

VISUAL COMFORT AND COMPANY TEST REPORT

SCOPE OF WORK

LED Performance Testing

MODEL NUMBER

700CLM6B-LED930

PROJECT NUMBER

G104941221

REPORT NUMBER

104941221CRT-004

ISSUE DATE

7/28/2022

REVISED DATE

None

TEST DATES

7/11/2022 through 7/28/2022

DOCUMENT CONTROL NUMBER

RTTDS-R-AMER-Test-3407

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REPORT NUMBER

104941221CRT-004

MODEL NUMBER(s)

700CLM6B-LED930

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.

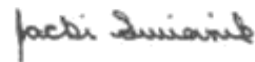
TEST STANDARDS

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
Lighting Division

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SAMPLE INFORMATION

REPORT NO. 104941221CRT-004

ITEMS RECEIVED

Item No.	Control No.	Model No.	Description	Type	Received
1	CRT2206301053-004	700CLM6B-LED930	Calumn 6-Light Chandelier	Production	6/30/2022

SAMPLE PHOTOS - TESTED CONFIGURATIONS



SUMMARY

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PRODUCT INFORMATION AND SUMMARY OF DATA

Product Model No.:	700CLM6B-LED930
Product Description:	Calumn 6-Light Chandelier
LED Model No.:	BRIDGELUX Bridgelux DS412 V10 Gen 8
Driver Model No.:	LTF DA45W1200C2036-301
Light Source:	LED

Criteria	Results	
	Goniophotometer	Integrating Sphere
Light Output (lumens)	3448.5	3205.5
Input Power (W) @ 120 (Vac)	46.41	47.19
Luminous Efficacy (lm/W)	74.31	67.93
Input Power Factor (I) @ 120 (Vac)	0.994	0.982

Criteria	Results
Input ATHD (%) @ 120 (Vac)	17.97
Correlated Color Temperature (K)	3032
Color Rendering Index - Ra (I)	91.7
Color Rendering Index - R9 (I)	56.7
Duv (I)	0.0011
Chromaticity Coordinate (x)	0.436
Chromaticity Coordinate (y)	0.407
Chromaticity Coordinate (u')	0.249
Chromaticity Coordinate (v')	0.522

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

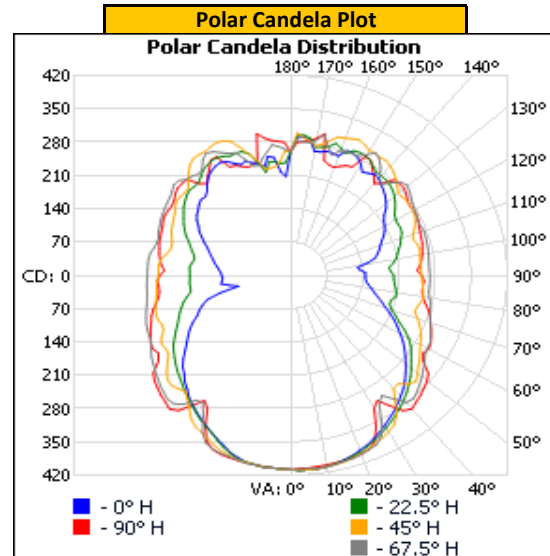
Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor ()
Up	120.24	388.2	46.41	0.994

Light Output (lm)	Efficacy (lm/W)
3448.5	74.3

LUMINOUS INTENSITY SUMMARY (candela)

Angle (°)	0	22.5	45	67.5	90
0	408	408	408	408	408
5	410	409	410	407	406
10	408	408	408	407	404
15	401	403	405	404	402
20	391	395	399	400	400
25	379	383	390	393	385
30	364	370	379	351	323
35	349	356	358	308	334
40	331	341	310	348	366
45	313	324	323	346	356
50	291	305	321	332	345
55	269	285	305	317	313
60	245	264	290	306	309
65	221	232	278	299	300
70	195	208	261	288	288
75	175	201	254	281	276
80	159	208	261	273	260
85	147	202	257	270	257
90	145	200	254	270	254
95	134	191	253	269	252
100	151	208	254	271	259
105	174	217	254	273	264
110	185	227	252	275	267
115	199	235	266	272	273
120	210	235	274	277	274
125	221	247	274	285	276
130	241	262	271	295	286
135	254	271	288	276	285
140	265	273	300	268	252
145	262	279	303	299	275
150	271	291	304	293	288
155	284	289	314	283	255
160	267	285	307	279	242
165	270	280	293	280	250
170	265	274	275	289	293
175	292	296	290	282	283
180	260	260	260	260	260

Entire luminous intensity matrix found in .IES file



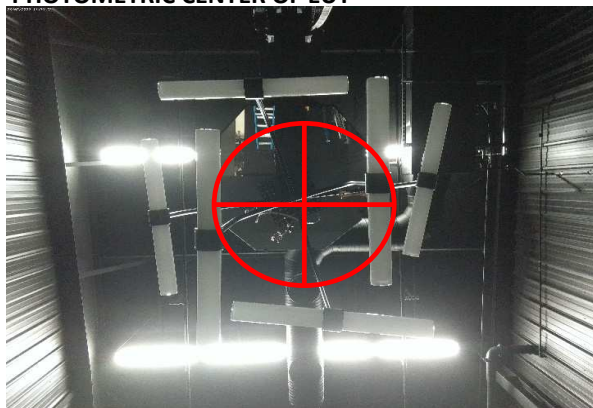
REPORT NO. 104941221CRT-004

ORIENTATION AND ALIGNMENT OF EUT

Luminous Opening		
Length (ft)	Width (ft)	Height (ft)
5.09	5.09	4.00
0°-180° H	90°-270° H	0°-180° V

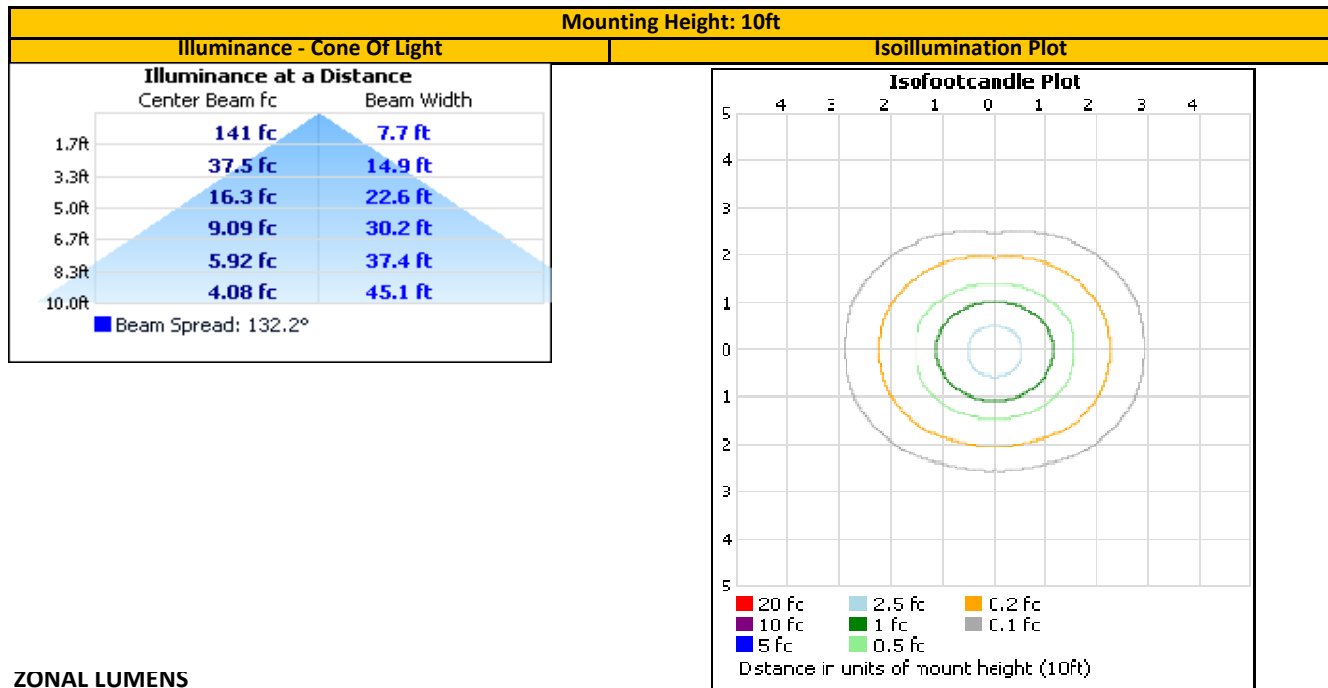
Test Distance (ft)
29.6

PHOTOMETRIC CENTER OF EUT



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ILLUMINANCE SUMMARY



ZONAL LUMENS

Zonal Lumen Summary																																																																																																			
<table><tr><th>Zone</th><th>Lumens</th><th>Luminaire</th></tr><tr><td>0-30</td><td>327.1</td><td>9.5%</td></tr><tr><td>0-40</td><td>540.5</td><td>15.7%</td></tr><tr><td>0-60</td><td>1,060.6</td><td>30.8%</td></tr><tr><td>60-90</td><td>778.1</td><td>22.6%</td></tr><tr><td>70-100</td><td>763.3</td><td>22.1%</td></tr><tr><td>90-120</td><td>747.6</td><td>21.7%</td></tr><tr><td>0-90</td><td>1,838.7</td><td>53.3%</td></tr><tr><td>90-180</td><td>1,609.8</td><td>46.7%</td></tr><tr><td>0-180</td><td>3,448.5</td><td>100.0%</td></tr></table>			Zone	Lumens	Luminaire	0-30	327.1	9.5%	0-40	540.5	15.7%	0-60	1,060.6	30.8%	60-90	778.1	22.6%	70-100	763.3	22.1%	90-120	747.6	21.7%	0-90	1,838.7	53.3%	90-180	1,609.8	46.7%	0-180	3,448.5	100.0%	<table><tr><th>Zone</th><th>Lumens</th><th>Total</th><th>Zone</th><th>Lumens</th><th>Total</th></tr><tr><td>0-10</td><td>38.9</td><td>1.1%</td><td>90-100</td><td>251.0</td><td>7.3%</td></tr><tr><td>10-20</td><td>113.5</td><td>3.3%</td><td>100-110</td><td>249.1</td><td>7.2%</td></tr><tr><td>20-30</td><td>174.8</td><td>5.1%</td><td>110-120</td><td>247.5</td><td>7.2%</td></tr><tr><td>30-40</td><td>213.3</td><td>6.2%</td><td>120-130</td><td>236.8</td><td>6.9%</td></tr><tr><td>40-50</td><td>253.4</td><td>7.3%</td><td>130-140</td><td>212.0</td><td>6.1%</td></tr><tr><td>50-60</td><td>266.8</td><td>7.7%</td><td>140-150</td><td>180.3</td><td>5.2%</td></tr><tr><td>60-70</td><td>265.9</td><td>7.7%</td><td>150-160</td><td>132.0</td><td>3.8%</td></tr><tr><td>70-80</td><td>257.8</td><td>7.5%</td><td>160-170</td><td>75.5</td><td>2.2%</td></tr><tr><td>80-90</td><td>254.4</td><td>7.4%</td><td>170-180</td><td>25.7</td><td>0.7%</td></tr></table>							Zone	Lumens	Total	Zone	Lumens	Total	0-10	38.9	1.1%	90-100	251.0	7.3%	10-20	113.5	3.3%	100-110	249.1	7.2%	20-30	174.8	5.1%	110-120	247.5	7.2%	30-40	213.3	6.2%	120-130	236.8	6.9%	40-50	253.4	7.3%	130-140	212.0	6.1%	50-60	266.8	7.7%	140-150	180.3	5.2%	60-70	265.9	7.7%	150-160	132.0	3.8%	70-80	257.8	7.5%	160-170	75.5	2.2%	80-90	254.4	7.4%	170-180	25.7	0.7%
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INTEGRATING SPHERE TESTING

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PHOTOMETRIC, RADIOMETRIC, COLORIMETRIC, AND ELECTRICAL MEASUREMENTS

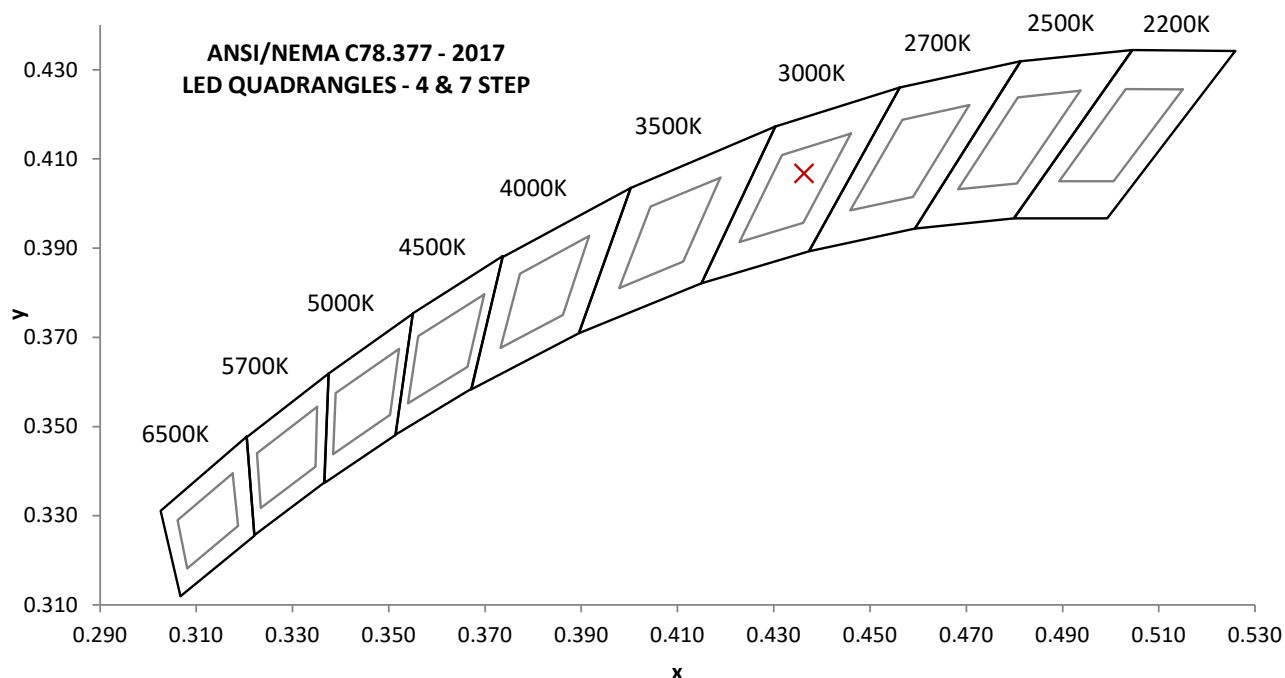
Base Orientation
Up

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
120.07	400.4	47.19	0.982	17.97

Measured at 120.07(Vac)

Light Output (lm)	Efficacy (lm/W)	CCT (K)	CRI - Ra (l)	CRI - R9 (l)
3205.5	67.9	3032	91.7	56.7

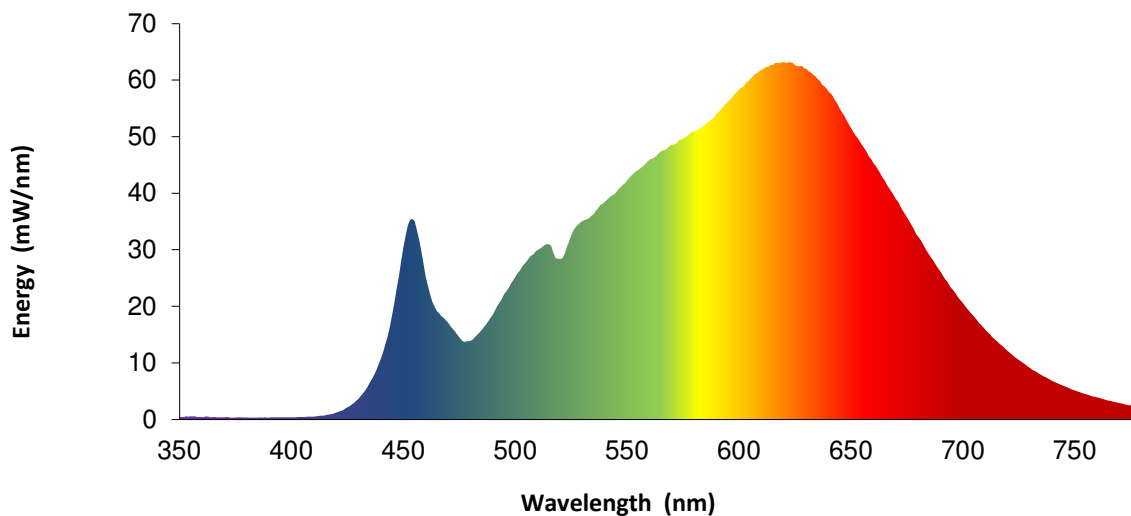
Duv (l)	1931 Chrom (x)	1931 Chrom (y)	1976 Chrom (u')	1976 Chrom (v')
0.0011	0.436	0.407	0.249	0.522



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SPECTRAL POWER DISTRIBUTION

nm	mW/nm		nm	mW/nm		nm	mW/nm		nm	mW/nm
350	0.5		460	25.2		570	48.6		680	32.3
355	0.6		465	19.2		575	49.7		685	29.1
360	0.4		470	17.1		580	50.9		690	26.1
365	0.4		475	14.5		585	52.2		695	23.1
370	0.4		480	13.9		590	54.1		700	20.6
375	0.4		485	15.8		595	56.2		705	18.1
380	0.4		490	18.6		600	58.4		710	15.8
385	0.3		495	22.1		605	60.3		715	13.9
390	0.3		500	25.2		610	61.9		720	12.1
395	0.4		505	27.9		615	62.7		725	10.5
400	0.4		510	30.0		620	63.2		730	9.1
405	0.5		515	31.0		625	62.6		735	7.9
410	0.5		520	28.3		630	62.0		740	6.8
415	0.7		525	32.6		635	60.2		745	5.9
420	1.2		530	35.1		640	57.9		750	5.1
425	2.1		535	36.3		645	54.9		755	4.5
430	3.7		540	38.5		650	51.5		760	3.9
435	6.5		545	40.2		655	48.5		765	3.3
440	10.8		550	42.3		660	45.3		770	2.9
445	18.5		555	44.2		665	42.3		775	2.5
450	30.4		560	46.0		670	39.0		780	2.1
455	35.1		565	47.4		675	35.7		---	---



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

EQUIPMENT LIST

REPORT NO. 104941221CRT-004

#	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	---	4/4/2022	7/4/2022
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	Multi Channel Spectroradiometer	OL 770	O230	6/1/2022	9/1/2022
17	Bosch Distance Laser	Pro GLM 20	L210	3/21/2022	3/15/2023
18	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

REPORT NO. 104941221CRT-004

TM-30 REPORT

