

Goniophotometry Report

1_PHOT_REFLEKTER-XL-4050lmChip-2700K-UGR_2303
www.factorylux.com



Tested Light Source - 1_PHOT_REFLEKTER-XL-4050lmChip-2700K-UGR_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

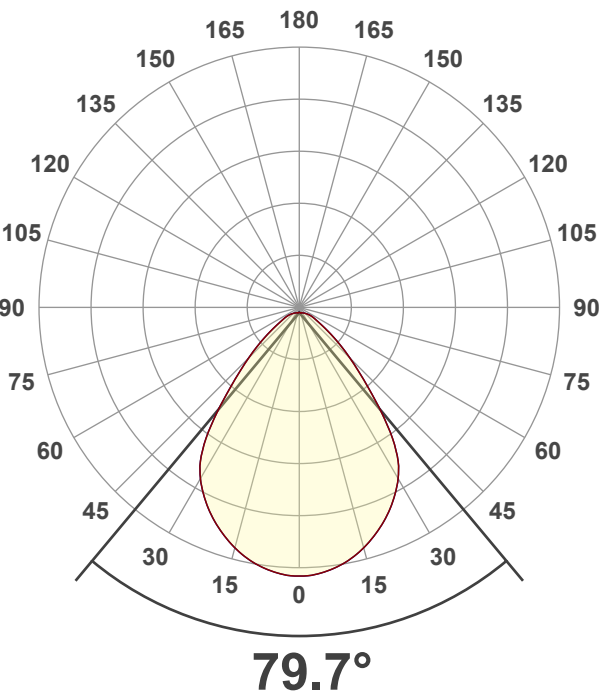
32 planes – 11.25°
3°
4.50 m
41.5 W – PF 0.97 – DPF 0.97
240 V – 0.179 A
50 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

2632 lm
63 lm/W
1536 cd – 79.7°
CRI 93.0

Light Intensity Distribution



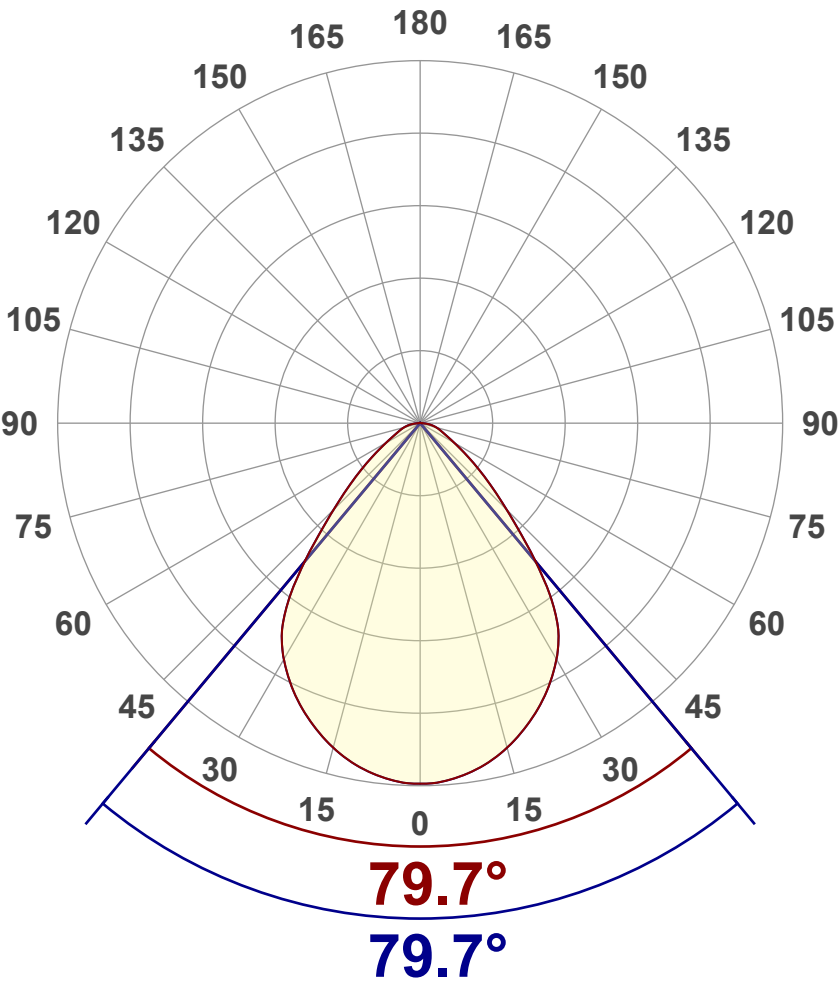
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2632 lm
Peak Intensity	1536 cd
Beam Angle (50%)	79.7°
Beam Angle (90%)	79.7°
Beam Angle (10%)	79.7°

Cut-off Angle

Average 2,5%	165.2°
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Field Angle

Average 10%	122.8°
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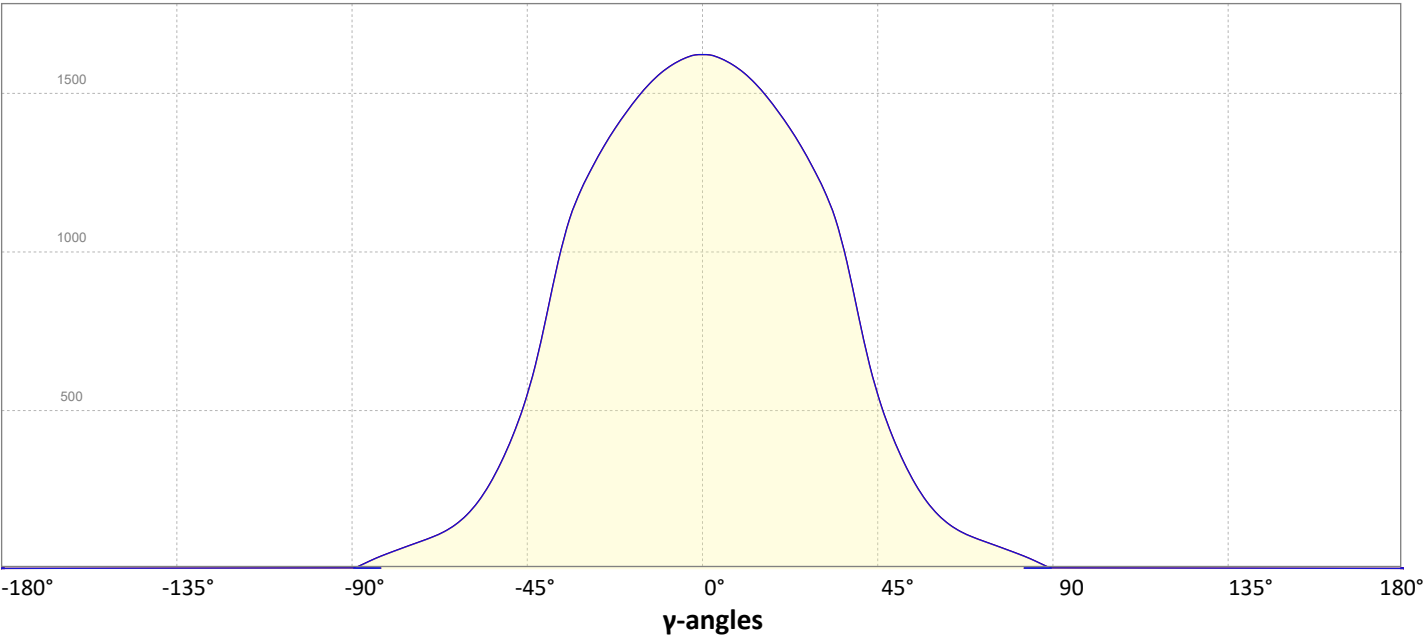
Intensity Ratio

In 120° cone	90.6%
In 90° cone	75.3%

C000-C180

C090-C270

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

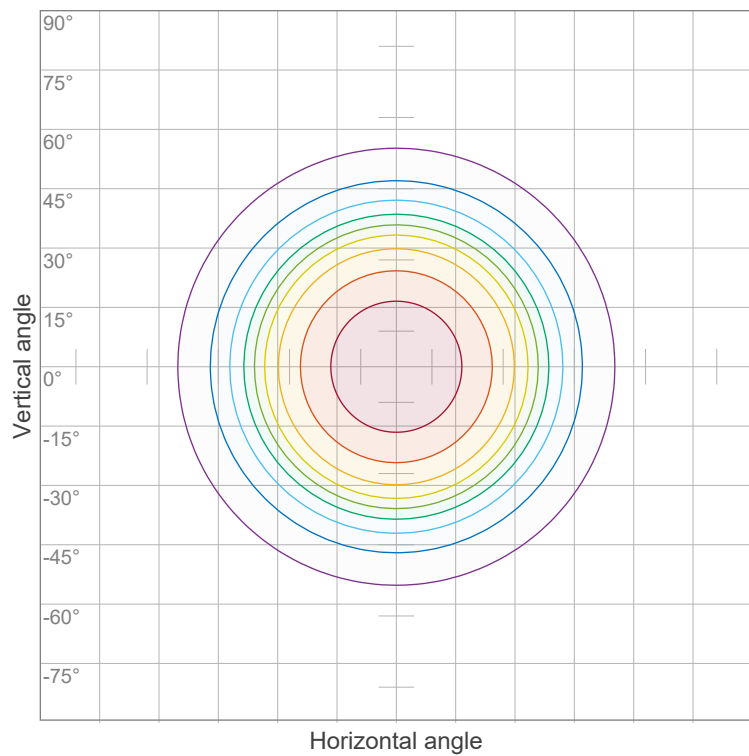


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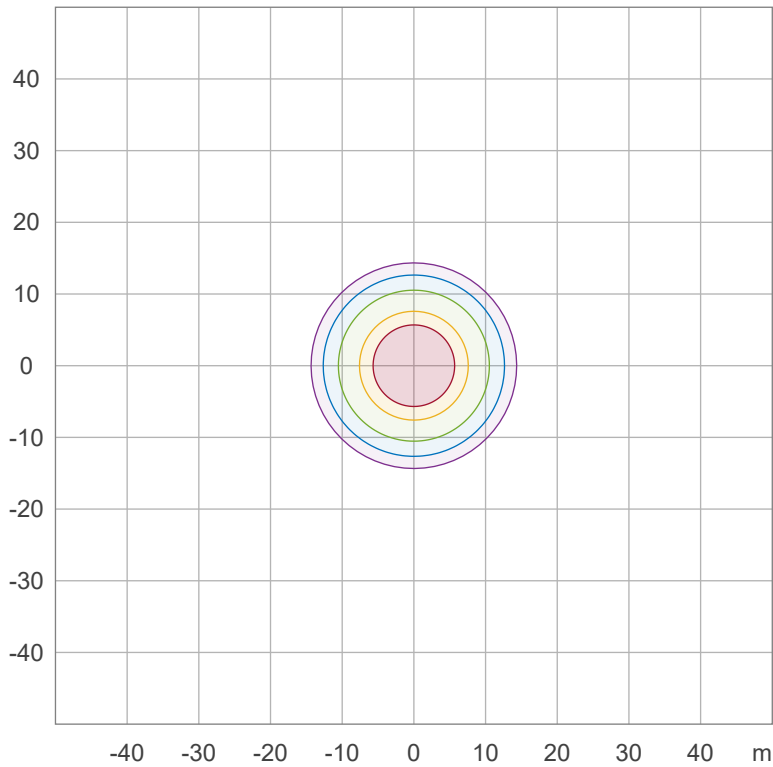
Iso-intensity Diagram (Iso-candela)



90 %	1382.1 cd
80 %	1228.6 cd
70 %	1075.0 cd
60 %	921.4 cd
50 %	767.9 cd
40 %	614.3 cd
30 %	460.7 cd
20 %	307.1 cd
10 %	153.6 cd

Peak intensity: 1535.7 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	7.7 lx
30.0 %	4.6 lx
10.0 %	1.5 lx
5.0 %	0.8 lx
3.0 %	0.5 lx

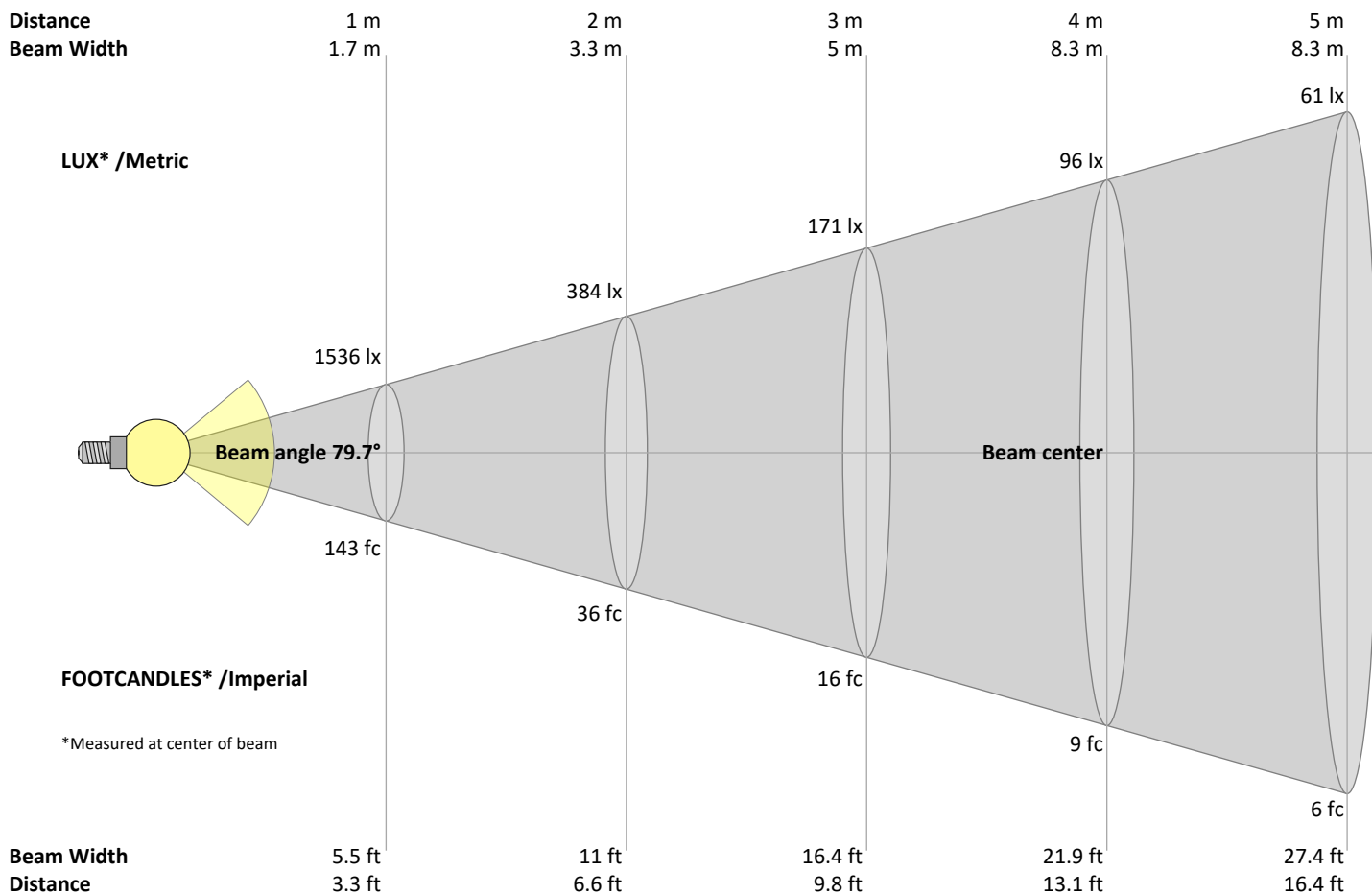
Peak illuminance: 15.4 lx
Mounting height: 10.0 m
Number of c-planes: 32

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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
1536	384	171	96	61	43	31	24	19	15	13	11	9	8	7	6	5	5	4	4	lux
142.7	35.7	15.9	8.9	5.7	4	2.9	2.2	1.8	1.4	1.2	1	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.4	fc

Intensities in 0° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1536	1523	1488	1431	1357	1269	1160	1008	759	524	364	248	169	122	93	72	50	27	4	4	cd
100%	99%	97%	93%	88%	83%	76%	66%	49%	34%	24%	16%	11%	8%	6%	5%	3%	2%	0%	0%	of 0°val

Intensities in 90° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1536	1523	1488	1431	1357	1269	1160	1008	759	524	364	248	169	122	93	72	50	27	4	4	cd
100%	99%	97%	93%	88%	83%	76%	66%	49%	34%	24%	16%	11%	8%	6%	5%	3%	2%	0%	0%	of 0°val

Intensities in 180° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1536	1523	1488	1431	1357	1269	1160	1008	759	524	364	248	169	122	93	72	50	27	4	4	cd
100%	99%	97%	93%	88%	83%	76%	66%	49%	34%	24%	16%	11%	8%	6%	5%	3%	2%	0%	0%	of 0°val

Intensities in 270° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1536	1523	1488	1431	1357	1269	1160	1008	759	524	364	248	169	122	93	72	50	27	4	4	cd
100%	99%	97%	93%	88%	83%	76%	66%	49%	34%	24%	16%	11%	8%	6%	5%	3%	2%	0%	0%	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	14.5	15.4	14.7	15.7	15.9	14.5	15.4	14.7	15.7	15.9
	3H	14.9	16.0	15.3	16.2	16.4	14.9	16.0	15.3	16.2	16.4
	4H	15.3	16.2	15.7	16.5	16.7	15.3	16.2	15.7	16.5	16.7
	6H	15.7	16.5	16.0	16.8	17.2	15.7	16.5	16.0	16.8	17.2
	8H	15.8	16.6	16.1	16.9	17.3	15.8	16.6	16.1	16.9	17.3
	12H	15.9	16.7	16.3	17.0	17.5	15.9	16.7	16.3	17.0	17.5
4H	2H	14.6	15.5	15.0	15.8	16.0	14.6	15.5	15.0	15.8	16.0
	3H	15.4	16.2	15.7	16.5	16.9	15.4	16.2	15.7	16.5	16.9
	4H	15.8	16.5	16.2	16.9	17.4	15.8	16.5	16.2	16.9	17.4
	6H	16.3	17.0	16.8	17.3	17.7	16.3	17.0	16.8	17.3	17.7
	8H	16.5	17.2	17.0	17.5	17.9	16.5	17.2	17.0	17.5	17.9
	12H	16.7	17.2	17.2	17.6	18.1	16.7	17.2	17.2	17.6	18.1
8H	4H	16.0	16.6	16.5	17.0	17.3	16.0	16.6	16.5	17.0	17.3
	6H	16.6	17.1	17.1	17.6	18.1	16.6	17.1	17.1	17.6	18.1
	8H	17.0	17.4	17.5	17.9	18.5	17.0	17.4	17.5	17.9	18.5
	12H	17.3	17.6	17.9	18.1	18.7	17.3	17.6	17.9	18.1	18.7
12H	4H	16.0	16.5	16.5	16.9	17.4	16.0	16.5	16.5	16.9	17.4
	6H	16.7	17.1	17.2	17.7	18.3	16.7	17.1	17.2	17.7	18.3
	8H	17.1	17.4	17.7	17.9	18.5	17.1	17.4	17.7	17.9	18.5

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

S = 1.0H	0.4 / -0.5	0.4 / -0.5
S = 1.5H	1.1 / -0.9	1.1 / -0.9
S = 2.0H	1.9 / -1.3	1.9 / -1.3

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	111	106	106	106	101	101	101	99
1	111	107	104	101	108	105	102	99	101	98	96	97	95	93	93	91	90	88
2	103	96	91	86	101	95	90	85	91	87	83	88	84	81	85	82	79	77
3	96	87	81	75	93	86	80	75	83	77	73	80	76	72	78	74	71	69
4	89	79	72	66	87	78	71	66	75	70	65	73	68	64	71	67	63	61
5	83	72	65	59	81	71	64	59	69	63	58	67	62	57	65	61	57	55
6	78	66	59	53	76	65	58	53	64	57	52	62	56	52	60	55	51	50
7	73	61	53	48	71	60	53	48	59	52	48	57	51	47	56	51	47	45
8	68	56	49	44	67	56	49	44	54	48	43	53	47	43	52	47	43	41
9	64	52	45	40	63	52	45	40	51	44	40	49	44	40	48	43	39	38
10	60	49	42	37	59	48	41	37	47	41	37	46	40	36	45	40	36	35

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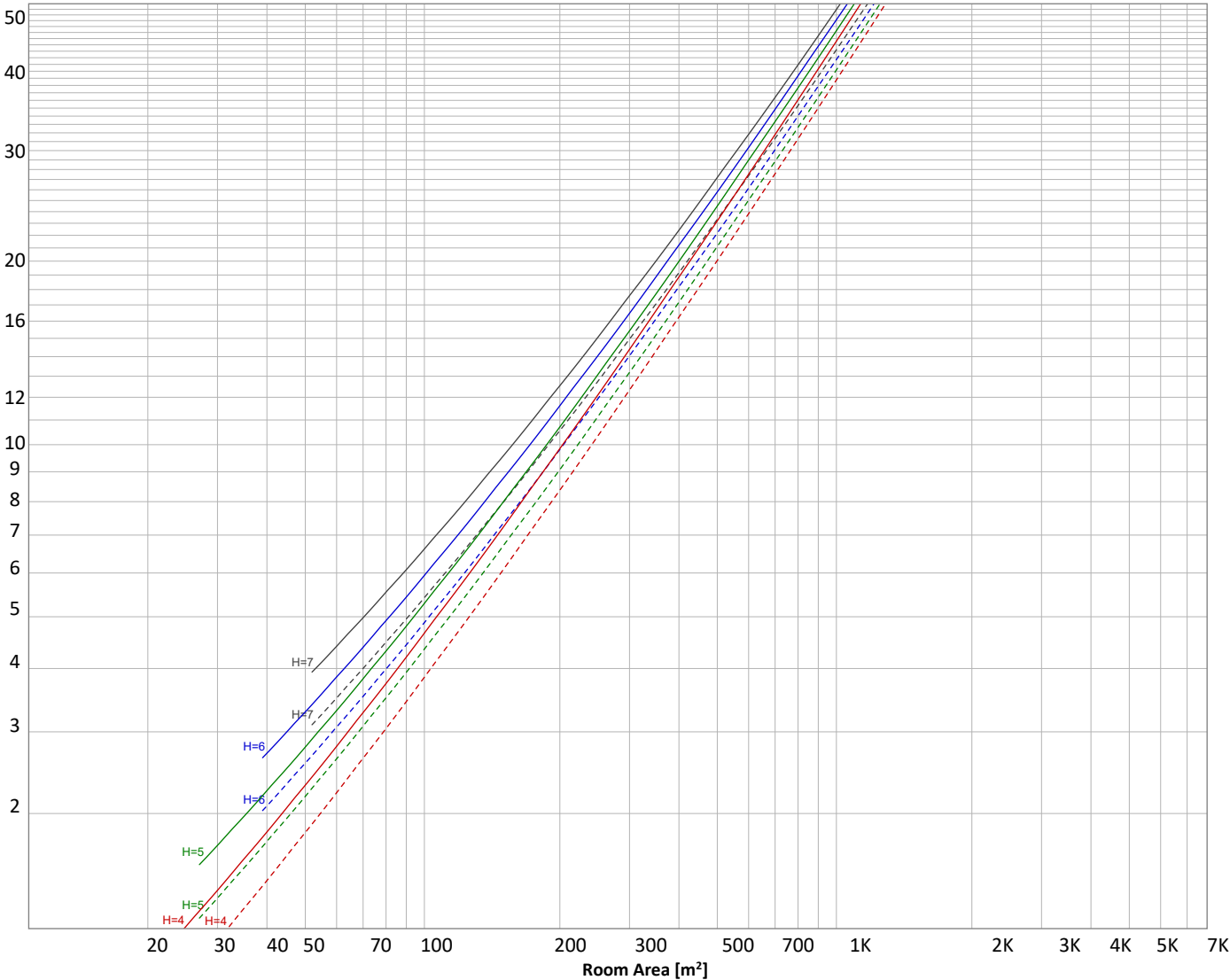
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 2632 lm	$\rho(\%)$		
H _{down} = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	Wall reflectance
H _{work} = Work area height from floor =	0.00 m	-----	70	50
E _{work} = 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°
144 lm	403 lm	583 lm	616 lm	413 lm	225 lm	123 lm	75.8 lm	28.2 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
3.98 lm	3.86 lm	3.62 lm	3.28 lm	2.22 lm	1.40 lm	1.03 lm	0.634 lm	0.213 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	144 lm	5.5%
10-20°	403 lm	15.3%
20-30°	583 lm	22.2%
30-40°	616 lm	23.4%
40-50°	413 lm	15.7%
50-60°	225 lm	8.5%
60-70°	123 lm	4.7%
70-80°	76 lm	2.9%
80-90°	28 lm	1.1%
90-100°	4 lm	0.2%
100-110°	4 lm	0.1%
110-120°	4 lm	0.1%
120-130°	3 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	2632 lm	100.0%

Intensity peaks

Max intensity	1536 cd
Intensity, 90°	4 cd
Intensity, 0°	1536 cd

Zonal Lumen summary

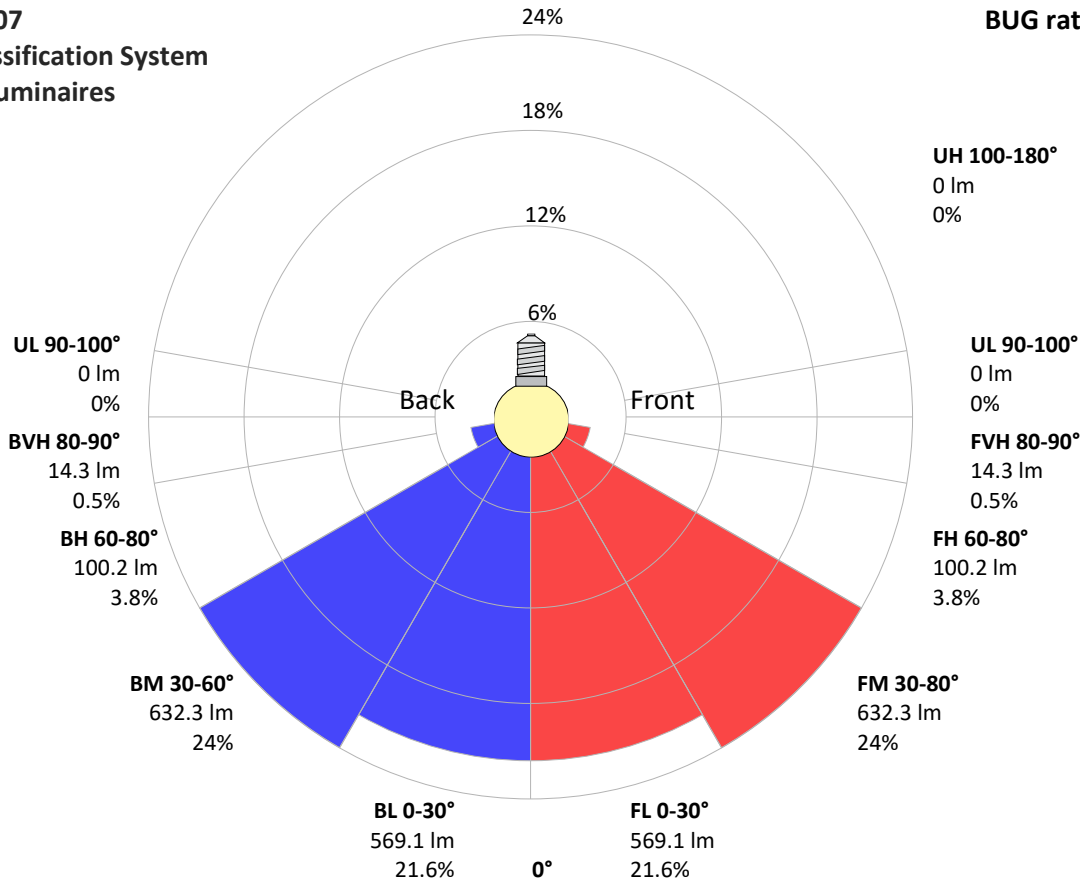
Zone (γ)	Lumen	% Total
0-30°	1131 lm	43.0%
0-40°	1747 lm	66.4%
0-60°	2385 lm	90.6%
60-90°	227 lm	8.6%
70-100°	108 lm	4.1%
90-120°	11 lm	0.4%
0-90°	2612 lm	99.2%
90-180°	20 lm	0.8%
0-180°	2632 lm	100.0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	569 lm	21.6%
Medium(30-60°)	632 lm	24.0%
High(60-80°)	100 lm	3.8%
Very high(80-90°)	14 lm	0.5%
Back light		
Low(0-30°)	569 lm	21.6%
Medium(30-60°)	632 lm	24.0%
High(60-80°)	100 lm	3.8%
Very high(80-90°)	14 lm	0.5%
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 G1



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Power Details

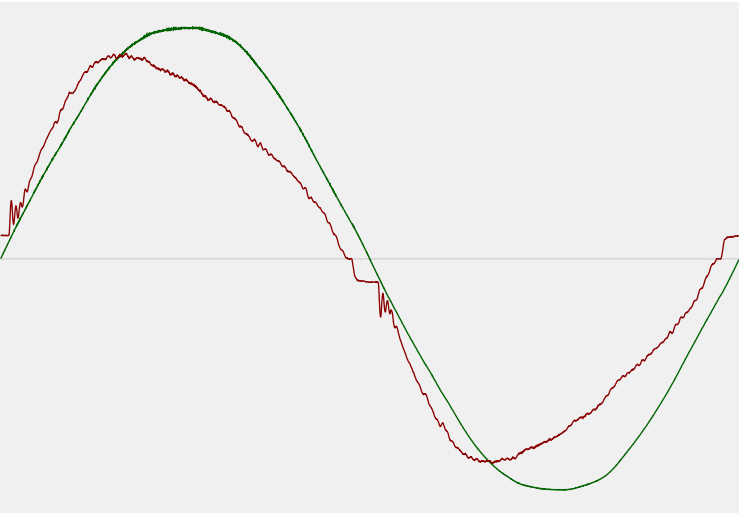
Input Power

Power feed to light source	41.5 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	240 V
RMS Input current feed, I_{RMS}	0.179 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.92 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.84%
Total harmonic distortion of the voltage	1.28%

Efficiency

Radiated power efficiency	23.4%
<div><div></div></div>	
Lumen efficiency	63 lm/W
<div><div></div></div>	

Input Power Curve



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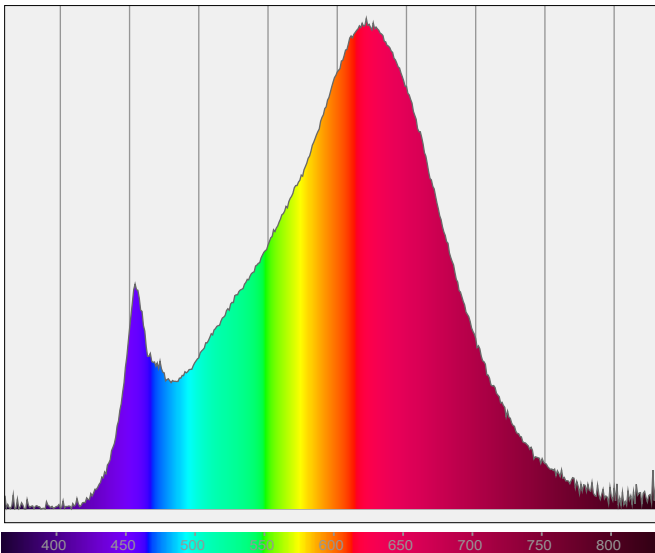
Color Measurements

Correlated Color Temperature CCT = 2700 K

Color Rendering TM30-18 R_f 91.8 — R_g 99.9

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 = 64.4	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.8 — R _g 99.9	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 90.2		

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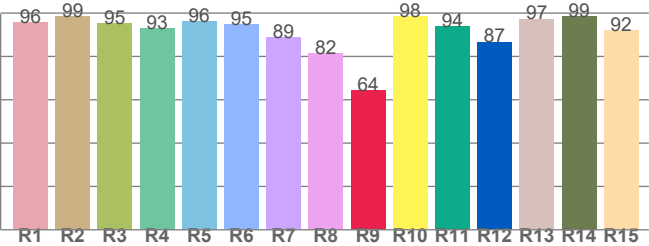
CIE 1931



CIE 1931 – zoomed on Planckian locus



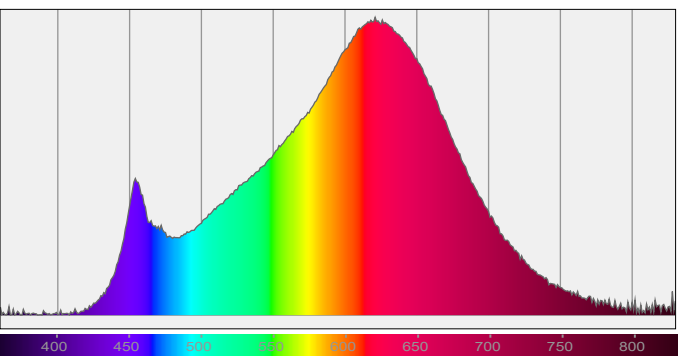
Color Rendering Index per reference color (CIE 1995)



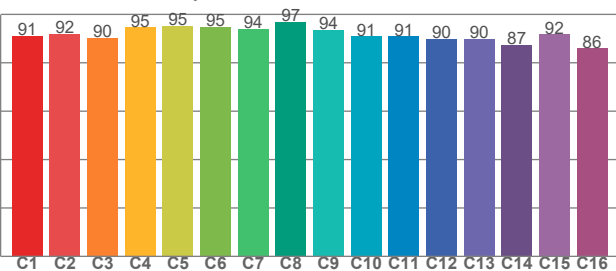
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
95.5	98.5	95.4	92.9	96.1	94.7	88.9	81.5	64.4	98.3	94.0	86.7	97.4	98.6	92.1

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



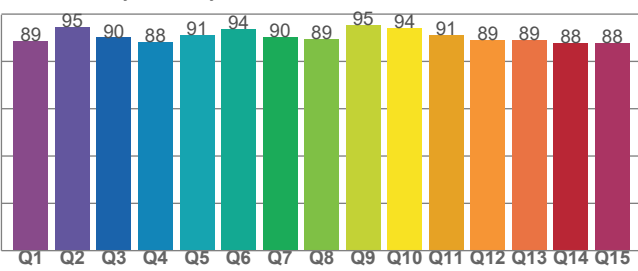
TM30-18 Rf-values per hue bin



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
90.9	92.0	90.2	94.6	95.3	94.9	94.0	96.9	93.6	90.9	90.8	89.8	89.8	87.3	91.7	85.9

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	94.6	90.0	88.2	91.2	93.5	90.2	89.4	95.2	93.9	91.1	89.2	88.8	87.7	87.8