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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:

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

Test date: June 19, 2015 to July 17, 2015

Test laboratory: LCTECH (Zhongshan) Testing Service Co., Ltd
2/F., Technology and Enterprise Development Center, Guangyuan Road,
Xiaolan, Zhongshan, Guangdong, China

Laboratory note: LED-8088M40, LED-8088M40C, LED-8088E40, LED-8088E40C is all the same except from lamp base.

Complied by:

Bowen Pang

Test Engineer

July 20, 2015

Reviewed by:

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July 22, 2015

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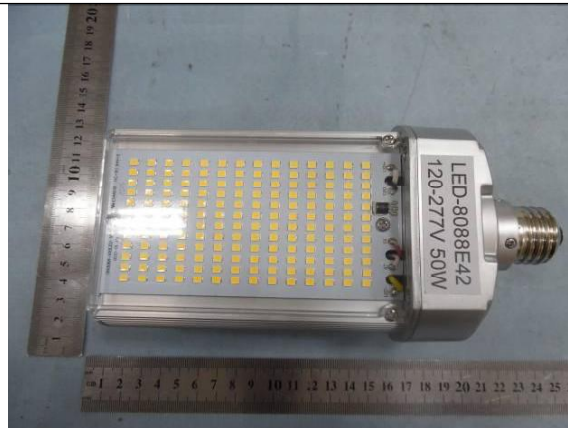
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1 General

0.50 Product Information

Brand Name	Light Efficient Design
Trade Mark	-
Luminaire Type	LED Lamp
Model Number	LED-8088M40/LED-8088M40C,LED-8088E40/LED-8088E40C
Rated Inputs	120-347VAC,50/60Hz
Rated Power	50 W
Rated Initial Lamp Lumens	6000 lm
Declared CCT	4000K
Power Supply	Integral LED driver
LED Package, Array or Module	No Provide
Date of Receipt Samples	June 18, 2015
Quantity of Receipt Samples	1 unit

Photo



Picture 1



Picture 2

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

ID	Instrument	Model name	Cal. Date	Next cal. Date
AC Power supply	LC-I-923	CHP-500	2015-02-05	2016-02-04
AC Power supply	LC-I-987	APW-120N	2015-02-05	2016-02-04
Power analyzer	LC-I-928	WT210	2015-02-09	2016-02-09
Power analyzer	LC-I-954	WT210	2015-03-04	2016-03-03
Multimeter	LC-I-972	Fluke 17B	2014-08-15	2015-08-14
Photometric colorimetric electric system (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp	LC-I-946	110V/200W	2014-10-09	2015-10-09
Goniophotometer(with mirror)	LC-I-902	GMS2000	2015-04-11	2016-04-11
Wireless temperature transmitter	LC-I-958	DWRP-B(0)	2014-08-19	2015-08-18
Wireless temperature transmitter	LC-I-959	DWRP-B(0)	2014-08-19	2015-08-18

2 Test conducted and method

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, 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

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	277.00 V~60Hz	277.02 V~60Hz
Input Current	0.209 A	0.211 A
Total Power	52.11 W	52.50 W
Power Factor	0.898	0.896
I-THD	18.25%	-

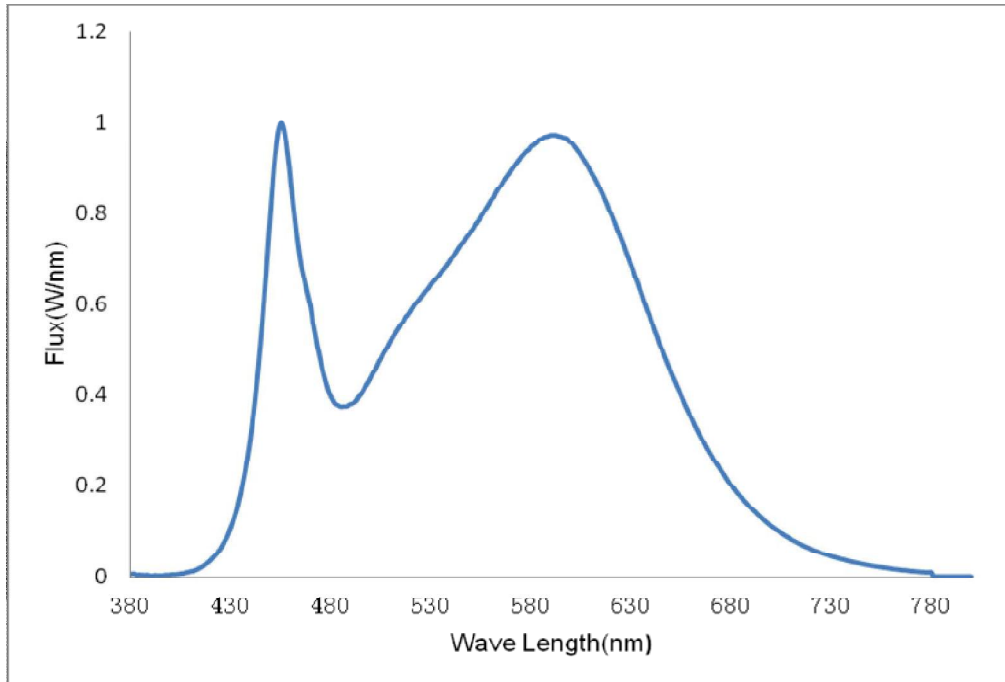
3.2 Photometric data

Criteria Item	Result (Sphere)	Result (Goniophotometer)
Total Lumens	-	6079.77 lm
Luminaire Efficacy	-	116.00 lm/W
Correlated Color Temperature (CCT)	4046 K	-
Color Rendering Index (CRI)	81.3	-
R9	0	-
Chromaticity Coordinate (x,y)	x= 0.3789,y= 0.3773	-
Chromaticity Coordinate (u,v)	u= 0.2239,v= 0.3344	-
Chromaticity Coordinate (u',v')	u'= 0.2239,v'= 0.5016	-
Duv	+0.0007	-
Beam angle	-	113.0°
Field angle	-	154.2°

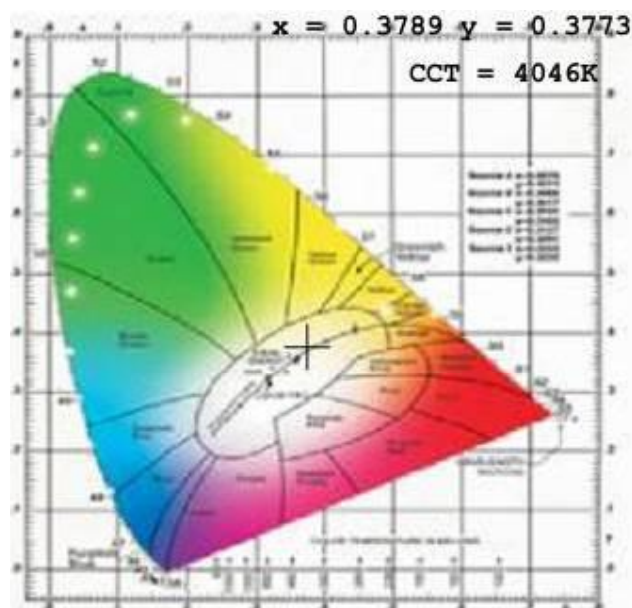
Note: N.A.

4 Test Data

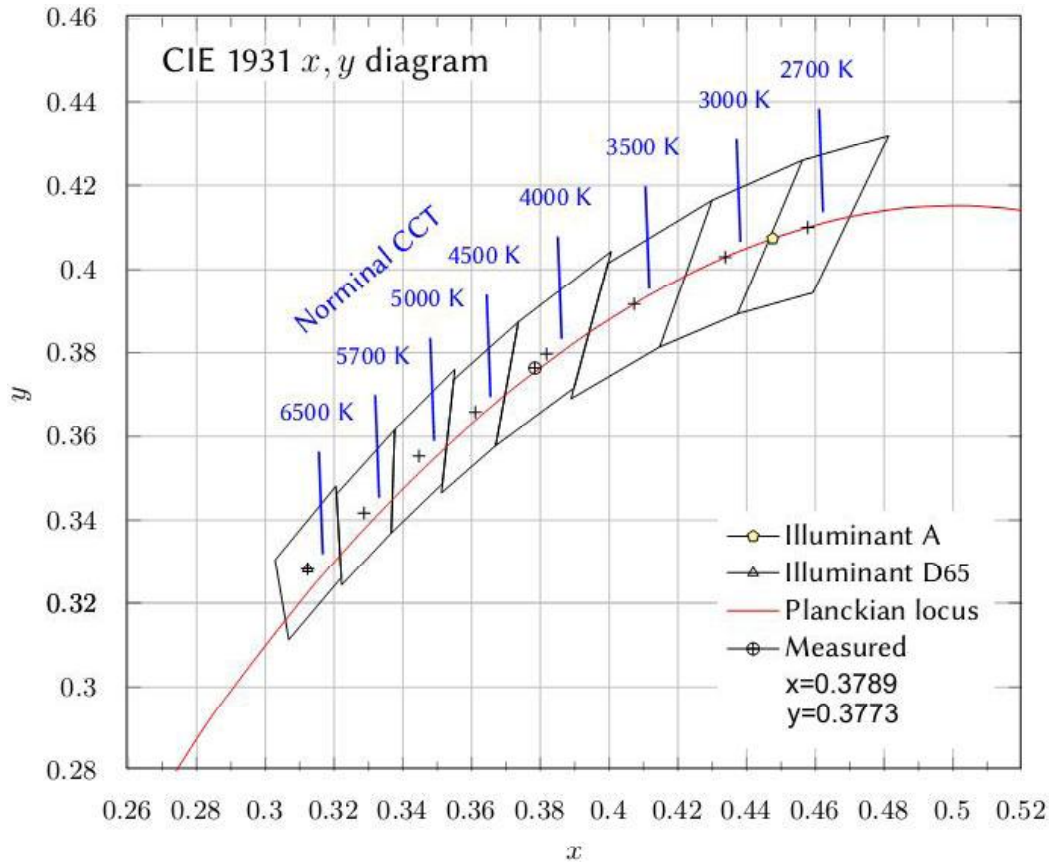
4.1 Spectral Distribution



4.2 Chromaticity Diagram (CIE 1931)



4.3 ANSI Chromaticity Quadrangles Diagram



4.4 Color Rendering Details

R1	R2	R3	R4	R5
80	91	95	77	79
R6	R7	R8	R9	R10
87	83	60	0	78
R11	R12	R13	R14	R15
74	61	83	98	73



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4.5 Goniometry Test Data

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

4.6 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-30	1701.69	28	28
0-40	2794.32	46	46
0-60	4932.39	81.1	81.1
0-90	6017.95	99	99
90-120	52.78	.9	.9
90-130	56.15	.9	.9
90-150	58.77	1	1
90-180	61.78	1	1
0-180	6079.74	100	100

Total Luminaire Efficiency = 100%

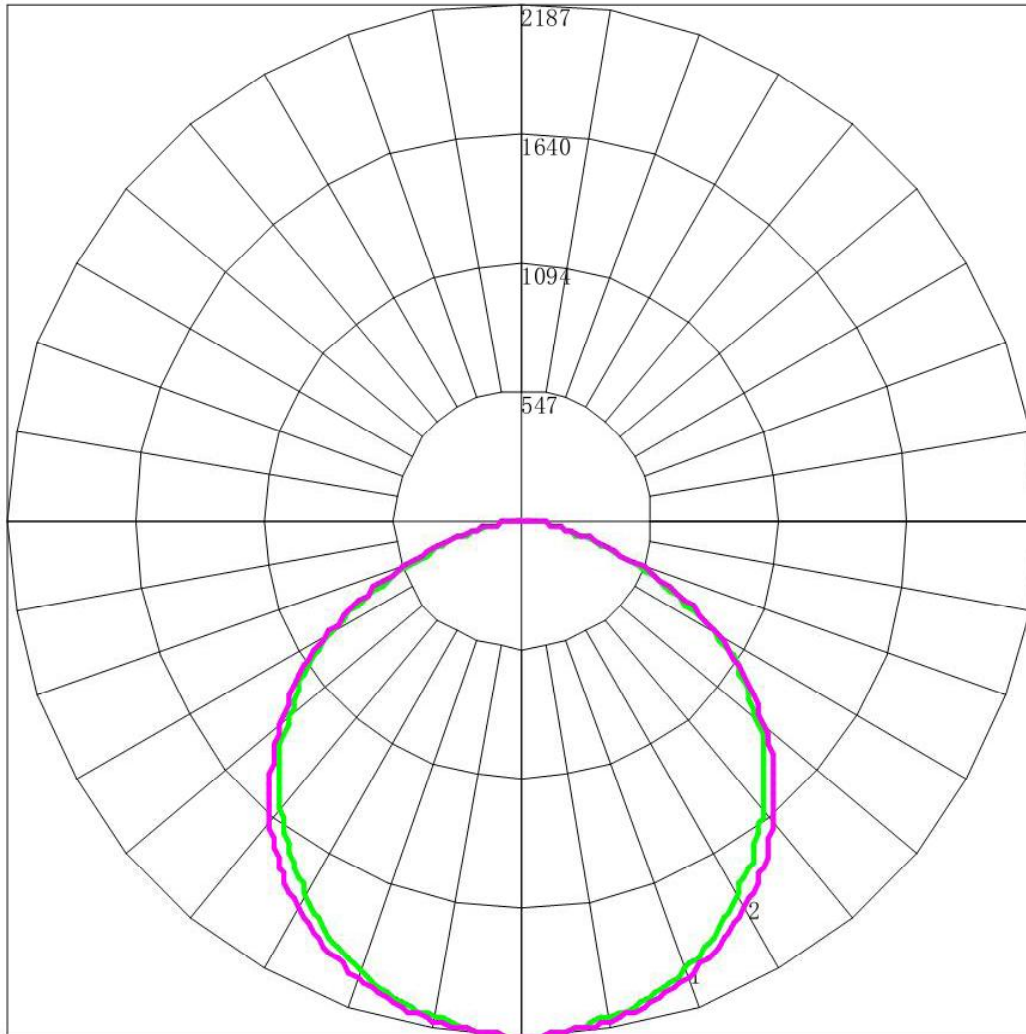
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	206.4
10-20	592.66
20-30	902.63
30-40	1092.63
40-50	1133.79
50-60	1004.27
60-70	701.61
70-80	311.43
80-90	72.53
90-100	24.79
100-110	20.13
110-120	7.85
120-130	3.37
130-140	1.45
140-150	1.17
150-160	1.33
160-170	1.22
170-180	.47



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4.7 Polar Curves



Maximum Candela = 2187.07 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)



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4.8 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	2187.07	2187.07	2187.07	2187.07	2187.07	2187.07	2187.07
1	2183.5	2179.7	2177.24	2182.38	2182.38	2182.61	2181.26
2	2179.93	2181.26	2178.36	2181.04	2183.05	2187.07	2179.48
3	2178.59	2174.34	2177.47	2177.69	2181.26	2182.83	2175.91
4	2176.8	2170.1	2174.79	2175.91	2177.47	2179.03	2174.57
5	2167.86	2166.3	2172.55	2170.77	2176.8	2178.59	2171.44
6	2162.5	2164.07	2166.08	2168.31	2171.66	2174.34	2166.97
7	2155.8	2156.25	2161.16	2162.5	2166.08	2168.09	2166.08
8	2147.32	2151.34	2153.79	2156.25	2160.27	2164.96	2162.5
9	2139.72	2129.00	2145.08	2150.44	2156.7	2156.7	2155.8
10	2134.36	2137.49	2143.52	2144.19	2150.00	2153.12	2149.55
11	2128.55	2127.66	2134.59	2136.59	2141.06	2146.2	2145.08
12	2119.17	2117.16	2122.08	2126.77	2136.15	2136.59	2137.04
13	2111.58	2107.78	2112.25	2115.82	2125.43	2130.79	2130.79
14	2100.86	2099.07	2102.64	2107.56	2115.82	2118.95	2118.28
15	2090.14	2088.8	2095.72	2097.73	2107.34	2112.25	2113.81
16	2076.29	2076.29	2080.98	2088.35	2095.28	2100.64	2100.41
17	2067.36	2061.55	2068.25	2075.17	2086.12	2089.47	2091.03
18	2051.27	2048.82	2055.96	2066.24	2071.38	2079.64	2078.08
19	2035.64	2035.86	2042.12	2049.71	2058.42	2065.57	2070.93
20	2022.24	2024.03	2029.39	2035.86	2046.81	2053.73	2052.61
21	2007.94	2008.61	2015.76	2022.02	2030.06	2042.12	2041.89
22	1991.42	1989.85	1996.33	2005.93	2016.65	2024.03	2028.49
23	1975.78	1975.33	1979.35	1991.19	2002.14	2009.95	2016.43
24	1958.36	1958.36	1964.39	1973.32	1984.27	1994.32	1997.67
25	1939.15	1938.48	1946.3	1957.91	1969.3	1978.24	1984.71
26	1921.28	1918.83	1925.3	1939.82	1951.21	1962.6	1970.42
27	1896.27	1901.63	1906.77	1921.28	1931.11	1944.07	1954.34
28	1872.59	1880.19	1889.34	1901.4	1915.92	1928.88	1936.47
29	1851.6	1857.4	1863.43	1881.08	1896.94	1909.44	1915.92
30	1834.17	1837.75	1845.12	1859.41	1873.93	1890.91	1898.05
31	1803.53	1804.92	1815.23	1837.08	1852.27	1867.9	1875.27
32	1788.61	1792.1	1793.41	1810.08	1831.05	1848.25	1856.06
33	1766.95	1769.25	1775.43	1794.44	1805.16	1819.55	1837.75
34	1741.31	1745.53	1752.63	1768.6	1787.27	1802.12	1806.35
35	1720.62	1719.3	1728.84	1743.47	1759.8	1778.63	1793.88
36	1689.71	1697.51	1703.00	1719.84	1737.64	1754.91	1765.07
37	1666.79	1671.84	1676.73	1693.31	1710.39	1731.84	1743.18
38	1640.84	1642.87	1651.03	1665.34	1683.55	1704.59	1713.65
39	1619.53	1619.06	1621.48	1635.68	1656.05	1679.84	1690.83
40	1593.18	1591.1	1593.56	1606.24	1630.79	1651.96	1663.89
41	1564.77	1567.31	1563.9	1578.57	1602.65	1624.11	1633.96
42	1537.07	1536.42	1539.24	1549.2	1572.58	1590.34	1603.27
43	1510.4	1509.73	1509.15	1518.33	1542.39	1564.34	1570.04
44	1484.54	1485.23	1480.88	1489.01	1510.63	1533.94	1542.83
45	1462.38	1455.37	1450.61	1455.88	1479.29	1501.00	1511.52
46	1433.61	1432.7	1423.12	1423.7	1445.16	1469.26	1477.79
47	1403.91	1403.24	1394.44	1391.87	1412.22	1433.75	1445.63
48	1367.72	1371.66	1365.74	1360.11	1375.65	1400.38	1407.39
49	1324.84	1331.63	1334.29	1325.06	1341.7	1364.8	1376.17
50	1287.81	1289.42	1302.55	1290.87	1308.09	1328.55	1337.8
51	1260.52	1254.82	1269.03	1256.47	1270.97	1293.5	1304.69
52	1229.2	1220.2	1231.88	1223.3	1233.22	1255.31	1269.23
53	1197.22	1187.3	1188.62	1184.6	1195.36	1217.81	1231.75
54	1165.55	1154.71	1151.45	1152.5	1157.53	1178.16	1192.21



55	1133.07	1124.07	1114.02	1113.93	1118.37	1138.56	1155.54
56	1097.83	1095.17	1080.6	1077.25	1078.59	1096.89	1110.91
57	1062.98	1058.56	1045.52	1039.37	1038.77	1057.91	1073.79
58	1023.85	1022.55	1010.96	994.01	999.46	1014.65	1032.25
59	980.79	985.17	973.24	948.98	956.62	974.71	990.35
60	930.36	938.46	935.18	909.92	914.74	932.12	942.24
61	878.22	884.46	898.39	872.13	873.64	887.74	901.94
62	824.35	833.49	854.35	832.19	832.66	846.08	853.61
63	783.34	787.65	803.24	798.78	790.31	805.05	814.97
64	738.76	743.39	754.80	761.12	749.66	762.77	773.92
65	695.83	698.29	702.00	719.75	709.15	717.12	732.42
66	658.09	655.18	660.12	680.60	667.38	674.28	692.89
67	604.97	608.70	610.78	634.95	623.98	631.80	645.71
68	560.97	559.77	569.44	586.32	580.12	586.08	601.22
69	525.55	523.34	523.20	536.00	543.04	541.70	548.51
70	479.36	485.75	478.96	490.77	503.39	492.67	497.00
71	430.31	438.33	441.23	448.14	463.81	443.71	448.09
72	382.65	388.83	402.75	406.81	419.97	410.41	423.39
73	346.82	347.78	361.16	368.78	385.84	369.47	371.30
74	326.86	327.70	330.61	333.98	343.43	320.29	326.63
75	275.39	275.80	276.36	286.58	291.41	287.61	290.00
76	241.13	245.84	243.90	244.93	255.76	251.32	255.07
77	215.49	216.41	213.62	208.90	223.53	220.74	221.70
78	187.79	185.54	184.82	178.97	190.54	193.13	193.29
79	160.46	160.14	158.42	153.65	166.67	166.64	164.21
80	135.89	136.38	134.77	131.09	140.38	143.93	139.10
81	114.89	115.30	115.14	113.91	116.57	122.33	114.45
82	92.42	93.47	97.11	99.01	99.86	101.74	97.20
83	76.43	77.15	81.08	86.24	84.14	85.48	78.84
84	66.96	67.61	69.60	74.11	72.86	72.68	67.23
85	57.67	57.18	62.02	63.83	63.95	61.20	54.77
86	51.10	50.12	53.69	56.89	54.41	50.95	46.15
87	46.59	44.49	47.62	47.95	45.74	41.05	36.72
88	39.40	39.49	39.87	38.75	35.42	30.20	24.70
89	34.40	32.72	32.81	29.93	26.16	20.91	12.15
90	22.11	22.58	22.54	20.44	17.60	14.79	8.26
91	20.55	19.25	18.94	17.56	14.54	12.02	9.52
92	16.21	16.06	17.60	18.72	17.02	14.59	12.60
93	15.46	15.66	18.56	20.10	21.26	20.64	20.41
94	16.75	17.53	21.66	23.70	24.64	25.95	26.89
95	16.53	17.91	23.21	26.38	29.64	31.00	31.63
96	18.36	18.85	23.09	27.90	31.09	34.02	34.13
97	17.73	19.03	24.17	27.41	31.65	33.23	33.91
98	18.23	18.43	22.40	28.63	30.84	33.12	33.77
99	16.39	17.06	22.94	26.38	30.11	32.12	32.39
100	16.48	17.44	21.91	25.95	30.42	30.87	31.31
101	18.72	18.32	18.63	24.61	28.21	29.50	31.00
102	16.57	16.13	16.48	24.95	26.69	26.65	29.35
103	14.74	14.90	15.12	23.68	25.28	24.57	25.73
104	14.34	15.34	14.85	22.49	25.24	22.65	23.50
105	14.65	15.17	14.50	20.12	24.46	22.05	21.40
106	14.29	14.34	15.12	16.62	21.91	21.69	22.65
107	13.89	14.59	14.81	14.23	19.92	20.55	22.87
108	14.43	15.26	13.91	12.69	16.73	19.01	20.37
109	14.83	14.88	12.62	11.77	13.36	16.35	17.51
110	14.34	13.96	11.68	10.77	11.23	13.18	14.56
111	13.22	12.53	11.03	9.72	9.29	10.03	11.08



112	12.06	11.59	10.63	9.07	7.84	8.60	9.07
113	11.35	11.08	10.10	8.67	6.23	7.77	7.91
114	10.90	10.61	9.72	8.11	4.96	7.06	7.19
115	10.32	10.01	9.36	7.62	3.93	6.03	6.21
116	9.78	9.60	8.93	6.99	3.48	4.85	5.00
117	9.43	9.16	8.64	6.23	3.28	4.00	4.02
118	9.07	8.85	8.24	5.45	3.17	3.40	3.22
119	8.62	8.51	7.82	4.76	3.08	3.15	2.90
120	8.31	8.20	7.28	4.15	2.99	3.02	2.73
121	8.00	7.86	6.63	3.57	2.90	2.99	2.64
122	7.68	7.46	5.96	3.17	2.84	2.93	2.50
123	7.33	6.90	5.25	2.77	2.81	2.84	2.55
124	6.83	6.39	4.60	2.55	2.77	2.86	2.46
125	6.30	5.67	3.98	2.41	2.70	2.77	2.41
126	5.81	5.05	3.51	2.28	2.57	2.73	2.46
127	5.09	4.53	3.08	2.21	2.52	2.70	2.46
128	4.51	4.04	2.68	2.14	2.44	2.64	2.46
129	4.11	3.62	2.44	2.06	2.30	2.57	2.46
130	3.53	3.15	2.21	1.99	2.26	2.50	2.41
131	3.13	2.77	2.08	1.85	2.17	2.39	2.32
132	2.73	2.39	1.99	1.79	2.08	2.28	2.23
133	2.41	2.19	1.92	1.74	1.99	2.19	2.06
134	2.23	2.06	1.88	1.63	1.85	2.03	2.01
135	2.06	1.97	1.83	1.61	1.74	1.92	1.83
136	1.92	1.85	1.74	1.52	1.54	1.72	1.70
137	1.83	1.74	1.68	1.47	1.41	1.61	1.52
138	1.74	1.79	1.61	1.43	1.34	1.50	1.34
139	1.70	1.70	1.61	1.45	1.32	1.41	1.25
140	1.79	1.72	1.61	1.47	1.25	1.25	1.12
141	1.74	1.74	1.63	1.52	1.39	1.29	1.12
142	1.92	1.81	1.76	1.63	1.47	1.36	1.21
143	1.97	1.92	1.81	1.68	1.52	1.50	1.21
144	2.06	1.99	1.92	1.83	1.70	1.56	1.39
145	2.10	2.03	2.06	1.90	1.76	1.72	1.47
146	2.19	2.17	2.12	2.03	1.90	1.81	1.52
147	2.28	2.23	2.21	2.10	1.97	1.85	1.61
148	2.37	2.35	2.30	2.19	2.01	1.94	1.79
149	2.37	2.39	2.37	2.21	2.17	2.06	1.83
150	2.55	2.55	2.50	2.37	2.30	2.19	2.06
151	2.68	2.64	2.55	2.39	2.39	2.23	2.06
152	2.68	2.68	2.66	2.50	2.41	2.32	2.23
153	2.81	2.77	2.70	2.61	2.52	2.39	2.23
154	2.90	2.99	2.84	2.75	2.64	2.50	2.37
155	3.04	3.02	2.97	2.86	2.79	2.68	2.50
156	3.22	3.19	3.15	3.04	2.95	2.84	2.68
157	3.35	3.35	3.28	3.17	3.08	2.95	2.86
158	3.48	3.53	3.44	3.35	3.24	3.17	2.99
159	3.66	3.62	3.57	3.51	3.44	3.37	3.17
160	3.89	3.89	3.77	3.69	3.60	3.57	3.35
161	4.07	4.04	3.95	3.86	3.82	3.73	3.48
162	4.15	4.20	4.02	4.02	3.93	3.89	3.75
163	4.29	4.36	4.22	4.18	4.11	4.07	3.89
164	4.42	4.47	4.38	4.29	4.20	4.22	4.02
165	4.56	4.56	4.45	4.42	4.31	4.36	4.15
166	4.60	4.69	4.60	4.53	4.45	4.40	4.24
167	4.78	4.76	4.65	4.62	4.53	4.53	4.42
168	4.78	4.82	4.71	4.71	4.60	4.53	4.42



LCTECH



169	4.91	4.87	4.82	4.76	4.74	4.67	4.56
170	4.87	4.87	4.85	4.76	4.71	4.74	4.56
171	4.91	4.91	4.89	4.80	4.80	4.76	4.69
172	5.00	4.96	4.89	4.85	4.87	4.82	4.69
173	5.00	4.94	4.94	4.89	4.87	4.85	4.69
174	4.91	4.94	4.94	4.98	4.94	4.82	4.74
175	5.00	4.98	4.94	4.96	4.94	4.87	4.78
176	5.00	4.91	4.98	4.98	4.91	4.91	4.74
177	5.00	5.03	4.96	4.96	4.98	4.91	4.78
178	4.91	4.98	4.98	4.98	4.98	4.96	4.87
179	4.96	4.98	5.00	4.98	4.98	4.98	4.91
180	4.99	4.99	4.99	4.99	4.99	4.99	4.99

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