

# Light Measurement Report

Print date: 15-10-2024

Measurement date and time: 15-10-2024 11:38:44 – Measurement no. VFR-241015-1279-MS

Measurement tracking No. and Link: [VT241015-009705](https://vt241015-009705)

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  
 $\gamma$  (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°  
12,13 m  
68,7 W – PF 0,97 – DPF 0,98  
230 V – 0,307 A  
50 Hz  
Lamp stabilized in 15 min 1 sec – 2,0%

## Tested Light Source

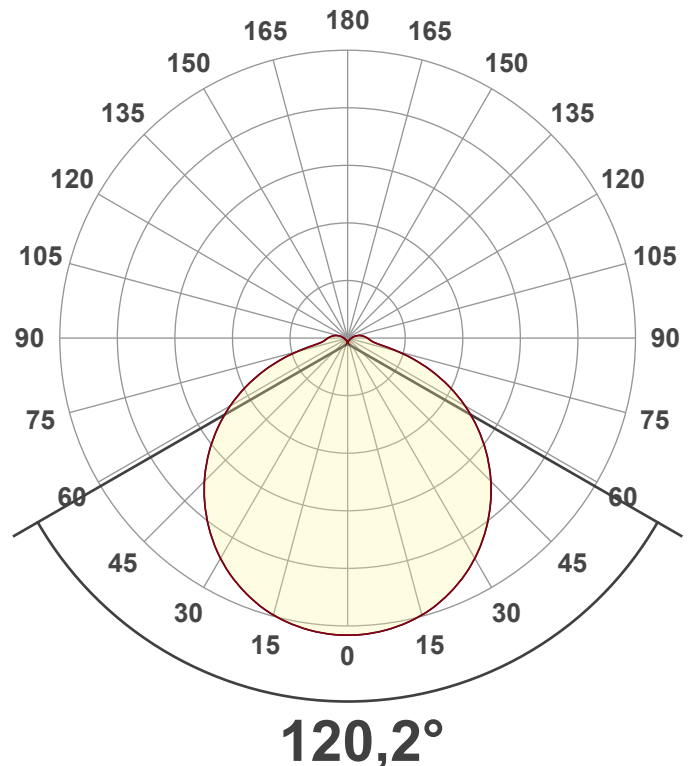
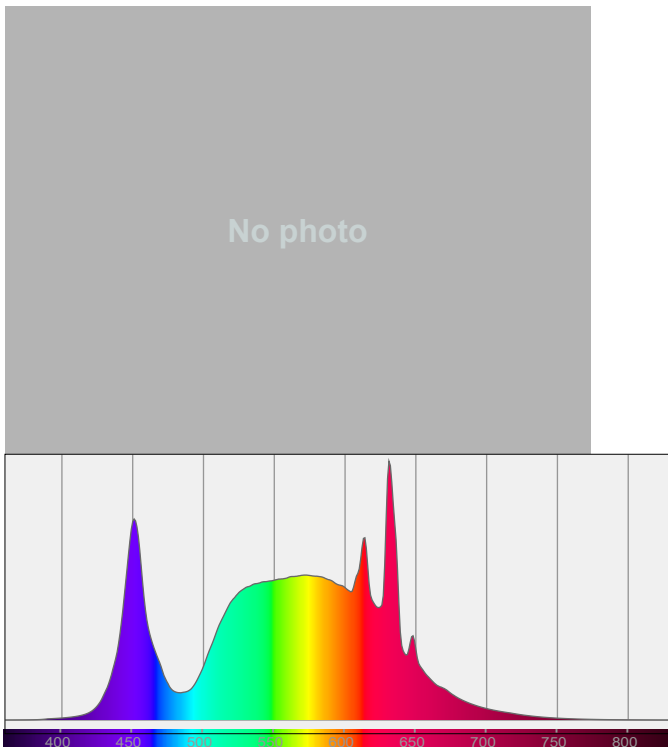
Product Name  
Item No. and Manufacturer  
Product Description (line 1)

276291-4000K  
276291-4000K – Dutchfulfillment  
LICHTLIJN JUPITER | LED MODULE | 33W/42W/58W/66W | 120°

## 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

10859 lm – 9,41% / 90,59%  
158 lm/W  
3049 cd – 120,2°  
CCT = 4000 K / 4081 K  
CRI 83,0  
 $R_f$  82,8 –  $R_g$  98,6  
Duv 0,0031 – SDCM 2,8  
SVM 0 – PstLM 0,01



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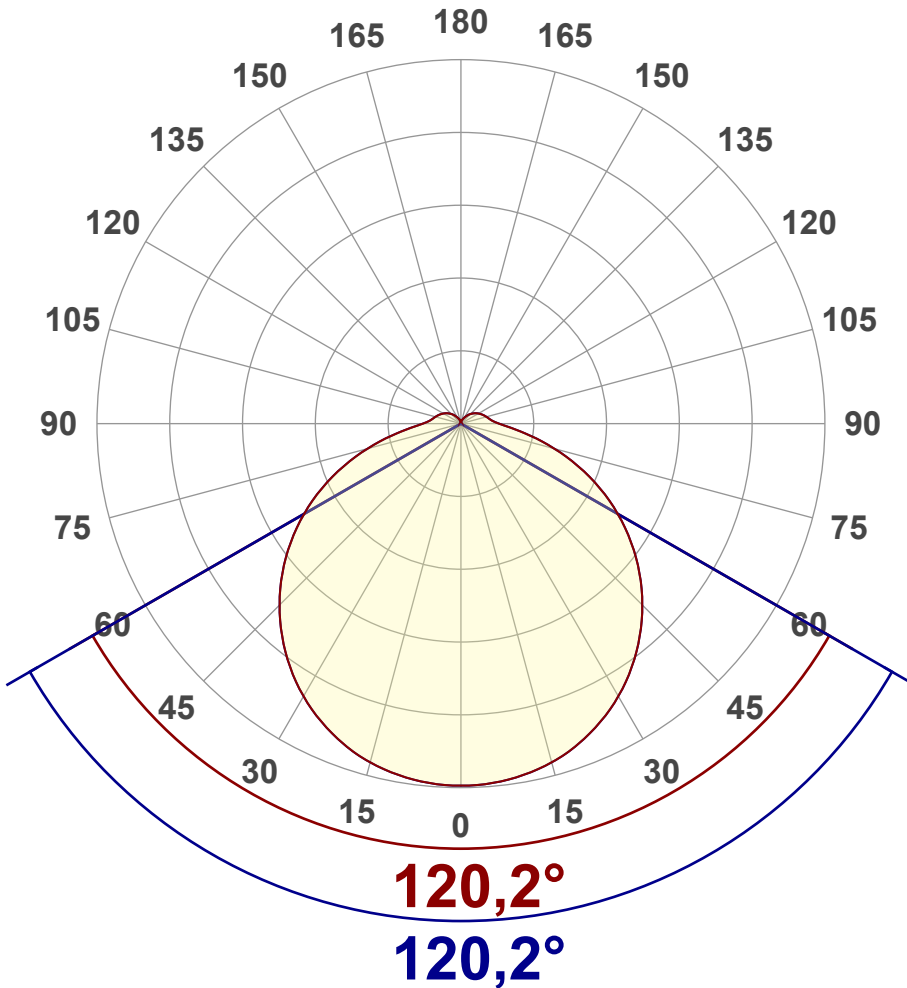
Measurement tracking No. and Link: [VT241015-009705](https://vt241015-009705)

Operator:



## Luminous Intensity diagram

Unit: 0-100% of peak intensity



## Main Values

Output (total Lumen)	10859 lm
Lumen Up% / Down%	9,41% / 90,59%
Peak Intensity	3049 cd
Beam Angle (50%)	120,2°
Beam Angle (90%)	120,2°
Beam Angle (10%)	120,2°

## Cut-off Angle

Average 2,5%	289,9°
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## Field Angle

Average 10%	182,9°
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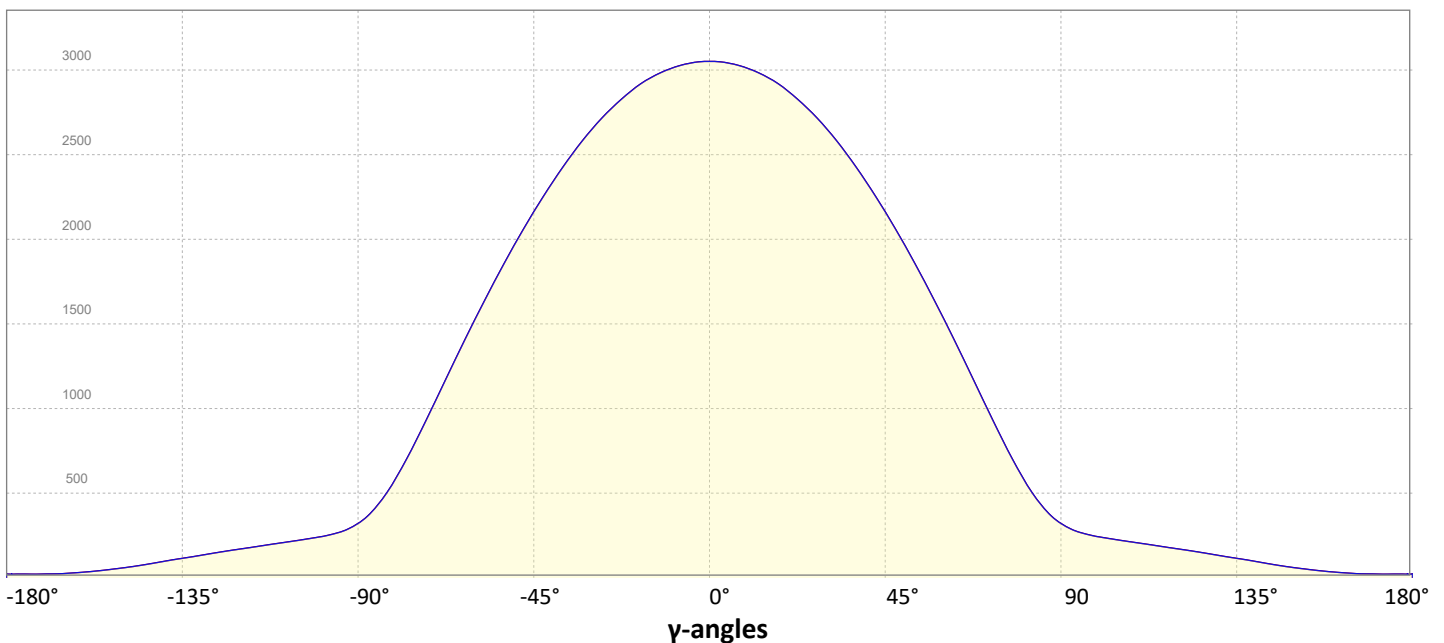
## Intensity Ratio

In 120° cone	66,4%
In 90° cone	44,3%

**C000-C180**

**C090-C270**

## Linear distribution diagram - Intensity (candela) vs $\gamma$ -angle



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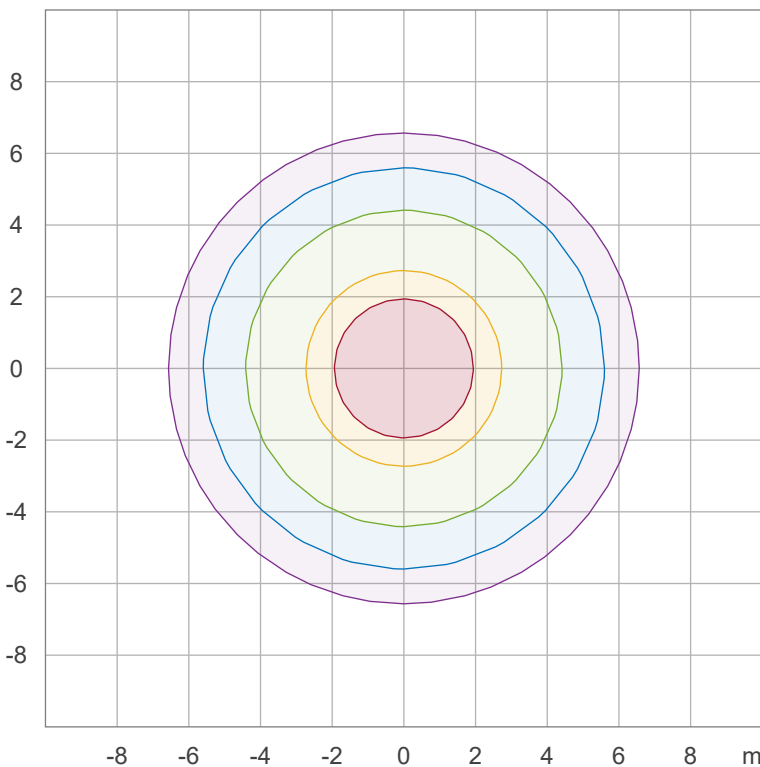
## Iso-intensity Diagram (Iso-candela)



90 %	2743,7 cd
80 %	2438,9 cd
70 %	2134,0 cd
60 %	1829,2 cd
50 %	1524,3 cd
40 %	1219,4 cd
30 %	914,6 cd
20 %	609,7 cd
10 %	304,9 cd

Peak intensity: 3048,6 cd  
Number of c-planes: 12

## Iso-illuminance Diagram (Iso-lux)



50,0 %	169,4 lx
30,0 %	101,6 lx
10,0 %	33,9 lx
5,0 %	16,9 lx
3,0 %	10,2 lx

Peak illuminance: 338,7 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 = 4081 K  
 Color Rendering Index CRI 83,0  
 Color Rendering Index, R9 (red component) R9 = 32,7  
 Color Rendering TM30-18 R<sub>f</sub> 82,8 – R<sub>g</sub> 98,6  
 Color Quality Scale CQS = 82,7

MacAdam Steps SDCM = 2,8  
 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 = 0,0031  
 Color coordinate CIEs 1976 (CIELUV) (u';v') = (0,225;0,502)

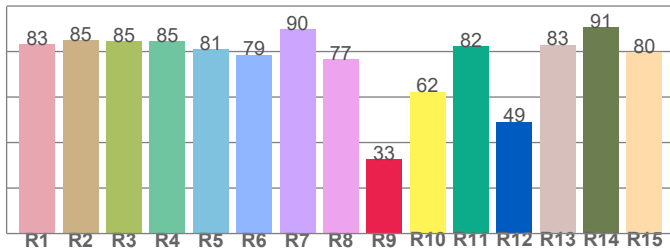
### CIE 1931



### CIE 1931 – zoomed on Planckian locus



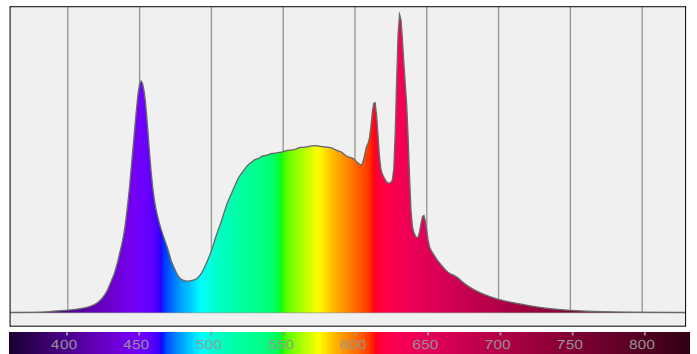
### Color Rendering Index per reference color (CIE 1995)



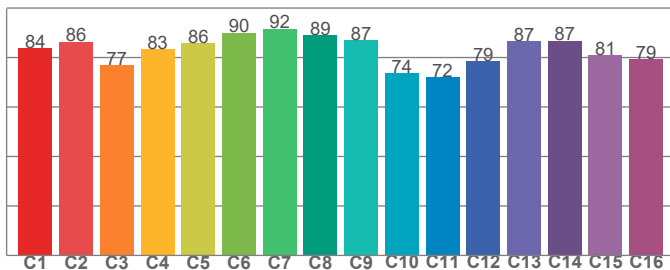
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
83,3	85,0	84,5	84,6	81,1	78,6	89,9	76,7	32,7	62,3	82,3	49,2	82,9	90,6	79,7

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



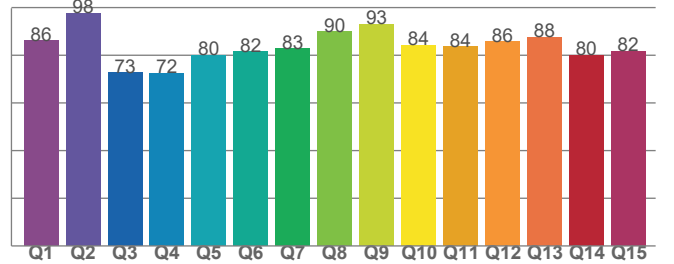
### TM30-18 R<sub>f</sub>-values per hue bin



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
83,9	86,4	76,8	83,4	85,7	90,0	91,6	89,1	87,1	73,7	72,0	78,6	86,5	86,8	80,9	79,4

### Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
86,1	97,7	72,7	72,4	80,1	81,5	82,7	89,8	93,1	84,2	83,6	85,7	87,6	80,0	81,7

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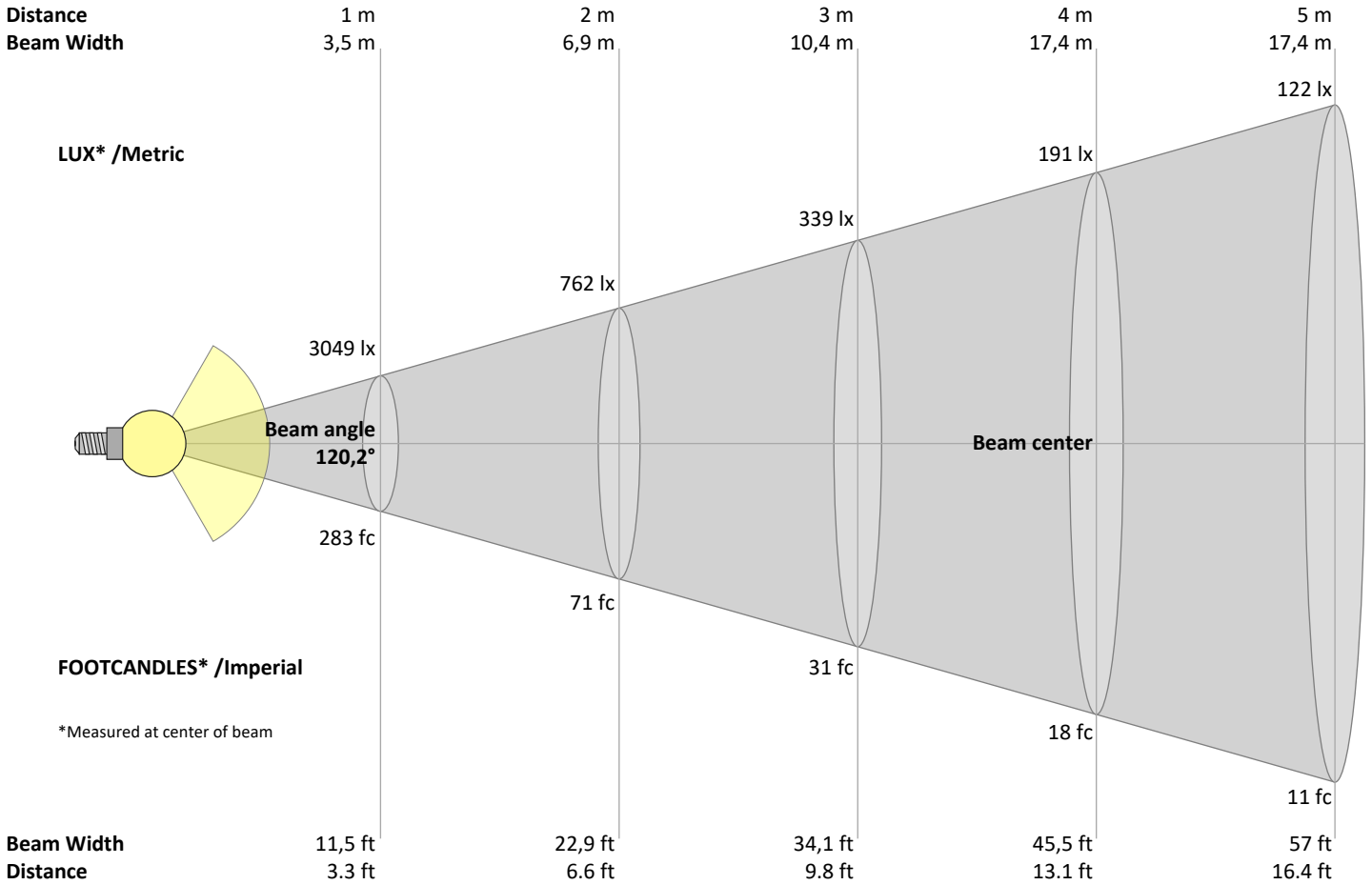
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## Beam Details



### 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
3049	762	339	191	122	85	62	48	38	30	25	21	18	16	14	12	11	9	8	8	lux
283,2	70,8	31,5	17,7	11,3	7,9	5,8	4,4	3,5	2,8	2,3	2	1,7	1,4	1,3	1,1	1	0,9	0,8	0,7	fc

### Intensities in 0° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
3049	3014	2911	2728	2475	2160	1795	1389	958	566	327	246	212	181	149	115	80	50	30	22	cd
100%	99%	95%	89%	81%	71%	59%	46%	31%	19%	11%	8%	7%	6%	5%	4%	3%	2%	1%	1%	of 0°val

### Intensities in 90° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
3049	3014	2911	2728	2475	2160	1795	1389	958	566	327	246	212	181	149	115	80	50	30	22	cd
100%	99%	95%	89%	81%	71%	59%	46%	31%	19%	11%	8%	7%	6%	5%	4%	3%	2%	1%	1%	of 0°val

### Intensities in 180° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
3049	3014	2911	2728	2475	2160	1795	1389	958	566	327	246	212	181	149	115	80	50	30	22	cd
100%	99%	95%	89%	81%	71%	59%	46%	31%	19%	11%	8%	7%	6%	5%	4%	3%	2%	1%	1%	of 0°val

### Intensities in 270° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°	γ
3049	3014	2911	2728	2475	2160	1795	1389	958	566	327	246	212	181	149	115	80	50	30	22	cd
100%	99%	95%	89%	81%	71%	59%	46%	31%	19%	11%	8%	7%	6%	5%	4%	3%	2%	1%	1%	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	24,0	25,2	24,4	25,6	26,0	23,5	24,7	23,9	25,2	25,6
	3H	25,7	26,9	26,3	27,4	27,8	25,1	26,3	25,6	26,7	27,1
	4H	26,6	27,7	27,1	28,1	28,6	25,8	26,9	26,3	27,4	27,8
	6H	27,4	28,4	27,9	28,9	29,4	26,4	27,4	26,9	27,9	28,4
	8H	27,8	28,8	28,3	29,2	29,8	26,7	27,7	27,2	28,1	28,7
	12H	28,2	29,2	28,7	29,6	30,2	26,9	27,9	27,4	28,4	29,0
4H	2H	24,5	25,7	25,1	26,1	26,6	24,2	25,3	24,7	25,8	26,2
	3H	26,6	27,6	27,1	28,0	28,6	26,0	27,0	26,5	27,5	28,1
	4H	27,5	28,5	28,0	28,9	29,6	26,8	27,8	27,4	28,3	28,9
	6H	28,4	29,3	29,0	29,8	30,3	27,5	28,4	28,2	28,9	29,4
	8H	28,9	29,6	29,5	30,2	30,7	27,9	28,6	28,5	29,2	29,7
	12H	29,4	30,0	30,0	30,6	31,2	28,2	28,8	28,8	29,4	30,0
8H	4H	27,8	28,5	28,4	29,1	29,6	27,2	27,9	27,8	28,5	29,0
	6H	28,9	29,5	29,5	30,1	30,8	28,1	28,7	28,7	29,3	30,0
	8H	29,5	30,0	30,1	30,7	31,4	28,6	29,1	29,2	29,7	30,5
	12H	30,1	30,6	30,8	31,2	31,9	29,0	29,4	29,7	30,1	30,8
12H	4H	27,8	28,4	28,4	29,0	29,6	27,2	27,9	27,8	28,4	29,1
	6H	29,0	29,5	29,6	30,2	30,9	28,2	28,8	28,9	29,4	30,2
	8H	29,6	30,1	30,3	30,7	31,4	28,7	29,2	29,4	29,8	30,6

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

S = 1.0H	0,1 / 0,0	0,1 / -0,1
S = 1.5H	0,1 / -0,1	0,1 / -0,2
S = 2.0H	0,3 / -0,3	0,3 / -0,4

## 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	117	117	117	117	113	113	113	113	106	106	106	99	99	99	93	93	93	91
1	105	100	95	91	101	97	92	88	91	87	84	85	82	80	80	78	76	73
2	95	86	79	73	92	84	77	71	78	73	68	74	69	65	69	66	62	60
3	86	75	67	60	83	73	65	59	69	62	56	65	59	54	61	56	52	50
4	79	66	57	50	76	64	56	49	61	53	48	57	51	46	54	49	44	42
5	72	59	50	43	70	57	49	42	54	47	41	51	45	40	48	43	38	36
6	67	53	44	37	64	52	43	37	49	41	36	46	40	35	44	38	34	31
7	62	48	39	33	59	47	38	32	44	37	31	42	35	31	40	34	30	28
8	57	44	35	29	55	43	34	29	40	33	28	38	32	27	37	31	27	24
9	54	40	32	26	52	39	31	26	37	30	25	35	29	24	34	28	24	22
10	50	37	29	24	48	36	28	23	34	27	23	33	27	22	31	26	22	20

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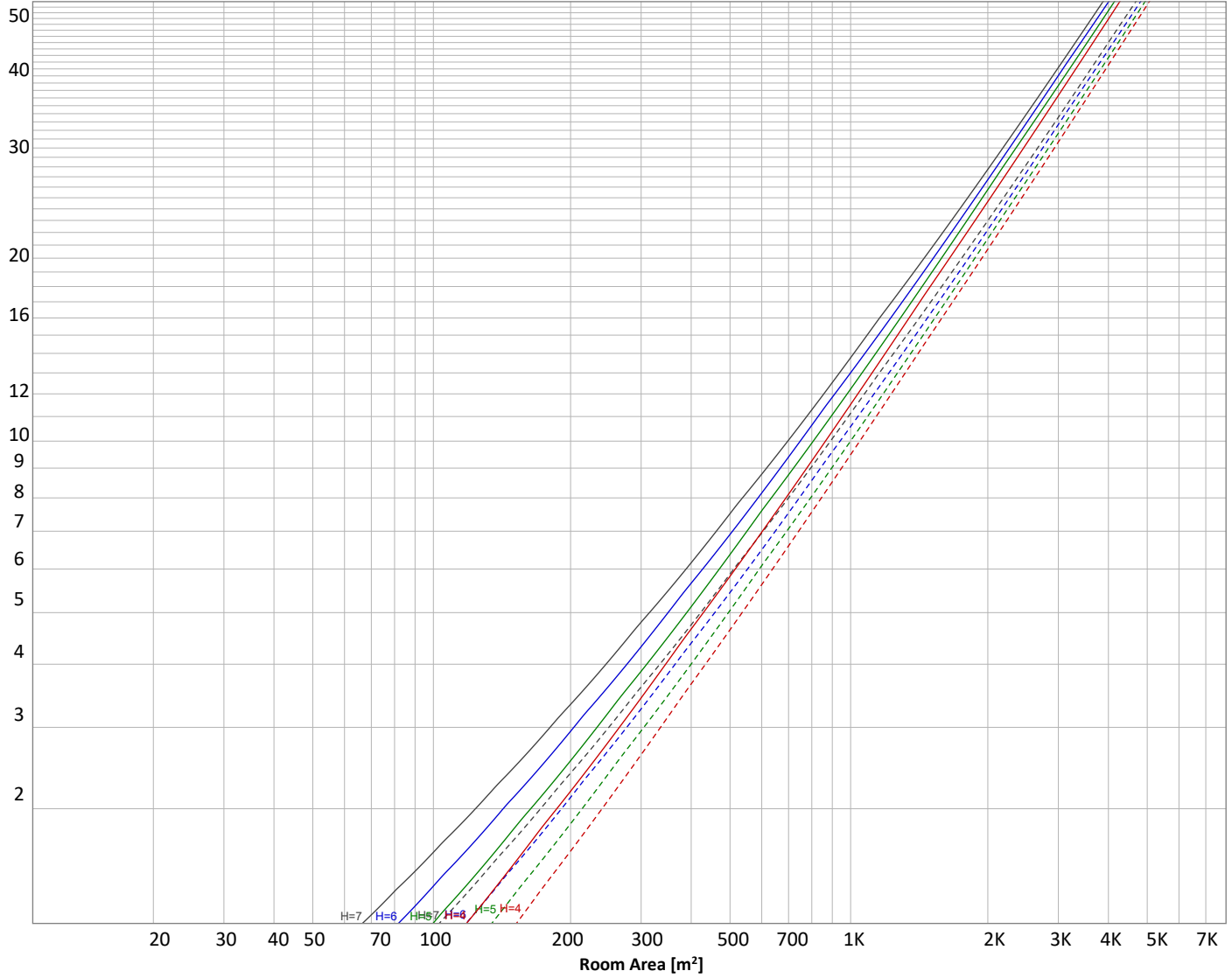
Operator:



## Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



### Conditions

H = Room height	Flux = 10859 lm			
H <sub>down</sub> = Lamp distance from ceiling =	0.00 m	Line type	Ceiling reflectance	ρ(%) 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
				20

### Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
289 lm	835 lm	1281 lm	1571 lm	1669 lm	1568 lm	1282 lm	865 lm	476 lm
90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
295 lm	235 lm	186 lm	137 lm	89,2 lm	48,1 lm	21,0 lm	7,63 lm	2,06 lm

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## Outdoor Light Planning

### Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	289 lm	2,7%
10-20°	835 lm	7,7%
20-30°	1281 lm	11,8%
30-40°	1571 lm	14,5%
40-50°	1669 lm	15,4%
50-60°	1568 lm	14,4%
60-70°	1282 lm	11,8%
70-80°	865 lm	8,0%
80-90°	476 lm	4,4%
90-100°	295 lm	2,7%
100-110°	235 lm	2,2%
110-120°	186 lm	1,7%
120-130°	137 lm	1,3%
130-140°	89 lm	0,8%
140-150°	48 lm	0,4%
150-160°	21 lm	0,2%
160-170°	8 lm	0,1%
170-180°	2 lm	0,0%
<b>Total</b>	<b>10859 lm</b>	<b>100,0%</b>

### Intensity peaks

Max intensity	3049 cd
Intensity, 90°	327 cd
Intensity, 0°	3049 cd

### Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	2406 lm	22,2%
0-40°	3977 lm	36,6%
0-60°	7214 lm	66,4%
60-90°	2623 lm	24,2%
70-100°	1636 lm	15,1%
90-120°	717 lm	6,6%
0-90°	9837 lm	90,6%
90-180°	1022 lm	9,4%
0-180°	10859 lm	100,0%

### BUG rating

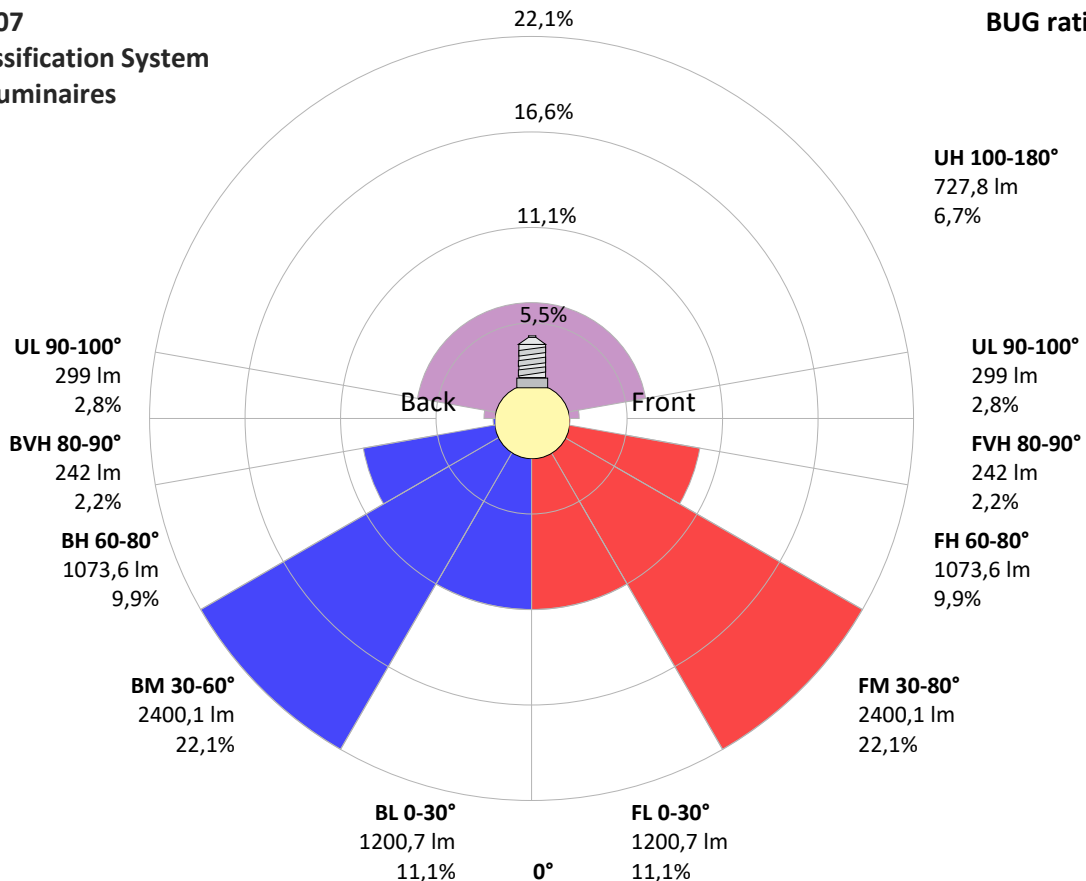
	Lumen	% Total
<b>Forward light</b>		
Low(0-30°)	1201 lm	11,1%
Medium(30-60°)	2400 lm	22,1%
High(60-80°)	1074 lm	9,9%
Very high(80-90°)	242 lm	2,2%
<b>Back light</b>		
Low(0-30°)	1201 lm	11,1%
Medium(30-60°)	2400 lm	22,1%
High(60-80°)	1074 lm	9,9%
Very high(80-90°)	242 lm	2,2%

### Uplight

Low(90-100°)	299 lm	2,8%
High(100-180°)	728 lm	6,7%

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

**BUG rating B3 U4 G3**



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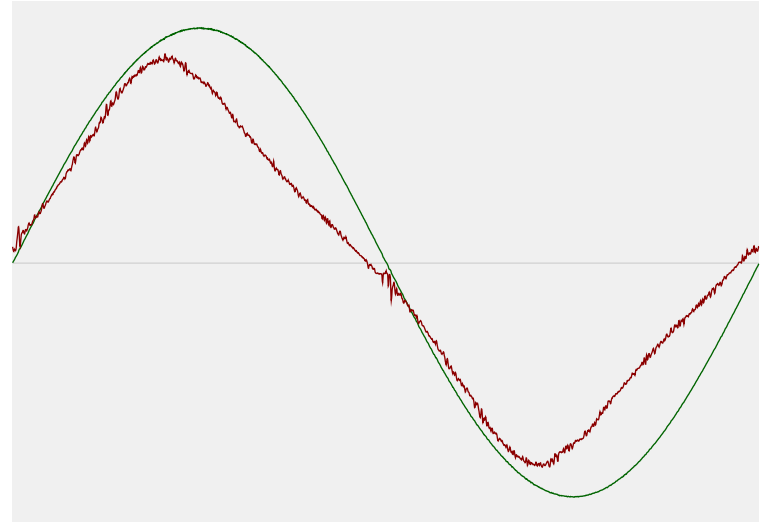


## Power Details

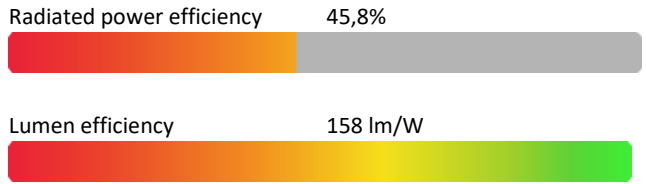
### Input Power

Power feed to light source	68,7 W
Frequency of input power	50 Hz
RMS Input voltage feed, $V_{RMS}$	230 V
RMS Input current feed, $I_{RMS}$	0,307 A
Volt-Ampere or apparent power = $V_{RMS} * I_{RMS}$	70,58 VA
Displacement factor of AC power feed	0,98
Power factor of AC current feed	0,97
Total harmonic distortion of the current	13,83%
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	4005 K
CCT shift	-5 K
CCT end	4000 K

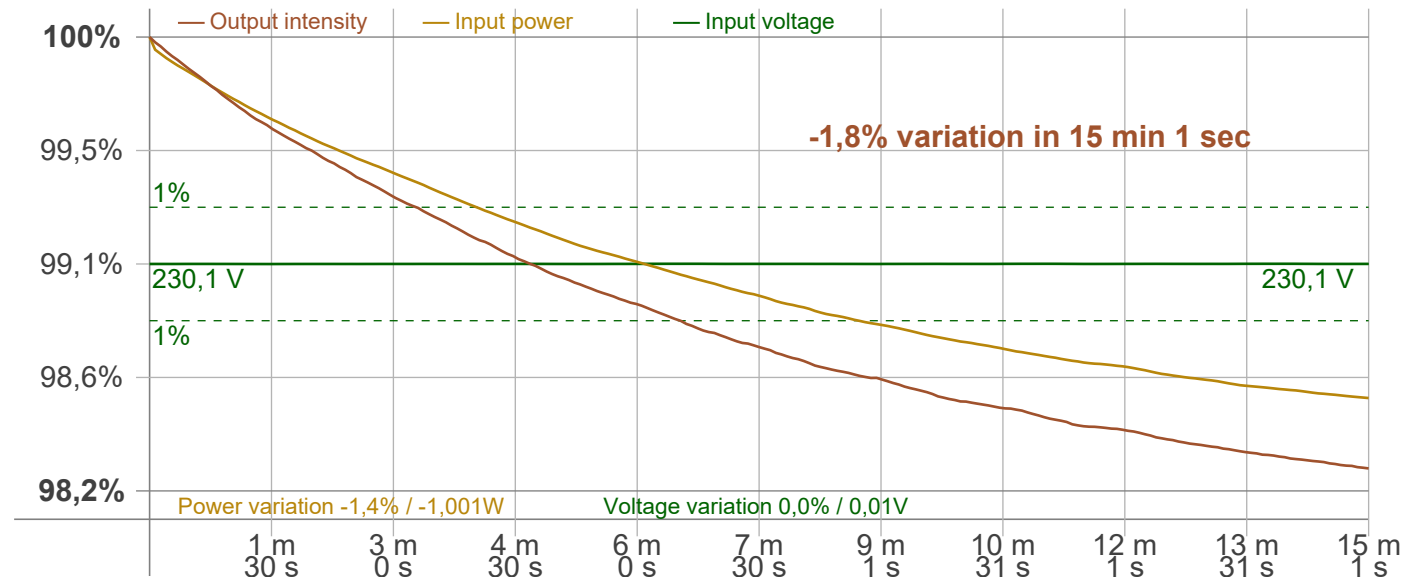
### Warmup Result

Total warmup time	Lamp stabilized in 15 min 1 sec
Warmup variation	-1,8%

### Output Change

Output start	11051 lm
Output change	-192 lm
Output end	10859 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 20000 samples/s

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

### Flicker indices according to Illuminating Engineering Society (IES)

Flicker frequency 96,15 Hz  
 Percent Flicker 0,08 %  
 Flicker index 0

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

JA8/10 40 Hz 0,02 %  
 JA8/10 90 Hz 0,02 %  
 JA8/10 200 Hz 0,05 %  
 JA8/10 400 Hz 0,06 %  
 JA8/10 1000 Hz 0,07 %

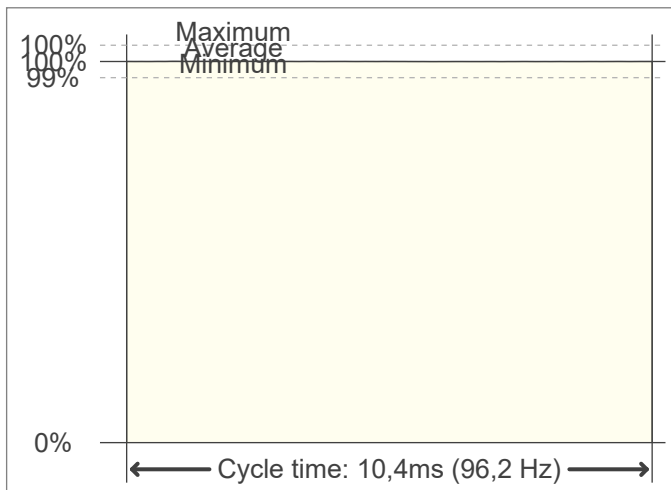
### TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

PstLM value (F < 80 Hz) 0,01  
 SVM value (80 < F < 2000 Hz) 0

### Flicker indices according to Lighting Research Center (2015)

Perception metric, Assist Mp 0,01

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



### Flicker FFT (flicker curve in frequency domain)



### IEEE 1789 Frequency/modulation plot

