

Goniophotometry Report

1_PHOT_NINETY-NINE-2000lmChip-2700K-58Deg_2303
www.factorylux.com



Tested Light Source - 1_PHOT_NINETY-NINE-2000lmChip-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

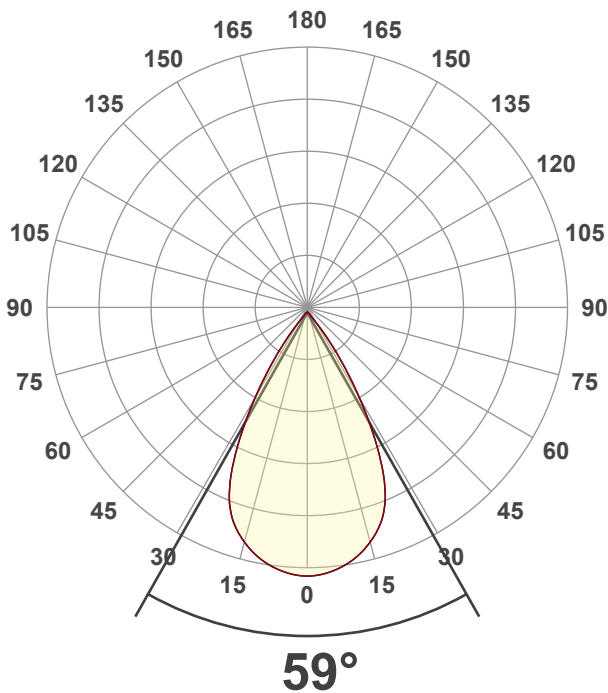
32 planes – 11.25°
2.5°
1.50 m
15.9 W – PF 0.98 – DPF 0.98
243 V – 0.067 A
50 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

1452 lm
91 lm/W
1666 cd – 59°
CRI 92.6

Light Intensity Distribution



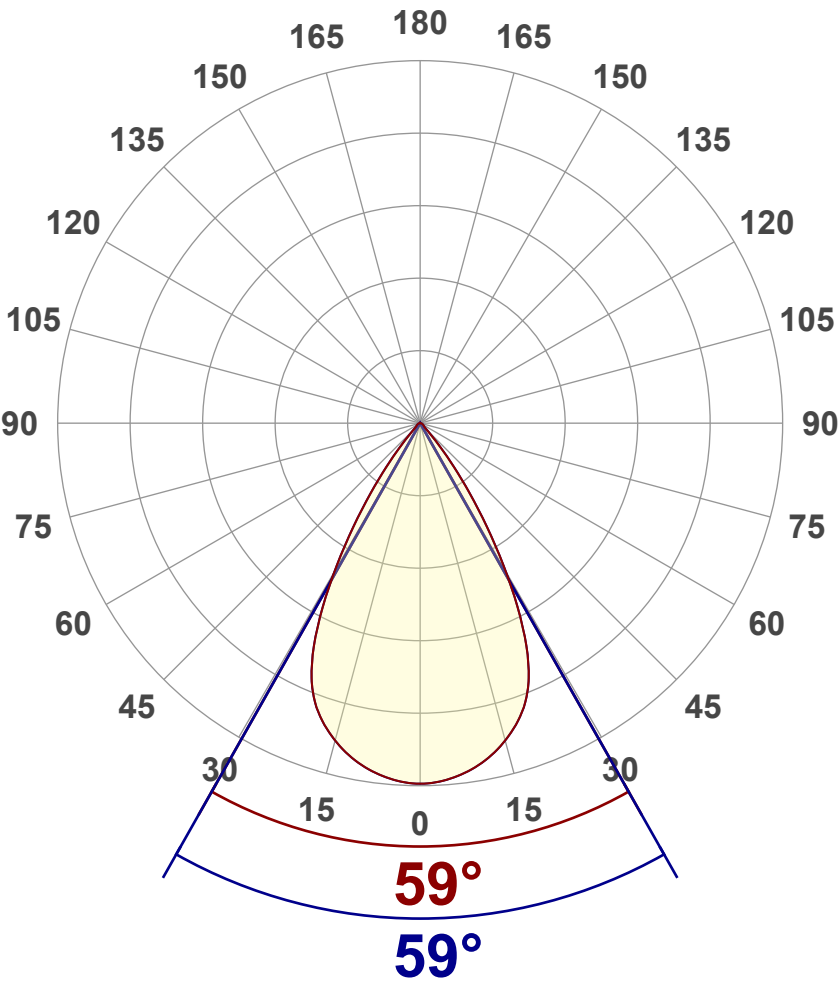
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1452 lm
Peak Intensity	1666 cd
Beam Angle (50%)	59°
Beam Angle (90%)	59°
Beam Angle (10%)	59°

Cut-off Angle

Average 2,5%	90.7°
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Field Angle

Average 10%	79.3°
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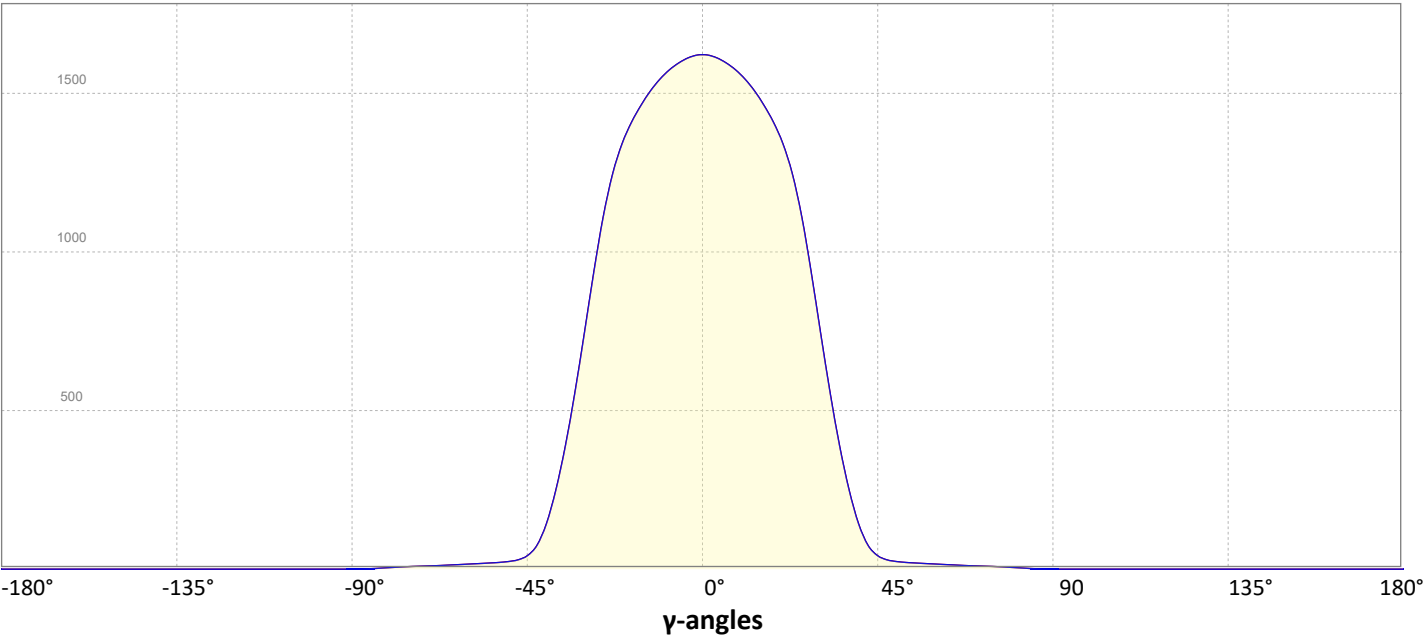
Intensity Ratio

In 120° cone	98.3%
In 90° cone	96.2%

C000-C180

C090-C270

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

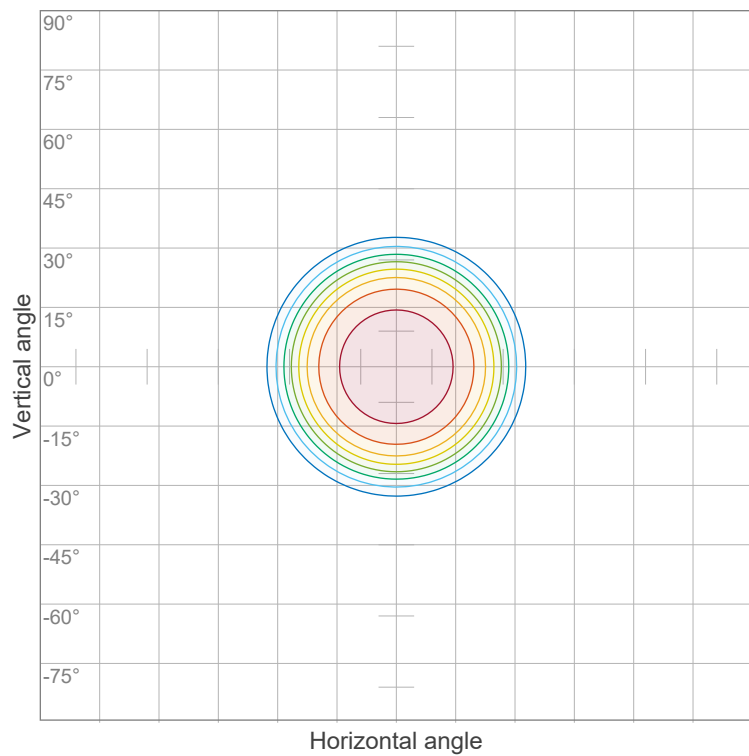


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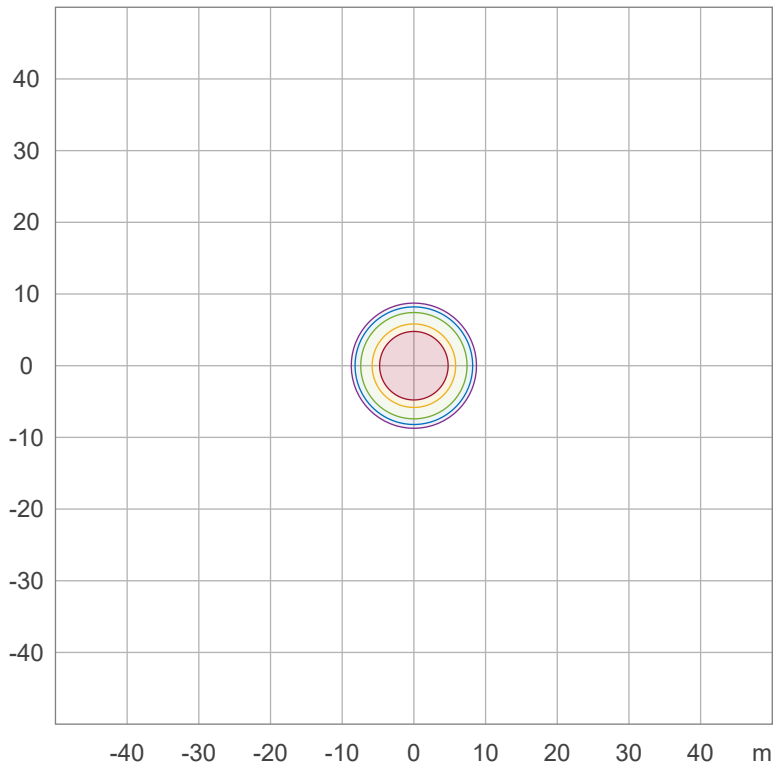
Iso-intensity Diagram (Iso-candela)



90 %	1499.1 cd
80 %	1332.5 cd
70 %	1166.0 cd
60 %	999.4 cd
50 %	832.8 cd
40 %	666.3 cd
30 %	499.7 cd
20 %	333.1 cd
10 %	166.6 cd

Peak intensity: 1665.7 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	8.3 lx
30.0 %	5.0 lx
10.0 %	1.7 lx
5.0 %	0.8 lx
3.0 %	0.5 lx

Peak illuminance: 16.7 lx
Mounting height: 10.0 m
Number of c-planes: 32

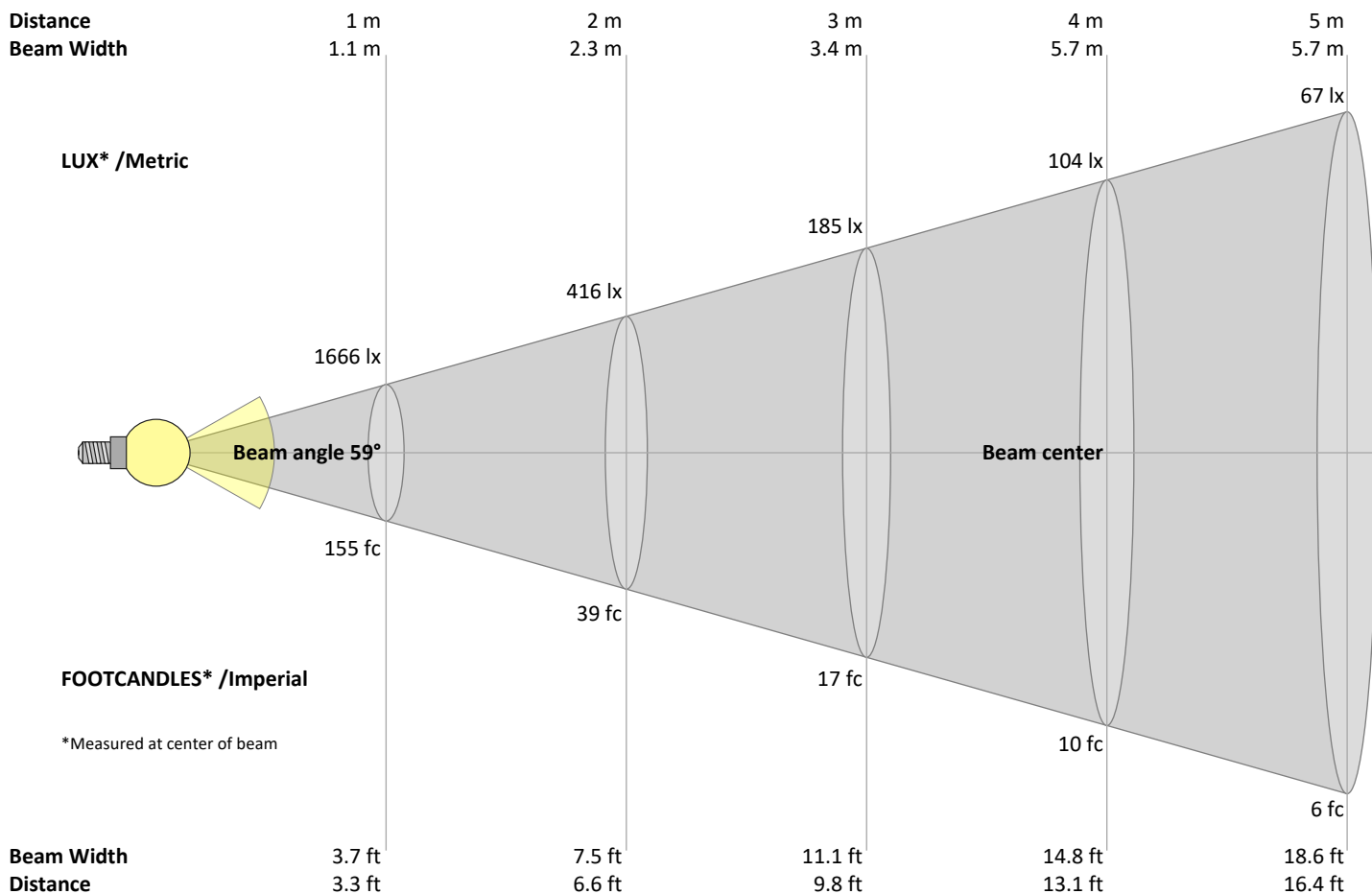
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Beam Details



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
1666	416	185	104	67	46	34	26	21	17	14	12	10	8	7	7	6	5	5	4	lux
154.7	38.7	17.2	9.7	6.2	4.3	3.2	2.4	1.9	1.5	1.3	1.1	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	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
1666	1663	1654	1641	1622	1599	1571	1537	1498	1453	1397	1324	1227	1104	955	792	633	485	353	241	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	84%	79%	74%	66%	57%	48%	38%	29%	21%	14%	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
1666	1663	1654	1641	1622	1599	1571	1537	1498	1453	1397	1324	1227	1104	955	792	633	485	353	241	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	84%	79%	74%	66%	57%	48%	38%	29%	21%	14%	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
1666	1663	1654	1641	1622	1599	1571	1537	1498	1453	1397	1324	1227	1104	955	792	633	485	353	241	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	84%	79%	74%	66%	57%	48%	38%	29%	21%	14%	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
1666	1663	1654	1641	1622	1599	1571	1537	1498	1453	1397	1324	1227	1104	955	792	633	485	353	241	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	84%	79%	74%	66%	57%	48%	38%	29%	21%	14%	of 0°val

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Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances											
	ρ Ceiling	70	70	50	50	30	70	70	50	50	30
	ρ Walls	50	30	50	30	30	50	30	50	30	30
	ρ Floor	20	20	20	20	20	20	20	20	20	20
Room size											
H = mounting height above eye level											
X	Y	Viewed Crosswise (Viewing direction orthogonal to lamp length axis)					Viewed Endwise (Viewing direction parallel to lamp length axis)				
2H	2H	19.9	20.5	20.0	20.8	21.0	19.9	20.5	20.0	20.8	21.0
	3H	19.8	20.6	20.2	20.8	21.0	19.8	20.6	20.2	20.8	21.0
	4H	19.9	20.6	20.2	20.8	21.1	19.9	20.6	20.2	20.8	21.1
	6H	20.0	20.6	20.3	20.9	21.2	20.0	20.6	20.3	20.9	21.2
	8H	20.0	20.6	20.3	20.9	21.3	20.0	20.6	20.3	20.9	21.3
	12H	19.9	20.5	20.3	20.9	21.3	19.9	20.5	20.3	20.9	21.3
4H	2H	19.6	20.4	20.0	20.6	20.8	19.6	20.4	20.0	20.6	20.8
	3H	19.8	20.4	20.1	20.7	21.1	19.8	20.4	20.1	20.7	21.1
	4H	19.9	20.4	20.3	20.8	21.3	19.9	20.4	20.3	20.8	21.3
	6H	20.0	20.5	20.5	20.9	21.2	20.0	20.5	20.5	20.9	21.2
	8H	20.0	20.5	20.5	20.9	21.2	20.0	20.5	20.5	20.9	21.2
	12H	20.0	20.4	20.5	20.8	21.3	20.0	20.4	20.5	20.8	21.3
8H	4H	19.8	20.4	20.4	20.7	21.1	19.8	20.4	20.4	20.7	21.1
	6H	20.1	20.4	20.6	20.9	21.4	20.1	20.4	20.6	20.9	21.4
	8H	20.2	20.4	20.7	20.9	21.6	20.2	20.4	20.7	20.9	21.6
	12H	20.2	20.4	20.7	20.9	21.5	20.2	20.4	20.7	20.9	21.5
12H	4H	19.8	20.2	20.3	20.6	21.1	19.8	20.2	20.3	20.6	21.1
	6H	20.1	20.4	20.6	20.9	21.5	20.1	20.4	20.6	20.9	21.5
	8H	20.1	20.4	20.7	20.9	21.5	20.1	20.4	20.7	20.9	21.5

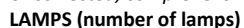
Variations with the observer position for the luminaire spacings, S:

S = 1.0H	4.7 / -3.7	4.7 / -3.7
S = 1.5H	7.2 / -3.9	7.2 / -3.9
S = 2.0H	9.2 / -4.2	9.2 / -4.2

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	113	111	108	106	111	109	106	104	104	103	101	101	99	98	97	96	95	93
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	98	90	85	80	96	89	84	80	87	82	79	85	81	78	83	80	77	76
5	93	85	79	75	91	84	78	74	82	77	74	80	76	73	79	75	72	71
6	88	80	74	69	87	79	73	69	77	72	69	76	72	68	75	71	68	66
7	84	75	69	65	83	74	69	65	73	68	64	72	67	64	71	67	64	62
8	80	71	65	61	79	70	65	61	69	64	61	68	64	60	67	63	60	59
9	76	67	61	57	75	66	61	57	66	61	57	65	60	57	64	60	57	55
10	73	63	58	54	72	63	58	54	62	57	54	61	57	54	61	57	53	52

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Zonal Lumen Summary

[illegible]

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	156 lm	10.7%
10-20°	425 lm	29.3%
20-30°	520 lm	35.8%
30-40°	264 lm	18.2%
40-50°	45 lm	3.1%
50-60°	18 lm	1.2%
60-70°	13 lm	0.9%
70-80°	9 lm	0.6%
80-90°	2 lm	0.2%
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	1452 lm	100.0%

Intensity peaks

Max intensity	1666 cd
Intensity, 90°	0 cd
Intensity, 0°	1666 cd

Zonal Lumen summary

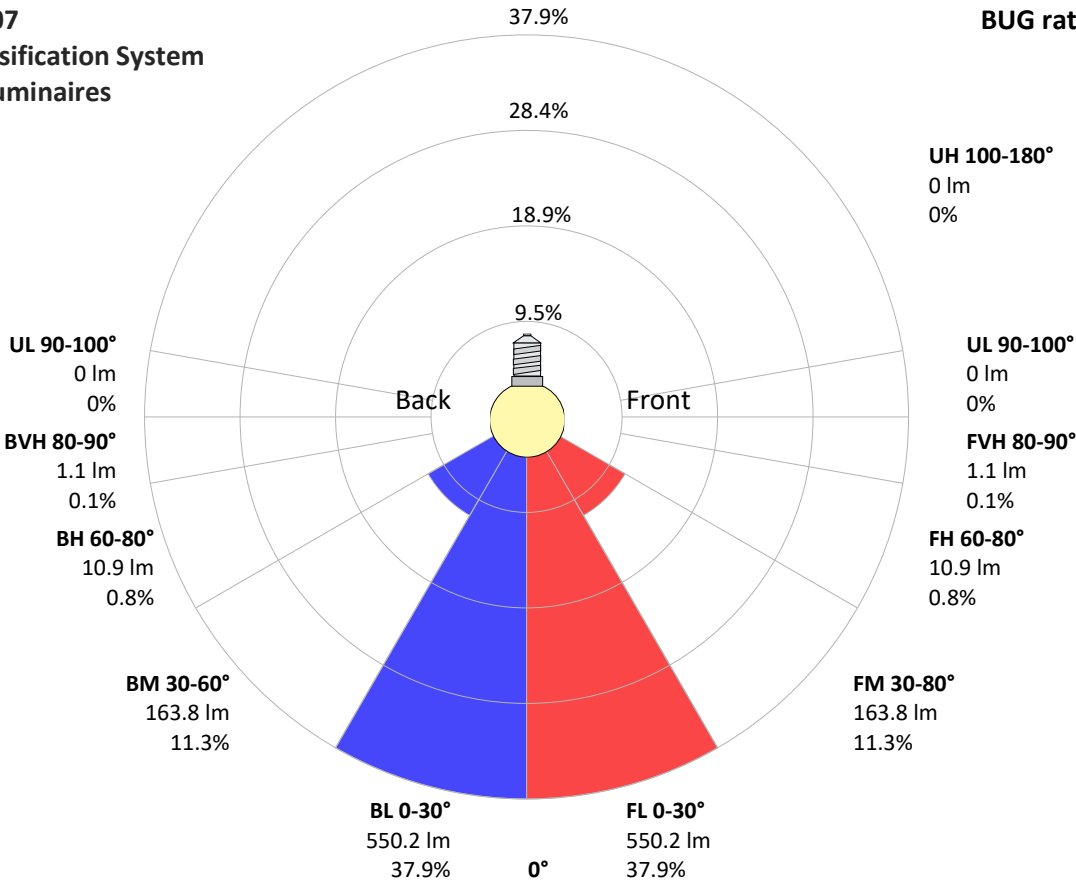
Zone (γ)	Lumen	% Total
0-30°	1101 lm	75.8%
0-40°	1366 lm	94.1%
0-60°	1428 lm	98.3%
60-90°	24 lm	1.7%
70-100°	11 lm	0.8%
90-120°	0 lm	0.0%
0-90°	1452 lm	100.0%
90-180°	0 lm	0.0%
0-180°	1452 lm	100.0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	550 lm	37.9%
Medium(30-60°)	164 lm	11.3%
High(60-80°)	11 lm	0.8%
Very high(80-90°)	1 lm	0.1%
Back light		
Low(0-30°)	550 lm	37.9%
Medium(30-60°)	164 lm	11.3%
High(60-80°)	11 lm	0.8%
Very high(80-90°)	1 lm	0.1%
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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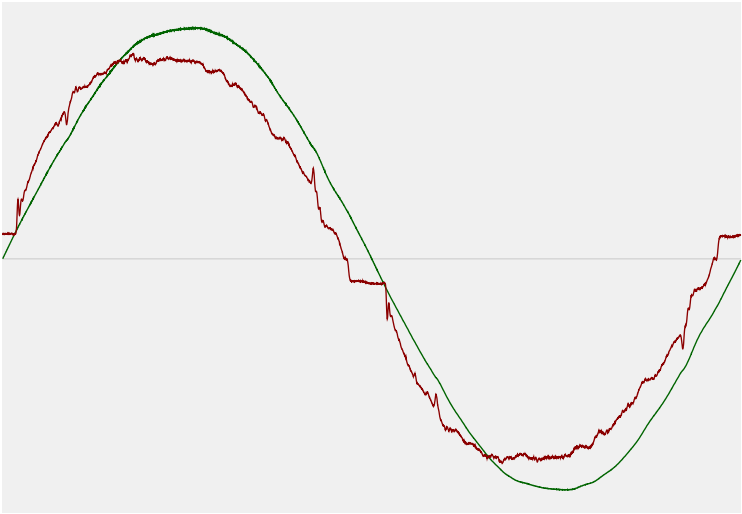


Power Details

Input Power

Power feed to light source	15.9 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	243 V
RMS Input current feed, I_{RMS}	0.067 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	16.19 VA
Displacement factor of AC power feed	0.98
Power factor of AC current feed	0.98
Total harmonic distortion of the current	6.25%
Total harmonic distortion of the voltage	1.07%

Input Power Curve



Efficiency

Radiated power efficiency	33.4%
Lumen efficiency	91 lm/W

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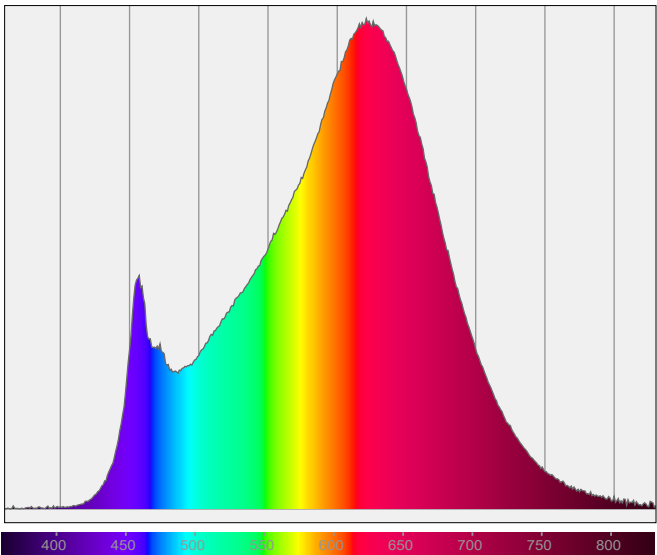
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Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R _f 91.3 — R _g 98.9
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 = 66.4	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.3 — R _g 98.9	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 90.5		

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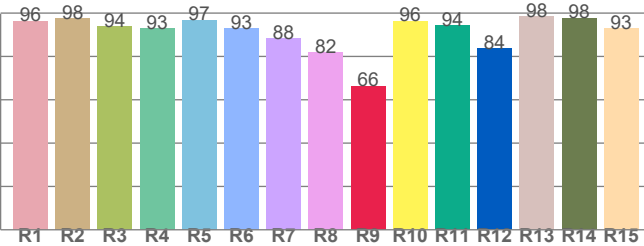
CIE 1931



CIE 1931 – zoomed on Planckian locus



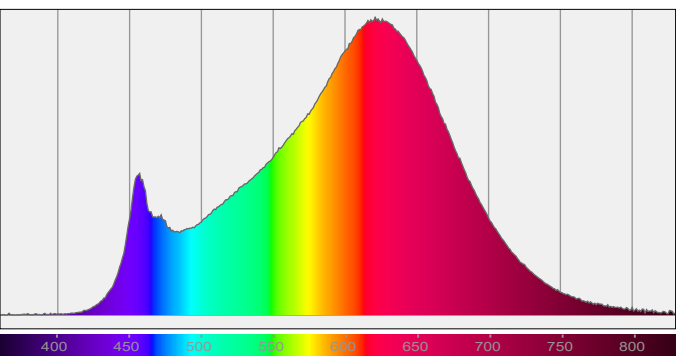
Color Rendering Index per reference color (CIE 1995)



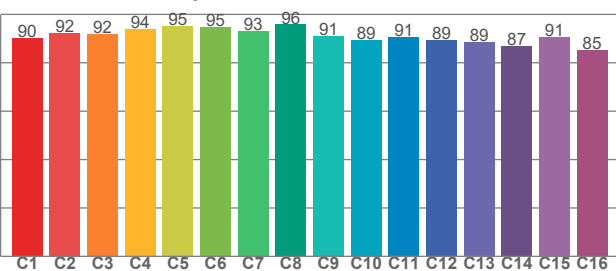
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
96.4	97.6	93.9	93.1	96.9	93.1	88.3	81.9	66.4	96.4	94.4	83.9	98.4	97.8	93.0

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



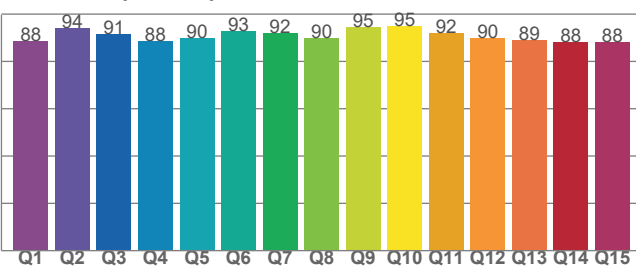
TM30-18 Rf-values per hue bin



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	92.3	92.0	93.9	95.1	94.9	93.1	95.8	91.0	89.4	90.6	89.4	88.6	86.9	90.6	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
88.4	93.9	91.4	88.5	90.0	92.9	91.8	90.0	94.7	95.0	92.0	89.7	89.0	88.0	88.1