

Tested Light Source - 1\_PHOT\_REFLEKTER-XL-4300lmChip-3000K-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

γ (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

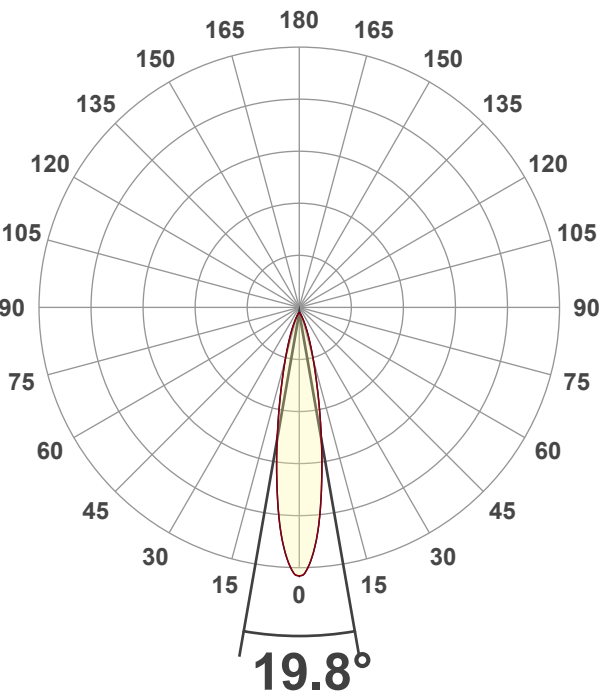
2563 lm

62 lm/W

14060 cd – 19.8°

CRI 92.7

Light Intensity Distribution



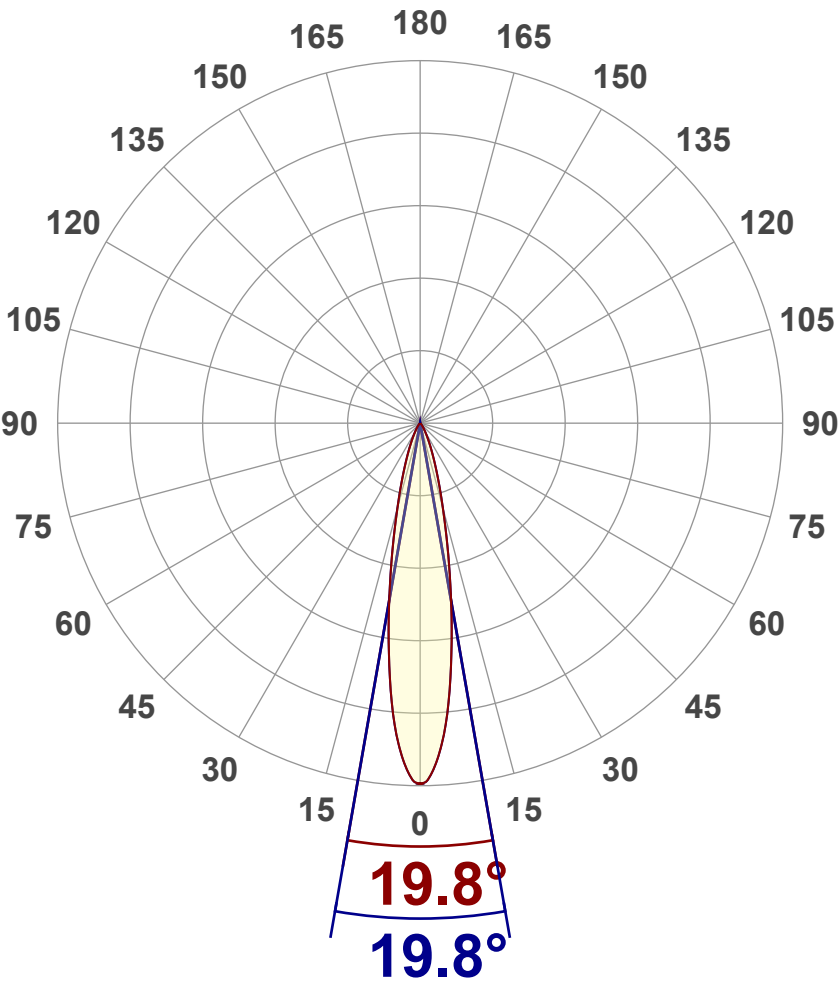
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2563 lm
Peak Intensity	14060 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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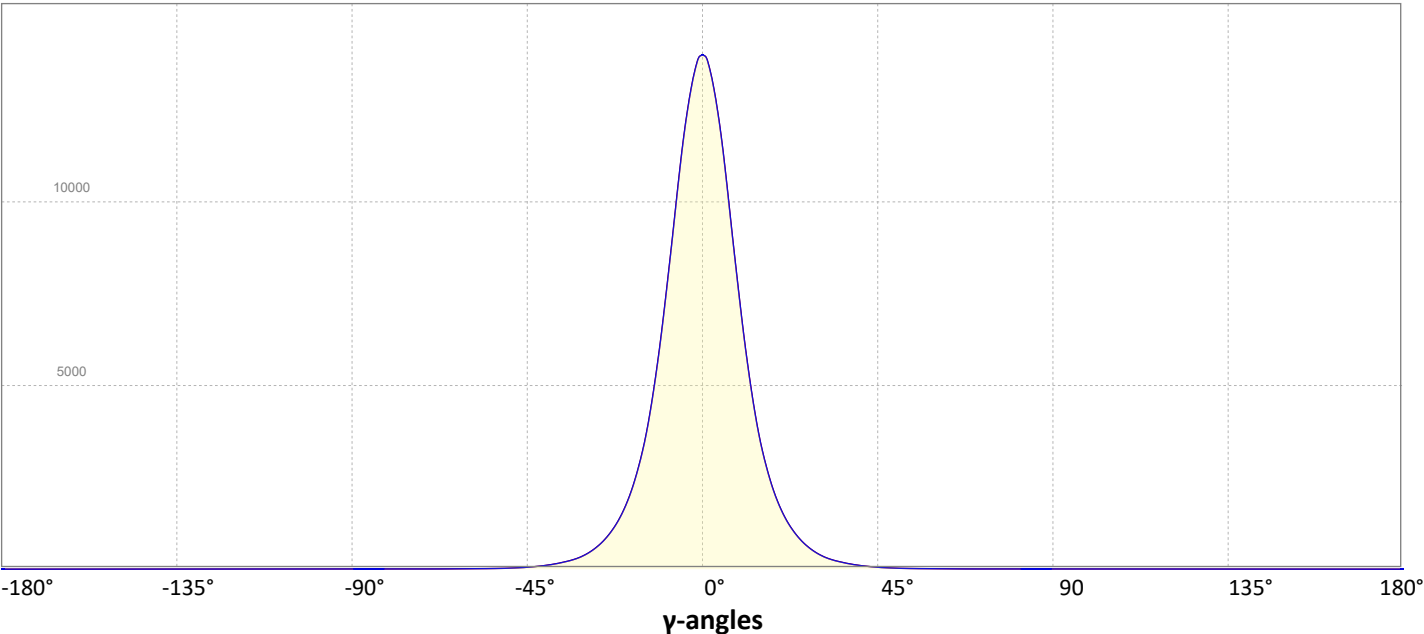
Intensity Ratio

In 120° cone	98.4%
In 90° cone	97.2%

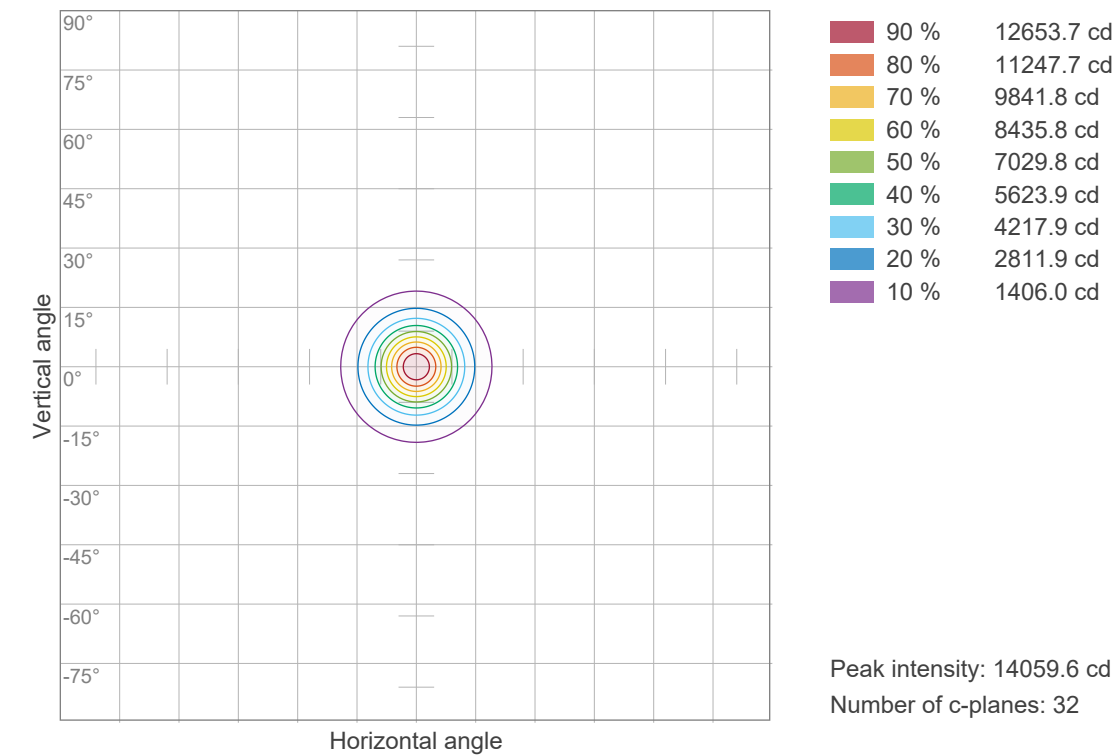
C000-C180

C090-C270

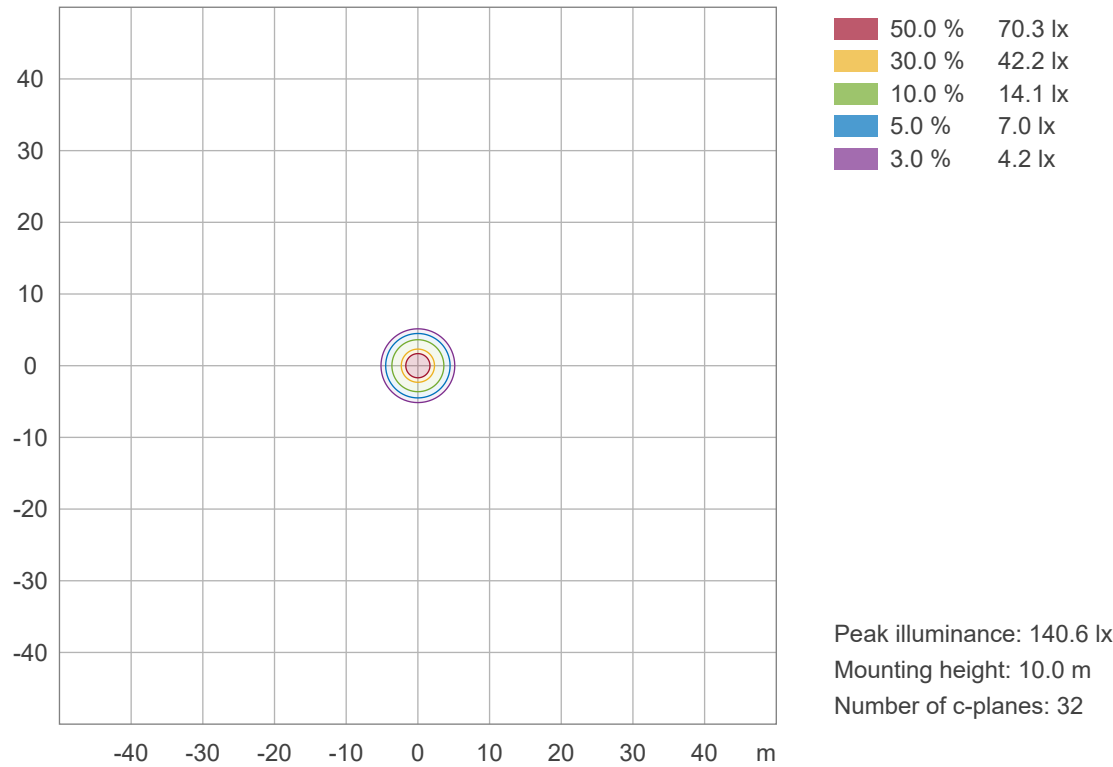
Linear distribution diagram - Intensity (candela) vs γ-angle



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)

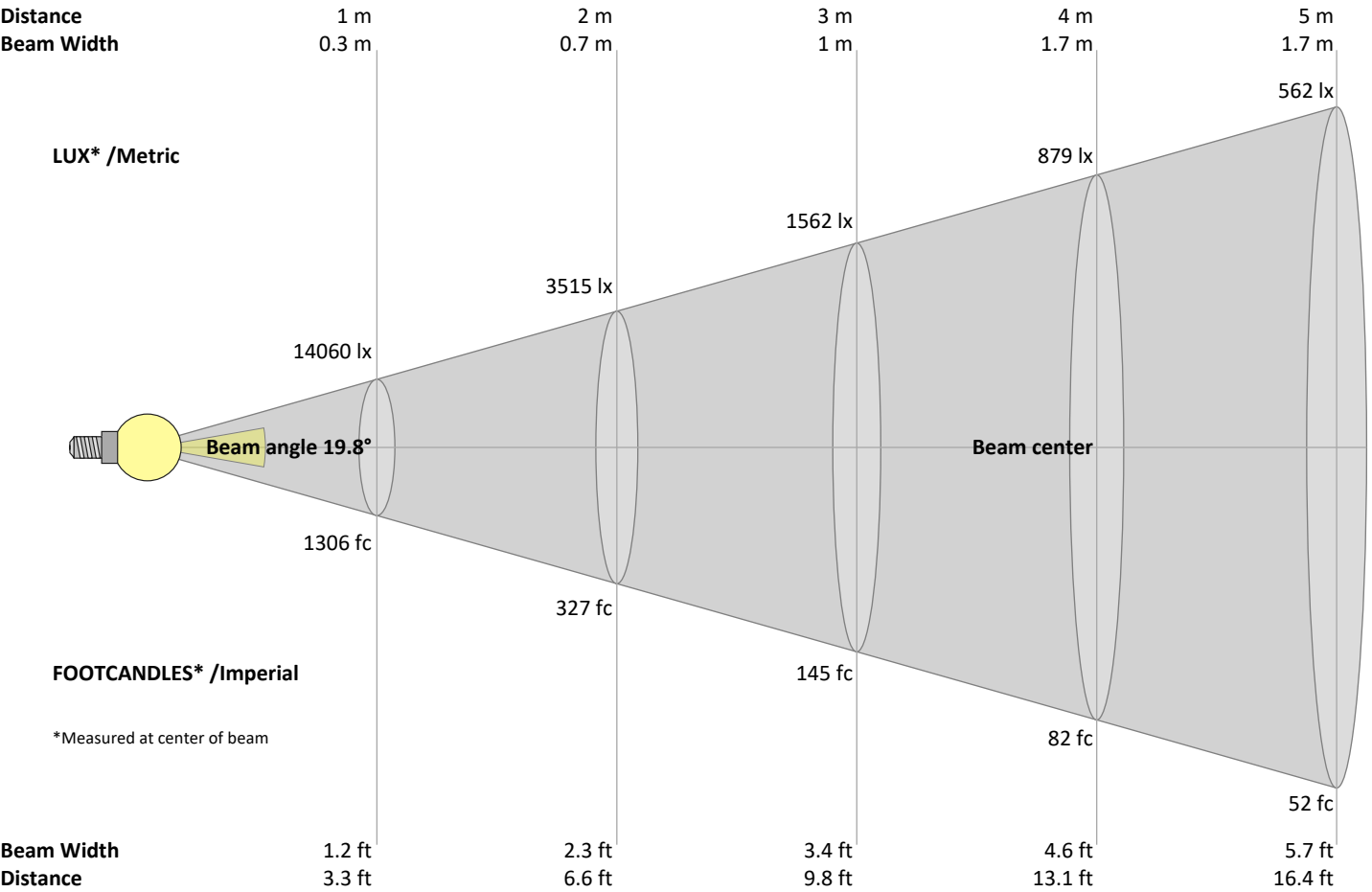


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Beam Details



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
14060	3515	1562	879	562	391	287	220	174	141	116	98	83	72	62	55	49	43	39	35	lux
1306.2	326.5	145.1	81.6	52.2	36.3	26.7	20.4	16.1	13.1	10.8	9.1	7.7	6.7	5.8	5.1	4.5	4	3.6	3.3	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
14.1K	13.6K	12.4K	10.8K	8.8K	6.9K	5.3K	4.0K	3.0K	2.2K	1.7K	1.3K	1.0K	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
14.1K	13.6K	12.4K	10.8K	8.8K	6.9K	5.3K	4.0K	3.0K	2.2K	1.7K	1.3K	1.0K	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
14.1K	13.6K	12.4K	10.8K	8.8K	6.9K	5.3K	4.0K	3.0K	2.2K	1.7K	1.3K	1.0K	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
14.1K	13.6K	12.4K	10.8K	8.8K	6.9K	5.3K	4.0K	3.0K	2.2K	1.7K	1.3K	1.0K	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

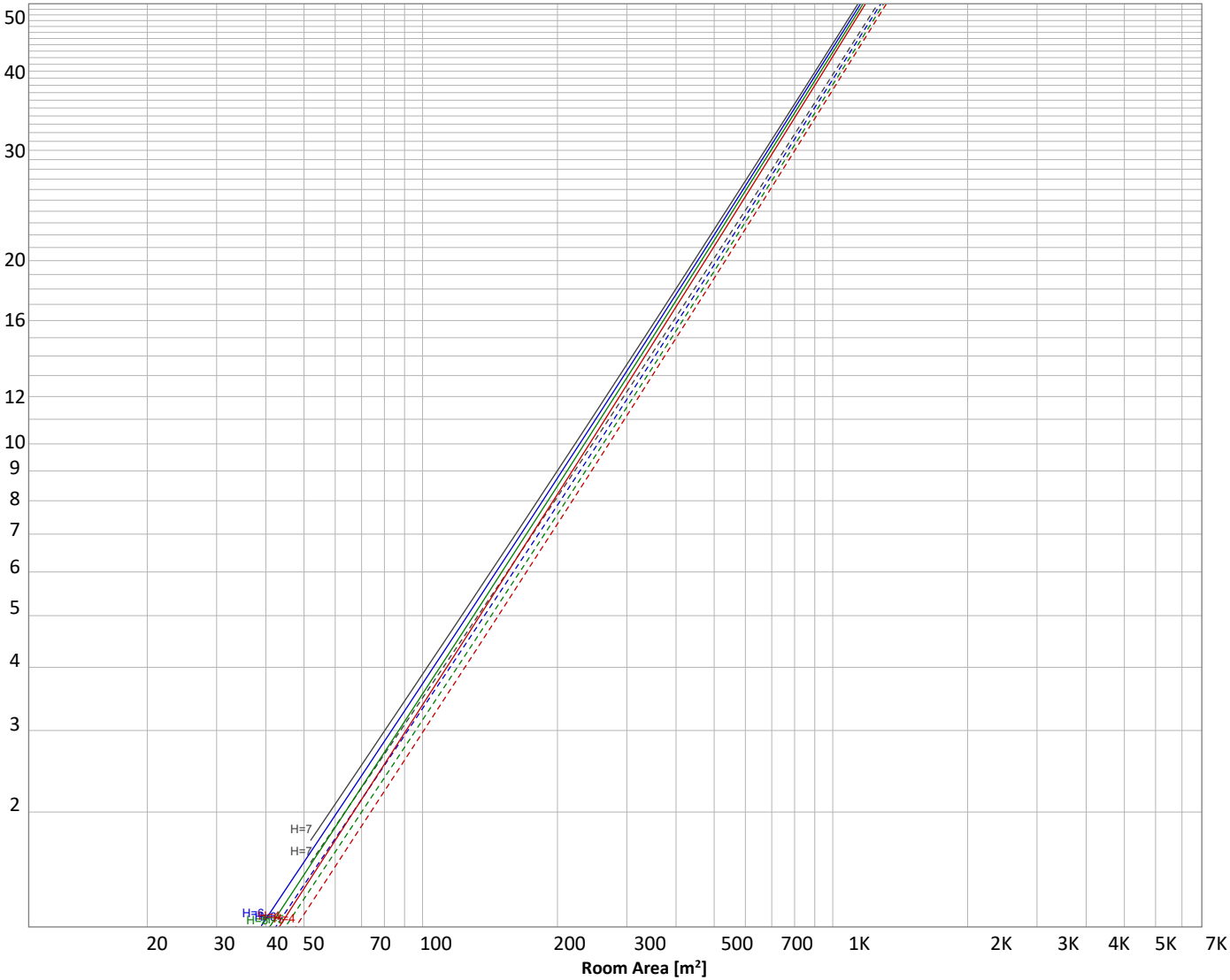
Uncorrected, comprehensive UGR table according to 117-1995

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	13.7	14.1	13.8	14.3	14.5	13.7	14.1	13.8	14.3	14.5
	3H	13.5	14.1	13.9	14.3	14.5	13.5	14.1	13.9	14.3	14.5
	4H	13.6	14.1	14.0	14.4	14.6	13.6	14.1	14.0	14.4	14.6
	6H	13.8	14.2	14.0	14.5	14.9	13.8	14.2	14.0	14.5	14.9
	8H	13.8	14.3	14.1	14.6	15.0	13.8	14.3	14.1	14.6	15.0
	12H	13.9	14.4	14.3	14.7	15.1	13.9	14.4	14.3	14.7	15.1
4H	2H	13.4	14.0	13.8	14.2	14.4	13.4	14.0	13.8	14.2	14.4
	3H	13.5	13.9	13.8	14.3	14.7	13.5	13.9	13.8	14.3	14.7
	4H	13.5	13.9	13.9	14.4	14.9	13.5	13.9	13.9	14.4	14.9
	6H	13.8	14.2	14.3	14.5	14.9	13.8	14.2	14.3	14.5	14.9
	8H	13.9	14.3	14.4	14.7	15.0	13.9	14.3	14.4	14.7	15.0
	12H	14.1	14.4	14.6	14.8	15.3	14.1	14.4	14.6	14.8	15.3
8H	4H	13.5	13.9	14.0	14.3	14.6	13.5	13.9	14.0	14.3	14.6
	6H	13.9	14.2	14.4	14.6	15.1	13.9	14.2	14.4	14.6	15.1
	8H	14.2	14.4	14.7	14.9	15.5	14.2	14.4	14.7	14.9	15.5
	12H	14.5	14.7	15.1	15.2	15.8	14.5	14.7	15.1	15.2	15.8
12H	4H	13.5	13.8	14.0	14.2	14.7	13.5	13.8	14.0	14.2	14.7
	6H	14.0	14.2	14.5	14.7	15.3	14.0	14.2	14.5	14.7	15.3
	8H	14.3	14.4	14.8	14.9	15.5	14.3	14.4	14.8	14.9	15.5
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

**Luminaire budgetary diagram**  
*Uncorrected, comprehensive UGR table according to 117-1995*  
**LAMPS (number of lamps)**



Conditions		p(%)			
H = Room height	Flux = 2563 lm	Line type	Ceiling reflectance	Wall reflectance	Floor reflectance
H <sub>down</sub> = Lamp distance from ceiling =	0.00 m	-----	70	50	30
H <sub>work</sub> = Work area height from floor =	0.00 m	—————	50	30	20
E <sub>work</sub> = Average lux on work area =	100 lx				

**Zonal Lumen Summary**

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
953 lm	976 lm	396 lm	137 lm	44.2 lm	15.2 lm	7.89 lm	5.73 lm	5.70 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
5.61 lm	5.44 lm	5.10 lm	4.61 lm	1.78 lm	0.010 lm	0.007 lm	0.004 lm	0.001 lm

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## Outdoor Light Planning

### Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	953 lm	37.2%
10-20°	976 lm	38.1%
20-30°	396 lm	15.4%
30-40°	137 lm	5.3%
40-50°	44 lm	1.7%
50-60°	15 lm	0.6%
60-70°	8 lm	0.3%
70-80°	6 lm	0.2%
80-90°	6 lm	0.2%
90-100°	6 lm	0.2%
100-110°	5 lm	0.2%
110-120°	5 lm	0.2%
120-130°	5 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	2563 lm	100.0%

### Intensity peaks

Max intensity	14060 cd
Intensity, 90°	5 cd
Intensity, 0°	14060 cd

### Zonal Lumen summary

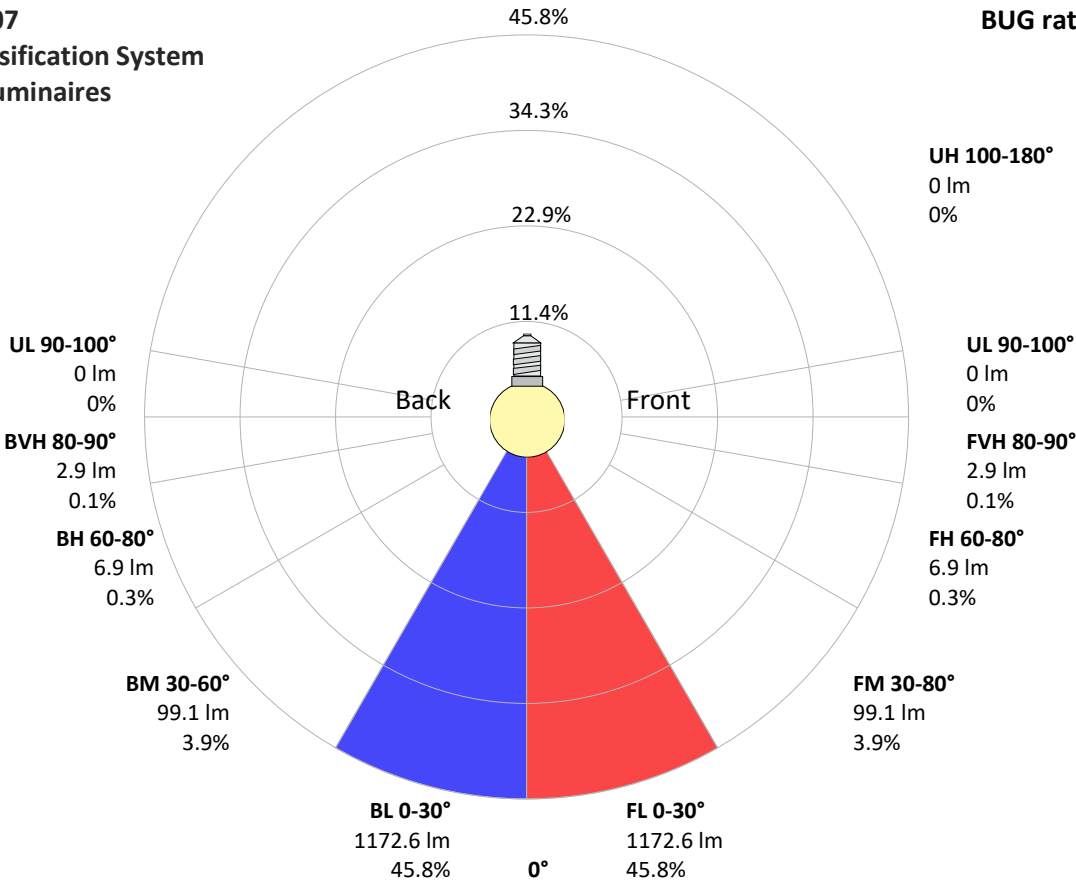
Zone (γ)	Lumen	% Total
0-30°	2325 lm	90.7%
0-40°	2462 lm	96.0%
0-60°	2521 lm	98.4%
60-90°	19 lm	0.8%
70-100°	17 lm	0.7%
90-120°	16 lm	0.6%
0-90°	2540 lm	99.1%
90-180°	23 lm	0.9%
0-180°	2563 lm	100.0%

### BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	1173 lm	45.8%
Medium(30-60°)	99 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°)	1173 lm	45.8%
Medium(30-60°)	99 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

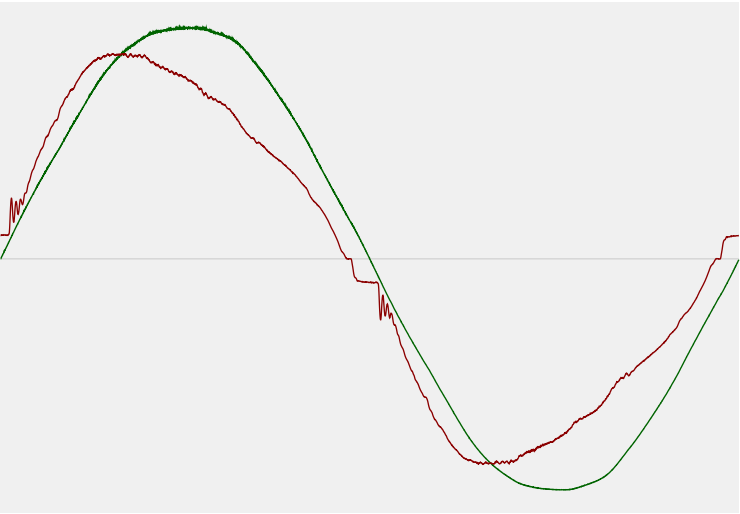
### Input Power

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%

### Efficiency

Radiated power efficiency	22.5%
<div><div></div></div>	
Lumen efficiency	62 lm/W
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### Input Power Curve





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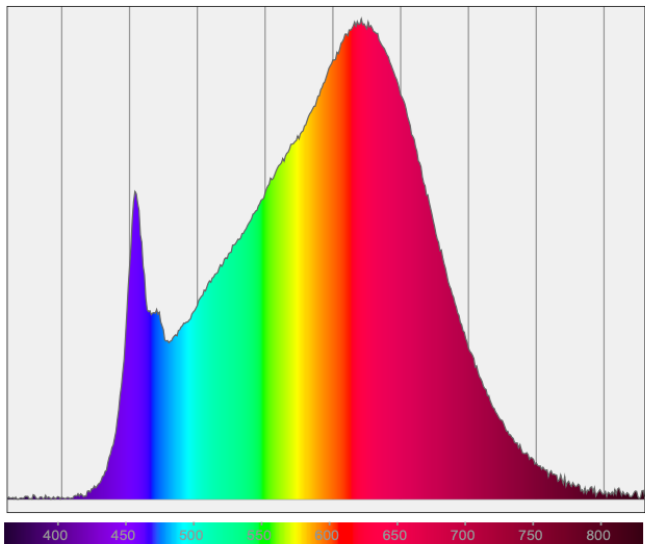
1\_PHOT\_REFLEKTER-XL-4300lmChip-3000K-21Deg-HoneycombLouvre\_2303  
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## Color Measurements

Correlated Color Temperature	CCT = 3000 K
Color Rendering TM30-18	R <sub>f</sub> 91.0 — R <sub>g</sub> 97.7
Color Shift, CIE duv	Duv ±0.0003

## Spectral distribution



## Color details

Correlated Color Temperature	CCT = 3000 K	Color coordinates CIE 1931	(x;y) = (0.437;0.404)
Color Rendering Index	CRI 94.1	Color coordinate CIEs 1960	(u;v) = (0.251;0.348)
Color Rendering Index, R9 (red component)	R9 = 68.6	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R <sub>f</sub> 91.0 — R <sub>g</sub> 97.7	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.251;0.251)
Color Quality Scale	CQS = 91.8		

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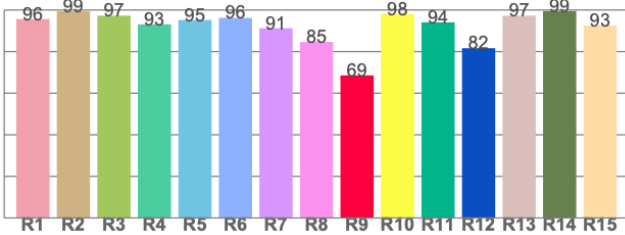
CIE 1931



CIE 1931 – zoomed on Planckian locus



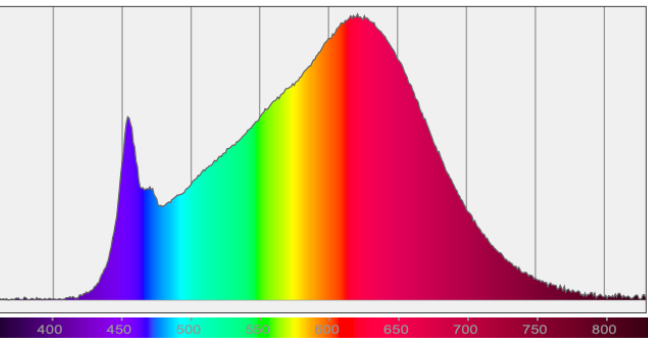
Color Rendering Index per reference color (CIE 1995)



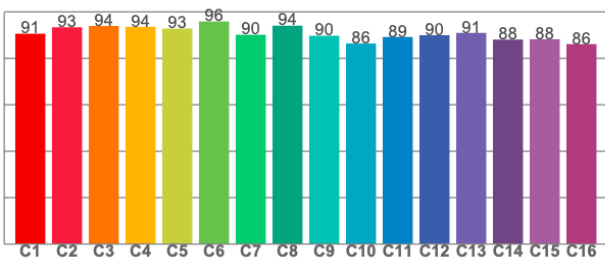
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
95.7	99.5	97.3	93.1	95.2	96.2	91.3	84.6	68.6	98.2	94.1	81.6	97.2	99.5	92.5

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



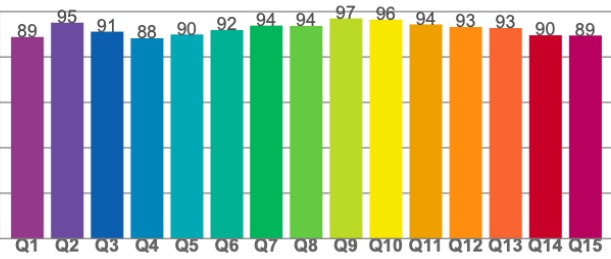
TM30-18 Rf-values per hue bin



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
90.6	93.4	93.9	93.6	92.8	95.9	90.1	94.0	89.7	86.4	89.2	89.9	90.9	88.1	88.2	86.1

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88.8	95.1	91.2	88.2	89.9	91.9	93.8	93.7	97.0	96.5	94.4	93.2	92.8	89.6	89.5