

# Goniophotometry Report

1\_PHOT\_REFLEKTER-XL-4050lmChip-2700K-21Deg\_2303  
www.factorylux.com



Tested Light Source - 1\_PHOT\_REFLEKTER-XL-4050lmChip-2700K-21Deg\_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  
 $\gamma$  (gamma)-Resolution  
Test Distance  
Input Power, Power and Displ. Factors  
Input RMS Voltage and Current  
Frequency of Input Power

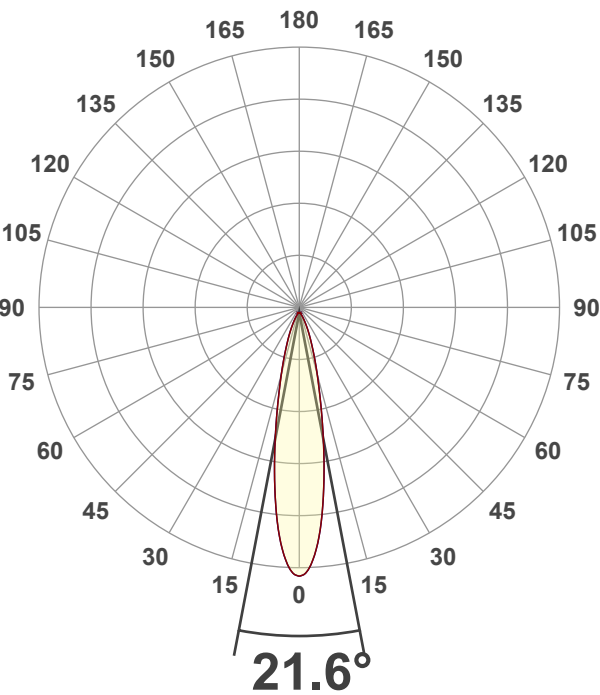
32 planes – 11.25°  
1°  
4.50 m  
41.5 W – PF 0.97 – DPF 0.97  
239 V – 0.180 A  
50 Hz

## Main Light Measurement Results

Output  
Efficiency  
Peak Intensity and Beam Angle  
Color Rendering Index

3416 lm  
82 lm/W  
14448 cd – 21.6°  
CRI 92.7

## Light Intensity Distribution



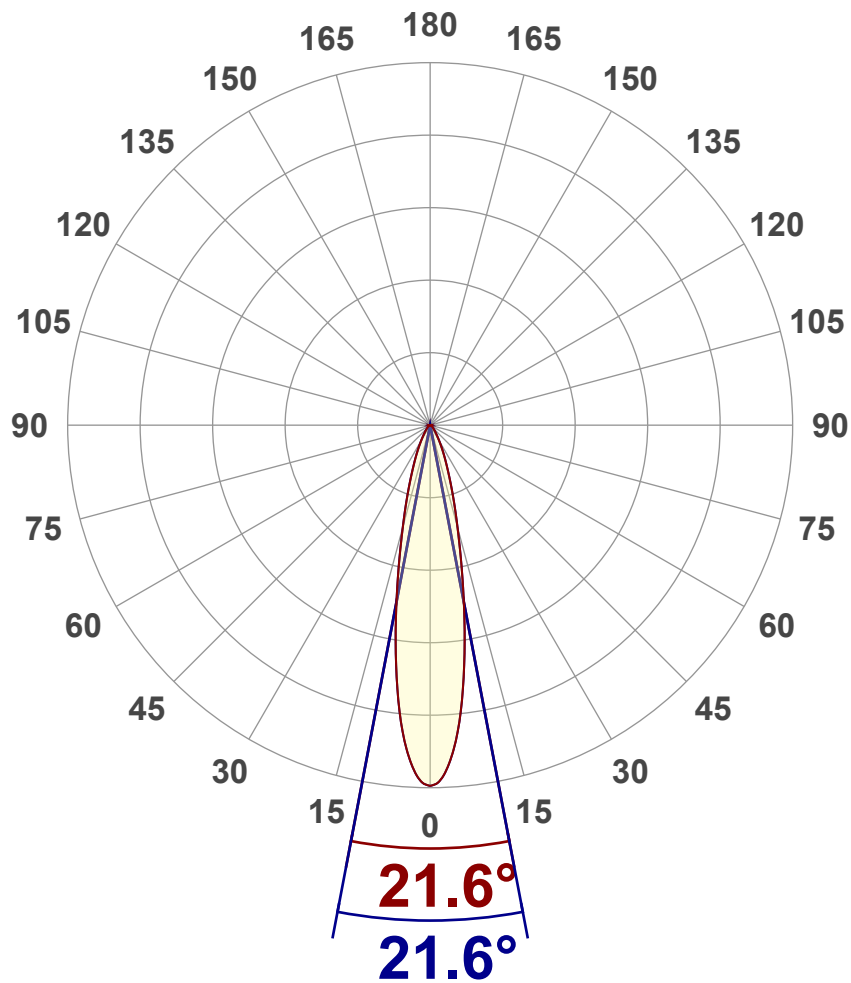
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## Luminous Intensity diagram

Unit: 0-100% of peak intensity



## Main Values

Output (total Lumen)	3416 lm
Peak Intensity	14448 cd
Beam Angle (50%)	21.6°
Beam Angle (90%)	21.6°
Beam Angle (10%)	21.6°

## Cut-off Angle

Average 2,5%	73.2°
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## Field Angle

Average 10%	48.1°
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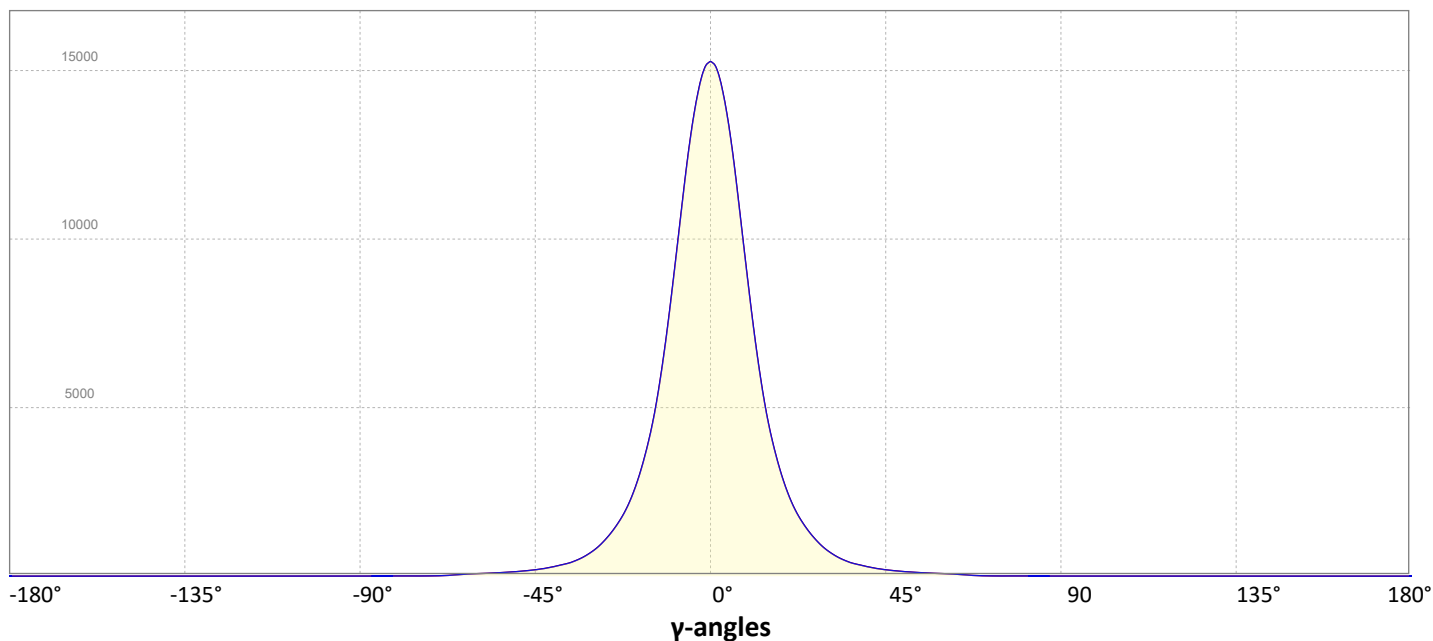
## Intensity Ratio

In 120° cone	98.1%
In 90° cone	93.9%

C000-C180

C090-C270

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

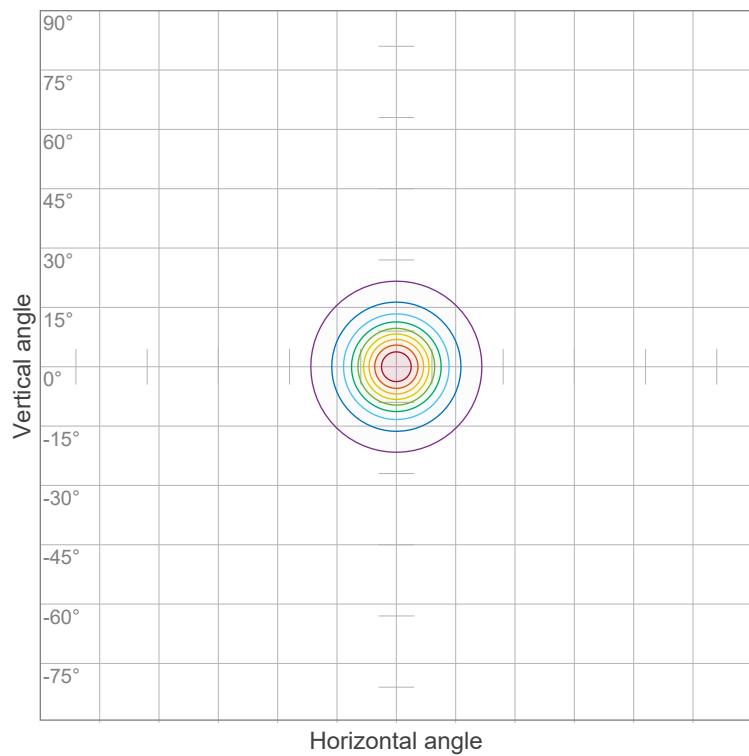


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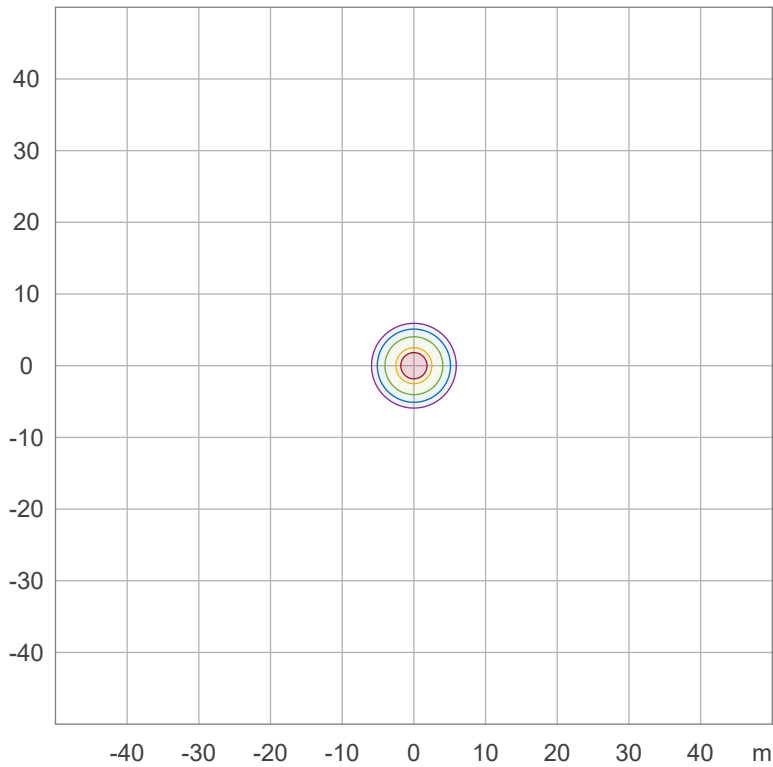
## Iso-intensity Diagram (Iso-candela)



90 %	13002.9 cd
80 %	11558.1 cd
70 %	10113.4 cd
60 %	8668.6 cd
50 %	7223.8 cd
40 %	5779.1 cd
30 %	4334.3 cd
20 %	2889.5 cd
10 %	1444.8 cd

Peak intensity: 14447.6 cd  
Number of c-planes: 32

## Iso-illuminance Diagram (Iso-lux)



50.0 %	72.2 lx
30.0 %	43.3 lx
10.0 %	14.4 lx
5.0 %	7.2 lx
3.0 %	4.3 lx

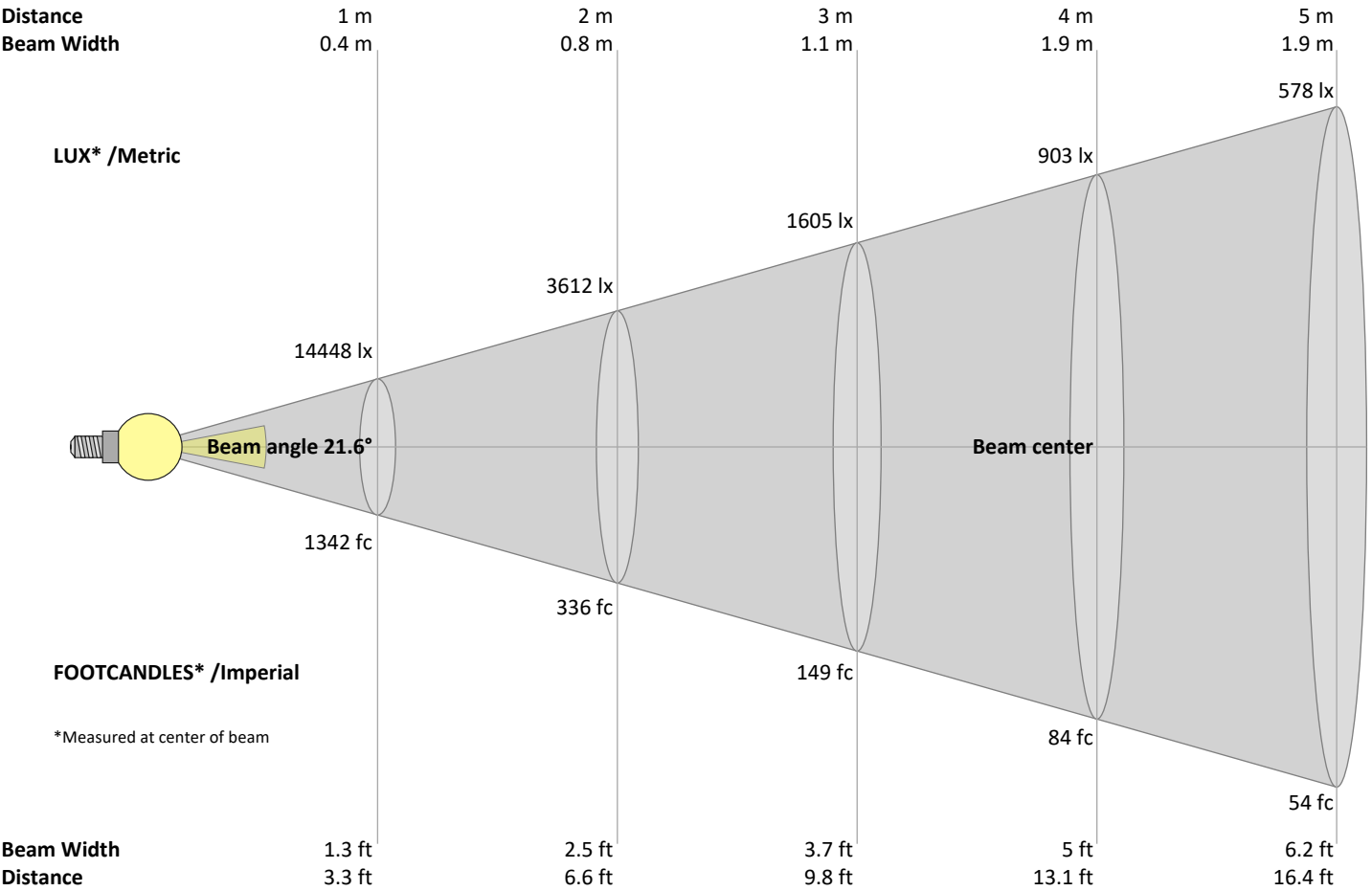
Peak illuminance: 144.5 lx  
Mounting height: 10.0 m  
Number of c-planes: 32

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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
14448	3612	1605	903	578	401	295	226	178	144	119	100	85	74	64	56	50	45	40	36	lux
1342.2	335.6	149.1	83.9	53.7	37.3	27.4	21	16.6	13.4	11.1	9.3	7.9	6.8	6	5.2	4.6	4.1	3.7	3.4	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
14.4K	14.1K	13.1K	11.6K	9.8K	7.9K	6.2K	4.8K	3.8K	2.9K	2.3K	1.8K	1.4K	1.2K	0.9K	0.7K	0.6K	0.5K	0.4K	0.3K	cd
100%	98%	91%	80%	68%	55%	43%	33%	26%	20%	16%	13%	10%	8%	6%	5%	4%	3%	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
14.4K	14.1K	13.1K	11.6K	9.8K	7.9K	6.2K	4.8K	3.8K	2.9K	2.3K	1.8K	1.4K	1.2K	0.9K	0.7K	0.6K	0.5K	0.4K	0.3K	cd
100%	98%	91%	80%	68%	55%	43%	33%	26%	20%	16%	13%	10%	8%	6%	5%	4%	3%	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
14.4K	14.1K	13.1K	11.6K	9.8K	7.9K	6.2K	4.8K	3.8K	2.9K	2.3K	1.8K	1.4K	1.2K	0.9K	0.7K	0.6K	0.5K	0.4K	0.3K	cd
100%	98%	91%	80%	68%	55%	43%	33%	26%	20%	16%	13%	10%	8%	6%	5%	4%	3%	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
14.4K	14.1K	13.1K	11.6K	9.8K	7.9K	6.2K	4.8K	3.8K	2.9K	2.3K	1.8K	1.4K	1.2K	0.9K	0.7K	0.6K	0.5K	0.4K	0.3K	cd
100%	98%	91%	80%	68%	55%	43%	33%	26%	20%	16%	13%	10%	8%	6%	5%	4%	3%	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		Viewed Crosswise					Viewed Endwise				
X	Y	(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
2H	2H	20.2	20.7	20.2	20.9	21.1	20.2	20.7	20.2	20.9	21.1
	3H	20.0	20.7	20.4	20.9	21.1	20.0	20.7	20.4	20.9	21.1
	4H	20.0	20.6	20.4	20.8	21.1	20.0	20.6	20.4	20.8	21.1
	6H	20.0	20.5	20.3	20.8	21.2	20.0	20.5	20.3	20.8	21.2
	8H	20.0	20.5	20.3	20.8	21.2	20.0	20.5	20.3	20.8	21.2
	12H	19.9	20.4	20.3	20.8	21.2	19.9	20.4	20.3	20.8	21.2
4H	2H	20.1	20.7	20.5	20.9	21.2	20.1	20.7	20.5	20.9	21.2
	3H	20.2	20.7	20.5	21.0	21.4	20.2	20.7	20.5	21.0	21.4
	4H	20.1	20.5	20.5	20.9	21.5	20.1	20.5	20.5	20.9	21.5
	6H	20.0	20.5	20.5	20.8	21.2	20.0	20.5	20.5	20.8	21.2
	8H	20.0	20.5	20.5	20.8	21.2	20.0	20.5	20.5	20.8	21.2
	12H	20.0	20.3	20.5	20.7	21.2	20.0	20.3	20.5	20.7	21.2
8H	4H	19.9	20.4	20.5	20.7	21.1	19.9	20.4	20.5	20.7	21.1
	6H	19.9	20.2	20.4	20.7	21.2	19.9	20.2	20.4	20.7	21.2
	8H	20.0	20.2	20.5	20.7	21.3	20.0	20.2	20.5	20.7	21.3
	12H	20.0	20.2	20.6	20.7	21.3	20.0	20.2	20.6	20.7	21.3
12H	4H	19.9	20.2	20.4	20.6	21.1	19.9	20.2	20.4	20.6	21.1
	6H	19.9	20.2	20.4	20.7	21.3	19.9	20.2	20.4	20.7	21.3
	8H	19.9	20.1	20.5	20.6	21.2	19.9	20.1	20.5	20.6	21.2

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

S = 1.0H	2.2 / -1.8	2.2 / -1.8
S = 1.5H	4.0 / -2.7	4.0 / -2.7
S = 2.0H	5.6 / -6.4	5.6 / -6.4

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	105	104	102	102	100	99	98	97	96	95
2	110	105	102	99	107	104	100	98	100	98	96	97	95	93	95	93	92	90
3	105	100	95	92	103	98	94	91	96	93	90	93	91	88	91	89	87	86
4	101	95	90	87	99	94	89	86	92	88	85	90	87	84	88	85	83	82
5	97	90	86	82	96	90	85	82	88	84	81	86	83	80	85	82	79	78
6	94	87	82	78	93	86	81	78	84	80	77	83	79	77	82	79	76	75
7	91	83	78	75	89	82	78	75	81	77	74	80	76	74	79	76	73	72
8	88	80	75	72	87	79	75	72	78	74	71	77	74	71	76	73	71	70
9	85	77	72	69	84	77	72	69	76	72	69	75	71	69	74	71	68	67
10	82	74	70	67	81	74	70	67	73	69	66	73	69	66	72	69	66	65

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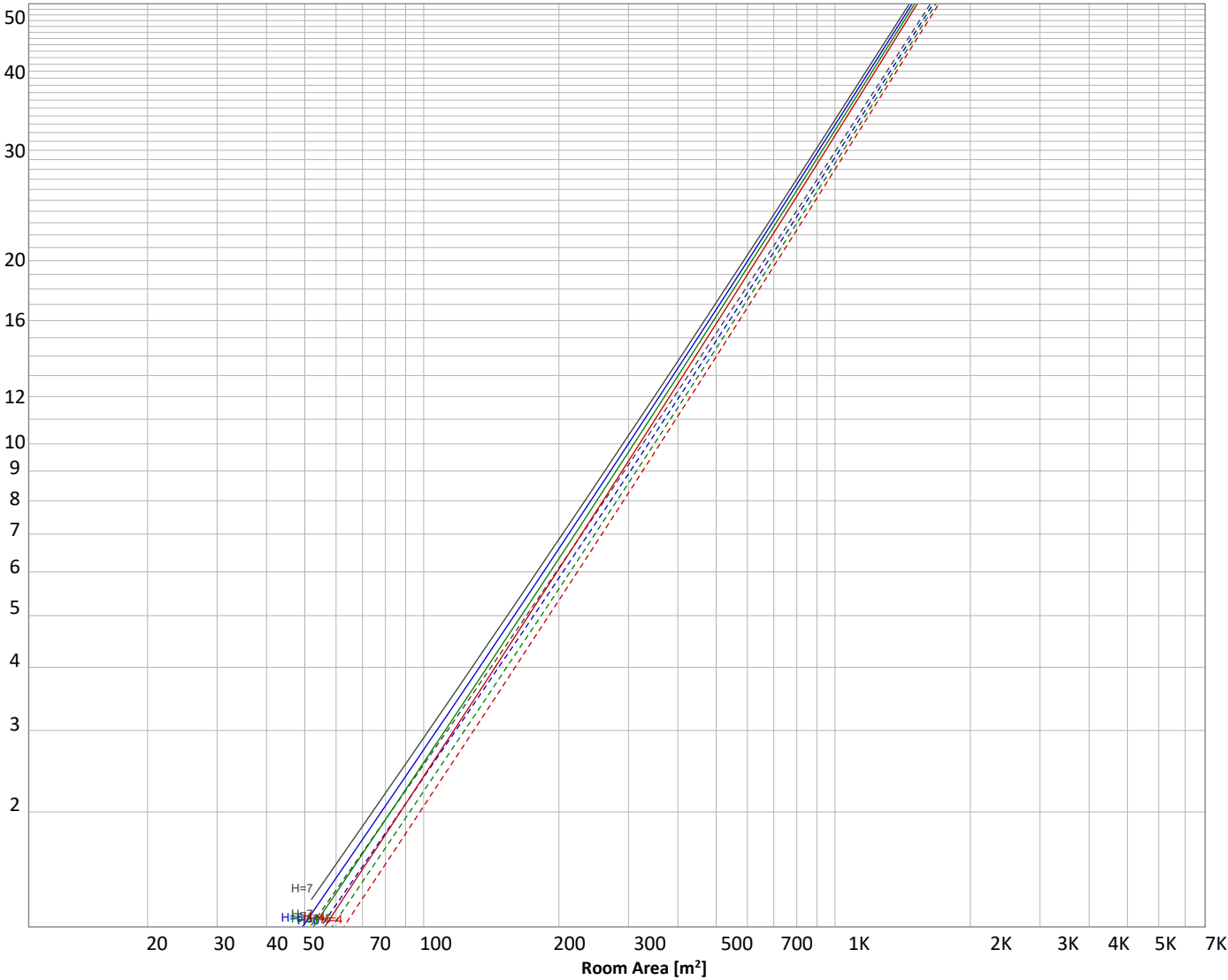
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## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 3416 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
				20

## Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
1034 lm	1203 lm	608 lm	277 lm	144 lm	83.8 lm	38.8 lm	6.40 lm	5.43 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
3.27 lm	3.17 lm	2.97 lm	2.69 lm	1.50 lm	0.641 lm	0.472 lm	0.289 lm	0.097 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	1034 lm	30.3%
10-20°	1203 lm	35.2%
20-30°	608 lm	17.8%
30-40°	277 lm	8.1%
40-50°	144 lm	4.2%
50-60°	84 lm	2.5%
60-70°	39 lm	1.1%
70-80°	6 lm	0.2%
80-90°	5 lm	0.2%
90-100°	3 lm	0.1%
100-110°	3 lm	0.1%
110-120°	3 lm	0.1%
120-130°	3 lm	0.1%
130-140°	1 lm	0.0%
140-150°	1 lm	0.0%
150-160°	0 lm	0.0%
160-170°	0 lm	0.0%
170-180°	0 lm	0.0%
Total	3416 lm	100.0%

Intensity peaks

Max intensity	14448 cd
Intensity, 90°	3 cd
Intensity, 0°	14448 cd

Zonal Lumen summary

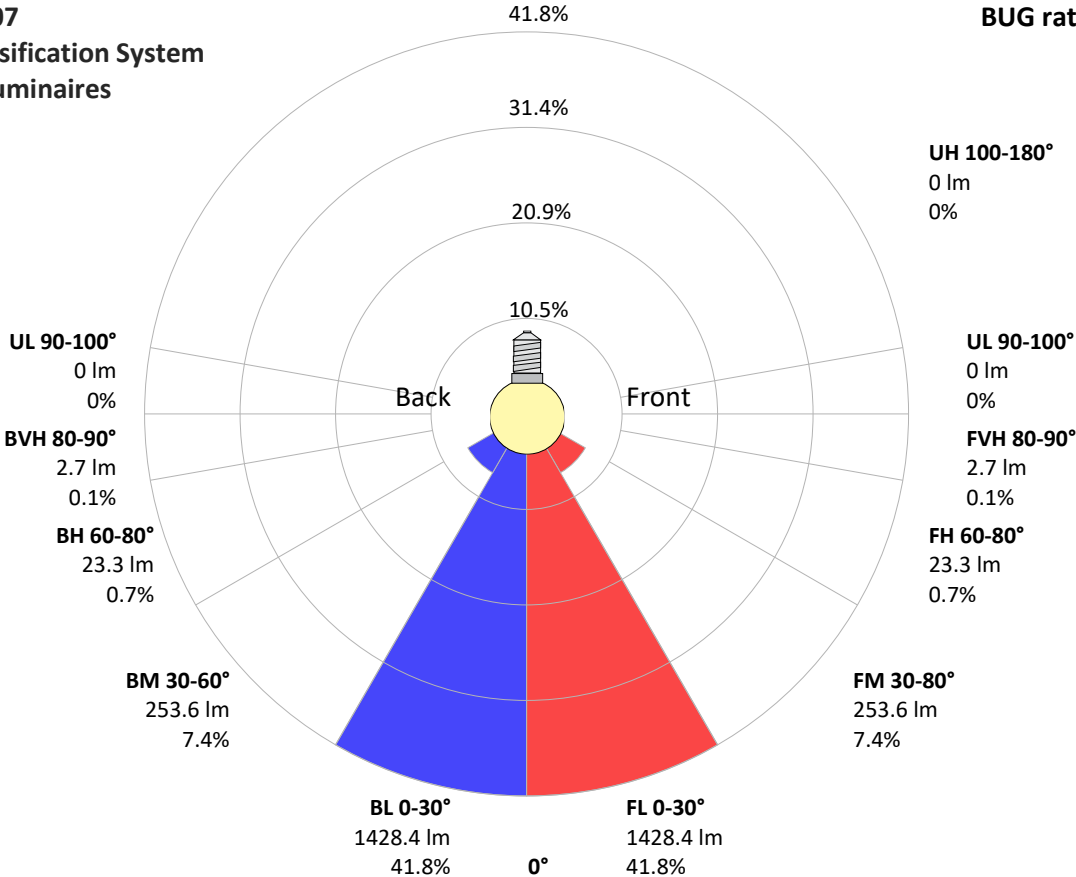
Zone (γ)	Lumen	% Total
0-30°	2845 lm	83.3%
0-40°	3122 lm	91.4%
0-60°	3350 lm	98.1%
60-90°	51 lm	1.5%
70-100°	15 lm	0.4%
90-120°	9 lm	0.3%
0-90°	3401 lm	99.6%
90-180°	15 lm	0.4%
0-180°	3416 lm	100.0%

BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	1428 lm	41.8%
Medium(30-60°)	254 lm	7.4%
High(60-80°)	23 lm	0.7%
Very high(80-90°)	3 lm	0.1%
<b>Back light</b>		
Low(0-30°)	1428 lm	41.8%
Medium(30-60°)	254 lm	7.4%
High(60-80°)	23 lm	0.7%
Very high(80-90°)	3 lm	0.1%
<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 B3 U1 G0



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## Power Details

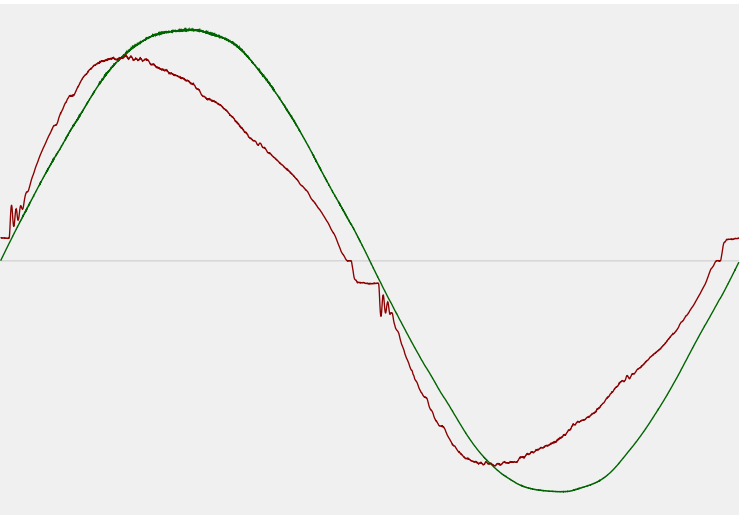
### Input Power

Power feed to light source	41.5 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	239 V
RMS Input current feed, $I_{RMS}$	0.180 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.84 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.69%
Total harmonic distortion of the voltage	1.14%

### Efficiency

Radiated power efficiency	29.9%
<div><div></div></div>	
Lumen efficiency	82 lm/W
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### Input Power Curve





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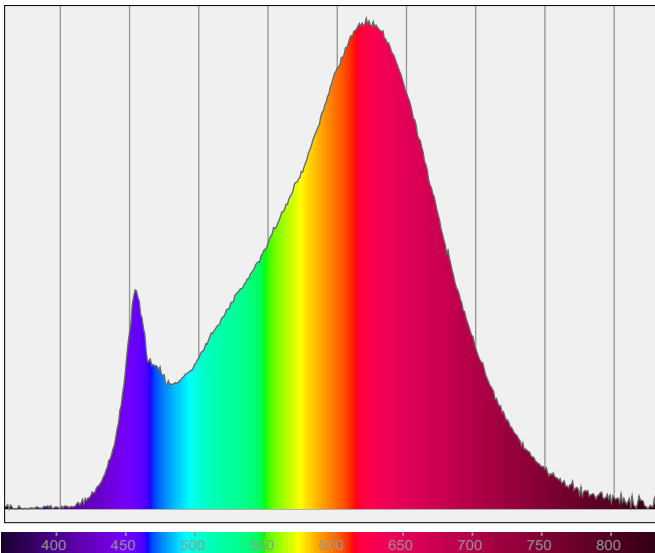
## Color Measurements

Correlated Color Temperature      CCT = 2700 K

Color Rendering TM30-18      R<sub>f</sub> 91.6 — R<sub>g</sub> 99.6

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 = 61.8	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R <sub>f</sub> 91.6 — R <sub>g</sub> 99.6	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 89.9		

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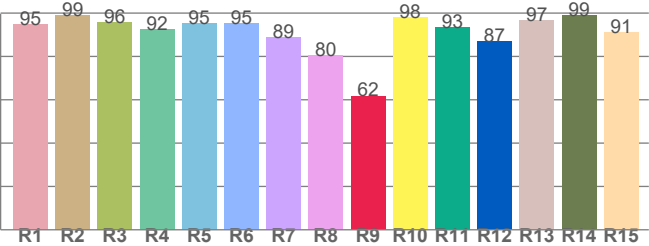
CIE 1931



CIE 1931 – zoomed on Planckian locus



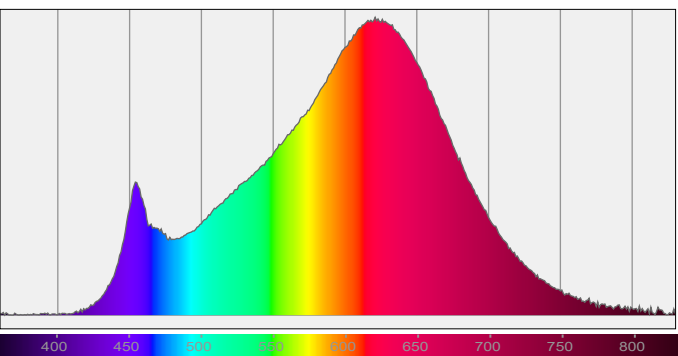
Color Rendering Index per reference color (CIE 1995)



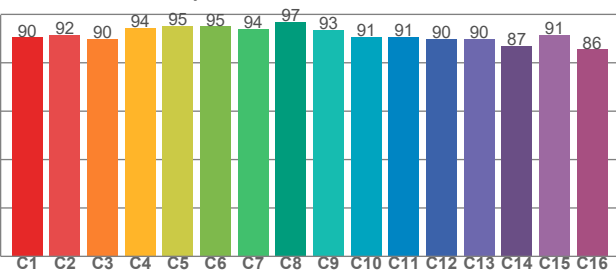
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
94.8	98.9	95.7	92.3	95.2	95.4	88.8	80.5	61.8	98.1	93.4	87.0	96.6	98.8	91.0

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



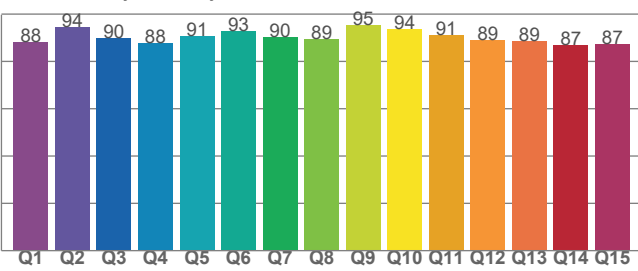
TM30-18 Rf-values per hue bin



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
90.4	91.5	89.8	94.5	95.3	94.9	93.9	96.7	93.4	90.6	90.5	89.7	89.7	87.0	91.4	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
88.0	94.5	89.8	87.9	90.8	92.9	90.2	89.4	95.2	93.7	91.0	89.1	88.7	87.1	87.1