ILLUMADYNE, INC

TEST REPORT

SCOPE OF WORK
LED Performance Testing

MODEL NUMBER
2WR-UNV-22-25W-3500K

PROJECT NUMBER
G104560142

REPORT NUMBER
104560142CRT-001

ISSUE DATE
1/20/2021

REVISED DATE
None

TEST DATES
January 11, 2021 through January 20, 2021

DOCUMENT CONTROL NUMBER
RTTDS-R-AMER-Test-3407

PAGES
14

REPORT NUMBER
104560142CRT-001

MODEL NUMBER(s)
2WR-UNV-22-25W-3500K

REPORT RENDERED TO:
ILLUMADYNE, INC
3840 HOPKINS STREET
PENSACOLA, FL 32505

STATEMENT OF LIMITATION

NVLAP Lab Code 100402-0. 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-01137808-0.

TEST STANDARDS

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting
ANSI NEMA ANSLG C78.377: 2017: Specifications for the Chromaticity of Solid State Lighting (SSL) Products
ANSI/UL 1598-2018: Standard for Safety - Luminaires

In Charge of Testing:	Reviewer:
Melanie Brittain	Jacki Swiernik
Senior Associate Engineer	Staff Engineer
Lighting Division	Lighting Division

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Telephone: (607) 753-6711
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SAMPLE INFORMATION

REPORT NO. 104560142CRT-001

ITEMS RECEIVED

Item No.	Control No.	Model No.	Description	Type	Received
1	CRT2011050908-002B	2WR-UNV-22-25W-3500K	LED Wrap	Production	11/5/2020

SAMPLE PHOTOS - TESTED CONFIGURATIONS

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SUMMARY **REPORT NO. 104560142CRT-001**

PRODUCT INFORMATION AND SUMMARY OF DATA

Product Model No.:	2WR-UNV-22-25W-3500K
Product Description:	LED Wrap
LED Model No.:	Samsung LM281B+
Driver Model No.:	SS-25H-40
Light Source:	LED

Criteria	Results	
	Goniophotometer	Integrating Sphere
Light Output (lumens)	3958.5	3974.5
Input Power (W) @ 120 (Vac)	31.33	31.39
Lumen Efficacy (lm/W)	126.3	126.6
Input Power Factor () @ 120 (Vac)	0.996	0.994

Criteria	Results
Input ATHD (%) @ 120 (Vac)	4.8
Correlated Color Temperature (K)	3393
Color Rendering Index - Ra ()	83.0
Color Rendering Index - R9 ()	7.8
Duv ()	0.0010
Chromaticity Coordinate (x)	0.411
Chromaticity Coordinate (y)	0.392
Chromaticity Coordinate (u')	0.239
Chromaticity Coordinate (v')	0.513
Max LED Source Temperature (°C)	39.0
Max Driver Case Temperature (°C)	42.0
Input Power (W) @ 277 (Vac)	31.20
Input Power Factor () @ 277 (Vac)	0.934
Input ATHD (%) @ 277 (Vac)	11.3

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TEST METHODS

SEASONING IN SAMPLE ORIENTATION - LED PRODUCTS

No seasoning was performed in accordance with IESNA LM-79.

INTEGRATING SPHERE TESTING

A spectroradiometer and integrating sphere were used to measure the spectral distribution for each EUT resulting in photometric and colorimetric data. Electrical measurements of the unit were measured using a power analyzer. Each EUT was operated at the rated input voltage of the system in its designated orientation. The ambient temperature was measured at a position inside the sphere and stabilization procedures to LM-79 were followed.

TYPE C GONIOPHOTOMETER DISTRIBUTION TESTING

A Type C Mirror Goniophotometer system was used to measure the luminous intensity (candela) at each angle of distribution for the EUT. Electrical measurements of the unit were measured using a power analyzer. Each EUT was operated at the rated input voltage of the system in its designated orientation. The ambient temperature was measured at a position near the EUT at equal height and stabilization procedures to LM-79 were followed.

INSITU TEMPERATURE MEASUREMENT TESTING*

Thermal measurements were taken on the EUT using a thermocouple and temperature meter. The EUT was allowed to reach thermal equilibrium for three and a half to seven and a half hours before measurements were taken. Temperatures were measured at the TMPps or Ts point as indicated by the included diagram in accordance with manufacturers declared thermal test point location, or at a thermal test point 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.

*Not NVLAP Accredited

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TYPE C GONIOPHOTOMETER DISTRIBUTION TESTING

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PHOTOMETRIC AND ELECTRICAL MEASUREMENTS (25°C +/- 1°C)

Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor ()
Up	119.92	262.4	31.33	0.996

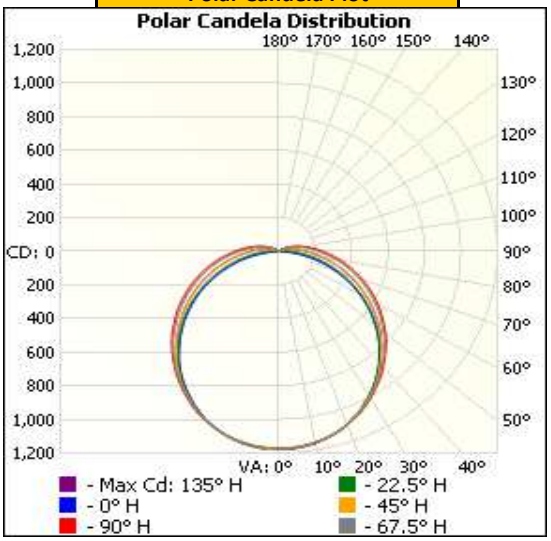
Light Output (lm)	Lumen Efficacy (lm/W)
3958.5	126.3

INTENSITY SUMMARY - CANDELA

Angle	0	22.5	45	67.5	90
0	1175	1175	1175	1175	1175
5	1173	1172	1170	1169	1167
10	1160	1157	1156	1154	1151
15	1132	1131	1130	1131	1129
20	1097	1093	1097	1097	1097
25	1050	1049	1052	1055	1058
30	991	992	996	1005	1007
35	927	928	937	948	952
40	856	858	868	886	892
45	778	781	797	820	830
50	694	699	720	751	765
55	608	613	644	681	696
60	516	525	566	611	627
65	421	435	487	538	557
70	326	348	411	468	488
75	232	266	338	399	421
80	141	189	270	334	356
85	56	121	208	273	296
90	0	71	157	219	242
95	0	41	117	175	196
100	0	21	84	137	156
105	0	9	58	104	120
110	0	2	38	75	89
115	0	0	22	52	64
120	0	0	11	34	43
125	0	0	4	19	26
130	0	0	0	9	13
135	0	0	0	2	4
140	0	0	0	0	0
145	0	0	0	0	0
150	0	0	0	0	0
155	0	0	0	0	0
160	0	0	0	0	0
165	0	0	0	0	0
170	0	0	0	0	0
175	0	0	0	0	0
180	0	0	0	0	0

Entire luminous intensity matrix found in .IES file

Polar Candela Plot



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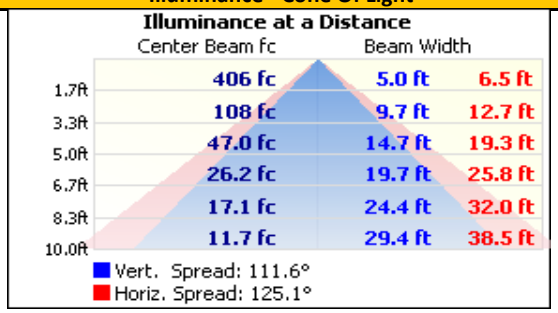
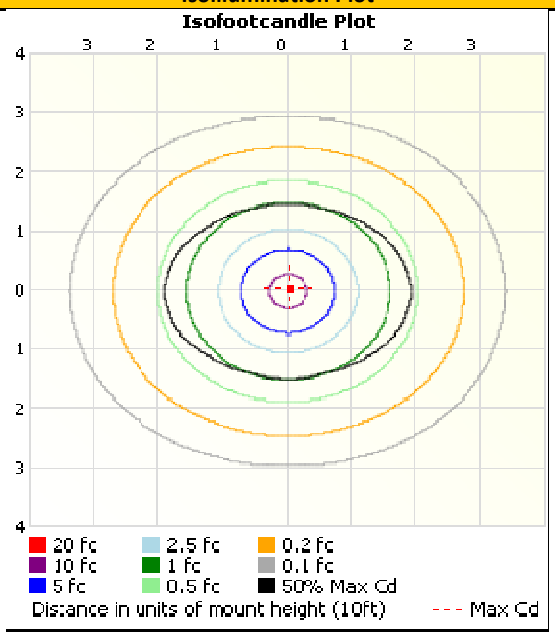
ILLUMINANCE SUMMARY

Mounting Height: 10ft

Illuminance - Cone Of Light



Isoillumination Plot



ZONAL LUMENS

Zonal Lumen Summary

Zone	Lumens	Luminaire
0-30	914.7	23.1%
0-40	1,501.7	37.9%
0-60	2,697.8	68.2%
60-90	1,046.1	26.4%
70-100	681.3	17.2%
90-120	205.2	5.2%
0-90	3,743.9	94.6%
90-180	214.6	5.4%
0-180	3,958.5	100.0%

Zone	Lumens	Total	Zone	Lumens	Total
0-10	111.3	2.8%	90-100	117.5	3.0%
10-20	319.0	8.1%	100-110	61.0	1.5%
20-30	484.4	12.2%	110-120	26.7	0.7%
30-40	587.0	14.8%	120-130	8.3	0.2%
40-50	617.4	15.6%	130-140	1.0	0.0%
50-60	578.7	14.6%	140-150	0.0	0.0%
60-70	482.2	12.2%	150-160	0.0	0.0%
70-80	350.5	8.9%	160-170	0.0	0.0%
80-90	213.3	5.4%	170-180	0.0	0.0%

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Total Quality. Assured.

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UNIFIED GLARE RATING (UGR) SUMMARY

Reflectances						
Ceiling Cavity		70	70	50	50	30
Walls		50	30	50	30	30
Floor Cavity		20	20	20	20	20

Room Size		UGR Viewed Crosswise				
X=2H	Y=2H	17.1	18.6	17.5	19.1	19.5
	3H	18.7	20.2	19.2	20.6	21.1
	4H	19.3	20.7	19.8	21.2	21.7
	6H	19.8	21.0	20.3	21.5	22.0
	8H	19.8	21.1	20.4	21.6	22.1
	12H	19.9	21.1	20.4	21.6	22.1
4H	2H	17.9	19.2	18.3	19.7	20.2
	3H	19.8	20.9	20.3	21.4	22.0
	4H	20.5	21.5	21.0	22.1	22.6
	6H	21.0	22.0	21.6	22.5	23.1
	8H	21.2	22.1	21.7	22.6	23.2
	12H	21.3	22.1	21.9	22.7	23.3
8H	4H	21.1	22.0	21.6	22.5	23.1
	6H	21.8	22.5	22.4	23.1	23.7
	8H	22.1	22.7	22.7	23.3	23.9
	12H	22.2	22.8	22.8	23.4	24.1
12H	4H	21.2	22.0	21.8	22.6	23.2
	6H	22.1	22.7	22.7	23.3	24.0
	8H	22.4	23.0	23.0	23.6	24.3

Room Size		UGR Viewed Endwise				
X=2H	Y=2H	18.0	19.6	18.5	20.0	20.5
	3H	20.2	21.7	20.7	22.1	22.6
	4H	21.3	22.6	21.8	23.1	23.6
	6H	22.3	23.5	22.8	24.0	24.5
	8H	22.7	23.9	23.2	24.4	25.0
	12H	23.2	24.3	23.7	24.8	25.4
4H	2H	18.6	19.9	19.1	20.4	20.9
	3H	21.0	22.2	21.5	22.7	23.3
	4H	22.3	23.3	22.8	23.8	24.4
	6H	23.4	24.4	24.0	24.9	25.5
	8H	24.0	24.9	24.5	25.4	26.0
	12H	24.6	25.4	25.1	25.9	26.5
8H	4H	22.6	23.5	23.1	24.0	24.6
	6H	24.0	24.7	24.5	25.3	25.9
	8H	24.7	25.3	25.3	25.9	26.6
	12H	25.4	26.0	26.0	26.6	27.3
12H	4H	22.6	23.4	23.2	24.0	24.6
	6H	24.1	24.7	24.7	25.3	26.0
	8H	24.8	25.4	25.4	26.0	26.7

Maximum UGR
24.0

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INTEGRATING SPHERE TESTING **REPORT NO. 104560142CRT-001**

PHOTOMETRIC, COLORIMETRIC, AND ELECTRICAL MEASUREMENTS (25°C +/- 1°C)

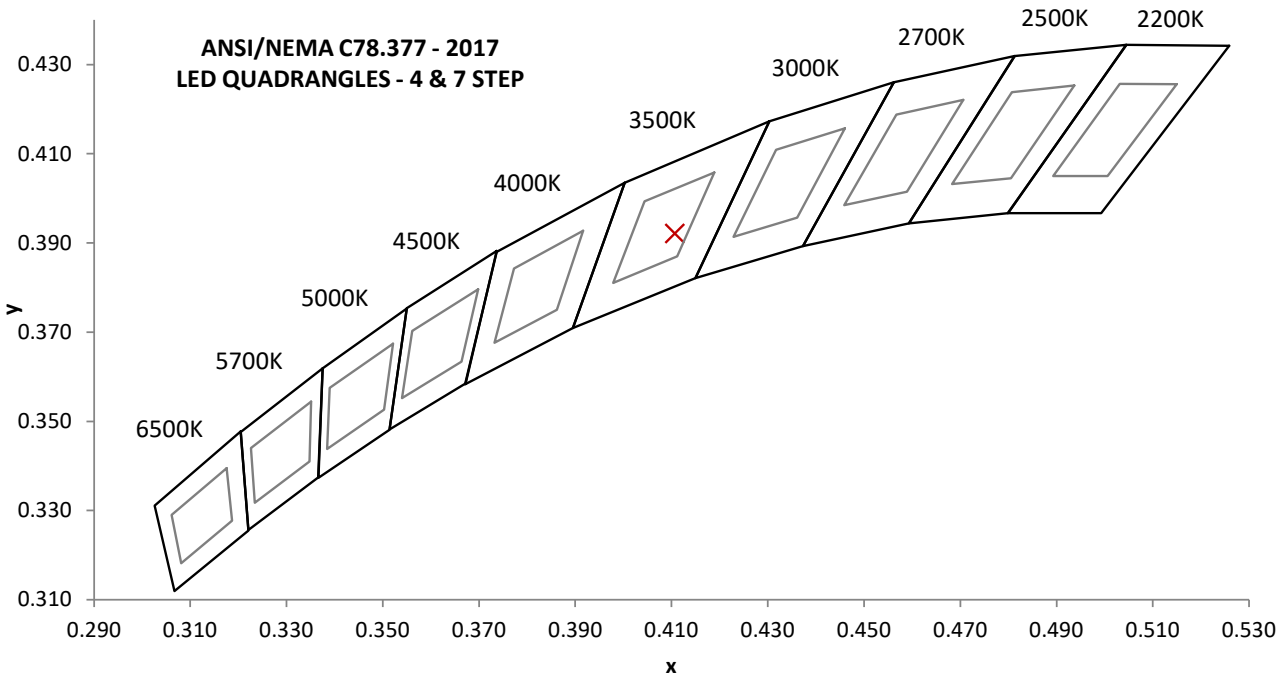
Base Orientation
Up

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor ()	Input ATHD (%)
120.01	263.1	31.39	0.994	4.8
277.03	120.7	31.20	0.934	11.3

Measured at 120.01(Vac)

Light Output (lm)	Lumen Efficacy (lm/W)	CCT (K)	CRI - Ra ()	CRI - R9 ()
3974.5	126.6	3393	83.0	7.8

Duv ()	1931 Chrom (x)	1931 Chrom (y)	1976 Chrom (u')	1976 Chrom (v')
0.0010	0.411	0.392	0.239	0.513



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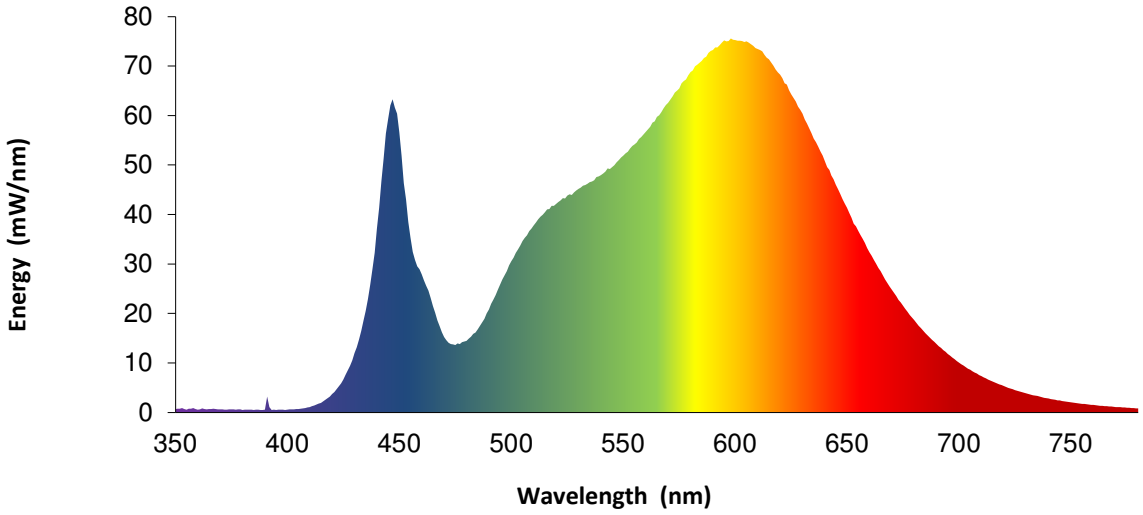
SPECTRAL DISTRIBUTION OVER WAVELENGTHS

nm	mW/nm		nm	mW/nm		nm	mW/nm		nm	mW/nm
350	0.7		460	27.9		570	62.6		680	18.7
355	0.6		465	21.5		575	65.5		685	16.0
360	0.6		470	15.3		580	68.8		690	13.8
365	0.7		475	13.6		585	71.1		695	11.8
370	0.6		480	14.5		590	73.3		700	10.1
375	0.6		485	16.8		595	75.2		705	8.6
380	0.5		490	20.8		600	75.2		710	7.3
385	0.5		495	25.9		605	75.0		715	6.3
390	0.5		500	30.6		610	73.4		720	5.3
395	0.5		505	34.7		615	71.4		725	4.5
400	0.6		510	37.8		620	68.3		730	3.9
405	0.7		515	40.5		625	64.3		735	3.3
410	1.1		520	42.1		630	60.4		740	2.8
415	1.9		525	43.8		635	55.3		745	2.4
420	3.7		530	45.2		640	50.7		750	2.0
425	6.6		535	46.6		645	46.0		755	1.7
430	12.0		540	47.9		650	41.3		760	1.5
435	20.6		545	49.6		655	36.7		765	1.3
440	37.2		550	51.9		660	32.4		770	1.1
445	59.3		555	54.2		665	28.6		775	1.0
450	56.6		560	56.7		670	24.8		780	0.8
455	35.3		565	59.7		675	21.6		---	---



Portrayed color in graphic is estimated by wavelength (nm) and may not be exact - it is a visual representation only

Output Electricals (Out of Driver) - if applicable				
Input Voltage (Vac)	Output Voltage (Vdc)	Output Current (mA)	Output Power (W)	Efficiency (%)
120.01	38.79	701.0	27.19	86.63
277.03	38.79	702.0	27.23	87.28

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INSITU TEMPERATURE MEASUREMENT TESTING

REPORT NO. 104560142CRT-001

LED MEASUREMENTS AND RATINGS

Mounting Type	Input Voltage (Vac)
Ceiling Surface	120.00

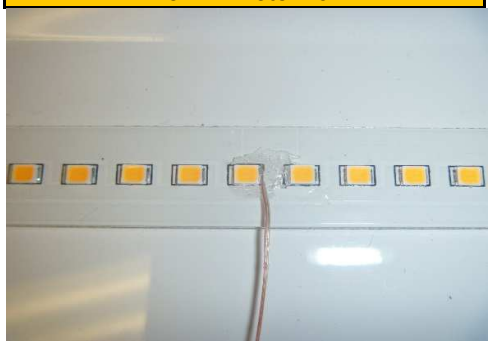
LED Model No.	Samsung LM281B+

Max Junction Temp - Tj (°C)	Max Thermal Resistance - Rth (°C/W)	Max Forward Voltage - Vf (V)
115.0	25.0	3.0

Measured LED Current (mA)	Measured LED Temp - Ts (°C)	Max LED Temp - Ts Max (°C)
70.1	39.0	109.7

Max LED Temp = Max Junction Temp – (LED Wattage x Thermal Resistance)

ISTMT Photo - Ts



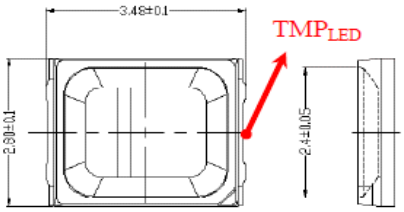
ISTMT Photo - Ts Location

LED SOURCE MANUFACTURER'S SUPPORTING DOCUMENTATION

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	T_a	-40 ~ +85	℃	-
Storage Temperature	T_{stg}	-40 ~ +85	℃	-
LED Junction Temperature	T_j	115	℃	-
Forward Current	I_F	160	mA	-

Item	Unit	Rank	Bin	Min.	Typ.	Max.
Forward Voltage (VF)	V	WA or WK	A1	2.8		2.9
			A2	2.9		3.0
			A3	3.0		3.1
			A4	3.1		3.2
		WN or WM	A1	2.8		2.9
			A2	2.9		3.0
Color Rendering Index (Ra)	-	5		80	-	-
		7		90		
Special CRI (R9)	For Ra 90			50		
Thermal Resistance (junction to solder point)	°C/W			-	25	-



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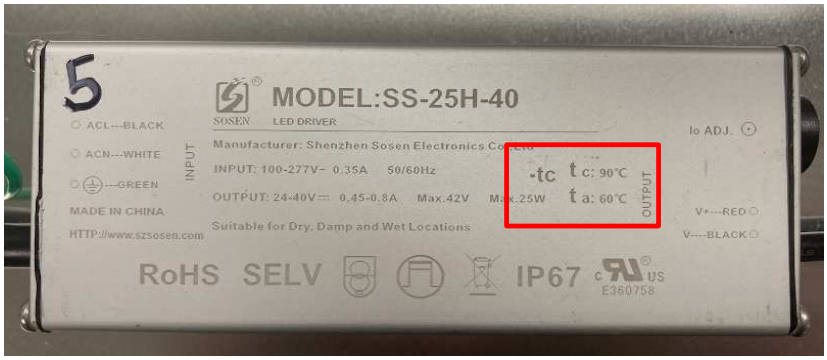
DRIVER MEASUREMENTS AND RATINGS

Measured Case Temp - Td (°C)	Max Case Temp (°C)
42.0	90.0

ISTMT Photo - Td

DRIVER MANUFACTURER'S SUPPORTING DOCUMENTATION



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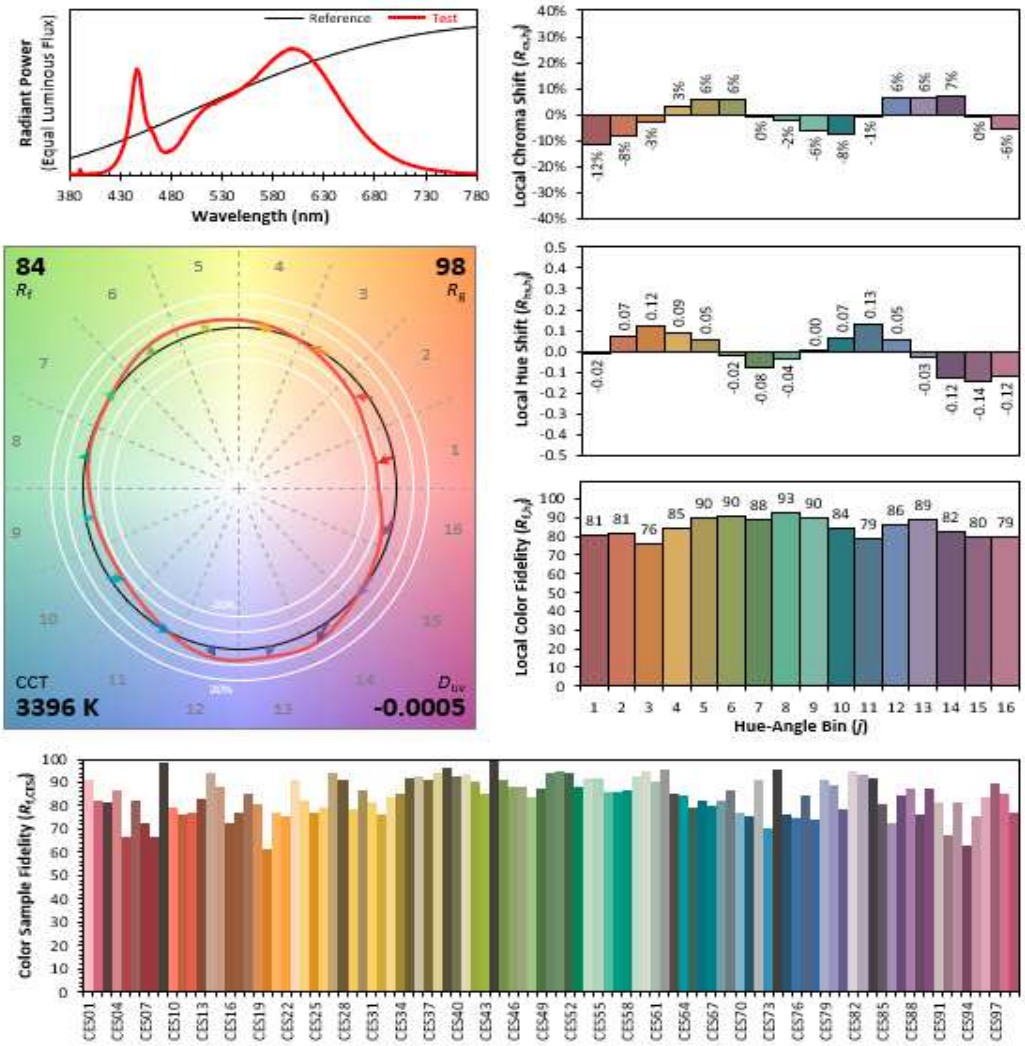
ANNEX A - TM-30 CALCULATIONS **REPORT NO. 104560142CRT-001**

TM-30 REPORT



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EQUIPMENT LIST

REPORT NO. 104560142CRT-001

#	Equipment	Model No	Control No.	Last Cal	Cal Due
1	LSI High Speed Mirror Goniophotometer	6440	---	12/23/2020	1/23/2021
2	Elgar AC Power Supply	CW1251	---	VBU	VBU
3	Yokogawa Power Analyzer	WT210	E464	5/11/2020	5/11/2021
4	Traceable Hygrothermometer	4800	L203	2/17/2020	2/17/2021
5	M-D Building Products Digital Level	Smart Tool	307-L112	5/14/2020	5/14/2021
6	NIST Luminous Intensity Standard Source	NBS10322	N1427	2/11/2019	2/11/2021
7	NIST Luminous Intensity Standard Source	NBS10332	N1435	2/11/2019	2/11/2021
8	NIST Luminous Intensity Standard Source	NBS10265	N1437	2/11/2019	2/11/2021
9	NIST Luminous Flux Standard Source	NBS10428	N1424	1/3/2019	1/3/2021
10	Sorenson DC Power Supply	XG 150-10	---	VBU	VBU
11	Omega Thermometer	DPi8-C24	M263	2/27/2020	2/27/2021
12	Elgar AC Power Supply	CW1251	---	VBU	VBU
13	Sorenson DC Power Supply	XFR 150-8	---	VBU	VBU
14	Traceable Hygrothermometer	4800	L202	2/17/2020	2/17/2021
15	Yokogawa Power Analyzer	WT1600	E473	6/22/2020	6/22/2021
16	Fluke Thermometer	53 II	N1324	3/19/2020	3/19/2021
17	Fluke Multimeter	87V	D590	6/15/2020	6/15/2021
18	3M Integrating Sphere Spectrometer System	CDS 1100	---	12/28/2020	3/28/2021
19	Fisher Scientific Stopwatch	14-649-9	N1132	3/18/2020	3/18/2021
20	Digital Thermometer	Fluke 53II	307-T1316	4/15/2020	4/15/2021
21	Fluke Multimeter	87III	307-M145	3/19/2020	3/19/2021
22	Digital Hygrothermometer	Traceable4800	L207	2/17/2020	2/17/2021

Note: Standard sources listed above are traceable to NIST: National Institute of Standards and Technology

REVISION HISTORY

#	Revision Date	Updated By	Reviewed By	Description of Change
---	None	---	---	---
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