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

REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G102710907 Date: December 22, 2016

REPORT NO. 102710907CRT-015

TEST OF ONE LED AR111 INDIRECT 3000K

MODEL NO. LED AR111 INDIRECT AR-L720-C30-B25-90-ID
PART NO. 99551

RENDERED TO:

VERBATIM AMERICAS
8210 UNIVERSITY EXECUTIVE PARK DRIVE, SUITE 300
CHARLOTTE, NC 28262

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-00707669.

STANDARDS USED:

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting
ANSI NEMA ANSLG C78.377: 2011: Specifications of the Chromaticity of Solid State Lighting Products

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number LED AR111 INDIRECT AR-L720-C30-B25-90-ID. The sample was received by Intertek on January 0, 1900 in undamaged condition and one sample was tested as received. The sample designation was .

DATE OF TESTS: December 20, 2016 through December 21, 2016.

SUMMARY:

MODEL NO. LED AR111 INDIRECT AR-L720-C30-B25-90-ID
DESCRIPTION: LED AR111 INDIRECT 3000K

Criteria	Integrating Sphere	Goniophotometer
Light Output (Lumens)	709.2	730.4
Total Power (W)	10.11	10.44
Lumen Efficacy (Lm/W)	70.10	69.90
Power Factor ( )	0.912	0.913

Criteria	Results
Current ATHD (%)	35.84
Correlated Color Temp. (CCT-K)	3068
Color Rendering Index (CRI - Ra)	91.0
CRI - R9	64.4
DUV ( )	0.002
Chromaticity Coordinate (x)	0.435
Chromaticity Coordinate (y)	0.408
Chromaticity Coordinate (u')	0.247
Chromaticity Coordinate (v')	0.523

EQUIPMENT LIST

Equipment Used	Model No.	Control No.	Last Cal.	Cal. Due
LSI High Speed Mirror Goniometer	6440	---	12/08/16	01/08/17
Elgar AC Power Supply	CW1251	---	VBU	VBU
Sorenson DC Power Supply	XG 150-10	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	05/02/16	05/02/17
Omega Thermometer	DPi8-C24	M263	05/02/16	05/02/17
M-D Building Products Digital Level	Smart Tool	L112	04/08/16	04/08/17
NIST Luminous Intensity Standard Source	NBS10322	N1427	12/12/14	12/12/16
NIST Luminous Intensity Standard Source	NBS10215	N1432	12/12/14	12/12/16
NIST Luminous Intensity Standard Source	960629-3	N1428	12/12/14	12/12/16
NIST Luminous Flux Standard Source	NBS10428	N1424	12/17/14	12/17/16
2M Integrating Sphere Spectrometer System	CDS 600	W/N308	12/19/16	01/19/17
Yokogawa Power Analyzer	WT1600	E475	07/01/16	07/01/17
Extech Hygro-Thermometer	445715	T1550	01/08/16	01/08/17
Fluke Digital Thermometer	53II	N1324	04/07/16	04/07/17
Sorensen DC Power Supply	XFR 35-35	---	VBU	VBU
Xantrex DC Power Supply	XTR 150-5.6	---	VBU	VBU
Elgar AC Power Supply	CW1251	---	VBU	VBU
Secondary Spectral Intensity Standard Source	BS5186	RF5186	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS3616	---	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS4116	---	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS3612	---	01/27/16	01/27/17

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.

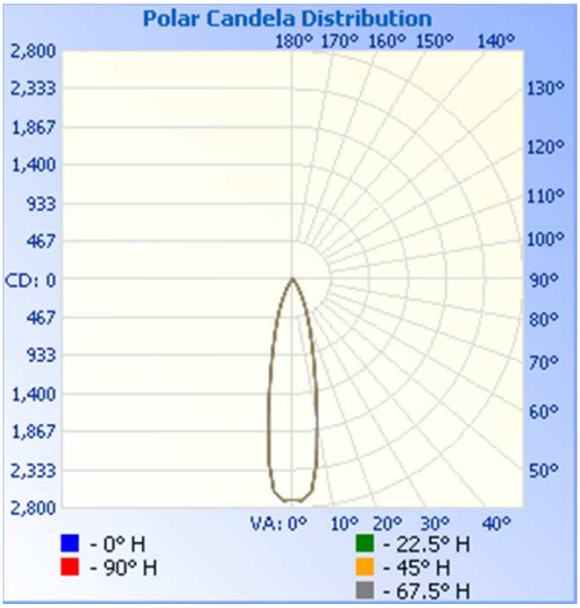
RESULTS:

Photometric and Electrical Measurements at Ambient Temperature (25℃ +/- 1℃) – 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)
CRT1612140822-001E	Base Up	12.05	949.9	10.44	0.913	730.4	69.90

Intensity (Candlepower) Summary at 25℃ - Candelas

Angle	0	22.5	45	67.5	90
0	2700	2700	2700	2700	2700
5	2609	2607	2609	2607	2615
10	1720	1709	1724	1725	1721
15	962	952	953	969	965
20	573	568	565	571	569
25	336	339	331	337	337
30	178	178	171	177	182
35	97	98	94	97	99
40	48	49	46	48	50
45	27	28	27	27	29
50	7	7	7	6	7
55	0	0	0	0	0
60	0	0	0	0	0
65	0	0	0	0	0
70	0	0	0	0	0
75	0	0	0	0	0
80	0	0	0	0	0
85	0	0	0	0	0
90	0	0	0	0	0

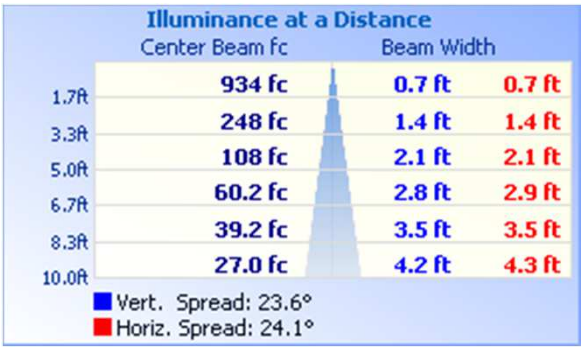


RESULTS:

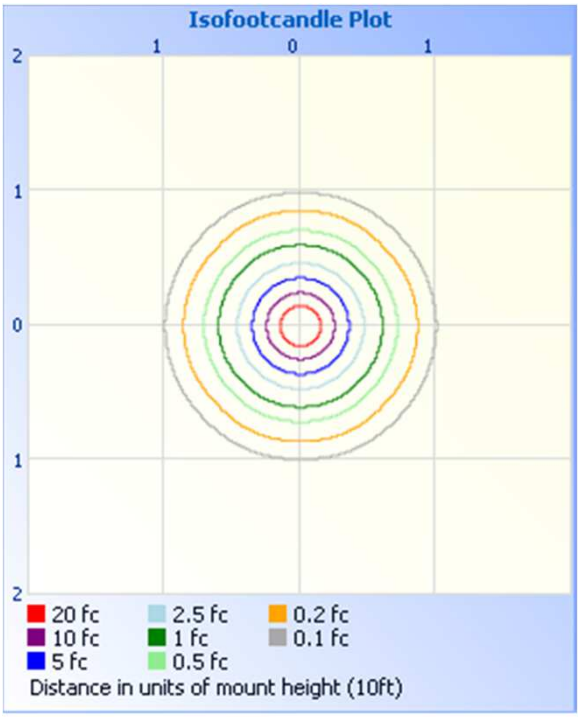
Illumination Plots

Mounting Height: 10ft

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25℃

Zone	Lumens	% Luminaire
0-30	646.7	88.5
0-40	708.8	97.0
0-60	730.4	100.0
60-90	0.0	0.0
0-90	730.4	100.0
90-180	0.0	0.0
0-180	730.4	100.0

Zonal Lumens and Percentages at 25℃

Zone	Lumens	% Luminaire
0-10	217.4	29.8
10-20	273.2	37.4
20-30	156.2	21.4
30-40	62.1	8.5
40-50	20.6	2.8
50-60	1.1	0.1
60-70	0.0	0.0
70-80	0.0	0.0
80-90	0.0	0.0

RESULTS:

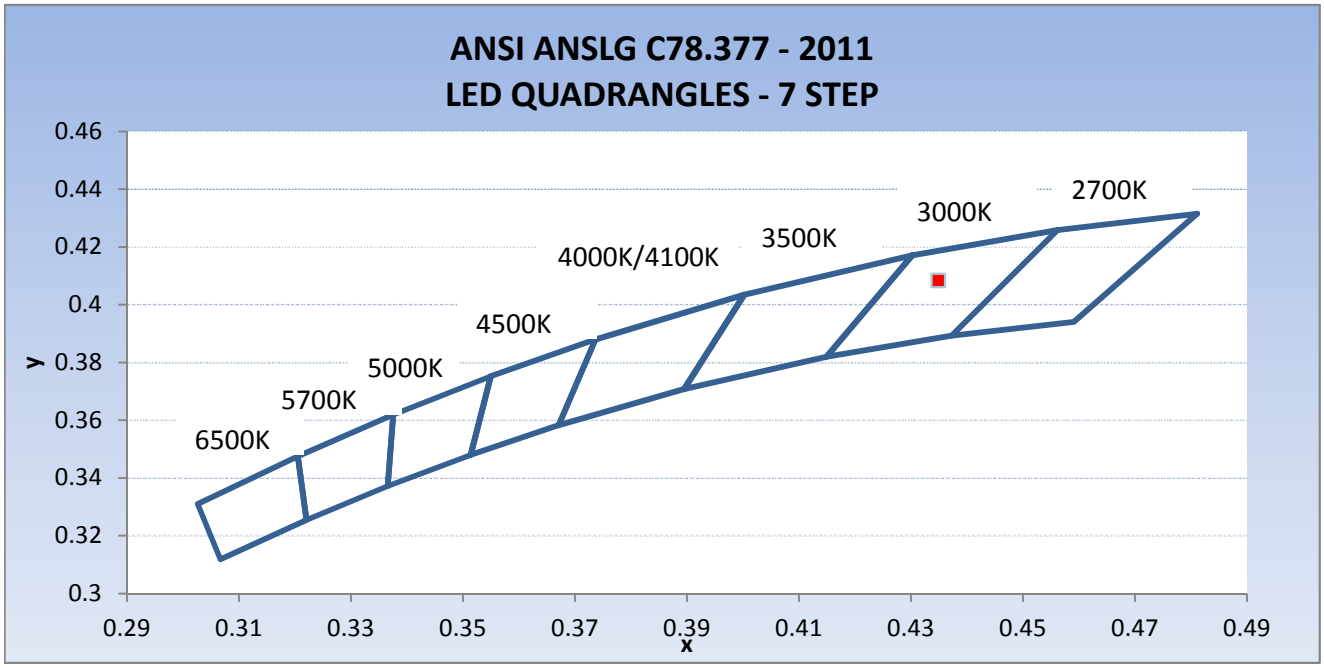
Photometric and Electrical Measurements at Ambient Temperature (25℃ +/- 1℃) – Sphere Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ( )	Current ATHD (%)
CRT1612140822-001E	Base Up	12.01	923.6	10.11	0.912	35.84

Light Output (Lumens)	Lumen Efficacy (lm/W)	Correlated Color Temperature - CCT (K)	CRI -Ra	CRI -R9	DUV ( )
709.2	70.10	3068	91.0	64.4	0.002

CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
0.435	0.408	0.247	0.523

ANSI C78.377 SSL Chromaticity (2011 Version)

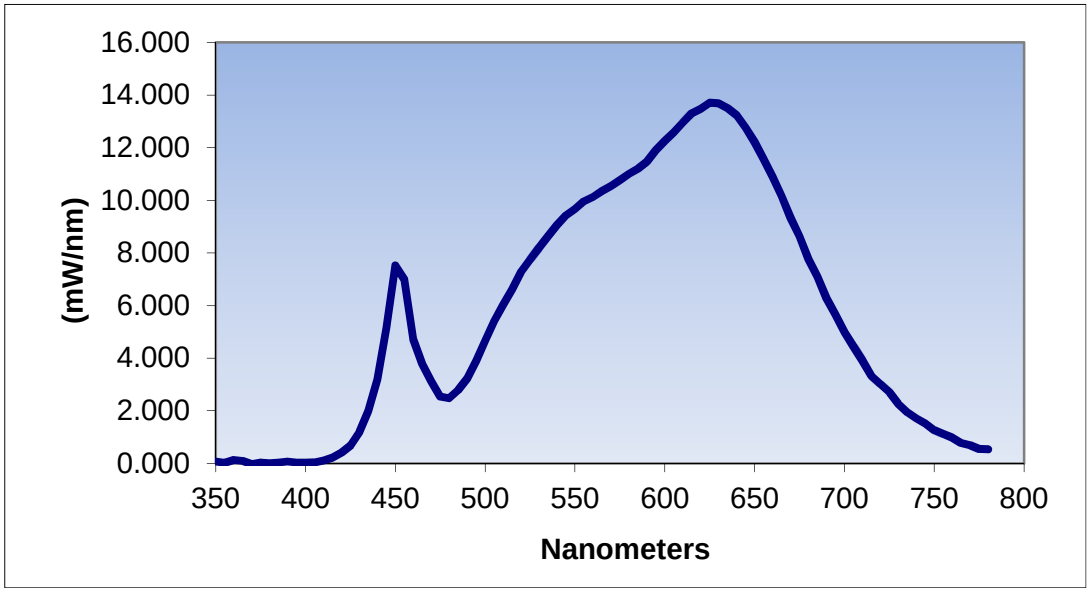


RESULTS:

Spectral Distribution Over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.073	460	4.713	570	10.549	680	7.753
355	0.024	465	3.779	575	10.759	685	7.096
360	0.127	470	3.126	580	11.009	690	6.289
365	0.092	475	2.540	585	11.207	695	5.666
370	-0.024	480	2.474	590	11.465	700	4.991
375	0.037	485	2.778	595	11.909	705	4.432
380	0.004	490	3.236	600	12.261	710	3.904
385	0.038	495	3.900	605	12.570	715	3.324
390	0.069	500	4.670	610	12.951	720	3.019
395	0.031	505	5.408	615	13.304	725	2.706
400	0.022	510	6.031	620	13.478	730	2.257
405	0.030	515	6.612	625	13.707	735	1.943
410	0.101	520	7.283	630	13.683	740	1.718
415	0.218	525	7.743	635	13.495	745	1.517
420	0.407	530	8.197	640	13.232	750	1.263
425	0.677	535	8.638	645	12.753	755	1.115
430	1.185	540	9.066	650	12.215	760	0.979
435	1.991	545	9.427	655	11.572	765	0.775
440	3.196	550	9.664	660	10.901	770	0.696
445	5.138	555	9.958	665	10.170	775	0.545
450	7.530	560	10.132	670	9.344	780	0.528
455	7.001	565	10.351	675	8.633		

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:

Melanie Brittain

Melanie Brittain
Associate Engineer
Lighting Division

Report Reviewed By:

Jeffrey Davis
Engineering Supervisor
Lighting Division

Attachments: IES File - CRT1612140822-001E