Report No.:SZ13010010W01

TESTING CNAS L3572

FCC/IC RADIO TEST REPORT

Issued to

GN Netcom A/S

For

Bluetooth Stereo Headset

Model Name	:	OTE12
Trade Name	:	Jabra
Brand Name	:	Jabra
FCC ID	:	BCE-OTE12
IC Number		2386C-OTE12
Standard	:	47 CFR Part 15 Subpart C RSS-GEN RSS-210
Test date	:	2013-1-17 to 2013-1-30
Issue date	:	2013-1-30

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)	*(Department Manager)*	*(Project Manager)*
Date 2013.1.30	*Date* 2013.1.30	*Date* 2013.1.30

CTIA Authorized Test Lab LAB CODE 20081223-00 IEEE 1725 OTA

OFTA 電訊管理局

TAF Testing Laboratory 2030

GCF Official Observer of Global Certification Forum

Bluetooth BQTF

FCC Reg. No. 695796

DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	January 30, 2013	First edition

1. General Information

1.1. EUT Description

EUT Type ..... :	Bluetooth Stereo Headset
Serial No..... :	(n.a, marked #1 by test site)
Hardware Version ..... :	V05
Software Version ..... :	1-17-0
Applicant ..... :	GN Netcom A/S Lautrupbjerg 7, DK-2750 Ballerup, Denmark
Manufacturer ..... :	Dong Guan G-Com Computer Co.,Ltd 1st Row Yin Shan Road, Yin Hwu Industrial Area, Qingxi , DongGuan , GuangDong, P.R.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..... :	PIFA antenna
Antenna Gain..... :	0dBi

Note 1: The EUT is a Bluetooth Stereo Headset, 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 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 and RSS-210 (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC/IC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-09 Edition)	Radio Frequency Devices
2	RSS-GEN:Issue 3, December 2010	General Requirements and Information for the Certification of Radio Apparatus
3	RSS-210: Issue 8, December 2010	Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

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

No.	Section in CFR 47	Section in RSS-GEN , RSS-210	Description	Result
1	15.203	7.1.4	Antenna Requirement	PASS
2	15.247(a)	A8.1 (d)	Number of Hopping Frequency	PASS
3	15.247(b)	A8.4 (2)	Peak Output Power	PASS
4	15.247(a)	A8.1 (a)	20dB Bandwidth	PASS
5	15.247(a)	A8.1 (b)	Carrier Frequency Separation	PASS
6	15.247(a)	A8.1 (d)	Time of Occupancy (Dwell time)	PASS
7	15.247(d)	A8.1 (d)	Conducted Spurious Emission	PASS
8	15.247(d)	A8.5	Band Edge	PASS
9	15.207	7.2.2	Conducted Emission	PASS
10	15.209 15.247(c)	A8.5	Radiated Emission	PASS
11	15.247(i), 1.1307&2.1093	RSS-102	RF exposure evaluation	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 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.

The IC registration number is 7183A-2.

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 and RSS-210 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.

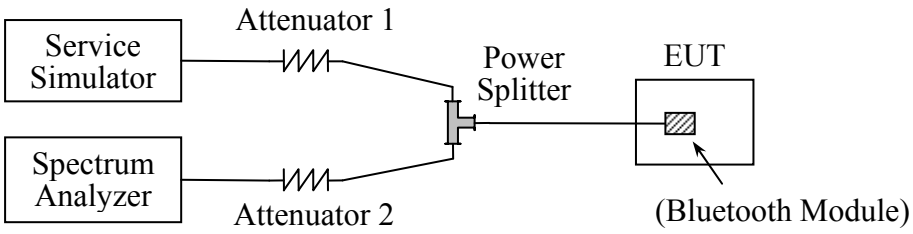
2.2. Number of Hopping Frequency

2.2.1. Requirement

According to FCC §15.247(a)(1)(iii) and RSS-210 A8.1 (d), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 75 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

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
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

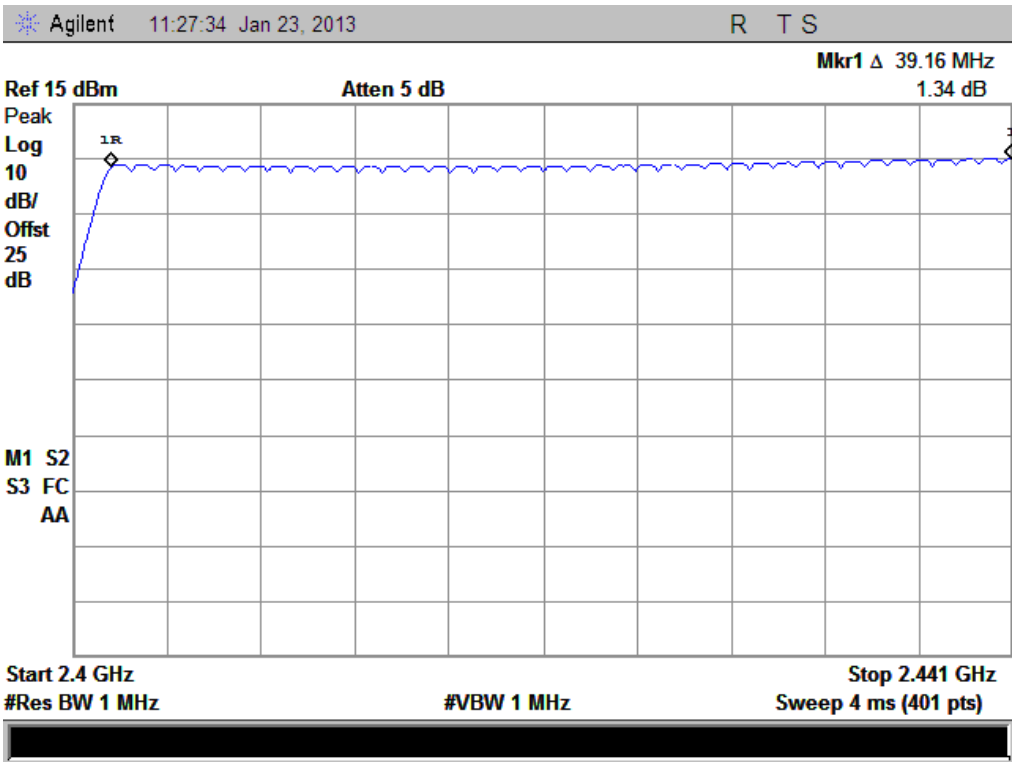
2.2.4. Test Result

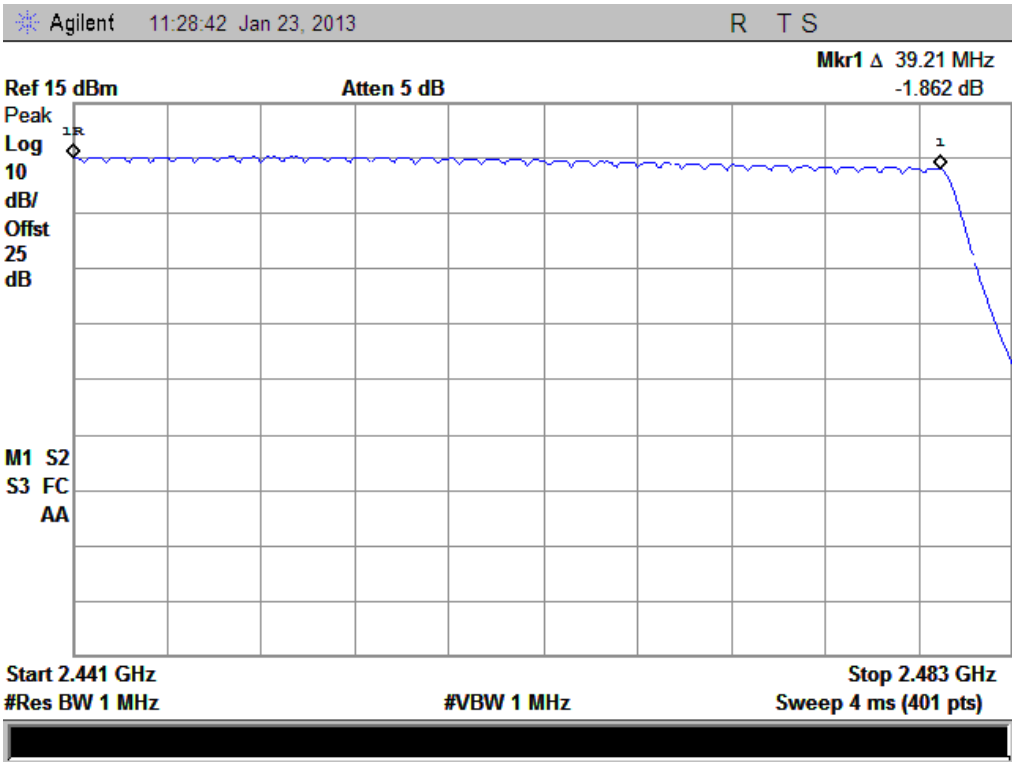
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

A. Test Verdict:

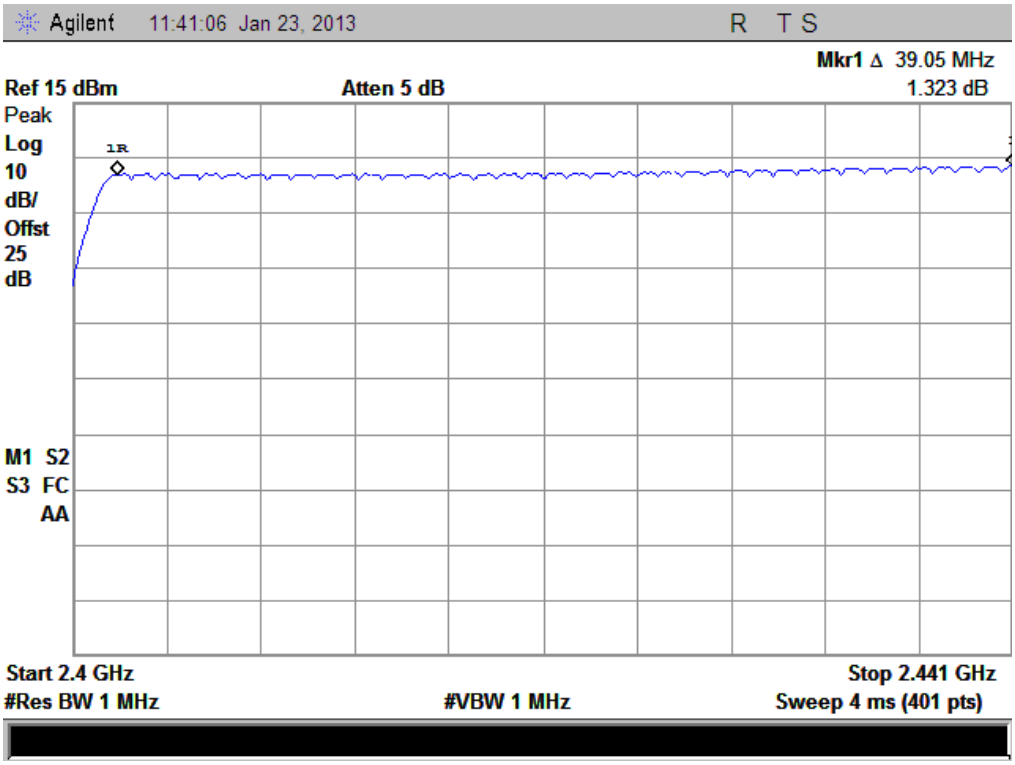
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS
Π/4-DQPSK	2400 - 2483.5	79	15	Plot B	PASS
8-DPSK	2400 - 2483.5	79	15	Plot C	PASS

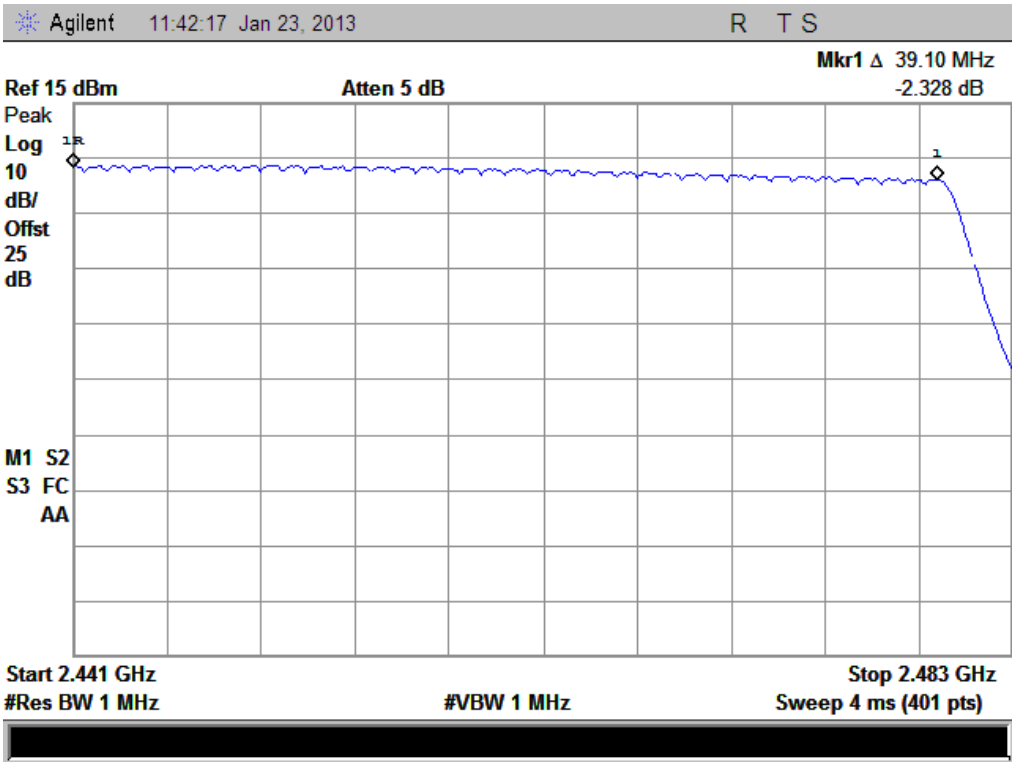
Test Plots:



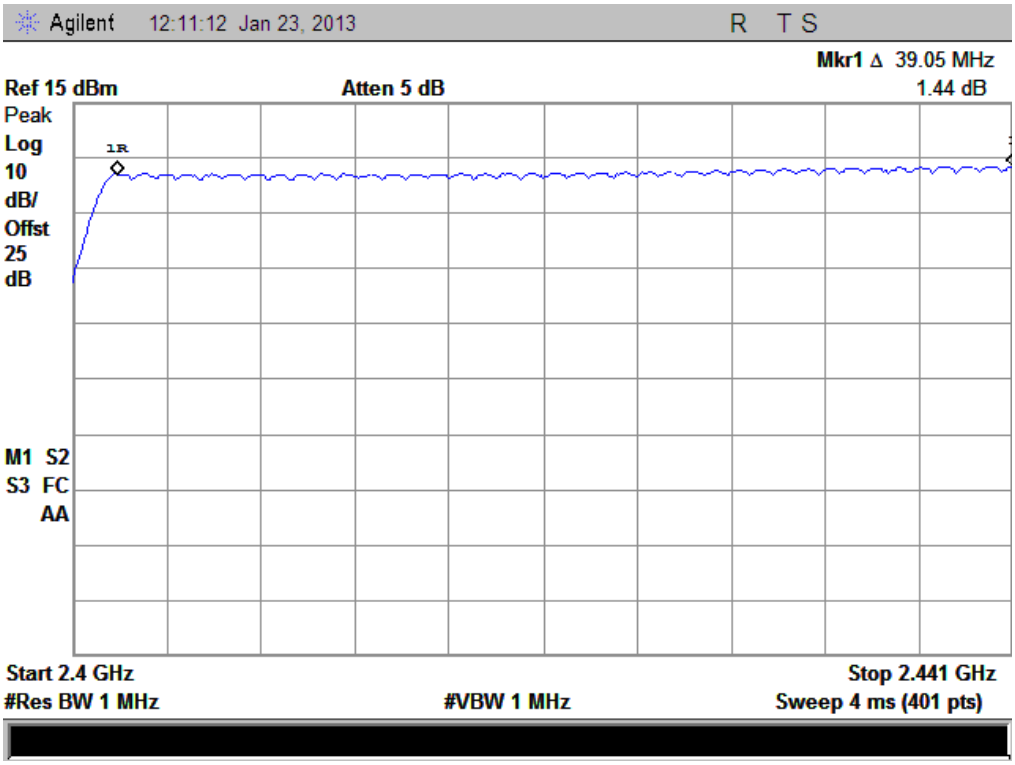

Agilent 11:28:42 Jan 23, 2013
R T S
Mkr1 Δ 39.21 MHz
-1.862 dB
Ref 15 dBm
Atten 5 dB
Peak
Log
10
dB/
Offst
25
dB
1R
1
M1 S2
S3 FC
AA
Start 2.441 GHz
#Res BW 1 MHz
#VBW 1 MHz
Stop 2.483 GHz
Sweep 4 ms (401 pts)

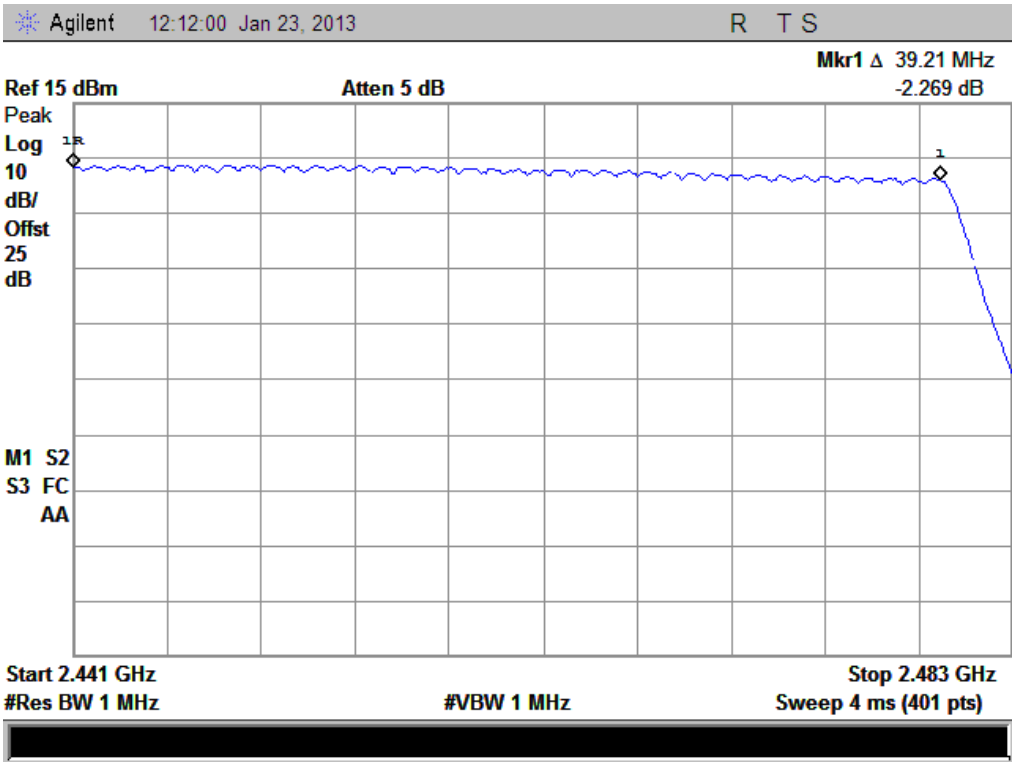
(Plot A: GFSK)


Agilent 11:41:06 Jan 23, 2013
R T S
Mkr1 Δ 39.05 MHz
1.323 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 1 MHz
Stop 2.441 GHz
Sweep 4 ms (401 pts)



(Plot B: ∏/4-DQPSK)




Agilent 12:12:00 Jan 23, 2013
R T S
Mkr1 Δ 39.21 MHz
-2.269 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 1 MHz
Stop 2.483 GHz
Sweep 4 ms (401 pts)

(Plot C: 8- DPSK)

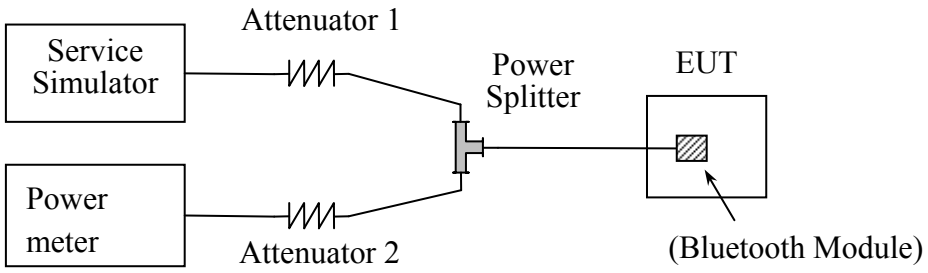
2.3. Peak Output Power

2.3.1. Requirement

According to FCC §15.247(b)(1) and RSS-210 A8.4 (2), 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	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	3.803	0.002400	20.97	0.125	PASS
39	2441	5.018	0.003175			PASS
78	2480	3.160	0.002070			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	2.085	0.001616	20.97	0.125	PASS
39	2441	3.461	0.002219			PASS
78	2480	1.194	0.001316			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	2.120	0.001629	20.97	0.125	PASS
39	2441	3.491	0.002234			PASS
78	2480	1.243	0.001331			PASS

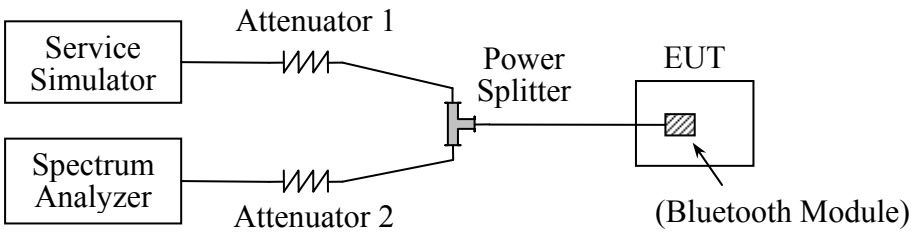
2.4. 20dB Bandwidth

2.4.1. Definition

According to FCC §15.247(a)(1) and RSS-210 A8.1(a), 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.

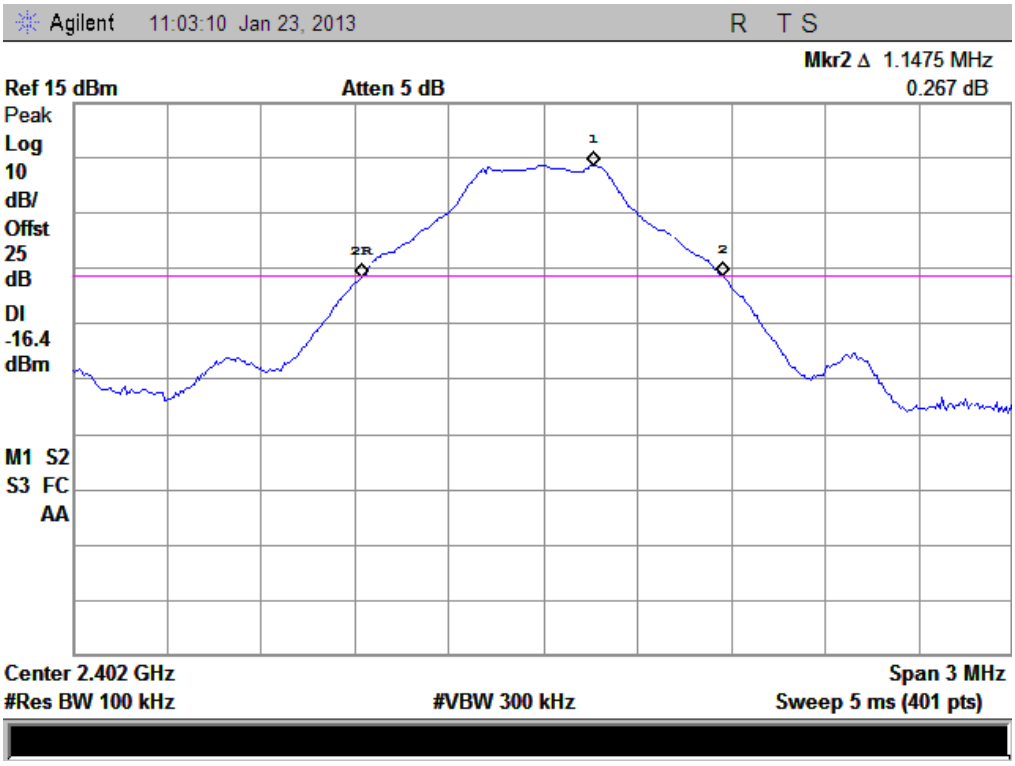
2.4.2.1. GFSK Mode

A. Test Verdict:

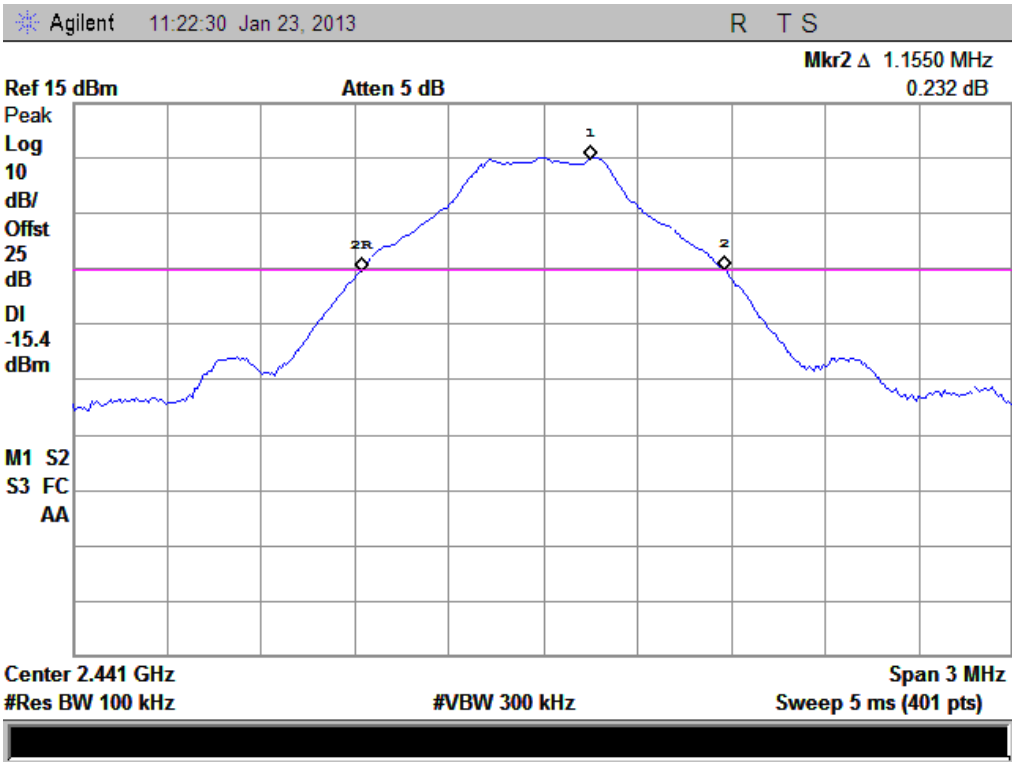
The maximum 20dB bandwidth measured is 1.1550MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.1475	Plot A
39	2441	1.1550	Plot B
78	2480	1.1550	Plot C

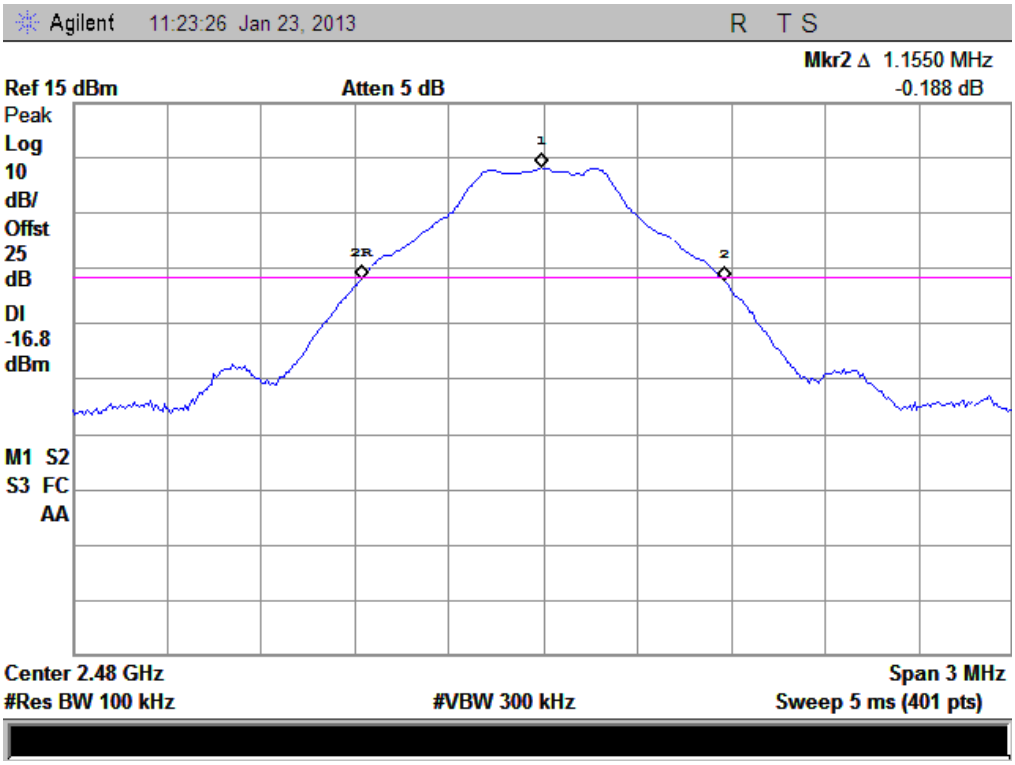
Test Plots:



(Plot A: Channel = 2402 @ GFSK)



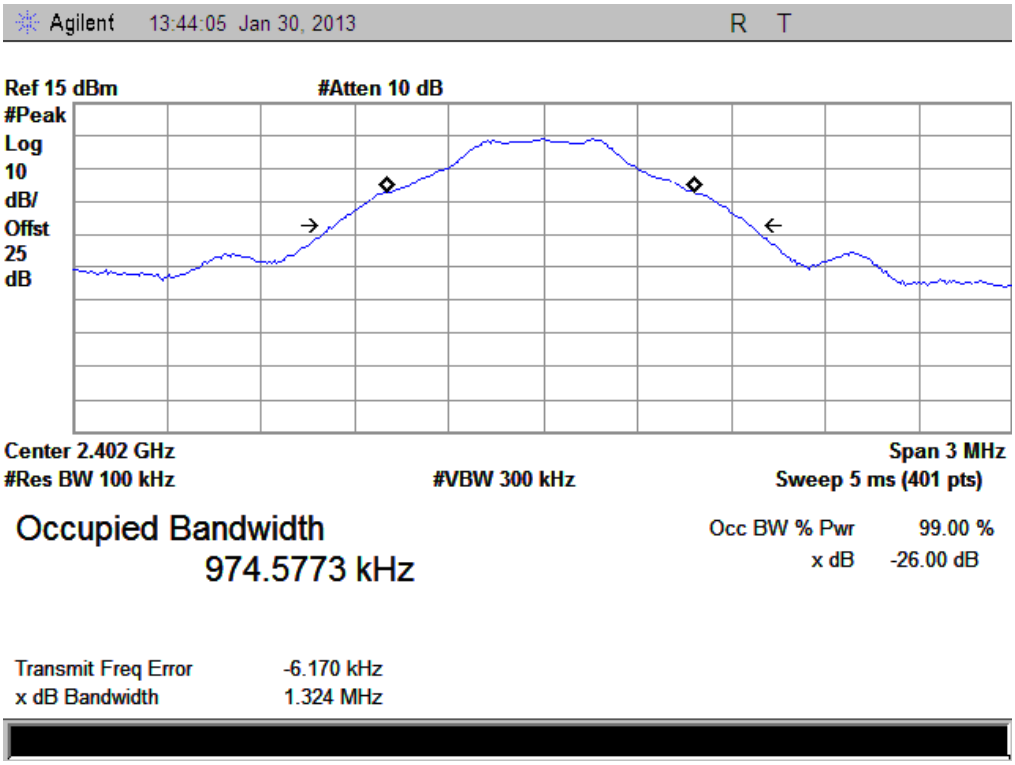
(Plot B: Channel = 2441 @ GFSK)



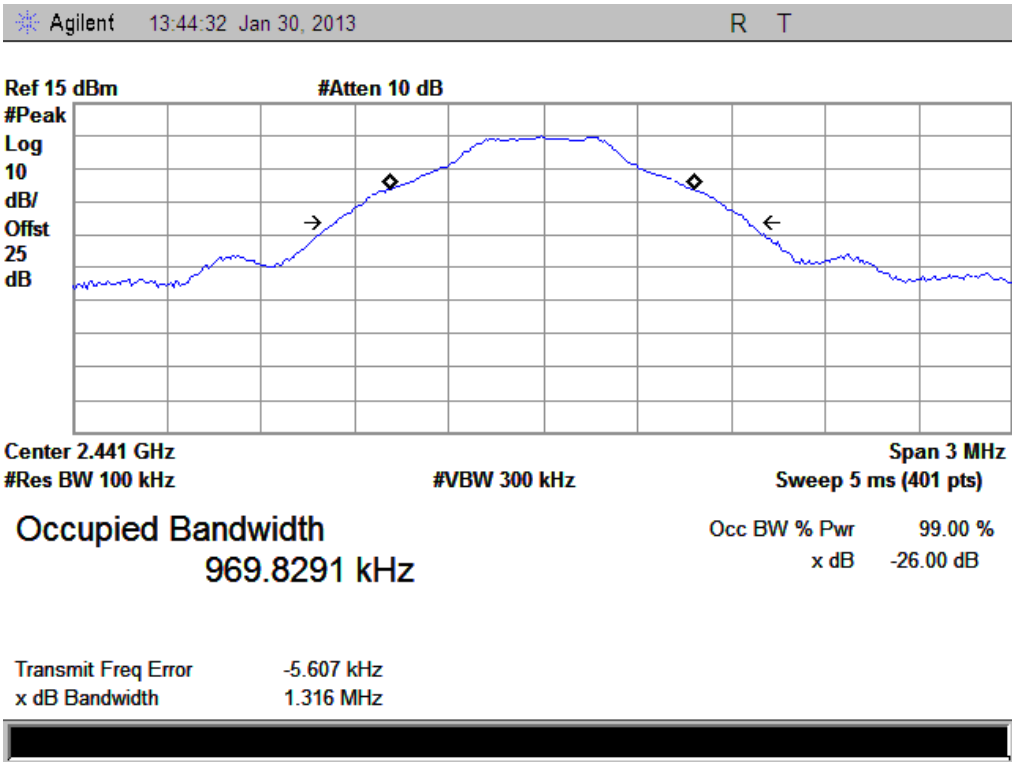
(Plot C: Channel = 2480 @ GFSK)

99% Bandwidth

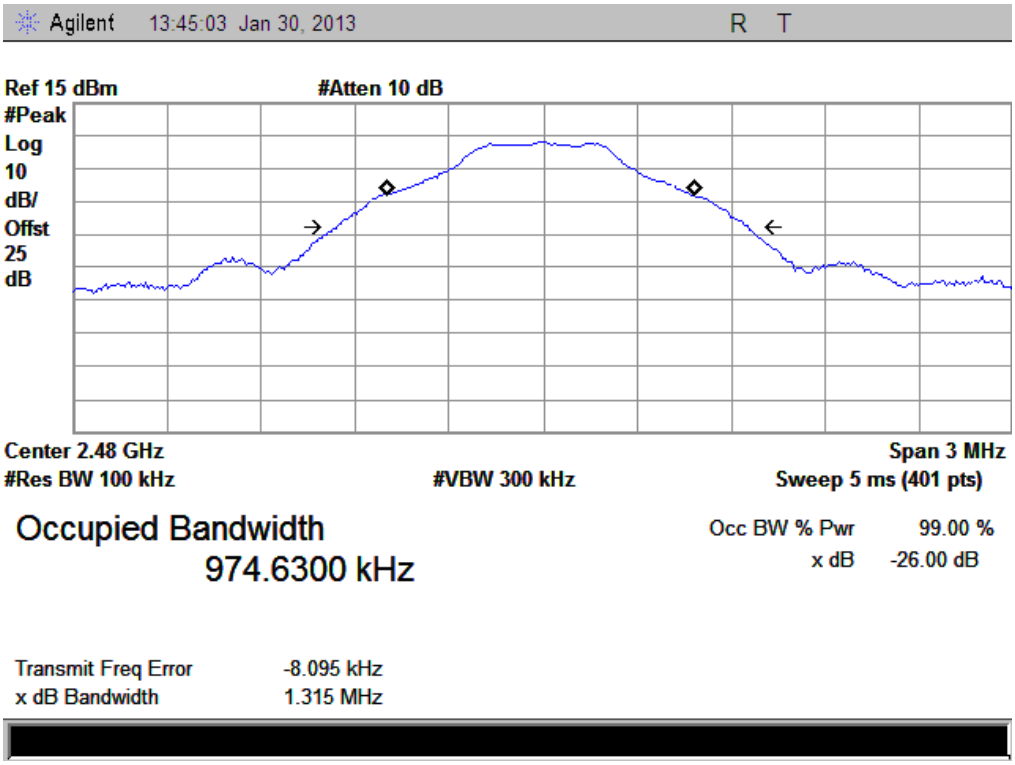
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Refer to Plot
0	2402	974.5773	Plot A1
39	2441	969.8291	Plot B1
78	2480	974.6300	Plot C1



(Plot A1:Channel = 2402)



(Plot B1:Channel = 2441)



(Plot C1:Channel = 2480)

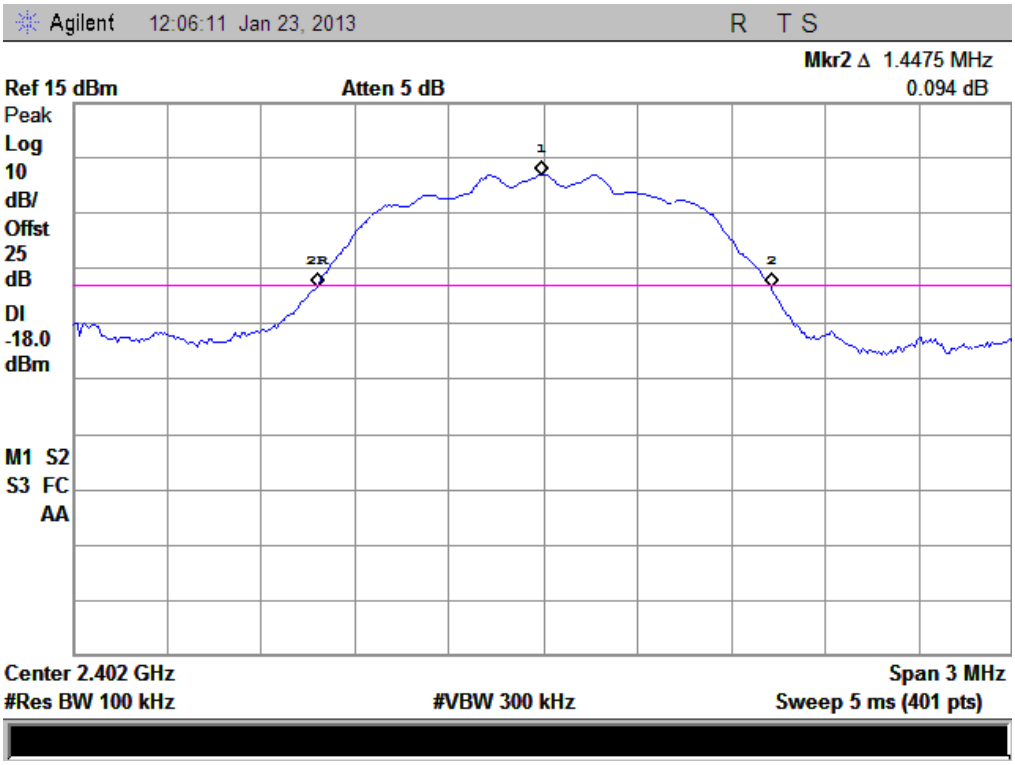
2.4.2.2. Π/4-DQPSK Mode

A. Test Verdict:

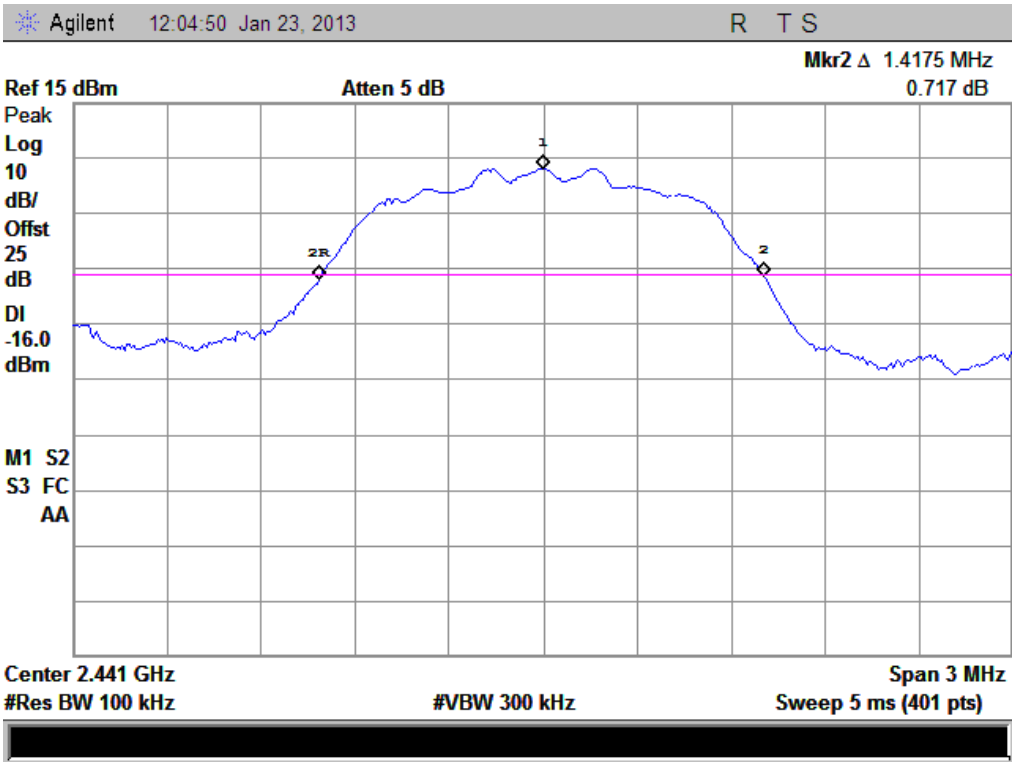
The maximum 20dB bandwidth measured is 1.4250MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.4475	Plot D
39	2441	1.4175	Plot E
78	2480	1.4250	Plot F

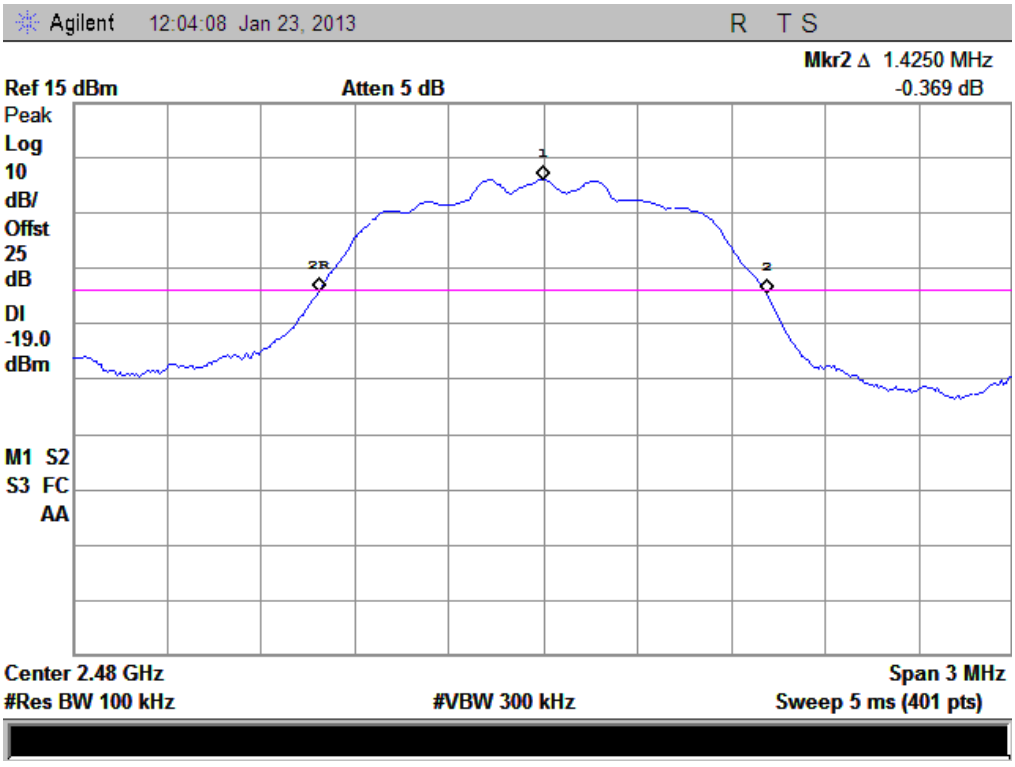
Test Plots:



(Plot D: Channel = 2402 @ Π/4-DQPSK)



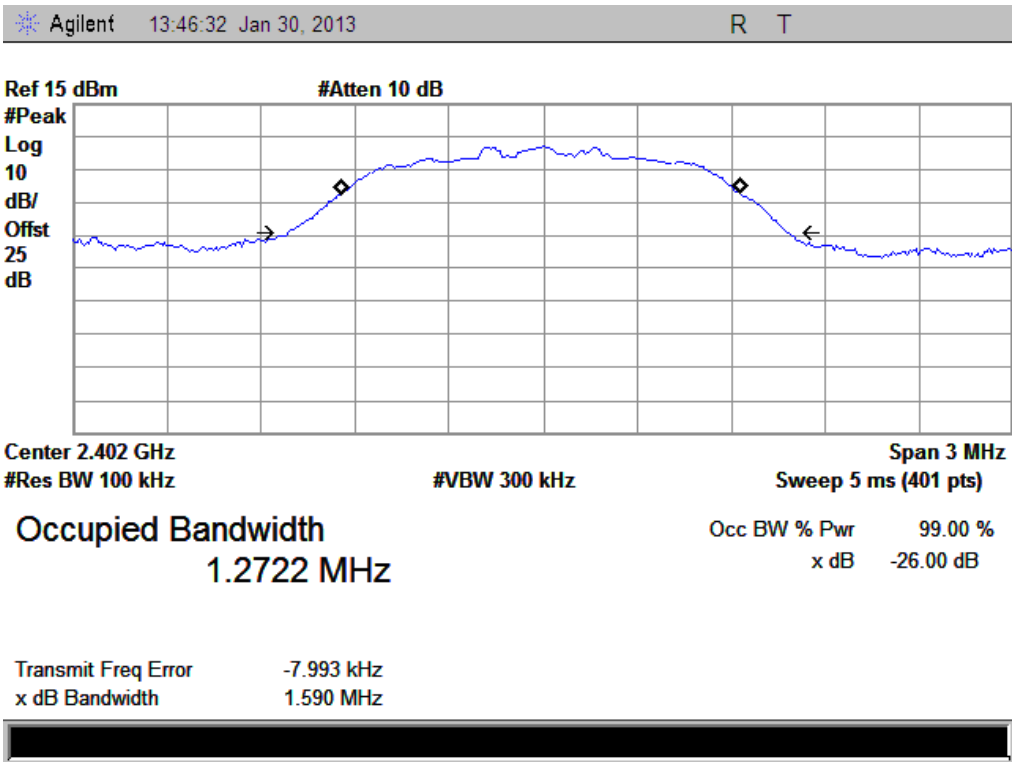
(Plot E: Channel = 2441 @ ∏/4-DQPSK)



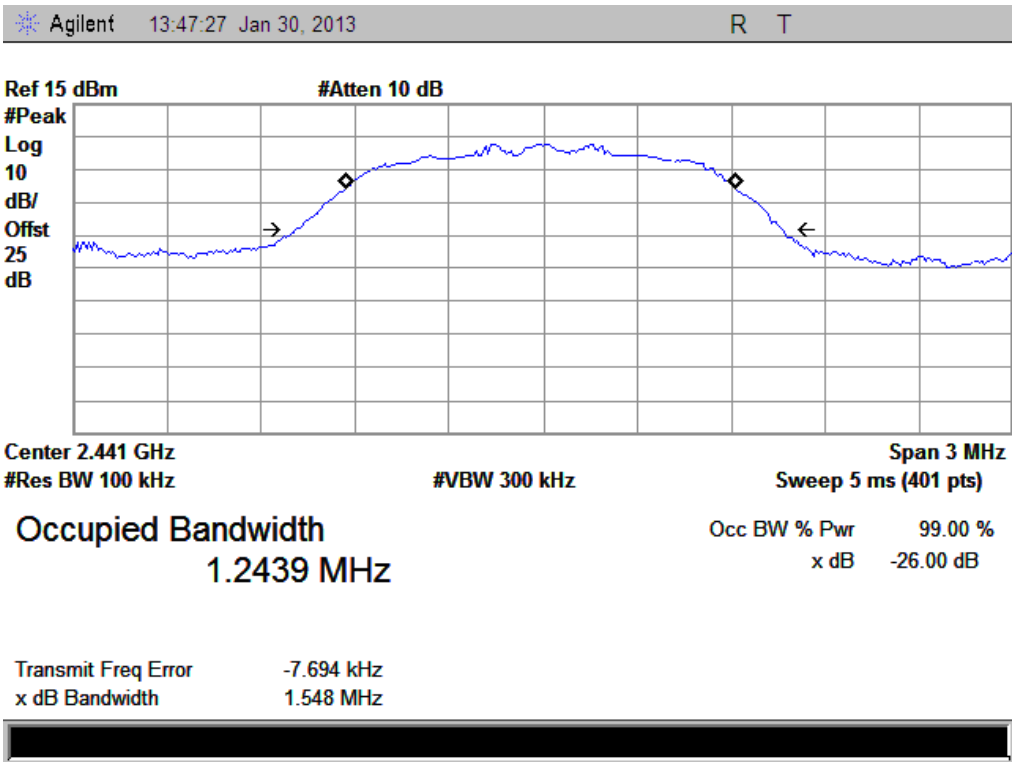
(Plot F: Channel = 2480 @ ∏/4-DQPSK)

99% Bandwidth

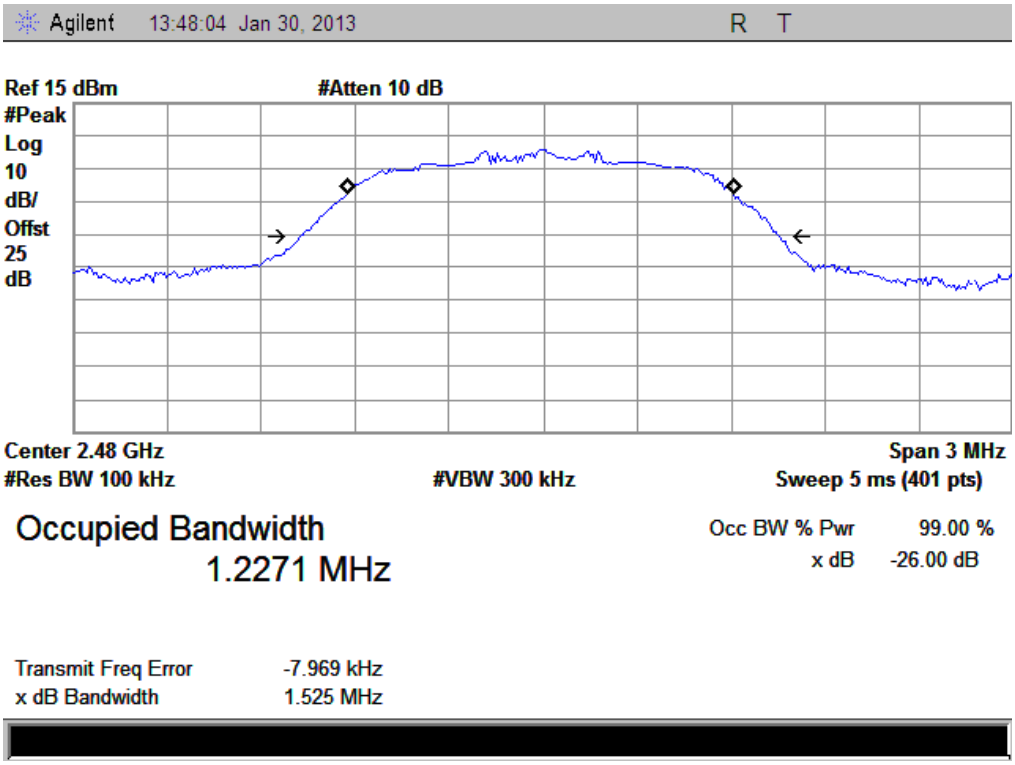
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Refer to Plot
0	2402	1.2722	Plot D1
39	2441	1.2439	Plot E1
78	2480	1.2271	Plot F1



(Plot D1: Channel = 2402)



(Plot E1: Channel = 2441)



(Plot F1: Channel = 2480)

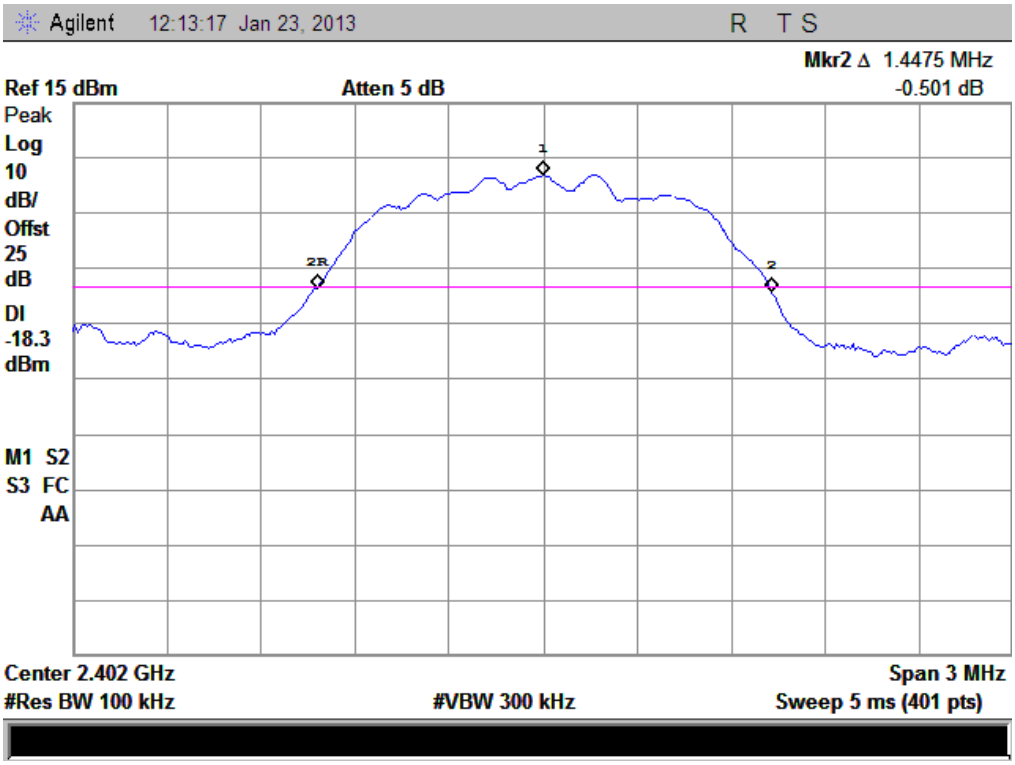
2.4.2.3. 8-DPSK Mode

A. Test Verdict:

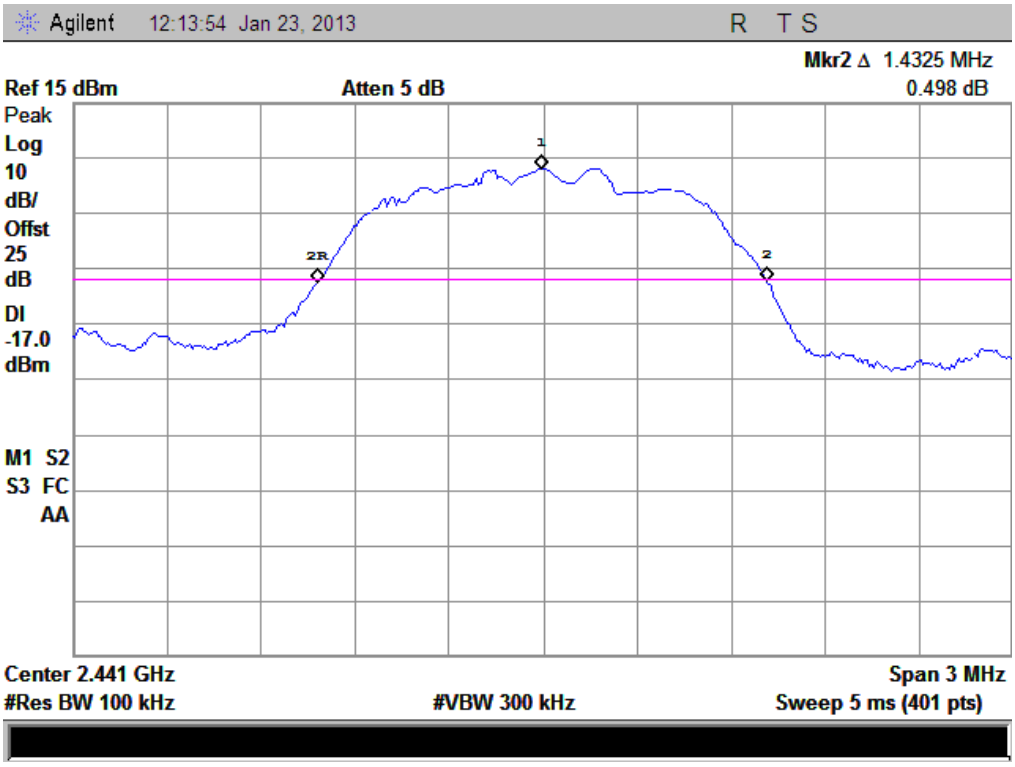
The maximum 20dB bandwidth measured is 1.4475MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.4475	Plot G
39	2441	1.4325	Plot H
78	2480	1.4250	Plot I

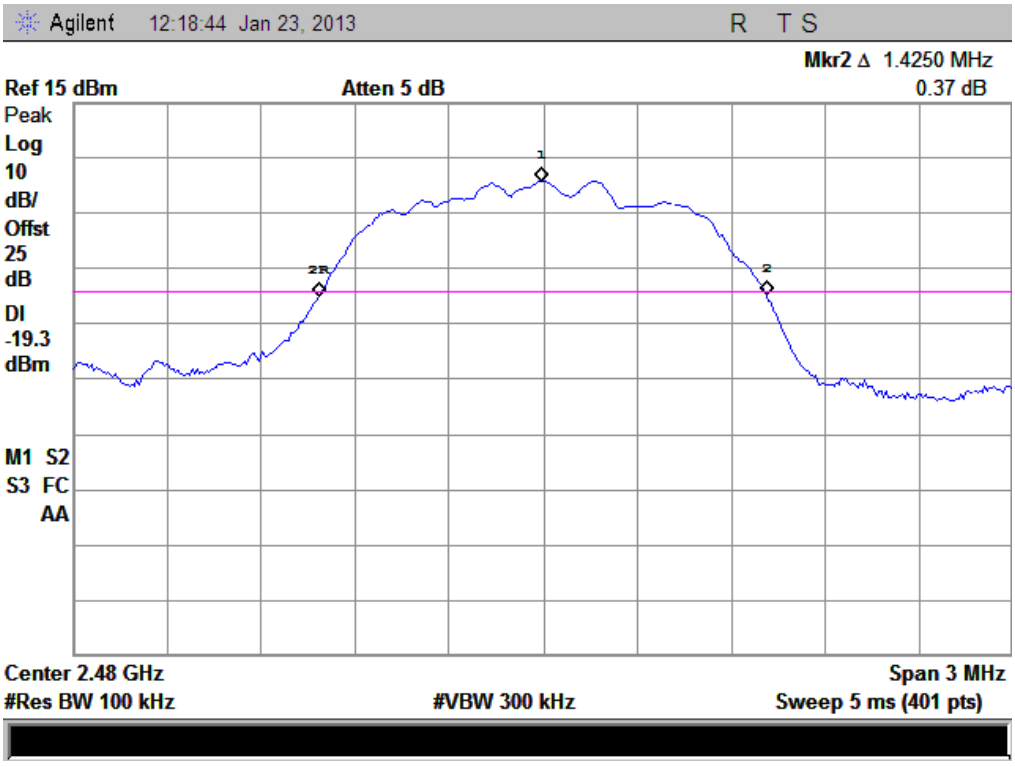
B. Test Plots:



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



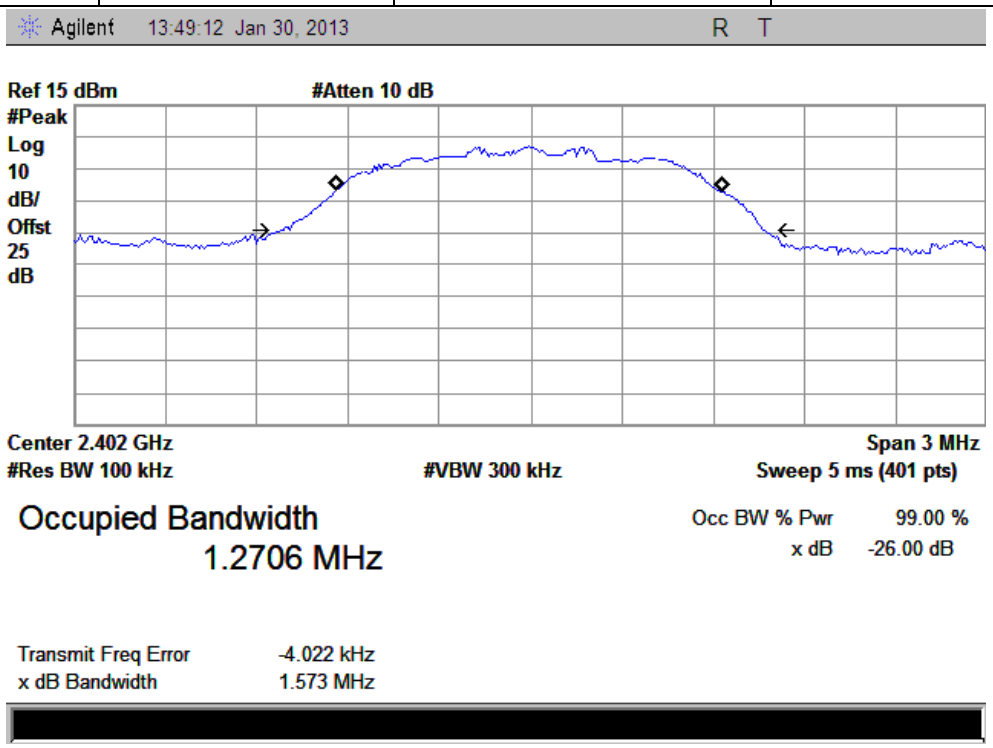
(Plot H: Channel = 2441 @ 8-DPSK)



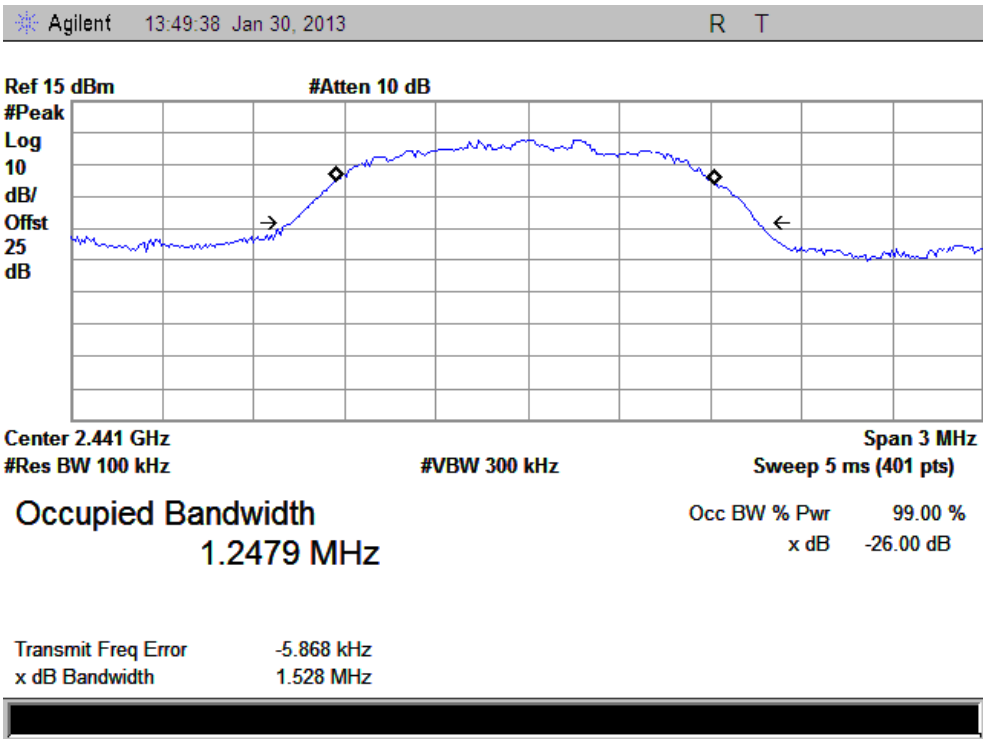
(Plot I: Channel = 2480 @ 8-DPSK)

99% Bandwidth

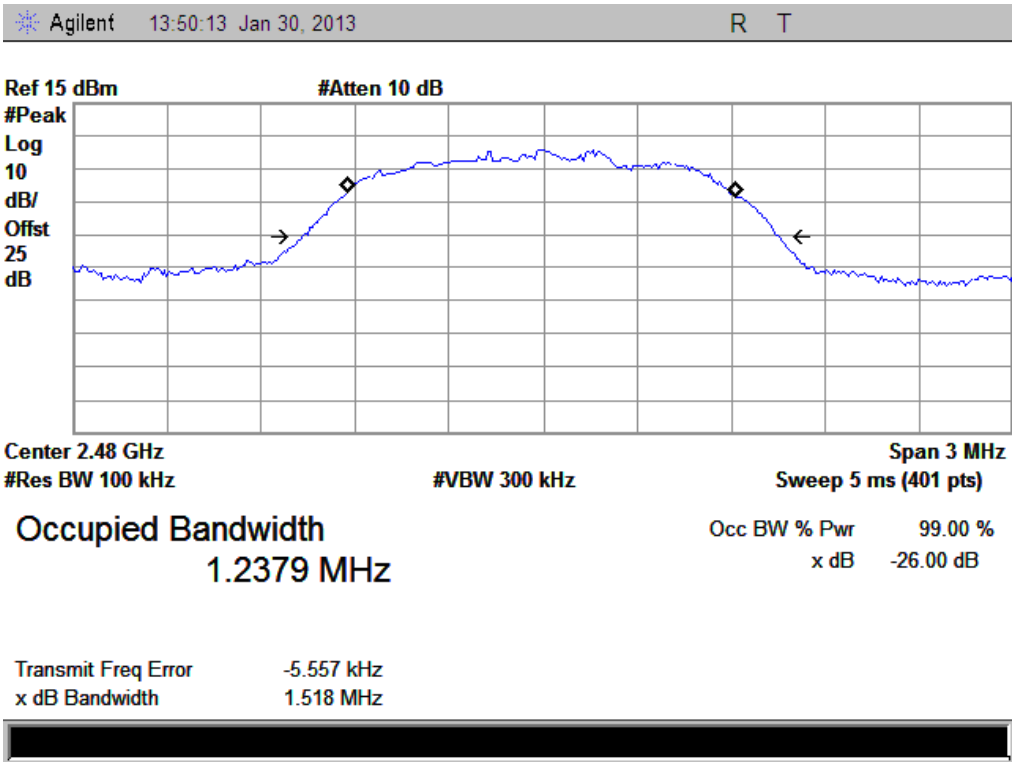
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Refer to Plot
0	2402	1.2706	Plot G1
39	2441	1.2479	Plot H1
78	2480	1.2379	Plot I1



(Plot G1: Channel = 2402)



(Plot H1: Channel = 2441)



(Plot I1: Channel = 2480)

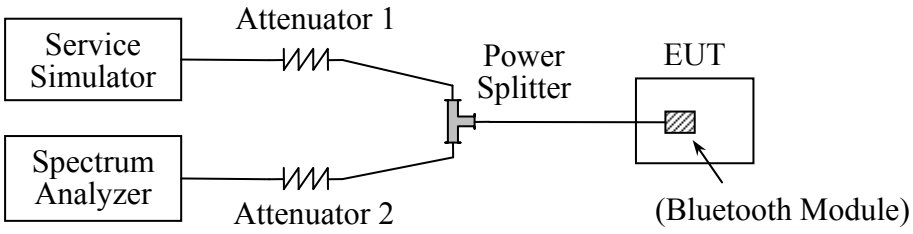
2.5. Carried Frequency Separation

2.5.1. Definition

According to FCC §15.247(a)(1) and RSS-210 A8.1 (b), 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	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

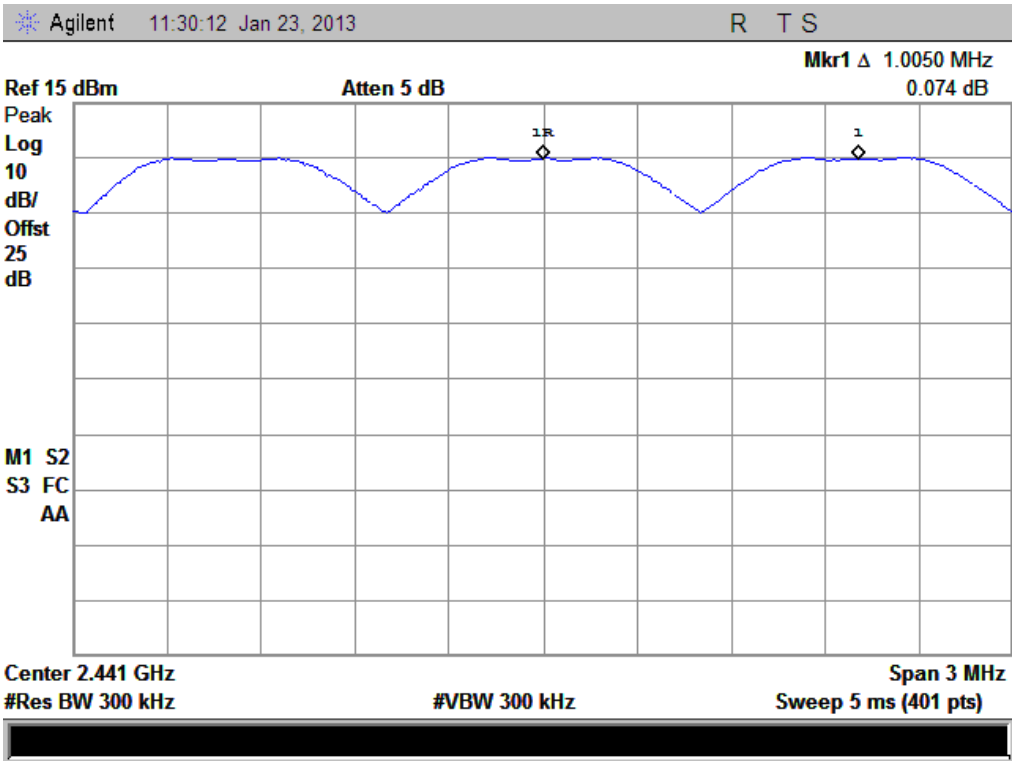
Trace = max hold

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

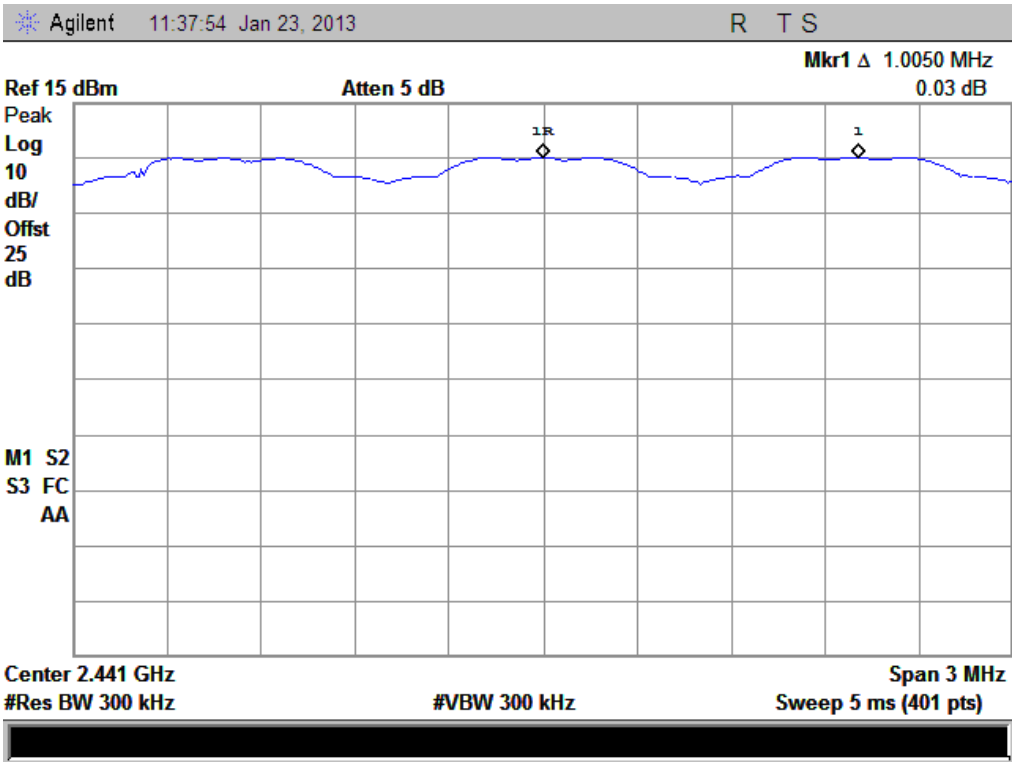
2.5.4. Test Result

The Bluetooth Module operates at hopping-on test mode.

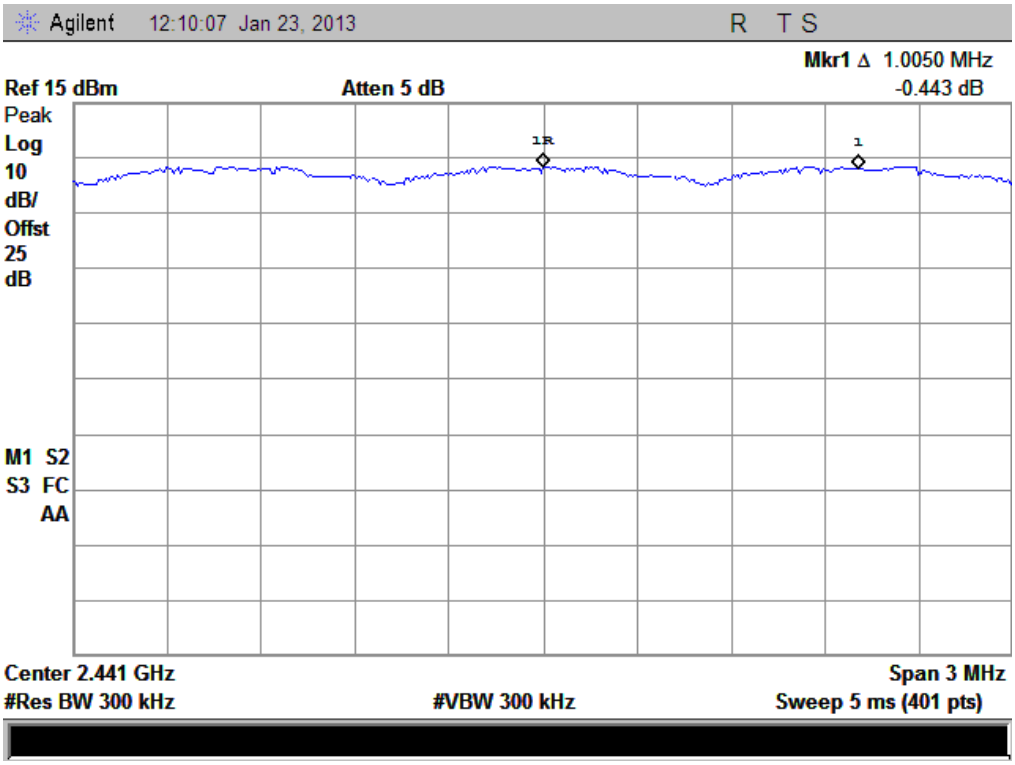
For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (1.1550MHz for GFSK mode, 1.4250MHz for Π/4-DQPSK mode and 1.4475MHz for 8-DPSK mode, refer to section 2.4.1), whichever is greater. So, the verdict is PASSING



(Plot A: GFSK)



(Plot B: π/4-DQPSK)



(Plot C: 8-DPSK)

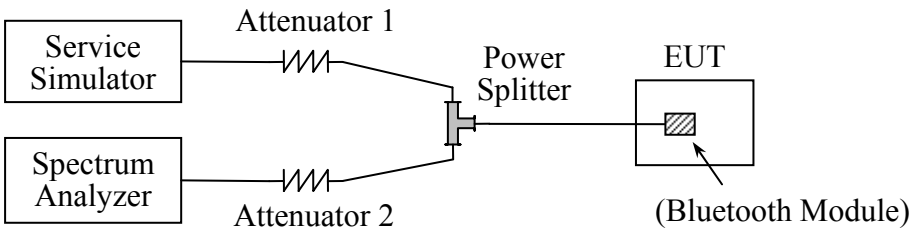
2.6. Time of Occupancy (Dwell time)

2.6.1. Requirement

According to FCC §15.247(a) (1) (iii) and RSS-210 A8.1 (d), 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.

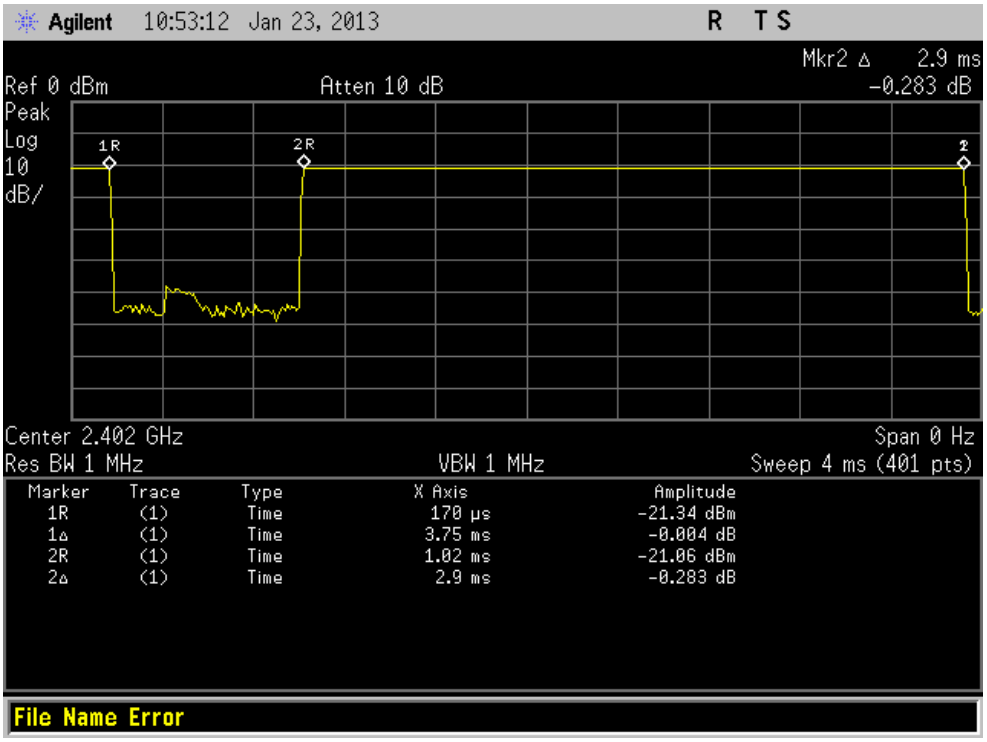
2.6.4.1. GFSK Mode

A. Test Verdict:

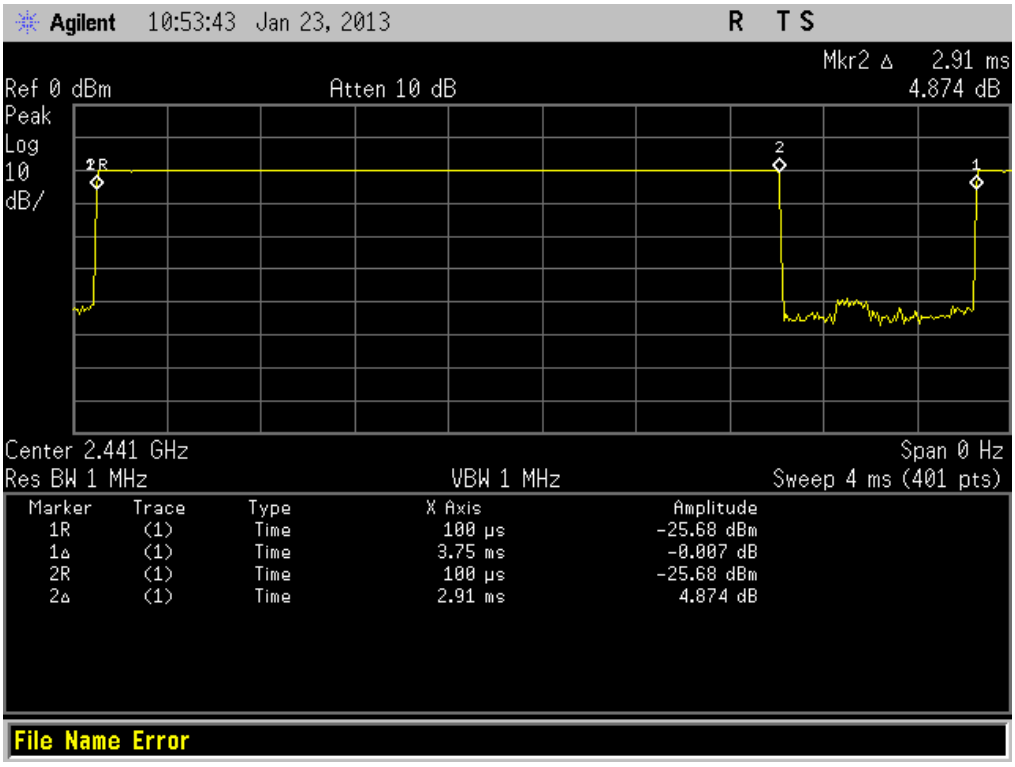
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.900	Plot A	309.333	400	PASS
39	2441	2.910	Plot B	310.400		PASS
78	2480	2.910	Plot C	310.400		PASS

Test Plots:

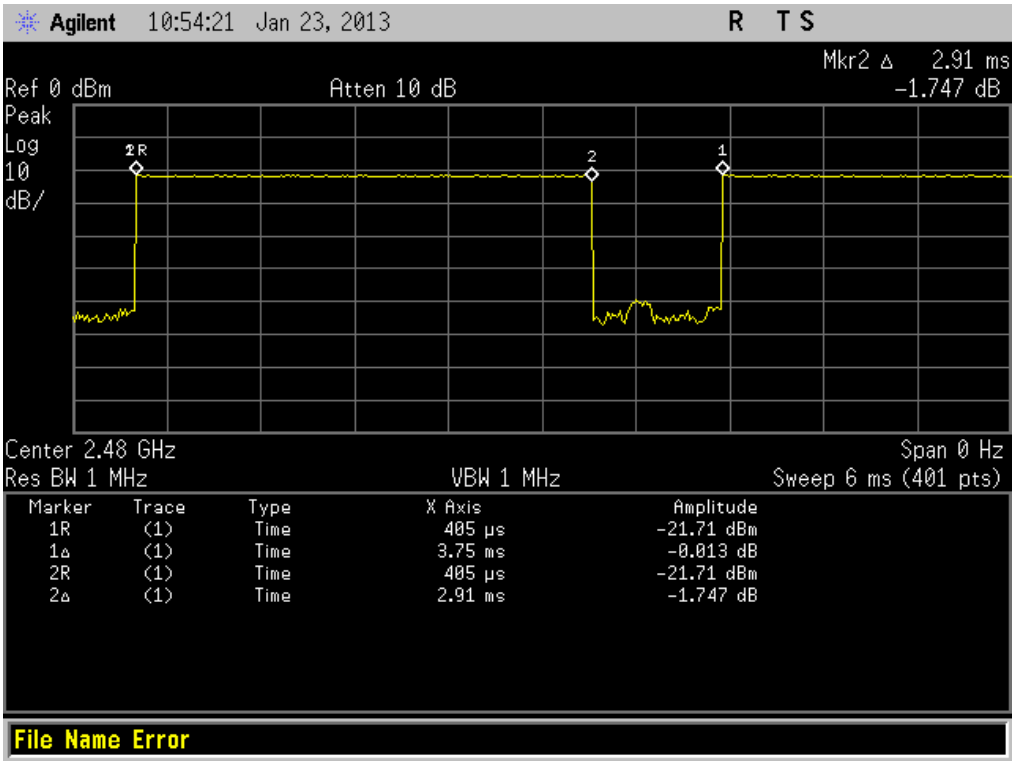
Note: the following plots record the Pulse Time of the Module carrier.



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

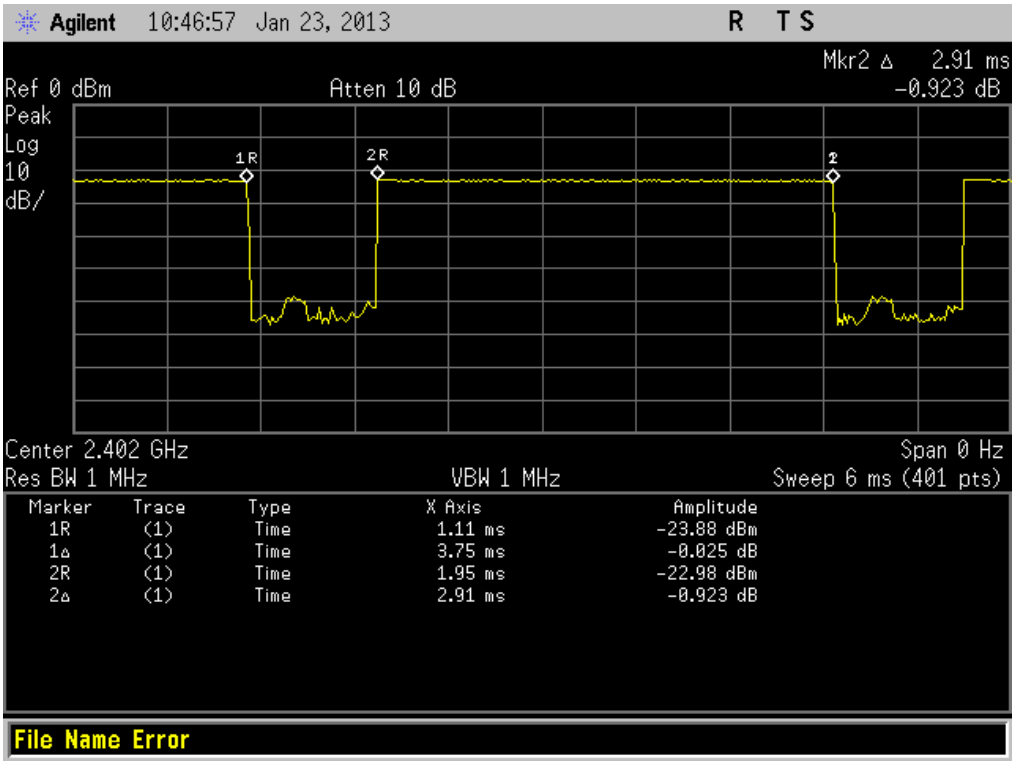
2.6.4.2. Π/4-DQPSK Mode

A. Test Verdict:

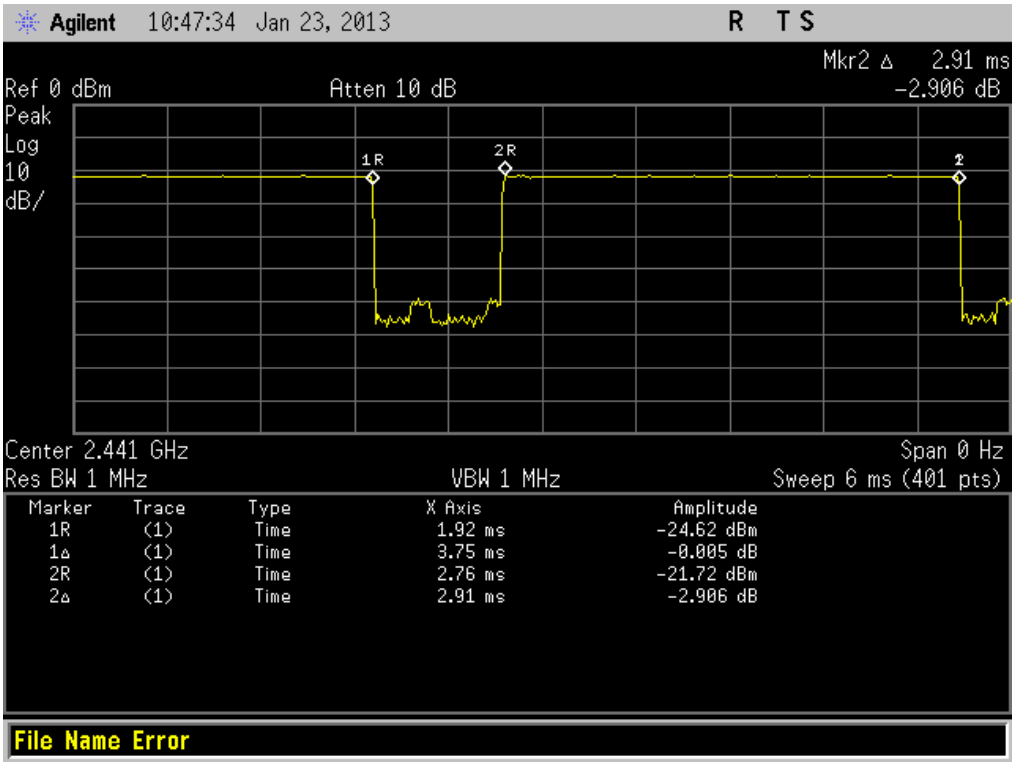
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.910	Plot D	310.400	400	PASS
39	2441	2.910	Plot E	310.400		PASS
78	2480	2.920	Plot F	311.467		PASS

Test Plots:

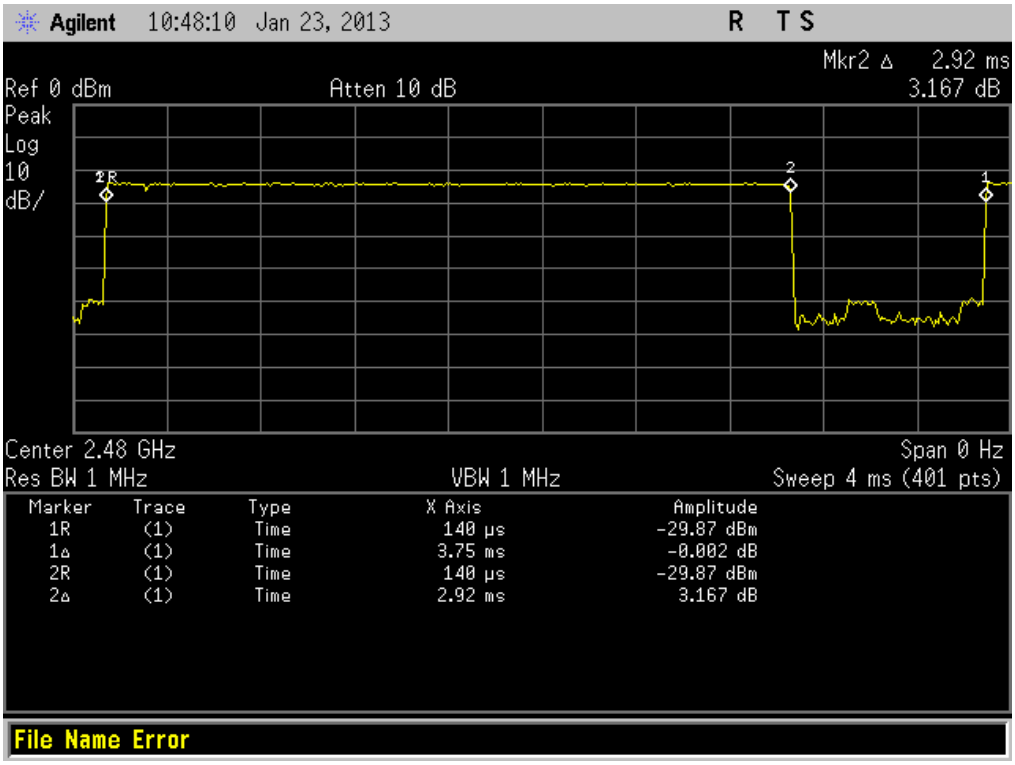
Note: the following plots record the Pulse Time of the Module carrier.



(Plot D: Channel = 2402 @ Π/4-DQPSK)



(Plot E: Channel = 2441 @ ∏/4-DQPSK)



(Plot F: Channel = 2480 @ ∏/4-DQPSK)

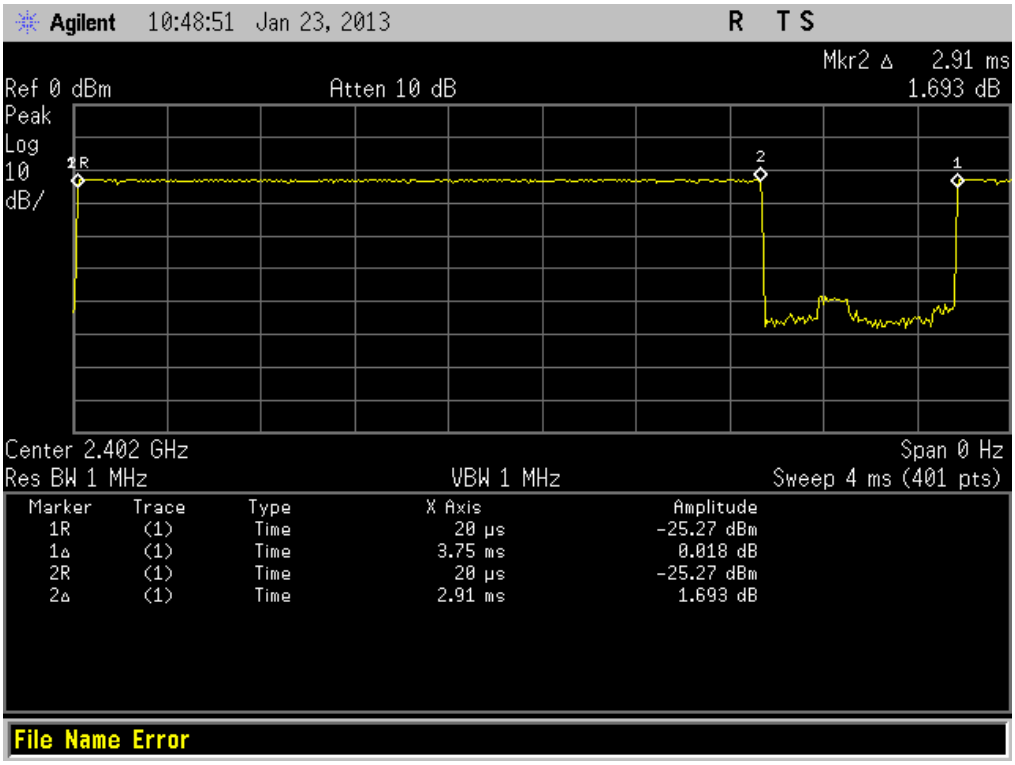
2.6.4.3. 8-DPSK mode

A. Test Verdict:

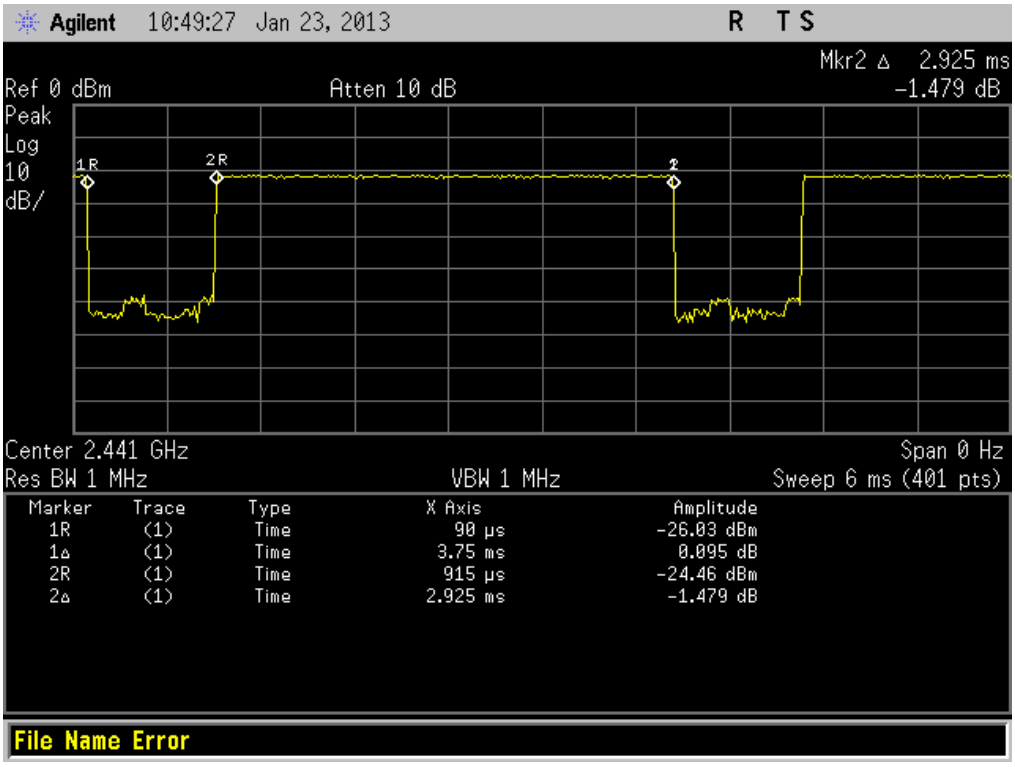
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.910	Plot G	310.400	400	PASS
39	2441	2.925	Plot H	312.00		PASS
78	2480	2.910	Plot I	310.400		PASS

Test Plots:

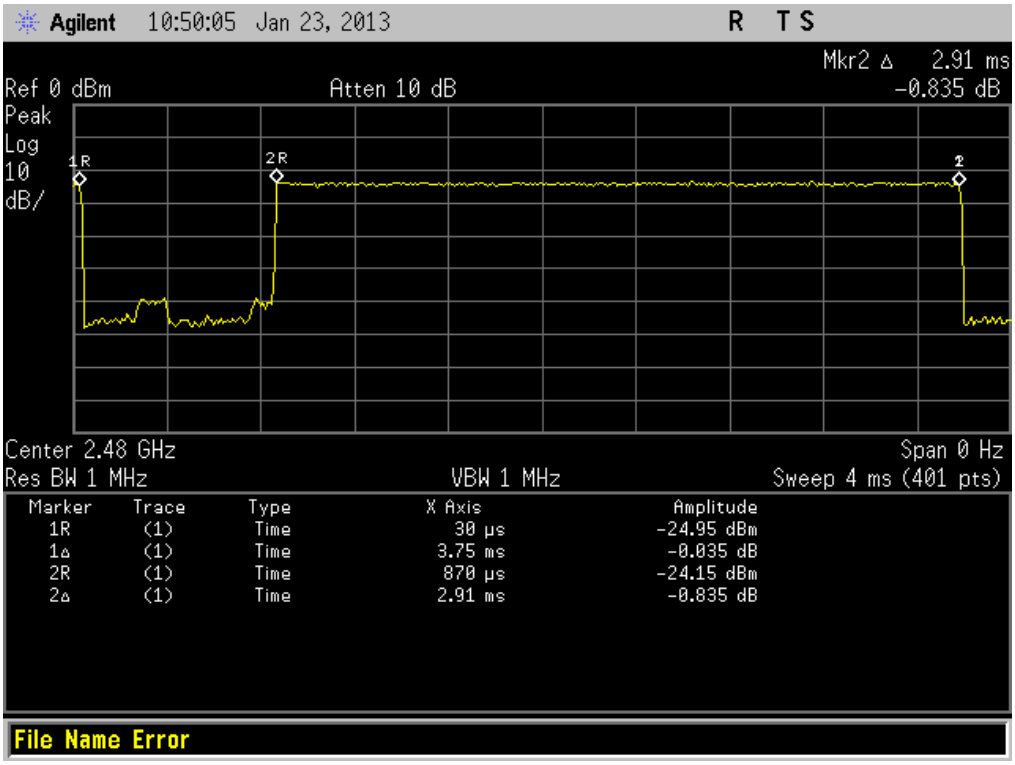
Note: the following plots record the Pulse Time of the Module carrier.



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



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



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

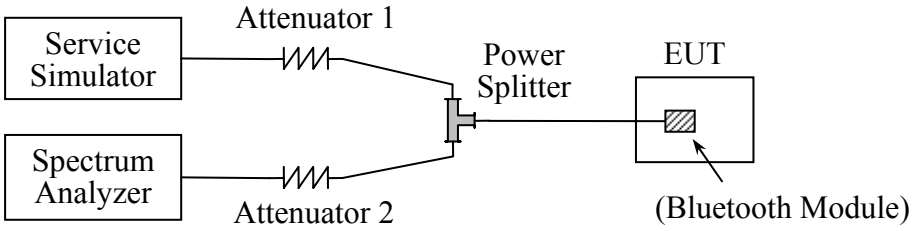
2.7. Conducted Spurious Emissions

2.7.1. Requirement

According to FCC §15.247(d) and RSS-A8.5, 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.

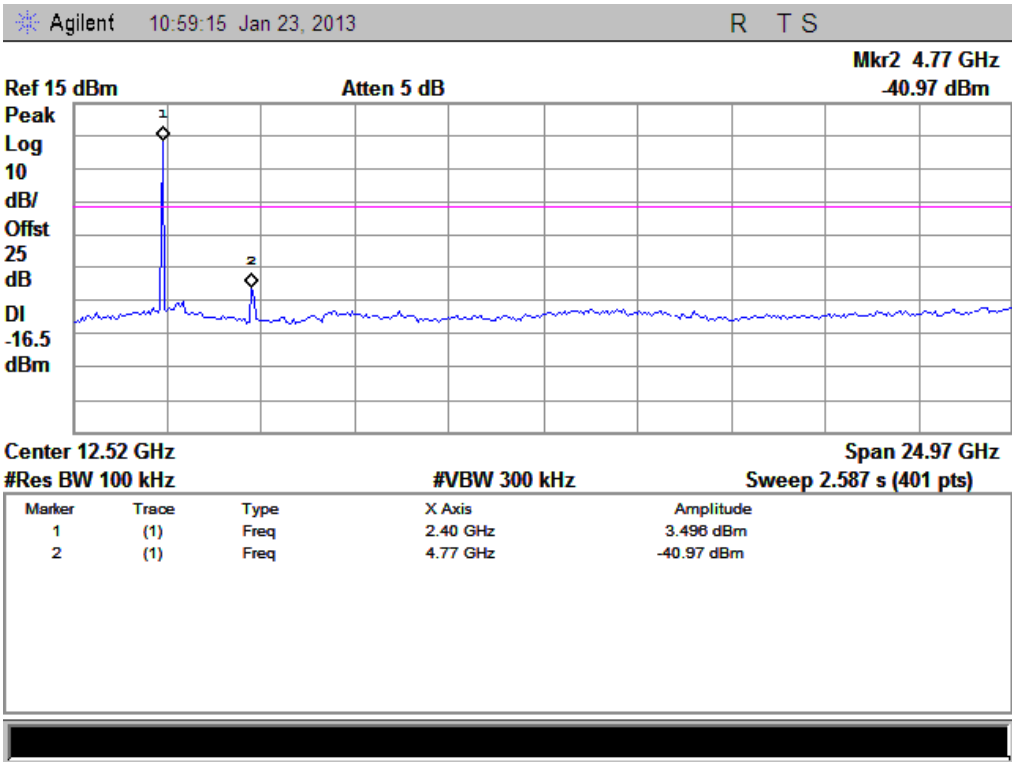
2.7.4.1. GFSK Mode

A. Test Verdict:

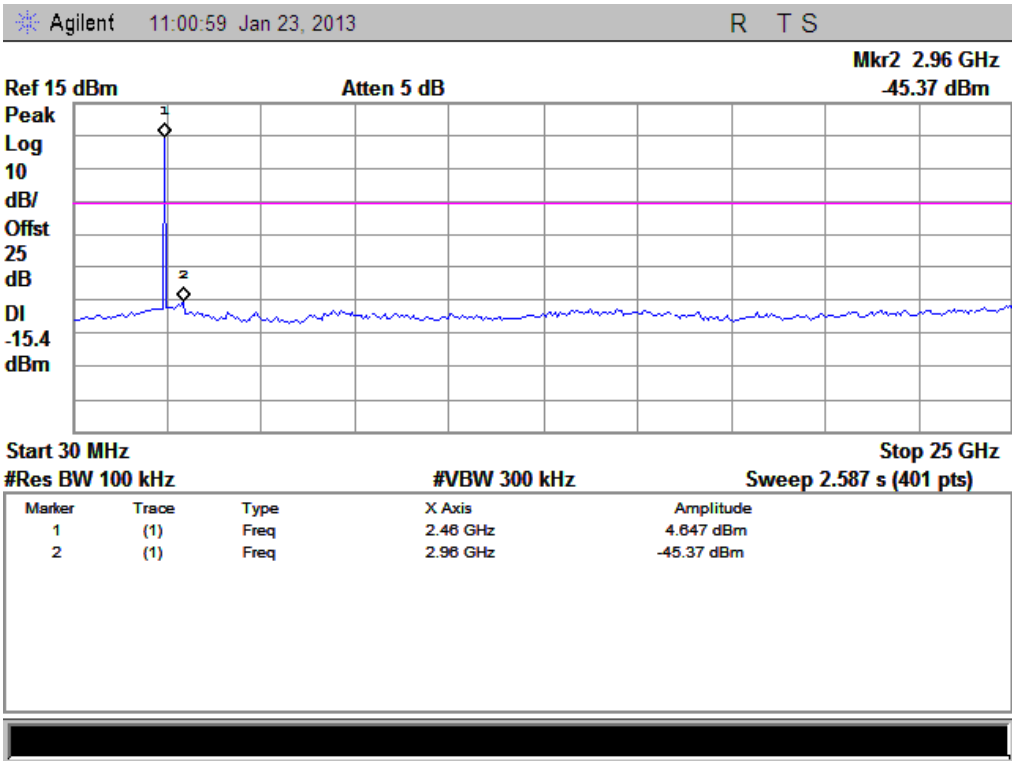
Channel	Frequency (MHz)	Measured Max. Out of Band Emission dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-40.97	Plot A.1	3.496	-16.5	PASS
39	2441	-45.37	Plot B.1	4.647	-15.4	PASS
78	2480	-45.85	Plot C.1	2.134	-17.9	PASS

B. Test Plots:

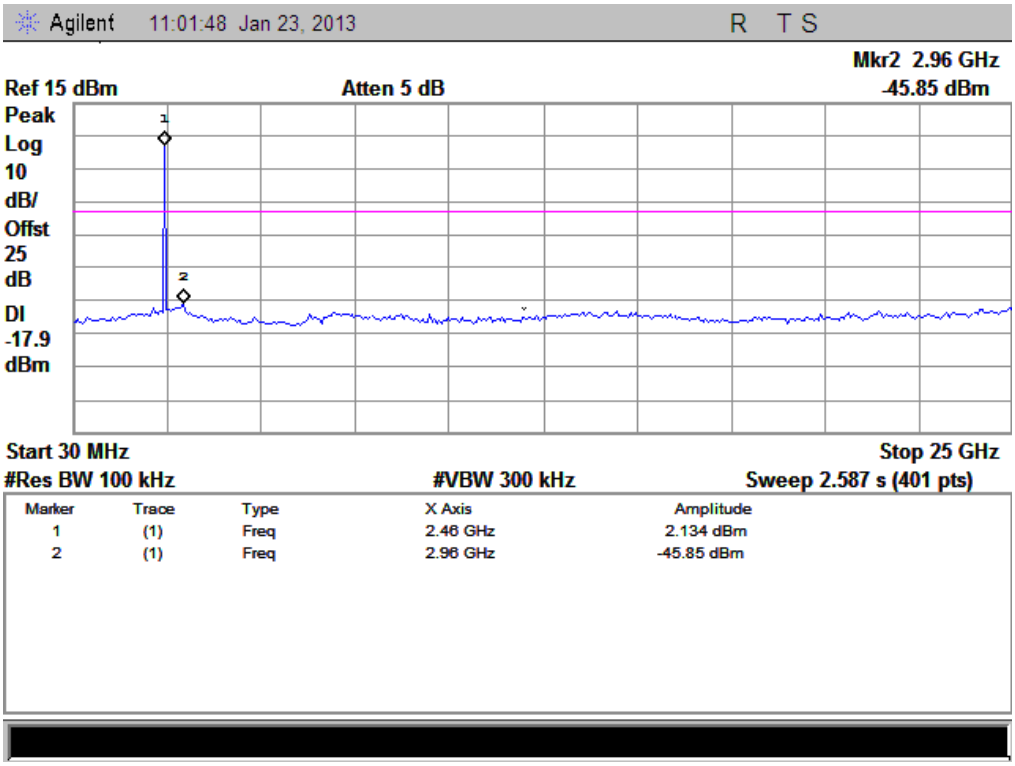
Note: the power of the Module transmitting frequency should be ignored.



(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)

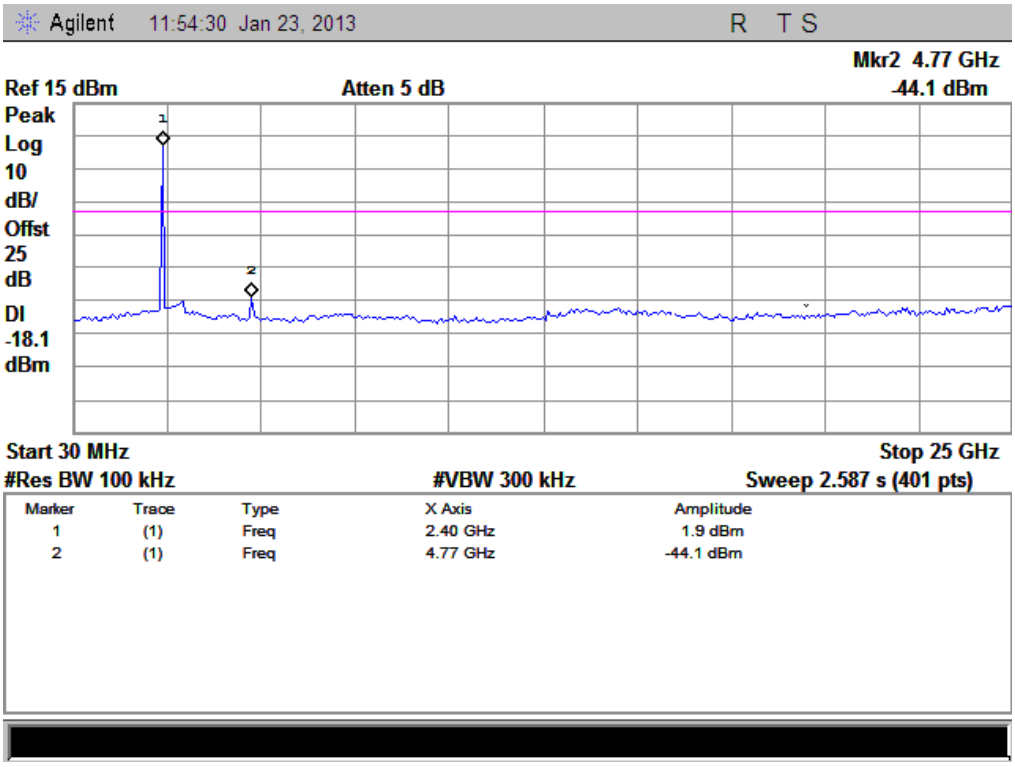
2.7.4.2. ∏/4-DQPSK Mode

A. Test Verdict:

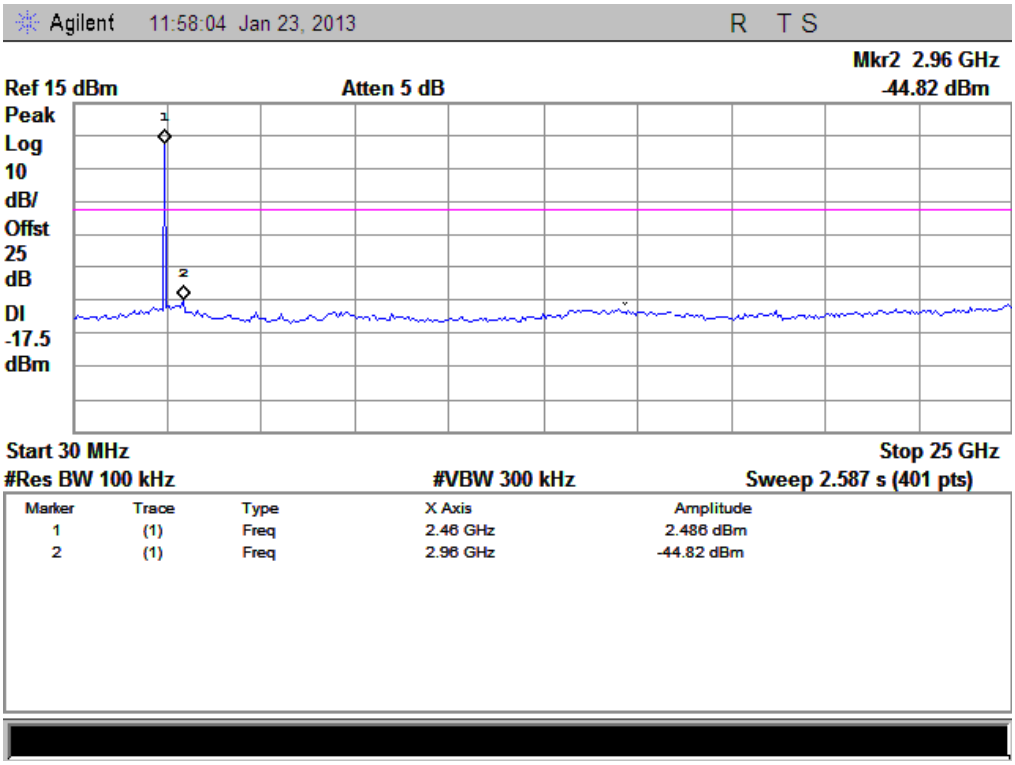
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-44.10	Plot D.1	1.900	-18.1	PASS
39	2441	-44.82	Plot E.1	2.486	-17.5	PASS
78	2480	-45.25	Plot F.1	-1.588	-21.5	PASS

B. Test Plots:

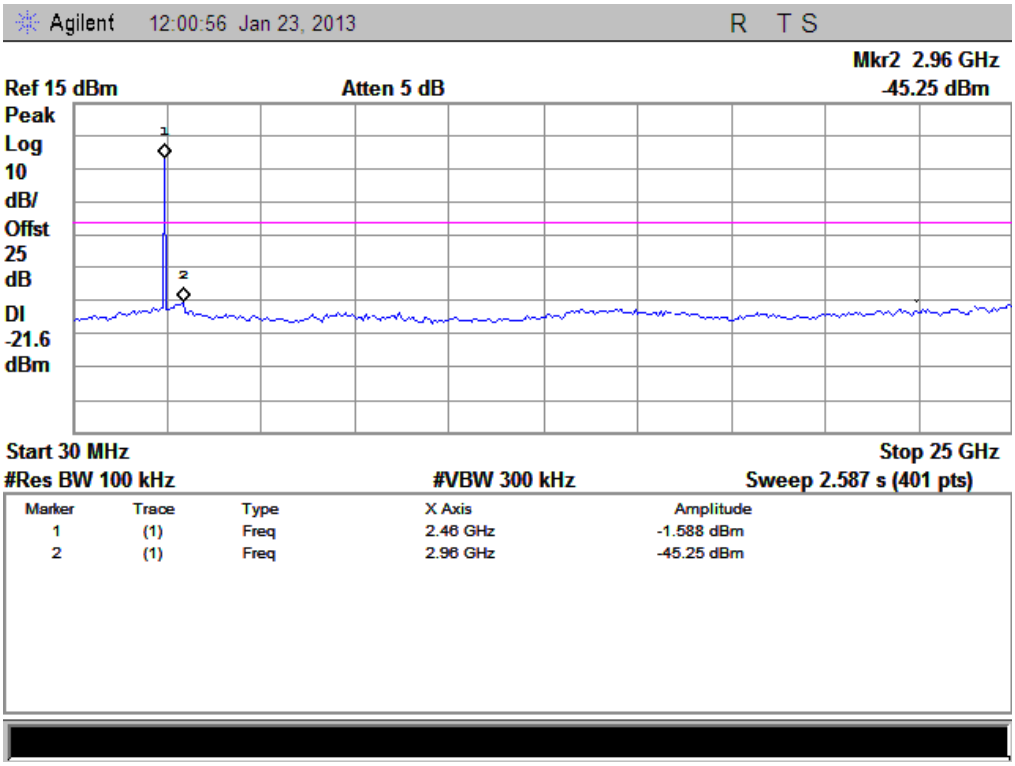
Note: the power of the Module transmitting frequency should be ignored.



(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 @ Π/3-DQPSK)

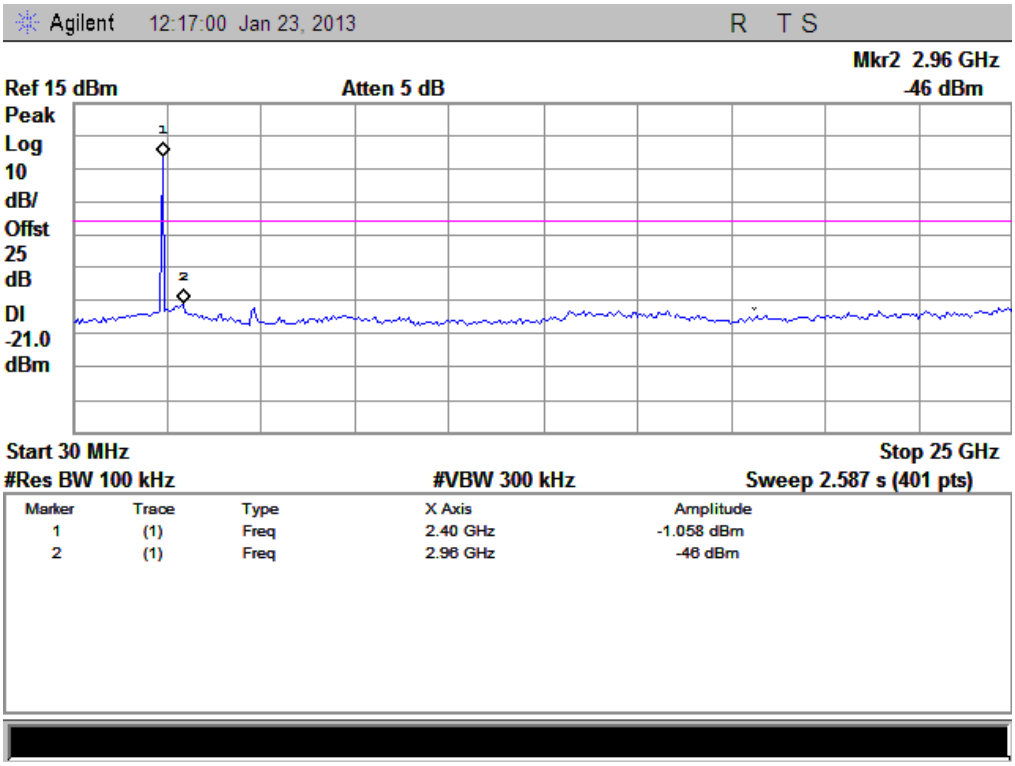
2.7.4.3. 8-DPSK Mode

A. Test Verdict:

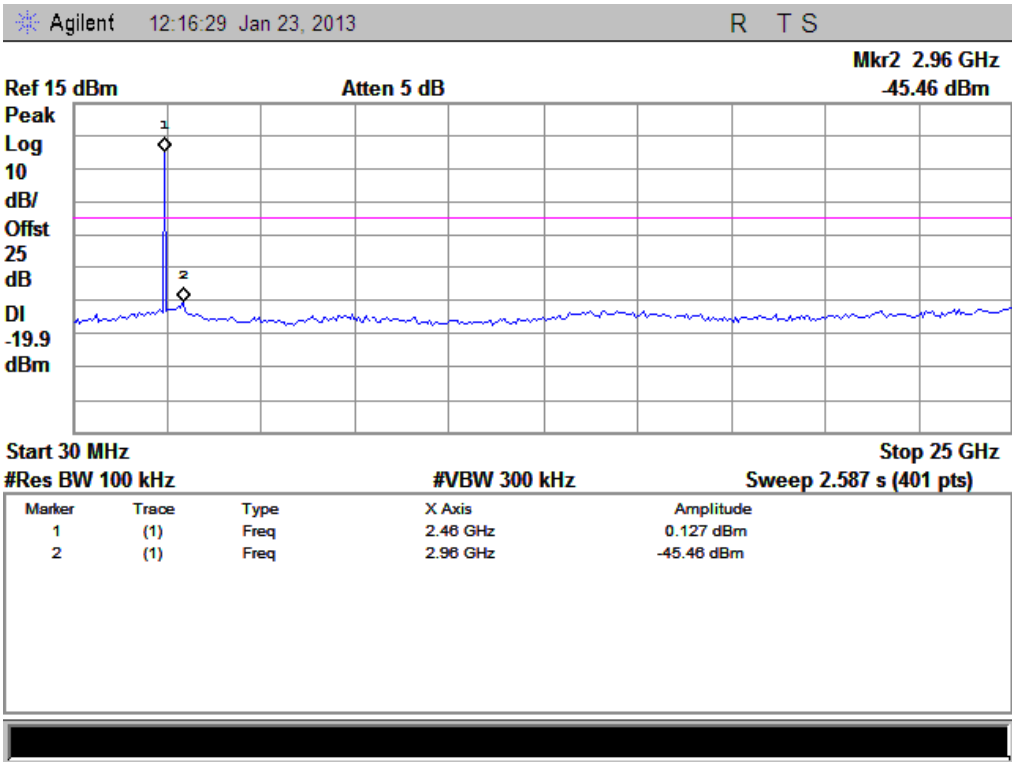
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-46.00	Plot G.1	-1.058	-21.0	PASS
39	2441	-45.46	Plot H.1	0.127	-19.9	PASS
78	2480	-45.25	Plot I.1	-1.588	-21.6	PASS

B. Test Plots:

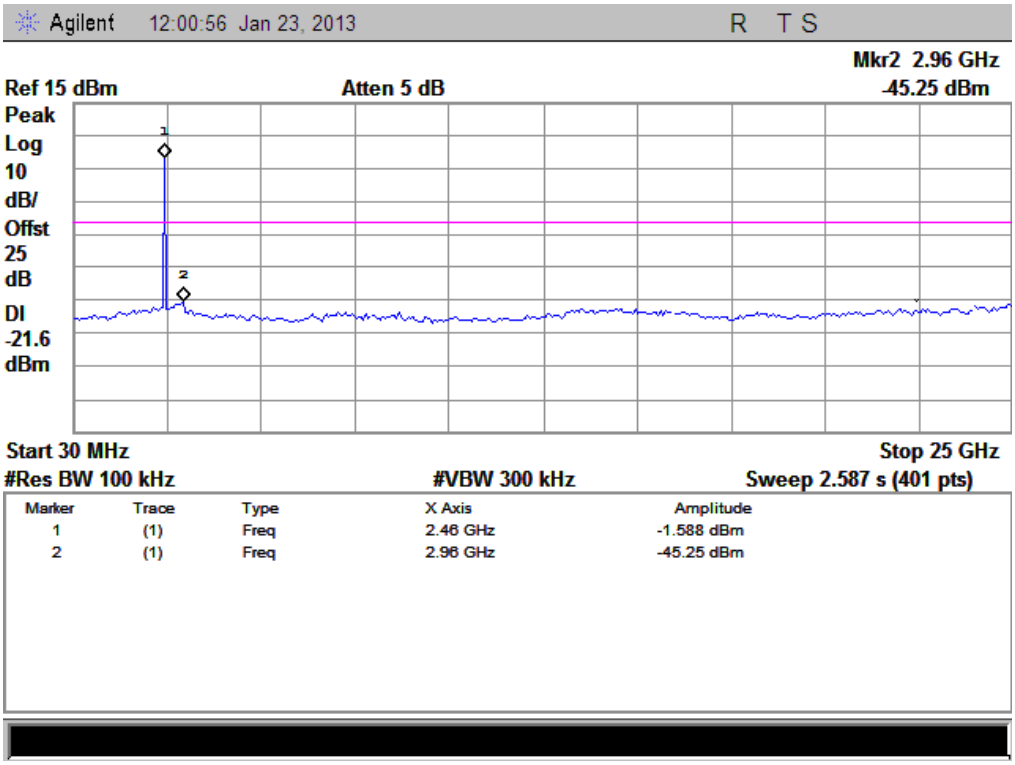
Note: the power of the Module transmitting frequency should be ignored.



(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)

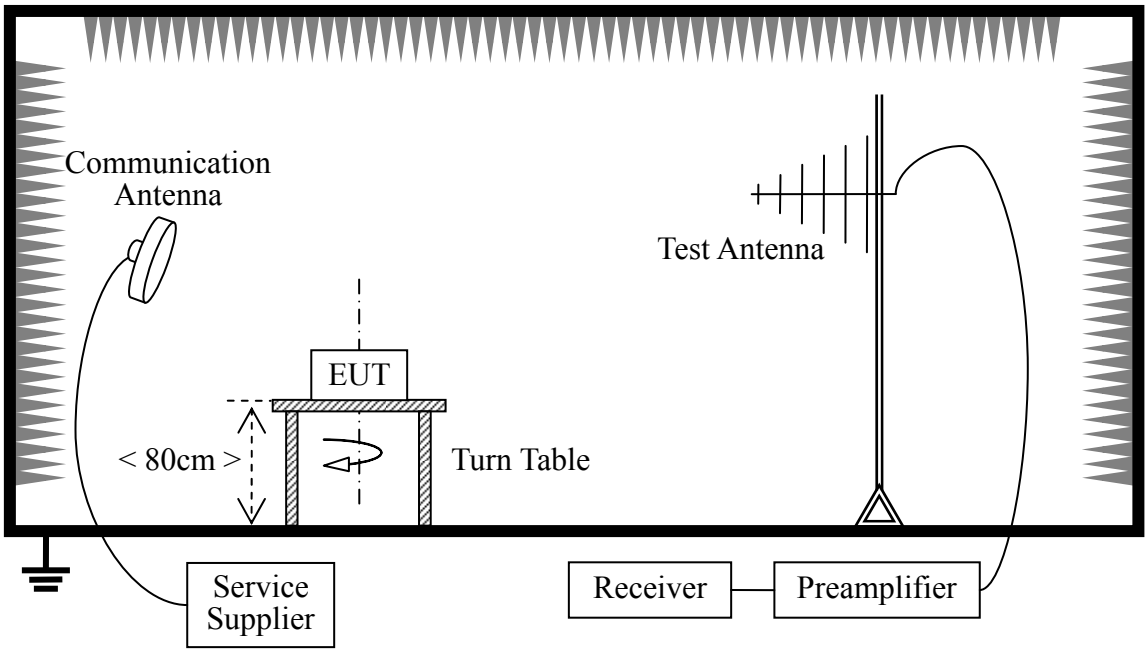
2.8. Band Edge

2.8.1. Requirement

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

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05	2013.05
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

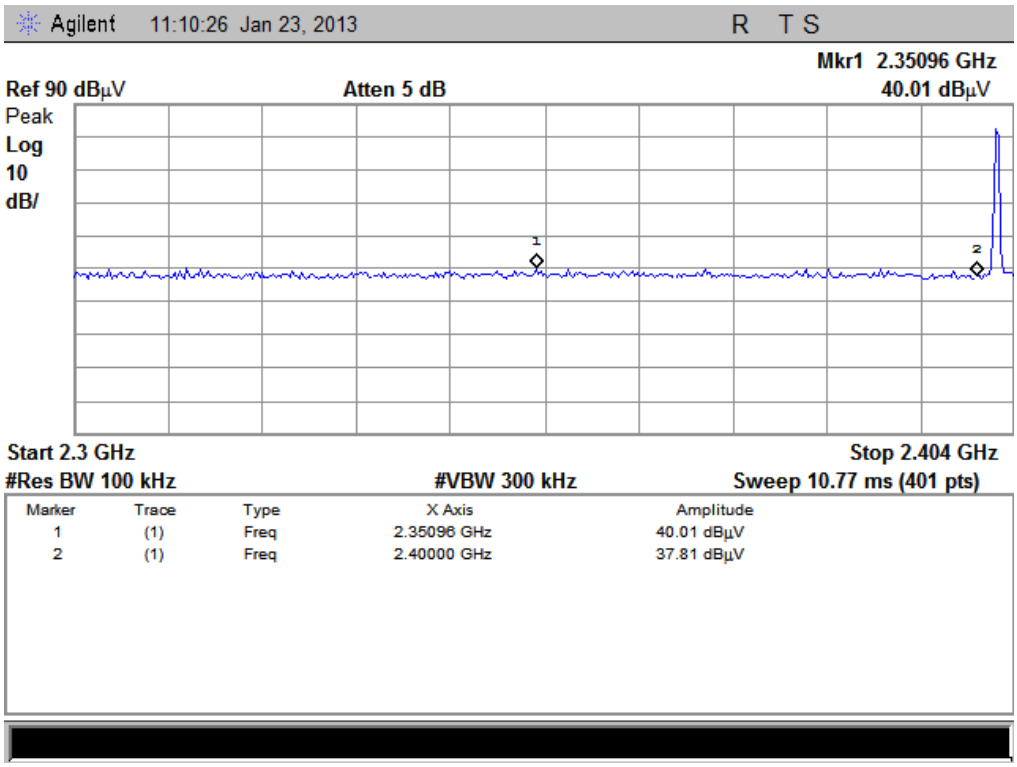
A. Test Verdict:

(Un-hopping)

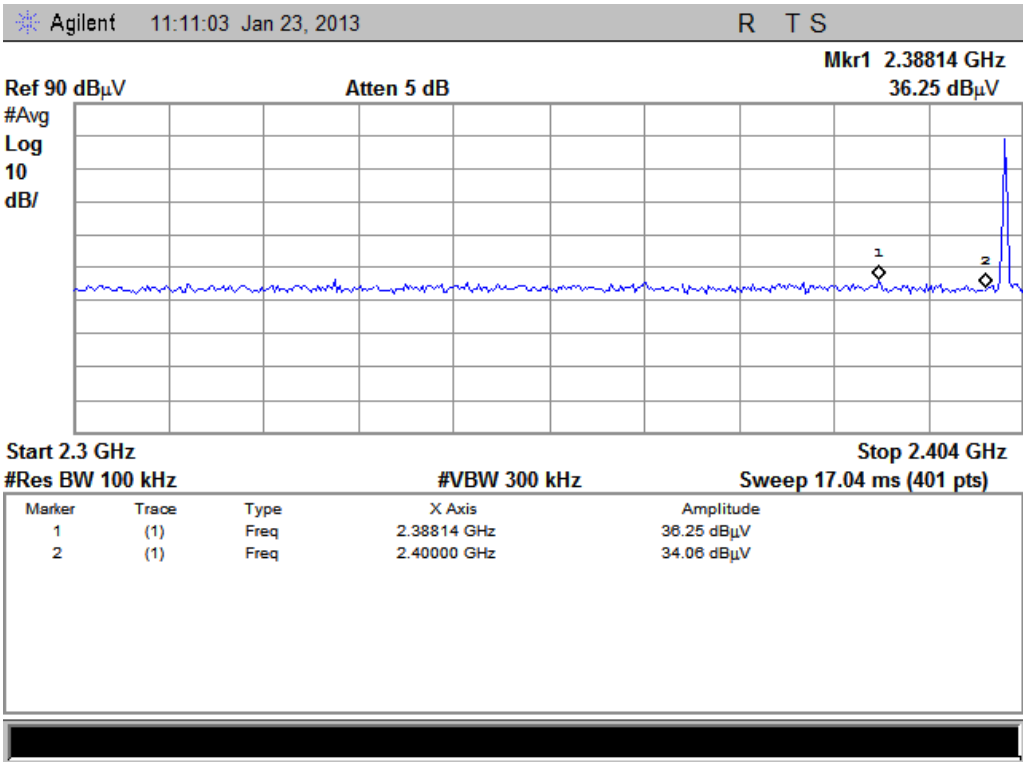
Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
0	2350.96	PK	40.01	-30.93	32.56	41.64	74	Pass
0	2388.14	AV	36.25	-30.93	32.56	37.88	54	Pass
78	2499.51	PK	39.54	-29.05	32.50	42.99	74	Pass

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
78	2489.94	AV	37.93	-29.05	32.50	41.38	54	Pass

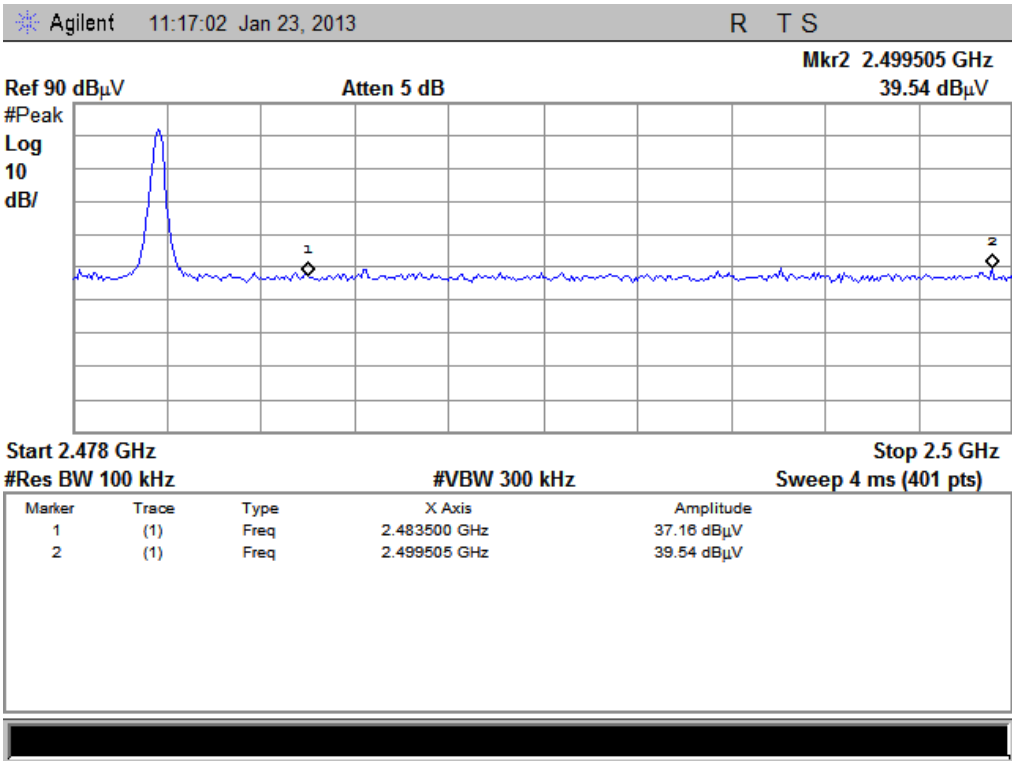
B. Test Plots:



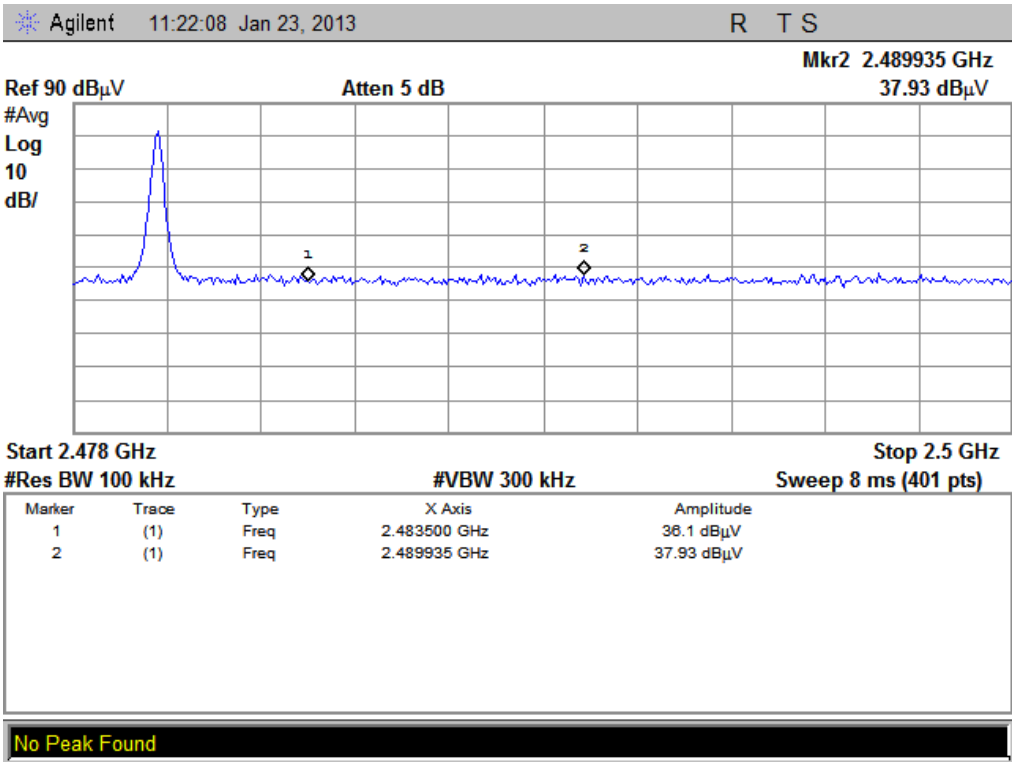
(Plot A1: Channel = 0 PEAK @ GFSK)



(Plot A2: Channel = 0 AVERAGE @ GFSK)



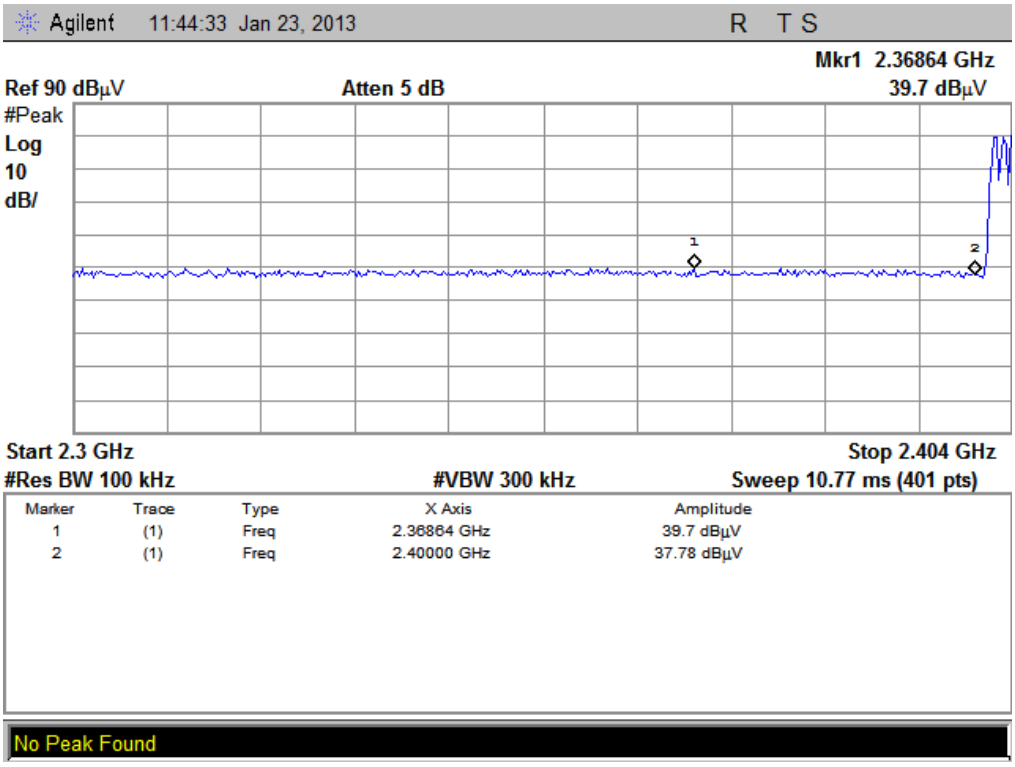
(Plot B1: Channel = 78 PEAK @ GFSK)



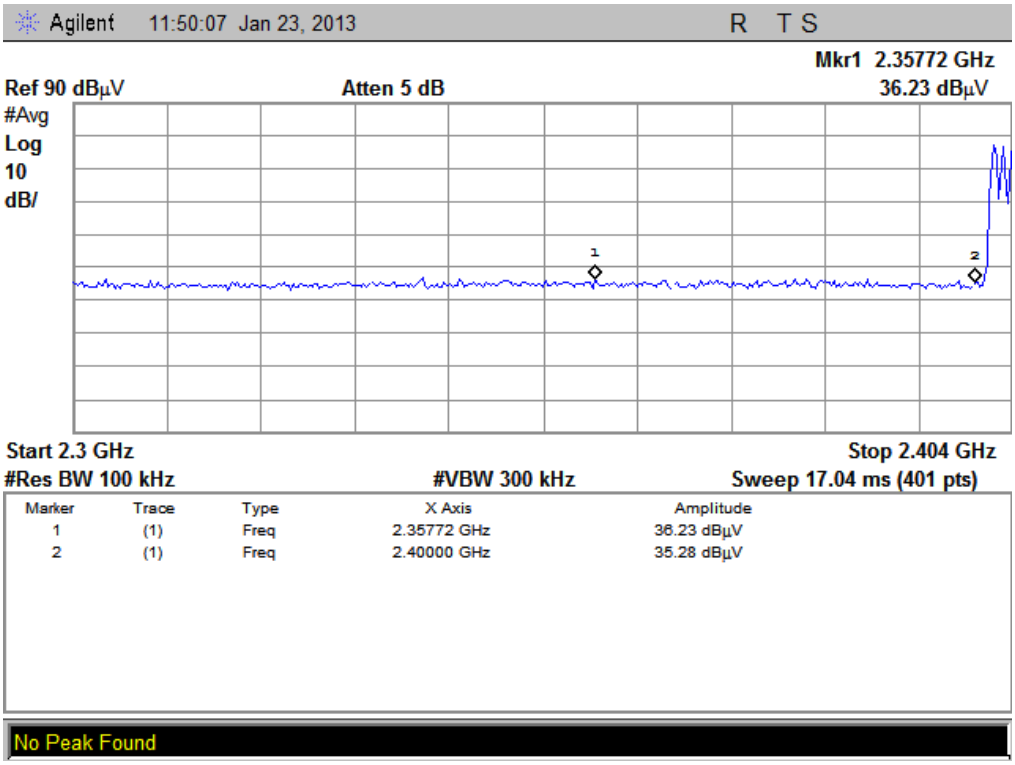
(Plot B2: Channel = 78 AVERAGE @ GFSK)

(hopping)

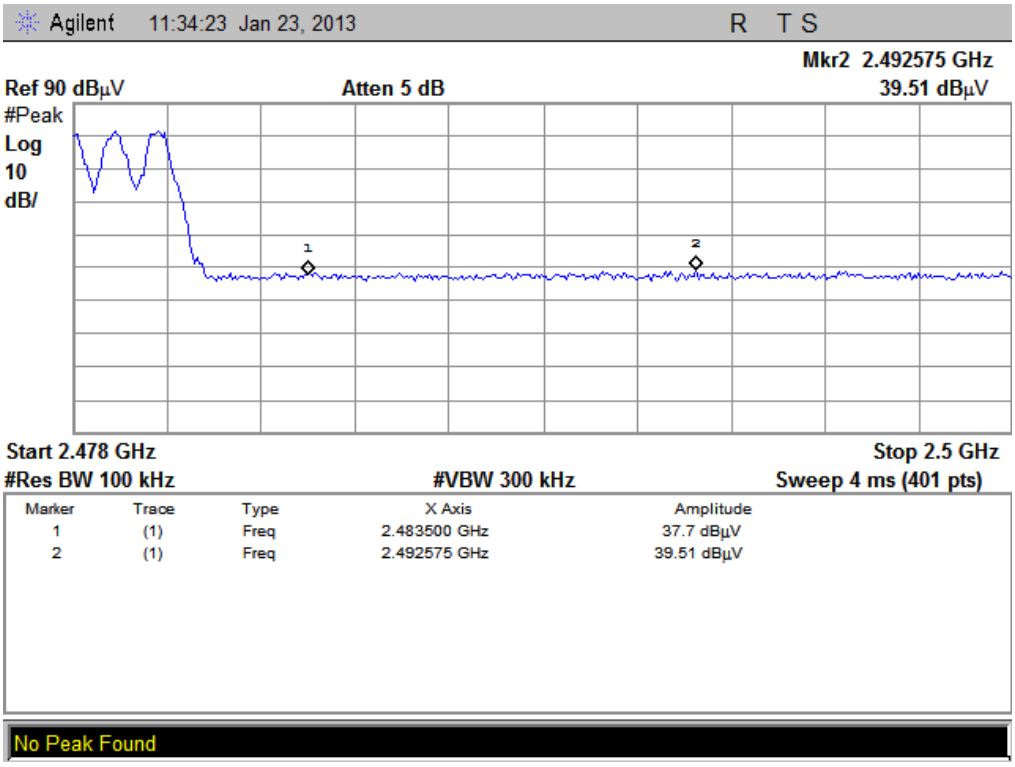
Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
0	2368.64	PK	39.70	-30.93	32.56	41.33	74	Pass
0	2357.72	AV	36.23	-30.93	32.56	37.86	54	Pass
78	2492.58	PK	39.51	-29.05	32.50	42.96	74	Pass
78	2485.22	AV	38.17	-29.05	32.50	41.62	54	Pass



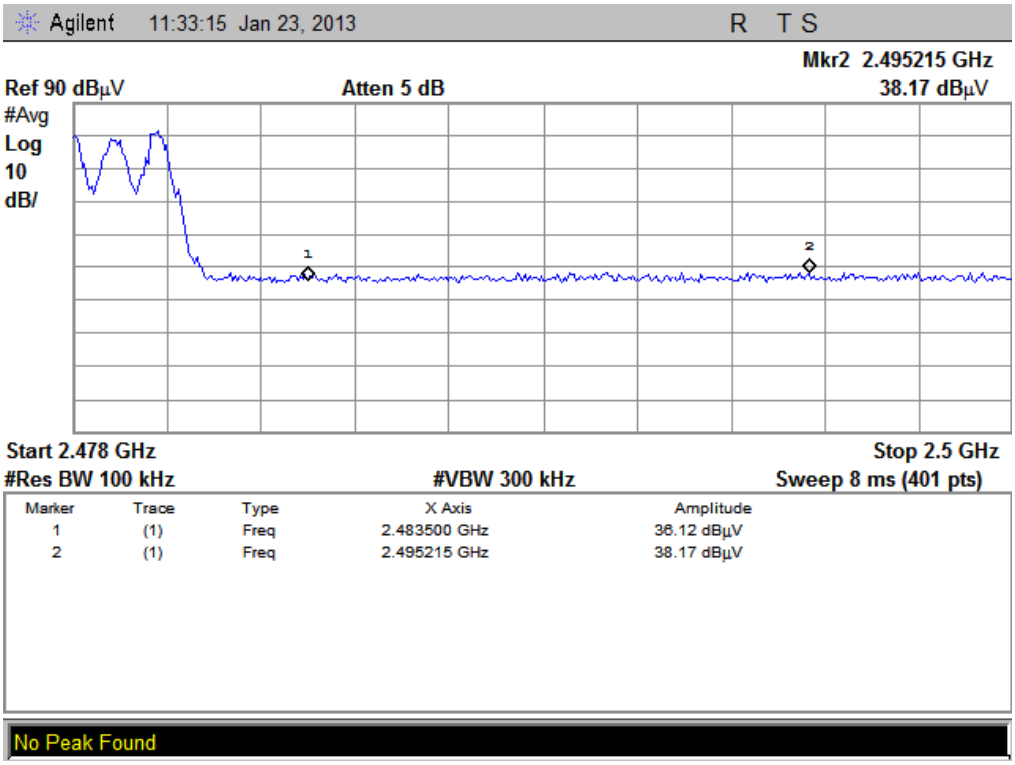
(Plot A1-1: Channel = 0 PEAK)



(Plot A2-1: Channel = 0 AVERAGE)



(Plot B1-1: Channel = 78 PEAK)



(Plot B2-1: Channel = 78 AVERAGE)

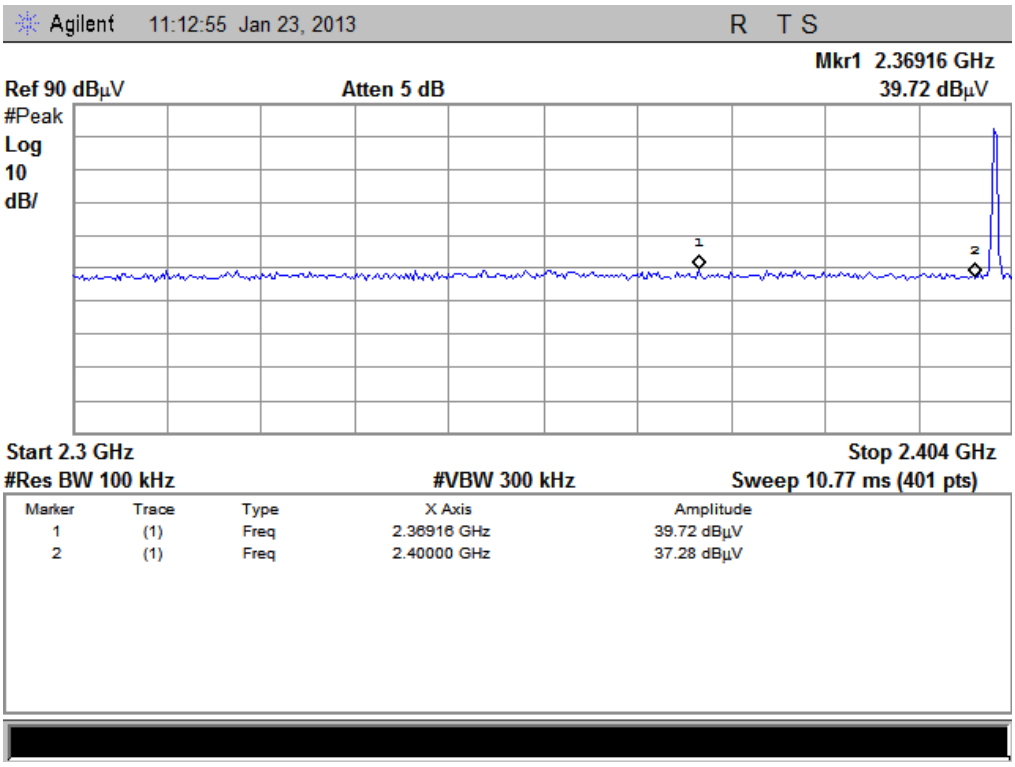
2.8.4.2. ∏/4-DQPSK Mode

A. Test Verdict:

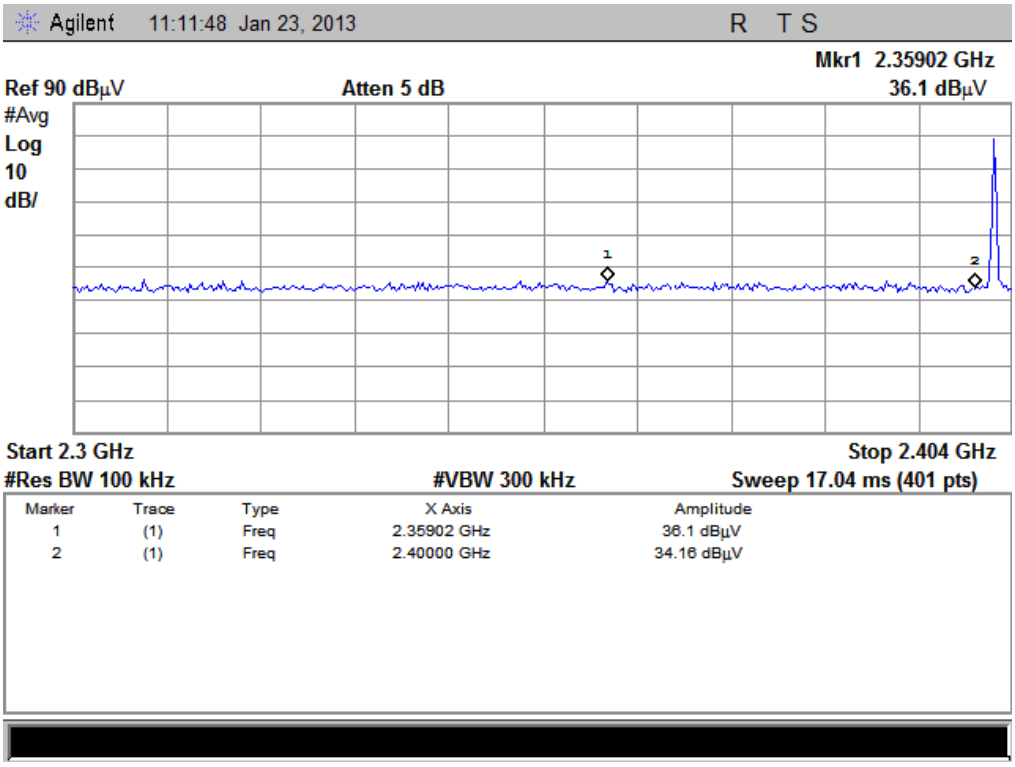
(Un-hopping)

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	2369.16	PK	39.72	-30.93	32.56	41.35	74	Pass
0	2369.02	AV	36.10	-30.93	32.56	37.73	54	Pass
78	2499.45	PK	39.52	-29.05	32.50	42.97	74	Pass
78	2495.71	AV	37.78	-29.05	32.50	41.23	54	Pass

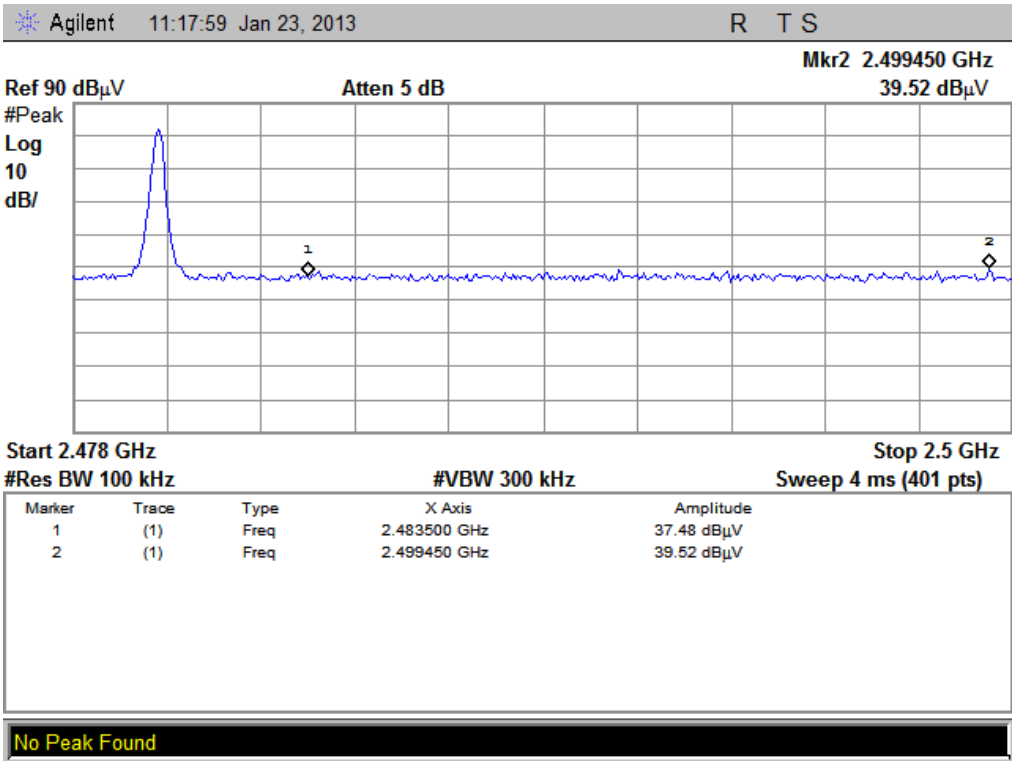
B. Test Plots:



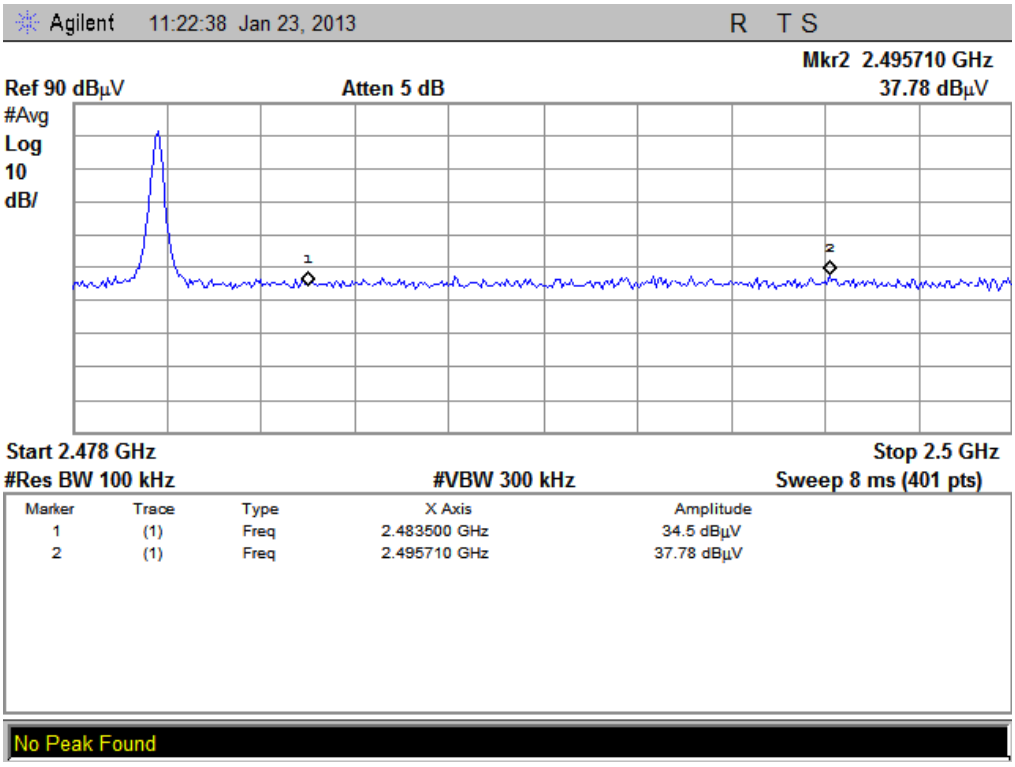
(Plot C1: Channel = 0 PEAK @ ∏/4-DQPSK)



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



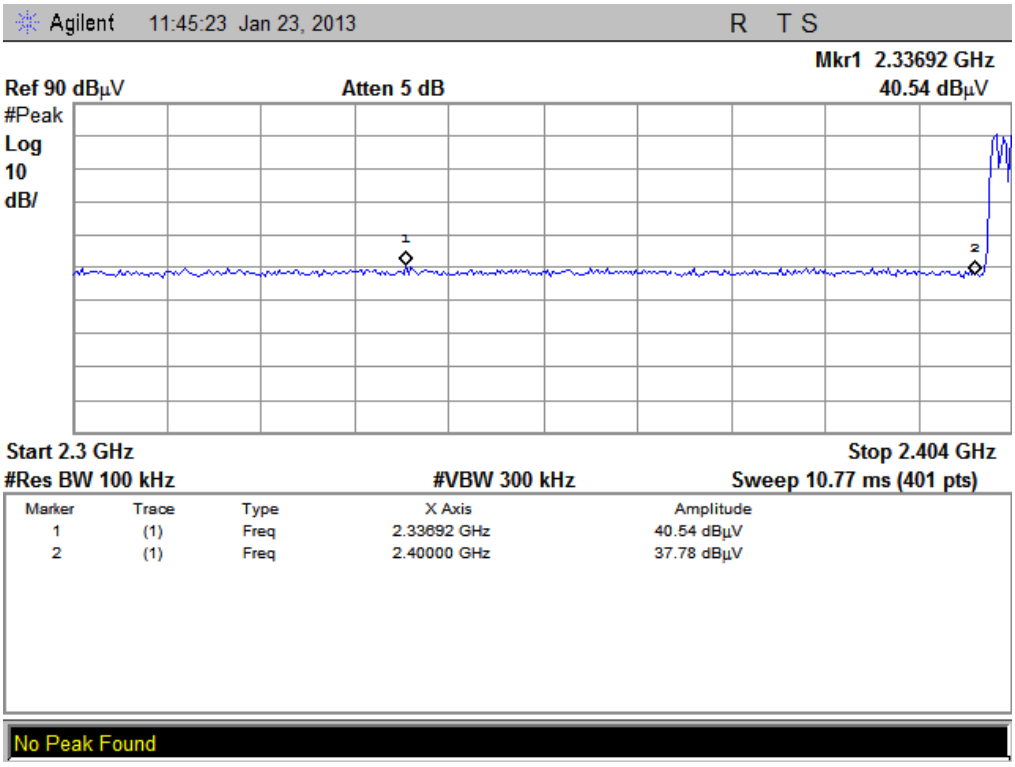
(Plot D1: Channel = 78 PEAK @ ∏/4-DQPSK)



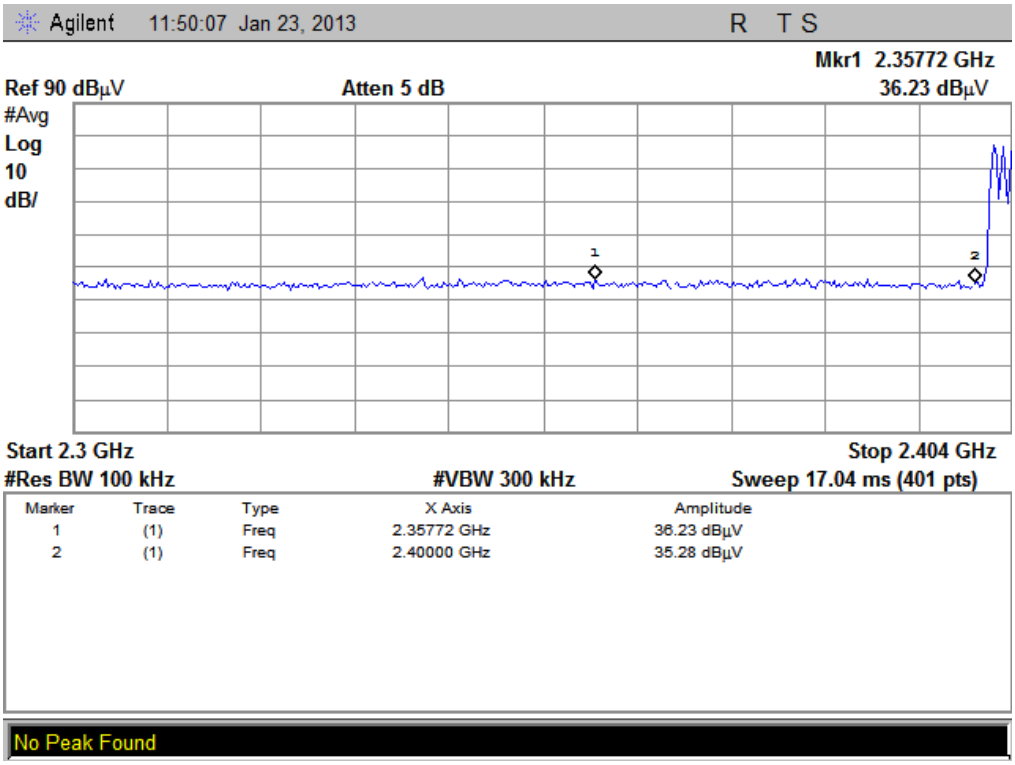
(Plot D2: Channel = 78 AVERAGE @ Π/4-DQPSK)

(hopping)

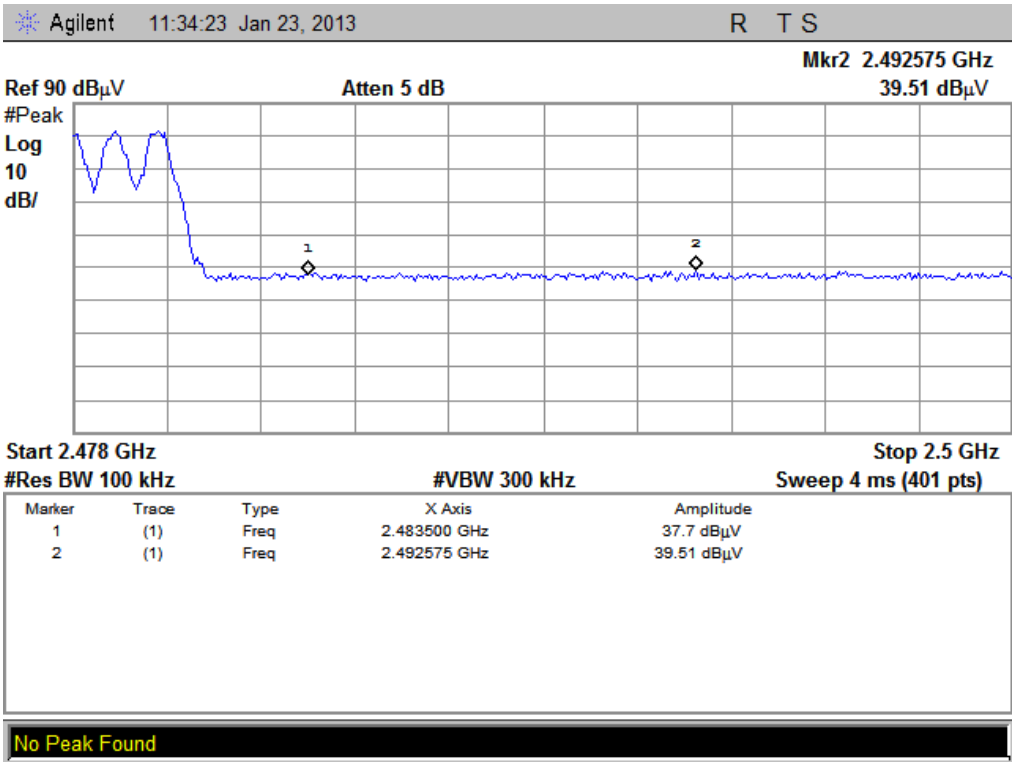
Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2336.92	PK	40.54	-30.93	32.56	42.17	74	Pass
0	2357.72	AV	36.23	-30.93	32.56	37.86	54	Pass
78	2492.58	PK	39.51	-29.05	32.50	42.96	74	Pass
78	2495.22	AV	38.17	-29.05	32.50	41.62	54	Pass



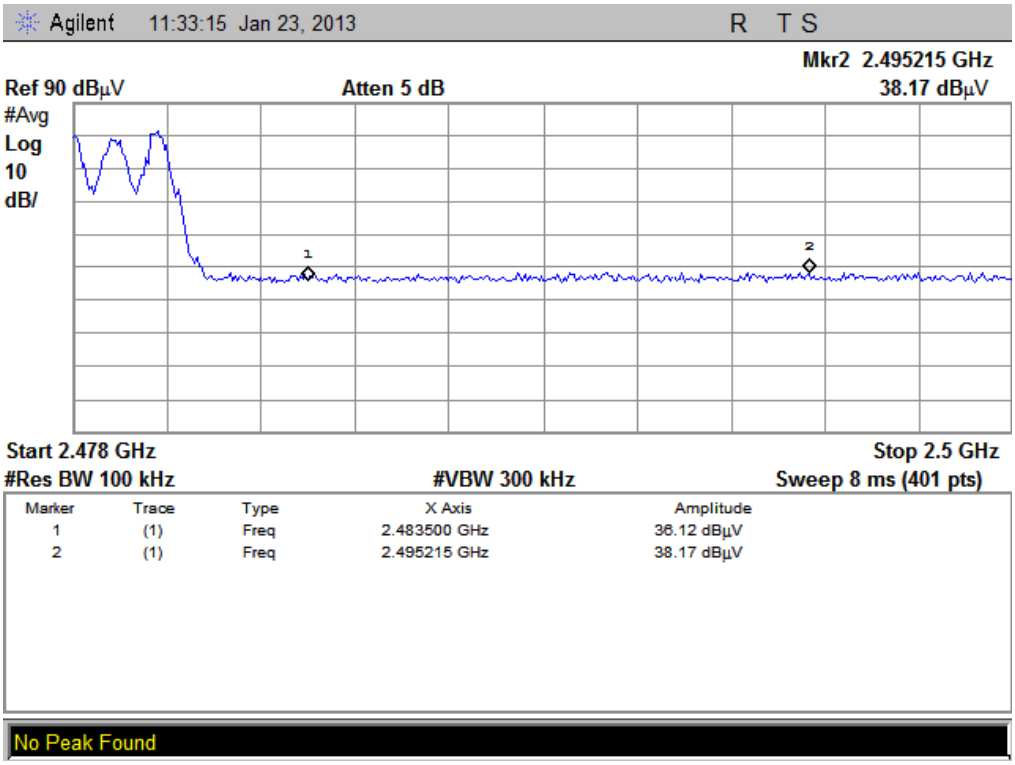
(Plot C1-1: Channel = 0 PEAK)



(Plot C2-1: Channel = 0 AVERAGE)



(Plot D1-1: Channel = 78 PEAK)



(Plot D2-1: Channel = 78 AVERAGE)

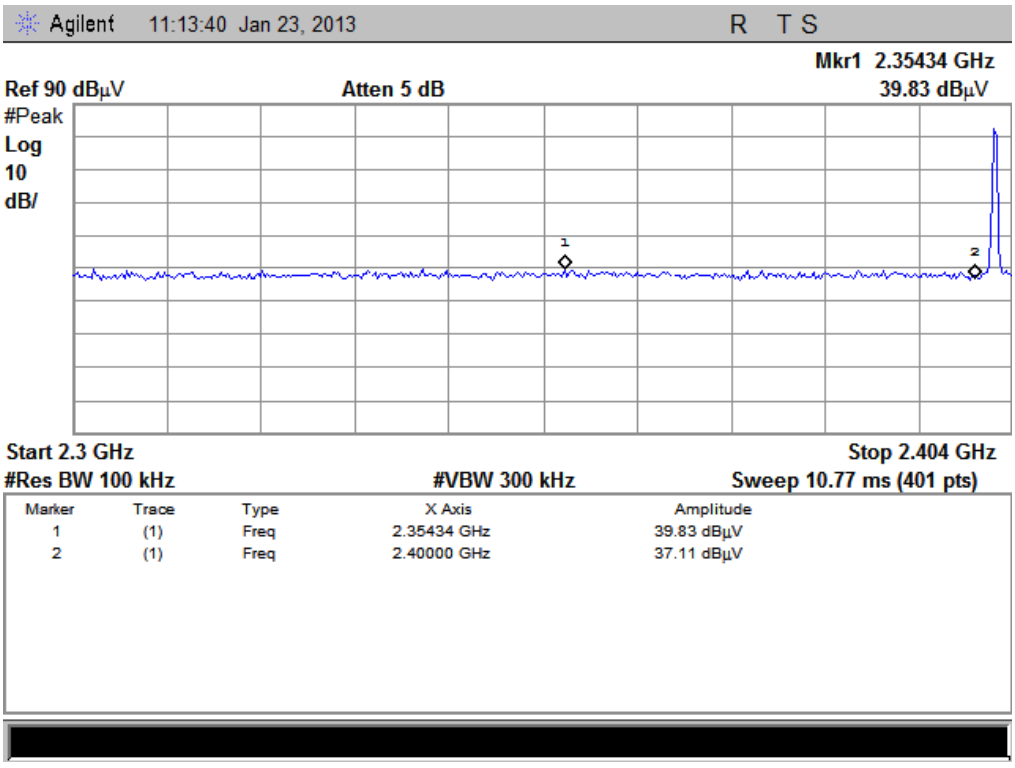
2.8.4.3. 8-DPSK Mode

A. Test Verdict:

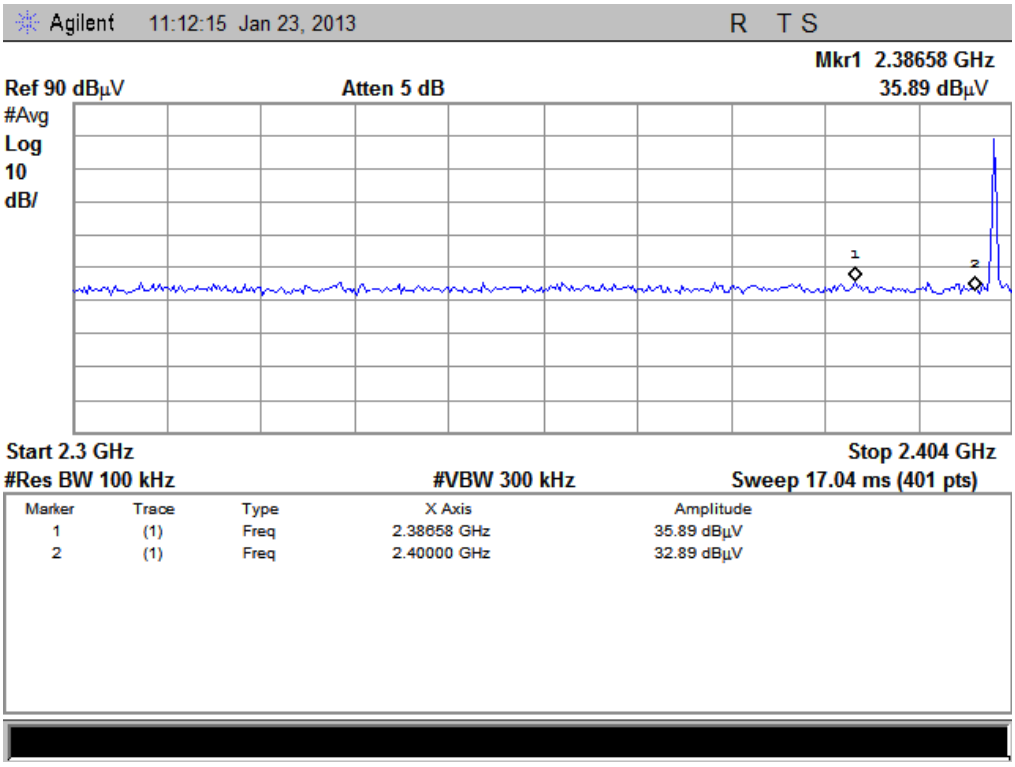
(Un-hopping)

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	2354.34	PK	39.83	-30.93	32.56	41.46	74	Pass
0	2386.58	AV	35.89	-30.93	32.56	37.52	54	Pass
78	2482.69	PK	39.52	-29.05	32.50	42.97	74	Pass
78	2498.08	AV	37.91	-29.05	32.50	41.36	54	Pass

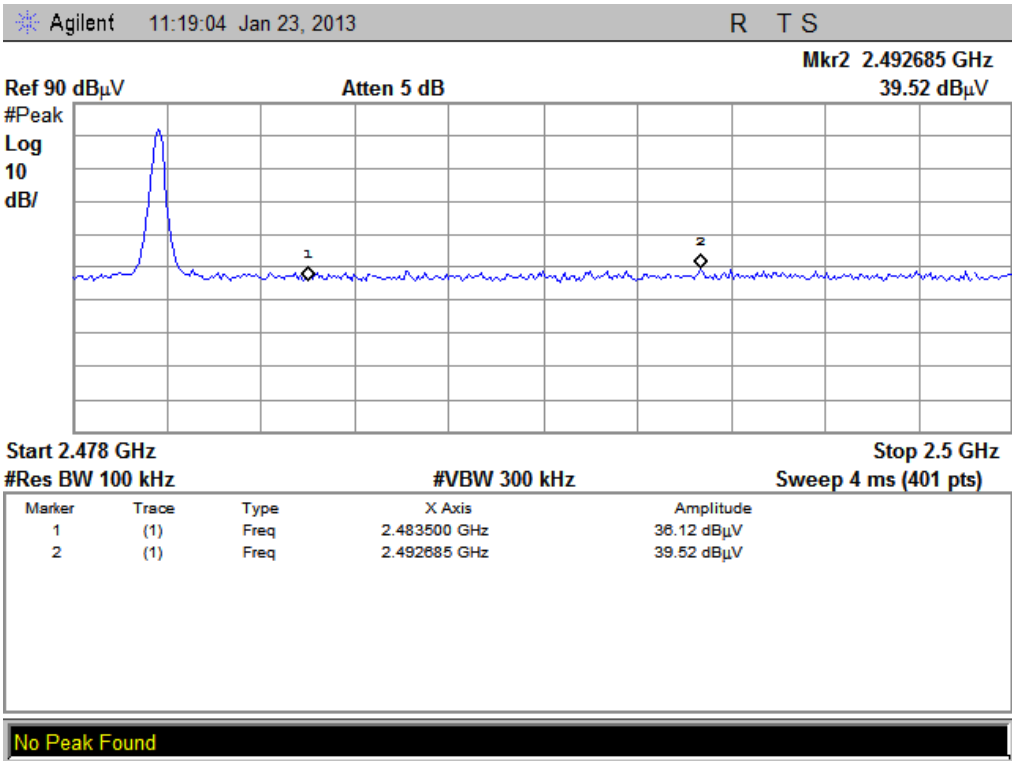
B. Test Plots:



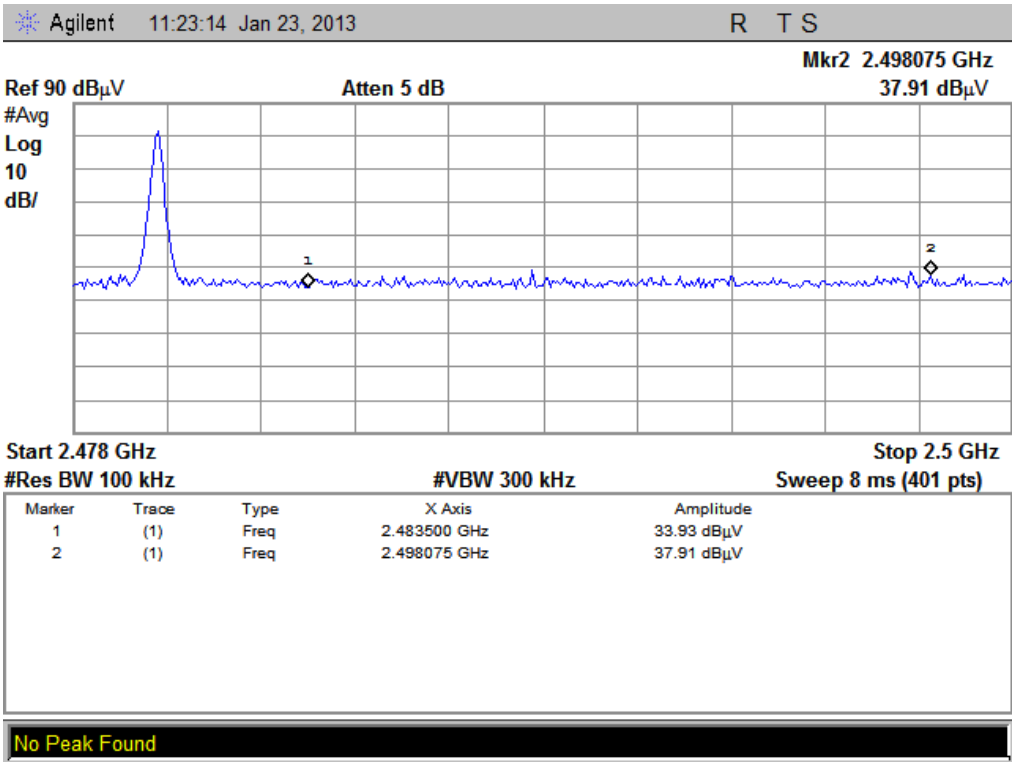
(Plot E1: Channel = 0 PEAK @ 8-DPSK Mode)



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



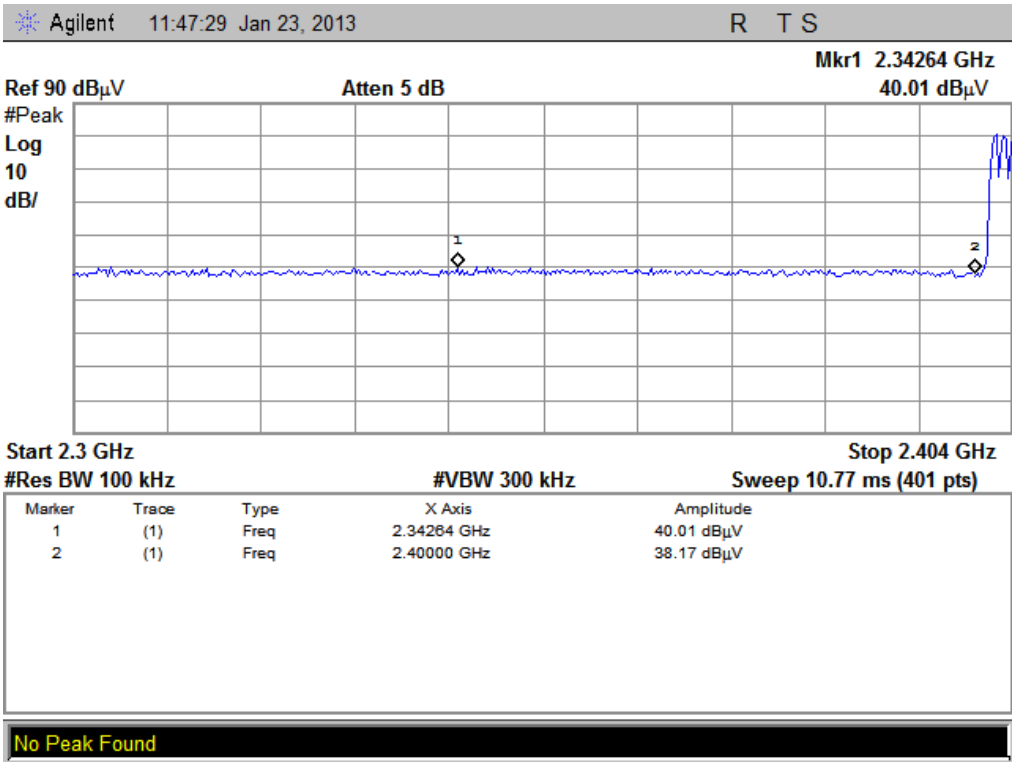
(Plot F1: Channel = 78 PEAK @ 8-DPSK Mode)



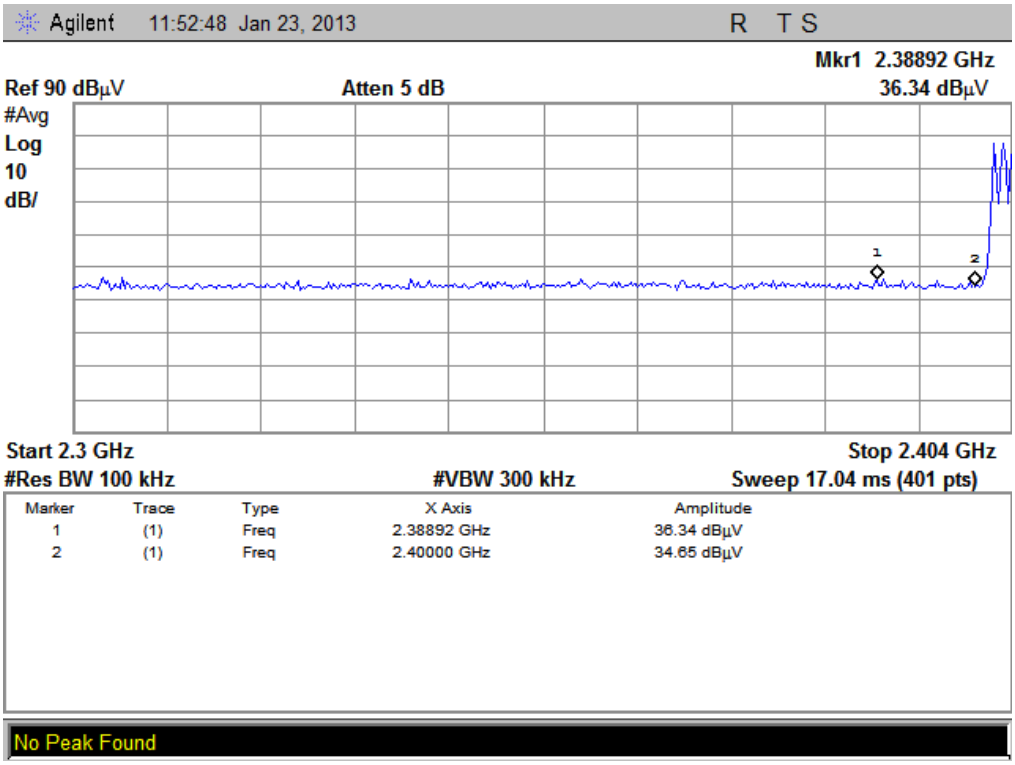
(Plot F2: Channel = 78 AVERAGE @ 8-DPSK Mode)

(hopping)

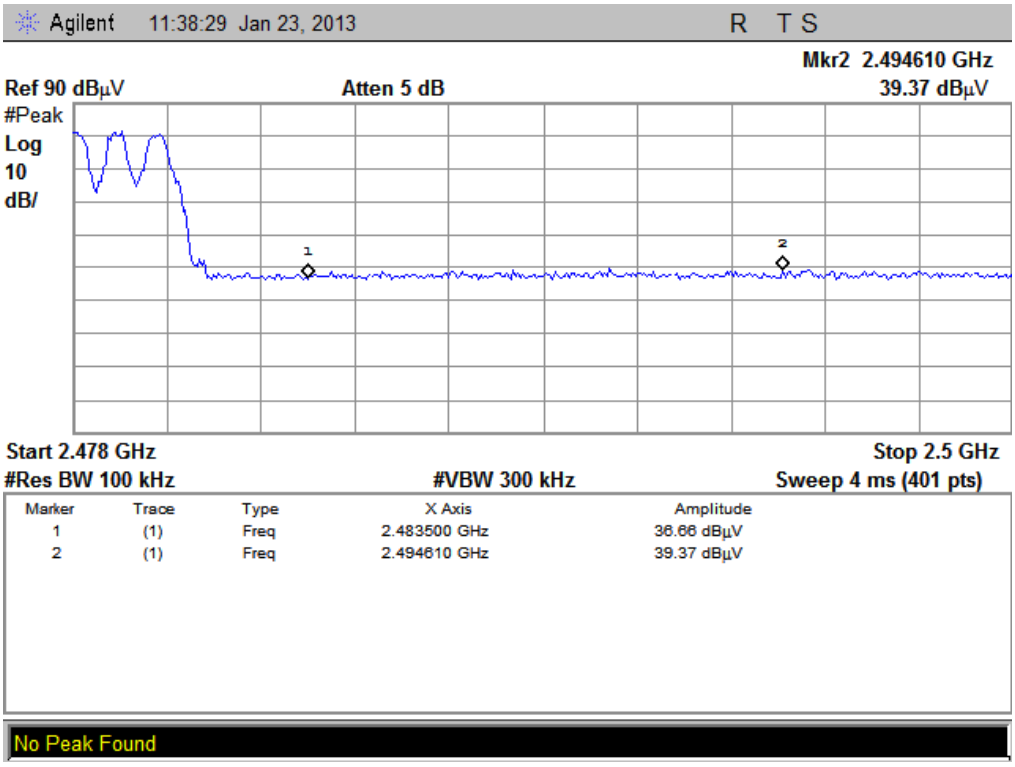
Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2342.64	PK	40.01	-30.93	32.56	41.64	74	Pass
0	2388.92	AV	36.34	-30.93	32.56	37.97	54	Pass
78	2494.61	PK	39.37	-29.05	32.50	42.82	74	Pass
78	2488.56	AV	37.93	-29.05	32.50	41.38	54	Pass



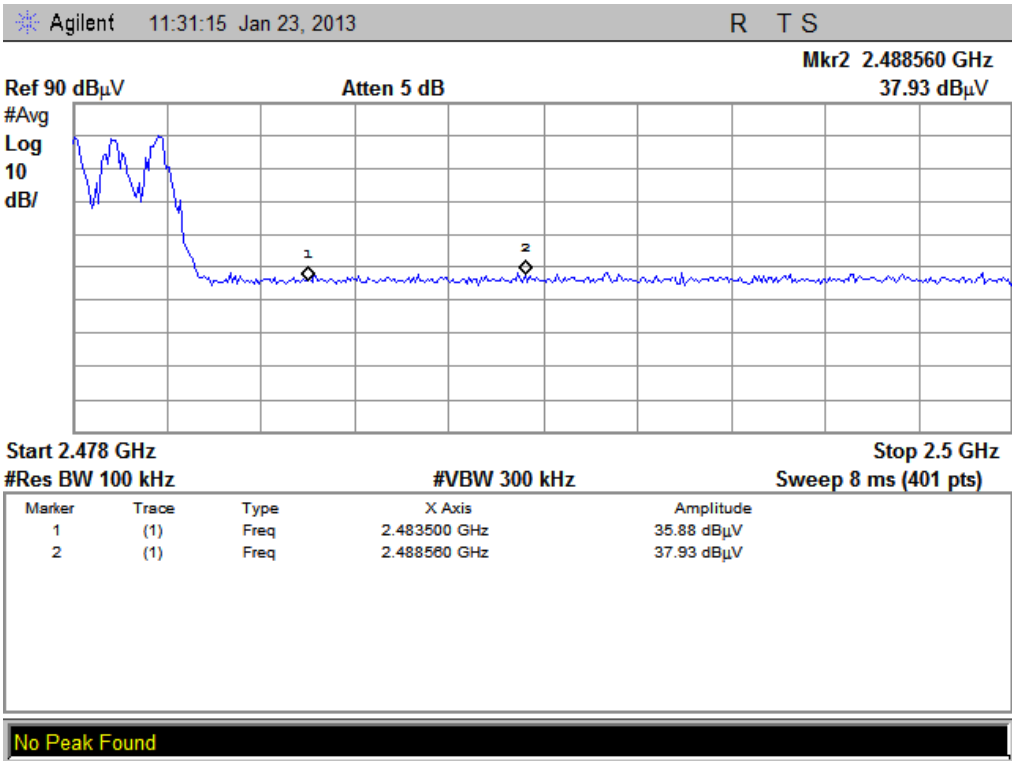
(Plot E1-1: Channel = 0 PEAK)



(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

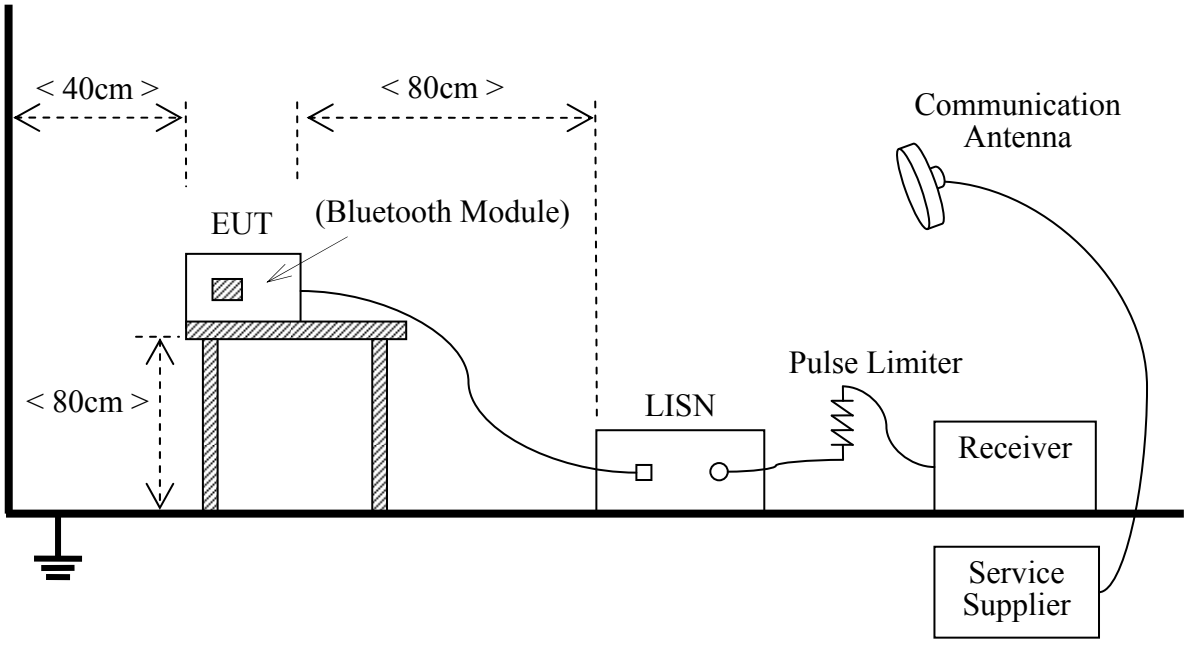
According to FCC section 15.207 and RSS-210 7.2.2, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits 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

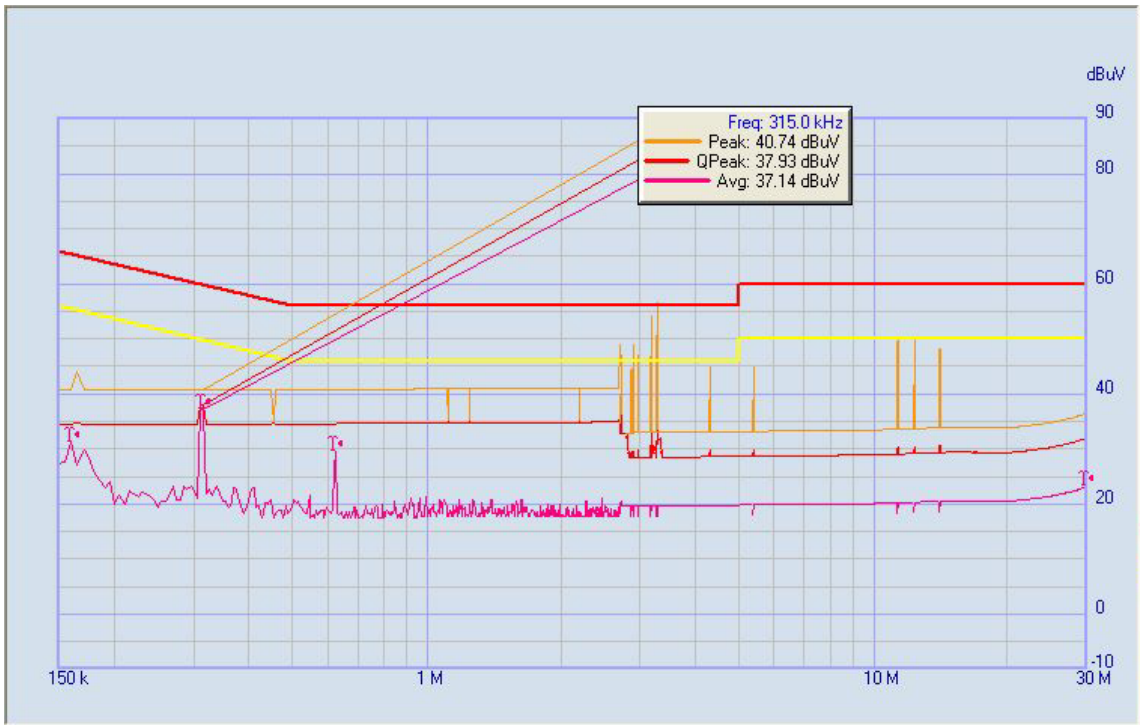
2.9.3. Test Result

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.

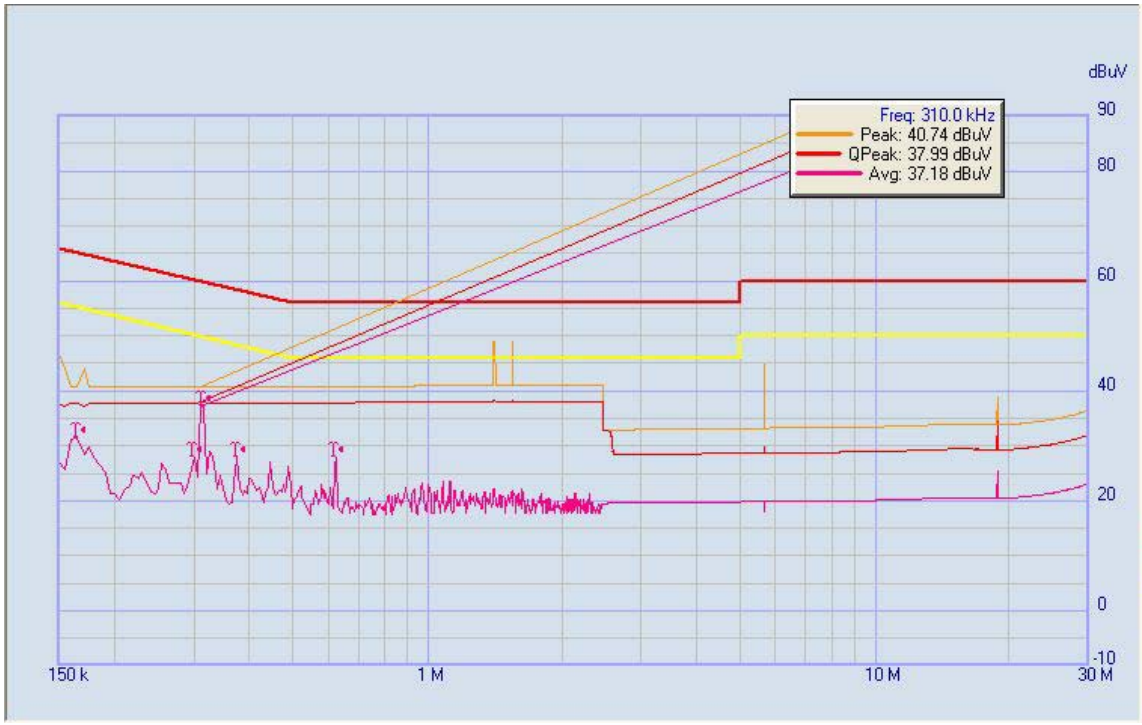
A. Test setup:

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 RSS- Gen section 7.2.3. Those emissions generated in a receiver and radiated from the receiver either via the antenna path or via the control, power, and audio cables that may be used with the receiver. All spurious emissions shall comply with the limits of next table:

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:

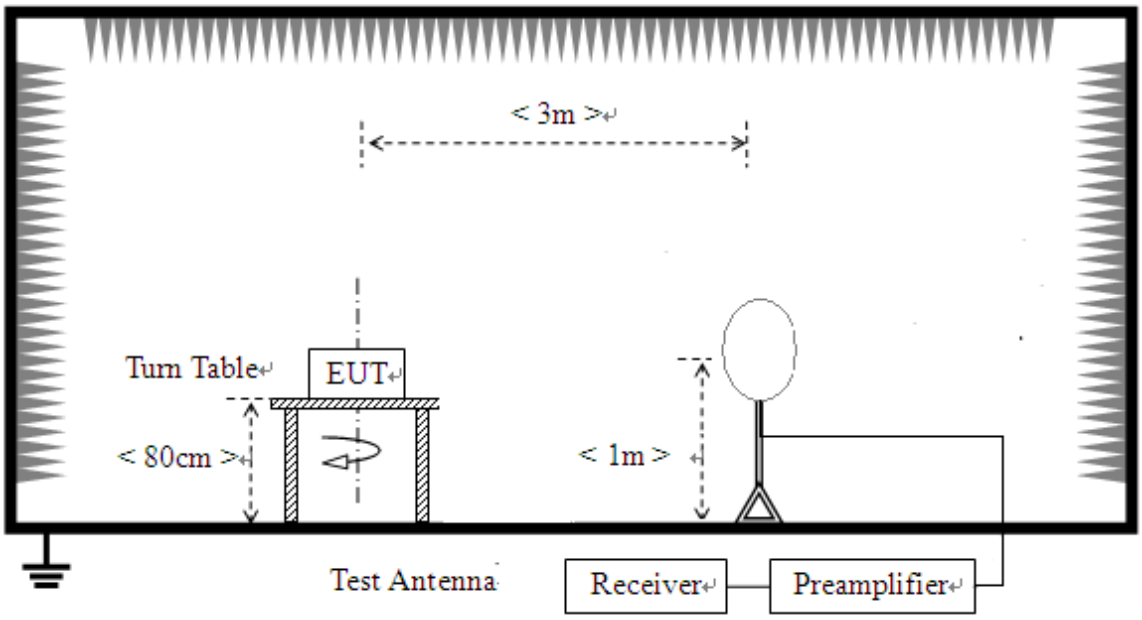
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength 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)

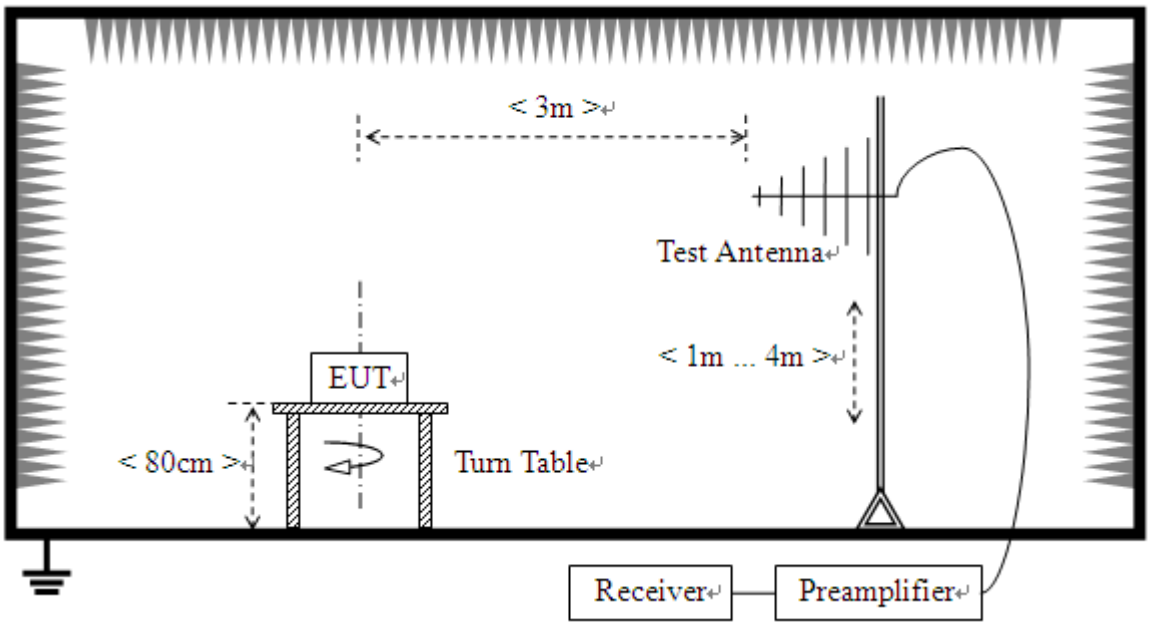
2.10.2. Test Description

A. Test Setup:

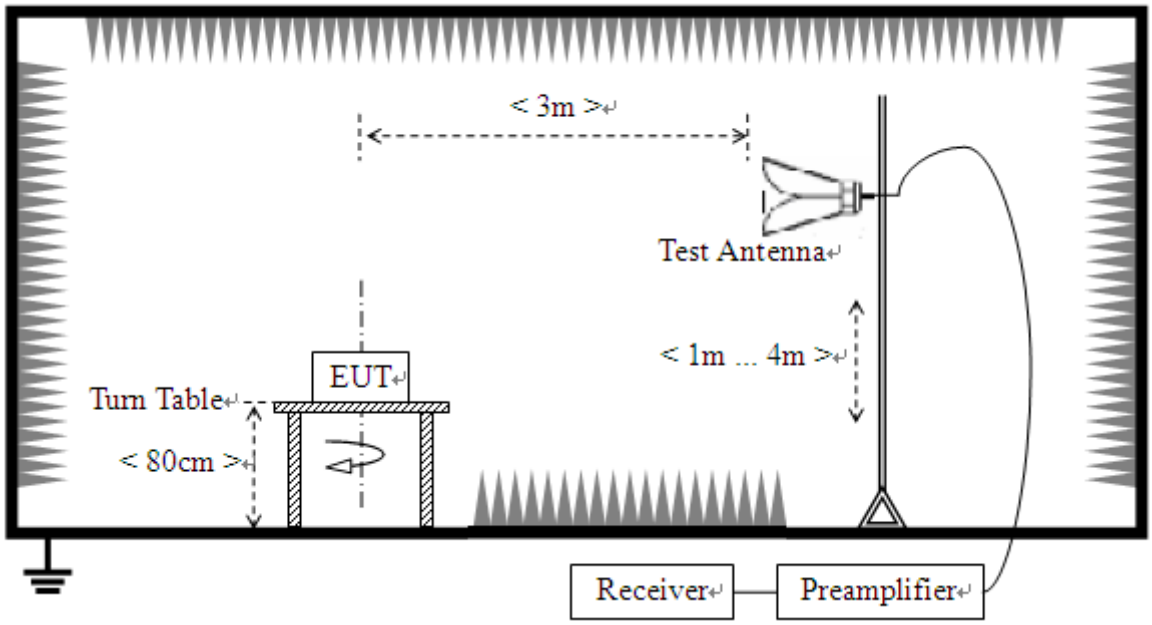
1) For radiated emissions from 9kHz to 30MHz



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

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

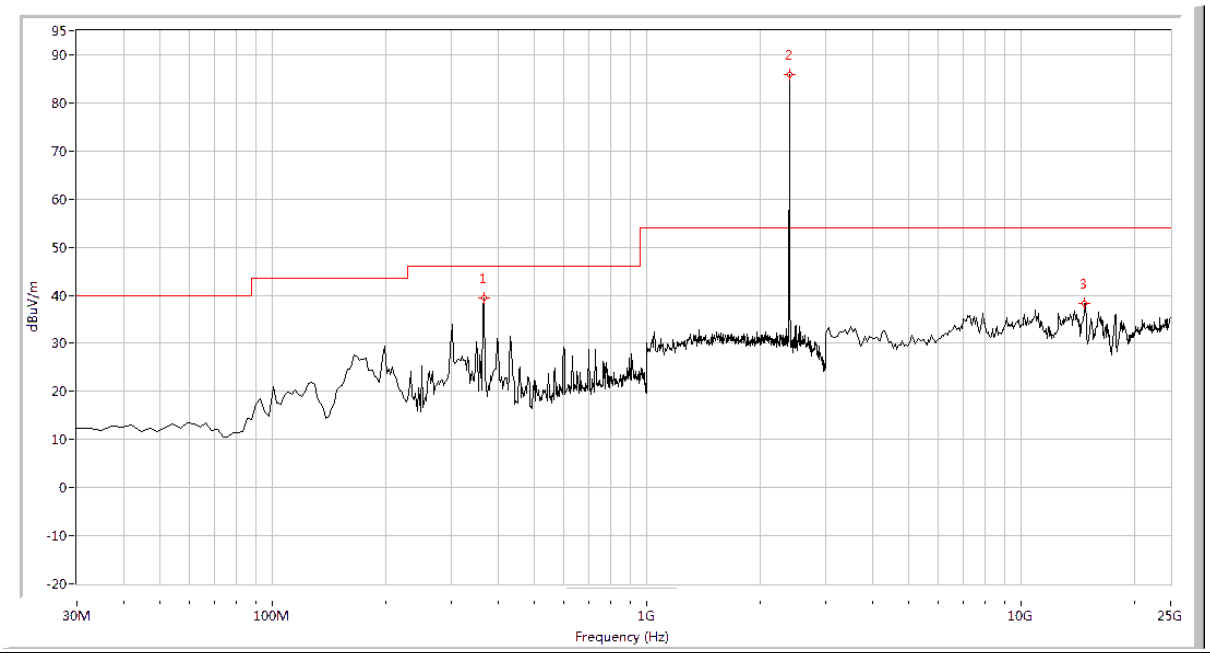
The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	86.00	N/A	Horizontal	Plot A.1
		86.09	N/A	Vertical	Plot A.2
39	2441	89.16	N/A	Horizontal	Plot B.1
		88.70	N/A	Vertical	Plot B.2
78	2480	89.15	N/A	Horizontal	Plot C.1
		89.17	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

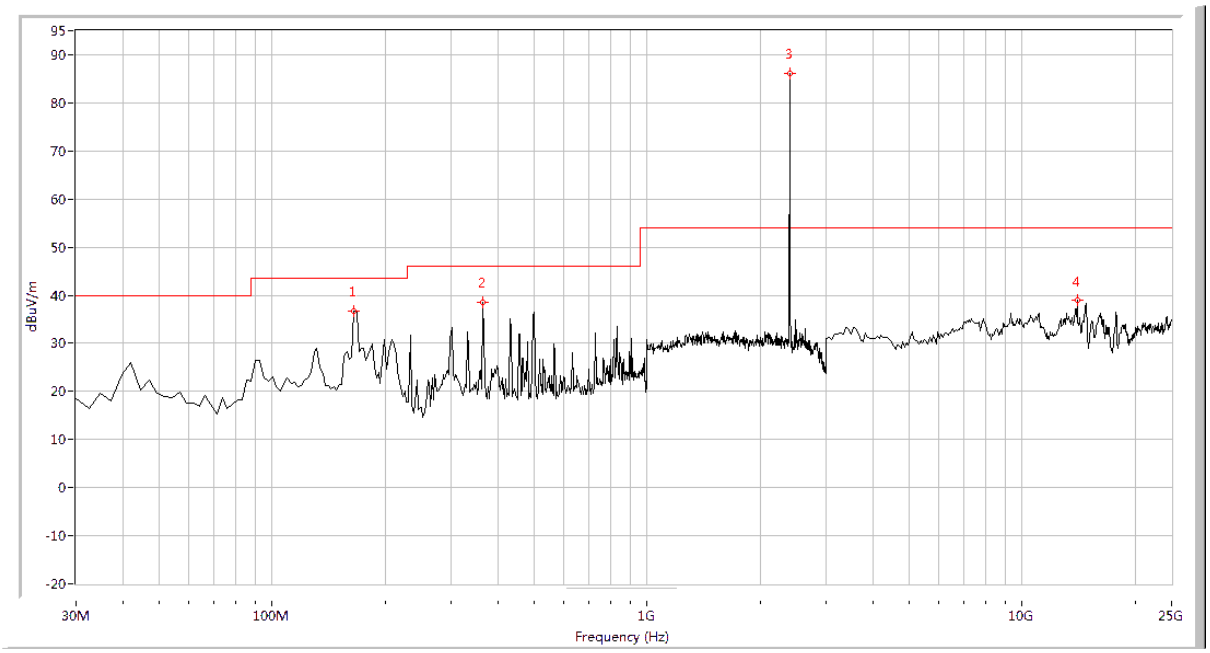
Plots for Channel = 0

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



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
366.234	39.53	N.A	N.A	N.A	46.0	N.A	53.4	Horizontal	PASS
2402.000	86.00	N.A	N.A	N.A	N.A	54.0	156.6	Horizontal	N.A
14740.648	38.35	N.A	N.A	74.0	N.A	54.0	36.8	Horizontal	PASS

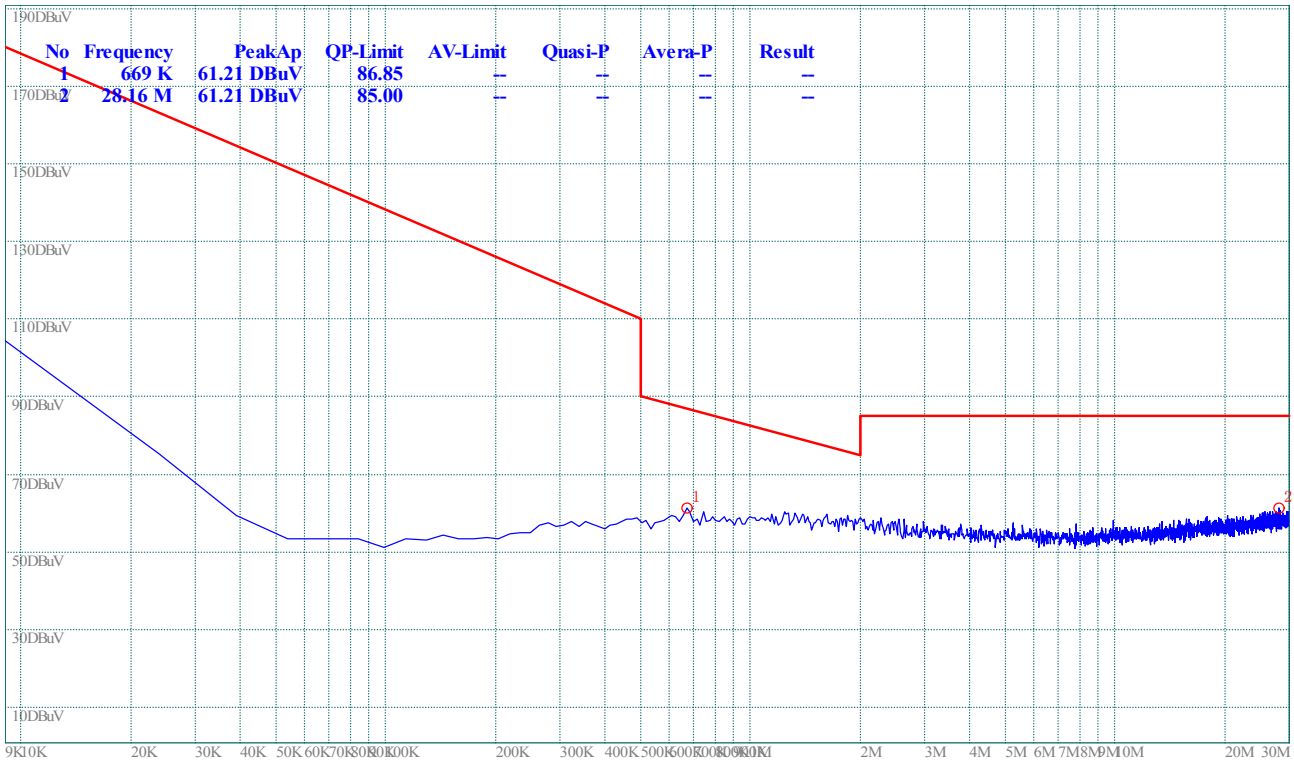
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 0)



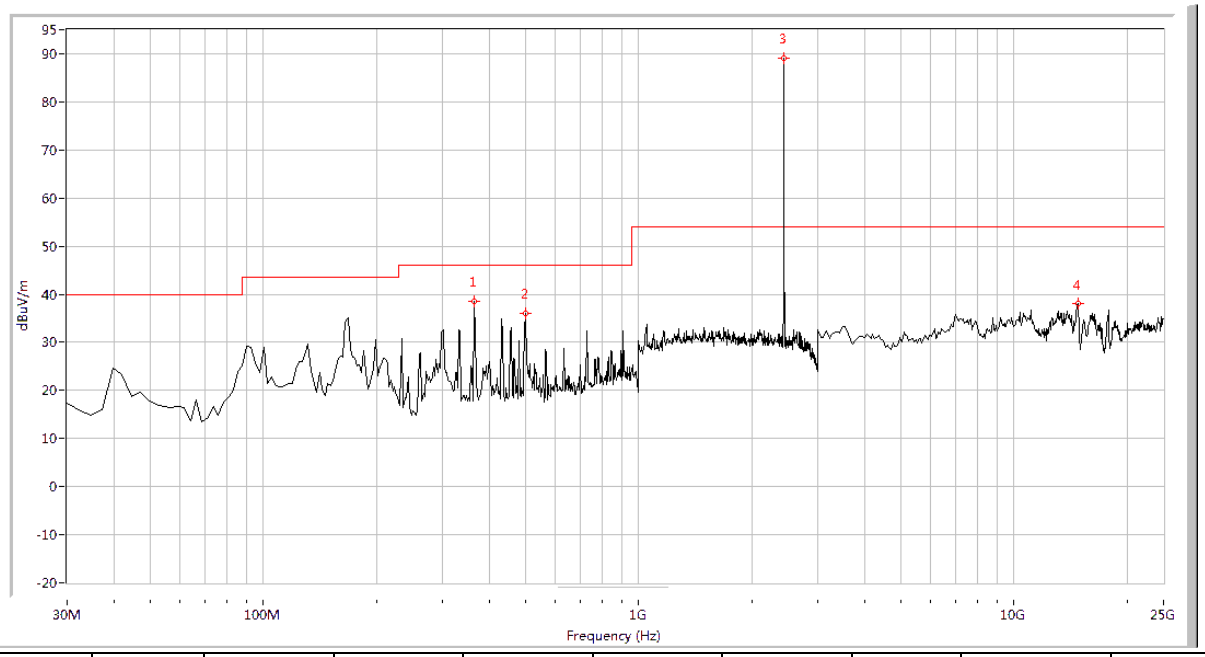
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
165.461	36.81	N.A	N.A	N.A	43.5	N.A	116.2	Vertical	PASS
363.815	38.57	N.A	N.A	N.A	46.0	N.A	96.6	Vertical	PASS
2402.000	86.09	N.A	N.A	N.A	N.A	54.0	15.2	Vertical	N.A
14027.431	39.05	N.A	N.A	74.0	N.A	54.0	6.4	Vertical	PASS

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

Plot for Channel = 39

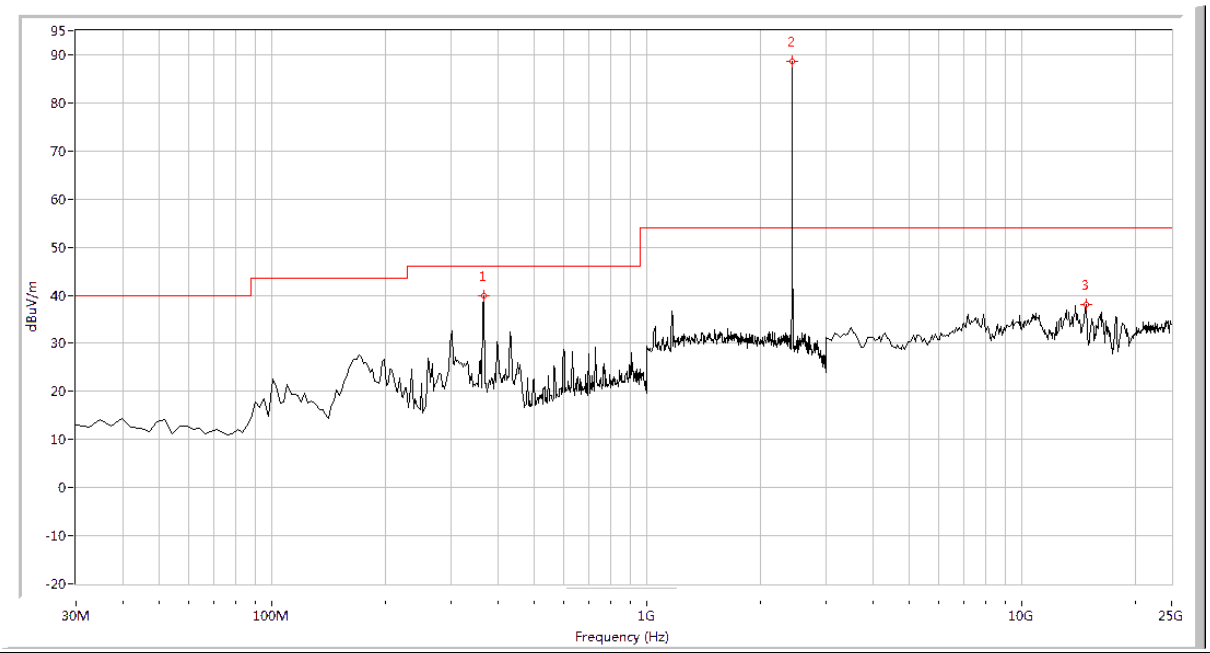


(Plot B.0: 9kHz to 30MHz @ GFSK, channel 39)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	38.46	N.A	N.A	N.A	46.0	N.A	51.6	Horizontal	PASS
499.277	36.05	N.A	N.A	N.A	46.0	N.A	183.9	Horizontal	PASS
2441.000	89.16	N.A	N.A	N.A	N.A	54.0	74.1	Horizontal	N.A
14795.511	38.15	N.A	N.A	74.0	N.A	54.0	264.5	Horizontal	PASS

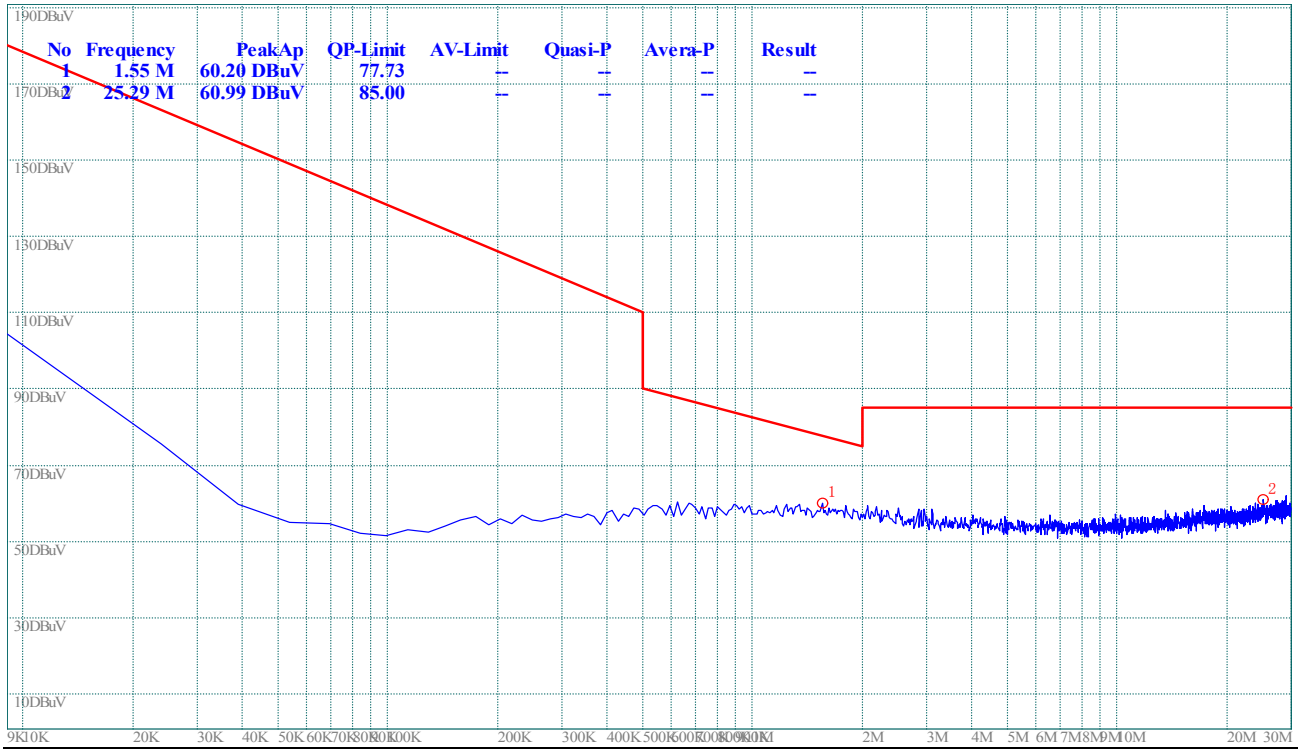
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 39)



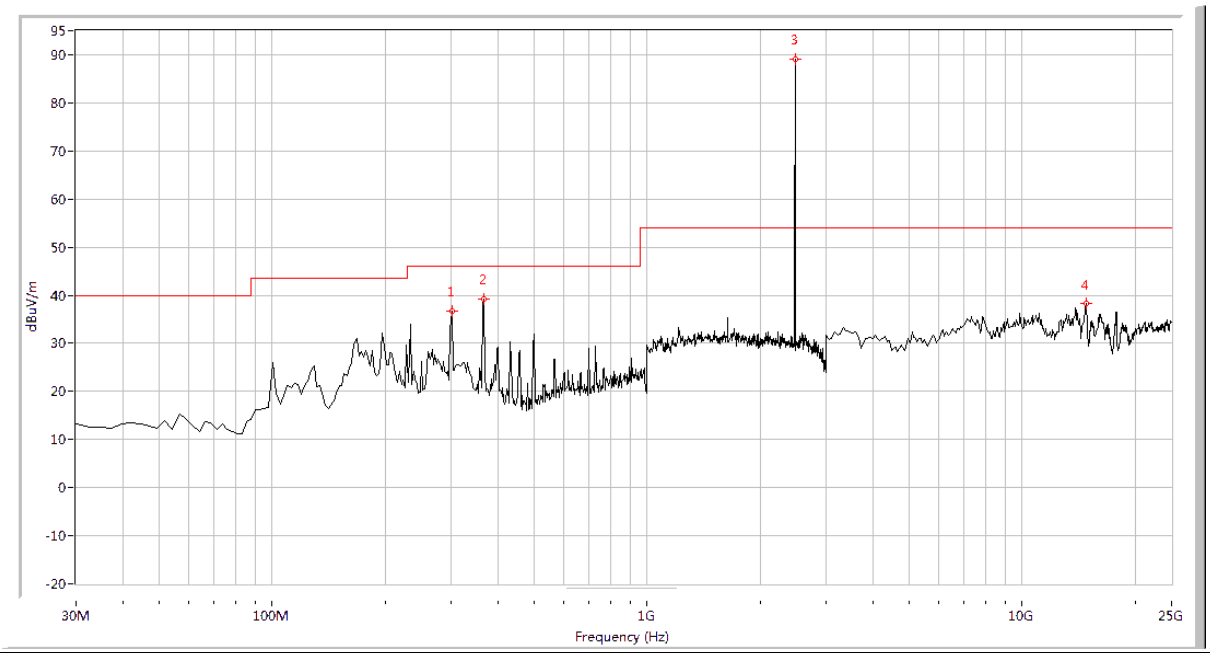
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
366.234	40.00	N.A	N.A	N.A	46.0	N.A	285.3	Vertical	PASS
2441.000	88.70	N.A	N.A	N.A	N.A	54.0	155.9	Vertical	N.A
14795.511	38.04	N.A	N.A	74.0	N.A	54.0	12.4	Vertical	PASS

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

Plot for Channel = 78

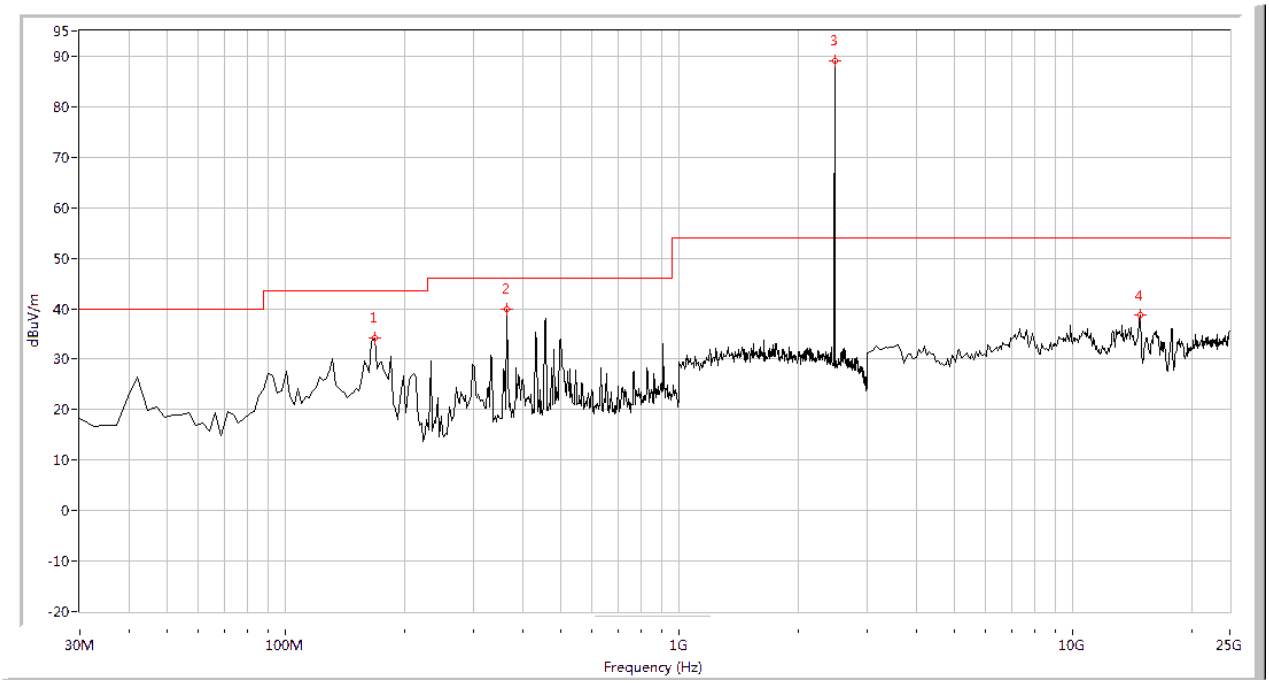


(Plot C.0: 9kHz to 30MHz @ GFSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
300.923	36.71	N.A	N.A	N.A	46.0	N.A	152.6	Horizontal	PASS
366.234	39.26	N.A	N.A	N.A	46.0	N.A	95.4	Horizontal	PASS
2480.000	89.15	N.A	N.A	N.A	N.A	54.0	211.5	Horizontal	N.A
14795.511	38.22	N.A	N.A	74.0	N.A	54.0	259.7	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
167.880	34.28	N.A	N.A	N.A	43.5	N.A	158.2	Vertical	PASS
363.815	39.81	N.A	N.A	N.A	46.0	N.A	93.8	Vertical	PASS
2480.000	89.17	N.A	N.A	54.0	N.A	54.0	97.4	Vertical	N.A
14795.511	38.70	N.A	N.A	54.0	N.A	54.0	25.5	Vertical	PASS

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

2.10.4.2. Π/4-DQPSK Mode:

A. Test Verdict for Harmonics:

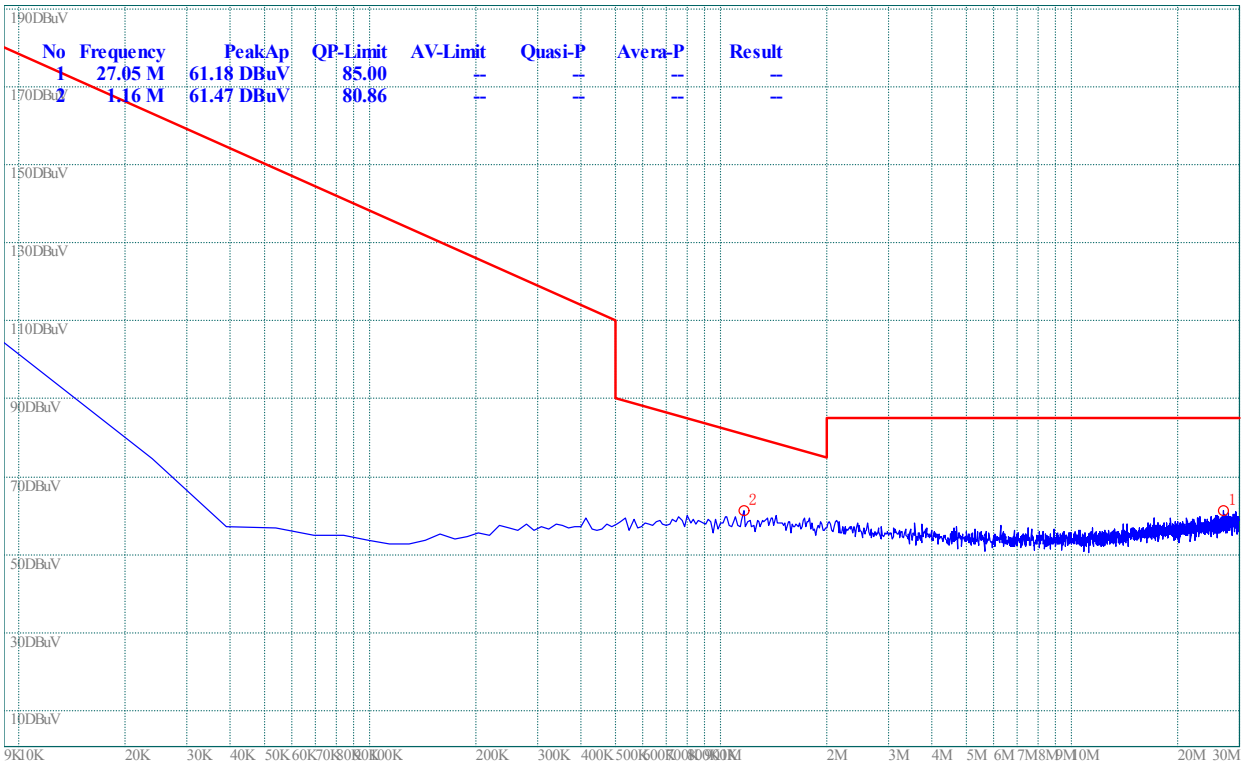
The Fundamental Emissions

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

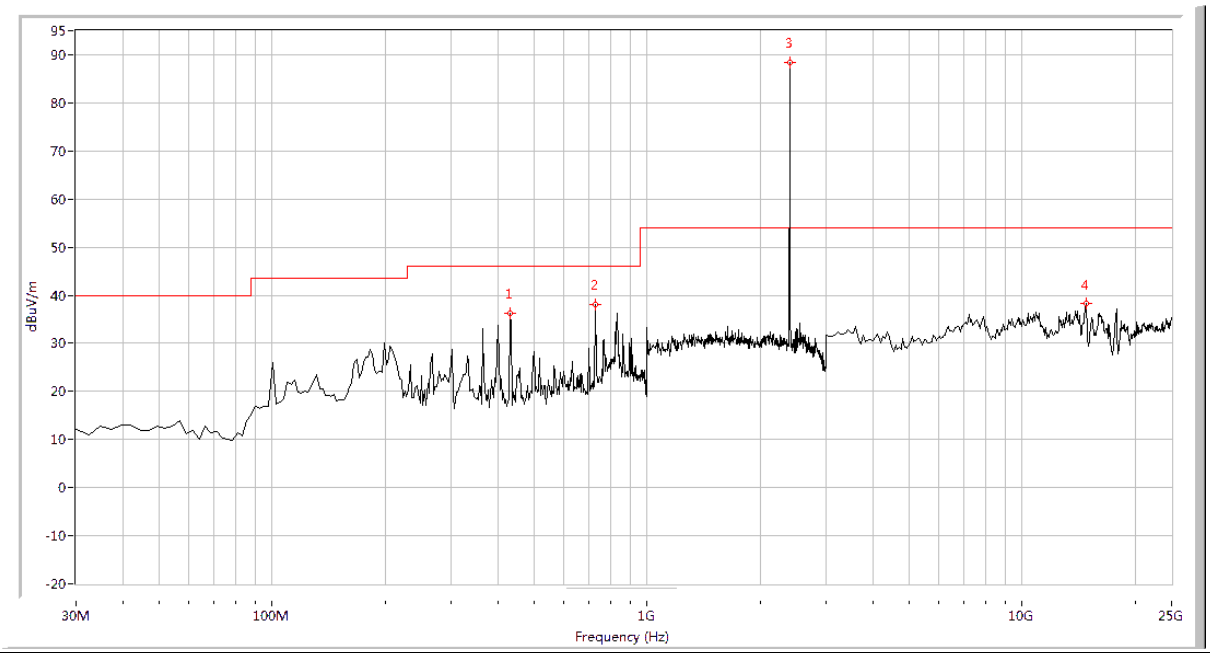
Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	88.37	N/A	Horizontal	Plot A.1
		87.70	N/A	Vertical	Plot A.2
39	2441	86.09	N/A	Horizontal	Plot B.1
		86.26	N/A	Vertical	Plot B.2
78	2480	88.99	N/A	Horizontal	Plot C.1
		90.29	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0

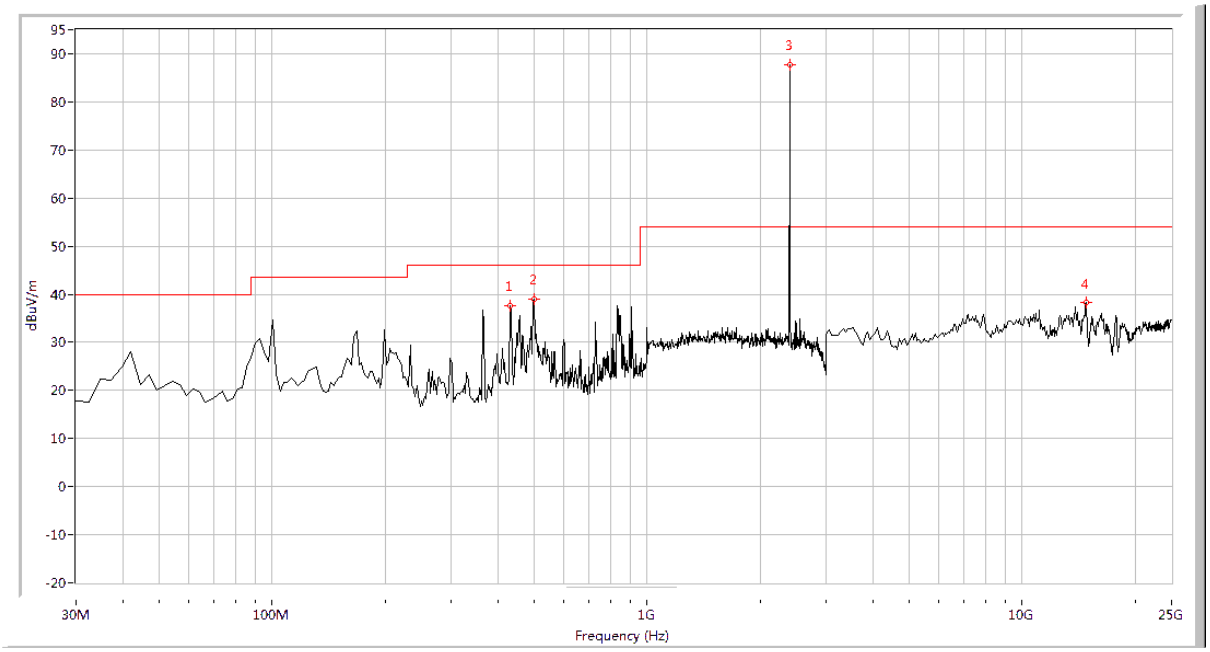


(Plot A.0: 9kHz to 30MHz @ Π/4-DQPSK, channel 0)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
431.546	36.24	N.A	N.A	N.A	46.0	N.A	121.3	Horizontal	PASS
726.658	37.99	N.A	N.A	N.A	46.0	N.A	98.5	Horizontal	PASS
2402.000	88.37	N.A	N.A	N.A	N.A	54.0	86.6	Horizontal	N.A
14795.511	38.27	N.A	N.A	74.0	N.A	54.0	251.6	Horizontal	PASS

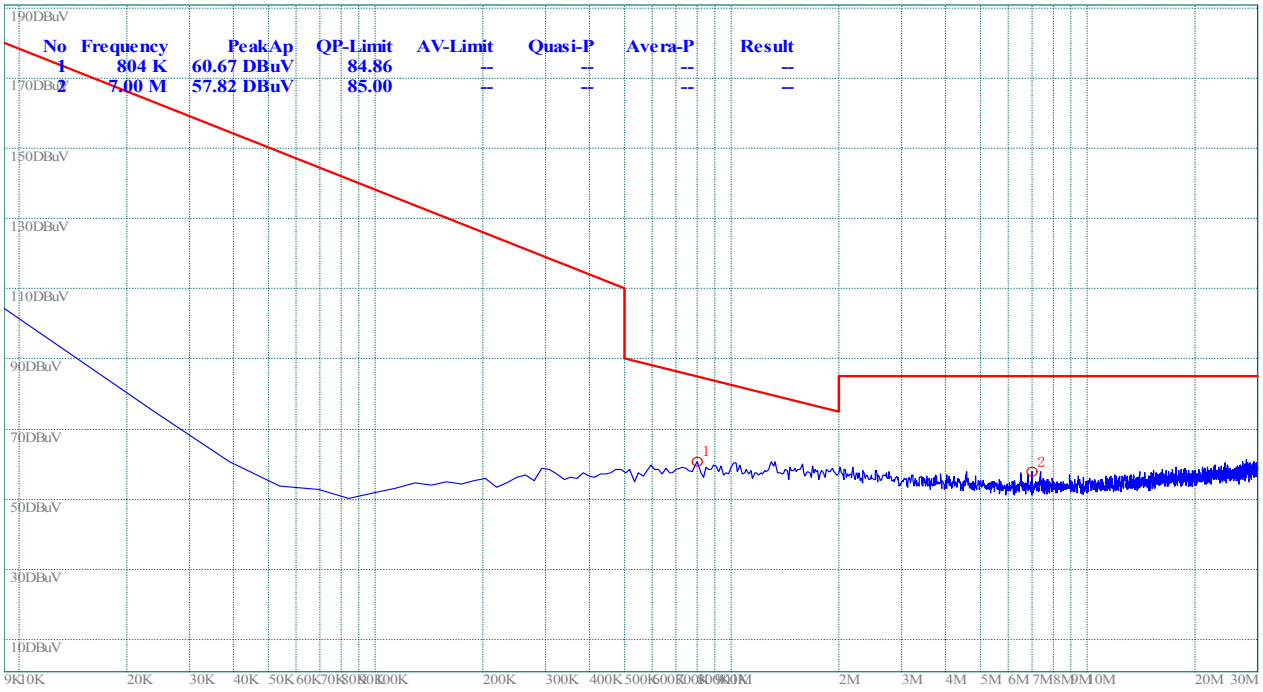
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @ ∏/4-DQPSK, channel 0)



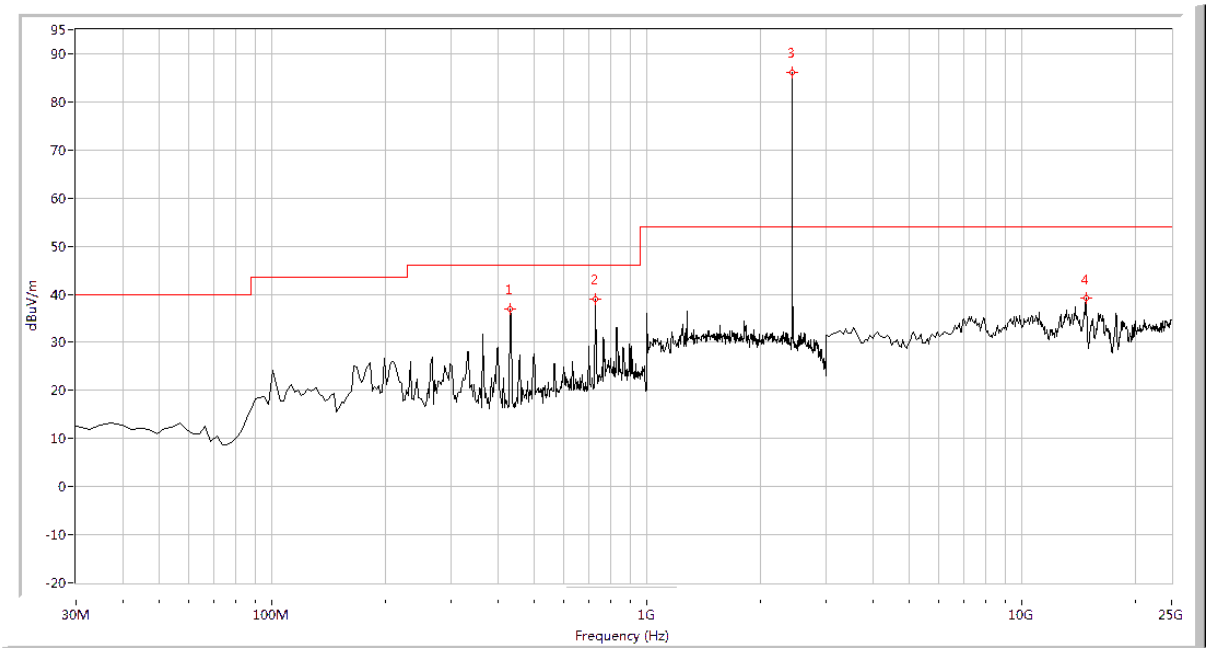
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
431.546	37.57	N.A	N.A	N.A	46.0	N.A	15.6	Vertical	PASS
499.277	39.00	N.A	N.A	N.A	46.0	N.A	59.3	Vertical	PASS
2402.000	87.70	N.A	N.A	N.A	N.A	54.0	182.7	Vertical	N.A
14795.511	38.24	N.A	N.A	74.0	N.A	54.0	73.9	Vertical	PASS

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

Plot for Channel = 39

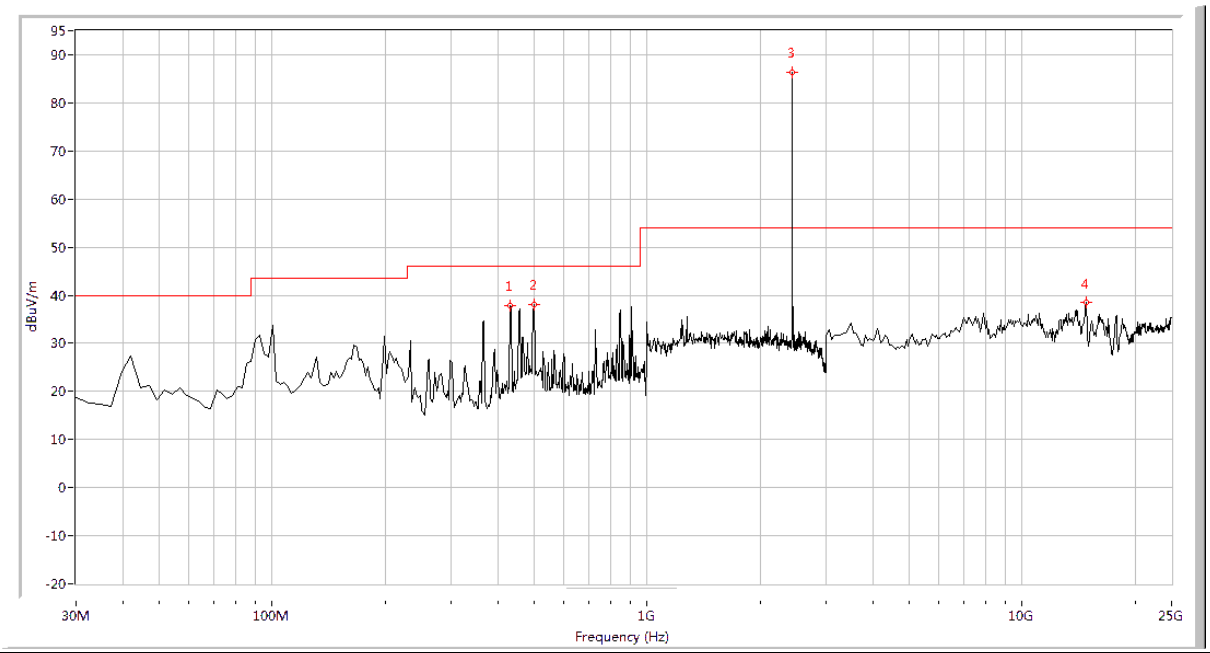


(Plot B.0: 9kHz to 30MHz @ ∏/4-DQPSK, channel 39)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
431.546	36.98	N.A	N.A	N.A	46.0	N.A	152.1	Horizontal	PASS
729.077	39.05	N.A	N.A	N.A	46.0	N.A	265.5	Horizontal	PASS
2441.000	86.09	N.A	N.A	N.A	N.A	54.0	293.1	Horizontal	N.A
14795.511	39.25	N.A	N.A	74.0	N.A	54.0	15.6	Horizontal	PASS

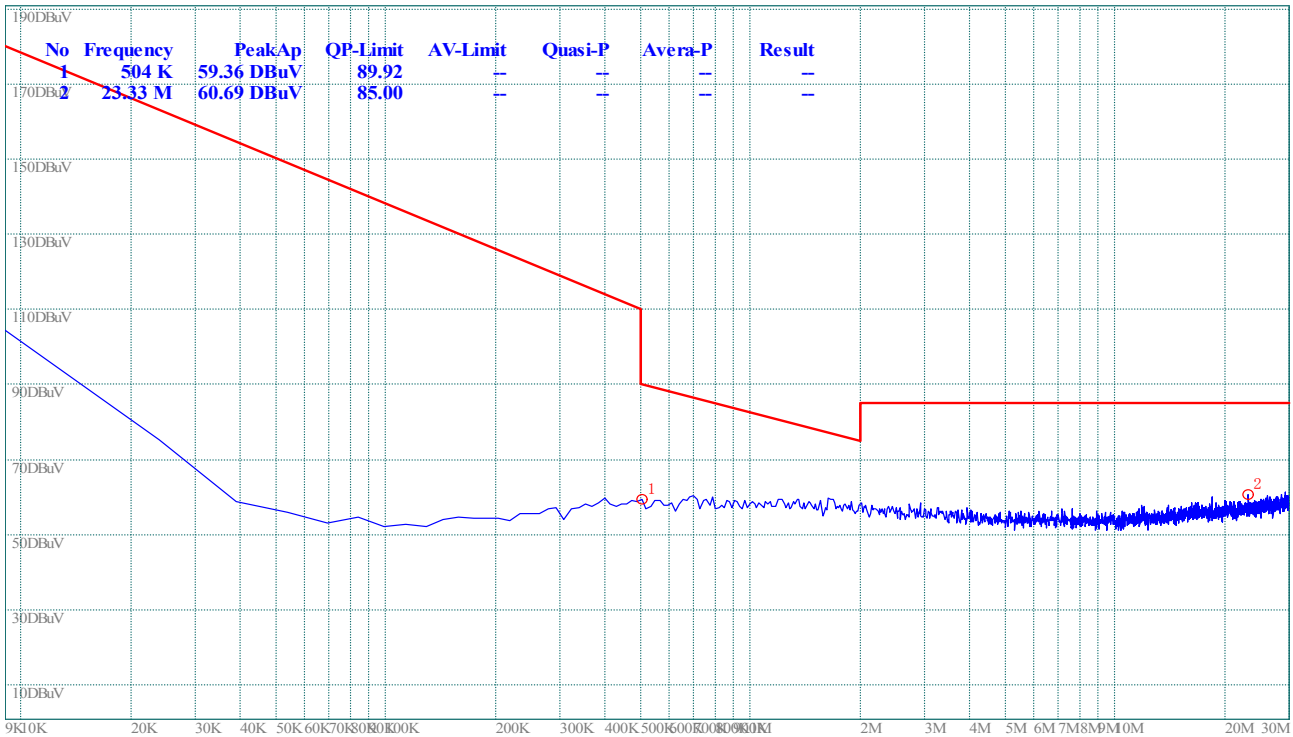
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ ∏/4-DQPSK, channel 39)



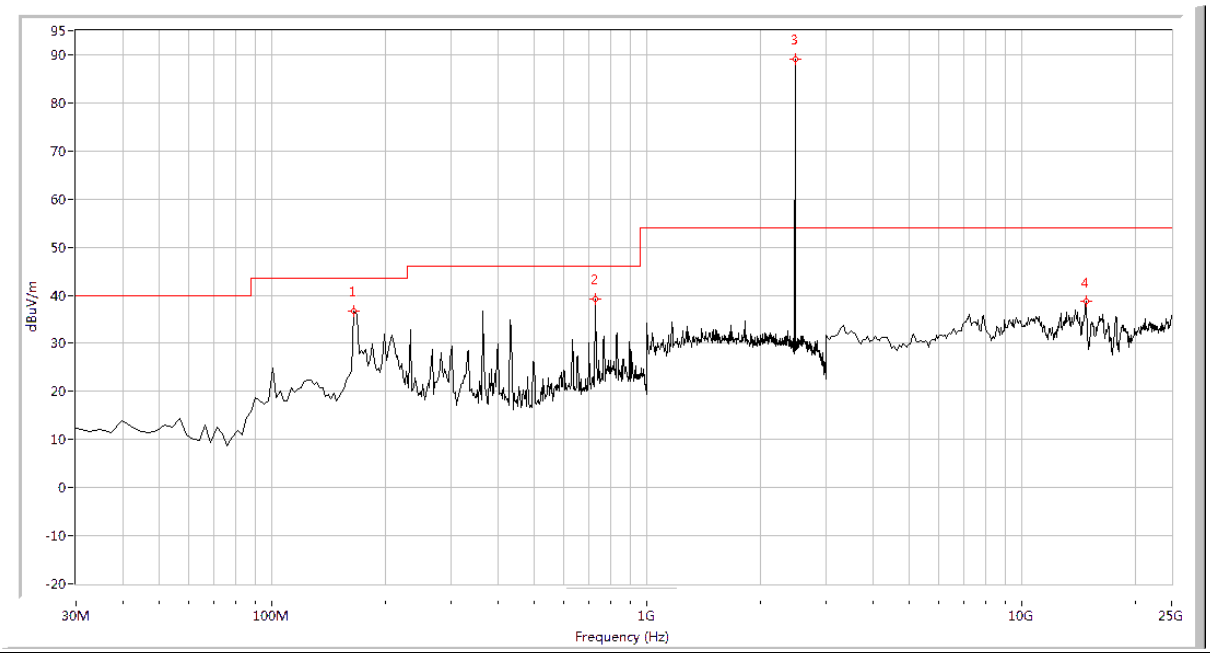
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
431.546	37.94	N.A	N.A	N.A	46.0	N.A	153.6	Vertical	PASS
499.277	38.10	N.A	N.A	N.A	46.0	N.A	171.2	Vertical	PASS
2441.000	86.26	N.A	N.A	N.A	N.A	54.0	52.1	Vertical	N.A
14795.511	38.52	N.A	N.A	74.0	N.A	54.0	8.9	Vertical	PASS

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

Plot for Channel = 78

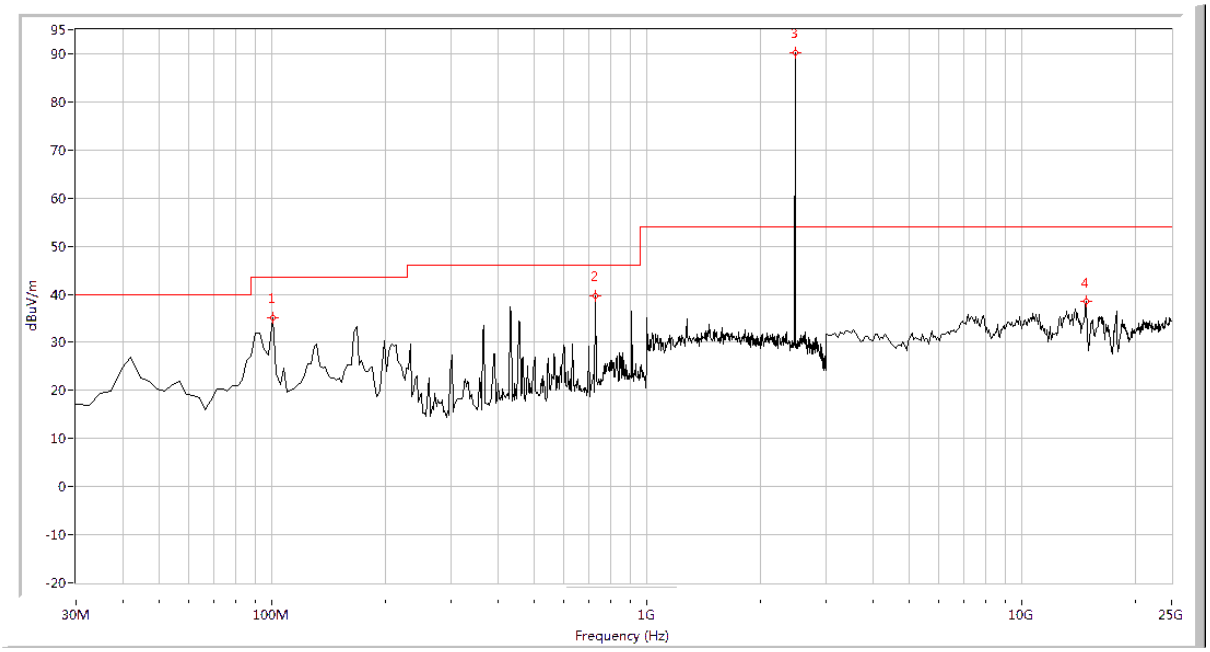


(Plot C.0: 9kHz to 30MHz @ Π/4-DQPSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
165.461	36.75	N.A	N.A	N.A	43.5	N.A	18.1	Horizontal	PASS
726.658	39.11	N.A	N.A	N.A	46.0	N.A	65.3	Horizontal	PASS
2480.000	88.99	N.A	N.A	N.A	N.A	54.0	5.6	Horizontal	N.A
14795.511	38.77	N.A	N.A	7.0	N.A	54.0	86.5	Horizontal	PASS

(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
100.150	35.10	N.A	N.A	N.A	43.5	N.A	151.3	Vertical	PASS
729.077	39.67	N.A	N.A	N.A	46.0	N.A	86.2	Vertical	PASS
2480.000	90.29	N.A	N.A	N.A	N.A	54.0	111.5	Vertical	N.A
14795.511	38.45	N.A	N.A	7.0	N.A	54.0	9.7	Vertical	PASS

(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

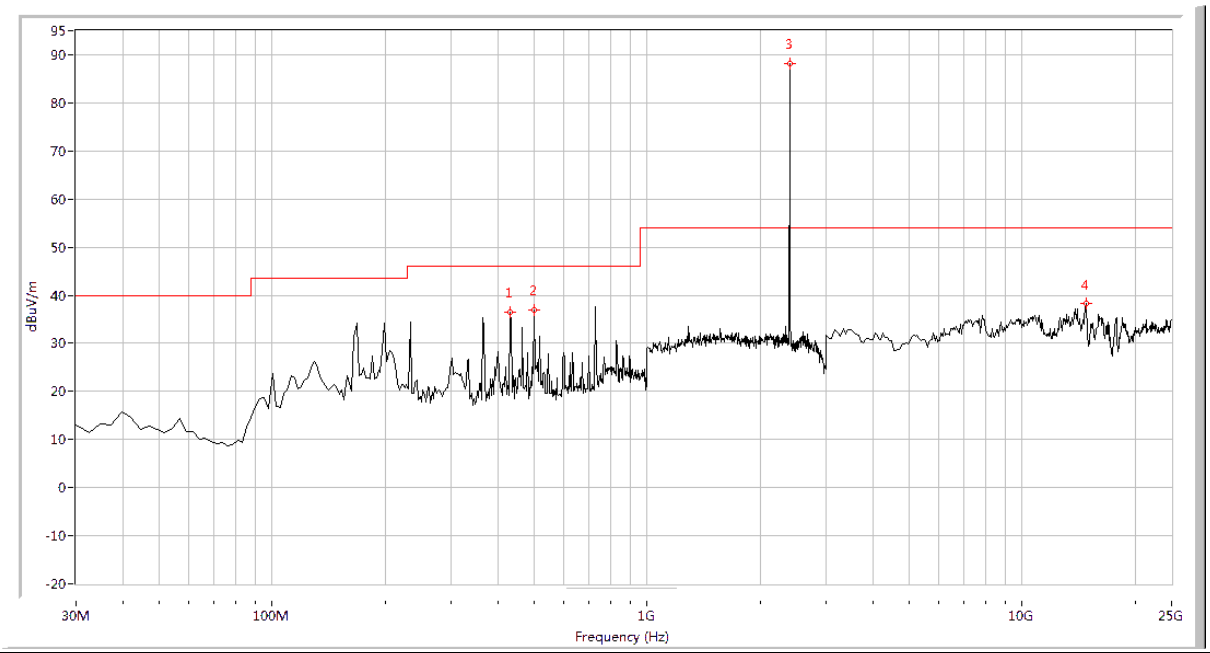
The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	88.25	N/A	Horizontal	Plot A.1
		88.63	N/A	Vertical	Plot A.2
39	2441	86.69	N/A	Horizontal	Plot B.1
		88.48	N/A	Vertical	Plot B.2
78	2480	90.89	N/A	Horizontal	Plot C.1
		90.23	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

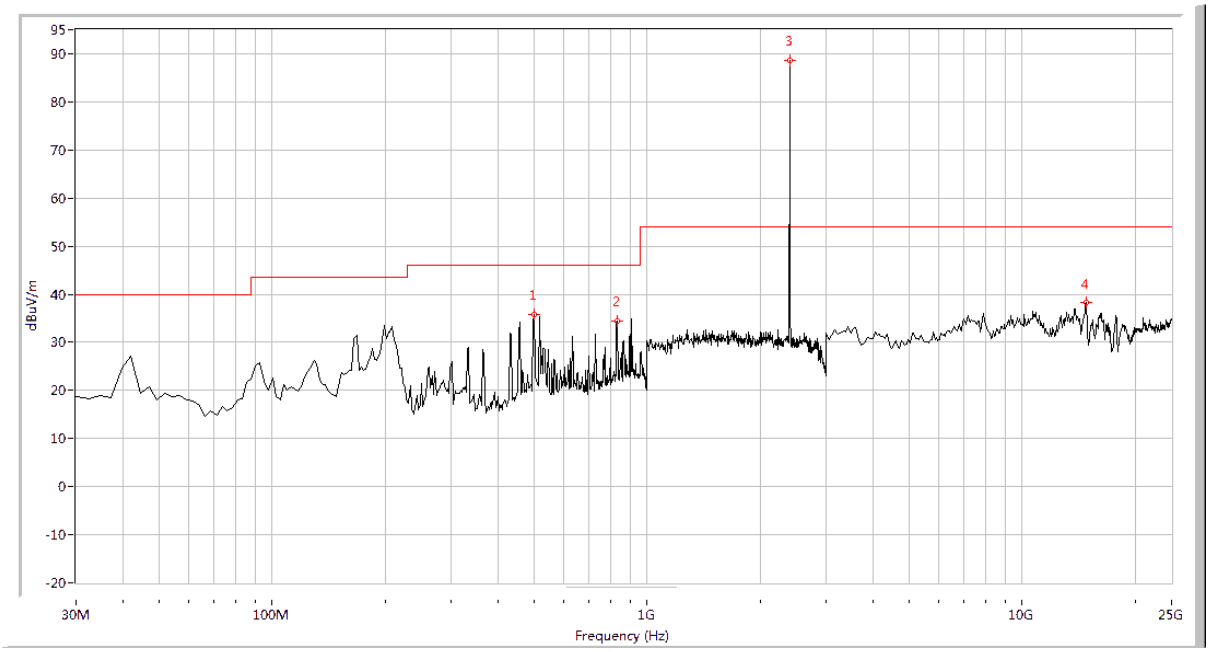
Plots for Channel = 0

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



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
431.546	36.41	N.A	N.A	N.A	46.0	N.A	86.3	Horizontal	PASS
499.277	36.95	N.A	N.A	N.A	46.0	N.A	172.1	Horizontal	PASS
2402.000	88.25	N.A	N.A	N.A	N.A	54.0	53.6	Horizontal	54.0
14795.511	38.26	N.A	N.A	7.0	N.A	54.0	76.9	Horizontal	PASS

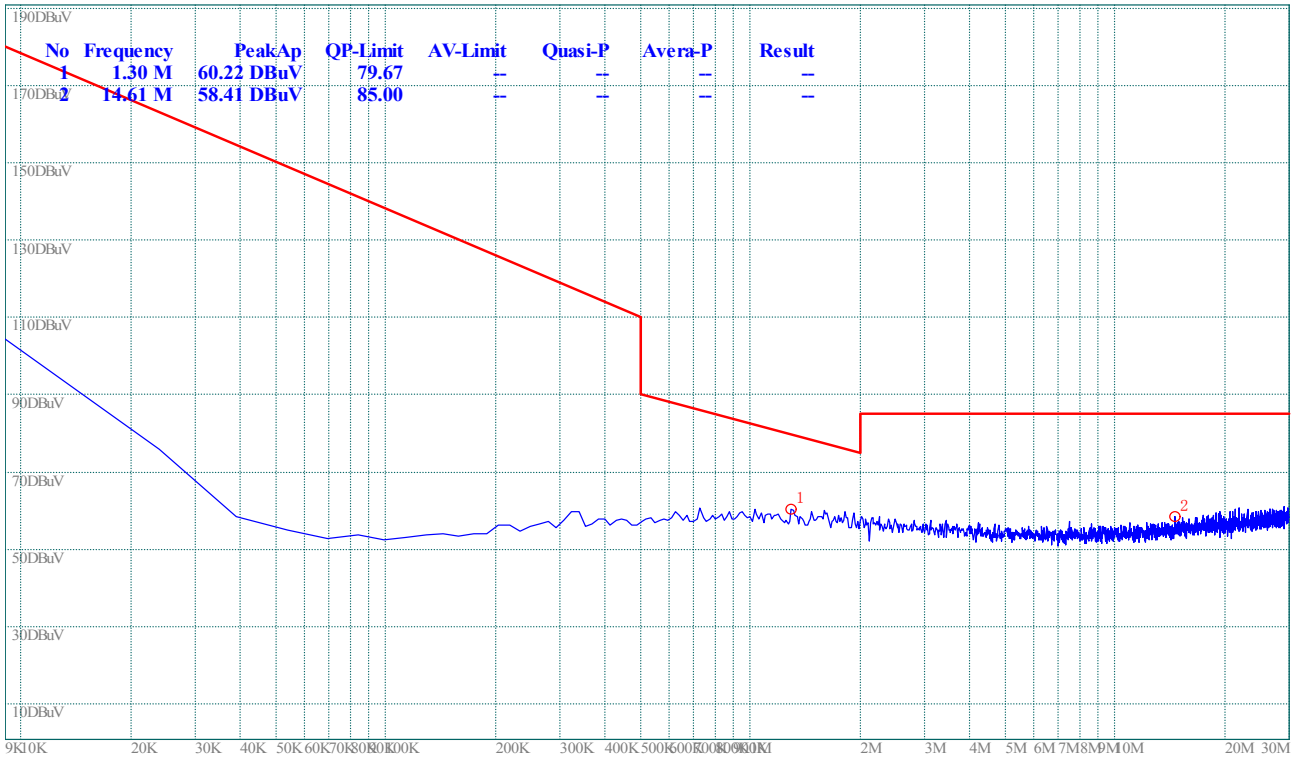
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 0)



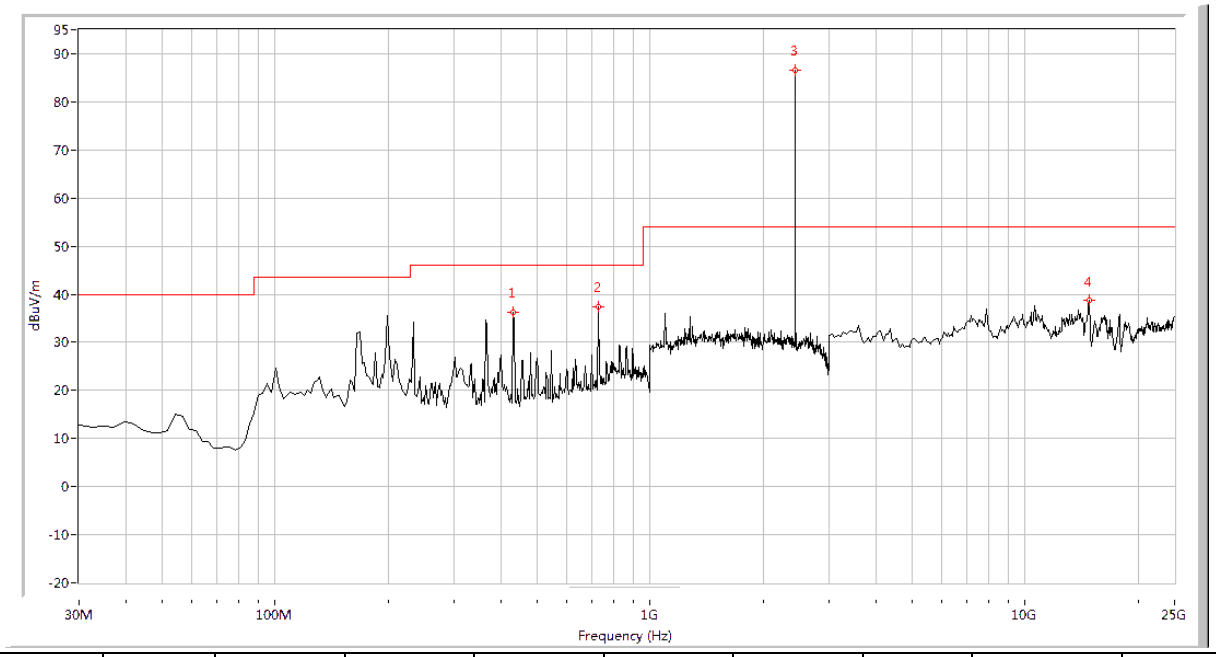
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
499.277	35.72	N.A	N.A	N.A	46.0	N.A	8.6	Vertical	PASS
830.673	34.39	N.A	N.A	N.A	46.0	N.A	182.1	Vertical	PASS
2402.000	88.63	N.A	N.A	N.A	N.A	54.0	53.8	Vertical	N.A
14795.511	38.20	N.A	N.A	74	N.A	54.0	192.4	Vertical	PASS

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

Plot for Channel = 39

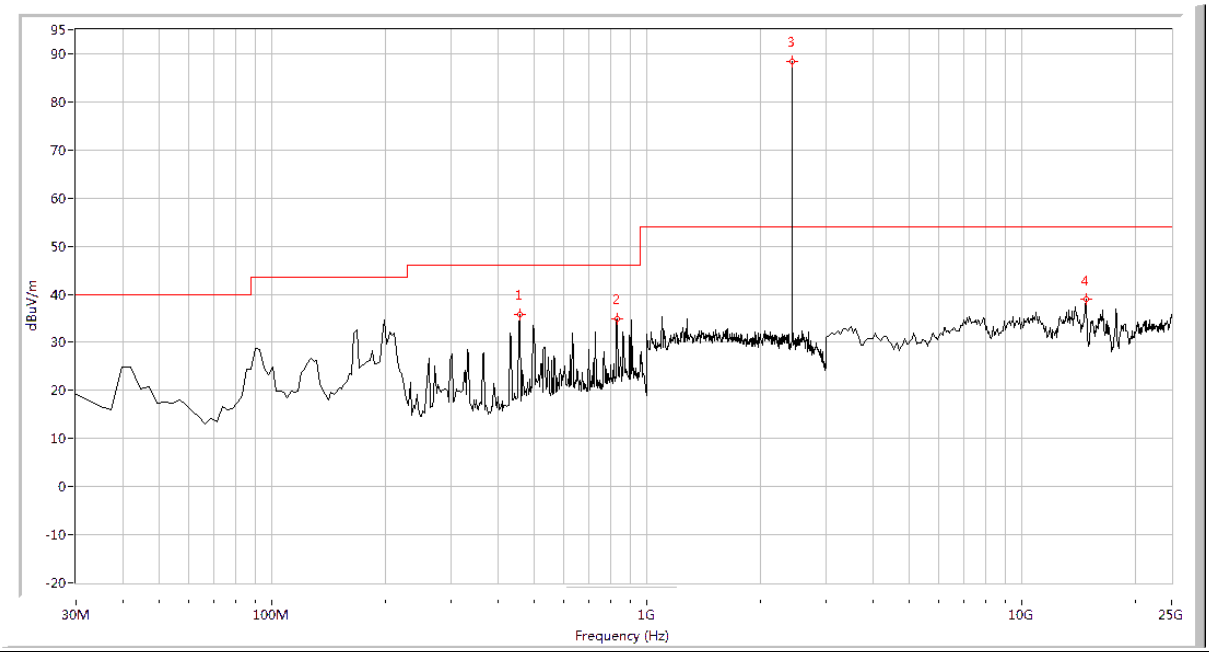


(Plot B.0: 9kHz to 30MHz @ 8-DPSK, channel 39)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
431.546	36.20	N.A	N.A	N.A	46.0	N.A	153.8	Horizontal	PASS
729.077	37.48	N.A	N.A	N.A	46.0	N.A	86.5	Horizontal	PASS
2441.000	86.69	N.A	N.A	N.A	N.A	54.0	257.1	Horizontal	N.A
14795.511	38.84	N.A	N.A	7.0	N.A	54.0	131.5	Horizontal	PASS

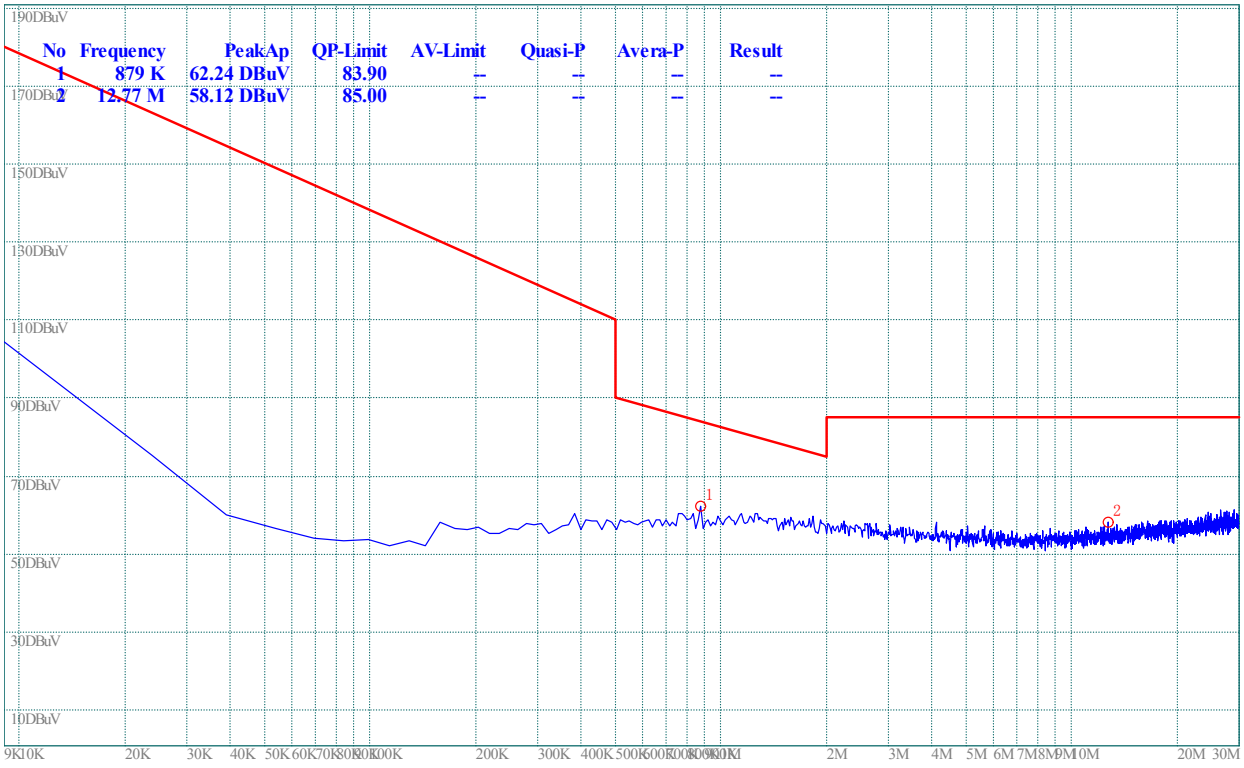
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ 8-DPSK, channel 39)



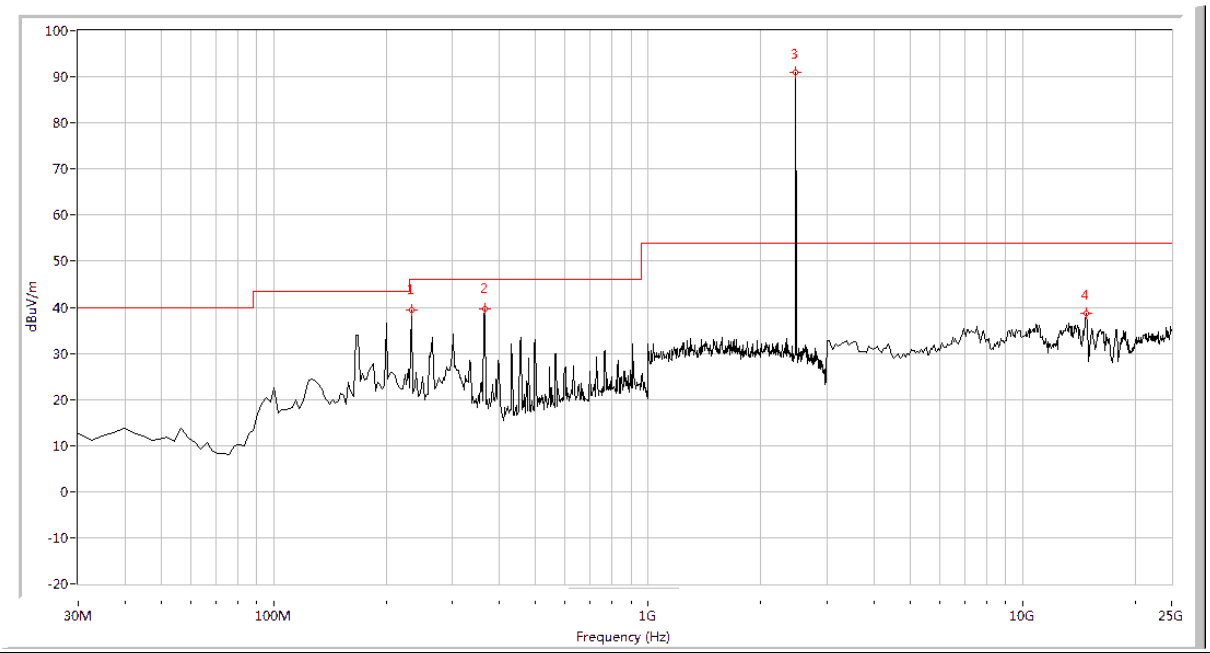
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
458.155	35.80	N.A	N.A	N.A	46.0	N.A	63.1	Horizontal	PASS
830.673	34.93	N.A	N.A	N.A	46.0	N.A	155.7	Horizontal	PASS
2441.000	88.48	N.A	N.A	N.A	N.A	54.0	191.5	Horizontal	N.A
14795.511	39.09	N.A	N.A	7.0	N.A	54.0	151.8	Horizontal	PASS

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

Plot for Channel = 78

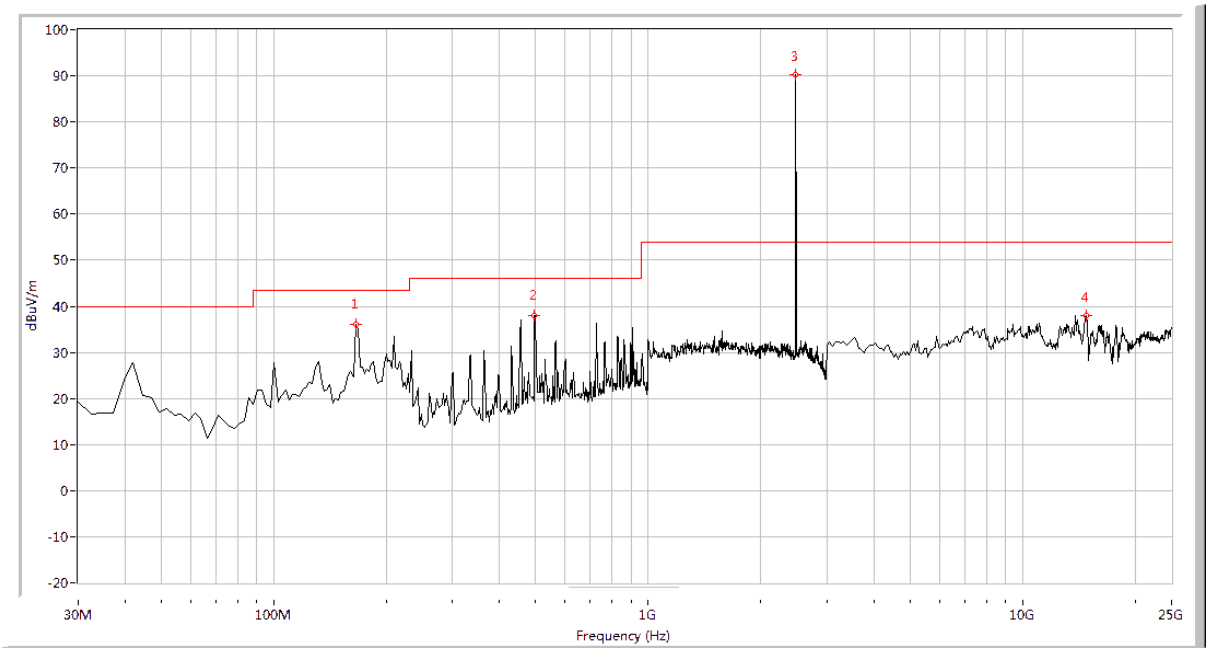


(Plot C.0: 9kHz to 30MHz @ 8-DPSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
233.192	39.35	N.A	N.A	N.A	46.0	N.A	183.5	Horizontal	PASS
366.234	39.68	N.A	N.A	N.A	46.0	N.A	261.2	Horizontal	PASS
2480.000	90.89	N.A	N.A	N.A	N.A	54.0	75.8	Horizontal	N.A
14795.511	38.63	N.A	N.A	74.0	N.A	54.0	95.2	Horizontal	PASS

(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
165.461	35.98	N.A	N.A	N.A	43.5	N.A	118.4	Vertical	PASS
496.858	37.94	N.A	N.A	N.A	46.0	N.A	291.8	Vertical	PASS
2480.000	90.23	N.A	N.A	N.A	N.A	54.0	85.9	Vertical	N.A
14795.511	37.90	N.A	N.A	74.0	N.A	54.0	183.1	Vertical	PASS

(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 5.018dBm, the maximum gain of antenna is 0dBi, the maximum output power is 5.018dBm (3.175mW). which is lower than the exclusion threshold 10mW, at frequency 2441MHz, and distance is 5mm.

The SAR measurement is not required.

** END OF REPORT **