

IES LM-79-08

MEASUREMENT AND TEST REPORT

Test Model: P20A02-D 3000K

Report Type:	Electrical and Photometric tests including: Luminous Flux, Color, Luminous Intensity Distribution, Spatial Non-uniformity of Chromaticity
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	R2XM140901057-10A1
Test Date:	2014-09-11 to 2014-09-12
Report Date:	2014-09-26
Reviewed By:	Jeanne Han/Safety Manager <i>Jeanne Han</i>
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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:

Two samples were received on 2014-09-01. One was tested in integrating sphere and the other was tested in goniophotometer.

Model Tested: P20A02-D 3000K
 Manufacturer: Xiamen Bymea Lighting Co.,Ltd.
 Brand Name: BYMEA
 Product Designation: Directional LED Lamp
 Burning Time Before Test: 0 hour(For New Products)

Rated Values:

Rated Voltage/Frequency: AC120 V 60Hz
 Rated Power: 8W
 Nominal CCT: 3000K
 Nominal Lumen Output: 500 lm

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	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	N/A	N/A	1.5meter	2014-03-16	2015-03-16
Power Meter	SENSING	UI2008	908735	10.0-600.0V	2014-03-12	2015-03-12
Spectral photometer	SENSING	SPR3000	s0902024	350nm~800nm	2014-03-16	2015-03-16
AC Power Supply	ALL Power	APW-105N	970663	0V-300V 50-400Hz	2014-03-12	2015-03-12
Standard Light Source	EVERFINE	D204	201311	N/A	2013-09-26	2014-09-26
Thermal Meter	SENSING	N/A	N/A	20~30°C	2014-03-13	2015-03-13
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2014-03-12	2015-03-12
AC Power Supply	EVERFINE	VPS1060 PWM	1101006	0-150V, 0-300V	2014-03-12	2015-03-12
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2014-03-12	2015-03-12
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2014-03-12	2015-03-12
Goniophotometer	EVERFINE	GO- R5000	YG108492N10120001	1600mm,3000W/10A	2014-03-04	2015-03-04
Thermal Meter	Victor	VC230	EE091	0~40°C 0~90%	2013-04-01	2016-03-31
Standard Light Source	EVERFINE	D908	1012001	N/A	2014-05-06	2015-05-06

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.

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 the light output (luminous flux) measurements is $U=1.60\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=21\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=1.3(K=2)$, at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

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: **1.0 hours**

Test orientation: **Base up**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.0	60.0	0.072	8.0	0.929

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
518.105	1.479	64.763	3005	3.00E-05

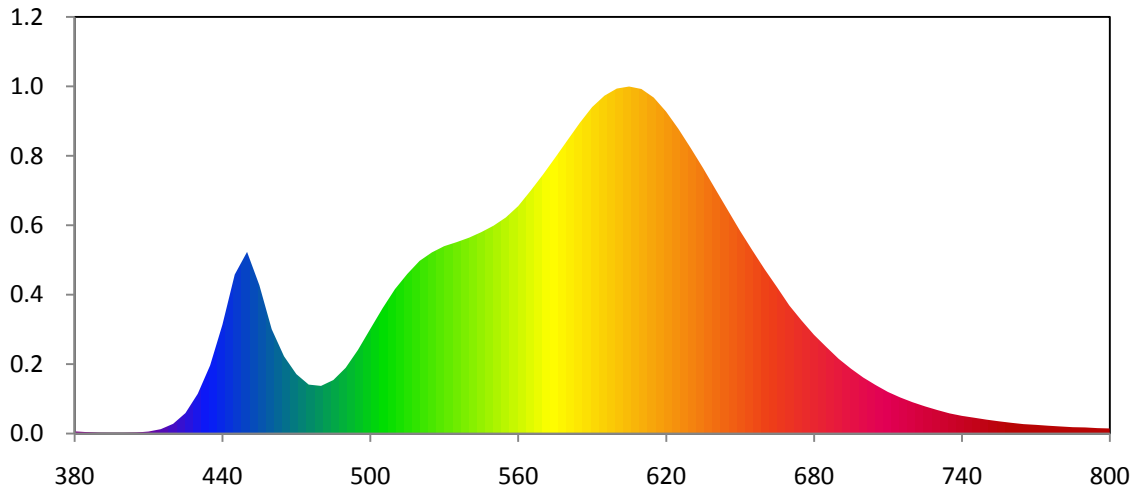
Chromaticity Coordinate

x	y	u	v	u'	v'
0.4366	0.4040	0.2504	0.3475	0.2504	0.5213

Color Rendering Index

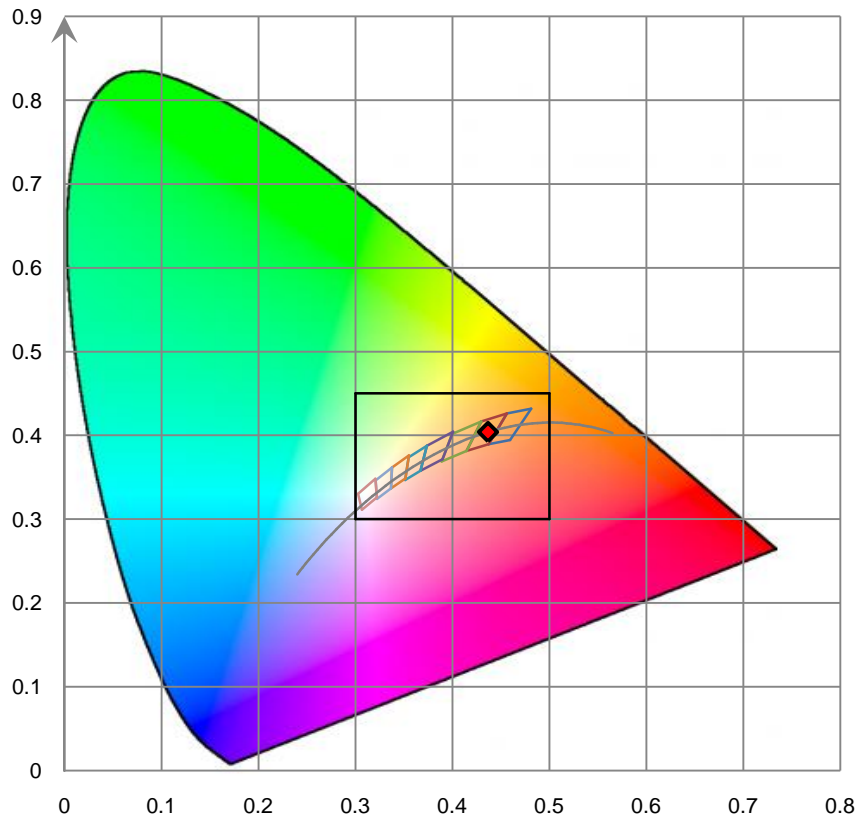
Ra			
83.5			
R1 82	R2 90	R3 97	R4 84
R5 82	R6 88	R7 84	R8 61
R9 10	R10 77	R11 84	R12 71
R13 85	R14 98	R15 74	

Relative Spectral Power Distribution

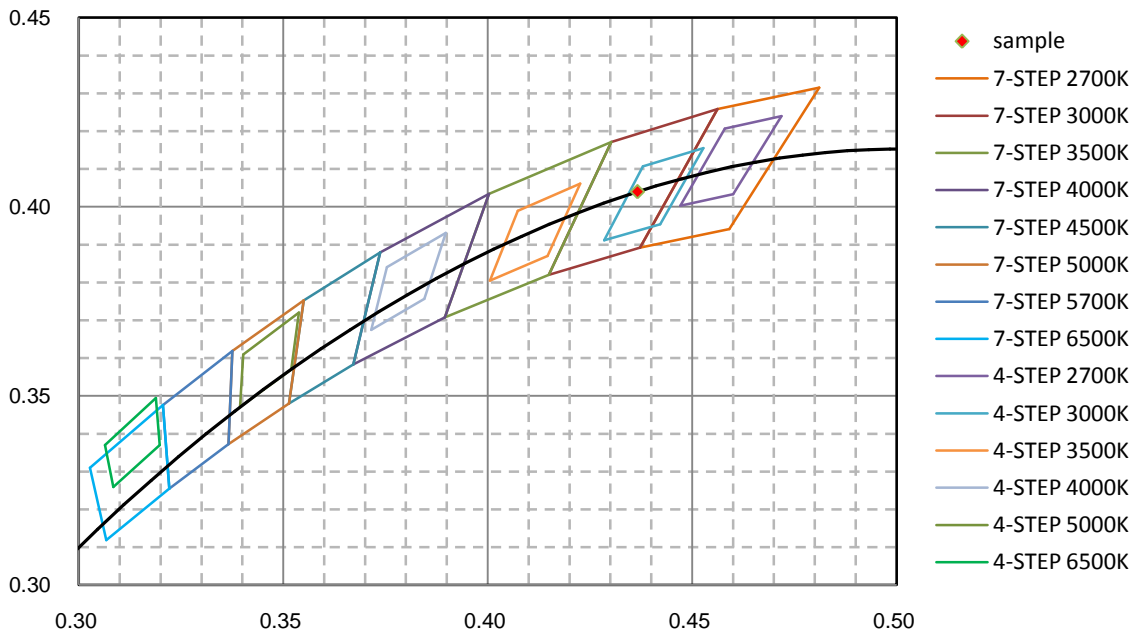


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.174E-04	465	1.101E-02	550	2.961E-02	635	3.782E-02	720	4.463E-03
385	2.051E-04	470	8.462E-03	555	3.079E-02	640	3.482E-02	725	3.881E-03
390	1.212E-04	475	6.975E-03	560	3.240E-02	645	3.185E-02	730	3.355E-03
395	1.028E-04	480	6.787E-03	565	3.457E-02	650	2.888E-02	735	2.876E-03
400	1.039E-04	485	7.624E-03	570	3.686E-02	655	2.610E-02	740	2.522E-03
405	1.478E-04	490	9.364E-03	575	3.929E-02	660	2.339E-02	745	2.258E-03
410	2.890E-04	495	1.192E-02	580	4.178E-02	665	2.086E-02	750	1.984E-03
415	6.298E-04	500	1.490E-02	585	4.426E-02	670	1.824E-02	755	1.747E-03
420	1.387E-03	505	1.786E-02	590	4.650E-02	675	1.609E-02	760	1.537E-03
425	2.917E-03	510	2.057E-02	595	4.812E-02	680	1.407E-02	765	1.347E-03
430	5.667E-03	515	2.273E-02	600	4.914E-02	685	1.234E-02	770	1.242E-03
435	9.702E-03	520	2.460E-02	605	4.943E-02	690	1.065E-02	775	1.117E-03
440	1.551E-02	525	2.581E-02	610	4.907E-02	695	9.246E-03	780	1.011E-03
445	2.265E-02	530	2.670E-02	615	4.785E-02	700	7.981E-03	785	9.108E-04
450	2.587E-02	535	2.726E-02	620	4.586E-02	705	6.913E-03	790	8.736E-04
455	2.112E-02	540	2.789E-02	625	4.340E-02	710	5.932E-03	795	7.781E-04
460	1.486E-02	545	2.869E-02	630	4.066E-02	715	5.145E-03	800	7.310E-04

CIE 1931 x y Chromaticity Diagram



7-Step & 4-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **2.0 hours**

Test orientation: **Base up**

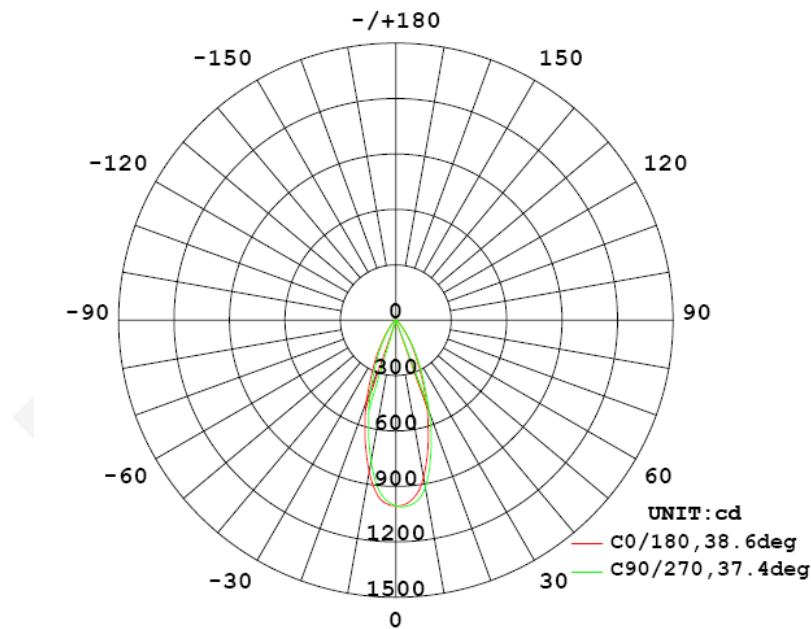
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60.0	0.07	7.75	0.9221

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	CBCP (cd)	S/MH (C0/180)	S/MH (C90/270)
536.202	69.19	1005	0.61	0.55

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	38.6	38.1	37.4	37.9	38.00
Field Angle (10% I _{max}):	72.3	71.8	71.3	71.7	71.78

Luminous Intensity (cd) Distribution Data

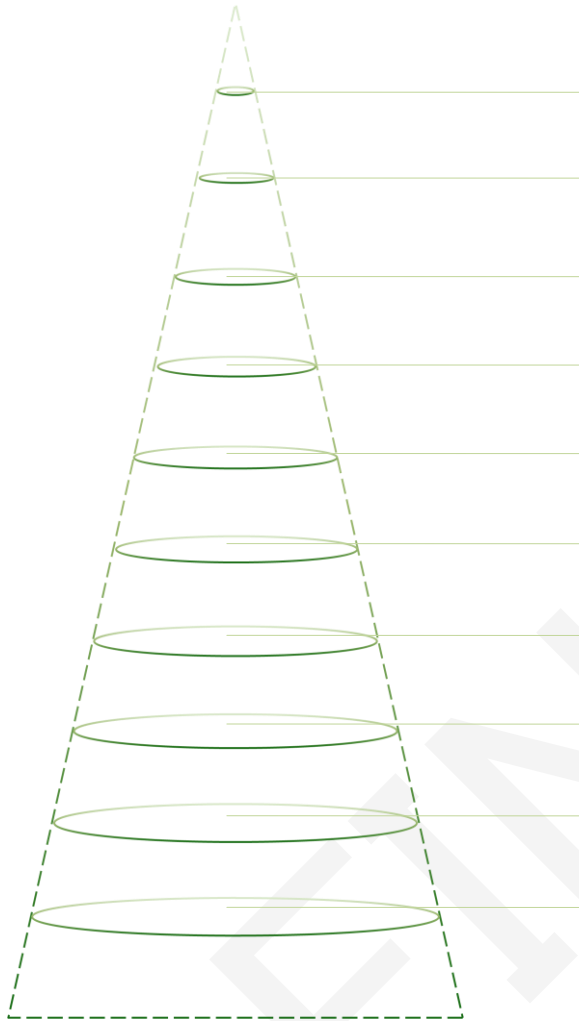
C \ y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1005	1005	1005	1005	1005	1005	1005	1005
5.0°	972	961	949	942	941	947	957	969
10.0°	834	814	789	773	773	789	812	846
15.0°	648	624	595	575	575	590	612	660
20.0°	463	431	411	401	394	411	437	466
25.0°	300	280	265	259	255	263	283	308
30.0°	187	171	164	160	159	168	181	194
35.0°	108	97	92	90	91	97	105	113
40.0°	59	57	54	52	52	56	60	66
45.0°	35	33	31	30	29	32	34	38
50.0°	21	20	18	18	17	18	20	22
55.0°	14	13	12	11	11	11	12	14
60.0°	9	8	8	8	7	8	8	9
65.0°	6	5	5	5	5	5	5	6
70.0°	4	3	3	3	3	3	3	4
75.0°	2	2	1	1	1	2	2	2
80.0°	1	1	1	0	0	1	1	1
85.0°	0	0	0	0	0	0	0	0
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
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°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1005	1005	1005	1005	1005	1005	1005	1005
5.0°	977	990	997	999	1001	999	992	978
10.0°	865	892	916	921	919	904	887	853
15.0°	678	710	734	733	735	713	700	673
20.0°	490	516	533	532	530	523	499	475
25.0°	324	342	353	354	350	337	325	310
30.0°	204	217	225	227	224	217	202	192
35.0°	123	132	138	140	136	131	119	109
40.0°	69	74	77	78	75	72	67	63
45.0°	40	43	45	44	44	42	39	36
50.0°	24	25	26	26	25	25	23	22
55.0°	15	15	16	15	15	14	14	14
60.0°	10	10	10	10	10	9	9	9
65.0°	6	7	7	7	6	6	6	6
70.0°	4	4	4	4	4	4	4	4
75.0°	2	2	2	2	2	2	2	2
80.0°	1	1	1	1	1	1	1	1
85.0°	0	0	0	0	0	0	0	0
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
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°	0	0	0	0	0	0	0	0

Average Area Illumination Figure

Angle: 38.00°. Flux out: 252.4 lm.



Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	34.4	2710.0	4067.0
1.0	68.9	677.6	1017.0
1.5	103.3	301.1	451.8
2.0	137.7	169.4	254.2
2.5	172.2	108.4	162.7
3.0	206.6	75.3	113.0
3.5	241.0	55.3	83.0
4.0	275.5	42.4	63.5
4.5	309.9	33.5	50.2
5.0	344.3	27.1	40.7

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	23.7	4.42
5-10	65.3	12.17
10-15	89.0	16.61
15-20	92.2	17.20
20-25	80.0	14.93
25-30	62.0	11.57
30-35	44.3	8.25
35-40	28.8	5.37
40-45	18.3	3.40
45-50	11.6	2.17
50-55	7.5	1.40
55-60	5.1	0.96
60-65	3.5	0.65
65-70	2.4	0.44
70-75	1.4	0.27
75-80	0.7	0.13
80-85	0.3	0.05
85-90	0.0	0.01
90-95	0.0	0.00
95-100	0.0	0.00
100-105	0.0	0.00
105-110	0.0	0.00
110-115	0.0	0.00
115-120	0.0	0.00
120-125	0.0	0.00
125-130	0.0	0.00
130-135	0.0	0.00
135-140	0.0	0.00
140-145	0.0	0.00
145-150	0.0	0.00
150-155	0.0	0.00
155-160	0.0	0.00
160-165	0.0	0.00
165-170	0.0	0.00
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	23.7	4.42
0-10	89.0	16.59
0-15	178.0	33.20
0-20	270.2	50.40
0-25	350.3	65.33
0-30	412.3	76.90
0-35	456.6	85.15
0-40	485.4	90.52
0-45	503.6	93.92
0-50	515.2	96.09
0-55	522.8	97.49
0-60	527.9	98.45
0-65	531.4	99.10
0-70	533.7	99.54
0-75	535.2	99.81
0-80	535.9	99.94
0-85	536.2	99.99
0-90	536.2	100.00
0-95	536.2	100.00
0-100	536.2	100.00
0-105	536.2	100.00
0-110	536.2	100.00
0-115	536.2	100.00
0-120	536.2	100.00
0-125	536.2	100.00
0-130	536.2	100.00
0-135	536.2	100.00
0-140	536.2	100.00
0-145	536.2	100.00
0-150	536.2	100.00
0-155	536.2	100.00
0-160	536.2	100.00
0-165	536.2	100.00
0-170	536.2	100.00
0-175	536.2	100.00
0-180	536.2	100.00

Color Spatial Uniformity

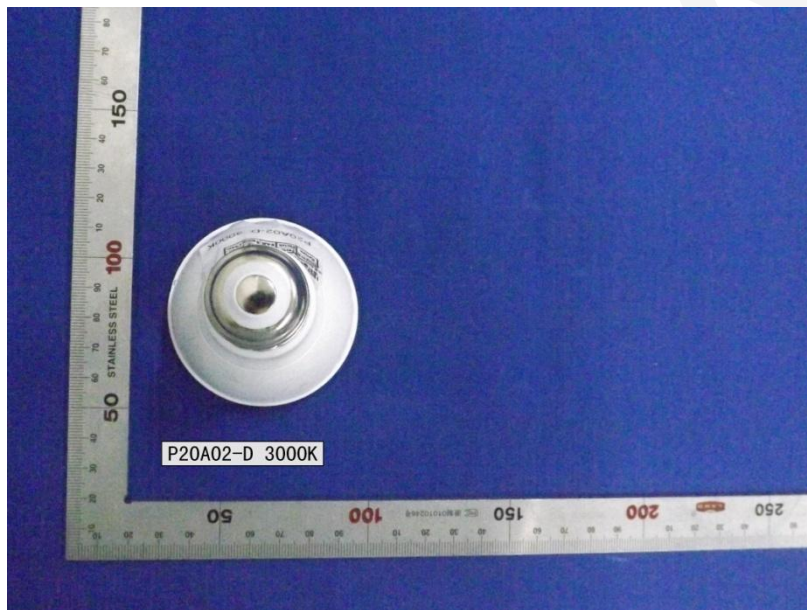
Average Weighted
u': 0.2499, v': 0.5209

$\gamma \setminus C0-180$	u'	v'	$Du'v'$
-20	0.2507	0.5217	0.0011
-15	0.2506	0.5213	0.0009
-10	0.2501	0.5208	0.0003
-5	0.2497	0.5206	0.0003
0	0.2498	0.5210	0.0001
5	0.2495	0.5208	0.0004
10	0.2492	0.5205	0.0008
15	0.2491	0.5206	0.0008
20	0.2491	0.5204	0.0009

$\gamma \setminus C90-270$	u'	v'	$Du'v'$
-20	0.2508	0.5212	0.0009
-15	0.2501	0.5204	0.0006
-10	0.2496	0.5201	0.0009
-5	0.2496	0.5205	0.0005
0	0.2498	0.5211	0.0001
5	0.2496	0.5211	0.0003
10	0.2494	0.5211	0.0005
15	0.2502	0.5218	0.0009
20	0.2506	0.5226	0.0019

FINAL

6. Product Photo



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