

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: P832740

Luminaire Tested: **HLBT609FS5*-950**

Issue Date: 05/14/2024



Test Information

Test Method: LM-79-08
Report Number: P832740
Test Lab: ETA Testing Technology
Issue Date: 05/14/2024
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)
Product Line: HALO
Catalog Number: HLBT609FS5*-950
Description: HALO SLIM RETROFIT 6 inch 90 CRI COLOR SELECTABLE FIXTURE
Light Source: 5000K CCT, 90 CRI LEDS
Ballast/Driver: ELECTRONIC DRIVER

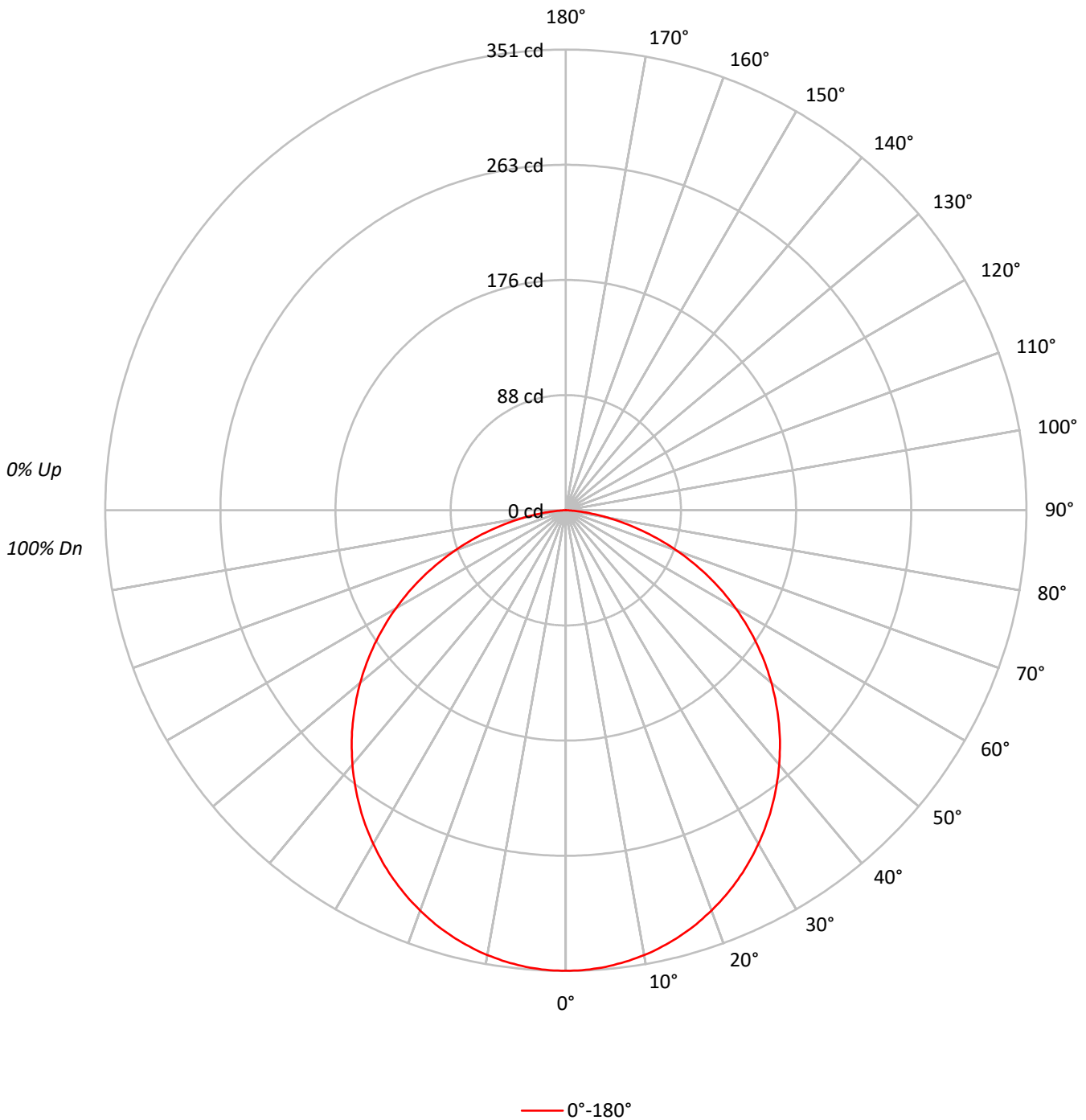
Summary

Lumens per Lamp: N/A
Luminaire Lumens: 975.0 lumens
Efficiency: N/A
Efficacy: 98.5 lumens/watt
Spacing Criteria (0/90/45): 1.24 / 1.24 / 1.36
Luminous Opening: Circular (Dia: 0.5' x H: 0')
CIE Type: Direct

Input Watts (W): 9.9
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	
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	97	89	83	78	86	80	76	82	78	74	79	76	72	70
3	90	80	72	65	88	78	71	65	75	69	64	73	67	62	70	65	61	59
4	83	71	62	55	80	69	61	55	67	60	54	65	58	53	62	57	53	51
5	76	63	54	48	74	62	54	47	60	53	47	58	51	46	56	50	46	44
6	70	57	48	42	68	56	48	41	54	47	41	52	46	41	51	45	40	38
7	65	52	43	37	63	51	42	37	49	42	36	48	41	36	46	40	36	34
8	61	47	39	33	59	46	38	33	45	38	32	44	37	32	43	37	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	27	37	31	26	37	31	26	25

AVERAGE LUMINANCE (cd/sqm):

	0°
0°	19231
5°	19216
10°	19160
15°	19064
20°	18931
25°	18775
30°	18579
35°	18357
40°	18105
45°	17800
50°	17441
55°	16993
60°	16402
65°	15605
70°	14474
75°	12793
80°	10260
85°	6604



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ZONAL LUMENS:

Zone	Lumens	% Fixture
0°-10°	33.2	3.4
10°-20°	94.8	9.7
20°-30°	143.0	14.7
30°-40°	171.6	17.6
40°-50°	177.0	18.2
50°-60°	158.8	16.3
60°-70°	118.9	12.2
70°-80°	64.0	6.6
80°-90°	13.8	1.4
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°	270.9	27.8
0°-40°	442.5	45.4
0°-60°	778.3	79.8
0°-90°	975.0	100.0
90°-120°	0.0	0.0
90°-150°	0.0	0.0
90°-180°	0.0	0.0
0°-180°	975.0	100.0

CANDELA DISTRIBUTION:

	0°	Flux
0°	351	
5°	349	33
15°	336	95
25°	310	143
35°	274	172
45°	230	177
55°	178	159
65°	120	119
75°	60	64
85°	10	14
90°	1	



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CANDELA DISTRIBUTION (FULL):

	0°
0°	350.8
0.5°	350.8
1°	350.8
1.5°	350.7
2°	350.6
2.5°	350.4
3°	350.3
3.5°	350.0
4°	349.8
4.5°	349.5
5°	349.2
5.5°	348.8
6°	348.4
6.5°	347.9
7°	347.6
7.5°	347.0
8°	346.5
8.5°	345.9
9°	345.4
9.5°	344.7
10°	344.2
10.5°	343.4
11°	342.8
11.5°	342.0
12°	341.2
12.5°	340.4
13°	339.6
13.5°	338.7
14°	337.8
14.5°	336.8
15°	335.9
15.5°	334.8
16°	333.9
16.5°	332.8
17°	331.8
17.5°	330.6
18°	329.4
18.5°	328.3
19°	327.0
19.5°	325.8
20°	324.5
20.5°	323.2
21°	321.9
21.5°	320.6
22°	319.2



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CANDELA DISTRIBUTION (continued):

	0°
22.5°	317.8
23°	316.4
23.5°	314.9
24°	313.4
24.5°	311.9
25°	310.4
25.5°	308.7
26°	307.3
26.5°	305.5
27°	304.0
27.5°	302.3
28°	300.6
28.5°	298.8
29°	297.1
29.5°	295.3
30°	293.5
30.5°	291.7
31°	289.8
31.5°	288.0
32°	286.1
32.5°	284.2
33°	282.2
33.5°	280.3
34°	278.4
34.5°	276.3
35°	274.3
35.5°	272.3
36°	270.2
36.5°	268.1
37°	266.0
37.5°	263.9
38°	261.7
38.5°	259.6
39°	257.4
39.5°	255.2
40°	253.0
40.5°	250.7
41°	248.5
41.5°	246.1
42°	243.9
42.5°	241.5
43°	239.2
43.5°	236.8
44°	234.5
44.5°	232.0



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CANDELA DISTRIBUTION (continued):

	0°
45°	229.6
45.5°	227.2
46°	224.7
46.5°	222.3
47°	219.7
47.5°	217.2
48°	214.8
48.5°	212.2
49°	209.6
49.5°	207.1
50°	204.5
50.5°	201.9
51°	199.3
51.5°	196.7
52°	194.0
52.5°	191.3
53°	188.6
53.5°	185.9
54°	183.2
54.5°	180.5
55°	177.8
55.5°	175.0
56°	172.2
56.5°	169.4
57°	166.6
57.5°	163.8
58°	161.0
58.5°	158.2
59°	155.3
59.5°	152.5
60°	149.6
60.5°	146.7
61°	143.8
61.5°	140.9
62°	138.0
62.5°	135.1
63°	132.1
63.5°	129.2
64°	126.2
64.5°	123.3
65°	120.3
65.5°	117.3
66°	114.3
66.5°	111.3
67°	108.3



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CANDELA DISTRIBUTION (continued):

	0°
67.5°	105.3
68°	102.3
68.5°	99.3
69°	96.3
69.5°	93.3
70°	90.3
70.5°	87.3
71°	84.3
71.5°	81.3
72°	78.3
72.5°	75.3
73°	72.2
73.5°	69.3
74°	66.3
74.5°	63.3
75°	60.4
75.5°	57.5
76°	54.6
76.5°	51.7
77°	48.8
77.5°	46.0
78°	43.2
78.5°	40.4
79°	37.8
79.5°	35.1
80°	32.5
80.5°	30.0
81°	27.5
81.5°	25.0
82°	22.6
82.5°	20.3
83°	18.1
83.5°	16.0
84°	14.0
84.5°	12.2
85°	10.5
85.5°	9.0
86°	7.6
86.5°	6.2
87°	5.0
87.5°	4.0
88°	3.2
88.5°	2.6
89°	2.0
89.5°	1.5

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Scaled Data Report



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CANDELA DISTRIBUTION (continued):

90° | $\frac{0^\circ}{1.0}$

LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-
State Lighting Products

Report Prepared for

Cooper Lighting Solutions

HALO

Report Number: SP1-2403-328-20

Test Date: 05/03/2024

Luminaire Tested: HLT609FS5-5000K

Data in this report applies to families of products HLT609FS5-5000K.

Test Information

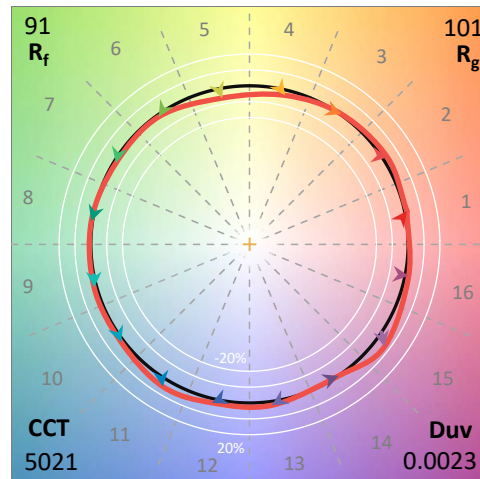
Test Method: LM-79-2019
 Report Number: SP1-2403-328-20
 Test Lab: COOPER LIGHTING SOLUTIONS
 Photometer: SP1 - 76IN SPHERE
 Measurement Geometry: 4π
 Issue Date: 05/03/2024
 Manufacturer: COOPER LIGHTING SOLUTIONS
 Product Line: HALO
 Catalog Number: **HLT609FSS-5000K**
 Description: HLBSL RETROFIT 6 INCH SAMPLE #2.

Spectral Parameters

CCT (K): 5021
 CIE u': 0.2096
 CIE v': 0.4868
 Duv: 0.0023
 CIE x: 0.3449
 CIE y: 0.3560
 CIE z: 0.2991
 Peak Wavelength (nm): 632
 Dominant Wavelength (nm): 570
 Purity: 10.4

CRI (Ra):	94.4		
R1:	92.3	R9:	75.3
R2:	97.2	R10:	97.2
R3:	94.7	R11:	92.4
R4:	94.9	R12:	76.5
R5:	94.8	R13:	93.5
R6:	95.1	R14:	95.6
R7:	96.3		
R8:	89.7		

Rf: 91.5
 Rg: 101.2



Test Conditions

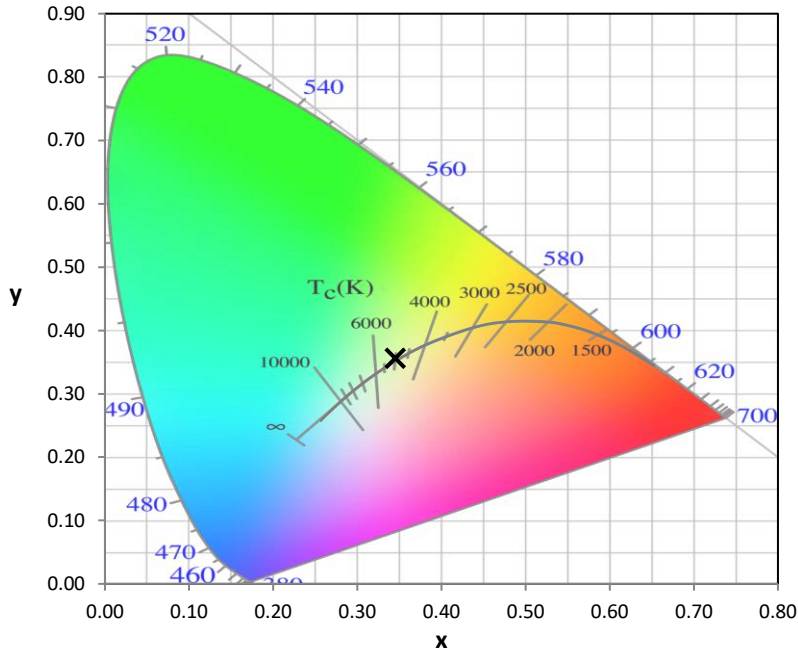
Stabilization Time: 27M
 Operation Time: 12H
 Room Temperature (°C) / RH%: 25.1/43%
 Sphere Temperature (°C): 24.9

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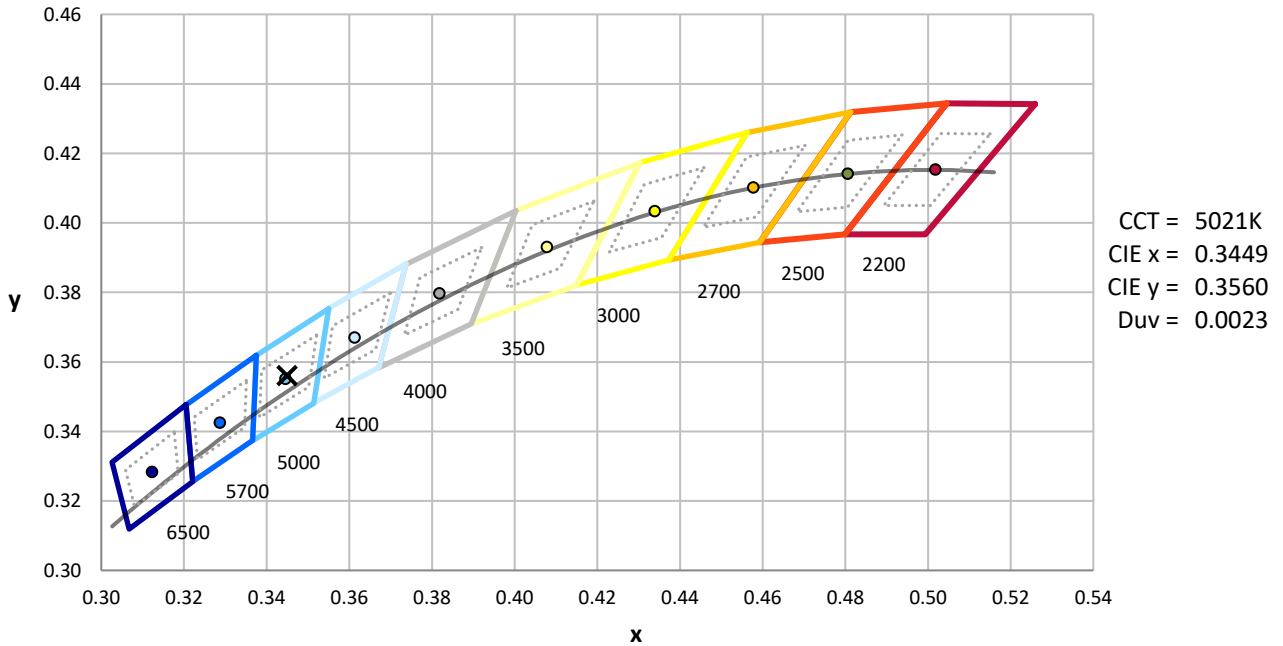
Measurement and Test Equipment			
Instrument	Identification Number	Calibration Date	Calibration Due Date
Photometer	76INCH SPHERE IN0058	2/12/2024	8/12/2024
Power Meter	XITRON 2801 IN0071	10/23/2023	10/23/2024
AC Power Source	CHROMA 61603 IN0063	10/24/2023	10/24/2024
DC Power Source	AGILENT E3634A IN0208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



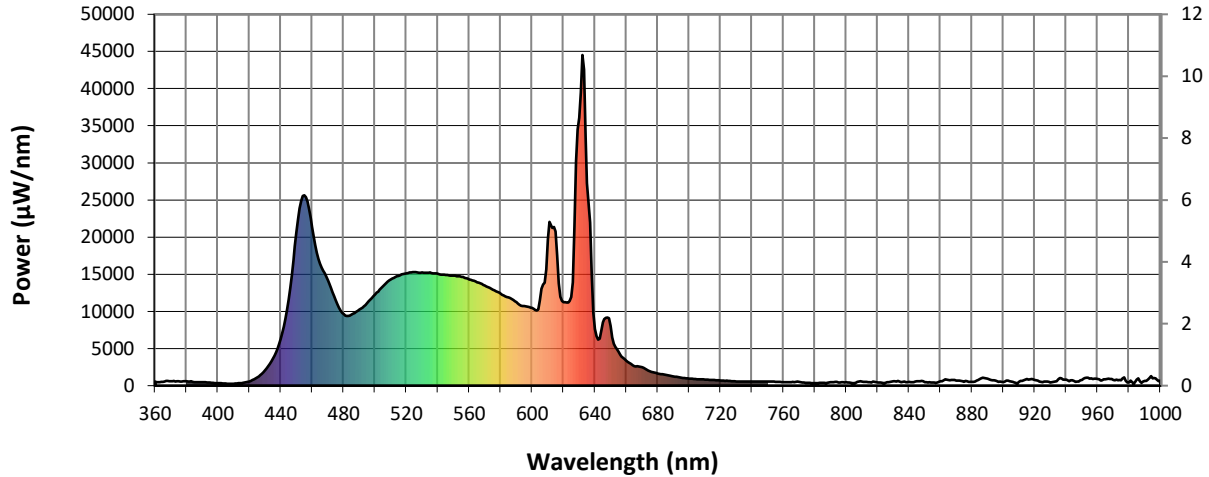
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 5000K 4-step quadrangle

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Photopic Flux vs. Wavelength

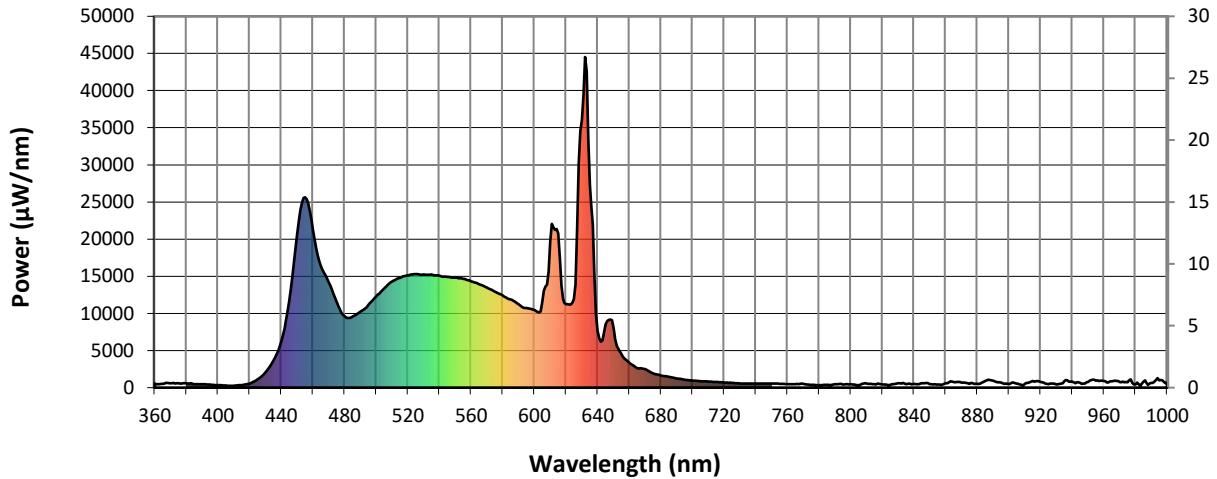


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λ (nm)	Power ($\mu\text{W}/\text{nm}$)	Lumens (ϕ/nm)	λ (nm)	Power ($\mu\text{W}/\text{nm}$)	Lumens (ϕ/nm)	λ (nm)	Power ($\mu\text{W}/\text{nm}$)	Lumens (ϕ/nm)	λ (nm)	Power ($\mu\text{W}/\text{nm}$)	Lumens (ϕ/nm)	λ (nm)	Power ($\mu\text{W}/\text{nm}$)	Lumens (ϕ/nm)
360	548	NR	490	10235	NR	620	11227	NR	750	558	NR	880	496	NR
365	510	NR	495	11110	NR	625	11920	NR	755	519	NR	885	883	NR
370	603	NR	500	12270	NR	630	36073	NR	760	466	NR	890	940	NR
375	605	NR	505	13341	NR	635	27251	NR	765	471	NR	895	693	NR
380	585	NR	510	14282	NR	640	7638	NR	770	498	NR	900	474	NR
385	484	NR	515	14790	NR	645	8518	NR	775	390	NR	905	553	NR
390	451	NR	520	15128	NR	650	8057	NR	780	355	NR	910	527	NR
395	403	NR	525	15285	NR	655	4546	NR	785	394	NR	915	904	NR
400	325	NR	530	15226	NR	660	3337	NR	790	483	NR	920	787	NR
405	287	NR	535	15226	NR	665	2633	NR	795	441	NR	925	482	NR
410	268	NR	540	15077	NR	670	2481	NR	800	448	NR	930	437	NR
415	353	NR	545	14910	NR	675	1951	NR	805	341	NR	935	863	NR
420	567	NR	550	14801	NR	680	1649	NR	810	569	NR	940	828	NR
425	1105	NR	555	14662	NR	685	1439	NR	815	444	NR	945	643	NR
430	2040	NR	560	14275	NR	690	1242	NR	820	401	NR	950	753	NR
435	3650	NR	565	13916	NR	695	1076	NR	825	388	NR	955	956	NR
440	6279	NR	570	13459	NR	700	954	NR	830	614	NR	960	912	NR
445	11600	NR	575	12919	NR	705	863	NR	835	481	NR	965	839	NR
450	20615	NR	580	12382	NR	710	818	NR	840	487	NR	970	764	NR
455	25650	NR	585	11890	NR	715	760	NR	845	586	NR	975	716	NR
460	21341	NR	590	11225	NR	720	702	NR	850	486	NR	980	441	NR
465	16392	NR	595	10733	NR	725	657	NR	855	433	NR	985	828	NR
470	14182	NR	600	10446	NR	730	567	NR	860	612	NR	990	646	NR
475	11498	NR	605	11491	NR	735	567	NR	865	750	NR	995	994	NR
480	9625	NR	610	19680	NR	740	556	NR	870	698	NR	1000	677	NR
485	9543	NR	615	20739	NR	745	571	NR	875	503	NR			

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Scotopic Flux vs. Wavelength



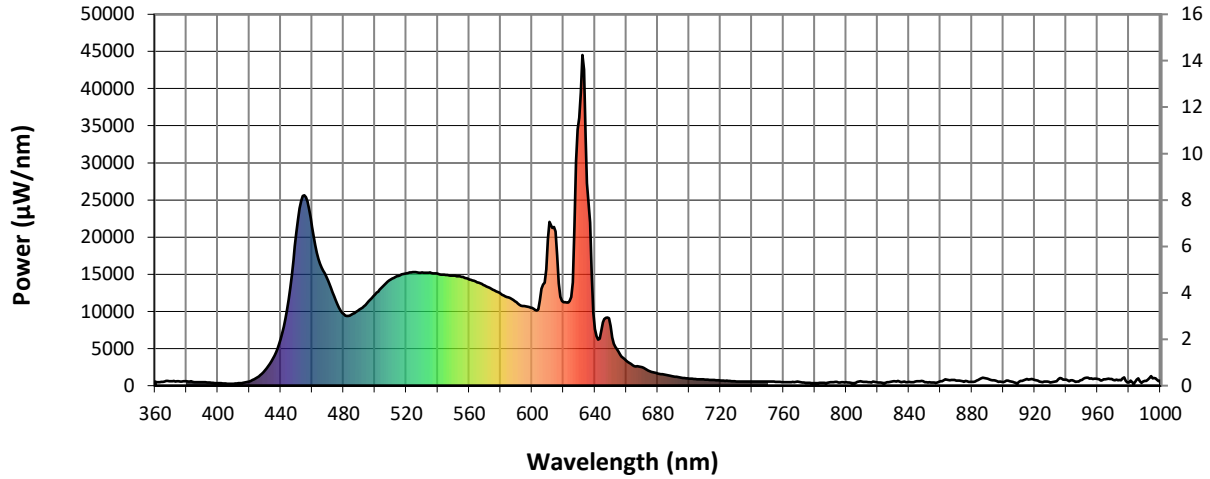
Scotopic Lumens: 2224.5

S/P: 2.18

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	548	NR	490	10235	NR	620	11227	NR	750	558	NR	880	496	NR
365	510	NR	495	11110	NR	625	11920	NR	755	519	NR	885	883	NR
370	603	NR	500	12270	NR	630	36073	NR	760	466	NR	890	940	NR
375	605	NR	505	13341	NR	635	27251	NR	765	471	NR	895	693	NR
380	585	NR	510	14282	NR	640	7638	NR	770	498	NR	900	474	NR
385	484	NR	515	14790	NR	645	8518	NR	775	390	NR	905	553	NR
390	451	NR	520	15128	NR	650	8057	NR	780	355	NR	910	527	NR
395	403	NR	525	15285	NR	655	4546	NR	785	394	NR	915	904	NR
400	325	NR	530	15226	NR	660	3337	NR	790	483	NR	920	787	NR
405	287	NR	535	15226	NR	665	2633	NR	795	441	NR	925	482	NR
410	268	NR	540	15077	NR	670	2481	NR	800	448	NR	930	437	NR
415	353	NR	545	14910	NR	675	1951	NR	805	341	NR	935	863	NR
420	567	NR	550	14801	NR	680	1649	NR	810	569	NR	940	828	NR
425	1105	NR	555	14662	NR	685	1439	NR	815	444	NR	945	643	NR
430	2040	NR	560	14275	NR	690	1242	NR	820	401	NR	950	753	NR
435	3650	NR	565	13916	NR	695	1076	NR	825	388	NR	955	956	NR
440	6279	NR	570	13459	NR	700	954	NR	830	614	NR	960	912	NR
445	11600	NR	575	12919	NR	705	863	NR	835	481	NR	965	839	NR
450	20615	NR	580	12382	NR	710	818	NR	840	487	NR	970	764	NR
455	25650	NR	585	11890	NR	715	760	NR	845	586	NR	975	716	NR
460	21341	NR	590	11225	NR	720	702	NR	850	486	NR	980	441	NR
465	16392	NR	595	10733	NR	725	657	NR	855	433	NR	985	828	NR
470	14182	NR	600	10446	NR	730	567	NR	860	612	NR	990	646	NR
475	11498	NR	605	11491	NR	735	567	NR	865	750	NR	995	994	NR
480	9625	NR	610	19680	NR	740	556	NR	870	698	NR	1000	677	NR
485	9543	NR	615	20739	NR	745	571	NR	875	503	NR			

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Melanopic Flux vs. Wavelength



Melanopic Lumens: 961

M/P: 0.94

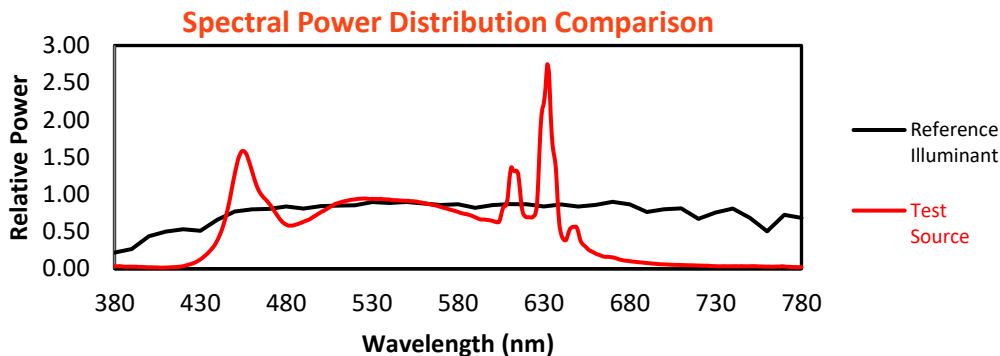
λ (nm)	Power (µW/nm)	Lumens (φ/nm)	λ (nm)	Power (µW/nm)	Lumens (φ/nm)	λ (nm)	Power (µW/nm)	Lumens (φ/nm)	λ (nm)	Power (µW/nm)	Lumens (φ/nm)	λ (nm)	Power (µW/nm)	Lumens (φ/nm)
360	548	NR	490	10235	NR	620	11227	NR	750	558	NR	880	496	NR
365	510	NR	495	11110	NR	625	11920	NR	755	519	NR	885	883	NR
370	603	NR	500	12270	NR	630	36073	NR	760	466	NR	890	940	NR
375	605	NR	505	13341	NR	635	27251	NR	765	471	NR	895	693	NR
380	585	NR	510	14282	NR	640	7638	NR	770	498	NR	900	474	NR
385	484	NR	515	14790	NR	645	8518	NR	775	390	NR	905	553	NR
390	451	NR	520	15128	NR	650	8057	NR	780	355	NR	910	527	NR
395	403	NR	525	15285	NR	655	4546	NR	785	394	NR	915	904	NR
400	325	NR	530	15226	NR	660	3337	NR	790	483	NR	920	787	NR
405	287	NR	535	15226	NR	665	2633	NR	795	441	NR	925	482	NR
410	268	NR	540	15077	NR	670	2481	NR	800	448	NR	930	437	NR
415	353	NR	545	14910	NR	675	1951	NR	805	341	NR	935	863	NR
420	567	NR	550	14801	NR	680	1649	NR	810	569	NR	940	828	NR
425	1105	NR	555	14662	NR	685	1439	NR	815	444	NR	945	643	NR
430	2040	NR	560	14275	NR	690	1242	NR	820	401	NR	950	753	NR
435	3650	NR	565	13916	NR	695	1076	NR	825	388	NR	955	956	NR
440	6279	NR	570	13459	NR	700	954	NR	830	614	NR	960	912	NR
445	11600	NR	575	12919	NR	705	863	NR	835	481	NR	965	839	NR
450	20615	NR	580	12382	NR	710	818	NR	840	487	NR	970	764	NR
455	25650	NR	585	11890	NR	715	760	NR	845	586	NR	975	716	NR
460	21341	NR	590	11225	NR	720	702	NR	850	486	NR	980	441	NR
465	16392	NR	595	10733	NR	725	657	NR	855	433	NR	985	828	NR
470	14182	NR	600	10446	NR	730	567	NR	860	612	NR	990	646	NR
475	11498	NR	605	11491	NR	735	567	NR	865	750	NR	995	994	NR
480	9625	NR	610	19680	NR	740	556	NR	870	698	NR	1000	677	NR
485	9543	NR	615	20739	NR	745	571	NR	875	503	NR			

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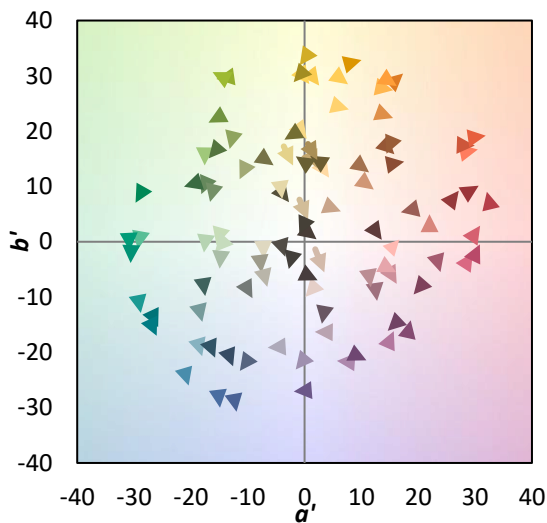
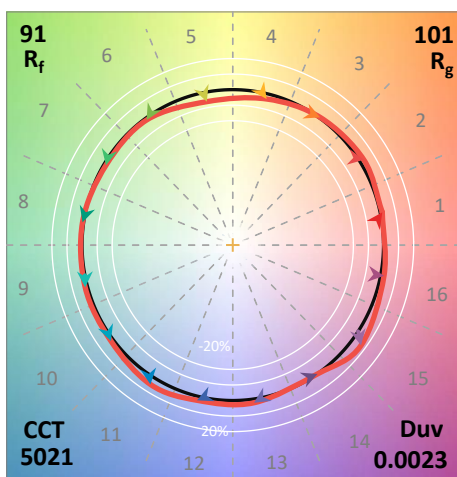
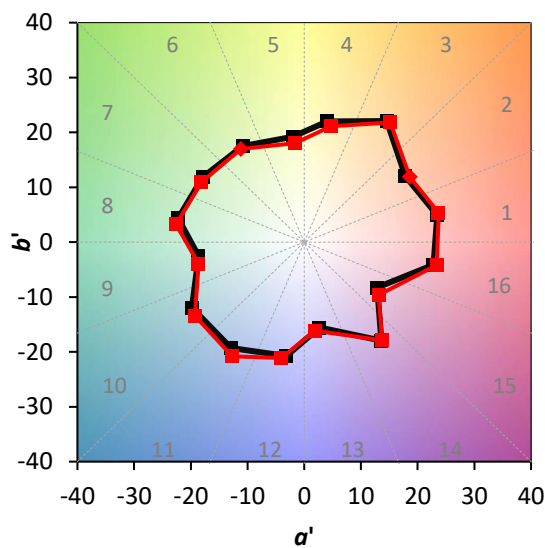
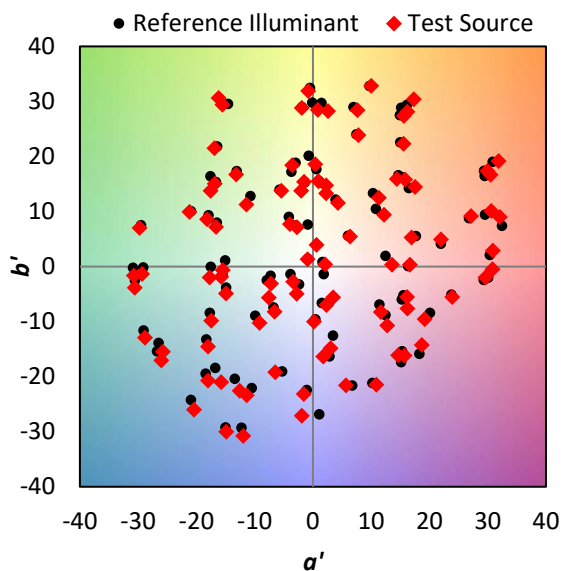
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Summary

$R_f = 91.5$
 $R_g = 101.2$
 CIE $R_a = 94.4$
 $R_9 = 75.3$



Color Vector Graphics

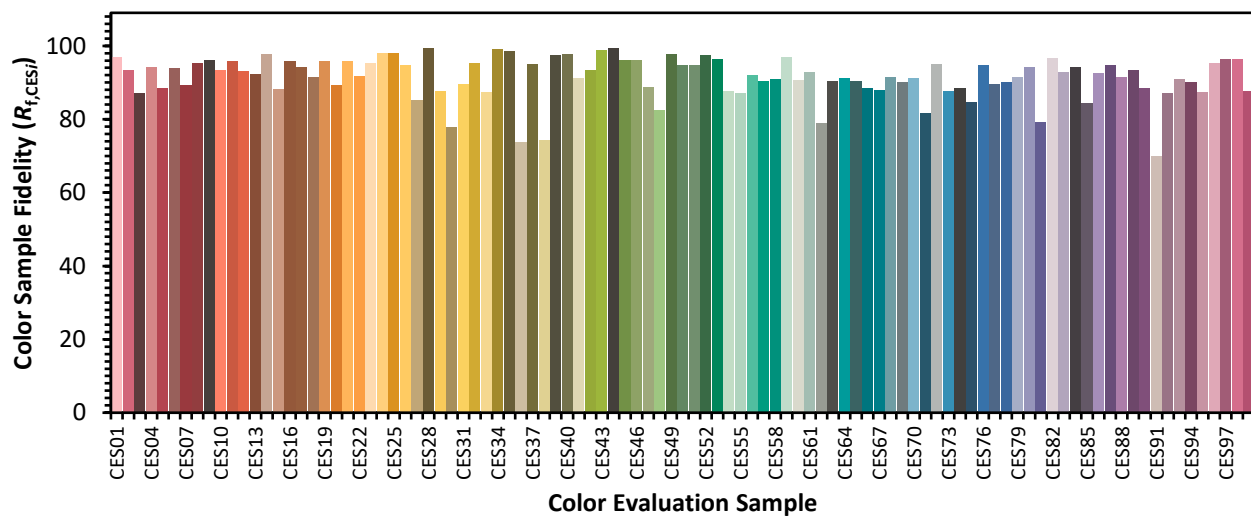


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Individual Sample Fidelity Index ($R_{f,i}$)

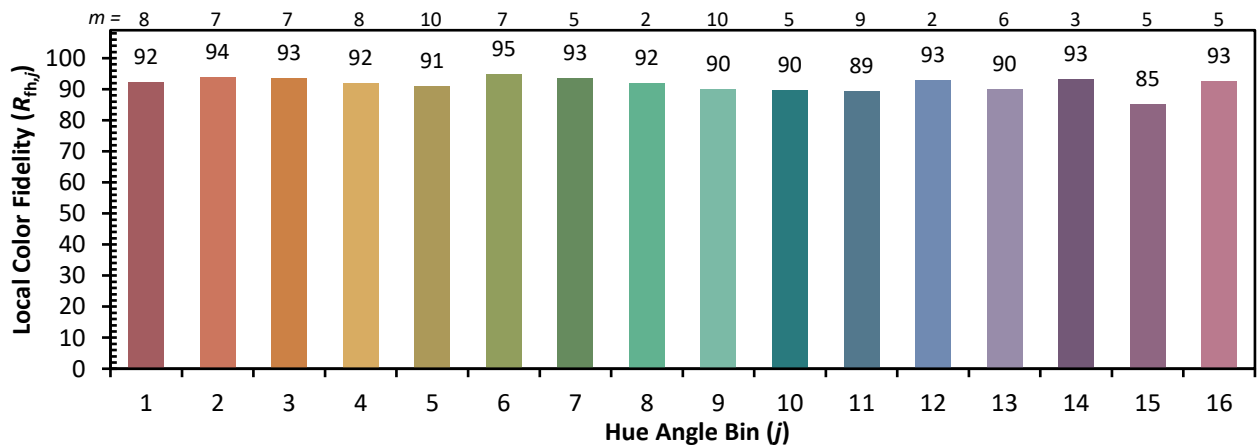
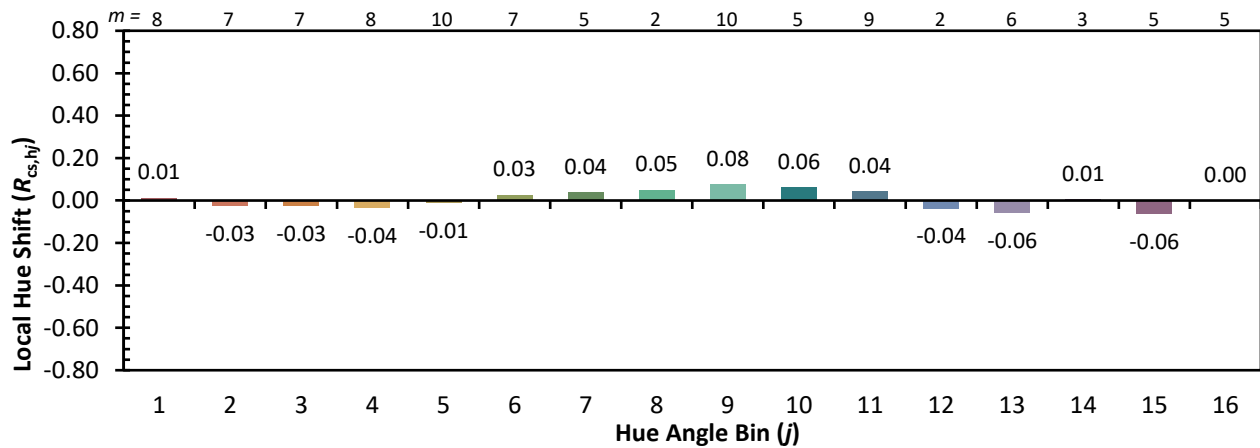
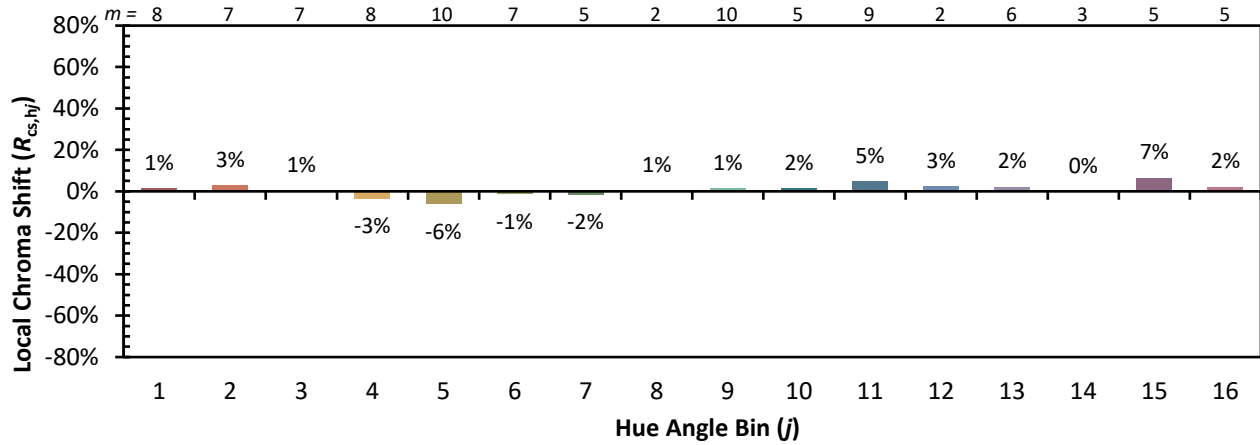
CES01 = 85	CES26 = 95	CES51 = 95	CES76 = 95
CES02 = 61	CES27 = 85	CES52 = 98	CES77 = 90
CES03 = 31	CES28 = 99	CES53 = 96	CES78 = 90
CES04 = 68	CES29 = 88	CES54 = 88	CES79 = 92
CES05 = 48	CES30 = 78	CES55 = 87	CES80 = 94
CES06 = 50	CES31 = 90	CES56 = 92	CES81 = 79
CES07 = 42	CES32 = 95	CES57 = 90	CES82 = 97
CES08 = 41	CES33 = 87	CES58 = 91	CES83 = 93
CES09 = 29	CES34 = 99	CES59 = 97	CES84 = 94
CES10 = 73	CES35 = 99	CES60 = 91	CES85 = 84
CES11 = 55	CES36 = 74	CES61 = 93	CES86 = 93
CES12 = 62	CES37 = 95	CES62 = 79	CES87 = 95
CES13 = 43	CES38 = 74	CES63 = 90	CES88 = 91
CES14 = 74	CES39 = 97	CES64 = 91	CES89 = 93
CES15 = 71	CES40 = 98	CES65 = 90	CES90 = 88
CES16 = 47	CES41 = 91	CES66 = 88	CES91 = 70
CES17 = 48	CES42 = 93	CES67 = 88	CES92 = 87
CES18 = 56	CES43 = 99	CES68 = 91	CES93 = 91
CES19 = 70	CES44 = 99	CES69 = 90	CES94 = 90
CES20 = 66	CES45 = 96	CES70 = 91	CES95 = 87
CES21 = 84	CES46 = 96	CES71 = 82	CES96 = 95
CES22 = 77	CES47 = 89	CES72 = 95	CES97 = 96
CES23 = 91	CES48 = 82	CES73 = 88	CES98 = 96
CES24 = 89	CES49 = 98	CES74 = 88	CES99 = 88
CES25 = 70	CES50 = 95	CES75 = 85	



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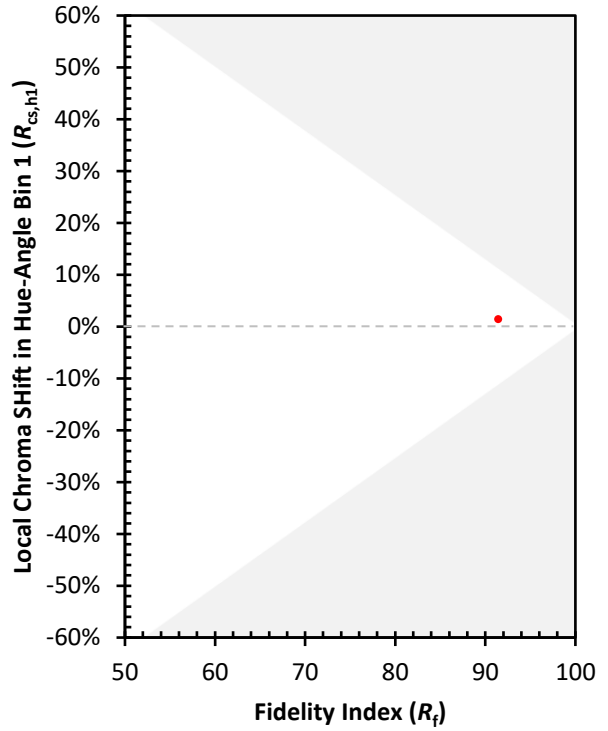
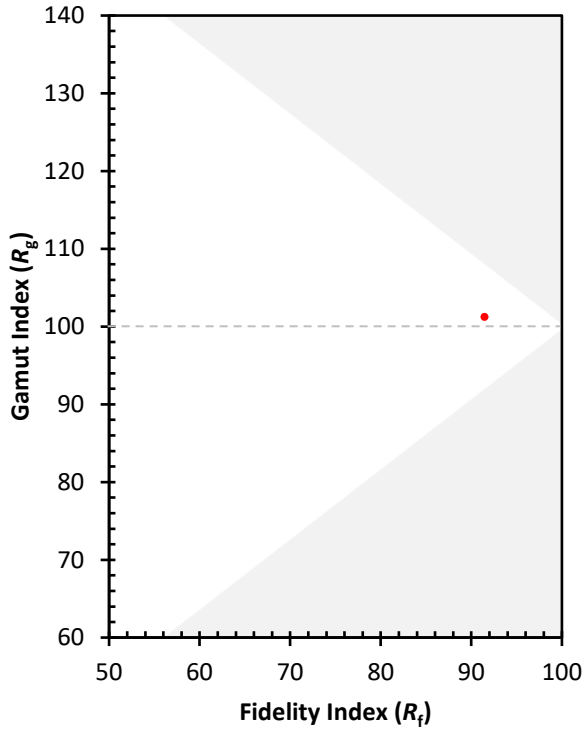
Color Rendition by Hue-Angle Bin



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Measure Comparisons



(END OF REPORT)