

# 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-16-WH

## Test Conditions

Test Temperature: 26.5 °C  
Luminaire Sample Length: 16.0 in.  
Power Supply: Agilent E3634A DC Power Supply  
Voltage: 120.00 VDC  
Current: .10 A  
Power Consumption: 12 W

## Test Date

12/26/2019

## Prepared By



Olivia M. Tanguileg, Electrical Engineer

## Approved By



Andrew Lassen, Compliance Manager

# Integrating Sphere

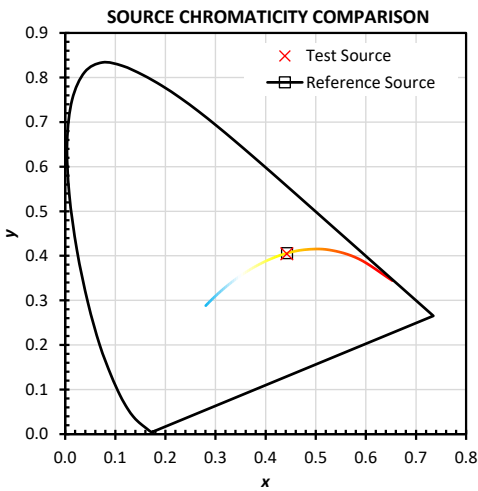
## SUMMARY OF RESULTS

Metric	Test	Reference	Notes	Metric	Test	Reference	Notes
$R_f$	90	100	IES TM-30-15 Fidelity Index	CCT	2921	2921	Correlated Color Temperature
$R_g$	97	100	IES TM-30-15 Gamut Index	$D_{uv}$	-0.0004	0.0000	Distance from the blackbody locus
$R_a$ (CRI)	92	100	CIE Test Color Method General Index	$x$	0.4421	0.4426	CIE 1931 chromaticity coordinate
$R_9$	53	100	CIE Test Color Method Sample Nine Score	$y$	0.4048	0.4060	CIE 1931 chromaticity coordinate
LER	293	159	Luminous Efficacy of Radiation	$u$	0.2536	0.2534	CIE 1960 chromaticity coordinate
Lumens	1069	1852	Luminous Flux	$v$	0.3483	0.3487	CIE 1960 chromaticity coordinate
$R_{f,skin}$	94	100	Average of CES15 and CES18 (skin)	$u'$	0.2536	0.2534	CIE 1976 chromaticity coordinate
				$v'$	0.5224	0.5230	CIE 1976 chromaticity coordinate

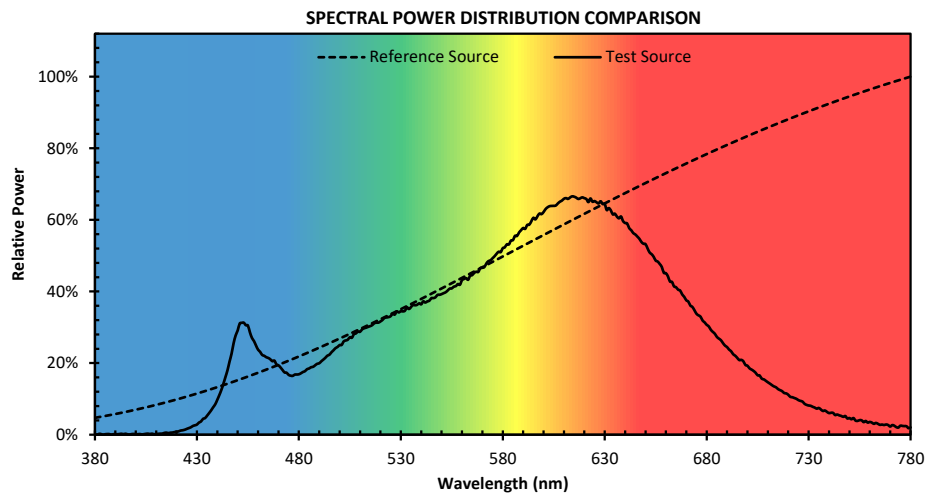
## COLOR RENDERING INDEX

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
93.1	98.1	97.2	92.4	93.4	96.9	89.5	78.3	53.5	95.1	94.3	84.1	94.8	99.3

## SOURCE PROPERTIES

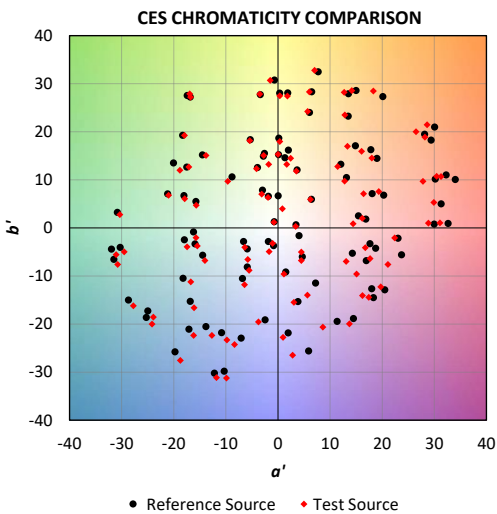


This chart plots the chromaticity of the test and reference sources in the CIE 1931 chromaticity

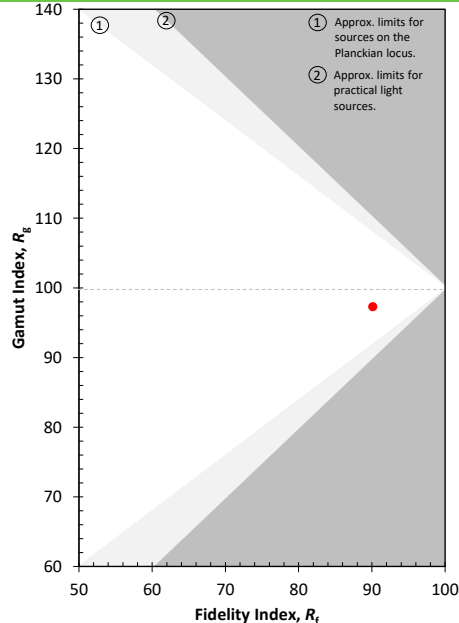


This chart displays the spectral power distributions for the test and reference source. Each SPD has been normalized so that the maximum values is 100%.

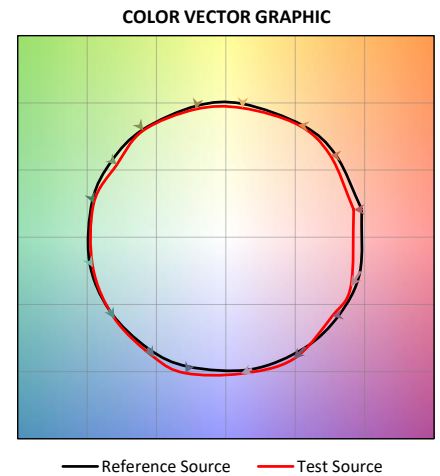
## GENERAL COLOR RENDITION



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.

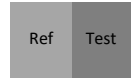
COLOR SAMPLE COMPARISON (APPROXIMATION)

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

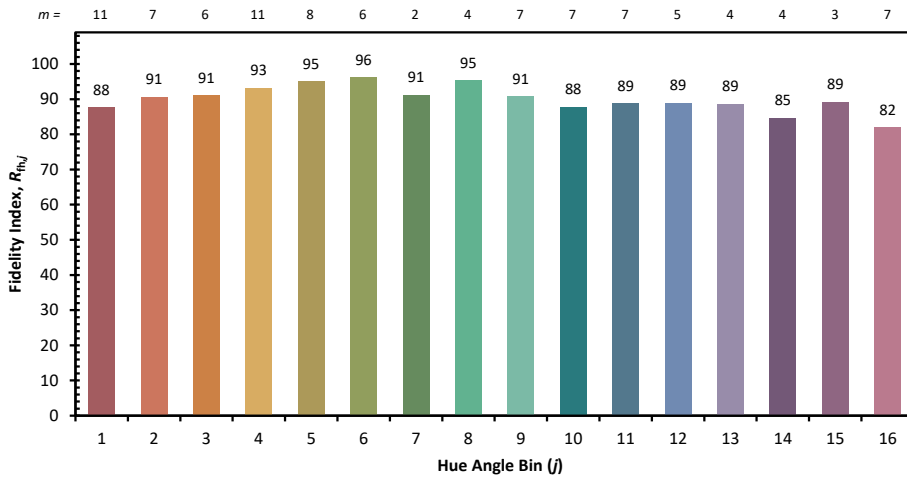


Elemental

Competitor



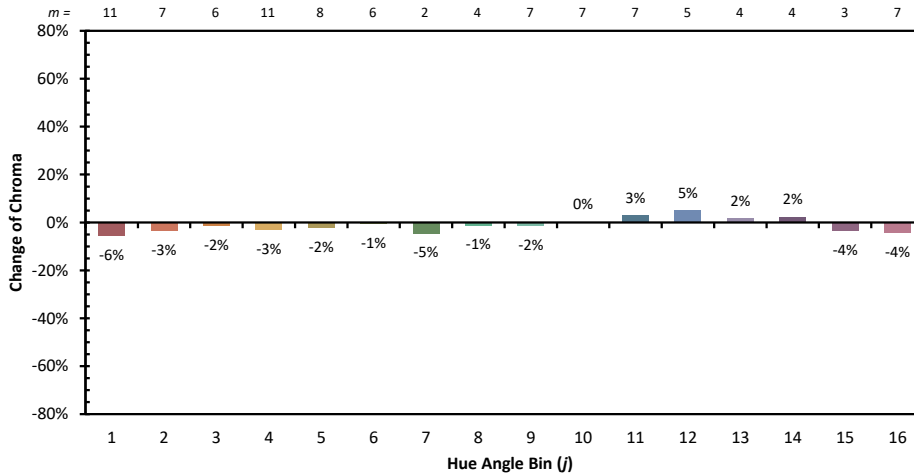
## COLOR RENDITION BY HUE



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°

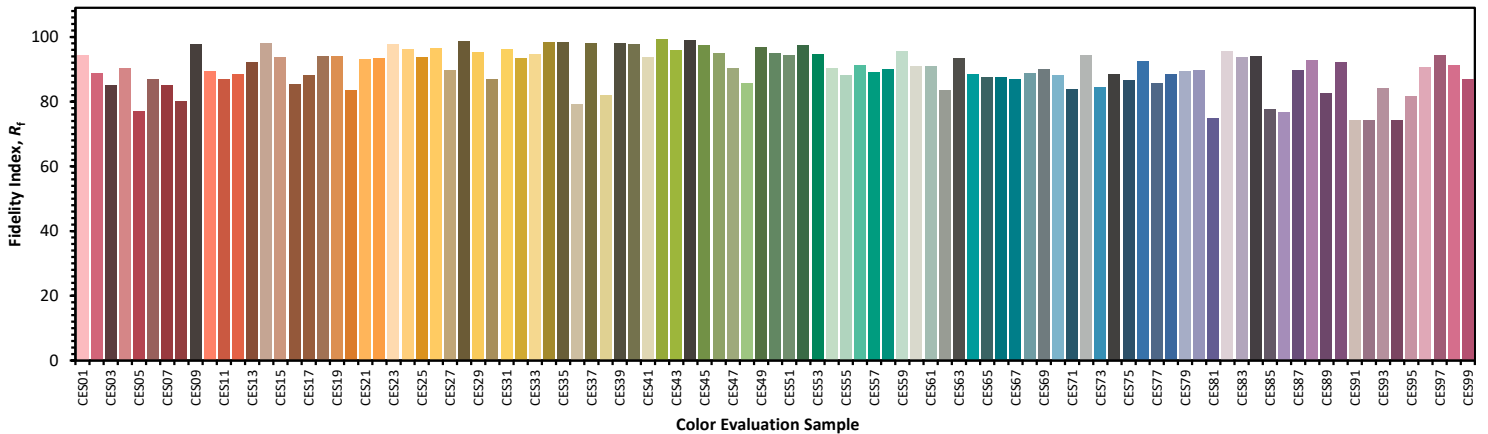
m = Samples per Angle Bin

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-16-WH

Luminous Flux: 1086 Lumens

Power Consumption: 12 Watts

Efficacy: 90.5 Lumens/Watt

Spacing Criterion (0-180): 1.22

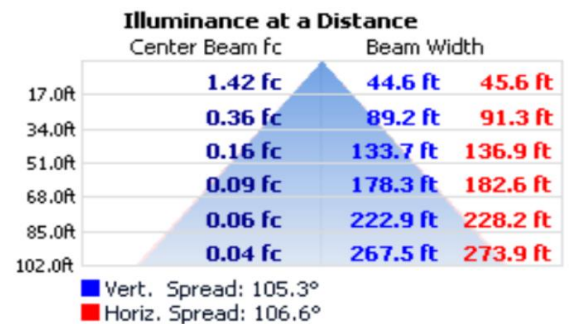
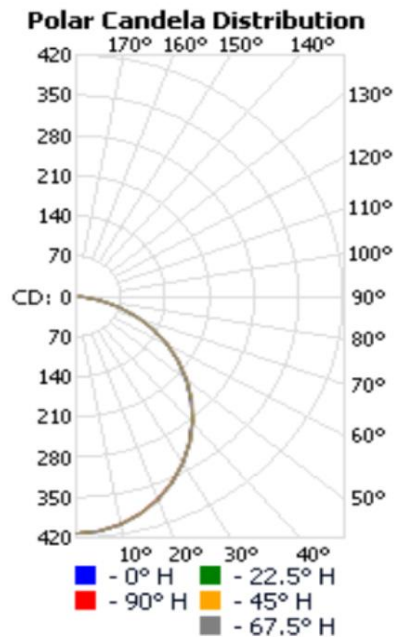
Spacing Criterion (90-270): 1.22

\*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	148.01	13.60
0-30	310.68	28.60
0-40	502.69	46.30
0-60	870.38	80.20
0-80	1068.55	98.40
0-90	1085.53	100.00
20-40	354.68	32.70
20-50	549.70	50.60
40-70	496.17	45.70
60-80	198.17	18.30
70-80	69.68	6.40
80-90	16.99	1.60
90-180	0.00	0.00
0-180	1085.53	100.00



# 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-16-WH

## Test Conditions

Test Temperature: 26.5 °C  
Luminaire Sample Length: 16.0 in.  
Power Supply: Agilent E3634A DC Power Supply  
Voltage: 120.00 VDC  
Current: .10 A  
Power Consumption: 12 W

## Test Date

12/26/2019

### Prepared By



Olivia M. Tanguileg, Electrical Engineer

### Approved By



Andrew Lassen, Compliance Manager

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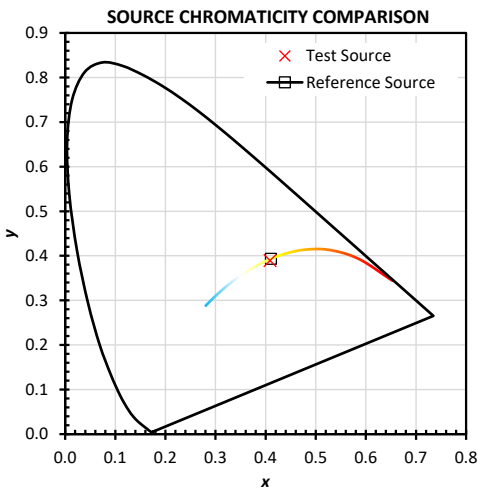
## SUMMARY OF RESULTS

Metric	Test	Reference	Notes	Metric	Test	Reference	Notes
$R_f$	90	100	IES TM-30-15 Fidelity Index	CCT	3409	3409	Correlated Color Temperature
$R_g$	98	100	IES TM-30-15 Gamut Index	$D_{uv}$	-0.0013	0.0000	Distance from the blackbody locus
$R_a$ (CRI)	94	100	CIE Test Color Method General Index	$x$	0.4090	0.4105	CIE 1931 chromaticity coordinate
$R_9$	63	100	CIE Test Color Method Sample Nine Score	$y$	0.3895	0.3933	CIE 1931 chromaticity coordinate
LER	294	178	Luminous Efficacy of Radiation	$u$	0.2386	0.2380	CIE 1960 chromaticity coordinate
Lumens	1184	1852	Luminous Flux	$v$	0.3409	0.3421	CIE 1960 chromaticity coordinate
$R_{f,skin}$	94	100	Average of CES15 and CES18 (skin)	$u'$	0.2386	0.2380	CIE 1976 chromaticity coordinate
				$v'$	0.5113	0.5131	CIE 1976 chromaticity coordinate

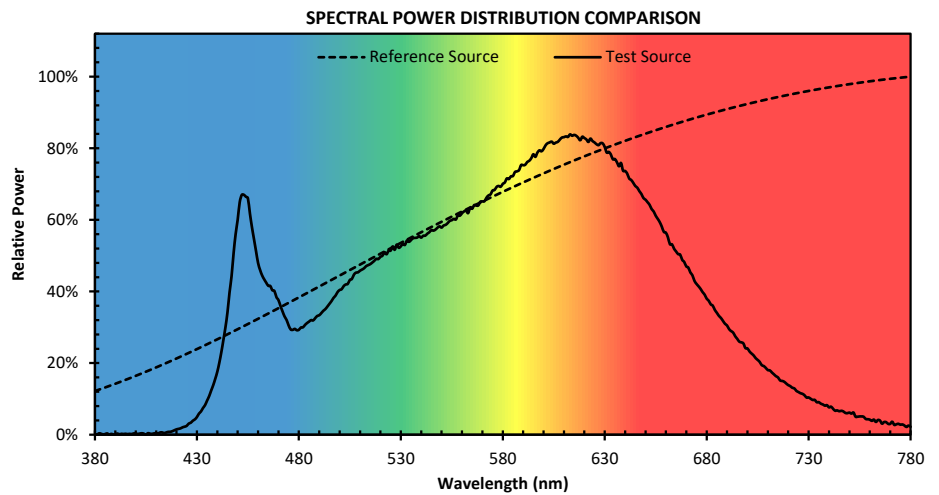
## COLOR RENDERING INDEX

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
95.0	98.9	97.8	93.4	94.5	96.0	91.3	83.1	62.9	96.3	95.0	78.7	96.6	99.7

## SOURCE PROPERTIES

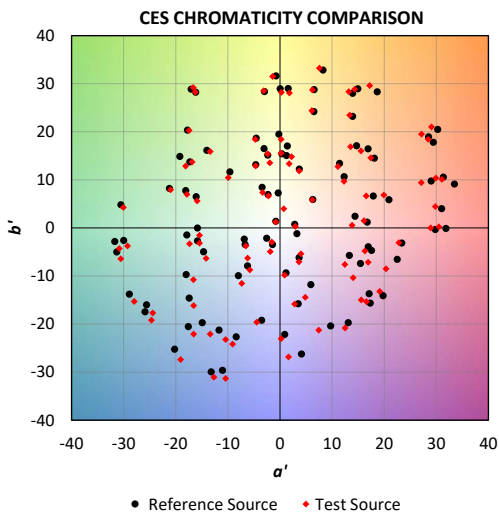


This chart plots the chromaticity of the test and reference sources in the CIE 1931 chromaticity

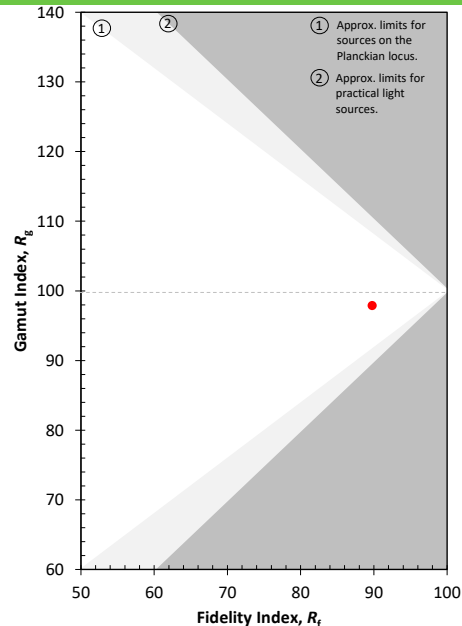


This chart displays the spectral power distributions for the test and reference source. Each SPD has been normalized so that the maximum values is 100%.

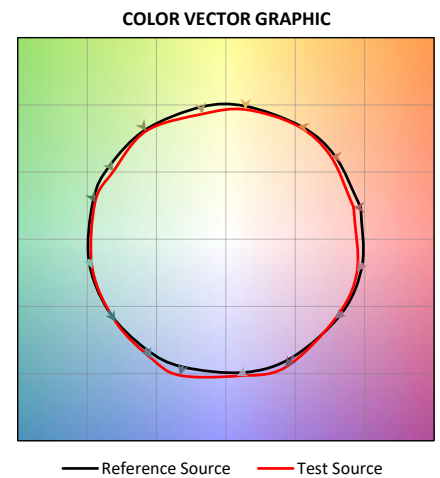
## GENERAL COLOR RENDITION



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.

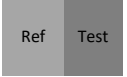
COLOR SAMPLE COMPARISON (APPROXIMATION)

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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



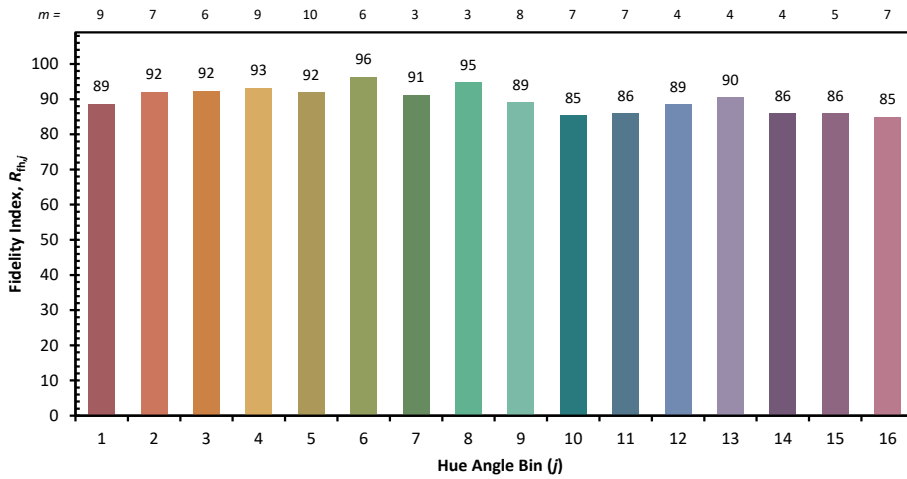
Elemental

Competitor





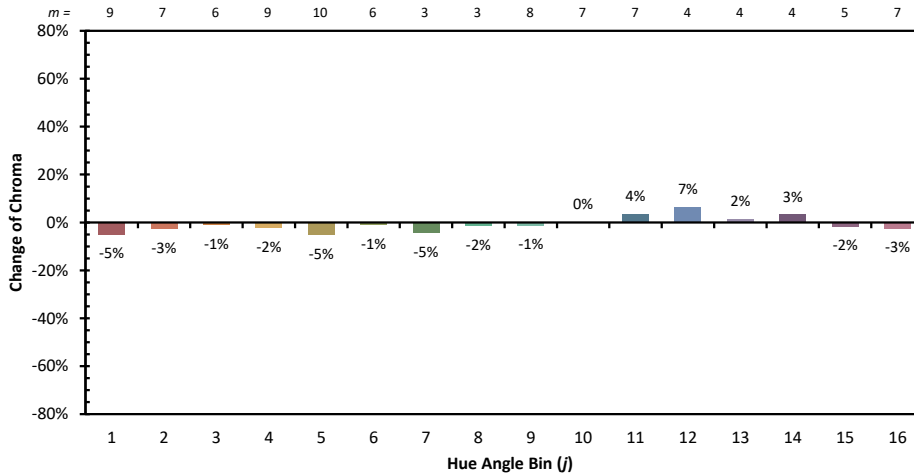
## COLOR RENDITION BY HUE



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°
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11	225.0°-247.5°
12	247.5°-270.0°
13	270.0°-292.5°
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15	315.0°-337.5°
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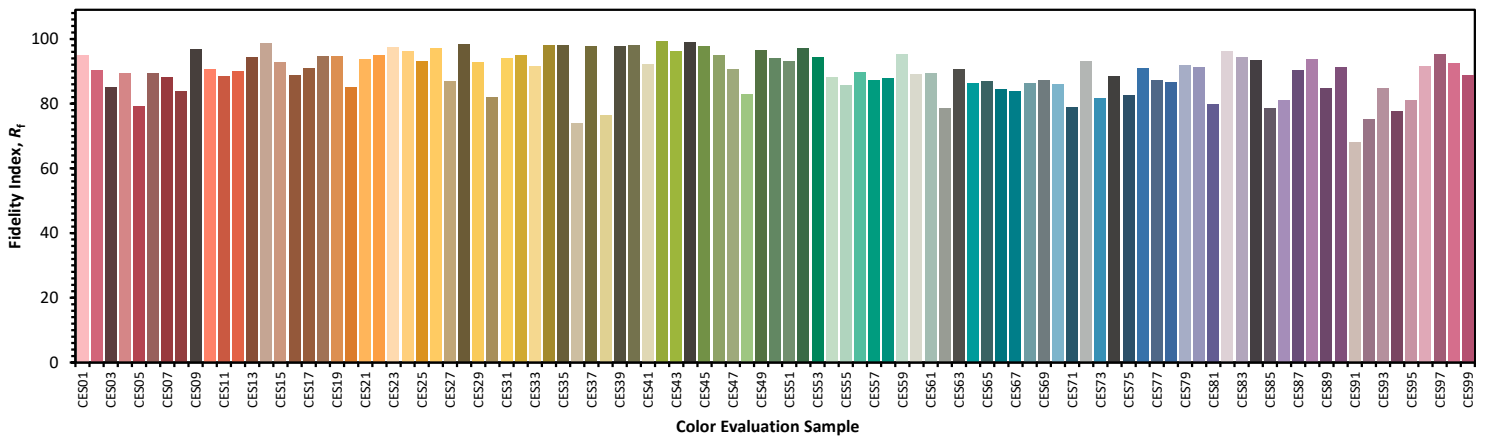
m = Samples per Angle Bin

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



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-16-WH

Luminous Flux: 1252 Lumens

Power Consumption: 12 Watts

Efficacy: 104.33 Lumens/Watt

Spacing Criterion (0-180): 1.24

Spacing Criterion (90-270): 1.22

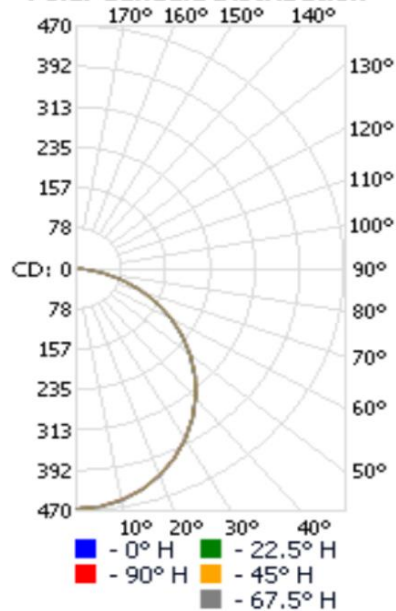
\*Graphs below are for reference, full IES files are available on Diode LED website\*

## DISTRIBUTION CHARTS AND TABLES

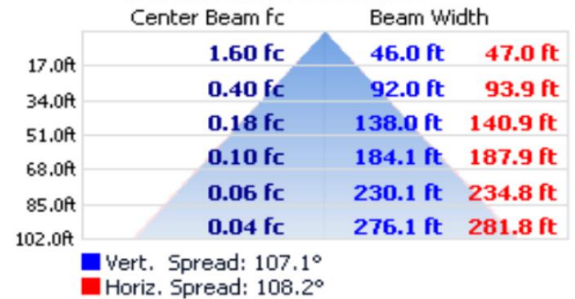
### Zonal Lumen Data

Zone	Lumens	%Luminaire
0-20	167.80	13.40
0-30	352.97	28.20
0-40	572.42	45.70
0-60	996.13	79.50
0-80	1230.39	98.30
0-90	1252.27	100.00
20-40	404.62	32.30
20-50	628.62	50.20
40-70	574.09	45.80
60-80	234.26	18.70
70-80	83.88	6.70
80-90	21.88	1.70
90-180	0.00	0.00
0-180	1252.27	100.00

### Polar Candela Distribution



### Illuminance at a Distance



# 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

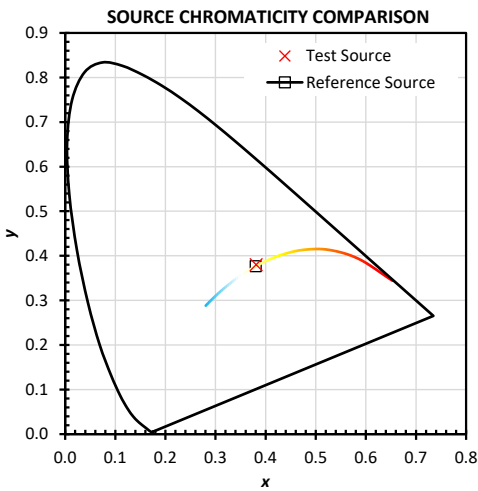
## SUMMARY OF RESULTS

Metric	Test	Reference	Notes	Metric	Test	Reference	Notes
$R_f$	89	100	IES TM-30-15 Fidelity Index	CCT	4006	4007	Correlated Color Temperature
$R_g$	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
				$v'$	0.5033	0.5015	CIE 1976 chromaticity coordinate

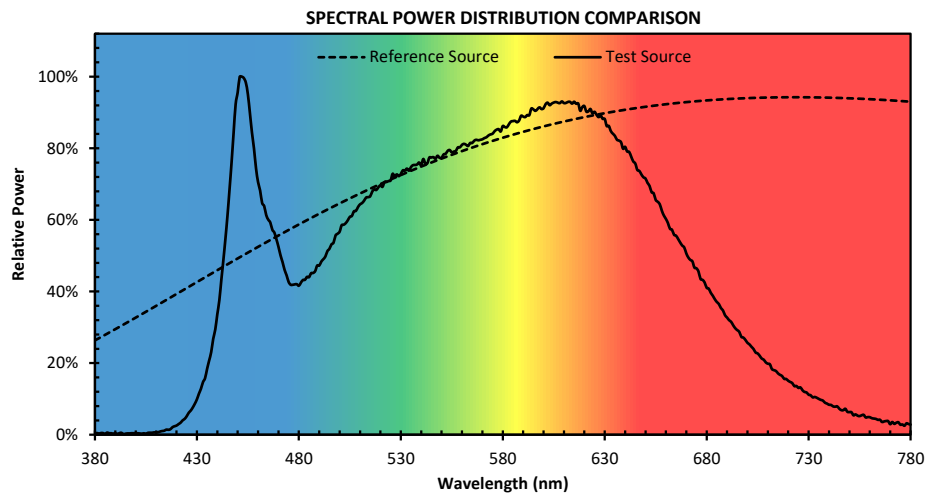
## COLOR RENDERING INDEX

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

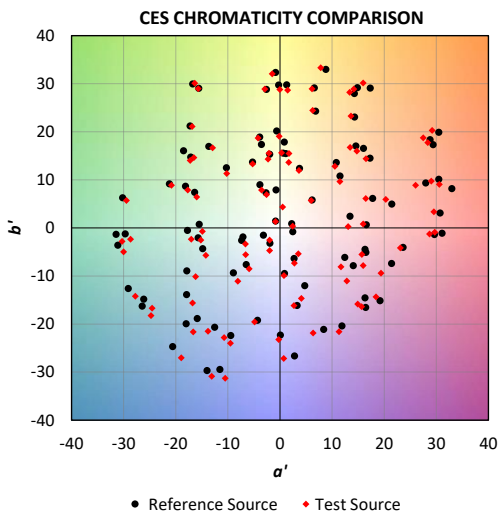


This chart plots the chromaticity of the test and reference sources in the CIE 1931 chromaticity

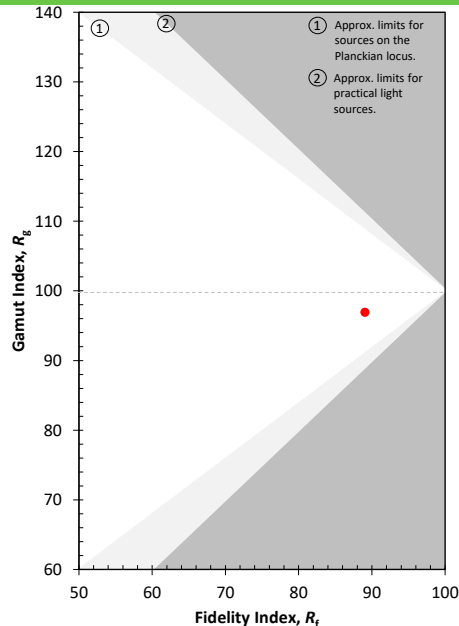


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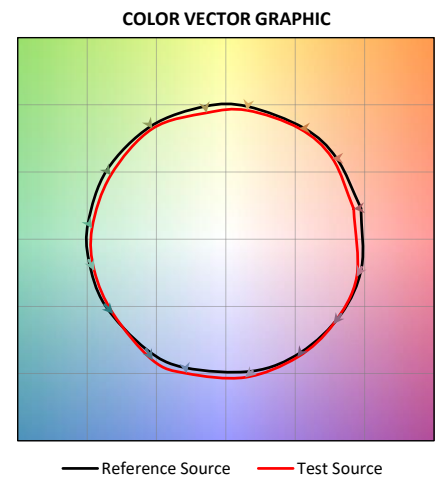
## GENERAL COLOR RENDITION



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.

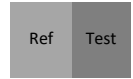
COLOR SAMPLE COMPARISON (APPROXIMATION)

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CES 57 Type C	CES 58 Type D	CES 59 Type E	CES 60 Type G	CES 61 Type F	CES 62 Type C	CES 63 Type F	CES 64 Type E
CES 65 Type F	CES 66 Type E	CES 67 Type E	CES 68 Type F	CES 69 Type F	CES 70 Type F	CES 71 Type F	CES 72 Type F
CES 73 Type F	CES 74 Type C	CES 75 Type F	CES 76 Type F	CES 77 Type A	CES 78 Type F	CES 79 Type C	CES 80 Type G
CES 81 Type A	CES 82 Type C	CES 83 Type C	CES 84 Type F	CES 85 Type A	CES 86 Type C	CES 87 Type F	CES 88 Type F
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

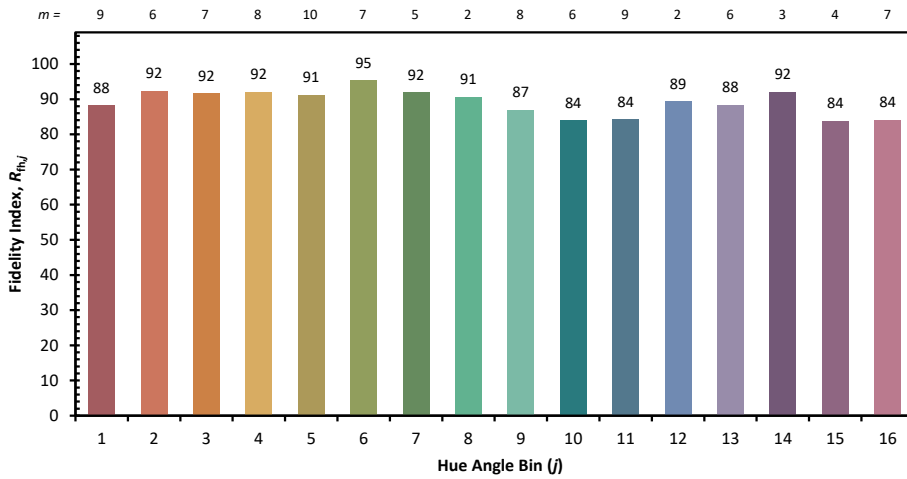


Elemental

Competitor



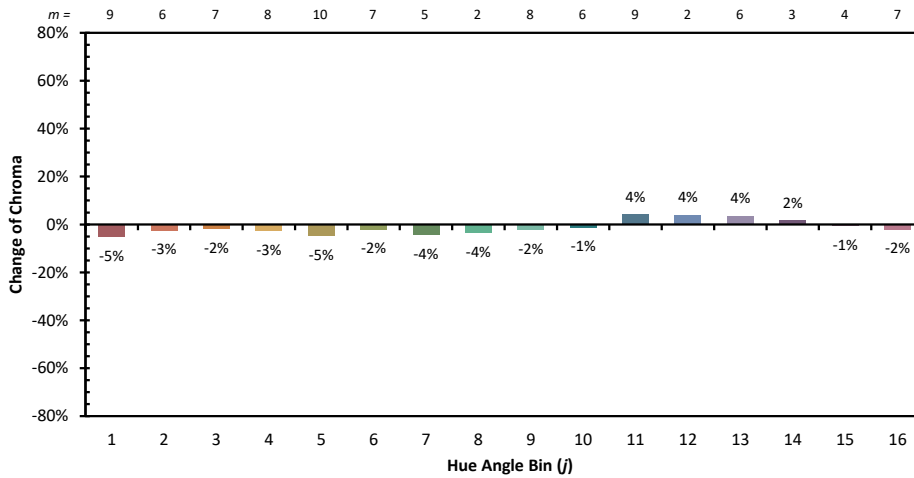
## COLOR RENDITION BY HUE



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°

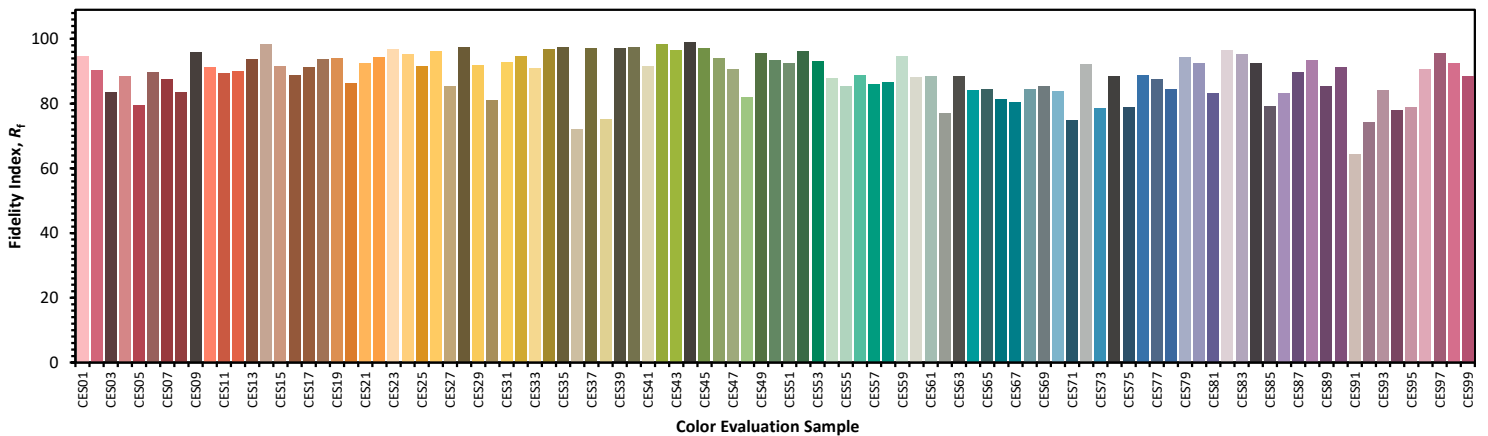
m = Samples per Angle Bin

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

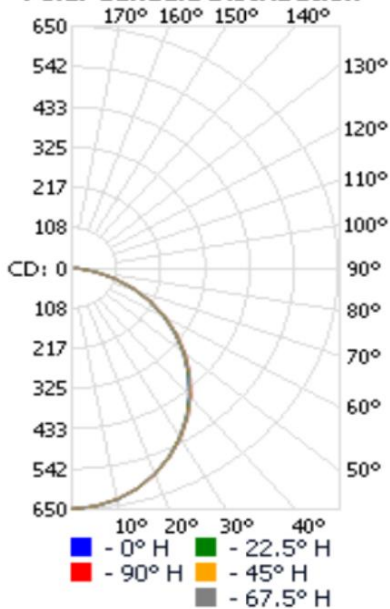
\*Graphs below are for reference, full IES files are available on Diode LED website\*

## 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

