

VISUAL COMFORT AND COMPANY TEST REPORT

SCOPE OF WORK

LED Performance Testing

MODEL NUMBER

700SPRFR-LED927

PROJECT NUMBER

G104941221

REPORT NUMBER

104941221CRT-028

ISSUE DATE

9/2/2022

REVISED DATE

None

TEST DATES

9/1/2022 through 9/2/2022

DOCUMENT CONTROL NUMBER

RTTDS-R-AMER-Test-3407

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REPORT NUMBER

104941221CRT-028

MODEL NUMBER(s)

700SPRFR-LED927

REPORT RENDERED TO:

VISUAL COMFORT AND COMPANY
VISUAL COMFORT AND COMPANY
7400 LINDER AVE
SKOKIE, IL 60077

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-01236637-1.

TEST STANDARDS

ANSI/IES LM-79-19: Optical and Electrical Measurements of Solid State Lighting Products

ANSI NEMA ANSLG C78.377: 2017: Specifications for the Chromaticity of Solid State Lighting (SSL) Products

In Charge of Testing:



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Lighting Division

Reviewer:



Jeff Davis
Technical Lead
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SAMPLE INFORMATION

REPORT NO. 104941221CRT-028

ITEMS RECEIVED

Item No.	Control No.	Model No.	Description	Type	Received
1	CRT2208311454-001	700SPRFR-LED927	Spur Chandelier	Production	8/31/2022
2	CRT2208311454-002	--	Glass		

SAMPLE PHOTOS - TESTED CONFIGURATIONS



SUMMARY

REPORT NO. 104941221CRT-028

PRODUCT INFORMATION AND SUMMARY OF DATA

Product Model No.:	700SPRFR-LED927
Product Description:	Spur Chandelier
LED Model No.:	Luminus MP-3020-1100-30-90
Driver Model No.:	MDR-503-24-60-LD
Light Source:	LED

Criteria	Results	
	Goniophotometer	Integrating Sphere
Light Output (lumens)	3178.9	3166.6
Input Power (W) @ 120 (Vac)	65.37	65.11
Luminous Efficacy (lm/W)	48.63	48.64
Input Power Factor () @ 120 (Vac)	0.990	0.985

Criteria	Results
Input ATHD (%) @ 120 (Vac)	8.7
Correlated Color Temperature (K)	2609
Color Rendering Index - Ra ()	93.1
Color Rendering Index - R9 ()	61.4
Duv ()	-0.0022
Chromaticity Coordinate (x)	0.463
Chromaticity Coordinate (y)	0.405
Chromaticity Coordinate (u')	0.267
Chromaticity Coordinate (v')	0.526

TEST METHODS

SEASONING IN SAMPLE ORIENTATION - LED PRODUCTS

No seasoning was performed in accordance with ANSI/IES LM-79-19

INTEGRATING SPHERE TESTING

A spectroradiometer and integrating sphere were used to measure the spectral power distribution for photometric and colorimetric data of 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 and relative humidity was measured at $25^{\circ}\text{C} \pm 1.2^{\circ}\text{C}$ and 10-65% respectively at a position inside of the sphere within 1.5m and at equal height of the EUT. Stabilization procedures to LM-79-19 were followed. The EUT was mounted in a 4π configuration.

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 and relative humidity was measured at $25^{\circ}\text{C} \pm 1.2^{\circ}\text{C}$ and 10-65% respectively at a position within 1.5m and at equal height of the EUT. Stabilization procedures to LM-79-19 were followed. The test distance was $\geq 5x$ the longest luminous dimension of the EUT.

TYPE C GONIOPHOTOMETER DISTRIBUTION TESTING

REPORT NO. 104941221CRT-028

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS

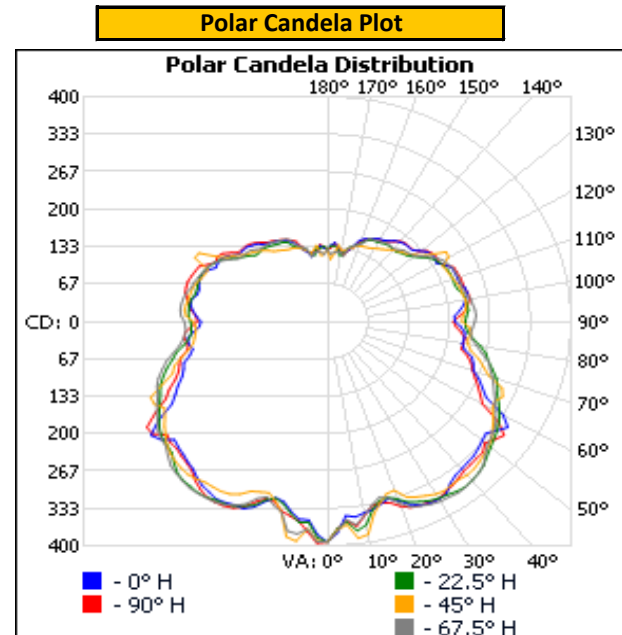
Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)
Up	120.01	551.4	65.37	0.990

Light Output (lm)	Efficacy (lm/W)
3178.9	48.6

LUMINOUS INTENSITY SUMMARY (candela)

Angle (°)	0	22.5	45	67.5	90
0	393	393	393	393	393
5	347	359	363	355	356
10	346	368	385	350	351
15	337	331	334	325	335
20	340	337	320	344	350
25	361	354	345	362	361
30	366	364	355	370	365
35	352	370	355	373	357
40	343	370	357	369	348
45	339	363	353	362	346
50	331	350	346	343	337
55	339	340	331	335	354
60	333	326	312	319	294
65	281	308	317	302	272
70	255	295	281	288	253
75	245	274	257	273	238
80	225	256	234	249	227
85	226	232	236	236	220
90	209	226	221	242	207
95	217	232	228	243	227
100	231	230	230	238	237
105	233	221	226	229	232
110	227	219	220	229	231
115	226	218	216	226	228
120	207	211	229	218	210
125	209	198	208	201	211
130	196	180	186	183	195
135	188	172	174	179	189
140	185	167	166	169	186
145	175	168	157	170	173
150	169	163	150	166	169
155	163	161	146	163	162
160	154	145	144	145	150
165	131	136	134	136	132
170	125	119	128	126	130
175	141	135	121	124	140
180	129	129	129	129	129

Entire luminous intensity matrix found in .IES file



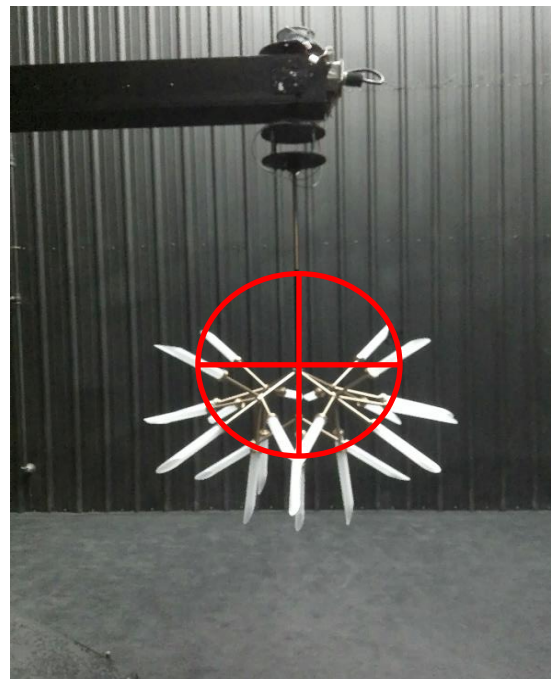
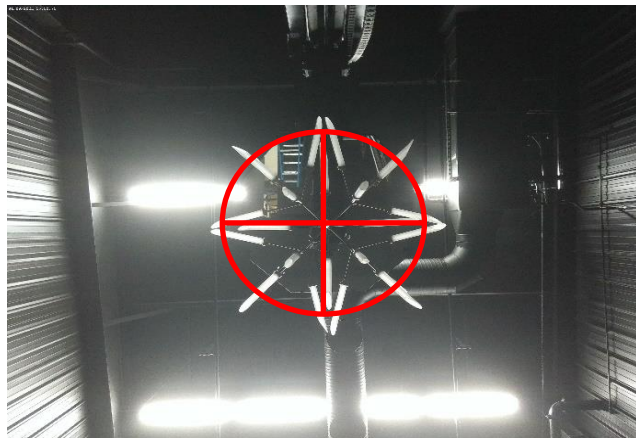
REPORT NO. 104941221CRT-028

ORIENTATION AND ALIGNMENT OF EUT

Luminous Opening		
Length (ft)	Width (ft)	Height (ft)
2.88	2.88	2.17
0°-180° H	90°-270° H	0°-180° V

Test Distance (ft)
29.6

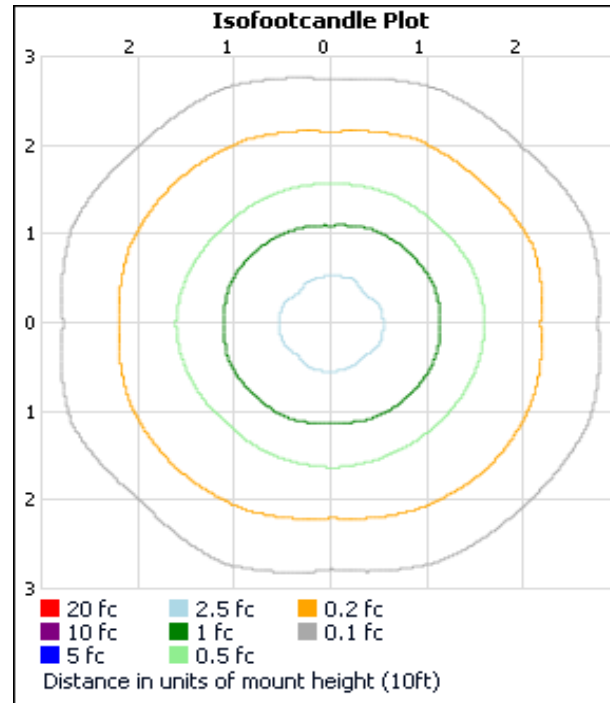
PHOTOMETRIC CENTER OF EUT



REPORT NO. 104941221CRT-028

ILLUMINANCE SUMMARY

Mounting Height: 10ft
Isoillumination Plot



ZONAL LUMENS

Zonal Lumen Summary

Zone	Lumens	Luminaire
0-30	295.6	9.3%
0-40	523.7	16.5%
0-60	1,097.1	34.5%
60-90	821.8	25.9%
70-100	776.9	24.4%
90-120	714.0	22.5%
0-90	1,918.9	60.4%
90-180	1,260.0	39.6%
0-180	3,178.9	100.0%

Zone	Lumens	Total	Zone	Lumens	Total
0-10	35.3	1.1%	90-100	252.3	7.9%
10-20	95.8	3.0%	100-110	241.7	7.6%
20-30	164.6	5.2%	110-120	219.9	6.9%
30-40	228.1	7.2%	120-130	181.5	5.7%
40-50	273.2	8.6%	130-140	137.9	4.3%
50-60	300.2	9.4%	140-150	104.5	3.3%
60-70	297.2	9.3%	150-160	71.9	2.3%
70-80	272.6	8.6%	160-170	37.9	1.2%
80-90	252.0	7.9%	170-180	12.2	0.4%

INTEGRATING SPHERE TESTING

REPORT NO. 104941221CRT-028

PHOTOMETRIC, RADIOMETRIC, COLORIMETRIC, AND ELECTRICAL MEASUREMENTS

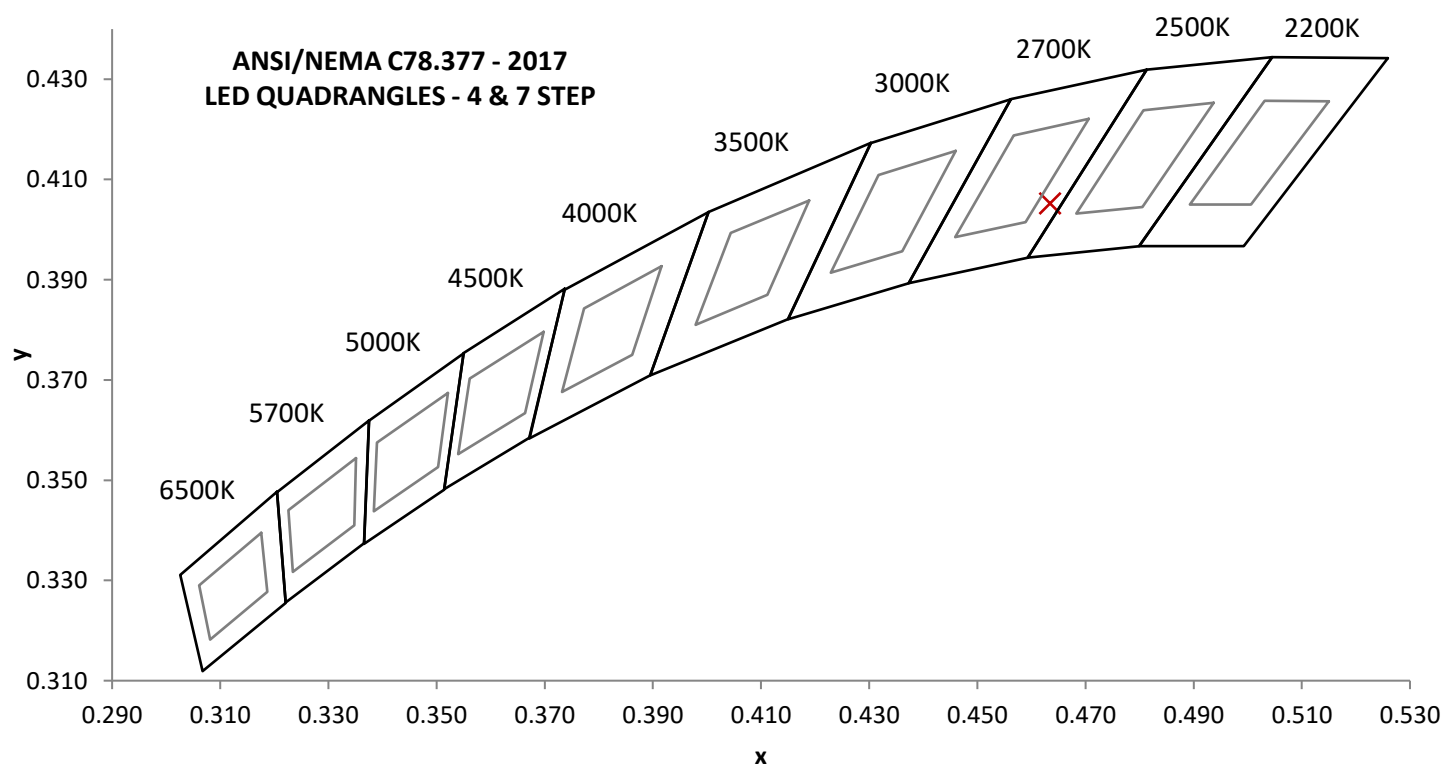
Base Orientation
Up

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
120.05	550.8	65.11	0.985	8.7

Measured at 120.05(Vac)

Light Output (lm)	Efficacy (lm/W)	CCT (K)	CRI - Ra (l)	CRI - R9 (l)
3166.6	48.6	2609	93.1	61.4

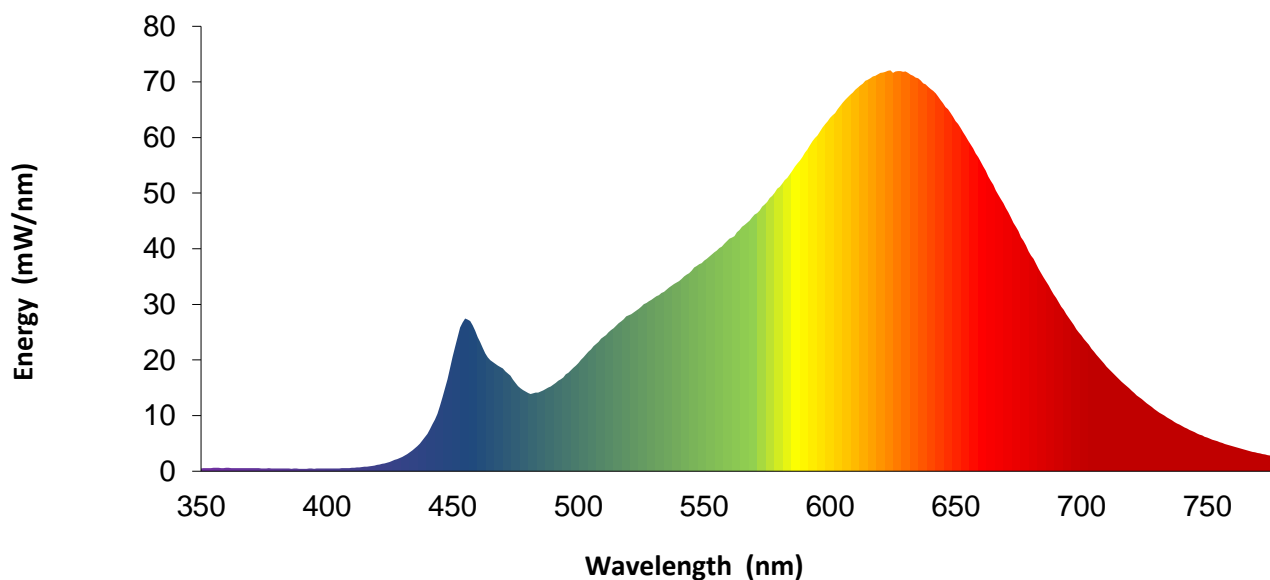
Duv (l)	1931 Chrom (x)	1931 Chrom (y)	1976 Chrom (u')	1976 Chrom (v')
-0.0022	0.463	0.405	0.267	0.526



REPORT NO. 104941221CRT-028

SPECTRAL POWER DISTRIBUTION

nm	mW/nm		nm	mW/nm		nm	mW/nm		nm	mW/nm
350	0.5		460	24.1		570	46.1		680	38.8
355	0.6		465	20.0		575	48.4		685	34.8
360	0.6		470	18.5		580	51.2		690	31.1
365	0.5		475	15.9		585	54.1		695	27.6
370	0.6		480	14.1		590	57.2		700	24.4
375	0.5		485	14.4		595	60.4		705	21.5
380	0.5		490	15.5		600	63.6		710	18.8
385	0.5		495	17.5		605	66.3		715	16.5
390	0.5		500	19.4		610	68.6		720	14.5
395	0.5		505	21.9		615	70.4		725	12.6
400	0.5		510	24.2		620	71.6		730	10.9
405	0.5		515	26.1		625	71.7		735	9.4
410	0.6		520	28.0		630	71.9		740	8.2
415	0.8		525	29.6		635	70.7		745	7.0
420	1.1		530	31.2		640	68.7		750	6.0
425	1.7		535	32.6		645	66.2		755	5.2
430	2.6		540	34.2		650	63.0		760	4.5
435	4.1		545	36.0		655	59.4		765	3.8
440	6.7		550	37.9		660	55.6		770	3.3
445	11.7		555	39.7		665	51.5		775	2.8
450	20.6		560	41.8		670	47.3		780	2.4
455	27.5		565	43.9		675	43.2		---	---



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

EQUIPMENT LIST

REPORT NO. 104941221CRT-028

#	Equipment	Model No	Control No.	Last Cal	Cal Due
1	LSI High Speed Mirror Goniophotometer	6440	---	6/30/2022	9/30/2022
2	Elgar AC Power Supply	CW1251	---	VBV	VBV
3	Yokogawa Power Analyzer	WT210	307-E464	6/21/2022	6/21/2023
4	Traceable Hygrothermometer	4800	L204	2/21/2022	2/21/2023
5	Sorenson DC Power Supply	XG 150-10	---	VBV	VBV
6	Omega Thermometer	DPi8-C24	M263	3/1/2022	3/1/2023
7	Bosch Distance Laser	Pro GLM 20	L210	3/21/2022	3/15/2023
8	Tape Measure	Crescent	---	9/21/2021	9/21/2024
9	Elgar AC Power Supply	CW1251	---	VBV	VBV
10	Sorenson DC Power Supply	XFR 150-8	---	VBV	VBV
11	Traceable Hygrothermometer	200110913	L206	2/21/2022	2/21/2023
12	Yokogawa Power Analyzer	WT1600	E462	5/21/2022	5/21/2023
13	Fluke Thermometer	53 II	D588	6/13/2022	6/13/2023
14	Fluke Multimeter	87III	M145	3/25/2022	3/25/2023
15	Current Monitor	411	A197	8/26/2021	8/26/2024
16	3M Integrating Sphere Spectrometer System	CDS 2600	L231	8/29/2022	11/29/2022
17	Fisher Scientific Stopwatch	14-649-9	N1132	3/24/2022	3/24/2023
The AC power supplies used for testing have a crest factor capable of 0-3.5					

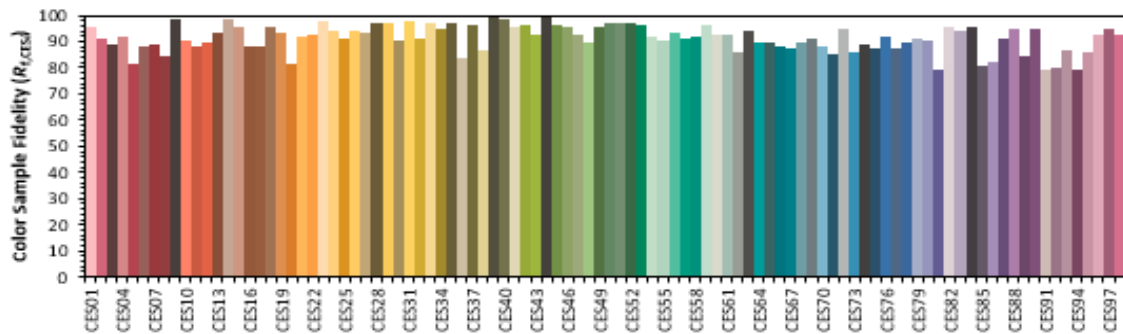
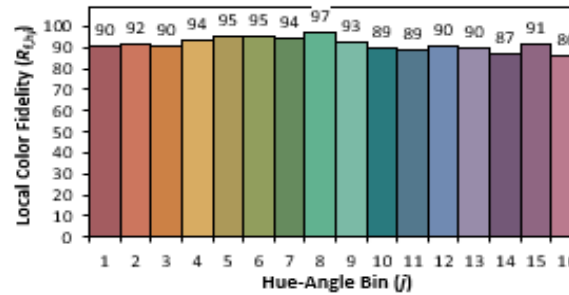
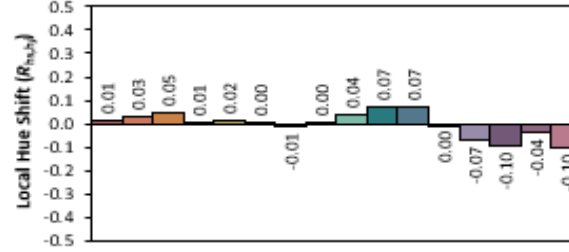
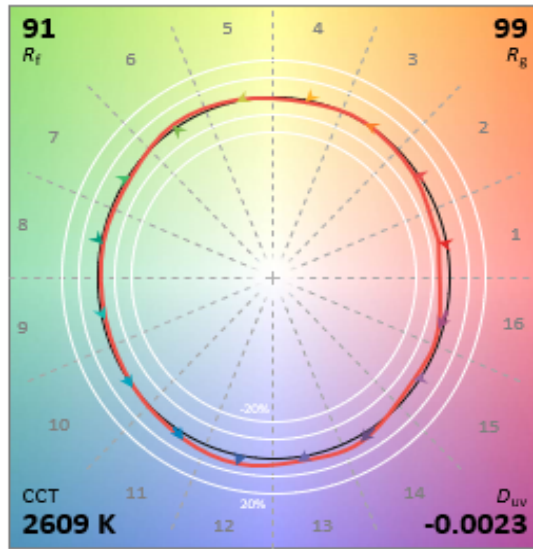
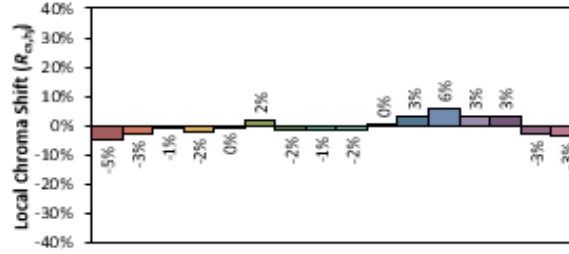
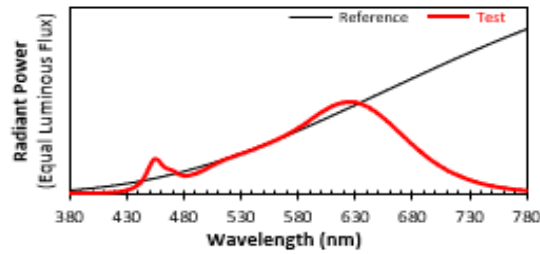
REVISION HISTORY

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

ANNEX A - TM-30 CALCULATIONS

REPORT NO. 104941221CRT-028

TM-30 REPORT



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0.4635
 y 0.4052
 u' 0.2673
 v' 0.5258

CIE 13.3-1995
(CRI)
 R_a 93
 R_g 61