

LM-79 Test Report

Relevant Standards

IES LM-79-2008
IES TM-30-2015
CIE 13.3-1995

Product SKU

FENCER® Series FOIL™ SELECT - Color Selectable Lighting System
SKU: DI-120V-FLSEL-24-WH

Test Conditions

Test Temperature: 26.5 °C
Luminaire Sample Length: 24.0 in.
Power Supply: Agilent E3634A DC Power Supply
Voltage: 120.00 VDC
Current: 0.16 A
Power Consumption: 19.2 W

Test Date

12/26/2019

Prepared By



Olivia M. Tanguileg, Electrical Engineer

Approved By



Andrew Lassen, Compliance Manager

Integrating Sphere

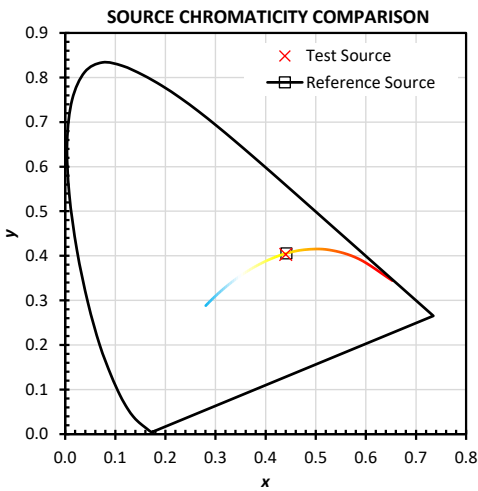
SUMMARY OF RESULTS

Metric	Test	Reference	Notes	Metric	Test	Reference	Notes
R_f	90	100	IES TM-30-15 Fidelity Index	CCT	2938	2938	Correlated Color Temperature
R_g	97	100	IES TM-30-15 Gamut Index	D_{uv}	-0.0007	0.0000	Distance from the blackbody locus
R_a (CRI)	92	100	CIE Test Color Method General Index	x	0.4403	0.4414	CIE 1931 chromaticity coordinate
R_9	54	100	CIE Test Color Method Sample Nine Score	y	0.4033	0.4056	CIE 1931 chromaticity coordinate
LER	293	160	Luminous Efficacy of Radiation	u	0.2531	0.2528	CIE 1960 chromaticity coordinate
Lumens	1532	1852	Luminous Flux	v	0.3477	0.3484	CIE 1960 chromaticity coordinate
$R_{f,skin}$	94	100	Average of CES15 and CES18 (skin)	u'	0.2531	0.2528	CIE 1976 chromaticity coordinate
				v'	0.5216	0.5227	CIE 1976 chromaticity coordinate

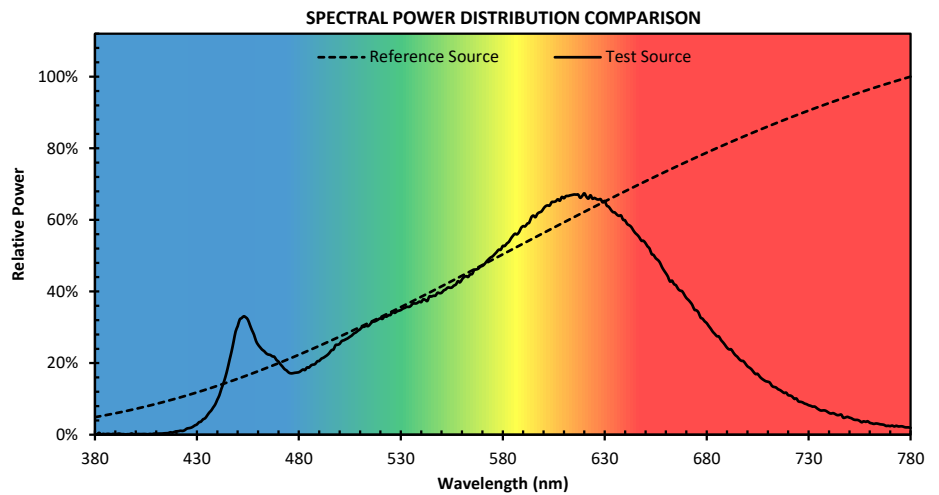
COLOR RENDERING INDEX

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
93.4	98.4	96.9	92.4	93.7	96.7	89.4	78.6	54.3	95.7	94.4	83.8	95.1	99.2

SOURCE PROPERTIES

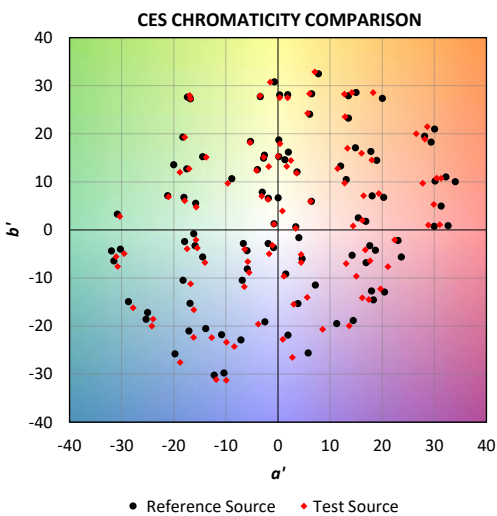


This chart plots the chromaticity of the test and reference sources in the CIE 1931 chromaticity

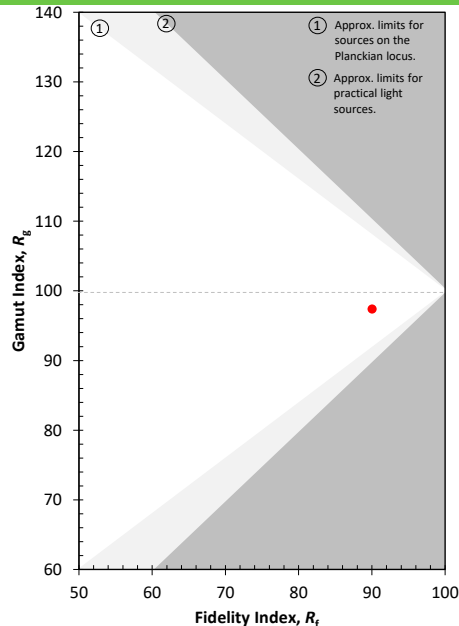


This chart displays the spectral power distributions for the test and reference source. Each SPD has been normalized so that the maximum values is 100%.

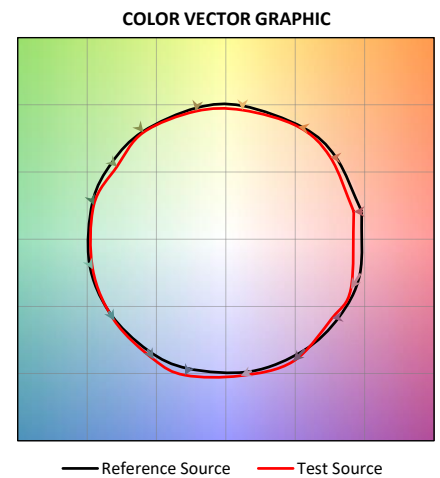
GENERAL COLOR RENDITION



This plot shows the shift in chromaticity for each individual CES.



This plot shows the R_f and R_g values relative to possible values.



This plot shows the average chromaticity shift for the samples within each of 16 hue bins. The values are normalized so that the reference is a circle.

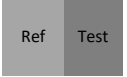
COLOR SAMPLE COMPARISON (APPROXIMATION)

CES 1 Type C	CES 2 Type C	CES 3 Type A	CES 4 Type A	CES 5 Type D	CES 6 Type C	CES 7 Type E	CES 8 Type D
CES 9 Type F	CES 10 Type G	CES 11 Type C	CES 12 Type A	CES 13 Type F	CES 14 Type E	CES 15 Type B	CES 16 Type C
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NOTE: CES stands for "Color Evaluation Sample", these 99 samples are used in place of the 16 R values. The colors shown are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately. For each sample, the color on the left represents the reference source, and the color on the right represents the test source.

Sample Type:

- A - Nature
- B - Skin
- C - Textiles
- D - Paints

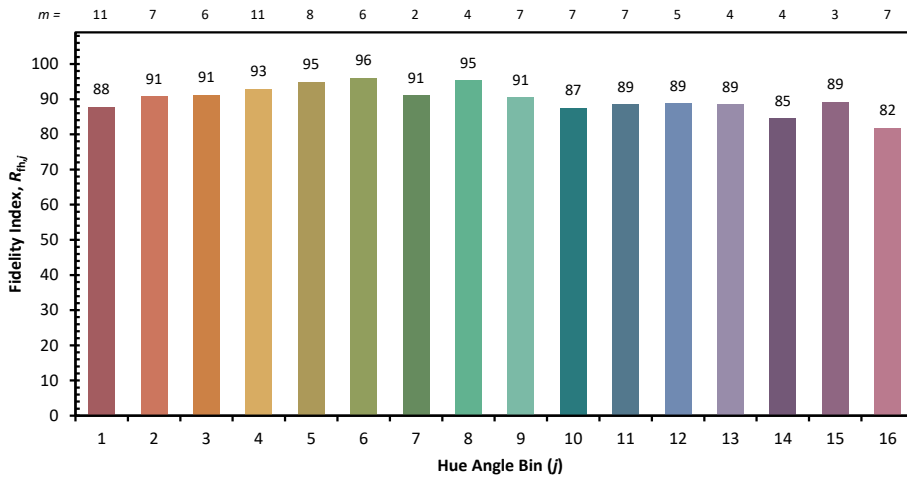


Elemental

Competitor



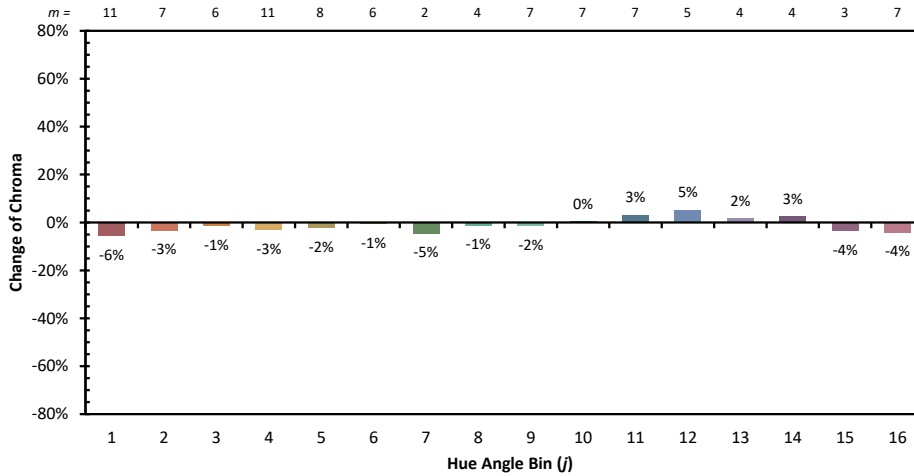
COLOR RENDITION BY HUE



j	Hue Angle
1	0.0°-22.5°
2	22.5° - 45.0°
3	45.0° - 67.5°
4	67.5° - 90.0°
5	90.0°-112.5°
6	112.5°-135.0°
7	135.0°-157.5°
8	157.5°-180.0°
9	180.0°-202.5°
10	202.5°-225.0°
11	225.0°-247.5°
12	247.5°-270.0°
13	270.0°-292.5°
14	292.5°-315.0°
15	315.0°-337.5°
16	337.5°-360.0°

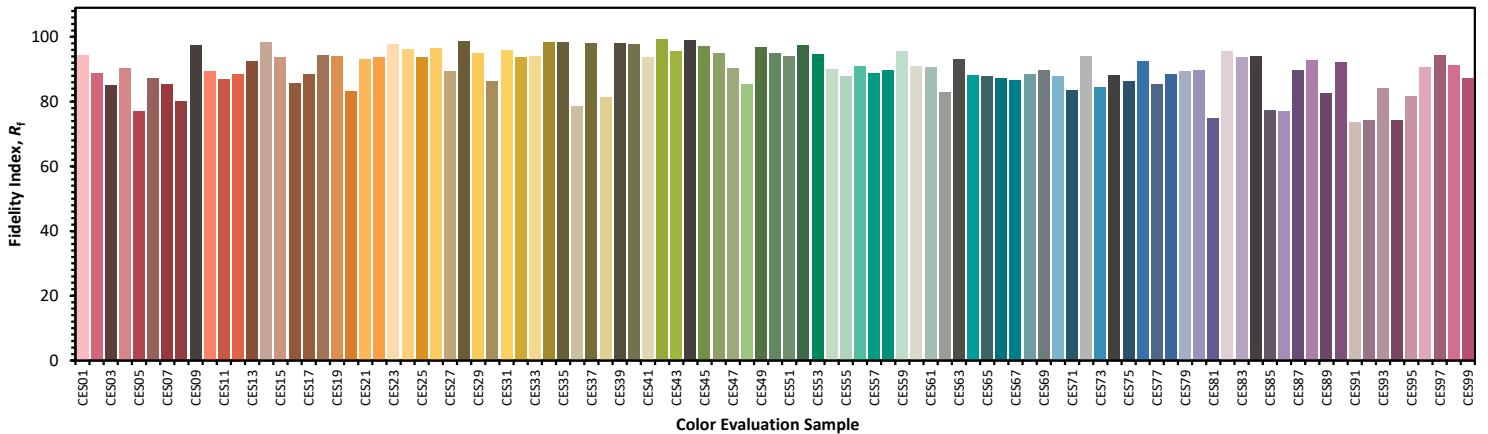
m = Samples per Angle Bin

This chart displays the average Fidelity Index for all samples within the hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.



This chart displays the change in chroma for the average sample within each hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.

COLOR FIDELITY BY SAMPLE



This chart displays the Fidelity Index for each of the 99 CES. The CES are arranged by their hue angle under the 5000 K reference source, which was also used to determine the color of each bar. The colors are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately.

Goniophotometer Test

SUMMARY OF RESULTS

Luminaire: FENCER® Series FOIL™ SELECT - Color Selectable Lighting System

SKU: DI-120V-FLSEL-24-WH

Luminous Flux: 1569 Lumens

Power Consumption: 19.2 Watts

Efficacy: 81.71 Lumens/Watt

Spacing Criterion (0-180): 1.2

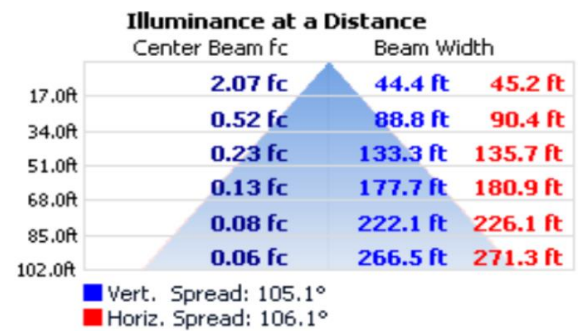
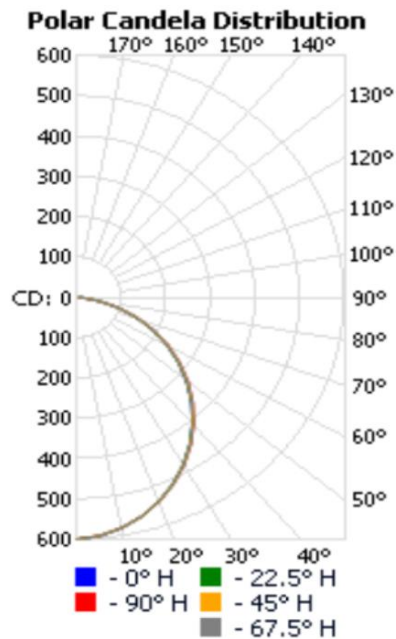
Spacing Criterion (90-270): 1.2

Graphs below are for reference, full IES files are available on Diode LED website

DISTRIBUTION CHARTS AND TABLES

Zonal Lumen Data

Zone	Lumens	%Luminaire
0-20	213.70	13.60
0-30	448.06	28.60
0-40	724.77	46.20
0-60	1255.72	80.00
0-80	1543.50	98.40
0-90	1569.16	100.00
20-40	511.07	32.60
20-50	792.43	50.50
40-70	717.12	45.70
60-80	287.79	18.30
70-80	101.62	6.50
80-90	25.66	1.60
90-180	0.00	0.00
0-180	1569.16	100.00



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Relevant Standards

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IES TM-30-2015
CIE 13.3-1995

Product SKU

FENCER® Series FOIL™ SELECT - Color Selectable Lighting System
SKU: DI-120V-FLSEL-24-WH

Test Conditions

Test Temperature: 26.5 °C
Luminaire Sample Length: 24.0 in.
Power Supply: Agilent E3634A DC Power Supply
Voltage: 120.00 VDC
Current: 0.15 A
Power Consumption: 18 W

Test Date

12/26/2019

Prepared By

Olivia Tanguileg

Olivia M. Tanguileg, Electrical Engineer

Approved By

Andrew Lassen

Andrew Lassen, Compliance Manager

Integrating Sphere

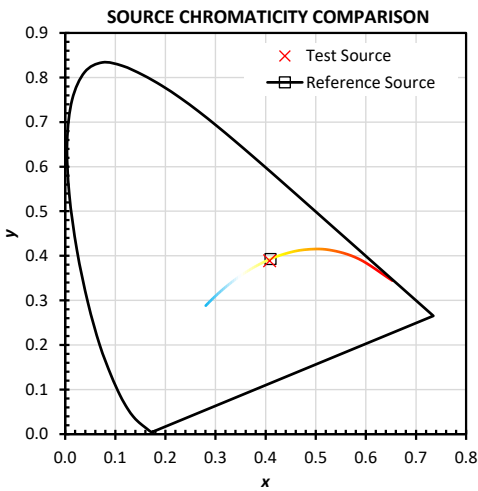
SUMMARY OF RESULTS

Metric	Test	Reference	Notes	Metric	Test	Reference	Notes
R_f	90	100	IES TM-30-15 Fidelity Index	CCT	3426	3425	Correlated Color Temperature
R_g	98	100	IES TM-30-15 Gamut Index	D_{uv}	-0.0015	0.0000	Distance from the blackbody locus
R_a (CRI)	94	100	CIE Test Color Method General Index	x	0.4080	0.4096	CIE 1931 chromaticity coordinate
R_9	64	100	CIE Test Color Method Sample Nine Score	y	0.3887	0.3928	CIE 1931 chromaticity coordinate
LER	294	178	Luminous Efficacy of Radiation	u	0.2383	0.2376	CIE 1960 chromaticity coordinate
Lumens	1782	1852	Luminous Flux	v	0.3405	0.3418	CIE 1960 chromaticity coordinate
$R_{f,skin}$	94	100	Average of CES15 and CES18 (skin)	u'	0.2383	0.2376	CIE 1976 chromaticity coordinate
				v'	0.5108	0.5128	CIE 1976 chromaticity coordinate

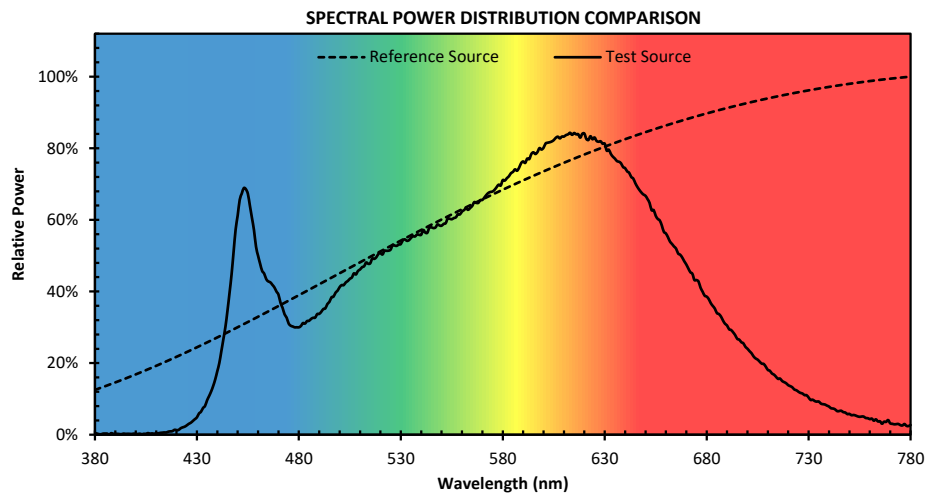
COLOR RENDERING INDEX

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
95.2	99.0	97.8	93.5	94.7	96.0	91.3	83.4	63.6	96.6	95.0	78.5	96.8	99.7

SOURCE PROPERTIES

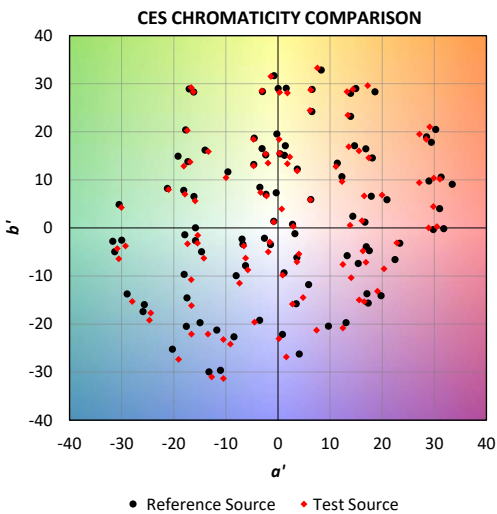


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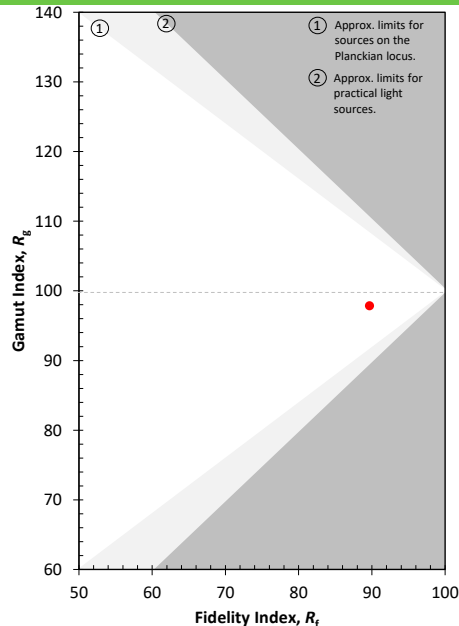


This chart displays the spectral power distributions for the test and reference source. Each SPD has been normalized so that the maximum values is 100%.

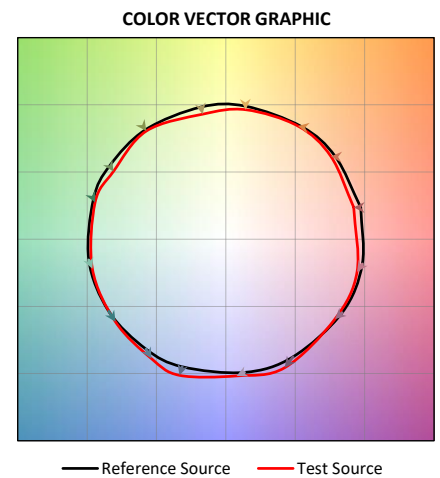
GENERAL COLOR RENDITION



This plot shows the shift in chromaticity for each individual CES.



This plot shows the R_f and R_g values relative to possible values.



This plot shows the average chromaticity shift for the samples within each of 16 hue bins. The values are normalized so that the reference is a circle.

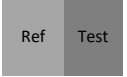
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NOTE: CES stands for "Color Evaluation Sample", these 99 samples are used in place of the 16 R values. The colors shown are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately. For each sample, the color on the left represents the reference source, and the color on the right represents the test source.

Sample Type:

- A - Nature
- B - Skin
- C - Textiles
- D - Paints

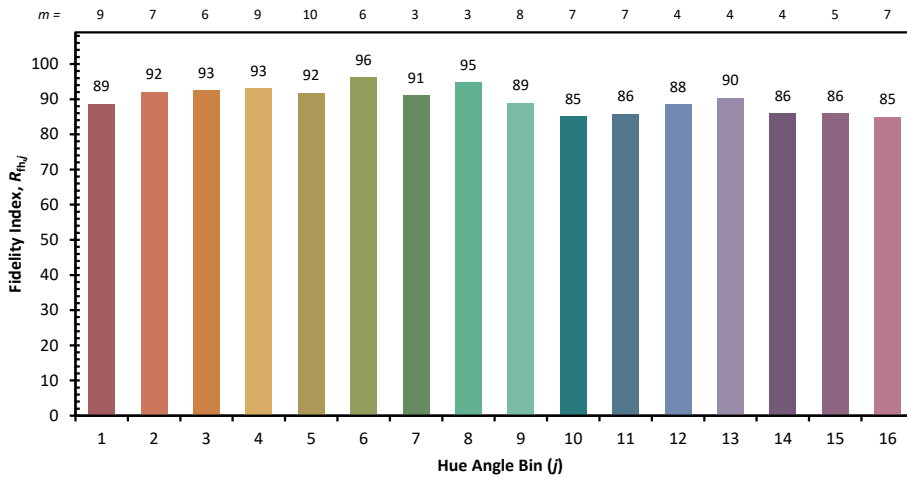


Elemental

Competitor



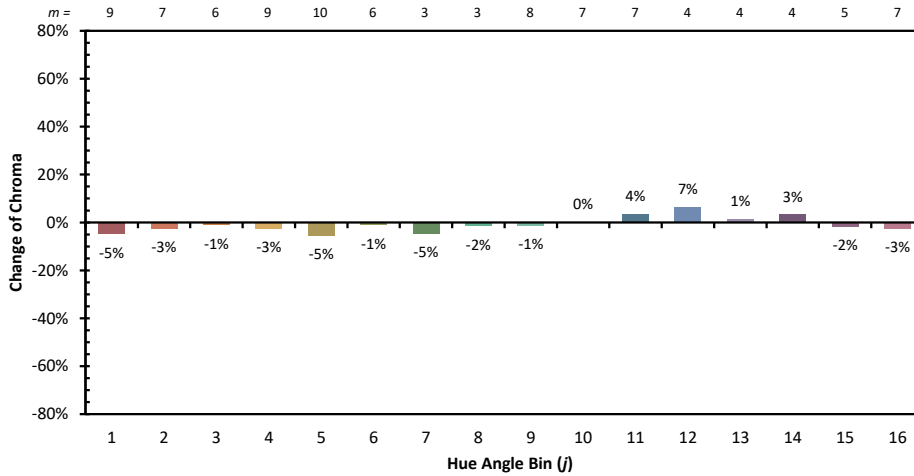
COLOR RENDITION BY HUE



j	Hue Angle
1	0.0°-22.5°
2	22.5° - 45.0°
3	45.0° - 67.5°
4	67.5° - 90.0°
5	90.0°-112.5°
6	112.5°-135.0°
7	135.0°-157.5°
8	157.5°-180.0°
9	180.0°-202.5°
10	202.5°-225.0°
11	225.0°-247.5°
12	247.5°-270.0°
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15	315.0°-337.5°
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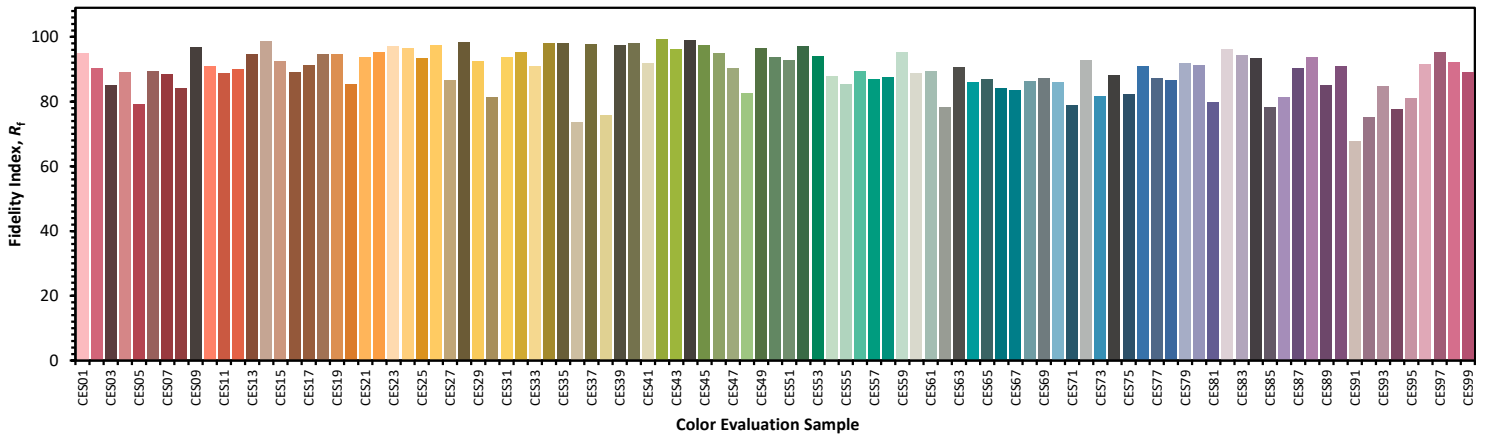
m = Samples per Angle Bin

This chart displays the average Fidelity Index for all samples within the hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.



This chart displays the change in chroma for the average sample within each hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.

COLOR FIDELITY BY SAMPLE



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Goniophotometer Test

SUMMARY OF RESULTS

Luminaire: FENCER® Series FOIL™ SELECT - Color Selectable Lighting System

SKU: DI-120V-FLSEL-24-WH

Luminous Flux: 1796 Lumens

Power Consumption: 18 Watts

Efficacy: 99.77 Lumens/Watt

Spacing Criterion (0-180): 1.24

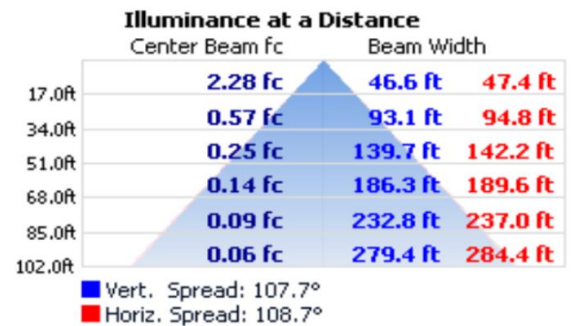
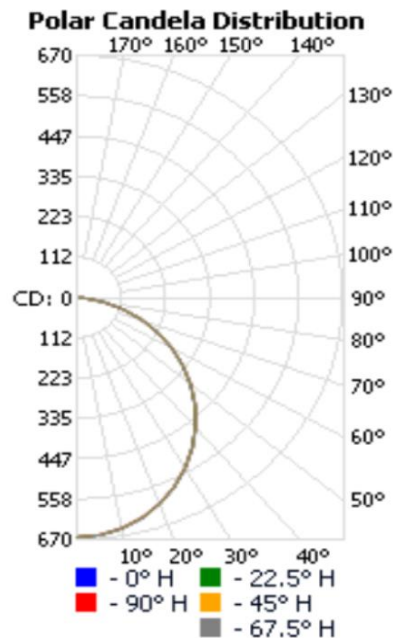
Spacing Criterion (90-270): 1.24

Graphs below are for reference, full IES files are available on Diode LED website

DISTRIBUTION CHARTS AND TABLES

Zonal Lumen Data

Zone	Lumens	%Luminaire
0-20	238.98	13.30
0-30	503.23	28.00
0-40	817.00	45.50
0-60	1424.99	79.30
0-80	1763.40	98.20
0-90	1796.15	100.00
20-40	578.02	32.20
20-50	899.04	50.10
40-70	824.74	45.90
60-80	338.41	18.80
70-80	121.66	6.80
80-90	32.76	1.80
90-180	0.00	0.00
0-180	1796.15	100.00



LM-79 Test Report

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IES LM-79-2008
IES TM-30-2015
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Product SKU

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SKU: DI-120V-FLSEL-24-WH

Test Conditions

Test Temperature: 26.5 °C
Luminaire Sample Length: 24.0 in.
Power Supply: Agilent E3634A DC Power Supply
Voltage: 120.00 VDC
Current: 0.16 A
Power Consumption: 19.2 W

Test Date

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Approved By



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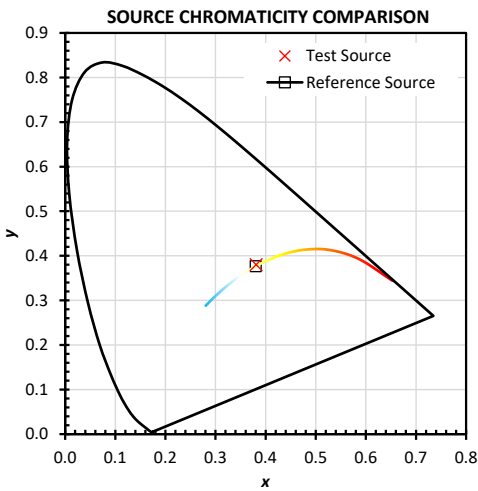
SUMMARY OF RESULTS

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R_g	97	100	IES TM-30-15 Gamut Index	D_{uv}	0.0015	0.0000	Distance from the blackbody locus
R_a (CRI)	93	100	CIE Test Color Method General Index	x	0.3812	0.3802	CIE 1931 chromaticity coordinate
R_9	60	100	CIE Test Color Method Sample Nine Score	y	0.3803	0.3766	CIE 1931 chromaticity coordinate
LER	299	191	Luminous Efficacy of Radiation	u	0.2242	0.2250	CIE 1960 chromaticity coordinate
Lumens	1711	1852	Luminous Flux	v	0.3355	0.3343	CIE 1960 chromaticity coordinate
$R_{f,skin}$	93	100	Average of CES15 and CES18 (skin)	u'	0.2242	0.2250	CIE 1976 chromaticity coordinate
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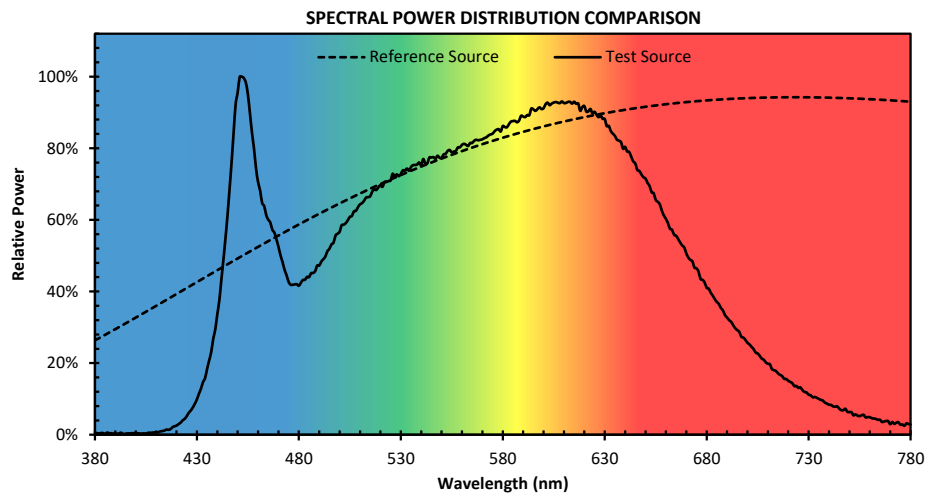
COLOR RENDERING INDEX

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
93.1	96.6	98.3	92.0	92.1	94.2	93.1	83.9	60.5	90.9	92.8	72.5	94.3	99.0

SOURCE PROPERTIES

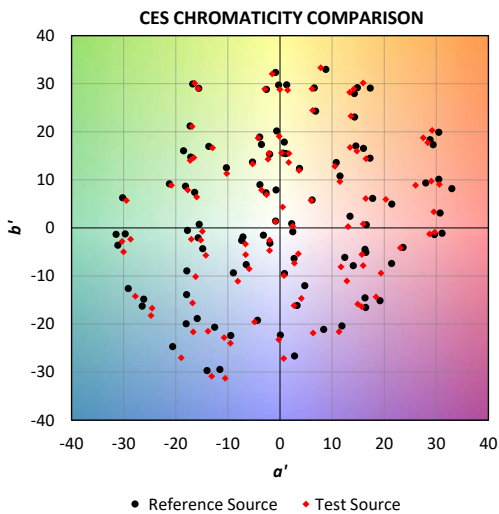


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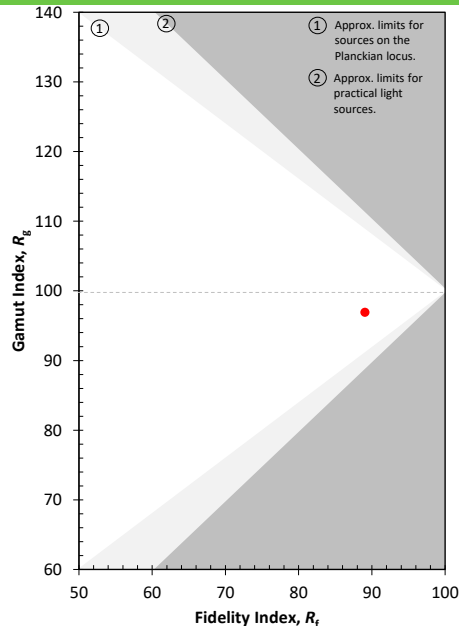


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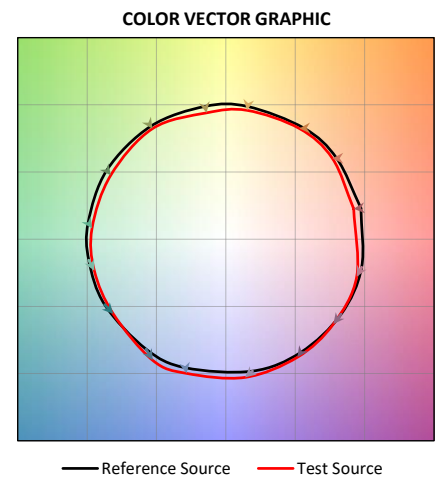
GENERAL COLOR RENDITION



This plot shows the shift in chromaticity for each individual CES.



This plot shows the R_f and R_g values relative to possible values.



This plot shows the average chromaticity shift for the samples within each of 16 hue bins. The values are normalized so that the reference is a circle.

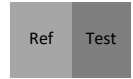
COLOR SAMPLE COMPARISON (APPROXIMATION)

CES 1 Type C	CES 2 Type C	CES 3 Type A	CES 4 Type A	CES 5 Type D	CES 6 Type C	CES 7 Type E	CES 8 Type D
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CES 89 Type A	CES 90 Type E	CES 91 Type A	CES 92 Type A	CES 93 Type D	CES 94 Type C	CES 95 Type A	CES 96 Type A
CES 97 Type F	CES 98 Type A	CES 99 Type E					

NOTE: CES stands for "Color Evaluation Sample", these 99 samples are used in place of the 16 R values. The colors shown are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately. For each sample, the color on the left represents the reference source, and the color on the right represents the test source.

Sample Type:

- A - Nature
- B - Skin
- C - Textiles
- D - Paints

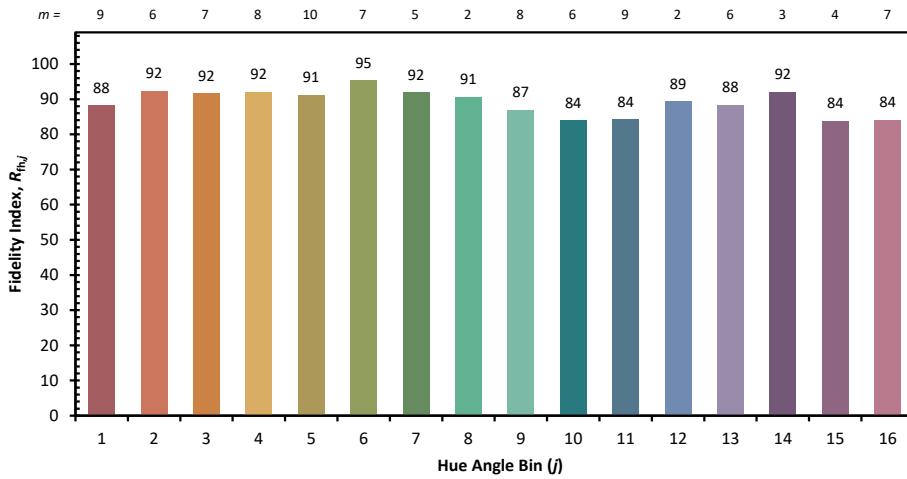


Elemental

Competitor



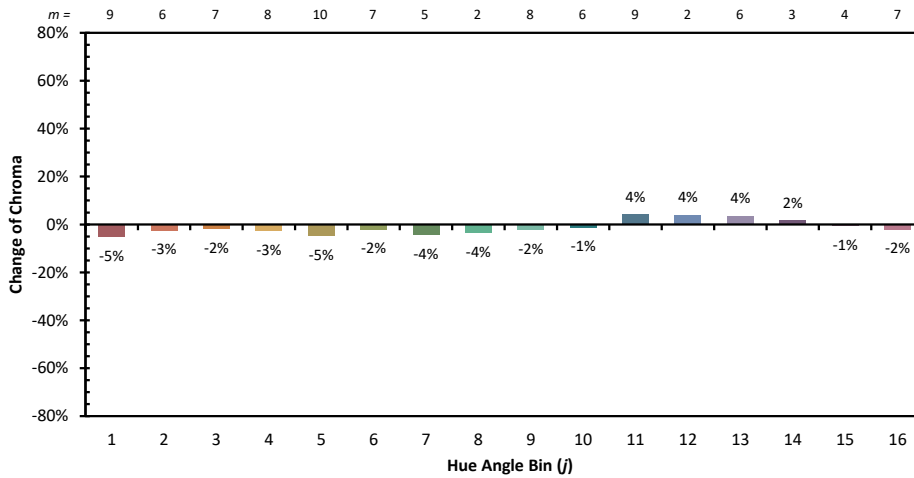
COLOR RENDITION BY HUE



j	Hue Angle
1	0.0°-22.5°
2	22.5° - 45.0°
3	45.0° - 67.5°
4	67.5° - 90.0°
5	90.0°-112.5°
6	112.5°-135.0°
7	135.0°-157.5°
8	157.5°-180.0°
9	180.0°-202.5°
10	202.5°-225.0°
11	225.0°-247.5°
12	247.5°-270.0°
13	270.0°-292.5°
14	292.5°-315.0°
15	315.0°-337.5°
16	337.5°-360.0°

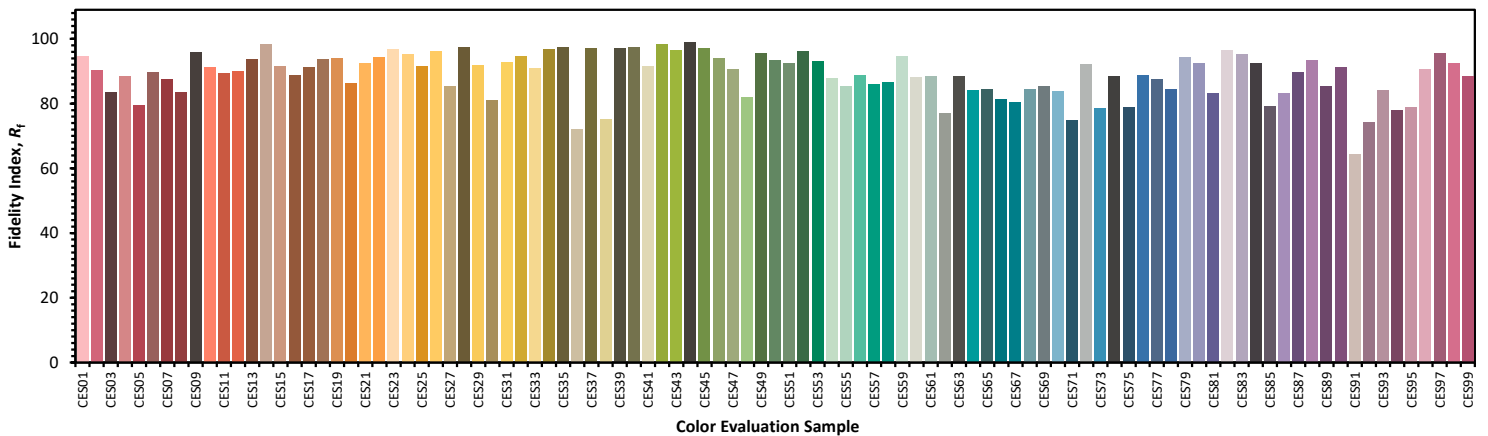
m = Samples per Angle Bin

This chart displays the average Fidelity Index for all samples within the hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.



This chart displays the change in chroma for the average sample within each hue bin. The number of samples per bin, which can vary based on the CCT used for the calculation, is shown at the top. The color of the bar is based on the average chromaticity under the 5000 K reference illuminant; the colors may not display accurately depending on the calibration of the monitor, and should be used for orientation only.

COLOR FIDELITY BY SAMPLE



This chart displays the Fidelity Index for each of the 99 CES. The CES are arranged by their hue angle under the 5000 K reference source, which was also used to determine the color of each bar. The colors are approximate and depend on proper monitor calibration. Some colors may be outside of the gamut of the monitor, and will not be displayed accurately.

Goniophotometer Test

SUMMARY OF RESULTS

Luminaire: FENCER® Series FOIL™ SELECT - Color Selectable Lighting System
 SKU: DI-120V-FLSEL-24-WH
 Luminous Flux: 1723 Lumens
 Power Consumption: 19.2 Watts
 Efficacy: 89.73 Lumens/Watt
 Spacing Criterion (0-180): 1.22
 Spacing Criterion (90-270): 1.22

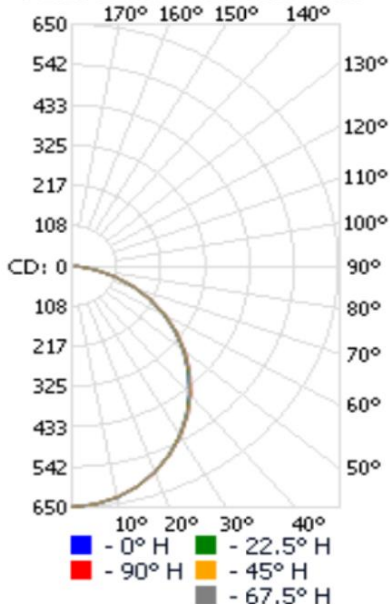
Graphs below are for reference, full IES files are available on Diode LED website

DISTRIBUTION CHARTS AND TABLES

Zonal Lumen Data

Zone	Lumens	%Luminaire
0-20	232.93	13.50
0-30	489.57	28.40
0-40	793.37	46.00
0-60	1377.63	79.90
0-80	1695.13	98.40
0-90	1723.46	100.00
20-40	560.44	32.50
20-50	869.80	50.50
40-70	789.58	45.80
60-80	317.50	18.40
70-80	112.17	6.50
80-90	28.33	1.60
90-180	0.00	0.00
0-180	1723.46	100.00

Polar Candela Distribution



Illuminance at a Distance

