

Tested Light Source - 1_PHOT_SKIN+BONES-4750lmChip-4000K-58Deg-HoneycombLouve_2303

Laboratory and Equipment

Laboratory Owner and Location	Factorylux, Greenhill Mills, Hebden Bridge, HX7 5QF, UK
Goniospectrometer System and Type	BaseSpion – Type C, horizontal
Spectrometer Manufacturer and Model	Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

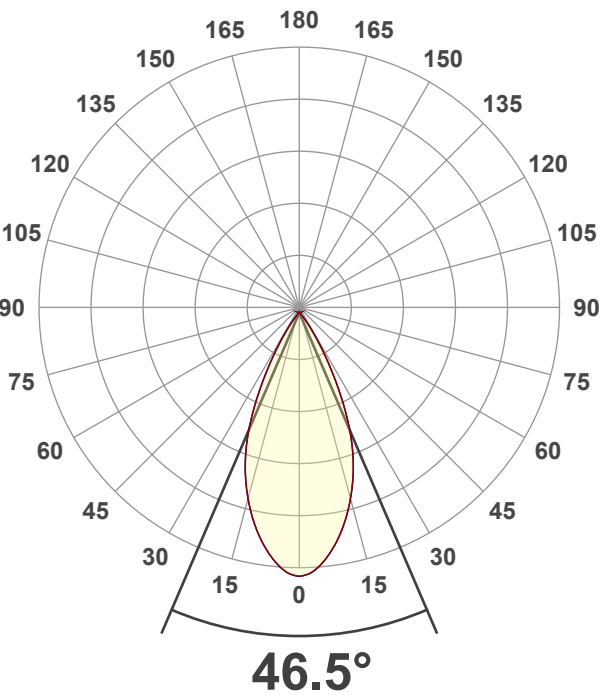
Measurement Conditions

Number of C-planes and Resolution	4 planes – 90°
γ (gamma)-Resolution	2°
Test Distance	1.50 m
Input Power, Power and Displ. Factors	41.3 W – PF 0.97 – DPF 0.97
Input RMS Voltage and Current	239 V – 0.179 A
Frequency of Input Power	50 Hz

Main Light Measurement Results

Output	2630 lm
Efficiency	64 lm/W
Peak Intensity and Beam Angle	4438 cd – 46.5°
Color Rendering Index	CRI 92.6

Light Intensity Distribution



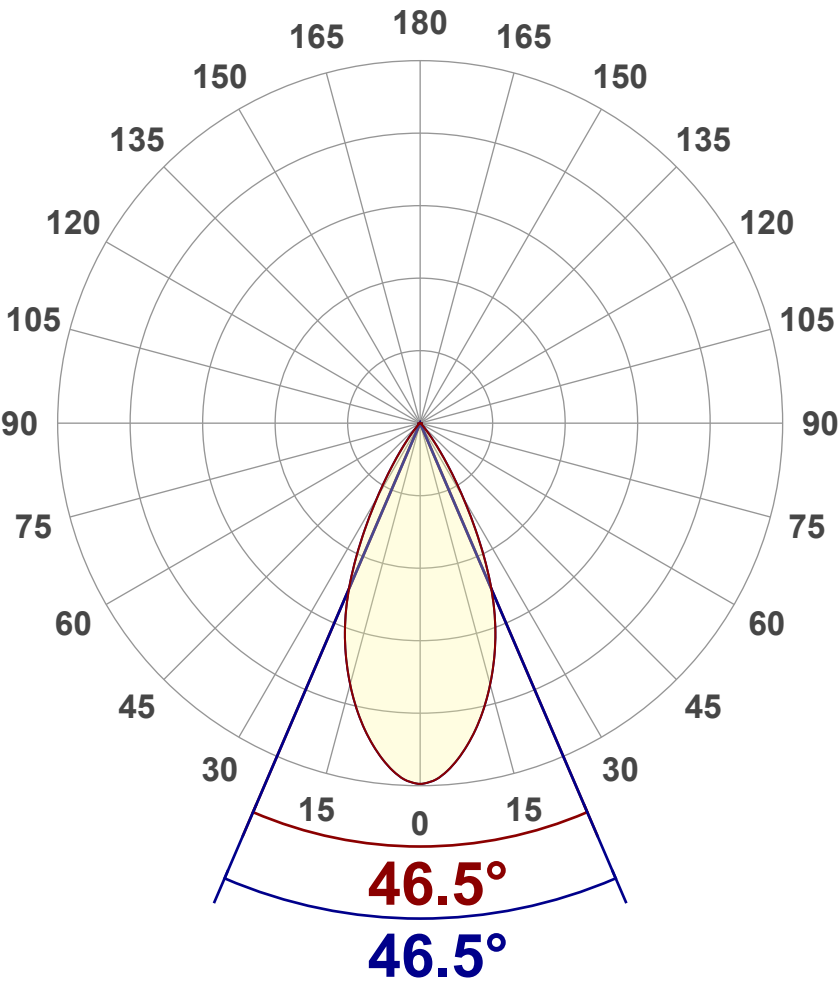
Goniophotometry Report

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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2630 lm
Peak Intensity	4438 cd
Beam Angle (50%)	46.5°
Beam Angle (90%)	46.5°
Beam Angle (10%)	46.5°

Cut-off Angle

Average 2,5%	81.7°
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Field Angle

Average 10%	70°
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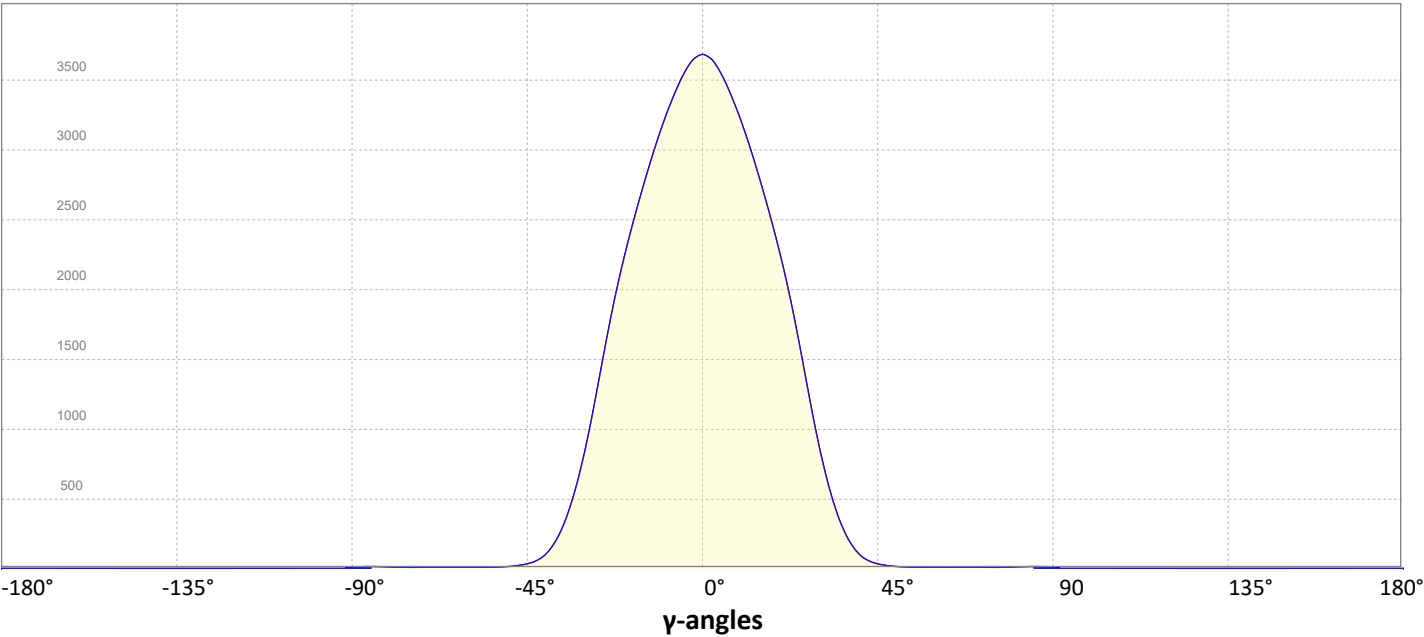
Intensity Ratio

In 120° cone	96.2%
In 90° cone	95.1%

C000-C180

C090-C270

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

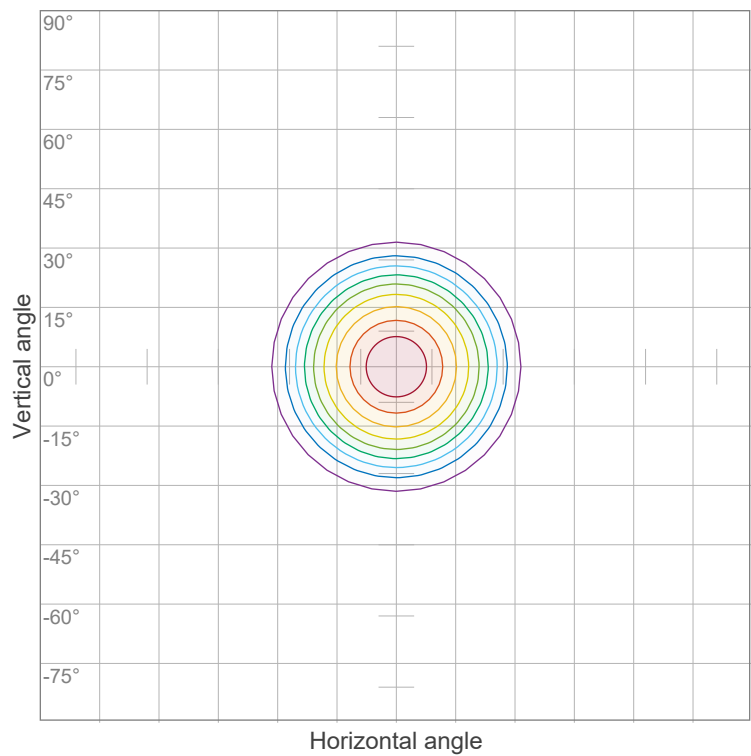


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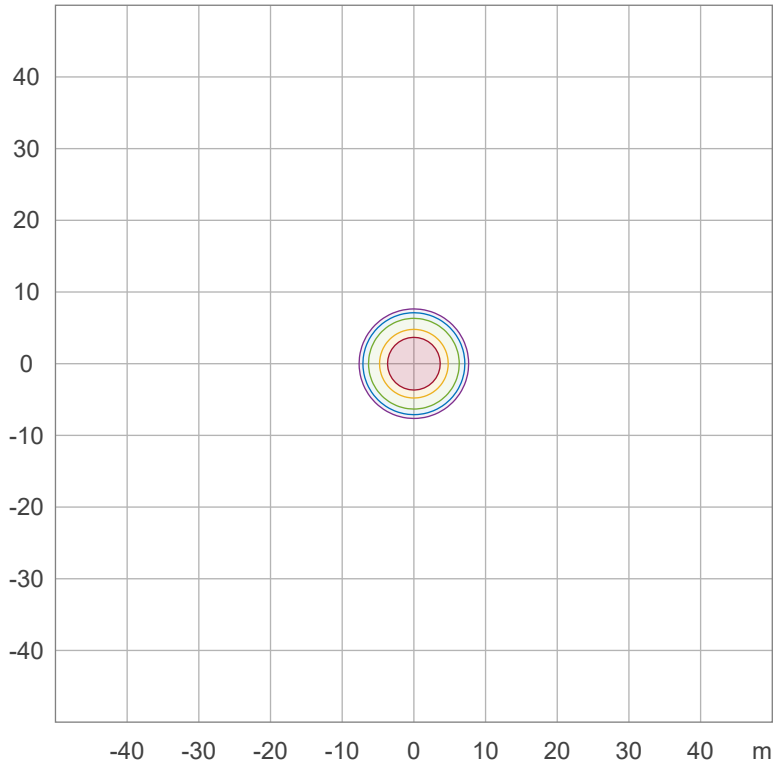
Iso-intensity Diagram (Iso-candela)



90 %	3994.1 cd
80 %	3550.3 cd
70 %	3106.5 cd
60 %	2662.8 cd
50 %	2219.0 cd
40 %	1775.2 cd
30 %	1331.4 cd
20 %	887.6 cd
10 %	443.8 cd

Peak intensity: 4437.9 cd
Number of c-planes: 4

Iso-illuminance Diagram (Iso-lux)



50.0 %	22.2 lx
30.0 %	13.3 lx
10.0 %	4.4 lx
5.0 %	2.2 lx
3.0 %	1.3 lx

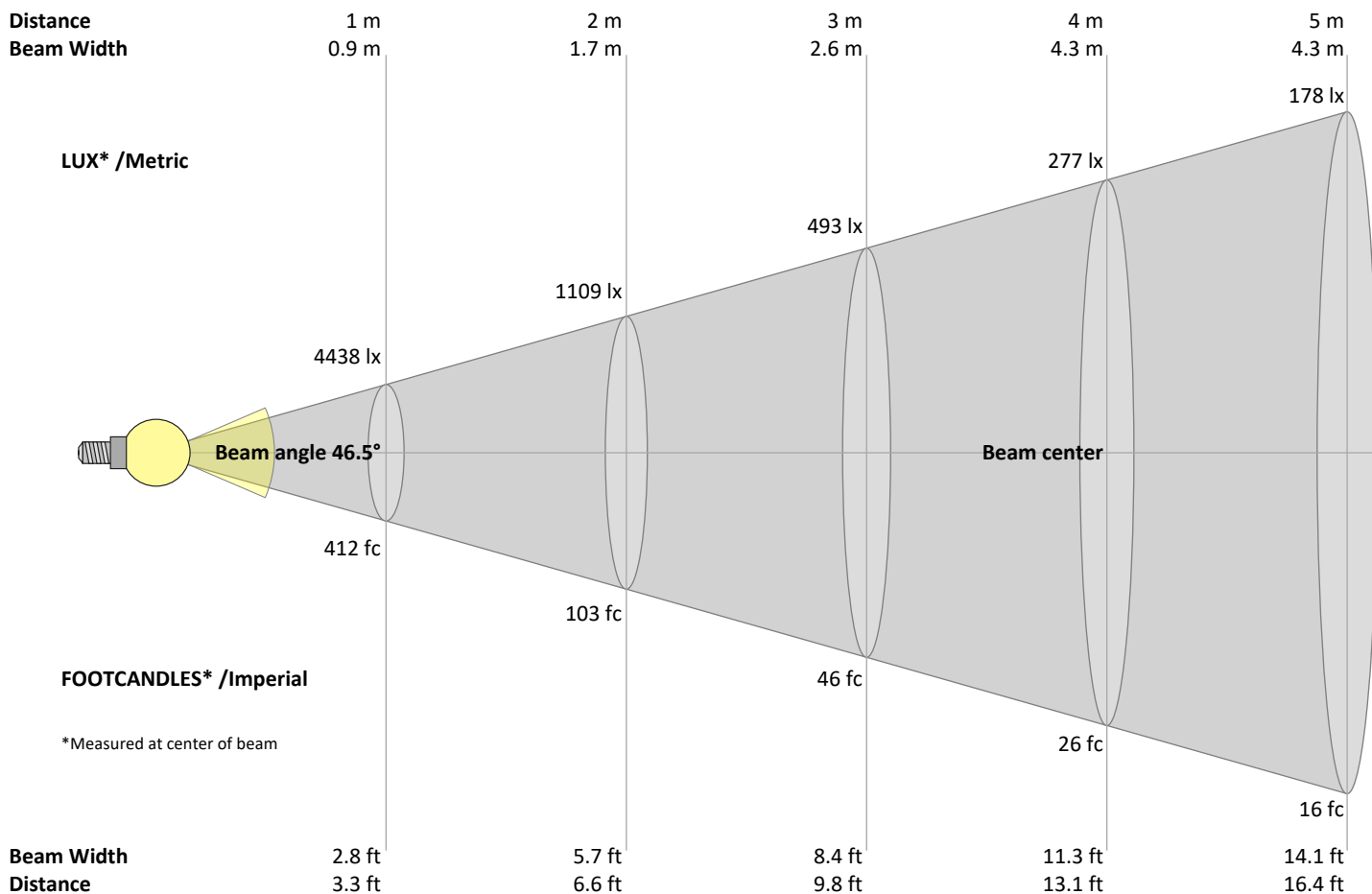
Peak illuminance: 44.4 lx
Mounting height: 10.0 m
Number of c-planes: 4

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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
4438	1109	493	277	178	123	91	69	55	44	37	31	26	23	20	17	15	14	12	11	lux
412.3	103.1	45.8	25.8	16.5	11.5	8.4	6.4	5.1	4.1	3.4	2.9	2.4	2.1	1.8	1.6	1.4	1.3	1.1	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
4438	4406	4320	4191	4035	3858	3660	3445	3214	2970	2707	2417	2094	1742	1387	1059	777	544	363	231	cd
100%	99%	97%	94%	91%	87%	82%	78%	72%	67%	61%	54%	47%	39%	31%	24%	18%	12%	8%	5%	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
4438	4406	4320	4191	4035	3858	3660	3445	3214	2970	2707	2417	2094	1742	1387	1059	777	544	363	231	cd
100%	99%	97%	94%	91%	87%	82%	78%	72%	67%	61%	54%	47%	39%	31%	24%	18%	12%	8%	5%	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
4438	4406	4320	4191	4035	3858	3660	3445	3214	2970	2707	2417	2094	1742	1387	1059	777	544	363	231	cd
100%	99%	97%	94%	91%	87%	82%	78%	72%	67%	61%	54%	47%	39%	31%	24%	18%	12%	8%	5%	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
4438	4406	4320	4191	4035	3858	3660	3445	3214	2970	2707	2417	2094	1742	1387	1059	777	544	363	231	cd
100%	99%	97%	94%	91%	87%	82%	78%	72%	67%	61%	54%	47%	39%	31%	24%	18%	12%	8%	5%	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	18.3	18.9	18.4	19.1	19.3	18.3	18.9	18.4	19.1	19.3
	3H	18.2	18.9	18.6	19.1	19.3	18.2	18.9	18.6	19.1	19.3
	4H	18.4	19.1	18.8	19.3	19.5	18.4	19.1	18.8	19.3	19.5
	6H	18.8	19.4	19.1	19.7	20.0	18.8	19.4	19.1	19.7	20.0
	8H	19.1	19.7	19.4	20.0	20.4	19.1	19.7	19.4	20.0	20.4
	12H	19.6	20.1	19.9	20.5	20.9	19.6	20.1	19.9	20.5	20.9
4H	2H	18.0	18.7	18.4	18.9	19.1	18.0	18.7	18.4	18.9	19.1
	3H	18.2	18.8	18.6	19.1	19.6	18.2	18.8	18.6	19.1	19.6
	4H	18.5	19.0	18.9	19.4	19.9	18.5	19.0	18.9	19.4	19.9
	6H	19.0	19.6	19.5	19.9	20.3	19.0	19.6	19.5	19.9	20.3
	8H	19.6	20.1	20.1	20.4	20.8	19.6	20.1	20.1	20.4	20.8
	12H	20.3	20.7	20.8	21.1	21.6	20.3	20.7	20.8	21.1	21.6
8H	4H	18.6	19.1	19.1	19.4	19.8	18.6	19.1	19.1	19.4	19.8
	6H	19.4	19.8	19.9	20.2	20.8	19.4	19.8	19.9	20.2	20.8
	8H	20.3	20.5	20.8	21.0	21.7	20.3	20.5	20.8	21.0	21.7
	12H	21.3	21.5	21.9	22.0	22.6	21.3	21.5	21.9	22.0	22.6
12H	4H	18.6	19.0	19.1	19.4	19.8	18.6	19.0	19.1	19.4	19.8
	6H	19.6	19.9	20.1	20.4	21.0	19.6	19.9	20.1	20.4	21.0
	8H	20.5	20.7	21.1	21.2	21.8	20.5	20.7	21.1	21.2	21.8

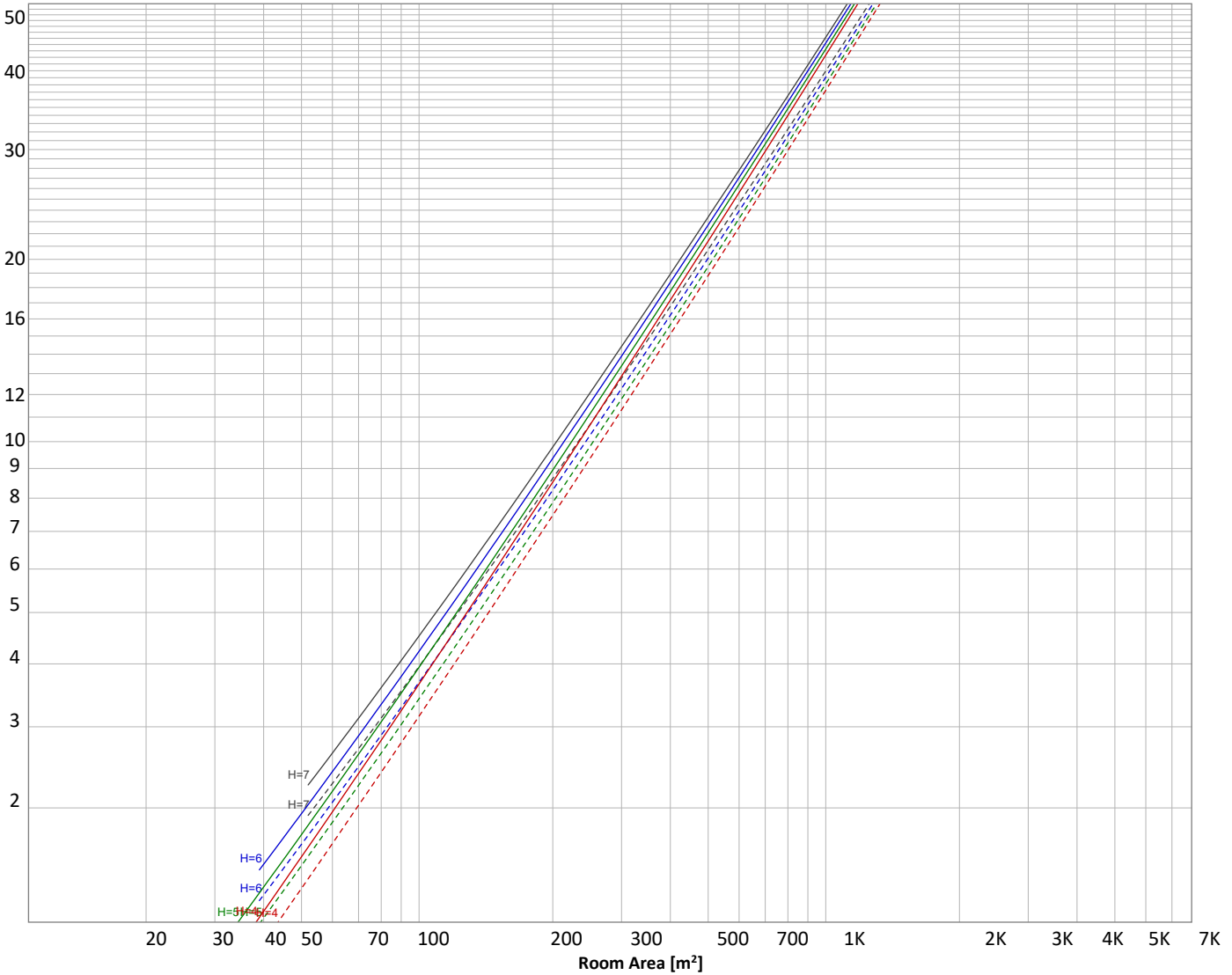
Variations with the observer position for the luminaire spacings, S:

S = 1.0H	2.6 / -0.9	2.6 / -0.9
S = 1.5H	4.7 / -1.0	4.7 / -1.0
S = 2.0H	6.4 / -1.1	6.4 / -1.1

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	110	110	110	105	105	105	101	101	101	98
1	113	110	108	106	111	108	106	104	104	102	100	100	98	97	96	95	94	92
2	108	103	100	96	106	102	98	95	98	95	93	95	93	91	92	90	88	87
3	103	97	93	89	101	96	91	88	93	89	86	90	87	85	88	85	83	82
4	99	92	87	83	97	90	86	82	88	84	81	86	83	80	84	81	79	77
5	94	87	81	77	93	86	81	77	84	79	76	82	78	75	80	77	75	73
6	90	82	77	73	89	81	76	72	80	75	72	78	74	71	77	73	71	69
7	86	78	73	69	85	77	72	68	76	71	68	75	71	68	73	70	67	66
8	83	74	69	65	82	74	68	65	72	68	65	71	67	64	70	67	64	63
9	80	71	65	62	78	70	65	62	69	65	61	68	64	61	67	64	61	60
10	76	68	62	59	75	67	62	59	66	62	58	65	61	58	65	61	58	57

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



Conditions		p(%)			
H = Room height	Flux = 2630 lm	Line type	Ceiling reflectance	Wall reflectance	Floor reflectance
H _{down} = Lamp distance from ceiling =	0.00 m	-----	70	50	30
H _{work} = Work area height from floor =	0.00 m	-----	50	30	20
E _{work} = Average lux on work area =	100 lx	-----	50	30	20

Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
393 lm	922 lm	858 lm	300 lm	42.3 lm	15.4 lm	16.2 lm	17.1 lm	22.3 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
8.76 lm	7.14 lm	6.70 lm	6.06 lm	5.23 lm	4.24 lm	3.12 lm	1.91 lm	0.644 lm

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	393 lm	15.0%
10-20°	922 lm	35.0%
20-30°	858 lm	32.6%
30-40°	300 lm	11.4%
40-50°	42 lm	1.6%
50-60°	15 lm	0.6%
60-70°	16 lm	0.6%
70-80°	17 lm	0.6%
80-90°	22 lm	0.8%
90-100°	9 lm	0.3%
100-110°	7 lm	0.3%
110-120°	7 lm	0.3%
120-130°	6 lm	0.2%
130-140°	5 lm	0.2%
140-150°	4 lm	0.2%
150-160°	3 lm	0.1%
160-170°	2 lm	0.1%
170-180°	1 lm	0.0%
Total	2630 lm	100.0%

Intensity peaks

Max intensity	4438 cd
Intensity, 90°	17 cd
Intensity, 0°	4438 cd

Zonal Lumen summary

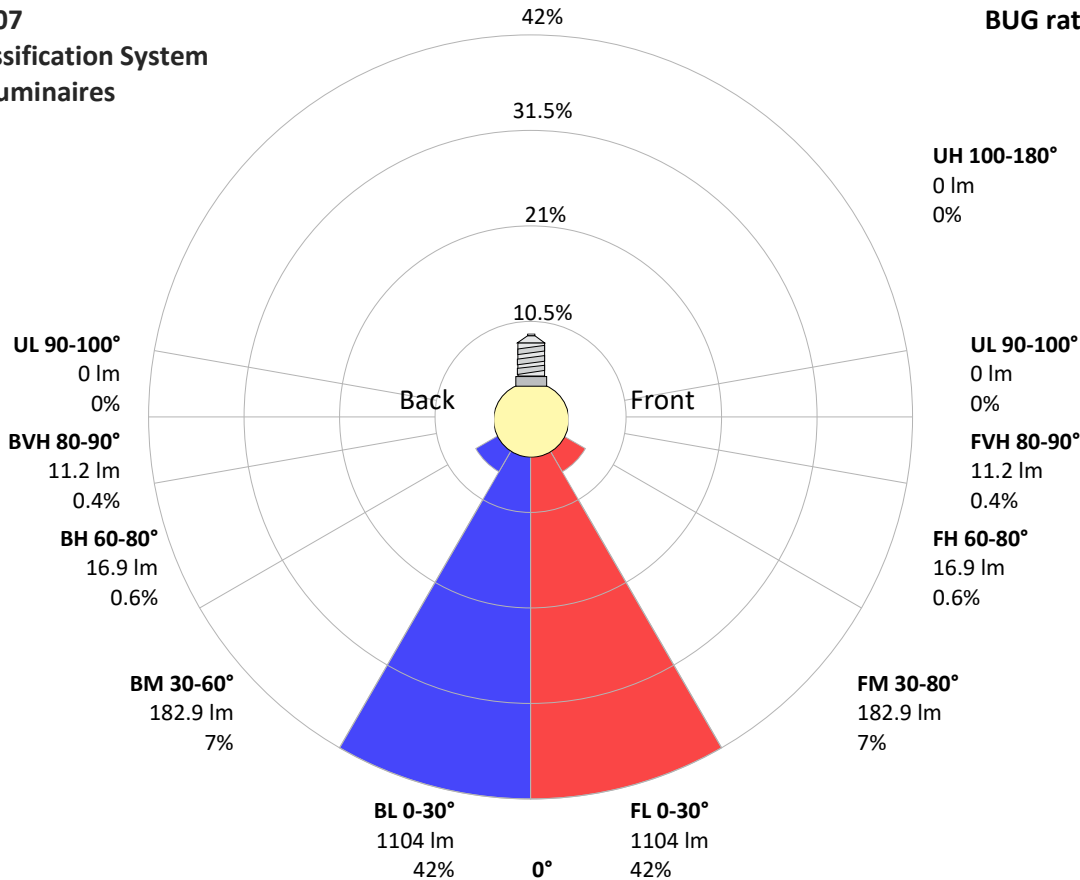
Zone (γ)	Lumen	% Total
0-30°	2173 lm	82.6%
0-40°	2473 lm	94.0%
0-60°	2531 lm	96.2%
60-90°	56 lm	2.1%
70-100°	48 lm	1.8%
90-120°	23 lm	0.9%
0-90°	2586 lm	98.3%
90-180°	44 lm	1.7%
0-180°	2630 lm	100.0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1104 lm	42.0%
Medium(30-60°)	183 lm	7.0%
High(60-80°)	17 lm	0.6%
Very high(80-90°)	11 lm	0.4%
Back light		
Low(0-30°)	1104 lm	42.0%
Medium(30-60°)	183 lm	7.0%
High(60-80°)	17 lm	0.6%
Very high(80-90°)	11 lm	0.4%
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 B3 U1 G1



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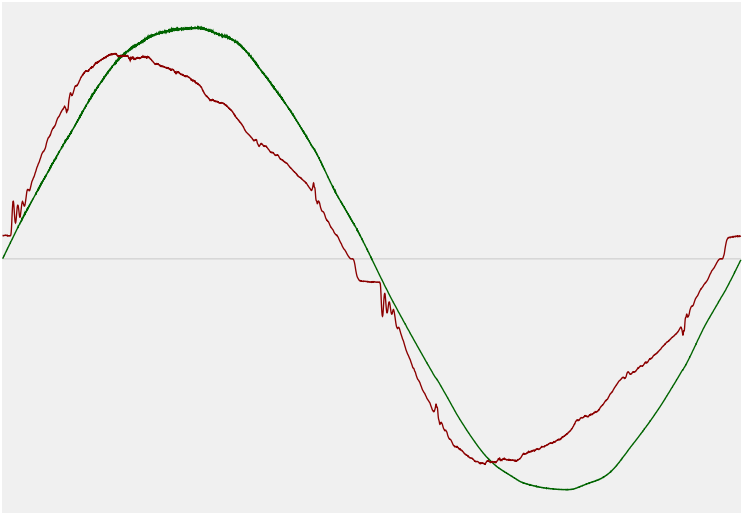


Power Details

Input Power

Power feed to light source	41.3 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	239 V
RMS Input current feed, I_{RMS}	0.179 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	42.74 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.93%
Total harmonic distortion of the voltage	1.21%

Input Power Curve



Efficiency

Radiated power efficiency	23.0%
Lumen efficiency	64 lm/W

Goniophotometry Report

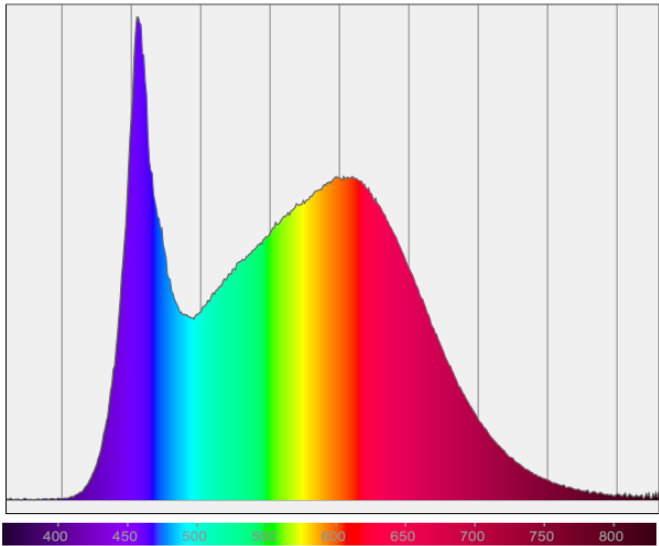
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Color Measurements

Correlated Color Temperature	CCT = 4000 K
Color Rendering TM30-18	R _f 88.9 – R _g 98.5
Color Shift, CIE duv	Duv ±0.0003

Spectral distribution



Color details

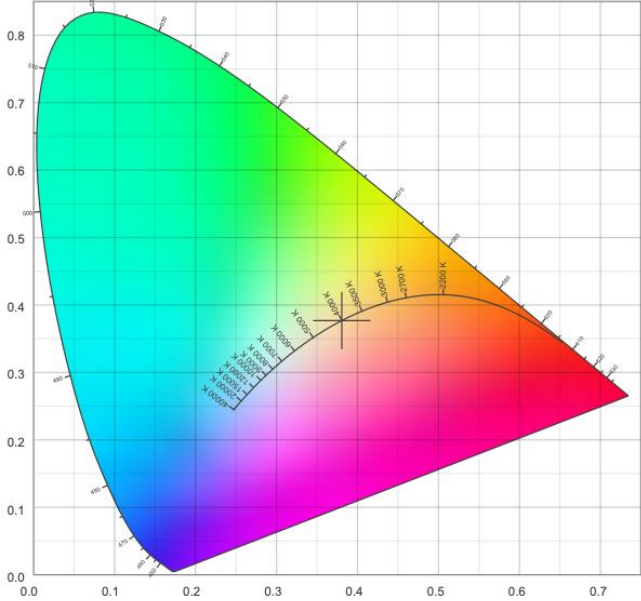
Correlated Color Temperature	CCT = 4000 K	Color coordinates CIE 1931	(x;y) = (0.381;0.377)
Color Rendering Index	CRI 92.6	Color coordinate CIEs 1960	(u;v) = (0.225;0.334)
Color Rendering Index, R9 (red component)	R9 = 72.2	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 88.9 – R _g 98.5	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.225;0.225)
Color Quality Scale	CQS = 88.9		

Goniophotometry Report

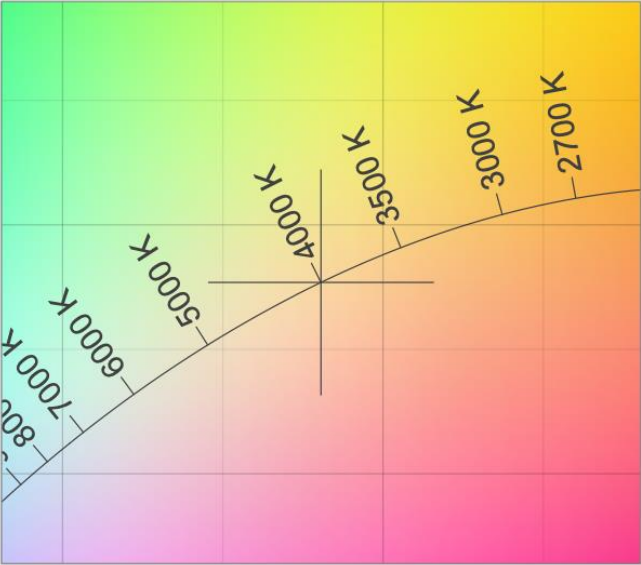
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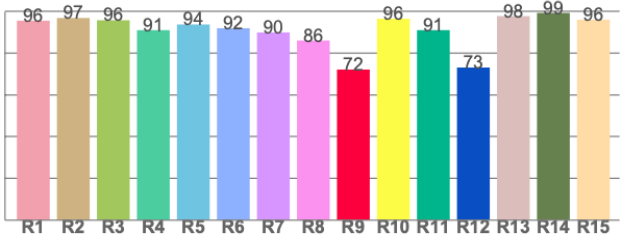
CIE 1931



CIE 1931 – zoomed on Planckian locus



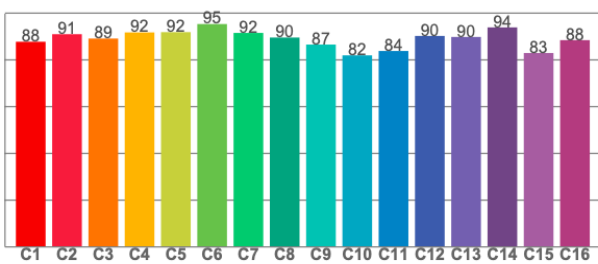
Color Rendering Index per reference color (CIE 1995)



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	96.8	95.7	91.0	93.7	91.9	89.9	86.0	72.2	96.4	91.0	73.1	97.7	99.2	96.0

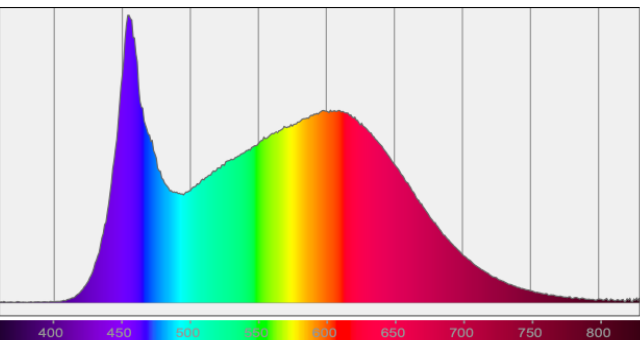
TM30-18 Rf-values per hue bin



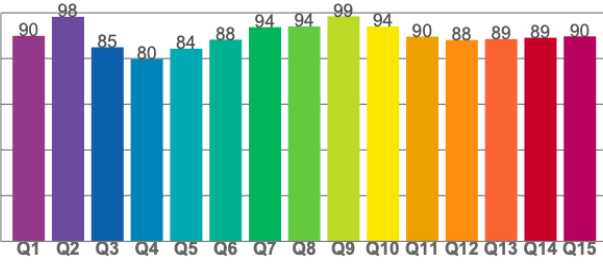
TM30 C values, 16 binned values out of total of 99 C values

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
87.8	91.0	89.1	91.7	91.9	95.3	91.5	89.6	86.6	81.9	83.8	90.3	89.8	93.9	83.0	88.4

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



Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
89.9	98.3	84.9	79.8	84.3	88.3	93.7	94.1	98.5	94.0	89.6	88.1	88.6	89.1	89.7