**Light efficiency:**

**142 Lumen/Watt**

**Light quality:**

**CRI: 75.0**

**Color temperature:**

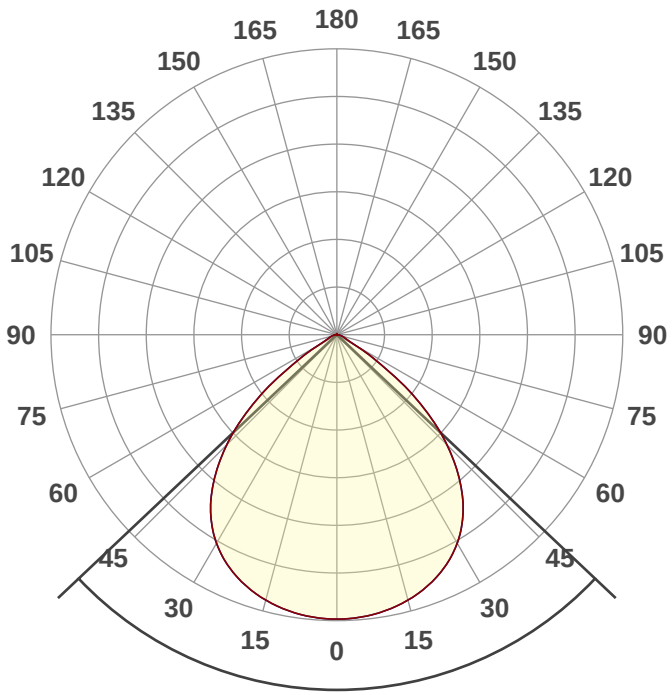
**5427 K**

**Output:** 44054 lm

**Peak:** 22487 cd

**Power:** 310.6 W

**PF:** 1.0



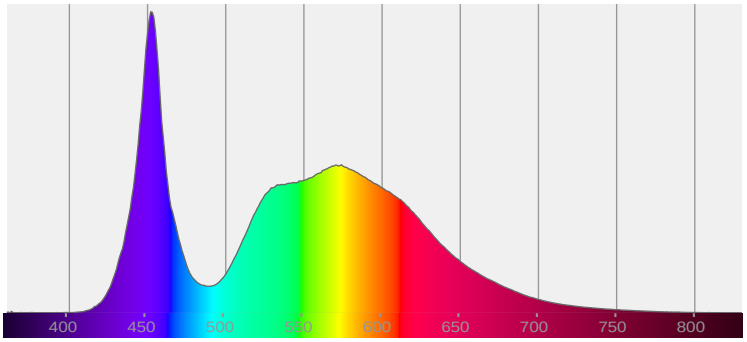

**Product name:**
**HPAL2-50K300-90**

**Date and time:**
**3/3/2021 12:25:14 PM**

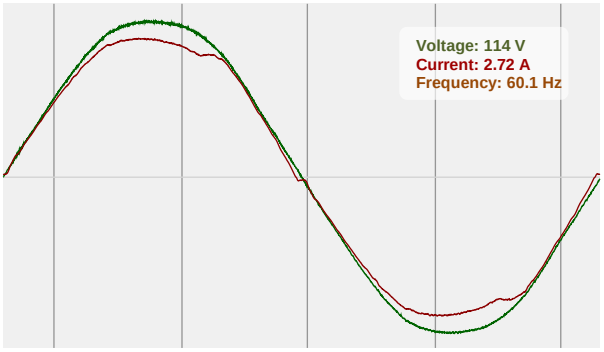
**Beam angle** **93.3°**

**CIE 1931**
**x: 0.334**
**y: 0.334**

**Spectra**




**Power**

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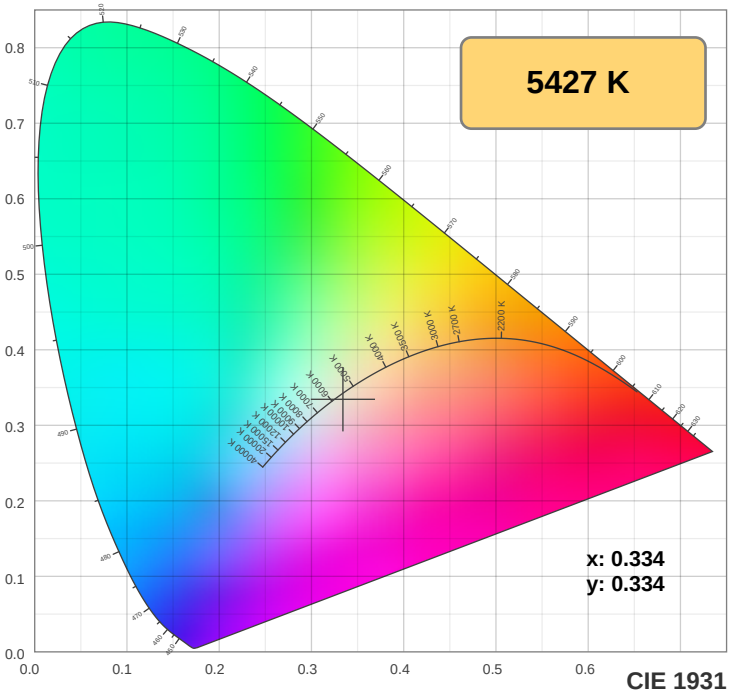
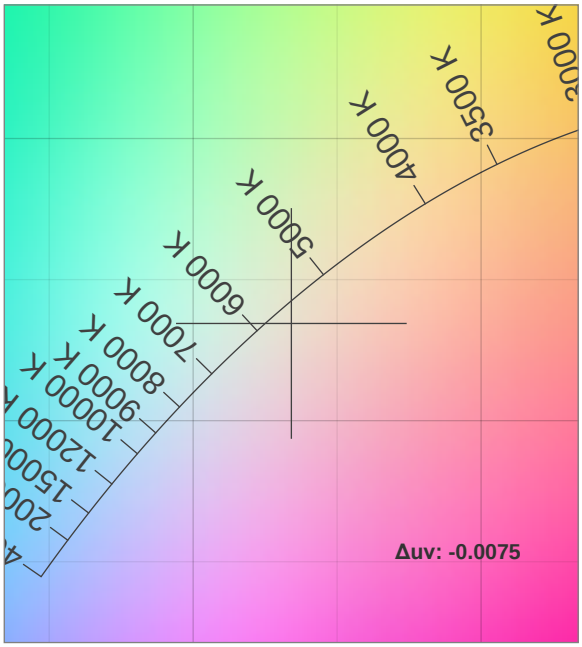
## Color Specifications

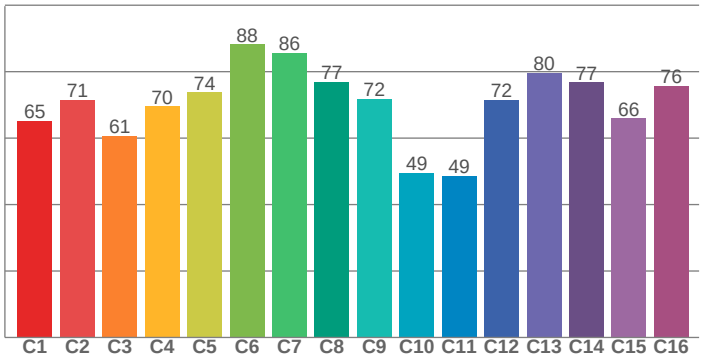



CIE 1931

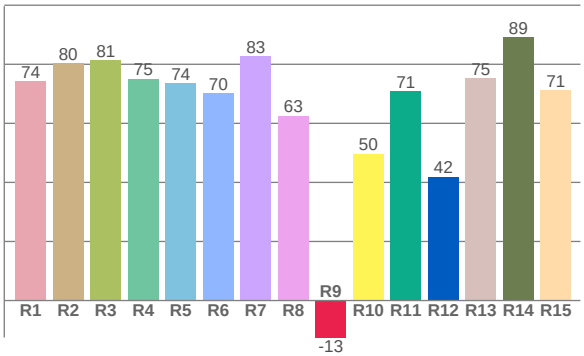



CIE 1931 ZOOM

### TM30: 70.1




### CRI: 75.0 (R1-R8)




CRI R values, only R1-R8 are used to calculate final CRI value

| R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 74.3 | 80.3 | 81.3 | 75.2 | 73.6 | 70.2 | 82.7 | 62.5 | -12.5 | 49.7 | 70.8 | 41.9 | 75.4 | 89.1 | 71.2 |

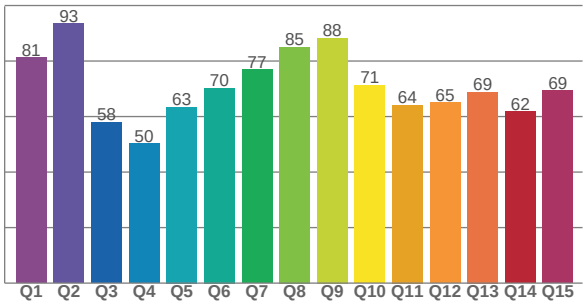
TM30 C values, 16 binned values out of total of 99 C values

| C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 | C16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 65.1 | 71.4 | 60.6 | 69.6 | 73.8 | 88.2 | 85.6 | 77.0 | 71.8 | 49.5 | 48.6 | 71.5 | 79.6 | 76.8 | 65.9 | 75.8 |

CQS Q values

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 81.2 | 93.5 | 57.9 | 50.3 | 63.4 | 70.3 | 76.9 | 85.1 | 88.3 | 71.3 | 64.2 | 65.0 | 68.9 | 61.7 | 69.3 |

### CQS: 68.9




### Color parameters

| Color temperature | Color rendering index | Red component | Color fidelity | Color gamut | Color quality scale | Color coordinate cie 1931 | Color coordinate cie 1931 | Color coordinate | Color coordinate | Color diviation from black body |
|---|---|---|---|---|---|---|---|---|---|---|
| CCT | CRI | CRI R9 | TM30 Rf | TM30 Rg | CQS | x | y | u | v | Δuv |
| 5427 K | 75.0 | -12.5 | 70.1 | 94.0 | 68.9 | 0.334 | 0.334 | 0.211 | 0.316 | -0.0075 |

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HPAL2-50K300-90

# TM30 Report

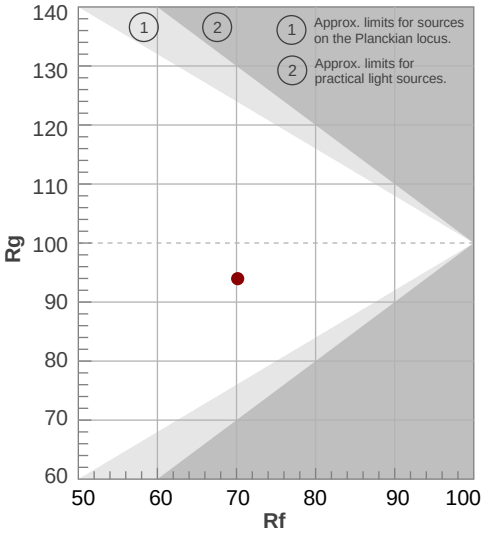
**Rf 70.1**

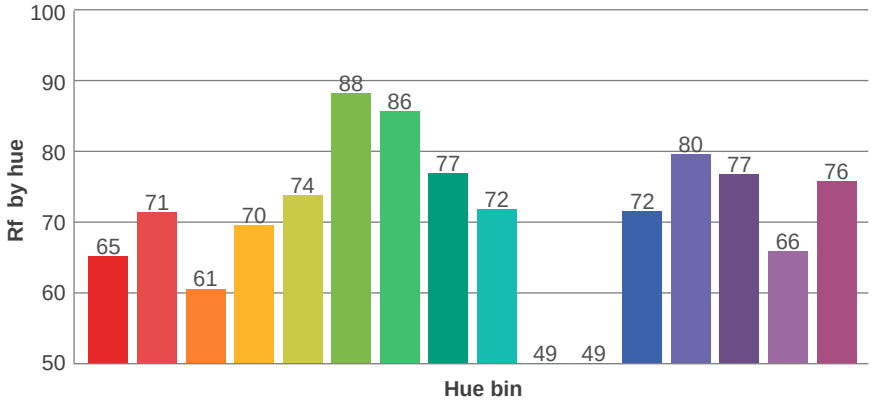
Fidelity index Rf

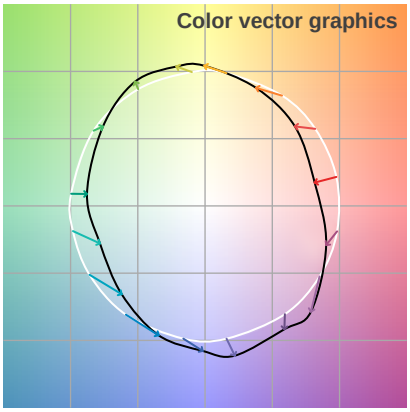
**Rg 94.0**

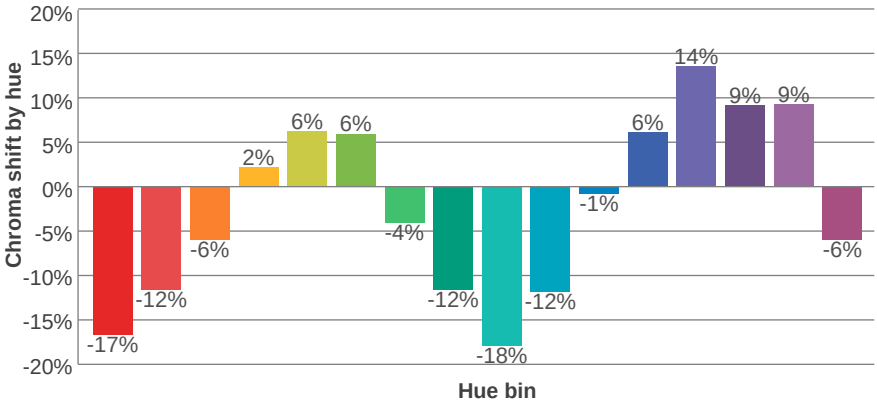
Gammut index Rg

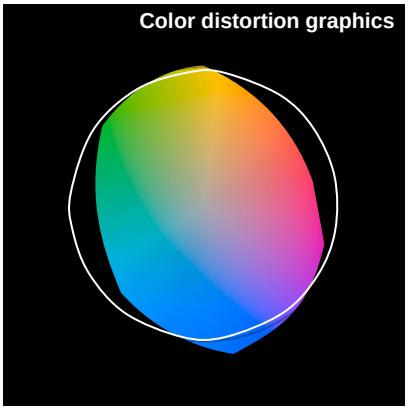
| | | Graphic shifts (%) | |
|---|---|---|---|
| Hue Bin | $R_f$ | Chroma | Hue |
| 1 | 65 | -17% | -1% |
| 2 | 71 | -12% | 10% |
| 3 | 61 | -6% | 19% |
| 4 | 70 | 2% | 17% |
| 5 | 74 | 6% | 10% |
| 6 | 88 | 6% | -1% |
| 7 | 86 | -4% | -6% |
| 8 | 77 | -12% | -2% |
| 9 | 72 | -18% | 13% |
| 10 | 49 | -12% | 25% |
| 11 | 49 | -1% | 29% |
| 12 | 72 | 6% | 16% |
| 13 | 80 | 14% | 4% |
| 14 | 77 | 9% | -7% |
| 15 | 66 | 9% | -25% |
| 16 | 76 | -6% | -12% |

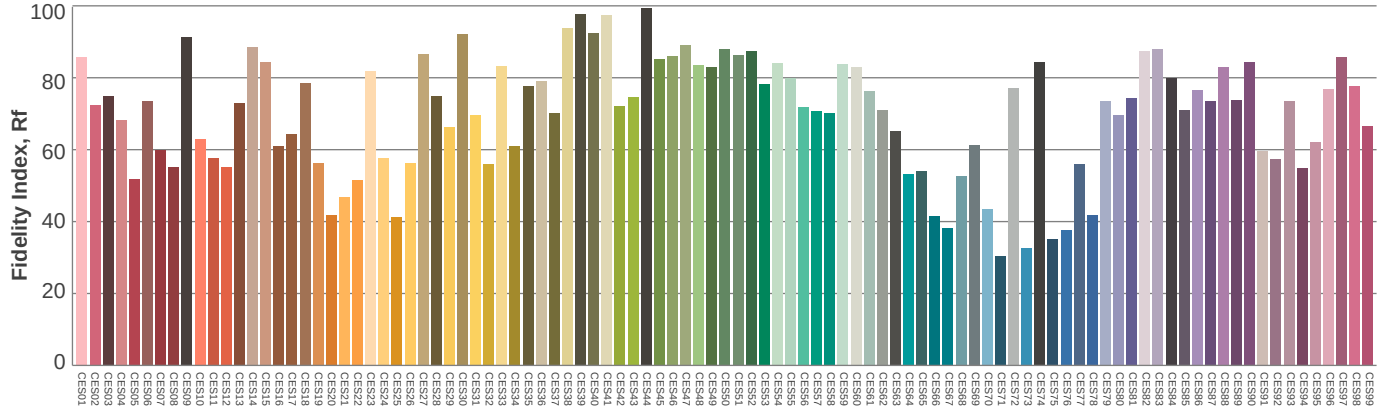




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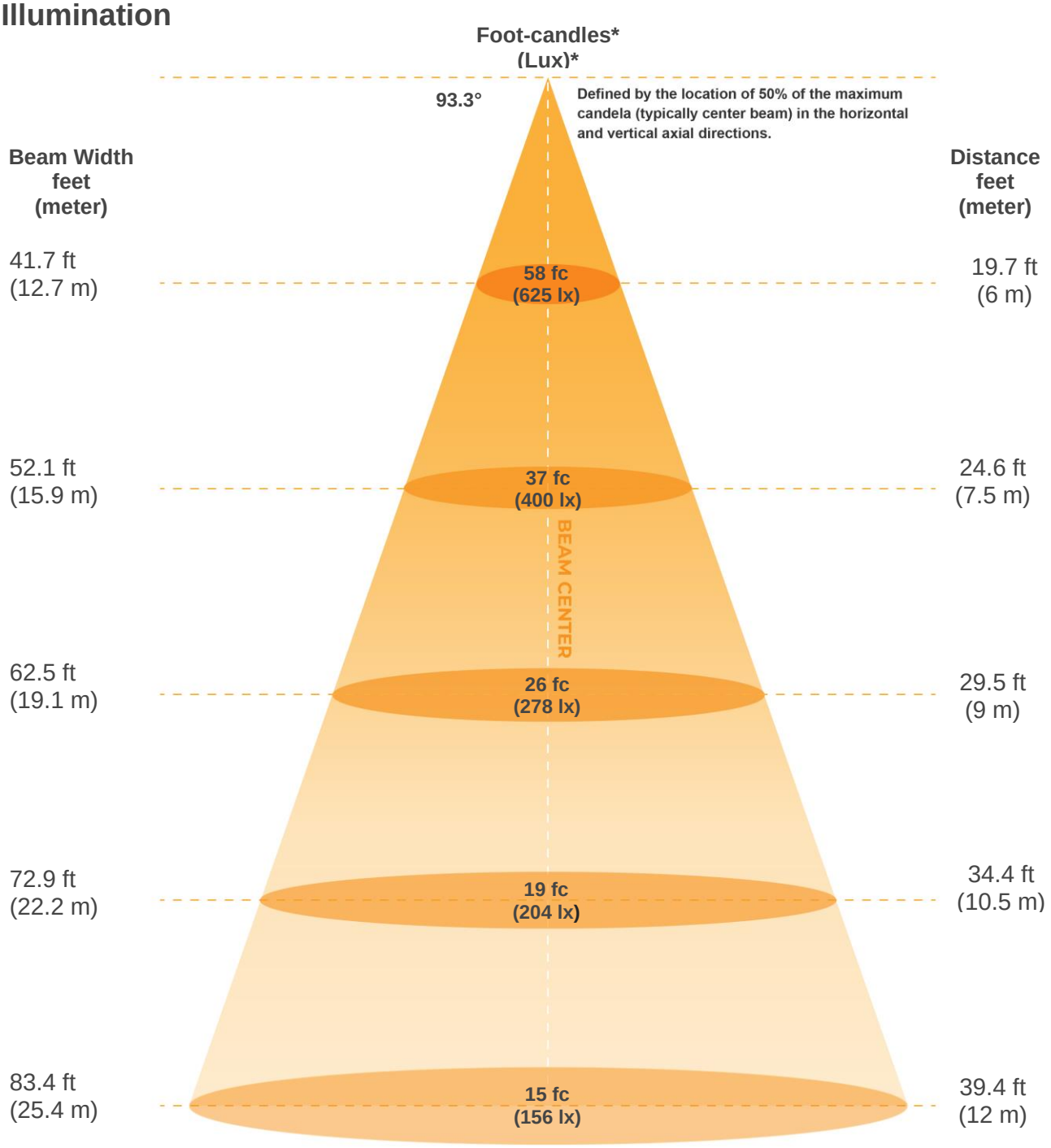
## Illumination




*measured at center of beam

**Beam intensities from 1-20m**

| 1m | 2m | 3m | 4m | 5m | 6m | 7m | 8m | 9m | 10m | 11m | 12m | 13m | 14m | 15m | 16m | 17m | 18m | 19m | 20m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.3ft | 6.6ft | 9.8ft | 13.1ft | 16.4ft | 19.7ft | 23ft | 26.2ft | 29.5ft | 32.8ft | 36.1ft | 39.4ft | 42.7ft | 45.9ft | 49.2ft | 52.5ft | 55.8ft | 59.1ft | 62.3ft | 65.6ft |
| 22487lx | 5622lx | 2499lx | 1405lx | 899lx | 625lx | 459lx | 351lx | 278lx | 225lx | 186lx | 156lx | 133lx | 115lx | 100lx | 88lx | 78lx | 69lx | 62lx | 56lx |
| 2089.1f | 522.3fc | 232.1fc | 130.6fc | 83.6fcd | 58fcd | 42.6fcd | 32.6fcd | 25.8fcd | 20.9fcd | 17.3fcd | 14.5fcd | 12.4fcd | 10.7fcd | 9.3fcd | 8.2fcd | 7.2fcd | 6.4fcd | 5.8fcd | 5.2fcd |

| Beam angle 50% | Field angle 10% | Cutoff angle 2,5% | Intensity ratio in 120° cone | Intensity ratio in 90° cone |
|---|---|---|---|---|
| **93.3°** | **119.5°** | **141°** | **96.3%** | **76.1%** |

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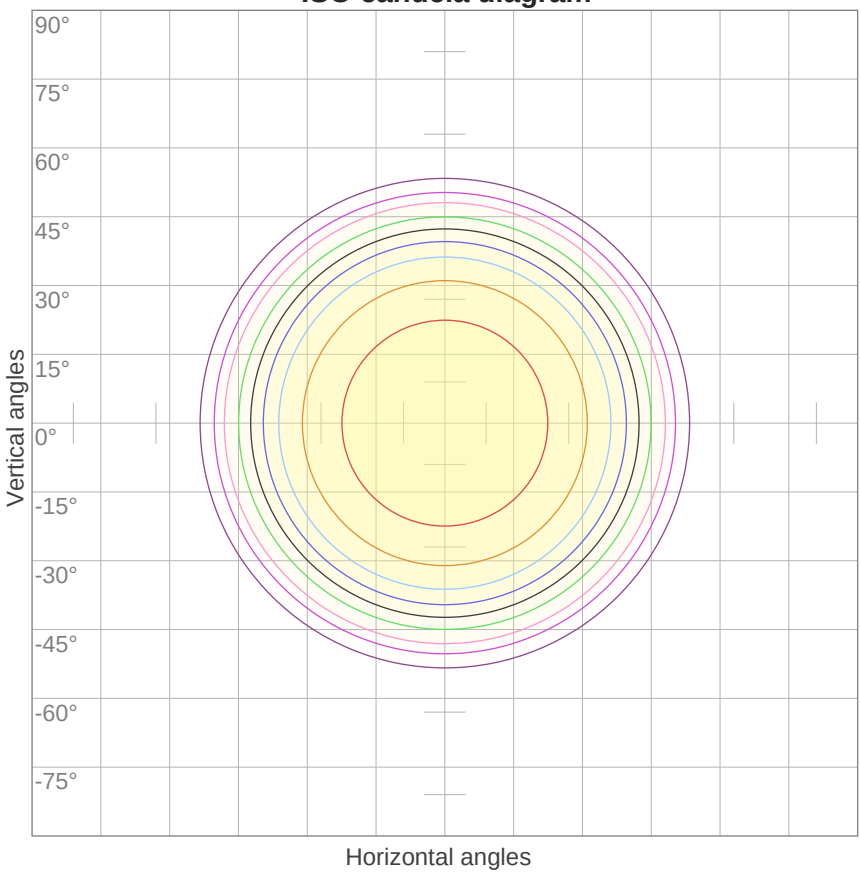
## ISO Diagrams

### ISO candela diagram



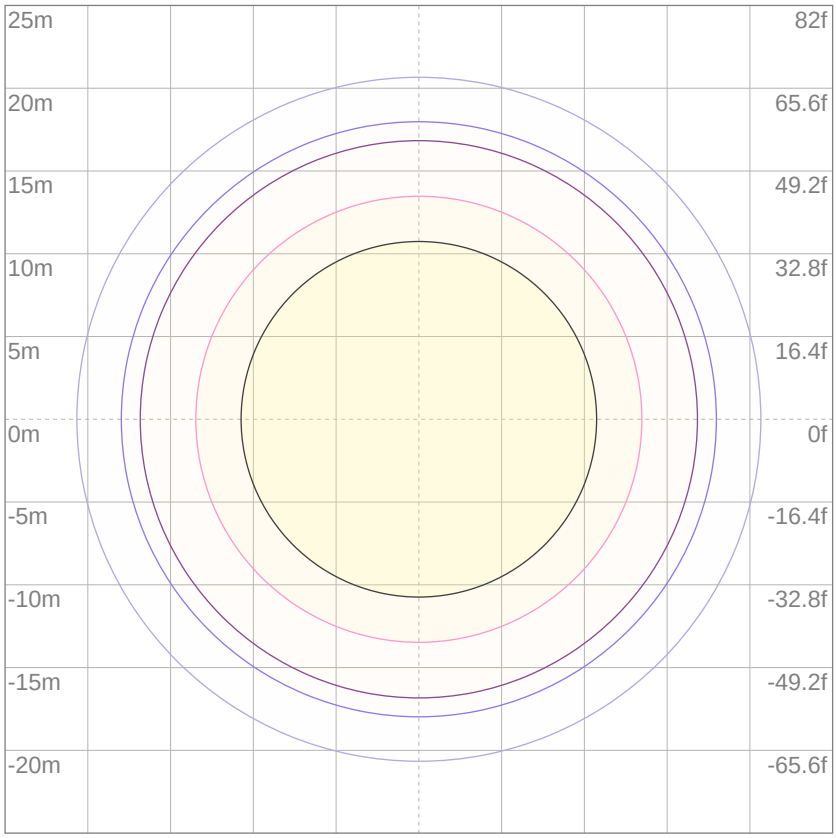

| | |
|---|---|
| 10% | 2249 cd |
| 20% | 4497 cd |
| 30% | 6746 cd |
| 40% | 8995 cd |
| 50% | 11244 cd |
| 60% | 13492 cd |
| 70% | 15741 cd |
| 80% | 17990 cd |
| 90% | 20239 cd |

Conditions:

Number of c-planes: 16

Candela at center: 22487 cd

### ISO lux diagram




Mounting height: 10 meters (33 feet)

| | |
|---|---|
| 3% | 6.75 lx |
| 5% | 11.2 lx |
| 10% | 22.5 lx |
| 30% | 67.5 lx |
| 50% | 112 lx |

Conditions:

Number of c-planes: 16

Lux at center: 225 lx

*Lux distribution on a surface when lamp is mounted at 10 meters from the surface.*

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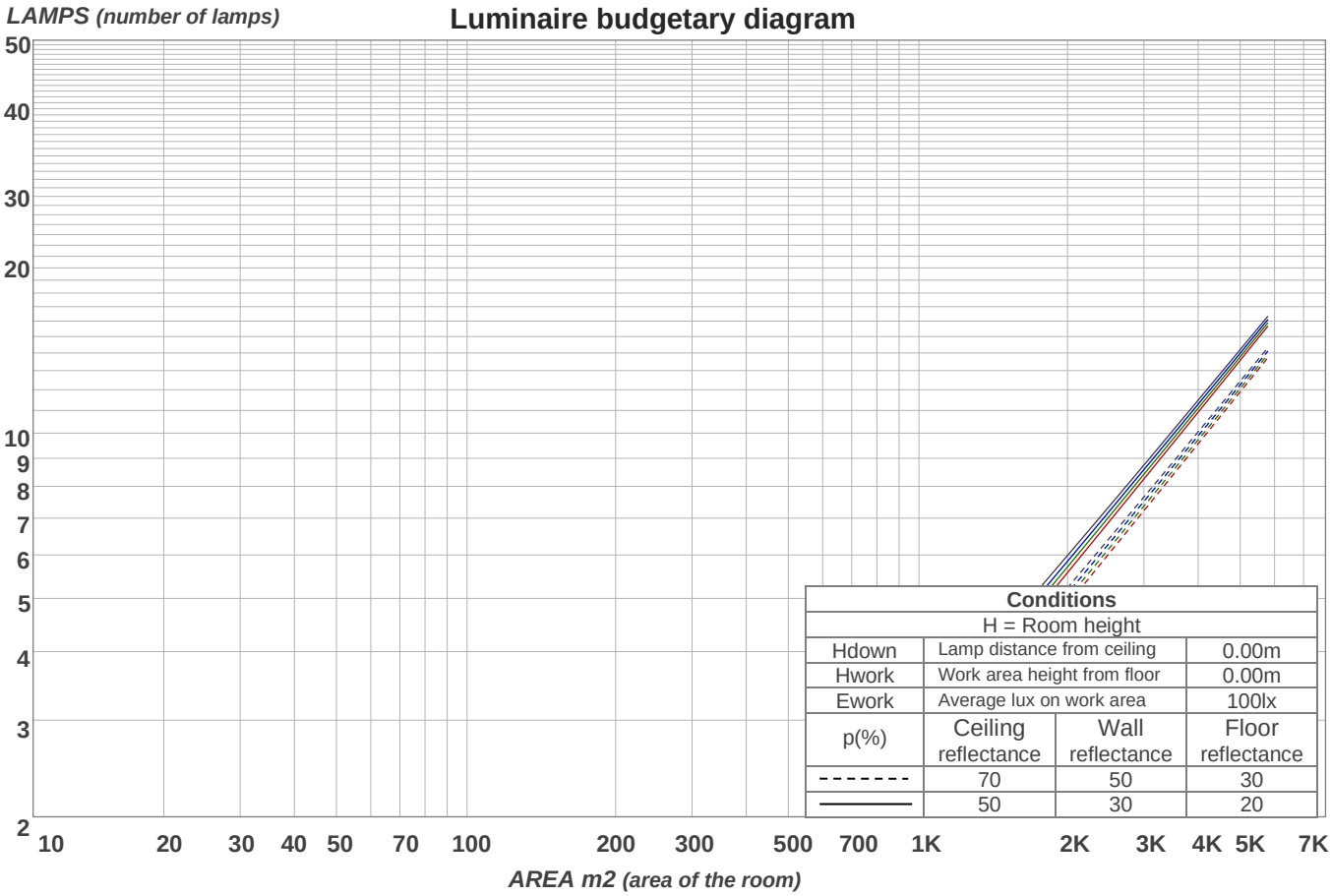
# Light Planning

## Coefficients of Utilization

| Ceiling reflectance | 80 | | | | 70 | | | | 50 | | | 30 | | | 10 | | | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wall reflectance | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 0 |
| Floor reflectance | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 0 |
| **RCR** | **(RCR: Room Cavity Ratio)** | | | | | | | | **Room Values are expressed as percentage of Lumens delivered to the task surface** | | | | | | | | | |
| 0 | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 99 |
| 1 | 112 | 108 | 105 | 102 | 109 | 106 | 103 | 100 | 102 | 99 | 97 | 98 | 96 | 94 | 94 | 93 | 91 | 89 |
| 2 | 104 | 98 | 92 | 88 | 102 | 96 | 91 | 87 | 92 | 88 | 85 | 89 | 86 | 83 | 86 | 84 | 81 | 79 |
| 3 | 97 | 88 | 82 | 77 | 94 | 87 | 81 | 76 | 84 | 79 | 75 | 81 | 77 | 73 | 79 | 75 | 72 | 70 |
| 4 | 90 | 80 | 73 | 67 | 88 | 79 | 72 | 67 | 76 | 71 | 66 | 74 | 69 | 65 | 72 | 68 | 64 | 62 |
| 5 | 84 | 73 | 65 | 60 | 82 | 72 | 65 | 59 | 70 | 64 | 59 | 68 | 62 | 58 | 66 | 61 | 58 | 56 |
| 6 | 78 | 66 | 59 | 53 | 76 | 66 | 58 | 53 | 64 | 57 | 53 | 62 | 57 | 52 | 61 | 56 | 52 | 50 |
| 7 | 73 | 61 | 53 | 48 | 71 | 60 | 53 | 48 | 59 | 52 | 47 | 57 | 51 | 47 | 56 | 51 | 47 | 45 |
| 8 | 68 | 56 | 48 | 43 | 66 | 55 | 48 | 43 | 54 | 48 | 43 | 53 | 47 | 43 | 52 | 46 | 42 | 41 |
| 9 | 64 | 52 | 44 | 39 | 62 | 51 | 44 | 39 | 50 | 44 | 39 | 49 | 43 | 39 | 48 | 43 | 39 | 37 |
| 10 | 60 | 48 | 41 | 36 | 59 | 47 | 41 | 36 | 46 | 40 | 36 | 45 | 40 | 36 | 45 | 39 | 35 | 34 |

## Luminaire budgetary diagram




## Zonal Lumen Summary

| 0°-10° | 10°-20° | 20°-30° | 30°-40° | 40°-50° | 50°-60° | 60°-70° | 70°-80° | 80°-90° |
|---|---|---|---|---|---|---|---|---|
| 2134 lm | 6142 lm | 9324 lm | 10833 lm | 9418 lm | 4558 lm | 874 lm | 427 lm | 120 lm |

| 90°-100° | 100°-110° | 110°-120° | 120°-130° | 130°-140° | 140°-150° | 150°-160° | 160°-170° | 170°-180° |
|---|---|---|---|---|---|---|---|---|
| 15.8 lm | 21.3 lm | 27.6 lm | 33.9 lm | 35.9 lm | 33.4 lm | 28.3 lm | 19.6 lm | 7.10 lm |

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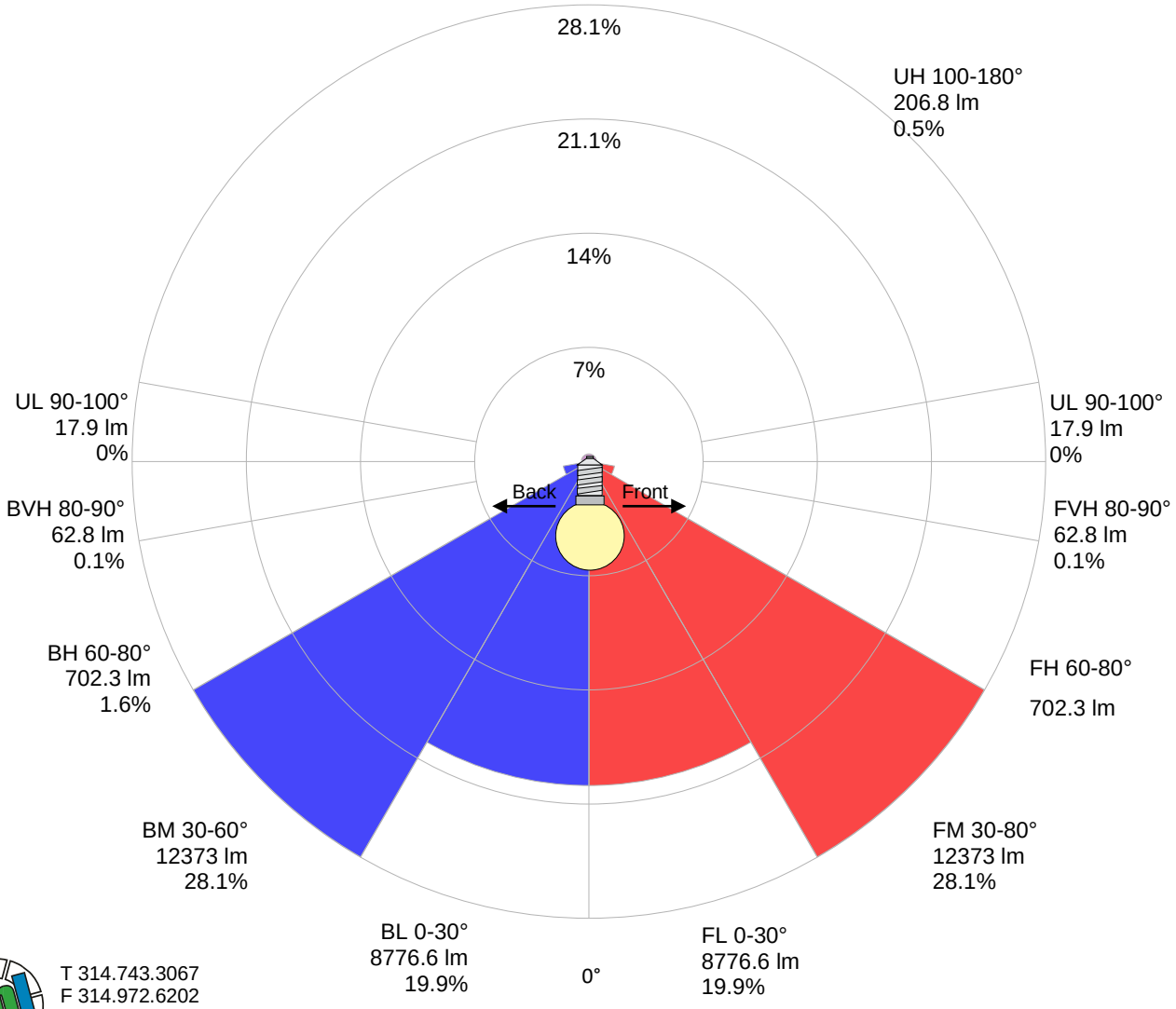
## Road Report

### LCS table

| BUG rating: | B5 U3 G1 | |
|---|---|---|
| **Forward light** | Lumens | Lumens % |
| Low(0-30): | 8776.6 | 19.9% |
| Medium(30-60): | 12373 | 28.1% |
| High(60-80): | 702.3 | 1.6% |
| Very high(80-90): | 62.8 | 0.1% |
| **Back light** | | |
| Low(0-30): | 8776.6 | 19.9% |
| Medium(30-60): | 12373 | 28.1% |
| High(60-80): | 702.3 | 1.6% |
| Very high(80-90): | 62.8 | 0.1% |
| **Uplight** | | |
| Low(90-100): | 17.9 | 0% |
| High(100-180): | 206.8 | 0.5% |

### LCS graph

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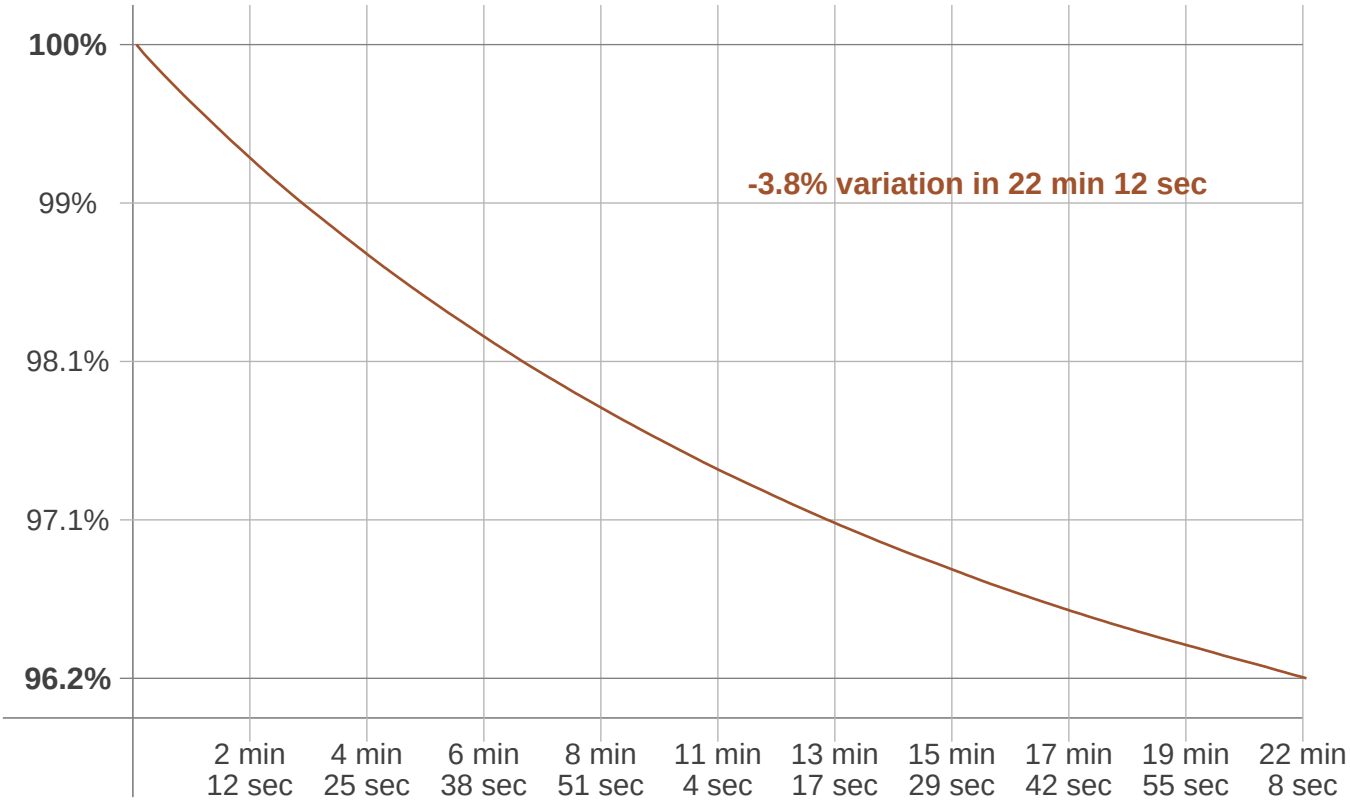
# Stabilization

## Warmup curve




## Warmup result

| | |
|---|---|
| **Warmup time:** | **22 min 12 sec** |
| **Warmup variation** | **-3.9%** |

## Warmup conditions

| | |
|---|---|
| **Stable period:** | **15 min** |
| **Stable change max:** | **2.0%** |
| **Minimum time:** | **15 min** |

## Color temperature change

| CCT start | CCT change | CCT end |
|---|---|---|
| 5371 K | +56 K | 5427 K |

## Output change

| Output start | Output change | Output end |
|---|---|---|
| 45762 lm | -1708 lm | 44054 lm |

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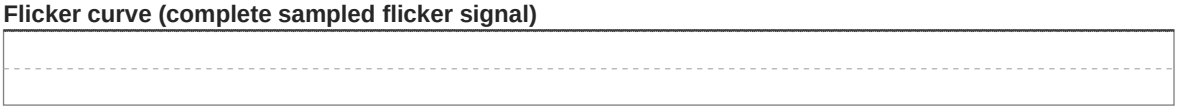
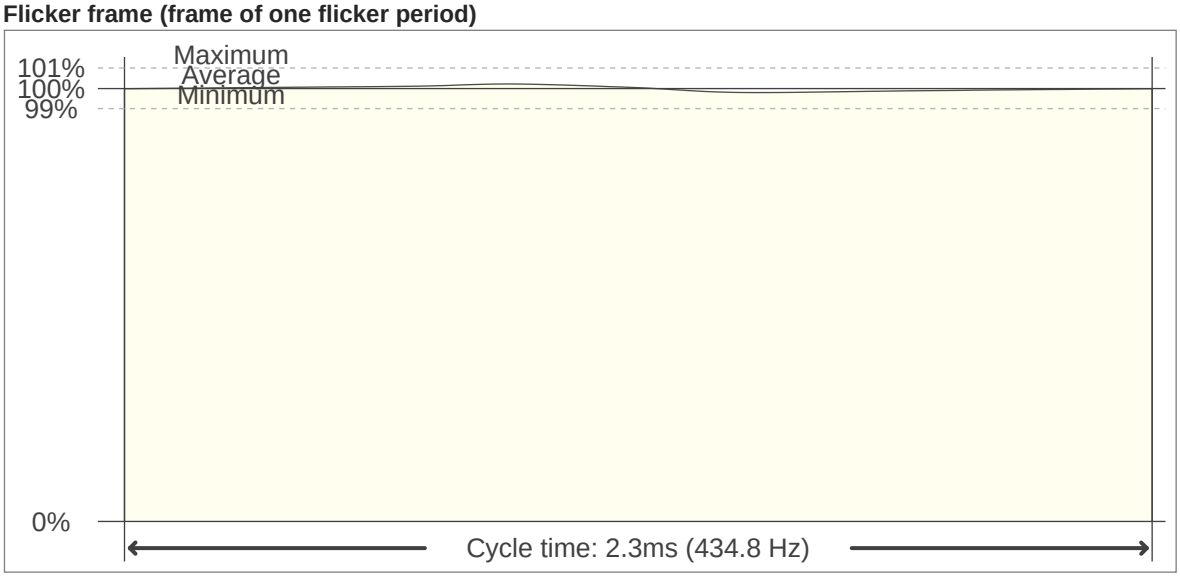
# Flicker

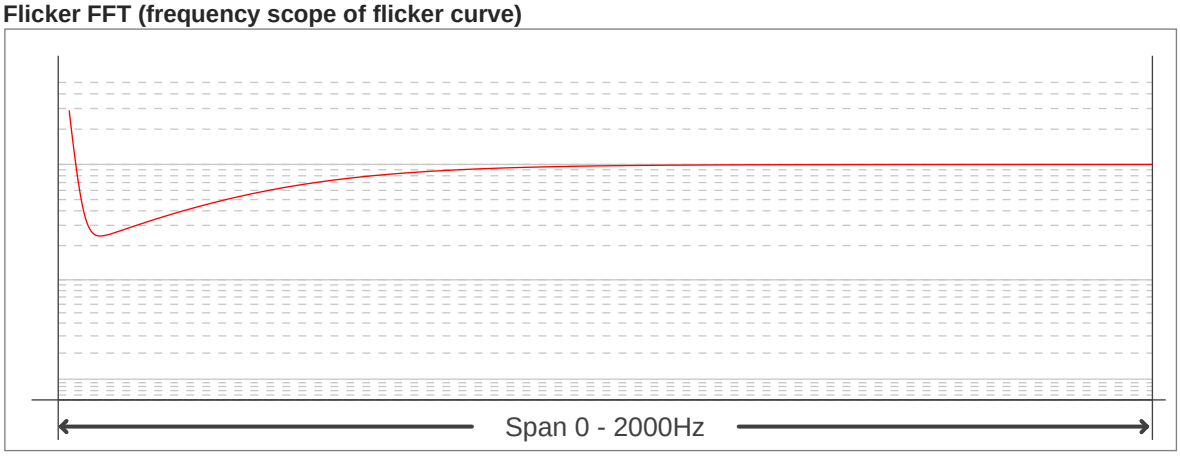
**Flicker curve (complete sampled flicker signal)**



**Flicker frame (frame of one flicker period)**




**Flicker FFT (frequency scope of flicker curve)**




**Flicker results:**

| | |
|---|---|
| **Flicker frequency:** | **434.78 Hz** |
| **Flicker index:** | **0** |
| **Flicker percentage:** | **1.13 %** |
| **SVM: (Visual flicker)** | **0.01** |

**Flicker conditions:**

| | |
|---|---|
| **Sample rate:** | **40000 samples/second** |

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