FCC Report

Applicant:	FLYSKY RC MODEL TECHNOLOGY CO., LTD
Address of Applicant:	West building3, Huangjianyuan Ind, Park QIAOLI North Gate Changping Town, Dongguan, China
Manufacturer:	ShenZhen FLYSKY Technology Co.,Ltd
Address of Manufacturer:	ADD 16F, Huafeng Building, No. 6006 Shennan Road, Futian District, Shenzhen, Guangdong, China
Factory:	Dongguan Flysky RC Model technology Co.,Ltd
Address of Factory:	West building3, Huangjianyuan Ind, Park QIAOLI North Gate Changping Town, Dongguan, China

Equipment Under Test (EUT)

Product Name:	Mini two-way receive
Model No.:	FS-iA8X
Trade Mark:	FLYSKY
FCC ID:	N4ZIA8X00
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	November 20, 2018
Date of Test:	November 21, 2018-December 12, 2018
Date of report issued:	December 13, 2018
Test Result :	PASS *

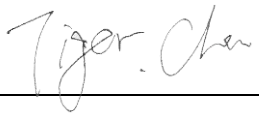
* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*December 13, 2018*	*Original*

Prepared By:  ***Date:*** *December 13, 2018*

Project Engineer

Check By:  ***Date:*** *December 13, 2018*

Reviewer

3 Contents

Page

4 Test Summary

Test Item	Section	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
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.

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

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(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 General Description of EUT

Product Name:	Mini two-way receive
Model No.:	FS-iA8X
Serial No.:	N/A
Hardware version:	FS-iA8X-V1.2
Software version:	FS-iA8X V1.0.6
Test sample(s) ID:	GTS201811000172-1
Sample(s) Status	Engineer sample
Operation Frequency:	2408MHz~2475.0MHz
Channel numbers:	135
Channel separation:	500kHz
Modulation technology:	GFSK
Antenna Type:	Integral Antenna
Antenna gain:	0dBi
Power supply:	DC 4V ~ 8.4V

Remark: The system works in the frequency range of 2408MHz to 2475MHz. This band has been divided to 135 independent channels. Each radio system uses 16 different channels; the minimum channel separation is ≥2.0MHz. By using various switch-on times, hopping scheme and channel frequencies, the system can guarantee a jamming free radio transmission. The channel list is below.

Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	----	36	2423.00	71	2440.50	106	2458.00
2	----	37	2423.50	72	2441.00	107	2458.50
3	----	38	2424.00	73	2441.50	108	2459.00
4	----	39	2424.50	74	2442.00	109	2459.50
5	----	40	2425.00	75	2442.50	110	2460.00
6	2408.00	41	2425.50	76	2443.00	111	2460.50
7	2408.50	42	2426.00	77	2443.50	112	2461.00
8	2409.00	43	2426.50	78	2444.00	113	2461.50
9	2409.50	44	2427.00	79	2444.50	114	2462.00
10	2410.00	45	2427.50	80	2445.00	115	2462.50
11	2410.50	46	2428.00	81	2445.50	116	2463.00
12	2411.00	47	2428.50	82	2446.00	117	2463.50
13	2411.50	48	2429.00	83	2446.50	118	2464.00
14	2412.00	49	2429.50	84	2447.00	119	2464.50
15	2412.50	50	2430.00	85	2447.50	120	2465.00
16	2413.00	51	2430.50	86	2448.00	121	2465.50
17	2413.50	52	2431.00	87	2448.50	122	2466.00
18	2414.00	53	2431.50	88	2449.00	123	2466.50
19	2414.50	54	2432.00	89	2449.50	124	2467.00
20	2415.00	55	2432.50	90	2450.00	125	2467.50
21	2415.50	56	2433.00	91	2450.50	126	2468.00
22	2416.00	57	2433.50	92	2451.00	127	2468.50
23	2416.50	58	2434.00	93	2451.50	128	2469.00
24	2417.00	59	2434.50	94	2452.00	129	2469.50
25	2417.50	60	2435.00	95	2452.50	130	2470.00
26	2418.00	61	2435.50	96	2453.00	131	2470.50
27	2418.50	62	2436.00	97	2453.50	132	2471.00
28	2419.00	63	2436.50	98	2454.00	133	2471.50
29	2419.50	64	2437.00	99	2454.50	134	2472.00
30	2420.00	65	2437.50	100	2455.00	135	2472.50
31	2420.50	66	2438.00	101	2455.50	136	2473.00
32	2421.00	67	2438.50	102	2456.00	137	2473.50
33	2421.50	68	2439.00	103	2456.50	138	2474.00
34	2422.00	69	2439.50	104	2457.00	139	2474.50
35	2422.50	70	2440.00	105	2457.50	140	2475.00

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	2408.0MHz
The middle channel	2440.0MHz
The Highest channel	2475.0MHz

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.

5.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 381383**

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 No.: 381383, January 08, 2018.

● **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.

5.4 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

5.5 Other Information Requested by the Customer

None.

5.6 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC Approval
FLYSKY	Remote controller	FS-i10	N/A	Certificated
MEILI	DC POWER SUPPLY	MCH-305A	011121168	Voc

5.7 Additional Instructions

EUT Software Settings:

Mode	Special test firmware was pre-built-in by manufacturer		
Mode	Channel	Frequency (MHz)	Level Set
GFSK	CH01	2408	TX level : default
	CH70	2440	
	CH140	2475	

6 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. 27 2018	June. 26 2019
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 27 2018	June. 26 2019
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 27 2018	June. 26 2019
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 27 2018	June. 26 2019
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 27 2018	June. 26 2019
9	Coaxial Cable	GTS	N/A	GTS211	June. 27 2018	June. 26 2019
10	Coaxial cable	GTS	N/A	GTS210	June. 27 2018	June. 26 2019
11	Coaxial Cable	GTS	N/A	GTS212	June. 27 2018	June. 26 2019
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 27 2018	June. 26 2019
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 27 2018	June. 26 2019
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 27 2018	June. 26 2019
15	Band filter	Amindeon	82346	GTS219	June. 27 2018	June. 26 2019
16	Power Meter	Anritsu	ML2495A	GTS540	June. 27 2018	June. 26 2019
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 27 2018	June. 26 2019
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 27 2018	June. 26 2019
19	Splitter	Agilent	11636B	GTS237	June. 27 2018	June. 26 2019
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 27 2018	June. 26 2019

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 27 2018	June. 26 2019
2	Barometer	ChangChun	DYM3	GTS255	June. 27 2018	June. 26 2019

RF Conducted Test:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 27 2018	June. 26 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 27 2018	June. 26 2019
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 27 2018	June. 26 2019
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 27 2018	June. 26 2019
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 27 2018	June. 26 2019
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 27 2018	June. 26 2019
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 27 2018	June. 26 2019
8	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 27 2018	June. 26 2019
9	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 27 2018	June. 26 2019

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	7.3(L)x3.1(W)x2.9(H)	GTS252	May.16 2014	May.15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 27 2018	June. 26 2019
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 27 2018	June. 26 2019
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 27 2018	June. 26 2019
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 27 2018	June. 26 2019
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 27 2018	June. 26 2019

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

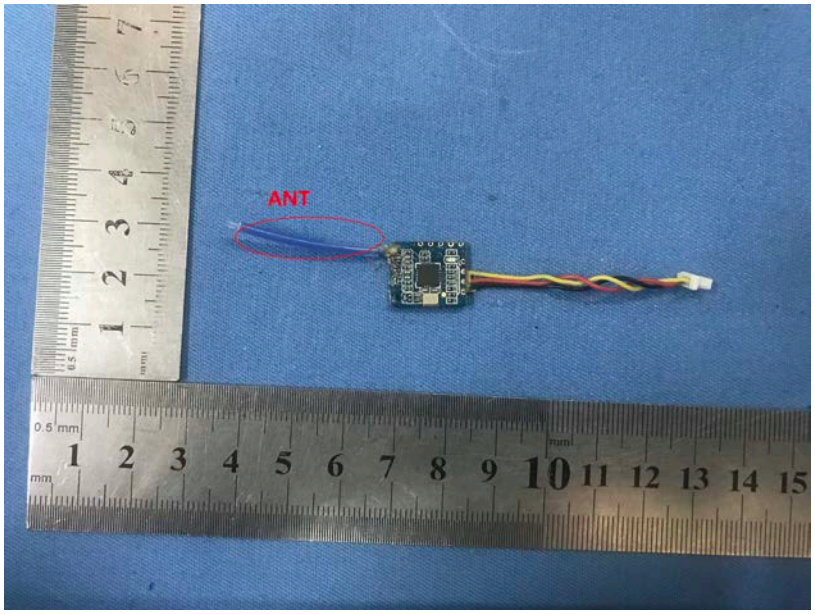
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

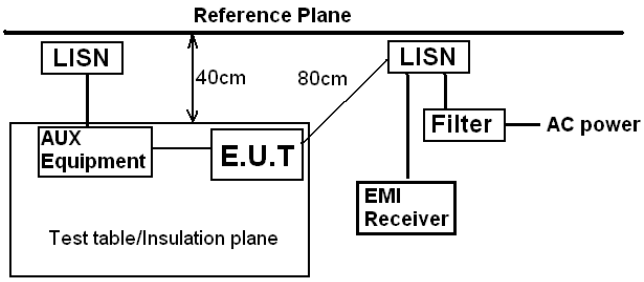
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

EUT Antenna:

The antenna is integral Antenna, the best case gain of the antenna is 0dBi

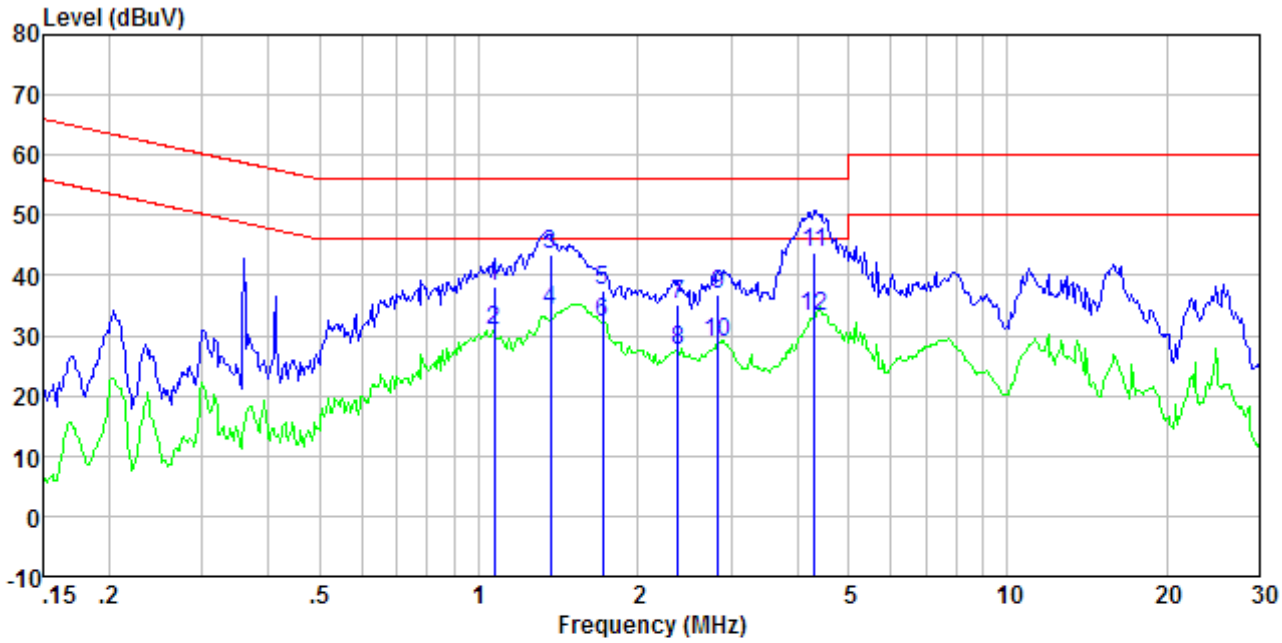


7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average 0.15-0.5: 66 to 56* / 56 to 46* 0.5-5: 56 / 46 5-30: 60 / 50 * Decreases with the logarithm of the frequency.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test procedure:	1. The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.
Test environment:	Temp.: 25 °C / Humid.: 52% / Press.: 1012mbar
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

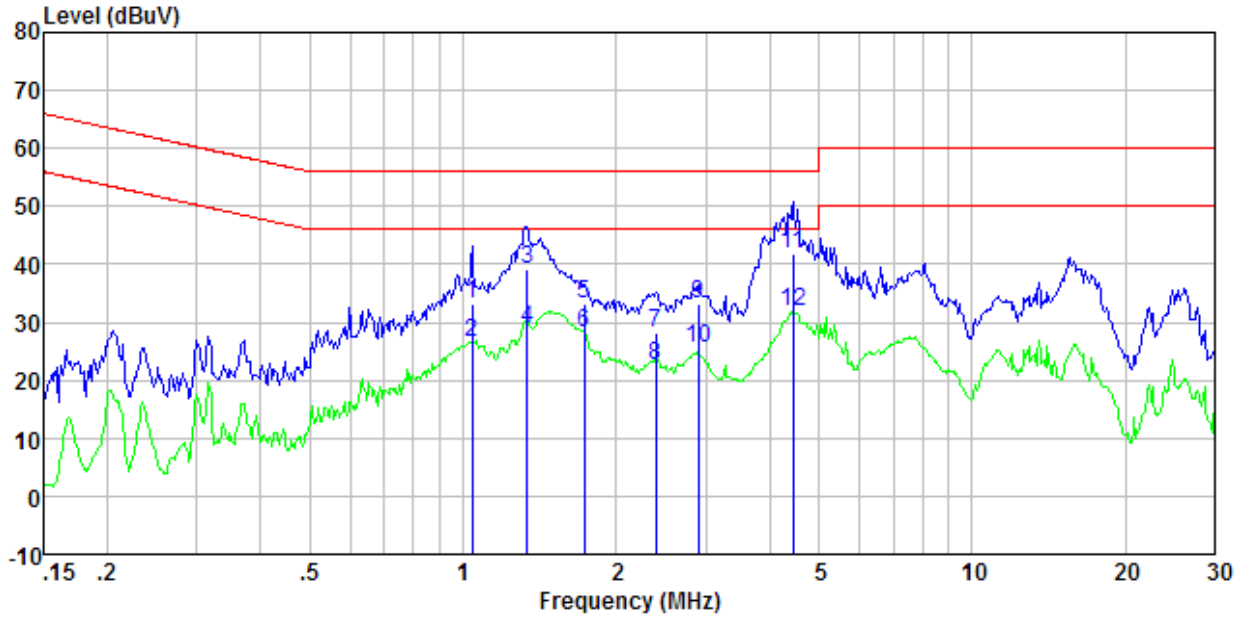
Measurement data:

Test mode:	transmitting mode	Phase Polarity:	Line



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
1.07	37.84	0.20	0.15	38.19	56.00	-17.81	QP
1.07	30.37	0.20	0.15	30.72	46.00	-15.28	Average
1.37	43.04	0.20	0.16	43.40	56.00	-12.60	QP
1.37	33.95	0.20	0.16	34.31	46.00	-11.69	Average
1.72	37.08	0.20	0.17	37.45	56.00	-18.55	QP
1.72	31.75	0.20	0.17	32.12	46.00	-13.88	Average
2.38	34.70	0.20	0.18	35.08	56.00	-20.92	QP
2.38	27.15	0.20	0.18	27.53	46.00	-18.47	Average
2.84	36.47	0.20	0.19	36.86	56.00	-19.14	QP
2.84	28.31	0.20	0.19	28.70	46.00	-17.30	Average
4.31	43.27	0.20	0.18	43.65	56.00	-12.35	QP
4.31	32.76	0.20	0.18	33.14	46.00	-12.86	Average

Test mode:	transmitting mode	Phase Polarity:	Neutral

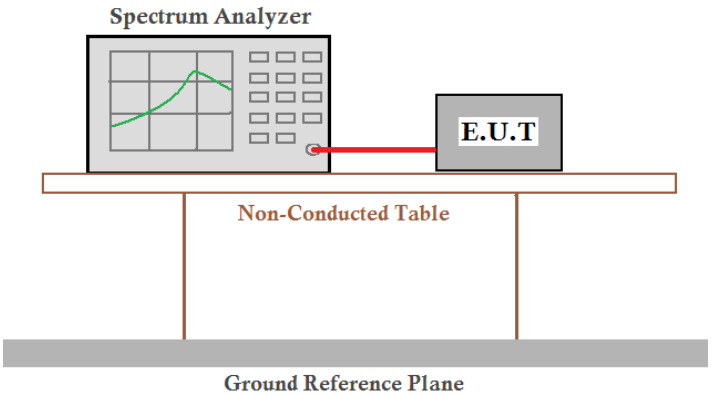


Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dBuV	dBuV	dB	
1.04	32.68	0.20	0.15	33.03	56.00	-22.97	QP
1.04	26.16	0.20	0.15	26.51	46.00	-19.49	Average
1.34	38.83	0.20	0.16	39.19	56.00	-16.81	QP
1.34	28.38	0.20	0.16	28.74	46.00	-17.26	Average
1.73	32.77	0.20	0.17	33.14	56.00	-22.86	QP
1.73	27.76	0.20	0.17	28.13	46.00	-17.87	Average
2.40	27.85	0.20	0.18	28.23	56.00	-27.77	QP
2.40	22.17	0.20	0.18	22.55	46.00	-23.45	Average
2.90	32.71	0.20	0.19	33.10	56.00	-22.90	QP
2.90	25.08	0.20	0.19	25.47	46.00	-20.53	Average
4.45	41.51	0.20	0.17	41.88	56.00	-14.12	QP
4.45	31.36	0.20	0.17	31.73	46.00	-14.27	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

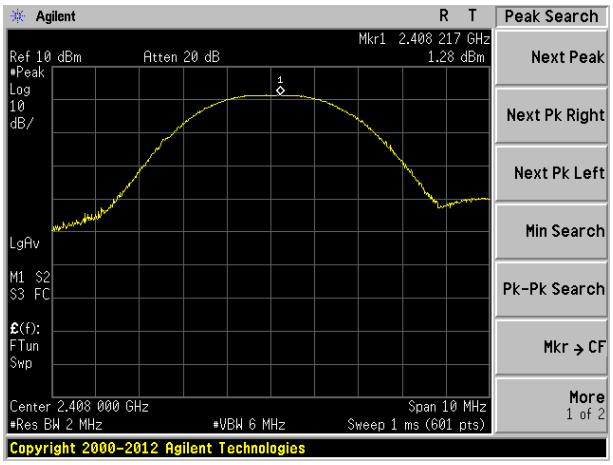
7.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013
Limit:	20.97dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

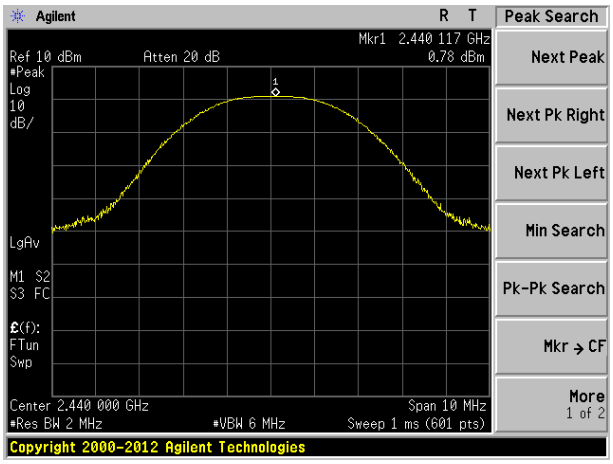
Measurement Data

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	1.28	20.97	Pass
Middle	0.78		
Highest	1.22		

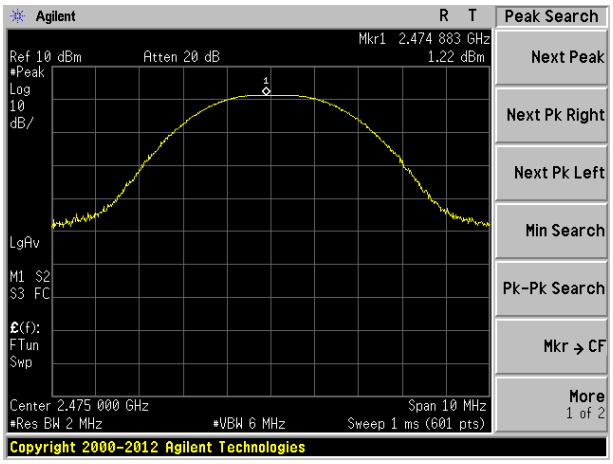
Test plot as follows:



Lowest channel

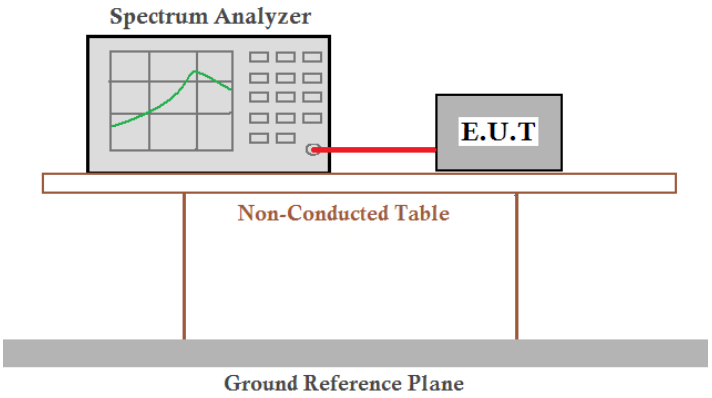


Middle channel



Highest channel

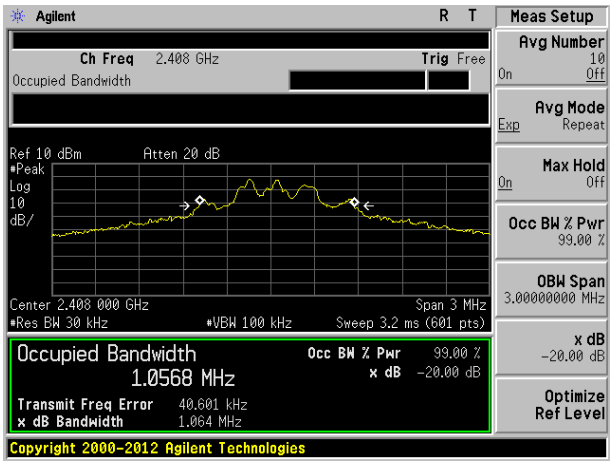
7.4 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

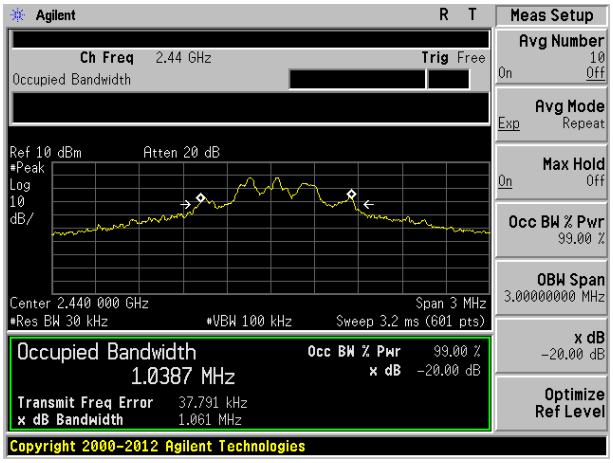
Measurement Data

Test channel	20dB Emission Bandwidth (MHz)	Result
Lowest	1.064	Pass
Middle	1.061	
Highest	1.056	

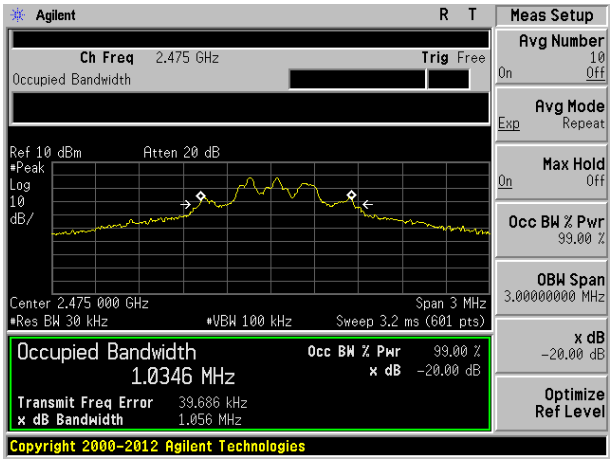
Test plot as follows:



Lowest channel

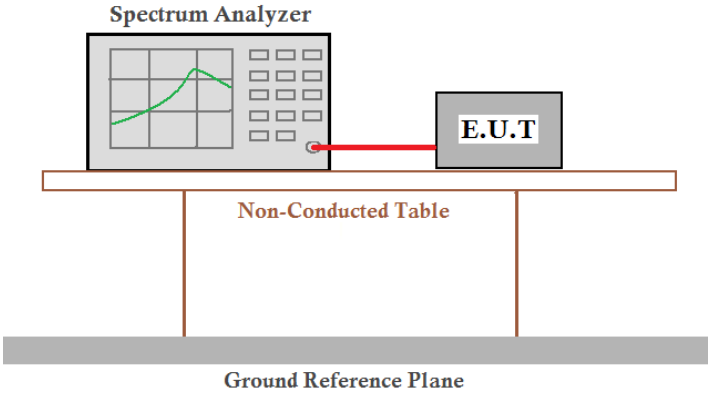


Middle channel



Highest channel

7.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	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:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

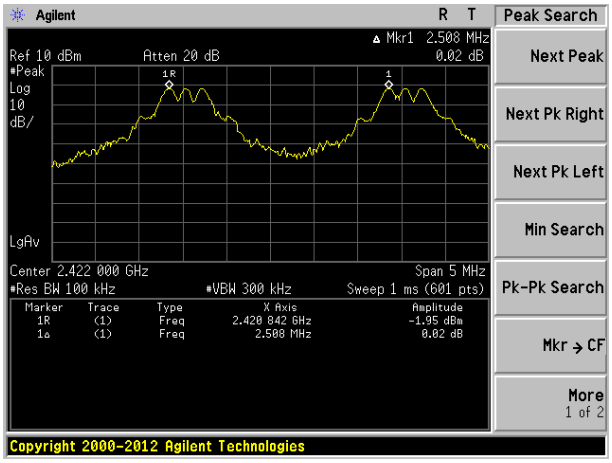
Measurement Data

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	2508	709	Pass
Middle	2008	709	Pass
Highest	3017	709	Pass

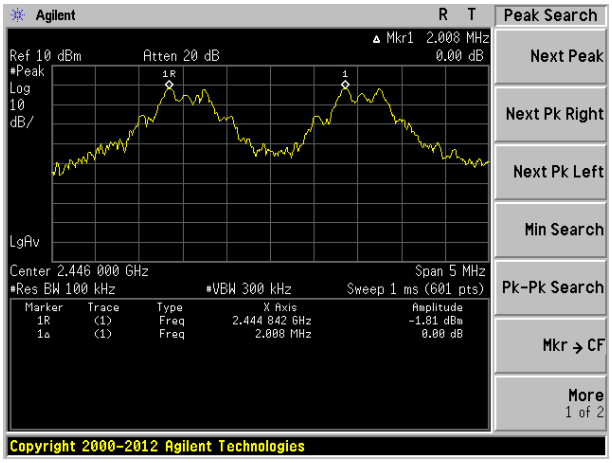
Note: According to section 7.3

Mode	*20dB bandwidth (kHz) (worse case)*	*Limit (kHz) (Carrier Frequencies Separation)*
GFSK	*1064*	*709*

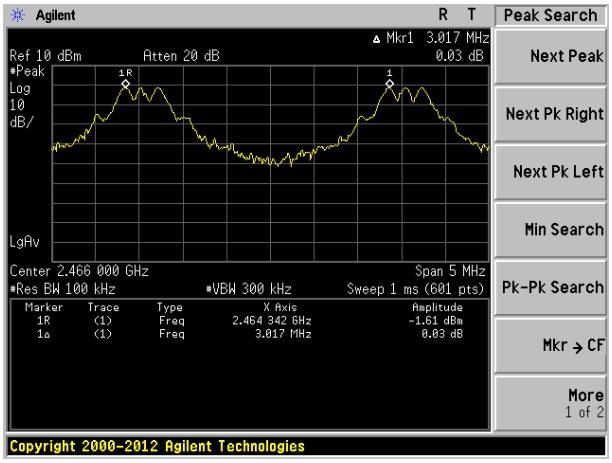
Test plot as follows:



Lowest channel

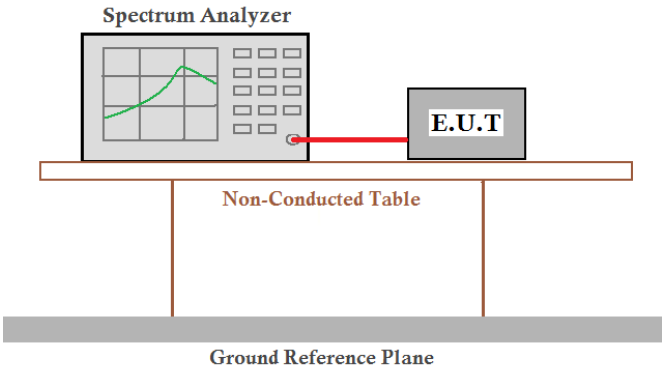


Middle channel



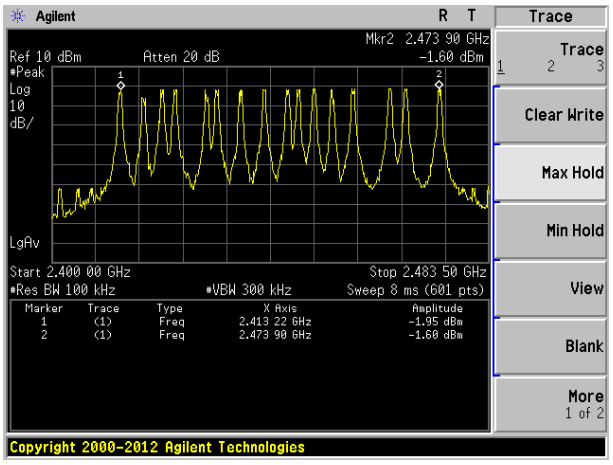
Highest channel

7.6 Hopping Channel Number

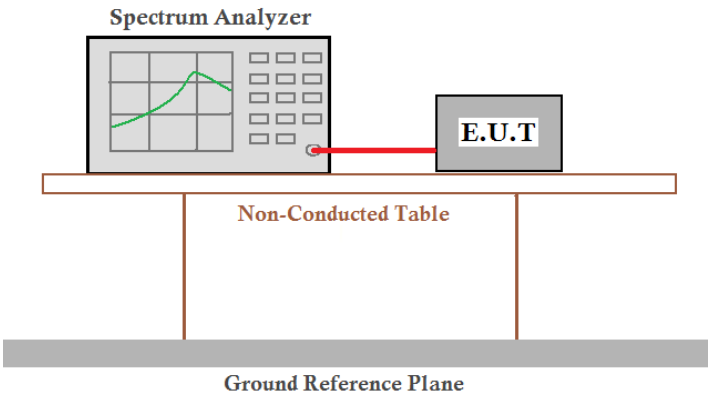
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data:

Hopping channel numbers	Limit	Result
16	15	Pass



7.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Frequency	Ton (ms)	Dwell time(ms)	Limit(ms)	Result
2.408GHz	1.333	25.59	400	Pass
2.440GHz	1.333	17.06	400	Pass
2.475GHz	1.333	25.59	400	Pass

The formula as below:

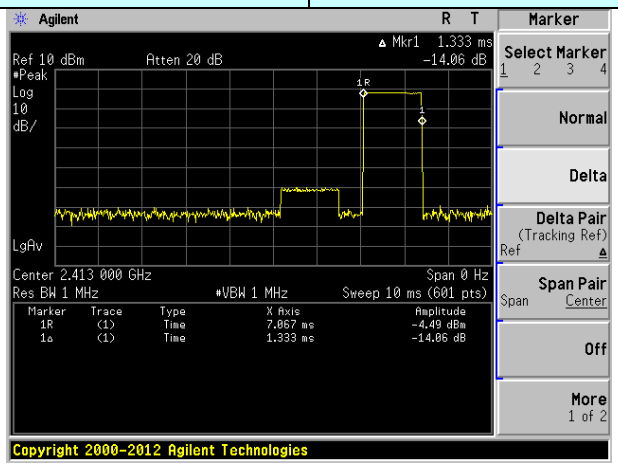
2408MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=1.333ms*3*0.4*16=25.59ms

2440MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=1.333ms*2*0.4*16=17.06ms

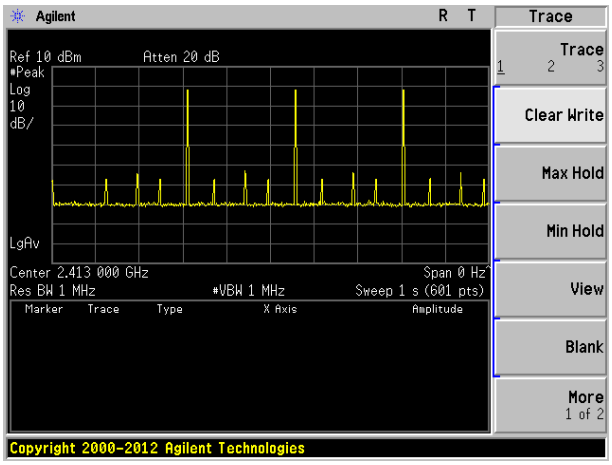
2475MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=1.333ms*3*0.4*16=25.59ms

Test plot as follows:

Frequency:	2408MHz

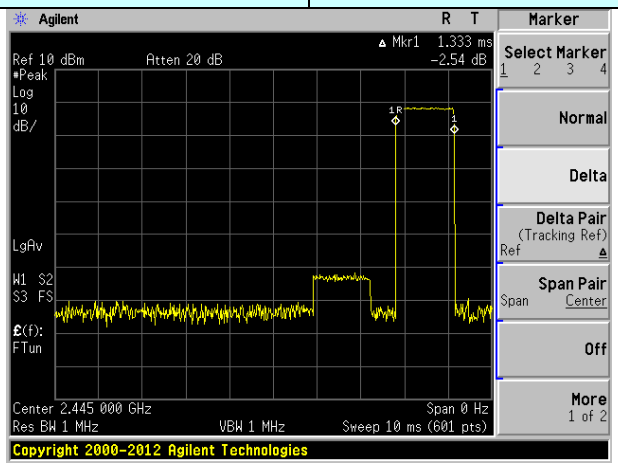


Ton

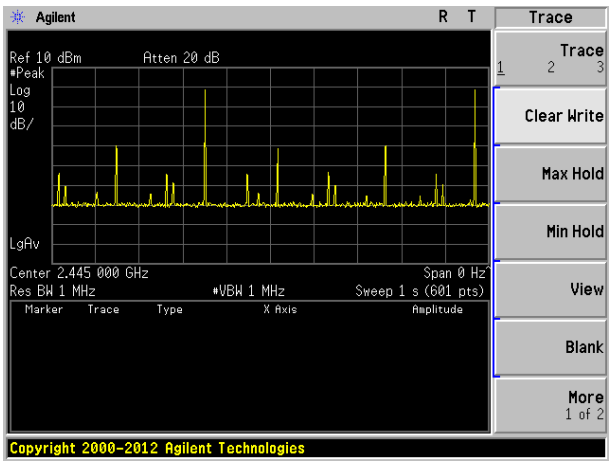


Ton times in 1s

Frequency:	2440MHz

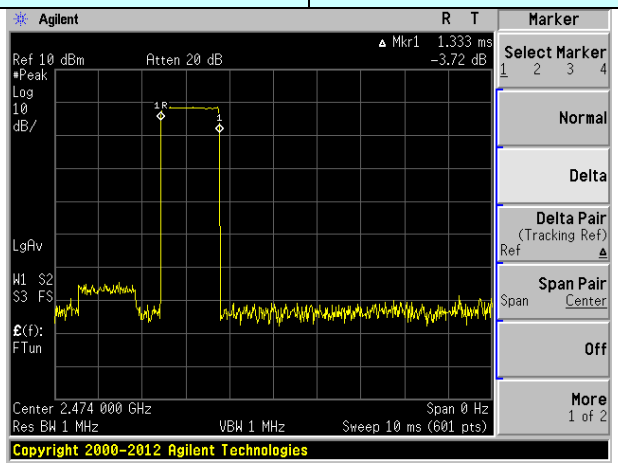


Ton

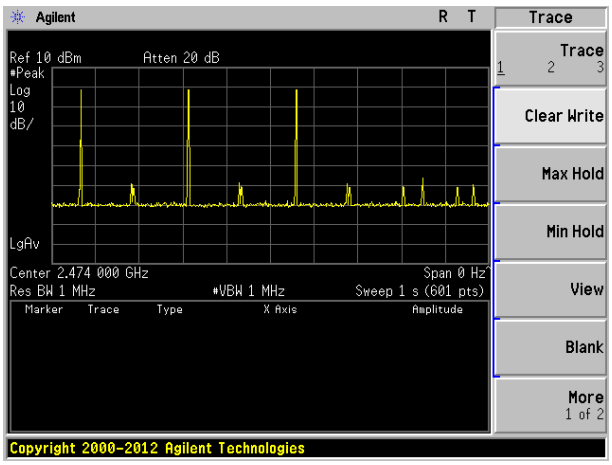


Ton times in 1s

Frequency:	2475MHz



Ton



Ton times in 1s

7.8 Pseudorandom Frequency Hopping Sequence

Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:

a(1): 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.

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.

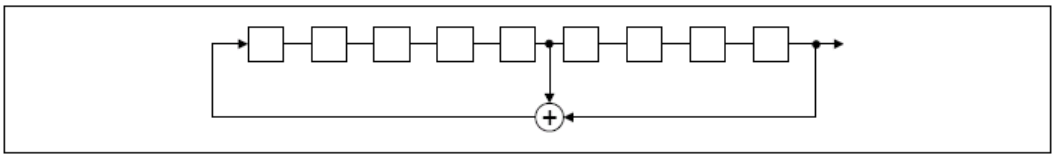
(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

EUT Pseudorandom Frequency Hopping Sequence

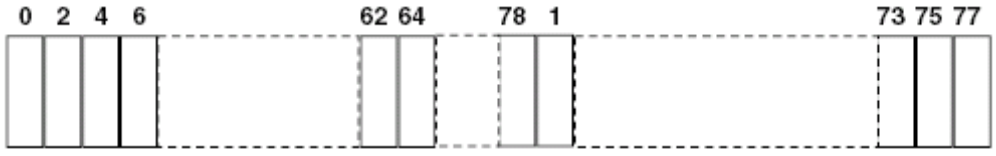
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- *Number of shift register stages: 9*
- *Length of pseudo-random sequence: 2^9 -1 = 511 bits*
- *Longest sequence of zeros: 8 (non-inverted signal)*



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



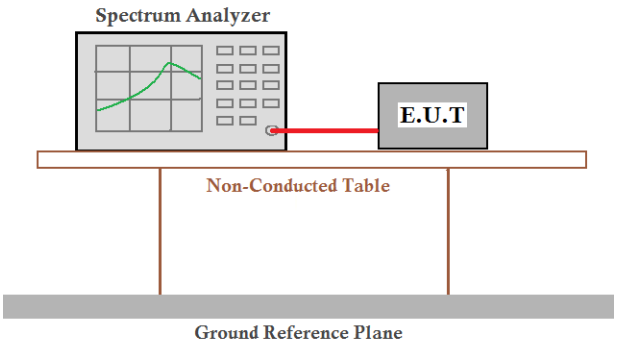
Each frequency used equally on the average by each transmitter.

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.

it permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted.

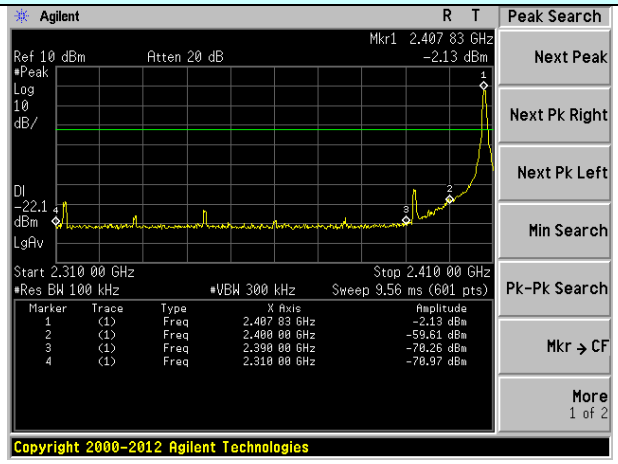
7.9 Band Edge

7.9.1 Conducted Emission Method

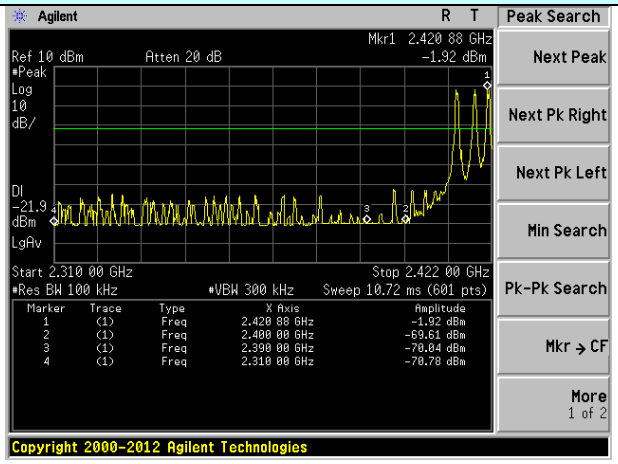
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by 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:	
Test Instruments:	Refer to section6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:

Test channel:	Lowest channel

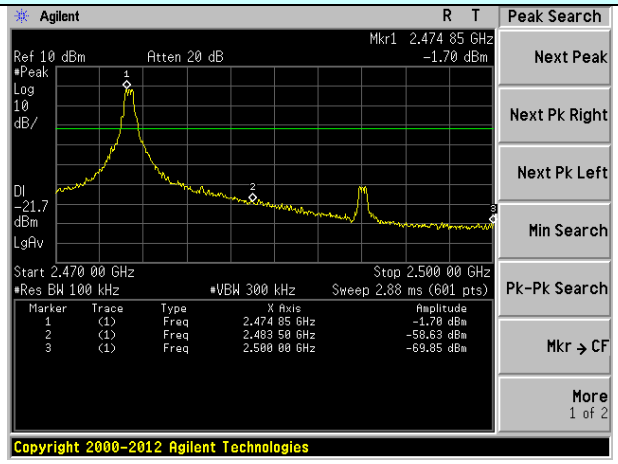


No-hopping mode

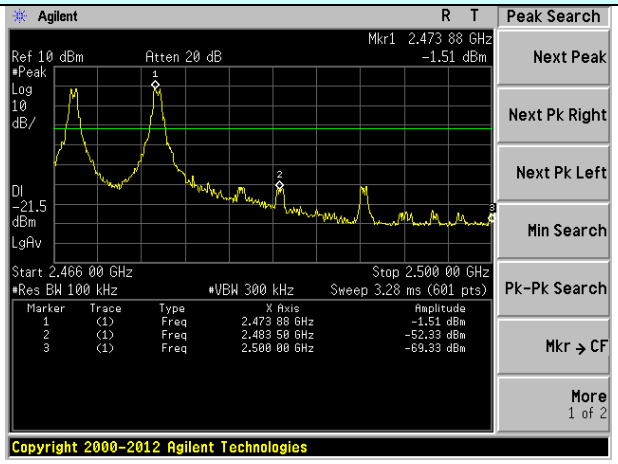


Hopping mode

Test channel:	Highest channel

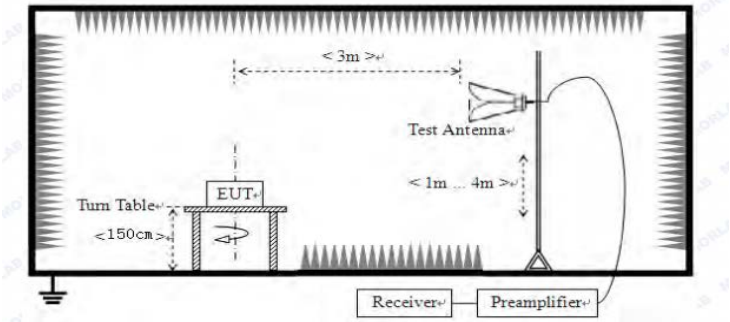


No-hopping mode



Hopping mode

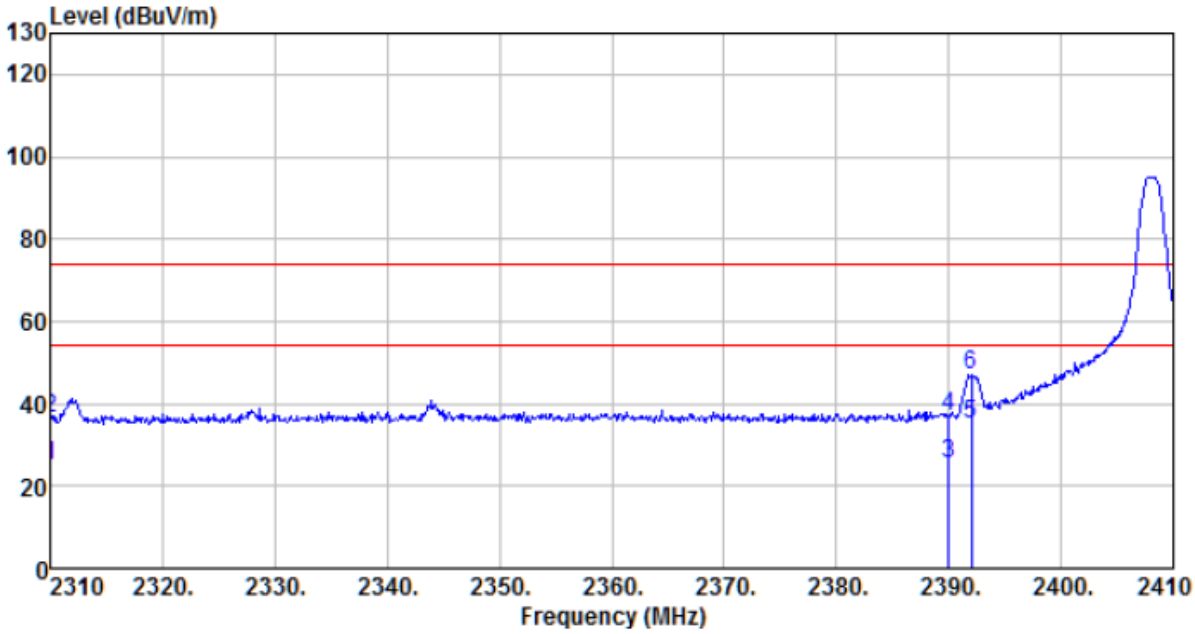
7.9.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>All restriction band have been tested, and 2.3GHz to 2.5GHz band is the worse case</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.00</td><td>Average Value</td></tr>
<tr><td>74.00</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td> 
</td></tr>
<tr><td>Test Procedure:</td><td>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.
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.</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 6.0 for details</td></tr>
<tr><td>Test mode:</td><td>Non hopping mode is worse case and only reported</td></tr>
<tr><td>Temp. / Hum.</td><td>Temp.: 25 °C Humid.: 52% Press.: 1 012mbar</td></tr>
<tr><td>Test results:</td><td>Pass</td></tr>
</table>

Remark:

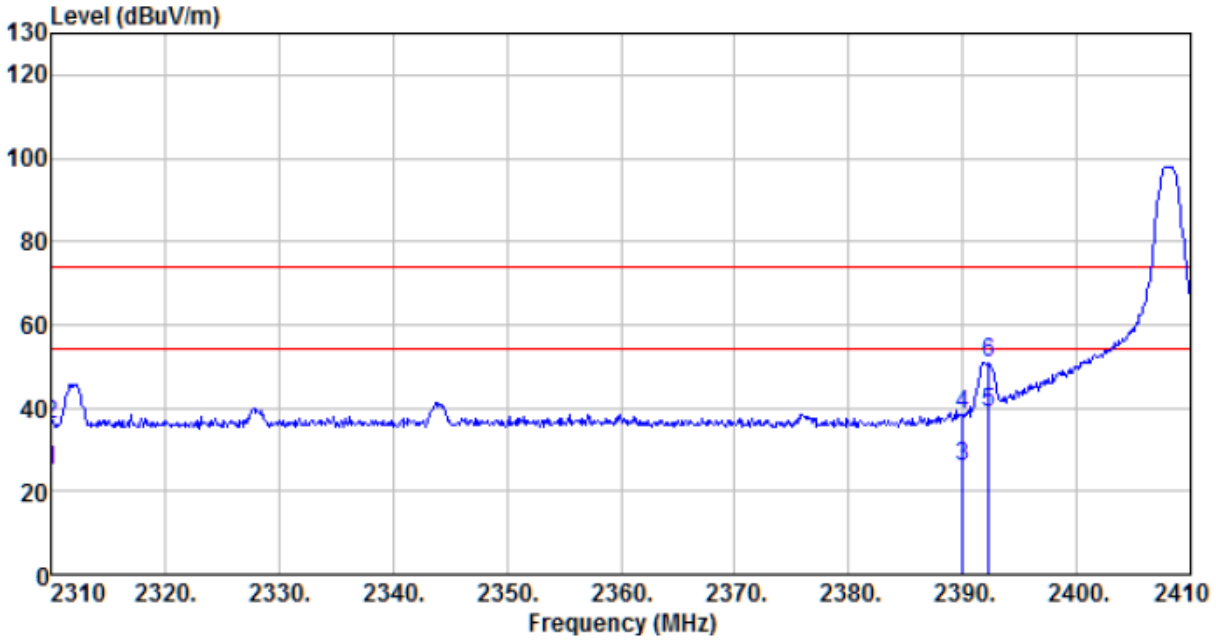
1. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

Test channel:	Lowest	Polarization:	Vertical



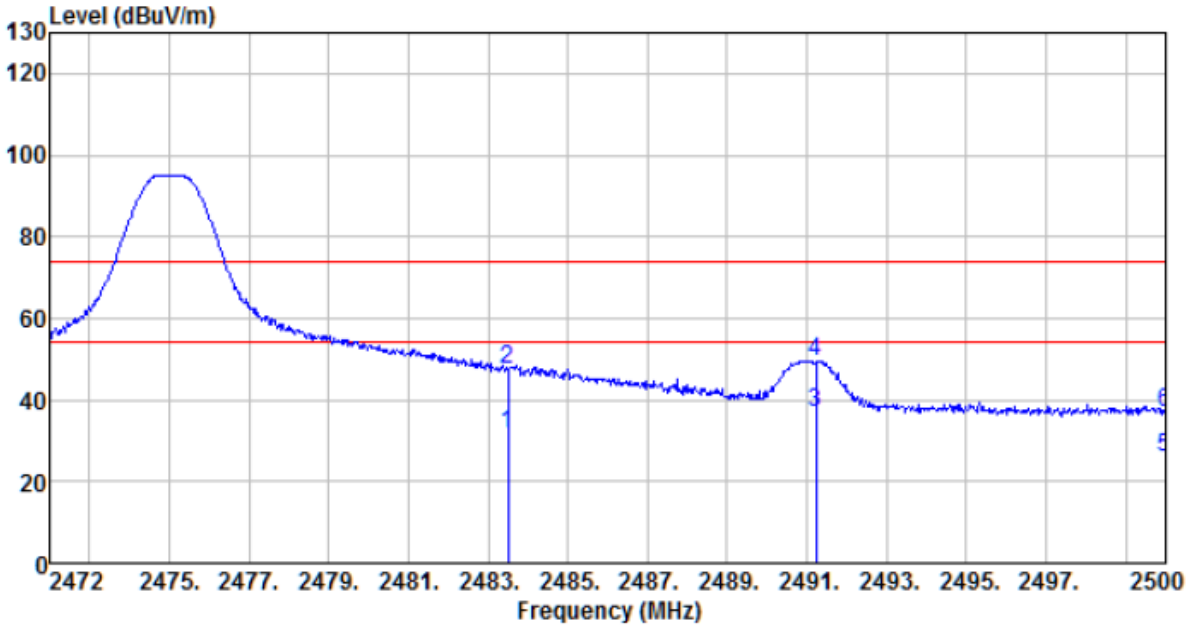
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
2310.000	33.54	27.14	6.19	42.04	24.83	54.00	-29.17	Average
2310.000	45.39	27.14	6.19	42.04	36.68	74.00	-37.32	Peak
2390.000	33.94	27.37	6.31	42.11	25.51	54.00	-28.49	Average
2390.000	45.40	27.37	6.31	42.11	36.97	74.00	-37.03	Peak
2392.000	43.47	27.39	6.32	42.11	35.07	54.00	-18.93	Average
2392.000	55.43	27.39	6.32	42.11	47.03	74.00	-26.97	Peak

Test channel:	Lowest	Polarization:	Horizontal



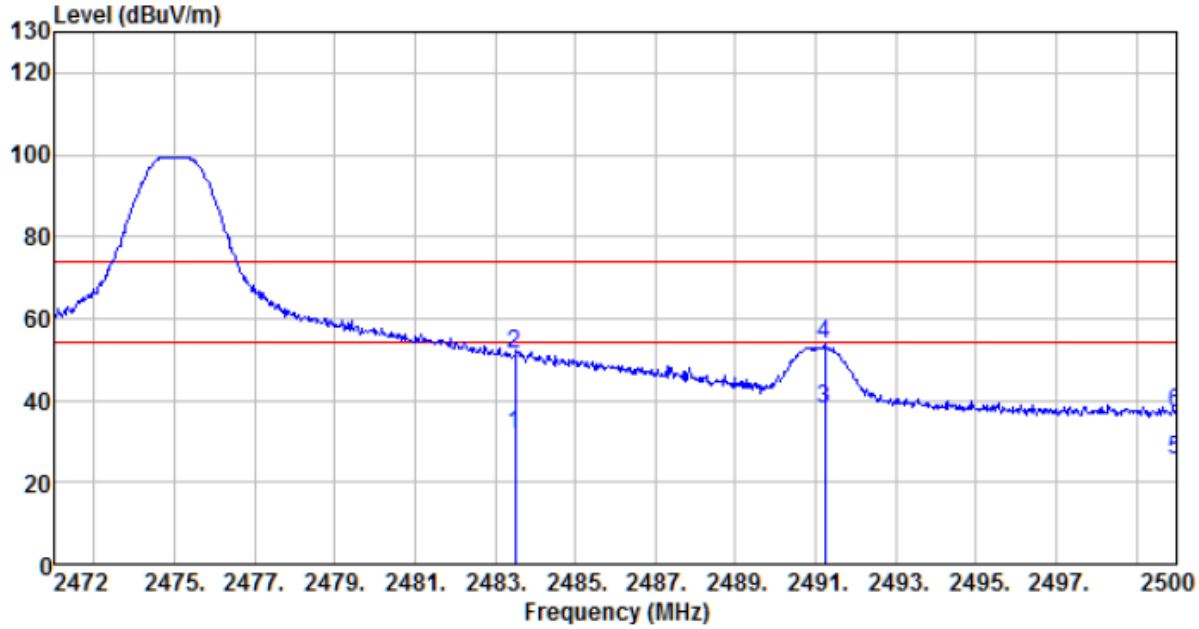
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV	dBuV/m	dB	
2310.000	33.45	27.14	6.19	42.04	24.74	54.00	-29.26	Average
2310.000	44.90	27.14	6.19	42.04	36.19	74.00	-37.81	Peak
2390.000	34.50	27.37	6.31	42.11	26.07	54.00	-27.93	Average
2390.000	46.94	27.37	6.31	42.11	38.51	74.00	-35.49	Peak
2392.300	47.43	27.39	6.32	42.11	39.03	54.00	-14.97	Average
2392.300	59.25	27.39	6.32	42.11	50.85	74.00	-23.15	Peak

Test channel:	Highest	Polarization:	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
2483.508	39.50	27.66	6.45	42.01	31.60	54.00	-22.40	Average
2483.508	55.53	27.66	6.45	42.01	47.63	74.00	-26.37	Peak
2491.236	44.70	27.68	6.46	42.01	36.83	54.00	-17.17	Average
2491.236	57.19	27.68	6.46	42.01	49.32	74.00	-24.68	Peak
2500.000	33.56	27.70	6.47	42.00	25.73	54.00	-28.27	Average
2500.000	45.00	27.70	6.47	42.00	37.17	74.00	-36.83	Peak

Test channel:	Highest	Polarization:	Horizontal



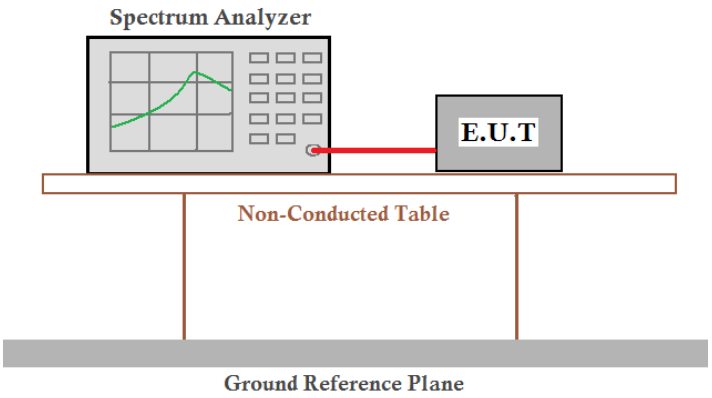
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
2483.508	39.50	27.66	6.45	42.01	31.60	54.00	-22.40	Average
2483.508	59.14	27.66	6.45	42.01	51.24	74.00	-22.76	Peak
2491.236	45.95	27.68	6.46	42.01	38.08	54.00	-15.92	Average
2491.236	61.38	27.68	6.46	42.01	53.51	74.00	-20.49	Peak
2500.000	33.40	27.70	6.47	42.00	25.57	54.00	-28.43	Average
2500.000	44.91	27.70	6.47	42.00	37.08	74.00	-36.92	Peak

Remark:

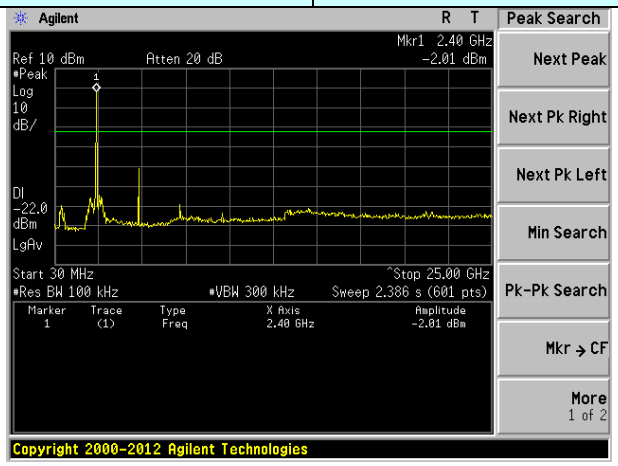
1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

7.10 Spurious Emission

7.10.1 Conducted Emission Method

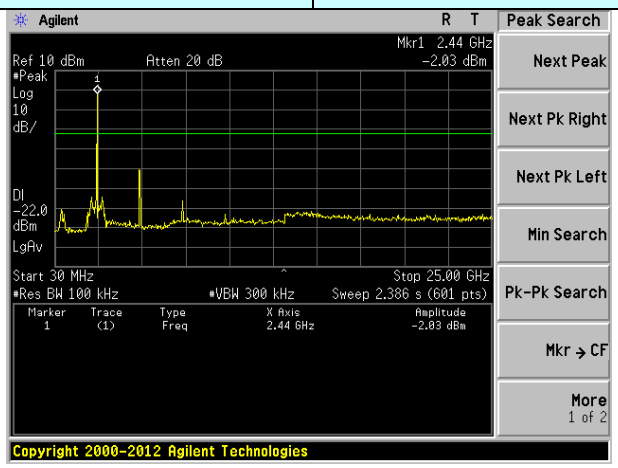
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 Meas Guidance V04
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional 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:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Non hopping mode is worse case and only reported
Test results:	Pass

Test channel:	Lowest channel



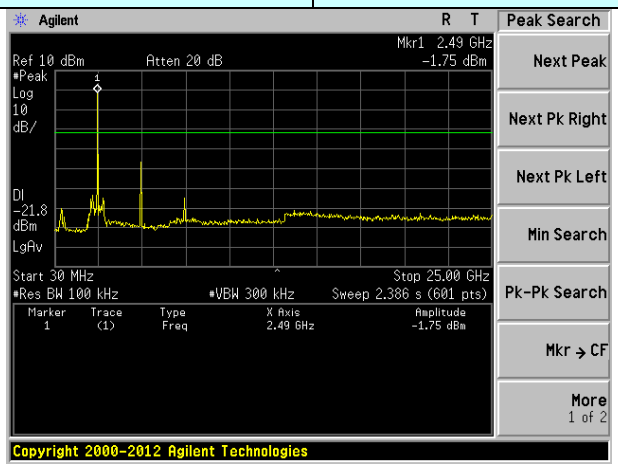
30MHz~25GHz

Test channel:	Middle channel



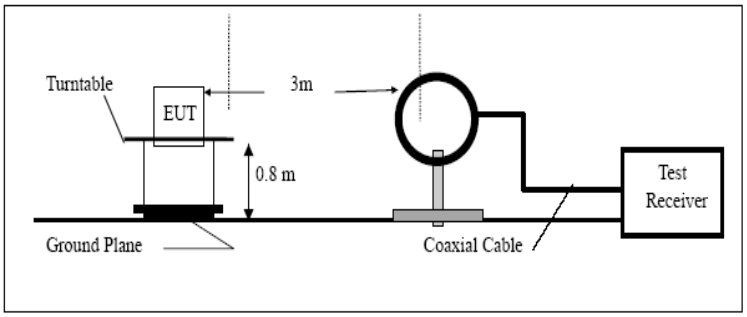
30MHz~25GHz

Test channel:	Highest channel

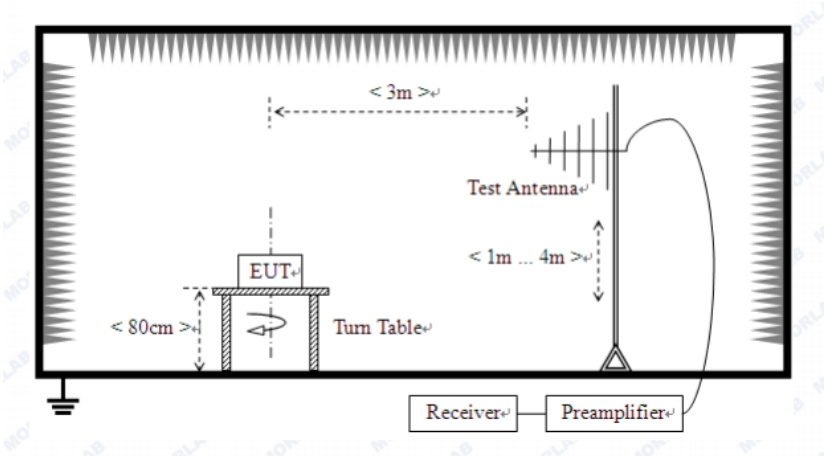


30MHz~25GHz

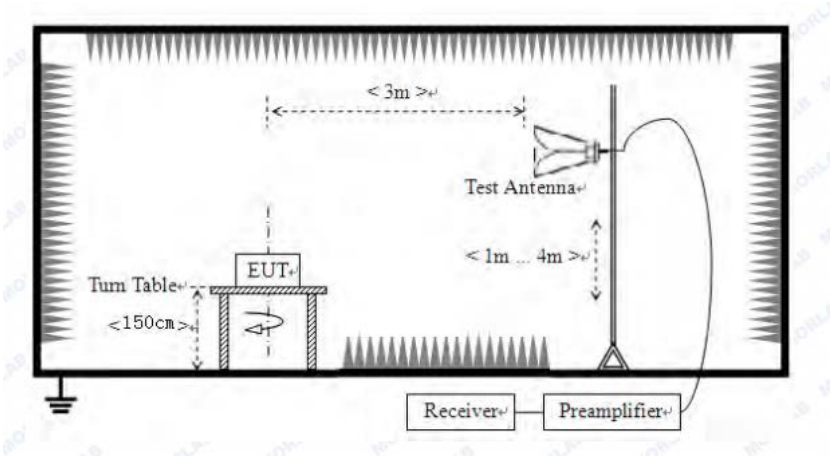
7.10.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>9kHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Value</th></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average</td></tr>
</table>
</td></tr>
<tr><td>Limit:
(Spurious Emissions)</td><td>
<table>
<tr><th>Frequency</th><th>Limit (uV/m)</th><th>Value</th><th>Measurement Distance</th></tr>
<tr><td>30MHz-88MHz</td><td>100</td><td>QP</td><td rowspan="6">3m</td></tr>
<tr><td>88MHz-216MHz</td><td>150</td><td>QP</td></tr>
<tr><td>216MHz-960MHz</td><td>200</td><td>QP</td></tr>
<tr><td>960MHz-1GHz</td><td>500</td><td>QP</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>Average</td></tr>
<tr><td>5000</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>Below 30MHz
 

Below 1GHz</td></tr>
</table>



Above 1GHz



Test Procedure:

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:	Non hopping mode is worse case and only reported					
Temp. / Hum.	Temp.:	25 °C	Humid.:	52%	Press.:	1 012mbar
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.

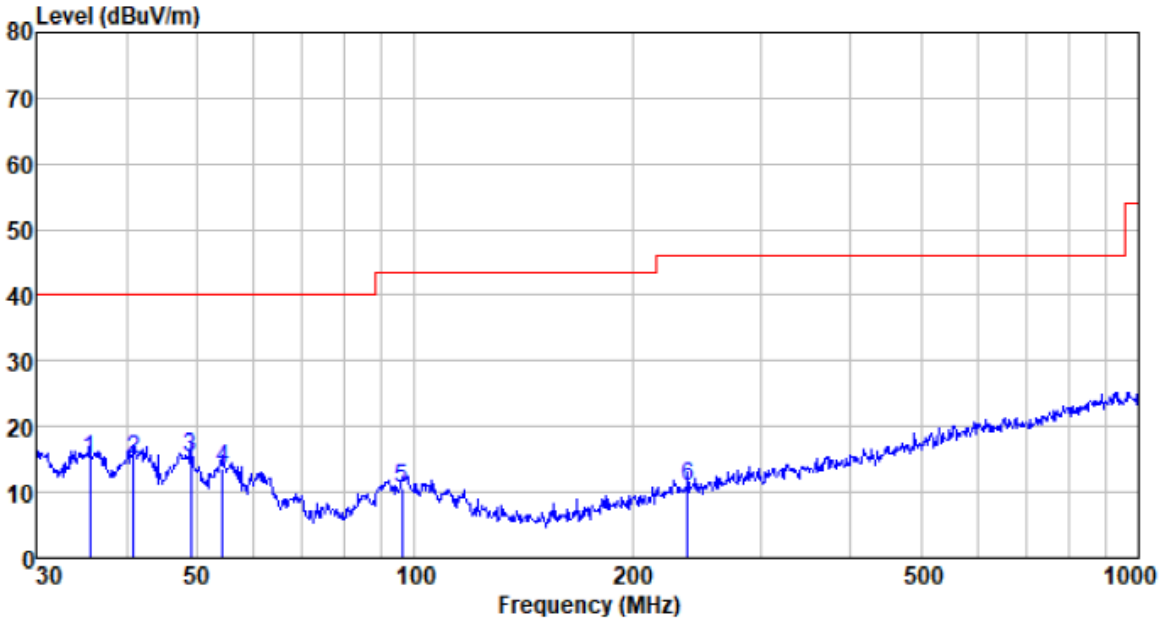
Measurement data:

■ **Below 30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

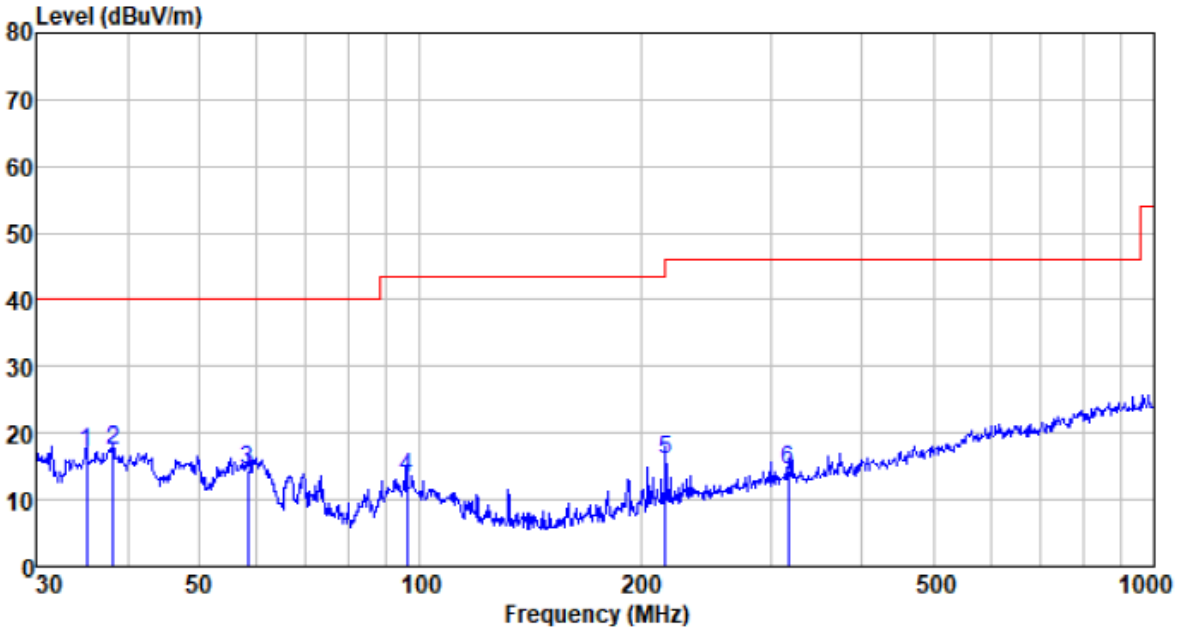
■ **30MHz ~ 1GHz**

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
35.624	38.51	11.42	0.62	35.40	15.15	40.00	-24.85	QP
40.845	37.84	12.21	0.67	35.71	15.01	40.00	-24.99	QP
49.014	38.49	12.29	0.76	36.13	15.41	40.00	-24.59	QP
54.261	37.17	11.85	0.81	36.24	13.59	40.00	-26.41	QP
96.099	34.42	11.65	1.16	36.69	10.54	43.50	-32.96	QP
238.310	34.39	11.78	2.06	37.37	10.86	46.00	-35.14	QP

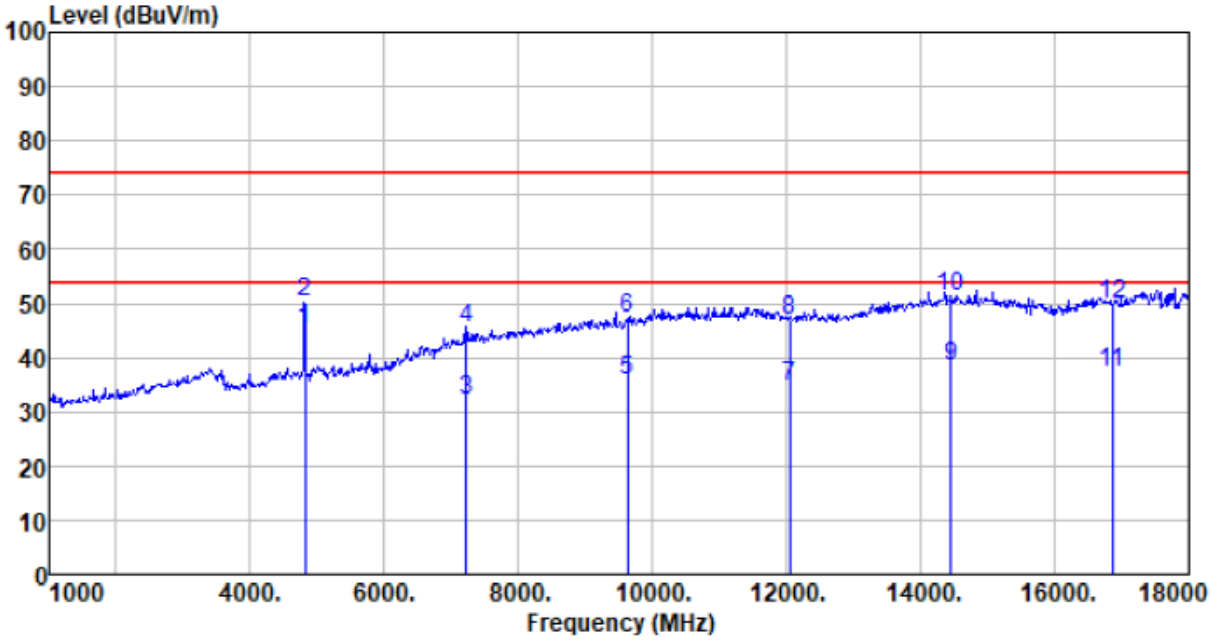
Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
35.128	40.60	11.33	0.61	35.36	17.18	40.00	-22.82	QP
38.212	40.41	11.92	0.64	35.56	17.41	40.00	-22.59	QP
58.203	38.46	11.48	0.84	36.30	14.48	40.00	-25.52	QP
96.099	37.25	11.65	1.16	36.69	13.37	43.50	-30.13	QP
216.024	40.43	11.02	1.93	37.35	16.03	46.00	-29.97	QP
317.701	35.38	13.93	2.45	37.44	14.32	46.00	-31.68	QP

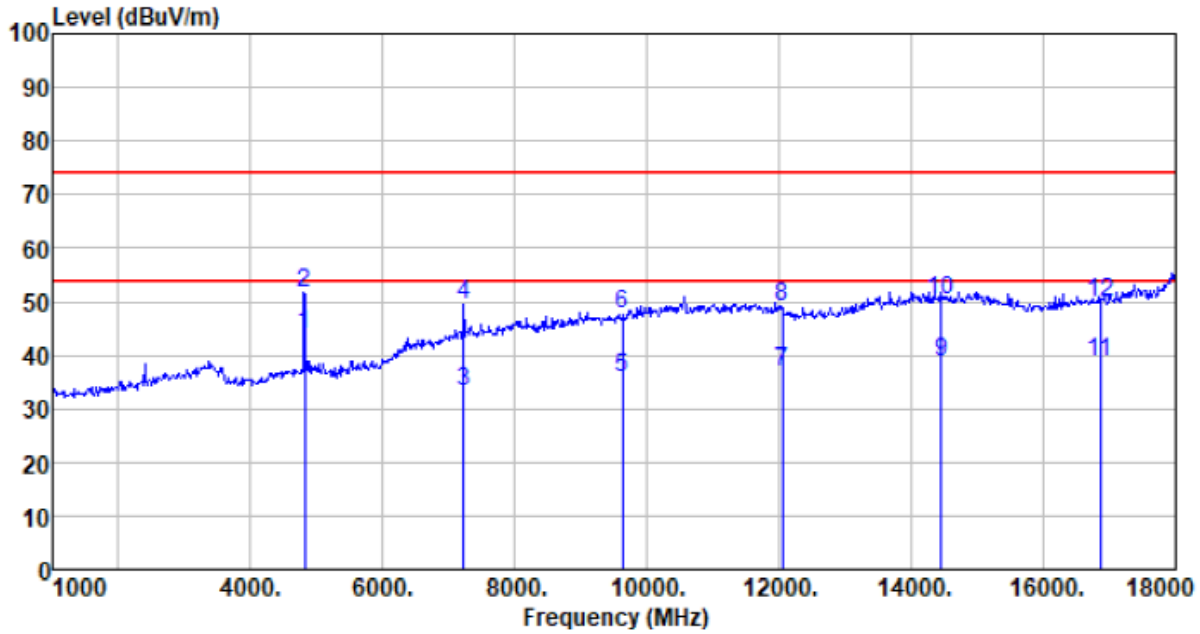
■ **Above 1GHz**

Test channel:	Lowest	Polarization:	Vertical



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV	dBuV/m	dB	
4816.000	41.73	31.37	9.37	37.58	44.89	54.00	-9.11	Average
4816.000	47.09	31.37	9.37	37.58	50.25	74.00	-23.75	Peak
7224.000	20.41	35.94	11.23	35.45	32.13	54.00	-21.87	Average
7224.000	33.71	35.94	11.23	35.45	45.43	74.00	-28.57	Peak
9632.000	20.13	37.79	12.92	34.98	35.86	54.00	-18.14	Average
9632.000	31.40	37.79	12.92	34.98	47.13	74.00	-26.87	Peak
12040.000	17.99	38.68	14.56	36.41	34.82	54.00	-19.18	Average
12040.000	30.04	38.68	14.56	36.41	46.87	74.00	-27.13	Peak
14448.000	16.74	41.53	16.13	36.10	38.30	54.00	-15.70	Average
14448.000	29.71	41.53	16.13	36.10	51.27	74.00	-22.73	Peak
16856.000	16.16	39.87	17.49	36.25	37.27	54.00	-16.73	Average
16856.000	28.87	39.87	17.49	36.25	49.98	74.00	-24.02	Peak

Test channel:	Lowest	Polarization:	Horizontal

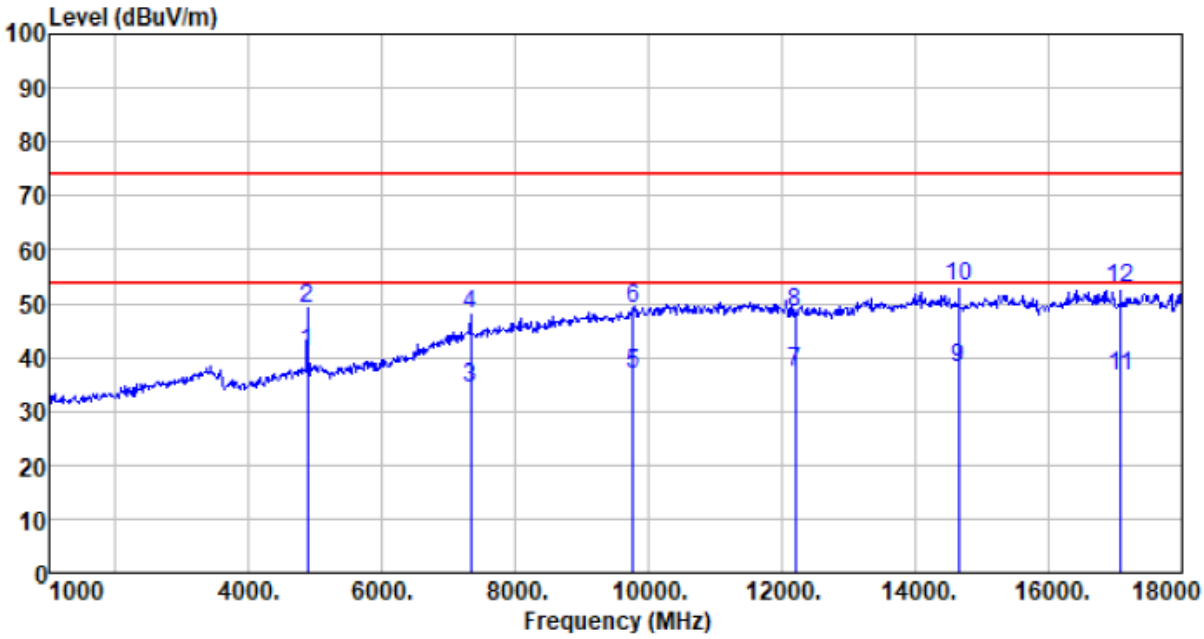


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
4816.000	40.89	31.37	9.37	37.58	44.05	54.00	-9.95	Average
4816.000	48.60	31.37	9.37	37.58	51.76	74.00	-22.24	Peak
7224.000	21.33	35.94	11.23	35.45	33.05	54.00	-20.95	Average
7224.000	37.73	35.94	11.23	35.45	49.45	74.00	-24.55	Peak
9632.000	20.24	37.79	12.92	34.98	35.97	54.00	-18.03	Average
9632.000	31.90	37.79	12.92	34.98	47.63	74.00	-26.37	Peak
12040.000	19.89	38.68	14.56	36.41	36.72	54.00	-17.28	Average
12040.000	32.15	38.68	14.56	36.41	48.98	74.00	-25.02	Peak
14448.000	17.30	41.53	16.13	36.10	38.86	54.00	-15.14	Average
14448.000	28.52	41.53	16.13	36.10	50.08	74.00	-23.92	Peak
16856.000	17.68	39.87	17.49	36.25	38.79	54.00	-15.21	Average
16856.000	28.89	39.87	17.49	36.25	50.00	74.00	-24.00	Peak

Remark:

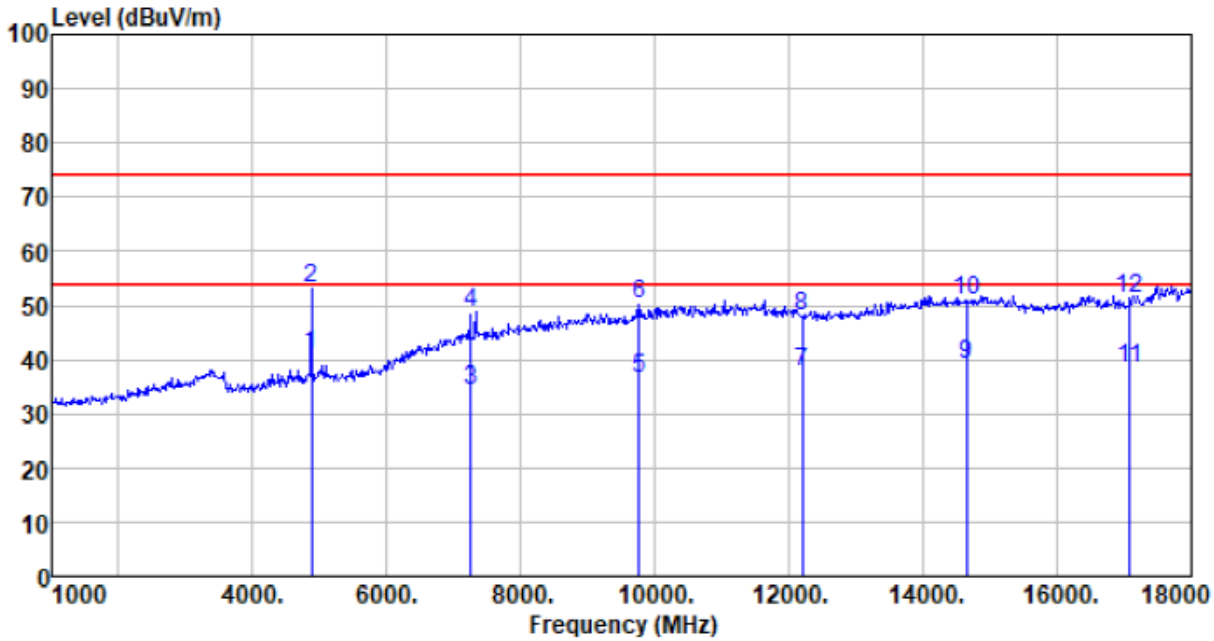
1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Test channel:	Middle	Polarization:	Vertical



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV	dBuV/m	dB	
4880.000	37.74	31.48	9.42	37.59	41.05	54.00	-12.95	Average
4880.000	45.89	31.48	9.42	37.59	49.20	74.00	-24.80	Peak
7320.000	22.16	36.17	11.30	35.47	34.16	54.00	-19.84	Average
7320.000	36.07	36.17	11.30	35.47	48.07	74.00	-25.93	Peak
9760.000	20.87	38.07	13.01	35.09	36.86	54.00	-17.14	Average
9760.000	33.19	38.07	13.01	35.09	49.18	74.00	-24.82	Peak
12200.000	20.28	38.62	14.67	36.44	37.13	54.00	-16.87	Average
12200.000	31.31	38.62	14.67	36.44	48.16	74.00	-25.84	Peak
14640.000	16.26	41.28	16.24	35.89	37.89	54.00	-16.11	Average
14640.000	31.33	41.28	16.24	35.89	52.96	74.00	-21.04	Peak
17080.000	15.04	40.33	17.60	36.39	36.58	54.00	-17.42	Average
17080.000	31.07	40.33	17.60	36.39	52.61	74.00	-21.39	Peak

Test channel:	Middle	Polarization:	Horizontal

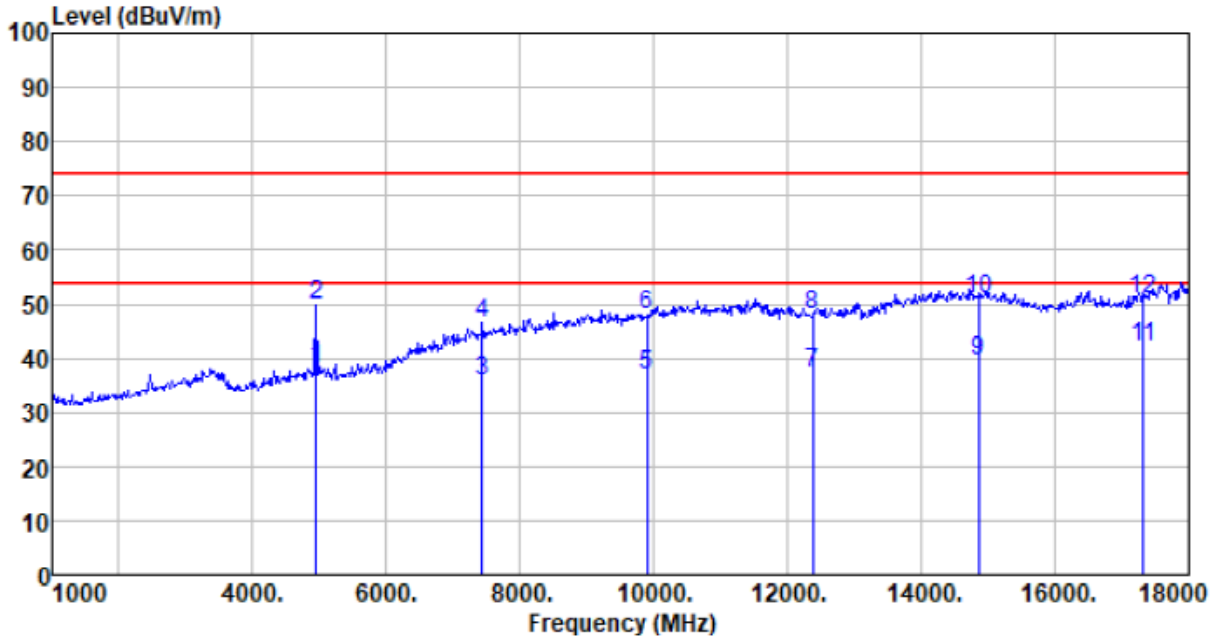


Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV	dBuV/m	dB	
4880.000	37.51	31.48	9.42	37.59	40.82	54.00	-13.18	Average
4880.000	50.00	31.48	9.42	37.59	53.31	74.00	-20.69	Peak
7256.000	22.57	36.01	11.25	35.45	34.38	54.00	-19.62	Average
7256.000	37.03	36.01	11.25	35.45	48.84	74.00	-25.16	Peak
9760.000	20.43	38.07	13.01	35.09	36.42	54.00	-17.58	Average
9760.000	34.20	38.07	13.01	35.09	50.19	74.00	-23.81	Peak
12200.000	20.67	38.62	14.67	36.44	37.52	54.00	-16.48	Average
12200.000	31.11	38.62	14.67	36.44	47.96	74.00	-26.04	Peak
14640.000	17.47	41.28	16.24	35.89	39.10	54.00	-14.90	Average
14640.000	29.27	41.28	16.24	35.89	50.90	74.00	-23.10	Peak
17080.000	16.99	40.33	17.60	36.39	38.53	54.00	-15.47	Average
17080.000	29.85	40.33	17.60	36.39	51.39	74.00	-22.61	Peak

Remark:

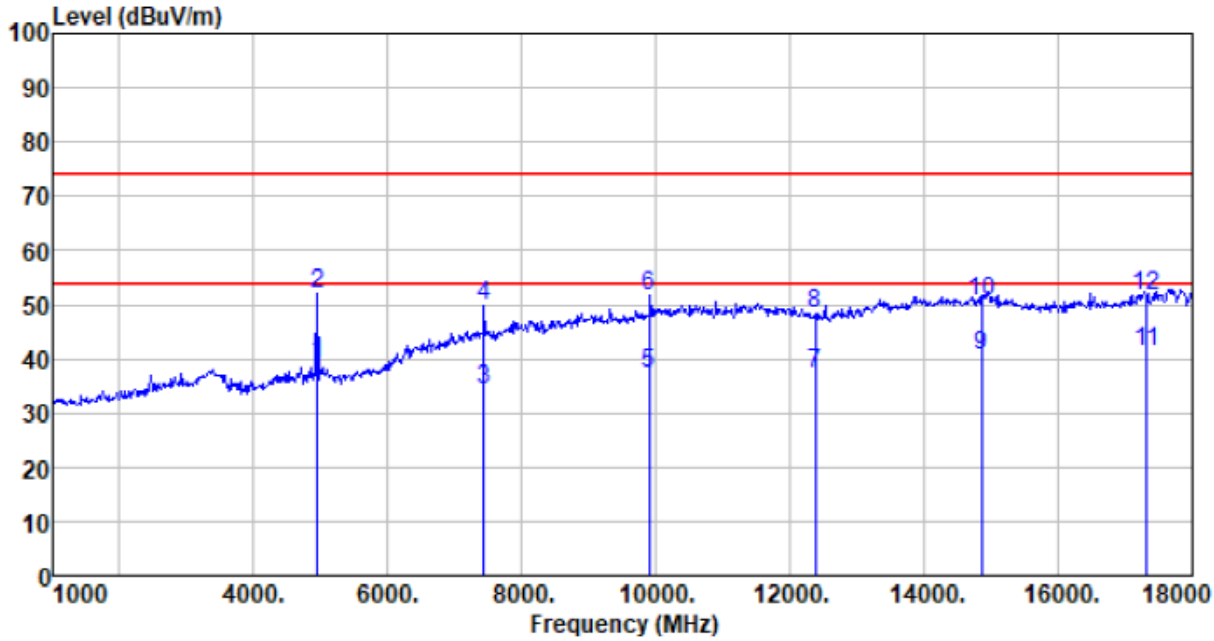
1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Test channel:	Highest	Polarization:	Vertical



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV	dBuV/m	dB	
4950.000	34.39	31.61	9.47	37.60	37.87	54.00	-16.13	Average
4950.000	46.19	31.61	9.47	37.60	49.67	74.00	-24.33	Peak
7425.000	23.39	36.42	11.38	35.49	35.70	54.00	-18.30	Average
7425.000	34.07	36.42	11.38	35.49	46.38	74.00	-27.62	Peak
9900.000	20.70	38.38	13.11	35.21	36.98	54.00	-17.02	Average
9900.000	31.84	38.38	13.11	35.21	48.12	74.00	-25.88	Peak
12375.000	20.57	38.55	14.79	36.48	37.43	54.00	-16.57	Average
12375.000	30.96	38.55	14.79	36.48	47.82	74.00	-26.18	Peak
14850.000	17.96	40.94	16.36	35.66	39.60	54.00	-14.40	Average
14850.000	29.38	40.94	16.36	35.66	51.02	74.00	-22.98	Peak
17325.000	19.07	41.65	17.73	36.37	42.08	54.00	-11.92	Average
17325.000	27.97	41.65	17.73	36.37	50.98	74.00	-23.02	Peak

Test channel:	Highest	Polarization:	Horizontal



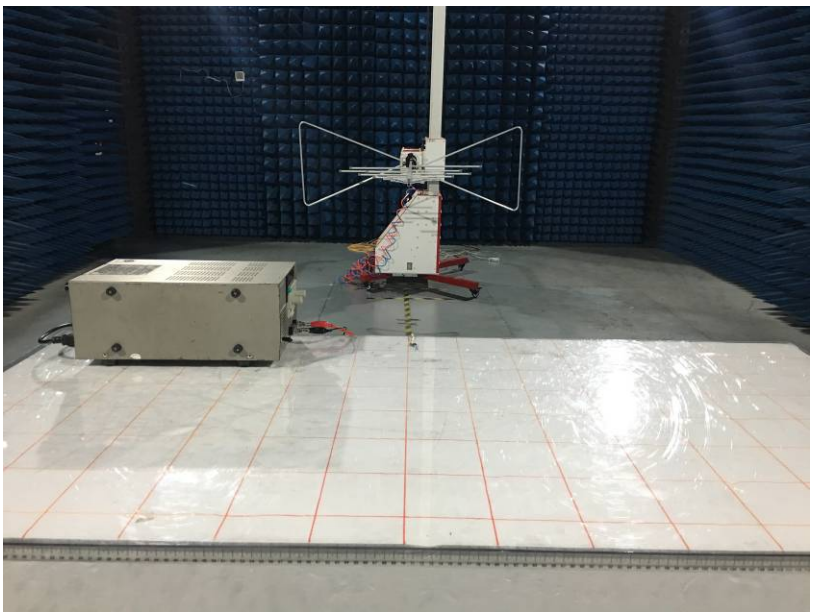
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
4950.000	35.75	31.61	9.47	37.60	39.23	54.00	-14.77	Average
4950.000	48.37	31.61	9.47	37.60	51.85	74.00	-22.15	Peak
7425.000	22.04	36.42	11.38	35.49	34.35	54.00	-19.65	Average
7425.000	37.36	36.42	11.38	35.49	49.67	74.00	-24.33	Peak
9900.000	21.12	38.38	13.11	35.21	37.40	54.00	-16.60	Average
9900.000	35.28	38.38	13.11	35.21	51.56	74.00	-22.44	Peak
12375.000	20.41	38.55	14.79	36.48	37.27	54.00	-16.73	Average
12375.000	31.35	38.55	14.79	36.48	48.21	74.00	-25.79	Peak
14850.000	19.03	40.94	16.36	35.66	40.67	54.00	-13.33	Average
14850.000	28.89	40.94	16.36	35.66	50.53	74.00	-23.47	Peak
17325.000	18.26	41.65	17.73	36.37	41.27	54.00	-12.73	Average
17325.000	28.56	41.65	17.73	36.37	51.57	74.00	-22.43	Peak

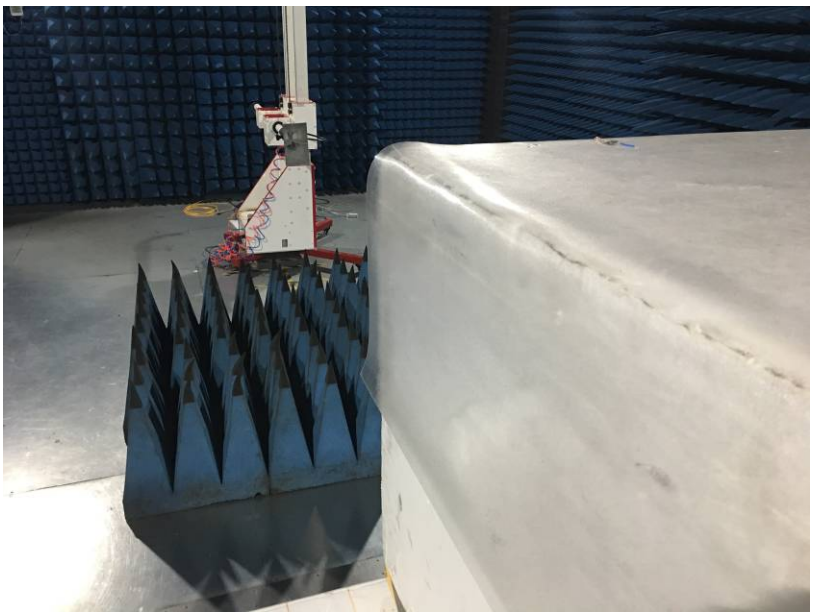
Remark:

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.*

8 Test Setup Photo

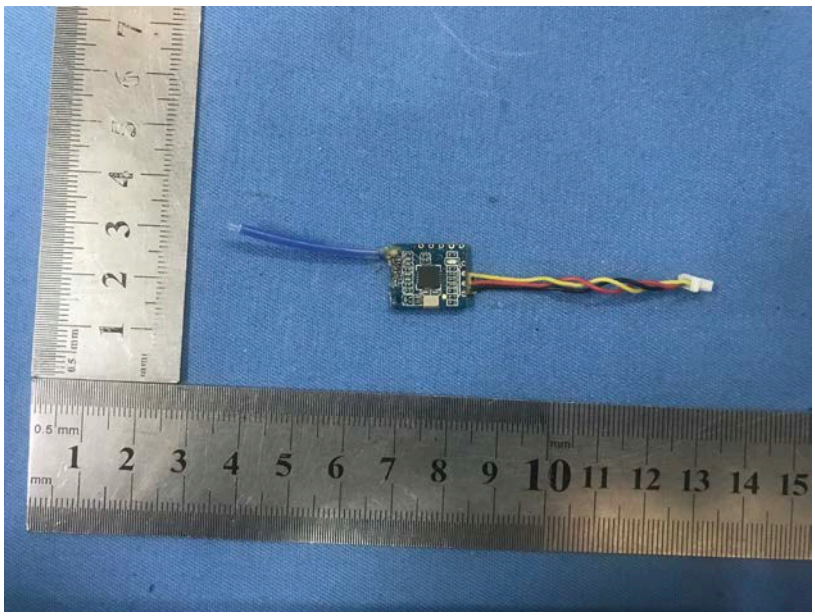
Radiated Emission

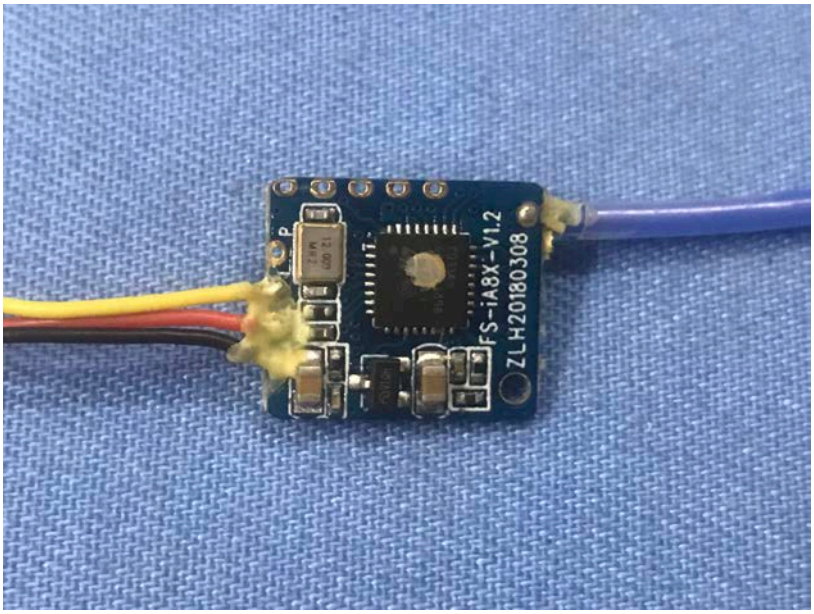


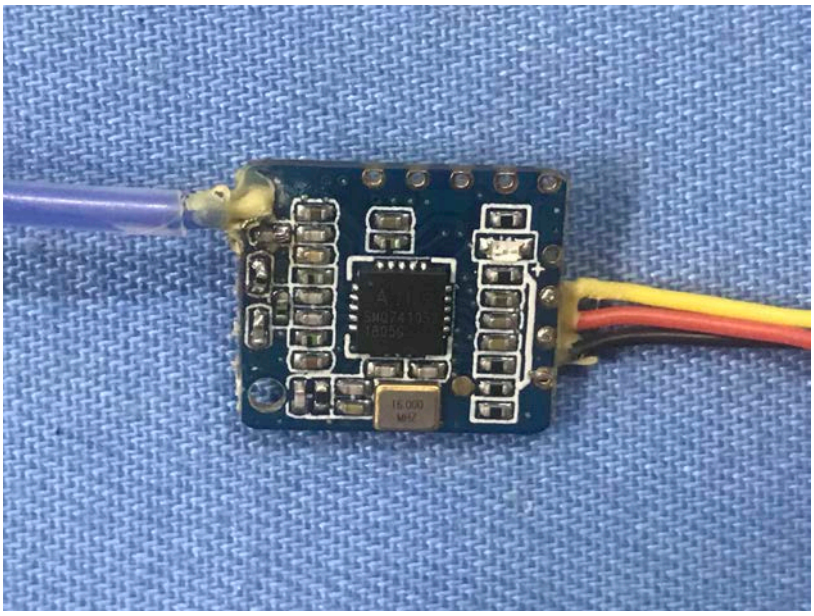


Conducted Emission

9 EUT Constructional Details







---End---