FCC TEST REPORT(Bluetooth)

for

Voxx Accessories Corp.

BLUETOOTH SPEAKER

Model Number: ARSP10

FCC ID: VIXARSP10

Prepared for : Voxx Accessories Corp.
Address : 3502 Woodview Trace Suite 220
Indianapolis In 46268,United States

Prepared by : Keyway Testing Technology Co., Ltd.
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Report No. : 14KWE06154502F
Date of Test : Jun. 9~14, 2014
Date of Report : Jun. 15, 2014

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Keyway Testing Technology Co., Ltd.

Applicant: **Address:**	Voxx Accessories Corp. 3502 Woodview Trace Suite 220 Indianapolis In 46268, United States		
Manufacturer: **Address:**	Shenzhen Great Power Enterprise Co., Ltd Building E,Xin Xulong Industrial Area, Kukeng Village, Guanlan Town,Baoan District,Shenzhen, China		
E.U.T:	BLUETOOTH SPEAKER		
Model Number:	ARSP10		
Trade Name:	AR	**Serial No.:**	------
Date of Receipt:	Jun. 9, 2014	**Date of Test:**	Jun. 9~14, 2014
Test Specification:	FCC Part 15, Subpart C: Oct. 1, 2013 ANSI C63.4:2009		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied. **Issue Date: Jun. 15, 2014**		

Tested by:	Reviewed by:	Approved by:
Andy Gao / Engineer	Jade Yang/ Supervisor	Chris Du / Manager

Other Aspects:

None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Keyway Testing Technology Co., Ltd.

1. TEST SUMMARY

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emissions	15.205(a)/15.209 15.247(d)	PASS
20dB Bandwidth	15.247(a)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Emissions from out of band	15.247(d)	PASS
Antenna Requirement	15.203	PASS

2.GENERAL PRODUCT INFORMATION

2.1. Product Function

Refer to Technical Construction Form and User Manual.

2.2. Description of Device (EUT)

Product Name:	BLUETOOTH SPEAKER
Model No.:	ARSP10
Operation Frequency:	2402~2480MHz
Channel numbers:	79 Channels
Channel separation:	1M
Modulation technology:	GFSK, Pi/4DQPSK, 8-DPSK
Antenna Type:	PCB Antenna
Antenna gain:	0dBi
BT version:	2.1+EDR
Power supply:	DC 3.7V, DC 5V from PC input AC 120V/60Hz

2.3. Difference between Model Numbers

The EUT comes in color variations but are electrically and mechanically the same.
The only difference is the color.

2.4. Independent Operation Modes

The basic operation modes are:

2.4.1. EUT work continues TX mode and frequency as below:

Modulation technology	Channel	Output Power(dBm)
GFSK	Middle	-1.98
Pi/4DQPSK	Middle	-2.05
8-DPSK	Middle	-1.02

Note: During the test, pre-scan the GFSK, Pi/4DQPSK, 8-DPSK modulation, and found the 8-DPSK modulation which it is worse case. all test data base on 8-DPSK.

2.5. Test Supporting System

None.

3. TEST SITES

3.1. Test Facilities

Lab Qualifications : 944 Shielded Room built by ETS-Lindgren, USA
Date of completion: March 28, 2011

966 Chamber built by ETS-Lindgren, USA
Date of completion: March 28, 2011

Certificated by TUV Rheinland, Germany.
Registration No.: UA 50207153
Date of registration: July 13, 2011

Certificated by UL, USA
Registration No.: 100567-237
Date of registration: September 1, 2011

Certificated by Intertek
Registration No.: 2011-RTL-L1-31
Date of registration: October 11, 2011

Certificated by Industry Canada
Registration No.: 9868A
Date of registration: December 8, 2011

Certificated by FCC, USA
Registration No.: 370994
Date of registration: February 21, 2012

Certificated by CNAS China
Registration No.: CNAS L5783
Date of registration: August 8, 2012

Name of Firm : Keyway Testing Technology Co., Ltd.

Site Location : Baishun Industrial Zone, Zhangmutou Town, Dongguan, Guangdong, China

3.2. List of Test and Measurement Instruments

3.2.1. For conducted emission at the mains terminals test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 27,14	Apr. 27,15
Artificial Mains Network	Rohde&Schwarz	ENV216	101315	Apr. 27,14	Apr. 27,15
Artificial Mains Network (AUX)	Rohde&Schwarz	ENV216	101314	Apr. 27,14	Apr. 27,15
RF Cable	FUJIKURA	3D-2W	944 Cable	Apr. 27,14	Apr. 27,15

3.2.2. For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 27,14	Apr. 27,15
System Simulator	Agilent	E5515C	GB43130245	Apr. 30,14	Apr. 30,15
Power Splitter	Weinschel	1506A	NW425	Apr. 30,14	Apr. 30,15
Bilog Antenna	ETS-LINDGREEN	3142D	135452	Apr. 27,14	Apr. 27,15
Spectrum Analyzer	Agilent	E4411B	MY4511304	Apr. 27,14	Apr. 27,15
3m Semi-anechoic Chamber	ETS-LINDGREEN	966	KW01	Apr. 27,14	Apr. 27,15
Signal Amplifier	SONOMA	310	187016	Apr. 27,14	Apr. 27,15
Signal Amplifier	Agilent	8449B	3008A00251	Apr. 27,14	Apr. 27,15
RF Cable	IMRO	IMRO-400	966 Cable 1#	N/A	N/A
MULTI-DEVICE Controller	ETS-LINDGREEN	2090	126913	N/A	N/A
Horn Antenna	DAZE	ZN30701	11003	Apr. 27,14	Apr. 27,15
Horn Antenna	SCHWARZBECK	BBHA9170	9170-068	Apr. 27,14	Apr. 27,15
Spectrum Analyzer	Agilent	8593E	3911A04271	Apr. 27,14	Apr. 27,15
Spectrum Analyzer	Agilent	E4408B	MY44211125	Apr. 30,14	Apr. 30,15
Signal Amplifier	DAZE	ZN3380C	11001	Apr. 27,14	Apr. 27,15
High Pass filter	Micro	HPM50111	324216	Apr. 30,14	Apr. 30,15
Filter	COM-MW	ZBSF-C836.5-25-X	KW032	Apr. 30,14	Apr. 30,15
Filter	COM-MW	ZBSF-C1747.5-75-X2	KW035	Apr. 30,14	Apr. 30,15
Filter	COM-MW	ZBSF-C1880-60-X2	KW037	Apr. 30,14	Apr. 30,15
DC Power Supply	LongWei	PS-305D	010964729	Apr. 27,14	Apr. 27,15
Constant temperature and humidity box	GF	GTH-800-40-1P	MAA9906-005	Apr. 27,14	Apr. 27,15
Universal radio communication tester	Rohde&Schwarz	CMU200	3215420	Apr. 27,14	Apr. 27,15
Splitter	Agilent	11636B	0025164	Apr. 27,14	Apr. 27,15

4. TEST SET-UP AND OPERATION MODES

4.1. Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

4.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators

(EUT: BLUETOOTH SPEAKER)

4.3. Test Operation Mode and Test Software

None.

4.4. Special Accessories and Auxiliary Equipment

None.

4.5. Countermeasures to Achieve EMC Compliance

None.

5. MAXIMUM PEAK OUTPUT POWER

5.1. Limits

According to FCC Section 15.247(b)(1), For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

5.2. Test setup

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the power meter, during the measurement, the Bluetooth module of the EUT is activated and controlled by the software, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

Test data:

	Channel Frequency (MHz)	Peak output Power dBm	Limit dBm	Result
GFSK	2402	-1.57	30.00	Pass
	2441	-1.98	30.00	Pass
	2480	-1.43	30.00	Pass
Pi/4DQPSK	2402	-1.69	30.00	Pass
	2441	-2.05	30.00	Pass
	2480	-1.52	30.00	Pass
8-DPSK	2402	-1.13	21.00	Pass
	2441	-1.02	21.00	Pass
	2480	-1.11	21.00	Pass

6. EMISSION TEST RESULTS

6.1. Conducted Emission at the Mains Terminals Test

6.1.1. Limit 15.207 limits

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

6.1.2. Test Setup

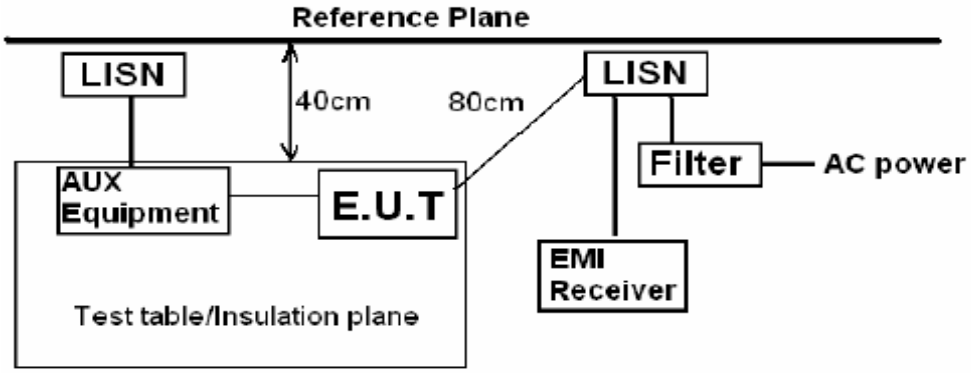
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the centre so as to form a bundle no longer than 0.4 m.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

The frequency range from 150 kHz to 30 MHz was investigated.

The bandwidth of the test receiver was set at 9 kHz.

Pretest for all mode, The test data of the worst case condition(s) was reported on the following page.

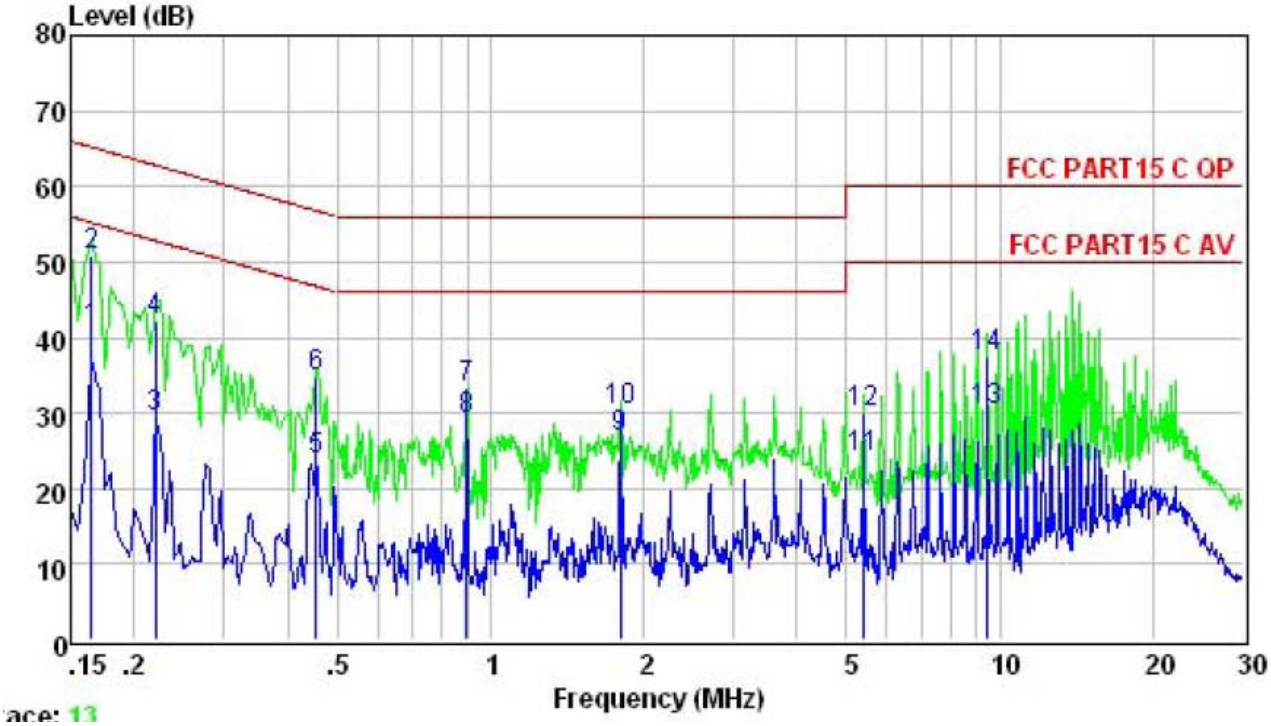


Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

6.1.3. Test Mode

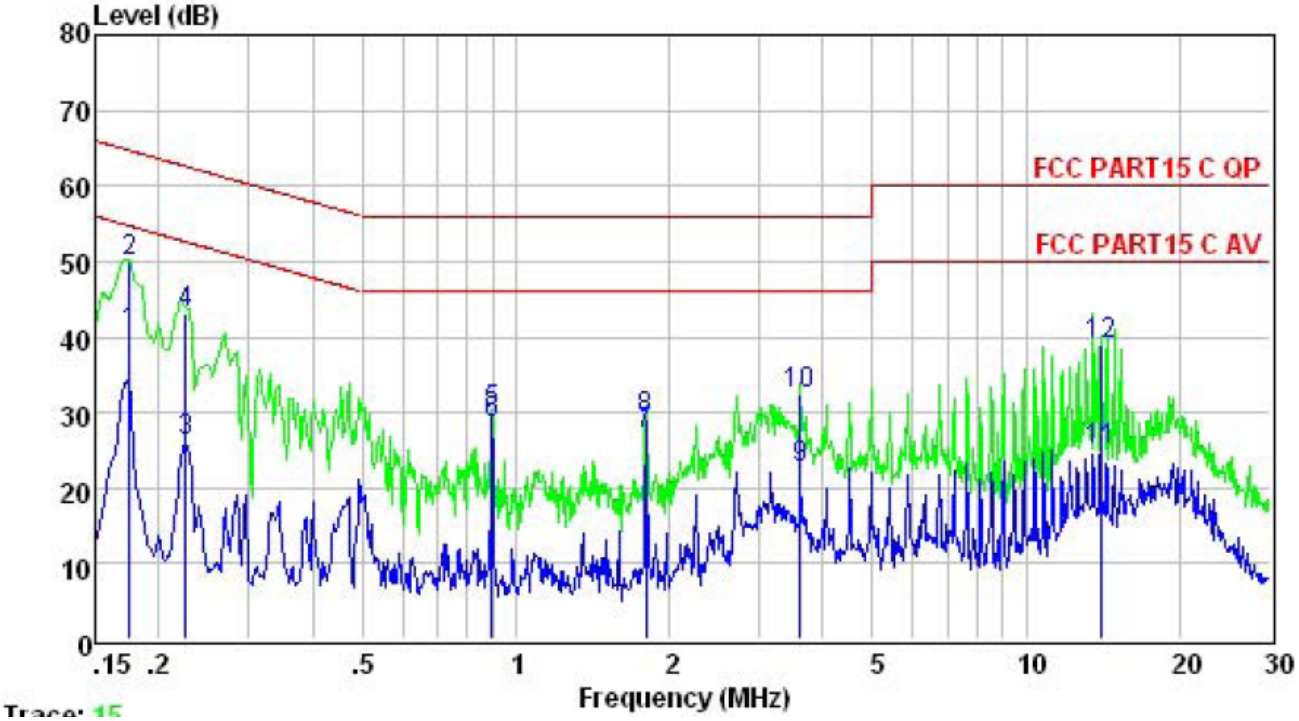
Set EUT in TX mode.

Line:



	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dB	
1	0.165	41.10	55.21	-14.11	Average
2	0.165	50.80	65.21	-14.41	QP
3	0.220	29.46	52.83	-23.37	Average
4	0.220	42.10	62.83	-20.73	QP
5	0.454	23.80	46.80	-23.00	Average
6	0.454	34.80	56.80	-22.00	QP
7	0.899	33.20	56.00	-22.80	QP
8	0.899	29.10	46.00	-16.90	Average
9	1.800	26.90	46.00	-19.10	Average
10	1.800	30.20	56.00	-25.80	QP
11	5.419	24.21	50.00	-25.79	Average
12	5.419	30.10	60.00	-29.90	QP
13	9.451	30.24	50.00	-19.76	Average
14	9.451	37.60	60.00	-22.40	QP

Neutral



	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dB	
1	0.175	40.30	54.72	-14.42	Average
2	0.175	49.90	64.72	-14.82	QP
3	0.226	26.18	52.61	-26.43	Average
4	0.226	43.20	62.61	-19.41	QP
5	0.899	30.10	56.00	-25.90	QP
6	0.899	28.53	46.00	-17.47	Average
7	1.800	27.20	46.00	-18.80	Average
8	1.800	29.20	56.00	-26.80	QP
9	3.603	22.72	46.00	-23.28	Average
10	3.603	32.50	56.00	-23.50	QP
11	13.989	24.86	50.00	-25.14	Average
12	13.989	39.10	60.00	-20.90	QP

6.2. Radiated Emission Test

6.2.1. Limit 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

6.2.2. Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

6.2.3. Test setup

The EUT was placed on a turn table which was 0.8 m above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz.

The frequency range from 30MHz to 10th harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

Notes: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading-Preamp Factor.

2. Measurement Uncertainty: ±3.2 dB at a level of confidence of 95%.

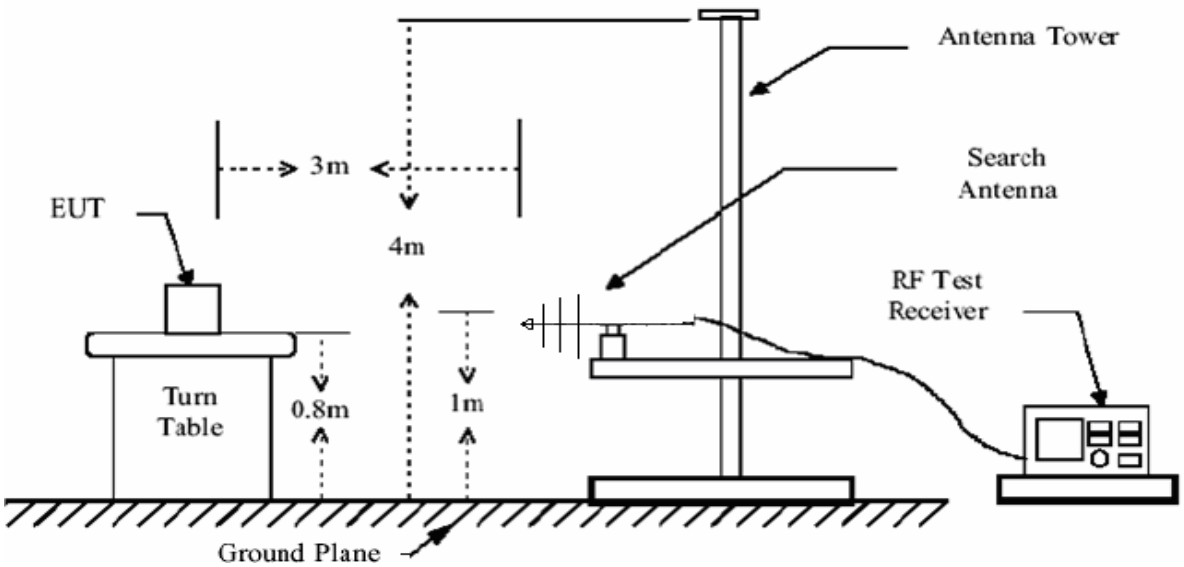
3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

4. For emissions below 1GHz, pretest for all mode, The test data of the worst case condition(s) was reported on the following pages.

5: we pretest 3 packages DH1, DH3, DH5, package DH5 is largest; we are testing DH5 in the report.

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

7：we pretest all modulation, The worst was 8-DPSK, the worst data was show in the report.



Below 1GHz

BT Mode Horizontal polarizations

	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	66.86	31.31	49.95	0.85	7.44	26.93	40.00	-13.07	QP
2	156.10	31.24	47.70	1.30	9.12	26.88	43.50	-16.62	QP
3	243.40	30.95	47.57	1.61	12.72	30.95	46.00	-15.05	QP
4	289.96	30.93	49.54	1.87	13.48	33.96	46.00	-12.04	QP
5	335.55	30.74	44.20	2.10	14.92	30.48	46.00	-15.52	QP
6	461.65	30.61	35.92	2.69	17.93	25.93	46.00	-20.07	QP

BT Mode Vertical polarizations

	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	66.86	31.31	54.70	0.85	7.44	31.68	40.00	-8.32	QP
2	156.10	31.24	50.62	1.30	9.12	29.80	43.50	-13.70	QP
3	287.05	30.94	43.10	1.87	13.39	27.42	46.00	-18.58	QP
4	418.00	30.63	40.69	2.48	16.88	29.42	46.00	-16.58	QP
5	612.00	30.62	33.36	3.38	20.94	27.06	46.00	-18.94	QP
6	757.50	30.66	33.11	4.12	22.77	29.34	46.00	-16.66	QP

Above 1GHz

2402MHz Horizontal polarizations

	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	4804.00	27.49	32.26	11.96	32.94	49.67	74.00	-24.33	Peak
2	7206.00	27.94	18.85	16.61	37.28	44.80	74.00	-29.20	Peak
3	10197.00	28.82	18.52	17.00	38.72	45.42	74.00	-28.58	Peak
4	12118.00	29.02	16.63	17.47	39.42	44.50	74.00	-29.50	Peak
5	13053.00	29.21	13.72	18.28	40.94	43.73	74.00	-30.27	Peak
6	14719.00	29.51	14.30	19.83	39.69	44.31	74.00	-29.69	Peak

2402MHz Vertical polarizations

	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	4804.00	27.49	31.97	11.96	32.94	49.38	74.00	-24.62	Peak
2	7206.00	27.94	16.14	16.61	37.28	42.09	74.00	-31.91	Peak
3	10605.00	28.86	15.69	17.09	39.26	43.18	74.00	-30.82	Peak
4	12917.00	29.18	16.08	18.14	40.50	45.54	74.00	-28.46	Peak
5	14362.00	29.45	13.34	19.60	41.40	44.89	74.00	-29.11	Peak
6	16011.00	29.71	13.75	20.64	40.40	45.08	74.00	-28.92	Peak

2441MHz Horizontal polarizations

	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	4880.00	27.53	32.30	12.14	33.11	50.02	74.00	-23.98	Peak
2	7320.00	27.96	17.84	16.62	37.33	43.83	74.00	-30.17	Peak
3	10350.00	28.84	18.40	17.04	38.96	45.56	74.00	-28.44	Peak
4	12271.00	29.05	17.26	17.59	39.46	45.26	74.00	-28.74	Peak
5	13376.00	29.27	13.48	18.65	42.44	45.30	74.00	-28.70	Peak
6	14821.00	29.52	16.87	19.88	39.27	46.50	74.00	-27.50	Peak

2441MHz Vertical polarizations

	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	4880.00	27.53	32.15	12.14	33.11	49.87	74.00	-24.13	Peak
2	7320.00	27.96	21.21	16.62	37.33	47.20	74.00	-26.80	Peak
3	8973.00	28.39	19.72	16.87	37.36	45.56	74.00	-28.44	Peak
4	10197.00	28.82	19.73	17.00	38.72	46.63	74.00	-27.37	Peak
5	12254.00	29.05	19.82	17.58	39.45	47.80	74.00	-26.20	Peak
6	14107.00	29.42	15.44	19.43	42.90	48.35	74.00	-25.65	Peak

2480MHz Horizontal polarizations

	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	4960.00	27.58	31.77	12.36	33.32	49.87	74.00	-24.13	Peak
2	7440.00	27.99	18.00	16.62	37.38	44.01	74.00	-29.99	Peak
3	8786.00	28.33	15.98	16.83	37.14	41.62	74.00	-32.38	Peak
4	10843.00	28.88	15.41	17.13	39.41	43.07	74.00	-30.93	Peak
5	13495.00	29.30	11.88	18.77	43.00	44.35	74.00	-29.65	Peak
6	14277.00	29.44	11.53	19.54	41.90	43.53	74.00	-30.47	Peak

2480MHz Vertical polarizations

	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	4960.00	27.58	31.56	12.36	33.32	49.66	74.00	-24.34	Peak
2	7443.00	27.99	22.91	16.62	37.38	48.92	74.00	-25.08	Peak
3	7987.00	28.10	19.20	16.66	36.43	44.19	74.00	-29.81	Peak
4	10928.00	28.89	16.10	17.15	39.46	43.82	74.00	-30.18	Peak
5	12305.00	29.06	16.07	17.62	39.46	44.09	74.00	-29.91	Peak
6	15518.00	29.63	15.62	20.33	38.47	44.79	74.00	-29.21	Peak

7. 20DB OCCUPY BANDWIDTH

7.1. Limits

According to FCC Section 15.247(a)(1), the 20dB bandtidth is known as the 99% emission bandwidth, or 20dB bandwidth(10*log1%=20dB)taking the RF output power

7.2. Test setup

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum, During the measurement, the Bluetooth module of the EUT is activated and controlled by the software, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

2. Set the spectrum analyzer:

Span: approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel

RBW ≥1% of the 20dB bandwidth

VBW ≥ RBW

Sweep=auto

Detector function=peak

Trace=max hold

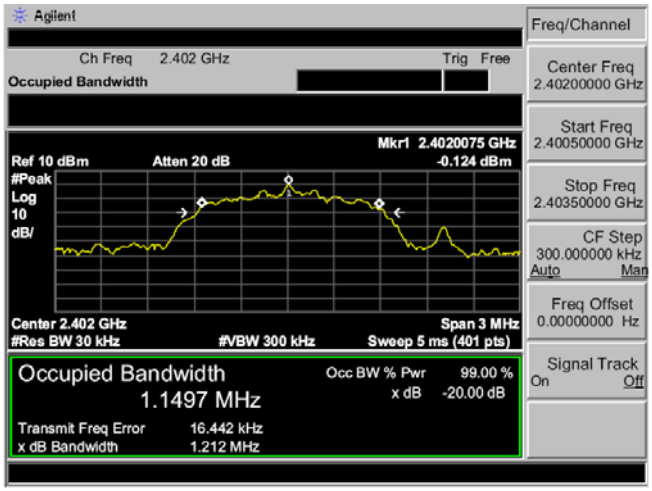
Test data:

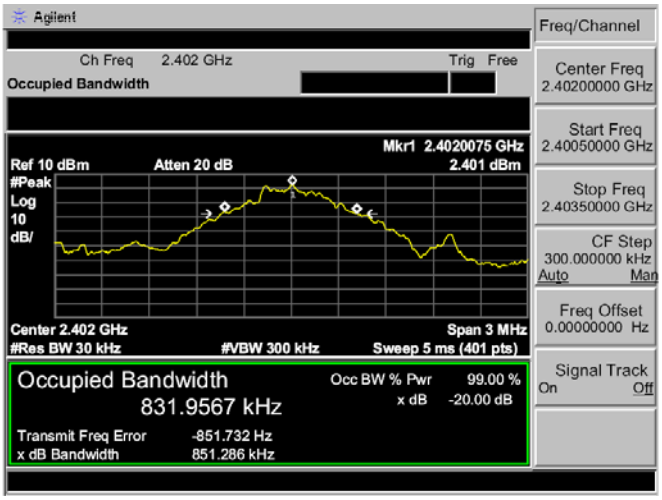
Channel Frequency (MHz)	20dB Bandwidth (MHz)		Result
	8-DPSK	GFSK	
2402	1.212	0.851	Pass
2441	1.210	0.854	Pass
2480	1.213	0.852	Pass

Test plot as follows:

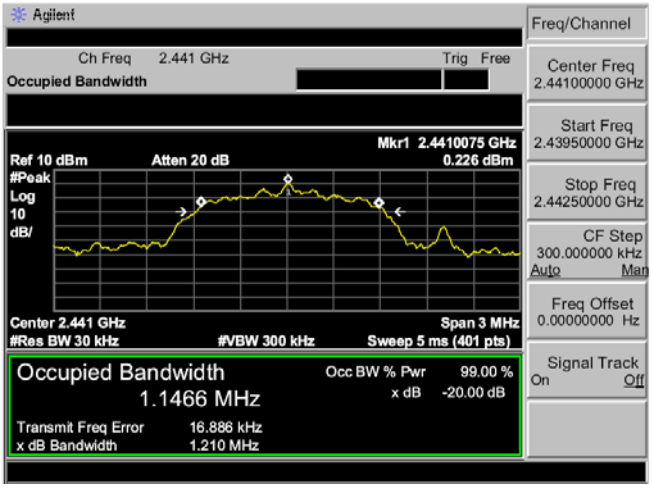
8-DPSK **GFSK**

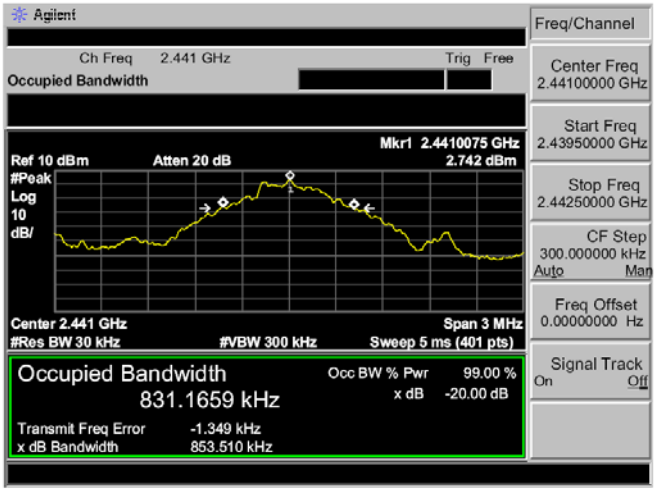
2402MHz



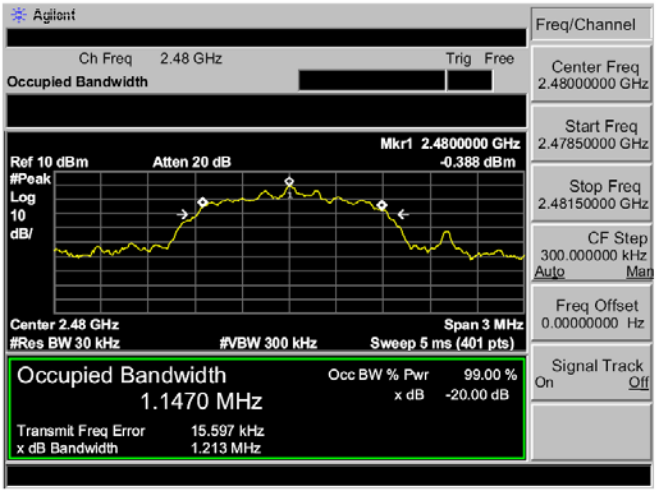


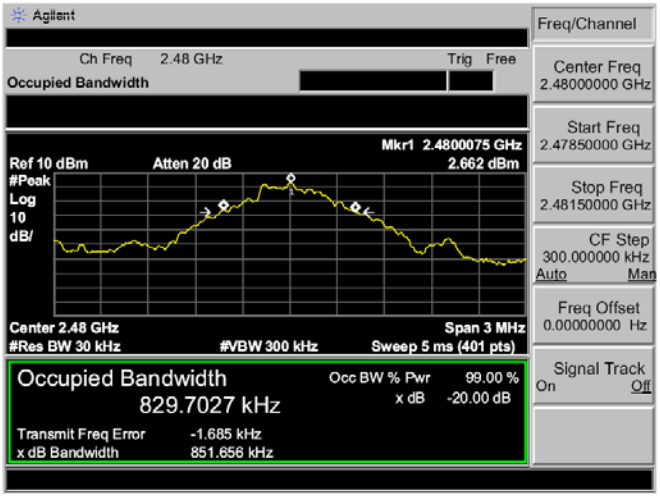
2441 MHz





2480 MHz





8. FREQUENCY SEPARATION

8.1. Limits

According to FCC Section 15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

8.2. Test setup

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum, During the measurement, the Bluetooth module of the EUT is activated and controlled by the software, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

2. Set the spectrum analyzer:

Span: wide enough to capture the peaks of two adjacent channels

RBW ≥1% of the span

VBW ≥ RBW

Sweep=auto

Detector function=peak

Trace=max hold

Test data:

	Separation (MHz)	**Limit (MHz)**	**Result**
8-DPSK	1.0125	0.808	PASS
GFSK	1.0250	0.854	PASS

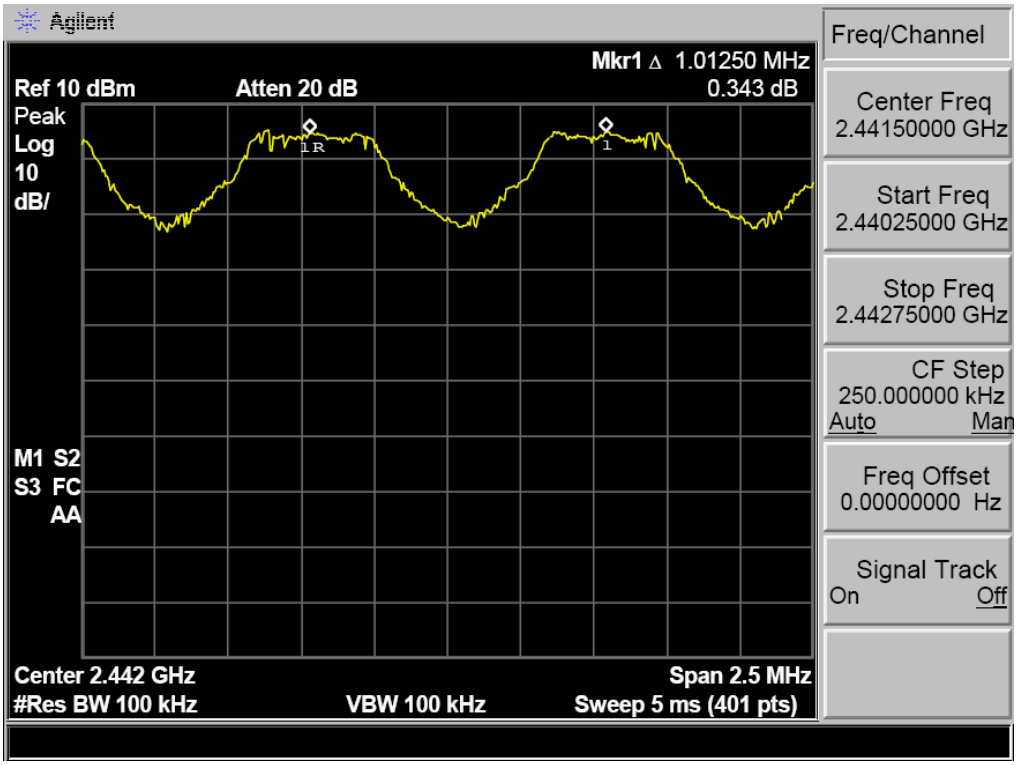
Note: we pretest low, middle, high channel. The middle channel's data record in the report.

Note: Limit according to section 6

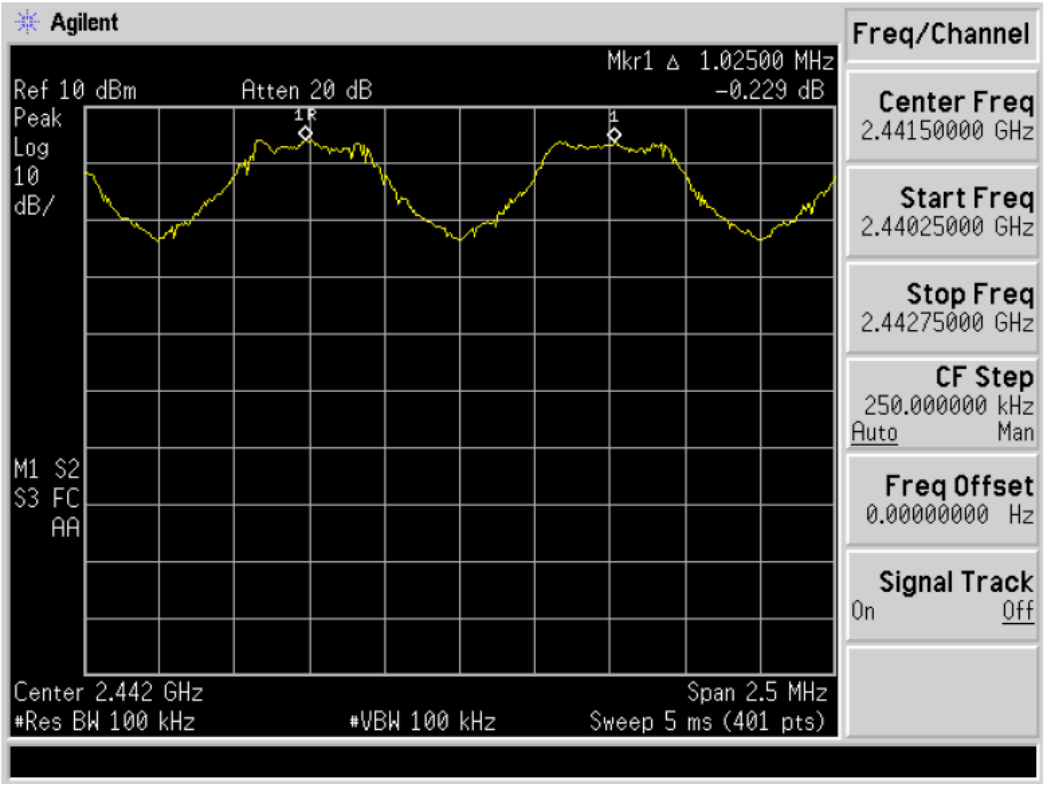
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
8-DPSK	1213	808
GFSK	854	854

Test plot as follows:

8-DPSK


Agilent
Mkr1 Δ 1.01250 MHz
0.343 dB
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
1R
1
M1 S2
S3 FC
AA
Center 2.442 GHz
#Res BW 100 kHz
VBW 100 kHz
Span 2.5 MHz
Sweep 5 ms (401 pts)
Freq/Channel
Center Freq
2.44150000 GHz
Start Freq
2.44025000 GHz
Stop Freq
2.44275000 GHz
CF Step
250.000000 kHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off

GFSK


Agilent
Mkr1 Δ 1.02500 MHz
-0.229 dB
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
1R
1
M1 S2
S3 FC
AA
Center 2.442 GHz
#Res BW 100 kHz
#VBW 100 kHz
Span 2.5 MHz
Sweep 5 ms (401 pts)
Freq/Channel
Center Freq
2.44150000 GHz
Start Freq
2.44025000 GHz
Stop Freq
2.44275000 GHz
CF Step
250.000000 kHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off

9. NUMBER OF HOPPING FREQUENCY

9.1. Limits

According to FCC Section 15.247(a)(1)(iii), Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

9.2. Test setup

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum, During the measurement, the Bluetooth module of the EUT is activated and controlled by the software, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

2. Set the spectrum analyzer:

Span: the frequency band of operation

RBW ≥1% of the span

VBW ≥ RBW

Sweep=auto

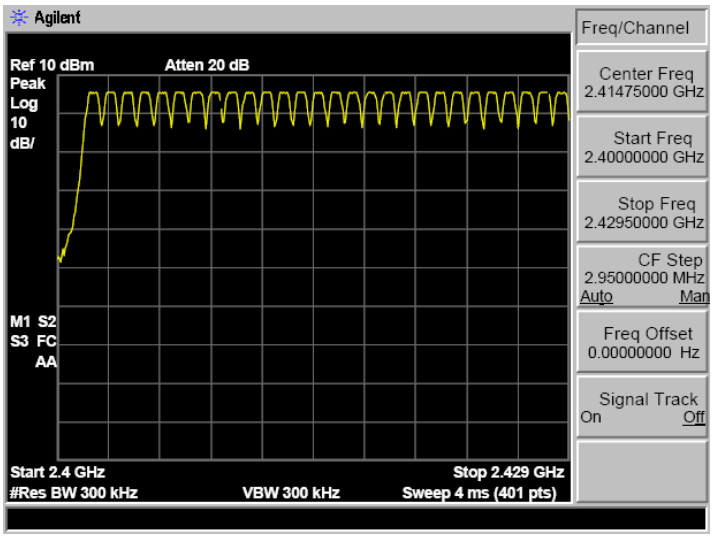
Detector function=peak

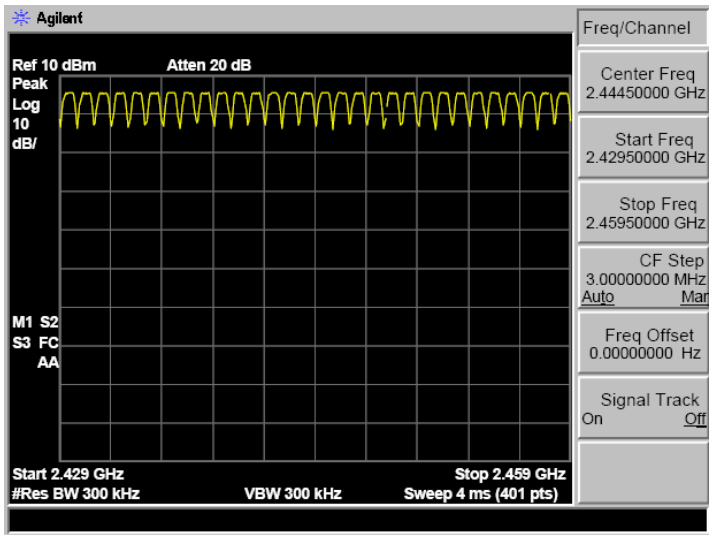
Trace=max hold

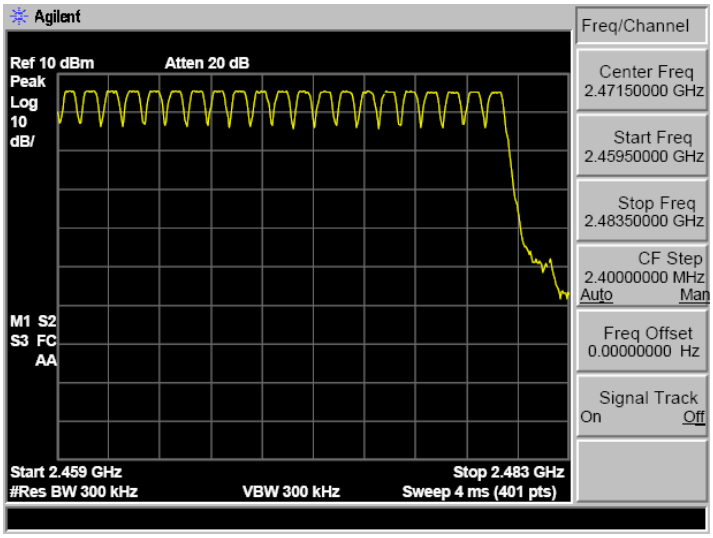
Test data:

Measured channel numbers	Limit	Result
79	>15	PASS

Test plot as follows:


Agilent
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 2.4 GHz
Stop 2.429 GHz
#Res BW 300 kHz
VBW 300 kHz
Sweep 4 ms (401 pts)
Freq/Channel
Center Freq
2.41475000 GHz
Start Freq
2.40000000 GHz
Stop Freq
2.42950000 GHz
CF Step
2.95000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off


Agilent
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 2.429 GHz
Stop 2.459 GHz
#Res BW 300 kHz
VBW 300 kHz
Sweep 4 ms (401 pts)
Freq/Channel
Center Freq
2.44450000 GHz
Start Freq
2.42950000 GHz
Stop Freq
2.45950000 GHz
CF Step
3.00000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off


Agilent
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Start 2.459 GHz
Stop 2.483 GHz
#Res BW 300 kHz
VBW 300 kHz
Sweep 4 ms (401 pts)
Freq/Channel
Center Freq
2.47150000 GHz
Start Freq
2.45950000 GHz
Stop Freq
2.48350000 GHz
CF Step
2.40000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off

10. DWELL TIME

10.1. Limits

According to FCC Section 15.247(a)(1)(iii), Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

10.2. Test setup

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum, During the measurement, the Bluetooth module of the EUT is activated and controlled by the software, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

2. Set the spectrum analyzer:

Span= 0Hz

RBW =1000 kHz

VBW = 1000 kHz

Sweep=auto

Detector function=peak

Test data:

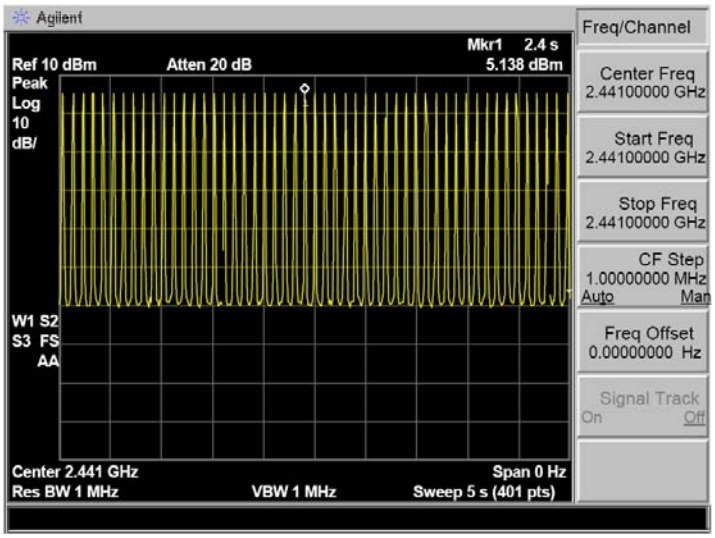
Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2402MHz 2441MHz 2480MHz	DH1	186.44	400	Pass
	DH3	297.04	400	Pass
	DH5	328.77	400	Pass

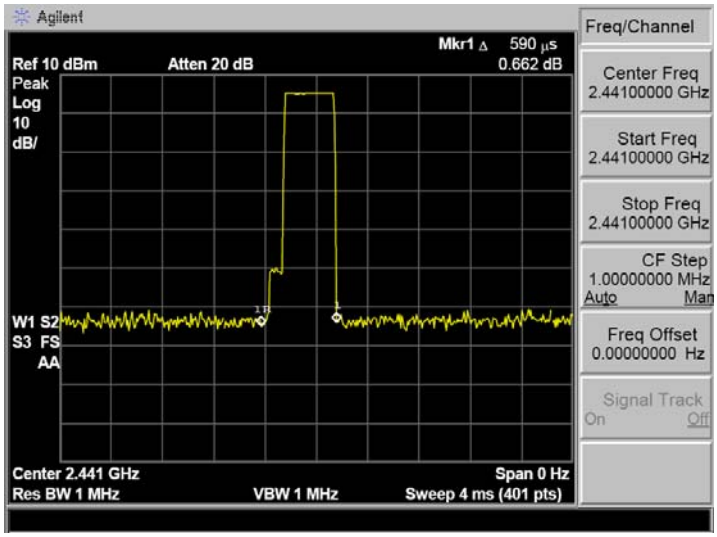
Test plot as follows:

GFSK/8-DPSK

DH1

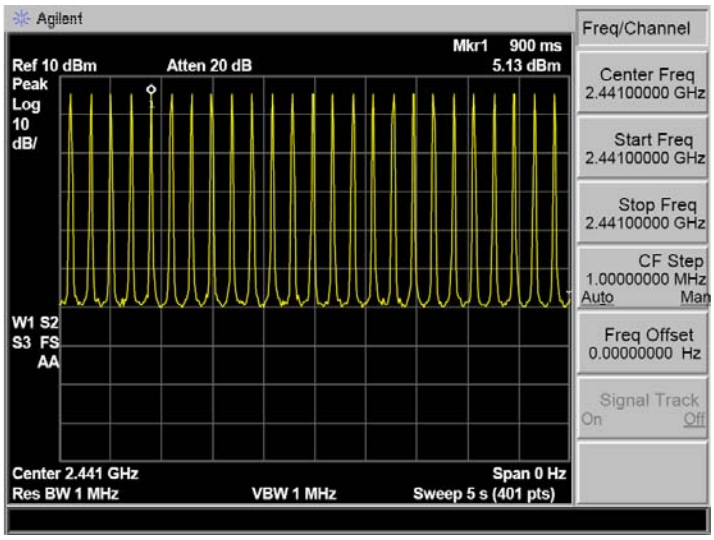
50hop/5s * 0.4 * 79 * 0.59ms = 186.44

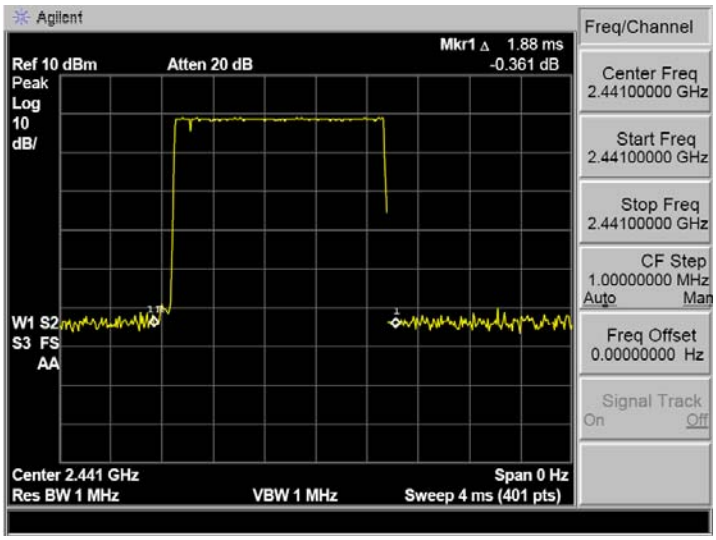




DH3

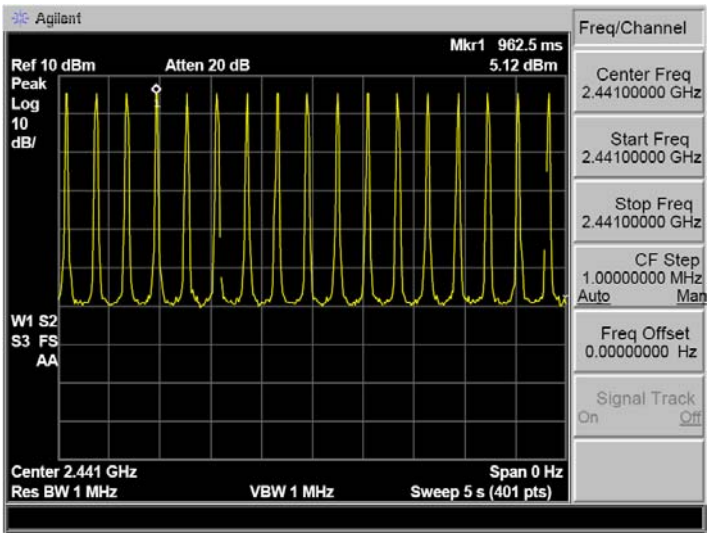
25hop/5s * 0.4 * 79 * 1.88ms= 297.04

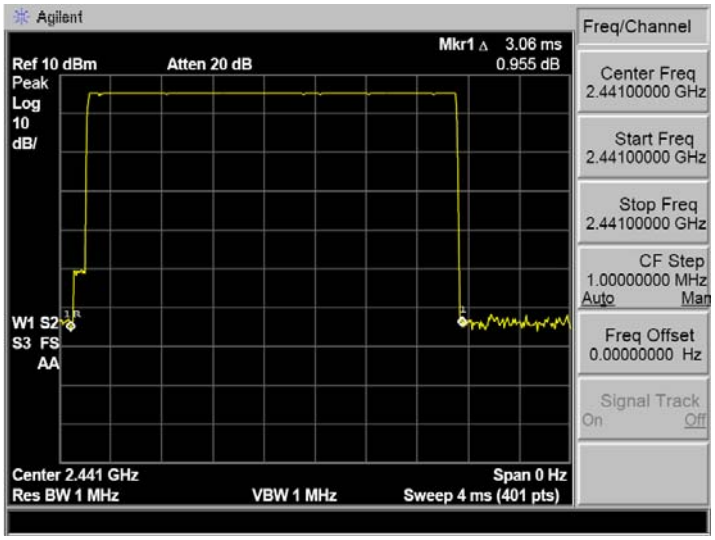




DH5

17hop/5s * 0.4 * 79 *3.06ms = 328.77





11. BAND EDGE COMPLIANCE TEST

11.1. Limits

According to FCC Section 15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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 con-ducted or a radiated measurement

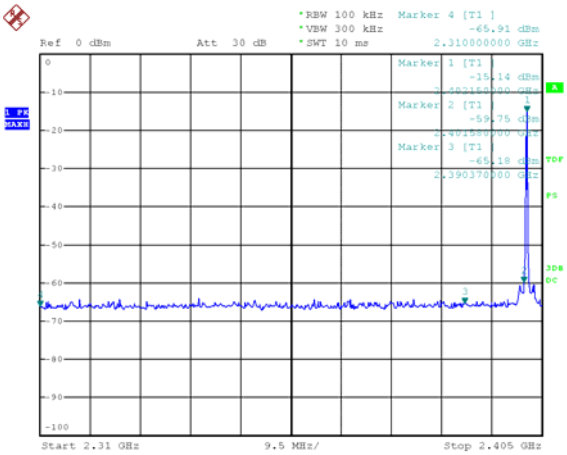
11.2. Test setup

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set to span from the lowest frequency generated in the device up to and including the tenth harmonic of the highest fundamental frequency

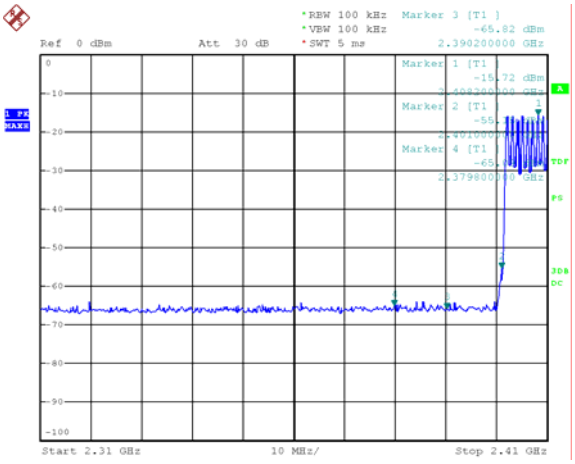
The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure.

Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

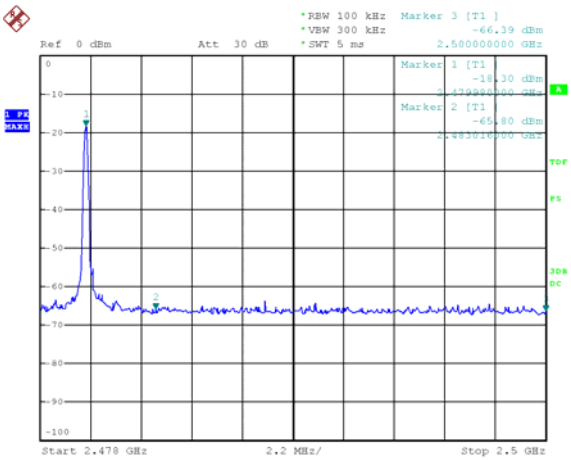
Test plot as follows:



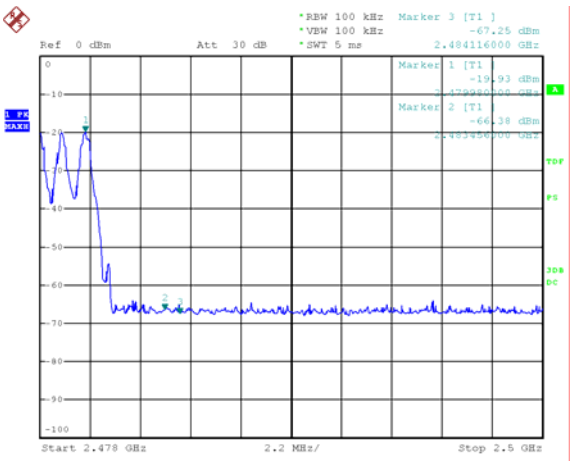
No-hopping mode



Hopping mode



No-hopping mode



Hopping mode

For radiated test as follows:

	Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)	Band edge Limit (dBuV/m)		Result
			PK	PK	AV	Pass
Hopping	<2400	H	49.31	74.00	54.00	Pass
	<2400	V	50.24	74.00	54.00	Pass
	>2483.5	H	50.53	74.00	54.00	Pass
	>2483.5	V	49.79	74.00	54.00	Pass
Unhopping	<2400	H	51.05	74.00	54.00	Pass
	<2400	V	50.57	74.00	54.00	Pass
	>2483.5	H	51.02	74.00	54.00	Pass
	>2483.5	V	50.07	74.00	54.00	Pass

If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

12. ANTENNA REQUIREMENTS

12.1. Limits

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

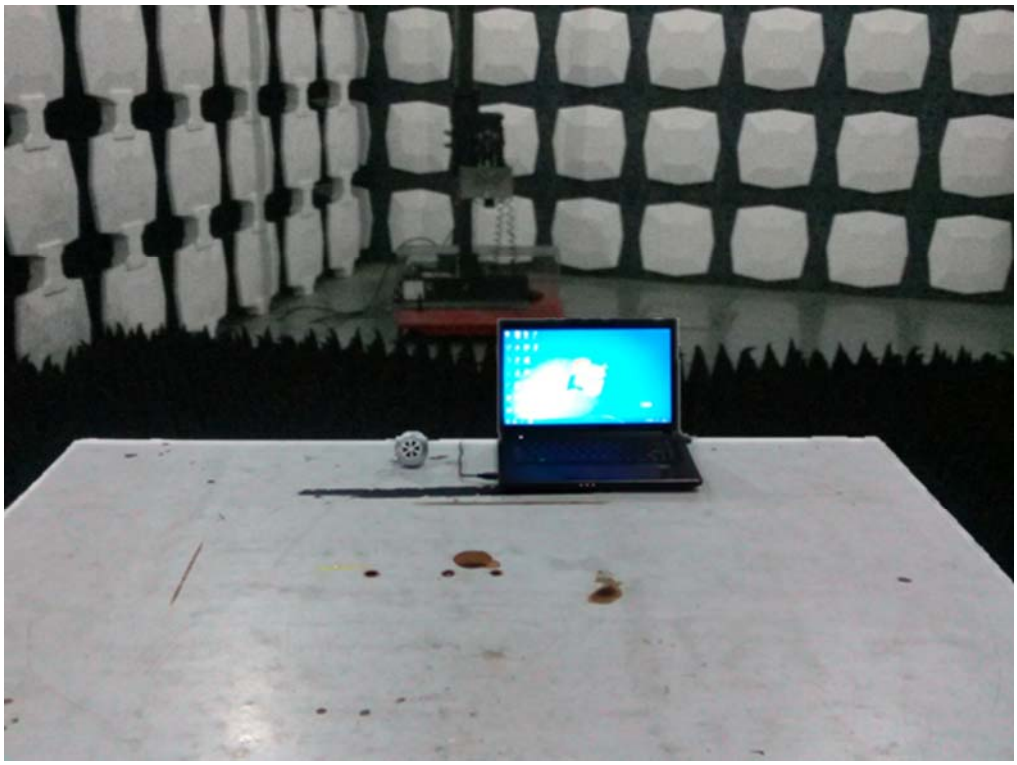
12.2. Result

The antennas used for this product are integral Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi.

13. PHOTOGRAPHS OF TEST SET-UP

Conducted Emission at the Mains Terminals Test

Radiated Emission Test



14. PHOTOGRAPHS OF THE EUT

------END------