

TEST REPORT

Applicant: Babysense Dongguan Ltd.

Address of Applicant: Room 401, Building 1, No. 17, Dongxingyuan 1 Road,
Dongkeng Town, Dongguan City

Manufacturer/Factory: Babysense Dongguan Ltd.

**Address of
Manufacturer/ Factory:** Room 401, Building 1, No. 17, Dongxingyuan 1 Road,
Dongkeng Town, Dongguan City

Equipment Under Test (EUT)

Product Name: Baby monitor

Model No.: V24R

FCC ID: 2AQVL-V24R

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

Date of sample receipt: December 02, 2019

Date of Test: December 02, 2019- April 13, 2020

Date of report issued: April 13, 2020

Test Result : PASS *

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

Authorized Signature:

A circular blue ink stamp from GTS (Global United Technology Services Co., Ltd.) is visible. The stamp contains the text "GTS", "GLOBAL UNITED TECHNOLOGY SERVICES CO., LTD.", and "DONGGUAN, CHINA". Overlaid on the stamp is a handwritten signature in black ink, which appears to read "Robinson Lo".

Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	April 13, 2020	Original

Prepared By:

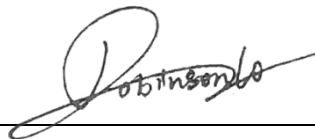


Date:

April 13, 2020

Project Engineer

Check By:



Date:

April 13, 2020

Reviewer

3 Contents

Page

1	COVER PAGE	1
2	VERSION	2
3	CONTENTS	3
4	TEST SUMMARY	4
4.1	MEASUREMENT UNCERTAINTY	4
5	GENERAL INFORMATION	5
5.1	GENERAL DESCRIPTION OF EUT	5
5.2	TEST MODE	6
5.3	TEST FACILITY	6
5.4	TEST LOCATION	6
5.5	OTHER INFORMATION REQUESTED BY THE CUSTOMER.....	6
5.6	DESCRIPTION OF SUPPORT UNITS	7
5.7	DEVIATION FROM STANDARDS.....	7
5.8	ABNORMALITIES FROM STANDARD CONDITIONS.....	7
6	TEST INSTRUMENTS LIST	8
7	TEST RESULTS AND MEASUREMENT DATA	10
7.1	ANTENNA REQUIREMENT	10
7.2	CONDUCTED EMISSIONSS	11
7.3	CONDUCTED PEAK OUTPUT POWER.....	14
7.4	20dB EMISSION BANDWIDTH	16
7.5	CARRIER FREQUENCIES SEPARATION.....	18
7.6	HOPPING CHANNEL NUMBER	21
7.7	DWELL TIME	23
7.8	PSEUDORANDOM FREQUENCY HOPPING SEQUENCE	25
7.9	BAND EDGE	26
7.9.1	Conducted Emission Method	26
7.9.2	Radiated Emission Method	28
7.10	SPURIOUS EMISSION	30
7.10.1	Conducted Emission Method	30
7.10.2	Radiated Emission Method	32
8	TEST SETUP PHOTO	40
9	EUT CONSTRUCTIONAL DETAILS.....	40

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.

N/A: Not applicable.

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

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	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:	Baby monitor
Model No.:	V24R
Test sample(s) ID:	GTS201912000233-1
Sample(s) Status:	Engineer sample
Serial No.:	N/A
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	2410.875MHz-2471.625MHz
Channel numbers:	19
Channel separation:	3.375MHz
Modulation technology:	GFSK
Antenna Type:	Integral Antenna
Antenna gain:	0dBi
Power supply:	Adapter 1 AC ADAPTER MODEL:AW007WR-0500070UV INPUT:100-240V-50/60Hz 0.3A OUTPUT:5V/0.7A OR Adapter 2 AC ADAPTER MODEL:AW007WR-0500060UV INPUT:100-240V-50/60Hz 0.3A OUTPUT:5V/0.6A All adapters were tested, and this report shows only the worst data (adapter 1)

Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2410.875	6	2427.750	11	2444.625	16	2461.500
2	2414.250	7	2431.125	12	2448.000	17	2464.875
3	2417.625	8	2434.500	13	2451.375	18	2468.250
4	2421.000	9	2437.875	14	2454.750	19	2471.625
5	2424.375	10	2441.250	15	2458.125	20	

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	2410.875
The middle channel	2441.250
The Highest channel	2471.625

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. 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 Other Information Requested by the Customer

None.

5.6 Description of Support Units

None.

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

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

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. 26 2019	June. 25 2020
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 26 2019	June. 25 2020
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 26 2019	June. 25 2020
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 26 2019	June. 25 2020
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 26 2019	June. 25 2020
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 26 2019	June. 25 2020
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 26 2019	June. 25 2020

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. 26 2019	June. 25 2020
2	Barometer	ChangChun	DYM3	GTS255	June. 26 2019	June. 25 2020

7 Test results and Measurement Data

7.1 Antenna requirement

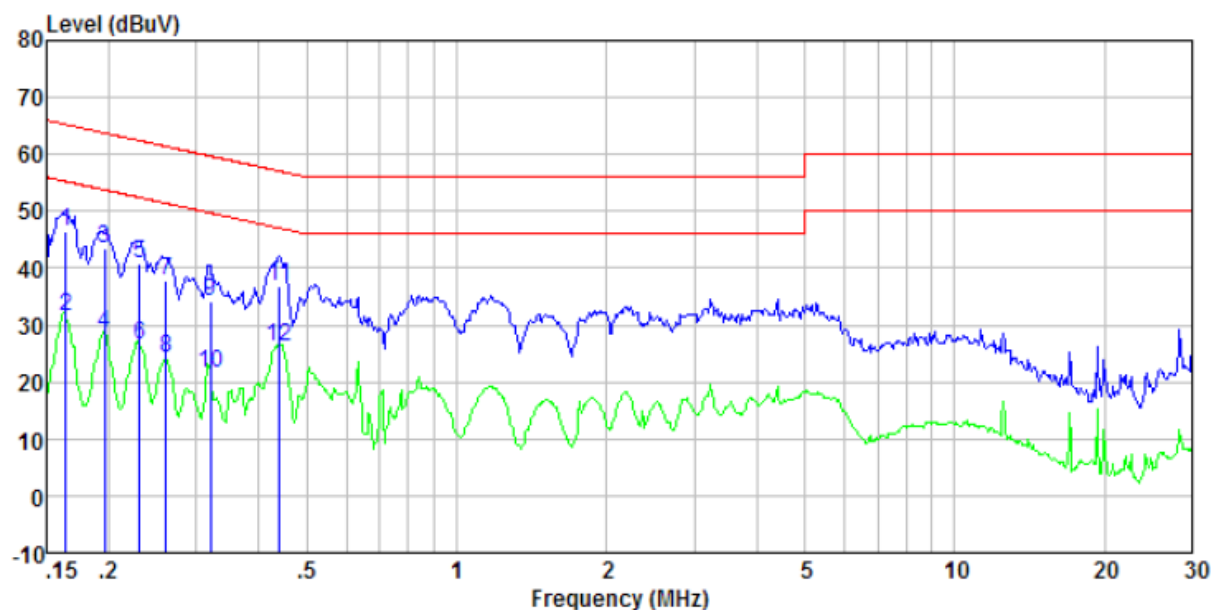
Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique 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:	
<i>The antenna is integral Antenna, the best case gain of the antenna is 0dBi, reference to the appendix II for details</i>	

7.2 Conducted Emissionss

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:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table> * Decreases with the logarithm of the frequency.			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
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															
Test setup:	Reference Plane Test table/Insulation plane <i>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</i>																
Test procedure:	1. The E.U.T 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 Instruments:	Refer to section 6.0 for details																
Test mode:	Refer to section 5.3 for details																
Test results:	Pass																

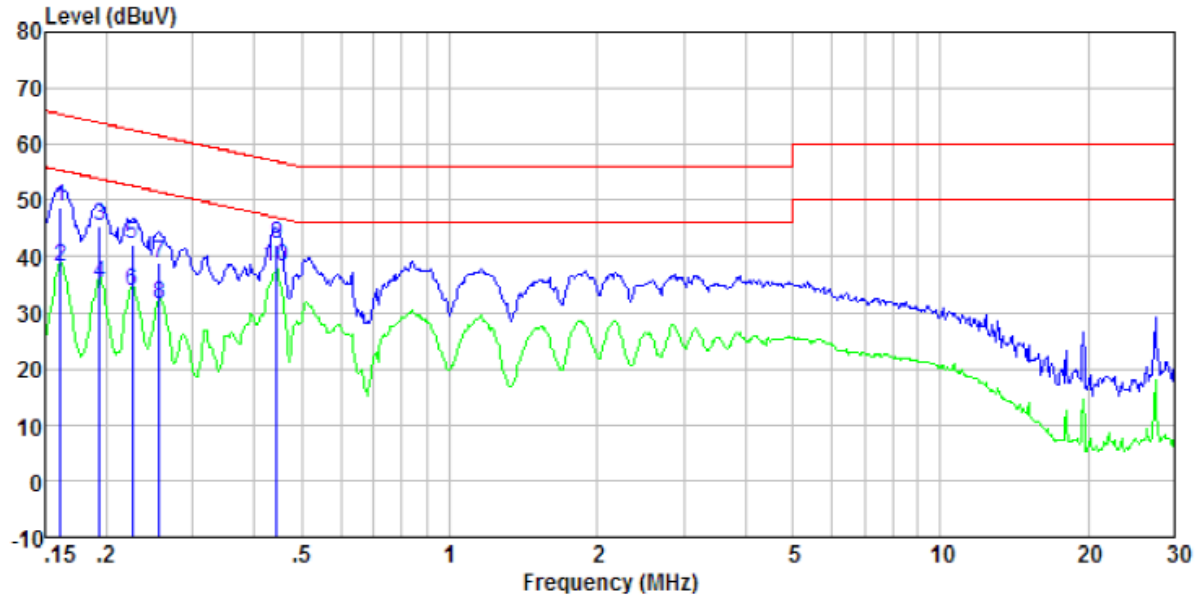
Measurement data:

Line:



Freq MHz	Reading level dBuV	ISSN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.164	45.97	0.42	0.12	46.51	65.25	-18.74	QP
0.164	30.89	0.42	0.12	31.43	55.25	-23.82	Average
0.197	42.93	0.43	0.13	43.49	63.76	-20.27	QP
0.197	27.96	0.43	0.13	28.52	53.76	-25.24	Average
0.230	40.23	0.43	0.12	40.78	62.44	-21.66	QP
0.230	25.97	0.43	0.12	26.52	52.44	-25.92	Average
0.260	37.40	0.44	0.11	37.95	61.42	-23.47	QP
0.260	23.55	0.44	0.11	24.10	51.42	-27.32	Average
0.320	33.79	0.44	0.10	34.33	59.71	-25.38	QP
0.320	20.95	0.44	0.10	21.49	49.71	-28.22	Average
0.440	36.47	0.40	0.11	36.98	57.07	-20.09	QP
0.440	25.66	0.40	0.11	26.17	47.07	-20.90	Average

Neutral:

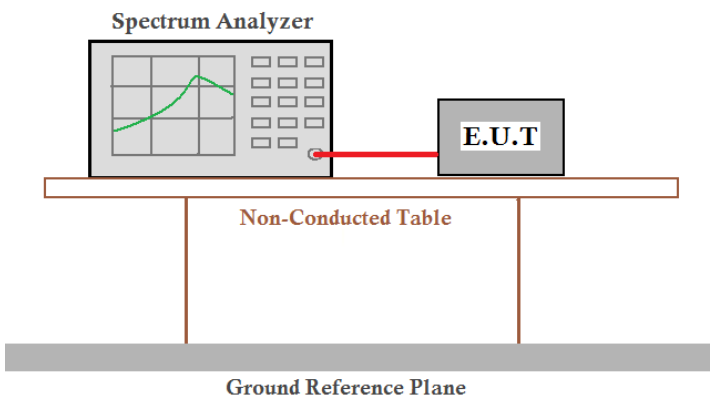


Freq MHz	Reading level dBuV	LISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.162	48.09	0.41	0.12	48.62	65.38	-16.76	QP
0.162	37.55	0.41	0.12	38.08	55.38	-17.30	Average
0.193	44.84	0.41	0.13	45.38	63.89	-18.51	QP
0.193	34.57	0.41	0.13	35.11	53.89	-18.78	Average
0.226	41.70	0.42	0.12	42.24	62.61	-20.37	QP
0.226	33.44	0.42	0.12	33.98	52.61	-18.63	Average
0.256	38.16	0.42	0.11	38.69	61.56	-22.87	QP
0.256	30.87	0.42	0.11	31.40	51.56	-20.16	Average
0.444	41.76	0.38	0.11	42.25	56.98	-14.73	QP
0.444	37.74	0.38	0.11	38.23	46.98	-8.75	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. Both 120V and 240V are tested, only show the worst case 120V test data on the report.
5. 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.

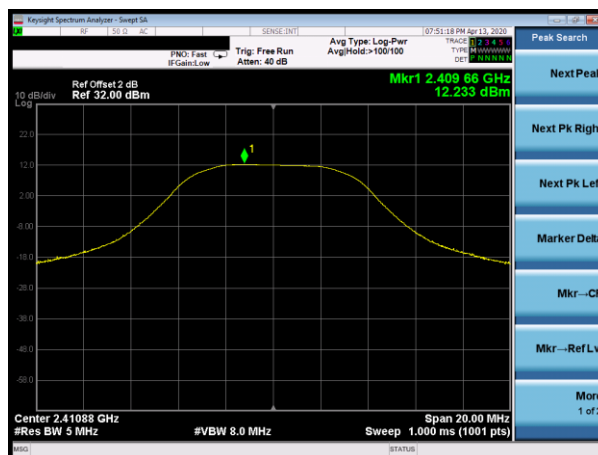
7.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	DA 00-705, ANSI C63.10:2013
Limit:	20.97dBm
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

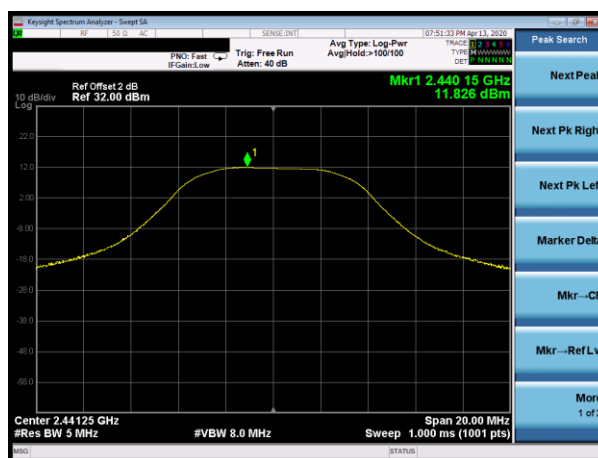
Measurement Data

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	12.233	20.97	Pass
Middle	11.826		
Highest	11.142		

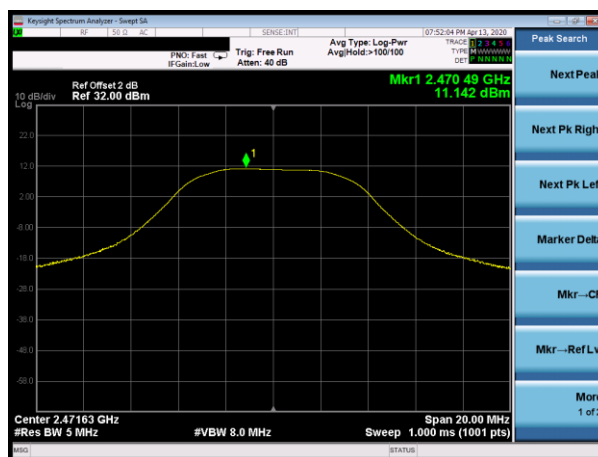
Test plot as follows:



Lowest channel

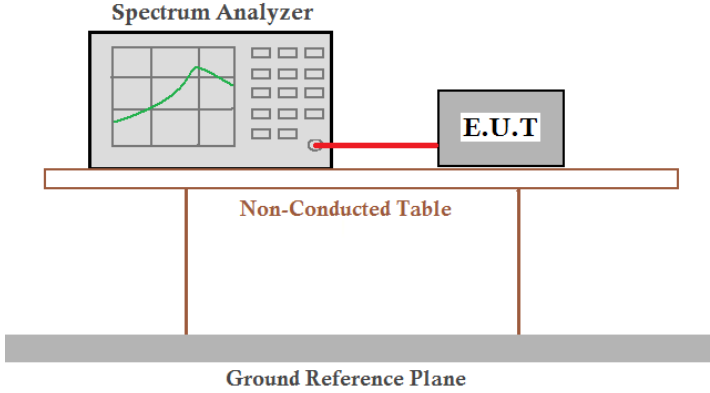


Middle channel



Highest channel

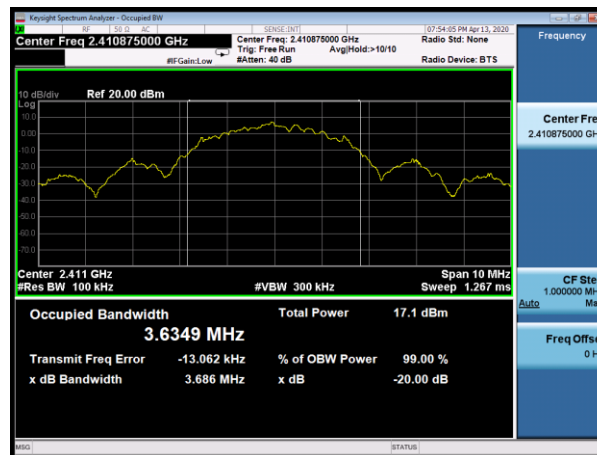
7.4 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	DA 00-705, ANSI C63.10:2013
Limit:	N/A
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

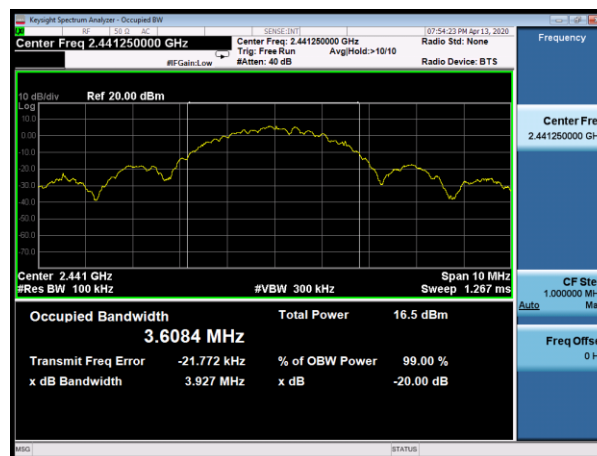
Measurement Data

Test channel	20dB Emission Bandwidth (MHz)	Result
Lowest	3.686	Pass
Middle	3.927	
Highest	3.935	

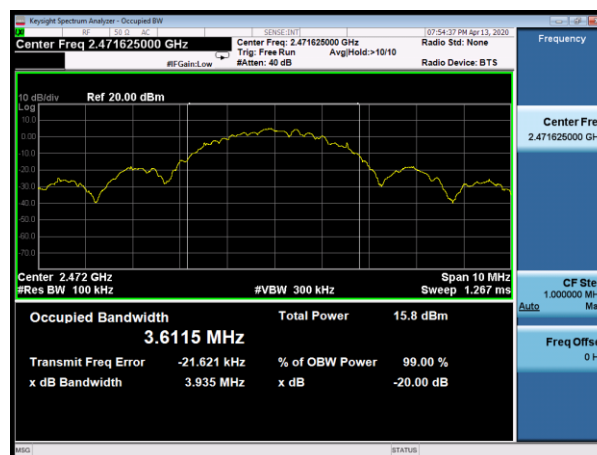
Test plot as follows:



Lowest channel

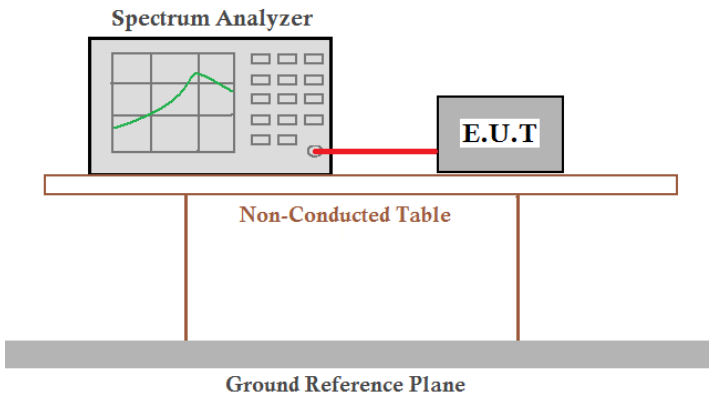


Middle channel



Highest channel

7.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	DA 00-705, ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, detector=Peak
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer, shown with a grid and a green signal trace, is connected to an E.U.T. (Equipment Under Test) box by a red cable. Both the Spectrum Analyzer and the E.U.T. are resting on a table labeled 'Non-Conducted Table'. Below this table is a thick grey horizontal bar labeled 'Ground Reference Plane'.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

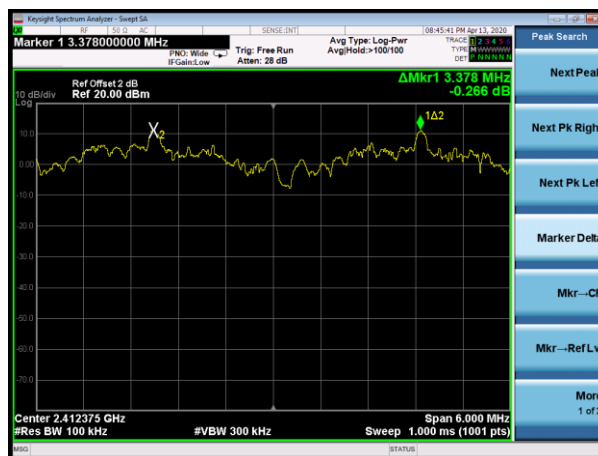
Measurement Data

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	3378	2457	Pass
Middle	3378	2457	Pass
Highest	3372	2457	Pass

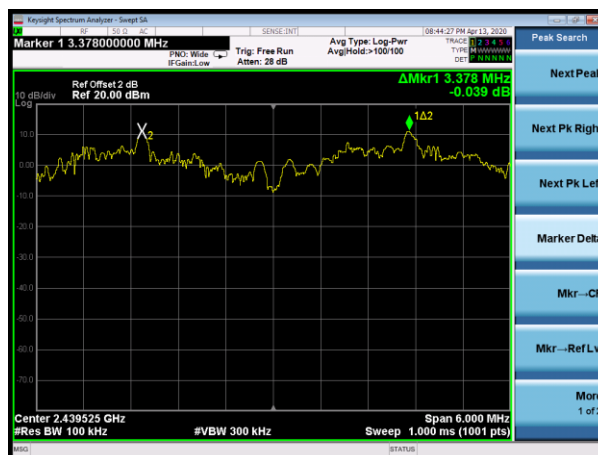
Note: According to section 6.3

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	3686	2457

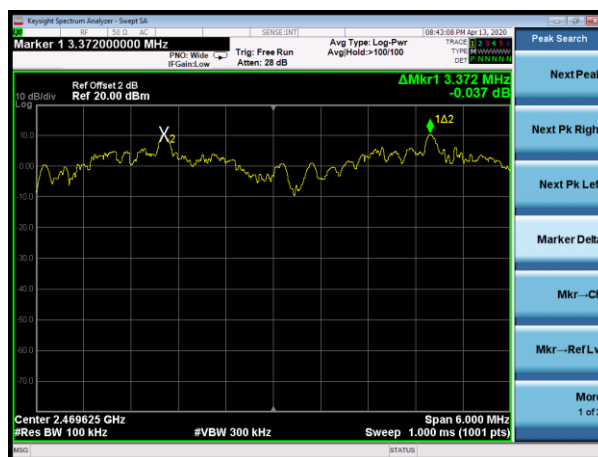
Test plot as follows:



Lowest channel

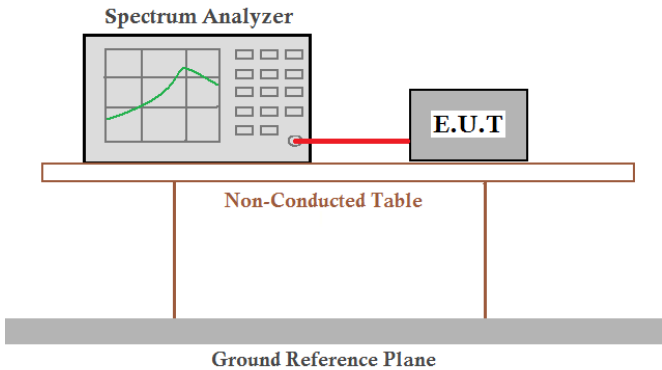


Middle channel



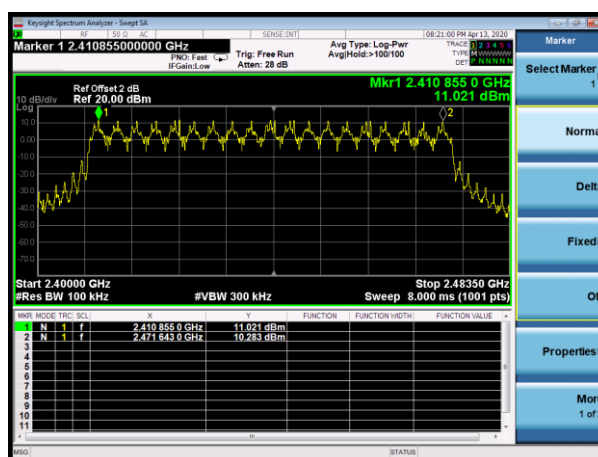
Highest channel

7.6 Hopping Channel Number

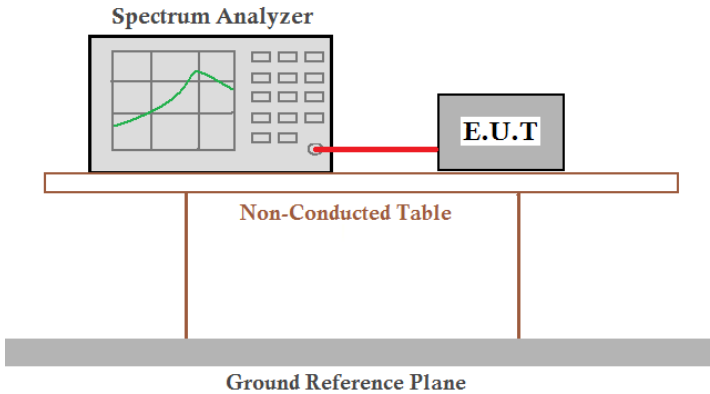
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	DA 00-705, ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
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
19	15	Pass



7.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	DA 00-705, ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Channel	Ton(ms)	Dwell time(ms)	Limit(ms)	Result
Lowest	0.113ms	80.7272ms	400	Pass
Middle	0.113ms	86.7388ms	400	Pass
Highest	0.113ms	85.0212ms	400	Pass

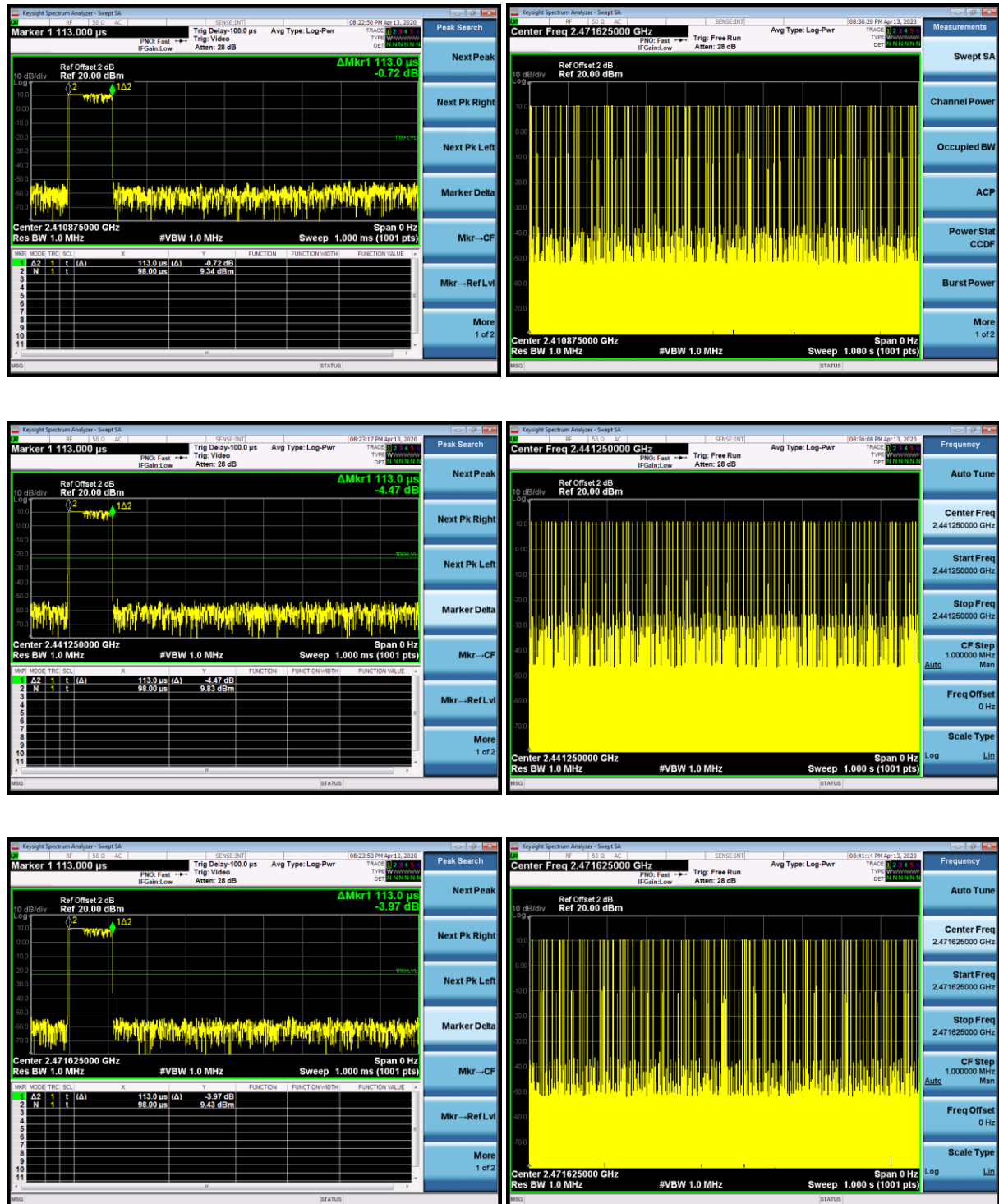
The Formula as bellow:

Lowest: Dwell time=Ton* Ton times on 1s*0.4s*channel numbers=0.113*94*0.4*19=80.7272ms

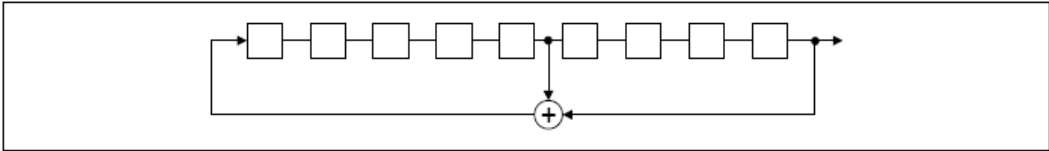
Middle: Dwell time=Ton* Ton times on 1s*0.4s*channel numbers=0.113*101*0.4*19=86.7388ms

Highest: Dwell time=Ton* Ton times on 1s*0.4s*channel numbers=0.113*99*0.4*19=85.0212ms

Test plot as follows:

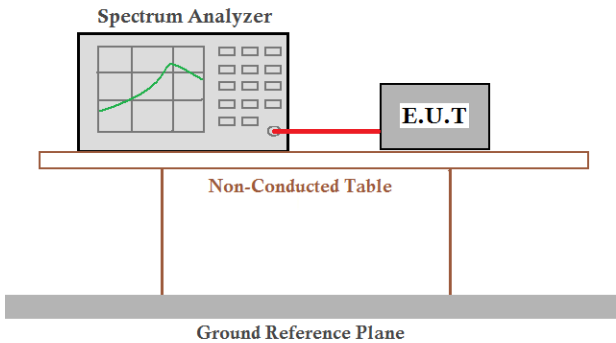


7.8 Pseudorandom Frequency Hopping Sequence

Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:
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.	
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)  <i>Linear Feedback Shift Register for Generation of the PRBS sequence</i> 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.	

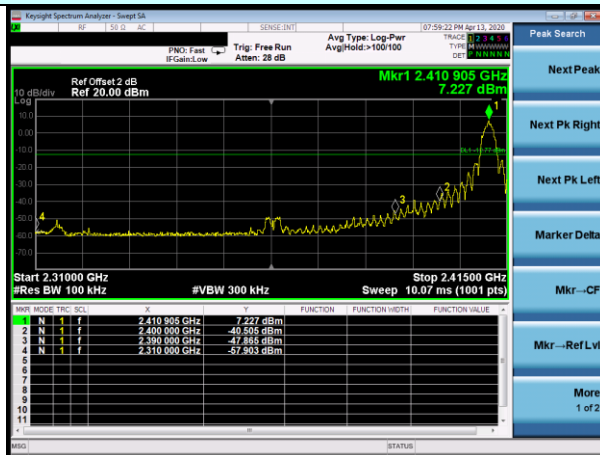
7.9 Band Edge

7.9.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	DA 00-705, ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

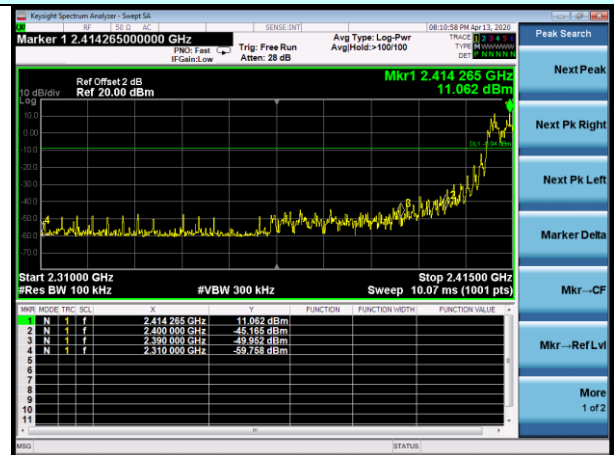
Test plot as follows:

Test channel:



No-hopping mode

Lowest channel



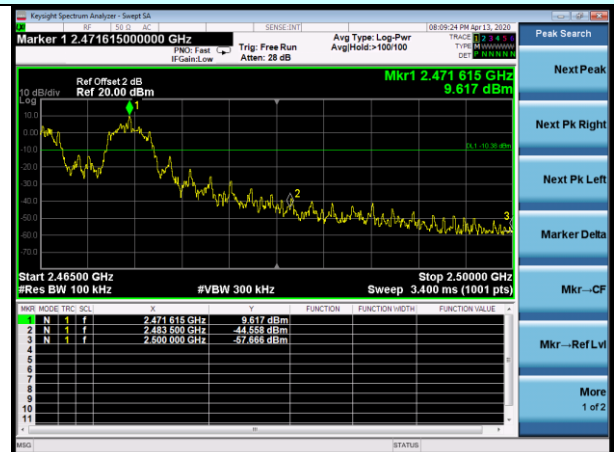
Hopping mode

Test channel:



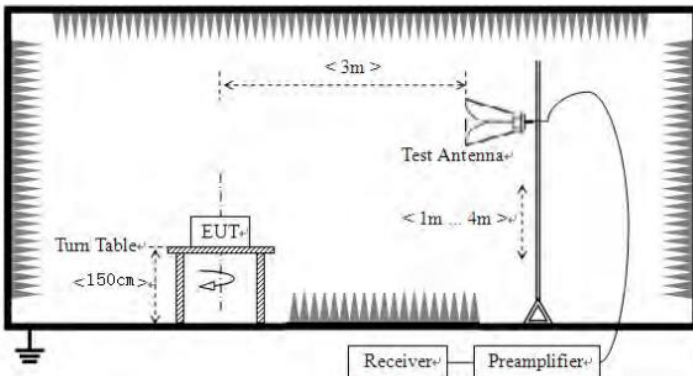
No-hopping mode

Highest channel



Hopping mode

7.9.2 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				
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. Two antenna were tested and found the antenna1 is worse. So only the data of antenna1 is reported.

Measurement Data:

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

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	48.82	27.59	5.38	30.18	51.61	74.00	-22.39	Vertical
2400.00	51.17	27.58	5.39	30.18	53.96	74.00	-20.04	Vertical
2390.00	47.75	27.59	5.38	30.18	50.54	74.00	-23.46	Horizontal
2400.00	56.63	27.58	5.39	30.18	59.42	74.00	-14.58	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	36.48	27.59	5.38	30.18	39.27	54.00	-14.73	Vertical
2400.00	37.95	27.58	5.39	30.18	40.74	54.00	-13.26	Vertical
2390.00	36.71	27.59	5.38	30.18	39.50	54.00	-14.50	Horizontal
2400.00	39.98	27.58	5.39	30.18	42.77	54.00	-11.23	Horizontal

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

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	49.40	27.53	5.47	29.93	52.47	74.00	-21.53	Vertical
2500.00	47.82	27.55	5.49	29.93	50.93	74.00	-23.07	Vertical
2483.50	50.90	27.53	5.47	29.93	53.97	74.00	-20.03	Horizontal
2500.00	49.19	27.55	5.49	29.93	52.30	74.00	-21.70	Horizontal

Average value:

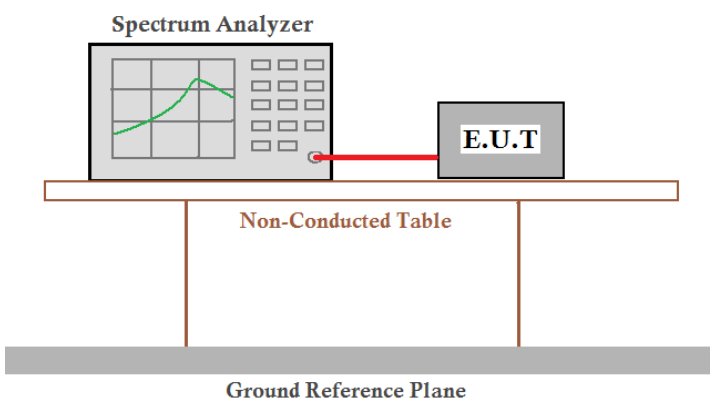
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	39.36	27.53	5.47	29.93	42.43	54.00	-11.57	Vertical
2500.00	36.79	27.55	5.49	29.93	39.90	54.00	-14.10	Vertical
2483.50	40.90	27.53	5.47	29.93	43.97	54.00	-10.03	Horizontal
2500.00	37.04	27.55	5.49	29.93	40.15	54.00	-13.85	Horizontal

Remark:

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

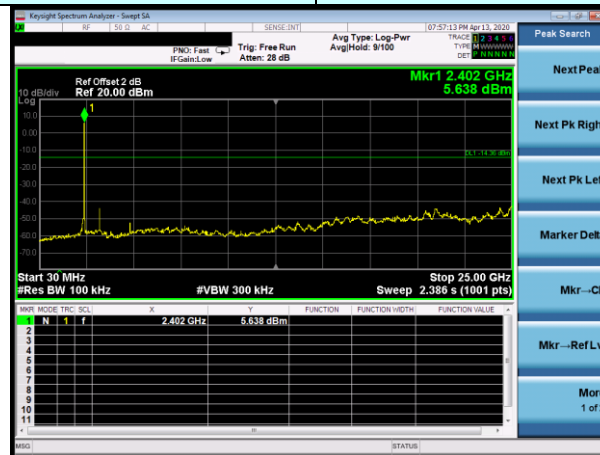
7.10 Spurious Emission

7.10.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
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:	 The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T (Equipment Under Test). Both are placed on a Non-Conducted Table, which sits on a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

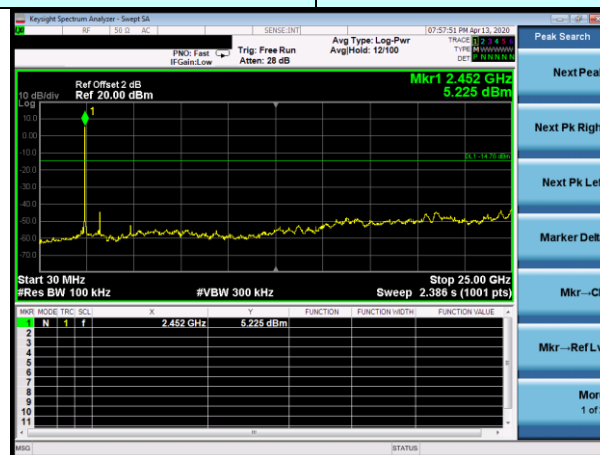
Test plot as follows:

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



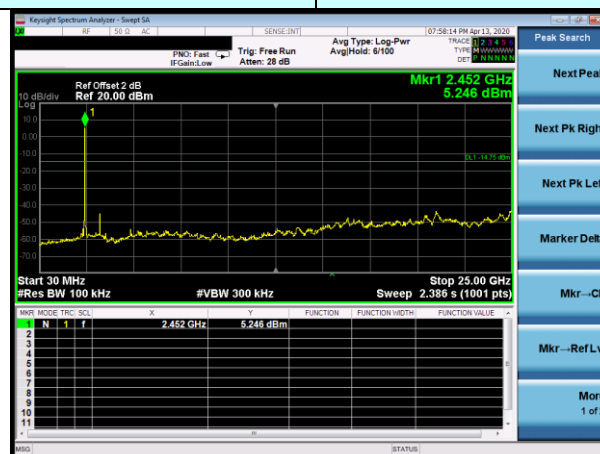
30MHz~25GHz

Test channel:	Middle channel
---------------	----------------



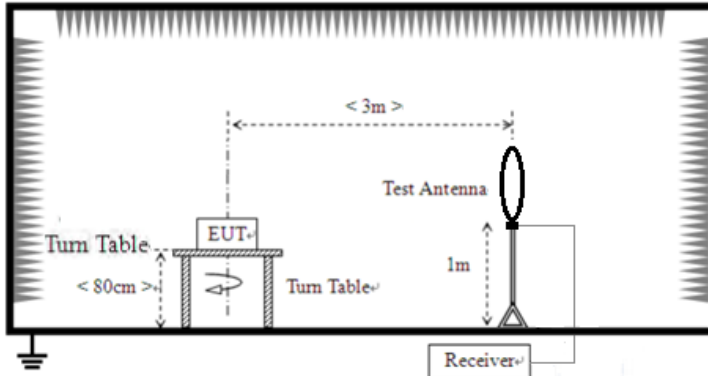
30MHz~25GHz

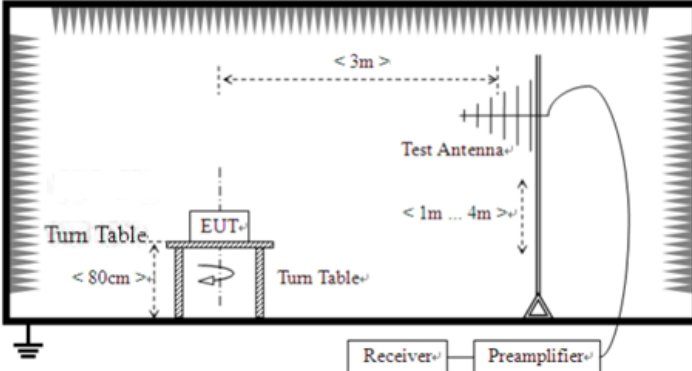
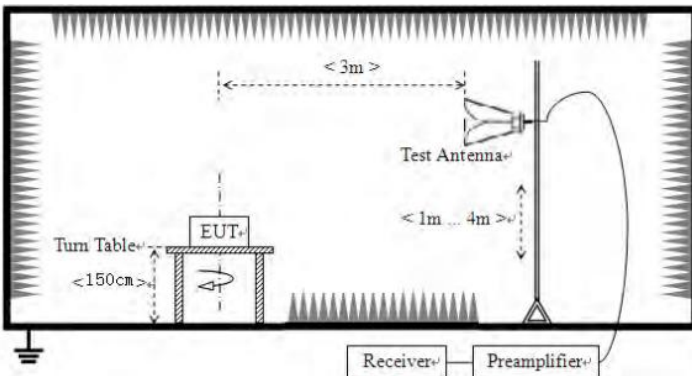
Test channel:	Highest channel
---------------	-----------------



30MHz~25GHz

7.10.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	30m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
		5000	Peak		
Test setup:	For radiated emissions from 9kHz to 30MHz				
					

	For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 						
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) 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						
Test environment:	<table><tr><td>Temp.:</td><td>25 °C</td><td>Humid.:</td><td>52%</td><td>Press.:</td><td>1012mbar</td></tr></table>	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar		

Test voltage:	AC 120V, 60Hz
Test results:	Pass

Measurement data:*Remarks:*

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. Two antenna were tested and found the antenna1 is worse. So only the data of antenna1 is reported.

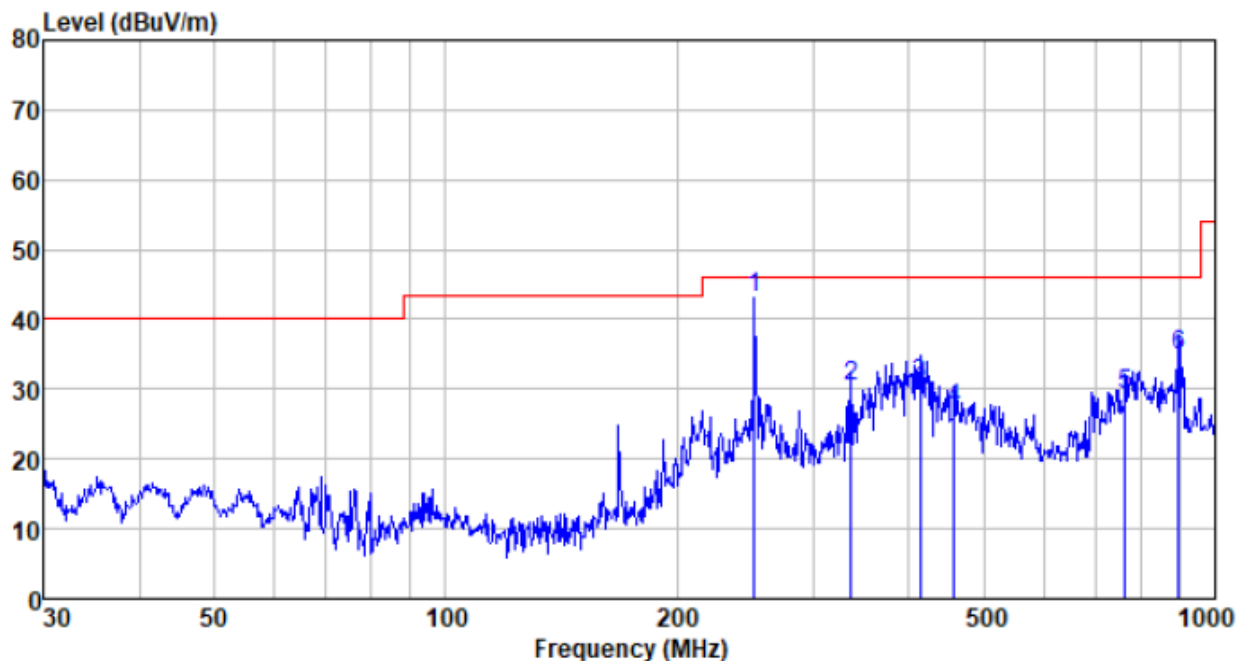
■ 9kHz~30MHz

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.

Antenna 1:

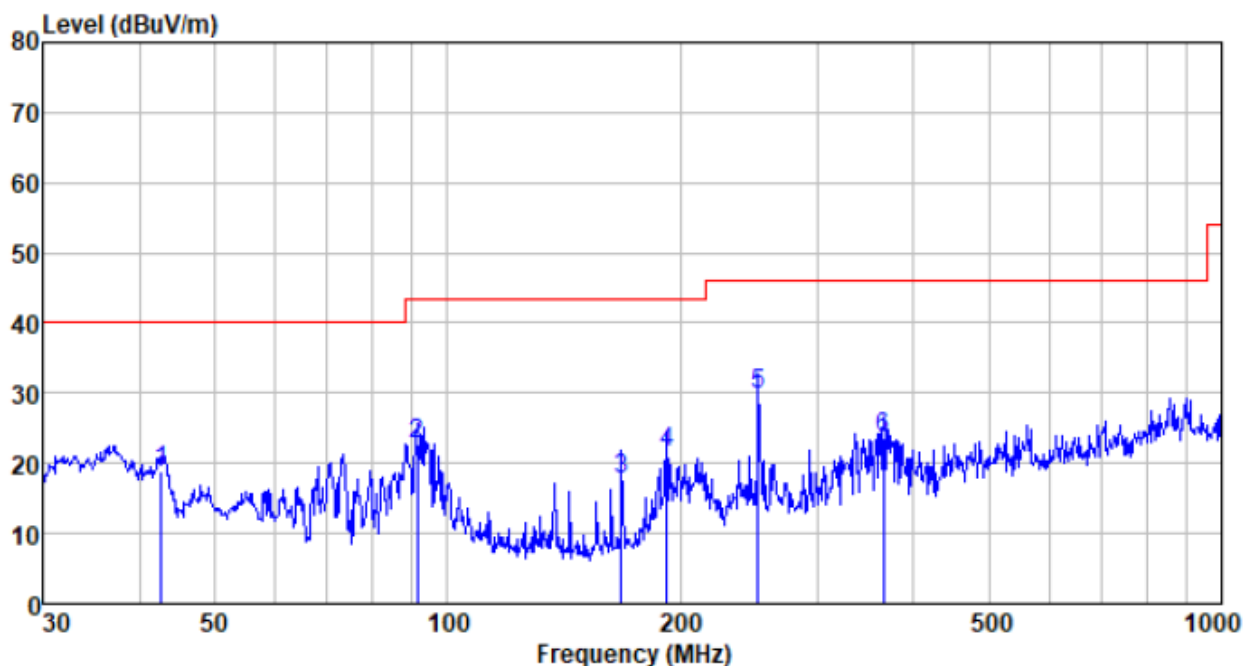
■ Below 1GHz

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
252.063	65.99	12.22	2.14	37.38	42.97	46.00	-3.03	QP
336.035	51.11	14.29	2.55	37.46	30.49	46.00	-15.51	QP
413.271	49.81	15.63	2.92	37.52	30.84	46.00	-15.16	QP
457.507	45.13	16.52	3.12	37.51	27.26	46.00	-18.74	QP
763.376	41.67	20.78	4.32	37.62	29.15	46.00	-16.85	QP
896.997	45.42	22.27	4.83	37.60	34.92	46.00	-11.08	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
42.750	41.86	12.23	0.69	35.82	18.96	40.00	-21.04	QP
91.495	47.45	10.90	1.12	36.65	22.82	43.50	-20.68	QP
167.824	44.86	8.46	1.67	37.18	17.81	43.50	-25.69	QP
191.745	47.06	9.99	1.80	37.29	21.56	43.50	-21.94	QP
252.063	52.71	12.22	2.14	37.38	29.69	46.00	-16.31	QP
365.539	43.51	14.78	2.69	37.49	23.49	46.00	-22.51	QP

■ Above 1GHz

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

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4821.750	44.37	31.79	14.44	37.67	52.93	74.00	-21.07	Vertical
7232.625	35.53	36.19	16.31	35.68	52.35	74.00	-21.65	Vertical
9643.500	33.84	38.07	18.24	34.92	55.23	74.00	-18.77	Vertical
12054.375	*					74.00		Vertical
14465.250	*					74.00		Vertical
16876.125	45.57	31.79	14.44	37.67	54.13	74.00	-19.87	Horizontal
4821.750	34.67	36.19	16.31	35.68	51.49	74.00	-22.51	Horizontal
7232.625	33.87	38.07	18.24	34.92	55.26	74.00	-18.74	Horizontal
9643.500	*					74.00		Horizontal
12054.375	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4821.750	36.87	31.79	14.44	37.67	45.43	54.00	-8.57	Vertical
7232.625	25.77	36.19	16.31	35.68	42.59	54.00	-11.41	Vertical
9643.500	25.87	38.07	18.24	34.92	47.26	54.00	-6.74	Vertical
12054.375	*					54.00		Vertical
14465.250	*					54.00		Vertical
16876.125	35.76	31.79	14.44	37.67	44.32	54.00	-9.68	Horizontal
4821.750	26.88	36.19	16.31	35.68	43.70	54.00	-10.30	Horizontal
7232.625	25.03	38.07	18.24	34.92	46.42	54.00	-7.58	Horizontal
9643.500	*					54.00		Horizontal
12054.375	*					54.00		Horizontal

Remark:

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

Test channel:	Middle
---------------	--------

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2441.250	50.03	31.85	14.51	37.68	58.71	74.00	-15.29	Vertical
4882.500	36.89	36.37	16.48	35.64	54.10	74.00	-19.90	Vertical
7323.750	33.41	38.35	18.52	34.99	55.29	74.00	-18.71	Vertical
9765.000								Vertical
12206.250	*	*	*	*	*	*	*	Vertical
4882.500	48.34	31.85	14.51	37.68	57.02	74.00	-16.98	Horizontal
7323.750	37.85	36.37	16.48	35.64	55.06	74.00	-18.94	Horizontal
9765.000	32.54	38.35	18.52	34.99	54.42	74.00	-19.58	Horizontal
12206.250								Horizontal
14647.500	*	*	*	*	*	*	*	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2441.250	38.63	31.85	14.51	37.68	47.31	54.00	-6.69	Vertical
4882.500	30.71	36.37	16.48	35.64	47.92	54.00	-6.08	Vertical
7323.750	25.85	38.35	18.52	34.99	47.73	54.00	-6.27	Vertical
9765.000								Vertical
12206.250	*	*	*	*	*	*	*	Vertical
4882.500	37.02	31.85	14.51	37.68	45.70	54.00	-8.30	Horizontal
7323.750	29.22	36.37	16.48	35.64	46.43	54.00	-7.57	Horizontal
9765.000	26.54	38.35	18.52	34.99	48.42	54.00	-5.58	Horizontal
12206.250								Horizontal
14649.00	*					54.00		Horizontal

Remark:

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

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

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4943.250	49.12	31.91	14.61	37.69	57.95	74.00	-16.05	Vertical
7414.875	37.06	36.56	16.63	35.60	54.65	74.00	-19.35	Vertical
9886.500	33.44	38.72	18.51	35.05	55.62	74.00	-18.38	Vertical
12358.125								Vertical
14829.750	*	*	*	*	*	*	*	Vertical
4943.250	46.71	31.91	14.61	37.69	55.54	74.00	-18.46	Horizontal
7414.875	33.58	36.56	16.63	35.60	51.17	74.00	-22.83	Horizontal
9886.500	32.02	38.72	18.51	35.05	54.20	74.00	-19.80	Horizontal
12358.125								Horizontal
14829.750	*	*	*	*	*	*	*	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4943.250	36.64	31.91	14.61	37.69	45.47	54.00	-8.53	Vertical
7414.875	31.52	36.56	16.63	35.60	49.11	54.00	-4.89	Vertical
9886.500	26.74	38.72	18.51	35.05	48.92	54.00	-5.08	Vertical
12358.125								Vertical
14829.750	*	*	*	*	*	*	*	Vertical
4943.250	35.47	31.91	14.61	37.69	44.30	54.00	-9.70	Horizontal
7414.875	32.01	36.56	16.63	35.60	49.60	54.00	-4.40	Horizontal
9886.500	26.54	38.72	18.51	35.05	48.72	54.00	-5.28	Horizontal
12358.125								Horizontal
14838.00	*							Horizontal

Remark:

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

8 Test Setup Photo

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

9 EUT Constructional Details

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

---End---