

Light Measurement Report

Print date: 12-8-2025

Measurement date and time: 31-7-2025 15:39:43 – Measurement no. VFR-250731-2285-MS

Measurement tracking No. and Link: [VT250731-000726](#)

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 Model2 – 11-1-2024 – 3130191315
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

12 planes – 30°
5°
6,22 m
29,6 W – PF 0,97 – DPF 0,97
230 V – 0,133 A
50 Hz
Lamp stabilized in 15 min 1 sec – 2,0%

Tested Light Source

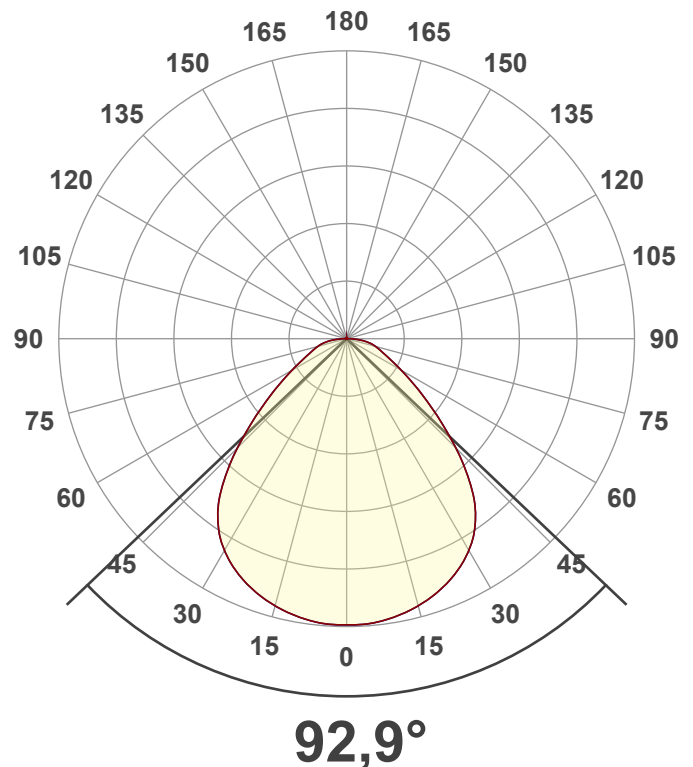
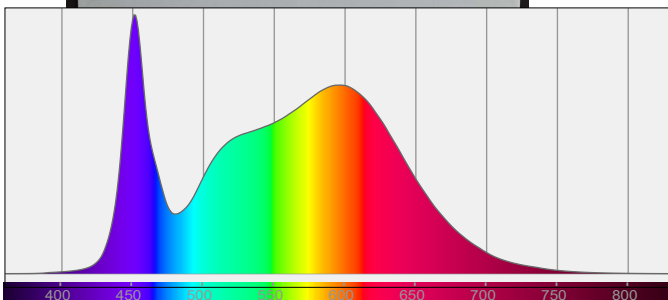
Product Name
Item No. and Manufacturer
Product Description (line 1)
ZONDER DRIVER

812645-28W-4000K
812645 – Dutchfulfillment
BACK-LIT LED PANEEL | EUROPA | 60X60CM | 28W | CCT-SWITCH |

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

3528 lm – 0,47% / 99,53%
119 lm/W
1539 cd – 92,9°
CCT = 4000 K / 4267 K
CRI 85,6
 R_f 84,7 – R_g 96,7
Duv -0,0021 – SDCM 6,0
SVM n/a – PstLM n/a



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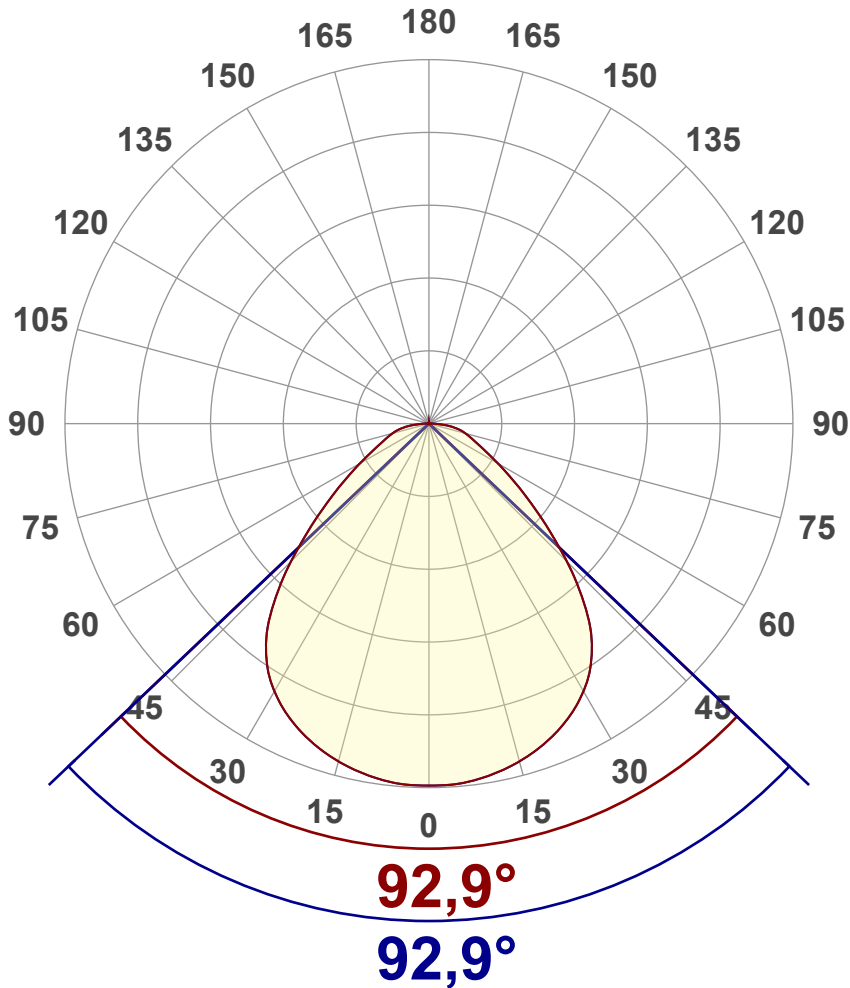
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Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	3528 lm
Lumen Up% / Down%	0,47% / 99,53%
Peak Intensity	1539 cd
Beam Angle (50%)	92,9°
Beam Angle (90%)	92,9°
Beam Angle (10%)	92,9°

Cut-off Angle

Average 2,5%	175,2°
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Field Angle

Average 10%	151,7°
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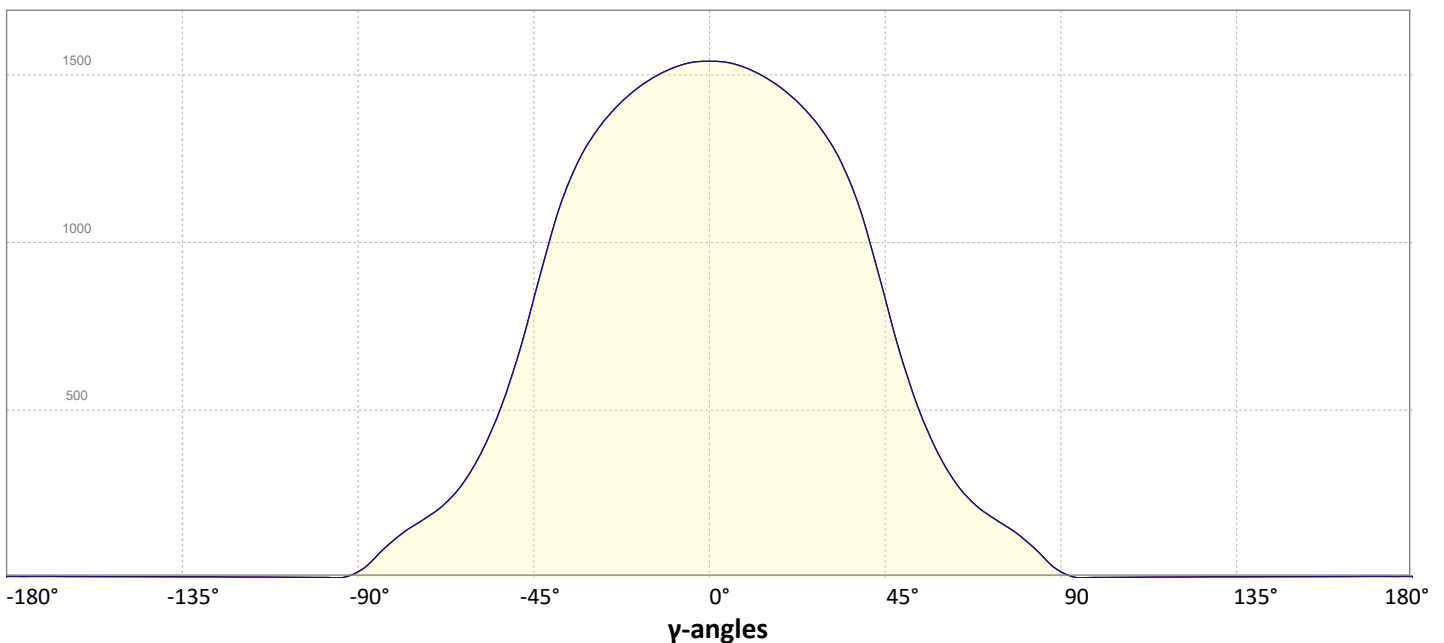
Intensity Ratio

In 120° cone	85,4%
In 90° cone	65,2%

C000-C180

C090-C270

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



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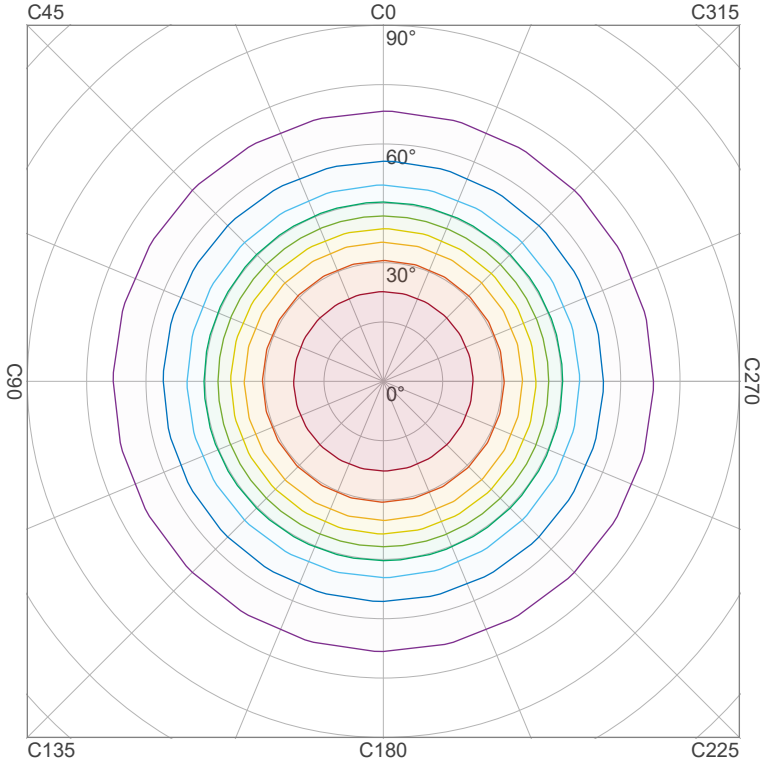
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Iso-intensity Diagram (Iso-candela)

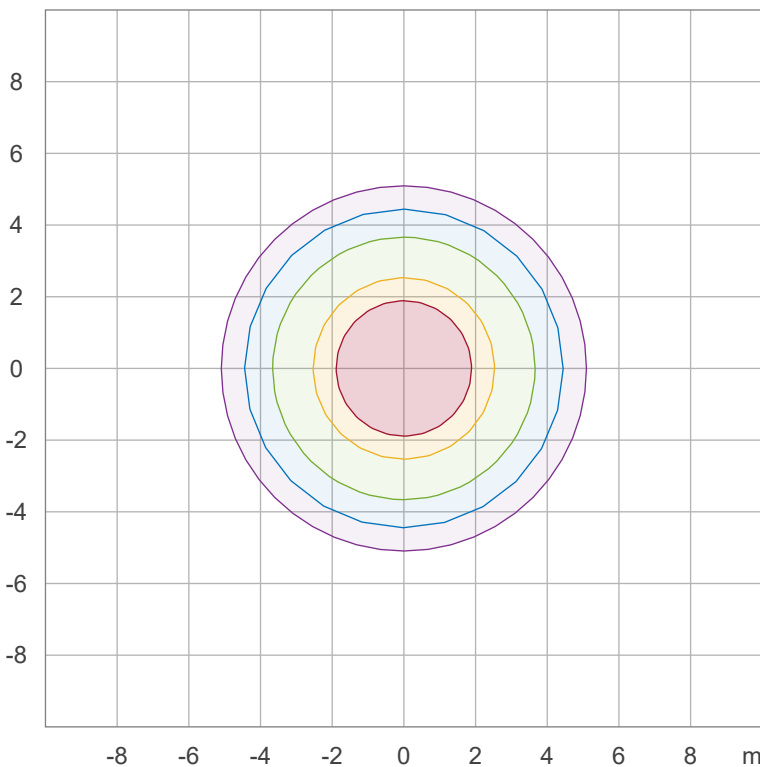


90 %	1385,1 cd
80 %	1231,2 cd
70 %	1077,3 cd
60 %	923,4 cd
50 %	769,5 cd
40 %	615,6 cd
30 %	461,7 cd
20 %	307,8 cd
10 %	153,9 cd

Peak intensity: 1539,0 cd

Number of c-planes: 12

Iso-illuminance Diagram (Iso-lux)



50,0 %	85,5 lx
30,0 %	51,3 lx
10,0 %	17,1 lx
5,0 %	8,5 lx
3,0 %	5,1 lx

Peak illuminance: 171,0 lx

Mounting height: 3,0 m

Number of c-planes: 12

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Color details

Correlated Color Temperature, Target CCT = 4000 K
 Correlated Color Temperature, Measured CCT = 4267 K
 Color Rendering Index CRI 85,6
 Color Rendering Index, R9 (red component) R9 = 18,6
 Color Rendering TM30-18 R_f 84,7 – R_g 96,7
 Color Quality Scale CQS = 83,4

MacAdam Steps
 Color coordinates CIE 1931 (x;y) = (0,381;0,377)
 Color coordinate CIEs 1960 (u;v) = (0,225;0,334)
 Color deviation from BBL Duv = -0,0021
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

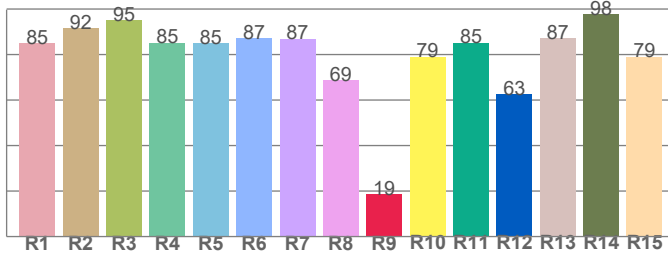
CIE 1931



CIE 1931 – zoomed on Planckian locus



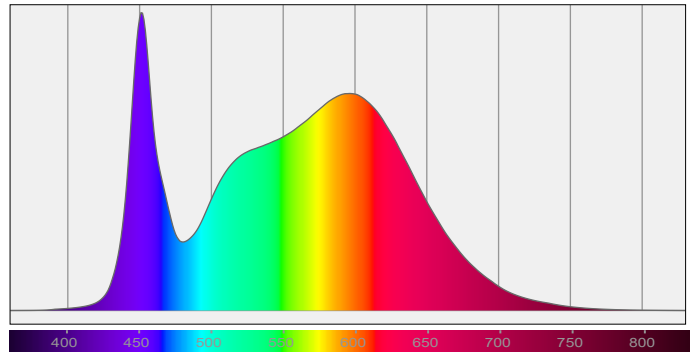
Color Rendering Index per reference color (CIE 1995)



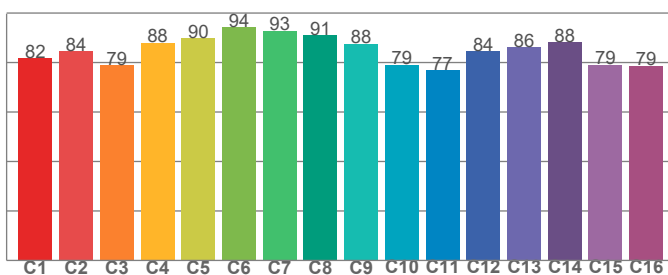
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
85,0	91,5	95,1	85,2	84,8	87,1	86,9	68,7	18,6	79,1	85,3	62,5	87,1	97,6	79,1

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



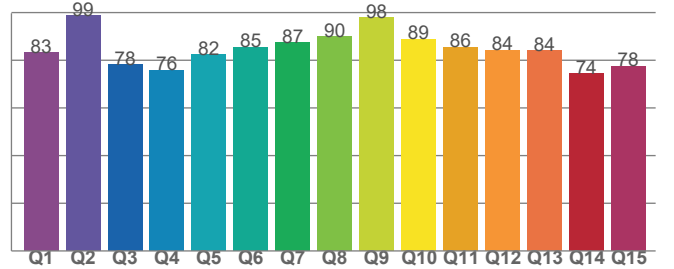
TM30-18 R_f-values per hue bin



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
81,6	84,4	78,9	87,9	89,7	94,2	92,9	90,9	87,6	79,2	77,0	84,4	86,3	88,1	79,1	78,7

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
83,1	98,7	78,2	75,7	82,3	85,4	87,4	89,9	97,8	88,8	85,5	84,2	84,1	74,4	77,6

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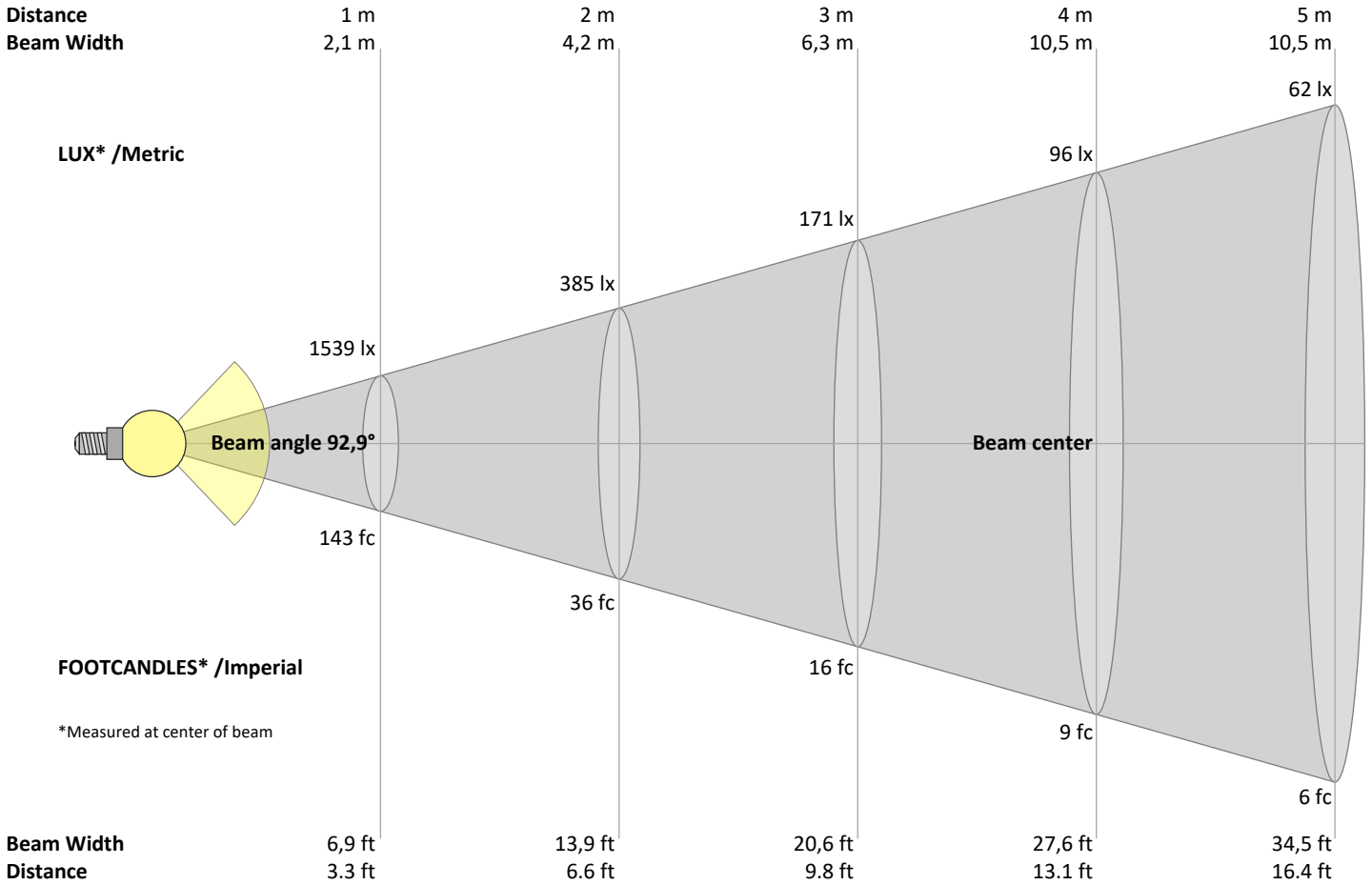
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Operator:



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
1539	385	171	96	62	43	31	24	19	15	13	11	9	8	7	6	5	5	4	4	lux
143	35,7	15,9	8,9	5,7	4	2,9	2,2	1,8	1,4	1,2	1	0,8	0,7	0,6	0,6	0,5	0,4	0,4	0,4	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
1539	1534	1516	1486	1444	1388	1311	1201	1039	832	629	465	343	257	201	160	119	68	21	2	cd
100%	100%	99%	97%	94%	90%	85%	78%	68%	54%	41%	30%	22%	17%	13%	10%	8%	4%	1%	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
1539	1534	1516	1486	1444	1388	1311	1201	1039	832	629	465	343	257	201	160	119	68	21	2	cd
100%	100%	99%	97%	94%	90%	85%	78%	68%	54%	41%	30%	22%	17%	13%	10%	8%	4%	1%	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
1539	1534	1516	1486	1444	1388	1311	1201	1039	832	629	465	343	257	201	160	119	68	21	2	cd
100%	100%	99%	97%	94%	90%	85%	78%	68%	54%	41%	30%	22%	17%	13%	10%	8%	4%	1%	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
1539	1534	1516	1486	1444	1388	1311	1201	1039	832	629	465	343	257	201	160	119	68	21	2	cd
100%	100%	99%	97%	94%	90%	85%	78%	68%	54%	41%	30%	22%	17%	13%	10%	8%	4%	1%	0%	of 0°val

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Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances		70	70	50	50	30	70	70	50	50	30
	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		Viewed Crosswise					Viewed Endwise				
H = mounting height above eye level		(Viewing direction orthogonal to lamp length axis)					(Viewing direction parallel to lamp length axis)				
X	Y										
2H	2H	15,5	16,6	15,7	16,9	17,1	15,5	16,6	15,7	16,9	17,1
	3H	16,3	17,5	16,7	17,7	17,9	16,3	17,5	16,7	17,7	17,9
	4H	16,9	18,0	17,3	18,2	18,5	16,9	18,0	17,3	18,2	18,5
	6H	17,5	18,4	17,8	18,7	19,1	17,5	18,4	17,8	18,7	19,1
	8H	17,7	18,7	18,1	19,0	19,4	17,7	18,7	18,1	19,0	19,4
	12H	18,0	18,8	18,3	19,2	19,6	18,0	18,8	18,3	19,2	19,6
4H	2H	15,8	16,9	16,2	17,1	17,4	15,8	16,9	16,2	17,1	17,4
	3H	17,0	17,9	17,4	18,2	18,7	17,0	17,9	17,4	18,2	18,7
	4H	17,6	18,5	18,1	18,9	19,4	17,6	18,5	18,1	18,9	19,4
	6H	18,4	19,2	18,9	19,5	19,9	18,4	19,2	18,9	19,5	19,9
	8H	18,7	19,5	19,2	19,8	20,2	18,7	19,5	19,2	19,8	20,2
	12H	19,0	19,6	19,5	20,1	20,5	19,0	19,6	19,5	20,1	20,5
8H	4H	17,9	18,7	18,4	19,0	19,4	17,9	18,7	18,4	19,0	19,4
	6H	18,9	19,5	19,4	19,9	20,5	18,9	19,5	19,4	19,9	20,5
	8H	19,4	19,9	19,9	20,4	21,0	19,4	19,9	19,9	20,4	21,0
	12H	19,8	20,2	20,4	20,7	21,4	19,8	20,2	20,4	20,7	21,4
12H	4H	18,0	18,6	18,5	19,0	19,5	18,0	18,6	18,5	19,0	19,5
	6H	19,0	19,5	19,6	20,0	20,7	19,0	19,5	19,6	20,0	20,7
	8H	19,6	20,0	20,2	20,5	21,1	19,6	20,0	20,2	20,5	21,1

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

S = 1.0H	0,1 / -0,2	0,1 / -0,2
S = 1.5H	0,4 / -0,4	0,4 / -0,4
S = 2.0H	0,8 / -0,7	0,8 / -0,7

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	110	105	101	98	107	103	99	96	99	96	93	95	92	90	91	89	87	85
2	101	93	87	82	98	91	86	81	88	83	79	85	81	77	82	78	75	73
3	93	83	76	70	90	82	75	69	79	73	68	76	71	67	73	69	66	64
4	86	75	67	61	84	73	66	60	71	64	59	69	63	58	66	62	58	56
5	79	67	59	53	77	66	59	53	64	57	52	62	56	52	60	55	51	49
6	74	61	53	47	72	60	52	47	59	52	46	57	51	46	55	50	46	44
7	69	56	48	42	67	55	47	42	54	47	42	52	46	41	51	45	41	39
8	64	51	43	38	63	51	43	38	49	42	37	48	42	37	47	41	37	35
9	60	47	40	34	59	47	39	34	46	39	34	45	38	34	44	38	34	32
10	56	44	36	31	55	43	36	31	42	36	31	41	35	31	40	35	31	29

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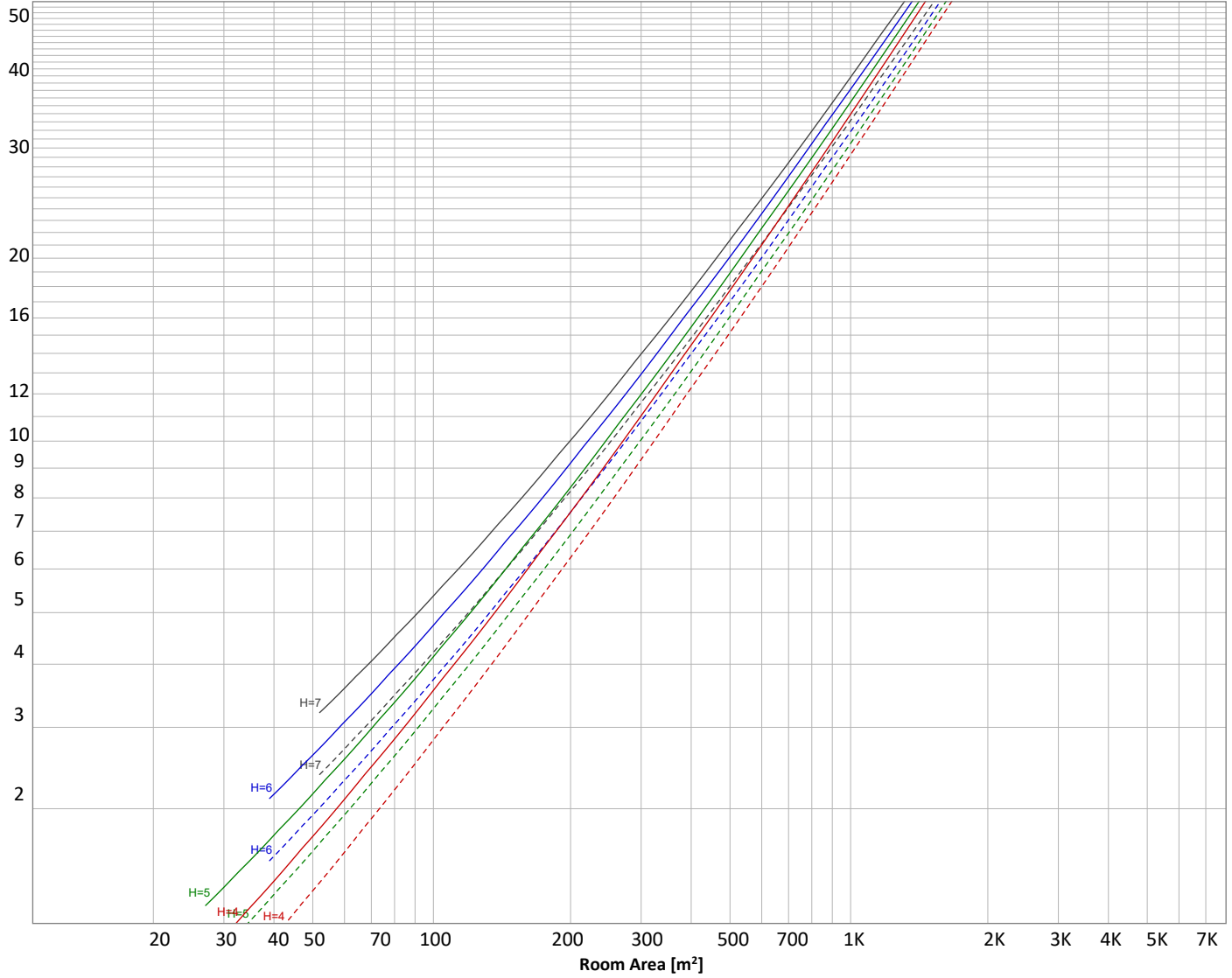
Operator:



Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 3528 lm				
H _{down} = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	ρ(%) Wall reflectance	Floor reflectance
H _{work} = Work area height from floor =	0.00 m	-----	70	50	30
E _{work} = Average lux on work area =	100 lx	_____	50	30	20

Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
146 lm	420 lm	640 lm	749 lm	639 lm	418 lm	257 lm	170 lm	73,1 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
4,31 lm	1,37 lm	1,82 lm	2,10 lm	2,04 lm	1,94 lm	1,53 lm	1,03 lm	0,369 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	146 lm	4,1%
10-20°	420 lm	11,9%
20-30°	640 lm	18,1%
30-40°	749 lm	21,2%
40-50°	639 lm	18,1%
50-60°	418 lm	11,9%
60-70°	257 lm	7,3%
70-80°	170 lm	4,8%
80-90°	73 lm	2,1%
90-100°	4 lm	0,1%
100-110°	1 lm	0,0%
110-120°	2 lm	0,1%
120-130°	2 lm	0,1%
130-140°	2 lm	0,1%
140-150°	2 lm	0,1%
150-160°	2 lm	0,0%
160-170°	1 lm	0,0%
170-180°	0 lm	0,0%
Total	3528 lm	100,0%

Intensity peaks

Max intensity	1539 cd
Intensity, 90°	21 cd
Intensity, 0°	1539 cd

Zonal Lumen summary

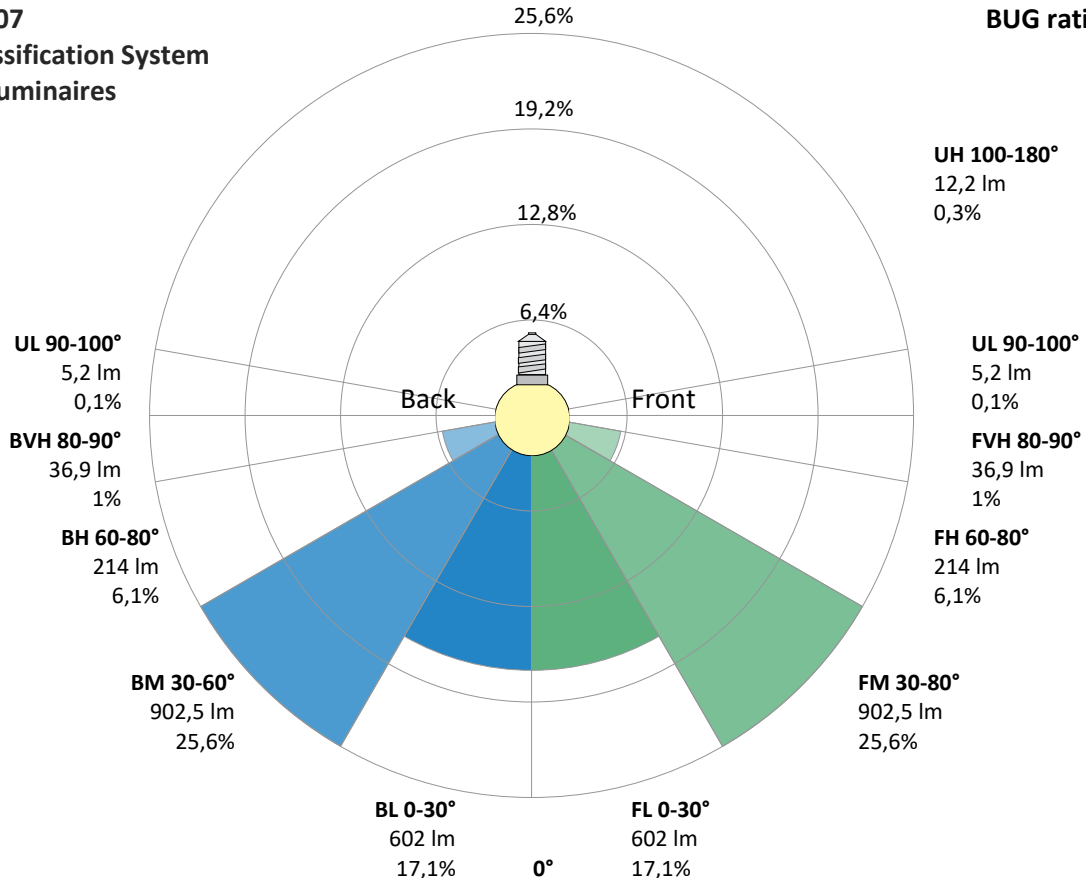
Zone (γ)	Lumen	% Total
0-30°	1206 lm	34,2%
0-40°	1954 lm	55,4%
0-60°	3011 lm	85,4%
60-90°	500 lm	14,2%
70-100°	247 lm	7,0%
90-120°	7 lm	0,2%
0-90°	3511 lm	99,5%
90-180°	17 lm	0,5%
0-180°	3528 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	602 lm	17,1%
Medium(30-60°)	902 lm	25,6%
High(60-80°)	214 lm	6,1%
Very high(80-90°)	37 lm	1,0%
Back light		
Low(0-30°)	602 lm	17,1%
Medium(30-60°)	902 lm	25,6%
High(60-80°)	214 lm	6,1%
Very high(80-90°)	37 lm	1,0%
Uplight		
Low(90-100°)	5 lm	0,1%
High(100-180°)	12 lm	0,3%

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

BUG rating B2 U2 G1



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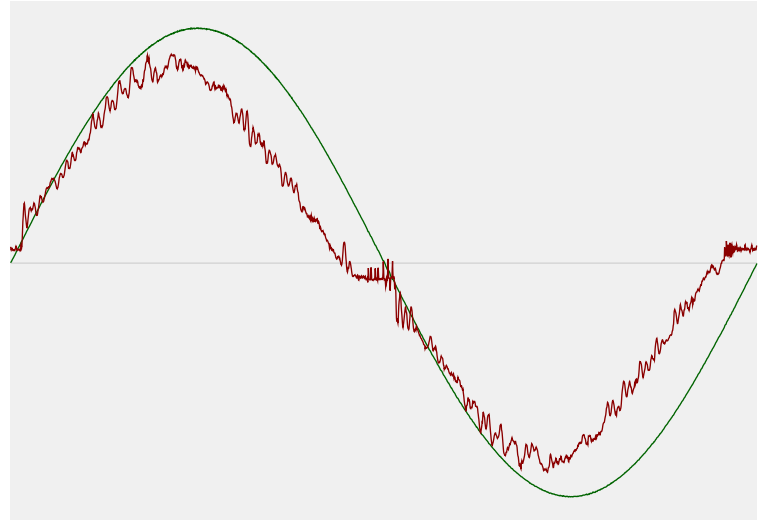


Power Details

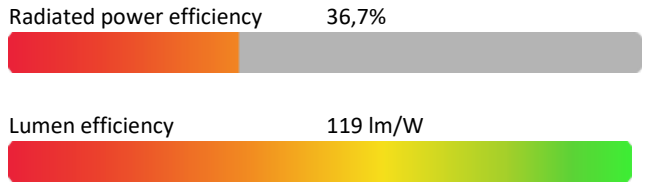
Input Power

Power feed to light source	29,6 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,133 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	30,71 VA
Displacement factor of AC power feed	0,97
Power factor of AC current feed	0,97
Total harmonic distortion of the current	12,95%
Total harmonic distortion of the voltage	0,08%

Input Power Curve



Efficiency



Stabilization Details

Warmup Conditions

Stable period	15 min
Stable change max	2,0%
Minimum time	15 min

Color Temperature Change

CCT start	3996 K
CCT shift	+4 K
CCT end	4000 K

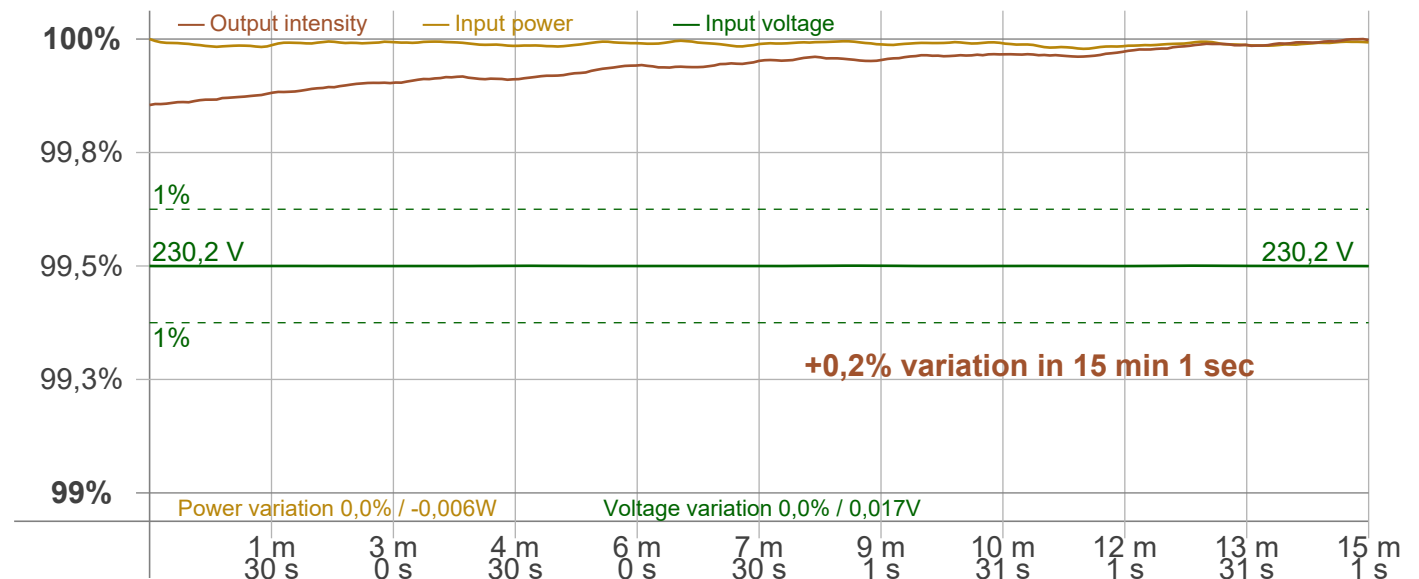
Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	+0,2%

Output Change

Output start	3523 lm
Output change	+5 lm
Output end	3528 lm

Stabilization Curve



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Flicker /TLA details

Flicker Meter Type Viso Systems LabFlicker
 Frequency of input power 50 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

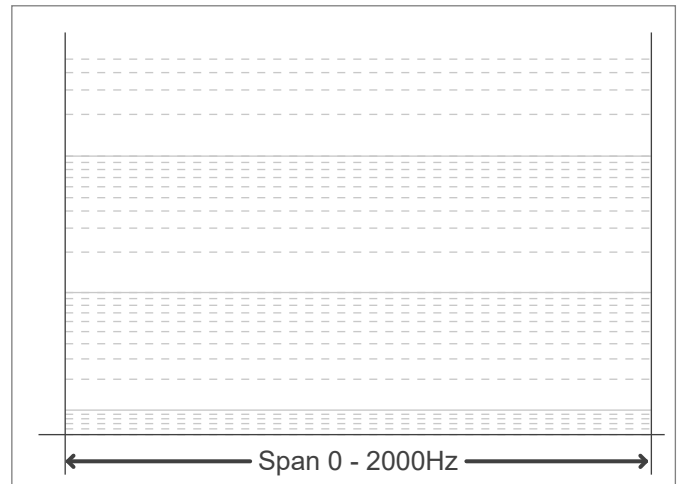
Flicker indices according to Lighting Research Center (2015)

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

