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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-8088E40, LED-8088E40C, LED-8088M40, LED-8088M40C

Test Date: Apr. 25, 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**

2/F., Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China

Tel: +86-760-22833366

Fax: +86-760-22833399

E-mail: Service@lccert.com

<http://www.lccert.com>

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

Test Note: *LED-8088E40, LED-8088E40C, LED-8088M40 and LED-8088M40C are all the same except for model number and lamp base. Model LED-8088E40 is selected as the representative test sample.*

Complied by:

Bowen Pang
Project Engineer

Apr. 27, 2016

Reviewed by:

Richard Li
Technical Manager

Apr. 27, 2016

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1. General

1.1 Product Information

Brand Name	Light Efficient Design
Product Type	LED Lamp
Model Number	LED-8088E40, LED-8088E40C, LED-8088M40, LED-8088M40C
Rated Inputs	120-347VAC,50/60Hz
Rated Power	50 W
Rated Light output	6000 lm
Declared CCT	4000K
Power Supply	N/A
LED Package, Array or Module	N/A
Receipt Samples	1 unit
Date of Receipt Samples	Apr. 21, 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	2015-08-17	2016-08-16
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	2015-05-07	2016-05-07
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 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 (60 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 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	277.00V~60Hz	276.99V~60Hz
Input Current(A)	0.200	0.201
Total Power(W)	50.91	51.11
Power Factor	0.918	0.918
I-THD	18.48%	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	5946.51
Luminaire Efficacy(Lm/W)	-	116.35
Correlated Color Temperature (CCT)(K)	3947	-
Color Rendering Index (CRI)	83.8	-
R9	12	-
Chromaticity Coordinate (x,y)	x=0.3835 y=0.3806	-
Chromaticity Coordinate (u,v)	u=0.2256 v=0.3358	-
Chromaticity Coordinate (u',v')	u'=0.2256 v'=0.5037	-
Duv	0.0009	-
Beam angle	-	113.0°
Field angle	-	154.2°

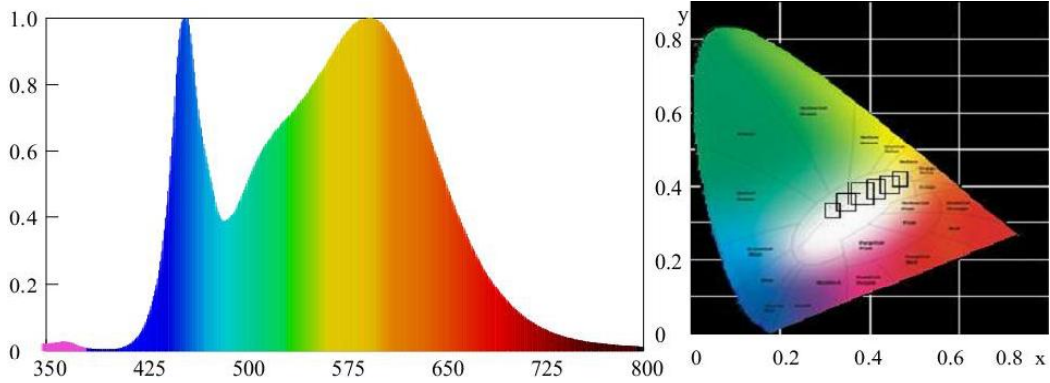
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
83	93	96	80	82	89	84	64
R9	R10	R11	R12	R13	R14	R15	-
12	82	79	64	86	98	77	-

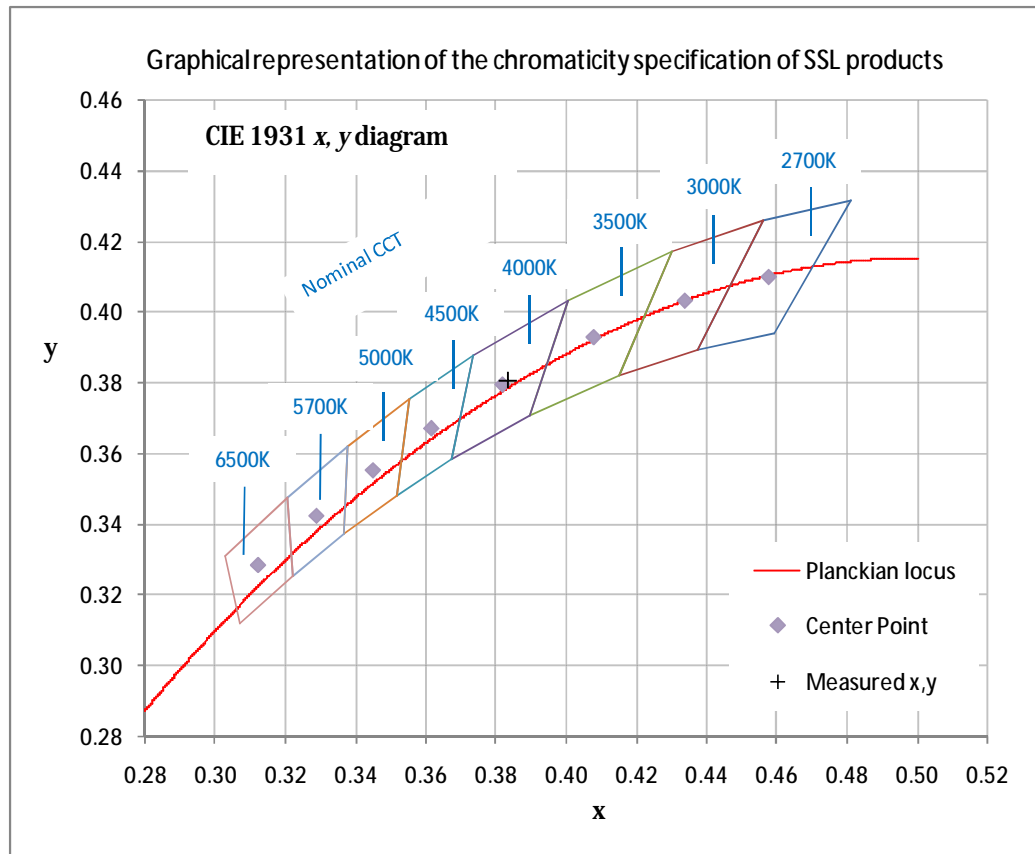
Note: N.A.

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 w/Sides
Spacing Criteria (0-180)	1.26	Luminous Length	0.12m
Spacing Criteria (90-270)	1.30	Luminous Width	0.08m
Spacing Criteria (Diagonal)	1.38	Luminous Height	0.01m
Test Distance	29.89 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	781.54	13.10	13.10
0-30	1664.44	28.00	28.00
0-40	2733.17	46.00	46.00
0-60	4824.5	81.10	81.10
0-80	5815.43	97.80	97.80
0-90	5886.37	99.00	99.00
10-90	5684.56	95.60	95.60
20-40	1951.64	32.80	32.80
20-50	3060.63	51.50	51.50
40-70	2777.6	46.70	46.70
60-80	990.94	16.70	16.70
70-80	304.65	5.10	5.10
80-90	70.94	1.20	1.20
90-110	43.66	0.70	0.70
90-120	51.29	0.90	0.90
90-130	54.56	0.90	0.90
90-150	57.09	1.00	1.00
90-180	60.03	1.00	1.00
110-180	16.37	0.30	0.30
0-180	5946.4	100.00	100.00

Total Luminaire Efficiency = 100.00%

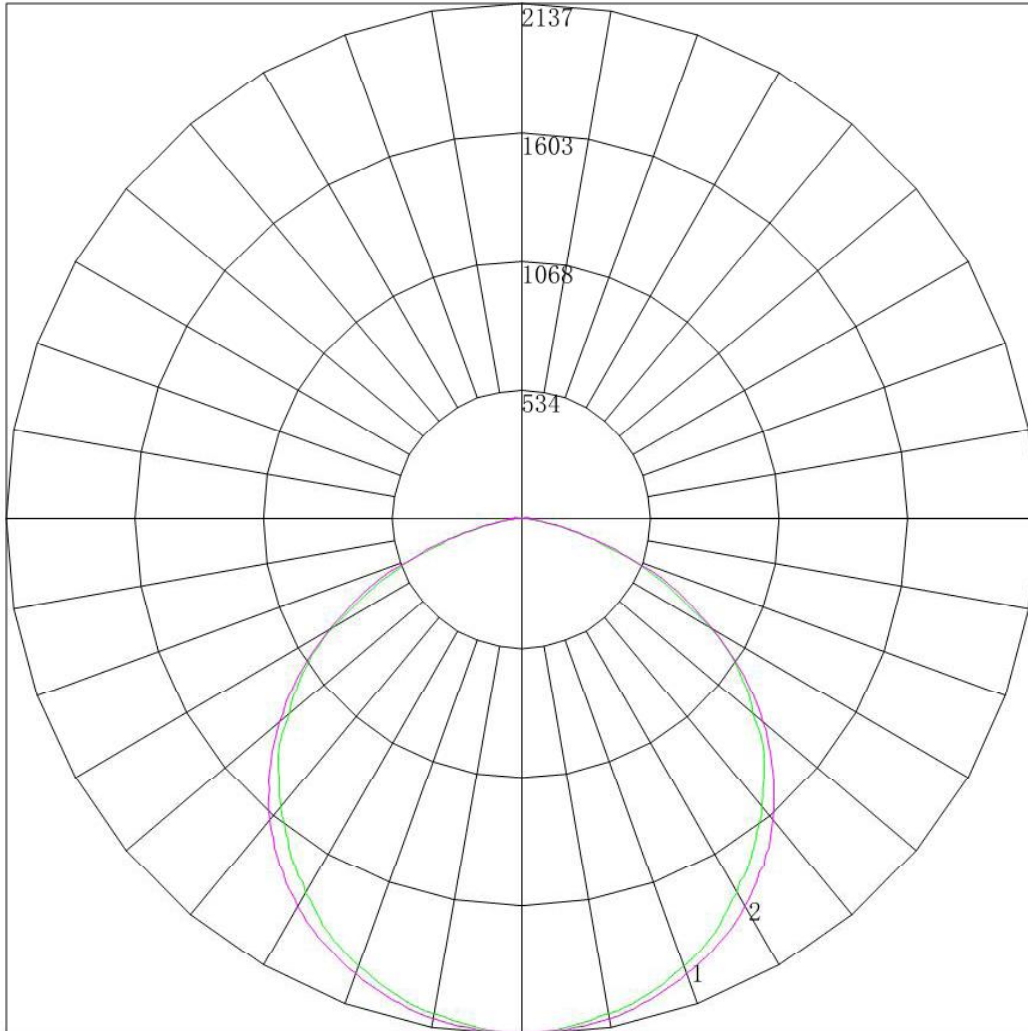
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	201.81
10-20	579.73
20-30	882.90
30-40	1068.74
40-50	1108.99
50-60	982.33
60-70	686.28
70-80	304.65
80-90	70.94
90-100	24.11
100-110	19.55
110-120	7.63
120-130	3.27
130-140	1.41
140-150	1.13
150-160	1.29
160-170	1.18
170-180	0.46



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4.5 Polar Curves



Maximum Candela = 2136.747 Located At Horizontal Angle = 15, Vertical Angle = 2
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)



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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>
0	2134.733	2134.733	2134.733	2134.733	2134.733	2134.733	2134.733
1	2129.388	2135.408	2135.629	2135.848	2131.399	2130.725	2130.718
2	2126.270	2136.747	2136.747	2134.506	2131.854	2135.181	2129.379
3	2124.933	2130.260	2135.852	2131.153	2130.082	2130.948	2126.255
4	2123.151	2126.014	2133.165	2129.367	2126.507	2127.823	2124.917
5	2114.687	2122.206	2131.146	2124.448	2126.061	2126.933	2121.793
6	2109.341	2120.188	2124.878	2121.988	2120.925	2123.364	2117.331
7	2103.104	2112.585	2119.947	2116.180	2115.576	2117.120	2116.438
8	2094.640	2107.883	2112.783	2110.367	2109.767	2114.001	2112.869
9	2087.068	2082.035	2100.750	2101.699	2096.550	2101.796	2106.175
10	2082.167	2094.236	2102.698	2098.525	2099.954	2102.183	2100.374
11	2076.821	2084.842	2093.965	2091.148	2091.271	2095.941	2095.912
12	2067.466	2074.548	2082.092	2081.763	2086.359	2086.574	2088.326
13	2059.893	2065.379	2072.236	2071.033	2076.104	2080.778	2082.079
14	2049.647	2056.652	2062.830	2062.767	2066.948	2069.182	2070.031
15	2038.955	2046.806	2055.881	2053.156	2058.486	2063.164	2065.569
16	2025.146	2034.065	2041.324	2044.216	2046.663	2051.569	2052.628
17	2016.682	2019.964	2029.005	2031.032	2037.734	2040.642	2043.704
18	2000.645	2006.987	2016.904	2022.093	2022.780	2030.612	2030.317
19	1985.498	1994.461	2003.239	2005.777	2010.523	2016.560	2023.624
20	1972.579	1983.054	1990.698	1992.369	1998.928	2004.964	2005.329
21	1958.324	1967.619	1977.257	1978.957	1982.426	1994.038	1995.066
22	1942.732	1949.716	1958.440	1963.317	1969.708	1976.204	1982.125
23	1927.586	1935.399	1941.866	1949.009	1955.221	1962.822	1970.077
24	1910.658	1919.066	1927.531	1931.578	1938.269	1947.440	1952.228
25	1891.502	1899.374	1909.386	1916.603	1923.328	1932.053	1939.288
26	1873.683	1879.696	1888.774	1898.279	1906.152	1916.666	1925.455
27	1849.182	1862.688	1869.958	1880.403	1886.310	1898.831	1909.837
28	1826.462	1842.110	1853.387	1860.958	1871.130	1883.447	1891.988
29	1805.970	1819.731	1828.073	1840.843	1852.622	1864.269	1871.462
30	1789.488	1800.719	1810.153	1820.056	1829.882	1846.205	1854.505
31	1759.195	1768.285	1780.790	1798.380	1809.130	1823.910	1832.194
32	1744.494	1755.748	1759.090	1771.552	1788.836	1804.956	1813.452
33	1723.111	1733.154	1741.383	1756.588	1762.938	1776.622	1796.050
34	1698.165	1709.884	1718.982	1730.445	1745.347	1759.692	1764.814
35	1678.563	1684.387	1695.911	1706.082	1718.590	1736.735	1752.766
36	1648.271	1663.352	1670.821	1683.287	1697.170	1713.538	1724.208
37	1625.997	1638.076	1645.060	1657.584	1670.413	1691.019	1703.235
38	1600.605	1609.438	1619.525	1630.097	1644.539	1664.482	1674.677
39	1580.113	1586.621	1590.631	1600.596	1617.784	1640.628	1652.366
40	1554.275	1559.103	1563.306	1571.992	1592.791	1613.423	1625.592
41	1526.210	1535.617	1534.406	1544.951	1565.146	1585.550	1596.588
42	1499.036	1505.186	1509.767	1516.116	1535.923	1552.771	1566.245
43	1473.198	1479.234	1480.427	1486.171	1506.714	1527.577	1534.117
44	1448.251	1455.297	1452.869	1457.341	1475.483	1498.146	1507.789
45	1426.868	1425.992	1423.305	1424.711	1444.712	1465.810	1477.000
46	1398.803	1403.841	1395.747	1393.198	1411.252	1434.374	1443.533
47	1368.956	1374.534	1367.524	1362.356	1379.361	1399.814	1412.297
48	1334.208	1343.880	1339.749	1331.070	1343.447	1367.701	1375.261
49	1292.334	1304.735	1309.063	1297.324	1310.240	1332.700	1344.472
50	1256.250	1263.117	1278.146	1263.580	1277.662	1296.798	1306.543
51	1229.521	1229.564	1244.776	1229.608	1241.327	1262.913	1274.415
52	1198.783	1195.559	1208.484	1197.428	1204.749	1225.670	1240.502
53	1167.599	1163.119	1166.368	1159.658	1167.505	1189.549	1203.465
54	1136.862	1131.348	1129.636	1127.926	1130.481	1150.313	1164.643
55	1105.233	1101.815	1092.899	1089.933	1092.109	1111.734	1128.946
56	1070.931	1073.182	1060.194	1054.398	1053.323	1071.153	1085.662
57	1036.629	1036.932	1025.472	1017.747	1014.729	1032.805	1049.072
58	998.763	1001.816	991.647	972.826	975.937	990.661	1008.465



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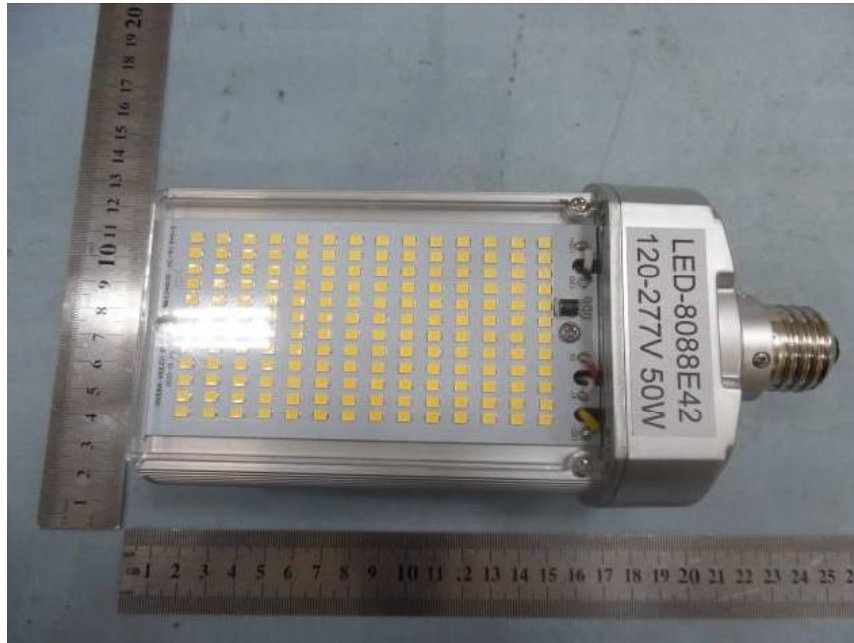


59	956.888	965.121	954.911	928.804	934.441	951.638	967.859
60	907.885	919.483	917.502	890.584	893.405	910.172	921.006
61	856.655	866.458	881.440	853.486	853.497	866.913	881.292
62	804.534	816.791	838.205	814.381	813.346	826.332	833.992
63	763.996	771.601	787.806	781.522	771.882	786.200	796.509
64	720.339	728.424	740.546	745.100	732.392	744.948	756.349
65	678.909	684.126	688.798	704.427	692.264	700.349	715.296
66	641.935	641.849	647.579	665.762	651.888	658.437	676.921
67	589.814	595.982	599.193	621.514	609.519	616.958	630.960
68	547.493	548.332	558.645	573.908	566.479	572.145	587.677
69	512.746	512.980	513.176	524.968	530.119	528.886	535.915
70	467.307	475.847	469.721	480.266	491.769	481.172	485.938
71	420.086	429.089	432.764	438.697	453.192	433.236	437.745
72	373.311	381.216	395.135	398.022	410.157	400.671	413.649
73	338.564	340.942	354.140	361.140	376.899	360.789	362.780
74	318.963	321.040	324.366	327.192	335.713	312.823	318.604
75	269.069	270.475	271.264	280.474	284.590	280.950	283.352
76	235.213	240.496	239.006	239.581	249.568	245.491	249.439
77	210.266	211.863	209.665	204.268	218.579	215.386	216.418
78	183.092	181.888	181.667	175.436	186.447	188.642	188.306
79	156.363	157.273	155.908	150.411	162.821	162.548	160.641
80	132.753	133.343	132.162	128.283	136.953	140.697	136.098
81	111.815	112.755	112.900	111.522	114.200	119.738	112.002
82	89.987	91.506	94.979	96.770	97.699	99.228	95.046
83	74.840	75.843	79.526	84.257	82.309	83.844	77.643
84	65.040	66.225	68.547	72.413	71.378	70.910	65.149
85	56.576	56.158	61.156	62.356	62.677	59.540	53.547
86	50.339	48.997	52.868	55.874	52.860	49.502	44.622
87	45.884	43.403	46.819	46.933	44.383	39.913	35.698
88	38.311	38.705	39.204	37.772	34.354	29.437	24.096
89	32.965	31.770	32.038	29.505	25.445	20.300	12.048
90	21.383	21.927	21.956	19.893	17.186	14.500	8.032
91	20.047	18.569	18.370	16.987	14.056	11.596	9.371
92	16.037	15.660	16.802	18.326	16.506	14.272	12.494
93	14.701	15.213	18.145	19.443	20.738	20.067	20.080
94	16.483	17.227	21.057	23.243	23.860	24.970	25.881
95	16.037	17.451	22.626	25.702	28.769	29.877	30.789
96	17.819	18.345	22.403	27.266	30.109	33.000	33.021
97	17.374	18.570	23.522	26.596	31.001	32.108	32.574
98	17.819	18.123	21.953	28.160	30.113	32.331	32.574
99	16.037	16.780	22.402	25.479	29.219	31.219	31.682
100	16.037	17.227	21.283	25.032	29.439	29.879	30.343
101	18.265	17.675	18.146	23.914	27.435	28.541	29.897
102	16.037	15.661	16.130	24.360	26.099	25.866	28.558
103	14.255	14.542	14.786	23.020	24.537	24.083	24.989
104	13.810	14.990	14.337	21.903	24.533	21.855	23.204
105	14.255	14.766	14.337	19.445	23.638	21.407	20.526
106	13.810	14.095	14.785	16.092	21.190	21.182	21.865
107	13.364	14.318	14.113	13.633	19.184	20.068	22.311
108	13.810	14.766	13.441	12.515	16.284	18.508	19.634
109	14.255	14.542	12.097	11.175	12.937	15.833	16.957
110	13.810	13.647	11.425	10.504	10.705	12.711	13.833
111	12.919	12.305	10.529	9.610	8.921	9.588	10.709
112	11.582	11.410	10.304	8.940	7.585	8.473	8.924
113	11.137	10.515	9.856	8.492	6.023	7.581	7.586
114	10.246	10.291	9.408	8.045	4.685	6.913	6.693
115	9.801	9.844	9.185	7.599	3.792	5.798	6.247
116	9.355	9.396	8.512	6.928	3.568	4.906	4.908
117	8.910	8.949	8.513	6.034	3.122	3.791	4.016
118	8.464	8.278	8.289	5.140	3.122	3.122	3.124
119	8.464	8.278	7.616	4.693	3.122	2.899	2.677



120	8.019	8.054	7.168	4.247	2.898	2.899	2.231
121	7.573	7.606	6.496	3.353	2.898	2.899	2.231
122	7.573	6.936	5.824	3.129	2.676	2.899	2.231
123	7.128	6.488	5.152	2.682	2.676	2.899	2.231
124	6.682	6.041	4.256	2.458	2.454	2.899	2.231
125	6.237	5.593	3.808	2.458	2.454	2.899	2.231
126	5.791	4.922	3.360	2.235	2.454	2.676	2.677
127	4.900	4.474	2.912	2.235	2.454	2.676	2.677
128	4.455	4.027	2.688	2.012	2.230	2.453	2.677
129	4.009	3.580	2.464	2.012	2.230	2.453	2.231
130	3.564	3.132	2.240	2.012	2.230	2.453	2.231
131	3.118	2.909	2.016	1.788	2.230	2.230	2.231
132	2.227	2.461	1.792	1.564	1.784	2.006	2.231
133	2.227	2.013	2.016	1.564	1.784	2.006	2.231
134	1.782	2.013	1.792	1.564	1.784	2.006	2.231
135	1.782	2.014	1.792	1.788	1.784	1.784	1.785
136	1.782	1.790	1.568	1.564	1.560	1.784	1.339
137	1.336	1.566	1.792	1.341	1.562	1.561	1.339
138	1.782	1.790	1.792	1.341	1.338	1.338	1.339
139	1.782	1.790	1.568	1.565	1.338	1.338	0.892
140	1.782	1.790	1.568	1.341	1.338	1.338	0.892
141	1.782	1.790	1.568	1.341	1.338	1.338	0.892
142	1.782	1.790	1.792	1.565	1.338	1.338	0.892
143	1.782	1.790	1.792	1.565	1.338	1.338	0.892
144	1.782	1.790	1.792	1.788	1.562	1.338	1.339
145	1.782	1.790	1.792	1.788	1.562	1.560	1.785
146	1.782	1.790	2.016	2.011	2.006	1.560	1.785
147	1.782	1.790	2.016	2.011	2.230	2.007	1.785
148	2.673	2.461	2.240	2.235	2.006	2.230	1.785
149	2.673	2.685	2.464	2.235	2.230	2.230	1.785
150	2.673	2.685	2.688	2.235	2.230	2.230	2.231
151	2.673	2.685	2.688	2.235	2.230	2.230	1.785
152	2.673	2.685	2.688	2.235	2.230	2.230	2.231
153	2.673	2.685	2.688	2.682	2.230	2.230	2.231
154	2.673	2.685	2.688	2.682	2.454	2.230	2.231
155	2.673	2.685	2.688	2.682	2.676	2.452	2.231
156	3.118	3.132	2.912	2.682	2.676	2.898	2.231
157	3.118	3.355	3.360	3.129	3.122	2.898	3.124
158	3.564	3.580	3.584	3.576	3.122	3.122	3.124
159	3.564	3.580	3.584	3.576	3.568	3.122	3.124
160	4.009	3.804	3.584	3.576	3.568	3.568	3.124
161	4.009	4.027	3.584	3.576	3.568	3.568	3.124
162	4.009	4.027	3.808	3.576	3.568	3.568	3.570
163	4.009	4.251	4.032	4.247	3.790	4.014	4.016
164	4.455	4.474	4.480	4.470	4.014	4.014	4.016
165	4.455	4.474	4.480	4.470	4.460	4.237	4.016
166	4.455	4.474	4.480	4.470	4.460	4.459	4.016
167	4.455	4.474	4.480	4.470	4.460	4.459	4.016
168	4.455	4.474	4.480	4.470	4.460	4.459	4.016
169	4.900	4.698	4.704	4.470	4.907	4.905	4.462
170	4.900	4.922	4.928	4.917	4.682	4.905	4.462
171	4.900	4.922	4.928	4.917	4.907	4.905	4.462
172	4.900	4.922	4.928	4.917	4.907	4.905	4.462
173	4.900	4.922	4.928	4.917	4.907	4.905	4.462
174	4.900	4.922	4.928	4.917	4.907	4.905	4.462
175	4.900	4.922	4.928	4.917	4.907	4.905	4.462
176	4.900	4.922	4.928	4.917	4.907	4.683	4.462
177	4.900	4.922	4.928	4.917	4.907	4.683	4.462
178	4.900	4.922	4.928	4.917	4.685	4.683	4.462
179	4.900	4.922	4.928	4.917	4.685	4.906	4.462
180	4.786	4.786	4.786	4.786	4.786	4.786	4.786

Appendix 1 Product Photo



Picture 1



Picture 2

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