



FCC Report

Applicant: Firelands Group, LLC

Address of Applicant: 1214 Dorchester Dr, 2919 Crossing Court, Suite 2, Champaign, IL 61822, United States

Equipment Under Test (EUT)

Product Name: Mini quadcopter

Model No.: Neon X Plus

Trade Mark: Ares

FCC ID: 2AEIGNEONXP

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247:2015

Date of sample receipt: October 14, 2016

Date of Test: October 14-25, 2016

Date of report issued: October 25, 2016

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	October 25, 2016	Original

Prepared By:

Edward Pan

Date:

October 25, 2016

Project Engineer

Check By:

Andy Wu

Date:

October 25, 2016

Reviewer

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4 Test Summary

Test Item	Section	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	N/A
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

Pass: The EUT complies with the essential requirements in the standard.

N/A: Not applicable

Remark: Test according to ANSI C63.10: 2013.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	$\pm 4.34\text{dB}$	(1)
Radiated Emission	30MHz ~ 1000MHz	$\pm 4.24\text{dB}$	(1)
Radiated Emission	1GHz ~ 26.5GHz	$\pm 4.68\text{dB}$	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	$\pm 3.45\text{dB}$	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 Client Information

Applicant:	Firelands Group,LLC
Address of Applicant:	1214 Dorchester Dr, 2919 Crossing Court, Suite 2, Champaign, IL 61822, United States
Manufacturer:	LANDBOW INDUSTRY CO., LIMITED
Address of Manufacturer:	UNIT 04, 7/F BRIGHT WAY TOWER NO. 33 MONG KOK RD, KL HK
Factory:	LANDBOW INDUSTRY CO., LIMITED
Address of Factory:	2/F Huatai Road, Chenghai, Shantou, Guangdong, China

5.2 General Description of EUT

Product Name:	Mini quadcopter
Model No.:	Neon X Plus
Operation Frequency:	2405~2475MHz
Channel numbers:	71
Modulation technology:	GFSK
Antenna Type:	Integral antenna
Antenna Gain:	0dBi (declare by Applicant)
Power Supply:	TX:DC 3.V 2*AAA Size Battery

Remark: The system works in the frequency range of 2405MHz to 2475MHz. This band has been divided to 71 independent channels. Each radio system uses 25 different channels, the minimum channel separation is 1MHz. By using various switch-on times, hopping scheme and channel frequencies, the system can guarantee a jamming free radio transmission.

Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405.00	19	2423.00	37	2441.00	55	2459.00
2	2406.00	20	2424.00	38	2442.00	56	2460.00
3	2407.00	21	2425.00	39	2443.00	57	2461.00
4	2408.00	22	2426.00	40	2444.00	58	2462.00
5	2409.00	23	2427.00	41	2445.00	59	2463.00
6	2410.00	24	2428.00	42	2446.00	60	2464.00
7	2411.00	25	2429.00	43	2447.00	61	2465.00
8	2412.00	26	2430.00	44	2448.00	62	2466.00
9	2413.00	27	2431.00	45	2449.00	63	2467.00
10	2414.00	28	2432.00	46	2450.00	64	2468.00
11	2415.00	29	2433.00	47	2451.00	65	2469.00
12	2416.00	30	2434.00	48	2452.00	66	2470.00
13	2417.00	31	2435.00	49	2453.00	67	2471.00
14	2418.00	32	2436.00	50	2454.00	68	2472.00
15	2419.00	33	2437.00	51	2455.00	69	2473.00
16	2420.00	34	2438.00	52	2456.00	70	2474.00
17	2421.00	35	2439.00	53	2457.00	71	2475.00
18	2422.00	36	2440.00	54	2458.00		

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2405.0MHz
The middle channel	2445.0MHz
The Highest channel	2475.0MHz

5.3 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
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5.4 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none">● FCC —Registration No.: 600491 Global United Technology Services Co., Ltd., Shenzhen 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 files. Registration 600491, June 22, 2016.● Industry Canada (IC) —Registration No.: 9079A-2 The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.
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5.5 Test Location

All other tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

5.6 Other Information Requested by the Customer

None.

5.7 Description of Support Units

None.

5.8 Test Instruments list

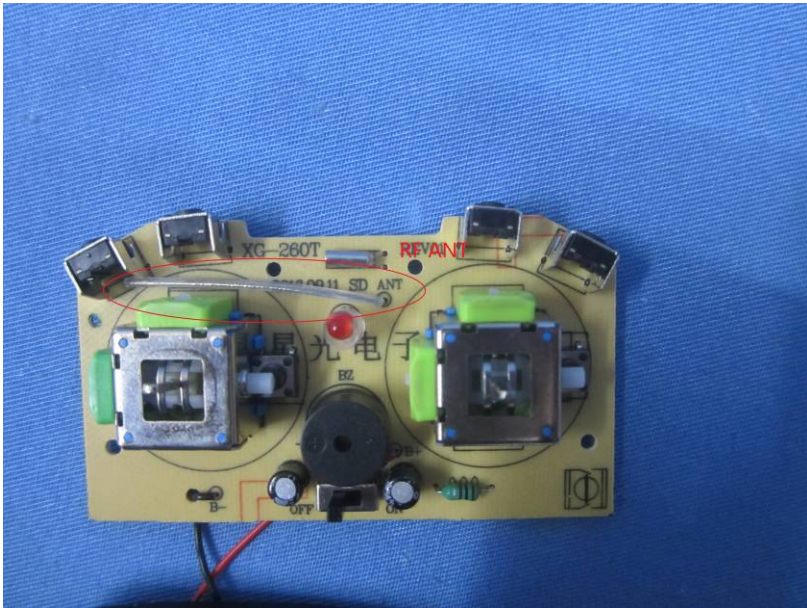
Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 29 2016	June. 28 2017
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 29 2016	June. 28 2017
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June. 29 2016	June. 28 2017
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 29 2016	June. 28 2017
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 29 2016	June. 28 2017
9	Coaxial Cable	GTS	N/A	GTS211	June. 29 2016	June. 28 2017
10	Coaxial cable	GTS	N/A	GTS210	June. 29 2016	June. 28 2017
11	Coaxial Cable	GTS	N/A	GTS212	June. 29 2016	June. 28 2017
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 29 2016	June. 28 2017
13	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June. 29 2016	June. 28 2017
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 29 2016	June. 28 2017
15	Band filter	Amindeon	82346	GTS219	June. 29 2016	June. 28 2017
16	Constant temperature and humidity box	Oregon Scientific	BA-888	GTS248	June. 29 2016	June. 28 2017
17	D.C. Power Supply	Instek	PS-3030	GTS232	June. 29 2016	June. 28 2017
18	Splitter	Agilent	11636B	GTS237	June. 29 2016	June. 28 2017

Conducted Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.0(L)x3.0(W)x3.0(H)	GTS264	May.16 2014	May.15 2019
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	June 29 2016	June 28 2017
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	June 29 2016	June 28 2017
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June 29 2016	June 28 2017
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	June 29 2016	June 28 2017
6	Coaxial Cable	GTS	N/A	GTS227	June 29 2016	June 28 2017
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

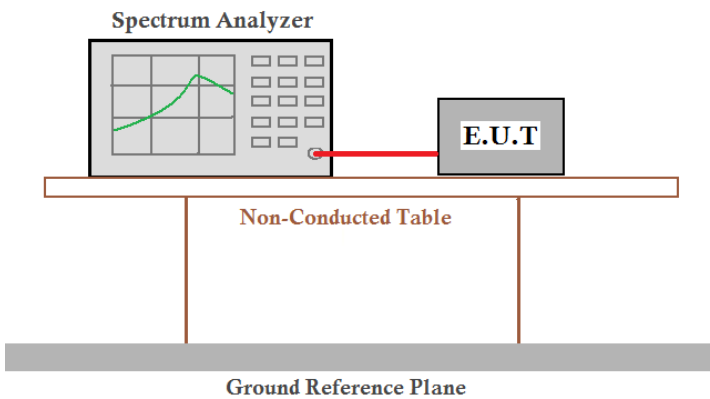
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	ChangChun	DYM3	GTS257	June 29 2016	June 28 2017

6 Test results and Measurement Data

6.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p>15.203 requirement:</p> <p>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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(c) (1)(i) requirement:</p> <p>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p>	
EUT Antenna:	
<p><i>The antenna is integral Antenna, the best case gain of the antenna is 0dBi</i></p> 	

6.2 Conducted Peak Output Power

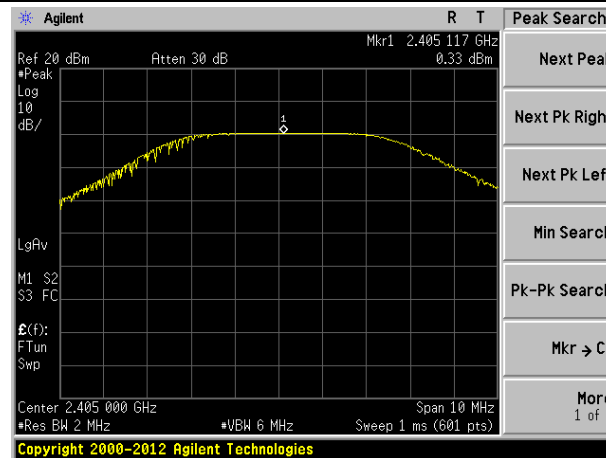
Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	DA 00-705, ANSI C63.10:2013
Limit:	30dBm
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

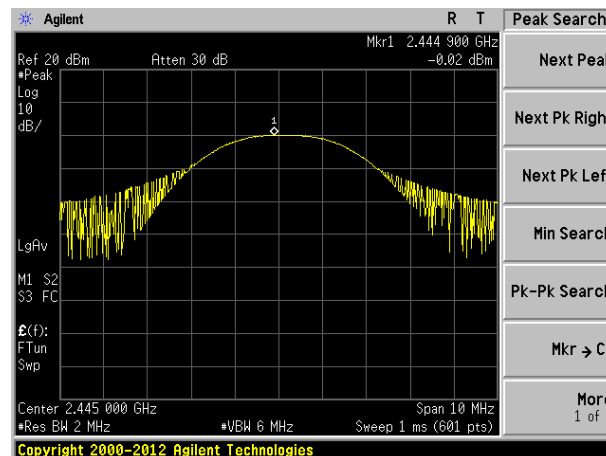
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	0.33	30	Pass
Middle	-0.02		
Highest	0.88		

Test plot as follows:

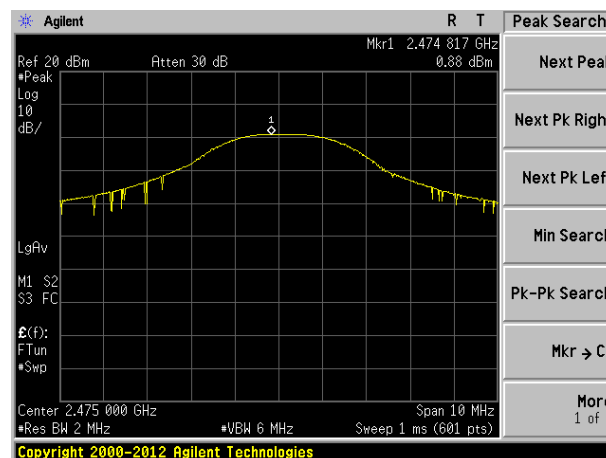
		Antenna:	Antenna 1
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Lowest channel

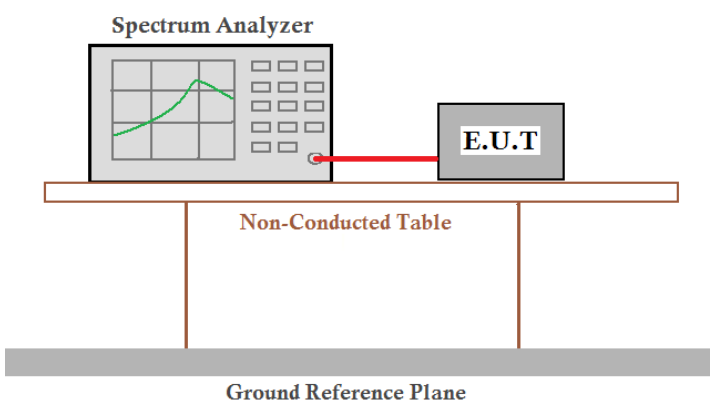


Middle channel



Highest channel

6.3 20dB Emission Bandwidth

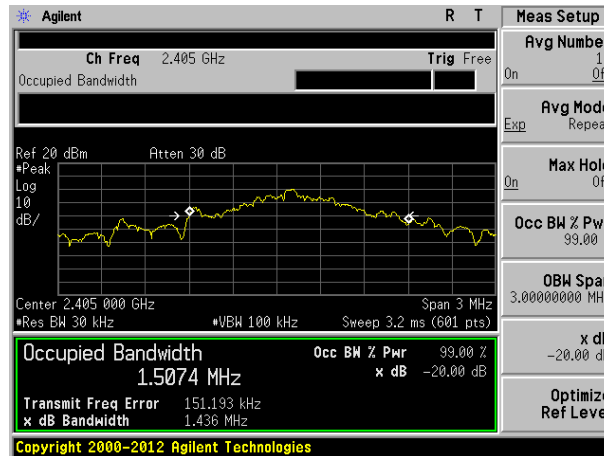
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	DA 00-705, ANSI C63.10:2013
Limit:	N/A
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

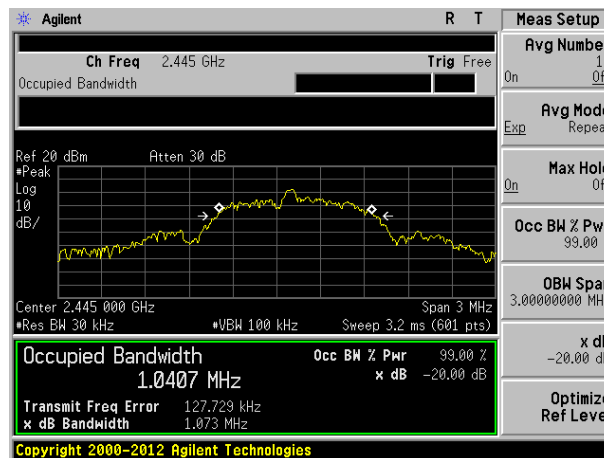
Test channel	20dB Emission Bandwidth (MHz)	Result
Lowest	1.436	Pass
Middle	1.073	
Highest	1.133	

Test plot as follows:

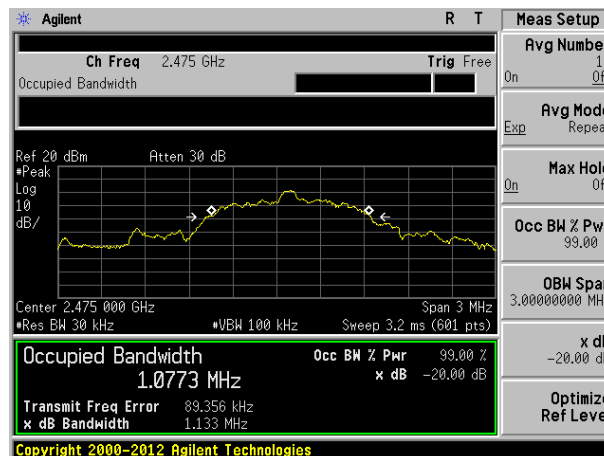
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Lowest channel

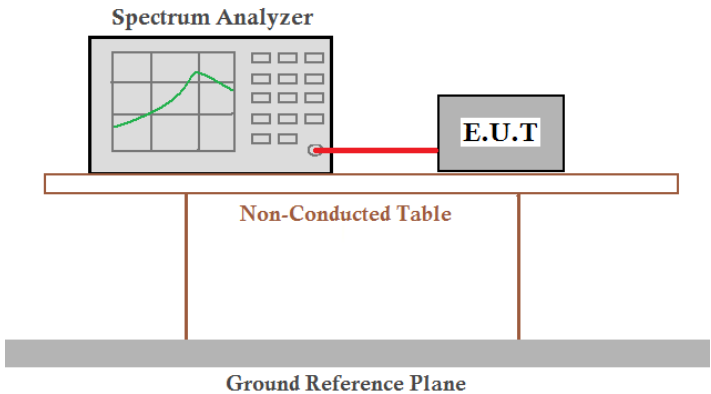


Middle channel



Highest channel

6.4 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	DA 00-705, ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, detector=Peak
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

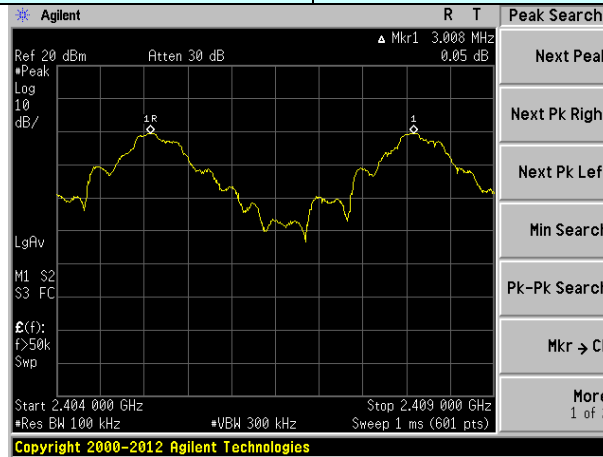
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	3008	957.33	Pass
Middle	1000	957.33	Pass
Highest	3025	957.33	Pass

Note: According to section 6.3

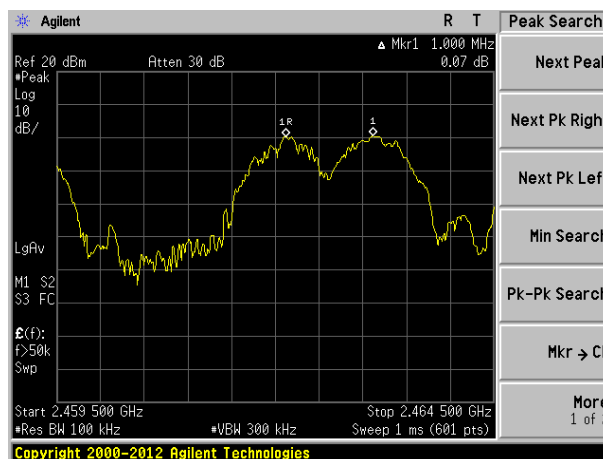
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	1436.00	957.33

Test plot as follows:

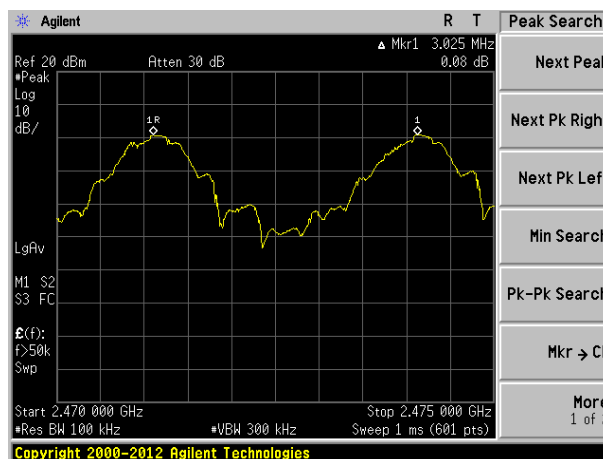
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Lowest channel

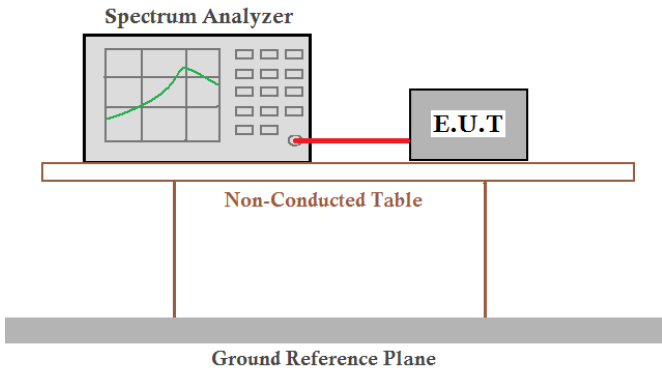


Middle channel



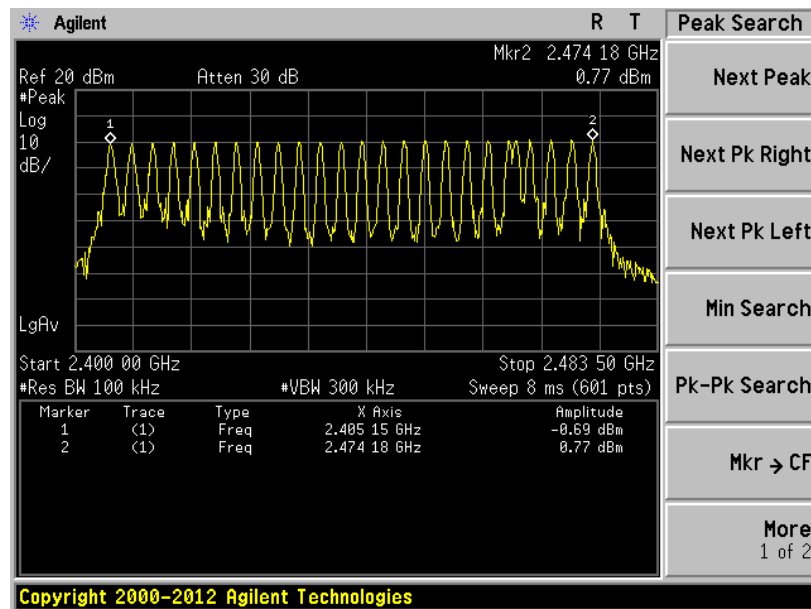
Highest channel

6.5 Hopping Channel Number

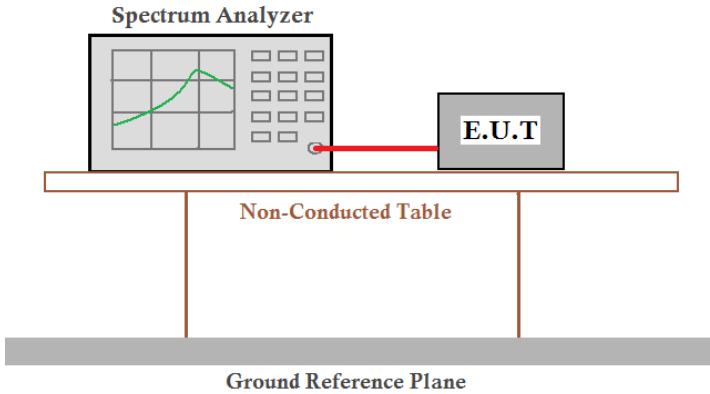
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	DA 00-705, ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data:

Hopping channel numbers	Limit	Result
25	15	Pass



6.6 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	DA 00-705, ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

Frequency	Ton (ms)	Dwell time(ms)	Limit(ms)	Result
2.405GHz	0.440	17.60	400	Pass
2.445GHz	0.440	17.60	400	Pass
2.475GHz	0.435	17.40	400	Pass

The formula as below:

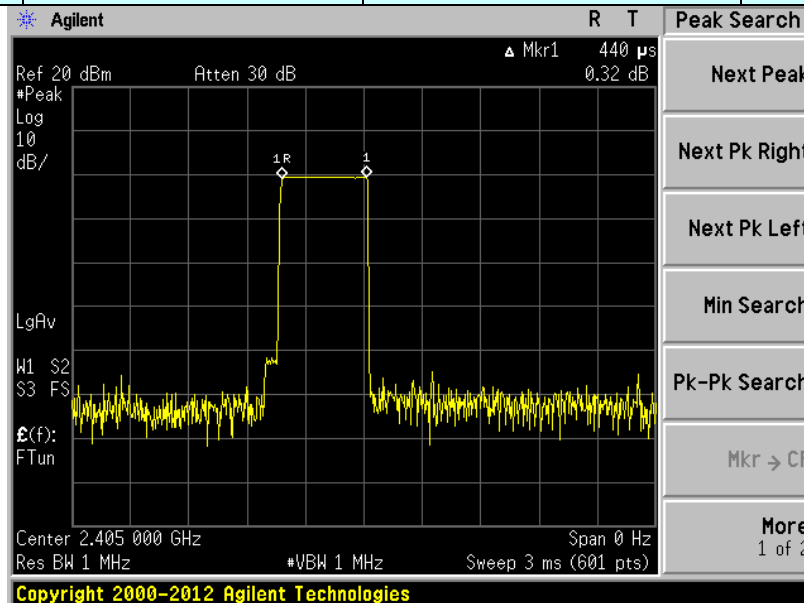
2405MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=0.440ms*4*0.4*25=17.60ms

2445MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=0.440ms*4*0.4*25=17.60ms

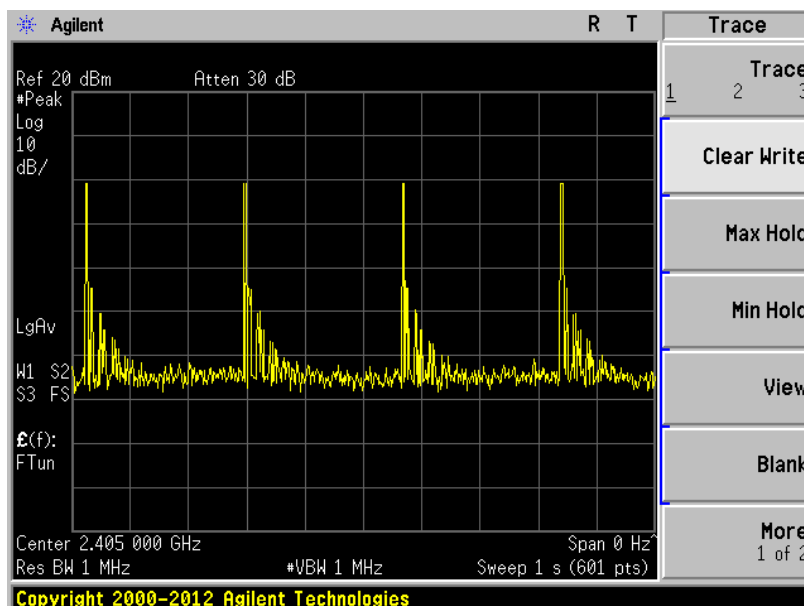
2475MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=0.435ms*4*0.4*25=17.40ms

Test plot as follows:

Frequency:	2405MHz		
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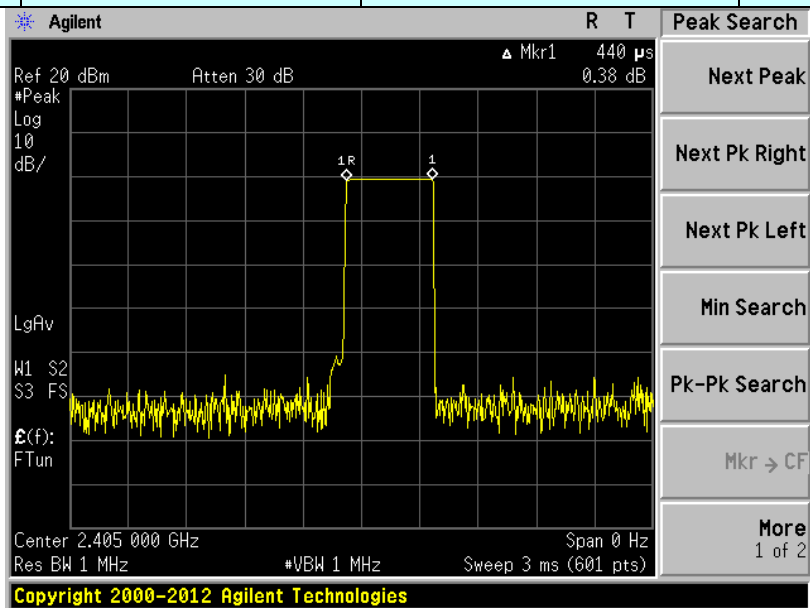


Ton

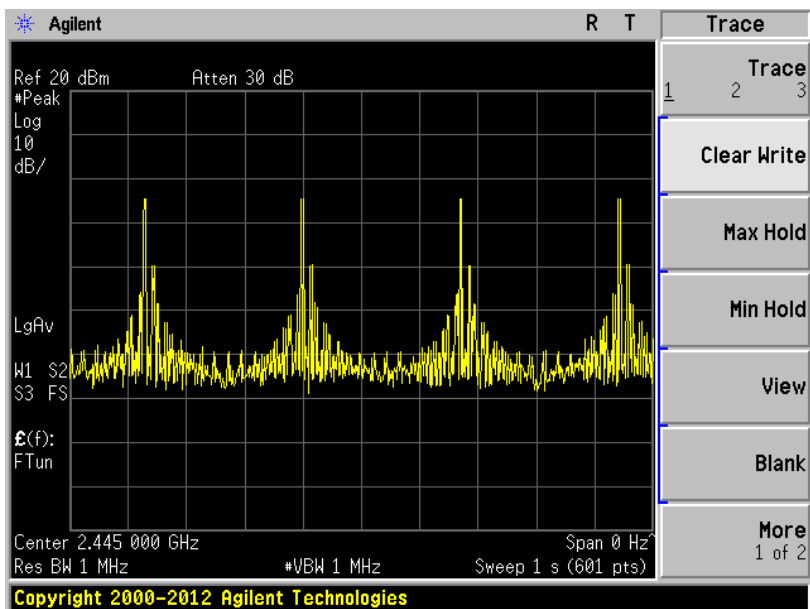


Ton times in 1s

Frequency:	2445MHz		
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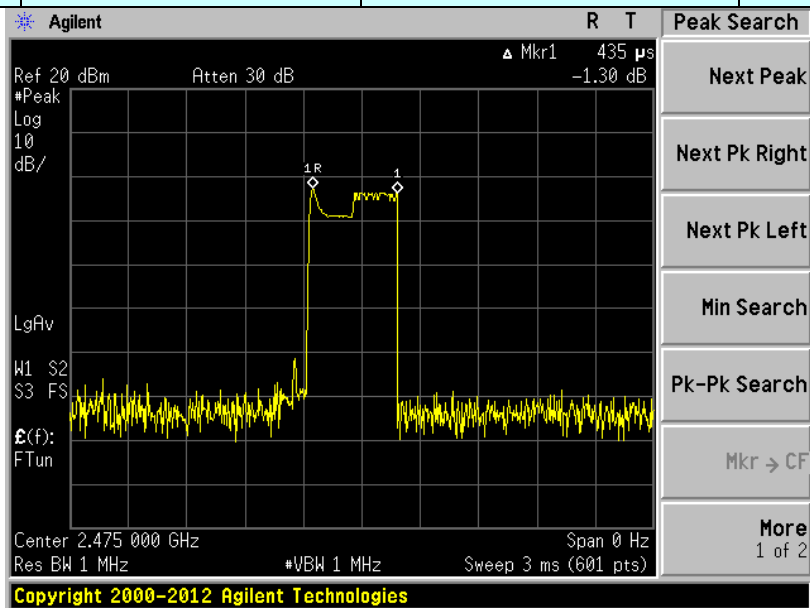


Ton

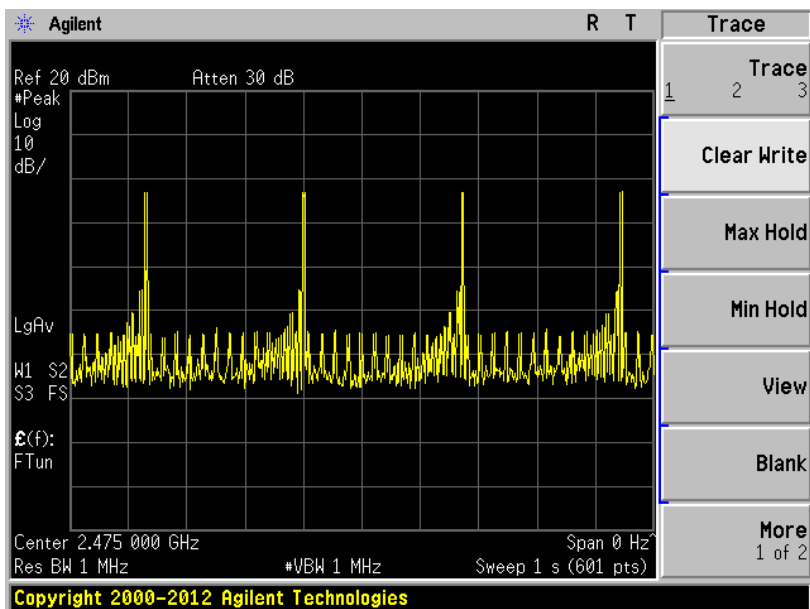


Ton times in 1s

Frequency:	2475MHz		
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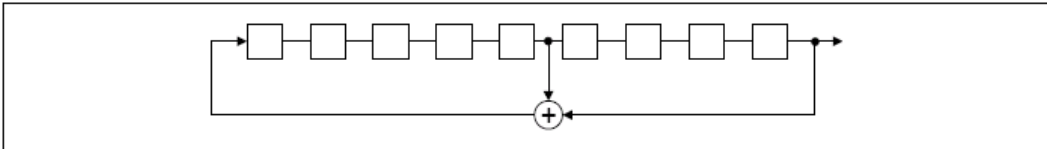


Ton



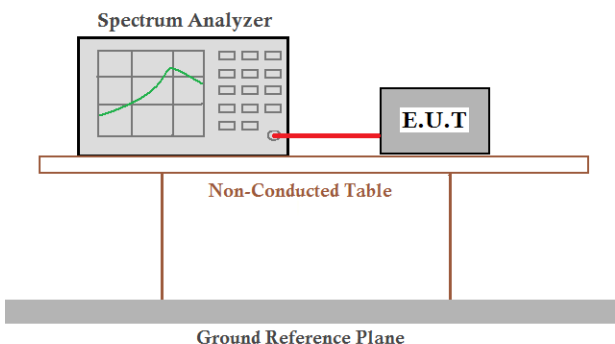
Ton times in 1s

6.7 Pseudorandom Frequency Hopping Sequence

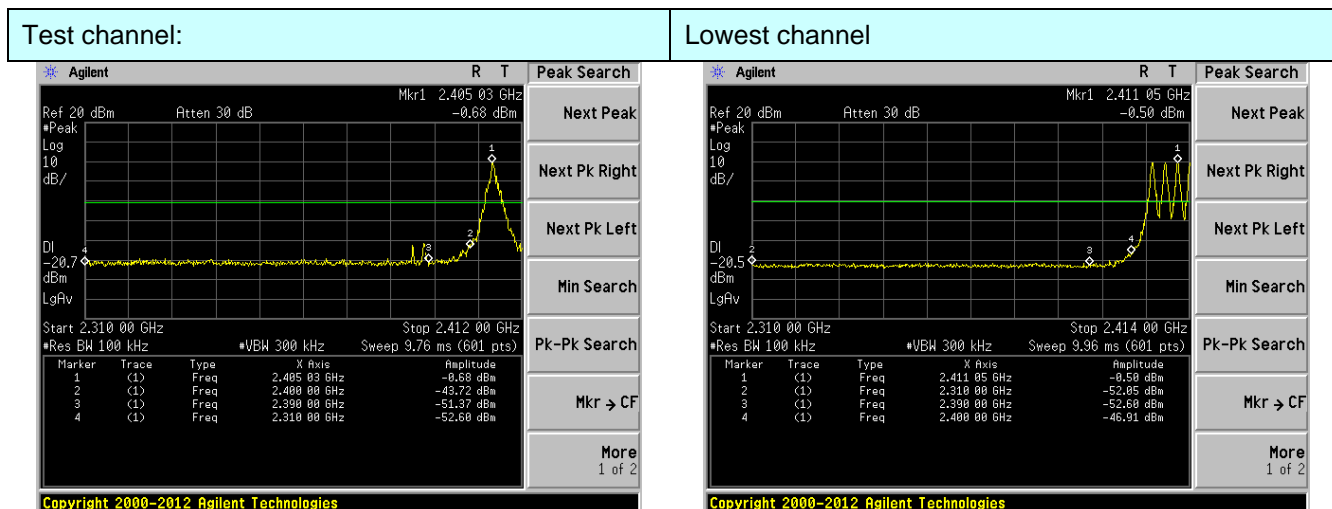
Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:
<p><i>Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.</i></p> <p><i>Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.</i></p>	
EUT Pseudorandom Frequency Hopping Sequence	
<p><i>The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.</i></p> <ul style="list-style-type: none"> • Number of shift register stages: 9 • Length of pseudo-random sequence: $2^9 - 1 = 511$ bits • Longest sequence of zeros: 8 (non-inverted signal)  <p><i>Linear Feedback Shift Register for Generation of the PRBS sequence</i></p> <p><i>Each frequency used equally on the average by each transmitter.</i></p> <p><i>The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.</i></p>	

6.8 Band Edge

6.8.1 Conducted Emission Method

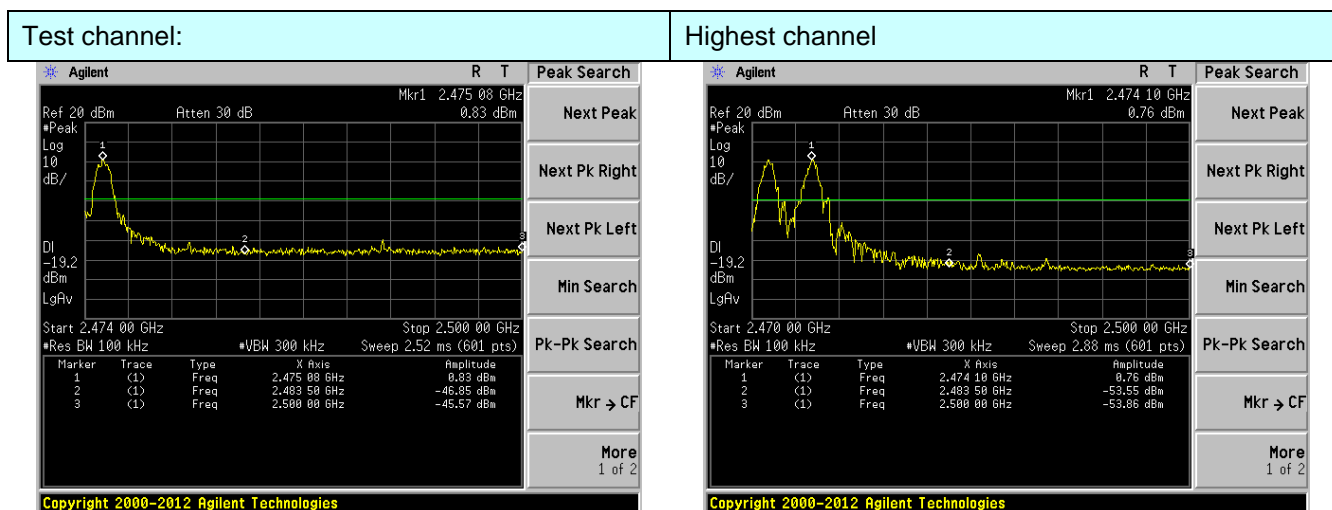
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	DA 00-705, ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Test plot as follows:



No-hopping mode

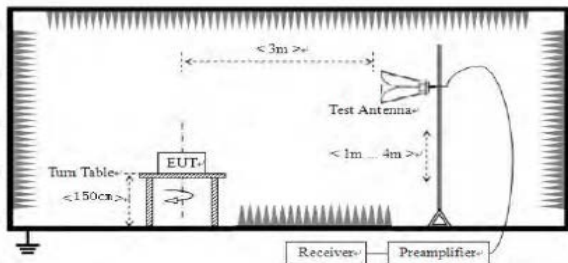
Hopping mode



No-hopping mode

Hopping mode

6.8.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	All restriction band have been tested, and 2.3GHz to 2.5GHz band is the worse case				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Test setup:					
Test Procedure:	<div>1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</div> <div>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div>				
Test Instruments:	Refer to section 5.8 for details				
Test mode:	Refer to section 5.3 for details				
Test results:	Pass				

Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

Test channel:	Lowest
---------------	--------

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	47.50	27.91	5.30	30.37	50.34	74.00	-23.66	Vertical
2390.00	47.13	27.59	5.38	30.18	49.92	74.00	-24.08	Vertical
2400.00	48.28	27.58	5.39	30.18	51.07	74.00	-22.93	Vertical
2310.00	44.89	27.91	5.30	30.37	47.73	74.00	-26.27	Horizontal
2390.00	47.75	27.59	5.38	30.18	50.54	74.00	-23.46	Horizontal
2400.00	46.02	27.58	5.39	30.18	48.81	74.00	-25.19	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	34.88	27.91	5.30	30.37	37.72	54.00	-16.28	Vertical
2390.00	34.74	27.59	5.38	30.18	37.53	54.00	-16.47	Vertical
2400.00	37.23	27.58	5.39	30.18	40.02	54.00	-13.98	Vertical
2310.00	34.80	27.91	5.30	30.37	37.64	54.00	-16.36	Horizontal
2390.00	35.36	27.59	5.38	30.18	38.15	54.00	-15.85	Horizontal
2400.00	35.60	27.58	5.39	30.18	38.39	54.00	-15.61	Horizontal

Test channel:	Highest
---------------	---------

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	47.09	27.53	5.47	29.93	50.16	74.00	-23.84	Vertical
2500.00	44.39	27.55	5.49	29.93	47.50	74.00	-26.50	Vertical
2483.50	48.44	27.53	5.47	29.93	51.51	74.00	-22.49	Horizontal
2500.00	44.64	27.55	5.49	29.93	47.75	74.00	-26.25	Horizontal

Average value:

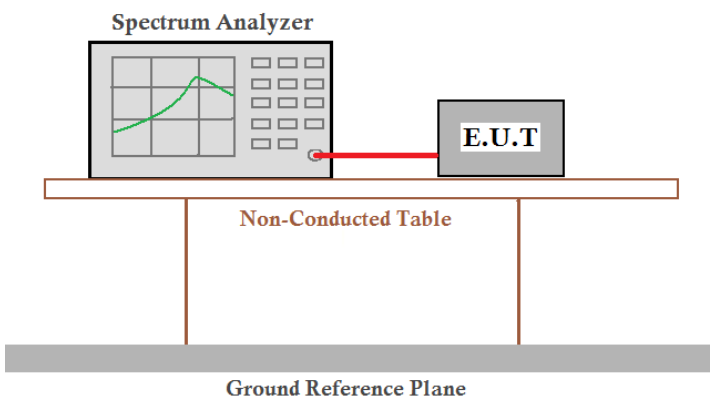
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	33.98	27.53	5.47	29.93	37.05	54.00	-16.95	Vertical
2500.00	34.08	27.55	5.49	29.93	37.19	54.00	-16.81	Vertical
2483.50	33.53	27.53	5.47	29.93	36.60	54.00	-17.40	Horizontal
2500.00	34.12	27.55	5.49	29.93	37.23	54.00	-16.77	Horizontal

Remark:

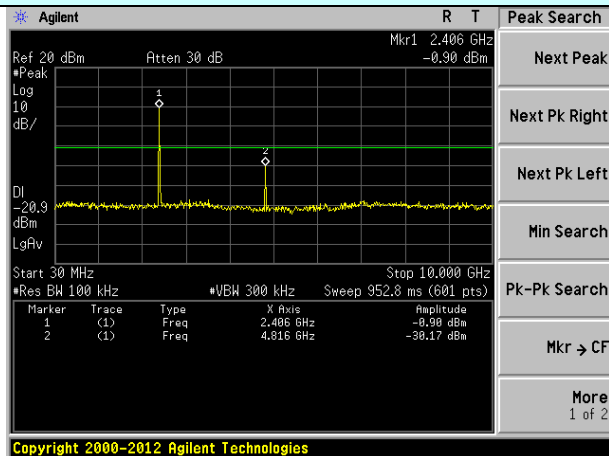
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

6.9 Spurious Emission

6.9.1 Conducted Emission Method

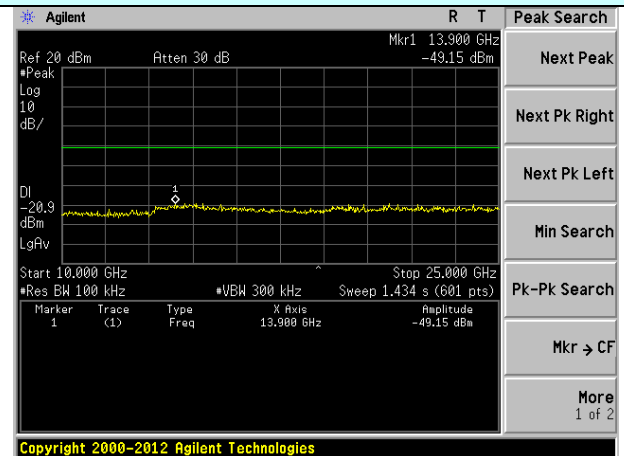
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by two vertical legs and sits on a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Test channel:



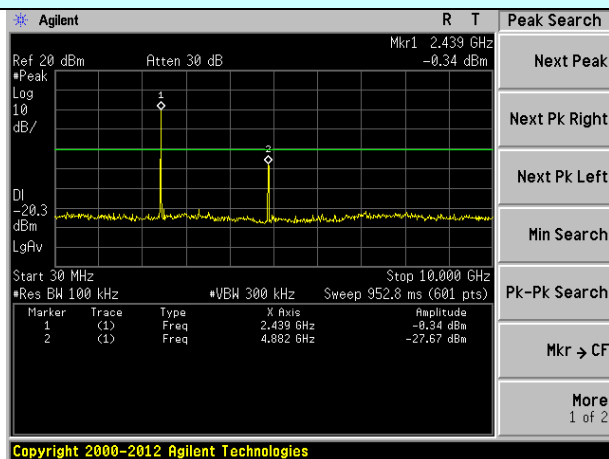
30MHz~10GHz

Lowest channel



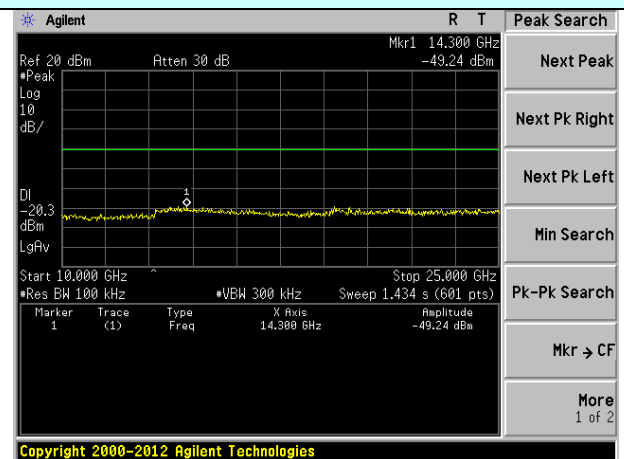
10GHz~25GHz

Test channel:



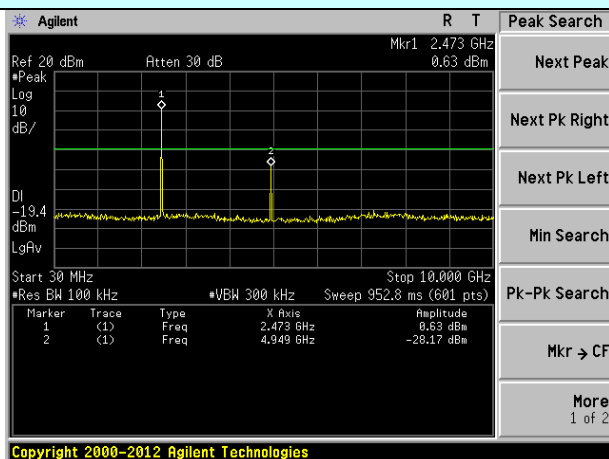
30MHz~10GHz

Middle channel



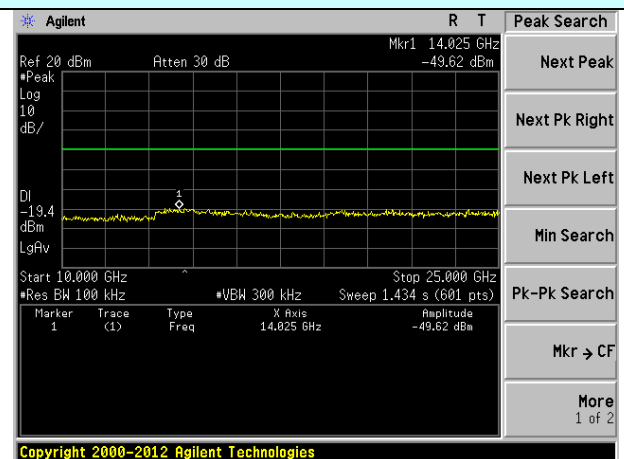
10GHz~25GHz

Test channel:



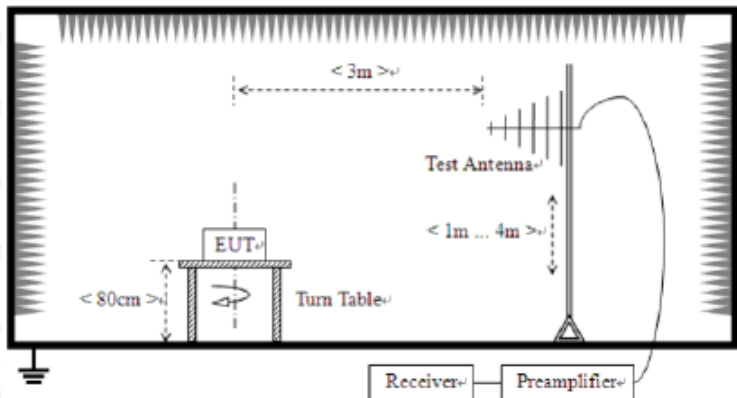
30MHz~10GHz

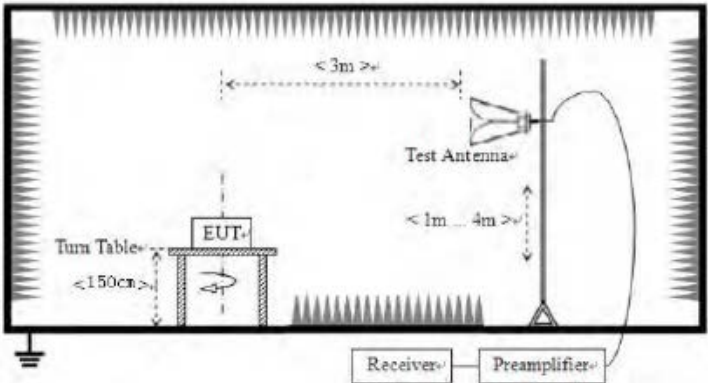
Highest channel



10GHz~25GHz

6.9.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-10KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit: (Spurious Emissions)	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	300m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
		5000	Peak		
Test setup:	Below 1GHz				
	<div></div>				
Test setup:	Above 1GHz				

	
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Remark:

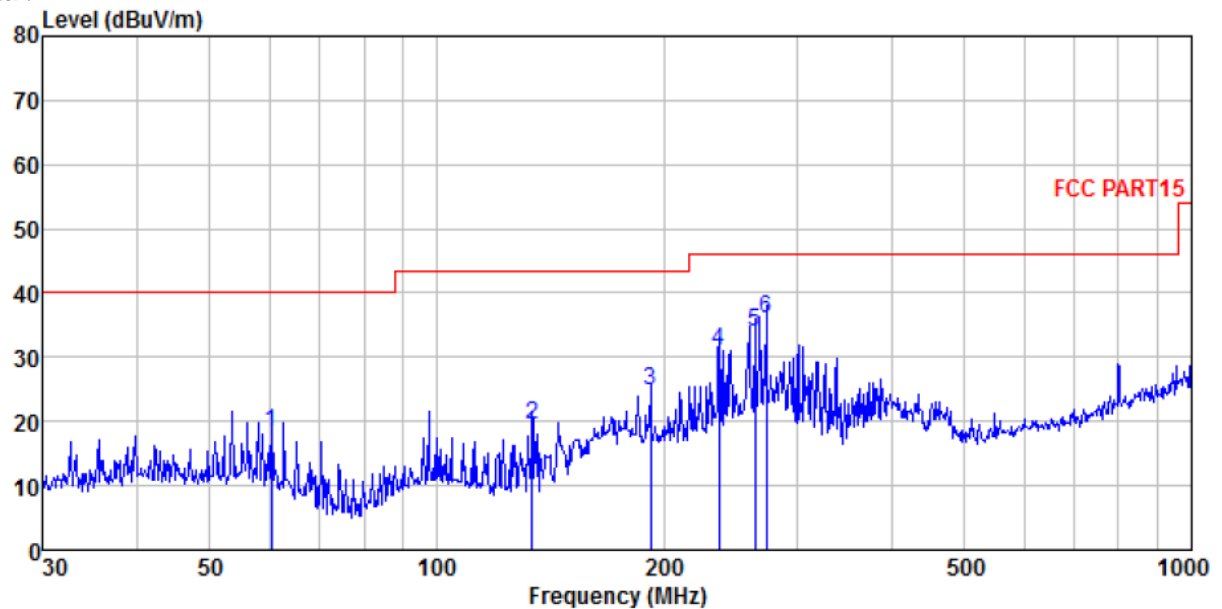
1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.
2. The measured filed strength at frequencies below 30MHz are lower than the limit over 30dB. So the data isn't reported.

Measurement data:

■ 30MHz ~ 1GHz

ANT 2:

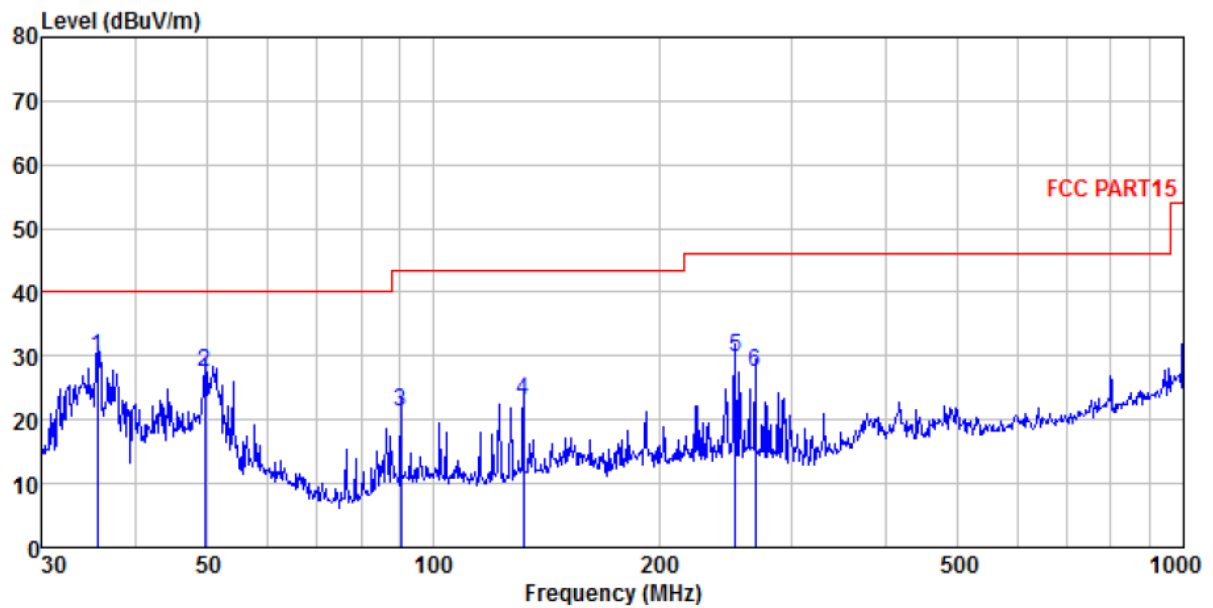
Horizontal:



Site : 3m chamber
Condition : FCC PART15 3m HORIZONTAL
Job No. : 109
Test Mode : Transmitting mode
Test Engineer: Sky

	ReadAntenna	Cable	Preamp		Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit
-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	60.280	32.68	14.69	0.86	29.92	18.31	40.00 -21.69 QP
2	133.619	36.80	10.67	1.46	29.49	19.44	43.50 -24.06 QP
3	191.745	39.63	12.56	1.80	29.23	24.76	43.50 -18.74 QP
4	236.645	44.60	13.93	2.05	29.54	31.04	46.00 -14.96 QP
5	263.819	47.30	14.17	2.19	29.75	33.91	46.00 -12.09 QP
6	273.234	49.14	14.46	2.24	29.82	36.02	46.00 -9.98 QP

Vertical:



Site : 3m chamber
 Condition : FCC PART15 3m VERTICAL
 Job No. : 109
 Test Mode : Transmitting mode
 Test Engineer: Sky

	Freq	ReadAntenna	Cable Preamp		Limit	Over		
	Level	Factor	Loss	Factor	Line	Limit	Remark	
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	35.624	44.66	14.49	0.62	30.07	29.70	40.00	-10.30 QP
2	49.533	41.48	15.28	0.77	30.00	27.53	40.00	-12.47 QP
3	90.537	35.90	14.07	1.11	29.74	21.34	43.50	-22.16 QP
4	131.758	40.12	10.82	1.45	29.50	22.89	43.50	-20.61 QP
5	252.948	43.25	14.06	2.14	29.66	29.79	46.00	-16.21 QP
6	268.485	40.69	14.34	2.21	29.79	27.45	46.00	-18.55 QP

■ Above 1GHz

Test channel:	Lowest
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4810.00	55.10	31.78	8.60	32.09	63.39	74.00	-10.61	Vertical
7215.00	40.30	36.15	11.66	31.99	56.12	74.00	-17.88	Vertical
9620.00	31.93	38.01	14.14	31.60	52.48	74.00	-21.52	Vertical
12025.00	*					74.00		Vertical
14430.00	*					74.00		Vertical
4810.00	51.96	31.78	8.60	32.09	60.25	74.00	-13.75	Horizontal
7215.00	33.00	36.15	11.66	31.99	48.82	74.00	-25.19	Horizontal
9620.00	30.13	38.01	14.14	31.60	50.68	74.00	-23.32	Horizontal
12025.00	*					74.00		Horizontal
14430.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4810.00	39.31	31.78	8.60	32.09	47.60	54.00	-6.40	Vertical
7215.00	28.94	36.15	11.66	31.99	44.76	54.00	-9.24	Vertical
9620.00	19.36	38.01	14.14	31.60	39.91	54.00	-14.09	Vertical
12025.00	*					54.00		Vertical
14430.00	*					54.00		Vertical
4810.00	36.76	31.78	8.60	32.09	45.05	54.00	-8.95	Horizontal
7215.00	24.49	36.15	11.66	31.99	40.31	54.00	-13.70	Horizontal
9620.00	19.83	38.01	14.14	31.60	40.38	54.00	-13.62	Horizontal
12025.00	*					54.00		Horizontal
14430.00	*					54.00		Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test channel:	Middle
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4890.00	53.83	31.86	8.67	32.13	62.23	74.00	-11.77	Vertical
7335.00	30.86	36.41	11.72	31.88	47.11	74.00	-26.89	Vertical
9780.00	28.88	38.43	14.27	31.62	49.96	74.00	-24.04	Vertical
12225.00	*					74.00		Vertical
14670.00	*					74.00		Vertical
4890.00	51.79	31.86	8.67	32.13	60.19	74.00	-13.81	Horizontal
7335.00	29.37	36.41	11.72	31.88	45.62	74.00	-28.38	Horizontal
9780.00	28.41	38.43	14.27	31.62	49.49	74.00	-24.51	Horizontal
12225.00	*					74.00		Horizontal
14670.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4890.00	27.40	31.86	8.67	32.13	35.80	54.00	-18.20	Vertical
7335.00	21.61	36.41	11.72	31.88	37.86	54.00	-16.14	Vertical
9780.00	18.93	38.43	14.27	31.62	40.01	54.00	-13.99	Vertical
12225.00	*					54.00		Vertical
14670.00	*					54.00		Vertical
4890.00	22.46	31.86	8.67	32.13	30.86	54.00	-23.14	Horizontal
7335.00	21.31	36.41	11.72	31.88	37.56	54.00	-16.44	Horizontal
9780.00	18.75	38.43	14.27	31.62	39.83	54.00	-14.17	Horizontal
12225.00	*					54.00		Horizontal
14670.00	*					54.00		Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test channel:	Highest
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4950.00	48.84	31.91	8.71	32.16	57.30	74.00	-16.70	Vertical
7425.00	35.20	36.56	11.79	31.80	51.75	74.00	-22.25	Vertical
9900.00	29.75	39.12	14.45	32.06	51.26	74.00	-22.74	Vertical
12375.00	*					74.00		Vertical
14850.00	*					74.00		Vertical
4950.00	49.85	31.91	8.71	32.16	58.31	74.00	-15.69	Horizontal
7425.00	33.47	36.56	11.79	31.80	50.02	74.00	-23.98	Horizontal
9900.00	31.04	39.12	14.35	32.06	52.45	74.00	-21.55	Horizontal
12375.00	*					74.00		Horizontal
14850.00	*					74.00		Horizontal

Average value:

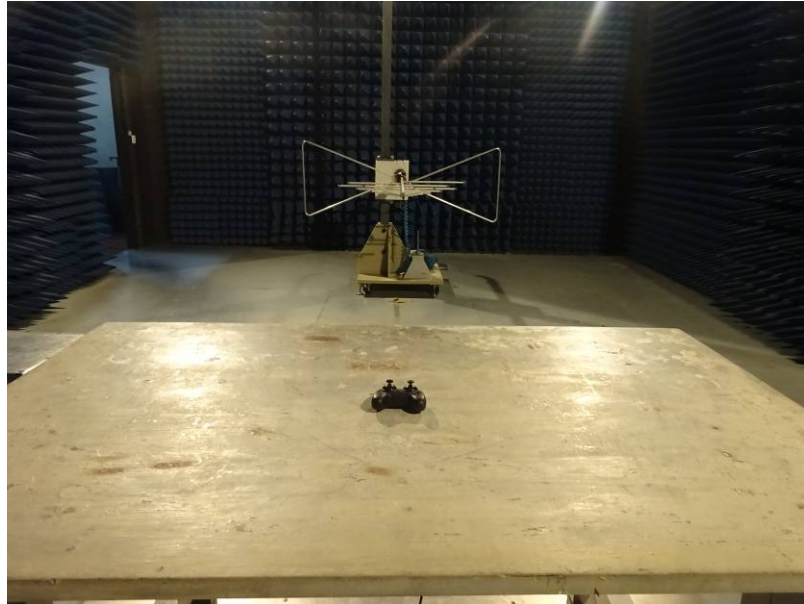
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4950.00	36.98	31.91	8.71	32.16	45.44	54.00	-8.56	Vertical
7425.00	24.33	36.56	11.79	31.80	40.88	54.00	-13.12	Vertical
9900.00	19.45	39.12	14.45	32.06	40.96	54.00	-13.04	Vertical
12375.00	*					54.00		Vertical
14850.00	*					54.00		Vertical
4950.00	35.86	31.91	8.71	32.16	44.32	54.00	-9.68	Horizontal
7425.00	24.53	36.56	11.79	31.80	41.08	54.00	-12.92	Horizontal
9900.00	20.05	39.12	14.35	32.06	41.46	54.00	-12.54	Horizontal
12375.00	*					54.00		Horizontal
14850.00	*					54.00		Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

7 Test Setup Photo

Radiated Emission



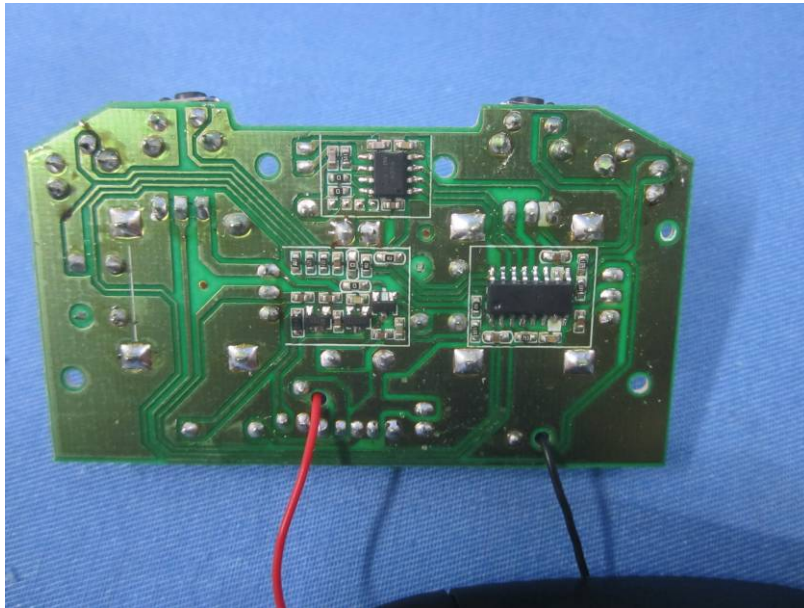
8 EUT Constructional Details

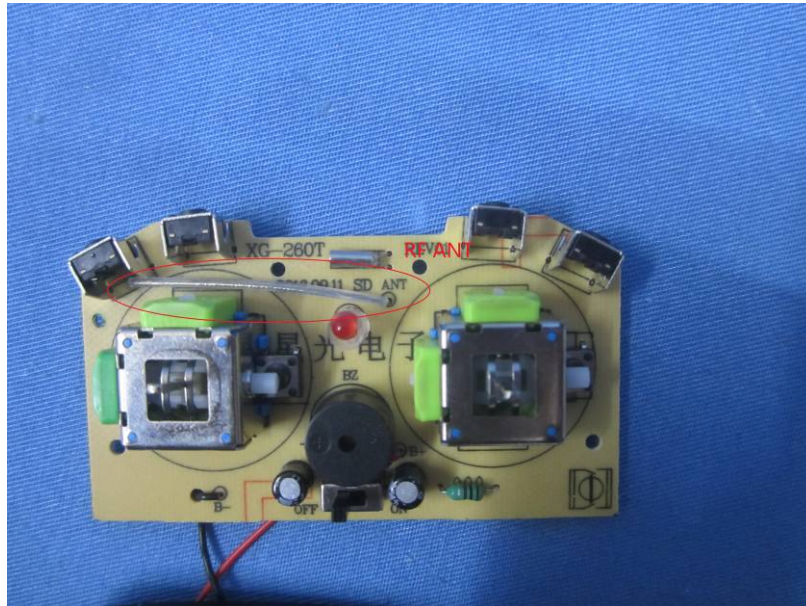












---End---