



FOR THE SCOPE OF
ACCREDITATION UNDER NVLAP LAB
CODE 100402-0.

REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G102747073

Date: May 17, 2017

REPORT NO. 102747073CRT-018

TEST OF ONE 4FT LED TUBE, 110V

MODEL NO. BH4-G110-50-C
LED MODEL NO. SAMSUNG LM561C
DRIVER MODEL NO. INTEGRAL TO LUMINAIRE

RENDERED TO:

US LIGHTING GROUP
34099 MELINZ PKWY, UNIT E
EASTLAKE, OH 44095

TESTS: Electrical and Photometric tests as required to the IESNA test standard.

STATEMENT OF LIMITATION: 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-00704468.

STANDARDS USED:

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting
ANSI NEMA ANSLG C78.377: 2015: Specifications of the Chromaticity of Solid State Lighting Products

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number BH4-G110-50-C . The sample was received by Intertek on May 12, 2017 in undamaged condition and one sample was tested as received. The sample designation was CRT1705121144-001.

DATE OF TESTS: May 17, 2017 through May 17, 2017.

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SUMMARY:

MODEL NO. BH4-G110-50-C
DESCRIPTION: 4FT LED TUBE, 110V

Criteria	Integrating Sphere	Goniophotometer
Light Output (Lumens)	3077.0	3080.9
Total Power (W)	19.31	19.24
Lumen Efficacy (Lm/W)	159.3	160.2
Power Factor ()	0.996	0.996

Criteria	Results
Current ATHD (%)	8.06
Correlated Color Temp. (CCT-K)	5062
Color Rendering Index (CRI - Ra)	82.1
CRI - R9	-0.8
DUV ()	0.002
Chromaticity Coordinate (x)	0.344
Chromaticity Coordinate (y)	0.355
Chromaticity Coordinate (u')	0.209
Chromaticity Coordinate (v')	0.486

EQUIPMENT LIST

Equipment Used	Model No.	Control No.	Last Cal.	Cal. Due
LSI High Speed Mirror Goniometer	6440	---	5/1/2017	6/1/2017
Elgar AC Power Supply	CW1251	---	VBU	VBU
Sorenson DC Power Supply	XG 150-10	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	5/2/2017	5/2/2018
Omega Thermometer	DPI8-C24	M263	5/2/2017	5/2/2018
M-D Building Products Digital Level	Smart Tool	L112	4/4/2017	4/4/2018
NIST Luminous Intensity Standard Source	NBS10322	N1427	1/9/2017	1/9/2019
NIST Luminous Intensity Standard Source	NBS10332	N1435	1/9/2017	1/9/2019
NIST Luminous Intensity Standard Source	NBS10265	N1437	1/9/2017	1/9/2019
NIST Luminous Flux Standard Source	NBS10428	N1424	1/11/2017	1/11/2019
Elgar AC Power Supply	CW1251	---	VBU	VBU
Sorenson DC Power Supply	XFR 150-8	---	VBU	VBU
Yokogawa Power Analyzer	WT1600	E474	5/4/2017	5/4/2018
Fluke Thermometer	53 II	D587	12/29/2016	12/29/2017
Fluke Multimeter	87V	D590	4/28/2017	4/28/2018
3M Integrating Sphere Spectrometer System	CDS 1100	---	5/1/2017	6/1/2017
Fisher Scientific Stopwatch	130471471	N1404	12/29/2016	12/19/2017
Secondary Spectral Intensity Standard Source	BS5186	RF5186	1/28/2017	1/28/2018
Secondary Luminous Flux Standard Source	BS3616	--	1/28/2017	1/28/2018
Secondary Luminous Flux Standard Source	BS4116	--	1/28/2017	1/28/2018
Secondary Luminous Flux Standard Source	6836	--	1/28/2017	1/28/2018



TEST METHODS:

Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79.

Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere Model CDS 1100 CCD Array Spectroradiometer and two meter or ten foot sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

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. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

Photometric and Electrical measurements – Distribution Method

A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for the SSL sample.

Ambient temperature was measured equal to the height of the sample mounted on the goniometer equipment. The SSL sample was operated on the client provided driver at rated input volts in its designated orientation. The SSL sample was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.



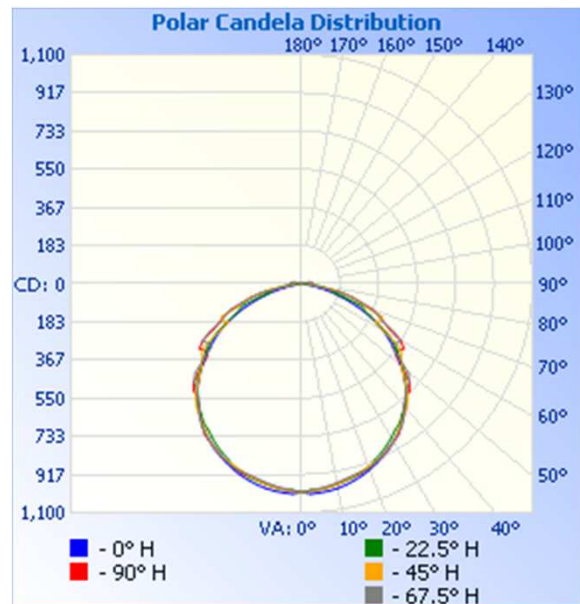
RESULTS:

Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Distribution Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ()	Light Output (Lumens)	Lumen Efficacy (lm/W)
CRT1705121144-001	Horizontal	110.05	175.5	19.24	0.996	3080.9	160.2

Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	1002	1002	1002	1002	1002
5	1006	991	992	986	990
10	997	978	979	970	975
15	977	960	957	951	960
20	950	939	932	942	944
25	916	896	912	909	910
30	876	854	875	871	876
35	828	815	825	833	826
40	771	766	778	764	762
45	701	705	705	707	728
50	623	630	625	664	628
55	537	553	581	526	560
60	448	466	448	546	544
65	347	354	420	424	430
70	237	301	326	360	352
75	138	152	253	246	250
80	53	121	149	94	73
85	8	52	49	56	59
90	0	25	38	44	46
95	0	19	44	50	51
100	0	6	23	39	42
105	0	3	12	21	25
110	0	0	7	11	12
115	0	0	4	7	8
120	0	0	0	5	5
125	0	0	0	0	1



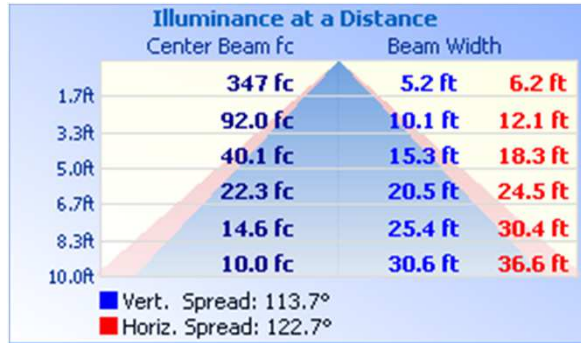


RESULTS:

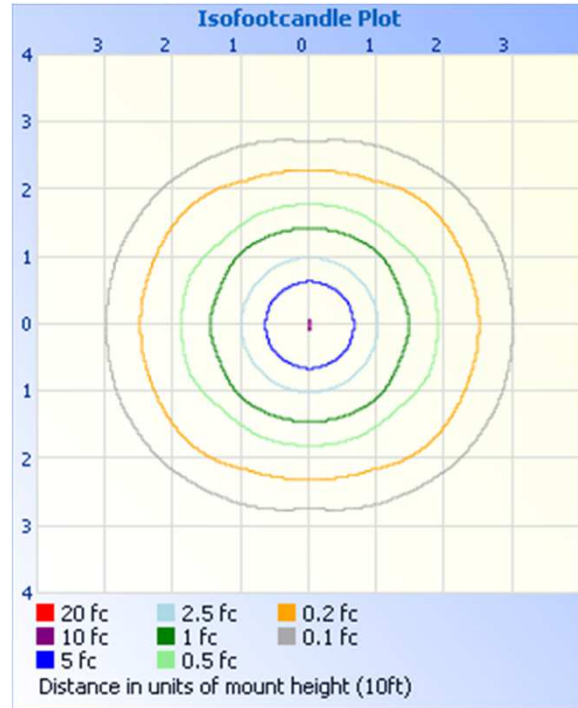
Illumination Plots

Mounting Height: 10ft

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	783.8	25.4
0-40	1298.7	42.2
0-60	2343.4	76.1
60-90	685.4	22.2
0-90	3028.8	98.3
90-180	52.2	1.7
0-180	3080.9	100.0

Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	94.2	3.1
10-20	271.3	8.8
20-30	418.3	13.6
30-40	514.8	16.7
40-50	545.5	17.7
50-60	499.1	16.2
60-70	396.8	12.9
70-80	228.7	7.4
80-90	59.8	1.9
90-100	34.4	1.1
100-110	13.6	0.4
110-120	3.6	0.1
120-130	0.6	0.0

RESULTS:

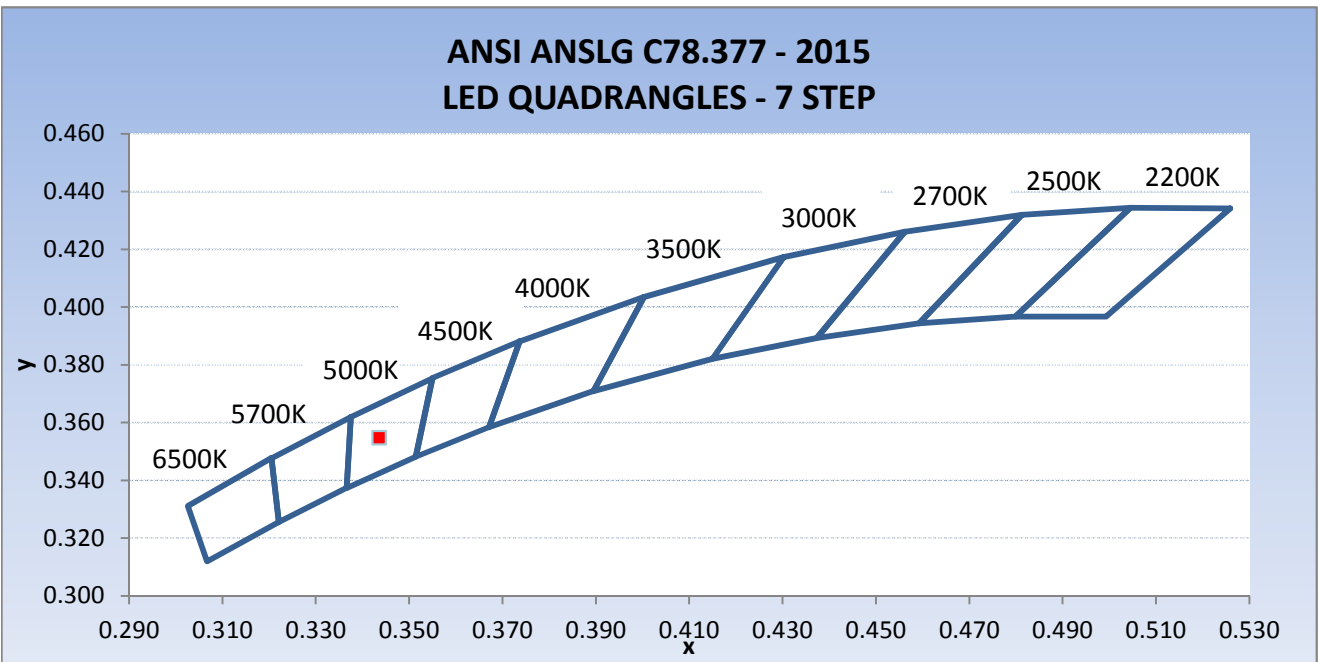
Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Sphere Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ()	Current ATHD (%)
CRT1705121144-001	Horizontal	110.04	176.2	19.31	0.996	8.06

Light Output (Lumens)	Lumen Efficacy (lm/W)	Correlated Color Temperature - CCT (K)	CRI -Ra	CRI -R9	DUV ()
3077.0	159.3	5062	82.1	-0.8	0.002

CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
0.344	0.355	0.209	0.486

ANSI C78.377 SSL Chromaticity (2015 Version)



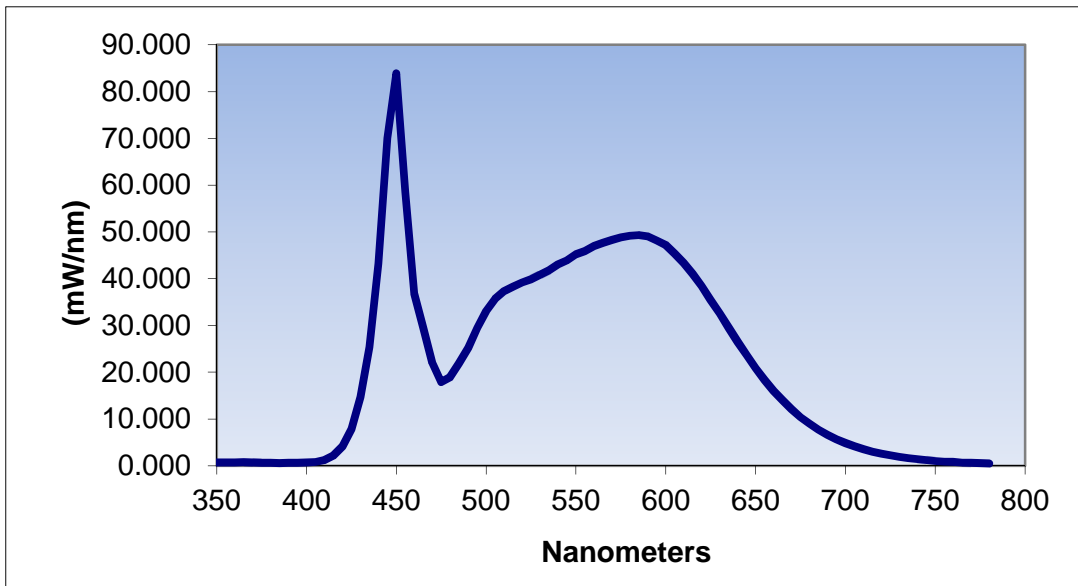


RESULTS:

Spectral Distribution Over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.679	460	36.808	570	48.297	680	8.983
355	0.647	465	29.518	575	48.819	685	7.685
360	0.672	470	22.100	580	49.210	690	6.607
365	0.710	475	17.903	585	49.317	695	5.656
370	0.650	480	18.939	590	49.051	700	4.872
375	0.575	485	21.901	595	48.183	705	4.163
380	0.606	490	25.249	600	47.183	710	3.547
385	0.564	495	29.484	605	45.363	715	3.024
390	0.594	500	33.130	610	43.381	720	2.591
395	0.590	505	35.676	615	41.060	725	2.224
400	0.638	510	37.321	620	38.455	730	1.898
405	0.837	515	38.329	625	35.507	735	1.618
410	1.230	520	39.177	630	32.554	740	1.406
415	2.178	525	39.905	635	29.469	745	1.209
420	4.158	530	40.816	640	26.461	750	1.042
425	7.835	535	41.784	645	23.642	755	0.902
430	14.687	540	43.051	650	20.880	760	0.779
435	25.374	545	43.889	655	18.299	765	0.680
440	43.222	550	45.183	660	16.023	770	0.600
445	70.076	555	45.923	665	13.984	775	0.518
450	83.884	560	47.004	670	12.128	780	0.451
455	58.569	565	47.648	675	10.415		

Spectral Data Over Visible Wavelengths





PRODUCT PICTURE:



CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Gerald Gray
Associate Engineer
Lighting Division

Report Reviewed By:

Jeffrey Davis
Engineering Supervisor
Lighting Division

Attachments: IES File - CRT1705121144-001