Report No.:SZ13040058W01

FCC PART 15C TEST REPORT

Issued to

Guangdong Appscomm Co., Ltd.

For

Bluetooth Bracelet

Model Name:	L6
Trade Name:	N/A
Brand Name:	N/A
FCC ID:	2AAB4-L600001
Standard:	47 CFR Part 15 Subpart C
Test date:	2013-4-23 to 2013-5-27
Issue date:	2013-5-27

By

Shenzhen MORLAB Communication Technology Co., Ltd.

Tested by Nie Quan	*Approved by* Zeng Dexin	*Review by* Peng Huarui
Nie Quan	*Zeng Dexin*	*Peng Huarui*
(Test Engineer)	*(Department Manager)*	*(Project Manager)*
Date 2013.5.27	*Date* 2013.5.27	*Date* 2013.5.27

DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	May 27, 2013	First edition

1. General Information

1.1. EUT Description

EUT Type ..... :	Bluetooth Bracelet
Serial No..... :	(n.a, marked #1 by test site)
Hardware Version ..... :	V1.0
Software Version ..... :	V1.0
Applicant ..... :	Guangdong Appscomm Co., Ltd. Rm 903, Block C3, Chuangxin Building, No.182, Science Road, Science City, LuoGang Zone, Guangzhou 510000, PRC
Manufacturer ..... :	Guangdong Appscomm Co., Ltd. Rm 903, Block C3, Chuangxin Building, No.182, Science Road, Science City, LuoGang Zone, Guangzhou 510000, PRC
Frequency Range..... :	The frequency range used is 2402MHz - 2480MHz (79 channels, at intervals of 1MHz); The frequency block is 2400MHz to 2483.5MHz.
Bluetooth Version ..... :	V2.1(No EDR)
Modulation Type ..... :	Bluetooth: FHSS (GFSK(1Mbps)
Antenna Type..... :	Ceramic Antenna
Antenna Gain..... :	0.5dBi
Power Supply ..... :	AC 110V/ 60Hz (supplied by the AC adapter)

Note 1: The EUT is a Bluetooth Bracelet, it contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth Module is F(MHz)=2402+1*n (0<=n<=78). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 3: a. When power on, the EUT will scan the whole frequency until a Connection command from the other BT devices.

b. When receiving the signal from the other BT devices, The EUT transmit aresponse signal.

c. The other devices receive the response signal and recognize it, then send a connection command to establish the connection.

d. After the connection establish successfully, the data transmission is beginning. At the same time, the both devices will shift frequencies in synchronization per a same pseudo randomly ordered list of hopping frequencies, the hopping rate is1600 times per second. This device conforms to the criteria in FCC Public Notice DA 00-705.

e. The bandwidth of the receiver, which is set to a fixed width by the software.

Note 4: Bluetooth signal has 3 packages DH1, DH3, DH5 package is largest, we are testing DH5 in the document.

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-09 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.247(a)	Number of Hopping Frequency	PASS
3	15.247(b)	Peak Output Power	PASS
4	15.247(a)	20dB Bandwidth	PASS
5	15.247(a)	Carrier Frequency Separation	PASS
6	15.247(a)	Time of Occupancy (Dwell time)	PASS
7	15.247(d)	Conducted Spurious Emission	PASS
8	15.247(d)	Band Edge	PASS
9	15.207	Conducted Emission	PASS
10	15.209 15.247(d)	Radiated Emission	PASS

NOTE: The tests were performed according to the method of measurements prescribed in DA-00-705 (Released March 30, 2000).

1.3. Facilities and Accreditations

1.3.1. Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2009, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.

1.3.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 - 60
Atmospheric Pressure (kPa):	86 - 106

2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. **Result:** Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

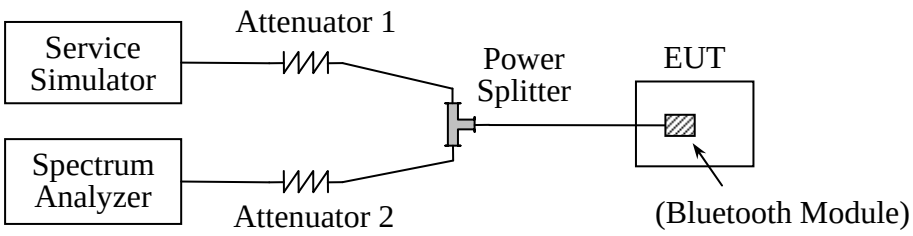
2.2. Number of Hopping Frequency

2.2.1. Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

2.2.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05	2014.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05	2014.05

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Power Splitter	Weinschel	1506A	NW521	2013.05	2014.05
Attenuator 1	Resnet	20dB	(n.a.)	2013.05	2014.05
Attenuator 2	Resnet	3dB	(n.a.)	2013.05	2014.05

2.2.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

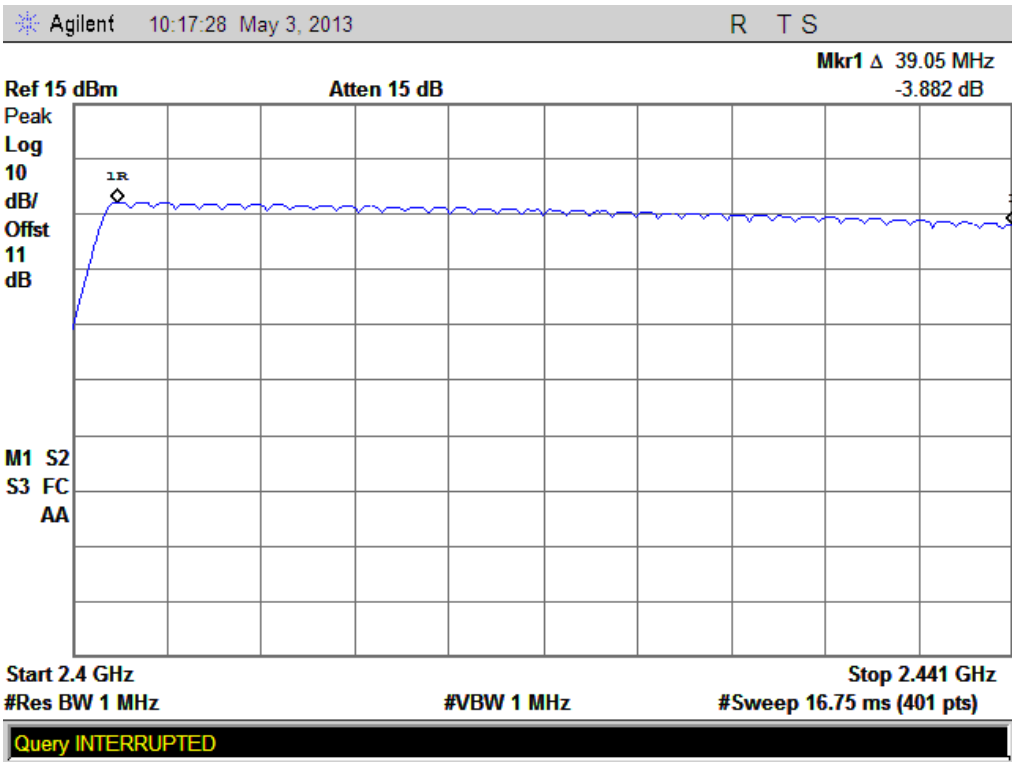
2.2.4. Test Result

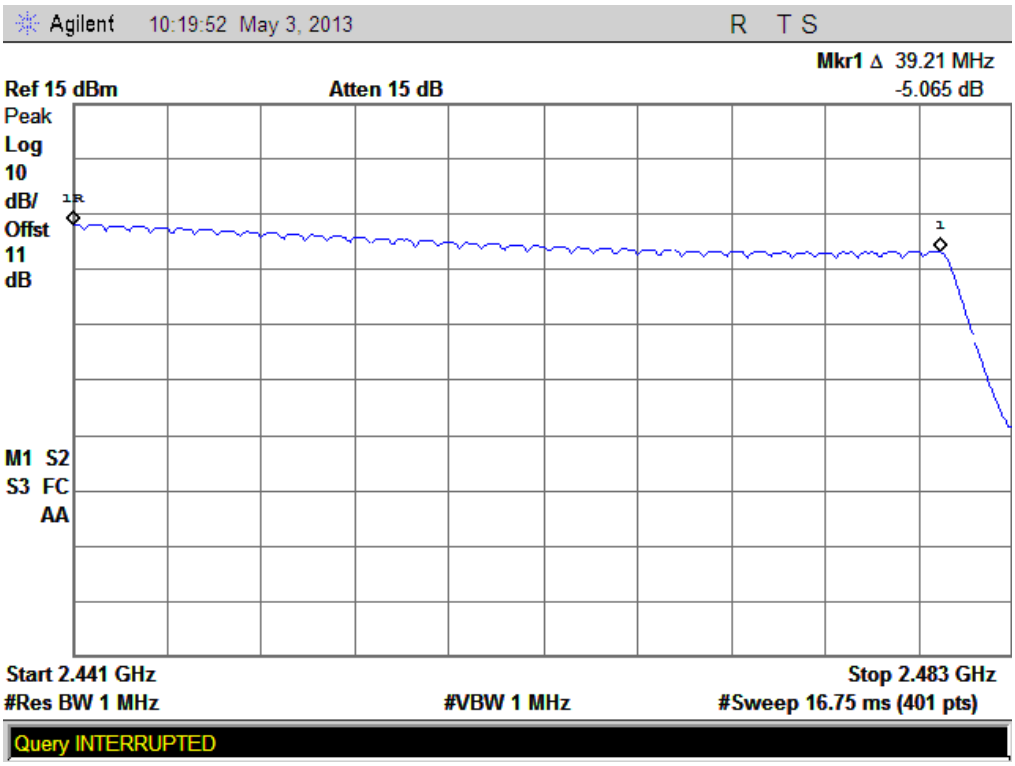
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

Test Verdict:

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS

A. Test Plots


Agilent 10:17:28 May 3, 2013
R T S
Mkr1 Δ 39.05 MHz
-3.882 dB
Ref 15 dBm
Atten 15 dB
Peak
Log
10
dB/
Offst
11
dB
1R
M1 S2
S3 FC
AA
Start 2.4 GHz
#Res BW 1 MHz
#VBW 1 MHz
Stop 2.441 GHz
#Sweep 16.75 ms (401 pts)
Query INTERRUPTED


Agilent 10:19:52 May 3, 2013
R T S
Mkr1 Δ 39.21 MHz
-5.065 dB
Ref 15 dBm
Atten 15 dB
Peak
Log
10
dB/
Offst
11
dB
1R
1
M1 S2
S3 FC
AA
Start 2.441 GHz
#Res BW 1 MHz
#VBW 1 MHz
Stop 2.483 GHz
#Sweep 16.75 ms (401 pts)
Query INTERRUPTED

(Plot A: GFSK)

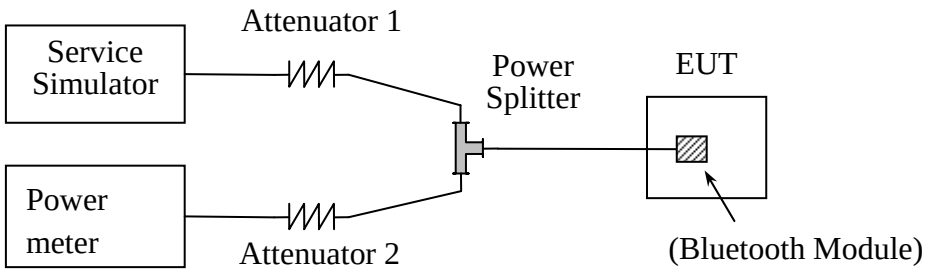
2.3. Peak Output Power

2.3.1. Requirement

According to FCC §15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

2.3.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is coupled to the Power meter and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

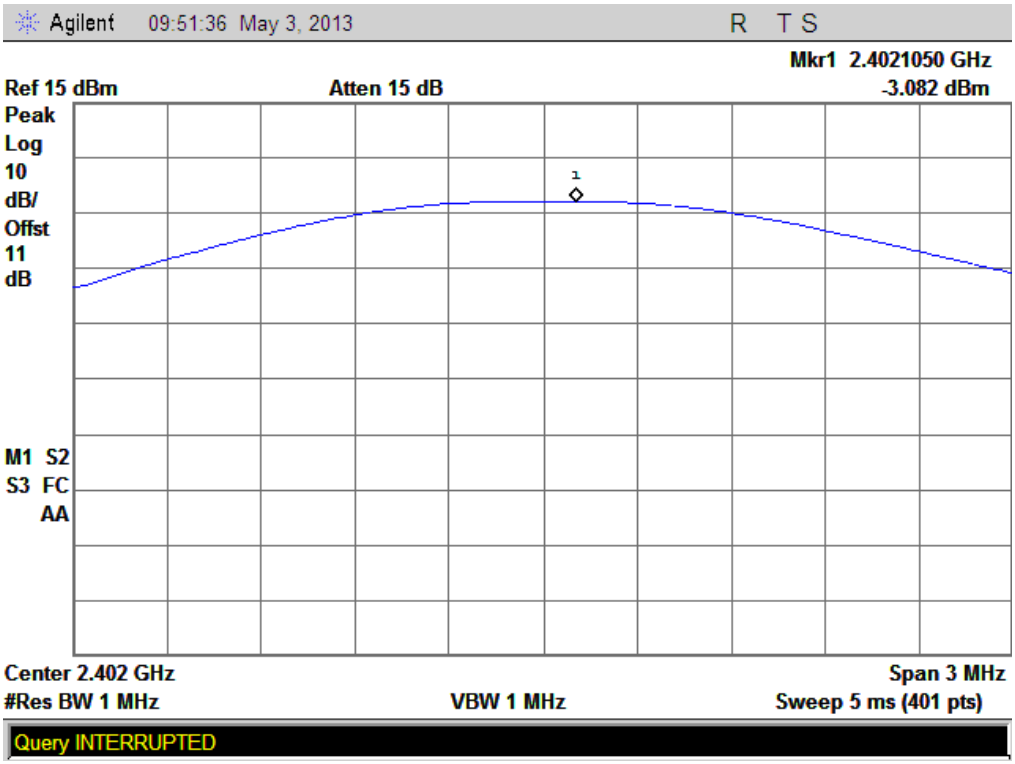
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05	2014.05
Power meter	Agilent	E4418B	GB44318055	2013.05	2014.05
Power Splitter	Weinschel	1506A	NW521	2013.05	2014.05
Power Sensor	Agilent	8482A	MY41091706	2013.05	2014.05
Attenuator 1	Resnet	20dB	(n.a.)	2013.05	2014.05
Attenuator 2	Resnet	3dB	(n.a.)	2013.05	2014.05

2.3.3. Test Result

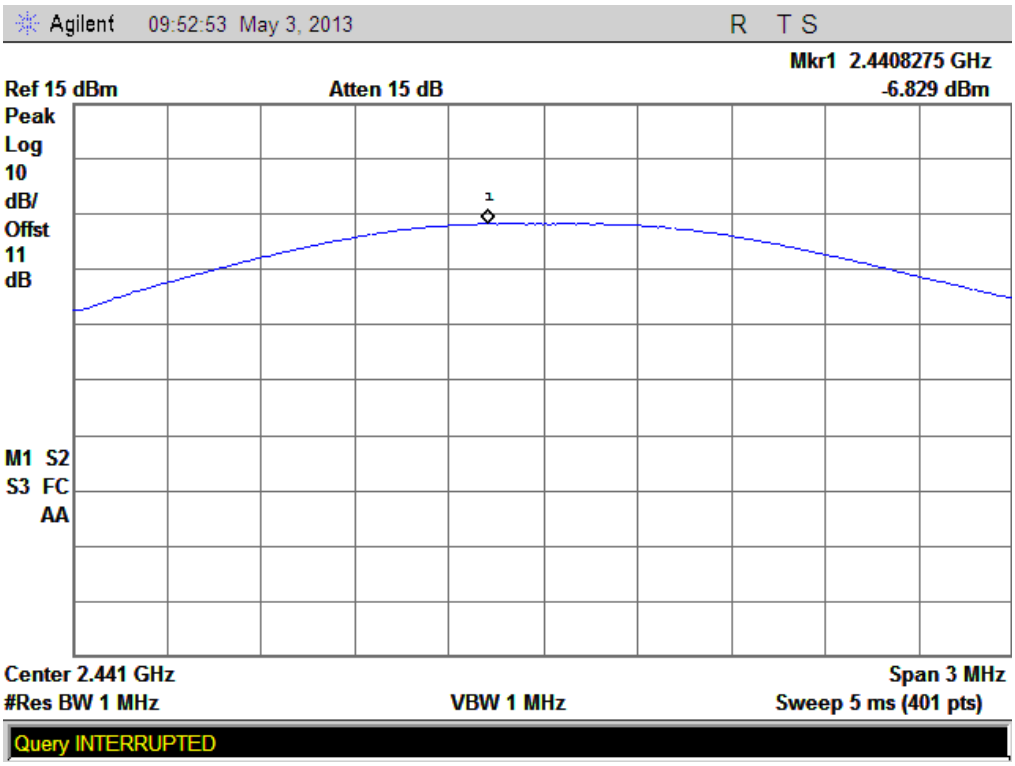
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module. The lowest, middle and highest channel were tested by Power meter.

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	-3.082	0.000492	20.97	0.125	PASS
39	2441	-6.829	0.000208			PASS
78	2480	-11.84	0.000065			PASS

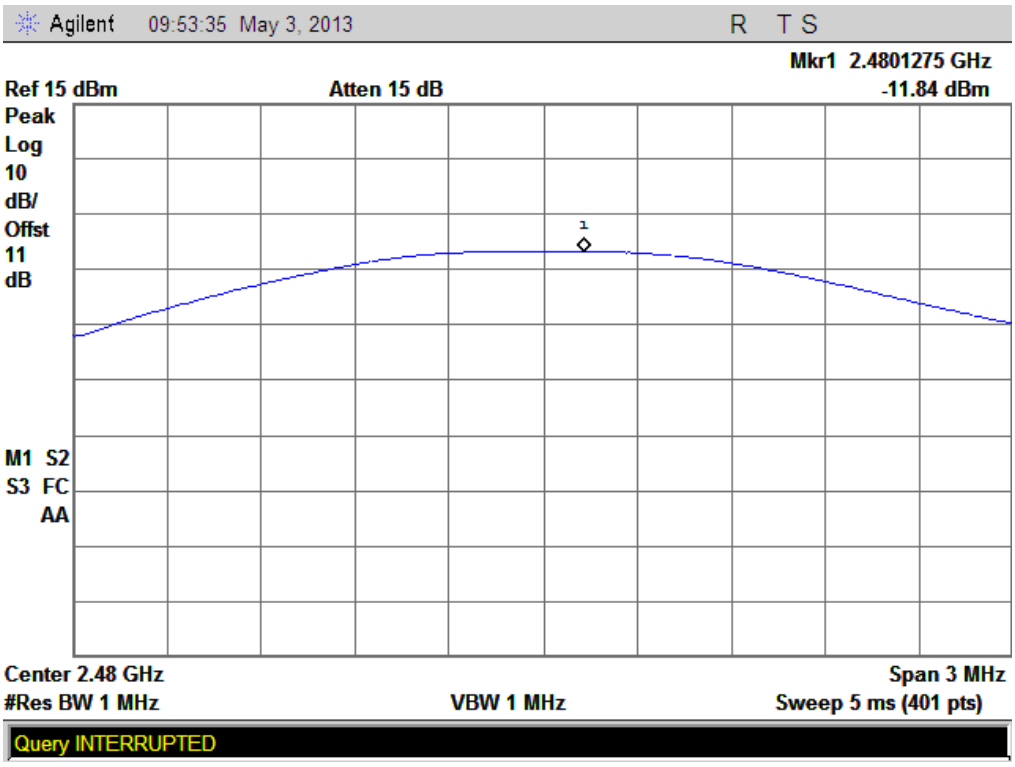
A. Test Plots



(Plot: A)


Agilent 09:52:53 May 3, 2013
R T S
Mkr1 2.4408275 GHz
-6.829 dBm
Ref 15 dBm
Atten 15 dB
Peak
Log
10
dB/
Offst
11
dB
M1 S2
S3 FC
AA
Center 2.441 GHz
#Res BW 1 MHz
VBW 1 MHz
Span 3 MHz
Sweep 5 ms (401 pts)
Query INTERRUPTED

(Plot: B)


Agilent 09:53:35 May 3, 2013
R T S
Mkr1 2.4801275 GHz
-11.84 dBm
Ref 15 dBm
Atten 15 dB
Peak
Log
10
dB/
Offst
11
dB
M1 S2
S3 FC
AA
Center 2.48 GHz
#Res BW 1 MHz
VBW 1 MHz
Span 3 MHz
Sweep 5 ms (401 pts)
Query INTERRUPTED

(Plot: C)

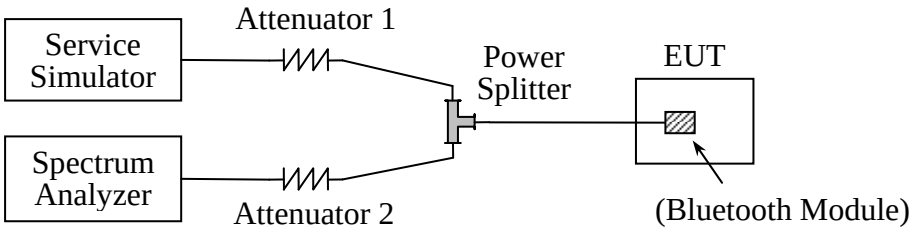
2.4. 20dB Bandwidth

2.4.1. Definition

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

2.4.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05	2014.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05	2014.05
Power Splitter	Weinschel	1506A	NW521	2013.05	2014.05
Attenuator 1	Resnet	20dB	(n.a.)	2013.05	2014.05
Attenuator 2	Resnet	3dB	(n.a.)	2013.05	2014.05

2.4.1. Test Procedure

Use the following spectrum analyzer settings:

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

RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

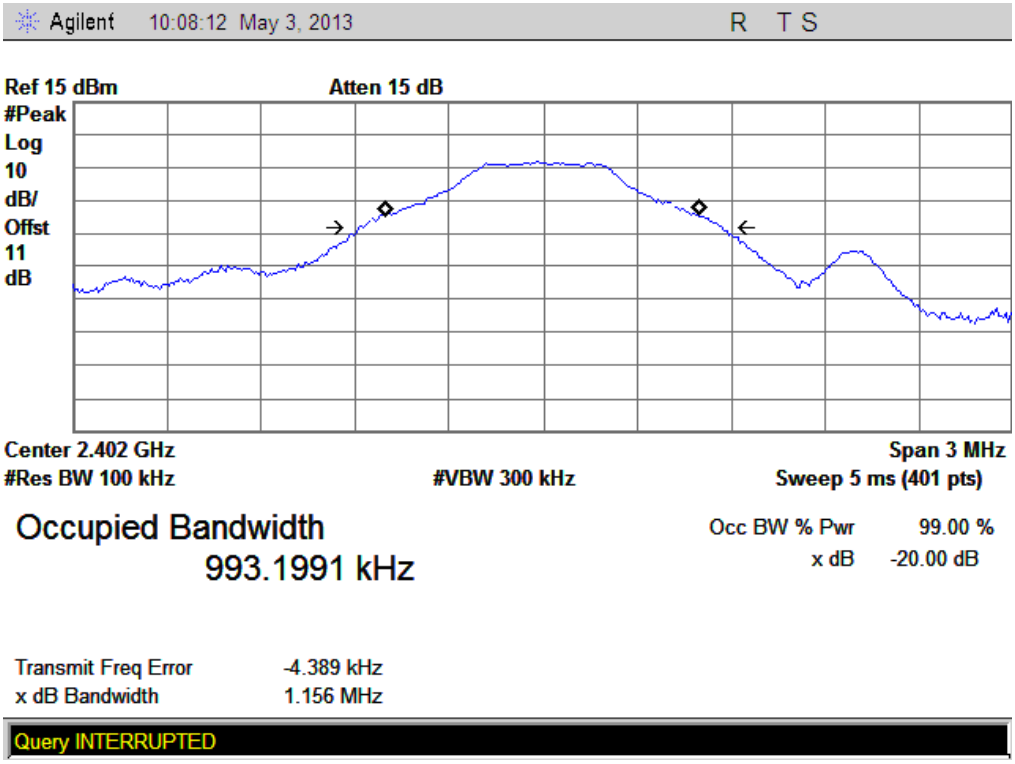
2.4.2. Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

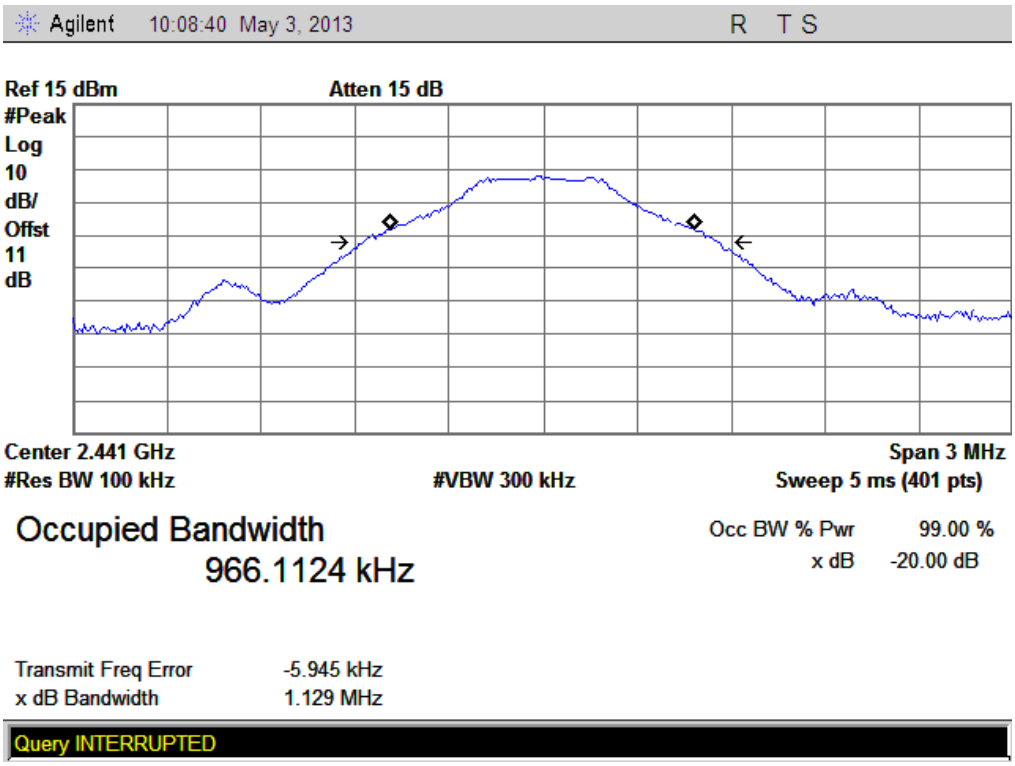
The maximum 20dB bandwidth measured is 1.156 MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.156	Plot A
39	2441	1.129	Plot B
78	2480	1.137	Plot C

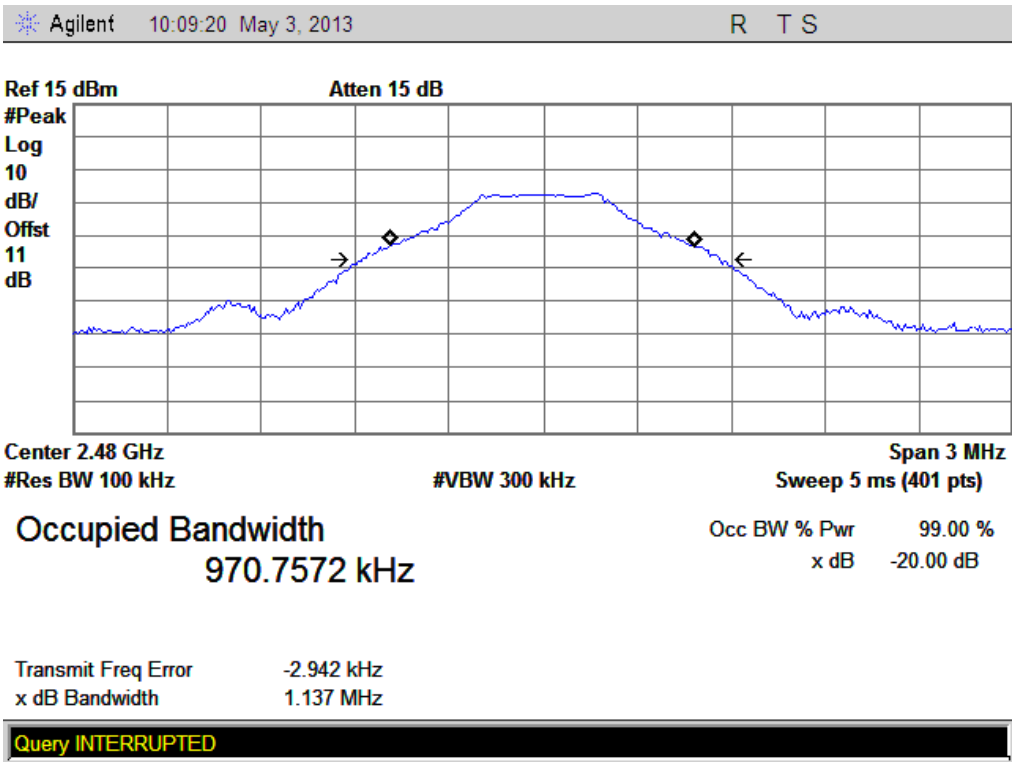
A. Test Plots



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

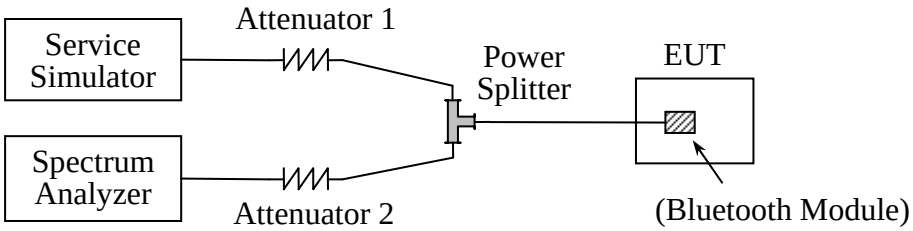
2.5. Carried Frequency Separation

2.5.1. Definition

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

2.5.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05	2014.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05	2014.05
Power Splitter	Weinschel	1506A	NW521	2013.05	2014.05
Attenuator 1	Resnet	20dB	(n.a.)	2013.05	2014.05
Attenuator 2	Resnet	3dB	(n.a.)	2013.05	2014.05

2.5.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

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

Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ RBW

Sweep = auto

Detector function = peak

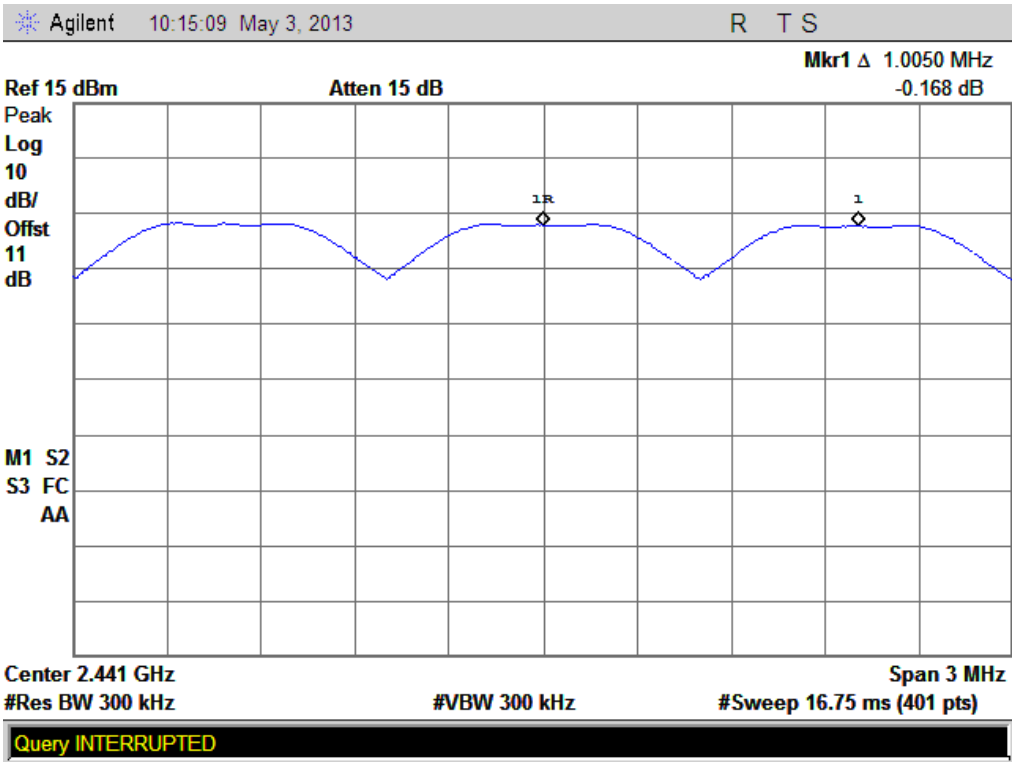
Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

2.5.4. Test Result

The Bluetooth Module operates at hopping-on test mode.

For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (1.156 MHz for GFSK mode), whichever is greater. So, the verdict is PASSING.



(Plot A: GFSK)

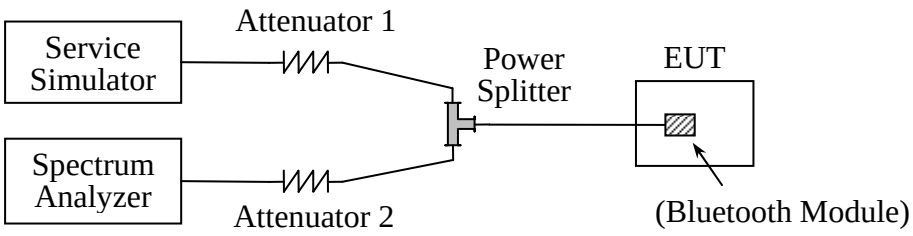
2.6. Time of Occupancy (Dwell time)

2.6.1. Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping 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.

2.6.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05	2014.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05	2014.05
Power Splitter	Weinschel	1506A	NW521	2013.05	2014.05
Attenuator 1	Resnet	20dB	(n.a.)	2013.05	2014.05
Attenuator 2	Resnet	3dB	(n.a.)	2013.05	2014.05

2.6.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1 MHz

VBW ≥ RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

2.6.4. Test Result

The average time of occupancy on any channel within the Period can be calculated with formulas (for DH5 package type):

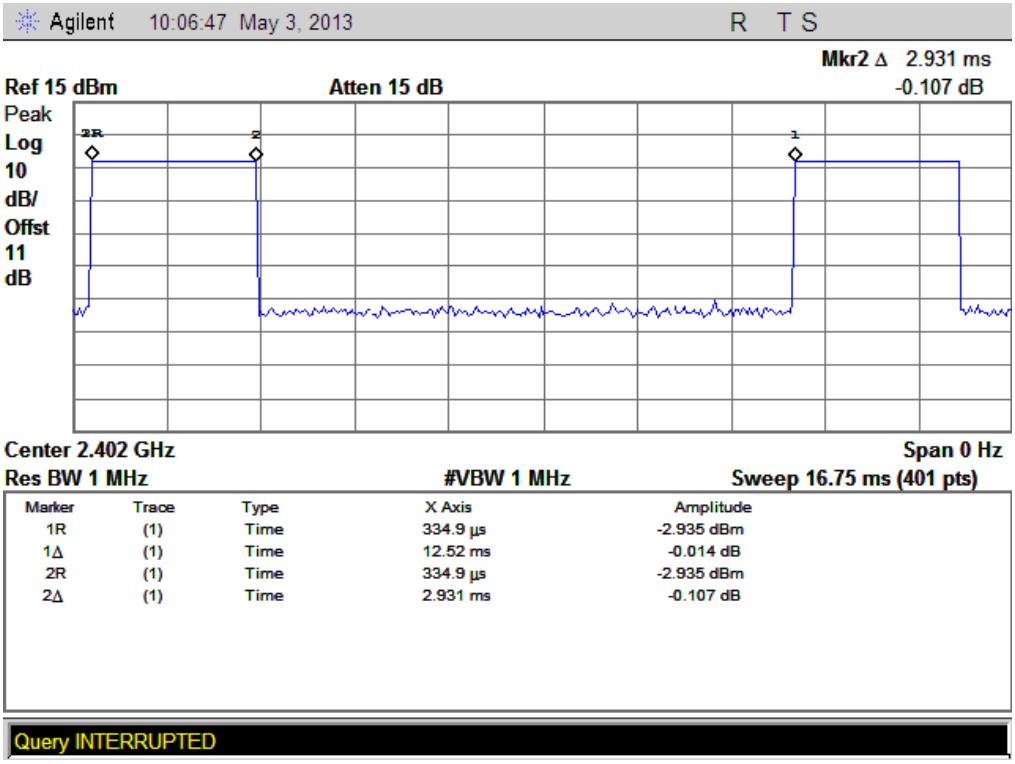
{Total of Dwell} = {Pulse Time} * (1600 / 6) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4s * {Number of Hopping Frequency}

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

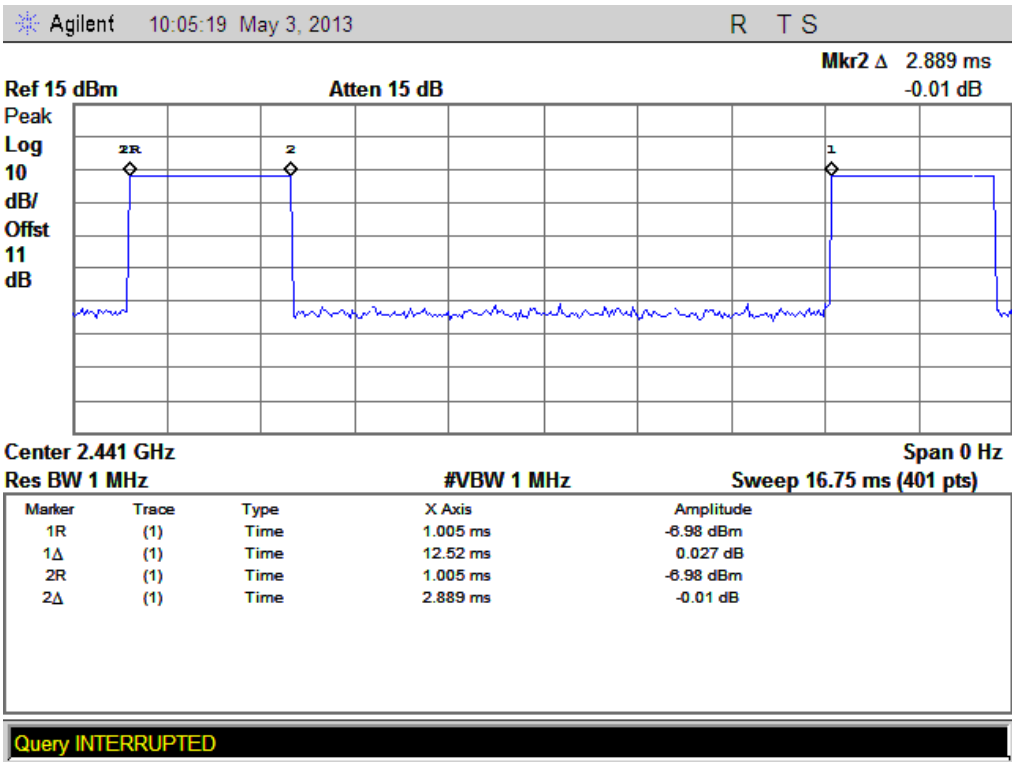
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.931	Plot A	312.640	400	PASS
39	2441	2.889	Plot B	308.160		PASS
78	2480	2.931	Plot C	312.640		PASS

A. Test Plots

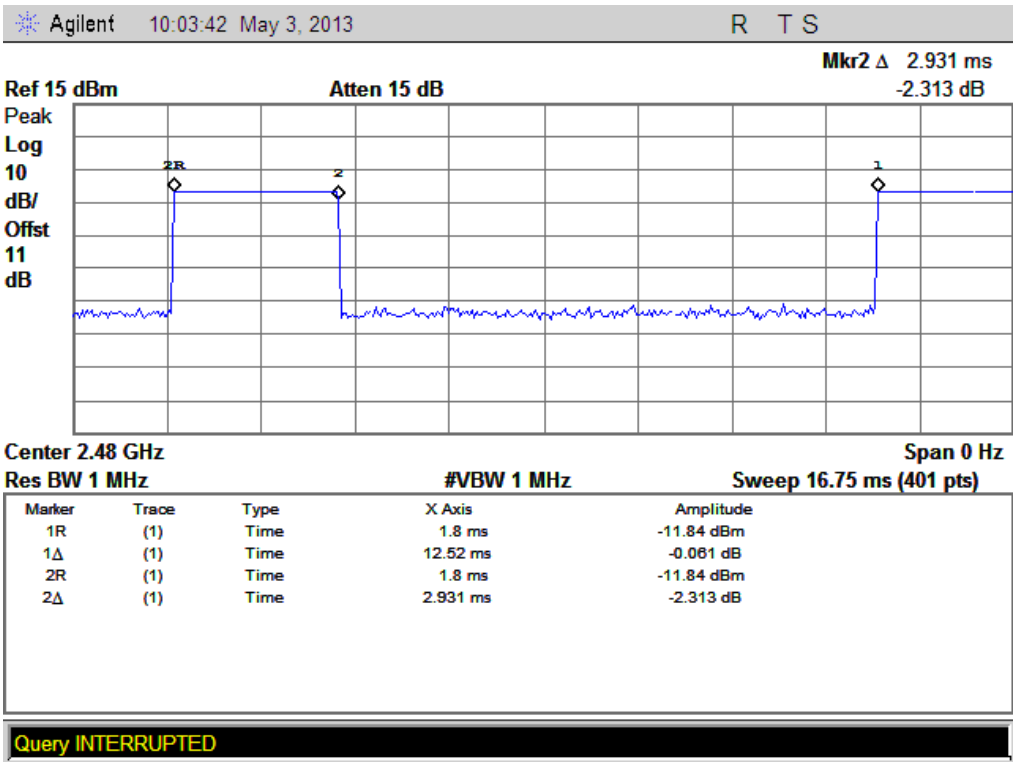
Note: the following plots record the Pulse Time of the Module carrier.



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

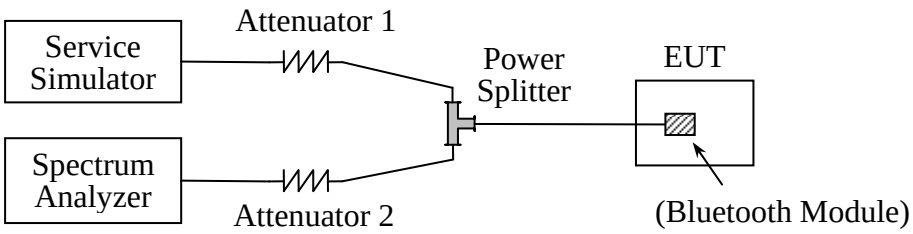
2.7. Conducted Spurious Emissions

2.7.1. Requirement

According to FCC §15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.7.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05	2014.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05	2014.05
Power Splitter	Weinschel	1506A	NW521	2013.05	2014.05
Attenuator 1	Resnet	20dB	(n.a.)	2013.05	2014.05
Attenuator 2	Resnet	3dB	(n.a.)	2013.05	2014.05

2.7.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

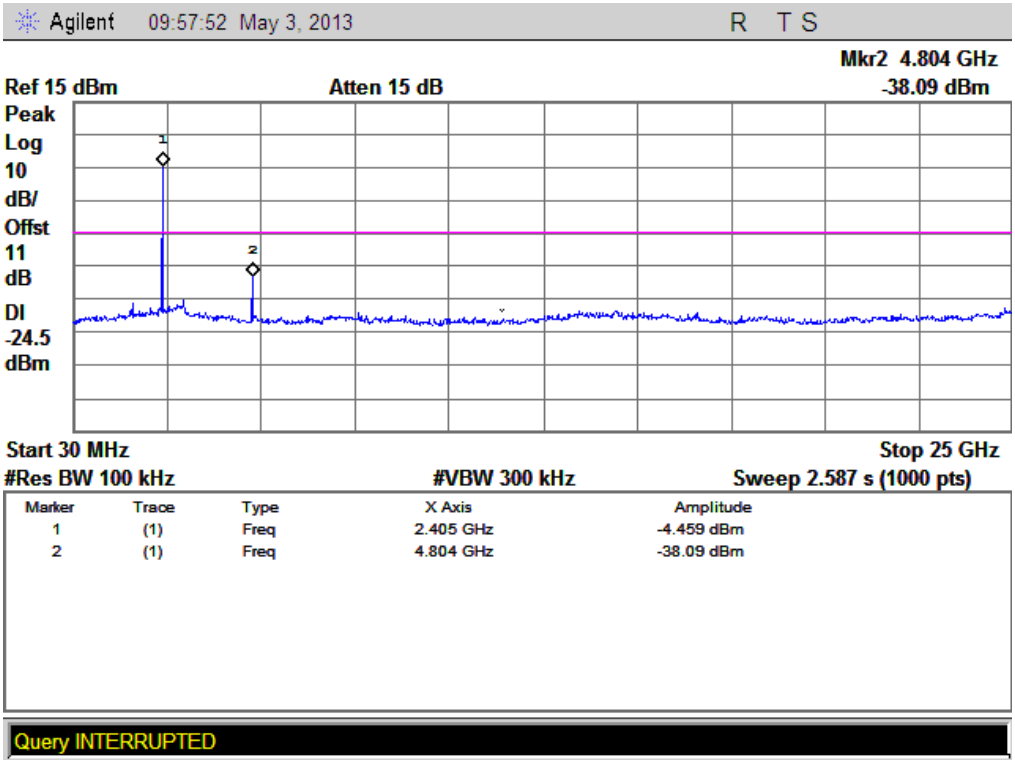
2.7.4. Test Result

The Bluetooth Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

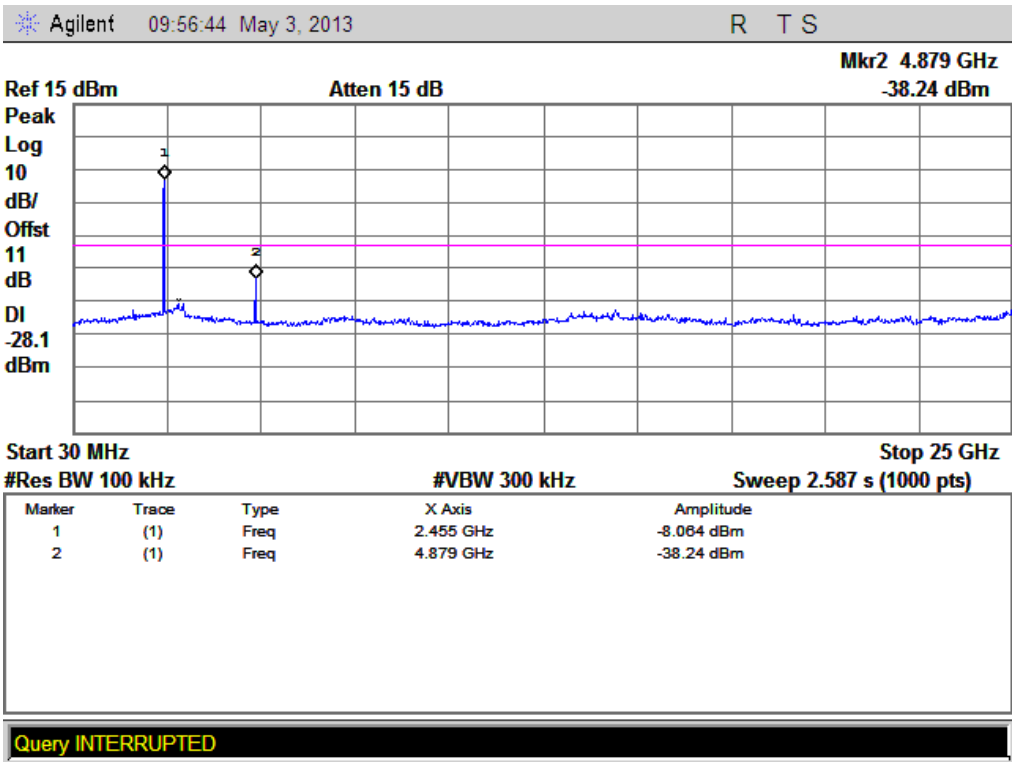
Channel	Frequency (MHz)	Measured Max. Out of Band Emission dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-38.09	Plot A.1	-4.459	-24.459	PASS
39	2441	-38.24	Plot B.1	-8.064	-28.064	PASS
78	2480	-45.26	Plot C.1	-12.64	-32.64	PASS

A. Test Plots:

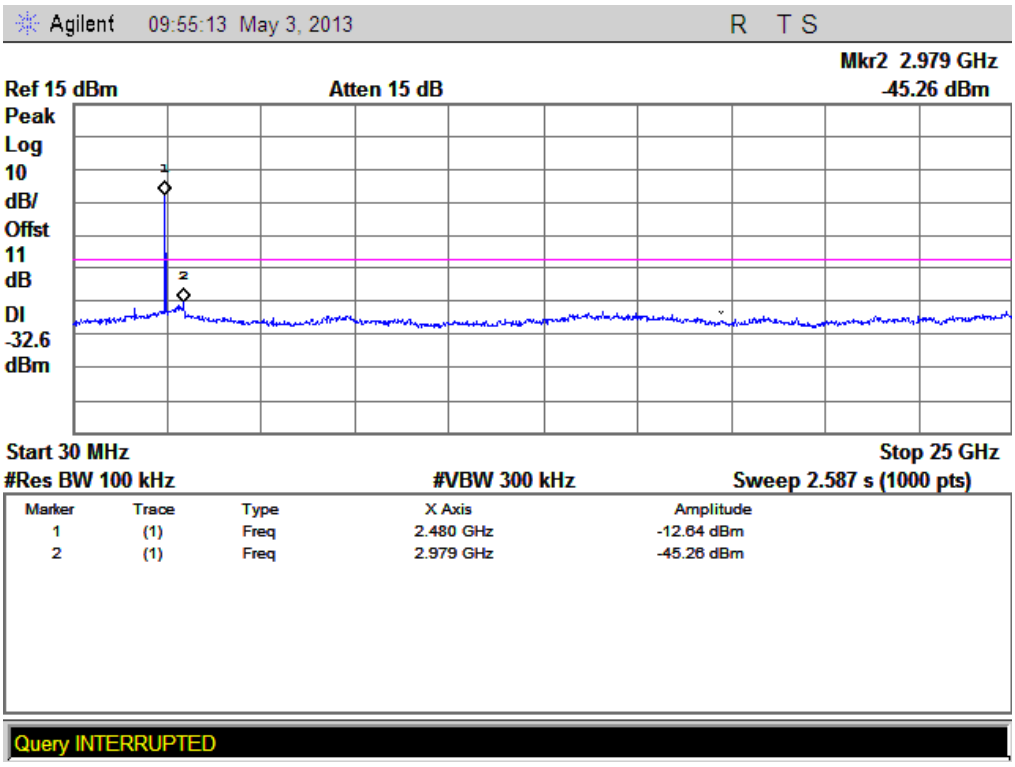
Note: the power of the Module transmitting frequency should be ignored.



(Plot A.1: Channel = 0, 30MHz to 25GHz @ GFSK Mode)



(Plot B.1: Channel = 39, 30MHz to 25GHz @ GFSK Mode)



(Plot C.1: Channel = 78, 30MHz to 25GHz @ GFSK Mode)

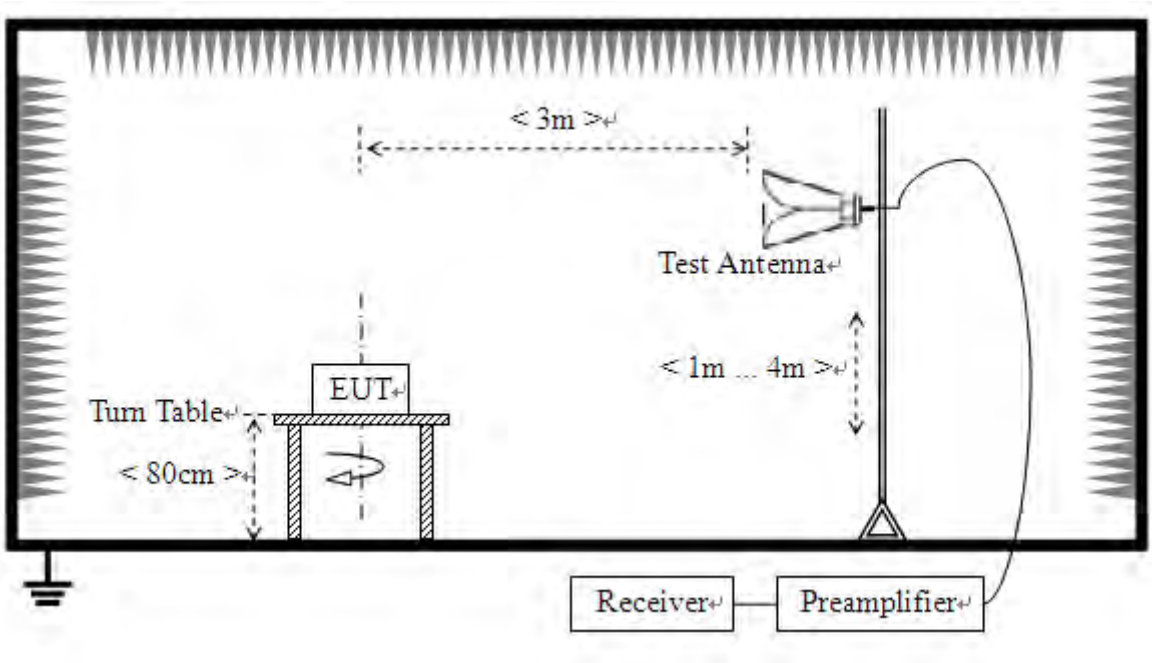
2.8. Band Edge

2.8.1. Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.8.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is powered by the Battery. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2013.05	2014.05
Receiver	Agilent	E7405A	US44210471	2013.05	2014.05

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2013.05	2014.05
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	9120D-963	2013.05	2014.05

2.8.3. Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak /AV

Trace = max hold

Allow the trace to stabilize

2.8.4. Test Result

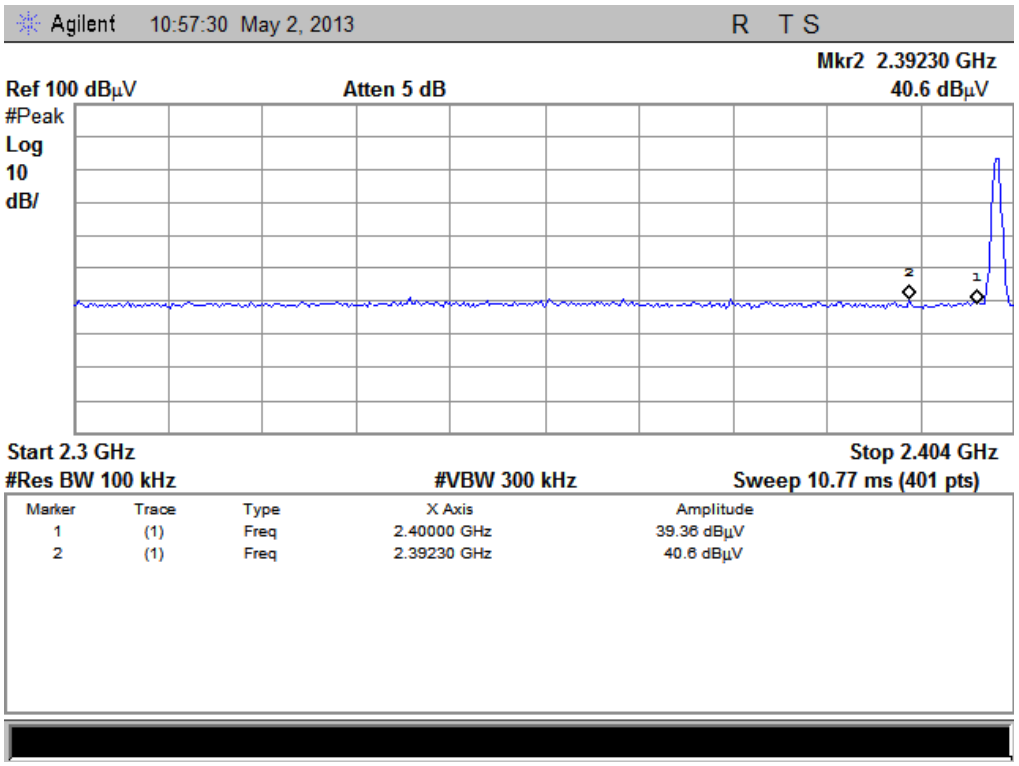
The Bluetooth Module operates at hopping-off test mode. The lowest and highest channels are tested to verify the band edge emissions.

The measurement results are obtained as below:
$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier Gain
A_{Factor}: Antenna Factor at 3m

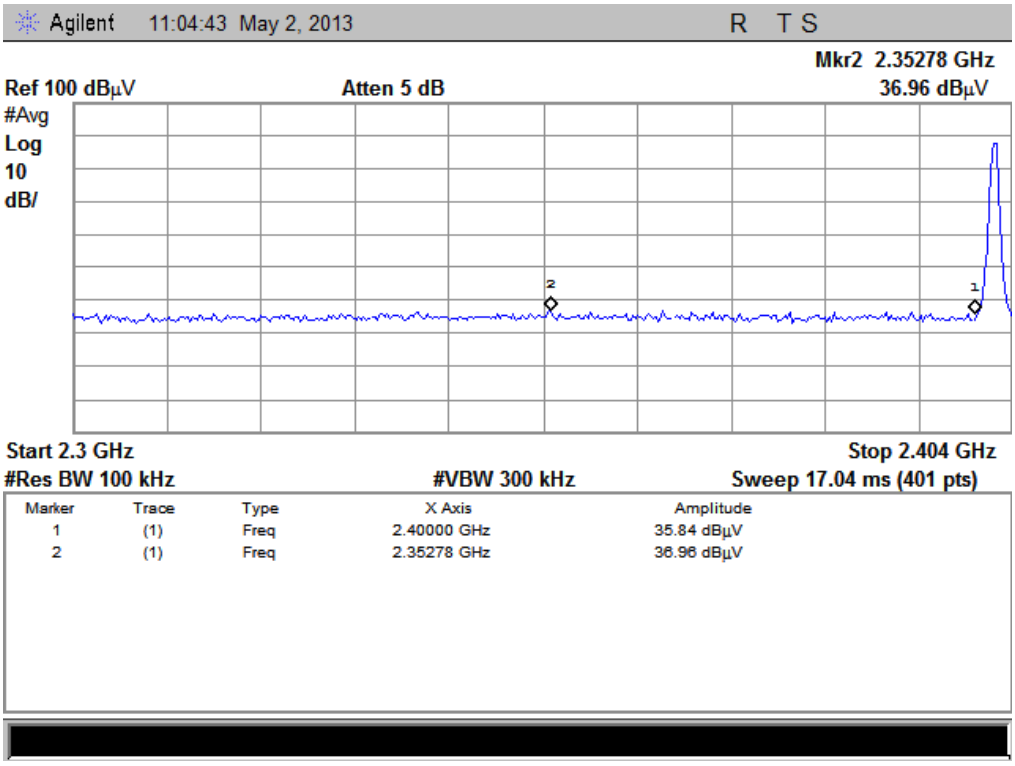
(Un-hopping)

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
0	2.3923	PK	39.36	-30.93	32.56	40.99	74	Pass
0	2.3528	AV	36.96	-30.93	32.56	38.59	54	Pass
78	2.4986	PK	40.13	-29.05	32.50	43.58	74	Pass
78	2.4858	AV	38.43	-29.05	32.50	41.88	54	Pass

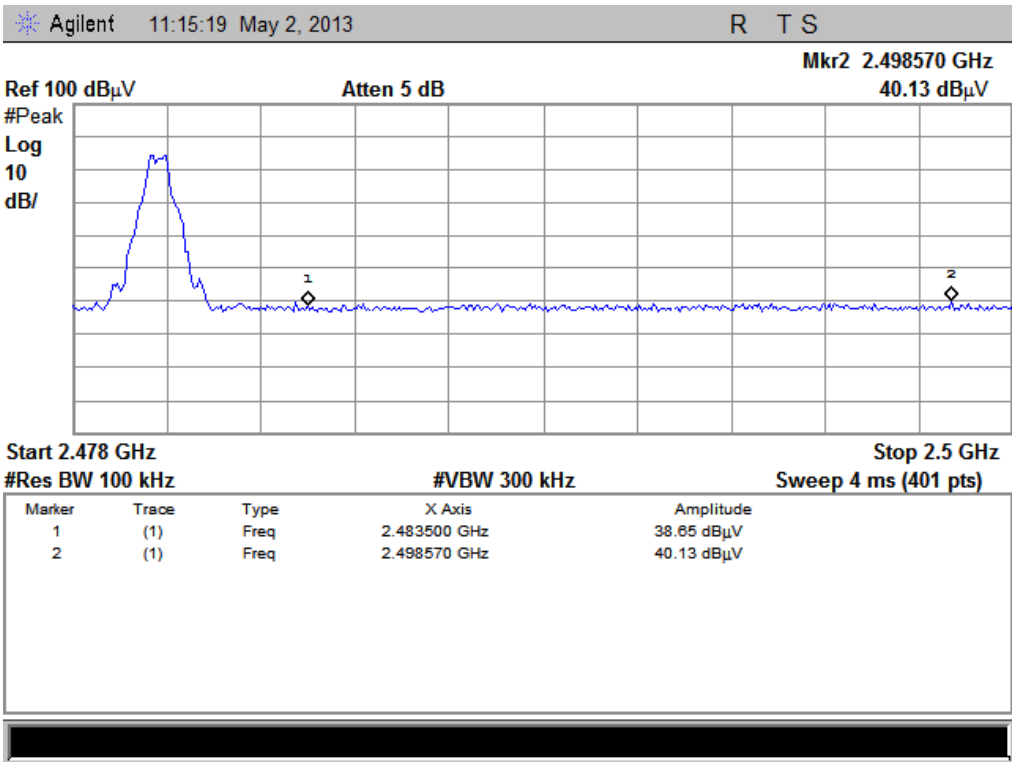
A. Test Plots:



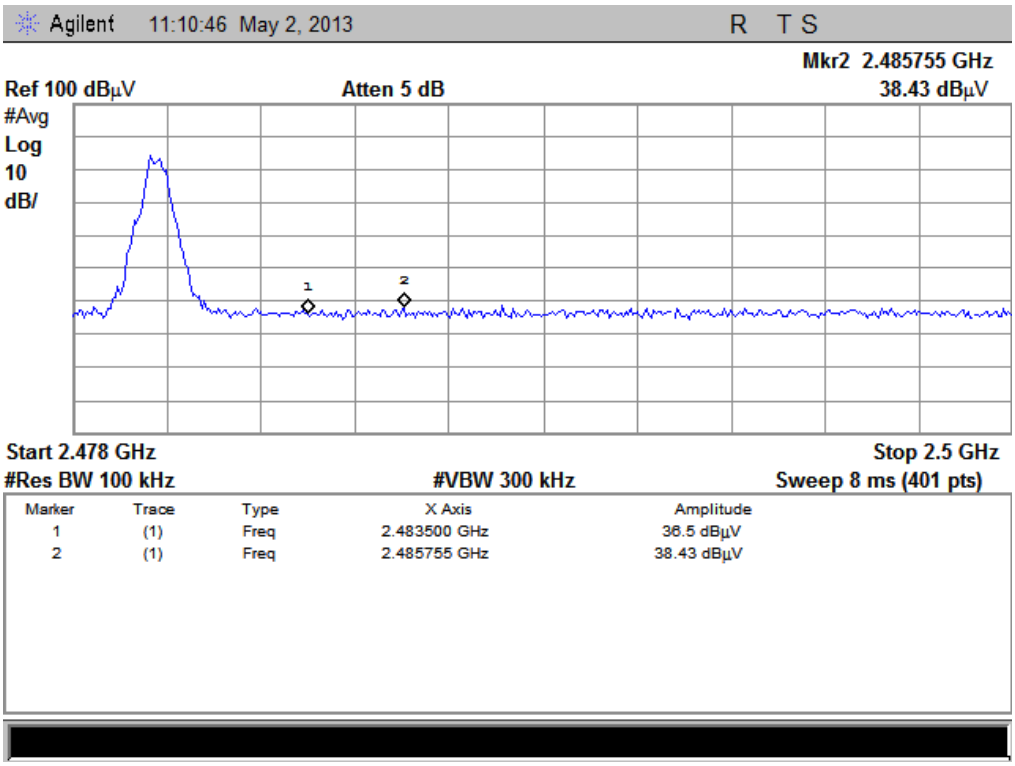
(Plot A1: Channel = 0 PEAK @ GFSK)



(Plot A2: Channel = 0 AVERAGE @ GFSK)



(Plot B1: Channel = 78 PEAK @ GFSK)

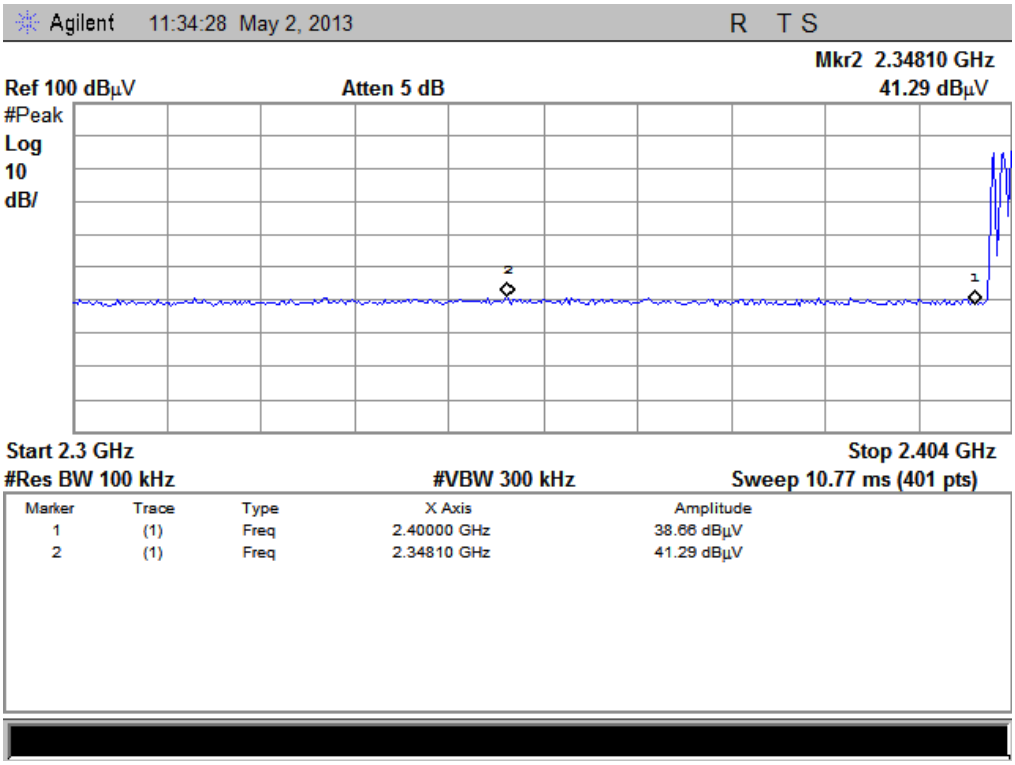


(Plot B2: Channel = 78 AVERAGE @ GFSK)

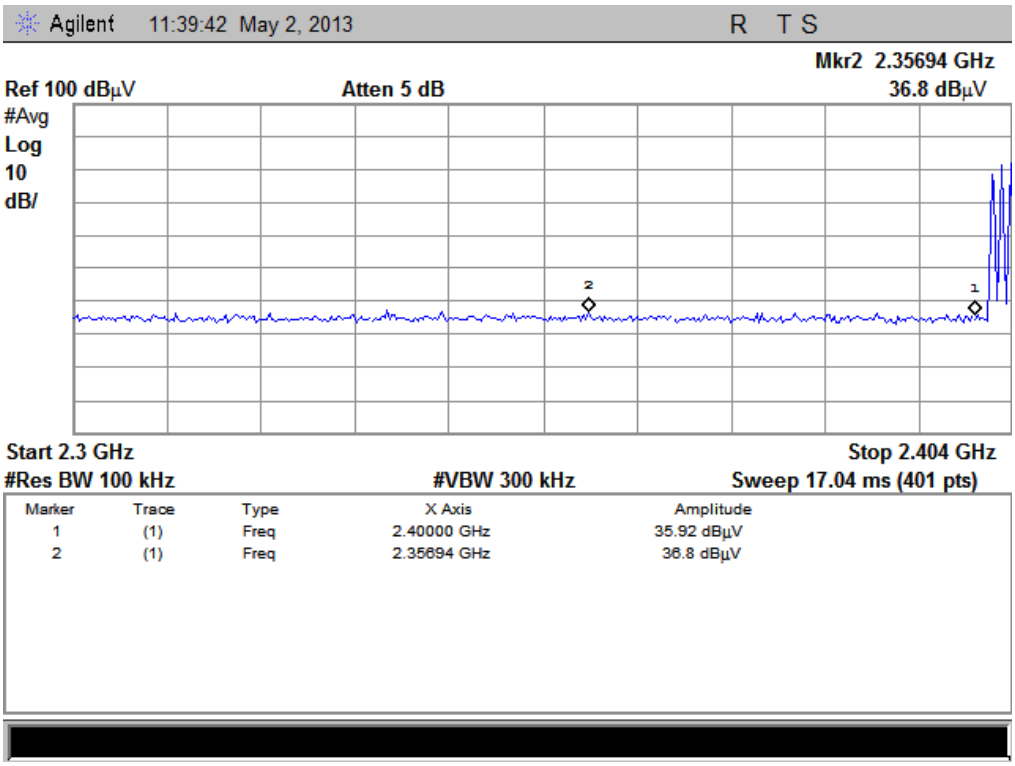
(hopping)

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
0	2.3481	PK	41.29	-30.93	32.56	42.92	74	Pass
0	2.3596	AV	36.8	-30.93	32.56	38.43	54	Pass
78	2.4860	PK	39.49	-29.05	32.50	42.94	74	Pass
78	2.4927	AV	38.47	-29.05	32.50	41.92	54	Pass

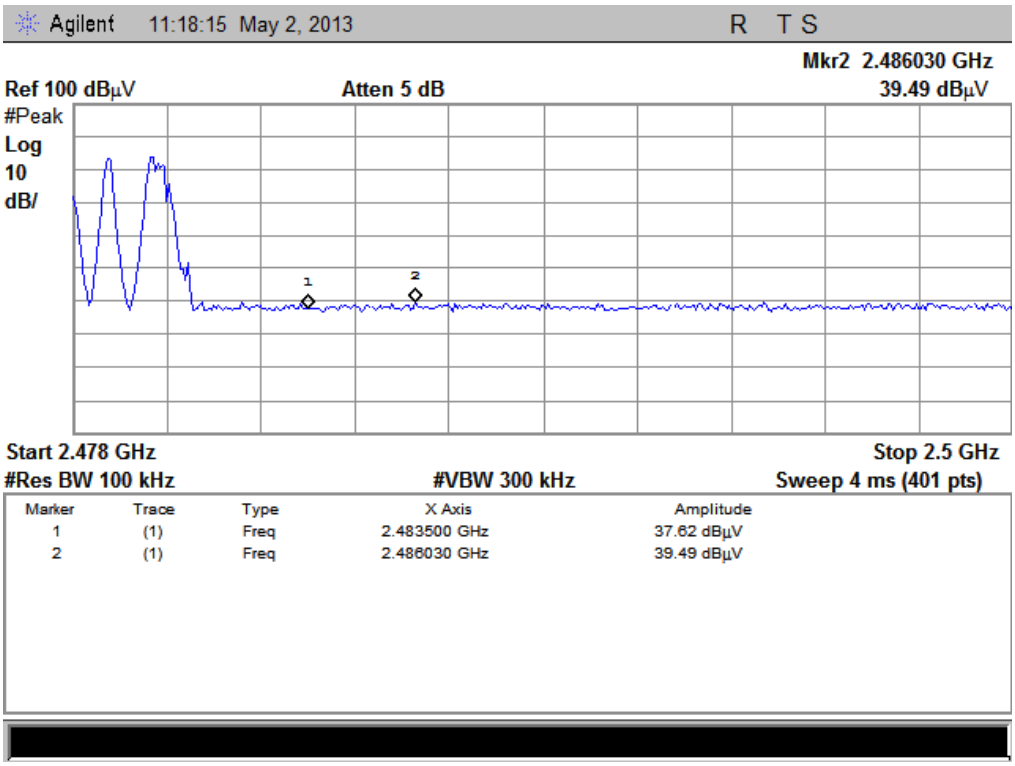
A. Test Plots:



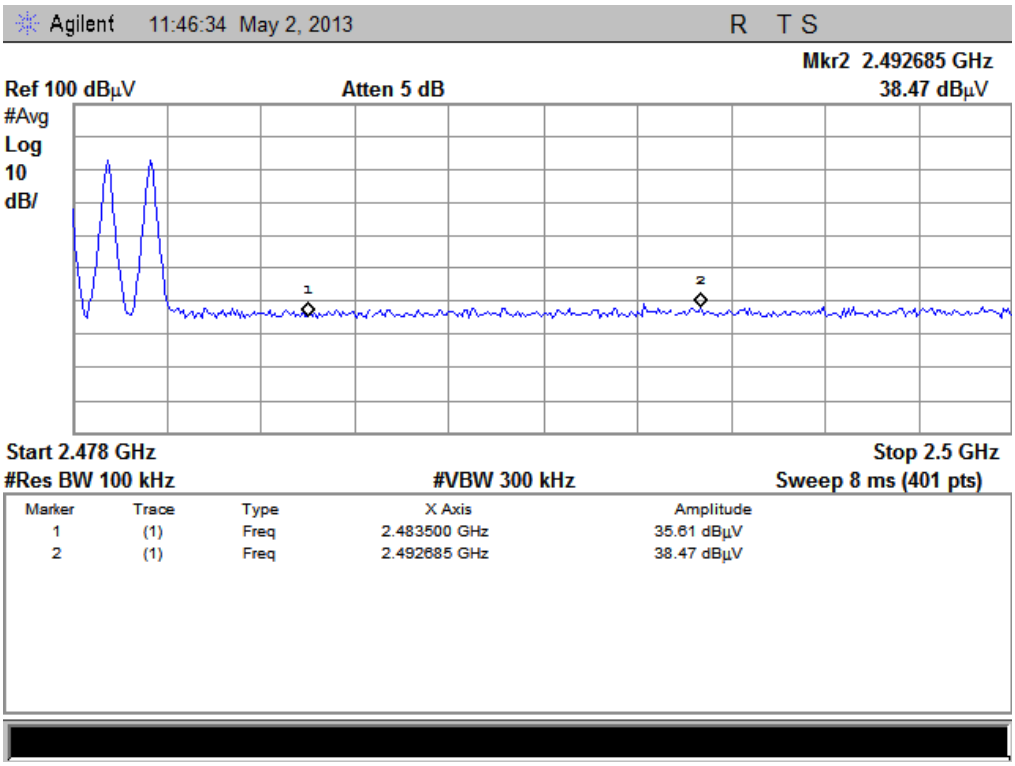
(Plot A1-1: Channel = 0 PEAK)



(Plot A2-1: Channel = 0 AVERAGE)



(Plot B1-1: Channel = 78 PEAK)



(Plot B2-1: Channel = 78 AVERAGE)

2.9. Conducted Emission

2.9.1. Requirement

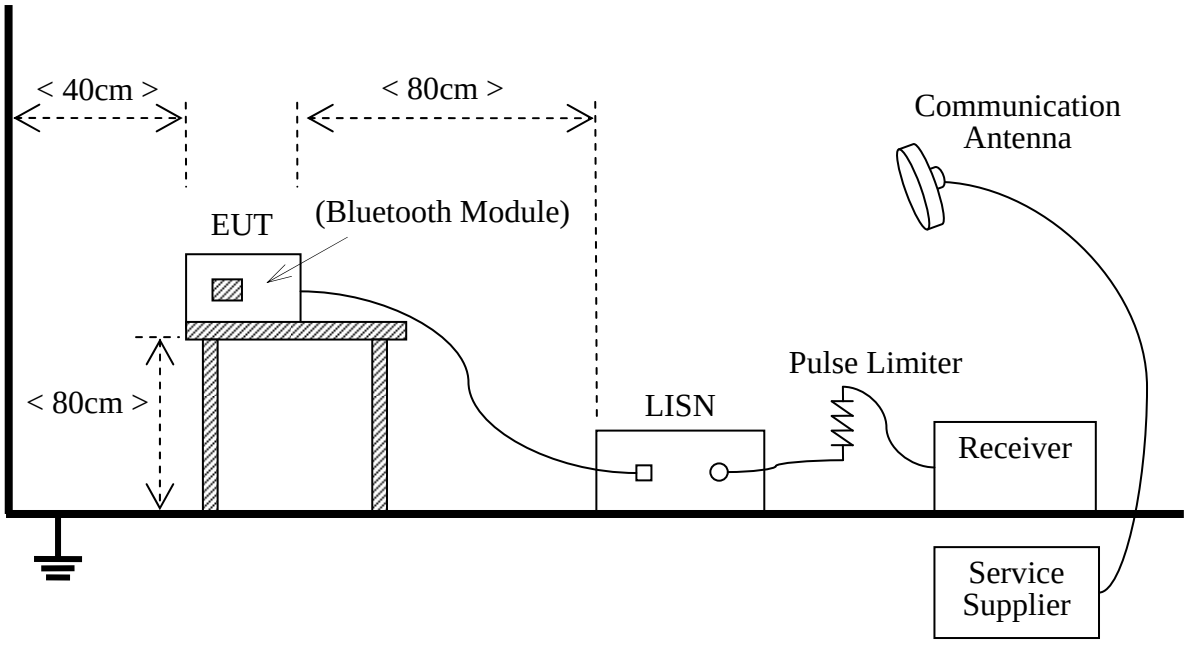
According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

NOTE:
(a) The lower limit shall apply at the band edges.
(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.9.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

The Bluetooth Module of the EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply. The factors of the site are calibrated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting

339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2013.05	2014.05
Receiver	Agilent	E7405A	US44210471	2013.05	2014.05
LISN	Schwarzbeck	NSLK 8127	812744	2013.05	2014.05
Service Supplier	R&S	CMU200	100448	2013.05	2014.05
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	2013.05	2014.05

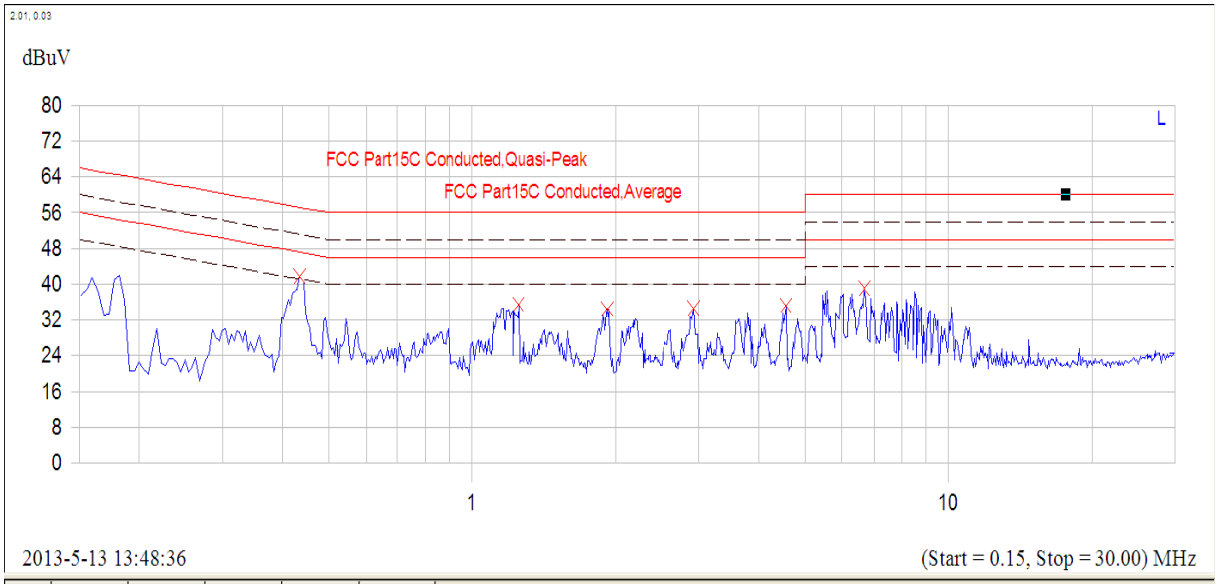
2.9.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

A. Test setup:

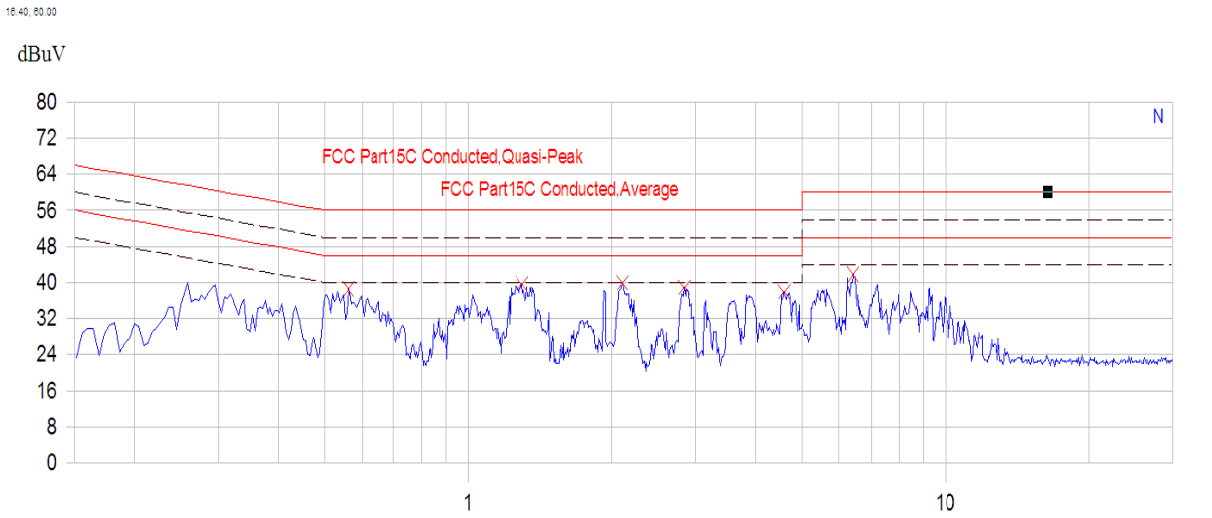
The EUT configuration of the emission tests is EUT + Link + Charging.

B. Test Plots:



	Frequency MHz	Peak dBuV	QP dBuV	Avg dBuV	Trace Name	Comment
1	0.434	41.7			L	
2	1.253	35.3			L	
3	1.919	34.3			L	
4	2.928	34.6			L	
5	4.558	35.1			L	
6	6.692	39.0			L	

(Plot A: L Phase)



2013-5-13 13:55:12 (Start = 0.15, Stop = 30.00) MHz

	Frequency MHz	Peak dBuV	QP dBuV	Avg dBuV	Trace Name	Comment
1	0.560	38.5			N	
2	1.298	39.6			N	
3	2.109	39.8			N	
4	2.843	38.9			N	
5	4.585	37.9			N	
6	6.418	41.7			N	

(Plot B: N Phase)

2.10. Radiated Emission

2.10.1. Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 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)	Measurement Distance (m)
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

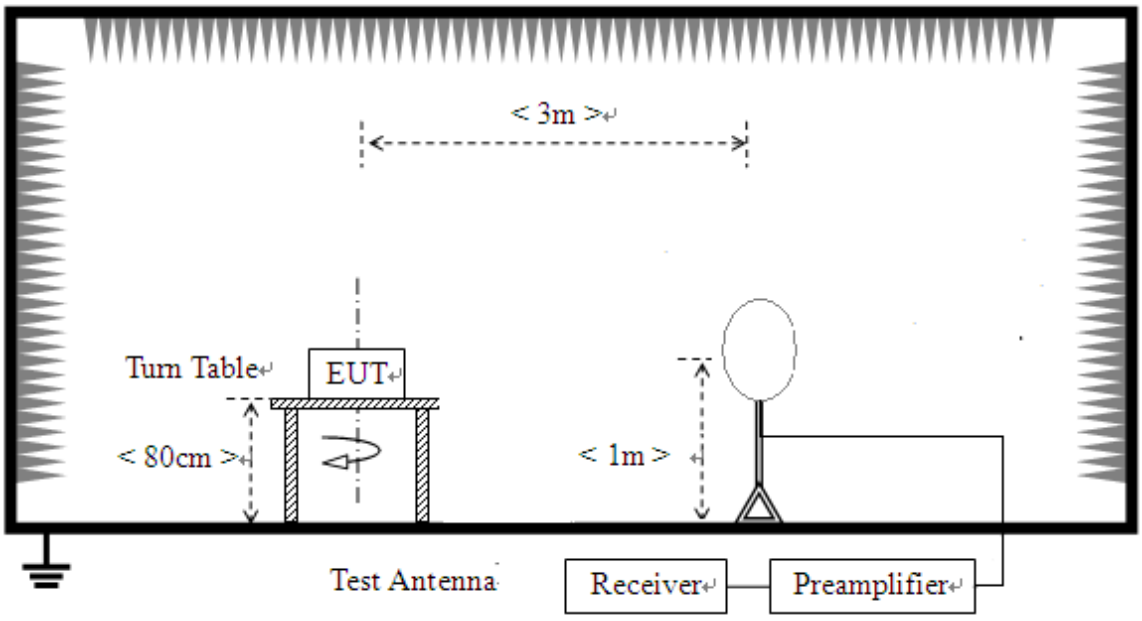
Note:

1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

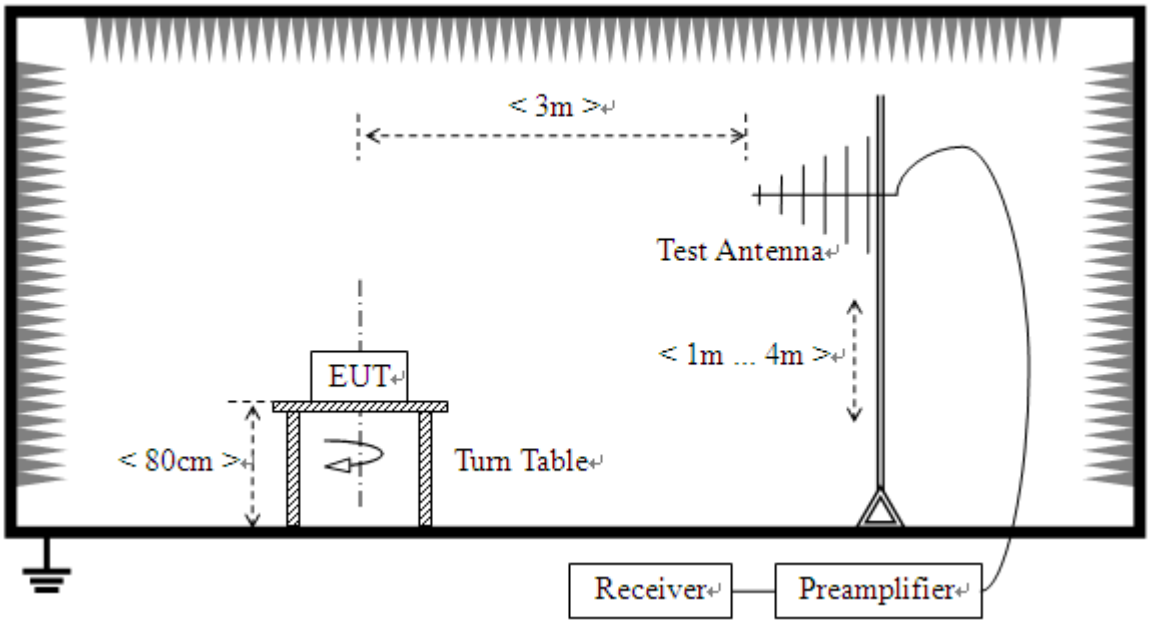
2.10.2. Test Description

A. Test Setup:

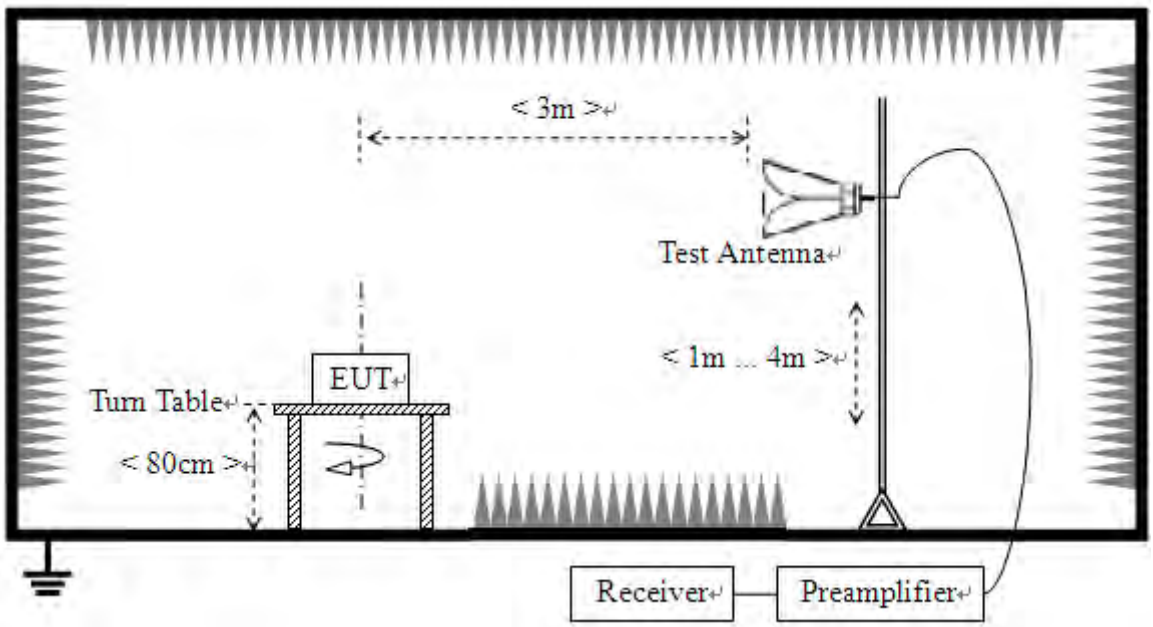
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 2GHz) and Horn Test Antenna (above 2GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2013.05	2014.05
Receiver	Agilent	E7405A	US44210471	2013.05	2014.05
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2013.05	2014.05
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2013.05	2014.05
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	9120D-963	2013.05	2014.05
Test Antenna - Horn	R&S	HL050S7	71688	2013.05	2014.05
Test Antenna - Loop	Schwarzbeck	FMZB 1519	1519-022	2013.05	2014.05

2.10.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.10.4. Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor AT and A_{Factor} were built in test software.

Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

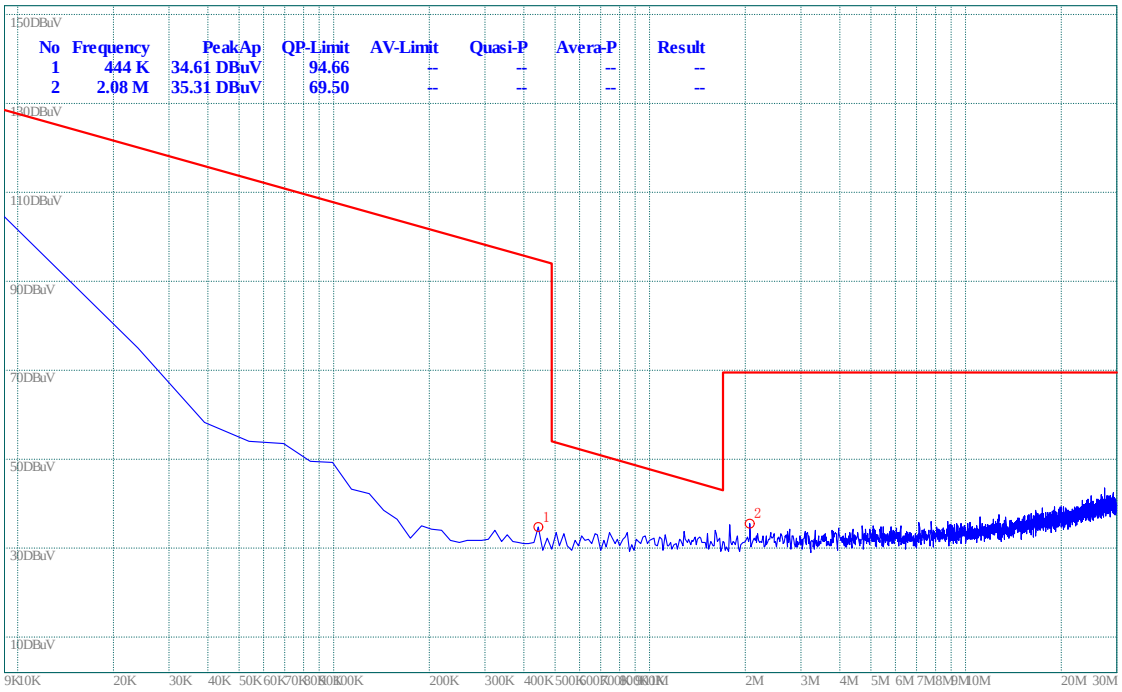
A. The Fundamental Emissions

The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

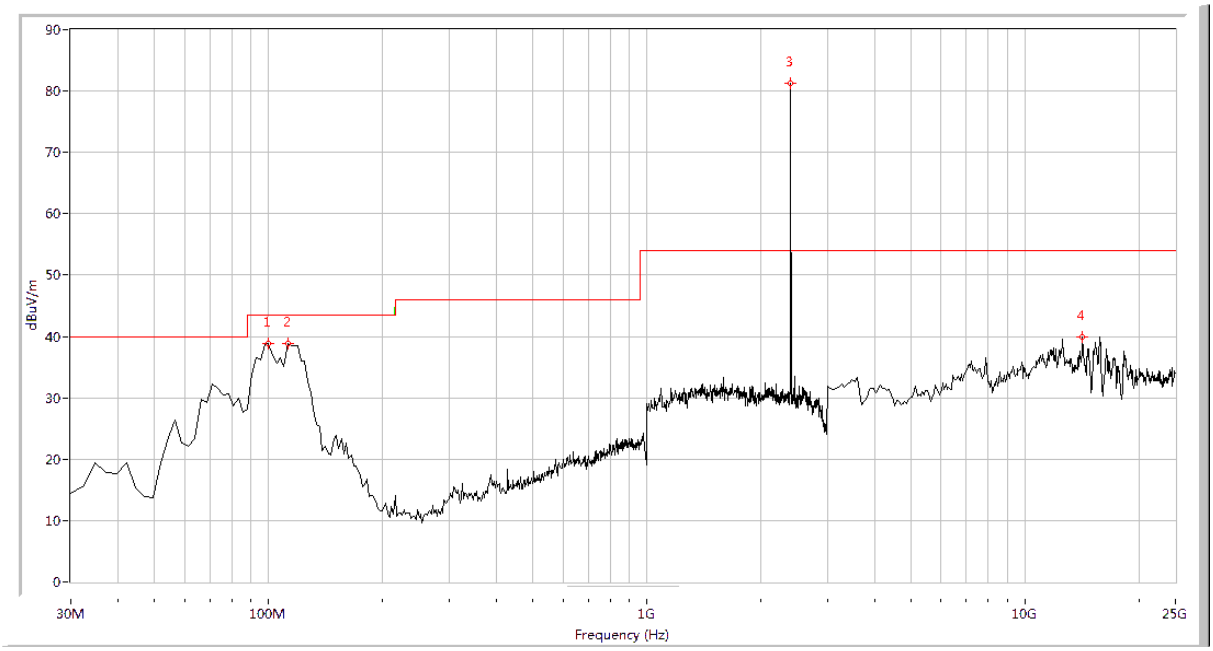
Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	81.22	N/A	Horizontal	Plot A.1
		81.58	N/A	Vertical	Plot A.2
39	2441	82.28	N/A	Horizontal	Plot B.1
		82.88	N/A	Vertical	Plot B.2
78	2480	84.48	N/A	Horizontal	Plot C.1
		84.96	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range

Plots for Channel = 0

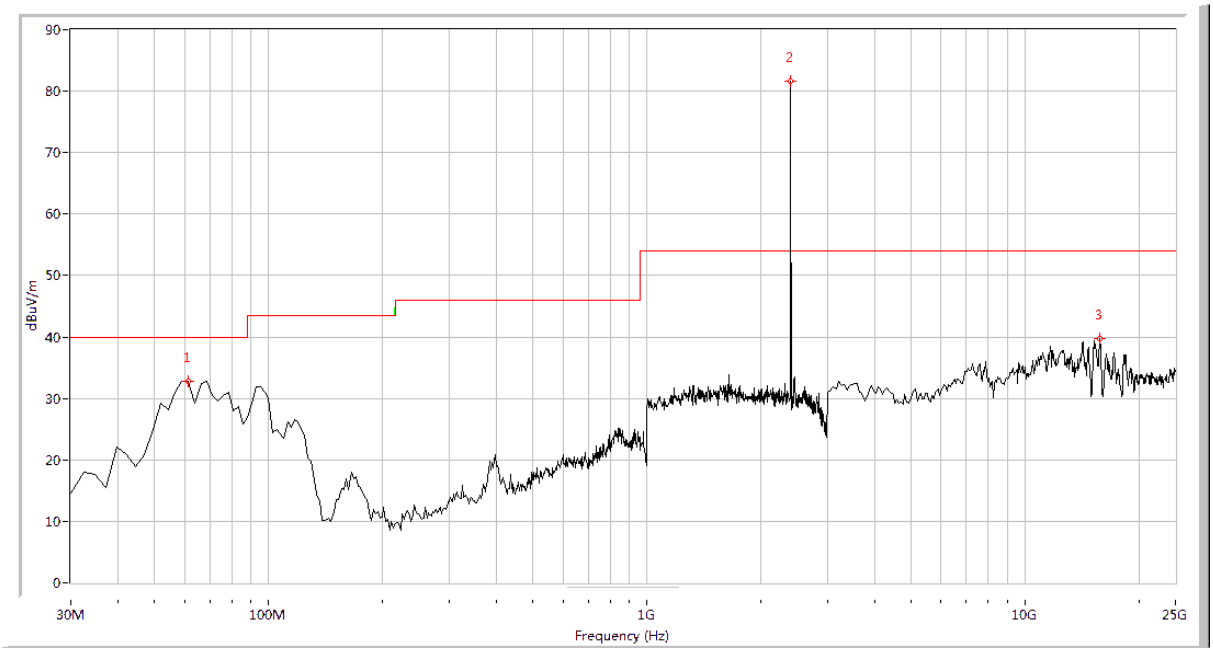


(Plot A.0: 9kHz to 30MHz @ GFSK, channel 0)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
100.150	38.92	N.A	N.A	N.A	43.5	N.A	0.0	Horizontal	PASS
112.244	38.81	N.A	N.A	N.A	43.5	N.A	0.0	Horizontal	PASS
2396.509	81.22	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N.A
14192.020	39.91	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	PASS

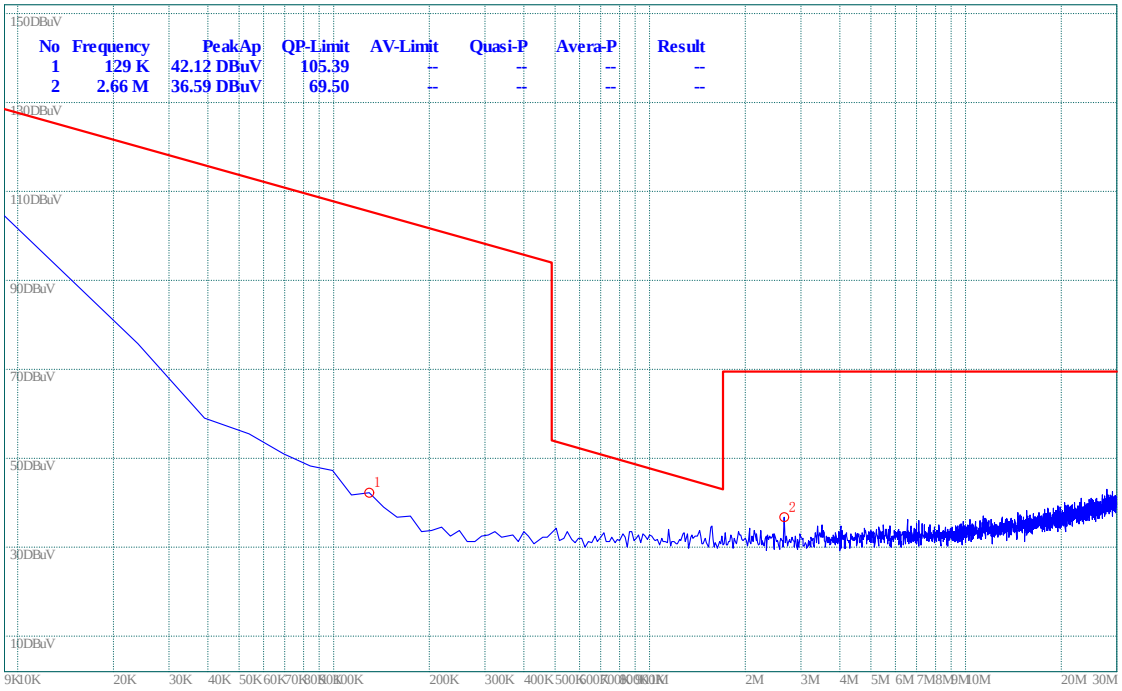
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 0)



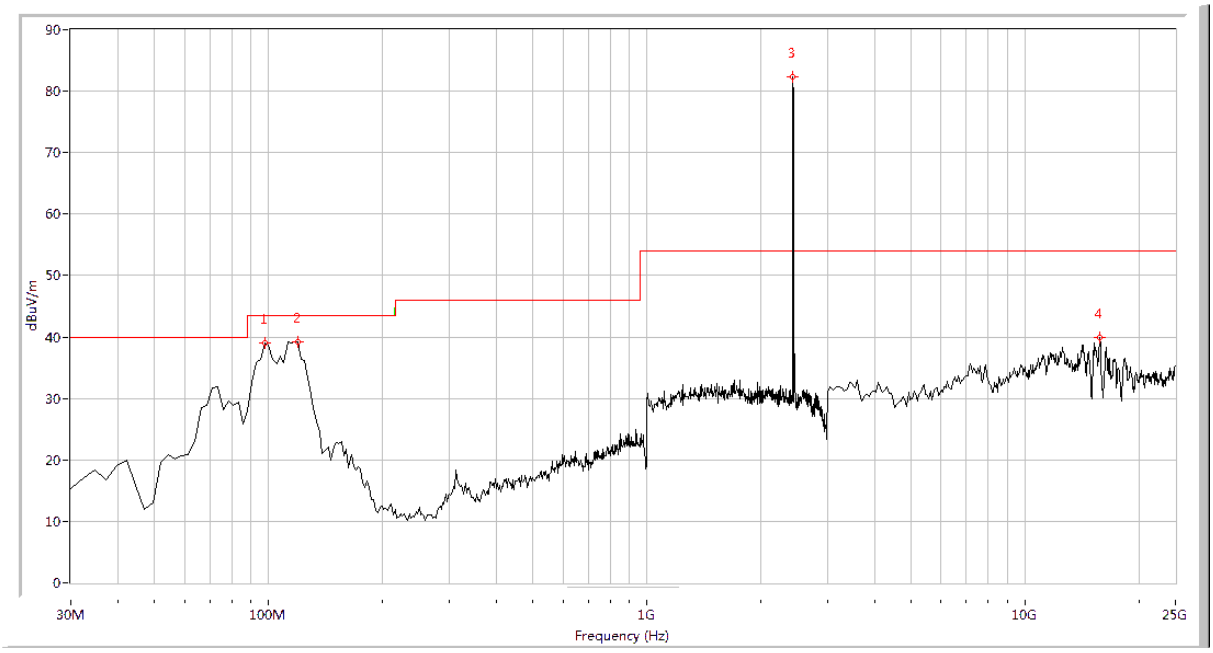
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
61.446	15.45	N.A	N.A	N.A	40.0	N.A	0.0	Vertical	PASS
2396.509	81.58	N.A	N.A	54.0	N.A	54.0	301.8	Vertical	N.A
15783.042	39.70	N.A	N.A	54.0	N.A	54.0	11.5	Vertical	PASS

(Plot A.2: 30MHz to 25GHz, Antenna Vertical @ GFSK, channel 0)

Plot for Channel = 39

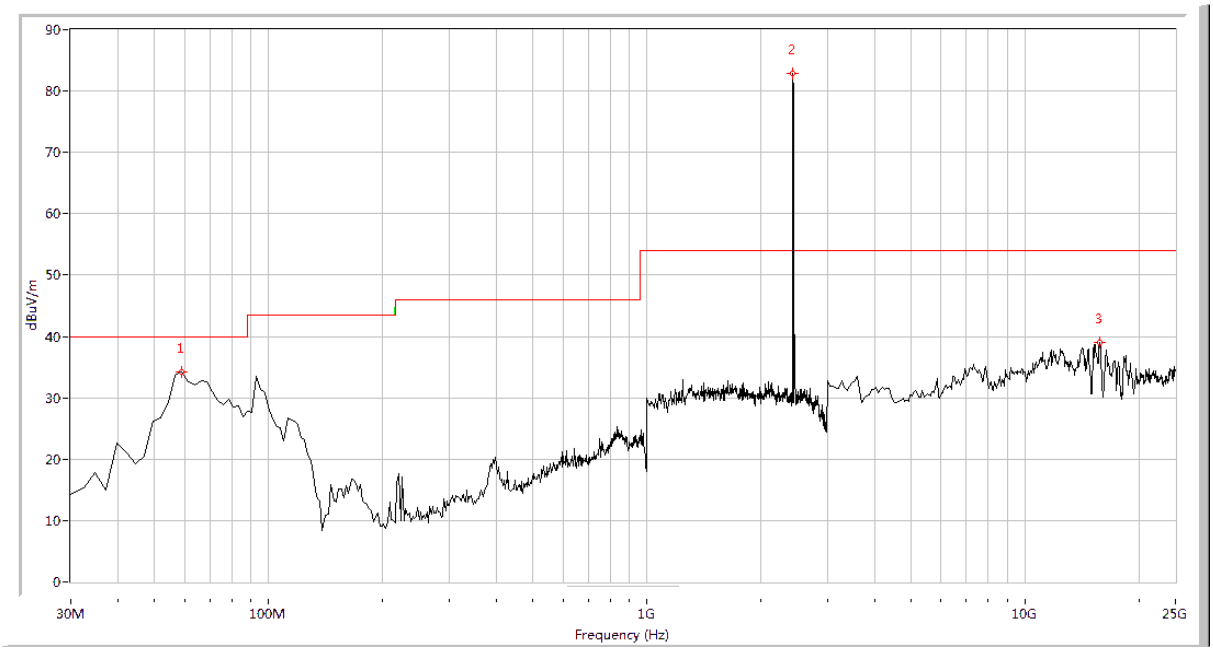


(Plot B.0: 9kHz to 30MHz @ GFSK, channel 39)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
97.731	38.96	35.7	29.2	N.A	43.5	N.A	1.1	Horizontal	PASS
119.501	39.13	31.8	27.2	N.A	43.5	N.A	15.9	Horizontal	PASS
2436.409	82.28	N.A	N.A	54.0	N.A	54.0	261.0	Horizontal	N.A
15783.042	39.93	N.A	N.A	54.0	N.A	54.0	360.0	Horizontal	PASS

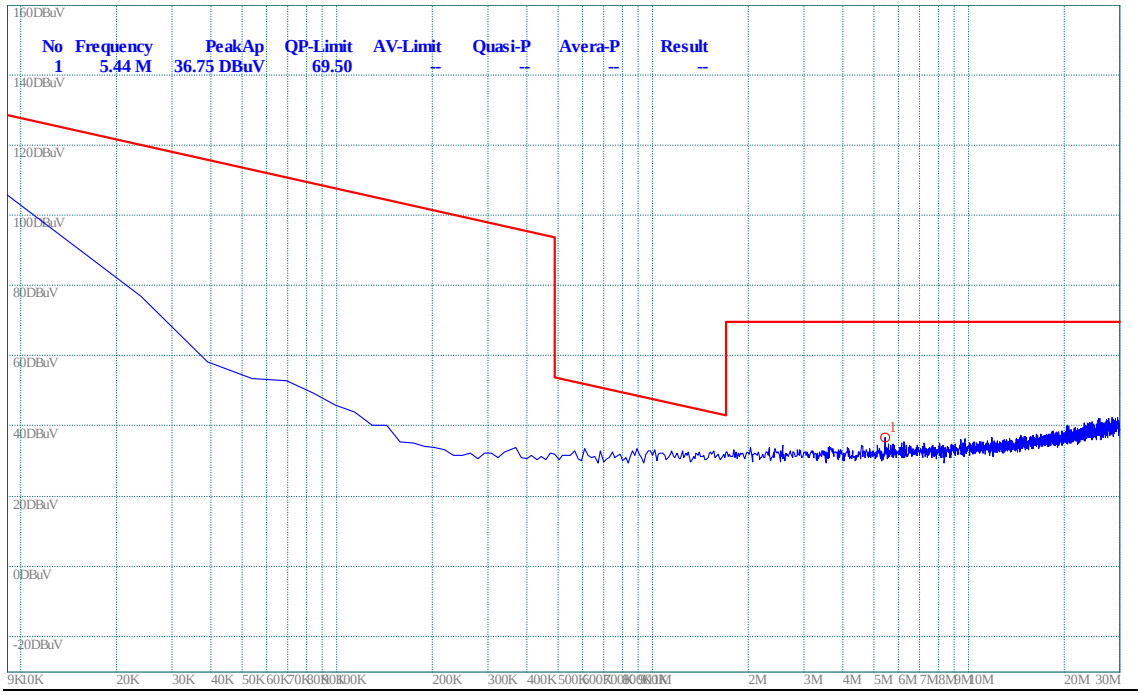
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 39)



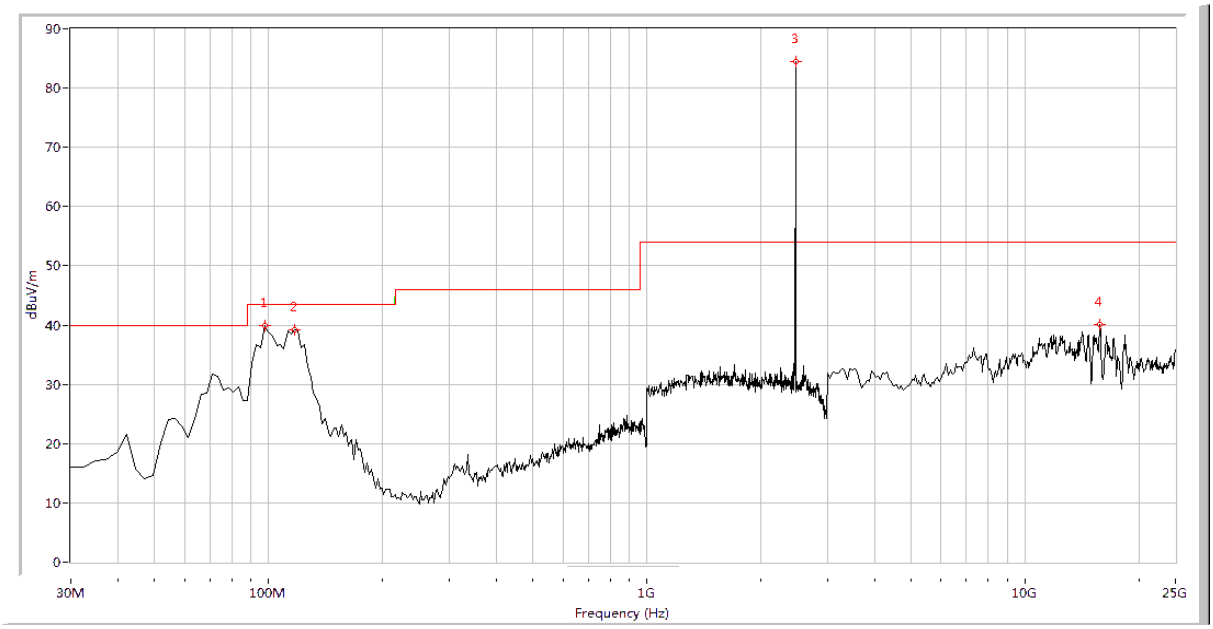
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
59.027	34.27	N.A	N.A	N.A	40.0	N.A	92.7	Vertical	PASS
2436.409	82.88	N.A	N.A	54.0	N.A	54.0	55.6	Vertical	N.A
15783.042	39.09	N.A	N.A	54.0	N.A	54.0	15.0	Vertical	PASS

(Plot B.2: 30MHz to 25GHz, Antenna Vertical @ GFSK, channel 39)

Plot for Channel = 78

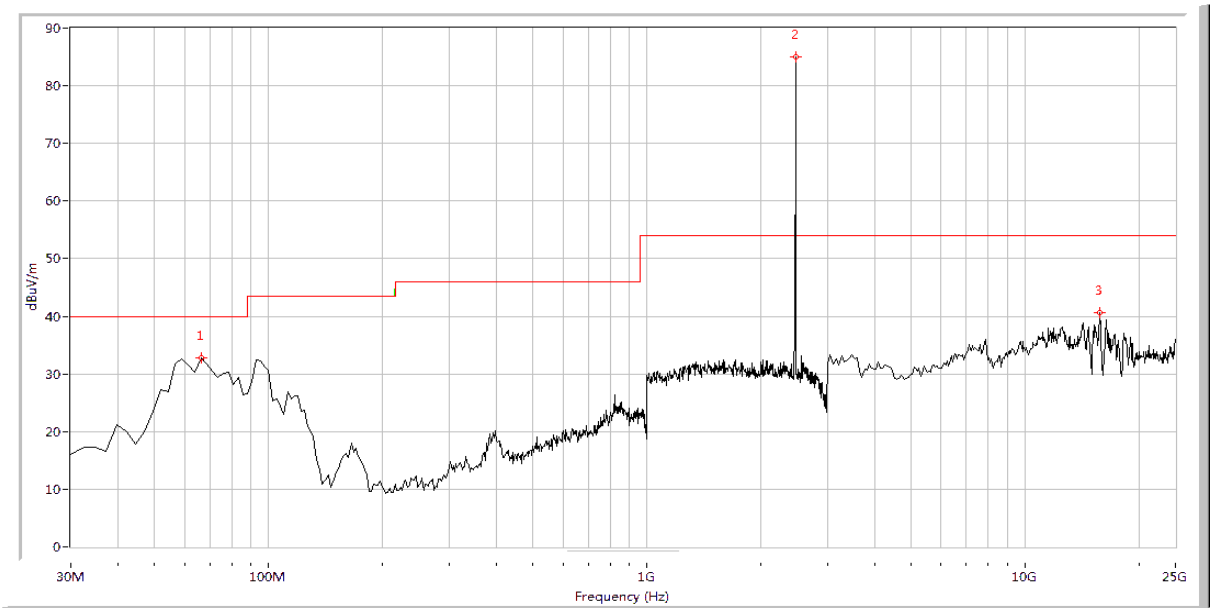


(Plot C.0: 9kHz to 30MHz @ GFSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
97.731	39.89	34.1	32.0	N.A	43.5	N.A	55.8	Horizontal	PASS
117.082	39.16	33.8	31.8	N.A	43.5	N.A	95.1	Horizontal	PASS
2476.309	84.48	N.A	N.A	54.0	N.A	54.0	28.7	Horizontal	N.A
15783.042	40.06	N.A	N.A	54.0	N.A	54.0	9.1	Horizontal	PASS

(Plot C.1: 30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
66.284	32.75	N.A	N.A	N.A	40.0	N.A	65.7	Vertical	PASS
2476.309	84.96	N.A	N.A	54.0	N.A	54.0	91.7	Vertical	N.A
15783.042	40.65	N.A	N.A	54.0	N.A	54.0	257.0	Vertical	PASS

(Plot C.2: 30MHz to 25GHz, Antenna Vertical @ GFSK, channel 78)

** END OF REPORT **