

Light Measurement Report

Print date: 9/28/2023

Measurement date and time: 9/28/2023 12:16:07 PM – Measurement no. VFR-230928-0057-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

16 planes – 22.5°

5°

6.89 m

14.0 W – PF 1.0 – DPF 0.71

24.0 V – 0.584 A

0 Hz

Lamp stabilized in 19 min 1 sec – 0.5%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

Essence warm dim 24vdc 100% test

–

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

786 lm – 2.45% / 97.55%

56 lm/W

258 cd – 115.9°

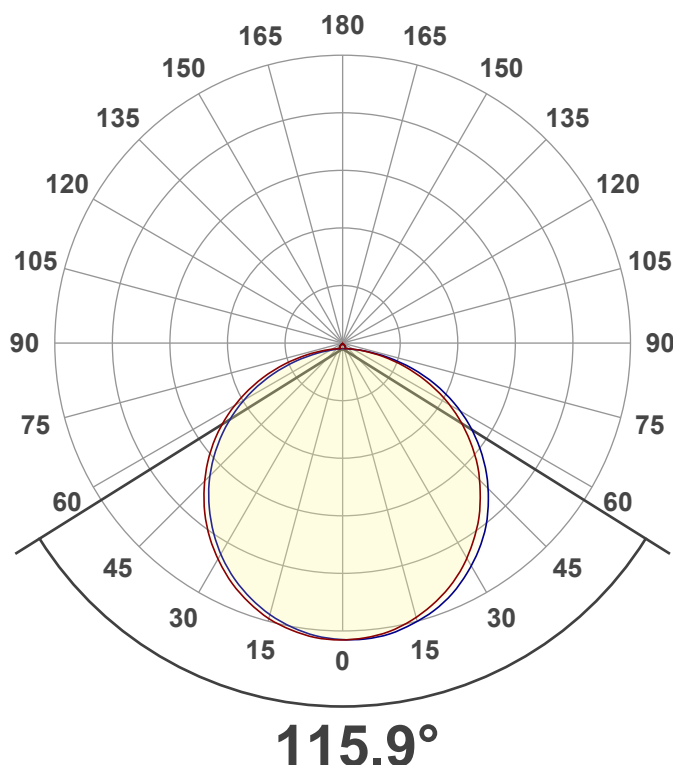
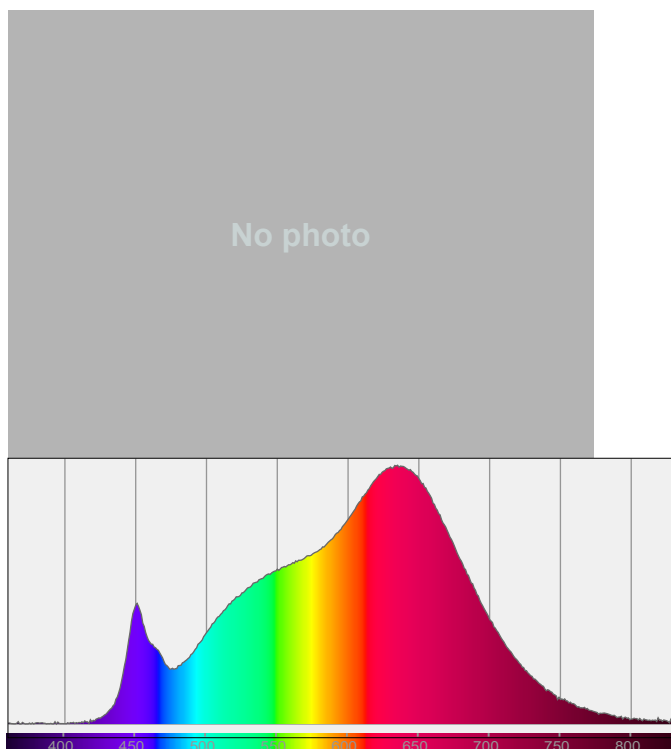
CCT = 2950 K / 2950 K

CRI 98.3

R_f 95.2 – R_g 101.3

Duv -0.0002 – SDCM n/a

SVM n/a – PstLM n/a



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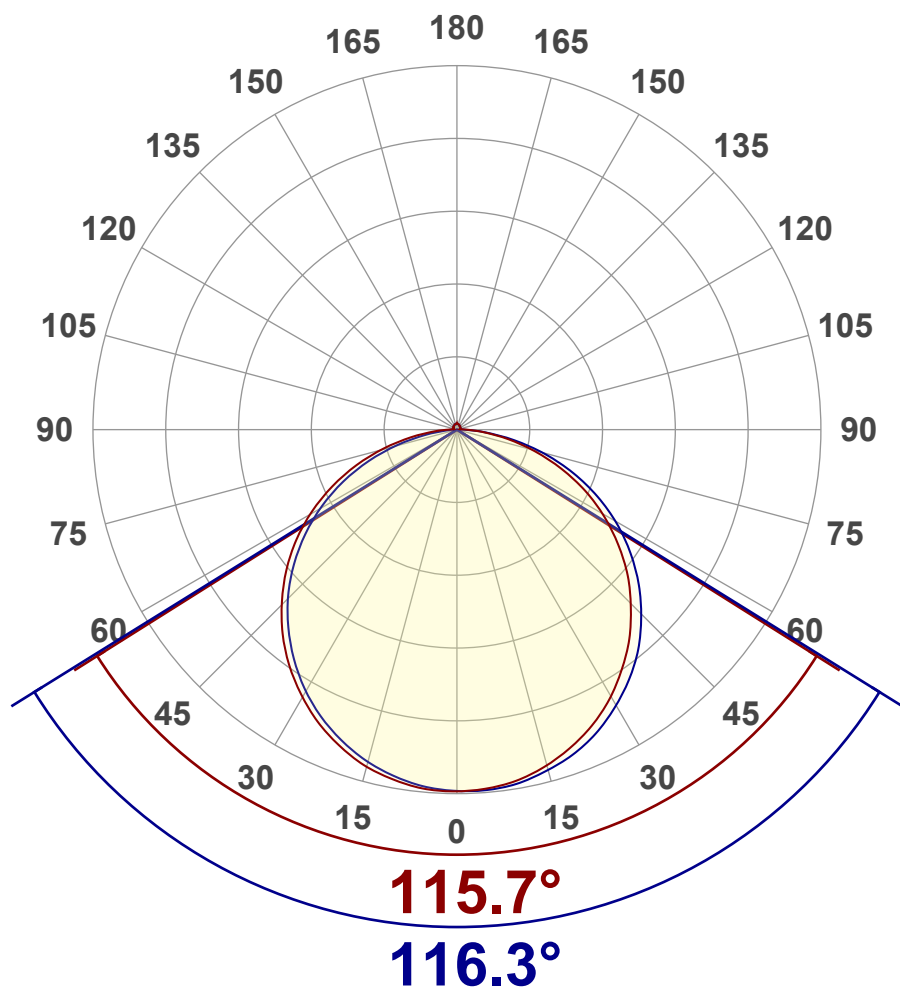
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Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	786 lm
Lumen Up% / Down%	2.45% / 97.55%
Peak Intensity	258 cd
Beam Angle (50%)	115.9°
Beam Angle (90%)	116.3°
Beam Angle (10%)	115.7°

Cut-off Angle

Average 2,5%	178.4°
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Field Angle

Average 10%	164.2°
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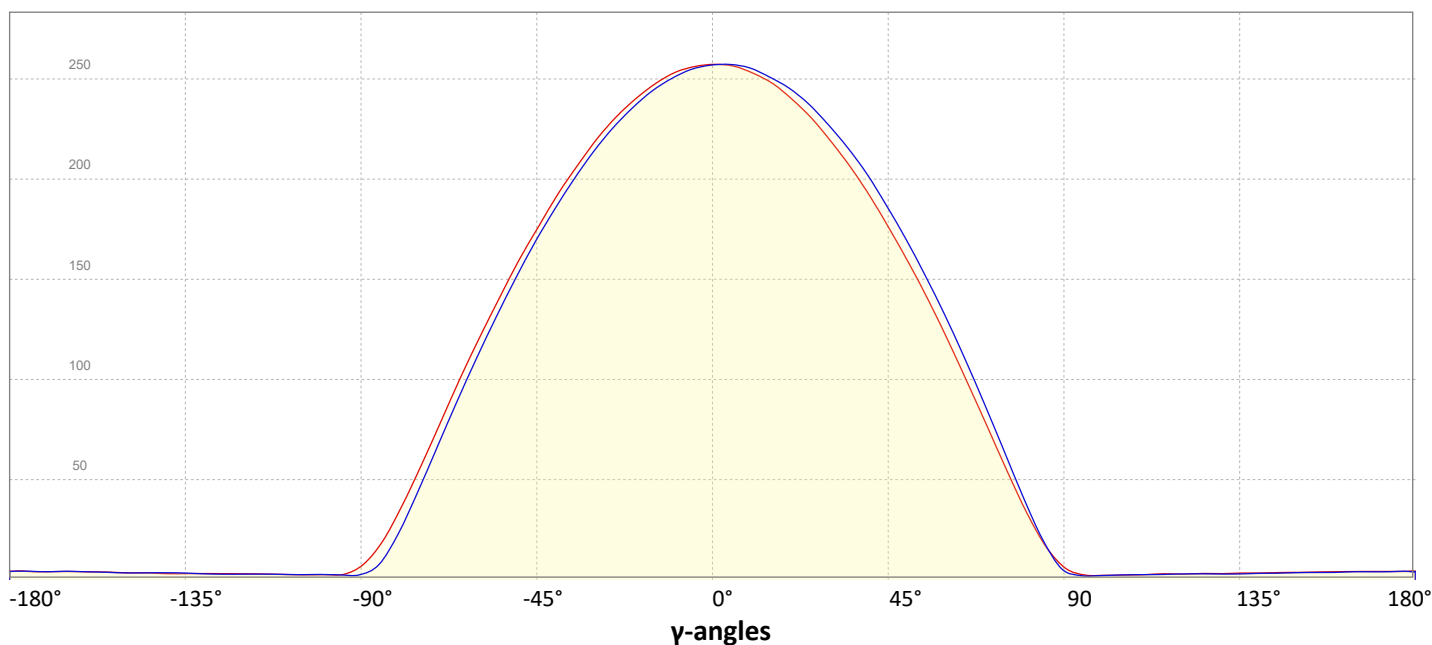
Intensity Ratio

In 120° cone	75.3%
In 90° cone	50.7%

C000-C180

C090-C270

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

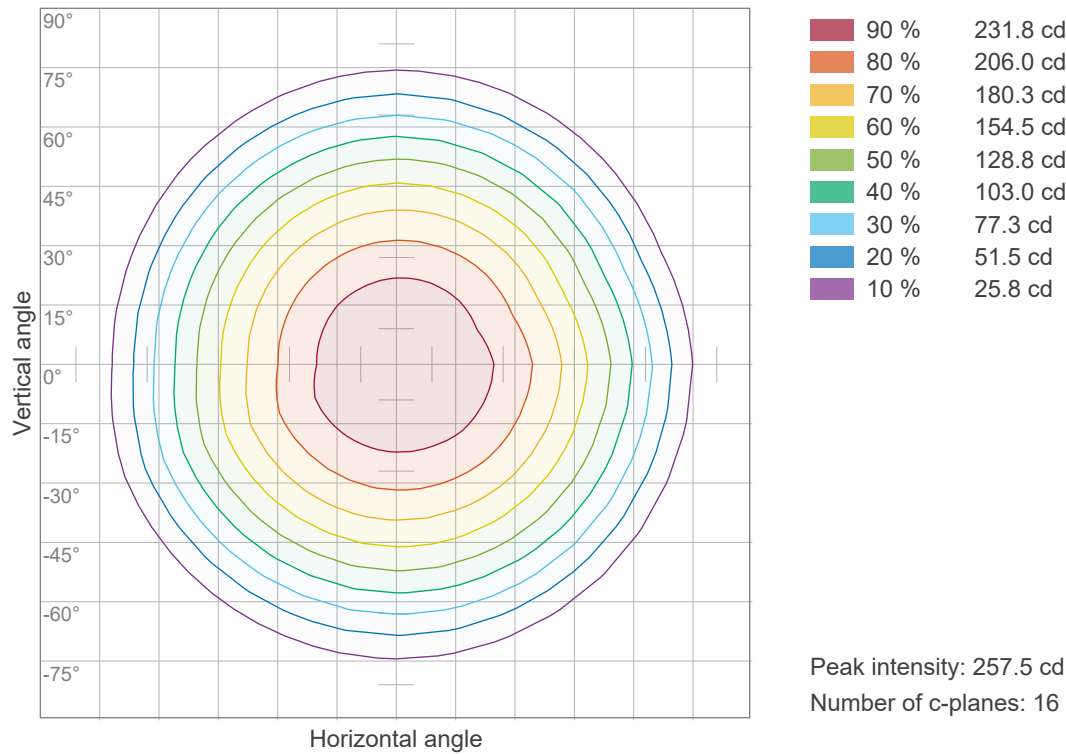


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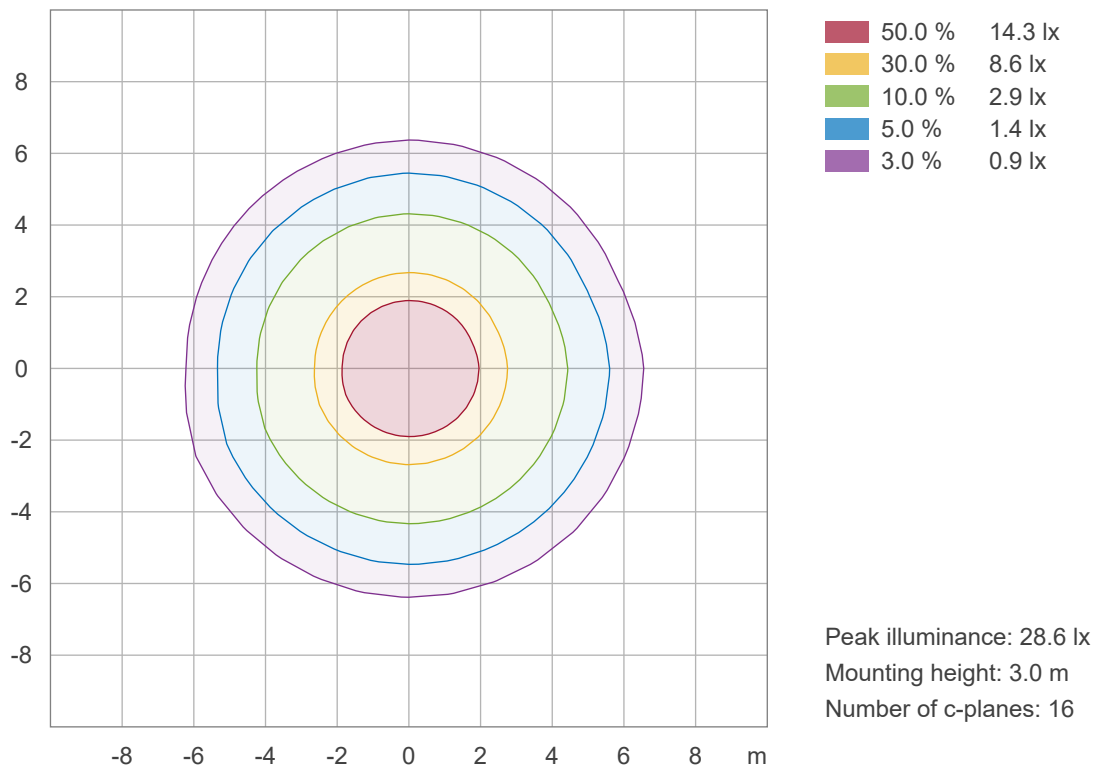
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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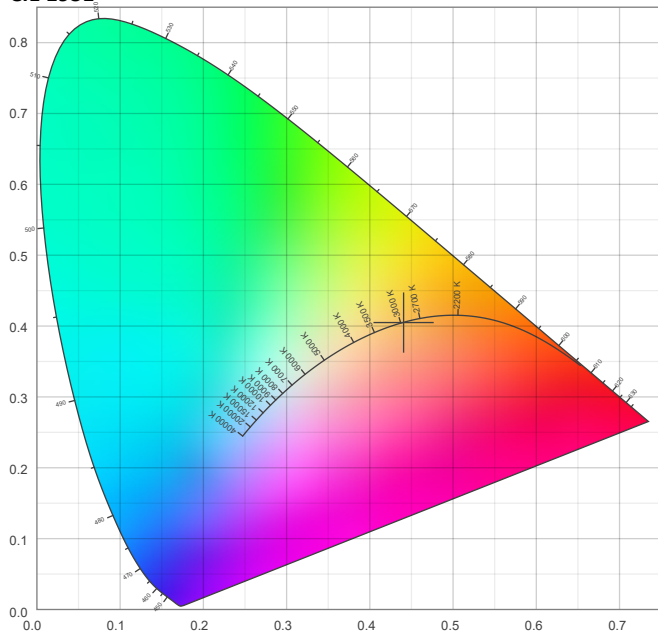


Color details

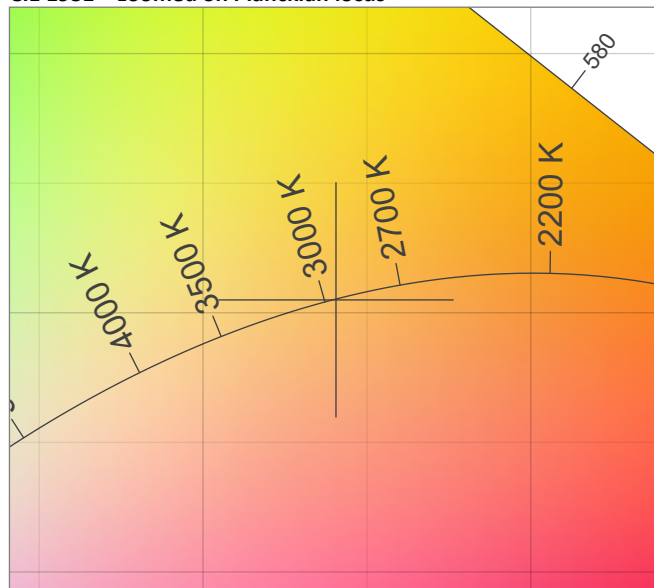
Correlated Color Temperature, Target CCT = 2950 K
Correlated Color Temperature, Measured CCT = 2950 K
Color Rendering Index CRI 98.3
Color Rendering Index, R9 (red component) R9 = 93.9
Color Rendering TM30-18 R_f 95.2 – R_g 101.3
Color Quality Scale CQS = 95.5

MacAdam Steps
Color coordinates CIE 1931 (x;y) = (0.441;0.405)
Color coordinate CIEs 1960 (u;v) = (0.253;0.348)
Color deviation from BBL Duv = -0.0002
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0.253;0.522)

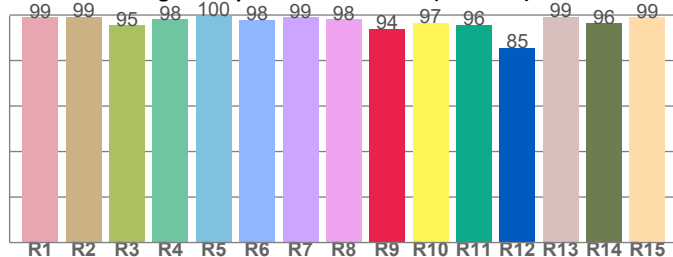
CIE 1931



CIE 1931 – zoomed on Planckian locus



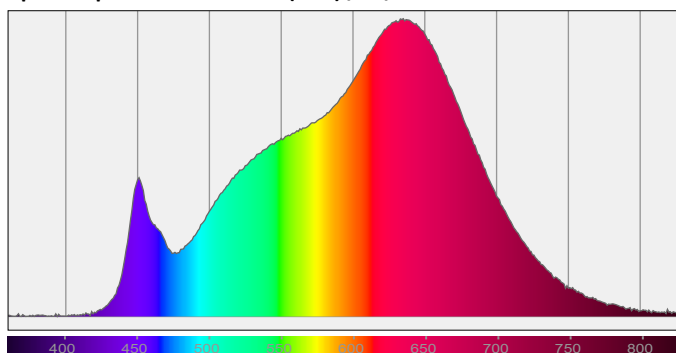
Color Rendering Index per reference color (CIE 1995)



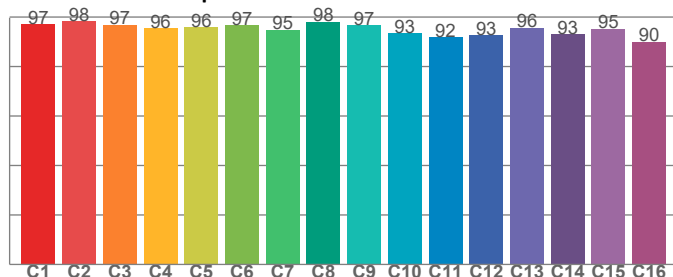
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
99.0	99.3	95.4	98.0	99.6	97.9	99.0	98.2	93.9	96.6	95.8	85.5	99.3	96.4	99.0

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



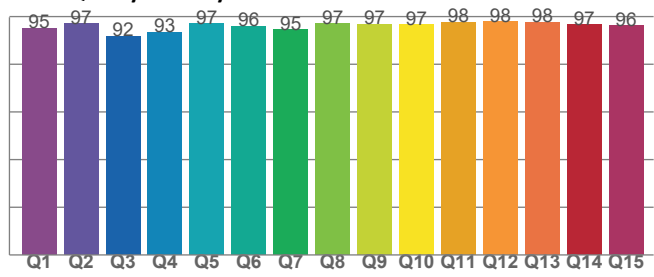
TM30-18 R_f-values per hue bin



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	98.3	96.8	95.5	95.8	96.8	94.7	98.2	96.7	93.4	91.8	92.6	95.6	93.1	95.2	90.0

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
95.1	97.0	91.8	93.4	96.9	96.0	94.5	97.0	96.7	96.5	97.7	97.9	97.7	96.6	96.1

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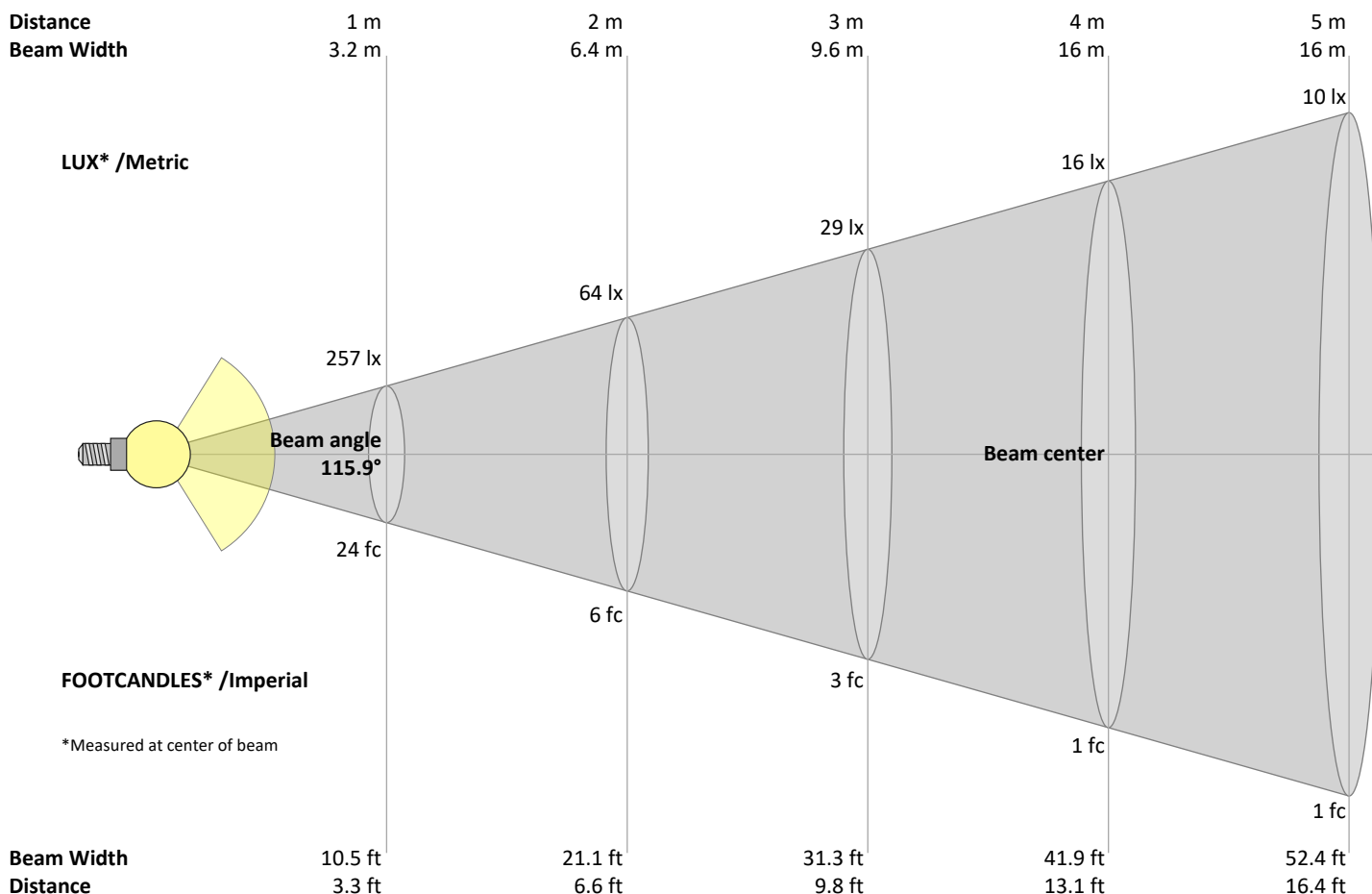
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Beam Details



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
257	64	29	16	10	7	5	4	3	3	2	2	2	1	1	1	1	1	1	1	lux
23.9	6	2.7	1.5	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
257	256	253	247	239	230	219	206	191	175	158	139	119	99	77	55	35	18	7	3	cd
100%	99%	98%	96%	93%	89%	85%	80%	74%	68%	61%	54%	46%	38%	30%	22%	14%	7%	3%	1%	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
257	257	255	251	245	237	226	215	201	185	168	150	130	109	86	63	39	19	5	2	cd
100%	100%	99%	97%	95%	92%	88%	83%	78%	72%	65%	58%	51%	42%	33%	24%	15%	7%	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
257	256	253	248	240	231	220	207	192	176	159	141	121	100	78	56	35	18	7	3	cd
100%	100%	98%	96%	93%	90%	85%	80%	75%	68%	62%	55%	47%	39%	30%	22%	14%	7%	3%	1%	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
257	255	251	245	236	227	215	201	186	170	152	133	112	91	68	46	25	9	3	2	cd
100%	99%	97%	95%	92%	88%	83%	78%	72%	66%	59%	52%	44%	35%	27%	18%	10%	3%	1%	1%	of 0°val

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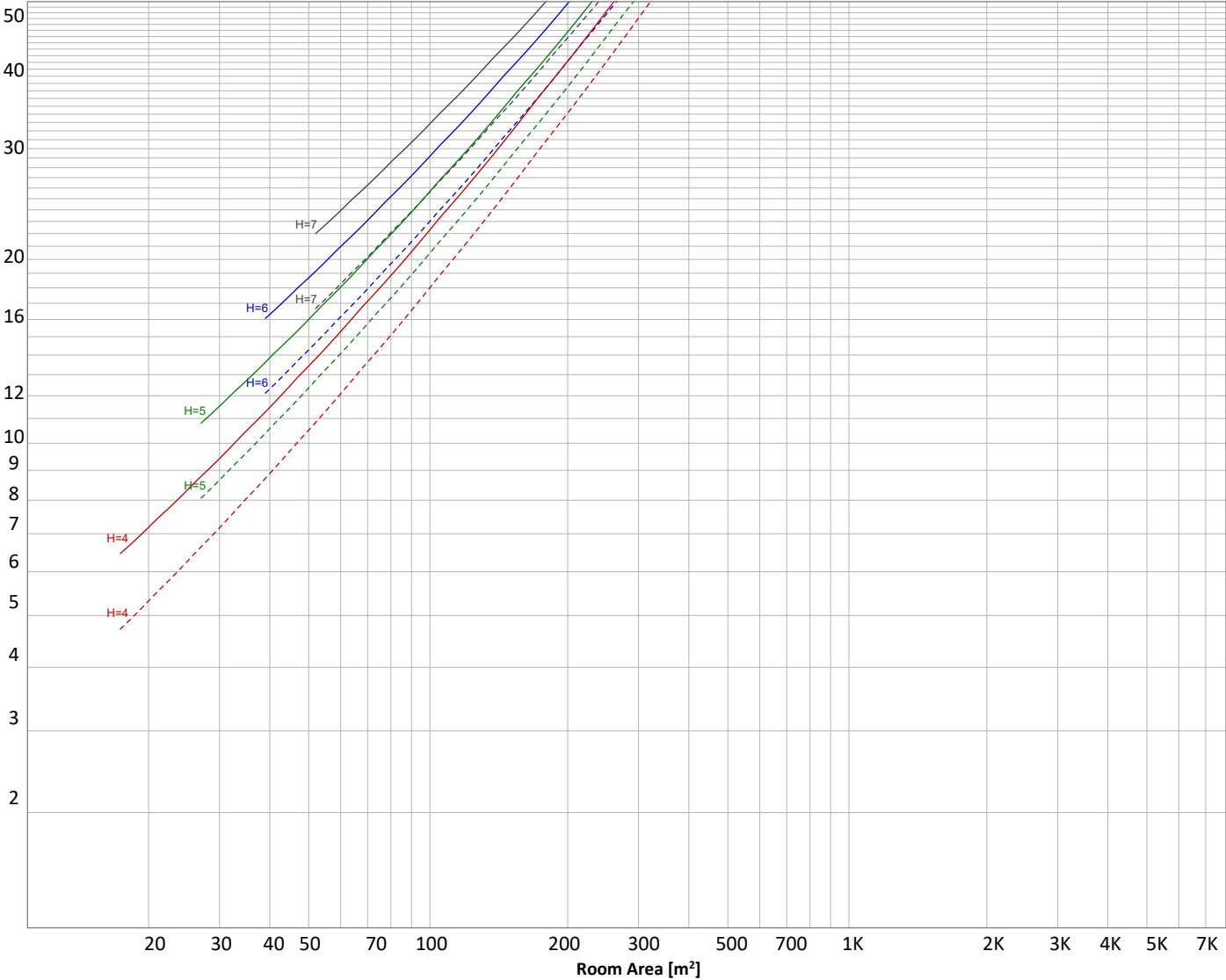
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 786 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°
24.3 lm	69.9 lm	106 lm	129 lm	136 lm	125 lm	98.1 lm	58.2 lm	18.9 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
3.31 lm	2.62 lm	2.74 lm	2.67 lm	2.49 lm	2.18 lm	1.72 lm	1.13 lm	0.394 lm

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Outdoor Light Planning

Lumen per Zone

Zone (y)	Lumen	% Total
0-10°	24 lm	3.1%
10-20°	70 lm	8.9%
20-30°	106 lm	13.5%
30-40°	129 lm	16.5%
40-50°	136 lm	17.3%
50-60°	125 lm	15.9%
60-70°	98 lm	12.5%
70-80°	58 lm	7.4%
80-90°	19 lm	2.4%
90-100°	3 lm	0.4%
100-110°	3 lm	0.3%
110-120°	3 lm	0.3%
120-130°	3 lm	0.3%
130-140°	2 lm	0.3%
140-150°	2 lm	0.3%
150-160°	2 lm	0.2%
160-170°	1 lm	0.1%
170-180°	0 lm	0.1%
Total	786 lm	100.0%

Intensity peaks

Max intensity	258 cd
Intensity, 90°	7 cd
Intensity, 0°	257 cd

Zonal Lumen summary

Zone (y)	Lumen	% Total
0-30°	201 lm	25.5%
0-40°	330 lm	42.0%
0-60°	592 lm	75.3%
60-90°	175 lm	22.3%
70-100°	80 lm	10.2%
90-120°	9 lm	1.1%
0-90°	767 lm	97.6%
90-180°	19 lm	2.4%
0-180°	786 lm	100.0%

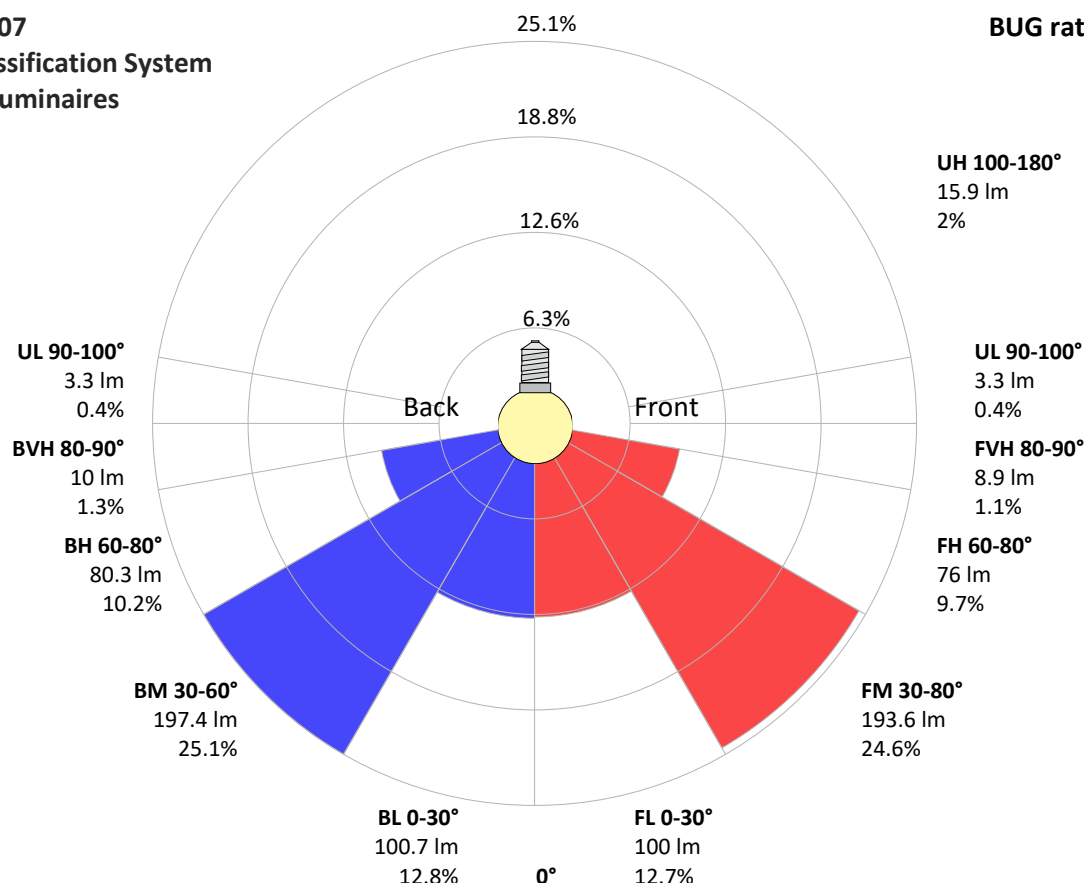
BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	100 lm	12.7%
Medium(30-60°)	194 lm	24.6%
High(60-80°)	76 lm	9.7%
Very high(80-90°)	9 lm	1.1%
Back light		
Low(0-30°)	101 lm	12.8%
Medium(30-60°)	197 lm	25.1%
High(60-80°)	80 lm	10.2%
Very high(80-90°)	10 lm	1.3%
Uplight		
Low(90-100°)	3 lm	0.4%
High(100-180°)	16 lm	2.0%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B0 U2 G0



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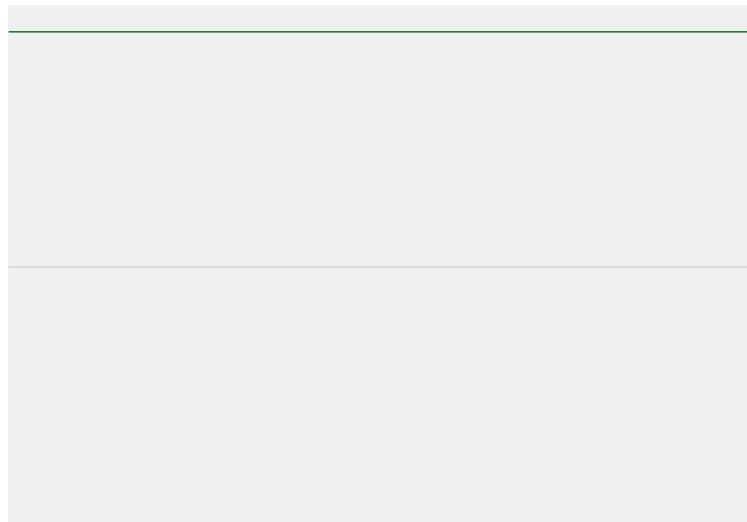


Power Details

Input Power

Power feed to light source	14.0 W
Frequency of input power	0 Hz
RMS Input voltage feed, V_{RMS}	24.0 V
RMS Input current feed, I_{RMS}	0.584 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	14.02 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 21.1%



Lumen efficiency 56 lm/W



Stabilization Details

Warmup Conditions

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

Color Temperature Change

CCT start	2967 K
CCT shift	-17 K
CCT end	2950 K

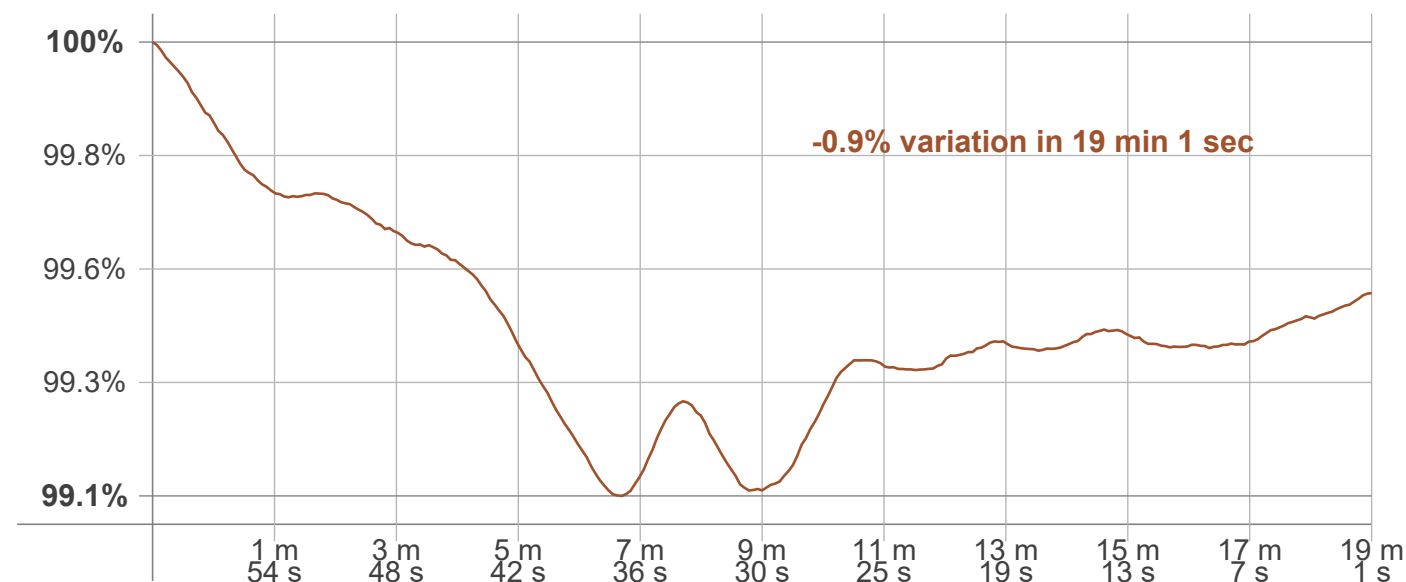
Warmup Result

Total warmup time	Lamp stabilized in 19 min 1 sec
Warmup variation	-0.9%

Output Change

Output start	790 lm
Output change	-4 lm
Output end	786 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 %

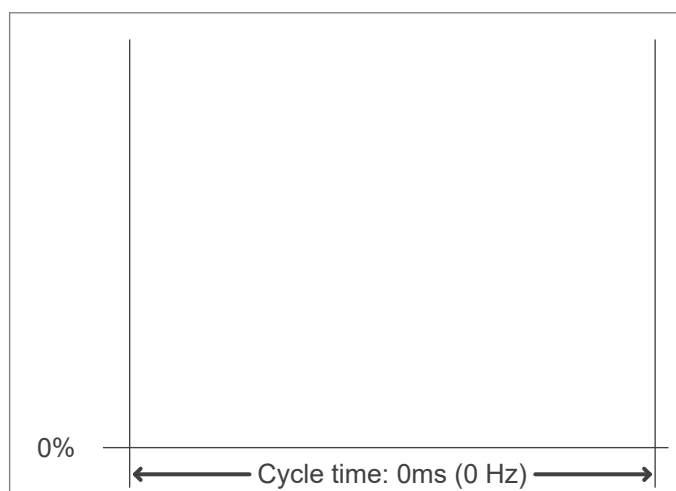
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

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

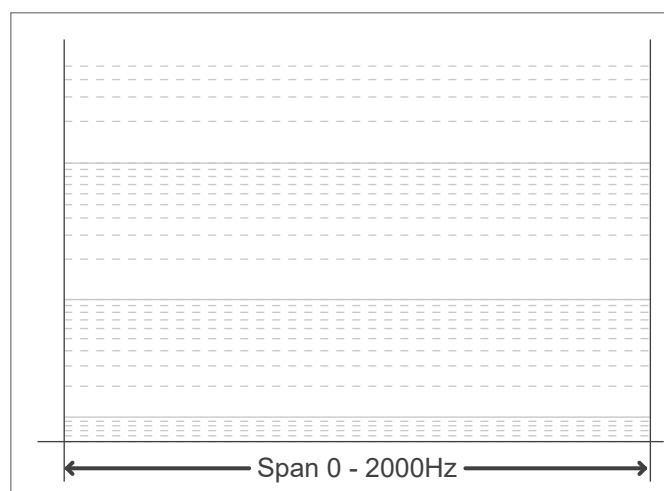
Flicker indices according to Lighting Research Center (2015)

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

