

Goniophotometry Report

1_PHOT_REFLEKTER-L-4050lmChip-2700K-58Deg_2303
www.factorylux.com



Tested Light Source - 1_PHOT_REFLEKTER-L-4050lmChip-2700K-58Deg_2303

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

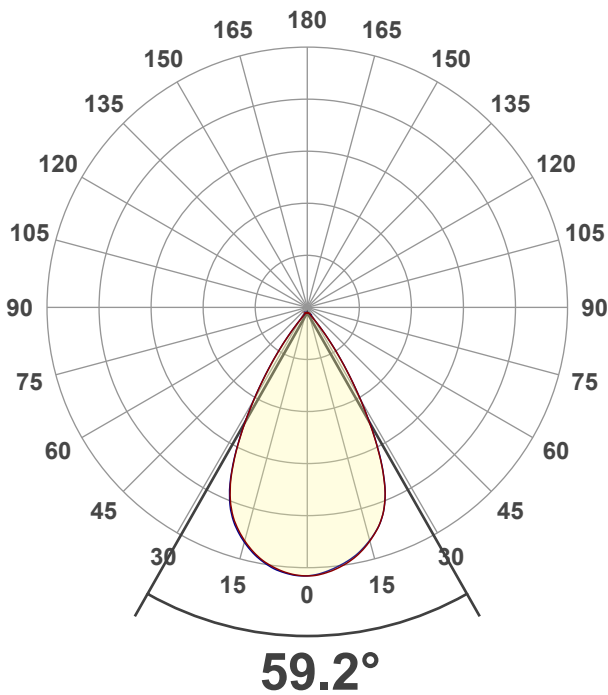
32 planes – 11.25°
2.5°
3.00 m
41.3 W – PF 0.97 – DPF 0.97
239 V – 0.179 A
50 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

3448 lm
83 lm/W
3892 cd – 59.2°
CRI 92.6

Light Intensity Distribution



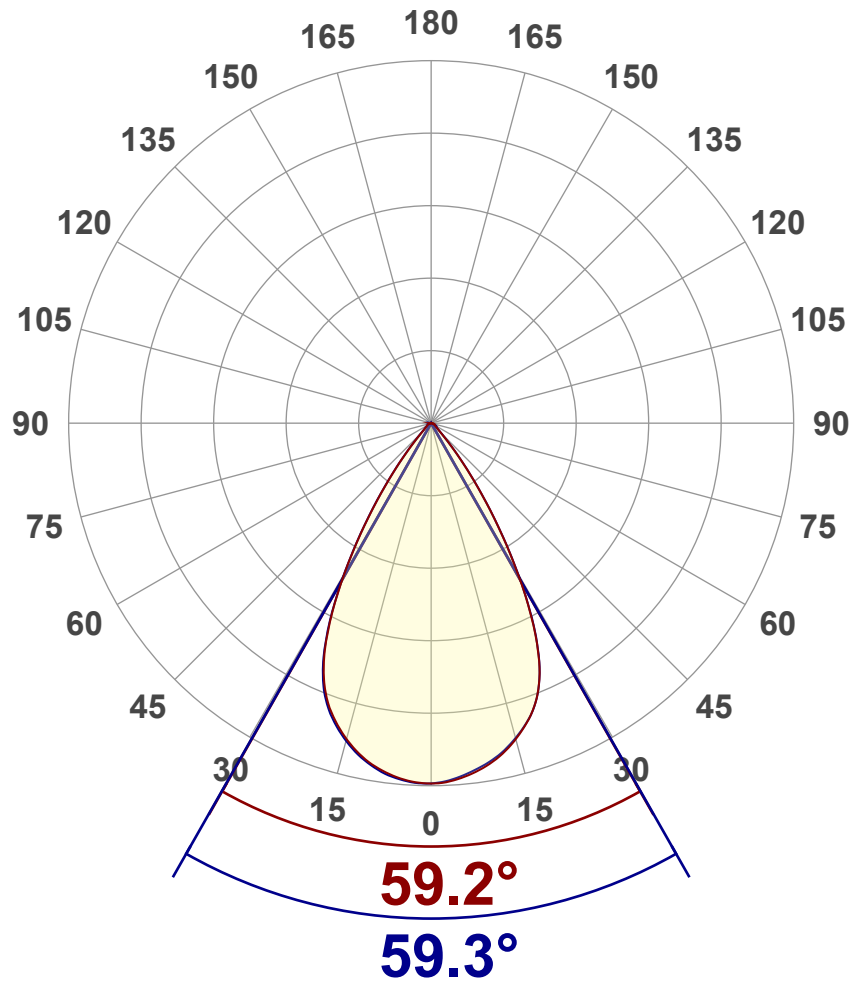
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3448 lm
Peak Intensity	3892 cd
Beam Angle (50%)	59.2°
Beam Angle (90%)	59.3°
Beam Angle (10%)	59.2°

Cut-off Angle

Average 2,5%	97.3°
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Field Angle

Average 10%	80.9°
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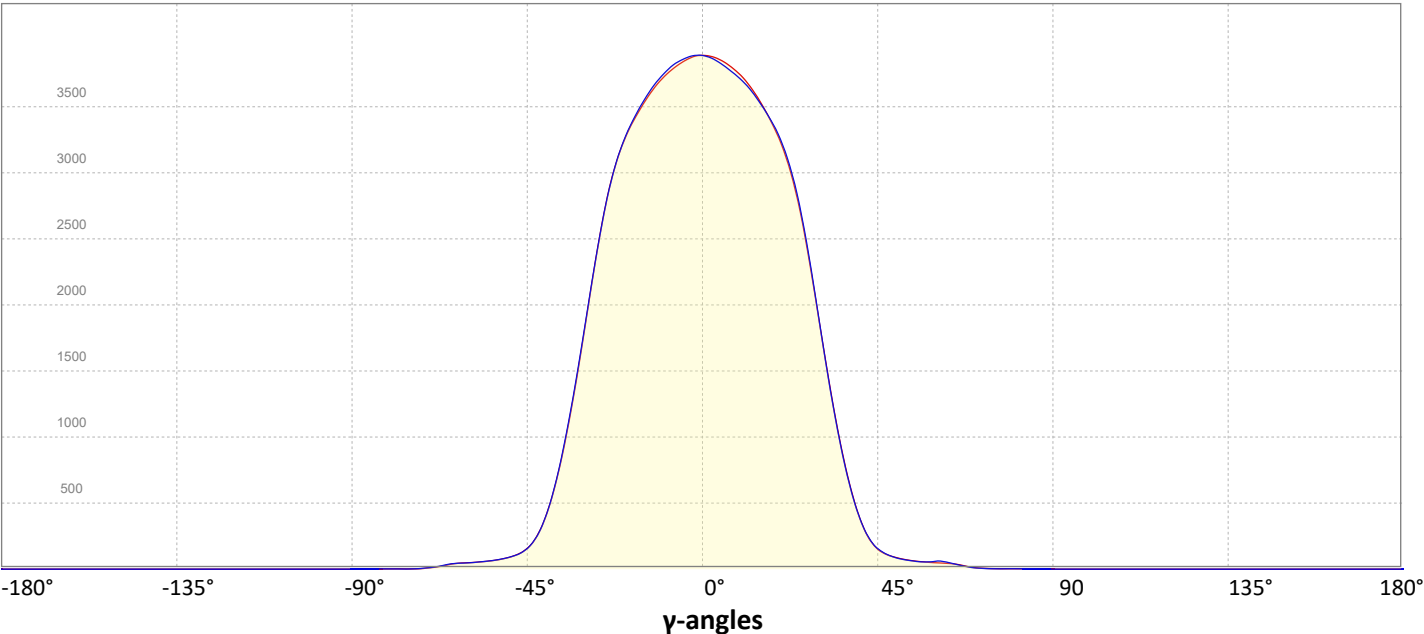
Intensity Ratio

In 120° cone	98.9%
In 90° cone	95.9%

C000-C180

C090-C270

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

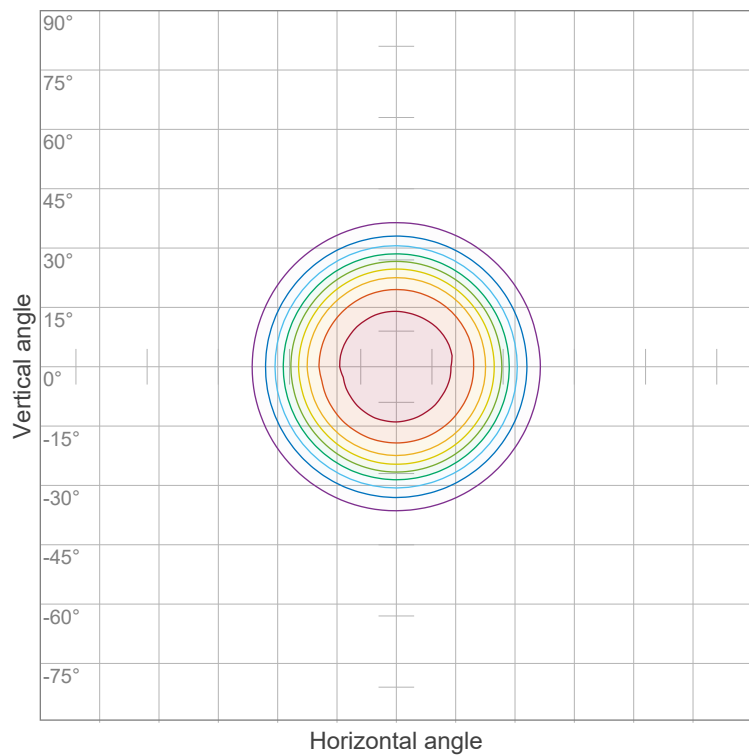


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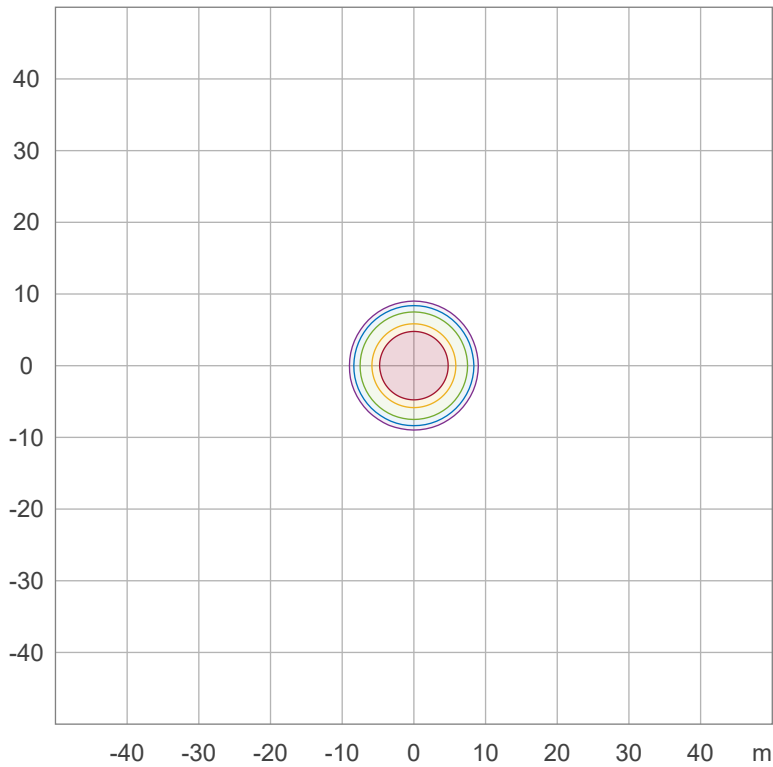
Iso-intensity Diagram (Iso-candela)



90 %	3501.4 cd
80 %	3112.3 cd
70 %	2723.3 cd
60 %	2334.2 cd
50 %	1945.2 cd
40 %	1556.2 cd
30 %	1167.1 cd
20 %	778.1 cd
10 %	389.0 cd

Peak intensity: 3890.4 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	19.4 lx
30.0 %	11.7 lx
10.0 %	3.9 lx
5.0 %	1.9 lx
3.0 %	1.2 lx

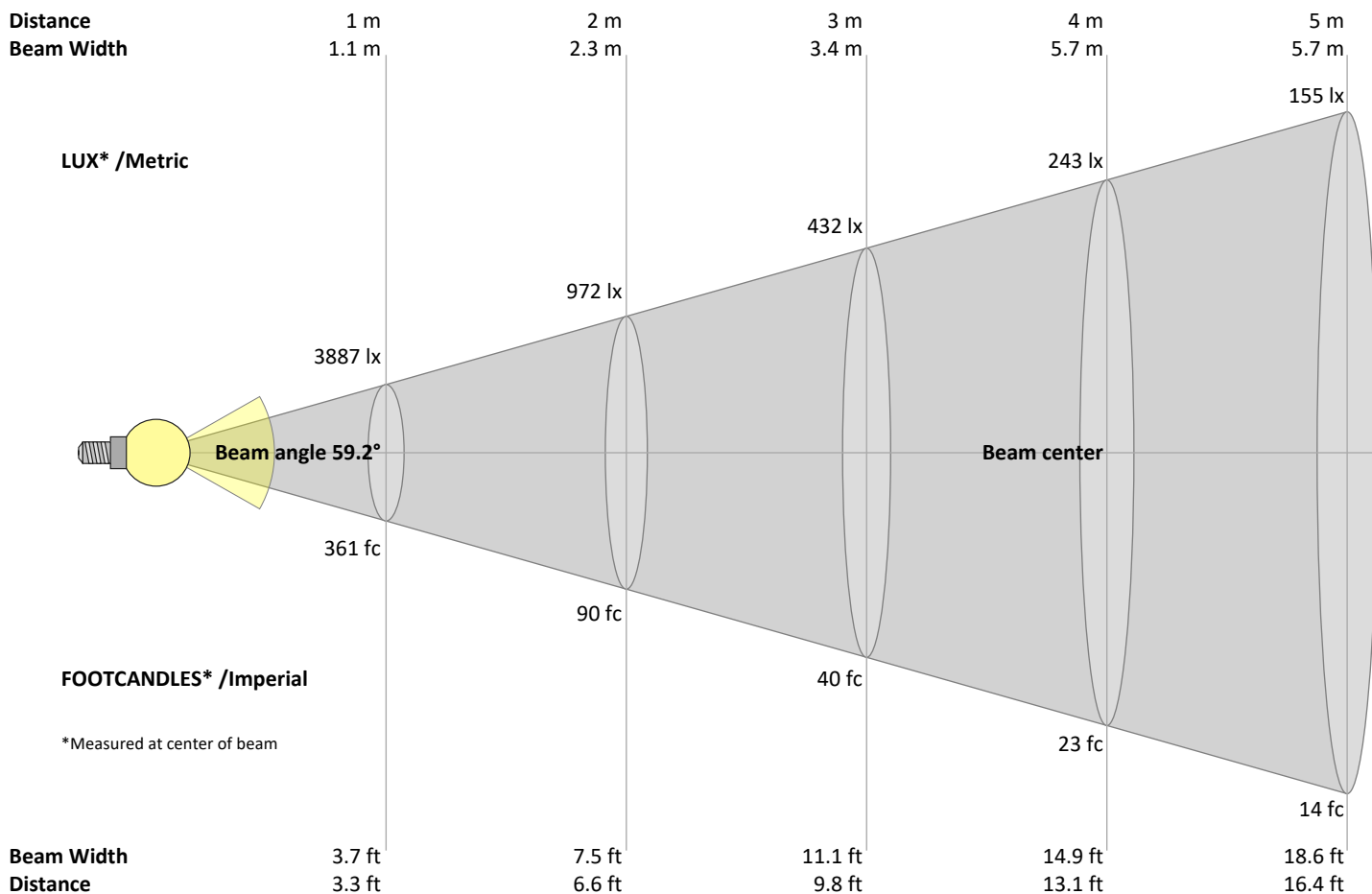
Peak illuminance: 38.9 lx
Mounting height: 10.0 m
Number of c-planes: 32

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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
3887	972	432	243	155	108	79	61	48	39	32	27	23	20	17	15	13	12	11	10	lux
361.1	90.3	40.1	22.6	14.4	10	7.4	5.6	4.5	3.6	3	2.5	2.1	1.8	1.6	1.4	1.2	1.1	1	0.9	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
3887	3881	3856	3820	3775	3721	3655	3575	3480	3375	3247	3083	2871	2580	2235	1867	1504	1165	864	621	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	84%	79%	74%	66%	57%	48%	39%	30%	22%	16%	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
3887	3871	3839	3798	3752	3701	3639	3560	3471	3371	3248	3088	2871	2582	2244	1876	1505	1162	868	622	cd
100%	100%	99%	98%	97%	95%	94%	92%	89%	87%	84%	79%	74%	66%	58%	48%	39%	30%	22%	16%	of 0°val

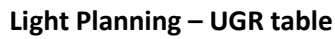
Intensities in 180° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
3887	3880	3861	3829	3786	3731	3660	3574	3476	3363	3233	3060	2838	2560	2231	1870	1510	1175	878	626	cd
100%	100%	99%	99%	97%	96%	94%	92%	89%	87%	83%	79%	73%	66%	57%	48%	39%	30%	23%	16%	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
3887	3886	3870	3842	3803	3747	3678	3594	3497	3385	3256	3090	2862	2574	2239	1878	1513	1179	881	629	cd
100%	100%	100%	99%	98%	96%	95%	92%	90%	87%	84%	79%	74%	66%	58%	48%	39%	30%	23%	16%	of 0°val

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[illegible]

n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a

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 Lumen delivered to the task surface														
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	114	111	108	106	111	109	106	104	105	103	101	101	99	98	97	96	95	94
2	108	103	99	96	106	101	98	95	98	95	93	95	93	91	92	90	89	87
3	103	96	91	87	101	95	90	87	92	88	85	90	87	84	88	85	83	81
4	97	90	84	80	96	89	84	80	87	82	79	85	81	78	83	80	77	76
5	93	84	79	74	91	83	78	74	82	77	73	80	76	73	78	75	72	71
6	88	79	73	69	87	78	73	69	77	72	68	76	71	68	74	70	67	66
7	84	75	69	64	82	74	68	64	73	68	64	71	67	64	70	66	63	62
8	80	70	64	60	79	70	64	60	69	64	60	68	63	60	67	63	59	58
9	76	66	61	57	75	66	60	57	65	60	56	64	60	56	63	59	56	55
10	73	63	57	53	72	63	57	53	62	57	53	61	56	53	60	56	53	52

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LAMPS (number of lamps)

[illegible]

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	363 lm	10.5%
10-20°	989 lm	28.7%
20-30°	1214 lm	35.2%
30-40°	645 lm	18.7%
40-50°	142 lm	4.1%
50-60°	55 lm	1.6%
60-70°	33 lm	0.9%
70-80°	4 lm	0.1%
80-90°	2 lm	0.1%
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	3448 lm	100.0%

Intensity peaks

Max intensity	3892 cd
Intensity, 90°	0 cd
Intensity, 0°	3887 cd

Zonal Lumen summary

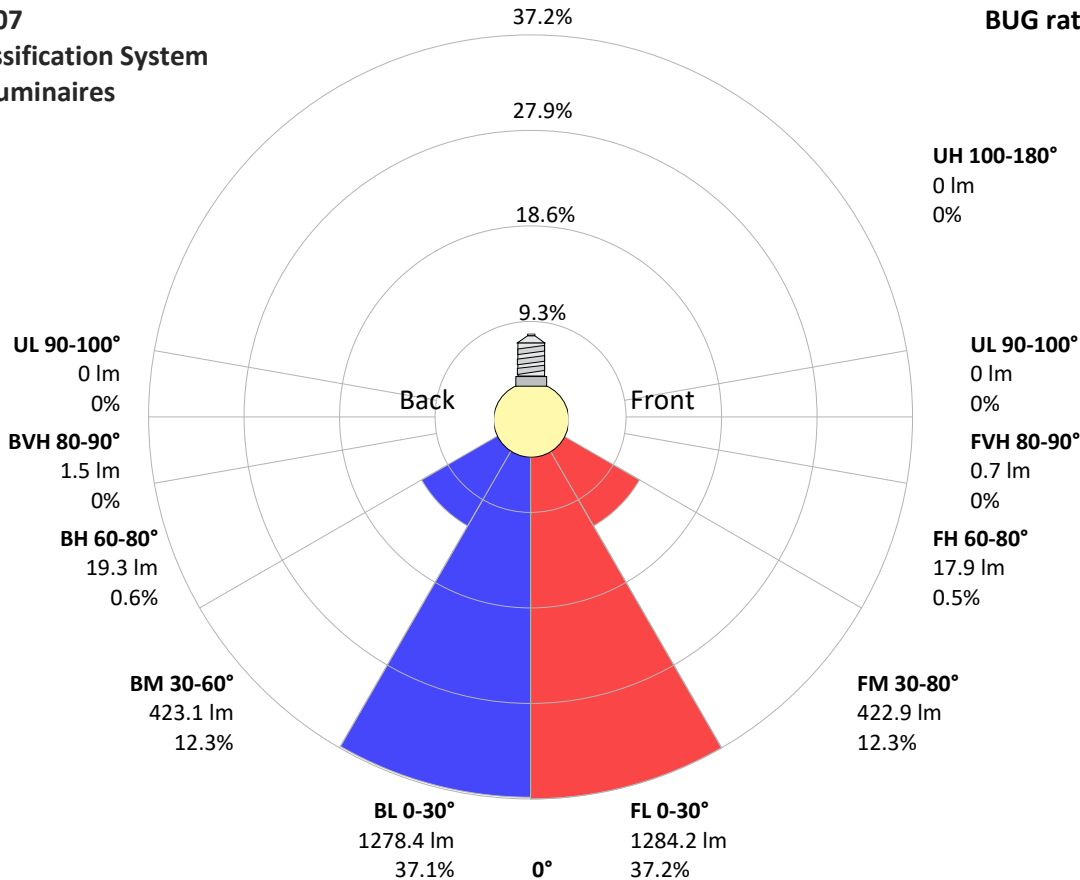
Zone (γ)	Lumen	% Total
0-30°	2566 lm	74.4%
0-40°	3211 lm	93.1%
0-60°	3409 lm	98.9%
60-90°	39 lm	1.1%
70-100°	7 lm	0.2%
90-120°	0 lm	0.0%
0-90°	3448 lm	100.0%
90-180°	0 lm	0.0%
0-180°	3448 lm	100.0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1284 lm	37.2%
Medium(30-60°)	423 lm	12.3%
High(60-80°)	18 lm	0.5%
Very high(80-90°)	1 lm	0.0%
Back light		
Low(0-30°)	1278 lm	37.1%
Medium(30-60°)	423 lm	12.3%
High(60-80°)	19 lm	0.6%
Very high(80-90°)	2 lm	0.0%
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 B3 U1 G0



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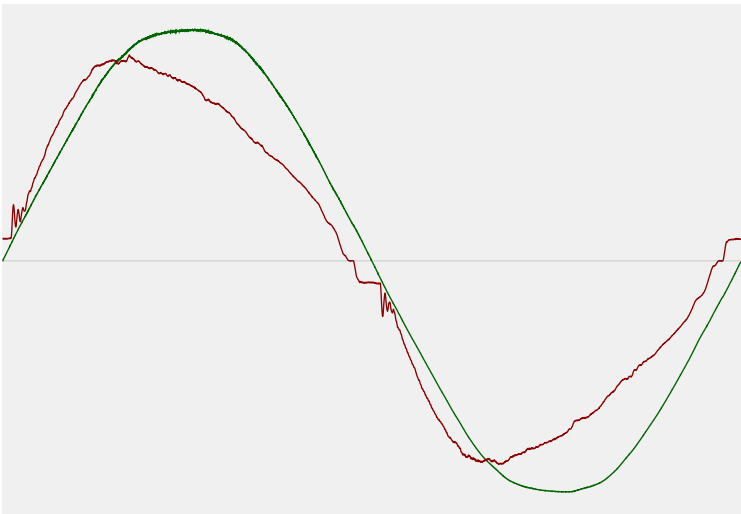


Power Details

Input Power

Power feed to light source	41.3 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	239 V
RMS Input current feed, I_{RMS}	0.179 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.69 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	11.15%
Total harmonic distortion of the voltage	1.49%

Input Power Curve



Efficiency

Radiated power efficiency	30.3%
Lumen efficiency	83 lm/W

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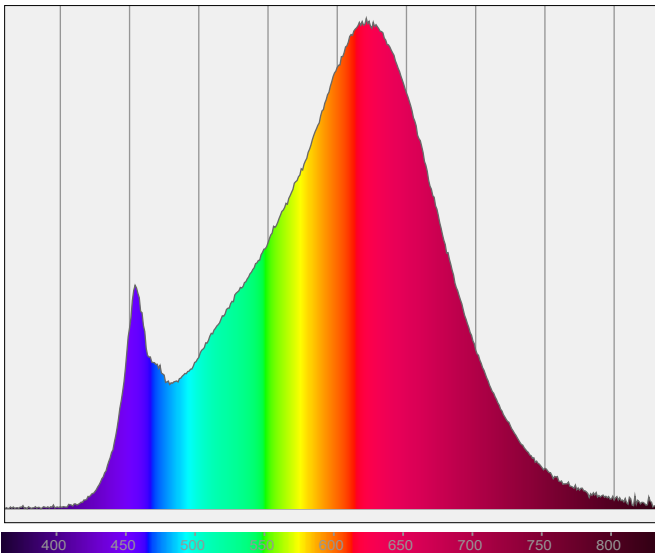
Color Measurements

Correlated Color Temperature CCT = 2700 K

Color Rendering TM30-18 R_f 91.5 — R_g 99.6

Color Shift, CIE duv Duv ±0.0003

Spectral distribution



Color details

Correlated Color Temperature	CCT = 2700 K	Color coordinates CIE 1931	(x;y) = (0.460;0.411)
Color Rendering Index	CRI 92.6	Color coordinate CIEs 1960	(u;v) = (0.263;0.352)
Color Rendering Index, R9 (red component)	R9 = 61.5	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.5 — R _g 99.6	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 89.8		

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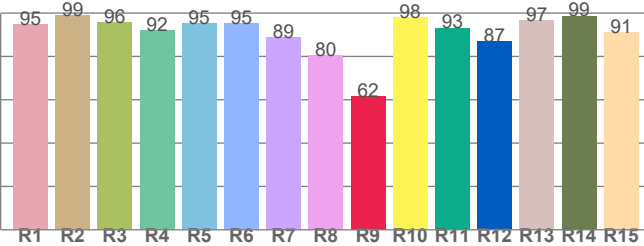
CIE 1931



CIE 1931 – zoomed on Planckian locus



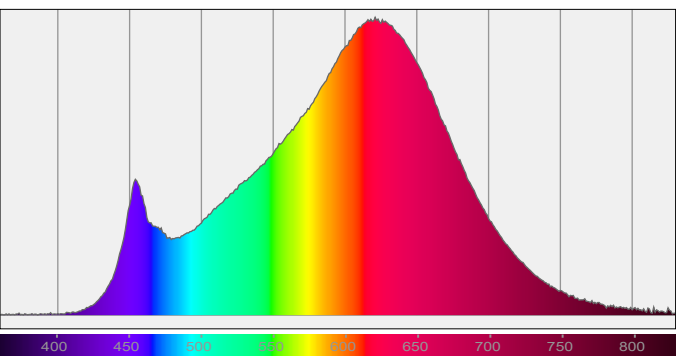
Color Rendering Index per reference color (CIE 1995)



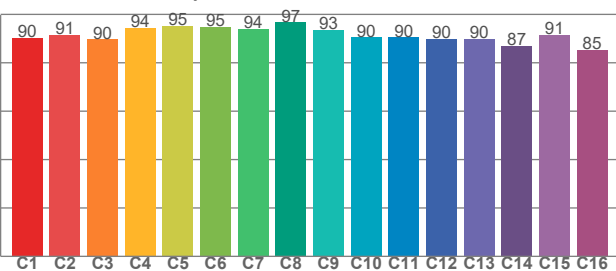
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
94.7	98.8	95.6	92.2	95.2	95.3	88.6	80.3	61.5	98.1	93.1	86.9	96.5	98.7	91.0

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



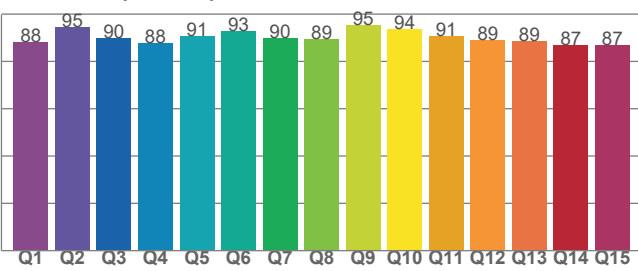
TM30-18 Rf-values per hue bin



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
90.3	91.4	89.6	94.4	95.2	94.8	93.8	96.6	93.4	90.5	90.4	89.7	89.7	86.9	91.3	85.4

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88.0	94.5	89.7	87.7	90.7	92.8	90.0	89.2	95.2	93.6	90.9	88.8	88.5	87.0	87.1