

Goniophotometry Report

1_PHOT_NINETY-NINE-2350lmChip-4000K-58Deg_2303
www.factorylux.com



Tested Light Source - 1_PHOT_NINETY-NINE-2350lmChip-4000K-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

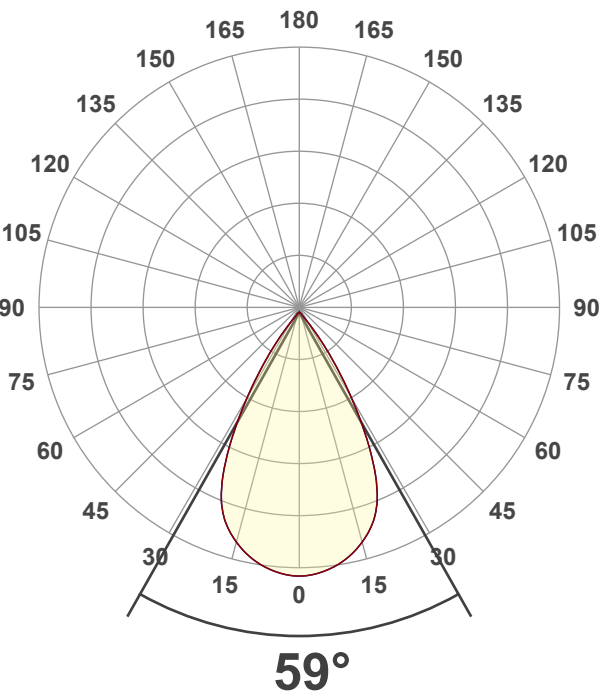
32 planes – 11.25°
2.5°
1.50 m
15.9 W – PF 0.98 – DPF 0.98
243 V – 0.067 A
50 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

1704 lm
107 lm/W
1955 cd – 59°
CRI 92.6

Light Intensity Distribution



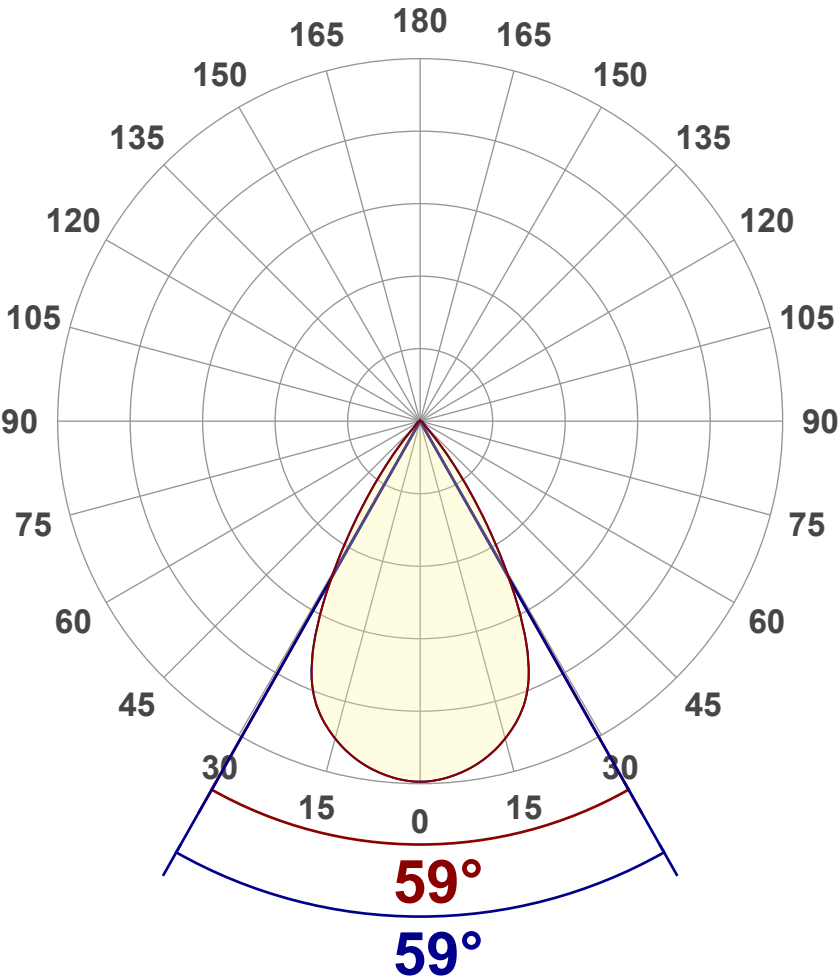
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1704 lm
Peak Intensity	1955 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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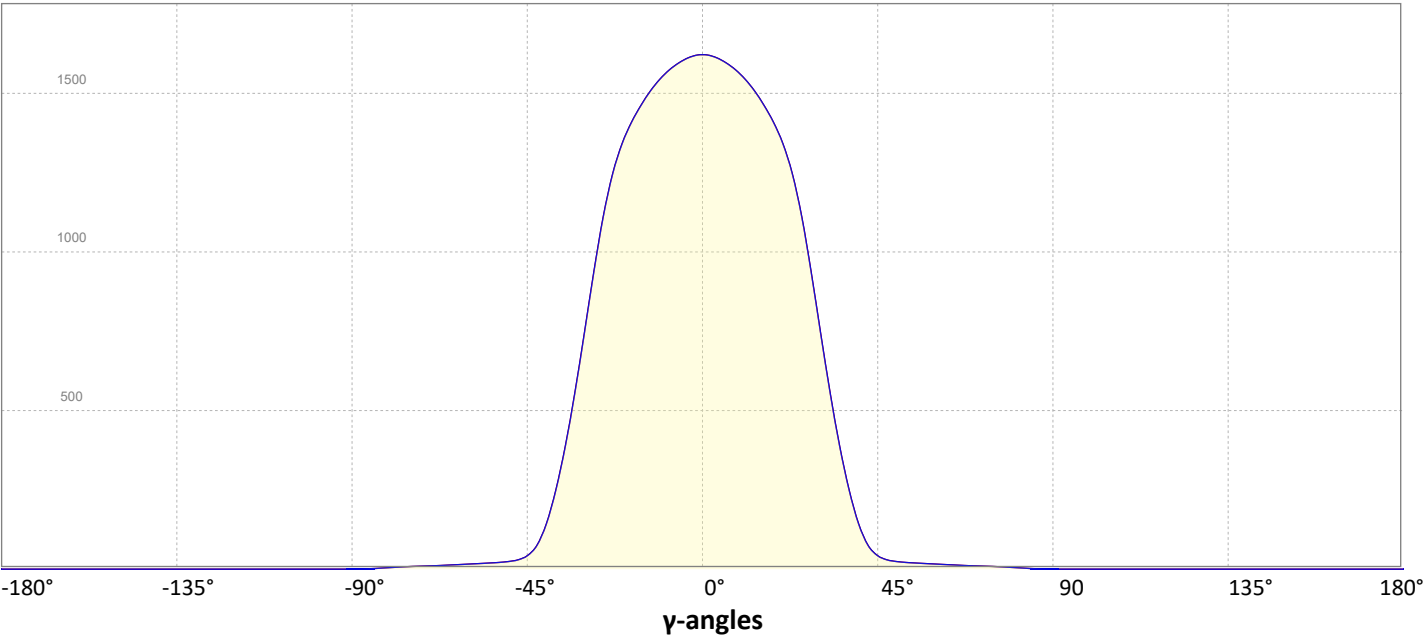
Intensity Ratio

In 120° cone	98.3%
In 90° cone	96.2%

C000-C180

C090-C270

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

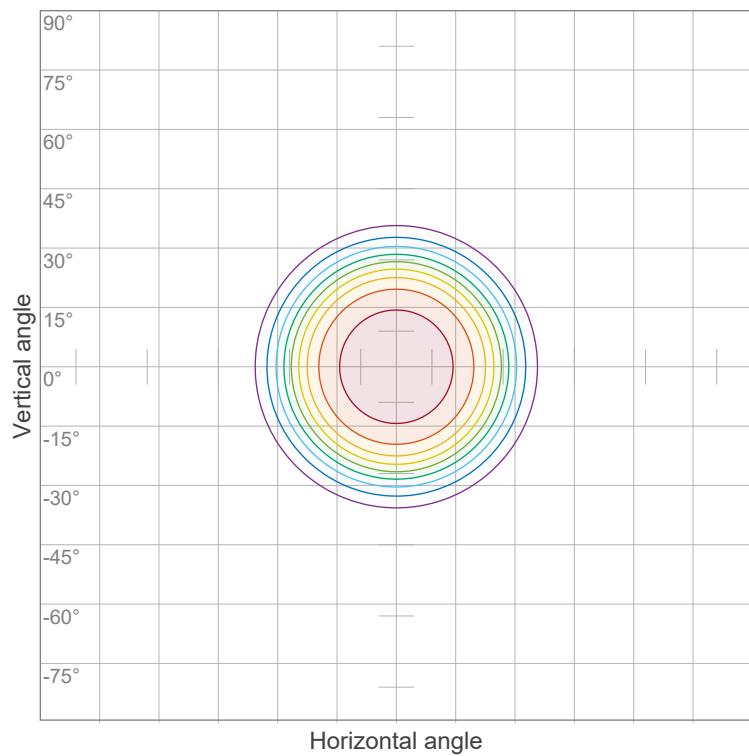


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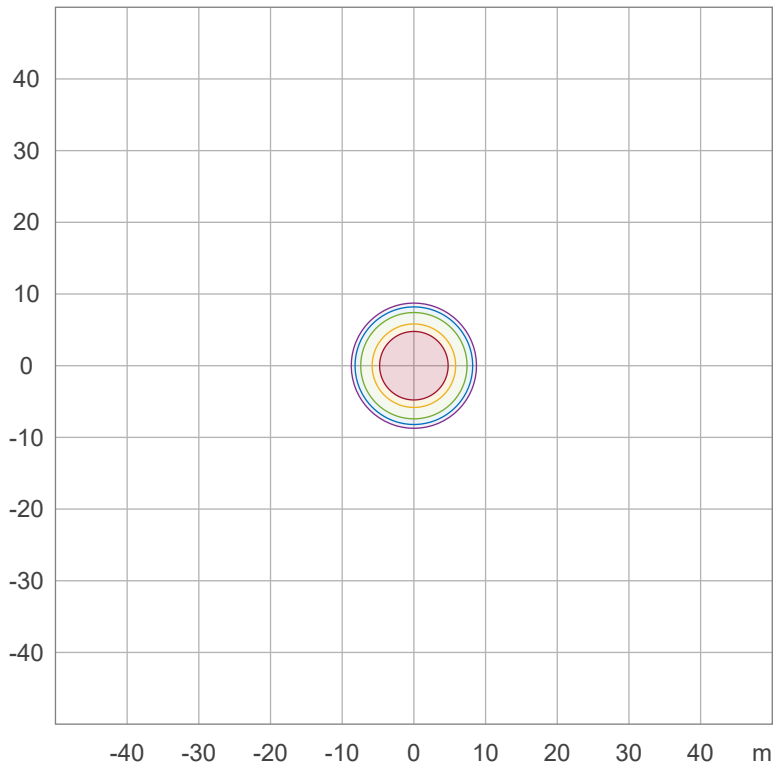
Iso-intensity Diagram (Iso-candela)



90 %	1759.3 cd
80 %	1563.8 cd
70 %	1368.3 cd
60 %	1172.8 cd
50 %	977.4 cd
40 %	781.9 cd
30 %	586.4 cd
20 %	390.9 cd
10 %	195.5 cd

Peak intensity: 1954.7 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	9.8 lx
30.0 %	5.9 lx
10.0 %	2.0 lx
5.0 %	1.0 lx
3.0 %	0.6 lx

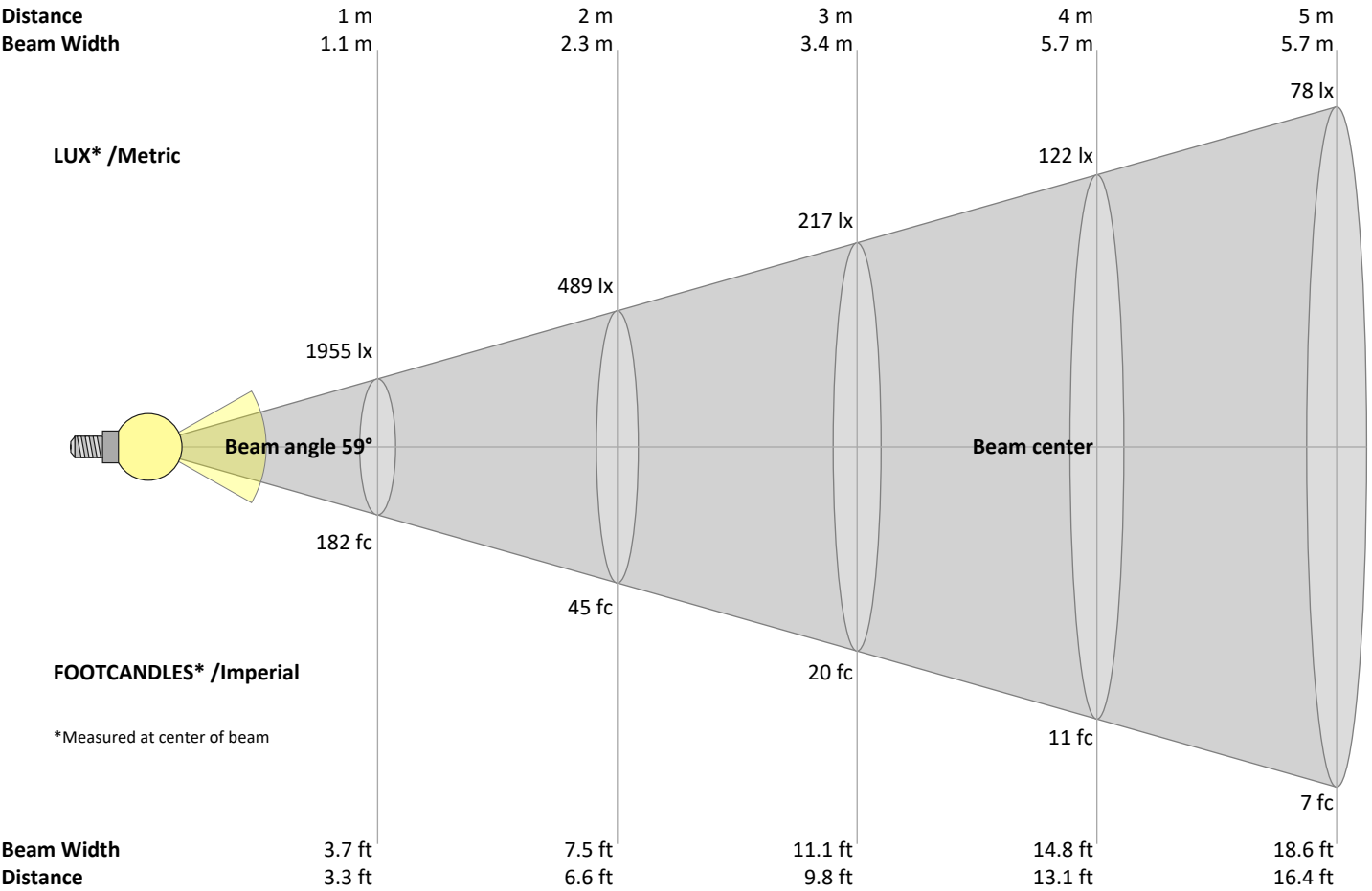
Peak illuminance: 19.5 lx
Mounting height: 10.0 m
Number of c-planes: 32

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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
1955	489	217	122	78	54	40	31	24	20	16	14	12	10	9	8	7	6	5	5	lux
181.6	45.4	20.2	11.4	7.3	5	3.7	2.8	2.2	1.8	1.5	1.3	1.1	0.9	0.8	0.7	0.6	0.6	0.5	0.5	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
1955	1951	1941	1925	1904	1876	1843	1804	1758	1705	1639	1554	1440	1295	1121	929	743	569	414	283	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
1955	1951	1941	1925	1904	1876	1843	1804	1758	1705	1639	1554	1440	1295	1121	929	743	569	414	283	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
1955	1951	1941	1925	1904	1876	1843	1804	1758	1705	1639	1554	1440	1295	1121	929	743	569	414	283	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
1955	1951	1941	1925	1904	1876	1843	1804	1758	1705	1639	1554	1440	1295	1121	929	743	569	414	283	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											
	p Ceiling	70	70	50	50	30	70	70	50	50	30
	p Walls	50	30	50	30	30	50	30	50	30	30
	p Floor	20	20	20	20	20	20	20	20	20	20
Room size		Viewed Crosswise					Viewed Endwise				
H = mounting height above eye level		(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
X	Y										
2H	2H	20.5	21.1	20.6	21.3	21.5	20.5	21.1	20.6	21.3	21.5
	3H	20.3	21.1	20.7	21.3	21.5	20.3	21.1	20.7	21.3	21.5
	4H	20.4	21.1	20.8	21.4	21.6	20.4	21.1	20.8	21.4	21.6
	6H	20.5	21.1	20.8	21.4	21.8	20.5	21.1	20.8	21.4	21.8
	8H	20.5	21.1	20.9	21.4	21.8	20.5	21.1	20.9	21.4	21.8
	12H	20.5	21.1	20.8	21.4	21.8	20.5	21.1	20.8	21.4	21.8
4H	2H	20.2	20.9	20.6	21.1	21.4	20.2	20.9	20.6	21.1	21.4
	3H	20.3	20.9	20.7	21.3	21.7	20.3	20.9	20.7	21.3	21.7
	4H	20.4	20.9	20.8	21.4	21.9	20.4	20.9	20.8	21.4	21.9
	6H	20.5	21.1	21.0	21.4	21.8	20.5	21.1	21.0	21.4	21.8
	8H	20.6	21.1	21.1	21.4	21.8	20.6	21.1	21.1	21.4	21.8
	12H	20.5	20.9	21.0	21.4	21.8	20.5	20.9	21.0	21.4	21.8
8H	4H	20.4	20.9	20.9	21.3	21.6	20.4	20.9	20.9	21.3	21.6
	6H	20.6	21.0	21.1	21.4	21.9	20.6	21.0	21.1	21.4	21.9
	8H	20.7	21.0	21.2	21.5	22.1	20.7	21.0	21.2	21.5	22.1
	12H	20.7	20.9	21.3	21.5	22.1	20.7	20.9	21.3	21.5	22.1
12H	4H	20.4	20.8	20.9	21.2	21.6	20.4	20.8	20.9	21.2	21.6
	6H	20.6	20.9	21.1	21.4	22.1	20.6	20.9	21.1	21.4	22.1
	8H	20.7	20.9	21.3	21.4	22.0	20.7	20.9	21.3	21.4	22.0

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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[illegible]

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	183 lm	10.7%
10-20°	499 lm	29.3%
20-30°	610 lm	35.8%
30-40°	310 lm	18.2%
40-50°	52 lm	3.1%
50-60°	21 lm	1.2%
60-70°	15 lm	0.9%
70-80°	10 lm	0.6%
80-90°	3 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	1704 lm	100.0%

Intensity peaks

Max intensity	1955 cd
Intensity, 90°	0 cd
Intensity, 0°	1955 cd

Zonal Lumen summary

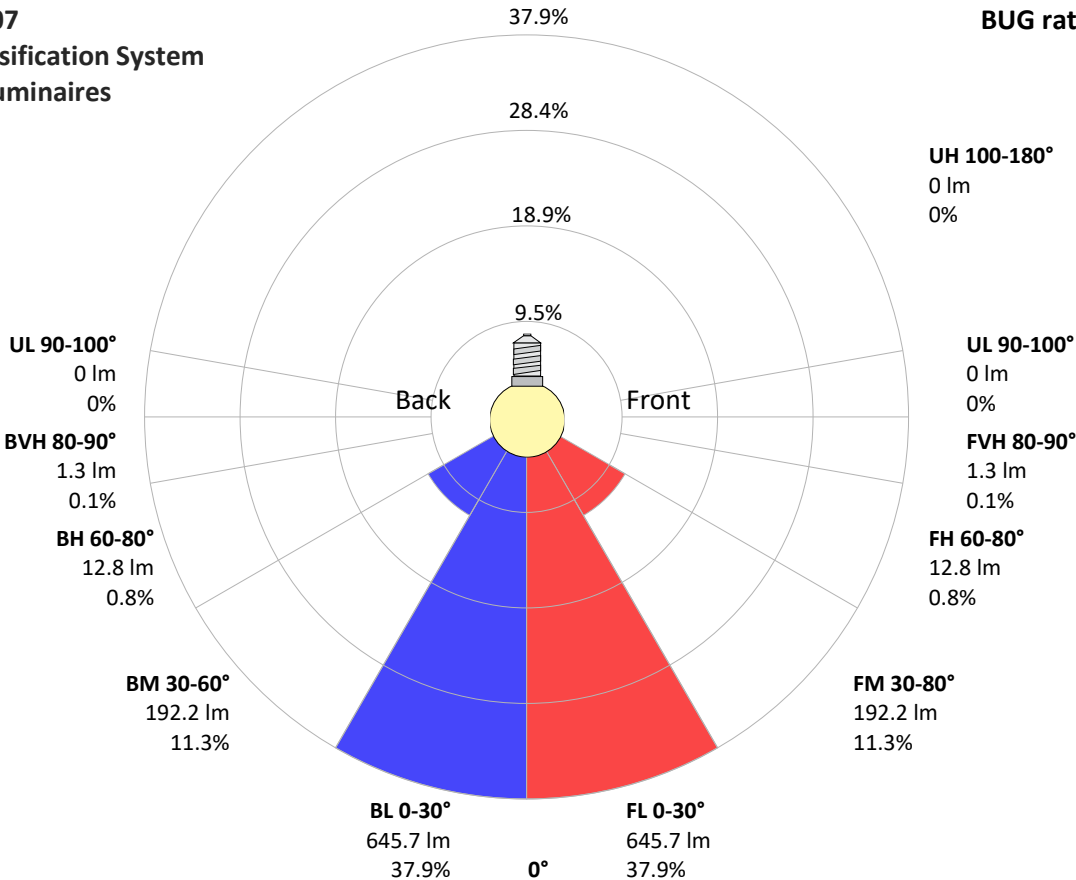
Zone (γ)	Lumen	% Total
0-30°	1292 lm	75.8%
0-40°	1603 lm	94.1%
0-60°	1676 lm	98.3%
60-90°	28 lm	1.7%
70-100°	13 lm	0.8%
90-120°	0 lm	0.0%
0-90°	1704 lm	100.0%
90-180°	0 lm	0.0%
0-180°	1704 lm	100.0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	646 lm	37.9%
Medium(30-60°)	192 lm	11.3%
High(60-80°)	13 lm	0.8%
Very high(80-90°)	1 lm	0.1%
Back light		
Low(0-30°)	646 lm	37.9%
Medium(30-60°)	192 lm	11.3%
High(60-80°)	13 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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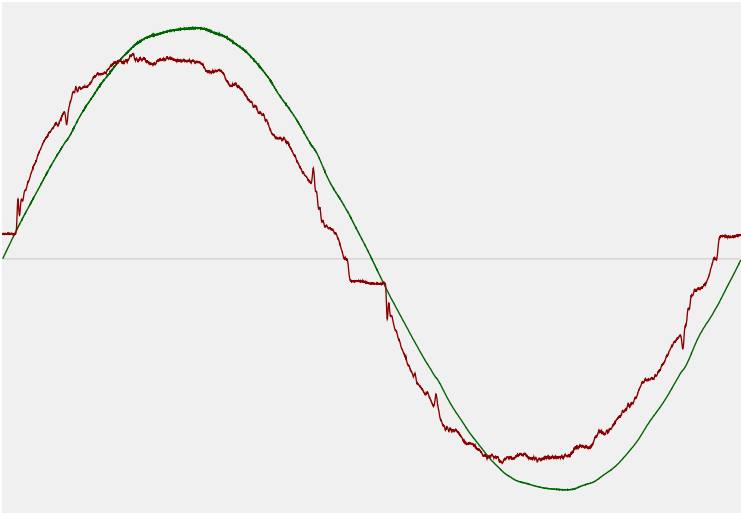


Power Details

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	39.2%
<div><div></div></div>	
Lumen efficiency	107 lm/W
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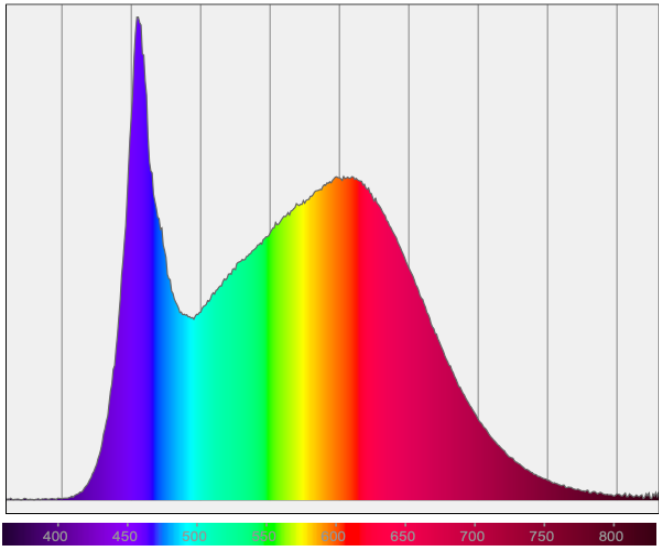
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Color Measurements

Correlated Color Temperature	CCT = 4000 K
Color Rendering TM30-18	R _f 88.9 – R _g 98.5
Color Shift, CIE duv	Duv ±0.0003

Spectral distribution



Color details

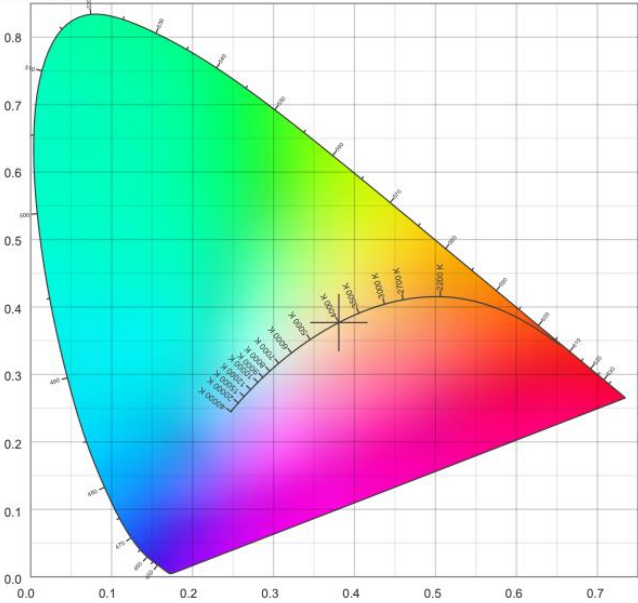
Correlated Color Temperature	CCT = 4000 K	Color coordinates CIE 1931	(x;y) = (0.381;0.377)
Color Rendering Index	CRI 92.6	Color coordinate CIEs 1960	(u;v) = (0.225;0.334)
Color Rendering Index, R9 (red component)	R9 = 72.2	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 88.9 – R _g 98.5	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.225;0.225)
Color Quality Scale	CQS = 88.9		

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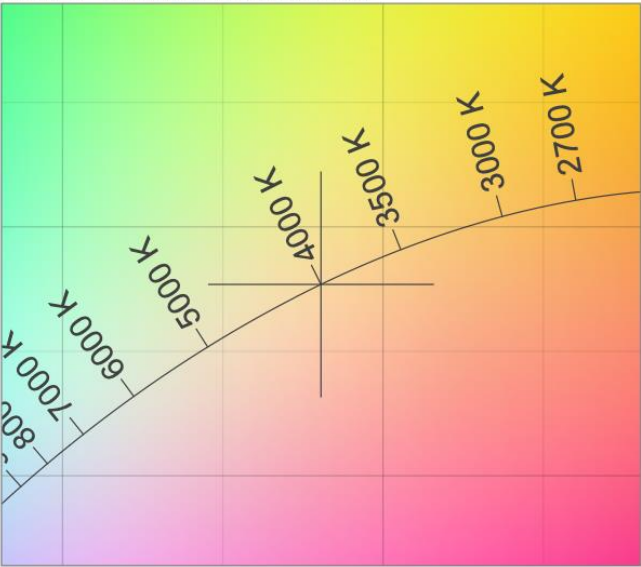
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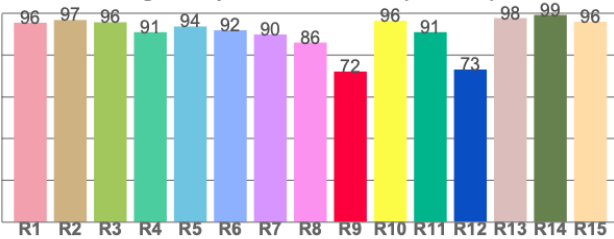
CIE 1931



CIE 1931 – zoomed on Planckian locus



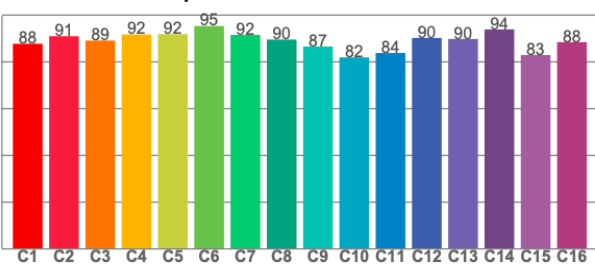
Color Rendering Index per reference color (CIE 1995)



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
95.5	96.8	95.7	91.0	93.7	91.9	89.9	86.0	72.2	96.4	91.0	73.1	97.7	99.2	96.0

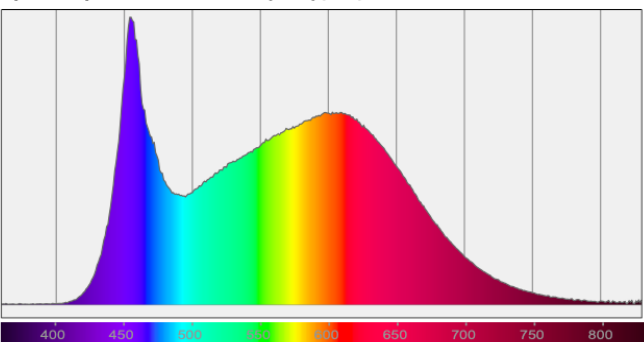
TM30-18 Rf-values per hue bin



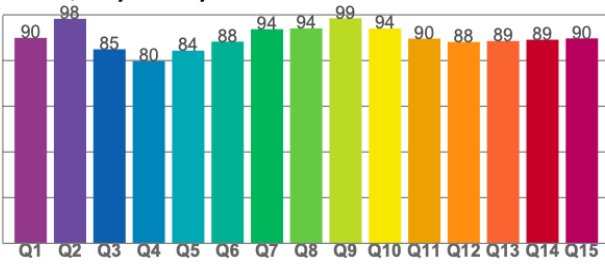
TM30 C values, 16 binned values out of total of 99 C values

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
87.8	91.0	89.1	91.7	91.9	95.3	91.5	89.6	86.6	81.9	83.8	90.3	89.8	93.9	83.0	88.4

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



Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
89.9	98.3	84.9	79.8	84.3	88.3	93.7	94.1	98.5	94.0	89.6	88.1	88.6	89.1	89.7