

Tested Light Source - 1_PHOT_REFLEKTER-L-4600lmChip-3500K-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°

3.00 m

41.3 W – PF 0.97 – DPF 0.97

239 V – 0.178 A

50 Hz

Main Light Measurement Results

Output

Efficiency

Peak Intensity and Beam Angle

Color Rendering Index

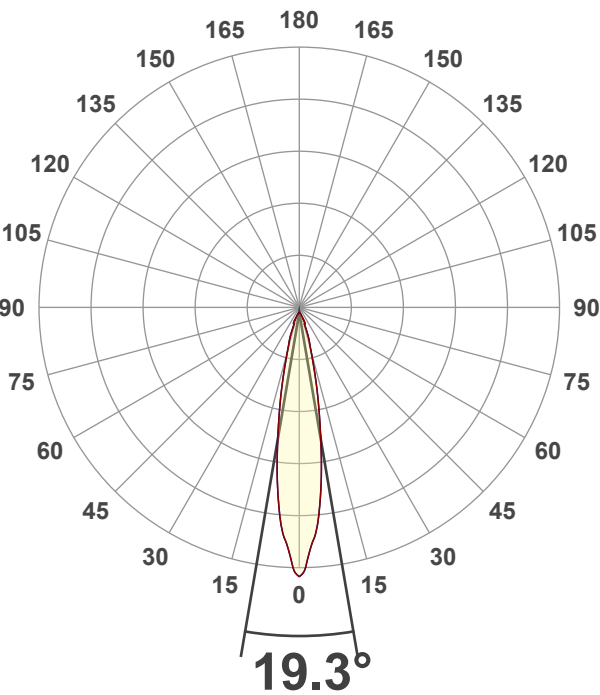
3097 lm

75 lm/W

16614 cd – 19.3°

CRI 92.7

Light Intensity Distribution



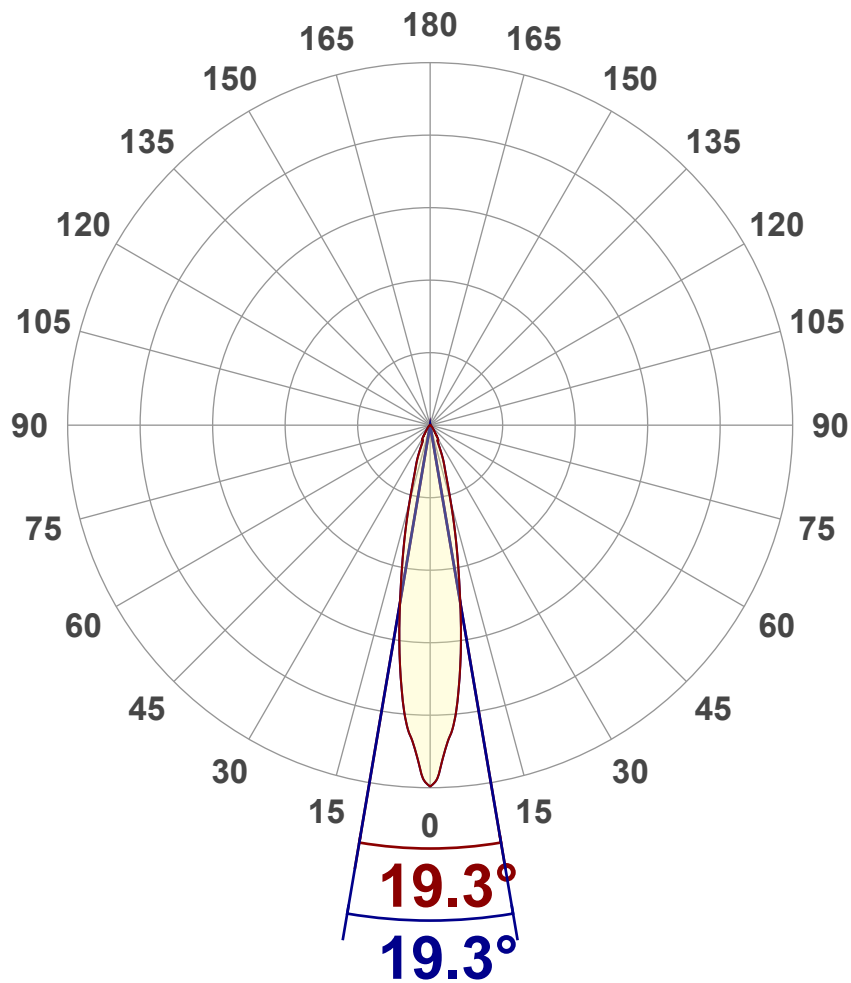
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3097 lm
Peak Intensity	16614 cd
Beam Angle (50%)	19.3°
Beam Angle (90%)	19.3°
Beam Angle (10%)	19.3°

Cut-off Angle

Average 2,5%	67.3°
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Field Angle

Average 10%	41.5°
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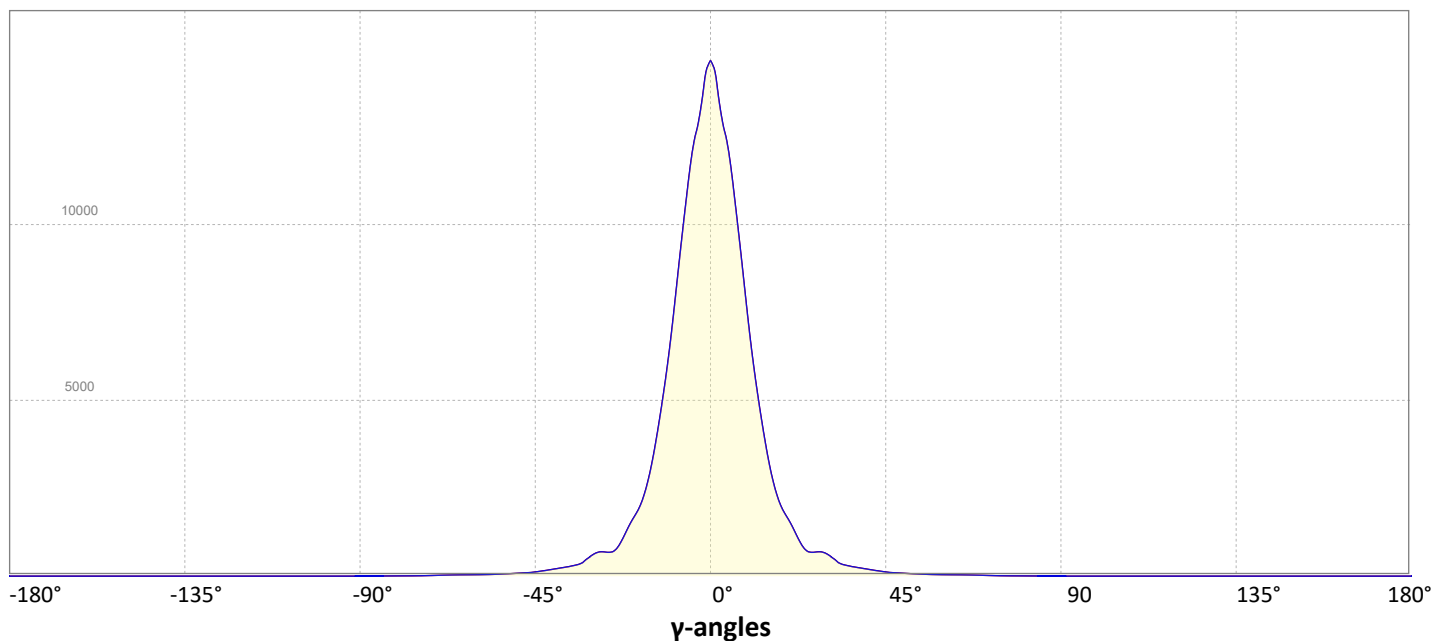
Intensity Ratio

In 120° cone	97.9%
In 90° cone	94.6%

C000-C180

C090-C270

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

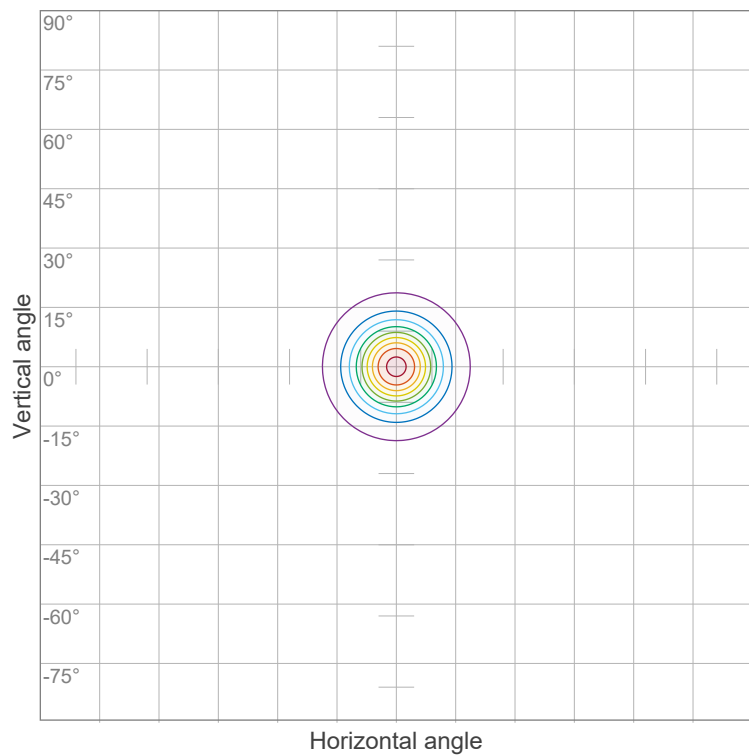


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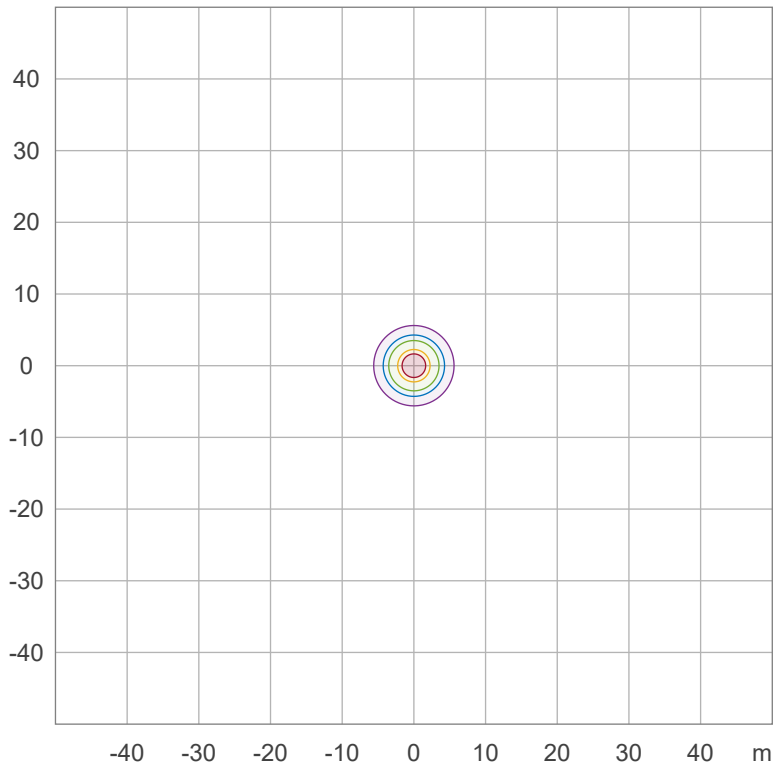
Iso-intensity Diagram (Iso-candela)



90 %	14952.4 cd
80 %	13291.0 cd
70 %	11629.6 cd
60 %	9968.3 cd
50 %	8306.9 cd
40 %	6645.5 cd
30 %	4984.1 cd
20 %	3322.8 cd
10 %	1661.4 cd

Peak intensity: 16613.8 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	83.1 lx
30.0 %	49.8 lx
10.0 %	16.6 lx
5.0 %	8.3 lx
3.0 %	5.0 lx

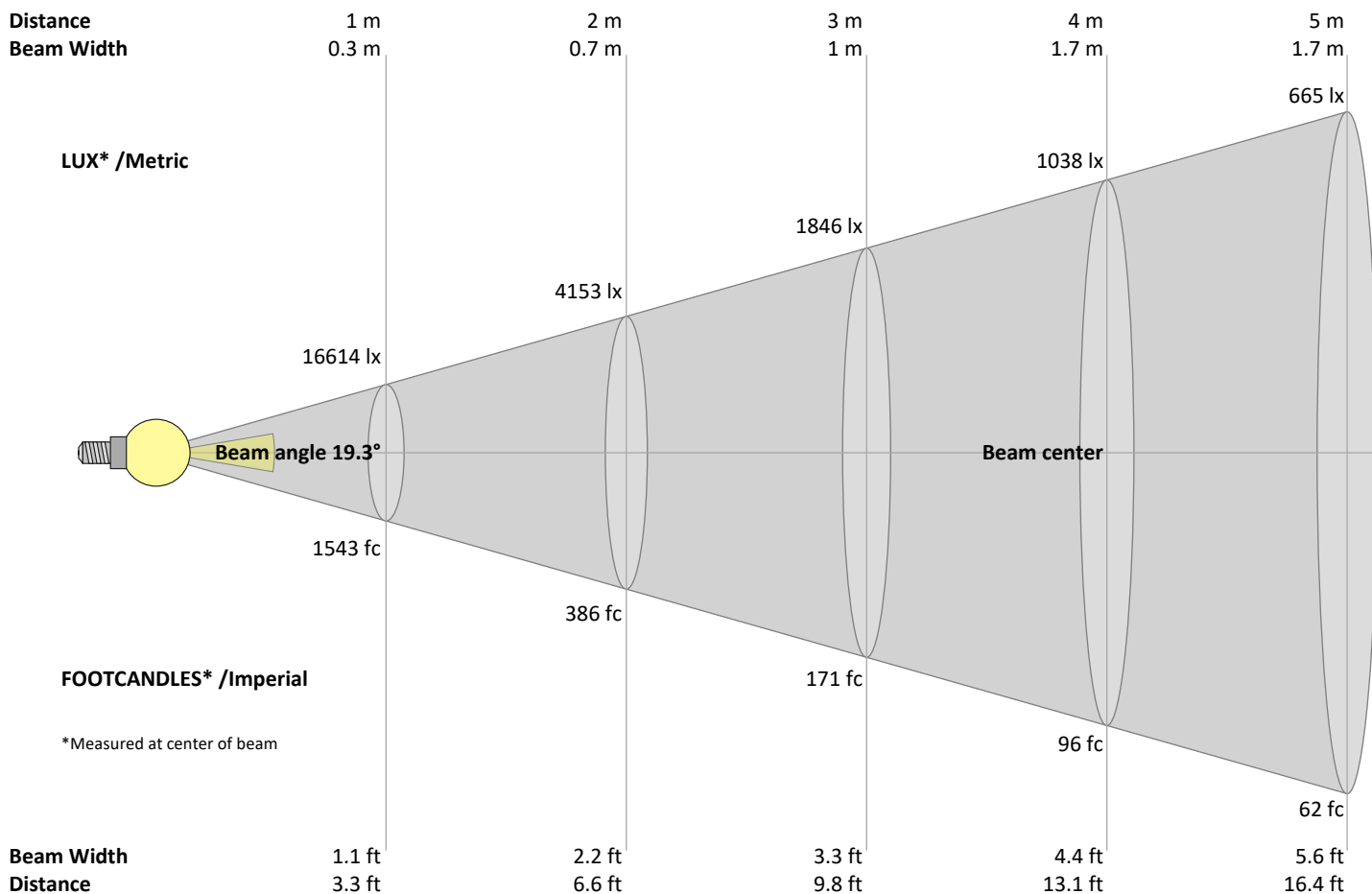
Peak illuminance: 166.1 lx
Mounting height: 10.0 m
Number of c-planes: 32

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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
16614	4153	1846	1038	665	461	339	260	205	166	137	115	98	85	74	65	57	51	46	42	lux
1543.5	385.9	171.5	96.5	61.7	42.9	31.5	24.1	19.1	15.4	12.8	10.7	9.1	7.9	6.9	6	5.3	4.8	4.3	3.9	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
16.6K	15.5K	14.2K	12.4K	10.2K	7.9K	6.0K	4.4K	3.1K	2.3K	1.8K	1.3K	0.9K	0.8K	0.8K	0.7K	0.5K	0.4K	0.3K	0.3K	cd
100%	94%	85%	75%	61%	48%	36%	26%	19%	14%	11%	8%	5%	5%	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
16.6K	15.5K	14.2K	12.4K	10.2K	7.9K	6.0K	4.4K	3.1K	2.3K	1.8K	1.3K	0.9K	0.8K	0.8K	0.7K	0.5K	0.4K	0.3K	0.3K	cd
100%	94%	85%	75%	61%	48%	36%	26%	19%	14%	11%	8%	5%	5%	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
16.6K	15.5K	14.2K	12.4K	10.2K	7.9K	6.0K	4.4K	3.1K	2.3K	1.8K	1.3K	0.9K	0.8K	0.8K	0.7K	0.5K	0.4K	0.3K	0.3K	cd
100%	94%	85%	75%	61%	48%	36%	26%	19%	14%	11%	8%	5%	5%	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
16.6K	15.5K	14.2K	12.4K	10.2K	7.9K	6.0K	4.4K	3.1K	2.3K	1.8K	1.3K	0.9K	0.8K	0.8K	0.7K	0.5K	0.4K	0.3K	0.3K	cd
100%	94%	85%	75%	61%	48%	36%	26%	19%	14%	11%	8%	5%	5%	5%	4%	3%	2%	2%	2%	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	18.8	19.3	18.9	19.5	19.7	18.8	19.3	18.9	19.5	19.7
	3H	19.1	19.7	19.5	19.9	20.1	19.1	19.7	19.5	19.9	20.1
	4H	19.1	19.8	19.5	20.0	20.2	19.1	19.8	19.5	20.0	20.2
	6H	19.2	19.7	19.5	20.0	20.4	19.2	19.7	19.5	20.0	20.4
	8H	19.2	19.7	19.5	20.0	20.4	19.2	19.7	19.5	20.0	20.4
	12H	19.2	19.7	19.5	20.0	20.4	19.2	19.7	19.5	20.0	20.4
4H	2H	18.8	19.4	19.2	19.6	19.8	18.8	19.4	19.2	19.6	19.8
	3H	19.4	19.9	19.7	20.2	20.6	19.4	19.9	19.7	20.2	20.6
	4H	19.4	19.9	19.8	20.3	20.8	19.4	19.9	19.8	20.3	20.8
	6H	19.5	20.0	20.0	20.3	20.6	19.5	20.0	20.0	20.3	20.6
	8H	19.5	19.9	20.0	20.3	20.6	19.5	19.9	20.0	20.3	20.6
	12H	19.5	19.8	20.0	20.2	20.7	19.5	19.8	20.0	20.2	20.7
8H	4H	19.4	19.8	19.9	20.2	20.5	19.4	19.8	19.9	20.2	20.5
	6H	19.5	19.8	20.0	20.3	20.8	19.5	19.8	20.0	20.3	20.8
	8H	19.6	19.8	20.1	20.3	21.0	19.6	19.8	20.1	20.3	21.0
	12H	19.6	19.8	20.2	20.3	20.9	19.6	19.8	20.2	20.3	20.9
12H	4H	19.3	19.7	19.8	20.1	20.5	19.3	19.7	19.8	20.1	20.5
	6H	19.5	19.8	20.0	20.3	20.9	19.5	19.8	20.0	20.3	20.9
	8H	19.6	19.8	20.1	20.3	20.9	19.6	19.8	20.1	20.3	20.9

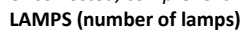
Variations with the observer position for the luminaire spacings, S:

S = 1.0H	2.2 / -1.7	2.2 / -1.7
S = 1.5H	4.2 / -2.3	4.2 / -2.3
S = 2.0H	5.8 / -2.6	5.8 / -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	102	102	102	100
1	114	112	110	108	112	110	108	106	106	104	103	102	101	100	99	98	97	95
2	110	106	102	100	108	104	101	99	101	98	96	98	96	94	95	94	92	91
3	106	101	96	93	104	99	95	92	97	94	91	94	92	90	92	90	88	87
4	102	96	91	88	100	95	91	88	93	89	87	91	88	86	89	87	85	83
5	98	92	87	84	97	91	87	83	89	86	83	88	85	82	86	84	81	80
6	95	88	84	80	94	88	83	80	86	82	79	85	81	79	84	81	78	77
7	92	85	80	77	91	84	80	77	83	79	76	82	79	76	81	78	76	75
8	89	82	77	74	88	82	77	74	81	77	74	80	76	74	79	76	73	72
9	87	79	75	72	86	79	75	72	78	74	72	77	74	71	77	73	71	70
10	84	77	73	70	84	77	72	70	76	72	69	75	72	69	75	71	69	68

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Zonal Lumen Summary

[illegible]

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Outdoor Light Planning

Lumen per Zone

Zone (°)	Lumen	% Total
0-10°	1094 lm	35.3%
10-20°	1068 lm	34.5%
20-30°	454 lm	14.7%
30-40°	260 lm	8.4%
40-50°	100 lm	3.2%
50-60°	57 lm	1.8%
60-70°	37 lm	1.2%
70-80°	15 lm	0.5%
80-90°	5 lm	0.2%
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°	7 lm	0.2%
Total	3097 lm	100.0%

Intensity peaks

Max intensity	16614 cd
Intensity, 90°	3 cd
Intensity, 0°	16614 cd

Zonal Lumen summary

Zone (°)	Lumen	% Total
0-30°	2615 lm	84.5%
0-40°	2875 lm	92.8%
0-60°	3032 lm	97.9%
60-90°	58 lm	1.9%
70-100°	21 lm	0.7%
90-120°	0 lm	0.0%
0-90°	3090 lm	99.8%
90-180°	7 lm	0.2%
0-180°	3097 lm	100.0%

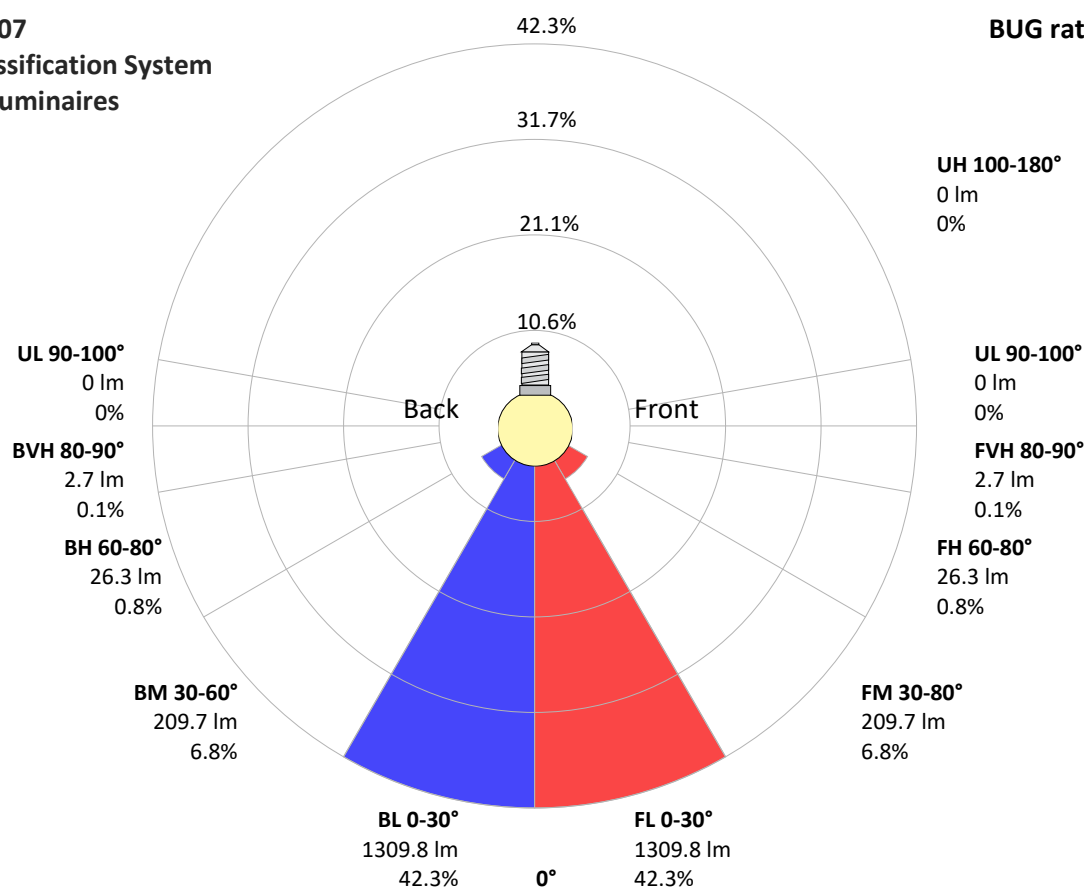
BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	1310 lm	42.3%
Medium(30-60°)	210 lm	6.8%
High(60-80°)	26 lm	0.8%
Very high(80-90°)	3 lm	0.1%
Back light		
Low(0-30°)	1310 lm	42.3%
Medium(30-60°)	210 lm	6.8%
High(60-80°)	26 lm	0.8%
Very high(80-90°)	3 lm	0.1%
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 G0



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Power Details

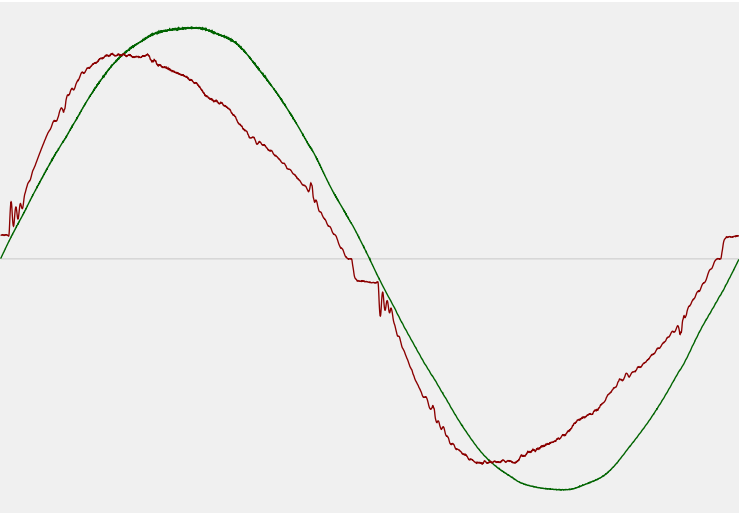
Input Power

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}	0.178 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.67 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	10.64%
Total harmonic distortion of the voltage	1.09%

Efficiency

Radiated power efficiency	27.2%
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Lumen efficiency	75 lm/W
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Input Power Curve



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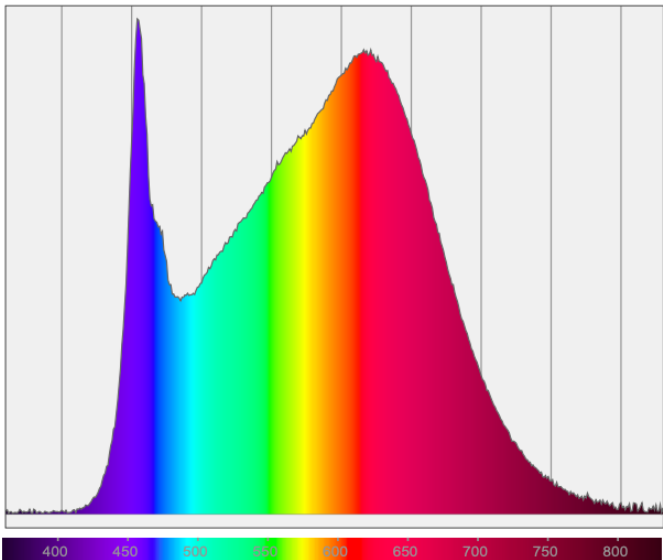
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Color Measurements

Correlated Color Temperature	CCT = 3500 K
Color Rendering TM30-18	R _f 90.2 – R _g 98.1
Color Shift, CIE duv	Duv ±0.0003

Spectral distribution



Color details

Correlated Color Temperature	CCT = 3500 K	Color coordinates CIE 1931	(x;y) = (0.406;0.391)
Color Rendering Index	CRI 94.0	Color coordinate CIEs 1960	(u;v) = (0.236;0.341)
Color Rendering Index, R9 (red component)	R9 = 77.7	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R _f 90.2 – R _g 98.1	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.236;0.236)
Color Quality Scale	CQS = 92.3		

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CIE 1931



CIE 1931 – zoomed on Planckian locus



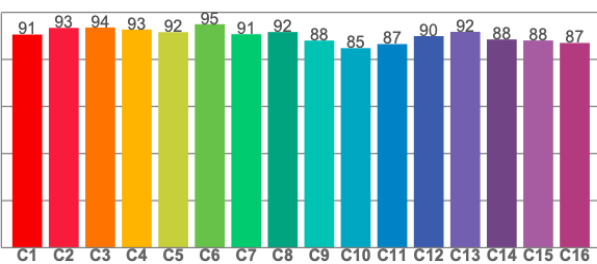
Color Rendering Index per reference color (CIE 1995)



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
97.3	97.2	95.9	93.4	95.9	93.5	90.9	87.9	77.7	96.6	94.1	77.1	98.8	99.0	96.4

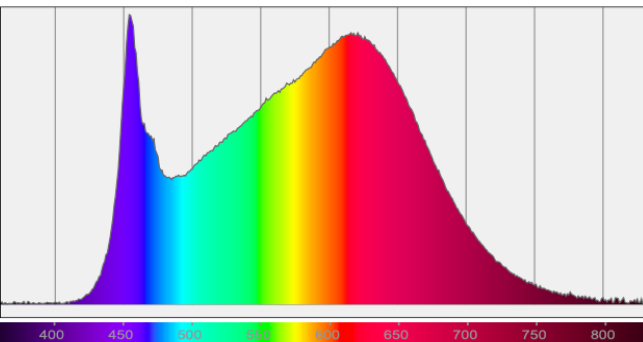
TM30-18 Rf-values per hue bin



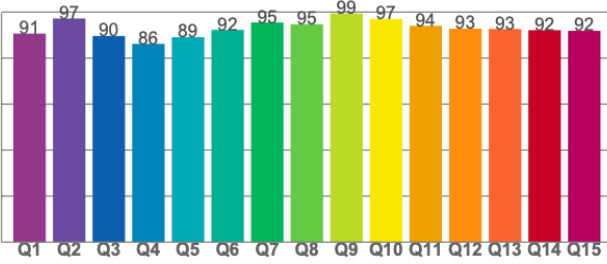
TM30 C values, 16 binned values out of total of 99 C values

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
90.6	93.4	93.6	92.7	91.6	95.0	90.7	91.6	88.0	84.8	86.5	89.9	91.7	88.5	88.1	87.0

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
90.6	97.2	89.6	86.2	89.1	92.3	95.5	94.7	99.4	97.0	94.0	92.8	92.6	92.1	91.8