

VISUAL COMFORT AND COMPANY TEST REPORT

SCOPE OF WORK

LED Performance Testing

MODEL NUMBER

700BCOKO3S-LED930

PROJECT NUMBER

G104941221

REPORT NUMBER

104941221CRT-019

ISSUE DATE

7/28/2022

REVISED DATE

None

TEST DATES

7/15/2022 through 7/25/2022

DOCUMENT CONTROL NUMBER

RTTDS-R-AMER-Test-3407

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REPORT NUMBER

104941221CRT-019

MODEL NUMBER(s)

700BCOKO3S-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

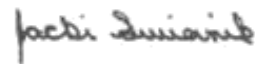
ANSI NEMA ANSLG C78.377: 2017: Specifications for the Chromaticity of Solid State Lighting (SSL) Products

In Charge of Testing:

Reviewer:



Melanie Brittain
Senior Associate Engineer
Lighting Division



Jacki Swiernik
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SAMPLE INFORMATION

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ITEMS RECEIVED

Item No.	Control No.	Model No.	Description	Type	Received
1	CRT2206301053-019	700BCOKO3S-LED930	Oko 3-Light Bath	Production	6/30/2022

SAMPLE PHOTOS - TESTED CONFIGURATIONS



SUMMARY

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PRODUCT INFORMATION AND SUMMARY OF DATA

Product Model No.:	700BCOKO3S-LED930
Product Description:	Oko 3-Light Bath
LED Model No.:	Bridgelux DS412 V10 Gen 8
Driver Model No.:	EPT D35-900RC3
Light Source:	LED

Criteria	Results	
	Goniophotometer	Integrating Sphere
Light Output (lumens)	3054.7	2944.0
Input Power (W) @ 120 (Vac)	33.86	33.77
Luminous Efficacy (lm/W)	90.21	87.18
Input Power Factor (I) @ 120 (Vac)	0.993	0.992

Criteria	Results
Input ATHD (%) @ 120 (Vac)	12.10
Correlated Color Temperature (K)	3055
Color Rendering Index - Ra (I)	92.5
Color Rendering Index - R9 (I)	56.6
Duv (I)	0.0013
Chromaticity Coordinate (x)	0.435
Chromaticity Coordinate (y)	0.407
Chromaticity Coordinate (u')	0.248
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

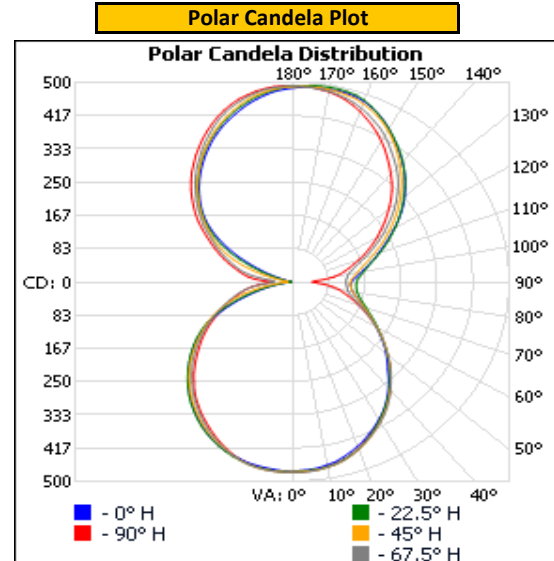
Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor ()
Wall Mount	120.20	283.8	33.86	0.993

Light Output (lm)	Efficacy (lm/W)
3054.7	90.2

LUMINOUS INTENSITY SUMMARY (candela)

Angle (°)	0	22.5	45	67.5	90
0	476	476	476	476	476
5	472	474	475	477	475
10	466	470	471	472	470
15	454	461	463	462	461
20	439	445	448	447	444
25	420	425	428	427	424
30	399	401	405	406	401
35	375	376	380	382	378
40	345	349	351	352	351
45	311	318	320	322	320
50	283	287	289	288	287
55	253	256	256	254	256
60	224	227	224	222	223
65	197	201	196	190	190
70	172	179	173	164	159
75	155	163	154	143	132
80	142	152	142	130	110
85	136	148	136	126	78
90	136	148	134	124	46
95	148	156	141	127	75
100	166	170	155	134	112
105	187	189	173	151	136
110	212	215	199	177	163
115	240	244	228	208	195
120	272	274	259	242	227
125	307	305	292	277	259
130	338	336	324	312	292
135	367	368	356	345	324
140	394	395	385	373	353
145	419	421	414	398	381
150	444	444	440	425	409
155	466	466	460	446	434
160	482	485	476	464	455
165	489	493	485	477	473
170	490	496	490	485	484
175	490	494	491	490	491
180	486	491	490	492	492

Entire luminous intensity matrix found in .IES file



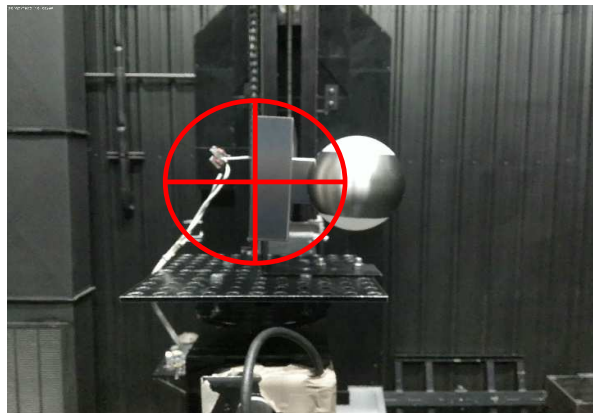
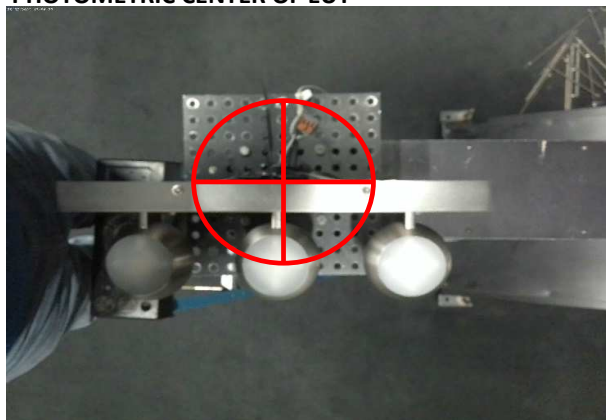
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ORIENTATION AND ALIGNMENT OF EUT

Luminous Opening		
Length (ft)	Width (ft)	Height (ft)
0.31	1.29	0.31
0°-180° H	90°-270° H	0°-180° V

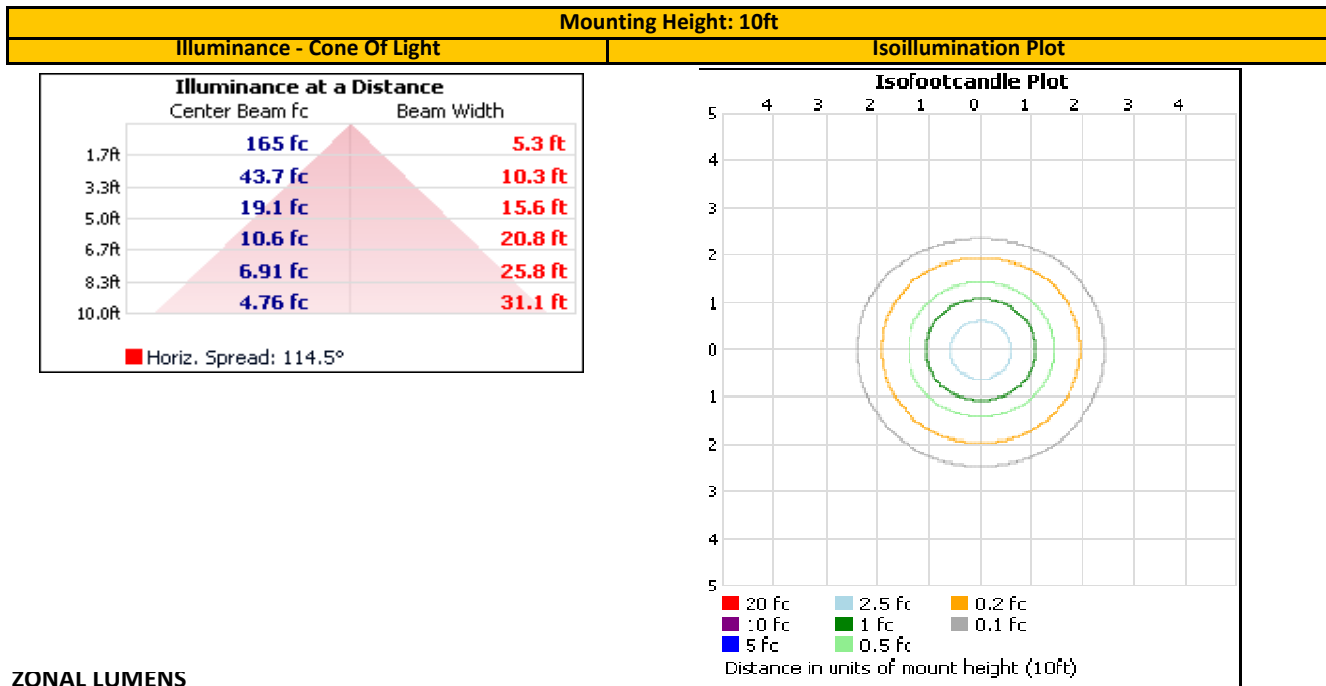
Test Distance (ft)
29.6

PHOTOMETRIC CENTER OF EUT



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ILLUMINANCE SUMMARY



ZONAL LUMENS

Zonal Lumen Summary									
Zone	Lumens	Luminaire		Zone	Lumens	Total	Zone	Lumens	Total
0-30	372.9	12.2%		0-10	45.2	1.5%	90-100	89.6	2.9%
0-40	612.7	20.1%		10-20	130.2	4.3%	100-110	130.9	4.3%
0-60	1,099.1	36.0%		20-30	197.5	6.5%	110-120	190.5	6.2%
60-90	425.6	13.9%		30-40	239.8	7.8%	120-130	237.8	7.8%
70-100	321.5	10.5%		40-50	251.8	8.2%	130-140	256.3	8.4%
90-120	411.0	13.5%		50-60	234.7	7.7%	140-150	243.5	8.0%
0-90	1,524.8	49.9%		60-70	193.8	6.3%	150-160	201.8	6.6%
90-180	1,529.9	50.1%		70-80	139.2	4.6%	160-170	133.2	4.4%
0-180	3,054.7	100.0%		80-90	92.6	3.0%	170-180	46.4	1.5%

INTEGRATING SPHERE TESTING

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PHOTOMETRIC, RADIOMETRIC, COLORIMETRIC, AND ELECTRICAL MEASUREMENTS

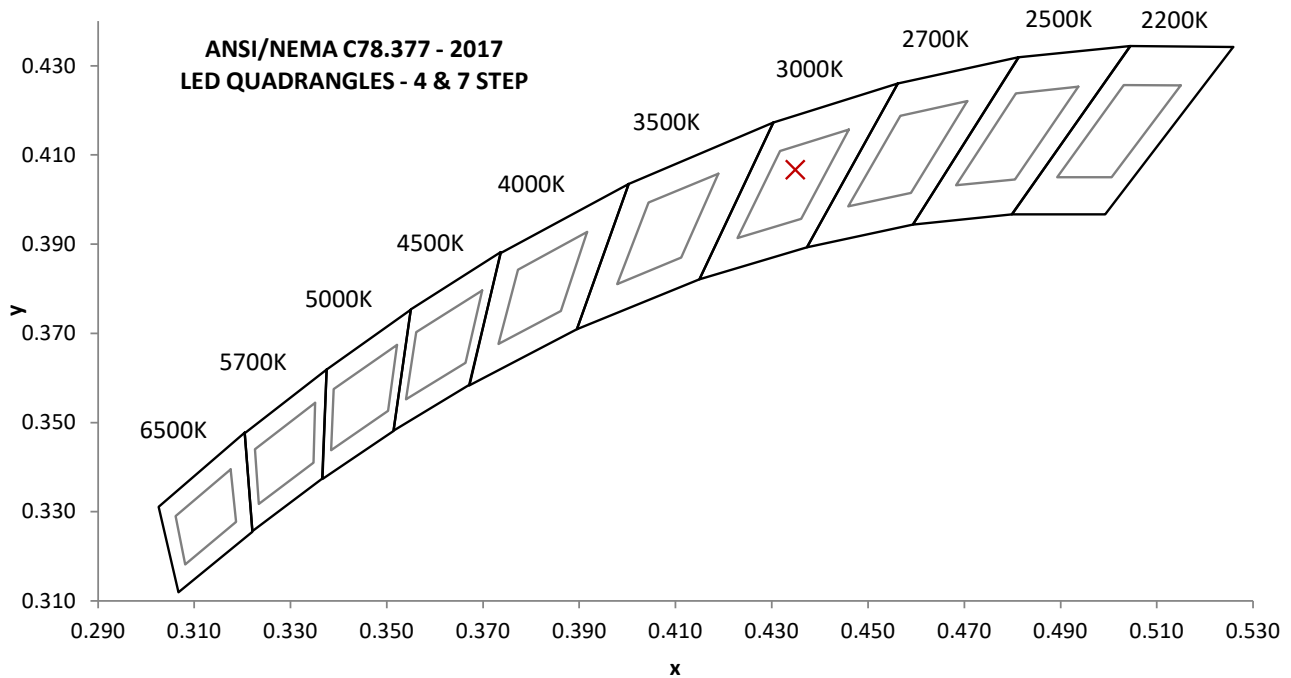
Base Orientation
Wall Mount

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
120.08	283.5	33.77	0.992	12.10

Measured at 120.08(Vac)

Light Output (lm)	Efficacy (lm/W)	CCT (K)	CRI - Ra (l)	CRI - R9 (l)
2944.0	87.2	3055	92.5	56.6

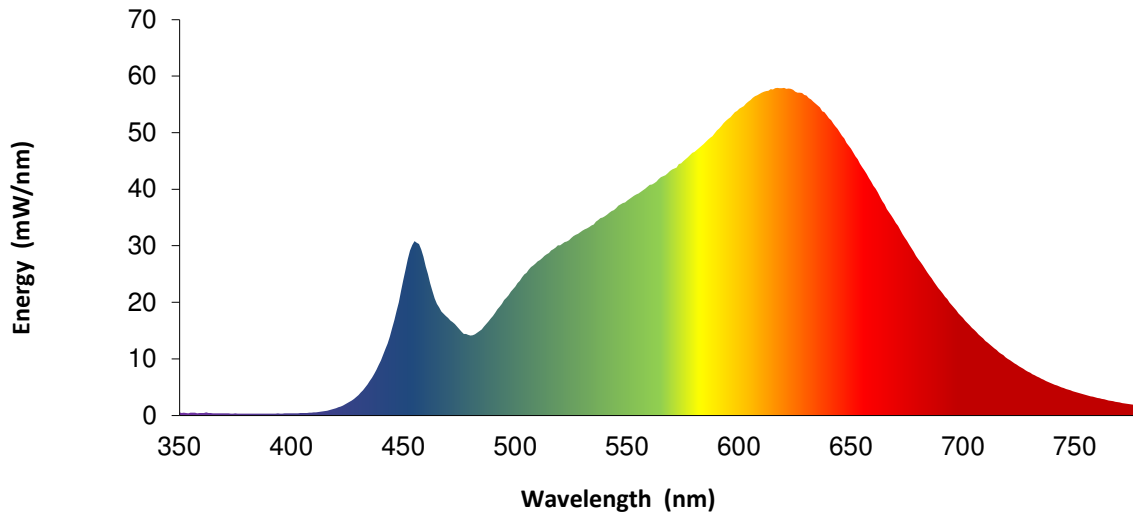
Duv (l)	1931 Chrom (x)	1931 Chrom (y)	1976 Chrom (u')	1976 Chrom (v')
0.0013	0.435	0.407	0.248	0.522



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SPECTRAL POWER DISTRIBUTION

nm	mW/nm		nm	mW/nm		nm	mW/nm		nm	mW/nm
350	0.6		460	26.4		570	43.5		680	27.7
355	0.5		465	19.7		575	44.9		685	24.7
360	0.4		470	17.2		580	46.6		690	22.1
365	0.4		475	15.3		585	48.4		695	19.5
370	0.4		480	14.1		590	50.4		700	17.2
375	0.4		485	15.2		595	52.4		705	15.1
380	0.3		490	17.6		600	54.3		710	13.2
385	0.3		495	20.4		605	55.8		715	11.6
390	0.3		500	22.8		610	57.1		720	10.0
395	0.3		505	25.2		615	57.6		725	8.7
400	0.4		510	27.2		620	57.9		730	7.5
405	0.4		515	28.7		625	57.3		735	6.5
410	0.5		520	30.1		630	56.6		740	5.6
415	0.8		525	31.4		635	54.8		745	4.8
420	1.3		530	32.7		640	52.6		750	4.2
425	2.2		535	33.8		645	50.0		755	3.6
430	3.6		540	35.2		650	47.1		760	3.1
435	6.1		545	36.7		655	43.9		765	2.7
440	9.7		550	38.0		660	40.6		770	2.3
445	15.4		555	39.3		665	37.3		775	2.0
450	24.0		560	40.8		670	34.0		780	1.7
455	30.8		565	42.1		675	30.9		---	---



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

