

Tested Light Source - 1\_PHOT\_NINETY-NINE-1650lmChip-2700K-38Deg-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)

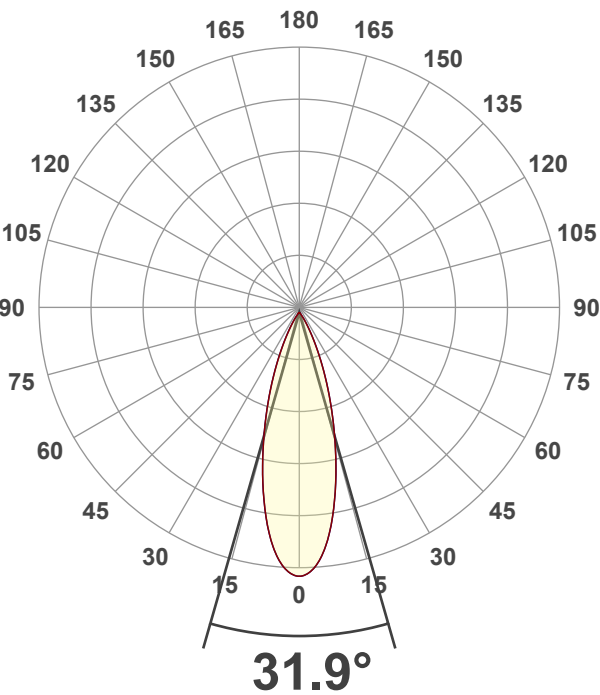
Measurement Conditions

Number of C-planes and Resolution	32 planes – 11.25°
γ (gamma)-Resolution	1.5°
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	240 V – 0.132 A
Frequency of Input Power	50 Hz

Main Light Measurement Results

Output	804 lm
Efficiency	55 lm/W
Peak Intensity and Beam Angle	2271 cd – 31.9°
Color Rendering Index	CRI 93.0

Light Intensity Distribution



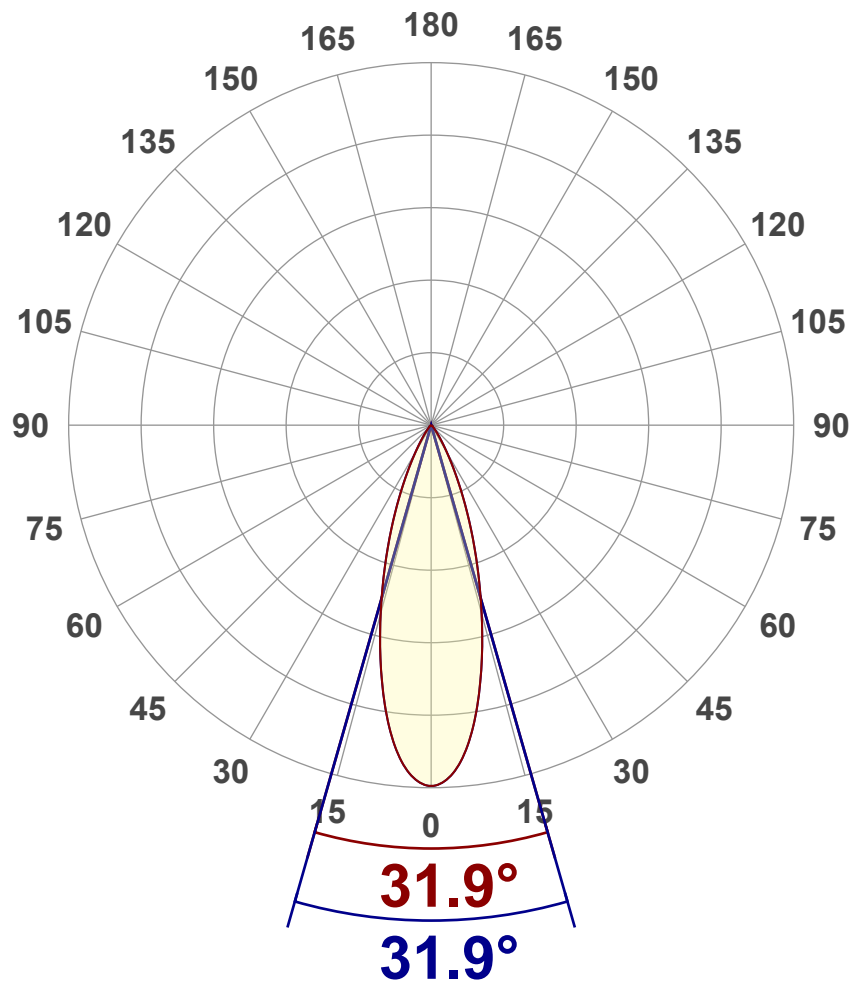
Goniophotometry Report

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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	804 lm
Peak Intensity	2271 cd
Beam Angle (50%)	31.9°
Beam Angle (90%)	31.9°
Beam Angle (10%)	31.9°

Cut-off Angle

Average 2,5%	75°
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Field Angle

Average 10%	58.5°
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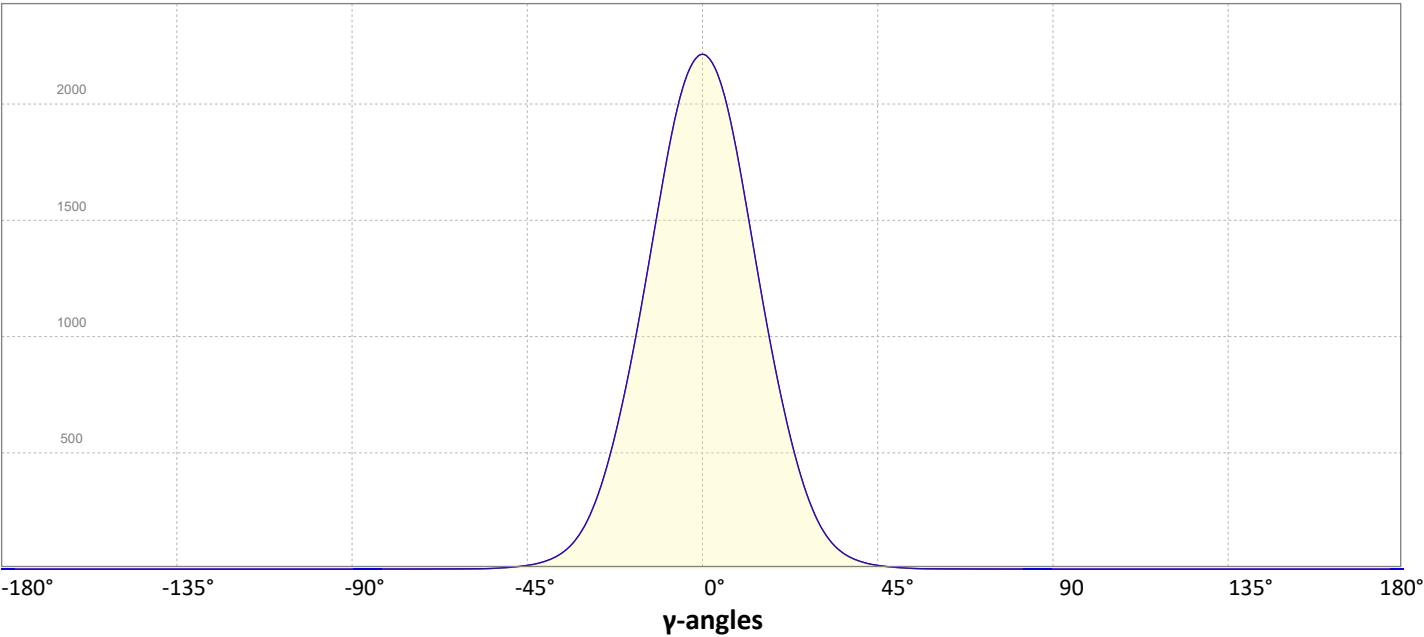
Intensity Ratio

In 120° cone	99.6%
In 90° cone	98.7%

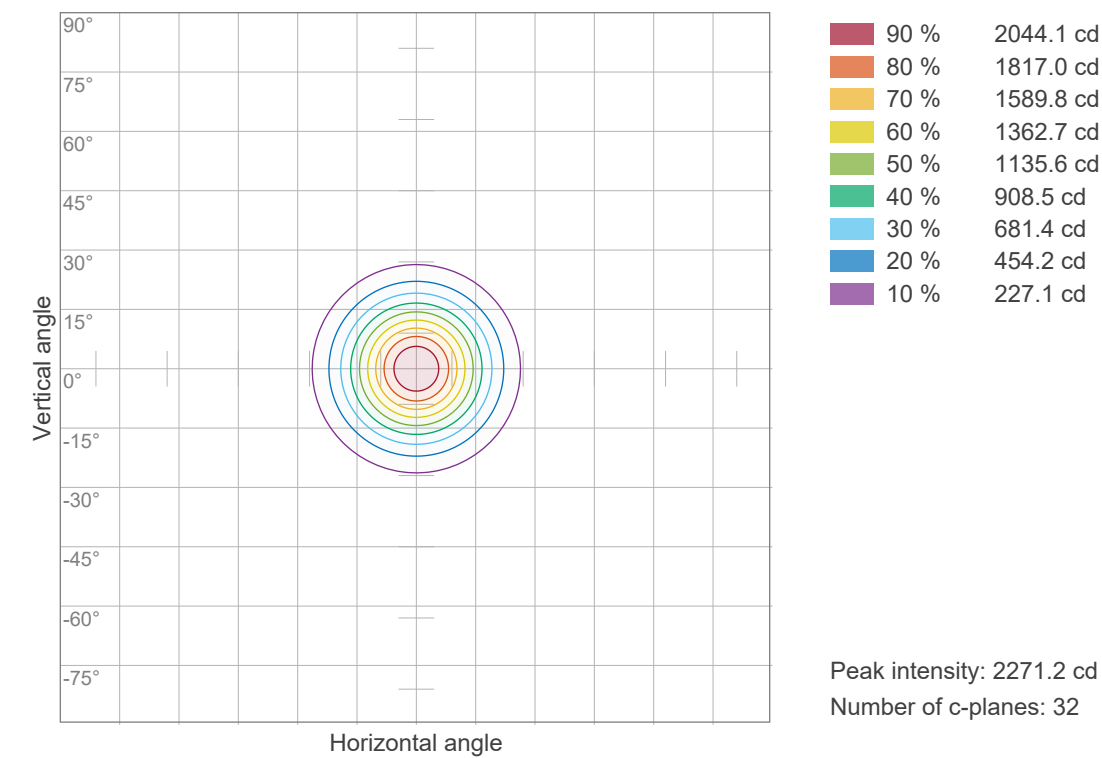
C000-C180

C090-C270

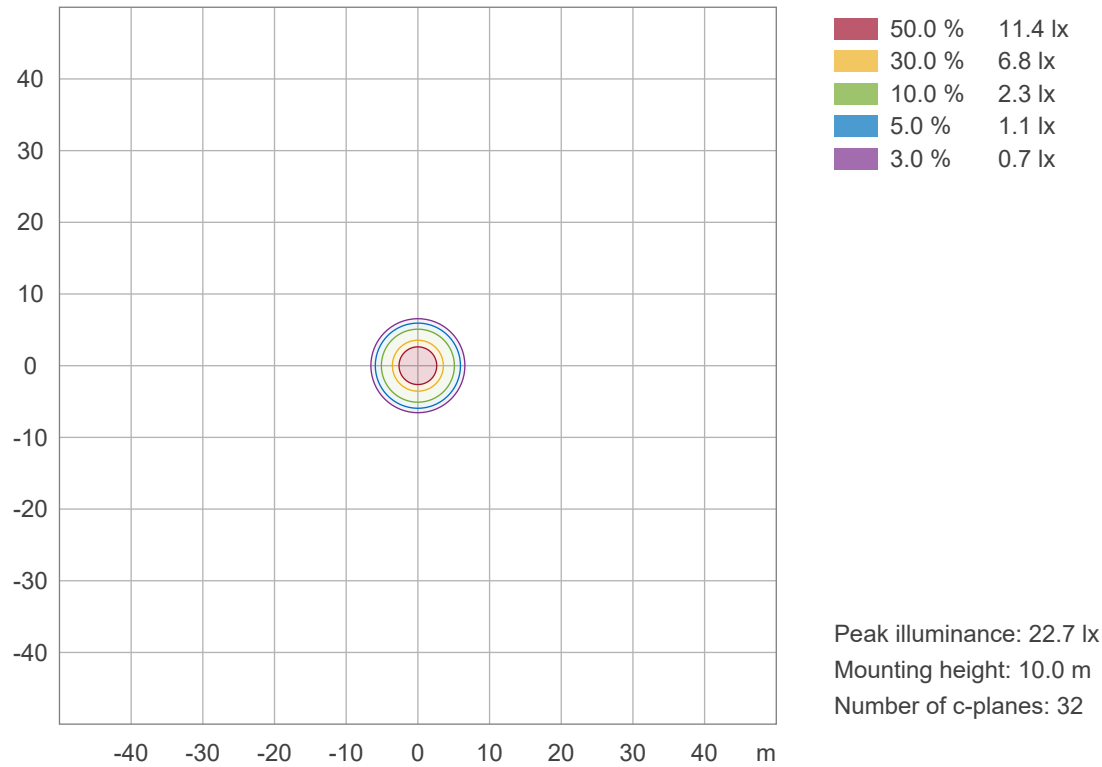
Linear distribution diagram - Intensity (candela) vs γ-angle



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)

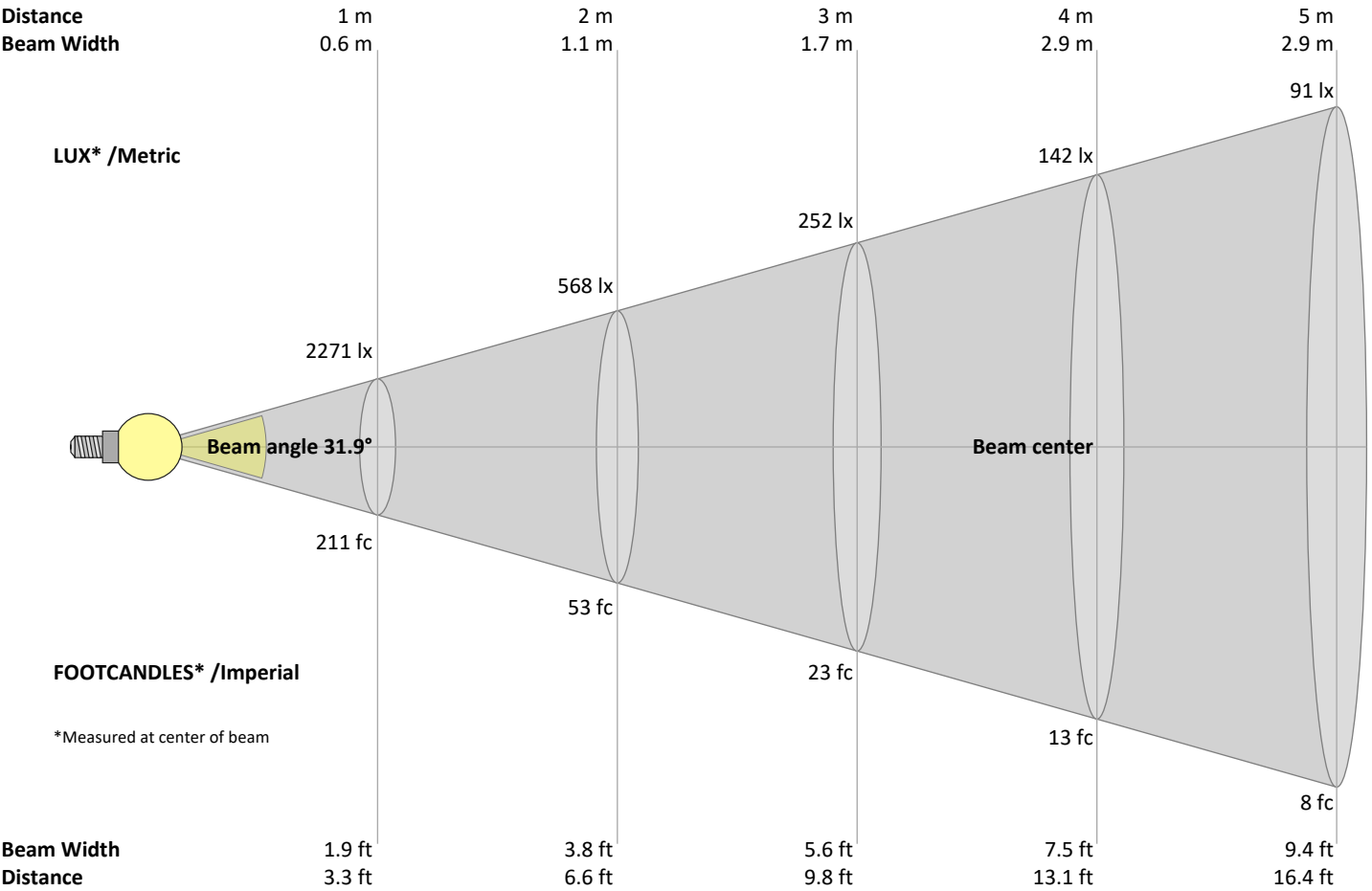


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Beam Details



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
2271	568	252	142	91	63	46	35	28	23	19	16	13	12	10	9	8	7	6	6	lux
211	52.8	23.4	13.2	8.4	5.9	4.3	3.3	2.6	2.1	1.7	1.5	1.2	1.1	0.9	0.8	0.7	0.7	0.6	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
2271	2249	2178	2065	1913	1728	1531	1329	1133	947	778	624	488	372	276	200	144	102	73	52	cd
100%	99%	96%	91%	84%	76%	67%	59%	50%	42%	34%	27%	21%	16%	12%	9%	6%	4%	3%	2%	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
2271	2249	2178	2065	1913	1728	1531	1329	1133	947	778	624	488	372	276	200	144	102	73	52	cd
100%	99%	96%	91%	84%	76%	67%	59%	50%	42%	34%	27%	21%	16%	12%	9%	6%	4%	3%	2%	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
2271	2249	2178	2065	1913	1728	1531	1329	1133	947	778	624	488	372	276	200	144	102	73	52	cd
100%	99%	96%	91%	84%	76%	67%	59%	50%	42%	34%	27%	21%	16%	12%	9%	6%	4%	3%	2%	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
2271	2249	2178	2065	1913	1728	1531	1329	1133	947	778	624	488	372	276	200	144	102	73	52	cd
100%	99%	96%	91%	84%	76%	67%	59%	50%	42%	34%	27%	21%	16%	12%	9%	6%	4%	3%	2%	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	11.7	12.1	11.7	12.3	12.5	11.7	12.1	11.7	12.3	12.5
	3H	11.3	12.0	11.7	12.2	12.3	11.3	12.0	11.7	12.2	12.3
	4H	11.3	11.9	11.7	12.1	12.3	11.3	11.9	11.7	12.1	12.3
	6H	11.3	11.8	11.6	12.1	12.4	11.3	11.8	11.6	12.1	12.4
	8H	11.3	11.8	11.6	12.1	12.5	11.3	11.8	11.6	12.1	12.5
	12H	11.3	11.7	11.6	12.1	12.5	11.3	11.7	11.6	12.1	12.5
4H	2H	11.3	11.9	11.7	12.1	12.3	11.3	11.9	11.7	12.1	12.3
	3H	11.2	11.6	11.5	12.0	12.4	11.2	11.6	11.5	12.0	12.4
	4H	11.1	11.5	11.5	11.9	12.4	11.1	11.5	11.5	11.9	12.4
	6H	11.0	11.5	11.5	11.8	12.2	11.0	11.5	11.5	11.8	12.2
	8H	11.0	11.4	11.5	11.8	12.1	11.0	11.4	11.5	11.8	12.1
	12H	11.0	11.3	11.5	11.7	12.2	11.0	11.3	11.5	11.7	12.2
8H	4H	10.9	11.4	11.4	11.7	12.1	10.9	11.4	11.4	11.7	12.1
	6H	10.9	11.2	11.4	11.7	12.2	10.9	11.2	11.4	11.7	12.2
	8H	11.0	11.2	11.5	11.7	12.3	11.0	11.2	11.5	11.7	12.3
	12H	11.0	11.2	11.6	11.7	12.3	11.0	11.2	11.6	11.7	12.3
12H	4H	10.9	11.2	11.4	11.6	12.1	10.9	11.2	11.4	11.6	12.1
	6H	10.9	11.2	11.4	11.7	12.3	10.9	11.2	11.4	11.7	12.3
	8H	10.9	11.1	11.5	11.6	12.2	10.9	11.1	11.5	11.6	12.2

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

S = 1.0H	5.3 / -6.8	5.3 / -6.8
S = 1.5H	7.9 / -7.3	7.9 / -7.3
S = 2.0H	9.9 / -7.6	9.9 / -7.6

## 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	112	110	108	112	110	108	106	106	104	103	102	101	100	99	98	97	95
2	110	106	103	100	108	104	101	99	101	99	97	98	96	95	96	94	93	91
3	106	101	97	93	104	99	96	93	97	94	91	94	92	90	92	90	88	87
4	102	96	91	88	100	95	91	87	93	89	86	91	88	85	89	87	85	83
5	98	92	87	83	97	91	86	83	89	85	82	87	84	82	86	83	81	80
6	95	88	83	79	93	87	82	79	85	82	79	84	81	78	83	80	78	76
7	91	84	79	76	90	83	79	76	82	78	75	81	78	75	80	77	74	73
8	88	81	76	73	87	80	76	72	79	75	72	78	75	72	77	74	72	70
9	85	78	73	70	84	77	73	70	76	72	69	75	72	69	75	71	69	68
10	82	75	70	67	82	74	70	67	74	70	67	73	69	67	72	69	66	65

Goniophotometry Report

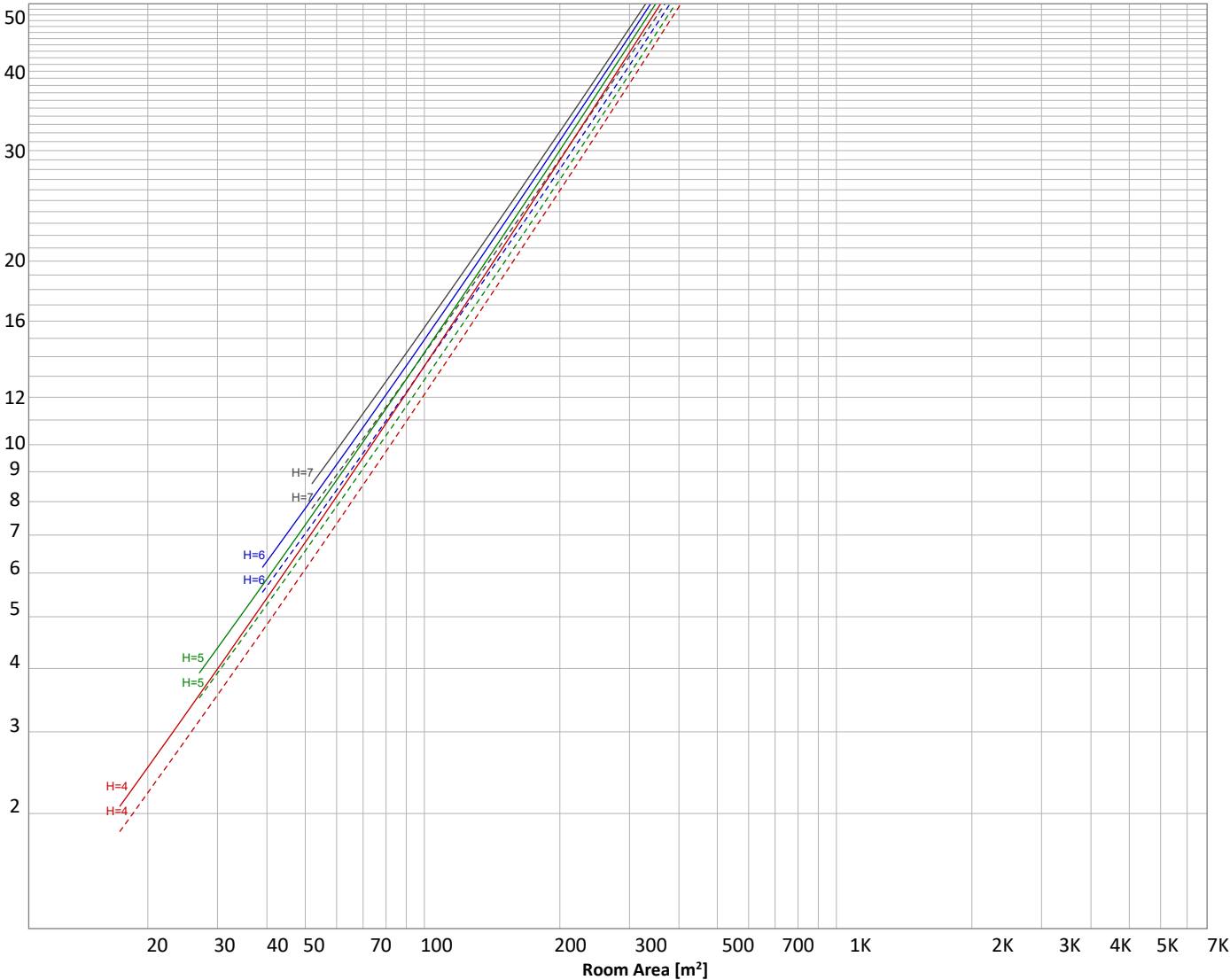
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 804 lm	p(%)		
H <sub>down</sub> = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	Wall reflectance
H <sub>work</sub> = Work area height from floor =	0.00 m	-----	70	50
E <sub>work</sub> = Average lux on work area =	100 lx	-----	50	30
				Floor reflectance
				20

Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
190 lm	336 lm	199 lm	58.7 lm	14.0 lm	2.92 lm	0.937 lm	0.624 lm	0.535 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0.231 lm	0.224 lm	0.210 lm	0.190 lm	0.126 lm	0.087 lm	0.064 lm	0.039 lm	0.013 lm

Outdoor Light Planning

Lumen per Zone		
Zone (γ)	Lumen	% Total
0-10°	190 lm	23.7%
10-20°	336 lm	41.8%
20-30°	199 lm	24.7%
30-40°	59 lm	7.3%
40-50°	14 lm	1.7%
50-60°	3 lm	0.4%
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	804 lm	100.0%

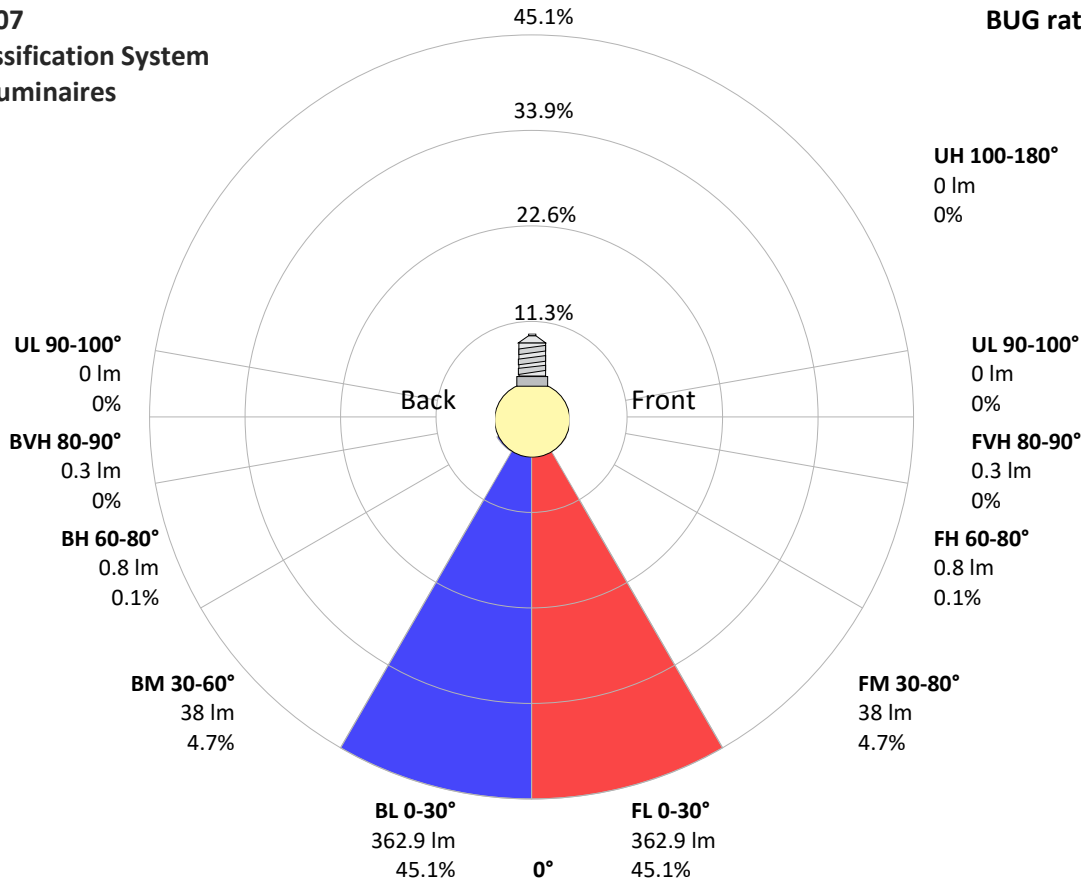
Intensity peaks	
Max intensity	2271 cd
Intensity, 90°	0 cd
Intensity, 0°	2271 cd

Zonal Lumen summary		
Zone (γ)	Lumen	% Total
0-30°	725 lm	90.2%
0-40°	784 lm	97.5%
0-60°	801 lm	99.6%
60-90°	2 lm	0.3%
70-100°	1 lm	0.2%
90-120°	1 lm	0.1%
0-90°	803 lm	99.9%
90-180°	1 lm	0.1%
0-180°	804 lm	100.0%

BUG rating		
	Lumen	% Total
Forward light		
Low(0-30°)	363 lm	45.1%
Medium(30-60°)	38 lm	4.7%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 lm	0.0%
Back light		
Low(0-30°)	363 lm	45.1%
Medium(30-60°)	38 lm	4.7%
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



# Goniophotometry Report

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## Power Details

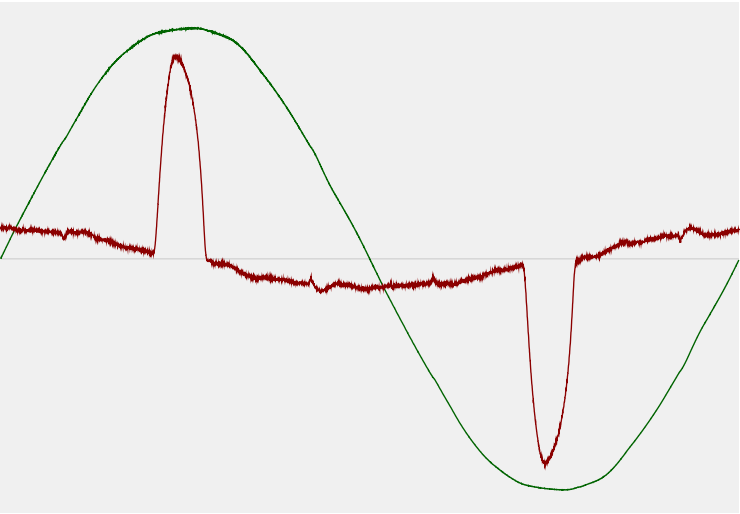
### Input Power

Power feed to light source	14.6 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	240 V
RMS Input current feed, $I_{RMS}$	0.132 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	31.74 VA
Displacement factor of AC power feed	0.8
Power factor of AC current feed	0.46
Total harmonic distortion of the current	139.71%
Total harmonic distortion of the voltage	1.19%

### Efficiency

Radiated power efficiency	20.2%
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Lumen efficiency	55 lm/W
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### Input Power Curve





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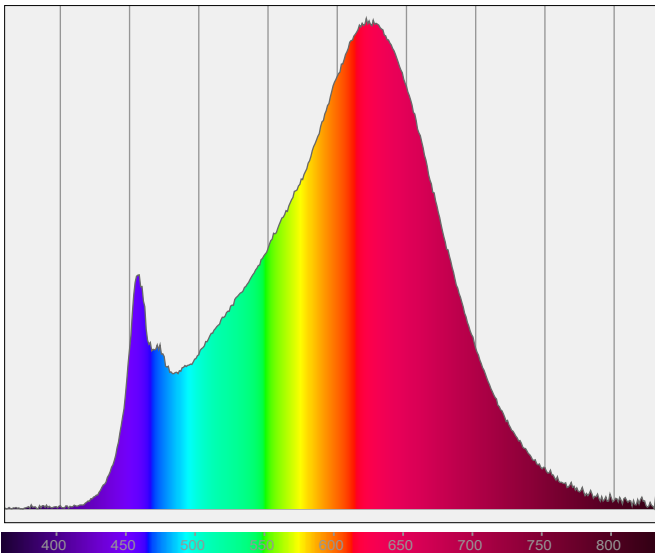
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## Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R <sub>f</sub> 91.4 — R <sub>g</sub> 98.9
Color Shift, CIE duv	Duv ±0.0003

## Spectral distribution



## Color details

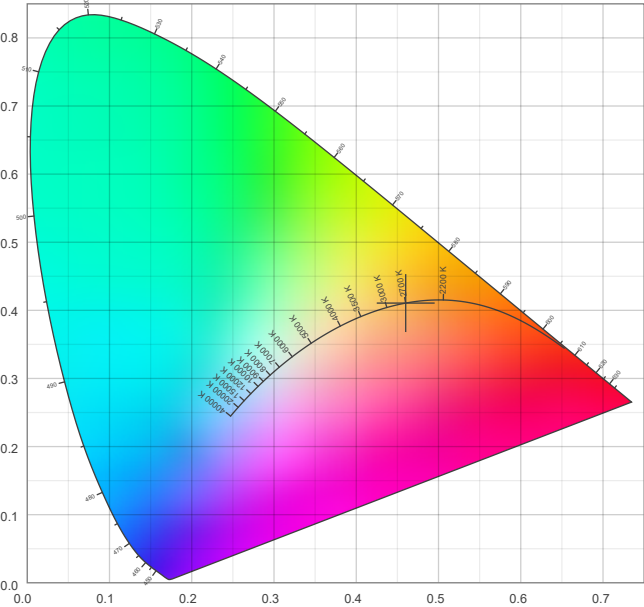
Correlated Color Temperature	CCT = 2700 K	Color coordinates CIE 1931	(x;y) = (0.460;0.411)
Color Rendering Index	CRI 93.0	Color coordinate CIEs 1960	(u;v) = (0.263;0.352)
Color Rendering Index, R9 (red component)	R9 = 67.9	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R <sub>f</sub> 91.4 — R <sub>g</sub> 98.9	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 90.8		

Goniophotometry Report

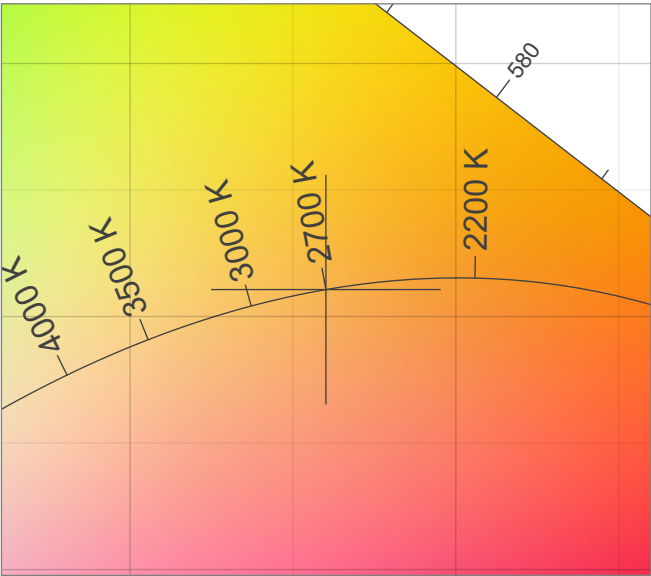
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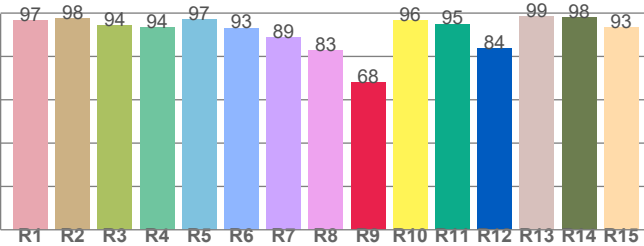
CIE 1931



CIE 1931 – zoomed on Planckian locus



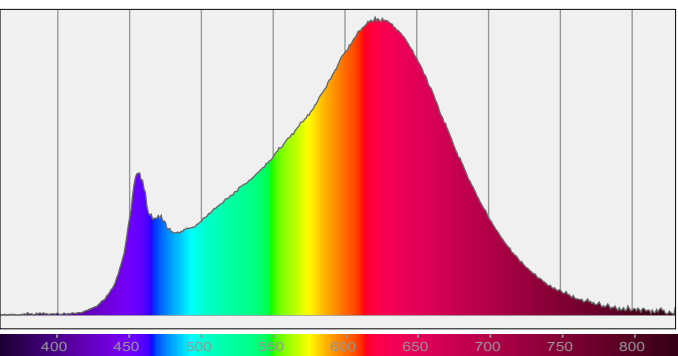
Color Rendering Index per reference color (CIE 1995)



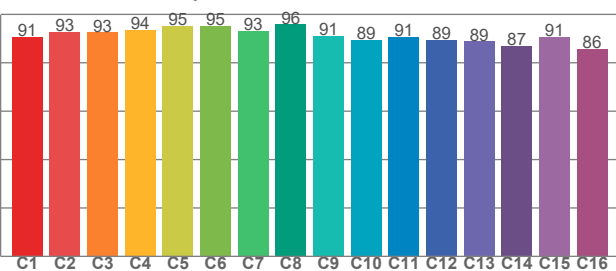
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
96.7	97.6	94.2	93.5	97.1	93.1	88.7	82.7	67.9	96.5	95.0	83.8	98.6	98.0	93.3

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



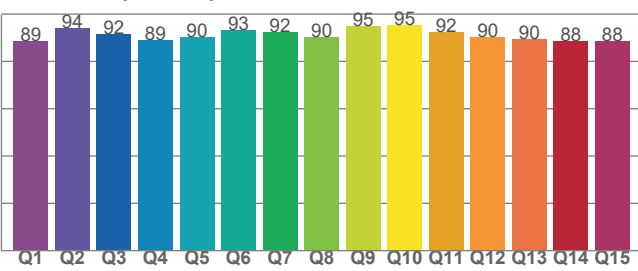
TM30-18 Rf-values per hue bin



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	92.6	92.5	93.7	95.1	95.1	93.1	95.8	91.0	89.4	90.6	89.5	88.8	87.1	90.7	85.6

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	93.9	91.6	88.8	90.2	93.1	92.3	90.4	94.8	95.3	92.4	90.2	89.5	88.4	88.5