

## LM-79-08 Test Report

For

# Beyond LED TECHNOLOGY

1939 Parker Court, Stone Mountain, GA 30087

## 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces

Model name(s): ZS-BL2\*2-F40-CC

Remark: the "CC" in the model names represents the different CCT, it could be 30=3000K,35=3500K,40=4000K,45=4500K,50=5000K.

Representative (Tested) Model: ZS-BL2\*2-F40-30

Model Different: All construction and rating are the same, except CCT

Test & Report By:

*Leo Wang*

Engineer: Leo Wang

Date: Jul.04,2019

Review By:

*Garman Mo*

Manager: Garman Mo

Note: 1. The results contained in this report pertain only to the tested samples.

2. This report does not imply product certification, approval, or endorsement by A2LA, or any agency of the Federal Government.

**Laboratory: Standard-Tech Co., Ltd. Testing Center**

Report Format Number STD-QP019-409-B/0

Address: Standard-Tech Building, No.6 Guanhong Road,Guangzhou Science City, Guangzhou 510663, China

Tel: 8620-3229 0320 Fax: 8620-32290422 <http://www.standard-tech.com>

**1.1 Product Information:**

Organization Name	SHENZHEN ZENITH TECHNOLOGY CO.,LTD.	
Brand Name	N/A	
Model Number	ZS-BL2*2-F40-CC	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces	
Rated Voltage / Frequency	100-277Vac, 50/60Hz	
Nominal Power	40W	
Rated Initial Lamp Lumen	--	
Declared CCT	3000K,3500K,4000K,4500K,5000K	
LED Manufacturer	Shenzhen CHANGFANG GROUP Co., LTD	
LED Model	3000K:P28351-W29SJ0K1FE8F2-XXXX 5000K:P28351-W50SJ0K2FE8F2-XXXX	
Sample Number	JBE190415-A1(3000K),A2(5000K)	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaires Width	--	mm
Number of Units (modular products)	N/A	s

**Photo**



## 1.2 Test Specifications:

Date of Receipt	Jun.18,2019
Date of Test	Jun.20,2019
Test item	<ol style="list-style-type: none"> <li>1. Total Luminous Flux</li> <li>2. Luminous Distribution Intensity</li> <li>3. Luminous Efficacy</li> <li>4. Correlated Color Temperature</li> <li>5. Color Rendering Index</li> <li>6. Chromaticity Coordinate</li> <li>7. Electrical Parameters</li> </ol>
Reference Standard	<ol style="list-style-type: none"> <li>1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products</li> <li>2. ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products</li> <li>3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources</li> <li>4. CIE 15-2004 Technical Report Colorimetry</li> <li>5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source</li> <li>6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems</li> </ol>

## 1.3 Test Methods

### 1) Photometric and Light Distribution Measurement – Goniophotometer Method:

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ , measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at  $1^{\circ}$  vertical intervals and  $22.5^{\circ}$  horizontal intervals.

### 2) Chromaticity Measurement – Sphere-Spectroradiometer Method:

Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.

### 3) Electrical Measurements:

Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

## 2.1 Electrical, Photometric and Chromaticity Measurements

<b>Test date</b>	2019-06-20	<b>Test Ambient:</b>	25.1 °C
<b>Test Orientation</b>	As intended	<b>Stabilization Time (min)</b>	60
<b>Model Number</b>	ZS-BL2*2-F40-30	<b>Total Operating Time (min)</b>	90

### Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JBE190415-	120.0	60	0.3340	39.77	0.9923	4.61
A1	277.0	60	0.1616	40.87	0.9133	14.20
<b>DLC Pass Criteria</b>					$\geq 0.9(-3\%)$	$\leq 20(+5)$

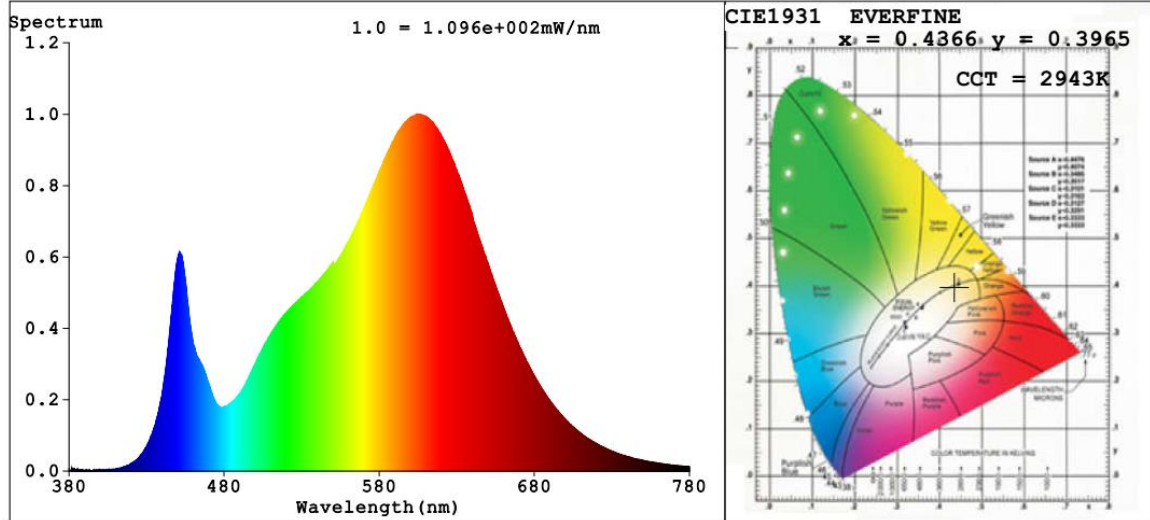
### Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result	Special Color Rendering Indices			
Test Voltage (V)	120.0	R1	83	R9	12
Frequency (Hz)	60	R2	93	R10	83
CCT (K)	2943	R3	95	R11	82
Duv	-0.0030	R4	82	R12	75
Chromaticity (x, y)	x=0.4366 y=0.3965	R5	83	R13	86
Chromaticity (u', v')	u'=0.2536 v'=0.5183	R6	91	R14	98
Color Rendering Index (CRI)	83.8	R7	82	R15	76
R9	12	R8	60	--	--

### Photometric Measurement – Goniophotometer Method (Test Distance: 26.000m):

Parameter	Result		DLC V4.4 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	5321.1	5499.4	$\geq 2000 (-10\%)$	
Luminous Efficacy (lm/W)	133.80	134.56	Standard: $\geq 100(-3\%)$	Premium: $\geq 125(-3\%)$
Zonal lumens in the 0-60° zone (%)	78.0	--	$\geq 75(-3)$	
SC: 0-180° (if applicable)	1.27	--	1.0-2.0( $\pm 0.1$ )	
SC: 90-270° (if applicable)	1.26	--	1.0-2.0( $\pm 0.1$ )	
Beam Angle (°)	113.7	--	--	
Center Beam Candle Power (cd)	1828	--	--	

**Spectral Power Distribution & Chromaticity Diagram**

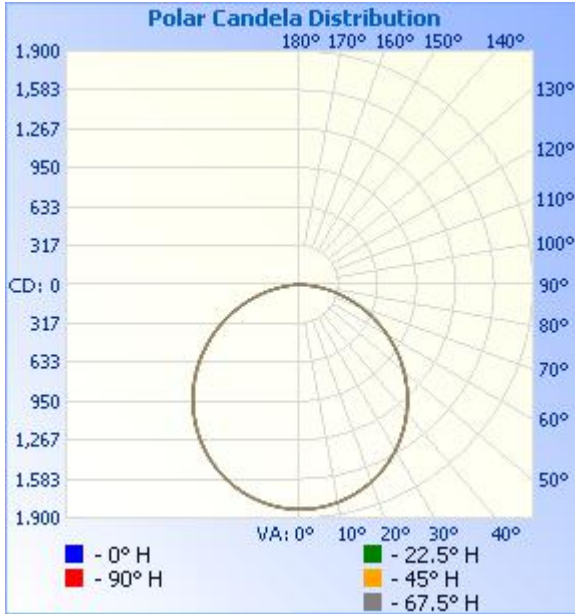


**Zonal Lumen Tabulation**

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1,422.6	26.7%
0-40	2,334.3	43.9%
0-60	4,147.5	78%
60-90	1,160.7	21.8%
70-100	498.4	9.4%
90-120	5.5	0.1%
0-90	5,308.2	99.8%
90-180	12.4	0.2%
0-180	5,320.6	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	173.0	3.3%	90-100	1.8	0%
10-20	496.0	9.3%	100-110	1.7	0%
20-30	753.6	14.2%	110-120	2.0	0%
30-40	911.8	17.1%	120-130	2.1	0%
40-50	950.2	17.9%	130-140	1.7	0%
50-60	863.0	16.2%	140-150	1.3	0%
60-70	664.1	12.5%	150-160	0.9	0%
70-80	390.9	7.3%	160-170	0.6	0%
80-90	105.7	2.0%	170-180	0.2	0%

**Photometric Data**



**Illuminance at a Distance**

	Center Beam fc	Beam Width	
4.0ft	114.2 fc	12.2 ft	12.3 ft
8.0ft	28.6 fc	24.5 ft	24.5 ft
12.0ft	12.7 fc	36.7 ft	36.8 ft
16.0ft	7.1 fc	48.9 ft	49.0 ft
20.0ft	4.6 fc	61.2 ft	61.3 ft

■ Vert. Spread: 113.6°  
■ Horiz. Spread: 113.7°

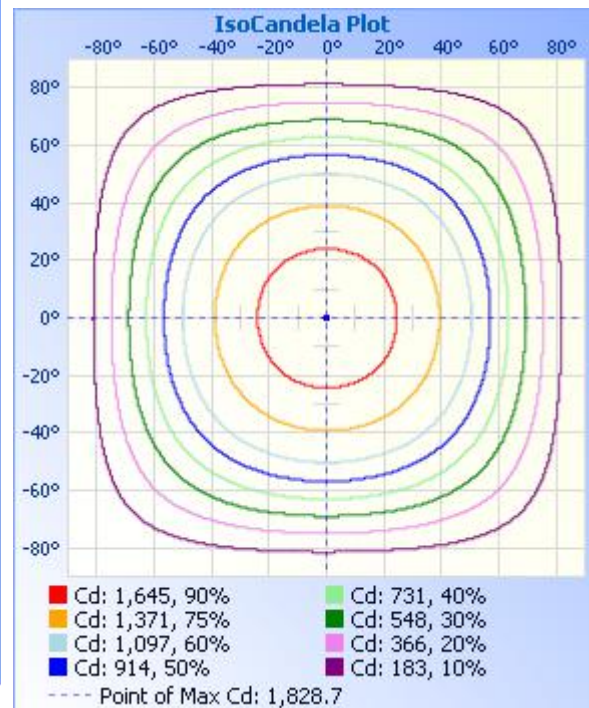
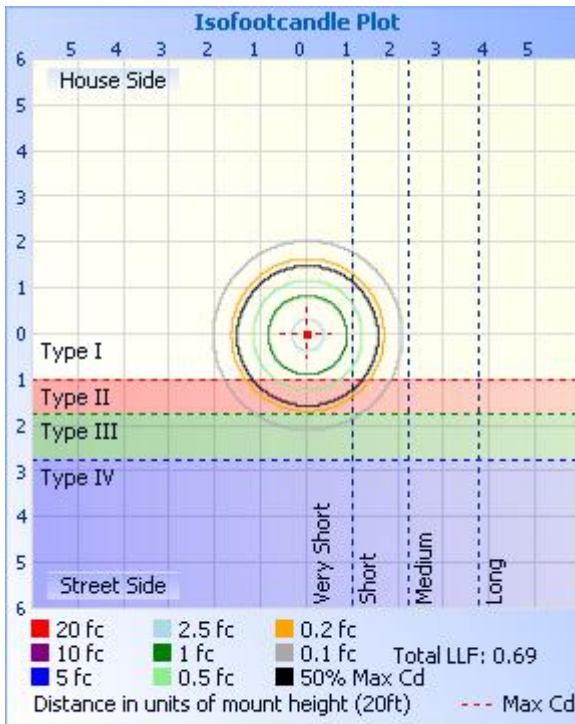




Table--1

UNIT: cd

C (DEG) \ γ (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	
0	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	
5	1819	1819	1820	1819	1822	1822	1822	1820	1821	1820	1818	1818	1820	1818	1819	1821	
10	1795	1796	1798	1795	1798	1797	1800	1798	1797	1797	1795	1793	1795	1793	1795	1796	
15	1756	1756	1760	1757	1761	1759	1762	1761	1759	1757	1756	1755	1755	1753	1756	1756	
20	1702	1702	1706	1704	1708	1706	1708	1709	1705	1703	1702	1701	1700	1699	1701	1702	
25	1633	1633	1638	1637	1640	1639	1642	1641	1638	1635	1632	1631	1631	1629	1632	1632	
30	1550	1552	1555	1555	1559	1559	1560	1559	1556	1553	1551	1548	1548	1545	1548	1549	
35	1455	1456	1461	1461	1463	1463	1466	1465	1461	1458	1456	1452	1452	1450	1452	1453	
40	1348	1350	1355	1356	1357	1357	1360	1358	1355	1350	1348	1345	1343	1342	1345	1346	
45	1229	1231	1235	1238	1239	1239	1243	1240	1237	1232	1230	1227	1226	1222	1225	1229	
50	1101	1102	1107	1109	1111	1112	1114	1113	1108	1103	1100	1097	1096	1093	1096	1099	
55	963	965	970	973	975	976	976	975	971	966	962	958	956	954	958	961	
60	819	820	825	828	830	832	832	832	827	822	817	812	811	808	812	816	
65	670	672	676	678	680	682	682	681	678	672	665	662	659	658	660	667	
70	519	522	524	526	529	530	531	531	526	521	514	508	505	506	509	515	
75	370	373	375	375	375	379	381	381	377	372	365	357	353	355	359	365	
80	225	229	232	230	231	233	237	234	230	227	221	214	210	212	219	221	
85	90.2	93.3	95.2	97.7	98.3	100	98.7	97.5	95.4	91.3	87.1	85.1	82.2	83.3	83.8	86.8	
90	2.55	2.63	2.66	2.75	2.79	2.90	2.89	2.62	2.33	2.02	1.90	1.78	1.91	1.78	1.91	2.09	
95	1.66	1.66	1.54	1.42	1.48	1.66	1.66	1.54	1.44	1.50	1.52	1.58	1.52	1.50	1.69	1.74	
100	1.63	1.47	1.50	1.42	1.41	1.53	1.60	1.40	1.52	1.29	1.41	1.42	1.44	1.49	1.60	1.61	
105	1.60	1.47	1.54	1.42	1.53	1.58	1.60	1.36	1.84	1.60	1.78	1.48	1.57	1.54	1.79	1.79	
110	1.91	1.90	1.69	1.47	1.97	1.84	1.72	1.84	2.09	2.03	1.90	1.62	1.79	1.60	1.99	2.10	
115	2.39	2.24	1.76	1.68	2.22	1.92	1.92	2.15	2.34	2.27	1.97	1.63	2.01	1.60	1.97	2.13	
120	2.65	2.40	1.90	1.84	2.52	1.84	1.99	2.40	2.45	2.27	1.89	2.09	2.16	2.09	1.97	2.17	
125	3.07	2.46	1.91	2.46	2.67	2.43	1.98	2.63	2.56	2.27	1.72	2.15	2.58	2.35	1.97	2.20	
130	2.94	2.64	1.86	2.38	2.65	2.52	1.98	2.59	2.51	2.27	1.54	2.07	2.55	2.40	1.83	2.11	
135	2.93	2.57	1.80	2.31	2.59	2.61	1.97	2.55	2.47	2.27	1.35	2.01	2.58	2.46	1.66	2.07	
140	2.93	2.52	1.48	2.24	2.53	2.57	1.54	2.48	2.43	2.27	1.31	2.00	2.31	2.51	1.60	2.04	
145	2.89	2.29	1.11	2.17	2.46	2.38	0.98	2.21	2.39	2.27	1.25	2.01	2.23	2.57	1.73	1.87	
150	2.73	2.10	1.10	2.17	2.71	2.29	1.05	2.14	2.36	2.27	1.29	2.02	2.77	2.58	1.97	1.72	
155	2.34	1.90	1.08	2.11	2.65	2.18	1.08	2.04	2.38	2.27	1.58	2.02	2.40	2.60	2.10	1.72	
160	2.21	1.89	1.06	2.09	2.67	2.03	1.10	1.88	2.46	2.27	1.78	1.77	2.37	2.62	2.13	1.72	
165	2.21	1.87	1.11	1.99	2.68	1.99	1.30	1.90	2.61	2.40	1.91	1.83	2.35	2.64	2.21	1.89	
170	2.25	1.85	1.29	2.06	2.70	2.15	1.66	1.98	2.64	2.76	1.94	1.82	2.83	3.01	2.42	1.95	
175	2.27	1.94	1.54	2.21	2.83	2.25	1.78	2.07	2.33	2.41	1.96	1.72	2.32	2.91	2.35	1.89	
180	2.27	1.96	1.60	2.21	2.89	2.34	1.78	2.09	2.33	2.27	1.97	1.60	2.22	2.89	2.34	1.78	

**2.2 Electrical, Photometric and Chromaticity Measurements**

<b>Test date</b>	2019-06-20	<b>Test Ambient:</b>	25.1 ° C
<b>Test Orientation</b>	As intended	<b>Stabilization Time (min)</b>	60
<b>Model Number</b>	ZS-BL2*2-F40-50	<b>Total Operating Time (min)</b>	90

**Electrical Measurement:**

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JBE190415-	120.0	60	0.3335	39.85	0.9957	4.02
A2	277.0	60	0.1599	40.95	0.9246	13.78
<b>DLC Pass Criteria</b>					$\geq 0.9(-3\%)$	$\leq 20(+5)$

**Chromaticity Measurement - Sphere-Spectroradiometer Method:**

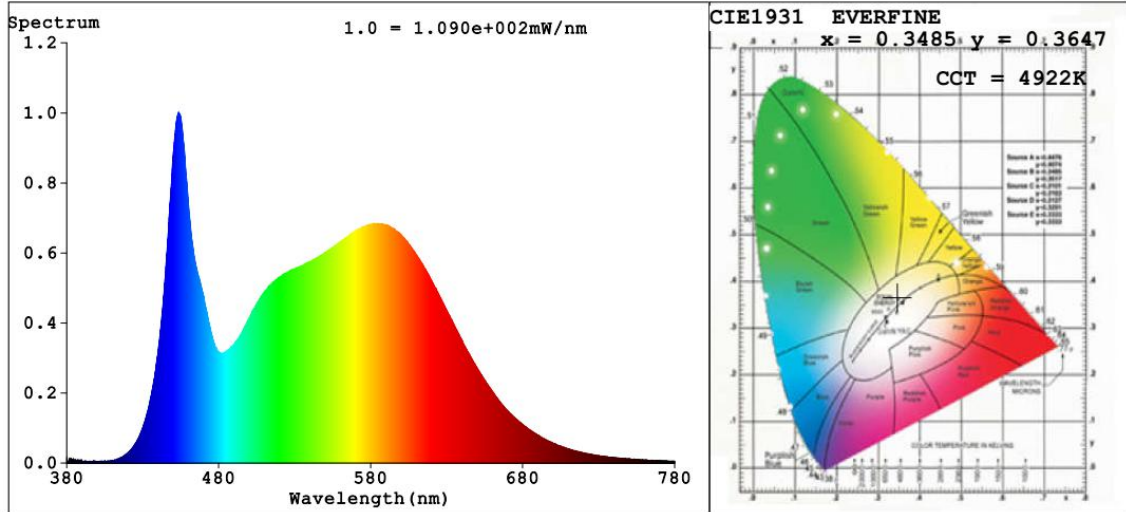
Parameter	Result	Special Color Rendering Indices			
Test Voltage (V)	120.0	R1	79	R9	0
Frequency (Hz)	60	R2	90	R10	75
CCT (K)	4922	R3	95	R11	76
Duv	0.0051	R4	77	R12	56
Chromaticity (x, y)	x=0.3485 y=0.3647	R5	79	R13	82
Chromaticity (u', v')	u'=0.2087 v'=0.4914	R6	85	R14	98
Color Rendering Index (CRI)	81.3	R7	85	R15	71
R9	0	R8	61	--	--

**Photometric Measurement – Sphere-Spectroradiometer Method:**

Parameter	Result		DLC V4.4 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	5558	5744	$\geq 2000 (-10\%)$	
Luminous Efficacy (lm/W)	139.47	140.27	Standard: $\geq 100(-3\%)$	Premium: $\geq 125(-3\%)$



**Spectral Power Distribution & Chromaticity Diagram**



**2.3 Performance Assessment:**

Model name	CCT(K)	Total Luminous (lm)	Power (W)	Luminous Efficacy (lm/W)
ZS-BL2*2-F40-30	3000K	5321.1	39.77	133.80
ZS-BL2*2-F40-35	3500K	5380* <sup>1</sup>	39.81* <sup>2</sup>	135.14* <sup>3</sup>
ZS-BL2*2-F40-40	4000K	5440* <sup>1</sup>	39.81* <sup>2</sup>	136.65* <sup>3</sup>
ZS-BL2*2-F40-45	4500K	5499* <sup>1</sup>	39.81* <sup>2</sup>	138.13* <sup>3</sup>
ZS-BL2*2-F40-50	5000K	5558	39.85	139.47

\*1: This value is calculated and the calculation formula is as below:

$$5380 = (5558 - 5321.1) / 4 * 1 + 5321.1$$

$$5440 = (5558 - 5321.1) / 4 * 2 + 5321.1$$

$$5499 = (5558 - 5321.1) / 4 * 3 + 5321.1$$

\*2: This value is calculated and the calculation formula is as below:

$$39.81 = (39.77 + 39.85) / 2$$

\*3: This value is calculated and the calculation formula is as below:

$$135.14 = (5380 / 39.81)$$

$$136.65 = (5440 / 39.81)$$

$$138.13 = (5499 / 39.81)$$

**3. Test Equipment**

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-423	2 meter Integrating Sphere	Verified by D204 standard lamp	
ST-R-327	Spectral analysis system HAAS-2000	Verified by D204 standard lamp	
ST-R-332	Standard Lamp	2019-07-03	2020-07-02
ST-R-333	Power Meter for Integrating Sphere	2019-06-27	2020-06-26
ST-R-355	Goniophotometer system	Verified by D908S standard lamp	
ST-R-359	Standard Lamp	2019-07-03	2020-07-02
ST-R-358	Power Meter for Goniophotometer	2019-06-27	2020-06-26
Expand Uncertainty: Photometric Measurement (Sphere):2.66%, k=2 Chromaticity Measurement(Sphere):28.6K, k=2 Photometric Measurement(Goniophotometer):2.76%, k=2			

**\*\*\*\*\* END OF REPORT \*\*\*\*\***