

RF TEST REPORT

Report No.:	SET2021-10261		
Product Name:	Projector Lamp		
FCC ID:	2AX2GX-X54P		
Model No. :	X-54P		
Applicant:	Shenzhen X Photoelectric Technology Co., Ltd		
Address:	301, No.1 Building Workshop, No.16 Dahua Road, Yanchuan ,		
	Shenzhen , Guangdong , 518105 , China		
Dates of Testing:	08/10/2021 — 08/26/2021		
Issued by:	CCIC Southern Testing Co., Ltd.		
Lab Location:	Electronic Testing Building, No. 43 Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China.		
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Test Report

Product Name:	Projector Lamp	
Brand Name:	N/A	
Trade Name:	N/A	
Applicant:	Shenzhen X Photoelectric Technology Co., Ltd	
Applicant Address:	301, No.1 Building Workshop, No.16 Dahua Road, Yanchuan , Shenzhen , Guangdong , 518105 , China	
Manufacturer	Shenzhen X Photoelectric Technology Co., Ltd	
Manufacturer Address:	301, No.1 Building Workshop, No.16 Dahua Road, Yanchuan , Shenzhen , Guangdong , 518105 , China	
Test Standards:	FCC Part 15.231	
Test Result:	PASS	
Tested by	Vincent 2021.08.26	
Reviewed by:	Vincent, Test Engineer	
	Chris You, Senior Engineer	
Approved by:	Shuangwan Thomas 2021.08.26	
	Shuangwen Zhang, Manager	



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Change History				
Issue	Date	Reason for change		
1.0	2021.08.26	First edition		



1. General Information

1.1. EUT Description

EUT Type	Projector Lamp
Hardware Version	V3.0
Software Version	V3.0
Operation Frequency	433.92 TX
Power supply	Transmitter 2*AAA batteries
Modulation Type	ASK
Antenna Type	External
Antenna Gain	10dBi

1.2. Test Mode(Worst)

Radiated Emission Measurement			
Test conditionBandedge, Emission for Unwanted and fundamental			
Worst mode 433.92 Tx			
	Placed in fixed position		
Worst position	Placed in fixed position at X-Plane		
worst position	Placed in fixed position at Y-Plane		
	Placed in fixed position at Z-Plane		

Remark: The worst mode was record in this report .EUT Pre-scanned in three axis, XYZ and two polarity, for Radiated measurement .The worst case were recorded in the report.



1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C	Radio Frequency Devices
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.231(C)	Emission Bandwidth	PASS
3	15.231(b)	Field strength of Fundamental	PASS
	15.231(b)		PASS
4	15.205	Radiated unwanted emission	
	15.209		
5	15.231(a)	Operation Restriction	PASS

Note: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013.

1.4. EUT Operation Test Setup

For RF test items, press the button to keep EUT transmit



1.5. Facilities and Accreditations

1.5.1. Facilities

FCC-Registration No.: CN1283

CCIC Southern Testing Co., Ltd EMC Laboratory has been registered and fully described in a re port filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN1283, valid time is until April 19th, 2023.

ISED Registration: 11185A-1

CAB identifier: CN0064

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engi neering Bureau of Industry Canada for the performance of radiated measurements with Registrati on No. 11185A-1 on Aug. 04, 2016, valid time is until April 20th, 2023

A2LA Code: 5721.01

CCIC-SET is a third party testing organization accredited by A2LA according to ISO/IEC 17025. The accreditation certificate number is 5721.01.

1.5.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86KPa-106KPa



2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

And according to FCC 47 CFR Section §15.247(c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

2.1.2. Antenna Information

Antenna Category: Internal antenna

An Internal antenna was soldered to the antenna port of EUT via an adaptor cable, can't be removed.

Antenna General Information:

No.	EUT	Ant. Type	Working Frequency	Ant. Gain
1	Projector Lamp	External	433.92MHz	10dBi

2.1.3. Result: comply

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.



2.2. Emission Bandwidth

2.2.1. Test Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.2.3. Test Setup



2.2.4. Test Procedure

- 1. The testing follows ANSI C63.10-2013 Clause 6.9.2
- 2. The Receiver antenna was connected to the spectrum analyzer to receive the transmission signal.
- 3. Using the spectrum analyzer 20dB function to measure emission bandwidth.
- 4. Record the measurement data derived from spectrum analyzer.



2.2.5. Test Results

🔤 Keysight Spectrum Analyze	r - Swept SA		
₩ RF Marker 2 ∧ 5 350	50 Ω DC SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	06:56:37 PM Aug 11, 2021 TRACE 123456
	PNO: Close Trig: Free IEGaia: Auto #Atten: 0	e Run Avg Hold:>100/100 dB	TYPE MWWWWW DET P S N N N N
	iroan.auto		Mkr2 5 35 kHz
10 dB/div Ref -20	.00 dBm	-	-1.077 dB
Log			
-30.0			
-40.0			
-60.0		Ă I I I I I I I I I I I I I I I I I I I	
-70.0			-73.17 dBm
-80.0		X3" WWAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	
-90.0			Marine Marine
-100			
-110			
Center 433.96000	MHz		Span 50.00 kHz
#Res BW 200 Hz	#VBW 1.0 kHz	Sweep (FFT) ~1	0.73 ms (1001 pts)
MKR MODE TRC SCL		NCTION FUNCTION WIDTH FUNCTI	ON VALUE
2 Δ3 1 f (Δ)	433.963 05 MHZ -55.166 dBm 5.35 kHz (Δ) -1.077 dB		
	433.960 40 MHZ -/4.091 dBm		
6			=E
8			
9			
MSG		STATUS	
		T •••/	D 1/
requency	20dB Bandwidth	Limit	Result
(MHz)	(KHz)	(KHz)	
433.92	5.36	1084.8	Pass

Note: Limit=0.25%*433.92MHz=1084.8KHz



2.3. Field strength of Fundamental

2.3.1. Test Limit

According to FCC §15.231(b)

Fundamental frequency	Field strength of fundamental	Field strength of spurious
(MHz)	(microvolts/meter)	emission (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 ¹	¹ 125 to 375 ¹
174-260	3,750	375
260-470	¹ 3,750 to12,500 ¹	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

For 260-470MHz:Field Strength(uV/m) =(41.67 x f)-7083

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency

2.3.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.3.3. Test Setup



2.3.4. Test Procedures

The testing follows ANSI C63.10-2013 Clause 4.1.4, and clause 6.5.

	⊠4.1.4.2.2:Measurement Peak value
Clause 4.1.4	□4.1.4.2.3:Duty cycle≥100%
	⊠4.1.4.2.4:Measurement Average value



2.3.5. Test Result

Frequency (MHz)	Reading level (dBµV/m)	Limit (dBµV/m)	Margin	Antenna	Verdict	Remark
433.92	74.95	100.83	25.88	Horizontal	Pass	Peak
433.92	67.73	80.83	13.1	Horizontal	Pass	Average
433.92	78.48	100.83	22.35	Vertical	Pass	Peak
433.92	71.26	80.83	9.57	Vertical	Pass	Average

Remark:

- 1. Fundmental measured setting on spectrum, RBW=100KHz, VBW=100KHz and Detector=Peak.
- 2. Average result=Peak result+duty cycle factor
- 3. 260MHz~470MHz limit(Average) is 41.67*(Frequency, MHz)-7083 Limit=41.67*(433.92MHz)-7083 =10998.4464(uV/m) dBuV/m=20log(uV/m)=20log(10998.4464uV/m)=80.83dBuV/m
- 4. Duty factor=20log(dutycycle)=-7.22, duty cycle refer to section 2.4



2.4. Radiated unwanted emission

2.4.1. Test Limit

According to FCC §15.231(b) and §15.209, §15.205

Unwanted emission limit follow the table or the FCC Part 15.209, whichever limit permit higher field strength.

According to §15.231(b)

Fundamental frequency	Field strength of fundamental	Field strength of spurious
(MHz)	(microvolts/meter)	emission (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 ¹	¹ 125 to 375 ¹
174-260	3,750	375
260-470	¹ 3,750 to12,500 ¹	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

§15.209

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.4.3. Test Setup



1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz





3) For radiated emissions above 1GHz



2.4.1. Test Procedure

- 1. The EUT was placed on a turntable 0.8m below 1GHz and 1.5m above 1GHz above ground.
- 2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 4. Set to the maximum power setting and enable the EUT transmit continuously.
- 5. Use the following spectrum analyzer settings:
- (1) Span shall wide enough to fully capture the emission being measured;

(2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW \ge RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak

(3) For average measurement: use duty cycle correction factor method per 15.35(c).

Duty cycle = On time/100 milliseconds

On time = $N_1 * L_1 + N_2 * L_2 + ... + N_{n-1} * LN_{n-1} + Nn * Ln$

Where N_1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.

Average Emission Level = Peak Emission Level + 20*log(Duty cycle)

6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level



2.4.2. Test Results

For 9 KHz to 30MHz

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For 30MHz to 1000MHz



Frequency (MHz)	Reading level (dBµV/m)	Bandwidth (kHz)	Correction Factor (dB/m)	Antenna height (cm)	Limit (dBµV/m)	Margin	Antenna	Verdict
321.590000	18.90	120.000	17.90	100.0	46.0	27.1	Horizontal	Pass
342.960000	20.36	120.000	8.2	100	46.0	25.64	Horizontal	Pass
366.290000	20.65	120.000	6.8	100.0	46.0	25.35	Horizontal	Pass
407.110000	19.47	120.000	9.4	100.0	46.0	26.53	Horizontal	Pass
869.750000	27.70	120.000	10.8	100.0	60.8	33.1	Horizontal	Pass
914.460000	46.15	120.000	23.9	100.0	60.8	14.65	Horizontal	Pass

(Plot A: 30MHz to 1GHz, Antenna Horizontal)



Frequency (MHz)	Reading level (dB µ V/m)	Bandwidth (kHz)	Correction Factor (dB/m)	Antenna height (cm)	Limit (dB µ V/m)	Margin	Antenna	Verdict
461.540000	25.71	120.000	17.90	100.0	46.0	20.29	Vertical	Pass
407.110000	25.56	120.000	17.90	100.0	46.0	20.44	Vertical	Pass
420.720000	25.15	120.000	10.20	100.0	46.0	20.85	Vertical	Pass
447.930000	22.76	120.000	10.6	100.0	46.0	23.24	Vertical	Pass
869.750000	24.33	120.000	24.80	100.0	46.0	36.47	Vertical	Pass
906.690000	41.23	120.000	24.80	100.0	60.8	19.57	Vertical	Pass

(Plot B: 30MHz to 1GHz, Antenna Vertical)



Above 1GHz									
NO.	Freq. [MHz]	Emission Level [dBµV/m]	Correction Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity
1	1302.6	35.31	-12.85	74.00	38.69	PK	100	250	Horizontal
2	1302.6	28.09	/	54.00	25.91	AV	100	79	Horizontal
3	1745.3	30.61	-10.98	54.00	23.39	AV	100	276	Horizontal
4	1747.8	37.83	/	74.00	36.17	PK	100	298	Horizontal
5	2168.0	38.8	-9.16	74.00	35.2	PK	100	86	Horizontal
6	2168.0	31.58	/	54.00	22.42	AV	100	79	Horizontal

Above 1GHz									
NO.	Freq. [MHz]	Emission Level [dBµV/m]	Correction Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity
1	1302.6	36.53	-12.85	74.00	37.47	PK	100	222	Vertical
2	1302.6	29.31	/	54.00	24.69	AV	100	120	Vertical
3	1745.3	41	-10.98	54.00	13	AV	100	258	Vertical
4	1745.3	48.22	/	74.00	25.78	PK	100	227	Vertical
5	2168.0	36.82	-9.16	54.00	17.18	AV	100	10	Vertical
6	2168.0	44.04	/	74.00	29.96	PK	100	10	Vertical

Note:1.duty cycle factor=20log(duty-cycle), Average=Peak+ duty cycle factor

2.Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) - Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value -Emission Level

5. AV value= PK+ Duty-cycle Factor



Span 0 Hz ep 40.00 ms (1001 pts)

Sw

Center 433.920000 MHz Res BW 100 kHz

#VBW 100 kHz

Total number=Burst type2 numbers + Burst type1 numbers

#VBW 100 kHz

Duty-cycle=Total on time/one period=12.6/28.92=0.436 Duty-cycle factor=20log(duty-cycle)=-7.22

Center 433.920000 MHz Res BW 100 kHz

Span 0 Sweep 40.00 ms (1001 p



2.5. Operation Restriction

2.5.1. Test Limit

Operation Restriction

Manually operated: A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Activated automatically: A transmitter activated shall cease transmission within 5 seconds after activation.

Periodic transmissions: Permitted with total transmission time of 2sec per hour or less

Periodic transmissions(Lower field strength):each transmission is not greater than 1sec and the silent period between transmission is at least 30 times the duration of transmission but in no case less than 10sec.

2.5.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.5.3. Test Setup



2.5.4. Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated



2.5.5. Test Results

433.92MHz





3. List of measuring equipment

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date	
1	EMI TEST RECEIVER	KEYSIGHT	N9038A	A141202036	2020.09.21	2021.09.20	
2	TURNTABLE	ETS	2088	2149	N/A	N/A	
3	ANTENNA MAST	ETS	2075	2346	N/A	N/A	
4	EMI TEST Software	R&S	ESK1	N/A	N/A	N/A	
5	Horn antenna	٨D	4740024	225206	2020 00 16	2022.00.15	
5	(18GHz~26.5GHz)	AK	A14005A	525500	2020.09.10	2022.09.13	
6	Amplifier 30M~1GHz	MILMEGA	80RF1000-10004	A140101634	2021.01.26	2022.01.25	
7	Amplifier	MII MEGA	AS0104R-800/40	A160302517	2021 01 26	2022.01.25	
/	1G~18GHz	MILMEGA	0		2021.01.20	2022.01.23	
8	Horn Antenna	R&S	HF906	A0304225	2019.04.17	2022.04.16	
9	Horn Antenna	R&S	ESIB7	A0501375	2020.06.24	2022.06.22	
10	ULTRA-BROADBAND	SCHWARZBEC		10805560	2010 05 24	2022.05.22	
10	ANTENNA	K	VULB9100	A0805500	2019.03.24	2022.05.25	
11	Passive Loop Antenna	R&S	HFH2-Z2	100047	2019.04.26	2022.04.25	
12	Spectrum Analyzer	KEYSIGHT	N9030A	A160702554	2021.04.26	2022.04.25	



4. Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Emission Measurement (150KHz~30MHz)

Measuring Uncertainty for a level of	2 8 dB
confidence of 95% (U=2Uc(y))	2.800

Uncertainty of Radiated Emission Measurement (30MHz~1GHz)

Measuring Uncertainty for a level of	3.91dB	
confidence of 95% (U=2Uc(y))	5.910B	

Uncertainty of Radiated Emission Measurement (1GHz~18GHz)

Measuring Uncertainty for a level of	4.5dB
confidence of 95% (U=2Uc(y))	4.30B

Uncertainty of Radiated Emission Measurement (18GHz~40GHz)

Measuring Uncertainty for a level of	4.9dB
confidence of 95%(U=2Uc(y))	

** END OF REPORT **