

Photometric and Electrical Measurement and Test Report for **LED GROUP ROBUS**

Room 1804-1810, East Block Huaxin Building, 2 Shuiyin Road, Yuexiu District, Guangzhou City

April 07, 2013

Product Name:	Down light
Model No:	R18230DL-01
Test Engineer:	David Zhang <i>David Zhang</i>
Report No.:	BTR66.181.13.522.01-1
Sample Received Date:	April 03, 2013
Test Performed Date:	April 03, 2013 to April 07, 2013
Reviewed By:	Steven Hsu <i>Steven Hsu</i>
Prepared By:	BEST Test Service Shenzhen Co., Ltd. 1st Floor, 1st Building, Weitai Industrial Park, Yingrenshi, Shiyan, Baoan, Shenzhen, China TEL: +86-755-28236006 FAX: +86-755-23467087-811 Email: certification@bestcert.cn



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1 - GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

Applicant	:	LED GROUP ROBUS
Product Name	:	Down light
Model No	:	R18230DL-01
Brand	:	ROBUS
Nominal Operation Voltage	:	AC 220V-240V/60Hz
Nominal Power	:	18W
Nominal CCT	:	4000K
Nominal CRI	:	83
Nominal Lumen Output	:	1350 Lumens
Nominal Life Time	:	35000 Hours
Number of hours operated prior to measurement for new sample	:	0 Hours
Stabilization Time	:	1.5 hours
Total operating time for measurement include stabilization time	:	3.5 hours
Date of Receiving Sample	:	April 03, 2013
Measurement quantities measured	:	1 pcs
Test Requested	:	1. Electrical and Photometric Test 2. Luminous Intensity Distribution Test;

1.2 Objective

The following test report is prepared on behalf of LED GROUP ROBUS used the following American National Standards or illumination Engineering Society of North America test guides:

ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products;

ANSI C79.1- 2002: American National Standard for Electric Lamps – Nomenclature for Glass Bulbs Intended for Use with Electric Lamps;

ANSI C78.20 – 2003: American National Standard for Electric Lamps – A, G, PS, and Similar Shapes with E26 Medium Screw Bases;

ANSI C78.21 – 2003: American National Standard for Electric Lamps – PAR and R Shapes;

ANSI C78.24 – 2001: American National Standard for Electric Lamps – Two-inch (51 mm);

Integral-reflector Lamps with Front Covers and GU5.3 or GX 5.3 Bases;

ANSI/IEC C81.61-2003: American National Standard for Electric Lamp Bases;

ANSI/IEEE C62.41 – 1991 (01-May-1991): Surge Voltages in Low-Voltage AC Power Circuits, Recommended Practice for;

CIE Publication No. 13.3 – 1995: Method of Measuring and Specifying Color Rendering of Light Sources;

CIE Publication No. 18.2 – 1983: The Basis of Physical Photometry;

IESNA LM-16-1993: Practical Guide to Colorimetry of Light Sources;

IESNA LM-28-89 – 1989: Guide for the Selection, Care, and Use of Electrical Instruments in the Photometric Laboratory;

IESNA LM-79-08 Electrical and Photometric Measurement of Solid State Lighting Products

UL 1993 – 1999: Standard for Self-Ballasted Lamps and Lamp Adapters;

UL 8750 – 2009: Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.3 Test Facility Description

The Energy Efficiency Lab used by BEST to collect energy efficiency measurement data is located in 1st Floor, 1st Building, Weitai Industrial Park, Yingrenshi, Shiyao, Baoan, Shenzhen, China. BEST Test Service Shenzhen Co., Ltd is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200770-0). BEST Test Service Shenzhen Co., Ltd is also an ELI accredited lab for lighting products (ELI Certificate No. ELI-L04-2010) and UL accredited lab for lighting products

1.4 Test Equipment List

Device	Manufacture	Model No	Serial No	Cal. Date	Cal Due Date
Integral Sphere	Everfine	1.5M SPEKTRON	608040T	Oct 20, 2012	Oct 20, 2013
Integral Sphere	Everfine	1.5M SPEKTRON	906025	Oct 20, 2012	Oct 20, 2013
Integral Sphere	Labsphere	LMS-650	6101002416	Mar 10, 2013	Mar 09, 2014
Spectro Meter Assy	Labsphere	CDS 2100	217101416	Mar 10, 2013	Mar 09, 2014
Plus UV-VIS-Near IR Spectrophotometer Colorimeter	Everfine	PMS-80-V1 (380nm-800nm)	608033	Oct 20, 2012	Oct 20, 2013
Plus UV-VIS-Near IR Spectrophotometer Colorimeter	Everfine	PMS-700 (200nm-800nm)	908001	Oct 20, 2012	Oct 20, 2013
Goniophotometer	Everfine	GOR-5000	1009001	Nov 20, 2012	Nov 19, 2013
6 ^{1/2} Digital Multimeter	Agilent	34401A	MY4702386	Oct 18, 2012	Oct 17, 2013
AC Power Source	California Instrument	1501I	S13093	N/A	N/A
AC Power Source	California Instrument	1501L	L03572	N/A	N/A
Standard Light Source	OSRAM	24V/50W	NO.1	Sep 17, 2012	Sep 16, 2013
Standard Light Source	OSRAM	24V/50W	NO.2	Sep 17, 2012	Sep 16, 2013
Multi-Function AC standard Meter	Everfine	PF2010S	605010	Oct 18, 2012	Oct 17, 2013
Digital Power Meter	Everfine	PF9811	902029	Oct 18, 2012	Oct 17, 2013
Digital Power Meter	YOKOGAWA	WT210	91K310009	Oct 18, 2012	Oct 17, 2013
Digital Power Meter	YOKOGAWA	WT210	91K310017	Oct 18, 2012	Oct 17, 2013
Digital Power Meter	YOKOGAWA	WT210	91K310016	Oct 18, 2012	Oct 17, 2013
Ballast Parameter Analyzer	Everfine	PF9821	905050	Oct 18, 2012	Oct 17, 2013
Second Meter	TIANFU	PC 396	N/A	Oct 18, 2012	Oct 17, 2013
Digital Storage Oscilloscope	Tektronix	TDS2012B	C051911	Oct 18, 2012	Oct 17, 2013

Statement of Traceability: BEST Test Service Shenzhen Co., Ltd. certifies that all calibration has been performed using suitable standards traceable to the NIM China.

2 - Test Method

2.1 Photometric and Electrical Measurement (Integrated Sphere Method)

Total light output (luminous flux) for the $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ambient temperature conditions is measured using an Everfine integrating sphere. Temperature is measured at a position inside the sphere. Spectral radiant flux measurements are made using PMS-80-V1 to the detector port of the integrating sphere. Each lamp is operated at rated voltage in its designated orientation. Each lamp should be stable before measurements are made. The determining method of stable is as follows:

Step 1 Take 3 measurements of the lamp light output at 15 minute interval (total time=30mintues.)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 350 to 1050 nm. The calibration of the sphere photometer-spectrometer system is traceable to the NIST USA. 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 WT210 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 380-800 nm.

2.2 Photometric and Electrical Measurement (GonioPhotometer Method)

Before each measurement, the method below should be used to determine the lamp is stable or not.

Step 1 Take 3 measurements of the lamp intensity at 15 minute interval (total time=30mintues.)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.

A Everfine GOR-5000 Goniometer was used to measure the intensity (candelas) at each angle of distribution for each sample; the photometric distance is 2.436m for near field, the photometric distance is 24.62meters for far field. Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to be stable before measurement was made. Electrical measurements including voltage, current, power and power factor were measured using the YOKOGAWA WT210 Power Analyzer.

Some graphics were created with Photometric Plus software.

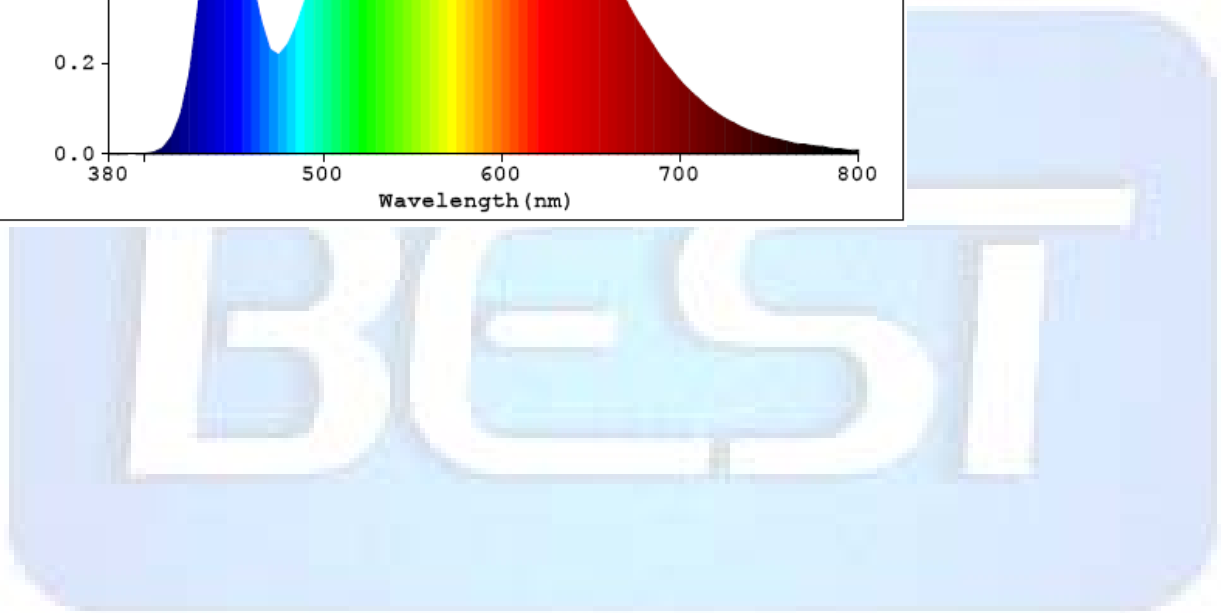
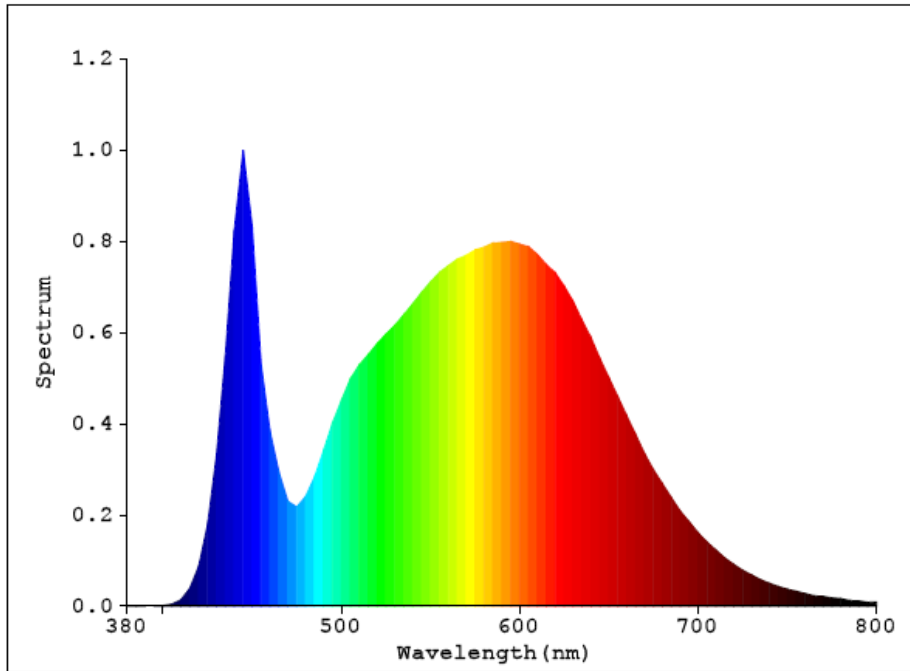
2.3 Deviation from standard operating procedure

None

3 – Summary of Test Result

	Item	Test Result		Accreditation
Required Fields	Lumen Output (Lumens)	1311.46		NVLAP/EPA
	Luminous Efficacy (lm/w)	76.73		NVLAP/EPA
	Correlated Color Temperature (CCT)	4159		NVLAP/EPA
	Color Rendering Index- CRI	84.6		NVLAP/EPA
	Input Power (W)	17.09		NVLAP/EPA
Optional Fields	Power Type	<input checked="" type="checkbox"/> AC	<input type="checkbox"/> DC	/
	Input Voltage (V)	220.0		NVLAP/EPA
	Input Current (A)	0.0839		NVLAP/EPA
	Power Factor	0.9258		NVLAP/EPA
	x(CIE 1931)	0.3729		NVLAP/EPA
	y(CIE 1931)	0.3693		NVLAP/EPA
	u' (CIE 1976)	0.2231		NVLAP/EPA
	v' (CIE 1976)	0.4971		NVLAP/EPA
	Duv(CIE 1976)	0.0013		NVLAP/EPA
	R9	28		NVLAP/EPA
	50% Beam Angle: (Degree)	107.8		NVLAP/EPA
	Center beam candlepower: (cd)	483.5		NVLAP/EPA
	Zonal lumen density (0-60°):	79.5%		NVLAP/EPA
	Zonal lumen density (60-90°):	20.5%		NVLAP/EPA
	Zonal lumen density (90-120°):	0%		NVLAP/EPA
Zonal lumen density (120-180°):	0%		NVLAP/EPA	

4 – Spectral Flux Plots



5 – EUT Photos



6 – Luminous Intensity Distribution Test Plots (IES Chromaticity)

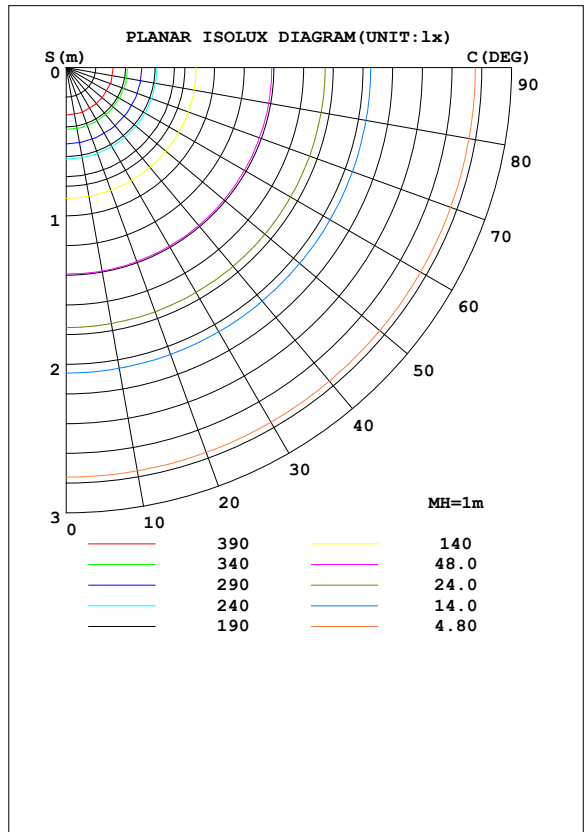
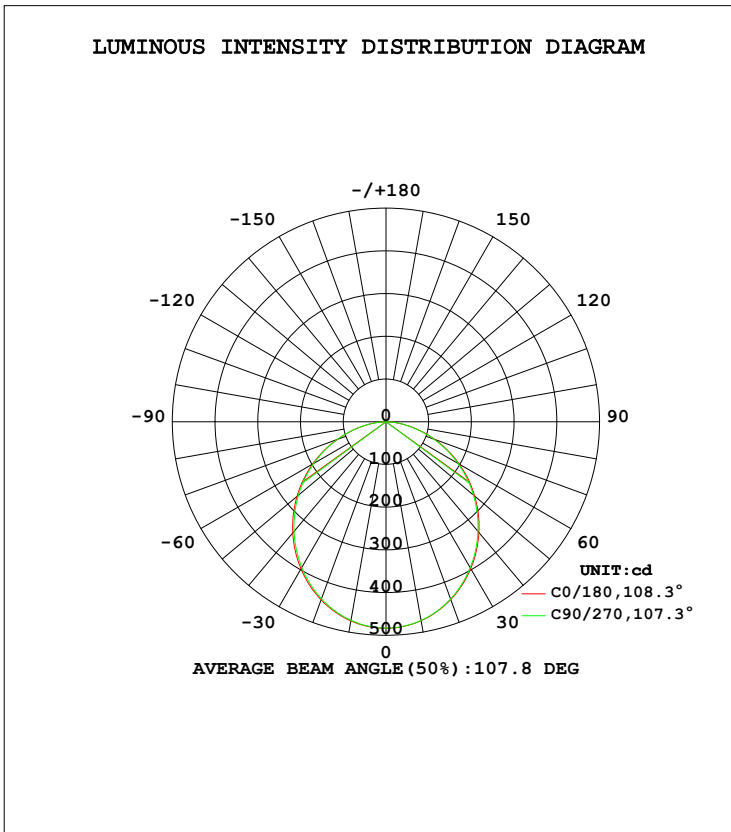
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LUMINAIRE PHOTOMETRIC TEST REPORT

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

DATA OF LAMP		PHOTOMETRIC DATA Eff: 76.73 lm/W			
MODEL	R18230DL-01	I _{max} (cd)	483.5	S/MH (C0/180)	1.23
NOMINAL POWER (W)	18	LOR (%)	100.0	S/MH (C90/270)	1.22
RATED VOLTAGE (V)	220	TOTAL FLUX (lm)	1311.5	η UP, DN (C0-180)	0.0, 50.0
NOMINAL FLUX (lm)	1311.46	CIE CLASS	DIRECT	η UP, DN (C180-360)	0.0, 50.0
LAMPS INSIDE	1	η up (%)	0.0	CIBSE SHR NOM	1.25
TEST VOLTAGE (V)	220.0	η down (%)	100.0	CIBSE SHR MAX	1.35



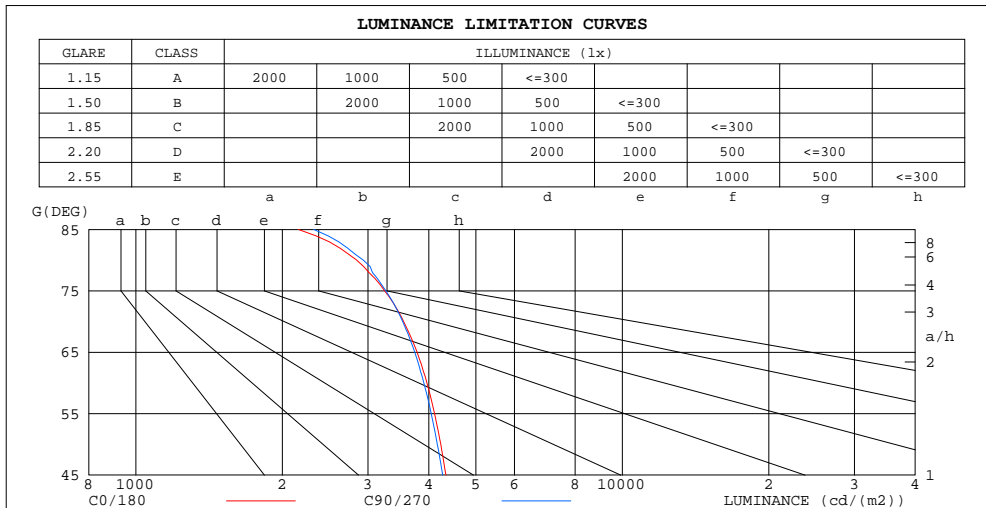
C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature: 24.3DEG
 Operators: David
 Test Date: 2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System: EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity: 46.4%
 Test Distance: 2.420m [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	473.4	473.0	472.2	472.0	472.8	472.5	472.5	473.1	0- 10	45.62	45.62	3.48,3.48
20	443.9	442.8	441.4	441.4	443.0	442.0	441.8	443.2	10- 20	129.7	175.3	13.4,13.4
30	397.8	396.3	394.1	394.5	396.8	395.3	394.4	396.8	20- 30	193.8	369.1	28.1,28.1
40	339.5	337.6	335.0	335.7	338.4	336.2	335.0	337.9	30- 40	229.9	599.0	45.7,45.7
50	272.1	270.4	267.8	268.5	271.2	268.8	267.4	270.5	40- 50	234.5	833.5	63.6,63.6
60	198.3	197.3	195.4	195.8	197.8	195.5	194.4	196.9	50- 60	208.7	1042	79.5,79.5
70	121.5	121.5	120.9	120.7	122.0	120.1	119.6	121.3	60- 70	156.9	1199	91.4,91.4
80	49.41	50.51	50.98	50.26	49.94	48.99	48.90	49.91	70- 80	89.12	1288	98.2,98.2
90	0.0967	0.1470	0.1756	0.1315	0.1580	0	0	0.0017	80- 90	23.17	1311	100,100
100	0	0	0	0	0	0	0	0	90-100	0.0046	1311	100,100
110	0	0	0	0	0	0	0	0	100-110	0.0000	1311	100,100
120	0	0	0	0	0	0	0	0	110-120	0	1311	100,100
130	0	0	0	0	0	0	0	0	120-130	0	1311	100,100
140	0	0	0	0	0	0	0	0	130-140	0	1311	100,100
150	0	0	0	0	0	0	0	0	140-150	0	1311	100,100
160	0	0	0	0	0	0	0	0	150-160	0	1311	100,100
170	0	0	0	0	0	0	0	0	160-170	0	1311	100,100
180	0	0	0	0	0	0	0	0	170-180	0	1311	100,100
DEG	LUMINOUS INTENSITY:cd									UNIT:lm		



LUMINANCE cd/(m2)		
G(DEG)	C0/180	C90/270
85	2157	2320
80	2845	2936
75	3247	3267
70	3554	3535
65	3785	3742
60	3966	3908
55	4110	4046
50	4234	4167
45	4338	4275

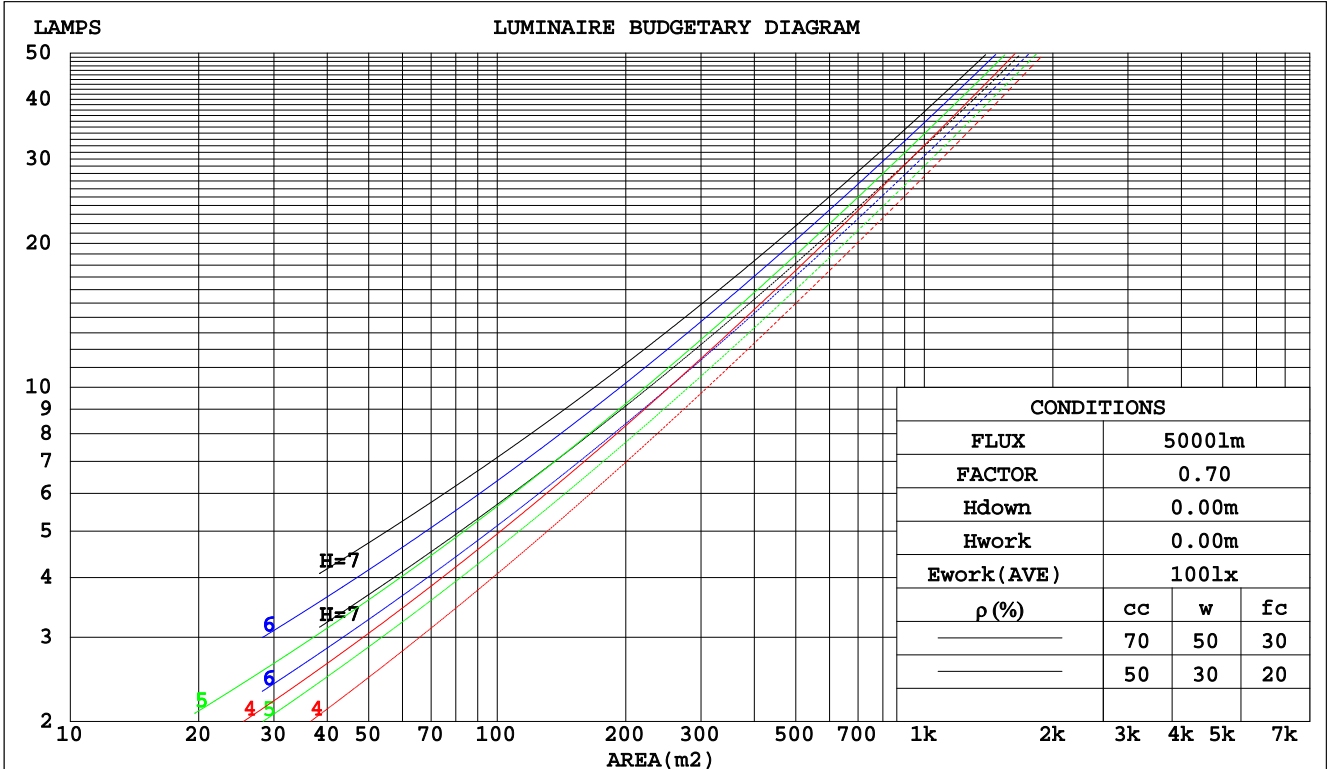
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 Operators:David
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γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

CU AND LUMINAIRE BUDGETARY ESTIMATE DIAGRAM

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

pcc	80%			70%			50%			30%			10%			0
	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0
pw																0
pfc	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	1.04	.00	.96	1.02	.98	.94	.98	.94	.91	.94	.91	.89	.90	.88	.86	.84
2.0	.91	.84	.78	.89	.83	.77	.85	.80	.76	.82	.78	.74	.79	.75	.72	.70
3.0	.80	.72	.65	.78	.71	.65	.75	.69	.63	.72	.67	.62	.70	.65	.61	.59
4.0	.71	.62	.55	.69	.61	.55	.67	.60	.54	.65	.58	.53	.62	.57	.53	.50
5.0	.63	.54	.48	.62	.54	.47	.60	.53	.47	.58	.51	.46	.56	.50	.46	.44
6.0	.57	.48	.42	.56	.48	.41	.54	.47	.41	.53	.46	.41	.51	.45	.40	.38
7.0	.52	.43	.37	.51	.43	.37	.49	.42	.36	.48	.41	.36	.47	.40	.36	.34
8.0	.47	.39	.33	.47	.38	.33	.45	.38	.33	.44	.37	.32	.43	.37	.32	.30
9.0	.43	.35	.30	.43	.35	.30	.42	.34	.29	.41	.34	.29	.39	.33	.29	.27
10.0	.40	.32	.27	.39	.32	.27	.38	.32	.27	.38	.31	.27	.37	.31	.26	.25



C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

WEC AND CCEC

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	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 Coefficients(WEC)									
0.0																
1.0	.306	.174	.055	.299	.170	.054	.285	.164	.052	.273	.158	.051	.262	.152	.049	
2.0	.288	.158	.048	.282	.155	.048	.270	.150	.047	.260	.146	.046	.250	.141	.045	
3.0	.267	.142	.043	.262	.140	.042	.251	.136	.041	.242	.133	.041	.233	.129	.040	
4.0	.247	.128	.038	.242	.127	.037	.233	.123	.037	.224	.120	.036	.216	.118	.036	
5.0	.228	.116	.034	.224	.115	.034	.216	.112	.033	.208	.110	.033	.201	.108	.032	
6.0	.212	.106	.030	.208	.105	.030	.201	.103	.030	.194	.101	.030	.188	.099	.029	
7.0	.197	.098	.028	.194	.097	.028	.188	.095	.027	.181	.093	.027	.176	.091	.027	
8.0	.184	.090	.025	.181	.089	.025	.176	.088	.025	.170	.086	.025	.165	.085	.025	
9.0	.173	.084	.023	.170	.083	.023	.165	.082	.023	.160	.080	.023	.156	.079	.023	
10.0	.163	.078	.022	.160	.077	.022	.156	.076	.021	.151	.075	.021	.147	.074	.021	

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						Ceiling Cavity Exitance Coefficients(CCEC)									
0.0	.190	.190	.190	.163	.163	.163	.111	.111	.111	.064	.064	.064	.020	.020	.020	
1.0	.180	.156	.135	.154	.134	.116	.105	.092	.080	.061	.053	.047	.019	.017	.015	
2.0	.172	.132	.098	.147	.114	.085	.101	.079	.059	.058	.046	.035	.019	.015	.011	
3.0	.164	.114	.075	.141	.099	.065	.096	.068	.045	.056	.040	.027	.018	.013	.009	
4.0	.156	.101	.059	.134	.087	.051	.092	.061	.036	.053	.036	.021	.017	.012	.007	
5.0	.149	.091	.047	.128	.078	.041	.088	.055	.029	.051	.032	.017	.016	.010	.006	
6.0	.142	.082	.039	.122	.071	.034	.084	.050	.024	.049	.029	.014	.016	.010	.005	
7.0	.135	.075	.033	.116	.065	.029	.080	.046	.021	.047	.027	.012	.015	.009	.004	
8.0	.128	.069	.029	.111	.060	.025	.077	.042	.018	.045	.025	.011	.014	.008	.004	
9.0	.122	.064	.025	.105	.056	.022	.073	.039	.016	.043	.023	.009	.014	.008	.003	
10.0	.117	.060	.023	.101	.052	.020	.070	.037	.014	.041	.022	.008	.013	.007	.003	

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

Uncorrected UGR Table

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm										
NAME:					TYPE:R18230DL-01			WEIGHT:		
DIM.:					SPEC.:			SERIAL No.:		
MFR.: LED GROUP ROBUS					SUR.:			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	17.8	19.3	18.0	19.5	19.7	17.7	19.2	18.0	19.4	19.6
3H	19.2	20.6	19.5	20.8	21.1	19.2	20.6	19.5	20.8	21.0
4H	19.8	21.1	20.1	21.4	21.6	19.7	21.1	20.1	21.3	21.6
6H	20.2	21.4	20.5	21.7	22.0	20.2	21.4	20.5	21.7	22.0
8H	20.3	21.5	20.6	21.8	22.1	20.3	21.5	20.6	21.8	22.1
12H	20.4	21.5	20.7	21.8	22.1	20.4	21.5	20.7	21.8	22.1
4H 2H	18.3	19.7	18.7	19.9	20.2	18.3	19.6	18.6	19.9	20.1
3H	20.0	21.2	20.3	21.5	21.8	20.0	21.1	20.3	21.4	21.7
4H	20.7	21.8	21.1	22.1	22.4	20.7	21.7	21.0	22.0	22.4
6H	21.2	22.2	21.6	22.5	22.9	21.2	22.1	21.6	22.5	22.9
8H	21.4	22.3	21.8	22.6	23.0	21.4	22.3	21.8	22.6	23.0
12H	21.5	22.3	21.9	22.7	23.1	21.5	22.3	21.9	22.7	23.1
8H 4H	20.9	21.8	21.4	22.2	22.6	20.9	21.8	21.3	22.2	22.5
6H	21.6	22.3	22.1	22.7	23.2	21.6	22.3	22.1	22.7	23.2
8H	21.9	22.5	22.3	22.9	23.4	21.9	22.5	22.3	22.9	23.4
12H	22.0	22.6	22.5	23.0	23.5	22.0	22.6	22.5	23.0	23.5
12H 4H	21.0	21.8	21.4	22.1	22.6	20.9	21.7	21.4	22.1	22.5
6H	21.7	22.3	22.1	22.7	23.2	21.7	22.3	22.1	22.7	23.2
8H	21.9	22.5	22.4	22.9	23.4	22.0	22.5	22.4	23.0	23.4
Variations with the observer position at spacings:										
S = 1.0H	+ 0.2 / - 0.2					+ 0.2 / - 0.2				
1.5H	+ 0.2 / - 0.3					+ 0.2 / - 0.3				
2.0H	+ 0.2 / - 0.3					+ 0.2 / - 0.3				

CIE Pub.117 Corrected 1311 lm Total Lamp Luminous Flux.(8log(F/F0) = 0.9)

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

UTILIZATION FACTORS TABLE

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

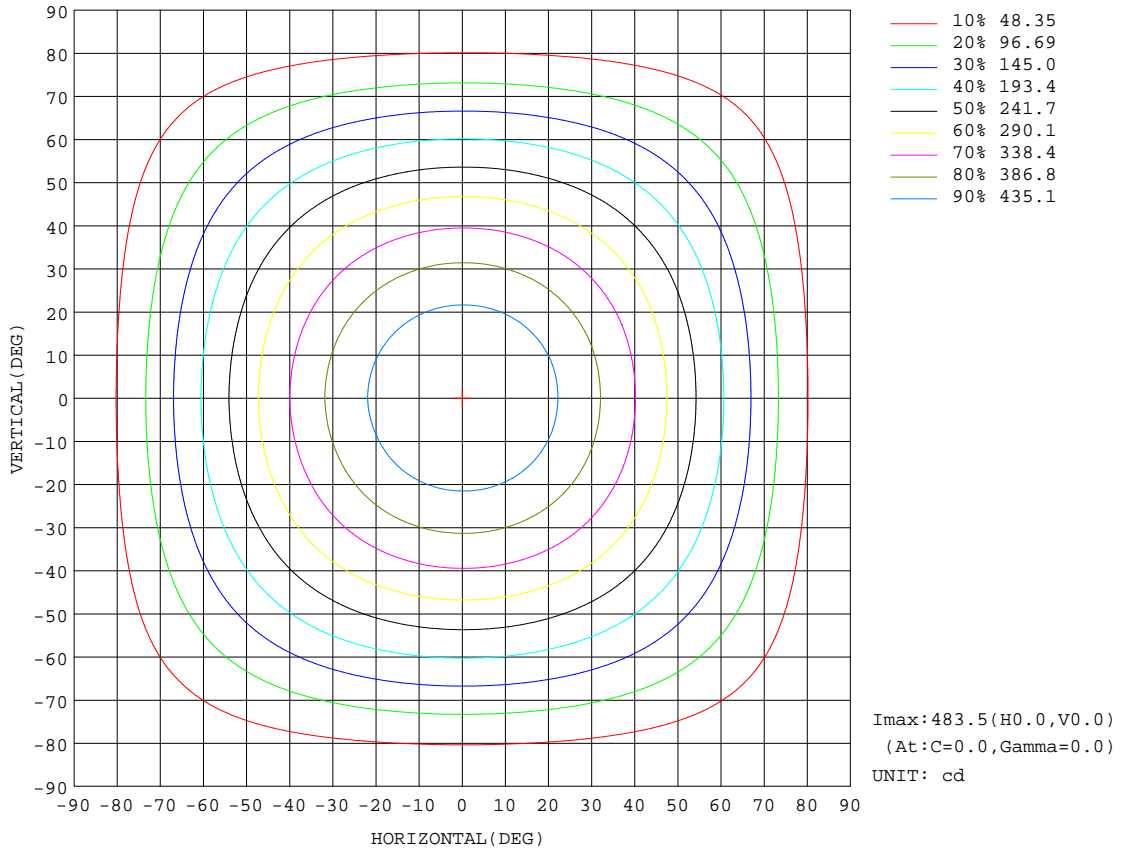
REFLECTANCE										
Ceiling	0.8	0.8	0.8	0.7	0.7	0.7	0.5	0.5	0.5	0
Walls	0.7	0.5	0.3	0.7	0.5	0.3	0.7	0.5	0.3	0
Working plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0
ROOM INDEX	UTILIZATION FACTORS(PERCENT) k(RI) x RCR = 5									
k = 0.60	58	47	40	57	46	40	56	46	39	33
0.80	68	57	49	67	56	49	65	55	49	42
1.00	77	66	58	75	65	58	73	66	57	50
1.25	84	73	66	82	72	66	79	71	65	58
1.50	89	79	72	87	78	71	84	76	70	63
2.00	95	87	80	93	86	80	90	83	78	70
2.50	99	91	86	97	90	85	93	87	83	75
3.00	102	96	90	100	94	89	96	91	87	79
4.00	106	101	96	104	99	95	100	96	92	83
5.00	109	104	100	106	102	98	102	98	95	86
ROOM INDEX	UF(total)									Direct
According to DIN EN 13032-2 2004			Suspended				SHRNOM = 1.25			

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

ISOCANDELA DIAGRAM

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

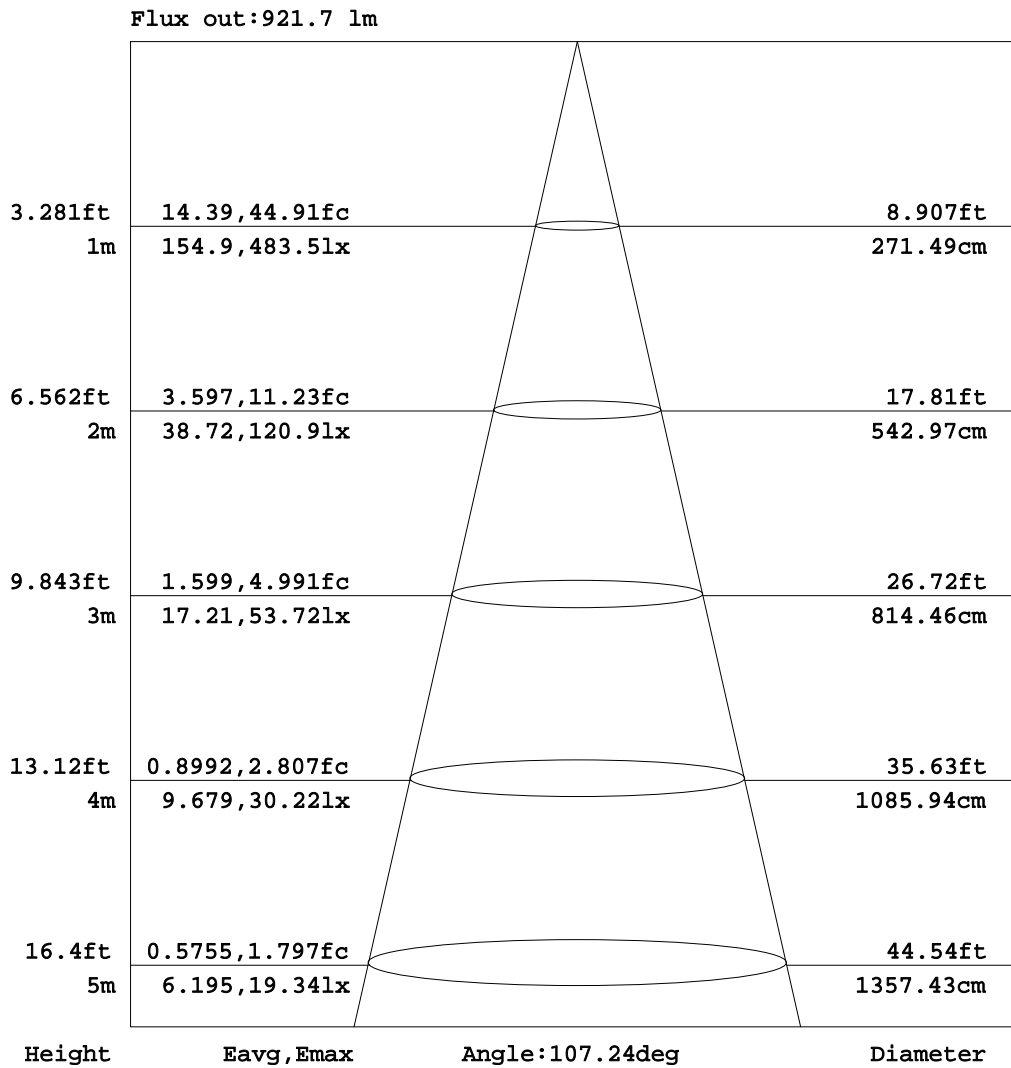


C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature: 24.3DEG
 Operators: David
 Test Date: 2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System: EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity: 46.4%
 Test Distance: 2.420m [K=1.0000]
 Remarks:

AAI Figure

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:



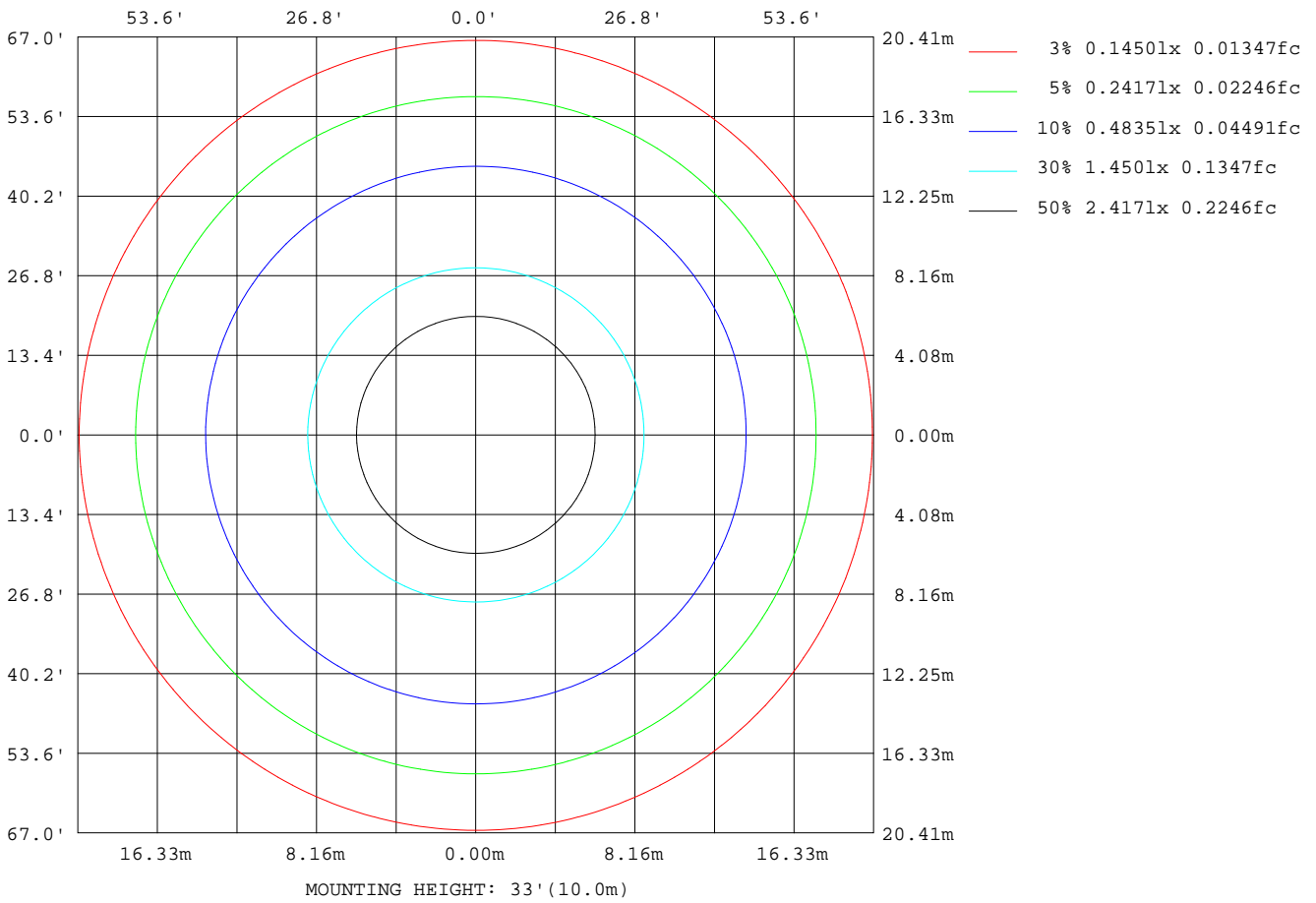
Note:The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

ISOLUX DIAGRAM

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:



C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

Average Luminance Table (CIBSE)

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

Parameter description for average Luminance	Symbol	Value	Unit
Luminance in Azimuth Plane	Bc	refer Table 2	cd/sq.m.
Intensity at angle Gamma in given azimuth plane	I	from data	cd/klm
Number of lamps	N	1	
Output of each lamp(initial lumens as specified)	F	1311.46	lm
Multiplying factor	K	1	
Luminous area in horizontal plane used in calculations	A	0.1	sq.m.
Angle to the downward vertical from light centre	Gamma	from data	deg

Table 1. Calculation parameters for determination of CIBSE LG3:1996 Average Luminance

G deg	C plane(deg)																		
	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
55	4110	4114	4112	4104	4092	4078	4065	4054	4046	4040	4038	4040	4045	4052	4060	4068	4078	4090	4098
60	3966	3971	3971	3962	3949	3935	3922	3911	3903	3898	3896	3898	3902	3909	3916	3923	3933	3947	3956
65	3785	3791	3791	3784	3773	3760	3749	3739	3731	3726	3724	3725	3728	3733	3738	3745	3755	3769	3779
70	3554	3565	3570	3566	3556	3545	3535	3526	3520	3515	3513	3513	3515	3518	3522	3526	3535	3553	3566
75	3247	3263	3271	3272	3267	3261	3256	3250	3243	3237	3233	3230	3231	3233	3233	3232	3239	3259	3273
80	2845	2869	2885	2892	2893	2891	2888	2885	2881	2876	2868	2860	2858	2858	2854	2847	2848	2863	2876
85	2157	2206	2244	2273	2292	2297	2289	2276	2262	2252	2256	2263	2266	2265	2257	2247	2253	2290	2318

Table 2. Average Luminance(cd/sq.m.) for defined C plane,Gamma angle

CIBSE Category	Gamma (deg)	Average Luminance		Patch Luminance	
		maximum	specified	maximum	specified
		calculated	maximum	measured	maximum
Category 1	55 to 90	4114	200	---	500
Category 2	65 to 90	3791	200	---	500
Category 3	75 to 90	3273	200	---	500

Table 3. Tabulation of Average and Patch Luminance(cd/sq.m.) for defined CIBSE categories

No match

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

Average Luminance Table (CIBSE)

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

Parameter description for average Luminance	Symbol	Value	Unit
Luminance in Azimuth Plane	Bc	refer Table 2	cd/sq.m.
Intensity at angle Gamma in given azimuth plane	I	from data	cd/klm
Number of lamps	N	1	
Output of each lamp(initial lumens as specified)	F	1311.46	lm
Multiplying factor	K	1	
Luminous area in horizontal plane used in calculations	A	0.1	sq.m.
Angle to the downward vertical from light centre	Gamma	from data	deg

Table 1. Calculation parameters for determination of CIBSE LG3:2001 Average Luminance

G deg	C plane (deg)																		
	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
55	4110	4114	4112	4104	4092	4078	4065	4054	4046	4040	4038	4040	4045	4052	4060	4068	4078	4090	4098
60	3966	3971	3971	3962	3949	3935	3922	3911	3903	3898	3896	3898	3902	3909	3916	3923	3933	3947	3956
65	3785	3791	3791	3784	3773	3760	3749	3739	3731	3726	3724	3725	3728	3733	3738	3745	3755	3769	3779
70	3554	3565	3570	3566	3556	3545	3535	3526	3520	3515	3513	3513	3515	3518	3522	3526	3535	3553	3566
75	3247	3263	3271	3272	3267	3261	3256	3250	3243	3237	3233	3230	3231	3233	3233	3232	3239	3259	3273
80	2845	2869	2885	2892	2893	2891	2888	2885	2881	2876	2868	2860	2858	2858	2854	2847	2848	2863	2876
85	2157	2206	2244	2273	2292	2297	2289	2276	2262	2252	2256	2263	2266	2265	2257	2247	2253	2290	2318

Table 2. Average Luminance(cd/sq.m.) for defined C plane,Gamma angle

range (deg)	Maximum measured	Average Luminance (cd/sq.m)			
		Maximum limit for screen type & software category used			
		Type I,II screen Some neg.s'ware	Type I,II screen Only pos.s'ware	Type III screen Some neg.s'ware	Type III screen Only pos.s'ware
55 to 90	4114	1000	1500	200	500
65 to 90	3791	1000	1500	200	500

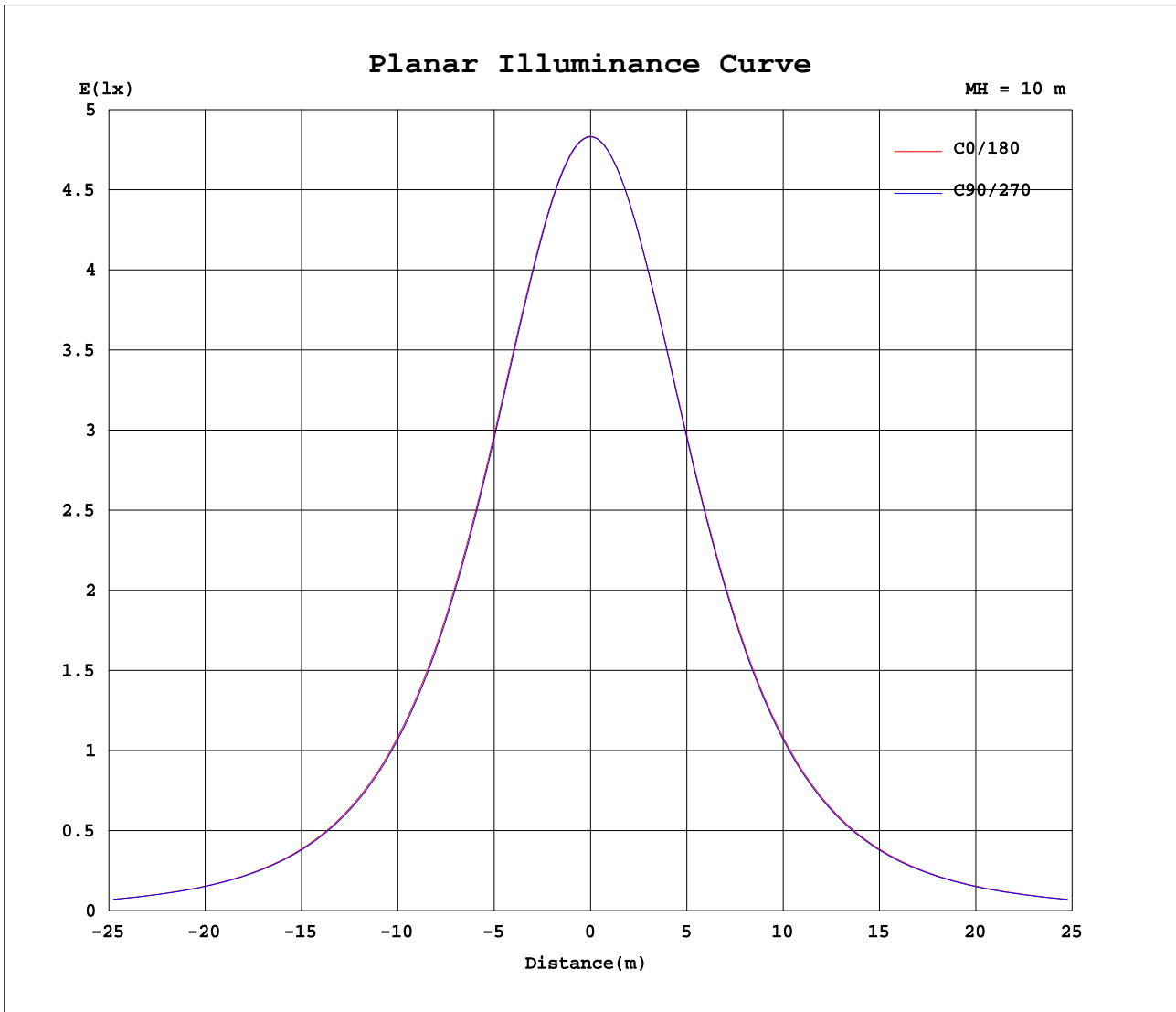
Table 3. Tabulation of average luminance(cd/sq.m.) and luminance limits

No match

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

Planar Illuminance Curve



C Range: 0 - 360DEG
C Interval: 22.5DEG
Test Speed: HIGH
Temperature: 24.3DEG
Operators: David
Test Date: 2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
Test System: EVERFINE GO-R5000_V2 SYSTEM V2.0.265
Humidity: 46.4%
Test Distance: 2.420m [K=1.0000]
Remarks:

LUMINOUS DISTRIBUTION INTENSITY DATA

Test:U:220.0V I:0.0839A P:17.09W PF:0.9258 Lamp Flux:1311.46x1 lm		
NAME:	TYPE:R18230DL-01	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

Table--1

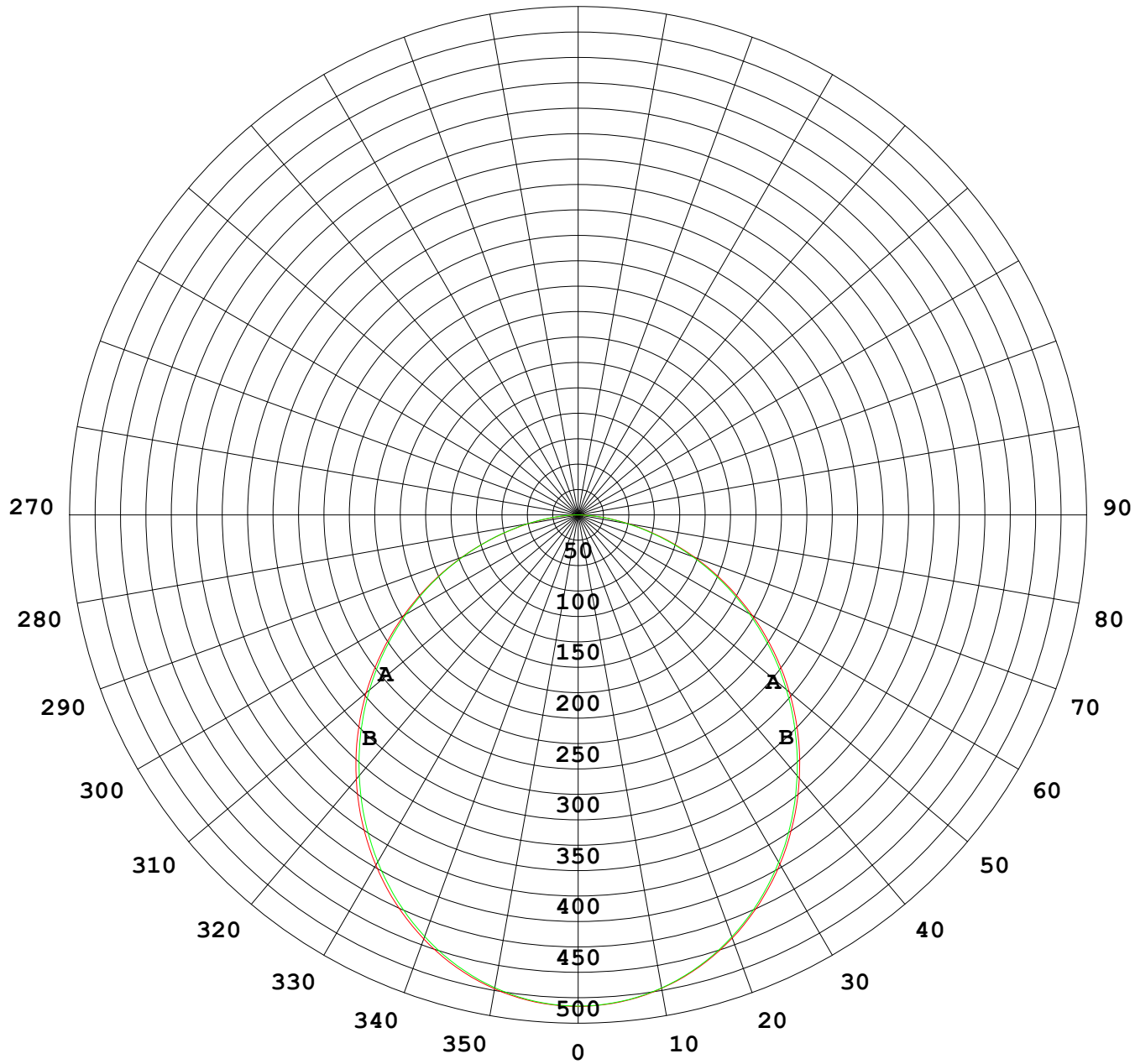
UNIT: cd

C (DEG) \ γ (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338			
0	483	483	483	483	483	483	483	483	483	483	483	483	483	483	483	483			
5	481	481	481	480	480	480	480	480	481	481	481	480	480	481	481	481			
10	473	473	473	473	472	472	472	472	473	473	472	472	473	473	473	473			
15	461	461	460	460	459	459	459	459	460	460	460	459	459	460	460	461			
20	444	444	443	442	441	441	441	442	443	443	442	442	442	442	443	444			
25	423	422	421	420	419	419	420	420	422	421	420	420	420	421	422	423			
30	398	398	396	395	394	394	395	395	397	396	395	395	394	395	397	398			
35	370	370	368	367	366	366	366	367	369	368	367	366	366	367	369	370			
40	339	339	338	336	335	335	336	336	338	338	336	335	335	336	338	340			
45	307	306	305	303	302	302	303	304	306	305	303	302	302	303	305	307			
50	272	272	270	269	268	268	268	269	271	270	269	268	267	268	270	272			
55	236	235	234	233	232	232	233	233	235	234	233	231	231	232	234	236			
60	198	198	197	196	195	195	196	196	198	197	195	194	194	195	197	199			
65	160	160	159	159	158	158	158	158	160	159	158	157	157	158	159	160			
70	122	122	122	121	121	121	121	121	122	121	120	120	120	120	121	122			
75	84.0	84.4	84.6	84.7	84.6	84.4	84.2	83.6	84.7	83.8	83.2	82.8	83.0	83.6	84.4	85.0			
80	49.4	50.0	50.5	50.8	51.0	50.4	50.3	49.5	49.9	49.3	49.0	48.8	48.9	49.4	49.9	50.3			
85	18.8	19.5	20.1	20.3	20.2	20.3	20.0	19.3	20.2	19.9	19.4	19.2	19.0	19.4	19.9	19.8			
90	0.10	0.11	0.15	0.16	0.18	0.18	0.13	0.11	0.16	0.04	0.00	0.00	0.00	0.00	0.00	0.03			
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
140	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
170	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

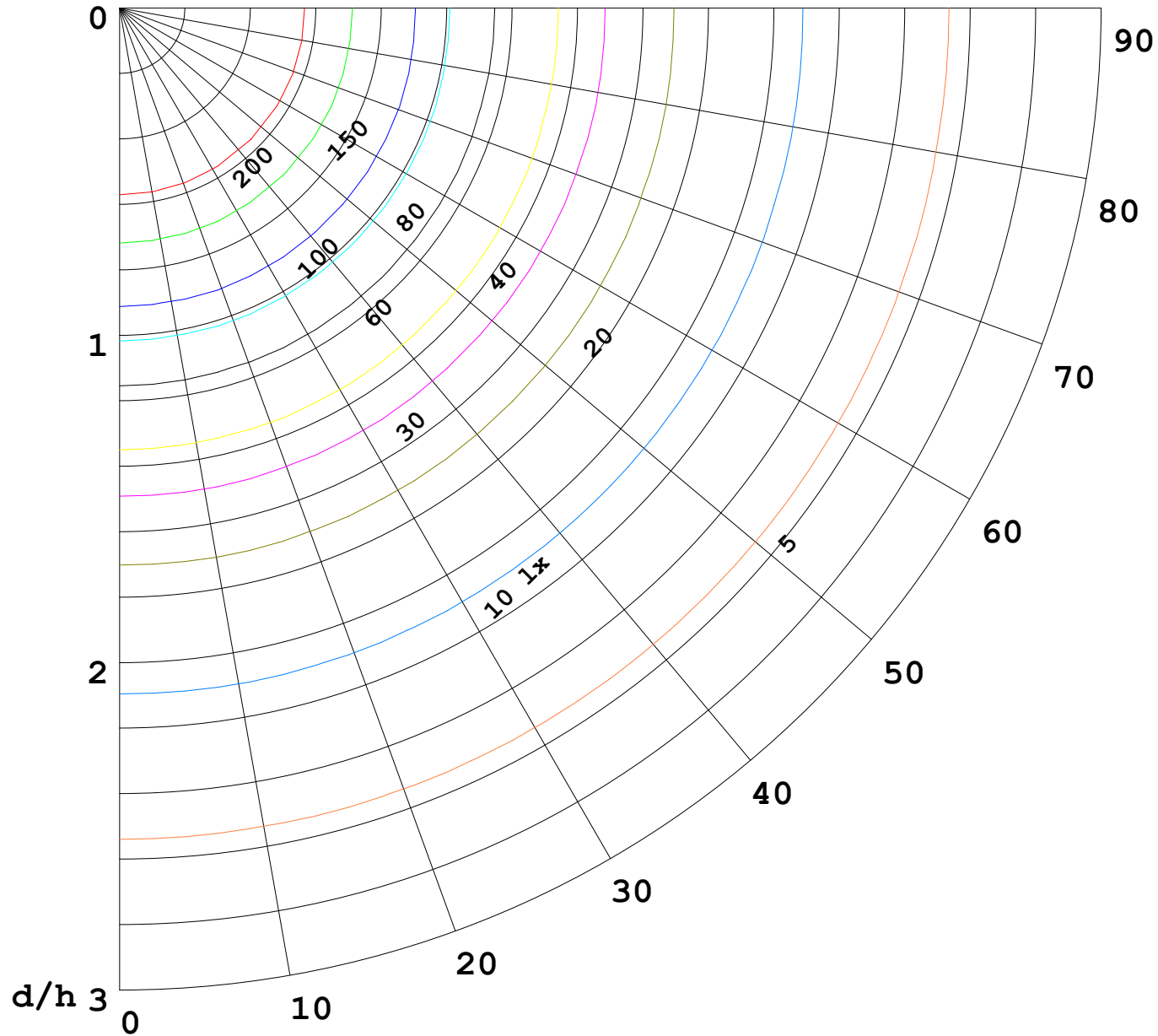
γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

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

