

LM-79-08 Test Report

For

ATG ELECTRONICS CORP**(Brand Name: N/A)**

10700 7th Street Rancho Cucamonga, CA 91730

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

Model name(s): FPEL22-20W-ZZ

Remark: The suffix of the model name "ZZ" stands for different color
temperature as below: 30=3000K, 35=3500K, 40=4000K,
45=4500K, 50=5000K.

Representative (Tested) Model: FPEL22-20W-30
FPEL22-20W-50

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

Test & Report By:

Garman Mo

Engineer: Garman Mo

Date: Mar.29,2017

Review By:

Tommy Liang

Manager: Tommy Liang

Remark: This is a multiple listed report, the Project Number of the original report is GZE170352-H-B.

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or
any agency of the Federal Government.

Laboratory: Standard-Tech Co. Ltd Testing Center**NVLAP CODE: 201011-0**

Report Format Number STD/QR4909-A/2

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

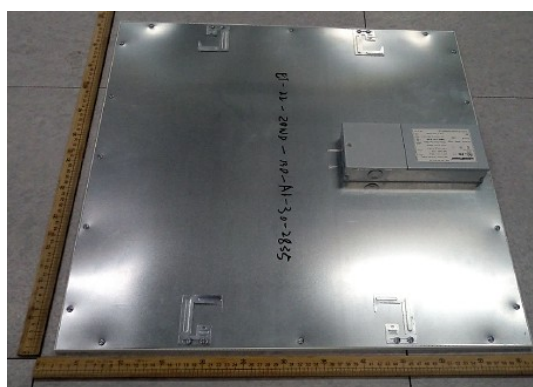
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<http://www.standard-tech.com>

1.1 Product Information:

Organization Name	ATG ELECTRONICS CORP	
Brand Name	N/A	
Model Number	FPEL22-20W-ZZ	
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, 50/60 Hz	
Nominal Power	20W	
Rated Initial Lamp Lumen	--	
Declared CCT	3000K,3500K,4000K,4500K,5000K	
LED Manufacturer	EVERLIGHT ELECTRONICS CO., LTD	
LED Model	67-21S Series (3000K)	
Sample Number	GZE170352-H-B1(3000K),B2(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	Mar.26,2017
Date of Test	Mar.27,2017
Test item	<ol style="list-style-type: none"> 1. Total Luminous Flux 2. Luminous Distribution Intensity 3. Luminous Efficacy 4. Correlated Color Temperature 5. Color Rendering Index 6. Chromaticity Coordinate 7. Electrical Parameters
Reference Standard	<ol style="list-style-type: none"> 1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products 2. ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products 3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources 4. CIE 15-2004 Technical Report Colorimetry 5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source 6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems
Reference Work Instruction	QD25

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° vertical intervals and 22.5° 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
(Refer to Work Instruction QD25)

Test date	2017-03-27	Test Ambient:	25.2 °C
Test Orientation	As intended	Stabilization Time (min)	90
Model Number	FPEL22-20W-30		

Electrical Measurement:

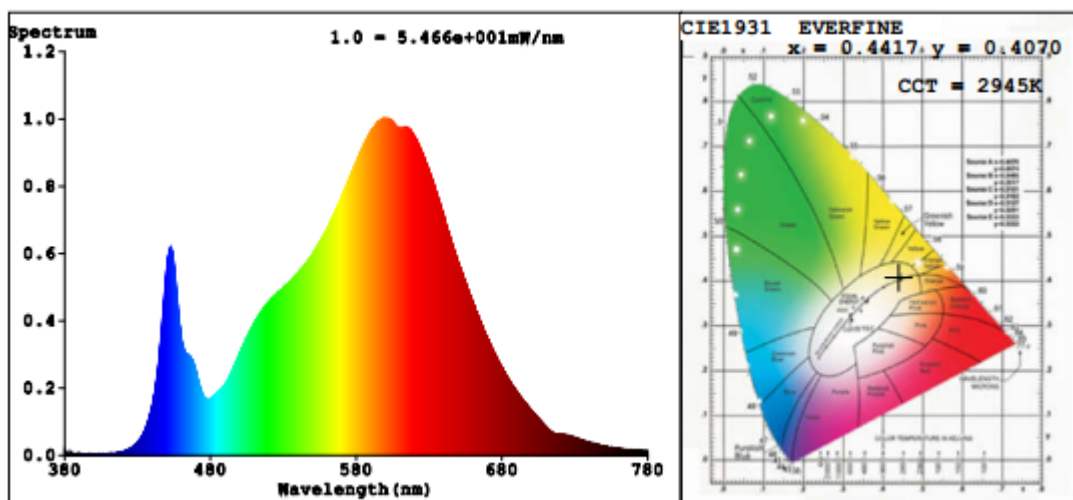
Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE170352-H-B1	120.0	60	0.1697	20.05	0.9848	8.57
	277.0	60	0.0817	20.37	0.9006	14.24
DLC Pass Criteria					$\geq 0.9(-3\%)$	$\leq 20(+5)$

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result	Special Color Rendering Indices			
Test Voltage (V)	120.0	R1	80	R9	5
Frequency (Hz)	60	R2	91	R10	79
CCT (K)	2945	R3	96	R11	79
Duv	0.0005	R4	80	R12	68
Chromaticity (x, y)	x=0.4417 y=0.4070	R5	80	R13	83
Chromaticity (u', v')	u'=0.2524 v'=0.5232	R6	89	R14	99
Color Rendering Index (CRI)	82.1	R7	82	R15	73
R9	5	R8	58	--	--

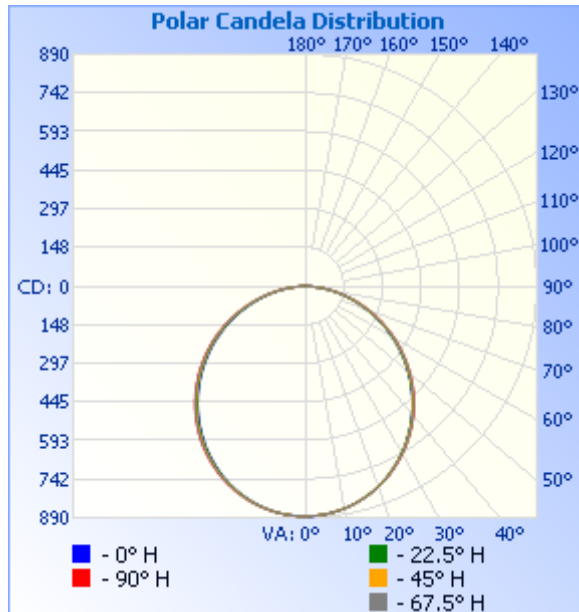
Photometric Measurement – Goniophotometer Method:

Parameter	Result		DLC V4.1 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	2540.7	2548.5	$\geq 2000 (-10\%)$	
Luminous Efficacy (lm/W)	126.72	125.11	Standard: $\geq 100(-3\%)$	Premium: $\geq 125(-3\%)$
Zonal lumens in the 0-60° zone (%)	78	--	$\geq 75(-3)$	
SC: 0-180° (if applicable)	1.25	--	1.0-2.0(± 0.1)	
SC: 90-270° (if applicable)	1.25	--	1.0-2.0(± 0.1)	
Beam Angle (°)	112.6	--	--	
Center Beam Candle Power (cd)	883	--	--	

Spectral Power Distribution & Chromaticity Diagram

Zonal Lumen Tabulation

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	684.6	26.9%
0-40	1,120.4	44.1%
0-60	1,982.8	78%
60-90	557.7	22%
70-100	240.5	9.5%
90-120	0.0	0%
0-90	2,540.5	100%
90-180	0.0	0%
0-180	2,540.5	100%

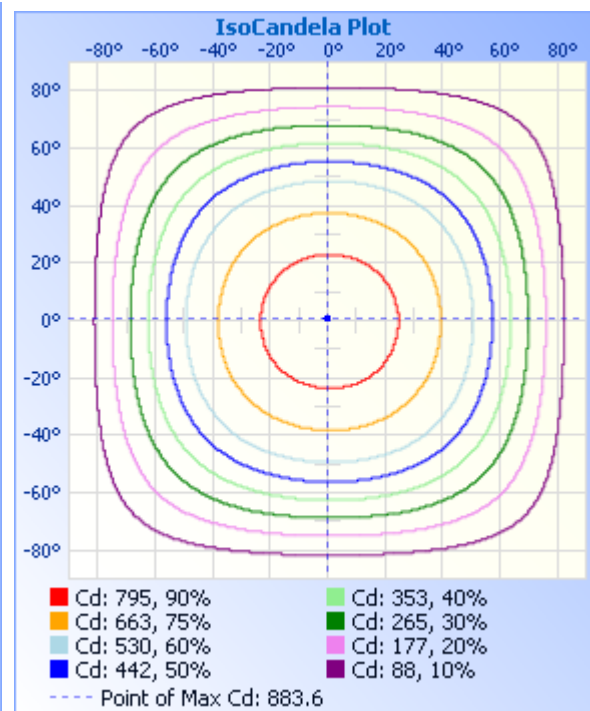
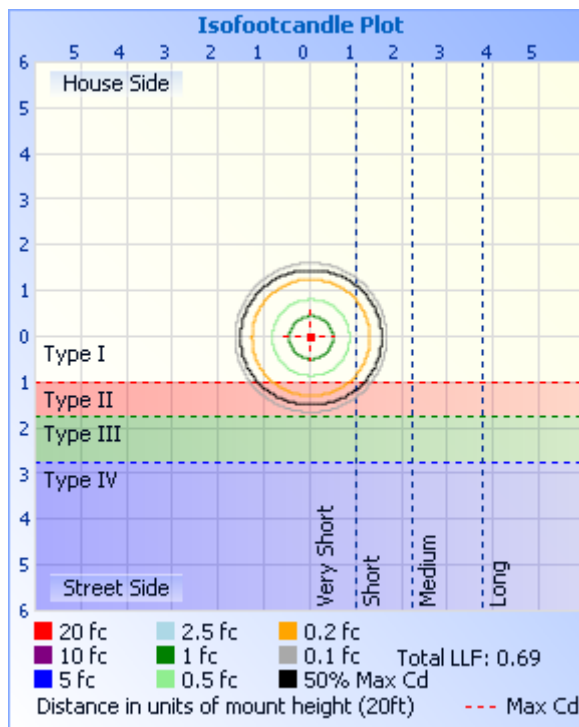
Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	83.5	3.3%	90-100	0.0	0%
10-20	239.1	9.4%	100-110	0	0%
20-30	361.9	14.2%	110-120	0	0%
30-40	435.9	17.2%	120-130	0	0%
40-50	452.2	17.8%	130-140	0	0%
50-60	410.1	16.1%	140-150	0	0%
60-70	317.2	12.5%	150-160	0	0%
70-80	189.1	7.4%	160-170	0	0%
80-90	51.4	2.0%	170-180	0.0	0%

Photometric Data


Illuminance at a Distance

	Center Beam fc	Beam Width	
17.0ft	3.06 fc	50.0 ft	51.9 ft
34.0ft	0.76 fc	100.0 ft	103.8 ft
51.0ft	0.34 fc	150.0 ft	155.7 ft
68.0ft	0.19 fc	200.0 ft	207.6 ft
85.0ft	0.12 fc	250.0 ft	259.5 ft
102.0ft	0.08 fc	300.0 ft	311.4 ft

■ Vert. Spread: 111.6°
■ Horiz. Spread: 113.5°



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Table--1 UNIT: cd

C (DEG) γ (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338	
0	883	883	883	883	883	883	883	883	883	883	883	883	883	883	883	883	
5	880	880	879	880	880	879	879	879	879	879	879	879	879	880	879	880	
10	869	869	868	867	867	867	867	867	867	867	866	866	867	867	867	868	
15	850	850	849	847	847	847	847	847	847	847	846	845	846	847	849	850	
20	824	824	821	819	819	818	819	820	820	819	818	817	818	819	821	823	
25	791	790	787	784	783	783	784	786	786	785	783	782	783	784	787	790	
30	751	750	746	742	741	741	742	745	746	744	742	740	741	742	746	749	
35	705	703	699	694	692	692	695	698	699	697	694	692	692	695	699	703	
40	653	651	646	641	639	639	642	645	646	645	642	639	639	642	647	651	
45	597	595	588	583	580	580	584	588	589	587	584	581	581	584	589	594	
50	535	533	527	520	518	518	522	526	527	526	522	518	519	522	527	533	
55	470	468	462	455	452	452	457	460	462	460	456	453	453	457	462	468	
60	402	400	394	387	383	384	388	392	393	392	388	385	385	388	394	399	
65	331	329	324	317	313	314	317	322	323	322	318	315	314	318	324	330	
70	259	257	253	246	243	243	247	251	252	251	247	244	243	247	253	257	
75	186	185	182	177	174	174	177	181	182	181	177	173	173	176	181	184	
80	115	115	113	111	108	108	110	111	111	110	108	106	105	109	111	114	
85	48.3	48.1	46.9	46.5	45.9	45.2	44.0	44.4	44.6	43.1	41.9	42.0	42.2	43.4	44.6	47.0	
90	0.03	0.02	0.02	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
140	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
170	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

2.2 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2017-03-27	Test Ambient:	25.2 ° C
Test Orientation	As intended	Stabilization Time (min)	90
Model Number	FPEL22-20W-50		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE170352-H-B2	120.0	60	0.1736	20.43	0.9805	9.14
	277.0	60	0.0837	20.78	0.8962	14.86
DLC Pass Criteria					>= 0.9(-3%)	<= 20(+5)

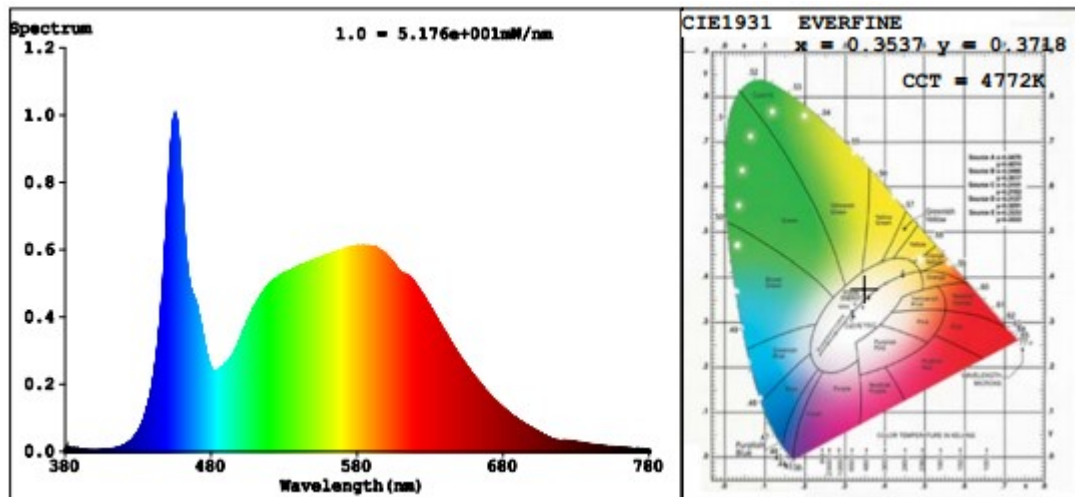
Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result	Special Color Rendering Indices			
Test Voltage (V)	120.0	R1	79	R9	3
Frequency (Hz)	60	R2	89	R10	72
CCT (K)	4772	R3	95	R11	76
Duv	0.0065	R4	78	R12	50
Chromaticity (x, y)	x=0.3537 y=0.3718	R5	78	R13	82
Chromaticity (u', v')	u'=0.2095 v'=0.4954	R6	83	R14	97
Color Rendering Index (CRI)	81.7	R7	87	R15	73
R9	3	R8	65	--	--

Photometric Measurement – Sphere-Spectroradiometer Method:

Parameter	Result		DLC V4.1 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	2653	2665	>=2000(-10%)	
Luminous Efficacy (lm/W)	129.87	128.25	Standard: >= 100(-3%)	Premium: >= 125(-3%)

Spectral Power Distribution & Chromaticity Diagram



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2.3 Performance Assessment:

Model name	CCT(K)	Total Luminous (lm)	Power (W)	Luminous Efficacy (lm/W)
FPEL22-20W-30	3000K	2450.7	20.05	126.72
FPEL22-20W-35	3500K	2501 ^{*1}	20.24 ^{*2}	123.57 ^{*3}
FPEL22-20W-40	4000K	2552 ^{*1}	20.24 ^{*2}	126.09 ^{*3}
FPEL22-20W-45	4500K	2602 ^{*1}	20.24 ^{*2}	128.56 ^{*3}
FPEL22-20W-50	5000K	2653	20.43	129.87

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

$$2501 = (2653 - 2450.7) / 4 + 2450.7$$

$$2552 = (2653 - 2450.7) / 4 + 2501$$

$$2602 = (2653 - 2450.7) / 4 + 2552$$

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

$$20.24 = (20.05 + 20.43) / 2$$

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

$$123.57 = 2501 / 20.24$$

$$126.09 = 2552 / 20.24$$

$$128.56 = 2602 / 20.24$$

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3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-331	2 meter Integrating Sphere	2016-07-01	2017-06-30
ST-R-327	Spectral analysis system HAAS-2000	2016-07-01	2017-06-30
D204	Standard Lamp	2016-07-12	2017-07-11
PF2010	Power Meter for Integrating Sphere	2016-07-01	2017-06-30
GO-R5000	Goniophotometer system	2016-07-01	2017-06-30
D908S	Standard Lamp	2016-07-12	2017-07-11
PF210	Power Meter for Goniophotometer	2016-07-07	2017-07-06
Expand Uncertainty: Photometric Measurement (Sphere):2.04%, k=2 Chromaticity Measurement(Sphere):28.8K, k=2 Photometric Measurement(Goniophotometer):2.36%, k=2			

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