Goniophotometry Report

1_PHOT_SKIN+BONES-4750lmChip-4000K-Spreader_2303
www.factorylux.com

Tested Light Source - 1_PHOT_SKIN+BONES-4750lmChip-4000K-Spreader_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)

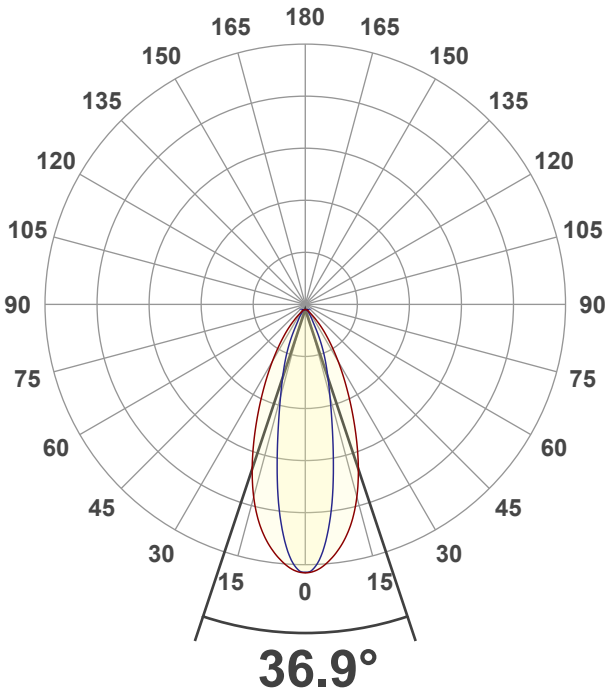
Measurement Conditions

Number of C-planes and Resolution	16 planes – 22.5°
γ (gamma)-Resolution	1°
Test Distance	1.50 m
Input Power, Power and Displ. Factors	41.4 W – PF 0.97 – DPF 0.97
Input RMS Voltage and Current	240 V – 0.178 A
Frequency of Input Power	50.2 Hz

Main Light Measurement Results

Output	4061 lm
Efficiency	98 lm/W
Peak Intensity and Beam Angle	7098 cd – 36.9°
Color Rendering Index	CRI 92.6

Light Intensity Distribution



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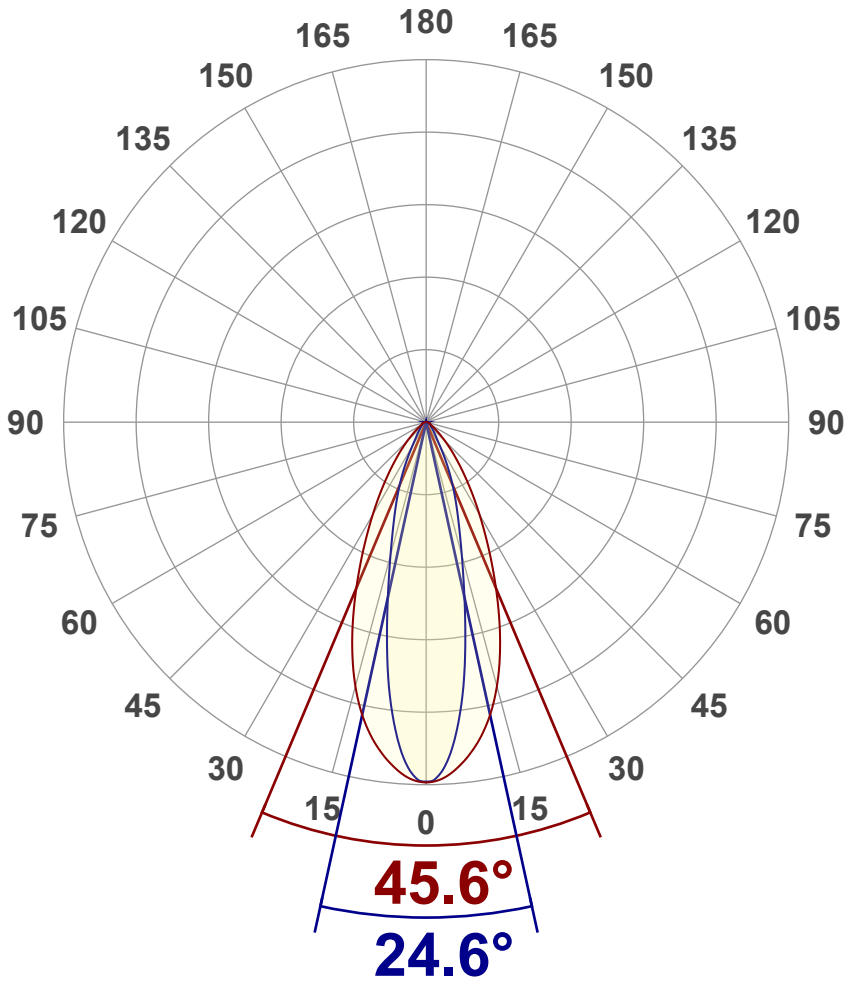
Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	4061 lm
Peak Intensity	7098 cd
Beam Angle (50%)	36.9°
Beam Angle (90%)	24.6°
Beam Angle (10%)	45.6°

Cut-off Angle

Average 2,5%	98.7°

Field Angle

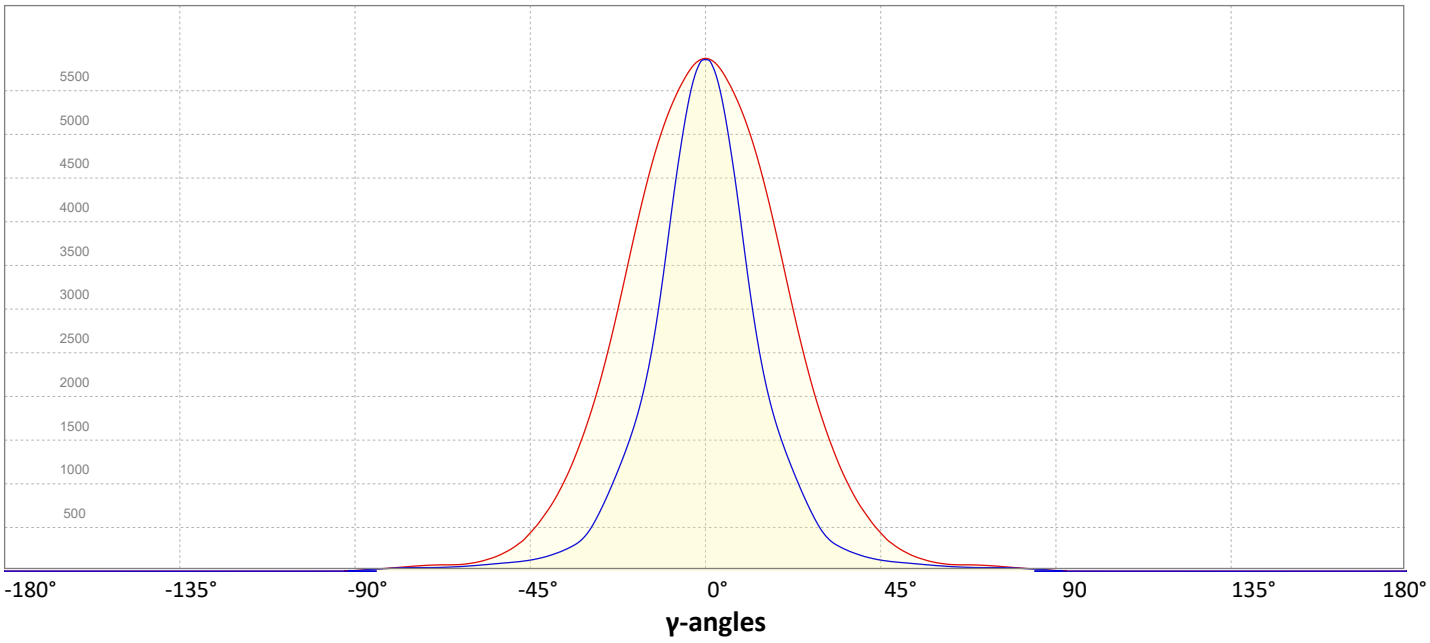
Average 10%	70.9°

Intensity Ratio

In 120° cone	95.8%
In 90° cone	88.9%

C000-C180
C090-C270

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



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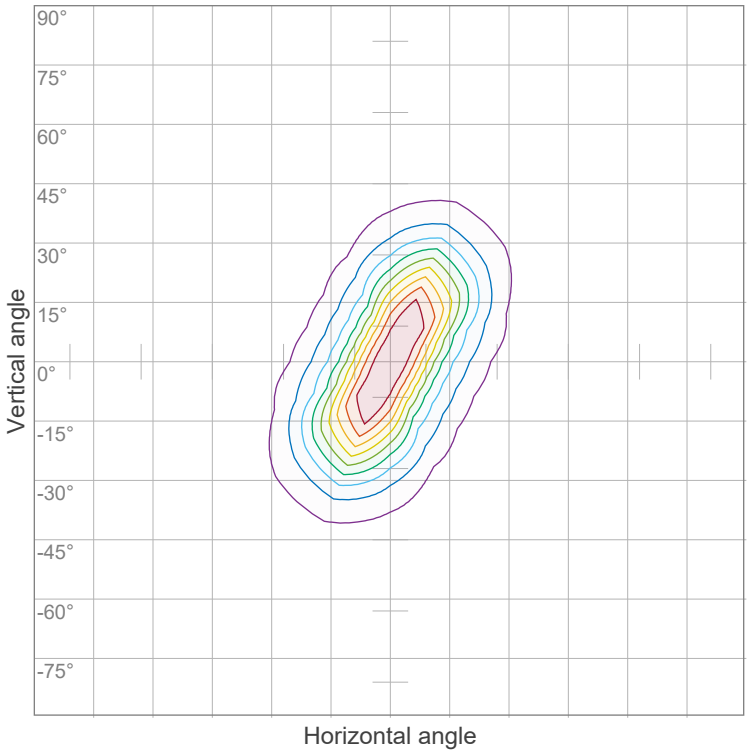
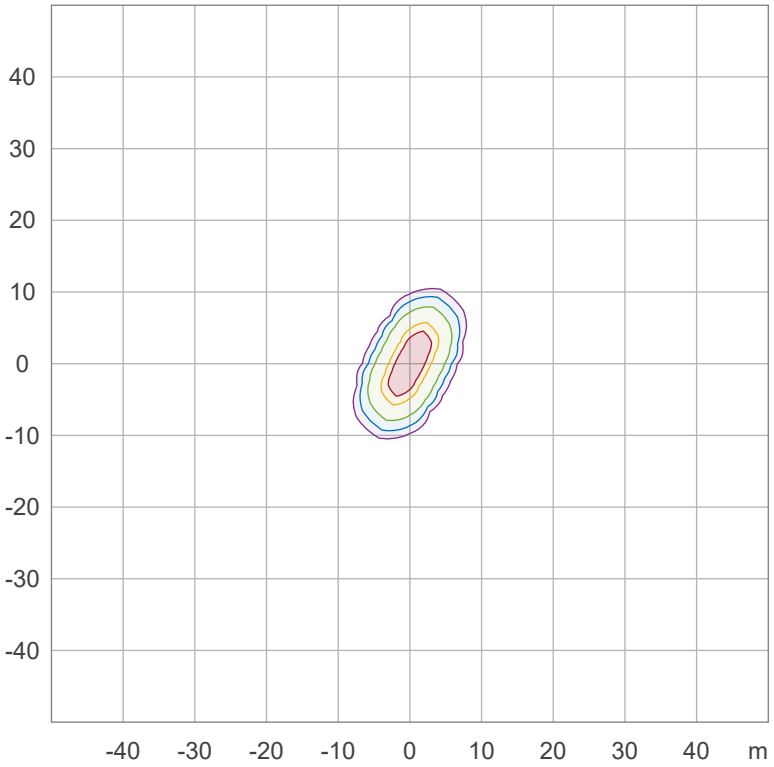
Iso-intensity Diagram (Iso-candela)



90 %	6386.3 cd
80 %	5676.7 cd
70 %	4967.1 cd
60 %	4257.6 cd
50 %	3548.0 cd
40 %	2838.4 cd
30 %	2128.8 cd
20 %	1419.2 cd
10 %	709.6 cd

Peak intensity: 7095.9 cd
Number of c-planes: 16

Iso-illuminance Diagram (Iso-lux)



50.0 %	35.4 lx
30.0 %	21.2 lx
10.0 %	7.1 lx
5.0 %	3.5 lx
3.0 %	2.1 lx

Peak illuminance: 70.7 lx
Mounting height: 10.0 m
Number of c-planes: 16

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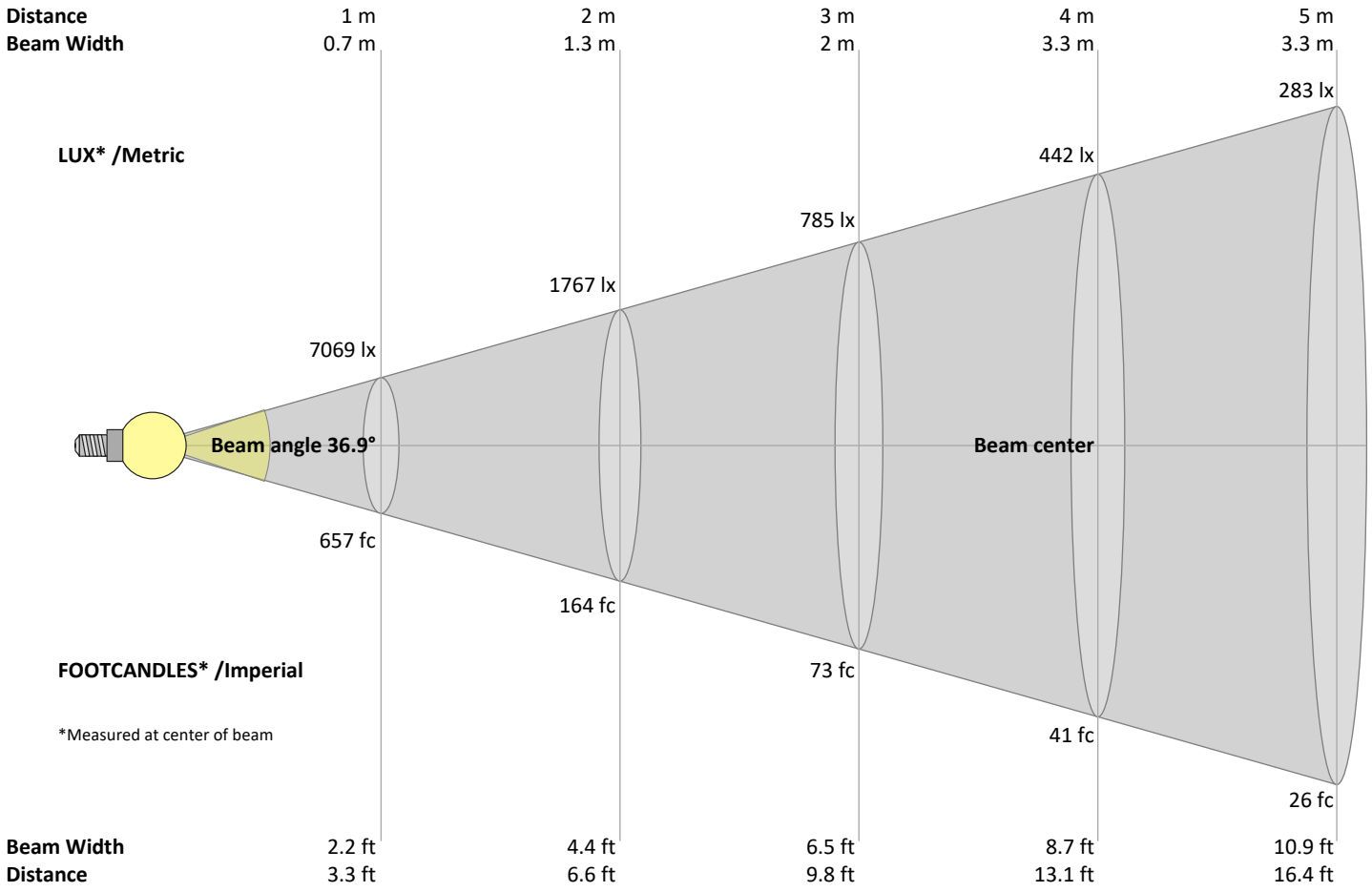
Beam Details



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
7069	1767	785	442	283	196	144	110	87	71	58	49	42	36	31	28	24	22	20	18	lux
656.7	164.2	73	41	26.3	18.2	13.4	10.3	8.1	6.6	5.4	4.6	3.9	3.4	2.9	2.6	2.3	2	1.8	1.6	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
7069	7037	6919	6737	6516	6253	5940	5572	5155	4697	4217	3731	3265	2836	2445	2099	1790	1513	1270	1060	cd
100%	100%	98%	95%	92%	88%	84%	79%	73%	66%	60%	53%	46%	40%	35%	30%	25%	21%	18%	15%	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
7069	6946	6567	5973	5248	4429	3646	2986	2465	2060	1735	1452	1190	947	729	549	426	351	297	253	cd
100%	98%	93%	84%	74%	63%	52%	42%	35%	29%	25%	21%	17%	13%	10%	8%	6%	5%	4%	4%	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
7069	7037	6919	6737	6516	6253	5940	5572	5155	4697	4217	3731	3265	2836	2445	2099	1790	1513	1270	1060	cd
100%	100%	98%	95%	92%	88%	84%	79%	73%	66%	60%	53%	46%	40%	35%	30%	25%	21%	18%	15%	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
7069	6946	6567	5973	5248	4429	3646	2986	2465	2060	1735	1452	1190	947	729	549	426	351	297	253	cd
100%	98%	93%	84%	74%	63%	52%	42%	35%	29%	25%	21%	17%	13%	10%	8%	6%	5%	4%	4%	of 0°val

Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances											
	ρ Ceiling	70	70	50	50	30	70	70	50	50	30
	ρ Walls	50	30	50	30	30	50	30	50	30	30
	ρ Floor	20	20	20	20	20	20	20	20	20	20
Room size H = mounting height above eye level		**Viewed Crosswise** (Viewing direction orthogonal to lamp length axis)					**Viewed Endwise** (Viewing direction parallel to lamp length axis)				
X	**Y**										
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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

n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a

UGR data could not be calculated due to missing/wrong symmetry. Goto Edit->Photometric->Corrections and select Correct asymmetry.

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	102	102	102	100
1	113	110	107	105	110	108	105	103	104	102	100	100	98	97	96	95	94	92
2	107	102	97	94	105	100	96	93	97	93	90	94	91	89	91	89	87	85
3	101	94	89	85	99	93	88	84	90	86	83	88	84	82	86	83	80	79
4	96	88	82	78	94	87	82	77	85	80	77	83	79	76	81	77	75	73
5	91	83	77	72	90	82	76	72	80	75	71	78	74	70	77	73	70	68
6	87	78	71	67	85	77	71	67	75	70	66	74	69	66	73	69	65	64
7	83	73	67	63	81	72	67	63	71	66	62	70	65	62	69	65	62	60
8	79	69	63	59	78	69	63	59	68	62	59	66	62	58	65	61	58	57
9	75	66	60	56	74	65	59	56	64	59	55	63	59	55	62	58	55	54
10	72	62	57	53	71	62	56	53	61	56	52	60	56	52	60	55	52	51

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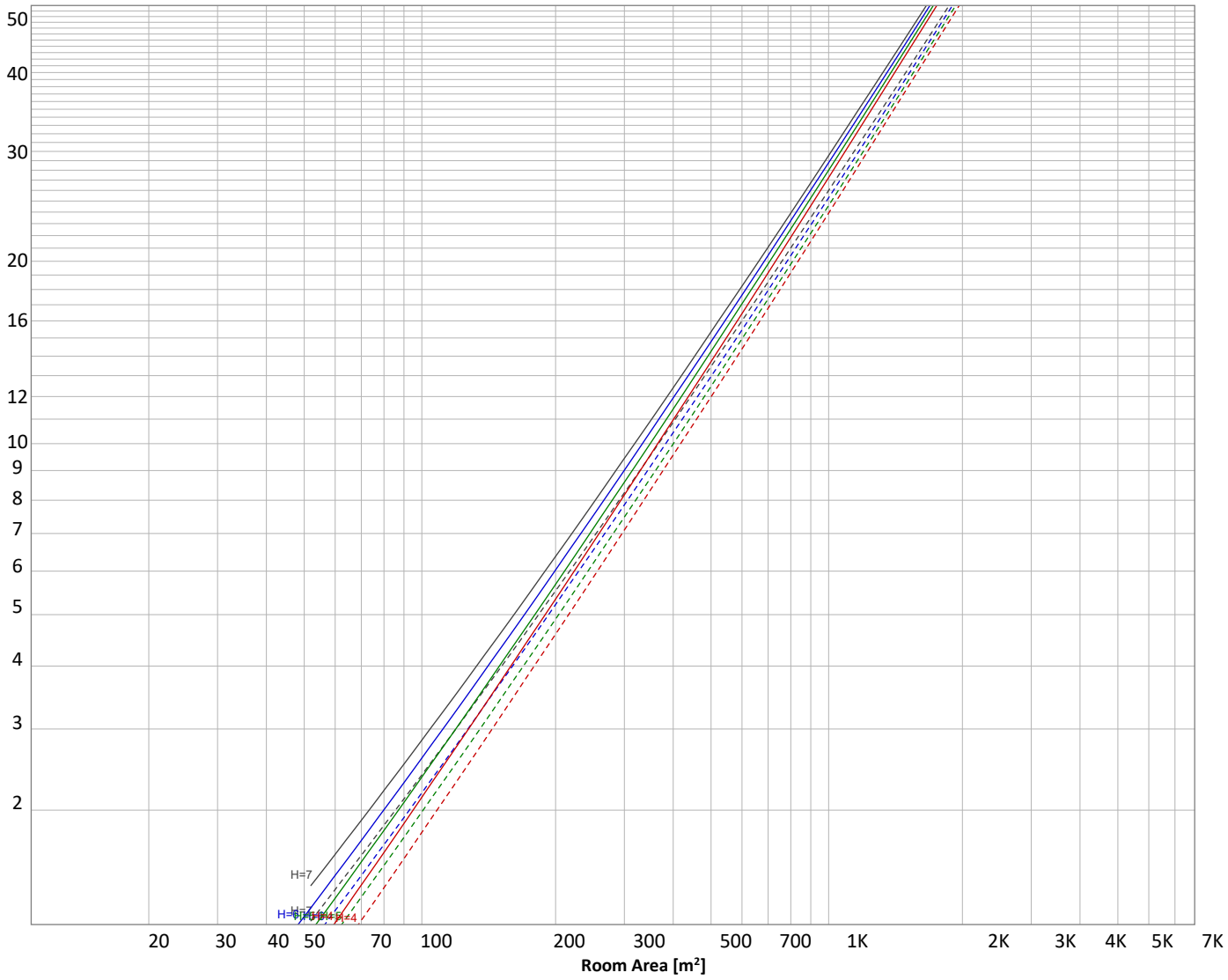
Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 4061 lm
H_{down} = Lamp distance from ceiling =	0.00 m
H_{work} = Work area height from floor =	0.00 m
E_{work} = Average lux on work area =	100 lx

	ρ(%)		
Line type	Ceiling reflectance	Wall reflectance	Floor reflectance
----------	70	50	30
————	50	30	20

Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
588 lm	1152 lm	1050 lm	638 lm	313 lm	149 lm	80.2 lm	59.8 lm	29.3 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
1.91 lm	0.000 lm	0.000 lm	0.000 lm	0.000 lm	0.000 lm	0.000 lm	0.000 lm	0.000 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	588 lm	14.5%
10-20°	1152 lm	28.4%
20-30°	1050 lm	25.9%
30-40°	638 lm	15.7%
40-50°	313 lm	7.7%
50-60°	149 lm	3.7%
60-70°	80 lm	2.0%
70-80°	60 lm	1.5%
80-90°	29 lm	0.7%
90-100°	2 lm	0.0%
100-110°	0 lm	0.0%
110-120°	0 lm	0.0%
120-130°	0 lm	0.0%
130-140°	0 lm	0.0%
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	4061 lm	100.0%

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	2790 lm	68.7%
0-40°	3428 lm	84.4%
0-60°	3890 lm	95.8%
60-90°	169 lm	4.2%
70-100°	91 lm	2.2%
90-120°	2 lm	0.0%
0-90°	4059 lm	100.0%
90-180°	2 lm	0.0%
0-180°	4061 lm	100.0%

BUG rating

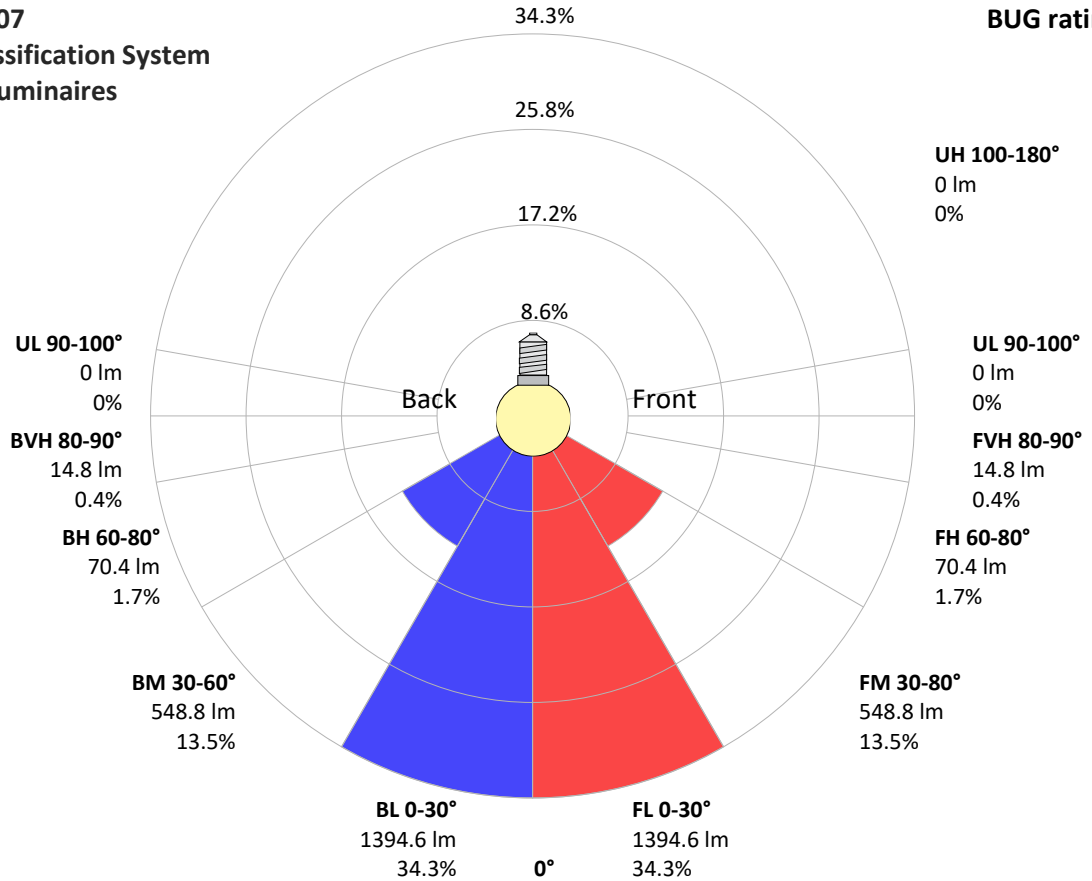
	Lumen	% Total
Forward light		
Low(0-30°)	1395 lm	34.3%
Medium(30-60°)	549 lm	13.5%
High(60-80°)	70 lm	1.7%
Very high(80-90°)	15 lm	0.4%
Back light		
Low(0-30°)	1395 lm	34.3%
Medium(30-60°)	549 lm	13.5%
High(60-80°)	70 lm	1.7%
Very high(80-90°)	15 lm	0.4%
Uplight		
Low(90-100°)	0 lm	0.0%
High(100-180°)	0 lm	0.0%

Intensity peaks

Max intensity	7098	cd
Intensity, 90°	9	cd
Intensity, 0°	7069	cd

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

BUG rating B3 U1 G1



Goniophotometry Report

1_PHOT_SKIN+BONES-4750lmChip-4000K-Spreader_2303
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Power Details

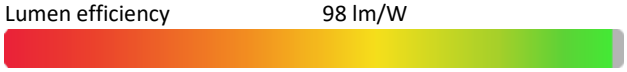
Input Power

Power feed to light source	41.4 W
Frequency of input power	50.2 Hz
RMS Input voltage feed, V_{RMS}	240 V
RMS Input current feed, I_{RMS}	0.178 A
Volt-Ampere or apparent power = V_{RMS}*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	10.82%
Total harmonic distortion of the voltage	1.2%

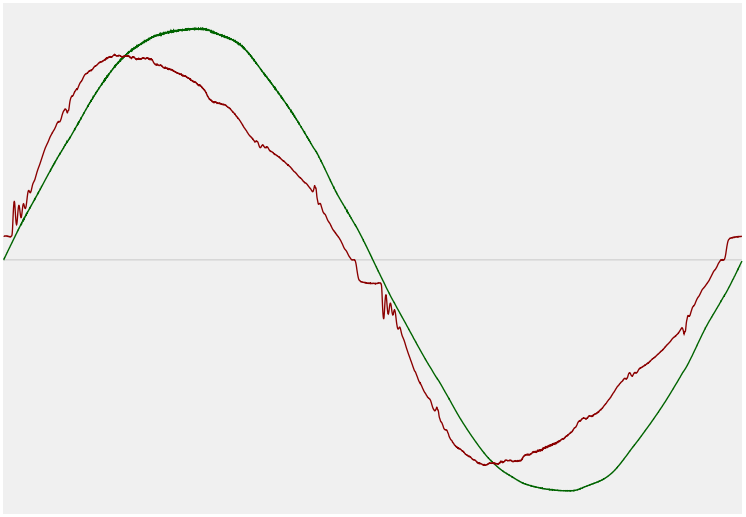
Efficiency

Radiated power efficiency 35.5%

Lumen efficiency 98 lm/W



Input Power Curve



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1_PHOT_SKIN+BONES-4750lmChip-4000K-Spreader_2303
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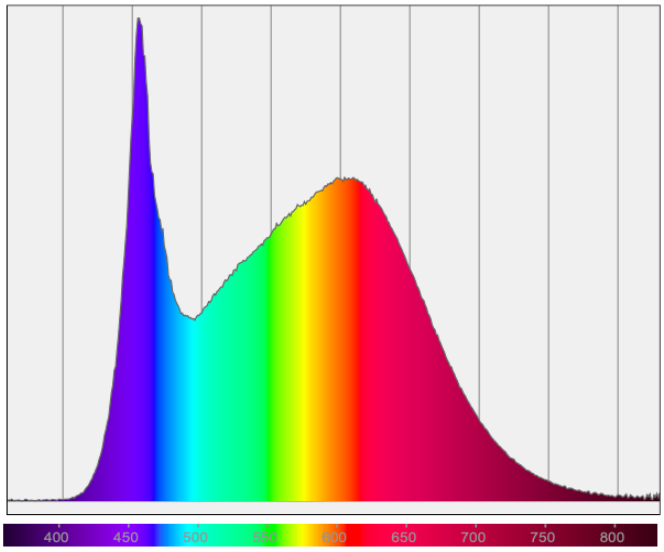
Color Measurements

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		

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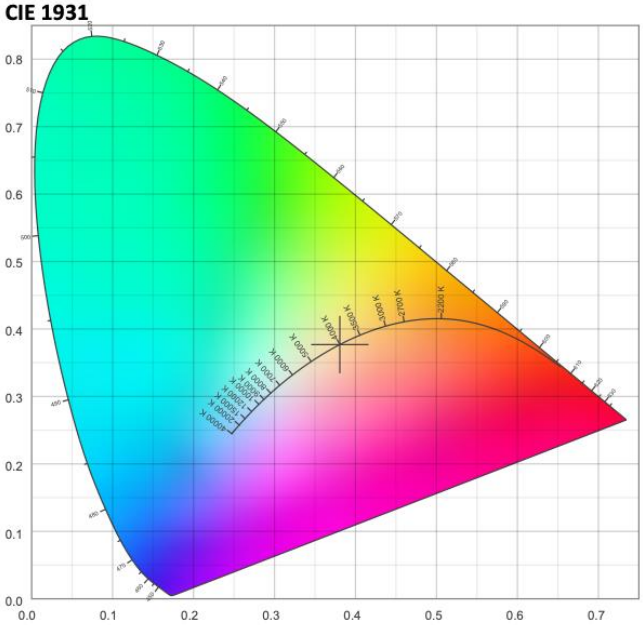
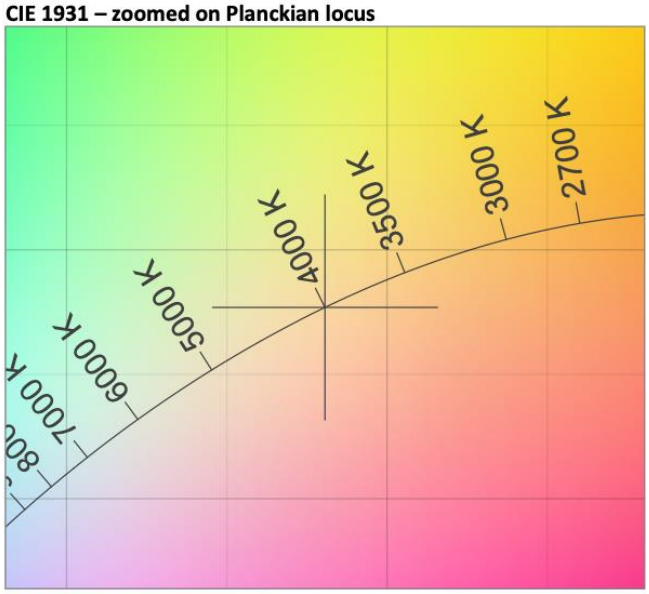
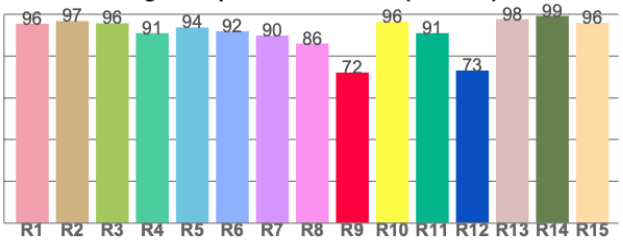
CIE 1931



CIE 1931 – zoomed on Planckian locus



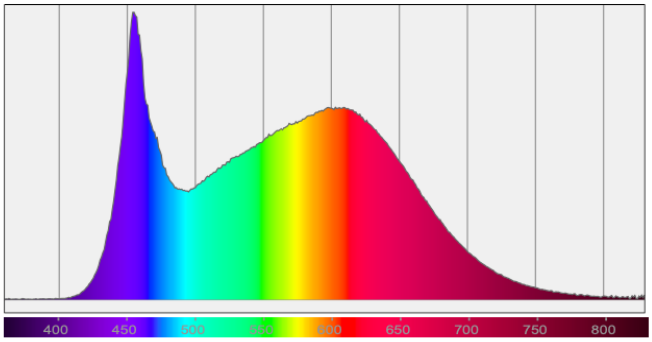
Color Rendering Index per reference color (CIE 1995)



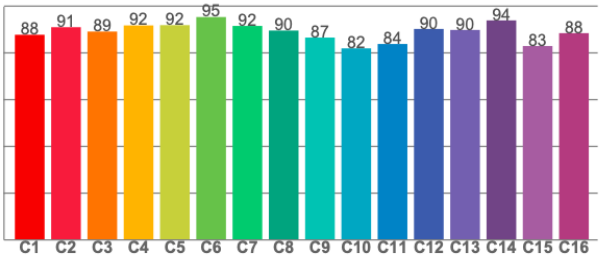
CRI R values, only R1-R8 are used to calculate final CRI value

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

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



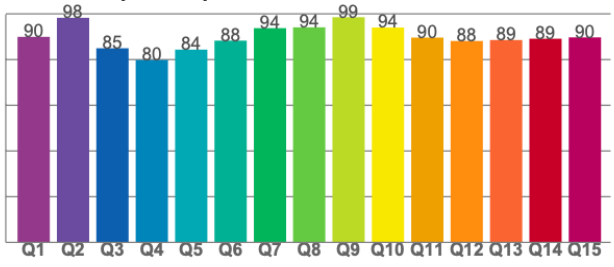
TM30-18 Rf-values per hue bin



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
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

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