

Light Measurement Report

Print date: 28-1-2025

Measurement date and time: 28-1-2025 10:23:42 – Measurement no. VFR-250128-3172-MS

Measurement tracking No. and Link: [VT250128-006316](#)

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

60 planes – 6°

5°

2,00 m

10,9 W – PF 0,84 – DPF 0,88

230 V – 0,057 A

50 Hz

Lamp stabilized in 15 min 2 sec – 2,0%

Tested Light Source

Product Name

Item No. and Manufacturer

Product Description (line 1)

AR-T12D-4000K

AR-T12D-4000K – Dutchfulfillment

LED | AR111 | G53 | SPOT | 45° | DIMBAAR | 12W

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

822 lm – 0,11% / 99,89%

75 lm/W

1004 cd – 35,9°

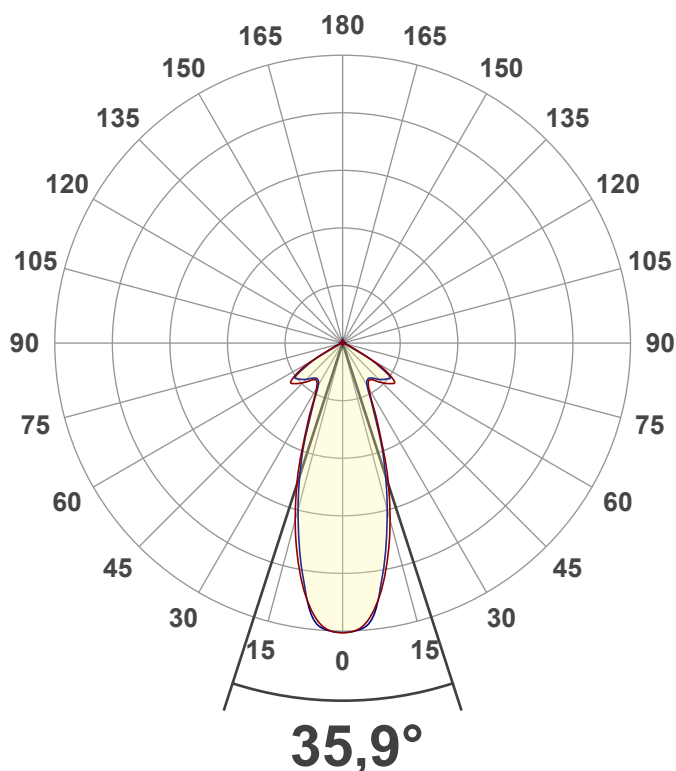
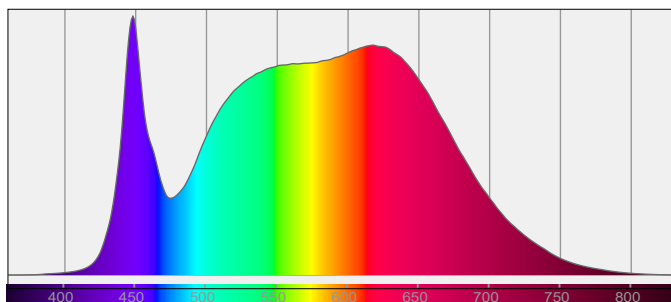
CCT = 4000 K / 4019 K

CRI 91,6

R_f 91,3 – R_g 100,1

Duv 0,0029 – SDCM 2,4

SVM 0,02 – PstLM 0,16



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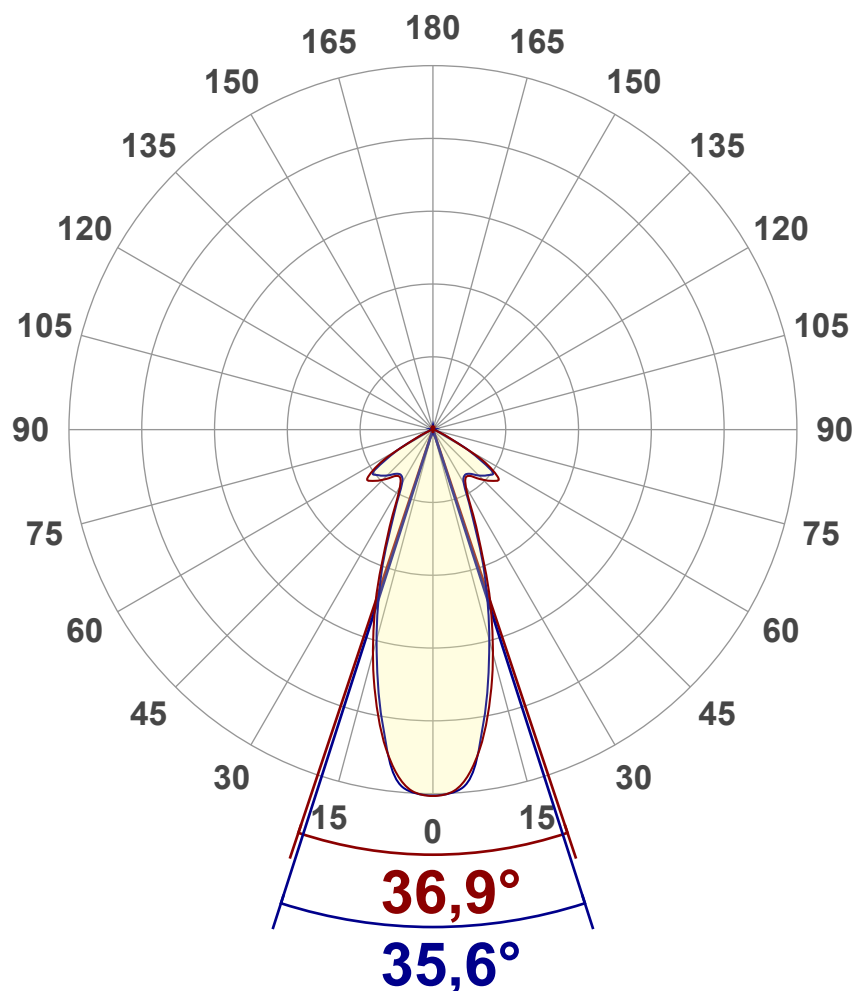
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Operator:



Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	822 lm
Lumen Up% / Down%	0,11% / 99,89%
Peak Intensity	1004 cd
Beam Angle (50%)	35,9°
Beam Angle (90%)	35,6°
Beam Angle (10%)	36,8°

Cut-off Angle

Average 2,5%	132,2°
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Field Angle

Average 10%	121,2°
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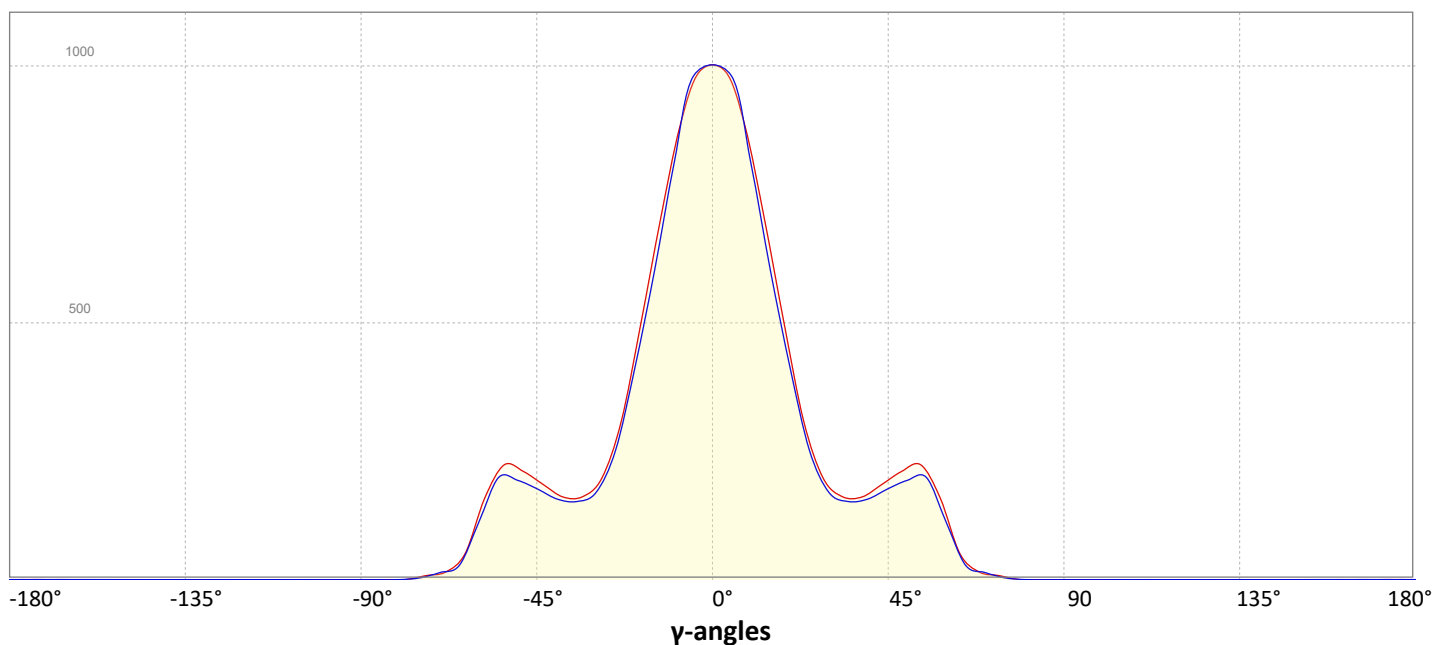
Intensity Ratio

In 120° cone	94,4%
In 90° cone	65,3%

C000-C180

C090-C270

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

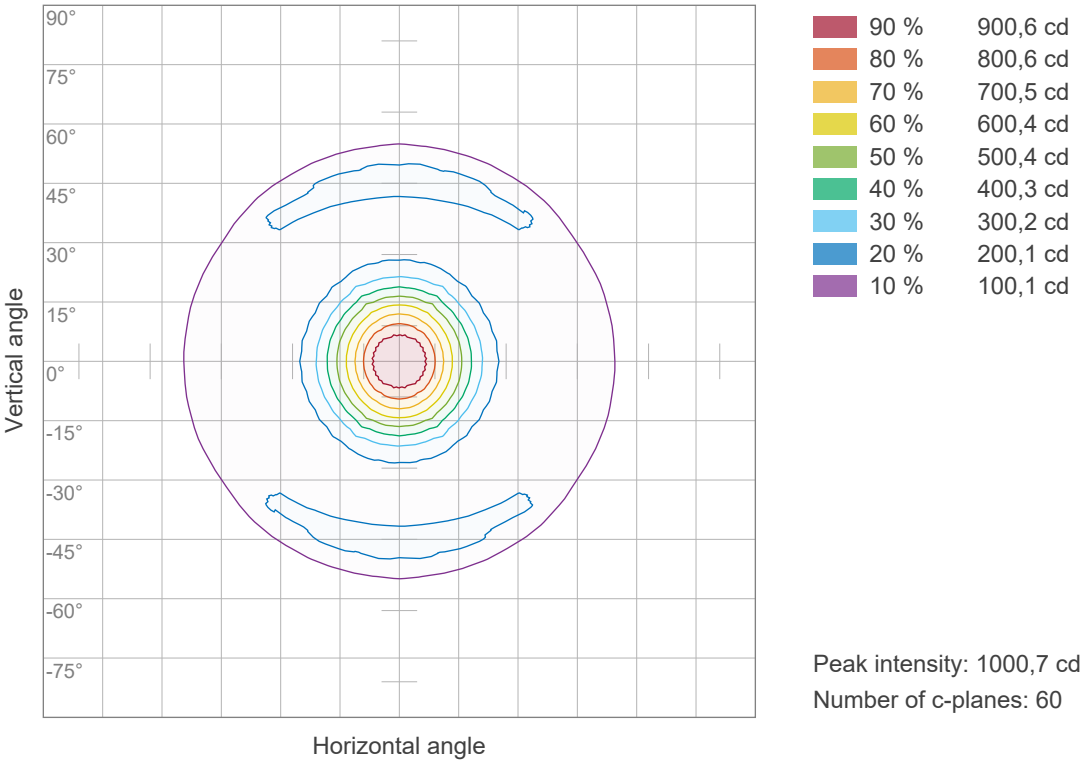


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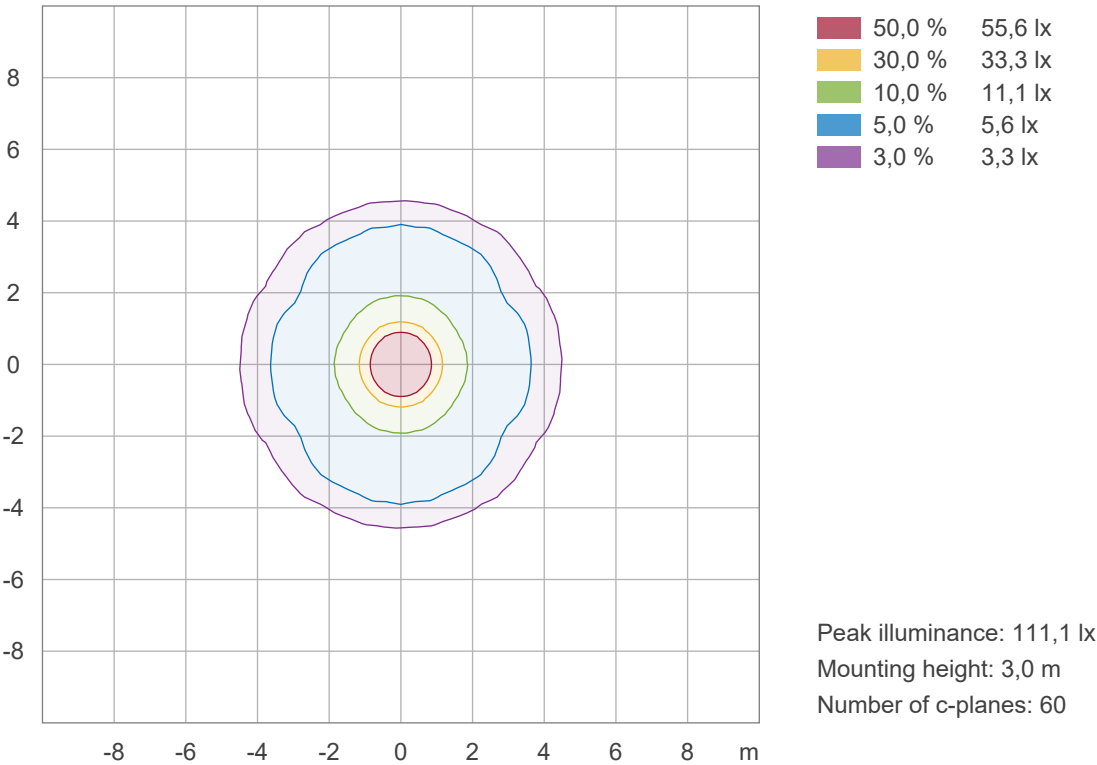
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Iso-intensity Diagram (Iso-candela)



Iso-illuminance Diagram (Iso-lux)



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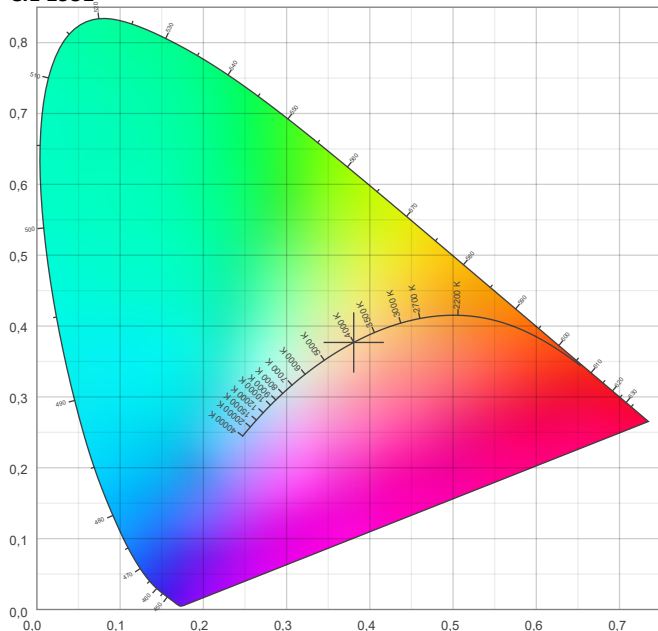


Color details

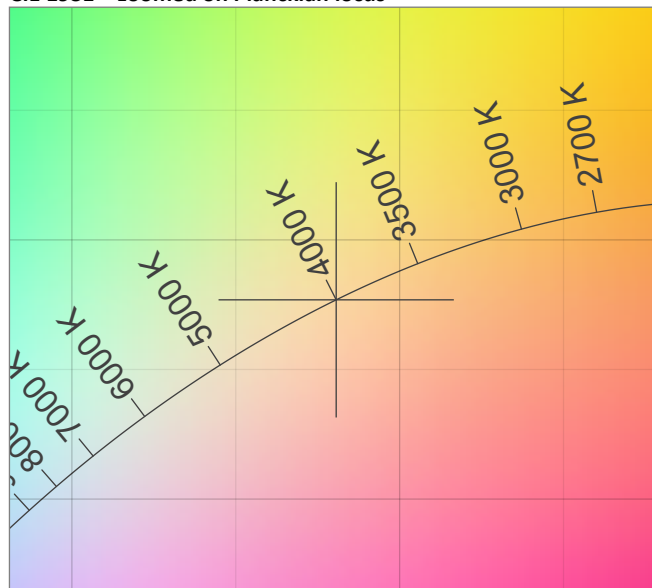
Correlated Color Temperature, Target CCT = 4000 K
Correlated Color Temperature, Measured CCT = 4019 K
Color Rendering Index CRI 91,6
Color Rendering Index, R9 (red component) R9 = 66,7
Color Rendering TM30-18 R_f 91,3 – R_g 100,1
Color Quality Scale CQS = 92,0

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 = 0,0029
Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

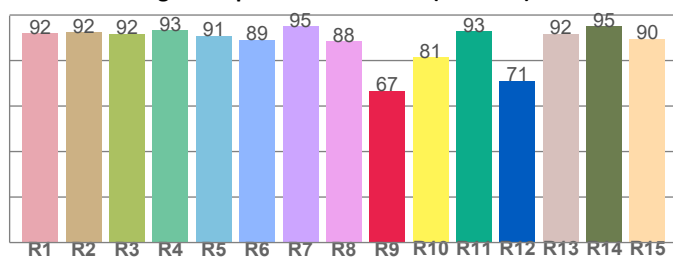
CIE 1931



CIE 1931 – zoomed on Planckian locus



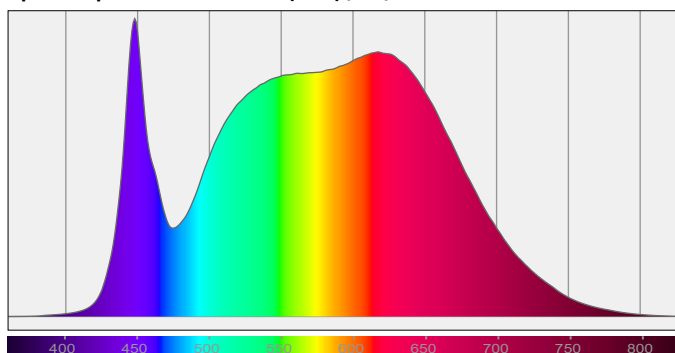
Color Rendering Index per reference color (CIE 1995)



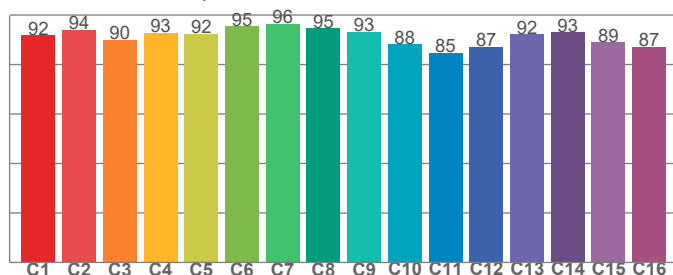
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
92,0	92,4	91,8	93,2	90,9	89,1	95,1	88,4	66,7	81,4	92,8	71,1	91,8	95,1	89,5

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



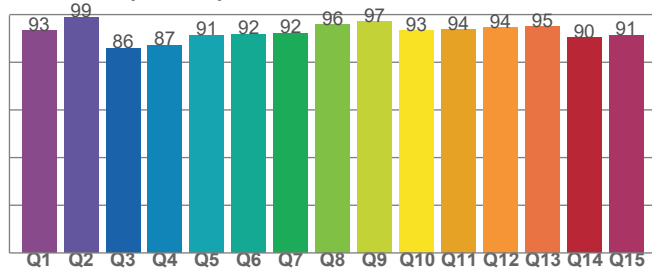
TM30-18 R_f-values per hue bin



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
92,0	94,1	90,0	92,8	92,5	95,5	96,5	94,6	93,3	88,1	84,8	87,1	92,2	93,2	88,9	87,1

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
93,3	98,9	86,0	87,2	91,4	91,7	92,3	95,8	97,0	93,2	93,6	94,4	95,0	90,2	91,3

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VISO
SYSTEMS

Distance
Beam Width

LUX* /Metric

FOOTCANDLES* /Imperial

*Measured at center of beam

Beam Width
Distance

1 m
0,6 m

2 m
1,3 m

3 m
1,9 m

4 m
3,2 m

5 m
3,2 m

999 lx

250 lx

111 lx

62 lx

40 lx

93 fc

23 fc

10 fc

6 fc

4 fc

Beam angle 35,9°

Beam center

2,1 ft
3.3 ft

4,3 ft
6.6 ft

6,3 ft
9.8 ft

8,5 ft
13.1 ft

10,6 ft
16.4 ft

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
999	250	111	62	40	28	20	16	12	10	8	7	6	5	4	4	3	3	3	2	lux
92,8	23,2	10,3	5,8	3,7	2,6	1,9	1,4	1,1	0,9	0,8	0,6	0,5	0,5	0,4	0,4	0,3	0,3	0,3	0,2	fc

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
999	954	822	633	436	272	186	161	169	194	215	202	123	39	13	6	0	0	0	0	cd
100%	95%	82%	63%	44%	27%	19%	16%	17%	19%	22%	20%	12%	4%	1%	1%	0%	0%	0%	0%	of 0°v

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
999	975	803	595	408	249	169	152	158	177	193	195	109	28	14	4	0	0	0	0	cd
100%	98%	80%	60%	41%	25%	17%	15%	16%	18%	19%	20%	11%	3%	1%	0%	0%	0%	0%	0%	of 0°v

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
999	954	822	633	436	272	186	161	169	194	215	202	123	39	13	6	0	0	0	0	cd
100%	95%	82%	63%	44%	27%	19%	16%	17%	19%	22%	20%	12%	4%	1%	1%	0%	0%	0%	0%	of 0°v

0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	γ
999	975	803	595	408	249	169	152	158	177	193	195	109	28	14	4	0	0	0	0	cd
100%	98%	80%	60%	41%	25%	17%	15%	16%	18%	19%	20%	11%	3%	1%	0%	0%	0%	0%	0%	of 0° v

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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		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	25,2	26,1	25,4	26,4	26,6	24,6	25,5	24,8	25,8	26,0
	3H	25,0	26,0	25,4	26,3	26,5	24,4	25,4	24,8	25,7	25,9
	4H	24,9	25,9	25,4	26,2	26,4	24,4	25,3	24,8	25,6	25,8
	6H	24,9	25,8	25,3	26,1	26,4	24,3	25,2	24,7	25,5	25,8
	8H	24,9	25,7	25,2	26,0	26,4	24,3	25,1	24,6	25,4	25,8
	12H	24,8	25,6	25,2	26,0	26,4	24,2	25,0	24,6	25,4	25,8
4H	2H	25,2	26,2	25,6	26,4	26,7	24,7	25,7	25,1	25,9	26,2
	3H	25,2	26,0	25,6	26,3	26,8	24,7	25,5	25,1	25,8	26,3
	4H	25,1	25,8	25,5	26,2	26,8	24,6	25,3	25,0	25,7	26,2
	6H	25,0	25,7	25,5	26,1	26,4	24,5	25,2	25,0	25,6	25,9
	8H	25,0	25,6	25,5	26,0	26,3	24,5	25,1	25,0	25,5	25,8
	12H	24,9	25,4	25,4	25,9	26,3	24,4	24,9	24,9	25,3	25,8
8H	4H	25,0	25,6	25,5	26,0	26,4	24,5	25,1	25,0	25,5	25,8
	6H	24,9	25,4	25,4	25,8	26,4	24,4	24,9	24,9	25,3	25,9
	8H	24,9	25,3	25,4	25,8	26,5	24,4	24,8	24,9	25,3	25,9
	12H	24,9	25,2	25,5	25,7	26,3	24,3	24,7	24,9	25,2	25,8
12H	4H	24,9	25,4	25,4	25,9	26,3	24,4	24,9	24,9	25,3	25,8
	6H	24,9	25,3	25,4	25,8	26,5	24,4	24,8	24,9	25,3	25,9
	8H	24,9	25,2	25,5	25,7	26,3	24,3	24,7	24,9	25,2	25,8
Variations with the observer position for the luminaire spacings, S:											
S = 1.0H		0,7 / -0,9					0,7 / -0,7				
S = 1.5H		2,4 / -3,9					2,4 / -3,5				
S = 2.0H		4,0 / -9,8					4,0 / -9,6				

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	112	108	105	102	109	106	103	101	102	99	97	98	96	94	94	93	92	90
2	104	98	92	88	101	96	91	87	92	88	85	89	86	83	86	84	81	79
3	97	88	82	76	94	87	81	76	84	79	75	81	77	73	79	75	72	70
4	90	80	73	67	88	79	72	67	76	71	66	74	69	65	72	68	64	63
5	84	73	66	60	82	72	65	60	70	64	59	68	63	59	67	62	58	56
6	78	67	60	54	77	66	59	54	65	58	54	63	57	53	62	57	53	51
7	74	62	55	49	72	61	54	49	60	54	49	59	53	49	57	52	48	47
8	69	58	51	46	68	57	50	45	56	50	45	55	49	45	54	49	45	43
9	66	54	47	42	64	54	47	42	53	46	42	52	46	42	51	45	42	40
10	62	51	44	39	61	50	44	39	49	43	39	49	43	39	48	43	39	37

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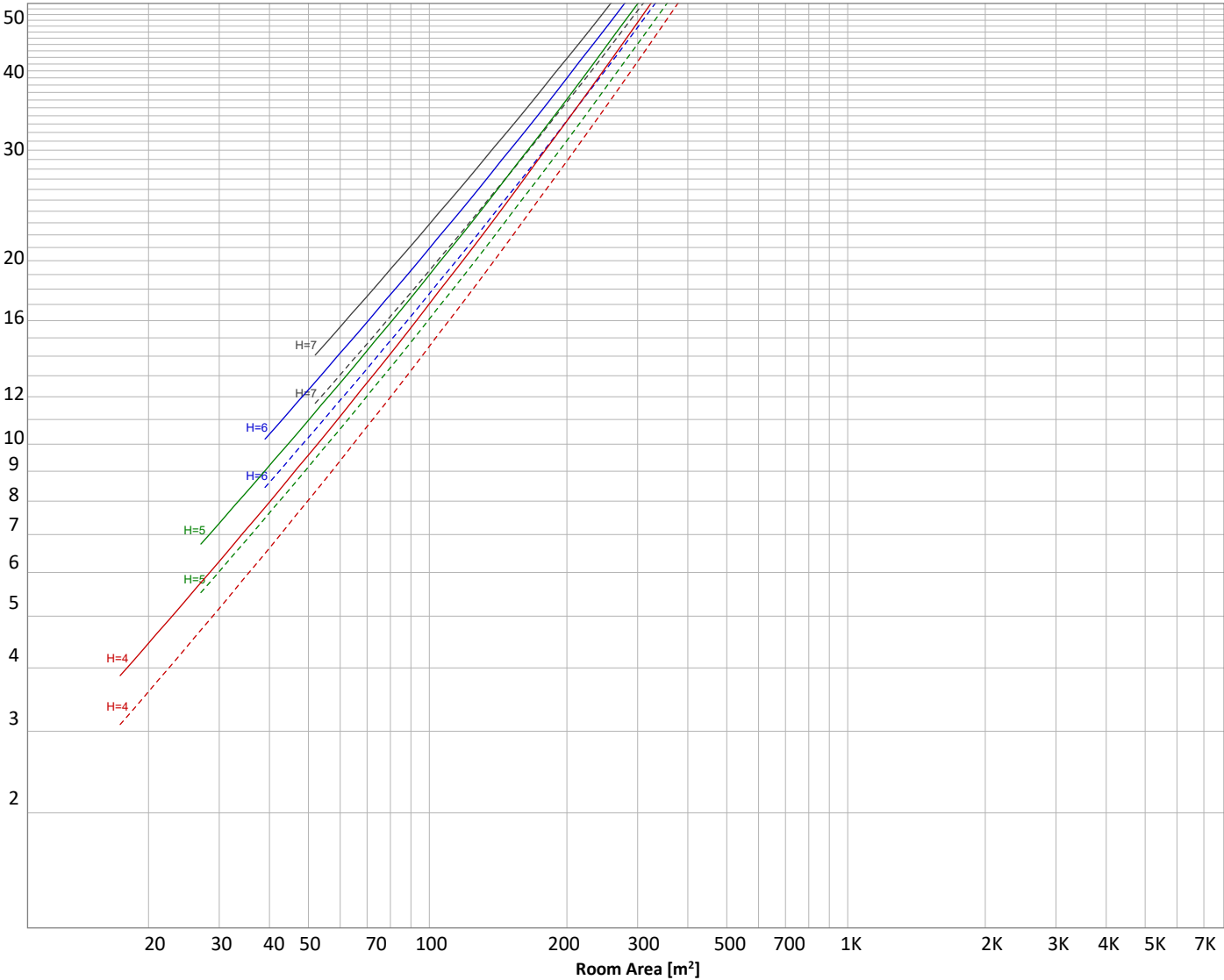
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Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 822 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
				20

Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
87,5 lm	168 lm	121 lm	97,9 lm	140 lm	162 lm	39,8 lm	5,37 lm	0,138 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0,107 lm	0,115 lm	0,125 lm	0,130 lm	0,116 lm	0,105 lm	0,102 lm	0,079 lm	0,028 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	88 lm	10,6%
10-20°	168 lm	20,5%
20-30°	121 lm	14,7%
30-40°	98 lm	11,9%
40-50°	140 lm	17,0%
50-60°	162 lm	19,7%
60-70°	40 lm	4,8%
70-80°	5 lm	0,7%
80-90°	0 lm	0,0%
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	822 lm	100,0%

Intensity peaks

Max intensity	1004 cd
Intensity, 90°	0 cd
Intensity, 0°	999 cd

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	377 lm	45,8%
0-40°	474 lm	57,7%
0-60°	776 lm	94,4%
60-90°	45 lm	5,5%
70-100°	6 lm	0,7%
90-120°	0 lm	0,0%
0-90°	821 lm	99,9%
90-180°	1 lm	0,1%
0-180°	822 lm	100,0%

BUG rating

	Lumen	% Total
Forward light		
Low(0-30°)	189 lm	22,9%
Medium(30-60°)	198 lm	24,1%
High(60-80°)	24 lm	2,9%
Very high(80-90°)	0 lm	0,0%
Back light		
Low(0-30°)	189 lm	22,9%
Medium(30-60°)	198 lm	24,1%
High(60-80°)	24 lm	2,9%
Very high(80-90°)	0 lm	0,0%

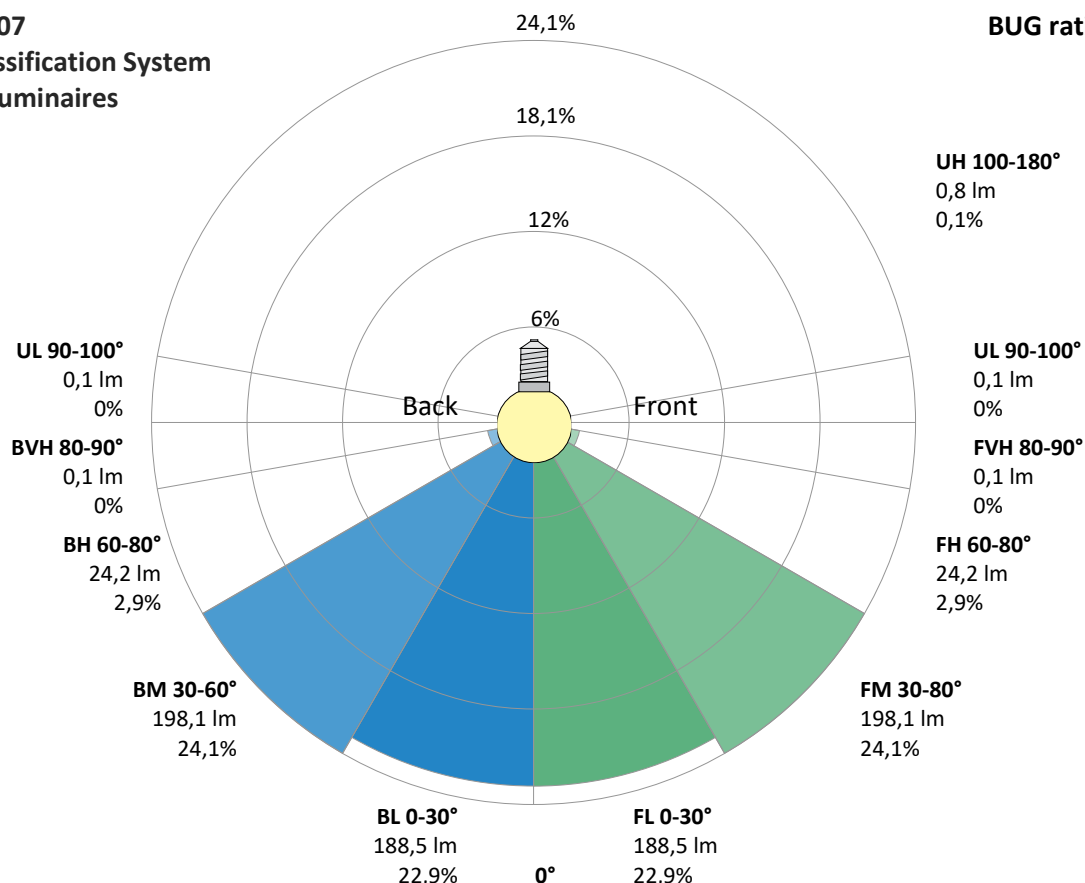
Uplight

Low(90-100°)	0 lm	0,0%
High(100-180°)	1 lm	0,1%

IESNA TM-15-07

Luminaire Classification System For Outdoor Luminaires

BUG rating B1 U1 G0



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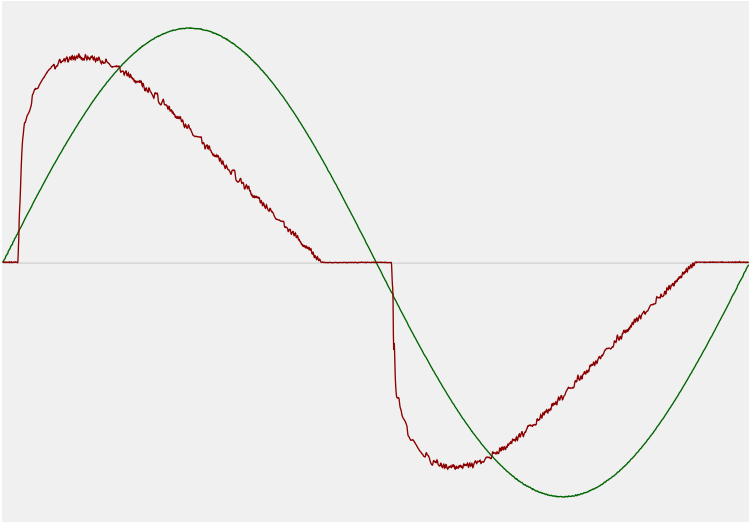


Power Details

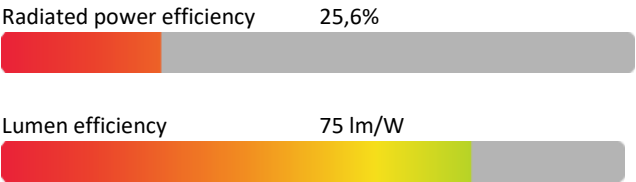
Input Power

Power feed to light source	10,9 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	230 V
RMS Input current feed, I_{RMS}	0,057 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	13,02 VA
Displacement factor of AC power feed	0,88
Power factor of AC current feed	0,84
Total harmonic distortion of the current	29,94%
Total harmonic distortion of the voltage	0,12%

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	3993 K
CCT shift	+7 K
CCT end	4000 K

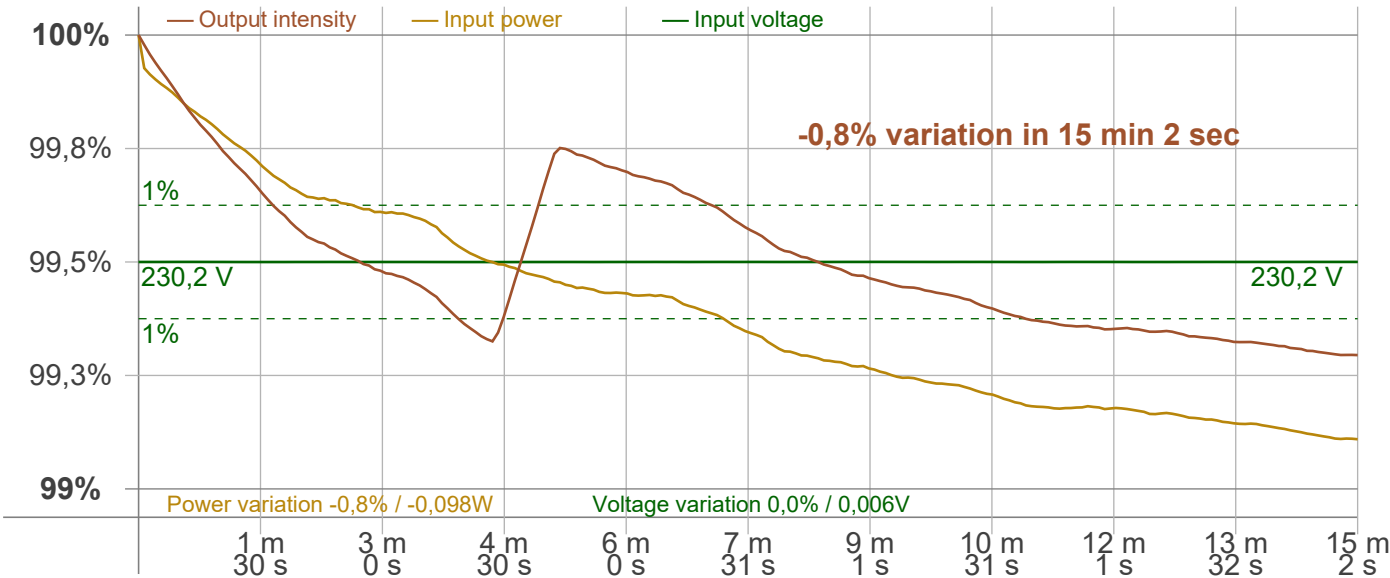
Warmup Result

Total warmup time	Lamp stabilized in 15 min 2 sec
Warmup variation	-0,8%

Output Change

Output start	829 lm
Output change	-6 lm
Output end	822 lm

Stabilization Curve



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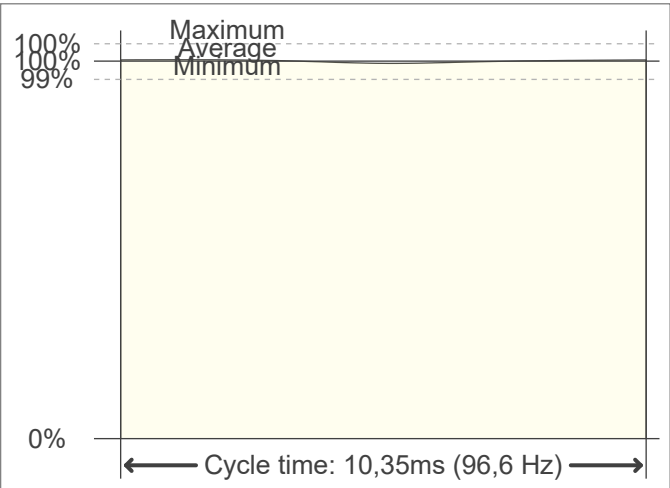
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Flicker /TLA details

Flicker Meter Type	Viso Systems LabFlicker	Measurement time	
Frequency of input power	50 Hz	PstLM	180 sec
Flicker/TLA sample rate	20000 samples/s	All other indices	1,2 sec
Flicker indices according to Illuminating Engineering Society (IES)		Flicker indices according to California Energy Commission (CEC) 2016b	
Flicker frequency	96,62 Hz	JA8/10 40 Hz	0,4 %
Percent Flicker	0,87 %	JA8/10 90 Hz	0,4 %
Flicker index	0	JA8/10 200 Hz	0,83 %
TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)		JA8/10 400 Hz	0,86 %
PstLM value (F < 80 Hz)	0,16	JA8/10 1000 Hz	0,86 %
SVM value (80 < F < 2000 Hz)	0,02	Flicker indices according to Lighting Research Center (2015)	
		Perception metric, Assist Mp	0,05

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



Flicker FFT (flicker curve in frequency domain)



IEEE 1789 Frequency/modulation plot

