

# Goniophotometry Report

1\_PHOT\_REFLEKTER-L-4600lmChip-3500K-21Deg\_2303  
www.factorylux.com



Tested Light Source - 1\_PHOT\_REFLEKTER-L-4600lmChip-3500K-21Deg\_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  
 $\gamma$  (gamma)-Resolution  
Test Distance  
Input Power, Power and Displ. Factors  
Input RMS Voltage and Current  
Frequency of Input Power

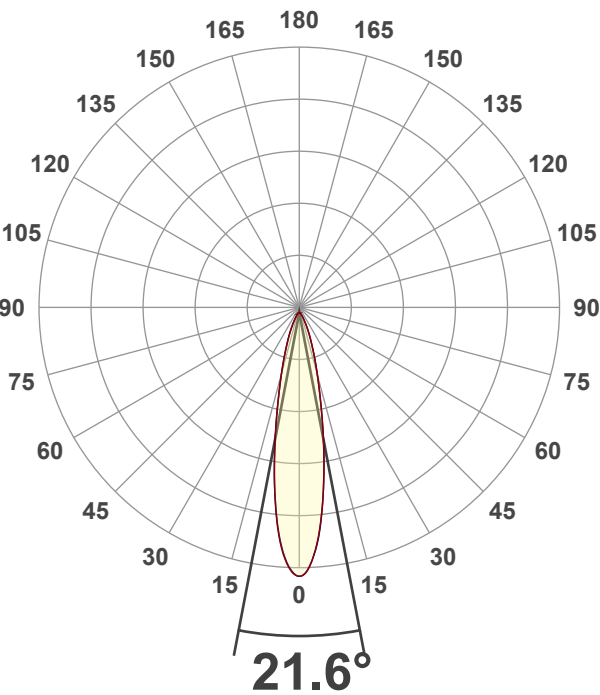
32 planes – 11.25°  
1°  
3.00 m  
41.3 W – PF 0.97 – DPF 0.97  
241 V – 0.177 A  
50 Hz

## Main Light Measurement Results

Output  
Efficiency  
Peak Intensity and Beam Angle  
Color Rendering Index

3927 lm  
95 lm/W  
16706 cd – 21.6°  
CRI 92.7

## Light Intensity Distribution



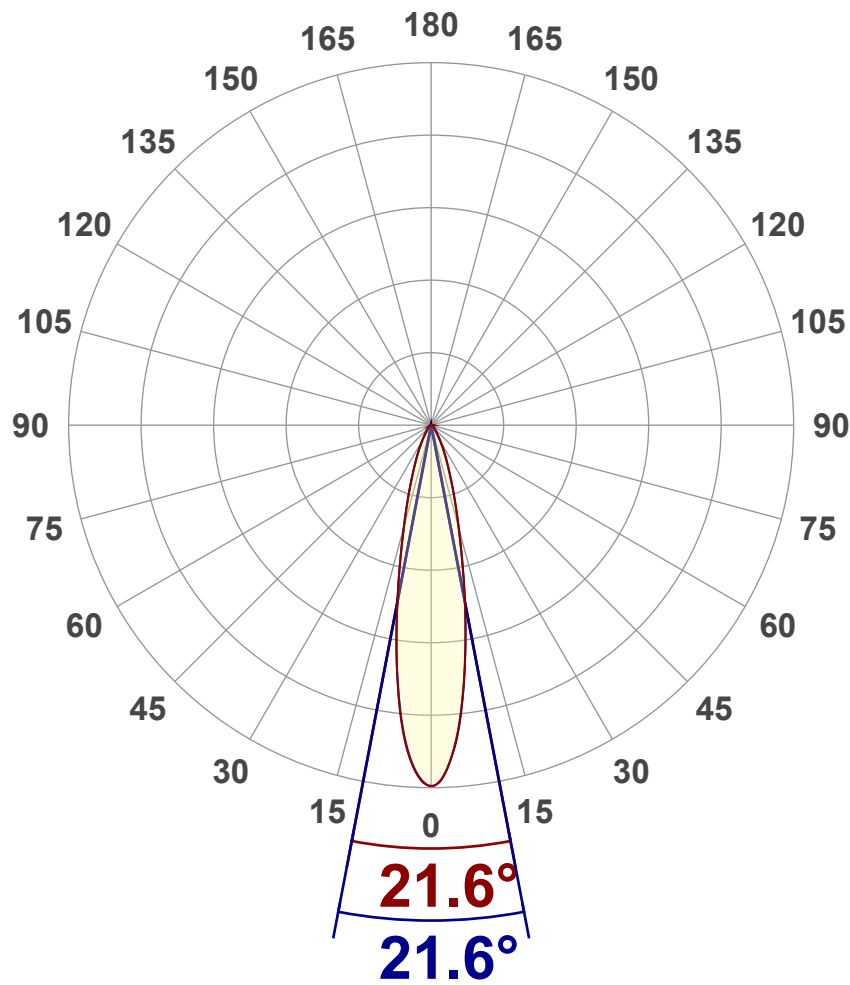
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3927 lm
Peak Intensity	16706 cd
Beam Angle (50%)	21.6°
Beam Angle (90%)	21.6°
Beam Angle (10%)	21.6°

Cut-off Angle

Average 2,5%	72.9°
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Field Angle

Average 10%	48°
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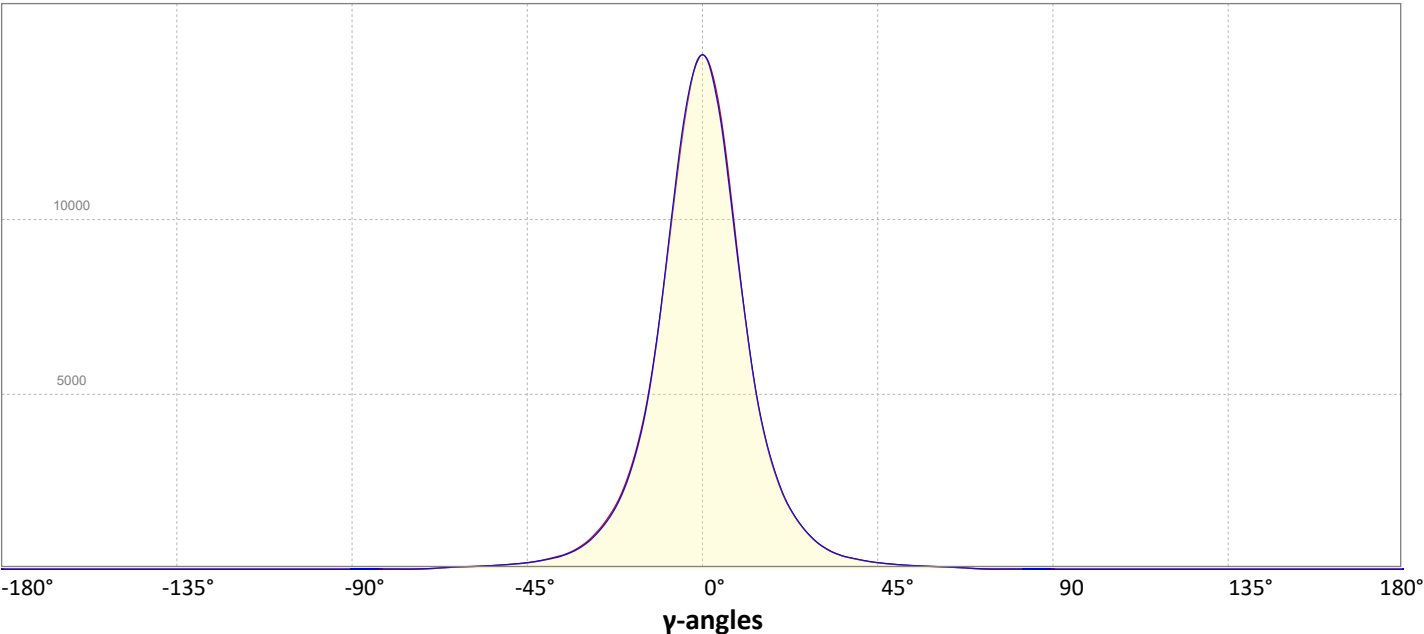
Intensity Ratio

In 120° cone	98.4%
In 90° cone	94.1%

C000-C180

C090-C270

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

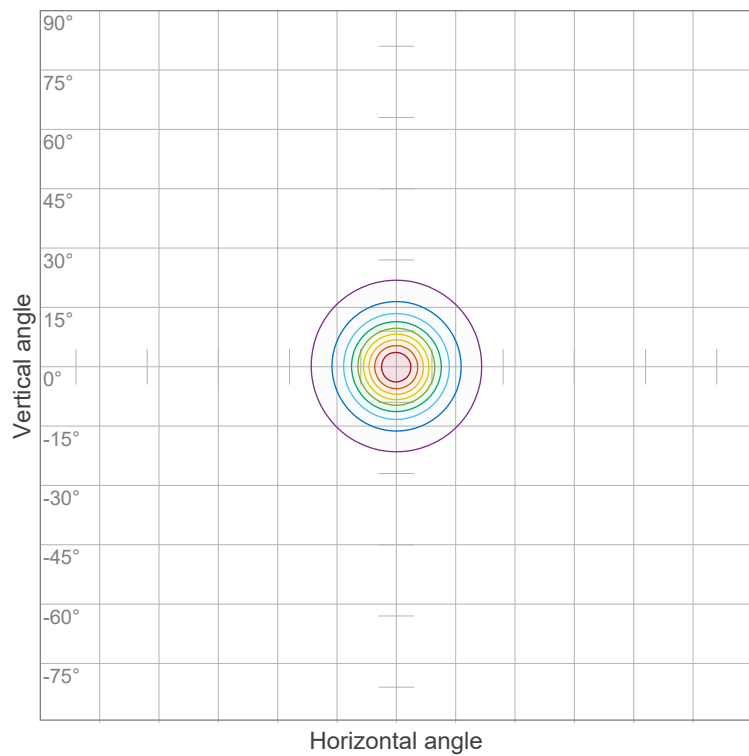


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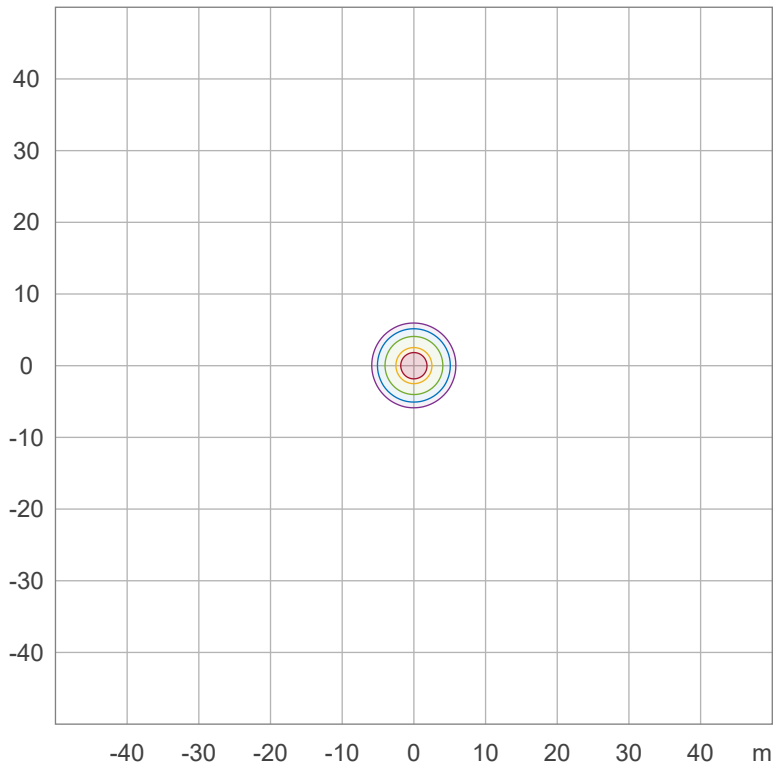
## Iso-intensity Diagram (Iso-candela)



90 %	15016.3 cd
80 %	13347.8 cd
70 %	11679.4 cd
60 %	10010.9 cd
50 %	8342.4 cd
40 %	6673.9 cd
30 %	5005.4 cd
20 %	3337.0 cd
10 %	1668.5 cd

Peak intensity: 16684.8 cd  
Number of c-planes: 32

## Iso-illuminance Diagram (Iso-lux)



50.0 %	83.4 lx
30.0 %	50.1 lx
10.0 %	16.7 lx
5.0 %	8.3 lx
3.0 %	5.0 lx

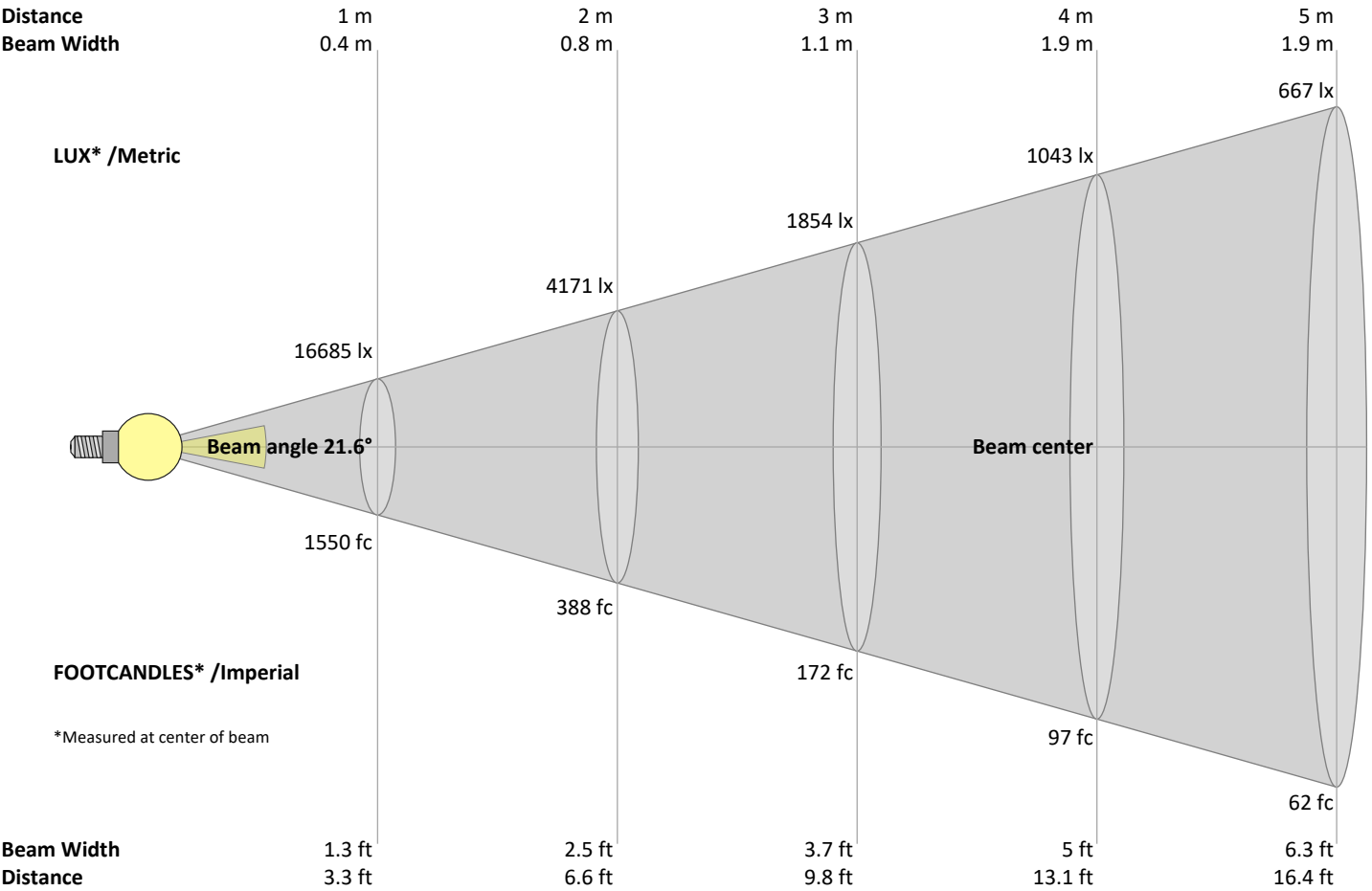
Peak illuminance: 166.8 lx  
Mounting height: 10.0 m  
Number of c-planes: 32

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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
16685	4171	1854	1043	667	463	341	261	206	167	138	116	99	85	74	65	58	51	46	42	lux
1550.1	387.5	172.2	96.9	62	43.1	31.6	24.2	19.1	15.5	12.8	10.8	9.2	7.9	6.9	6.1	5.4	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
16.7K	16.3K	15.0K	13.3K	11.2K	9.1K	7.2K	5.6K	4.4K	3.5K	2.7K	2.1K	1.7K	1.4K	1.1K	0.9K	0.7K	0.5K	0.5K	0.4K	cd
100%	97%	90%	79%	67%	55%	43%	34%	26%	21%	16%	13%	10%	8%	7%	5%	4%	3%	3%	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
16.7K	16.2K	15.1K	13.3K	11.2K	9.1K	7.2K	5.6K	4.4K	3.4K	2.7K	2.1K	1.7K	1.3K	1.0K	0.8K	0.6K	0.5K	0.4K	0.4K	cd
100%	97%	90%	80%	67%	55%	43%	33%	26%	20%	16%	13%	10%	8%	6%	5%	4%	3%	3%	2%	of 0°val

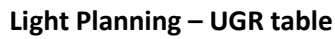
Intensities in 180° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
16.7K	16.3K	15.2K	13.5K	11.4K	9.2K	7.2K	5.5K	4.3K	3.4K	2.6K	2.1K	1.6K	1.3K	1.0K	0.8K	0.7K	0.5K	0.4K	0.4K	cd
100%	98%	91%	81%	68%	55%	43%	33%	26%	20%	16%	12%	10%	8%	6%	5%	4%	3%	3%	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
16.7K	16.3K	15.1K	13.4K	11.4K	9.2K	7.2K	5.5K	4.3K	3.4K	2.6K	2.1K	1.7K	1.3K	1.0K	0.8K	0.7K	0.5K	0.4K	0.4K	cd
100%	97%	91%	81%	68%	55%	43%	33%	26%	20%	16%	12%	10%	8%	6%	5%	4%	3%	3%	2%	of 0°val

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[illegible]

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.

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	105	102	99	108	104	101	98	101	98	96	98	96	94	95	93	92	90
3	105	100	96	92	103	99	95	92	96	93	90	94	91	89	91	89	87	86
4	101	95	90	87	100	94	90	86	92	88	85	90	87	84	88	86	83	82
5	98	91	86	82	96	90	85	82	88	84	81	86	83	80	85	82	80	79
6	94	87	82	78	93	86	81	78	85	81	78	83	80	77	82	79	77	75
7	91	83	78	75	90	83	78	75	81	77	74	80	77	74	79	76	74	72
8	88	80	75	72	87	80	75	72	79	74	72	78	74	71	77	73	71	70
9	85	77	73	69	84	77	72	69	76	72	69	75	71	69	74	71	69	67
10	82	75	70	67	82	74	70	67	74	69	67	73	69	67	72	69	66	65

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**LAMPS (number of lamps)**

[illegible]

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## Outdoor Light Planning

### Lumen per Zone

Zone (°)	Lumen	% Total
0-10°	1194 lm	30.4%
10-20°	1391 lm	35.4%
20-30°	701 lm	17.8%
30-40°	314 lm	8.0%
40-50°	167 lm	4.2%
50-60°	98 lm	2.5%
60-70°	53 lm	1.3%
70-80°	6 lm	0.1%
80-90°	3 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	3927 lm	100.0%

### Intensity peaks

Max intensity	16706 cd
Intensity, 90°	0 cd
Intensity, 0°	16685 cd

### Zonal Lumen summary

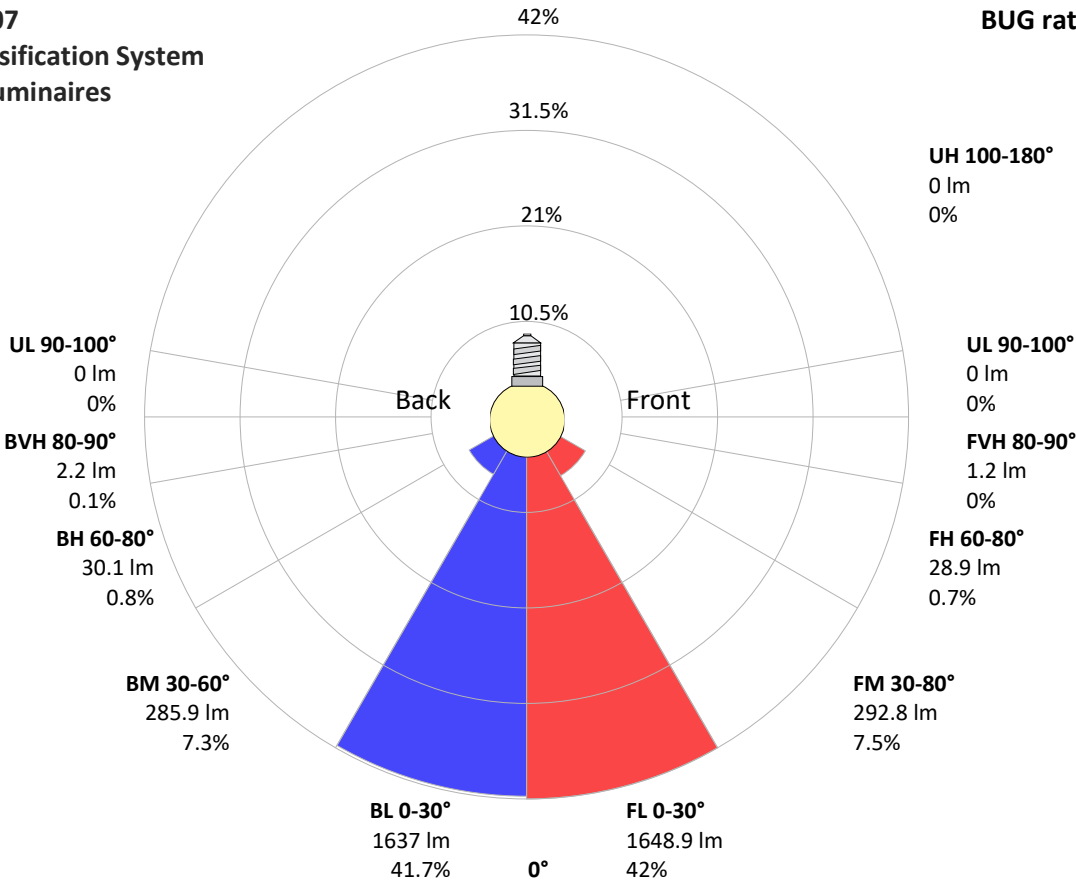
Zone (°)	Lumen	% Total
0-30°	3286 lm	83.7%
0-40°	3600 lm	91.7%
0-60°	3865 lm	98.4%
60-90°	62 lm	1.6%
70-100°	9 lm	0.2%
90-120°	0 lm	0.0%
0-90°	3927 lm	100.0%
90-180°	0 lm	0.0%
0-180°	3927 lm	100.0%

### BUG rating

	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	1649 lm	42.0%
Medium(30-60°)	293 lm	7.5%
High(60-80°)	29 lm	0.7%
Very high(80-90°)	1 lm	0.0%
<b>Back light</b>		
Low(0-30°)	1637 lm	41.7%
Medium(30-60°)	286 lm	7.3%
High(60-80°)	30 lm	0.8%
Very high(80-90°)	2 lm	0.1%
<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 B3 U1 G0



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## Power Details

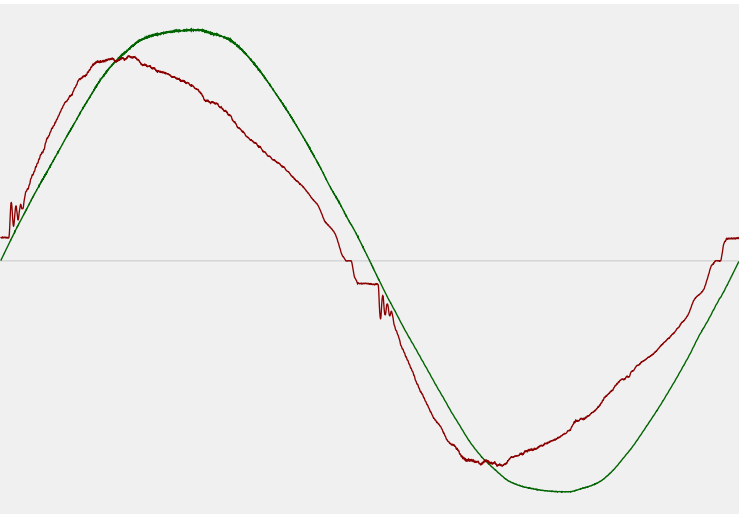
### Input Power

Power feed to light source	41.3 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	241 V
RMS Input current feed, $I_{RMS}$	0.177 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.71 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	11.13%
Total harmonic distortion of the voltage	1.38%

### Efficiency

Radiated power efficiency	34.5%
<div><div></div></div>	
Lumen efficiency	95 lm/W
<div><div></div></div>	

### Input Power Curve





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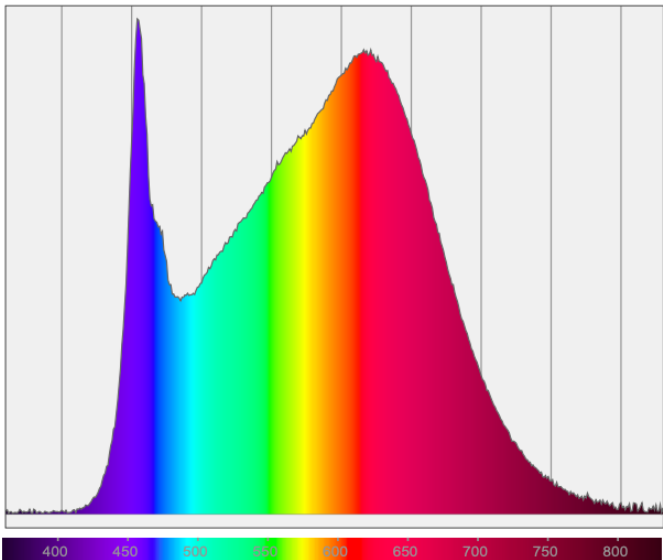
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## Color Measurements

Correlated Color Temperature	CCT = 3500 K
Color Rendering TM30-18	R <sub>f</sub> 90.2 – R <sub>g</sub> 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 <sub>f</sub> 90.2 – R <sub>g</sub> 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



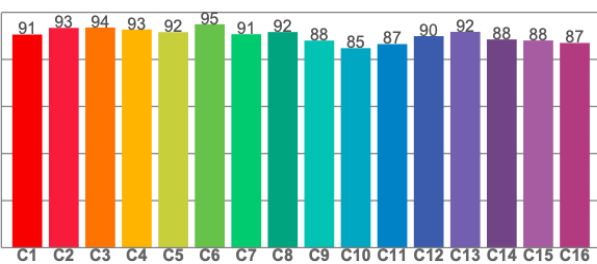
Color Rendering Index per reference color (CIE 1995)



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

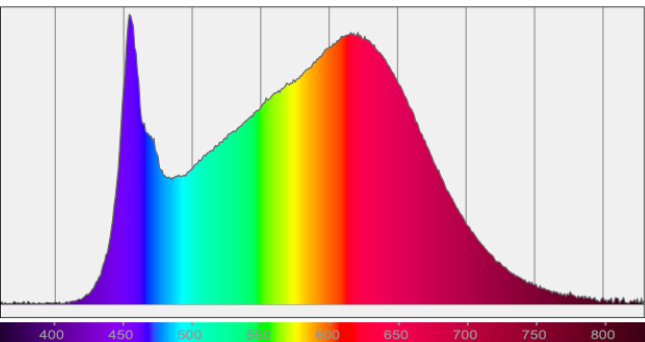
TM30-18 Rf-values per hue bin



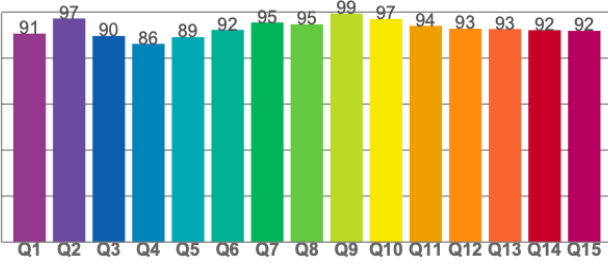
TM30 C values, 16 binned values out of total of 99 C values

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