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-011

TEST OF ONE LED AR111 INDIRECT 2700K

MODEL NO. LED AR111 INDIRECT AR-L690-C27-B12-90-ID
PART NO. 99547

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-L690-C27-B12-90-ID. The sample was received by Intertek on December 14, 2016 in undamaged condition and one sample was tested as received. The sample designation was .

DATE OF TESTS: December 19, 2016 through December 22, 2016.

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SUMMARY:

MODEL NO. LED AR111 INDIRECT AR-L690-C27-B12-90-ID
DESCRIPTION: LED AR111 INDIRECT 2700K

Criteria	Integrating Sphere	Goniophotometer
Light Output (Lumens)	676.4	696.8
Total Power (W)	10.06	10.40
Lumen Efficacy (Lm/W)	67.20	67.00
Power Factor ( )	0.910	0.912

Criteria	Results
Current ATHD (%)	36.12
Correlated Color Temp. (CCT-K)	2791
Color Rendering Index (CRI - Ra)	90.5
CRI - R9	61.4
DUV ( )	0.002
Chromaticity Coordinate (x)	0.456
Chromaticity Coordinate (y)	0.415
Chromaticity Coordinate (u')	0.258
Chromaticity Coordinate (v')	0.528

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	01/12/17
NIST Luminous Intensity Standard Source	NBS10215	N1432	12/12/14	01/12/17
NIST Luminous Intensity Standard Source	960629-3	N1428	12/12/14	01/12/17
NIST Luminous Flux Standard Source	NBS10428	N1424	12/17/14	01/12/17
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.

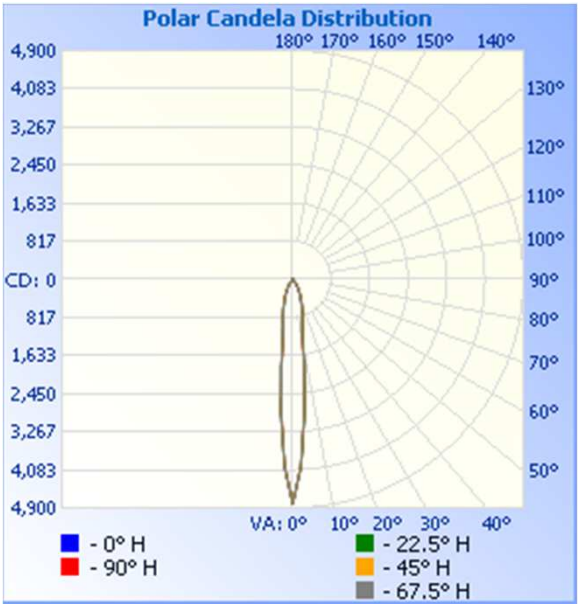
RESULTS:

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)
CRT1612140822-001A	Base Up	12.07	945.6	10.40	0.912	696.8	67.00

Intensity (Candlepower) Summary at 25℃ - Candelas

Angle	0	22.5	45	67.5	90
0	4806	4806	4806	4806	4806
5	2886	2877	2868	2845	2817
10	1199	1203	1187	1151	1148
15	782	802	796	776	798
20	530	556	549	527	561
25	353	378	374	352	382
30	221	242	236	217	240
35	126	140	138	124	139
40	42	47	44	40	44
45	9	10	9	8	8
50	3	4	4	3	3
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

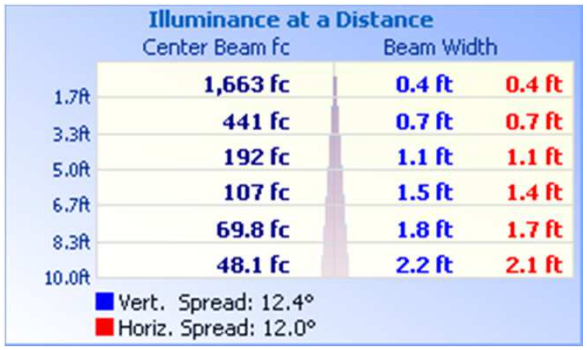


RESULTS:

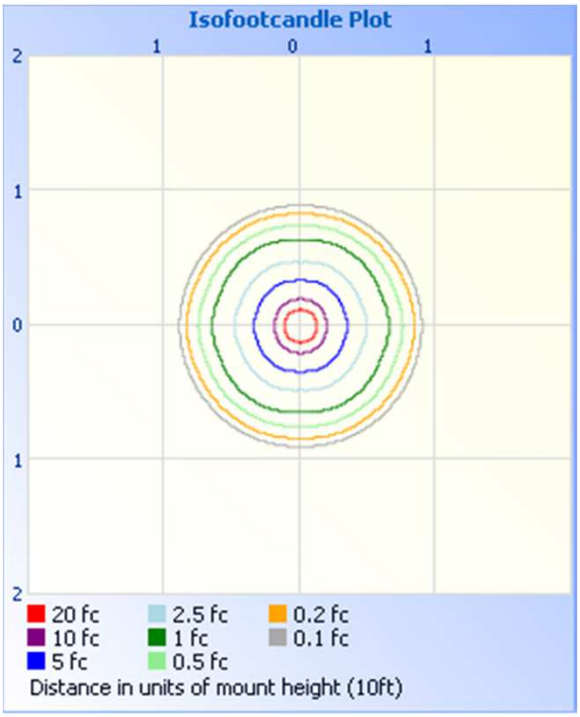
Illumination Plots

Mounting Height: 10ft

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25℃

Zone	Lumens	% Luminaire
0-30	604.3	86.7
0-40	686.0	98.4
0-60	696.8	100.0
60-90	0.0	0.0
0-90	696.8	100.0
90-180	0.0	0.0
0-180	696.8	100.0

Zonal Lumens and Percentages at 25℃

Zone	Lumens	% Luminaire
0-10	215.3	30.9
10-20	220.2	31.6
20-30	168.8	24.2
30-40	81.7	11.7
40-50	10.3	1.5
50-60	0.5	0.1
60-70	0.0	0.0
70-80	0.0	0.0
80-90	0.0	0.0

RESULTS:

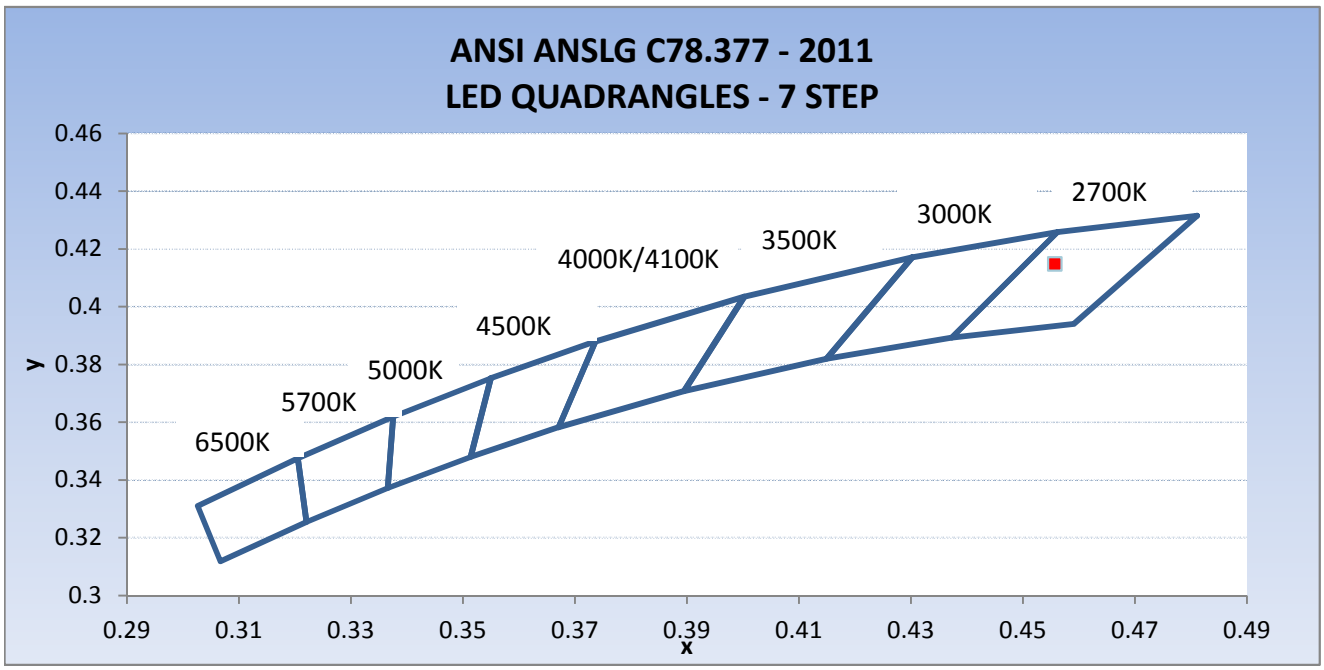
Photometric and Electrical Measurements at Ambient Temperature (25℃ +/- 1℃) – Sphere Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ( )	Current ATHD (%)
CRT1612140822-001A	Base Up	12.08	915.7	10.06	0.910	36.12

Light Output (Lumens)	Lumen Efficacy (lm/W)	Correlated Color Temperature - CCT (K)	CRI -Ra	CRI -R9	DUV ( )
676.4	67.20	2791	90.5	61.4	0.002

CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
0.456	0.415	0.258	0.528

ANSI C78.377 SSL Chromaticity (2011 Version)

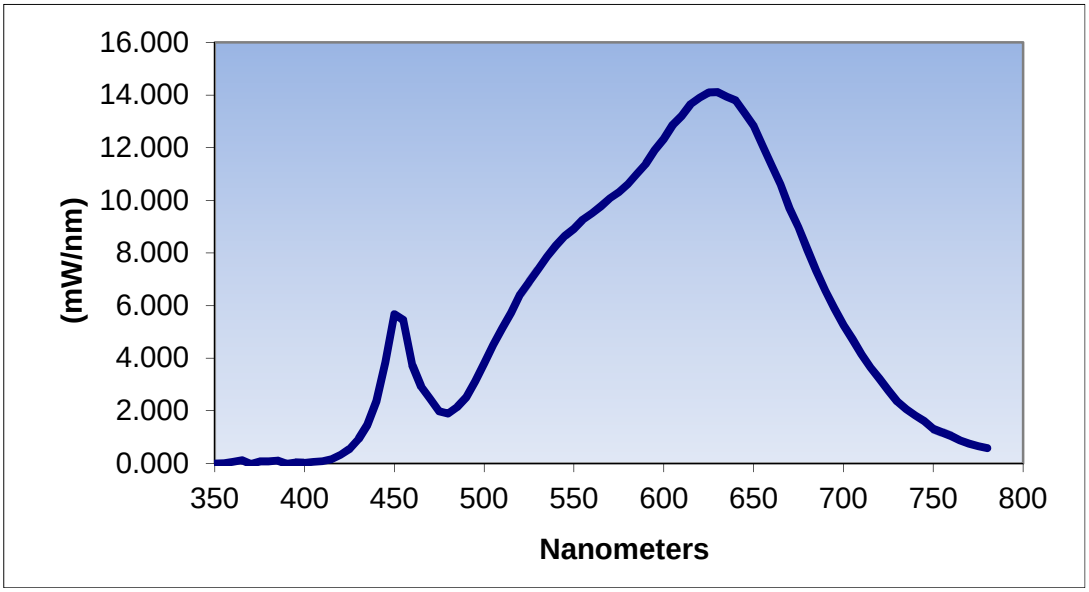


RESULTS:

Spectral Distribution Over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	-0.010	460	3.741	570	10.088	680	8.129
355	-0.003	465	2.921	575	10.313	685	7.318
360	0.063	470	2.452	580	10.619	690	6.571
365	0.122	475	1.982	585	11.003	695	5.891
370	-0.030	480	1.897	590	11.385	700	5.254
375	0.076	485	2.138	595	11.903	705	4.714
380	0.067	490	2.520	600	12.327	710	4.147
385	0.101	495	3.120	605	12.866	715	3.647
390	-0.019	500	3.803	610	13.211	720	3.216
395	0.030	505	4.500	615	13.664	725	2.768
400	0.023	510	5.125	620	13.907	730	2.346
405	0.055	515	5.726	625	14.094	735	2.048
410	0.076	520	6.416	630	14.109	740	1.827
415	0.161	525	6.890	635	13.936	745	1.599
420	0.323	530	7.370	640	13.793	750	1.310
425	0.539	535	7.854	645	13.319	755	1.173
430	0.917	540	8.284	650	12.829	760	1.040
435	1.465	545	8.648	655	12.074	765	0.870
440	2.355	550	8.914	660	11.336	770	0.746
445	3.837	555	9.270	665	10.605	775	0.656
450	5.665	560	9.505	670	9.689	780	0.586
455	5.452	565	9.774	675	8.973		

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

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Report Reviewed By:

Jeffrey Davis
Engineering Supervisor
Lighting Division

Attachments: IES File - CRT1612140822-001A