

# Goniophotometric Test Report



## TEST ARTEFACT

The measurement device (DUT) was LED light. The burning position of the DUT was not changed during the measurements.  
Customer: Secto design Oy

## MEASUREMENT METHOD

The test method is with accordance of LM-79-08 / CIE S025 test standards. The measurements were made by a goniophotometer SSL C-1R.1600.4A at the dark room of SSL Resource Ltd.

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 (SSL L-200, sn L200-004, Measuring head LH200-003) used in goniophotometer is traceable to national standard of illuminance

responsivity at PTB (Certificate of calibration CR 0054 signed on 6 March 2019). The power meter and supply of type TDK Lambda is traceable national standard of electrical parameters at NIST (Calibration date 5 February 2018). The expanded uncertainties of the luminous flux and efficacy are  $\pm 3.8\%$  and  $\pm 4.0\%$  ( $k = 2$ ), 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.

**Table - Measurement information**

Ambient temperature of the laboratory	25.0 degC
Power supply	230.0 Vac
Measurement distance	8748 mm
Location of the rotation axis (behind the outermost surface of the optics)	30 mm
Angular step, C plane	15.0 deg
Angular step, gamma angle	2.5 deg
Maximum gamma angle	180.0 deg
Stabilization time	50 min

**Table. Luminous intensity data (cd) at measured C planes (rows) and gamma angles (columns)**

	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345
0.0	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566	566
2.5	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565	565
5.0	564	564	564	563	563	563	563	563	563	563	564	564	564	564	564	563	563	563	563	563	563	563	564	564
7.5	561	561	561	560	560	560	560	560	560	560	561	561	561	561	561	560	560	560	560	560	560	560	561	561
10.0	557	557	557	557	556	556	555	556	556	557	557	557	557	557	557	557	556	556	555	556	556	557	557	557
12.5	552	552	552	551	551	550	550	550	551	551	552	552	552	552	552	551	551	550	550	550	551	551	552	552
15.0	545	545	545	545	544	543	543	543	544	545	545	545	545	545	545	545	544	543	543	543	544	545	545	545
17.5	536	536	537	537	536	534	533	534	536	537	537	536	536	536	537	537	536	534	533	534	536	537	537	536
20.0	525	525	527	528	526	524	522	524	526	528	527	525	525	525	527	528	526	524	522	524	526	528	527	525
22.5	512	513	515	517	515	511	510	511	515	517	515	513	512	513	515	517	515	511	510	511	515	517	515	513
25.0	497	499	502	503	501	497	495	497	501	503	502	499	497	499	502	503	501	497	495	497	501	503	502	499
27.5	482	483	487	488	487	482	480	482	487	488	487	483	482	483	487	488	487	482	480	482	487	488	487	483
30.0	465	467	471	472	470	465	463	465	470	472	471	467	465	467	471	472	470	465	463	465	470	472	471	467
32.5	447	449	453	454	453	448	445	448	453	454	453	449	447	449	453	454	453	448	445	448	453	454	453	449
35.0	428	430	435	435	434	429	426	429	434	435	435	430	428	430	435	435	434	429	426	429	434	435	435	430
37.5	408	411	415	415	414	410	406	410	414	415	415	411	408	411	415	415	414	410	406	410	414	415	415	411
40.0	387	390	394	394	393	389	385	389	393	394	394	390	387	390	394	394	393	389	385	389	393	394	394	390
42.5	365	369	372	373	372	368	363	368	372	373	372	369	365	369	372	373	372	368	363	368	372	373	372	369
45.0	343	347	350	350	350	346	341	346	350	350	350	347	343	347	350	350	350	346	341	346	350	350	350	347
47.5	321	325	327	327	327	324	319	324	327	327	327	325	321	325	327	327	327	324	319	324	327	327	327	325
50.0	298	302	304	304	303	301	296	301	303	304	304	302	298	302	304	304	303	301	296	301	303	304	304	302
52.5	275	279	280	280	280	278	273	278	280	280	280	279	275	279	280	280	280	278	273	278	280	280	280	279
55.0	251	255	256	256	256	255	250	255	256	256	256	255	251	255	256	256	256	255	250	255	256	256	256	255
57.5	227	231	232	232	232	231	226	231	232	232	232	231	227	231	232	232	232	231	226	231	232	232	232	231
60.0	203	207	208	207	208	207	203	207	208	207	208	207	203	207	208	207	208	207	203	207	208	207	208	207
62.5	179	182	183	183	183	182	179	182	183	183	183	182	179	182	183	183	183	182	179	182	183	183	183	182
65.0	155	158	158	159	159	158	155	158	159	159	158	158	155	158	158	159	159	158	155	158	159	159	158	158
67.5	131	134	134	135	135	134	131	134	135	135	134	134	131	134	134	135	135	134	131	134	135	135	134	134
70.0	108	111	112	113	112	111	108	111	112	113	112	111	108	111	112	113	112	111	108	111	112	113	112	111
72.5	87	89	91	92	91	89	87	89	91	92	91	89	87	89	91	92	91	89	87	89	91	92	91	89
75.0	69	71	73	74	73	71	69	71	73	74	73	71	69	71	73	74	73	71	69	71	73	74	73	71
77.5	56	57	58	59	58	56	55	56	58	59	58	57	56	57	58	59	58	56	55	56	58	59	58	57
80.0	47	46	46	47	46	46	46	46	46	47	46	46	47	46	46	47	46	46	46	46	46	47	46	46
82.5	40	37	36	36	36	37	38	37	36	36	36	37	40	37	36	36	36	37	38	37	36	36	36	37
85.0	31	29	27	27	27	28	30	28	27	27	27	29	31	29	27	27	27	28	30	28	27	27	27	29
87.5	23	22	20	18	20	21	22	21	20	18	20	22	23	22	20	18	20	21	22	21	20	18	20	22
90.0	17	16	14	12	14	16	16	16	14	12	14	16	17	16	14	12	14	16	16	14	12	14	16	16
92.5	13	12	10	9	10	12	12	12	10	9	10	12	13	12	10	9	10	12	12	10	9	10	12	12
95.0	9	9	7	6	7	9	10	9	7	6	7	9	9	9	7	6	7	9	10	9	7	6	7	9
97.5	7	6	5	4	5	7	8	7	5	4	5	6	7	6	5	4	5	7	8	7	5	4	5	6
100.0	5	4	3	3	3	4	6	4	3	3	3	4	5	4	3	3	3	4	6	4	3	3	3	4
102.5	3	2	1	1	2	2	3	2	2	1	1	2	3	2	1	1	2	2	3	2	2	1	1	2
105.0	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1
107.5	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0
110.0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
112.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
115.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
117.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
120.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
122.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
125.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
127.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
130.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
132.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
135.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
137.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
140.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
142.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
145.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
147.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
150.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
152.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
155.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
157.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345
160.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
162.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
165.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
167.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
170.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
172.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
175.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
177.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
180.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

**Table. Measurement results of the main luminous parameters**

Luminous flux	Input power	Luminous efficacy	LOR	DWFF	Luminous intensity (g=0)
1485.9 lm	21.60 W	68.8 lm/W	100.0 %	98.8 %	565 cd

**Table. Electrical parameters during the light measurements.**

	Pin	PF	Vin	If
Value	21.58 W	0.9953	230.0 V	0.0942 A
St.dev.	0.85 %	0.05 %	0.00 %	0.89 %

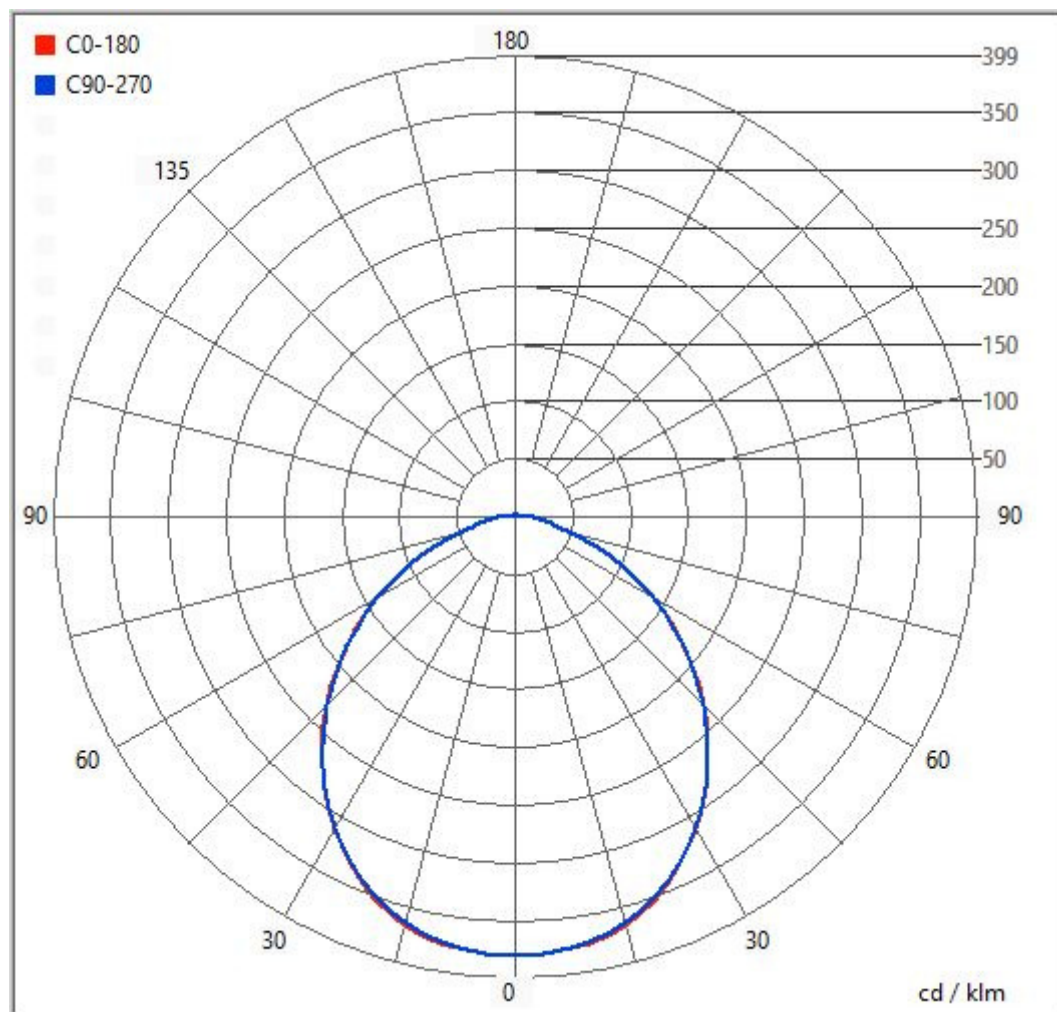
**Table. Maximum luminous intensity and its direction**

Iv	g	C plane
566 cd	-0.0 deg	0.0 deg

**Table. Beam widths at two perpendicular planes**

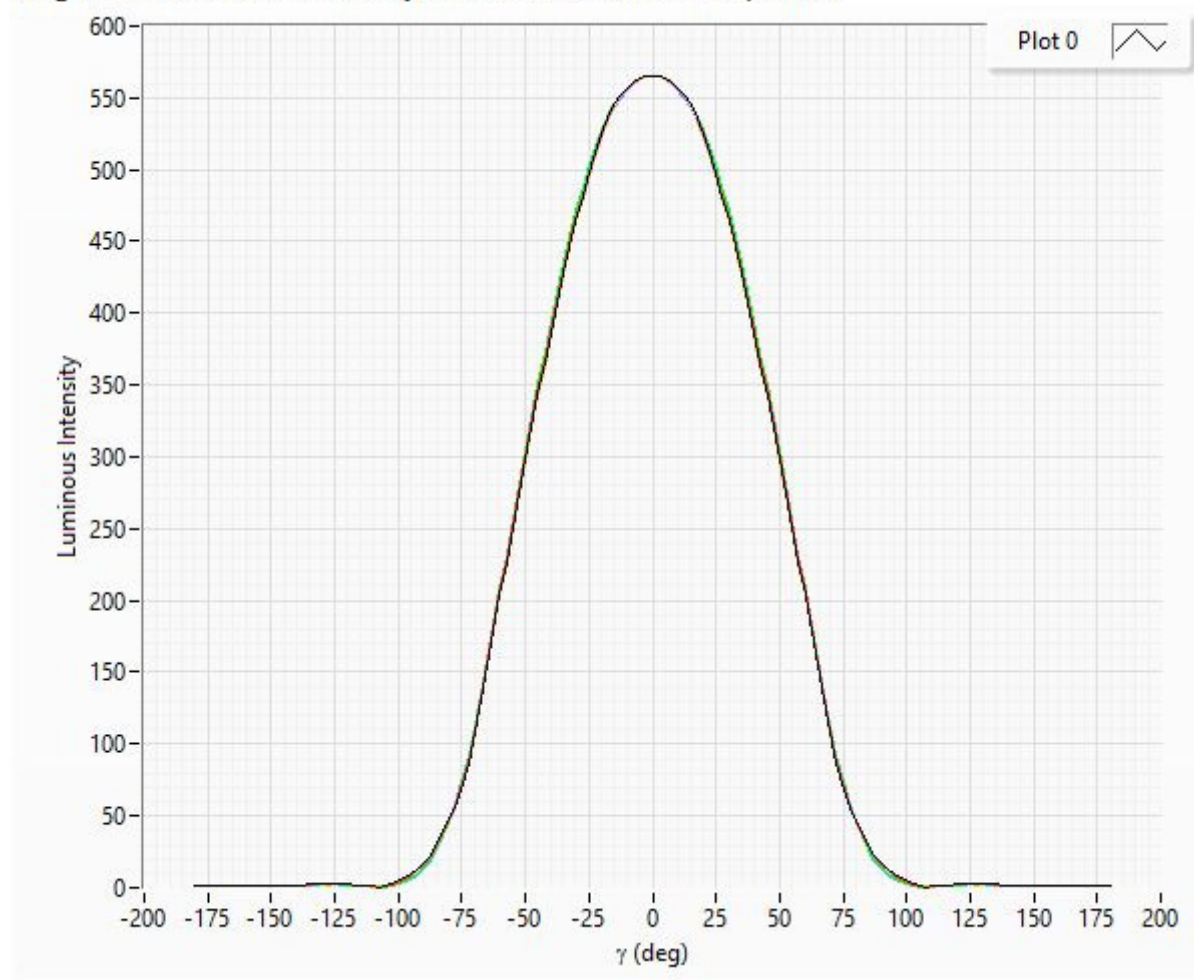
	Beam angle, FWHM, 50% (deg)	Beam angle, 10% (deg)	Effective beam direction from g=0
C0-180	103.3	154.6	-0.0
C90-270	102.9	154.5	0.0

**Figure. Polar curve of the angular luminous intensity distribution at two perpendicular C planes and at C plane with maximum luminous intensity.**

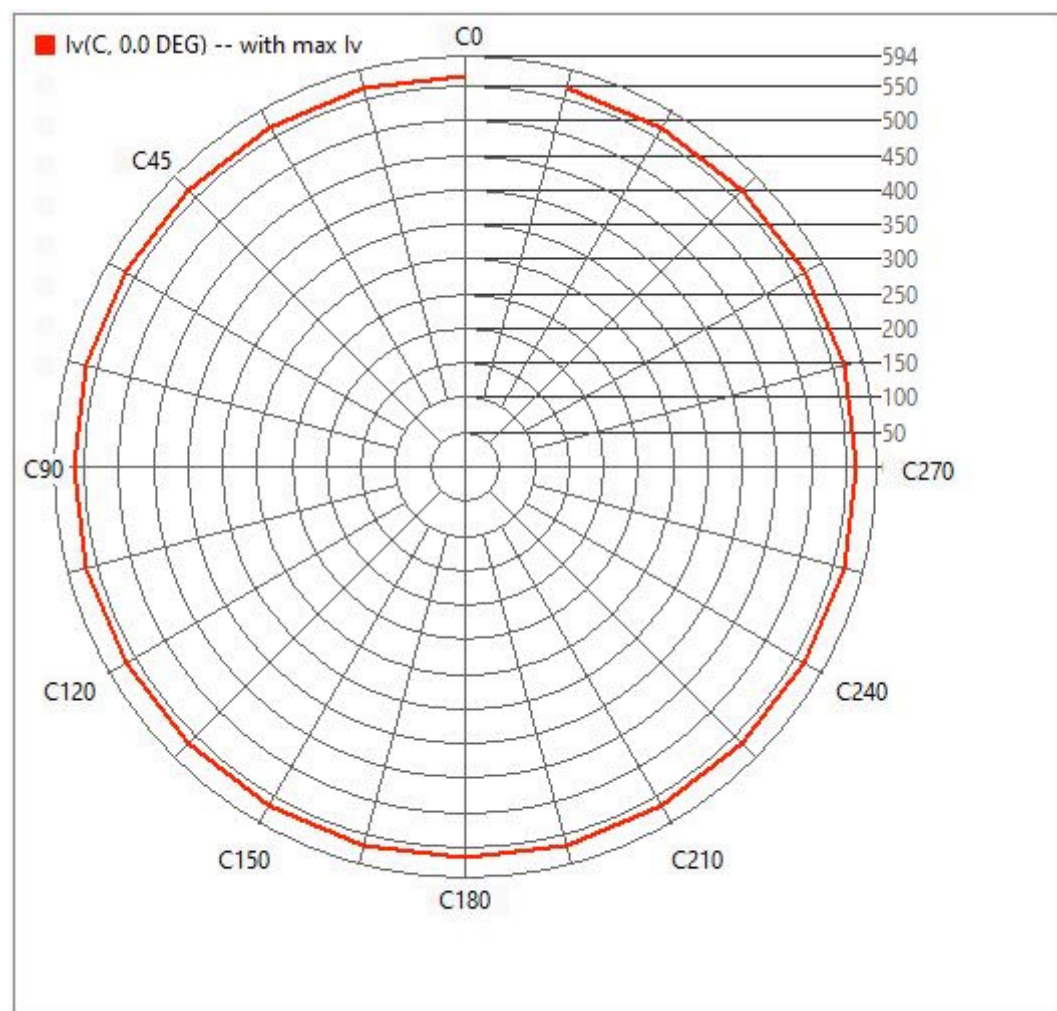


**Figure. Luminous intensity distribution in cartesian diagram at all measured C planes**

Angular luminous intensity distributions at all C planes



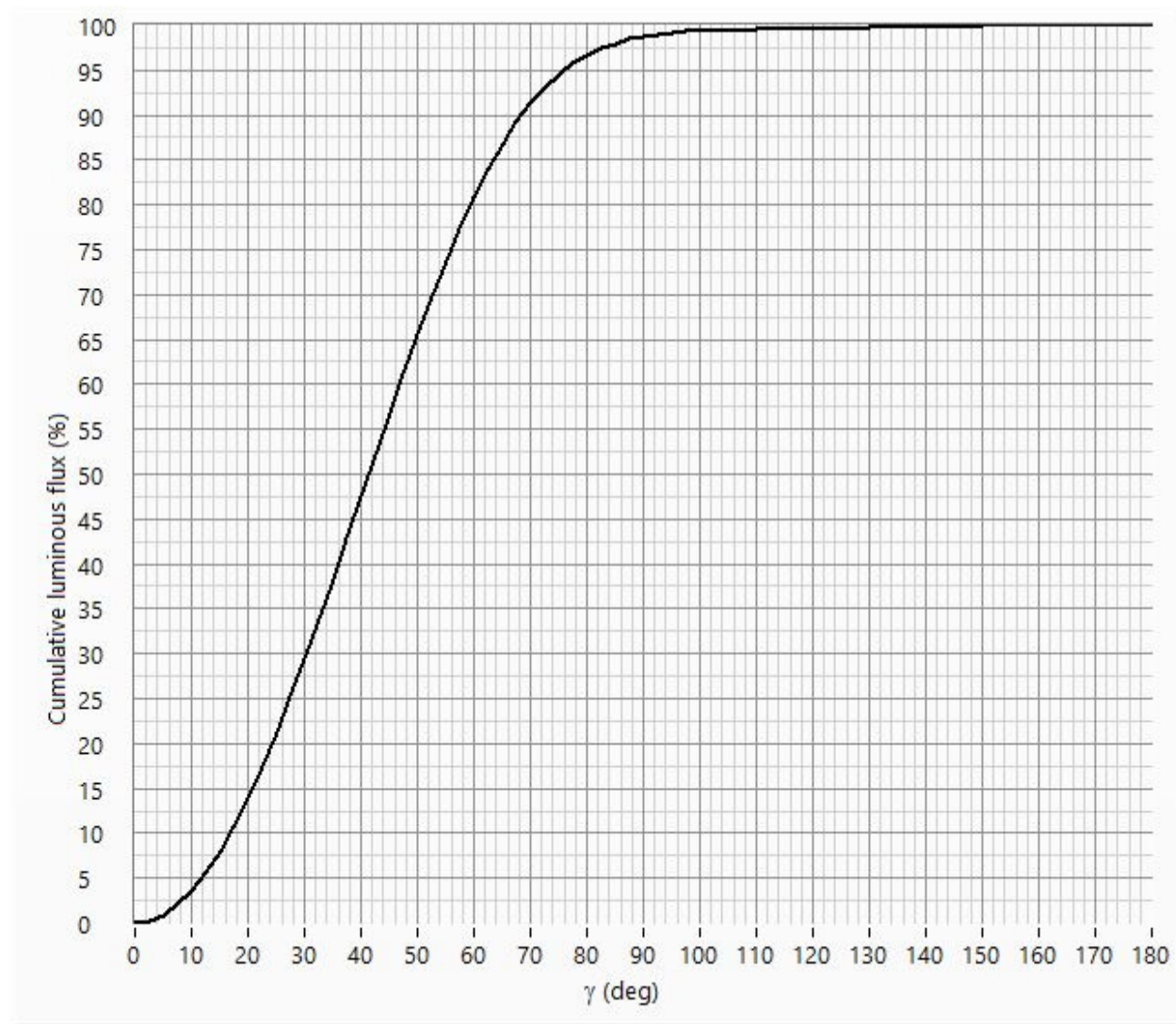
**Figure. Isocandela as a function of C plane at gamma angle with maximum luminous intensity**



**Table. Zonal lumen summary**

	<b>Lumens</b>	<b>Relative lumens (%)</b>
0-20	207.00	13.93
0-30	436.80	29.40
0-40	706.40	47.54
0-60	1201.40	80.85
0-80	1435.80	96.63
0-90	1467.50	98.76
10-90	1414.00	95.16
20-40	499.40	33.61
20-50	767.10	51.63
40-70	651.20	43.83
40-90	761.10	51.22
60-80	234.40	15.77
60-90	266.10	17.91
70-80	78.20	5.26
80-90	31.70	2.13
90-110	10.60	0.71
90-120	12.20	0.82
90-130	14.10	0.95
90-150	16.90	1.14
90-180	18.40	1.24
110-180	7.80	0.52
0-180	1485.90	100.00



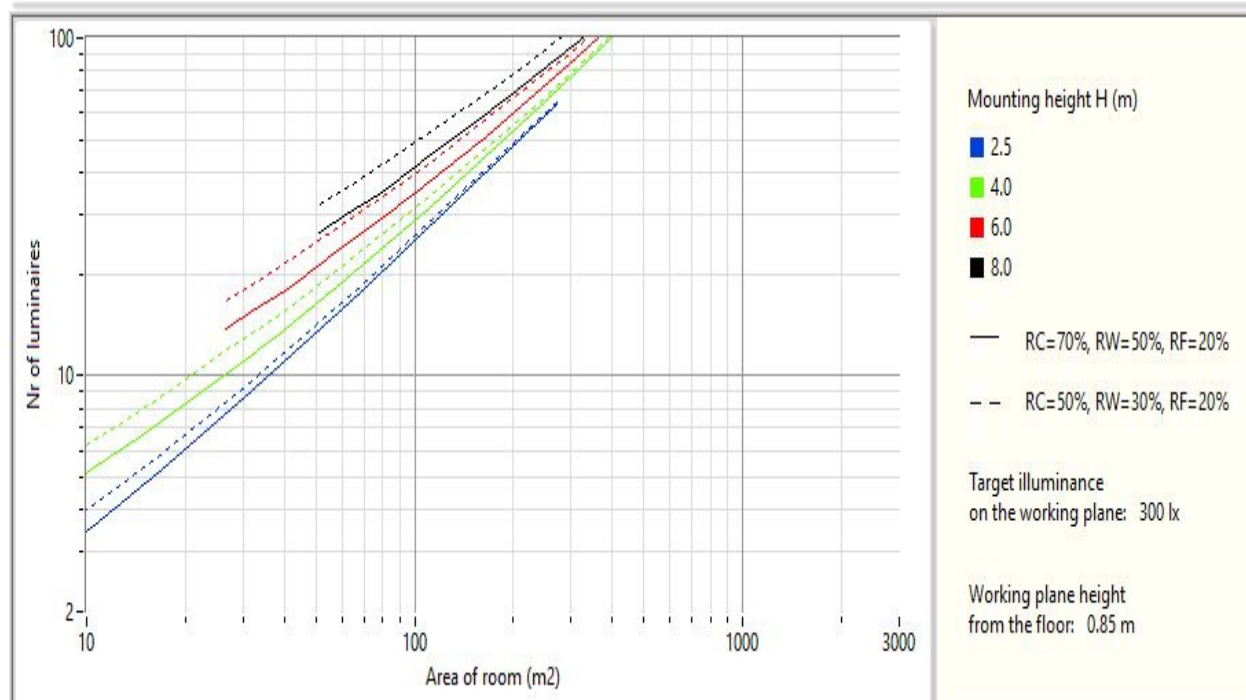
**Figure. Cumulative luminous flux**

## UGR table

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	13.1	14.7	13.5	15.0	15.4	13.1	14.7	13.5	15.0	15.3
		3H	14.4	15.8	14.8	16.2	16.6	14.4	15.8	14.8	16.2	16.5
		4H	14.8	16.1	15.2	16.5	16.9	14.8	16.1	15.2	16.5	16.9
		6H	15.1	16.3	15.5	16.7	17.1	15.1	16.3	15.5	16.7	17.1
		8H	15.2	16.4	15.6	16.8	17.2	15.2	16.3	15.6	16.8	17.2
		12H	15.3	16.4	15.7	16.8	17.3	15.3	16.4	15.7	16.8	17.3
	4H	2H	13.6	14.9	14.0	15.3	15.7	13.6	14.9	14.0	15.3	15.7
		3H	15.1	16.2	15.5	16.6	17.0	15.0	16.2	15.5	16.6	17.0
		4H	15.5	16.5	16.0	17.0	17.4	15.5	16.5	16.0	17.0	17.4
		6H	15.9	16.8	16.4	17.3	17.7	15.9	16.8	16.4	17.2	17.7
		8H	16.1	16.9	16.6	17.4	17.9	16.1	16.9	16.5	17.3	17.8
		12H	16.2	17.0	16.7	17.5	18.0	16.2	16.9	16.7	17.4	17.9
	8H	4H	15.7	16.5	16.2	17.0	17.5	15.7	16.5	16.2	17.0	17.5
		6H	16.2	16.9	16.7	17.4	17.9	16.2	16.9	16.7	17.4	17.9
		8H	16.4	17.0	16.9	17.6	18.1	16.4	17.0	16.9	17.5	18.0
		12H	16.6	17.2	17.2	17.7	18.3	16.6	17.1	17.1	17.7	18.2
	12H	4H	15.7	16.4	16.2	16.9	17.4	15.7	16.4	16.2	16.9	17.4
		6H	16.2	16.8	16.8	17.3	17.9	16.2	16.8	16.8	17.3	17.9
		8H	16.5	17.0	17.0	17.5	18.1	16.5	17.0	17.0	17.5	18.1

## CU table

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	119	119	119	119	116	116	116	116	110	110	110	106	106	106	101	101	101
1	88	84	81	78	89	86	83	80	88	85	83	91	88	86	93	91	89
2	84	78	72	68	84	78	73	69	79	75	71	80	76	73	81	78	75
3	80	71	64	59	79	71	65	59	71	66	61	72	67	62	72	68	64
4	75	65	57	51	74	65	57	52	65	58	53	64	59	54	64	59	55
5	71	59	51	45	70	59	51	46	59	52	46	58	52	47	58	52	48
6	66	54	46	40	65	54	46	41	53	46	41	53	47	42	52	47	42
7	62	50	42	36	61	49	42	36	49	42	37	48	42	37	48	42	37
8	58	46	38	33	57	46	38	33	45	38	33	44	38	33	44	38	34
9	55	42	35	30	54	42	35	30	42	35	30	41	35	30	41	35	30
10	52	39	32	27	51	39	32	27	39	32	27	38	32	27	38	32	28





## WEC table

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	44.1	29.8	17.0	5.4	42.9	29.1	16.6	5.3	27.7	15.9	5.1	26.4	15.2	4.9	25.1	14.6	4.7
2	43.4	28.1	15.4	4.7	42.1	27.4	15.1	4.7	26.2	14.6	4.5	25.0	14.0	4.4	23.9	13.5	4.3
3	41.8	26.1	13.9	4.2	40.6	25.5	13.7	4.1	24.4	13.3	4.0	23.4	12.8	3.9	22.4	12.4	3.8
4	40.0	24.3	12.6	3.7	38.8	23.7	12.5	3.7	22.7	12.1	3.6	21.8	11.7	3.5	20.9	11.3	3.5
5	38.2	22.6	11.5	3.4	37.1	22.1	11.4	3.3	21.2	11.1	3.3	20.3	10.7	3.2	19.5	10.4	3.1
6	36.5	21.0	10.6	3.0	35.4	20.6	10.4	3.0	19.8	10.2	3.0	19.0	9.9	2.9	18.2	9.6	2.9
7	34.8	19.7	9.8	2.8	33.8	19.3	9.7	2.8	18.5	9.4	2.7	17.8	9.2	2.7	17.1	8.9	2.6
8	33.2	18.4	9.1	2.6	32.2	18.1	9.0	2.5	17.4	8.7	2.5	16.8	8.5	2.5	16.1	8.3	2.4
9	31.8	17.4	8.5	2.4	30.8	17.0	8.4	2.4	16.4	8.2	2.3	15.8	7.9	2.3	15.2	7.7	2.2
10	30.4	16.4	7.9	2.2	29.5	16.1	7.8	2.2	15.5	7.6	2.2	15.0	7.5	2.1	14.4	7.3	2.1

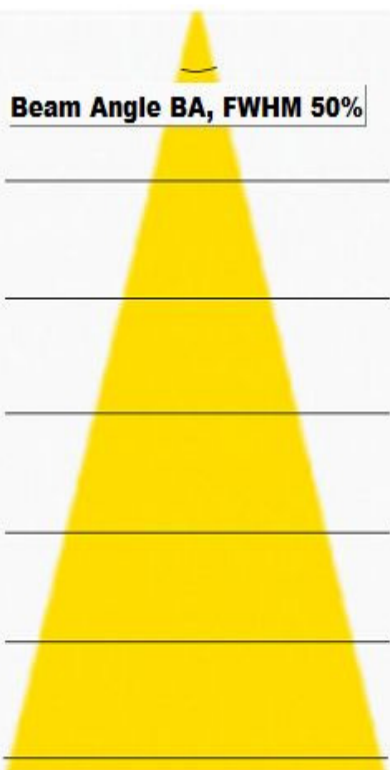
## CCEC table

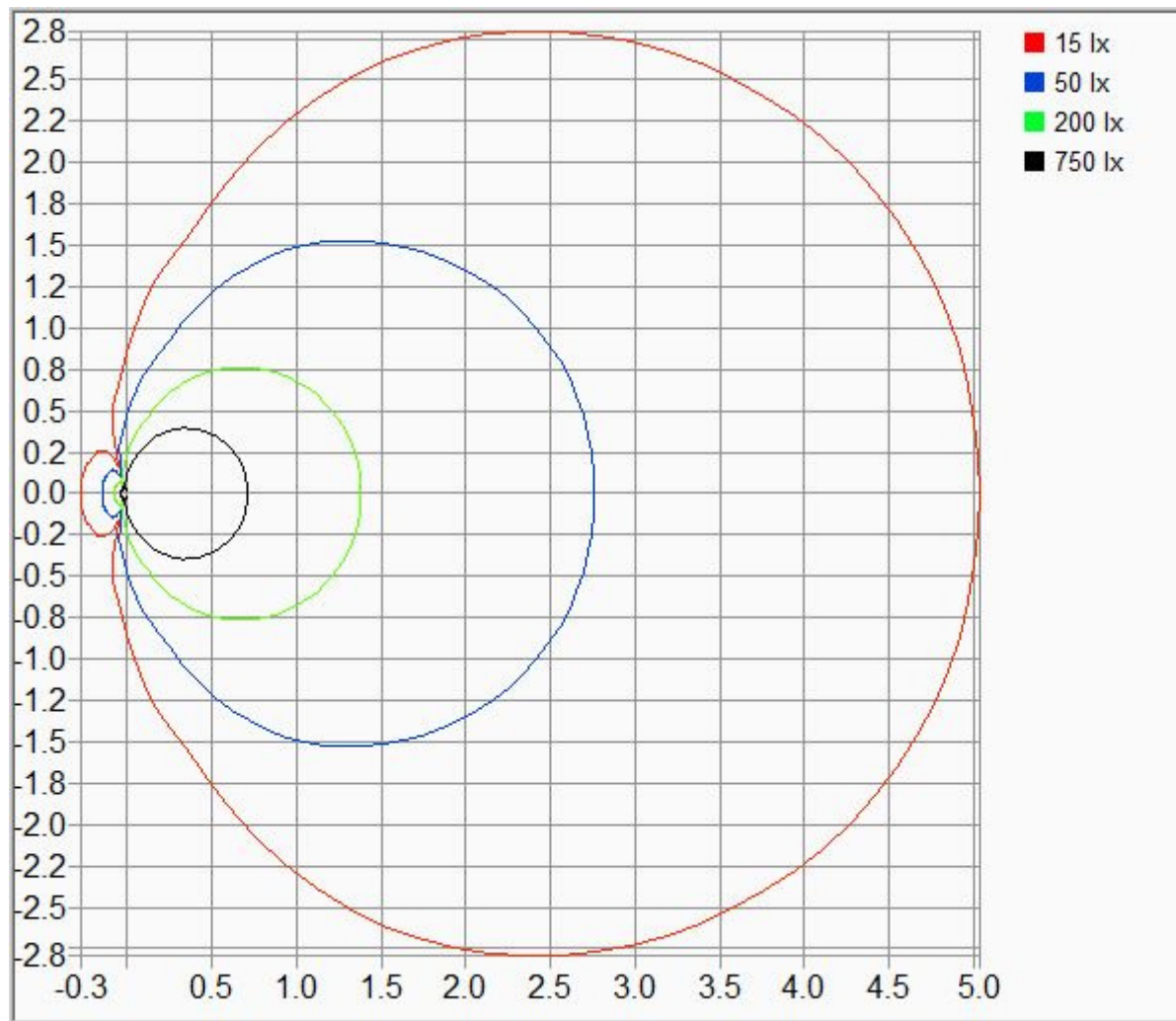
RC	80				70				50			30			10		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10
RF / RCR	20				20				20			20			20		
1	31.4	28.2	25.2	22.6	20.8	18.4	16.3	14.4	11.0	9.7	8.5	6.1	5.4	4.8	2.0	1.7	1.5
2	32.2	26.3	21.4	17.3	21.7	17.4	13.8	10.8	10.4	8.2	6.3	5.9	4.6	3.6	1.9	1.5	1.2
3	32.4	24.5	18.5	13.6	22.1	16.4	11.9	8.3	9.9	7.1	4.8	5.6	4.1	2.8	1.8	1.3	0.9
4	32.2	22.9	16.1	10.8	22.2	15.4	10.4	6.5	9.4	6.3	3.8	5.3	3.6	2.2	1.7	1.2	0.7
5	31.7	21.3	14.1	8.7	22.1	14.5	9.2	5.1	9.0	5.6	3.0	5.1	3.2	1.8	1.6	1.1	0.6
6	30.9	19.8	12.4	7.1	21.7	13.7	8.1	4.1	8.5	5.1	2.5	4.9	2.9	1.5	1.6	1.0	0.5
7	30.0	18.5	11.0	5.7	21.3	12.9	7.3	3.3	8.1	4.6	2.1	4.6	2.7	1.2	1.5	0.9	0.4
8	29.0	17.2	9.7	4.6	20.7	12.1	6.5	2.7	7.7	4.2	1.7	4.4	2.5	1.1	1.4	0.8	0.4
9	28.0	16.0	8.7	3.7	20.1	11.4	5.9	2.2	7.3	3.9	1.4	4.2	2.3	0.9	1.4	0.8	0.3
10	26.9	14.9	7.7	2.9	19.5	10.7	5.4	1.7	6.9	3.6	1.2	4.0	2.1	0.8	1.3	0.7	0.3

**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

H (m)	D (m) C0-180	D (m) C90-270	Ev (lx) Center	Ev (lx) Edge, C0-180	Ev (lx) Edge, C90-270
1.0	2.5	2.5	566	68	68
2.0	5.1	5.0	141	17	17
2.5	6.3	6.3	90	11	11
3.0	7.6	7.5	63	7.5	7.6
4.0	10	10	35	4.2	4.3
5.0	13	13	23	2.7	2.7



**Vertical isolux**

## Horizontal isolux



**Floor illuminance figures. Mounting height of 2.5 m. C rotation of 0.0 deg. Gamma rotation of 0.0 deg. Maintenance factor = 0.80.**

