

# Goniophotometry Report

1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_2303  
www.factorylux.com



Tested Light Source - 1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_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

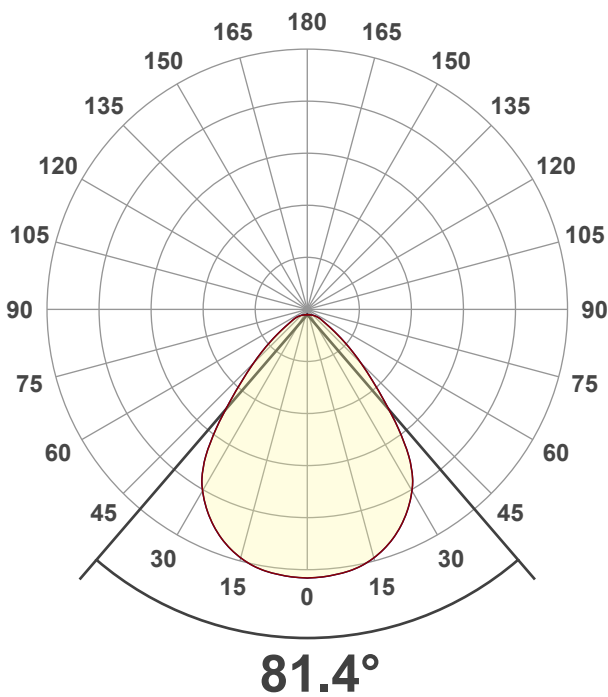
32 planes – 11.25°  
3°  
3.00 m  
41.2 W – PF 0.97 – DPF 0.97  
243 V – 0.176 A  
49.9 Hz

## Main Light Measurement Results

Output  
Efficiency  
Peak Intensity and Beam Angle  
Color Rendering Index

2575 lm  
62 lm/W  
1443 cd – 81.4°  
CRI 92.7

## Light Intensity Distribution



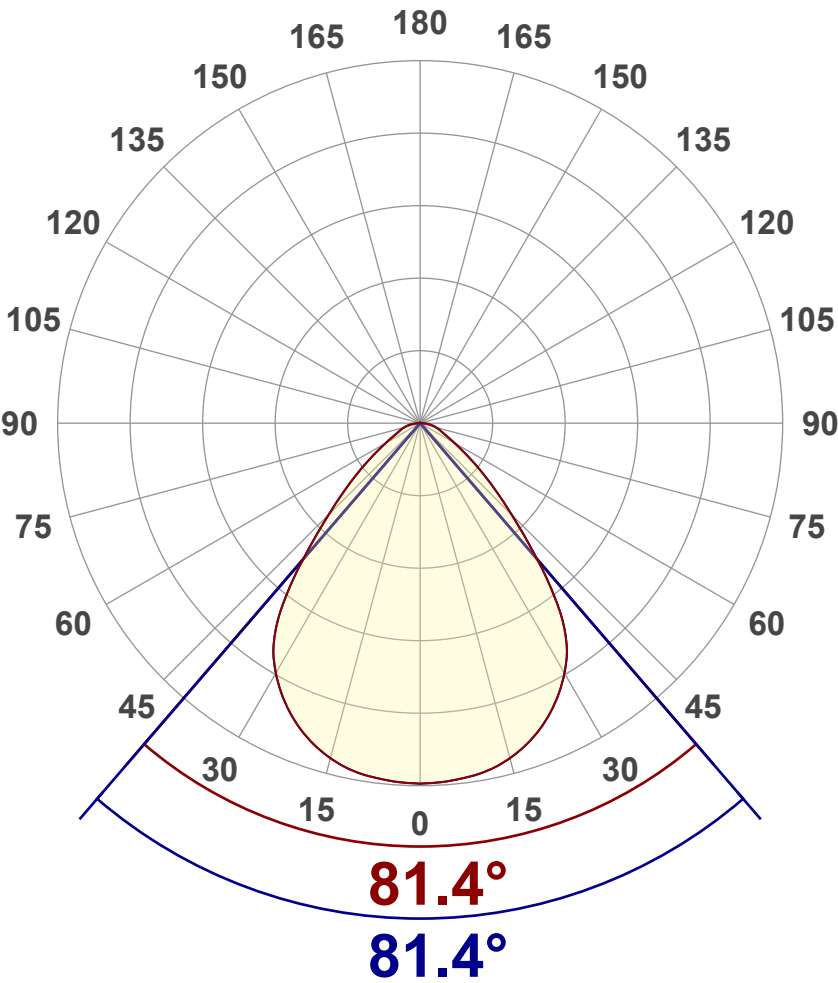
Goniophotometry Report

1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_2303  
www.factorylux.com



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	2575 lm
Peak Intensity	1443 cd
Beam Angle (50%)	81.4°
Beam Angle (90%)	81.4°
Beam Angle (10%)	81.4°

Cut-off Angle

Average 2,5%	165.4°
--------------	--------

Field Angle

Average 10%	122.7°
-------------	--------

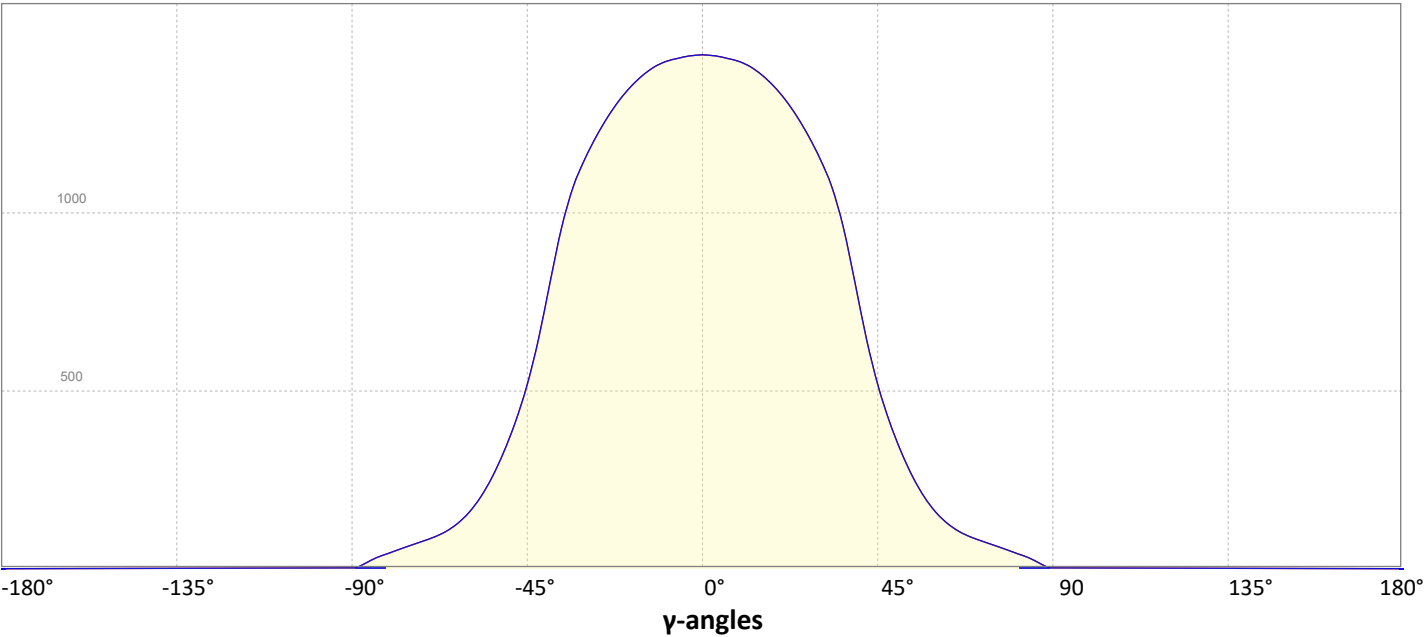
Intensity Ratio

In 120° cone	91.2%
In 90° cone	75.9%

C000-C180

C090-C270

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

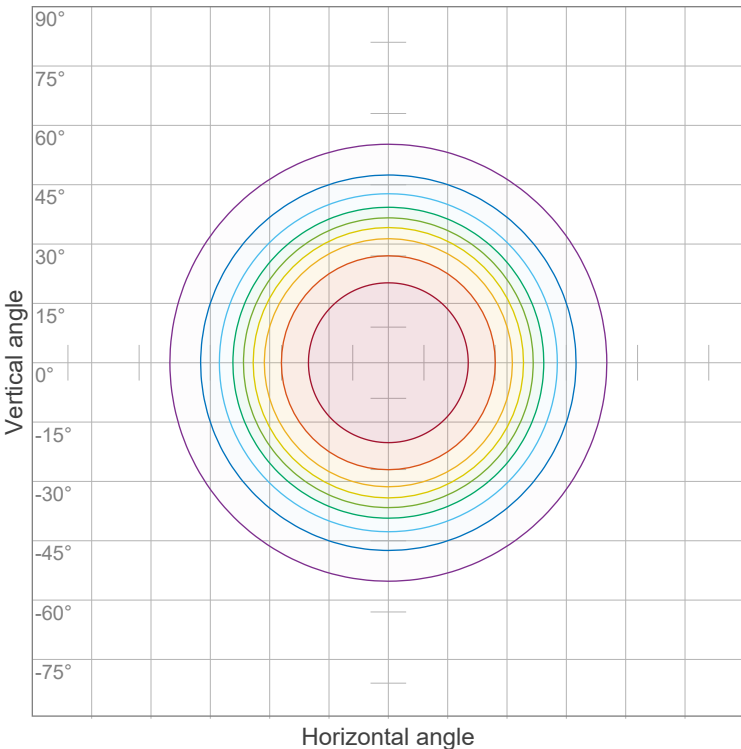


# Goniophotometry Report

1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_2303  
www.factorylux.com



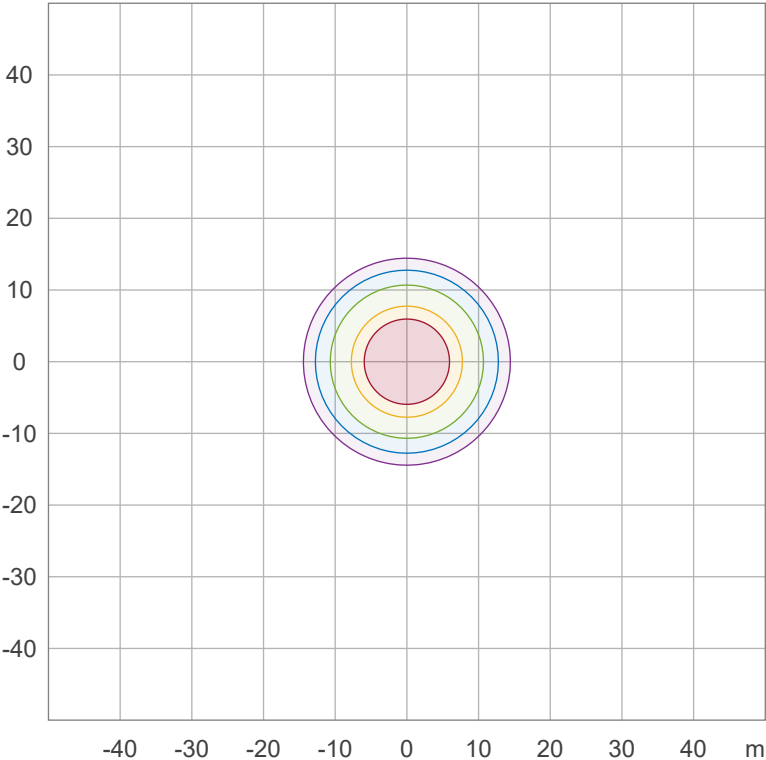
## Iso-intensity Diagram (Iso-candela)



90 %	1298.9 cd
80 %	1154.6 cd
70 %	1010.3 cd
60 %	865.9 cd
50 %	721.6 cd
40 %	577.3 cd
30 %	433.0 cd
20 %	288.6 cd
10 %	144.3 cd

Peak intensity: 1443.2 cd  
Number of c-planes: 32

## Iso-illuminance Diagram (Iso-lux)



50.0 %	7.2 lx
30.0 %	4.3 lx
10.0 %	1.4 lx
5.0 %	0.7 lx
3.0 %	0.4 lx

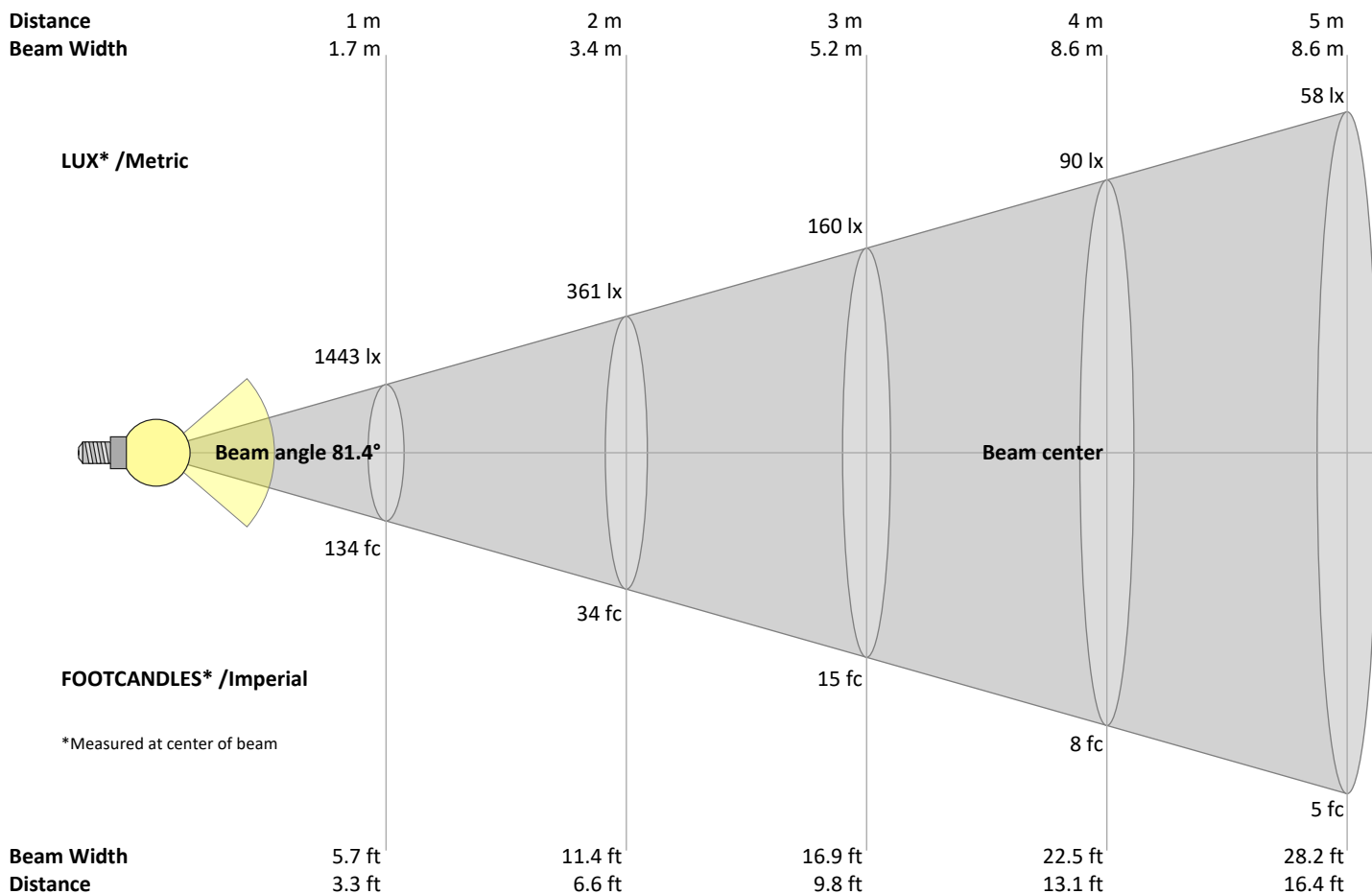
Peak illuminance: 14.4 lx  
Mounting height: 10.0 m  
Number of c-planes: 32

# Goniophotometry Report

1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_2303  
www.factorylux.com



## 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
1443	361	160	90	58	40	29	23	18	14	12	10	9	7	6	6	5	4	4	4	lux
134.1	33.5	14.9	8.4	5.4	3.7	2.7	2.1	1.7	1.3	1.1	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	fc

### Intensities in 0° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1443	1437	1422	1389	1334	1257	1156	1004	759	518	358	240	159	112	86	66	47	25	3	3	cd
100%	100%	99%	96%	92%	87%	80%	70%	53%	36%	25%	17%	11%	8%	6%	5%	3%	2%	0%	0%	of 0°val

### Intensities in 90° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1443	1437	1422	1389	1334	1257	1156	1004	759	518	358	240	159	112	86	66	47	25	3	3	cd
100%	100%	99%	96%	92%	87%	80%	70%	53%	36%	25%	17%	11%	8%	6%	5%	3%	2%	0%	0%	of 0°val

### Intensities in 180° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1443	1437	1422	1389	1334	1257	1156	1004	759	518	358	240	159	112	86	66	47	25	3	3	cd
100%	100%	99%	96%	92%	87%	80%	70%	53%	36%	25%	17%	11%	8%	6%	5%	3%	2%	0%	0%	of 0°val

### Intensities in 270° c-plane

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
1443	1437	1422	1389	1334	1257	1156	1004	759	518	358	240	159	112	86	66	47	25	3	3	cd
100%	100%	99%	96%	92%	87%	80%	70%	53%	36%	25%	17%	11%	8%	6%	5%	3%	2%	0%	0%	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	16.7	17.6	16.9	17.9	18.1	16.7	17.6	16.9	17.9	18.1
	3H	17.0	18.1	17.4	18.3	18.5	17.0	18.1	17.4	18.3	18.5
	4H	17.3	18.3	17.7	18.6	18.8	17.3	18.3	17.7	18.6	18.8
	6H	17.7	18.6	18.0	18.8	19.2	17.7	18.6	18.0	18.8	19.2
	8H	17.9	18.7	18.2	19.0	19.4	17.9	18.7	18.2	19.0	19.4
	12H	18.0	18.7	18.3	19.1	19.5	18.0	18.7	18.3	19.1	19.5
4H	2H	16.7	17.7	17.1	17.9	18.2	16.7	17.7	17.1	17.9	18.2
	3H	17.4	18.2	17.8	18.6	19.0	17.4	18.2	17.8	18.6	19.0
	4H	17.8	18.5	18.2	18.9	19.5	17.8	18.5	18.2	18.9	19.5
	6H	18.3	19.0	18.8	19.3	19.7	18.3	19.0	18.8	19.3	19.7
	8H	18.5	19.1	19.0	19.5	19.9	18.5	19.1	19.0	19.5	19.9
	12H	18.7	19.2	19.2	19.6	20.1	18.7	19.2	19.2	19.6	20.1
8H	4H	18.0	18.6	18.5	19.0	19.4	18.0	18.6	18.5	19.0	19.4
	6H	18.6	19.1	19.1	19.6	20.1	18.6	19.1	19.1	19.6	20.1
	8H	19.0	19.4	19.5	19.9	20.5	19.0	19.4	19.5	19.9	20.5
	12H	19.3	19.6	19.8	20.1	20.7	19.3	19.6	19.8	20.1	20.7
12H	4H	18.0	18.5	18.5	18.9	19.4	18.0	18.5	18.5	18.9	19.4
	6H	18.7	19.1	19.2	19.6	20.3	18.7	19.1	19.2	19.6	20.3
	8H	19.1	19.4	19.7	19.9	20.5	19.1	19.4	19.7	19.9	20.5

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

S = 1.0H	0.4 / -0.6	0.4 / -0.6
S = 1.5H	1.2 / -1.0	1.2 / -1.0
S = 2.0H	2.1 / -1.4	2.1 / -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	111	111	111	106	106	106	101	101	101	99
1	111	107	104	101	108	105	102	99	101	98	96	97	95	93	93	92	90	88
2	103	97	91	87	101	95	90	86	91	87	84	88	85	82	85	82	80	78
3	96	87	81	75	94	86	80	75	83	78	73	80	76	72	78	74	71	69
4	89	79	72	67	87	78	71	66	76	70	65	73	68	64	71	67	63	62
5	83	72	65	59	81	71	64	59	69	63	58	67	62	58	66	61	57	55
6	78	66	59	53	76	65	58	53	64	57	53	62	56	52	61	56	52	50
7	73	61	53	48	71	60	53	48	59	52	48	57	52	47	56	51	47	45
8	68	56	49	44	67	56	49	44	54	48	43	53	47	43	52	47	43	41
9	64	52	45	40	63	52	45	40	51	44	40	50	44	40	49	43	39	38
10	60	49	42	37	59	48	41	37	47	41	37	46	41	36	45	40	36	35

# Goniophotometry Report

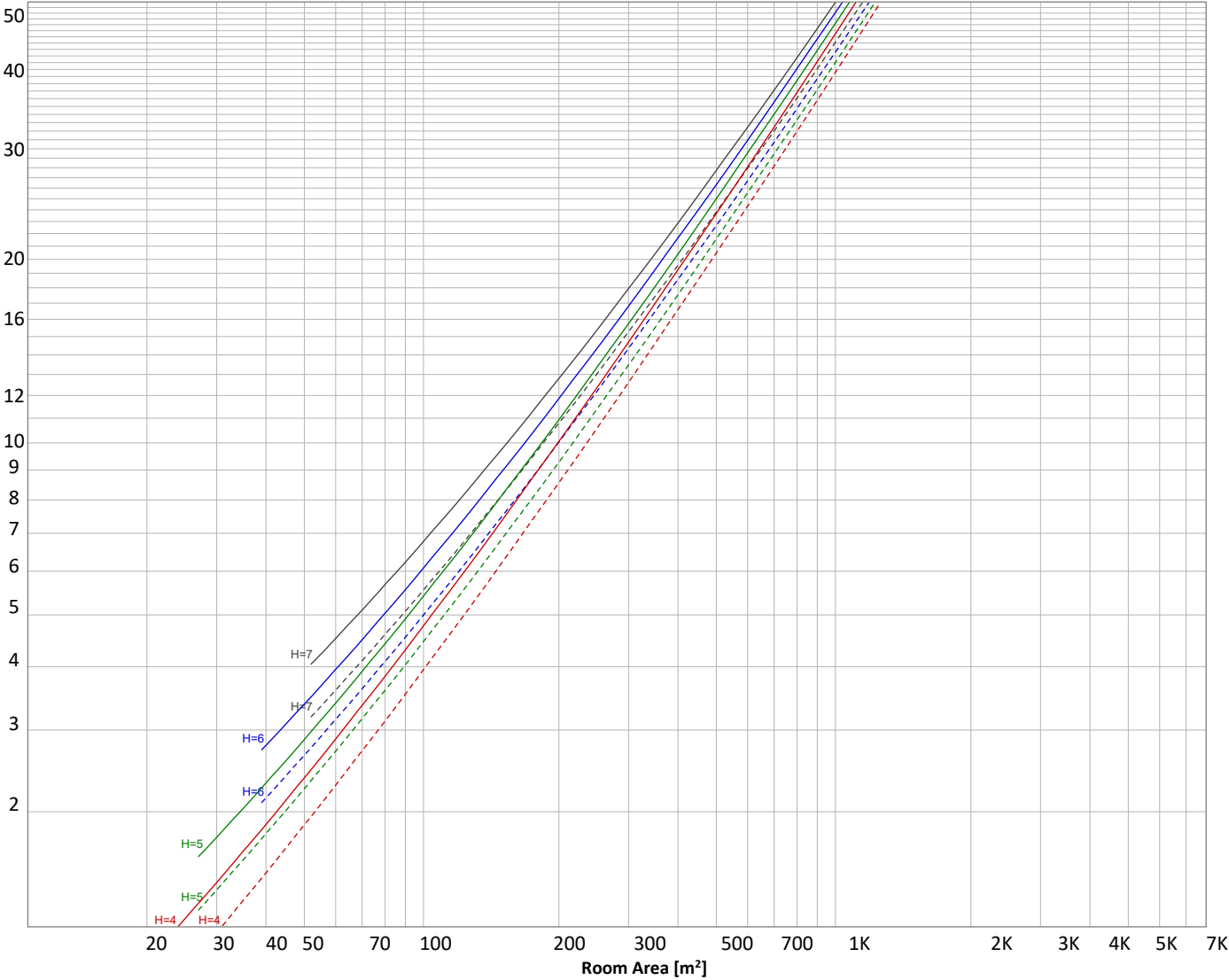
1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_2303  
www.factorylux.com



## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 2575 lm	p(%)		
H <sub>down</sub> = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	Wall reflectance
H <sub>work</sub> = Work area height from floor =	0.00 m	-----	70	50
E <sub>work</sub> = 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°
137 lm	392 lm	577 lm	616 lm	408 lm	217 lm	115 lm	69.9 lm	26.3 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
3.66 lm	3.55 lm	3.33 lm	3.01 lm	1.66 lm	0.821 lm	0.605 lm	0.370 lm	0.125 lm

Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	137 lm	5.3%
10-20°	392 lm	15.2%
20-30°	577 lm	22.4%
30-40°	616 lm	23.9%
40-50°	408 lm	15.9%
50-60°	217 lm	8.4%
60-70°	115 lm	4.4%
70-80°	70 lm	2.7%
80-90°	26 lm	1.0%
90-100°	4 lm	0.1%
100-110°	4 lm	0.1%
110-120°	3 lm	0.1%
120-130°	3 lm	0.1%
130-140°	2 lm	0.1%
140-150°	1 lm	0.0%
150-160°	1 lm	0.0%
160-170°	0 lm	0.0%
170-180°	0 lm	0.0%
Total	2575 lm	100.0%

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	1105 lm	42.9%
0-40°	1721 lm	66.9%
0-60°	2347 lm	91.2%
60-90°	211 lm	8.2%
70-100°	100 lm	3.9%
90-120°	11 lm	0.4%
0-90°	2558 lm	99.3%
90-180°	17 lm	0.7%
0-180°	2575 lm	100.0%

BUG rating

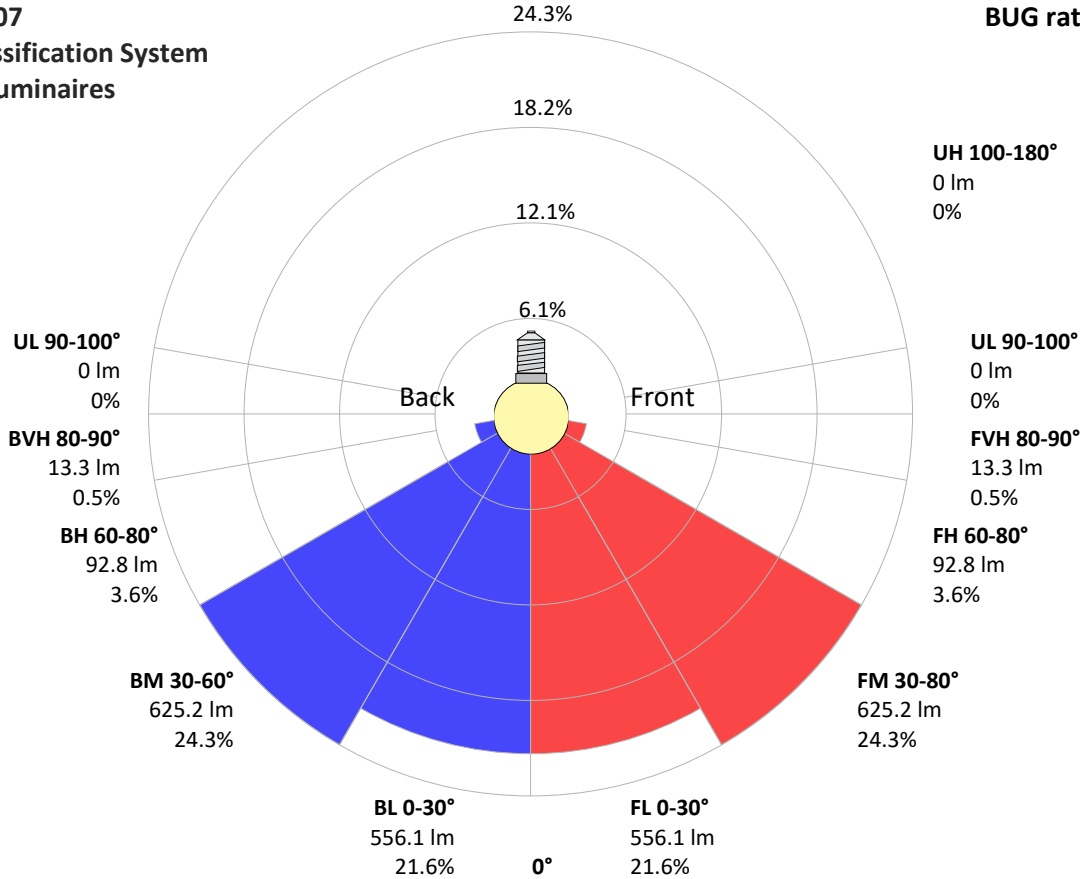
	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	556 lm	21.6%
Medium(30-60°)	625 lm	24.3%
High(60-80°)	93 lm	3.6%
Very high(80-90°)	13 lm	0.5%
<b>Back light</b>		
Low(0-30°)	556 lm	21.6%
Medium(30-60°)	625 lm	24.3%
High(60-80°)	93 lm	3.6%
Very high(80-90°)	13 lm	0.5%
<b>Uplight</b>		
Low(90-100°)	0 lm	0.0%
High(100-180°)	0 lm	0.0%

Intensity peaks

Max intensity	1443 cd
Intensity, 90°	3 cd
Intensity, 0°	1443 cd

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

BUG rating B2 U1 G1



# Goniophotometry Report

1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_2303  
www.factorylux.com



## Power Details

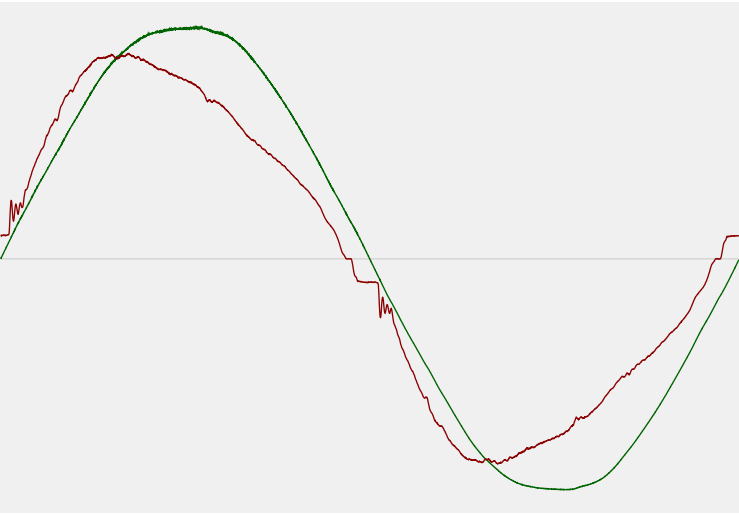
### Input Power

Power feed to light source	41.2 W
Frequency of input power	49.9 Hz
RMS Input voltage feed, $V_{RMS}$	243 V
RMS Input current feed, $I_{RMS}$	0.176 A
Volt-Ampere or apparent power = $V_{RMS} \cdot I_{RMS}$	42.7 VA
Displacement factor of AC power feed	0.97
Power factor of AC current feed	0.97
Total harmonic distortion of the current	11.14%
Total harmonic distortion of the voltage	1.4%

### Efficiency

Radiated power efficiency	23.0%
<div><div></div></div>	
Lumen efficiency	62 lm/W
<div><div></div></div>	

### Input Power Curve





# Goniophotometry Report

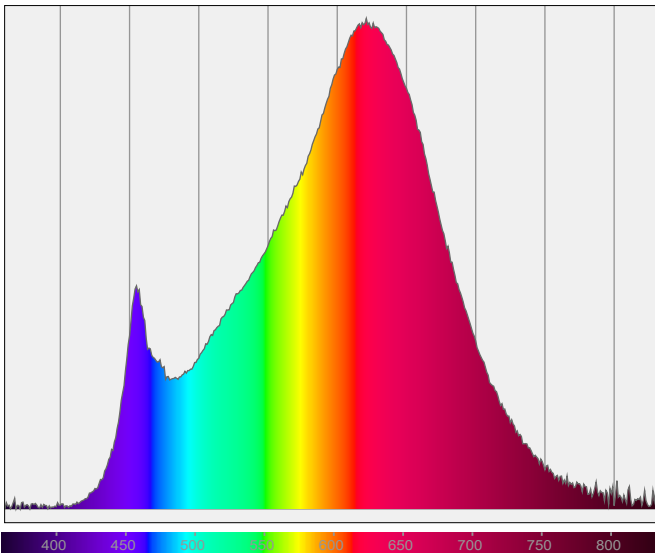
1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_2303  
www.factorylux.com



## Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R <sub>f</sub> 91.7 – R <sub>g</sub> 99.8
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 92.7	Color coordinate CIEs 1960	(u;v) = (0.263;0.352)
Color Rendering Index, R9 (red component)	R9 = 64.0	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R <sub>f</sub> 91.7 – R <sub>g</sub> 99.8	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 90.1		

Goniophotometry Report

1\_PHOT\_REFLEKTER-L-4050lmChip-2700K-UGR\_2303  
www.factorylux.com



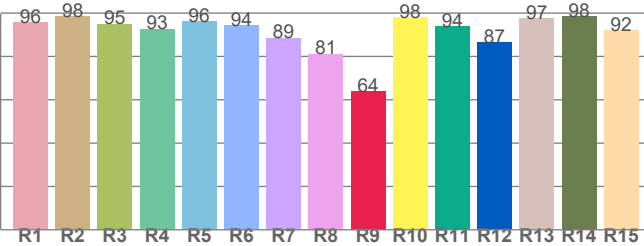
CIE 1931



CIE 1931 – zoomed on Planckian locus



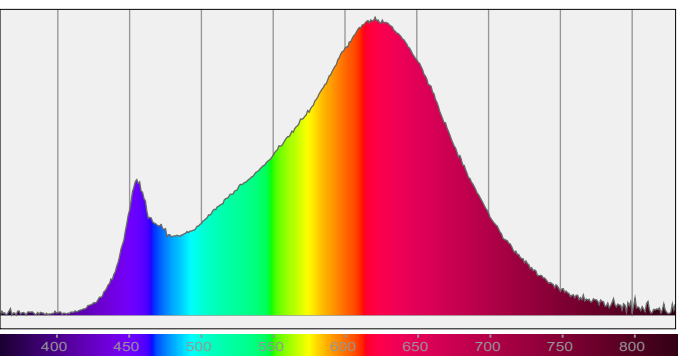
Color Rendering Index per reference color (CIE 1995)



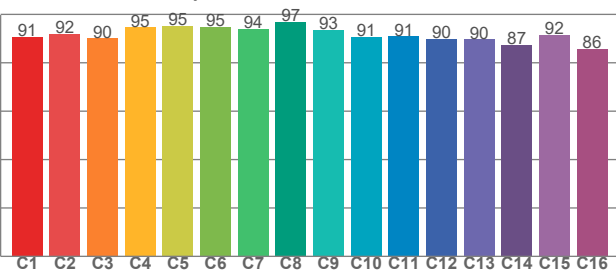
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
95.5	98.4	95.0	92.7	96.1	94.4	88.6	81.2	64.0	98.1	93.8	86.5	97.4	98.4	92.1

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



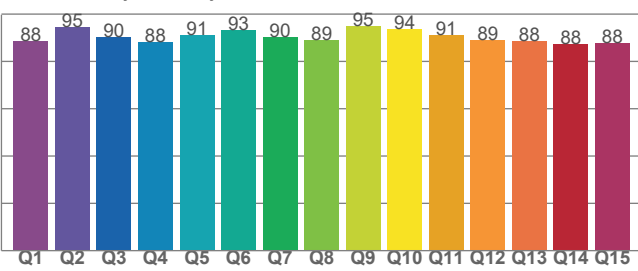
TM30-18 Rf-values per hue bin



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
90.7	91.8	90.0	94.6	95.3	94.7	93.9	96.8	93.5	90.8	90.9	89.8	89.6	87.2	91.5	85.8

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88.5	94.5	90.1	88.1	91.0	93.4	90.1	89.2	95.1	93.8	91.0	88.9	88.5	87.5	87.6