

Light Measurement Report

Print date: 10/23/2023

Measurement date and time: 10/20/2023 3:48:28 PM – Measurement no. VFR-231020-0075-MS

Measurement tracking No. and Link: [n/a](#)

Operator:



Laboratory and Equipment

Laboratory Owner and Location

Goniospectrometer System and Type

Sensor Name, Calibr. Date and Serial No.

Spectrometer Manufacturer and Model

Viso Systems, Copenhagen V, Denmark

LabSpion – Type C, horizontal

LabSensor – 6/20/2022 – 0166732104

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

Warm-up Time and Variation

8 planes – 45°

5°

7.00 m

16.7 W – PF 1.0 – DPF 0.71

24.0 V – 0.697 A

0 Hz

Lamp stabilized in 35 min 11 sec – 0.5%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

TR1223 Essence Side bend 930K

AB1983-02 LNTT 930K 300LPF WH 0408 2S 24V 2.0IN 5.5WPF SIL –

Main Light Measurement Results

Output – Total Lumen (Up% / Down%)

Efficiency

Peak Intensity and Beam Angle

Correlated Color Temperature, Target/Measured

Color Rendering Index

Color Rendering TM30-18

Color Shift, CIE duv and MacAdam Steps

Flicker

809 lm – 3.12% / 96.88%

48 lm/W

268 cd – 112.4°

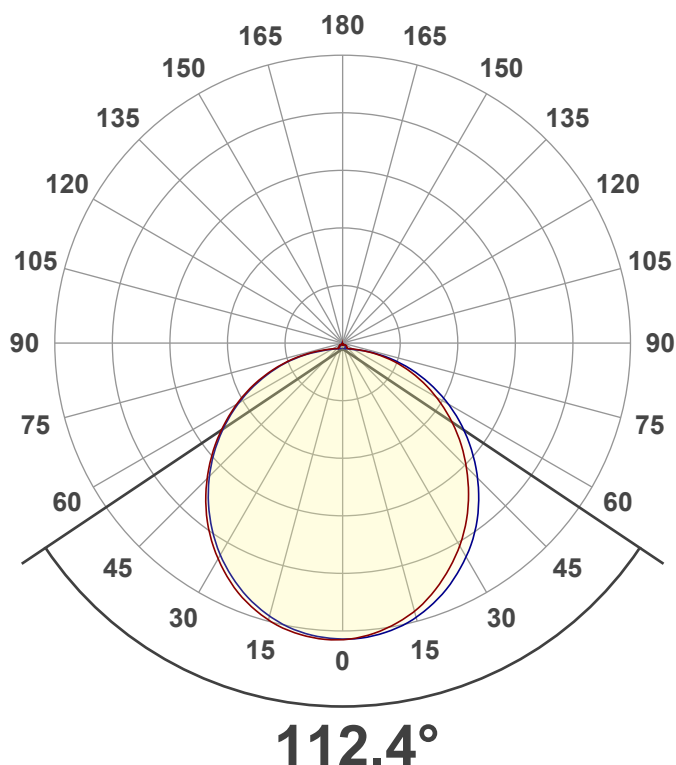
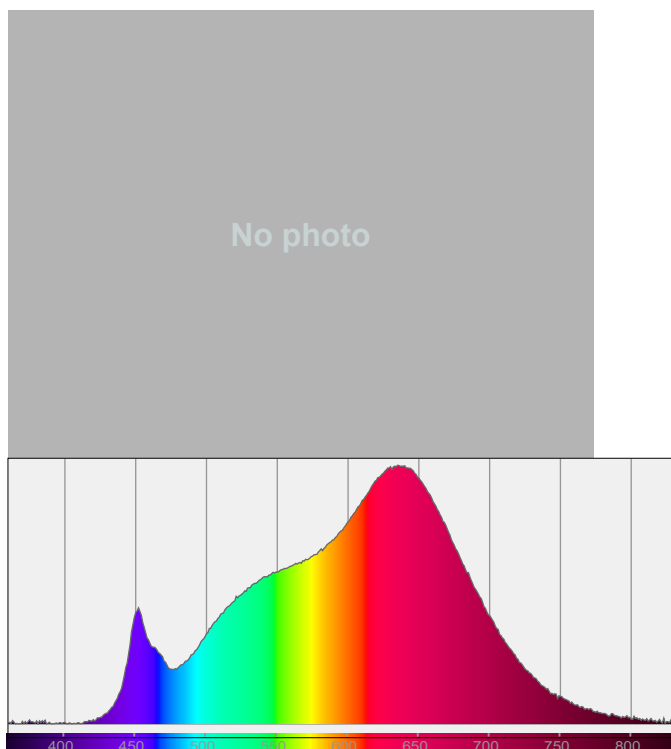
CCT = 2938 K / 2938 K

CRI 98.4

R_f 95.1 – R_g 100.9

Duv 0.0004 – SDCM n/a

SVM n/a – PstLM n/a



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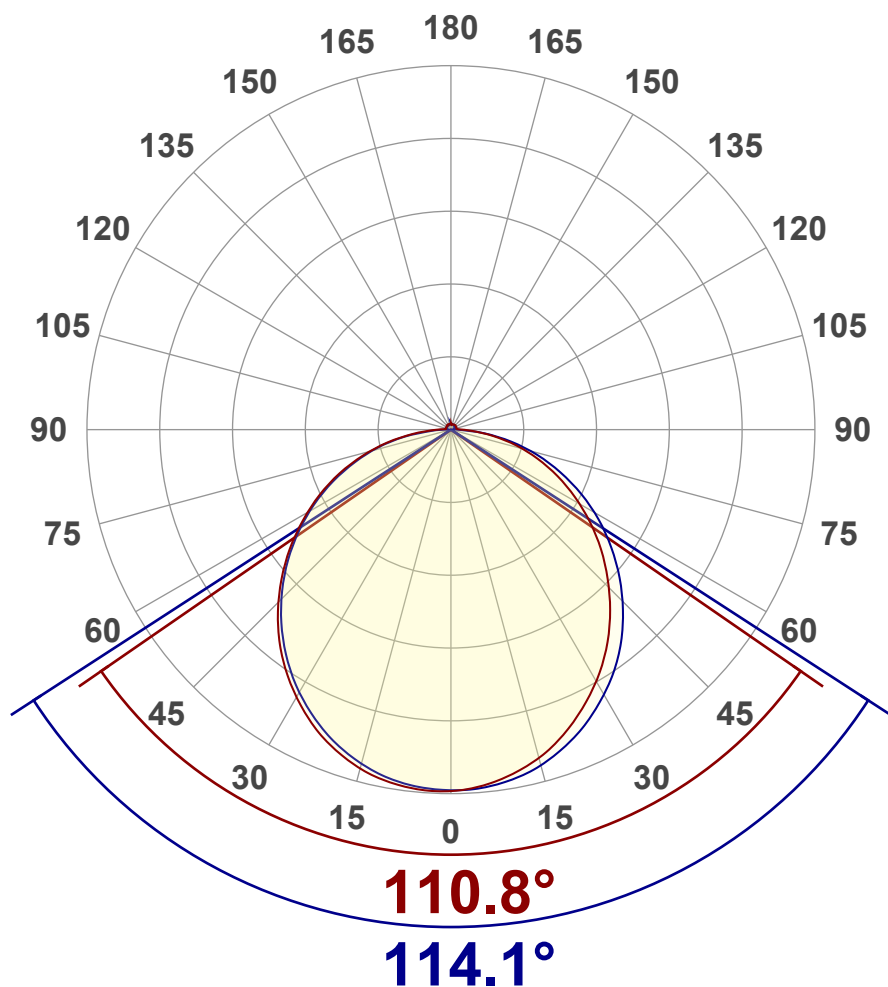
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Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	809 lm
Lumen Up% / Down%	3.12% / 96.88%
Peak Intensity	268 cd
Beam Angle (50%)	112.4°
Beam Angle (90%)	114.1°
Beam Angle (10%)	110.8°

Cut-off Angle

Average 2,5%	181.9°
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Field Angle

Average 10%	167°
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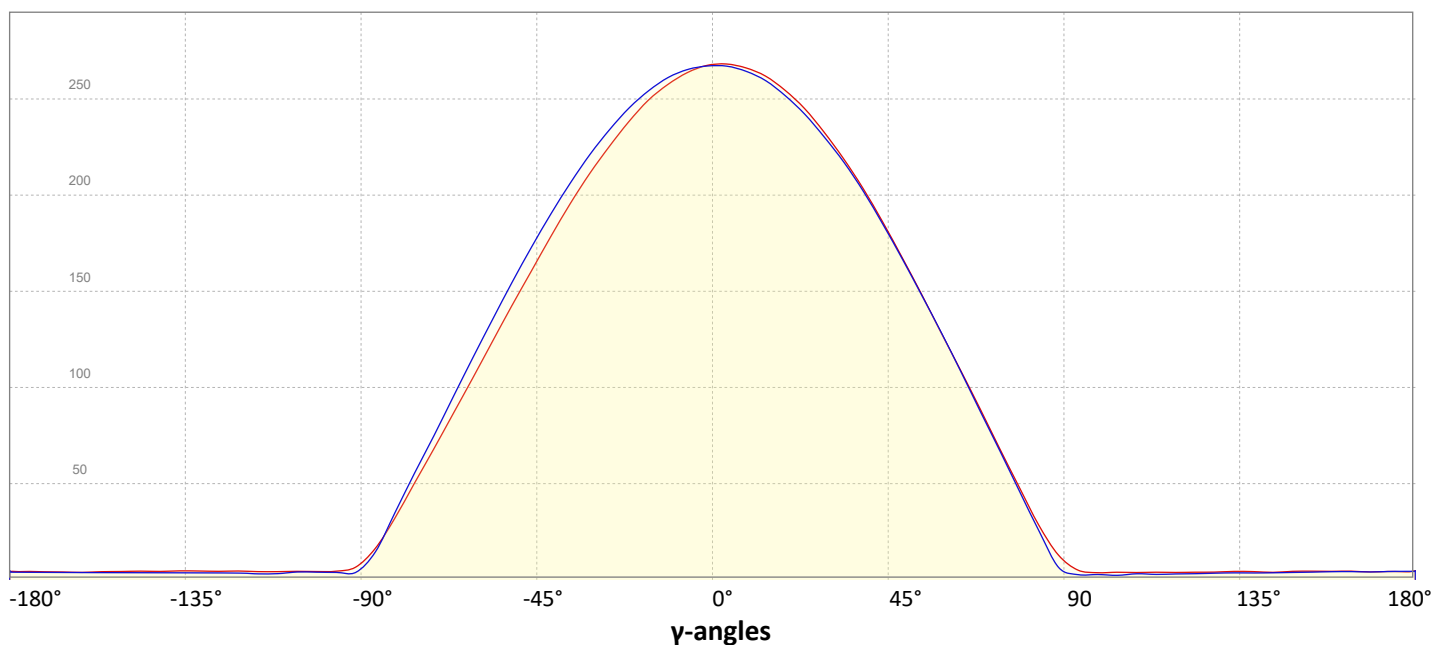
Intensity Ratio

In 120° cone	73.9%
In 90° cone	50.2%

C000-C180

C090-C270

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

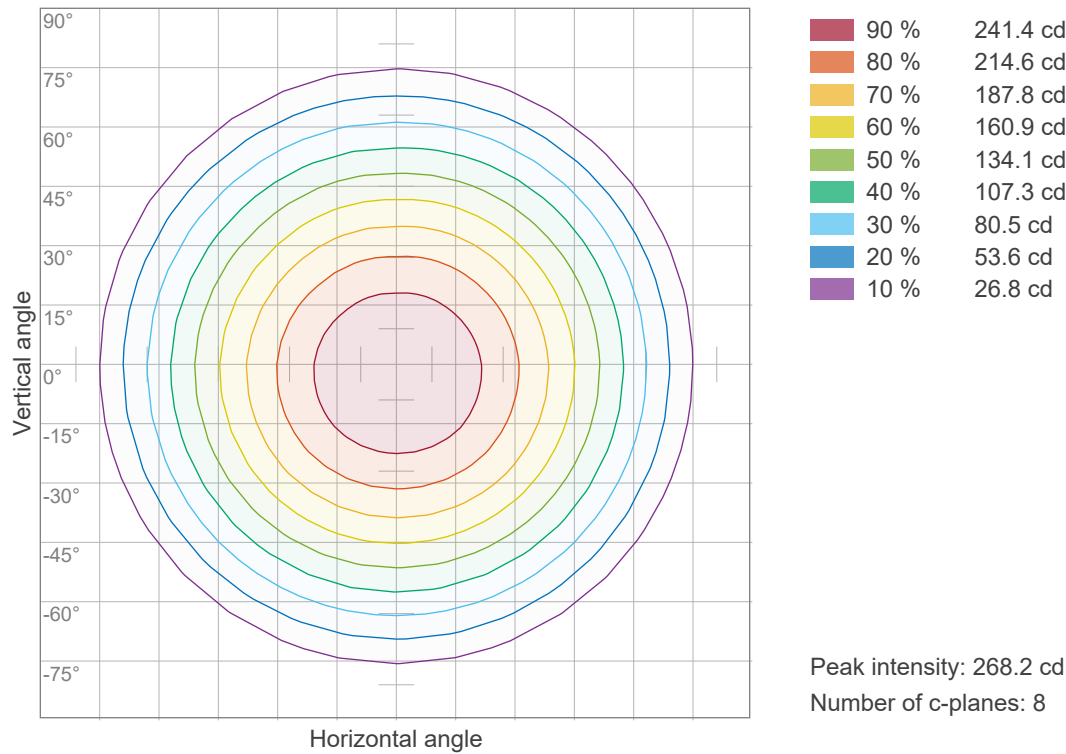


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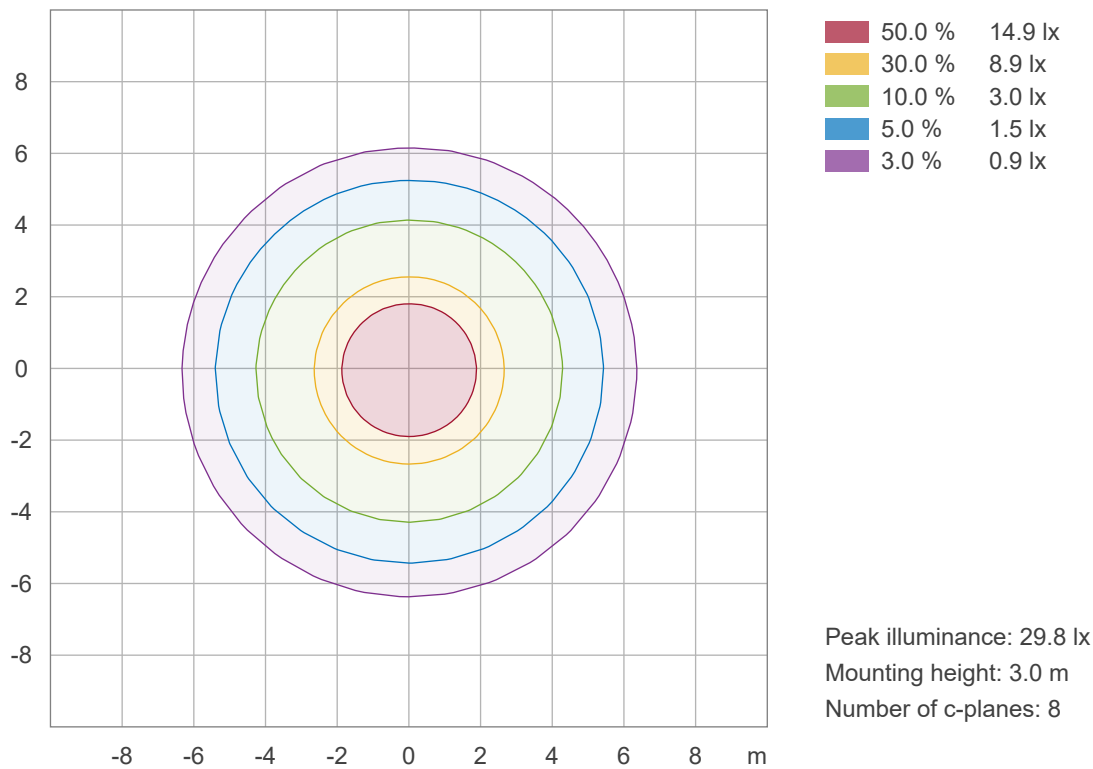
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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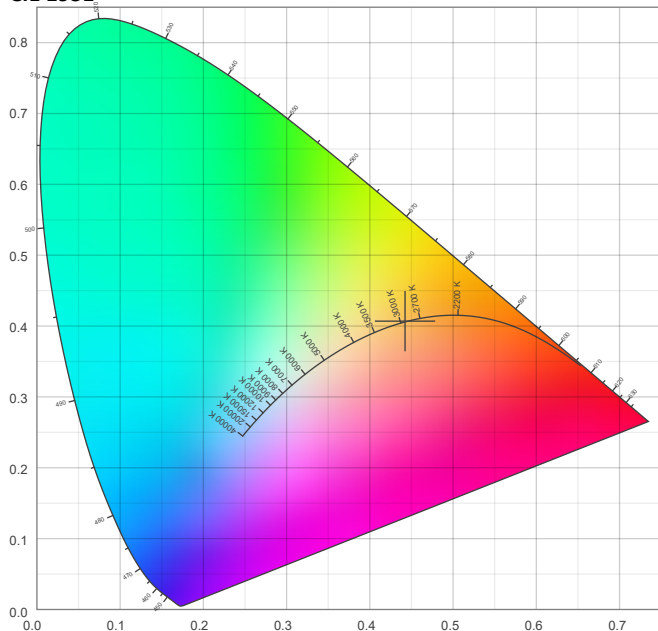


Color details

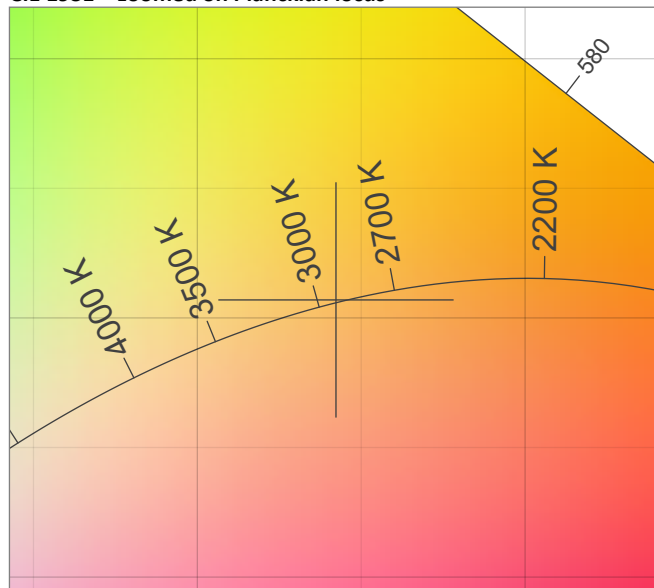
Correlated Color Temperature, Target CCT = 2938 K
Correlated Color Temperature, Measured CCT = 2938 K
Color Rendering Index CRI 98.4
Color Rendering Index, R9 (red component) R9 = 95.4
Color Rendering TM30-18 R_f 95.1 – R_g 100.9
Color Quality Scale CQS = 95.7

MacAdam Steps
Color coordinates CIE 1931 (x;y) = (0.442;0.407)
Color coordinate CIEs 1960 (u;v) = (0.253;0.349)
Color deviation from BBL Duv = 0.0004
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0.253;0.523)

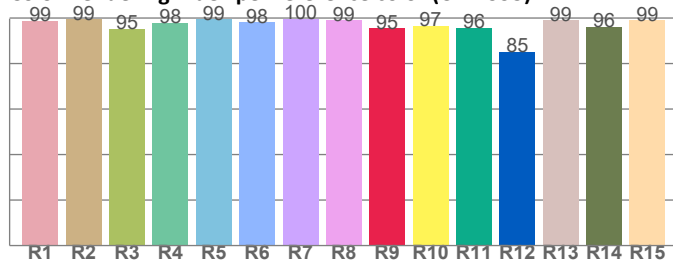
CIE 1931



CIE 1931 – zoomed on Planckian locus



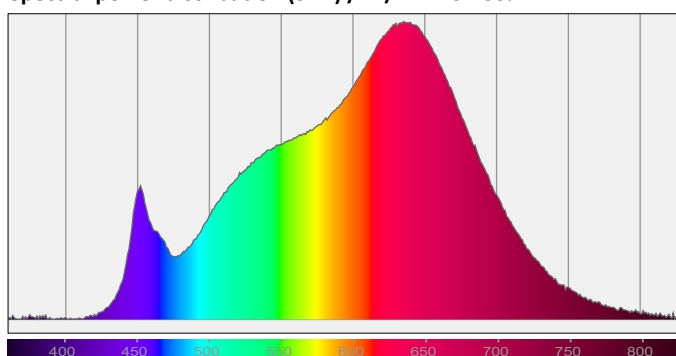
Color Rendering Index per reference color (CIE 1995)



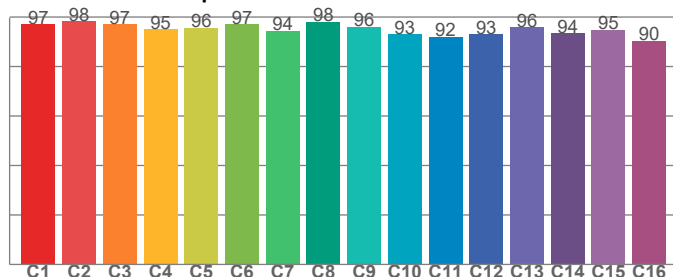
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
98.7	99.4	95.2	97.9	99.4	98.1	99.6	98.9	95.4	96.7	95.6	85.3	99.0	96.2	98.9

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



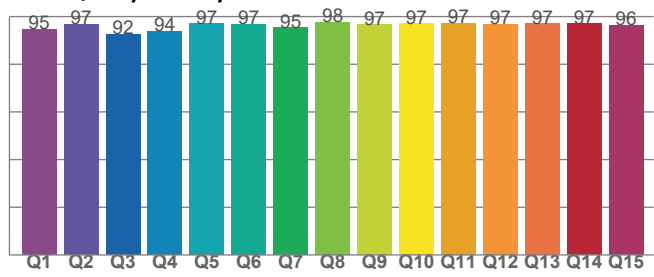
TM30-18 R_f-values per hue bin



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
97.0	98.2	97.0	95.0	95.7	97.1	94.5	98.0	96.1	93.1	91.9	93.0	95.8	93.5	94.9	90.4

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
94.6	96.9	92.4	93.8	97.0	96.7	95.4	97.7	96.6	97.0	97.2	96.8	96.9	97.0	96.2

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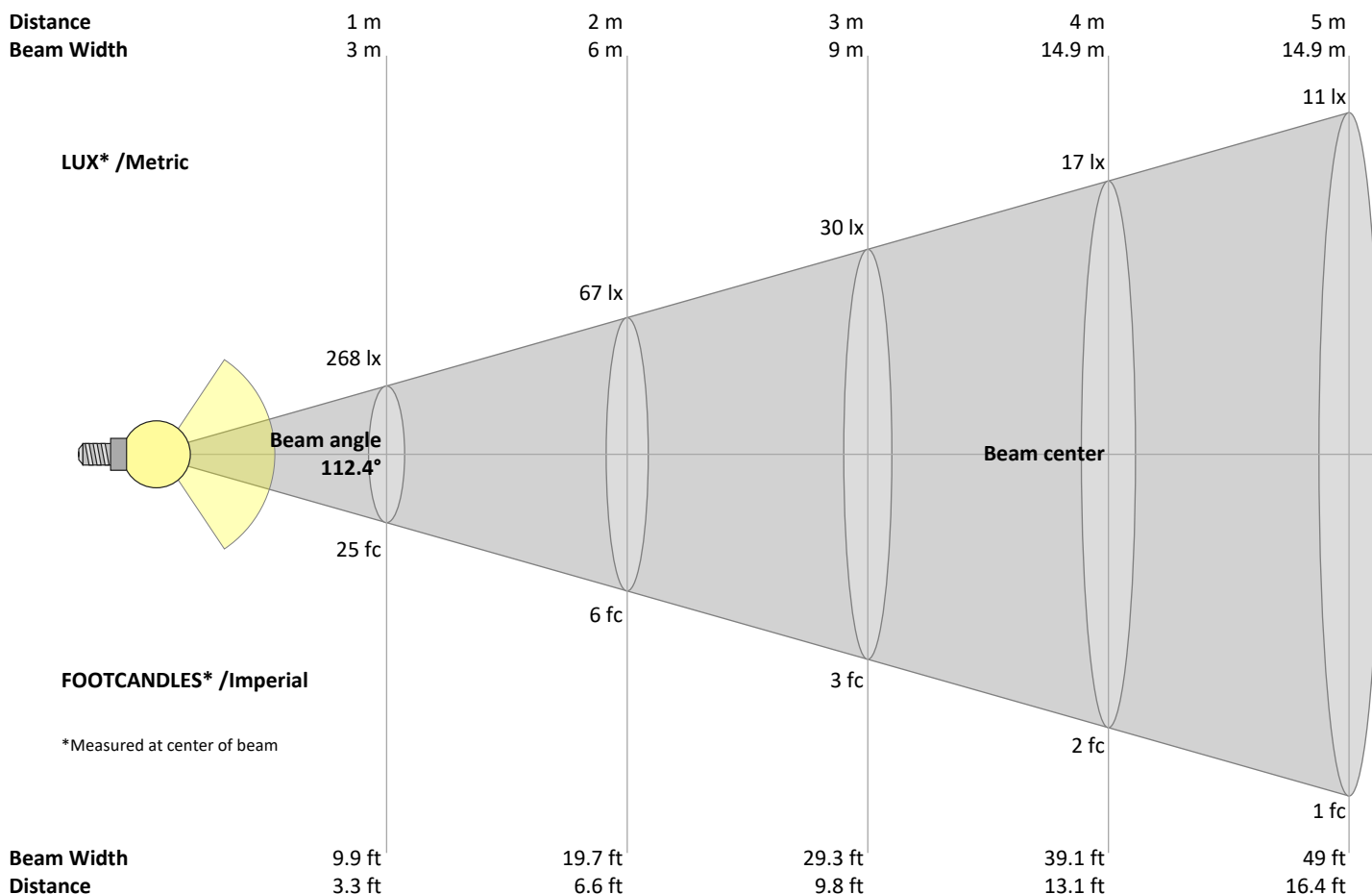
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Beam Details



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
268	67	30	17	11	7	5	4	3	3	2	2	2	1	1	1	1	1	1	1	lux
24.9	6.2	2.8	1.6	1	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	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
268	265	259	252	241	229	215	200	183	165	147	129	110	92	73	55	37	21	9	5	cd
100%	99%	97%	94%	90%	86%	80%	75%	69%	62%	55%	48%	41%	34%	27%	21%	14%	8%	3%	2%	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
268	266	263	257	249	239	227	213	197	180	161	142	123	102	82	61	40	20	5	3	cd
100%	100%	98%	96%	93%	89%	85%	80%	74%	67%	60%	53%	46%	38%	31%	23%	15%	8%	2%	1%	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
268	268	265	260	252	242	229	214	198	181	162	143	123	103	83	62	42	24	11	5	cd
100%	100%	99%	97%	94%	90%	86%	80%	74%	68%	61%	53%	46%	39%	31%	23%	16%	9%	4%	2%	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
268	266	262	256	248	237	225	210	195	178	160	140	121	101	80	61	40	20	7	4	cd
100%	99%	98%	96%	93%	89%	84%	79%	73%	66%	60%	52%	45%	38%	30%	23%	15%	7%	2%	1%	of 0°val

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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											
X	Y	Viewed Crosswise (Viewing direction orthogonal to lamp length axis)					Viewed Endwise (Viewing direction parallel to lamp length axis)				
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	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					

UGR data could not be calculated due to missing dimensions. Goto Edit->Photometric->Dimensions and set the fixture/lamp dimensions.

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	118	118	118	118	115	115	115	115	109	109	109	104	104	104	99	99	99	97
1	107	102	98	94	104	100	96	92	95	91	88	90	88	85	86	84	82	80
2	97	89	82	76	94	87	80	75	82	77	72	79	74	70	75	71	68	66
3	89	78	69	63	86	76	68	62	72	66	60	69	64	59	66	62	57	55
4	81	69	60	53	78	67	59	52	64	57	51	61	55	50	59	54	49	47
5	74	61	52	45	72	60	51	45	57	50	44	55	49	43	53	47	43	40
6	69	55	46	40	67	54	45	39	52	44	39	50	43	38	48	42	37	35
7	64	50	41	35	62	49	41	35	47	40	34	45	39	34	44	38	33	31
8	59	46	37	31	57	45	37	31	43	36	30	42	35	30	40	34	30	28
9	55	42	34	28	54	41	33	28	40	32	27	38	32	27	37	31	27	25
10	52	39	31	25	50	38	30	25	37	30	25	36	29	25	34	29	24	23

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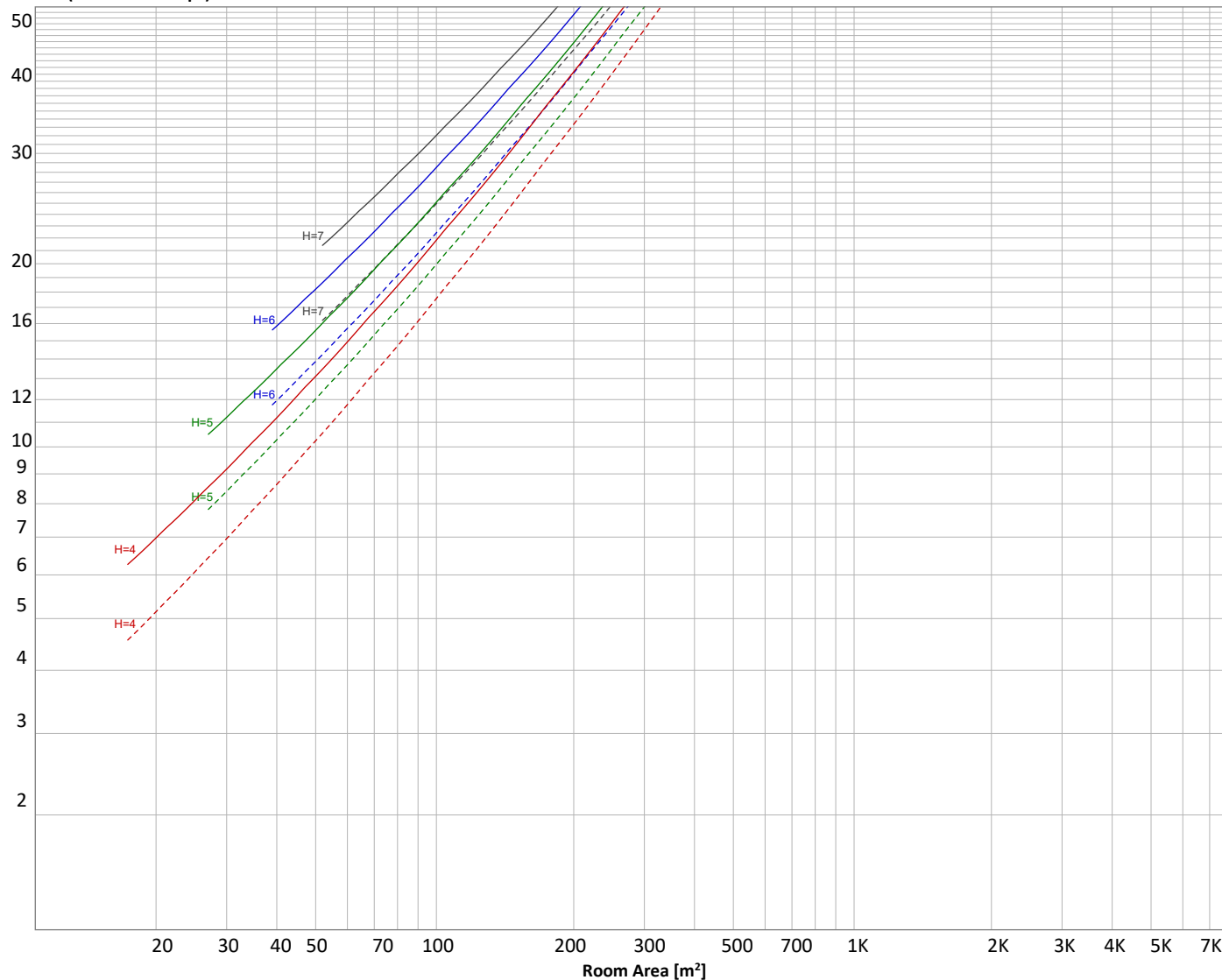
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 809 lm	p(%)		
H _{down} = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	Wall reflectance
H _{work} = Work area height from floor =	0.00 m	-----	70	50
E _{work} = 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°
25.3 lm	72.3 lm	109 lm	131 lm	136 lm	124 lm	98.6 lm	63.3 lm	24.1 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
4.94 lm	3.96 lm	3.74 lm	3.48 lm	3.11 lm	2.55 lm	1.92 lm	1.15 lm	0.402 lm

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Outdoor Light Planning

Lumen per Zone

Zone (y)	Lumen	% Total
0-10°	25 lm	3.1%
10-20°	72 lm	8.9%
20-30°	109 lm	13.5%
30-40°	131 lm	16.2%
40-50°	136 lm	16.8%
50-60°	124 lm	15.3%
60-70°	99 lm	12.2%
70-80°	63 lm	7.8%
80-90°	24 lm	3.0%
90-100°	5 lm	0.6%
100-110°	4 lm	0.5%
110-120°	4 lm	0.5%
120-130°	3 lm	0.4%
130-140°	3 lm	0.4%
140-150°	3 lm	0.3%
150-160°	2 lm	0.2%
160-170°	1 lm	0.1%
170-180°	0 lm	0.0%
Total	809 lm	100.0%

Intensity peaks

Max intensity	268 cd
Intensity, 90°	9 cd
Intensity, 0°	268 cd

Zonal Lumen summary

Zone (y)	Lumen	% Total
0-30°	207 lm	25.6%
0-40°	338 lm	41.8%
0-60°	598 lm	73.9%
60-90°	186 lm	23.0%
70-100°	92 lm	11.4%
90-120°	13 lm	1.6%
0-90°	784 lm	96.9%
90-180°	25 lm	3.1%
0-180°	809 lm	100.0%

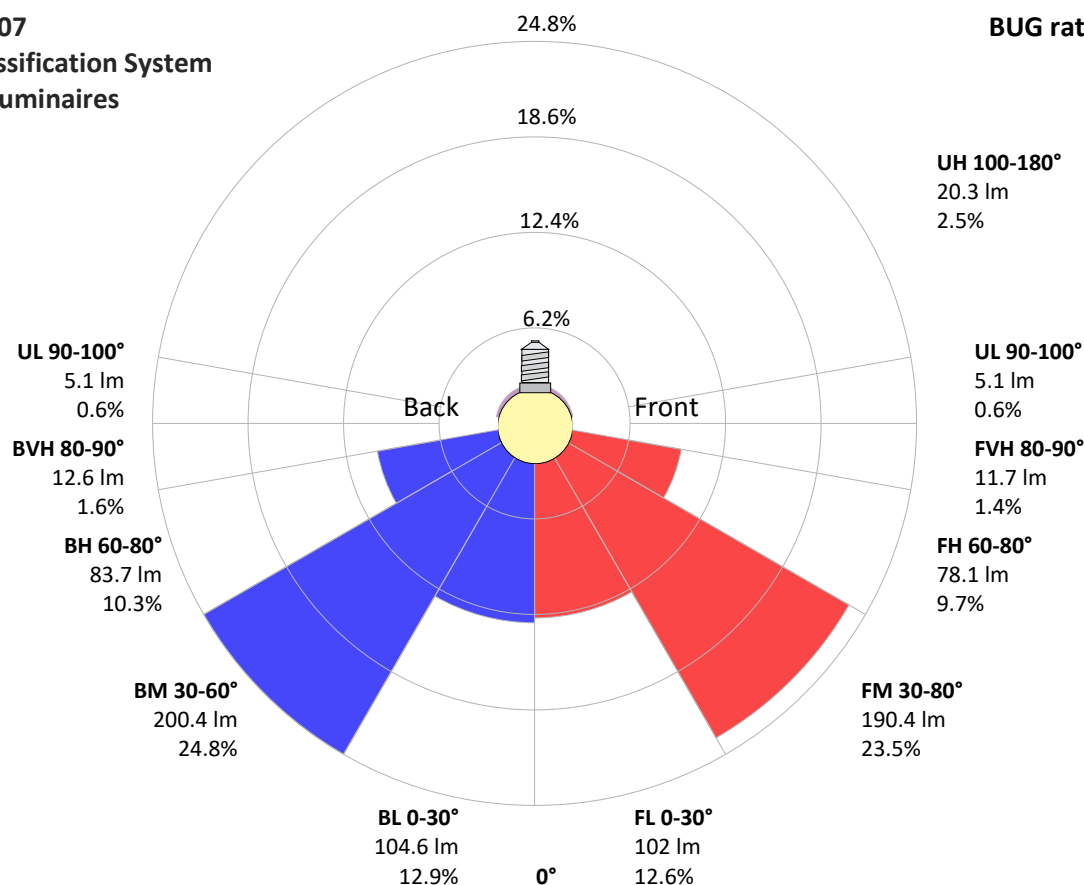
BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	102 lm	12.6%
Medium(30-60°)	190 lm	23.5%
High(60-80°)	78 lm	9.7%
Very high(80-90°)	12 lm	1.4%
Back light		
Low(0-30°)	105 lm	12.9%
Medium(30-60°)	200 lm	24.8%
High(60-80°)	84 lm	10.3%
Very high(80-90°)	13 lm	1.6%
Uplight		
Low(90-100°)	5 lm	0.6%
High(100-180°)	20 lm	2.5%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B0 U2 G1



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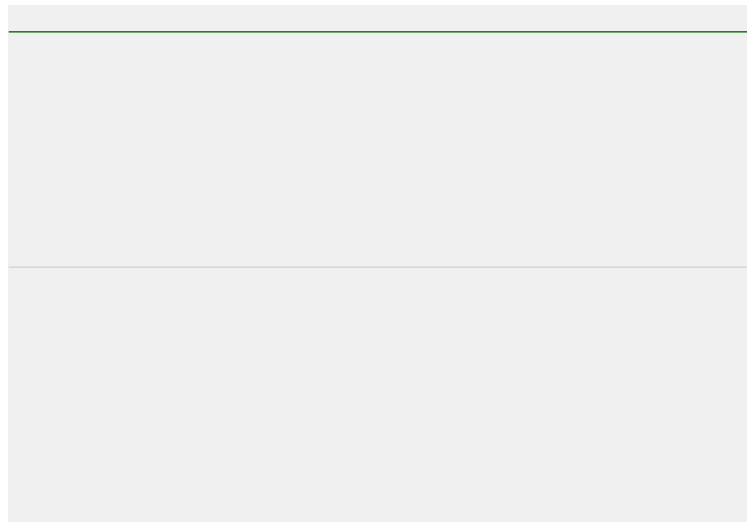


Power Details

Input Power

Power feed to light source	16.7 W
Frequency of input power	0 Hz
RMS Input voltage feed, V_{RMS}	24.0 V
RMS Input current feed, I_{RMS}	0.697 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	16.72 VA
Displacement factor of AC power feed	0.71
Power factor of AC current feed	1.0
Total harmonic distortion of the current	0%
Total harmonic distortion of the voltage	0%

Input Power Curve



Efficiency

Radiated power efficiency 18.4%



Lumen efficiency 48 lm/W



Stabilization Details

Warmup Conditions

Stable period	15 min
Stable change max	0.5%
Minimum time	30 min

Color Temperature Change

CCT start	2977 K
CCT shift	-39 K
CCT end	2938 K

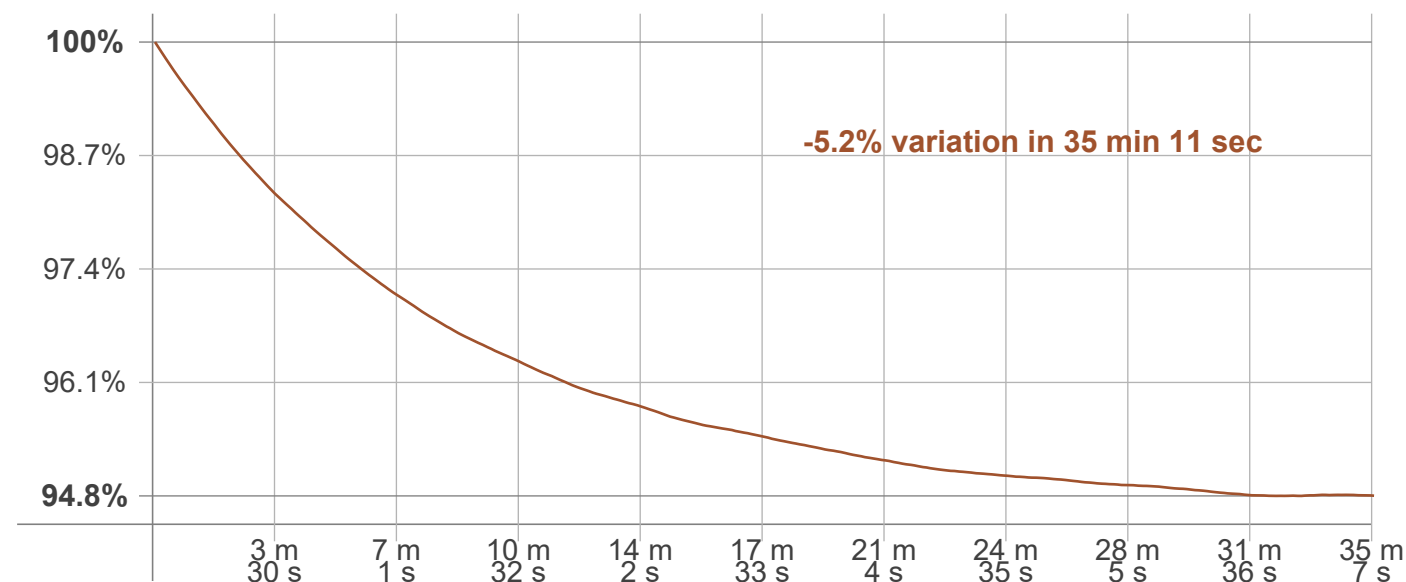
Warmup Result

Total warmup time	Lamp stabilized in 35 min 11 sec
Warmup variation	-5.2%

Output Change

Output start	852 lm
Output change	-43 lm
Output end	809 lm

Stabilization Curve



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Flicker /TLA details

Flicker Meter Type Viso Systems LabFlicker
Frequency of input power 0 Hz
Flicker/TLA sample rate n/a samples/s

Measurement time
PstLM 180 sec
All other indices 1,2 sec

Flicker indices according to Illuminating Engineering Society (IES)

Flicker frequency n/a Hz
Percent Flicker n/a %
Flicker index n/a

Flicker indices according to California Energy Commission (CEC) 2016b

JA8/10 40 Hz n/a %
JA8/10 90 Hz n/a %
JA8/10 200 Hz n/a %
JA8/10 400 Hz n/a %
JA8/10 1000 Hz n/a %

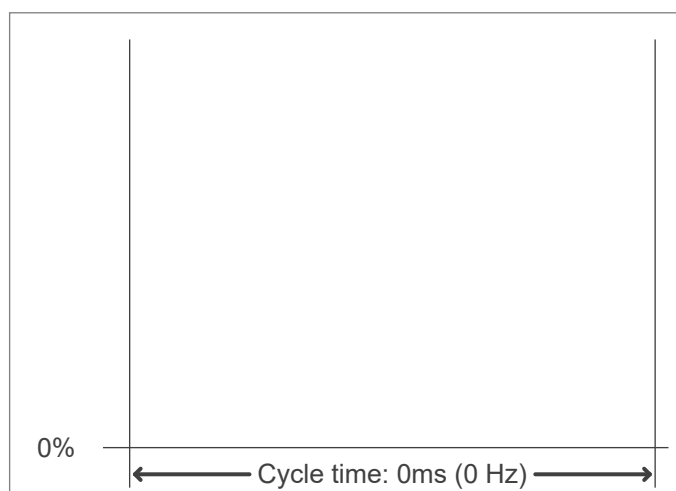
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value ($F < 80$ Hz) n/a
SVM value ($80 < F < 2000$ Hz) n/a

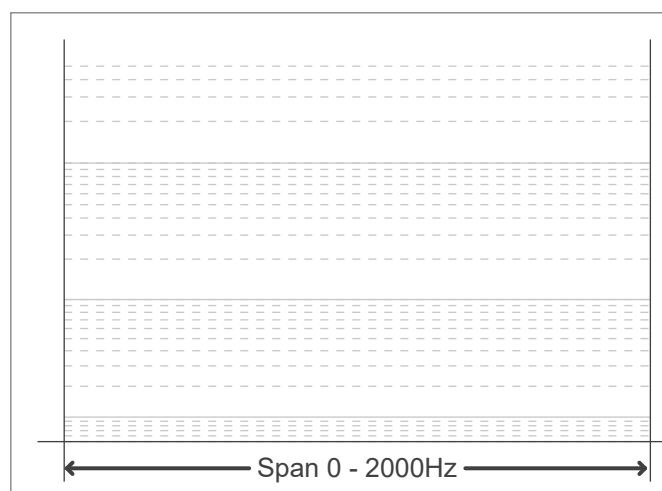
Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp n/a

Flicker frame (frame of one flicker period in time domain)



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

