

# Goniophotometry Report

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



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

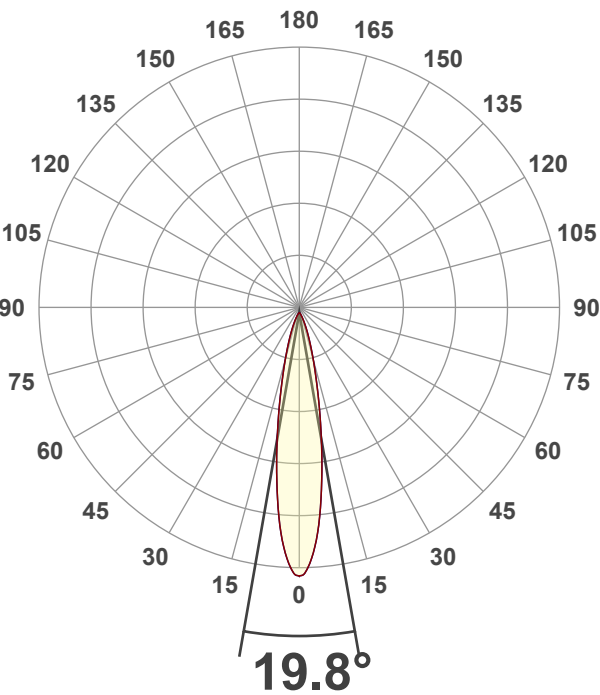
32 planes – 11.25°  
1°  
4.50 m  
41.3 W – PF 0.97 – DPF 0.97  
243 V – 0.176 A  
49.9 Hz

## Main Light Measurement Results

Output  
Efficiency  
Peak Intensity and Beam Angle  
Color Rendering Index

2418 lm  
58 lm/W  
13264 cd – 19.8°  
CRI 92.7

## Light Intensity Distribution



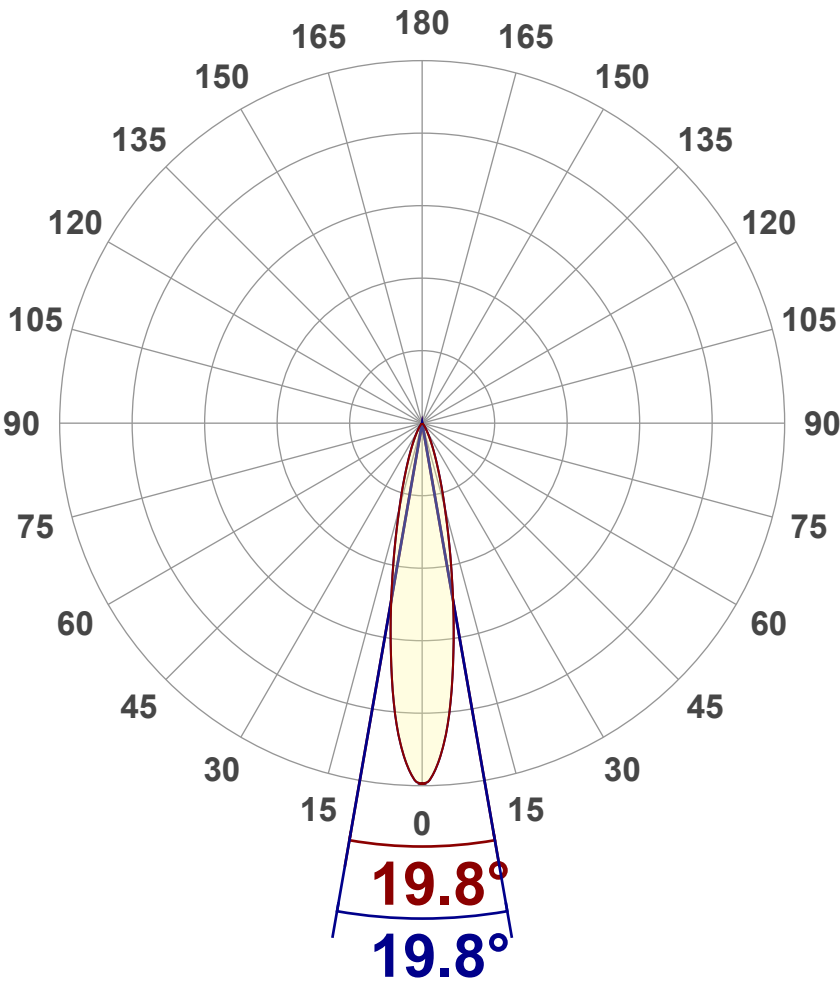
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2418 lm
Peak Intensity	13264 cd
Beam Angle (50%)	19.8°
Beam Angle (90%)	19.8°
Beam Angle (10%)	19.8°

Cut-off Angle

Average 2,5%	61.9°
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Field Angle

Average 10%	42.4°
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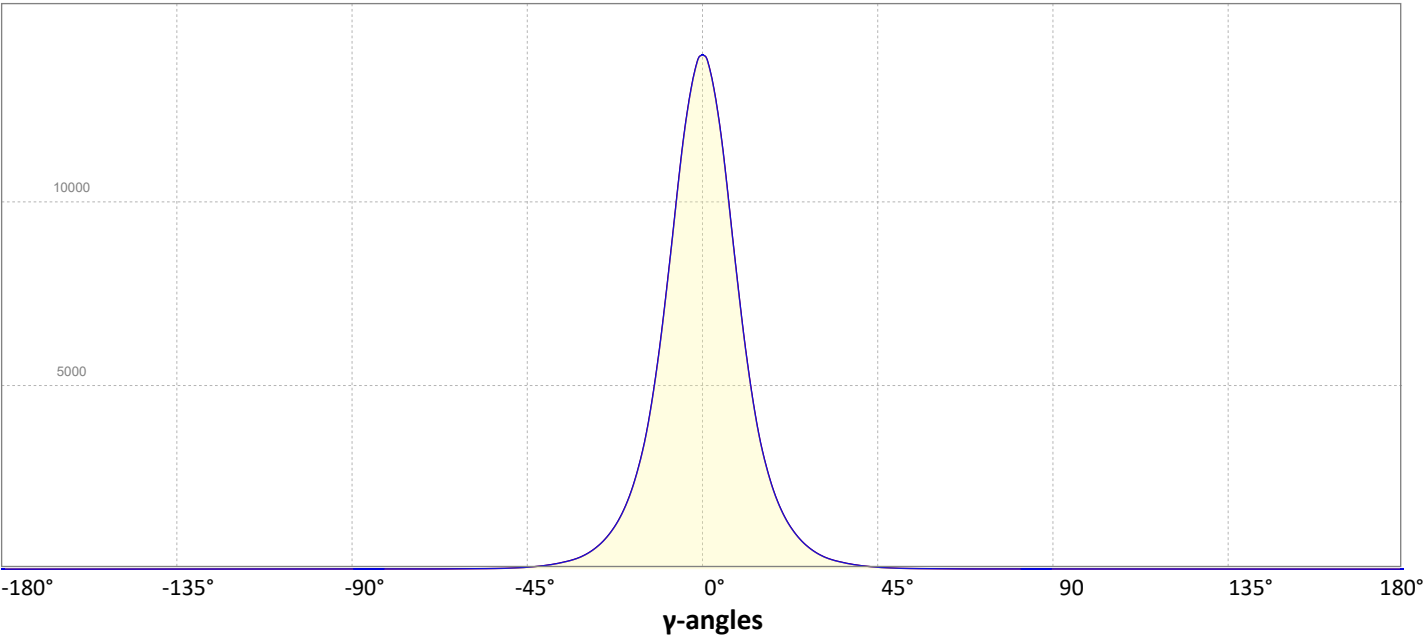
Intensity Ratio

In 120° cone	98.4%
In 90° cone	97.2%

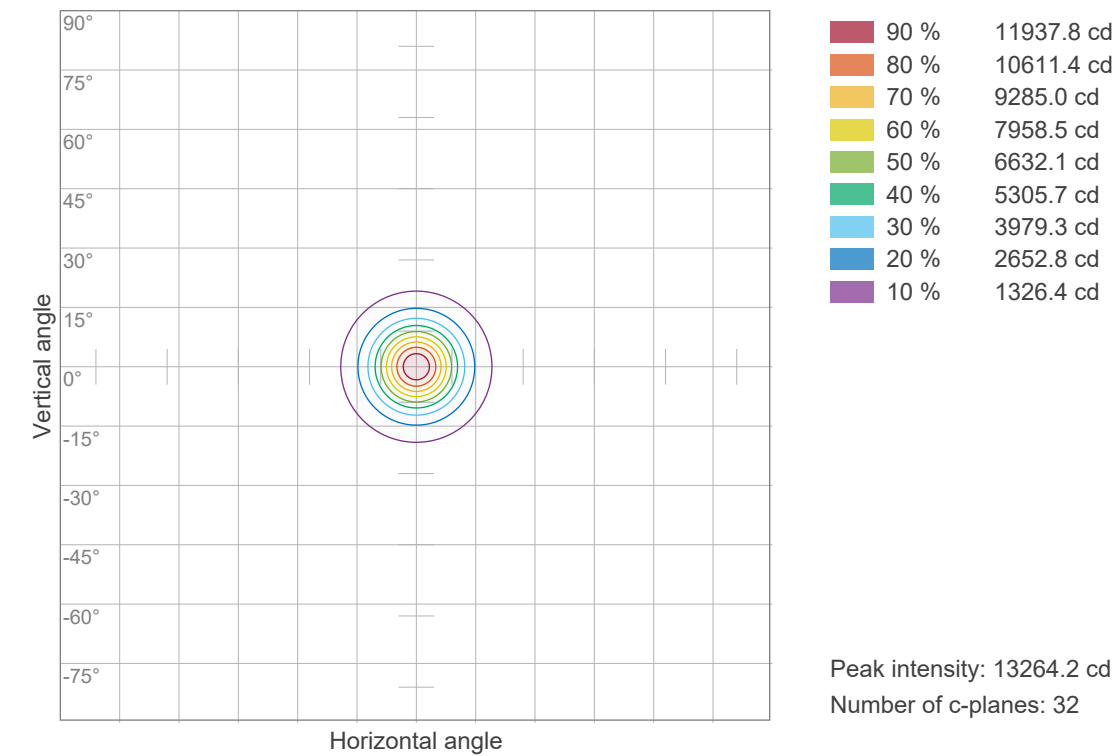
C000-C180

C090-C270

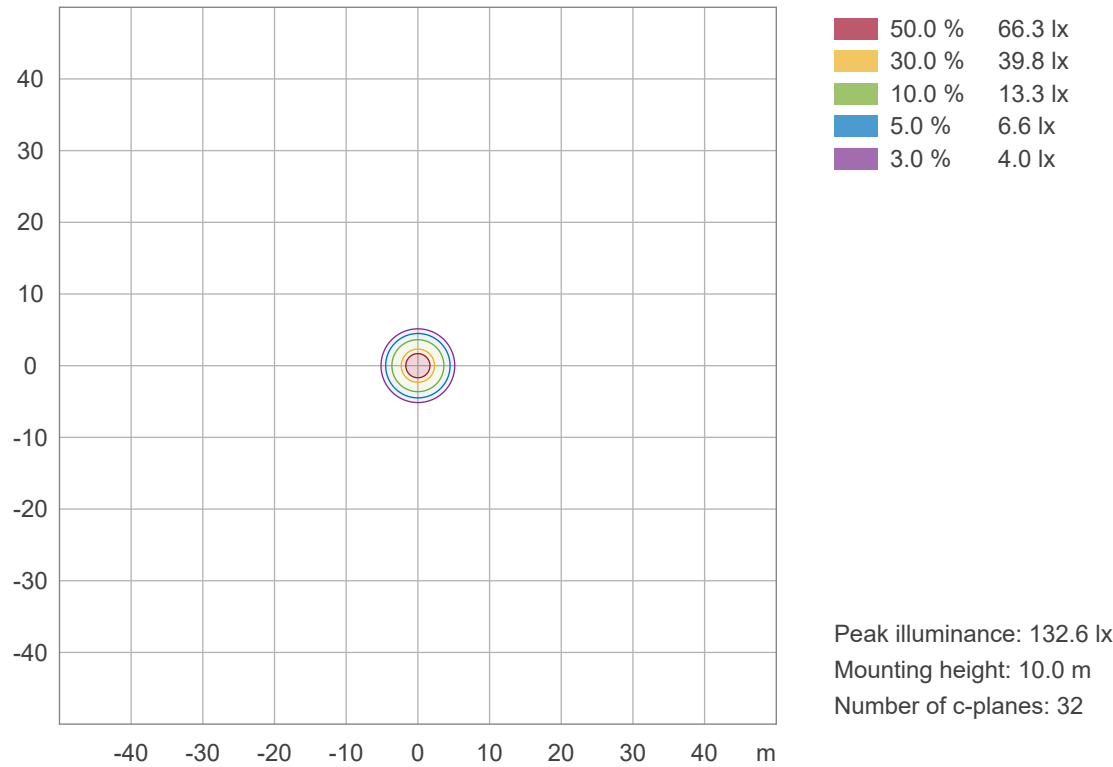
Linear distribution diagram - Intensity (candela) vs γ-angle



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)

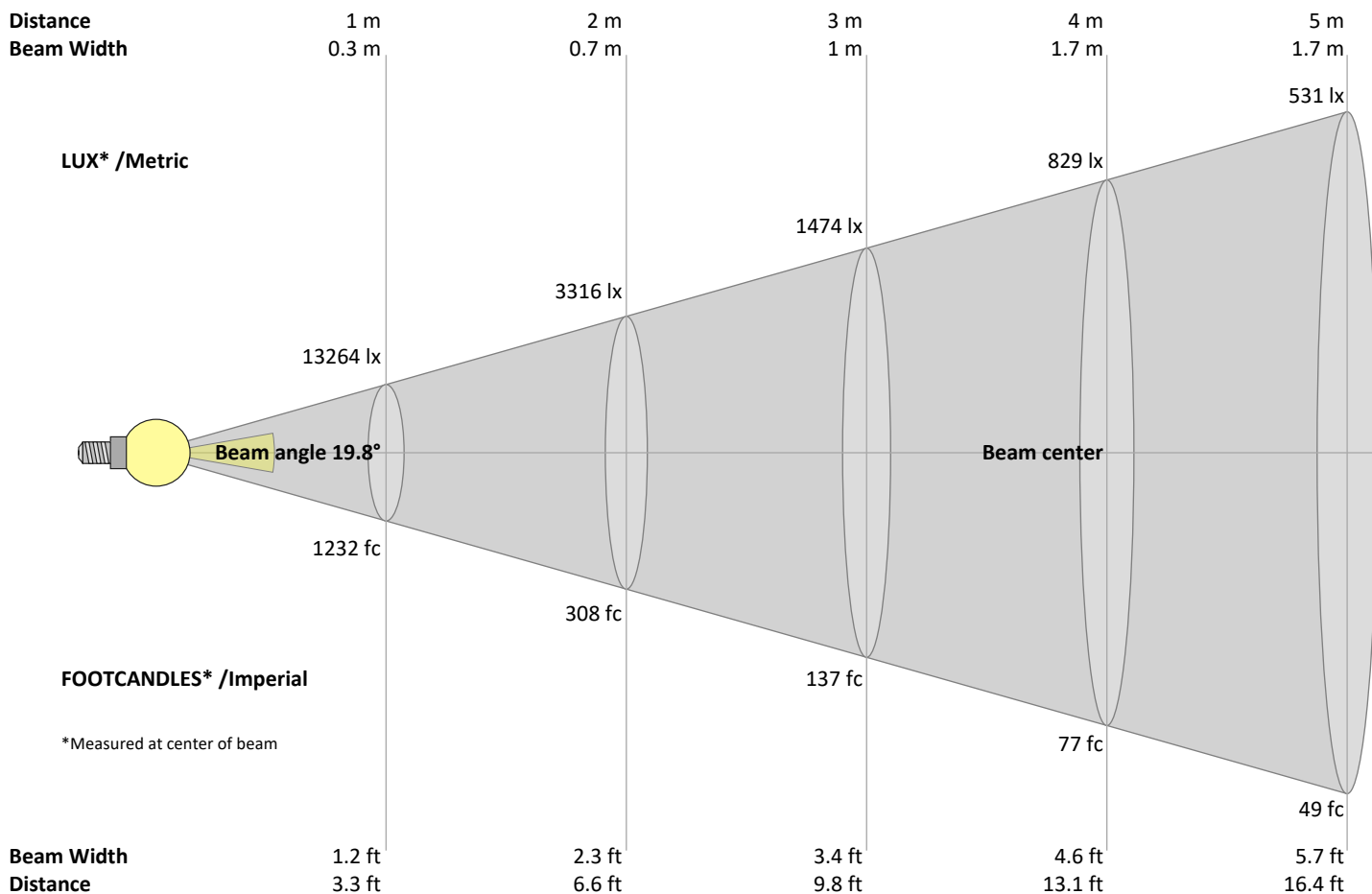


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## Beam Details



## 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
13264	3316	1474	829	531	368	271	207	164	133	110	92	78	68	59	52	46	41	37	33	lux
1232.3	308.1	136.9	77	49.3	34.2	25.1	19.3	15.2	12.3	10.2	8.6	7.3	6.3	5.5	4.8	4.3	3.8	3.4	3.1	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
13.3K	12.8K	11.7K	10.2K	8.3K	6.5K	5.0K	3.7K	2.8K	2.1K	1.6K	1.2K	0.9K	0.7K	0.5K	0.4K	0.3K	0.2K	0.2K	0.1K	cd
100%	97%	88%	77%	63%	49%	38%	28%	21%	16%	12%	9%	7%	5%	4%	3%	2%	2%	1%	1%	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
13.3K	12.8K	11.7K	10.2K	8.3K	6.5K	5.0K	3.7K	2.8K	2.1K	1.6K	1.2K	0.9K	0.7K	0.5K	0.4K	0.3K	0.2K	0.2K	0.1K	cd
100%	97%	88%	77%	63%	49%	38%	28%	21%	16%	12%	9%	7%	5%	4%	3%	2%	2%	1%	1%	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
13.3K	12.8K	11.7K	10.2K	8.3K	6.5K	5.0K	3.7K	2.8K	2.1K	1.6K	1.2K	0.9K	0.7K	0.5K	0.4K	0.3K	0.2K	0.2K	0.1K	cd
100%	97%	88%	77%	63%	49%	38%	28%	21%	16%	12%	9%	7%	5%	4%	3%	2%	2%	1%	1%	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
13.3K	12.8K	11.7K	10.2K	8.3K	6.5K	5.0K	3.7K	2.8K	2.1K	1.6K	1.2K	0.9K	0.7K	0.5K	0.4K	0.3K	0.2K	0.2K	0.1K	cd
100%	97%	88%	77%	63%	49%	38%	28%	21%	16%	12%	9%	7%	5%	4%	3%	2%	2%	1%	1%	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	13.5	13.9	13.6	14.1	14.3	13.5	13.9	13.6	14.1	14.3
	3H	13.3	13.9	13.7	14.1	14.3	13.3	13.9	13.7	14.1	14.3
	4H	13.4	13.9	13.8	14.2	14.4	13.4	13.9	13.8	14.2	14.4
	6H	13.5	14.0	13.8	14.3	14.6	13.5	14.0	13.8	14.3	14.6
	8H	13.6	14.1	13.9	14.4	14.8	13.6	14.1	13.9	14.4	14.8
	12H	13.7	14.2	14.1	14.5	14.9	13.7	14.2	14.1	14.5	14.9
4H	2H	13.2	13.8	13.6	14.0	14.2	13.2	13.8	13.6	14.0	14.2
	3H	13.3	13.7	13.6	14.1	14.5	13.3	13.7	13.6	14.1	14.5
	4H	13.3	13.7	13.7	14.2	14.7	13.3	13.7	13.7	14.2	14.7
	6H	13.6	14.0	14.1	14.3	14.7	13.6	14.0	14.1	14.3	14.7
	8H	13.7	14.1	14.2	14.5	14.8	13.7	14.1	14.2	14.5	14.8
	12H	13.9	14.2	14.4	14.6	15.1	13.9	14.2	14.4	14.6	15.1
8H	4H	13.3	13.7	13.8	14.1	14.4	13.3	13.7	13.8	14.1	14.4
	6H	13.7	14.0	14.2	14.4	14.9	13.7	14.0	14.2	14.4	14.9
	8H	14.0	14.2	14.5	14.7	15.3	14.0	14.2	14.5	14.7	15.3
	12H	14.3	14.5	14.9	15.0	15.6	14.3	14.5	14.9	15.0	15.6
12H	4H	13.3	13.6	13.8	14.0	14.5	13.3	13.6	13.8	14.0	14.5
	6H	13.8	14.0	14.3	14.5	15.1	13.8	14.0	14.3	14.5	15.1
	8H	14.1	14.2	14.6	14.7	15.3	14.1	14.2	14.6	14.7	15.3
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		3.1 / -2.1					3.1 / -2.1				
S = 1.5H		5.3 / -2.3					5.3 / -2.3				
S = 2.0H		7.1 / -2.7					7.1 / -2.7				

## 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	115	112	110	109	112	110	108	107	106	105	103	102	101	100	99	98	97	95
2	111	107	104	101	108	105	102	100	102	100	98	99	97	95	96	95	93	92
3	107	102	98	95	105	101	97	94	98	95	93	96	93	91	93	92	90	89
4	103	98	94	91	102	97	93	90	95	91	89	93	90	88	91	89	87	86
5	100	94	90	87	99	93	89	86	91	88	85	90	87	85	88	86	84	83
6	97	91	86	83	96	90	86	83	89	85	82	87	84	82	86	83	81	80
7	94	88	83	80	93	87	83	80	86	82	80	85	82	79	84	81	79	78
8	92	85	81	78	91	84	80	78	83	80	77	83	79	77	82	79	77	76
9	89	82	78	75	88	82	78	75	81	78	75	80	77	75	80	77	75	74
10	87	80	76	73	86	80	76	73	79	75	73	78	75	73	78	75	73	72

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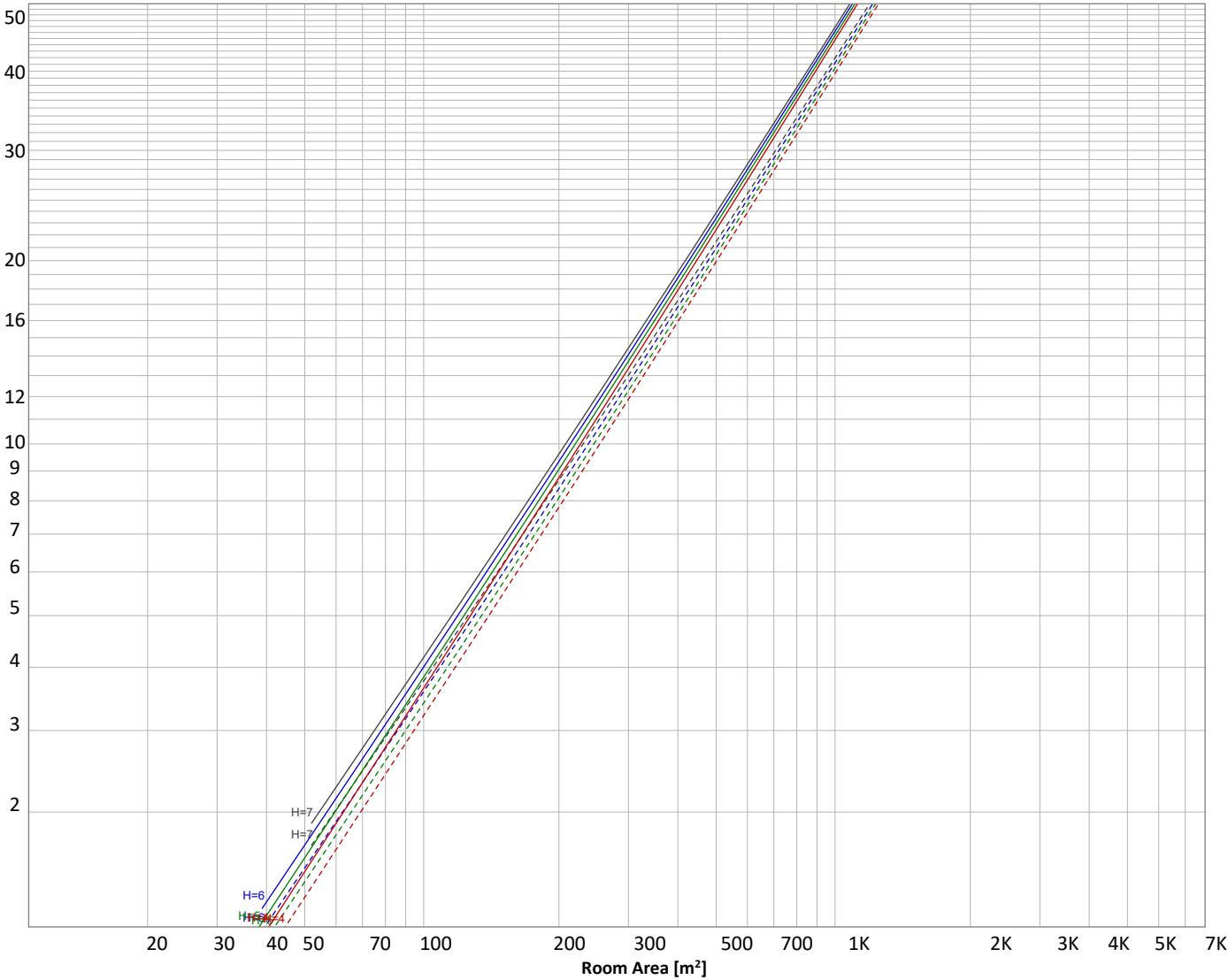
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## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 2418 lm	$\rho(\%)$		
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°
899 lm	921 lm	373 lm	129 lm	41.7 lm	14.3 lm	7.45 lm	5.41 lm	5.38 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
5.29 lm	5.13 lm	4.81 lm	4.35 lm	1.68 lm	0.009 lm	0.007 lm	0.004 lm	0.001 lm

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	899 lm	37.2%
10-20°	921 lm	38.1%
20-30°	373 lm	15.4%
30-40°	129 lm	5.3%
40-50°	42 lm	1.7%
50-60°	14 lm	0.6%
60-70°	7 lm	0.3%
70-80°	5 lm	0.2%
80-90°	5 lm	0.2%
90-100°	5 lm	0.2%
100-110°	5 lm	0.2%
110-120°	5 lm	0.2%
120-130°	4 lm	0.2%
130-140°	2 lm	0.1%
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	2418 lm	100.0%

Intensity peaks

Max intensity	13264 cd
Intensity, 90°	5 cd
Intensity, 0°	13264 cd

Zonal Lumen summary

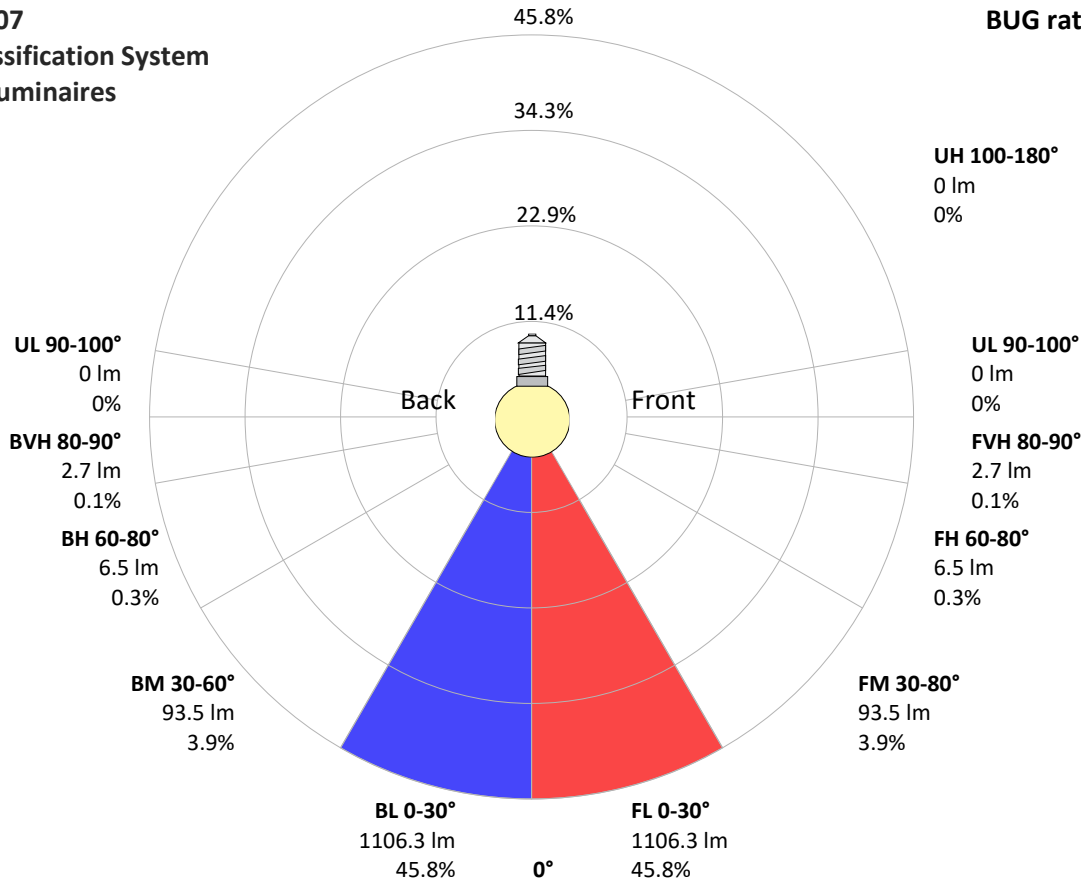
Zone (γ)	Lumen	% Total
0-30°	2193 lm	90.7%
0-40°	2322 lm	96.0%
0-60°	2378 lm	98.4%
60-90°	18 lm	0.8%
70-100°	16 lm	0.7%
90-120°	15 lm	0.6%
0-90°	2397 lm	99.1%
90-180°	21 lm	0.9%
0-180°	2418 lm	100.0%

BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	1106 lm	45.8%
Medium(30-60°)	93 lm	3.9%
High(60-80°)	7 lm	0.3%
Very high(80-90°)	3 lm	0.1%
<b>Back light</b>		
Low(0-30°)	1106 lm	45.8%
Medium(30-60°)	93 lm	3.9%
High(60-80°)	7 lm	0.3%
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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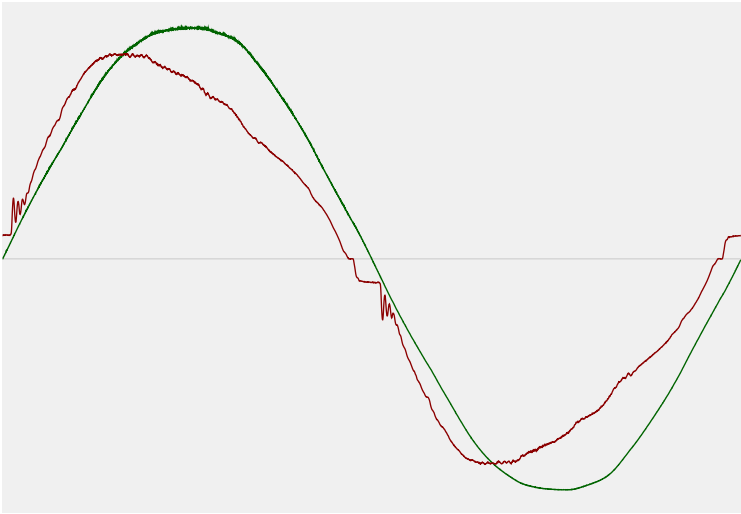


## Power Details

### Input Power

Power feed to light source	41.3 W
Frequency of input power	49.9 Hz
RMS Input voltage feed, $V_{RMS}$	243 V
RMS Input current feed, $I_{RMS}$	0.176 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.78 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.8%
Total harmonic distortion of the voltage	1.31%

### Input Power Curve



### Efficiency

Radiated power efficiency	21.3%
Lumen efficiency	58 lm/W



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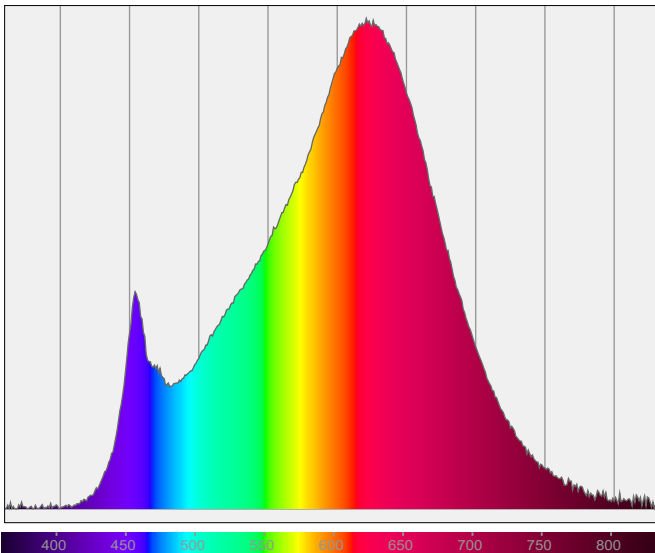
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## Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R <sub>f</sub> 91.6 — 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 = 61.9	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 = 90.0		

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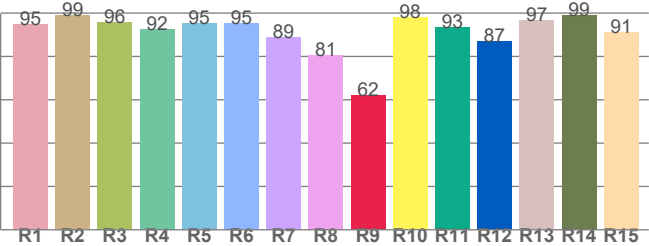
CIE 1931



CIE 1931 – zoomed on Planckian locus



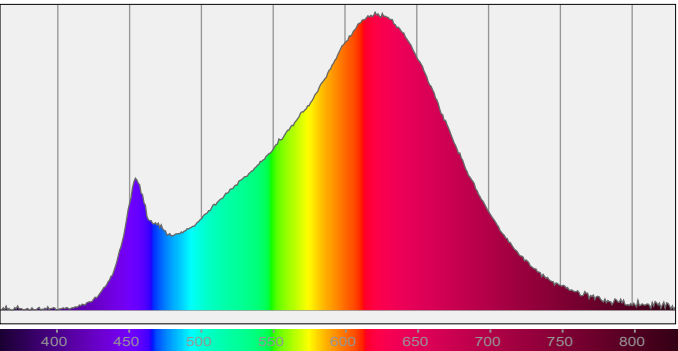
Color Rendering Index per reference color (CIE 1995)



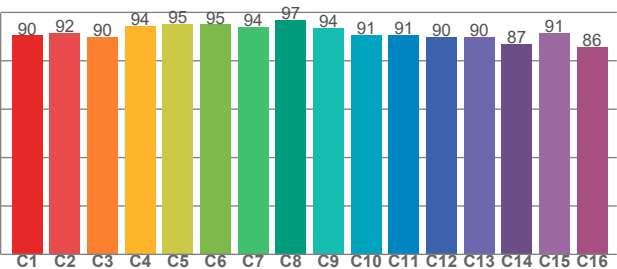
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
94.8	98.9	95.8	92.4	95.2	95.4	88.8	80.6	61.9	98.0	93.4	87.1	96.6	98.8	91.0

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



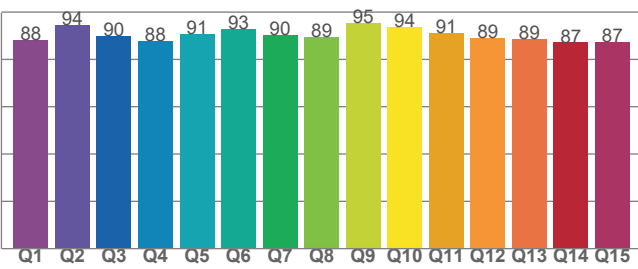
TM30-18 Rf-values per hue bin



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
90.5	91.6	89.8	94.5	95.3	94.9	93.9	96.8	93.5	90.6	90.6	89.7	89.7	87.0	91.4	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
88.1	94.5	89.8	87.9	90.8	92.9	90.1	89.4	95.2	93.7	91.0	89.1	88.8	87.1	87.2