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Test report of

## IES LM-79-08

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

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

For products:

LED Lamp

Models No.:

LED-8032M40-MHBC

**Test Date:** Sep. 12, 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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**Test Note:**

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## 1. General

### 1.1 Product Information

Brand Name	-
Product Type	LED Lamp
Model Number	LED-8032M40-MHBC
Rated Inputs	277V, 60Hz
Rated Power	210 W
Rated Light output	N/A
Declared CCT	4000K
Ballast	M59
LED Package, Array or Module	Model: SPMWHX1228FXXXXXXXXX, 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  $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ ; 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	277.00V~60Hz
Input Current(A)	1.294	1.298
Total Power(W)	208.80	208.82
Power Factor	0.583	0.581
I-THD(%)	32.87	-
Off-state Power(W)	-	-

#### 3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	19578.57
Luminaire Efficacy(Lm/W)	-	93.76
Correlated Color Temperature (CCT)(K)	3967	-
Color Rendering Index (CRI)	82.8	-
R9	9	-
Chromaticity Coordinate (x,y)	x=0.3817 y=0.3767	-
Chromaticity Coordinate (u,v)	u=0.2259 v=0.3345	-
Chromaticity Coordinate (u',v')	u'= 0.2259 v'=0.5018	-
Duv	-0.00036	-
Central intensity(cd)	-	6933.605
Beam angle	-	107.4°
Spacing Criteria(0-180°)	-	1.24
Spacing Criteria(90-270°)	-	1.26
Zone Lumens between 0-60 °	-	77.90%
Zone Lumens between60-90 °	-	18.20%
Zone Lumens between 90-120 °	-	2.70%
Zone Lumens between 120-180 °	-	1.20%

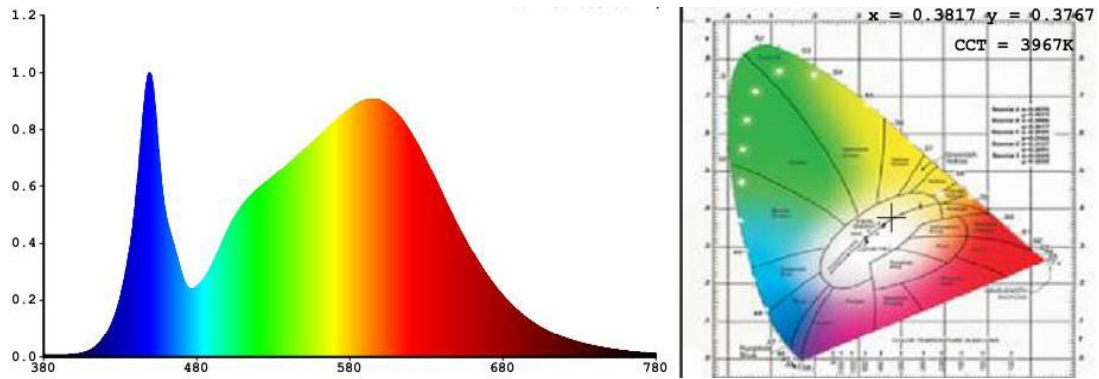
#### 3.3 Color Rendering Details

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

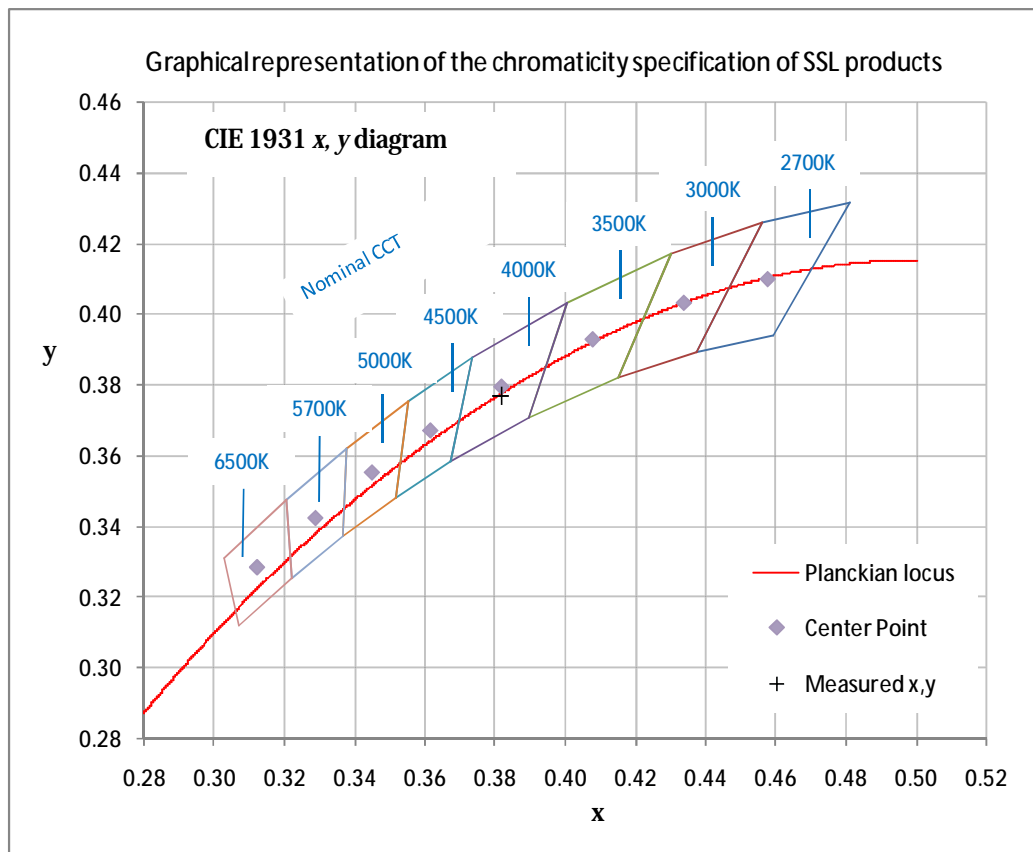
Note: N.A.

## 4. Test Data

### 4.1 Spectral Distribution



### 4.2 ANSI Chromaticity Quadrangles Diagram





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**4.3 Goniometry Test Data**

CIE Type	Semi-Direct	Basic Luminous Shape	Circular w/ Sides
Spacing Criteria (0-180°)	1.24	Luminous Diameter	0.22 m
Spacing Criteria (90-270°)	1.26	Luminous Height	0.03 m
Spacing Criteria (Diagonal)	1.38		
Test Distance	29.54 m		

**4.4 Zonal Lumen Summary**

Zone	Lumens	%Lamp	%Fixt
0-20	2567.12	13.10	13.10
0-30	5435.97	27.80	27.80
0-40	8821.72	45.10	45.10
0-60	15260.55	77.90	77.90
0-80	18363.11	93.80	93.80
0-90	18814.47	96.10	96.10
10-90	18156.79	92.70	92.70
20-40	6254.6	31.90	31.90
20-50	9760.3	49.90	49.90
40-70	8433.21	43.10	43.10
60-80	3102.56	15.80	15.80
70-80	1108.18	5.70	5.70
80-90	451.36	2.30	2.30
90-110	353.81	1.80	1.80
90-120	518.86	2.70	2.70
90-130	629.32	3.20	3.20
90-150	724.73	3.70	3.70
90-180	764.11	3.90	3.90
110-180	410.29	2.10	2.10
0-180	19578.57	100.00	100.00

Total Luminaire Efficiency = 100.00%

**ZONAL LUMEN SUMMARY**

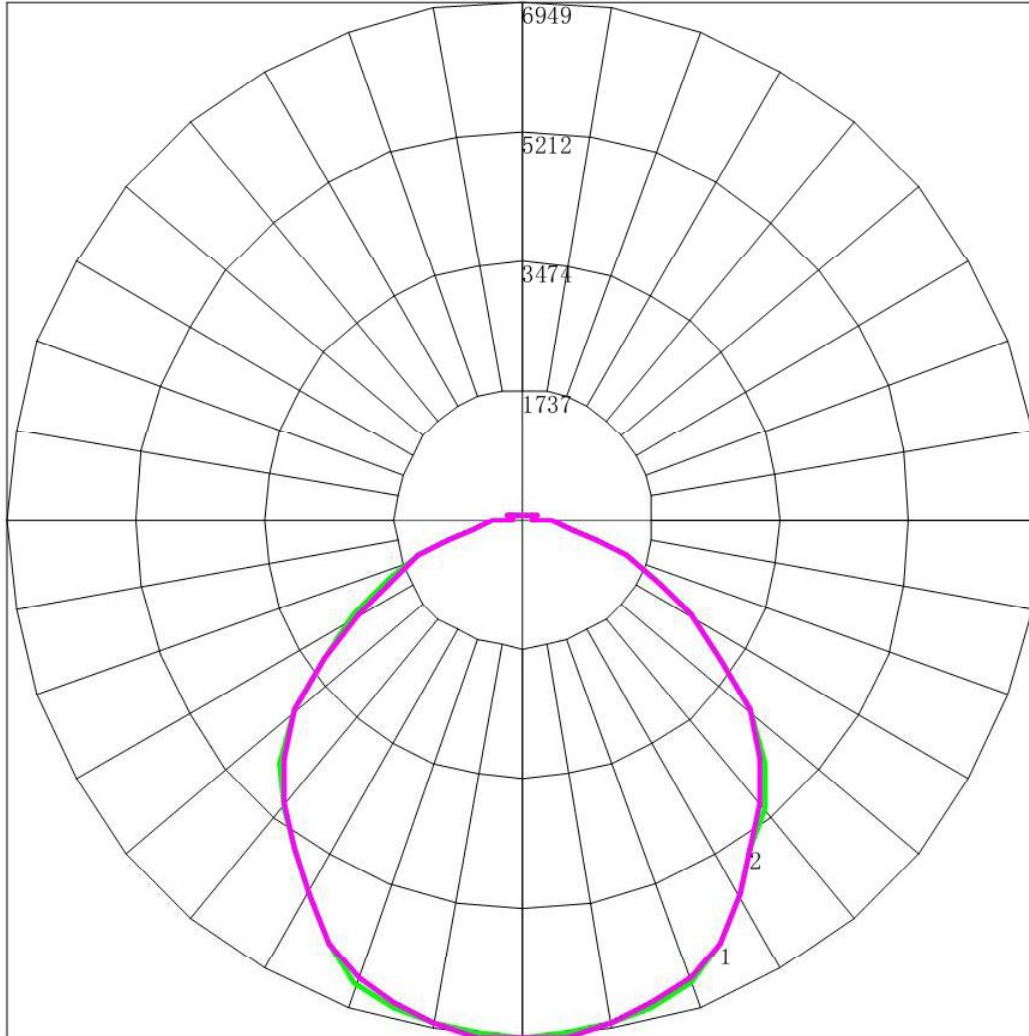
Zone	Lumens
0-10	657.68
10-20	1909.45
20-30	2868.85
30-40	3385.74
40-50	3505.7
50-60	2933.13
60-70	1994.38
70-80	1108.18
80-90	451.36
90-100	157.88
100-110	195.94
110-120	165.04
120-130	110.47
130-140	62.88
140-150	32.52
150-160	19.45
160-170	14.09
170-180	5.84





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4.5 Polar Curves

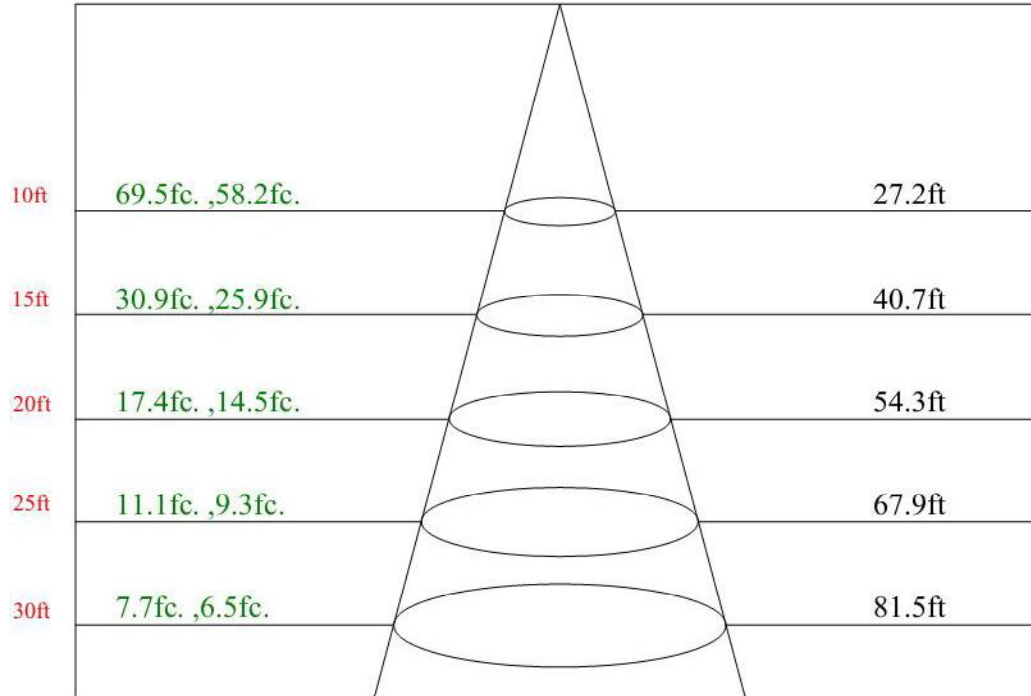


Maximum Candela = 6948.875 Located At Horizontal Angle = 90, Vertical Angle = 5  
# 1 - Vertical Plane Through Horizontal Angles (0 - 180)  
# 2 - Vertical Plane Through Horizontal Angles (90 - 270)



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4.6 Lux distance Curve

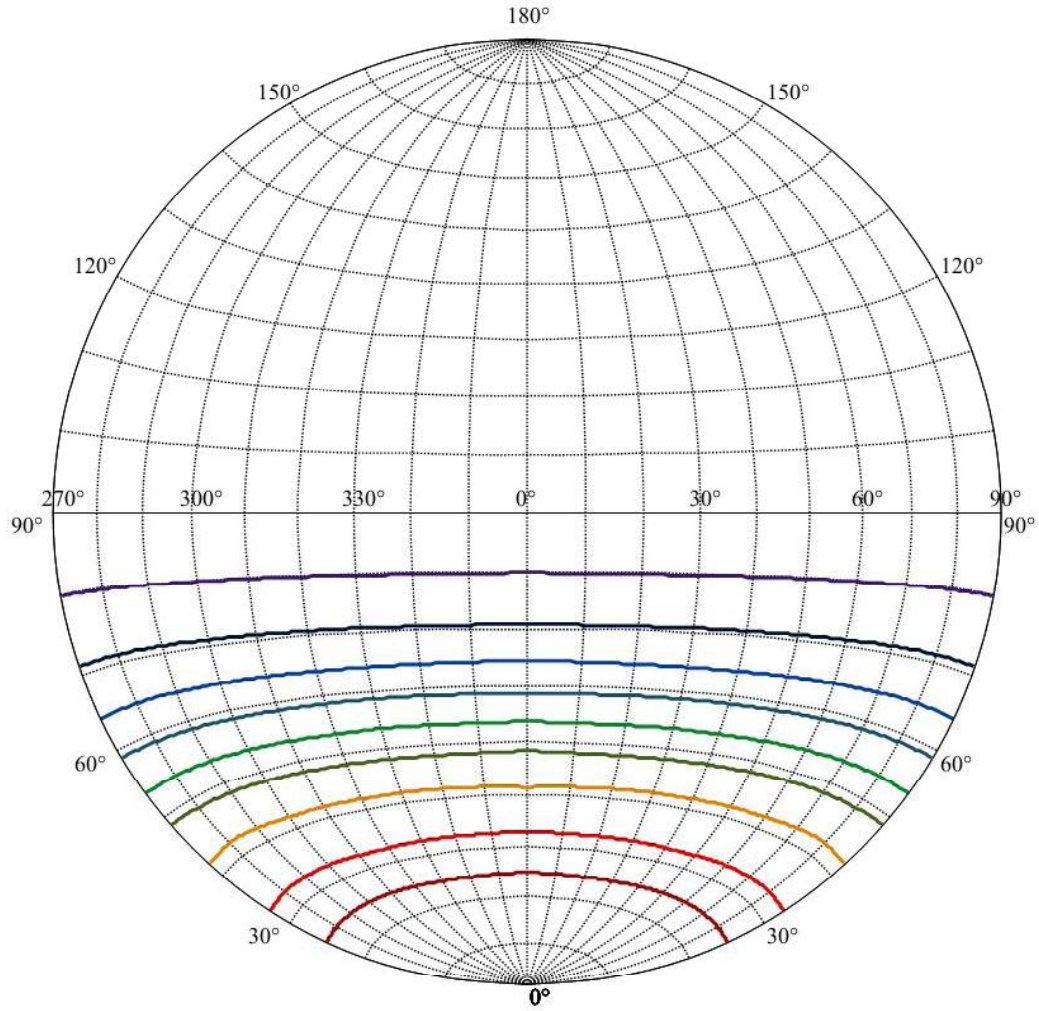




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4.7 ISO candela diagram on circular web



House

[Unit:cd]

Road

Imax:6948.88

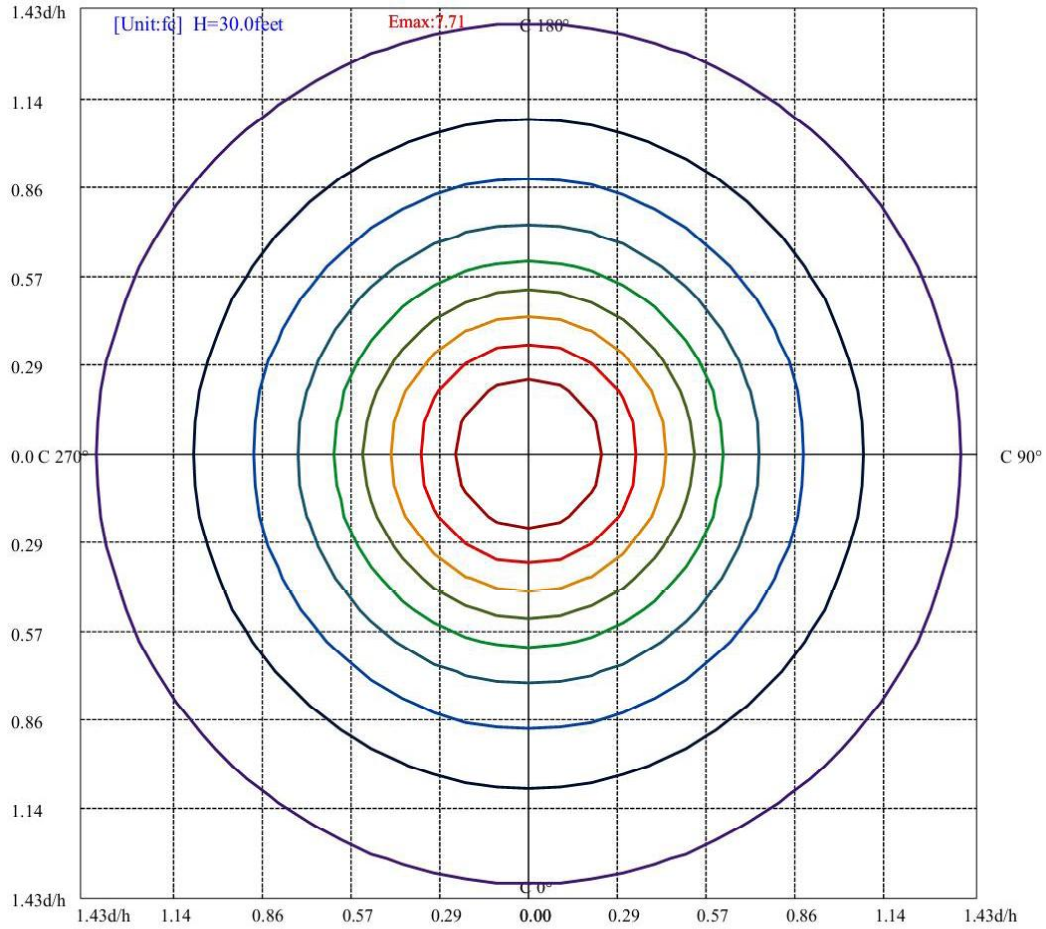
(10%Imax) 694.888	
(20%Imax) 1389.78	
(30%Imax) 2084.66	
(40%Imax) 2779.55	
(50%Imax) 3474.44	
(60%Imax) 4169.33	
(70%Imax) 4864.21	
(80%Imax) 5559.1	
(90%Imax) 6253.99	



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### 4.8 ISO illuminance diagram



(10%Emax) 0.7706799	—
(20%Emax) 1.54136	—
(30%Emax) 2.31204	—
(40%Emax) 3.08272	—
(50%Emax) 3.8534	—
(60%Emax) 4.62408	—
(70%Emax) 5.39476	—
(80%Emax) 6.165439	—
(90%Emax) 6.93612	—





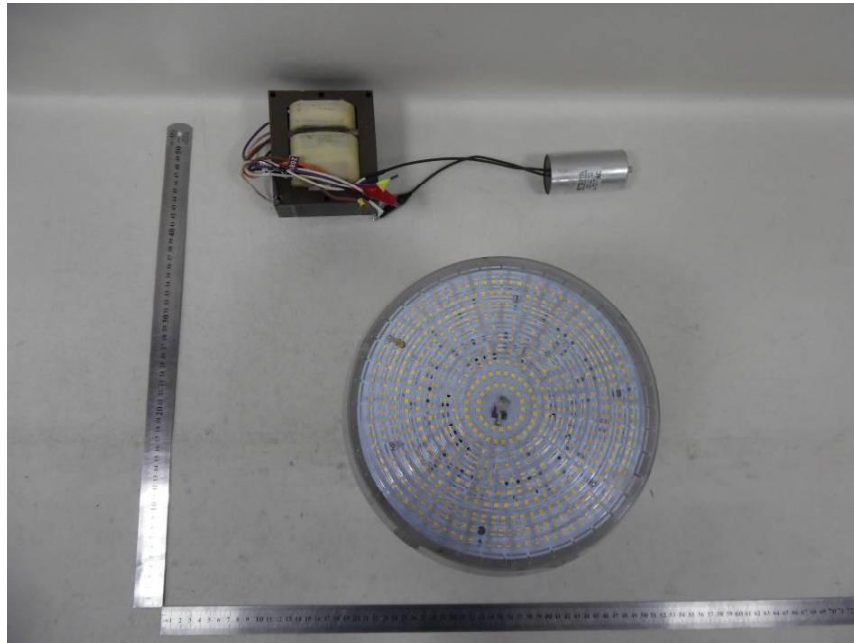
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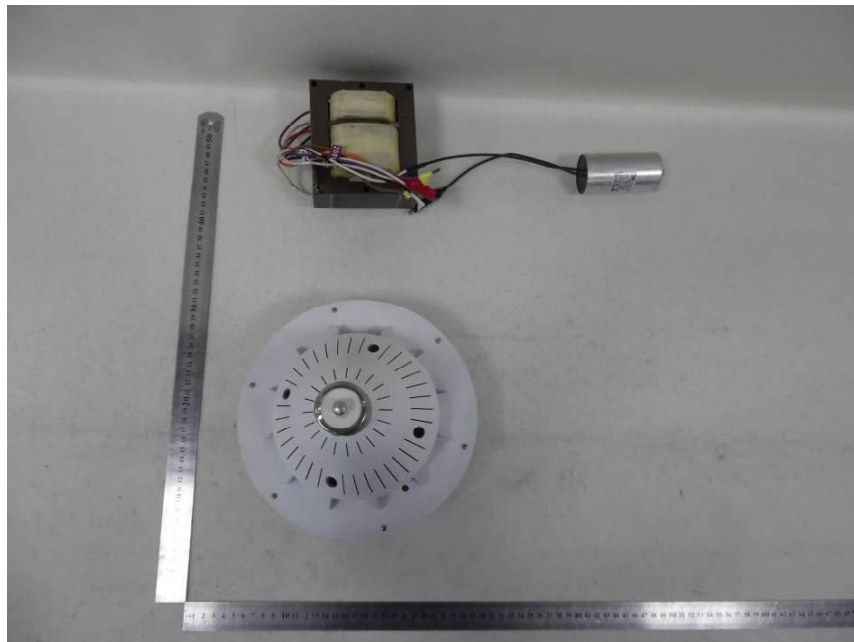
4.9 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
<b>0</b>	6933.605	6933.605	6933.605	6933.605	6933.605	6933.605	6933.605
<b>5</b>	6910.028	6919.613	6910.698	6903.520	6903.265	6909.239	6948.875
<b>10</b>	6866.802	6861.699	6845.992	6848.159	6835.803	6823.417	6841.547
<b>15</b>	6784.279	6805.082	6781.224	6766.633	6769.142	6752.844	6740.763
<b>20</b>	6628.404	6635.027	6604.206	6573.069	6590.835	6579.232	6538.758
<b>25</b>	6252.471	6258.393	6258.145	6248.918	6233.193	6229.708	6251.240
<b>30</b>	5788.774	5777.926	5796.738	5754.523	5762.991	5785.657	5822.797
<b>35</b>	5380.530	5414.637	5393.814	5373.495	5394.569	5377.267	5378.649
<b>40</b>	5043.019	5068.624	5047.566	5036.279	5051.371	5048.620	5002.126
<b>45</b>	4614.689	4650.246	4576.820	4578.308	4551.904	4533.569	4538.780
<b>50</b>	3995.119	3948.348	3964.350	3943.534	3941.168	3927.881	3989.484
<b>55</b>	3279.927	3291.049	3285.629	3268.870	3288.784	3268.836	3278.760
<b>60</b>	2621.497	2610.595	2604.470	2606.210	2602.423	2608.473	2571.961
<b>65</b>	1985.290	2006.703	1995.050	1979.238	1982.074	1993.750	2029.864
<b>70</b>	1480.726	1494.527	1474.743	1460.551	1456.818	1441.431	1467.916
<b>75</b>	1042.180	1039.757	1025.666	1023.604	1023.494	1014.978	1019.971
<b>80</b>	684.148	685.033	681.456	678.602	675.517	672.194	682.497
<b>85</b>	408.812	414.859	410.527	406.627	399.144	401.315	386.383
<b>90</b>	162.075	160.857	160.686	165.142	166.171	168.916	202.397
<b>95</b>	122.342	122.278	122.385	122.158	122.929	123.882	127.878
<b>100</b>	165.743	166.717	165.557	164.991	164.415	165.280	162.825
<b>105</b>	193.469	194.543	195.015	196.883	195.177	194.289	191.490
<b>110</b>	187.618	186.652	184.832	186.136	186.939	186.864	186.560
<b>115</b>	170.284	168.662	167.038	166.038	164.804	165.826	167.930
<b>120</b>	146.313	145.470	144.755	142.801	141.952	142.936	145.592
<b>125</b>	126.010	125.666	122.516	122.899	121.018	121.374	120.636
<b>130</b>	105.663	104.332	101.606	100.795	99.927	99.727	101.308
<b>135</b>	83.264	81.839	80.107	79.302	79.059	77.751	78.271
<b>140</b>	63.180	63.084	62.751	61.624	60.843	60.329	61.212
<b>145</b>	51.565	51.281	51.130	50.747	49.777	49.286	49.650
<b>150</b>	43.575	43.586	43.303	43.095	42.915	42.622	43.281
<b>155</b>	41.043	41.007	40.730	40.697	40.519	40.335	40.750
<b>160</b>	43.444	43.455	43.477	43.531	43.503	43.450	44.066
<b>165</b>	50.256	50.385	50.192	50.223	50.279	50.288	50.523
<b>170</b>	56.805	56.920	56.843	56.915	56.989	56.887	57.111
<b>175</b>	63.398	63.412	63.209	63.193	63.067	63.007	63.394
<b>180</b>	66.010	66.010	66.010	66.010	66.010	66.010	66.010

**Appendix 1 Product Photo**



Picture 1



Picture 2

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