

Tested Light Source - 1\_PHOT\_NINETY-NINE-2000lmChip-2700K-58Deg-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)

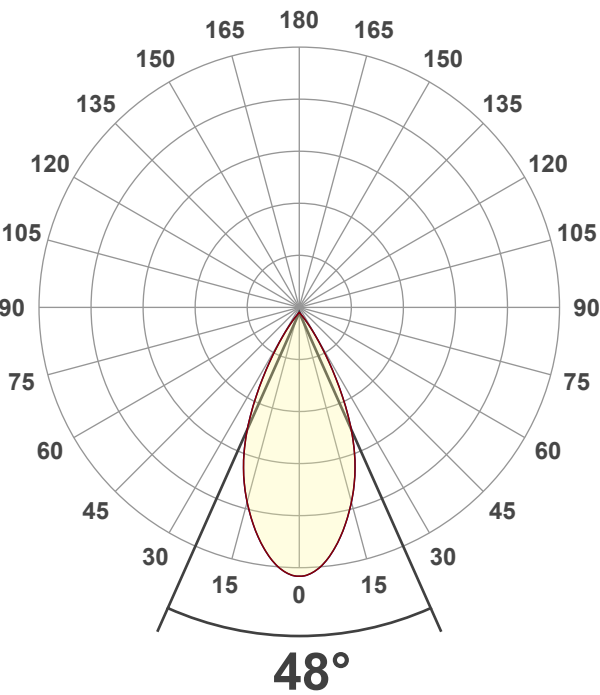
Measurement Conditions

Number of C-planes and Resolution	32 planes – 11.25°
γ (gamma)-Resolution	2°
Test Distance	1.50 m
Input Power, Power and Displ. Factors	15.8 W – PF 0.98 – DPF 0.98
Input RMS Voltage and Current	240 V – 0.067 A
Frequency of Input Power	50.1 Hz

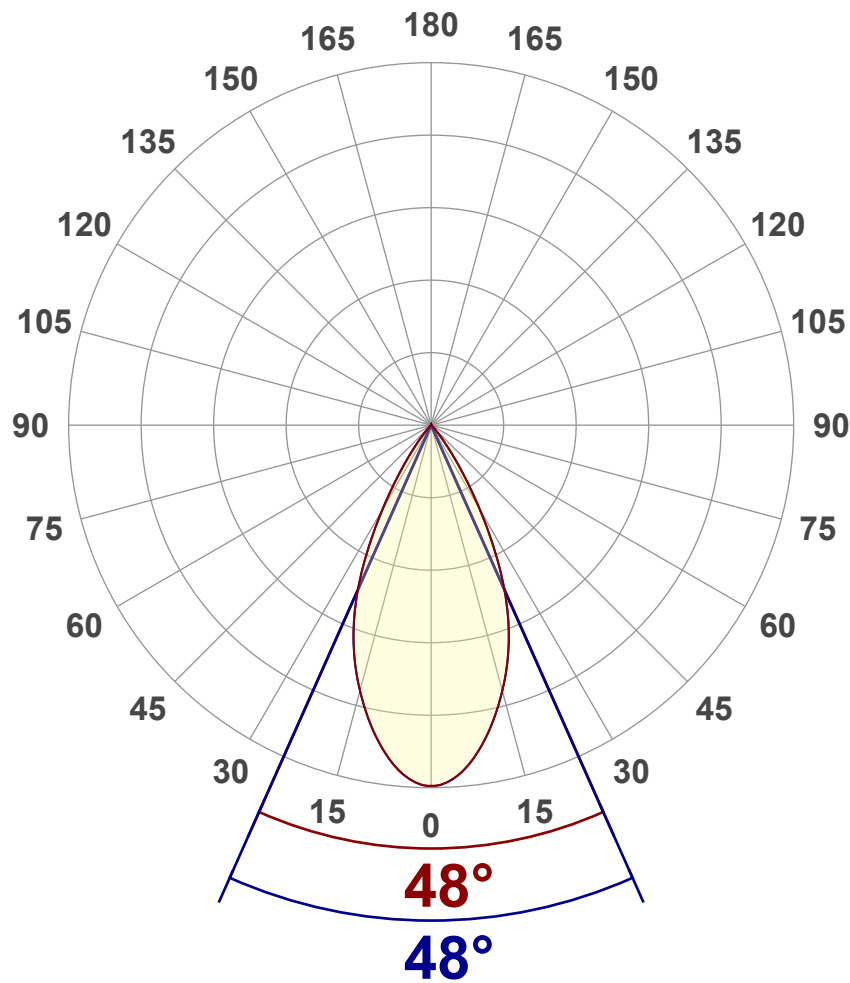
Main Light Measurement Results

Output	932 lm
Efficiency	59 lm/W
Peak Intensity and Beam Angle	1552 cd – 48°
Color Rendering Index	CRI 92.7

Light Intensity Distribution



Luminous Intensity diagramUnit: 0-100% of peak intensity



Main Values	
Output (total Lumen)	932 lm
Peak Intensity	1552 cd
Beam Angle (50%)	48°
Beam Angle (90%)	48°
Beam Angle (10%)	48°

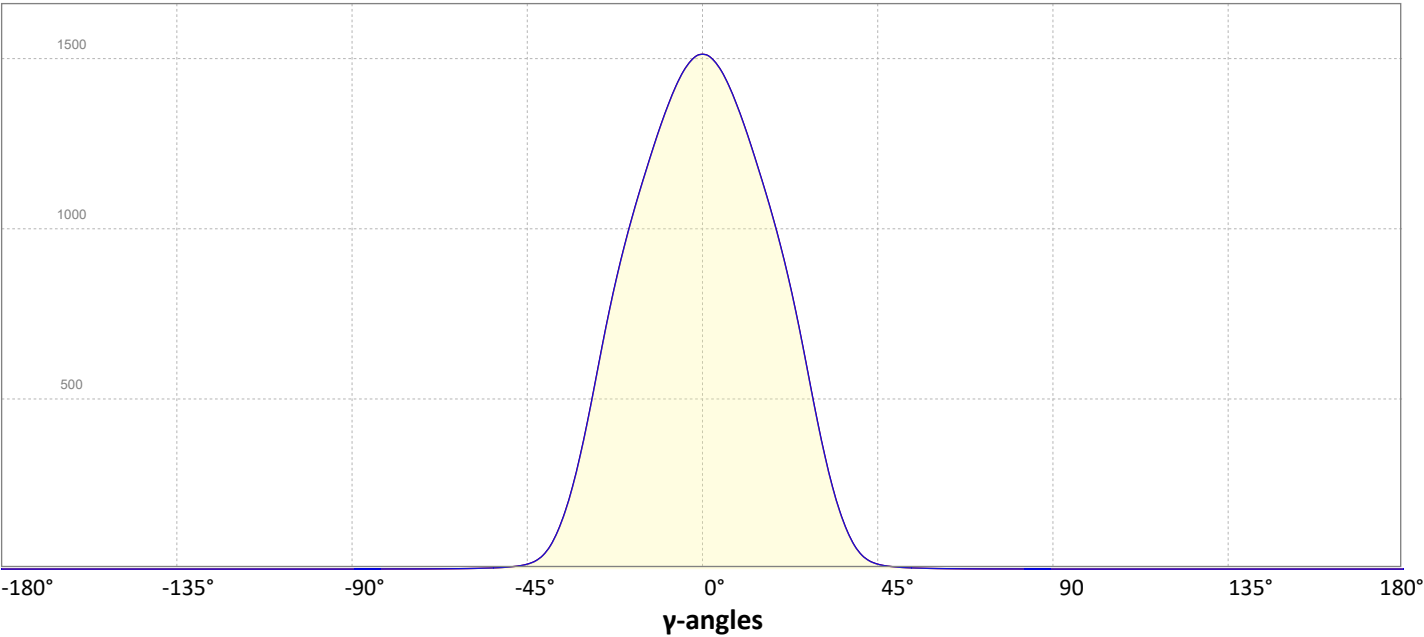
Cut-off Angle	
Average 2,5%	82.6°

Field Angle	
Average 10%	71.7°

Intensity Ratio	
In 120° cone	99.6%
In 90° cone	98.8%

C000-C180  
C090-C270

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

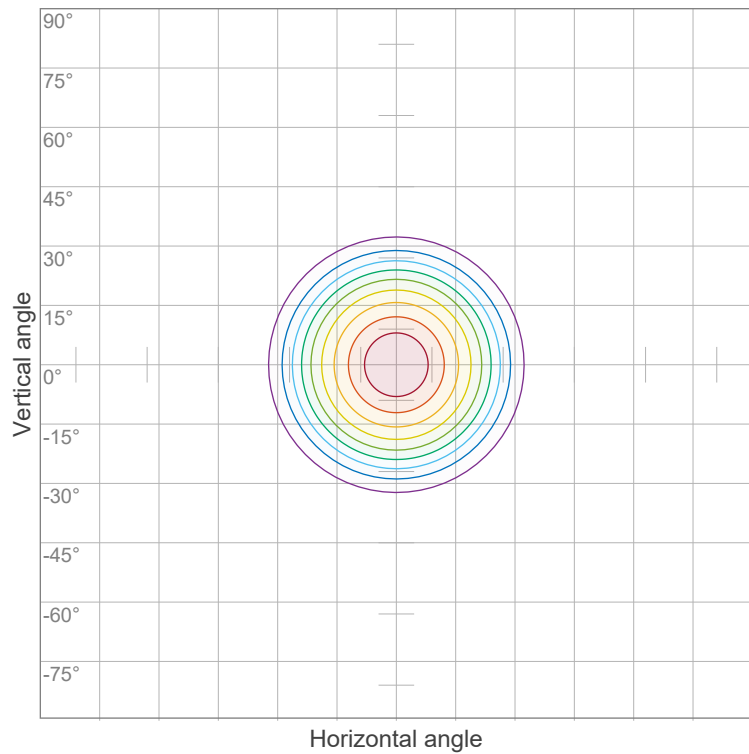


Goniophotometry Report

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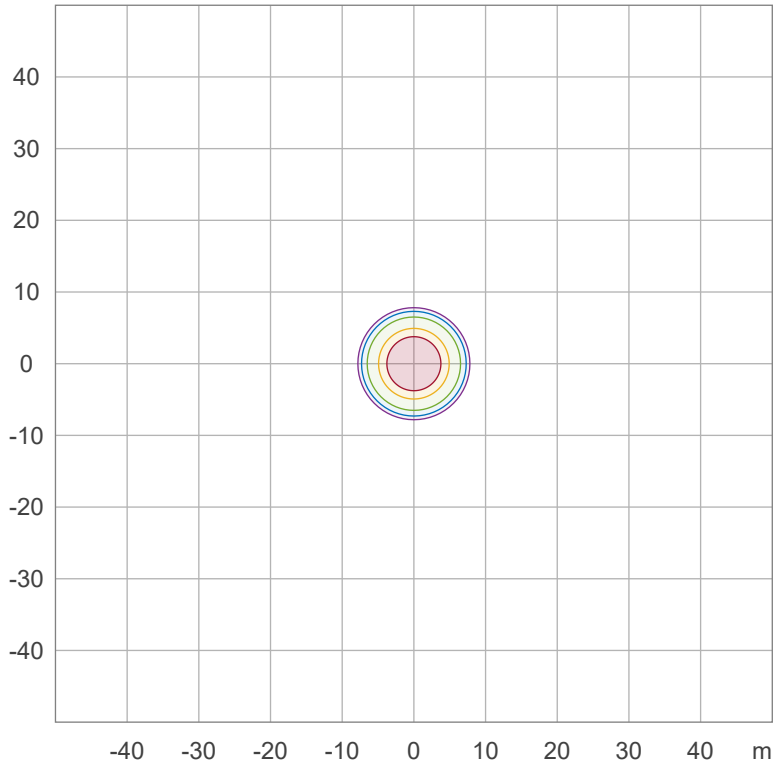
Iso-intensity Diagram (Iso-candela)



90 %	1396.5 cd
80 %	1241.4 cd
70 %	1086.2 cd
60 %	931.0 cd
50 %	775.8 cd
40 %	620.7 cd
30 %	465.5 cd
20 %	310.3 cd
10 %	155.2 cd

Peak intensity: 1551.7 cd  
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	7.8 lx
30.0 %	4.7 lx
10.0 %	1.6 lx
5.0 %	0.8 lx
3.0 %	0.5 lx

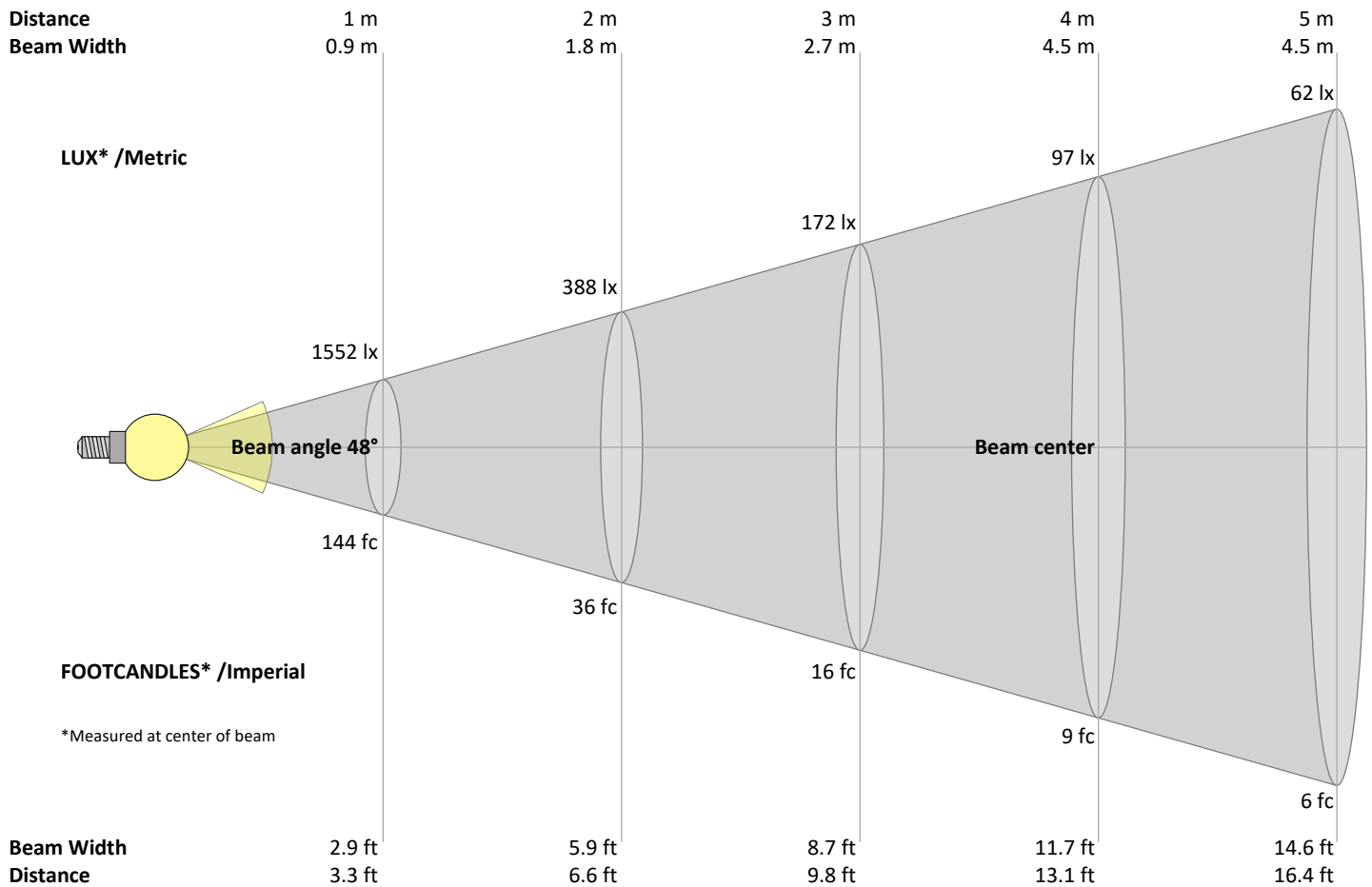
Peak illuminance: 15.5 lx  
Mounting height: 10.0 m  
Number of c-planes: 32

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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
1552	388	172	97	62	43	32	24	19	16	13	11	9	8	7	6	5	5	4	4	lux
144.2	36	16	9	5.8	4	2.9	2.3	1.8	1.4	1.2	1	0.9	0.7	0.6	0.6	0.5	0.4	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
1552	1543	1517	1477	1424	1363	1295	1221	1145	1065	978	882	775	659	537	420	314	224	151	95	cd
100%	99%	98%	95%	92%	88%	83%	79%	74%	69%	63%	57%	50%	42%	35%	27%	20%	14%	10%	6%	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
1552	1543	1517	1477	1424	1363	1295	1221	1145	1065	978	882	775	659	537	420	314	224	151	95	cd
100%	99%	98%	95%	92%	88%	83%	79%	74%	69%	63%	57%	50%	42%	35%	27%	20%	14%	10%	6%	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
1552	1543	1517	1477	1424	1363	1295	1221	1145	1065	978	882	775	659	537	420	314	224	151	95	cd
100%	99%	98%	95%	92%	88%	83%	79%	74%	69%	63%	57%	50%	42%	35%	27%	20%	14%	10%	6%	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
1552	1543	1517	1477	1424	1363	1295	1221	1145	1065	978	882	775	659	537	420	314	224	151	95	cd
100%	99%	98%	95%	92%	88%	83%	79%	74%	69%	63%	57%	50%	42%	35%	27%	20%	14%	10%	6%	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	15.9	16.5	16.0	16.7	16.9	15.9	16.5	16.0	16.7	16.9
	3H	15.6	16.3	16.0	16.5	16.7	15.6	16.3	16.0	16.5	16.7
	4H	15.5	16.2	15.9	16.4	16.7	15.5	16.2	15.9	16.4	16.7
	6H	15.5	16.1	15.8	16.4	16.7	15.5	16.1	15.8	16.4	16.7
	8H	15.5	16.0	15.8	16.3	16.7	15.5	16.0	15.8	16.3	16.7
	12H	15.4	16.0	15.8	16.3	16.7	15.4	16.0	15.8	16.3	16.7
4H	2H	15.5	16.2	15.9	16.4	16.7	15.5	16.2	15.9	16.4	16.7
	3H	15.4	15.9	15.8	16.3	16.7	15.4	15.9	15.8	16.3	16.7
	4H	15.3	15.8	15.7	16.2	16.7	15.3	15.8	15.7	16.2	16.7
	6H	15.2	15.7	15.7	16.1	16.4	15.2	15.7	15.7	16.1	16.4
	8H	15.2	15.6	15.7	16.0	16.3	15.2	15.6	15.7	16.0	16.3
	12H	15.1	15.5	15.6	15.9	16.4	15.1	15.5	15.6	15.9	16.4
8H	4H	15.2	15.6	15.7	16.0	16.3	15.2	15.6	15.7	16.0	16.3
	6H	15.1	15.4	15.6	15.9	16.4	15.1	15.4	15.6	15.9	16.4
	8H	15.1	15.4	15.6	15.9	16.5	15.1	15.4	15.6	15.9	16.5
	12H	15.1	15.3	15.7	15.8	16.4	15.1	15.3	15.7	15.8	16.4
12H	4H	15.1	15.5	15.6	15.9	16.3	15.1	15.5	15.6	15.9	16.3
	6H	15.1	15.3	15.6	15.9	16.5	15.1	15.3	15.6	15.9	16.5
	8H	15.0	15.3	15.6	15.8	16.4	15.0	15.3	15.6	15.8	16.4
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		6.1 / -11.3					6.1 / -11.3				
S = 1.5H		8.8 / -11.8					8.8 / -11.8				
S = 2.0H		10.8 / -12.2					10.8 / -12.2				

## 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	114	111	109	107	112	109	107	105	105	104	102	102	100	99	98	97	96	94
2	109	105	101	98	107	103	100	97	100	97	95	97	95	93	94	92	91	89
3	104	99	94	91	102	97	93	90	95	91	88	92	89	87	90	88	86	84
4	100	93	88	84	98	92	87	84	90	86	83	88	85	82	86	83	81	80
5	96	88	83	79	94	87	82	79	85	81	78	84	80	77	82	79	77	75
6	91	83	78	74	90	83	78	74	81	77	74	80	76	73	79	75	73	71
7	88	79	74	70	86	79	74	70	77	73	70	76	72	69	75	72	69	68
8	84	75	70	66	83	75	70	66	74	69	66	73	69	66	72	68	65	64
9	80	72	67	63	79	71	66	63	70	66	63	70	65	62	69	65	62	61
10	77	69	63	60	76	68	63	60	67	63	60	67	62	59	66	62	59	58

Goniophotometry Report

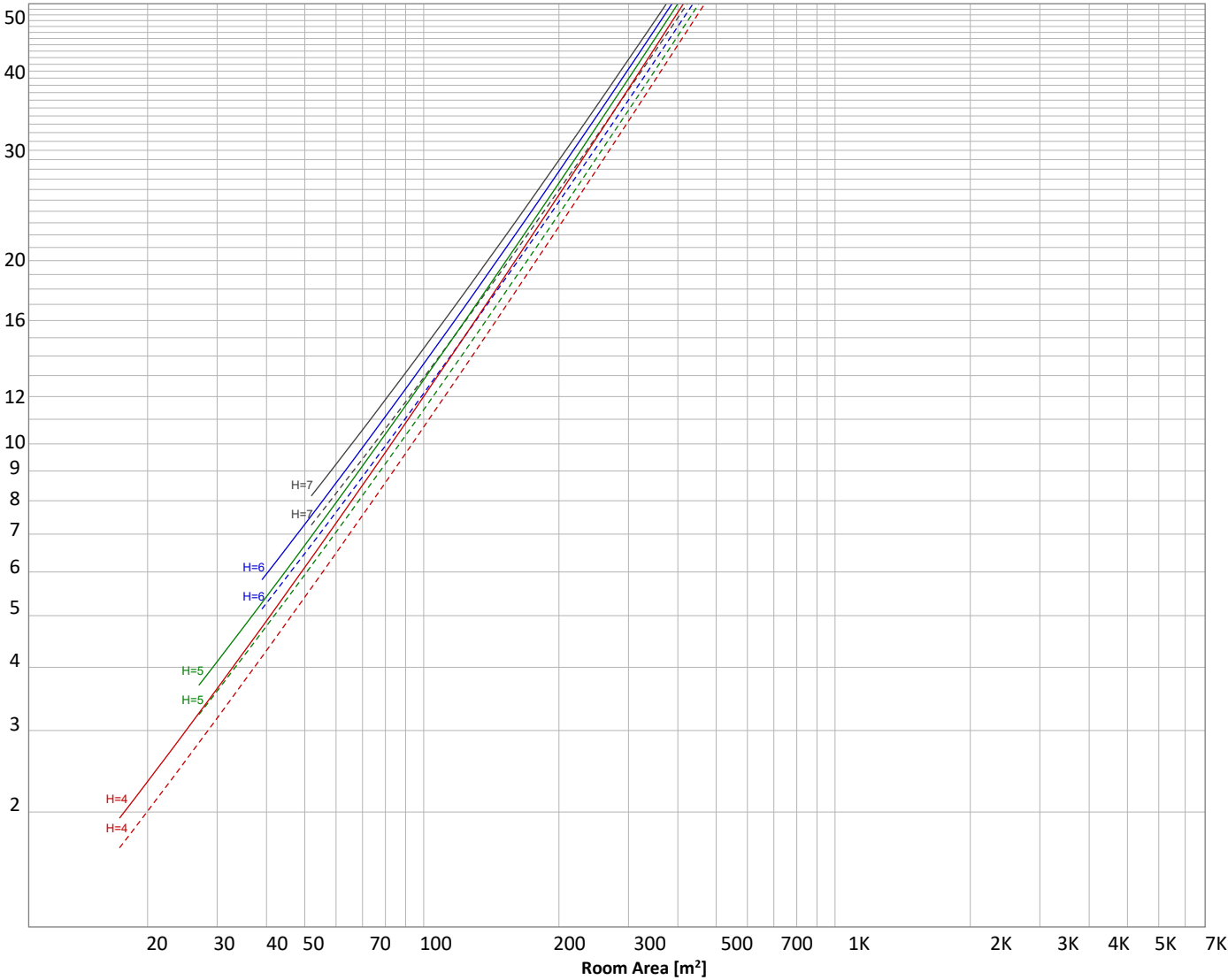
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 932 lm	ρ(%)		
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
				30
				20

Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
139 lm	328 lm	321 lm	123 lm	14.7 lm	3.06 lm	1.25 lm	0.697 lm	0.491 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0.251 lm	0.243 lm	0.228 lm	0.206 lm	0.178 lm	0.144 lm	0.106 lm	0.065 lm	0.022 lm

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	139 lm	14.9%
10-20°	328 lm	35.2%
20-30°	321 lm	34.4%
30-40°	123 lm	13.2%
40-50°	15 lm	1.6%
50-60°	3 lm	0.3%
60-70°	1 lm	0.1%
70-80°	1 lm	0.1%
80-90°	0 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	932 lm	100.0%

Intensity peaks

Max intensity	1552 cd
Intensity, 90°	0 cd
Intensity, 0°	1552 cd

Zonal Lumen summary

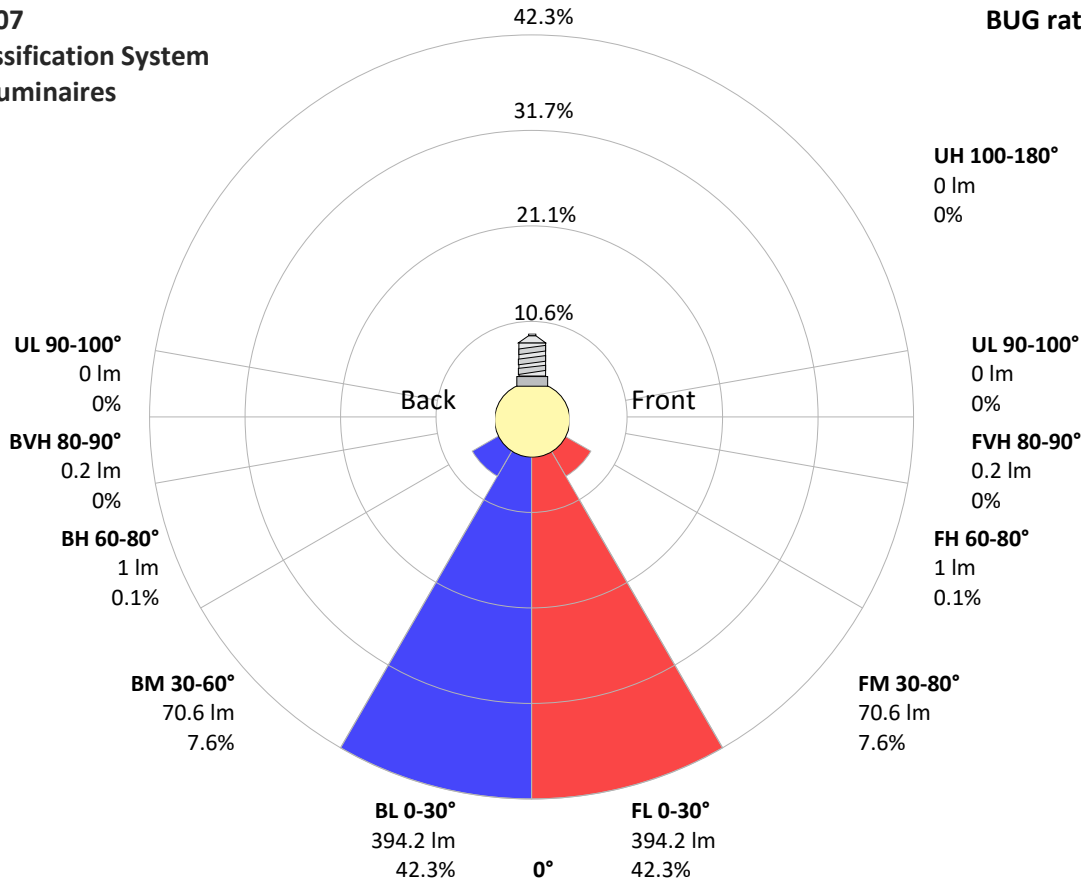
Zone (γ)	Lumen	% Total
0-30°	788 lm	84.5%
0-40°	910 lm	97.7%
0-60°	928 lm	99.6%
60-90°	2 lm	0.3%
70-100°	1 lm	0.2%
90-120°	1 lm	0.1%
0-90°	931 lm	99.8%
90-180°	1 lm	0.2%
0-180°	932 lm	100.0%

BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	394 lm	42.3%
Medium(30-60°)	71 lm	7.6%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 lm	0.0%
<b>Back light</b>		
Low(0-30°)	394 lm	42.3%
Medium(30-60°)	71 lm	7.6%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 lm	0.0%
<b>Uplight</b>		
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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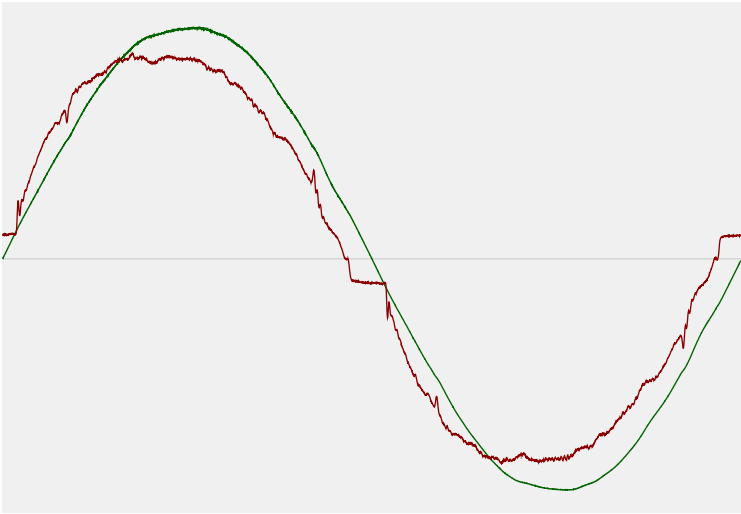


## Power Details

### Input Power

Power feed to light source	15.8 W
Frequency of input power	50.1 Hz
RMS Input voltage feed, $V_{RMS}$	240 V
RMS Input current feed, $I_{RMS}$	0.067 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	16.14 VA
Displacement factor of AC power feed	0.98
Power factor of AC current feed	0.98
Total harmonic distortion of the current	6.26%
Total harmonic distortion of the voltage	1.11%

### Input Power Curve



### Efficiency

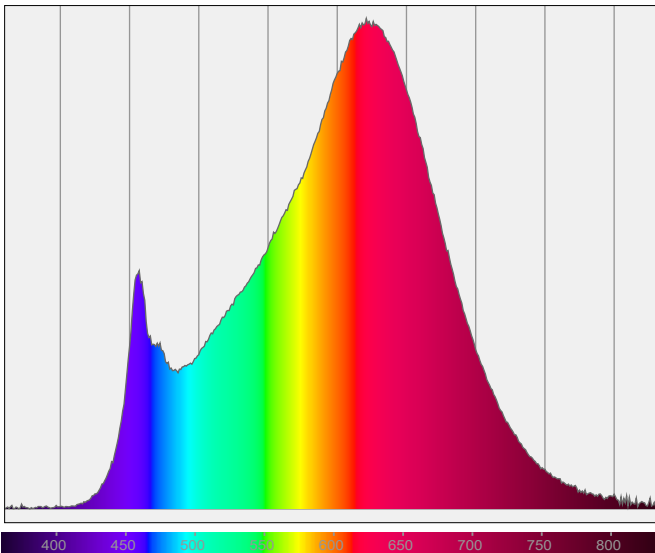
Radiated power efficiency	21.5%
<div><div></div></div>	
Lumen efficiency	59 lm/W
<div><div></div></div>	



Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R <sub>f</sub> 91.4 — R <sub>g</sub> 99.0
Color Shift, CIE duv	Duv ±0.0003

Spectral distribution



Color details

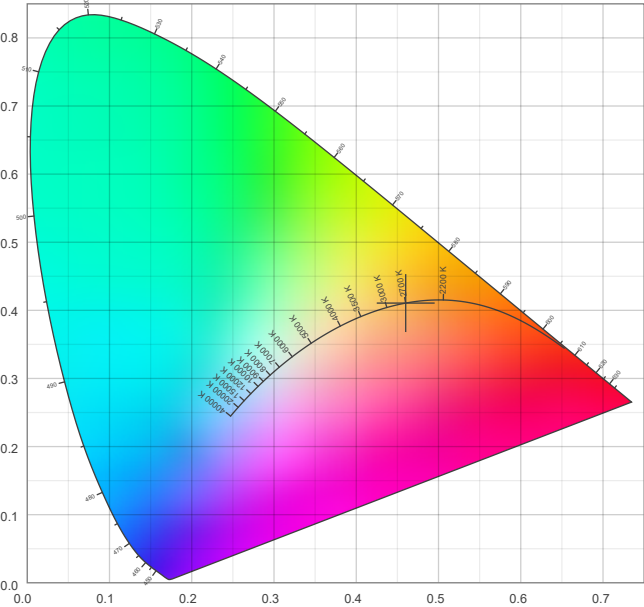
Correlated Color Temperature	CCT = 2700 K	Color coordinates CIE 1931	(x;y) = (0.460;0.411)
Color Rendering Index	CRI 92.7	Color coordinate CIEs 1960	(u;v) = (0.263;0.352)
Color Rendering Index, R9 (red component)	R9 = 67.2	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R <sub>f</sub> 91.4 — R <sub>g</sub> 99.0	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 90.6		

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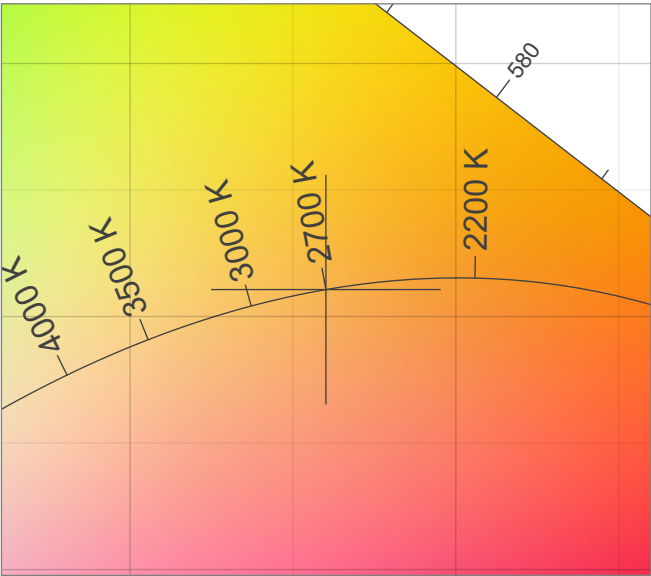
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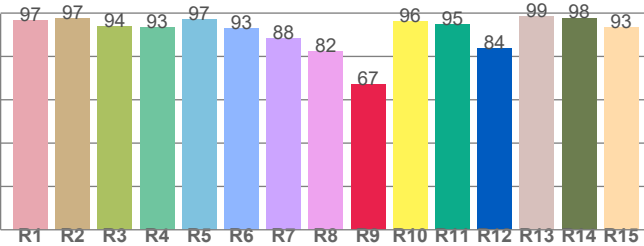
CIE 1931



CIE 1931 – zoomed on Planckian locus



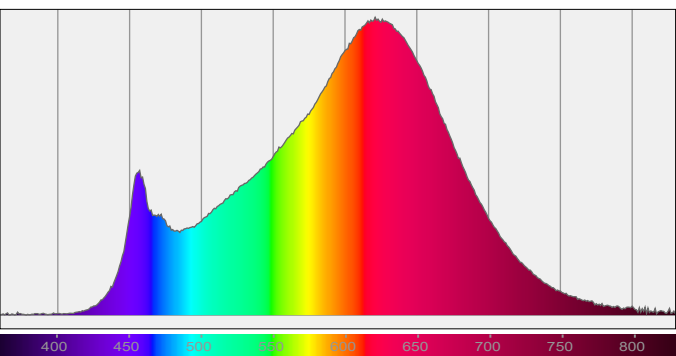
Color Rendering Index per reference color (CIE 1995)



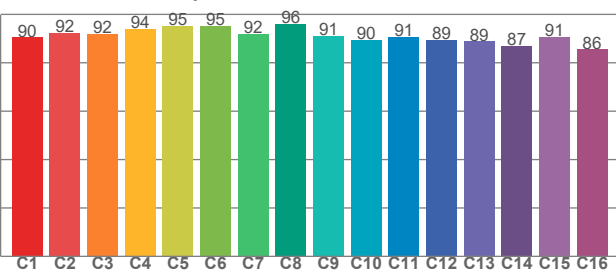
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
96.6	97.4	93.9	93.2	97.1	92.9	88.3	82.2	67.2	96.2	94.6	83.8	98.6	97.8	93.3

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



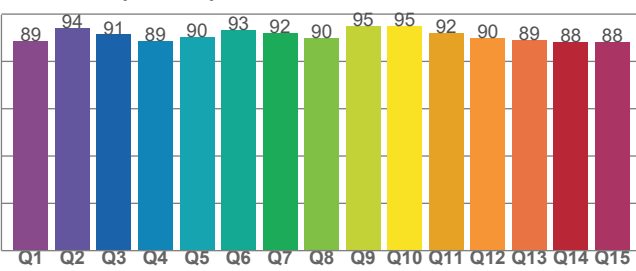
TM30-18 Rf-values per hue bin



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	92.4	92.0	93.9	95.1	95.1	92.0	95.9	91.2	89.5	90.6	89.5	88.8	87.0	90.8	85.5

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	94.0	91.3	88.5	90.2	93.2	91.8	90.0	94.8	95.0	92.0	89.7	89.1	88.2	88.3