FCC 47 CFR PART 15 SUBPART C

Product Type	:	Bluetooth Mono Speaker
Applicant	:	Guoguang Electric Co.,Ltd
Address	:	No. 8 Jinghu Road, Xinhua Town, Huadu Region, Guangzhou, 510800 P. R. China
Model Number	:	BTV4
Trade Name	:	NA
Test Specification	:	FCC 47 CFR PART 15 SUBPART C: Oct., 2012 ANSI C63.10:2009
Receive Date	:	18 July, 2014
Test Period	:	22 July, 2014~09 August, 2014
Issue Date	:	09 August, 2014

Issue by

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Taiwan Accreditation Foundation accreditation number: 1330

Revision History

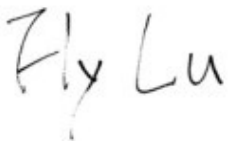
Rev.	Issue Date	Revisions	Revised By
Draft	09 August, 2014		

Verification of Compliance

Issued Date: 09 August, 2014

Product Type	:	Bluetooth Mono Speaker
Applicant	:	Guoguang Electric Co.,Ltd
Address	:	No. 8 Jinghu Road, Xinhua Town, Huadu Region, Guangzhou, 510800 P. R. China
Model Number	:	BTV4
Trade Name	:	NA
FCC ID	:	2AAP800007
EUT Rated Voltage	:	DC 3.7V
Test Voltage	:	DC 3.7V
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C: Oct., 2012 ANSI C63.4:2009
Test Result	:	Complied
Performing Lab.	:	Shenzhen Academy of Metrology and Quality Inspection No.4 Tongfa Road, Xili Town, Nanshan District, Shenzhen, Guangdong, China Tel：0086-755-86928965 / Fax：0086-755-86009898-31396 Web: www.smq.com.cn

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with FCC Rules Part 15.207, 15.209 and 15.247.
The test results of this report relate only to the tested sample identified in this report.

Approved By :  Reviewed By : 

(Manager) (Testing Engineer)

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1 General Information

1.1. Summary of Test Result

Standard	Item	Result	Remark
FCC 15.207&FCC15.247			
15.207	AC Power Conducted Emission	PASS	-----
15.247(b)(1)	Max. Output Power	PASS	-----
15.247(c)	Transmitter Radiated Emissions	PASS	-----
15.247(a)(1)	20dB RF Bandwidth	PASS	-----
15.247(a)(1)(iii)	Carrier Frequency Separation	PASS	-----
15.247(a)(1)(iii)	Number of Hopping	PASS	-----
15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	PASS	-----
15.247(c)	Out of Band Conducted Spurious Emission	PASS	-----
15.247(c)	Band Edge Measurement	PASS	-----
15.247(c)	Occupied Bandwidth Measurement	PASS	-----
15.203	Antenna Requirement	PASS	-----

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

1.2. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conducted Emission	9kHz ~ 30MHz	3.50
Radiated Emission	30MHz ~ 1000MHz	4.50
	1000MHz ~ 18000MHz	4.60
	18000MHz ~ 40000MHz	5.12

2 EUT Description

Product	Bluetooth Mono Speaker					
Trade Name	N/A					
Model Number	BTV4					
Applicant	Guoguang Electric Co.,Ltd No. 8 Jinghu Road, Xinhua Town, Huadu Region, Guangzhou, 510800 P. R. China					
Manufacturer	Guoguang Electric Co.,Ltd No. 8 Jinghu Road, Xinhua Town, Huadu Region, Guangzhou, 510800 P. R. China					
FCC ID	2AAP800007					
Frequency Range	2402 ~ 2480 MHz					
Modulation Type	Bluetooth 3.0+EDR	GFSK for 1Mbps				
		8DPSK for 3Mbps				
Antenna Type	PCB Antenna					
Antenna Gain	0.0dBi					
RF Output Power (Conducted)	BT3.0 GFSK for 1Mbps	6.102	dBm /	4.706	mW	
	BT3.0 8DPSK for 3Mbps	4.931	dBm /	3.112	mW	
20dB Bandwidth	BT 3.0 GFSK: 0.889MHz BT3.0 8DPSK: 1.1879MHz					

3 Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at Bldg. of Metrology & Quality Inspection, Longzhu Road, Nanshan District, Shenzhen, Guangdong, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579. The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number are 446246 806614 994606(semi anechoic chamber).

The Laboratory is listed in Voluntary Control Council for Interference by Information Technology Equipment (VCCI), and the registration number are R-1974(open area test site) , R-1966(semi anechoic chamber),C-2117(mains ports conducted interference measurement) and T-180(telecommunication ports conducted interference measurement).

The Laboratory is registered to perform emission tests with Industry Canada (IC), and the registration number is 11177A-1 11177A-2.

TUV Rhineland accredits the Laboratory for conformance to IEC and EN standards, the registration number is E2024086Z02.

4 Test Methodology

4.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Normal Working Mode
Mode 2: GFSK Link Mode
Mode 3: π/4-DQPSK Link Mode
Mode 4: 8DPSK Link Mode
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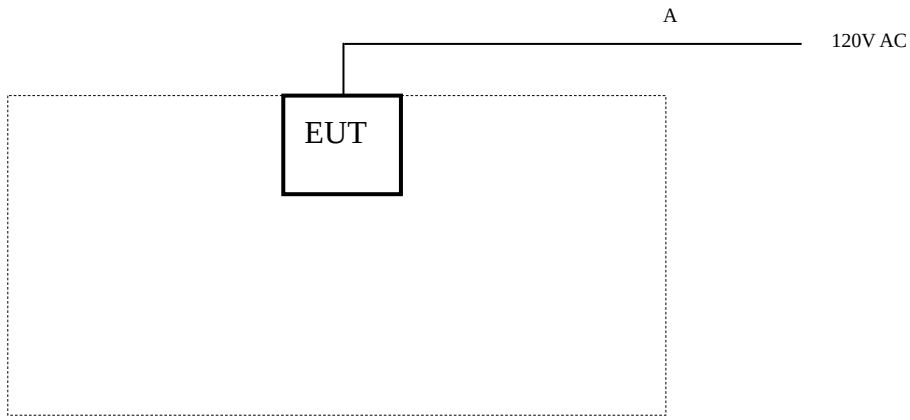
By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

Description of Test Modes
Preliminary tests were performed in different modulation to find the worst case. The modulation has shown the worst-case in section 6.5. Investigation has been done on all the possible configurations for searching the worst cases.

4.2. EUT Exercise Software

1	Setup the EUT as shown on 3.2.
2	Turn on the power of all EUT.
3	Keep EUT in continuous transmitting under the help of PC software CSR BlueTest3.

4.3. Configuration of Test System Details



Signal Cable Type		Signal Cable Description
A	AC Power Cable	Non-Shielded, 1.0 m

4.4. Test Site Environment

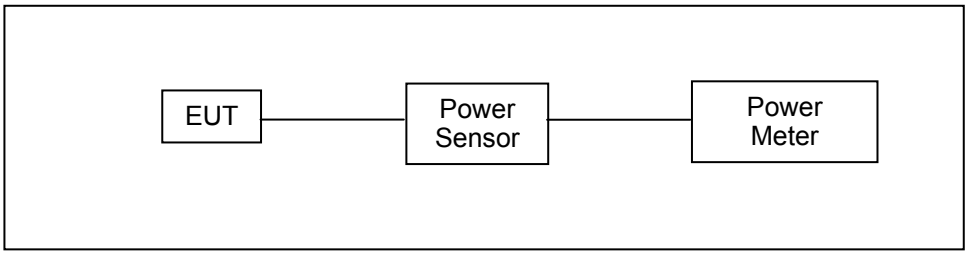
Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

5 Maximum Conducted Output Power Measurement

5.1. Limit

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



5.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Single Channel PK Power Sensor	Agilent	N1911A	MY45101619	12/19/2013	(1)
Wideband Power Meter	Agilent	N1921A	MY45241957	12/19/2013	(1)

Remark: (1) Calibration period 1 year.

5.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor. The maximum peak output power shall not exceed 1 watt.

Use a direct connection between the antenna port of transmitter and the power sensor, for prevent the power sensor input attenuation 40-50 dB. Set the RBW Bandwidth of the emission or use a channel power meter mode.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

The antenna port of the EUT was connected to the input of a power sensor. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

5.5. Test Result

Model Number	BTV4			
Test Item	Maximum Conducted Output Power			
Test Mode	Mode 2: GFSK Link Mode			
Date of Test	2014/07/22			
Frequency (MHz)	Packet Type	Peak Power		Limit (mW)
		(dBm)	(mW)	
2402	DH1	3.391	2.183	< 1000
	DH3	3.383	2.179	
	DH5	3.394	2.185	
2441	DH1	5.738	3.748	
	DH3	5.831	3.829	
	DH5	5.711	3.725	
2480	DH1	6.102	4.076	
	DH3	6.082	4.057	
	DH5	6.052	4.029	

Model Number	BTV4			
Test Item	Maximum Conducted Output Power			
Test Mode	Mode 4: 8DPSK Link Mode			
Date of Test	2014/07/22			
Frequency (MHz)	Packet Type	Peak Power		Limit (mW)
		(dBm)	(mW)	
2402	DH1	1.534	1.424	< 125
	DH3	1.521	1.419	
	DH5	1.507	1.415	
2441	DH1	4.384	2.744	
	DH3	4.353	2.725	
	DH5	4.375	2.738	
2480	DH1	4.729	2.971	
	DH3	4.931	3.112	
	DH5	4.927	3.110	

6 Conducted Emission Measurement

6.1. Limit

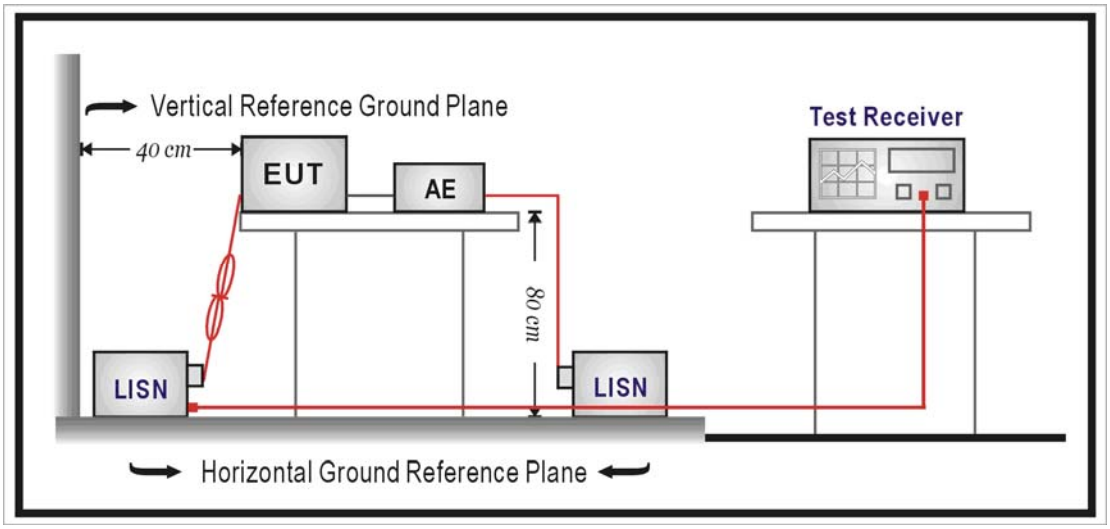
Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

6.2. Test Instruments

Describe	Manufacturer	Model Number	No.	Cal. Date	Remark
Test Receiver	R&S	ESCS	SB3319	01/20/2014	(1)
LISN	R&S	ESH2-Z5	SB3321	01/20/2014	(1)
LISN	R&S	ESH3-Z5	SB2604	01/20/2014	(1)
Test Software	R&S	ESK1	N/A	N/A	N/A

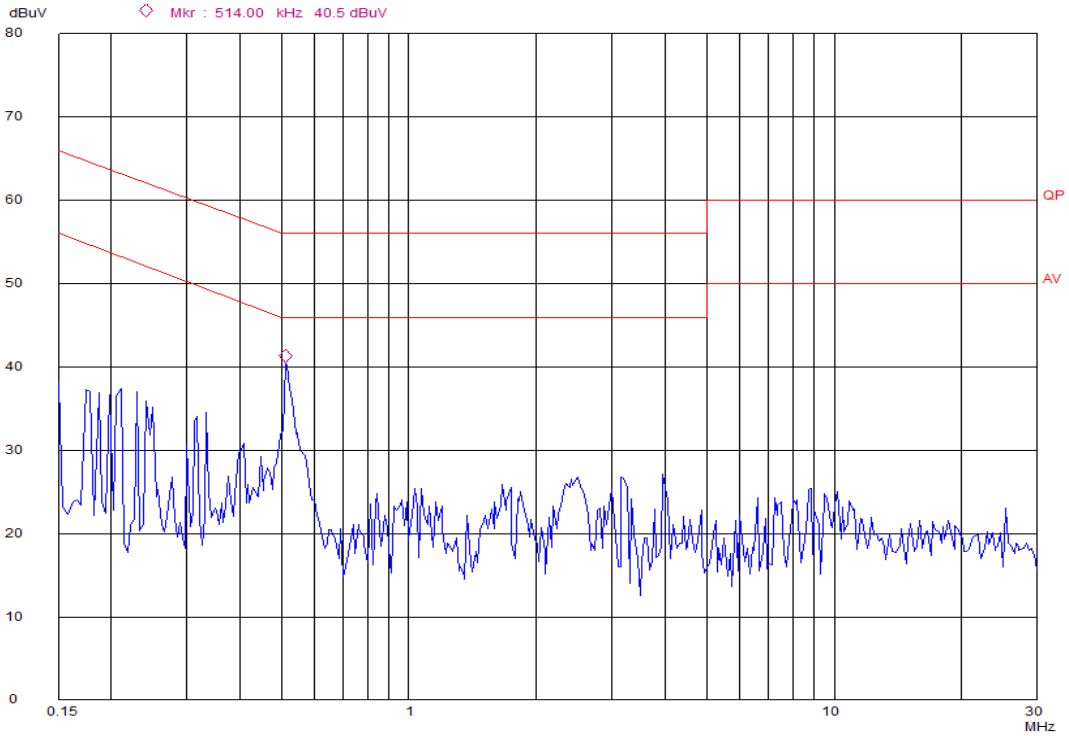
Remark: (1) Calibration period 1 year.

6.3. Test Setup



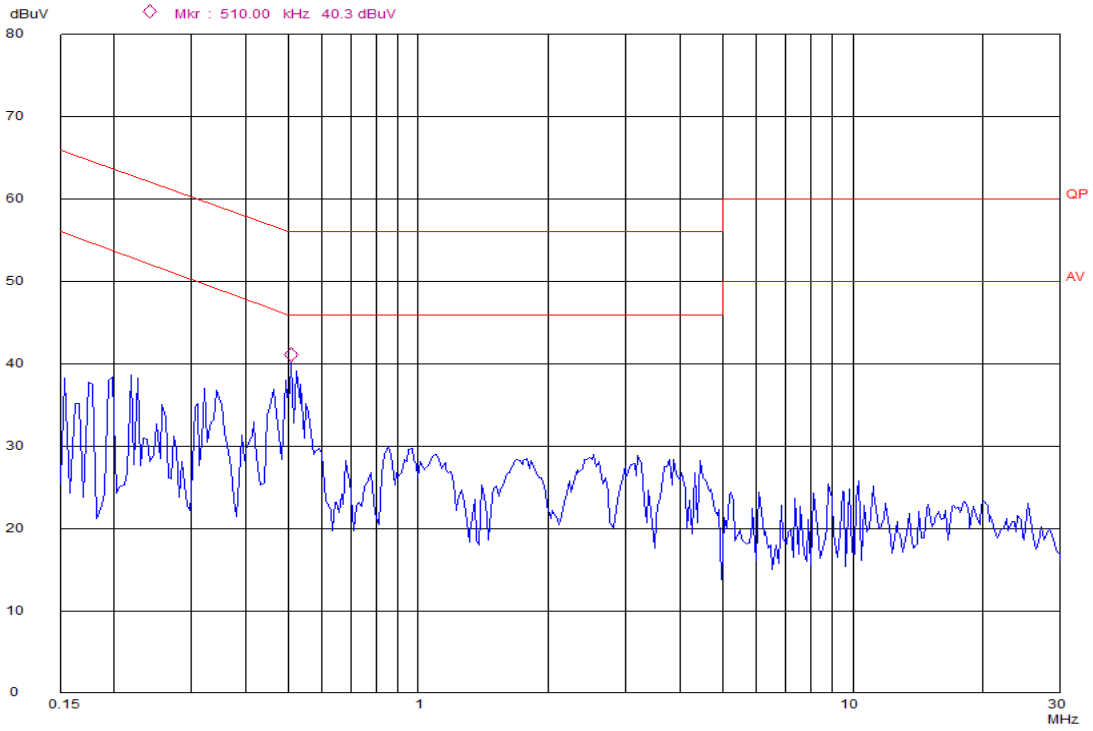
6.4. Test Result

Standard:	FCC 15.107	Line:	L1
Test item:	Conducted Emission	Power:	AC 120V/60Hz
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	18(℃)/50%RH
Mode:	2	Date:	2014/07/10
		Test By:	Fly Lu
Description:	L line		



Frequency (MHz)	QP(dBμV)		Ave.(dBμV)	
	Level	Limit	Level	Limit
0.178	23.7	64.6	8.4	54.6
0.210	22.8	63.2	6.9	53.2
0.230	21.7	62.4	7.0	52.4
0.334	21.4	59.4	8.0	49.4
0.518	32.3	56.0	14.5	46.0
2.506	15.2	56.0	4.5	46.0

Standard:	FCC 15.207	Line:	N
Test item:	Conducted Emission	Power:	AC 120V/60Hz
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	18(℃)/50%RH
Mode:	2	Date:	2014/07/10
		Test By:	Fly Lu
Description:	N line		



Frequency (MHz)	QP(dBμV)		Ave.(dBμV)	
	Level	Limit	Level	Limit
0.154	25.6	65.8	10.3	55.8
0.194	23.9	63.9	8.0	53.9
0.226	24.4	62.6	8.5	52.6
0.342	27.0	59.2	10.7	49.2
0.510	31.8	56.0	14.7	46.0
0.996	21.1	56.0	6.7	46.0

7 Radiated Interference Measurement

7.1. Limit

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m at meter)	Measurement Distance (meters)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

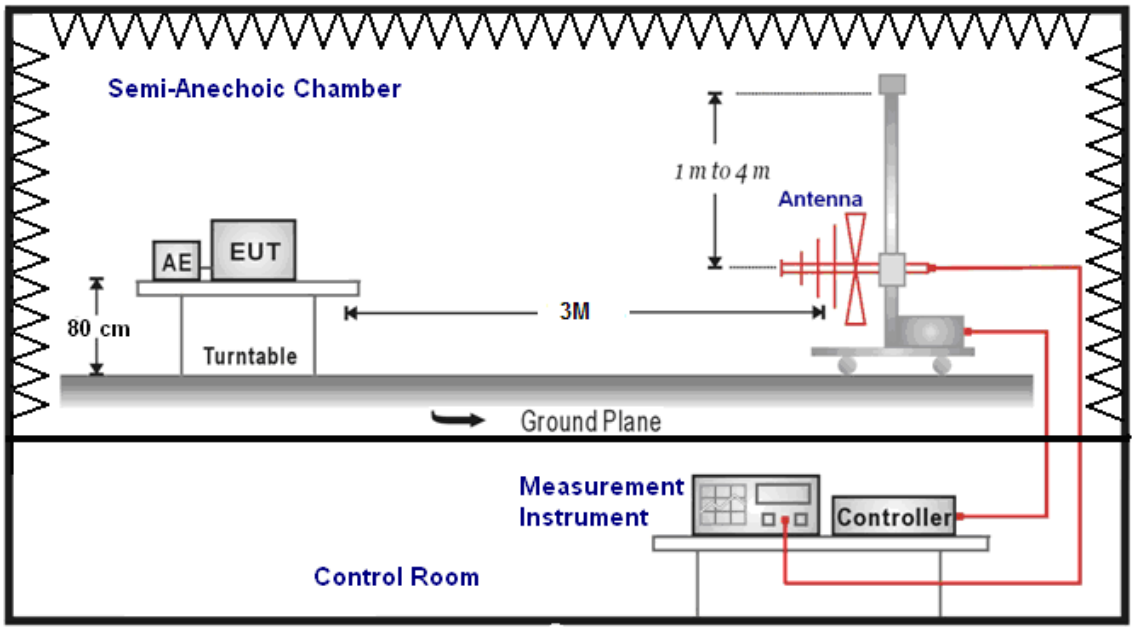
7.2. Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Number	Cal. Date	Remark
Loop Antenna	Schwarzbeck	FMZB1516	SB3345	01/22/2014	(1)
Horn Antenna	Amplifier Research	AT4560	SB3450/01	05/16/2014	(1)
Amplifier(18-40GHz)	R&S	---	SB3435/02	05/16/2014	(1)
Amplifier(1-18GHz)	R&S	---	SB3435/01	01/22/2014	(1)
Horn Antenna	R&S	HF907	SB8501/01	05/13/2014	(1)
Bilog Antenna	Schwarzbeck	VULB9163	SB8501/04	01/20/2014	(1)
EMI Test Receiver	R&S	ESU40	SB85001/09	05/16/2014	(1)
EMI Test Receiver	R&S	ESIB26	SB3253	01/22/2014	(1)
Test Software	R&S	ESK1	N/A	N/A	(1)
Test Software	R&S	EMC32	N/A	N/A	(1)

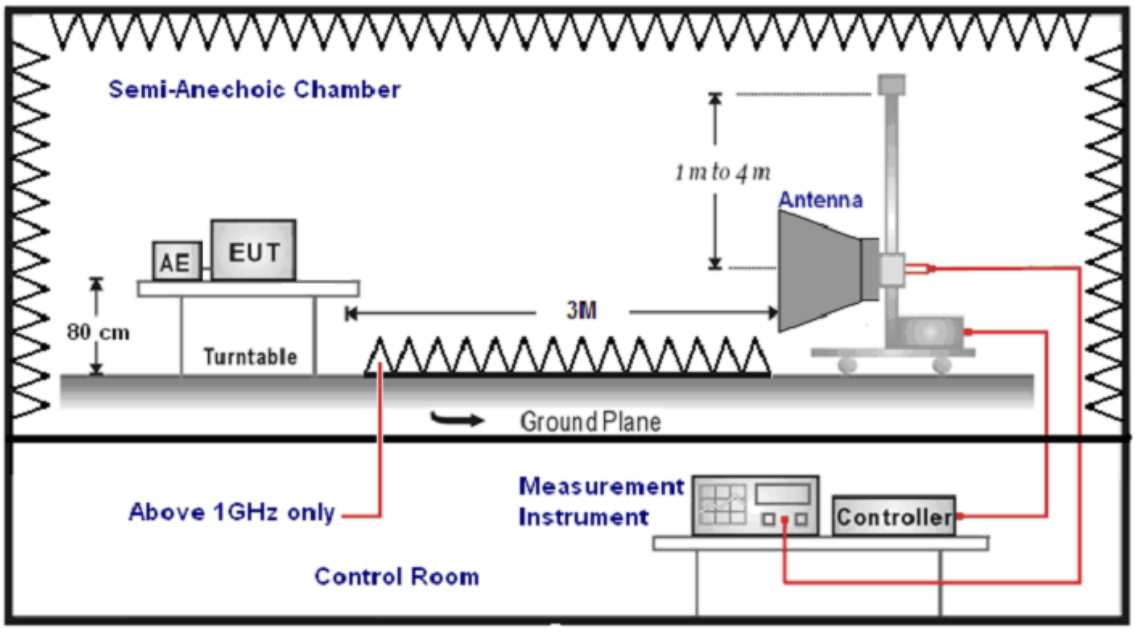
Remark: (1) Calibration period 1 year.

7.3. Setup

Below 1GHz



Above 1GHz



7.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

Biconilog Antenna (mode VULB9163) at 3 Meter and Horn antenna was used in frequencies 1 – 18 GHz at a distance of 3 meter while 18-40GHz at distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

7.5. Test Result

Below 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	2014/07/23
Channel	2480MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dB	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
39.991	3.9	13.0	16.9	40.0	23.1	QP	H
90.237	6.3	13.0	19.3	43.5	24.2	QP	H
104.593	1.4	14.5	15.9	43.5	27.6	QP	H
238.938	5.1	13.0	18.1	46.0	27.9	QP	H
415.09	4.8	17.6	22.4	46.0	23.6	QP	H
764.775	7.9	22.4	30.3	46.0	15.7	QP	H
45.523	4.3	14.4	18.7	40.0	21.3	QP	V
54.056	3.9	14.1	18.0	40.0	22.0	QP	V
89.267	9.4	11.4	20.8	43.5	22.7	QP	V
173.756	4.4	10.5	14.9	43.5	28.6	QP	V
316.056	6.2	15.2	21.4	46.0	24.6	QP	V
641.197	7.0	21.6	28.6	46.0	17.4	QP	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2014/07/23
Channel	2440MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dB	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
146.40	2.81	13.07	15.88	43.5	27.62	QP	H
458.04	6.51	12.53	19.04	43.5	24.46	QP	H
192.96	6.41	11.51	17.92	43.5	25.58	QP	H
204.60	4.44	12.44	16.88	43.5	26.62	QP	H
536.34	1.64	21.08	22.72	46.0	23.28	QP	H
668.26	2.17	22.93	25.10	46.0	20.90	QP	H
37.76	8.41	16.41	24.82	40.0	15.18	QP	V
109.54	6.63	13.70	20.33	43.5	23.17	QP	V
131.85	2.71	14.24	16.95	43.5	26.55	QP	V
165.80	8.10	12.17	20.27	43.5	23.23	QP	V
173.56	6.97	11.71	18.68	43.5	24.82	QP	V
251.16	3.30	15.14	18.44	46.0	27.56	QP	V

Note: No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~30MHz).

Above 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	2014/07/23
		Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
1227.799	50.5	-16.6	33.9	74	40.1	peak	H
1634.101	49.7	-14.0	35.7	74	38.3	peak	H
2521.501	51.7	-11.5	40.2	74	33.8	peak	H
4320.1	48.8	-5.7	43.1	74	30.9	peak	H
7488.899	52.1	-2.0	50.1	74	23.9	peak	H
13974.4	51.3	4.3	55.6	74	18.4	peak	H
1273.7	51.2	-16.5	34.7	74	39.3	peak	V
1923.1	50.3	-13.5	36.8	74	37.2	peak	V
2737.399	49.5	-10.2	39.3	74	34.7	peak	V
4119.5	50.7	-6.5	44.2	74	29.8	peak	V
5617.2	50.7	-4.0	46.7	74	27.3	peak	V
8524.2	51.2	-0.8	50.4	74	23.6	peak	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2014/07/23
Frequency:	2402 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4804	27.6	5.8	33.4	74.0	40.6	peak	H
7206	34.0	6.8	40.8	74.0	33.2	peak	H
4804	29.2	5.8	35.0	74.0	39.0	peak	V
7206	32.9	6.8	39.7	74.0	34.3	peak	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2014/07/23
Frequency:	2441 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4882	28.5	5.9	34.4	74.0	39.6	peak	H
7323	34.1	6.8	40.9	74.0	33.1	peak	H
4882	37.6	5.9	43.5	74.0	30.5	peak	V
7323	33.5	6.8	40.3	74.0	33.7	peak	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2014/07/23
Frequency:	2480 MHz	Test By:	Fly Lu

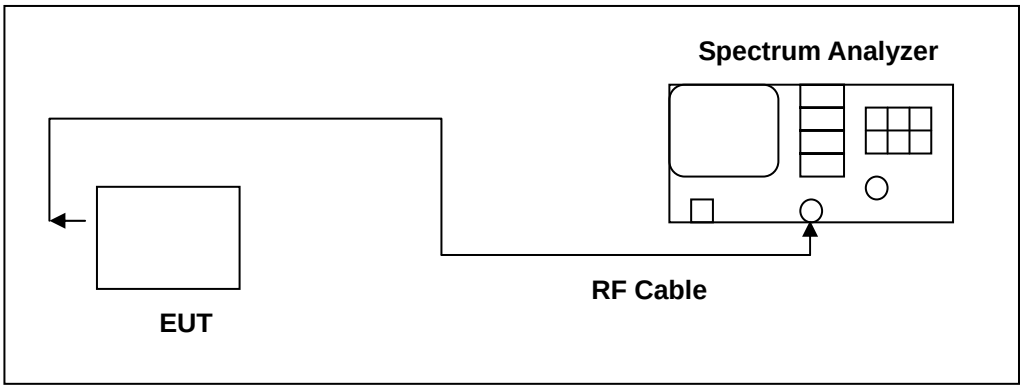
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4960	28.8	5.9	34.7	74.0	39.3	peak	H
7440	33.3	6.8	40.1	74.0	33.9	peak	H
4960	29.4	5.9	35.3	74.0	38.7	peak	V
7440	33.6	6.8	40.4	74.0	33.6	peak	V

8 20dB RF Bandwidth Measurement

8.1. Limit

N/A

8.2. Test Setup



8.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Signal Analyzer	Agilent	N9020A	MY53420615	12/19/2013	(1)

Remark: (1) Calibration period 1 year.

8.4. Test Procedure

20dB RF Bandwidth

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
2. RBW ≥ 1% of the 20dB span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

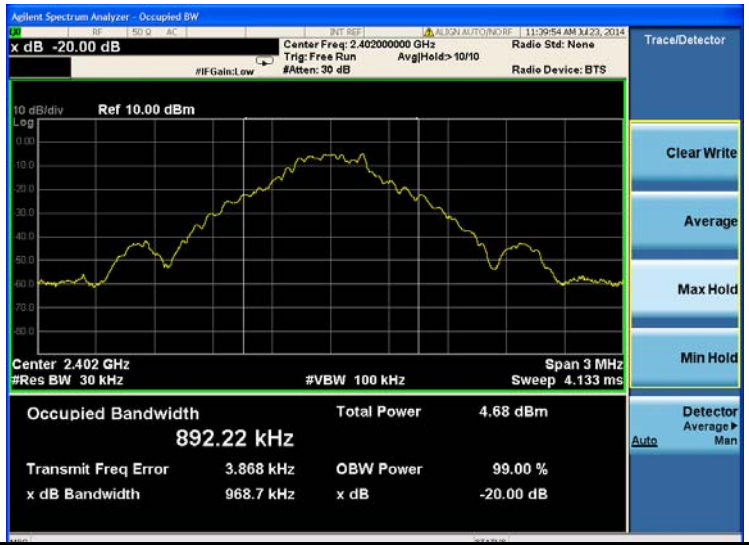
The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

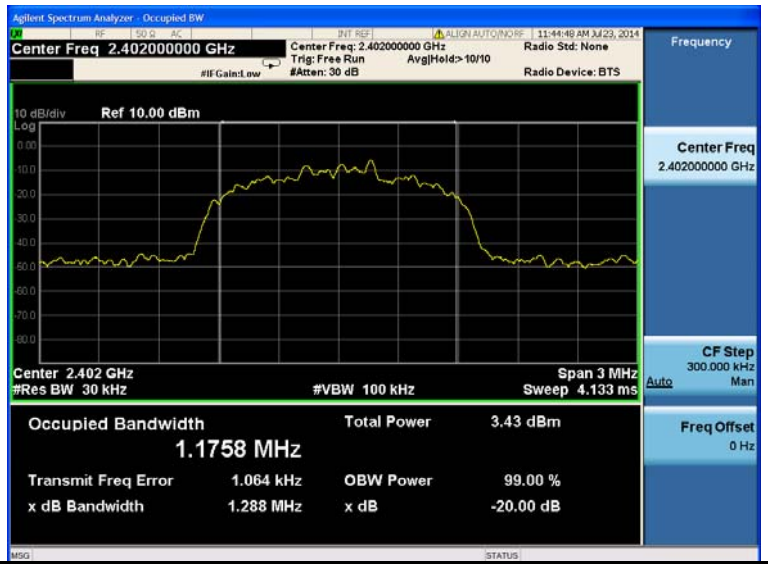
8.5. Test Result

Model Number	BTV4	
Test Item	20dB RF Bandwidth and 99 % Occupied Bandwidth	
Test Mode	Mode 2: GFSK Link Mode	
Date of Test	2014/07/22	
Frequency (MHz)	20dB RF Bandwidth (MHz)	Limit (MHz)
2402	0.969	-----
2441	0.961	-----
2480	0.964	-----

Model Number	BTV4		
Test Item	20dB RF Bandwidth and 99 % Occupied Bandwidth		
Test Mode	Mode 4: 8DPSK Link Mode		
Date of Test	2014/07/22		
Frequency (MHz)	20dB RF Bandwidth (MHz)		Limit (MHz)
2402	1.288		-----
2441	1.292		-----
2480	1.292		-----

8.6. Test Graphs

Mode 2: GFSK Link Mode	
2402	
2441	
2480	

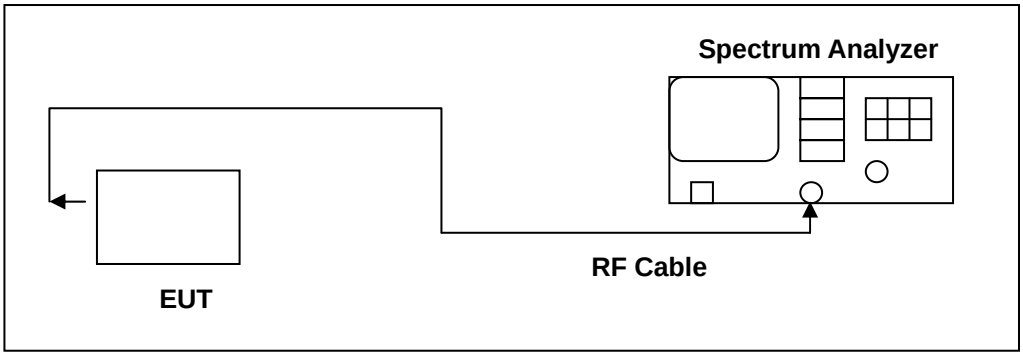
Mode 4: 8DPSK Link Mode	
2402	
2441	
2480	

9 Carrier Frequency Separation Measurement

9.1. Limit

Title 47 of the CFR, Part 15 Subpart (c) 15.247(a)(1)(i) requires the measurement of the bandwidth of the transmission between the -20 dB points on the transmitted spectrum. The results of this test determine the limits for channel spacing. The channel spacing shall be a minimum of 25 kHz or the 20 dB bandwidth.

9.2. Test Setup



9.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Signal Analyzer	Agilent	N9020A	MY53420615	12/19/2013	(1)

Remark: (1) Calibration period 1 year.

9.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth transmitter of the V6 had its hopping function enabled. The following spectrum analyzer settings were used:

1. Span = wide enough to capture the peaks of two adjacent channels
2. Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
3. Video (or Average) Bandwidth (VBW) ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

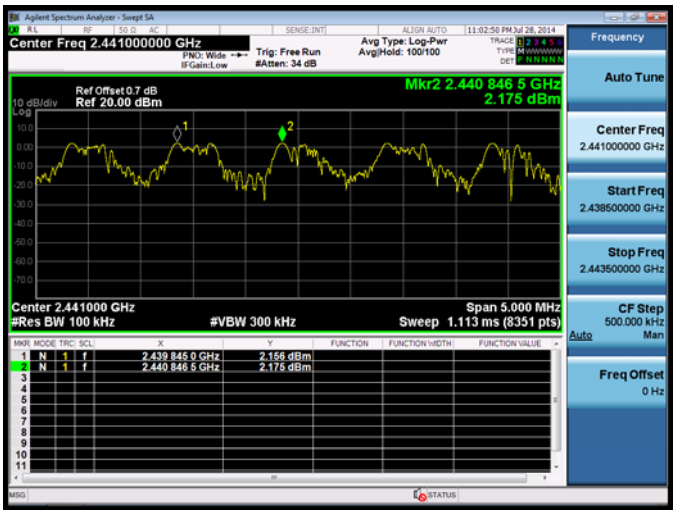
The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

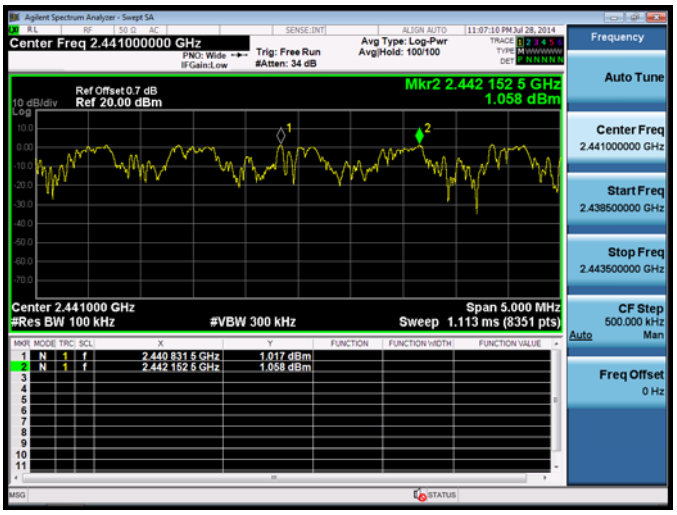
9.5. Test Result

Model Number	BTV4		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 2: GFSK Link Mode		
Date of Test	2014/07/28		
Frequency (MHz)		Measurement (MHz)	Limit (MHz)
2441		2.18	> 0.863

Model Number	BTV4		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 4: 8DPSK Link Mode		
Date of Test	2014/07/28		
Frequency (MHz)		Measurement (MHz)	Limit (MHz)
2441		1.06	> 0.863

9.6. Test Graphs

Mode 2: GFSK Link Mode	
2441	

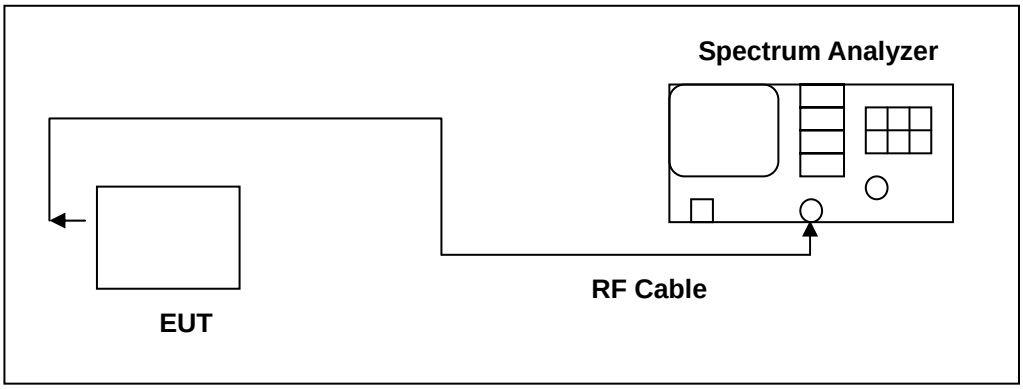
Mode 4: 8DPSK Link Mode	
2441	

10 Number of Hopping Measurement

10.1. Limit

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

10.2. Test Setup



10.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Signal Analyzer	Agilent	N9020A	MY53420615	12/19/2013	(1)

Remark: (1) Calibration period 1 year.

10.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = the frequency band of operation
2. RBW ≥ 1% of the span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize.

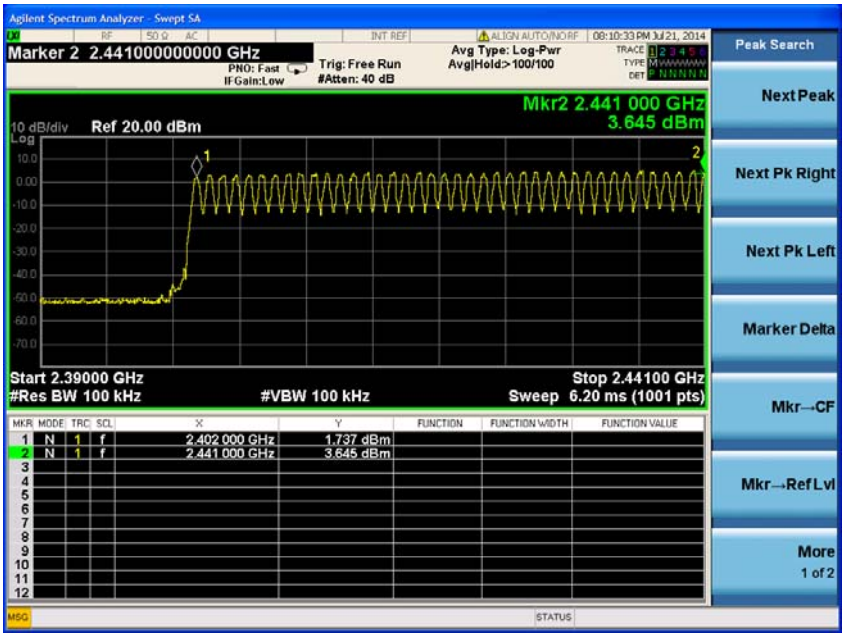
10.5. Test Result

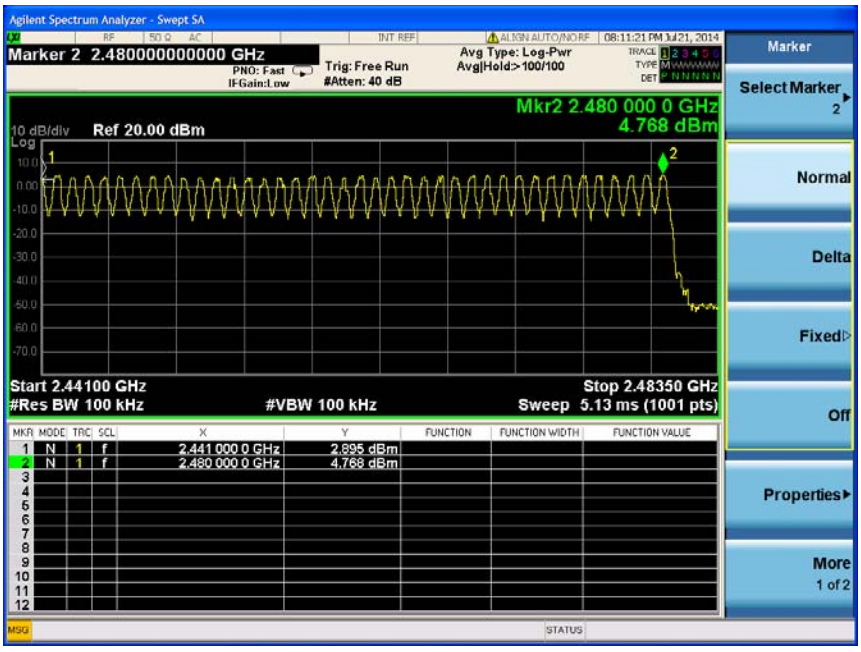
Model Number	BTV4	
Test Item	Number of Hopping	
Test Mode	Mode 2: GFSK Link Mode	
Date of Test	2014/07/21	
Frequency Range (MHz)	Measurement (ch)	Limit (ch)
2402 - 2480	79	> 15

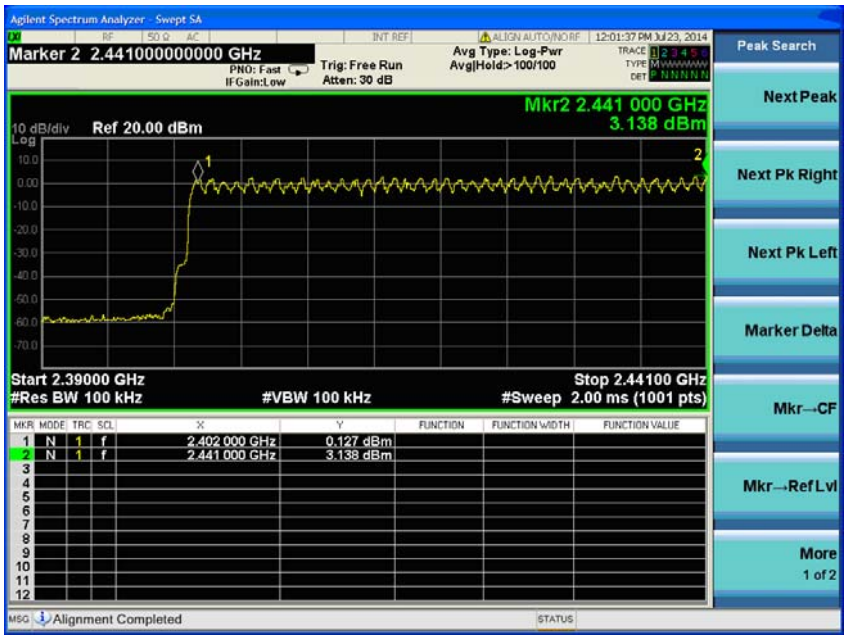
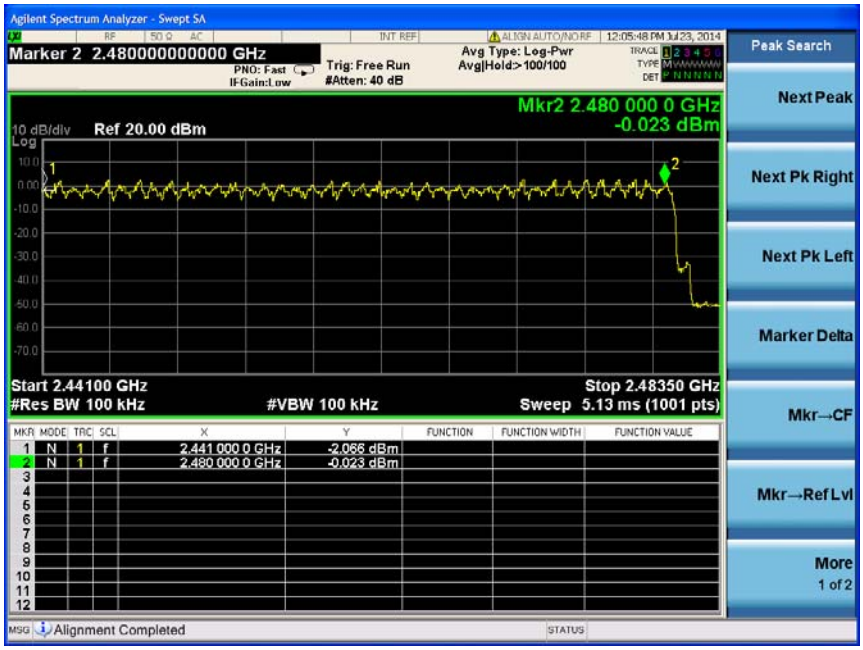
Model Number	BTV4	
Test Item	Number of Hopping	
Test Mode	Mode 4: 8DPSK Link Mode	
Date of Test	2014/07/21	
Frequency Range (MHz)	Measurement (ch)	Limit (ch)
2402 - 2480	79	> 15

10.6. Test Graphs

Mode 2: GFSK Link Mode





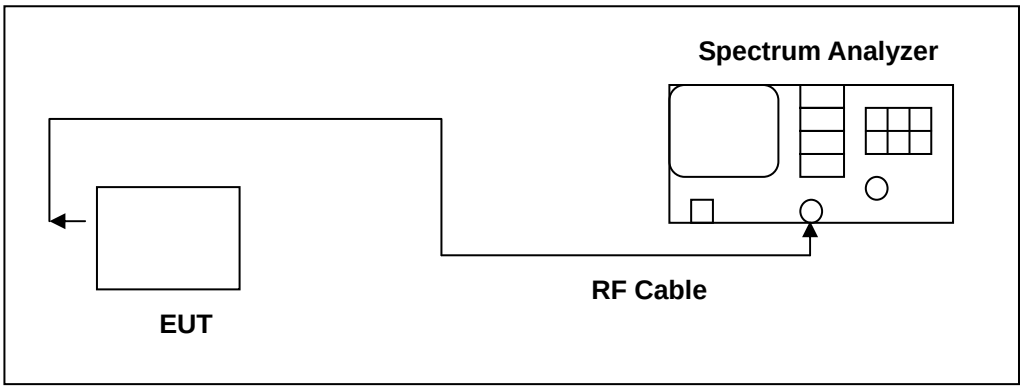
Mode 2: GFSK Link Mode



11 Time of Occupancy (Dwell Time) Measurement

11.1. Limit

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.

11.2. Test Setup



11.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Signal Analyzer	Agilent	N9020A	MY53420615	12/19/2013	(1)

Remark: (1) Calibration period 1 year.

11.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = zero span, centered on a hopping channel
2. RBW = 1 MHz
3. VBW ≥ RBW
4. Sweep = as necessary to capture the entire dwell time per hopping channel
5. Detector function = peak
6. Trace = max hold

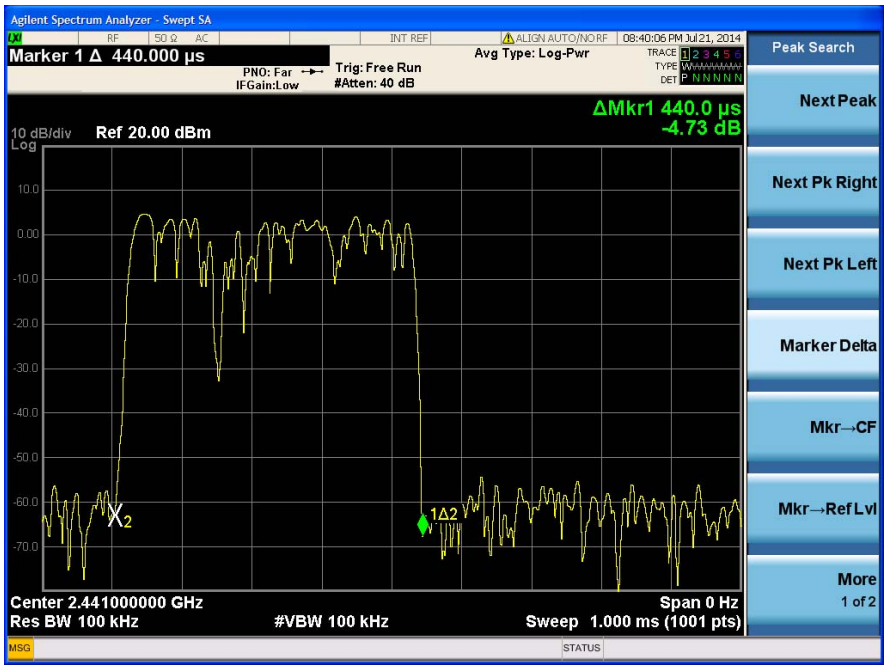
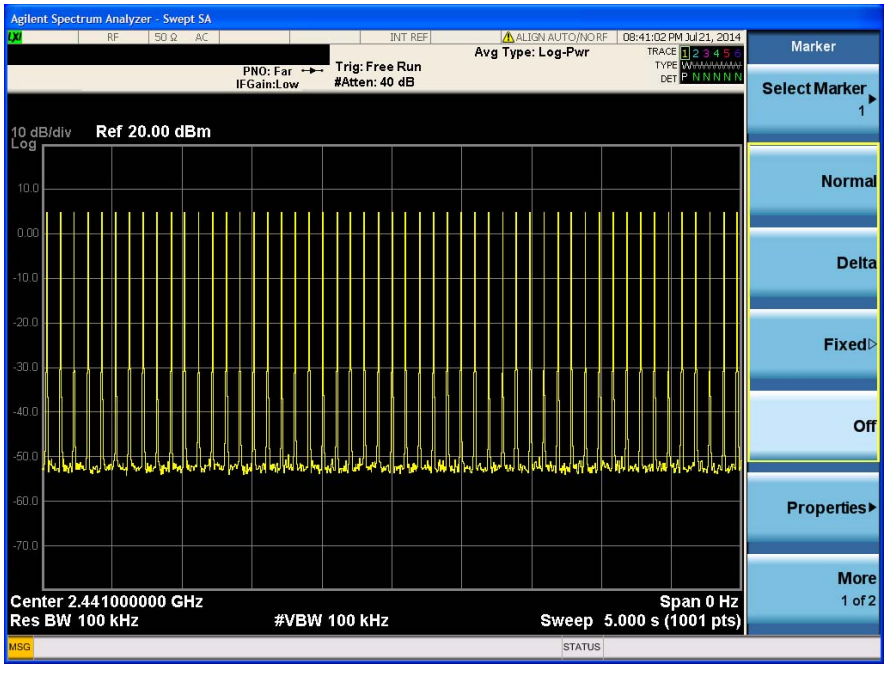
The marker-delta function was used to determine the dwell time.

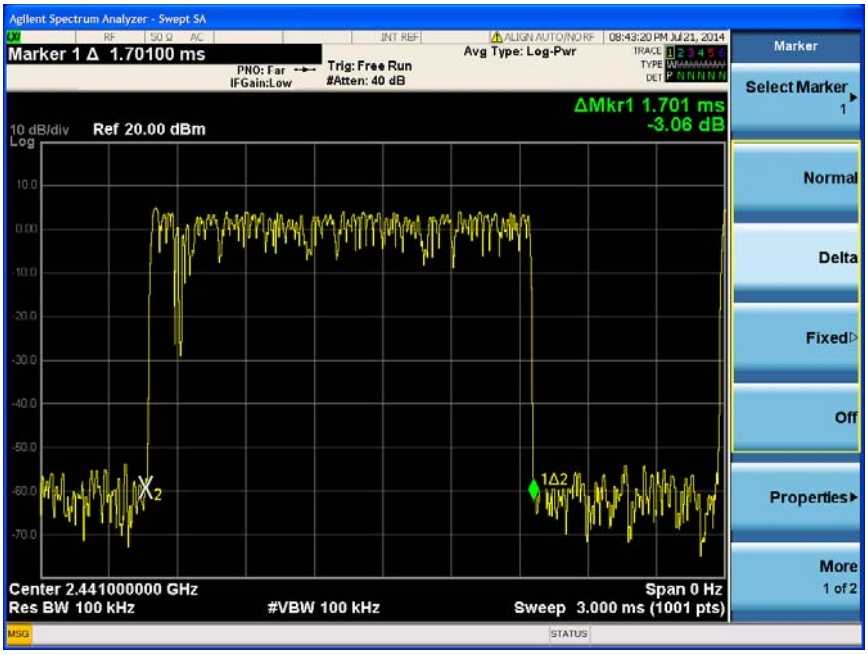
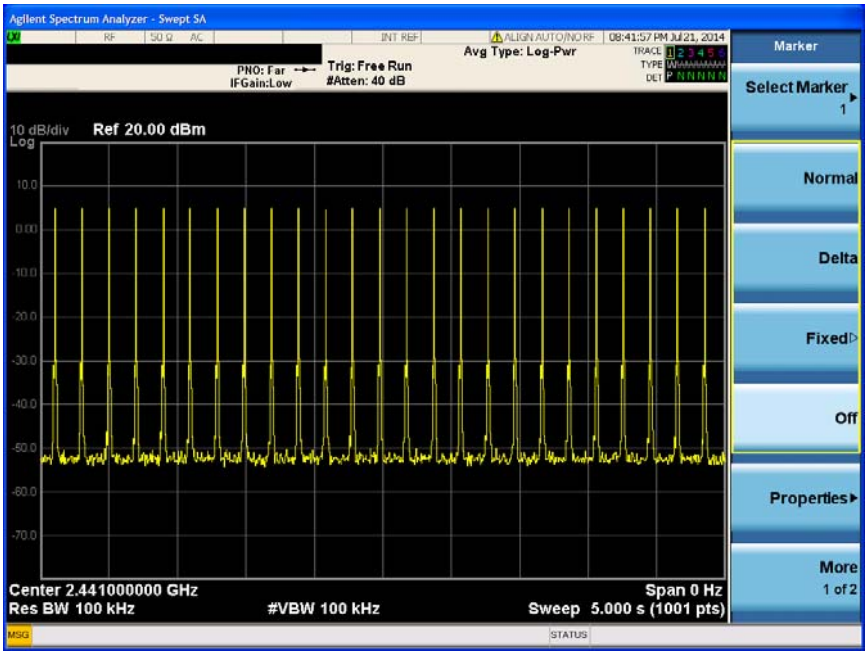
11.5. Test Result

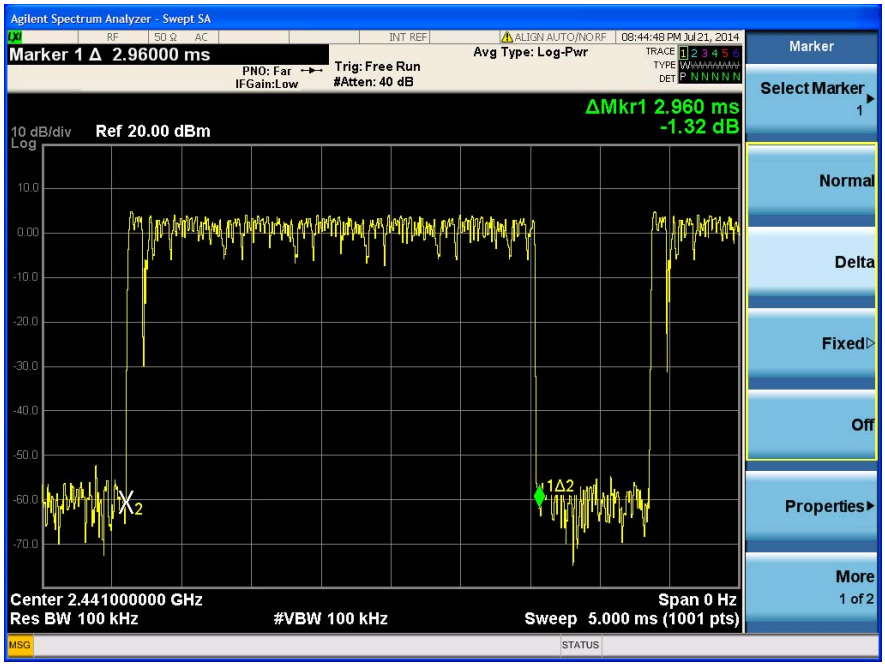
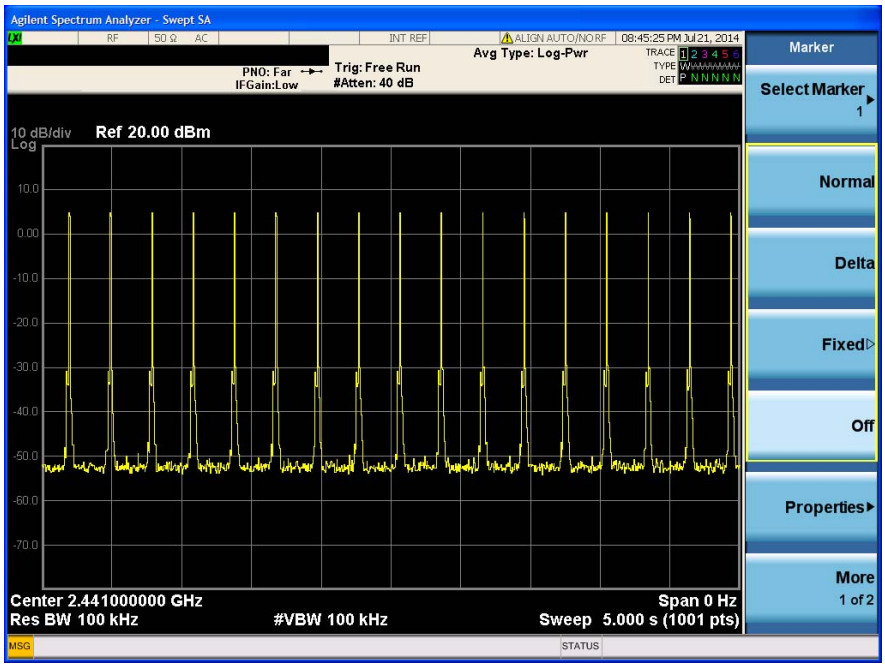
Model Number	BTV4
Test Item	Time of Occupancy (Dwell Time)
Test Mode	Mode 2: GFSK Link Mode
Date of Test	2014/07/22
DH1	
Length of per burst(ms)	0.440
Number of burst in 5 seconds	51
Cycle Calculate	79CH * 0.4 = 31.6 (sec)
Dwell Times	31.6/5*51*0.440 =141.821
LIMIT(msec)	< = 400
DH3	
Length of per burst(ms)	1.701
Number of burst in 5 seconds	25
Cycle Calculate	79CH * 0.4 = 31.6 (sec)
Dwell Times	31.6/5*25*1.701 =268.758
LIMIT(msec)	< = 400
DH5	
Length of per burst(ms)	2.960
Number of burst in 5 seconds	17
Cycle Calculate	79CH * 0.4 = 31.6 (sec)
Dwell Times	31.6/5*17*2.960 =318.022
LIMIT(msec)	< = 400

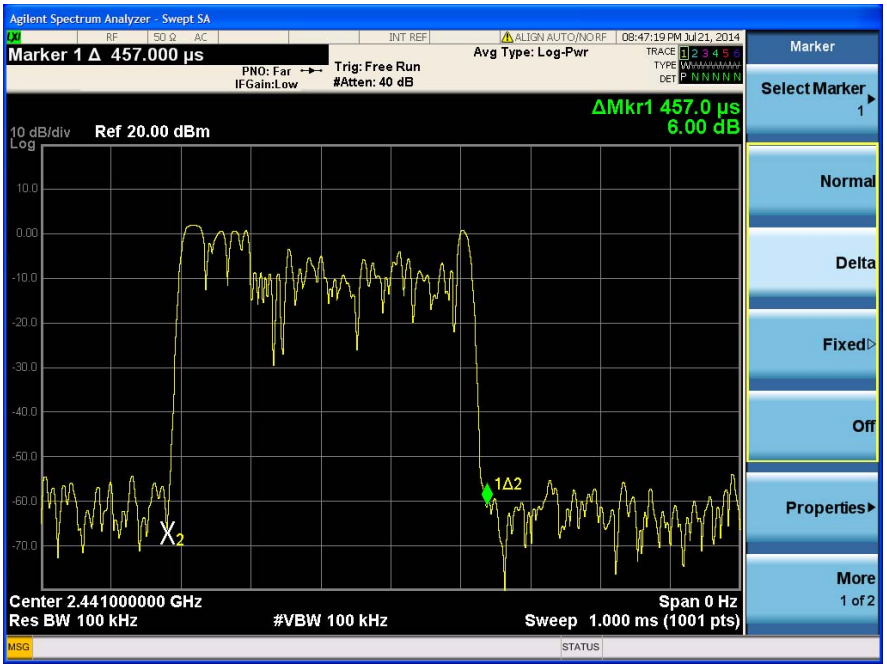
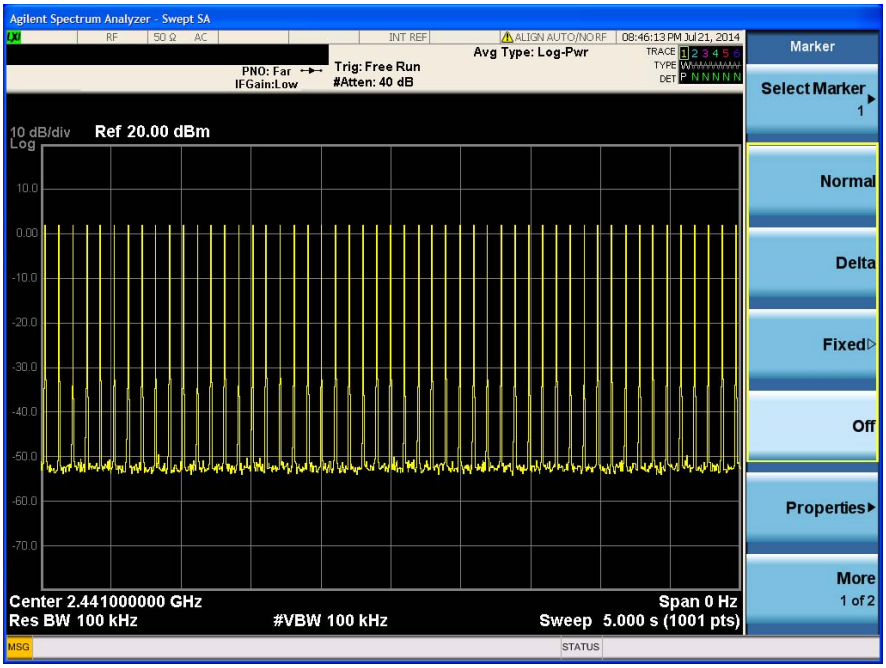
Model Number	BTV4
Test Item	Time of Occupancy (Dwell Time)
Test Mode	Mode 4: 8DPSK Link Mode
Date of Test	2014/07/22
DH1	
Length of per burst(ms)	0.457
Number of burst in 5 seconds	51
Cycle Calculate	79CH * 0.4 = 31.6 (sec)
Dwell Times	31.6/5*51*0.457 =147.300
LIMIT(msec)	< = 400
DH3	
Length of per burst(ms)	1.701
Number of burst in 5 seconds	25
Cycle Calculate	79CH * 0.4 = 31.6 (sec)
Dwell Times	31.6/5*25*1.701 =268.758
LIMIT(msec)	< = 400
DH5	
Length of per burst(ms)	2.975
Number of burst in 5 seconds	17
Cycle Calculate	79CH * 0.4 = 31.6 (sec)
Dwell Times	31.6/5*17*2.975 =319.634
LIMIT(msec)	< = 400

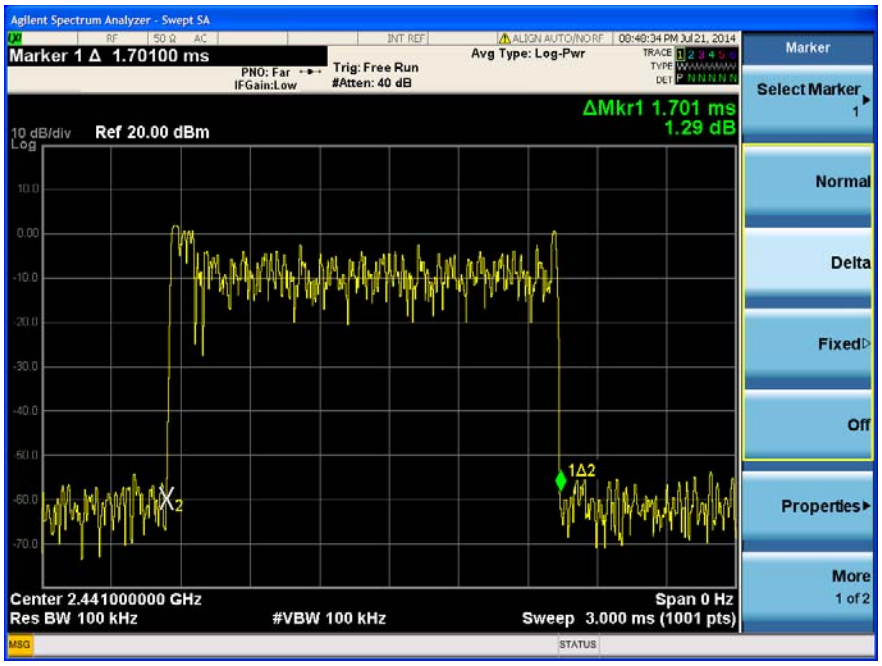
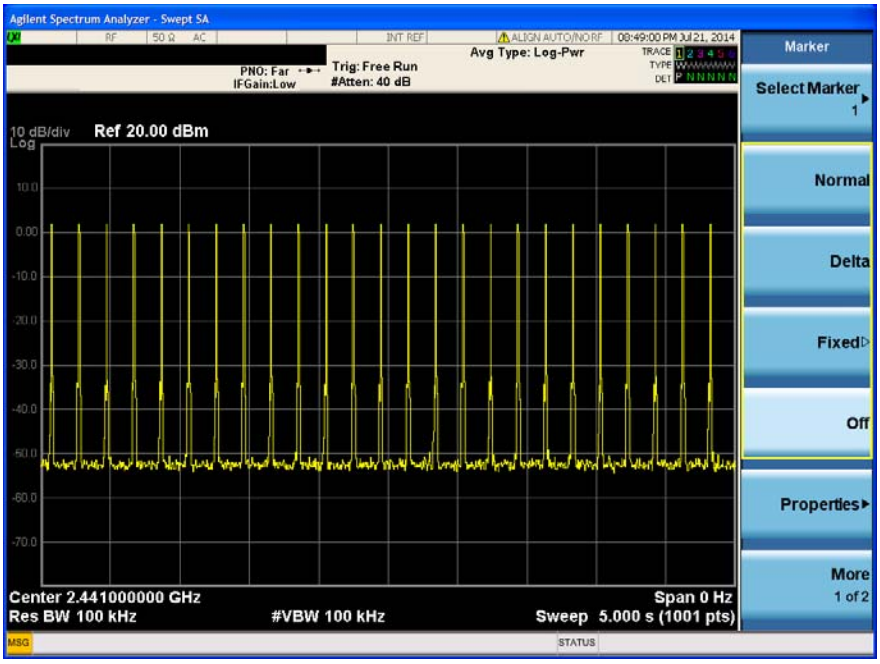
Test Graphs

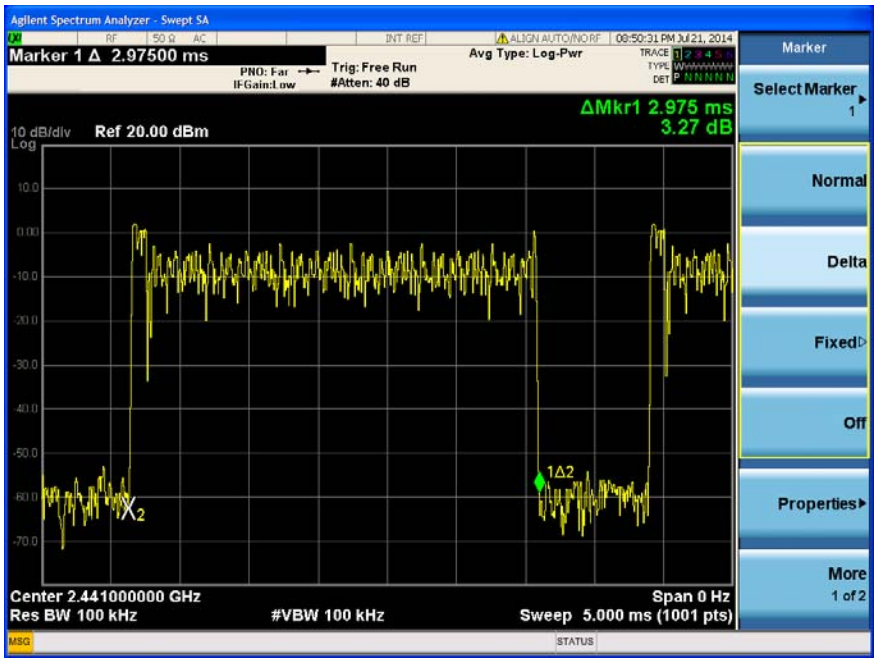
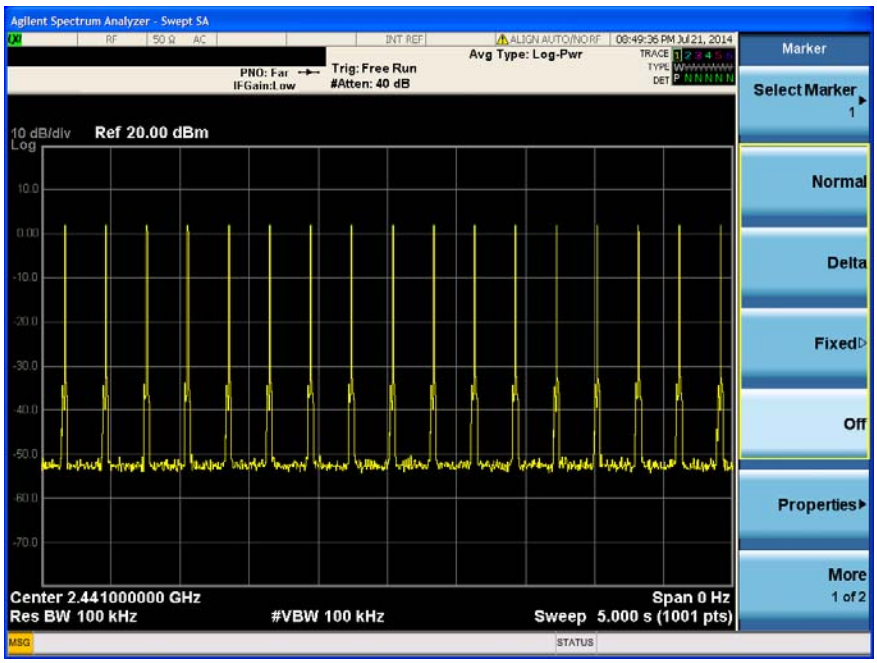
Mode 2: GFSK Link Mode	
DH1	 

Mode 2: GFSK Link Mode	
DH3	 

Mode 2: GFSK Link Mode	
DH5	 

Mode 4: 8DPSK Link Mode	
DH1	 

Mode 4: 8DPSK Link Mode	
DH3	 

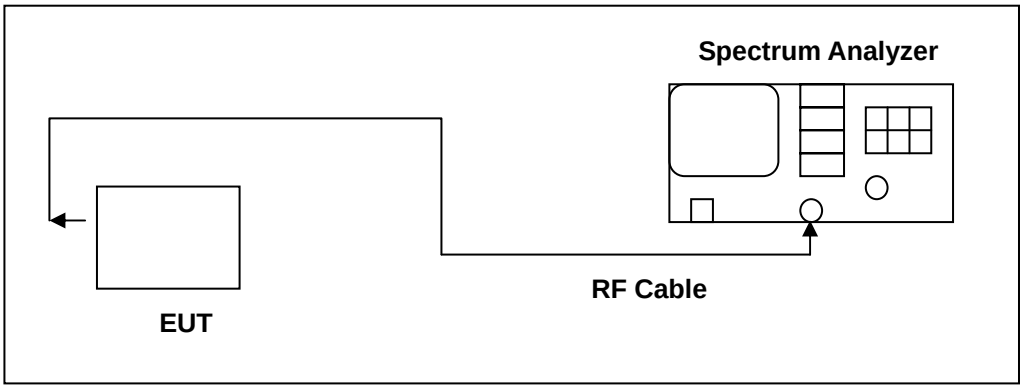
Mode 4: 8DPSK Link Mode	
DH5	 

12 Out of Band Conducted Emissions Measurement

12.1. Limit

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

12.2. Test Setup



12.3. Test Instruments

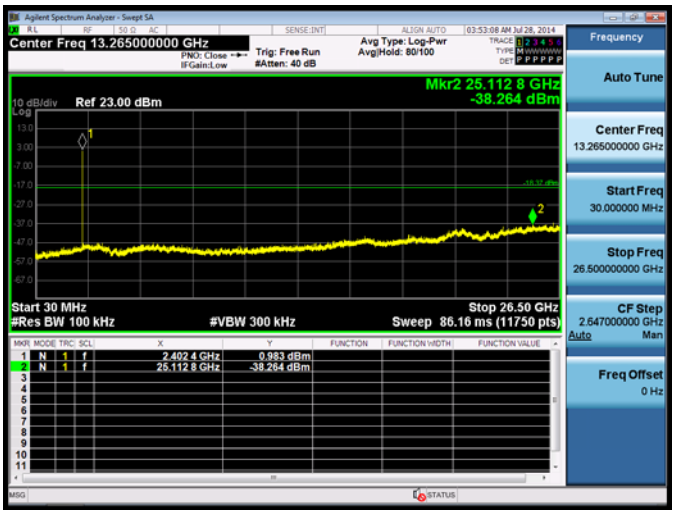
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Signal Analyzer	Agilent	N9020A	MY53420615	12/19/2013	(1)

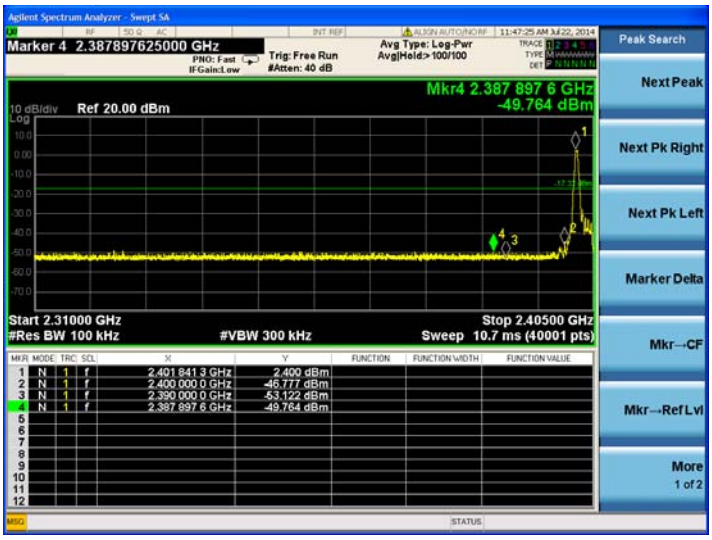
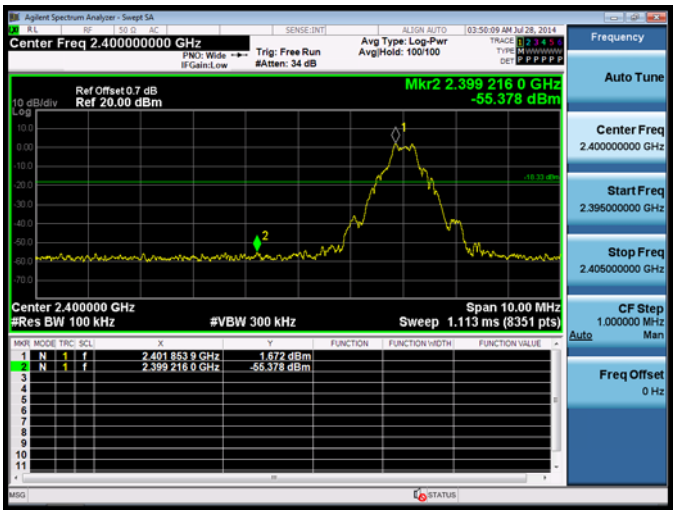
Remark: (1) Calibration period 1 year.

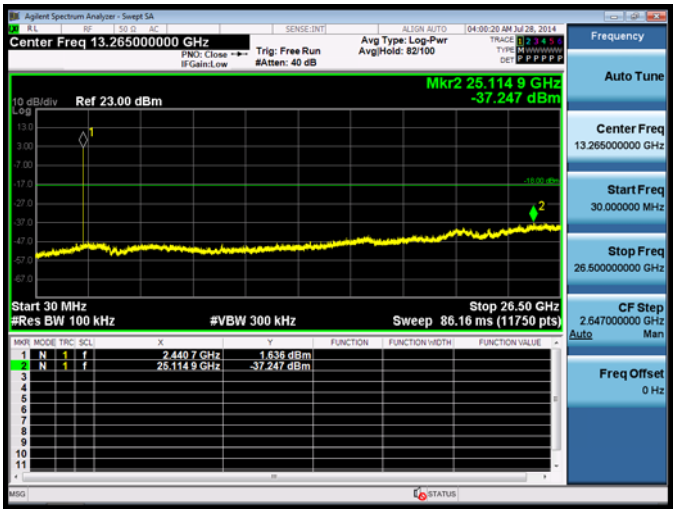
12.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band. The test was performed at 3 channels (Channel 0, 39, 78)

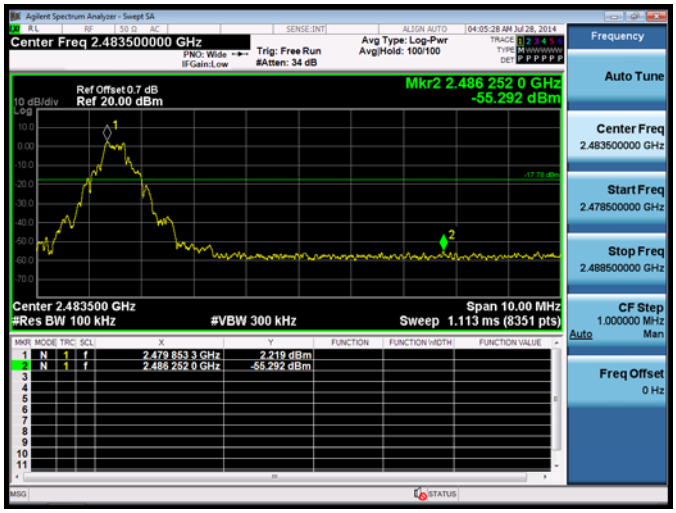
12.5. Test Graphs

Mode 2: GFSK Link Mode	
2402	
	

Mode 2: GFSK Link Mode(continuous)	
2402	
2402-Hopping OFF	
2402-Hopping ON	

Mode 2: GFSK Link Mode	
2441	
	

Mode 2: GFSK Link Mode	
2480	

	
2480-Hopping OFF	
2480-Hopping ON	

Mode 4: 8DPSK Link Mode	
2402	
	
2402-Hopping OFF	

2402-Hopping ON	

Mode 4: 8DPSK Link Mode	
2441	
	

Mode 4: 8DPSK Link Mode

2480	
	
2480-Hopping OFF	

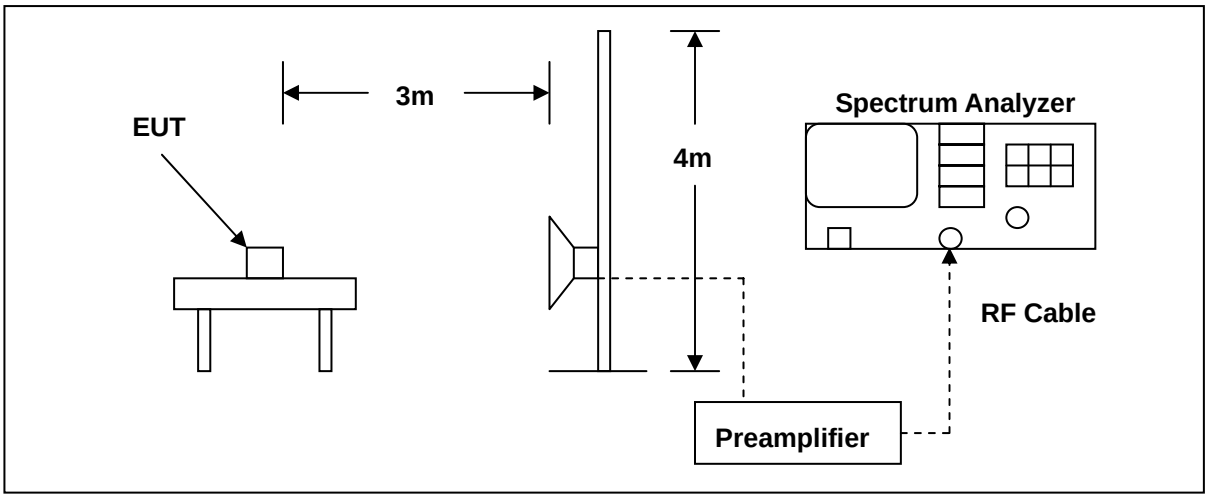
2480-Hopping ON	

13 Band Edges Measurement

13.1. Limit

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

13.2. Test Setup



13.3. Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Number	Cal. Date	Remark
Loop Antenna	Schwarzbeck	FMZB1516	SB3345	01/22/2014	(1)
Horn Antenna	Amplifier Research	AT4560	SB3450/01	05/16/2014	(1)
Amplifier(18-40GHz)	R&S	---	SB3435/02	05/16/2014	(1)
Amplifier(1-18GHz)	R&S	---	SB3435/01	01/22/2014	(1)
Horn Antenna	R&S	HF907	SB8501/01	05/13/2014	(1)
Bilog Antenna	Schwarzbeck	VULB9163	SB8501/04	01/20/2014	(1)
EMI Test Receiver	R&S	ESU40	SB85001/09	05/16/2014	(1)
EMI Test Receiver	R&S	ESIB26	SB3253	01/22/2014	(1)
Test Software	R&S	ESK1	N/A	N/A	(1)
Test Software	R&S	EMC32	N/A	N/A	(1)

Remark: (1) Calibration period 1 year.

13.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter was in full radiated power. The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz and at 2390.0 MHz

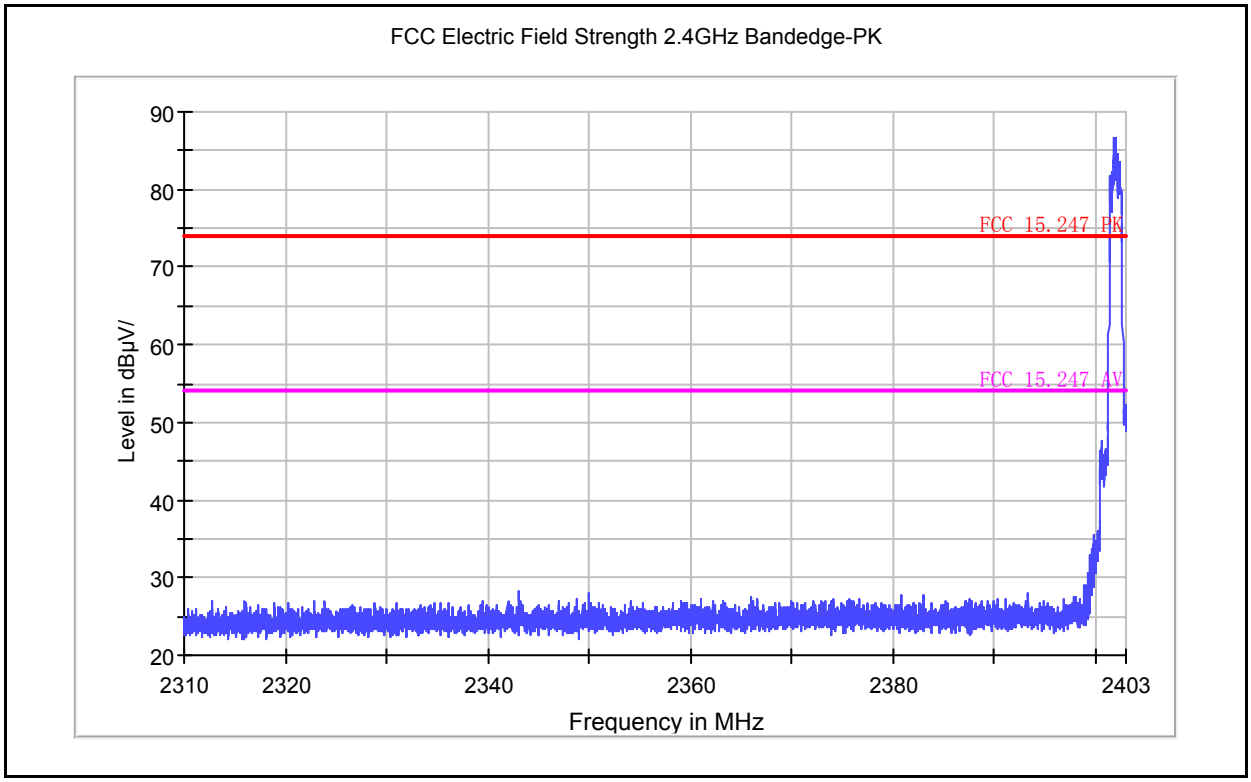
The transmitter was configured with the worst case antenna and setup to transmit at the highest channel. Then the field strength was measured at 2483.5 MHz

The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel. Then the field strength was measured at 2390.0 MHz these tests were performed at 4 different bit rates.

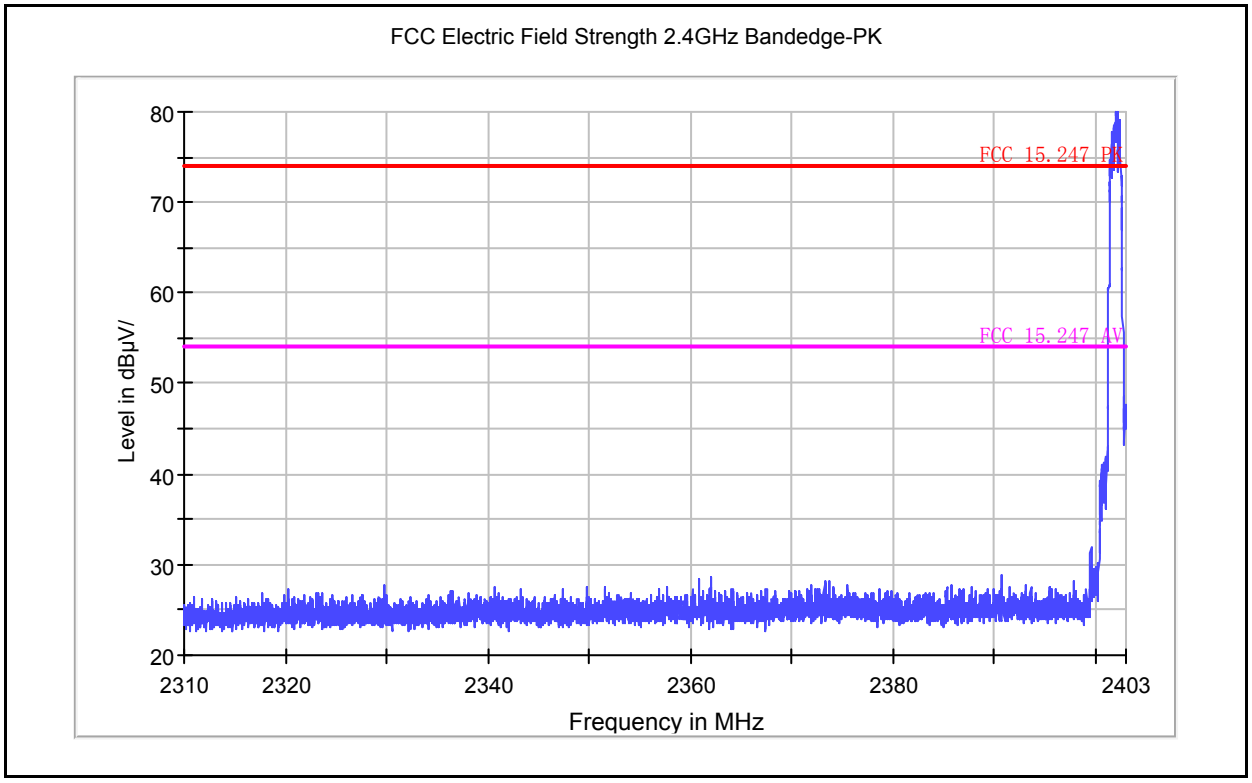
For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

13.5. Test Result

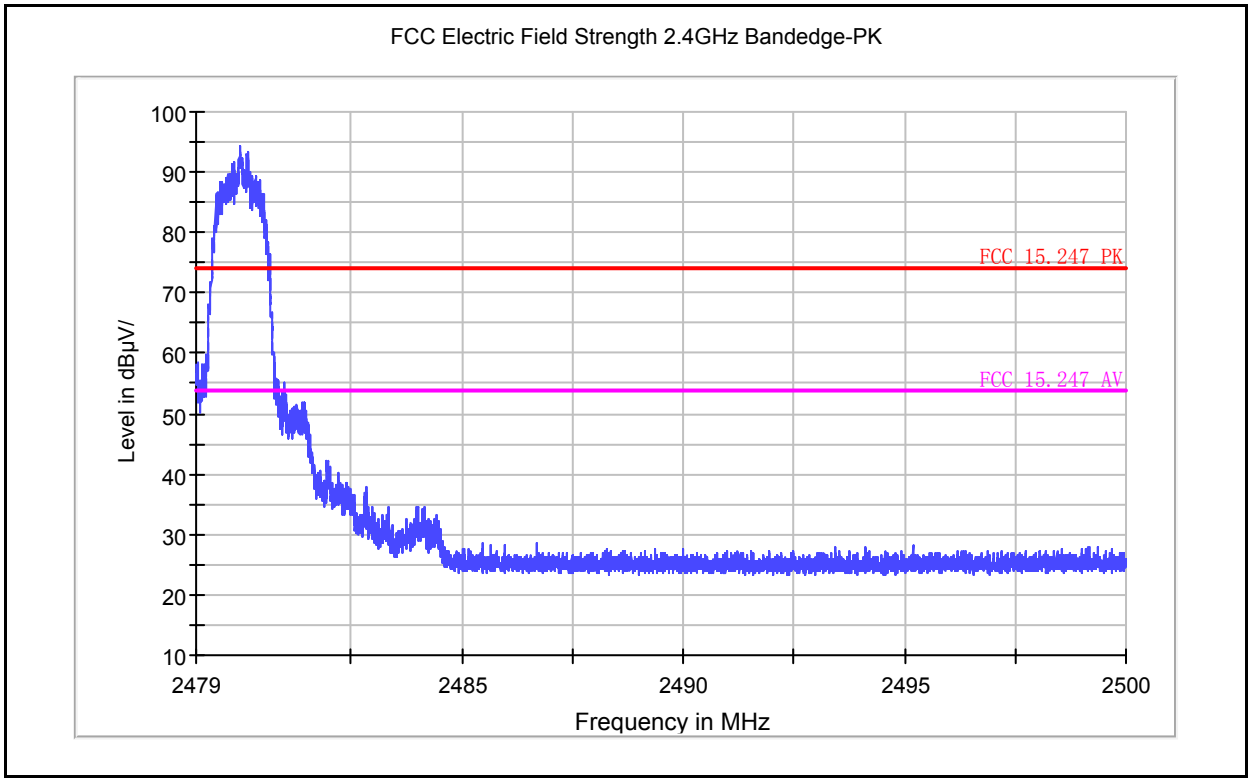
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2014/07/23
Frequency:	2402 MHz	Test By:	
Ant.Polar.:	Horizontal		



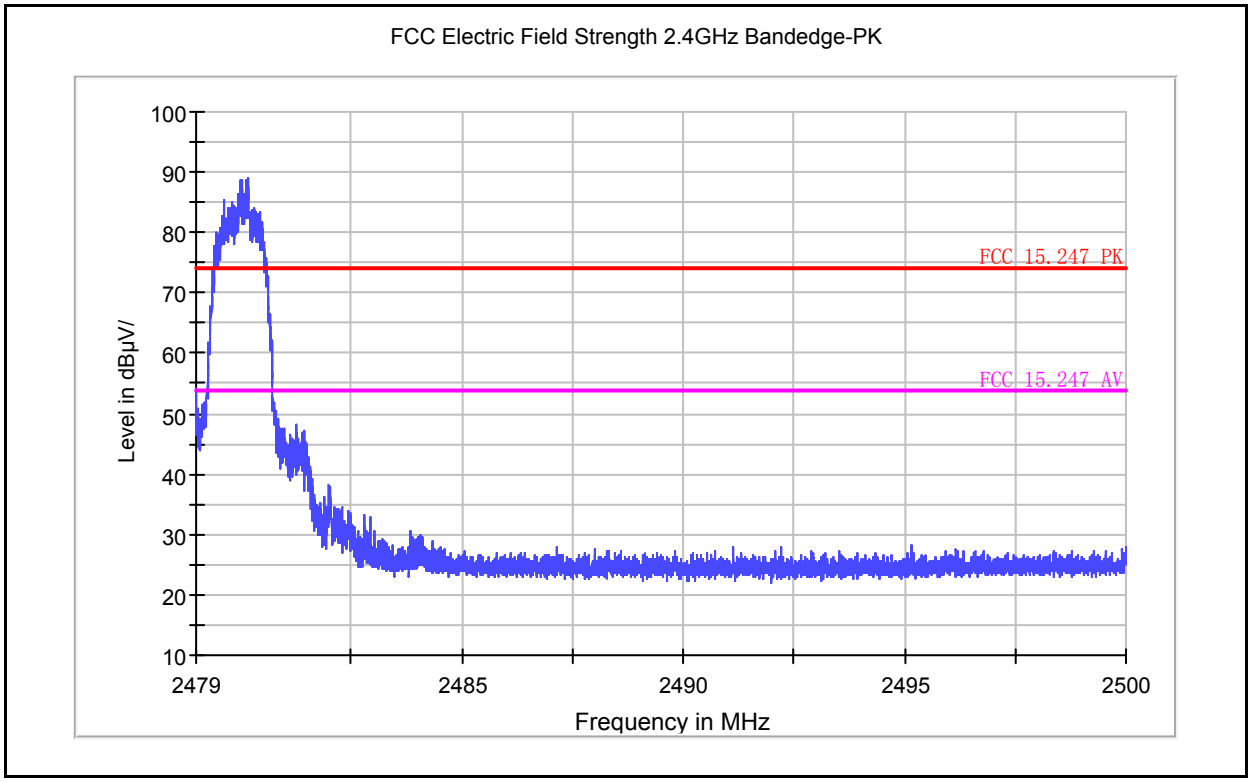
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2014/07/23
Frequency:	2402 MHz	Test By:	
Ant.Polar.:	Vertical		



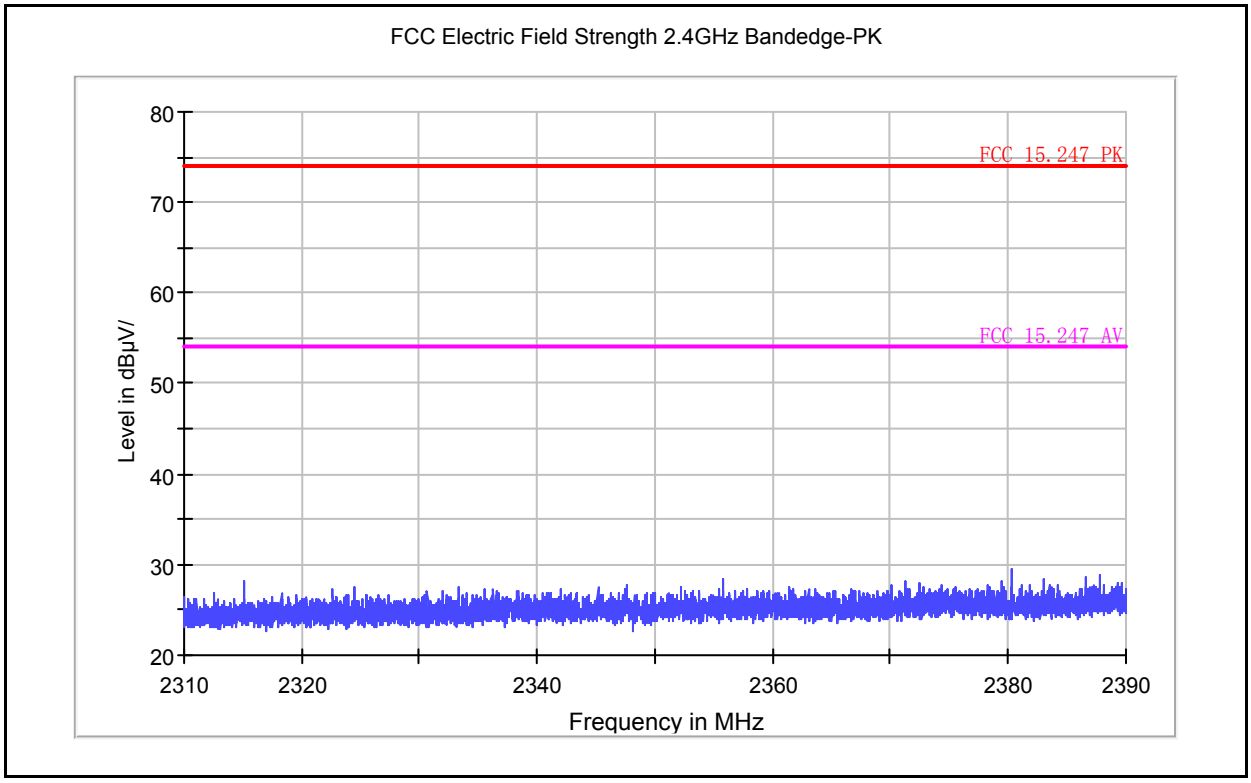
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2014/07/23
Frequency:	2480 MHz	Test By:	
Ant.Polar.:	Horizontal		



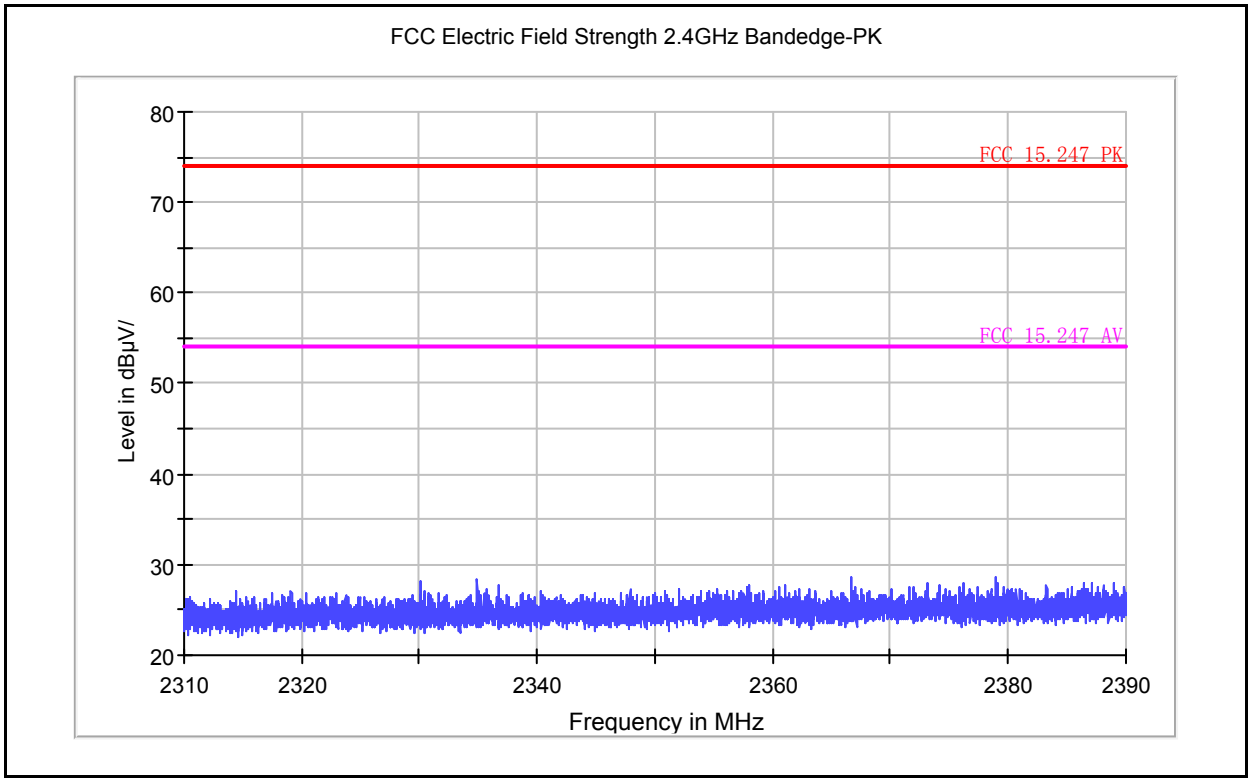
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2014/07/23
Frequency:	2480 MHz	Test By:	
Ant.Polar.:	Vertical		



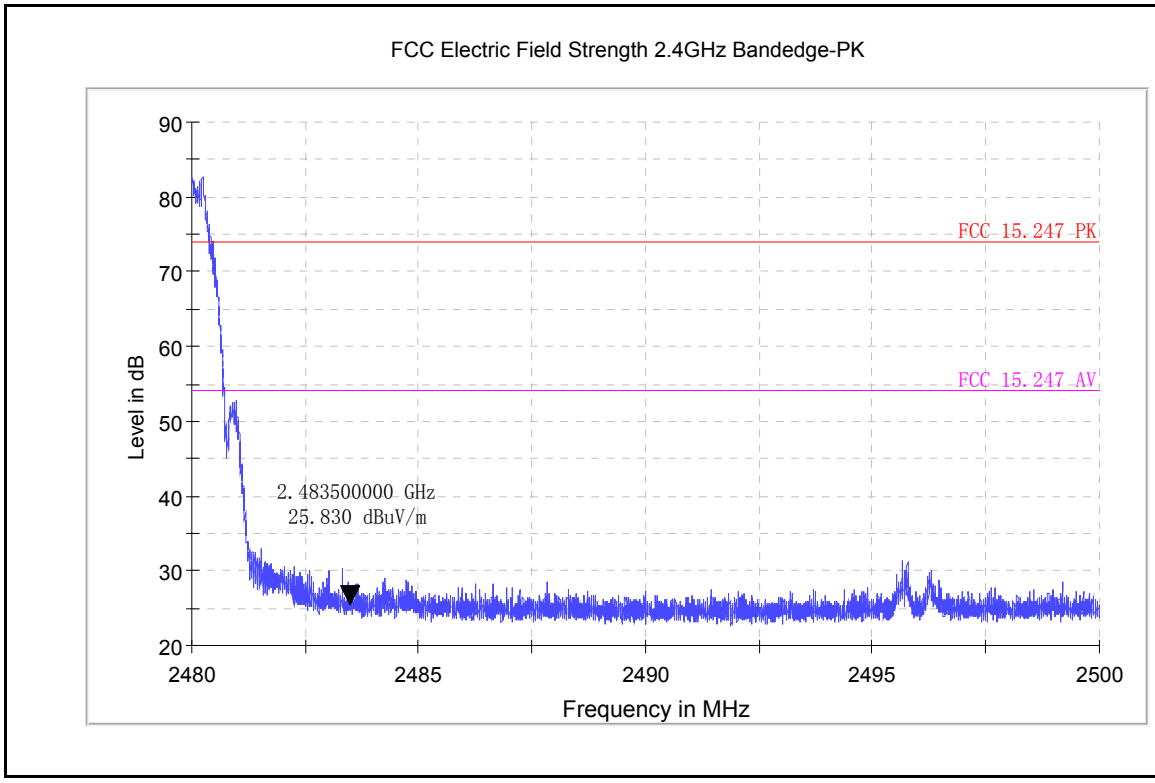
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	2014/07/23
Frequency:	2402 MHz	Test By:	
Ant.Polar.:	Horizontal		



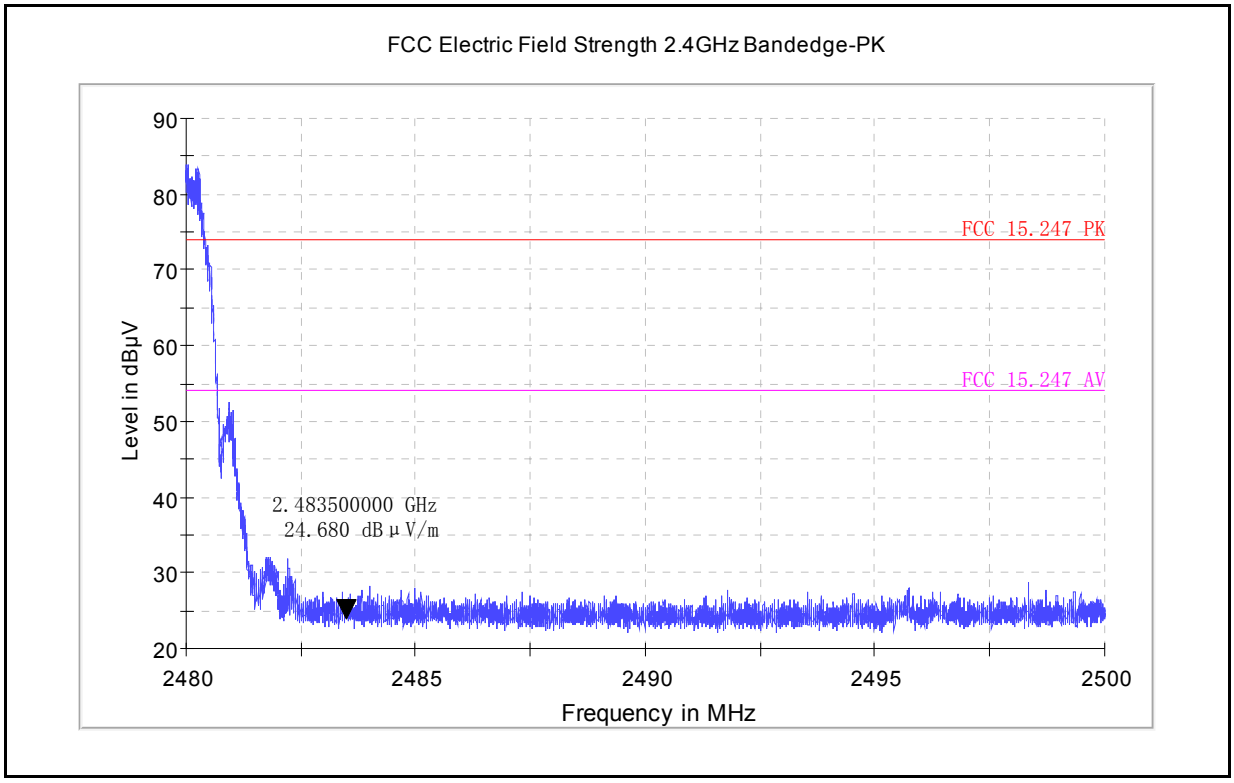
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	2014/07/23
Frequency:	2402 MHz	Test By:	
Ant.Polar.:	Vertical		



Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	2014/07/23
Frequency:	2480 MHz	Test By:	
Ant.Polar.:	Horizontal		



Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.7V
Model Number:	BTV4	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	2014/07/23
Frequency:	2480 MHz	Test By:	
Ant.Polar.:	Vertical		



14 Antenna Measurement

14.1. Limit

For intentional device, according to 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 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

14.2. Antenna Connector Construction

The antenna used in this product is internal PCB antenna. And the maximum Gain of this antenna is 0.0 dBi.