Report No.:SZ12110138W02

FCC Part 15C TEST REPORT

Issued to

Zhongshan K-mate General Electronics Co.,Ltd

For

Bluetooth Stereo Headset

Model Name	:	BTH023
Trade Name	:	K-mate
Brand Name	:	K-mate
FCC ID	:	WAD-BTH023
Standard	:	47 CFR Part 15 Subpart C
Test date	:	2012-11-26 to 2012-12-20
Issue date	:	2012-12-20

by

Shenzhen MORLAB Communication Technology Co., Ltd.

Tested by Nie Quan	*Approved by* Wu Xuewen	*Review by* Peng Huarui
Nie Quan	Wu Xuewen	Peng Huarui
Test Engineer	Responsible Test Lab Manager	Project Manager
Date 2012.12.20	*Date* 2012.12.20	*Date* 2012.12.20

Shenzhen MORLAB Communication Technology Co., Ltd. Tel: +86 755 61281201 Fax: +86 755 86130218
3 F, Electronic Testing Building, Shahe Road, Xili, Nanshan Districe, Shenzhen, 518055 P. R. China

DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	December 14, 2012	First edition
2.0	December 20, 2012	Second edition

1. General Information

1.1. EUT Description

EUT Type ..... :	Bluetooth Stereo Headset
Serial No..... :	(n.a, marked #1 by test site)
Hardware Version ..... :	BTH023MB-V10
Software Version ..... :	BTH023-V48.bin
Applicant ..... :	Zhongshan K-mate General Electronics Co.,Ltd B1 Building,Fuwan Ind.Zone,Fuwan Nan Road,East District,Zhongshan,China
Manufacturer ..... :	Zhongshan K-mate General Electronics Co.,Ltd B1 Building,Fuwan Ind.Zone,Fuwan Nan Road,East District,Zhongshan,China
Frequency Range..... :	The frequency range used is 2402MHz - 2480MHz (79 channels, at intervals of 1MHz); The frequency block is 2400MHz to 2483.5MHz.
Modulation Type ..... :	Bluetooth: FHSS (GFSK(1Mbps), ∏/4-DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps))
Antenna Type..... :	Ceramic Antenna
Antenna Gain..... :	0dBi

Note 1: The EUT is Bluetooth Stereo Headset, it contains Bluetooth 2.1 EDR, Bluetooth 4.0 LE Dual Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth 2.1 EDR 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 a response 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 9 packages DH1, DH3, DH5, 3DH1, 3DH3, 3DH5, 5DH1, 5DH3, 5DH5, 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(c)	Radiated Emission	PASS

NOTE:

The tests were performed according to the method of measurements prescribed in DA-00-705.

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 3/F, Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055 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 741109.

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.

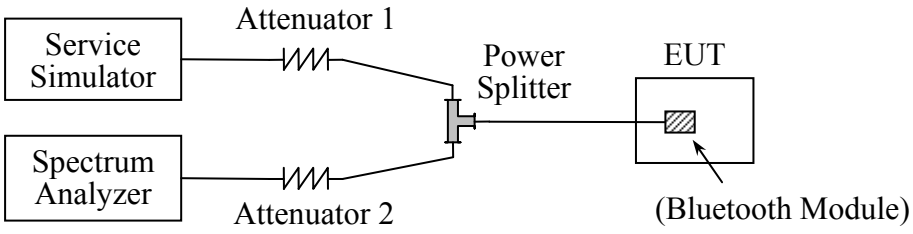
2.2. Number of Hopping Frequency

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

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.

Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2012.05	2013.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2012.05	2013.05
Power Splitter	Weinschel	1506A	NW521	2012.05	2013.05
Attenuator 1	Resnet	20dB	(n.a.)	2012.05	2013.05
Attenuator 2	Resnet	3dB	(n.a.)	2012.05	2013.05

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

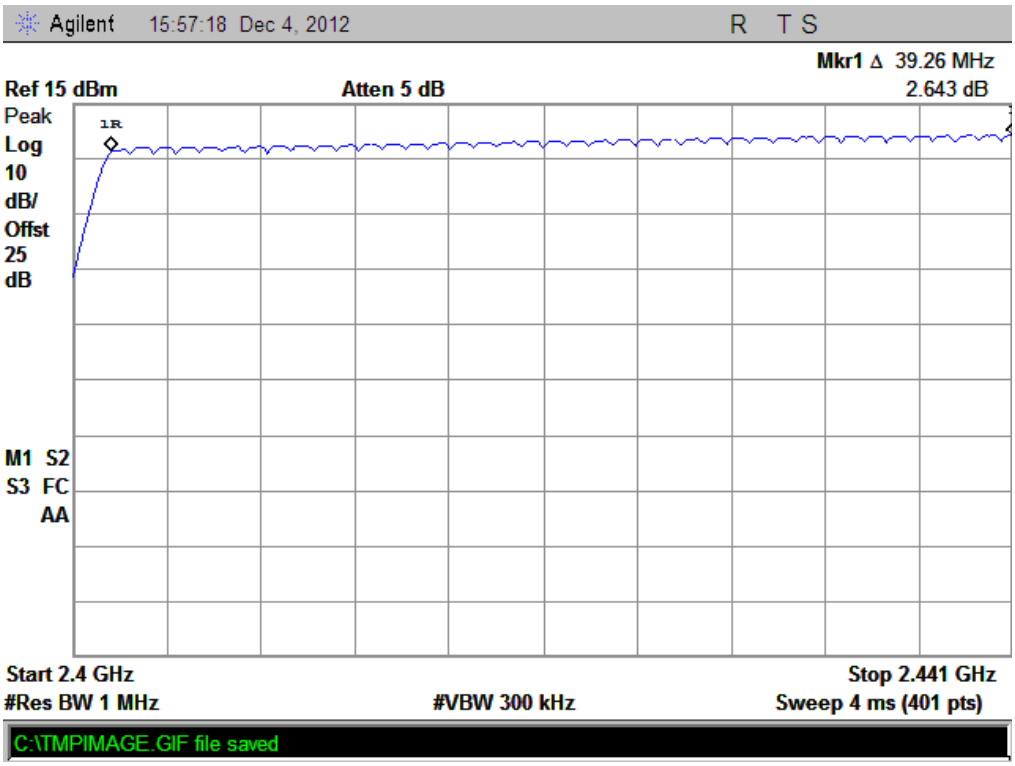
2.2.4. Test Result

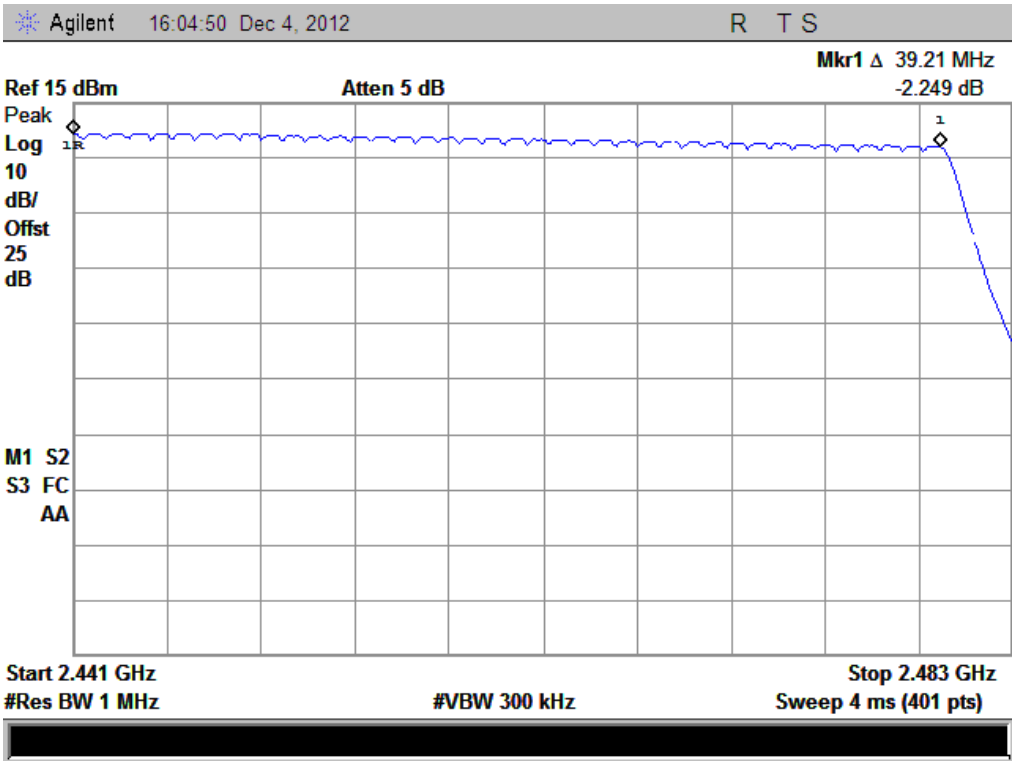
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

A. Test Verdict:

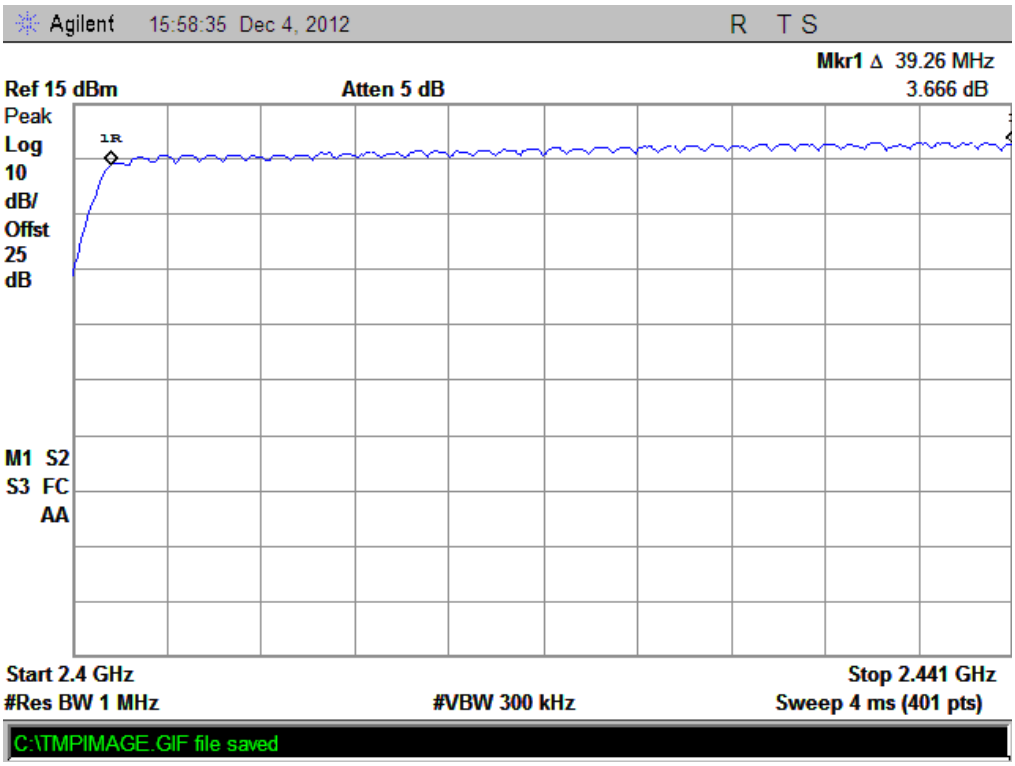
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS
Π/4-DQPSK	2400 - 2483.5	79	15	Plot B	PASS
8-DPSK	2400 - 2483.5	79	15	Plot C	PASS

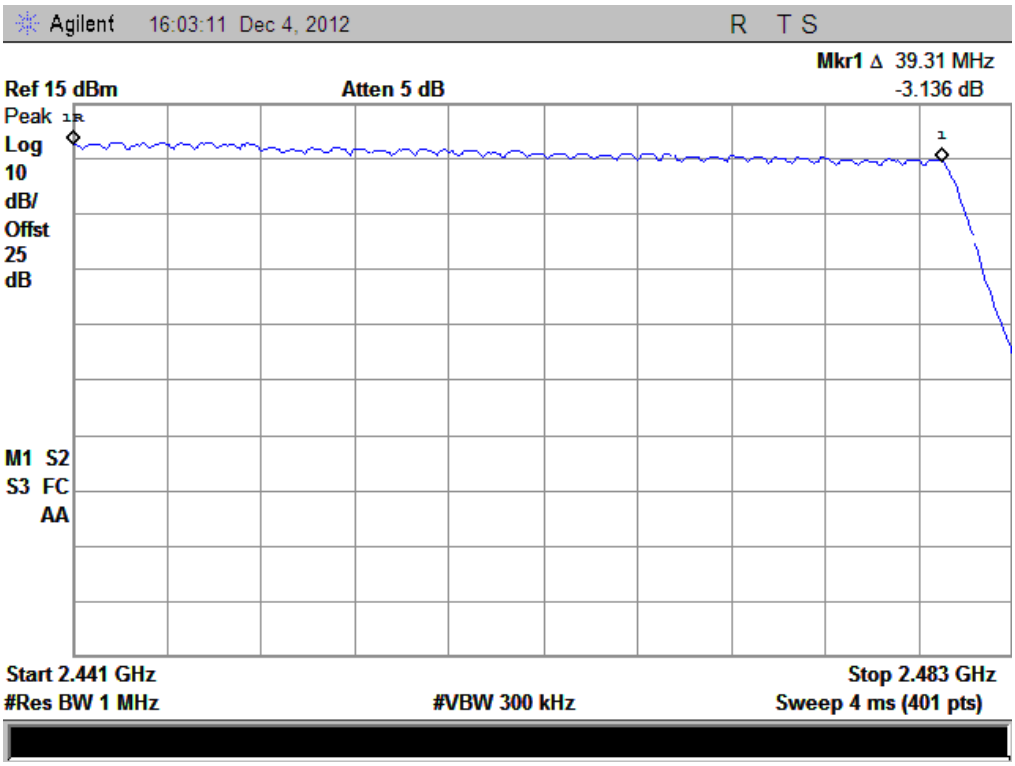
B. Test Plots:


Agilent 15:57:18 Dec 4, 2012
R T S
Mkr1 Δ 39.26 MHz
2.643 dB
Ref 15 dBm
Atten 5 dB
Peak
Log
10
dB/
Offst
25
dB
1R
M1 S2
S3 FC
AA
Start 2.4 GHz
#Res BW 1 MHz
#VBW 300 kHz
Stop 2.441 GHz
Sweep 4 ms (401 pts)
C:\TMPIMAGE.GIF file saved

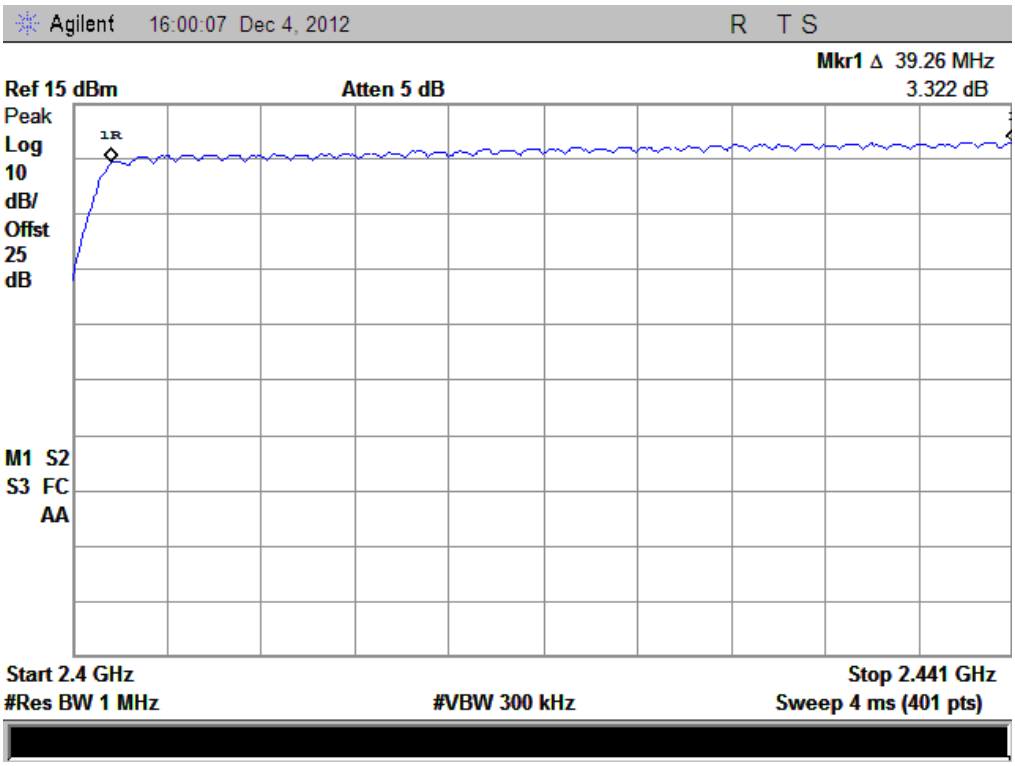

Agilent 16:04:50 Dec 4, 2012
R T S
Mkr1 Δ 39.21 MHz
-2.249 dB
Ref 15 dBm
Atten 5 dB
Peak
Log
10
dB/
Offst
25
dB
1R
1
M1 S2
S3 FC
AA
Start 2.441 GHz
#Res BW 1 MHz
#VBW 300 kHz
Stop 2.483 GHz
Sweep 4 ms (401 pts)

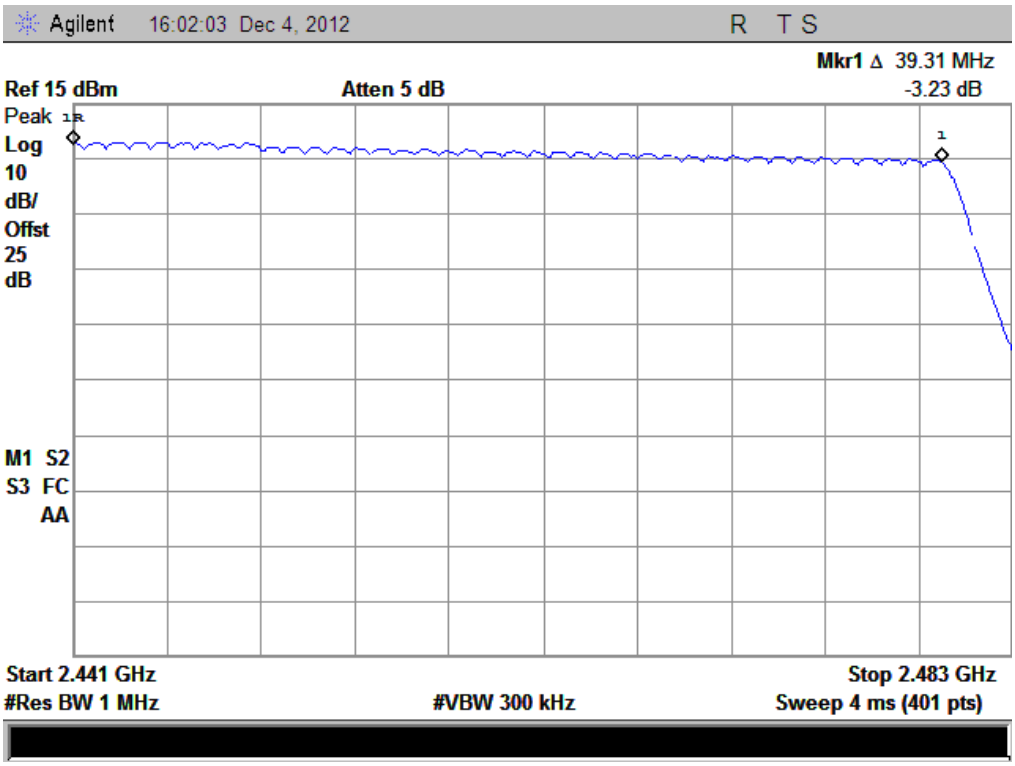
(Plot A: GFSK)





(Plot B: ∏/4-DQPSK)


Agilent 16:00:07 Dec 4, 2012
R T S
Mkr1 Δ 39.26 MHz
3.322 dB
Ref 15 dBm
Atten 5 dB
Peak
Log
10
dB/
Offst
25
dB
1R
M1 S2
S3 FC
AA
Start 2.4 GHz
#Res BW 1 MHz
#VBW 300 kHz
Stop 2.441 GHz
Sweep 4 ms (401 pts)


Agilent 16:02:03 Dec 4, 2012
R T S
Mkr1 Δ 39.31 MHz
-3.23 dB
Ref 15 dBm
Atten 5 dB
Peak
Log
10
dB/
Offst
25
dB
1R
1
M1 S2
S3 FC
AA
Start 2.441 GHz
#Res BW 1 MHz
#VBW 300 kHz
Stop 2.483 GHz
Sweep 4 ms (401 pts)

(Plot C: 8- DPSK)

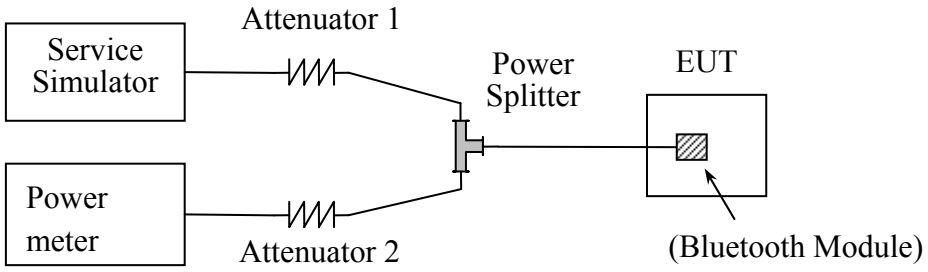
2.3. Peak Output Power

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 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	R&S	CMU200	100448	2012.05	2013.05
Power meter	Agilent	E4418B	GB44318055	2012.05	2013.05
Power Splitter	Weinschel	1506A	NW521	2012.05	2013.05
Power Sensor	Agilent	8482A	MY41091706	2012.05	2013.05
Attenuator 1	Resnet	20dB	(n.a.)	2012.05	2013.05
Attenuator 2	Resnet	3dB	(n.a.)	2012.05	2013.05

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.

2.3.3.1. GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	6.722	0.004701	30	1	PASS
39	2441	9.342	0.008594			PASS
78	2480	7.199	0.005247			PASS

2.3.3.2. π/4-DQPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	4.988	0.003154	30	1	PASS
39	2441	8.146	0.006525			PASS
78	2480	5.164	0.003284			PASS

2.3.3.3. 8-DPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	4.903	0.003092	30	1	PASS
39	2441	8.102	0.006460			PASS
78	2480	5.201	0.003312			PASS

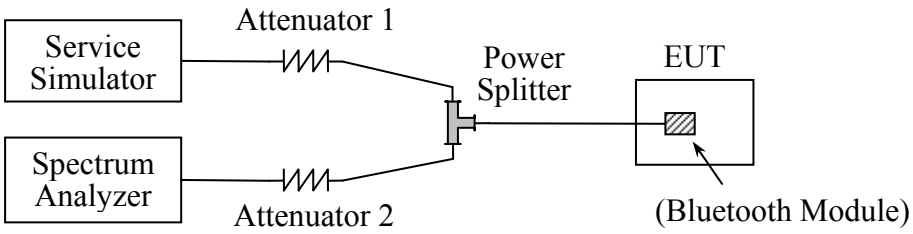
2.4. 20dB Bandwidth

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	R&S	CMU200	100448	2012.05	2013.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2012.05	2013.05
Power Splitter	Weinschel	1506A	NW521	2012.05	2013.05
Attenuator 1	Resnet	20dB	(n.a.)	2012.05	2013.05
Attenuator 2	Resnet	3dB	(n.a.)	2012.05	2013.05

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.

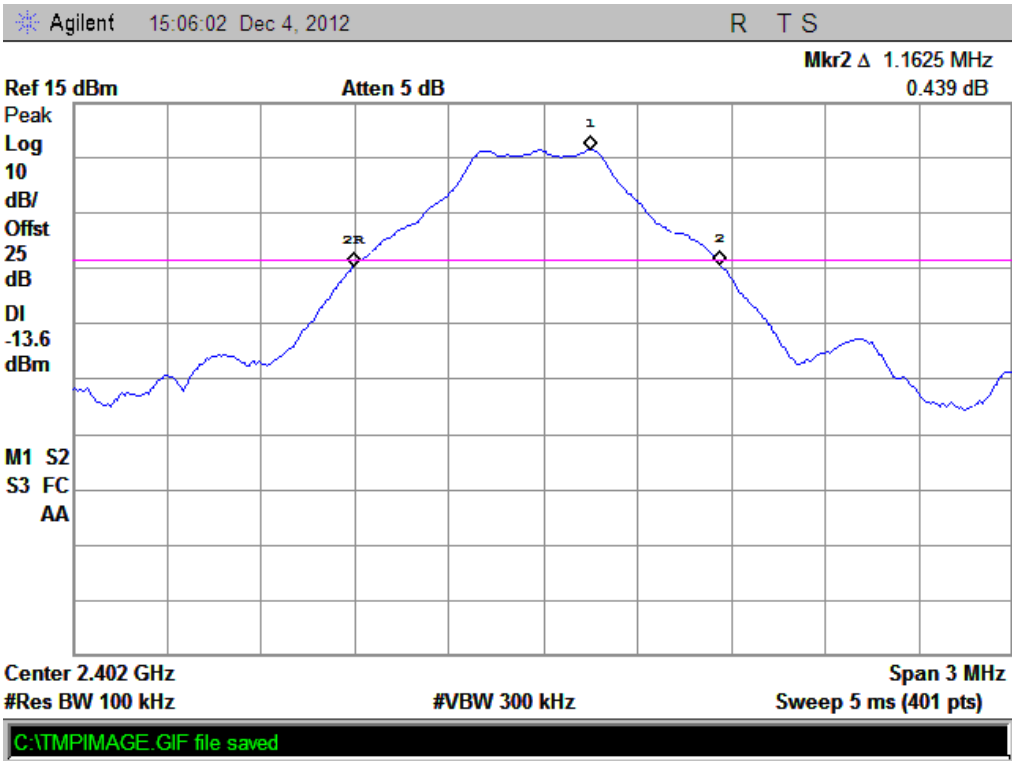
2.4.2.1. GFSK Mode

A. Test Verdict:

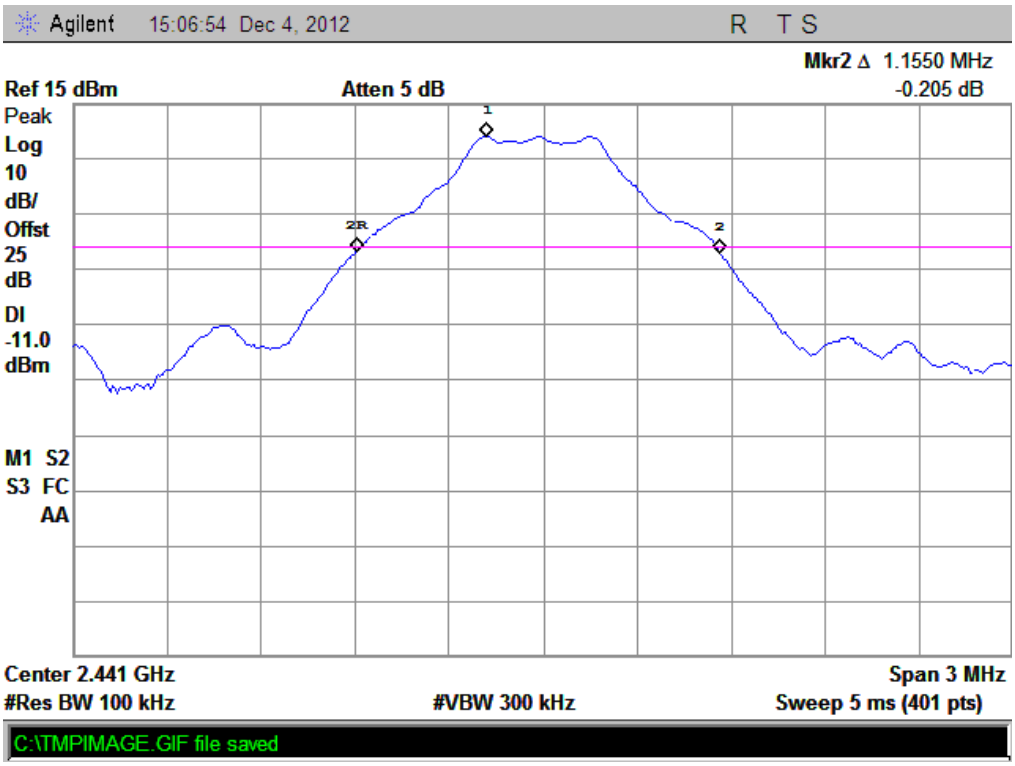
The maximum 20dB bandwidth measured is 1.1625MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.1625	Plot A
39	2441	1.1550	Plot B
78	2480	1.1625	Plot C

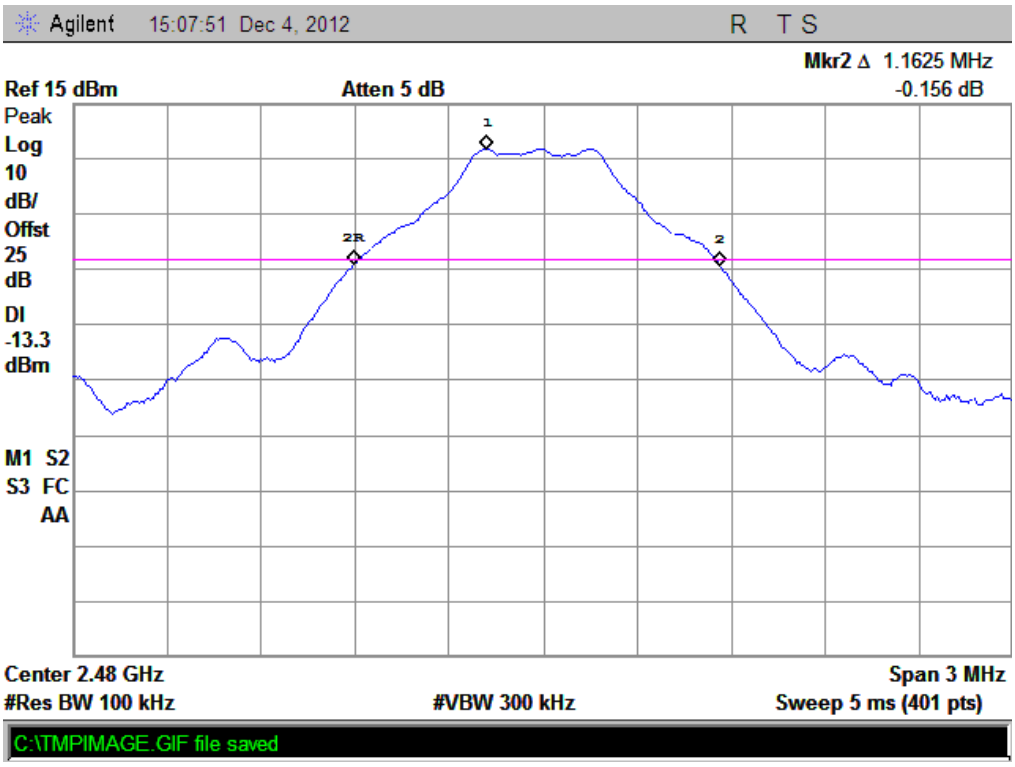
Test Plots:



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

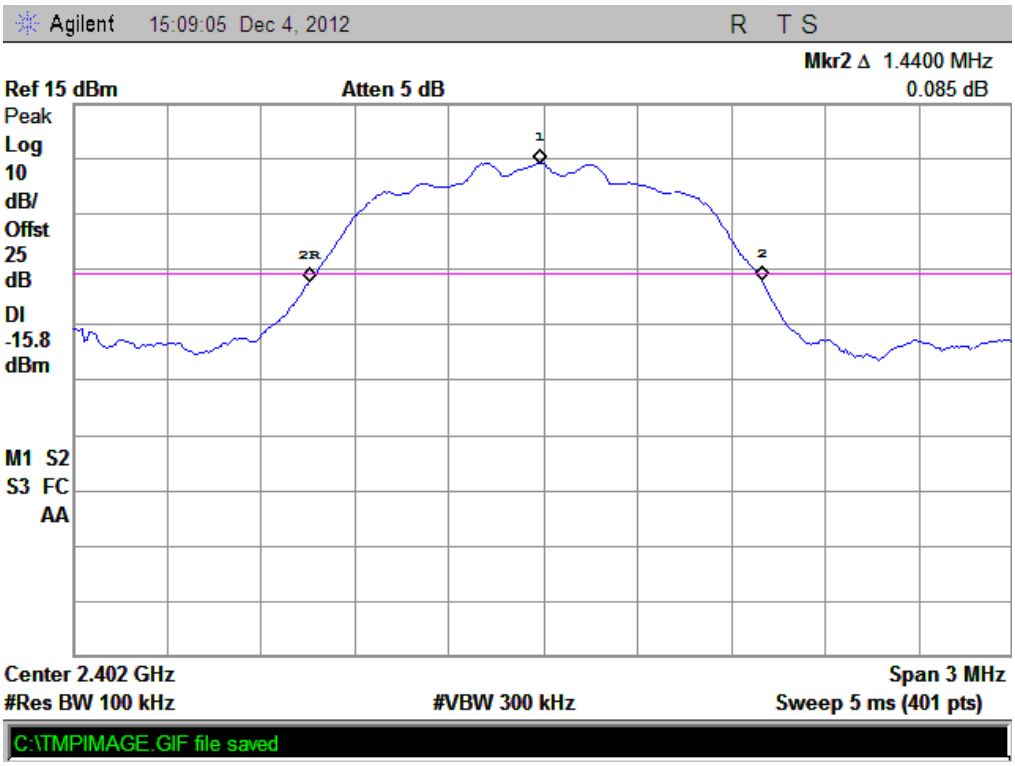
2.4.2.2. Π/4-DQPSK Mode

A. Test Verdict:

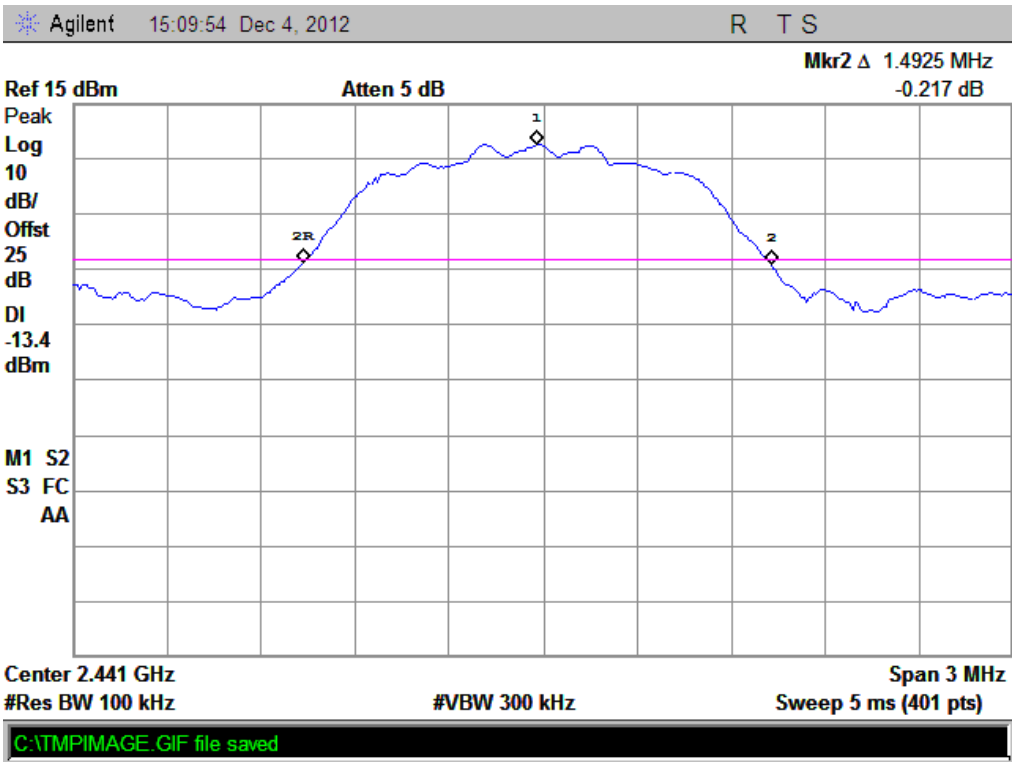
The maximum 20dB bandwidth measured is 1.4925MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.4400	Plot D
39	2441	1.4925	Plot E
78	2480	1.4475	Plot F

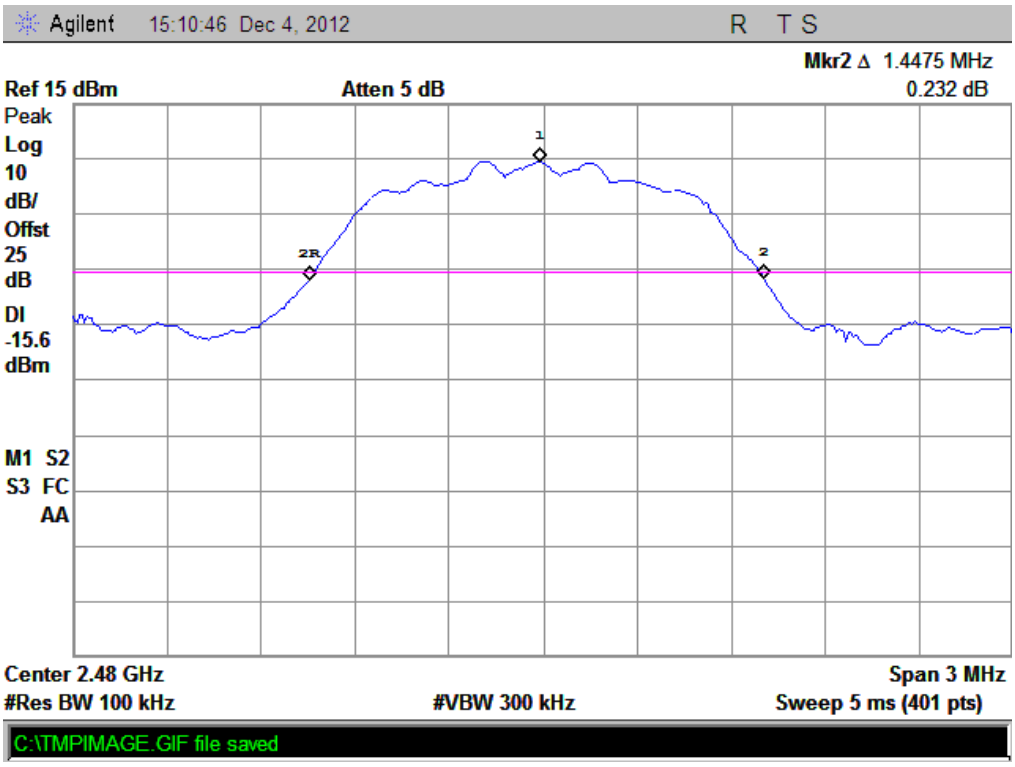
Test Plots:



(Plot D: Channel = 2402 @ Π/4-DQPSK)



(Plot E: Channel = 2441 @ Π/4-DQPSK)



(Plot F: Channel = 2480 @ Π/4-DQPSK)

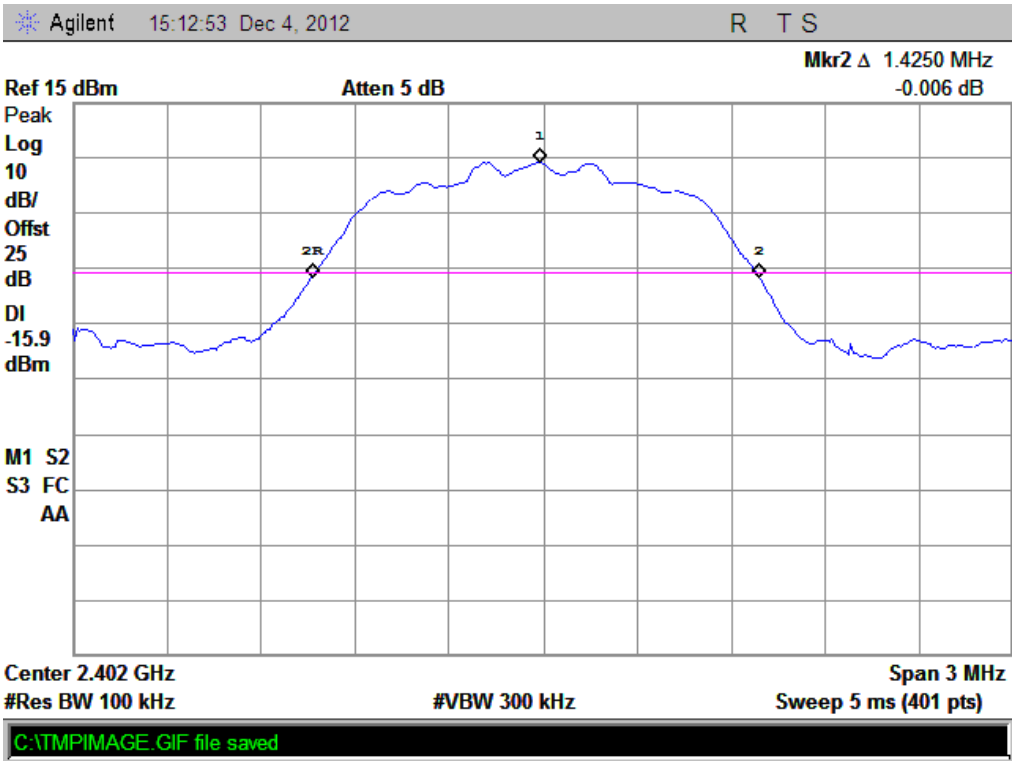
2.4.2.3. 8-DPSK Mode

A. Test Verdict:

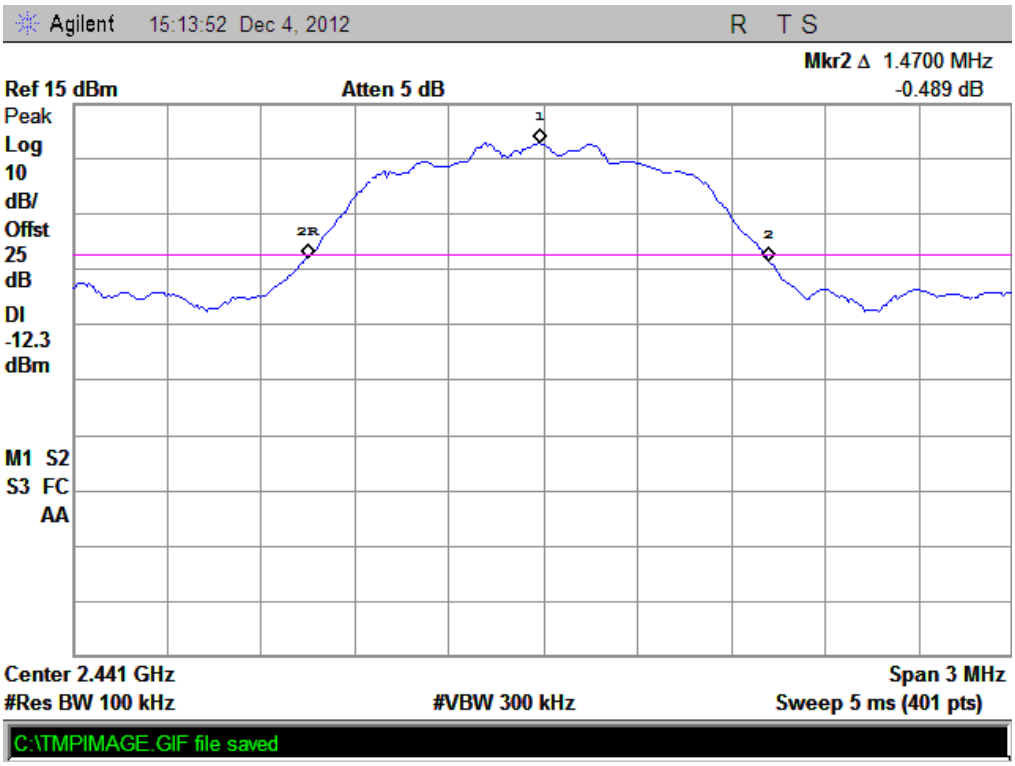
The maximum 20dB bandwidth measured is 1.4700MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.4250	Plot G
39	2441	1.4700	Plot H
78	2480	1.3875	Plot I

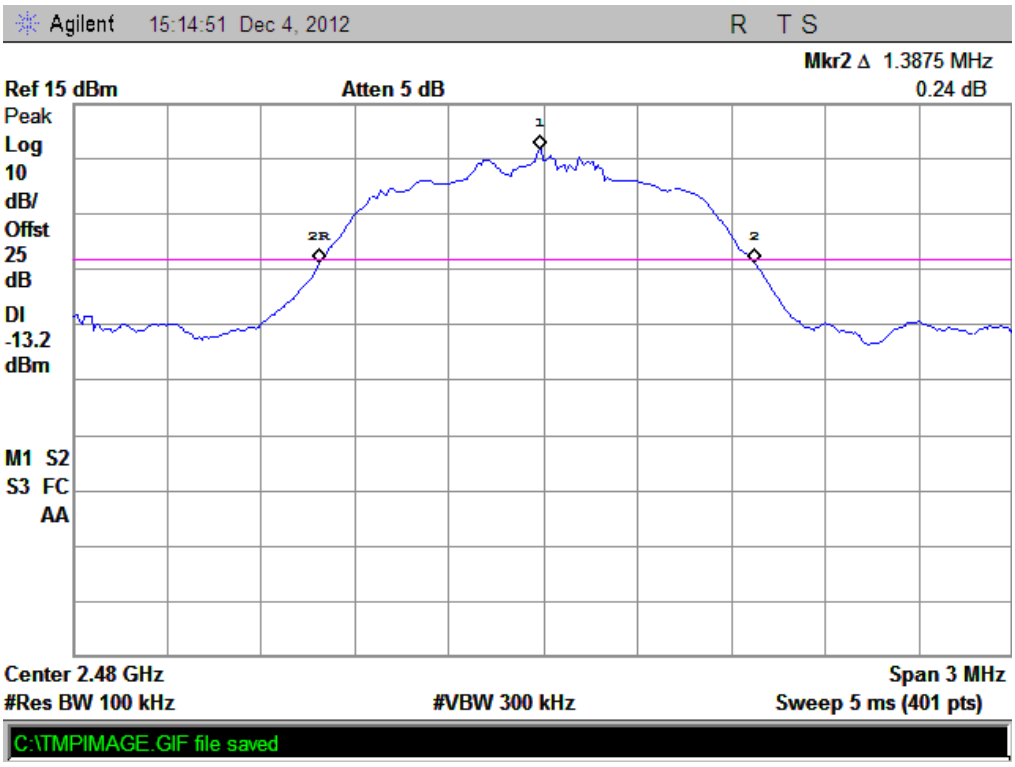
B. Test Plots:



(Plot G: Channel = 2402 @ 8-DPSK)



(Plot H: Channel = 2441 @ 8-DPSK)



(Plot I: Channel = 2480 @ 8-DPSK)

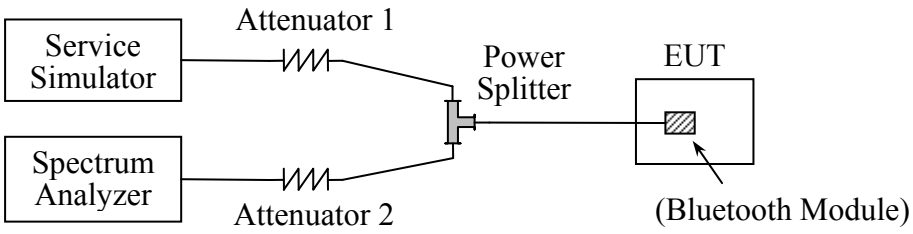
2.5. Carried Frequency Separation

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:



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B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2012.05	2013.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2012.05	2013.05
Power Splitter	Weinschel	1506A	NW521	2012.05	2013.05
Attenuator 1	Resnet	20dB	(n.a.)	2012.05	2013.05
Attenuator 2	Resnet	3dB	(n.a.)	2012.05	2013.05

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

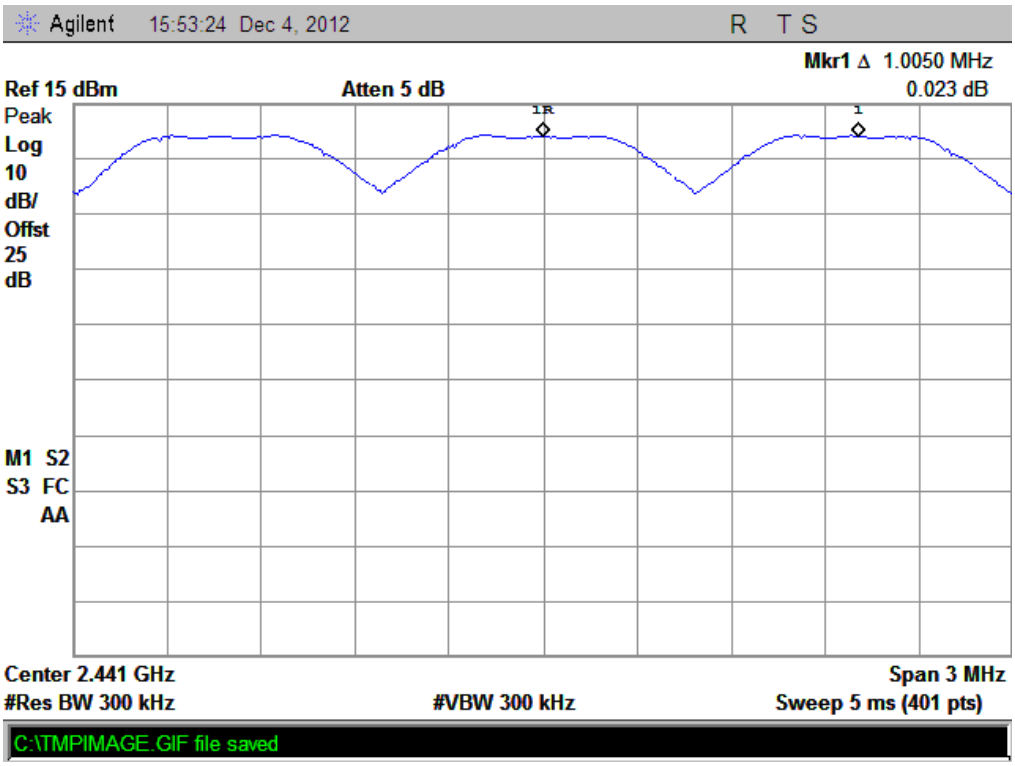
Trace = max hold

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

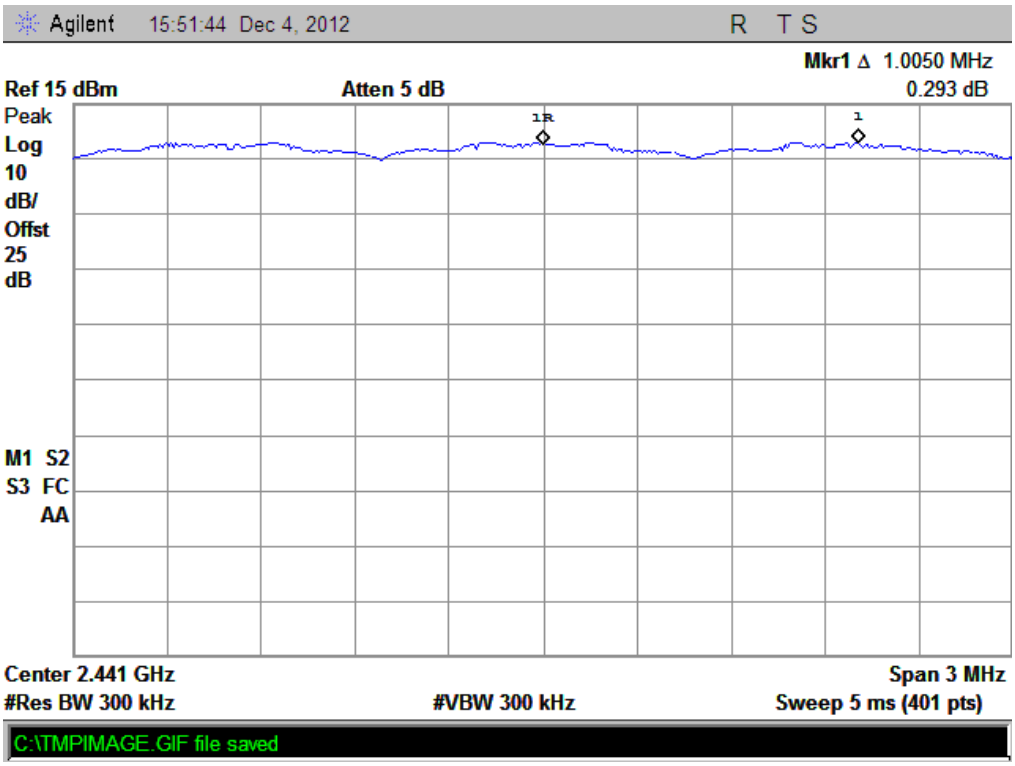
2.5.4. Test Result

The Bluetooth Module operates at hopping-on test mode.

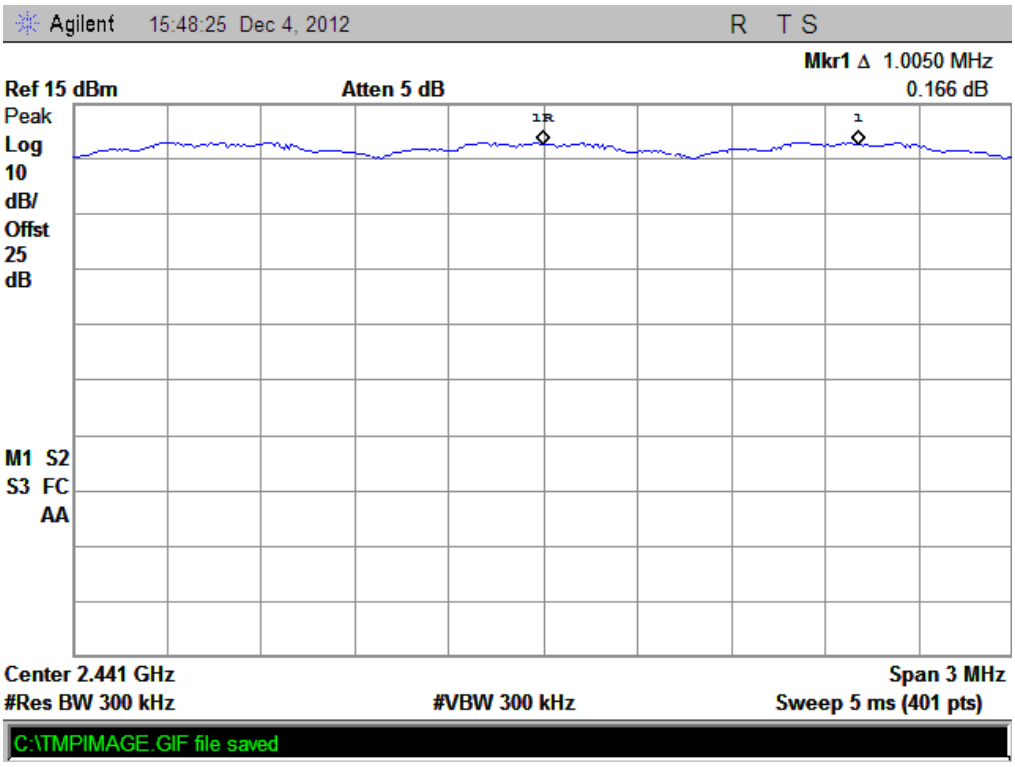
For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (1.1625MHz for GFSK mode, 1.4925MHz for Π/4-DQPSK mode and 1.4700MHz for 8-DPSK mode, refer to section 2.4.1), whichever is greater. So, the verdict is PASSING



(Plot A: GFSK)



(Plot B: ∏/4-DQPSK)



(Plot C: 8-DPSK)

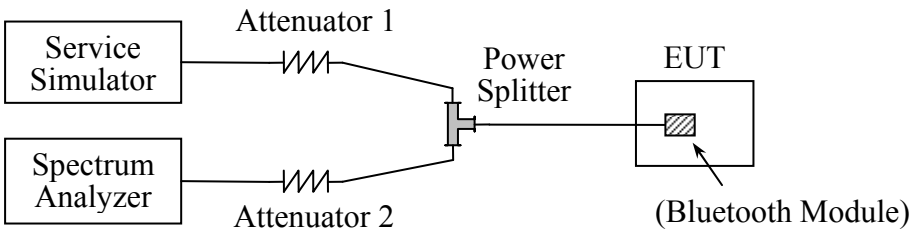
2.6. Time of Occupancy (Dwell time)

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	R&S	CMU200	100448	2012.05	2013.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2012.05	2013.05
Power Splitter	Weinschel	1506A	NW521	2012.05	2013.05
Attenuator 1	Resnet	20dB	(n.a.)	2012.05	2013.05
Attenuator 2	Resnet	3dB	(n.a.)	2012.05	2013.05

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.

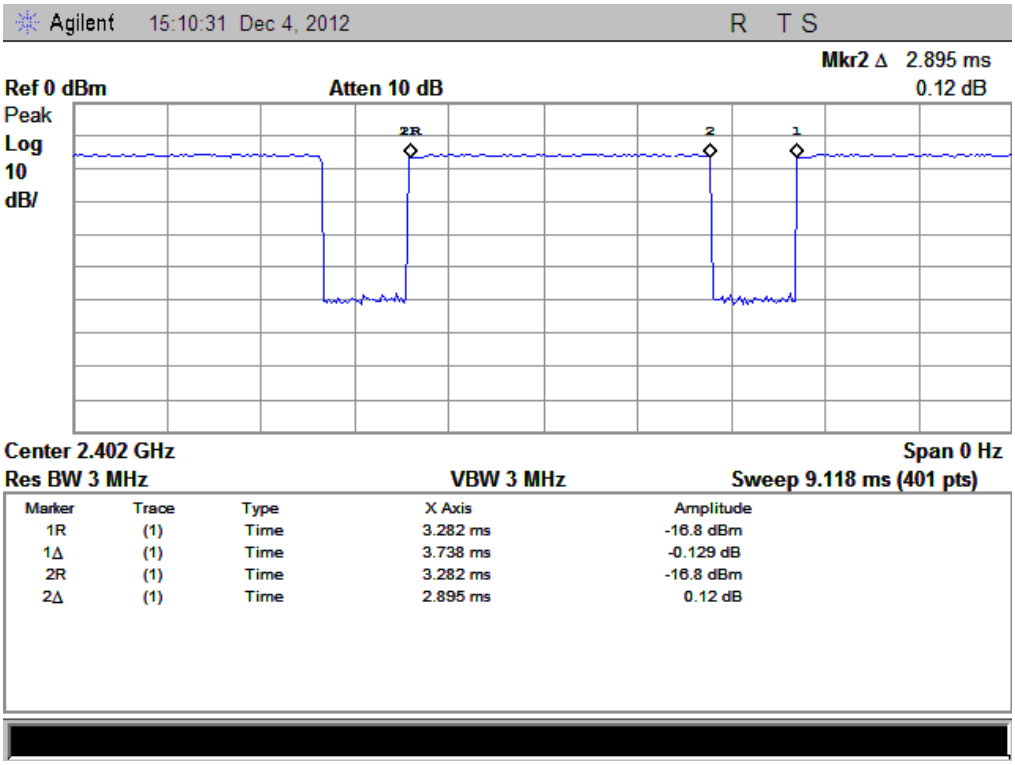
2.6.4.1. GFSK Mode

A. Test Verdict:

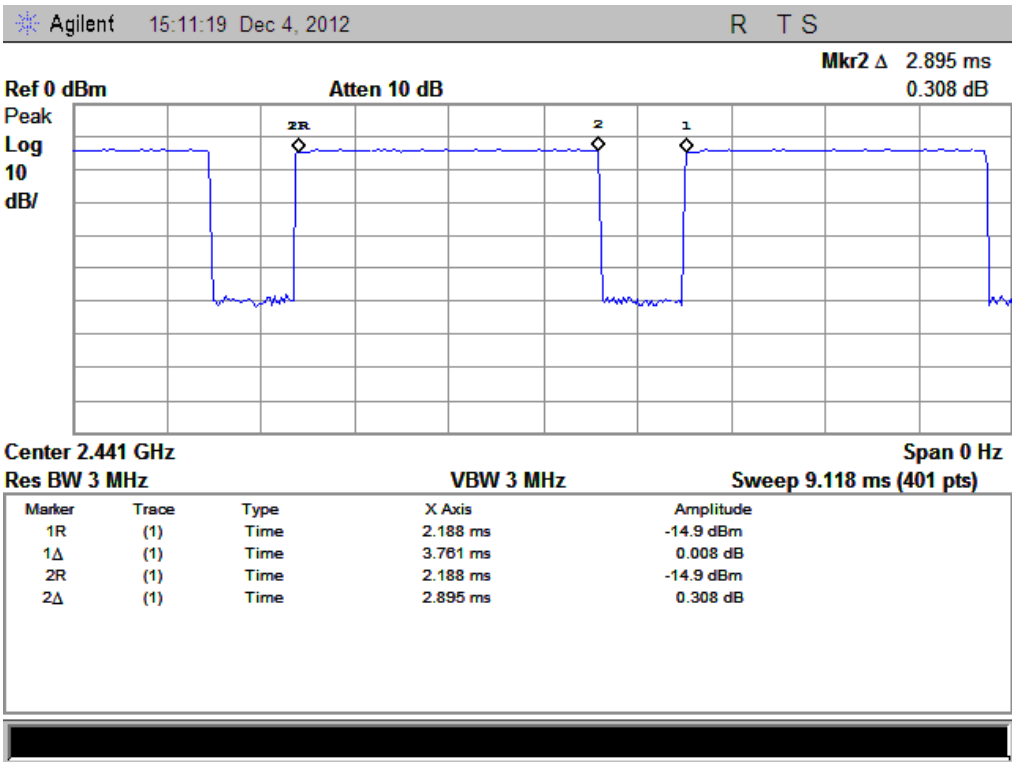
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.895	Plot A	308.800	400	PASS
39	2441	2.895	Plot B	308.800		PASS
78	2480	2.918	Plot C	311.253		PASS

Test Plots:

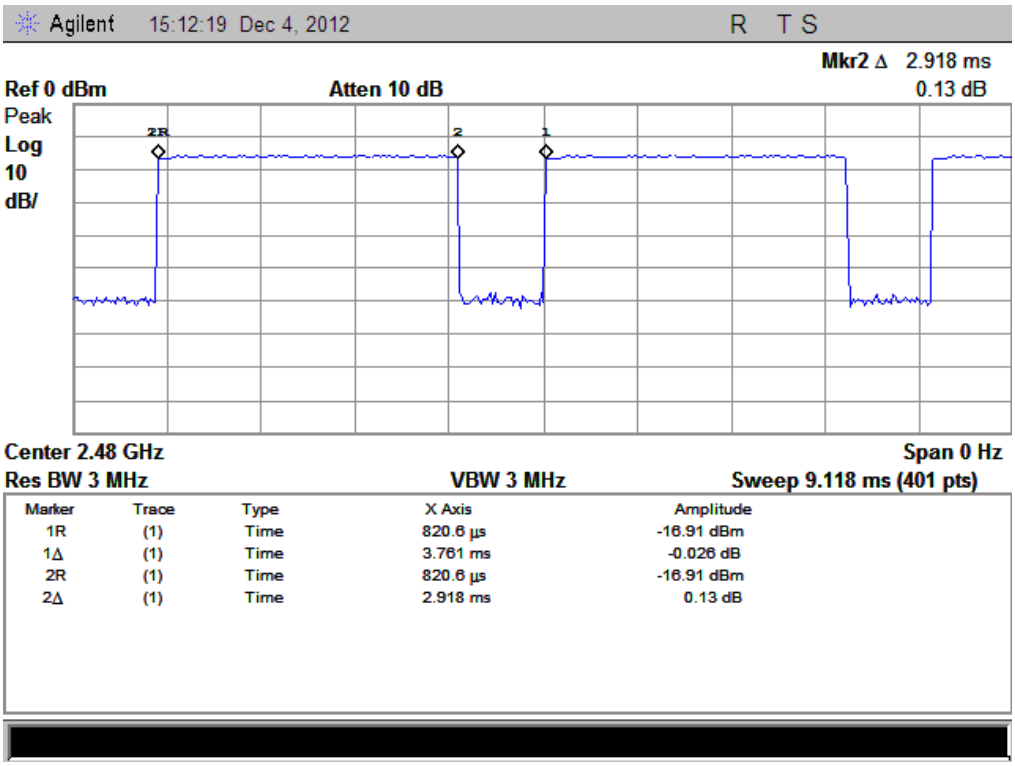
Note: the following plots record the Pulse Time of the Module carrier.



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

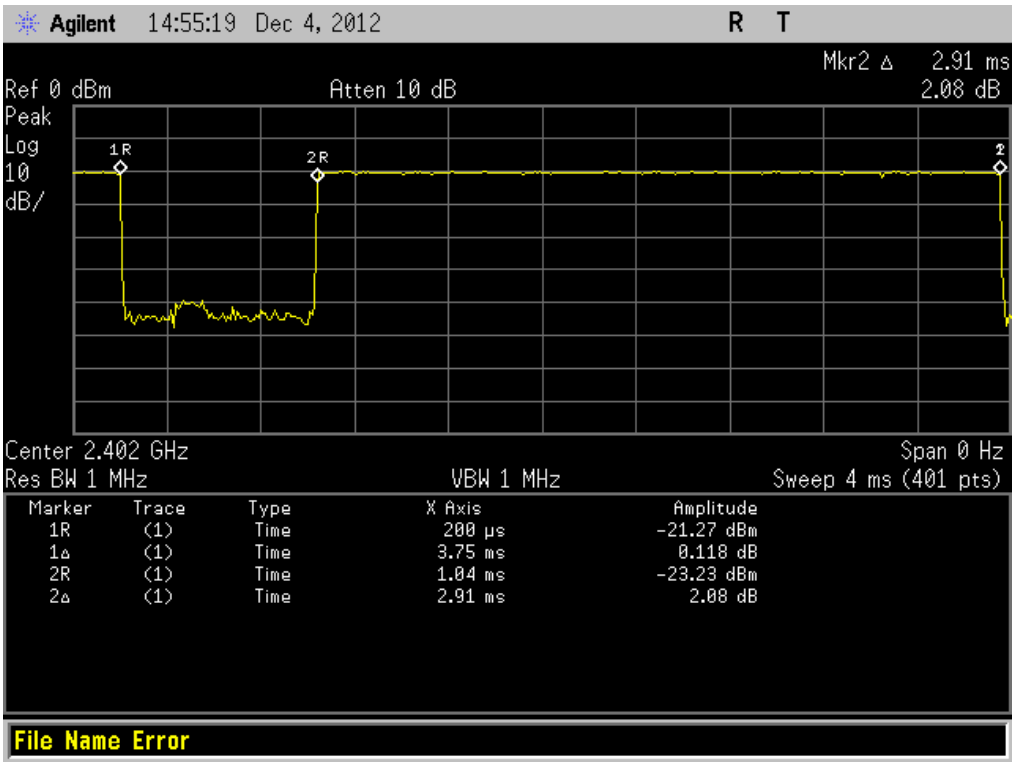
2.6.4.2. Π/4-DQPSK Mode

A. Test Verdict:

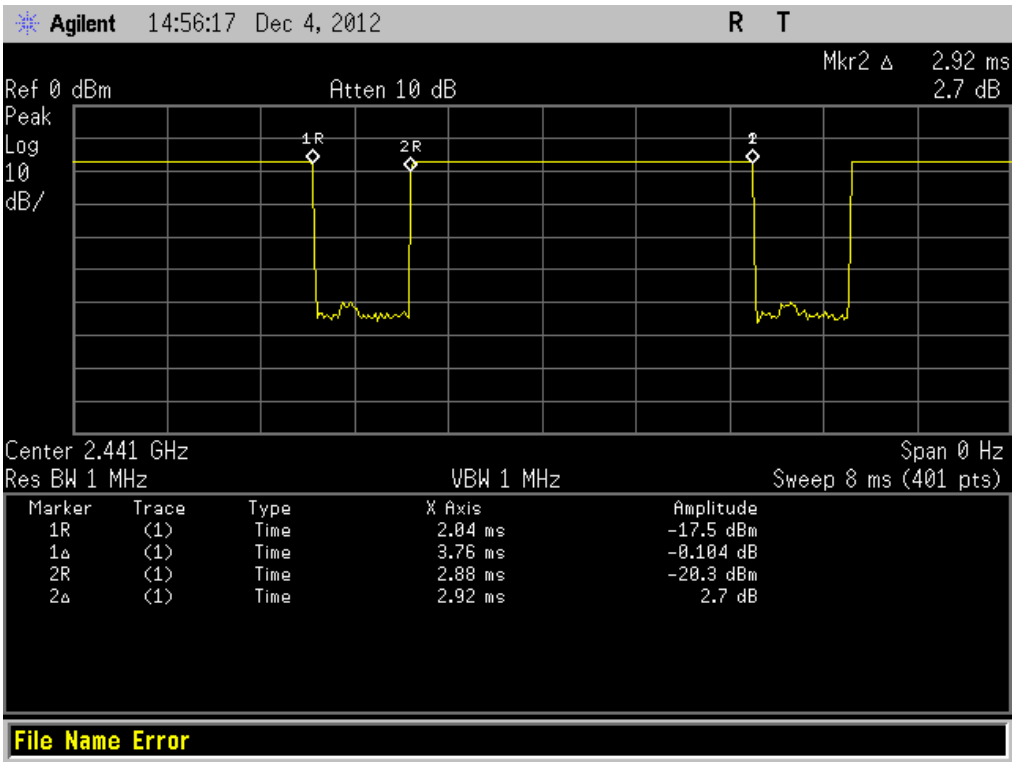
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.910	Plot D	310.400	400	PASS
39	2441	2.920	Plot E	311.467		PASS
78	2480	2.900	Plot F	309.333		PASS

Test Plots:

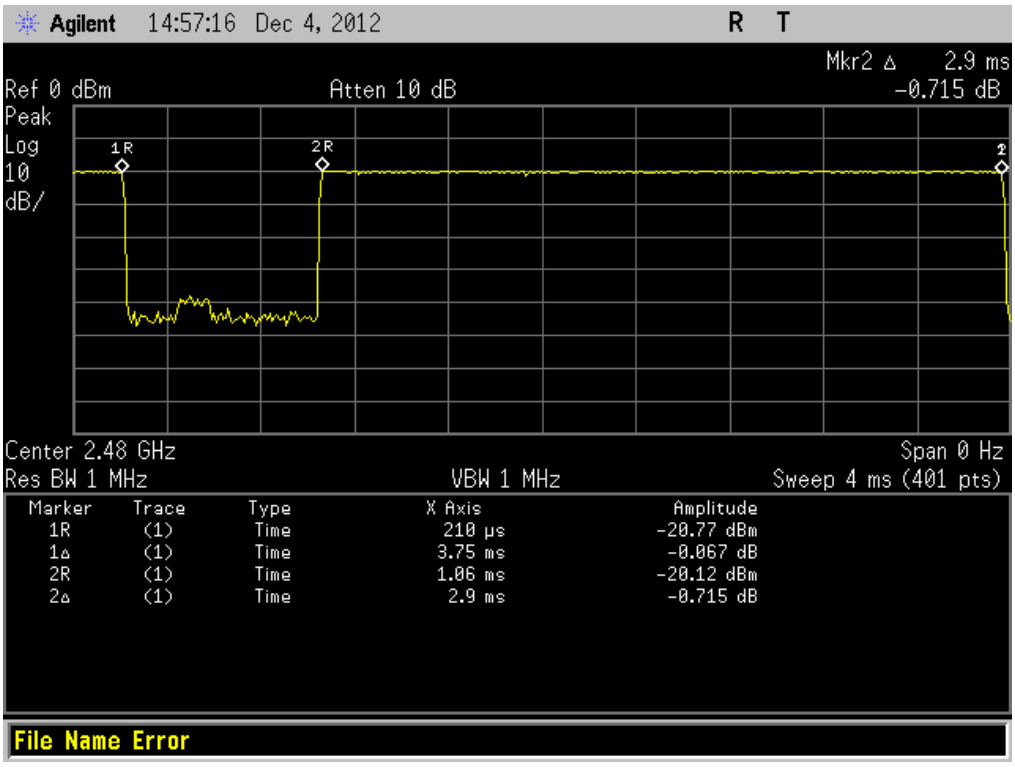
Note: the following plots record the Pulse Time of the Module carrier.



(Plot D: Channel = 2402 @ Π/4-DQPSK)



(Plot E: Channel = 2441 @ ∏/4-DQPSK)



(Plot F: Channel = 2480 @ ∏/4-DQPSK)

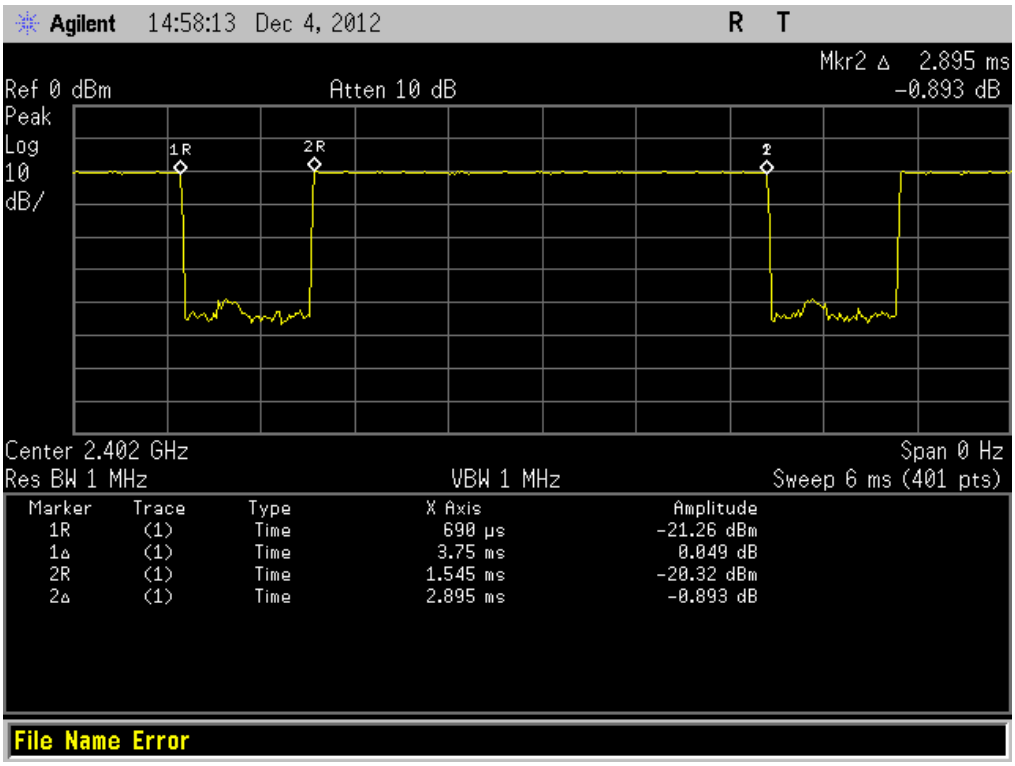
2.6.4.3. 8-DPSK mode

A. Test Verdict:

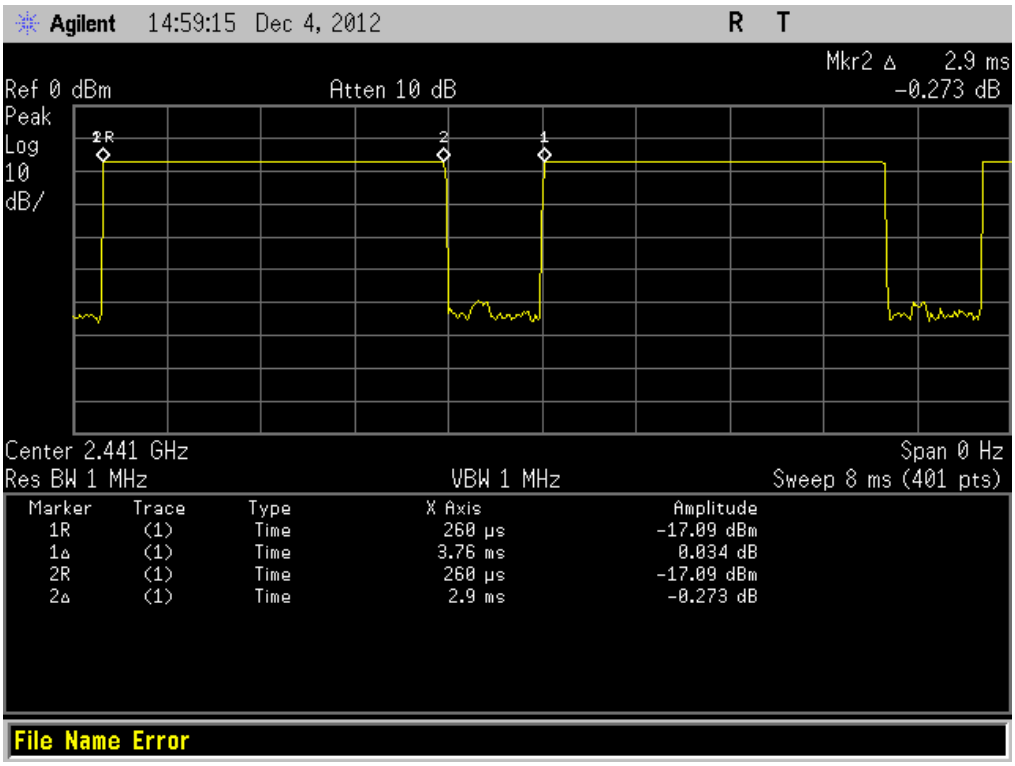
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.895	Plot G	308.800	400	PASS
39	2441	2.900	Plot H	309.333		PASS
78	2480	2.910	Plot I	310.400		PASS

Test Plots:

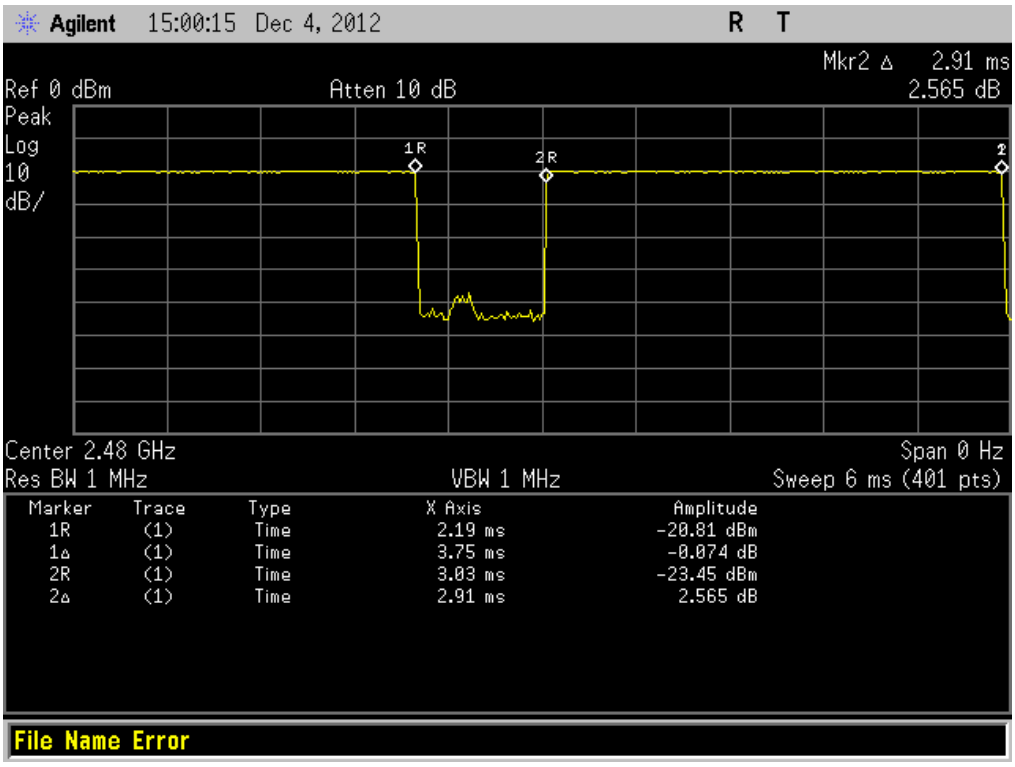
Note: the following plots record the Pulse Time of the Module carrier.



(Plot G: Channel = 2402 @ 8-DPSK)



(Plot H: Channel = 2441 @ 8-DPSK)



(Plot I: Channel = 2480 @ 8-DPSK)

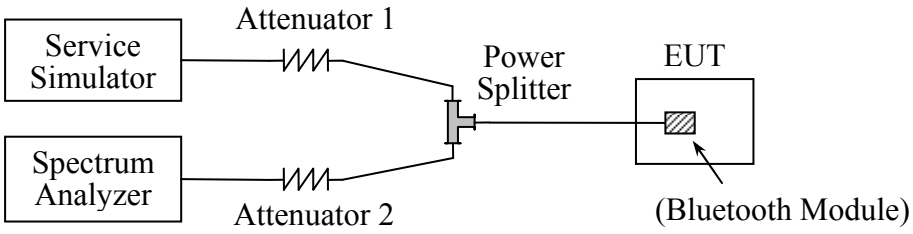
2.7. Conducted Spurious Emissions

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	R&S	CMU200	100448	2012.05	2013.05
Spectrum Analyzer	Agilent	E7405A	US44210471	2012.05	2013.05
Power Splitter	Weinschel	1506A	NW521	2012.05	2013.05
Attenuator 1	Resnet	20dB	(n.a.)	2012.05	2013.05
Attenuator 2	Resnet	3dB	(n.a.)	2012.05	2013.05

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.

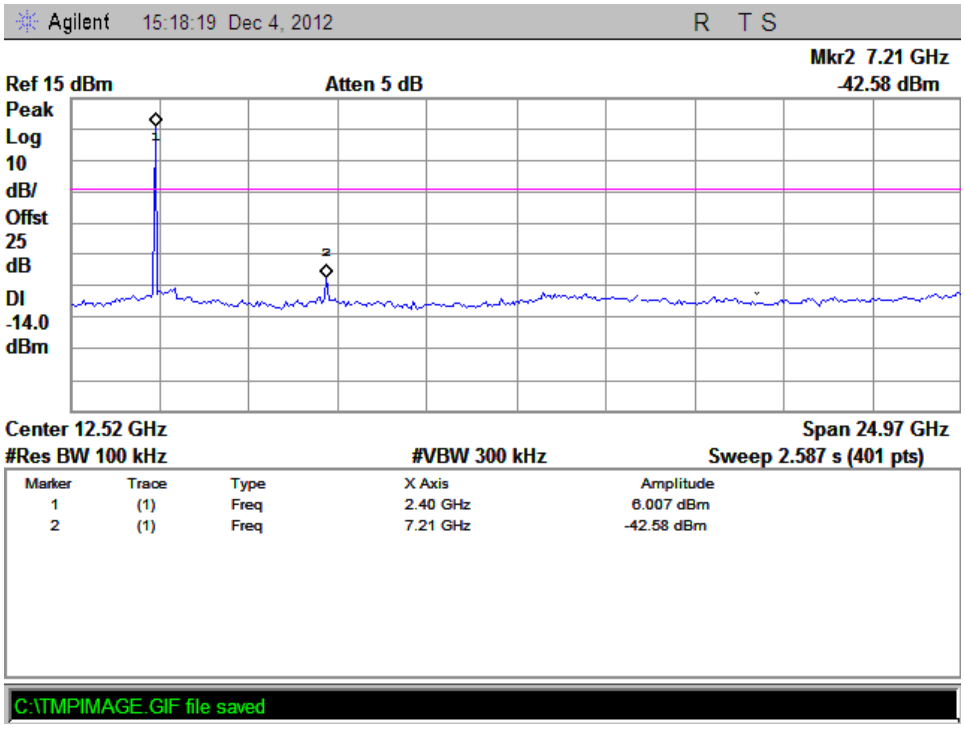
2.7.4.1. GFSK Mode

A. Test Verdict:

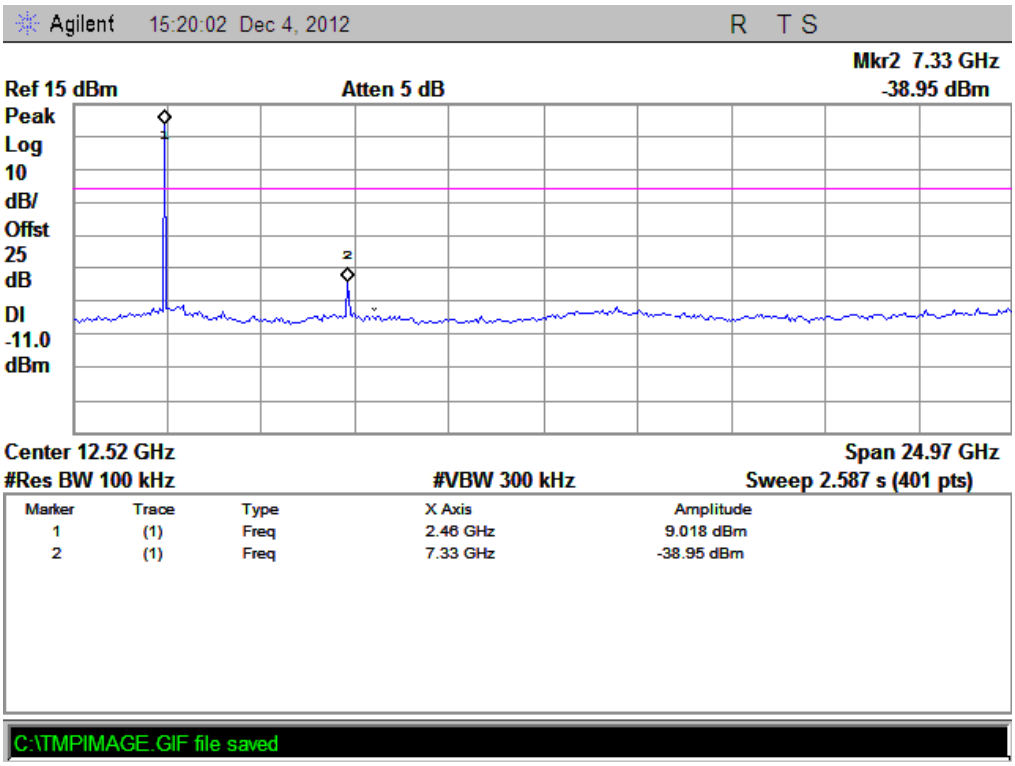
Channel	Frequency (MHz)	Measured Max. Out of Band EmissiondBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-42.58	Plot A.1	6.007	-14.0	PASS
39	2441	-38.95	Plot B.1	9.018	-11.0	PASS
78	2480	-40.47	Plot C.1	6.286	-13.7	PASS

B. Test Plots:

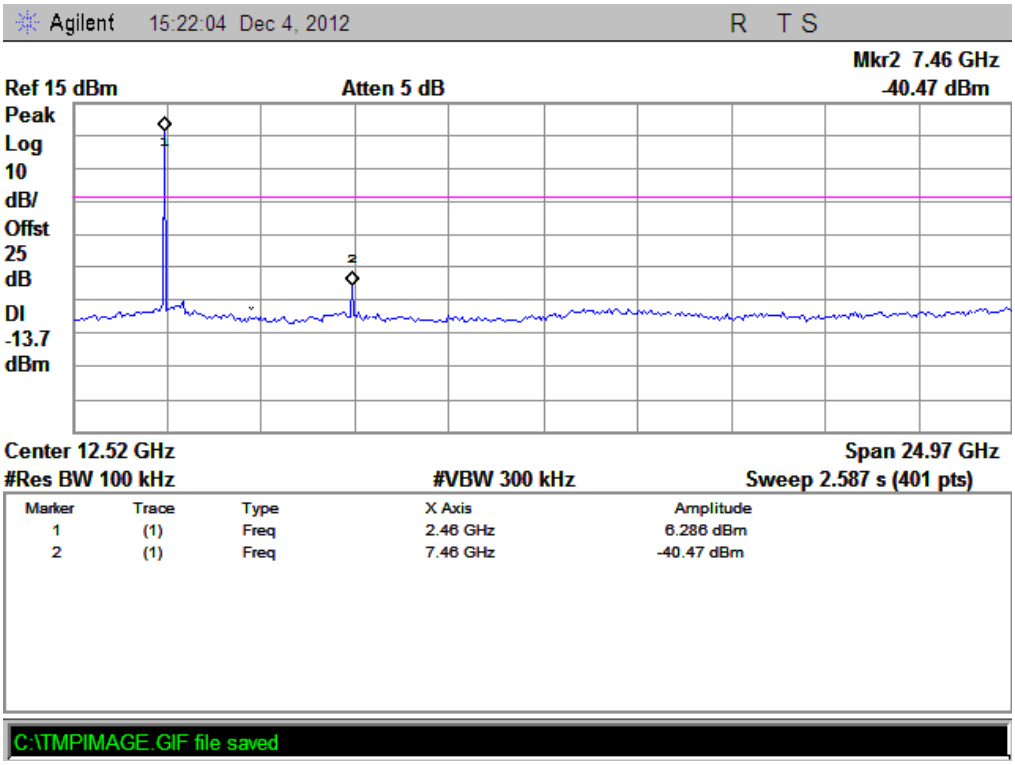
Note: the power of the Module transmitting frequency should be ignored.



(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)

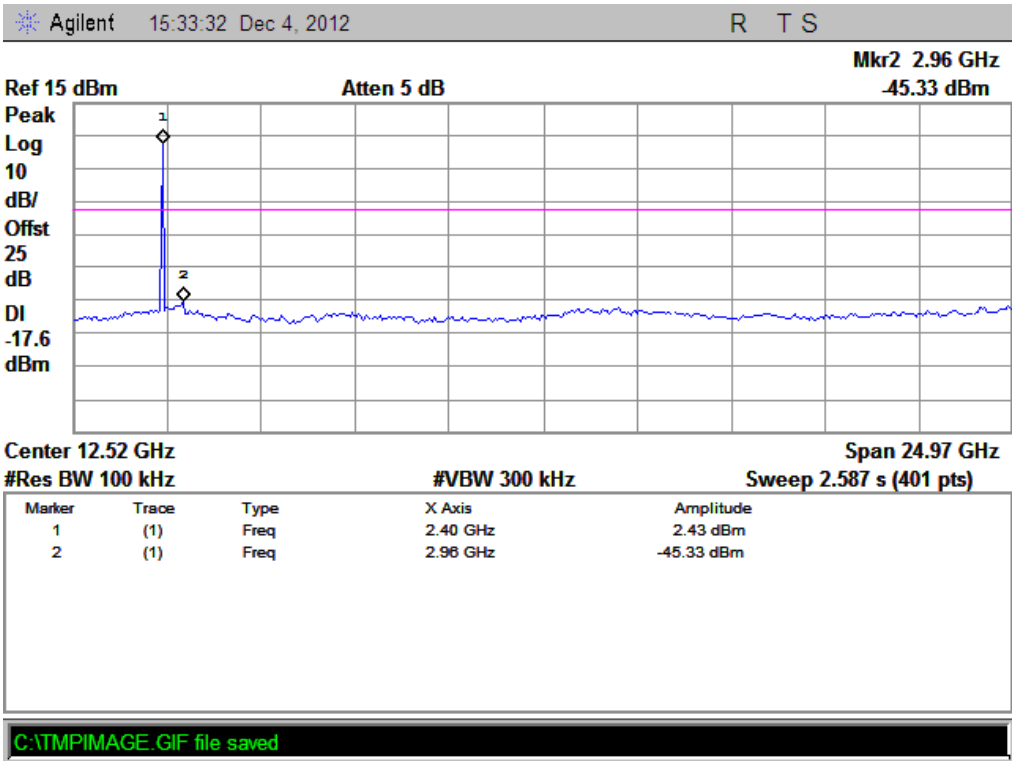
2.7.4.2. ∏/4-DQPSK Mode

A. Test Verdict:

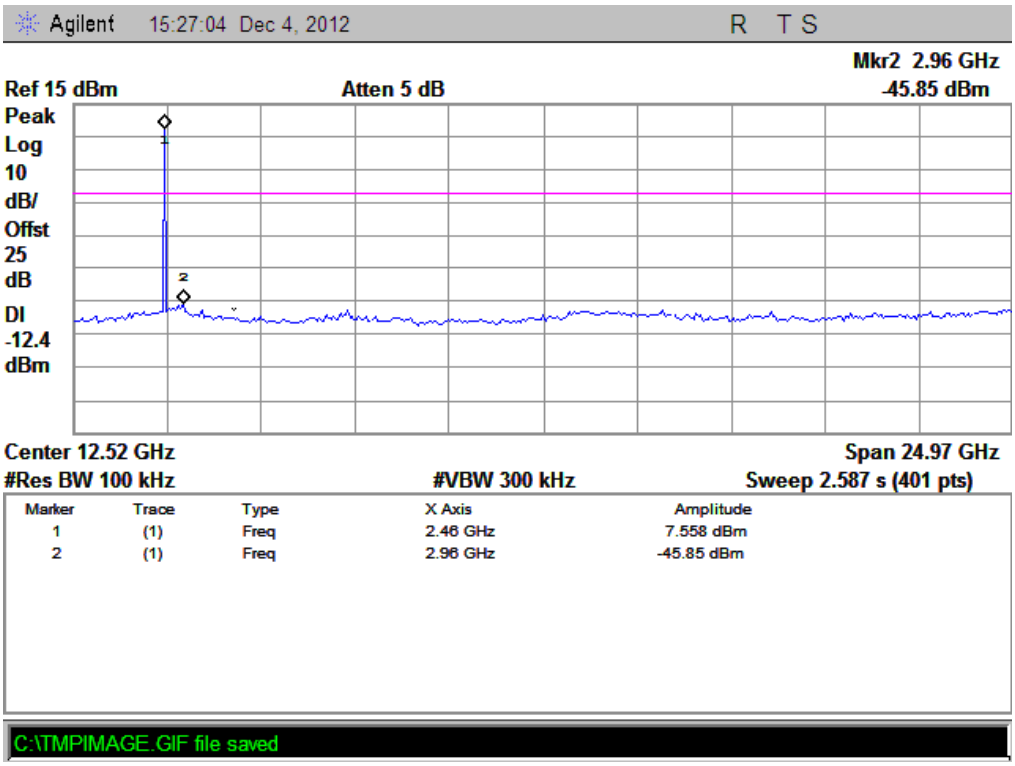
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-45.33	Plot D.1	2.430	-17.6	PASS
39	2441	-45.85	Plot E.1	7.558	-12.4	PASS
78	2480	-45.06	Plot F.1	4.062	-15.9	PASS

B. Test Plots:

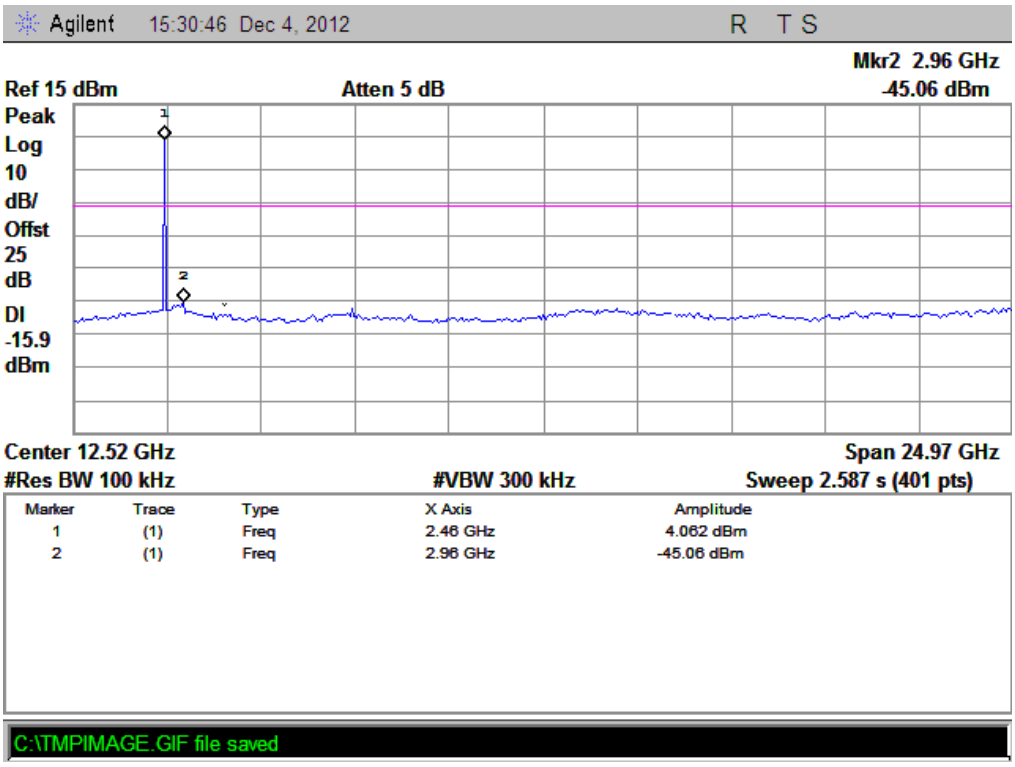
Note: the power of the Module transmitting frequency should be ignored.



(Plot D.1: Channel = 0, 30MHz to 25GHz @ ∏/4-DQPSK)



(Plot E.1: Channel = 39, 30MHz to 25GHz @ ∏/4-DQPSK)



(Plot F.1: Channel = 78, 30MHz to 25GHz @ ∏/3-DQPSK)

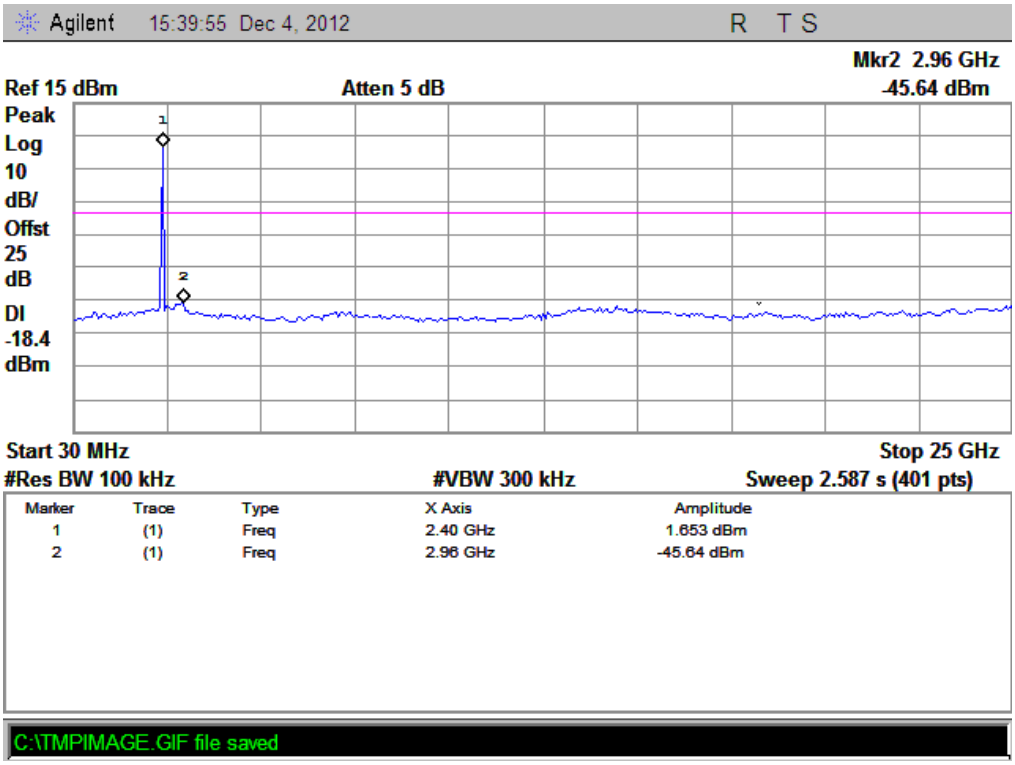
2.7.4.3. 8-DPSK Mode

A. Test Verdict:

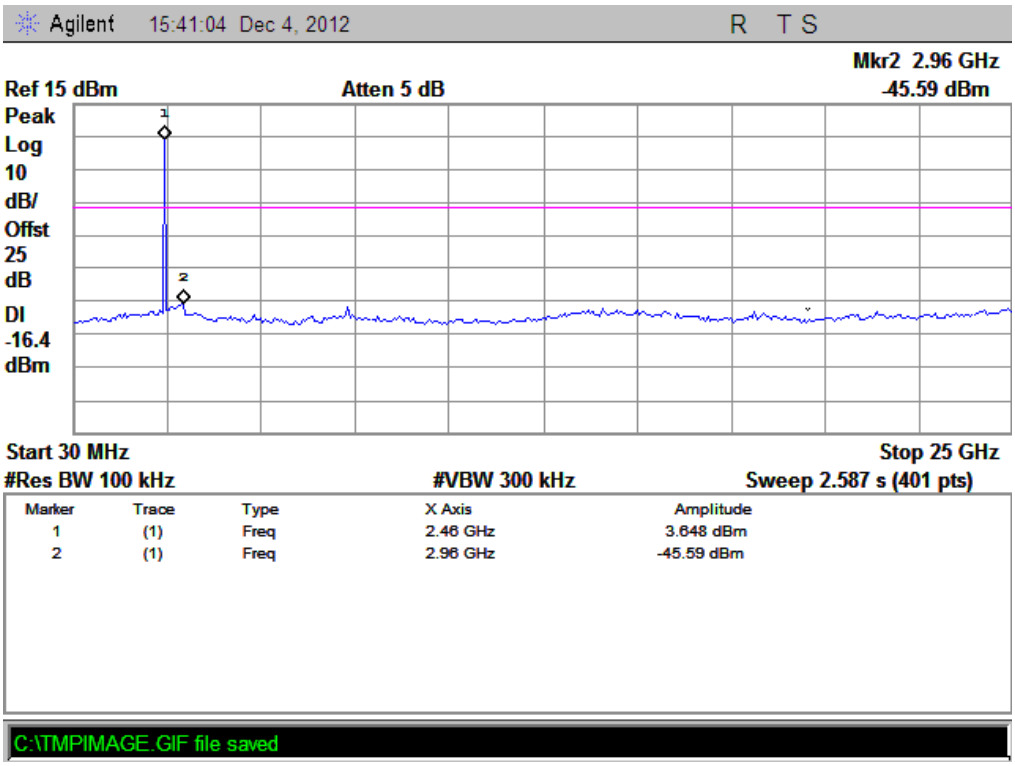
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-45.64	Plot G.1	1.653	-18.4	PASS
39	2441	-45.59	Plot H.1	3.648	-16.4	PASS
78	2480	-44.99	Plot I.1	1.896	-18.1	PASS

B. Test Plots:

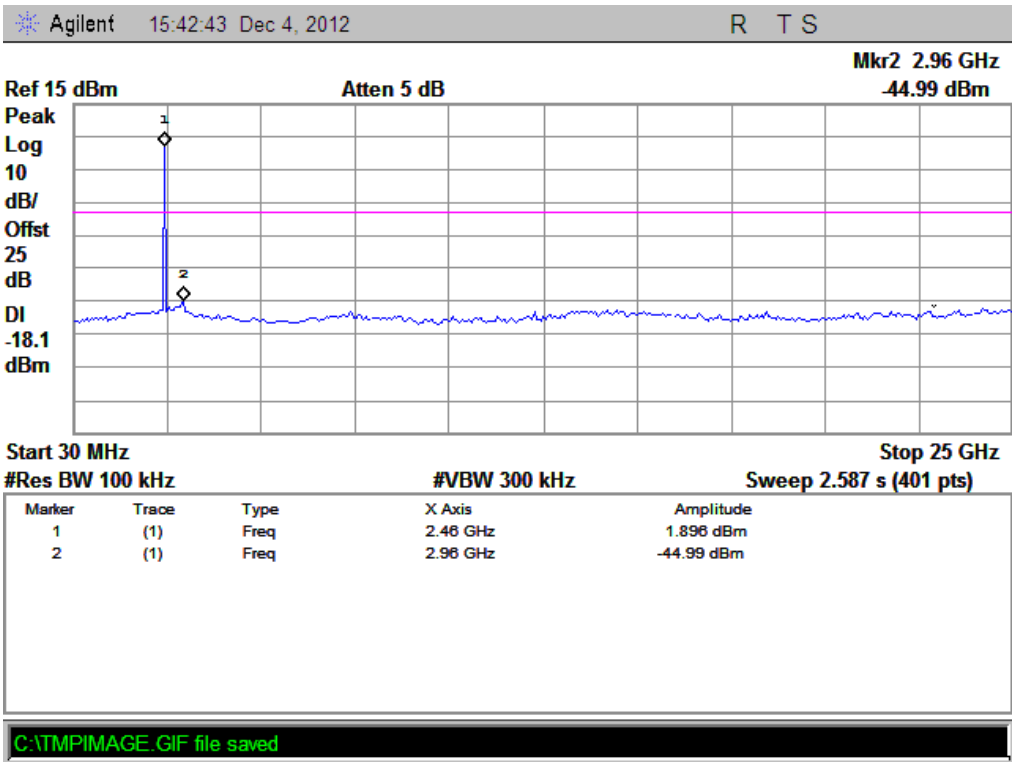
Note: the power of the Module transmitting frequency should be ignored.



(Plot G.1: Channel = 0, 30MHz to 25GHz @ 8-DPSK)



(Plot H.1: Channel = 39, 30MHz to 25GHz @ 8-DPSK)



(Plot I.1: Channel = 78, 30MHz to 25GHz @ 8-DPSK)

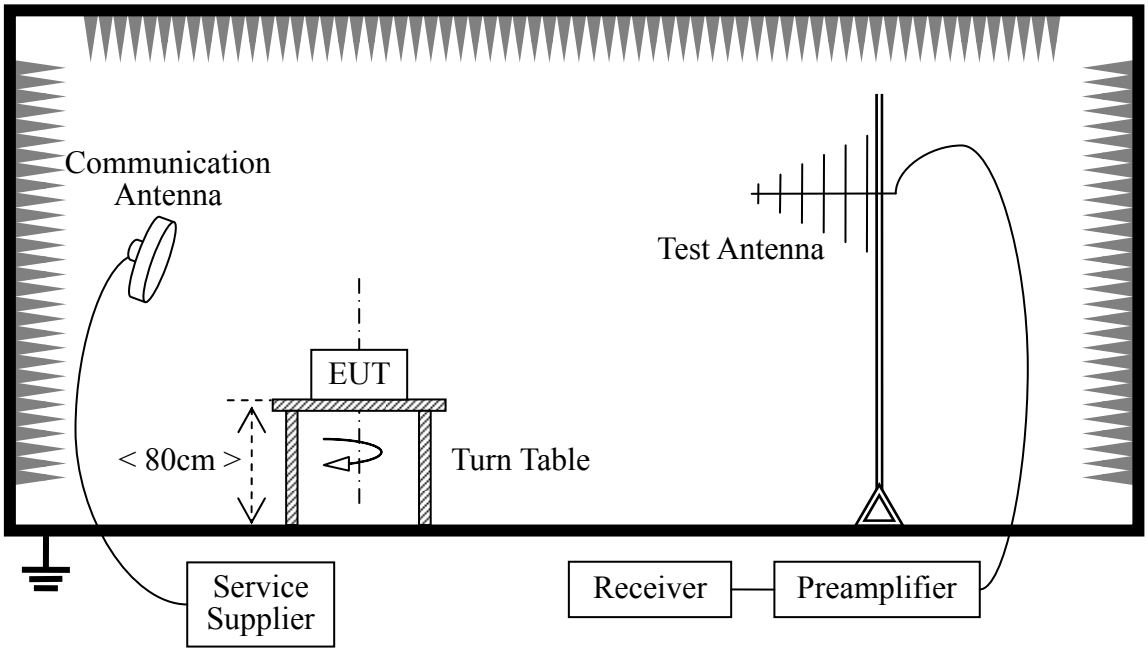
2.8. Band Edge

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	2012.05	2013.05
Receiver	Agilent	E7405A	US44210471	2012.05	2013.05
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05	2013.05

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2012.05	2013.05

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

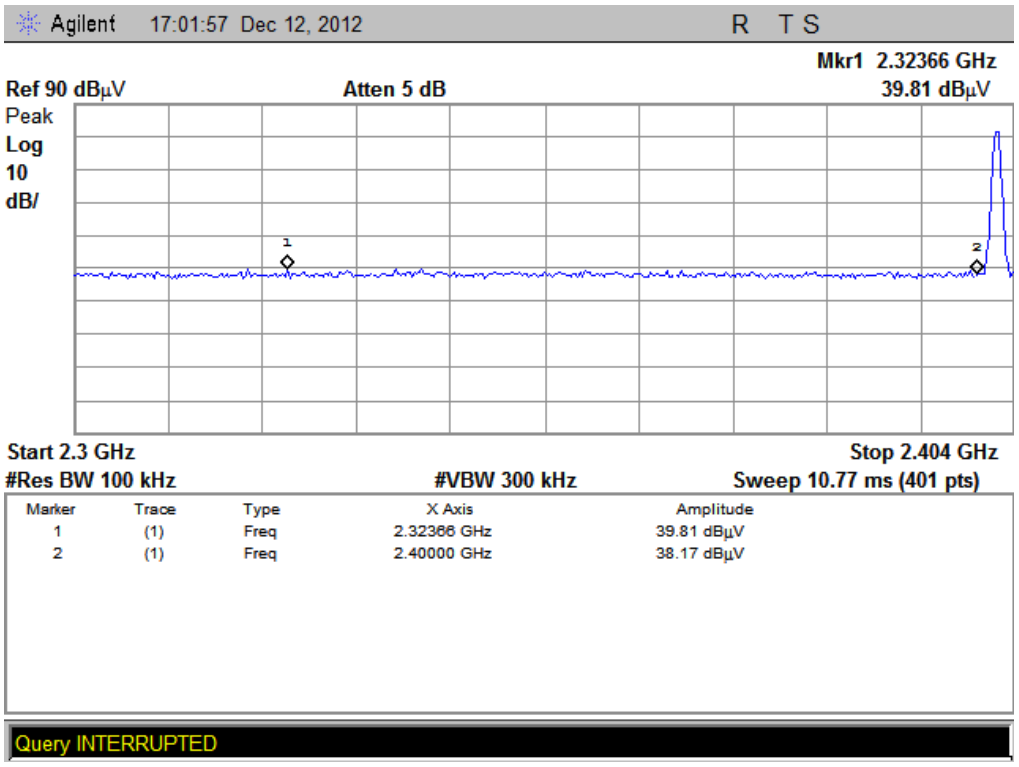
2.8.4.1. GFSK Mode

A. Test Verdict:

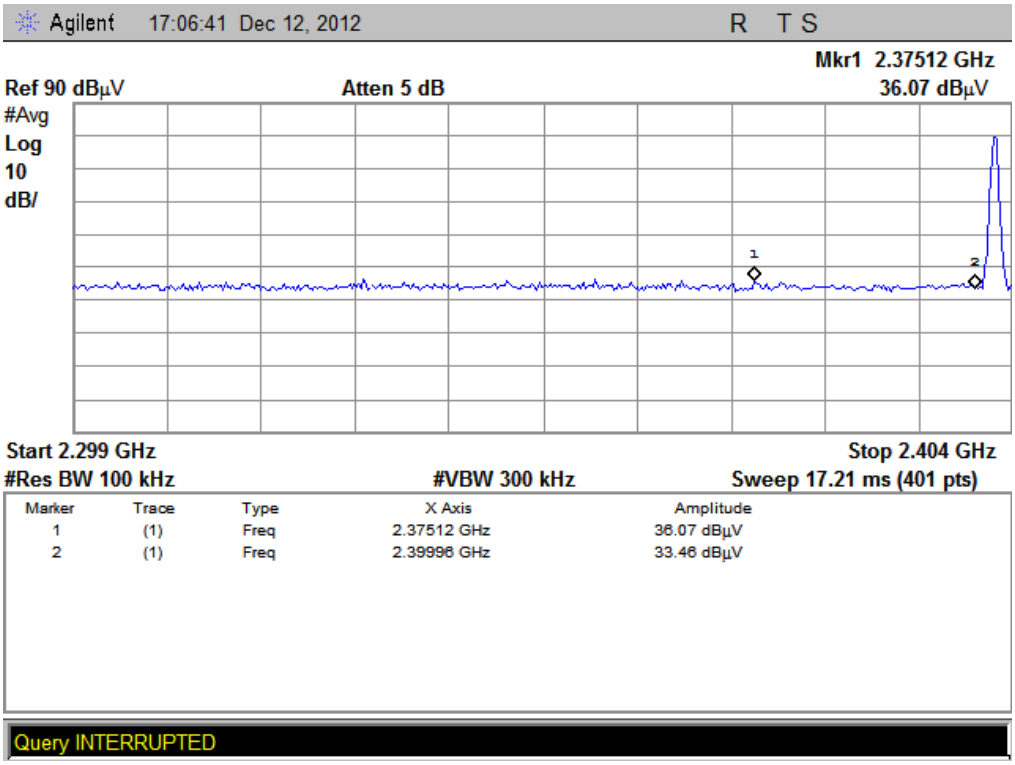
(Un-hopping)

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	2323.66	PK	39.81	-30.93	32.56	41.44	74	Pass
0	2375.12	AV	36.07	-30.93	32.56	37.70	54	Pass
78	2489.99	PK	39.33	-29.05	32.50	42.78	74	Pass
78	2494.28	AV	37.45	-29.05	32.50	40.90	54	Pass

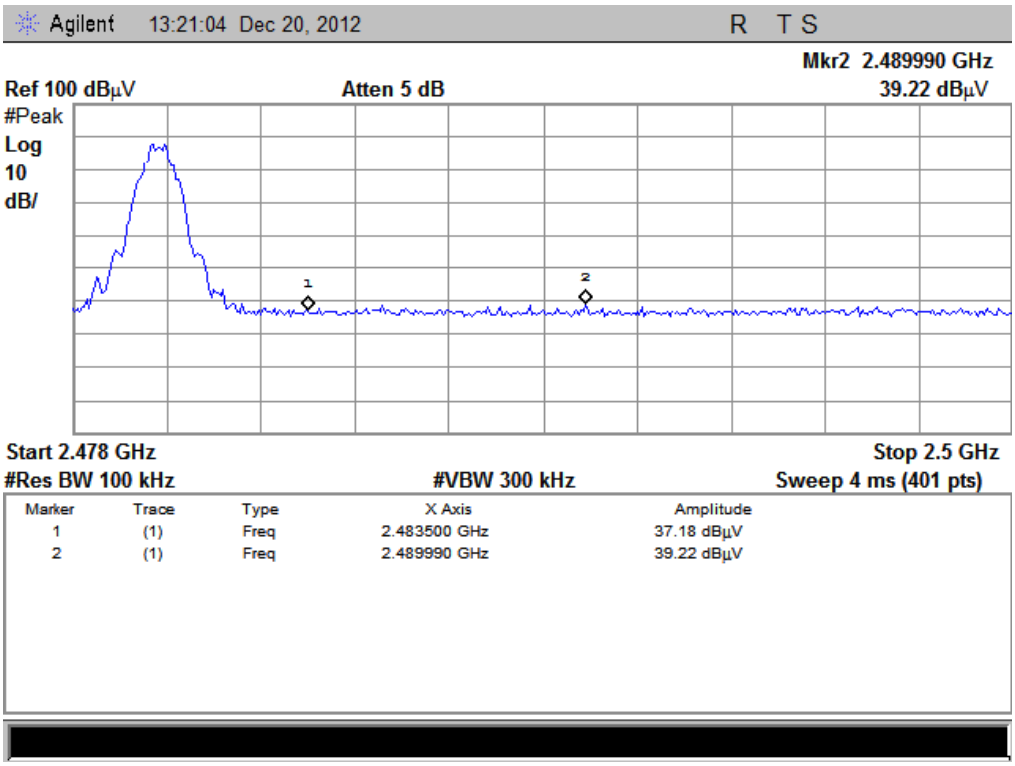
B. Test Plots:



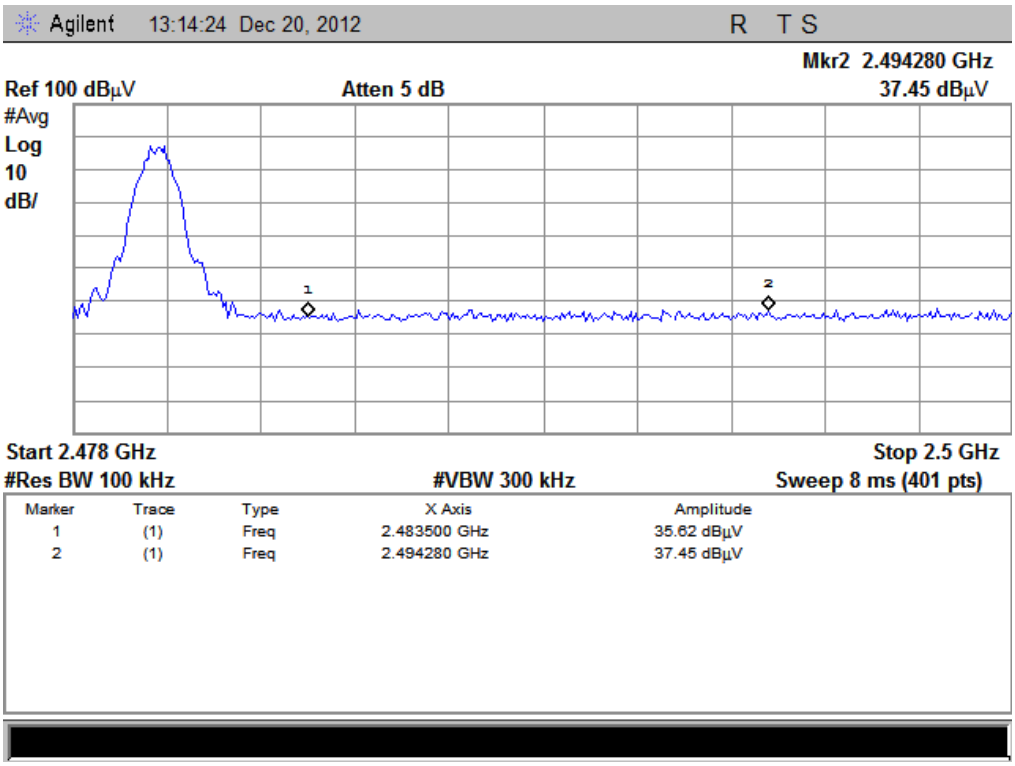
(Plot A1: Channel = 0 PEAK @ GFSK)



(Plot A2: Channel = 0 AVERAGE @ GFSK)



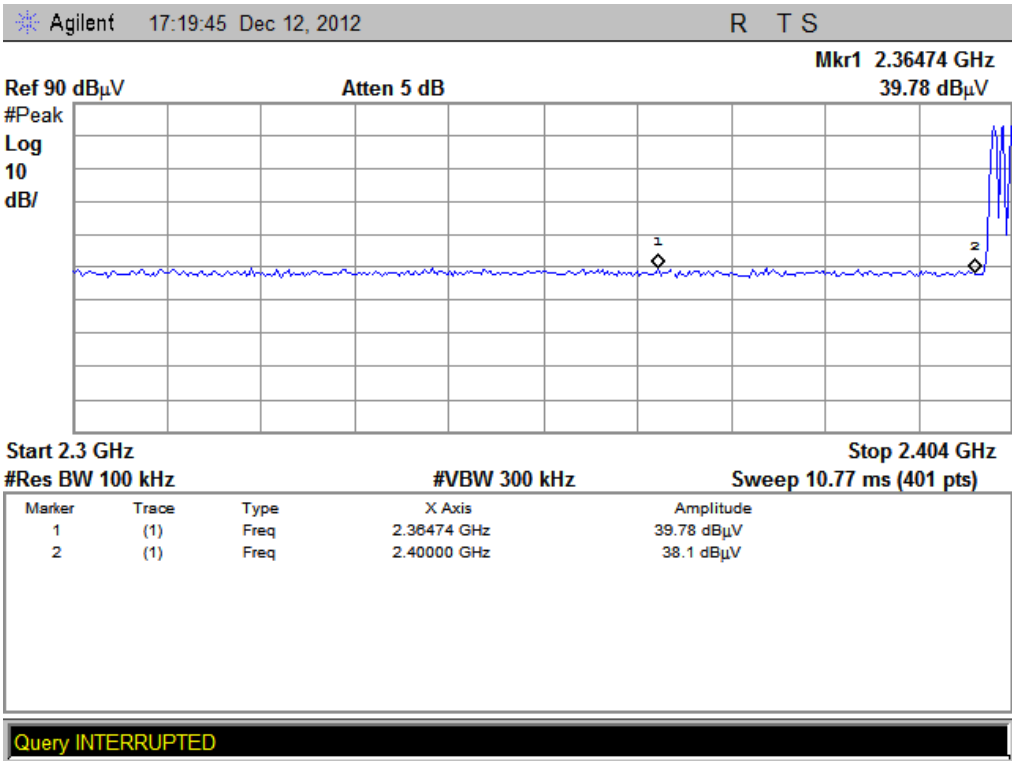
(Plot B1: Channel = 78 PEAK @ GFSK)



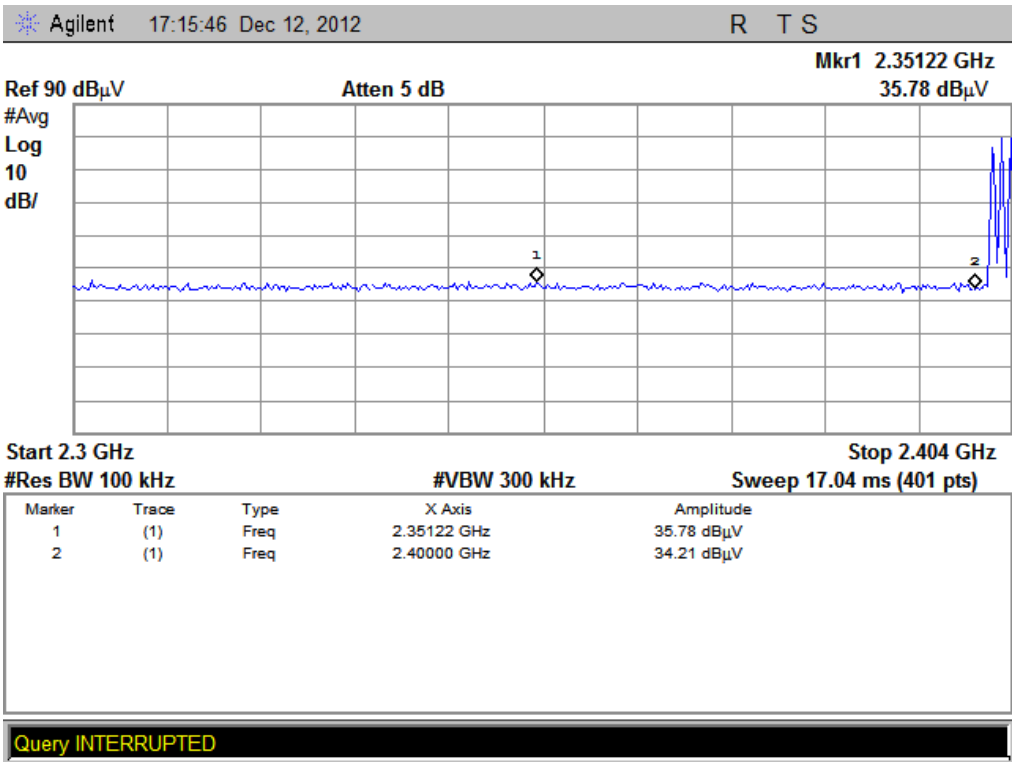
(Plot B2: Channel = 78 AVERAGE @ GFSK)

(hopping)

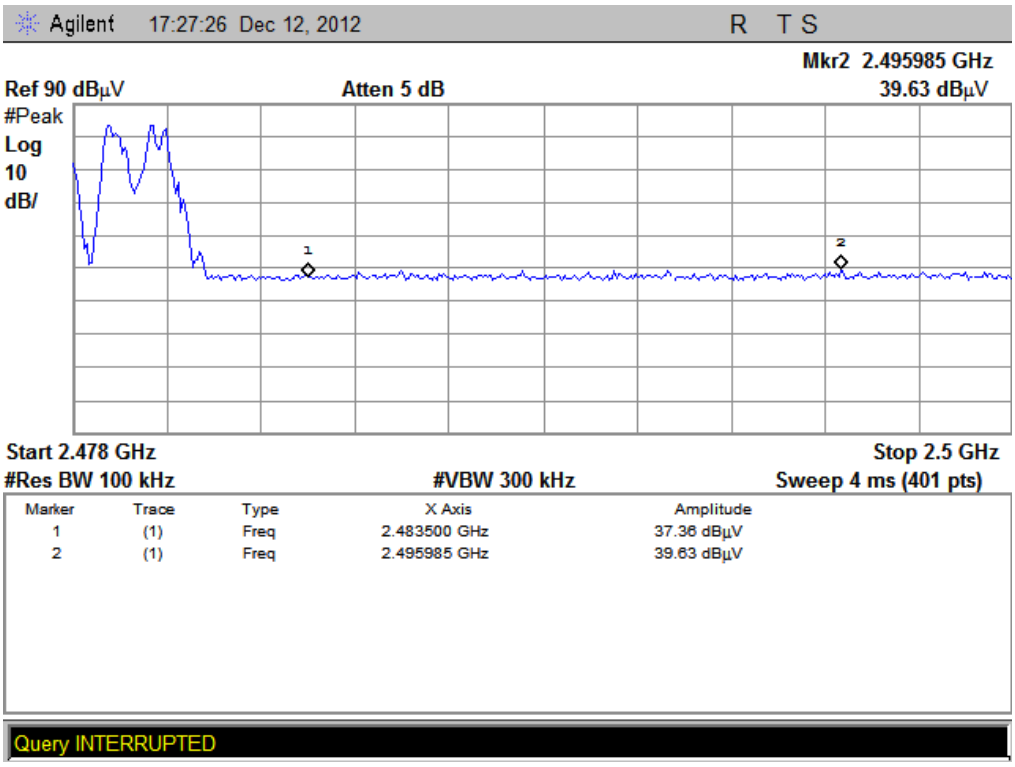
Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
0	2364.74	PK	39.78	-30.93	32.56	41.41	74	Pass
0	2351.22	AV	35.78	-30.93	32.56	37.41	54	Pass
78	2495.99	PK	39.63	-29.05	32.50	43.08	74	Pass
78	2488.23	AV	38.14	-29.05	32.50	41.59	54	Pass



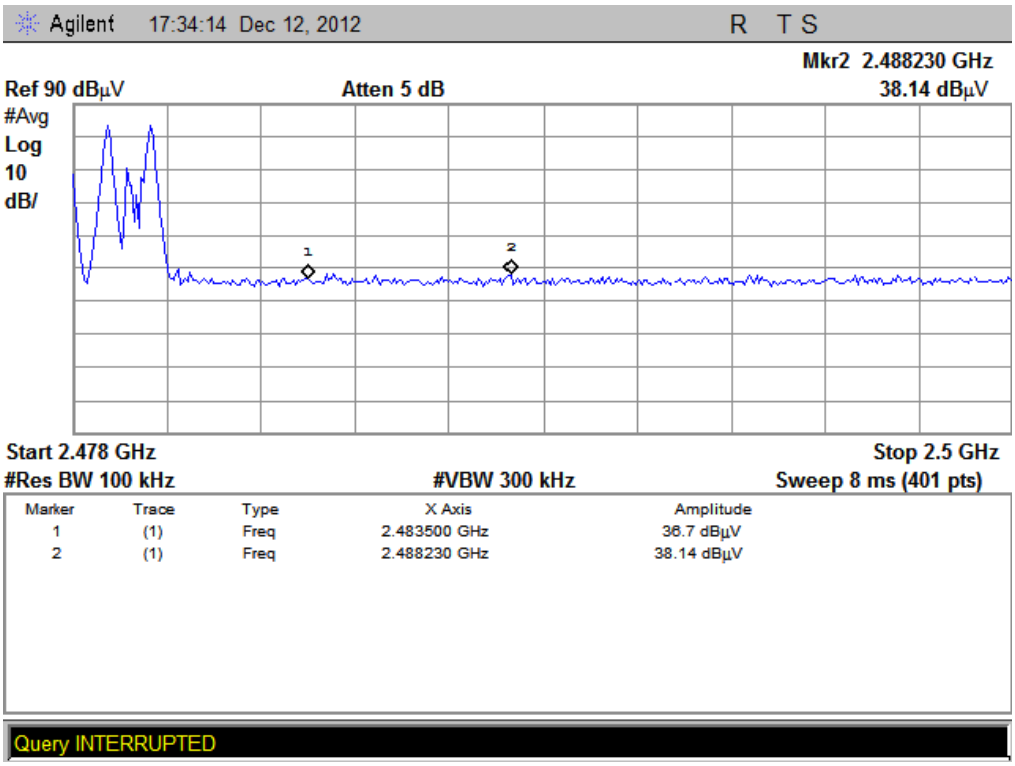
(Plot A1-1: Channel = 0 PEAK)



(Plot A2-1: Channel = 0 AVERAGE)



(Plot B1-1: Channel = 78 PEAK)



(Plot B2-1: Channel = 78 AVERAGE)

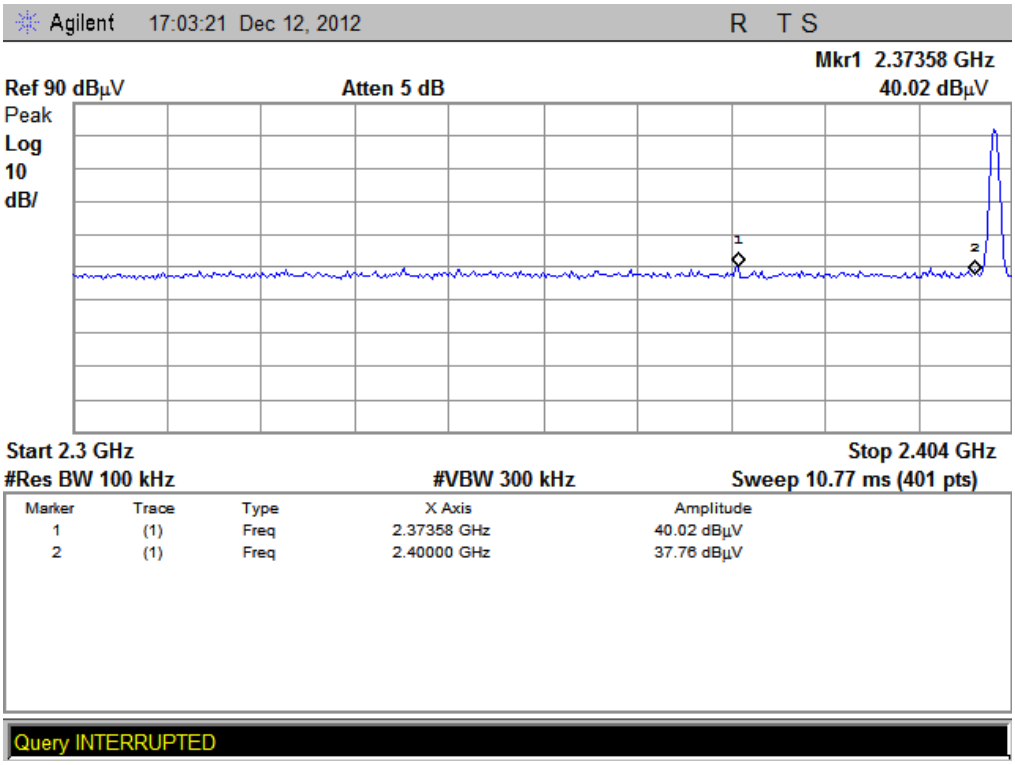
2.8.4.2. ∏/4-DQPSK Mode

A. Test Verdict:

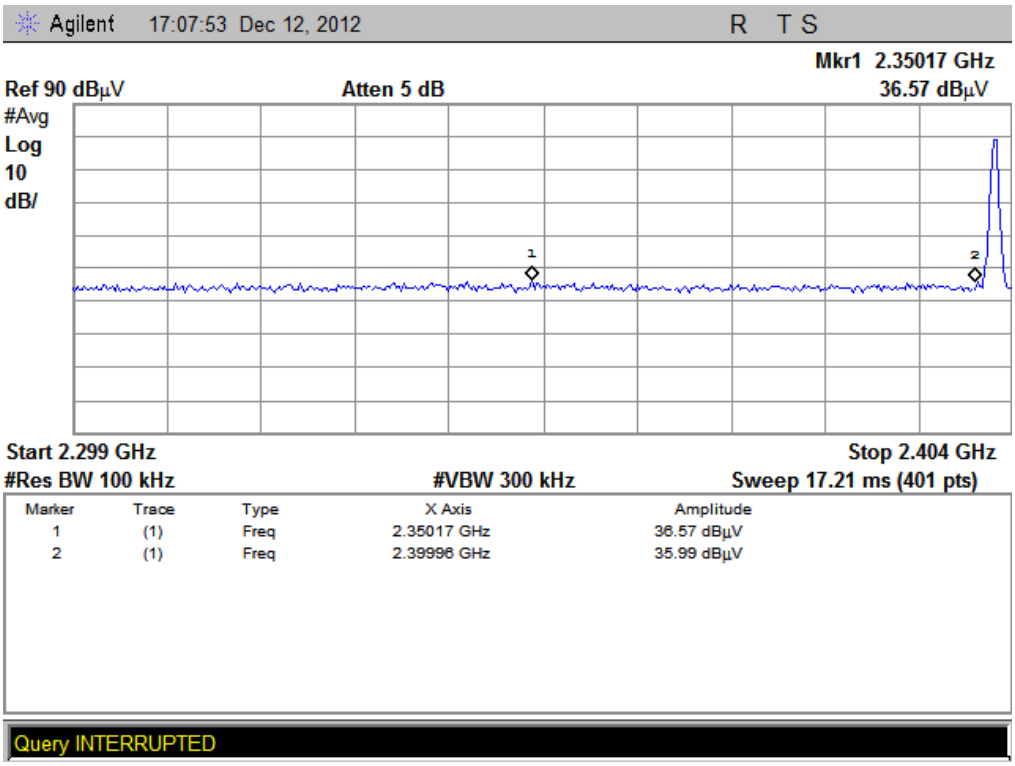
(Un-hopping)

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	2373.58	PK	40.02	-30.93	32.56	41.65	74	Pass
0	2350.17	AV	36.57	-30.93	32.56	38.20	54	Pass
78	2491.81	PK	38.60	-29.05	32.50	42.05	74	Pass
78	2495.11	AV	36.91	-29.05	32.50	40.36	54	Pass

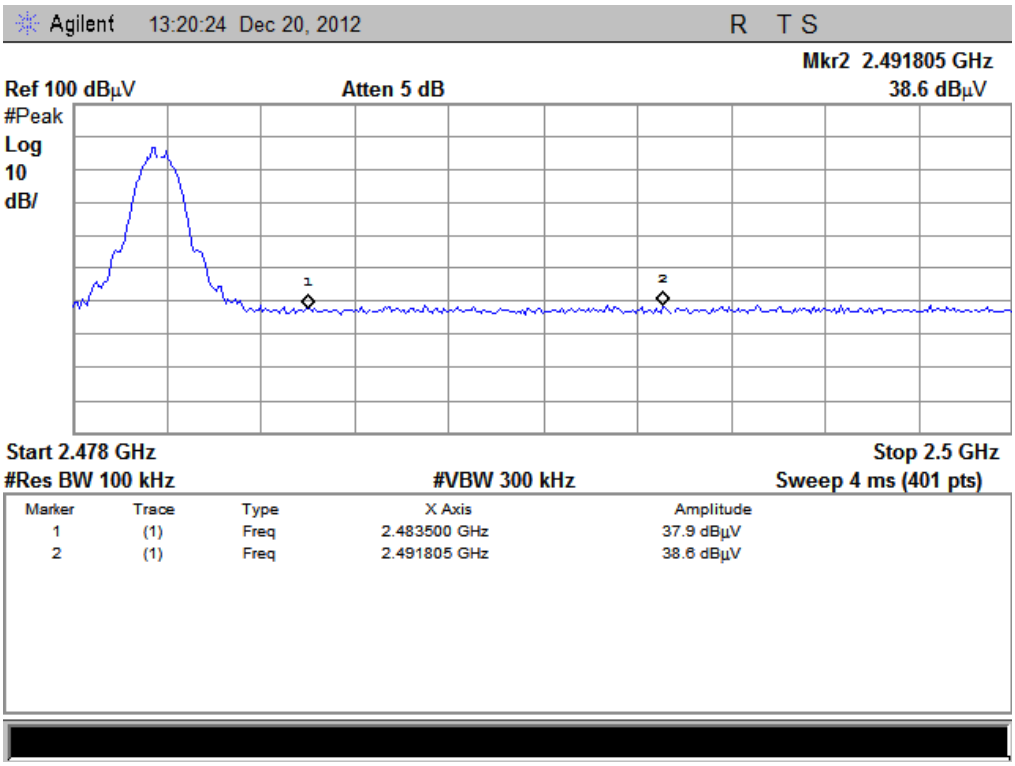
B. Test Plots:



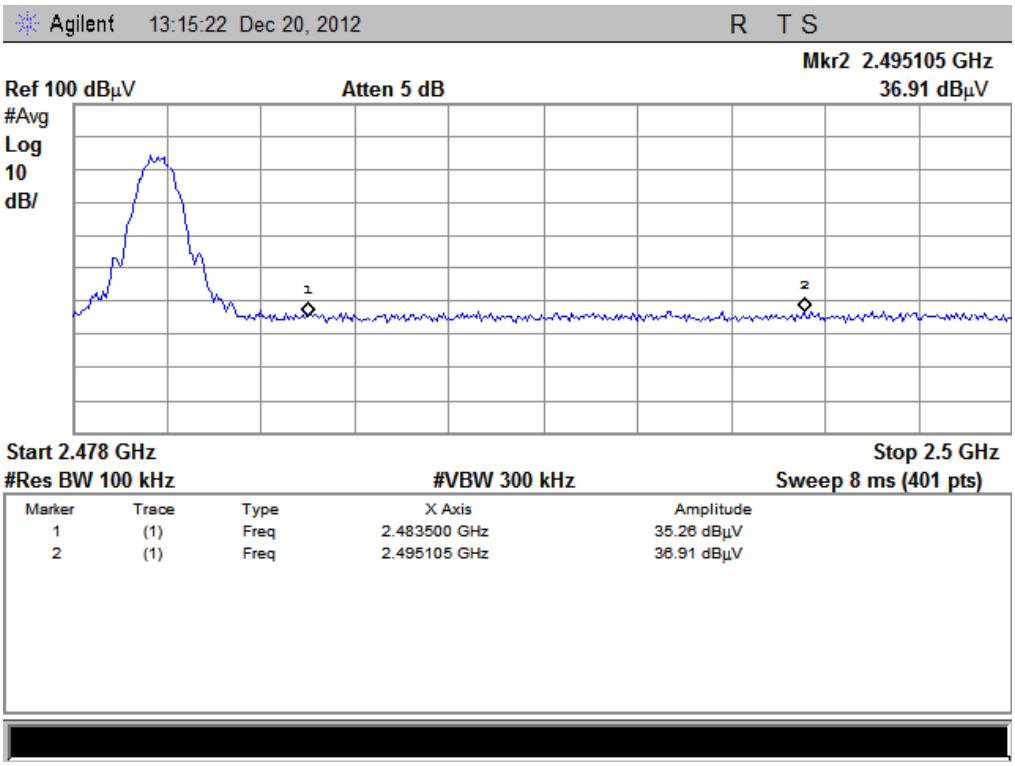
(Plot C1: Channel = 0 PEAK @ ∏/4-DQPSK)



(Plot C2: Channel = 0 AVERAGE @ ∏/4-DQPSK)



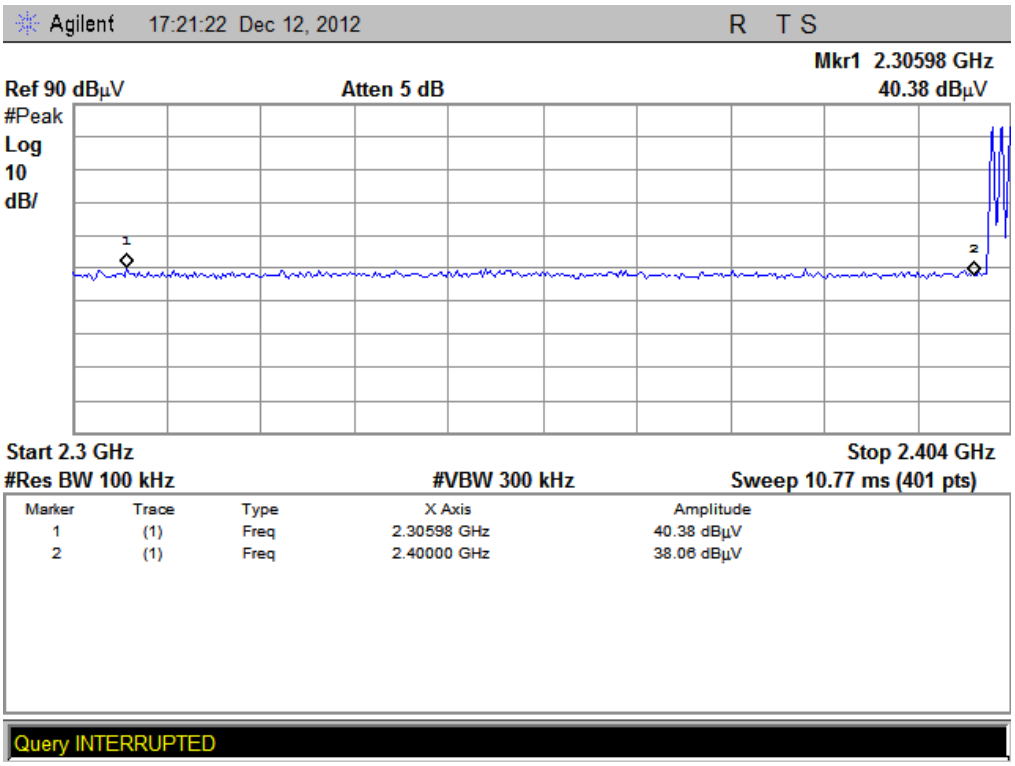
(Plot D1: Channel = 78 PEAK @ ∏/4-DQPSK)



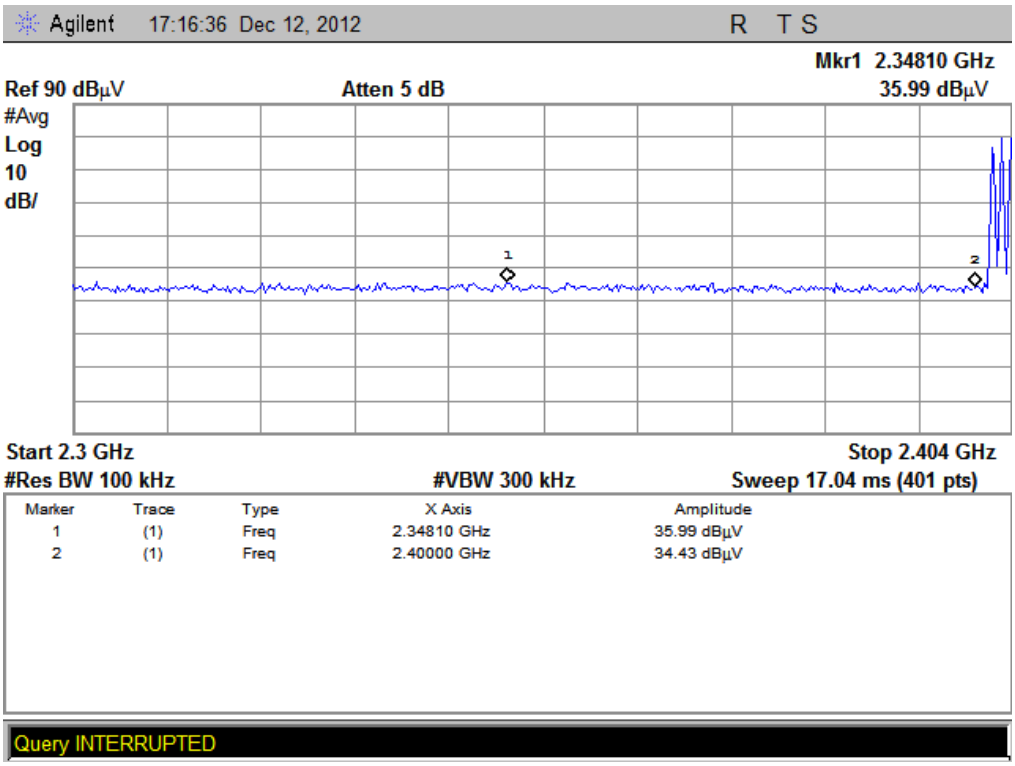
(Plot D2: Channel = 78 AVERAGE @ Π/4-DQPSK)

(hopping)

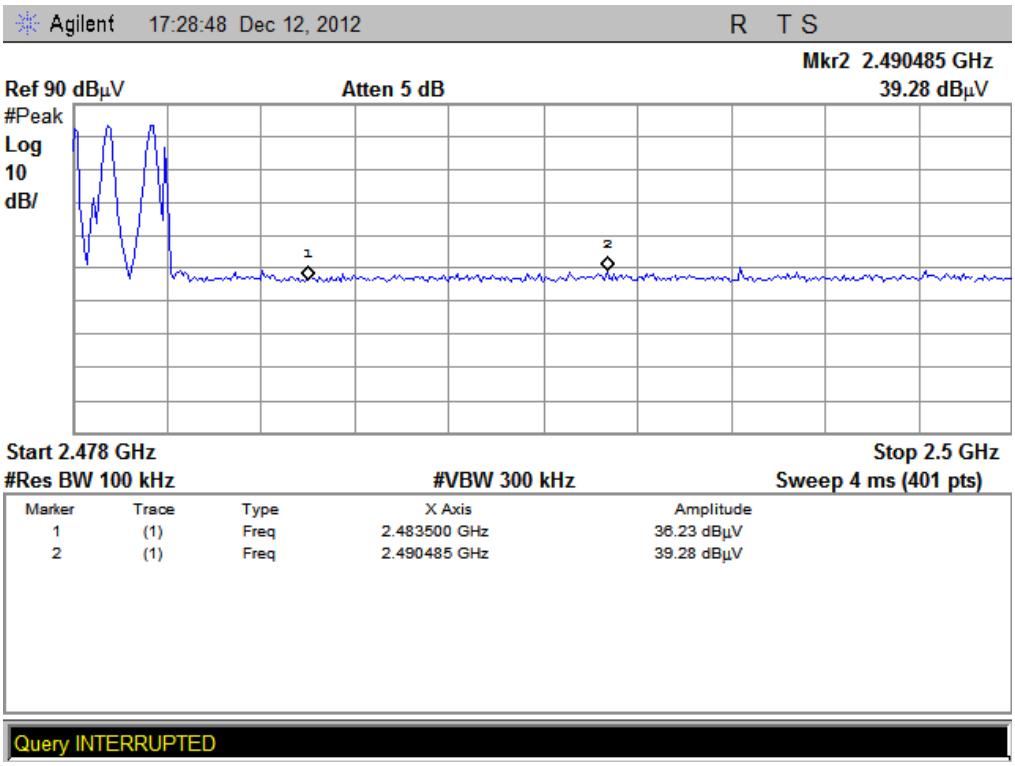
Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
0	2305.98	PK	40.38	-30.93	32.56	42.01	74	Pass
0	2348.10	AV	35.99	-30.93	32.56	37.62	54	Pass
78	2490.49	PK	39.28	-29.05	32.50	42.73	74	Pass
78	2488.45	AV	37.89	-29.05	32.50	41.34	54	Pass



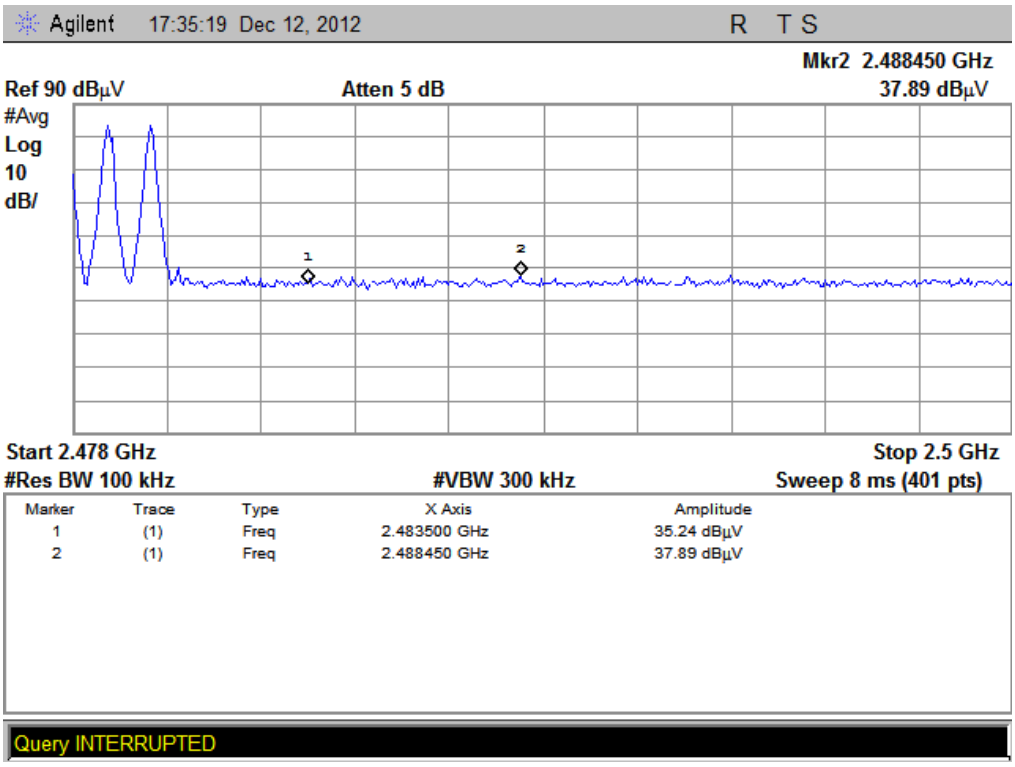
(Plot C1-1: Channel = 0 PEAK)



(Plot C2-1: Channel = 0 AVERAGE)



(Plot D1-1: Channel = 78 PEAK)



(Plot D2-1: Channel = 78 AVERAGE)

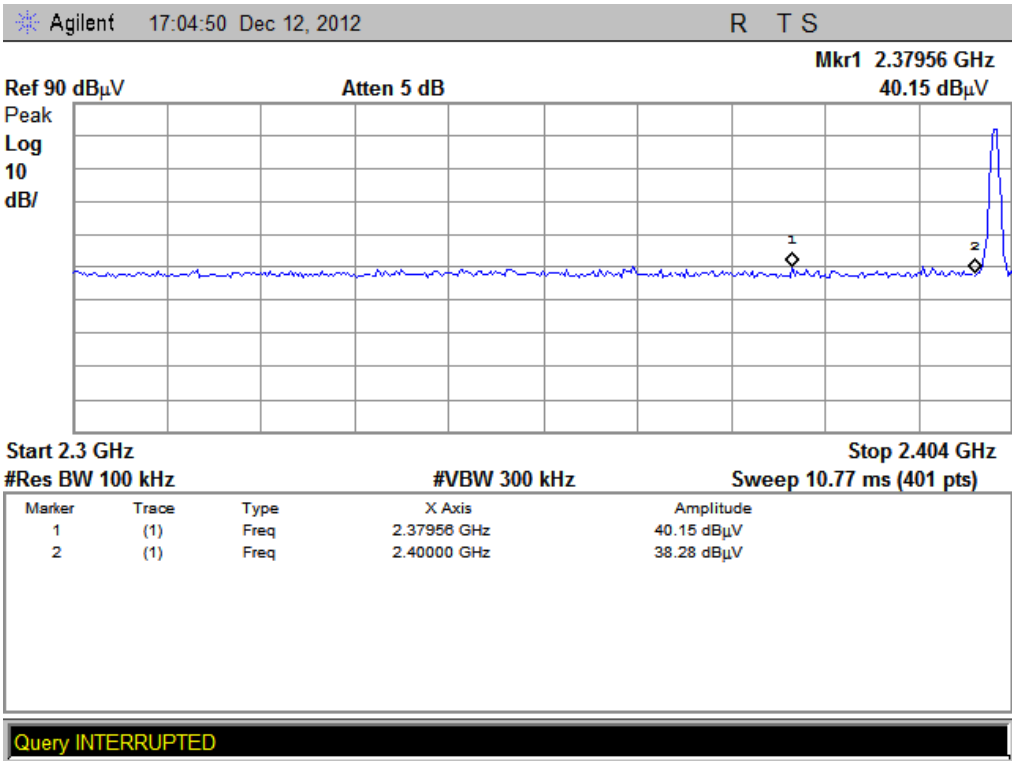
2.8.4.3. 8-DPSK Mode

A. Test Verdict:

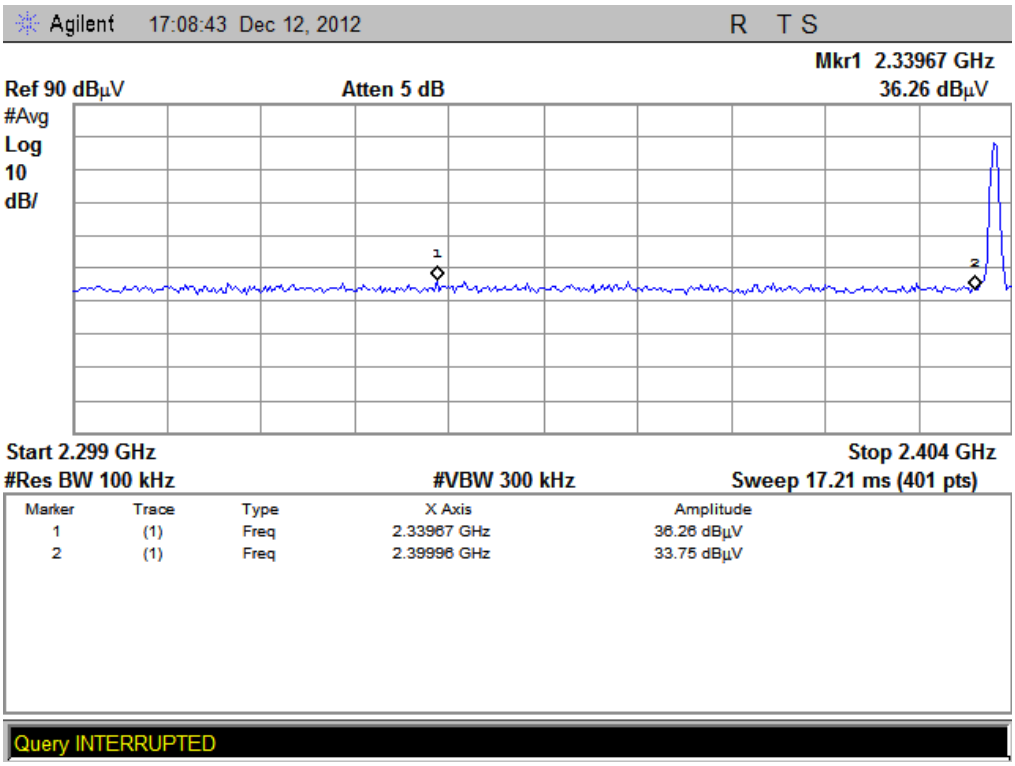
(Un-hopping)

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	2379.56	PK	40.15	-30.93	32.56	41.78	74	Pass
0	2339.67	AV	36.26	-30.93	32.56	37.89	54	Pass
78	2491.59	PK	39.09	-29.05	32.50	42.54	74	Pass
78	2487.02	AV	36.74	-29.05	32.50	40.19	54	Pass

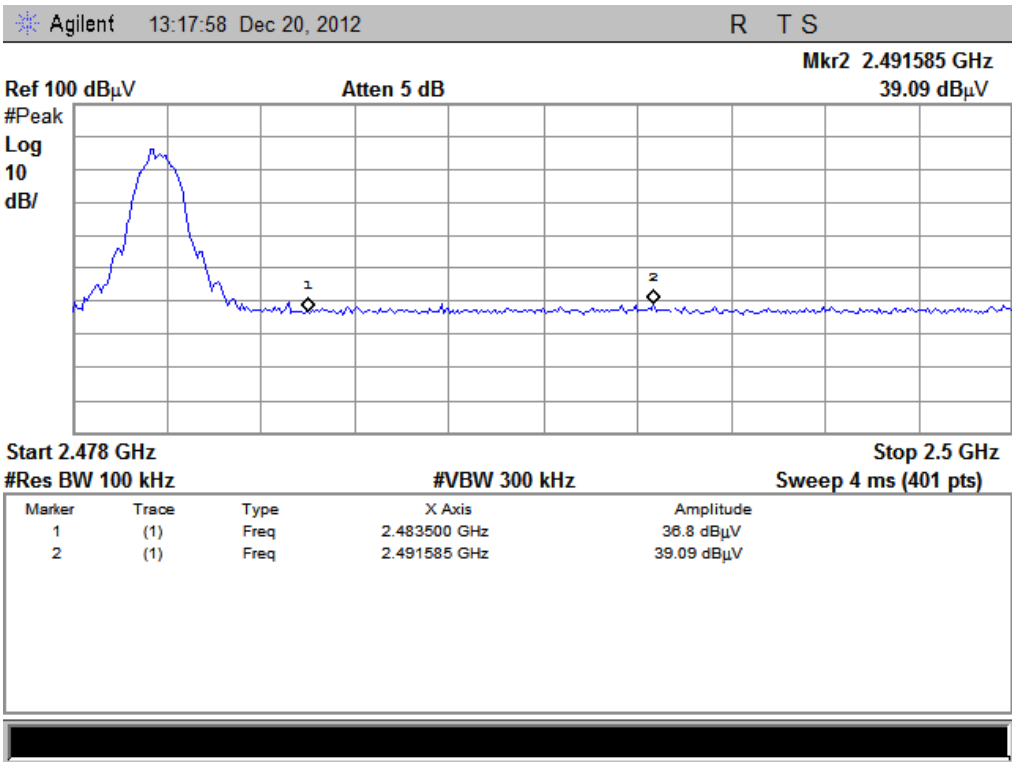
B. Test Plots:



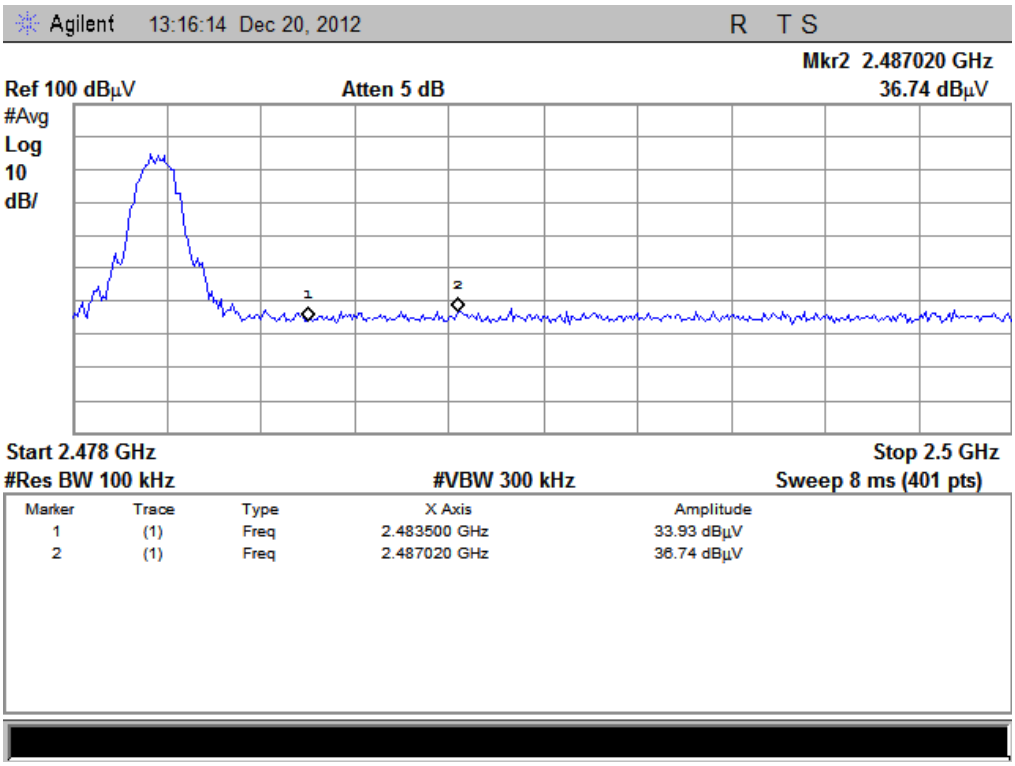
(Plot E1: Channel = 0 PEAK @ 8-DPSK Mode)



(Plot E2: Channel = 0 AVERAGE @ 8-DPSK Mode)



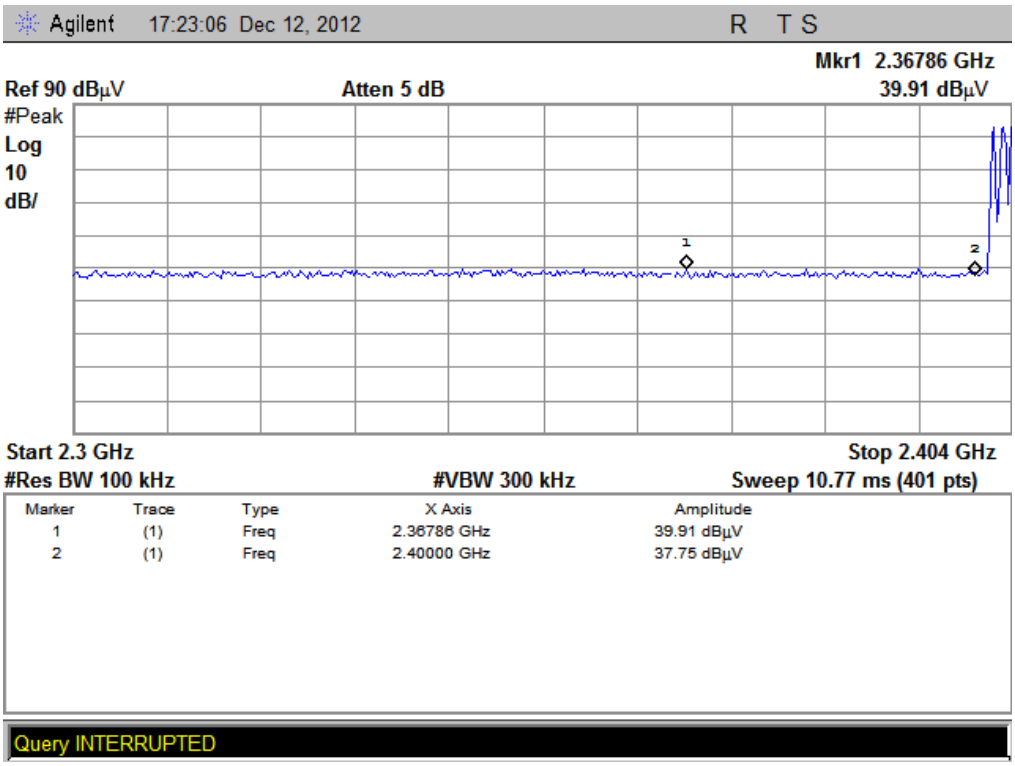
(Plot F1: Channel = 78 PEAK @ 8-DPSK Mode)



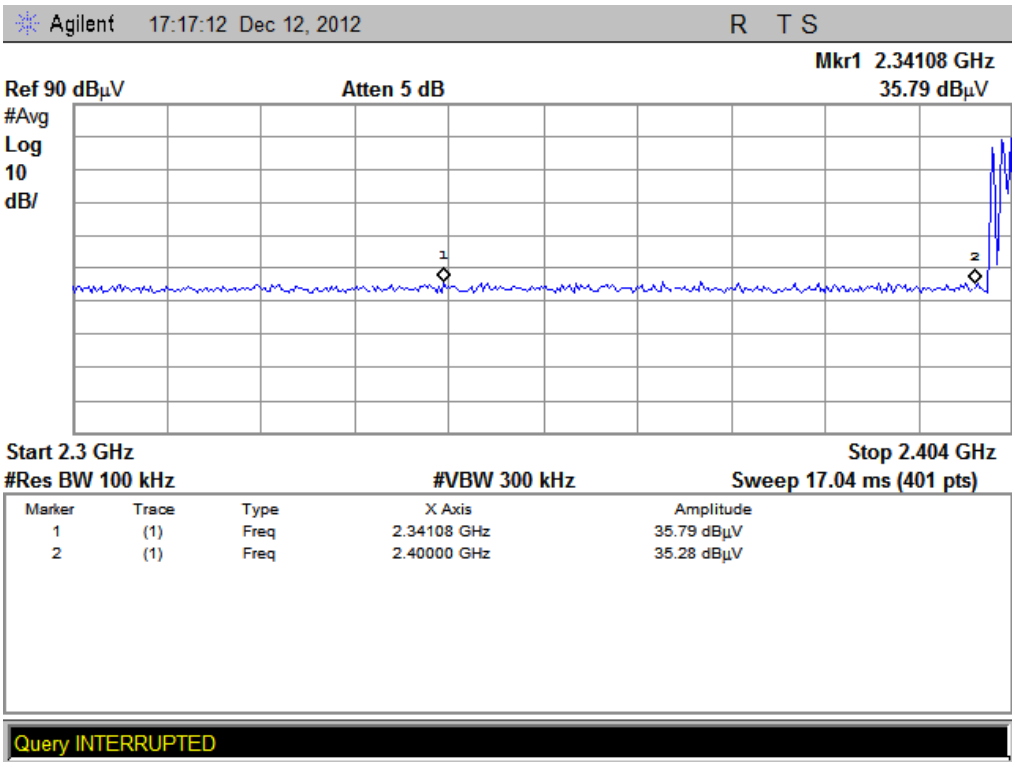
(Plot F2: Channel = 78 AVERAGE @ 8-DPSK Mode)

(hopping)

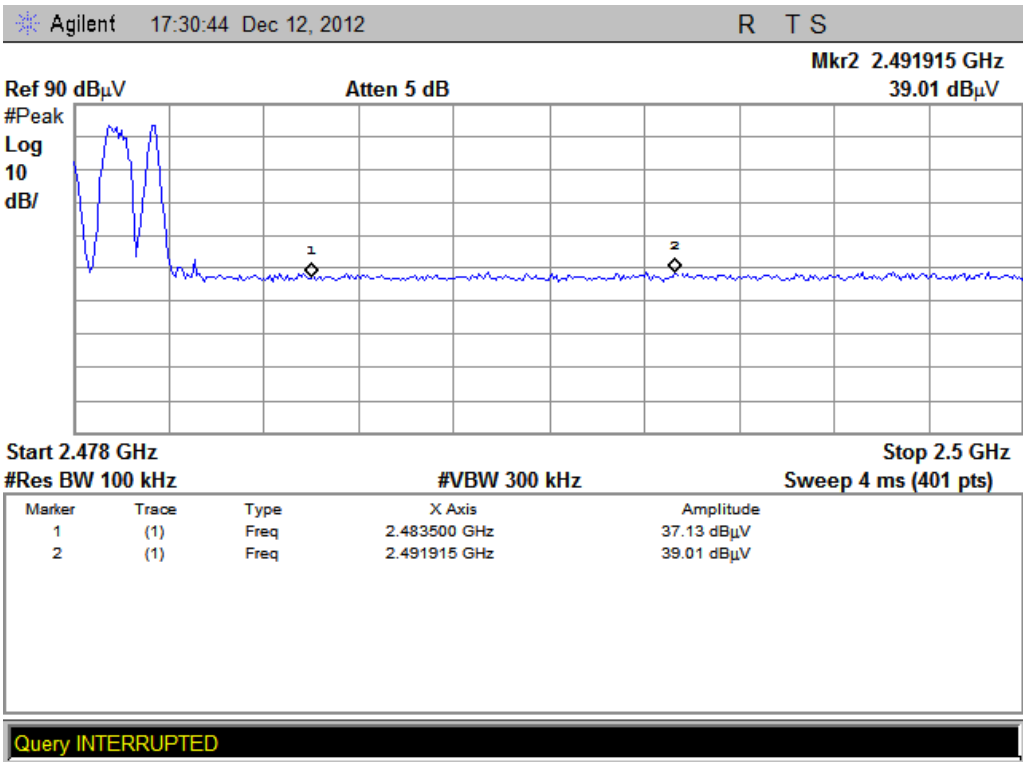
Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2367.86	PK	39.91	-30.93	32.56	41.54	74	Pass
0	2341.08	AV	35.79	-30.93	32.56	37.42	54	Pass
78	2491.92	PK	39.01	-29.05	32.50	42.46	74	Pass
78	2497.86	AV	37.31	-29.05	32.50	40.76	54	Pass



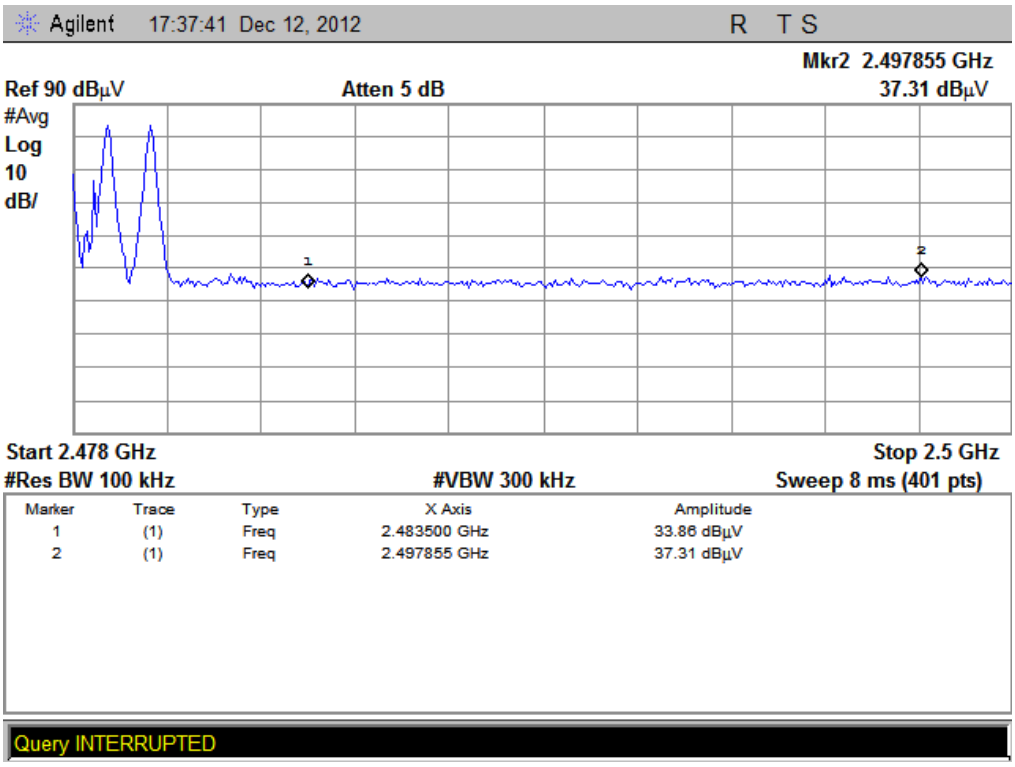
(Plot E1-1: Channel = 0 PEAK)



(Plot E2-1: Channel = 0 AVERAGE)



(Plot F1-1: Channel = 78 PEAK)



(Plot F2-1: Channel = 78 AVERAGE)

2.9. Conducted Emission

2.9.1. Requirement

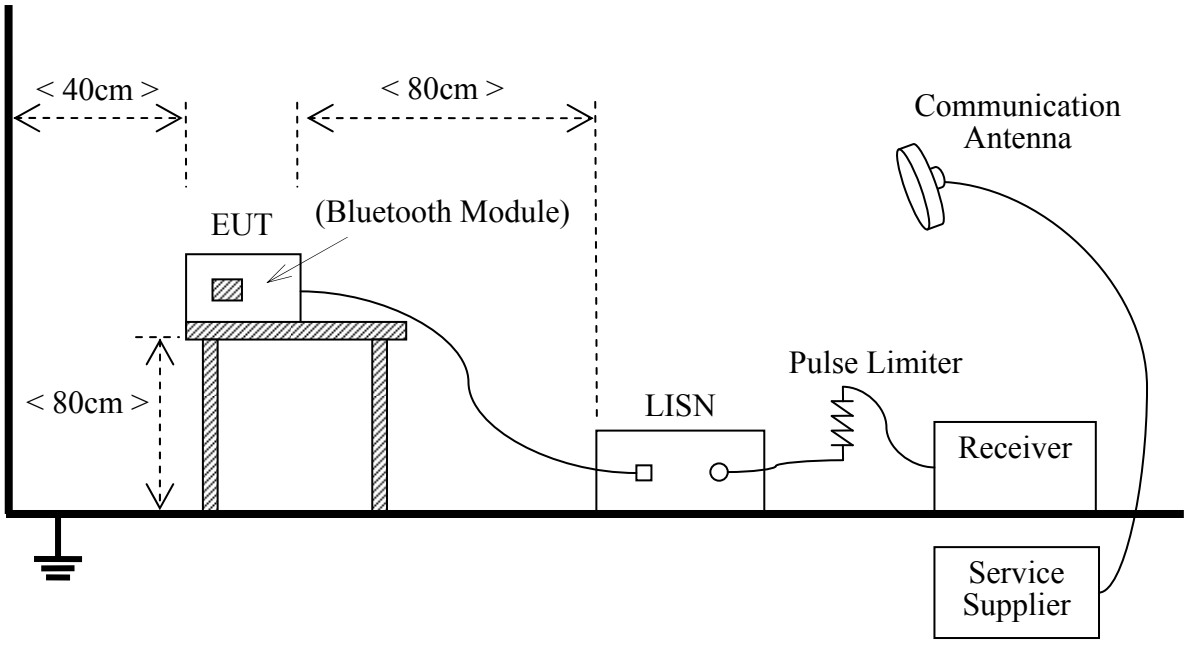
According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following 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.

Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2012.05	2013.05
LISN	Schwarzbeck	NSLK 8127	812744	2012.05	2013.05
Service Supplier	R&S	CMU200	100448	2012.05	2013.05
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	2012.05	2013.05

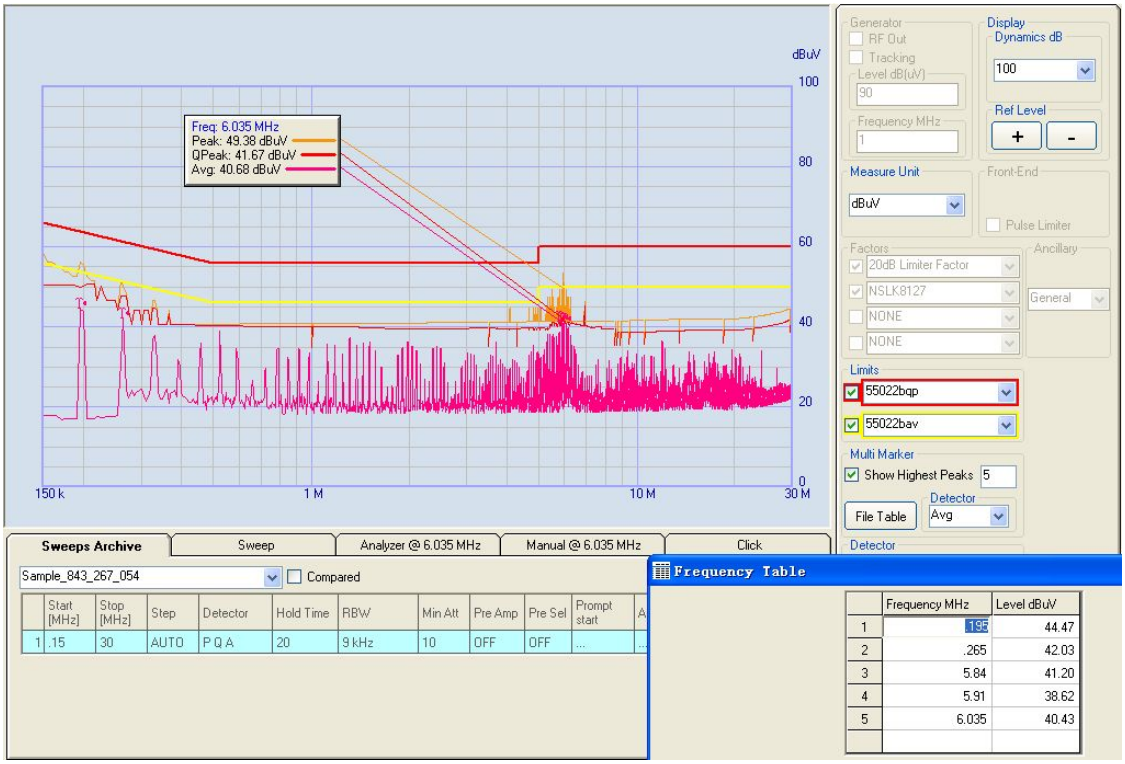
2.9.3. Test Result

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.

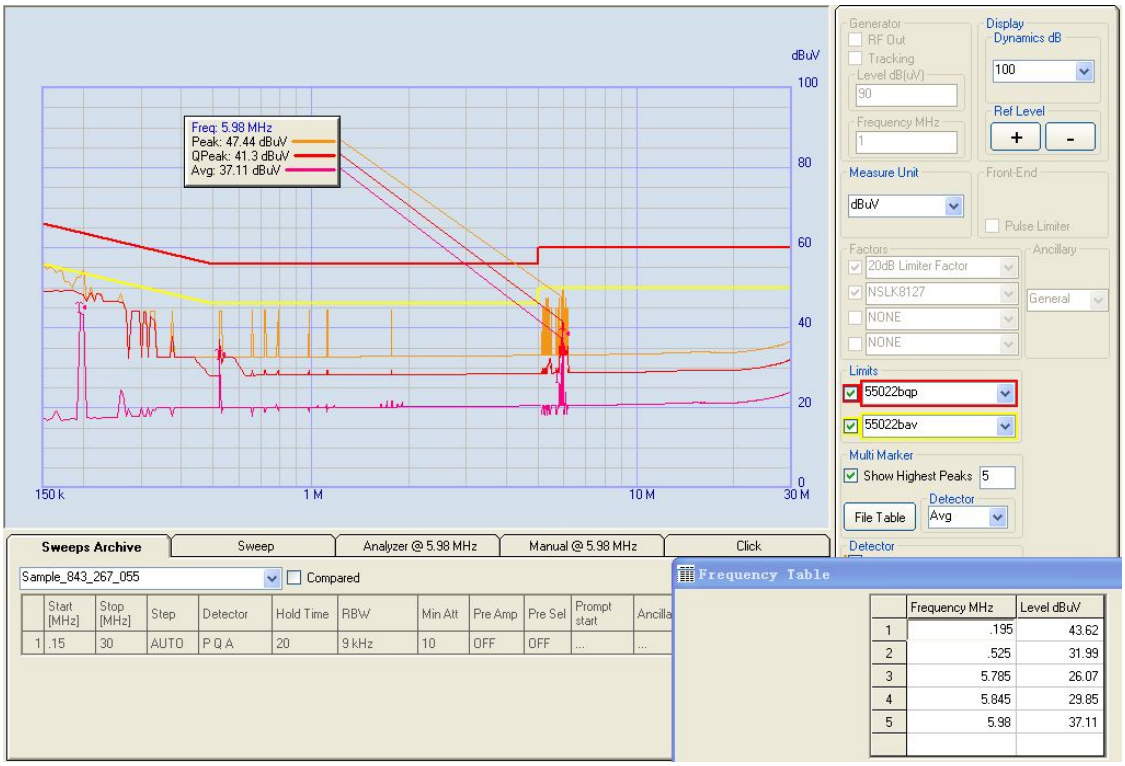
A. Test setup:

The EUT configuration of the emission tests is EUT + Charger.

B. Test Plots:



(Plot A: L Phase)



(Plot B: N Phase)

2.10. Radiated Emission

2.10.1. Requirement

According to FCC section 15.247(c) and RSS-A8.5, 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:

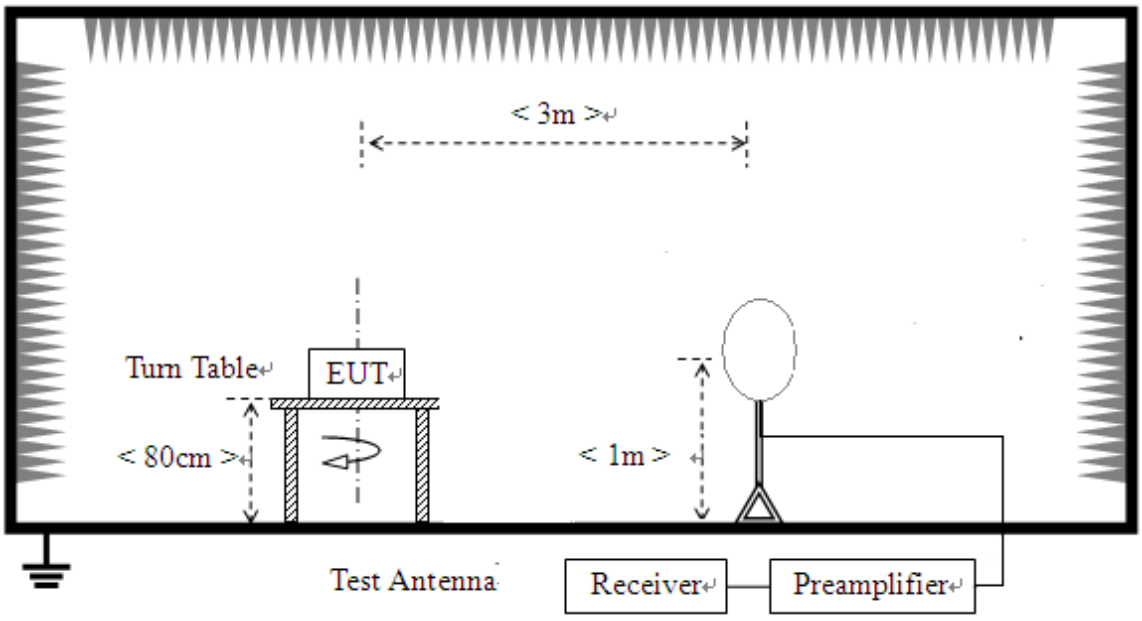
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength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

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

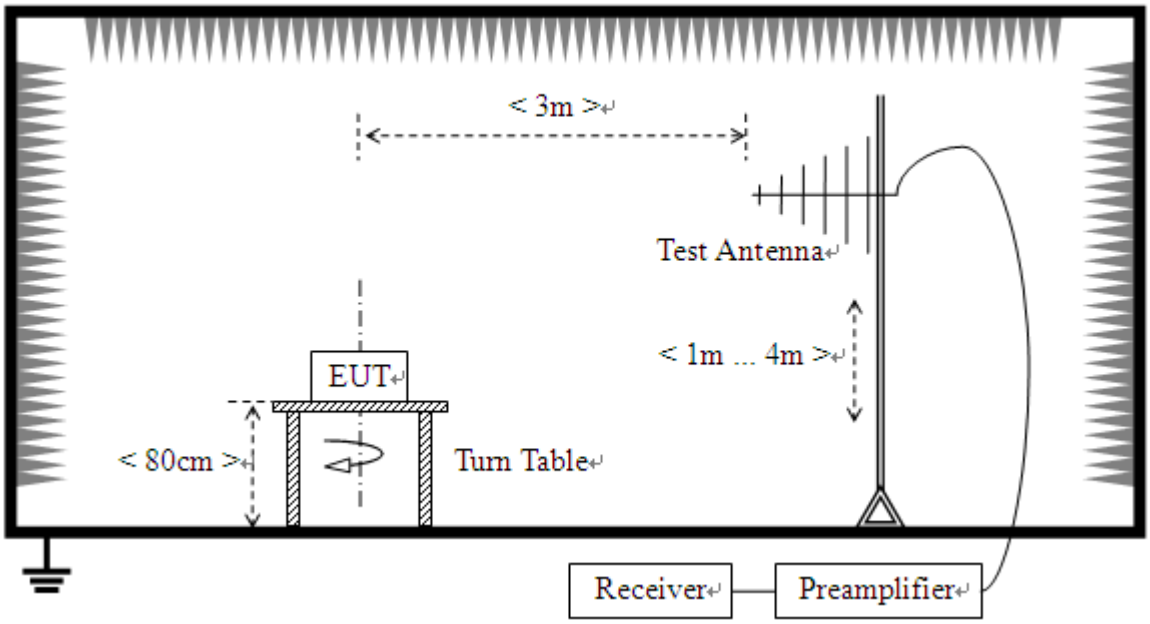
2.10.2. Test Description

A. Test Setup:

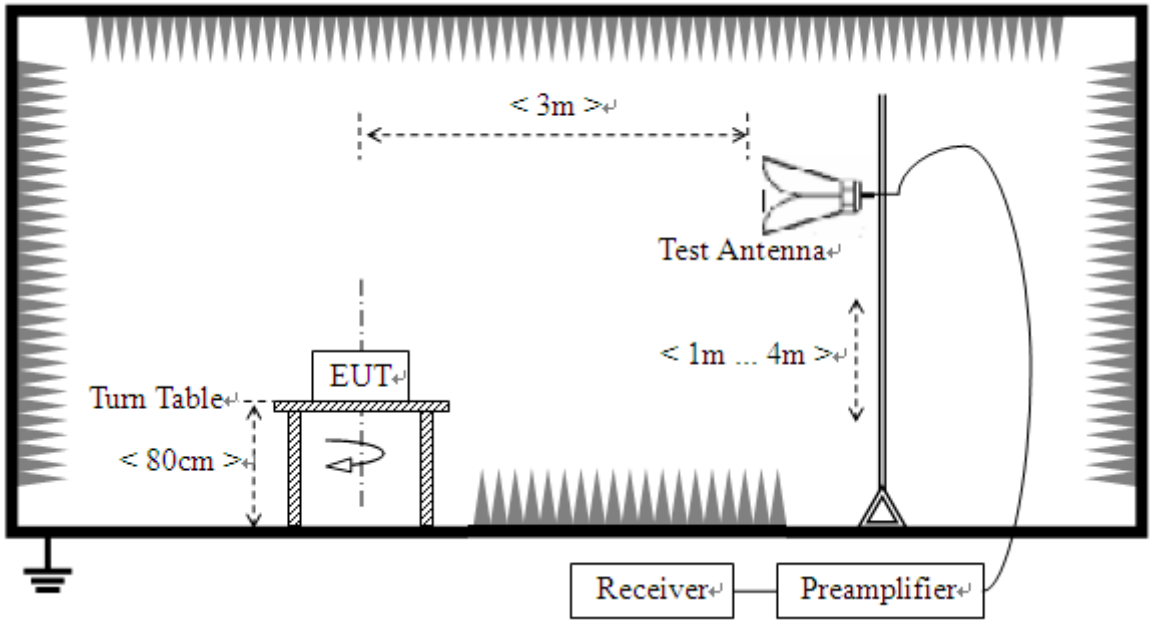
1) For radiated emissions from 9kHz to 30MHz



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.

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:

(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	2012.05	2013.05
Receiver	Agilent	E7405A	US44210471	2012.05	2013.05
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05	2014.05
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2012.05	2013.05
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2012.05	2013.05

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Test Antenna - Horn	R&S	HL050S7	71688	2012.05	2013.05
Test Antenna - Loop	Schwarzbeck	FMZB 1519	1519-022	2012.05	2013.05

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.

2.10.4.1. GFSK Mode:

A. Test Verdict for Harmonics:

The Fundamental Emissions

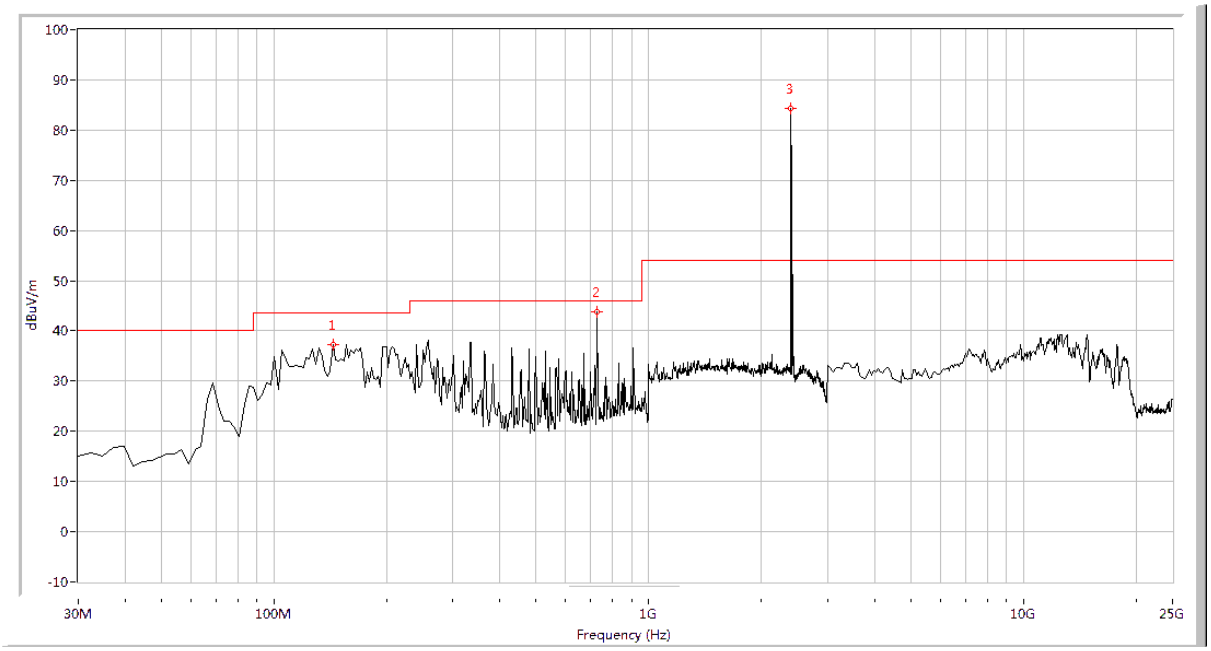
The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	84.26	N/A	Horizontal	Plot A.1
		83.70	N/A	Vertical	Plot A.2
39	2441	85.55	N/A	Horizontal	Plot B.1
		84.76	N/A	Vertical	Plot B.2
78	2480	84.94	N/A	Horizontal	Plot C.1
		83.29	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

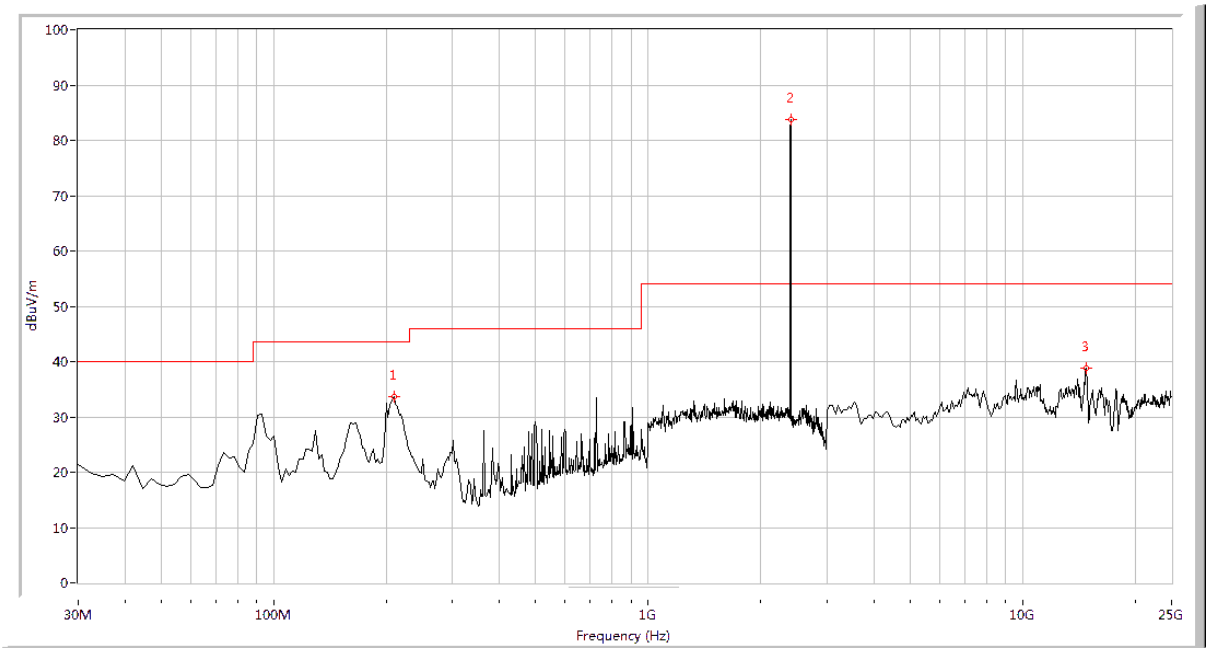
Plots for Channel = 0

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



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
143.691	37.18	N.A	N.A	N.A	43.5	N.A	335.3	Horizontal	PASS
729.077	43.76	N.A	N.A	N.A	46.0	N.A	318.2	Horizontal	PASS
2402.000	84.26	N.A	N.A	74.0	N.A	54.0	147.8	Horizontal	N.A

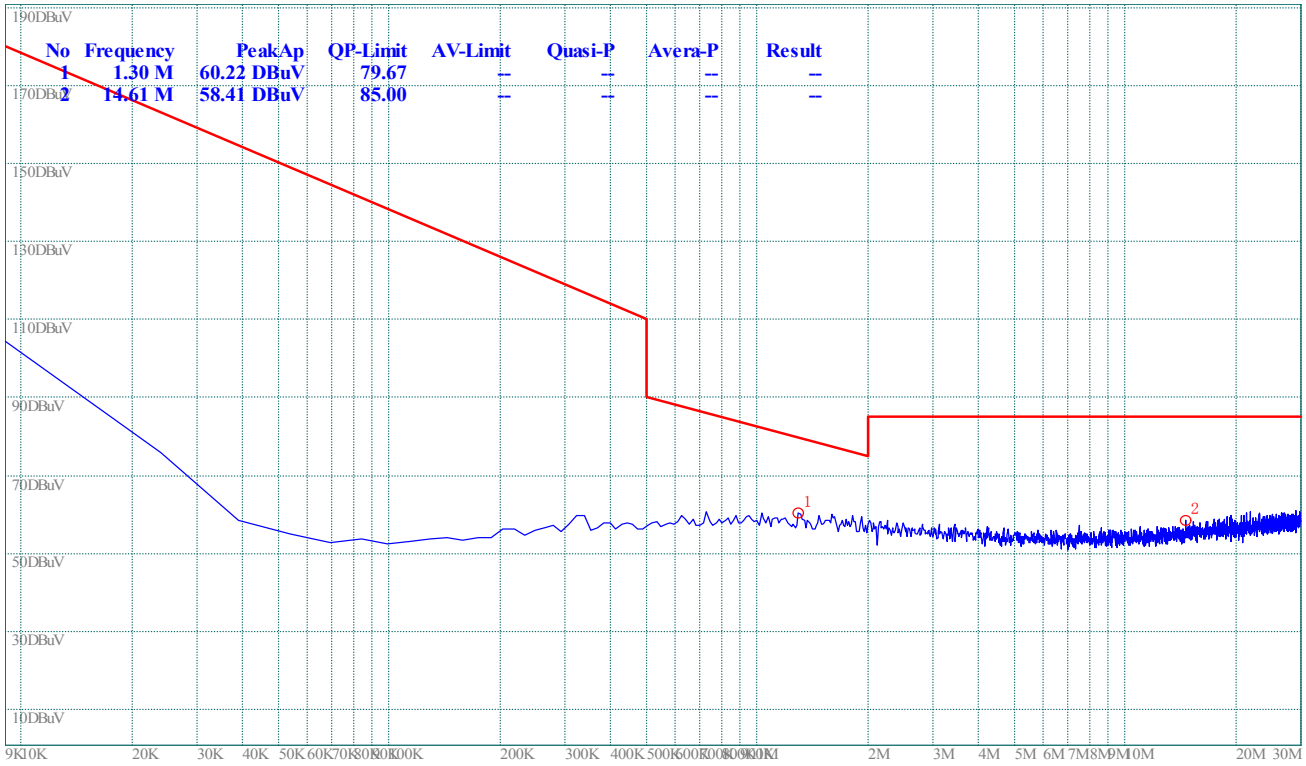
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 0)



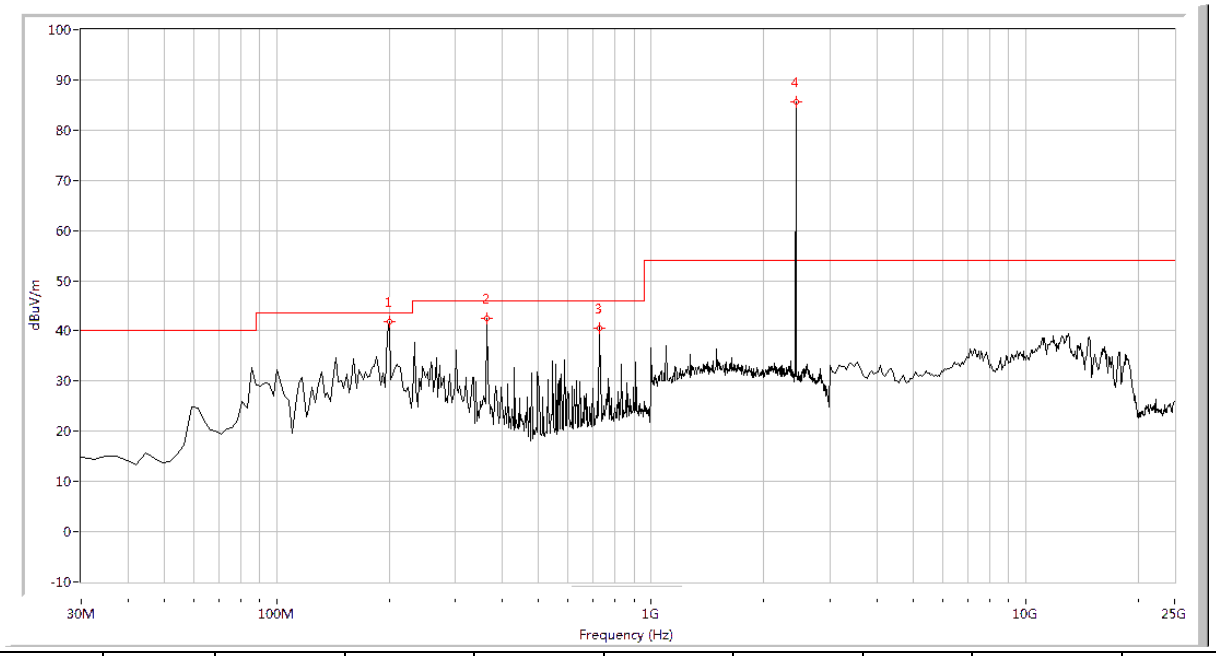
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
209.002	33.67	N.A	N.A	N.A	43.5	N.A	0.0	Vertical	PASS
2402.000	83.70	N.A	N.A	74.0	N.A	54.0	0.0	Vertical	N.A
14795.511	38.84	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

Plot for Channel = 39

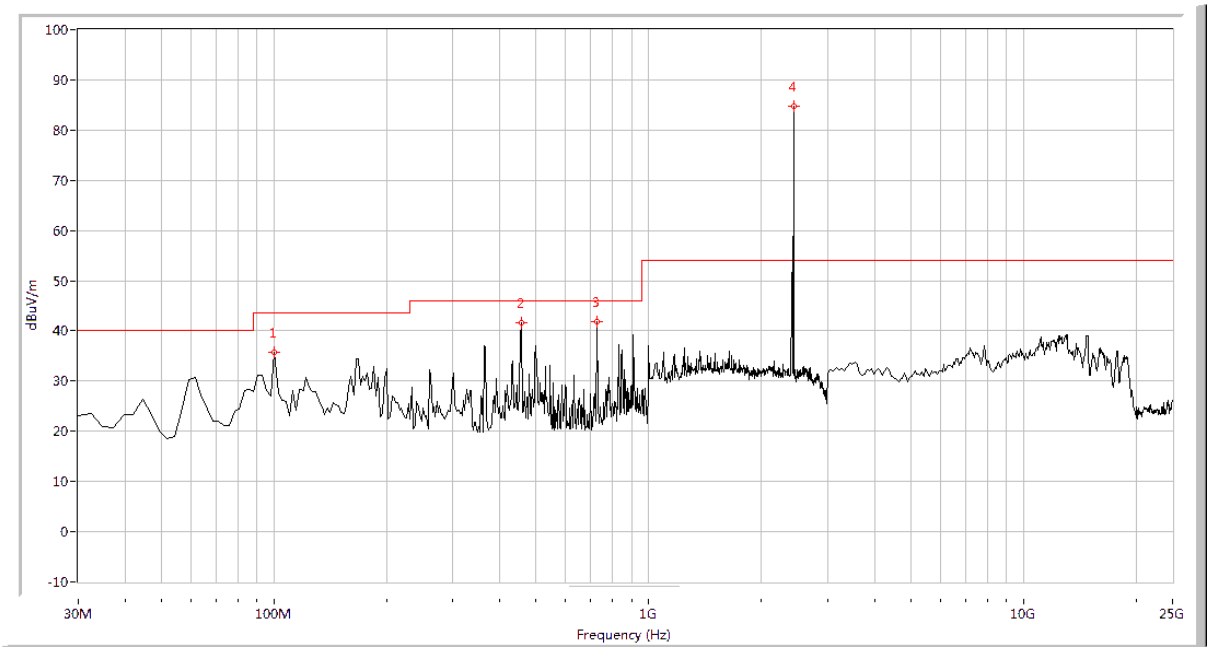


(Plot B.0: 9kHz to 30MHz @ GFSK, channel 39)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
199.327	41.76	N.A	N.A	N.A	43.5	N.A	360.0	Horizontal	PASS
363.815	42.48	N.A	N.A	N.A	46.0	N.A	330.2	Horizontal	PASS
726.658	40.57	N.A	N.A	N.A	46.0	N.A	59.1	Horizontal	PASS
2441.000	85.55	N.A	N.A	74.0	N.A	54.0	217.5	Horizontal	N.A

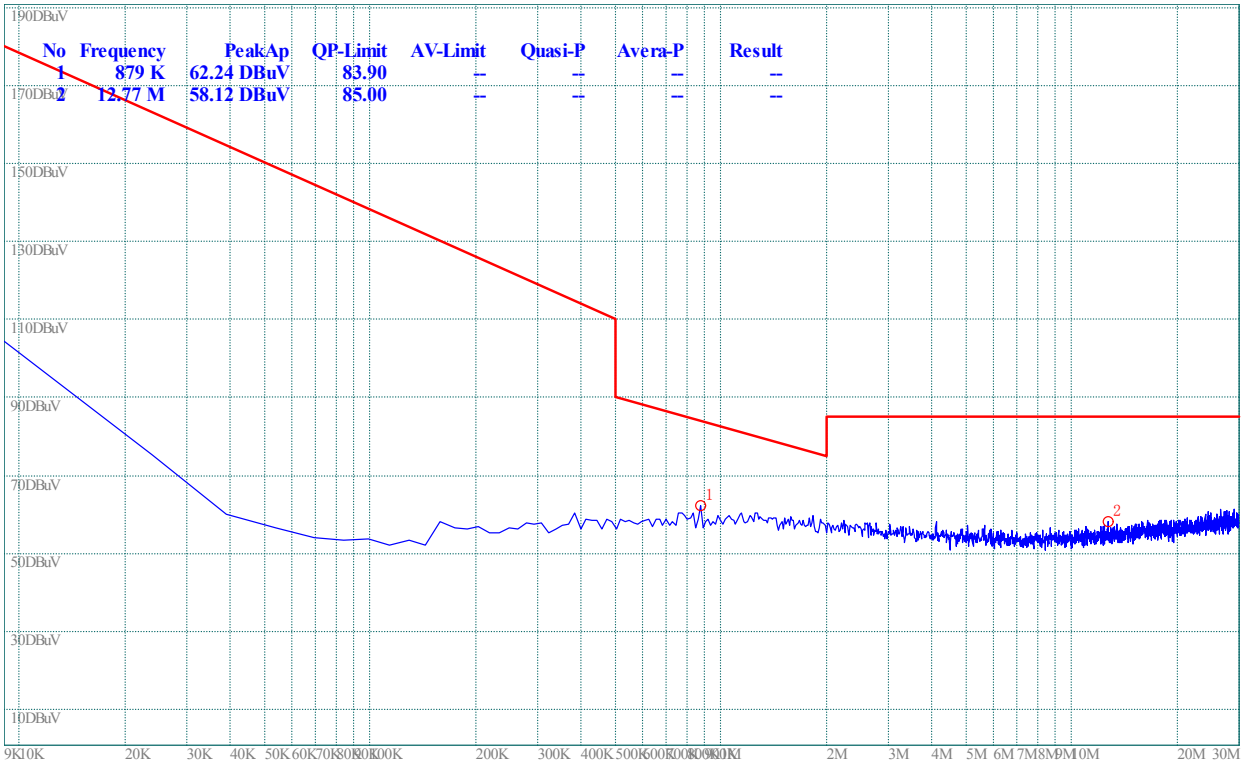
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 39)



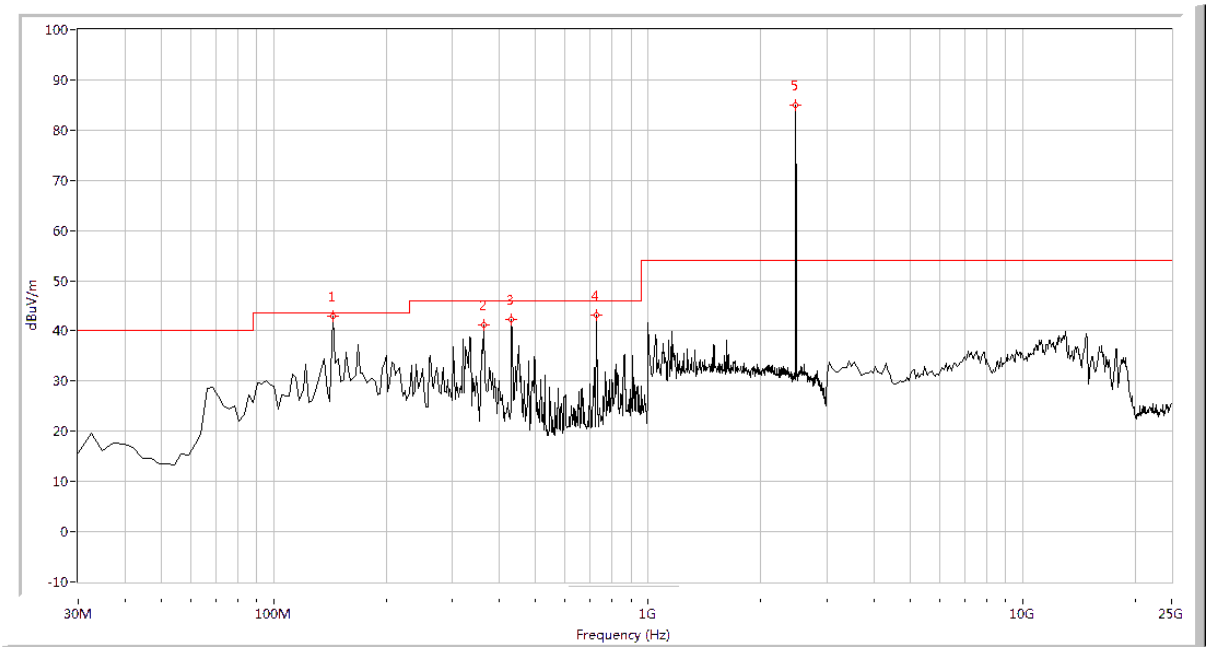
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
100.150	35.77	N.A	N.A	N.A	43.5	N.A	37.5	Vertical	PASS
458.155	41.55	N.A	N.A	N.A	46.0	N.A	142.8	Vertical	PASS
729.077	41.83	N.A	N.A	N.A	46.0	N.A	94.6	Vertical	PASS
2441.000	84.76	N.A	N.A	74.0	N.A	54.0	217.2	Vertical	N.A

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

Plot for Channel = 78

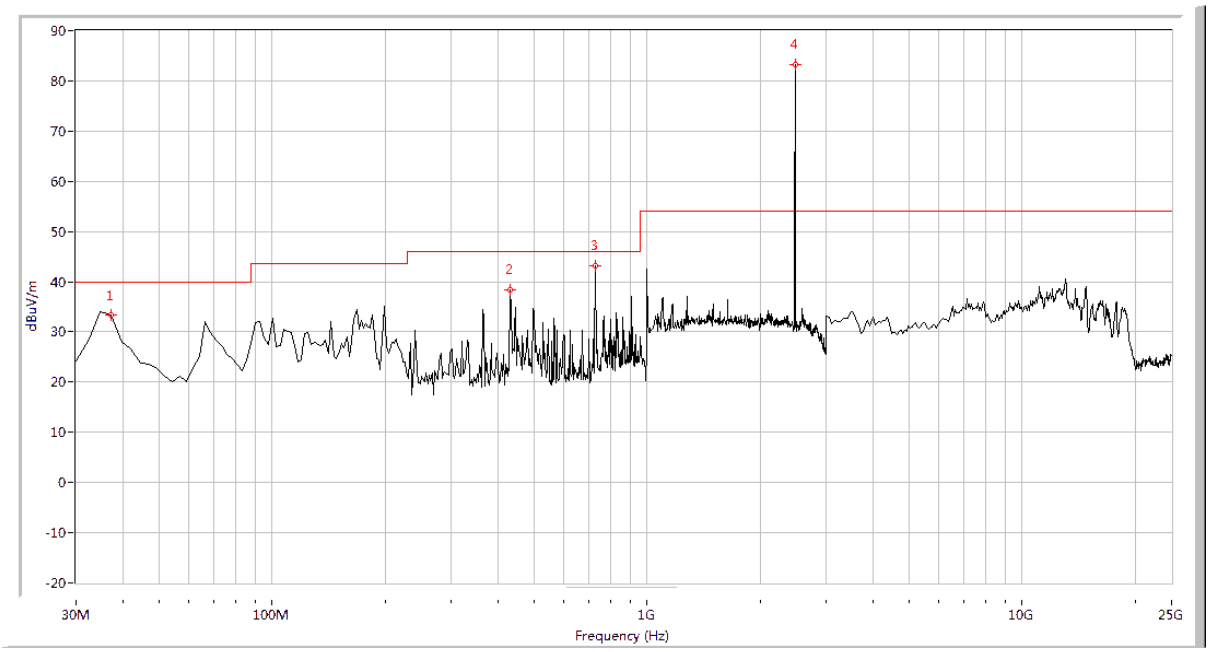


(Plot C.0: 9kHz to 30MHz @ GFSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
143.691	42.98	N.A	N.A	N.A	43.5	N.A	107.3	Horizontal	PASS
363.815	41.28	N.A	N.A	N.A	46.0	N.A	266.3	Horizontal	PASS
431.546	42.18	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
726.658	43.13	N.A	N.A	N.A	46.0	N.A	131.4	Horizontal	PASS
2480.000	84.94	N.A	N.A	74.0	N.A	54.0	30.1	Horizontal	N.A

(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
37.257	33.40	N.A	N.A	N.A	40.0	N.A	131.0	Vertical	PASS
431.546	38.31	N.A	N.A	N.A	46.0	N.A	83.7	Vertical	PASS
729.077	43.25	N.A	N.A	N.A	46.0	N.A	73.0	Vertical	PASS
2480.000	83.29	N.A	N.A	74.0	N.A	54.0	33.8	Vertical	N.A

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

2.10.4.2. π/4-DQPSK Mode:

A. Test Verdict for Harmonics:

The Fundamental Emissions

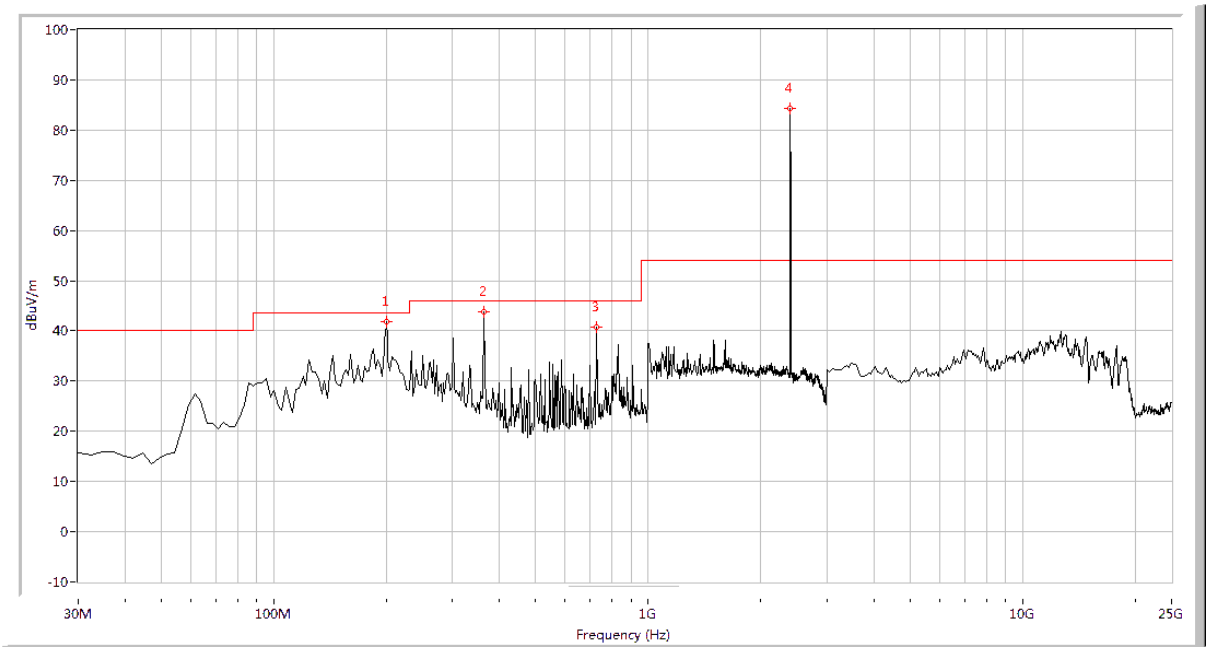
The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	84.41	N/A	Horizontal	Plot A.1
		84.58	N/A	Vertical	Plot A.2
39	2441	84.10	N/A	Horizontal	Plot B.1
		82.78	N/A	Vertical	Plot B.2
78	2480	83.29	N/A	Horizontal	Plot C.1
		83.04	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

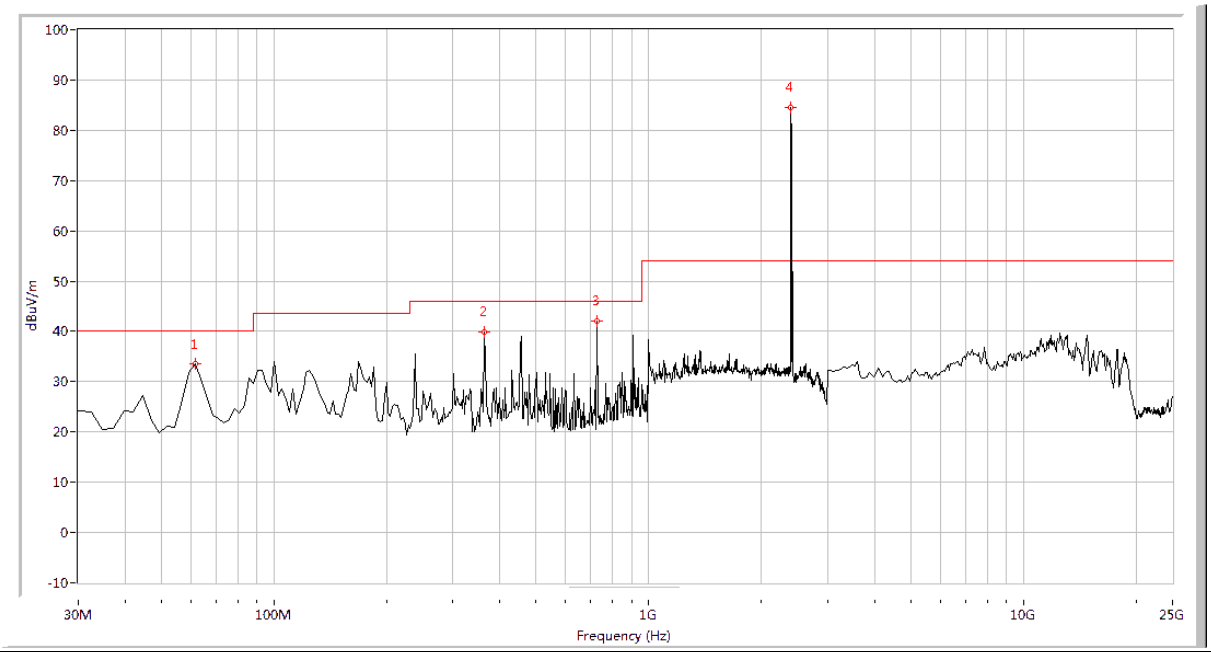
Plots for Channel = 0

(Plot A.0: 9kHz to 30MHz @ π/4-DQPSK, channel 0)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
199.327	41.25	N.A	N.A	N.A	43.5	N.A	323.4	Horizontal	PASS
363.815	43.76	N.A	N.A	N.A	46.0	N.A	323.4	Horizontal	PASS
729.077	40.86	N.A	N.A	N.A	46.0	N.A	49.6	Horizontal	PASS
2402.000	84.41	N.A	N.A	74.0	N.A	74.0	96.5	Horizontal	N.A

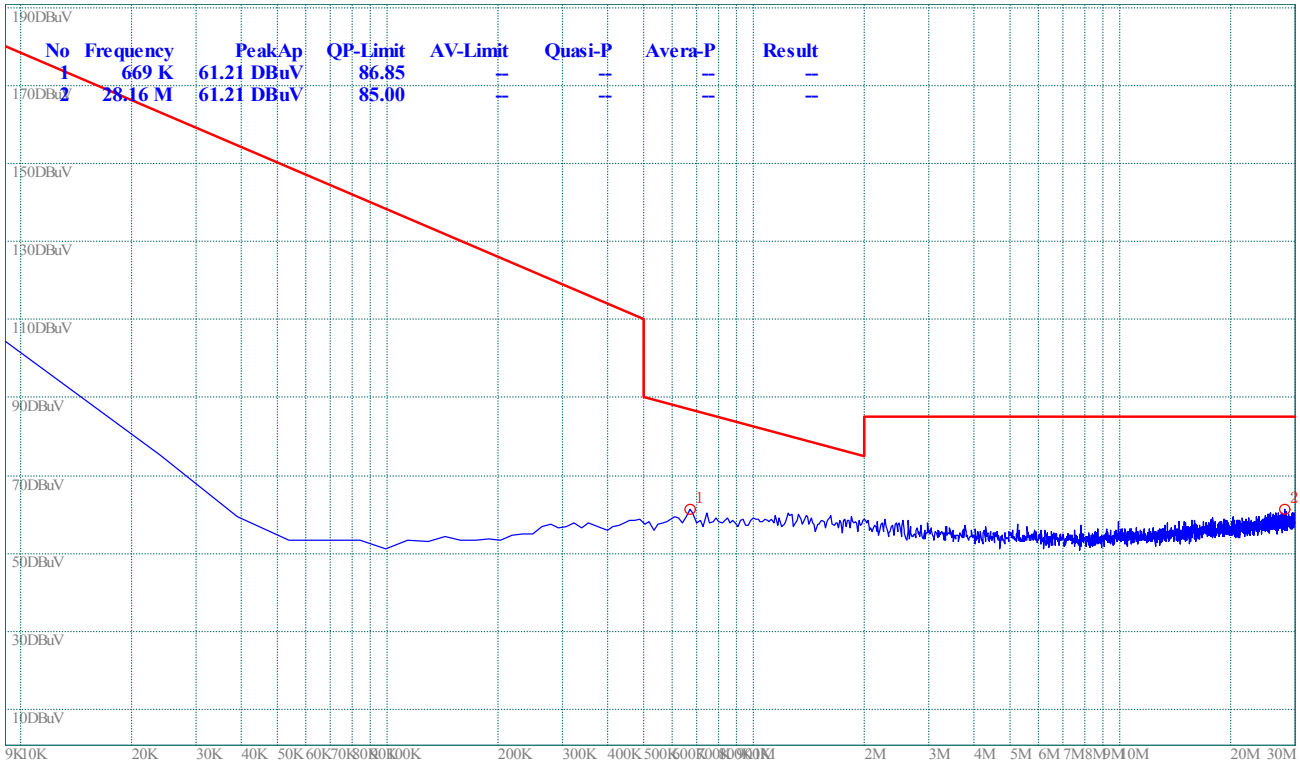
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @ Π/4-DQPSK, channel 0)



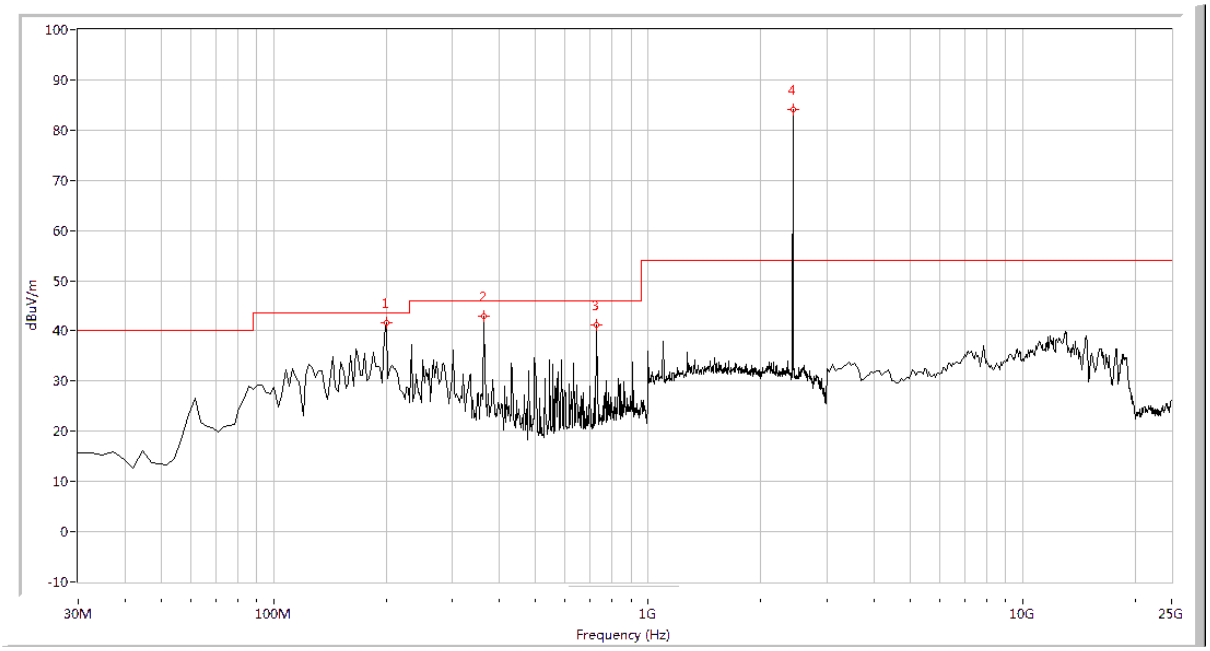
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
61.446	33.65	N.A	N.A	N.A	40.0	N.A	345.3	Vertical	PASS
363.815	39.88	N.A	N.A	N.A	46.0	N.A	27.0	Vertical	PASS
729.077	41.96	N.A	N.A	N.A	46.0	N.A	108.2	Vertical	PASS
2480.000	84.58	N.A	N.A	74.0	N.A	54.0	330.8	Vertical	N.A

(Plot A.2: 30MHz to 25GHz, Antenna Vertical @ Π/4-DQPSK, channel 0)

Plot for Channel = 39

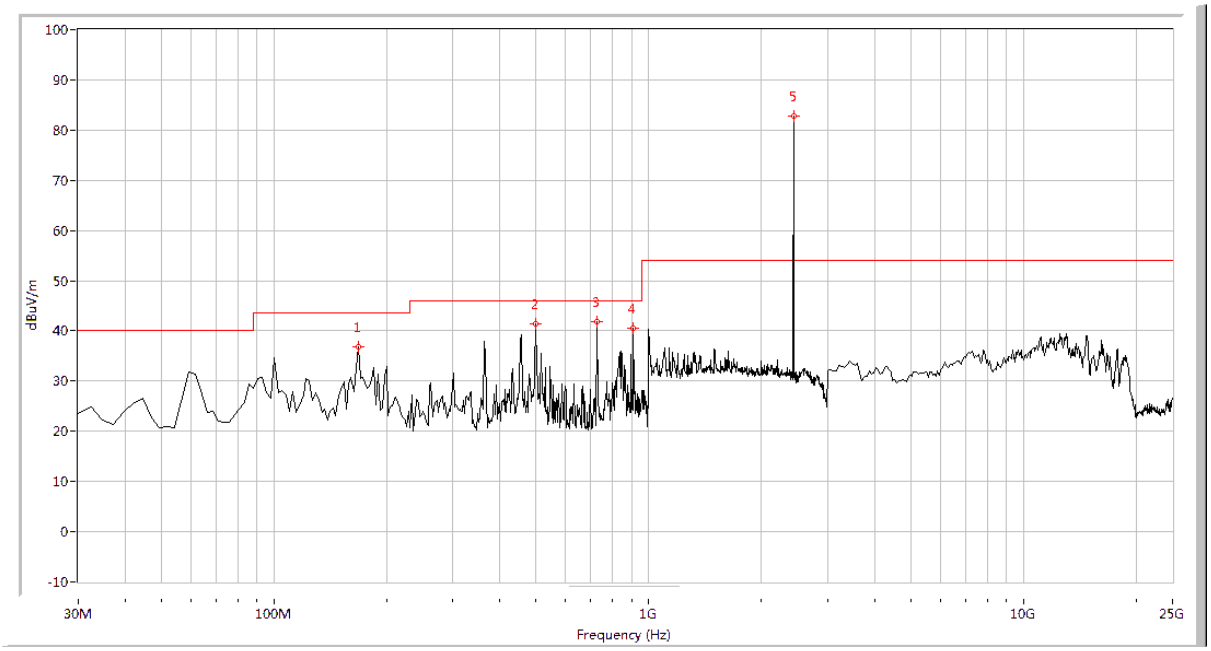


(Plot B.0: 9kHz to 30MHz @ ∏/4-DQPSK, channel 39)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
199.327	41.73	N.A	N.A	N.A	43.5	N.A	355.6	Horizontal	PASS
363.815	42.84	N.A	N.A	N.A	46.0	N.A	318.7	Horizontal	PASS
729.077	41.10	N.A	N.A	N.A	46.0	N.A	45.5	Horizontal	PASS
2441.000	84.10	N.A	N.A	74.0	N.A	54.0	216.0	Horizontal	N.A

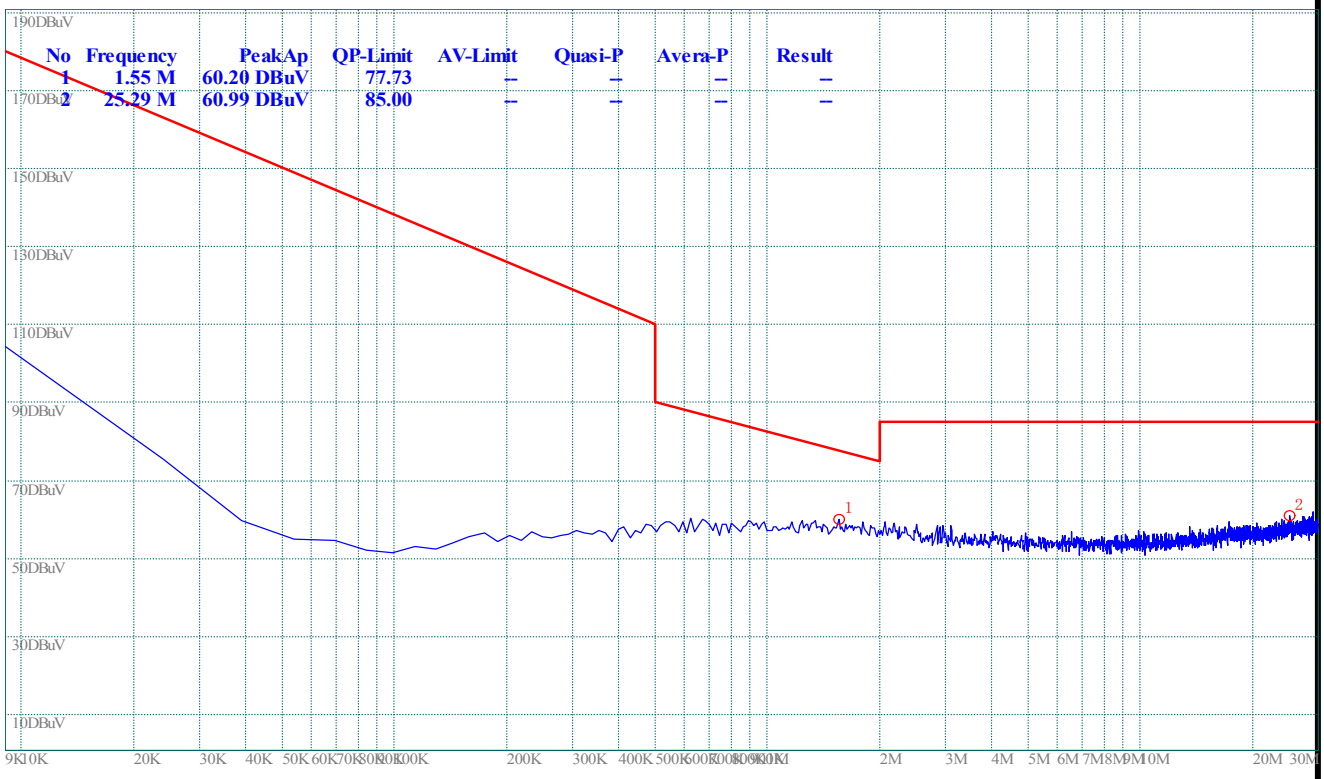
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ ∏/4-DQPSK, channel 39)



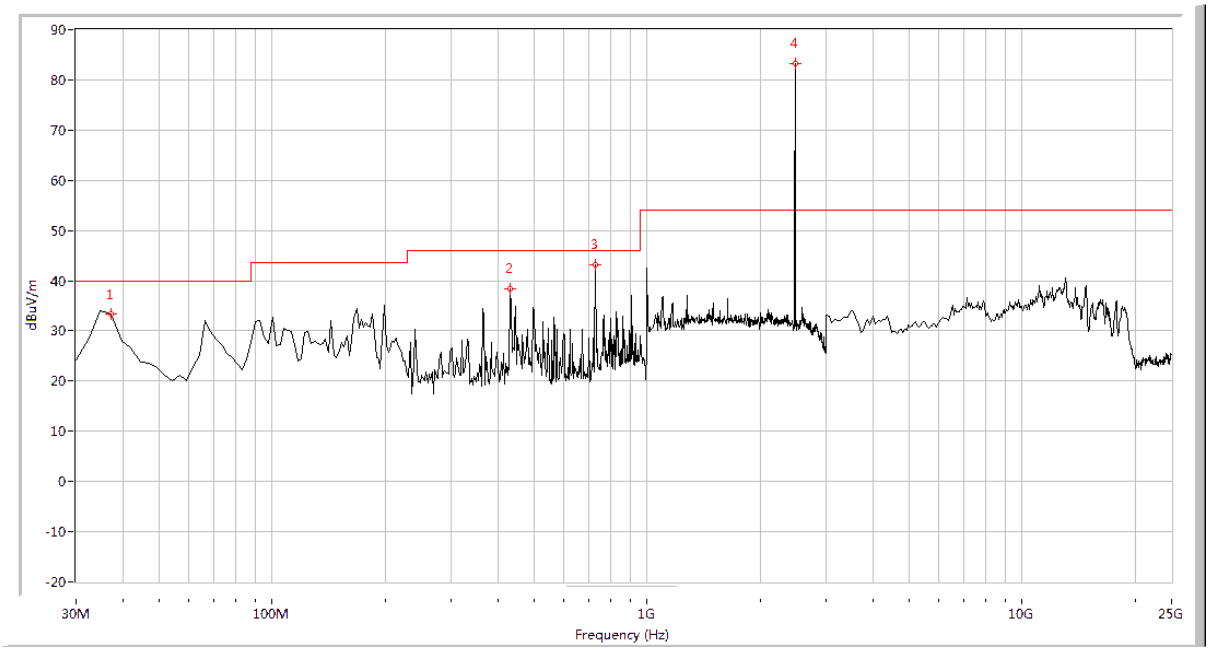
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
167.880	36.90	N.A	N.A	N.A	43.5	N.A	360.0	Vertical	PASS
499.277	41.46	N.A	N.A	N.A	46.0	N.A	130.4	Vertical	PASS
729.077	41.85	N.A	N.A	N.A	46.0	N.A	82.0	Vertical	PASS
910.499	40.59	N.A	N.A	N.A	46.0	N.A	130.4	Vertical	PASS
2441.000	82.78	N.A	N.A	7.0	N.A	54.0	217.8	Vertical	FAIL

(Plot B.2: 30MHz to 25GHz, Antenna Vertical @ Π/4-DQPSK, channel 39)

Plot for Channel = 78

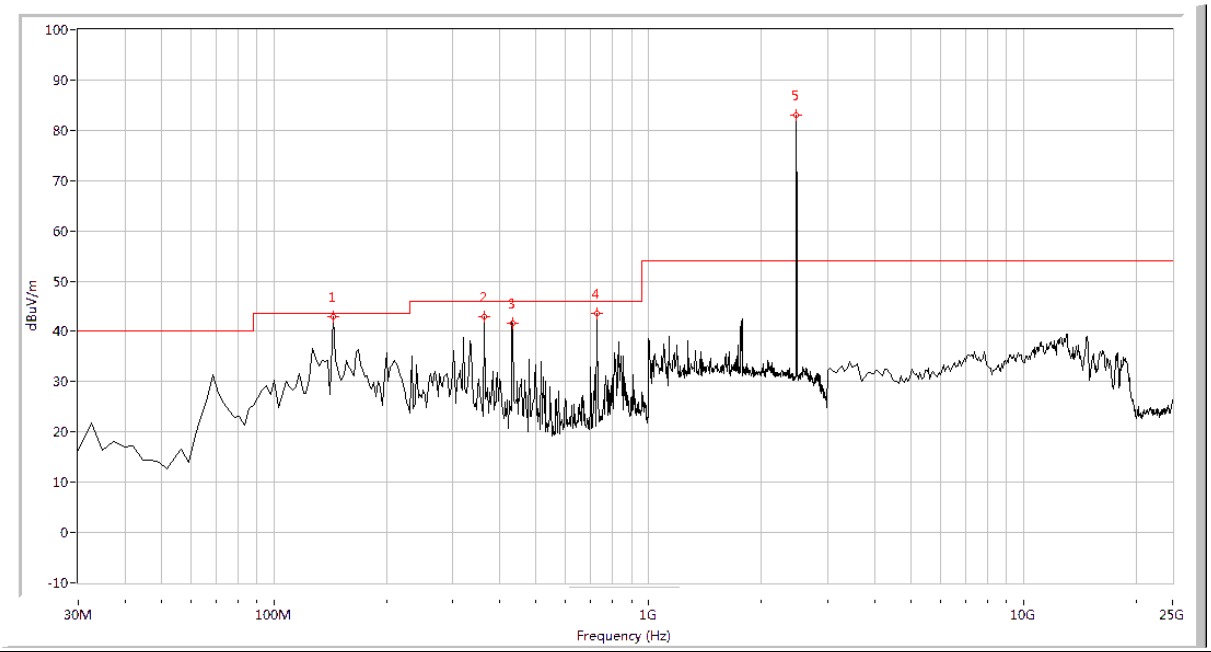


(Plot C.0: 9kHz to 30MHz @ Π/4-DQPSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
37.257	33.40	N.A	N.A	N.A	40.0	N.A	131.0	Vertical	PASS
431.546	38.31	N.A	N.A	N.A	46.0	N.A	-0.0	Vertical	PASS
729.077	43.25	N.A	N.A	N.A	46.0	N.A	73.0	Vertical	PASS
2480.000	83.29	N.A	N.A	74.0	N.A	54.0	33.8	Vertical	N.A

(Plot C.1: 30MHz to 25GHz, Antenna Horizontal @ ∏/4-DQPSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
143.691	42.92	N.A	N.A	N.A	43.5	N.A	98.0	Horizontal	PASS
363.815	42.83	N.A	N.A	N.A	46.0	N.A	215.9	Horizontal	PASS
433.965	41.62	N.A	N.A	N.A	46.0	N.A	154.5	Horizontal	PASS
726.658	43.50	N.A	N.A	N.A	46.0	N.A	130.4	Horizontal	PASS
2480.000	83.04	N.A	N.A	74.0	N.A	54.0	35.7	Horizontal	N.A

(Plot C.2: 30MHz to 25GHz, Antenna Vertical @ ∏/4-DQPSK, channel 78)

2.10.4.3. 8-DPSK Mode:

A. Test Verdict for Harmonics:

The Fundamental Emissions

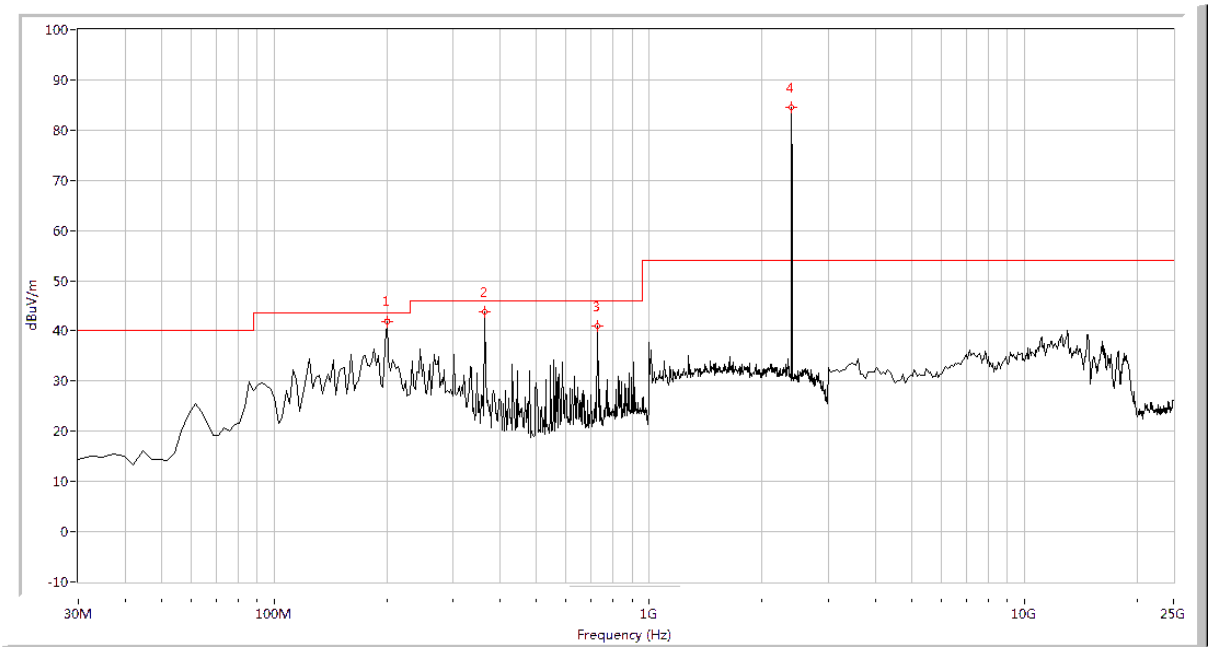
The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	84.54	N/A	Horizontal	Plot A.1
		83.25	N/A	Vertical	Plot A.2
39	2441	84.34	N/A	Horizontal	Plot B.1
		72.04	N/A	Vertical	Plot B.2
78	2480	84.54	N/A	Horizontal	Plot C.1
		83.15	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

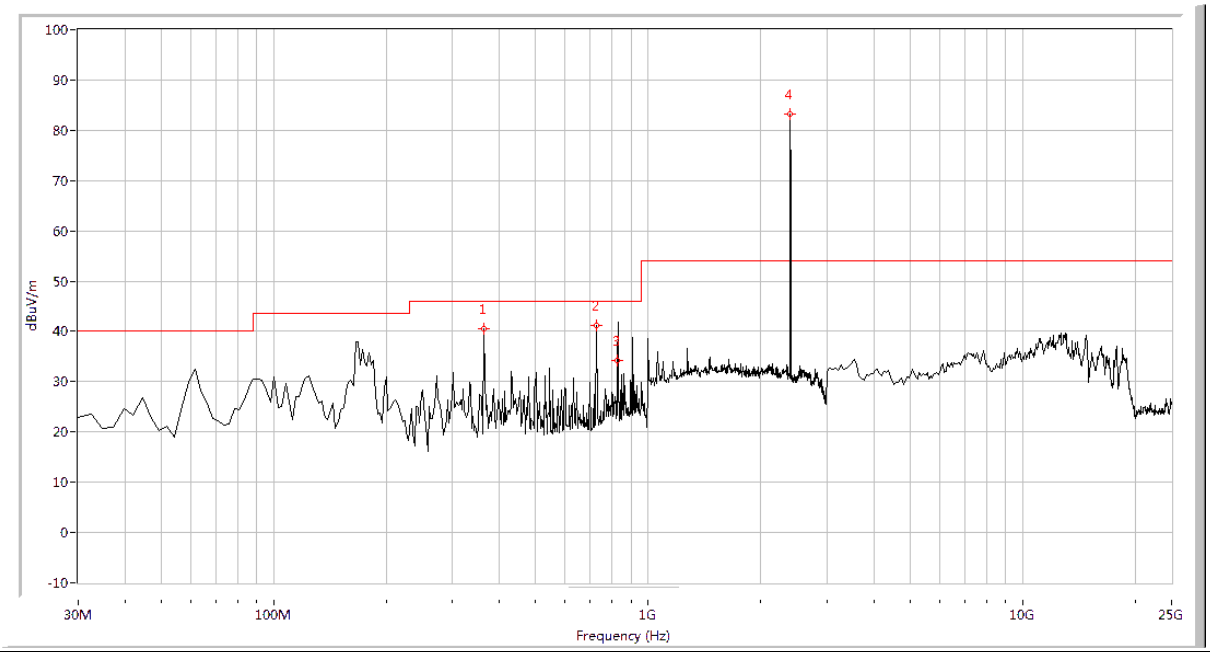
Plots for Channel = 0

(Plot A.0: 9kHz to 30MHz @8-DPSK, channel 0)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
199.327	41.30	N.A	N.A	N.A	43.5	N.A	309.8	Horizontal	PASS
363.815	43.82	N.A	N.A	N.A	46.0	N.A	319.4	Horizontal	PASS
729.077	40.91	N.A	N.A	N.A	46.0	N.A	51.7	Horizontal	PASS
2402.000	84.54	N.A	N.A	74.0	N.A	54.0	327.7	Horizontal	N.A

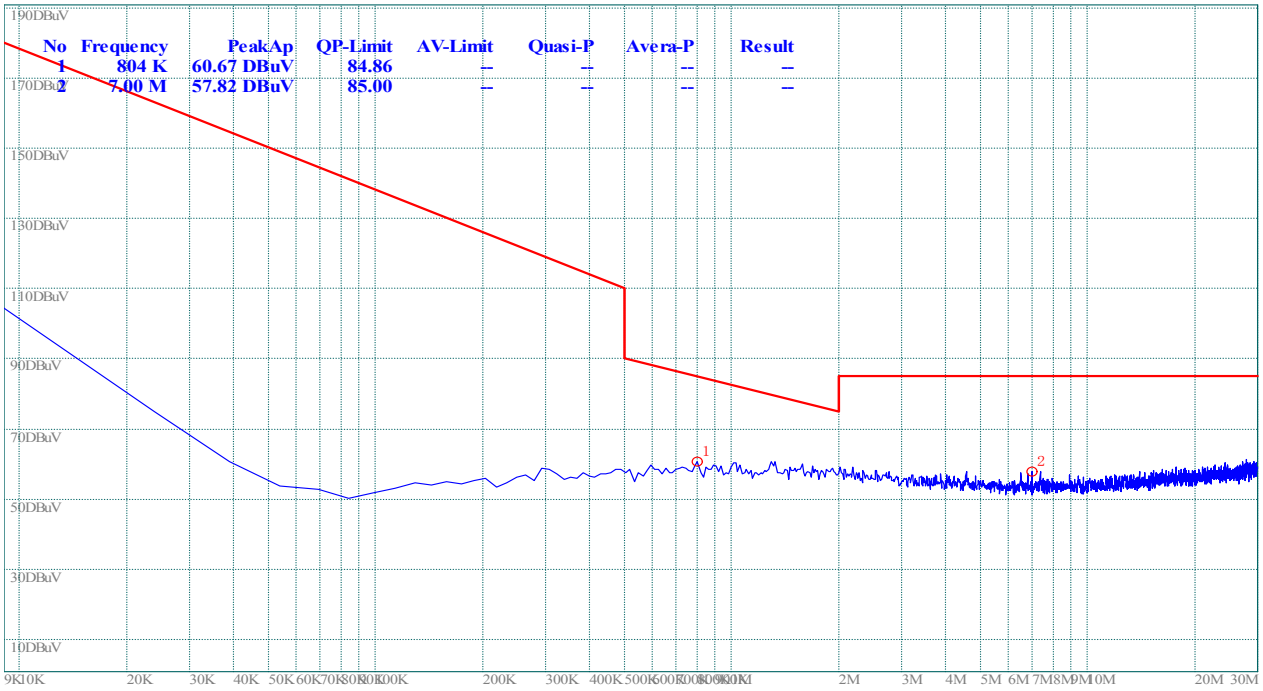
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 0)



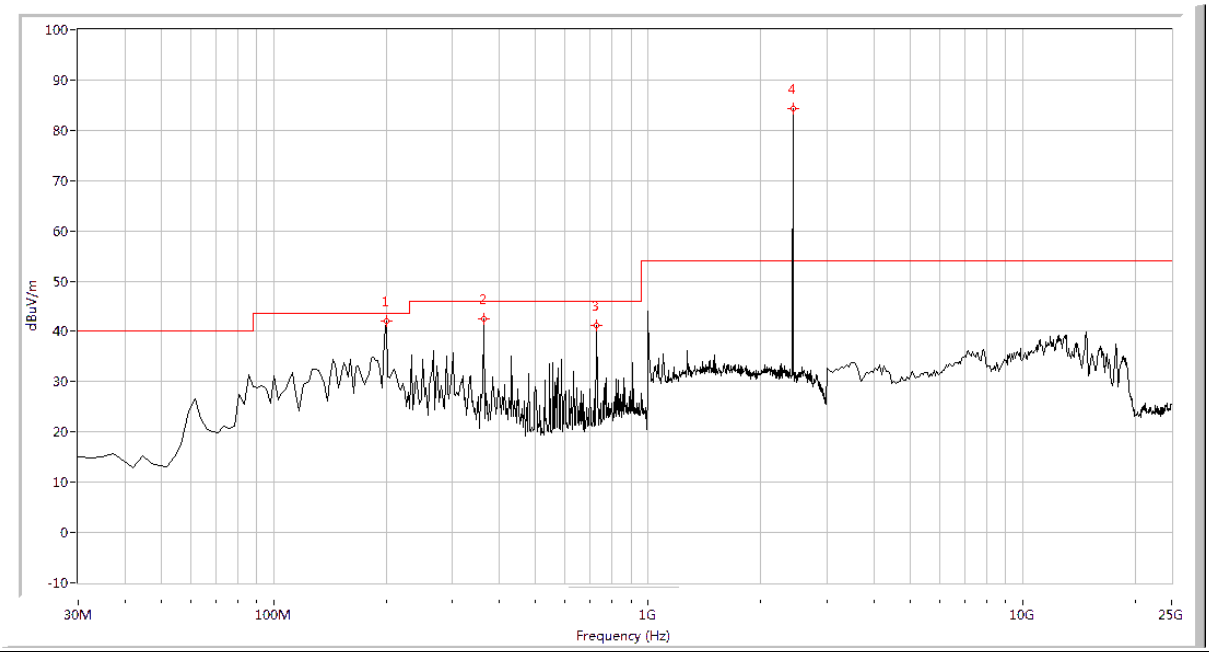
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	40.55	38.99	40.05	N.A	46.0	N.A	37.2	Vertical	PASS
729.077	41.23	40.27	37.43	N.A	46.0	N.A	83.2	Vertical	PASS
828.254	34.24	24.56	18.97	N.A	46.0	N.A	360.0	Vertical	PASS
2402.000	83.25	N.A	N.A	74.0	N.A	54.0	220.0	Vertical	N.A

(Plot A.2: 30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 0)

Plot for Channel = 39

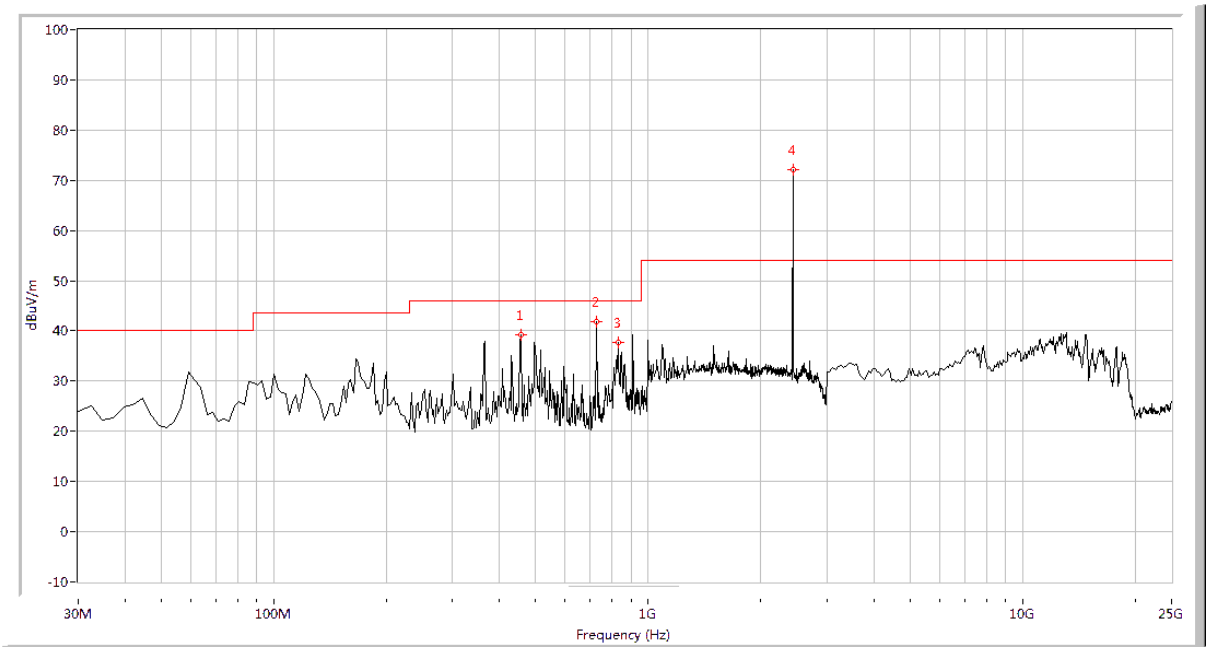


(Plot B.0: 9kHz to 30MHz @ 8-DPSK, channel 39)



Fre. (MHz)	Pk	N.A	N.A	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
199.327	42.05	N.A	N.A	N.A	43.5	N.A	349.3	Horizontal	PASS
363.815	42.45	N.A	N.A	N.A	46.0	N.A	325.2	Horizontal	PASS
729.077	41.12	N.A	N.A	N.A	46.0	N.A	50.8	Horizontal	PASS
2441.000	84.34	N.A	N.A	74.0	N.A	54.0	222.1	Horizontal	N.A

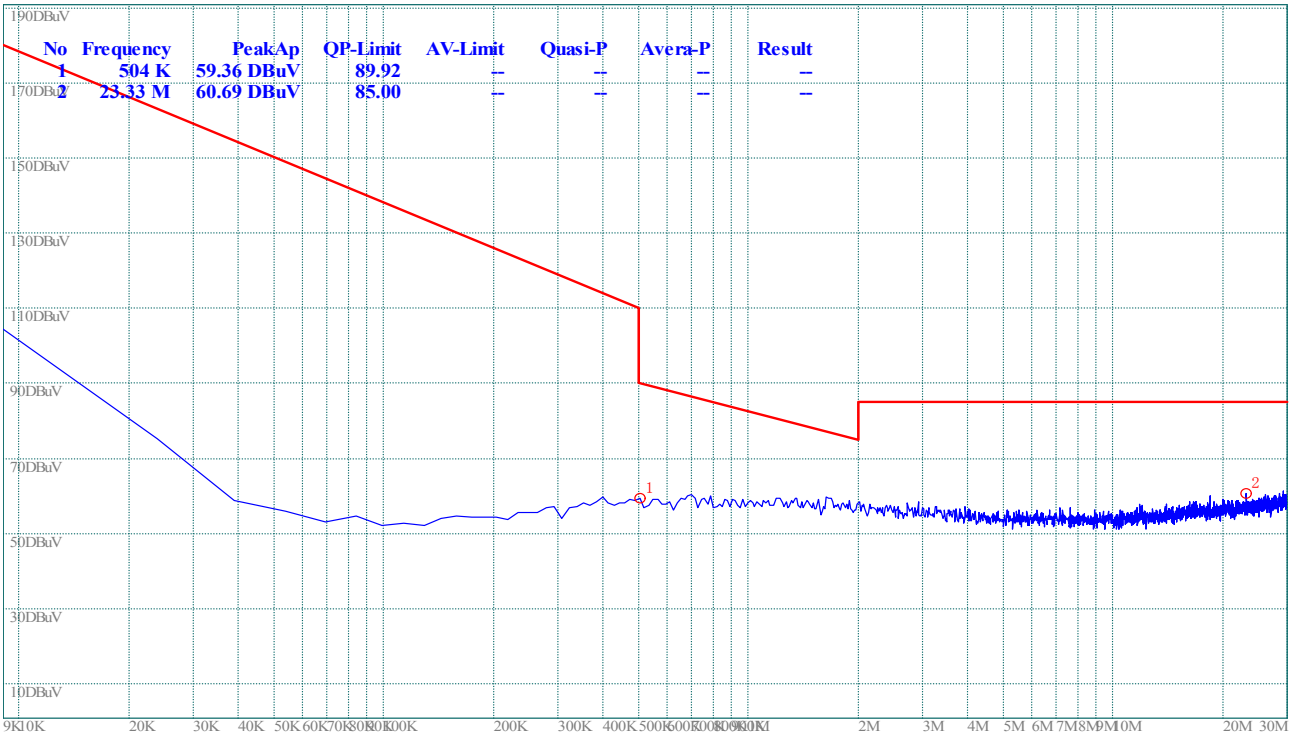
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ 8-DPSK, channel 39)



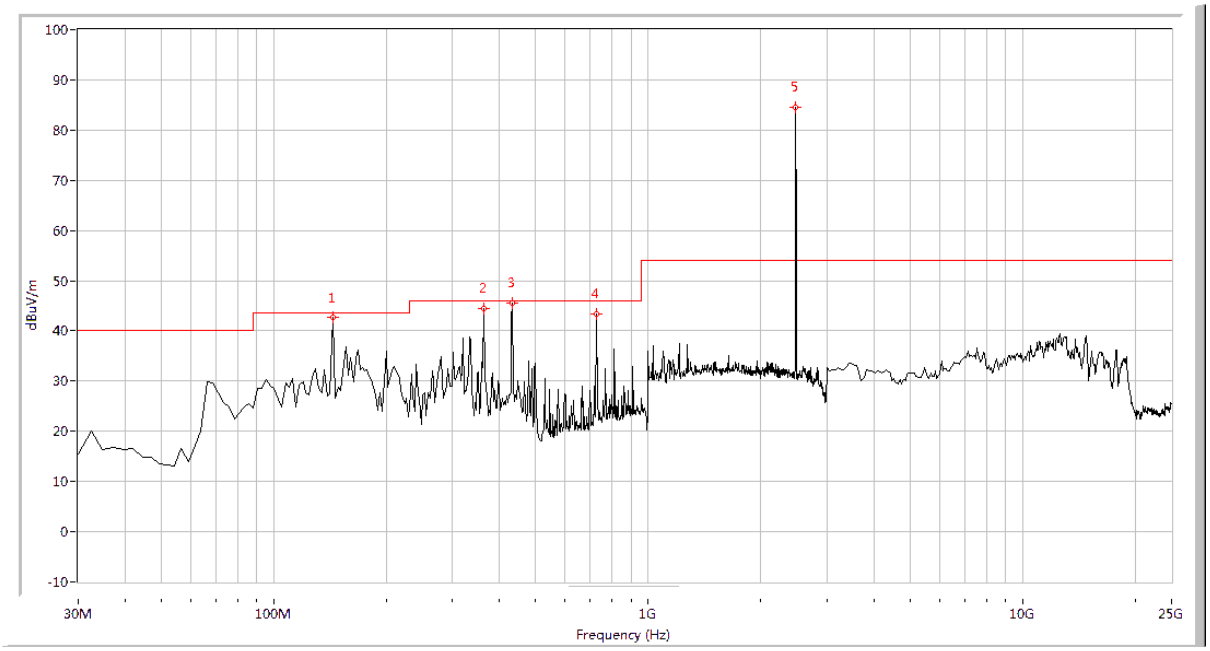
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
458.155	39.28	N.A	N.A	N.A	46.0	N.A	147.7	Vertical	PASS
729.077	41.75	N.A	N.A	N.A	46.0	N.A	99.6	Vertical	PASS
830.673	37.64	N.A	N.A	N.A	46.0	N.A	360.0	Vertical	PASS
2441.000	72.04	N.A	N.A	74.0	N.A	54.0	218.1	Vertical	N/A

(Plot B.2: 30MHz to 25GHz, Antenna Vertical @ 8-DPSK, channel 39)

Plot for Channel = 78

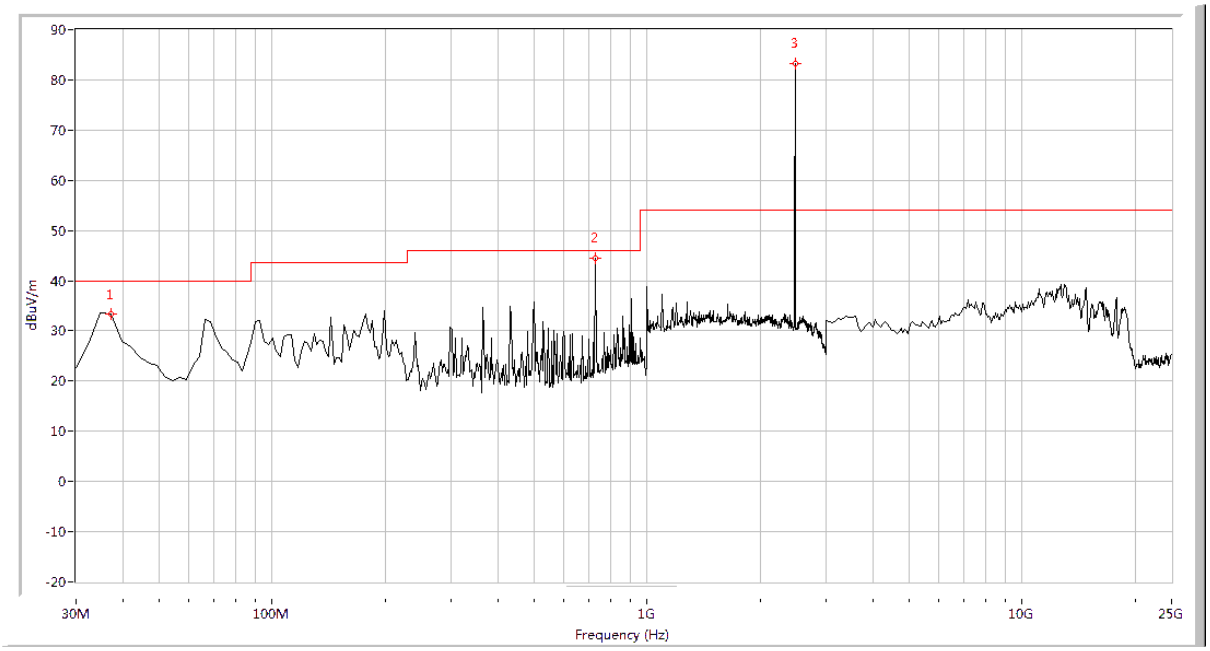


(Plot C.0: 9kHz to 30MHz @ 8-DPSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
143.691	42.79	N.A	N.A	N.A	43.5	N.A	99.9	Horizontal	PASS
363.815	44.44	N.A	N.A	N.A	46.0	N.A	213.6	Horizontal	PASS
433.965	45.59	N.A	N.A	N.A	46.0	N.A	256.8	Horizontal	PASS
726.658	43.29	N.A	N.A	N.A	46.0	N.A	129.0	Horizontal	PASS
2480.000	84.54	N.A	N.A	74.0	N.A	54.0	34.6	Horizontal	N.A

(Plot C.1: 30MHz to 25GHz, Antenna Horizontal @ 8-DPSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
37.257	33.31	N.A	N.A	N.A	40.0	N.A	145.5	Vertical	PASS
726.658	44.52	N.A	N.A	N.A	46.0	N.A	77.9	Vertical	PASS
2480.000	83.15	N.A	N.A	74.0	N.A	54.0	30.9	Vertical	N.A

(Plot C.2: 30MHz to 25GHz, Antenna Vertical @ 8-DPSK, channel 78)

2.11. RF exposure evaluation

According to § 1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy lever in excess of Commission's guideline.
According to 447498 D01 General RF Exposure Guidance v05, exclusion threshold values at selected frequencies and distances table as following.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

MHz	30	35	40	45	50	mm
150	232	271	310	349	387	SAR Test Exclusion Threshold (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

Routine SAR evaluation refers to the specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evolution is not required, the portable transmitters with output power greater than the applicable low threshold SAR evolution to qualify for TCB approval.

Result:
This is portable device and the Max conducted peak output power is 9.342dBm(8.594mW), the maximum gain of antenna is 0dBi, the maximum output power is 9.342dBm(8.594mW).which is lower than the exclusion threshold 10mW, at frequency 2450MHz, and distance is 5mm.

The SAR measurement is not required.

** END OF REPORT **