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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-8089M50-MHBC

**Test Date:** From Sep. 12, 2016 to Sep. 16, 2016

**Test Item:** Total luminous flux, Luminous Efficacy, Electrical values, Luminous Intensity Distribution, Chromaticity coordinates, CCT and CRI, Spectral Power Distribution.

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**Template No.:** LC-RT-PL/LM79-08/01

**Test Note:**

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## 1. General

### 1.1 Product Information

Brand Name	-
Product Type	LED Lamp
Model Number	LED-8089M50-MHBC
Rated Inputs	277V, 60Hz
Rated Power	108W
Rated Light output	N/A
Declared CCT	5000K
Ballast	M58
LED Package, Array or Module	Model: XMLBWT- XX- XXXX- XXXXXXXXXX, manufactured by Cree, Inc.
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  $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ ; 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  $\pm 0.2$  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	277.01V~60Hz
Input Current(A)	0.879	0.879
Total Power(W)	109.60	110.30
Power Factor	0.450	0.453
I-THD(%)	47.79	-
Off-state Power(W)	-	-

#### 3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	7635.67
Luminaire Efficacy(Lm/W)	-	69.23
Correlated Color Temperature (CCT)(K)	5084	-
Color Rendering Index (CRI)	72.4	-
R9	-13	-
Chromaticity Coordinate (x,y)	x=0.3427 y=0.3490	-
Chromaticity Coordinate (u,v)	u=0.2108 v=0.3220	-
Chromaticity Coordinate (u',v')	u'= 0.2108 v'=0.4830	-
Duv	-0.00035	-
Central intensity(cd)	-	2743.217
Beam angle	-	111.0°
Spacing Criteria(0-180°)	-	1.36
Spacing Criteria(90-270°)	-	1.34
Zone Lumens between 0-60 °	-	79.70%
Zone Lumens between 60-90 °	-	19.80%
Zone Lumens between 90-120 °	-	0.40%
Zone Lumens between 120-180 °	-	0.10%

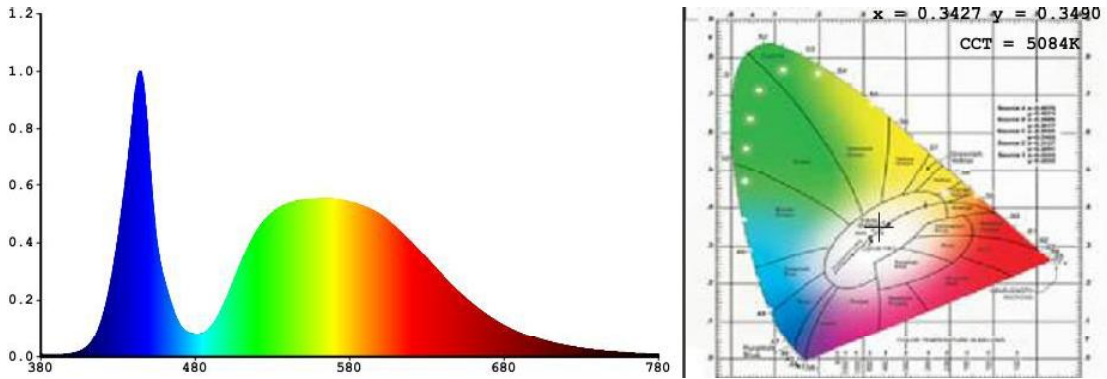
#### 3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
73	75	76	75	73	67	78	62
R9	R10	R11	R12	R13	R14	R15	-
-13	41	75	47	72	86	68	-

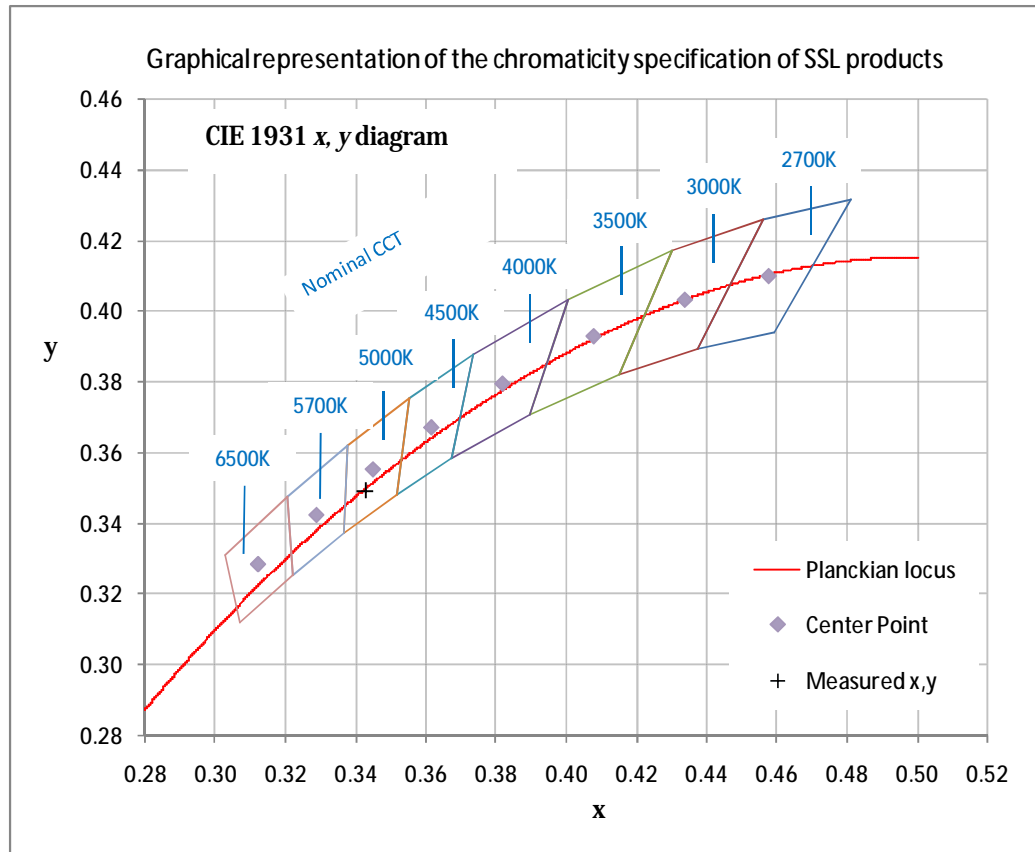
Note: N.A.

## 4. Test Data

### 4.1 Spectral Distribution



### 4.2 ANSI Chromaticity Quadrangles Diagram





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**4.3 Goniometry Test Data**

CIE Type	Direct	Basic Luminous Shape	Rectangular
Spacing Criteria (0-180°)	1.20	Luminous Length	0.13 m
Spacing Criteria (90-270°)	1.28	Luminous Width	0.07 m
Spacing Criteria (Diagonal)	1.34	Luminous Height	0.00 m
Test Distance	29.54 m		

**4.4 Zonal Lumen Summary**

Zone	Lumens	%Lamp	%Fixt
0-20	1005.9	13.20	13.20
0-30	2112.74	27.70	27.70
0-40	3429.00	44.90	44.90
0-60	6082.24	79.70	79.70
0-80	7466.38	97.80	97.80
0-90	7594.77	99.50	99.50
10-90	7334.31	96.10	96.10
20-40	2423.1	31.70	31.70
20-50	3814.07	50.00	50.00
40-70	3564.46	46.70	46.70
60-80	1384.14	18.10	18.10
70-80	472.92	6.20	6.20
80-90	128.40	1.70	1.70
90-110	24.69	0.30	0.30
90-120	27.54	0.40	0.40
90-130	29.45	0.40	0.40
90-150	33.53	0.40	0.40
90-180	40.89	0.50	0.50
110-180	16.20	0.20	0.20
0-180	7635.66	100.00	100.00

Total Luminaire Efficiency = 100.00%

**ZONAL LUMEN SUMMARY**

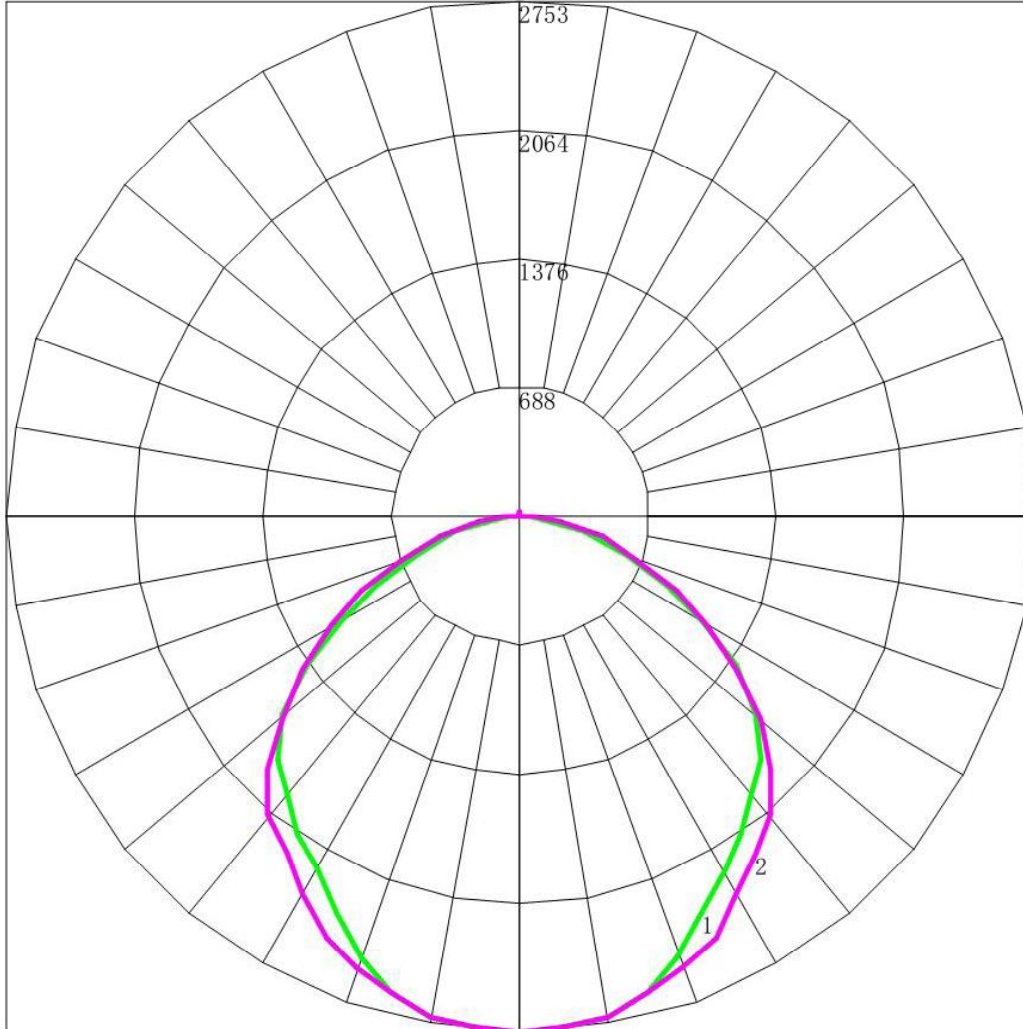
Zone	Lumens
0-10	260.46
10-20	745.44
20-30	1106.84
30-40	1316.27
40-50	1390.97
50-60	1262.27
60-70	911.22
70-80	472.92
80-90	128.40
90-100	18.95
100-110	5.74
110-120	2.85
120-130	1.91
130-140	1.68
140-150	2.39
150-160	3.04
160-170	3.00
170-180	1.32





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4.5 Polar Curves

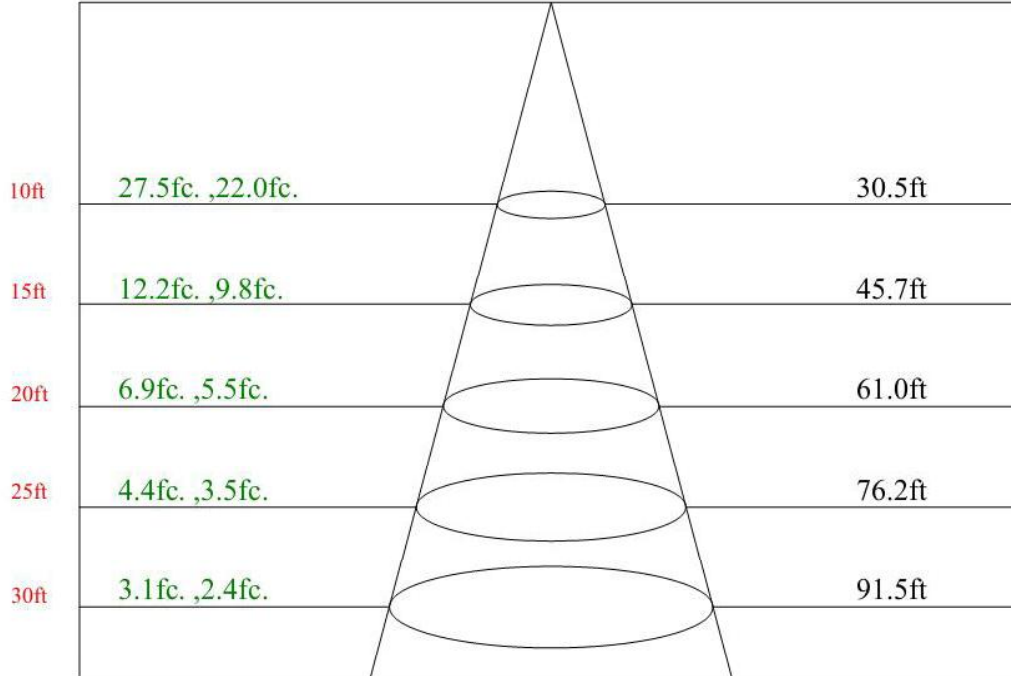


Maximum Candela = 2752.539 Located At Horizontal Angle = 45, Vertical Angle = 5  
# 1 - Vertical Plane Through Horizontal Angles (0 - 180)  
# 2 - Vertical Plane Through Horizontal Angles (90 - 270)



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4.6 Lux distance Curve

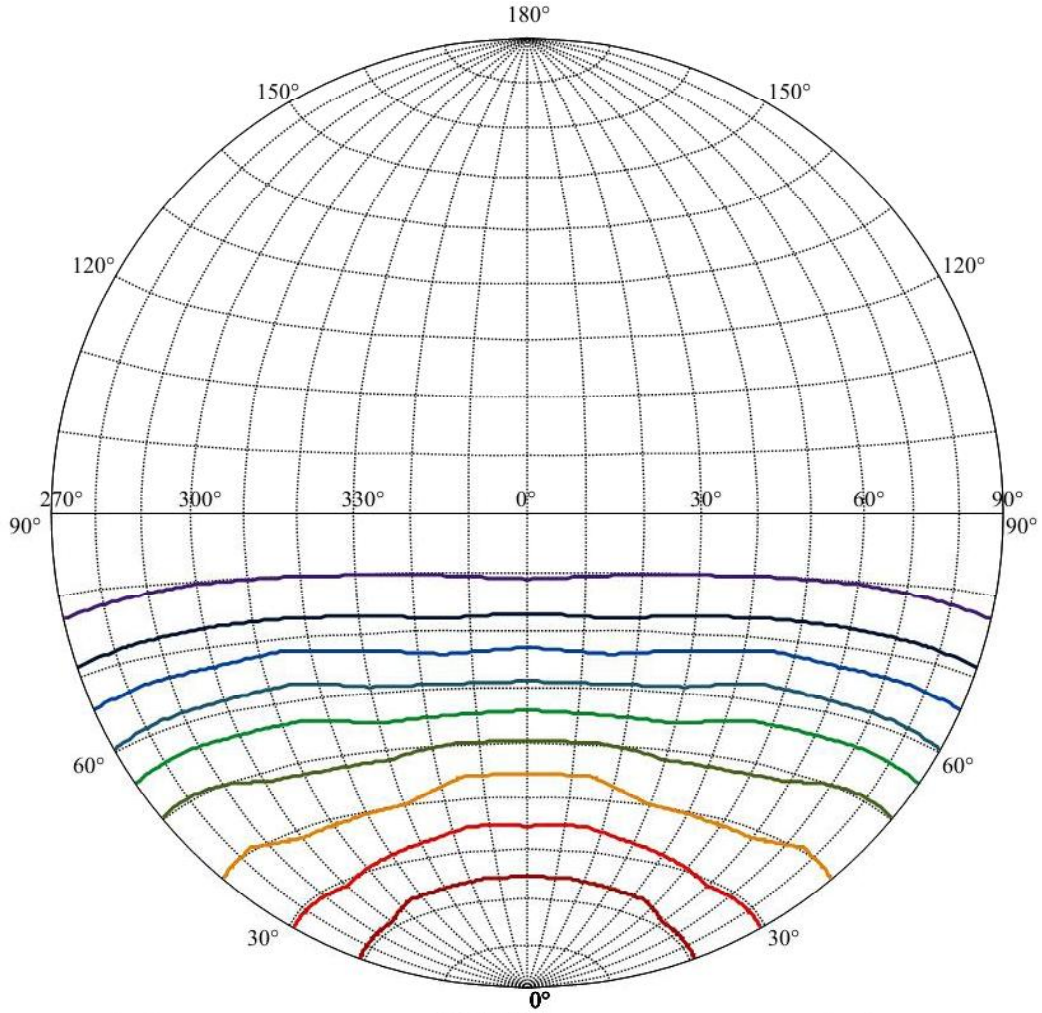




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4.7 ISO candela diagram on circular web



House

[Unit:cd]

Road

**Imax:2752.54**

- (10%Imax) 275.254
- (20%Imax) 550.508
- (30%Imax) 825.762
- (40%Imax) 1101.02
- (50%Imax) 1376.27
- (60%Imax) 1651.52
- (70%Imax) 1926.78
- (80%Imax) 2202.03
- (90%Imax) 2477.28

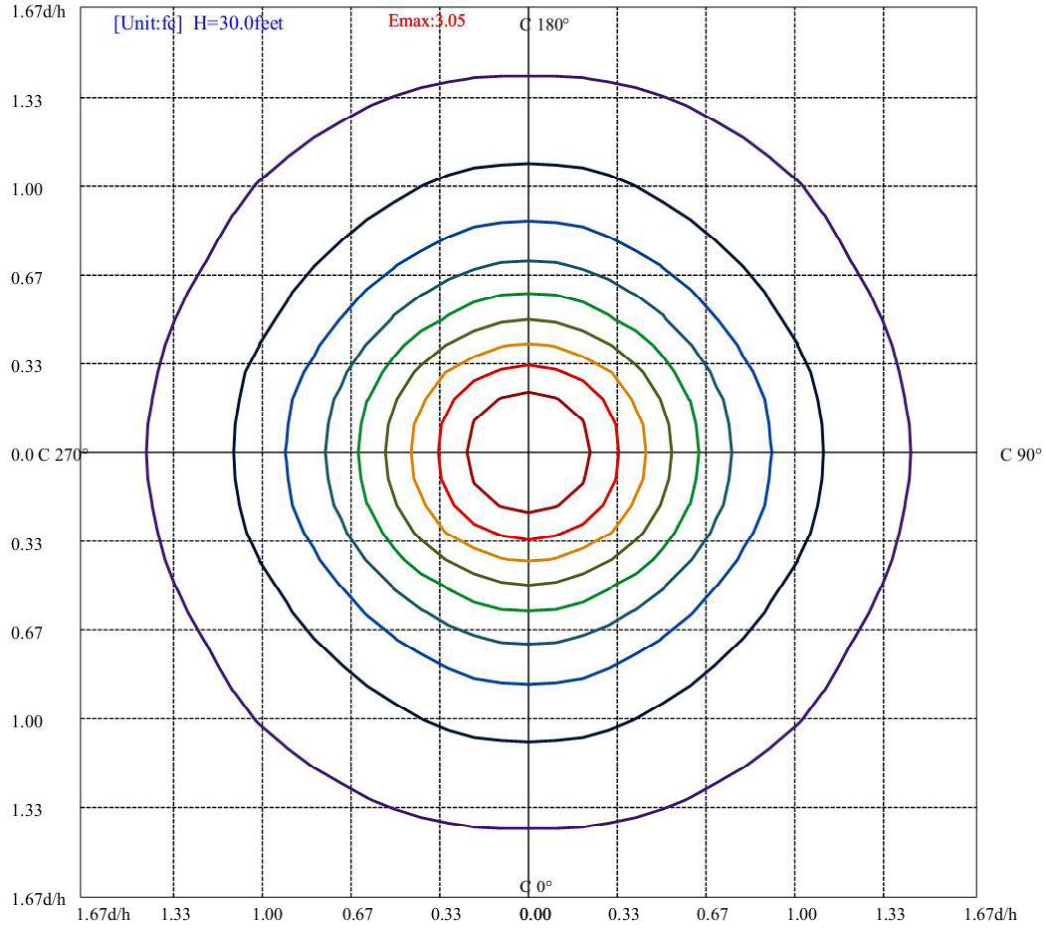




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4.8 ISO illuminance diagram

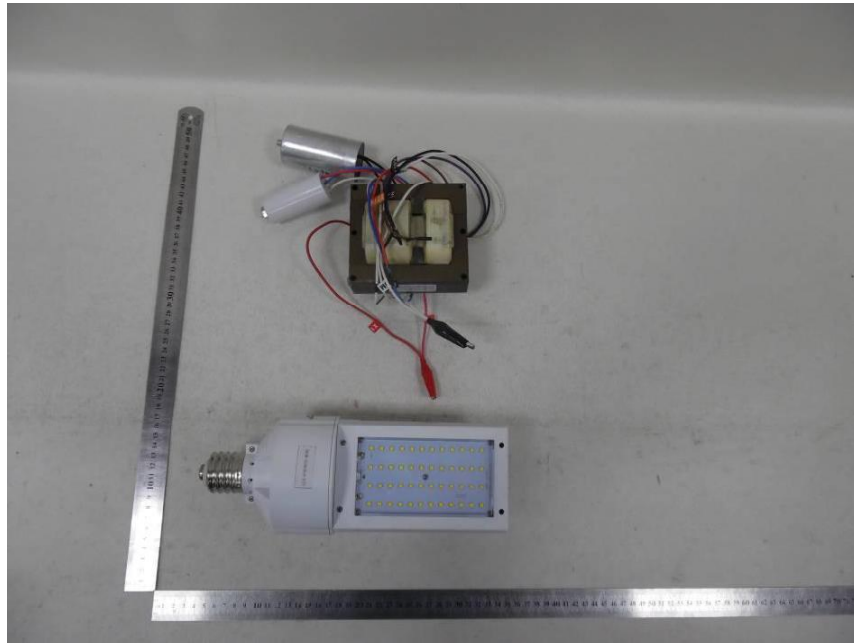


(10%Emax) 0.304913	—
(20%Emax) 0.6098248	—
(30%Emax) 0.9147379	—
(40%Emax) 1.219654	—
(50%Emax) 1.524565	—
(60%Emax) 1.829476	—
(70%Emax) 2.134386	—
(80%Emax) 2.439297	—
(90%Emax) 2.744208	—

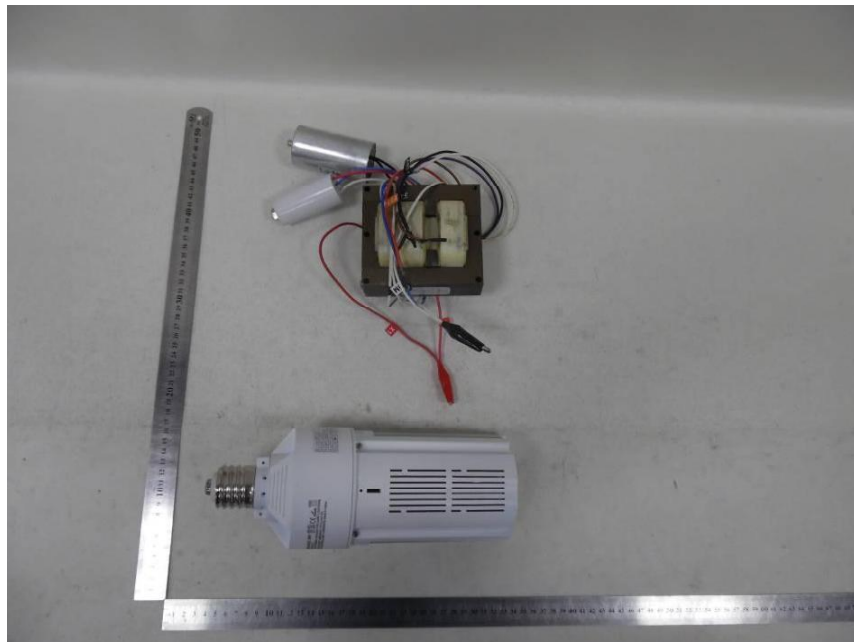
4.9 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
<b>0</b>	2743.216	2743.216	2743.216	2743.216	2743.216	2743.216	2743.216
<b>5</b>	2739.709	2730.747	2737.794	2752.539	2735.793	2738.848	2742.343
<b>10</b>	2702.011	2704.511	2705.297	2725.479	2705.824	2708.287	2711.339
<b>15</b>	2638.011	2636.069	2642.393	2668.607	2650.095	2652.618	2641.470
<b>20</b>	2497.738	2499.629	2508.033	2574.488	2564.171	2567.477	2561.121
<b>25</b>	2326.781	2331.050	2343.701	2420.257	2445.827	2466.186	2469.419
<b>30</b>	2185.192	2187.618	2171.907	2241.995	2300.847	2339.565	2331.428
<b>35</b>	2059.823	2057.745	2034.216	2061.126	2121.344	2198.761	2189.071
<b>40</b>	1920.865	1937.307	1882.748	1900.271	1933.115	2046.595	2086.451
<b>45</b>	1821.359	1831.267	1729.127	1742.800	1762.819	1903.837	1910.470
<b>50</b>	1663.595	1670.654	1618.760	1592.883	1592.335	1669.503	1674.794
<b>55</b>	1399.268	1444.327	1437.600	1456.202	1365.272	1393.618	1429.381
<b>60</b>	1113.637	1169.733	1199.594	1227.181	1142.040	1145.561	1151.085
<b>65</b>	860.663	904.234	934.417	997.021	947.428	874.335	926.807
<b>70</b>	605.717	652.362	659.497	724.062	671.077	625.894	678.599
<b>75</b>	359.801	417.400	469.688	455.270	467.865	448.349	448.906
<b>80</b>	163.900	209.346	254.721	271.996	270.456	258.151	221.265
<b>85</b>	56.942	94.930	116.324	115.663	102.779	88.145	84.803
<b>90</b>	31.561	35.553	39.729	36.927	30.629	25.562	20.611
<b>95</b>	15.386	16.923	19.493	18.129	13.991	8.710	5.983
<b>100</b>	1.929	4.350	10.876	12.312	10.079	6.178	2.445
<b>105</b>	1.885	2.121	6.234	8.522	7.498	4.519	1.790
<b>110</b>	1.797	1.793	3.664	5.657	5.661	3.777	1.878
<b>115</b>	1.710	1.793	2.334	3.697	4.000	2.947	1.790
<b>120</b>	1.710	1.771	1.905	2.575	2.907	2.423	1.834
<b>125</b>	1.885	1.924	1.883	2.158	2.448	2.227	1.921
<b>130</b>	2.060	2.077	1.989	2.114	2.208	2.183	2.096
<b>135</b>	1.885	2.012	1.903	1.872	1.968	1.987	1.921
<b>140</b>	2.718	2.777	2.695	2.666	2.711	2.772	2.751
<b>145</b>	3.770	3.827	3.743	3.724	3.826	3.886	3.843
<b>150</b>	5.041	5.226	4.983	4.914	5.008	5.108	5.109
<b>155</b>	6.444	6.669	6.417	6.368	6.450	6.440	6.376
<b>160</b>	8.636	8.900	8.533	8.461	8.615	8.601	8.515
<b>165</b>	10.915	11.152	10.737	10.597	10.736	10.806	10.742
<b>170</b>	12.888	13.164	12.661	12.558	12.661	12.618	12.664
<b>175</b>	14.422	14.891	14.308	14.234	14.323	14.386	14.236
<b>180</b>	15.129	15.129	15.129	15.129	15.129	15.129	15.129

### Appendix 1 Product Photo



Picture 1



Picture 2

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