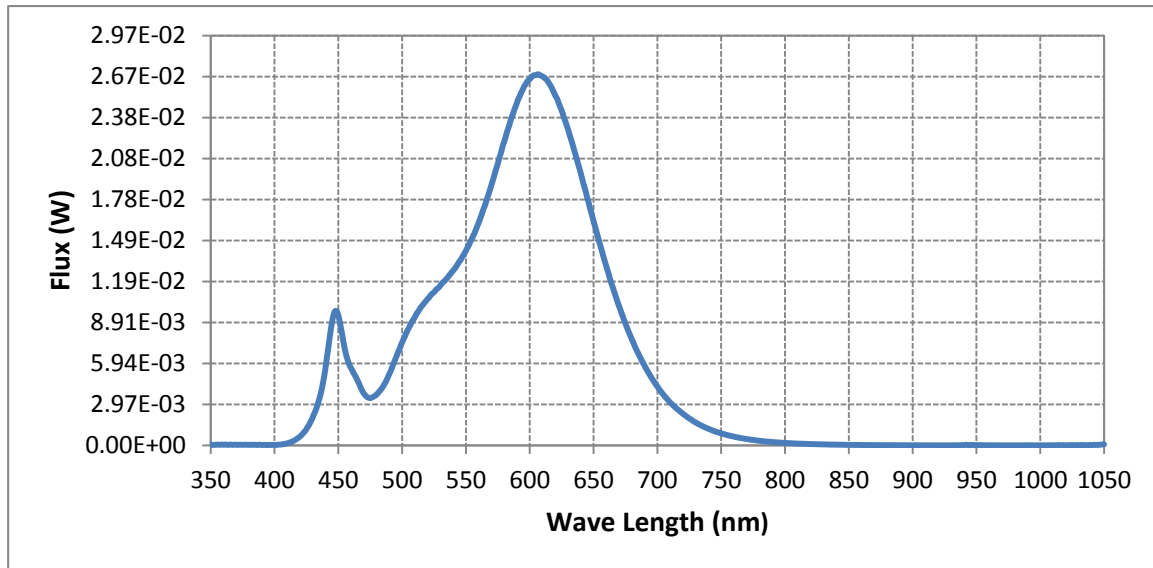


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.42E-05	485	4.27E-03	590	2.48E-02	695	4.97E-03
385	5.23E-05	490	5.20E-03	595	2.59E-02	700	4.27E-03
390	3.53E-05	495	6.33E-03	600	2.66E-02	705	3.65E-03
395	3.72E-05	500	7.47E-03	605	2.69E-02	710	3.12E-03
400	4.18E-05	505	8.48E-03	610	2.67E-02	715	2.68E-03
405	6.72E-05	510	9.32E-03	615	2.63E-02	720	2.30E-03
410	1.61E-04	515	1.01E-02	620	2.54E-02	725	1.96E-03
415	3.39E-04	520	1.06E-02	625	2.43E-02	730	1.66E-03
420	6.51E-04	525	1.11E-02	630	2.29E-02	735	1.42E-03
425	1.19E-03	530	1.16E-02	635	2.13E-02	740	1.21E-03
430	2.05E-03	535	1.21E-02	640	1.97E-02	745	1.03E-03
435	3.33E-03	540	1.27E-02	645	1.80E-02	750	8.80E-04
440	5.65E-03	545	1.33E-02	650	1.63E-02	755	7.51E-04
445	8.91E-03	550	1.41E-02	655	1.46E-02	760	6.42E-04
450	9.42E-03	555	1.51E-02	660	1.30E-02	765	5.43E-04
455	7.04E-03	560	1.62E-02	665	1.15E-02	770	4.67E-04
460	5.60E-03	565	1.74E-02	670	1.01E-02	775	4.02E-04
465	4.71E-03	570	1.89E-02	675	8.83E-03	780	3.39E-04
470	3.77E-03	575	2.04E-02	680	7.68E-03		
475	3.44E-03	580	2.20E-02	685	6.67E-03		
480	3.70E-03	585	2.36E-02	690	5.77E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method

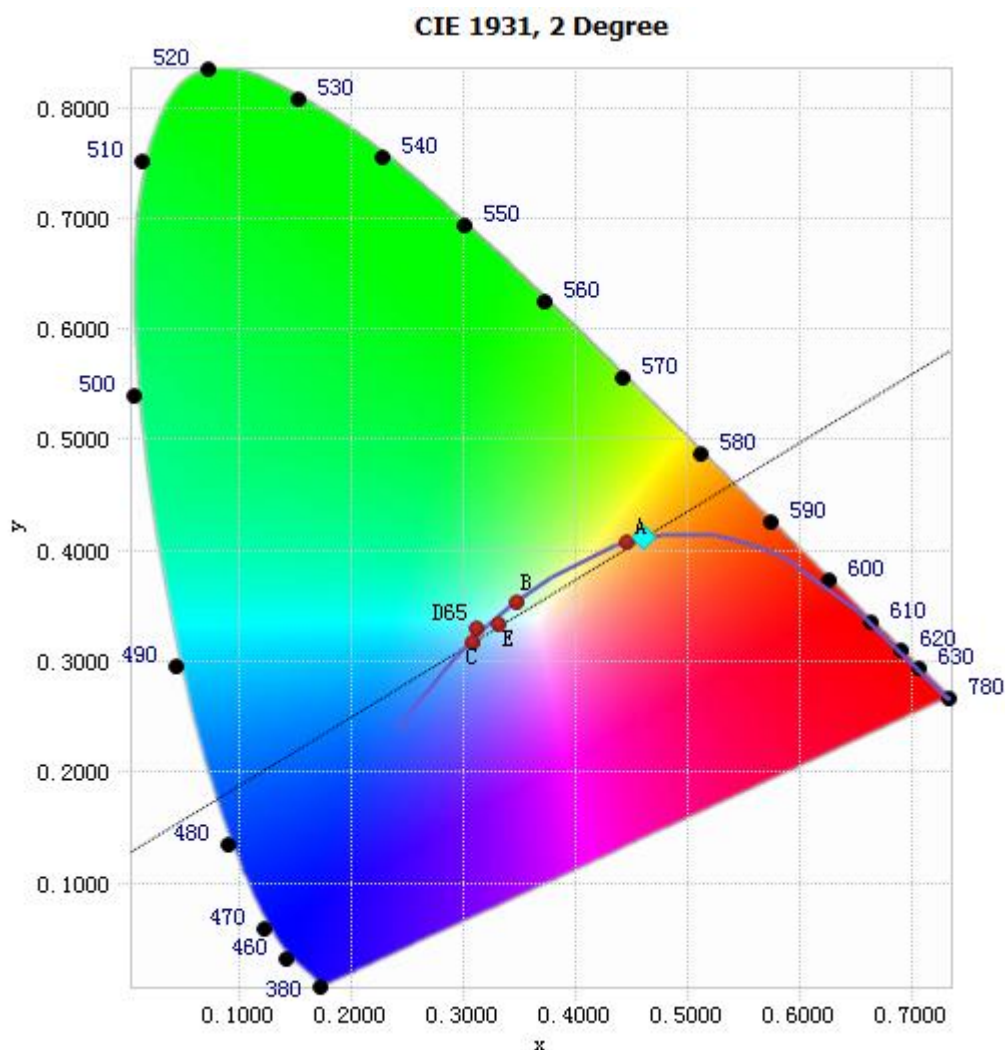


Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

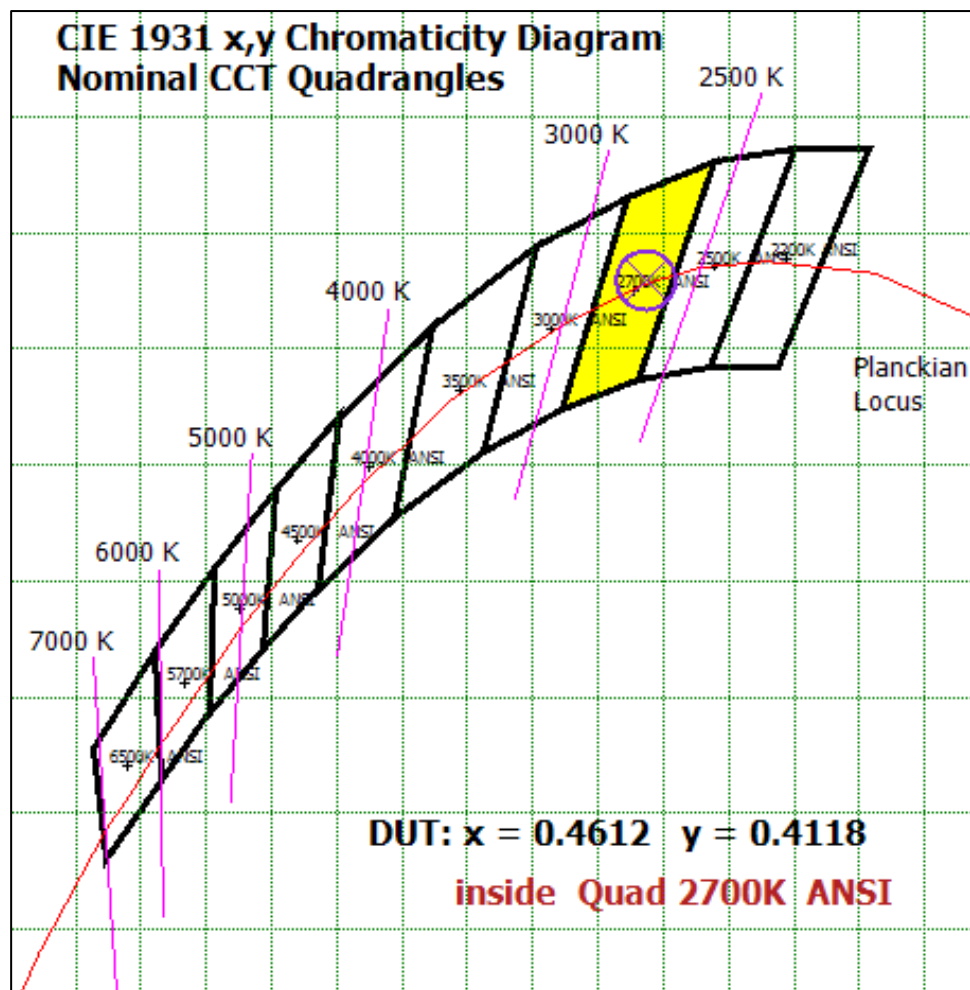
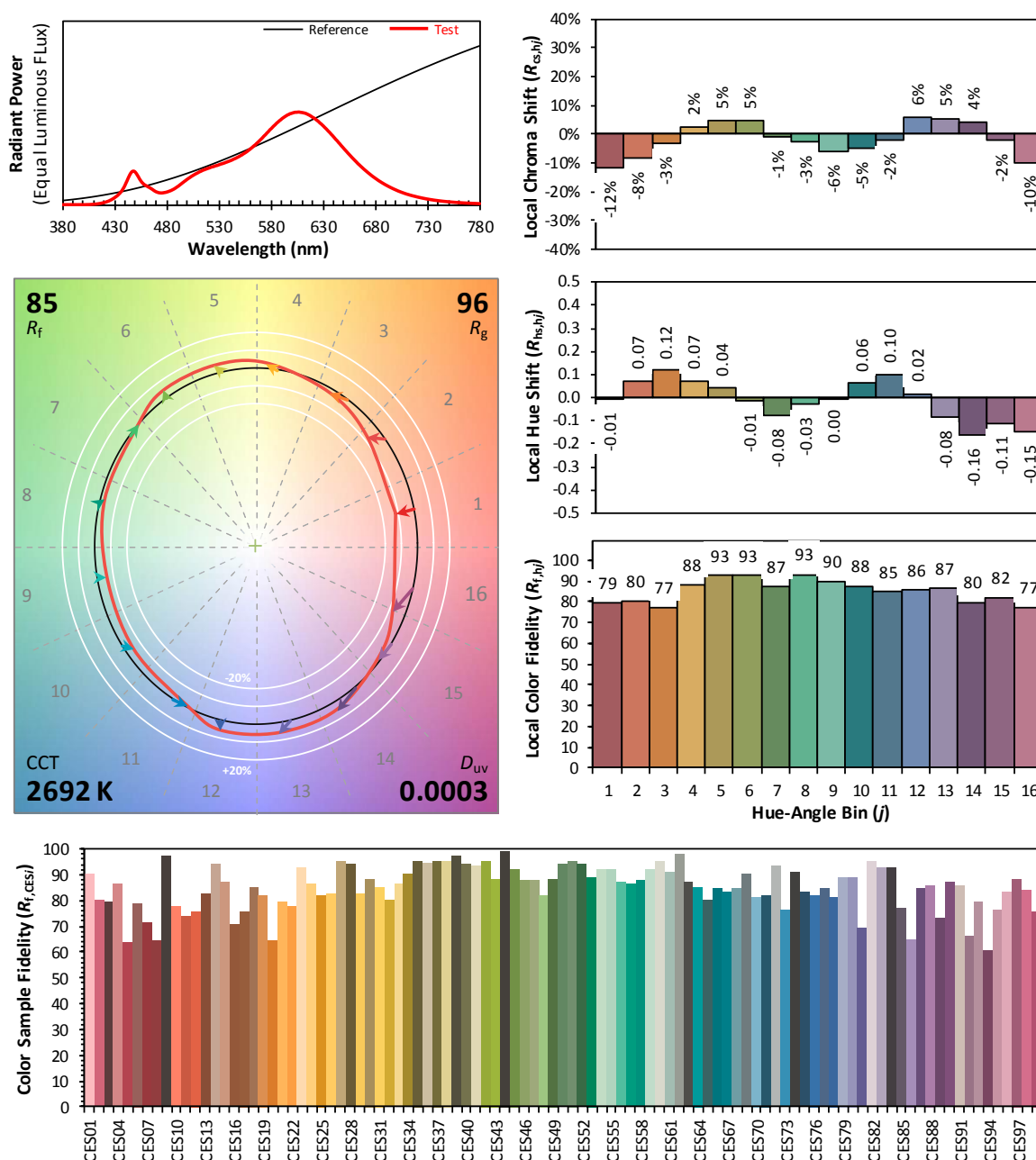


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.4612
y	0.4118
u'	0.2628
v'	0.5280

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	1.317	0.11%
10- 20	7.979	0.65%
20- 30	21.875	1.79%
30- 40	42.203	3.45%
40- 50	67.008	5.48%
50- 60	93.404	7.64%
60- 70	117.694	9.63%
70- 80	135.997	11.13%
80- 90	145.219	11.88%
90-100	143.86	11.77%
100-110	131.968	10.80%
110-120	111.711	9.14%
120-130	86.413	7.07%
130-140	59.933	4.90%
140-150	35.9	2.94%
150-160	16.295	1.33%
160-170	3.157	0.26%
170-180	0.03	0.00%
Total	1222.0	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	233.786	19.13%
60- 90	398.91	32.65%
0-90	632.696	51.78%
90- 180	589.267	48.22%
0- 180	1222.0	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

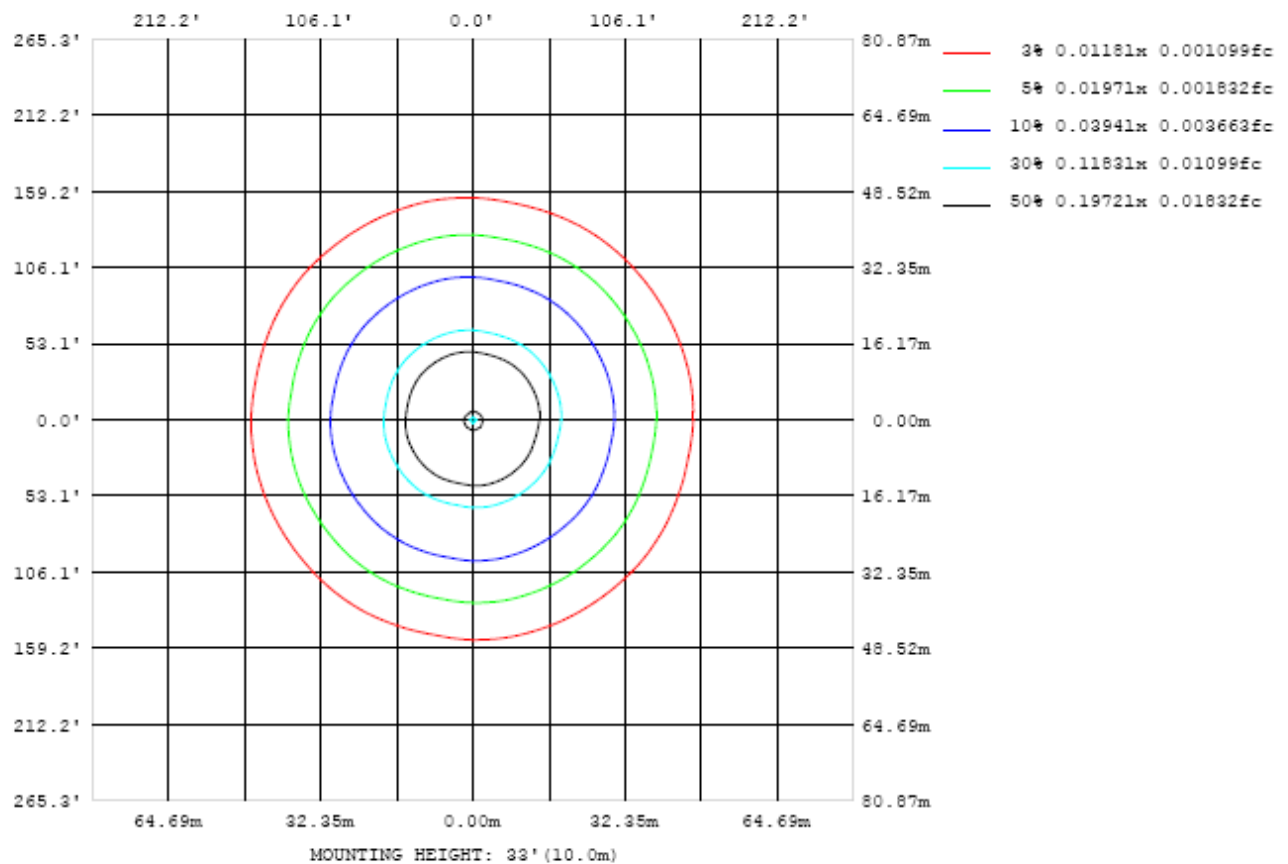


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

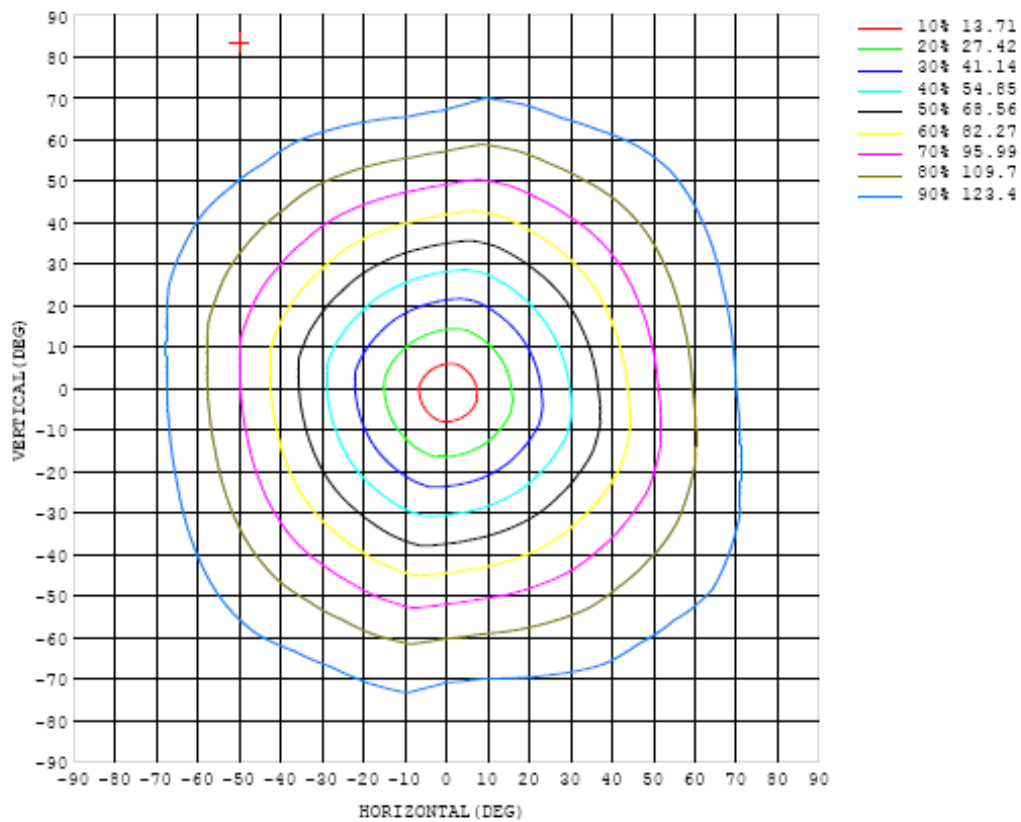


Chart 6: Isocandela Plot

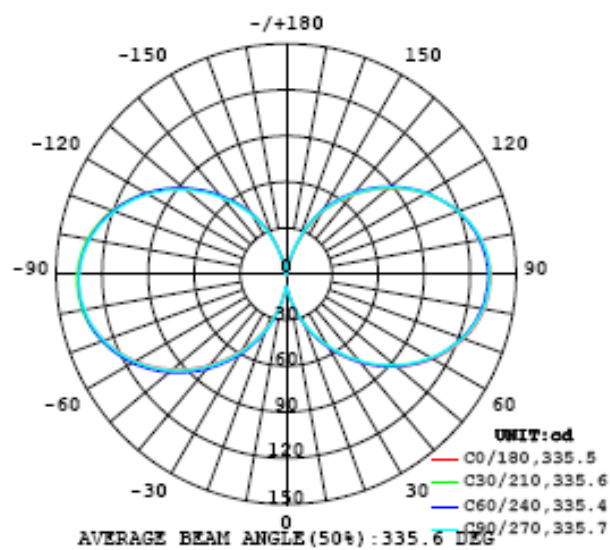


Chart 7: Polar Candela Distribution

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	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58
5	11.1	10.9	10.7	10.5	10.4	10.4	10.4	10.4	10.4	10.4	10.5	10.6	10.8	11.0	11.2	11.4	11.6	11.7	11.8
10	17.7	17.1	16.7	16.6	16.7	16.7	16.7	16.7	16.6	16.5	16.4	16.8	17.3	17.7	18.0	18.3	18.6	18.7	18.6
15	26.2	25.4	24.8	25.0	25.2	25.3	25.2	25.2	25.0	24.7	24.5	25.1	25.7	26.4	26.8	27.2	27.5	27.6	27.4
20	35.7	34.4	33.8	34.4	34.7	34.8	34.9	34.8	34.6	34.1	33.5	34.2	35.2	36.1	36.6	37.1	37.3	37.4	36.9
25	45.5	43.8	43.3	44.1	44.7	44.8	44.9	44.8	44.6	43.9	42.9	43.8	45.1	46.2	46.7	47.3	47.6	47.6	47.0
30	55.4	53.4	52.9	54.0	54.8	55.0	55.1	55.0	54.7	53.8	52.5	53.6	55.2	56.4	57.0	57.6	58.0	57.8	57.2
35	65.3	63.0	62.6	63.8	64.9	65.1	65.1	65.1	64.8	63.7	62.1	63.4	65.2	66.6	67.2	68.0	68.3	68.1	67.3
40	75.1	72.5	72.3	73.6	74.8	74.8	75.0	75.0	74.7	73.6	71.7	73.1	75.1	76.6	77.3	77.9	78.4	78.3	77.3
45	84.7	81.9	81.7	83.2	84.3	84.3	84.6	84.7	84.4	83.2	81.2	82.7	84.8	86.3	86.9	87.5	88.0	88.0	87.2
50	94.0	90.8	90.9	92.5	93.5	93.6	93.7	93.7	93.6	92.5	90.2	91.8	94.0	95.5	95.9	96.7	97.3	97.4	96.5
55	103	99.3	99.4	101	102	102	102	102	102	101	98.8	100	103	104	104	105	106	106	105
60	111	107	107	109	110	109	110	110	110	109	107	108	111	112	112	113	114	114	113
65	118	114	114	116	117	116	117	117	116	114	111	115	118	119	119	119	120	121	120
70	123	120	120	122	123	122	122	122	123	122	120	121	124	124	124	125	126	127	126
75	128	125	125	127	127	126	127	127	128	127	125	126	128	129	129	129	130	131	131
80	131	128	129	130	130	129	130	130	131	131	128	129	131	132	131	132	133	134	134
85	133	130	130	132	132	131	131	132	133	133	130	131	133	134	133	134	134	135	136
90	133	130	131	132	132	131	131	132	134	133	131	132	133	134	133	134	135	136	136
95	132	129	130	131	131	130	131	131	132	132	129	130	132	133	132	133	133	134	134
100	129	126	127	128	129	128	128	129	130	129	127	127	129	130	129	129	131	131	131
105	125	122	123	124	125	124	124	125	126	125	123	123	125	126	125	125	126	126	126
110	119	116	117	119	120	119	119	120	120	120	117	118	120	120	120	119	120	121	120
115	113	110	111	113	113	113	113	114	114	113	111	111	113	114	113	113	114	114	113
120	105	102	103	105	106	106	106	106	107	105	103	103	105	106	106	106	106	106	105
125	96.2	93.6	94.6	96.4	97.9	97.6	97.9	98.2	97.9	97.1	94.6	94.8	96.7	97.6	97.4	97.5	97.4	97.3	96.2
130	86.9	84.4	85.6	87.4	88.4	88.5	88.9	88.9	88.9	87.8	85.4	85.5	87.4	88.2	88.1	88.1	88.1	87.5	86.6
135	77.1	74.9	76.0	77.8	78.9	79.1	79.4	79.4	79.2	78.1	75.9	75.8	77.6	78.6	78.5	78.3	78.2	77.6	76.6
140	66.8	65.2	66.1	67.9	69.0	69.3	69.7	69.6	69.1	68.1	66.1	66.0	67.5	68.4	68.5	68.3	68.1	67.4	66.4
145	56.6	55.2	56.1	57.7	58.8	59.1	59.4	59.5	59.0	57.9	56.0	55.9	57.0	58.0	58.1	58.0	57.7	57.0	55.9
150	46.2	45.4	46.1	47.4	48.4	48.6	48.9	48.9	48.6	47.5	45.2	44.6	45.9	46.7	47.4	47.4	47.1	46.6	45.5
155	33.8	33.5	34.4	35.4	36.3	36.5	36.9	37.4	37.7	36.7	35.1	34.8	34.0	33.8	35.3	35.3	36.6	35.9	35.2
160	20.1	20.2	20.9	21.5	22.3	22.8	23.4	23.8	24.0	23.6	22.8	23.5	22.7	18.3	19.3	21.6	23.4	23.7	24.1
165	8.20	8.59	8.98	9.30	9.74	10.2	10.6	11.0	11.2	11.3	10.7	11.9	11.7	7.62	5.19	8.13	10.0	10.9	11.4
170	0.23	0.27	0.48	0.74	1.01	1.37	1.64	1.64	1.59	1.80	1.92	2.37	2.74	2.71	1.60	0.34	0.28	1.16	1.96
175	0.13	0.16	0.18	0.16	0.12	0.13	0.13	0.13	0.14	0.15	0.15	0.16	0.17	0.17	0.16	0.16	0.17	0.18	0.19
180	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) Y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58		
5	12.0	12.2	12.4	12.6	12.7	12.8	12.8	12.7	12.5	12.4	12.2	12.1	12.0	11.9	11.7	11.5	11.3		
10	18.7	19.3	19.7	20.1	20.3	20.4	20.3	20.2	19.8	19.4	19.1	19.1	19.1	18.9	18.7	18.4	18.0		
15	27.3	28.1	28.8	29.3	29.6	29.7	29.7	29.3	28.8	28.1	27.7	28.0	28.1	27.9	27.6	27.3	26.7		
20	36.6	37.7	38.6	39.4	39.6	39.9	39.7	39.3	38.5	37.4	37.1	37.6	37.9	37.8	37.5	37.1	36.4		
25	46.3	47.5	48.9	49.9	50.0	50.3	50.0	49.5	48.4	47.0	46.8	47.6	48.0	48.0	47.7	47.2	46.4		
30	56.1	57.5	59.0	60.4	60.5	60.7	60.5	59.8	58.6	56.7	56.6	57.5	58.2	58.2	57.9	57.5	56.6		
35	66.0	67.7	69.4	70.6	71.0	71.1	70.8	70.1	68.6	66.5	66.5	67.7	68.4	68.4	68.1	67.6	66.6		
40	75.8	77.6	79.4	80.9	81.0	81.2	80.9	80.2	78.6	76.1	76.2	77.6	78.3	78.3	78.0	77.5	76.6		
45	85.3	87.2	89.2	90.6	90.7	90.9	90.6	89.8	88.1	85.5	85.6	87.2	88.0	87.8	87.6	87.2	86.2		
50	94.7	96.4	98.6	100.0	99.9	100	99.8	99.2	97.5	94.5	94.8	96.4	97.1	96.8	96.6	96.3	95.4		
55	103	105	107	109	108	108	108	108	106	103	103	105	106	105	105	105	104		
60	111	113	115	116	116	116	116	116	114	111	111	113	113	113	112	112	112		
65	118	120	122	123	122	122	122	122	121	118	118	120	120	119	119	119	119		
70	124	126	128	129	128	128	128	128	126	123	124	125	125	125	124	125	125		
75	128	130	132	133	132	132	132	132	131	127	128	129	129	129	128	129	129		
80	132	133	135	136	135	134	135	135	134	130	131	132	132	131	131	132	132		
85	133	135	136	137	136	135	136	136	135	132	133	134	134	133	133	133	134		
90	133	135	136	137	135	135	135	136	135	132	133	134	134	133	133	134	134		
95	132	133	135	135	134	134	134	134	133	130	131	132	132	131	131	132	133		
100	129	130	131	132	131	130	131	131	130	127	128	129	129	129	129	129	130		
105	124	125	127	127	126	126	126	126	125	122	123	125	125	124	125	125	126		
110	118	119	121	121	120	120	120	120	119	116	118	119	119	119	119	120	120		
115	111	112	114	114	113	113	113	113	112	109	111	112	113	112	113	113	114		
120	103	104	105	106	106	106	105	105	104	101	103	104	105	105	105	106	106		
125	94.0	94.7	96.4	97.1	96.7	96.8	96.5	96.2	94.8	92.2	93.8	95.5	96.4	96.5	96.9	97.3	97.4		
130	84.4	85.1	86.6	87.6	87.4	87.3	87.0	86.6	84.9	82.8	84.3	86.0	87.0	87.4	87.9	88.2	88.2		
135	74.6	74.9	76.5	77.4	77.3	77.2	76.9	76.5	75.0	72.9	74.4	76.1	77.2	77.8	78.2	78.4	78.3		
140	64.4	64.8	66.1	66.9	67.0	66.9	66.6	66.1	64.8	62.9	64.4	66.0	67.1	67.7	68.2	68.3	68.2		
145	54.3	54.4	55.6	56.3	56.4	56.5	56.1	55.6	54.5	52.9	54.2	55.7	56.7	57.3	57.9	58.0	57.8		
150	44.2	44.1	45.0	45.7	45.8	45.8	45.6	45.0	44.1	43.0	44.1	45.1	45.9	46.2	46.8	47.1	47.1		
155	34.3	34.0	34.5	34.9	34.7	34.3	33.9	33.7	33.3	32.9	33.4	33.8	33.9	33.7	34.0	33.6	33.9		
160	24.1	22.9	22.5	22.6	21.9	21.7	21.7	21.3	20.7	20.1	19.8	19.8	19.8	19.5	19.6	19.4	19.8		
165	11.6	11.1	10.2	9.93	9.57	9.10	9.21	8.92	8.65	8.42	8.11	7.79	7.62	7.34	7.19	7.08	7.38		
170	2.03	2.03	1.36	1.11	1.10	1.09	1.23	0.97	0.73	0.48	0.26	0.18	0.24	0.28	0.33	0.21	0.12		
175	0.20	0.20	0.21	0.23	0.24	0.23	0.22	0.20	0.19	0.18	0.16	0.14	0.13	0.12	0.11	0.10	0.09		
180	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	PF2010A	HZTE028-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	DPS1060	HZTE001-06	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	WY12010	HZTE004-03	Aug. 02, 2019	Aug. 01, 2020
Temperature recorder	JM624U	HZTE018-08	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 02, 2019	Aug. 01, 2020
Standard source	D908	HZTE012-01	Aug. 02, 2019	Aug. 01, 2020
Integrate Sphere system	3M	HZTE015-04	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	PCR 500L	HZTE001-07	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	IT6154	HZTE004-04	Aug. 02, 2019	Aug. 01, 2020
Standard source	SCL-1400	HZTE012-02	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 02, 2019	Aug. 01, 2020
Temperature Meter	TES1310	HZTE017-01	Aug. 02, 2019	Aug. 01, 2020

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 Two 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 30 min, taken 15 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 30 min, taken 15 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

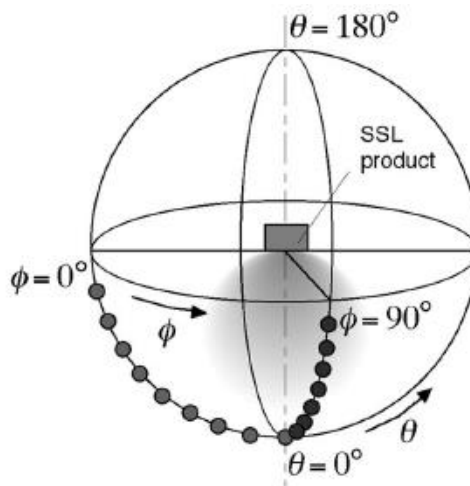
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ($C=0^\circ/180^\circ$ and $C=90^\circ/270^\circ$) and at 10° or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate

was calculated from these points. The data was then analyzed to check for delta color differences of the u' , v' chromaticity coordinates. The spatial non-uniformity of chromaticity, $\Delta u'v'$, is determined as the maximum deviation (distance on the CIE (u' , v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



*** End of Report ***

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