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: Tepcomp Oy

MEASUREMENT METHOD
The measurements were made by a goniophotometer of type LUMI 180. Goniometer was operated in horizontal axis. The DUT was rotated with 2-axis goniometer around the axes. The changed use position was corrected by the Burning position corrector (BPC) by measuring the relative change of light output between the measurement orientation and the application specific position. The Luminous Intesity of the DUT at different directions were measured with a calibrated photometer located at a known far-field position of the DUT. Measurement is accordance with the standard EN13032, CIE S025, IES LM79-08.

MEASUREMENT UNCERTAINTY
The photometer of type SSL L200-004 is traceable to national standard at NIST.The photometer head of type LH200-003 is traceable to national standard at PTB.
The power meter of type GW Instek APS-7050 is traceable to national standard at NIST.
The expanded uncertainties of the Luminous flux and efficacy are ±3.8% and ±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.
Burning position correction was measured by the SSL BPC setup. The BPC factor for lumen and input power were 0.998 and 0.999, respectively.
Temperature was measured with Delta OHM HD 2108.2 thermocouple thermometer from type K thermocouple cable. The temperature of the LED was 53.3°C

Table - Measurement information

Ambient temperature of the laboratory	25.0 degC
Power supply	230.0 Vac
Measurement distance	8893 mm
Location of the rotation axis (behind the outermost surface of the optics)	0 mm
Angular step, C plane	15.0 deg
Angular step, gamma angle	2.5 deg
Maximum gamma angle	90.0 deg
Stabilization time	30 min

Table. Luminous Intesity (cd) in horizontal (rows) and vertical planes (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	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415	1415
2.5	1415	1414	1414	1414	1414	1413	1413	1413	1413	1413	1413	1413	1414	1414	1414	1414	1414	1414	1414	1415	1415	1415	1415	1415
5.0	1411	1411	1411	1410	1410	1409	1409	1409	1409	1408	1409	1408	1410	1410	1410	1410	1411	1411	1412	1412	1412	1412	1412	1412
7.5	1406	1405	1405	1404	1403	1403	1402	1402	1402	1401	1402	1401	1404	1403	1404	1404	1405	1405	1406	1406	1407	1407	1407	1407
10.0	1397	1397	1396	1395	1394	1394	1393	1392	1392	1391	1391	1391	1394	1394	1395	1395	1396	1397	1397	1399	1399	1399	1400	1399
12.5	1386	1386	1385	1384	1383	1382	1381	1381	1380	1379	1379	1379	1383	1383	1383	1384	1385	1386	1387	1388	1389	1389	1390	1389
15.0	1373	1372	1371	1370	1369	1368	1367	1366	1365	1364	1364	1364	1368	1369	1369	1370	1371	1373	1374	1374	1376	1376	1377	1376
17.5	1357	1356	1355	1354	1352	1351	1350	1349	1348	1347	1347	1347	1351	1352	1353	1354	1355	1357	1358	1359	1360	1360	1361	1361
20.0	1338	1337	1336	1335	1333	1332	1330	1329	1328	1327	1327	1327	1332	1333	1334	1335	1337	1338	1339	1341	1342	1342	1343	1343
22.5	1317	1316	1315	1313	1312	1310	1309	1307	1306	1305	1304	1304	1309	1310	1313	1313	1316	1317	1319	1320	1321	1322	1323	1323
25.0	1285	1290	1291	1289	1288	1286	1284	1283	1281	1279	1279	1274	1272	1274	1286	1289	1292	1294	1295	1297	1298	1299	1300	1296
27.5	1245	1258	1264	1263	1261	1259	1257	1255	1254	1252	1251	1238	1230	1229	1250	1263	1265	1268	1270	1271	1273	1273	1272	1257
30.0	1203	1220	1233	1234	1232	1230	1228	1226	1224	1222	1217	1197	1186	1184	1209	1233	1237	1239	1242	1243	1244	1245	1236	1214
32.5	1166	1180	1197	1201	1200	1199	1196	1194	1192	1185	1176	1154	1148	1147	1166	1200	1205	1208	1211	1212	1214	1214	1197	1174
35.0	1132	1139	1155	1162	1166	1165	1162	1159	1157	1139	1128	1111	1113	1114	1127	1163	1172	1175	1178	1179	1181	1180	1156	1140
37.5	1096	1097	1107	1115	1130	1128	1125	1122	1119	1088	1077	1067	1077	1078	1088	1122	1136	1139	1142	1144	1145	1141	1116	1105
40.0	1058	1053	1058	1062	1090	1089	1086	1083	1075	1037	1028	1020	1039	1040	1045	1074	1096	1100	1104	1105	1107	1097	1073	1068
42.5	1018	1007	1008	1014	1043	1047	1044	1041	1024	991	977	970	999	999	996	1020	1050	1059	1063	1065	1064	1047	1026	1027
45.0	975	958	959	970	991	1003	1000	997	971	946	928	919	955	952	943	966	993	1016	1019	1022	1013	994	975	982
47.5	930	909	911	923	940	956	953	949	919	898	881	872	909	903	889	911	933	970	974	976	956	941	922	935
50.0	882	862	864	875	889	907	904	900	869	850	835	825	860	855	838	859	878	921	925	927	900	891	872	887
52.5	831	813	815	823	833	855	852	848	810	797	786	775	807	805	788	808	829	869	874	876	849	841	822	838
55.0	779	762	764	766	770	801	797	793	744	740	734	721	752	751	736	757	775	816	820	822	796	789	770	788
57.5	725	709	711	709	705	744	740	734	680	680	678	666	696	695	683	704	713	759	764	767	735	736	718	735
60.0	668	654	655	646	641	682	681	669	618	615	621	609	638	638	627	647	644	695	705	706	668	678	664	679
62.5	607	595	598	584	582	616	619	604	560	553	560	548	578	577	569	585	575	625	644	640	601	616	608	620
65.0	544	532	537	525	519	550	555	535	498	493	497	486	516	513	506	521	517	555	580	572	542	556	549	559
67.5	481	468	471	465	454	473	490	458	430	431	432	423	453	447	441	457	456	484	515	501	482	495	487	494
70.0	418	405	403	401	385	405	424	393	362	364	368	363	391	385	377	393	392	410	449	427	417	433	421	428
72.5	354	342	338	333	323	330	356	314	301	299	305	302	328	325	317	325	325	338	381	356	350	366	357	365
75.0	288	279	275	268	263	259	289	246	241	241	244	243	266	265	258	260	262	268	312	287	289	296	296	303
77.5	226	219	211	210	203	194	222	182	183	183	187	185	206	204	201	201	199	200	244	216	227	233	234	239
80.0	166	160	153	152	147	137	159	125	130	132	132	131	150	148	145	145	143	143	179	156	167	172	174	179
82.5	112	105	101	101	95	89	101	79	81	84	82	81	99	97	94	94	95	93	118	105	113	115	118	123
85.0	66	61	59	56	52	48	53	42	42	44	44	43	55	54	52	52	53	50	64	60	64	67	72	75
87.5	31	29	28	26	23	20	18	17	17	18	19	18	25	24	23	23	23	23	22	27	31	34	36	38
90.0	12	12	11	10	9	8	3	7	8	8	8	8	9	10	9	9	8	8	2	9	11	13	14	15

Table. Measurement results of the main luminous parameters

Luminous flux	Input power	Luminous efficacy	LOR	DWFF	Luminous intensity (g=0)
4164.5 lm	28.21 W	147.6 lm/W	100.0 %	100.0 %	1418 cd

Table. Electrical parameters during the light measurements.

	Pin	PF	Vin	If
Value	28.21 W	0.9980	230.0 V	0.1229 A
St.dev.	0.04 %	0.00 %	0.00 %	0.05 %

Table. Maximum Luminous Intesity and its direction

Iv	g	C plane
1417 cd	-0.0°	0.0°

Table. Beam widths at two perpendicular planes

	Beam angle, FWHM, 50% (deg)	Beam angle, 10% (deg)	Effective beam direction from g=0
C0-180	115.3°	161.6°	-0.0°
C90-270	118.7°	162.3°	0.0°

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

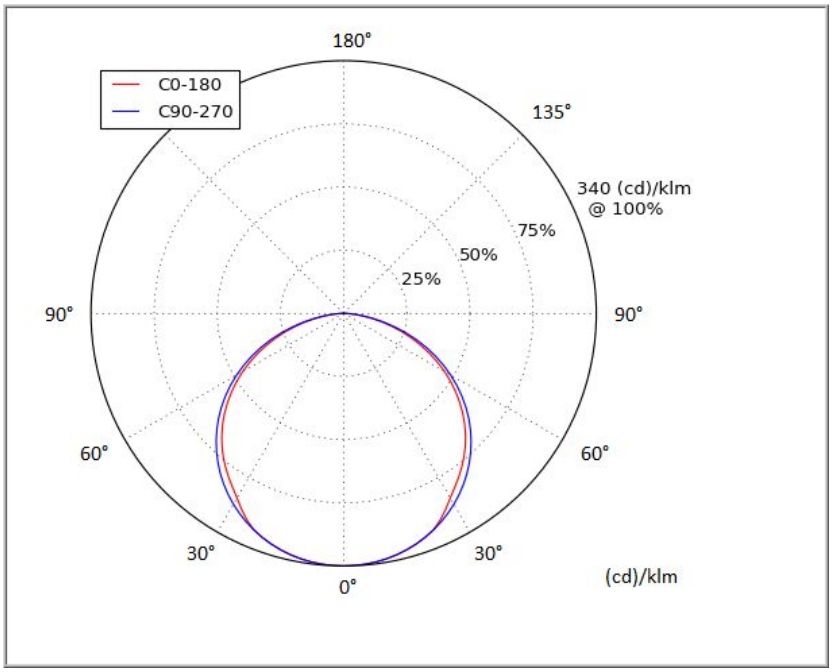


Figure. Luminous Intesity distribution in cartesian diagram at all measured C planes.

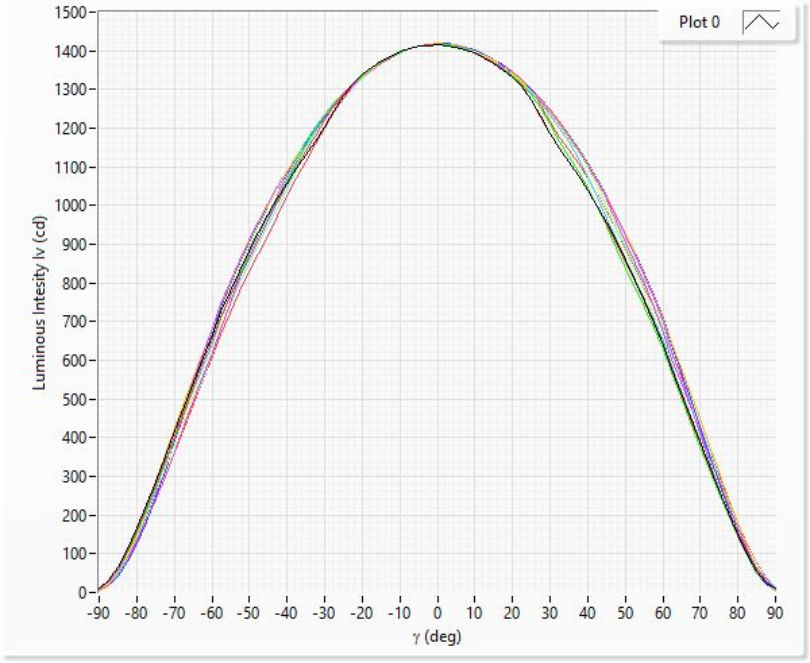


Figure. Isocandela as a function of C plane at gamma angle with maximum luminous intensity

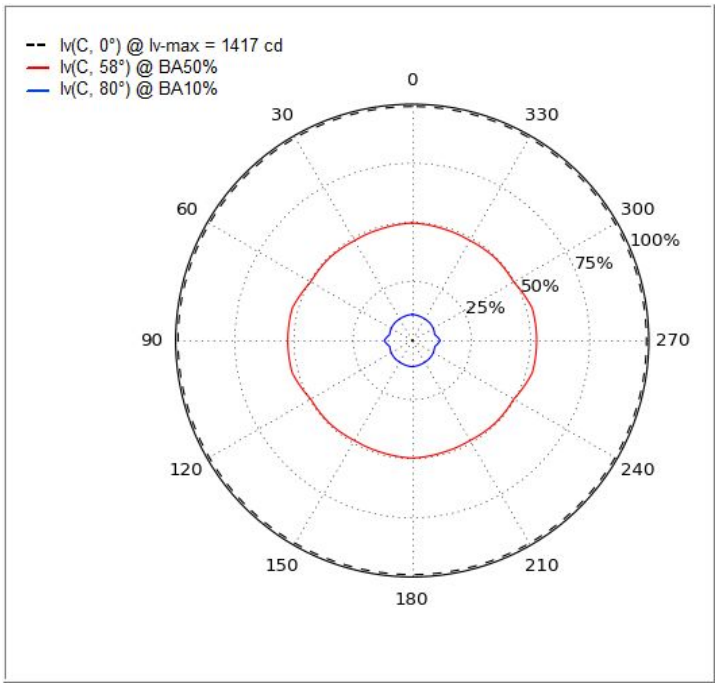


Table. Zonal lumen summary

	Lumens	Relative lumens (%)
0-20	521.70	12.53
0-30	1115.30	26.78
0-40	1836.80	44.11
0-60	3281.40	78.81
0-80	4094.00	98.32
0-90	4163.90	100.00
10-90	4029.60	96.77
20-40	1315.10	31.58
20-50	2069.50	49.70
40-70	1969.60	47.30
40-90	2327.10	55.89
60-80	812.60	19.52
60-90	882.50	21.19
70-80	287.60	6.91
80-90	69.90	1.68
90-110	0.00	0.00
90-120	0.00	0.00
90-130	0.00	0.00
90-150	0.00	0.00
90-180	0.00	0.00
110-180	0.00	0.00
0-180	4163.90	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
2.5	16.9	8.5	0.4	0.2
5.0	33.8	33.8	0.8	0.8
7.5	50.3	75.9	1.2	1.8
10.0	66.5	134.3	1.6	3.2
12.5	82.3	208.7	2.0	5.0
15.0	97.4	298.5	2.3	7.2
17.5	111.8	403.1	2.7	9.7
20.0	125.4	521.7	3.0	12.5
22.5	138.0	653.4	3.3	15.7
25.0	149.4	797.1	3.6	19.1
27.5	159.4	951.6	3.8	22.8
30.0	168.1	1115.3	4.0	26.8
32.5	175.4	1287.1	4.2	30.9
35.0	181.5	1465.5	4.4	35.2
37.5	186.0	1649.3	4.5	39.6
40.0	188.9	1836.8	4.5	44.1
42.5	190.2	2026.3	4.6	48.7
45.0	189.7	2216.2	4.6	53.2
47.5	187.8	2405.0	4.5	57.7
50.0	184.7	2591.2	4.4	62.2
52.5	180.1	2773.7	4.3	66.6
55.0	173.8	2950.6	4.2	70.9
57.5	165.8	3120.5	4.0	74.9
60.0	156.0	3281.4	3.7	78.8
62.5	144.8	3431.8	3.5	82.4
65.0	132.3	3570.3	3.2	85.7
67.5	118.3	3695.6	2.8	88.7
70.0	103.4	3806.4	2.5	91.4
72.5	87.7	3901.9	2.1	93.7
75.0	71.8	3981.7	1.7	95.6
77.5	56.0	4045.5	1.3	97.1
80.0	40.8	4094.0	1.0	98.3
82.5	27.0	4127.9	0.6	99.1
85.0	15.2	4148.9	0.4	99.6
87.5	6.8	4159.9	0.2	99.9
90.0	1.3	4163.9	0.0	100.0

Figure. Cumulative luminous flux

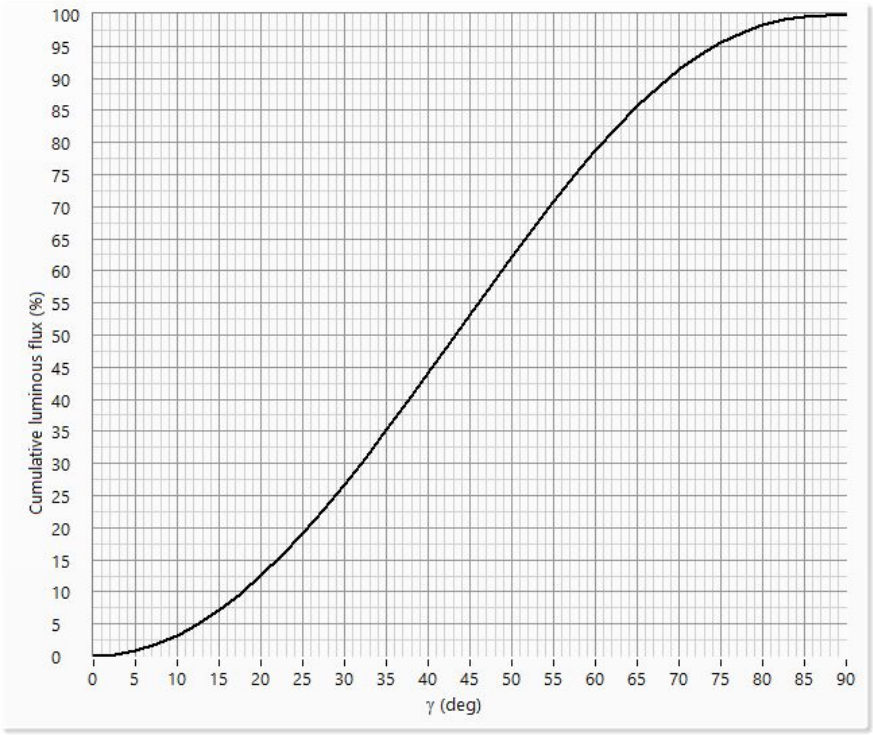


Table. Luminance at different angles based on the defined luminous areas and measured luminous intensities.

	C 0	C 45	C 90
g 0	96166	96166	96166
g 45	21632	26823	82459
g 55	16023	20034	76396
g 65	10737	13388	65961
g 75	5622	6888	46902
g 85	1323	1500	14177

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	27.8	29.4	28.2	29.8	30.1	28.2	29.8	28.5	30.1	30.5
	3H	29.6	31.1	30.0	31.4	31.8	30.0	31.5	30.4	31.8	32.2
	4H	30.3	31.7	30.7	32.0	32.4	30.6	32.0	31.0	32.4	32.7
	6H	30.7	32.0	31.1	32.4	32.8	31.0	32.3	31.5	32.7	33.1
	8H	30.9	32.1	31.3	32.5	32.9	31.2	32.4	31.6	32.8	33.2
	12H	30.9	32.1	31.4	32.5	32.9	31.2	32.4	31.7	32.8	33.2
4H	2H	28.5	29.9	28.9	30.2	30.6	28.8	30.2	29.2	30.5	30.9
	3H	30.5	31.6	30.9	32.0	32.4	30.7	31.9	31.1	32.3	32.7
	4H	31.2	32.3	31.7	32.7	33.1	31.5	32.5	31.9	32.9	33.4
	6H	31.8	32.7	32.3	33.2	33.6	32.0	32.9	32.4	33.4	33.8
	8H	32.0	32.9	32.4	33.3	33.8	32.1	33.0	32.6	33.4	33.9
	12H	32.1	32.9	32.6	33.4	33.8	32.2	33.0	32.7	33.5	34.0
8H	4H	31.5	32.4	32.0	32.8	33.3	31.7	32.6	32.2	33.0	33.5
	6H	32.2	32.9	32.7	33.4	33.9	32.3	33.1	32.8	33.5	34.0
	8H	32.4	33.1	32.9	33.6	34.1	32.5	33.2	33.1	33.7	34.2
	12H	32.6	33.2	33.1	33.7	34.2	32.7	33.3	33.2	33.7	34.3
12H	4H	31.5	32.3	32.0	32.8	33.3	31.7	32.5	32.2	33.0	33.5
	6H	32.2	32.9	32.8	33.4	33.9	32.4	33.0	32.9	33.5	34.0
	8H	32.5	33.1	33.0	33.6	34.1	32.6	33.2	33.1	33.7	34.2

Table. Coefficient of Utilization (CU).

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	111	111	111	106	106	106	102	102	102
1	87	84	80	77	89	85	82	79	88	85	83	91	88	86	93	91	89
2	84	77	71	66	84	77	72	67	79	74	69	80	75	72	81	77	74
3	79	70	62	57	78	70	63	57	70	64	59	71	65	61	71	66	62
4	74	63	55	49	73	63	56	50	63	56	51	63	57	52	63	57	53
5	69	57	49	43	68	57	49	43	57	50	44	57	50	45	56	50	46
6	65	52	44	38	64	52	44	38	52	44	39	51	45	39	51	45	40
7	61	48	40	34	60	48	40	34	47	40	35	47	40	35	46	40	35
8	57	44	36	30	56	44	36	31	43	36	31	43	36	31	42	36	32
9	54	41	33	28	53	40	33	28	40	33	28	39	33	28	39	33	28
10	51	38	30	25	50	38	30	25	37	30	25	37	30	26	36	30	26

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

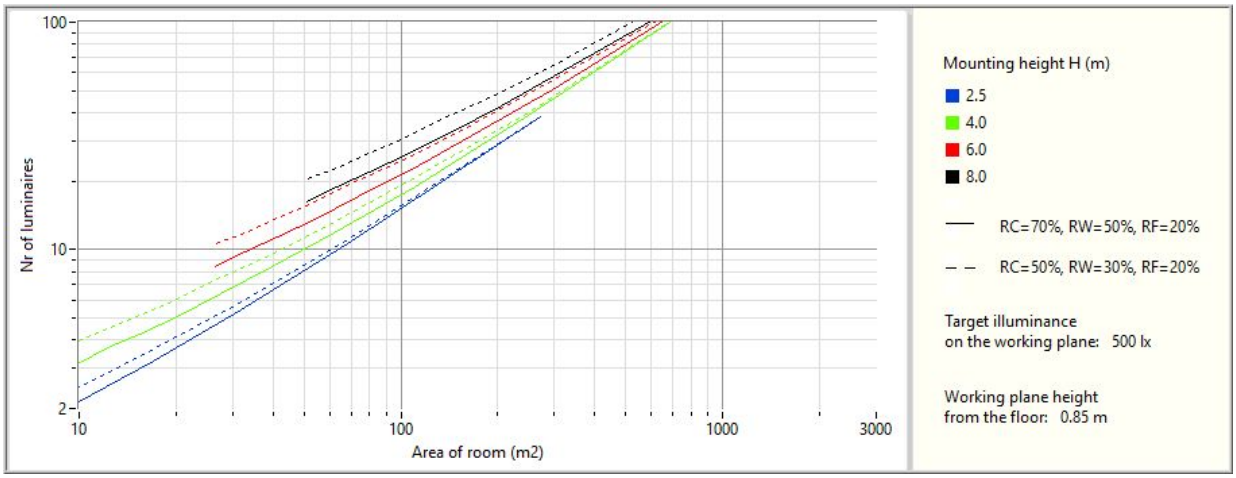


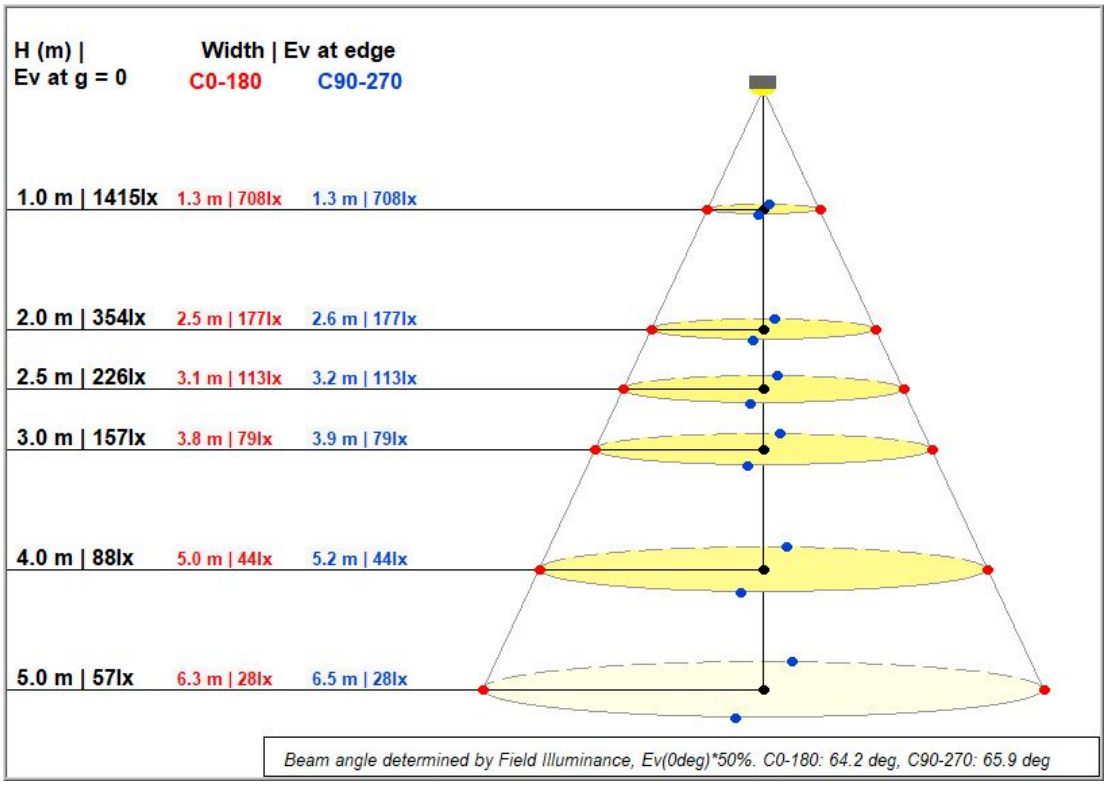
Table. Wall Exitance Coefficients (WEC).

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	45.4	30.6	17.4	5.5	44.2	29.9	17.1	5.4	28.6	16.4	5.2	27.4	15.8	5.1	26.3	15.2	4.9
2	44.9	29.1	15.9	4.9	43.7	28.4	15.7	4.8	27.3	15.2	4.7	26.2	14.7	4.6	25.2	14.3	4.5
3	43.3	27.0	14.4	4.3	42.1	26.4	14.2	4.3	25.4	13.8	4.2	24.4	13.4	4.1	23.6	13.0	4.0
4	41.3	24.9	13.0	3.8	40.1	24.5	12.8	3.8	23.5	12.5	3.7	22.7	12.2	3.7	21.9	11.9	3.6
5	39.3	23.1	11.8	3.4	38.1	22.6	11.6	3.4	21.8	11.4	3.3	21.1	11.1	3.3	20.4	10.9	3.3
6	37.3	21.4	10.7	3.1	36.3	21.0	10.6	3.1	20.3	10.4	3.0	19.6	10.2	3.0	19.0	10.0	3.0
7	35.5	19.9	9.9	2.8	34.5	19.6	9.8	2.8	18.9	9.6	2.8	18.3	9.4	2.7	17.8	9.2	2.7
8	33.8	18.6	9.1	2.6	32.8	18.3	9.0	2.5	17.7	8.9	2.5	17.2	8.7	2.5	16.7	8.6	2.5
9	32.2	17.5	8.4	2.4	31.3	17.2	8.4	2.3	16.7	8.2	2.3	16.2	8.1	2.3	15.7	8.0	2.3
10	30.7	16.4	7.9	2.2	29.9	16.2	7.8	2.2	15.7	7.7	2.2	15.2	7.6	2.2	14.8	7.5	2.1

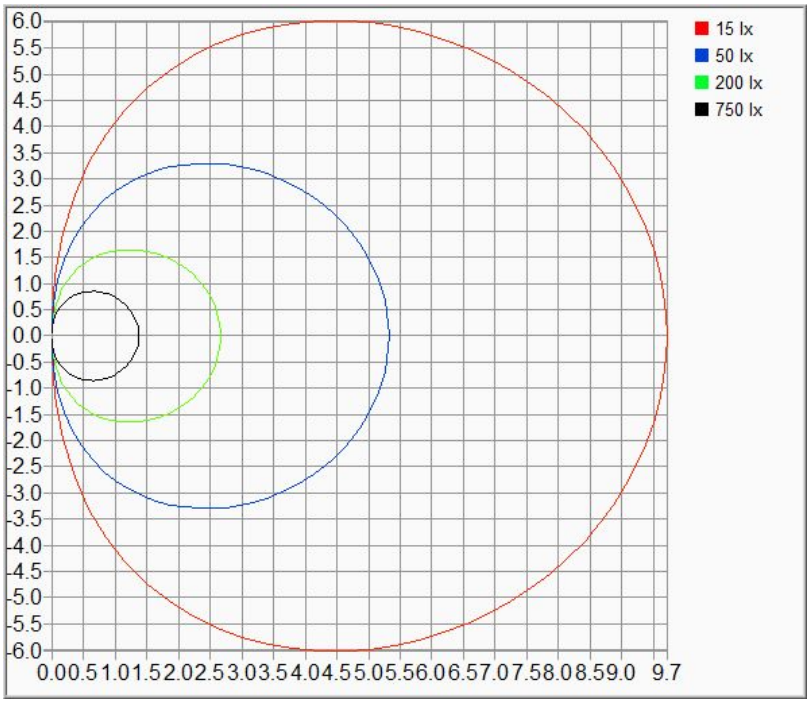
Table. Ceiling Cavity Exitance Coefficients (CCEC).

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	20.7	18.0	15.6	13.5	17.6	15.4	13.4	11.6	10.5	9.2	8.0	6.1	5.3	4.7	1.9	1.7	1.5
2	22.1	17.2	13.2	9.8	18.8	14.7	11.4	8.5	10.1	7.9	5.9	5.8	4.6	3.5	1.9	1.5	1.1
3	22.9	16.4	11.4	7.4	19.5	14.1	9.9	6.4	9.7	6.8	4.5	5.6	4.0	2.7	1.8	1.3	0.9
4	23.3	15.7	10.1	5.8	19.8	13.5	8.7	5.1	9.3	6.1	3.6	5.4	3.6	2.1	1.7	1.2	0.7
5	23.4	15.0	9.1	4.7	19.9	12.8	7.8	4.1	8.8	5.5	2.9	5.1	3.2	1.7	1.7	1.0	0.6
6	23.2	14.2	8.2	3.9	19.7	12.2	7.1	3.4	8.4	5.0	2.4	4.9	2.9	1.4	1.6	1.0	0.5
7	22.9	13.6	7.5	3.3	19.4	11.7	6.5	2.9	8.1	4.6	2.0	4.7	2.7	1.2	1.5	0.9	0.4
8	22.4	12.9	7.0	2.9	19.0	11.1	6.0	2.5	7.7	4.2	1.8	4.5	2.5	1.1	1.4	0.8	0.3
9	21.9	12.3	6.5	2.5	18.6	10.6	5.6	2.2	7.3	3.9	1.6	4.3	2.3	0.9	1.4	0.8	0.3
10	21.3	11.7	6.0	2.2	18.1	10.1	5.2	2.0	7.0	3.7	1.4	4.1	2.2	0.8	1.3	0.7	0.3

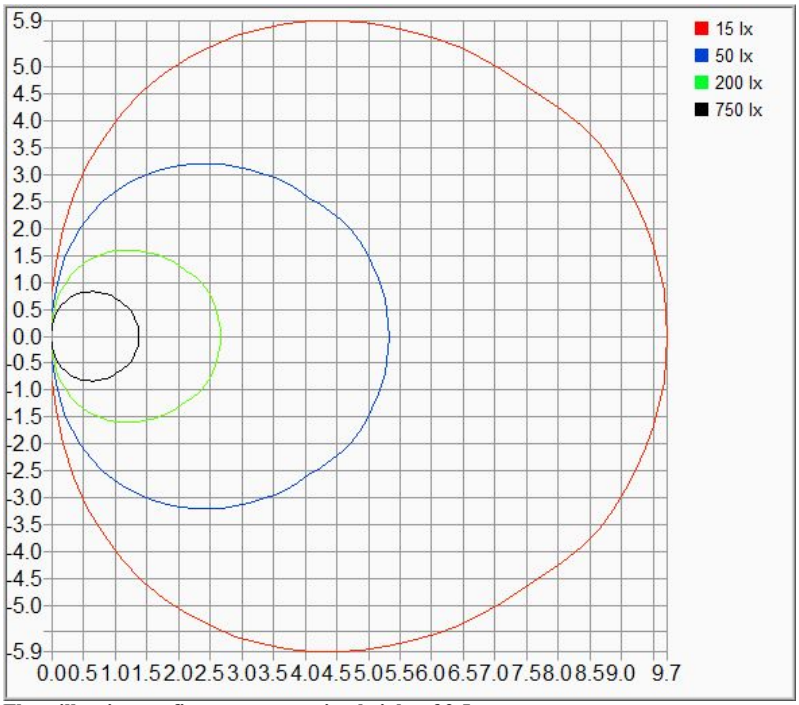
CONE DIAGRAM
- Cone is limited by the beam angle at the planes of C0 and C90
- H = Mounting Height
- D = Cone diameter
- Ev Edge = Illuminance at the edge of the cone of the C0/90 plane
- Ev Center = Illuminance at the center of the cone



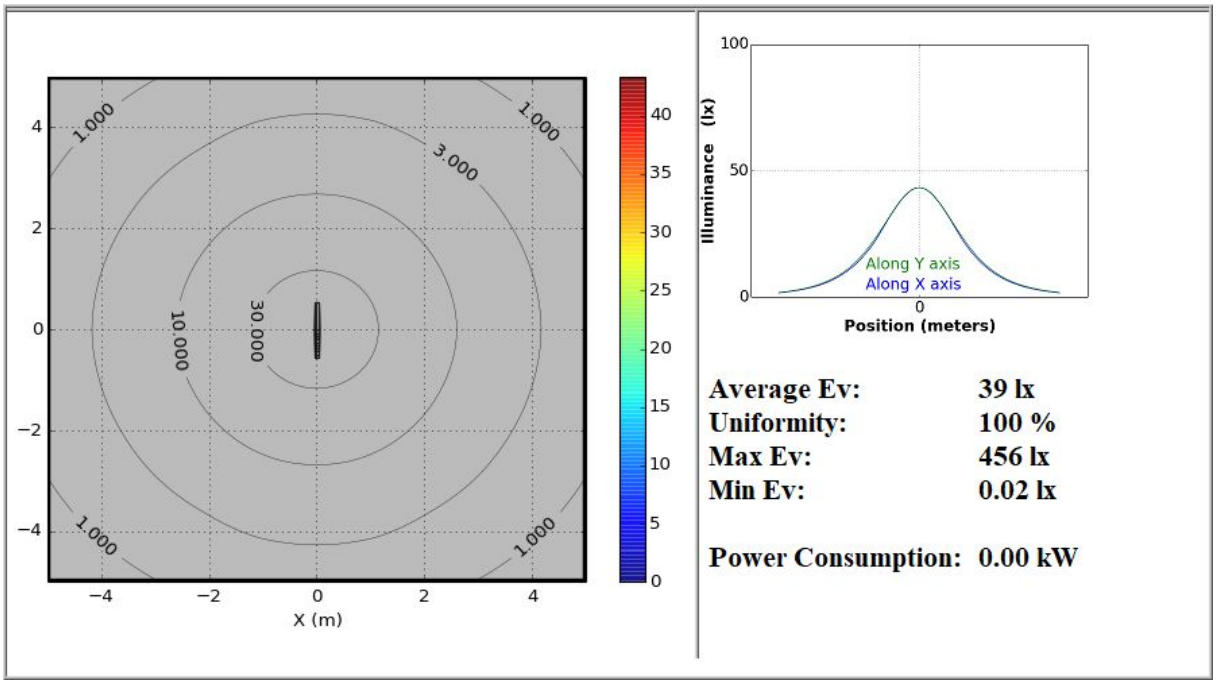
Vertical isolux



Horizontal isolux

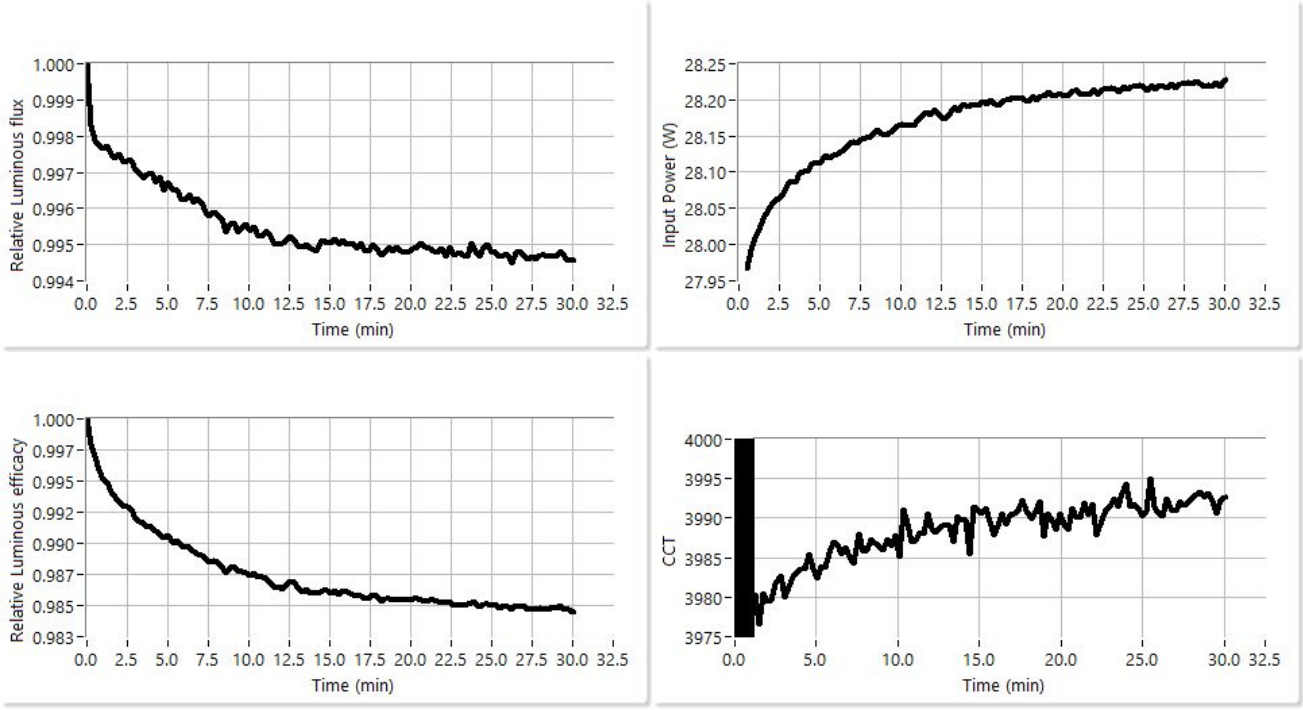


Floor illuminance figures at mounting height of 2.5 meters
with C rotation of 0.0 degrees and with gamma rotation of 0.0 degrees.
Degradation factor of installation was 0.80.



Stabilization curve

Lumen drift: -0.54 %
Input Power drift: 1.03 %
Lumen per watt drift: -1.56 %
CCT drift: 18 K
ccu'v' drift in CIE1976 diagram: 0.0006
Stabilization time: 30 min



Goniocolorimetric Test Report

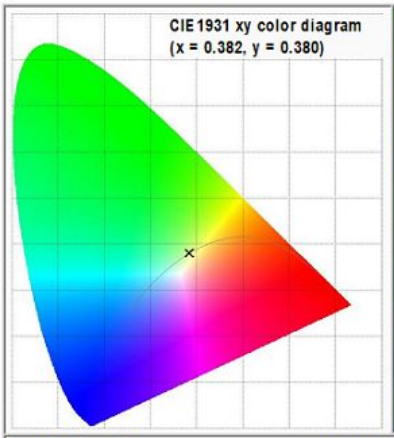
MEASUREMENT METHOD
The measurements were made by a goniospectrophotometer at the dark room of SSL Resource Ltd. The spectral radiant intensities of a light source at different directions were measured with a calibrated spectrometer located at a known distance from the light source.

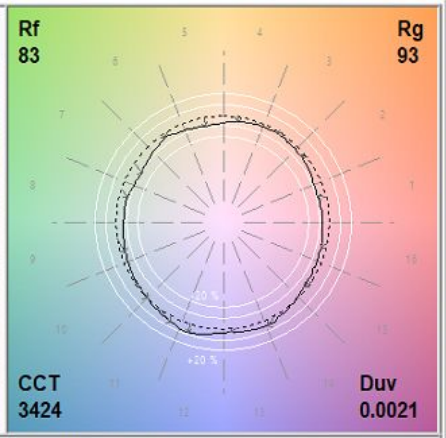
MEASUREMENT UNCERTAINTY
The photometer (SSL L-200, sn L200-004) used in goniophotometer is traceable to national standard of illuminance responsivity at VTT-MIKES (Certificate of calibration T-R 962 signed on 27 October 2016). The power meter of type Chroma 66201-30000266 is traceable national standard of electrical parameters at NIST (Calibration date 6 September 2016). The expanded measurement uncertainties of the luminous flux and luminous efficacy are ±3.8% and ±4.0% (k = 2), respectively.

Table - Measurement information

Ambient temperature of the laboratory	25.0 degC
Power supply	230.0 Vac
Measurement distance	3484 mm
Location of the rotation axis	0 mm
Angular step, C plane	90.0 deg
Angular step, gamma angle	5.0 deg
Maximum gamma angle	80.0 deg
Stabilization time	30 min

GonioSpectroRadiometric Test Report



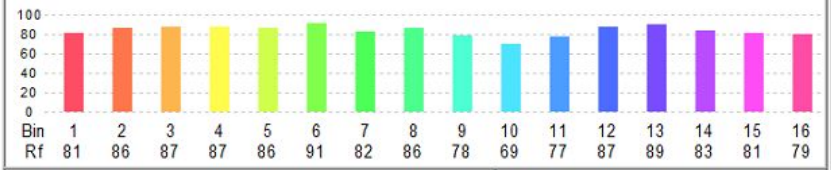


Ra (R1-R8) = 87

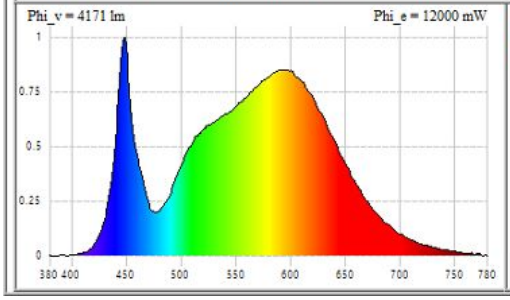
Special color rendition index CRI Ri 1-14

i	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ri	89	96	97	82	86	92	86	72	40	87	79	63	91	99

Fidelity indices Rf of the 16 hue bins



Bin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Rf	81	86	87	87	86	91	82	86	78	69	77	87	89	83	81	79



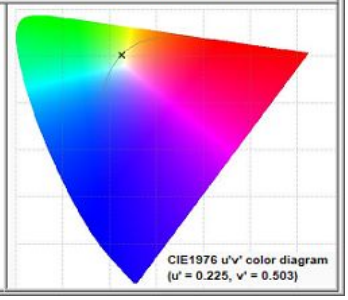


Table - Measurement results of the total colorimetric parameters

Color coordinates in CIE 1931 diagram	x,y	(0.3818, 0.3801)
Color coordinates in CIE 1976 diagram	u',v'	(0.2246, 0.5033)
Correlated color temperature	CCT	3997 K
General color rendering index	CRI, Ra	87.4
Spatial color uniformity	SDCM	3.2
Distance from Planckian locus	Du'v'	0.001

Weighted average of the angular color measurements. --SDCM = Maximum deviation of the angular u', v' measurements from the weighted average. -- SDCM corresponds 1-step MacAdam Ellipse, 1 SDCM corresponds to u'v' = 0.001

Table - Total special color rendering indeces

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
88.6	96.4	96.6	81.7	85.7	92.2	85.7	72.4	39.6	86.9	79.1	63.4	91.4	98.7

Figure - Color classification and MacAdam ellipse / SDCM ANSI C78.377

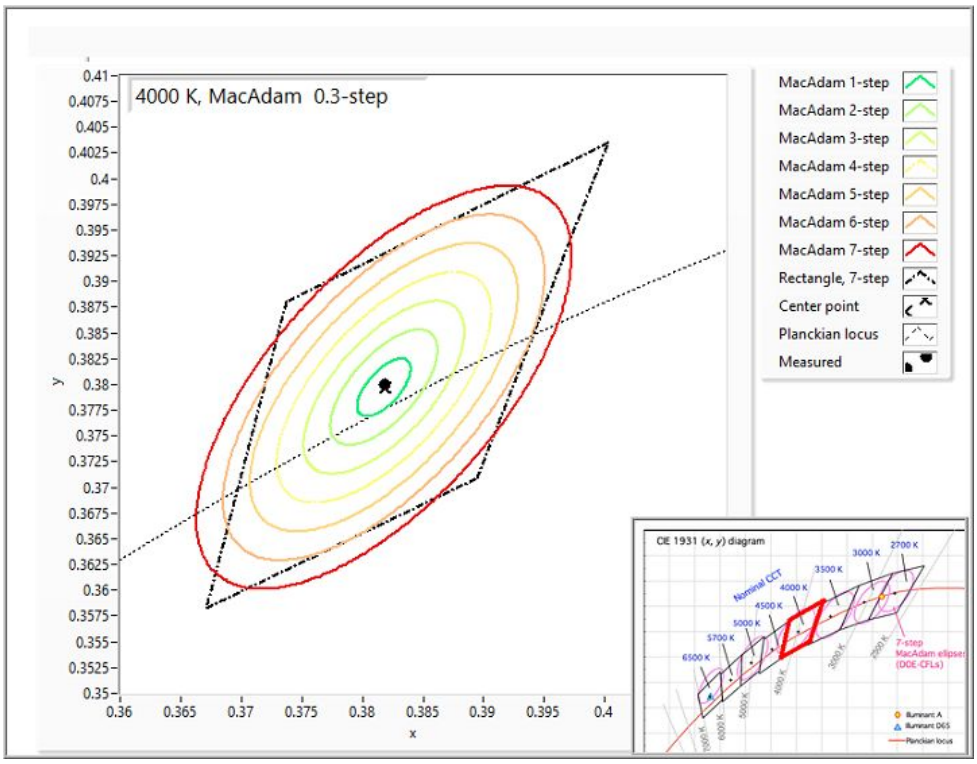


Table - Color rendition details according to TM30-18

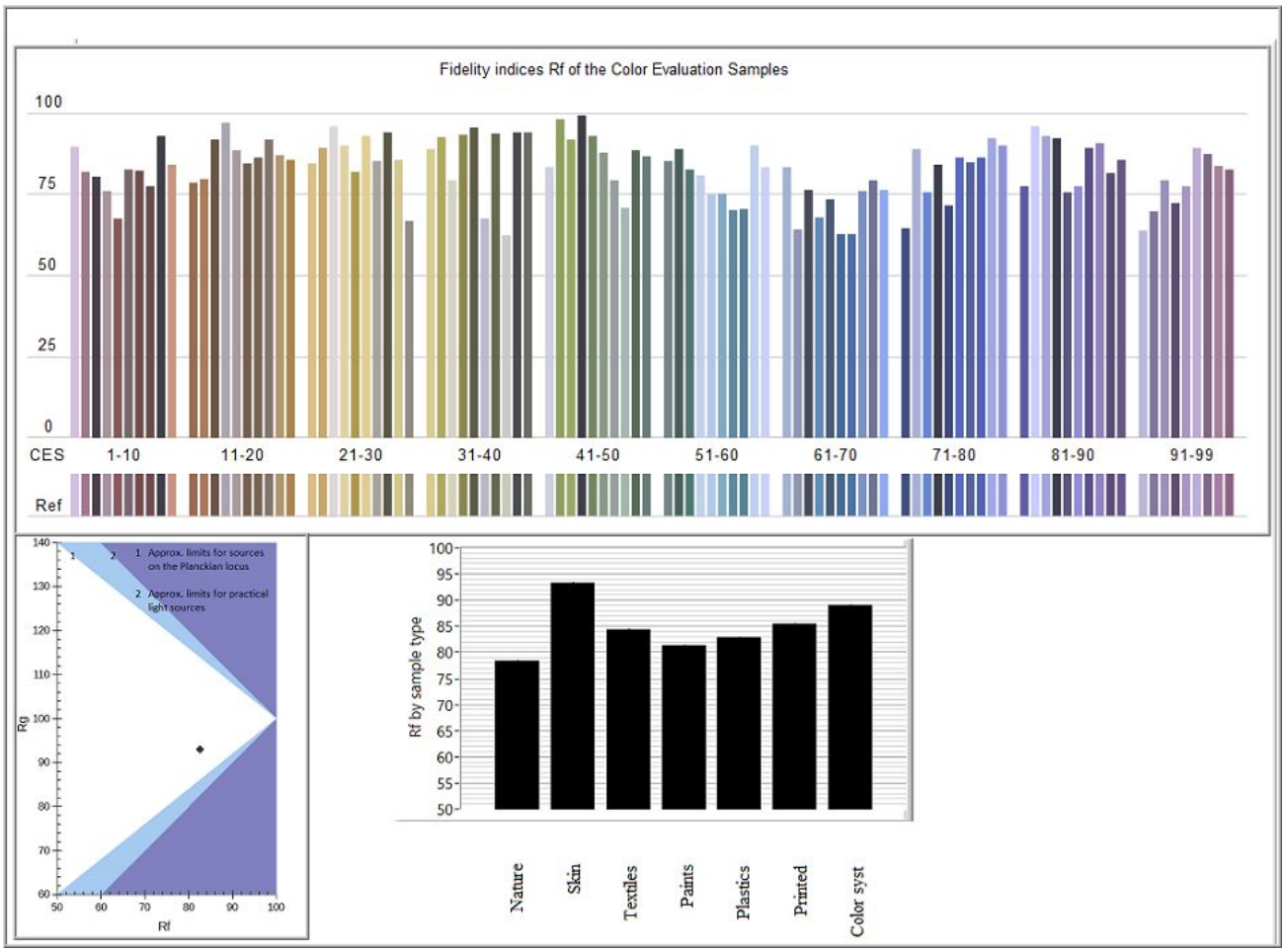


Figure - Total spectral radiant flux

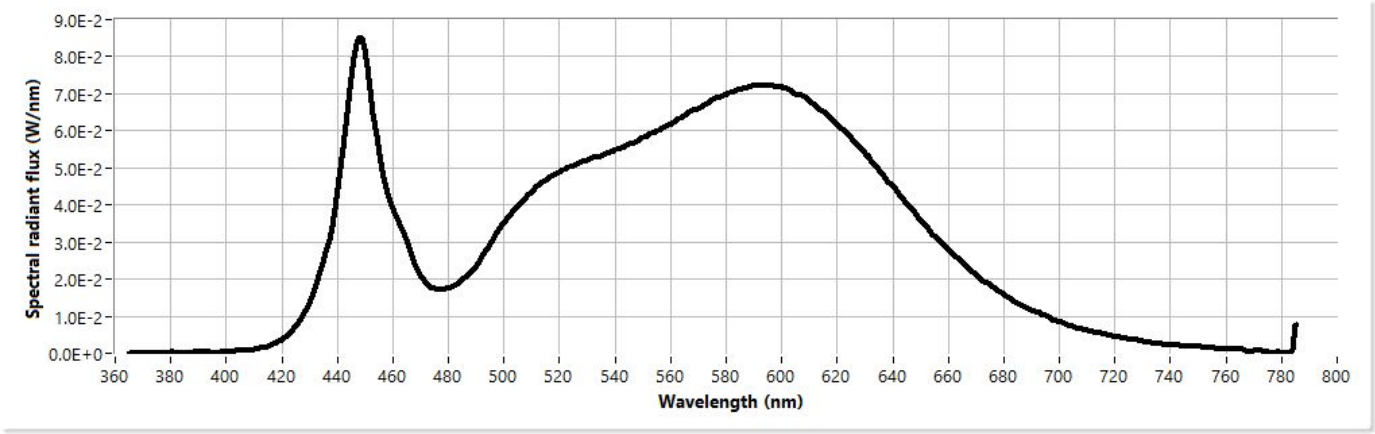


Table - Results of the absolute spectral distribution measurement

Luminous Flux	F	4171.0 lm
Electrical Power	Pel	28.2 W
Optical Power	Popt	12.50 W
Thermal Power	Pth	15.70 W
Luminous Efficacy	LPW	147.9 lm/W
Luminous Efficacy of Spectrum	LER	334 lm/W
Wall-Plug Efficiency	WPE	44.3 %
Photosynthetic Photon Flux	PPF	58.8 µmol/s

Table. **Photosynthetic photon flux (PPF) and optical power analysis.**

Band	WL range (nm)	Value	Unit	Rel. (%)
PPF	400 - 700	57.2	umol/s	97.4
PPF-Blue	400 - 499	9.8	umol/s	16.7
PPF-Green	500 - 599	26.5	umol/s	45.1
PPF-Red	600 - 699	20.4	umol/s	34.7
PF-UV	380 - 399	0.0	umol/s	0.0
PF-FarRed	700 - 780	1.4	umol/s	2.5
PF, Full	380 - 780	58.7	umol/s	99.9
PAR	400 - 700	12.2	W	98.0
Optical power	380 - 780	12.5	W	100
B:G Ratio	420-490 : 500-570	0.5		
R:FR Ratio	650-670 : 720-740	7.9		

Table - Color coordinates u'v' at different angles in CIE1976 color diagram

C-plane	gamma	u'	v'
0	-80.0	0.2246	0.5064
0	-75.0	0.2248	0.5063
0	-70.0	0.2248	0.5053
0	-65.0	0.2248	0.5043
0	-60.0	0.2247	0.5030
0	-55.0	0.2247	0.5024
0	-50.0	0.2247	0.5020
0	-45.0	0.2246	0.5019
0	-40.0	0.2246	0.5019
0	-35.0	0.2246	0.5021
0	-30.0	0.2246	0.5026
0	-25.0	0.2245	0.5029
0	-20.0	0.2246	0.5033
0	-15.0	0.2246	0.5037
0	-10.0	0.2245	0.5039
0	-5.0	0.2245	0.5039
0	0.0	0.2245	0.5038
180.0	80.0	0.2246	0.5063
180.0	75.0	0.2248	0.5062
180.0	70.0	0.2248	0.5052
180.0	65.0	0.2247	0.5041
180.0	60.0	0.2247	0.5029
180.0	55.0	0.2247	0.5023
180.0	50.0	0.2246	0.5018
180.0	45.0	0.2246	0.5017
180.0	40.0	0.2245	0.5016
180.0	35.0	0.2246	0.5018
180.0	30.0	0.2245	0.5023
180.0	25.0	0.2245	0.5028
180.0	20.0	0.2245	0.5031
180.0	15.0	0.2246	0.5035
180.0	10.0	0.2245	0.5037
180.0	5.0	0.2246	0.5038
180.0	0.0	0.2246	0.5039
90	-80.0	0.2245	0.5038
90	-75.0	0.2246	0.5040
90	-70.0	0.2247	0.5038
90	-65.0	0.2247	0.5038
90	-60.0	0.2247	0.5036
90	-55.0	0.2247	0.5035
90	-50.0	0.2247	0.5033
90	-45.0	0.2247	0.5033
90	-40.0	0.2247	0.5033
90	-35.0	0.2247	0.5034
90	-30.0	0.2247	0.5036
90	-25.0	0.2246	0.5037
90	-20.0	0.2246	0.5037
90	-15.0	0.2246	0.5038
90	-10.0	0.2246	0.5039
90	-5.0	0.2246	0.5040
90	0.0	0.2246	0.5040
270.0	80.0	0.2243	0.5039
270.0	75.0	0.2245	0.5042
270.0	70.0	0.2245	0.5039
270.0	65.0	0.2246	0.5038
270.0	60.0	0.2246	0.5036
270.0	55.0	0.2246	0.5034
270.0	50.0	0.2246	0.5033
270.0	45.0	0.2246	0.5033
270.0	40.0	0.2247	0.5034

270.0	35.0	0.2246	0.5034
270.0	30.0	0.2246	0.5035
270.0	25.0	0.2246	0.5037
270.0	20.0	0.2246	0.5038
270.0	15.0	0.2246	0.5041
270.0	10.0	0.2245	0.5040
270.0	5.0	0.2246	0.5040
270.0	0.0	0.2246	0.5041

Figure - Spatial color uniformity in CIE1976 diagram

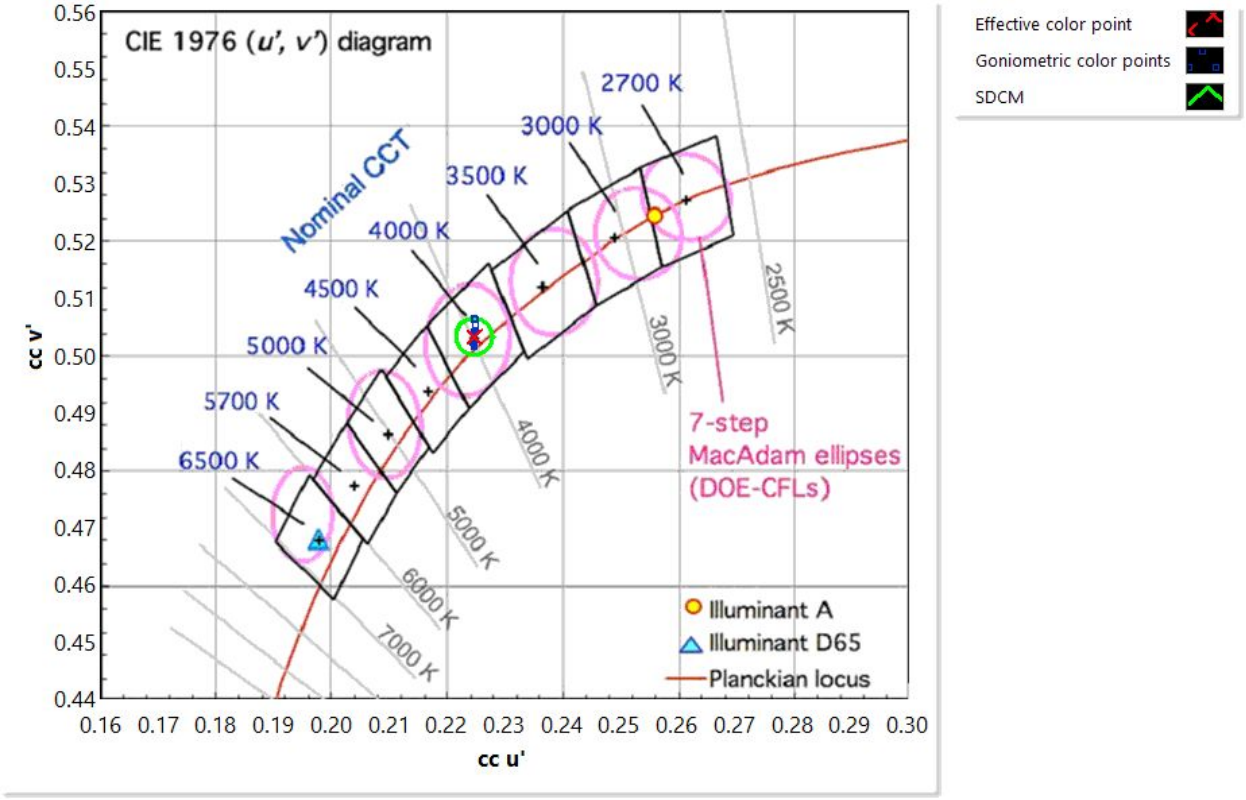


Figure - Normalized spectrum at different angles

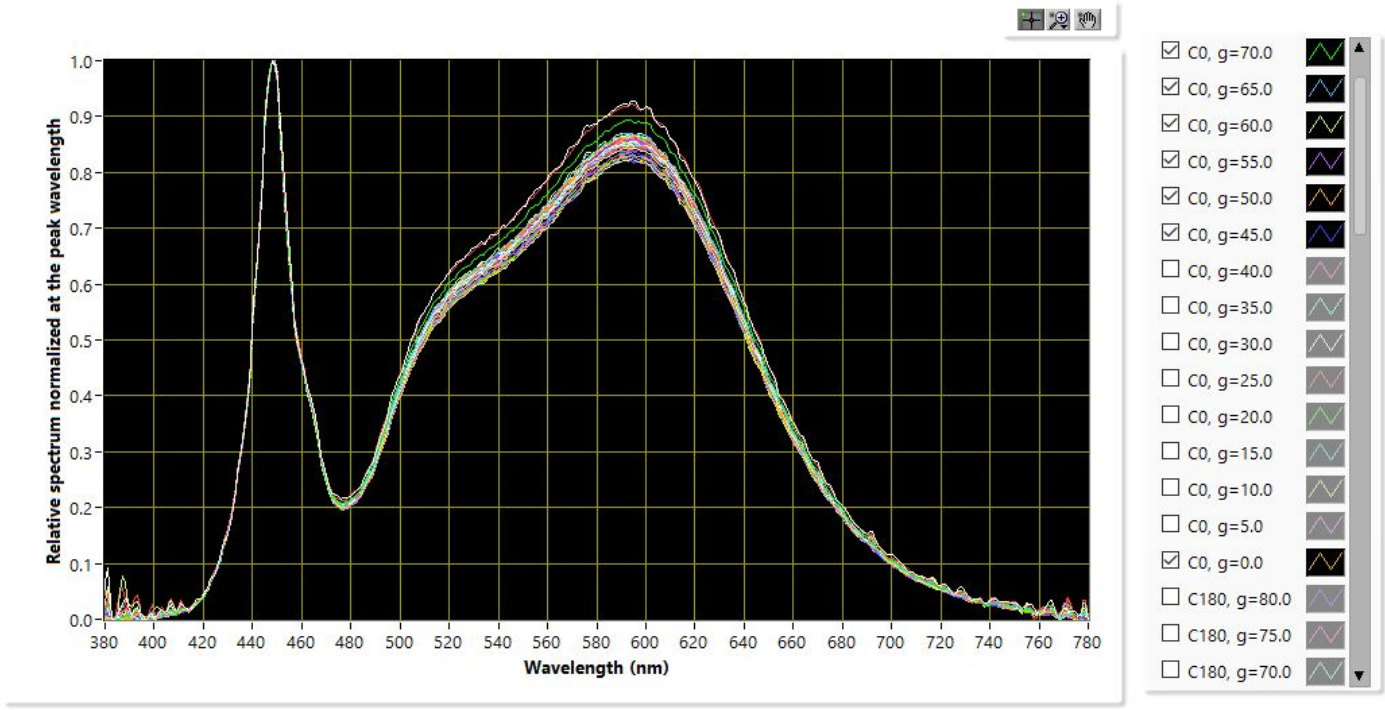


Figure - CCT as a function of angle

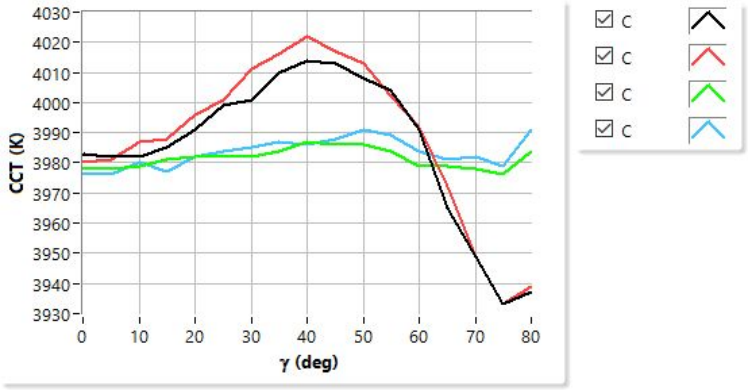
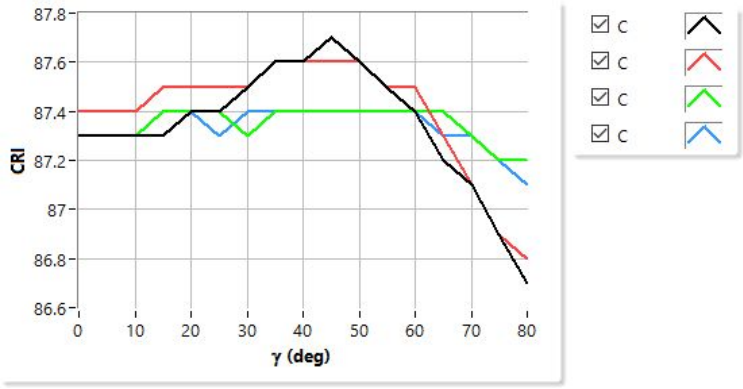


Figure - CRI, Ra as a function of angle



SSL Resource Oy Myllyojankatu 2 A FI-24100 Salo, Finland sales@sslresource.com www.sslresource.com

3.5.2021 14.34 **Test report: TR 3237_Flicker** **Luminaire: 1ActivePAQ-L-2F40-MSA2-2R-4K-840-3-5**

Flicker Test Report

FLICKER CLASSIFICATION (IEEE 1789-2015): No observable effect level NOEL
Short-Term Perceptibility of Light Modulation Pst LM (IEC TR 61547-1): PASS (Limit: 1.0)
Stroboscopic Visual Measure SVM (IEC TR 63158): PASS (Limit: 0.4)

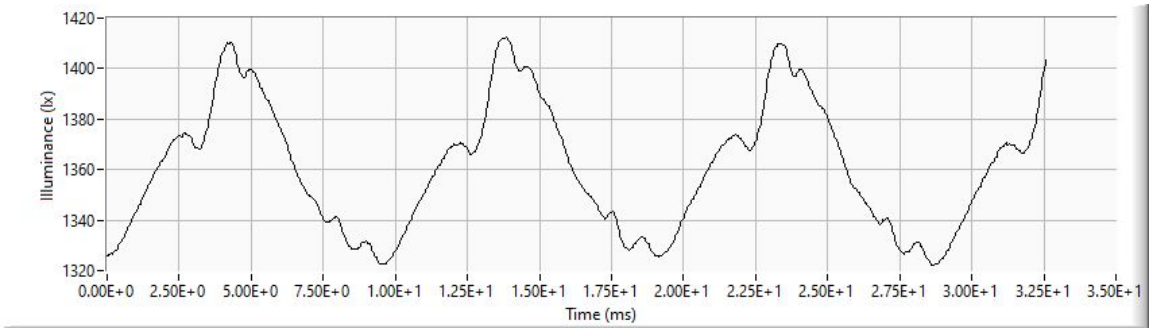
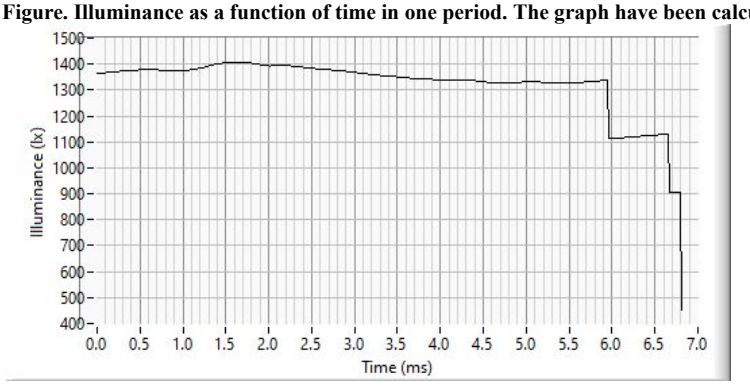


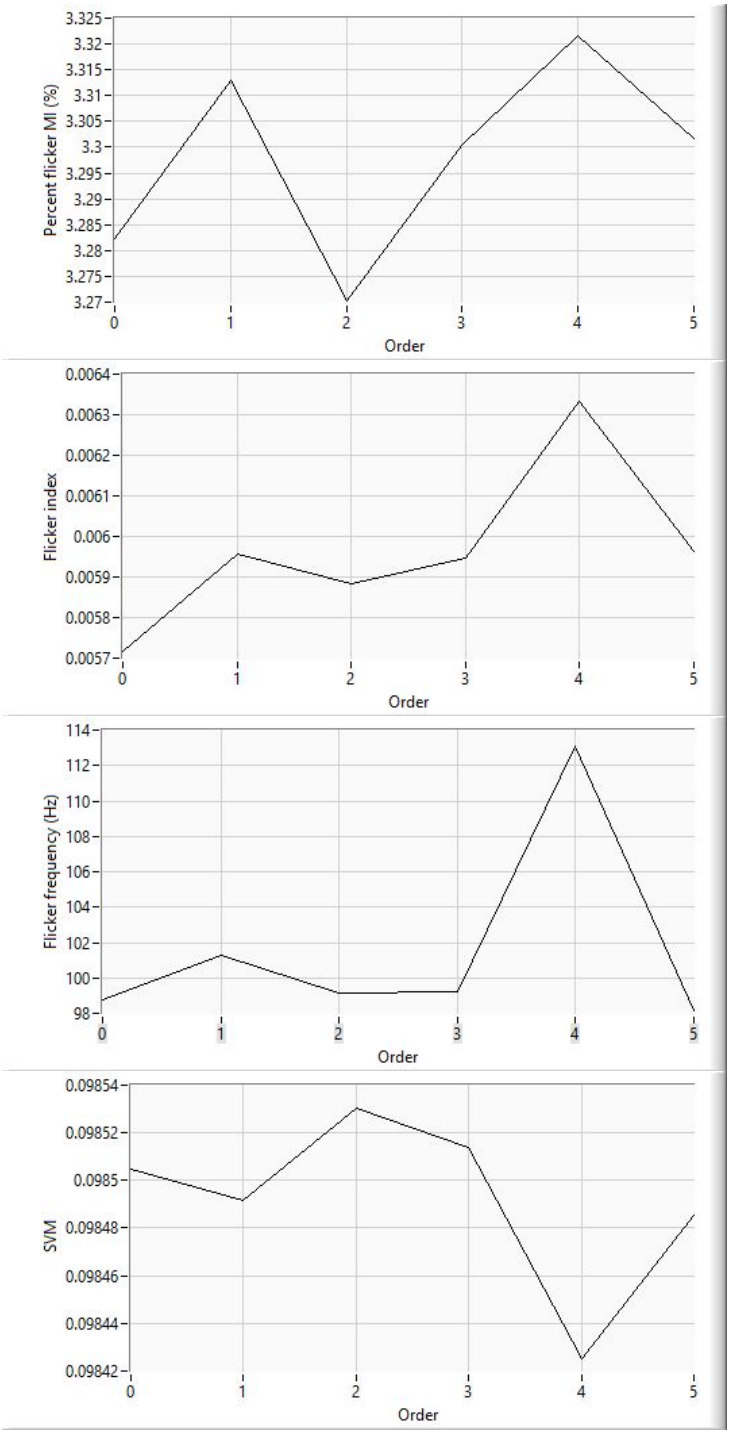
Table. Flicker analysis summary. The values have been calculated as an average of 6 signal periods.

	Value	St.dev.
Average Ev (lx)	1360.20	0.78
Mean Ev (lx)	1367.34	0.39
Max Ev (lx)	1412.44	0.44
Min Ev (lx)	1322.24	0.49
Percent flicker (%)	3.30	0.02
Flicker index	0.0060	0.0002
Flicker frequency (Hz)	101.6	5.7
SVM	0.0985	0.0000
Pst LM	0.1201	0.0144

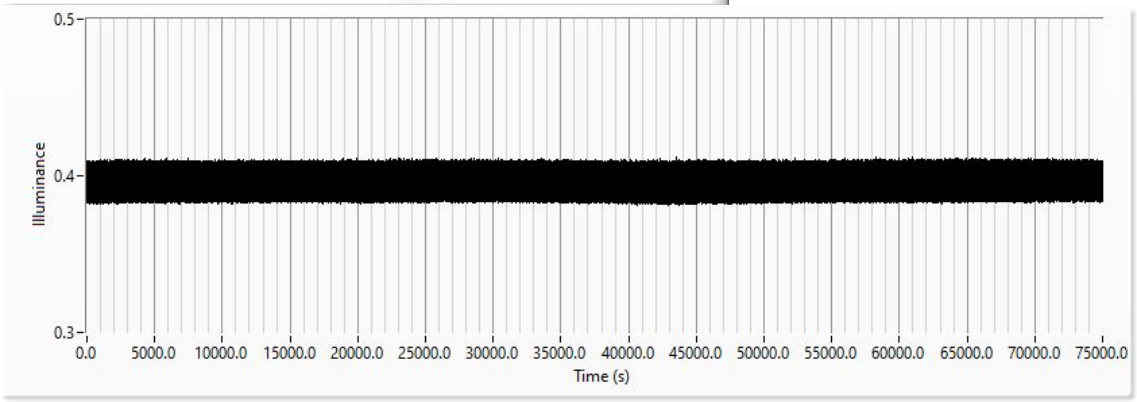
Figure. Illuminance as a function of time in one period. The graph have been calculated as an average of 6 signal periods.



Figures below show the data as a function of consecutive measurement repeats.




0.14
0.135
0.13
0.125
0.12
0.115
0.11
0.105
0.1
Pst LM
0
1
2
3
4
5
Order


0.5
0.4
0.3
Illuminance
0.0
5000.0
10000.0
15000.0
20000.0
25000.0
30000.0
35000.0
40000.0
45000.0
50000.0
55000.0
60000.0
65000.0
70000.0
75000.0
Time (s)

Figures below show the results of the Fast-Fourier transform for frequency analysis (SVM).

Harmonic order	Frequency (Hz)	Magnitude (%)
0	0	90.1
1	100	1.1