

FCC Part 15C Measurement and Test Report

For

Shenzhen Youkeshu technology. Co.,Ltd

District D, floor 6th, No.1 trading Square, China south city, longgang district

Pinghu town, Shenzhen, China

FCC ID: 2AHHRX5C-1

FCC Rule(s): FCC Part 15.249

Product Description: Remote Control Aircraft

Tested Model: X5C-1

Report No.: <u>STR16108174I-1</u>

Tested Date: <u>2016-10-31 to 2016-11-19</u>

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Tested By: Rode Liu / Engineer

Reviewed By: Silin Chen / EMC Manager

Approved & Authorized By: Jandy So / PSQ Manager

Prepared By:

Shenzhen SEM.Test Technology Co., Ltd.

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,

Rode Liu Silin chen Jumbres

Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.



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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shenzhen Youkeshu technology. Co.,Ltd

Address of applicant: District D, floor 6th, No.1 trading Square, China south

city, longgang district Pinghu town, Shenzhen, China

Manufacturer: Shenzhen Youkeshu technology. Co.,Ltd

Address of manufacturer: District D, floor 6th, No.1 trading Square, China south

city, longgang district Pinghu town, Shenzhen, China

General Description of EUT	
Product Name:	Remote Control Aircraft
Trade Name:	FPVRC
Model No.:	X5C-1
Adding Model(s):	K8, K8-1, Q7, CX-10P, U818, BATMAN, H8, X8, X8W, X5W
Rated Voltage:	DC 6.0V
	•

Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model X5C-1, but the circuit and the electronic construction do not change, declared by the manufacturer.

Technical Characteristics of EUT			
Frequency Range:	2471MHz-2480MHz		
Max. Field Strength:	79.62dBuV/m (3m)		
Modulation:	GFSK		
Quantity of Channels:	10		
Channel Separation:	1MHz		
Antenna Type:	Integral Antenna		
Antenna Gain:	2.0dBi		
Lowest Internal Frequency:	16MHz		
Highest Internal Frequency:	16MHz		

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Model: X5C-1

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Youkeshu technology. Co.,Ltd in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107,15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

FCC - Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

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Model: X5C-1

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List					
Test Mode	Description	Remark			
TM1	Low Channel	2471MHz			
TM2	Middle Channel	2475MHz			
TM3	High Channel	2480MHz			

Special Cable List and Details							
Cable Description Length (m) Shielded/Unshielded With / Without Ferrite							
/	/	/	/				

Auxiliary Equipment List and Details						
Description Manufacturer Model Serial Number						
/	/	/	/			

1.6 Measurement Uncertainty

Measurement uncertainty					
Parameter	Conditions	Uncertainty			
RF Output Power	Conducted	±0.42dB			
Occupied Bandwidth	Conducted	±1.5%			
Conducted Spurious Emission	Conducted	±2.17dB			
Conducted Emissions	Conducted	±2.88dB			
Transmitter Spurious Emissions	Radiated	±5.1dB			

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1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-06-04	2017-06-03
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2016-06-04	2017-06-03
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2016-06-04	2017-06-03
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2016-06-04	2017-06-03
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2016-06-04	2017-06-03
SEMT-1042	Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
SEMT-1121	Horn Antenna	ETS	3116B	00088203	2016-06-04	2017-06-03
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2016-06-04	2017-06-03
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2016-06-04	2017-06-03
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2016-06-04	2017-06-03
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2016-06-04	2017-06-03





2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	N/A
§ 15.209(a)(f)	Radiated Spurious Emissions	Compliant
§15.249(a)	Field Strength of Emissions	Compliant
§15.249(d)	Out of Band Emission	Compliant
§15.215 (c)	Emission Bandwidth	Compliant

N/A: not applicable



TEST Model: X5C-1

3. Antenna Requirements

3.1 Standard Applicable

According to FCC Part 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.

3.2 Test Result

This product has an integral antenna, fulfill the requirement of this section.



TEST Model: X5C-1

4. Radiated Emissions

4.1 Standard Applicable

According to \$15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental	Field strength of Harmonics
	(milli-volts/meter)	(micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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.

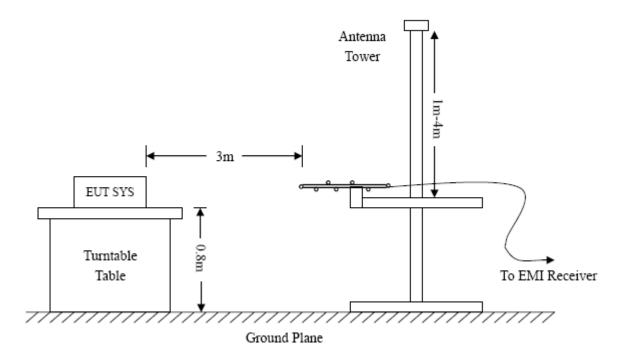
4.2 Test Procedure

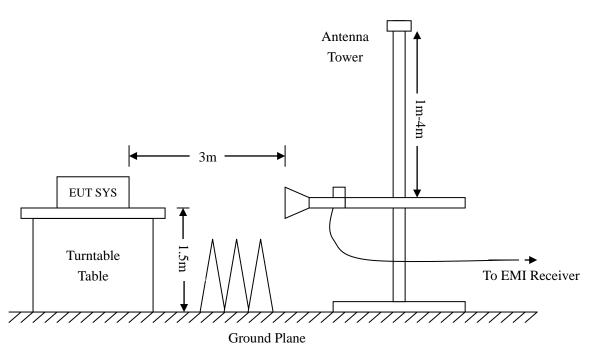
The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

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Frequency:9kHz-30MHz

RBW=10KHz,

VBW = 30KHz

Sweep time= Auto

Trace = max hold

 $Detector\ function = peak$

Frequency:30MHz-1GHz

RBW=120KHz,

VBW=300KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency : Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

TEST Model: X5C-1

4.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss - Ampl. Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of $-6dB\mu V$ means the emission is $6dB\mu V$ below the maximum limit. The equation for margin calculation is as follows:

4.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

4.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst margin of:

-15.86 dB at 126.3286 MHz in the Vertical polarization, Low Channel, 30 MHz to 1 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

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Plot of Radiated Emissions Test Data (30MHz to 1GHz)

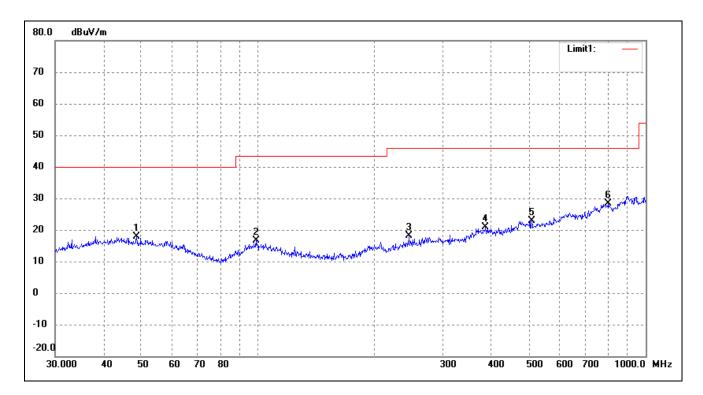
EUT: Remote Control Aircraft

Tested Model: X5C-1

Operating Condition: Transmitting Low Channel (2471MHz)

Comment: DC 6.0V

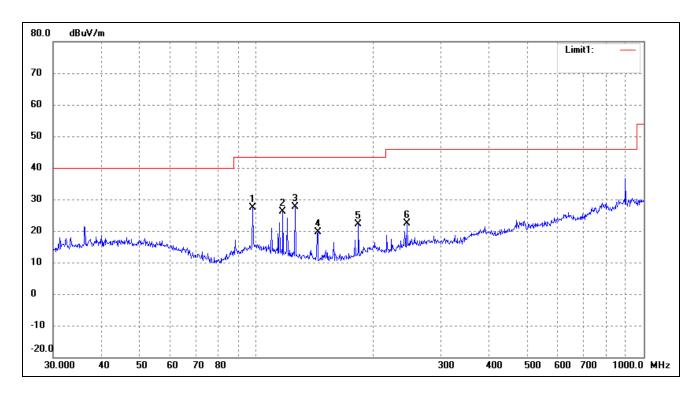
Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	48.6719	28.45	-10.68	17.77	40.00	-22.23	264	100	peak
2	98.8326	28.29	-11.66	16.63	43.50	-26.87	113	200	peak
3	245.0900	28.81	-10.73	18.08	46.00	-27.92	287	100	peak
4	386.6338	28.01	-7.20	20.81	46.00	-25.19	185	200	peak
5	508.2582	28.99	-6.12	22.87	46.00	-23.13	110	100	peak
6	801.7863	28.45	-0.13	28.32	46.00	-17.68	150	200	peak



Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	98.1419	39.17	-11.81	27.36	43.50	-16.14	264	100	peak
2	117.3603	39.64	-13.40	26.24	43.50	-17.26	113	200	peak
3	126.3286	41.69	-14.05	27.64	43.50	-15.86	287	100	peak
4	144.3348	34.52	-14.87	19.65	43.50	-23.85	185	200	peak
5	183.8440	35.94	-13.72	22.22	43.50	-21.28	110	100	peak
6	245.0900	33.17	-10.73	22.44	46.00	-23.56	150	200	peak

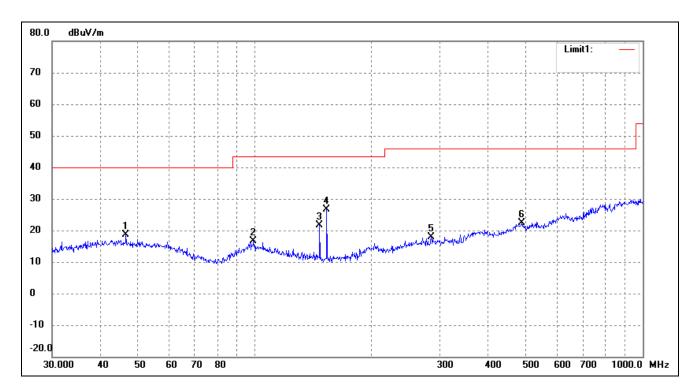




Operating Condition: Transmitting Middle Channel (2475MHz)

Comment: DC 6.0V

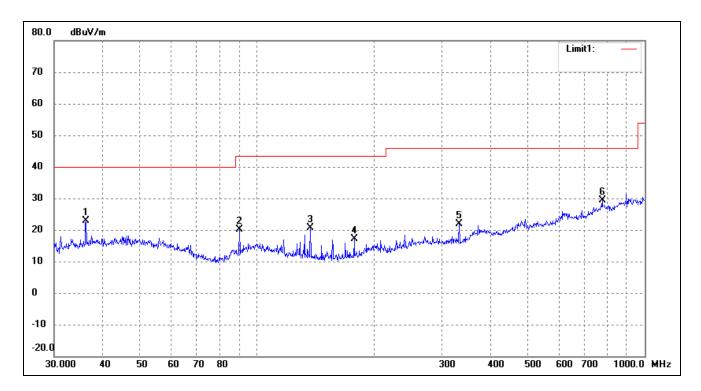
Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	46.5030	29.15	-10.63	18.52	40.00	-21.48	264	100	peak
2	99.1797	28.15	-11.58	16.57	43.50	-26.93	113	200	peak
3	146.8877	36.55	-14.90	21.65	43.50	-21.85	287	100	peak
4	153.2004	41.58	-14.98	26.60	43.50	-16.90	185	200	peak
5	284.9767	27.57	-9.57	18.00	46.00	-28.00	110	100	peak
6	487.3151	28.11	-5.66	22.45	46.00	-23.55	150	200	peak



Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	36.2541	34.15	-11.26	22.89	40.00	-17.11	264	100	peak
2	90.2205	33.78	-13.57	20.21	43.50	-23.29	113	200	peak
3	137.4202	35.40	-14.66	20.74	43.50	-22.76	287	100	peak
4	178.1327	31.36	-14.30	17.06	43.50	-26.44	185	200	peak
5	332.5187	31.55	-9.74	21.81	46.00	-24.19	110	100	peak
6	776.8778	28.96	0.30	29.26	46.00	-16.74	150	200	peak

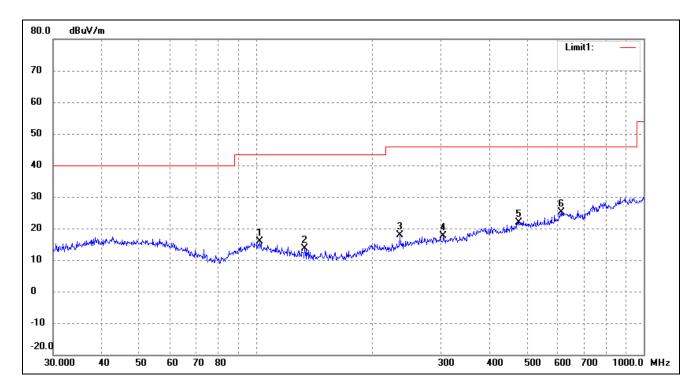




Operating Condition: Transmitting High Channel (2480MHz)

Comment: DC 6.0V

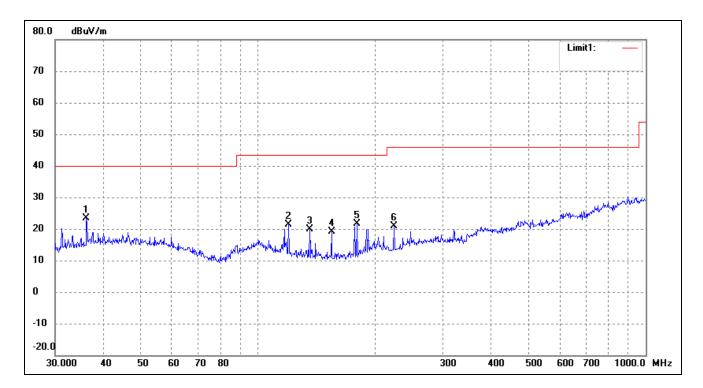
Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	102.3597	27.66	-11.67	15.99	43.50	-27.51	264	100	peak
2	133.6188	28.05	-14.45	13.60	43.50	-29.90	113	200	peak
3	234.9909	29.32	-11.34	17.98	46.00	-28.02	287	100	peak
4	304.6100	27.44	-9.72	17.72	46.00	-28.28	185	200	peak
5	477.1694	27.41	-5.55	21.86	46.00	-24.14	110	100	peak
6	612.0642	28.42	-3.40	25.02	46.00	-20.98	150	200	peak



Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	36.1272	34.68	-11.29	23.39	40.00	-16.61	264	100	peak
2	119.8556	35.18	-13.68	21.50	43.50	-22.00	113	200	peak
3	135.9822	34.41	-14.58	19.83	43.50	-23.67	287	100	peak
4	154.8205	34.01	-14.99	19.02	43.50	-24.48	185	200	peak
5	180.0165	35.76	-14.22	21.54	43.50	-21.96	110	100	peak
6	224.5193	33.10	-12.13	20.97	46.00	-25.03	150	200	peak





Spurious Emissions Above 1GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
			Low Chann	el-2471MHz			•
2471	83.92	-4.37	79.55	114	-34.45	Н	PK
2471	72.09	-4.37	67.72	94	-26.28	Н	AV
4942	68.64	-0.62	68.02	74	-5.98	Н	PK
4942	53.00	-0.62	52.38	54	-1.62	Н	AV
7413	33.22	1.44	34.66	74	-39.34	Н	PK
7413	44.25	1.44	45.69	54	-8.31	Н	AV
2471	83.93	-4.37	79.56	114	-34.44	V	PK
2471	77.6	-4.37	73.23	94	-20.77	V	AV
4942	70.12	-0.62	69.50	74	-4.50	V	PK
4942	52.13	-0.62	51.51	54	-3.49	V	AV
7413	52.86	1.44	54.30	74	-19.7	V	PK
7413	36.39	1.44	37.83	54	-16.17	V	AV
			Middle Chan	nel-2475MHz			
2475	81.89	-4.37	77.52	114	-36.48	Н	PK
2475	72.2	-4.37	67.83	94	-26.17	Н	AV
4950	72.12	-0.62	71.5	74	-2.50	Н	PK
4950	48.51	-0.62	47.89	54	-6.11	Н	AV
7425	48.66	1.45	50.11	74	-23.89	Н	PK
7425	35.5	1.45	36.95	54	-17.05	Н	AV
2475	83.94	-4.37	79.57	114	-34.43	V	PK
2475	78.48	-4.37	74.11	94	-19.89	V	AV
4950	72.16	-0.62	71.54	74	-2.46	V	PK
4950	44.99	-0.62	44.37	54	-9.63	V	AV
7425	47.19	1.45	48.64	74	-25.36	V	PK
7425	34.08	1.45	35.53	54	-18.47	V	AV





Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector			
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V				
	Low Channel-2480MHz									
2480	83.92	-4.36	79.56	114	-34.44	Н	PK			
2480	71.17	-4.36	66.81	94	-27.19	Н	AV			
4960	62.91	-0.59	62.32	74	-11.68	Н	PK			
4960	47	-0.59	46.41	54	-7.59	Н	AV			
7440	44.73	1.48	46.21	74	-27.79	Н	PK			
7440	32.82	1.48	34.30	54	-19.7	Н	AV			
2480	83.98	-4.36	79.62	114	-34.38	V	PK			
2480	71.27	-4.36	66.91	94	-27.09	V	AV			
4960	68.02	-0.59	67.43	74	-6.57	V	PK			
4960	51.58	-0.59	50.99	54	-3.01	V	AV			
7440	44.55	1.48	46.03	74	-27.97	V	PK			
7440	32.93	1.48	34.41	54	-19.59	V	AV			

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz..

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Model: X5C-1

5. Out of Band Emissions

5.1 Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.3 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

5.4 Summary of Test Results/Plots

T4	Frequency	Limit	Result	
Test mode	MHz	dBuV / dBc	Result	
	2310.00	<54 dBuV	Pass	
Lowest	2390.00	<54 dBuV	Pass	
	2400.00	<54 dBuV	Pass	
Lighoot	2483.50	<54 dBuV	Pass	
Highest	2500.00	<54 dBuV	Pass	

The edge emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.

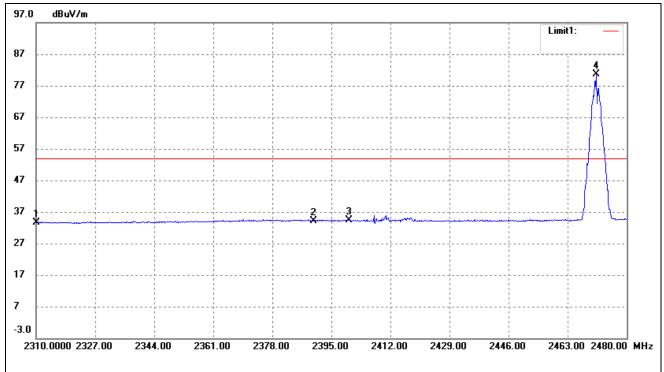
Please refer to the test plots as below.

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Lowest Bandedge

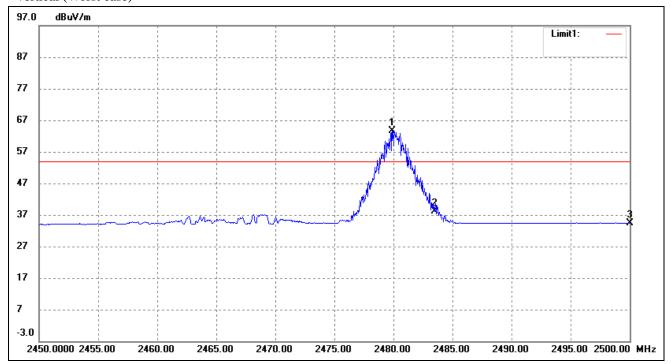
Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	35.04	-1.30	33.74	54.00	-20.26	Ave Detector
	2310.000	47.37	-1.30	46.07	74.00	-27.93	Peak Detector
2	2390.000	34.72	-0.50	34.22	54.00	-19.78	Ave Detector
	2390.000	47.41	-0.50	46.91	74.00	-27.09	Peak Detector
3	2400.000	34.76	-0.40	34.36	54.00	-19.64	Ave Detector
	2400.000	47.23	-0.40	46.83	74.00	-27.17	Peak Detector
4	2471.160	80.90	-0.15	80.75	/	/	Ave Detector
	2470.820	87.30	-0.15	87.15	/	/	Peak Detector



Highest Bandedge Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2479.900	63.86	-0.12	63.74	/	/	Ave Detector
	2480.600	85.05	-0.12	84.93	/	/	Peak Detector
2	2483.500	38.19	-0.11	38.08	54.00	-15.92	Ave Detector
	2483.500	59.17	-0.11	59.06	74.00	-14.94	Peak Detector
3	2500.000	34.38	-0.05	34.33	54.00	-19.67	Ave Detector
	2500.000	47.67	-0.05	47.62	74.00	-26.38	Peak Detector



TEST Model: X5C-1

6. Emission Bandwidth

6.1 Standard Applicable

According to 15.215 (c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

6.2 Test Procedure

According to the ANSI 63.10-2013, the emission bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1MHz, centered on a transmitting channel

RBW ≥1% 20dB Bandwidth, VBW ≥RBW

Sweep = auto

Detector function = peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

6.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

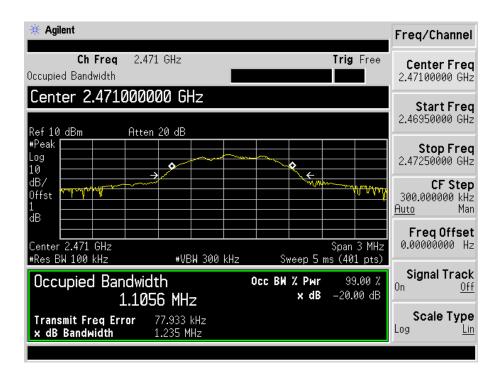
Channel	Frequency MHz	20dB Bandwidth kHz	99% Bandwidth kHz
Low Channel	2471	1235	1105.6
Middle Channel	2475	1232	1101.1
High Channel	2480	1207	1078.7

Please refer to the following test plots

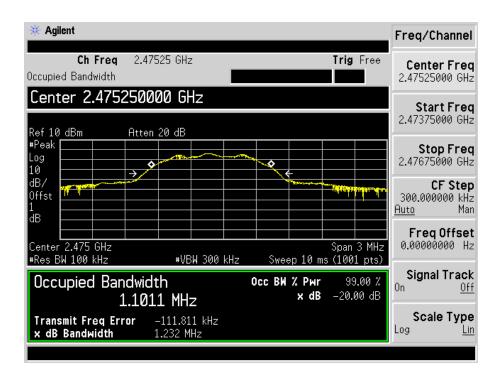
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Low Channel:

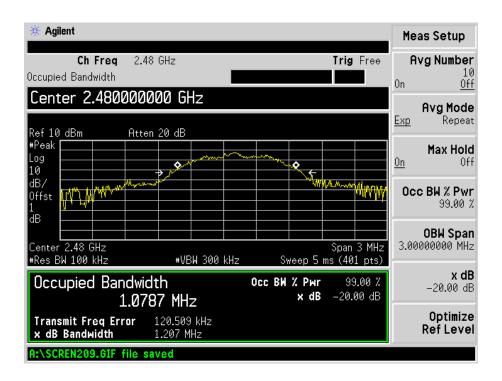


Middle Channel:





High Channel:



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