



Product Test Report - Photometric/Radiometric

Method: LM-79:2019

Evaluation: Photometric Summary

Evaluation: Distribution Plots

Test results reported for:

LightArt A 3FORM COMPANY

Product Description: Acoustic Ring

Issued Report:

LIGT010-010_Acoustic Ring

Project: 80037638 - TPPPT

Original issue date:

Wednesday, April 29, 2020

Revision Issue Date:

First Issue

Prepared for:

LightArt A 3FORM COMPANY

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A handwritten signature in blue ink that reads 'Aaron Miller'.

Aaron Miller

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Test & Measurement Services

Product Test Report - Photometric/Radiometric

Manufacturer: LightArt A 3FORM COMPANY

Report Number: LIGT010-010

Product Description: Acoustic Ring

Release Date: 4/29/2020

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Product Test Report - Photometric/Radiometric

Manufacturer: LightArt A 3FORM COMPANY

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SAMPLE DESCRIPTION

Lab sample identification: 1

Customer Identification: Acoustic Ring

Manufacturer: LightArt A 3FORM COMPANY

Part number: NA

Model Number: NA

Description: 1' x 1' section

Manufacturer's ratings

Max Current (A): 0.11072

Operating voltage: 120.2

CCT: 3098

Frequency (Hz): 60

Type: LED

Sample Device as Received



Sample Device Mounted to Test Apparatus

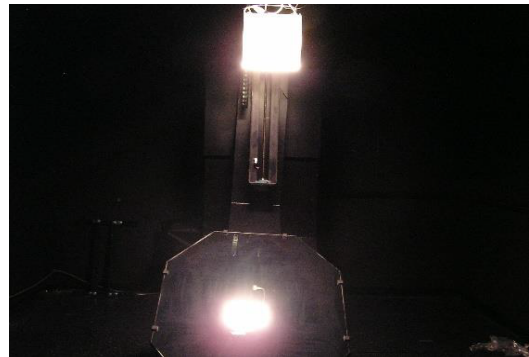
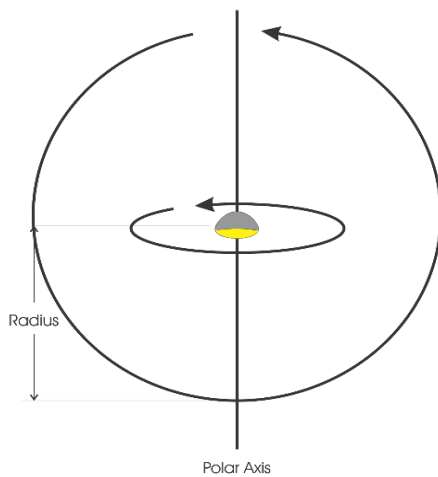


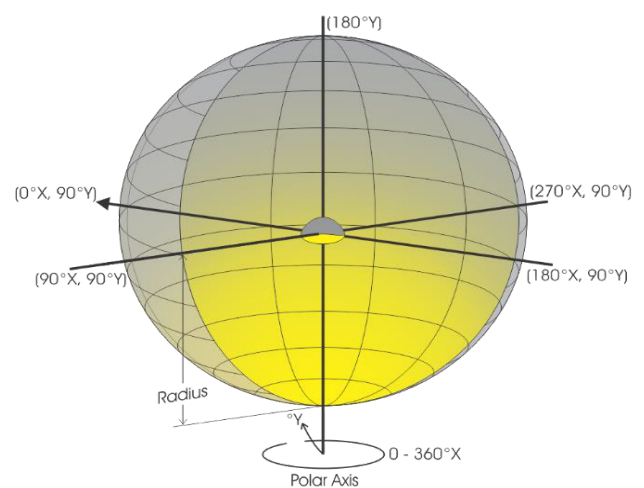
Image At 0° and 0°, See Equipment Geometry

Equipment Geometry - For Sample Device Mounted



Radius = 10cm ±0.1

Test Geometry - Type C Coordinates



Coordinate System Description

Reference: LM-75-01 Goniophotometer Types and Photometric Coordinates

Type C coordinate system, the polar axis is vertical. The angles measure in the vertical half planes of data are called vertical angles, and the angles to the horizontal half planes are called lateral angles. The vertical V angles range in value from 0° to 180°. The lateral L planes range in value from 0° to 360°.

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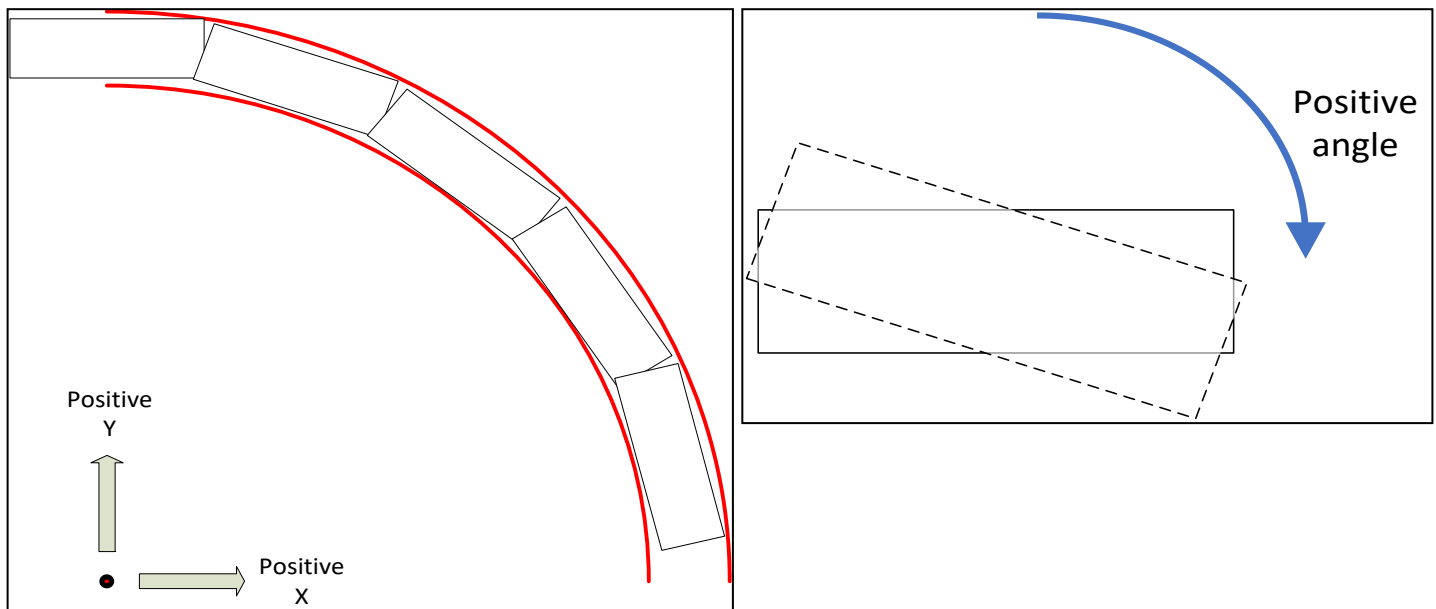
Release Date: 4/29/2020

IES FILE USAGE INSTRUCTIONS

This test report and accompanying IES file, are for a single 1' x 1' (ft) segment of the Acoustic Ring. To use this IES file in application, segments must be built around a ring diameter as described in the following table.

Ring Diameter [feet]	Number of 1' Segments [count]	Lumens [Lm]
Ø	1	268
6	19	5098
8	25	6708
10	32	8586
12	38	10195
14	44	11805
16	50	13415

IES File: **LIGT010-01 Acoustic Ring.ies**



Product Test Report - Photometric/Radiometric

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Product Description: Acoustic Ring

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RING DIAMETER (ft)																		
SEG	6			8			10			12			14			16		
	x [ft]	y [ft]	Ø	x [ft]	y [ft]	Ø	x [ft]	y [ft]	Ø	x [ft]	y [ft]	Ø	x [ft]	y [ft]	Ø	x [ft]	y [ft]	Ø
0	0	3	0	0	4	0	0	5	0	0	6	0	0	7	0	0	8	0
1	0	3	0	0	4	0	0	5	0	0	6	0	0	7	0	0	8	0
2	1	2.8	19	1	3.9	14	1	4.9	11	0.9	5.9	9	1	6.9	8	1	7.9	7
3	1.8	2.4	38	1.9	3.5	29	2	4.6	23	2	5.7	19	1.9	6.7	16	1.9	7.8	14
4	2.5	1.6	57	2.7	2.9	43	2.8	4.1	34	2.8	5.3	28	3	6.3	25	3	7.4	22
5	2.9	0.7	76	3.4	2.1	58	3.5	3.5	45	3.7	4.7	38	3.8	5.9	33	3.9	7	29
6	3	-0.3	95	3.8	1.2	72	4.1	2.8	56	4.4	4.1	47	4.6	5.3	41	4.7	6.5	36
7	2.7	-1.2	114	4	0.3	86	4.6	1.9	68	5	3.3	57	5.3	4.6	49	5.5	5.9	43
8	2.2	-2	133	3.9	-0.8	101	4.9	1	79	5.5	2.4	66	5.9	3.8	57	6.1	5.1	50
9	1.4	-2.6	152	3.6	-1.7	115	5	0	90	5.8	1.5	76	6.3	3	65	6.8	4.2	58
10	0.5	-3	171	3.1	-2.6	130	4.9	-1	101	6	0.5	85	6.7	1.9	74	7.3	3.4	65
11	-0.5	-3	189	2.4	-3.2	144	4.6	-2	113	6	-0.5	95	6.9	1	82	7.6	2.5	72
12	-1.4	-2.6	208	1.5	-3.7	158	4.1	-2.8	124	5.8	-1.5	104	7	0	90	7.9	1.5	79
13	-2.2	-2	227	0.5	-4	173	3.5	-3.5	135	5.5	-2.4	114	6.9	-1	98	8	0.6	86
14	-2.7	-1.2	246	-0.5	-4	187	2.8	-4.1	146	5	-3.3	123	6.7	-1.9	106	8	-0.6	94
15	-3	-0.3	265	-1.5	-3.7	202	1.9	-4.6	158	4.4	-4.1	133	6.3	-3	115	7.9	-1.5	101
16	-2.9	0.7	284	-2.4	-3.2	216	1	-4.9	169	3.7	-4.7	142	5.9	-3.8	123	7.6	-2.5	108
17	-2.5	1.6	303	-3.1	-2.6	230	0	-5	180	2.8	-5.3	152	5.3	-4.6	131	7.3	-3.4	115
18	-1.8	2.4	322	-3.6	-1.7	245	-1	-4.9	191	2	-5.7	161	4.6	-5.3	139	6.8	-4.2	122
19	-1	2.8	341	-3.9	-0.8	259	-2	-4.6	203	0.9	-5.9	171	3.8	-5.9	147	6.1	-5.1	130
20	-	-	-	-4	0.3	274	-2.8	-4.1	214	0	-6	180	3	-6.3	155	5.5	-5.9	137
21	-	-	-	-3.8	1.2	288	-3.5	-3.5	225	-0.9	-5.9	189	1.9	-6.7	164	4.7	-6.5	144
22	-	-	-	-3.4	2.1	302	-4.1	-2.8	236	-2	-5.7	199	1	-6.9	172	3.9	-7	151
23	-	-	-	-2.7	2.9	317	-4.6	-1.9	248	-2.8	-5.3	208	0	-7	180	3	-7.4	158
24	-	-	-	-1.9	3.5	331	-4.9	-1	259	-3.7	-4.7	218	-1	-6.9	188	1.9	-7.8	166
25	-	-	-	-1	3.9	346	-5	0	270	-4.4	-4.1	227	-1.9	-6.7	196	1	-7.9	173
26	-	-	-	0	4	360	-4.9	1	281	-5	-3.3	237	-3	-6.3	205	0	-8	180
27	-	-	-	1	3.9	374	-4.6	2	293	-5.5	-2.4	246	-3.8	-5.9	213	-1	-7.9	187
28	-	-	-	-	-	-	-4.1	2.8	304	-5.8	-1.5	256	-4.6	-5.3	221	-1.9	-7.8	194
29	-	-	-	-	-	-	-3.5	3.5	315	-6	-0.5	265	-5.3	-4.6	229	-3	-7.4	202
30	-	-	-	-	-	-	-2.8	4.1	326	-6	0.5	275	-5.9	-3.8	237	-3.9	-7	209
31	-	-	-	-	-	-	-1.9	4.6	338	-5.8	1.5	284	-6.3	-3	245	-4.7	-6.5	216
32	-	-	-	-	-	-	-1	4.9	349	-5.5	2.4	294	-6.7	-1.9	254	-5.5	-5.9	223
33	-	-	-	-	-	-	-	-	-	-5	3.3	303	-6.9	-1	262	-6.1	-5.1	230
34	-	-	-	-	-	-	-	-	-	-4.4	4.1	313	-7	0	270	-6.8	-4.2	238
35	-	-	-	-	-	-	-	-	-	-3.7	4.7	322	-6.9	1	278	-7.3	-3.4	245
36	-	-	-	-	-	-	-	-	-	-2.8	5.3	332	-6.7	1.9	286	-7.6	-2.5	252
37	-	-	-	-	-	-	-	-	-	-2	5.7	341	-6.3	3	295	-7.9	-1.5	259
38	-	-	-	-	-	-	-	-	-	-0.9	5.9	351	-5.9	3.8	303	-8	-0.6	266
39	-	-	-	-	-	-	-	-	-	-	-	-	-5.3	4.6	311	-8	0.6	274
40	-	-	-	-	-	-	-	-	-	-	-	-	-4.6	5.3	319	-7.9	1.5	281
41	-	-	-	-	-	-	-	-	-	-	-	-	-3.8	5.9	327	-7.6	2.5	288
42	-	-	-	-	-	-	-	-	-	-	-	-	-3	6.3	335	-7.3	3.4	295
43	-	-	-	-	-	-	-	-	-	-	-	-	-1.9	6.7	344	-6.8	4.2	302
44	-	-	-	-	-	-	-	-	-	-	-	-	-1	6.9	352	-6.1	5.1	310
45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-5.5	5.9	317
46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-4.7	6.5	324
47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-3.9	7	331
48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-3	7.4	338
49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-1.9	7.8	346
50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-1	7.9	353

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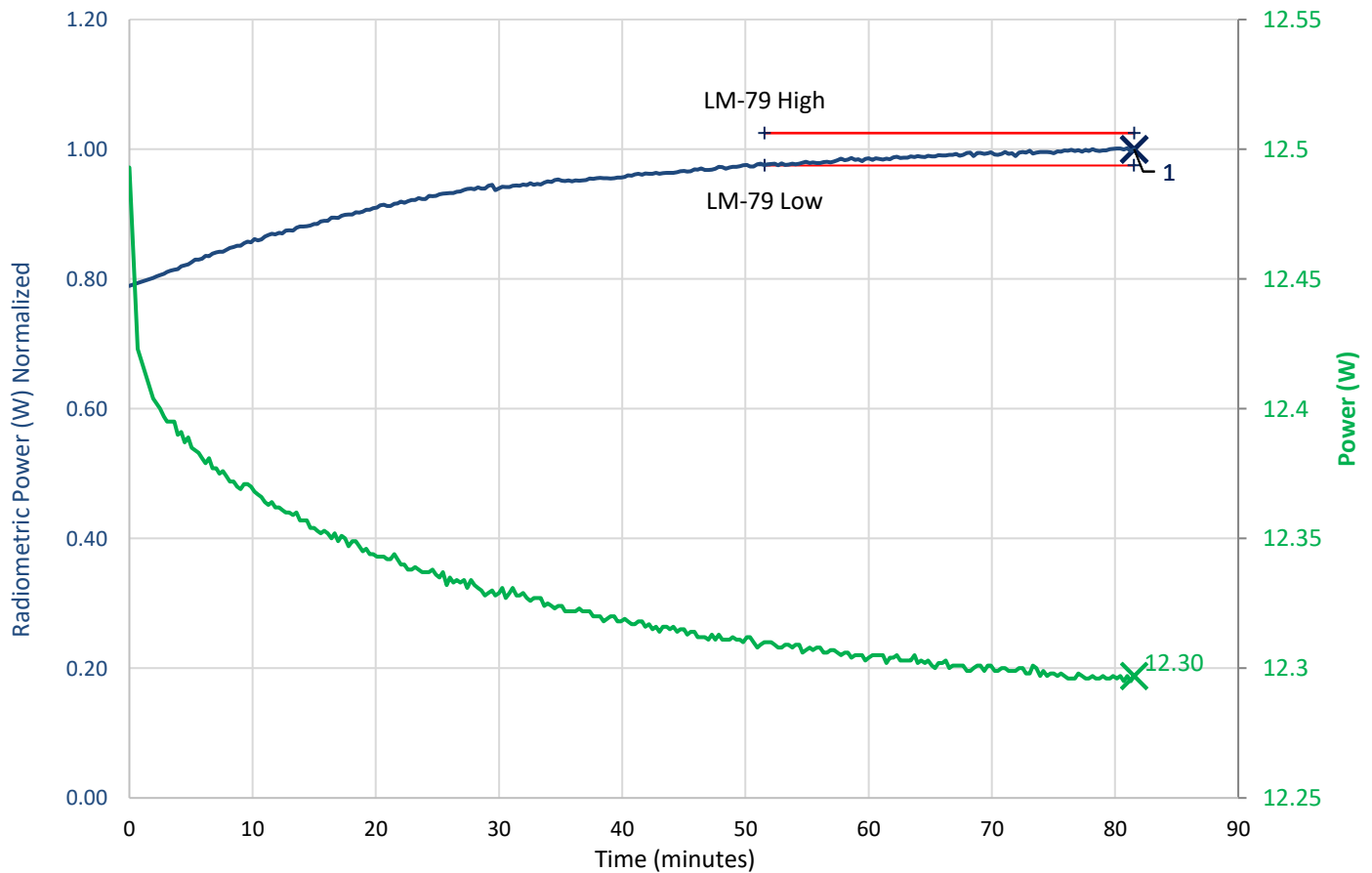
Release Date: 4/29/2020

OPTICAL STABILIZATION

Stabilization Description - A series of 283 measurements are recorded during the stabilization period. The final stabilized measurement, as defined by eport Type from List, is reported after 82 minutes of recorded device runtime. The 'Measurements in Range', provided below, are a histogram of measurements recorded during the 30 minute stabilization window.

% of range	Radiometric Power (W)	Measurements in Range
97.515%	0.98	12
97.780%	0.98	10
98.044%	0.98	4
98.309%	0.98	12
98.573%	0.99	9
98.837%	0.99	12
99.102%	0.99	11
99.366%	0.99	18
99.631%	1.00	13
99.895%	1.00	10
100.000%	1.00	Reported

% of range	Power (W)	Measurements in Range
99.984%	12.30	12
99.996%	12.30	17
100.008%	12.30	15
100.020%	12.30	18
100.033%	12.30	15
100.045%	12.30	12
100.057%	12.30	14
100.069%	12.31	10
100.081%	12.31	11
100.094%	12.31	11
100.000%	12.30	Reported



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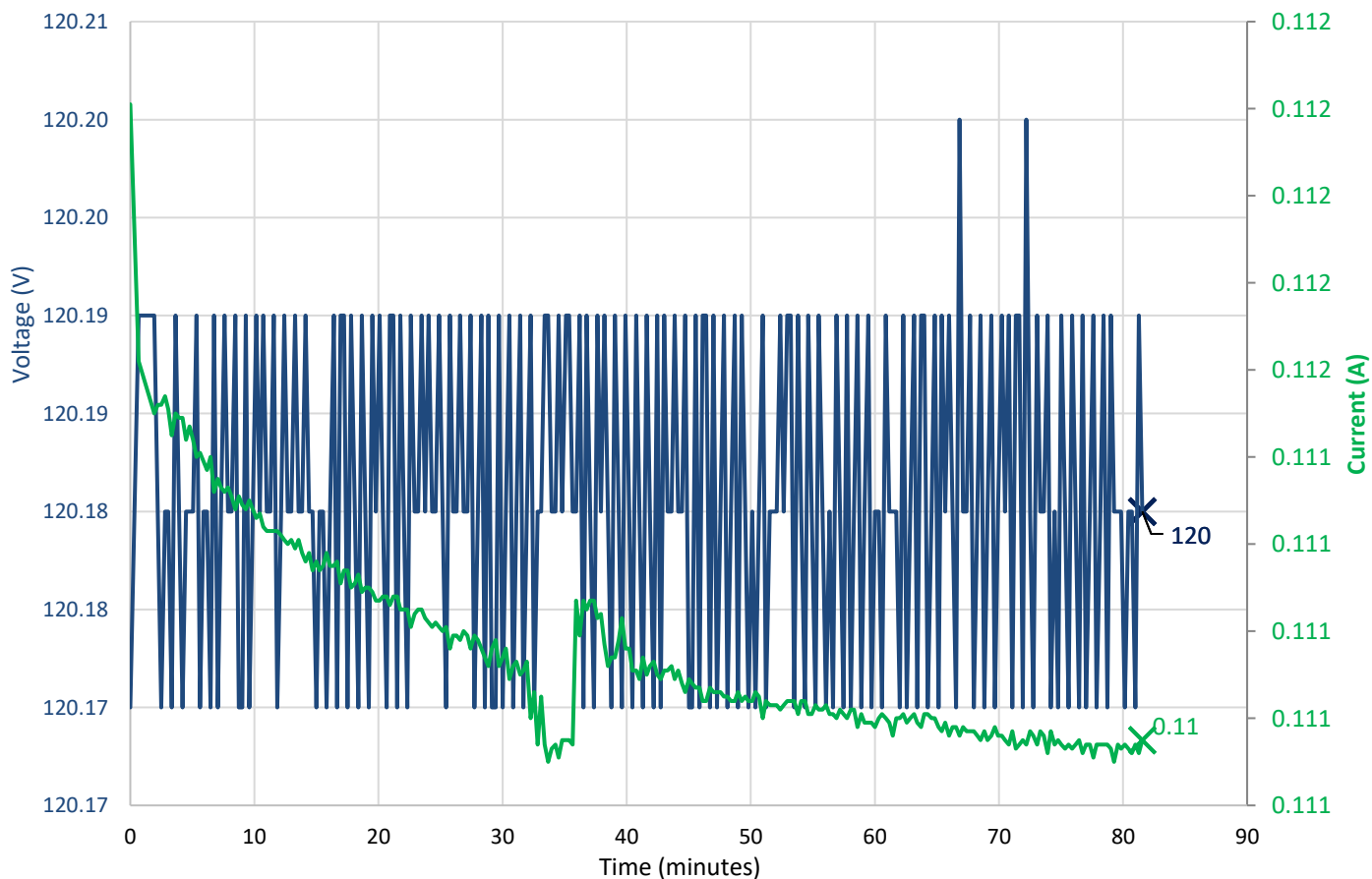
Release Date: 4/29/2020

ELECTRICAL STABILIZATION

Stabilization Description - A series of 283 measurements are recorded during the stabilization period. The final stabilized measurement, as defined by eport Type from List, is reported after 82 minutes of recorded device runtime. The 'Measurements in Range', provided below, are a histogram of measurements recorded during the 30 minute stabilization window.

% of range	Voltage (V)	Measurements in Range
99.992%	120.17	78
99.994%	120.17	0
99.997%	120.18	0
99.999%	120.18	108
100.002%	120.18	0
100.004%	120.19	0
100.007%	120.19	96
100.009%	120.19	0
100.012%	120.19	0
100.014%	120.20	2
100.000%	120.18	Reported

% of range	Current (A)	Measurements in Range
99.955%	0.111	2
99.967%	0.111	4
99.980%	0.111	23
99.993%	0.111	7
100.005%	0.111	18
100.018%	0.111	17
100.031%	0.111	7
100.043%	0.111	21
100.056%	0.111	6
100.069%	0.111	11
100.000%	0.111	Reported



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PHOTOMETRIC SUMMARY

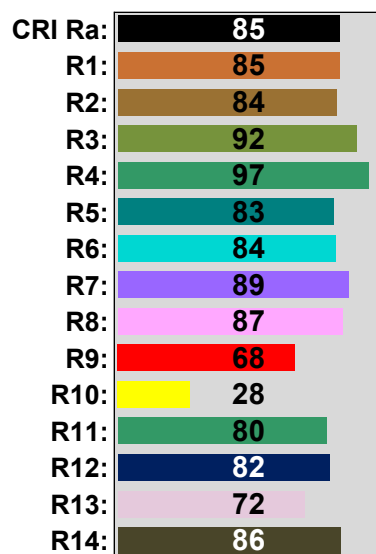
Radiometric Measurements

Peak WL: 611.4 nm
FWHM: 150.2 nm
Centroid WL: 626.6 nm

Photometric Measurements

Photopic Power: 268 lm
Luminous Efficacy: 22 lm/W
CCT: 3098 K - (on-axis)

Color Rendering Index



Color Coordinates

Cx: 0.4285
Cy: 0.3981
u: 0.2477
v: 0.3452
u': 0.2477
v': 0.5177
Duv: -0.0012
Du'v': 0.0000

Color Purity: - %
Dom WL: 582.9 nm
Comp WL: 482.4 nm
Gamut Area: 0.548

Electrical Performance

Voltage: 120.190 V
Current: 0.111 A
Frequency: 59.973 Hz
Active Power (P): 12.295 W
Apparent Power: 13.307 W
Power Factor: 0.924 cos θ
THD Voltage: 18.7 %
THD Current: 13.2 %

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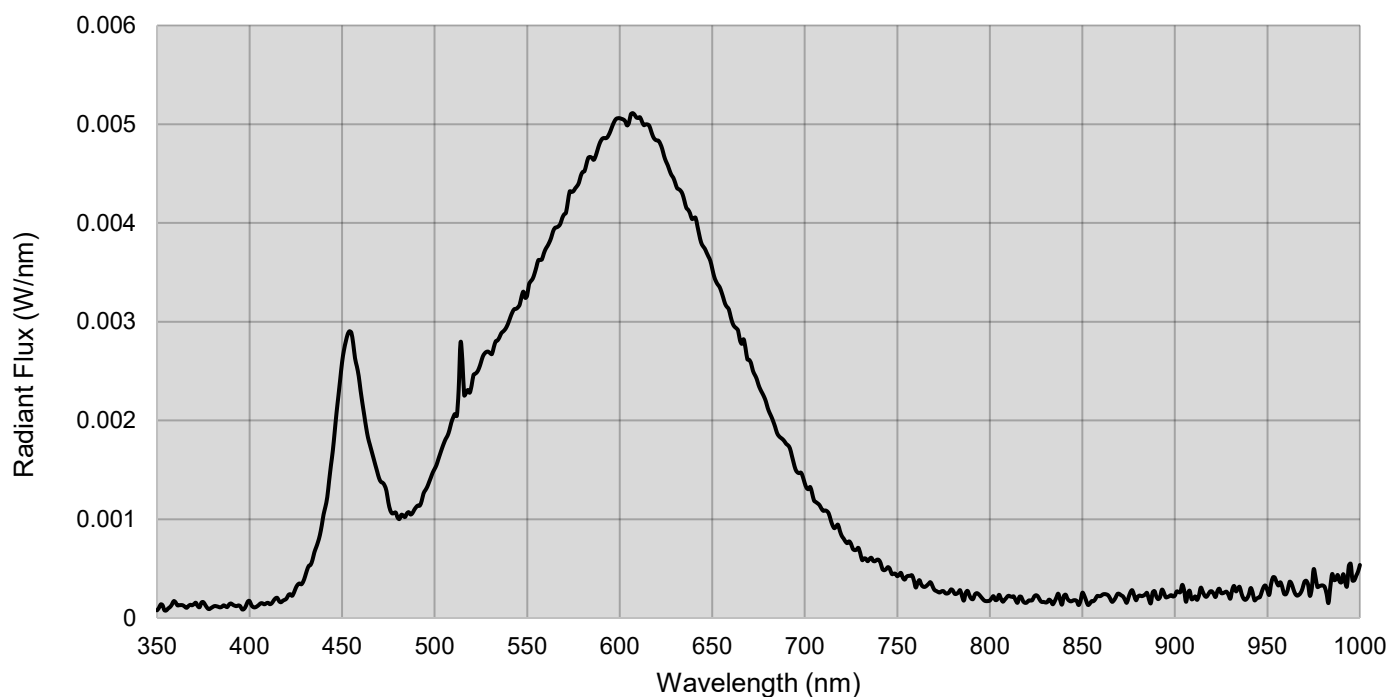
Report Number: LIGT010-010

Product Description: Acoustic Ring

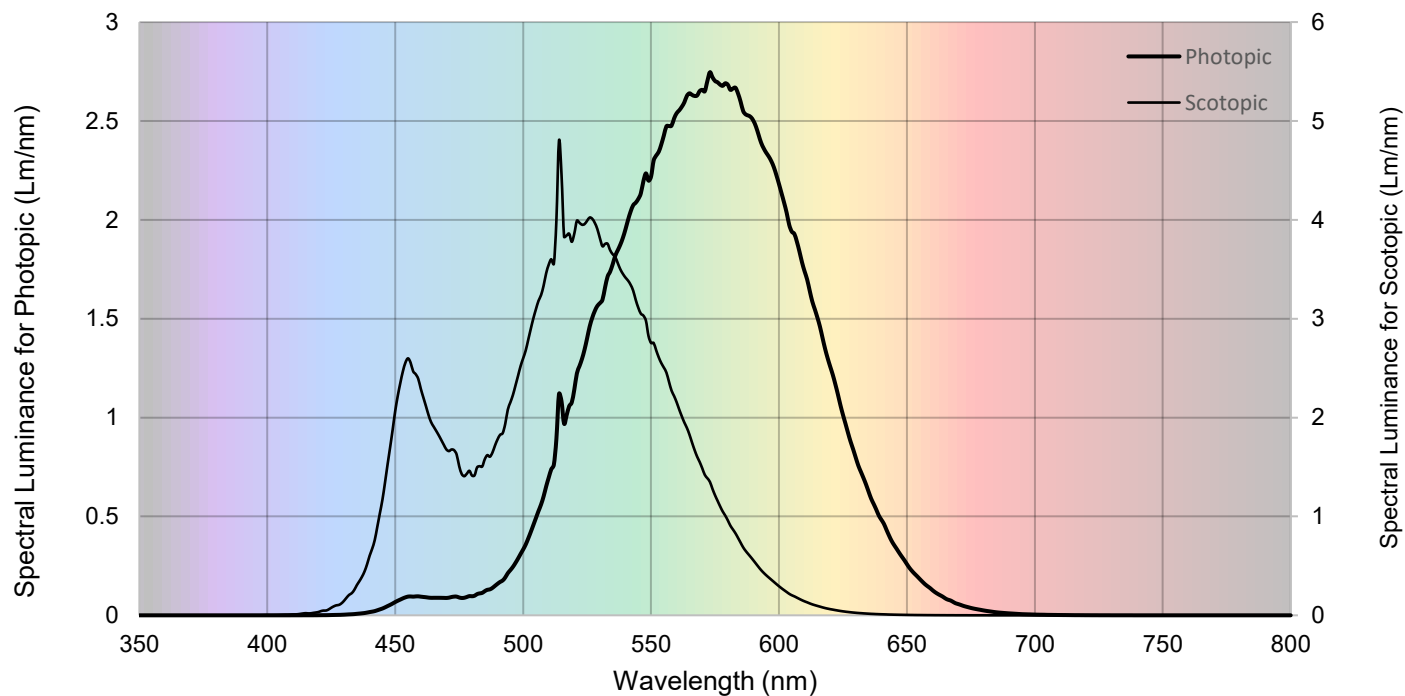
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VISIBLE SPECTRUM

Radiometric Spectrum



Photopic and Scotopic Spectrum



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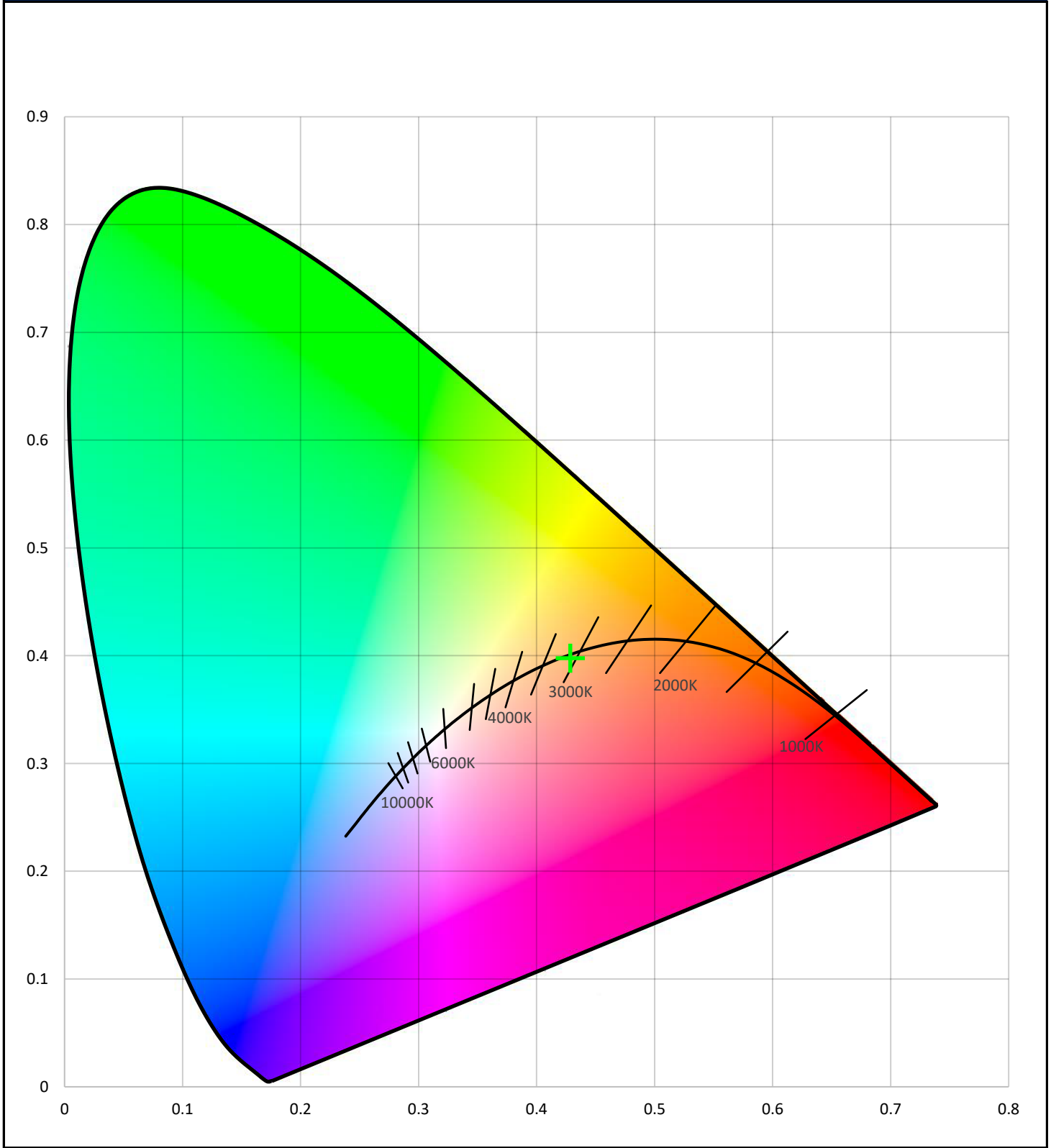
Manufacturer: LightArt A 3FORM COMPANY

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CIE 1931



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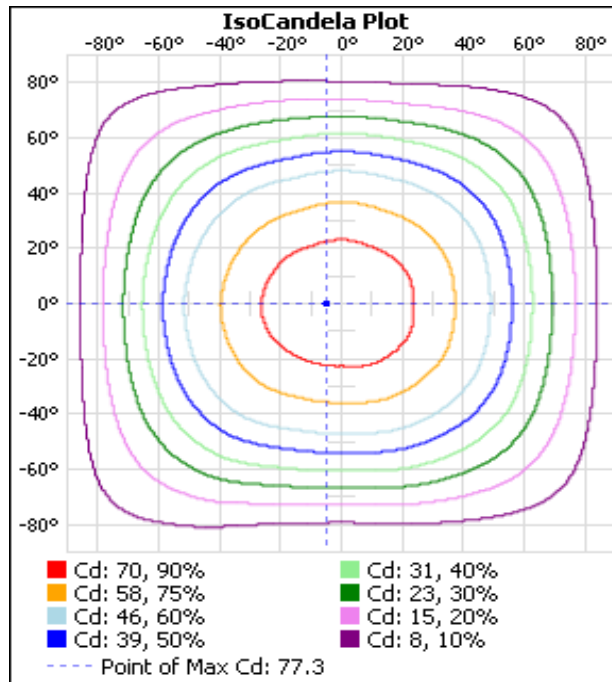
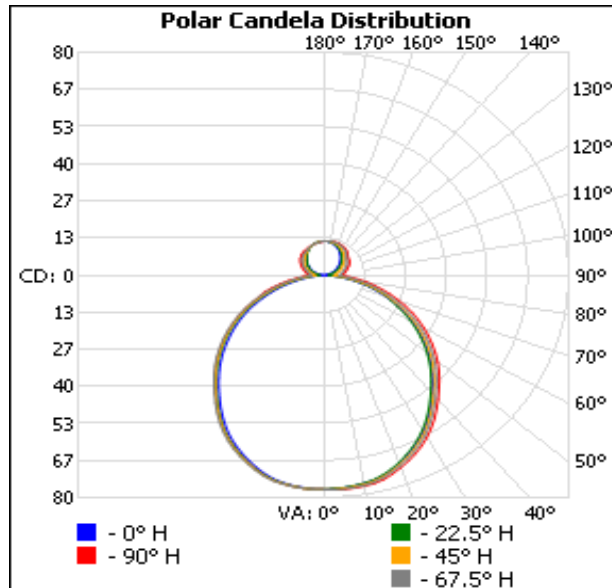
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CANDELA PLOTS



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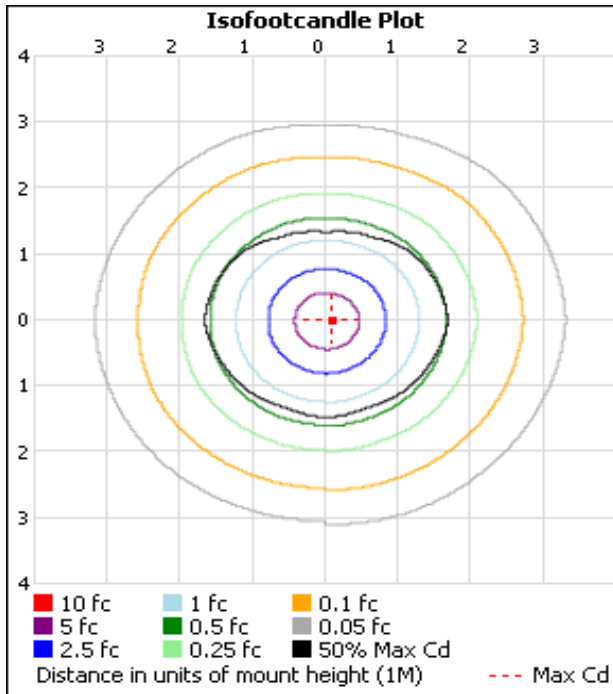
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ILLUMINANCE PLOTS



Illuminance at a Distance

	Center Beam fc	Beam Width
0.17M	255 fc	0.47 M 0.52 M
0.33M	64.8 fc	0.93 M 1.04 M
0.50M	28.6 fc	1.40 M 1.56 M
0.67M	16.1 fc	1.86 M 2.08 M
0.83M	10.3 fc	2.32 M 2.60 M
1.00M	7.16 fc	2.79 M 3.12 M

■ Vert. Spread: 108.8°
■ Horiz. Spread: 114.7°

ZONAL LUMEN SUMMARY

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	60.1	22.40%
0-40	97.8	36.50%
0-60	172.2	64.20%
60-90	50.3	18.70%
70-100	26.6	9.90%
90-120	15.5	5.80%
0-90	222.5	82.90%
90-180	45.8	17.10%
0-180	268.3	100.00%

Lumens Per Zone		
Zone	Lumens	% Total
0-10	7.3	2.70%
44124	21.1	7.80%
20-30	31.7	11.80%
30-40	37.7	14.10%
40-50	38.9	14.50%
50-60	35.5	13.20%
60-70	27.6	10.30%
70-80	16.7	6.20%
80-90	6	2.20%
90-100	3.9	1.50%
100-110	5.2	1.90%
110-120	6.4	2.40%
120-130	7	2.60%
130-140	7.1	2.60%
140-150	6.5	2.40%
150-160	5.2	1.90%
160-170	3.4	1.20%
170-180	1.2	0.40%

Lower Hemisphere

Upper Hemisphere

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CANDELA TABLE

LOWER HEMISPHERE

South Pole

Equator

0	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77
2.5	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77
5	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	76	76
7.5	76	76	77	77	77	77	77	76	76	76	76	77	77	77	76	76	76
10	76	76	76	77	77	77	76	76	76	76	76	76	76	76	76	76	76
12.5	75	75	76	76	77	76	76	75	75	75	76	76	76	76	75	75	75
15	75	74	75	75	76	76	75	74	74	74	75	75	74	75	75	74	74
17.5	74	73	74	74	75	75	73	73	73	73	73	74	73	74	73	73	73
20	72	72	72	73	74	73	72	71	71	72	72	72	72	72	72	71	71
22.5	70	70	71	72	72	72	71	70	69	70	70	71	70	71	70	70	70
25	69	68	69	70	71	70	69	68	68	68	69	69	68	69	69	68	68
27.5	67	67	68	68	69	69	67	66	66	67	67	67	67	67	67	66	66
30	65	64	66	66	67	67	65	64	63	65	65	65	65	65	65	64	64
32.5	63	62	63	64	65	65	63	62	61	62	62	63	62	63	63	62	62
35	60	60	61	62	63	62	60	59	58	60	60	61	60	61	60	59	59
37.5	58	57	58	59	61	60	59	56	56	57	57	58	57	58	58	57	57
40	55	54	56	57	58	57	56	54	53	54	55	55	55	56	55	54	54
42.5	53	52	53	55	56	55	54	51	51	52	52	53	52	53	52	52	52
45	50	50	51	52	53	53	52	49	48	49	50	51	50	51	50	49	49
47.5	48	47	49	50	51	50	49	46	45	47	47	48	47	48	48	47	47
50	45	44	46	47	49	48	47	44	43	44	45	45	45	46	45	44	44
52.5	42	41	43	44	46	45	44	41	40	41	42	43	42	43	42	41	41
55	39	39	40	42	43	42	41	38	37	38	39	40	39	40	39	39	38
57.5	36	36	37	39	41	40	38	35	34	35	36	37	36	37	37	36	35
60	34	33	35	36	38	37	35	32	31	33	33	34	34	34	34	33	32
62.5	31	30	32	33	35	34	33	29	28	30	30	31	31	32	31	30	29
65	27	27	28	30	32	31	30	26	25	26	27	28	28	29	28	27	26
67.5	24	24	25	27	29	28	26	23	21	23	24	25	25	25	25	23	23
70	21	22	22	24	26	25	23	19	18	20	21	22	22	22	21	20	20
72.5	18	19	19	21	23	22	20	16	15	17	18	19	20	19	18	17	17
75	15	15	16	18	20	19	17	13	12	14	15	16	17	16	15	14	14
77.5	12	12	13	15	17	16	14	10	9	11	12	13	14	14	13	11	11
80	9	10	10	12	14	13	11	8	6	8	9	10	12	11	10	8	8
82.5	6	7	8	9	11	10	9	5	4	5	6	8	9	8	7	6	5
85	3	4	5	7	9	8	6	3	1	3	4	5	6	6	5	3	2
87.5	1	2	3	5	7	6	4	2	0	1	3	4	5	4	3	2	1
90	0	2	4	5	6	5	4	2	0	1	3	4	5	4	3	2	0

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CANDELA TABLE

UPPER HEMISPHERE

	0	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
Equator	90	0	2	4	5	6	5	4	2	0	1	3	4	5	4	3	2	0
	92.5	0	2	4	6	6	6	4	2	0	1	3	4	5	4	3	2	0
	95	1	2	4	6	7	6	4	2	1	2	3	4	5	5	3	2	1
	97.5	1	2	4	6	7	6	4	3	1	2	4	5	6	5	4	2	1
	100	2	3	5	6	7	6	5	3	2	2	4	5	6	5	4	2	2
	102.5	2	3	5	7	8	7	5	3	2	3	4	5	6	6	4	3	2
	105	2	3	5	7	8	7	5	4	3	3	4	6	6	6	5	3	3
	107.5	3	4	6	7	8	7	6	4	3	4	5	6	7	6	5	4	3
	110	3	4	6	8	9	8	6	5	3	4	5	6	7	7	5	4	3
	112.5	4	5	6	8	9	8	6	5	4	4	6	7	8	7	6	5	4
	115	4	5	7	8	9	8	7	5	4	5	6	7	8	7	6	5	4
	117.5	5	6	7	9	10	9	7	6	5	5	7	7	8	8	7	5	5
	120	5	6	7	9	10	9	7	6	5	6	7	8	9	8	7	6	5
	122.5	6	7	8	9	10	9	8	7	6	6	7	8	9	9	7	6	6
	125	6	7	8	9	10	9	8	7	6	6	8	8	9	9	8	6	6
	127.5	7	7	9	9	10	10	9	8	7	7	8	9	10	9	8	7	7
	130	7	8	9	10	10	10	9	8	7	7	8	9	10	9	8	7	7
	132.5	7	8	9	10	11	10	9	8	7	7	8	9	10	10	8	8	7
	135	8	9	10	11	11	10	10	9	8	8	9	10	10	10	9	8	8
	137.5	8	9	10	11	11	11	10	9	8	8	9	10	10	10	9	8	8
	140	9	9	10	11	12	11	10	9	9	9	9	10	10	10	9	9	9
	142.5	9	10	10	11	12	11	11	10	9	9	9	10	11	10	9	9	9
	145	9	10	11	12	12	12	11	10	9	9	10	10	11	10	10	10	9
	147.5	10	10	11	12	12	12	11	10	10	10	10	10	11	10	10	10	10
	150	10	11	11	12	12	12	11	11	10	10	10	11	11	11	10	10	10
	152.5	10	11	11	12	12	12	12	11	10	10	11	11	11	11	11	11	10
	155	11	11	12	12	12	12	12	11	11	11	11	11	11	11	11	11	11
	157.5	11	11	12	12	12	12	12	11	11	11	11	11	11	11	11	11	11
	160	11	12	12	12	12	12	12	12	11	11	11	11	11	11	11	11	11
	162.5	12	12	12	12	12	12	12	12	12	11	11	11	12	12	12	12	12
	165	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	167.5	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	170	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	172.5	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	175	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	177.5	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
North Pole	180	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12

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EQUIPMENT

Item	Description/use	Manufacturer	Model	Serial #	Calibration Due
Spectrometer	Spectrum	Orb Optronix	SP-200	2009063	7/16/2020
Power Supply	DUT power supply	Chroma	31015	QT3101500128	-
Type C Goniometer	Light Distribution	Orb Optronix		GONI003	at use
Power Meter	Luminous Intensity	Newport	2936-R	18963	-
Power Analyzer	Electrical Power	Yokogawa	WT-210	91L137852	8/16/2020

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REVISION HISTORY

REVISION	DATE	APPROVED	DESCRIPTION OF REVISION
010	4/29/2020	ACM	① ORIGINAL

END OF REPORT