

Goniophotometric Test Report**TEST ARTEFACT**

The DUT worked fine during the calibration and no defects were observed.

The DUT was mounted on the goniometer i.e. the AC input cable of the DUT was located in the direction of the C270 plane.

Company: Secto Design Oy

MEASUREMENT METHOD

The measurements were made by a goniospectrophotometer DECO 50. The spectral radiant intensities of a light source at different directions were measured with a calibrated spectrometer located at a known distance from the light source.

MEASUREMENT UNCERTAINTY

The photometer of type - is traceable to national standard at NIST (Certificate of calibration CR-0067 signed on 10.6.2019). The photometer head of type - is traceable to national standard at PTB (Certificate of calibration CR-0072 signed on 12.6.2019).

The power meter of type - is traceable to national standard at NIST.

The expanded uncertainties of the Luminous flux and efficacy are $\pm 15.0\%$ and $\pm 16.0\%$ ($k = 2$), respectively.

MEASUREMENTS

Table below describes the measurement conditions. The luminaire under test and photometer/spectrometer were mounted onto the same optical axis and perpendicular by an alignment laser. The measurement distance from the rotation axis to the photometer optical receiving surface was measured by laser distance meter. 0.0000 and 0.0000, respectively.

Table - Measurement information

Ambient temperature of the laboratory	25.0 degC
Power supply	233.8 Vac
Measurement distance	2440 mm
Location of the rotation axis (behind the outermost surface of the optics)	30 mm
Angular step, C plane	22.5 deg
Angular step, gamma angle	5.0 deg
Maximum gamma angle	170.0 deg
Stabilization time	1 min

Table. Luminous Intesity (cd) in horizontal (rows) and vertical planes (columns).

	0.0	22.5	45.0	67.5	90.0	112.5	135.0	157.5	180.0	202.5	225.0	247.5	270.0	292.5	315.0	337.5
0	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
5	73	74	74	72	74	74	74	72	74	73	73	72	73	73	73	73
10	75	75	75	74	76	76	76	74	75	75	74	73	74	74	74	73
15	76	77	77	76	77	77	77	76	76	76	75	73	75	75	75	74
20	77	78	78	78	78	80	78	77	77	77	76	74	75	75	75	75
25	77	78	79	78	79	81	79	78	78	77	76	75	76	76	75	75
30	78	79	80	78	79	80	80	78	78	76	76	75	76	77	75	74
35	78	80	80	78	80	80	80	79	78	77	75	75	76	77	75	74
40	79	81	81	79	81	82	81	79	79	78	76	75	77	76	75	76
45	80	81	82	81	82	83	82	79	79	78	77	75	77	78	76	76
50	77	79	80	80	81	82	80	78	77	75	74	72	73	74	74	73
55	70	73	73	74	75	76	74	72	70	68	68	65	65	65	66	67
60	60	64	63	65	65	67	64	63	61	58	59	55	57	56	57	57
65	48	51	50	53	52	54	51	51	49	46	46	43	45	44	46	45
70	38	41	40	42	42	43	41	41	39	37	37	35	36	35	37	37
75	25	27	25	27	26	27	25	26	25	23	24	23	24	23	24	24
80	19	20	19	20	20	20	19	19	18	18	18	17	18	18	18	18
85	15	16	15	16	16	16	15	15	14	14	14	13	14	14	15	15
90	12	12	12	13	12	13	12	12	11	11	11	10	11	11	11	11
95	10	9	10	10	10	10	10	13	9	9	9	9	9	9	9	9
100	10	10	10	13	12	10	10	10	10	10	9	10	9	10	9	10
105	13	13	14	14	14	14	14	14	13	13	13	14	13	14	13	14
110	18	18	19	19	19	19	18	18	17	18	17	17	17	18	17	18
115	21	21	22	22	22	24	22	22	20	20	20	20	20	20	20	21
120	24	23	24	25	26	26	24	22	24	24	23	24	23	24	23	25
125	32	28	29	32	34	34	30	28	31	33	30	31	28	30	30	32
130	43	37	38	44	46	46	39	37	41	44	41	40	36	37	41	43
135	50	43	42	52	55	55	44	41	48	52	51	45	42	42	51	51
140	56	47	47	57	63	61	49	45	52	59	57	49	46	47	57	60
145	59	50	50	60	67	64	52	47	55	63	63	53	48	51	62	65
150	56	48	47	55	62	58	48	45	52	59	59	50	48	50	60	63
155	49	44	43	48	54	50	43	41	46	51	52	45	45	46	53	55
160	42	38	37	40	44	41	36	35	39	42	44	38	39	39	45	46
165	34	31	30	31	34	32	29	29	31	33	35	31	32	33	36	37
170	21	19	18	18	19	18	16	16	24	27	26	25	26	27	27	29

Table. Measurement results of the main luminous parameters

Luminous flux	Input power	Luminous efficacy	LOR	DWFF	Luminous intensity (g=0)
506.0 lm	6.80 W	74.5 lm/W	100.0 %	64.9 %	75 cd

Table. Electrical parameters during the light measurements.

	Pin	PF	Vin	If
Value	6.795 W	0.7457	233.8 V	0.0390 A
St.dev.	0.85 %	0.17 %	0.33 %	1.00 %

Table. Maximum Luminous Intensity and its direction

Iv	g	C plane
80 cd	45.0°	90.0°

Table. Beam widths at two perpendicular planes

	Beam angle, FWHM, 50% (deg)	Beam angle, 10% (deg)	Effective beam direction from g=0
C0-180	140.9°	346.6°	-0.0°
C90-270	140.5°	346.6°	0.0°

Figure. Polar curve of the angular Luminous Intesity distribution at two perpendicular C planes and at C plane with maximum Luminous Intesity.

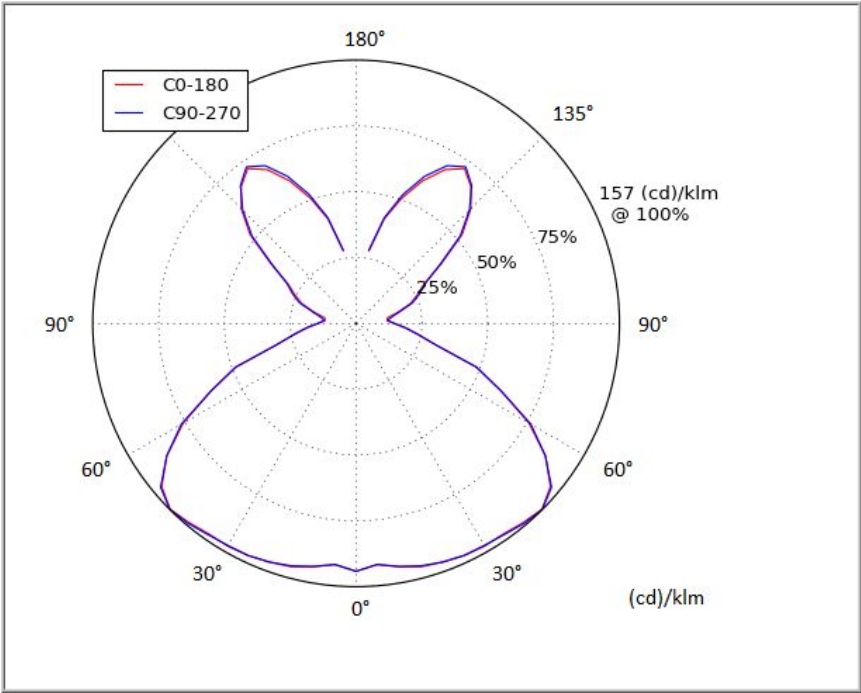


Figure. Luminous Intesity distribution in cartesian diagram at all measured C planes.

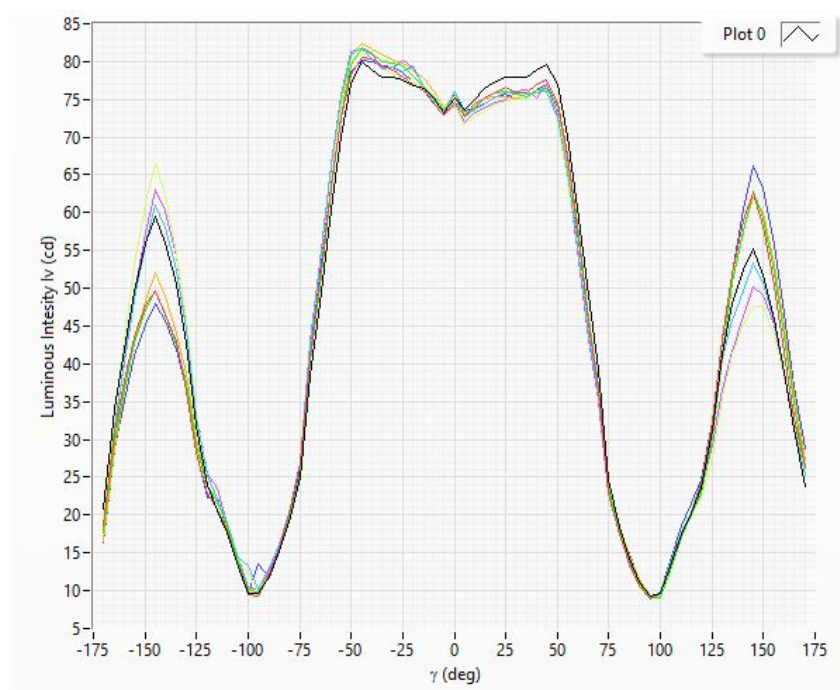


Figure. Isocandela as a function of C plane at gamma angle with maximum luminous intensity

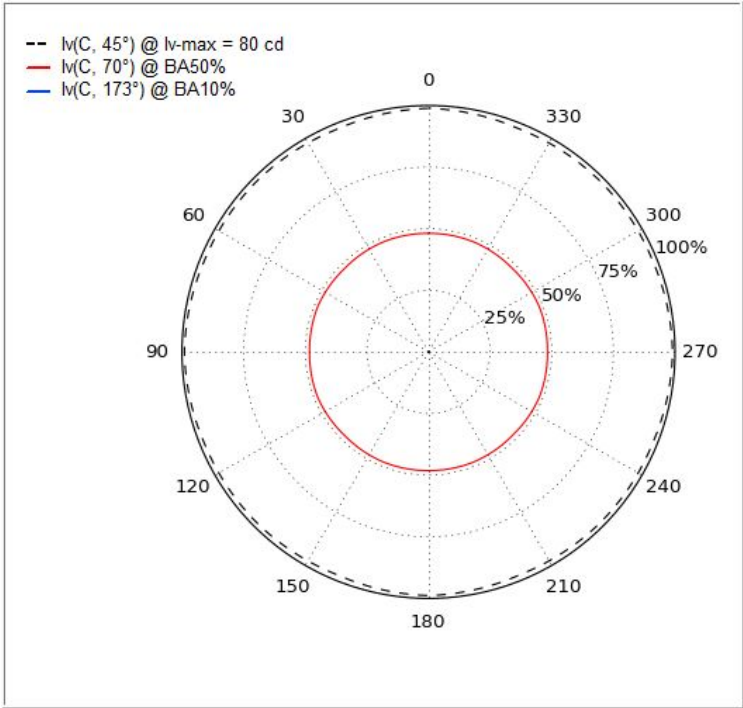


Table. Zonal lumen summary

	Lumens	Relative lumens (%)
0-20	28.50	5.64
0-30	64.20	12.70
0-40	113.00	22.36
0-60	235.60	46.62
0-80	312.30	61.79
0-90	328.60	65.02
10-90	321.60	63.63
20-40	84.50	16.72
20-50	145.10	28.71
40-70	171.00	33.83
40-90	215.60	42.66
60-80	76.70	15.18
60-90	93.00	18.40
70-80	28.30	5.60
80-90	16.30	3.23
90-110	25.80	5.10
90-120	46.60	9.22
90-130	74.60	14.76
90-150	145.70	28.83
90-180	176.80	34.98
110-180	151.00	29.88
0-180	505.40	100.00

Table. Cumulative and Zonal luminous flux

gamma (deg)	Zone Flux (lm)	Sum Flux (lm)	Zone Flux (%)	Sum Flux (%)
0.0	0.0	0.0	0.0	0.0
5.0	3.5	1.7	0.7	0.3
10.0	7.1	7.0	1.4	1.4
15.0	10.7	15.9	2.1	3.2
20.0	14.4	28.5	2.8	5.6
25.0	17.9	44.7	3.5	8.8
30.0	21.2	64.2	4.2	12.7
35.0	24.4	87.0	4.8	17.2
40.0	27.6	113.0	5.5	22.3
45.0	30.7	142.2	6.1	28.1
50.0	32.2	173.6	6.4	34.3
55.0	31.4	205.5	6.2	40.6
60.0	28.8	235.6	5.7	46.6
65.0	24.0	262.0	4.7	51.8
70.0	20.0	284.0	4.0	56.1
75.0	13.1	300.6	2.6	59.4
80.0	10.1	312.3	2.0	61.7
85.0	8.1	321.4	1.6	63.5
90.0	6.3	328.6	1.3	64.9
95.0	5.3	334.4	1.1	66.1
100.0	5.4	339.8	1.1	67.2
105.0	7.2	346.2	1.4	68.4
110.0	9.3	354.4	1.8	70.0
115.0	10.5	364.3	2.1	72.0
120.0	11.3	375.2	2.2	74.1
125.0	13.8	387.8	2.7	76.6
130.0	17.1	403.2	3.4	79.7
135.0	18.5	421.1	3.7	83.2
140.0	18.8	439.7	3.7	86.9
145.0	17.9	458.0	3.5	90.5
150.0	14.7	474.3	2.9	93.7
155.0	11.0	487.2	2.2	96.3
160.0	7.5	496.5	1.5	98.1
165.0	4.6	502.5	0.9	99.3
170.0	1.2	505.4	0.2	99.9

Figure. Cumulative luminous flux

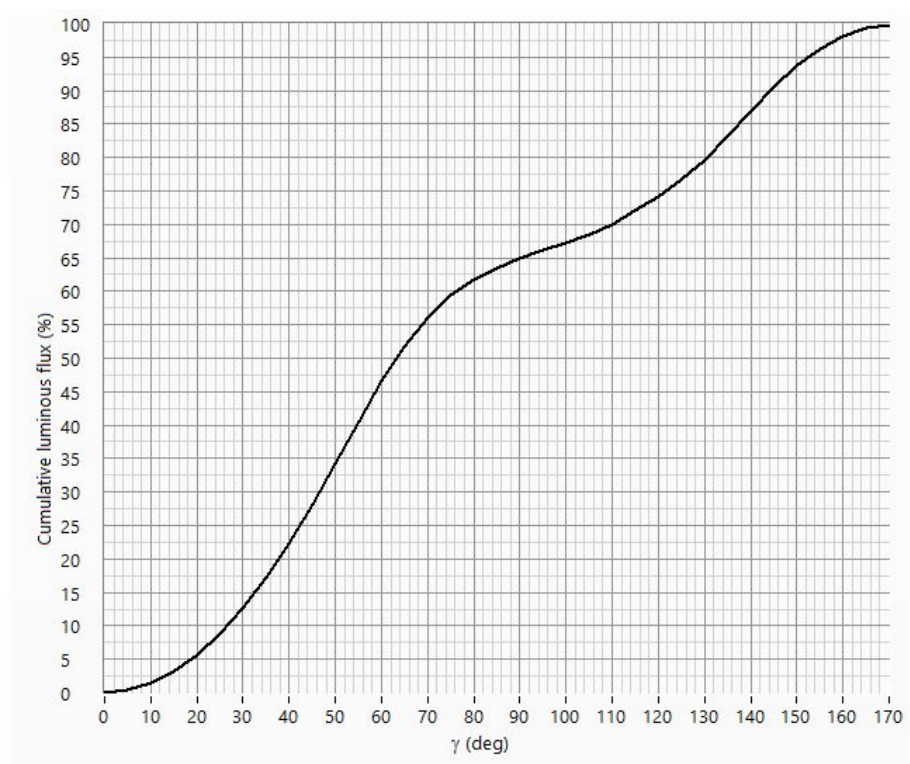


Table. Luminance at different angles based on the defined luminous areas and measured luminous intensities.

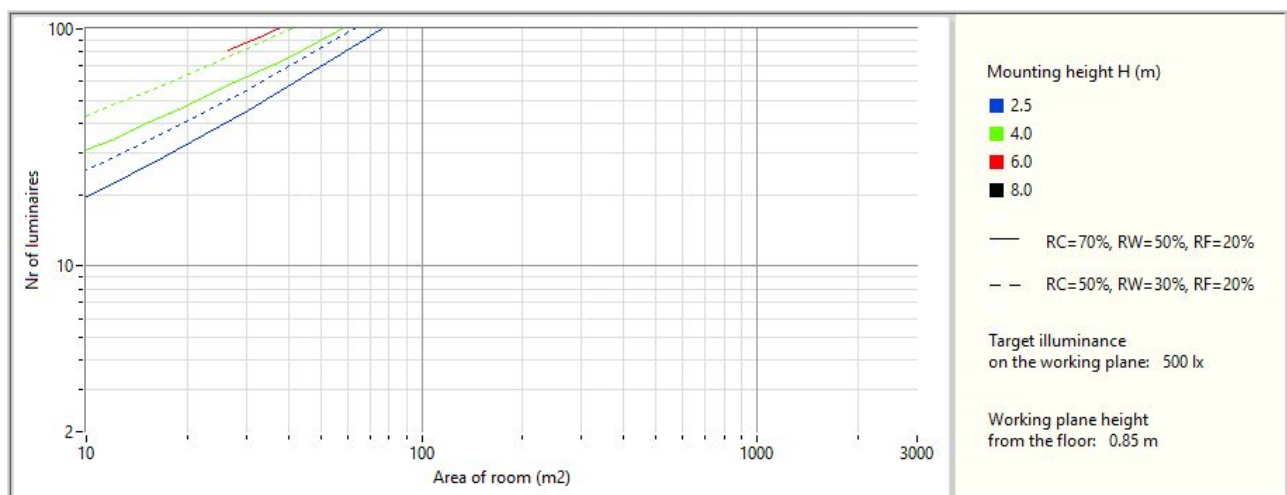
	C 0	C 45	C 90
g 0	2941	2941	2941
g 45	2695	2678	2699
g 55	2504	2506	2503
g 65	1898	1890	1900
g 75	1108	1103	1114
g 85	802	807	814

Table. Unified Glare Rating (UGR) Index in different types of indoor spaces.

Ceiling		70	70	50	50	30	70	70	50	50	30
Walls		50	30	50	30	30	50	30	50	30	30
Floor		20	20	20	20	20	20	20	20	20	20
Room size		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis				
X	Y										
2H	2H	13.5	14.6	14.3	15.4	16.5	13.5	14.6	14.3	15.4	16.5
	3H	15.0	16.0	15.9	16.9	17.9	15.1	16.1	15.9	16.9	18.0
	4H	15.5	16.4	16.3	17.3	18.3	15.5	16.4	16.3	17.3	18.4
	6H	15.8	16.7	16.7	17.6	18.6	15.8	16.7	16.7	17.6	18.7
	8H	16.0	16.8	16.8	17.7	18.8	16.0	16.8	16.9	17.7	18.8
	12H	16.1	16.9	17.0	17.8	18.9	16.2	17.0	17.0	17.8	18.9
4H	2H	13.9	14.9	14.7	15.7	16.8	13.9	14.9	14.8	15.7	16.8
	3H	15.6	16.4	16.5	17.3	18.4	15.7	16.5	16.5	17.3	18.4
	4H	16.2	16.9	17.0	17.8	18.9	16.2	16.9	17.1	17.8	18.9
	6H	16.6	17.3	17.5	18.2	19.3	16.7	17.3	17.5	18.2	19.3
	8H	16.9	17.4	17.7	18.4	19.5	16.9	17.5	17.8	18.4	19.5
	12H	17.1	17.6	18.0	18.5	19.7	17.1	17.6	18.0	18.6	19.7
8H	4H	16.3	16.9	17.2	17.8	19.0	16.3	16.9	17.2	17.8	19.0
	6H	16.9	17.4	17.8	18.4	19.5	16.9	17.4	17.8	18.4	19.5
	8H	17.2	17.7	18.1	18.6	19.7	17.2	17.7	18.2	18.6	19.8
	12H	17.5	17.9	18.5	18.9	20.1	17.6	18.0	18.5	18.9	20.1
12H	4H	16.3	16.9	17.2	17.8	18.9	16.3	16.9	17.2	17.8	18.9
	6H	17.0	17.4	17.9	18.3	19.5	17.0	17.4	17.9	18.3	19.5
	8H	17.3	17.7	18.2	18.6	19.8	17.3	17.7	18.3	18.7	19.9

RC	80				70				50			30			10		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10
RF / RCR	20				20				20			20			20		
0	111	111	111	111	104	104	104	104	92	92	92	80	80	80	70	70	70
1	93	88	84	81	88	84	81	78	77	75	72	71	69	67	65	63	62
2	86	78	72	66	81	74	69	64	67	63	59	61	58	54	55	52	50
3	79	69	61	55	74	66	59	53	59	54	49	53	49	45	48	44	41
4	72	61	53	47	68	58	51	45	52	46	41	47	42	38	42	38	34
5	67	54	46	40	63	52	44	38	46	40	35	41	36	32	37	33	29
6	61	49	40	34	58	46	39	33	42	35	30	37	32	28	33	29	25
7	57	44	36	30	53	42	34	29	37	31	26	33	28	24	30	25	22
8	53	40	32	26	49	38	30	25	34	28	23	30	25	21	27	23	19
9	49	36	29	23	46	35	27	22	31	25	21	28	23	19	25	20	17
10	46	33	26	21	43	32	25	20	28	23	18	25	20	17	23	18	15

Figure. Number of luminaires in different sizes of rectangular spaces.

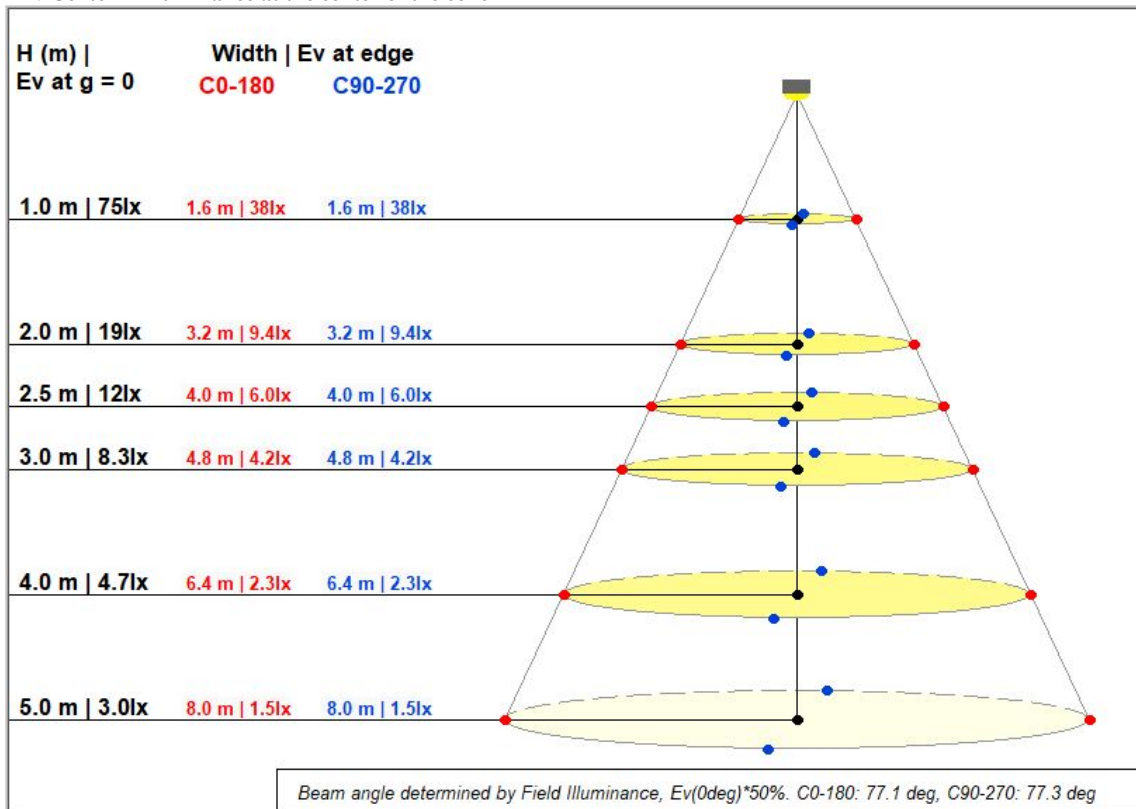


RC	80				70				50			30			10		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10
RF / RCR	20				20				20			20			20		
1	56.0	38.5	22.3	7.2	53.5	36.8	21.3	6.9	33.1	19.2	6.2	28.8	16.7	5.4	23.4	13.6	4.4
2	53.9	36.1	20.5	6.5	51.3	34.5	19.6	6.2	30.8	17.5	5.6	26.5	15.1	4.8	21.3	12.1	3.9
3	51.9	34.1	19.1	6.0	49.2	32.5	18.2	5.7	28.8	16.1	5.1	24.5	13.8	4.3	19.6	10.9	3.4
4	50.1	32.5	18.0	5.6	47.3	30.7	17.1	5.3	27.0	15.0	4.7	22.8	12.7	3.9	18.0	9.9	3.1
5	48.4	31.0	17.2	5.4	45.6	29.3	16.2	5.1	25.6	14.1	4.4	21.4	11.8	3.6	16.7	9.1	2.8
6	46.8	29.9	16.5	5.2	44.0	28.1	15.5	4.9	24.4	13.4	4.2	20.2	11.0	3.4	15.6	8.4	2.5
7	45.5	28.9	16.0	5.0	42.6	27.1	15.0	4.7	23.3	12.8	4.0	19.2	10.4	3.2	14.6	7.8	2.3
8	44.3	28.1	15.6	4.9	41.4	26.3	14.6	4.6	22.5	12.4	3.9	18.3	9.9	3.1	13.7	7.3	2.2
9	43.2	27.5	15.3	4.9	40.3	25.6	14.3	4.5	21.7	12.0	3.8	17.5	9.5	3.0	13.0	6.8	2.1
10	42.3	27.0	15.2	4.9	39.4	25.1	14.0	4.5	21.1	11.7	3.7	16.9	9.2	2.9	12.4	6.5	1.9

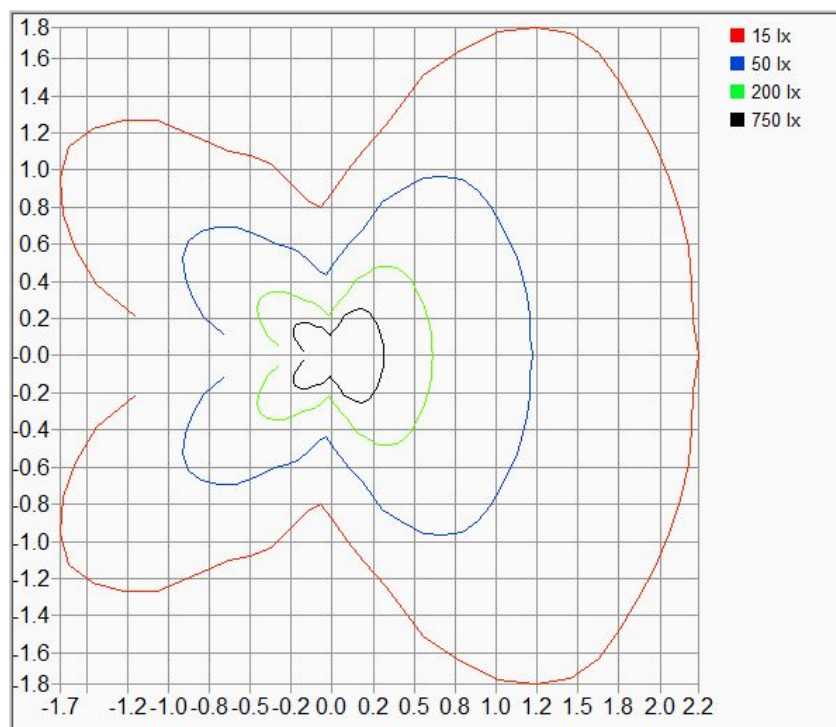
RC	80				70				50			30			10		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10
RF / RCR	20				20				20			20			20		
1	349.2	326.0	305.2	286.5	118.0	108.9	100.7	93.2	24.8	22.4	20.2	8.8	7.9	7.1	2.4	2.2	2.0
2	337.3	295.7	261.3	232.4	114.9	98.6	84.9	73.3	22.8	18.7	15.2	8.4	6.9	5.5	2.4	2.0	1.7
3	322.8	266.8	223.4	188.9	110.7	88.6	71.2	57.2	20.8	15.6	11.3	7.9	6.0	4.3	2.3	1.8	1.4
4	306.4	239.4	190.3	152.8	105.5	78.9	59.1	43.8	18.7	12.7	8.0	7.4	5.1	3.3	2.2	1.7	1.2
5	288.9	213.7	161.1	122.3	99.7	69.7	48.4	32.5	16.7	10.2	5.2	6.8	4.4	2.5	2.1	1.5	1.0
6	271.0	189.8	135.2	96.1	93.5	61.0	38.8	22.7	14.7	7.9	2.8	6.3	3.7	1.8	2.0	1.4	0.9
7	253.1	167.7	112.3	73.5	87.2	52.9	30.3	14.2	12.8	5.8	0.8	5.7	3.1	1.2	1.9	1.3	0.8
8	235.5	147.4	92.0	53.9	81.0	45.4	22.7	6.8	11.0	4.0	-1.0	5.2	2.6	0.6	1.8	1.2	0.7
9	218.6	128.8	73.9	36.8	74.8	38.5	15.9	0.4	9.3	2.3	-2.6	4.7	2.0	0.2	1.7	1.0	0.6
10	202.4	112.0	57.9	21.9	68.9	32.2	9.8	-5.3	7.7	0.8	-4.0	4.2	1.6	-0.3	1.6	1.0	0.5

CONE DIAGRAM

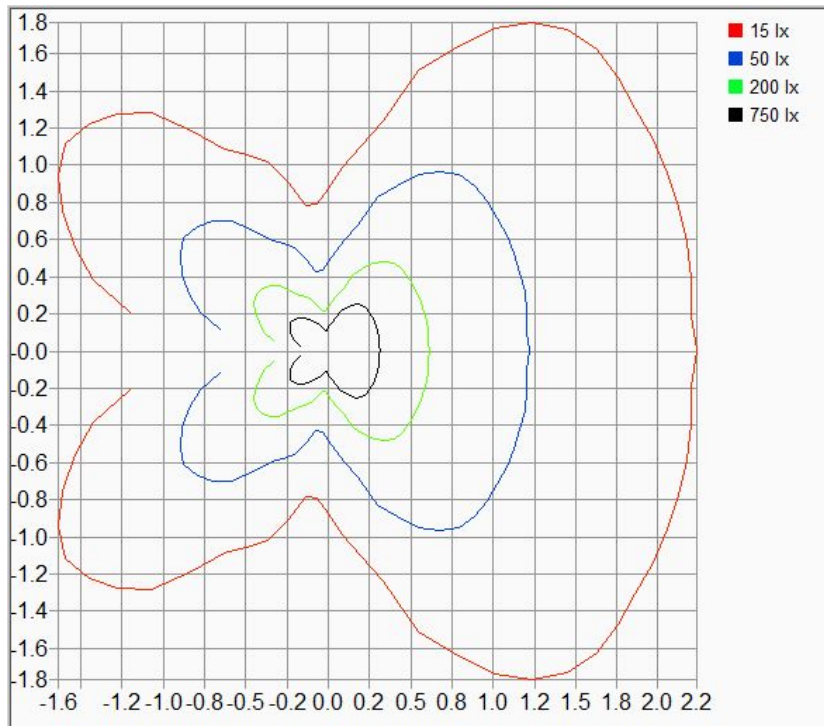
- Cone is limited by the beam angle at the planes of C0 and C90
- H = Mounting Height
- D = Cone diameter
- Ev Edge = Illuminance at the edge of the cone of the C0/90 plane
- Ev Center = Illuminance at the center of the cone



Vertical isolux



Horizontal isolux



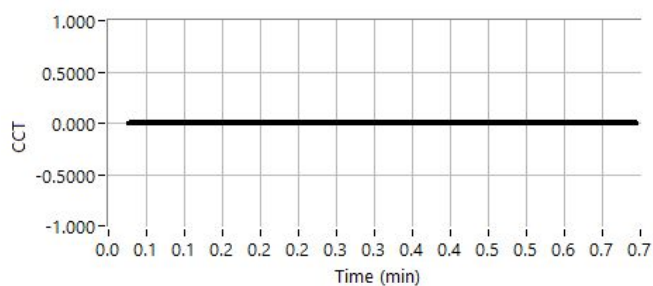
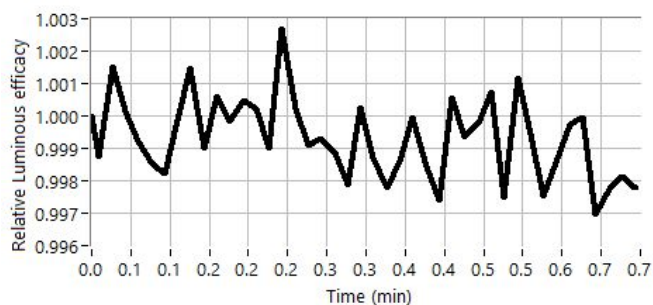
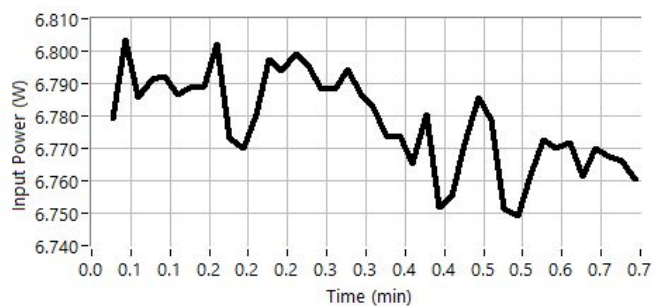
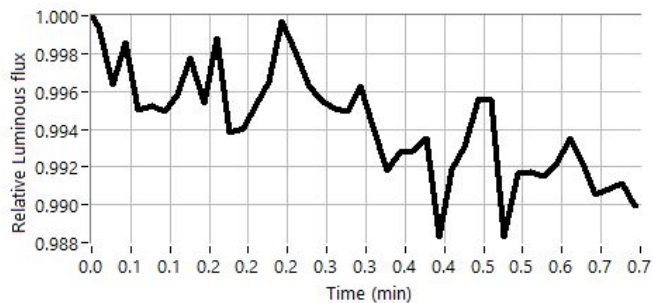
Stabilization curve

Lumen drift: -1.01 %

Input Power drift: -0.79 %

Lumen per watt drift: -0.22 %

Stabilization time: 1 min



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