



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-012

TEST OF ONE LED AR111 INDIRECT 2700K

MODEL NO. LED AR111 INDIRECT AR-L690-C27-B25-90-ID  
PART NO. 99548

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-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 19, 2016 through December 21, 2016.

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## SUMMARY:

MODEL NO. LED AR111 INDIRECT AR-L690-C27-B25-90-ID
DESCRIPTION: LED AR111 INDIRECT 2700K

Criteria	Integrating Sphere	Goniophotometer
Light Output (Lumens)	681.4	695.8
Total Power (W)	10.07	10.44
Lumen Efficacy (lm/W)	67.70	66.60
Power Factor ( )	0.910	0.911

Criteria	Results
Current ATHD (%)	36.24
Correlated Color Temp. (CCT-K)	2759
Color Rendering Index (CRI - Ra)	90.6
CRI - R9	61.4
DUV ( )	0.002
Chromaticity Coordinate (x)	0.459
Chromaticity Coordinate (y)	0.417
Chromaticity Coordinate (u')	0.259
Chromaticity Coordinate (v')	0.529

## 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	---	VBV	VBV
Sorenson DC Power Supply	XG 150-10	---	VBV	VBV
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	---	VBV	VBV
Xantrex DC Power Supply	XTR 150-5.6	---	VBV	VBV
Elgar AC Power Supply	CW1251	---	VBV	VBV
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.



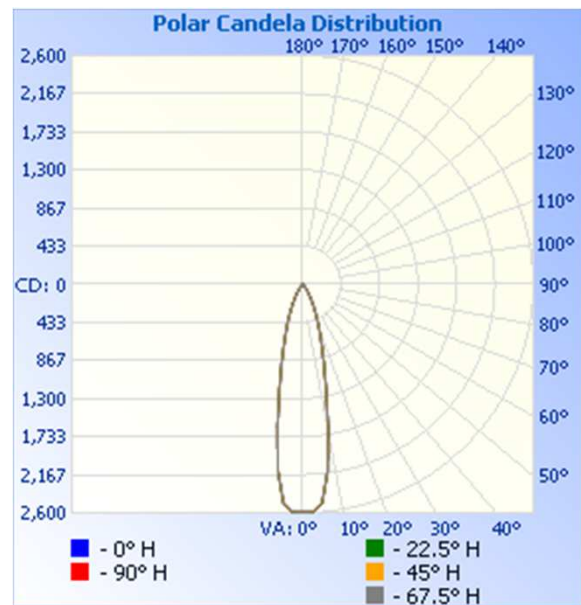
## RESULTS:

### Photometric and Electrical Measurements at Ambient Temperature (25°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)
CRT1612140822-001B	Base Up	12.06	950.2	10.44	0.911	695.8	66.60

### Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	2592	2592	2592	2592	2592
5	2492	2499	2494	2492	2501
10	1642	1645	1638	1646	1642
15	911	918	910	914	919
20	536	544	531	539	541
25	317	316	312	317	319
30	168	169	168	169	171
35	88	88	92	91	94
40	45	46	48	46	47
45	28	28	29	27	28
50	6	5	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

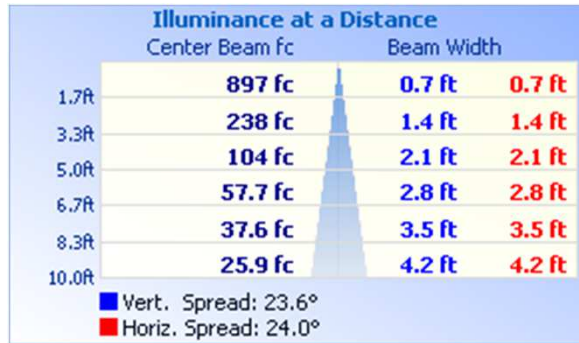


## RESULTS:

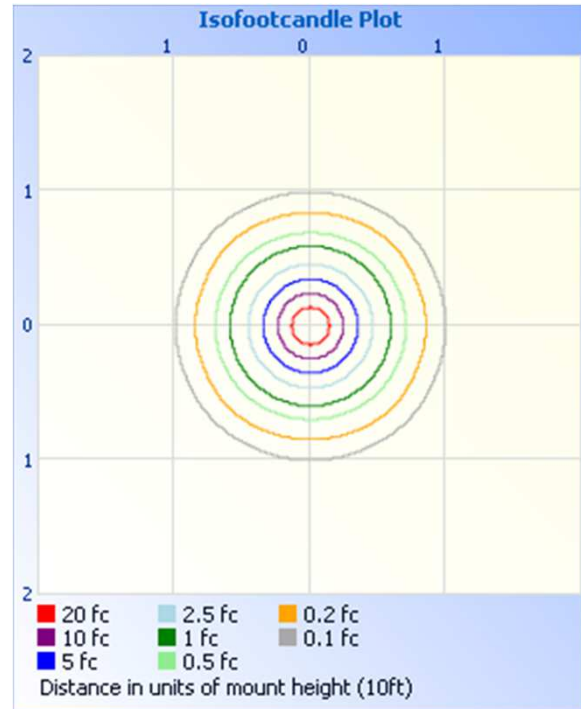
### Illumination Plots

Mounting Height: 10ft

#### Illuminance - Cone of Light



#### Isoillumination Plot



#### Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	615.9	88.5
0-40	674.6	96.9
0-60	695.8	100.0
60-90	0.0	0.0
0-90	695.8	100.0
90-180	0.0	0.0
0-180	695.8	100.0

#### Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	207.9	29.9
10-20	260.1	37.4
20-30	148.0	21.3
30-40	58.7	8.4
40-50	20.3	2.9
50-60	0.9	0.1
60-70	0.0	0.0
70-80	0.0	0.0
80-90	0.0	0.0

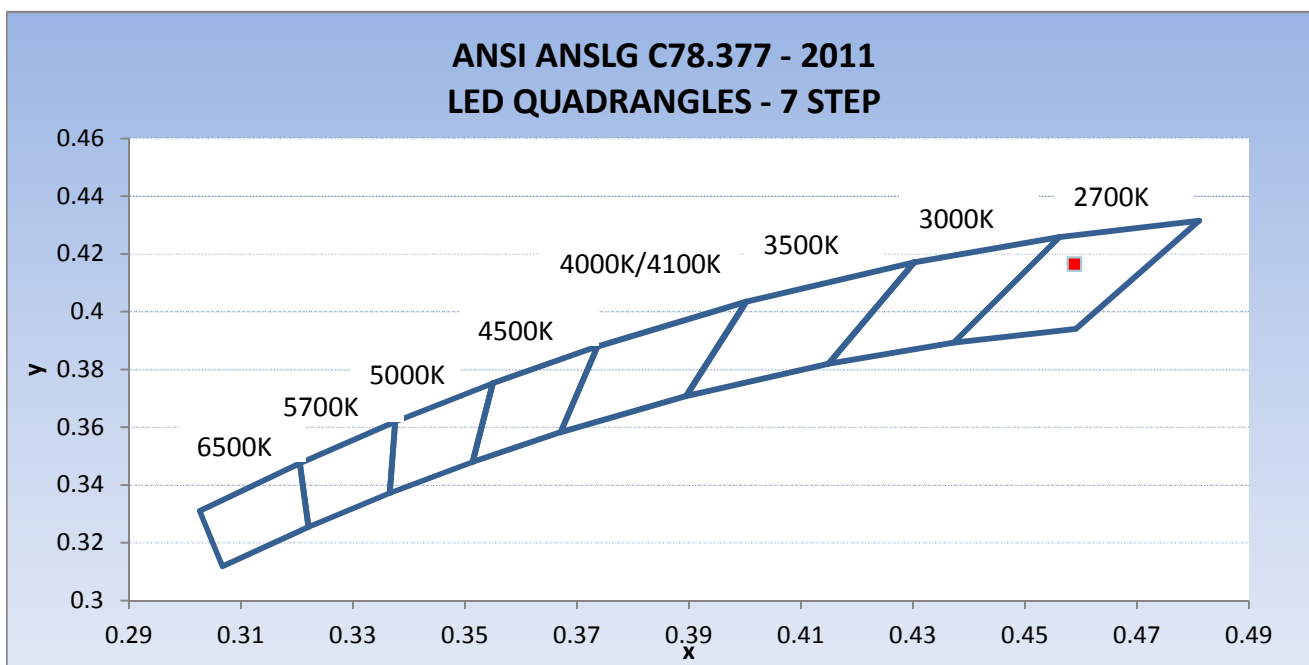


## RESULTS:

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

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ( )	Current ATHD (%)
CRT1612140822-001B	Base Up	12.08	916.1	10.07	0.910	36.24
Light Output (Lumens)	Lumen Efficacy (lm/W)	Correlated Color Temperature - CCT (K)		CRI -Ra	CRI -R9	DUV ( )
681.4	67.7	2759		90.6	61.4	0.002
CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')		CIE 76' Chromaticity Coordinate (v')		
0.459	0.417	0.259		0.529		

### ANSI C78.377 SSL Chromaticity (2011 Version)

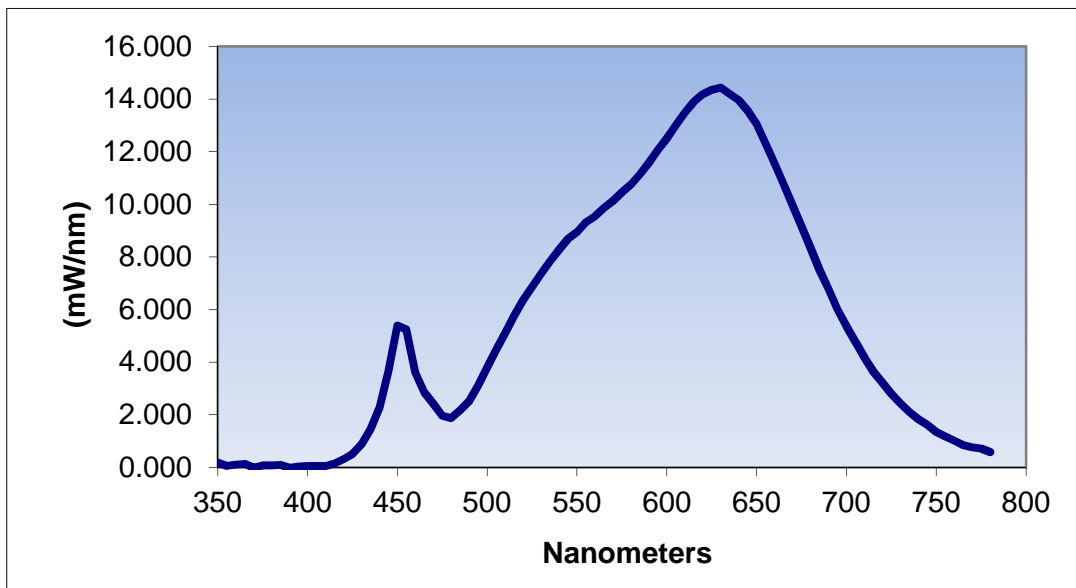


## RESULTS:

**Spectral Distribution Over Visible Wavelengths**

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.176	460	3.610	570	10.132	680	8.348
355	0.058	465	2.861	575	10.453	685	7.514
360	0.111	470	2.431	580	10.746	690	6.803
365	0.133	475	1.969	585	11.146	695	6.016
370	-0.013	480	1.876	590	11.580	700	5.366
375	0.070	485	2.166	595	12.065	705	4.769
380	0.070	490	2.531	600	12.498	710	4.172
385	0.100	495	3.120	605	13.003	715	3.637
390	-0.014	500	3.801	610	13.480	720	3.220
395	0.037	505	4.469	615	13.891	725	2.798
400	0.045	510	5.103	620	14.182	730	2.429
405	0.044	515	5.767	625	14.354	735	2.110
410	0.049	520	6.361	630	14.436	740	1.836
415	0.145	525	6.858	635	14.190	745	1.616
420	0.318	530	7.356	640	13.961	750	1.348
425	0.512	535	7.836	645	13.558	755	1.179
430	0.867	540	8.274	650	13.054	760	1.017
435	1.446	545	8.681	655	12.306	765	0.854
440	2.246	550	8.933	660	11.556	770	0.766
445	3.643	555	9.313	665	10.773	775	0.714
450	5.390	560	9.548	670	9.984	780	0.587
455	5.239	565	9.861	675	9.185		

**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:

A handwritten signature in black ink that reads "Melanie Brittain".

Melanie Brittain  
Associate Engineer  
Lighting Division

Report Reviewed By:

A handwritten signature in black ink that reads "Jeffrey Davis".

Jeffrey Davis  
Engineering Supervisor  
Lighting Division

Attachments: IES File - CRT1612140822-001B