

Tested Light Source - 1\_PHOT\_NINETY-NINE-2350lmChip-4000K-58Deg-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°

2°

1.50 m

15.8 W – PF 0.98 – DPF 0.98

240 V – 0.067 A

50.1 Hz

Main Light Measurement Results

Output

Efficiency

Peak Intensity and Beam Angle

Color Rendering Index

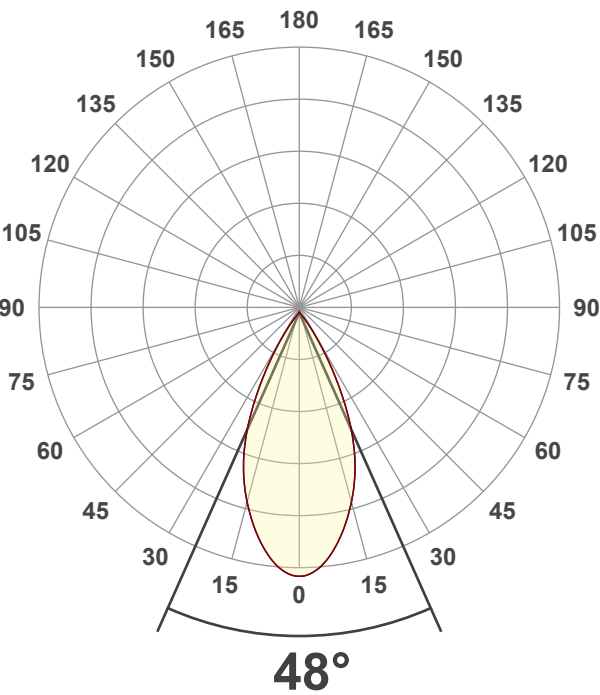
1094 lm

69 lm/W

1821 cd – 48°

CRI 92.7

Light Intensity Distribution



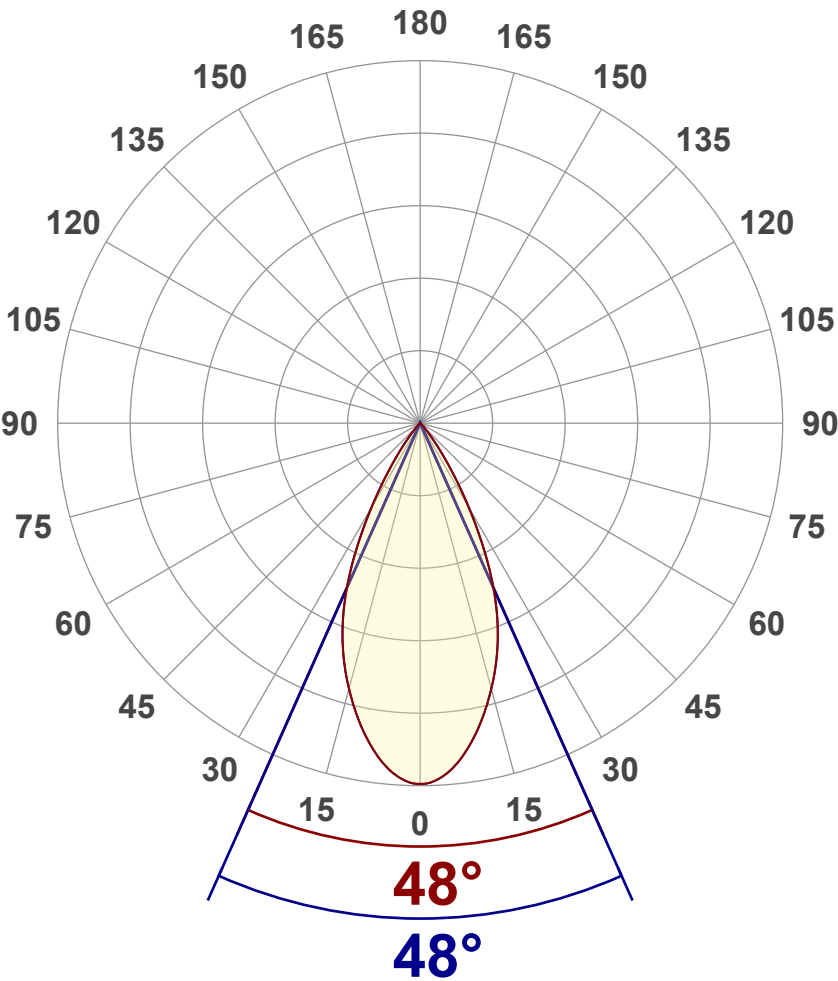
Goniophotometry Report

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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	1094 lm
Peak Intensity	1821 cd
Beam Angle (50%)	48°
Beam Angle (90%)	48°
Beam Angle (10%)	48°

Cut-off Angle

Average 2,5%	82.6°
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Field Angle

Average 10%	71.7°
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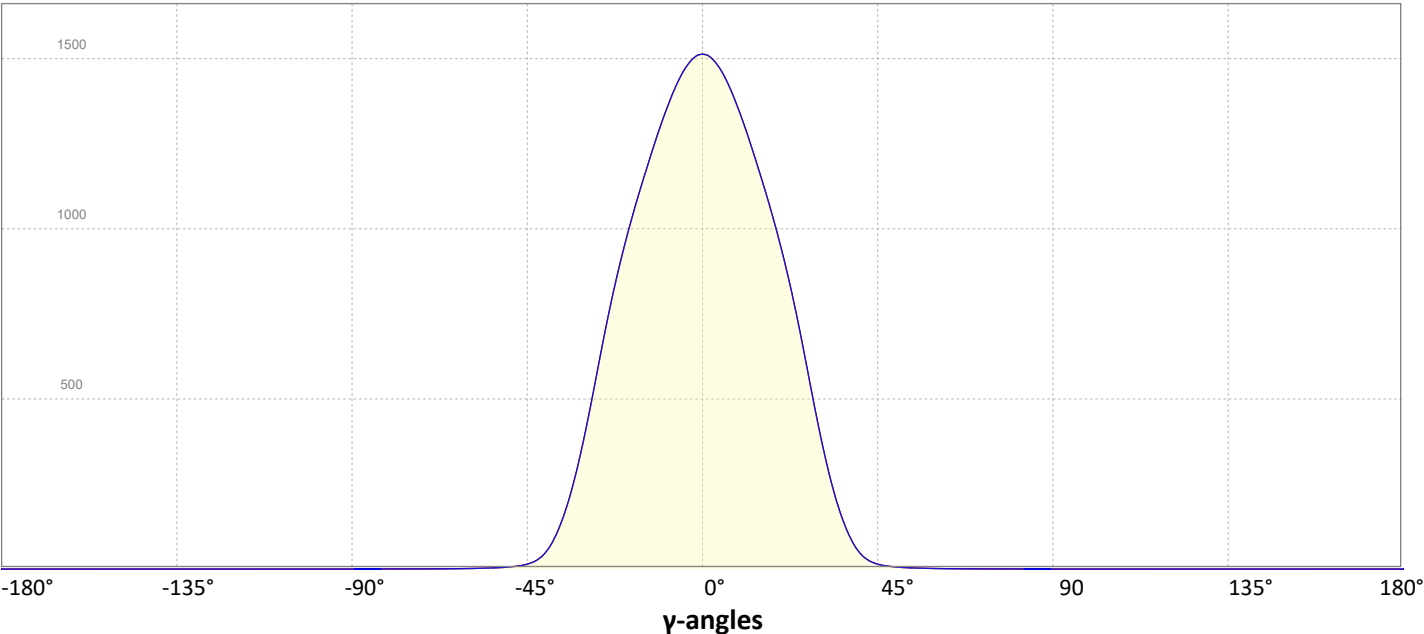
Intensity Ratio

In 120° cone	99.6%
In 90° cone	98.8%

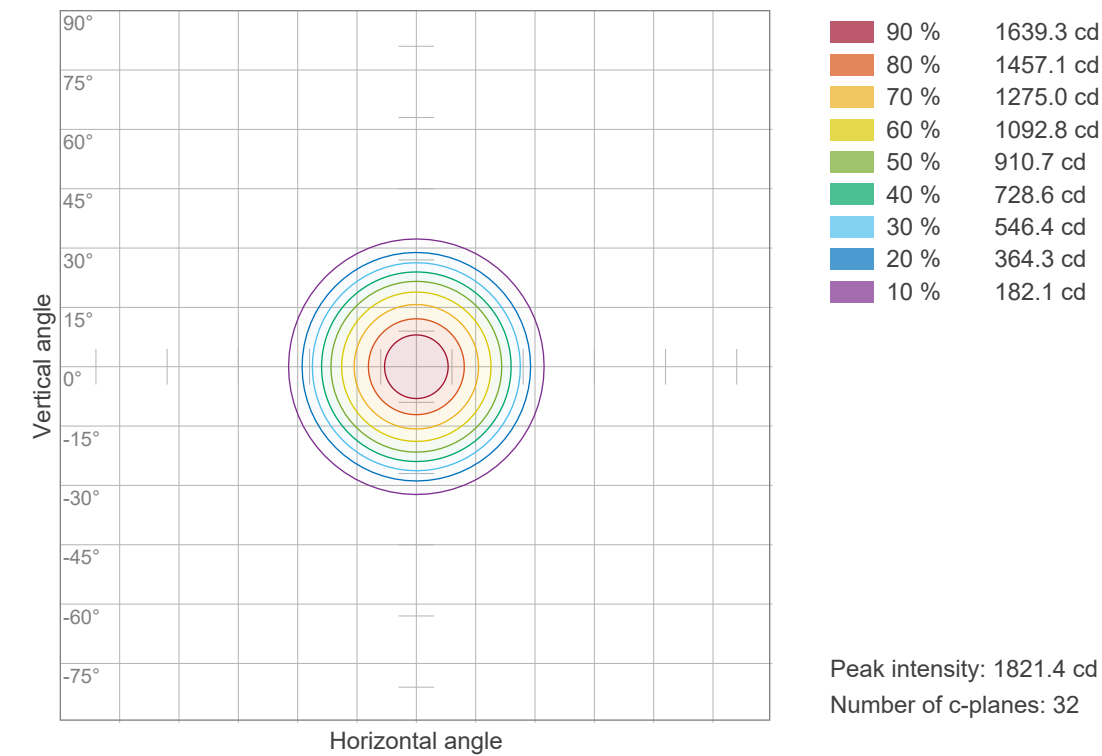
C000-C180

C090-C270

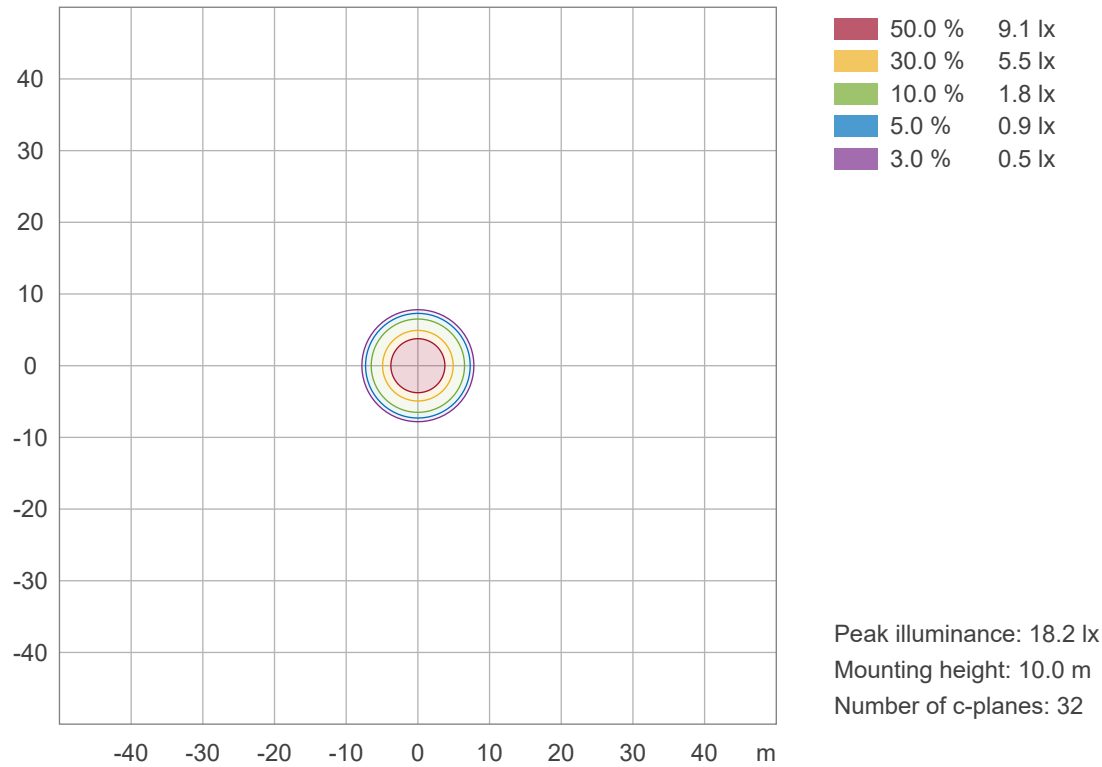
Linear distribution diagram - Intensity (candela) vs γ-angle



Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)

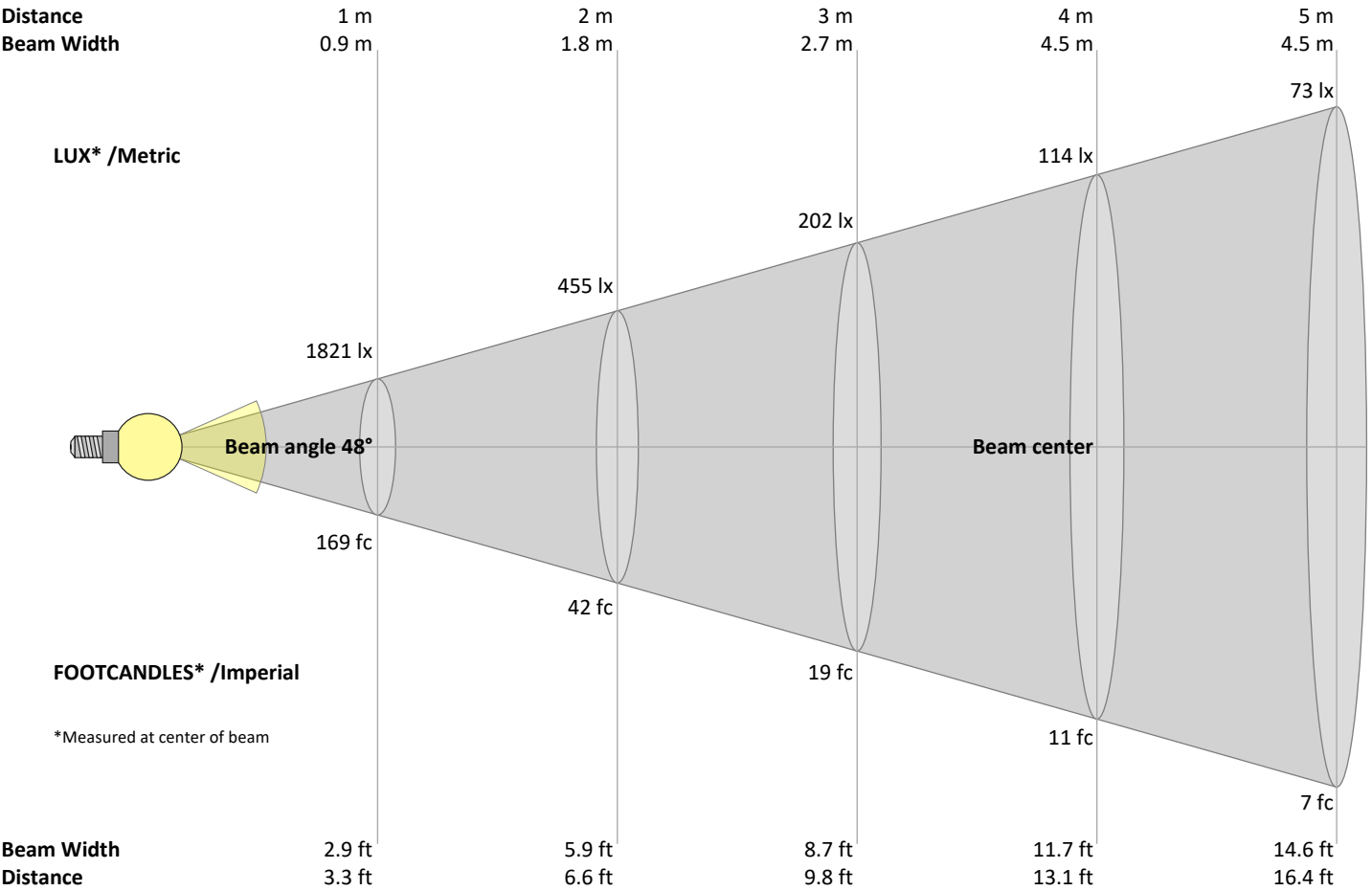


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Beam Details



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
1821	455	202	114	73	51	37	28	22	18	15	13	11	9	8	7	6	6	5	5	lux
169.2	42.3	18.8	10.6	6.8	4.7	3.5	2.6	2.1	1.7	1.4	1.2	1	0.9	0.8	0.7	0.6	0.5	0.5	0.4	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
1821	1811	1781	1734	1672	1600	1520	1434	1345	1250	1147	1035	910	773	630	493	369	263	177	112	cd
100%	99%	98%	95%	92%	88%	83%	79%	74%	69%	63%	57%	50%	42%	35%	27%	20%	14%	10%	6%	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
1821	1811	1781	1734	1672	1600	1520	1434	1345	1250	1147	1035	910	773	630	493	369	263	177	112	cd
100%	99%	98%	95%	92%	88%	83%	79%	74%	69%	63%	57%	50%	42%	35%	27%	20%	14%	10%	6%	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
1821	1811	1781	1734	1672	1600	1520	1434	1345	1250	1147	1035	910	773	630	493	369	263	177	112	cd
100%	99%	98%	95%	92%	88%	83%	79%	74%	69%	63%	57%	50%	42%	35%	27%	20%	14%	10%	6%	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
1821	1811	1781	1734	1672	1600	1520	1434	1345	1250	1147	1035	910	773	630	493	369	263	177	112	cd
100%	99%	98%	95%	92%	88%	83%	79%	74%	69%	63%	57%	50%	42%	35%	27%	20%	14%	10%	6%	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					Viewed Endwise				
X	Y	(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
2H	2H	16.5	17.0	16.6	17.2	17.4	16.5	17.0	16.6	17.2	17.4
	3H	16.2	16.9	16.5	17.1	17.2	16.2	16.9	16.5	17.1	17.2
	4H	16.1	16.8	16.5	17.0	17.2	16.1	16.8	16.5	17.0	17.2
	6H	16.1	16.6	16.4	16.9	17.3	16.1	16.6	16.4	16.9	17.3
	8H	16.0	16.6	16.4	16.9	17.3	16.0	16.6	16.4	16.9	17.3
	12H	16.0	16.5	16.3	16.9	17.3	16.0	16.5	16.3	16.9	17.3
4H	2H	16.1	16.8	16.5	17.0	17.2	16.1	16.8	16.5	17.0	17.2
	3H	16.0	16.5	16.3	16.9	17.3	16.0	16.5	16.3	16.9	17.3
	4H	15.8	16.3	16.3	16.7	17.3	15.8	16.3	16.3	16.7	17.3
	6H	15.8	16.3	16.3	16.6	17.0	15.8	16.3	16.3	16.6	17.0
	8H	15.7	16.2	16.2	16.5	16.9	15.7	16.2	16.2	16.5	16.9
	12H	15.7	16.0	16.2	16.4	16.9	15.7	16.0	16.2	16.4	16.9
8H	4H	15.7	16.2	16.2	16.5	16.9	15.7	16.2	16.2	16.5	16.9
	6H	15.7	16.0	16.2	16.4	17.0	15.7	16.0	16.2	16.4	17.0
	8H	15.7	15.9	16.2	16.4	17.1	15.7	15.9	16.2	16.4	17.1
	12H	15.6	15.8	16.2	16.3	16.9	15.6	15.8	16.2	16.3	16.9
12H	4H	15.6	16.0	16.1	16.4	16.9	15.6	16.0	16.1	16.4	16.9
	6H	15.7	15.9	16.2	16.4	17.0	15.7	15.9	16.2	16.4	17.0
	8H	15.6	15.8	16.2	16.3	16.9	15.6	15.8	16.2	16.3	16.9

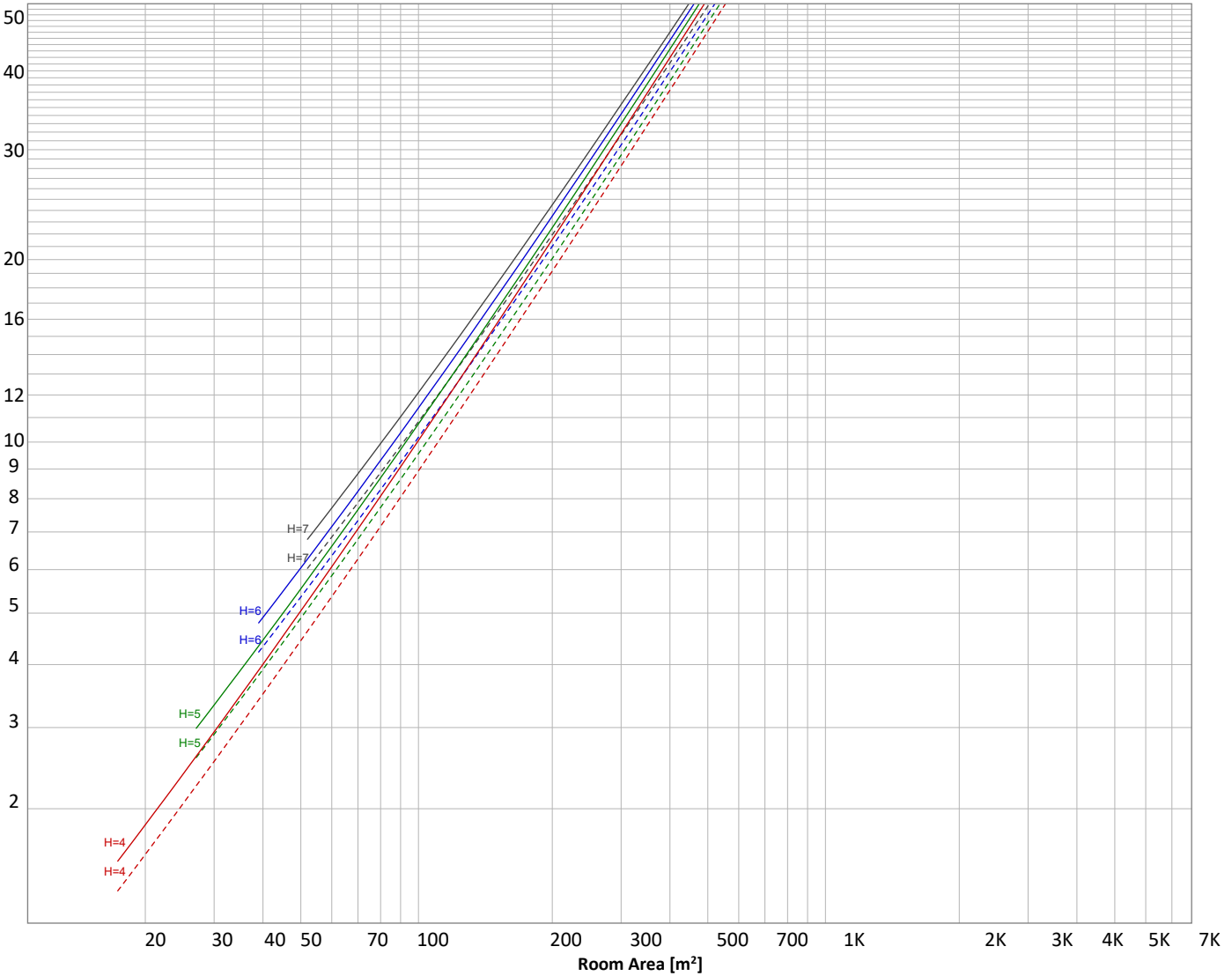
Variations with the observer position for the luminaire spacings, S:

S = 1.0H	6.1 / -11.3	6.1 / -11.3
S = 1.5H	8.8 / -11.8	8.8 / -11.8
S = 2.0H	10.8 / -12.2	10.8 / -12.2

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	114	111	109	107	112	109	107	105	105	104	102	102	100	99	98	97	96	94
2	109	105	101	98	107	103	100	97	100	97	95	97	95	93	94	92	91	89
3	104	99	94	91	102	97	93	90	95	91	88	92	89	87	90	88	86	84
4	100	93	88	84	98	92	87	84	90	86	83	88	85	82	86	83	81	80
5	96	88	83	79	94	87	82	79	85	81	78	84	80	77	82	79	77	75
6	91	83	78	74	90	83	78	74	81	77	74	80	76	73	79	75	73	71
7	88	79	74	70	86	79	74	70	77	73	70	76	72	69	75	72	69	68
8	84	75	70	66	83	75	70	66	74	69	66	73	69	66	72	68	65	64
9	80	72	67	63	79	71	66	63	70	66	63	70	65	62	69	65	62	61
10	77	69	63	60	76	68	63	60	67	63	60	67	62	59	66	62	59	58

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



Conditions		ρ(%)			
H = Room height	Flux = 1094 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°
163 lm	385 lm	376 lm	144 lm	17.2 lm	3.60 lm	1.47 lm	0.819 lm	0.576 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0.294 lm	0.286 lm	0.268 lm	0.242 lm	0.209 lm	0.170 lm	0.125 lm	0.077 lm	0.026 lm

Outdoor Light Planning

Lumen per Zone

Zone (°)	Lumen	% Total
0-10°	163 lm	14.9%
10-20°	385 lm	35.2%
20-30°	376 lm	34.4%
30-40°	144 lm	13.2%
40-50°	17 lm	1.6%
50-60°	4 lm	0.3%
60-70°	1 lm	0.1%
70-80°	1 lm	0.1%
80-90°	1 lm	0.1%
90-100°	0 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	1094 lm	100.0%

Intensity peaks

Max intensity	1821 cd
Intensity, 90°	0 cd
Intensity, 0°	1821 cd

Zonal Lumen summary

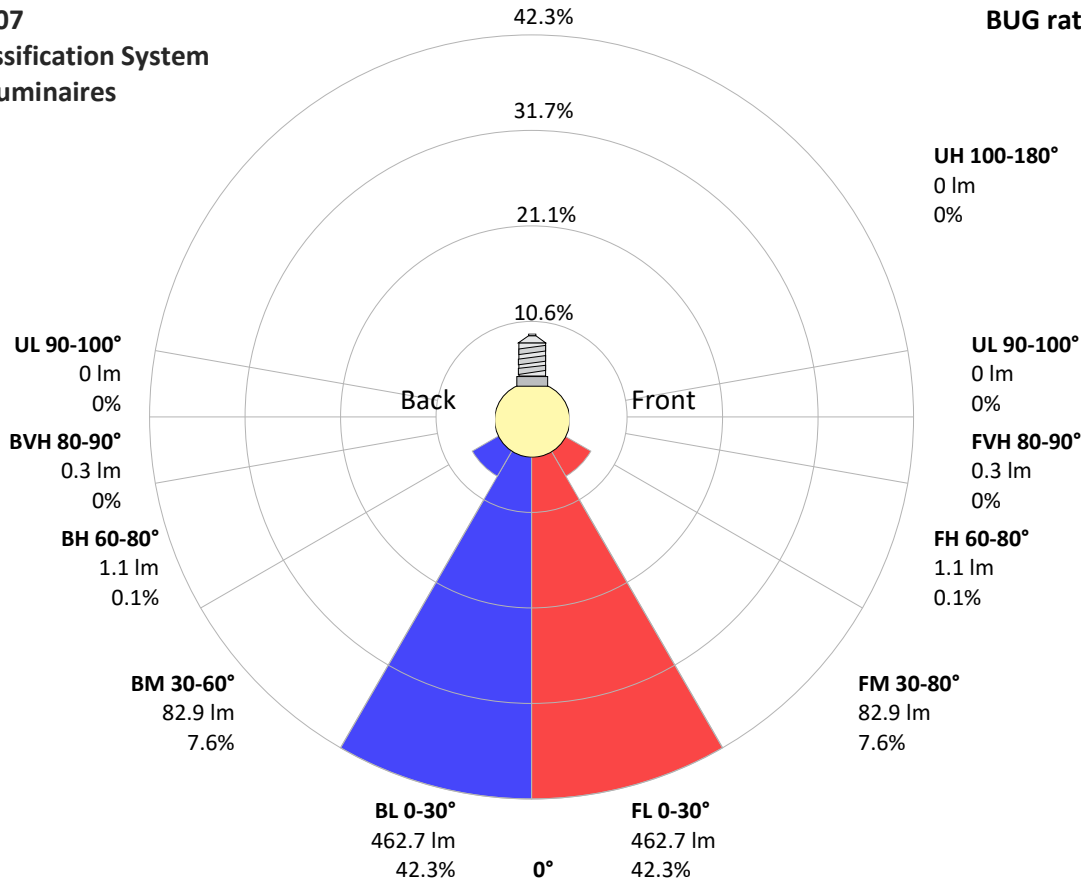
Zone (°)	Lumen	% Total
0-30°	925 lm	84.5%
0-40°	1069 lm	97.7%
0-60°	1089 lm	99.6%
60-90°	3 lm	0.3%
70-100°	2 lm	0.2%
90-120°	1 lm	0.1%
0-90°	1092 lm	99.8%
90-180°	2 lm	0.2%
0-180°	1094 lm	100.0%

BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	463 lm	42.3%
Medium(30-60°)	83 lm	7.6%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 lm	0.0%
<b>Back light</b>		
Low(0-30°)	463 lm	42.3%
Medium(30-60°)	83 lm	7.6%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 lm	0.0%
<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 B1 U1 G0



# Goniophotometry Report

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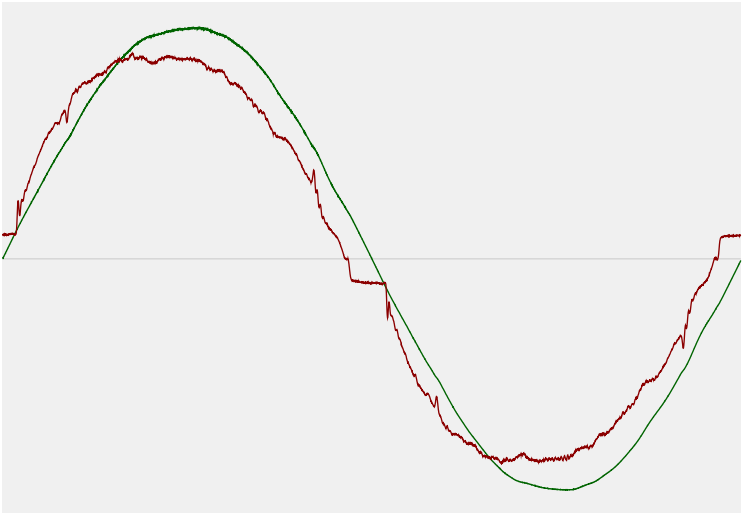


## Power Details

### Input Power

Power feed to light source	15.8 W
Frequency of input power	50.1 Hz
RMS Input voltage feed, $V_{RMS}$	240 V
RMS Input current feed, $I_{RMS}$	0.067 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	16.14 VA
Displacement factor of AC power feed	0.98
Power factor of AC current feed	0.98
Total harmonic distortion of the current	6.26%
Total harmonic distortion of the voltage	1.11%

### Input Power Curve



### Efficiency

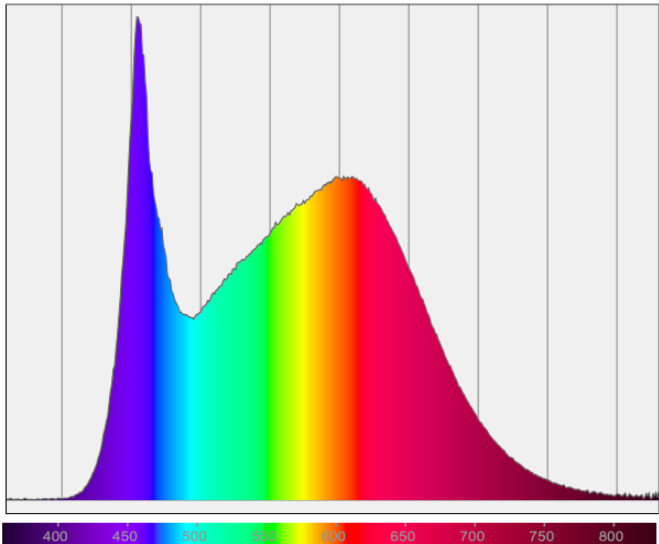
Radiated power efficiency	25.3%
<div><div></div></div>	
Lumen efficiency	69 lm/W
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Color Measurements

Correlated Color Temperature	CCT = 4000 K
Color Rendering TM30-18	R <sub>f</sub> 88.9 – R <sub>g</sub> 98.5
Color Shift, CIE duv	Duv ±0.0003

Spectral distribution



Color details

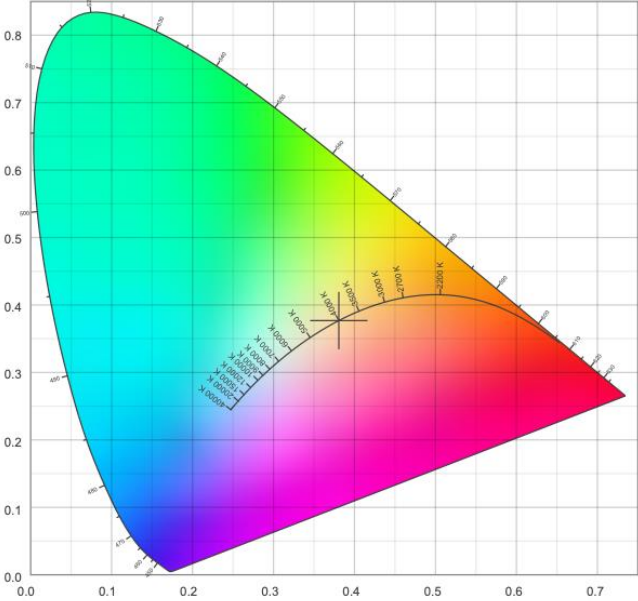
Correlated Color Temperature	CCT = 4000 K	Color coordinates CIE 1931	(x;y) = (0.381;0.377)
Color Rendering Index	CRI 92.6	Color coordinate CIEs 1960	(u;v) = (0.225;0.334)
Color Rendering Index, R9 (red component)	R9 = 72.2	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R <sub>f</sub>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

Goniophotometry Report

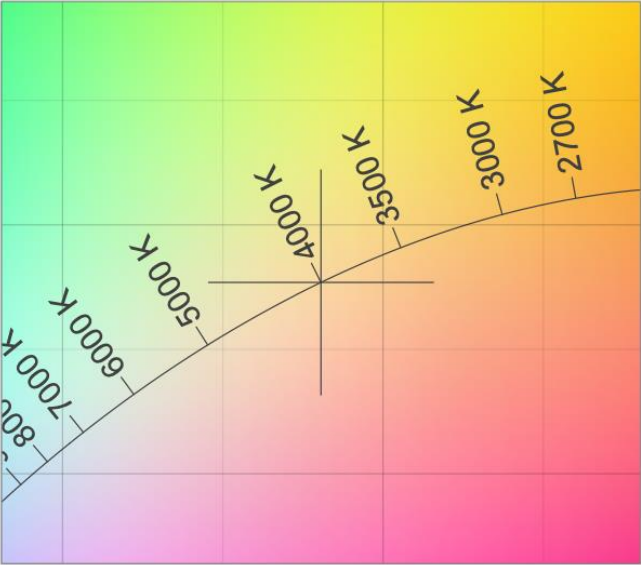
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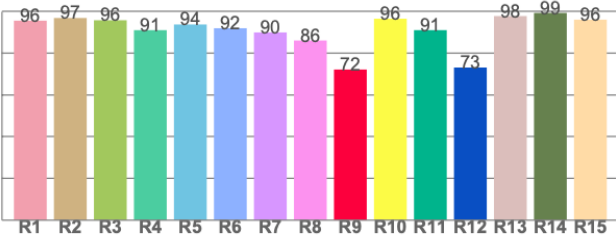
CIE 1931



CIE 1931 – zoomed on Planckian locus



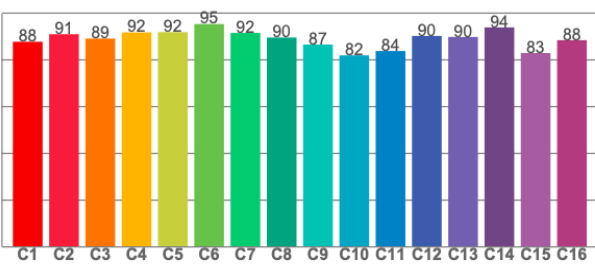
Color Rendering Index per reference color (CIE 1995)



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

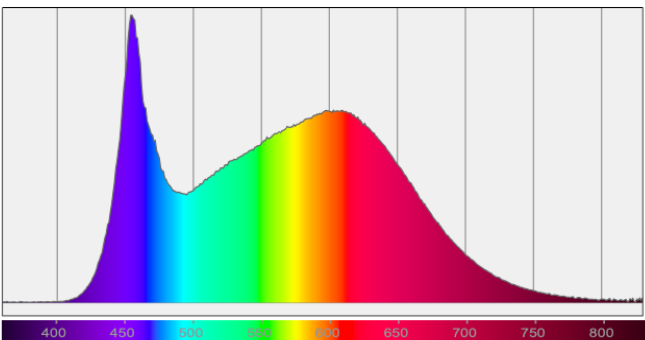
TM30-18 Rf-values per hue bin



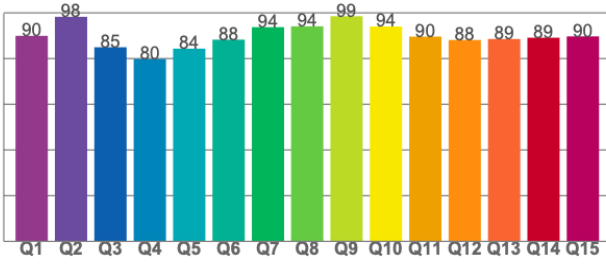
TM30 C values, 16 binned values out of total of 99 C values

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