



## FUSION Exo Wash 30 Photometric Report

Report 2021-04-20-8

GLP German Light Products GmbH  
GLP LightLab

|                         |   |
|-------------------------|---|
| Maximum Total Lumens    | 2580 lm                                 |
| Maximum Intensity       | 335000 cd                               |
| CRI                     | 73                                      |
| Energy Efficiency Class | C                                       |
| Energy Efficiency Index | 1.13                                    |
| Power Consumption       | 215 $\frac{\text{kWh}}{1000 \text{ h}}$ |
| Measurement Date        | 2021-04-20 15:31                        |
| Analysis Date           | 2021-07-14 11:28                        |
| Measurement SW Version  | 2.1.1                                   |
| Analysis SW Version     | 2.4.1                                   |





Contents

|          |                                   |           |
|----------|-----------------------------------|-----------|
| <b>1</b> | <b>Light Distribution</b>         | <b>2</b>  |
| 1.1      | Wide, RGBW Beam . . . . .         | 3         |
| 1.2      | Medium, RGBW Beam . . . . .       | 4         |
| 1.3      | Narrow, RGBW Beam . . . . .       | 5         |
| <b>2</b> | <b>White Quality – White Chip</b> | <b>6</b>  |
| 2.1      | TM-30-15 Detail Plots . . . . .   | 7         |
| 2.2      | TLCI-2012 Results . . . . .       | 9         |
| <b>3</b> | <b>Colors</b>                     | <b>10</b> |

# 1 Light Distribution

Table 1: Summary of beam opening angles for different fixture configurations.

| Beam         | Beam Angle (50 %) |      | Field Angle (10 %) |      | Cutoff Angle (3 %) |      |
|--------------|-------------------|------|--------------------|------|--------------------|------|
|              | C0                | C90  | C0                 | C90  | C0                 | C90  |
| Wide, RGBW   | 34°               | 35°  | 48°                | 48°  | 53°                | 54°  |
| Medium, RGBW | 18°               | 18°  | 23°                | 23°  | 25°                | 24°  |
| Narrow, RGBW | 4.5°              | 4.4° | 5.7°               | 5.7° | 6.3°               | 6.4° |

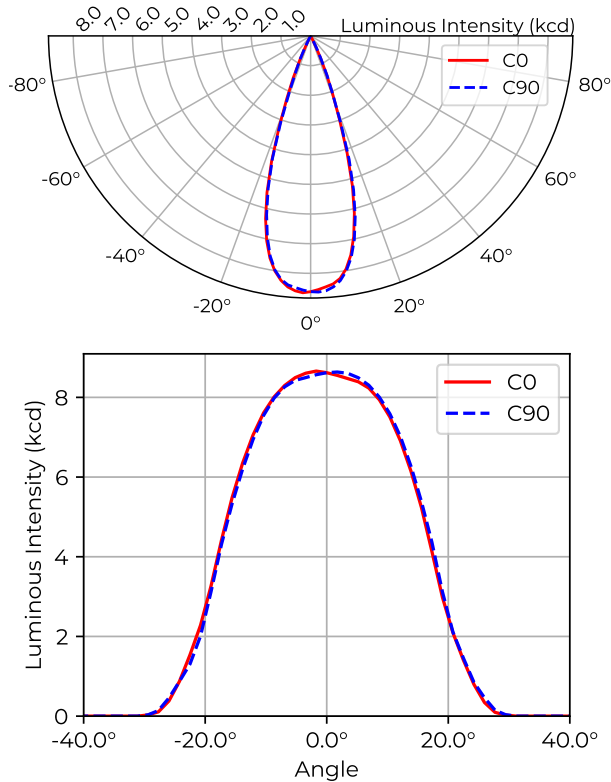
Table 2: Summary of luminous flux and intensity for different fixture configurations.

| Beam         | Total Lumen Output | Peak Luminous Intensity) |
|--------------|--------------------|--------------------------|
| Wide, RGBW   | 2.58 klm           | 8.67 kcd                 |
| Medium, RGBW | 2.29 klm           | 31.2 kcd                 |
| Narrow, RGBW | 1.64 klm           | 335 kcd                  |

Table 3: Approximate illuminance and beam diameter at different projection distances, calculated with the inverse-square law. The approximation is valid only for large distances, compared to the size of the fixture output port.

| Beam         | Parameter        | Factor | Projection Distance [m] |      |      |      |      |      |     |      |     |
|--------------|------------------|--------|-------------------------|------|------|------|------|------|-----|------|-----|
|              |                  |        | 5                       | 7.5  | 10   | 12.5 | 15   | 17.5 | 20  | 22.5 | 25  |
| Wide, RGBW   | Diameter [m]     | 1.2    | 6.2                     | 9.3  | 12   | 16   | 19   | 22   | 25  | 28   | 31  |
|              | Illuminance [lx] | 8.62k  | 340                     | 150  | 86   | 55   | 38   | 28   | 22  | 17   | 14  |
| Medium, RGBW | Diameter [m]     | 0.62   | 3.1                     | 4.6  | 6.2  | 7.7  | 9.2  | 11   | 12  | 14   | 15  |
|              | Illuminance [lx] | 30.9k  | 1.2k                    | 550  | 310  | 200  | 140  | 100  | 77  | 61   | 49  |
| Narrow, RGBW | Diameter [m]     | 0.16   | 0.78                    | 1.2  | 1.6  | 1.9  | 2.3  | 2.7  | 3.1 | 3.5  | 3.9 |
|              | Illuminance [lx] | 333k   | 13k                     | 5.9k | 3.3k | 2.1k | 1.5k | 1.1k | 830 | 660  | 530 |

## 1.1 Wide, RGBW Beam



Type B measurement, 1296 data points.

Table 4: Opening angles for different intensity thresholds. Wide, RGBW

|              |      | C0  | C90 |
|--------------|------|-----|-----|
| Beam Angle   | 50 % | 34° | 35° |
| Field Angle  | 10 % | 48° | 48° |
| Cutoff Angle | 3 %  | 53° | 54° |

Table 5: Luminous flux, integrated over the beam for several minimum threshold intensities. Wide, RGBW

|                    |       | Flux (lm) |
|--------------------|-------|-----------|
| Half-Peak Output   | @50 % | 1920      |
| Tenth-Peak Output  | @10 % | 2520      |
| Total Lumen Output | @3 %  | 2580      |

$$\text{diameter} = 1.2 \times \text{distance}$$

$$\text{illuminance} = \frac{8620 \text{ lx}}{(\text{distance [m]})^2}$$

Figure 1: Polar and cartesian light intensity distributions. Wide, RGBW

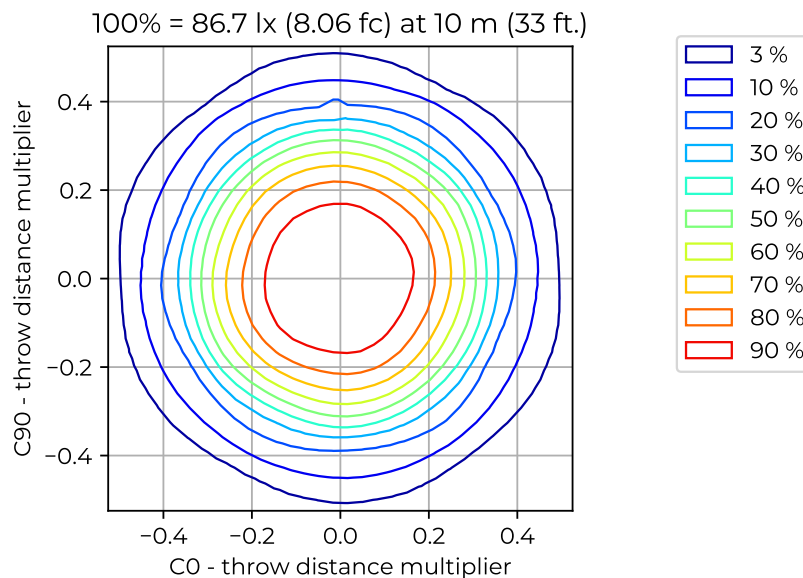
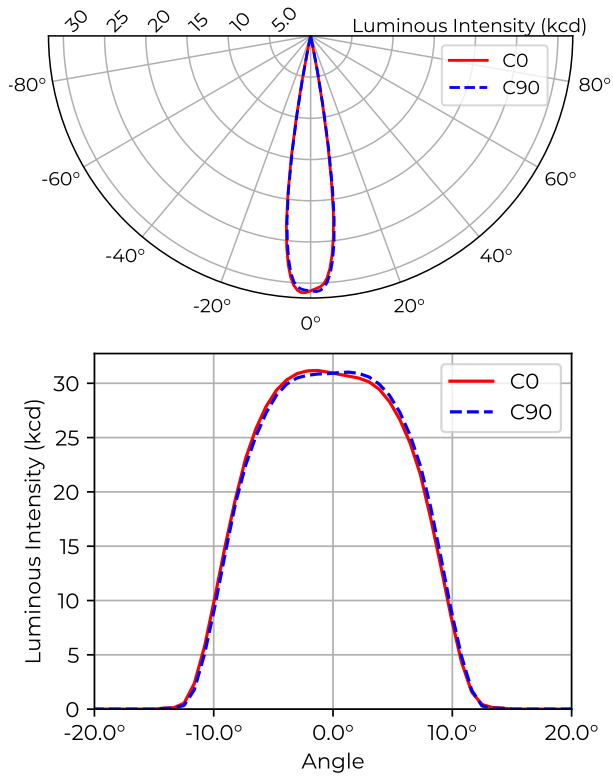


Figure 2: Iso-illuminance diagram of projected beam. Wide, RGBW  
dist. from origin = throw dist. × throw dist. multiplier

Table 6: Quick calculation diagram for illuminance and beam diameter. Wide, RGBW

| Parameter        | Factor | Projection Distance [m] |     |    |      |    |      |    |         |
|------------------|--------|-------------------------|-----|----|------|----|------|----|---------|
|                  |        | 5                       | 7.5 | 10 | 12.5 | 15 | 17.5 | 20 | 22.5 25 |
| Diameter [m]     | 1.2    | 6.2                     | 9.3 | 12 | 16   | 19 | 22   | 25 | 28 31   |
| Illuminance [lx] | 8.62k  | 340                     | 150 | 86 | 55   | 38 | 28   | 22 | 17 14   |

## 1.2 Medium, RGBW Beam



Type B measurement, 1296 data points.

Table 7: Opening angles for different intensity thresholds. Medium, RGBW

|              |      | C0  | C90 |
|--------------|------|-----|-----|
| Beam Angle   | 50 % | 18° | 18° |
| Field Angle  | 10 % | 23° | 23° |
| Cutoff Angle | 3 %  | 25° | 24° |

Table 8: Luminous flux, integrated over the beam for several minimum threshold intensities. Medium, RGBW

|                    |       | Flux (lm) |
|--------------------|-------|-----------|
| Half-Peak Output   | @50 % | 1830      |
| Tenth-Peak Output  | @10 % | 2250      |
| Total Lumen Output | @3 %  | 2290      |

$$\text{diameter} = 0.62 \times \text{distance}$$

$$\text{illuminance} = \frac{30\,900 \text{ lx}}{(\text{distance [m]})^2}$$

Figure 3: Polar and cartesian light intensity distributions. Medium, RGBW

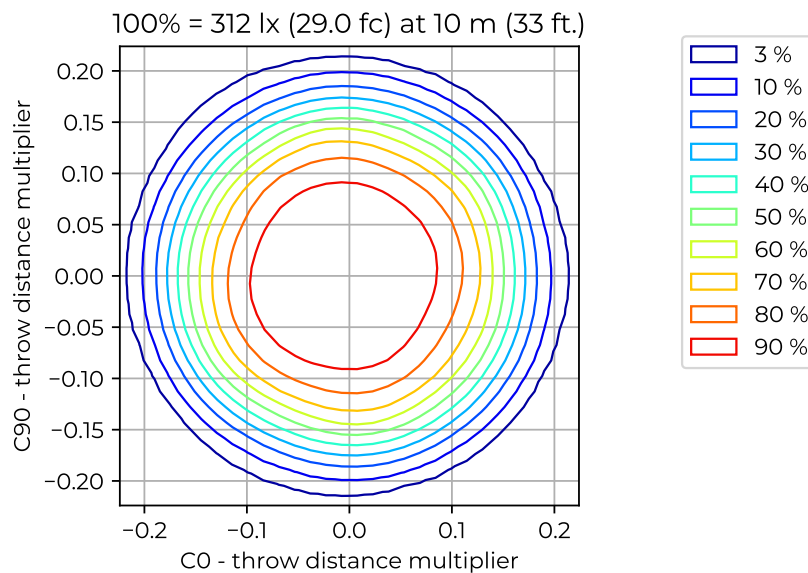
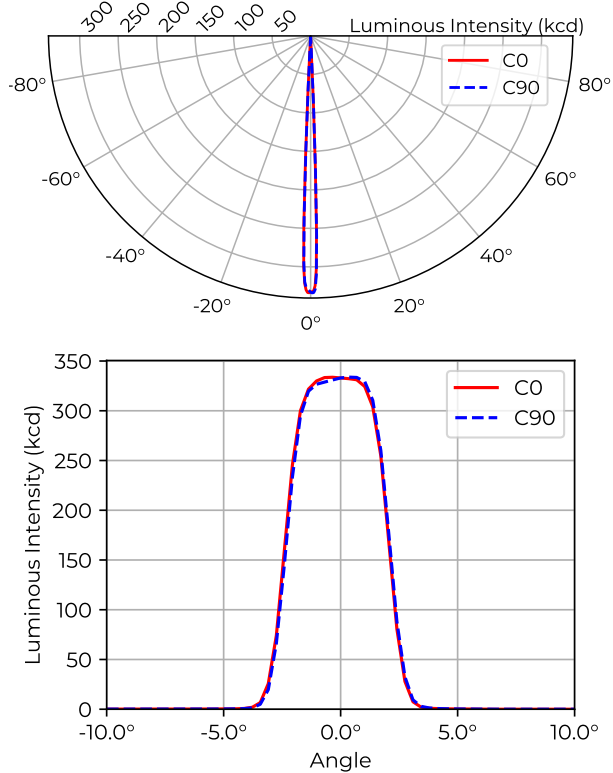


Figure 4: Iso-illuminance diagram of projected beam. Medium, RGBW  
dist. from origin = throw dist. × throw dist. multiplier

Table 9: Quick calculation diagram for illuminance and beam diameter. Medium, RGBW

| Parameter        | Factor | Projection Distance [m] |     |     |      |     |      |    |      |    |
|------------------|--------|-------------------------|-----|-----|------|-----|------|----|------|----|
|                  |        | 5                       | 7.5 | 10  | 12.5 | 15  | 17.5 | 20 | 22.5 | 25 |
| Diameter [m]     | 0.62   | 3.1                     | 4.6 | 6.2 | 7.7  | 9.2 | 11   | 12 | 14   | 15 |
| Illuminance [lx] | 30.9k  | 1.2k                    | 550 | 310 | 200  | 140 | 100  | 77 | 61   | 49 |

### 1.3 Narrow, RGBW Beam



Type B measurement, 1296 data points.

Table 10: Opening angles for different intensity thresholds. Narrow, RGBW

|              |      | C0   | C90  |
|--------------|------|------|------|
| Beam Angle   | 50 % | 4.5° | 4.4° |
| Field Angle  | 10 % | 5.7° | 5.7° |
| Cutoff Angle | 3 %  | 6.3° | 6.4° |

Table 11: Luminous flux, integrated over the beam for several minimum threshold intensities. Narrow, RGBW

|                    |       | Flux (lm) |
|--------------------|-------|-----------|
| Half-Peak Output   | @50 % | 1330      |
| Tenth-Peak Output  | @10 % | 1600      |
| Total Lumen Output | @3 %  | 1640      |

$$\text{diameter} = 0.16 \times \text{distance}$$

$$\text{illuminance} = \frac{333\,000 \text{ lx}}{(\text{distance [m]})^2}$$

Figure 5: Polar and cartesian light intensity distributions. Narrow, RGBW

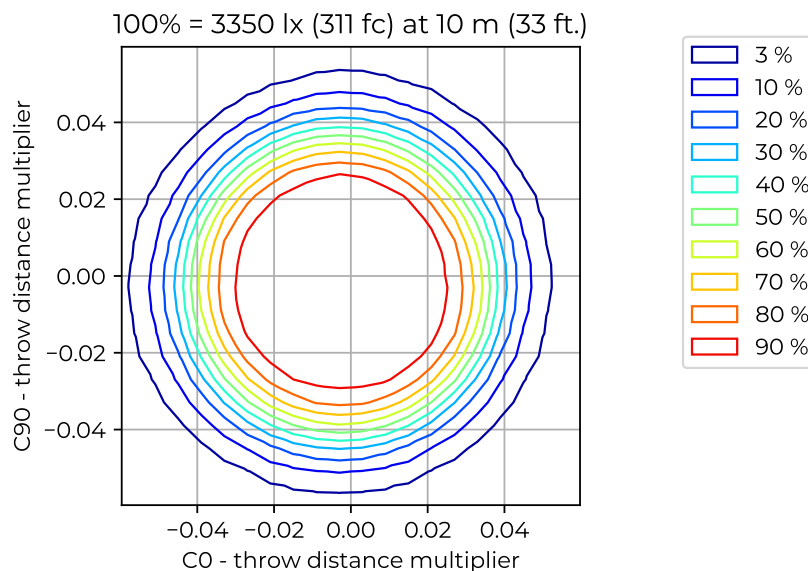


Figure 6: Iso-illuminance diagram of projected beam. Narrow, RGBW  
dist. from origin = throw dist. × throw dist. multiplier

Table 12: Quick calculation diagram for illuminance and beam diameter. Narrow, RGBW

| Parameter        | Factor | Projection Distance [m] |      |      |      |      |      |     |      |     |
|------------------|--------|-------------------------|------|------|------|------|------|-----|------|-----|
|                  |        | 5                       | 7.5  | 10   | 12.5 | 15   | 17.5 | 20  | 22.5 | 25  |
| Diameter [m]     | 0.16   | 0.78                    | 1.2  | 1.6  | 1.9  | 2.3  | 2.7  | 3.1 | 3.5  | 3.9 |
| Illuminance [lx] | 333k   | 13k                     | 5.9k | 3.3k | 2.1k | 1.5k | 1.1k | 830 | 660  | 530 |

## 2 White Quality – White Chip

Table 13: Summary for White Chip spectral measurement results and color metrics.

| Metric         | Value  |
|----------------|--------|
| CCT            | 9331 K |
| CCT $D_{uv}$   | -0.011 |
| CRI $R_a$      | 73     |
| CRI $R_g$      | 9.0    |
| TLCI-2015      | 44     |
| TM-30-15 $R_f$ | 97     |
| TM-30-15 $R_g$ | 63     |
| CIE 1931 x     | 0.291  |
| CIE 1931 y     | 0.280  |
| CIE 1960 u     | 0.201  |
| CIE 1960 v     | 0.291  |

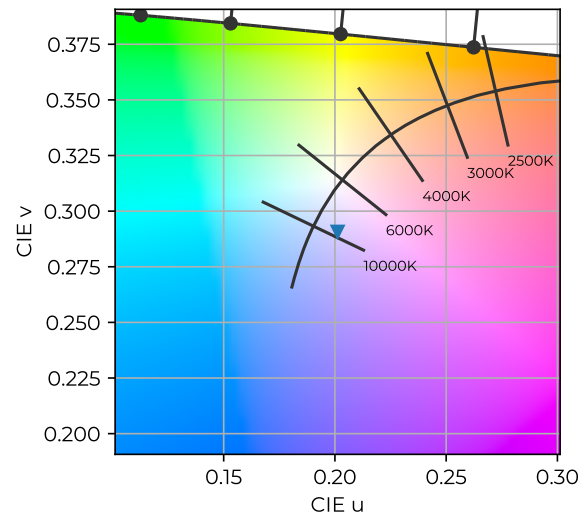


Figure 7: Color coordinates in CIE 1960 chromaticity diagram. White Chip

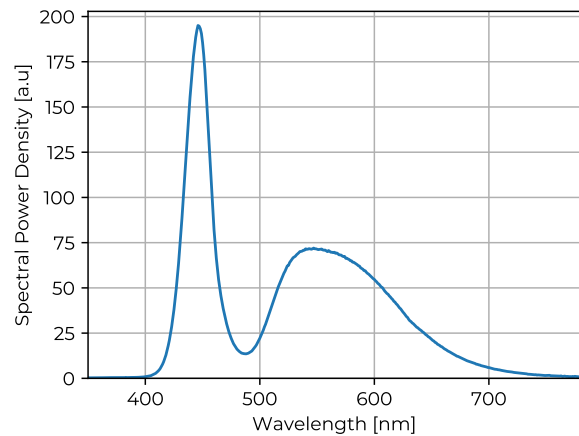
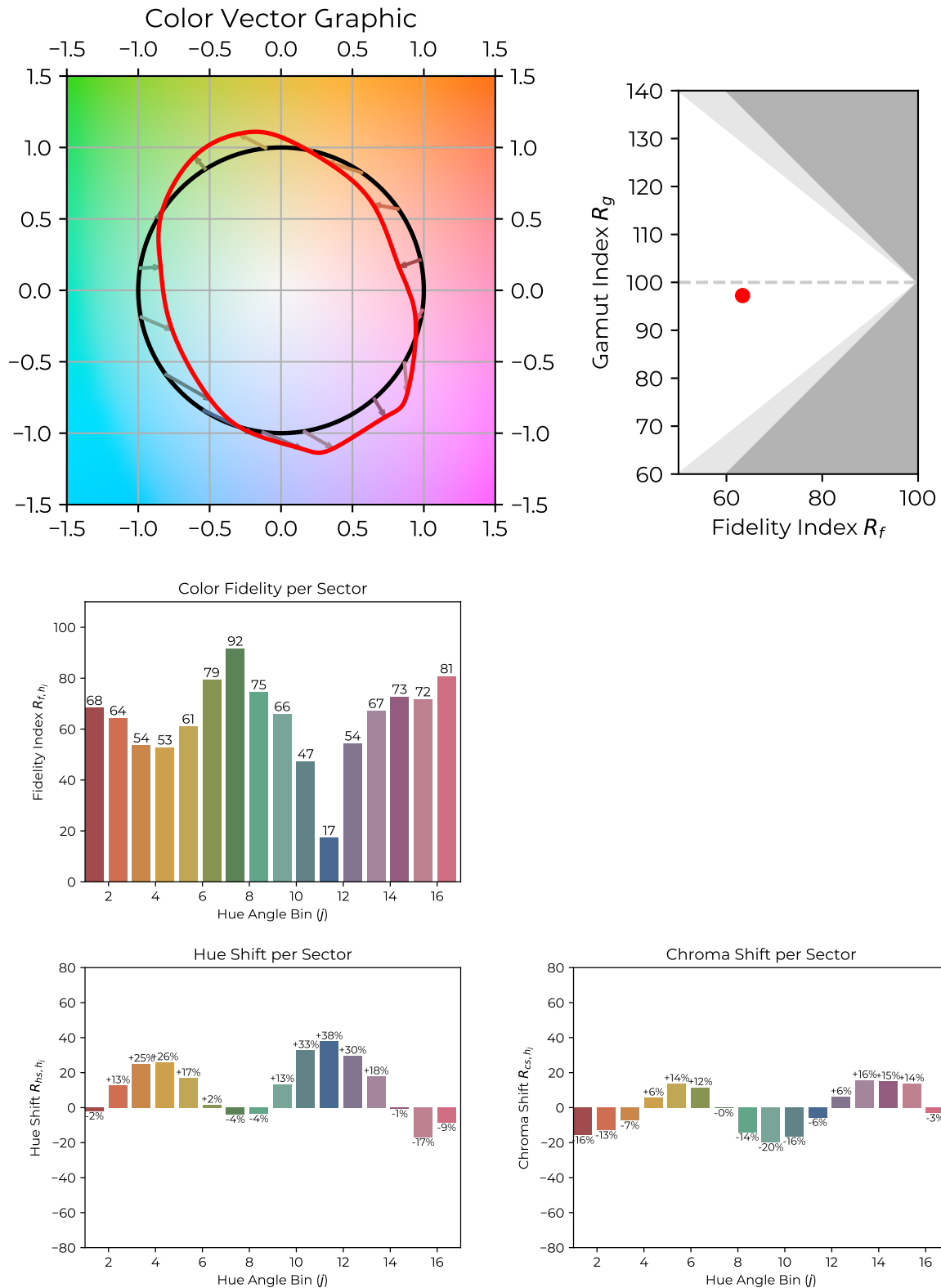
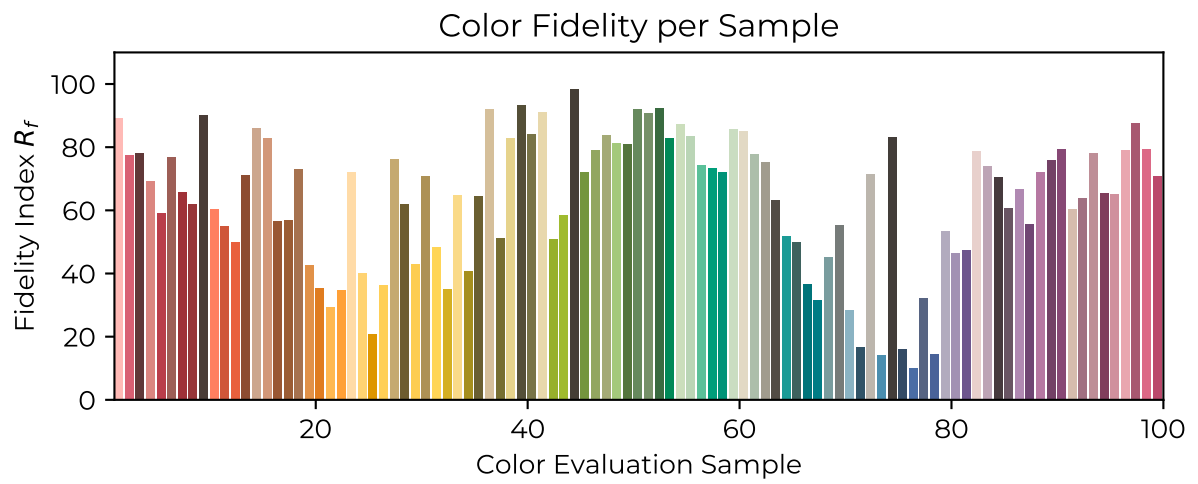


Figure 8: Measured Spectral Power Distribution of light source. White Chip

## 2.1 TM-30-15 Detail Plots

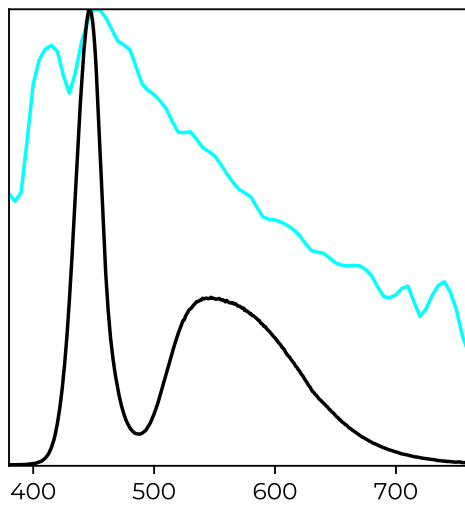
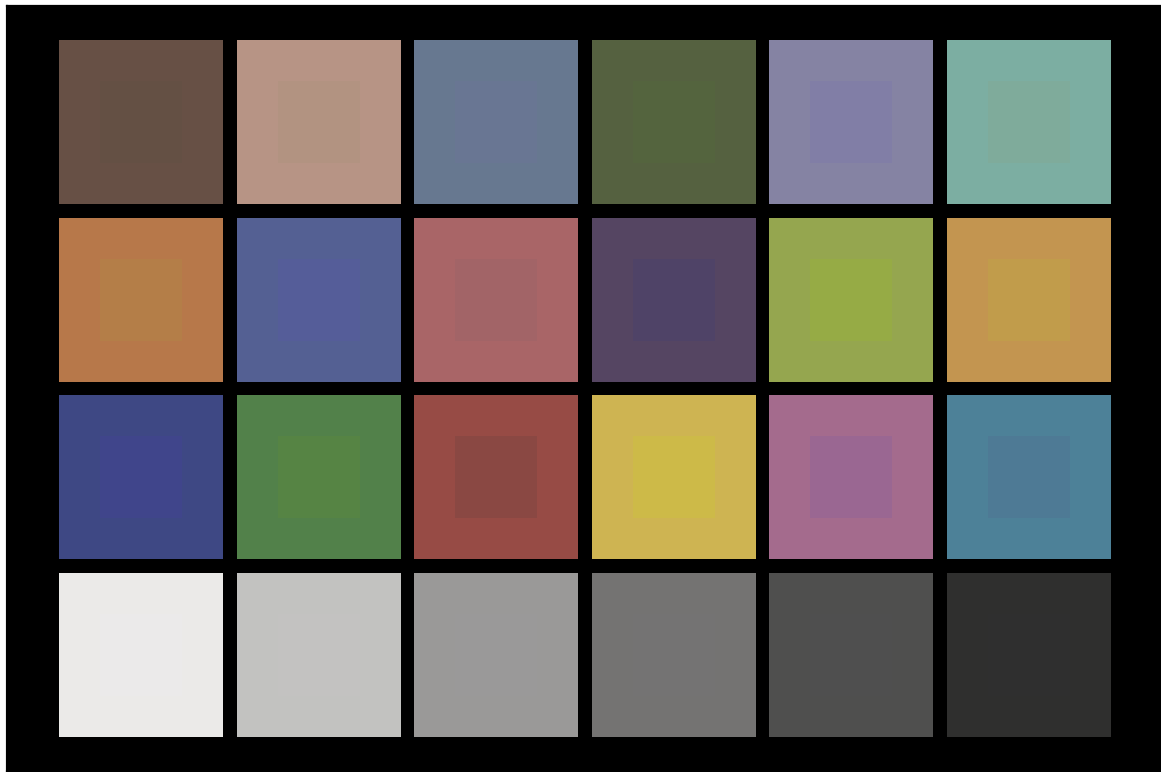






## 2.2 TLCI-2012 Results

FUSION Exo Wash 30 White Chip : CCT = D9383 -2.6, TLCI = 44



| Sector | Lightness | Chroma | Hue |
|--------|-----------|--------|-----|
| R      | 5         | 5      | 5   |
| R/Y    | 2         | 2      | 2   |
| Y      | 5         | 5      | 5   |
| Y/G    | 3         | 3      | 3   |
| G      | 4         | 4      | 4   |
| G/C    | 4         | 4      | 4   |
| C      | 6         | 6      | 6   |
| C/B    | 8         | 8      | 8   |
| B      | 4         | 4      | 4   |
| B/M    | 5         | 5      | 5   |
| M      | 8         | 8      | 8   |
| M/R    | 6         | 6      | 6   |

### 3 Colors

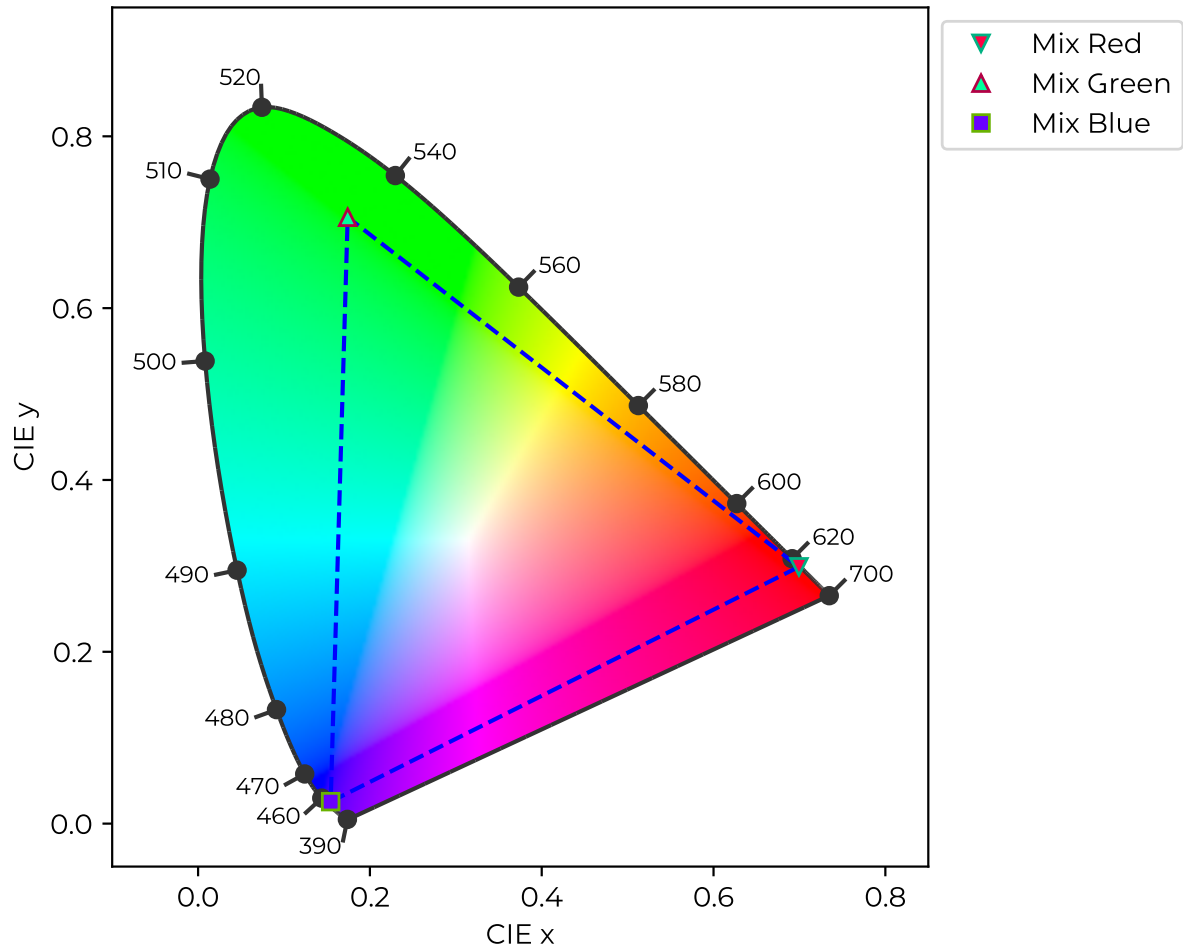





Figure 9: Chromaticity coordinates of device colors in a CIE 1931 chromaticity diagram. Gamut of color mixing system is outlined with dashed lines.

Table 14: Chromaticity coordinates for figure 9, in CIE 1931 xy and CIE 1960 UCS uv coordinates. Color swatches are illustrative only, limited by screen and print color space. Color appearance will be different when used for illumination.

| Color   | xy            | uv            |
|---|---------------|---------------|
|  Mix Red   | 0.699, 0.299  | 0.539, 0.346  |
|  Mix Green | 0.174, 0.706  | 0.0626, 0.381 |
|  Mix Blue  | 0.154, 0.0256 | 0.206, 0.0512 |