

Goniophotometry Report

1_PHOT_SKIN+BONES-4050lmChip-2700K-58Deg_2303
www.factorylux.com



Tested Light Source - 1_PHOT_SKIN+BONES-4050lmChip-2700K-58Deg_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

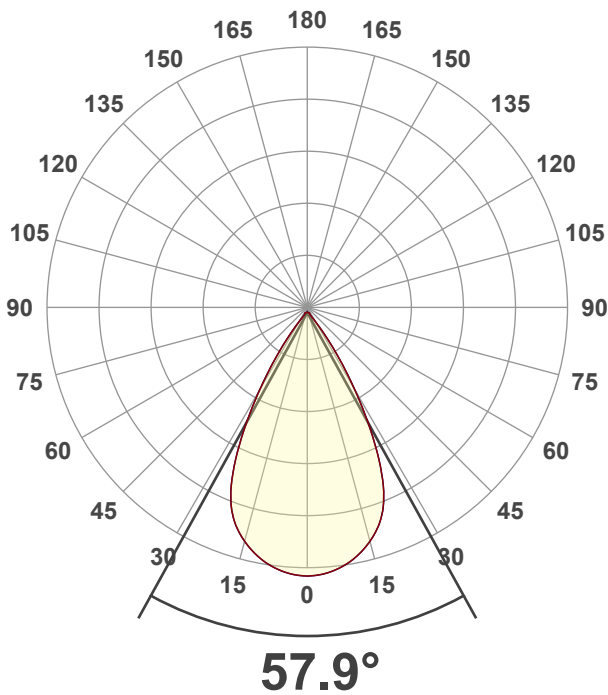
4 planes – 90°
2.5°
1.50 m
41.3 W – PF 0.97 – DPF 0.97
243 V – 0.176 A
50.1 Hz

Main Light Measurement Results

Output
Efficiency
Peak Intensity and Beam Angle
Color Rendering Index

3586 lm
87 lm/W
4058 cd – 57.9°
CRI 92.5

Light Intensity Distribution



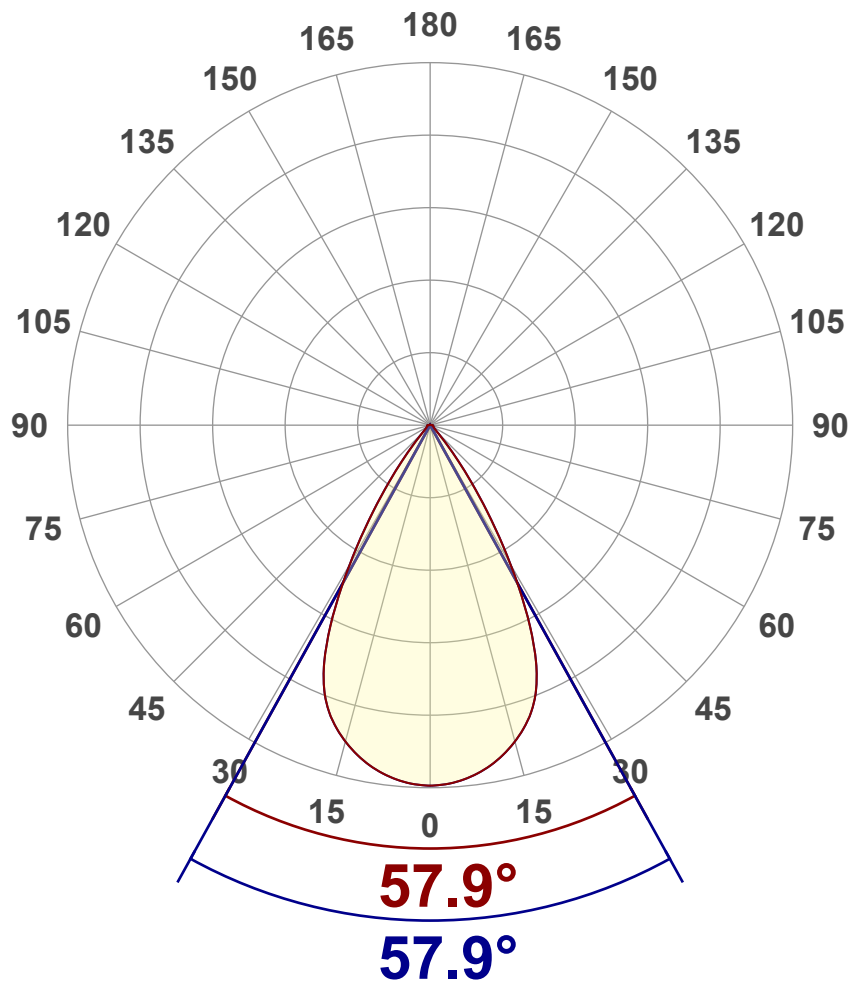
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3586 lm
Peak Intensity	4058 cd
Beam Angle (50%)	57.9°
Beam Angle (90%)	57.9°
Beam Angle (10%)	57.9°

Cut-off Angle

Average 2,5%	93.7°
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Field Angle

Average 10%	78.7°
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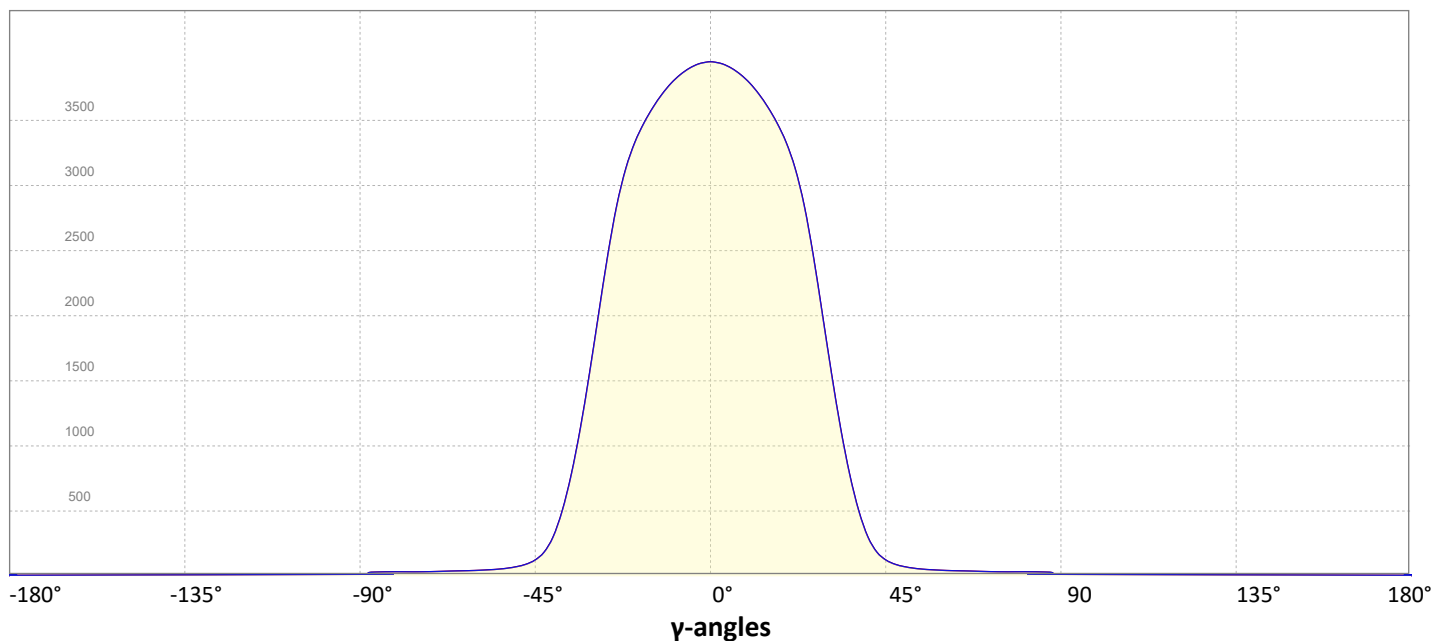
Intensity Ratio

In 120° cone	94.8%
In 90° cone	92.4%

C000-C180

C090-C270

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

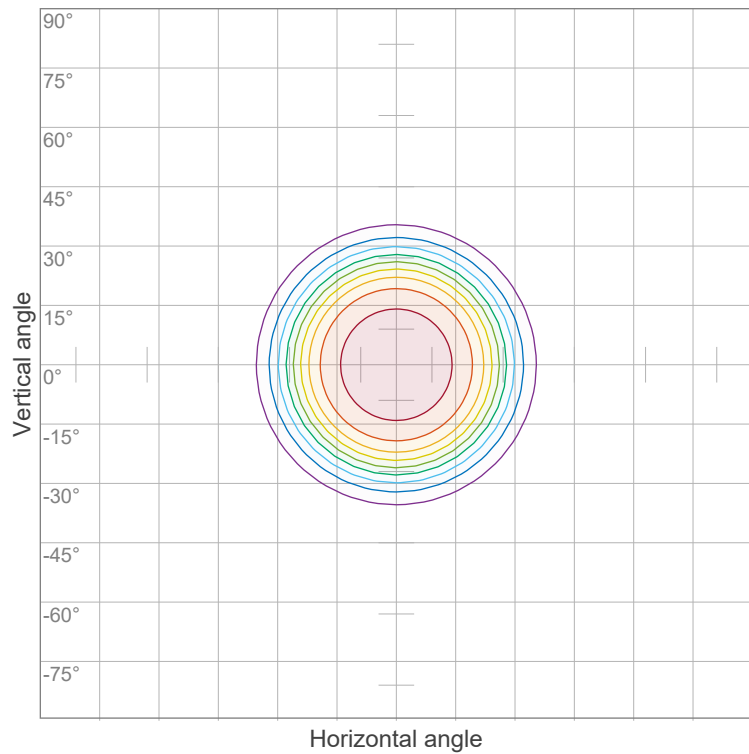


Goniophotometry Report

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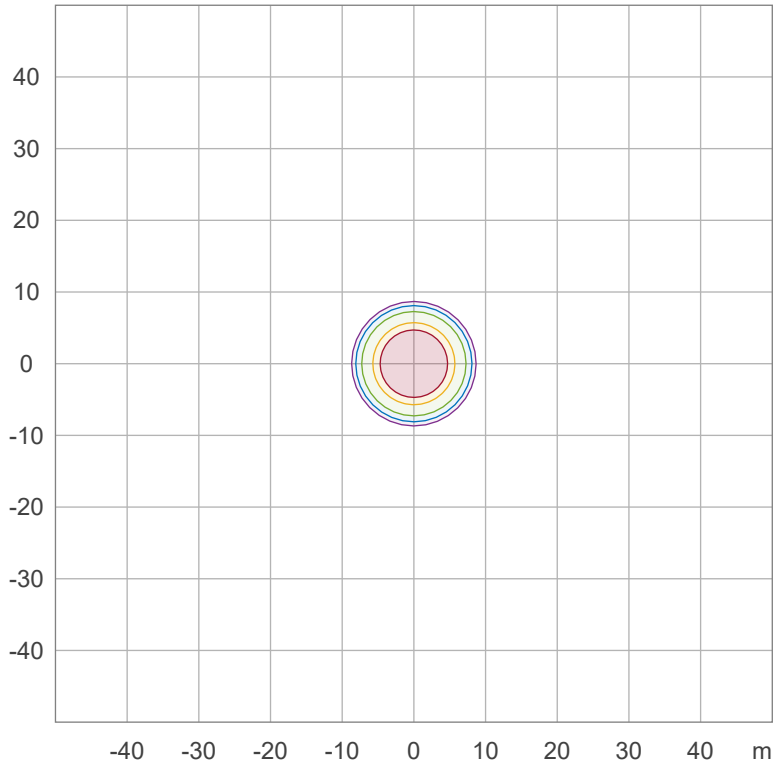
Iso-intensity Diagram (Iso-candela)



90 %	3652.5 cd
80 %	3246.7 cd
70 %	2840.8 cd
60 %	2435.0 cd
50 %	2029.2 cd
40 %	1623.3 cd
30 %	1217.5 cd
20 %	811.7 cd
10 %	405.8 cd

Peak intensity: 4058.3 cd
Number of c-planes: 4

Iso-illuminance Diagram (Iso-lux)



50.0 %	20.3 lx
30.0 %	12.2 lx
10.0 %	4.1 lx
5.0 %	2.0 lx
3.0 %	1.2 lx

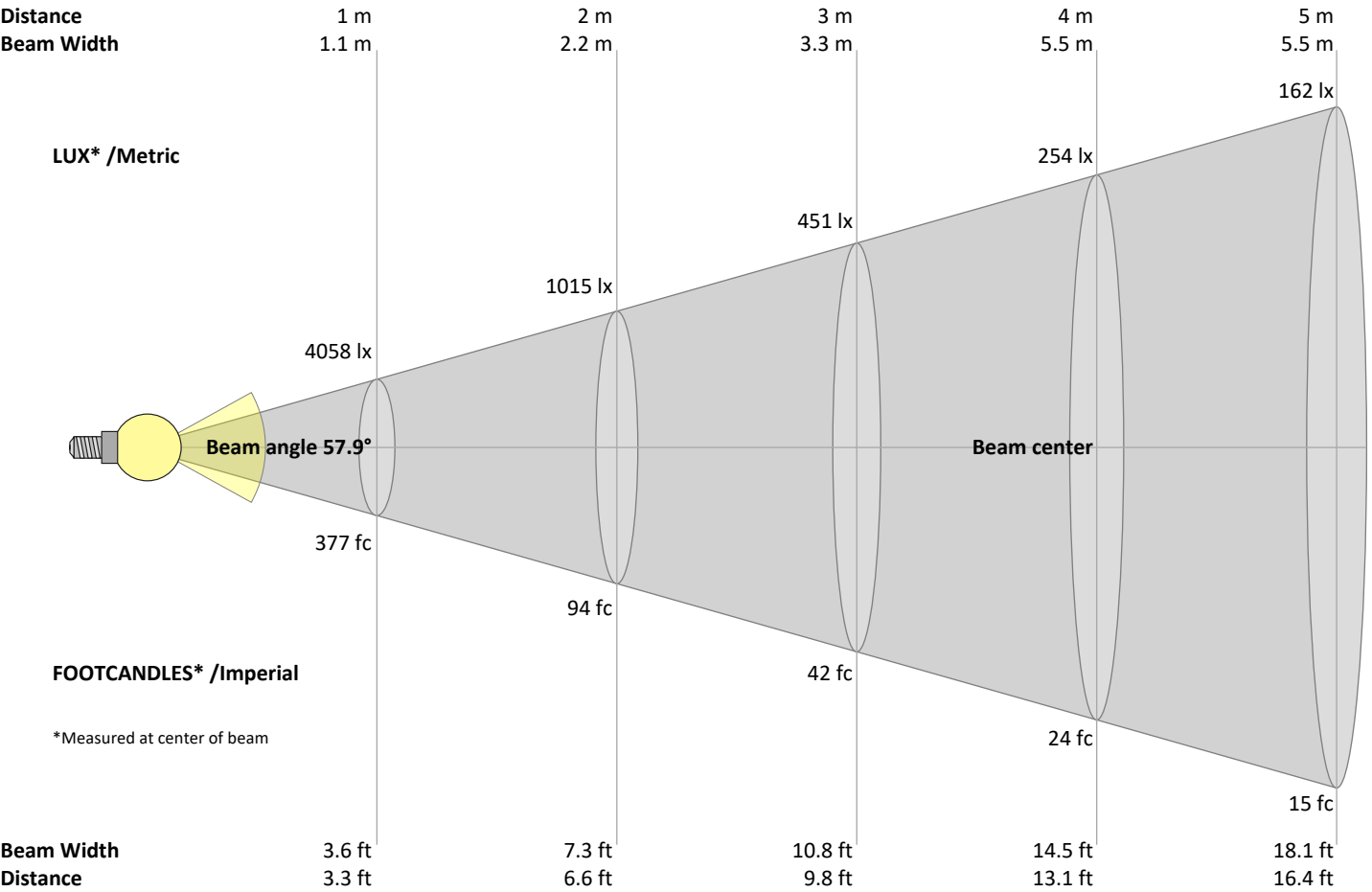
Peak illuminance: 40.6 lx
Mounting height: 10.0 m
Number of c-planes: 4

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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
4058	1015	451	254	162	113	83	63	50	41	34	28	24	21	18	16	14	13	11	10	lux
377	94.3	41.9	23.6	15.1	10.5	7.7	5.9	4.7	3.8	3.1	2.6	2.2	1.9	1.7	1.5	1.3	1.2	1	0.9	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
4058	4050	4029	3996	3951	3894	3821	3734	3634	3517	3373	3185	2934	2597	2213	1815	1429	1076	772	526	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	83%	78%	72%	64%	55%	45%	35%	27%	19%	13%	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
4058	4050	4029	3996	3951	3894	3821	3734	3634	3517	3373	3185	2934	2597	2213	1815	1429	1076	772	526	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	83%	78%	72%	64%	55%	45%	35%	27%	19%	13%	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
4058	4050	4029	3996	3951	3894	3821	3734	3634	3517	3373	3185	2934	2597	2213	1815	1429	1076	772	526	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	83%	78%	72%	64%	55%	45%	35%	27%	19%	13%	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
4058	4050	4029	3996	3951	3894	3821	3734	3634	3517	3373	3185	2934	2597	2213	1815	1429	1076	772	526	cd
100%	100%	99%	98%	97%	96%	94%	92%	90%	87%	83%	78%	72%	64%	55%	45%	35%	27%	19%	13%	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	22.2	22.8	22.3	23.0	23.2	22.2	22.8	22.3	23.0	23.2
	3H	22.2	23.0	22.5	23.2	23.3	22.2	23.0	22.5	23.2	23.3
	4H	22.3	23.1	22.7	23.3	23.6	22.3	23.1	22.7	23.3	23.6
	6H	22.7	23.4	23.0	23.7	24.0	22.7	23.4	23.0	23.7	24.0
	8H	23.0	23.6	23.3	23.9	24.3	23.0	23.6	23.3	23.9	24.3
	12H	23.2	23.8	23.6	24.2	24.6	23.2	23.8	23.6	24.2	24.6
4H	2H	21.9	22.7	22.3	22.9	23.1	21.9	22.7	22.3	22.9	23.1
	3H	22.3	22.9	22.6	23.2	23.6	22.3	22.9	22.6	23.2	23.6
	4H	22.5	23.1	22.9	23.5	24.0	22.5	23.1	22.9	23.5	24.0
	6H	23.0	23.6	23.5	24.0	24.3	23.0	23.6	23.5	24.0	24.3
	8H	23.4	23.9	23.9	24.3	24.6	23.4	23.9	23.9	24.3	24.6
	12H	23.8	24.2	24.3	24.6	25.1	23.8	24.2	24.3	24.6	25.1
8H	4H	22.6	23.2	23.1	23.5	23.9	22.6	23.2	23.1	23.5	23.9
	6H	23.4	23.8	23.9	24.2	24.8	23.4	23.8	23.9	24.2	24.8
	8H	24.0	24.3	24.5	24.8	25.4	24.0	24.3	24.5	24.8	25.4
	12H	24.6	24.8	25.2	25.3	25.9	24.6	24.8	25.2	25.3	25.9
12H	4H	22.6	23.1	23.1	23.5	23.9	22.6	23.1	23.1	23.5	23.9
	6H	23.5	23.8	24.1	24.4	25.0	23.5	23.8	24.1	24.4	25.0
	8H	24.1	24.4	24.7	24.9	25.5	24.1	24.4	24.7	24.9	25.5

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

S = 1.0H	2.7 / -1.2	2.7 / -1.2
S = 1.5H	4.9 / -1.2	4.9 / -1.2
S = 2.0H	6.6 / -1.4	6.6 / -1.4

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	110	110	110	105	105	105	100	100	100	98
1	112	110	107	104	110	107	105	103	103	101	99	99	97	96	95	94	93	91
2	107	102	97	94	104	100	96	93	96	93	90	93	90	88	90	88	86	84
3	101	95	90	86	99	93	89	85	90	86	83	88	84	82	85	82	80	78
4	96	89	83	79	94	87	82	78	85	81	77	83	79	76	81	77	75	73
5	92	83	77	73	90	82	77	72	80	75	72	78	74	71	76	73	70	68
6	87	78	72	68	85	77	72	68	76	71	67	74	70	66	72	69	66	64
7	83	74	68	63	81	73	67	63	71	66	63	70	66	62	69	65	62	60
8	79	70	64	60	78	69	63	59	68	63	59	66	62	59	65	61	58	57
9	75	66	60	56	74	65	60	56	64	59	56	63	58	55	62	58	55	54
10	72	62	57	53	71	62	56	53	61	56	52	60	55	52	59	55	52	51

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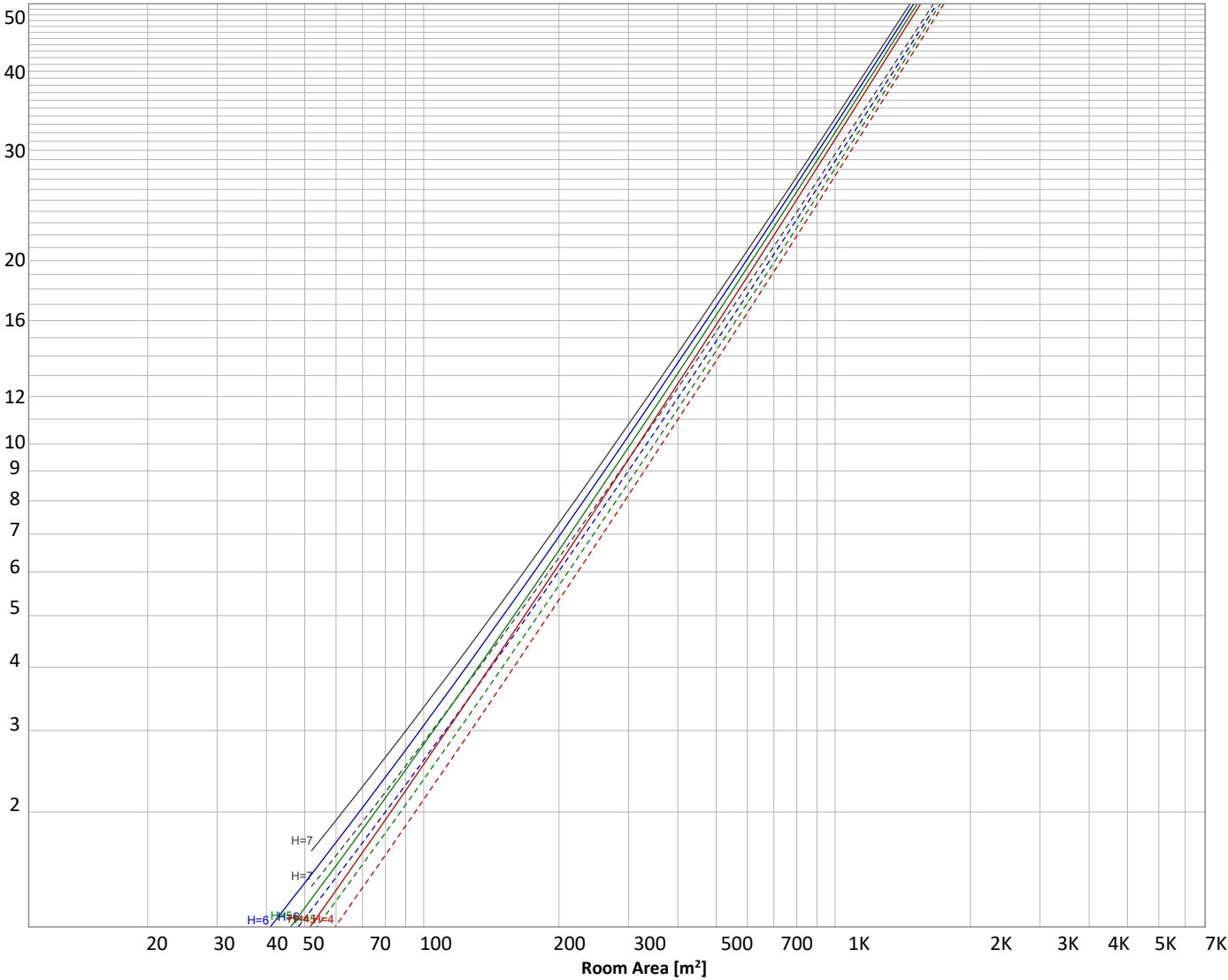
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 3586 lm	p(%)		
H _{down} = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	Wall reflectance
H _{work} = Work area height from floor =	0.00 m	-----	70	50
E _{work} = 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°
379 lm	1033 lm	1235 lm	586 lm	117 lm	49.9 lm	40.8 lm	36.6 lm	31.6 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
15.8 lm	15.4 lm	14.4 lm	13.0 lm	7.34 lm	4.45 lm	3.28 lm	2.01 lm	0.677 lm

Goniophotometry Report

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	379 lm	10.6%
10-20°	1033 lm	28.8%
20-30°	1235 lm	34.4%
30-40°	586 lm	16.3%
40-50°	117 lm	3.3%
50-60°	50 lm	1.4%
60-70°	41 lm	1.1%
70-80°	37 lm	1.0%
80-90°	32 lm	0.9%
90-100°	16 lm	0.4%
100-110°	15 lm	0.4%
110-120°	14 lm	0.4%
120-130°	13 lm	0.4%
130-140°	7 lm	0.2%
140-150°	4 lm	0.1%
150-160°	3 lm	0.1%
160-170°	2 lm	0.1%
170-180°	1 lm	0.0%
Total	3586 lm	100.0%

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	2647 lm	73.8%
0-40°	3233 lm	90.2%
0-60°	3401 lm	94.8%
60-90°	109 lm	3.0%
70-100°	84 lm	2.3%
90-120°	46 lm	1.3%
0-90°	3510 lm	97.9%
90-180°	76 lm	2.1%
0-180°	3586 lm	100.0%

BUG rating

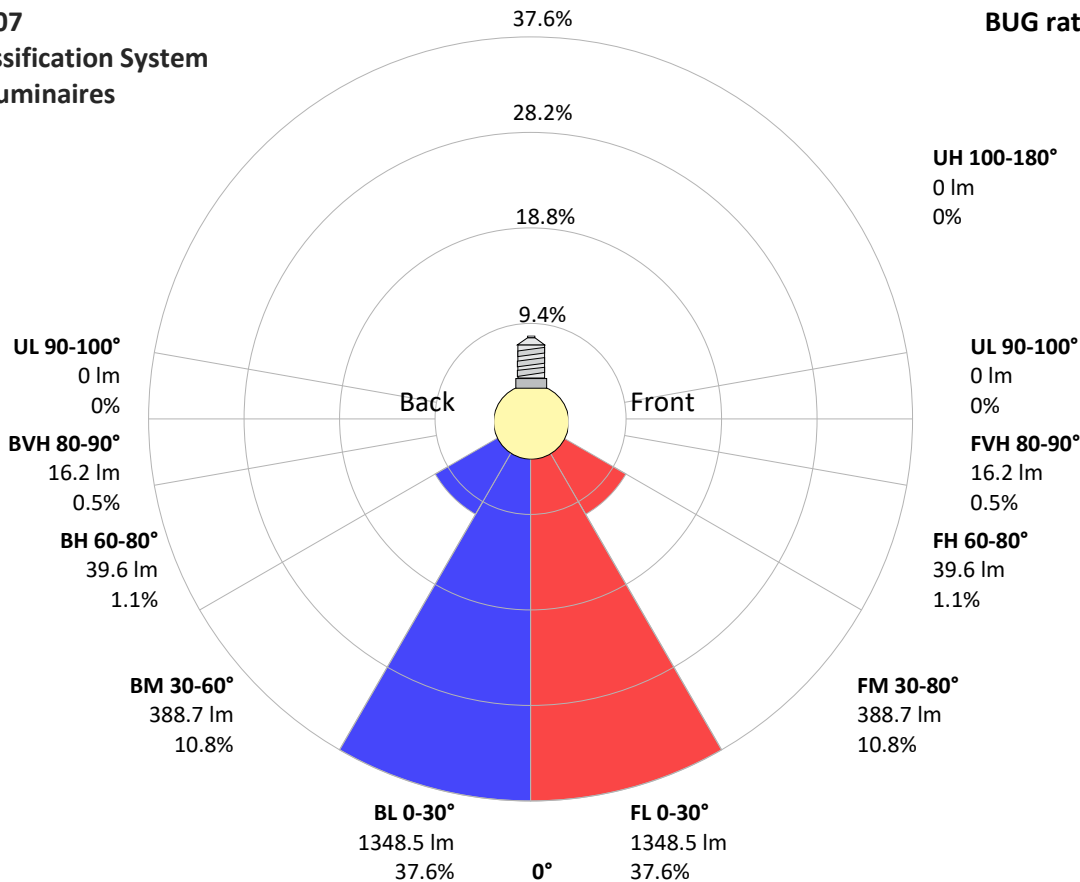
	Lumen	% Total
Forward light		
Low(0-30°)	1349 lm	37.6%
Medium(30-60°)	389 lm	10.8%
High(60-80°)	40 lm	1.1%
Very high(80-90°)	16 lm	0.5%
Back light		
Low(0-30°)	1349 lm	37.6%
Medium(30-60°)	389 lm	10.8%
High(60-80°)	40 lm	1.1%
Very high(80-90°)	16 lm	0.5%
Uplight		
Low(90-100°)	0 lm	0.0%
High(100-180°)	0 lm	0.0%

Intensity peaks

Max intensity	4058 cd
Intensity, 90°	14 cd
Intensity, 0°	4058 cd

IESNA TM-15-07
Luminaire Classification System
For Outdoor Luminaires

BUG rating B3 U1 G1



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Power Details

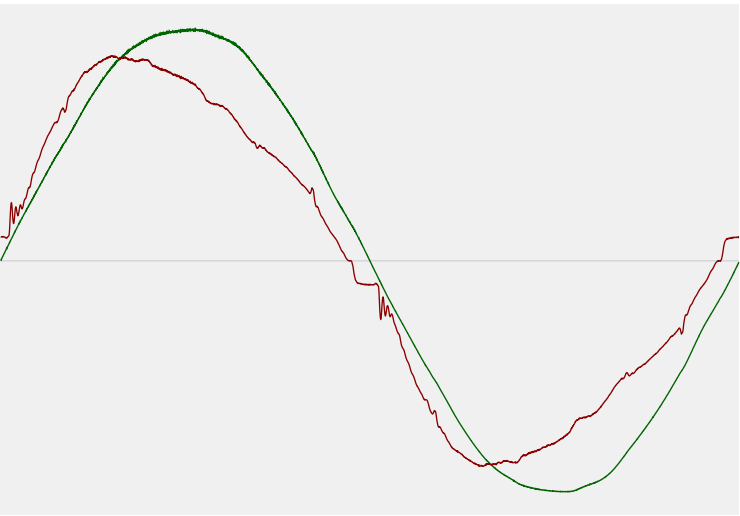
Input Power

Power feed to light source	41.3 W
Frequency of input power	50.1 Hz
RMS Input voltage feed, V_{RMS}	243 V
RMS Input current feed, I_{RMS}	0.176 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.75 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.86%
Total harmonic distortion of the voltage	1.23%

Efficiency

Radiated power efficiency	31.4%
<div><div></div></div>	
Lumen efficiency	87 lm/W
<div><div></div></div>	

Input Power Curve



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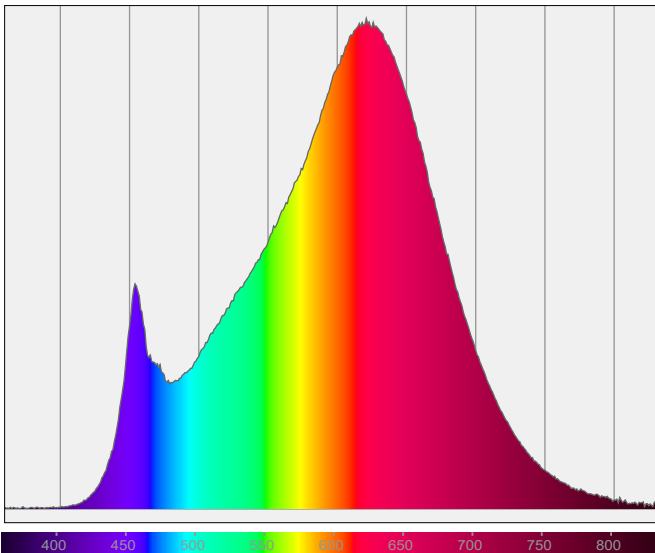
1_PHOT_SKIN+BONES-4050lmChip-2700K-58Deg_2303
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Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R _f 91.5 — R _g 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 92.5	Color coordinate CIEs 1960	(u;v) = (0.263;0.352)
Color Rendering Index, R9 (red component)	R9 = 61.3	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 91.5 — R _g 99.6	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 89.8		

Goniophotometry Report

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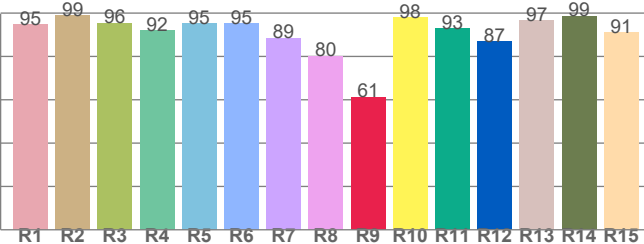
CIE 1931



CIE 1931 – zoomed on Planckian locus



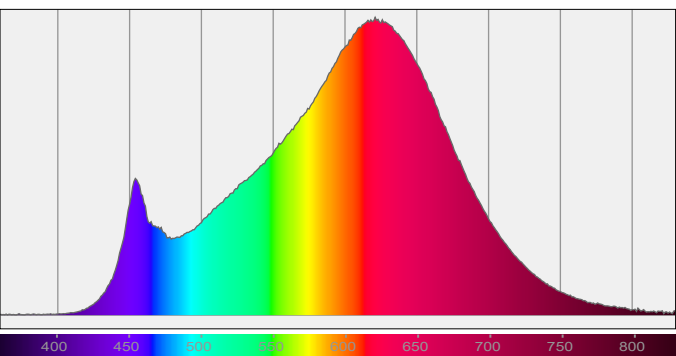
Color Rendering Index per reference color (CIE 1995)



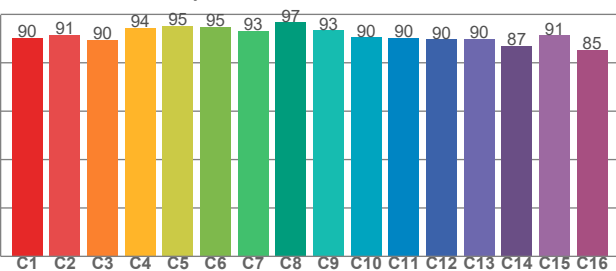
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
94.6	98.8	95.5	92.1	95.2	95.3	88.6	80.2	61.3	98.0	93.1	86.8	96.5	98.7	91.0

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



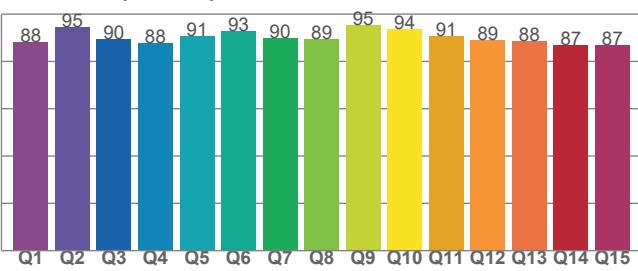
TM30-18 Rf-values per hue bin



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
90.3	91.4	89.5	94.4	95.2	94.9	93.1	96.6	93.4	90.4	90.4	89.6	89.7	86.9	91.3	85.3

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	94.6	89.6	87.7	90.7	92.8	90.0	89.2	95.3	93.6	90.8	88.8	88.5	86.9	87.0