Classified

Cooper Lighting Solutions Photometric Lab
1121 Highway 74 South
Peachtree City, GA 30269

Scaled data based on original data using

LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Test Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

Brand: HALO

Report Number: P832732

Luminaire Tested: **HLBT407FS5*-930**

Issue Date: 05/14/2024

Report Generated By 670245763 / DESKTOP-DVLU35A

Cooper Lighting Solutions Photometric Lab
1121 Highway 74 South
Peachtree City, GA 30269

Scaled Data Report

Test Information

Test Method:	LM-79-08
Report Number:	P832732
Test Lab:	ETA Testing Technology
Issue Date:	05/14/2024
Manufacturer:	COOPER LIGHTING SOLUTIONS (FORMERLY EATON)
Product Line:	HALO
Catalog Number:	HLBT407FS5*-930
Description:	HALO SLIM RETROFIT 4 inch 90 CRI COLOR SELECTABLE FIXTURE
Light Source:	3000K CCT, 90 CRI LEDS
Ballast/Driver:	ELECTRONIC DRIVER

Summary

Lumens per Lamp:	N/A
Luminaire Lumens:	705.2 lumens
Efficiency:	N/A
Efficacy:	92.8 lumens/watt
Spacing Criteria (0/90/45):	1.25 / 1.25 / 1.36
Luminous Opening:	Circular (Dia: 0.3' x H: 0')
CIE Type:	Direct

Input Watts (W):	7.6
Input Voltage (V):	120
Input Current (Ain):	NR
Voltage Rise (V):	NR
Power Factor:	NR
Total Harmonic Distortion (THDi):	NR
Frequency (hertz):	60
Stabilization Time:	NR
Operation Time:	NR
Ambient Temperature (°C):	NR
Test Distance:	25 FT

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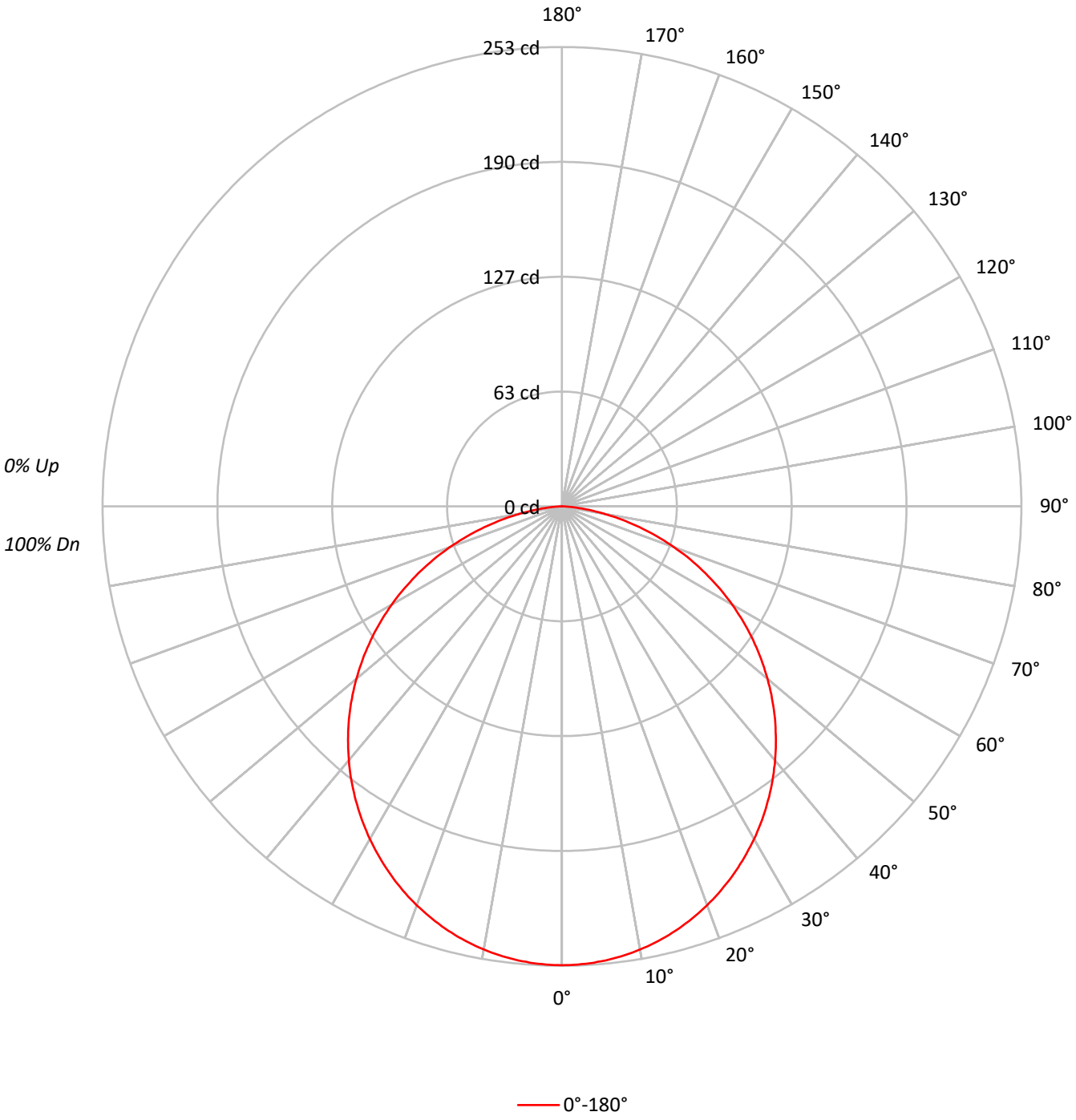
Luminous Intensity Polar Plot



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COEFFICIENT OF UTILIZATION - ZONAL CAVITY METHOD:

RF	20				20				20			20			20			20
RC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	109	104	100	96	106	102	98	95	98	95	92	94	91	89	90	88	86	84
2	99	91	84	78	96	89	83	77	85	80	76	82	78	74	79	75	72	70
3	90	80	72	65	88	78	71	65	75	69	63	72	67	62	70	65	61	59
4	83	71	62	55	80	69	61	55	67	60	54	64	58	53	62	57	53	50
5	76	63	54	47	74	62	54	47	60	52	47	58	51	46	56	50	46	44
6	70	57	48	41	68	56	47	41	54	47	41	52	46	41	51	45	40	38
7	65	52	43	37	63	51	42	36	49	42	36	48	41	36	46	40	36	34
8	61	47	38	33	59	46	38	33	45	38	32	44	37	32	43	36	32	30
9	57	43	35	29	55	43	35	29	41	34	29	40	34	29	39	33	29	27
10	53	40	32	27	52	39	32	27	38	31	26	37	31	26	36	30	26	24

AVERAGE LUMINANCE (cd/sqm):

	0°
0°	38481
5°	38429
10°	38317
15°	38136
20°	37888
25°	37569
30°	37207
35°	36771
40°	36298
45°	35727
50°	35014
55°	34142
60°	32983
65°	31456
70°	29252
75°	26005
80°	21134
85°	14327

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ZONAL LUMENS:

Zone	Lumens	% Fixture
0°-10°	23.9	3.4
10°-20°	68.2	9.7
20°-30°	103.0	14.6
30°-40°	123.7	17.5
40°-50°	127.9	18.1
50°-60°	114.8	16.3
60°-70°	86.2	12.2
70°-80°	46.8	6.6
80°-90°	10.6	1.5
90°-100°	0.0	0.0
100°-110°	0.0	0.0
110°-120°	0.0	0.0
120°-130°	0.0	0.0
130°-140°	0.0	0.0
140°-150°	0.0	0.0
150°-160°	0.0	0.0
160°-170°	0.0	0.0
170°-180°	0.0	0.0
0°-30°	195.1	27.7
0°-40°	318.9	45.2
0°-60°	561.6	79.6
0°-90°	705.2	100.0
90°-120°	0.0	0.0
90°-150°	0.0	0.0
90°-180°	0.0	0.0
0°-180°	705.2	100.0

CANDELA DISTRIBUTION:

	0°	Flux
0°	253	
5°	251	24
15°	242	68
25°	224	103
35°	198	124
45°	166	128
55°	129	115
65°	87	86
75°	44	47
85°	8	11
90°	1	

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CANDELA DISTRIBUTION (FULL):

	0°
0°	252.7
0.5°	252.6
1°	252.6
1.5°	252.5
2°	252.5
2.5°	252.3
3°	252.2
3.5°	252.1
4°	251.9
4.5°	251.6
5°	251.4
5.5°	251.2
6°	250.9
6.5°	250.6
7°	250.3
7.5°	249.9
8°	249.6
8.5°	249.1
9°	248.7
9.5°	248.3
10°	247.8
10.5°	247.3
11°	246.8
11.5°	246.3
12°	245.7
12.5°	245.1
13°	244.5
13.5°	243.9
14°	243.3
14.5°	242.6
15°	241.9
15.5°	241.2
16°	240.4
16.5°	239.6
17°	238.9
17.5°	238.1
18°	237.2
18.5°	236.4
19°	235.5
19.5°	234.6
20°	233.8
20.5°	232.8
21°	231.9
21.5°	230.9
22°	229.9

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CANDELA DISTRIBUTION (continued):

	0°
22.5°	228.9
23°	227.8
23.5°	226.8
24°	225.8
24.5°	224.7
25°	223.6
25.5°	222.4
26°	221.3
26.5°	220.1
27°	219.0
27.5°	217.8
28°	216.5
28.5°	215.3
29°	214.1
29.5°	212.8
30°	211.6
30.5°	210.3
31°	208.9
31.5°	207.6
32°	206.3
32.5°	204.9
33°	203.5
33.5°	202.1
34°	200.7
34.5°	199.2
35°	197.8
35.5°	196.4
36°	194.9
36.5°	193.4
37°	191.9
37.5°	190.4
38°	188.9
38.5°	187.3
39°	185.7
39.5°	184.2
40°	182.6
40.5°	180.9
41°	179.3
41.5°	177.7
42°	176.0
42.5°	174.4
43°	172.7
43.5°	171.0
44°	169.3
44.5°	167.6

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CANDELA DISTRIBUTION (continued):

	0°
45°	165.9
45.5°	164.1
46°	162.3
46.5°	160.6
47°	158.8
47.5°	156.9
48°	155.2
48.5°	153.3
49°	151.5
49.5°	149.6
50°	147.8
50.5°	145.9
51°	144.0
51.5°	142.2
52°	140.2
52.5°	138.3
53°	136.4
53.5°	134.4
54°	132.5
54.5°	130.5
55°	128.6
55.5°	126.6
56°	124.6
56.5°	122.6
57°	120.6
57.5°	118.6
58°	116.5
58.5°	114.5
59°	112.4
59.5°	110.4
60°	108.3
60.5°	106.2
61°	104.2
61.5°	102.1
62°	100.0
62.5°	97.9
63°	95.7
63.5°	93.6
64°	91.5
64.5°	89.4
65°	87.3
65.5°	85.1
66°	83.0
66.5°	80.8
67°	78.7

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CANDELA DISTRIBUTION (continued):

	0°
67.5°	76.5
68°	74.4
68.5°	72.2
69°	70.0
69.5°	67.9
70°	65.7
70.5°	63.5
71°	61.4
71.5°	59.2
72°	57.0
72.5°	54.9
73°	52.7
73.5°	50.6
74°	48.5
74.5°	46.3
75°	44.2
75.5°	42.1
76°	40.0
76.5°	37.9
77°	35.9
77.5°	33.9
78°	31.9
78.5°	29.9
79°	27.9
79.5°	26.0
80°	24.1
80.5°	22.3
81°	20.5
81.5°	18.7
82°	17.0
82.5°	15.3
83°	13.7
83.5°	12.2
84°	10.8
84.5°	9.5
85°	8.2
85.5°	7.0
86°	5.9
86.5°	5.0
87°	4.1
87.5°	3.4
88°	2.8
88.5°	2.3
89°	1.8
89.5°	1.4

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CANDELA DISTRIBUTION (continued):

	0°
90°	*1.0*

Cooper Lighting Solutions Photometric Lab
1121 Highway 74 South
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LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

HALO

Report Number: SP1-2403-328-12

Test Date: 05/03/2024

Luminaire Tested: HLT407FS5-3000K

Data in this report applies to families of products HLT407FS5-3000K.

Report Generated By FNC07603 / LDUCLS01DT446
Version: v6.13

Cooper Lighting Solutions Photometric Lab
1121 Highway 74 South
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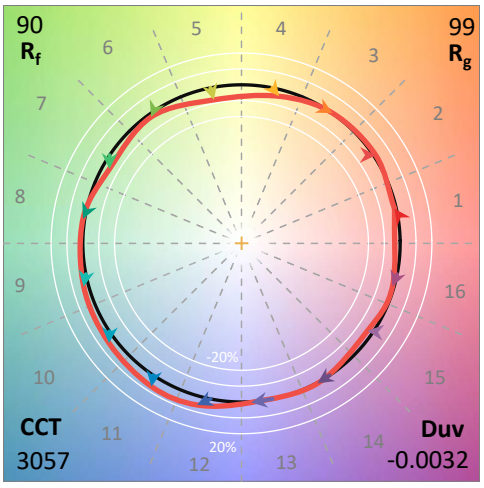
Test Information

Test Method:	LM-79-2019
Report Number:	SP1-2403-328-12
Test Lab:	COOPER LIGHTING SOLUTIONS
Photometer:	SP1 - 76IN SPHERE
Measurement Geometry:	4π
Issue Date:	05/03/2024
Manufacturer:	COOPER LIGHTING SOLUTIONS
Product Line:	HALO
Catalog Number:	**HLT407FS5-3000K**
Description:	HLBSL RETROFIT 4 INCH SAMPLE #2.

Spectral Parameters

CCT (K):	3057	CRI (Ra):	93.8		
CIE u':	0.2497	R1:	92.6	R9:	95.9
CIE v':	0.5158	R2:	94.0	R10:	90.4
Duv:	-0.0032	R3:	98.5	R11:	92.7
CIE x:	0.4284	R4:	95.3	R12:	80.3
CIE y:	0.3933	R5:	92.8	R13:	92.5
CIE z:	0.1783	R6:	87.8	R14:	98.3
Peak Wavelength (nm):	632	R7:	93.6		
Dominant Wavelength (nm):	583	R8:	95.9		
Purity:	47				

Rf:	90
Rg:	98.8



Test Conditions

Stabilization Time:	21M
Operation Time:	12H
Room Temperature (°C) / RH%:	25.1/43%
Sphere Temperature (°C):	24.9

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Measurement and Test Equipment			
Instrument	Identification Number	Calibration Date	Calibration Due Date
Photometer	76INCH SPHERE IN0058	2/12/2024	8/12/2024
Power Meter	XITRON 2801 IN0071	10/23/2023	10/23/2024
AC Power Source	CHROMA 61603 IN0063	10/24/2023	10/24/2024
DC Power Source	AGILENT E3634A IN0208	10/24/2023	10/24/2024
Sphere Thermometer	ONSET IN0085	10/24/2023	10/24/2024
Room Thermometer	ONSET IN0046	10/24/2023	10/24/2024

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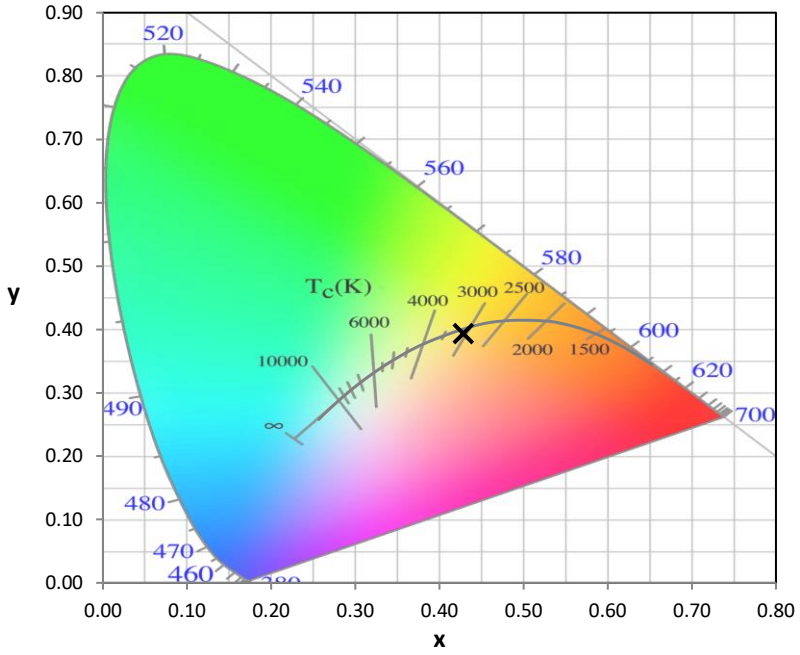
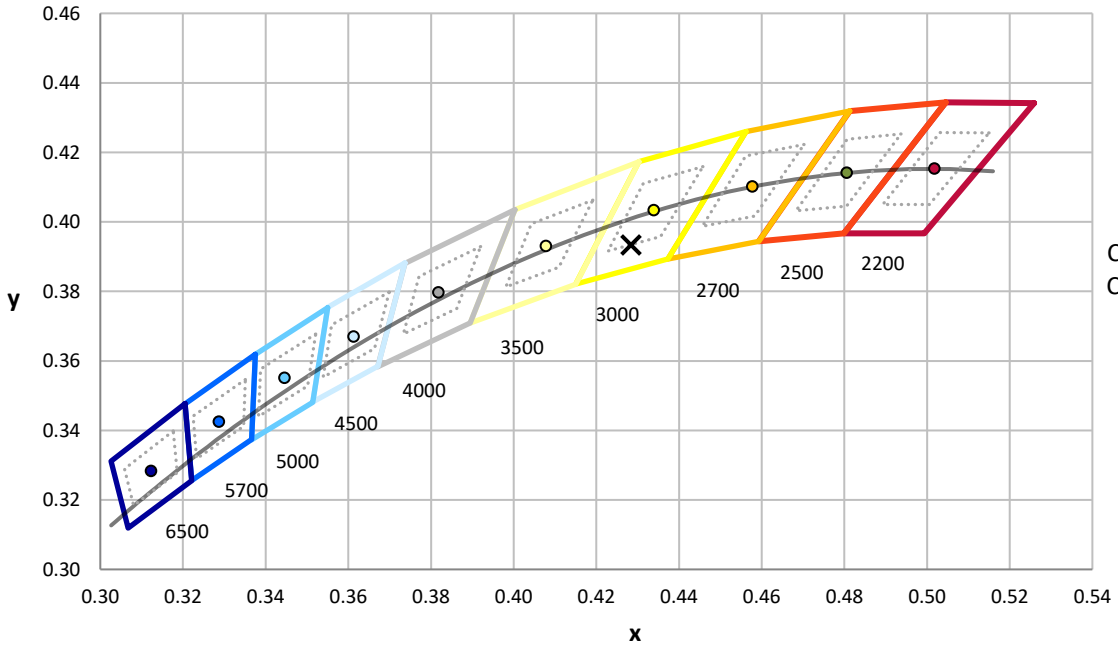
CIE 1931 Chromaticity Diagram



CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



CCT = 3057K
CIE x = 0.4284
CIE y = 0.3933
Duv = -0.0032

Point lies inside the ANSI 3000K 4-step quadrangle

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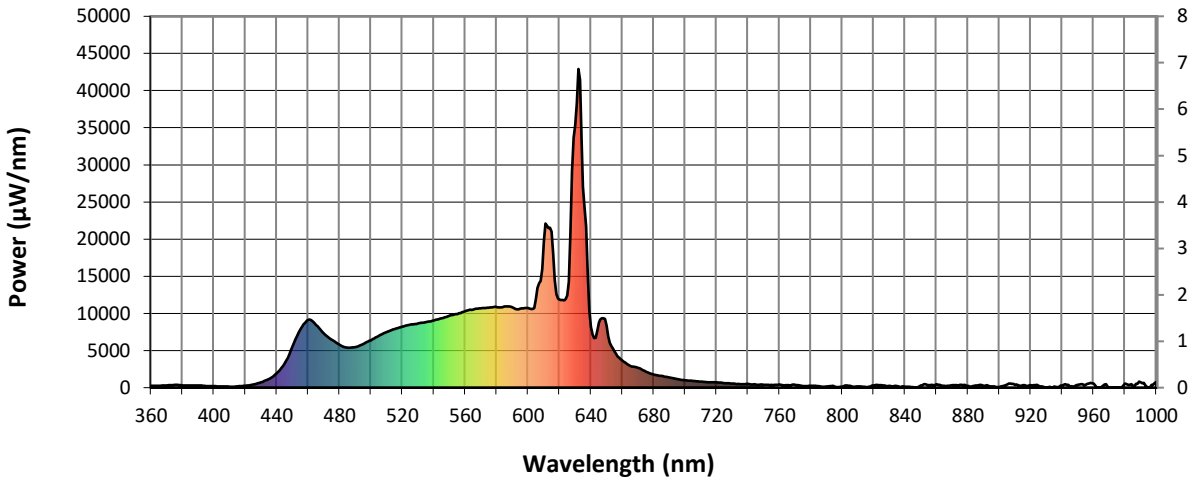
Photopic Flux vs. Wavelength



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λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)
360	257	NR	490	5448	NR	620	11820	NR	750	396	NR	880	248	NR
365	248	NR	495	5857	NR	625	12391	NR	755	375	NR	885	290	NR
370	307	NR	500	6386	NR	630	35348	NR	760	420	NR	890	260	NR
375	372	NR	505	6966	NR	635	27046	NR	765	339	NR	895	169	NR
380	310	NR	510	7498	NR	640	8164	NR	770	383	NR	900	69	NR
385	273	NR	515	7882	NR	645	8729	NR	775	216	NR	905	403	NR
390	292	NR	520	8212	NR	650	8346	NR	780	253	NR	910	397	NR
395	221	NR	525	8488	NR	655	4858	NR	785	205	NR	915	318	NR
400	189	NR	530	8646	NR	660	3640	NR	790	175	NR	920	334	NR
405	161	NR	535	8821	NR	665	2929	NR	795	168	NR	925	268	NR
410	142	NR	540	9056	NR	670	2671	NR	800	142	NR	930	0	NR
415	167	NR	545	9359	NR	675	2156	NR	805	239	NR	935	147	NR
420	259	NR	550	9665	NR	680	1754	NR	810	159	NR	940	235	NR
425	427	NR	555	9916	NR	685	1568	NR	815	63	NR	945	130	NR
430	710	NR	560	10275	NR	690	1350	NR	820	291	NR	950	387	NR
435	1172	NR	565	10512	NR	695	1147	NR	825	351	NR	955	371	NR
440	1936	NR	570	10698	NR	700	982	NR	830	240	NR	960	558	NR
445	3261	NR	575	10781	NR	705	889	NR	835	212	NR	965	66	NR
450	5513	NR	580	10848	NR	710	797	NR	840	116	NR	970	0	NR
455	7825	NR	585	10927	NR	715	725	NR	845	63	NR	975	0	NR
460	9146	NR	590	10809	NR	720	704	NR	850	286	NR	980	557	NR
465	8454	NR	595	10612	NR	725	607	NR	855	341	NR	985	279	NR
470	7264	NR	600	10731	NR	730	570	NR	860	457	NR	990	738	NR
475	6466	NR	605	11909	NR	735	485	NR	865	243	NR	995	38	NR
480	5750	NR	610	19670	NR	740	494	NR	870	336	NR	1000	755	NR
485	5383	NR	615	20998	NR	745	415	NR	875	394	NR			

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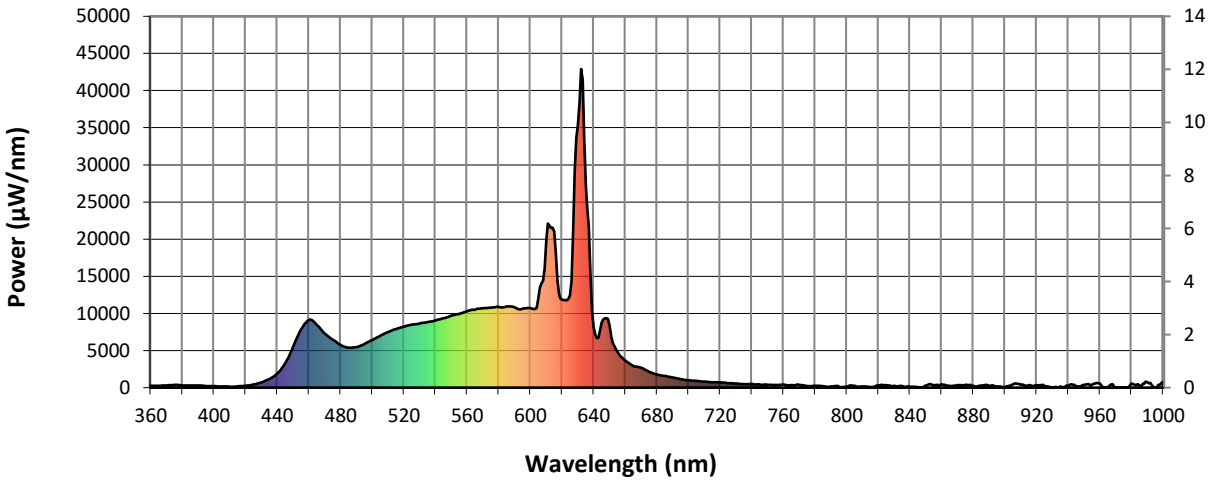
Scotopic Flux vs. Wavelength



Scotopic Lumens: 1197.1 **S/P: 1.58**

λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)
360	257	NR	490	5448	NR	620	11820	NR	750	396	NR	880	248	NR
365	248	NR	495	5857	NR	625	12391	NR	755	375	NR	885	290	NR
370	307	NR	500	6386	NR	630	35348	NR	760	420	NR	890	260	NR
375	372	NR	505	6966	NR	635	27046	NR	765	339	NR	895	169	NR
380	310	NR	510	7498	NR	640	8164	NR	770	383	NR	900	69	NR
385	273	NR	515	7882	NR	645	8729	NR	775	216	NR	905	403	NR
390	292	NR	520	8212	NR	650	8346	NR	780	253	NR	910	397	NR
395	221	NR	525	8488	NR	655	4858	NR	785	205	NR	915	318	NR
400	189	NR	530	8646	NR	660	3640	NR	790	175	NR	920	334	NR
405	161	NR	535	8821	NR	665	2929	NR	795	168	NR	925	268	NR
410	142	NR	540	9056	NR	670	2671	NR	800	142	NR	930	0	NR
415	167	NR	545	9359	NR	675	2156	NR	805	239	NR	935	147	NR
420	259	NR	550	9665	NR	680	1754	NR	810	159	NR	940	235	NR
425	427	NR	555	9916	NR	685	1568	NR	815	63	NR	945	130	NR
430	710	NR	560	10275	NR	690	1350	NR	820	291	NR	950	387	NR
435	1172	NR	565	10512	NR	695	1147	NR	825	351	NR	955	371	NR
440	1936	NR	570	10698	NR	700	982	NR	830	240	NR	960	558	NR
445	3261	NR	575	10781	NR	705	889	NR	835	212	NR	965	66	NR
450	5513	NR	580	10848	NR	710	797	NR	840	116	NR	970	0	NR
455	7825	NR	585	10927	NR	715	725	NR	845	63	NR	975	0	NR
460	9146	NR	590	10809	NR	720	704	NR	850	286	NR	980	557	NR
465	8454	NR	595	10612	NR	725	607	NR	855	341	NR	985	279	NR
470	7264	NR	600	10731	NR	730	570	NR	860	457	NR	990	738	NR
475	6466	NR	605	11909	NR	735	485	NR	865	243	NR	995	38	NR
480	5750	NR	610	19670	NR	740	494	NR	870	336	NR	1000	755	NR
485	5383	NR	615	20998	NR	745	415	NR	875	394	NR			

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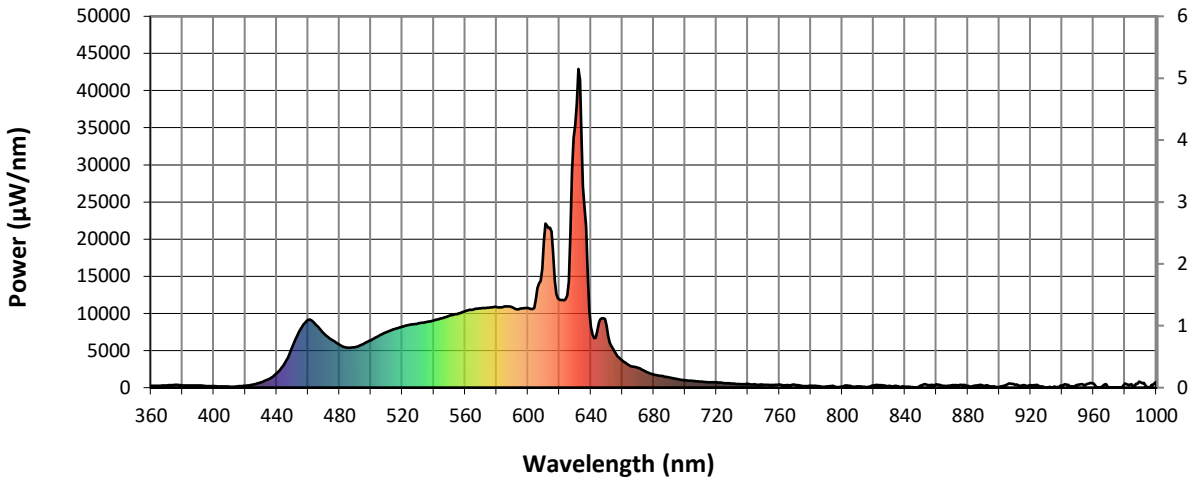
Melanopic Flux vs. Wavelength



Melanopic Lumens: 484.9 **M/P: 0.64**

λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)	λ (nm)	Power (µW/nm)	Lumens (ϕ/nm)
360	257	NR	490	5448	NR	620	11820	NR	750	396	NR	880	248	NR
365	248	NR	495	5857	NR	625	12391	NR	755	375	NR	885	290	NR
370	307	NR	500	6386	NR	630	35348	NR	760	420	NR	890	260	NR
375	372	NR	505	6966	NR	635	27046	NR	765	339	NR	895	169	NR
380	310	NR	510	7498	NR	640	8164	NR	770	383	NR	900	69	NR
385	273	NR	515	7882	NR	645	8729	NR	775	216	NR	905	403	NR
390	292	NR	520	8212	NR	650	8346	NR	780	253	NR	910	397	NR
395	221	NR	525	8488	NR	655	4858	NR	785	205	NR	915	318	NR
400	189	NR	530	8646	NR	660	3640	NR	790	175	NR	920	334	NR
405	161	NR	535	8821	NR	665	2929	NR	795	168	NR	925	268	NR
410	142	NR	540	9056	NR	670	2671	NR	800	142	NR	930	0	NR
415	167	NR	545	9359	NR	675	2156	NR	805	239	NR	935	147	NR
420	259	NR	550	9665	NR	680	1754	NR	810	159	NR	940	235	NR
425	427	NR	555	9916	NR	685	1568	NR	815	63	NR	945	130	NR
430	710	NR	560	10275	NR	690	1350	NR	820	291	NR	950	387	NR
435	1172	NR	565	10512	NR	695	1147	NR	825	351	NR	955	371	NR
440	1936	NR	570	10698	NR	700	982	NR	830	240	NR	960	558	NR
445	3261	NR	575	10781	NR	705	889	NR	835	212	NR	965	66	NR
450	5513	NR	580	10848	NR	710	797	NR	840	116	NR	970	0	NR
455	7825	NR	585	10927	NR	715	725	NR	845	63	NR	975	0	NR
460	9146	NR	590	10809	NR	720	704	NR	850	286	NR	980	557	NR
465	8454	NR	595	10612	NR	725	607	NR	855	341	NR	985	279	NR
470	7264	NR	600	10731	NR	730	570	NR	860	457	NR	990	738	NR
475	6466	NR	605	11909	NR	735	485	NR	865	243	NR	995	38	NR
480	5750	NR	610	19670	NR	740	494	NR	870	336	NR	1000	755	NR
485	5383	NR	615	20998	NR	745	415	NR	875	394	NR			

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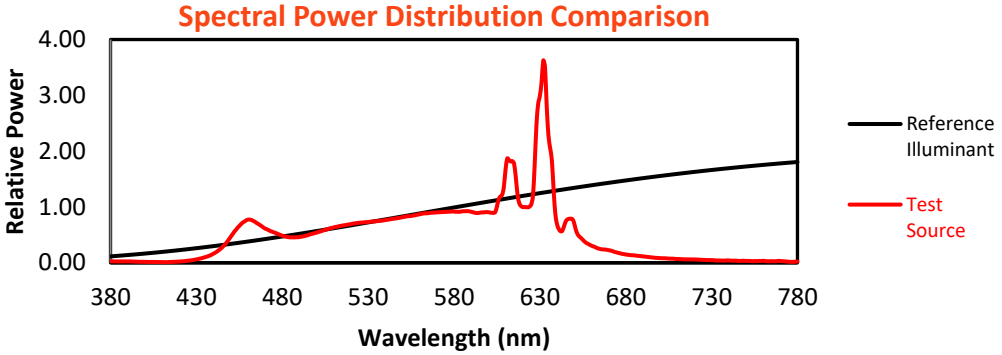
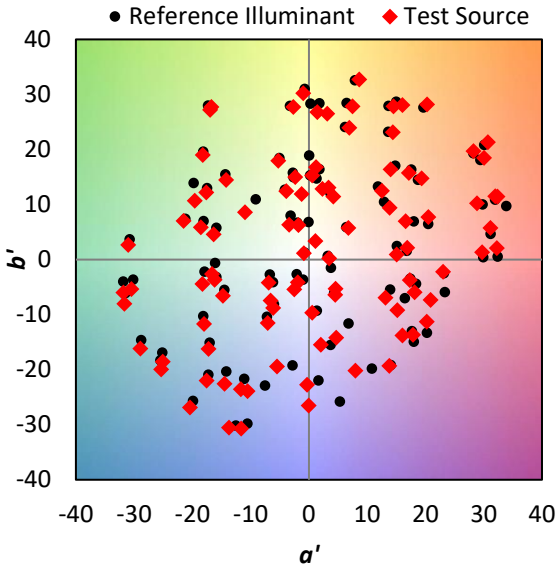
Summary

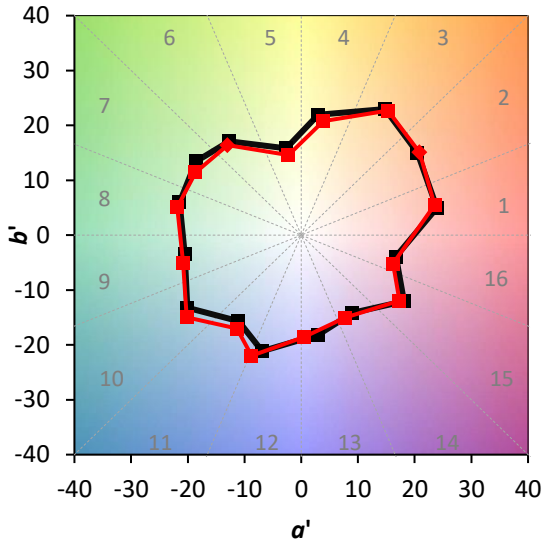
R_f = 90
R_g = 98.8
CIE R_a = 93.8
R_9 = 95.9

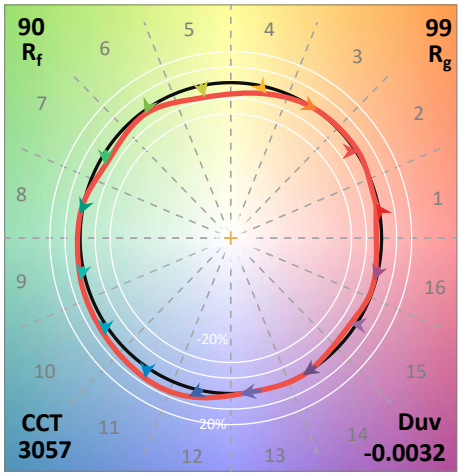
Spectral Power Distribution Comparison

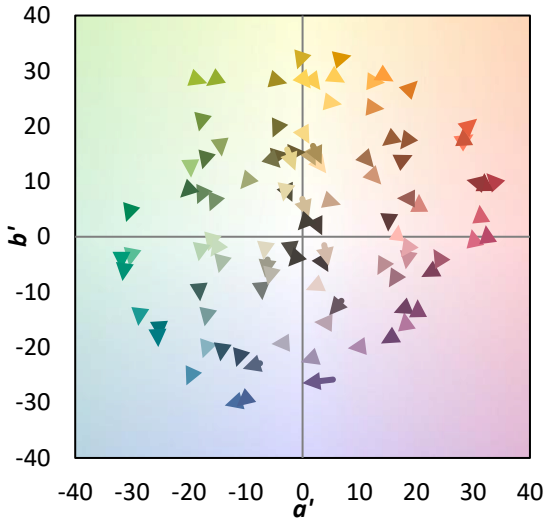


Color Vector Graphics









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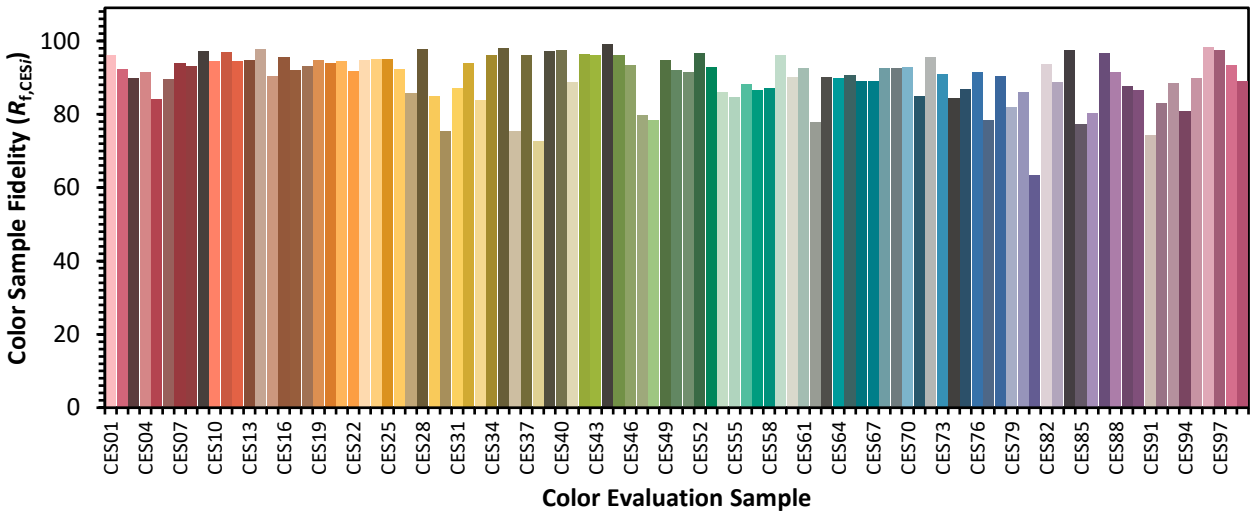
Individual Sample Fidelity Index ($R_{f,i}$)

CES01 = 86	CES26 = 92	CES51 = 92	CES76 = 91
CES02 = 63	CES27 = 86	CES52 = 97	CES77 = 78
CES03 = 32	CES28 = 98	CES53 = 93	CES78 = 90
CES04 = 70	CES29 = 85	CES54 = 86	CES79 = 82
CES05 = 51	CES30 = 75	CES55 = 85	CES80 = 86
CES06 = 51	CES31 = 87	CES56 = 88	CES81 = 63
CES07 = 44	CES32 = 94	CES57 = 86	CES82 = 94
CES08 = 43	CES33 = 84	CES58 = 87	CES83 = 89
CES09 = 29	CES34 = 96	CES59 = 96	CES84 = 97
CES10 = 76	CES35 = 98	CES60 = 90	CES85 = 77
CES11 = 58	CES36 = 75	CES61 = 92	CES86 = 80
CES12 = 65	CES37 = 96	CES62 = 78	CES87 = 97
CES13 = 44	CES38 = 73	CES63 = 90	CES88 = 91
CES14 = 74	CES39 = 97	CES64 = 90	CES89 = 88
CES15 = 72	CES40 = 97	CES65 = 91	CES90 = 86
CES16 = 48	CES41 = 89	CES66 = 89	CES91 = 74
CES17 = 49	CES42 = 96	CES67 = 89	CES92 = 83
CES18 = 57	CES43 = 96	CES68 = 93	CES93 = 89
CES19 = 71	CES44 = 99	CES69 = 93	CES94 = 81
CES20 = 68	CES45 = 96	CES70 = 93	CES95 = 90
CES21 = 86	CES46 = 93	CES71 = 85	CES96 = 98
CES22 = 79	CES47 = 80	CES72 = 95	CES97 = 98
CES23 = 91	CES48 = 78	CES73 = 91	CES98 = 93
CES24 = 90	CES49 = 95	CES74 = 84	CES99 = 89
CES25 = 71	CES50 = 92	CES75 = 87	



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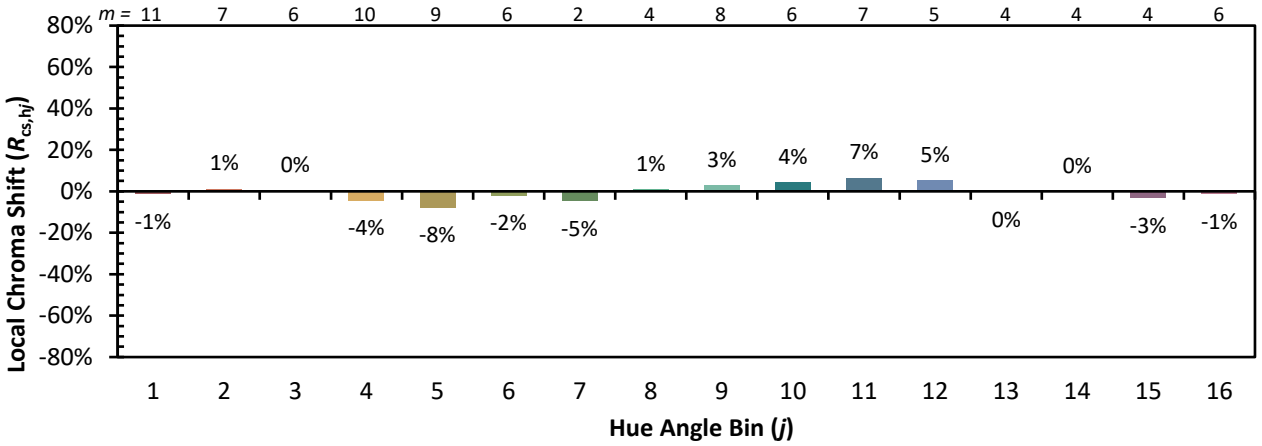
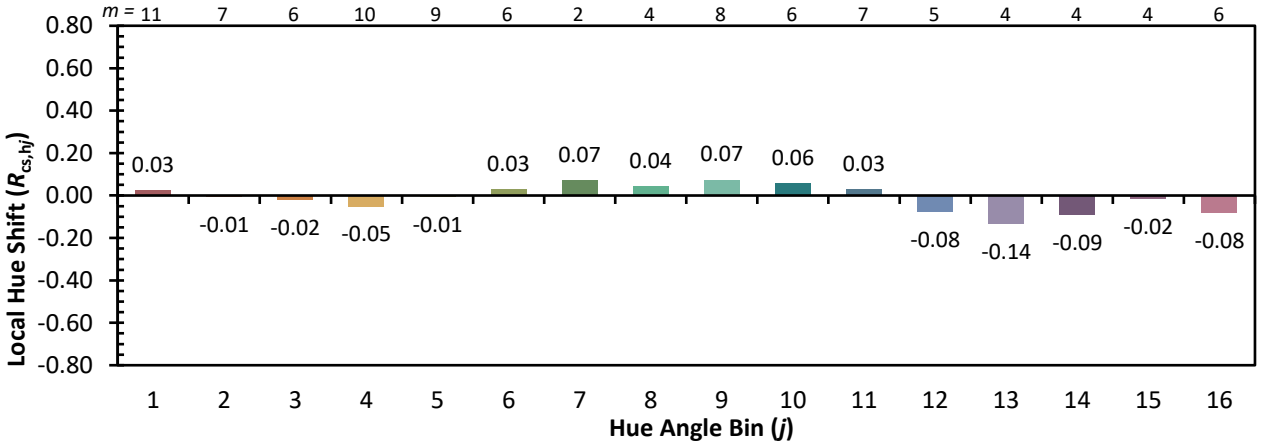
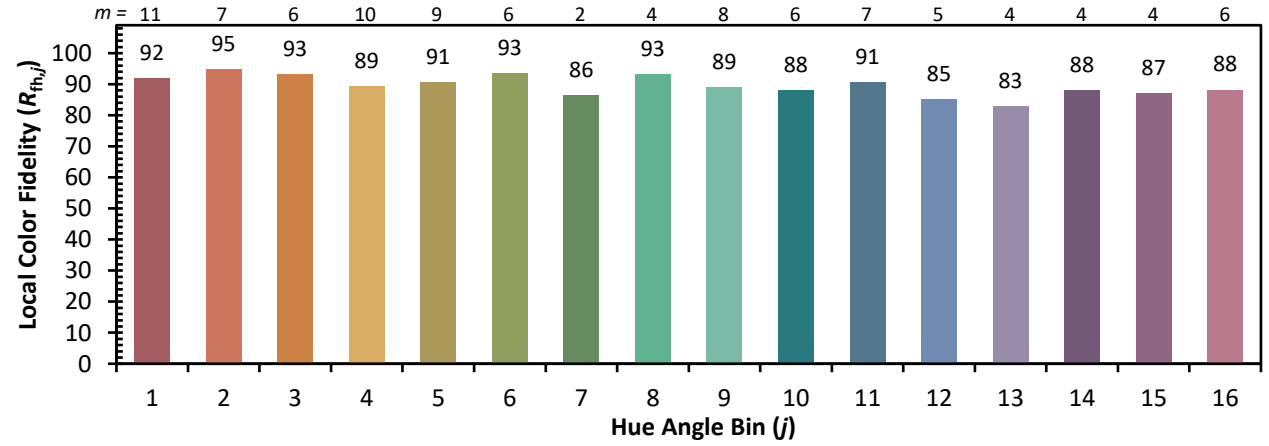
Color Rendition by Hue-Angle Bin







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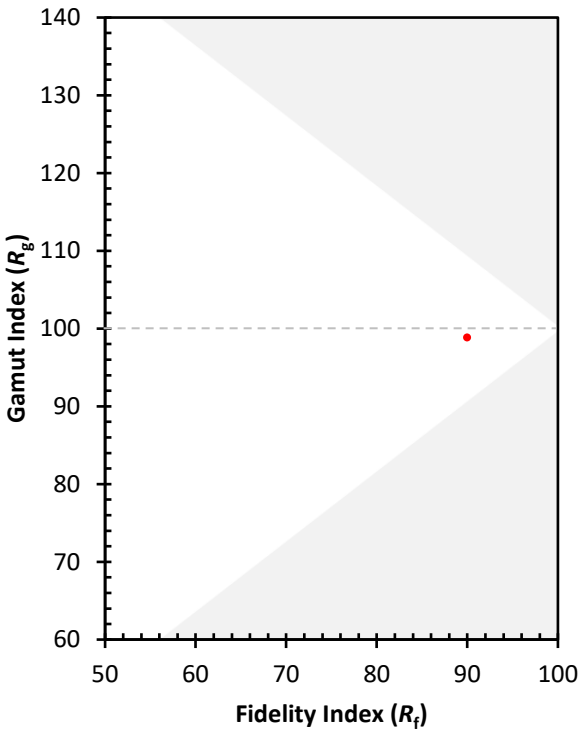
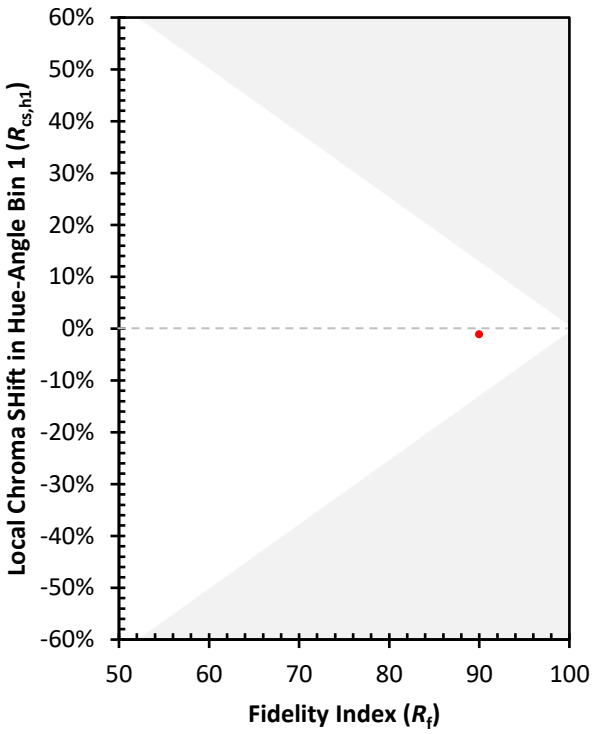
Measure Comparisons





(END OF REPORT)