

Tested Light Source - 1\_PHOT\_REFLEKTER-XL-4050lmChip-2700K-21Deg-ConcentricLouvre\_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

41.4 W – PF 0.97 – DPF 0.97

243 V – 0.176 A

50 Hz

Main Light Measurement Results

Output

Efficiency

Peak Intensity and Beam Angle

Color Rendering Index

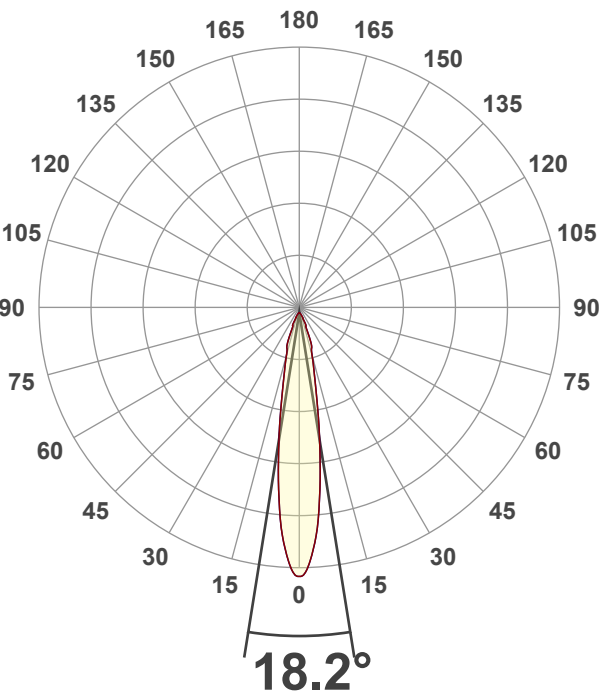
2600 lm

63 lm/W

13422 cd – 18.2°

CRI 92.8

Light Intensity Distribution



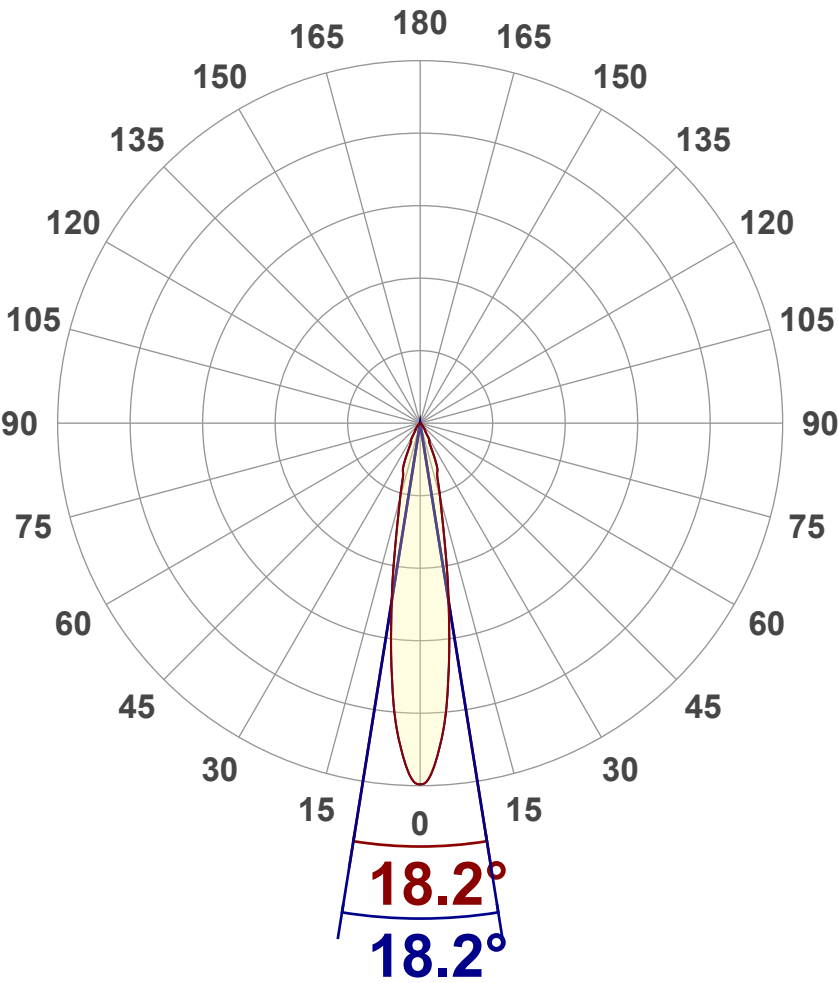
Goniophotometry Report

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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2600 lm
Peak Intensity	13422 cd
Beam Angle (50%)	18.2°
Beam Angle (90%)	18.2°
Beam Angle (10%)	18.2°

Cut-off Angle

Average 2,5%	66.7°
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Field Angle

Average 10%	45.5°
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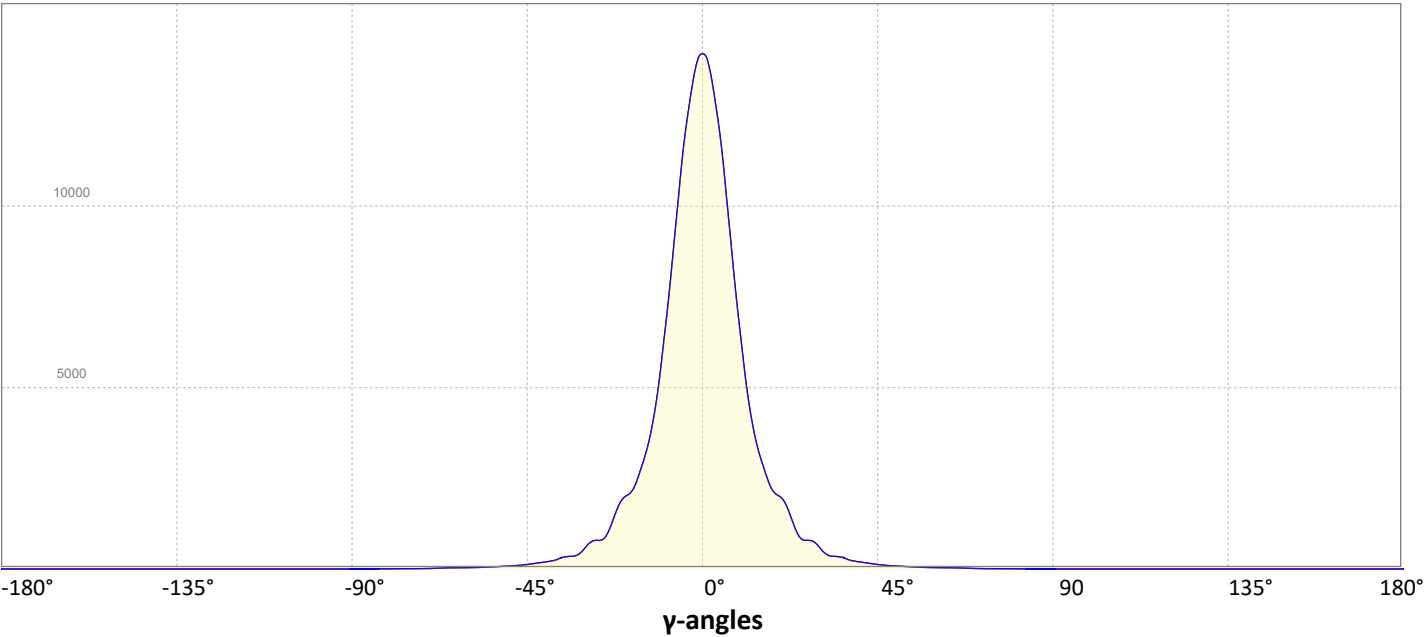
Intensity Ratio

In 120° cone	97.2%
In 90° cone	93.7%

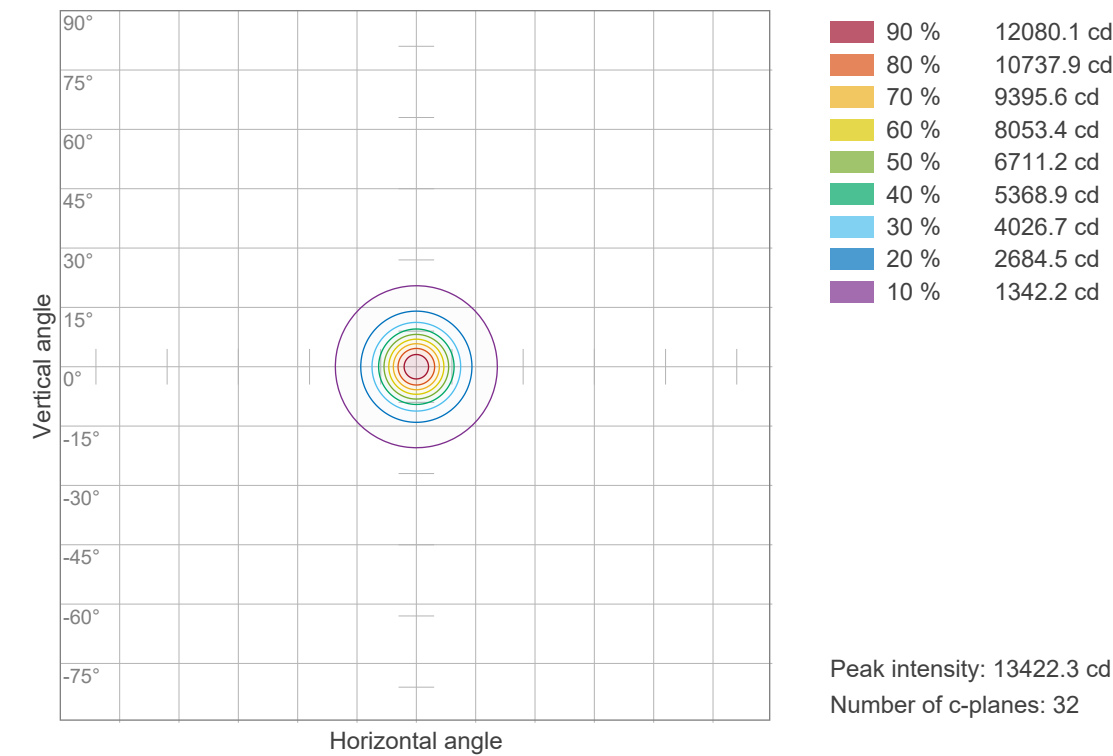
C000-C180

C090-C270

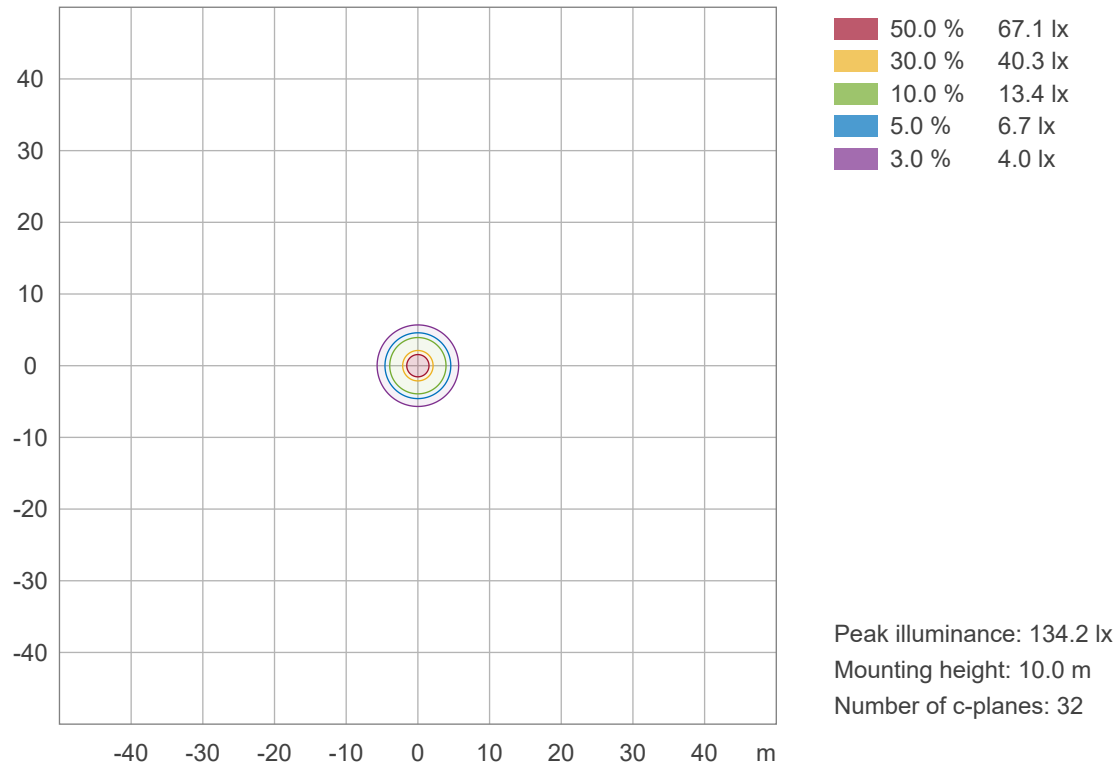
Linear distribution diagram - Intensity (candela) vs γ-angle



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



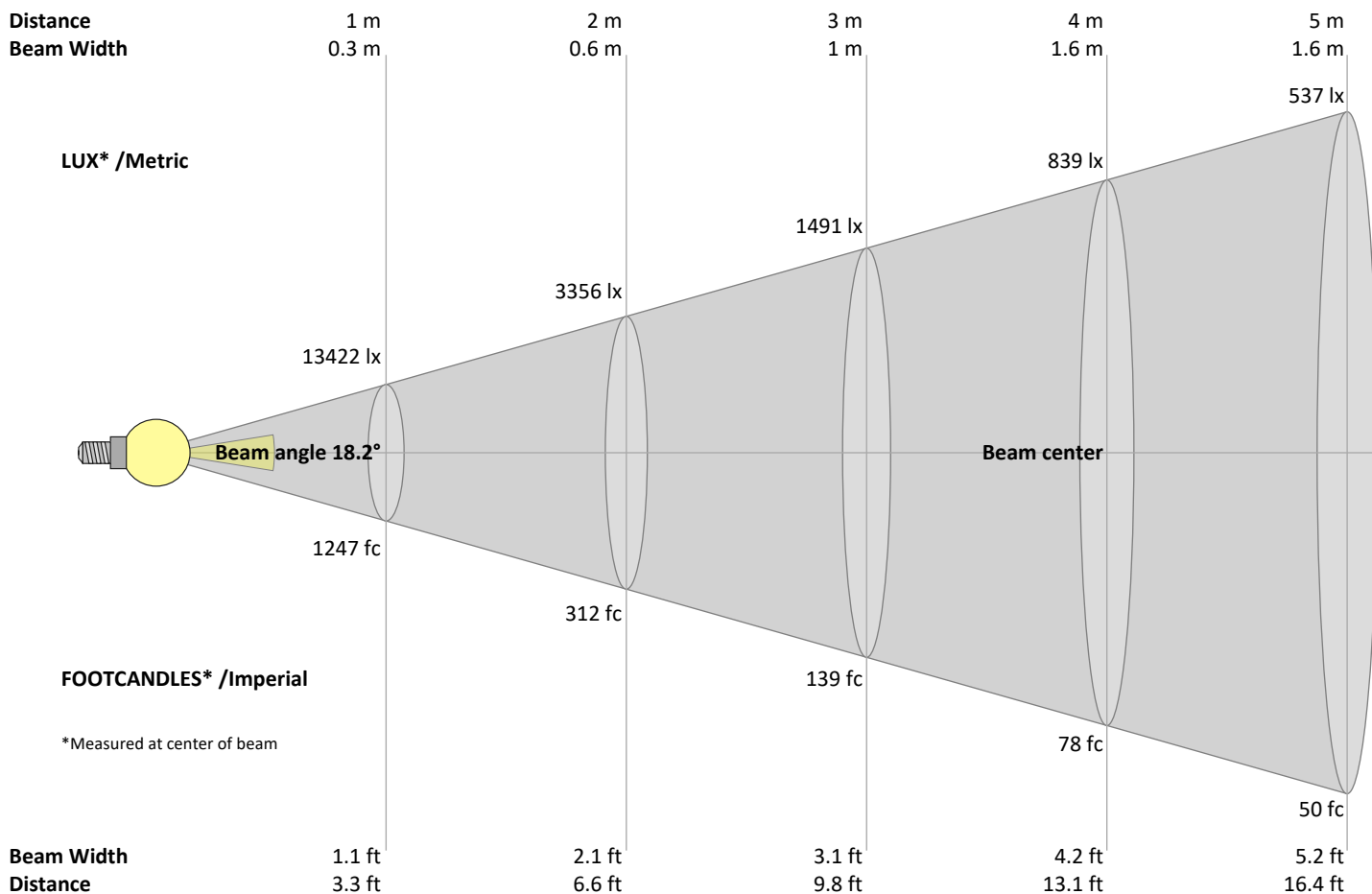
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## Beam Details



### 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
13422	3356	1491	839	537	373	274	210	166	134	111	93	79	68	60	52	46	41	37	34	lux
1247	311.7	138.6	77.9	49.9	34.6	25.4	19.5	15.4	12.5	10.3	8.7	7.4	6.4	5.5	4.9	4.3	3.8	3.5	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
13.4K	13.0K	11.7K	9.9K	7.8K	5.9K	4.3K	3.2K	2.6K	2.1K	1.9K	1.5K	1.0K	0.8K	0.7K	0.6K	0.4K	0.3K	0.3K	0.2K	cd
100%	97%	87%	74%	58%	44%	32%	24%	19%	15%	14%	11%	8%	6%	5%	4%	3%	2%	2%	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
13.4K	13.0K	11.7K	9.9K	7.8K	5.9K	4.3K	3.2K	2.6K	2.1K	1.9K	1.5K	1.0K	0.8K	0.7K	0.6K	0.4K	0.3K	0.3K	0.2K	cd
100%	97%	87%	74%	58%	44%	32%	24%	19%	15%	14%	11%	8%	6%	5%	4%	3%	2%	2%	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
13.4K	13.0K	11.7K	9.9K	7.8K	5.9K	4.3K	3.2K	2.6K	2.1K	1.9K	1.5K	1.0K	0.8K	0.7K	0.6K	0.4K	0.3K	0.3K	0.2K	cd
100%	97%	87%	74%	58%	44%	32%	24%	19%	15%	14%	11%	8%	6%	5%	4%	3%	2%	2%	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
13.4K	13.0K	11.7K	9.9K	7.8K	5.9K	4.3K	3.2K	2.6K	2.1K	1.9K	1.5K	1.0K	0.8K	0.7K	0.6K	0.4K	0.3K	0.3K	0.2K	cd
100%	97%	87%	74%	58%	44%	32%	24%	19%	15%	14%	11%	8%	6%	5%	4%	3%	2%	2%	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		Viewed Crosswise					Viewed Endwise				
H = mounting height above eye level		(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
X	Y										
2H	2H	18.2	18.7	18.3	18.9	19.1	18.2	18.7	18.3	18.9	19.1
	3H	18.3	19.0	18.7	19.2	19.4	18.3	19.0	18.7	19.2	19.4
	4H	18.4	19.0	18.8	19.3	19.5	18.4	19.0	18.8	19.3	19.5
	6H	18.6	19.1	18.9	19.4	19.7	18.6	19.1	18.9	19.4	19.7
	8H	18.6	19.1	18.9	19.4	19.8	18.6	19.1	18.9	19.4	19.8
	12H	18.6	19.1	19.0	19.5	19.9	18.6	19.1	19.0	19.5	19.9
4H	2H	18.1	18.8	18.5	19.0	19.2	18.1	18.8	18.5	19.0	19.2
	3H	18.6	19.1	18.9	19.4	19.8	18.6	19.1	18.9	19.4	19.8
	4H	18.7	19.1	19.1	19.5	20.0	18.7	19.1	19.1	19.5	20.0
	6H	18.8	19.3	19.3	19.7	20.0	18.8	19.3	19.3	19.7	20.0
	8H	18.9	19.4	19.4	19.7	20.1	18.9	19.4	19.4	19.7	20.1
	12H	19.0	19.3	19.5	19.7	20.2	19.0	19.3	19.5	19.7	20.2
8H	4H	18.7	19.1	19.2	19.5	19.8	18.7	19.1	19.2	19.5	19.8
	6H	18.9	19.2	19.4	19.7	20.2	18.9	19.2	19.4	19.7	20.2
	8H	19.1	19.4	19.6	19.9	20.5	19.1	19.4	19.6	19.9	20.5
	12H	19.2	19.4	19.8	19.9	20.5	19.2	19.4	19.8	19.9	20.5
12H	4H	18.6	19.0	19.1	19.4	19.8	18.6	19.0	19.1	19.4	19.8
	6H	19.0	19.2	19.5	19.7	20.4	19.0	19.2	19.5	19.7	20.4
	8H	19.1	19.3	19.7	19.8	20.4	19.1	19.3	19.7	19.8	20.4
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		1.4 / -1.3					1.4 / -1.3				
S = 1.5H		3.1 / -1.9					3.1 / -1.9				
S = 2.0H		4.6 / -2.6					4.6 / -2.6				

## 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	114	112	109	107	112	109	107	106	105	104	102	101	100	99	98	97	96	94
2	109	105	102	99	107	104	100	98	100	98	95	97	95	93	94	93	91	90
3	105	100	96	92	103	98	95	91	96	93	90	93	91	88	91	89	87	86
4	101	95	90	87	100	94	90	86	92	88	85	90	87	84	88	85	83	82
5	98	91	86	83	96	90	85	82	88	84	81	86	83	81	85	82	80	79
6	94	87	82	79	93	86	82	78	85	81	78	83	80	77	82	79	77	76
7	91	84	79	76	90	83	79	75	82	78	75	81	77	74	80	76	74	73
8	88	81	76	73	87	80	76	72	79	75	72	78	74	72	77	74	72	70
9	85	78	73	70	85	77	73	70	77	73	70	76	72	69	75	72	69	68
10	83	75	71	68	82	75	71	68	74	70	68	73	70	67	73	69	67	66

# Goniophotometry Report

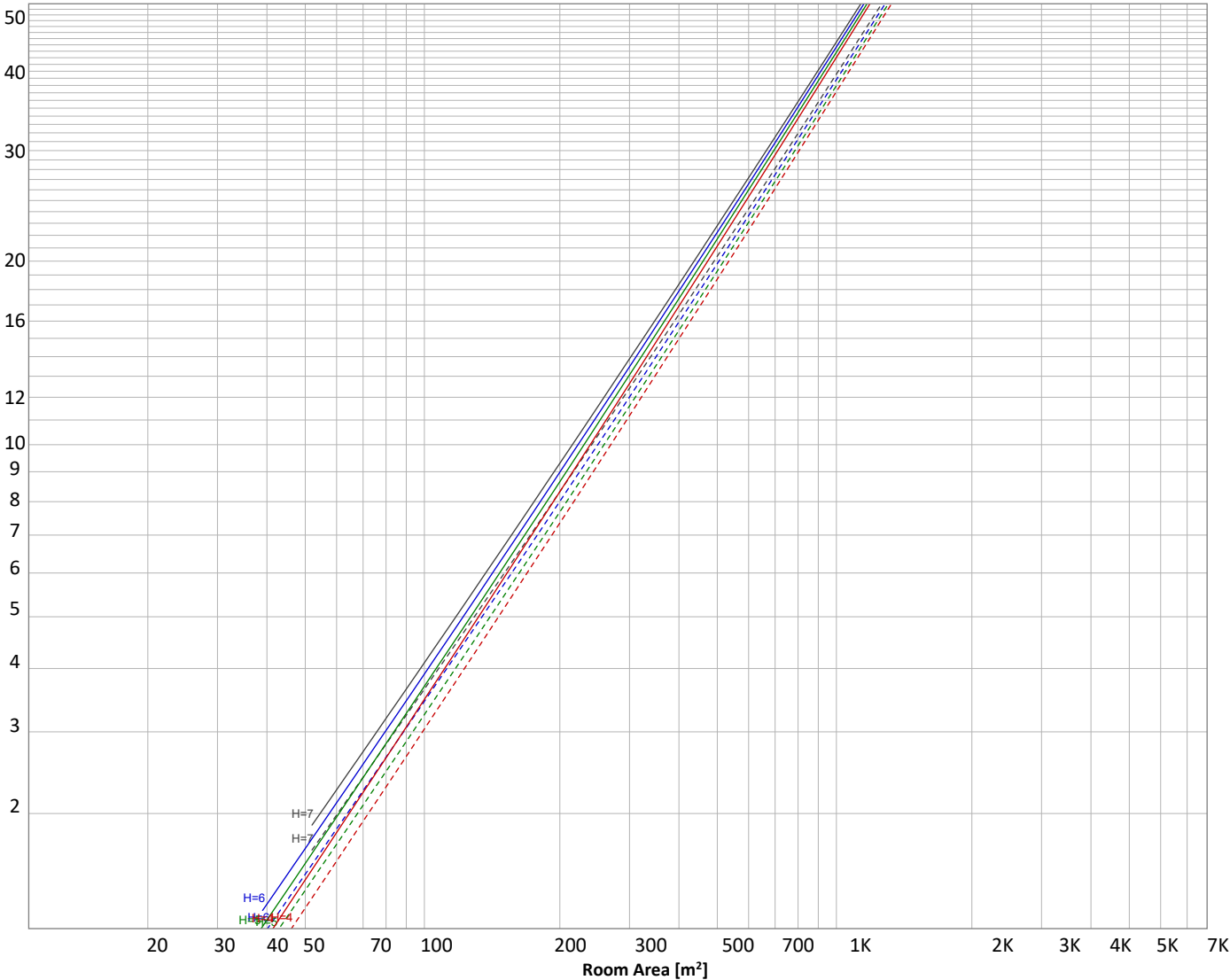
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## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 2600 lm	p(%)		
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°
864 lm	843 lm	471 lm	201 lm	97.3 lm	49.9 lm	29.2 lm	13.4 lm	7.40 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
4.14 lm	4.01 lm	3.76 lm	3.40 lm	2.94 lm	2.38 lm	1.75 lm	1.07 lm	0.362 lm

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	864 lm	33.2%
10-20°	843 lm	32.4%
20-30°	471 lm	18.1%
30-40°	201 lm	7.7%
40-50°	97 lm	3.7%
50-60°	50 lm	1.9%
60-70°	29 lm	1.1%
70-80°	13 lm	0.5%
80-90°	7 lm	0.3%
90-100°	4 lm	0.2%
100-110°	4 lm	0.2%
110-120°	4 lm	0.1%
120-130°	3 lm	0.1%
130-140°	3 lm	0.1%
140-150°	2 lm	0.1%
150-160°	2 lm	0.1%
160-170°	1 lm	0.0%
170-180°	0 lm	0.0%
Total	2600 lm	100.0%

Intensity peaks

Max intensity	13422 cd
Intensity, 90°	4 cd
Intensity, 0°	13422 cd

Zonal Lumen summary

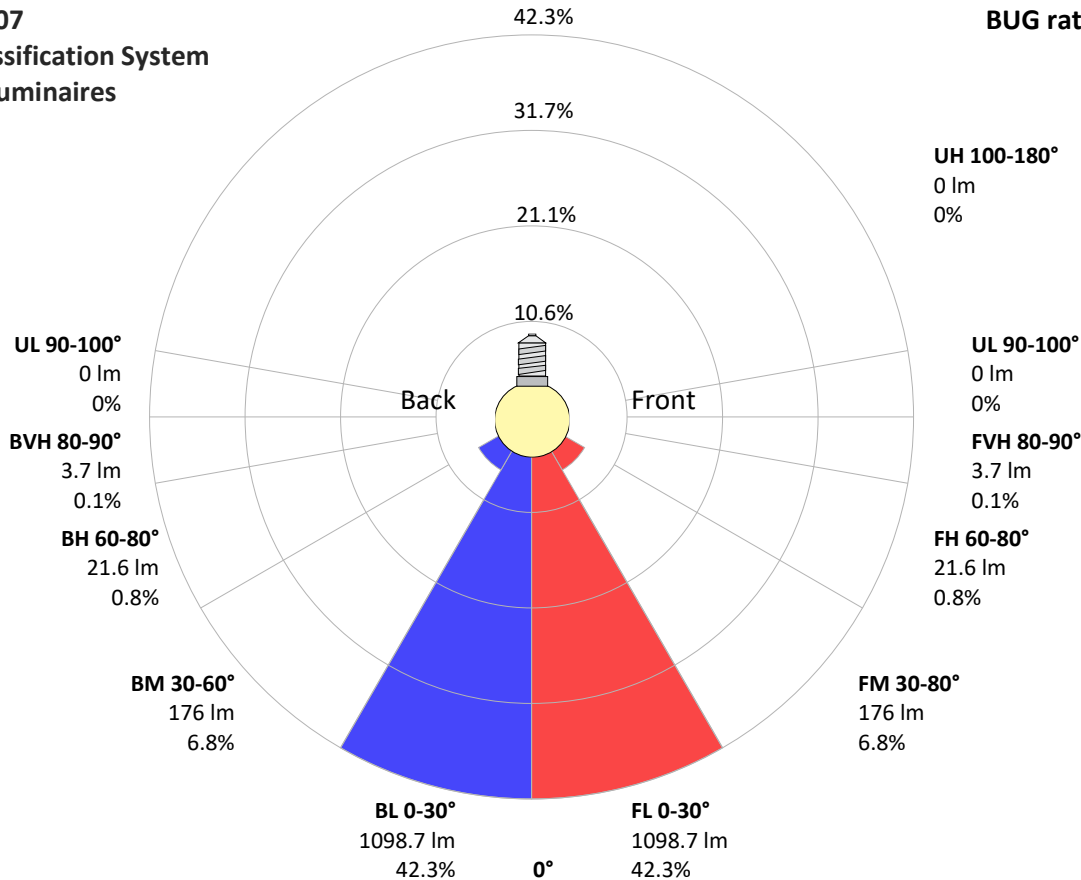
Zone (γ)	Lumen	% Total
0-30°	2178 lm	83.8%
0-40°	2379 lm	91.5%
0-60°	2526 lm	97.2%
60-90°	50 lm	1.9%
70-100°	25 lm	1.0%
90-120°	12 lm	0.5%
0-90°	2576 lm	99.1%
90-180°	24 lm	0.9%
0-180°	2600 lm	100.0%

BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	1099 lm	42.3%
Medium(30-60°)	176 lm	6.8%
High(60-80°)	22 lm	0.8%
Very high(80-90°)	4 lm	0.1%
<b>Back light</b>		
Low(0-30°)	1099 lm	42.3%
Medium(30-60°)	176 lm	6.8%
High(60-80°)	22 lm	0.8%
Very high(80-90°)	4 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

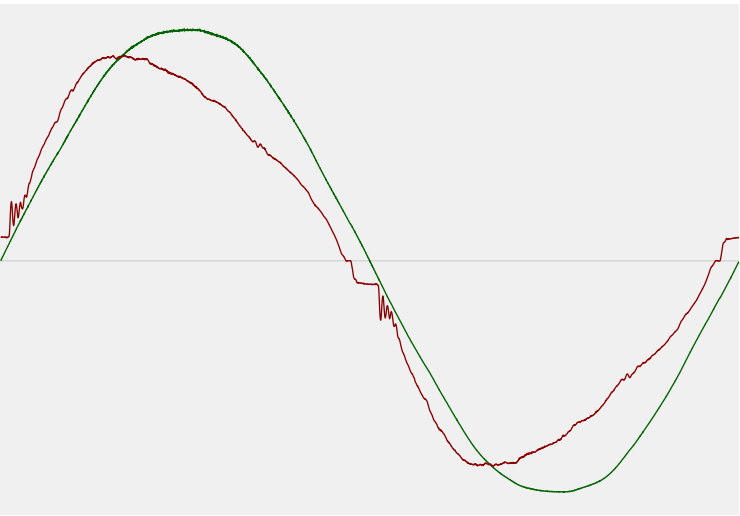
### Input Power

Power feed to light source	41.4 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	243 V
RMS Input current feed, $I_{RMS}$	0.176 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.83 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.89%
Total harmonic distortion of the voltage	1.29%

### Efficiency

Radiated power efficiency	22.8%
<div><div></div></div>	
Lumen efficiency	63 lm/W
<div><div></div></div>	

### Input Power Curve

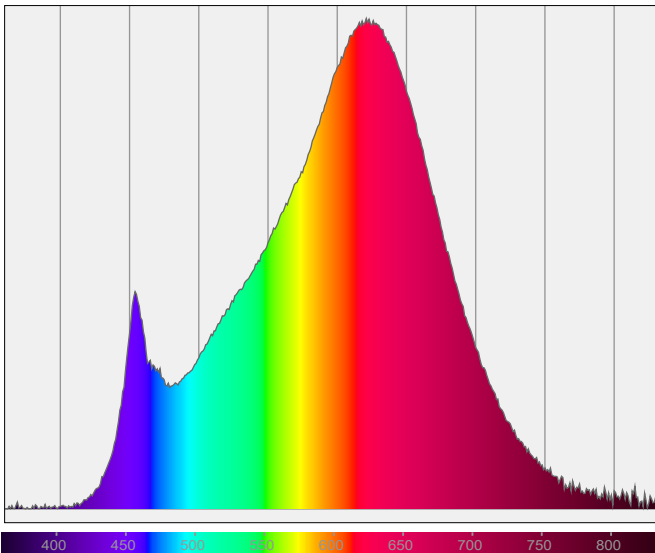




Color Measurements

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 92.8	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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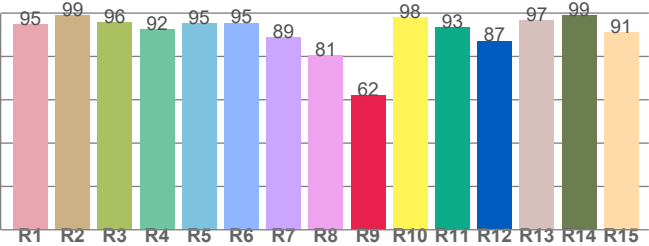
CIE 1931



CIE 1931 – zoomed on Planckian locus



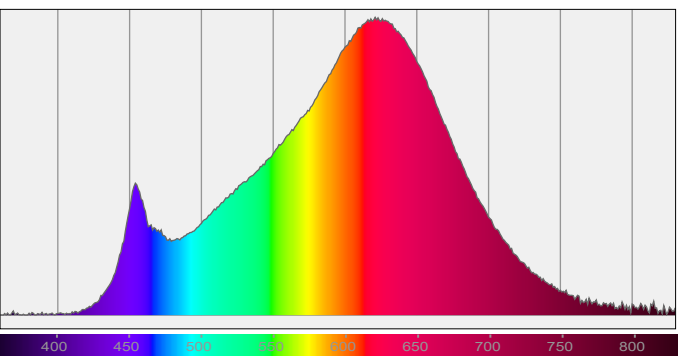
Color Rendering Index per reference color (CIE 1995)



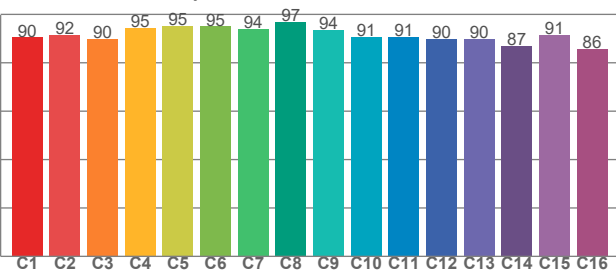
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
94.7	98.9	95.9	92.4	95.2	95.5	88.9	80.6	61.9	98.0	93.5	87.2	96.5	98.9	91.0

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



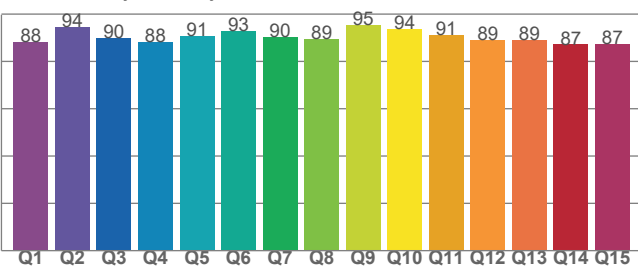
TM30-18 Rf-values per hue bin



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	93.6	90.7	90.6	89.7	89.7	87.1	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	88.0	90.9	92.9	90.1	89.4	95.2	93.7	91.1	89.2	88.8	87.1	87.2