



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

REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G103099340

Date: June 27, 2017

REPORT NO. 103099340CRT-001

TEST OF ONE LED T8 TUBE (8 FT)

MODEL NO. LED43WT8/96/8XX-DBL-G7D
LED MODEL NO. TOYODA GOSEI CO., LTD 2835 0.5W

RENDERED TO:

EIKO GLOBAL, LLC
23220 W. 84TH ST.
SHAWNEE, KS 66227

TESTS: Electrical and Photometric tests as required to the IESNA test standard and Insitu Temperature Measurement Tests.

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-00780535.

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
UL 1598-2009: Standard for Safety - Luminaires.

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number LED43WT8/96/8XX-DBL-G7D. The sample was received by Intertek on June 6, 2017 in undamaged condition and one sample was tested as received. The sample designation was CRT1706061014-001.

DATE OF TESTS: June 14, 2017 through June 21, 2017.

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SUMMARY:

MODEL NO. LED43WT8/96/8XX-DBL-G7D
DESCRIPTION: LED T8 TUBE (8 FT)

Criteria	Results	
	Integrating Sphere	Goniophotometer
Light Output (Lumens)	5643.4	5735.0
Total Power (W)	43.61	43.11
Lumen Efficacy (Lm/W)	129.4	133.0
Power Factor ()	0.979	0.979

Criteria	Results
Current ATHD (%)	19.82
Correlated Color Temp. (CCT-K)	4038
Color Rendering Index (CRI - Ra)	82.8
CRI - R9	4.4
DUV ()	0.000
Chromaticity Coordinate (x)	0.379
Chromaticity Coordinate (y)	0.379
Chromaticity Coordinate (u')	0.224
Chromaticity Coordinate (v')	0.502
Maximum LED Source In-Situ Temperature (°C)	62.8

EQUIPMENT LIST

Equipment Used	Model No.	Control No.	Last Cal.	Cal. Due
LSI High Speed Mirror Goniometer	6440	---	6/2/2017	7/2/2017
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	---	6/2/2017	7/2/2017
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
Exttech Hygro-Thermometer	445703	T1366	2/24/2017	2/24/2018
Fluke Multimeter	87 V	M226	12/29/2016	12/29/2017
Fluke Temperature Meter	53 II	N1324	3/31/2017	3/31/2018



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.

In-Situ Maximum Measured Power Supply Case and LED Source Point Temperature

Power supply case and/or LED source operating temperature measurements were taken on one test sample per model with a thermocouple and Fluke 87 temperature meter. The SSL sample was allowed to reach thermal equilibrium for seven and a half hours before measurements were taken. Power supply or source temperature measurements were measured at the TMPPS or TS point as indicated by the included diagram in accordance with manufacturers declared hot spot location, or at a hot spot location found with a thermal camera when no diagram from the manufacturer is given. The maximum temperature was recorded for the sample. A simulated ceiling or other enclosure may be used in accordance to UL 1598, UL 153, or UL 1993 as applicable.



RESULTS:

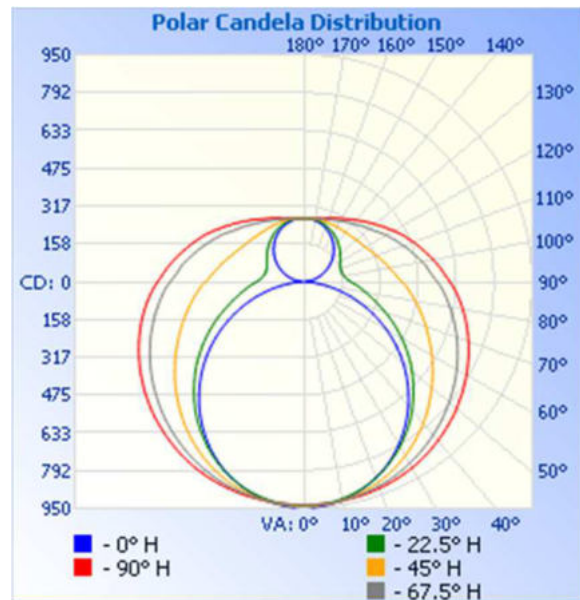
Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Distribution Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ()	Light Output (Lumens)	Lumen Efficacy (lm/W)
CRT1706061014-001	Base Up	120.04	366.8	43.11	0.979	5735.0	133.0

*Test Note: Each half of the tube was measured at 1 time. The (2) distribution scans were then merged to generate the 8 Foot distribution.

Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	938	938	938	938	938
5	943	935	938	934	933
10	929	923	930	929	932
15	906	904	916	922	928
20	874	875	897	911	921
25	836	840	872	897	912
30	789	799	842	879	900
35	735	752	809	859	885
40	676	701	773	837	868
45	612	645	734	814	849
50	543	588	695	788	828
55	470	529	654	762	805
60	395	470	615	734	781
65	317	411	576	706	755
70	241	354	540	677	728
75	164	306	504	647	701
80	96	264	472	617	672
85	35	229	440	588	641
90	5	197	409	554	608
95	15	177	380	523	575
100	32	167	358	497	544
105	53	163	338	468	513
110	74	164	320	440	485
115	95	169	306	416	458
120	117	176	294	393	429
125	138	186	286	368	403
130	158	197	279	348	380
135	176	208	273	332	357
140	193	219	271	317	338
145	209	229	269	305	320
150	224	239	268	294	306
155	236	248	267	285	293
160	246	255	267	279	283
165	255	260	268	273	275
170	262	265	267	269	269
175	265	266	266	265	265
180	264	264	264	264	264

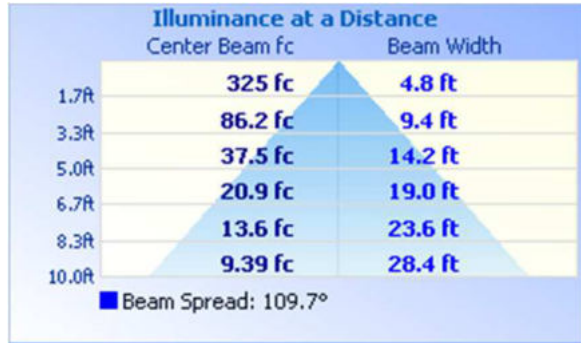


RESULTS:

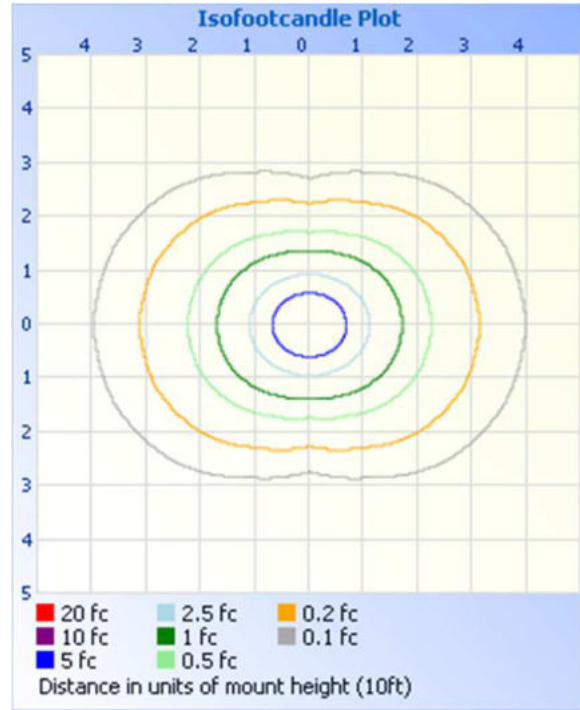
Illumination Plots

Mounting Height: 10ft

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	749.2	13.1
0-40	1255.3	21.9
0-60	2398.4	41.8
60-90	1488.3	26.0
0-90	3886.7	67.8
90-180	1848.3	32.2
0-180	5735.0	100.0

Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	89.1	1.6
10-20	258.3	4.5
20-30	401.8	7.0
30-40	506.1	8.8
40-50	564.7	9.8
50-60	578.4	10.1
60-70	552.7	9.6
70-80	500.2	8.7
80-90	435.4	7.6
90-100	376.2	6.6
100-110	331.9	5.8
110-120	289.9	5.1
120-130	249.2	4.3
130-140	209.3	3.6
140-150	167.7	2.9
150-160	123.2	2.1
160-170	75.5	1.3
170-180	25.4	0.4



RESULTS:

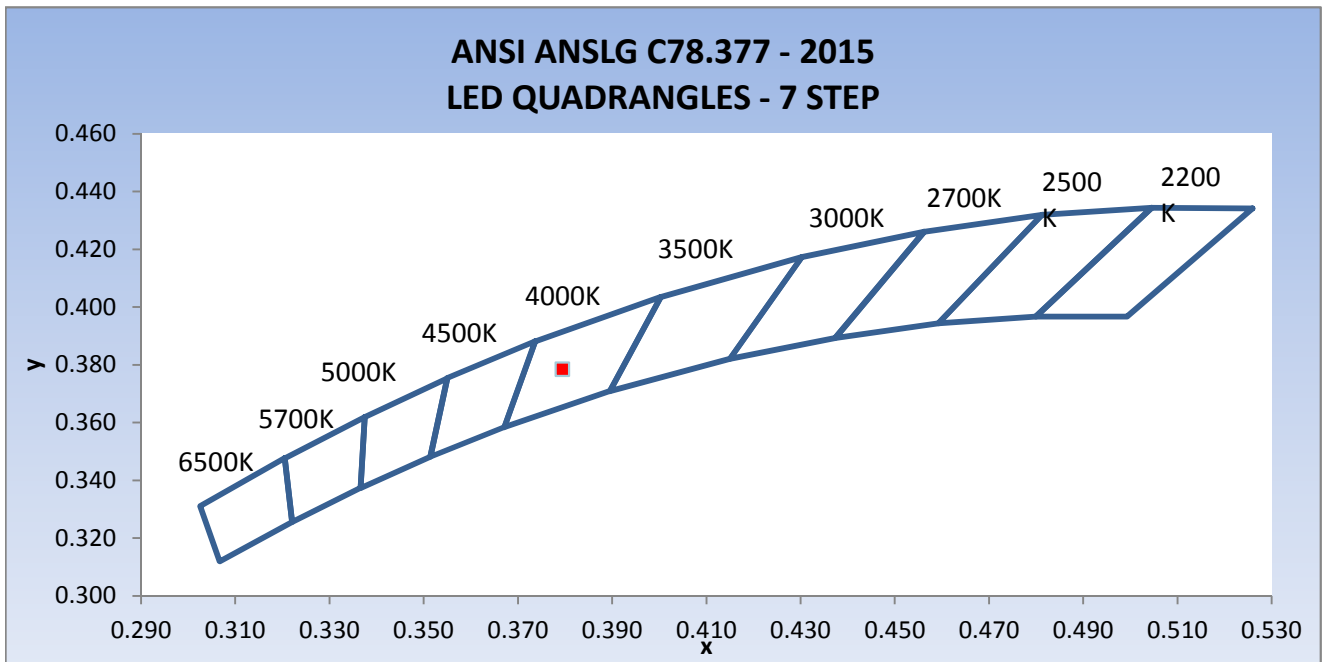
Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Sphere Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ()	Current ATHD (%)
CRT1706061014-001	Base Up	120.03	371.3	43.61	0.979	19.82
		277.02	172.0	44.01	0.923	21.67

Light Output (Lumens)	Lumen Efficacy (lm/W)	Correlated Color Temperature - CCT (K)	CRI -Ra	CRI -R9	DUV ()
5643.4	129.4	4038	82.8	4.4	0.000

CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
0.379	0.379	0.224	0.502

ANSI C78.377 SSL Chromaticity (2015 Version)



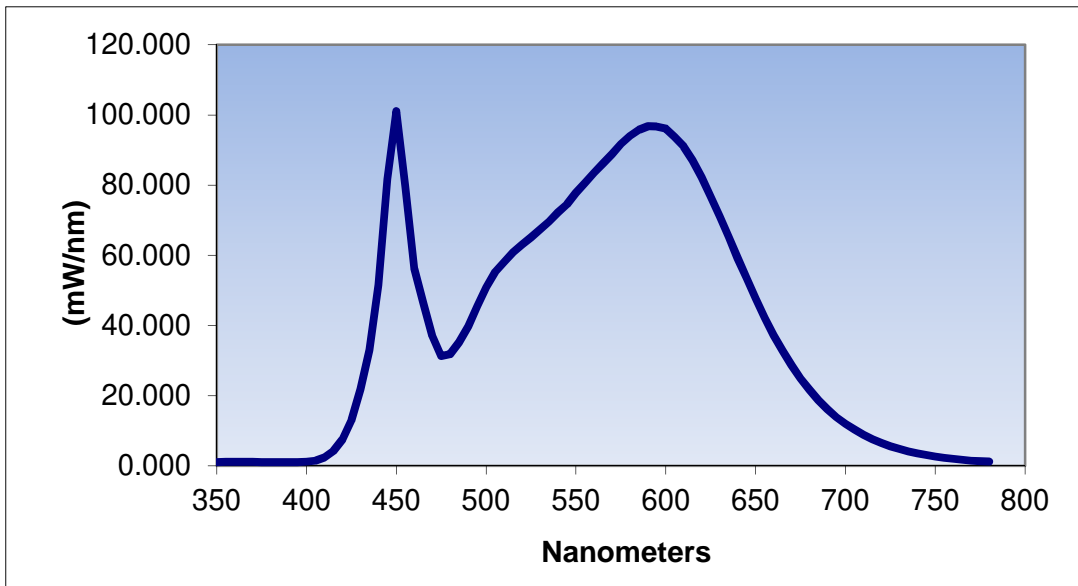


RESULTS:

Spectral Distribution Over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.960	460	56.231	570	88.849	680	21.649
355	1.040	465	46.535	575	91.743	685	18.638
360	1.087	470	37.109	580	94.024	690	16.124
365	1.055	475	31.241	585	95.776	695	13.861
370	1.049	480	31.848	590	96.769	700	11.941
375	1.019	485	35.221	595	96.676	705	10.318
380	0.943	490	39.736	600	96.180	710	8.795
385	0.998	495	45.492	605	93.787	715	7.565
390	0.962	500	50.873	610	91.007	720	6.498
395	0.991	505	55.242	615	87.083	725	5.549
400	1.145	510	58.115	620	82.302	730	4.780
405	1.479	515	60.823	625	76.817	735	4.101
410	2.396	520	63.054	630	71.081	740	3.532
415	4.213	525	65.086	635	65.228	745	3.063
420	7.572	530	67.337	640	59.101	750	2.615
425	13.054	535	69.603	645	53.436	755	2.261
430	21.825	540	72.282	650	47.708	760	1.956
435	32.967	545	74.547	655	42.233	765	1.707
440	51.538	550	77.777	660	37.197	770	1.484
445	81.711	555	80.525	665	32.804	775	1.287
450	101.099	560	83.510	670	28.602	780	1.139
455	79.671	565	86.190	675	24.904		

Spectral Data Over Visible Wavelengths



RESULTS:

In-Situ Maximum Measured LED Source Temperature

Maximum Junction Temperature from LED specification (T_j) = 125°C

Thermal Resistance Formula from LED specification = 45°C/W

Maximum Forward Voltage (V_f) from LED specification = 3V

Measured LED Current = 34.8mA

Calculated LED Wattage = $V_f \times$ Measured LED Current = 0.104W

Maximum Source Temperature (T_s) = $T_j - (\text{LED Wattage} \times \text{Thermal Resistance}) = 120.3^\circ\text{C}$

LED Source Temperature Manufacturer's Spec

LED Identified As: TOYODA GOSEI CO., LTD2835 0.5W

2. Absolute Maximum Ratings ($T_a=25^\circ\text{C}$)

Parameter	Maximum Performance
Forward Current (mA)	150
Pulse Forward Current (Duty 1/10 @1KHz)(mA)	240
LED Junction Temperature	125°C
Operating Board Temperature	-40°C - 105°C
Storage Temperature	-40°C - 105°C
Reverse Voltage	Not designed to be driven in reverse bias
Thermal Resistance	45°C/W
Power Dissipation	0.5W

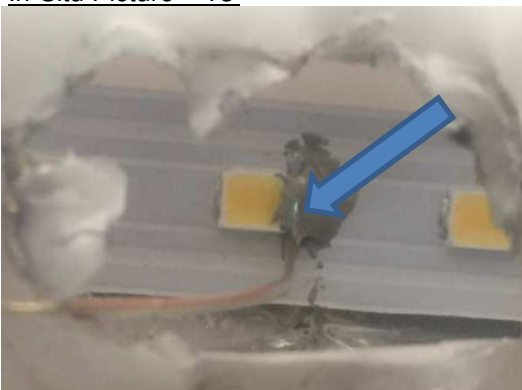
3. Electrical / Optical Characteristic ($I_f=42\text{mA}$, $T_a=25^\circ\text{C}$)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Forward Voltage $_{V_f}$	V_f	$I_f=42\text{mA}$	2.7	-	3.0	V

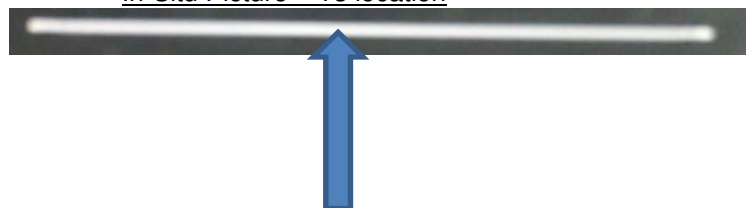
Maximum Measured Manufacturer Designated Source Temperature

Intertek Sample No.	Maximum Measured Source Temperature	Location of Thermocouple	Maximum Rated Source Temperature
CRT1706061014-001	62.8	Per Diagram	120.3

In-Situ Picture – T_s



In-Situ Picture – T_s location





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 - CRT1706061014-001