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Test report of

## **IES LM-79-08**

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

Rendered to:

Imminent Teknologies Limited

Suite 5, Valley Towers, Valley Road, Birkirkara BKR9022, Malta

For products:

LED bulk head

Models No.:

BLU-BULKZ-OVG-13W-840-B

**Test Date:** Jul. 1, 2020

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**Jul. 8, 2020**

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## 1. General

### 1.1 Product Information

Brand Name	BLUi
Product Type	LED bulk head
Model Number	BLU-BULKZ-OVG-13W-840-B
Rated Inputs	100-277VAC, 50/60Hz
Rated Power	13W
Rated Light output	1080lm
Declared CCT	4000K
Power Supply	Built in
LED Package, Array or Module	Samsung
Receipt Samples	1 unit
Sample Code of lab.	200630108001
Date of Receipt Samples	Jun. 30, 2020
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 or 2015 or 2017	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-987	APW-120N	2020-01-06	2021-01-05
AC Power supply	LC-I-989	APW-120N	2020-01-06	2021-01-05
Power analyzer	LC-I-928	WT210	2019-12-29	2020-12-28
Power analyzer	LC-I-954	WT210	2019-12-26	2020-12-25
Multimeter	LC-I-972	Fluke 17B	2019-07-29	2020-07-28
Photometric colorimetric electric system** (2 meter sphere)	LC-I-956	HAAS-2000	Before use	Before use
Standard lamp***	LC-PL-I-011	D204C	2019-08-01	2020-07-31
Luminous Flux Standard Lamp****	LC-PL-I-003	24V100W	2019-08-01	2020-07-31
Goniophotometer(with mirror)	LC-I-902	GMS2000	2020-04-23	2021-04-22
Wireless temperature transmitter	LC-I-PL-008	DWLR-DLR	2020-01-03	2021-01-02
Wireless temperature transmitter	LC-I-PL-009	DWLR-DLR	2020-01-03	2021-01-02

Note:

\* Bandwidth of spectroradiometer is 1 nm.

\*\* halogen lamp, 100W, omni-directional type, and its traceability to NIM.

\*\*\* halogen lamp, 100W, omni-directional type, and its traceability to NIM.

## 2. Test conducted and method

The luminaire 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 by 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	229.99 V~50Hz	230.02 V~50Hz
Input Current(A)	0.113	0.110
Total Power(W)	12.85	12.72
Power Factor	0.996	0.995
I-THD	18.96	18.98
Off-state Power(W)	-	-

#### 3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	1106.94
Luminaire Efficacy(Lm/W)	-	87.02
Correlated Color Temperature (CCT)(K)	4024	-
Color Rendering Index (CRI)	84.0	-
R9	1	-
Chromaticity Coordinate (x,y)	x = 0.3812 y = 0.3831	-
Chromaticity Coordinate (u,v)	u = 0.2231 v = 0.3363	-
Chromaticity Coordinate (u',v')	u' = 0.2231 v' = 0.5045	-
Duv	0.0027	-
Zone Lumens between 0-60 °	-	19.50%
Beam Angle(50%Imax)	-	C0/180=338.4° C90/270=183.2°

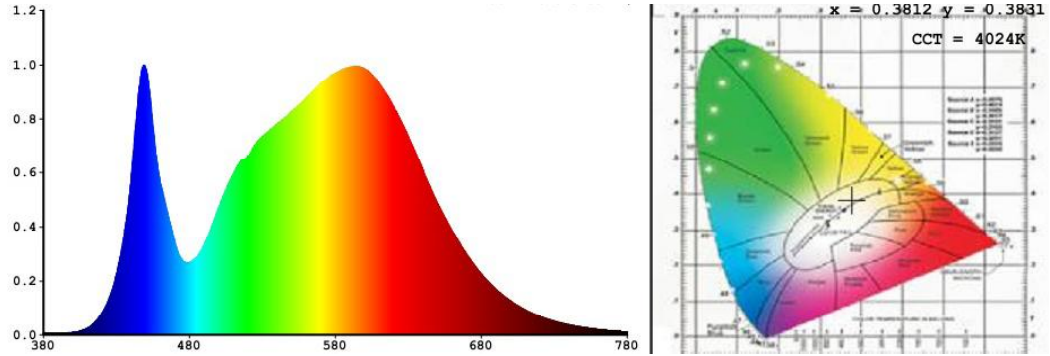
#### 3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
79	86	93	81	79	82	86	63
R9	R10	R11	R12	R13	R14	R15	-
1	68	79	60	80	96	72	-

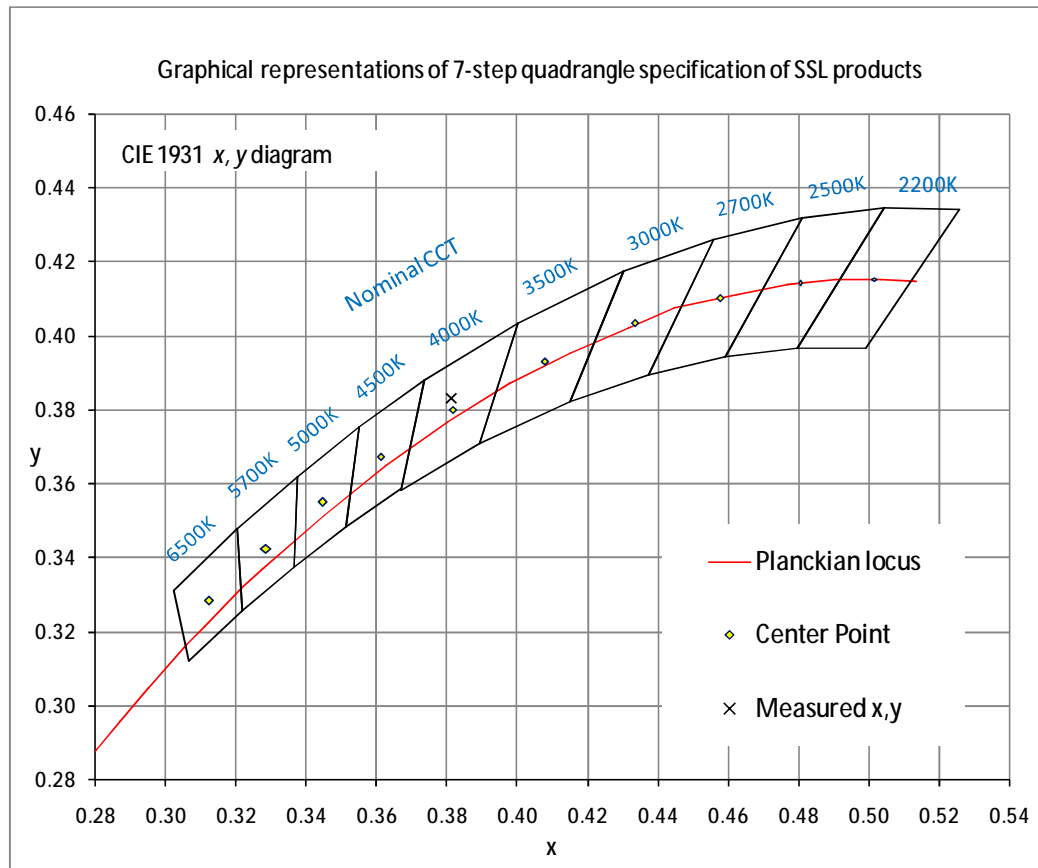
Note: N/A

## 4. Test Data

### 4.1 Spectral Distribution



### 4.2 ANSI Chromaticity Quadrangles Diagram



#### 4.3 Goniometry Test Data

CIE Type	General Diffuse	Basic Luminous Shape	Rectangular w/Sides
Spacing Criteria (0-180)	N.A.	Luminous Length	0.14 m
Spacing Criteria (90-270)	N.A.	Luminous Width	0.09 m
Spacing Criteria (Diagonal)	N.A.	Luminous Height	0.23 m
Test Distance	29.77 m		

#### 4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	8.14	0.90	0.90
0-30	24.87	2.90	2.90
0-40	57.67	6.70	6.70
0-60	168.79	19.50	19.50
0-80	329.96	38.10	38.10
0-90	424.95	49.00	49.00
10-90	423.28	48.80	48.80
20-40	49.52	5.70	5.70
20-50	98.46	11.40	11.40
40-70	185.82	21.40	21.40
60-80	161.17	18.60	18.60
70-80	86.47	10.00	10.00
80-90	94.99	11.00	11.00
90-110	184.76	21.30	21.30
90-120	261.27	30.10	30.10
90-130	325.12	37.50	37.50
90-150	412.45	47.60	47.60
90-180	441.99	51.00	51.00
110-180	257.23	29.70	29.70

Total Luminaire Efficiency = 100.00%

#### ZONAL LUMEN SUMMARY

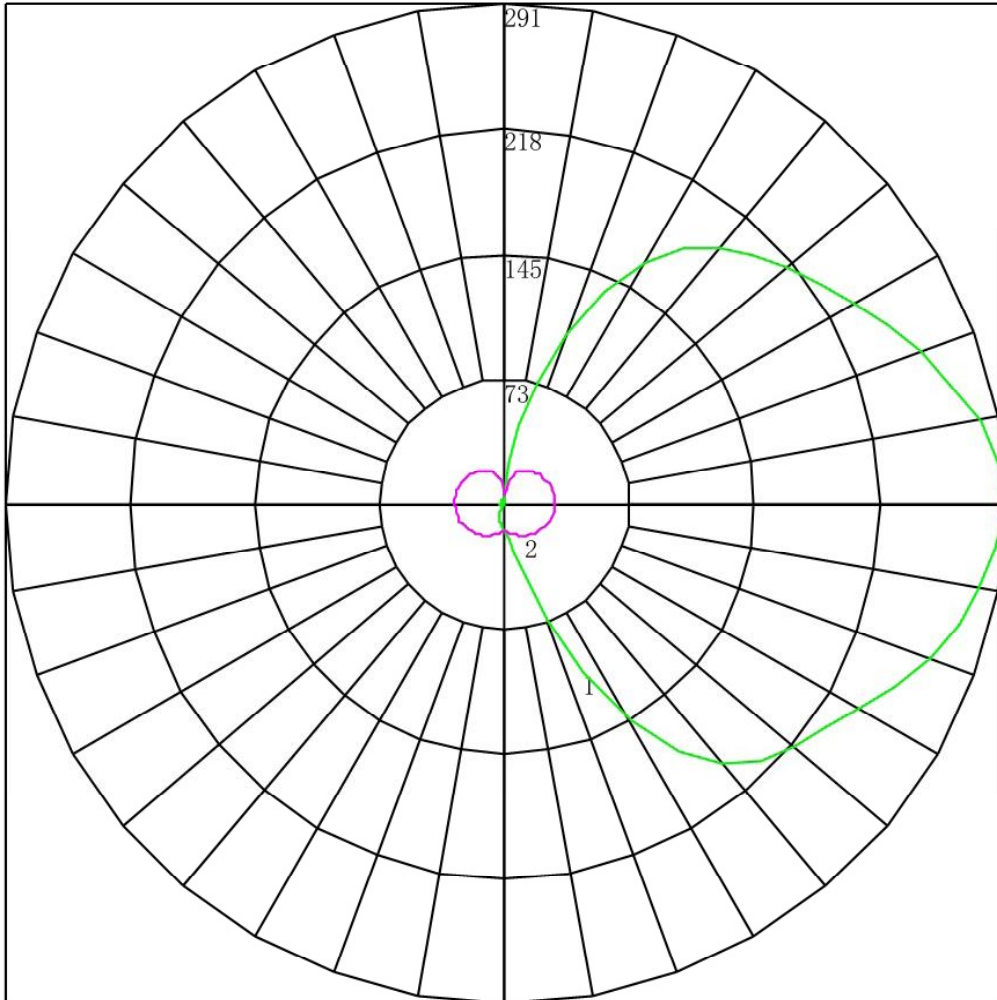
Zone	Lumens
0-10	1.66
10-20	6.48
20-30	16.73
30-40	32.80
40-50	48.94
50-60	62.18
60-70	74.70
70-80	86.47
80-90	94.99
90-100	96.14
100-110	88.62
110-120	76.51
120-130	63.85
130-140	50.97
140-150	36.35
150-160	20.45
160-170	7.82
170-180	1.27





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4.5 Polar Curves



Maximum Candela = 290.91 Located At Horizontal Angle = 0, Vertical Angle = 90  
# 1 - Vertical Plane Through Horizontal Angles (0 - 180)  
# 2 - Vertical Plane Through Horizontal Angles (90 - 270)

**4.6 Candela Tabulation**

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>	<u>105</u>	<u>120</u>	<u>135</u>
<b>0</b>	16.314	16.314	16.314	16.314	16.314	16.314	16.314	16.314	16.314	16.314
<b>5</b>	20.714	20.450	20.010	19.206	18.291	17.399	16.483	15.797	15.000	14.448
<b>10</b>	28.871	28.039	26.319	23.873	21.448	19.090	17.071	15.622	14.164	13.024
<b>15</b>	44.452	42.171	36.773	30.624	25.304	21.032	17.828	15.622	13.593	11.956
<b>20</b>	71.857	66.619	53.938	40.081	30.030	23.149	18.753	15.970	13.242	11.111
<b>25</b>	108.793	100.064	78.946	54.253	35.371	25.481	19.804	16.274	13.024	10.265
<b>30</b>	146.280	134.143	106.703	72.900	41.763	27.812	20.898	16.793	12.847	9.553
<b>35</b>	176.709	163.356	132.079	92.618	49.388	30.141	21.949	17.270	12.759	8.885
<b>40</b>	197.973	184.250	150.964	109.984	57.722	32.472	23.000	17.703	12.670	8.263
<b>45</b>	210.988	196.242	164.219	123.962	66.629	34.715	24.051	18.222	12.714	7.908
<b>50</b>	219.512	201.191	173.188	134.889	75.020	36.612	24.850	18.786	12.845	7.461
<b>55</b>	227.211	202.145	178.644	143.681	83.150	38.295	25.691	19.350	13.021	7.327
<b>60</b>	238.392	204.596	183.106	152.937	92.008	39.977	26.532	19.913	13.329	7.238
<b>65</b>	250.674	210.684	188.249	161.361	100.769	41.489	27.247	20.477	13.590	7.238
<b>70</b>	264.331	219.364	193.667	169.157	109.315	42.956	28.046	21.169	13.941	7.327
<b>75</b>	273.863	227.999	199.757	176.057	117.955	44.294	28.550	21.648	14.292	7.416
<b>80</b>	280.828	236.498	206.933	182.927	125.759	45.417	28.971	22.211	14.557	7.549
<b>85</b>	286.694	244.907	213.342	188.293	131.309	46.238	29.181	22.603	14.734	7.594
<b>90</b>	290.910	250.224	216.229	190.656	133.955	46.796	29.265	22.561	14.777	7.638
<b>95</b>	288.436	249.544	215.368	189.950	134.168	47.226	29.349	22.434	14.780	7.728
<b>100</b>	281.287	244.091	210.678	187.192	131.605	47.398	29.265	22.089	14.561	7.685
<b>105</b>	268.913	233.823	203.233	181.675	126.533	47.309	29.055	21.568	14.343	7.685
<b>110</b>	258.006	222.600	194.434	174.633	119.526	46.925	28.718	21.136	14.125	7.686
<b>115</b>	246.000	211.968	187.033	166.704	111.635	46.282	28.214	20.573	13.864	7.686
<b>120</b>	234.910	203.562	181.660	159.834	103.908	45.466	27.625	20.053	13.557	7.688
<b>125</b>	223.819	196.929	177.415	151.732	96.199	44.690	27.079	19.534	13.294	7.688
<b>130</b>	213.921	192.476	173.492	143.724	88.889	43.702	26.448	18.928	12.988	7.596
<b>135</b>	204.480	188.753	168.762	135.095	81.988	42.496	25.607	18.408	12.812	7.641
<b>140</b>	194.032	182.123	160.657	123.837	75.401	40.817	24.808	17.889	12.596	7.909
<b>145</b>	181.109	171.403	147.910	110.172	67.944	38.574	23.883	17.074	12.509	8.045
<b>150</b>	162.778	153.413	129.712	94.332	59.439	35.766	22.453	16.597	12.421	8.221
<b>155</b>	136.473	127.562	106.553	77.379	49.836	32.611	21.066	15.901	11.899	7.778
<b>160</b>	104.761	97.936	81.857	60.971	42.268	29.247	19.804	14.818	10.537	6.672
<b>165</b>	72.590	69.170	59.095	46.829	35.052	25.273	17.492	13.469	8.873	5.385
<b>170</b>	46.469	45.037	39.753	32.505	26.415	20.259	14.170	10.489	7.339	4.456
<b>175</b>	24.655	23.768	22.221	19.970	17.200	14.166	7.863	6.633	4.610	3.190
<b>180</b>	4.540	4.540	4.540	4.540	4.540	4.540	4.540	4.540	4.540	4.540

**Vert. Horizontal Angles**

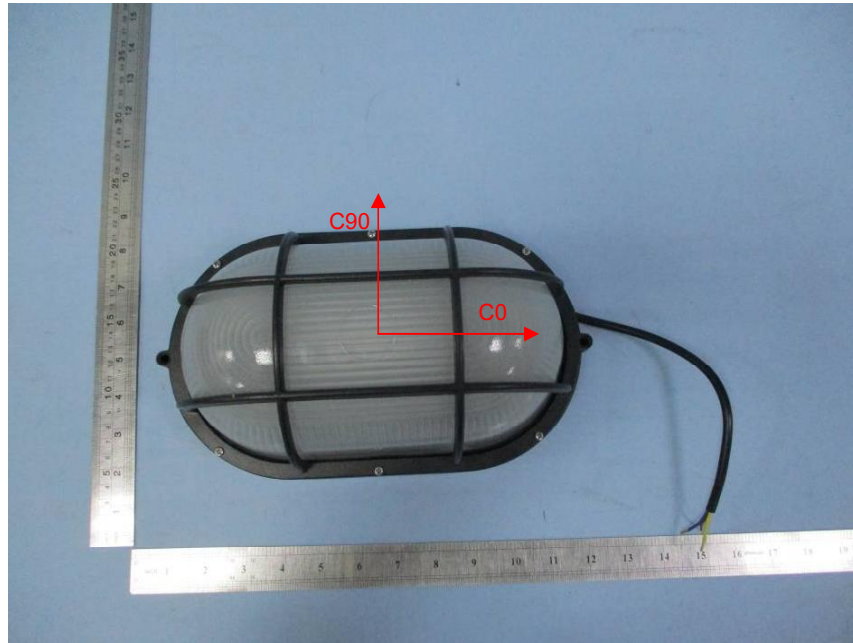
	<u>150</u>	<u>165</u>	<u>180</u>
<b>0</b>	16.314	16.314	16.314
<b>5</b>	13.970	13.678	13.656
<b>10</b>	12.213	11.770	11.640
<b>15</b>	10.770	10.088	9.899
<b>20</b>	9.508	8.543	8.249
<b>25</b>	8.246	7.044	6.782
<b>30</b>	6.983	5.680	5.316
<b>35</b>	5.812	4.317	3.849
<b>40</b>	4.865	3.181	2.750
<b>45</b>	4.054	2.363	1.925
<b>50</b>	3.468	1.726	1.375
<b>55</b>	3.107	1.590	1.192
<b>60</b>	2.927	1.499	1.466
<b>65</b>	2.791	1.727	1.741
<b>70</b>	2.836	1.999	2.108
<b>75</b>	2.836	2.136	2.291
<b>80</b>	2.926	2.318	2.383



**CANDELA TABULATION - (Cont.)**

<b>85</b>	2.926	2.454	2.566
<b>90</b>	3.107	2.545	2.658
<b>95</b>	3.061	2.454	2.566
<b>100</b>	3.061	2.408	2.566
<b>105</b>	3.151	2.318	2.383
<b>110</b>	3.197	2.136	2.108
<b>115</b>	3.241	1.999	1.833
<b>120</b>	3.376	1.953	1.558
<b>125</b>	3.557	1.953	1.375
<b>130</b>	3.918	2.181	1.466
<b>135</b>	4.233	2.453	1.741
<b>140</b>	4.413	2.908	2.200
<b>145</b>	4.684	3.180	2.475
<b>150</b>	4.999	3.589	2.933
<b>155</b>	4.413	3.089	2.933
<b>160</b>	3.559	1.953	1.650
<b>165</b>	2.974	1.045	0.550
<b>170</b>	2.301	0.728	0.367
<b>175</b>	1.902	1.047	0.642
<b>180</b>	4.540	4.540	4.540

### Appendix A Product Photo



Picture 1



Picture 2

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