

IES LM-79-08

MEASUREMENT AND TEST REPORT For

Beyond LED Technology

1939 Parker Ct Stone Mountain, GA 30087

Test Model: 10179

Report Type:	Electrical and Photometric including: Luminous Flux, Color, Luminous Intensity Distribution, Spatial Non-uniformity of Chromaticity
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	BAZ14010506-10
Test Date:	2014-02-26 to 2014-02-27
Report Date:	2014-02-28
Reviewed By:	Jeanne Han/Safety Manager <i>Jeanne Han</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008
Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
Accreditation:	The NVLAP Lab Code is 200707-0.

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1. Product Description

General Information:

Sample No.: RSZ140220506-S01 Model: 101790 One sample was received on 2014-02-20 and used for testing.

Model Tested: 101790

Manufacturer: Beyond LED Technology

Brand Name: BEYOND LED

Product Designation: LED tube

Burning Time Before Test: 0 hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 100-277VAC 50/60Hz

Rated Power: 28W

Nominal CCT: 7000K

2. Standards Used

- IESNA LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting

3. Description of Test Equipment

Device	Manufac.	Model No	Ser. No	Test Range	Calibration date
2.0m integrating sphere	EVERFINE	R98	1010018	N/A	2013-03-08
High accuracy array spectroradiometer	EVERFINE	FS-2000	1012016T	380-780nm	2013-03-08
Digital CC&CV DC Power Supply	EVERFINE	WY305	1101047	30V/5A	2013-03-25
Temperature/humidity, block	Victor	VC230	EE209	0~40°C0~90%	2013-04-01
Standard Light Source	SENSING	N/A	LSD090808	N/A	2013-05-13
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010	1011001T	N/A	2013-03-25
AC Power Supply	EVERFINE	VPS1060 PWM	1101006	0-150V, 0-300V	2013-03-26
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2013-03-25
Power Meter	YOKOGAWA	WT-210	91KB35700	N/A	2013-03-26
Goniophotometer	EVERFINE	GO-R5000	YG108492N1 0120001	1600mm,3000W/10A	2013-03-08
Thermal Meter	Victor	VC230	EE091	0~40°C0~90%	2013-04-01
Standard Light Source	EVERFINE	D908	1012003	N/A	2013-03-15

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$ during measurement. And relative humidity is less than 65%.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, spectrophotometer, and integrating sphere. The integrating sphere system is calibrated by standard light source before measurement. The system and standard light source has been calibrated regularly and traceable to the National Primary Standards.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement. The standard light source has been calibrated regularly and traceable to the National Primary Standards.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the luminous intensity is $U=2.82\%$ ($K=2$), at the 95% confidence level.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.5 hours**

Test orientation: **Downward**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.0	60.0	0.2277	26.98	0.987

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CU (Y)	Duv
2767.8	9.288	102.58	8170	1.81E-03

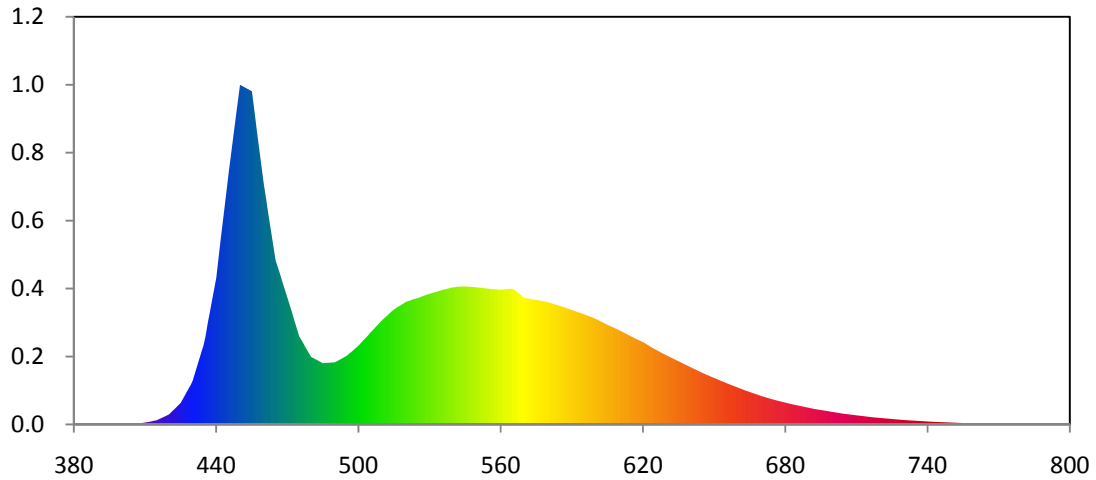
Chromaticity Coordinate

x	y	u	v	u'	v'
0.2928	0.3056	0.1926	0.301	0.1926	0.4522

Color Rendering Index

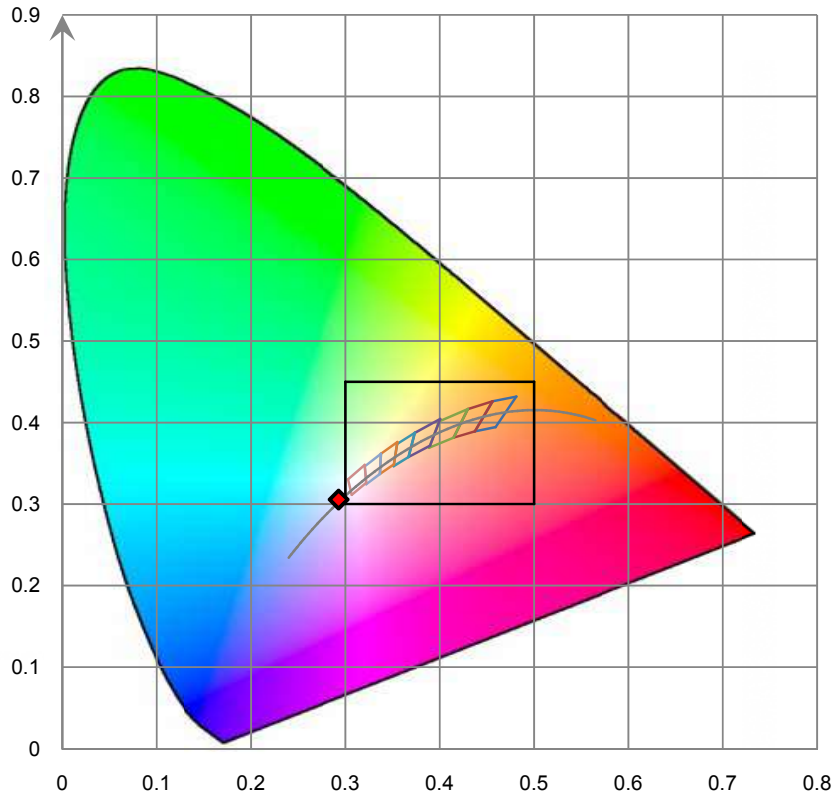
Ra 81.3			
R1	R2	R3	R4
80	85	85	81
R5	R6	R7	R8
80	77	89	73
R9	R10	R11	R12
9	62	79	48
R13	R14	R15	
82	92	78	

Relative Spectral Power Distribution

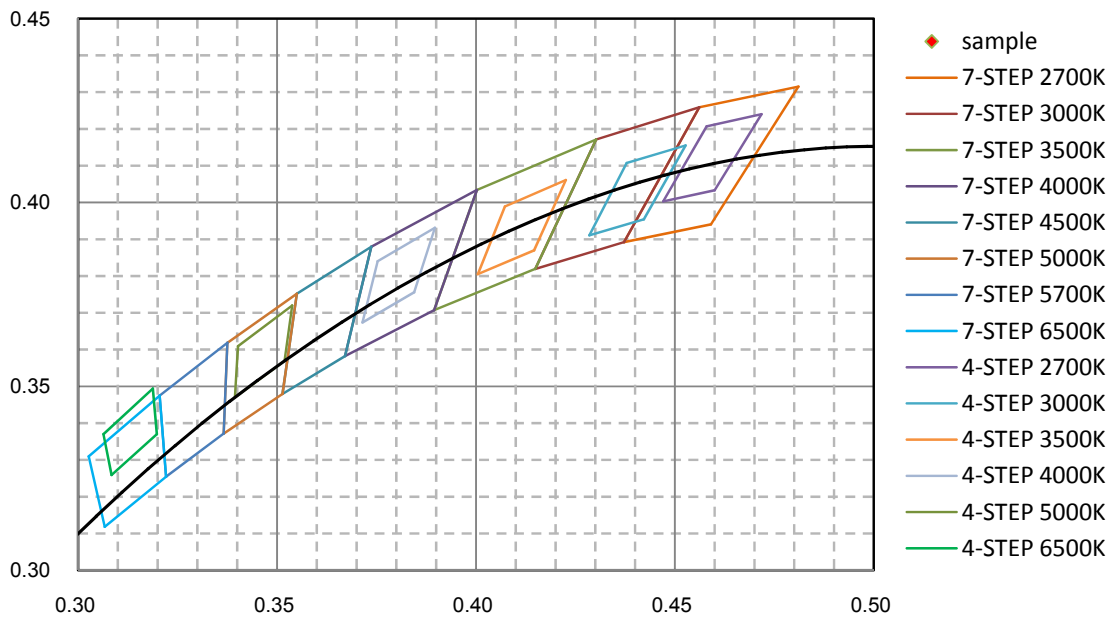


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	9.593E-02	465	5.364E+01	550	4.48E+01	635	2.054E+01	720	2.147E+00
385	6.816E-02	470	4.140E+01	555	4.423E+01	640	1.75E+01	725	1.742E+00
390	5.274E-02	475	2.878E+01	560	4.400E+01	645	1.684E+01	730	1.475E+00
395	7.017E-02	480	2.206E+01	565	4.34E+01	650	1.522E+01	735	1.203E+00
400	1.069E-01	485	2.001E+01	570	4.2E+01	655	1.349E+01	740	1.027E+00
405	2.317E-01	490	1.9E+01	575	4.1E+01	660	1.205E+01	745	8.244E-01
410	5.930E-01	495	2.2E+01	580	3.990E+01	665	1.061E+01	750	6.103E-01
415	1.469E+00	500	2.575E+01	585	3.868E+01	670	9.229E+00	755	4.359E-01
420	3.260E+00	505	2.996E+01	590	3.738E+01	675	8.089E+00	760	3.176E-01
425	7.052E+00	510	3.414E+01	595	3.601E+01	680	7.119E+00	765	1.461E-01
430	1.406E+01	515	3.763E+01	600	3.450E+01	685	6.186E+00	770	8.192E-02
435	2.695E+01	520	4.001E+01	605	3.251E+01	690	5.433E+00	775	0.000E+00
440	4.794E+01	525	4.23E+01	610	3.075E+01	695	4.683E+00	780	0.000E+00
445	8.065E+01	530	4.269E+01	615	2.871E+01	700	4.094E+00	785	0.000E+00
450	1.108E+02	535	4.383E+01	620	2.687E+01	705	3.497E+00	790	0.000E+00
455	1.087E+02	540	4.484E+01	625	2.450E+01	710	2.995E+00	795	0.000E+00
460	7.860E+01	545	4.502E+01	630	2.262E+01	715	2.493E+00	800	0.000E+00

CIE 1931 x y Chromaticity Diagram



7-Step & 4-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.5 hours**

Test orientation: **Downward**

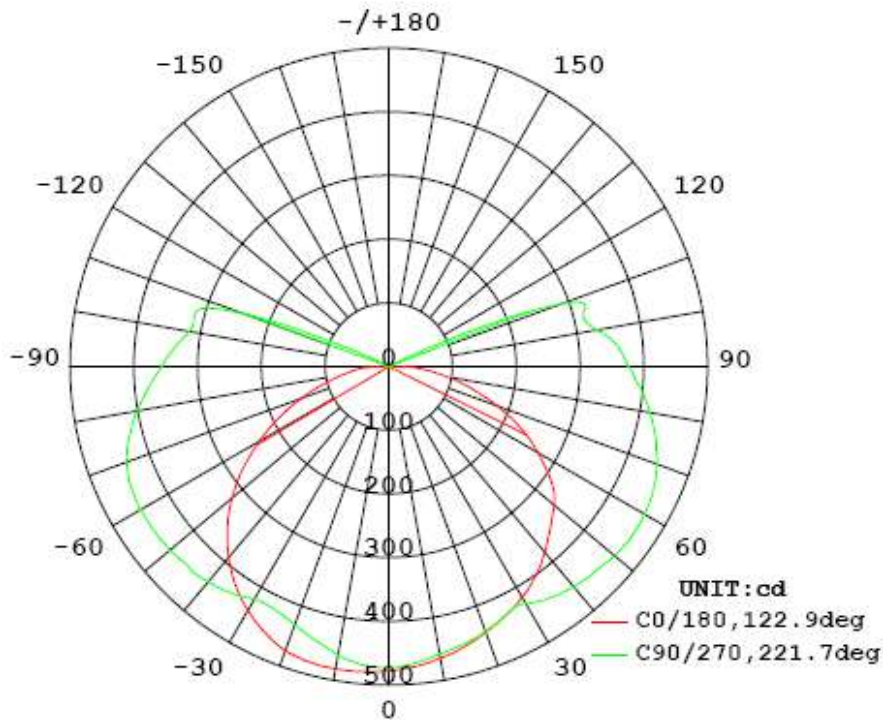
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60.0	0.226	26.76	0.9863

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	CBCP (cd)	S/MH (C0/180)	S/MH (C90/270)
2758.21	103.07	478	1.36	1.42

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% Imax):	122.9	212.8	221.7	194.6	188.0
Field Angle (10% Imax):	171.8	221.9	231.5	209.9	208.8

Luminous Intensity (cd) Distribution Data

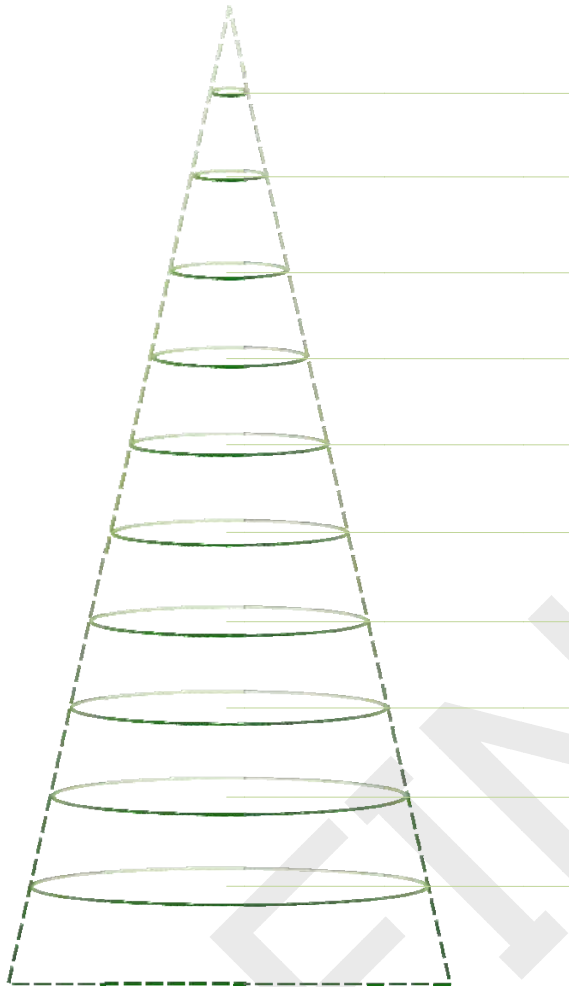
C \ Y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	478	475	472	472	473	476	479	482
5.0°	481	477	474	471	470	471	475	479
10.0°	482	476	469	463	460	461	466	472
15.0°	480	471	459	450	445	446	455	464
20.0°	475	462	447	437	431	433	440	454
25.0°	461	448	435	428	422	419	426	443
30.0°	442	429	427	427	422	411	413	429
35.0°	420	410	426	440	433	413	399	412
40.0°	391	391	436	449	441	421	390	393
45.0°	358	374	441	455	444	426	388	373
50.0°	321	367	442	458	448	426	391	357
55.0°	280	360	440	461	450	428	393	333
60.0°	235	350	438	461	449	429	390	295
65.0°	190	335	435	459	447	428	391	258
70.0°	147	321	427	451	437	427	391	226
75.0°	106	307	409	434	427	406	384	192
80.0°	74	282	383	414	401	392	356	150
85.0°	50	242	353	391	385	355	317	121
90.0°	24	205	327	358	356	330	280	73
95.0°	2	191	306	347	347	310	260	31
100.0°	1	142	287	327	335	293	261	3
105.0°	1	6	25	325	316	289	30	2
110.0°	0	3	61	243	245	109	4	1
115.0°	0		6	44	57	5	2	1
120.0°	0	2		5	5	3	2	0
125.0°	0	1	2	2	2	2	1	0
130.0°	0	1	2	2	2	2	1	0
135.0°	0		1	1	1	1	1	0
140.0°	0		1	1	1	1	1	0
145.0°	0	0	1	1	1	1	1	0
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Luminous Intensity (cd) Distribution Data (cont.)

C \ Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	478	475	472	472	473	476	479	482
5.0°	473	468	465	464	468	473	478	484
10.0°	465	457	452	453	458	465	474	483
15.0°	456	444	441	444	452	459	467	477
20.0°	444	432	430	434	442	453	461	467
25.0°	432	418	417	421	432	444	452	452
30.0°	418	405	402	414	430	435	439	434
35.0°	401	391	395	425	443	441	424	412
40.0°	381	376	402	432	451	452	408	386
45.0°	358	361	406	436	456	458	402	357
50.0°	338	360	409	439	462	461	401	325
55.0°	310	359	411	441	465	465	395	290
60.0°	270	358	411	438	463	464	375	255
65.0°	228	358	407	432	458	457	376	218
70.0°	181	354	398	421	448	448	360	189
75.0°	134	337	383	408	427	427	338	154
80.0°	93	308	364	392	416	416	310	124
85.0°	56	279	342	374	382	382	281	90
90.0°	30	246	320	354	376	357	253	67
95.0°	3	217	303	331	340	340	231	6
100.0°	2	191	310	310	304	304	230	3
105.0°	1	26	26	26	315	313	75	2
110.0°	1	3	92	264	291	136	4	1
115.0°	0	4	4	54	71	21	3	1
120.0°	0	1	1	5	5	3	2	1
125.0°	0	1	2	2	2	2	2	1
130.0°	0	1	1	2	2	2	1	1
135.0°	0	1	1	1	1	1	1	1
140.0°	0	1	1	1	1	1	1	1
145.0°	0	0	1	1	1	1	1	1
150.0°	0	0	0	1	1	0	1	1
155.0°	0	0	0	0	0	0	0	1
160.0°	0	0	0	0	0	0	0	1
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	1	1	1	1	1	1	1	1

Average Area Illumination Figure

Angle: 90.0°. Flux out: 788.9 lm.



Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	100.0	1004.0	1932.0
1.0	200.0	251.1	482.9
1.5	300.0	111.6	214.6
2.0	400.0	62.8	120.7
2.5	500.0	40.2	77.3
3.0	600.0	27.9	53.7
3.5	700.0	20.5	39.4
4.0	800.0	15.7	30.2
4.5	900.0	12.4	23.9
5.0	1000.0	10.0	19.3

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	11.3	0.41
5-10	33.6	1.22
10-15	54.7	1.98
15-20	74.4	2.70
20-25	92.4	3.35
25-30	108.5	3.93
30-35	123.8	4.49
35-40	138.6	5.03
40-45	151.5	5.49
45-50	162.9	5.91
50-55	172.5	6.25
55-60	178.8	6.48
60-65	181.9	6.60
65-70	182.0	6.59
70-75	178.1	6.46
75-80	169.5	6.14
80-85	157.4	5.71
85-90	143.0	5.14
90-95	130.6	4.74
95-100	117.0	4.24
100-105	99.2	3.49
105-110	68.0	2.43
110-115	25.6	0.93
115-120	0.9	0.11
120-125	0.9	0.03
125-130	0.6	0.02
130-135	0.4	0.02
135-140	0.3	0.01
140-145	0.2	0.01
145-150	0.2	0.00
150-155	0.1	0.01
155-160	0.1	0.00
160-165	0.1	0.01
165-170	0.1	0.00
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	11.3	0.41
0-10	44.9	1.63
0-15	99.7	3.61
0-20	174.1	6.31
0-25	266.4	9.66
0-30	374.9	13.59
0-35	498.8	18.08
0-40	637.4	23.11
0-45	788.9	28.60
0-50	951.8	34.51
0-55	1124.3	40.76
0-60	1303.0	47.24
0-65	1487.4	53.84
0-70	1666.9	60.43
0-75	1845.0	66.89
0-80	2014.5	73.03
0-85	2171.8	78.74
0-90	2314.8	83.92
0-95	2445.4	88.66
0-100	2562.4	92.90
0-105	2658.5	96.39
0-110	2726.5	98.85
0-115	2752.1	99.78
0-120	2755.2	99.89
0-125	2756.1	99.92
0-130	2756.7	99.94
0-135	2757.1	99.96
0-140	2757.4	99.97
0-145	2757.6	99.98
0-150	2757.8	99.98
0-155	2757.9	99.99
0-160	2758.0	99.99
0-165	2758.1	100.00
0-170	2758.2	100.00
0-175	2758.2	100.00
0-180	2758.2	100.00

Color Spatial Uniformity

Average Weighted
u':0.1966, v': 0.4532

$\gamma \setminus C0-180$	u'	v'	Du'v'	$\gamma \setminus C90-270$	u'	v'	Du'v'
-110	0.1978	0.4404	0.0128	-110	0.1970	0.4715	0.0183
-105	0.2012	0.4462	0.0084	-105	0.1968	0.4515	0.0017
-100	0.2049	0.4516	0.0084	-100	0.1969	0.4581	0.0049
-95	0.2110	0.4336	0.0243	-95	0.1968	0.4503	0.0029
-90	0.2010	0.4568	0.0057	-90	0.1968	0.4539	0.0007
-85	0.1983	0.4654	0.0123	-85	0.1967	0.4516	0.0016
-80	0.1975	0.4558	0.0028	-80	0.1967	0.4508	0.0024
-75	0.1970	0.4539	0.0008	-75	0.1966	0.4514	0.0018
-70	0.1969	0.4551	0.0019	-70	0.1966	0.4507	0.0024
-65	0.1968	0.4559	0.0027	-65	0.1966	0.4504	0.0028
-60	0.1967	0.4563	0.0031	-60	0.1966	0.4497	0.0035
-55	0.1968	0.4563	0.0031	-55	0.1966	0.4495	0.0037
-50	0.1967	0.4561	0.0029	-50	0.1966	0.4503	0.0029
-45	0.1967	0.4559	0.0027	-45	0.1966	0.4506	0.0026
-40	0.1967	0.4557	0.0025	-40	0.1966	0.4513	0.0019
-35	0.1967	0.4554	0.0022	-35	0.1966	0.4513	0.0016
-30	0.1966	0.4554	0.0022	-30	0.1966	0.4513	0.0012
-25	0.1966	0.4556	0.0024	-25	0.1966	0.4538	0.0006
-20	0.1966	0.4559	0.0027	-20	0.1967	0.4546	0.0014
-15	0.1966	0.4562	0.0030	-15	0.1967	0.4553	0.0021
-10	0.1966	0.4564	0.0032	-10	0.1967	0.4566	0.0034
-5	0.1966	0.4567	0.0034	-5	0.1967	0.4569	0.0037
0	0.1967	0.4568	0.0036	0	0.1966	0.4571	0.0039
5	0.1966	0.4566	0.0034	5	0.1966	0.4569	0.0037
10	0.1966	0.4565	0.0033	10	0.1966	0.4562	0.0030
15	0.1966	0.4562	0.0030	15	0.1965	0.4557	0.0025
20	0.1967	0.4559	0.0027	20	0.1965	0.4546	0.0014
25	0.1967	0.4557	0.0024	25	0.1965	0.4535	0.0003
30	0.1967	0.4555	0.0021	30	0.1964	0.4526	0.0007
35	0.1967	0.4552	0.0018	35	0.1964	0.4517	0.0015
40	0.1967	0.4552	0.0020	40	0.1964	0.4510	0.0022
45	0.1967	0.4555	0.0023	45	0.1964	0.4504	0.0028
50	0.1967	0.4552	0.0021	50	0.1964	0.4499	0.0033
55	0.1967	0.4552	0.0021	55	0.1964	0.4507	0.0025
60	0.1968	0.4565	0.0033	60	0.1964	0.4500	0.0032
65	0.1969	0.4569	0.0037	65	0.1964	0.4489	0.0043
70	0.1969	0.4571	0.0039	70	0.1964	0.4497	0.0035
75	0.1970	0.4576	0.0035	75	0.1965	0.4512	0.0021
80	0.1972	0.4583	0.0024	80	0.1965	0.4504	0.0028
85	0.1978	0.4574	0.0043	85	0.1965	0.4511	0.0021
90	0.2006	0.4637	0.0112	90	0.1966	0.4522	0.0010
95	0.2061	0.4543	0.0095	95	0.1966	0.4530	0.0002
100	0.2088	0.4577	0.0129	100	0.1967	0.4531	0.0001
105	0.1988	0.4241	0.0292	105	0.1967	0.4547	0.0015
110	0.1982	0.3923	0.0609	110	0.1965	0.4461	0.0071

6. Product Photo



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

FINAL