

VISUAL COMFORT AND COMPANY TEST REPORT

SCOPE OF WORK

LED Performance Testing

MODEL NUMBER

700MRAWB-LED927

PROJECT NUMBER

G104941221

REPORT NUMBER

104941221CRT-023

ISSUE DATE

7/28/2022

REVISED DATE

None

TEST DATES

7/15/2022 through 7/28/2022

DOCUMENT CONTROL NUMBER

RTTDS-R-AMER-Test-3407

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REPORT NUMBER

104941221CRT-023

MODEL NUMBER(s)

700MRAWB-LED927

REPORT RENDERED TO:

VISUAL COMFORT AND COMPANY
7400 LINDER AVE
SKOKIE, IL 60077

STATEMENT OF LIMITATION

NVLAP Lab Code 100402-0. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

AUTHORIZATION

The testing performed was authorized by signed quote number Qu-01236637-1.

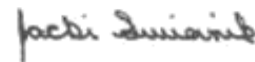
TEST STANDARDS

ANSI/IES LM-79-19: Optical and Electrical Measurements of Solid State Lighting Products

ANSI NEMA ANSLG C78.377: 2017: Specifications for the Chromaticity of Solid State Lighting (SSL) Products

In Charge of Testing:

Reviewer:



Melanie Brittain
Senior Associate Engineer
Lighting Division

Jacki Swiernik
Staff Engineer
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SAMPLE INFORMATION

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ITEMS RECEIVED

Item No.	Control No.	Model No.	Description	Type	Received
1	CRT2206301053-023	700MRAWB-LED927	Mara Chandelier	Production	6/30/2022
2	CRT2206301053-001	--	Globes		

SAMPLE PHOTOS - TESTED CONFIGURATIONS



SUMMARY

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PRODUCT INFORMATION AND SUMMARY OF DATA

Product Model No.:	700MRAWB-LED927
Product Description:	Mara Chandelier
LED Model No.:	Luminus MP-3020-1100-30-90
Driver Model No.:	MDR-503-24-60-LD
Light Source:	LED

Criteria	Results	
	Goniophotometer	Integrating Sphere
Light Output (lumens)	1611.5	1606.0
Input Power (W) @ 120 (Vac)	63.98	63.94
Luminous Efficacy (lm/W)	25.19	25.12
Input Power Factor (I) @ 120 (Vac)	0.988	0.986

Criteria	Results
Input ATHD (%) @ 120 (Vac)	8.43
Correlated Color Temperature (K)	2674
Color Rendering Index - Ra (I)	92.5
Color Rendering Index - R9 (I)	59.3
Duv (I)	-0.0020
Chromaticity Coordinate (x)	0.459
Chromaticity Coordinate (y)	0.405
Chromaticity Coordinate (u')	0.264
Chromaticity Coordinate (v')	0.525

TEST METHODS

SEASONING IN SAMPLE ORIENTATION - LED PRODUCTS

No seasoning was performed in accordance with ANSI/IES LM-79-19

INTEGRATING SPHERE TESTING

A spectroradiometer and integrating sphere were used to measure the spectral power distribution for photometric and colorimetric data of the EUT. Electrical measurements of the unit were measured using a power analyzer. Each EUT was operated at the rated input voltage of the system in its designated orientation. The ambient temperature and relative humidity was measured at $25^{\circ}\text{C} \pm 1.2^{\circ}\text{C}$ and 10-65% respectively at a position inside of the sphere within 1.5m and at equal height of the EUT. Stabilization procedures to LM-79-19 were followed. The EUT was mounted in a 4π configuration.

TYPE C GONIOPHOTOMETER DISTRIBUTION TESTING

A Type C Mirror Goniophotometer system was used to measure the luminous intensity (candela) at each angle of distribution for the EUT. Electrical measurements of the unit were measured using a power analyzer. Each EUT was operated at the rated input voltage of the system in its designated orientation. The ambient temperature and relative humidity was measured at $25^{\circ}\text{C} \pm 1.2^{\circ}\text{C}$ and 10-65% respectively at a position within 1.5m and at equal height of the EUT. Stabilization procedures to LM-79-19 were followed. The test distance was $\geq 5x$ the longest luminous dimension of the EUT.

TYPE C GONIOPHOTOMETER DISTRIBUTION TESTING

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PHOTOMETRIC AND ELECTRICAL MEASUREMENTS

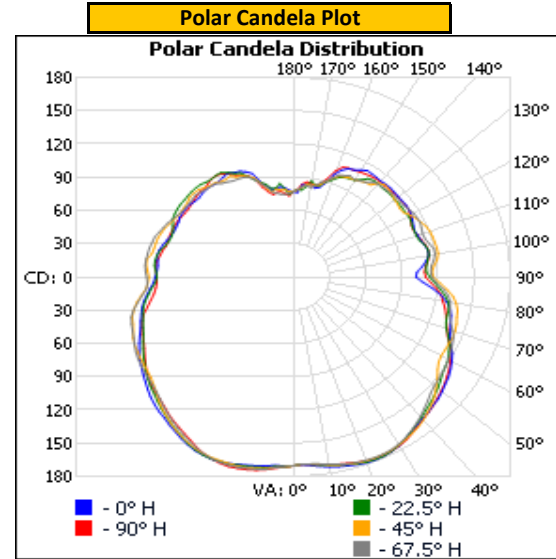
Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor ()
Up	120.00	539.7	63.98	0.988

Light Output (lm)	Efficacy (lm/W)
1611.5	25.2

LUMINOUS INTENSITY SUMMARY (candela)

Angle (°)	0	22.5	45	67.5	90
0	170	170	170	170	170
5	171	170	170	169	169
10	174	172	172	171	171
15	176	175	175	174	174
20	178	178	177	176	177
25	178	178	177	176	178
30	176	175	175	174	176
35	170	170	172	170	172
40	167	165	168	164	168
45	164	161	162	158	164
50	161	156	155	153	160
55	157	151	146	151	156
60	152	148	142	148	151
65	144	143	142	146	143
70	139	135	143	141	136
75	136	132	140	135	131
80	129	130	137	132	126
85	116	122	128	125	119
90	102	113	116	115	110
95	107	111	117	115	110
100	114	114	122	119	114
105	112	113	122	117	113
110	110	109	121	114	110
115	110	109	117	116	108
120	113	110	112	115	112
125	114	110	108	112	114
130	113	109	110	112	113
135	114	110	112	110	112
140	113	110	110	110	112
145	114	108	104	104	111
150	111	101	101	101	110
155	108	99	100	101	108
160	98	93	95	95	102
165	84	86	86	88	87
170	84	88	84	82	86
175	83	79	81	82	84
180	77	77	77	77	77

Entire luminous intensity matrix found in .IES file



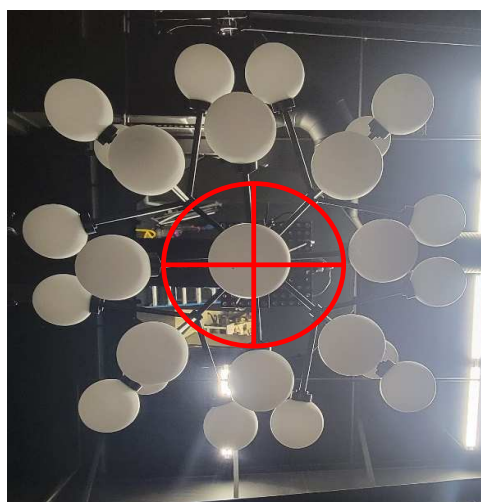
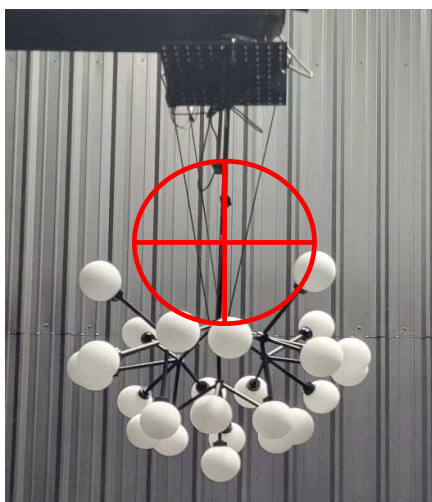
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ORIENTATION AND ALIGNMENT OF EUT

Luminous Opening		
Length (ft)	Width (ft)	Height (ft)
2.00	2.33	1.50
0°-180° H	90°-270° H	0°-180° V

Test Distance (ft)
29.6

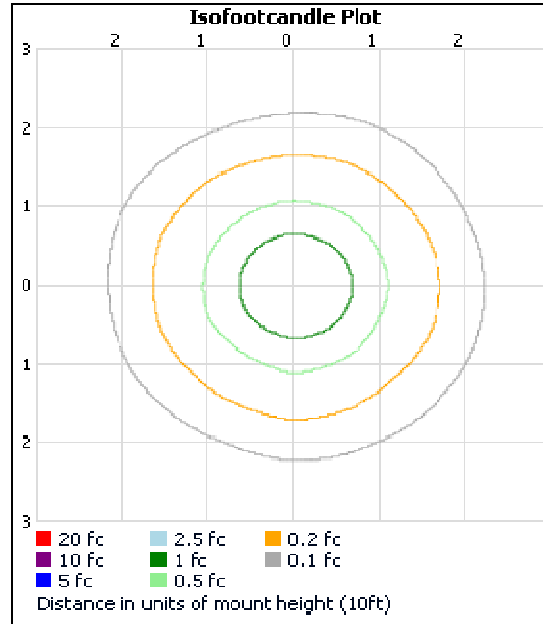
PHOTOMETRIC CENTER OF EUT



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ILLUMINANCE SUMMARY

Mounting Height: 10ft
Isoillumination Plot



ZONAL LUMENS

Zonal Lumen Summary

Zone	Lumens	Luminaire
0-30	147.8	9.2%
0-40	253.9	15.8%
0-60	511.4	31.7%
60-90	411.6	25.5%
70-100	397.0	24.6%
90-120	357.9	22.2%
0-90	923.0	57.3%
90-180	688.5	42.7%
0-180	1,611.5	100.0%

Zone	Lumens	Total	Zone	Lumens	Total
0-10	16.4	1.0%	90-100	125.6	7.8%
10-20	49.9	3.1%	100-110	121.3	7.5%
20-30	81.5	5.1%	110-120	110.9	6.9%
30-40	106.1	6.6%	120-130	98.8	6.1%
40-50	123.2	7.6%	130-140	85.1	5.3%
50-60	134.3	8.3%	140-150	67.5	4.2%
60-70	140.2	8.7%	150-160	46.9	2.9%
70-80	140.3	8.7%	160-170	24.6	1.5%
80-90	131.1	8.1%	170-180	7.7	0.5%

INTEGRATING SPHERE TESTING

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PHOTOMETRIC, RADIOMETRIC, COLORIMETRIC, AND ELECTRICAL MEASUREMENTS

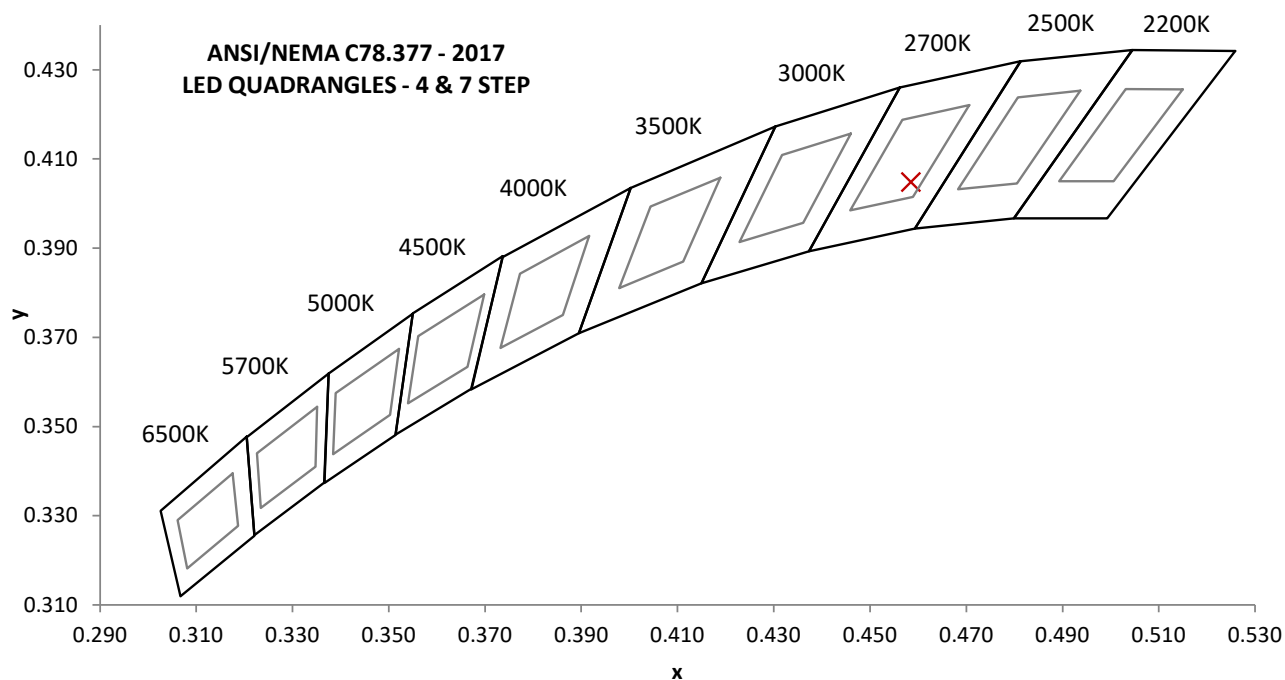
Base Orientation
Up

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
120.05	540.3	63.94	0.986	8.43

Measured at 120.05(Vac)

Light Output (lm)	Efficacy (lm/W)	CCT (K)	CRI - Ra (l)	CRI - R9 (l)
1606.0	25.1	2674	92.5	59.3

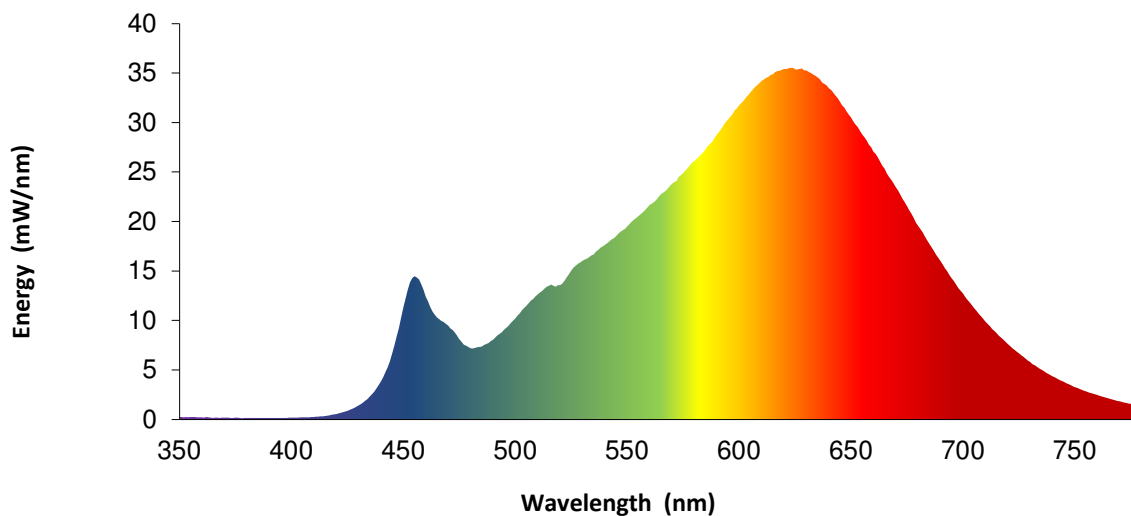
Duv (l)	1931 Chrom (x)	1931 Chrom (y)	1976 Chrom (u')	1976 Chrom (v')
-0.0020	0.459	0.405	0.264	0.525



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SPECTRAL POWER DISTRIBUTION

nm	mW/nm		nm	mW/nm		nm	mW/nm		nm	mW/nm
350	0.2		460	12.4		570	23.8		680	19.6
355	0.3		465	10.3		575	24.9		685	17.7
360	0.2		470	9.5		580	26.1		690	16.0
365	0.2		475	8.1		585	27.3		695	14.2
370	0.2		480	7.2		590	28.8		700	12.7
375	0.2		485	7.4		595	30.3		705	11.2
380	0.2		490	8.0		600	31.8		710	9.9
385	0.1		495	9.1		605	33.1		715	8.7
390	0.2		500	10.2		610	34.2		720	7.6
395	0.1		505	11.5		615	34.9		725	6.7
400	0.2		510	12.6		620	35.4		730	5.8
405	0.2		515	13.5		625	35.4		735	5.0
410	0.3		520	13.6		630	35.3		740	4.4
415	0.4		525	15.0		635	34.6		745	3.8
420	0.6		530	16.0		640	33.4		750	3.3
425	0.9		535	16.7		645	32.1		755	2.8
430	1.4		540	17.6		650	30.5		760	2.5
435	2.3		545	18.5		655	28.8		765	2.1
440	3.8		550	19.5		660	27.1		770	1.8
445	6.6		555	20.5		665	25.3		775	1.6
450	11.3		560	21.7		670	23.5		780	1.3
455	14.5		565	22.7		675	21.6		---	---



Portrayed color in graphic is estimated by wavelength (nm) and may not be exact - it is a visual representation only

EQUIPMENT LIST

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#	Equipment	Model No	Control No.	Last Cal	Cal Due
1	Elgar AC Power Supply	CW1251	---	VBU	VBU
2	Sorenson DC Power Supply	XFR 150-8	---	VBU	VBU
3	Traceable Hygrothermometer	200110913	L206	2/21/2022	2/21/2023
4	Yokogawa Power Analyzer	WT1600	E462	5/21/2022	5/21/2023
5	Fluke Thermometer	53 II	D588	6/13/2022	6/13/2023
6	Fluke Multimeter	87V	M145	3/25/2022	3/25/2023
7	Current Monitor	411	A197	8/26/2021	8/26/2024
8	3M Integrating Sphere Spectrometer System	CDS 2600	L231	7/1/2022	10/1/2022
9	Fisher Scientific Stopwatch	14-649-9	N1132	3/24/2022	3/24/2023
10	LSI High Speed Mirror Goniophotometer	6440	---	6/30/2022	9/30/2022
11	Elgar AC Power Supply	CW1251	---	VBU	VBU
12	Yokogawa Power Analyzer	WT210	307-E464	6/21/2022	6/21/2023
13	Traceable Hygrothermometer	4800	L204	2/21/2022	2/21/2023
14	Sorenson DC Power Supply	XG 150-10	---	VBU	VBU
15	Omega Thermometer	DPi8-C24	M263	3/1/2022	3/1/2023
16	Bosch Distance Laser	Pro GLM 20	L210	3/21/2022	3/15/2023
17	Tape Measure	Crescent	---	9/21/2021	9/21/2024

The AC power supplies used for testing have a crest factor capable of 0-3.5

REVISION HISTORY

#	Revision Date	Updated By	Reviewed By	Description of Change
---	None	---	---	---
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ANNEX A - TM-30 CALCULATIONS

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TM-30 REPORT

