

Tested Light Source - 1_PHOT_SKIN+BONES-4300lmChip-3000K-WallWash-HoneycombLouvre_2309

Laboratory and Equipment

Laboratory Owner and Location

Goniospectrometer System and Type

Spectrometer Manufacturer and Model

Factorylux, Greenhill Mills, Hebden Bridge, HX7 5QF, UK

BaseSpion – Type C, horizontal

Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

Measurement Conditions

Number of C-planes and Resolution

γ (gamma)-Resolution

Test Distance

Input Power, Power and Displ. Factors

Input RMS Voltage and Current

Frequency of Input Power

24 planes – 15°

2°

1.50 m

40.7 W – PF 0.97 – DPF 0.97

241 V – 0.175 A

49.9 Hz

Main Light Measurement Results

Output

Efficiency

Peak Intensity and Beam Angle

Color Rendering Index

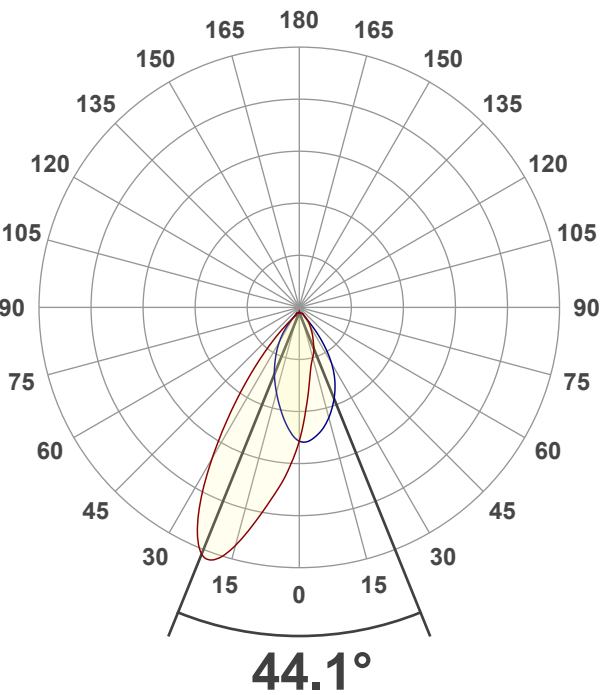
1183 lm

29 lm/W

1890 cd – 44.1°

CRI 91.4

Light Intensity Distribution



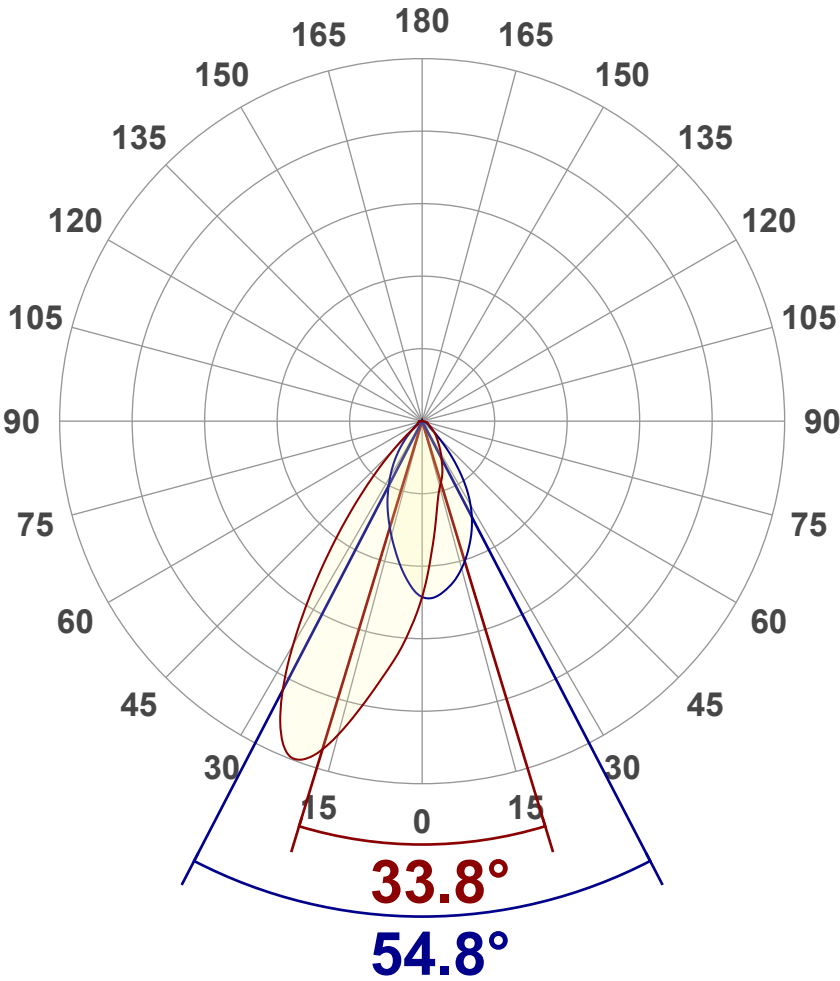
Goniophotometry Report

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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

| | |
|----------------------|---------|
| Output (total Lumen) | 1183 lm |
| Peak Intensity | 1890 cd |
| Beam Angle (50%) | 44.1° |
| Beam Angle (90%) | 54.8° |
| Beam Angle (10%) | 33.2° |

Cut-off Angle

| | |
|--------------|--------|
| Average 2,5% | 114.7° |
|--------------|--------|

Field Angle

| | |
|-------------|-------|
| Average 10% | 85.5° |
|-------------|-------|

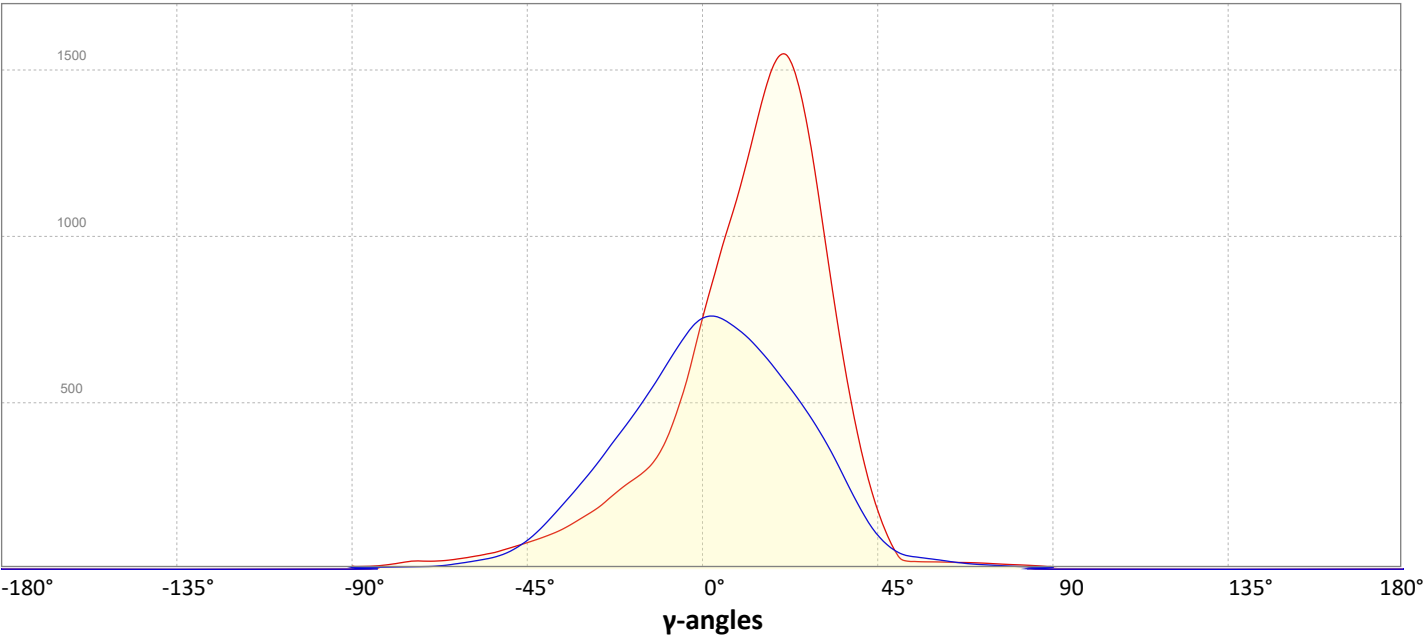
Intensity Ratio

| | |
|--------------|-------|
| In 120° cone | 95.9% |
| In 90° cone | 89.4% |

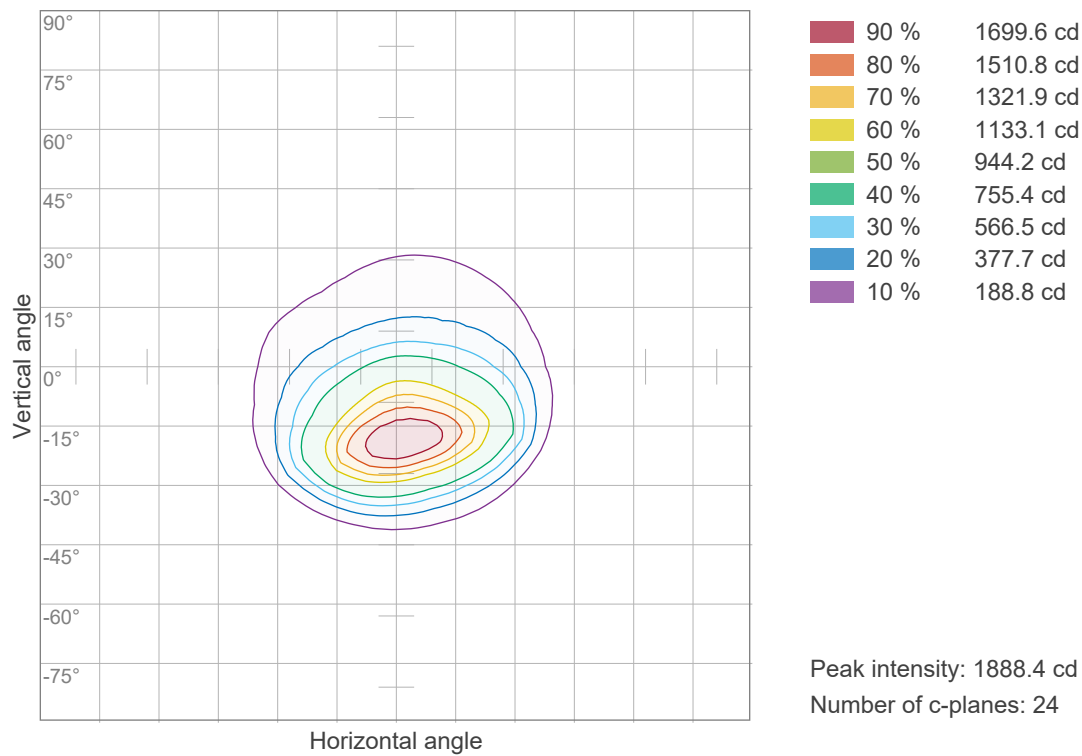
C000-C180

C090-C270

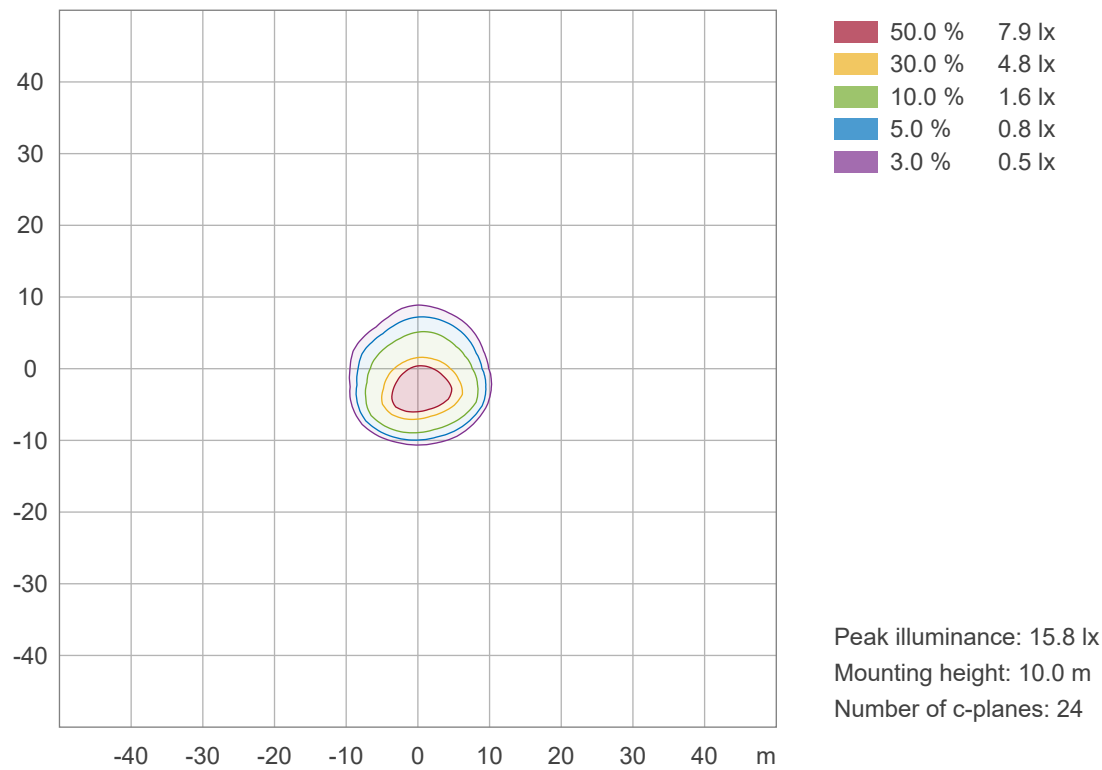
Linear distribution diagram - Intensity (candela) vs γ-angle



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)

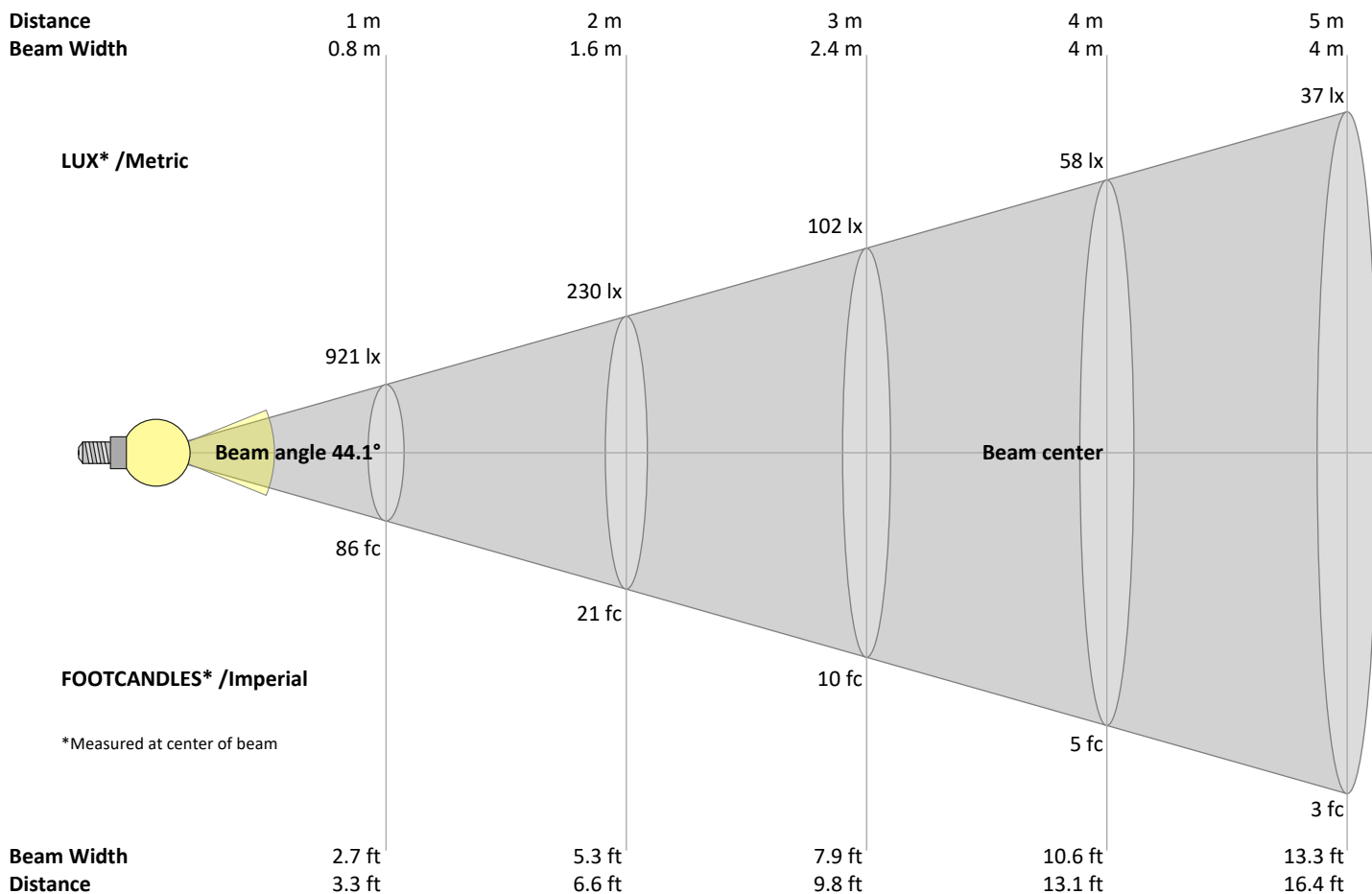


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Beam Details



Beam intensities from 1 – 20 m

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | m |
|------|------|-----|------|------|------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| 3.3 | 6.6 | 9.8 | 13.1 | 16.4 | 19.7 | 23 | 26.2 | 29.5 | 32.8 | 36.1 | 39.4 | 42.7 | 45.9 | 49.2 | 52.5 | 55.8 | 59.1 | 62.3 | 65.6 | ft |
| 921 | 230 | 102 | 58 | 37 | 26 | 19 | 14 | 11 | 9 | 8 | 6 | 5 | 5 | 4 | 4 | 3 | 3 | 3 | 2 | lux |
| 85.6 | 21.4 | 9.5 | 5.3 | 3.4 | 2.4 | 1.7 | 1.3 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | fc |

Intensities in 0° c-plane

| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 921 | 807 | 695 | 603 | 522 | 456 | 407 | 372 | 347 | 326 | 306 | 283 | 259 | 235 | 214 | 197 | 179 | 162 | 147 | 134 | cd |
| 100% | 88% | 75% | 65% | 57% | 49% | 44% | 40% | 38% | 35% | 33% | 31% | 28% | 25% | 23% | 21% | 19% | 18% | 16% | 15% | of 0°val |

Intensities in 90° c-plane

| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 921 | 929 | 925 | 912 | 893 | 871 | 845 | 815 | 783 | 748 | 712 | 674 | 636 | 596 | 553 | 507 | 458 | 405 | 349 | 291 | cd |
| 100% | 101% | 100% | 99% | 97% | 95% | 92% | 89% | 85% | 81% | 77% | 73% | 69% | 65% | 60% | 55% | 50% | 44% | 38% | 32% | of 0°val |

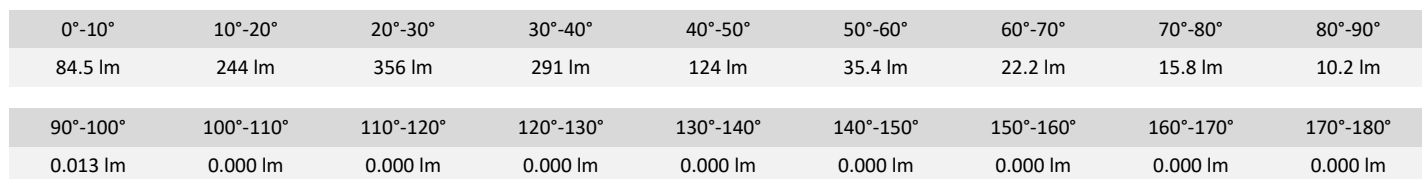
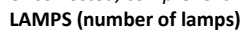
Intensities in 180° c-plane

| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|----------|
| 921 | 1027 | 1129 | 1228 | 1322 | 1422 | 1531 | 1646 | 1755 | 1842 | 1887 | 1878 | 1809 | 1692 | 1536 | 1353 | 1158 | 968 | 789 | 628 | cd |
| 100% | 112% | 123% | 133% | 144% | 154% | 166% | 179% | 191% | 200% | 205% | 204% | 196% | 184% | 167% | 147% | 126% | 105% | 86% | 68% | of 0°val |

Intensities in 270° c-plane

| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| 921 | 900 | 865 | 824 | 779 | 733 | 687 | 644 | 601 | 561 | 522 | 485 | 446 | 408 | 371 | 335 | 301 | 268 | 235 | 203 | cd |
| 100% | 98% | 94% | 89% | 85% | 80% | 75% | 70% | 65% | 61% | 57% | 53% | 48% | 44% | 40% | 36% | 33% | 29% | 26% | 22% | of 0°val |

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Outdoor Light Planning

Lumen per Zone

| Zone (γ) | Lumen | % Total |
|----------|---------|---------|
| 0-10° | 85 lm | 7.1% |
| 10-20° | 244 lm | 20.6% |
| 20-30° | 356 lm | 30.1% |
| 30-40° | 291 lm | 24.6% |
| 40-50° | 124 lm | 10.5% |
| 50-60° | 35 lm | 3.0% |
| 60-70° | 22 lm | 1.9% |
| 70-80° | 16 lm | 1.3% |
| 80-90° | 10 lm | 0.9% |
| 90-100° | 0 lm | 0.0% |
| 100-110° | 0 lm | 0.0% |
| 110-120° | 0 lm | 0.0% |
| 120-130° | 0 lm | 0.0% |
| 130-140° | 0 lm | 0.0% |
| 140-150° | 0 lm | 0.0% |
| 150-160° | 0 lm | 0.0% |
| 160-170° | 0 lm | 0.0% |
| 170-180° | 0 lm | 0.0% |
| Total | 1183 lm | 100.0% |

Intensity peaks

| | |
|----------------|---------|
| Max intensity | 1890 cd |
| Intensity, 90° | 7 cd |
| Intensity, 0° | 921 cd |

Zonal Lumen summary

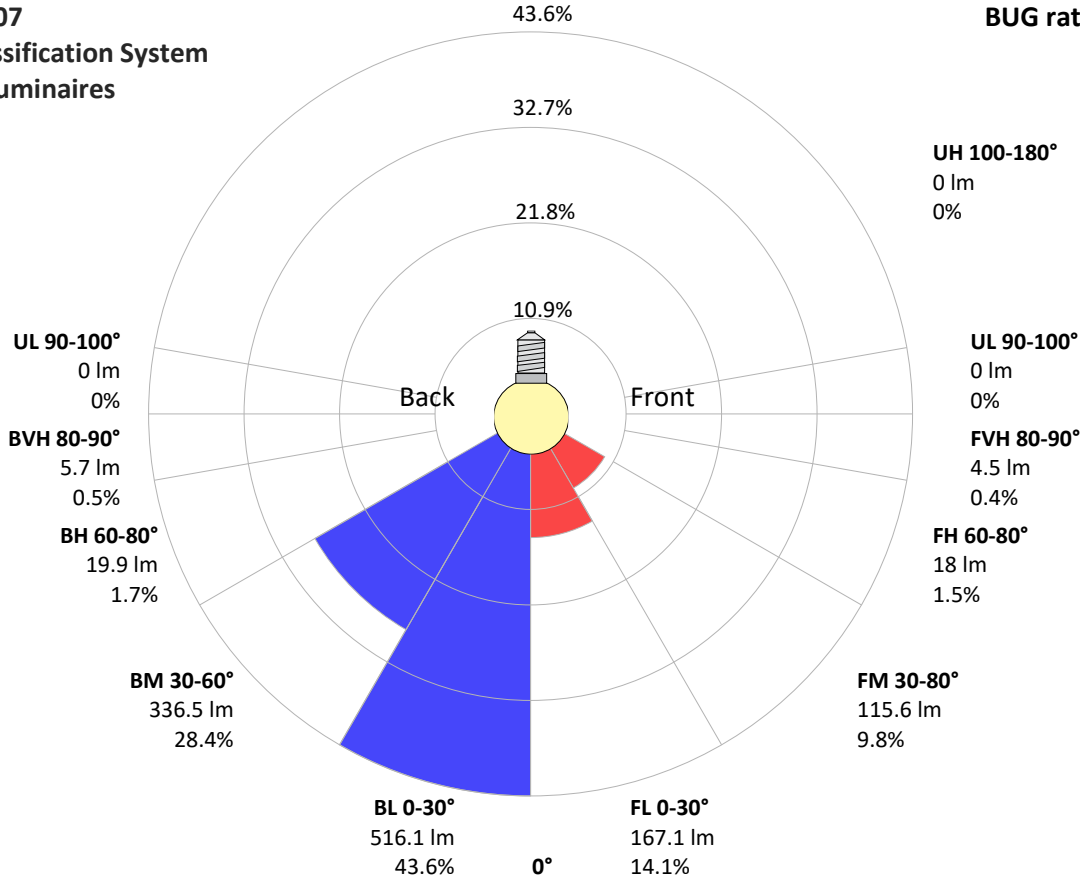
| Zone (γ) | Lumen | % Total |
|----------|---------|---------|
| 0-30° | 684 lm | 57.8% |
| 0-40° | 975 lm | 82.4% |
| 0-60° | 1135 lm | 95.9% |
| 60-90° | 48 lm | 4.1% |
| 70-100° | 26 lm | 2.2% |
| 90-120° | 0 lm | 0.0% |
| 0-90° | 1183 lm | 100.0% |
| 90-180° | 0 lm | 0.0% |
| 0-180° | 1183 lm | 100.0% |

BUG rating

| | Lumen | % Total |
|----------------------|--------|---------|
| Forward light | | |
| Low(0-30°) | 167 lm | 14.1% |
| Medium(30-60°) | 116 lm | 9.8% |
| High(60-80°) | 18 lm | 1.5% |
| Very high(80-90°) | 4 lm | 0.4% |
| Back light | | |
| Low(0-30°) | 516 lm | 43.6% |
| Medium(30-60°) | 336 lm | 28.4% |
| High(60-80°) | 20 lm | 1.7% |
| Very high(80-90°) | 6 lm | 0.5% |
| Uplight | | |
| Low(90-100°) | 0 lm | 0.0% |
| High(100-180°) | 0 lm | 0.0% |

IESNA TM-15-07
Luminaire Classification System
For Outdoor Luminaires

BUG rating B2 U1 G0



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Power Details

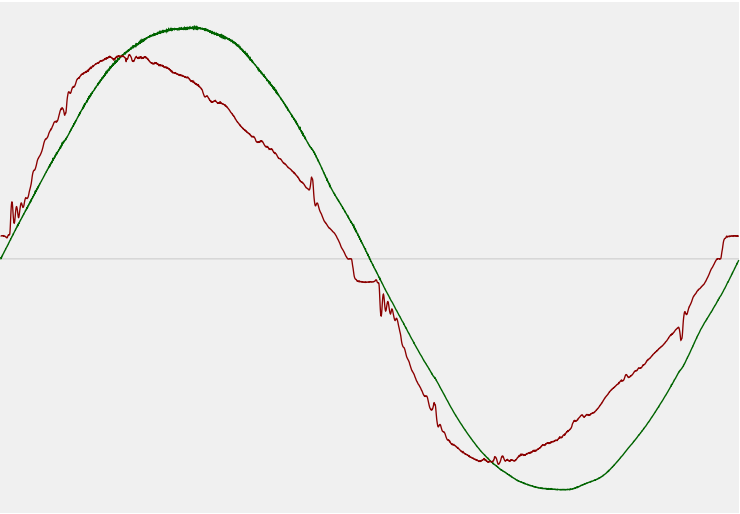
Input Power

| | |
|---|----------|
| Power feed to light source | 40.7 W |
| Frequency of input power | 49.9 Hz |
| RMS Input voltage feed, V_{RMS} | 241 V |
| RMS Input current feed, I_{RMS} | 0.175 A |
| Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$ | 42.03 VA |
| Displacement factor of AC power feed | 0.97 |
| Power factor of AC current feed | 0.97 |
| Total harmonic distortion of the current | 10.79% |
| Total harmonic distortion of the voltage | 1.1% |

Efficiency

| | |
|---------------------------|---------|
| Radiated power efficiency | 10.6% |
| Lumen efficiency | 29 lm/W |

Input Power Curve



Goniophotometry Report

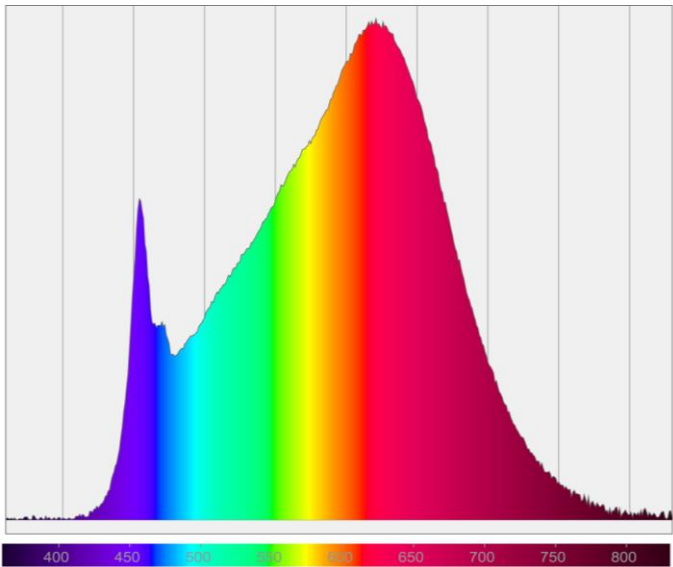
1_PHOT_SKIN+BONES-4300lmChip-3000K-WallWash-HoneycombLouvre_2309
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Color Measurements

| | |
|------------------------------|---|
| Correlated Color Temperature | CCT = 3000 K |
| Color Rendering TM30-18 | R _f 91.0 – R _g 97.7 |
| Color Shift, CIE duv | Duv ±0.0003 |

Spectral distribution



Color details

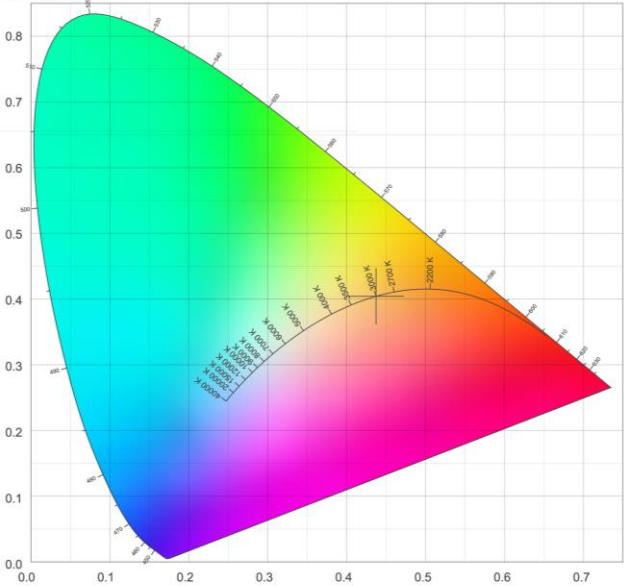
| | | | |
|---|---|-------------------------------------|-------------------------|
| Correlated Color Temperature | CCT = 3000 K | Color coordinates CIE 1931 | (x;y) = (0.437;0.404) |
| Color Rendering Index | CRI 94.1 | Color coordinate CIEs 1960 | (u;v) = (0.251;0.348) |
| Color Rendering Index, R9 (red component) | R9 = 68.6 | Color deviation from BBL | Duv = ±0.0003 |
| Color Rendering TM30-18 | R _f 91.0 – R _g 97.7 | Color coordinate CIEs 1976 (CIELUV) | (u';v') = (0.251;0.251) |
| Color Quality Scale | CQS = 91.8 | | |

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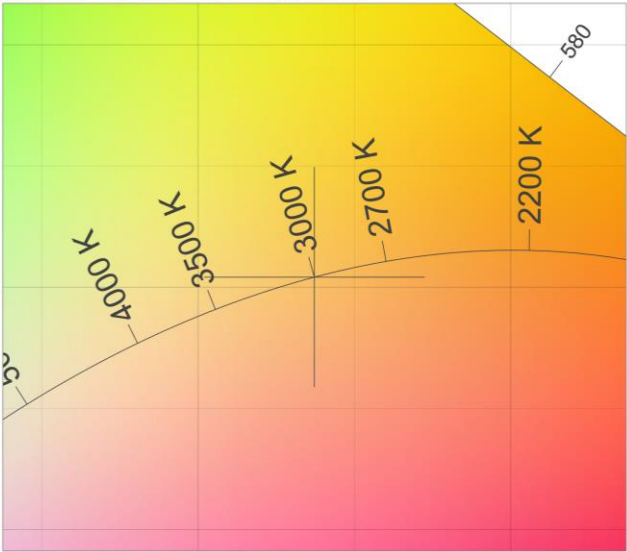
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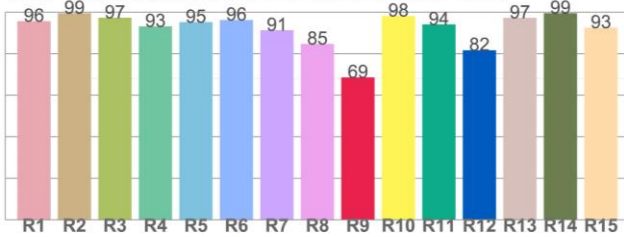
CIE 1931



CIE 1931 – zoomed on Planckian locus



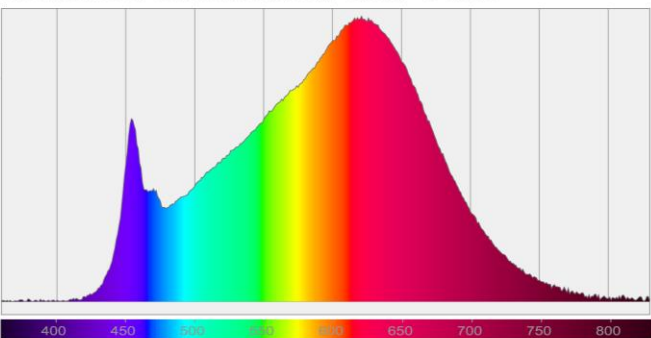
Color Rendering Index per reference color (CIE 1995)



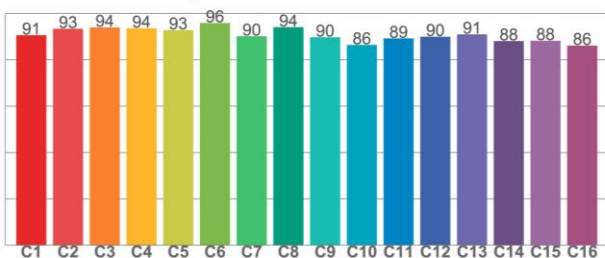
CRI R values, only R1-R8 are used to calculate final CRI value

| R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 95.7 | 99.5 | 97.3 | 93.1 | 95.2 | 96.2 | 91.3 | 84.6 | 68.6 | 98.2 | 94.1 | 81.6 | 97.2 | 99.5 | 92.5 |

Spectral power distribution (SPD) / W/nm – 0-100%



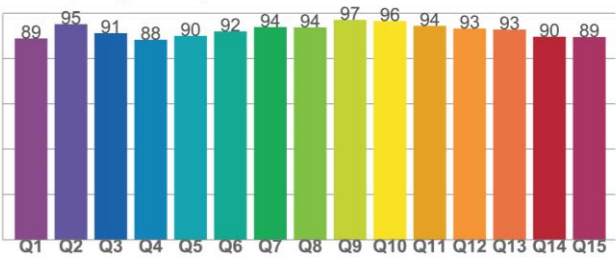
TM30-18 Rf-values per hue bin



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 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 90.6 | 93.4 | 93.9 | 93.6 | 92.8 | 95.9 | 90.1 | 94.0 | 89.7 | 86.4 | 89.2 | 89.9 | 90.9 | 88.1 | 88.2 | 86.1 |

Color Quality Scale by reference color



CQS Q values

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 88.8 | 95.1 | 91.2 | 88.2 | 89.9 | 91.9 | 93.8 | 93.7 | 97.0 | 96.5 | 94.4 | 93.2 | 92.8 | 89.6 | 89.5 |