

Tested Light Source - 1_PHOT_REFLEKTER-XL-4050lmChip-2700K-58Deg-HoneycombLouvre_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°

4.50 m

41.4 W – PF 0.97 – DPF 0.97

235 V – 0.182 A

50.1 Hz

Main Light Measurement Results

Output

Efficiency

Peak Intensity and Beam Angle

Color Rendering Index

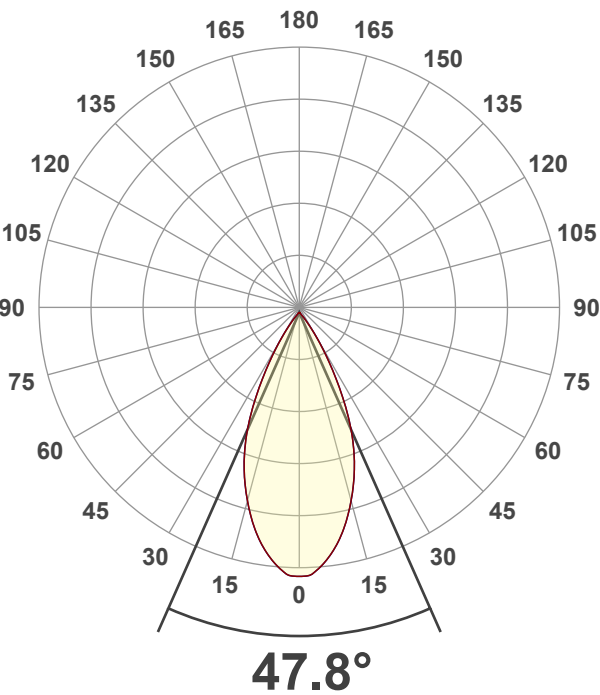
2176 lm

53 lm/W

3530 cd – 47.8°

CRI 92.7

Light Intensity Distribution



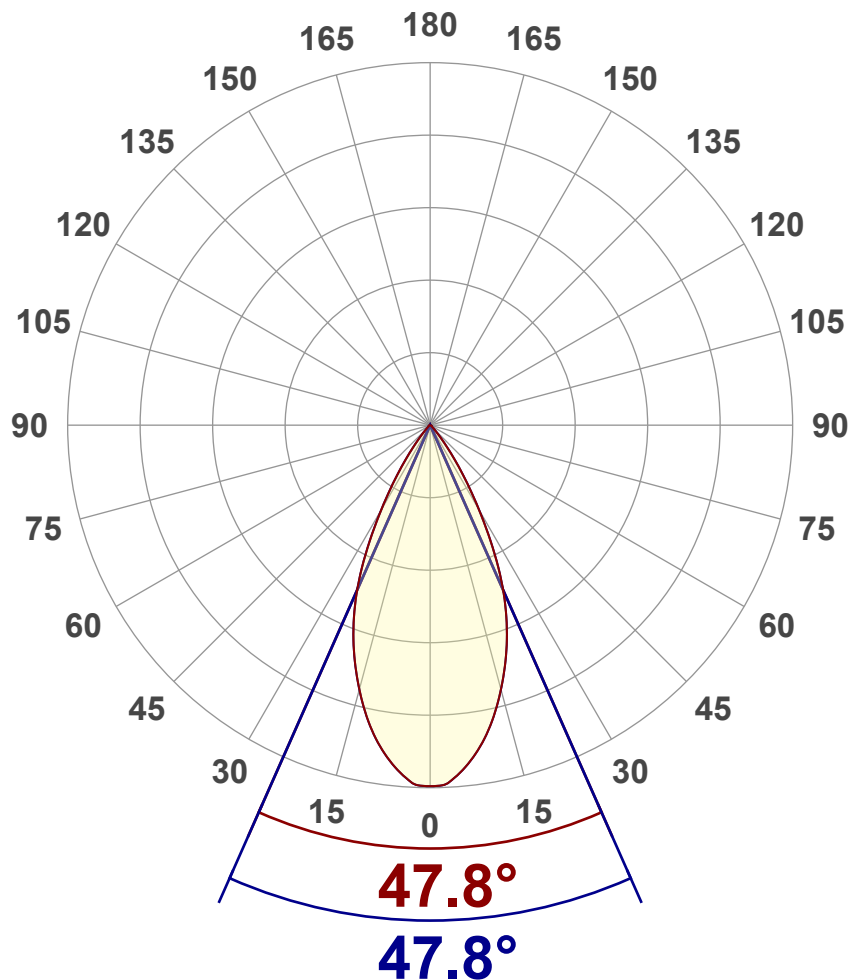
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2176 lm
Peak Intensity	3530 cd
Beam Angle (50%)	47.8°
Beam Angle (90%)	47.8°
Beam Angle (10%)	47.8°

Cut-off Angle

Average 2,5%	85.4°
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Field Angle

Average 10%	72.7°
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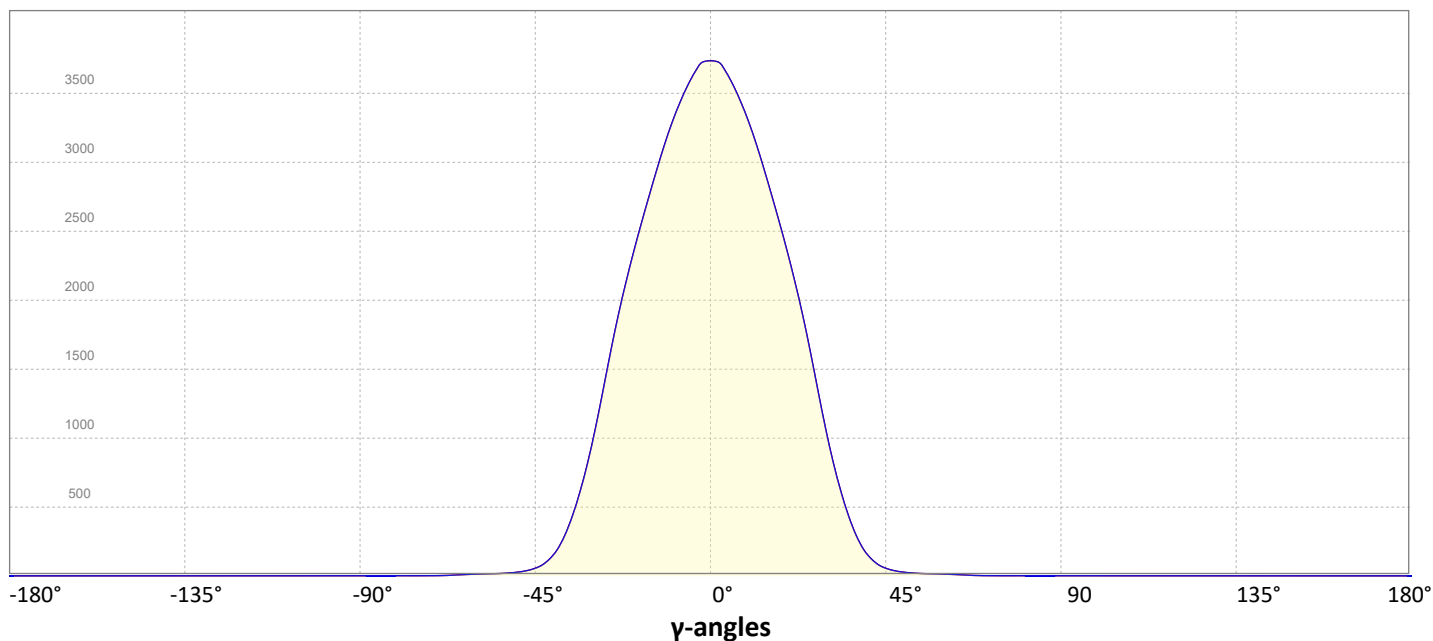
Intensity Ratio

In 120° cone	98.6%
In 90° cone	97.2%

C000-C180

C090-C270

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

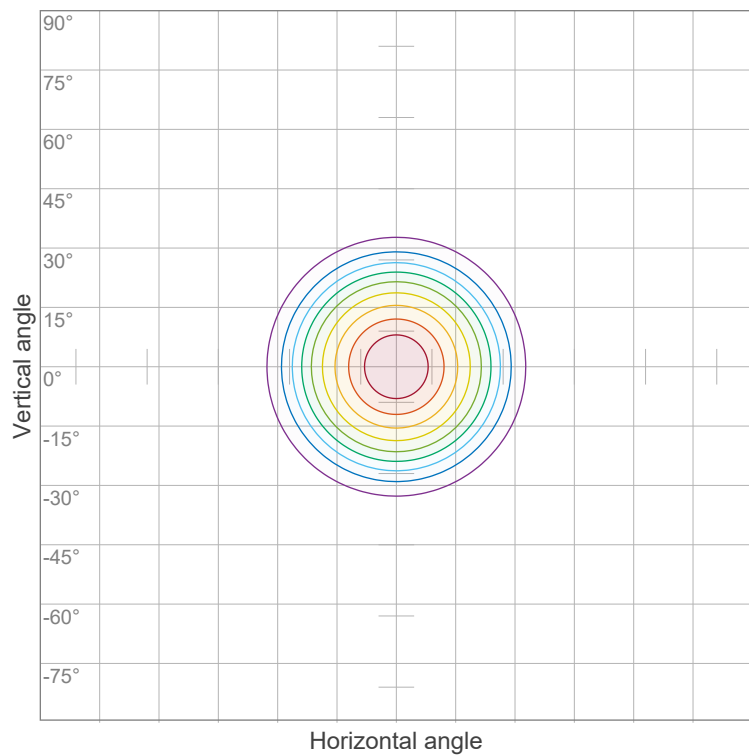


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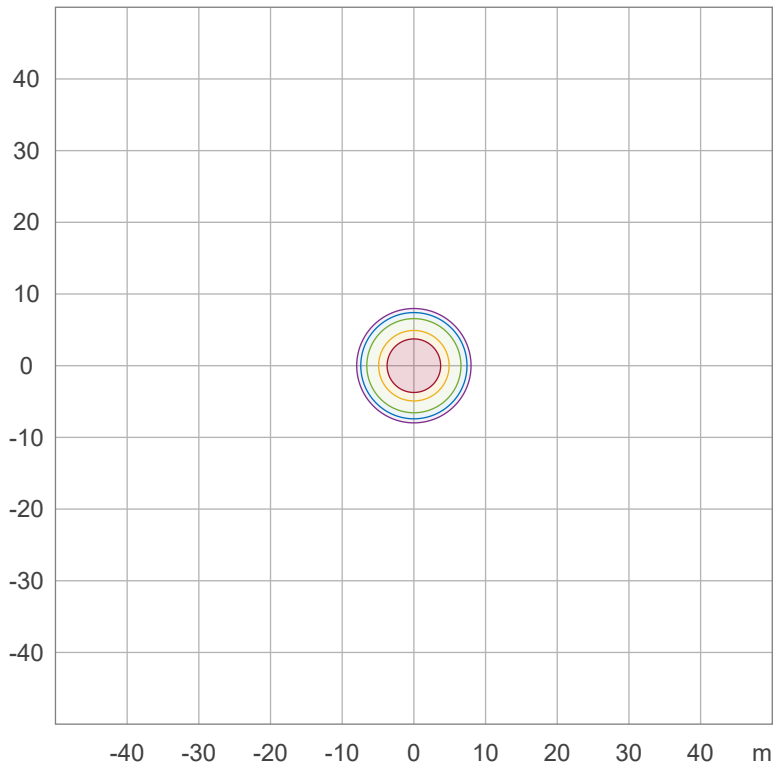
Iso-intensity Diagram (Iso-candela)



90 %	3177.2 cd
80 %	2824.2 cd
70 %	2471.2 cd
60 %	2118.1 cd
50 %	1765.1 cd
40 %	1412.1 cd
30 %	1059.1 cd
20 %	706.0 cd
10 %	353.0 cd

Peak intensity: 3530.2 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	17.7 lx
30.0 %	10.6 lx
10.0 %	3.5 lx
5.0 %	1.8 lx
3.0 %	1.1 lx

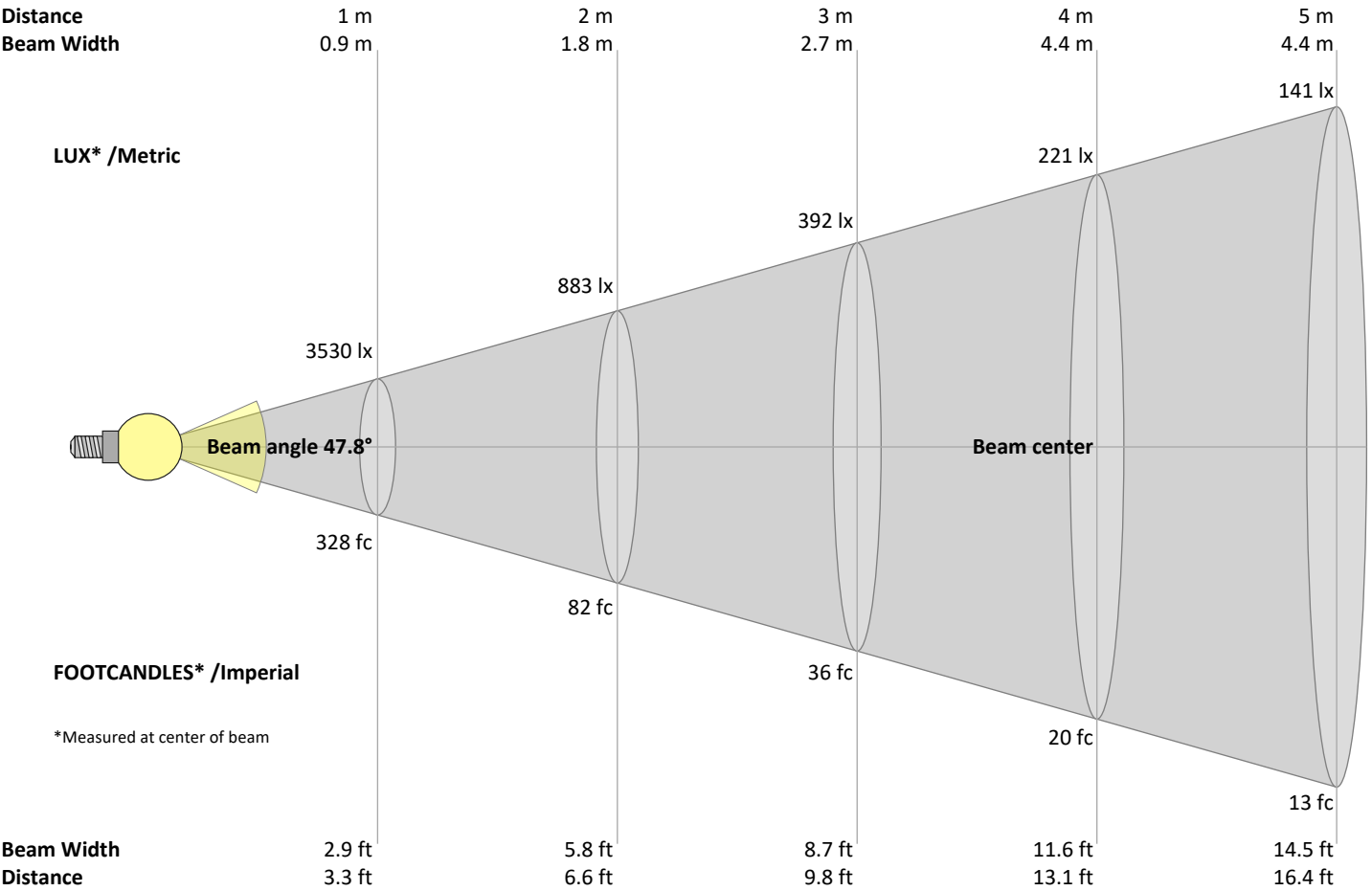
Peak illuminance: 35.3 lx
Mounting height: 10.0 m
Number of c-planes: 32

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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
3530	883	392	221	141	98	72	55	44	35	29	25	21	18	16	14	12	11	10	9	lux
328	82	36.4	20.5	13.1	9.1	6.7	5.1	4	3.3	2.7	2.3	1.9	1.7	1.5	1.3	1.1	1	0.9	0.8	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
3530	3529	3460	3360	3241	3104	2946	2771	2587	2398	2198	1983	1750	1492	1221	962	733	538	377	250	cd
100%	100%	98%	95%	92%	88%	83%	78%	73%	68%	62%	56%	50%	42%	35%	27%	21%	15%	11%	7%	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
3530	3529	3460	3360	3241	3104	2946	2771	2587	2398	2198	1983	1750	1492	1221	962	733	538	377	250	cd
100%	100%	98%	95%	92%	88%	83%	78%	73%	68%	62%	56%	50%	42%	35%	27%	21%	15%	11%	7%	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
3530	3529	3460	3360	3241	3104	2946	2771	2587	2398	2198	1983	1750	1492	1221	962	733	538	377	250	cd
100%	100%	98%	95%	92%	88%	83%	78%	73%	68%	62%	56%	50%	42%	35%	27%	21%	15%	11%	7%	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
3530	3529	3460	3360	3241	3104	2946	2771	2587	2398	2198	1983	1750	1492	1221	962	733	538	377	250	cd
100%	100%	98%	95%	92%	88%	83%	78%	73%	68%	62%	56%	50%	42%	35%	27%	21%	15%	11%	7%	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		Viewed Crosswise					Viewed Endwise				
X	Y	(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
2H	2H	18.8	19.4	18.9	19.6	19.8	18.8	19.4	18.9	19.6	19.8
	3H	18.6	19.3	18.9	19.5	19.7	18.6	19.3	18.9	19.5	19.7
	4H	18.5	19.2	18.9	19.4	19.6	18.5	19.2	18.9	19.4	19.6
	6H	18.5	19.1	18.8	19.4	19.7	18.5	19.1	18.8	19.4	19.7
	8H	18.5	19.0	18.8	19.3	19.7	18.5	19.0	18.8	19.3	19.7
	12H	18.4	19.0	18.8	19.3	19.7	18.4	19.0	18.8	19.3	19.7
4H	2H	18.5	19.2	18.9	19.4	19.6	18.5	19.2	18.9	19.4	19.6
	3H	18.4	18.9	18.8	19.3	19.7	18.4	18.9	18.8	19.3	19.7
	4H	18.3	18.8	18.7	19.2	19.7	18.3	18.8	18.7	19.2	19.7
	6H	18.2	18.8	18.7	19.1	19.4	18.2	18.8	18.7	19.1	19.4
	8H	18.2	18.7	18.7	19.0	19.4	18.2	18.7	18.7	19.0	19.4
	12H	18.2	18.5	18.7	18.9	19.4	18.2	18.5	18.7	18.9	19.4
8H	4H	18.2	18.6	18.7	19.0	19.3	18.2	18.6	18.7	19.0	19.3
	6H	18.1	18.5	18.6	18.9	19.4	18.1	18.5	18.6	18.9	19.4
	8H	18.2	18.4	18.7	18.9	19.6	18.2	18.4	18.7	18.9	19.6
	12H	18.1	18.4	18.7	18.9	19.5	18.1	18.4	18.7	18.9	19.5
12H	4H	18.1	18.5	18.6	18.9	19.3	18.1	18.5	18.6	18.9	19.3
	6H	18.1	18.4	18.6	18.9	19.5	18.1	18.4	18.6	18.9	19.5
	8H	18.1	18.3	18.7	18.8	19.4	18.1	18.3	18.7	18.8	19.4

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

S = 1.0H	5.6 / -7.7	5.6 / -7.7
S = 1.5H	8.3 / -8.1	8.3 / -8.1
S = 2.0H	10.3 / -9.3	10.3 / -9.3

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	106	106	106	101	101	101	99	
1	114	111	109	107	111	109	107	105	105	103	102	101	100	98	97	96	95	94
2	109	104	100	97	106	102	99	96	99	96	94	96	94	92	93	91	90	88
3	104	98	93	90	102	96	92	89	94	90	87	91	88	86	89	87	85	83
4	99	92	87	83	97	91	86	83	89	85	82	87	83	81	85	82	80	78
5	95	87	82	78	93	86	81	77	84	80	77	83	79	76	81	78	75	74
6	91	82	77	73	89	82	77	73	80	76	72	79	75	72	77	74	71	70
7	87	78	73	69	85	78	72	69	76	72	68	75	71	68	74	70	67	66
8	83	74	69	65	82	74	69	65	73	68	65	72	67	64	71	67	64	63
9	80	71	65	62	78	70	65	62	69	65	61	68	64	61	68	64	61	60
10	76	67	62	59	75	67	62	59	66	62	58	65	61	58	65	61	58	57

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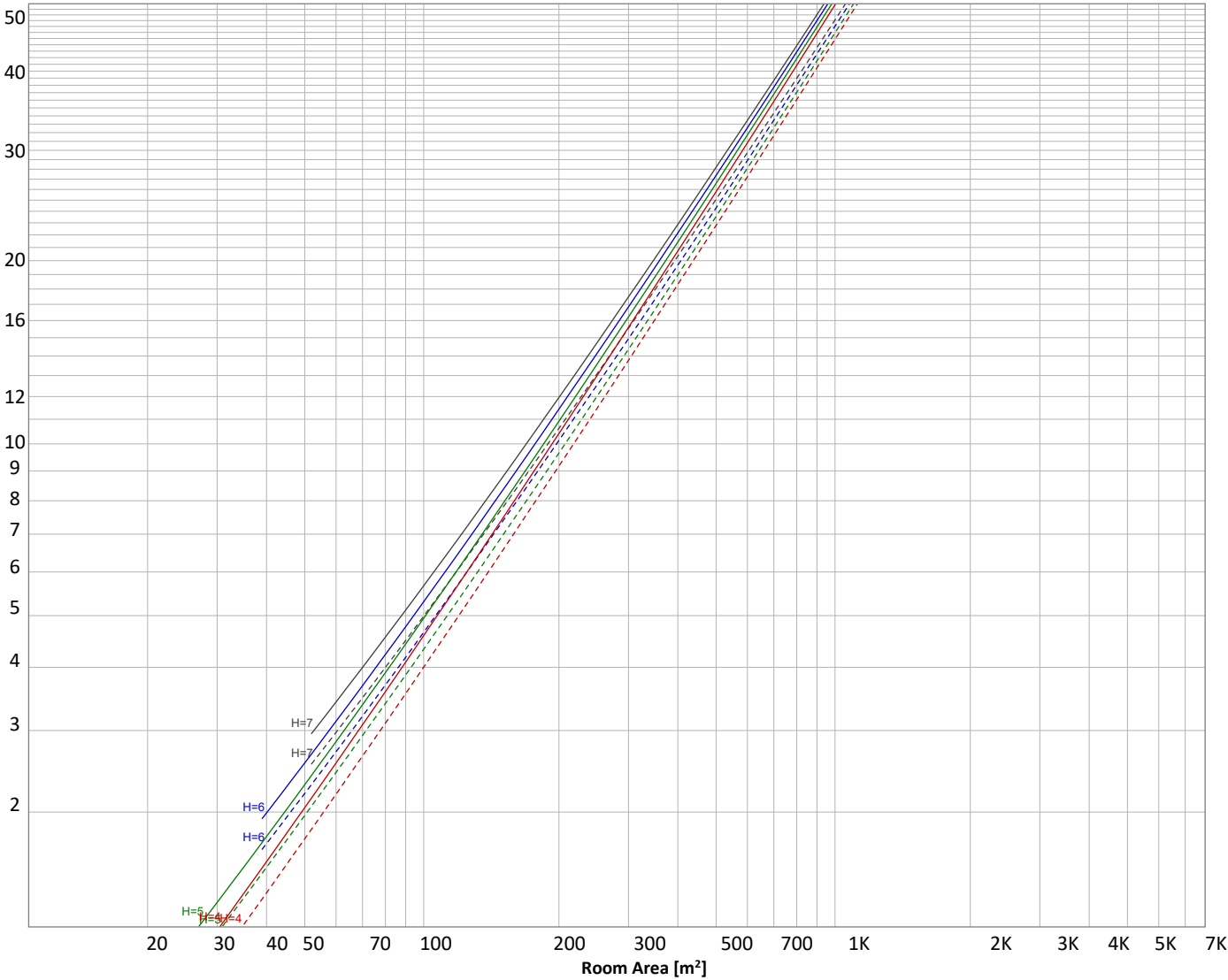
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 2176 lm	p(%)		
Hdown = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	Wall reflectance
Hwork = Work area height from floor =	0.00 m	-----	70	50
Ework = 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°
316 lm	743 lm	725 lm	296 lm	50.5 lm	16.4 lm	8.22 lm	3.21 lm	3.05 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
2.82 lm	2.74 lm	2.57 lm	2.32 lm	1.72 lm	1.25 lm	0.923 lm	0.565 lm	0.190 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	316 lm	14.5%
10-20°	743 lm	34.2%
20-30°	725 lm	33.3%
30-40°	296 lm	13.6%
40-50°	50 lm	2.3%
50-60°	16 lm	0.8%
60-70°	8 lm	0.4%
70-80°	3 lm	0.1%
80-90°	3 lm	0.1%
90-100°	3 lm	0.1%
100-110°	3 lm	0.1%
110-120°	3 lm	0.1%
120-130°	2 lm	0.1%
130-140°	2 lm	0.1%
140-150°	1 lm	0.1%
150-160°	1 lm	0.0%
160-170°	1 lm	0.0%
170-180°	0 lm	0.0%
Total	2176 lm	100.0%

Intensity peaks

Max intensity	3530 cd
Intensity, 90°	3 cd
Intensity, 0°	3530 cd

Zonal Lumen summary

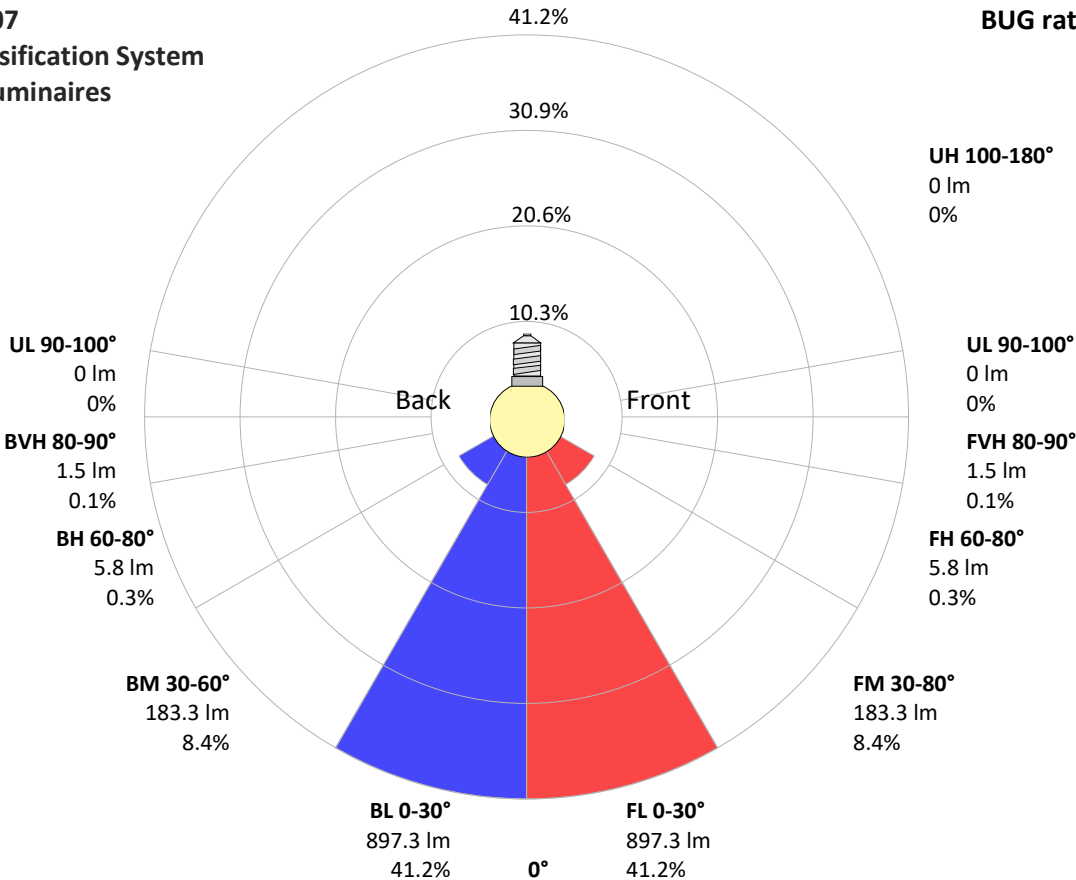
Zone (γ)	Lumen	% Total
0-30°	1784 lm	82.0%
0-40°	2080 lm	95.6%
0-60°	2146 lm	98.6%
60-90°	14 lm	0.7%
70-100°	9 lm	0.4%
90-120°	8 lm	0.4%
0-90°	2161 lm	99.3%
90-180°	15 lm	0.7%
0-180°	2176 lm	100.0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	897 lm	41.2%
Medium(30-60°)	183 lm	8.4%
High(60-80°)	6 lm	0.3%
Very high(80-90°)	2 lm	0.1%
Back light		
Low(0-30°)	897 lm	41.2%
Medium(30-60°)	183 lm	8.4%
High(60-80°)	6 lm	0.3%
Very high(80-90°)	2 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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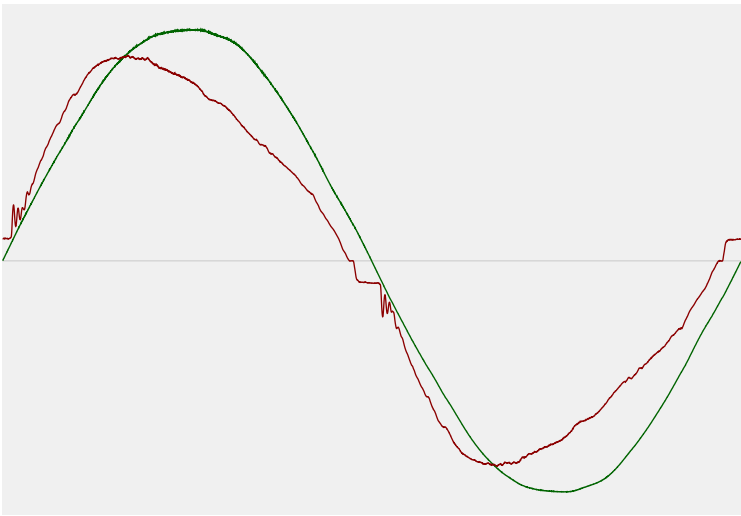


Power Details

Input Power

Power feed to light source	41.4 W
Frequency of input power	50.1 Hz
RMS Input voltage feed, V_{RMS}	235 V
RMS Input current feed, I_{RMS}	0.182 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.74 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.49%
Total harmonic distortion of the voltage	1.13%

Input Power Curve



Efficiency

Radiated power efficiency	19.1%
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Lumen efficiency	53 lm/W
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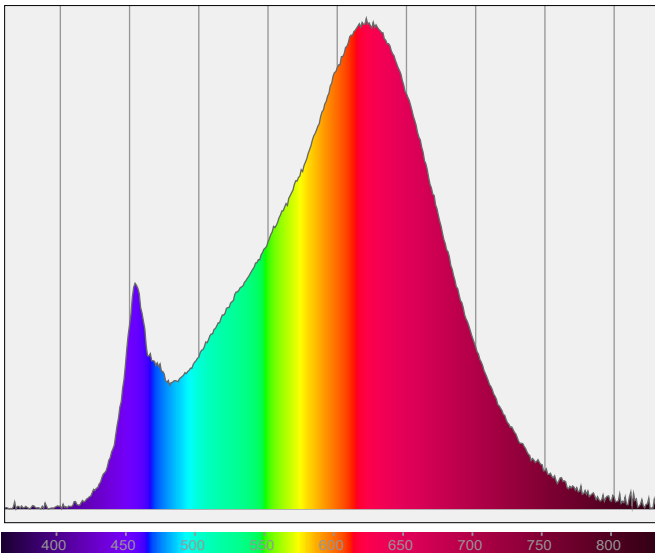
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Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R _f 91.5 — R _g 99.7
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 = 62.3	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.5 — R _g 99.7	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 89.9		

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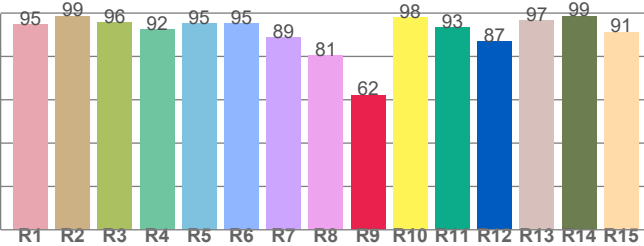
CIE 1931



CIE 1931 – zoomed on Planckian locus



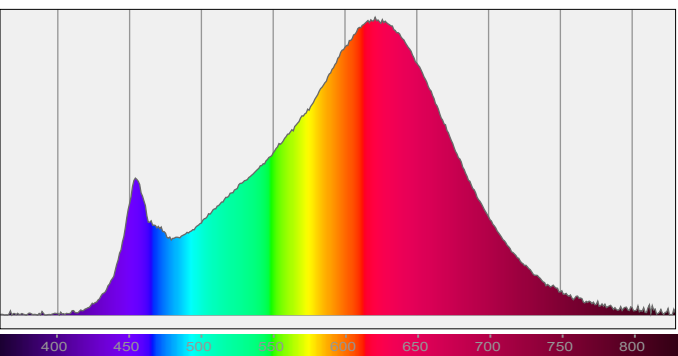
Color Rendering Index per reference color (CIE 1995)



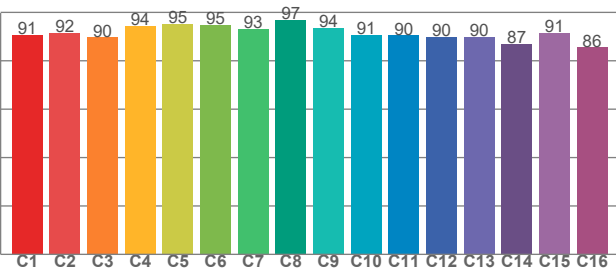
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
94.9	98.7	95.5	92.4	95.4	95.1	88.7	80.7	62.3	98.2	93.3	86.8	96.8	98.7	91.3

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



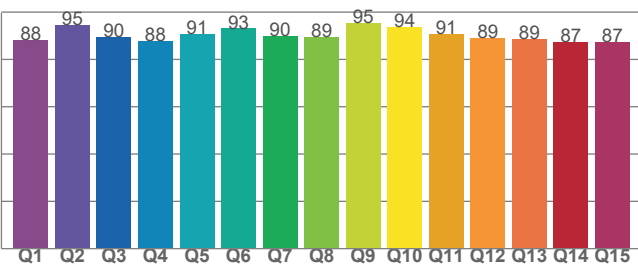
TM30-18 Rf-values per hue bin



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	91.5	89.6	94.4	95.2	94.9	93.2	96.7	93.5	90.6	90.4	89.7	89.8	87.0	91.5	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
88.2	94.6	89.6	87.7	90.8	93.0	90.0	89.2	95.3	93.6	90.9	88.9	88.6	87.2	87.3