TEST 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:	8 Channel Receiver
Model No.:	FTr8B
Trade Mark:	FLYSKY
FCC ID:	N4ZFTR8B
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	June 01, 2020
Date of Test:	June 02-28, 2020
Date of report issued:	June 28, 2020
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	*June 28, 2020*	*Original*

Prepared By: ***Date:*** *June 28, 2020*

Project Engineer

Check By: ***Date:*** *June 28, 2020*

Reviewer

3 Contents

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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.

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

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(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:	8 Channel Receiver
Model No.:	FTr8B
Serial No.:	N/A
Test sample(s) ID:	GTS202006000002-1
Sample(s) Status	Engineer sample
Operation Frequency:	2402.15MHz~2479.85MHz
Channel numbers:	171
Modulation technology:	GMSK
Antenna Type:	Integral Antenna
Antenna gain:	ANT 1: -0.5dBi ANT 2: -0.5dBi
Power supply:	DC 3.5-9V

Remark: The system works in the frequency range of 2402.15MHz to 2479.85MHz. This band has been divided to 171 independent channels. Radio system uses 32 different channels; the minimum channel separation is ≥2MHz. 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.

Note:ANT 1 and ANT 2 can not transmit simultaneously

Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402.15	45	2421.95	89	2441.75	133	2462.75
2	2402.60	46	2422.40	90	2442.20	134	2463.20
3	2403.05	47	2422.85	91	2442.65	135	2463.65
4	2403.50	48	2423.30	92	2443.10	136	2464.10
5	2403.95	49	2423.75	93	2444.75	137	2464.55
6	2404.40	50	2424.20	94	2445.20	138	2465.00
7	2404.85	51	2424.65	95	2445.65	139	2465.45
8	2405.30	52	2425.10	96	2446.10	140	2465.90
9	2405.75	53	2425.55	97	2446.55	141	2466.35
10	2406.20	54	2426.00	98	2447.00	142	2466.80
11	2406.65	55	2426.45	99	2447.45	143	2467.25
12	2407.10	56	2426.90	100	2447.90	144	2467.70
13	2407.55	57	2427.35	101	2448.35	145	2468.15
14	2408.00	58	2427.80	102	2448.80	146	2468.60
15	2408.45	59	2428.25	103	2449.25	147	2469.05
16	2408.90	60	2428.70	104	2449.70	148	2469.50
17	2409.35	61	2429.15	105	2450.15	149	2469.95
18	2409.80	62	2429.60	106	2450.60	150	2470.40
19	2410.25	63	2430.05	107	2451.05	151	2470.85
20	2410.70	64	2430.50	108	2451.50	152	2471.30
21	2411.15	65	2430.95	109	2451.95	153	2471.75
22	2411.60	66	2431.40	110	2452.40	154	2472.20
23	2412.05	67	2431.85	111	2452.85	155	2472.65
24	2412.50	68	2432.30	112	2453.30	156	2473.10
25	2412.95	69	2432.75	113	2453.75	157	2473.55
26	2413.40	70	2433.20	114	2454.20	158	2474.00
27	2413.85	71	2433.65	115	2454.65	159	2474.45
28	2414.30	72	2434.10	116	2455.10	160	2474.90
29	2414.75	73	2434.55	117	2455.55	161	2475.35
30	2415.20	74	2435.00	118	2456.00	162	2475.80
31	2415.65	75	2435.45	119	2456.45	163	2476.25
32	2416.10	76	2435.90	120	2456.90	164	2476.70
33	2416.55	77	2436.35	121	2457.35	165	2477.15
34	2417.00	78	2436.80	122	2457.80	166	2477.60
35	2417.45	79	2437.25	123	2458.25	167	2478.05
36	2417.90	80	2437.70	124	2458.70	168	2478.50
37	2418.35	81	2438.15	125	2459.15	169	2478.95
38	2418.80	82	2438.60	126	2459.60	170	2479.40

39	2419.25	83	2439.05	127	2460.05	171	2479.85
40	2419.70	84	2439.50	128	2460.50		
41	2420.15	85	2439.95	129	2460.95		
42	2420.60	86	2440.40	130	2461.40		
43	2421.05	87	2440.85	131	2461.85		
44	2421.50	88	2441.30	132	2462.30		

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	2402.15MHz
The middle channel	2440.40MHz/2441.75MHz
The Highest channel	2479.85MHz

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
Remark: During the test, the test voltage was tuned from DC3.5 to DC9.0V, and found that the worst case was the DC9.0V. So the report just shows that condition's data.	

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 381383.

● **IC —Registration No.: 9079A**

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

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.4 Test Location

All other tests were performed at:

Global United Technology Services Co., Ltd.
Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480
Fax: 0755-27798960

5.5 Description of Support Units

Manufacturer	Description	Model	Serial Number
ShenZhen FLYSKY Technology Co.,Ltd	Remote control	F6S	N/A
MEILI	DC POWER SUPPLY	MCH-305A	011121168

5.6 Deviation from Standards

None.

5.7 Abnormalities from Standard Conditions

None.

5.8 Additional Instructions

Software (Used for test) from client

Built-in by manufacturer, power set default.

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. 25 2020	June. 24 2021
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021
9	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021
10	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021
11	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021
15	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021
16	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021
19	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 19 2019	Oct. 18 2020
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 19 2019	Oct. 18 2020
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 19 2019	Oct. 18 2020
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021

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. 25 2020	June. 24 2021
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021

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. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

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.

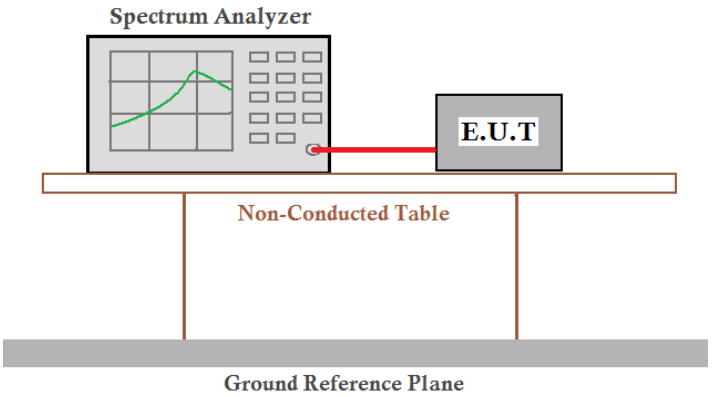
15.247(c) (1)(i) requirement:

(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 -0.5dBi, reference to the appendix II for details.

7.2 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
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

ANT 1:

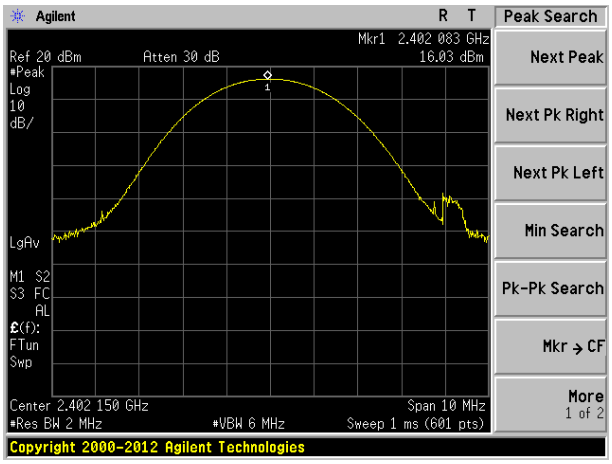
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	16.03	20.97	Pass
Middle	16.47		
Highest	15.76		

ANT 2:

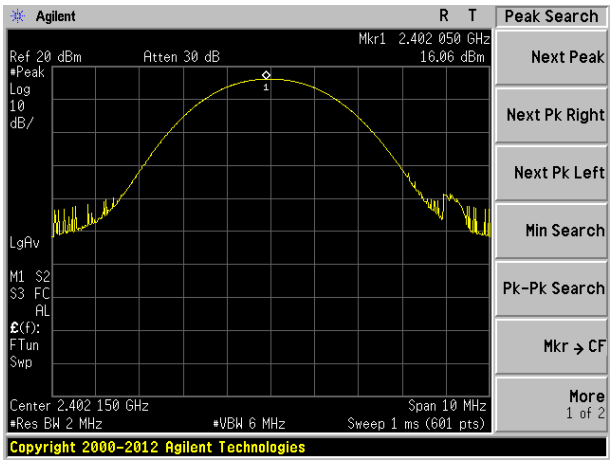
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	16.06	20.97	Pass
Middle	16.47		
Highest	15.74		

Test plot as follows:

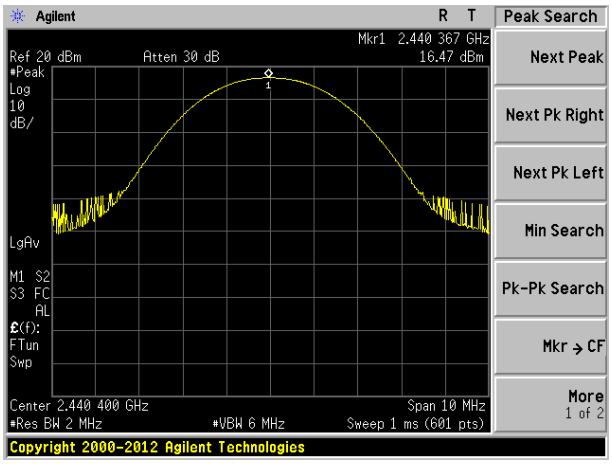
ANT 1

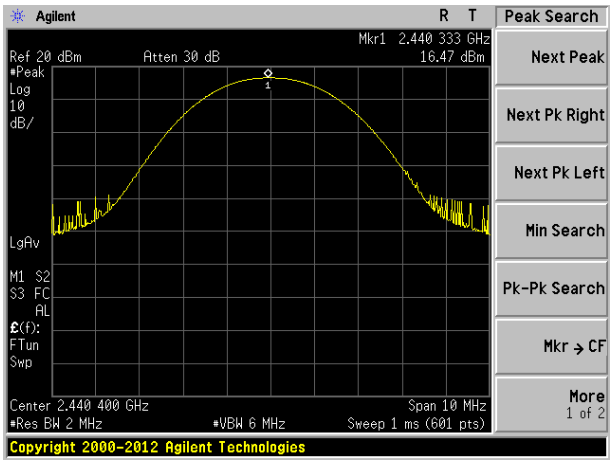


ANT 2

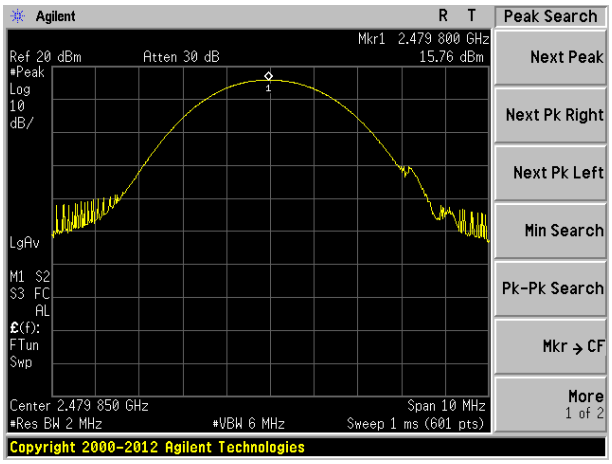


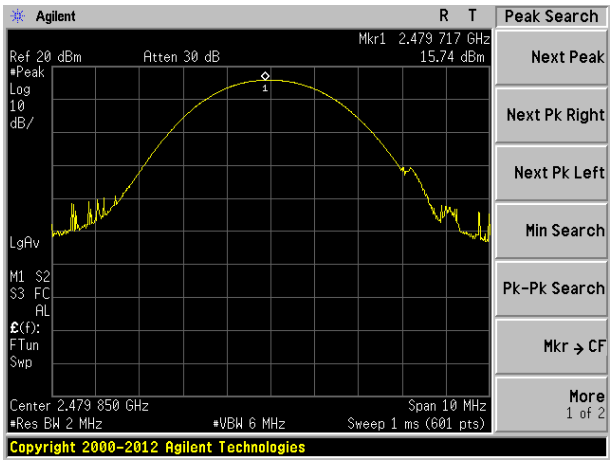
Lowest channel





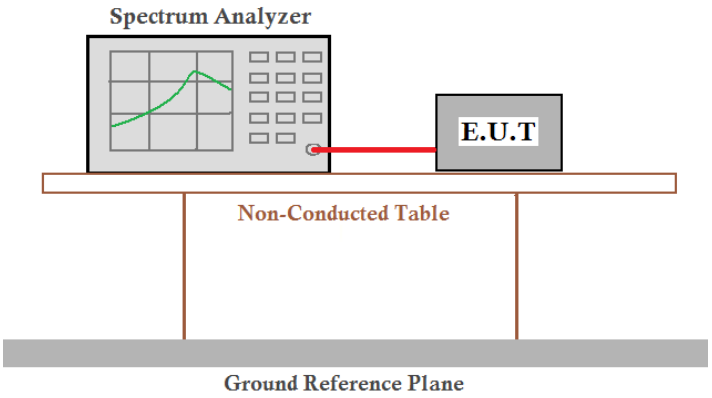
Middle channel





Highest channel

7.3 20dB Emission Bandwidth

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

ANT 1:

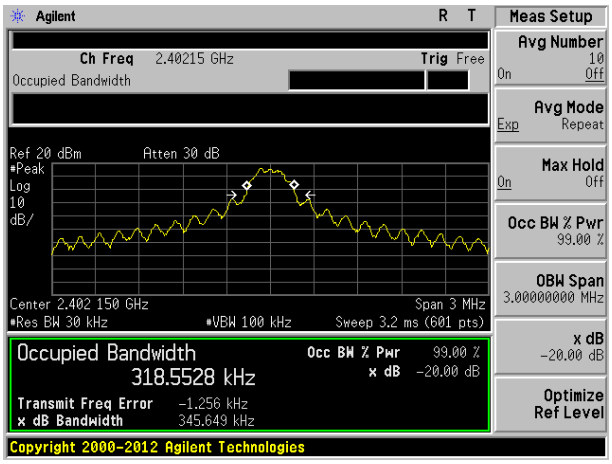
Test channel	20dB Emission Bandwidth (MHz)	Result
Lowest	0.346	Pass
Middle	0.349	
Highest	0.350	

ANT 2:

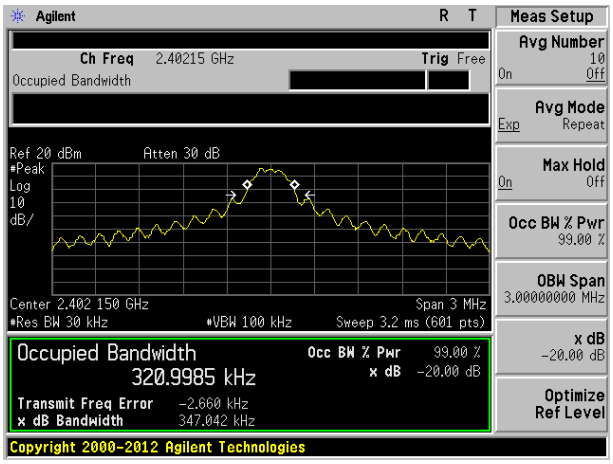
Test channel	20dB Emission Bandwidth (MHz)	Result
Lowest	0.347	Pass
Middle	0.353	
Highest	0.336	

Test plot as follows:

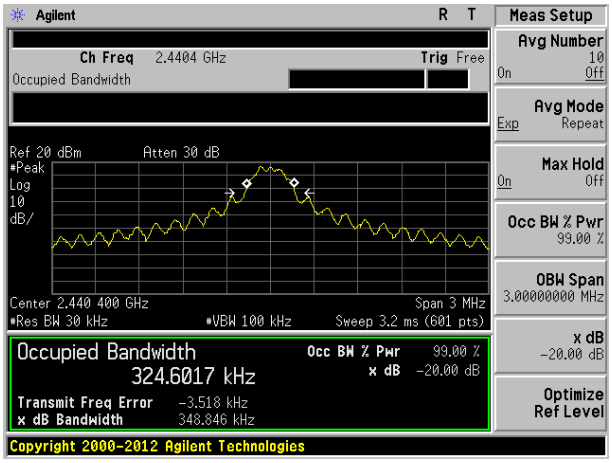
ANT 1

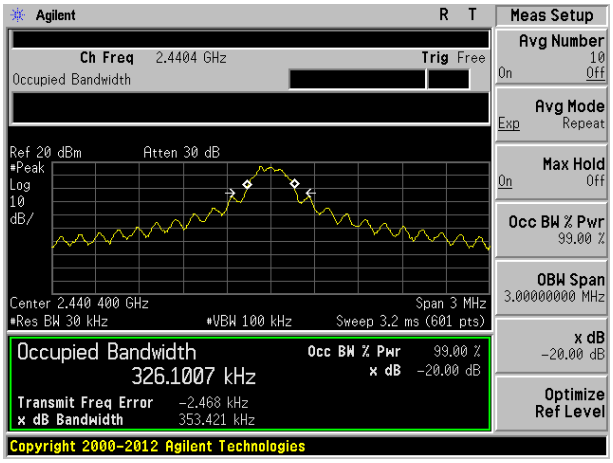


ANT 2

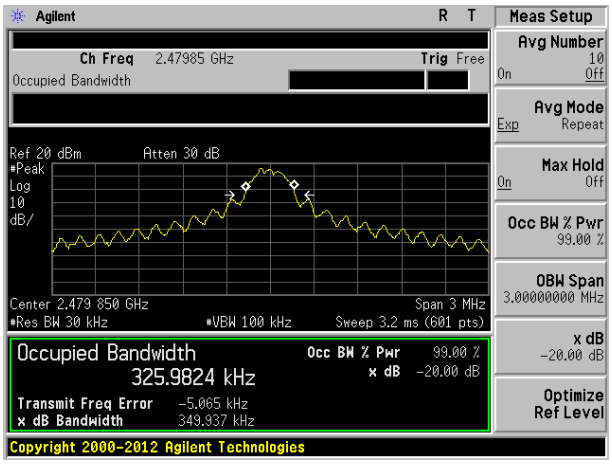


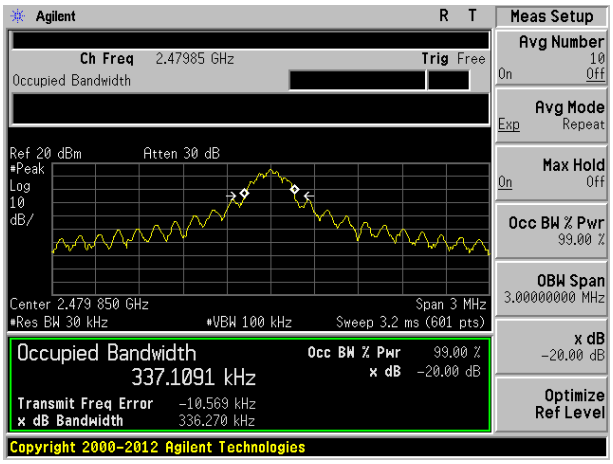
Lowest channel





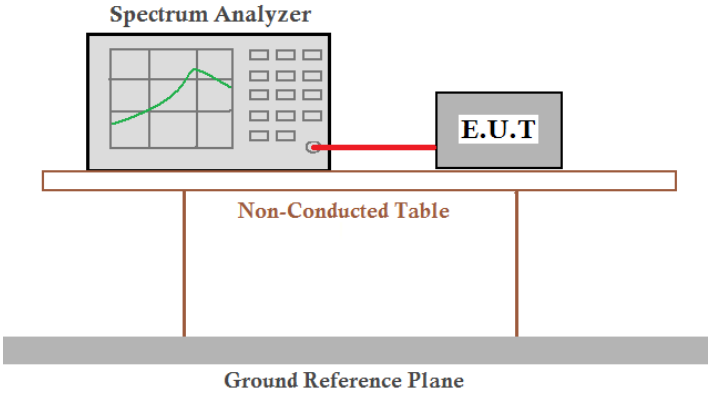
Middle channel





Highest channel

7.4 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

ANT 1:

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	2142	233	Pass
Middle	4070	233	Pass
Highest	2708	233	Pass

Note: According to section 7.3

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GMSK	349.937	233

ANT 2:

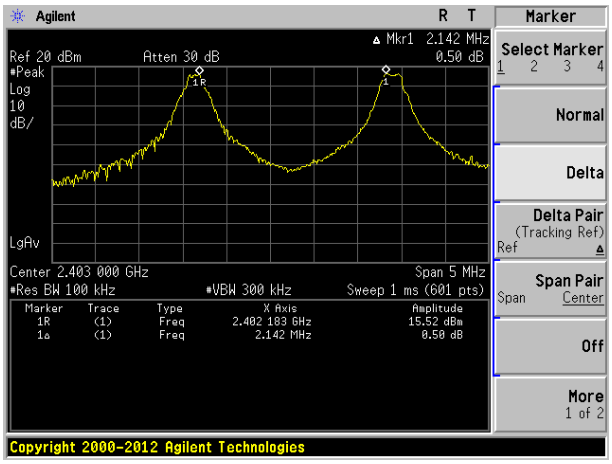
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	2258	236	Pass
Middle	4060	236	Pass
Highest	2692	236	Pass

Note: According to section 7.3

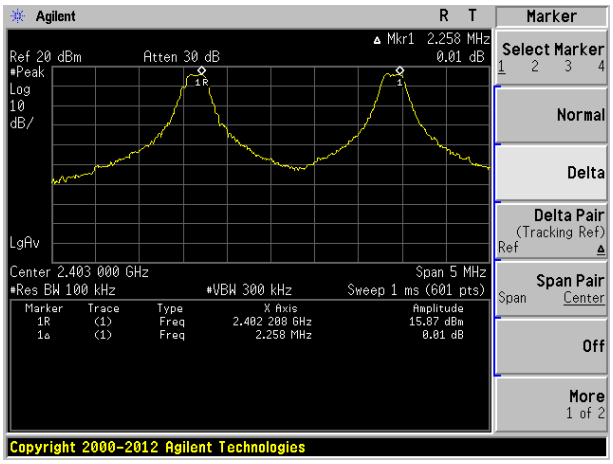
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GMSK	353.421	236

Test plot as follows:

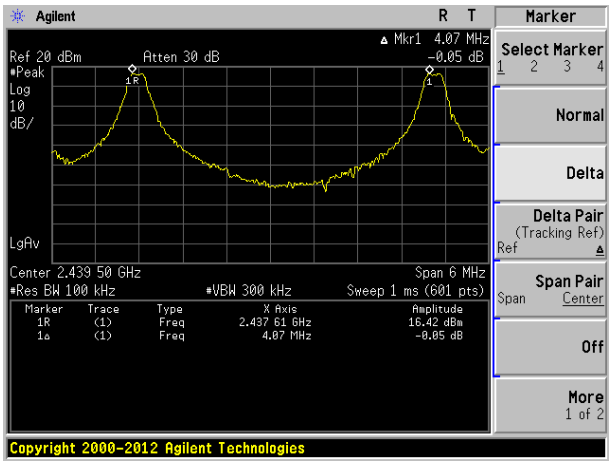
ANT 1

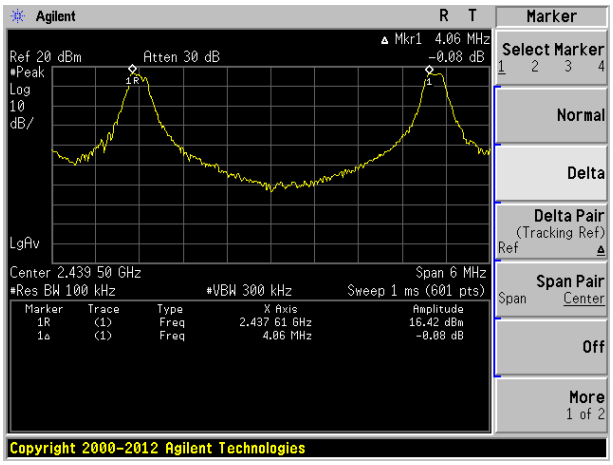


ANT 2

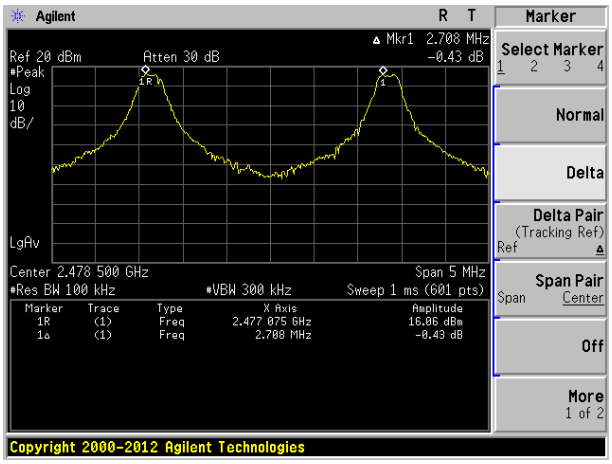


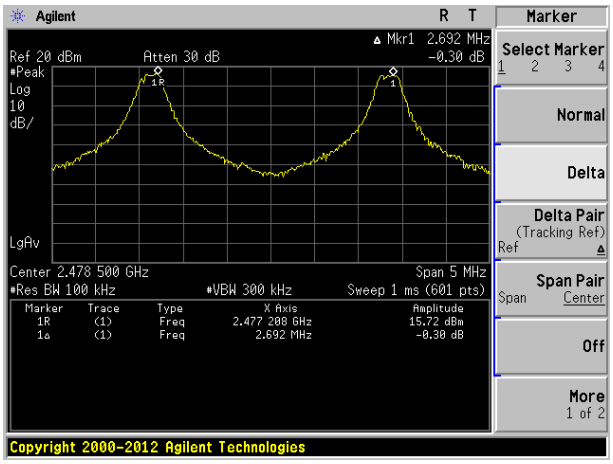
Lowest channel





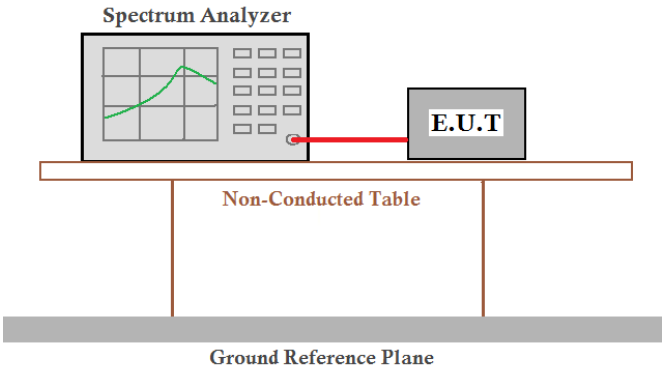
Middle channel





Highest channel

7.5 Hopping Channel Number

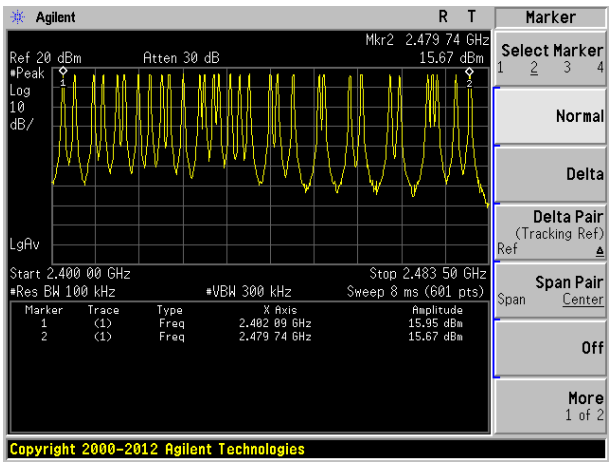
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test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

Measurement Data:

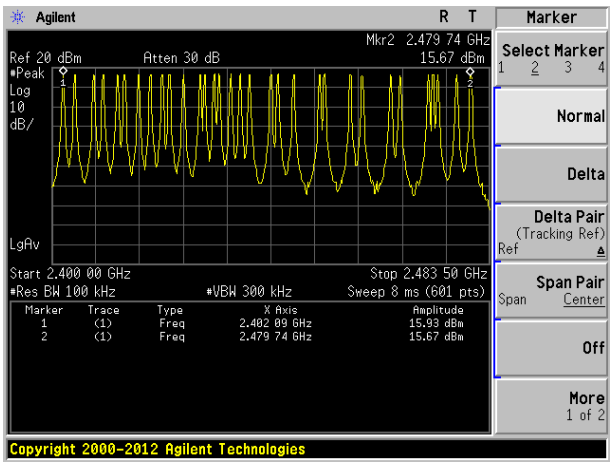
ANT 1&2:

Hopping channel numbers	Limit	Result
32	15	Pass

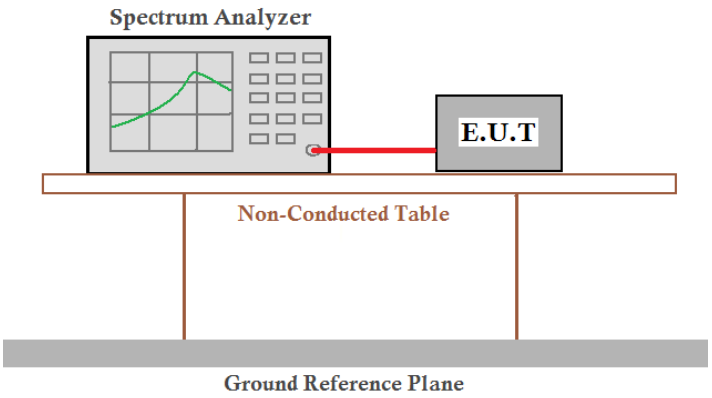
ANT 1



ANT 2



7.6 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

ANT 1:

Frequency(MHz)	Ton (ms)	Dwell time(ms)	Limit(ms)	Result
2402.15	2.433	93.4	400	Pass
2440.40	2.433	155.7	400	Pass
2479.85	2.433	93.4	400	Pass

The formula as below:

2402.15MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=2.433ms*3*0.4*32=93.4ms

2440.40MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=2.433ms*5*0.4*32=155.7ms

2479.85MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=2.433ms*3*0.4*32=93.4ms

ANT 2:

Frequency(MHz)	Ton (ms)	Dwell time(ms)	Limit(ms)	Result
2402.15	2.433	93.4	400	Pass
2440.40	2.417	154.7	400	Pass
2479.85	2.433	93.4	400	Pass

The formula as below:

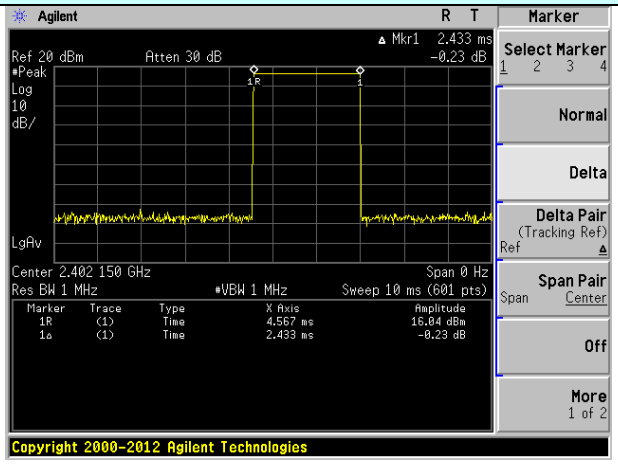
2402.15MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=2.433ms*3*0.4*32=93.4ms

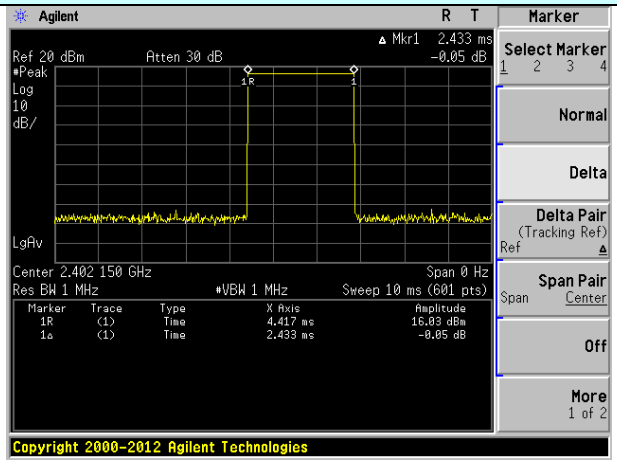
2440.40MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=2.417ms*5*0.4*32=154.7ms

2479.85MHz: Dwell time = Ton * Ton times in 1s * 0.4s * channel numbers=2.433ms*3*0.4*32=93.4ms

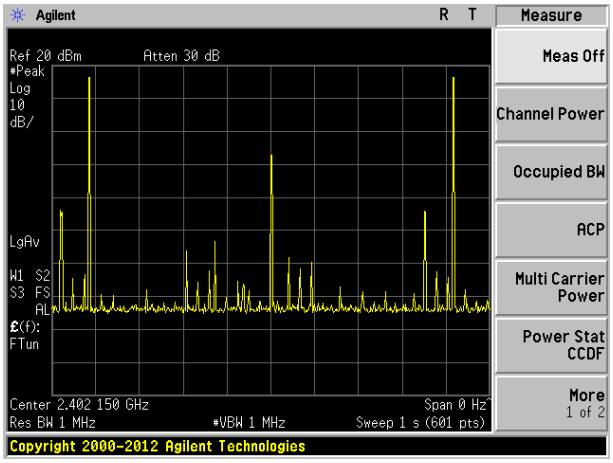
Test plot as follows:

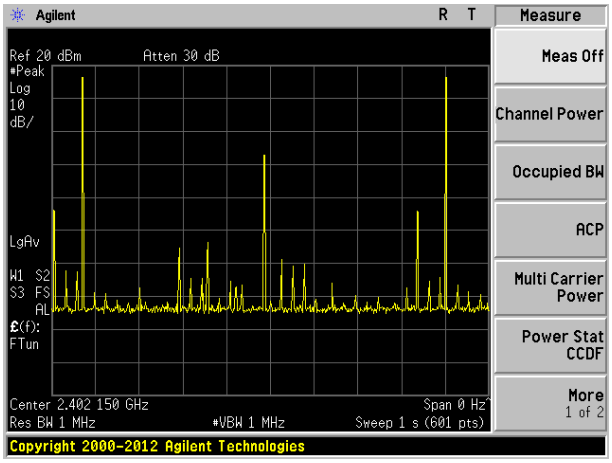
ANT 1:	ANT 2:
Frequency: 2402.15MHz	





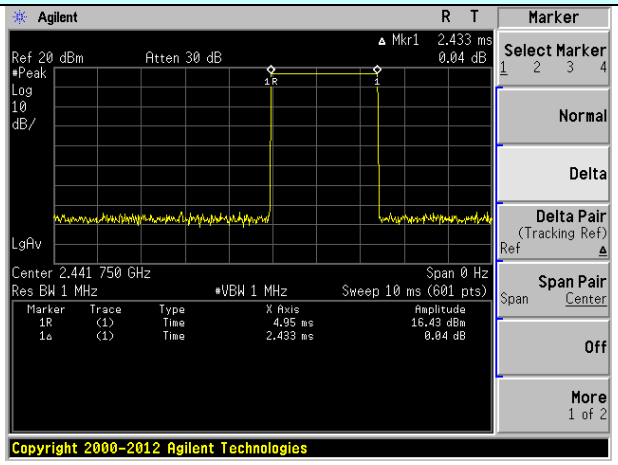
Ton

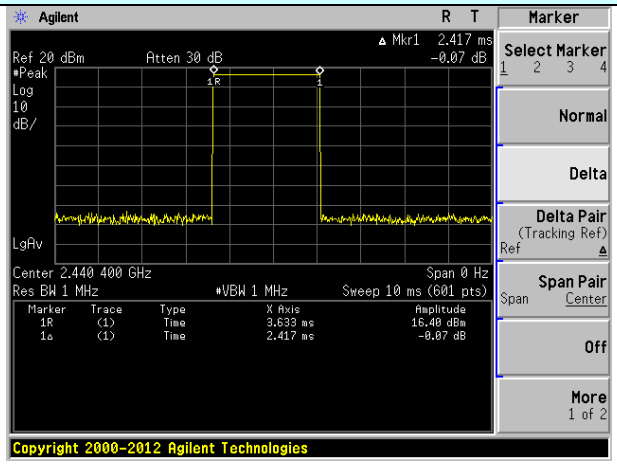




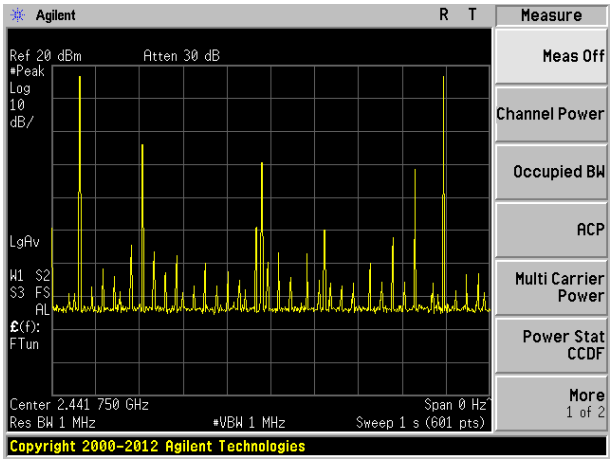
Ton times in 1s

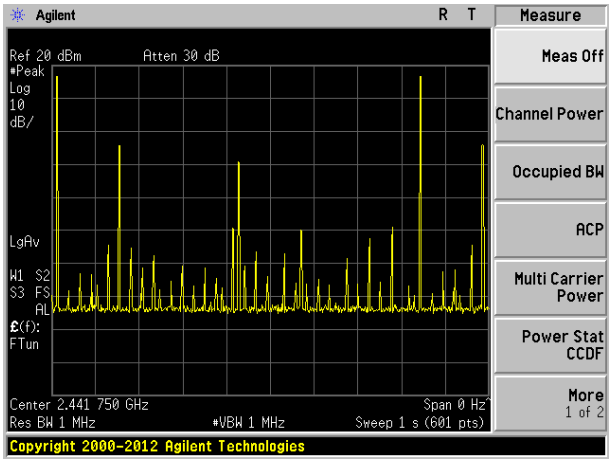
ANT 1:	ANT 2:
Frequency: 2440.40MHz	





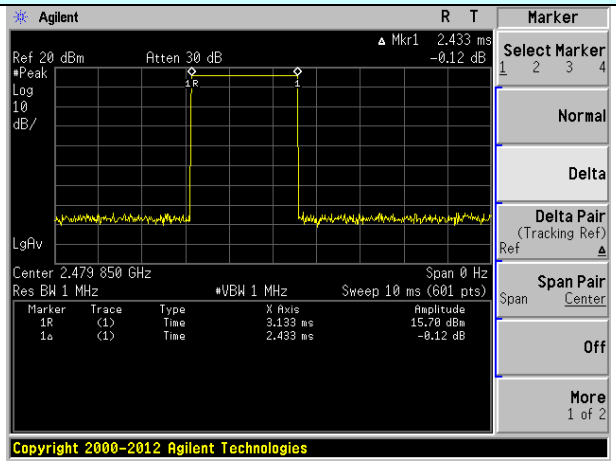
Ton

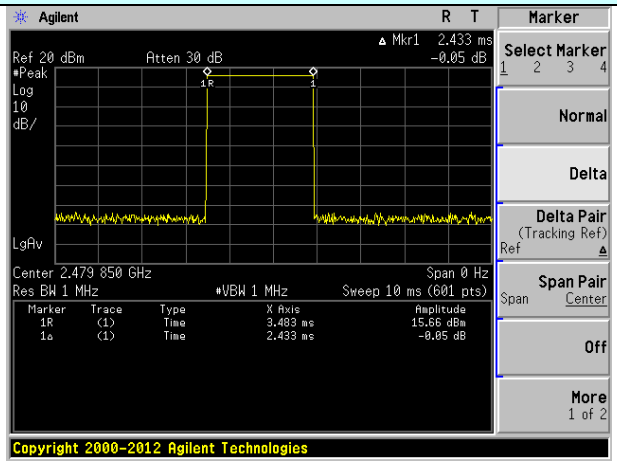




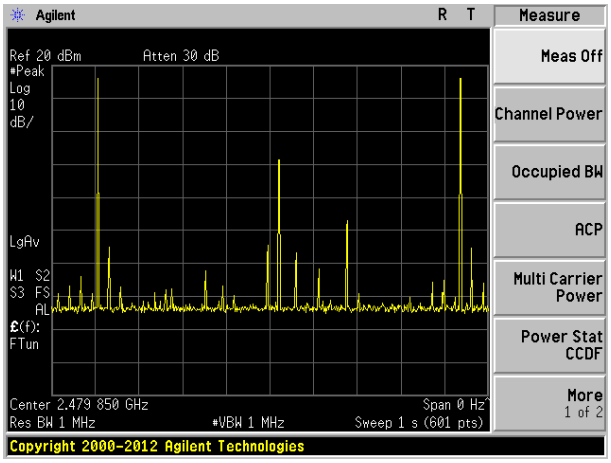
Ton times in 1s

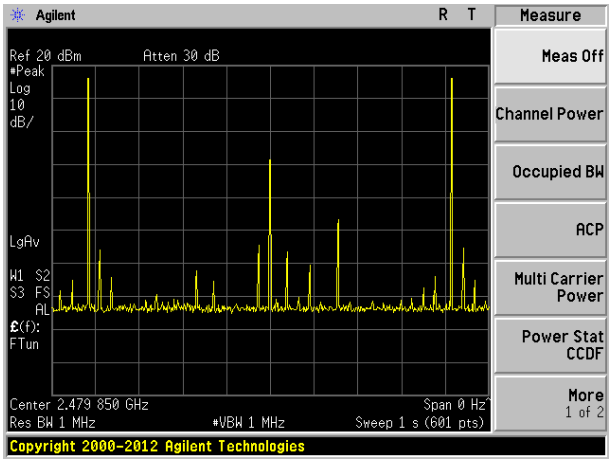
ANT 1:	ANT 2:
Frequency: 2479.85MHz	





Ton





Ton times in 1s

7.7 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.

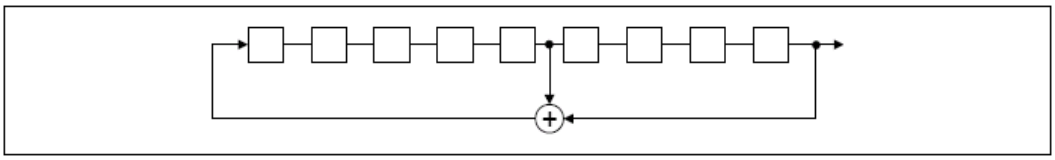
(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be 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

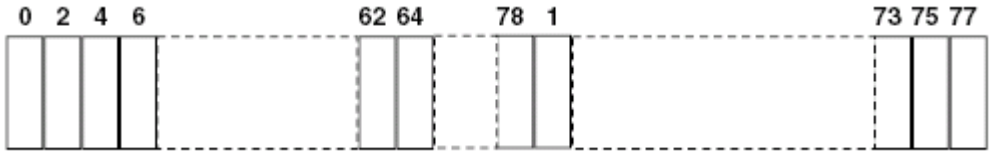
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized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



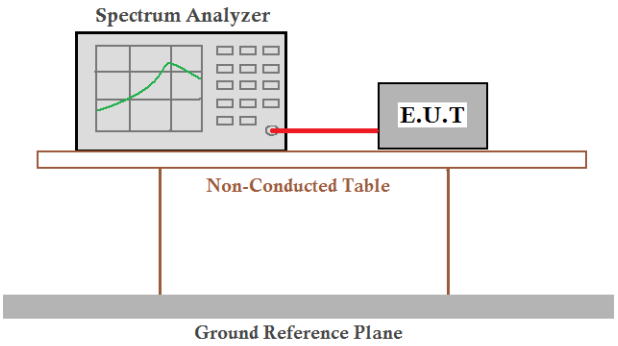
Each frequency used equally on the average by each transmitter.

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.

7.8 Band Edge

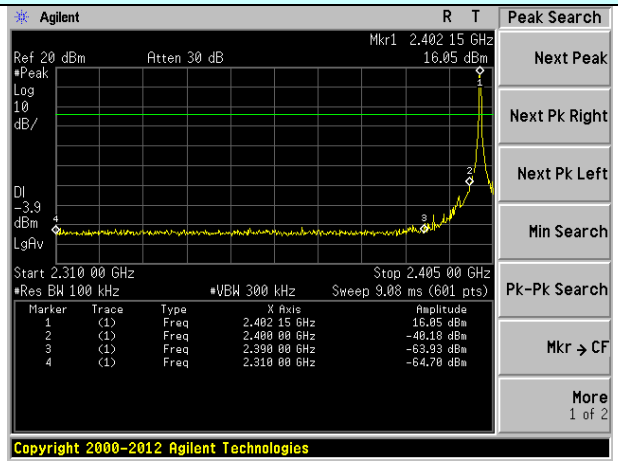
7.8.1 Conducted Emission Method

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

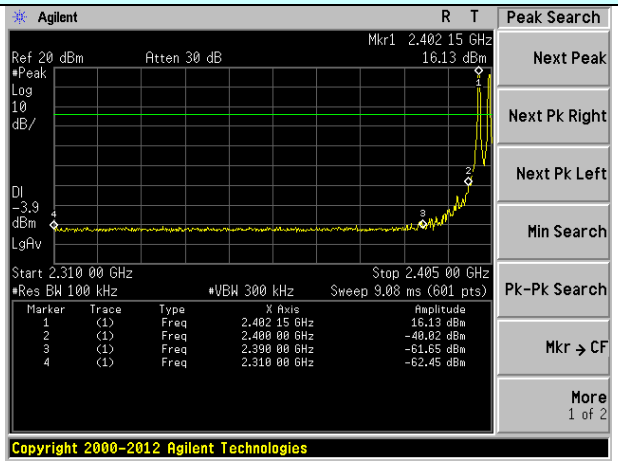
Test plot as follows:

ANT 1:

Test channel:	Lowest channel

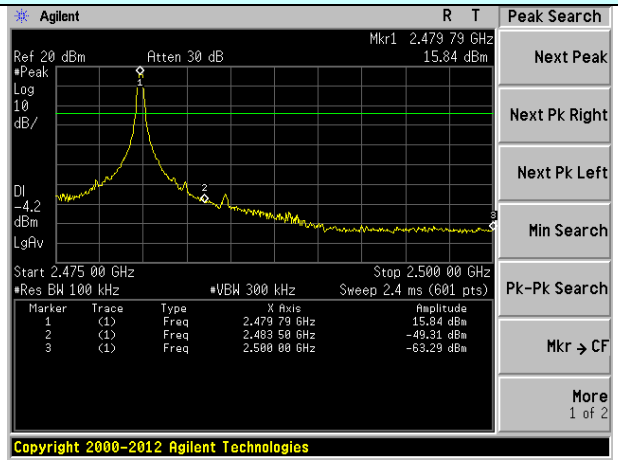


No-hopping mode

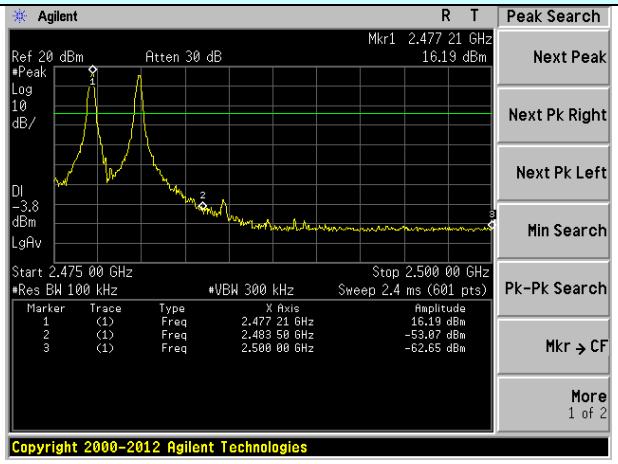


Hopping mode

Test channel:	Highest channel



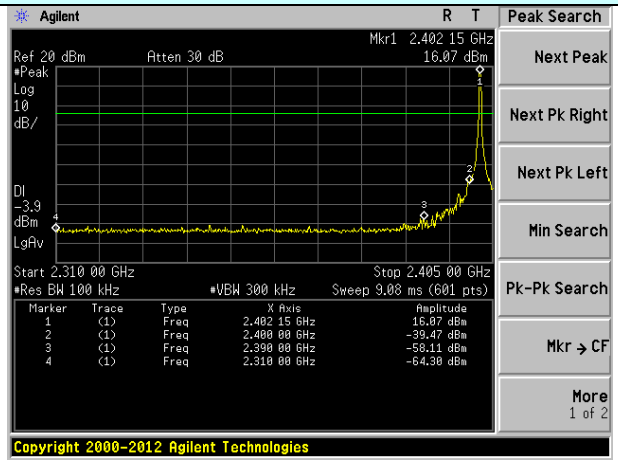
No-hopping mode



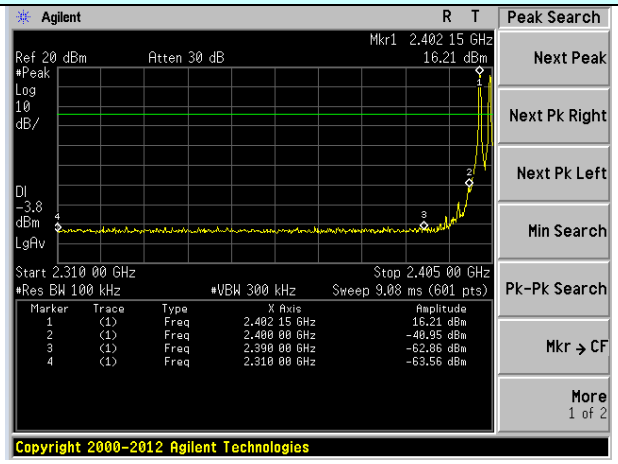
Hopping mode

ANT 2:

Test channel:	Lowest channel

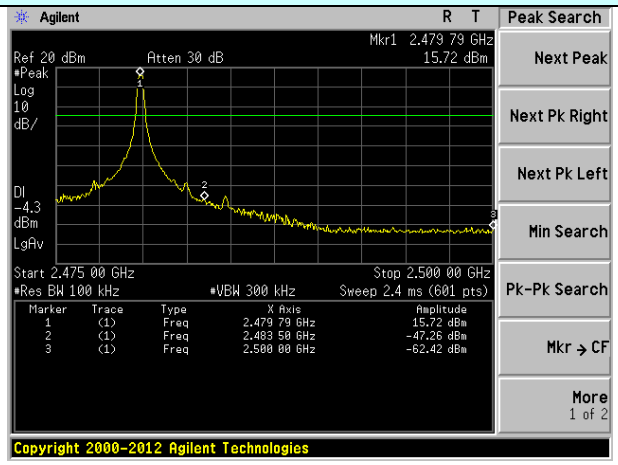


No-hopping mode

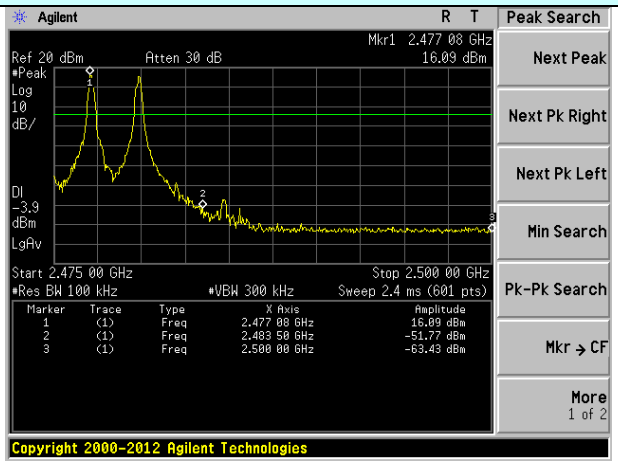


Hopping mode

Test channel:	Highest channel



No-hopping mode



Hopping mode

7.8.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10:2013
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.
Test site:	Measurement Distance: 3m

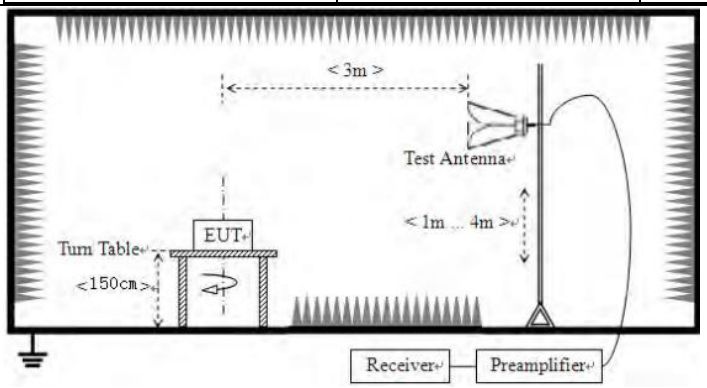
Receiver setup:

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:

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.

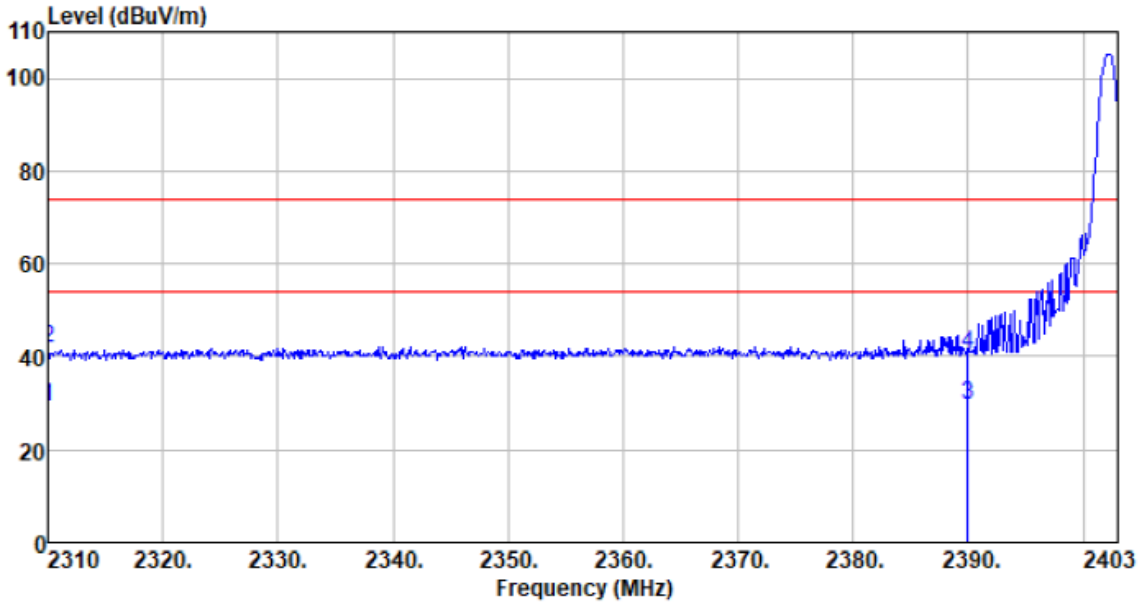
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Temp. / Hum.	Temp.:	25 °C	Humid.:	52%	Press.:	1 012mbar
Test results:	Pass					

Measurement Data

Remark:

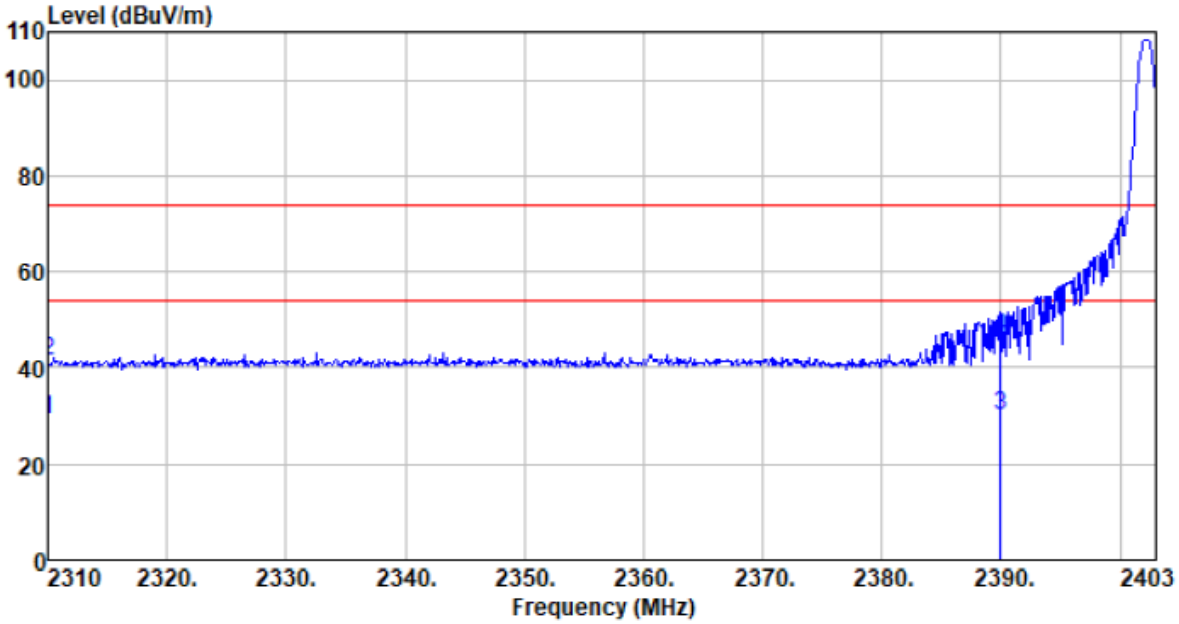
1. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*
2. *Pre-scan all ANTs, and found the ANT1 is the worst case. Only show the worst case.*

Test channel:	Lowest	Polarization:	Vertical



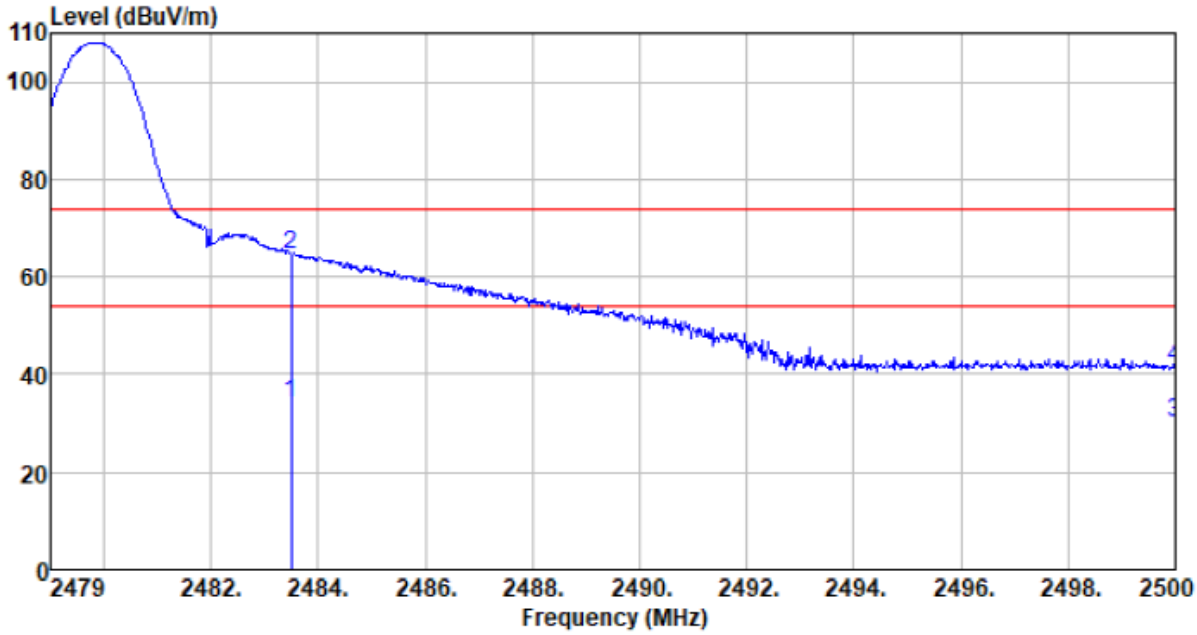
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2310.000	29.85	27.14	2.81	30.43	29.37	54.00	-24.63	Average
2310.000	42.14	27.14	2.81	30.43	41.66	74.00	-32.34	Peak
2390.000	29.70	27.37	2.91	30.24	29.74	54.00	-24.26	Average
2390.000	40.70	27.37	2.91	30.24	40.74	74.00	-33.26	Peak

Test channel:	Lowest	Polarization:	Horizontal



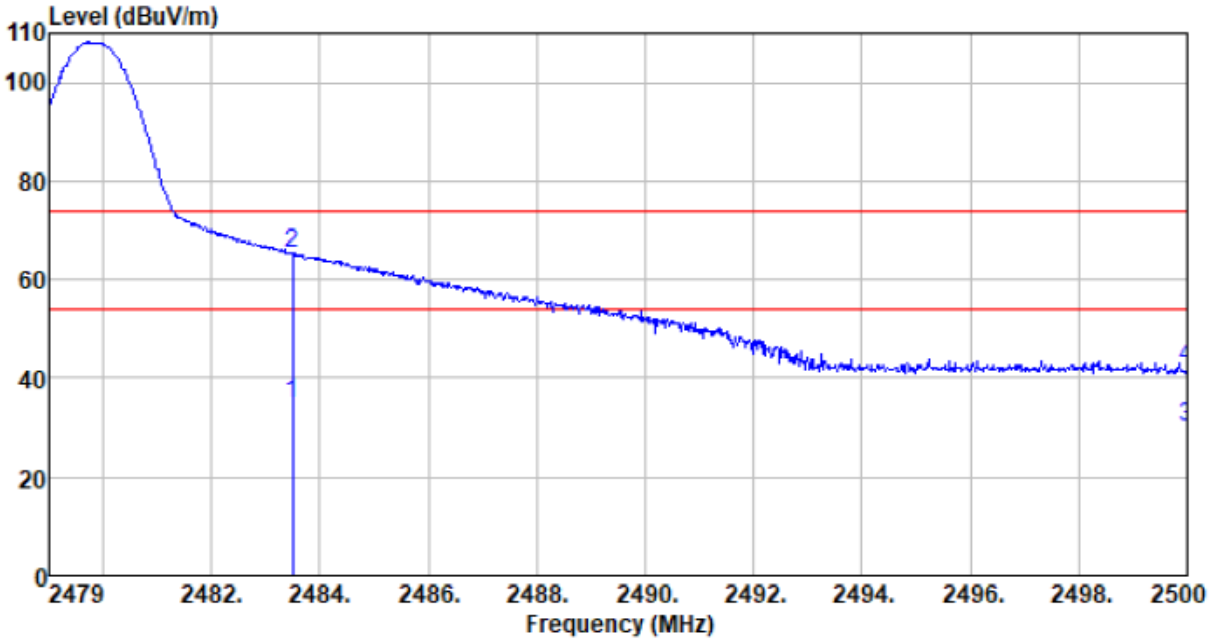
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2310.000	29.82	27.14	2.81	30.43	29.34	54.00	-24.66	Average
2310.000	41.79	27.14	2.81	30.43	41.31	74.00	-32.69	Peak
2390.000	29.84	27.37	2.91	30.24	29.88	54.00	-24.12	Average
2390.000	46.14	27.37	2.91	30.24	46.18	74.00	-27.82	Peak

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/m	dBuV/m	dB	
2483.500	33.50	27.66	2.99	30.12	34.03	54.00	-19.97	Average
2483.500	64.00	27.66	2.99	30.12	64.53	74.00	-9.47	Peak
2500.000	29.39	27.70	3.01	30.13	29.97	54.00	-24.03	Average
2500.000	40.63	27.70	3.01	30.13	41.21	74.00	-32.79	Peak

Test channel:	Highest	Polarziation:	Horizontal



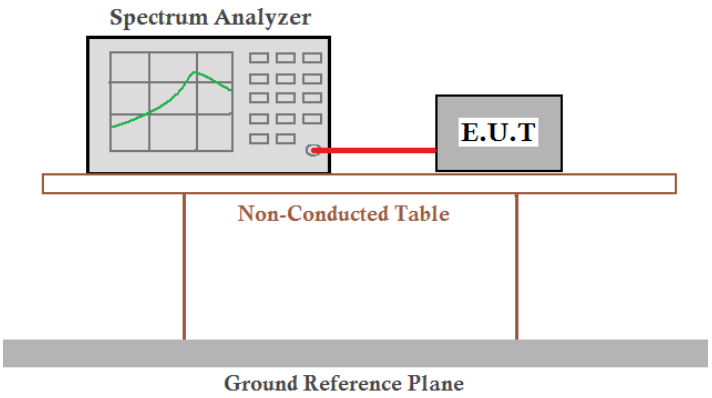
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
2483.500	34.25	27.66	2.99	30.12	34.78	54.00	-19.22	Average
2483.500	64.67	27.66	2.99	30.12	65.20	74.00	-8.80	Peak
2500.000	29.46	27.70	3.01	30.13	30.04	54.00	-23.96	Average
2500.000	41.76	27.70	3.01	30.13	42.34	74.00	-31.66	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.*

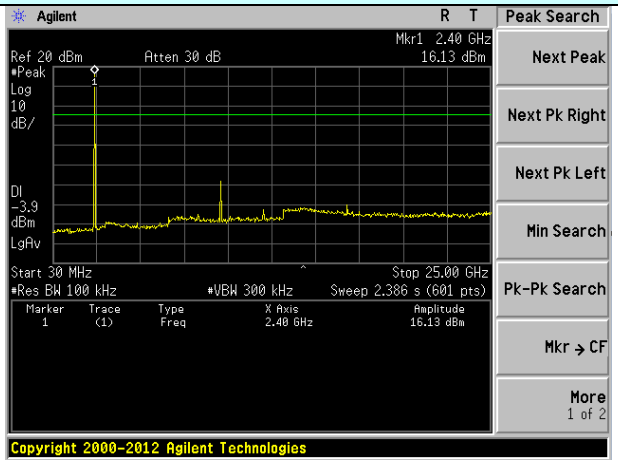
7.9 Spurious Emission

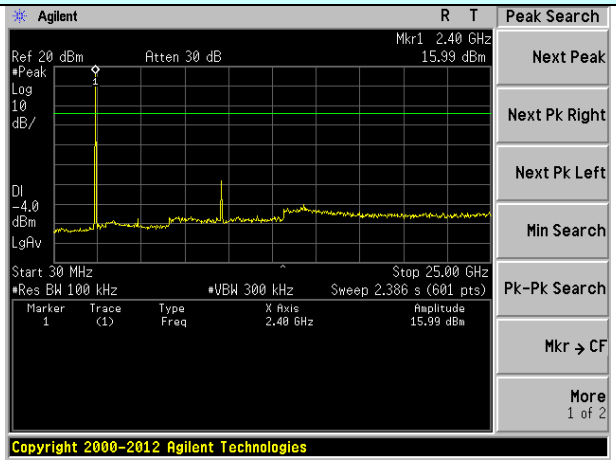
7.9.1 Conducted Emission Method

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:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

ANT 1	ANT 2

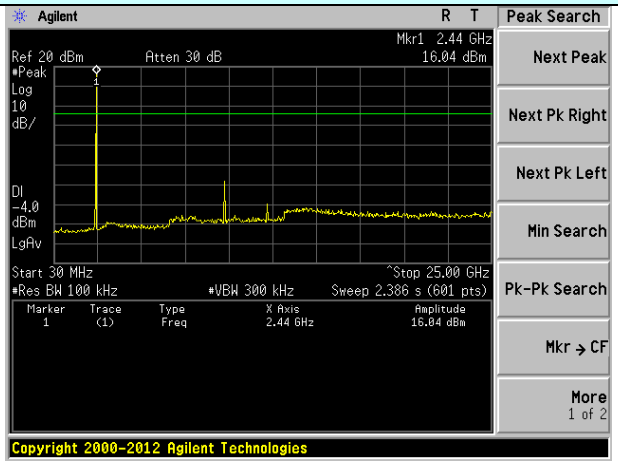
Lowest channel

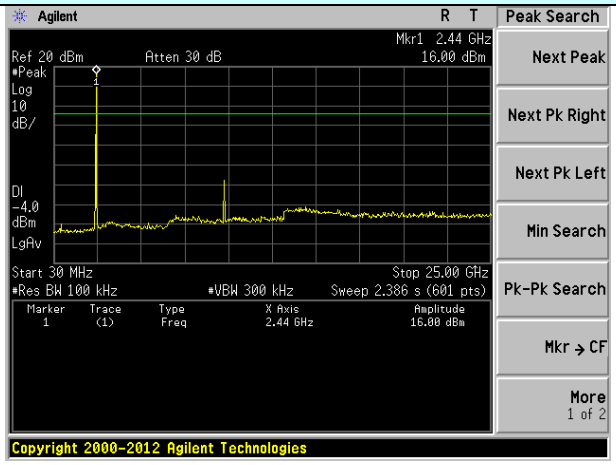




30MHz~25GHz

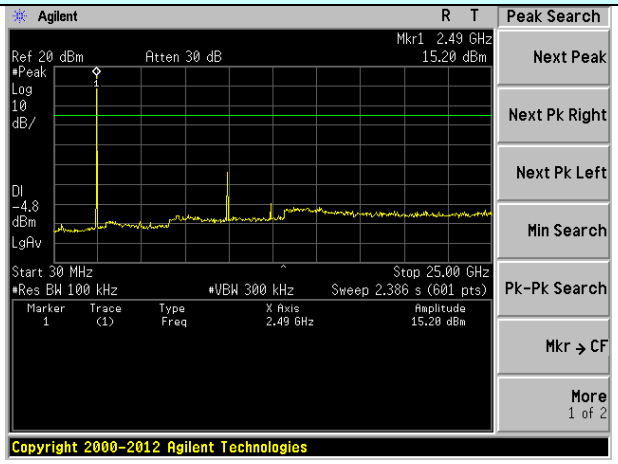
Middle channel

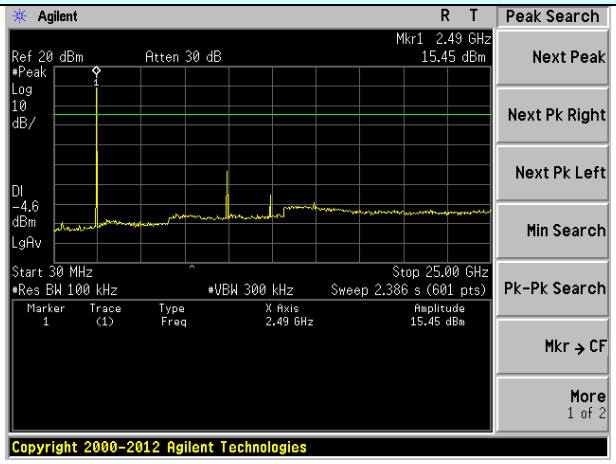




30MHz~25GHz

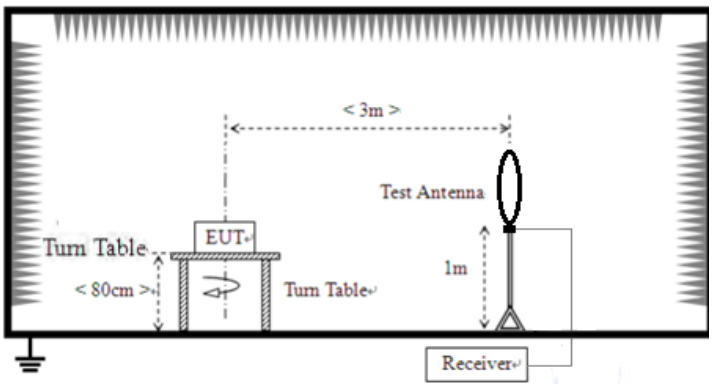
Highest channel



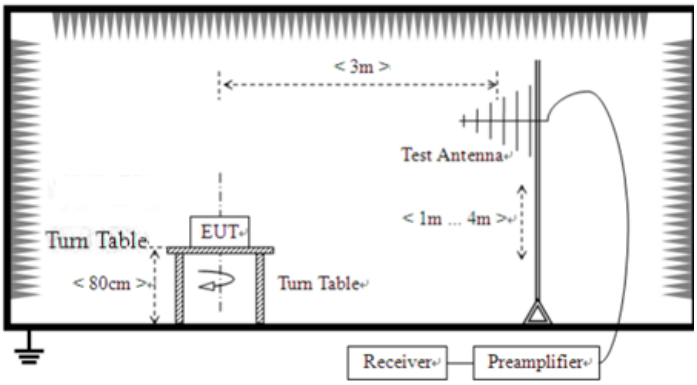


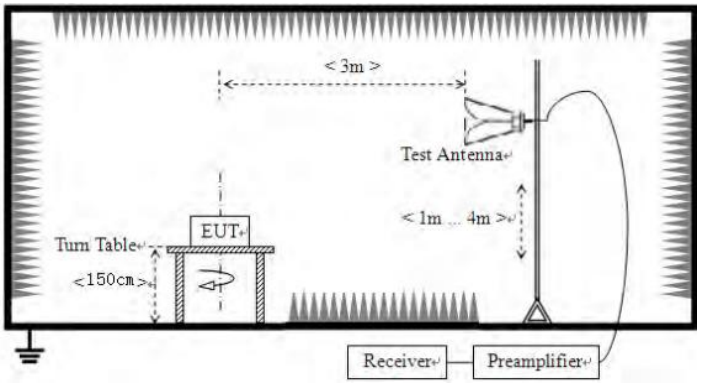
30MHz~25GHz

7.9.2 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>9KHz-150KHz</td><td>Quasi-peak</td><td>200Hz</td><td>600Hz</td><td>Quasi-peak</td></tr>
<tr><td>150KHz-30MHz</td><td>Quasi-peak</td><td>9KHz</td><td>30KHz</td><td>Quasi-peak</td></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>0.009MHz-0.490MHz</td><td>2400/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>0.490MHz-1.705MHz</td><td>24000/F(KHz)</td><td>QP</td><td>30m</td></tr>
<tr><td>1.705MHz-30MHz</td><td>30</td><td>QP</td><td>30m</td></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>

<table>
<tr><td></td><td>


Above 1GHz


</td></tr>
<tr><td>Test Procedure:</td><td>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.</td></tr>
<tr><td>Test Instruments:</td><td colspan="5">Refer to section 5.8 for details</td></tr>
<tr><td>Test mode:</td><td colspan="5">Refer to section 5.2 for details</td></tr>
<tr><td>Temp. / Hum.</td><td>Temp.:</td><td>25 °C</td><td>Humid.:</td><td>52%</td><td>Press.:</td><td>1 012mbar</td></tr>
</table>

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. *Pre-scan all ANTs, and found the ANT1 is the worse case. Only show the worst case.*

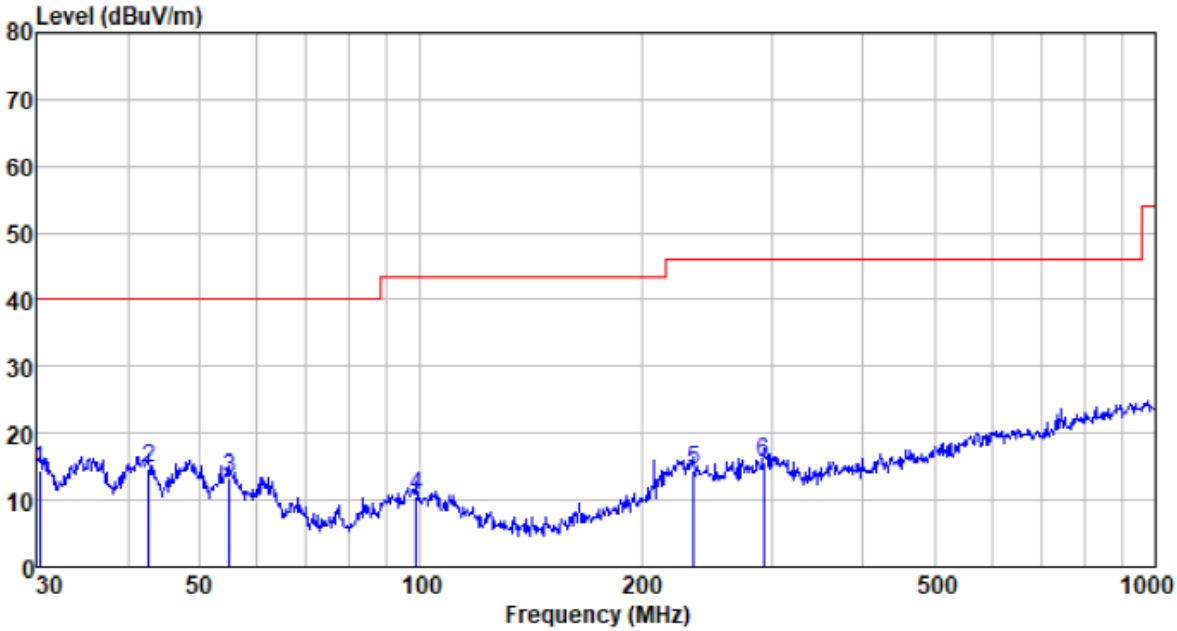
Measurement data:

■ **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.

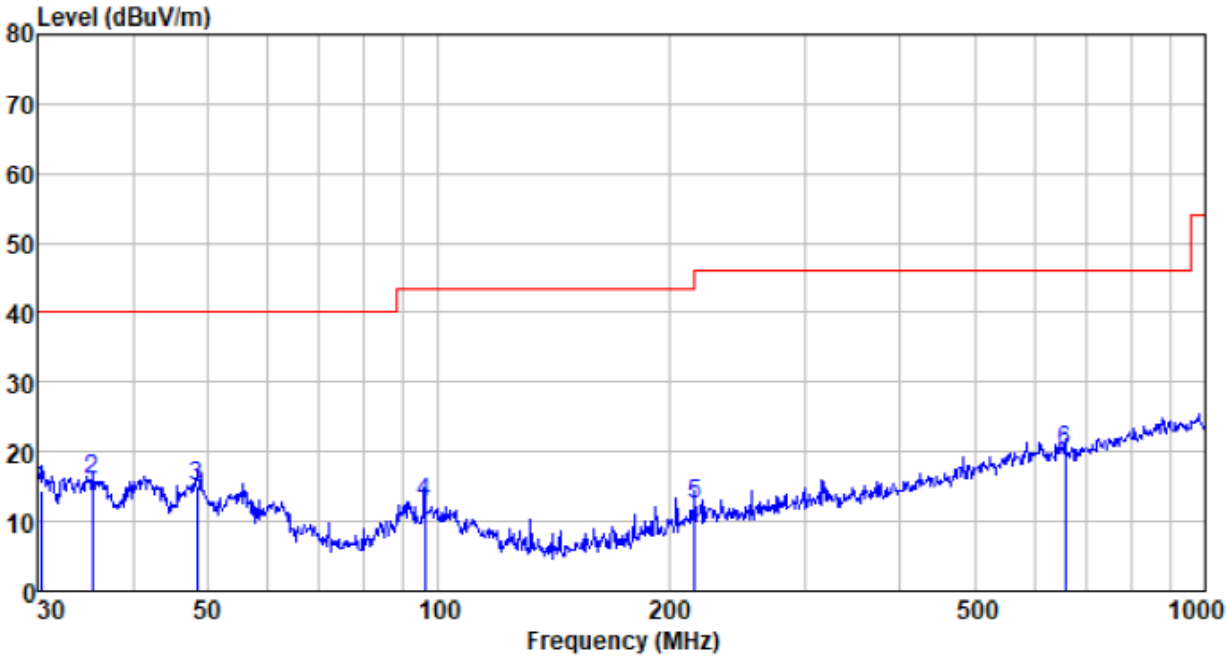
■ **30MHz ~ 1GHz**

Test channel:	Lowest	Polarziation:	Vertical



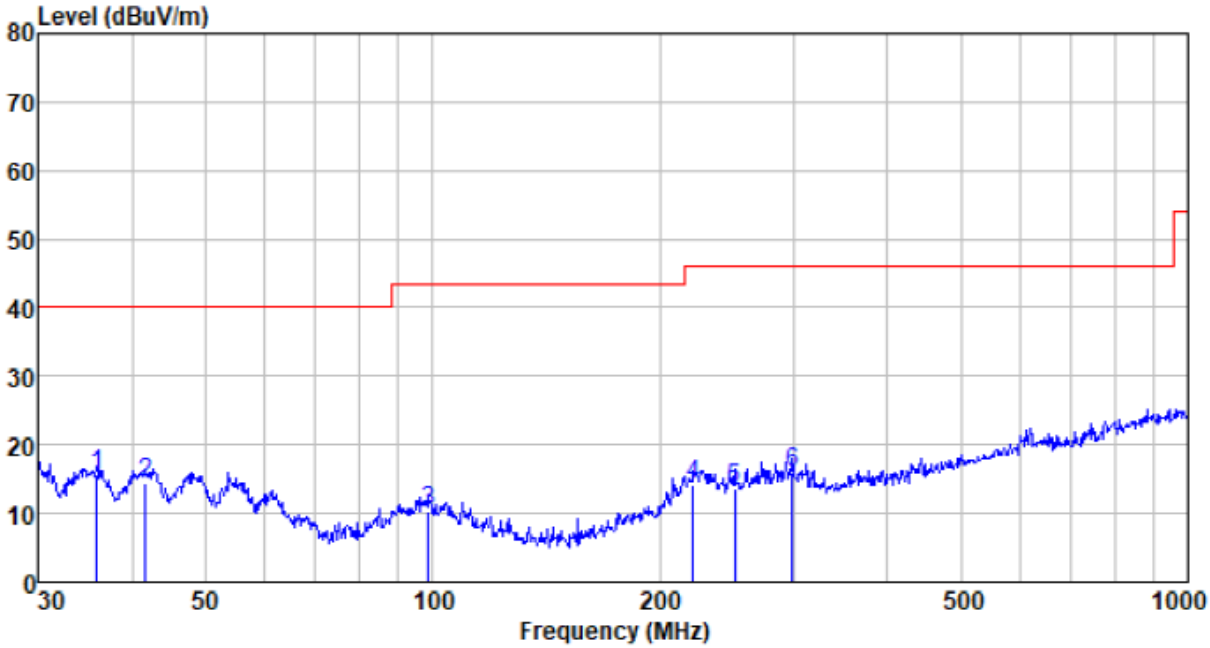
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
30.317	37.73	11.21	0.55	35.02	14.47	40.00	-25.53	QP
42.750	37.68	12.23	0.69	35.82	14.78	40.00	-25.22	QP
55.027	36.81	11.78	0.82	36.25	13.16	40.00	-26.84	QP
98.833	34.13	12.06	1.18	36.71	10.66	43.50	-32.84	QP
234.991	38.16	11.67	2.05	37.37	14.51	46.00	-31.49	QP
293.084	37.31	13.42	2.32	37.41	15.64	46.00	-30.36	QP

Test channel:	Lowest	Polarziation:	Horizontal



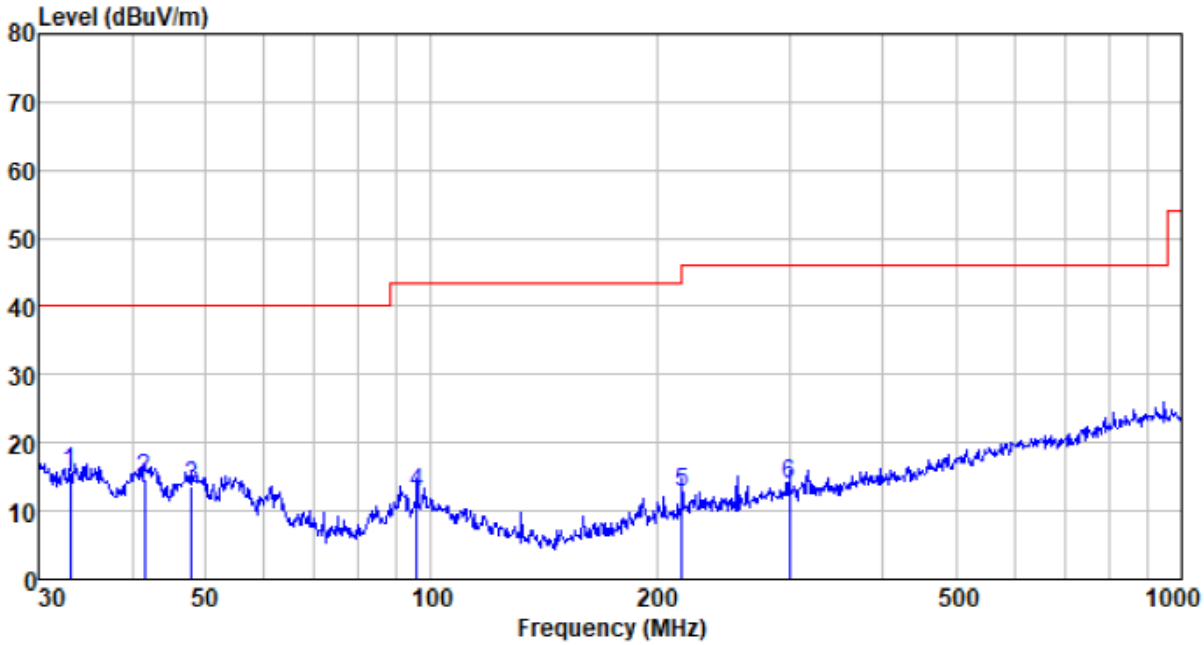
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
30.317	37.71	11.21	0.55	35.02	14.45	40.00	-25.55	QP
35.375	39.39	11.39	0.61	35.38	16.01	40.00	-23.99	QP
48.502	38.05	12.29	0.76	36.11	14.99	40.00	-25.01	QP
96.099	36.58	11.65	1.16	36.69	12.70	43.50	-30.80	QP
216.024	36.81	11.02	1.93	37.35	12.41	46.00	-33.59	QP
656.530	34.03	19.56	3.94	37.59	19.94	46.00	-26.06	QP

Test channel:	Middle	Polarziation:	Vertical



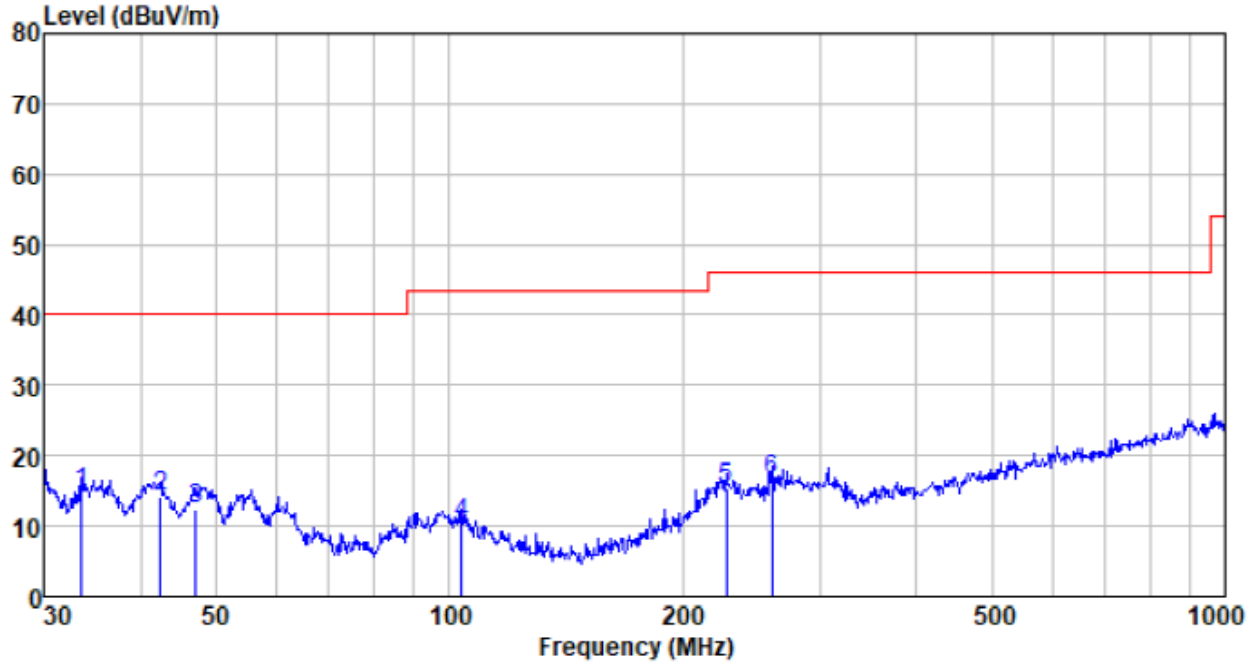
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
35.875	38.99	11.49	0.62	35.41	15.69	40.00	-24.31	QP
41.713	37.41	12.22	0.68	35.76	14.55	40.00	-25.45	QP
98.833	33.85	12.06	1.18	36.71	10.38	43.50	-33.12	QP
221.392	38.38	11.20	1.97	37.35	14.20	46.00	-31.80	QP
251.180	36.61	12.18	2.13	37.38	13.54	46.00	-32.46	QP
299.316	37.44	13.60	2.35	37.42	15.97	46.00	-30.03	QP

Test channel:	Middle	Polarziation:	Horizontal



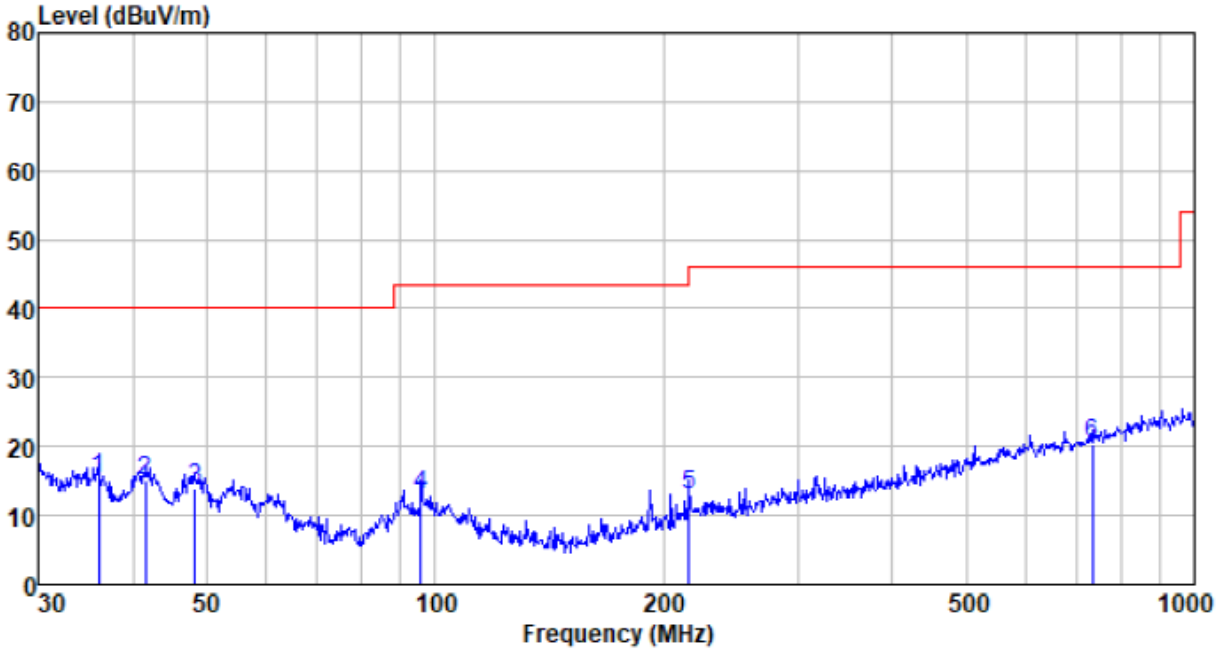
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
33.095	38.94	11.26	0.59	35.23	15.56	40.00	-24.44	QP
41.567	37.65	12.22	0.68	35.75	14.80	40.00	-25.20	QP
47.994	36.72	12.28	0.75	36.09	13.66	40.00	-26.34	QP
95.762	36.74	11.59	1.16	36.69	12.80	43.50	-30.70	QP
216.024	37.22	11.02	1.93	37.35	12.82	46.00	-33.18	QP
300.367	35.46	13.60	2.36	37.42	14.00	46.00	-32.00	QP

Test channel:	Highest	Polarziation:	Vertical



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
33.562	38.23	11.27	0.59	35.26	14.83	40.00	-25.17	QP
42.451	37.19	12.23	0.69	35.80	14.31	40.00	-25.69	QP
47.160	35.49	12.27	0.74	36.04	12.46	40.00	-27.54	QP
103.806	34.09	11.73	1.22	36.75	10.29	43.50	-33.21	QP
227.691	39.31	11.42	2.01	37.36	15.38	46.00	-30.62	QP
260.144	39.37	12.47	2.18	37.39	16.63	46.00	-29.37	QP

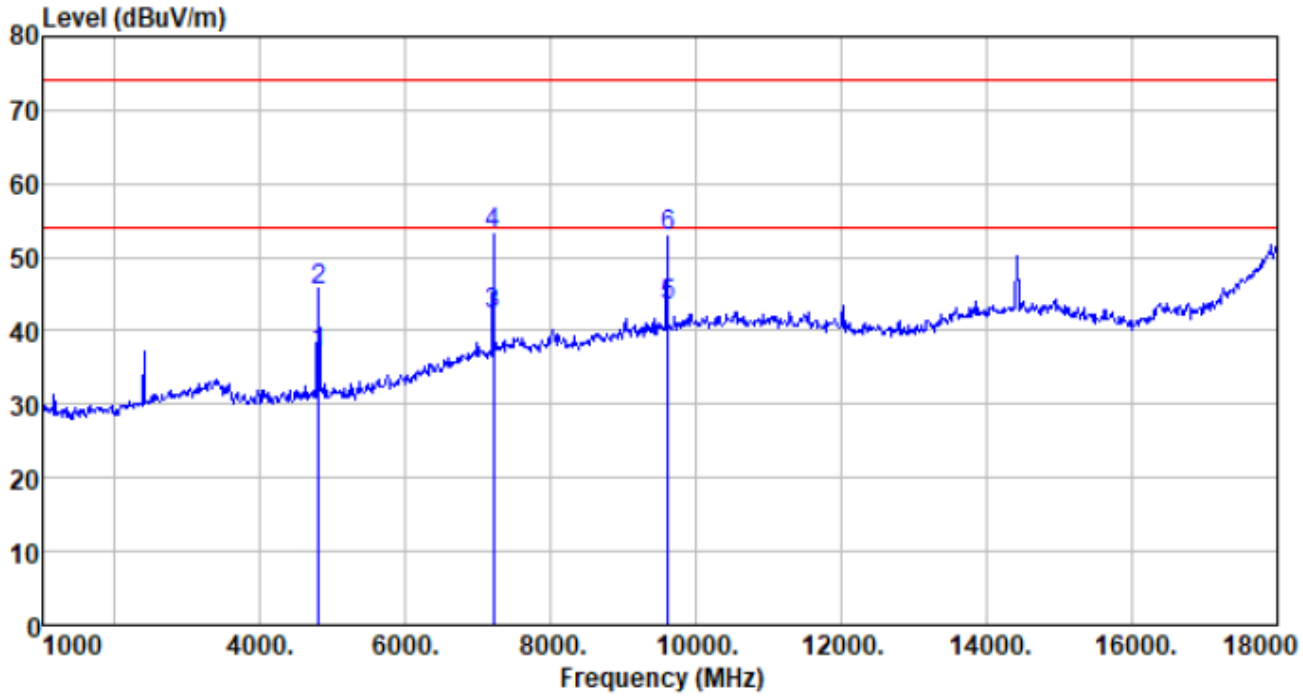
Test channel:	Highest	Polarziation:	Horizontal



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
36.001	38.72	11.52	0.62	35.42	15.44	40.00	-24.56	QP
41.567	37.98	12.22	0.68	35.75	15.13	40.00	-24.87	QP
48.332	37.05	12.29	0.75	36.10	13.99	40.00	-26.01	QP
95.762	36.92	11.59	1.16	36.69	12.98	43.50	-30.52	QP
216.024	37.35	11.02	1.93	37.35	12.95	46.00	-33.05	QP
734.491	33.50	20.22	4.22	37.63	20.31	46.00	-25.69	QP

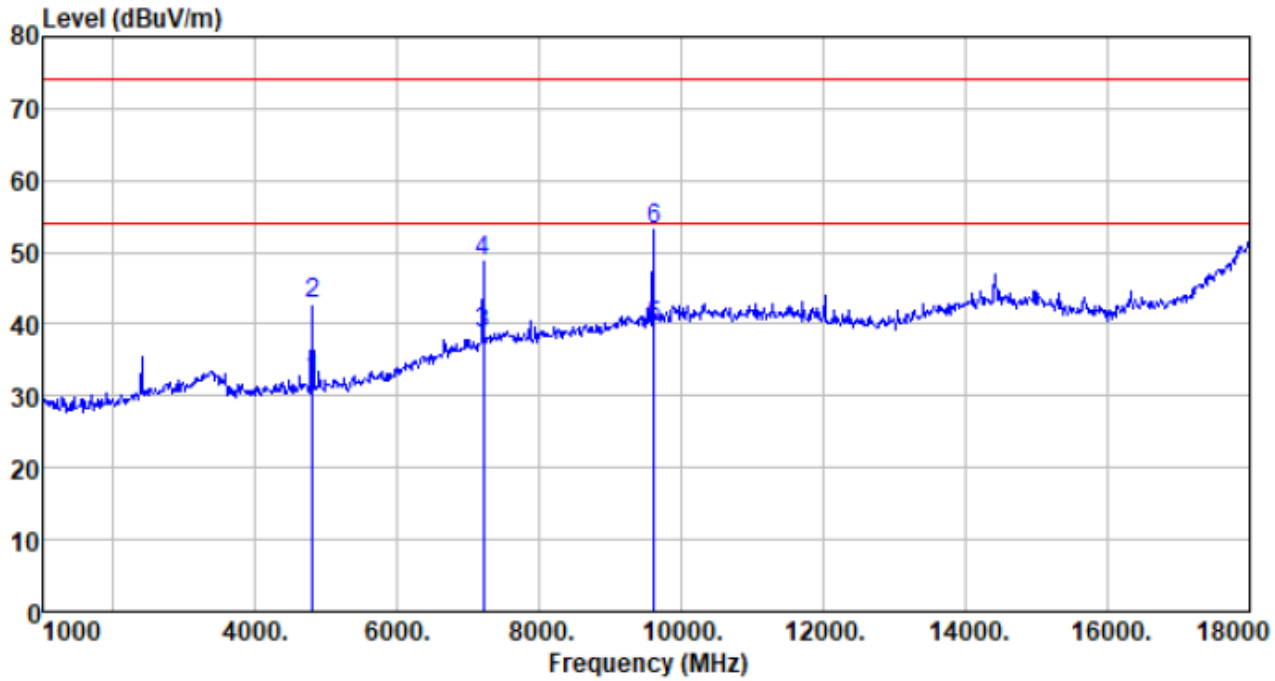
■ **Above 1GHz**

Test channel:	Lowest	Polarziation:	Vertical



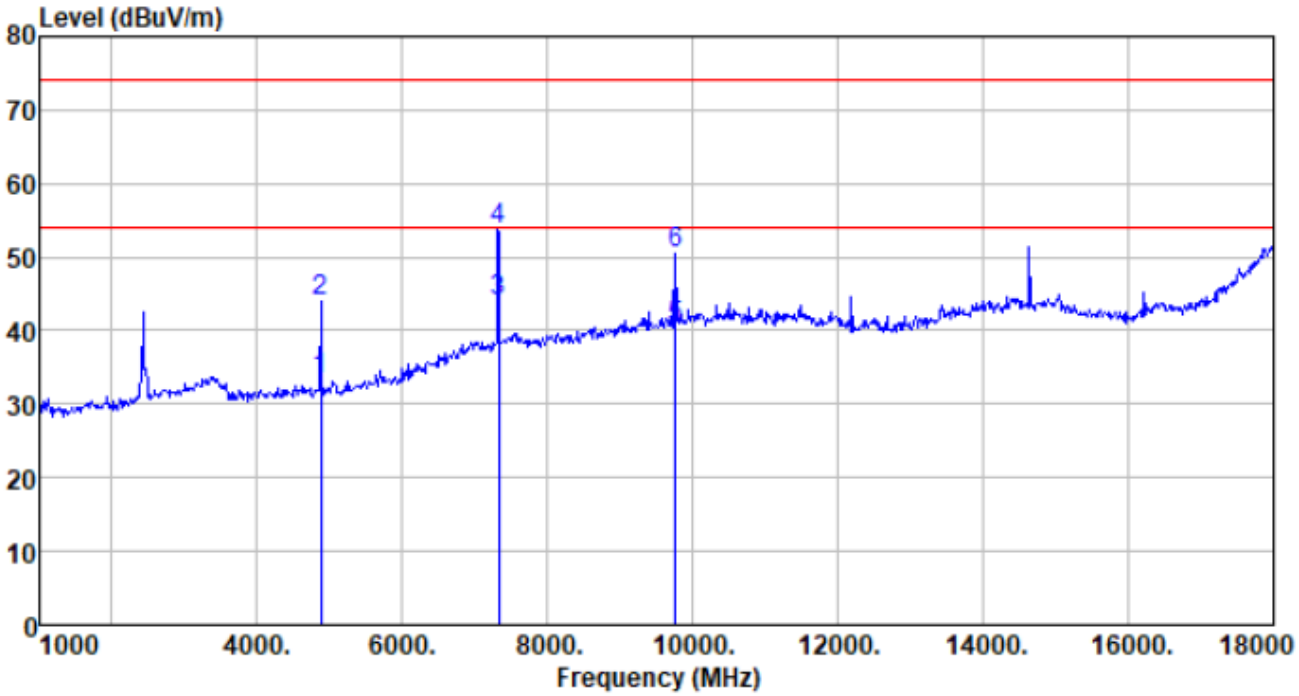
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4804.300	38.68	31.20	4.61	37.73	36.76	54.00	-17.24	Average
4804.300	47.33	31.20	4.61	37.73	45.41	74.00	-28.59	Peak
7206.450	35.24	36.16	6.48	35.63	42.25	54.00	-11.75	Average
7206.450	46.09	36.16	6.48	35.63	53.10	74.00	-20.90	Peak
9608.600	32.54	37.93	7.97	34.94	43.50	54.00	-10.50	Average
9608.600	41.82	37.93	7.97	34.94	52.78	74.00	-21.22	Peak

Test channel:	Lowest	Polarziation:	Horizontal



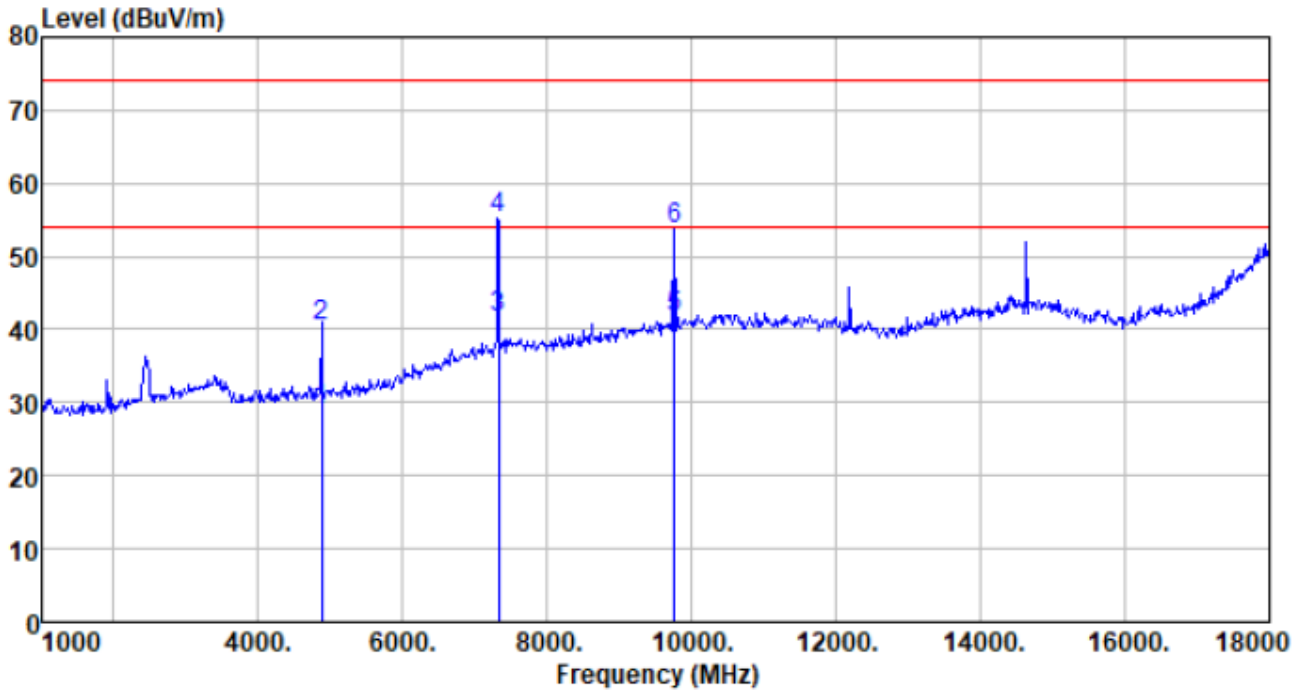
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
4804.300	34.13	31.20	4.61	37.73	32.21	54.00	-21.79	Average
4804.300	44.69	31.20	4.61	37.73	42.77	74.00	-31.23	Peak
7206.450	31.74	36.16	6.48	35.63	38.75	54.00	-15.25	Average
7206.450	41.58	36.16	6.48	35.63	48.59	74.00	-25.41	Peak
9608.600	28.70	37.93	7.97	34.94	39.66	54.00	-14.34	Average
9608.600	42.15	37.93	7.97	34.94	53.11	74.00	-20.89	Peak

Test channel:	Middle	Polarziation:	Vertical



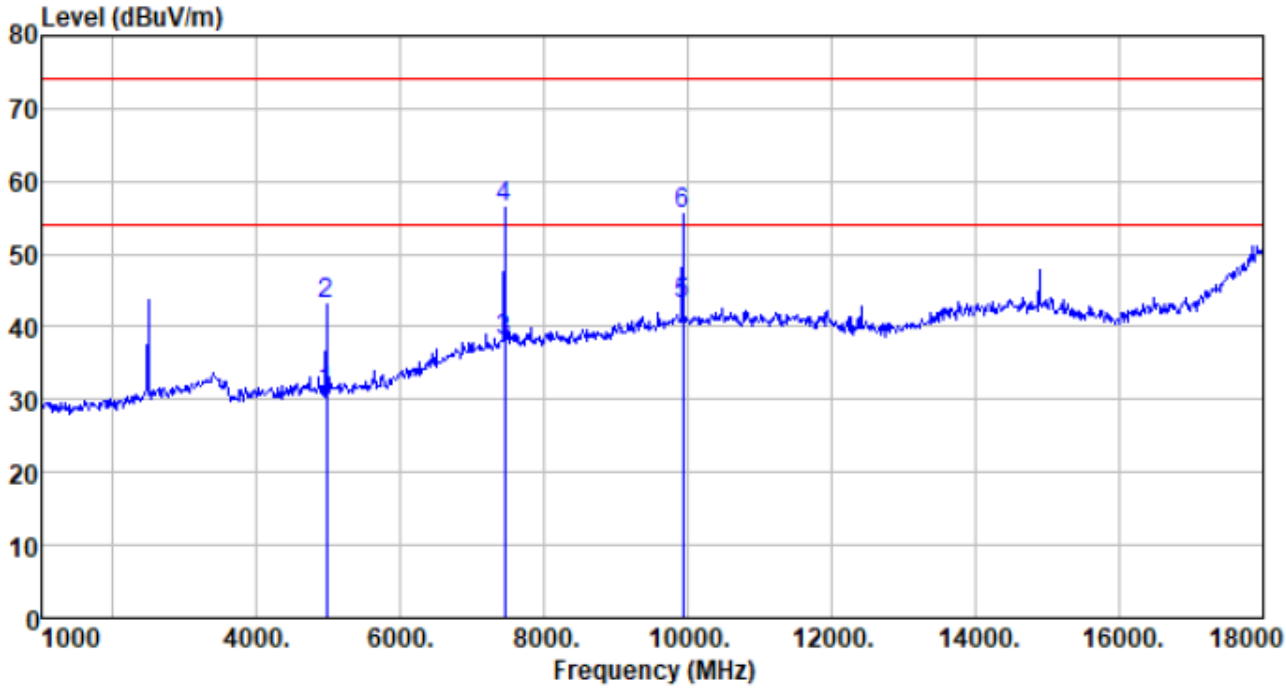
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.800	35.24	31.31	4.69	37.75	33.49	54.00	-20.51	Average
4880.800	45.77	31.31	4.69	37.75	44.02	74.00	-29.98	Peak
7321.200	36.38	36.43	6.63	35.60	43.84	54.00	-10.16	Average
7321.200	46.41	36.43	6.63	35.60	53.87	74.00	-20.13	Peak
9761.600	29.49	38.10	8.03	35.03	40.59	54.00	-13.41	Average
9761.600	39.30	38.10	8.03	35.03	50.40	74.00	-23.60	Peak

Test channel:	Middle	Polarziation:	Horizontal



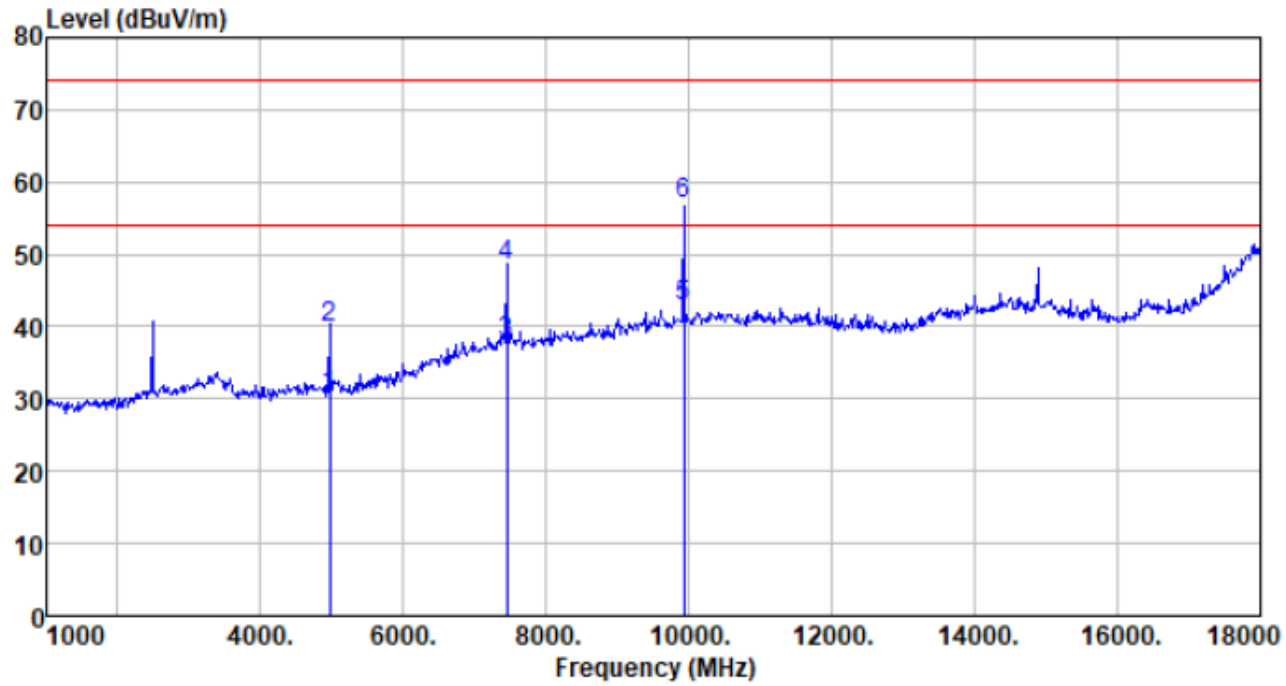
Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4880.800	30.67	31.31	4.69	37.75	28.92	54.00	-25.08	Average
4880.800	42.23	31.31	4.69	37.75	40.48	74.00	-33.52	Peak
7321.200	34.29	36.43	6.63	35.60	41.75	54.00	-12.25	Average
7321.200	47.74	36.43	6.63	35.60	55.20	74.00	-18.80	Peak
9761.600	30.39	38.10	8.03	35.03	41.49	54.00	-12.51	Average
9761.600	42.50	38.10	8.03	35.03	53.60	74.00	-20.40	Peak

Test channel:	Highest	Polarziation:	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4959.700	32.46	31.44	4.79	37.78	30.91	54.00	-23.09	Average
4959.700	44.79	31.44	4.79	37.78	43.24	74.00	-30.76	Peak
7439.550	30.23	36.66	6.77	35.56	38.10	54.00	-15.90	Average
7439.550	48.43	36.66	6.77	35.56	56.30	74.00	-17.70	Peak
9919.400	31.82	38.30	8.09	35.14	43.07	54.00	-10.93	Average
9919.400	44.14	38.30	8.09	35.14	55.39	74.00	-18.61	Peak

Test channel:	Highest	Polarziation:	Horizontal



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
4959.700	31.90	31.44	4.79	37.78	30.35	54.00	-23.65	Average
4959.700	41.36	31.44	4.79	37.78	39.81	74.00	-34.19	Peak
7439.550	29.86	36.66	6.77	35.56	37.73	54.00	-16.27	Average
7439.550	40.64	36.66	6.77	35.56	48.51	74.00	-25.49	Peak
9919.400	31.45	38.30	8.09	35.14	42.70	54.00	-11.30	Average
9919.400	45.63	38.30	8.09	35.14	56.88	74.00	-17.12	Peak

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *No emission found in frequency above 18GHz.*

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

---End---