# LM-79-08 Test Report

For

# RAB LIGHTING INC

## (Brand Name: N/A)

170 Ludlow Ave,PO BOX 970,Northvale, NJ 07647-2305 USA

# Model name(s): DLW0097(FWAFER6)

| | |
|---|---|
| **Report Type:** | Testing and Report According to IES LM-79-2008 |
| **Type of Luminaire:** | Downlights |
| **Report Date:** | 2023-04-11 |

**Prepared By:**

Test & Report By:

Engineer: Sun Fangfang

Review By:

Manager: Huang Qichong

| 1.1 Rated Values: | |
|---|---|
| Rated Voltage / Frequency | 120Vac, 60 Hz |
| Nominal Power | 15.0 W |
| Rated Initial Lamp Lumen | 1250 lm |
| Declared CCT | 2700K/3000K/3500K/4000K/5000K |

## 1.2 Test Specifications:

| | |
|---|---|
| Test item | 1. Total Luminous Flux<br>2. Luminous Distribution Intensity<br>3. Luminous Efficacy<br>4. Correlated Color Temperature<br>5. Color Rendering Index<br>6. Chromaticity Coordinate<br>7. Electrical Parameters |
| Reference Standard | 1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products<br>2. ANSI C78.377-2015 Specifications for the Chromaticity of Solid State Lighting Products<br>3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources<br>4. CIE 15-2004 Technical Report Colorimetry<br>5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source<br>6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems |
| Reference Work Instruction | QD25 |

## 1.3 Test Methods

**1) Photometric and Light Distribution Measurement – Goniophotometer Method:**

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at 25°C ±1°C, measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1°vertical intervals and 22.5°horizontal intervals.

**2) Chromaticity Measurement – Sphere-Spectroradiometer Method:**

Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25ºC ±1ºC. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.

**3) Electrical Measurements:**

Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at 25ºC ±1ºC. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

## 2.1.1 Electrical, Photometric and Chromaticity Measurements

| Test date | 2023-04-07 | Test Ambient: | 25.3 ºC |
|---|---|---|---|
| Test Orientation | As intended | Stabilization Time (min) | 90 |
| Model Number | DLW0097(FWAFER6) | 2700K | |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor |
|---|---|---|---|---|---|
| 202304060013 | 120.0 | 60 | 0.122 | 14.4 | 0.989 |

### Chromaticity Measurement - Sphere-Spectroradiometer Method:

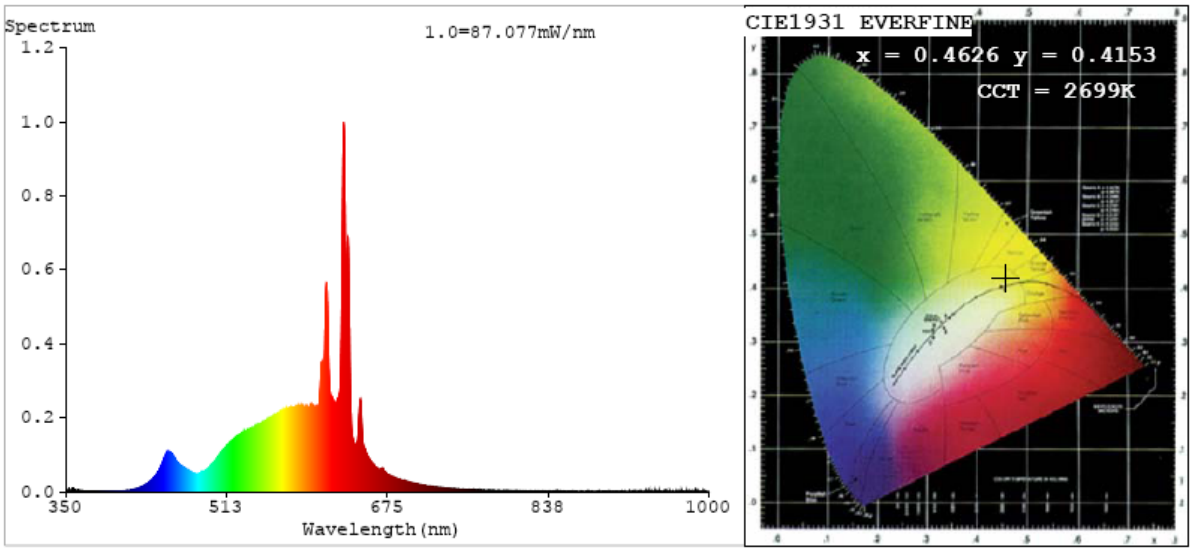
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120 |
| Frequency (Hz) | 60 |
| CCT (K) | 2699 |
| Duv | 0.0015 |
| Chromaticity (x, y) | x=0.4626 y=0.4153 |
| Chromaticity (u', v') | u'=0.2621 v'=0.5295 |
| Color Rendering Index (CRI) | 93.7 |
| R9 | 64 |

| Special Color Rendering Indices | | | |
|---|---|---|---|
| R1 | 96 | R9 | 64 |
| R2 | 96 | R10 | 86 |
| R3 | 93 | R11 | 96 |
| R4 | 96 | R12 | 80 |
| R5 | 94 | R13 | 95 |
| R6 | 96 | R14 | 94 |
| R7 | 94 | R15 | 91 |
| R8 | 85 | -- | -- |

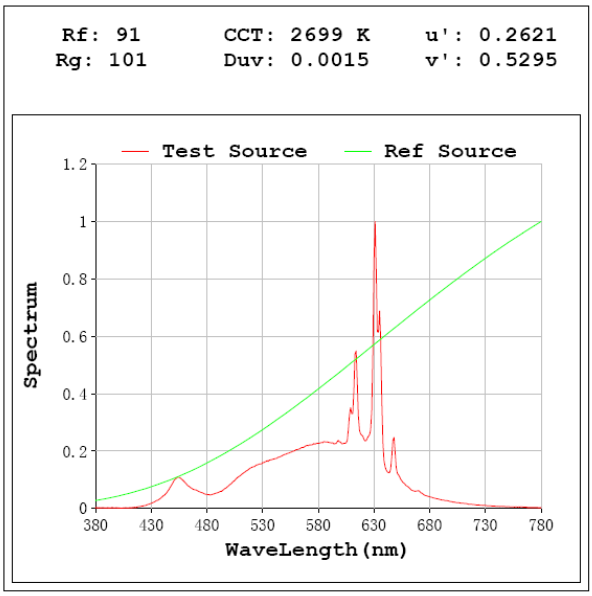
### Photometric Measurement – Goniophotometer Method:

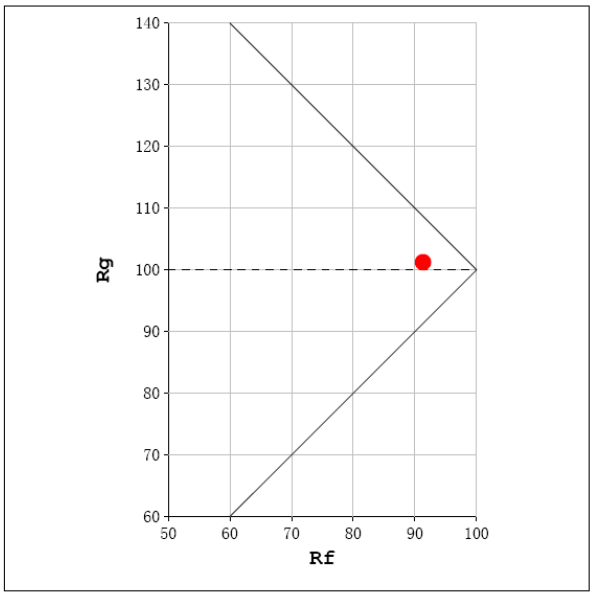
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120.0 |
| Frequency (Hz) | 60 |
| Total Luminous (lm) | 1270.3 |
| Luminous Efficacy (lm/W) | 88.21 |
| Beam Angle (°) | 110.2 |
| Center Beam Candle Power (cd) | 455.7 |

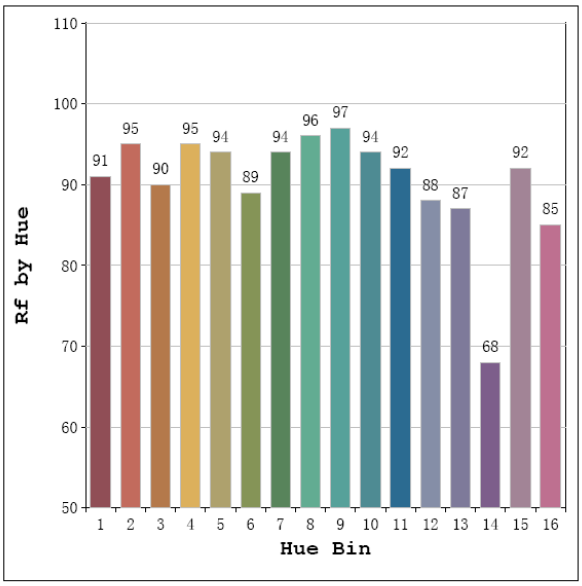
## Spectral Power Distribution & Chromaticity Diagram

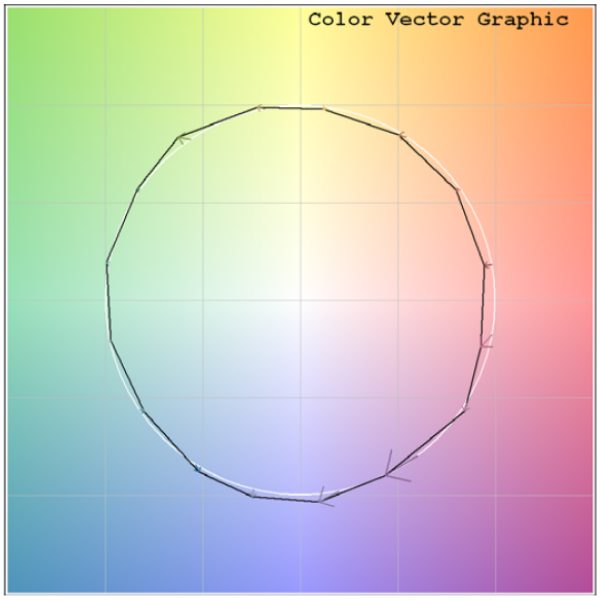



## TM30



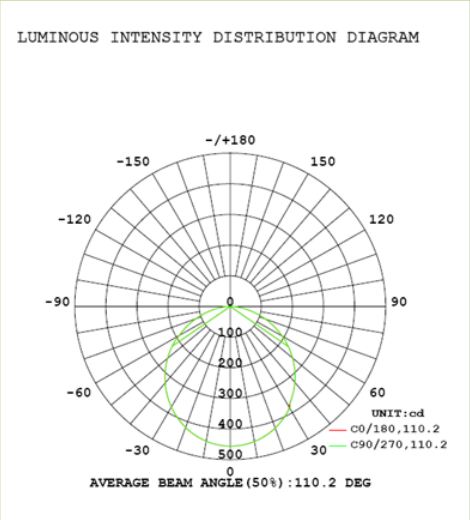



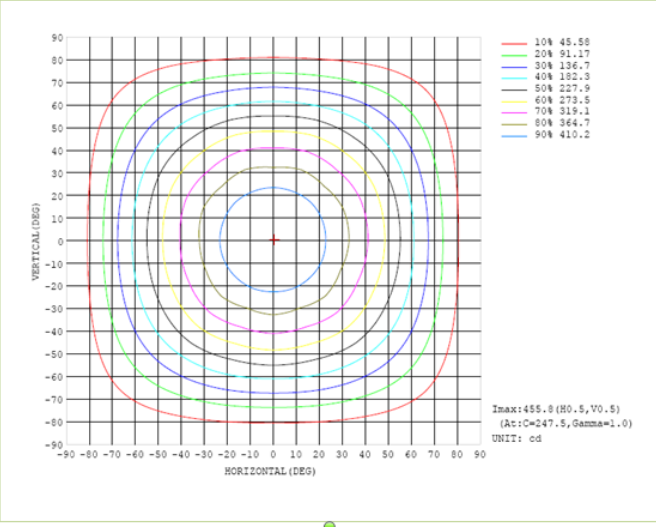
## Zonal Lumen Tabulation

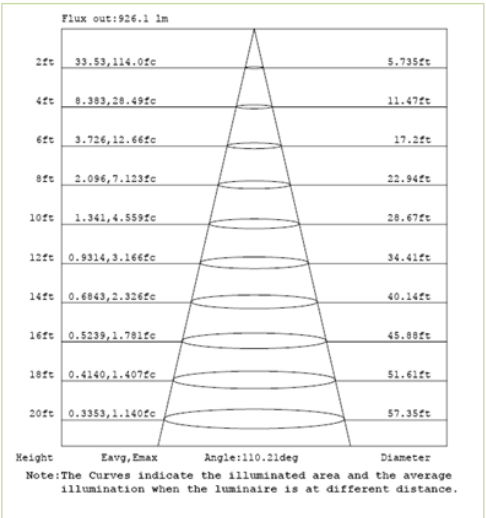
| Zonal Lumen Summary | | |
|---|---|---|
| Zone | Lumens | % Luminaire |
| 0-30 | 351.5 | 27.7% |
| 0-40 | 571.9 | 45.0% |
| 0-60 | 1003.1 | 79.0% |
| 60-90 | 267.2 | 21.0% |
| 70-100 | 113.4 | 8.9% |
| 90-120 | 0.0 | 0.0% |
| 0-90 | 1270.3 | 100.0% |
| 90-180 | 0.0 | 0.0% |
| 0-180 | 1270.3 | 100.0% |

| Lumens Per Zone | | | | | |
|---|---|---|---|---|---|
| Zone | Lumens | % Total | Zone | Lumens | % Total |
| 0-10 | 43.1 | 3.4% | 90-100 | 0.0 | 0.0% |
| 10-20 | 123.0 | 9.7% | 100-110 | 0.0 | 0.0% |
| 20-30 | 185.4 | 14.6% | 110-120 | 0.0 | 0.0% |
| 30-40 | 220.4 | 17.3% | 120-130 | 0.0 | 0.0% |
| 40-50 | 227.2 | 17.9% | 130-140 | 0.0 | 0.0% |
| 50-60 | 204.1 | 16.1% | 140-150 | 0.0 | 0.0% |
| 60-70 | 153.8 | 12.1% | 150-160 | 0.0 | 0.0% |
| 70-80 | 88.5 | 7.0% | 160-170 | 0.0 | 0.0% |
| 80-90 | 24.9 | 2.0% | 170-180 | 0.0 | 0.0% |

## Photometric Data



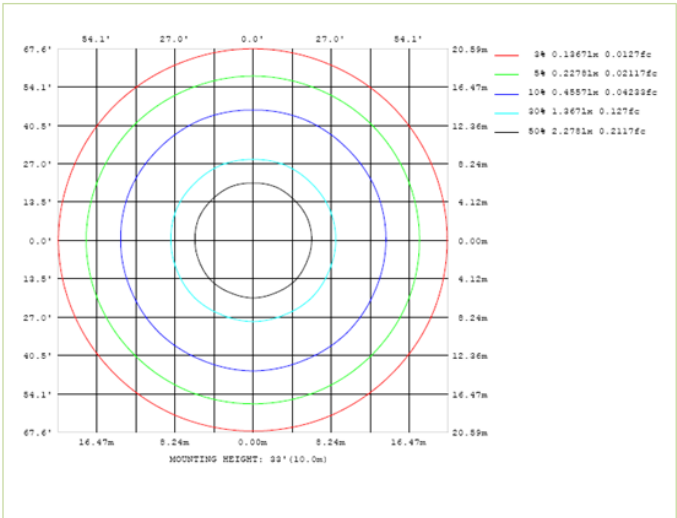



Table--1 UNIT: cd

| γ (DEG) \ C (DEG) | 0 | 22.5 | 45 | 67.5 | 90 | 112.5 | 135 | 157.5 | 180 | 202.5 | 225 | 247.5 | 270 | 292.5 | 315 | 337.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 | 456 |
| 5 | 453 | 453 | 453 | 453 | 453 | 453 | 453 | 453 | 454 | 454 | 454 | 454 | 454 | 454 | 454 | 453 |
| 10 | 446 | 446 | 446 | 446 | 446 | 446 | 446 | 447 | 447 | 447 | 448 | 448 | 448 | 447 | 447 | 447 |
| 15 | 435 | 435 | 435 | 435 | 435 | 435 | 435 | 436 | 437 | 437 | 437 | 437 | 437 | 436 | 437 | 436 |
| 20 | 420 | 421 | 420 | 420 | 420 | 420 | 420 | 421 | 422 | 422 | 423 | 422 | 423 | 422 | 422 | 421 |
| 25 | 401 | 402 | 401 | 402 | 401 | 402 | 401 | 402 | 404 | 403 | 404 | 404 | 404 | 403 | 403 | 403 |
| 30 | 379 | 377 | 379 | 376 | 379 | 376 | 379 | 377 | 378 | 381 | 383 | 382 | 384 | 381 | 378 | 380 |
| 35 | 354 | 349 | 354 | 348 | 353 | 348 | 353 | 349 | 350 | 356 | 351 | 357 | 351 | 356 | 350 | 355 |
| 40 | 326 | 321 | 326 | 321 | 325 | 321 | 326 | 321 | 323 | 328 | 324 | 329 | 324 | 328 | 323 | 327 |
| 45 | 296 | 291 | 296 | 291 | 295 | 291 | 295 | 291 | 293 | 298 | 294 | 299 | 294 | 298 | 293 | 297 |
| 50 | 264 | 260 | 263 | 259 | 263 | 259 | 263 | 260 | 261 | 266 | 262 | 266 | 262 | 266 | 261 | 265 |
| 55 | 230 | 226 | 229 | 226 | 229 | 225 | 229 | 226 | 228 | 231 | 228 | 232 | 229 | 231 | 228 | 231 |
| 60 | 190 | 191 | 190 | 191 | 190 | 190 | 190 | 191 | 193 | 192 | 193 | 193 | 193 | 192 | 193 | 192 |
| 65 | 154 | 155 | 154 | 155 | 154 | 155 | 154 | 155 | 156 | 156 | 157 | 156 | 157 | 156 | 157 | 156 |
| 70 | 118 | 119 | 118 | 119 | 118 | 118 | 118 | 119 | 120 | 119 | 120 | 120 | 120 | 119 | 120 | 119 |
| 75 | 82.7 | 83.6 | 82.6 | 83.3 | 82.2 | 83.0 | 82.2 | 83.2 | 84.3 | 83.7 | 84.6 | 83.9 | 84.7 | 83.8 | 84.6 | 83.8 |
| 80 | 49.6 | 50.3 | 49.4 | 49.9 | 49.0 | 49.6 | 49.0 | 49.9 | 51.0 | 50.4 | 51.3 | 50.6 | 51.4 | 50.6 | 51.4 | 50.6 |
| 85 | 20.5 | 20.9 | 20.1 | 20.5 | 19.7 | 20.2 | 19.8 | 20.7 | 21.7 | 21.3 | 22.1 | 21.7 | 22.4 | 21.8 | 22.4 | 21.7 |
| 90 | 2.44 | 2.43 | 2.39 | 2.34 | 2.29 | 2.18 | 2.15 | 2.13 | 2.46 | 2.59 | 2.62 | 2.84 | 2.90 | 3.03 | 2.90 | 2.83 |

## 2.1.2 Electrical, Photometric and Chromaticity Measurements

| Test date | 2023-04-07 | Test Ambient: | 25.3 ºC |
|---|---|---|---|
| Test Orientation | As intended | Stabilization Time (min) | 90 |
| Model Number | DLW0097(FWAFER6) | 3000K | |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor |
|---|---|---|---|---|---|
| 202304060013 | 120.0 | 60 | 0.121 | 14.3 | 0.989 |

### Chromaticity Measurement - Sphere-Spectroradiometer Method:

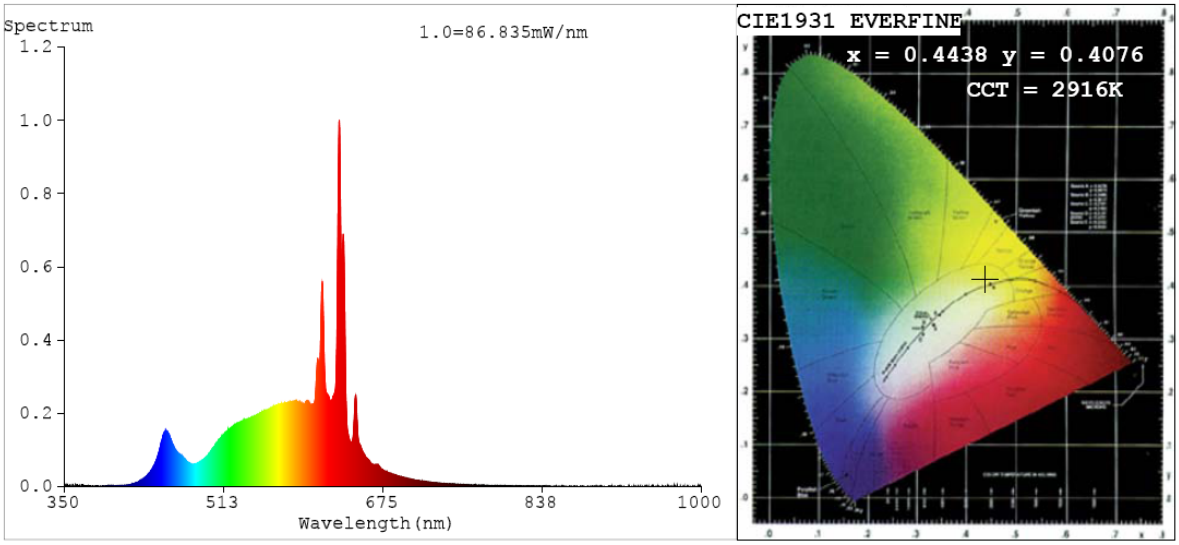
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120 |
| Frequency (Hz) | 60 |
| CCT (K) | 2916 |
| Duv | 0.0005 |
| Chromaticity (x, y) | x=0.4438 y=0.4076 |
| Chromaticity (u', v') | u'=0.2535 v'=0.5238 |
| Color Rendering Index (CRI) | 95.4 |
| R9 | 73 |

| Special Color Rendering Indices | | | |
|---|---|---|---|
| R1 | 98 | R9 | 73 |
| R2 | 97 | R10 | 89 |
| R3 | 94 | R11 | 97 |
| R4 | 97 | R12 | 80 |
| R5 | 96 | R13 | 97 |
| R6 | 97 | R14 | 95 |
| R7 | 95 | R15 | 94 |
| R8 | 90 | -- | -- |

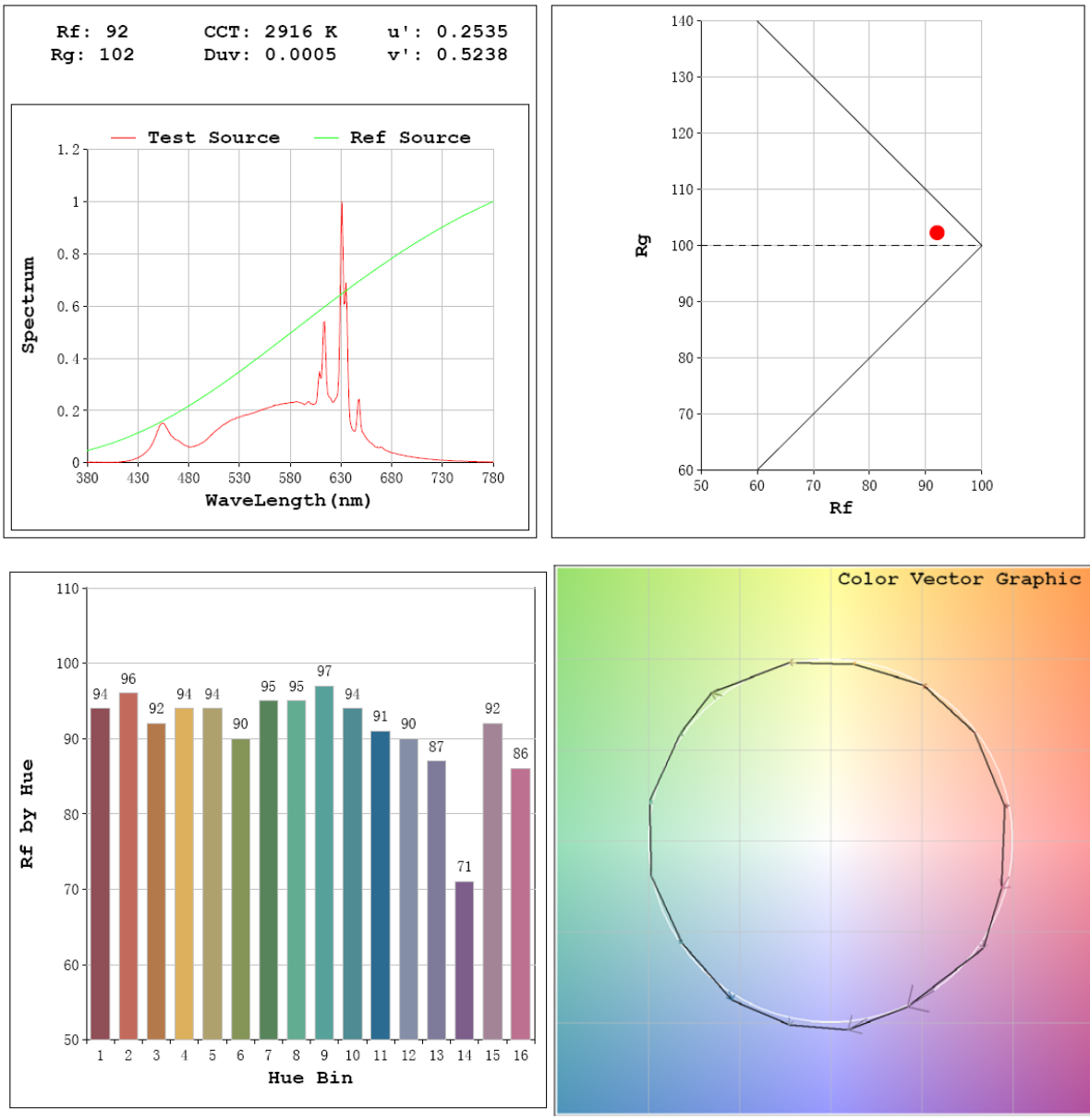
### Photometric Measurement – Goniophotometer Method:

| Parameter | Result |
|---|---|
| Test Voltage (V) | 120.0 |
| Frequency (Hz) | 60 |
| Total Luminous (lm) | 1313.5 |
| Luminous Efficacy (lm/W) | 91.85 |
| Beam Angle (°) | 110.2 |
| Center Beam Candle Power (cd) | 470.9 |

## Spectral Power Distribution & Chromaticity Diagram




## TM30

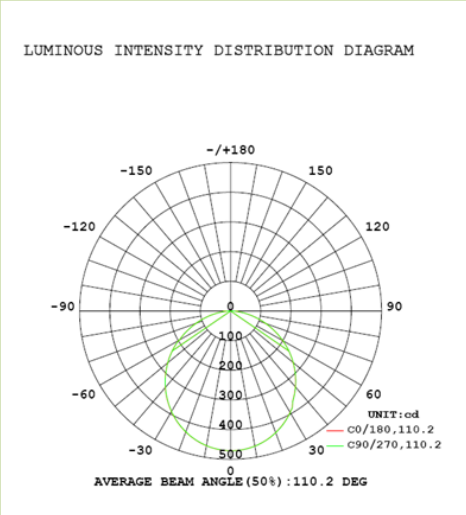


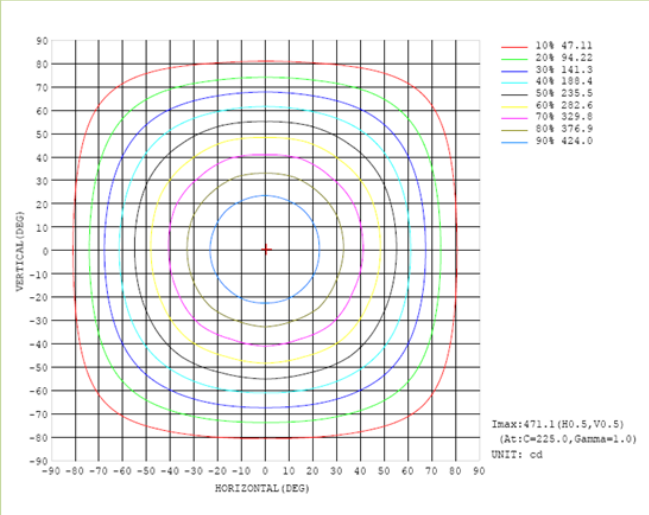
## Zonal Lumen Tabulation

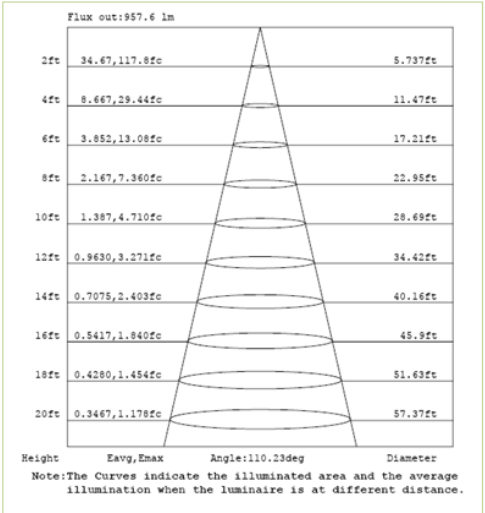
| Zonal Lumen Summary | | |
|---|---|---|
| Zone | Lumens | % Luminaire |
| 0-30 | 363.2 | 27.7% |
| 0-40 | 591.4 | 45.0% |
| 0-60 | 1037.2 | 79.0% |
| 60-90 | 276.2 | 21.0% |
| 70-100 | 117.2 | 8.9% |
| 90-120 | 0.0 | 0.0% |
| 0-90 | 1313.5 | 100.0% |
| 90-180 | 0.0 | 0.0% |
| 0-180 | 1313.5 | 100.0% |

| Lumens Per Zone | | | | | |
|---|---|---|---|---|---|
| Zone | Lumens | % Total | Zone | Lumens | % Total |
| 0-10 | 44.5 | 3.4% | 90-100 | 0.0 | 0.0% |
| 10-20 | 127.1 | 9.7% | 100-110 | 0.0 | 0.0% |
| 20-30 | 191.6 | 14.6% | 110-120 | 0.0 | 0.0% |
| 30-40 | 228.2 | 17.4% | 120-130 | 0.0 | 0.0% |
| 40-50 | 234.8 | 17.9% | 130-140 | 0.0 | 0.0% |
| 50-60 | 211.1 | 16.1% | 140-150 | 0.0 | 0.0% |
| 60-70 | 159.0 | 12.1% | 150-160 | 0.0 | 0.0% |
| 70-80 | 91.5 | 7.0% | 160-170 | 0.0 | 0.0% |
| 80-90 | 25.8 | 2.0% | 170-180 | 0.0 | 0.0% |

## Photometric Data



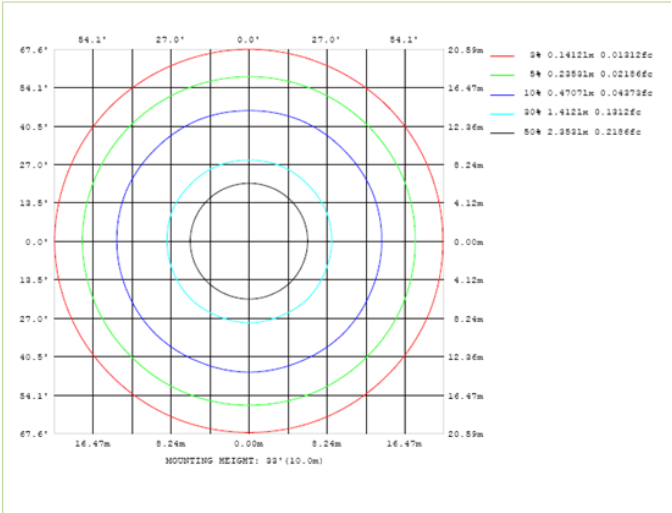



Table--1 UNIT: cd

| γ (DEG) \ C (DEG) | 0 | 22.5 | 45 | 67.5 | 90 | 112.5 | 135 | 157.5 | 180 | 202.5 | 225 | 247.5 | 270 | 292.5 | 315 | 337.5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | 471 | | | |
| 5 | 468 | 468 | 468 | 468 | 468 | 468 | 468 | 469 | 469 | 469 | 469 | 469 | 469 | 469 | 469 | 469 | | | |
| 10 | 461 | 461 | 461 | 461 | 461 | 461 | 461 | 462 | 462 | 462 | 463 | 462 | 463 | 462 | 462 | 462 | | | |
| 15 | 450 | 450 | 449 | 450 | 449 | 450 | 450 | 451 | 451 | 451 | 452 | 451 | 452 | 451 | 451 | 451 | | | |
| 20 | 434 | 434 | 434 | 434 | 433 | 434 | 434 | 435 | 436 | 436 | 437 | 436 | 436 | 436 | 436 | 435 | | | |
| 25 | 415 | 415 | 414 | 415 | 414 | 415 | 415 | 416 | 417 | 417 | 418 | 417 | 418 | 417 | 417 | 416 | | | |
| 30 | 392 | 393 | 391 | 392 | 391 | 392 | 392 | 393 | 394 | 394 | 396 | 395 | 395 | 394 | 394 | 393 | | | |
| 35 | 366 | 360 | 365 | 360 | 365 | 360 | 365 | 361 | 362 | 368 | 363 | 369 | 363 | 368 | 362 | 367 | | | |
| 40 | 337 | 332 | 337 | 332 | 336 | 331 | 336 | 332 | 334 | 340 | 335 | 340 | 335 | 339 | 334 | 338 | | | |
| 45 | 306 | 301 | 305 | 301 | 305 | 301 | 305 | 301 | 303 | 308 | 304 | 309 | 304 | 308 | 303 | 307 | | | |
| 50 | 272 | 268 | 272 | 268 | 272 | 268 | 272 | 268 | 270 | 275 | 271 | 275 | 271 | 274 | 270 | 274 | | | |
| 55 | 237 | 234 | 237 | 233 | 236 | 233 | 236 | 234 | 236 | 239 | 236 | 240 | 236 | 239 | 236 | 238 | | | |
| 60 | 196 | 198 | 196 | 197 | 196 | 197 | 196 | 197 | 199 | 200 | 200 | 201 | 200 | 200 | 199 | 200 | | | |
| 65 | 160 | 161 | 159 | 160 | 159 | 160 | 159 | 160 | 162 | 161 | 162 | 161 | 162 | 161 | 162 | 161 | | | |
| 70 | 122 | 123 | 122 | 123 | 121 | 122 | 122 | 123 | 124 | 123 | 125 | 124 | 124 | 123 | 124 | 123 | | | |
| 75 | 85.4 | 86.4 | 85.3 | 86.1 | 84.9 | 85.8 | 84.9 | 86.0 | 87.4 | 86.6 | 87.5 | 86.6 | 87.5 | 86.6 | 87.5 | 86.7 | | | |
| 80 | 51.2 | 52.0 | 51.0 | 51.6 | 50.5 | 51.3 | 50.5 | 51.6 | 52.9 | 52.2 | 53.1 | 52.4 | 53.2 | 52.5 | 53.3 | 52.3 | | | |
| 85 | 21.3 | 21.7 | 20.8 | 21.2 | 20.3 | 20.9 | 20.4 | 21.3 | 22.5 | 22.1 | 22.9 | 22.5 | 23.3 | 22.6 | 23.2 | 22.5 | | | |
| 90 | 2.53 | 2.50 | 2.47 | 2.40 | 2.37 | 2.23 | 2.22 | 2.19 | 2.52 | 2.66 | 2.73 | 2.94 | 3.02 | 3.14 | 3.01 | 2.92 | | | |

## 2.1.3 Electrical, Photometric and Chromaticity Measurements

| | | | |
|---|---|---|---|
| **Test date** | 2023-04-07 | **Test Ambient:** | 25.3 ºC |
| **Test Orientation** | As intended | **Stabilization Time (min)** | 90 |
| **Model Number** | DLW0097(FWAFER6) | 3500K | |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor |
|---|---|---|---|---|---|
| 202304060013 | 120.0 | 60 | 0.119 | 14.2 | 0.989 |

### Chromaticity Measurement - Sphere-Spectroradiometer Method:

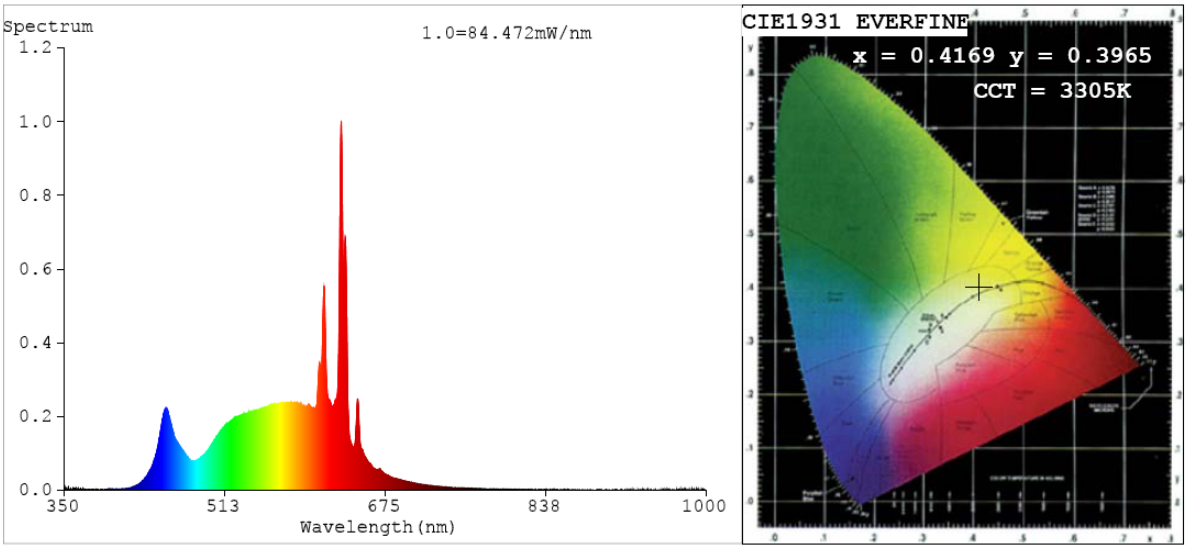
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120 |
| Frequency (Hz) | 60 |
| CCT (K) | 3305 |
| Duv | 0.0001 |
| Chromaticity (x, y) | x=0.4169 y=0.3965 |
| Chromaticity (u', v') | u'=0.2409 v'=0.5154 |
| Color Rendering Index (CRI) | 96.8 |
| R9 | 83 |

| Special Color Rendering Indices | | | |
|---|---|---|---|
| R1 | 99 | R9 | 83 |
| R2 | 98 | R10 | 91 |
| R3 | 93 | R11 | 96 |
| R4 | 98 | R12 | 78 |
| R5 | 98 | R13 | 99 |
| R6 | 96 | R14 | 95 |
| R7 | 97 | R15 | 97 |
| R8 | 95 | -- | -- |

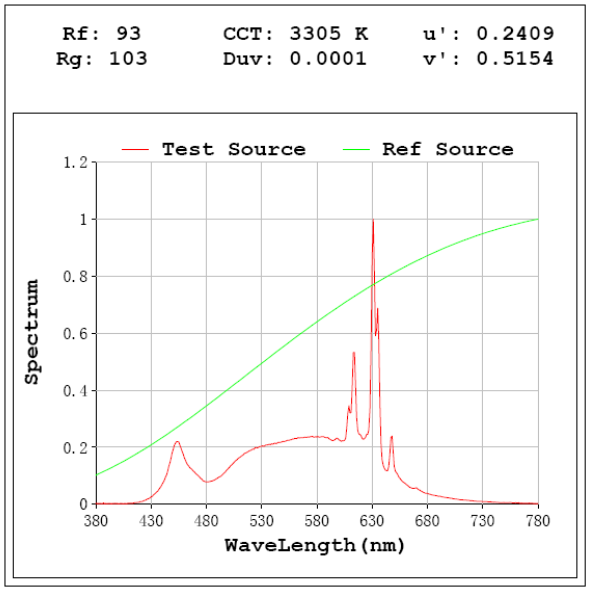
### Photometric Measurement – Goniophotometer Method:

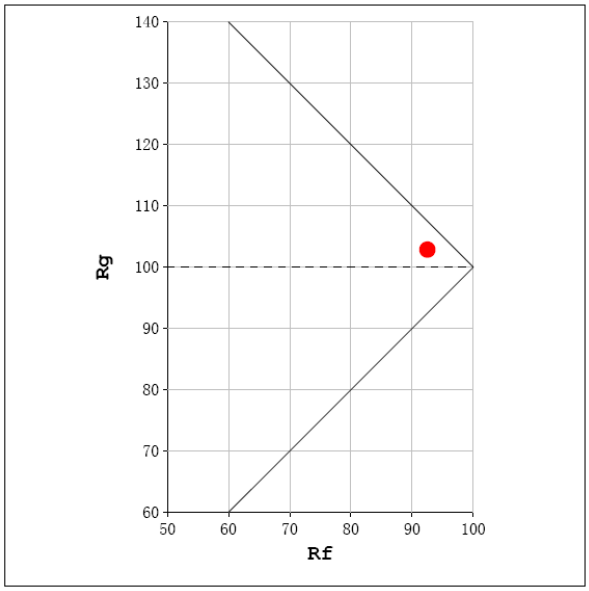
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120.0 |
| Frequency (Hz) | 60 |
| Total Luminous (lm) | 1364.4 |
| Luminous Efficacy (lm/W) | 96.08 |
| Beam Angle (°) | 110.3 |
| Center Beam Candle Power (cd) | 488.8 |

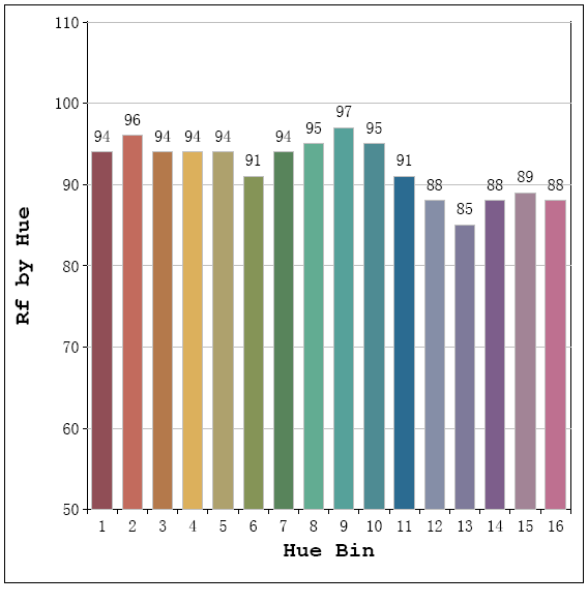
## Spectral Power Distribution & Chromaticity Diagram

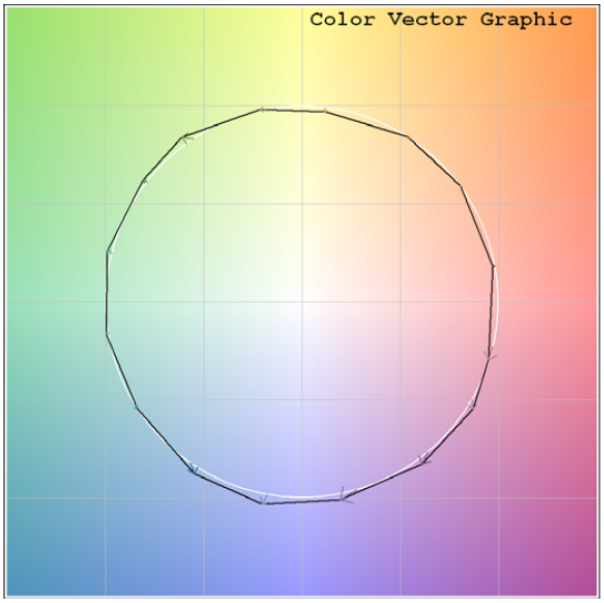



## TM30



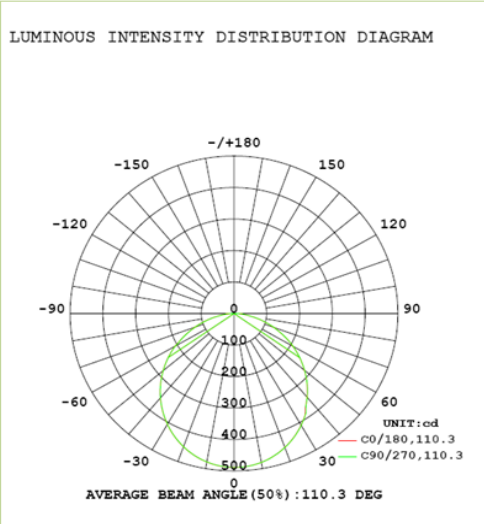



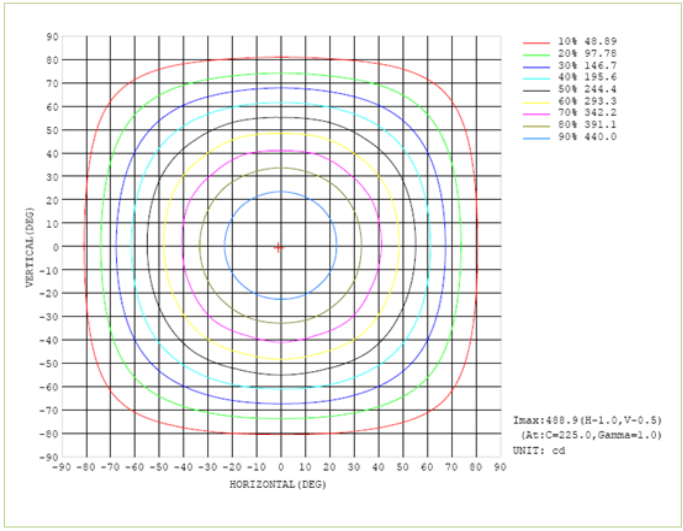
## Zonal Lumen Tabulation

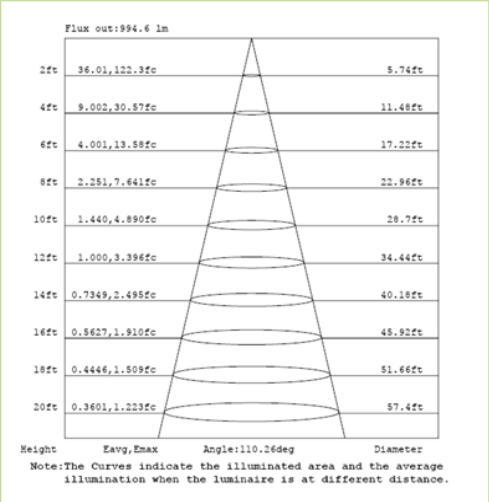
| Zonal Lumen Summary | | |
|---|---|---|
| Zone | Lumens | % Luminaire |
| 0-30 | 377.1 | 27.6% |
| 0-40 | 614.5 | 45.0% |
| 0-60 | 1077.4 | 79.0% |
| 60-90 | 286.9 | 21.0% |
| 70-100 | 121.7 | 8.9% |
| 90-120 | 0.0 | 0.0% |
| 0-90 | 1364.4 | 100.0% |
| 90-180 | 0.0 | 0.0% |
| 0-180 | 1364.4 | 100.0% |

| Lumens Per Zone | | | | | |
|---|---|---|---|---|---|
| Zone | Lumens | % Total | Zone | Lumens | % Total |
| 0-10 | 46.2 | 3.4% | 90-100 | 0.0 | 0.0% |
| 10-20 | 131.9 | 9.7% | 100-110 | 0.0 | 0.0% |
| 20-30 | 198.9 | 14.6% | 110-120 | 0.0 | 0.0% |
| 30-40 | 237.4 | 17.4% | 120-130 | 0.0 | 0.0% |
| 40-50 | 243.7 | 17.9% | 130-140 | 0.0 | 0.0% |
| 50-60 | 219.2 | 16.1% | 140-150 | 0.0 | 0.0% |
| 60-70 | 165.2 | 12.1% | 150-160 | 0.0 | 0.0% |
| 70-80 | 95.0 | 7.0% | 160-170 | 0.0 | 0.0% |
| 80-90 | 26.8 | 2.0% | 170-180 | 0.0 | 0.0% |

## Photometric Data



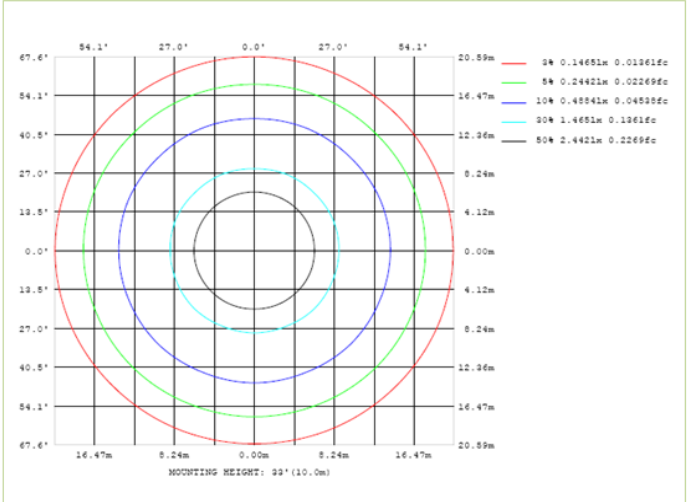



Table--1 UNIT: cd

| γ (DEG) \ C (DEG) | 0 | 22.5 | 45 | 67.5 | 90 | 112.5 | 135 | 157.5 | 180 | 202.5 | 225 | 247.5 | 270 | 292.5 | 315 | 337.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 | 489 |
| 5 | 486 | 486 | 486 | 486 | 486 | 486 | 486 | 486 | 487 | 487 | 487 | 487 | 487 | 486 | 487 | 486 |
| 10 | 479 | 479 | 478 | 479 | 478 | 479 | 479 | 479 | 480 | 480 | 480 | 480 | 480 | 480 | 480 | 479 |
| 15 | 467 | 467 | 466 | 467 | 466 | 467 | 467 | 468 | 468 | 468 | 469 | 469 | 469 | 468 | 468 | 468 |
| 20 | 451 | 451 | 450 | 451 | 450 | 451 | 451 | 452 | 453 | 453 | 453 | 453 | 453 | 452 | 452 | 452 |
| 25 | 430 | 431 | 430 | 431 | 430 | 431 | 431 | 432 | 433 | 433 | 434 | 433 | 433 | 432 | 432 | 432 |
| 30 | 407 | 407 | 406 | 407 | 406 | 407 | 407 | 408 | 410 | 409 | 410 | 410 | 410 | 409 | 409 | 408 |
| 35 | 380 | 377 | 379 | 377 | 379 | 377 | 379 | 378 | 379 | 382 | 384 | 383 | 384 | 382 | 379 | 381 |
| 40 | 350 | 345 | 349 | 344 | 349 | 344 | 350 | 345 | 347 | 352 | 348 | 353 | 347 | 352 | 346 | 351 |
| 45 | 317 | 313 | 317 | 312 | 317 | 312 | 317 | 313 | 315 | 320 | 316 | 320 | 315 | 320 | 315 | 319 |
| 50 | 283 | 279 | 282 | 278 | 282 | 278 | 282 | 279 | 281 | 285 | 281 | 285 | 281 | 285 | 280 | 284 |
| 55 | 246 | 243 | 246 | 242 | 246 | 242 | 246 | 243 | 245 | 248 | 245 | 249 | 245 | 248 | 245 | 248 |
| 60 | 208 | 205 | 208 | 205 | 208 | 205 | 208 | 205 | 207 | 210 | 207 | 210 | 207 | 210 | 207 | 209 |
| 65 | 166 | 167 | 166 | 166 | 165 | 166 | 165 | 166 | 168 | 167 | 168 | 168 | 169 | 167 | 168 | 167 |
| 70 | 127 | 128 | 127 | 128 | 126 | 127 | 126 | 127 | 129 | 128 | 129 | 128 | 129 | 128 | 129 | 128 |
| 75 | 88.9 | 89.7 | 88.7 | 89.4 | 88.4 | 89.1 | 88.3 | 89.3 | 90.7 | 89.8 | 90.8 | 90.0 | 90.8 | 89.9 | 90.9 | 89.9 |
| 80 | 53.2 | 54.0 | 53.0 | 53.6 | 52.5 | 53.3 | 52.6 | 53.6 | 54.8 | 54.2 | 55.1 | 54.4 | 55.2 | 54.4 | 55.2 | 54.4 |
| 85 | 22.2 | 22.5 | 21.6 | 22.0 | 21.2 | 21.7 | 21.2 | 22.1 | 23.3 | 23.0 | 23.8 | 23.4 | 24.1 | 23.5 | 24.1 | 23.3 |
| 90 | 2.64 | 2.60 | 2.57 | 2.49 | 2.46 | 2.32 | 2.30 | 2.28 | 2.62 | 2.78 | 2.82 | 3.05 | 3.12 | 3.25 | 3.12 | 3.03 |

## 2.1.4 Electrical, Photometric and Chromaticity Measurements

| Test date | 2023-04-07 | Test Ambient: | 25.3 ºC |
|---|---|---|---|
| Test Orientation | As intended | Stabilization Time (min) | 90 |
| Model Number | DLW0097(FWAFER6) | 4000K | |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor |
|---|---|---|---|---|---|
| 202304060013 | 120.0 | 60 | 0.12 | 14.2 | 0.989 |

### Chromaticity Measurement - Sphere-Spectroradiometer Method:

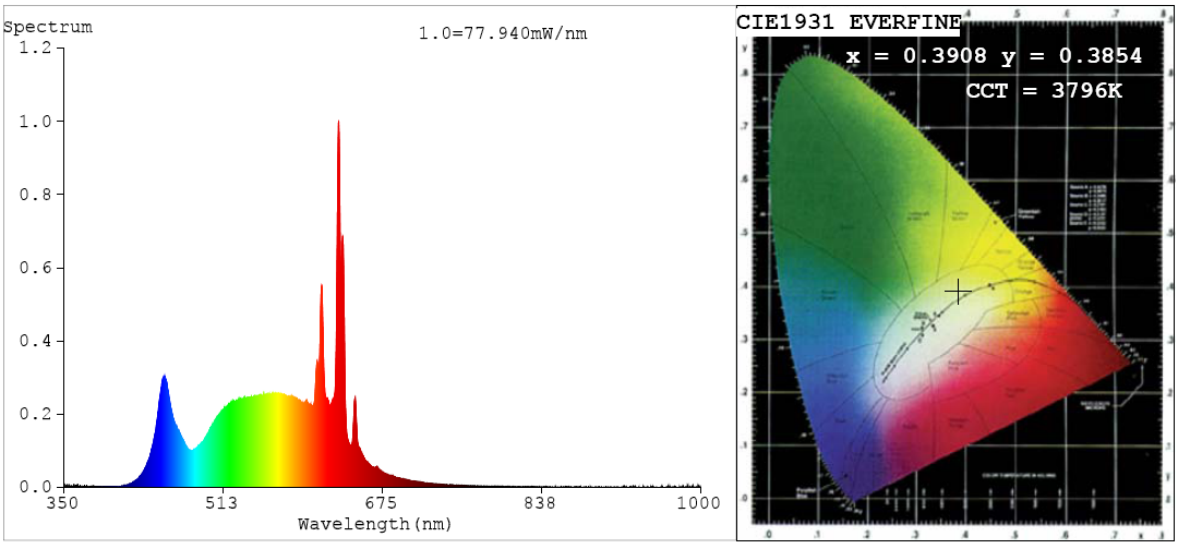
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120 |
| Frequency (Hz) | 60 |
| CCT (K) | 3796 |
| Duv | 0.0011 |
| Chromaticity (x, y) | x=0.3908 y=0.3854 |
| Chromaticity (u', v') | u'=0.2284 v'=0.5069 |
| Color Rendering Index (CRI) | 97.1 |
| R9 | 90 |

| Special Color Rendering Indices | | | |
|---|---|---|---|
| R1 | 99 | R9 | 90 |
| R2 | 97 | R10 | 91 |
| R3 | 92 | R11 | 96 |
| R4 | 98 | R12 | 75 |
| R5 | 98 | R13 | 99 |
| R6 | 96 | R14 | 94 |
| R7 | 99 | R15 | 98 |
| R8 | 98 | -- | -- |

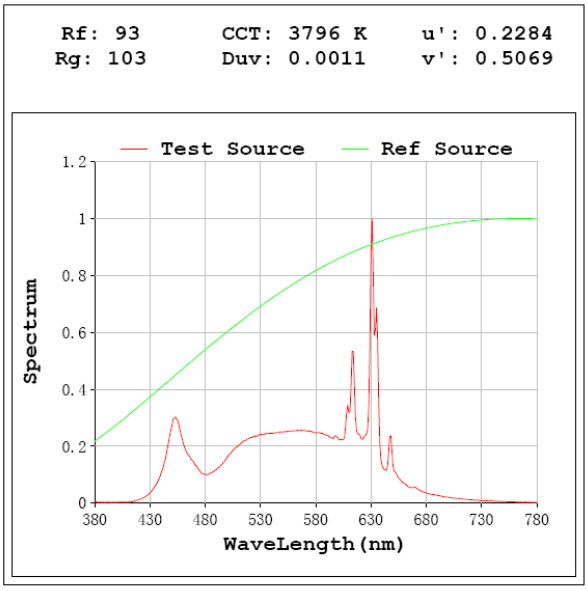
### Photometric Measurement – Goniophotometer Method:

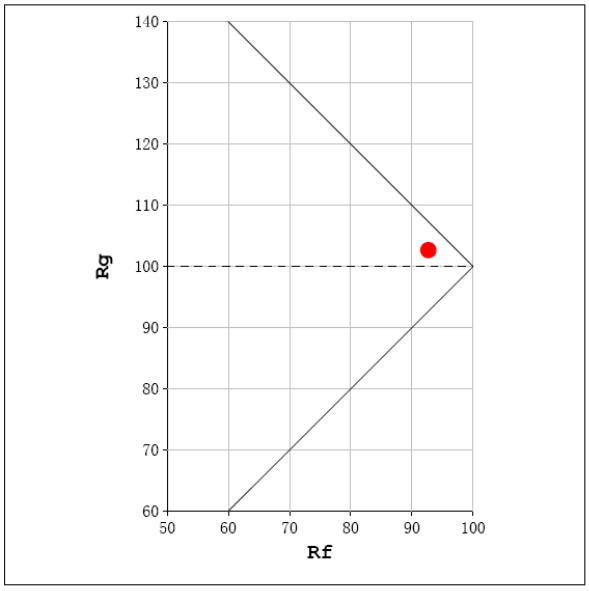
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120.0 |
| Frequency (Hz) | 60 |
| Total Luminous (lm) | 1378 |
| Luminous Efficacy (lm/W) | 97.04 |
| Beam Angle (°) | 110.3 |
| Center Beam Candle Power (cd) | 493.5 |

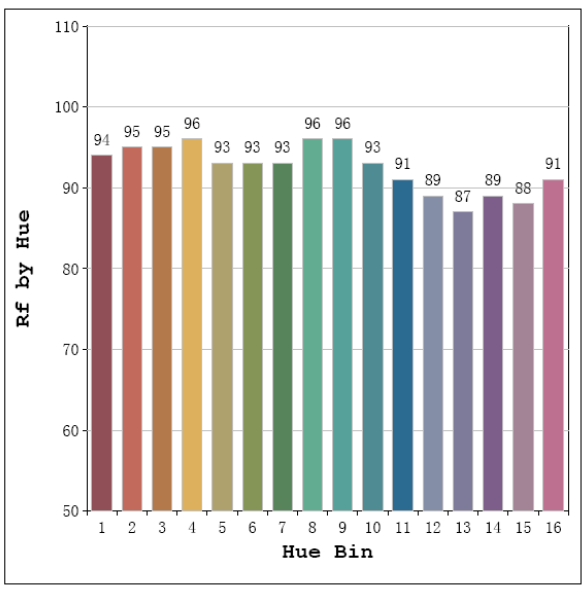
## Spectral Power Distribution & Chromaticity Diagram

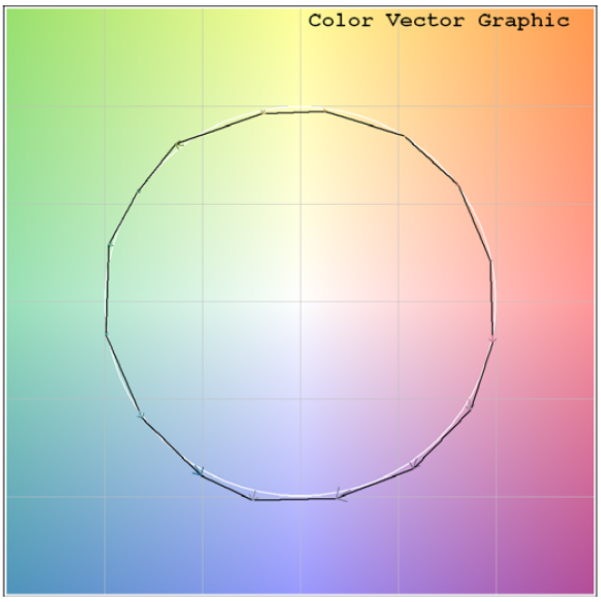



## TM30



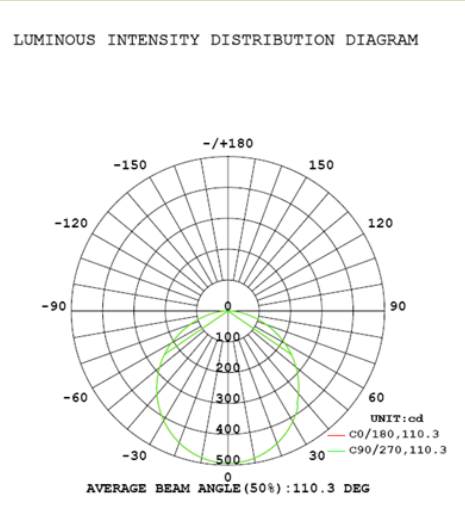



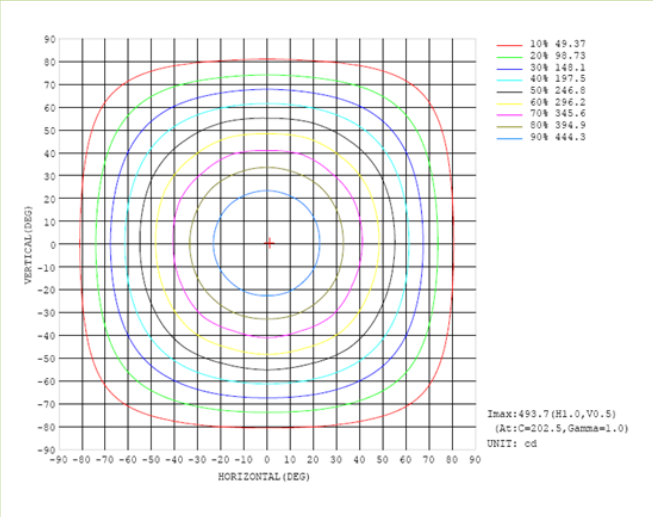
## Zonal Lumen Tabulation

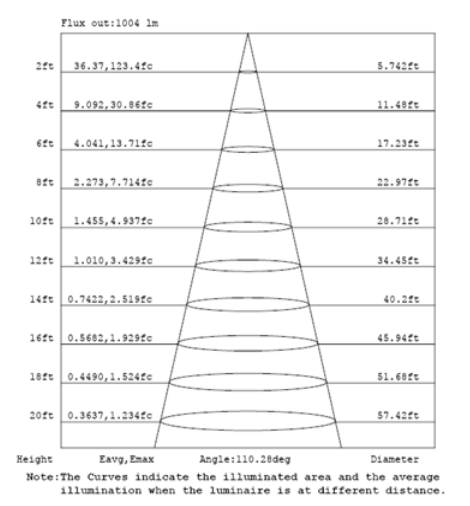
| Zonal Lumen Summary | | |
|---|---|---|
| Zone | Lumens | % Luminaire |
| 0-30 | 380.7 | 27.6% |
| 0-40 | 620.6 | 45.0% |
| 0-60 | 1088.1 | 79.0% |
| 60-90 | 289.9 | 21.0% |
| 70-100 | 123.0 | 8.9% |
| 90-120 | 0.0 | 0.0% |
| 0-90 | 1378.0 | 100.0% |
| 90-180 | 0.0 | 0.0% |
| 0-180 | 1378.0 | 100.0% |

| Lumens Per Zone | | | | | |
|---|---|---|---|---|---|
| Zone | Lumens | % Total | Zone | Lumens | % Total |
| 0-10 | 46.6 | 3.4% | 90-100 | 0.0 | 0.0% |
| 10-20 | 133.2 | 9.7% | 100-110 | 0.0 | 0.0% |
| 20-30 | 200.8 | 14.6% | 110-120 | 0.0 | 0.0% |
| 30-40 | 239.9 | 17.4% | 120-130 | 0.0 | 0.0% |
| 40-50 | 246.2 | 17.9% | 130-140 | 0.0 | 0.0% |
| 50-60 | 221.4 | 16.1% | 140-150 | 0.0 | 0.0% |
| 60-70 | 166.9 | 12.1% | 150-160 | 0.0 | 0.0% |
| 70-80 | 95.9 | 7.0% | 160-170 | 0.0 | 0.0% |
| 80-90 | 27.0 | 2.0% | 170-180 | 0.0 | 0.0% |

## Photometric Data



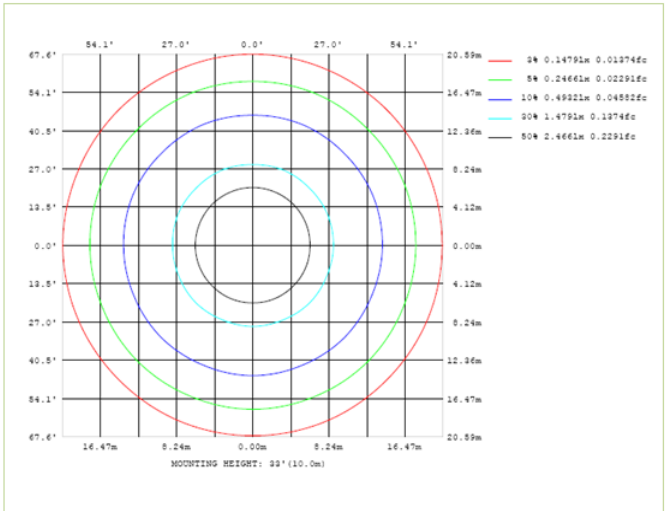



Table--1 UNIT: cd

| γ (DEG) \ C (DEG) | 0 | 22.5 | 45 | 67.5 | 90 | 112.5 | 135 | 157.5 | 180 | 202.5 | 225 | 247.5 | 270 | 292.5 | 315 | 337.5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | 493 | | | |
| 5 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | 491 | | | |
| 10 | 483 | 483 | 483 | 483 | 483 | 483 | 483 | 484 | 484 | 484 | 485 | 484 | 485 | 484 | 484 | 484 | | | |
| 15 | 471 | 472 | 471 | 471 | 471 | 472 | 471 | 472 | 473 | 473 | 473 | 473 | 473 | 473 | 473 | 472 | | | |
| 20 | 455 | 455 | 455 | 455 | 455 | 455 | 455 | 456 | 457 | 457 | 458 | 457 | 457 | 456 | 457 | 456 | | | |
| 25 | 435 | 435 | 434 | 435 | 434 | 435 | 435 | 436 | 437 | 437 | 438 | 437 | 438 | 437 | 437 | 436 | | | |
| 30 | 411 | 411 | 410 | 411 | 410 | 411 | 411 | 412 | 413 | 413 | 414 | 413 | 414 | 413 | 413 | 412 | | | |
| 35 | 383 | 385 | 383 | 384 | 383 | 384 | 383 | 385 | 387 | 386 | 387 | 386 | 387 | 386 | 386 | 385 | | | |
| 40 | 353 | 348 | 353 | 348 | 353 | 348 | 353 | 348 | 350 | 356 | 351 | 356 | 351 | 355 | 350 | 355 | | | |
| 45 | 321 | 316 | 320 | 315 | 320 | 315 | 320 | 316 | 318 | 323 | 319 | 323 | 318 | 323 | 318 | 322 | | | |
| 50 | 286 | 281 | 285 | 281 | 285 | 281 | 285 | 282 | 283 | 288 | 284 | 288 | 284 | 288 | 283 | 287 | | | |
| 55 | 249 | 245 | 248 | 245 | 248 | 245 | 248 | 245 | 247 | 251 | 248 | 251 | 248 | 251 | 247 | 250 | | | |
| 60 | 210 | 207 | 210 | 207 | 210 | 207 | 210 | 207 | 209 | 212 | 210 | 212 | 209 | 212 | 209 | 212 | | | |
| 65 | 167 | 168 | 167 | 168 | 167 | 168 | 167 | 168 | 170 | 169 | 170 | 169 | 170 | 169 | 170 | 169 | | | |
| 70 | 128 | 129 | 128 | 129 | 128 | 129 | 128 | 129 | 130 | 129 | 130 | 130 | 131 | 129 | 130 | 129 | | | |
| 75 | 89.8 | 90.6 | 89.5 | 90.3 | 89.2 | 90.0 | 89.2 | 90.2 | 91.5 | 90.8 | 91.8 | 90.8 | 91.8 | 90.9 | 91.7 | 90.9 | | | |
| 80 | 53.8 | 54.6 | 53.5 | 54.2 | 53.1 | 53.9 | 53.1 | 54.2 | 55.4 | 54.7 | 55.6 | 54.9 | 55.7 | 54.9 | 55.8 | 54.9 | | | |
| 85 | 22.4 | 22.7 | 21.8 | 22.2 | 21.4 | 21.9 | 21.5 | 22.4 | 23.6 | 23.2 | 24.0 | 23.6 | 24.3 | 23.7 | 24.3 | 23.6 | | | |
| 90 | 2.66 | 2.61 | 2.60 | 2.50 | 2.47 | 2.34 | 2.32 | 2.28 | 2.66 | 2.79 | 2.84 | 3.06 | 3.16 | 3.27 | 3.15 | 3.05 | | | |

## 2.1.5 Electrical, Photometric and Chromaticity Measurements

| | | | |
|---|---|---|---|
| **Test date** | 2023-04-07 | **Test Ambient:** | 25.3 ºC |
| **Test Orientation** | As intended | **Stabilization Time (min)** | 90 |
| **Model Number** | DLW0097(FWAFER6) | 5000K | |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor |
|---|---|---|---|---|---|
| 202304060013 | 120.0 | 60 | 0.122 | 14.4 | 0.989 |

### Chromaticity Measurement - Sphere-Spectroradiometer Method:

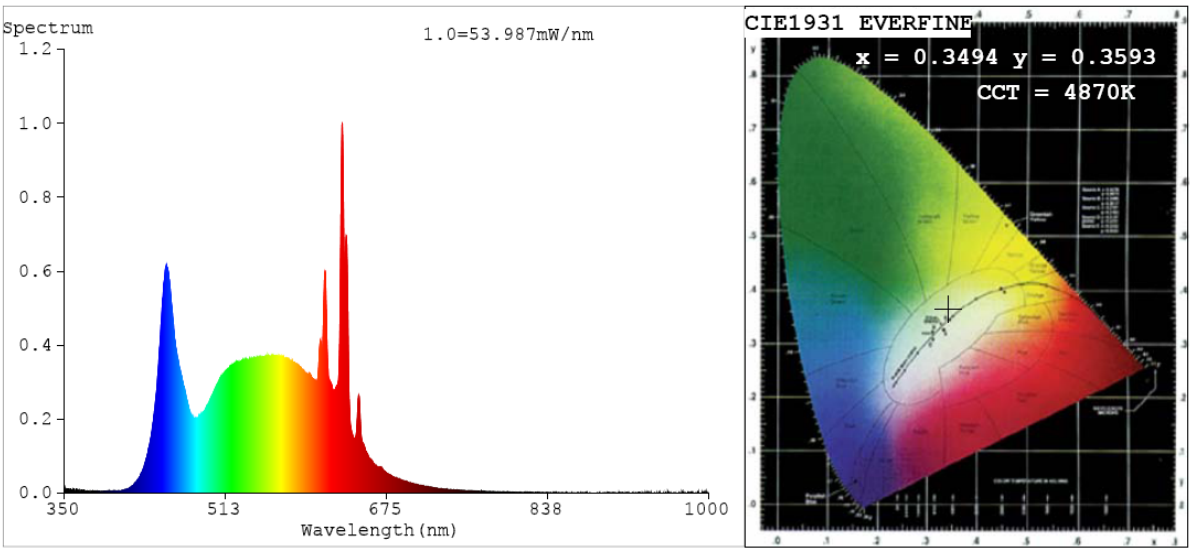
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120 |
| Frequency (Hz) | 60 |
| CCT (K) | 4870 |
| Duv | 0.0021 |
| Chromaticity (x, y) | x=0.3494 y=0.3593 |
| Chromaticity (u', v') | u'=0.2113 v'=0.4890 |
| Color Rendering Index (CRI) | 93.7 |
| R9 | 73 |

| Special Color Rendering Indices | | | |
|---|---|---|---|
| R1 | 95 | R9 | 73 |
| R2 | 96 | R10 | 89 |
| R3 | 95 | R11 | 93 |
| R4 | 93 | R12 | 66 |
| R5 | 92 | R13 | 95 |
| R6 | 93 | R14 | 97 |
| R7 | 95 | R15 | 92 |
| R8 | 90 | -- | -- |

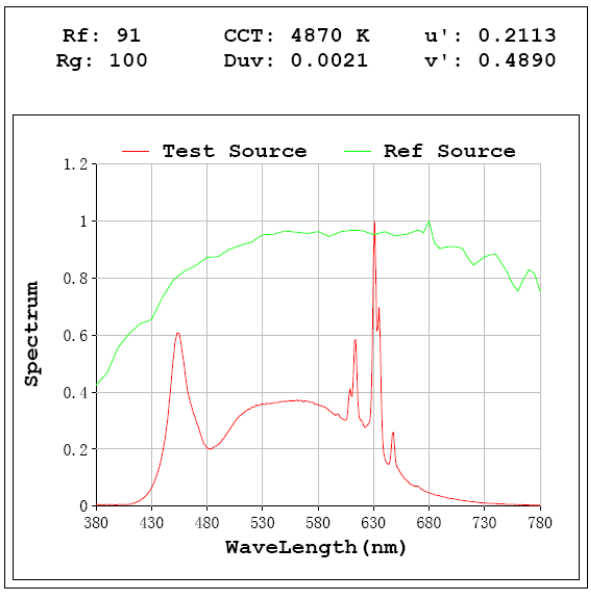
### Photometric Measurement – Goniophotometer Method:

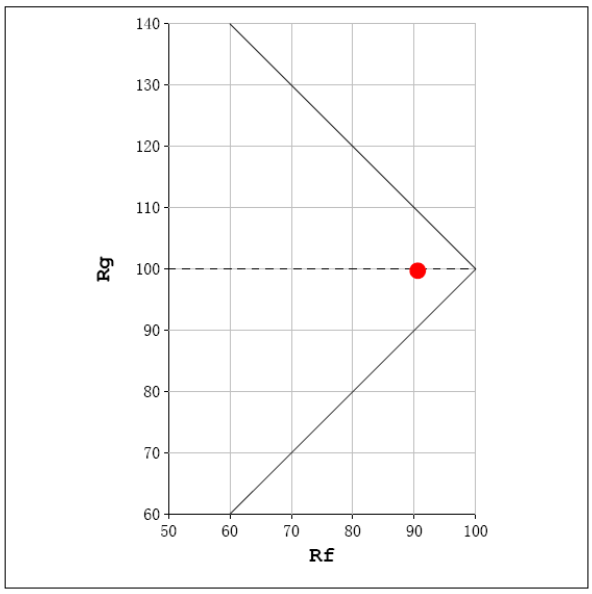
| Parameter | Result |
|---|---|
| Test Voltage (V) | 120.0 |
| Frequency (Hz) | 60 |
| Total Luminous (lm) | 1327 |
| Luminous Efficacy (lm/W) | 92.15 |
| Beam Angle (°) | 110.3 |
| Center Beam Candle Power (cd) | 475.3 |

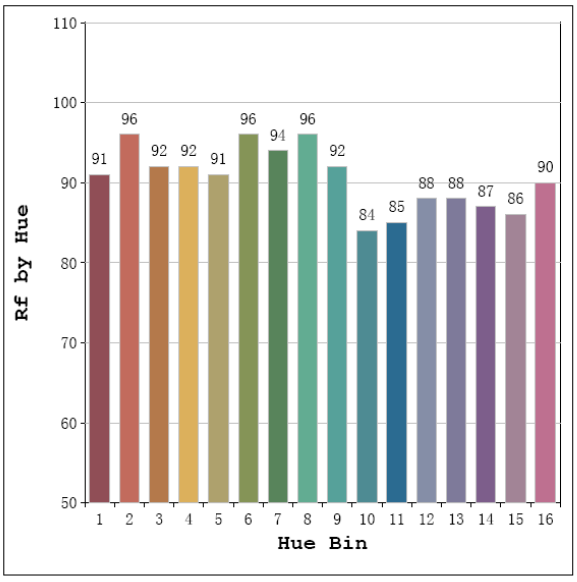
## Spectral Power Distribution & Chromaticity Diagram

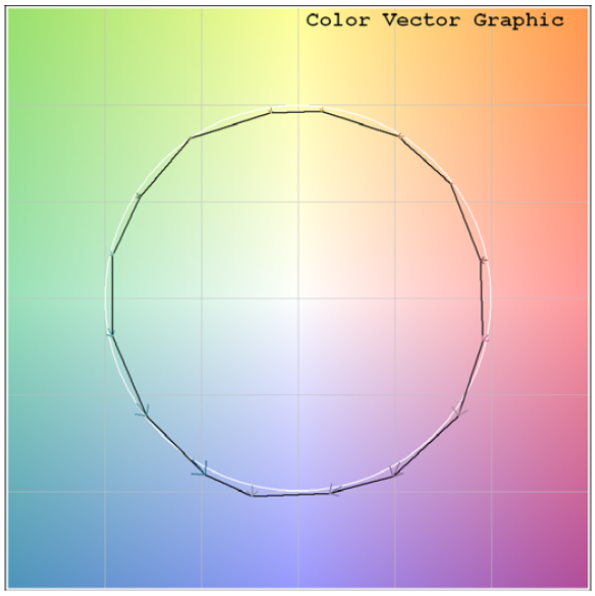



## TM30



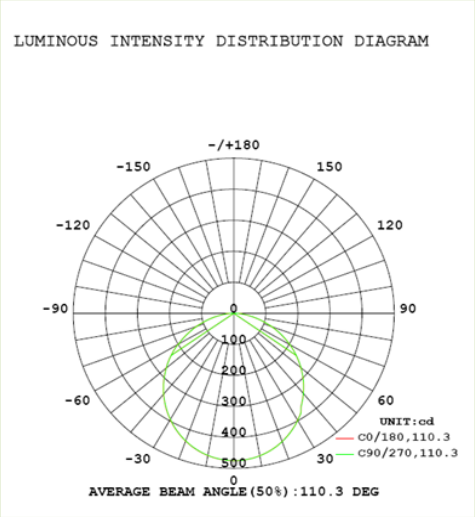



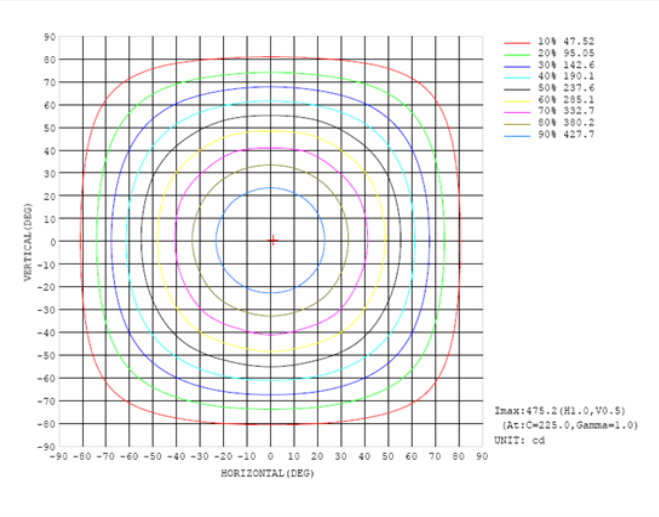
## Zonal Lumen Tabulation

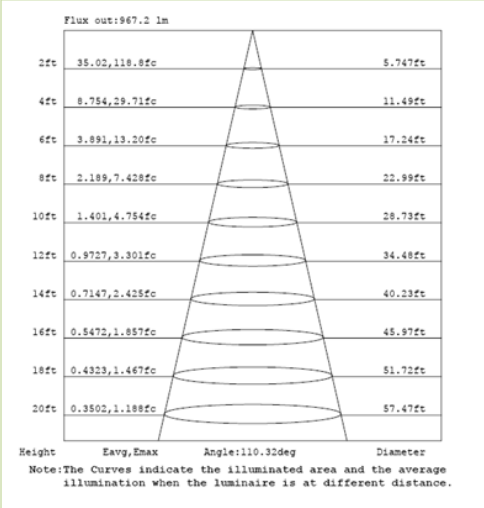
| Zonal Lumen Summary | | |
|---|---|---|
| Zone | Lumens | % Luminaire |
| 0-30 | 366.7 | 27.6% |
| 0-40 | 597.3 | 45.0% |
| 0-60 | 1047.8 | 79.0% |
| 60-90 | 279.2 | 21.0% |
| 70-100 | 118.5 | 8.9% |
| 90-120 | 0.0 | 0.0% |
| 0-90 | 1327.0 | 100.0% |
| 90-180 | 0.0 | 0.0% |
| 0-180 | 1327.0 | 100.0% |

| Lumens Per Zone | | | | | |
|---|---|---|---|---|---|
| Zone | Lumens | % Total | Zone | Lumens | % Total |
| 0-10 | 44.9 | 3.4% | 90-100 | 0.0 | 0.0% |
| 10-20 | 128.3 | 9.7% | 100-110 | 0.0 | 0.0% |
| 20-30 | 193.5 | 14.6% | 110-120 | 0.0 | 0.0% |
| 30-40 | 230.6 | 17.4% | 120-130 | 0.0 | 0.0% |
| 40-50 | 237.2 | 17.9% | 130-140 | 0.0 | 0.0% |
| 50-60 | 213.3 | 16.1% | 140-150 | 0.0 | 0.0% |
| 60-70 | 160.7 | 12.1% | 150-160 | 0.0 | 0.0% |
| 70-80 | 92.5 | 7.0% | 160-170 | 0.0 | 0.0% |
| 80-90 | 26.1 | 2.0% | 170-180 | 0.0 | 0.0% |

## Photometric Data



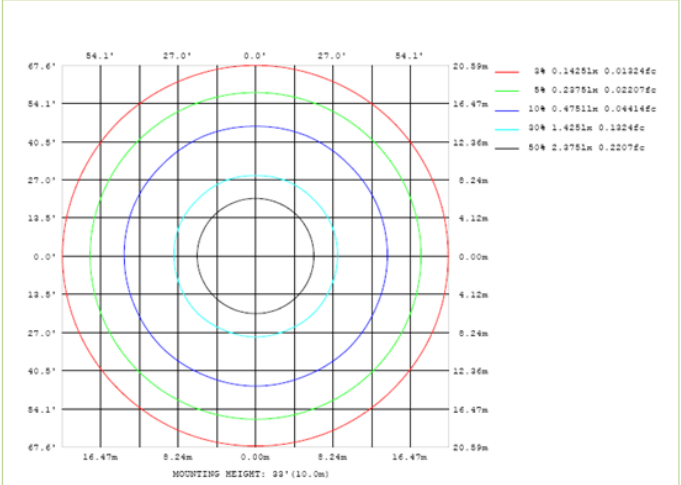
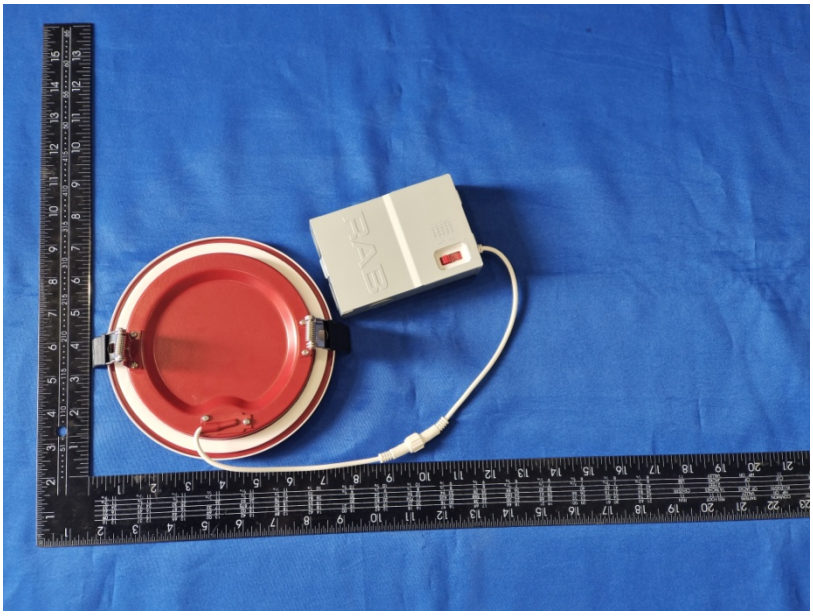



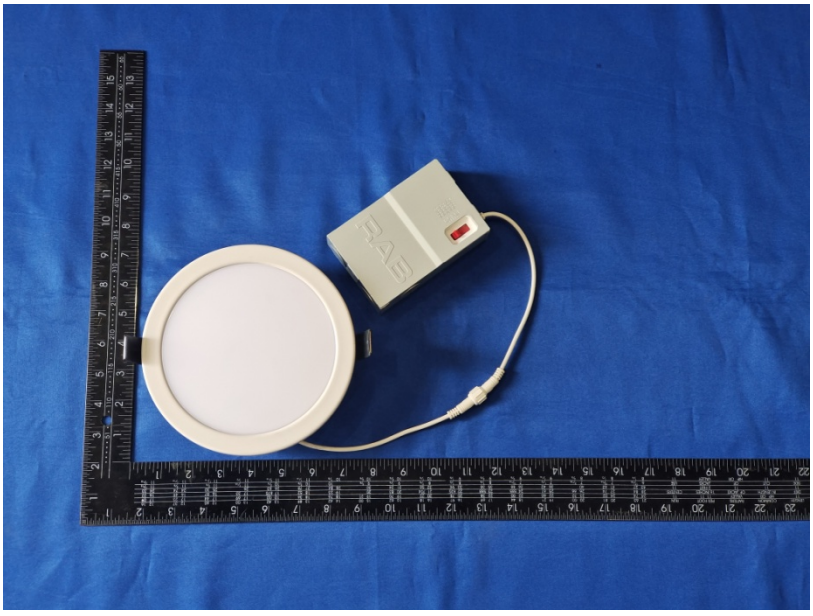
Table--1 UNIT: cd

| γ (DEG) \ C (DEG) | 0 | 22.5 | 45 | 67.5 | 90 | 112.5 | 135 | 157.5 | 180 | 202.5 | 225 | 247.5 | 270 | 292.5 | 315 | 337.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 | 475 |
| 5 | 473 | 473 | 473 | 473 | 472 | 473 | 472 | 473 | 473 | 473 | 473 | 473 | 473 | 473 | 473 | 473 |
| 10 | 466 | 466 | 465 | 466 | 465 | 466 | 465 | 466 | 466 | 466 | 467 | 467 | 467 | 466 | 467 | 466 |
| 15 | 454 | 454 | 454 | 454 | 454 | 454 | 454 | 455 | 455 | 455 | 456 | 456 | 456 | 455 | 455 | 455 |
| 20 | 438 | 439 | 438 | 439 | 438 | 438 | 438 | 439 | 440 | 440 | 441 | 440 | 440 | 440 | 440 | 439 |
| 25 | 419 | 419 | 419 | 419 | 418 | 419 | 419 | 420 | 421 | 421 | 422 | 421 | 421 | 421 | 421 | 420 |
| 30 | 396 | 396 | 396 | 396 | 395 | 396 | 395 | 397 | 398 | 398 | 399 | 398 | 399 | 398 | 398 | 397 |
| 35 | 370 | 364 | 369 | 364 | 369 | 363 | 369 | 364 | 366 | 371 | 366 | 372 | 366 | 371 | 366 | 371 |
| 40 | 341 | 335 | 340 | 335 | 340 | 335 | 340 | 335 | 337 | 342 | 338 | 343 | 338 | 342 | 337 | 342 |
| 45 | 309 | 304 | 309 | 304 | 308 | 304 | 308 | 304 | 306 | 311 | 307 | 311 | 307 | 311 | 306 | 310 |
| 50 | 276 | 271 | 275 | 271 | 275 | 271 | 275 | 271 | 273 | 277 | 274 | 278 | 273 | 277 | 273 | 277 |
| 55 | 240 | 236 | 240 | 236 | 239 | 236 | 239 | 236 | 238 | 241 | 238 | 242 | 238 | 242 | 238 | 241 |
| 60 | 201 | 200 | 201 | 200 | 200 | 199 | 200 | 200 | 201 | 202 | 202 | 203 | 202 | 203 | 202 | 202 |
| 65 | 162 | 162 | 161 | 162 | 161 | 162 | 161 | 162 | 163 | 163 | 164 | 163 | 164 | 163 | 164 | 163 |
| 70 | 124 | 125 | 123 | 124 | 123 | 124 | 123 | 124 | 125 | 125 | 126 | 125 | 126 | 125 | 126 | 125 |
| 75 | 86.4 | 87.4 | 86.3 | 87.1 | 86.0 | 86.7 | 85.9 | 87.0 | 88.2 | 87.4 | 88.4 | 87.6 | 88.4 | 87.5 | 88.4 | 87.7 |
| 80 | 51.9 | 52.6 | 51.6 | 52.2 | 51.2 | 51.9 | 51.2 | 52.2 | 53.4 | 52.7 | 53.6 | 52.9 | 53.7 | 53.0 | 53.8 | 53.0 |
| 85 | 21.6 | 21.9 | 21.0 | 21.4 | 20.6 | 21.1 | 20.7 | 21.6 | 22.7 | 22.4 | 23.2 | 22.7 | 23.4 | 22.9 | 23.4 | 22.7 |
| 90 | 2.55 | 2.52 | 2.49 | 2.42 | 2.39 | 2.24 | 2.25 | 2.22 | 2.55 | 2.70 | 2.74 | 2.96 | 3.03 | 3.16 | 3.03 | 2.93 |

| Sample No. | Wattage and CCT setting | Test Voltage(V) | Flux(lm) | P(W) | Luminous Efficacy lm/W |
|---|---|---|---|---|---|
| DLW0097(FWAFER6) | 2700K setting | 120.0 | 1270.3 | 14.4 | 88.21 |
| | 3000K setting | 120.0 | 1313.5 | 14.3 | 91.85 |
| | 3500K setting | 120.0 | 1364.4 | 14.2 | 96.08 |
| | 4000K setting | 120.0 | 1378 | 14.2 | 97.04 |
| | 5000K setting | 120.0 | 1327 | 14.4 | 92.15 |

## 3. Product Photo





# ****** END OF REPORT ******