LIGHT LABORATORY INC.
8165 E Kaiser Blvd. Anaheim, CA 92808
www.lightlaboratory.com



NVLAP TESTING
NVLAP LAB CODE 200927-0

**Report No:** **L021702108** **Issue Date: 2/15/2017**

**Report Prepared For:** Revolution Lighting Technologies
4139 Guardian St. Simi Valley, CA 93063

**Model Number:** **204403-113**

**Test:** Electrical and Photometric tests

**Standards Used:** Appropriate part or all test guidelines were used for test performed:
*IESNA LM79: 2008* Approved Methods for Electrical and Photometric Measurements of Solid-State Lighting Products
*ANSI NEMA ANSLG C78.377: 2008* Specification of the Chromaticity of Solid State Lighting Products
*ANSI C82.77:2002:* Harmonic Emission Limits-Related Quality Requirements for Lighting Equipment

**Description of Sample:** Client submitted the sample. Received in working and undamaged condition. No modifications were necessary.

**Testing Condition:** Fixture is tested with no special conditions.

**Sample Arrival Date:** 2/8/17

**Date of Tests:** 2/10/17 - 2/14/17

**Seasoning of Sample:** No seasoning was performed in accordance with IESNA LM-79.

**Equipment List**

| Equipment Used | Model No | Stock No | Calibration Due Date |
|---|---|---|---|
| Chroma Programmable AC Source | 61604 | PS-AC02 | -- |
| Yokogawa Digital Power Meter | WT210 | MT-EL06-S1 | 11/28/17 |
| ITECH | IT6122 | PS-DC03-S1 | 11/28/17 |
| Fluke Digital Thermometer | 52k/J | MT-TP02-GC | 11/28/17 |
| LLI Type C Goniophotometer System | RMG-C-MKII | CD-LL04-GC | -- |
| LLI 2M Sphere | 2MR97 | CD-SN03-S2 | -- |
| LLI Spectroradiometer | SPR-3000 | MT-SC01-S2 | Before Use |

*All Results in accordance to IESNA LM-79-2008: Approved Method for the Electrical and Photometric Testing of Solid-State Lighting.

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| Test Summary | |
|---|---|
| **Manufacturer:** | Revolution Lighting Technologies |
| **Model Number:** | 204403-113 |
| **Driver Model Number:** | N/A |
| **Total Lumens:** | 2377.76 |
| **Input Voltage (VAC/60Hz):** | 120.00 |
| **Input Current (Amp):** | 0.15 |
| **Input Power (W):** | 17.51 |
| **Input Power Factor:** | 0.99 |
| **Current ATHD @ 120V(%):** | 6% |
| **Current ATHD @ 277V(%):** | N/A |
| **Efficacy:** | 136 |
| **Color Rendering Index (CRI):** | 83 |
| **Correlated Color Temperature (K):** | 3954 |
| **Chromaticity Coordinate x:** | 0.3827 |
| **Chromaticity Coordinate y:** | 0.3787 |
| **Ambient Temperature (°C):** | 25.0 |
| **Stabilization Time (Hours):** | 0:35 |
| **Total Operating Time (Hours):** | 1:10 |

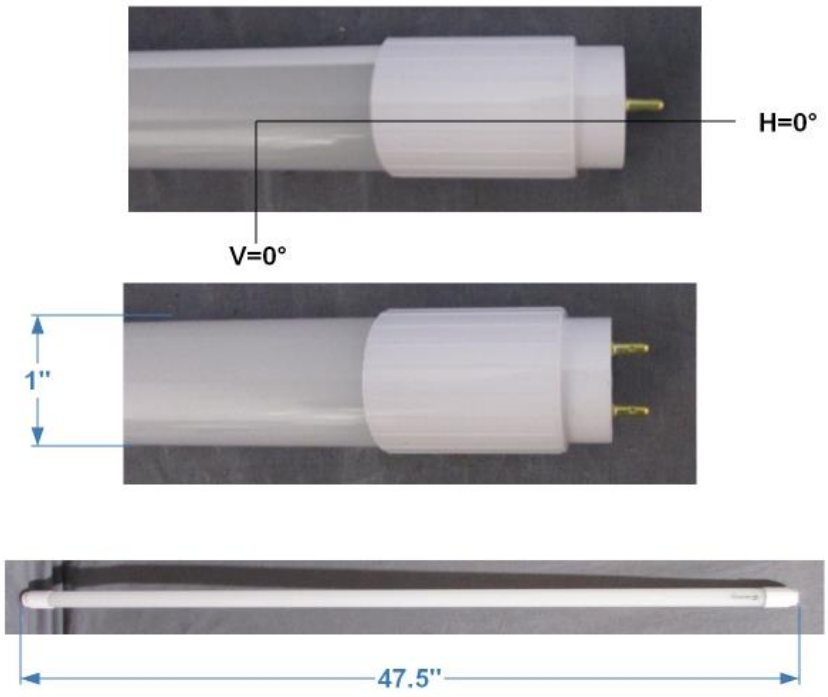


FIG. 1 LUMINAIRE

*All Results in accordance to IESNA LM-79-2008: Approved Method for the Electrical and Photometric Testing of Solid-State Lighting.

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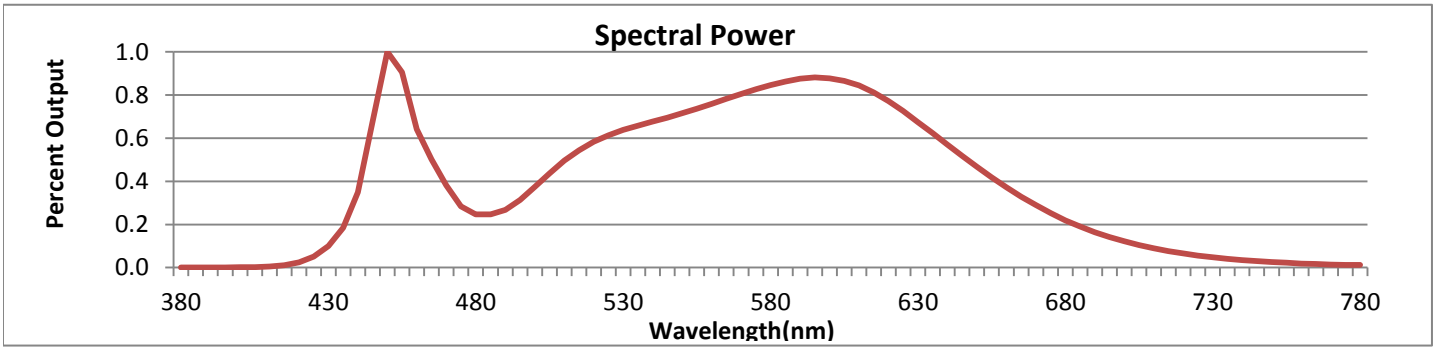


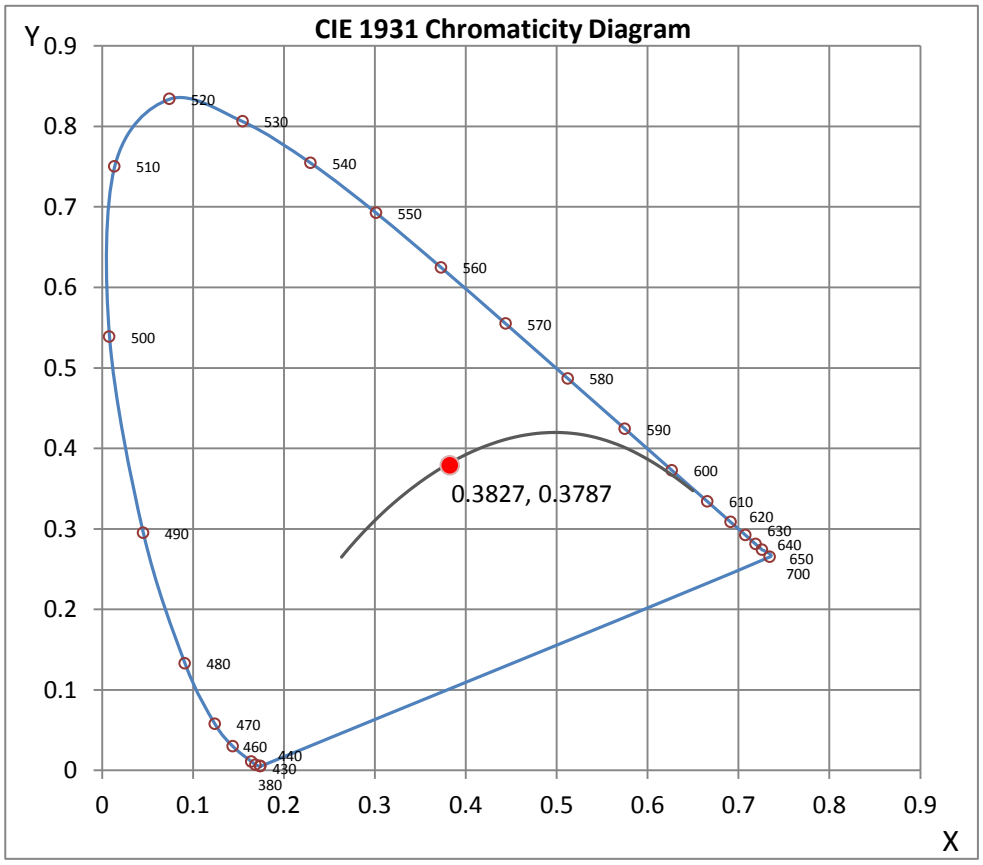

| Wavelength | W/m²nm | 440 | 0.3498 | 510 | 0.4957 | 580 | 0.8469 | 650 | 0.4681 | 720 | 0.0653 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 380 | 0.0009 | 450 | 1.0000 | 520 | 0.5836 | 590 | 0.8761 | 660 | 0.3732 | 730 | 0.0476 |
| 390 | 0.0010 | 460 | 0.6415 | 530 | 0.6379 | 600 | 0.8781 | 670 | 0.2892 | 740 | 0.0349 |
| 400 | 0.0016 | 470 | 0.3825 | 540 | 0.6770 | 610 | 0.8448 | 680 | 0.2193 | 750 | 0.0257 |
| 410 | 0.0046 | 480 | 0.2471 | 550 | 0.7155 | 620 | 0.7726 | 690 | 0.1642 | 760 | 0.0190 |
| 420 | 0.0248 | 490 | 0.2681 | 560 | 0.7592 | 630 | 0.6747 | 700 | 0.1217 | 770 | 0.0141 |
| 430 | 0.0993 | 500 | 0.3739 | 570 | 0.8052 | 640 | 0.5704 | 710 | 0.0894 | 780 | 0.0122 |

**CRI & CCT**

| | |
|---|---|
| x | 0.3827 |
| y | 0.3787 |
| u' | 0.2258 |
| v' | 0.5028 |
| CRI | 82.80 |
| CCT | 3954 |
| Duv | 0.00026 |

**R Values**

| | |
|---|---|
| R1 | 81.44 |
| R2 | 88.97 |
| R3 | 93.93 |
| R4 | 81.50 |
| R5 | 80.71 |
| R6 | 83.84 |
| R7 | 86.48 |
| R8 | 65.40 |
| R9 | 10.96 |
| R10 | 72.87 |
| R11 | 79.79 |
| R12 | 57.94 |
| R13 | 83.33 |
| R14 | 96.38 |

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## Test Methods

**Photometric Measurements - Goniophotometer**

A Custom Light Laboratory Type C Rotating Mirror Goniophotometer was used to measure candelas(intensity) at each angle of distribution as defined by IESNA for the appropriate fixture type.

Ambient temperature is set to 25°C and is measured from the center of the fixture, within 1ft from the outside of the fixture. Temperature is maintained at 25°C throughout the testing process and the sample is stabilized for at least 30mins and longer as necessary for the sample to achieve stabilization.

Electrical measurements are measured using the listed equipment.

**Spectral Measurements - Integrating Sphere**

A Sensing Spectroradiometer SPR-3000, in conjunction with Light Laboratory 2 meter integrating sphere was used to measure chromaticity coordinates, correlated color temperature(CCT) and the color rendering index(CRI) for each sample.

Ambient temperature is set to 25°C and is measured from the center of the fixture, within 1ft from the outside of the fixture. Temperature is maintained at 25°C throughout the testing process and the sample is stabilized for at least 30mins and longer as necessary for the sample to achieve stabilization.

Electrical measurements are measured using the listed equipment.

Disclaimers:

This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Government.

Report Prepared by : Keyur Patel

Test Report Released by:

Jeff Ahn
Engineering Manager

Test Report Reviewed by:

Steve Kang
Quality Assurance

**Attached are photometric data reports. Total number of pages: 9*

*All Results in accordance to IESNA LM-79-2008: Approved Method for the Electrical and Photometric Testing of Solid-State Lighting.

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# Photometric Test Report

**IES INDOOR REPORT**
**PHOTOMETRIC FILENAME : L021702108.IES**

**DESCRIPTION INFORMATION (From Photometric File)**

IESNA:LM-63-2002
[TEST] L021702108
[TESTLAB] LIGHT LABORATORY, INC.
[ISSUEDATE] 2/15/2017
[MANUFAC] REVOLUTION LIGHTING TECHNOLOGIES
[LUMCAT] 204403-113
[LUMINAIRE] 4FT LED TUBE
[BALLASTCAT] N/A
[LAMPPOSITION] 0,0
[LAMPCAT] N/A
[OTHER] INDICATING THE CANDELA VALUES ARE ABSOLUTE AND
[MORE] SHOULD NOT BE FACTORED FOR DIFFERENT LAMP RATINGS.
[INPUT] 120VAC, 17.51W
[TEST PROCEDURE] IESNA:LM-79-08

**CHARACTERISTICS**

| | |
|---|---|
| Lumens Per Lamp | N.A. (absolute) |
| Total Lamp Lumens | N.A. (absolute) |
| Luminaire Lumens | 2378 |
| Total Luminaire Efficiency | N.A. |
| Luminaire Efficacy Rating (LER) | 136 |
| Total Luminaire Watts | 17.51 |
| Ballast Factor | 1.00 |
| CIE Type | Semi-Direct |
| Spacing Criterion (0-180) | 1.22 |
| Spacing Criterion (90-270) | 1.44 |
| Spacing Criterion (Diagonal) | 1.48 |
| Basic Luminous Shape | Rectangular w/Sides |
| Luminous Length (0-180) | 3.63 ft |
| Luminous Width (90-270) | 0.08 ft |
| Luminous Height | 0.06 ft |

**LUMINANCE DATA (cd/sq.m)**

| Angle In Degrees | Average 0-Deg | Average 45-Deg | Average 90-Deg |
|---|---|---|---|
| 45 | 15456 | 12475 | 12775 |
| 55 | 14277 | 11714 | 12311 |
| 65 | 12655 | 11097 | 12028 |
| 75 | 10005 | 10759 | 11956 |
| 85 | 5193 | 10883 | 12104 |

**IES INDOOR REPORT**
**PHOTOMETRIC FILENAME : L021702108.IES**

**CANDELA TABULATION**

| | 0.0 | 22.5 | 45.0 | 67.5 | 90.0 |
|---|---|---|---|---|---|
| **0** | 483.92 | 483.92 | 483.92 | 483.92 | 483.92 |
| **5** | 480.95 | 481.78 | 482.07 | 482.82 | 483.11 |
| **10** | 472.81 | 474.64 | 477.21 | 480.04 | 481.28 |
| **15** | 460.27 | 462.97 | 468.91 | 475.34 | 477.96 |
| **20** | 442.09 | 447.40 | 457.66 | 468.58 | 473.31 |
| **25** | 419.75 | 427.89 | 443.91 | 460.15 | 467.08 |
| **30** | 393.93 | 404.60 | 427.56 | 449.98 | 459.36 |
| **35** | 364.95 | 378.73 | 409.04 | 438.06 | 450.56 |
| **40** | 334.14 | 351.04 | 388.40 | 424.48 | 439.60 |
| **45** | 300.01 | 321.44 | 367.31 | 409.29 | 426.89 |
| **50** | 264.80 | 290.21 | 345.02 | 392.76 | 411.78 |
| **55** | 226.36 | 258.16 | 321.89 | 374.12 | 394.92 |
| **60** | 188.00 | 227.02 | 297.77 | 354.73 | 378.07 |
| **65** | 149.55 | 195.43 | 273.86 | 334.31 | 358.05 |
| **70** | 111.27 | 165.53 | 250.11 | 314.38 | 337.21 |
| **75** | 74.24 | 138.13 | 227.31 | 292.66 | 317.45 |
| **80** | 40.69 | 113.47 | 205.27 | 270.82 | 295.78 |
| **85** | 14.53 | 92.59 | 184.30 | 249.65 | 272.69 |
| **90** | 2.24 | 76.27 | 165.78 | 228.73 | 250.94 |
| **95** | 0.75 | 63.52 | 148.01 | 207.80 | 229.93 |
| **100** | 0.00 | 54.26 | 132.15 | 188.58 | 208.75 |
| **105** | 0.00 | 47.87 | 117.91 | 170.31 | 188.83 |
| **110** | 0.00 | 43.26 | 105.54 | 152.95 | 169.81 |
| **115** | 0.00 | 39.78 | 94.00 | 136.68 | 152.70 |
| **120** | 0.00 | 37.03 | 83.95 | 121.61 | 135.52 |
| **125** | 0.00 | 34.79 | 75.69 | 108.11 | 119.99 |
| **130** | 0.00 | 32.97 | 67.09 | 94.99 | 105.71 |
| **135** | 0.00 | 30.64 | 59.62 | 83.24 | 92.25 |
| **140** | 0.00 | 28.36 | 52.06 | 72.74 | 81.54 |
| **145** | 0.00 | 26.53 | 44.34 | 62.90 | 68.84 |
| **150** | 0.00 | 24.54 | 38.16 | 53.81 | 58.62 |
| **155** | 0.00 | 20.72 | 33.96 | 44.72 | 49.74 |
| **160** | 0.00 | 17.89 | 30.14 | 36.37 | 42.10 |
| **165** | 0.00 | 16.65 | 23.87 | 29.40 | 35.87 |
| **170** | 0.00 | 14.70 | 18.56 | 20.51 | 26.32 |
| **175** | 0.00 | 13.00 | 15.15 | 14.95 | 13.54 |
| **180** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**IES INDOOR REPORT**
**PHOTOMETRIC FILENAME : L021702108.IES**

**ZONAL LUMEN SUMMARY**

| Zone | Lumens | %Lamp | %Fixt |
|---|---|---|---|
| 0-20 | 178.40 | N.A. | 7.50 |
| 0-30 | 383.20 | N.A. | 16.10 |
| 0-40 | 639.07 | N.A. | 26.90 |
| 0-60 | 1204.64 | N.A. | 50.70 |
| 0-80 | 1692.87 | N.A. | 71.20 |
| 0-90 | 1876.64 | N.A. | 78.90 |
| 10-90 | 1830.77 | N.A. | 77.00 |
| 20-40 | 460.67 | N.A. | 19.40 |
| 20-50 | 742.95 | N.A. | 31.20 |
| 40-70 | 827.84 | N.A. | 34.80 |
| 60-80 | 488.23 | N.A. | 20.50 |
| 70-80 | 225.97 | N.A. | 9.50 |
| 80-90 | 183.77 | N.A. | 7.70 |
| 90-110 | 260.64 | N.A. | 11.00 |
| 90-120 | 347.01 | N.A. | 14.60 |
| 90-130 | 409.66 | N.A. | 17.20 |
| 90-150 | 479.08 | N.A. | 20.10 |
| 90-180 | 501.12 | N.A. | 21.10 |
| 110-180 | 240.49 | N.A. | 10.10 |
| 0-180 | 2377.76 | N.A. | 100.00 |

Total Luminaire Efficiency = N.A.%

**ZONAL LUMEN SUMMARY**

| Zone | Lumens |
|---|---|
| 0-10 | 45.87 |
| 10-20 | 132.53 |
| 20-30 | 204.80 |
| 30-40 | 255.87 |
| 40-50 | 282.29 |
| 50-60 | 283.29 |
| 60-70 | 262.26 |
| 70-80 | 225.97 |
| 80-90 | 183.77 |
| 90-100 | 146.37 |
| 100-110 | 114.26 |
| 110-120 | 86.37 |
| 120-130 | 62.65 |
| 130-140 | 42.76 |
| 140-150 | 26.66 |
| 150-160 | 14.57 |
| 160-170 | 6.28 |
| 170-180 | 1.19 |

**IES INDOOR REPORT**
**PHOTOMETRIC FILENAME : L021702108.IES**

**COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD**

Effective Floor Cavity Reflectance 0.20

| RC | 80 | | | | 70 | | | | 50 | | | 30 | | | 10 | | | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RW | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 0 |
| 0 | 114 | 114 | 114 | 114 | 109 | 109 | 109 | 109 | 99 | 99 | 99 | 91 | 91 | 91 | 83 | 83 | 83 | 79 |
| 1 | 101 | 95 | 89 | 84 | 96 | 90 | 85 | 81 | 82 | 78 | 75 | 75 | 71 | 69 | 68 | 65 | 63 | 59 |
| 2 | 90 | 81 | 73 | 66 | 86 | 77 | 70 | 64 | 70 | 64 | 59 | 64 | 59 | 55 | 58 | 54 | 50 | 47 |
| 3 | 82 | 70 | 61 | 54 | 77 | 67 | 59 | 52 | 61 | 54 | 48 | 55 | 50 | 45 | 50 | 45 | 42 | 38 |
| 4 | 74 | 62 | 52 | 45 | 70 | 59 | 50 | 43 | 54 | 46 | 40 | 49 | 43 | 38 | 44 | 39 | 35 | 32 |
| 5 | 68 | 55 | 45 | 38 | 64 | 52 | 43 | 37 | 48 | 40 | 34 | 43 | 37 | 32 | 39 | 34 | 30 | 27 |
| 6 | 63 | 49 | 39 | 33 | 59 | 47 | 38 | 32 | 43 | 35 | 30 | 39 | 33 | 28 | 36 | 30 | 26 | 23 |
| 7 | 58 | 44 | 35 | 29 | 55 | 42 | 34 | 28 | 39 | 31 | 26 | 35 | 29 | 25 | 32 | 27 | 23 | 21 |
| 8 | 54 | 40 | 31 | 25 | 51 | 38 | 30 | 25 | 35 | 28 | 23 | 32 | 26 | 22 | 30 | 24 | 20 | 18 |
| 9 | 50 | 37 | 28 | 22 | 48 | 35 | 27 | 22 | 32 | 25 | 21 | 30 | 24 | 19 | 27 | 22 | 18 | 16 |
| 10 | 47 | 34 | 26 | 20 | 45 | 32 | 25 | 20 | 30 | 23 | 19 | 28 | 22 | 18 | 25 | 20 | 17 | 15 |

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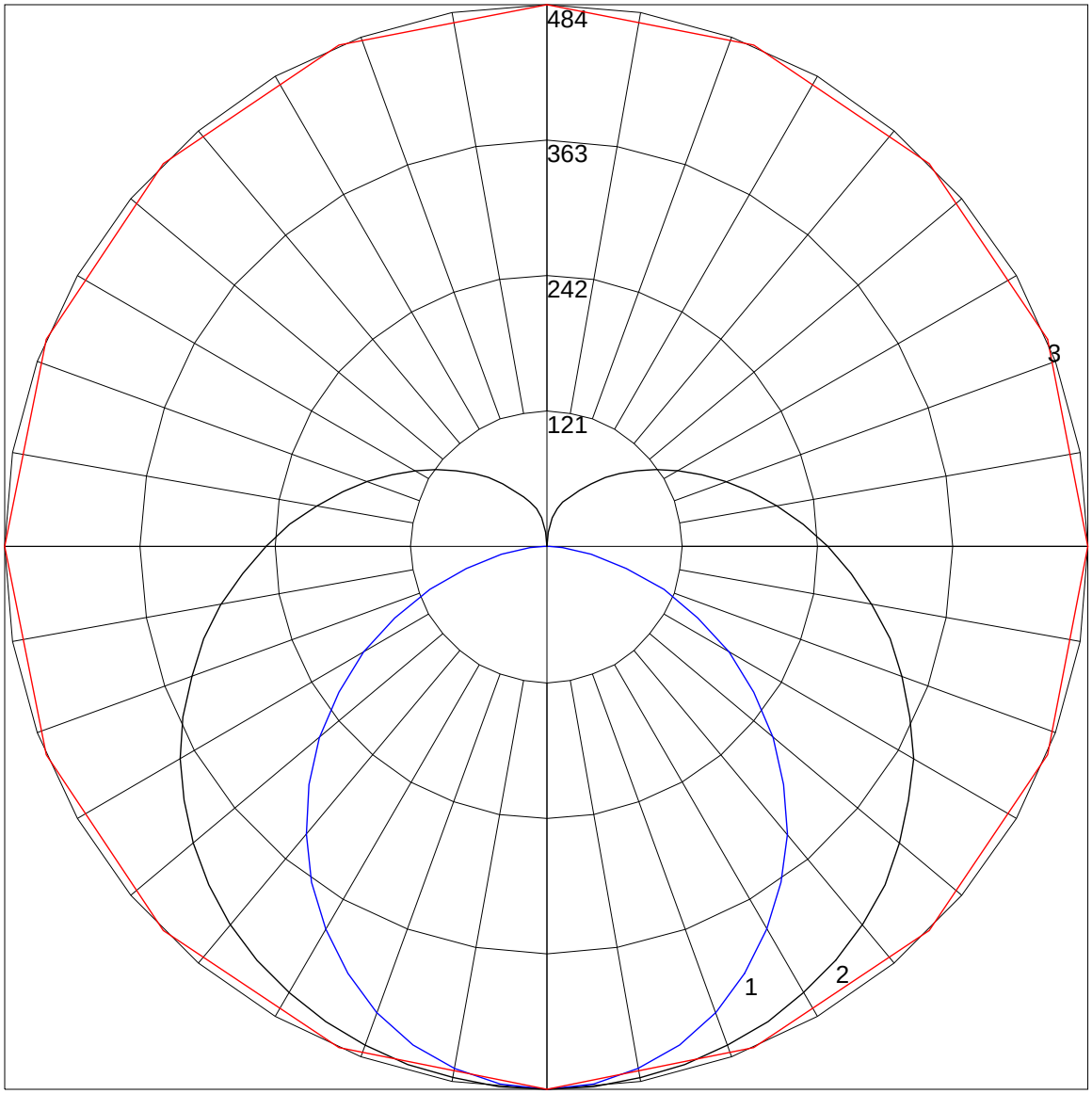
**POLAR GRAPH**




Maximum Candela = 483.92  Located At Horizontal Angle = 0, Vertical Angle = 0
# 1 - Vertical Plane Through Horizontal Angles (0 - 180) (Through Max. Cd.)
# 2 - Vertical Plane Through Horizontal Angles (90 - 270)
# 3 - Horizontal Cone Through Vertical Angle (0) (Through Max. Cd.)