

Tested Light Source - 1_PHOT_NINETY-NINE-1650lmChip-2700K-21Deg-HoneycombLouvre_2303

Laboratory and Equipment

Laboratory Owner and Location	Factorylux, Greenhill Mills, Hebden Bridge, HX7 5QF, UK
Goniospectrometer System and Type	BaseSpion – Type C, horizontal
Spectrometer Manufacturer and Model	Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

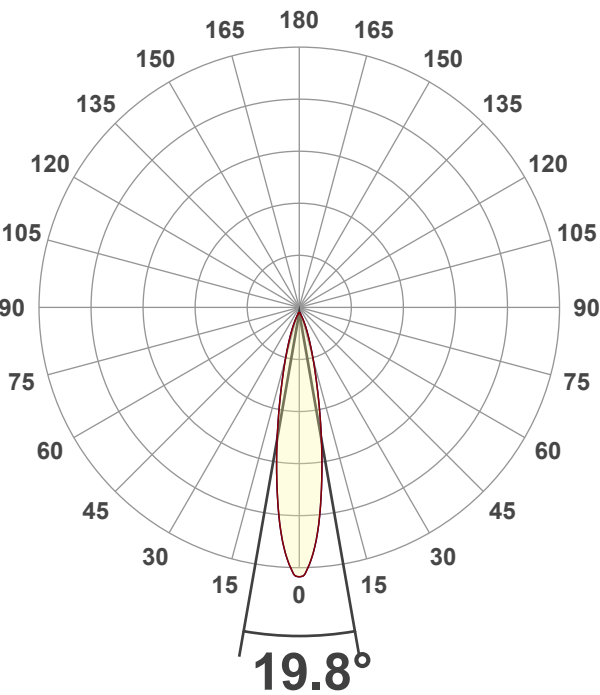
Measurement Conditions

Number of C-planes and Resolution	32 planes – 11.25°
γ (gamma)-Resolution	1°
Test Distance	1.50 m
Input Power, Power and Displ. Factors	14.6 W – PF 0.46 – DPF 0.8
Input RMS Voltage and Current	242 V – 0.131 A
Frequency of Input Power	50 Hz

Main Light Measurement Results

Output	896 lm
Efficiency	61 lm/W
Peak Intensity and Beam Angle	5071 cd – 19.8°
Color Rendering Index	CRI 93.0

Light Intensity Distribution



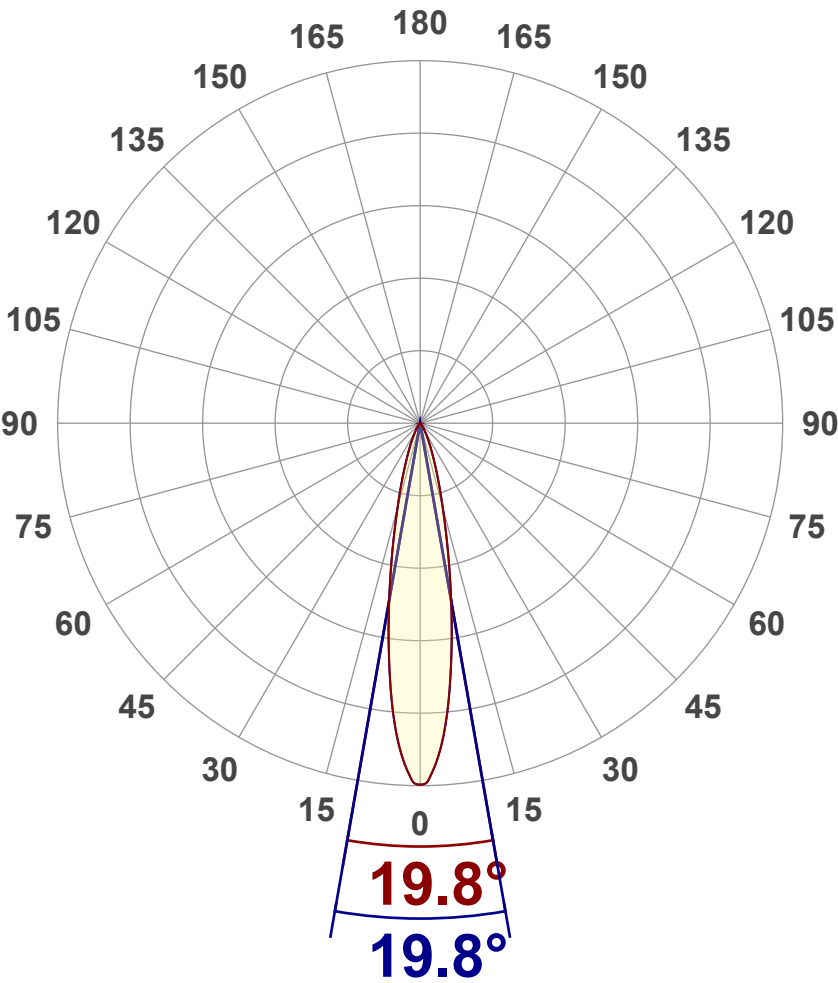
Goniophotometry Report

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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	896 lm
Peak Intensity	5071 cd
Beam Angle (50%)	19.8°
Beam Angle (90%)	19.8°
Beam Angle (10%)	19.8°

Cut-off Angle

Average 2,5%	61°
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Field Angle

Average 10%	42.1°
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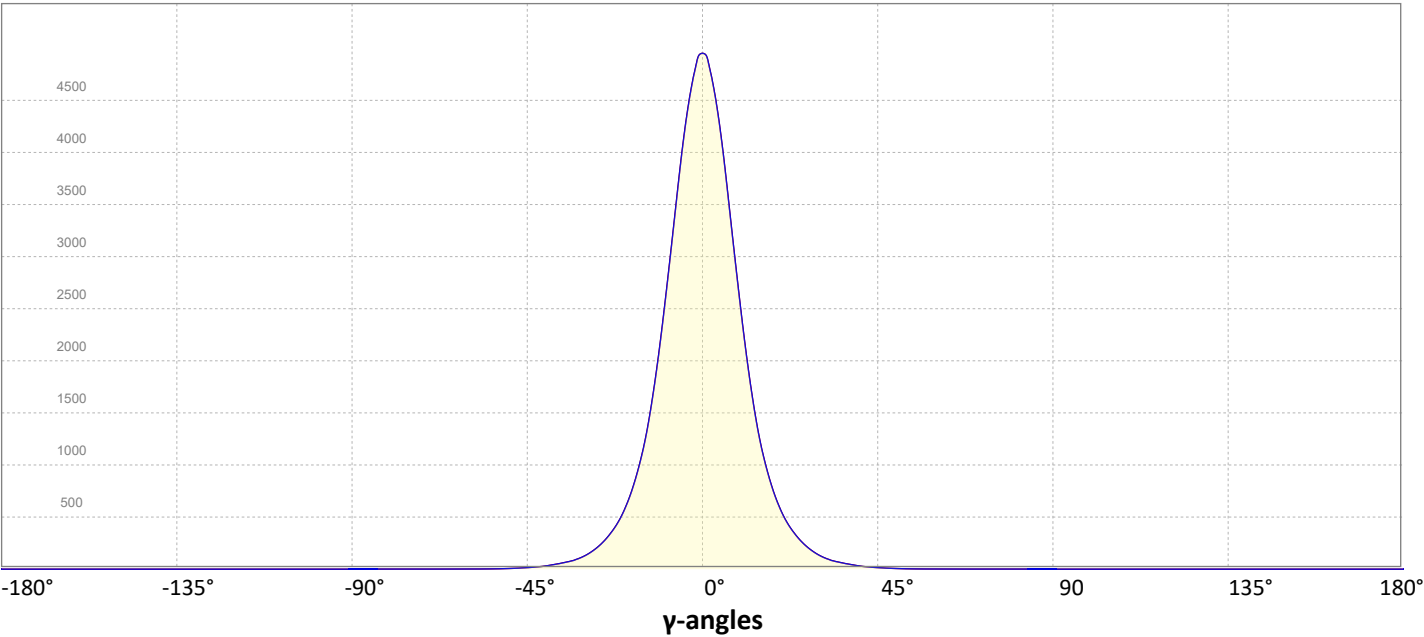
Intensity Ratio

In 120° cone	99.7%
In 90° cone	98.9%

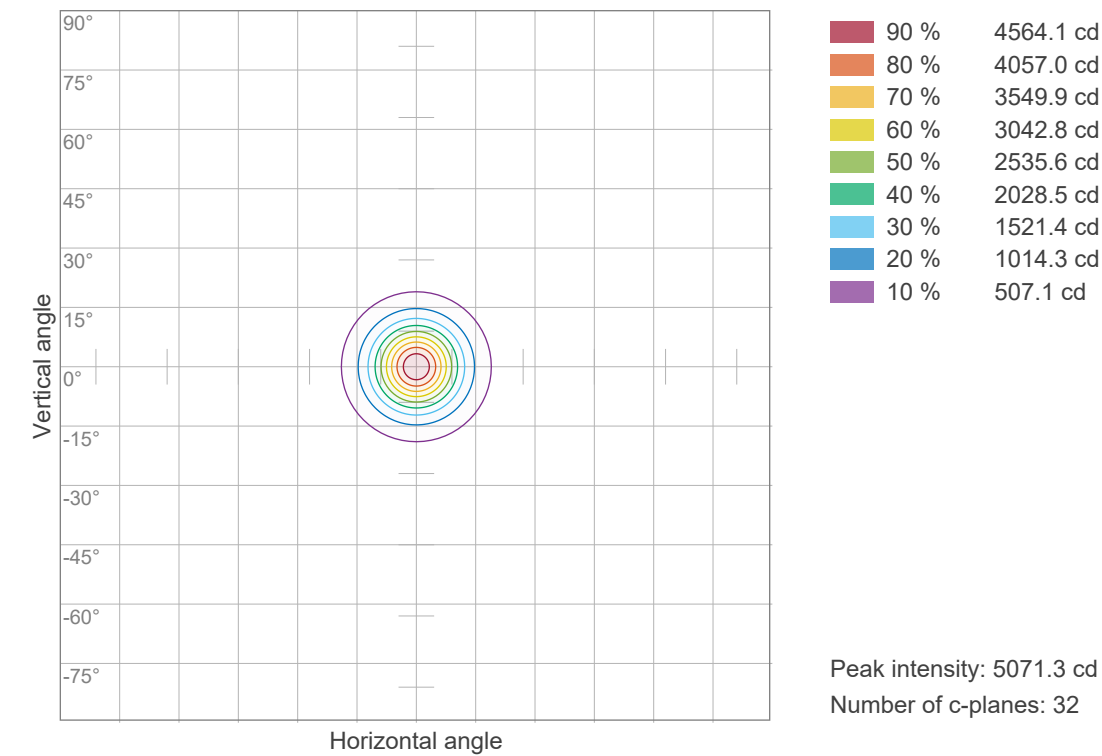
C000-C180

C090-C270

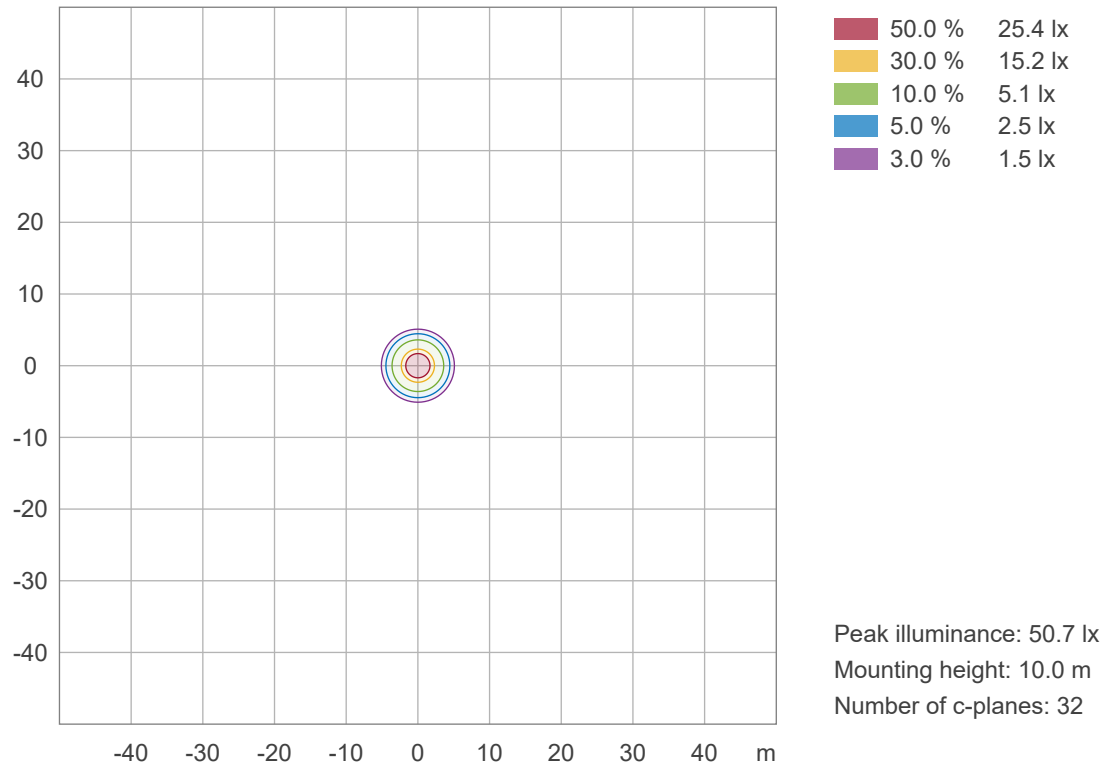
Linear distribution diagram - Intensity (candela) vs γ-angle



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)

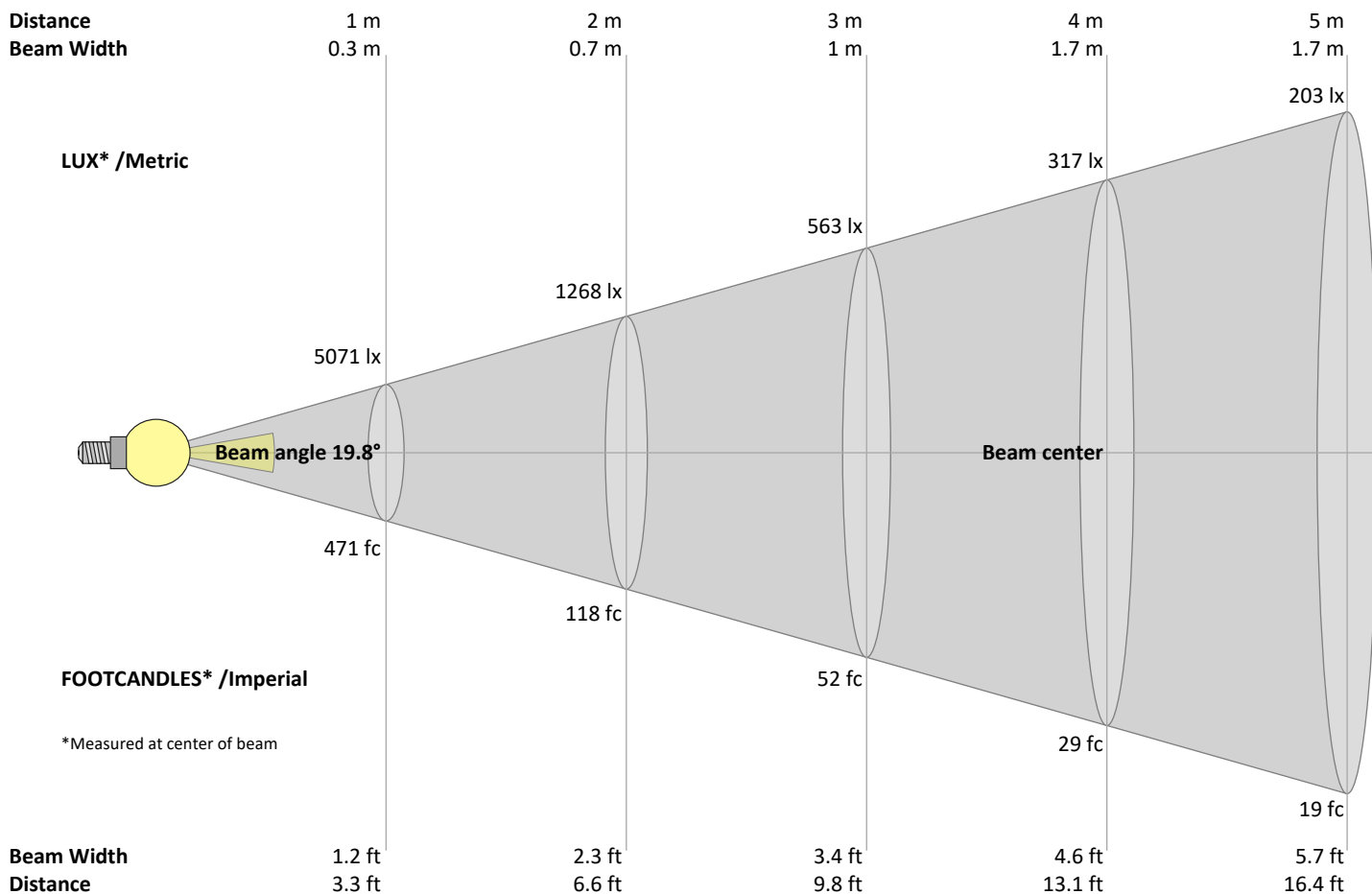


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Beam Details



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
5071	1268	563	317	203	141	103	79	63	51	42	35	30	26	23	20	18	16	14	13	lux
471.1	117.8	52.3	29.4	18.8	13.1	9.6	7.4	5.8	4.7	3.9	3.3	2.8	2.4	2.1	1.8	1.6	1.5	1.3	1.2	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
5071	4909	4480	3874	3178	2507	1910	1423	1063	794	592	443	335	250	185	137	102	78	62	47	cd
100%	97%	88%	76%	63%	49%	38%	28%	21%	16%	12%	9%	7%	5%	4%	3%	2%	2%	1%	1%	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
5071	4909	4480	3874	3178	2507	1910	1423	1063	794	592	443	335	250	185	137	102	78	62	47	cd
100%	97%	88%	76%	63%	49%	38%	28%	21%	16%	12%	9%	7%	5%	4%	3%	2%	2%	1%	1%	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
5071	4909	4480	3874	3178	2507	1910	1423	1063	794	592	443	335	250	185	137	102	78	62	47	cd
100%	97%	88%	76%	63%	49%	38%	28%	21%	16%	12%	9%	7%	5%	4%	3%	2%	2%	1%	1%	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
5071	4909	4480	3874	3178	2507	1910	1423	1063	794	592	443	335	250	185	137	102	78	62	47	cd
100%	97%	88%	76%	63%	49%	38%	28%	21%	16%	12%	9%	7%	5%	4%	3%	2%	2%	1%	1%	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											
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	9.7	10.1	9.8	10.3	10.5	9.7	10.1	9.8	10.3	10.5
	3H	9.4	10.0	9.8	10.2	10.3	9.4	10.0	9.8	10.2	10.3
	4H	9.4	9.9	9.8	10.2	10.4	9.4	9.9	9.8	10.2	10.4
	6H	9.5	9.9	9.8	10.2	10.6	9.5	9.9	9.8	10.2	10.6
	8H	9.5	9.9	9.8	10.2	10.6	9.5	9.9	9.8	10.2	10.6
	12H	9.5	10.0	9.9	10.3	10.7	9.5	10.0	9.9	10.3	10.7
4H	2H	9.3	9.9	9.7	10.1	10.3	9.3	9.9	9.7	10.1	10.3
	3H	9.3	9.7	9.6	10.0	10.5	9.3	9.7	9.6	10.0	10.5
	4H	9.2	9.6	9.6	10.0	10.5	9.2	9.6	9.6	10.0	10.5
	6H	9.3	9.7	9.8	10.0	10.4	9.3	9.7	9.8	10.0	10.4
	8H	9.3	9.8	9.9	10.1	10.5	9.3	9.8	9.9	10.1	10.5
	12H	9.5	9.8	10.0	10.2	10.6	9.5	9.8	10.0	10.2	10.6
8H	4H	9.1	9.5	9.6	9.9	10.2	9.1	9.5	9.6	9.9	10.2
	6H	9.3	9.5	9.8	10.0	10.5	9.3	9.5	9.8	10.0	10.5
	8H	9.5	9.7	10.0	10.2	10.8	9.5	9.7	10.0	10.2	10.8
	12H	9.7	9.9	10.3	10.4	11.0	9.7	9.9	10.3	10.4	11.0
12H	4H	9.1	9.4	9.6	9.8	10.2	9.1	9.4	9.6	9.8	10.2
	6H	9.3	9.5	9.8	10.0	10.6	9.3	9.5	9.8	10.0	10.6
	8H	9.5	9.7	10.1	10.2	10.8	9.5	9.7	10.1	10.2	10.8

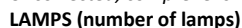
Variations with the observer position for the luminaire spacings, S:

S = 1.0H	4.0 / -3.6	4.0 / -3.6
S = 1.5H	6.4 / -3.9	6.4 / -3.9
S = 2.0H	8.4 / -4.1	8.4 / -4.1

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	115	113	111	109	113	111	109	107	107	105	104	103	102	101	100	99	98	97
2	111	108	104	102	109	106	103	101	103	101	99	100	98	97	97	96	95	93
3	108	103	99	96	106	102	98	96	99	96	94	97	95	93	95	93	91	90
4	104	99	95	92	103	98	94	91	96	93	90	94	91	89	92	90	88	87
5	101	95	91	88	100	94	91	88	93	89	87	91	88	86	90	87	86	84
6	98	92	88	85	97	91	87	85	90	87	84	89	86	83	88	85	83	82
7	95	89	85	82	94	88	84	82	87	84	81	86	83	81	85	83	81	80
8	93	86	82	79	92	86	82	79	85	81	79	84	81	79	83	80	78	77
9	90	84	80	77	90	83	80	77	83	79	77	82	79	76	81	78	76	75
10	88	82	78	75	87	81	77	75	80	77	75	80	77	74	79	76	74	73

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Zonal Lumen Summary

[illegible]

Outdoor Light Planning

Lumen per Zone		
Zone (γ)	Lumen	% Total
0-10°	343 lm	38.3%
10-20°	351 lm	39.1%
20-30°	138 lm	15.5%
30-40°	45 lm	5.1%
40-50°	13 lm	1.4%
50-60°	3 lm	0.3%
60-70°	1 lm	0.1%
70-80°	1 lm	0.1%
80-90°	1 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	896 lm	100.0%

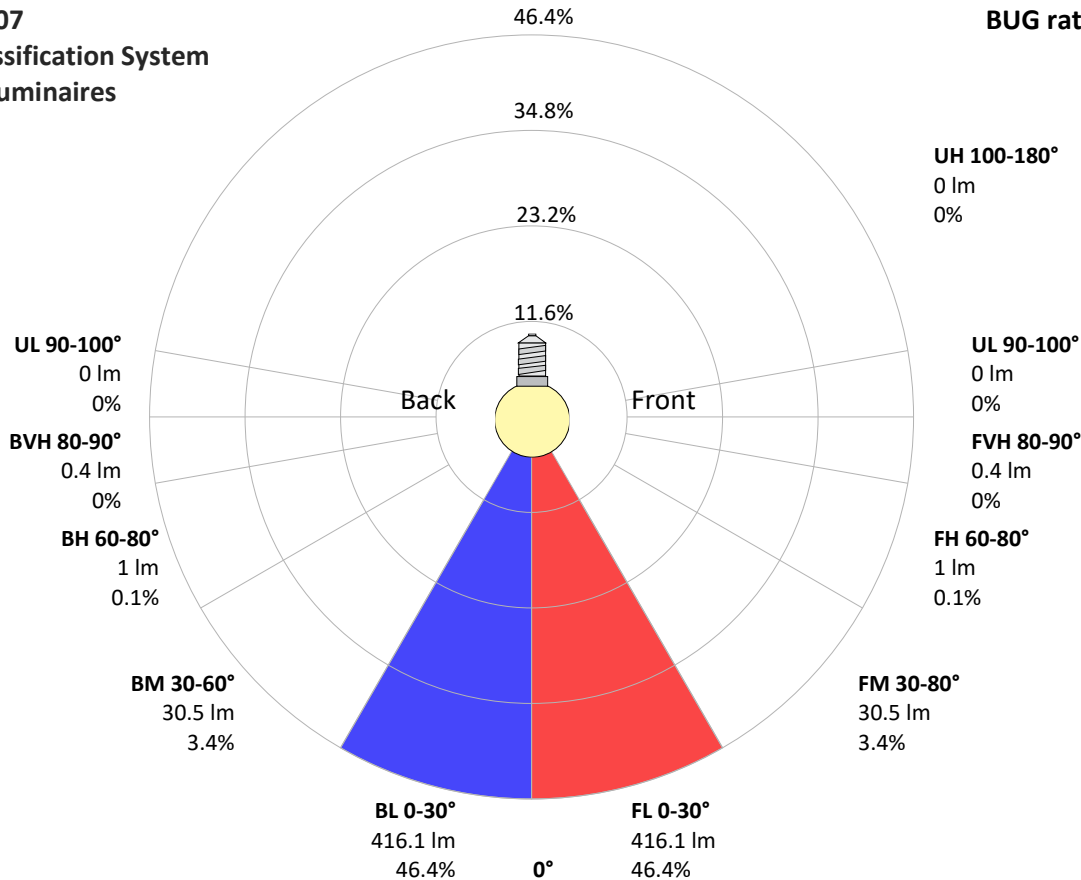
Intensity peaks		
Max intensity	5071 cd	
Intensity, 90°	0 cd	
Intensity, 0°	5071 cd	

Zonal Lumen summary		
Zone (γ)	Lumen	% Total
0-30°	832 lm	92.9%
0-40°	878 lm	98.0%
0-60°	893 lm	99.7%
60-90°	3 lm	0.3%
70-100°	2 lm	0.2%
90-120°	0 lm	0.0%
0-90°	896 lm	100.0%
90-180°	0 lm	0.0%
0-180°	896 lm	100.0%

BUG rating		
	Lumen	% Total
Forward light		
Low(0-30°)	416 lm	46.4%
Medium(30-60°)	31 lm	3.4%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 lm	0.0%
Back light		
Low(0-30°)	416 lm	46.4%
Medium(30-60°)	31 lm	3.4%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 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 B1 U1 G0



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Power Details

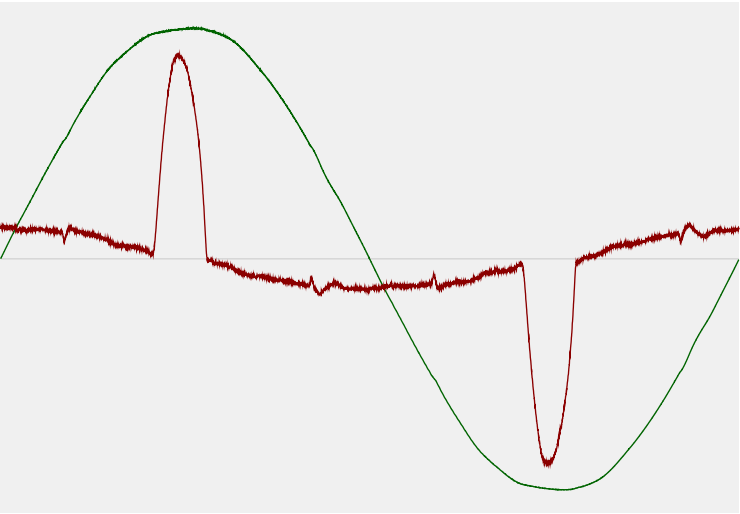
Input Power

Power feed to light source	14.6 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	242 V
RMS Input current feed, I_{RMS}	0.131 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	31.58 VA
Displacement factor of AC power feed	0.8
Power factor of AC current feed	0.46
Total harmonic distortion of the current	137.46%
Total harmonic distortion of the voltage	1.12%

Efficiency

Radiated power efficiency	22.5%
<div><div></div></div>	
Lumen efficiency	61 lm/W
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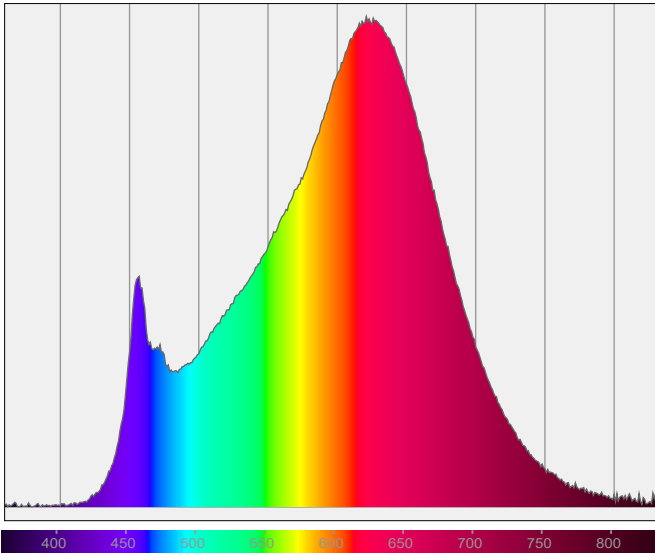
Input Power Curve



Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R _f 91.4 — R _g 98.8
Color Shift, CIE duv	Duv ±0.0003

Spectral distribution



Color details

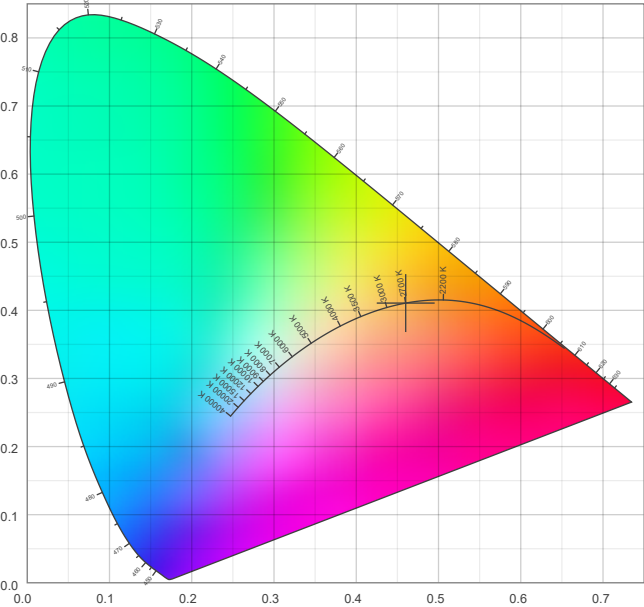
Correlated Color Temperature	CCT = 2700 K	Color coordinates CIE 1931	(x;y) = (0.460;0.411)
Color Rendering Index	CRI 93.0	Color coordinate CIEs 1960	(u;v) = (0.263;0.352)
Color Rendering Index, R9 (red component)	R9 = 67.9	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.4 — R _g 98.8	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 90.9		

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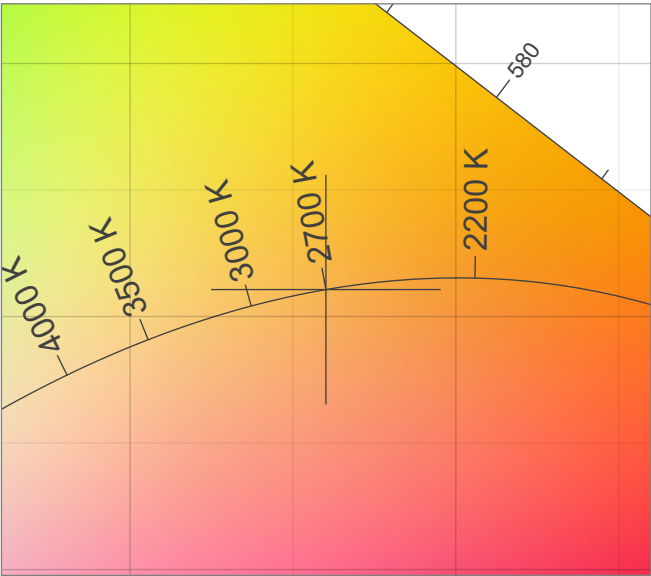
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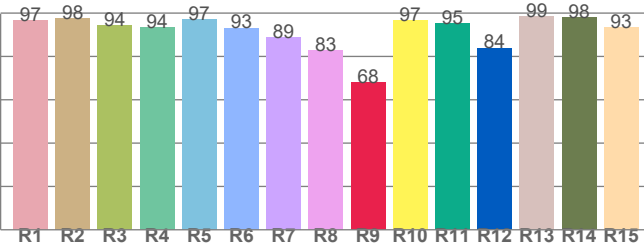
CIE 1931



CIE 1931 – zoomed on Planckian locus



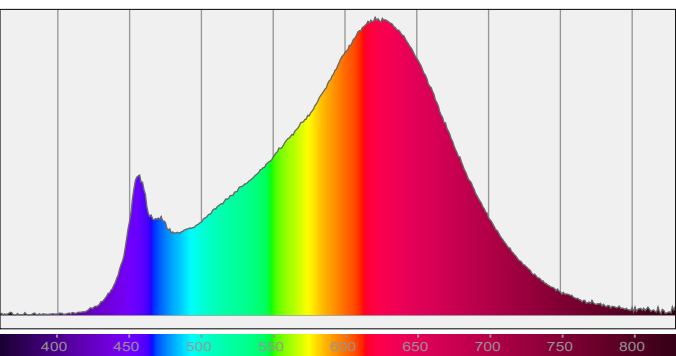
Color Rendering Index per reference color (CIE 1995)



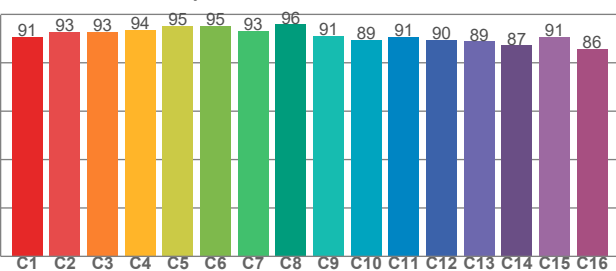
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
96.7	97.6	94.3	93.6	97.1	93.2	88.8	82.7	67.9	96.5	95.1	84.0	98.7	98.0	93.3

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



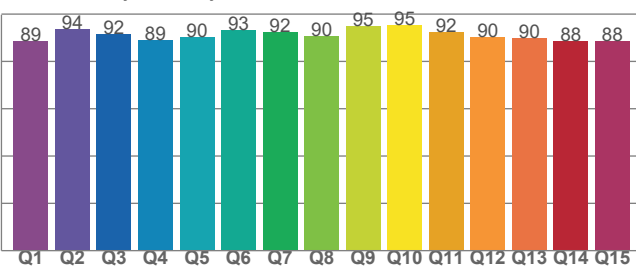
TM30-18 Rf-values per hue bin



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
90.5	92.7	92.7	93.7	95.1	95.1	93.1	95.8	91.0	89.5	90.7	89.5	88.8	87.1	90.7	85.7

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88.6	93.8	91.7	88.9	90.3	93.1	92.3	90.5	94.8	95.3	92.5	90.4	89.6	88.5	88.5