



IENALM-79 TEST REPORT

Applicant's name : Espen Technology Inc.

Address : 12257 Florence Ave., Santa Fe Springs, CA 90670, USA

Brand Name : ESPEN

Report No. : BTR66.181.15.0030.32

Product Name : LED T8 TUBE

Model Number : L48T8-830-15G-XT H

Tested by
(printed name and signature) : David Zhang

Title : Test Engineer

Approved by
(printed name and signature) : Steven Su

Title : Approved Signatory

Date of issue : Jan 20, 2016

Testing Laboratory Name : BEST Test Service Shenzhen Co., Ltd.

Address : 1st Floor, 1st Building, Weitai Industrial Park, Yingrenshi, Shiyang, Baoan,
Shenzhen, China

Accreditation : DLC/Lighting Facts/UL/ETL/ELI/NVLAP/EPA/DOE

Test specification

Standard : IESNA LM-79

Test procedure : IESNA LM-79 Test Procedure

Non-standard test method : No

Test Report Form No. : BEST_ LM-79

TRF originator..... : BEST Test Service Shenzhen Co., Ltd. Mr Tseng

Master TRF : BEST_ LM-79.doc

Note:

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Product description:	
Test date	Jan 15, 2016 to Jan 20, 2016
Sample Quantity	1 unit
SKU.....	N/A
Rating(s) (V; Hz)	AC 100-277V/60Hz
Nominal Power	15W
Nominal Power Factor	>0.9
Nominal Lumen Output.....	2200 lm
Nominal CCT	3000K
Nominal CRI(Ra)	80
Number of hours operated prior to measurement	0H
Total operating time of the product for measurements including stabilization	3.5H
Ambient temperature	25°C
Orientation (burning position) of SSL product during test	Lighting Surface Down
Stabilization time	1.5 H
Photometric method	Sphere-spectroradiometer+Goniophotometer
reference standard used	DC 24V 100W Omni-Directional Halogen Calibrated by NIM China
Correction factors applied	Self absorbing applied
Photometric measurement conditions	See test method description below
Bandwidth of spectroradiometer	2nm
Statement of uncertainties	1.12%
Deviation from standard operating procedures,	None

Photometric and Electrical Measurement

Total light output (luminous flux) for the $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ambient temperature conditions is measured using a EVERFINE 2.0 m 4 π geometry integrating sphere. Temperature is measured at a position inside the sphere. Spectral radiant flux measurements are made using Integral Sphere to the detector port of the integrating sphere. Each lamp is operated at rated voltage in its designated orientation by a CHROMA 61602 AC SOURCE. Each lamp should be stable before measurements are made as below:

Step 1 Take 3 measurements of the lamp light output at 15 minute interval (total time=30minutes.) This time period is in addition to the recommended pre-burning time.

Step 2 Calculate the percent difference between the maximum measured value and the minimum measured value for the three consecutive measurements.

Step 3 if the value calculated in Step 2 does not exceed 0.5 percent, the lamp is considered stable.

Luminous flux, chromaticity coordinates, correlated color temperature and color rendering index for each lamp are calculated from the spectral radiant flux measurements taken at 2 nm intervals over the range 380 to 780 nm by EVERFINE HASS-2000. The calibration of the sphere photometer-spectrometer system is traceable to the NIM China by a calibrated halogen incandescent lamp. Lamp efficacy (lumens per watts) for each lamp model is computed based on the revised luminous flux result. Electrical measurements including voltage, current, power and power factor are measured using the YOKOGAWA WT310 digital power Meter.

The total uncertainty of the light output measurements is estimated, at the 95% confidence level, not to exceed $\pm 1.12\%$ over the wavelength range 380-780 nm.

Luminous Intensity

A Everfine GOR-5000 Goniophotometer was used to measure the intensity at each angle of distribution, Luminous intensity (cd) is measured within each vertical plane at a 5° vertical angle increment (maximum) from 0° to 180° Luminous intensity (cd), measurements repeated in vertical planes about the lamp (polar) axis in maximum increments of 22.5° from 0° to 180° , and export the intensity (cd) with excel format. The test distance is 25meters from the Goniophotometer to the detector

Photometric and Electrical Test Data

Input Voltage (V)	Frequency (Hz)	Input Current (A)	ITHD	Input Power (W)	Power Factor	Lumen Output (Lumens)	Efficiency Lumen/w
120.0	60.0	0.143	/	17.12	0.998	2203.90	128.73
CCT (K)	CRI (Ra)	R9	x CIE1931	y CIE1931	u' CIE1976	v' CIE1976	Duv CIE1976
2928	82.7	10	0.4414	0.4044	0.2533	0.5222	-0.0005

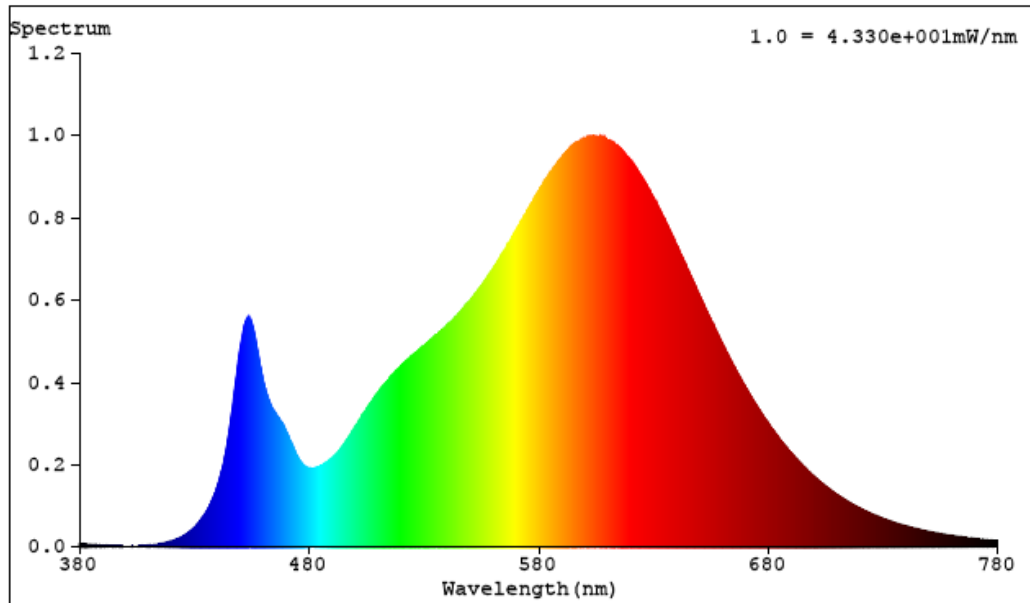
Luminous Intensity

2 lamps together with driver, were installed in a LITHONIA 2GT8 Troffer lensed 2*4, and mounted in the centre of Goniophotometer, Everfine GOR-5000 Goniophotometer was used to measure the intensity at each angle of distribution, Luminous intensity (cd) is measured within each vertical plane at a 5° vertical angle increment (maximum) from 0° to 180° Luminous intensity (cd), measurements repeated in vertical planes about the lamp (polar) axis in maximum increments of 22.5° from 0° to 180° , and export the intensity (cd) with excel format. The test distance is 25 meters from the Goniophotometer to the detector

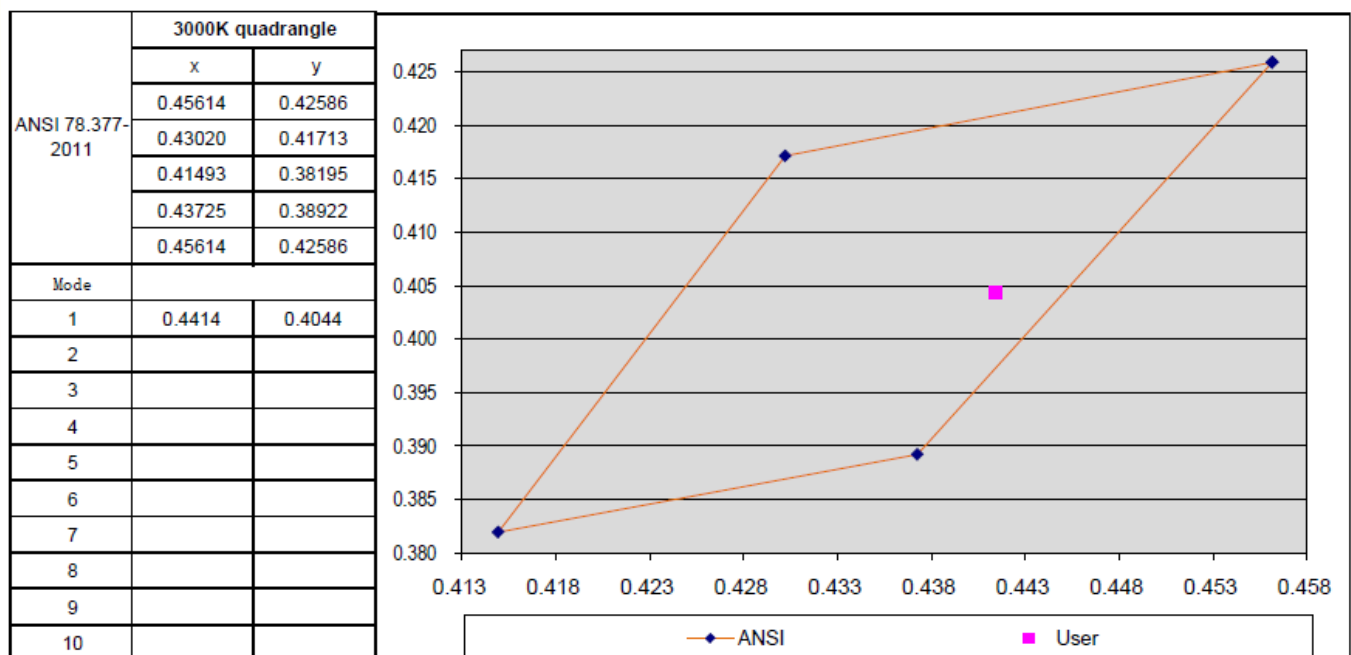
Photometric and Electrical Test Data

Input Voltage (V)	Frequency (Hz)	Input Current (A)	ITHD	Input Power (W)	Power Factor	Lumen Output (Lumens)	Efficiency Lumen/w	Spacing Criteria 0-180°	Spacing Criteria 90-270°
120.0	60.0	0.229	5.4%	35.80	0.998	3534.24	98.72	1.32	1.24

Spectral Plots



7 Step Quadrangle



EUT Photo



Luminous Intensity Distribution Test Plots (CIE Chromaticity)

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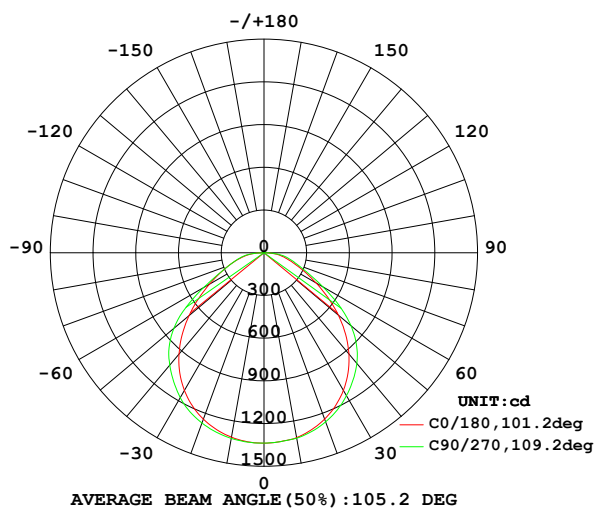


LUMINAIRE PHOTOMETRIC TEST REPORT

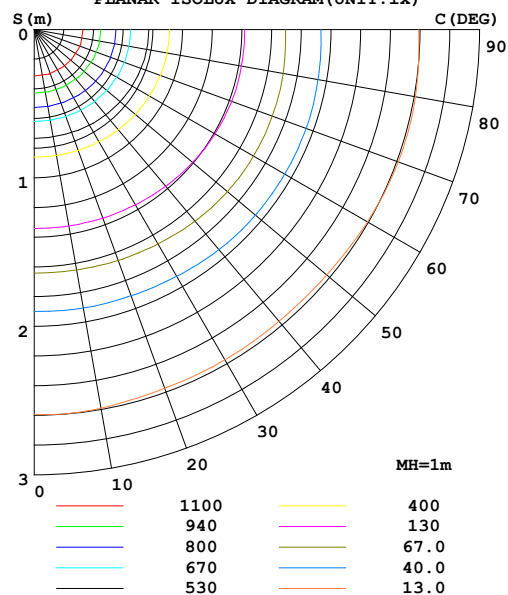
Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm		
NAME:	TYPE:L48T8/830/15G-XT H	WEIGHT:
SPEC.:	DIM.:	SERIAL No.:
MFR.: ESPEN	SUR.:1.2*0.6	PROTECTION ANGLE:

DATA OF LAMP		PHOTOMETRIC DATA Eff: 98.72 lm/W			
MODEL	L48T/830/15G-XT H	I _{max} (cd)	1338	S/MH (C0/180)	1.24
NOMINAL POWER (W)		LOR (%)	100.0	S/MH (C90/270)	1.29
RATED VOLTAGE (V)	120.0	TOTAL FLUX (lm)	3534.2	η UP, DN (C0-180)	0.1, 50.2
NOMINAL FLUX (lm)	1767.12	CIE CLASS	DIRECT	η UP, DN (C180-360)	0.0, 49.7
LAMPS INSIDE	2	η up (%)	0.1	CIBSE SHR NOM	1.25
TEST VOLTAGE (V)	120.0	η down (%)	99.9	CIBSE SHR MAX	1.35

LUMINOUS INTENSITY DISTRIBUTION DIAGRAM



PLANAR ISOLUX DIAGRAM (UNIT: lx)



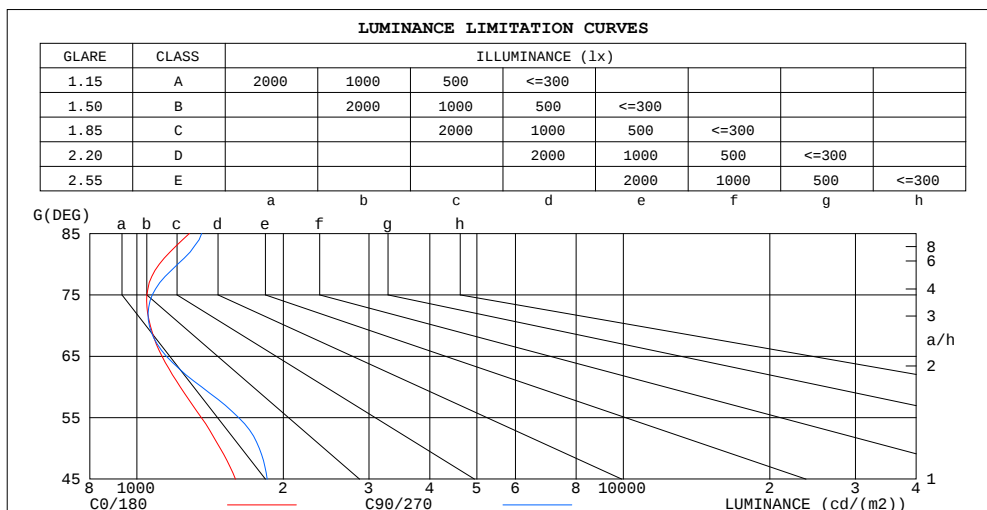
C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature: 25.6DEG
 Operators: David
 Test Date: 2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System: EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity: 67.1%
 Test Distance: 2.455m [K=1.0000]
 Remarks:

ZONAL FLUX DIAGRAM AND LUMINANCE LIMITATION CURVES

ZONAL FLUX DIAGRAM:

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	Φ zone	Φ total	%lum,lamp
10	1315	1321	1324	1317	1318	1319	1323	1323	0- 10	126.8	126.8	3.59,3.59
20	1244	1260	1273	1256	1244	1251	1264	1260	10- 20	365.3	492.0	13.9,13.9
30	1118	1152	1176	1146	1116	1136	1159	1147	20- 30	555.9	1048	29.7,29.7
40	928.6	982.3	1030	982.7	928.3	969.2	1014	971.5	30- 40	666.3	1714	48.5,48.5
50	686.9	757.2	826.5	758.4	682.1	742.6	798.0	741.5	40- 50	670.0	2384	67.5,67.5
60	442.2	492.7	489.4	461.5	420.4	454.0	477.3	479.7	50- 60	543.4	2928	82.8,82.8
70	262.4	246.9	261.2	204.4	230.1	208.3	256.3	241.6	60- 70	336.7	3264	92.4,92.4
80	139.0	123.5	151.6	111.8	120.6	109.5	146.6	124.3	70- 80	188.9	3453	97.7,97.7
90	8.249	8.622	3.759	3.497	0.3392	1.111	1.562	7.555	80- 90	77.61	3531	99.9,99.9
100	0.2980	0.4777	0.2410	0.4341	0.3212	0.3891	0.2039	0.3269	90-100	0.8783	3532	99.9,99.9
110	0.4275	0.5361	0.5836	0.5050	0.3134	0.4190	0.4437	0.3632	100-110	0.4347	3532	99.9,99.9
120	0.4502	0.4763	0.6445	0.4604	0.4027	0.4188	0.4777	0.3843	110-120	0.4477	3533	100,100
130	0.4489	0.5091	0.5851	0.5348	0.4775	0.4951	0.4897	0.4323	120-130	0.4187	3533	100,100
140	0.4838	0.5847	0.6835	0.5674	0.5208	0.5427	0.5490	0.5166	130-140	0.4020	3533	100,100
150	0.5766	0.6402	0.6578	0.5993	0.5470	0.5205	0.5154	0.4800	140-150	0.3541	3534	100,100
160	0.5864	0.6713	0.6105	0.6547	0.5411	0.5344	0.4429	0.5229	150-160	0.2606	3534	100,100
170	0.5797	0.6323	0.5638	0.6655	0.5468	0.5558	0.4812	0.5424	160-170	0.1622	3534	100,100
180	0.7139	0.6633	0.6444	0.6502	0.7163	0.6842	0.6053	0.6524	170-180	0.0625	3534	100,100
DEG	LUMINOUS INTENSITY:cd									UNIT:lm		



LUMINANCE cd/(m ²)		
G(°)	C0/180	C90/270
85	1282	1359
80	1112	1213
75	1048	1075
70	1065	1061
65	1126	1150
60	1228	1359
55	1357	1619
50	1484	1786
45	1595	1852

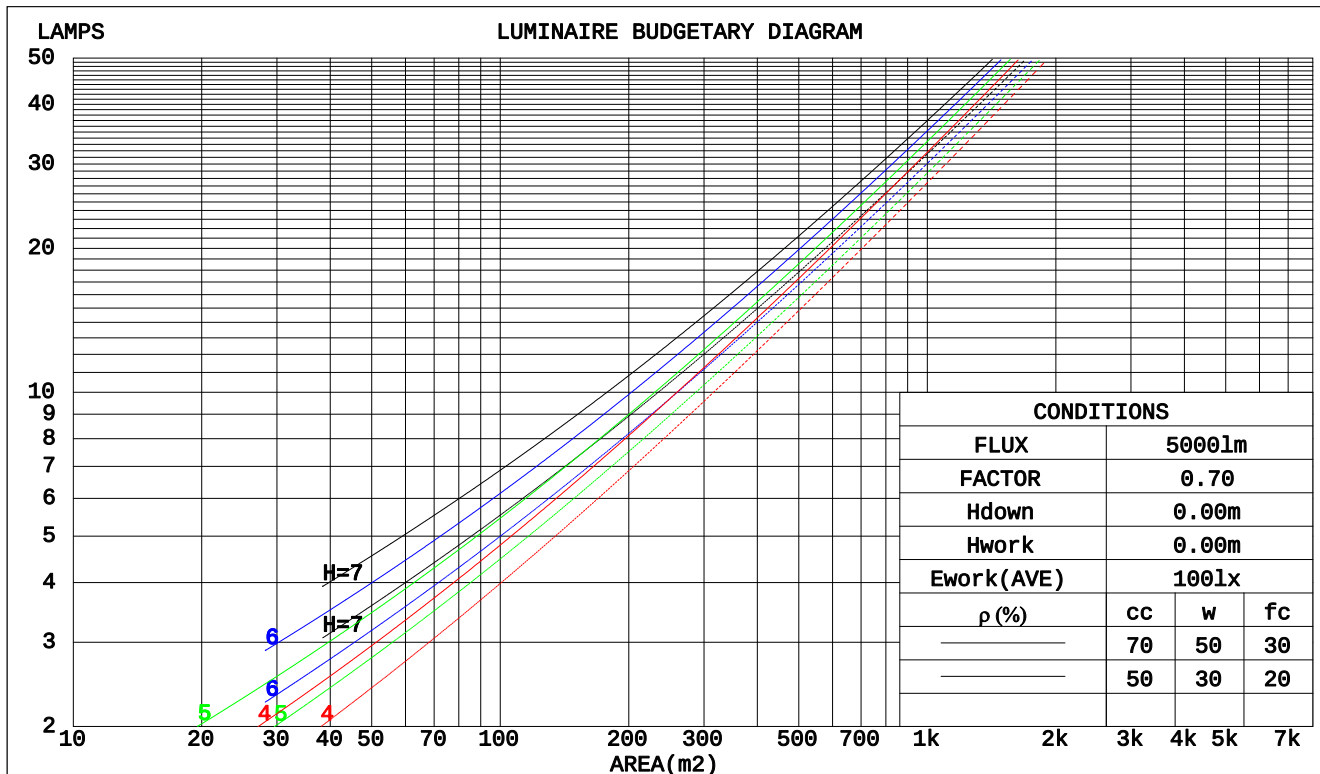
C Range: 0 - 360DEG
C Interval: 10.0DEG
Test Speed: HIGH
Temperature:25.6DEG
Operators:David
Test Date:2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
Test System:EVERFINE G0-R5000_V2 SYSTEM V2.0.287
Humidity:67.1%
Test Distance:2.455m [K=1.0000]
Remarks:

CU AND LUMINAIRE BUDGETARY ESTIMATE DIAGRAM

Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm		
NAME:	TYPE:L48T8/830/15G-XT H	WEIGHT:
SPEC.:	DIM.:	SERIAL No.:
MFR.: ESPEN	SUR.:1.2*0.6	PROTECTION ANGLE:

ρ_{cc}	80%			70%			50%			30%			10%			0
ρ_w	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0
ρ_{fc}	20%			20%			20%			20%			20%			0
RCR	RCR:Room Cavity Ratio						Coefficients of Utilization(CU)									
0.0	1.19	1.19	1.19	1.16	1.16	1.16	1.11	1.11	1.11	1.06	1.06	1.06	1.02	1.02	1.02	.00
1.0	1.05	1.00	.97	1.02	.99	.95	.98	.95	.92	.94	.92	.89	.91	.88	.87	.85
2.0	.92	.85	.80	.90	.84	.79	.86	.81	.77	.83	.79	.75	.80	.77	.74	.71
3.0	.81	.73	.67	.80	.72	.66	.77	.70	.65	.74	.69	.64	.71	.67	.63	.61
4.0	.72	.64	.57	.71	.63	.57	.68	.62	.56	.66	.60	.55	.64	.59	.55	.52
5.0	.65	.56	.50	.64	.55	.49	.62	.54	.49	.60	.53	.48	.58	.52	.48	.46
6.0	.58	.50	.43	.58	.49	.43	.56	.48	.43	.54	.48	.43	.52	.47	.42	.40
7.0	.53	.45	.39	.52	.44	.38	.51	.43	.38	.49	.43	.38	.48	.42	.38	.36
8.0	.49	.40	.34	.48	.40	.34	.47	.39	.34	.45	.39	.34	.44	.38	.34	.32
9.0	.45	.37	.31	.44	.36	.31	.43	.36	.31	.42	.35	.31	.41	.35	.30	.29
10.0	.41	.33	.28	.41	.33	.28	.40	.33	.28	.39	.32	.28	.38	.32	.28	.26



C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature: 25.6DEG
 Operators: David
 Test Date: 2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System: EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity: 67.1%
 Test Distance: 2.455m [K=1.0000]
 Remarks:

WEC AND CCEC

Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm		
NAME:	TYPE:L48T8/830/15G-XT H	WEIGHT:
SPEC.:	DIM.:	SERIAL No.:
MFR.: ESPEN	SUR.:1.2*0.6	PROTECTION ANGLE:

ρcc	80%			70%			50%			30%			10%			0	
ρw	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0	
ρfc	20%			20%			20%			20%			20%			0	
RCR	RCR:Room Cavity Ratio						Wall Exitance Coeffcients(WEC)										
0.0																	
1.0	.296	.169	.053	.289	.165	.052	.276	.158	.051	.264	.152	.049	.253	.146	.047		
2.0	.278	.152	.047	.272	.150	.046	.260	.145	.045	.250	.140	.044	.240	.136	.043		
3.0	.258	.137	.041	.253	.135	.041	.243	.131	.040	.233	.128	.039	.224	.124	.038		
4.0	.240	.124	.037	.235	.123	.036	.226	.120	.036	.217	.117	.035	.209	.114	.035		
5.0	.222	.113	.033	.218	.112	.033	.210	.109	.032	.203	.107	.032	.196	.105	.031		
6.0	.207	.104	.030	.203	.103	.030	.196	.101	.029	.189	.098	.029	.183	.096	.029		
7.0	.193	.096	.027	.190	.095	.027	.184	.093	.027	.178	.091	.026	.172	.089	.026		
8.0	.181	.089	.025	.178	.088	.025	.172	.086	.025	.167	.085	.024	.162	.083	.024		
9.0	.170	.082	.023	.168	.082	.023	.162	.080	.023	.157	.079	.023	.153	.078	.022		
10.0	.160	.077	.021	.158	.076	.021	.153	.075	.021	.149	.074	.021	.145	.073	.021		

ρ _{CC}	80%			70%			50%			30%			10%			0	
ρ _W	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0	
ρ _{fc}	20%			20%			20%			20%			20%			0	
RCR	RCR:Room Cavity Ratio						Ceiling Cavity Exitance Coefficients(CCEC)										
0.0	.191	.191	.191	.163	.163	.163	.112	.112	.112	.064	.064	.064	.020	.020	.020		
1.0	.180	.157	.136	.154	.135	.117	.105	.093	.081	.061	.054	.047	.019	.017	.015		
2.0	.171	.133	.100	.147	.114	.087	.100	.079	.061	.058	.046	.035	.019	.015	.012		
3.0	.163	.115	.077	.140	.099	.066	.096	.069	.047	.055	.040	.027	.018	.013	.009		
4.0	.155	.102	.061	.133	.088	.053	.092	.061	.037	.053	.036	.022	.017	.012	.007		
5.0	.148	.091	.049	.127	.079	.043	.087	.055	.030	.051	.032	.018	.016	.011	.006		
6.0	.141	.083	.041	.121	.072	.036	.083	.050	.025	.048	.029	.015	.016	.010	.005		
7.0	.134	.076	.035	.115	.066	.030	.080	.046	.021	.046	.027	.013	.015	.009	.004		
8.0	.128	.070	.030	.110	.061	.026	.076	.043	.019	.044	.025	.011	.014	.008	.004		
9.0	.122	.065	.026	.105	.056	.023	.073	.040	.016	.042	.023	.010	.014	.008	.003		
10.0	.116	.061	.024	.100	.053	.021	.070	.037	.015	.041	.022	.009	.013	.007	.003		

C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature:25.6DEG
 Operators:David
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γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity:67.1%
 Test Distance:2.455m [K=1.0000]
 Remarks:

UGR(Unified Glare Rating) Table

Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm											
NAME:					TYPE:L48T8/830/15G-XT H			WEIGHT:			
SPEC.:					DIM.:			SERIAL No.:			
MFR.: ESPEN					SUR.:1.2*0.6			PROTECTION ANGLE:			
ceiling/cavity	0.7	0.7	0.5	0.5	0.3	0.7	0.7	0.5	0.5	0.3	
walls	0.5	0.3	0.5	0.3	0.3	0.5	0.3	0.5	0.3	0.3	
working plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Room dimensions		Viewed crosswise					Viewed endwise				
x = 2H y = 2H		13.7	15.2	14.0	15.4	15.6	14.4	15.9	14.7	16.1	16.3
	3H	14.8	16.2	15.1	16.4	16.6	15.4	16.7	15.7	17.0	17.2
	4H	15.4	16.6	15.7	16.9	17.1	15.9	17.1	16.2	17.4	17.6
	6H	15.9	17.1	16.2	17.4	17.6	16.4	17.6	16.7	17.8	18.1
	8H	16.1	17.3	16.5	17.6	17.9	16.6	17.8	17.0	18.1	18.4
	12H	16.3	17.4	16.7	17.7	18.0	16.8	18.0	17.2	18.3	18.6
4H	2H	14.2	15.5	14.5	15.8	16.0	14.8	16.0	15.1	16.3	16.6
	3H	15.5	16.6	15.8	16.9	17.2	15.9	17.1	16.3	17.3	17.7
	4H	16.2	17.2	16.5	17.5	17.8	16.6	17.6	16.9	17.9	18.2
	6H	16.8	17.7	17.2	18.1	18.5	17.3	18.2	17.7	18.5	18.9
	8H	17.2	18.0	17.6	18.4	18.8	17.6	18.5	18.0	18.8	19.2
	12H	17.4	18.2	17.9	18.6	19.0	17.9	18.7	18.4	19.1	19.5
8H	4H	16.4	17.2	16.8	17.6	18.0	16.7	17.6	17.2	18.0	18.3
	6H	17.2	17.9	17.6	18.3	18.7	17.6	18.3	18.1	18.7	19.2
	8H	17.6	18.3	18.1	18.7	19.1	18.1	18.7	18.6	19.2	19.6
	12H	18.1	18.6	18.6	19.1	19.5	18.6	19.1	19.1	19.6	20.0
12H	4H	16.4	17.2	16.8	17.5	18.0	16.8	17.5	17.2	17.9	18.3
	6H	17.3	17.9	17.7	18.3	18.8	17.7	18.3	18.2	18.7	19.2
	8H	17.8	18.3	18.3	18.8	19.3	18.2	18.8	18.7	19.2	19.7
Variations with the observer position at spacings:											
S = 1.0H		+ 0.2 / - 0.3					+ 0.2 / - 0.2				
1.5H		+ 0.2 / - 0.4					+ 0.3 / - 0.5				
2.0H		+ 0.2 / - 0.4					+ 0.4 / - 0.4				

CIE Pub.117 Corrected 3534 lm Total Lamp Luminous Flux.(8log(F/F0) = 4.4)

C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature:25.6DEG
 Operators:David
 Test Date:2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity:67.1%
 Test Distance:2.455m [K=1.0000]
 Remarks:

UTILIZATION FACTORS TABLE

Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm		
NAME:	TYPE:L48T8/830/15G-XT H	WEIGHT:
SPEC.:	DIM.:	SERIAL No.:
MFR.: ESPEN	SUR.:1.2*0.6	PROTECTION ANGLE:

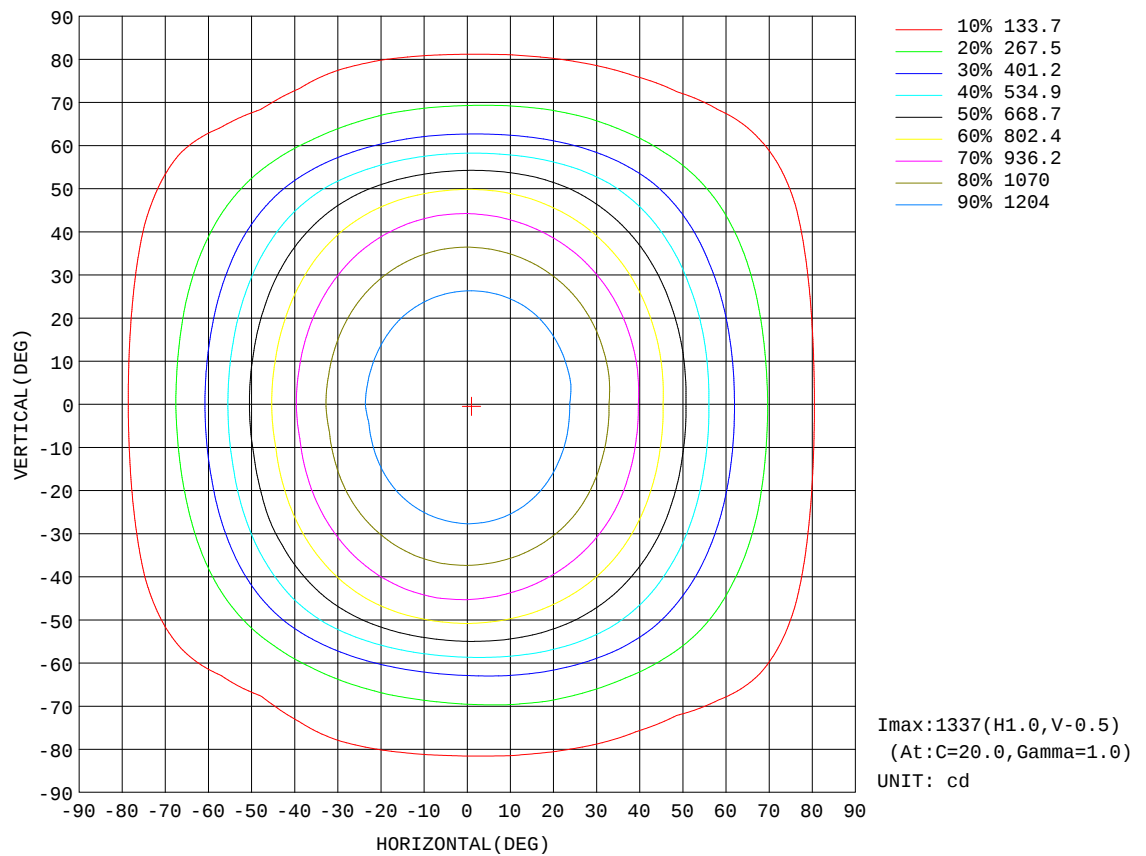
REFLECTANCE										
Ceiling	0.8	0.8	0.8	0.7	0.7	0.7	0.5	0.5	0.5	0
Walls	0.7	0.5	0.3	0.7	0.5	0.3	0.7	0.5	0.3	0
Working plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0
ROOM INDEX	UTILIZATION FACTORS(PERCENT) $k(RI) \times RCR = 5$									
$k = 0.60$	59	48	41	59	48	41	58	48	41	35
0.80	70	59	51	69	58	51	67	57	51	44
1.00	78	68	61	77	67	60	75	68	60	53
1.25	85	75	68	84	75	68	81	73	67	60
1.50	90	81	74	88	80	74	85	78	72	65
2.00	96	88	82	95	87	82	91	85	80	73
2.50	100	93	87	98	91	86	94	89	84	76
3.00	103	97	91	101	95	90	97	92	88	80
4.00	107	101	97	105	100	96	100	96	93	84
5.00	109	104	101	107	102	99	102	99	96	87
ROOM INDEX	UF(total)									Direct
According to DIN EN 13032-2 2004			Suspended					SHRNOM = 1.25		

C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature:25.6DEG
 Operators:David
 Test Date:2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity:67.1%
 Test Distance:2.455m [K=1.0000]
 Remarks:

ISOCANDELA DIAGRAM

Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm		
NAME:	TYPE:L48T8/830/15G-XT H	WEIGHT:
SPEC.:	DIM.:	SERIAL No.:
MFR.: ESPEN	SUR.:1.2*0.6	PROTECTION ANGLE:



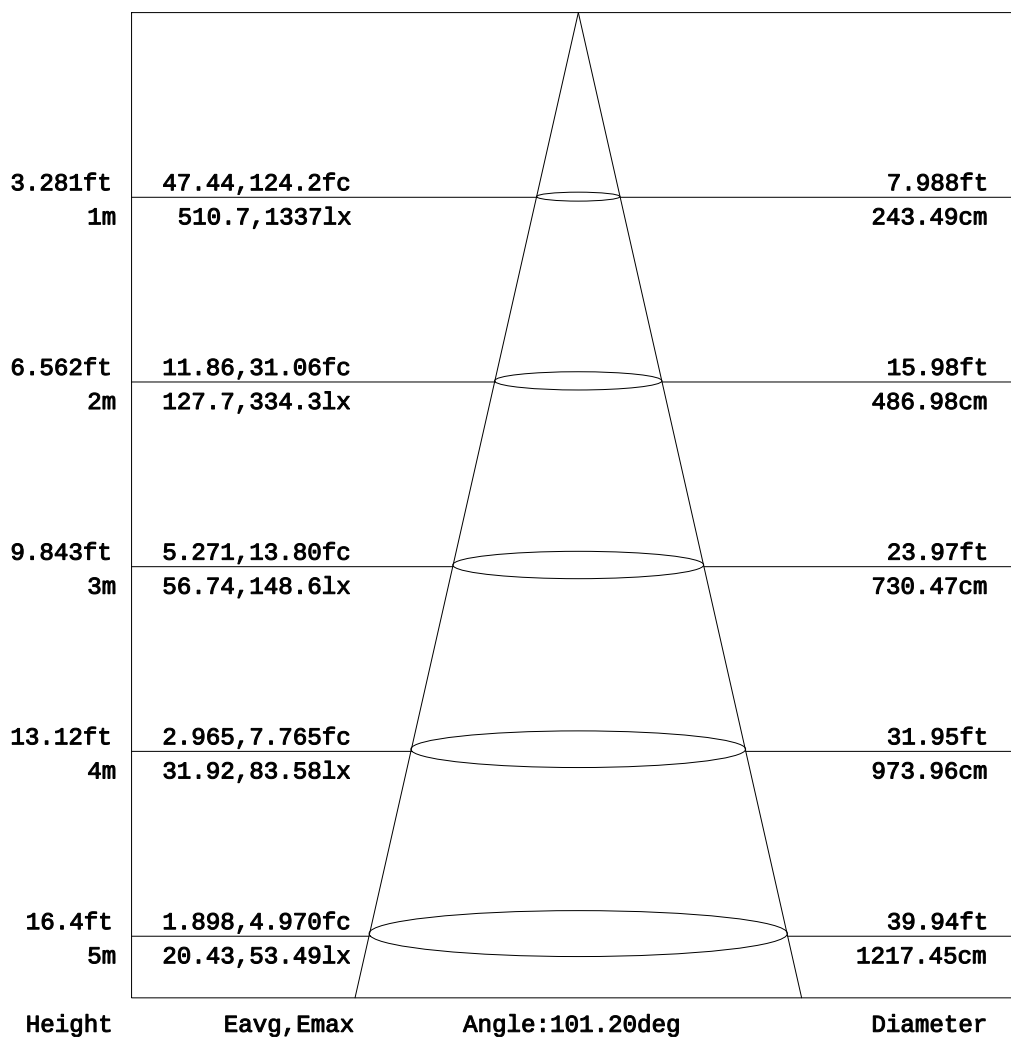
C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature:25.6DEG
 Operators:David
 Test Date:2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity:67.1%
 Test Distance:2.455m [K=1.0000]
 Remarks:

AAI Figure

Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm		
NAME:	TYPE:L48T8/830/15G-XT H	WEIGHT:
SPEC.:	DIM.:	SERIAL No.:
MFR.: ESPEN	SUR.:1.2*0.6	PROTECTION ANGLE:

Flux out:2446 lm



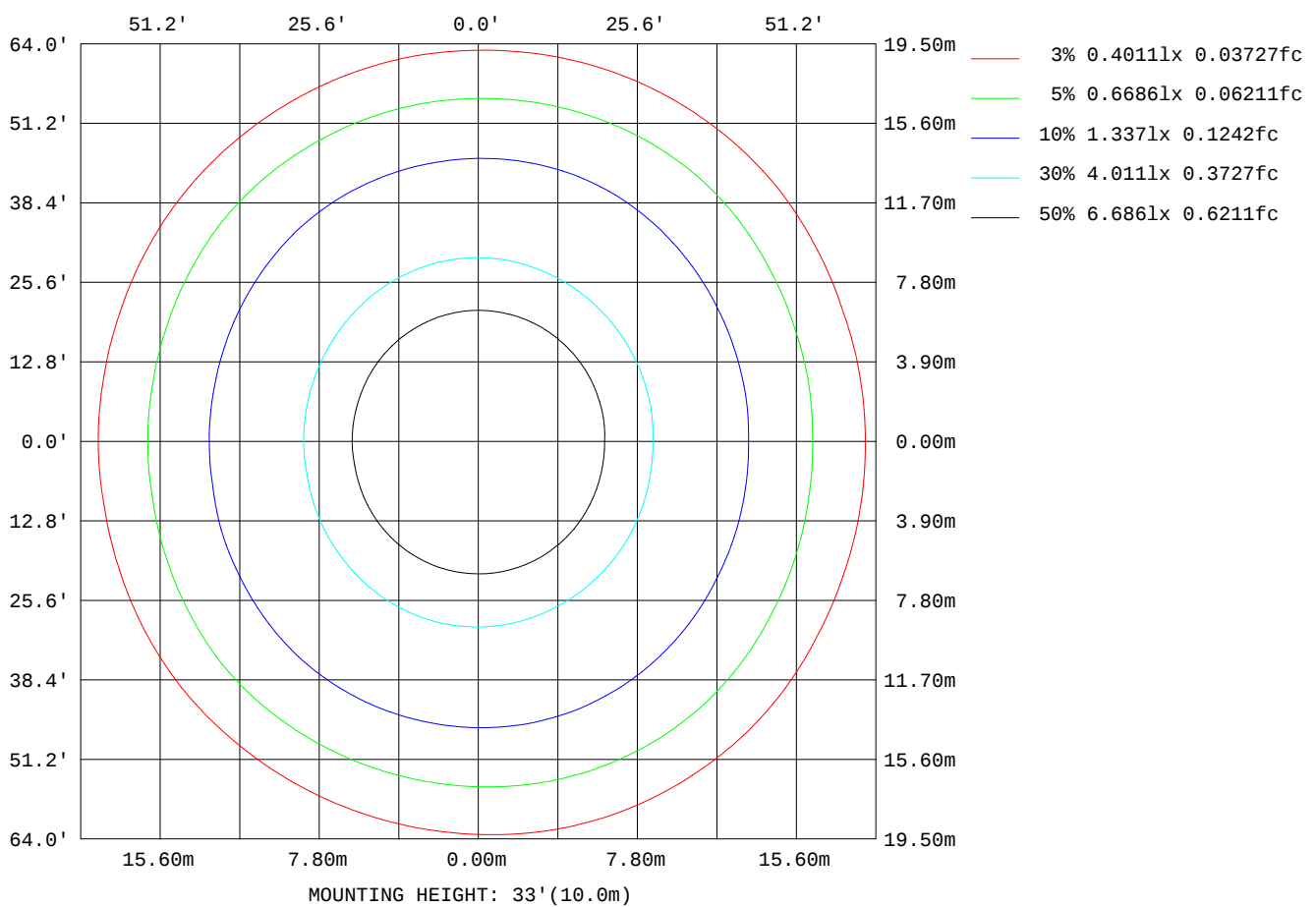
Note: The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

C Range: 0 - 360DEG
C Interval: 10.0DEG
Test Speed: HIGH
Temperature: 25.6DEG
Operators: David
Test Date: 2016-01-15

γ Range: 0 - 180DEG
γ Interval: 1.0DEG
Test System: EVERFINE G0-R5000_V2 SYSTEM V2.0.287
Humidity: 67.1%
Test Distance: 2.455m [K=1.0000]
Remarks:

ISOLUX DIAGRAM

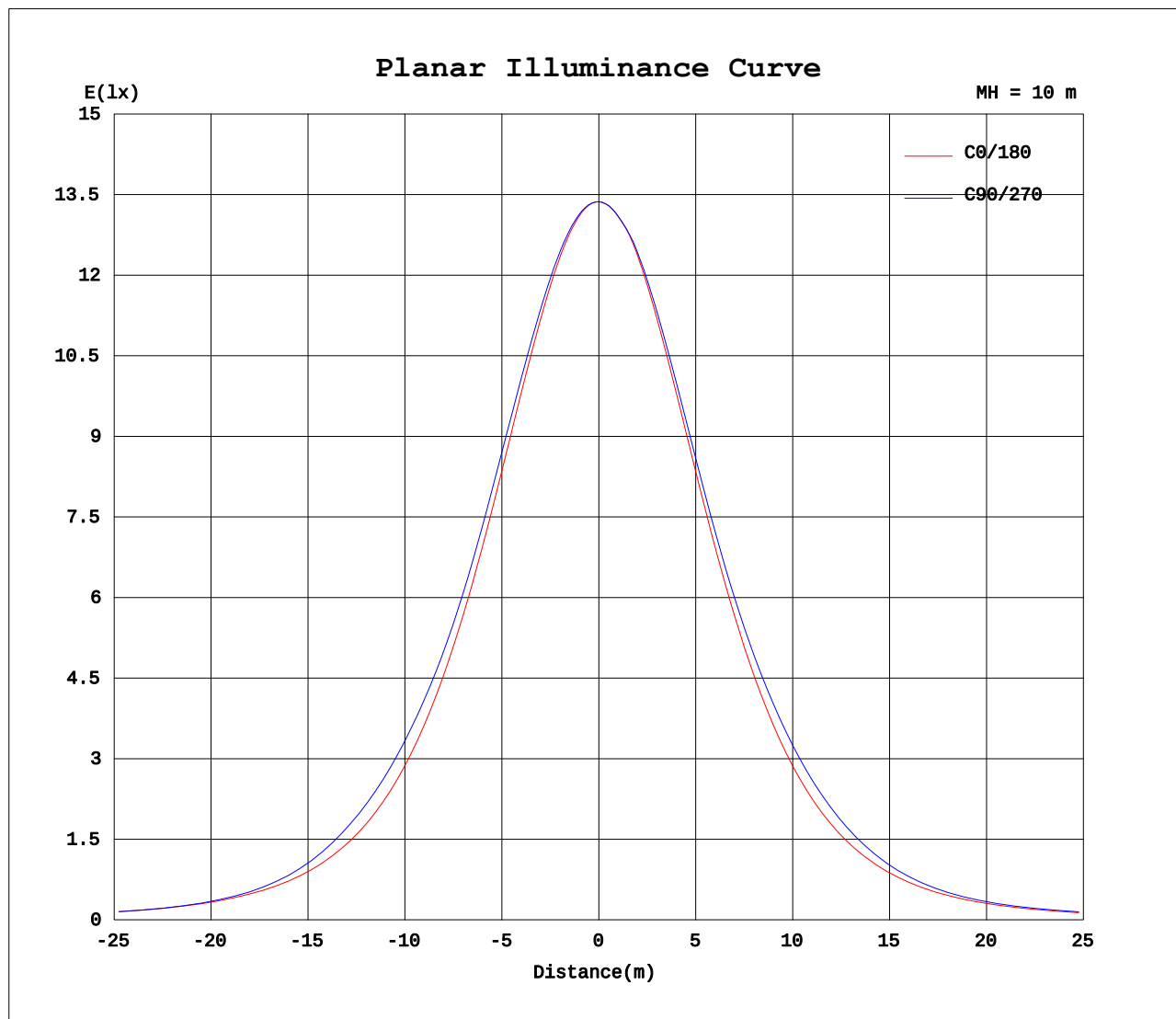
Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm		
NAME:	TYPE:L48T8/830/15G-XT H	WEIGHT:
SPEC.:	DIM.:	SERIAL No.:
MFR.: ESPEN	SUR.:1.2*0.6	PROTECTION ANGLE:



C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature:25.6DEG
 Operators:David
 Test Date:2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity:67.1%
 Test Distance:2.455m [K=1.0000]
 Remarks:

Planar Illuminance Curve



C Range: 0 - 360DEG
C Interval: 10.0DEG
Test Speed: HIGH
Temperature: 25.6DEG
Operators: David
Test Date: 2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
Test System: EVERFINE G0-R5000_V2 SYSTEM V2.0.287
Humidity: 67.1%
Test Distance: 2.455m [K=1.0000]
Remarks:

LUMINOUS DISTRIBUTION INTENSITY DATA

Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm																		
NAME:									TYPE:L48T8/830/15G-XT H					WEIGHT:				
SPEC.:									DIM.:					SERIAL No.:				
MFR.: ESPEN									SUR.: 1.2*0.6					PROTECTION ANGLE:				

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337
5	1332	1333	1333	1334	1334	1334	1334	1335	1335	1335	1334	1334	1333	1333	1332	1331	1330	1330	1331
10	1315	1316	1317	1319	1320	1321	1322	1323	1324	1324	1323	1322	1320	1318	1317	1315	1312	1311	1318
15	1287	1287	1290	1292	1295	1298	1301	1302	1303	1304	1302	1300	1298	1294	1290	1287	1283	1280	1287
20	1244	1245	1249	1253	1258	1263	1267	1271	1273	1273	1272	1269	1264	1259	1253	1247	1241	1237	1244
25	1188	1191	1195	1202	1209	1217	1223	1228	1231	1232	1230	1226	1220	1212	1204	1195	1188	1182	1187
30	1118	1120	1126	1135	1146	1157	1165	1172	1175	1176	1173	1168	1161	1151	1140	1129	1119	1111	1116
35	1031	1035	1043	1055	1069	1081	1091	1099	1104	1106	1104	1099	1089	1077	1064	1050	1036	1026	1030
40	929	933	945	960	975	990	1003	1015	1025	1030	1028	1021	1008	992	974	955	939	925	928
45	812	818	831	848	867	886	905	922	935	943	943	932	914	892	868	845	825	809	811
50	687	693	707	726	747	768	787	806	819	827	822	812	795	772	745	720	699	682	682
55	560	566	579	596	617	637	655	667	672	669	661	653	641	627	606	584	565	550	548
60	442	446	455	467	486	500	505	505	499	489	480	474	468	465	459	443	429	420	420
65	343	343	341	346	355	359	362	364	359	350	342	334	325	315	308	308	307	308	313
70	262	261	253	250	245	249	259	268	267	261	254	245	230	210	199	201	211	221	230
75	195	194	188	176	167	173	190	201	204	200	197	189	172	150	135	139	153	164	169
80	139	139	133	124	120	127	137	146	152	152	149	142	131	117	107	104	111	118	121
85	80.5	79.9	76.9	77.1	78.4	79.4	82.0	85.5	87.6	85.3	83.8	81.4	77.1	72.1	65.9	62.8	60.2	62.5	65.7
90	8.25	10.5	10.2	10.1	8.93	8.31	8.06	7.88	5.53	3.76	9.68	7.87	6.31	3.92	3.08	2.80	2.92	3.57	0.34
95	0.20	0.42	0.44	0.46	0.42	0.33	0.33	0.35	0.35	0.34	0.35	0.34	0.34	0.32	0.38	0.42	0.38	0.32	0.17
100	0.30	0.37	0.43	0.57	0.56	0.40	0.27	0.24	0.23	0.24	0.25	0.24	0.28	0.39	0.48	0.47	0.39	0.30	0.32
105	0.41	0.47	0.44	0.51	0.55	0.49	0.52	0.50	0.49	0.52	0.51	0.47	0.46	0.45	0.46	0.44	0.40	0.33	0.38
110	0.43	0.49	0.47	0.50	0.53	0.54	0.53	0.53	0.56	0.58	0.58	0.55	0.51	0.50	0.50	0.44	0.42	0.36	0.31
115	0.38	0.40	0.43	0.48	0.48	0.53	0.57	0.58	0.61	0.64	0.63	0.59	0.53	0.52	0.47	0.43	0.39	0.34	0.34
120	0.45	0.43	0.45	0.47	0.48	0.48	0.51	0.58	0.63	0.64	0.63	0.58	0.52	0.47	0.45	0.41	0.49	0.45	0.40
125	0.42	0.45	0.42	0.54	0.48	0.50	0.51	0.52	0.56	0.58	0.57	0.56	0.50	0.49	0.48	0.43	0.44	0.39	0.44
130	0.45	0.47	0.47	0.48	0.52	0.50	0.54	0.56	0.58	0.59	0.58	0.58	0.55	0.52	0.55	0.53	0.43	0.41	0.48
135	0.41	0.46	0.48	0.48	0.57	0.61	0.61	0.59	0.61	0.62	0.62	0.61	0.58	0.60	0.55	0.43	0.44	0.48	0.49
140	0.48	0.50	0.48	0.51	0.52	0.65	0.65	0.67	0.66	0.68	0.66	0.68	0.66	0.63	0.51	0.47	0.48	0.47	0.52
145	0.50	0.54	0.54	0.58	0.61	0.56	0.64	0.69	0.70	0.71	0.69	0.70	0.66	0.55	0.52	0.56	0.54	0.57	0.53
150	0.58	0.63	0.57	0.61	0.64	0.64	0.61	0.61	0.65	0.66	0.64	0.60	0.58	0.58	0.62	0.61	0.57	0.62	0.55
155	0.61	0.63	0.60	0.63	0.66	0.66	0.67	0.64	0.62	0.61	0.60	0.62	0.64	0.64	0.60	0.63	0.61	0.63	0.52
160	0.59	0.65	0.66	0.63	0.68	0.67	0.65	0.66	0.65	0.61	0.63	0.64	0.63	0.64	0.67	0.63	0.60	0.65	0.54
165	0.62	0.63	0.65	0.66	0.64	0.64	0.64	0.64	0.60	0.60	0.59	0.64	0.66	0.64	0.61	0.58	0.63	0.64	0.56
170	0.58	0.58	0.61	0.62	0.64	0.63	0.57	0.60	0.60	0.56	0.58	0.65	0.67	0.67	0.66	0.63	0.62	0.60	0.55
175	0.74	0.73	0.74	0.74	0.75	0.72	0.69	0.69	0.68	0.62	0.64	0.69	0.68	0.71	0.75	0.76	0.76	0.75	0.72
180	0.71	0.70	0.69	0.68	0.67	0.66	0.62	0.55	0.61	0.64	0.66	0.57	0.60	0.64	0.66	0.68	0.71	0.71	0.72

C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature:25.6DEG
 Operators:David
 Test Date:2016-01-15

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity:67.1%
 Test Distance:2.455m [K=1.0000]
 Remarks:

LUMINOUS DISTRIBUTION INTENSITY DATA

Test:U:120.0V I:0.2990A P:35.80W PF:0.9980 Lamp Flux:1767.12x2 lm																	
NAME:									TYPE:L48T8/830/15G-XT H						WEIGHT:		
SPEC.:									DIM.:						SERIAL No.:		
MFR.: ESPEN									SUR.: 1.2*0.6						PROTECTION ANGLE:		

Table--2

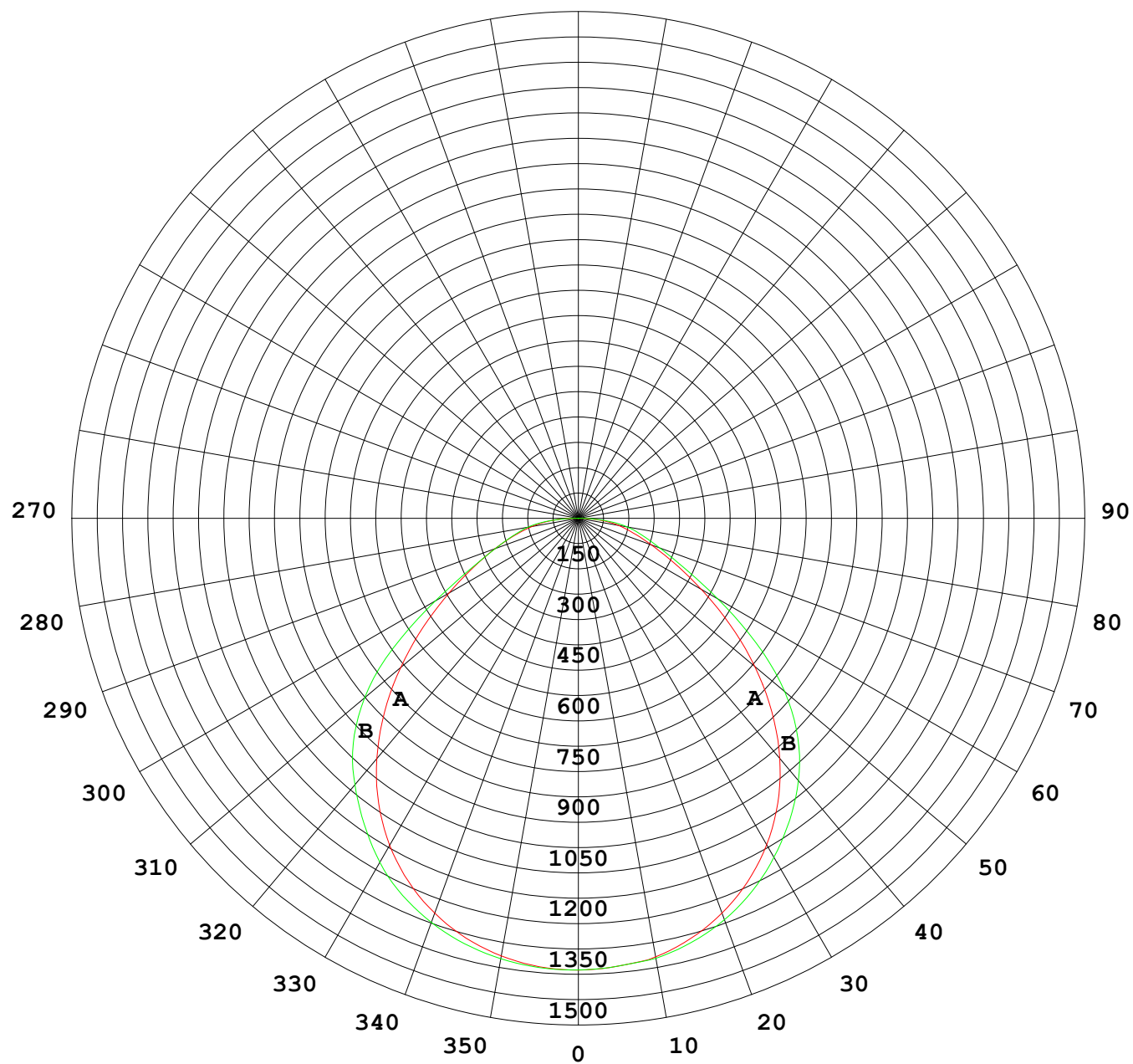
UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337	1337		
5	1331	1330	1330	1330	1331	1330	1331	1331	1331	1331	1332	1331	1332	1332	1332	1332	1332		
10	1317	1317	1317	1318	1319	1320	1321	1322	1323	1323	1323	1323	1323	1322	1322	1322	1322		
15	1286	1286	1288	1290	1292	1294	1296	1297	1299	1300	1299	1299	1298	1296	1295	1294	1294		
20	1243	1243	1246	1249	1252	1256	1259	1262	1264	1266	1265	1263	1262	1259	1256	1253	1252		
25	1186	1188	1191	1197	1203	1208	1212	1216	1218	1219	1219	1217	1213	1208	1203	1199	1197		
30	1115	1118	1124	1132	1140	1147	1152	1156	1159	1159	1158	1155	1150	1144	1137	1131	1127		
35	1030	1035	1045	1054	1065	1074	1083	1089	1091	1089	1085	1079	1072	1063	1055	1047	1042		
40	929	937	948	961	977	992	1004	1012	1014	1010	1002	990	978	965	955	946	940		
45	813	822	837	856	876	894	909	918	919	913	902	887	871	855	841	830	823		
50	684	695	712	732	753	771	785	793	798	796	785	769	750	733	716	703	696		
55	550	558	574	592	611	622	630	637	642	646	647	640	623	604	586	573	567		
60	420	426	437	450	458	463	469	474	477	481	485	486	485	475	459	448	446		
65	312	309	310	313	317	326	334	341	344	348	352	351	349	346	342	337	340		
70	227	218	209	204	212	230	246	253	256	260	260	255	245	239	242	250	257		
75	169	159	146	140	150	170	186	194	197	199	197	189	174	164	169	183	192		
80	121	115	106	105	114	127	138	144	147	147	143	135	126	123	123	129	138		
85	64.7	63.4	62.5	64.0	68.6	73.5	77.3	80.0	79.8	81.4	80.6	77.3	75.1	75.0	75.9	75.0	79.5		
90	0.54	0.76	0.83	1.00	1.22	1.29	1.28	1.48	1.56	1.90	2.40	2.77	3.09	12.0	11.7	12.6	13.3		
95	0.33	0.44	0.47	0.38	0.31	0.31	0.31	0.31	0.32	0.32	0.31	0.32	0.29	0.38	0.43	0.39	0.36		
100	0.30	0.37	0.53	0.46	0.32	0.28	0.21	0.19	0.20	0.22	0.21	0.23	0.25	0.40	0.52	0.39	0.30		
105	0.35	0.35	0.42	0.45	0.40	0.37	0.34	0.34	0.36	0.34	0.35	0.36	0.38	0.43	0.39	0.36	0.30		
110	0.34	0.35	0.39	0.41	0.43	0.42	0.40	0.43	0.44	0.42	0.41	0.41	0.38	0.34	0.36	0.35	0.38		
115	0.35	0.38	0.39	0.39	0.40	0.43	0.44	0.46	0.48	0.47	0.44	0.39	0.36	0.35	0.38	0.31	0.31		
120	0.42	0.47	0.39	0.43	0.41	0.41	0.42	0.46	0.48	0.46	0.43	0.40	0.38	0.39	0.35	0.36	0.38		
125	0.41	0.41	0.44	0.44	0.45	0.46	0.43	0.45	0.46	0.45	0.43	0.42	0.42	0.40	0.46	0.42	0.41		
130	0.45	0.45	0.48	0.53	0.46	0.47	0.49	0.50	0.49	0.48	0.47	0.46	0.43	0.43	0.47	0.37	0.45		
135	0.52	0.51	0.46	0.53	0.57	0.54	0.50	0.51	0.50	0.49	0.47	0.46	0.51	0.51	0.41	0.45	0.46		
140	0.50	0.52	0.50	0.50	0.58	0.58	0.57	0.54	0.55	0.50	0.54	0.53	0.53	0.51	0.44	0.44	0.48		
145	0.58	0.57	0.54	0.50	0.49	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.47	0.44	0.52	0.54	0.55		
150	0.57	0.53	0.53	0.54	0.50	0.46	0.46	0.52	0.52	0.49	0.44	0.42	0.45	0.51	0.51	0.51	0.59		
155	0.53	0.52	0.56	0.51	0.52	0.51	0.45	0.44	0.42	0.41	0.43	0.47	0.49	0.51	0.54	0.53	0.58		
160	0.54	0.56	0.51	0.55	0.52	0.50	0.47	0.48	0.44	0.44	0.47	0.48	0.49	0.55	0.51	0.52	0.57		
165	0.58	0.58	0.53	0.48	0.49	0.52	0.52	0.49	0.43	0.43	0.47	0.53	0.51	0.53	0.51	0.60	0.58		
170	0.55	0.58	0.57	0.56	0.55	0.56	0.55	0.54	0.48	0.47	0.51	0.53	0.52	0.56	0.56	0.58	0.57		
175	0.72	0.72	0.74	0.74	0.74	0.69	0.63	0.65	0.61	0.57	0.59	0.63	0.64	0.65	0.72	0.73	0.73		
180	0.72	0.70	0.69	0.69	0.68	0.67	0.66	0.61	0.61	0.63	0.63	0.58	0.64	0.67	0.68	0.69	0.71		

C Range: 0 - 360DEG
 C Interval: 10.0DEG
 Test Speed: HIGH
 Temperature:25.6DEG
 Operators:David
 Test Date:2016-01-15

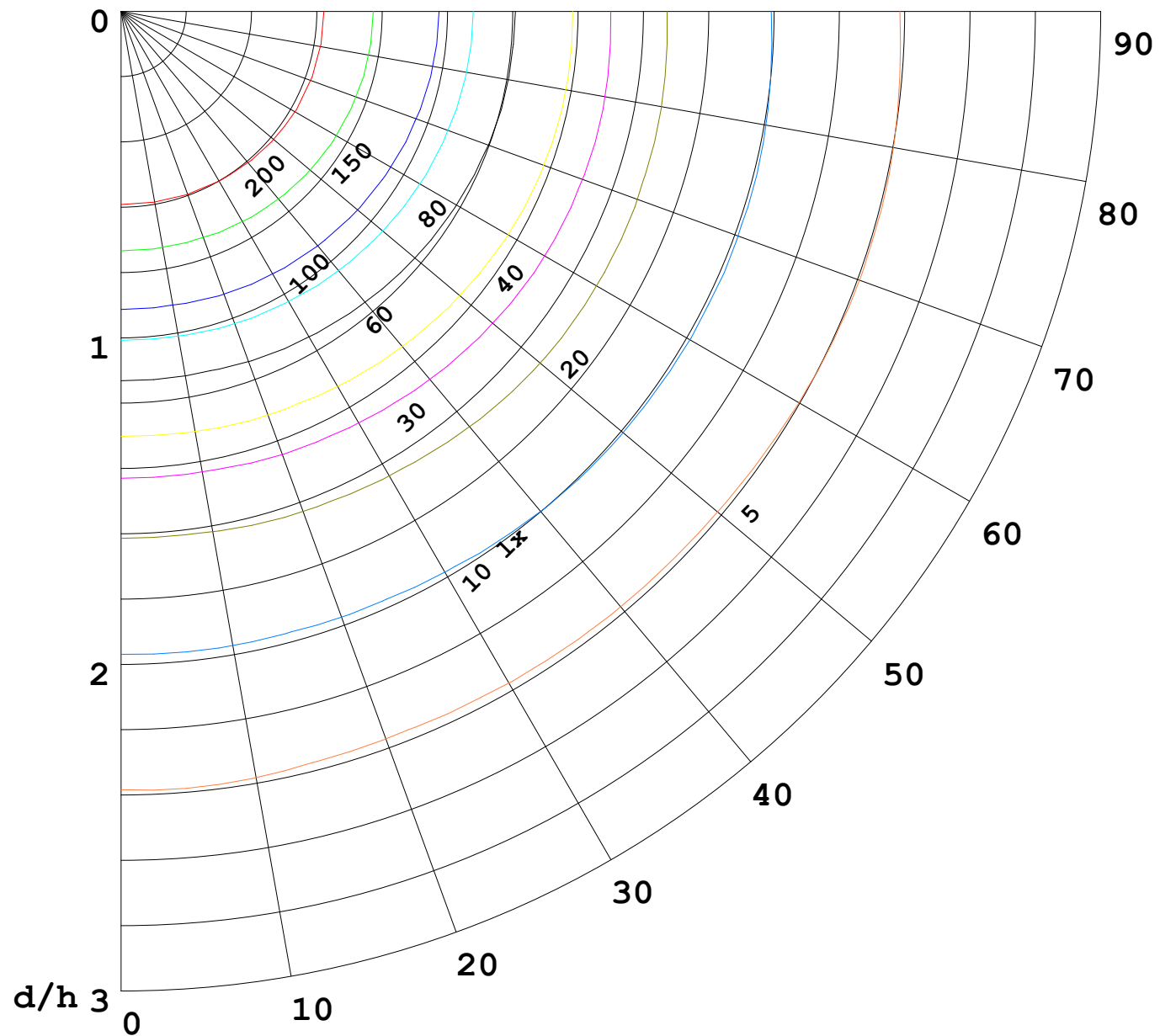
γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE G0-R5000_V2 SYSTEM V2.0.287
 Humidity:67.1%
 Test Distance:2.455m [K=1.0000]
 Remarks:

I (cd)



1000 lm

$\kappa = 1$



F = 5000 lm
 K = 0.7
 Hcc = 0.0 m
 Hfc = 0.0 m
 Eave = 100 lx

	Pcc	Pw	Pfc
—————	70	50	30
—————	50	30	20

