LCTECH

NVLAP LAB CODE 500080-0

IESNA SUSTAINING MEMBER

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**Test report of**

# IES LM-79-08

**Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products**

Rendered to:
LIGHT EFFICIENT DESIGN, DIV OF TADD LLC.
188 S. Northwest Highway Cary, IL 60013

For products:
LED Lamp

Models No.:
LED-8035E40-MHBC

| | |
|---|---|
| **Test Date:** | From Sep. 12, 2016 to Sep. 13, 2016 |
| **Test Item:** | Total luminous flux, Luminous Efficacy, Electrical values, Luminous Intensity Distribution, Chromaticity coordinates, CCT and CRI, Spectral Power Distribution. |
| **Test Lab.:** | **LCTECH (Zhongshan) Testing Service Co., Ltd**<br>2/F., Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China<br>Tel:+86-760-22833366 Fax:+86-760-22833399<br>E-mail:Service@lccert.com http://www.lccert.com |
| **Template No.:** | LC-RT-PL/LM79-08/01 |
| **Test Note:** | |

| | | | |
|---|---|---|---|
| **Complied by:** | | **Reviewed by:** | |
| **Bowen Pang** | Bowen Pang | **Richard Li** | |
| **Project Engineer** | | **Technical Manager** | |
| **Sep. 27, 2016** | | **Sep. 27, 2016** | |

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# 1. General

## 1.1 Product Information

| | |
|---|---|
| Brand Name | - |
| Product Type | LED Lamp |
| Model Number | LED-8035E40-MHBC |
| Rated Inputs | 277V, 60Hz |
| Rated Power | 78 W |
| Rated Light output | N/A |
| Declared CCT | 4000K |
| Ballast | M57 |
| LED Package, Array or Module | Model: SPMWHX1228FXXXXXXXX, manufactured by SAMSUNG ELECTRONICS CO., LTD |
| Receipt Samples | 1 unit |
| Date of Receipt Samples | Sep. 7, 2016 |
| Note | - |

### 1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

| No. | Name |
|---|---|
| ANSI/NEMA/ ANSLG C78.377-2011 | Specifications for the Chromaticity of Solid State Lighting Products |
| ANSI C82.77-2002 | Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment |
| CIE Pub. No. 13.3-1995 | Method of Measuring and Specifying Color Rendering of Light Sources |
| CIE Pub. No. 15:2004 | Colorimetry |
| IES LM-79-08 | Electrical and Photometric Measurements of Solid-State Lighting Products |

### 1.3 Equipment list

| Instrument | ID | Model name | Cal. date | Next cal. Date |
|---|---|---|---|---|
| AC Power supply | LC-I-923 | CHP-500 | 2016-02-04 | 2017-02-03 |
| AC Power supply | LC-I-987 | APW-110N | 2016-02-04 | 2017-02-03 |
| Power analyzer | LC-I-928 | WT210 | 2016-01-24 | 2017-01-24 |
| Power analyzer | LC-I-954 | WT210 | 2016-02-04 | 2017-02-03 |
| Multimeter | LC-I-972 | Fluke 17B | 2016-08-10 | 2017-08-09 |
| Photometric colorimetric electric system (2 meter sphere) | LC-I-900 | SPR3000 | Before use | Before use |
| Standard lamp | LC-I-917 | 24V100W | 2015-10-09 | 2016-10-08 |
| Luminous Flux Standard Lamp | LC-I-946 | 110V/200W | 2015-10-17 | 2016-10-16 |
| Goniophotometer(with mirror) | LC-I-902 | GMS2000 | 2016-05-07 | 2017-05-07 |
| Wireless temperature transmitter | LC-I-978 | DWRF-B | 2016-02-03 | 2017-02-02 |
| Wireless temperature transmitter | LC-I-979 | DWRF-B | 2016-02-03 | 2017-02-02 |

## 2. Test conducted and method

The lamp was operated at least 2 hours to reach stabilization and temperature equilibrium before test.

### 2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at 25 °C ± 1°C; the air flow around the sample(s) being tested did not affect the performance.

### 2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (50 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within±0.2 percent under load.

### 2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

### 2.4 Electrical Instrumentation

The calibration uncertainties of the instruments for AC voltage and current were less than 0.2 percent, and the calibration uncertainty of the AC power meter was less than 0.5 percent(95 % confidence interval, k=2).

### 2.5 Color Measurement Method

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the color characteristics (Color rendering index, correlated color temperature, chromaticity coordinate) were calculated from these by software automatically.

### 2.6 Total Luminous Flux Measurement Method

Total luminous flux was measured type C goniophotometer system.

Light intensity distribution was measured by a type C goniophotometer (with mirror) which can keep the sample in burn position when the tests conduct, and the total luminous flux was calculated from the intensity data by software automatically.

### 2.7 Luminous Intensity Distribution Measurement Method

Luminous intensity distribution was measured by a mirror-type goniophotometer (Type C) which can keep the sample in burn position when the tests conduct, and the kinds of graph were generated by software automatically.

### 2.8 Spatial Non-uniformity of Chromaticity

The customer did not require this measurement.

# 3. Test Result Summary

### 3.1 Electrical data

| Criteria Item | Result(Sphere) | Result(Goniophotometer) |
|---|---|---|
| Input Voltage & Frequency | 277.00V~60Hz | 277.00V~60Hz |
| Input Current(A) | 0.433 | 0.442 |
| Total Power(W) | 81.22 | 82.16 |
| Power Factor | 0.678 | 0.672 |
| I-THD(%) | 41.86 | - |
| Off-state Power(W) | - | - |

3.2 Photometric data

| Criteria Item | Result(Sphere) | Result(Goniophotometer) |
|---|---|---|
| Total Lumens(lm) | - | 5773.07 |
| Luminaire Efficacy(Lm/W) | - | 70.27 |
| Correlated Color Temperature (CCT)(K) | 3909 | - |
| Color Rendering Index (CRI) | 82.9 | - |
| R9 | 9 | - |
| Chromaticity Coordinate (x,y) | x=0.3848 y=0.3801 | - |
| Chromaticity Coordinate (u,v) | u=0.2266 v=0.3358 | - |
| Chromaticity Coordinate (u',v') | u'= 0.2266 v'=0.5037 | - |
| Duv | 0.00033 | - |
| Central intensity(cd) | - | 1438.282 |
| Beam angle | - | 102.4° |
| Spacing Criteria(0-180°) | - | 1.36 |
| Spacing Criteria(90-270°) | - | 1.34 |
| Zone Lumens between 0-60 ° | - | 56.90% |
| Zone Lumens between60-90 ° | - | 20.10% |
| Zone Lumens between 90-120 ° | - | 11.90% |
| Zone Lumens between 120-180 ° | - | 11.10% |

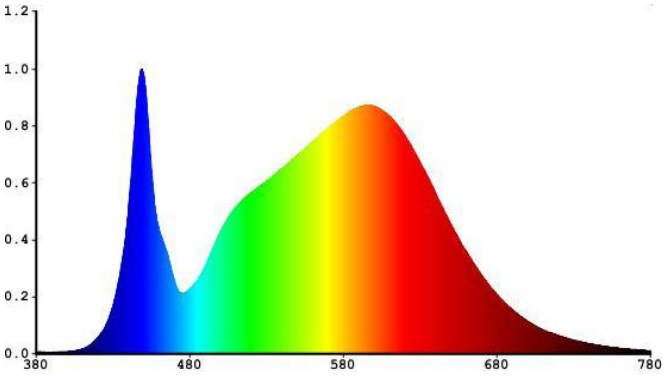
### 3.3 Color Rendering Details

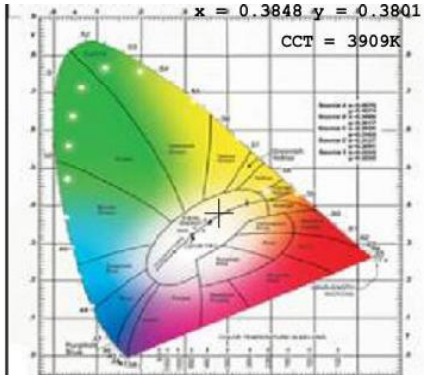
| R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 |
|---|---|---|---|---|---|---|---|
| 81 | 88 | 94 | 83 | 82 | 84 | 86 | 65 |
| R9 | R10 | R11 | R12 | R13 | R14 | R15 | - |
| 9 | 73 | 82 | 65 | 83 | 97 | 75 | - |

Note: N.A.

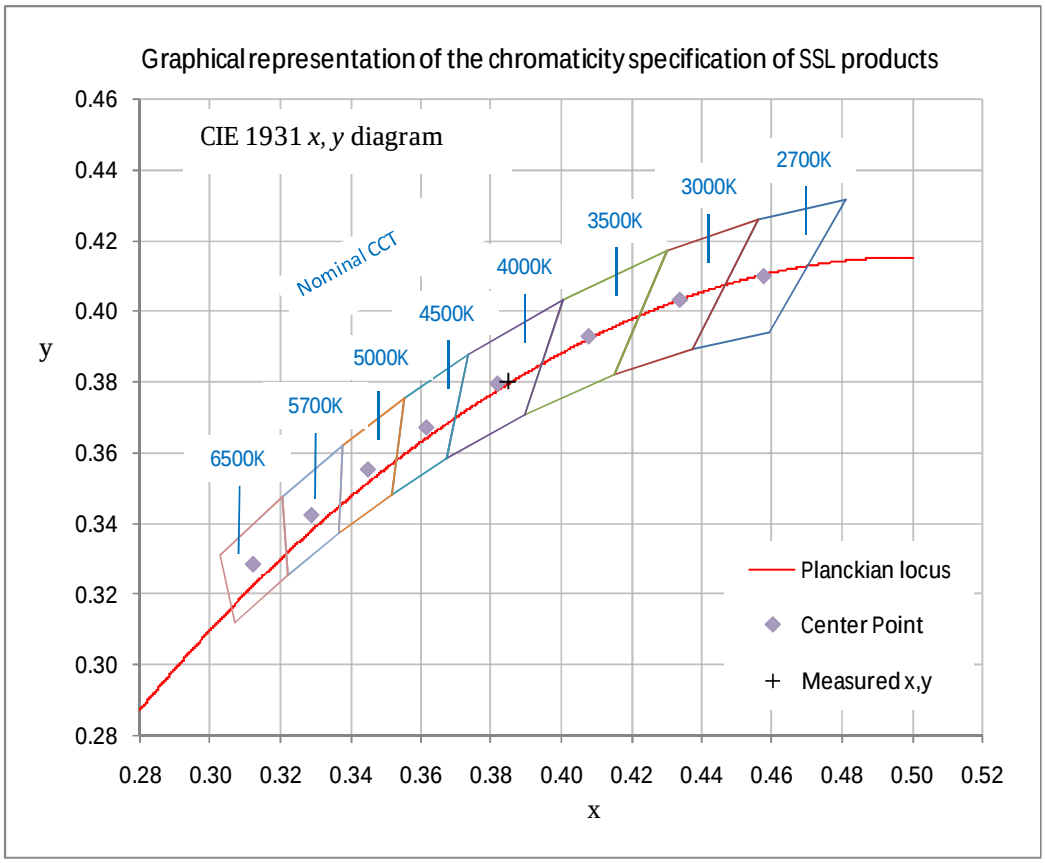
# 4. Test Data

## 4.1 Spectral Distribution




## 4.2 ANSI Chromaticity Quadrangles Diagram



### 4.3 Goniometry Test Data

| | | | |
|---|---|---|---|
| CIE Type | Semi-Direct | Basic Luminous Shape | Circular w/ Sides |
| Spacing Criteria (0-180°) | 1.36 | Luminous Diameter | 0.19m |
| Spacing Criteria (90-270°) | 1.34 | Luminous Height | 0.05 m |
| Spacing Criteria (Diagonal) | 1.38 | | |
| Test Distance | 29.54 m | | |

### 4.4 Zonal Lumen Summary

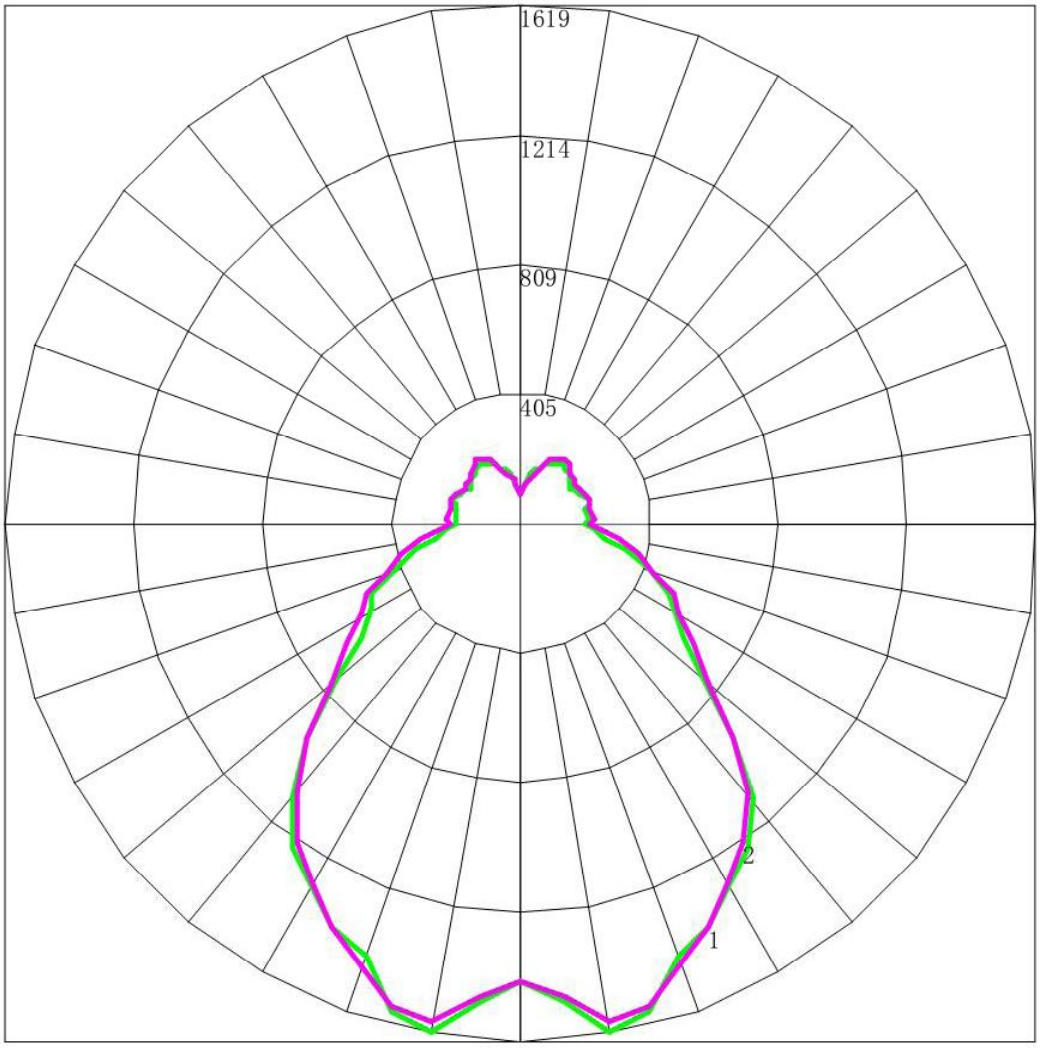
| Zone | Lumens | %Lamp | %Fixt |
|---|---|---|---|
| 0-20 | 584.90 | 10.10 | 10.10 |
| 0-30 | 1221.09 | 21.20 | 21.20 |
| 0-40 | 1983.84 | 34.40 | 34.40 |
| 0-60 | 3285.73 | 56.90 | 56.90 |
| 0-80 | 4175.00 | 72.30 | 72.30 |
| 0-90 | 4443.39 | 77.00 | 77.00 |
| 10-90 | 4297.16 | 74.40 | 74.40 |
| 20-40 | 1398.93 | 24.20 | 24.20 |
| 20-50 | 2124.25 | 36.80 | 36.80 |
| 40-70 | 1807.1 | 31.30 | 31.30 |
| 60-80 | 889.28 | 15.40 | 15.40 |
| 70-80 | 384.07 | 6.70 | 6.70 |
| 80-90 | 268.39 | 4.60 | 4.60 |
| 90-110 | 469.35 | 8.10 | 8.10 |
| 90-120 | 685.37 | 11.90 | 11.90 |
| 90-130 | 867.36 | 15.00 | 15.00 |
| 90-150 | 1175.5 | 20.40 | 20.40 |
| 90-180 | 1329.7 | 23.00 | 23.00 |
| 110-180 | 860.34 | 14.90 | 14.90 |
| 0-180 | 5773.09 | 100.00 | 100.00 |

Total Luminaire Efficiency = 100.00%

**ZONAL LUMEN SUMMARY**

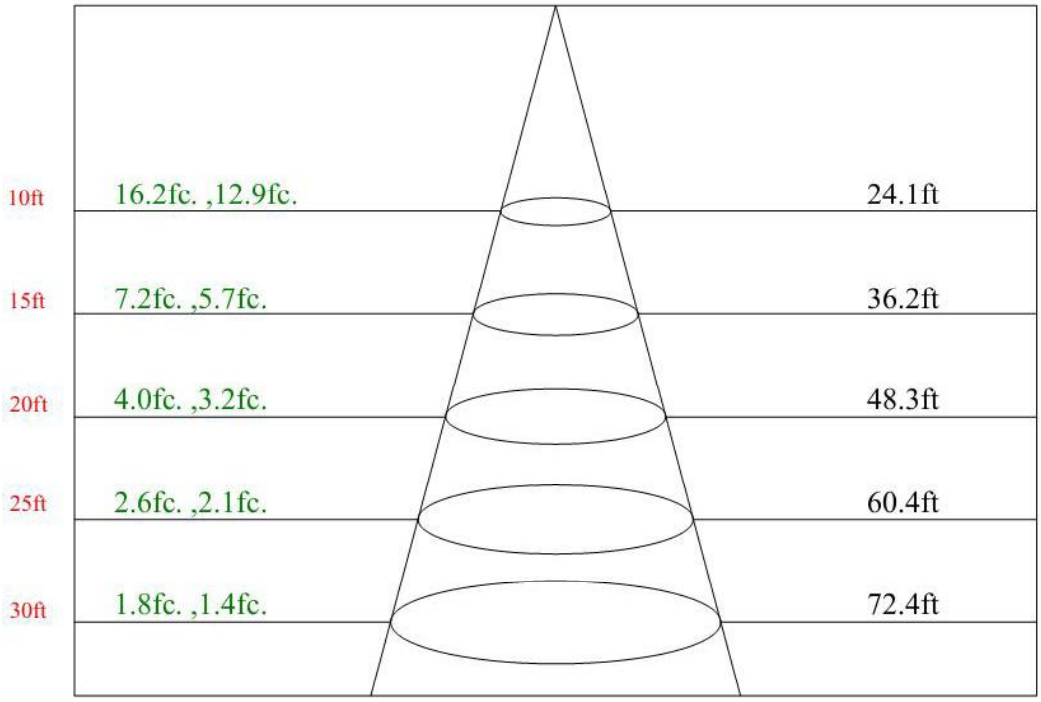
| Zone | Lumens |
|---|---|
| 0-10 | 146.23 |
| 10-20 | 438.67 |
| 20-30 | 636.19 |
| 30-40 | 762.74 |
| 40-50 | 725.31 |
| 50-60 | 576.58 |
| 60-70 | 505.20 |
| 70-80 | 384.07 |
| 80-90 | 268.39 |
| 90-100 | 234.02 |
| 100-110 | 235.33 |
| 110-120 | 216.02 |
| 120-130 | 181.98 |
| 130-140 | 166.57 |
| 140-150 | 141.57 |
| 150-160 | 92.81 |
| 160-170 | 48.61 |
| 170-180 | 12.77 |

**4.5 Polar Curves**

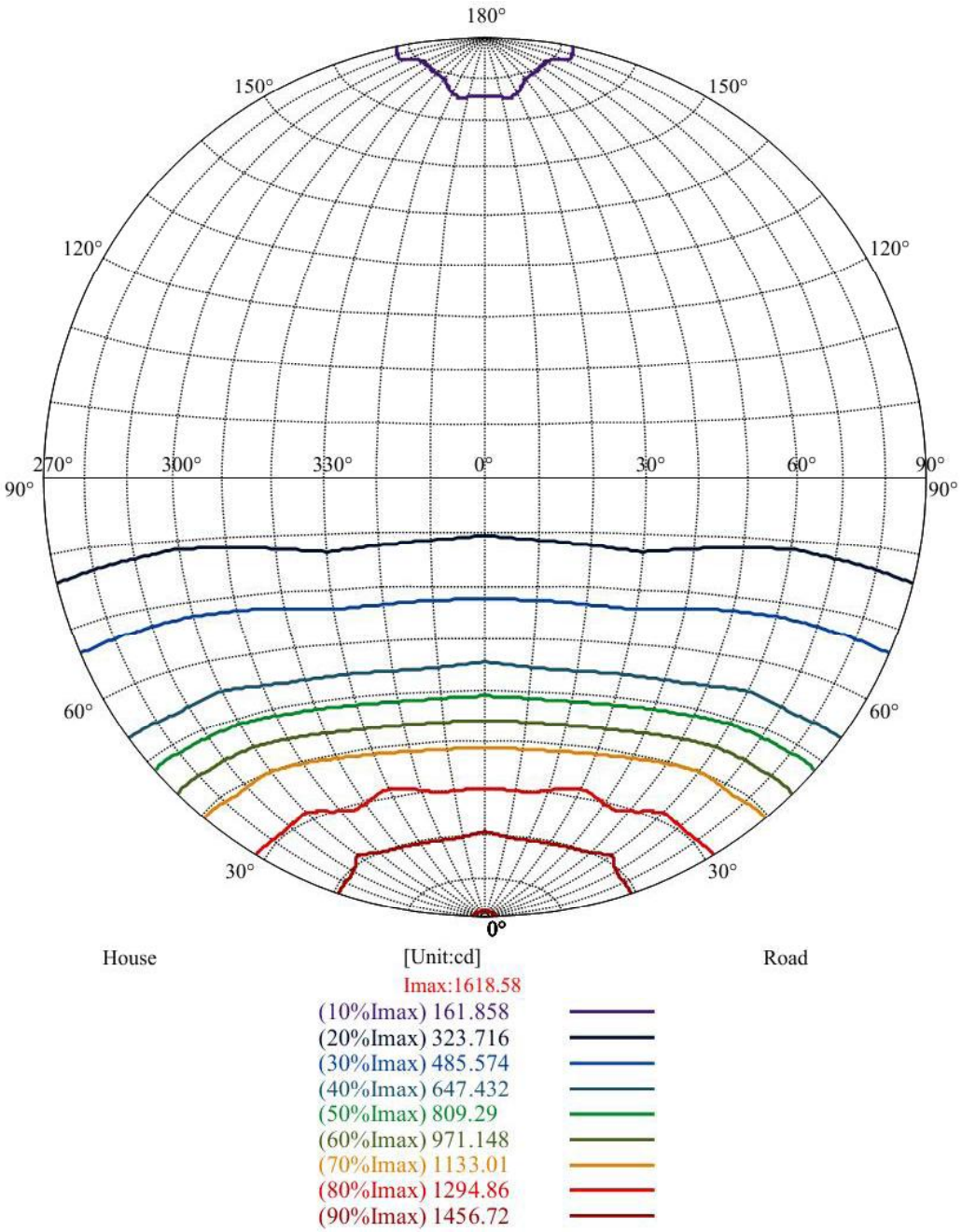



Maximum Candela = 1618.58 Located At Horizontal Angle = 60, Vertical Angle = 10
# 1 - Vertical Plane Through Horizontal Angles (0 - 180)
# 2 - Vertical Plane Through Horizontal Angles (90 - 270)

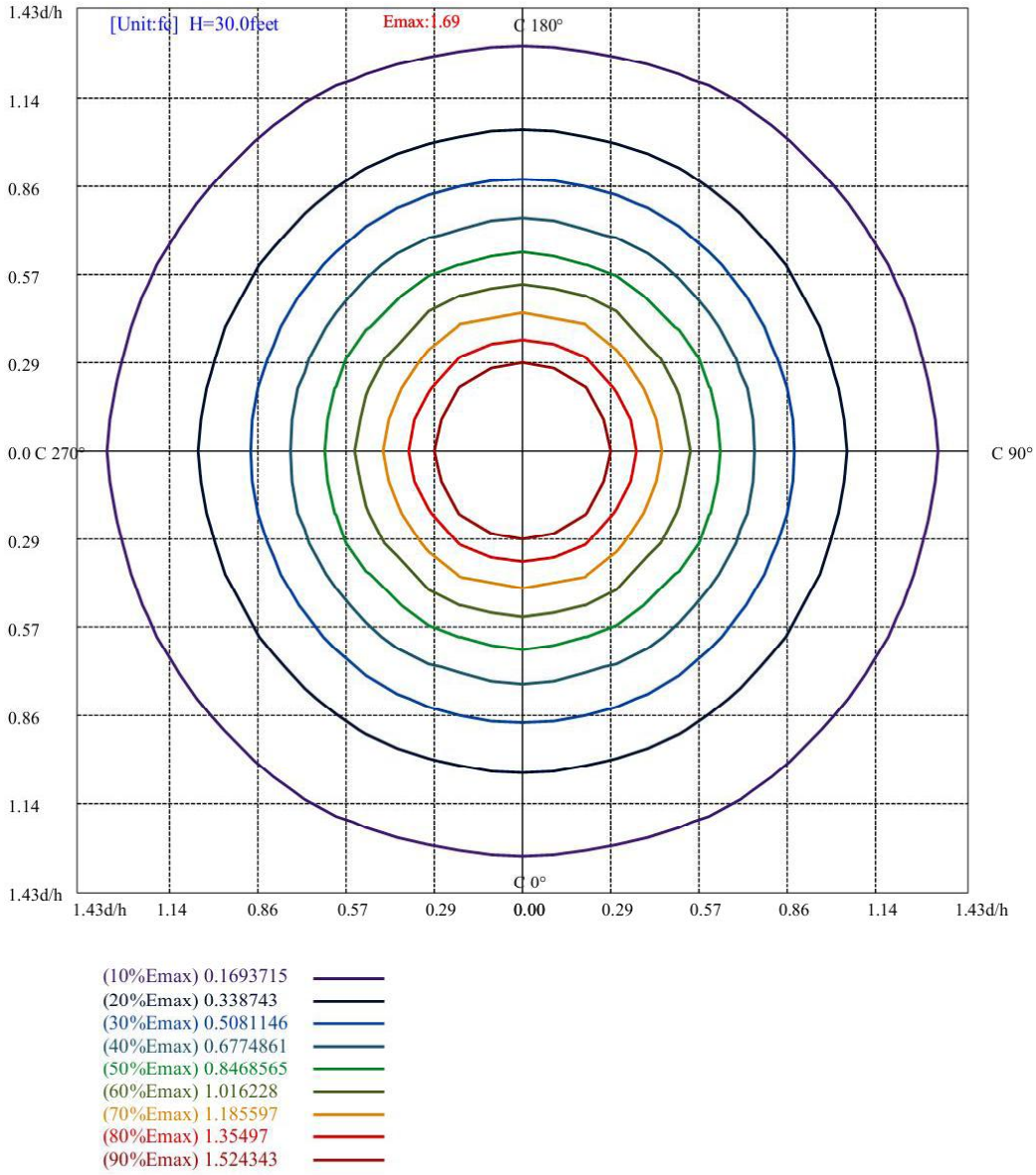
**4.6 Lux distance Curve**



**4.7 ISO candela diagram on circular web**



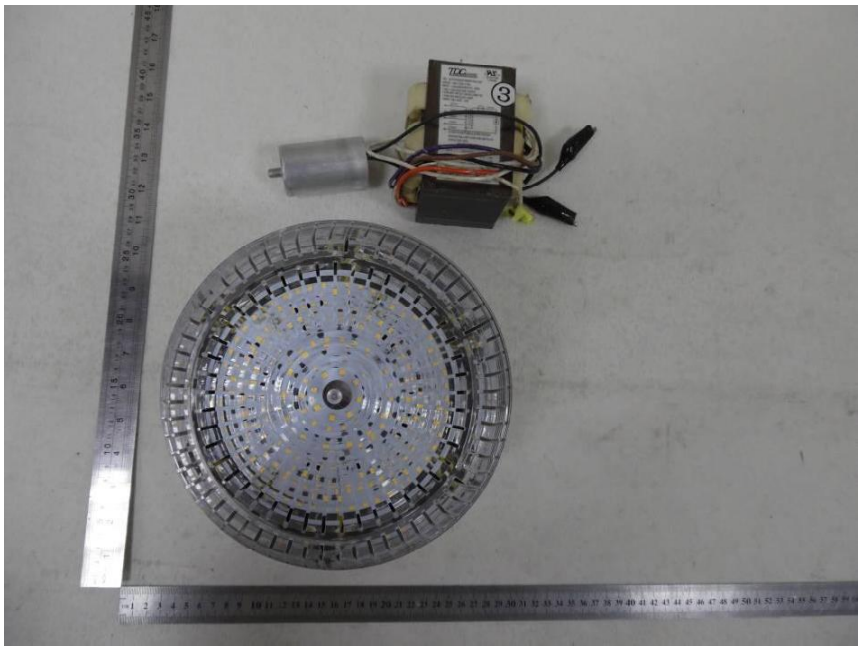
**4.8 ISO illuminance diagram**



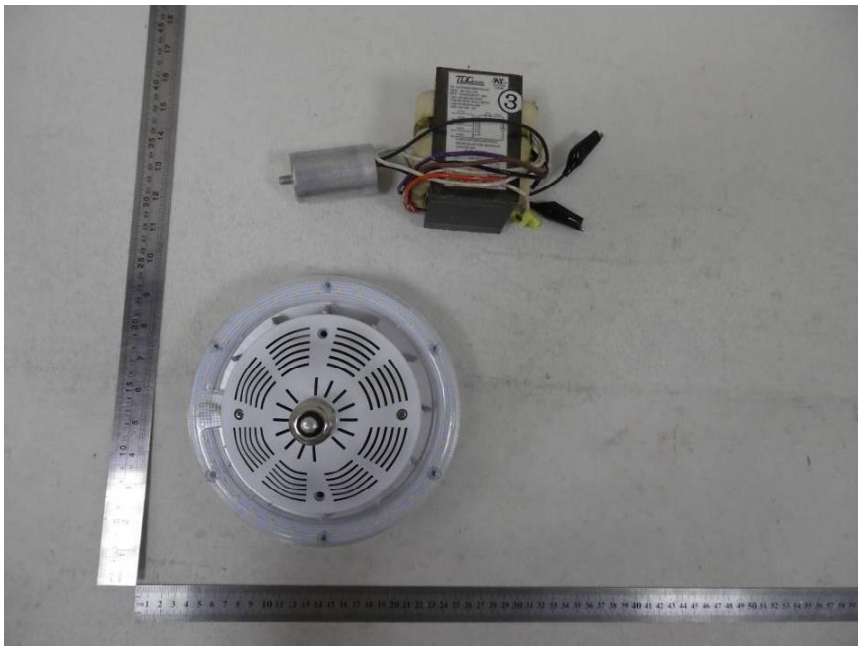
**4.9 Candela Tabulation**

| | 0 | 15 | 30 | 45 | 60 | 75 | 90 |
|---|---|---|---|---|---|---|---|
| 0 | 1438.282 | 1438.282 | 1438.282 | 1438.282 | 1438.282 | 1438.282 | 1438.282 |
| 5 | 1500.459 | 1496.678 | 1494.312 | 1496.236 | 1496.244 | 1490.455 | 1487.944 |
| 10 | 1618.442 | 1615.667 | 1610.806 | 1616.726 | 1618.580 | 1615.815 | 1581.592 |
| 15 | 1572.258 | 1586.659 | 1597.800 | 1572.468 | 1565.379 | 1577.942 | 1562.193 |
| 20 | 1438.154 | 1433.875 | 1471.370 | 1448.663 | 1442.314 | 1439.306 | 1468.458 |
| 25 | 1388.635 | 1369.660 | 1417.676 | 1375.277 | 1360.060 | 1368.602 | 1390.865 |
| 30 | 1312.560 | 1305.796 | 1317.952 | 1272.244 | 1327.203 | 1288.839 | 1298.932 |
| 35 | 1239.692 | 1215.565 | 1241.023 | 1217.693 | 1228.537 | 1230.714 | 1216.193 |
| 40 | 1123.035 | 1110.739 | 1133.497 | 1121.716 | 1102.352 | 1090.431 | 1101.519 |
| 45 | 944.586 | 945.578 | 962.375 | 948.016 | 932.844 | 935.185 | 947.125 |
| 50 | 753.052 | 749.445 | 772.399 | 761.314 | 757.456 | 753.876 | 775.664 |
| 55 | 615.912 | 609.960 | 644.408 | 624.290 | 630.772 | 630.436 | 657.648 |
| 60 | 548.047 | 548.481 | 575.369 | 560.004 | 550.015 | 554.359 | 573.501 |
| 65 | 510.972 | 518.156 | 531.077 | 526.262 | 509.867 | 519.098 | 527.886 |
| 70 | 424.292 | 435.701 | 446.362 | 446.441 | 422.125 | 445.627 | 448.930 |
| 75 | 338.938 | 355.854 | 370.635 | 366.007 | 345.261 | 365.385 | 381.498 |
| 80 | 269.320 | 285.800 | 306.043 | 297.166 | 283.881 | 298.975 | 314.374 |
| 85 | 230.320 | 238.205 | 247.649 | 243.194 | 235.980 | 242.973 | 247.778 |
| 90 | 198.376 | 201.321 | 214.414 | 207.433 | 206.645 | 208.552 | 220.638 |
| 95 | 210.521 | 209.139 | 223.554 | 214.320 | 219.234 | 215.101 | 229.436 |
| 100 | 209.195 | 206.604 | 226.919 | 214.233 | 218.273 | 214.414 | 224.773 |
| 105 | 219.758 | 213.781 | 213.559 | 220.795 | 230.482 | 226.652 | 226.005 |
| 110 | 227.754 | 224.218 | 227.906 | 232.524 | 234.930 | 235.479 | 234.230 |
| 115 | 208.982 | 208.626 | 214.856 | 217.420 | 222.698 | 222.906 | 224.377 |
| 120 | 198.761 | 197.112 | 202.919 | 205.544 | 209.908 | 208.015 | 209.026 |
| 125 | 192.732 | 191.644 | 200.918 | 201.002 | 202.592 | 202.215 | 206.035 |
| 130 | 204.791 | 200.032 | 208.211 | 208.940 | 212.724 | 207.746 | 211.797 |
| 135 | 212.146 | 206.785 | 213.968 | 214.832 | 219.824 | 215.357 | 216.899 |
| 140 | 223.008 | 215.618 | 223.723 | 222.072 | 231.344 | 229.297 | 232.866 |
| 145 | 229.123 | 221.896 | 222.555 | 226.070 | 232.787 | 238.223 | 238.893 |
| 150 | 214.926 | 210.738 | 212.386 | 209.875 | 221.108 | 227.784 | 231.063 |
| 155 | 194.742 | 192.348 | 201.382 | 193.315 | 195.563 | 202.582 | 218.703 |
| 160 | 181.143 | 181.462 | 194.963 | 181.868 | 181.513 | 181.057 | 186.944 |
| 165 | 171.735 | 171.432 | 174.620 | 176.131 | 171.415 | 161.744 | 163.895 |
| 170 | 157.453 | 155.678 | 164.187 | 160.683 | 158.342 | 146.648 | 146.212 |
| 175 | 124.867 | 122.298 | 133.441 | 128.627 | 128.550 | 123.195 | 123.427 |
| 180 | 94.969 | 94.969 | 94.969 | 94.969 | 94.969 | 94.969 | 94.969 |

## Appendix 1 Product Photo



Picture 1



Picture 2

****End of test report****