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

REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G102322298 Date: August 4, 2016

REPORT NO. 102322298CRT-044

TEST OF ONE LED FILAMENT A19 2700K DIMMABLE

MODEL NO. LED A19 A19-L450-C27-D-CL-F
PART NO. 99505

RENDERED TO:

VERBATIM AMERICAS
1200 W.T. HARRIS BLVD.
CHARLOTTE, NC 28269

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-00647973.

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 A19 A19-L450-C27-D-CL-F. The sample was received by Intertek on August 2, 2016 in undamaged condition and one sample was tested as received. The sample designation was CRT1608021039-001C.

DATE OF TESTS: August 3, 2016 through August 4, 2016.

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SUMMARY:

MODEL NO. LED A19 A19-L450-C27-D-CL-F
DESCRIPTION: LED Filament A19 2700K Dimmable

Criteria	Integrating Sphere	Goniophotometer
Light Output (Lumens)	476.1	479.2
Total Power (W)	4.870	4.886
Lumen Efficacy (Lm/W)	97.80	98.10
Power Factor ( )	0.927	0.937

Criteria	Results
Current ATHD (%)	37.78
Correlated Color Temp. (CCT-K)	2673
Color Rendering Index (CRI - Ra)	80.9
CRI - R9	5.0
DUV ( )	0.001
Chromaticity Coordinate (x)	0.465
Chromaticity Coordinate (y)	0.417
Chromaticity Coordinate (u')	0.263
Chromaticity Coordinate (v')	0.530

EQUIPMENT LIST

Equipment Used	Model No.	Control No.	Last Cal.	Cal. Due
LSI High Speed Mirror Goniometer	6440	---	07/06/16	08/06/16
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 1100	N308	07/07/16	08/07/16
Yokogawa Power Analyzer	WT1600	E536	12/18/15	12/18/16
Fluke Temperature Meter	53II	D588	05/06/16	05/06/17
Extech Hygro-thermometer	445715	T1550	01/08/16	01/08/17
Elgar AC Power Supply	CW1251	--	VBU	VBU
Secondary Spectral Flux Standard Source	BS5186	RF5186	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	6836	--	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS4116	--	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS3616	--	01/27/16	01/27/17
Sorenson DC Power Supply	XG 150-10	--	VBU	VBU
Fisher Scientific Stop Watch	14-649-9	N1315	01/15/16	01/15/17

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.

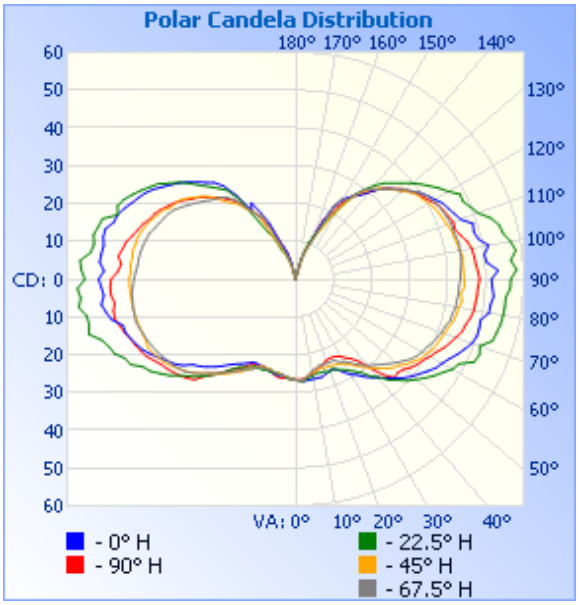
RESULTS:

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)
CRT1608021039-001C	Base Up	120.01	43.47	4.89	0.937	479.2	98.10

Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	27	27	27	27	27
5	27	27	27	26	26
10	27	26	25	25	25
15	27	26	24	24	24
20	26	26	25	24	23
25	26	26	25	24	23
30	29	28	26	25	24
35	32	30	28	28	26
40	34	34	31	30	31
45	37	38	33	32	37
50	40	41	36	34	37
55	42	44	38	37	39
60	44	48	40	38	41
65	47	52	41	40	43
70	49	52	42	41	45
75	50	55	43	42	46
80	52	55	44	43	48
85	52	56	44	43	48
90	52	57	44	43	48
95	50	57	44	44	48
100	52	57	44	44	47
105	48	55	43	44	45
110	46	51	42	43	44
115	44	49	42	43	43
120	42	46	40	42	41
125	40	43	39	40	39
130	36	40	36	37	37
135	34	36	34	34	34
140	30	32	31	31	30
145	27	27	27	27	27
150	24	20	20	25	22
155	17	14	13	14	17
160	10	10	9	8	9
165	5	4	3	3	5

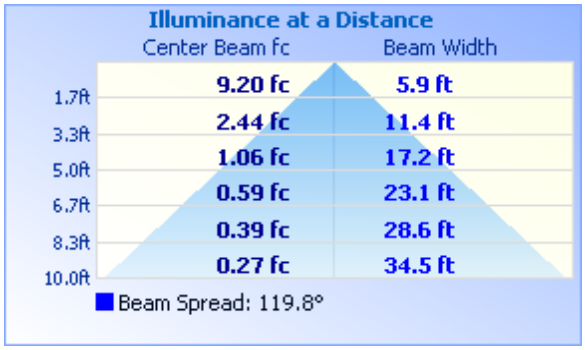


RESULTS:

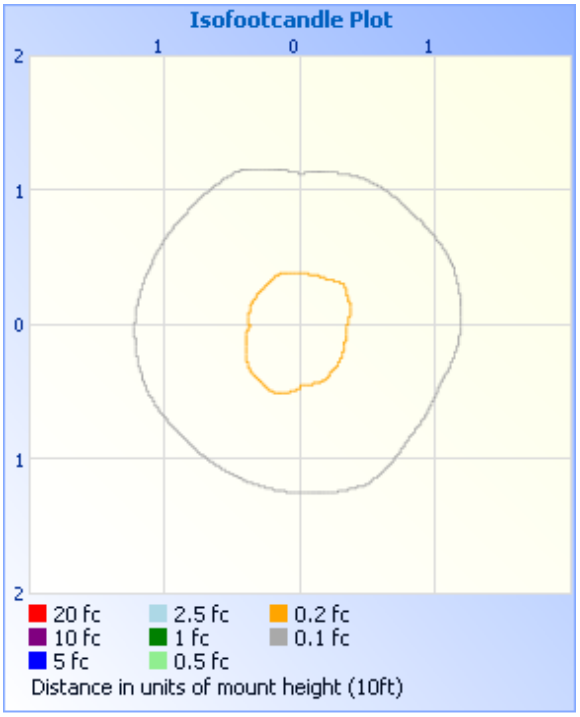
Illumination Plots

Mounting Height: 10ft

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	21.7	4.5
0-40	40.2	8.4
0-60	103.9	21.7
60-90	145.6	30.4
0-90	249.6	52.1
90-180	229.6	47.9
0-180	479.2	100.0

Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	2.5	0.5
10-20	7.2	1.5
20-30	12.0	2.5
30-40	18.5	3.9
40-50	27.4	5.7
50-60	36.2	7.6
60-70	43.8	9.1
70-80	49.5	10.3
80-90	52.3	10.9
90-100	52.0	10.8
100-110	49.0	10.2
110-120	43.0	9.0
120-130	35.2	7.4
130-140	26.1	5.4
140-150	16.4	3.4
150-160	6.7	1.4
160-170	1.3	0.3
170-180	0.0	0.0

RESULTS:

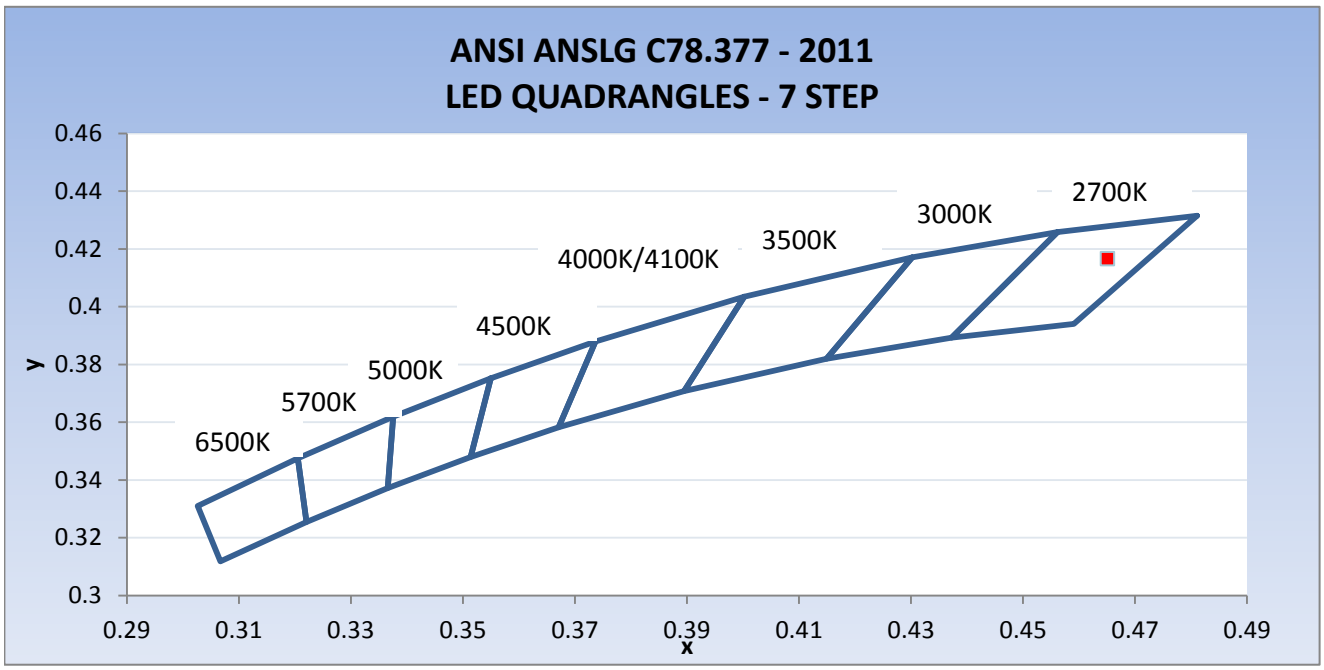
Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Sphere Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ( )	Current ATHD (%)
CRT1608021039-001C	Base Up	120.06	43.70	4.870	0.927	37.78

Light Output (Lumens)	Lumen Efficacy (lm/W)	Correlated Color Temperature - CCT (K)	CRI -Ra	CRI -R9	DUV ( )
476.1	97.80	2673	80.9	5.0	0.001

CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
0.465	0.417	0.263	0.530

ANSI C78.377 SSL Chromaticity (2011 Version)

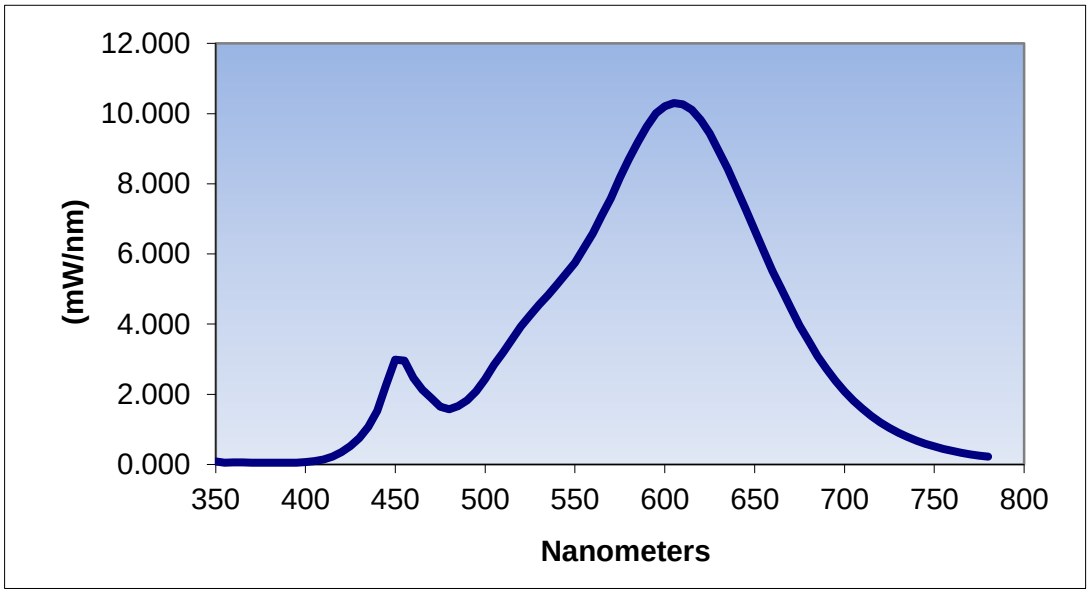


RESULTS:

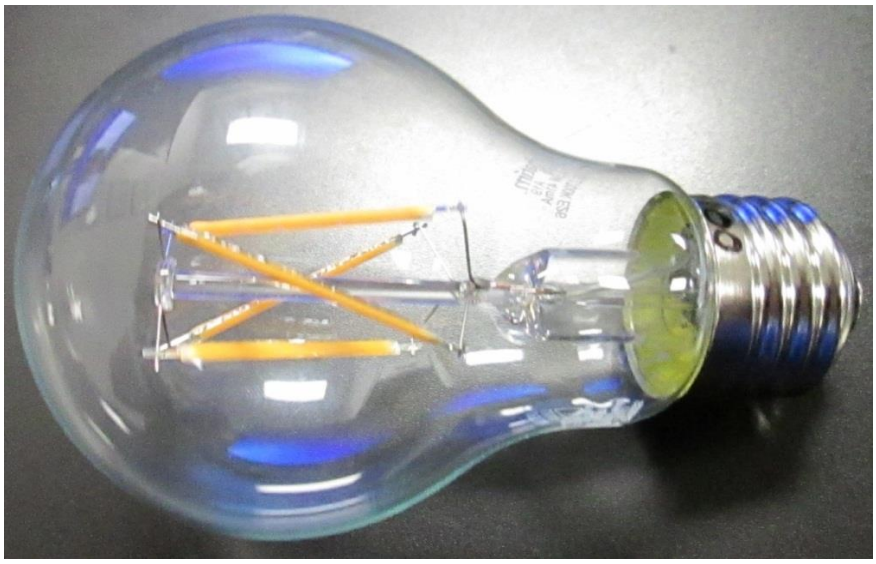
Spectral Distribution Over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.081	460	2.466	570	7.582	680	3.521
355	0.044	465	2.129	575	8.169	685	3.089
360	0.061	470	1.890	580	8.693	690	2.725
365	0.056	475	1.645	585	9.183	695	2.386
370	0.046	480	1.570	590	9.632	700	2.087
375	0.044	485	1.661	595	10.015	705	1.822
380	0.046	490	1.825	600	10.216	710	1.586
385	0.045	495	2.080	605	10.301	715	1.383
390	0.049	500	2.430	610	10.271	720	1.197
395	0.045	505	2.836	615	10.113	725	1.043
400	0.064	510	3.185	620	9.820	730	0.909
405	0.095	515	3.559	625	9.433	735	0.783
410	0.137	520	3.931	630	8.934	740	0.674
415	0.221	525	4.251	635	8.436	745	0.582
420	0.347	530	4.551	640	7.854	750	0.509
425	0.521	535	4.832	645	7.281	755	0.440
430	0.747	540	5.132	650	6.690	760	0.382
435	1.067	545	5.438	655	6.100	765	0.330
440	1.523	550	5.753	660	5.511	770	0.286
445	2.271	555	6.166	665	4.981	775	0.249
450	2.986	560	6.588	670	4.467	780	0.217
455	2.961	565	7.104	675	3.955		

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
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Lighting Division

Report Reviewed By:

Ryan Siddon

Ryan Siddon
Engineer
Lighting Division

Attachments: IES File - CRT1608021039-001C