Report No.:SZ12080135W03

FCC Part 15C TEST REPORT

Issued to

Ipteq S.A.

For

Smart Prayer Clock

Model Name	:	HIL 1
Trade Name	:	IPTEQ
Brand Name	:	IPTEQ
FCC ID	:	PVIHIL1IPTEQ
Standard	:	47 CFR Part 15 Subpart C
Test date	:	2012-9-23 to 2012-10-28
Issue date	:	2012-10-29

Shenzhen MORLAB Communication Technology Co., Ltd.

Tested by Nie Quan
Nie Quan
Date 2012.10.29

Approved by Wu Xuechen
Date 2012.10.29

Review by Peng Huarui
Peng Huarui
Date 2012.10.29

CTIA Authorized Test Lab LAB CODE 20081223-00 IEEE 1725 OTA OFTA 電訊管理局 ilac-MRA TAF Testing Laboratory GCF Official Observer of Global Certification Forum Bluetooth BQTF FCC Reg. No. 741109

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DIRECTORY

1. GENERAL INFORMATION 3

1.1. EUT Description 3

1.2. Test Standards and Results 4

1.3. Facilities and Accreditations 5

2. 47 CFR PART 15C REQUIREMENTS 6

2.1. Number of Hopping Frequency 6

2.2. Peak Output Power 10

2.3. 20dB Bandwidth 12

2.4. Carried Frequency Separation 19

2.5. Time of Occupancy (Dwell time) 22

2.6. Conducted Spurious Emissions 29

2.7. Band Edge 41

2.8. Conducted Emission 61

2.9. Radiated Emission 64

2.10. Prediction of MPE limit at given distance ..... 错误！未定义书签。

Change History		
Issue	Date	Reason for change
1.0	Oct 29, 2012	First edition

1. General Information

1.1. EUT Description

EUT Type ..... :	Smart Prayer Clock
Serial No..... :	(n.a, marked #1 by test site)
Hardware Version ..... :	N/A
Software Version ..... :	N/A
Applicant ..... :	Ipteq S.A. Avenue du Casino 521820, Montreux - Switzerland
Manufacturer ..... :	Shenzhen Chuangwei Electronic Appliance Tech Co., Ltd 4F & 6F, Overseas plant south, Skyworth Industrial Park, Shiyan Street, Bao'an District, Shenzhen, 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..... :	PCB Antenna
Antenna Gain..... :	0 dBi

Note 1: The EUT is a Smart Prayer Clock, 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.

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	15.247(a)	Number of Hopping Frequency	PASS
2	15.247(b)	Peak Output Power	PASS
3	15.247(a)	20dB Bandwidth	PASS
4	15.247(a)	Carrier Frequency Separation	PASS
5	15.247(a)	Time of Occupancy (Dwell time)	PASS
6	15.247(c)	Conducted Spurious Emission	PASS
7	15.247(c)	Band Edge	PASS
8	15.207	Conducted Emission	PASS
9	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 C63.7, ANSI C63.4 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

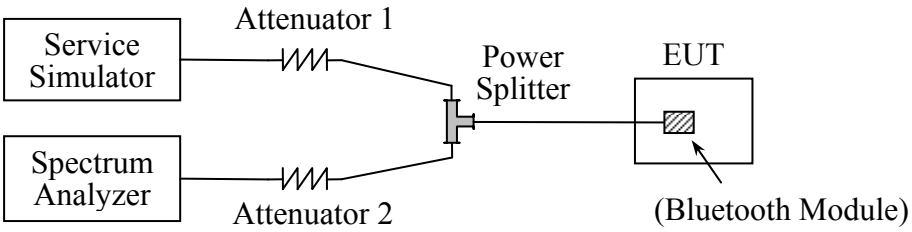
2.1. Number of Hopping Frequency

2.1.1. 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.

2.1.2. 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

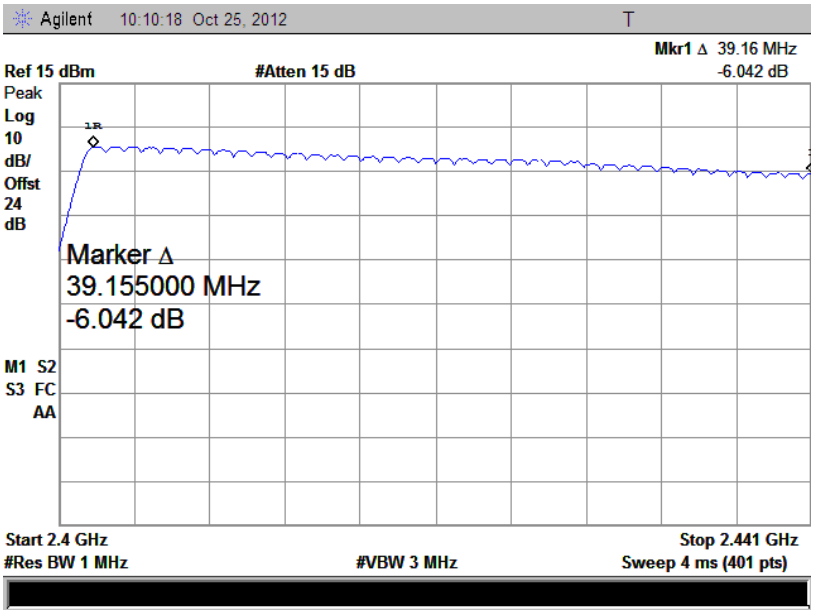
2.1.3. Test Result

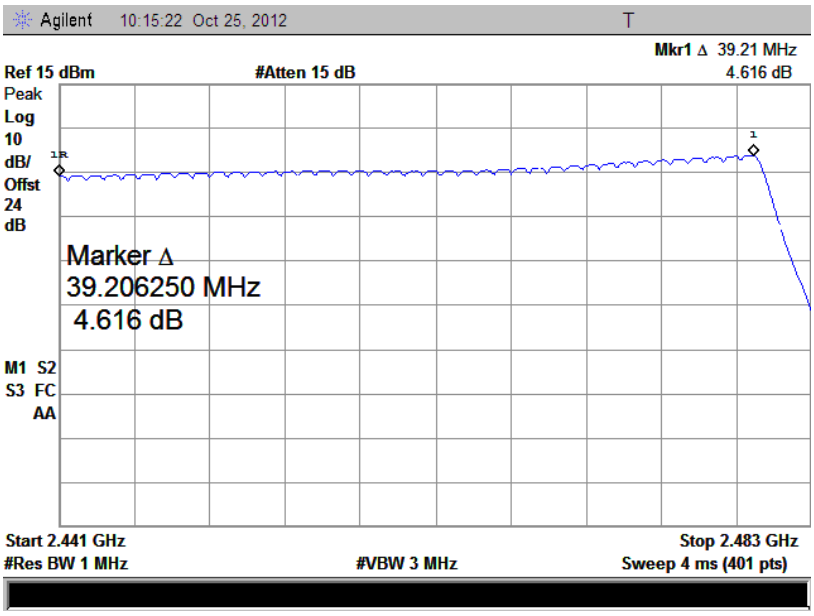
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

A. Test Verdict:

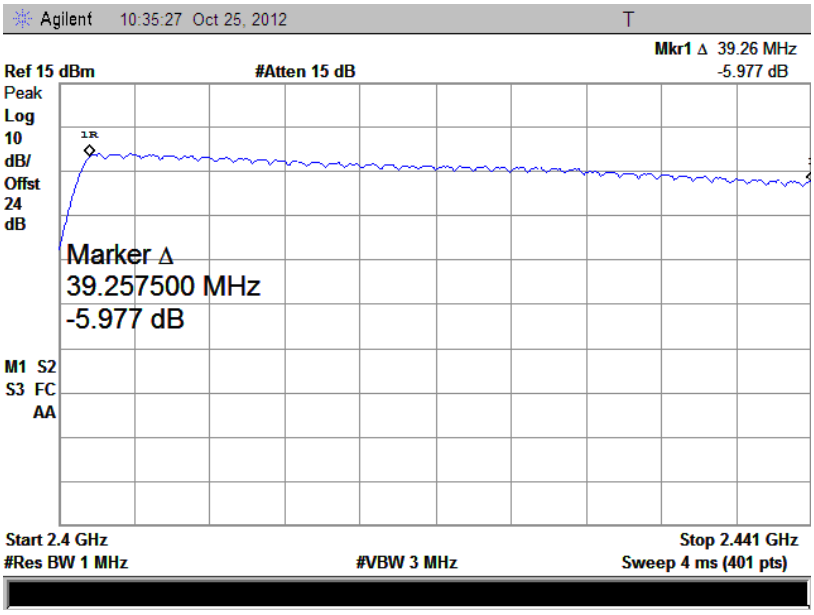
Test Mode	Frequency Block(MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS
∏/4-DQPSK	2400 - 2483.5	79	15	Plot B	PASS
8-DPSK	2400 - 2483.5	79	15	Plot C	PASS

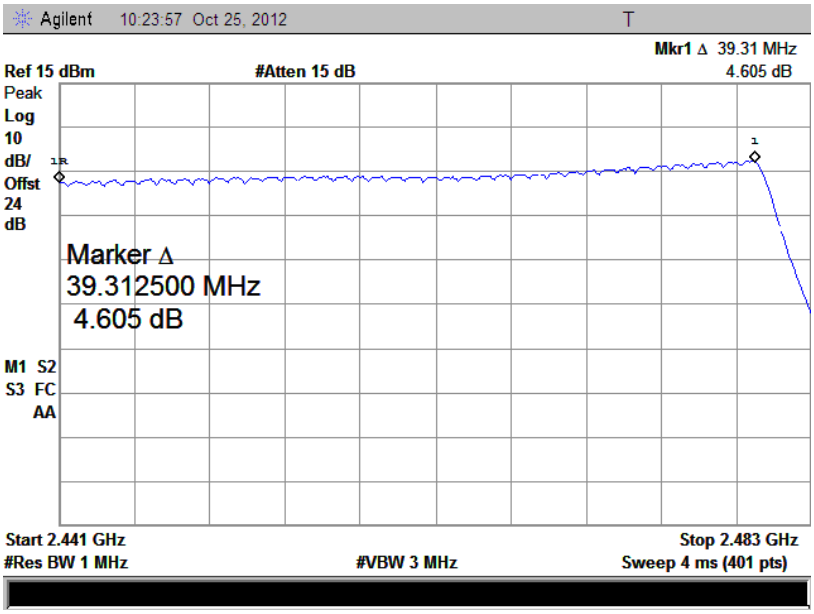
B. Test Plots:



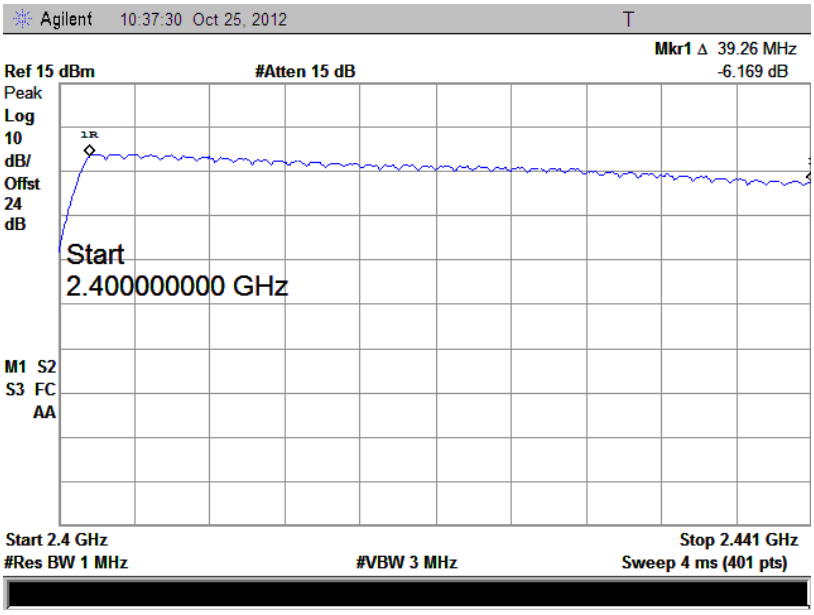


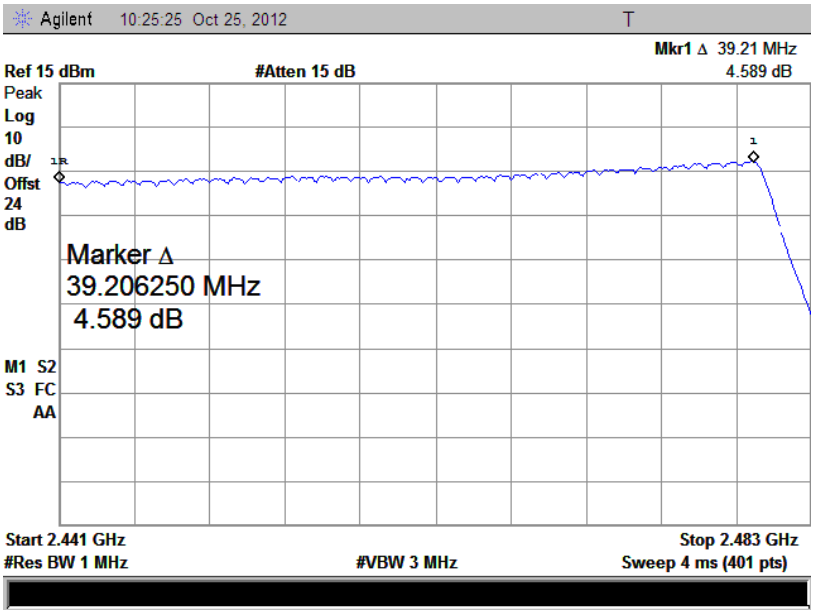
(Plot A: GFSK)





(Plot B: ∏/4-DQPSK)


Agilent 10:37:30 Oct 25, 2012
T
Mkr1 Δ 39.26 MHz
Ref 15 dBm
#Atten 15 dB
-6.169 dB
Peak
Log
10
dB/
Offst
24
dB
1R
Start
2.400000000 GHz
M1 S2
S3 FC
AA
Start 2.4 GHz
Stop 2.441 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)


Agilent 10:25:25 Oct 25, 2012
T
Mkr1 Δ 39.21 MHz
Ref 15 dBm
#Atten 15 dB
4.589 dB
Peak
Log
10
dB/
Offst
24
dB
1R
1
Marker Δ
39.206250 MHz
4.589 dB
M1 S2
S3 FC
AA
Start 2.441 GHz
Stop 2.483 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)

(Plot C: 8- DPSK)

2.2. Peak Output Power

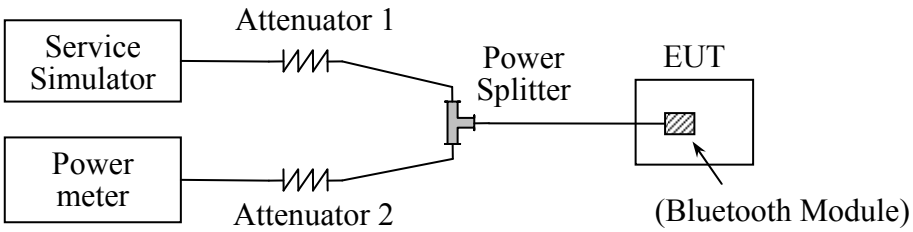
2.2.1. Requirement

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.

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

2.2.2. Test Description



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.

2.2.3. 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.

2.2.3.1. GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	5.515	0.0036	30	1	PASS
39	2441	6.053	0.0041			PASS
78	2480	8.013	0.0063			PASS

2.2.3.2. π/4-DQPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	5.261	0.0034	30	1	PASS
39	2441	5.332	0.0034			PASS
78	2480	7.018	0.0050			PASS

2.2.3.3. 8-DPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	5.533	0.0036	30	1	PASS
39	2441	6.029	0.0041			PASS
78	2480	8.011	0.0063			PASS

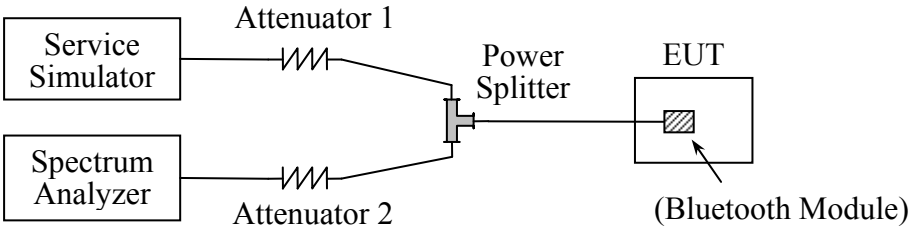
2.3. 20dB Bandwidth

2.3.1. 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.

2.3.2. 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

2.3.3. Test Result

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

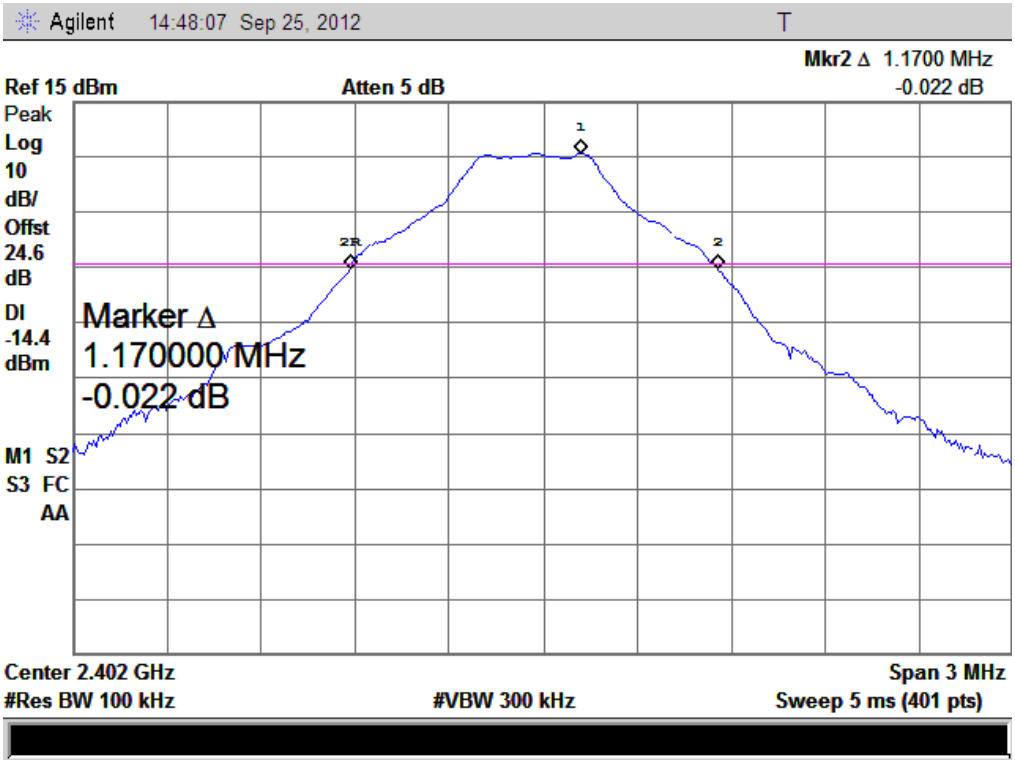
2.3.3.1. GFSK Mode

A. Test Verdict:

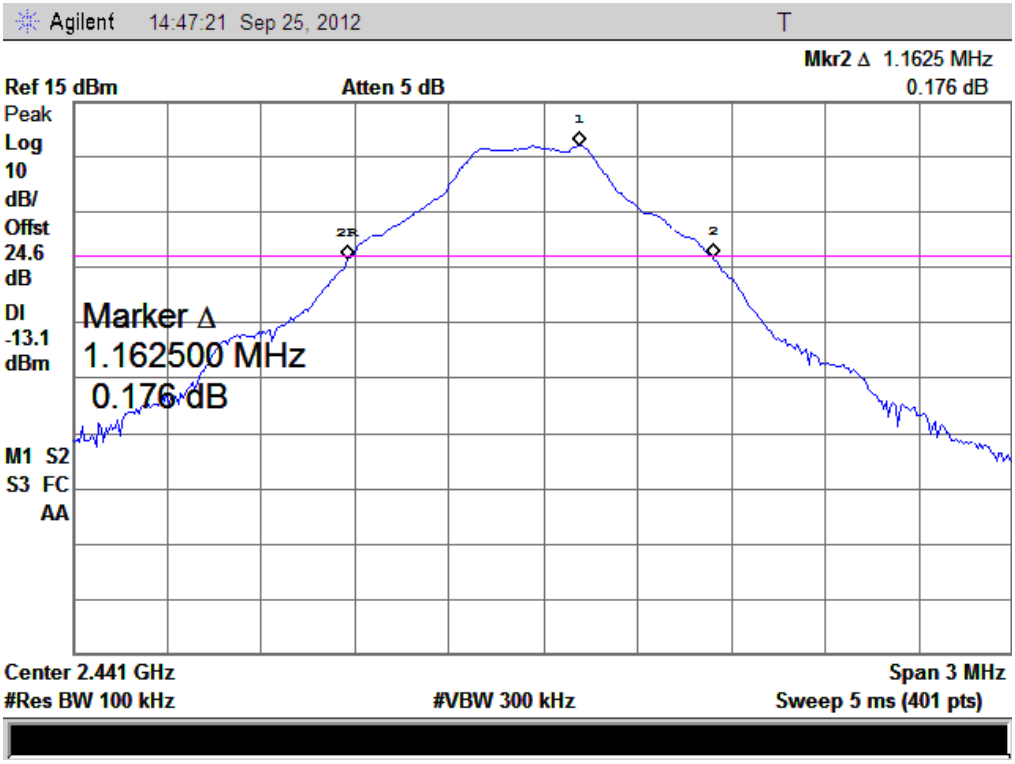
The maximum 20dB bandwidth measured is 1.170 MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.170	Plot A
39	2441	1.163	Plot B
78	2480	1.170	Plot C

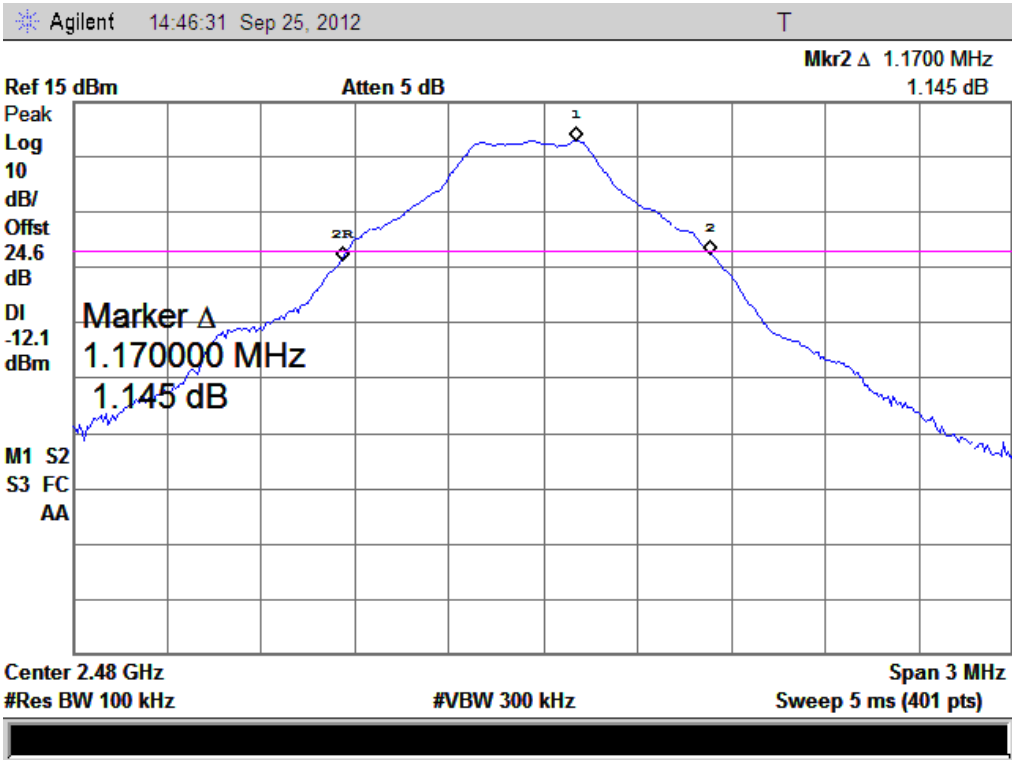
B. Test Plots:



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

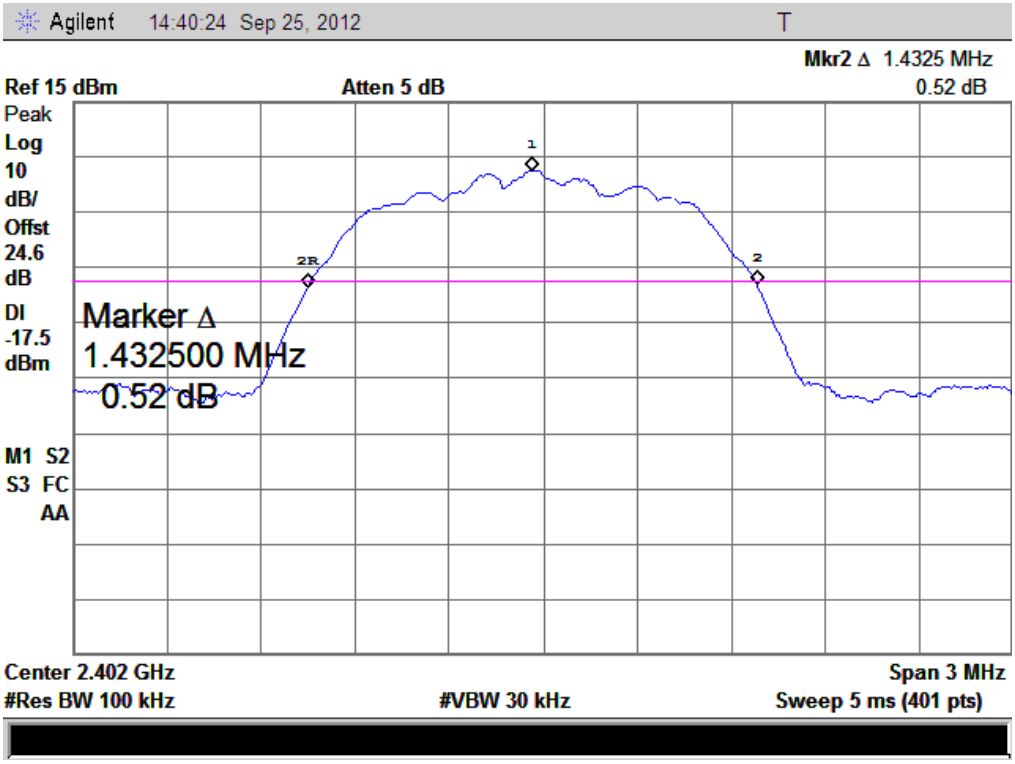
2.3.3.2. Π/4-DQPSK Mode

A. Test Verdict:

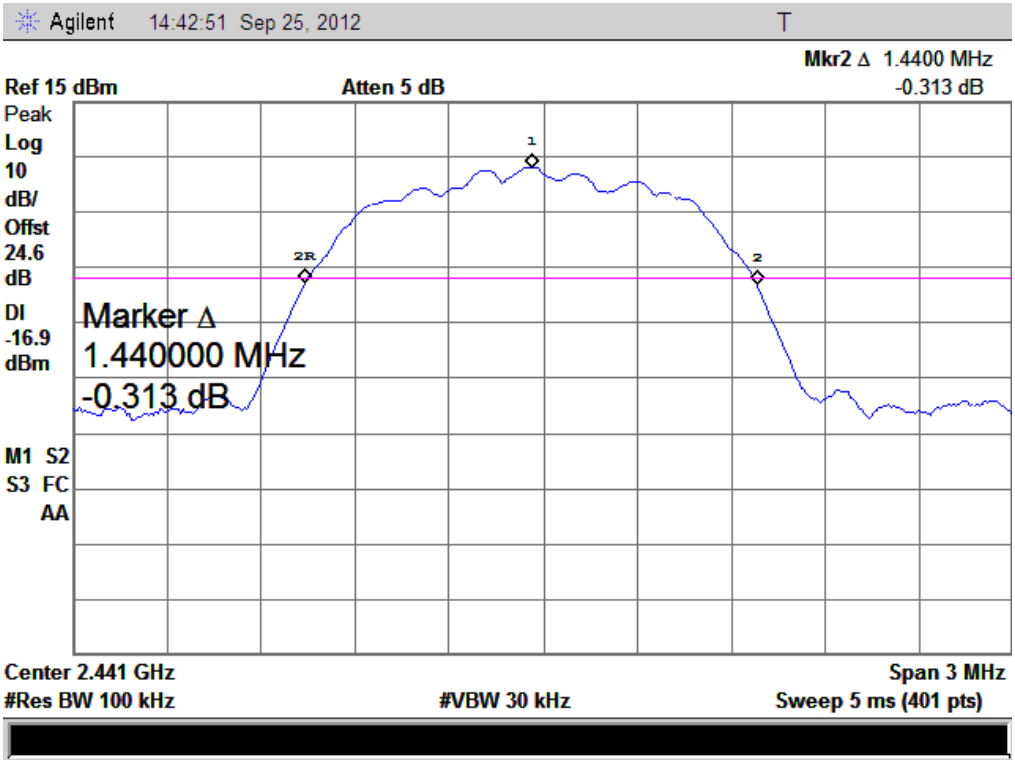
The maximum 20dB bandwidth measured is 1.448MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.433	Plot D
39	2441	1.440	Plot E
78	2480	1.448	Plot F

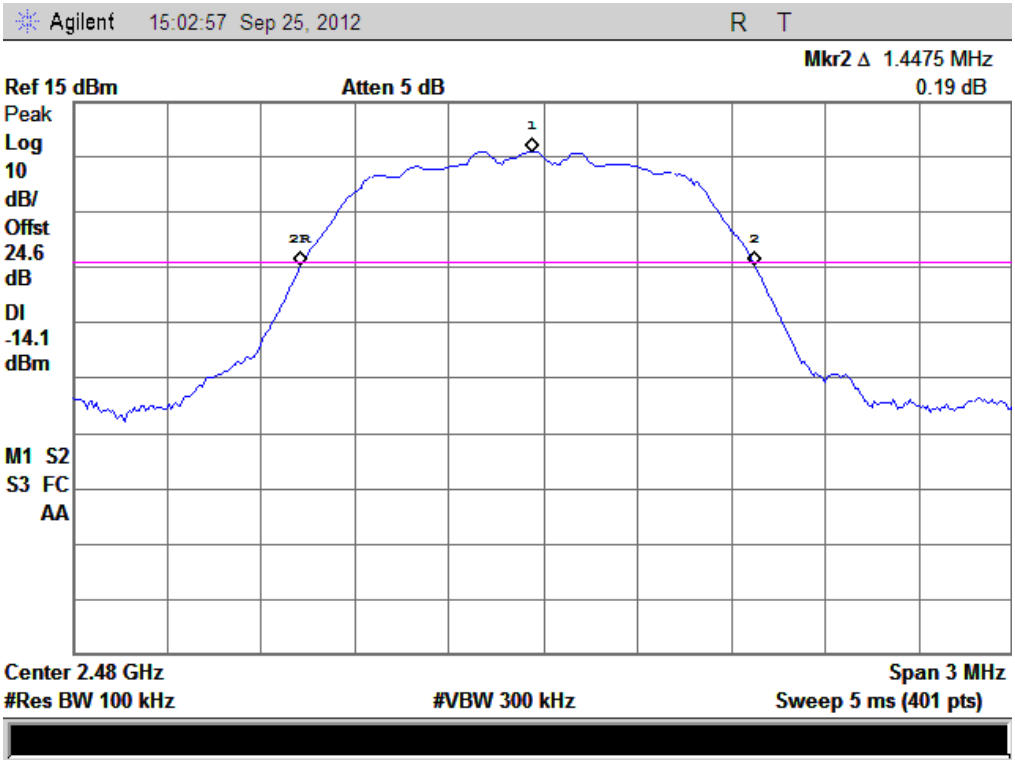
B. Test Plots:



(Plot D: Channel = 2402 @ Π/4-DQPSK)



(Plot E: Channel = 2441 @ Π/4-DQPSK)



(Plot F: Channel = 2480 @ Π/4-DQPSK)

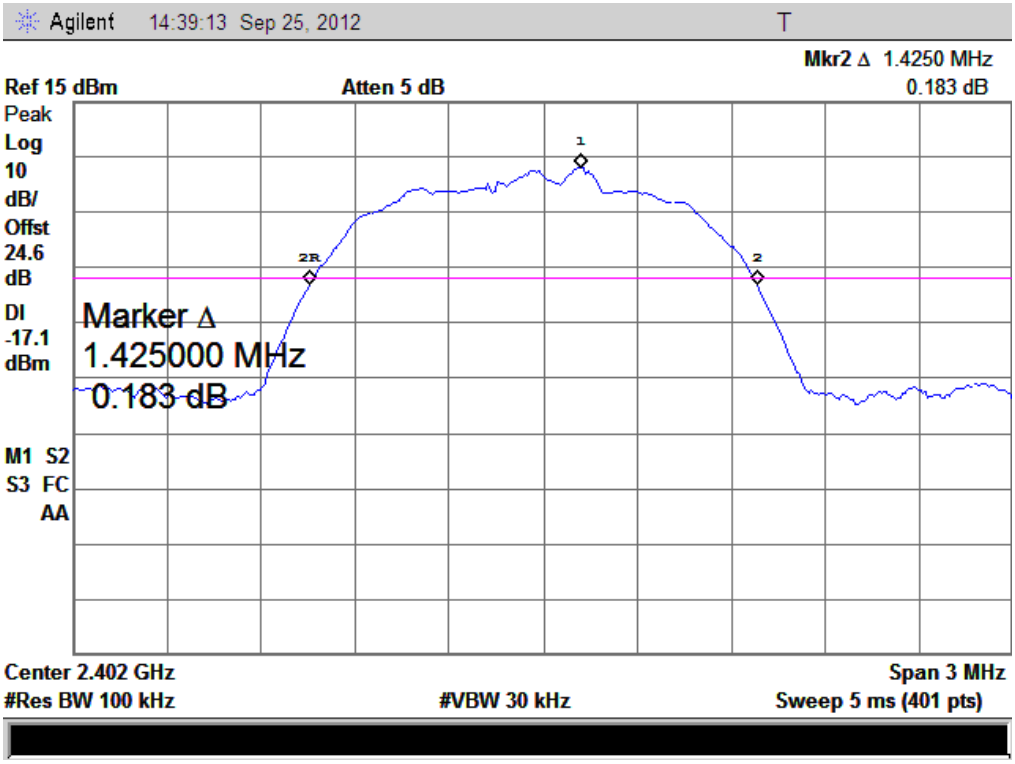
2.3.3.3. 8-DPSK Mode

A. Test Verdict:

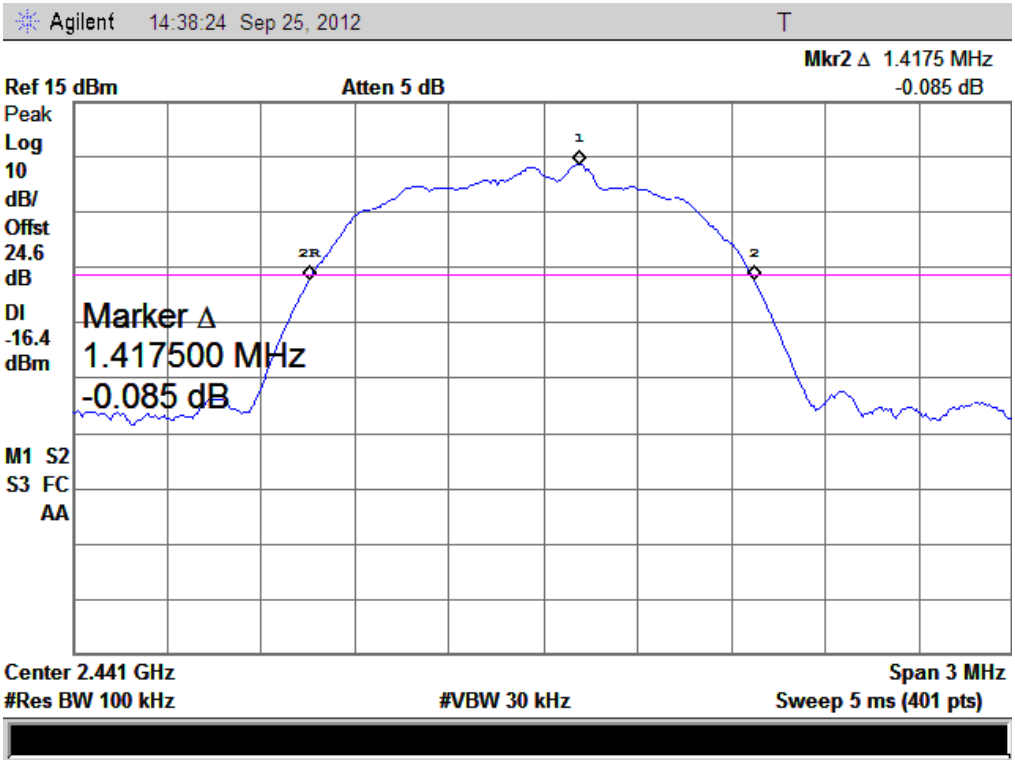
The maximum 20dB bandwidth measured is 1.425MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.425	Plot G
39	2441	1.418	Plot H
78	2480	1.425	Plot I

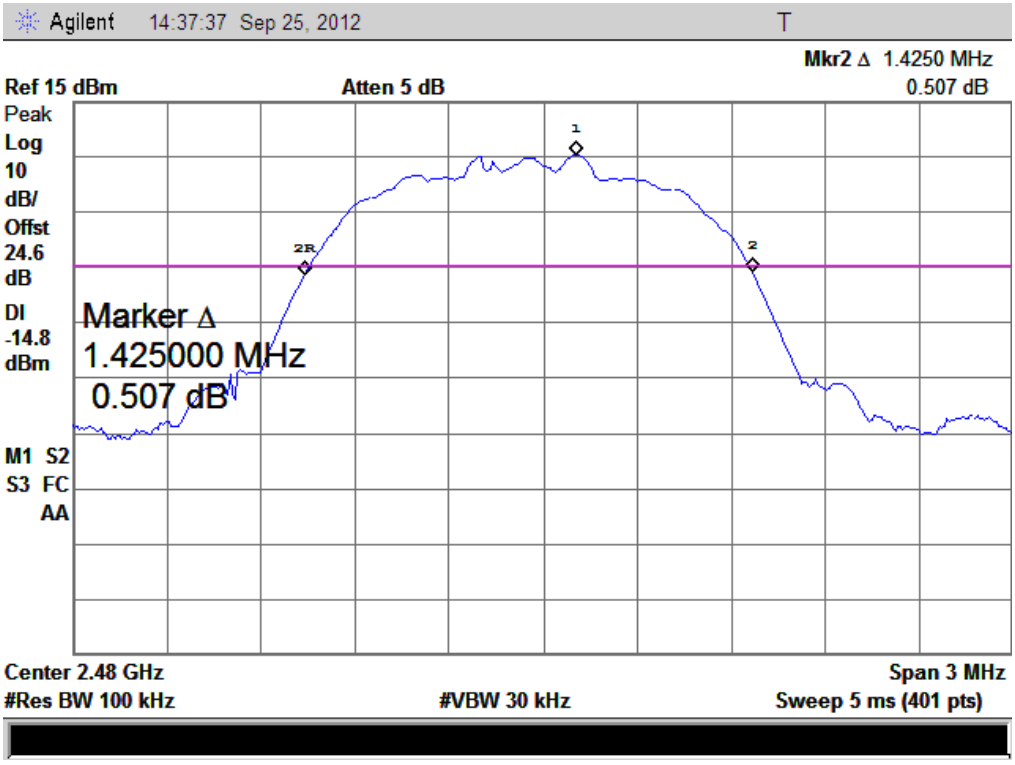
B. Test Plots:



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



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



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

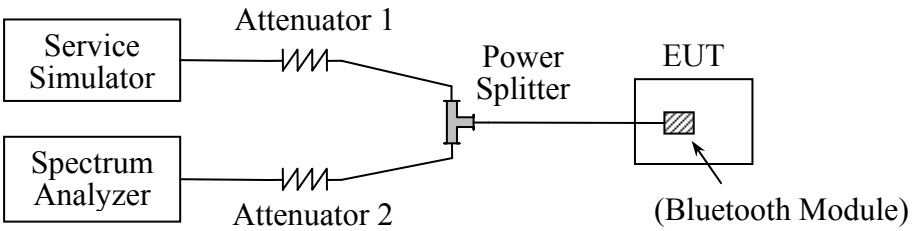
2.4. Carried Frequency Separation

2.4.1. 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.

2.4.2. Test Description

A. Test Setup:



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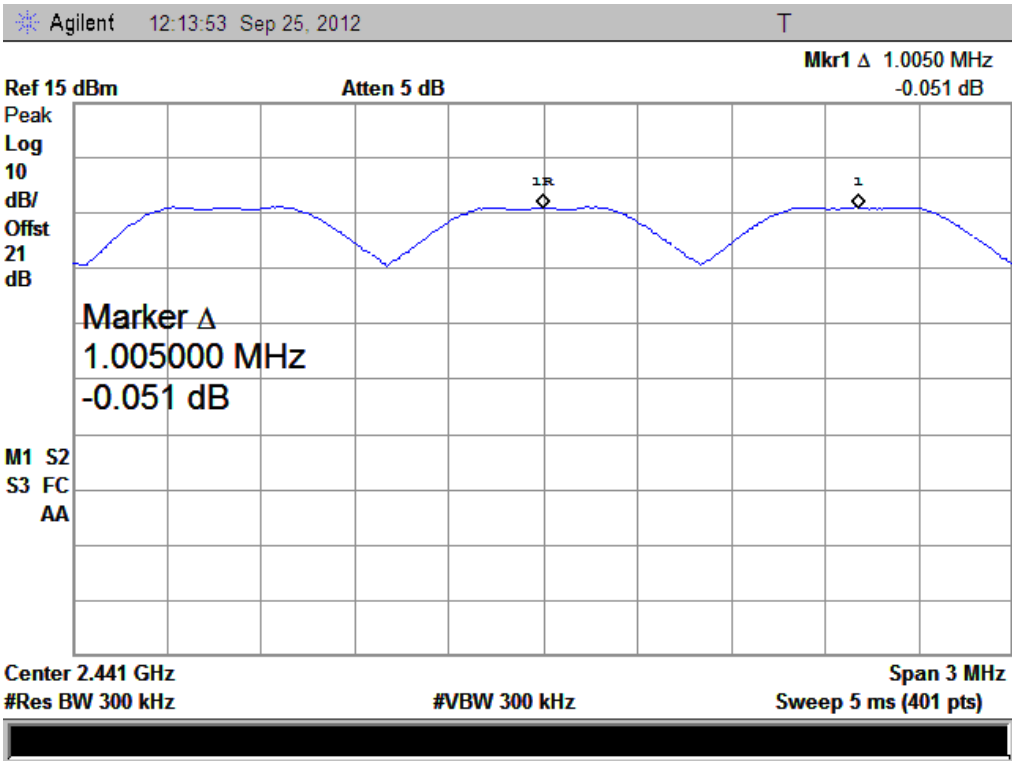
B. Equipments List:

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

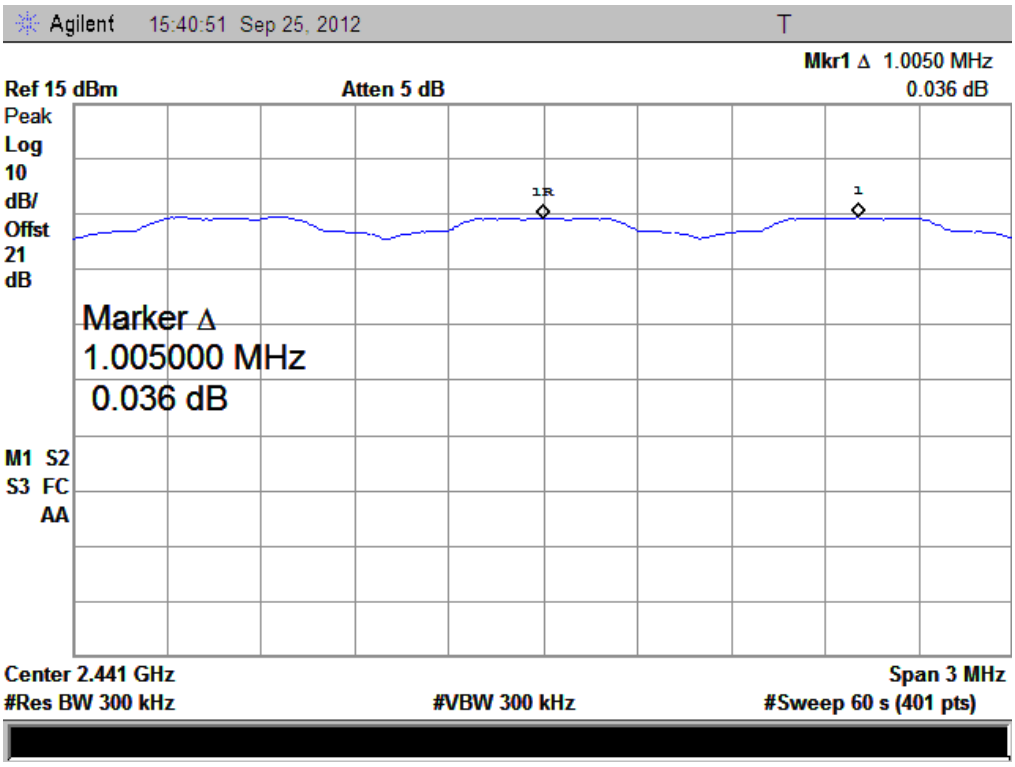
2.4.3. Test Result

The Bluetooth Module operates at hopping-on test mode.

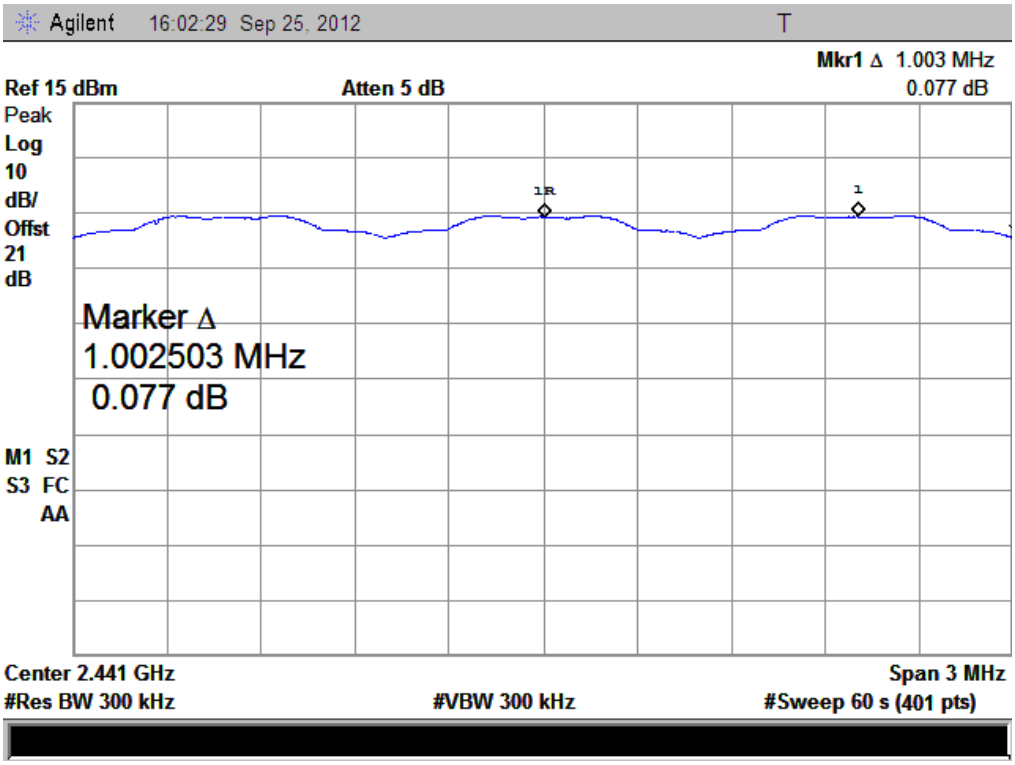
For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (1.170MHz for GFSK mode, 1.448MHz for Π/4-DQPSK mode and 1.425MHz for 8-DPSK mode, refer to section 2.3.3), whichever is greater. So, the verdict is PASSING



(Plot A: GFSK)



(Plot B: Π/4-DQPSK)


Agilent 16:02:29 Sep 25, 2012
T
Mkr1 Δ 1.003 MHz
0.077 dB
Ref 15 dBm
Atten 5 dB
Peak
Log
10
dB/
Offst
21
dB
1R
1
Marker Δ
1.002503 MHz
0.077 dB
M1 S2
S3 FC
AA
Center 2.441 GHz
Span 3 MHz
#Res BW 300 kHz
#VBW 300 kHz
#Sweep 60 s (401 pts)

(Plot C: 8-DPSK)

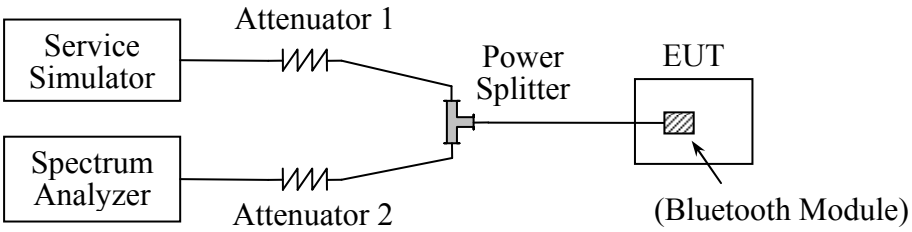
2.5. Time of Occupancy (Dwell time)

2.5.1. 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.

2.5.2. 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 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.

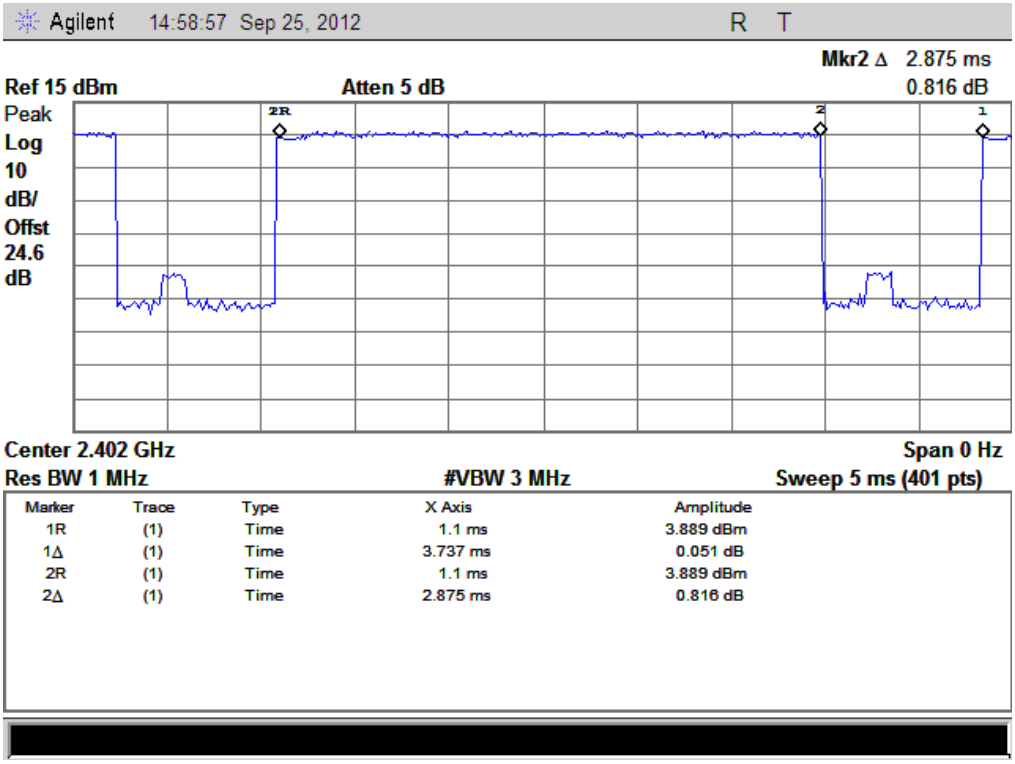
2.5.3.1. GFSK Mode

A. Test Verdict:

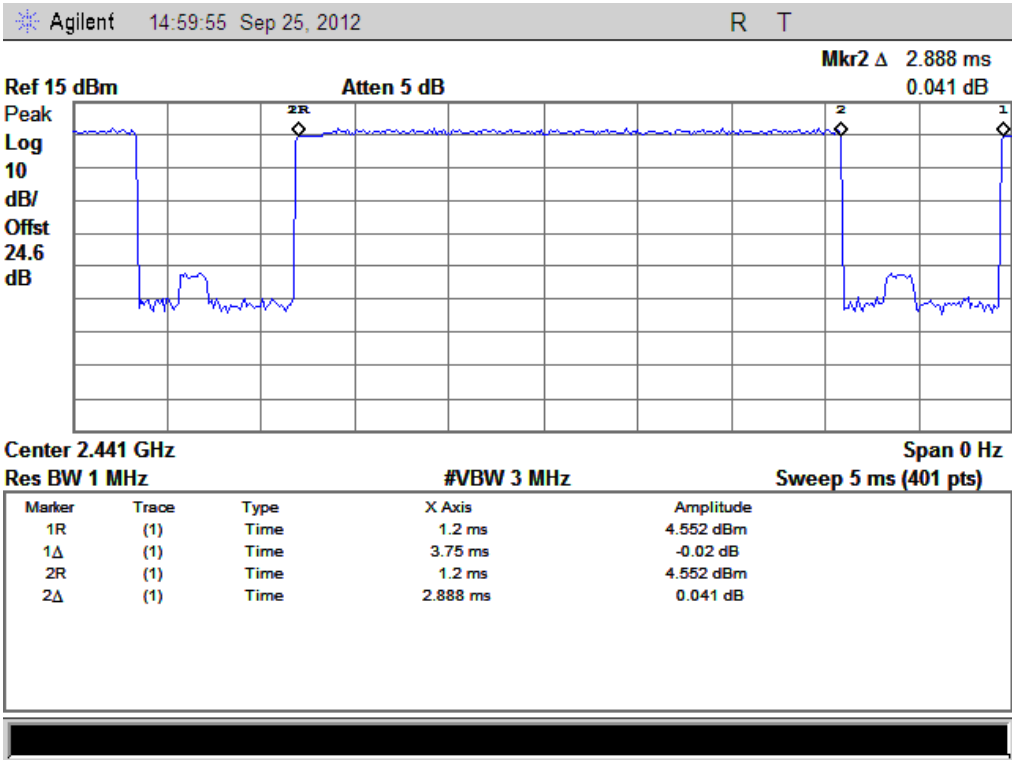
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.875	Plot A	306.667	400	PASS
39	2441	2.888	Plot B	308.053		PASS
78	2480	2.888	Plot C	308.053		PASS

B. Test Plots:

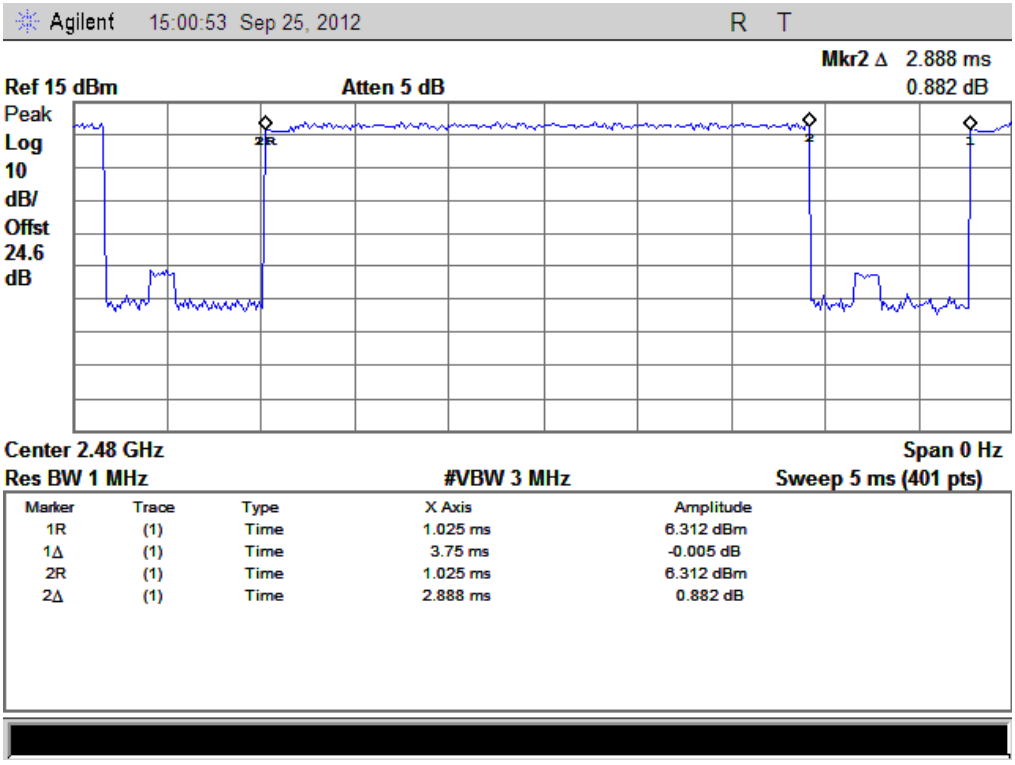
Note: the following plots record the Pulse Time of the Module carrier.



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

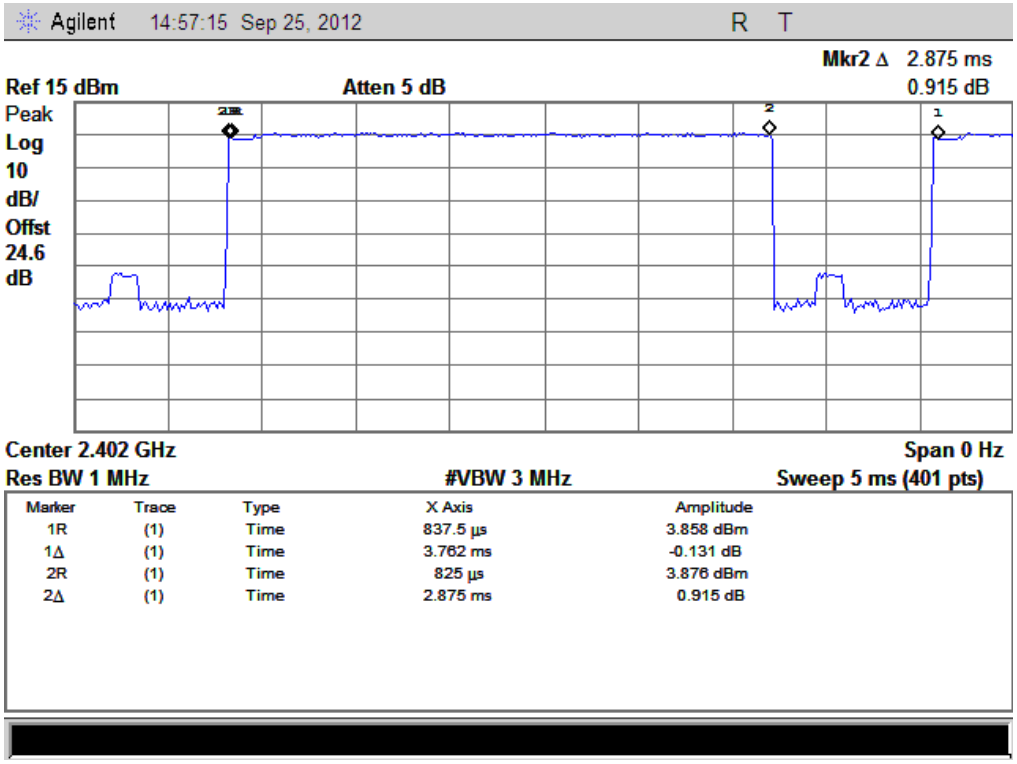
2.5.3.2. π/4-DQPSK Mode

A. Test Verdict:

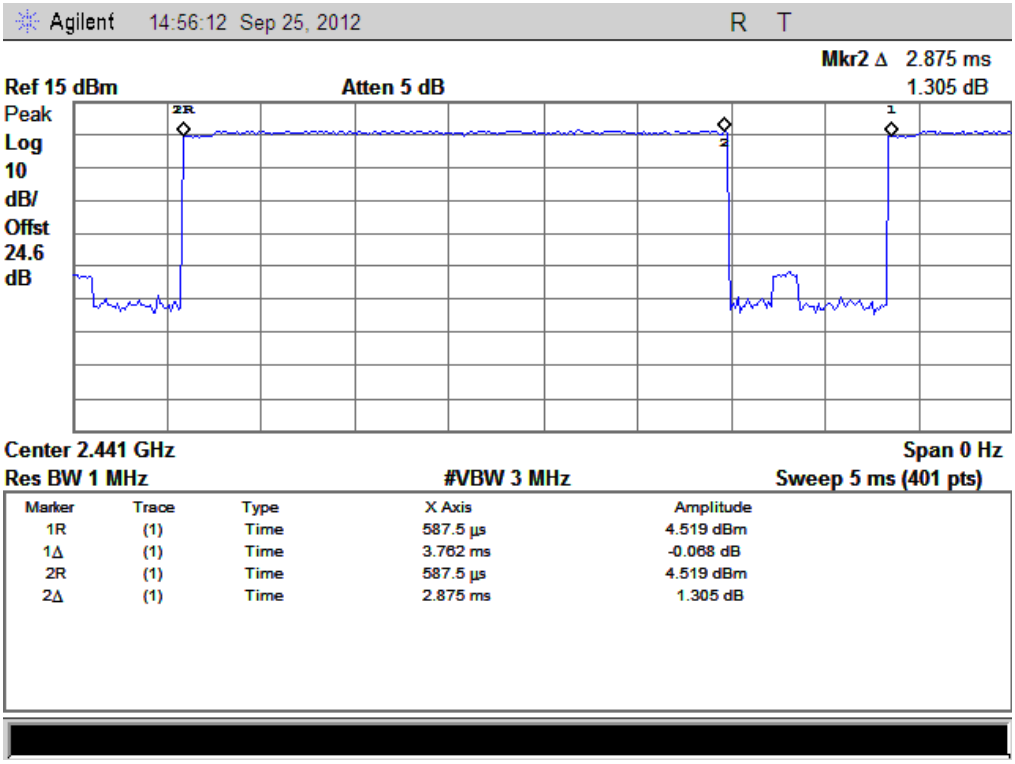
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.875	Plot D	306.667	400	PASS
39	2441	2.875	Plot E	306.667		PASS
78	2480	2.887	Plot F	307.947		PASS

B. Test Plots:

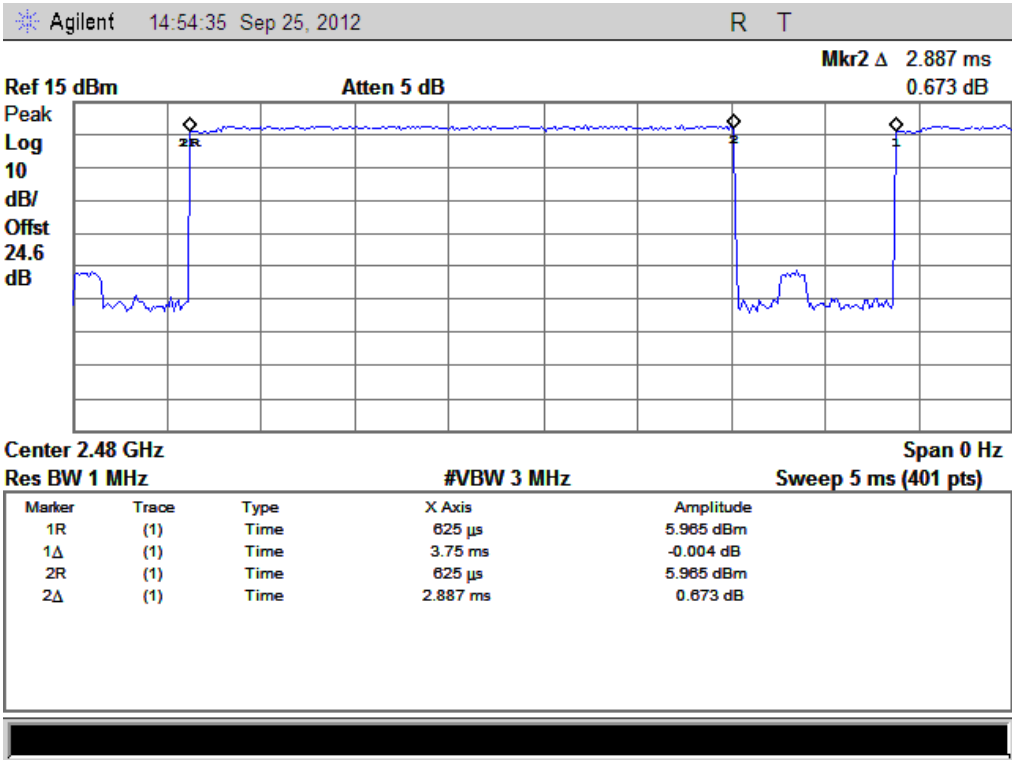
Note: the following plots record the Pulse Time of the Module carrier.



(Plot D: Channel = 2402 @ π/4-DQPSK)



(Plot E: Channel = 2441 @ Π/4-DQPSK)



(Plot F: Channel = 2480 @ Π/4-DQPSK)

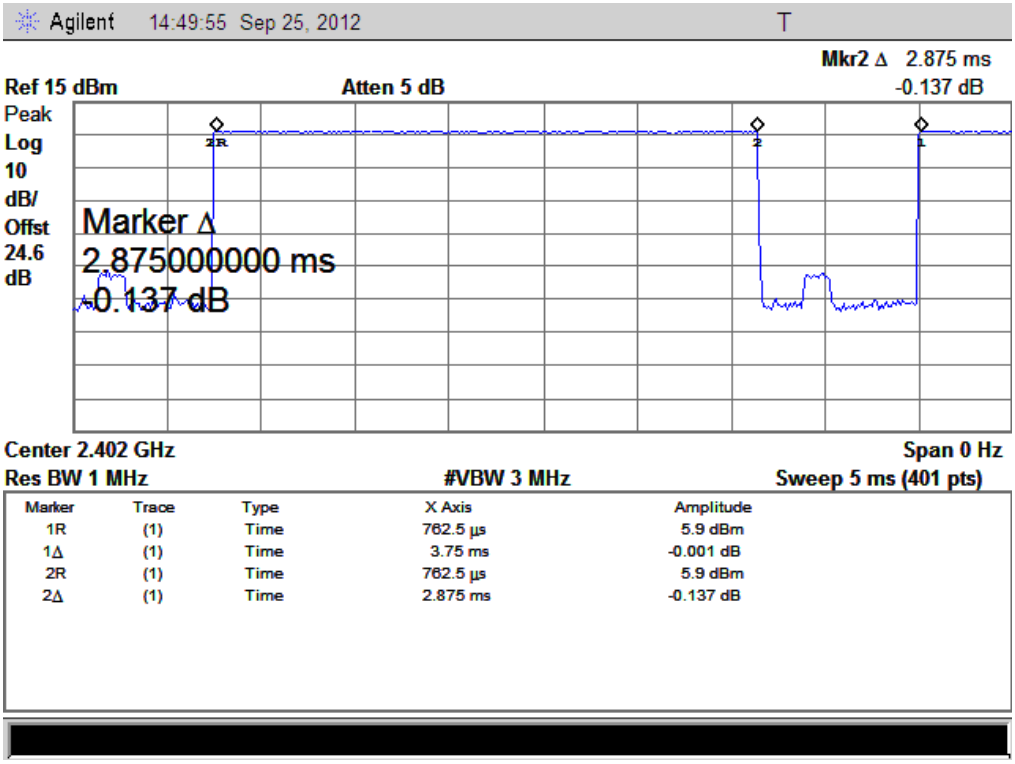
2.5.3.3. 8-DPSK mode

A. Test Verdict:

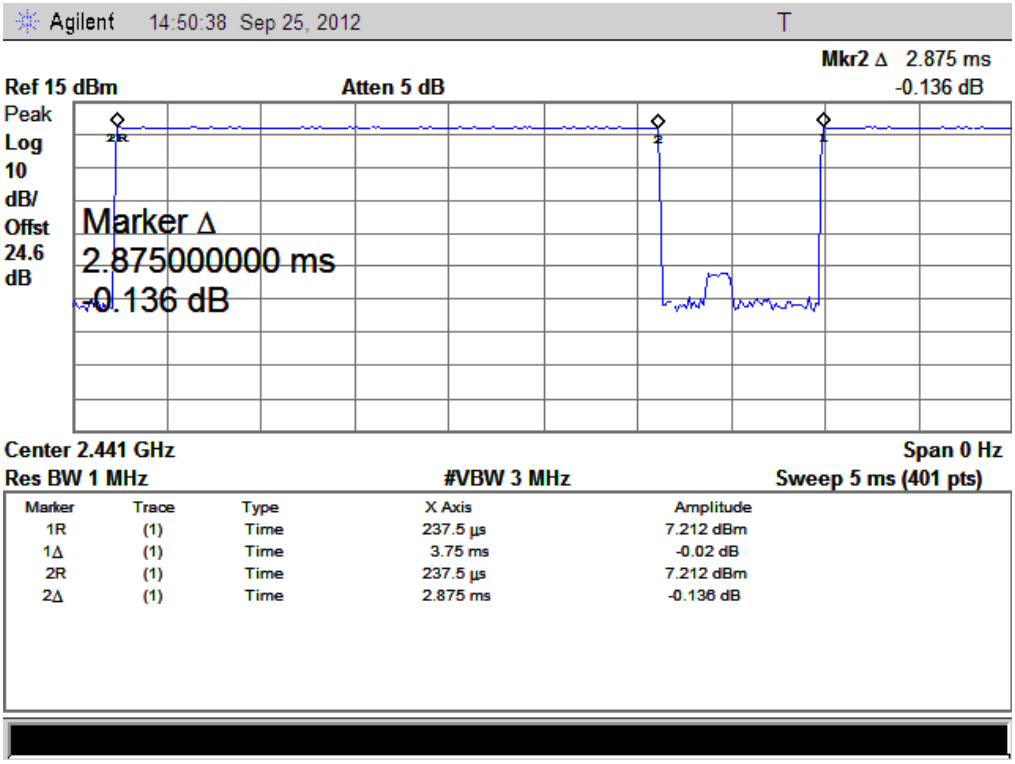
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.875	Plot G	306.067	400	PASS
39	2441	2.875	Plot H	306.067		PASS
78	2480	2.887	Plot I	307.947		PASS

B. Test Plots:

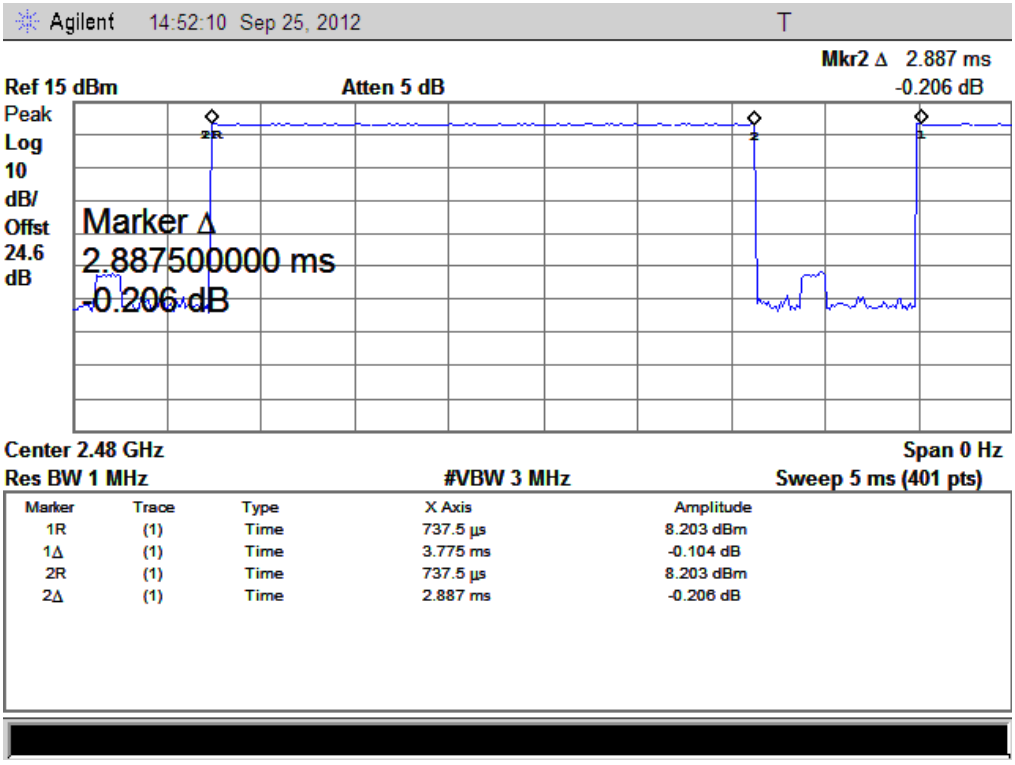
Note: the following plots record the Pulse Time of the Module carrier.



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



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



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

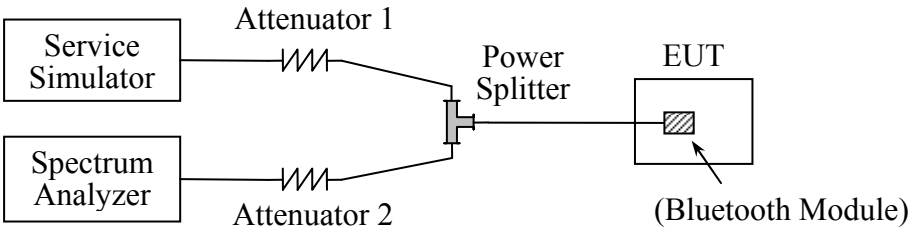
2.6. Conducted Spurious Emissions

2.6.1. Requirement

According to FCC §15.247(c), 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.

2.6.2. 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 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.

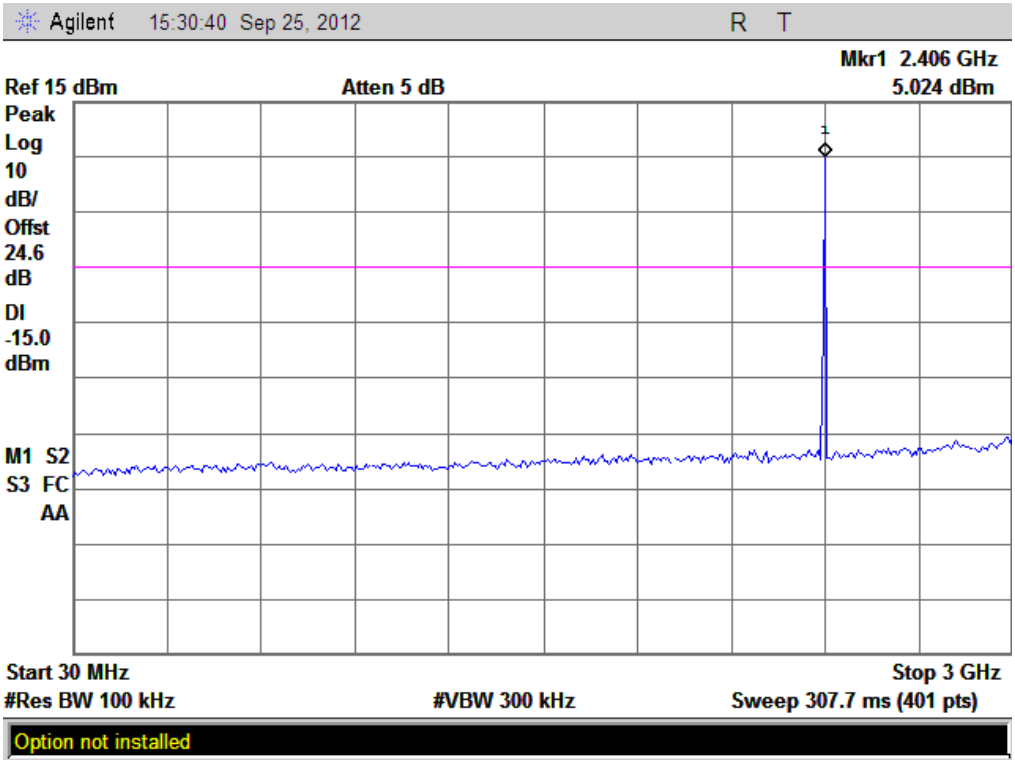
2.6.3.1. GFSK Mode

A. Test Verdict:

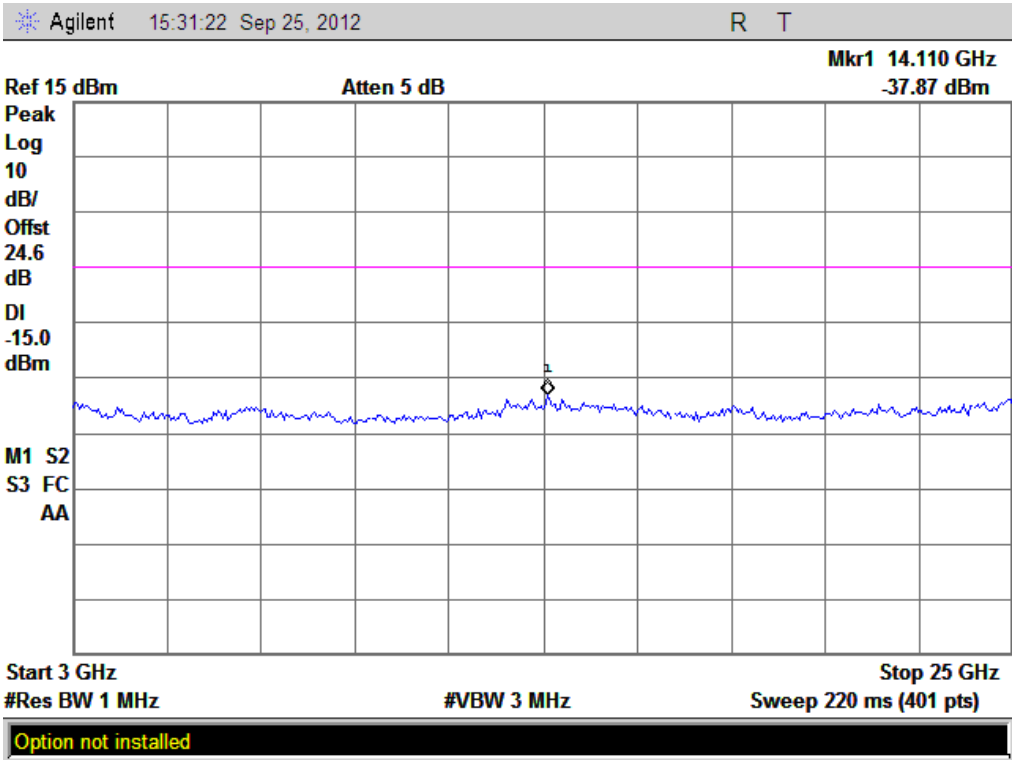
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	< -25	Plot A.1/A.2	5.024	-15.0	PASS
39	2441	< -25	Plot B.1/B.2	6.697	-13.3	PASS
78	2480	< -25	Plot C.1/C.2	7.856	-12.7	PASS

B. Test Plots:

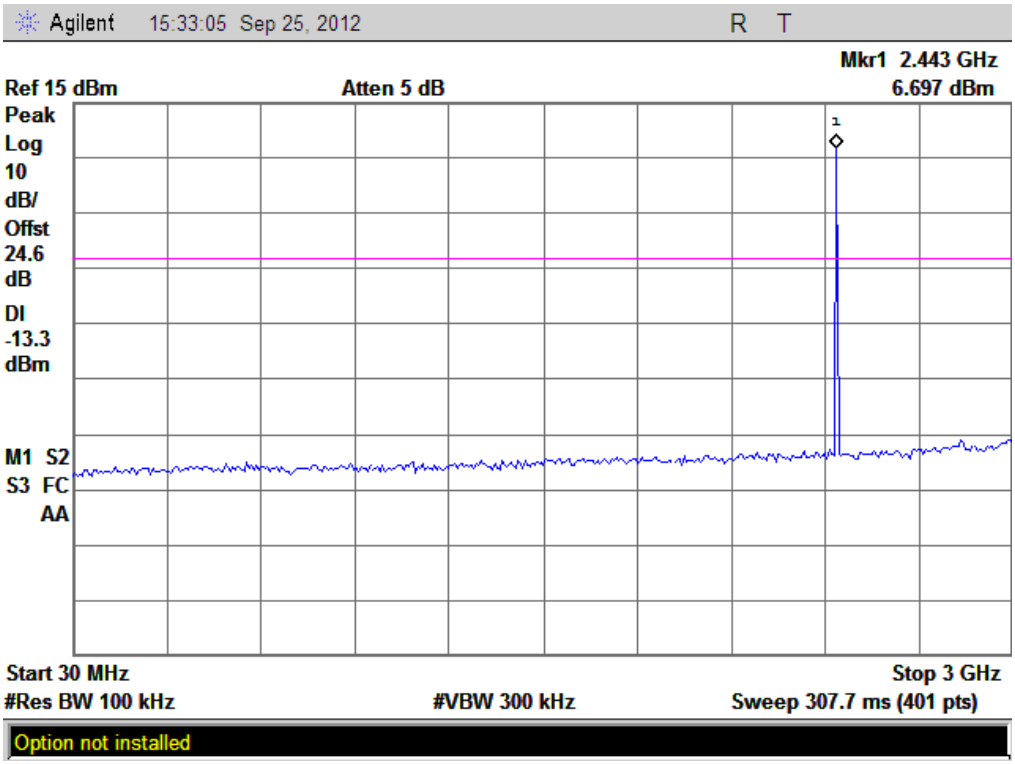
Note: the power of the Module transmitting frequency should be ignored.



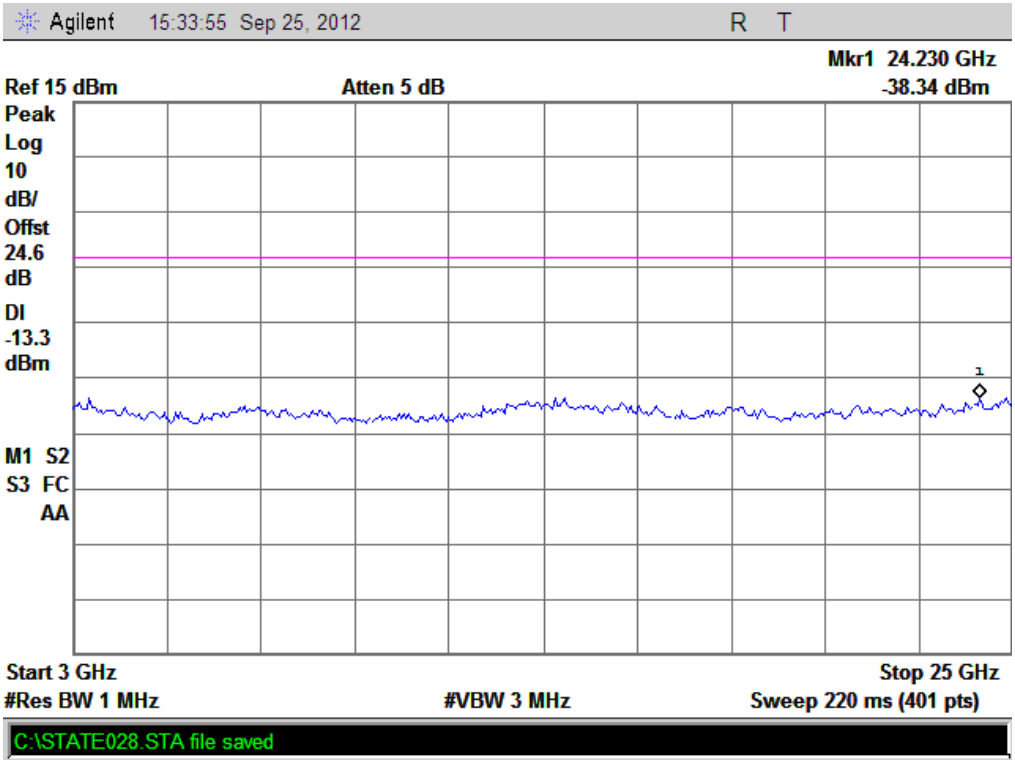
(Plot A.1: Channel = 0, 30MHz to 3GHz @ GFSK Mode)



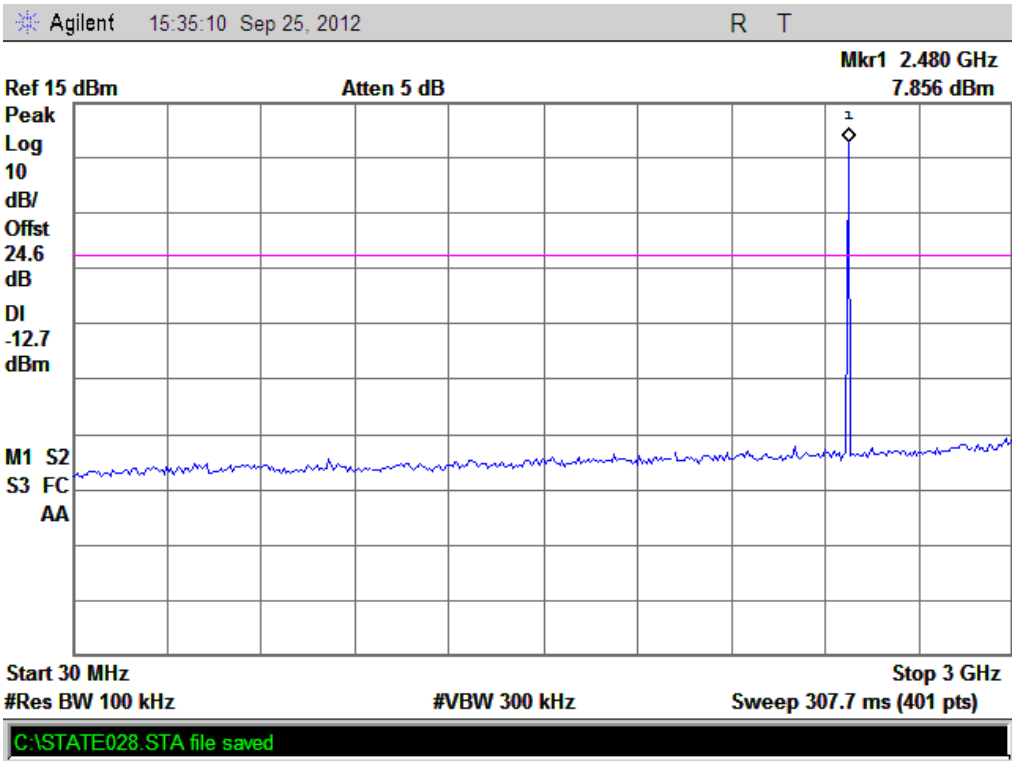
(Plot A.2: Channel = 0, 3GHz to 25GHz @ GFSK Mode)



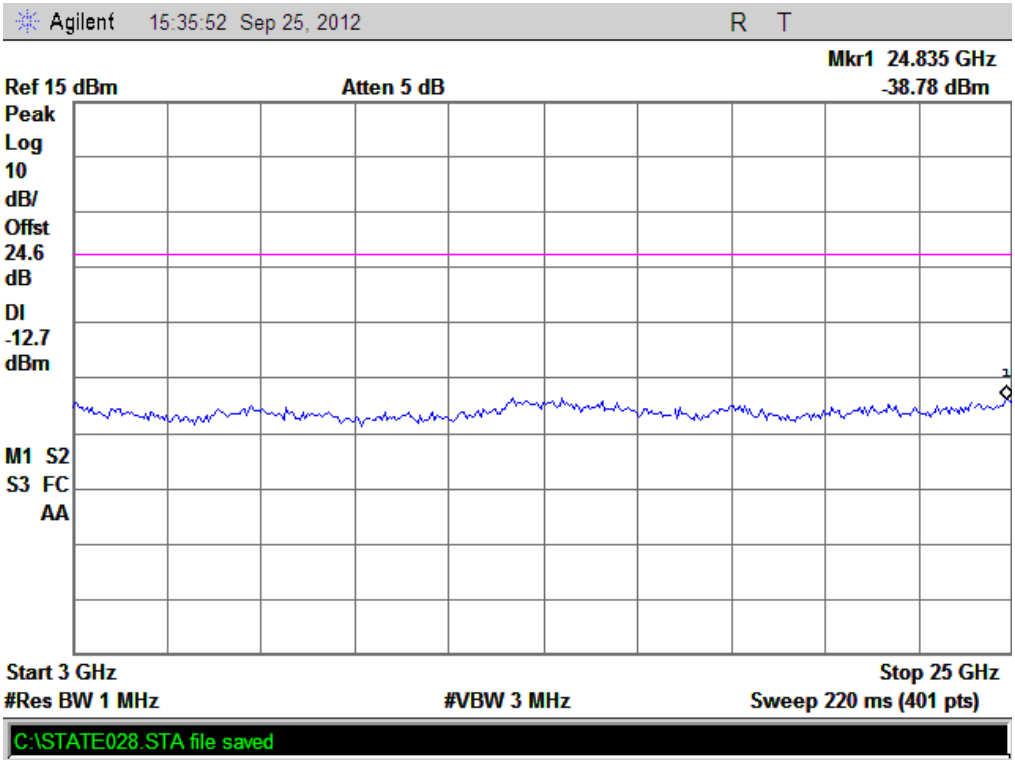
(Plot B.1: Channel = 39, 30MHz to 3GHz @ GFSK Mode)



(Plot B.2: Channel = 39, 3GHz to 25GHz @ GFSK Mode)



(Plot C.1: Channel = 78, 30MHz to 3GHz @ GFSK Mode)



(Plot C.2: Channel = 78, 3GHz to 25GHz @ GFSK Mode)

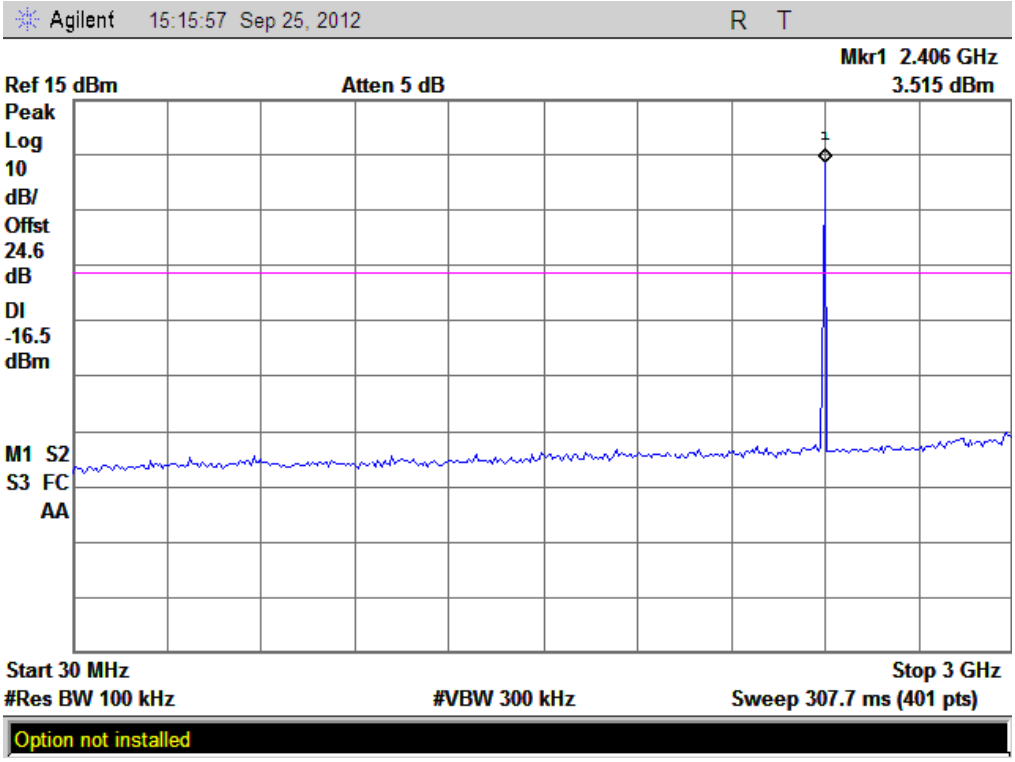
2.6.3.2. π/4-DQPSK Mode

A. Test Verdict:

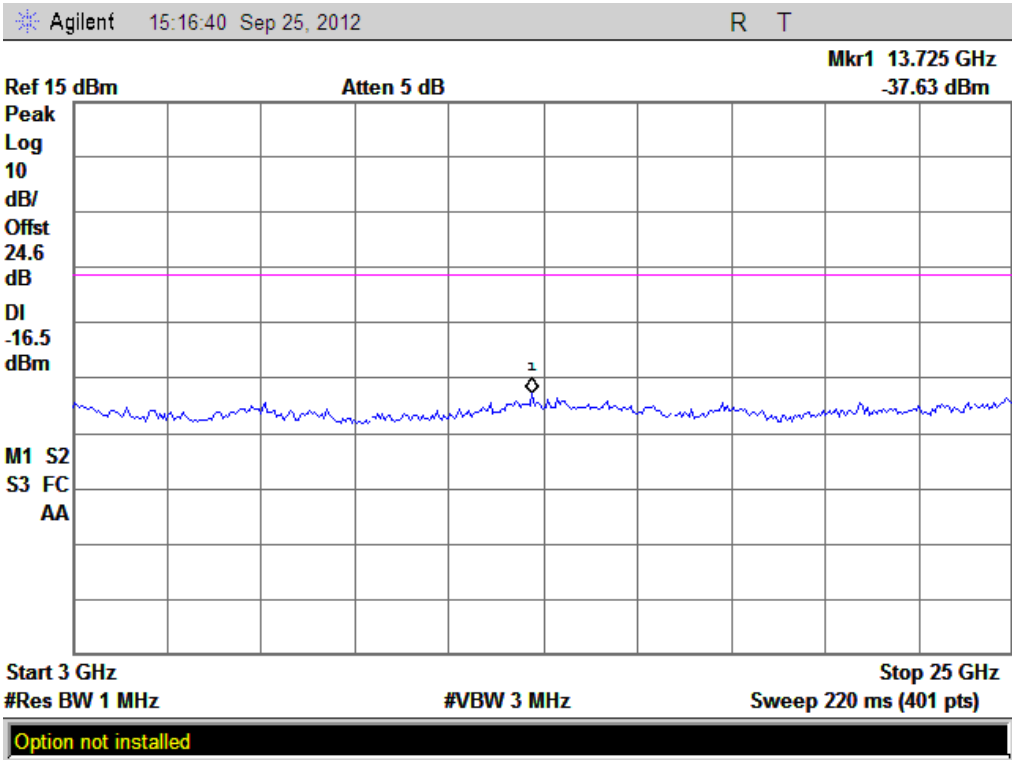
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	< -25	Plot D.1/D.2	3.515	-16.5	PASS
39	2441	< -25	Plot E.1/E.2	4.151	-16.2	PASS
78	2480	< -25	Plot F.1/F.2	4.554	-15.4	PASS

B. Test Plots:

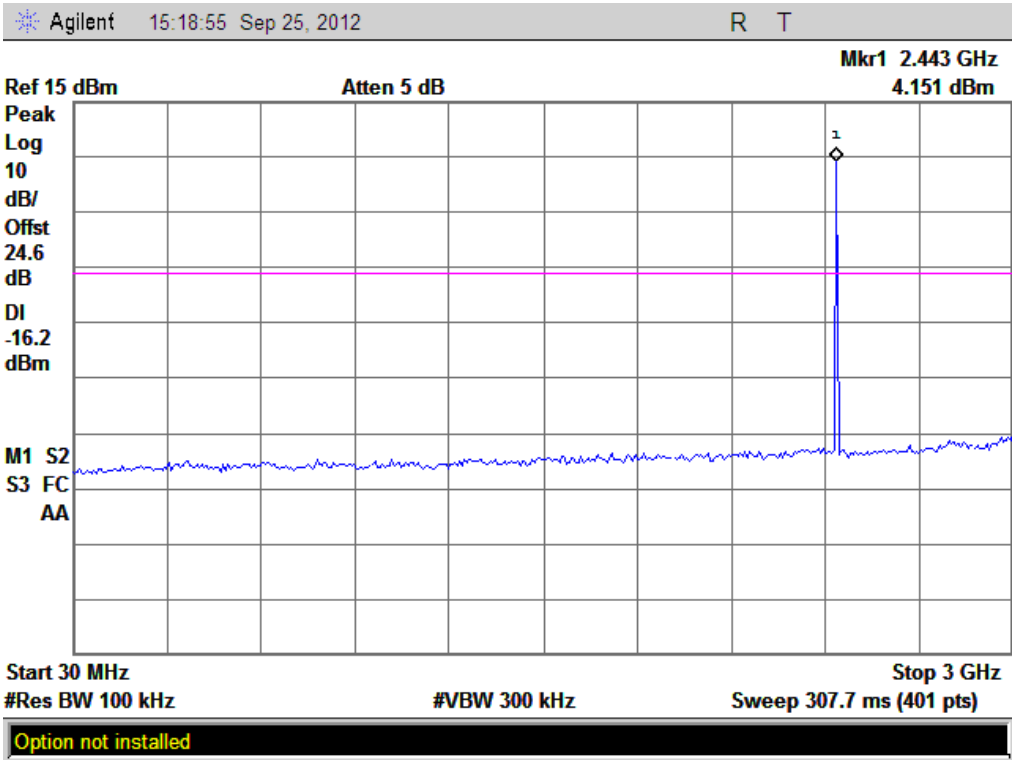
Note: the power of the Module transmitting frequency should be ignored.



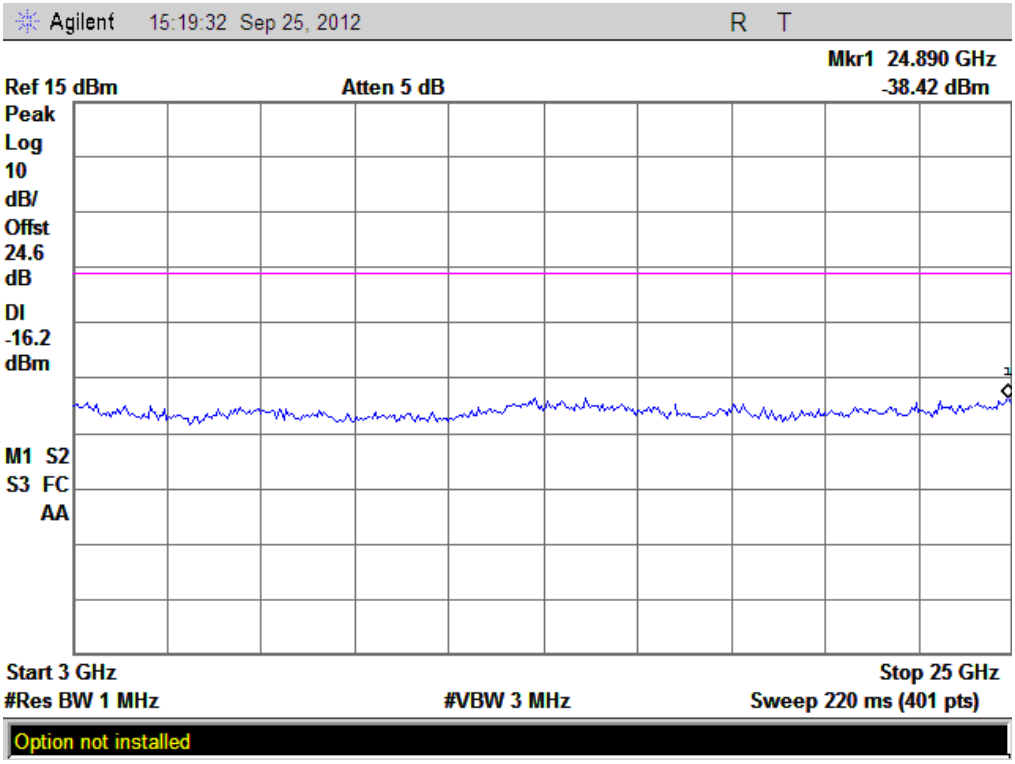
(Plot D.1: Channel = 0, 30MHz to 3GHz @ π/4-DQPSK)



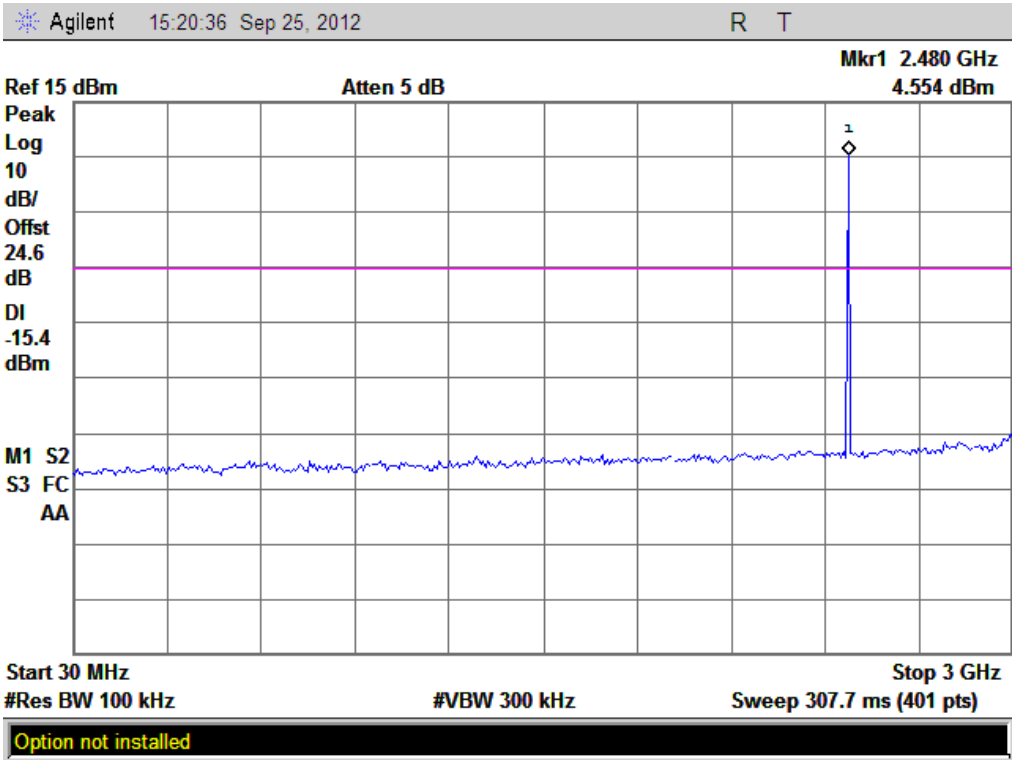
(Plot D.2: Channel = 0, 3GHz to 25GHz @ Π/4-DQPSK)



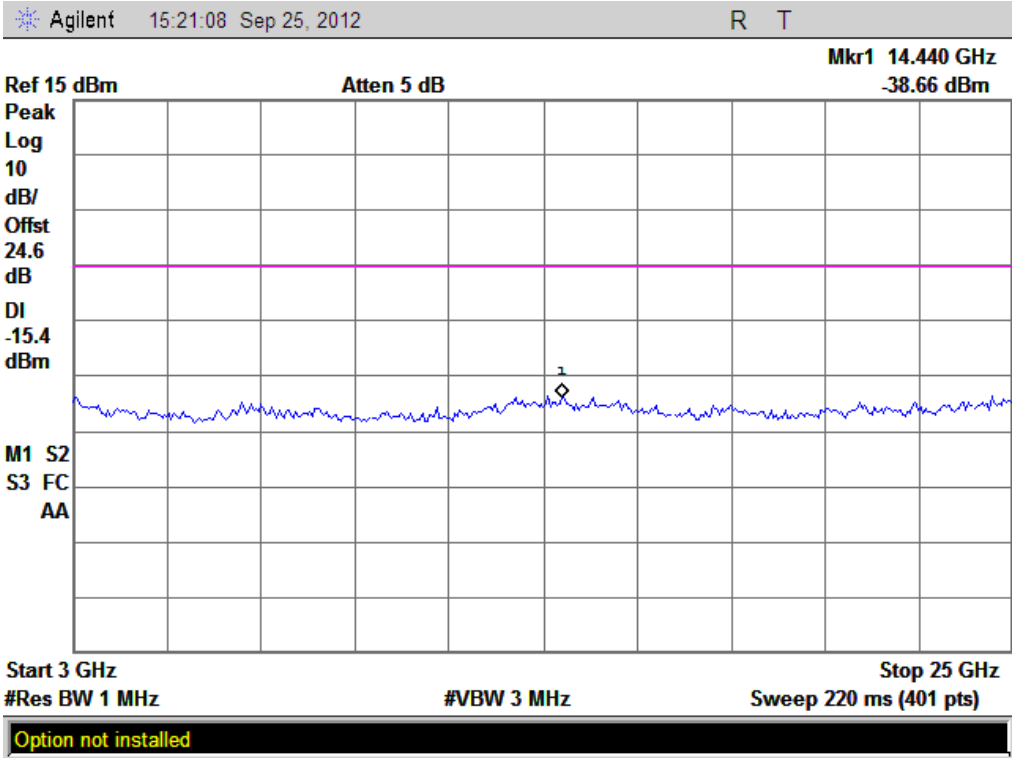
(Plot E.1: Channel = 39, 30MHz to 3GHz @ Π/4-DQPSK)



(Plot E.2: Channel = 39, 3GHz to 25GHz @ Π/4-DQPSK)



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



(Plot F.2: Channel = 78, 3GHz to 25GHz @ Π/4-DQPSK)

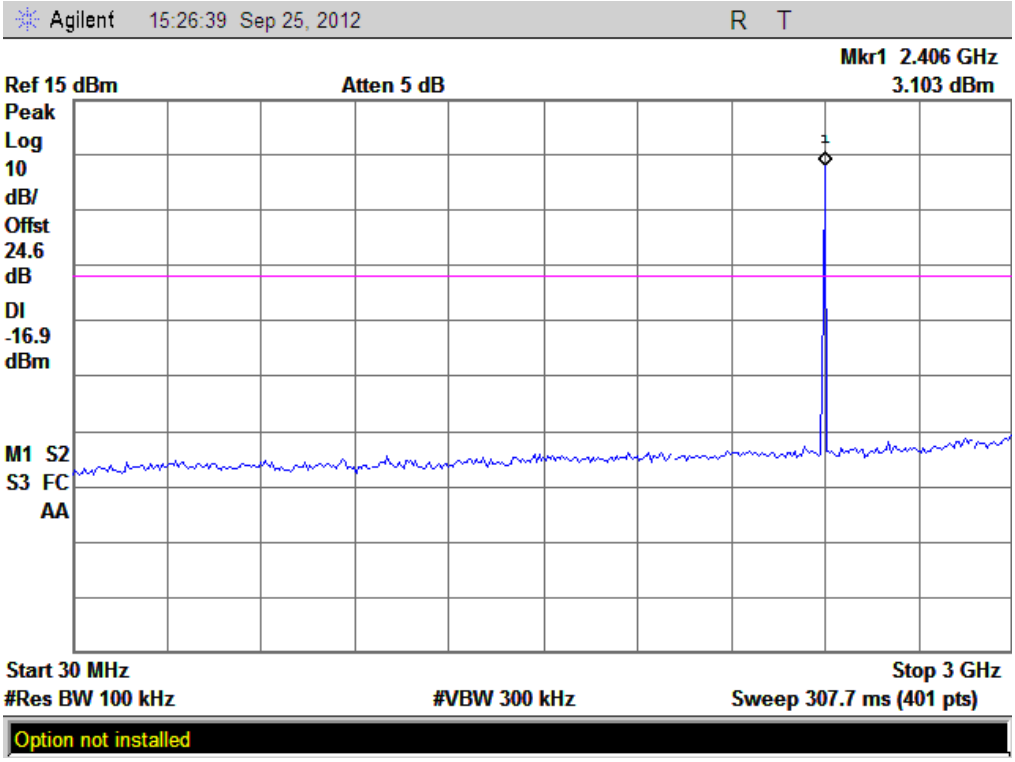
2.6.3.3. 8-DPSK Mode

A. Test Verdict:

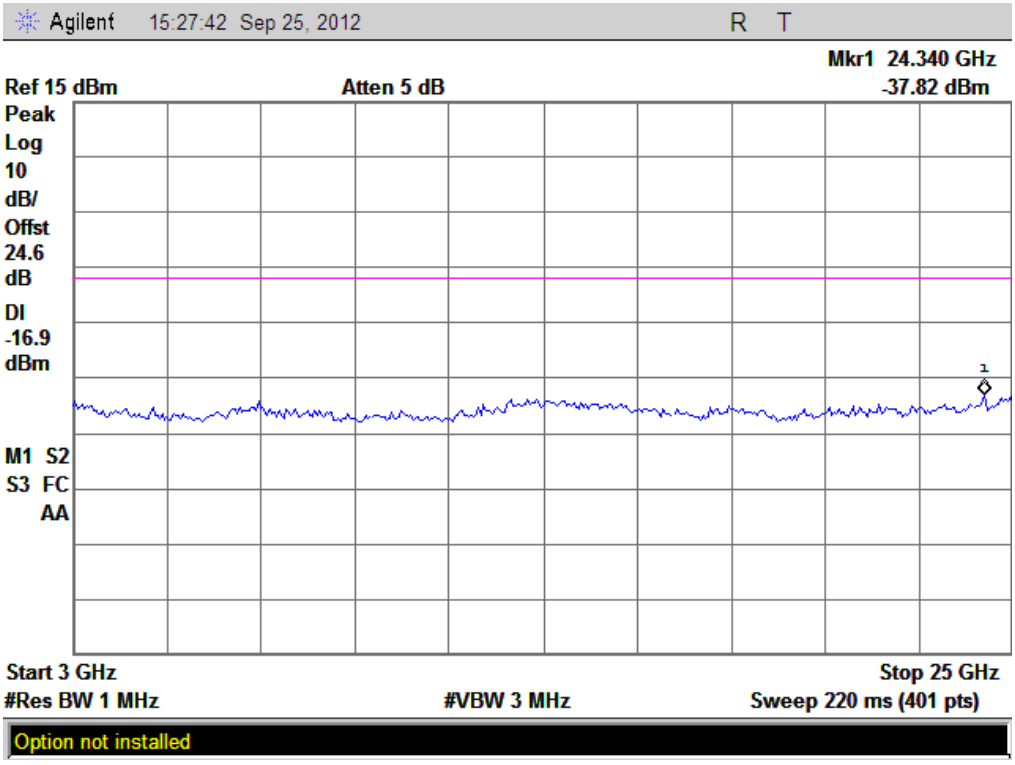
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	< -25	Plot G.1/G.2	3.103	-16.9	PASS
39	2441	< -25	Plot H.1/H.2	3.761	-16.2	PASS
78	2480	< -25	Plot I.1/I.2	4.692	-15.3	PASS

B. Test Plots:

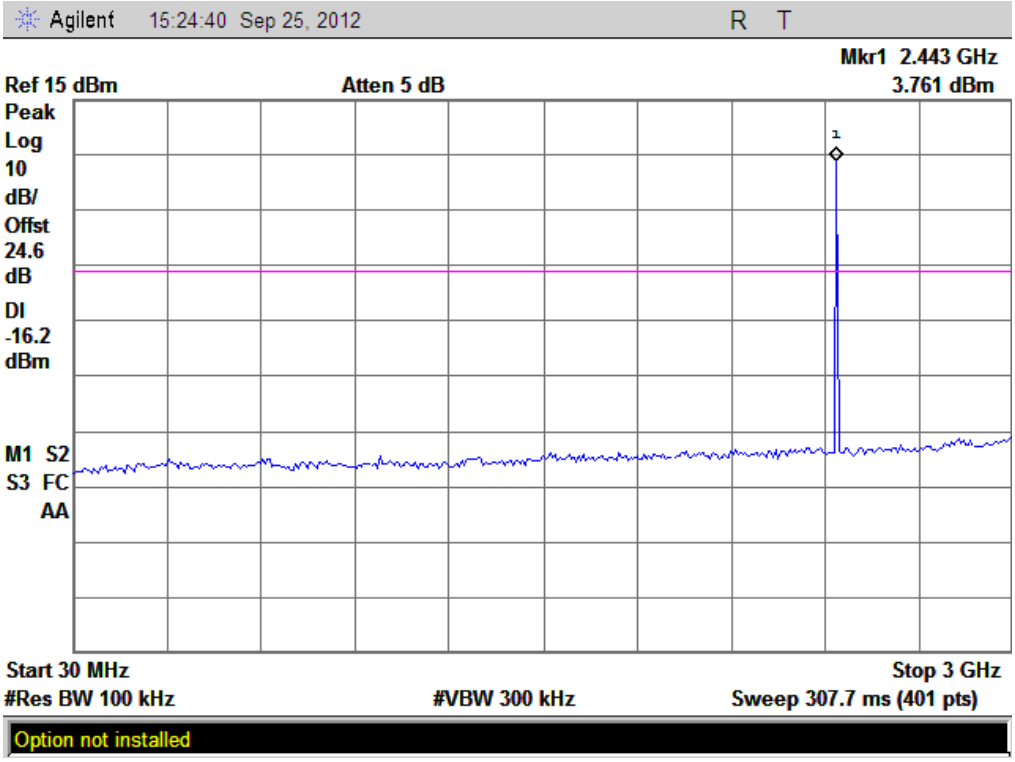
Note: the power of the Module transmitting frequency should be ignored.



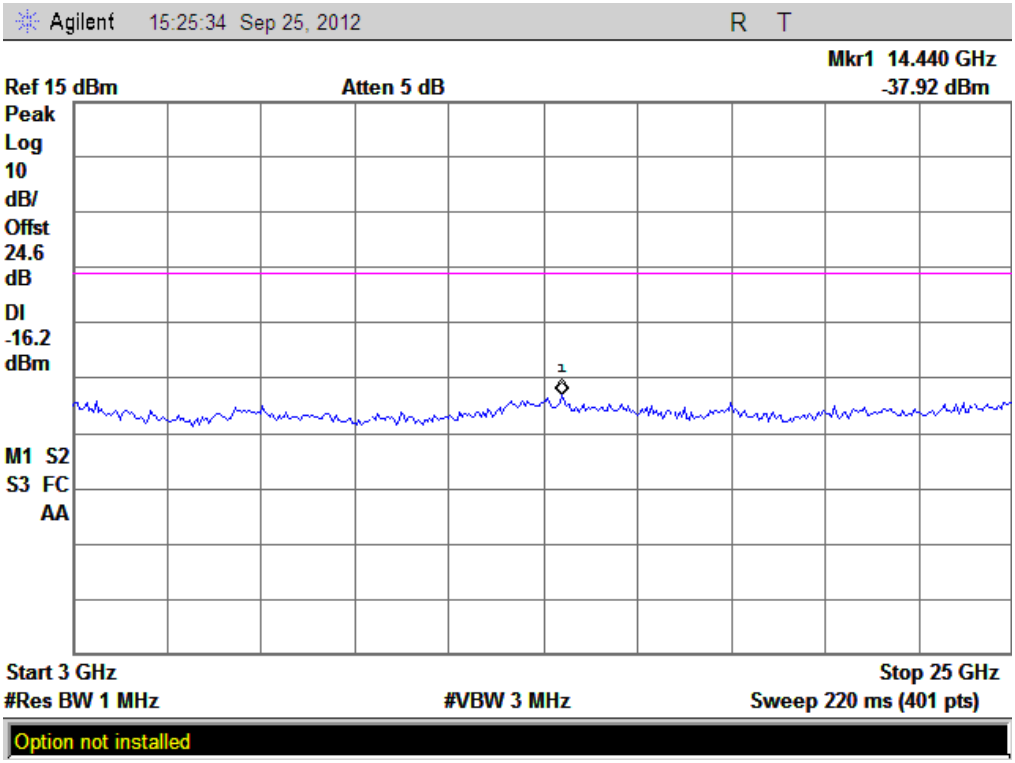
(Plot G.1: Channel = 0, 30MHz to 3GHz @ 8-DPSK)



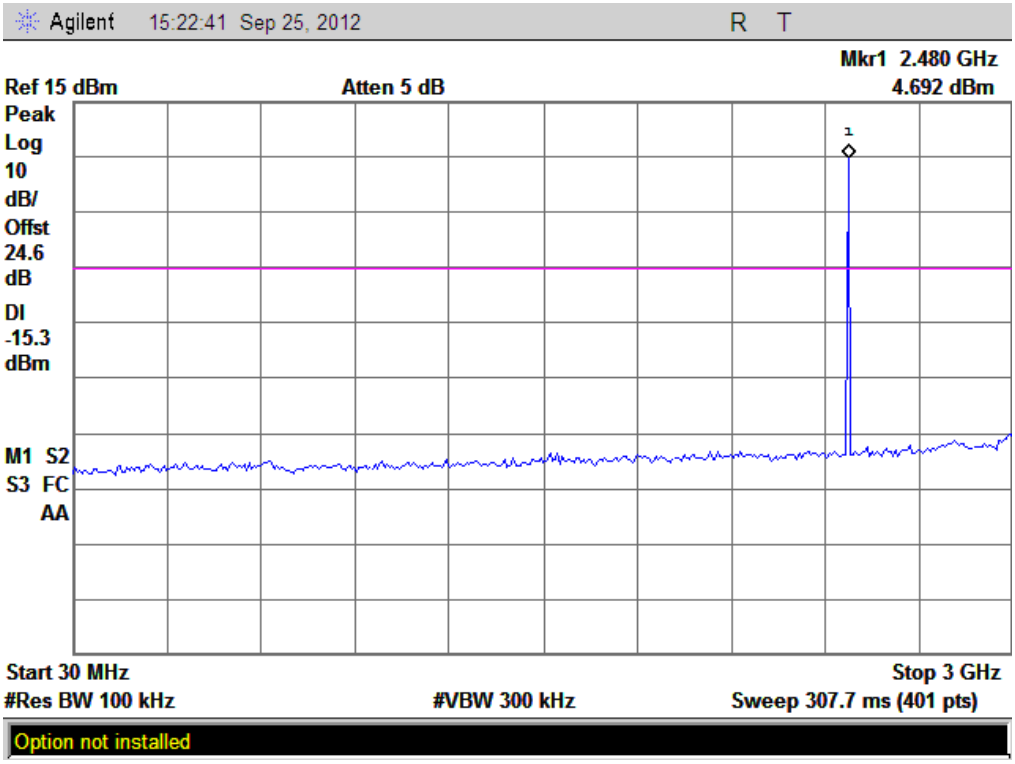
(Plot G.2: Channel = 0, 3GHz to 25GHz @ 8-DPSK)



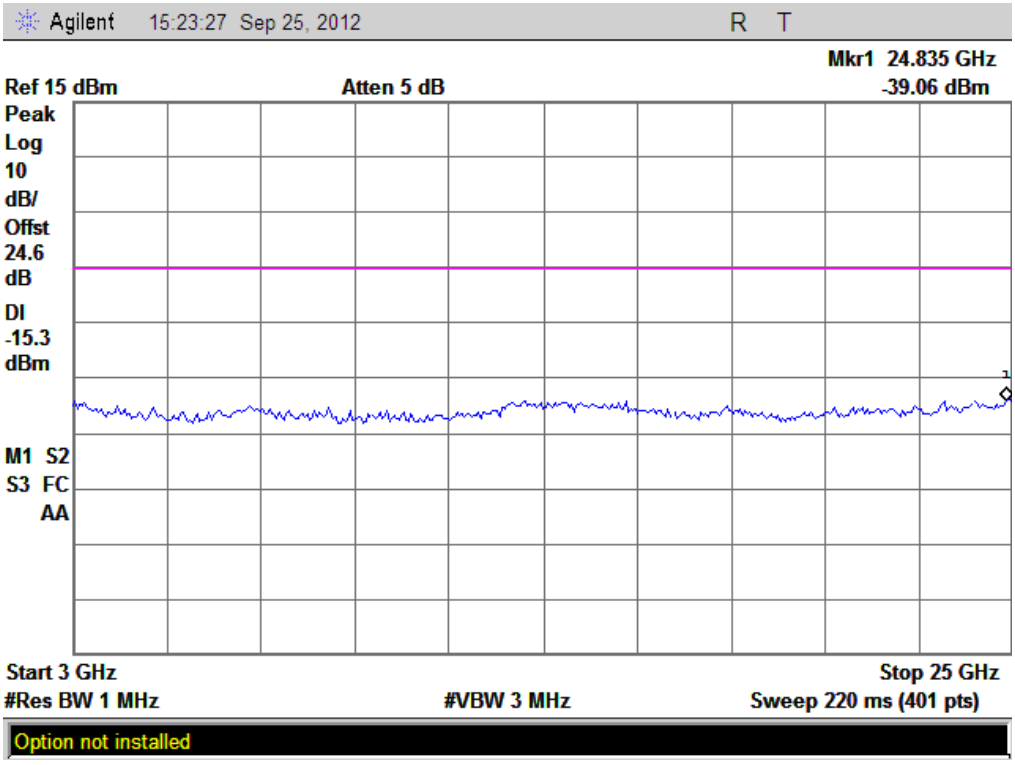
(Plot H.1: Channel = 39, 30MHz to 3GHz @ 8-DPSK)



(Plot H.2: Channel = 39, 3GHz to 25GHz @ 8-DPSK)



(Plot I.1: Channel = 78, 30MHz to 3GHz @ 8-DPSK)



(Plot I.2: Channel = 78, 3GHz to 25GHz @ 8-DPSK)

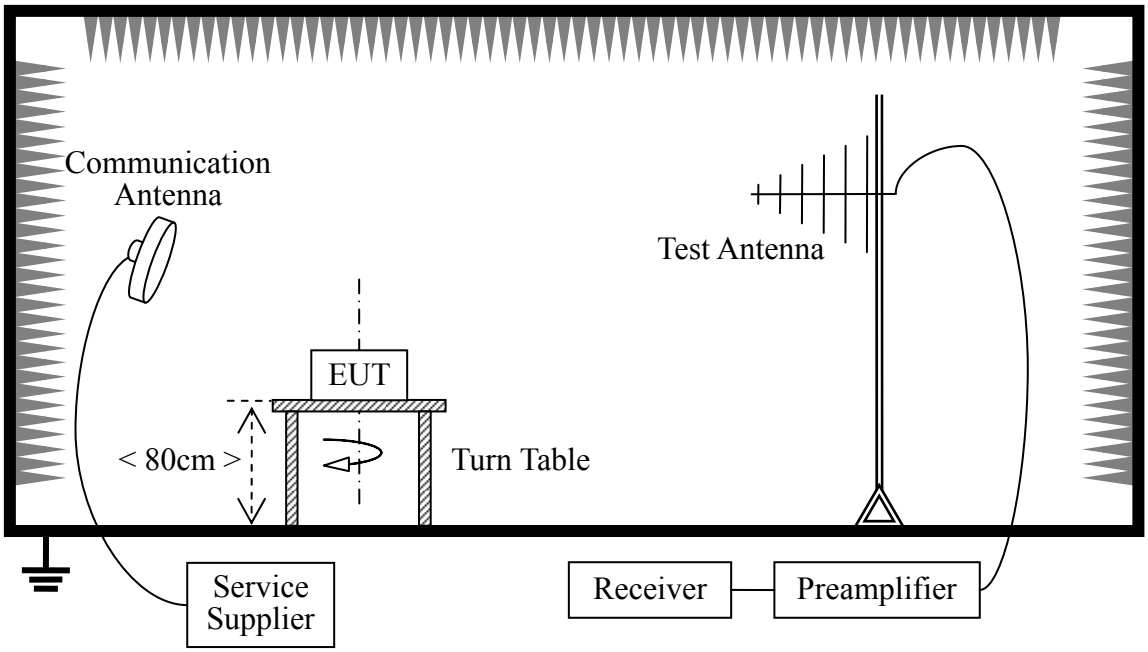
2.7. Band Edge

2.7.1. Requirement

According to FCC section 15.247(c), 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 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	2014.05

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

2.7.3. 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 [dBμV/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

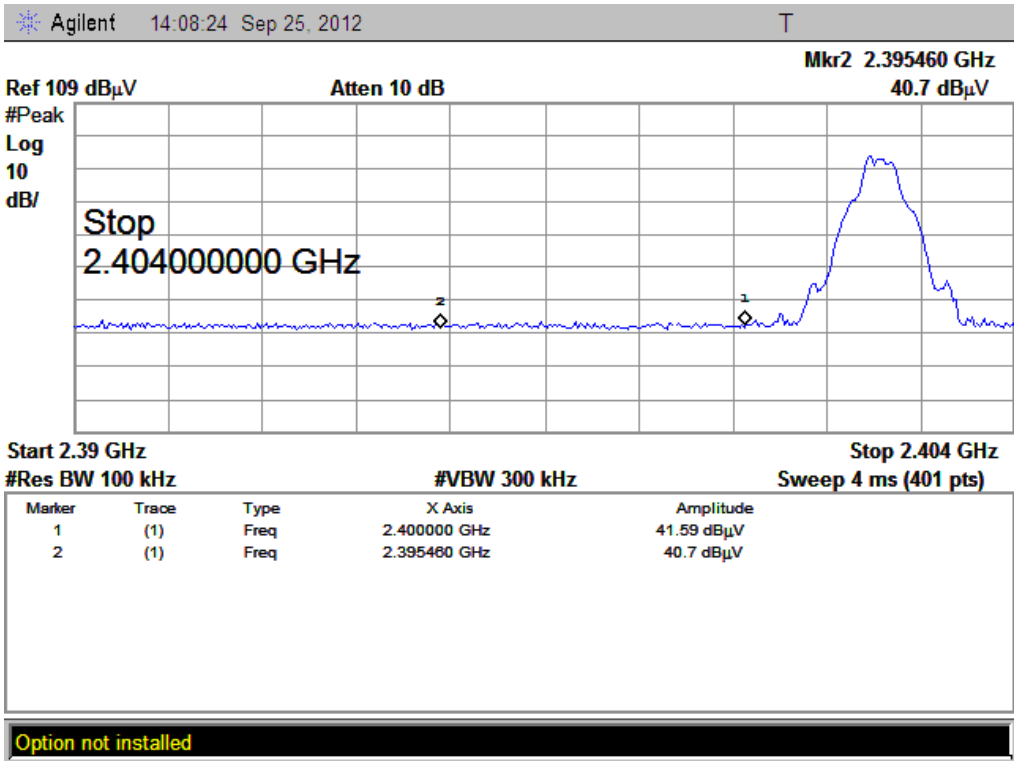
2.7.3.1. GFSK Mode

A. Test Verdict:

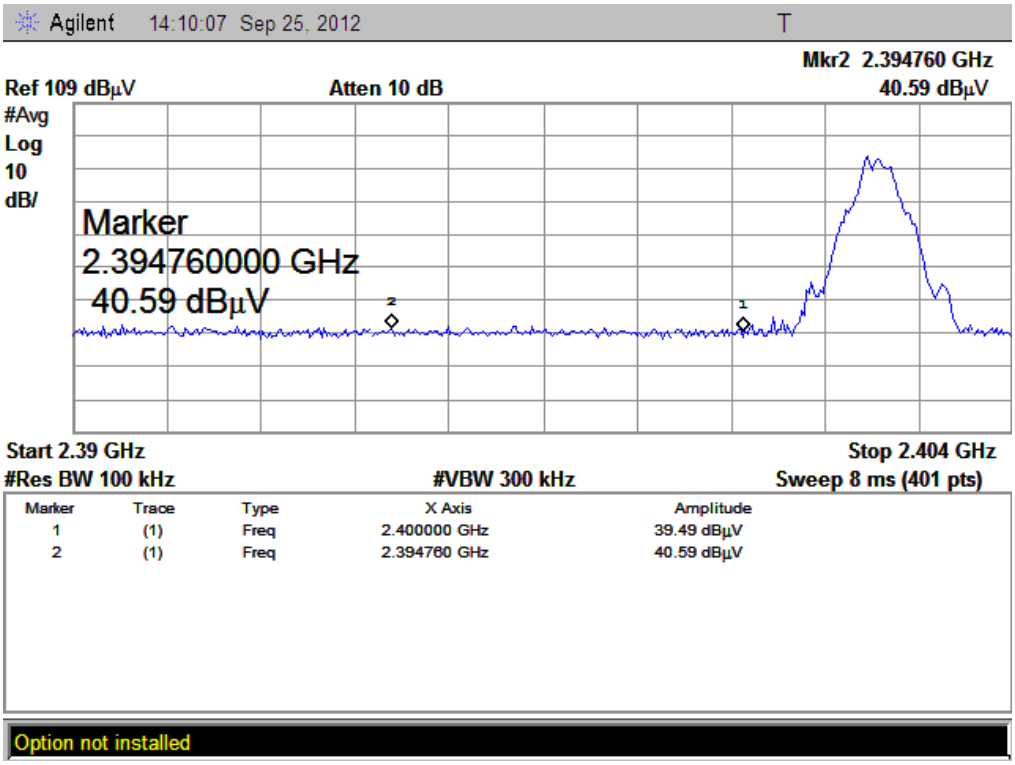
(Un-hopping)

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBμV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
0	2395.46	PK	40.7	-30.93	32.56	42.33	74	Pass
0	2394.76	AV	40.59	-30.93	32.56	42.22	54	Pass
78	2486.25	PK	42.24	-29.05	32.50	45.69	74	Pass
78	2489.99	AV	40.45	-29.05	32.50	43.90	54	Pass

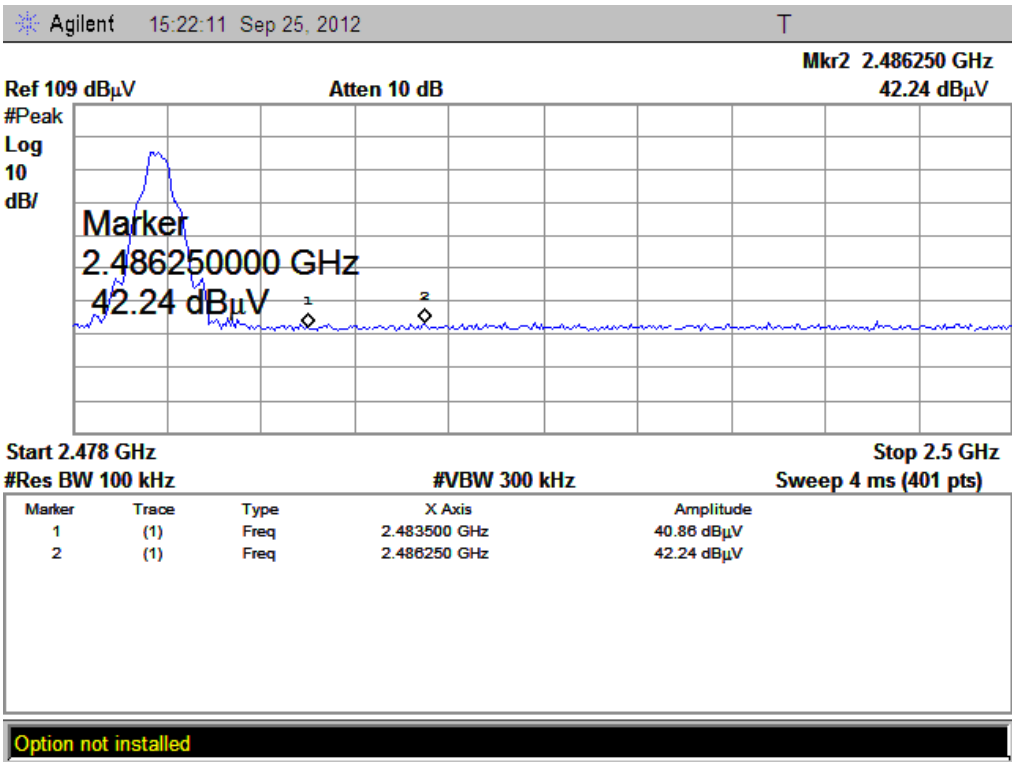
B. Test Plots:



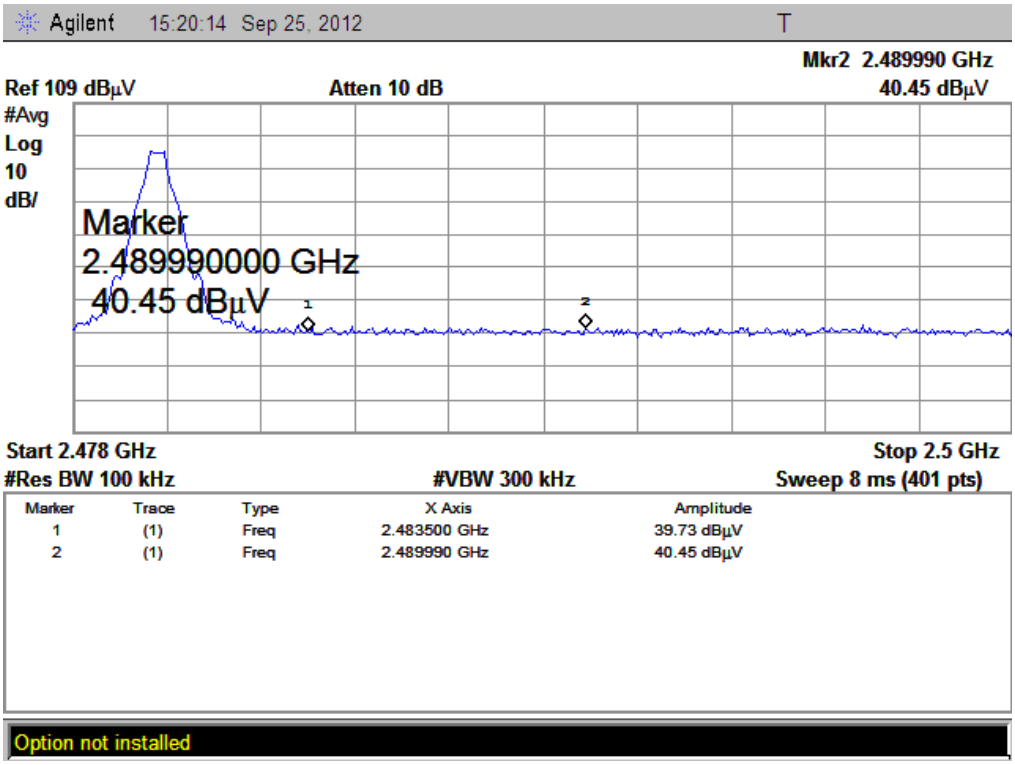
(Plot A1: Channel = 0 PEAK @ GFSK)



(Plot A2: Channel = 0 AVERAGE @ GFSK)



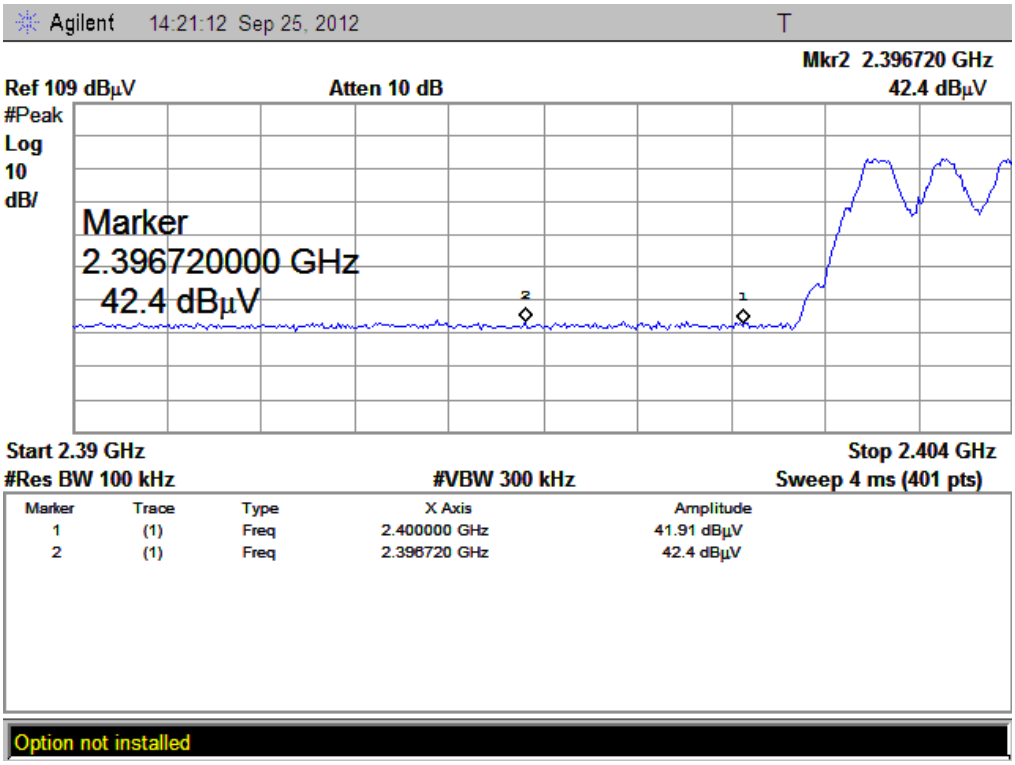
(Plot B1: Channel = 78 PEAK @ GFSK)



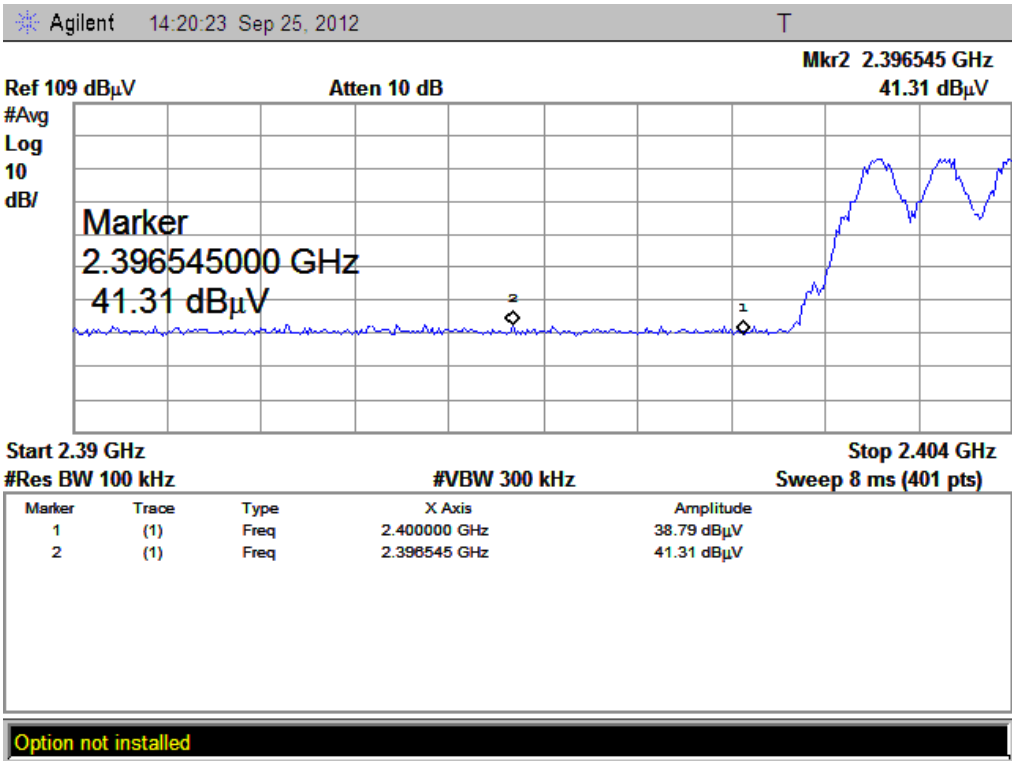
(Plot B2: Channel = 78 AVERAGE @ GFSK)

(Hopping)

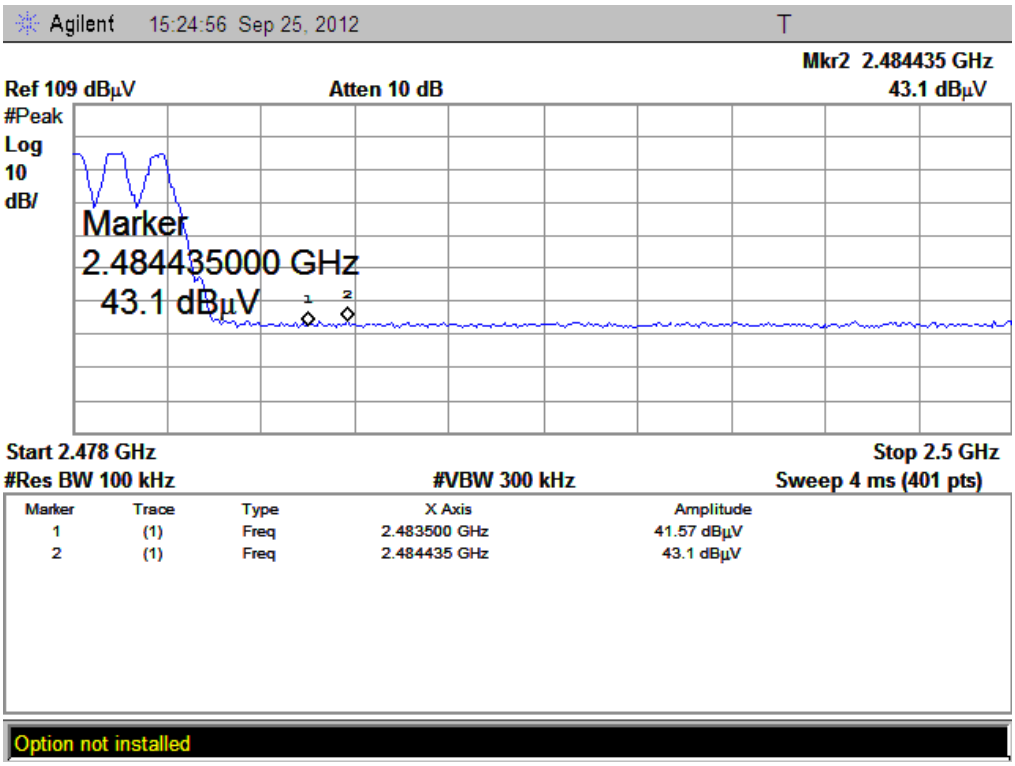
Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBμV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
0	2396.72	PK	42.4	-30.93	32.56	44.03	74	Pass
0	2396.55	AV	41.31	-30.93	32.56	42.94	54	Pass
78	2484.44	PK	43.1	-29.05	32.50	46.55	74	Pass
78	2487.35	AV	40.45	-29.05	32.50	43.9	54	Pass



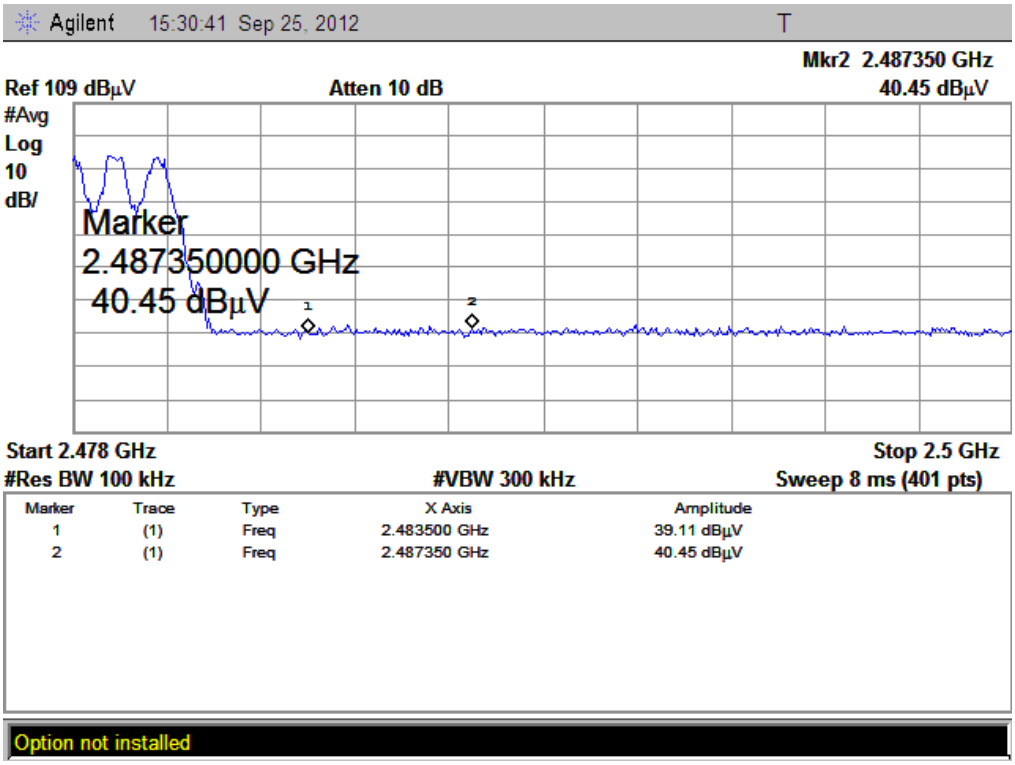
(Plot A1-1: Channel = 0 PEAK)



(Plot A2-1: Channel = 0 AVERAGE)



(Plot B1-1: Channel = 78 PEAK)



(Plot B2-1: Channel = 78 AVERAGE)

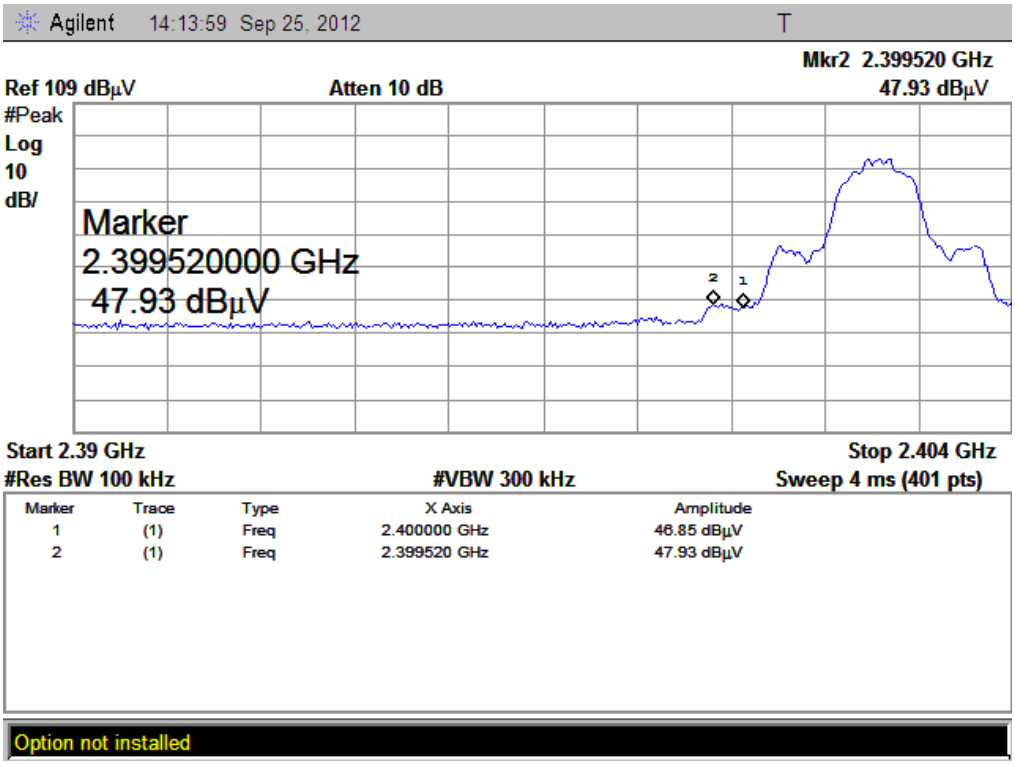
2.7.3.2. ∏/4-DQPSK Mode

A. Test Verdict:

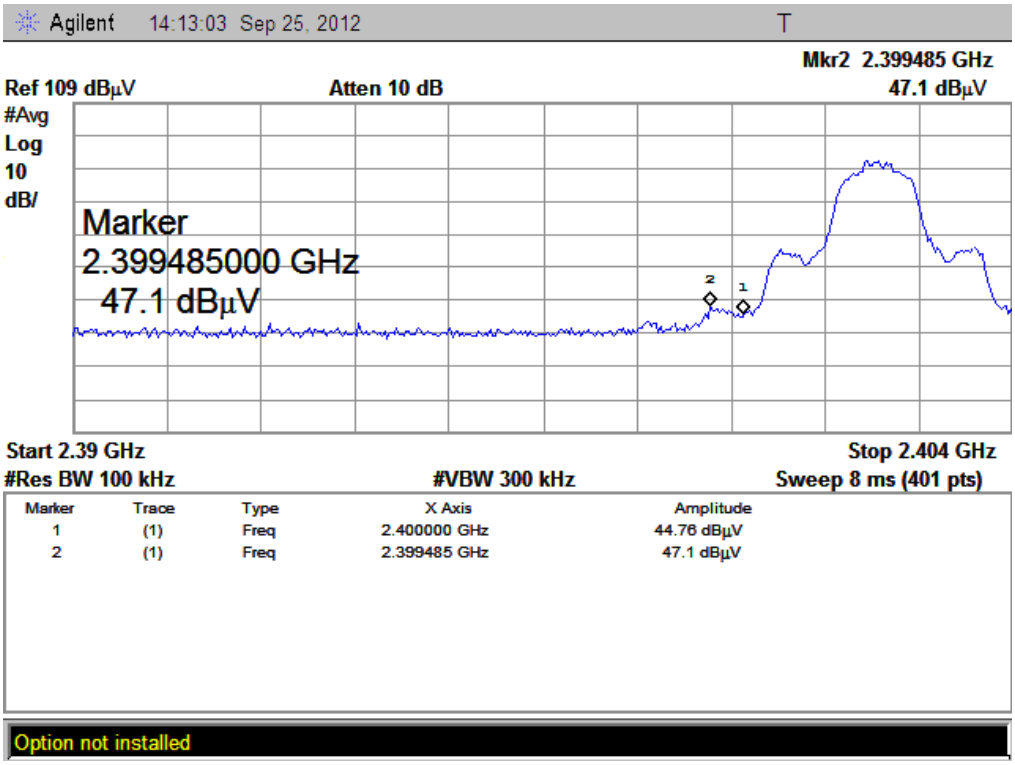
(Un-hopping)

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBμV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
0	2399.52	PK	47.93	-30.93	32.56	49.56	74	Pass
0	2399.49	AV	47.1	-30.93	32.56	48.73	54	Pass
78	2488.84	PK	41.91	-29.05	32.50	45.36	74	Pass
78	2490.49	AV	40.1	-29.05	32.50	43.55	54	Pass

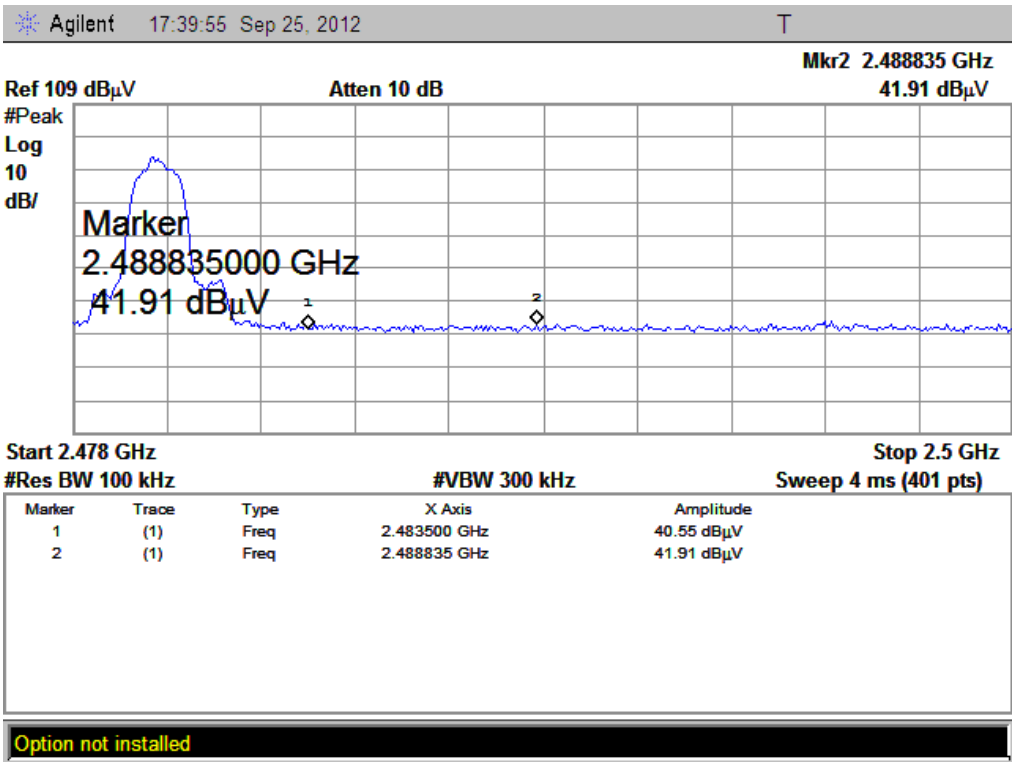
B. Test Plots:



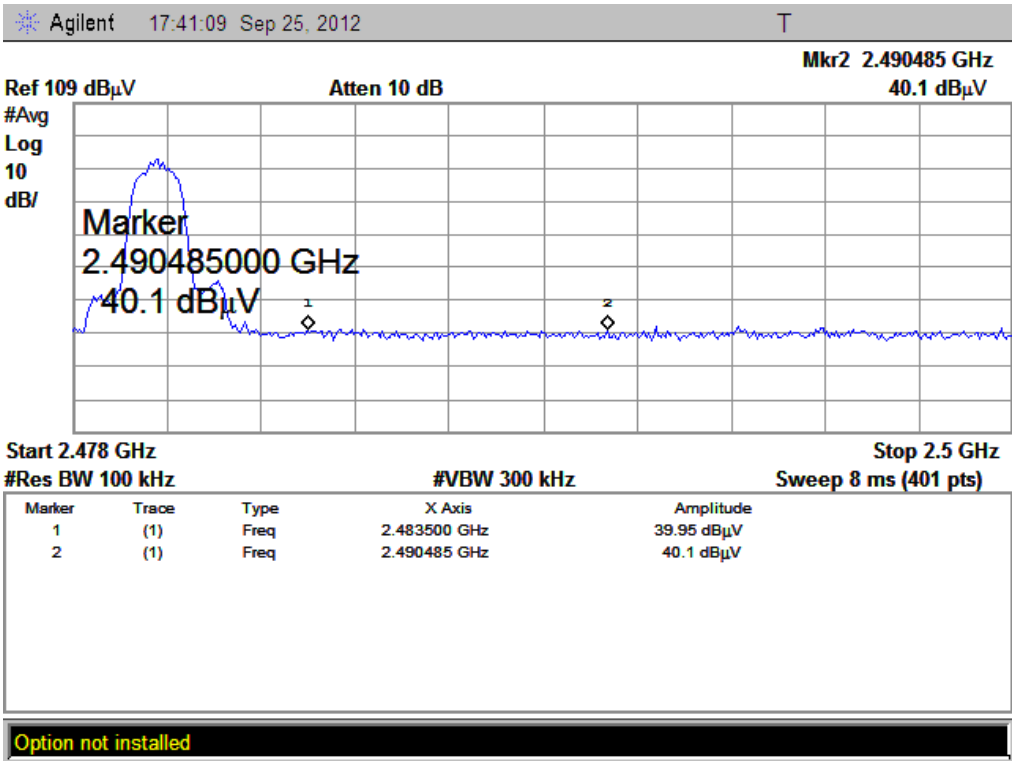
(Plot C1: Channel = 0 PEAK @ ∏/4-DQPSK)



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



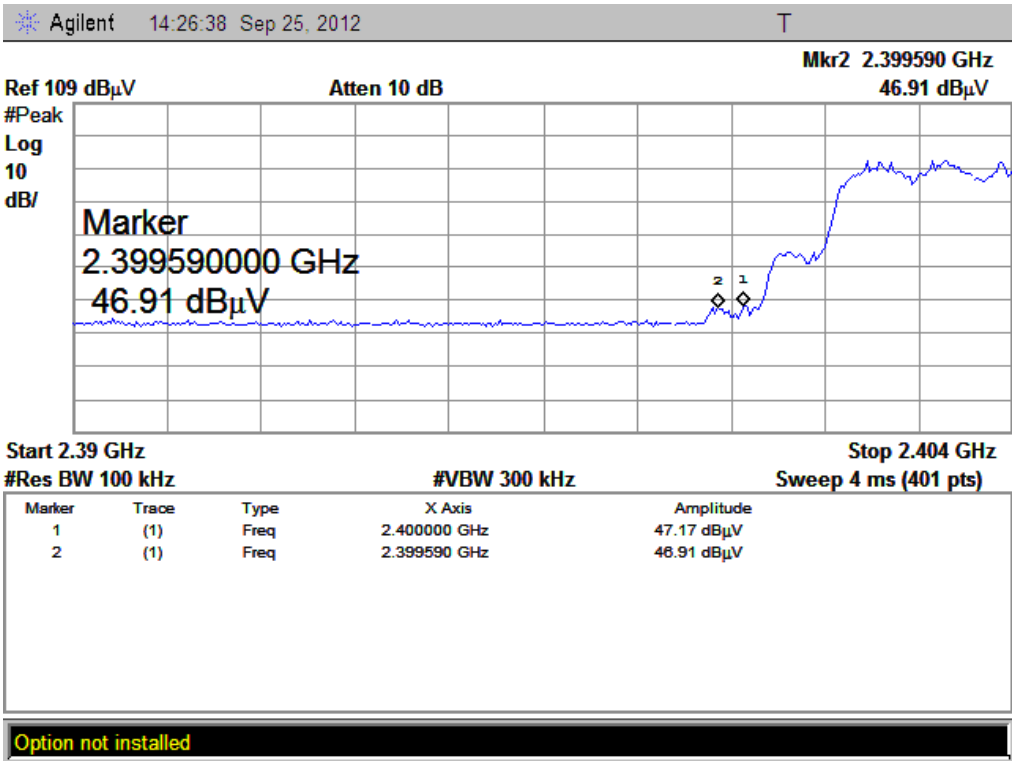
(Plot D1: Channel = 78 PEAK @ Π/4-DQPSK)



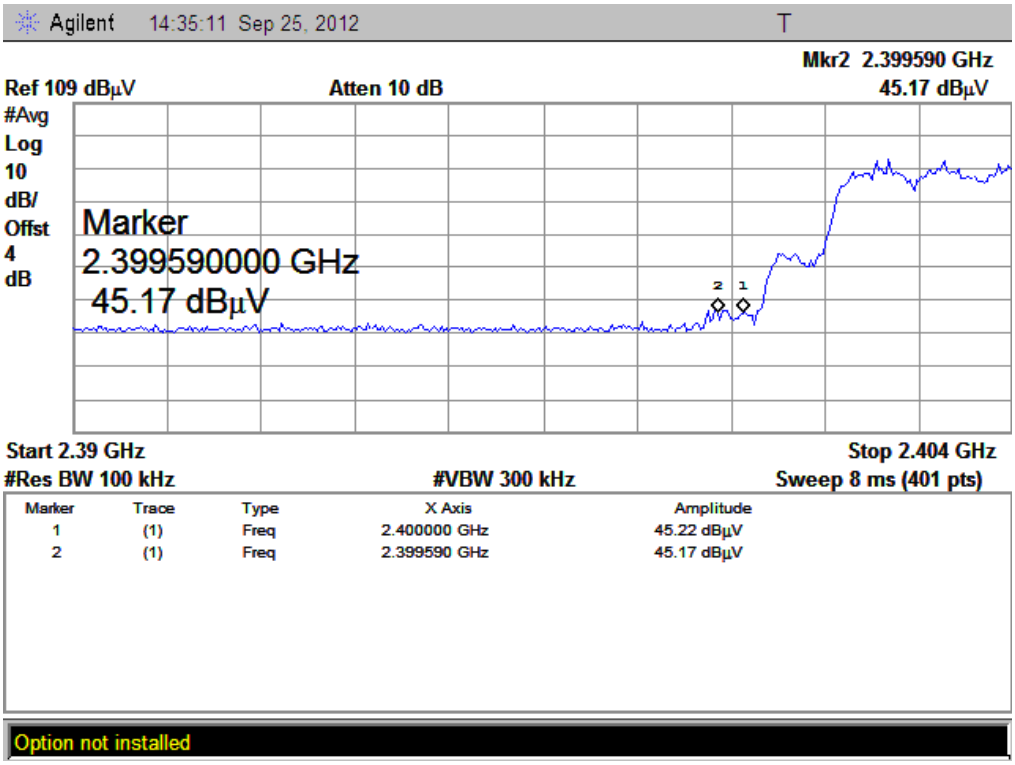
(Plot D2: Channel = 78 AVERAGE @ Π/4-DQPSK)

(Hopping)

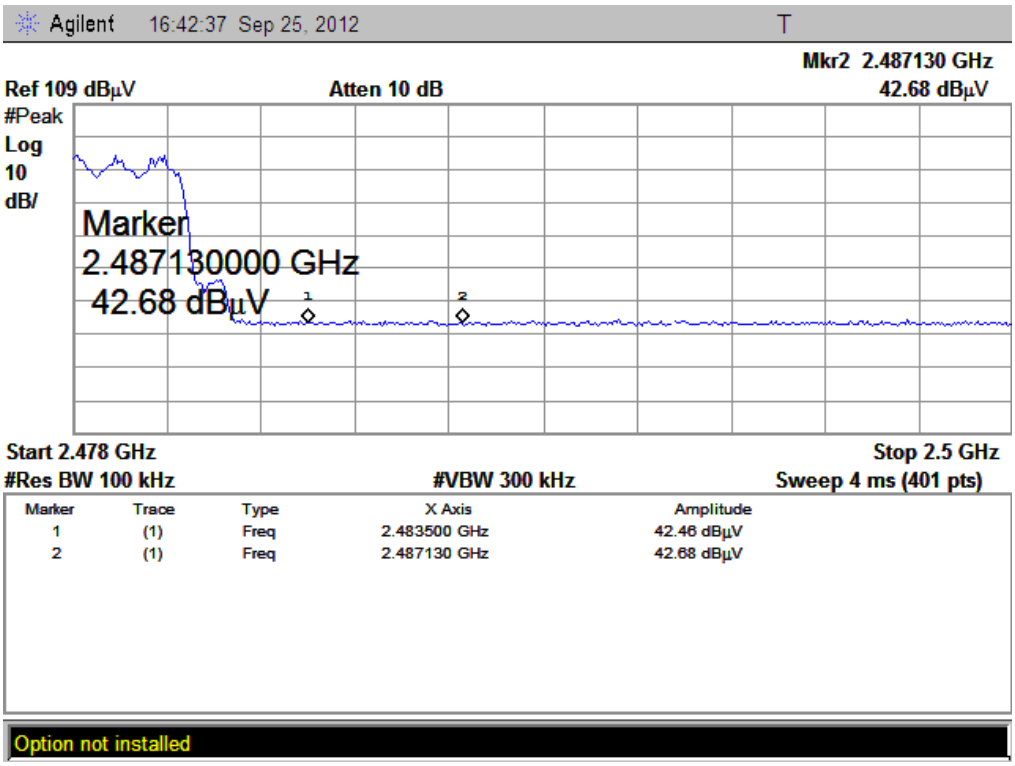
Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBμV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
0	2399.59	PK	46.91	-30.93	32.56	48.54	74	Pass
0	2399.59	AV	45.17	-30.93	32.56	46.8	54	Pass
78	2487.13	PK	42.68	-29.05	32.50	46.13	74	Pass
78	2487.35	AV	40.76	-29.05	32.50	44.21	54	Pass



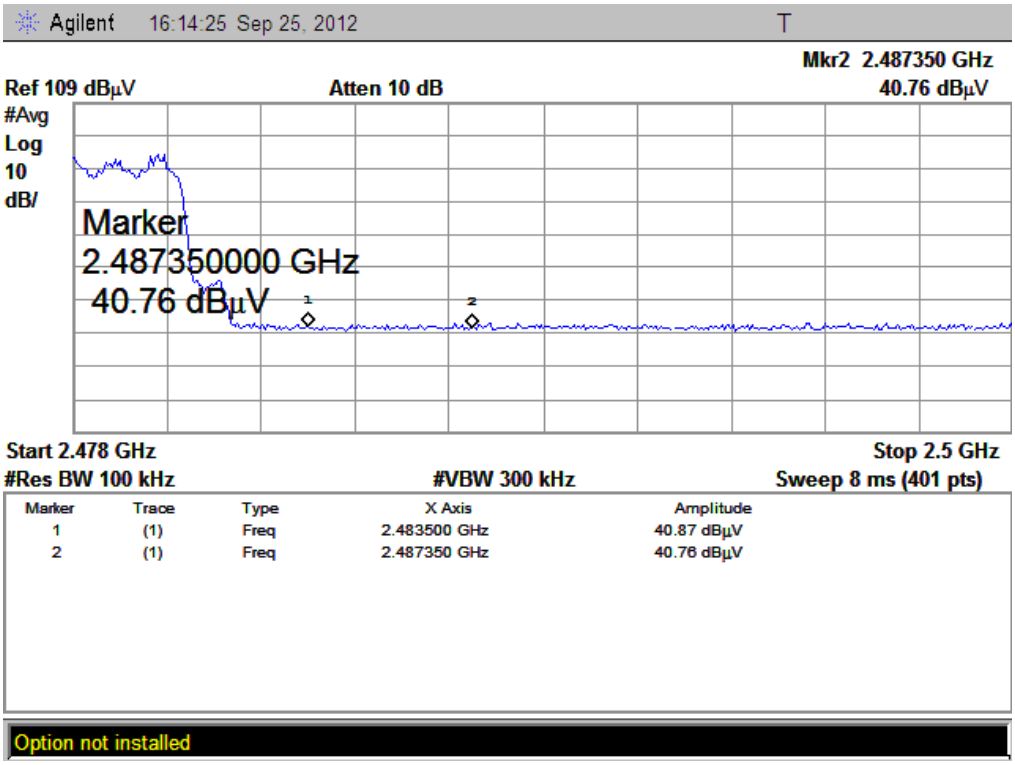
(Plot A1-1: Channel = 0 PEAK)



(Plot A2-1: Channel = 0 AVERAGE)



(Plot B1-1: Channel = 78 PEAK)



(Plot B2-1: Channel = 78 AVERAGE)

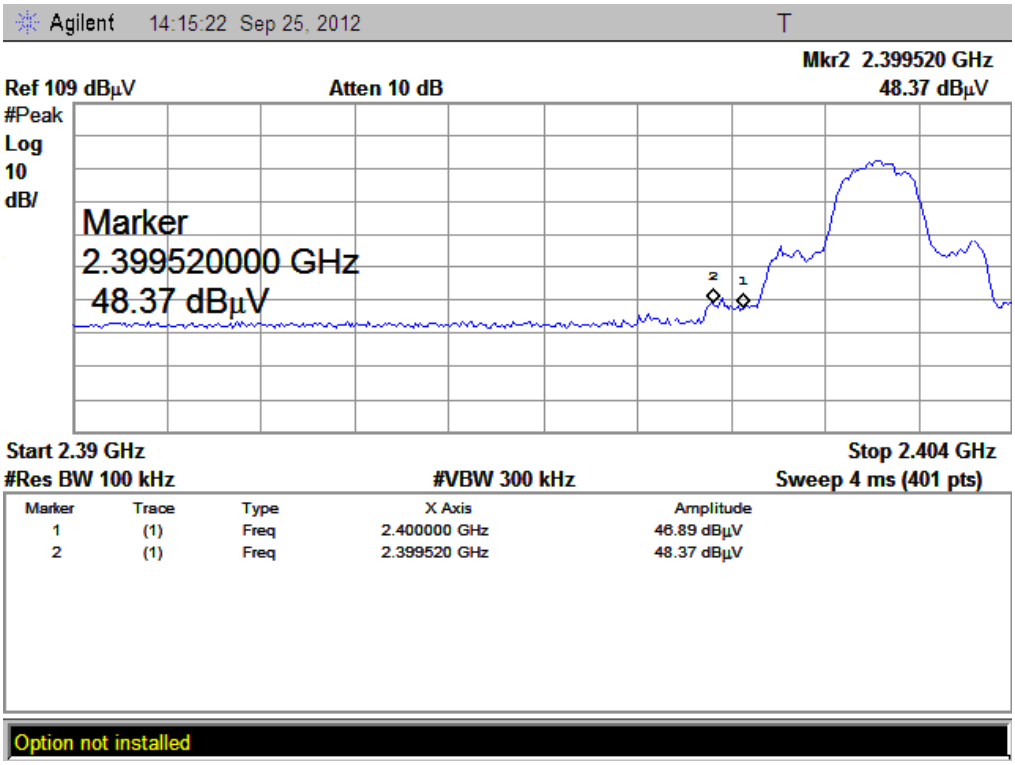
2.7.3.3. 8-DPSK Mode

A. Test Verdict:

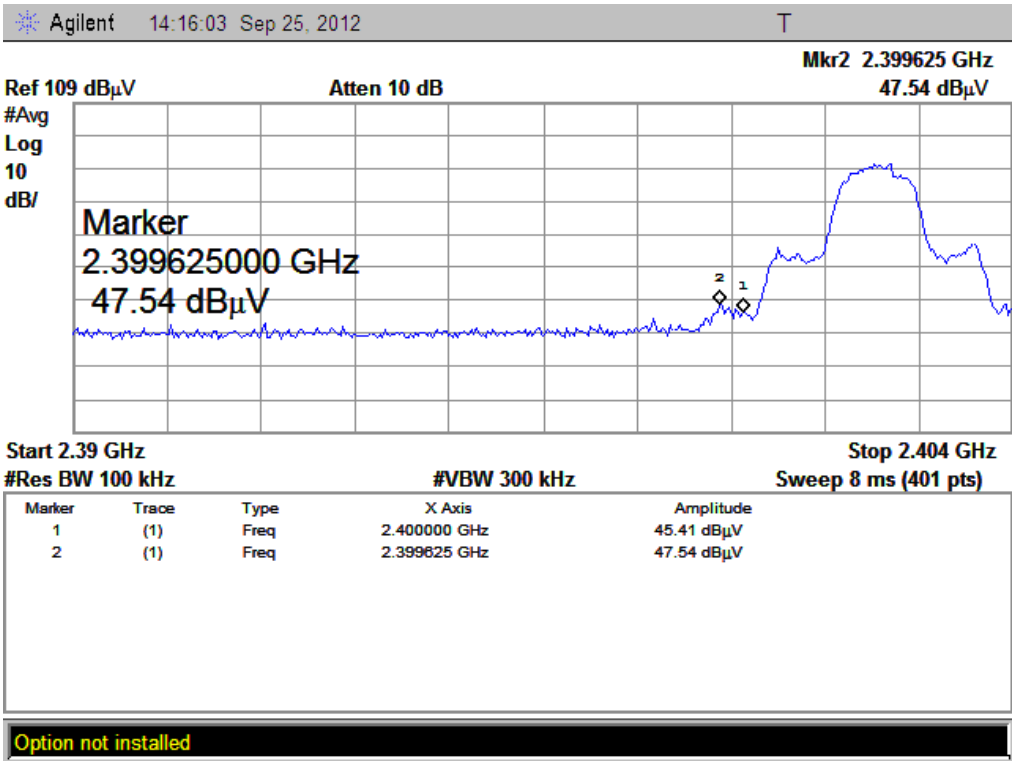
(Un-hopping)

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBμV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
0	2399.52	PK	48.37	-30.93	32.56	50	74	Pass
0	2399.63	AV	47.54	-30.93	32.56	49.17	54	Pass
78	2487.13	PK	42.05	-29.05	32.50	45.5	74	Pass
78	2487.08	AV	41	-29.05	32.50	44.45	54	Pass

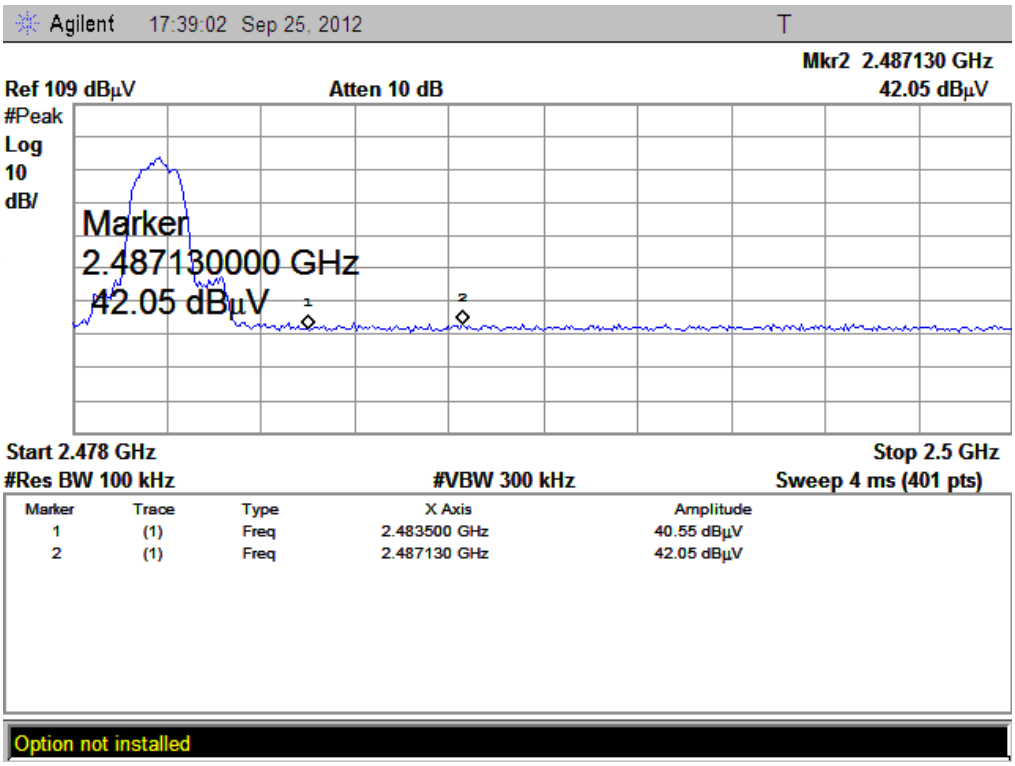
B. Test Plots:



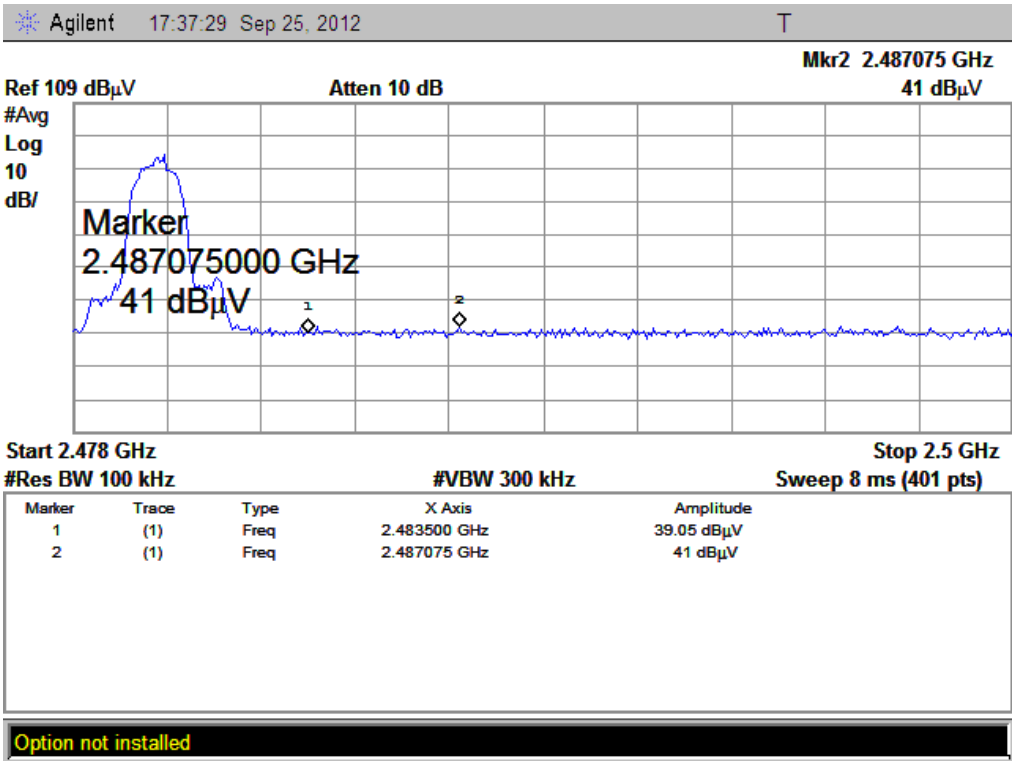
(Plot E1: Channel = 0 PEAK @ 8-DPSK Mode)



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



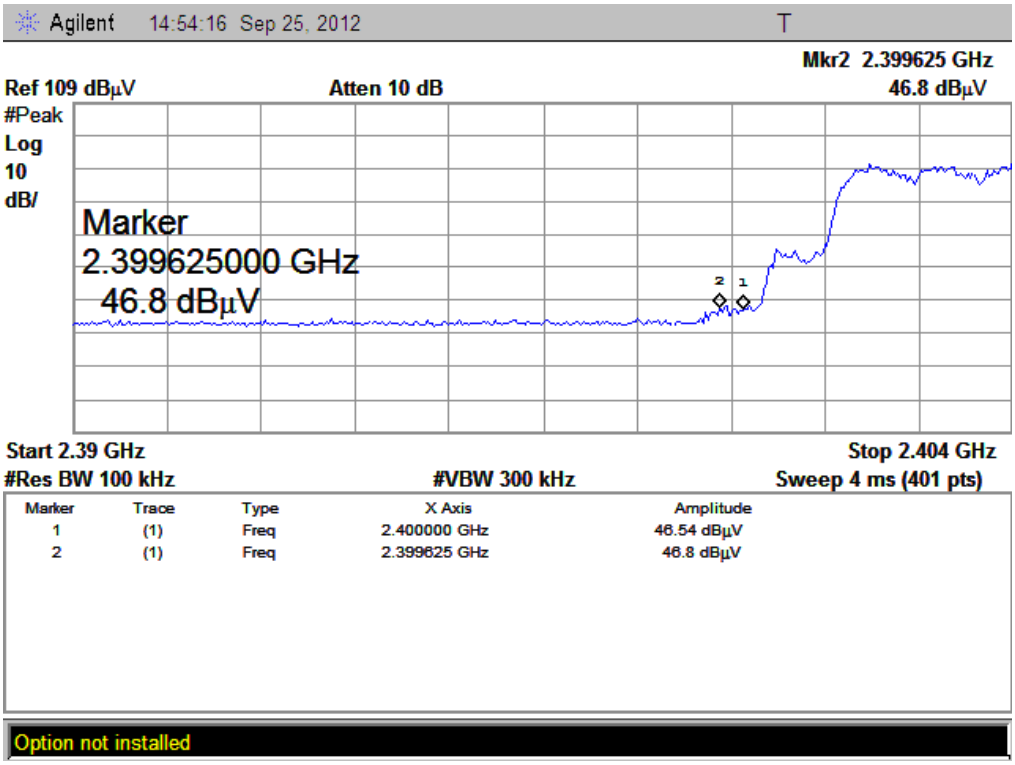
(Plot F1: Channel = 78 PEAK @ 8-DPSK Mode)



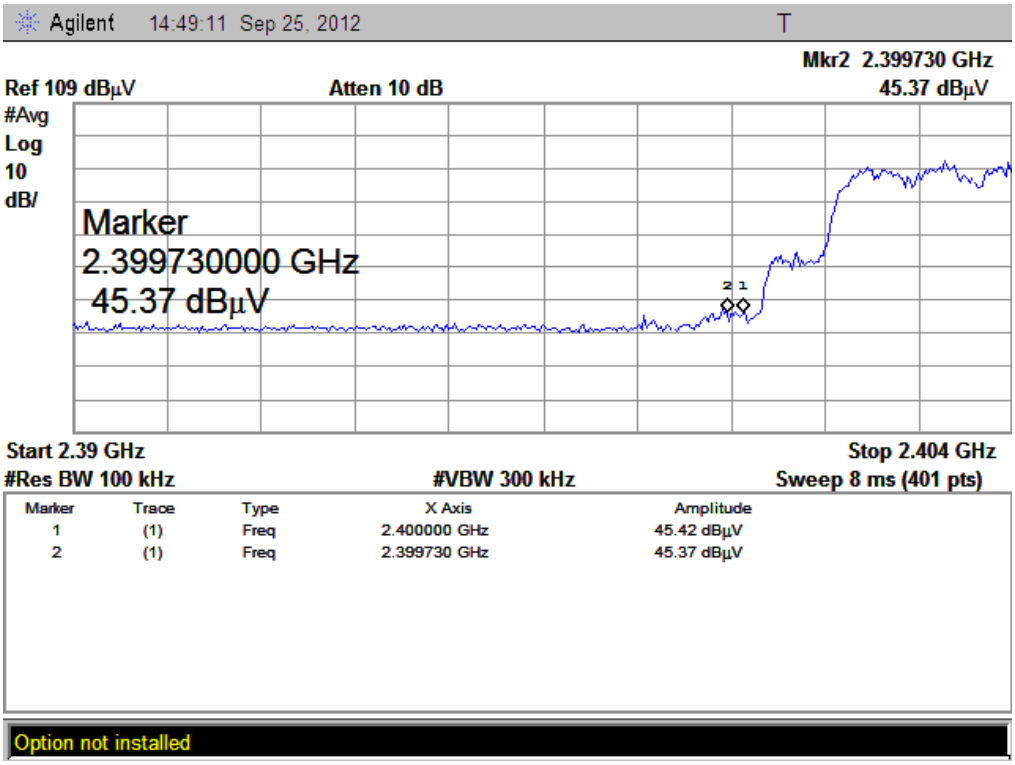
(Plot F2: Channel = 78 AVERAGE @ 8-DPSK Mode)

(Hopping)

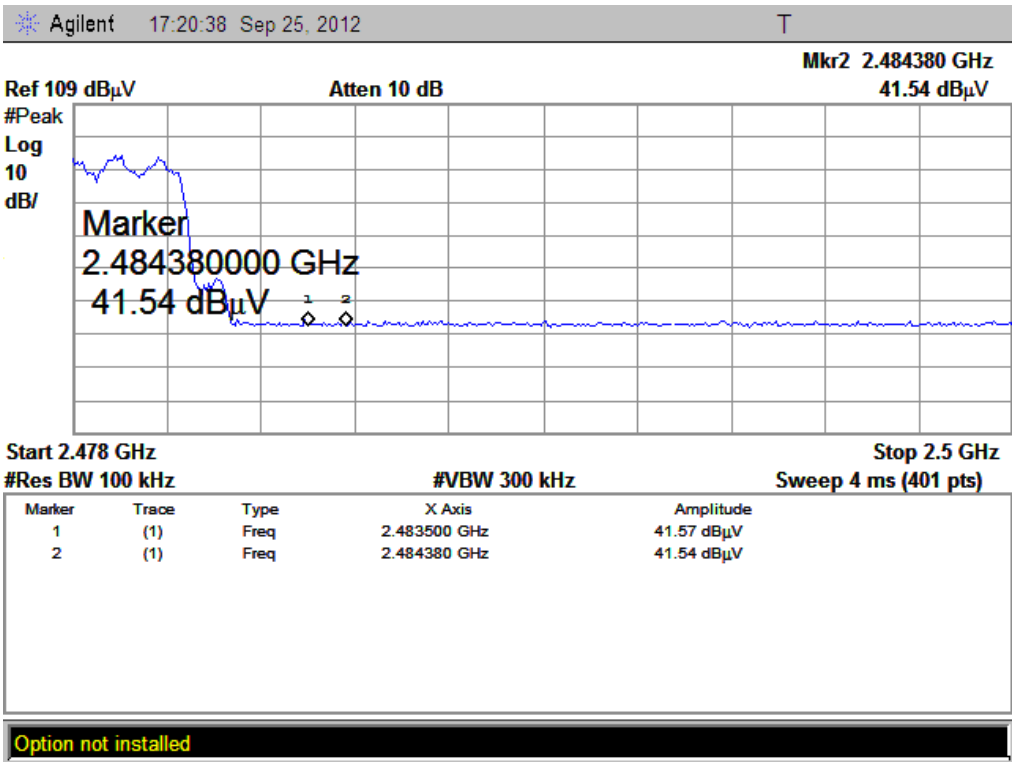
Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBμV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
0	2399.63	PK	46.8	-30.93	32.56	48.43	74	Pass
0	2399.73	AV	45.37	-30.93	32.56	47	54	Pass
78	2484.38	PK	41.54	-29.05	32.50	44.99	74	Pass
78	2489.00	AV	39.72	-29.05	32.50	43.17	54	Pass



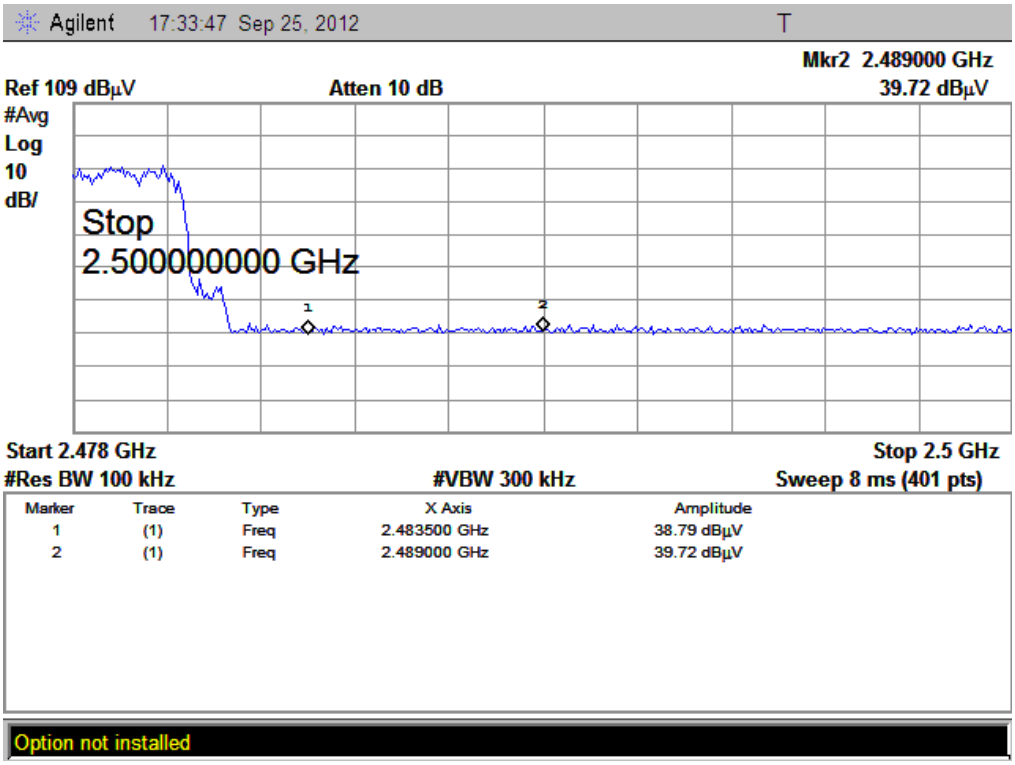
(Plot A1-1: Channel = 0 PEAK)



(Plot A2-1: Channel = 0 AVERAGE)



(Plot B1-1: Channel = 78 PEAK)



(Plot B2-1: Channel = 78 AVERAGE)

2.8. Conducted Emission

2.8.1. 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

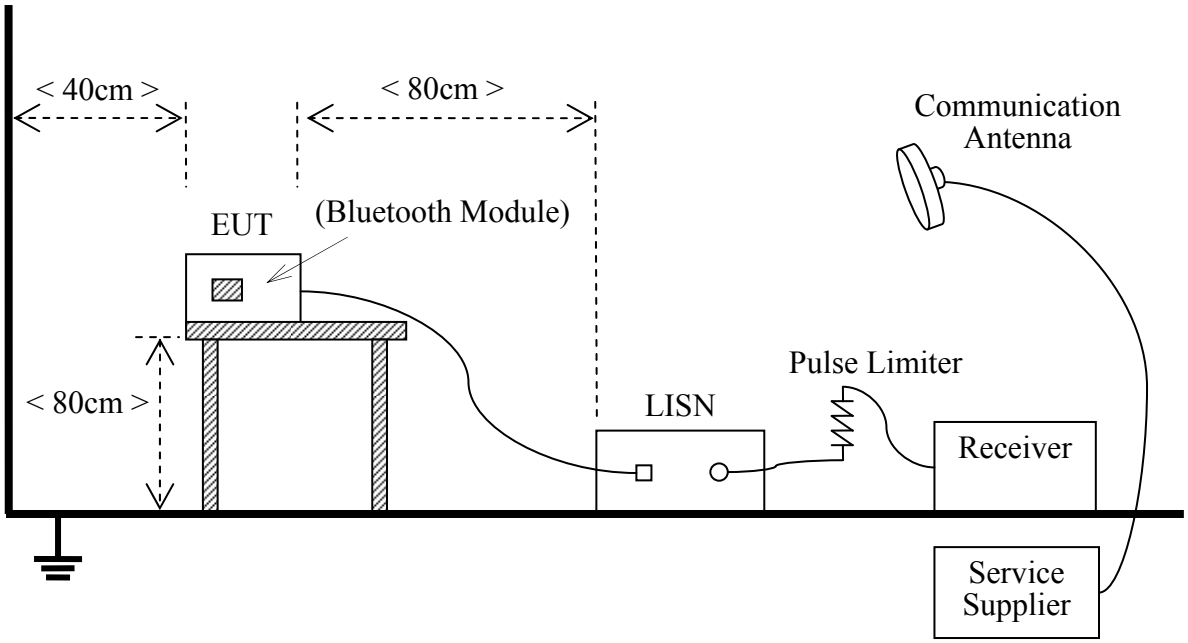
NOTE:

(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.

2.8.2. Test Description

A. Test Setup:



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

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

339 bytes DH5 packages at maximum power.

B. Equipments List:

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

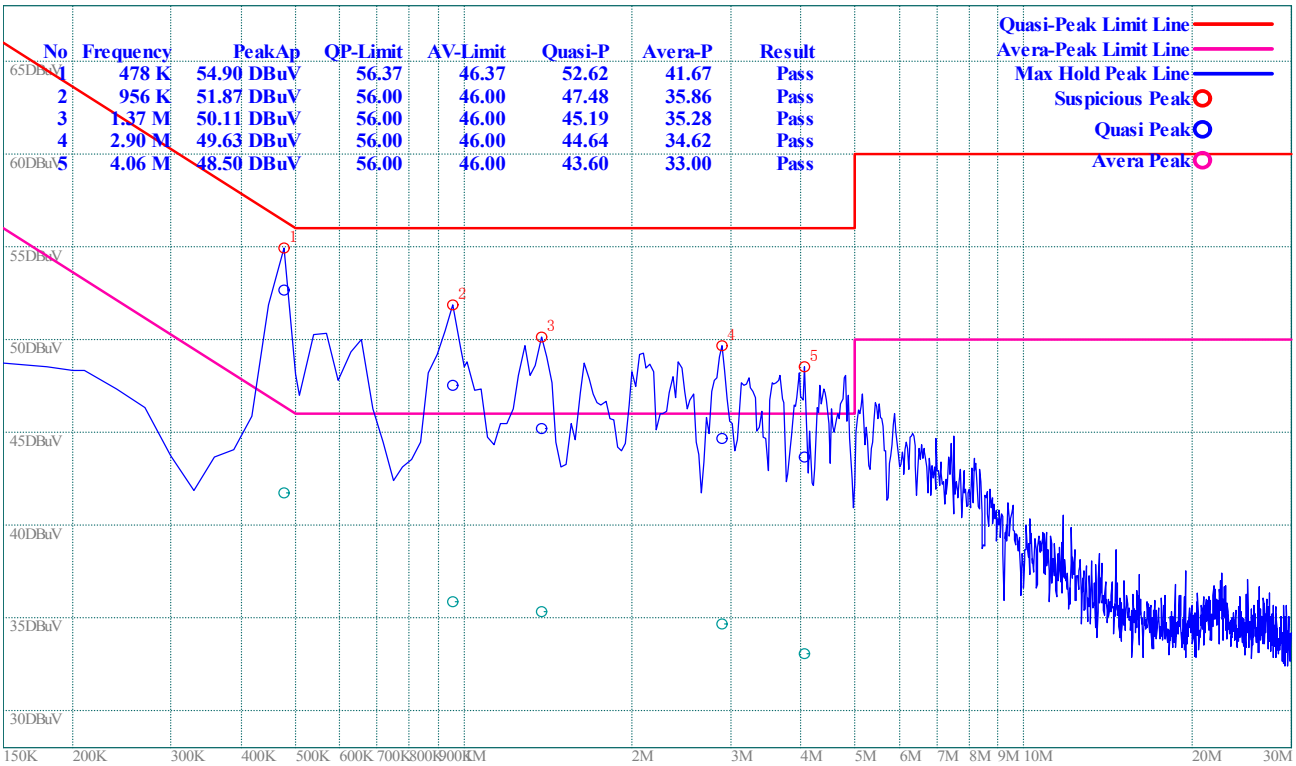
2.8.3. Test Result

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.

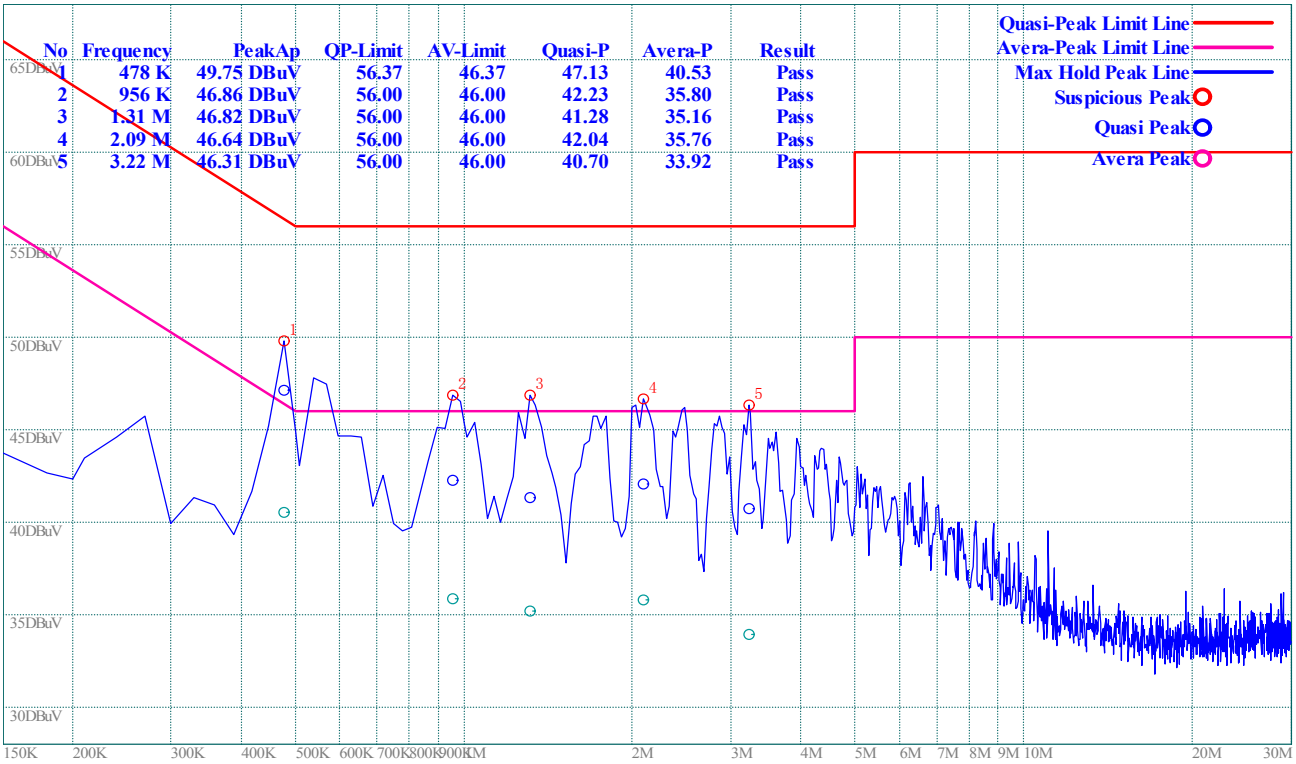
A. Test setup:

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

B. Test Plots:



(Plot A: L Phase)



No	Frequency	PeakAp	QP-Limit	AV-Limit	Quasi-P	Avera-P	Result
1	478 K	49.75 DBuV	56.37	46.37	47.13	40.53	Pass
2	956 K	46.86 DBuV	56.00	46.00	42.23	35.80	Pass
3	1.31 M	46.82 DBuV	56.00	46.00	41.28	35.16	Pass
4	2.09 M	46.64 DBuV	56.00	46.00	42.04	35.76	Pass
5	3.22 M	46.31 DBuV	56.00	46.00	40.70	33.92	Pass

(Plot B: N Phase)

2.9. Radiated Emission

2.9.1. 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:

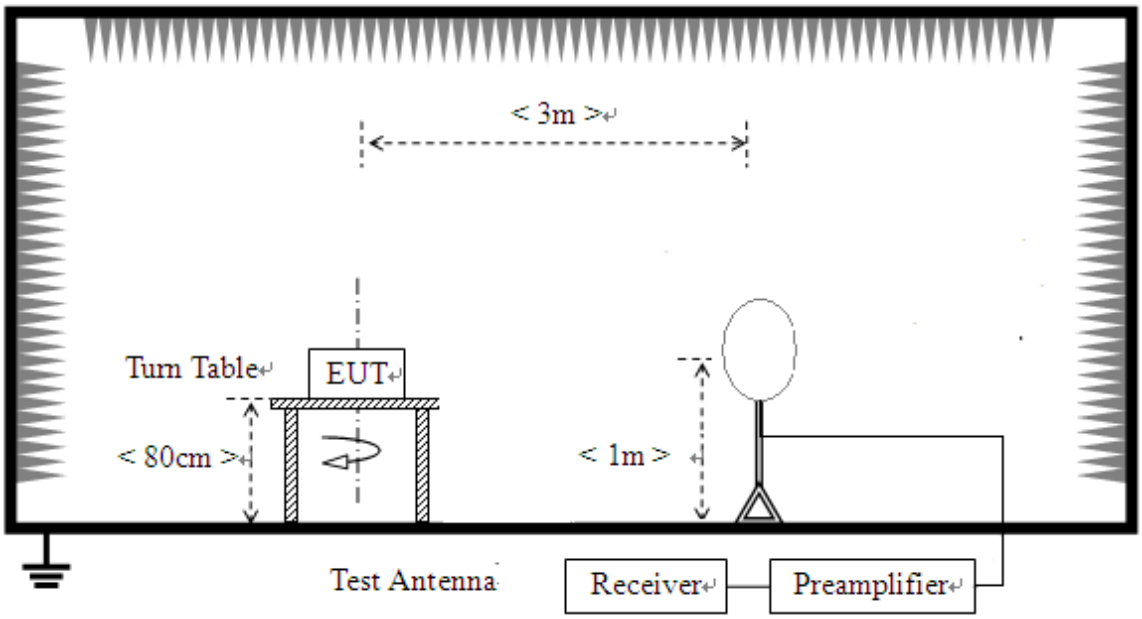
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength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

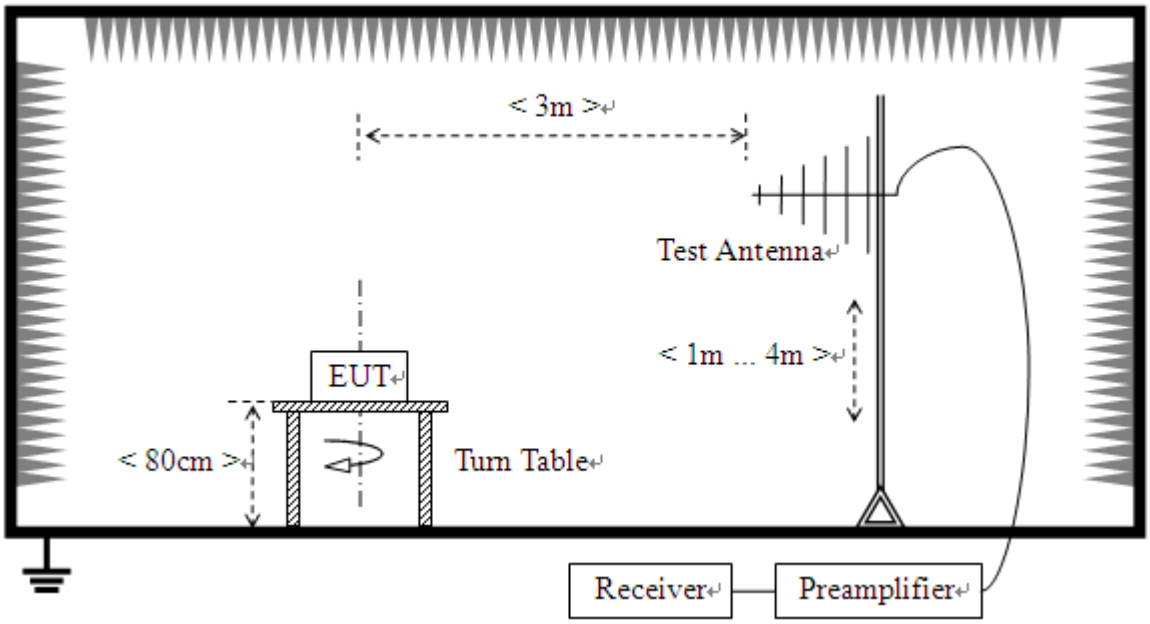
2.9.2. Test Description

A. Test Setup:

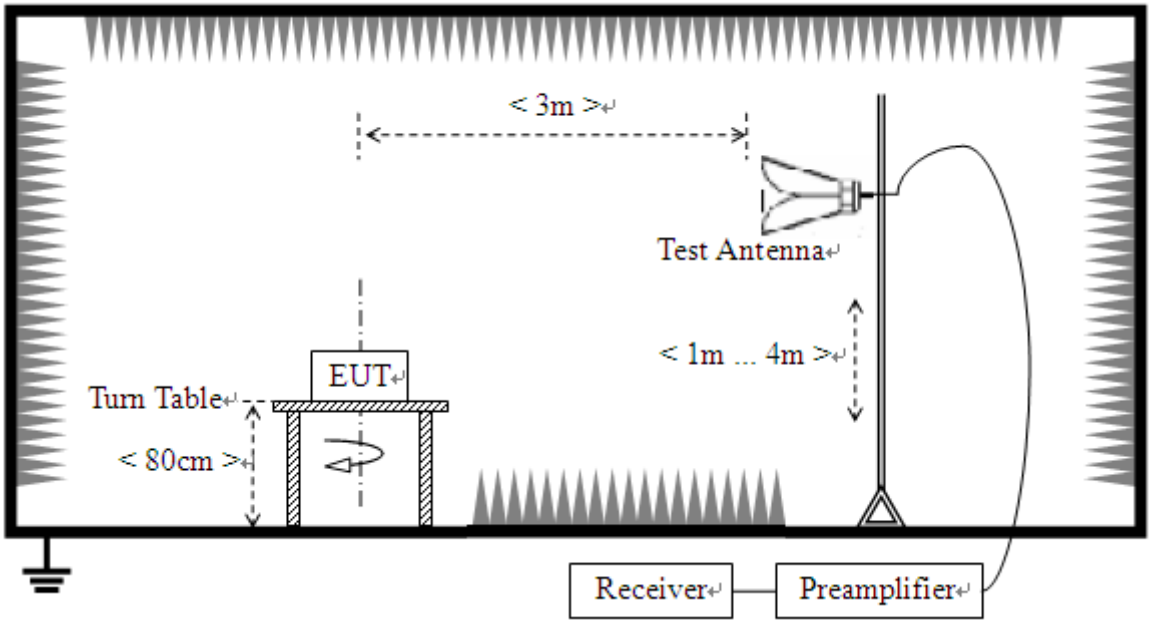
1) For radiated emissions from 9kHz to 30MHz



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 3m 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

2.9.3. 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 [dBμV/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.

2.9.3.1. GFSK Mode:

A. Test Verdict for Harmonics:

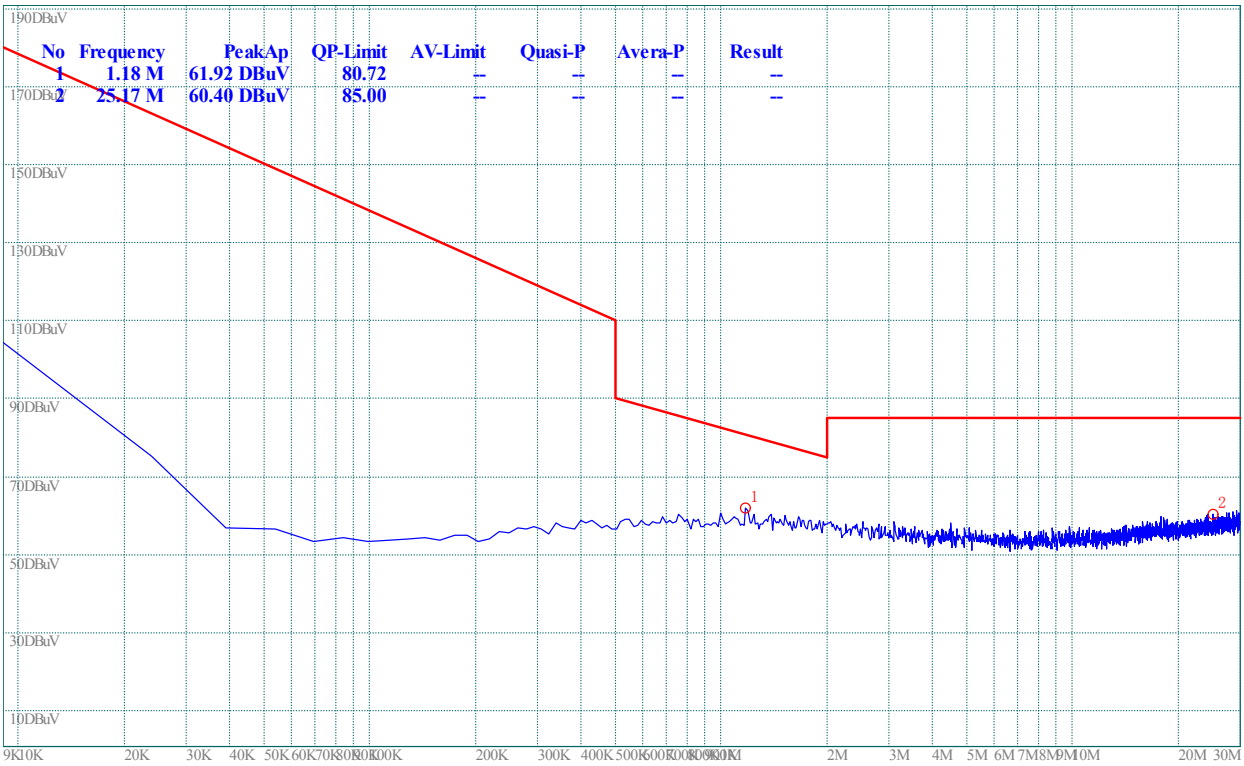
<u>The Fundamental Emissions</u>

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

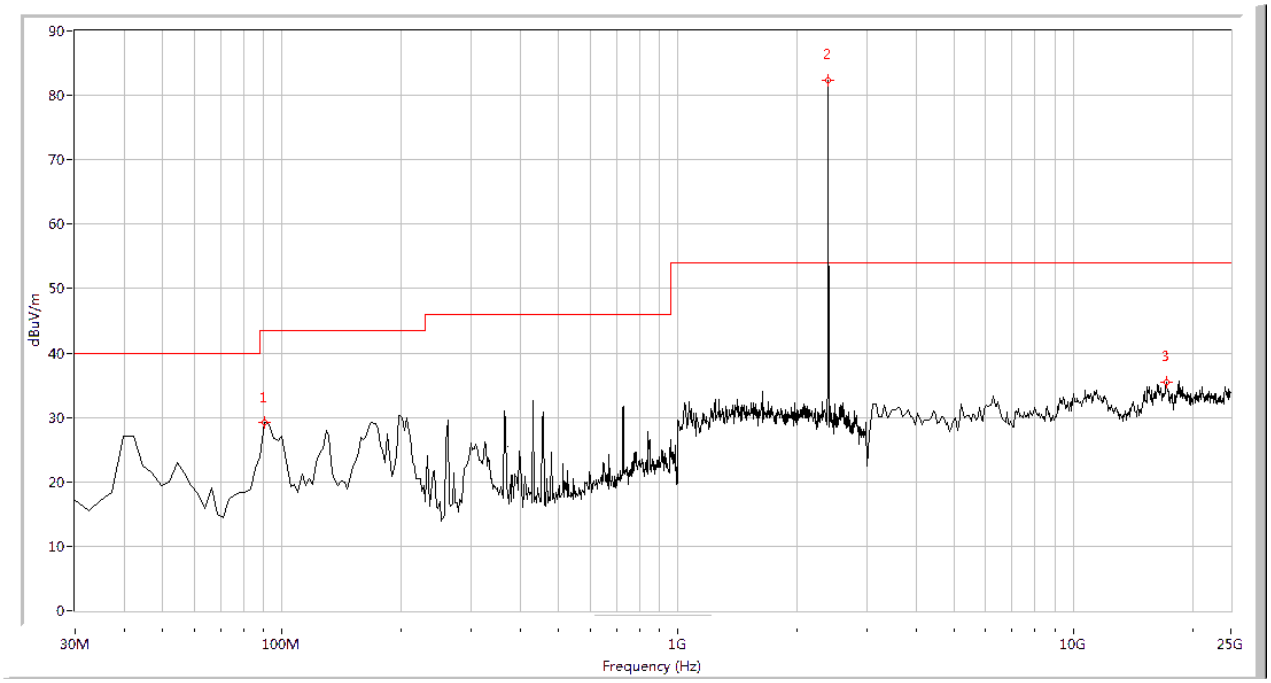
Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	82.86	N/A	Horizontal	Plot A.1
		82.42	N/A	Vertical	Plot A.2
39	2441	78.62	N/A	Horizontal	Plot B.1
		77.82	N/A	Vertical	Plot B.2
78	2480	79.02	N/A	Horizontal	Plot C.1
		79.04	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 0

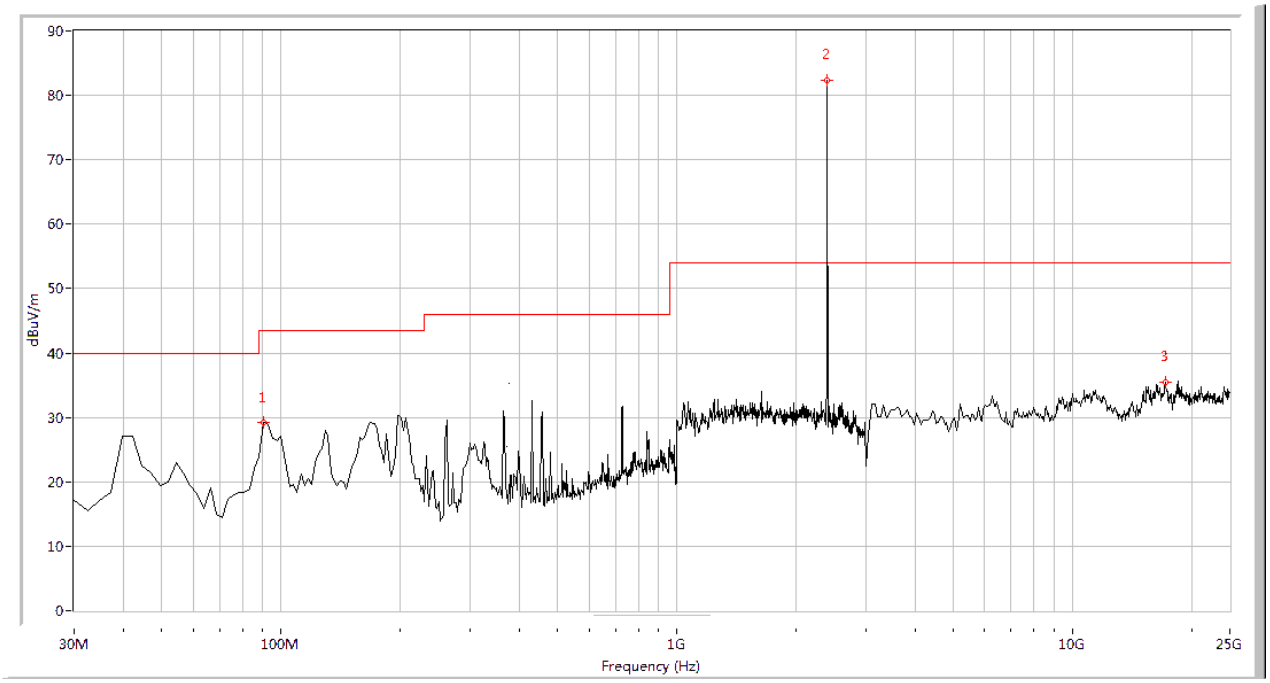


(Plot A.0: 9kHz to 30MHz @ GFSK, channel 0)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	39.04	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2396.509	82.86	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
17154.613	35.87	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	PASS

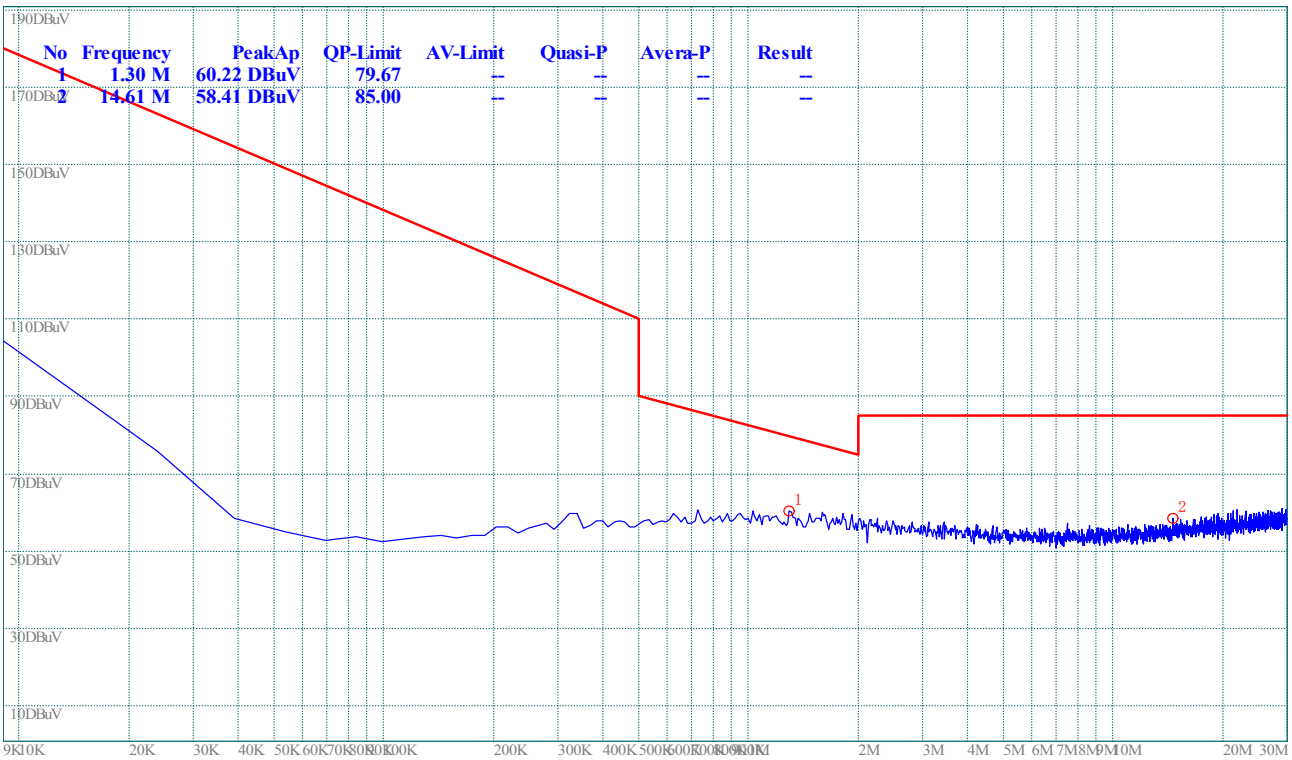
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @ GFSK, channel 0)



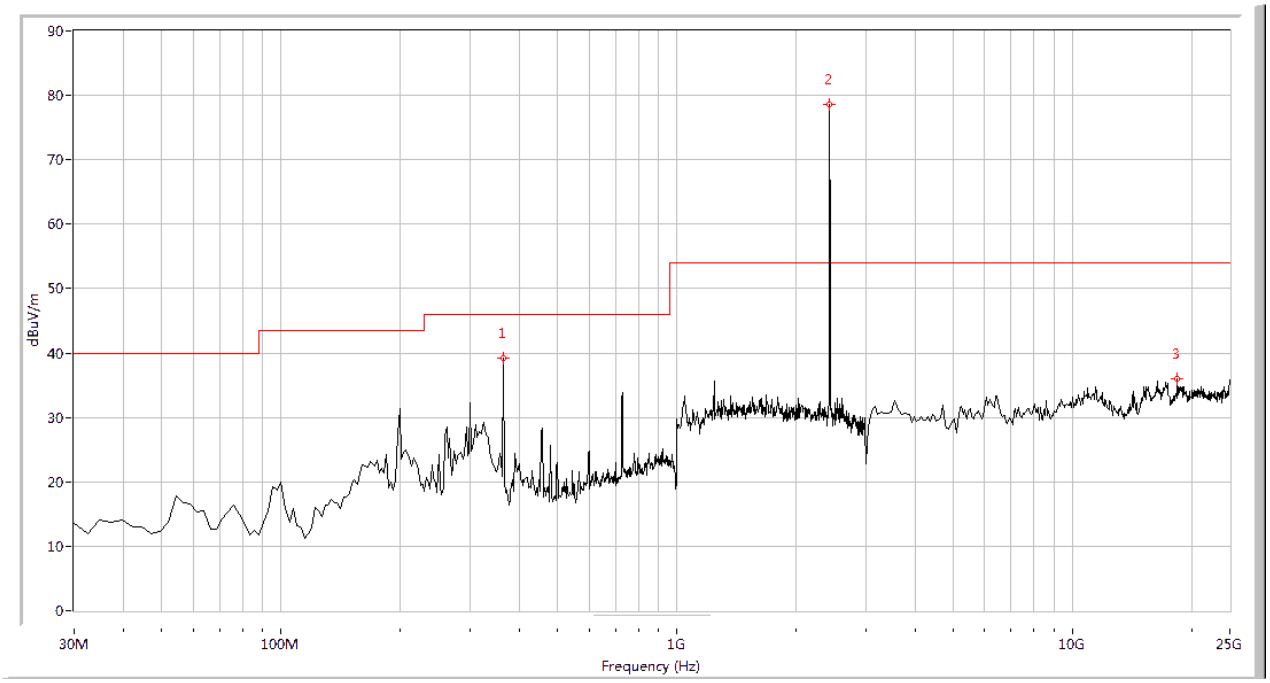
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
90.474	29.16	N.A	N.A	N.A	43.5	N.A	0.0	Vertical	PASS
2396.509	82.42	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
17154.613	35.42	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

Plot for Channel = 39

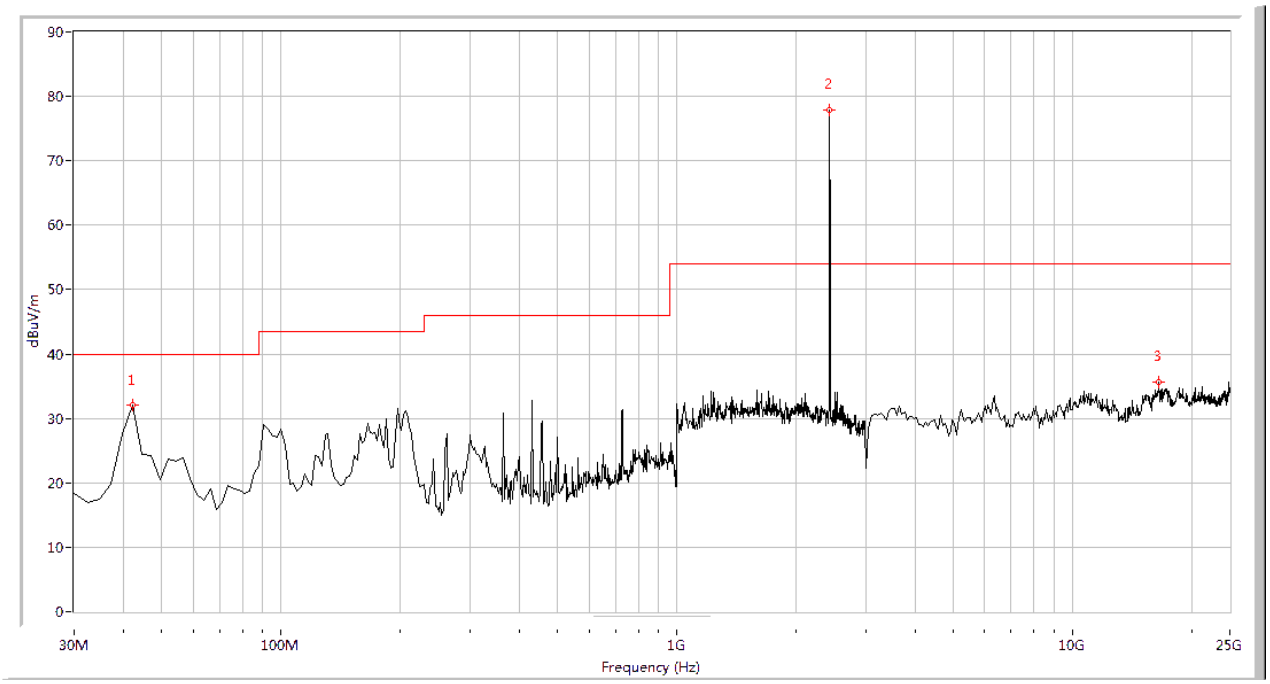


(Plot B.0: 9kHz to 30MHz @ GFSK, channel 39)

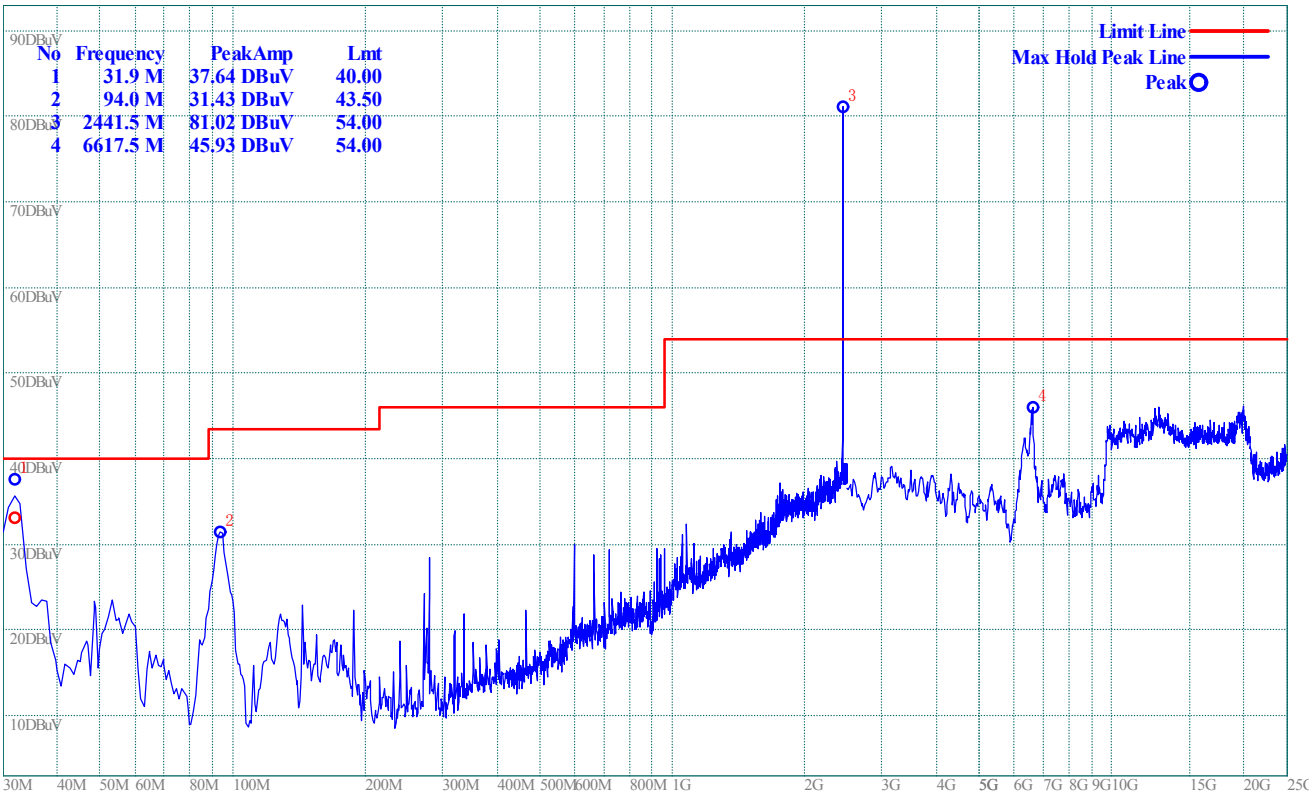


Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	39.16	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2436.409	78.62	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
18416.459	36.03	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	PASS

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



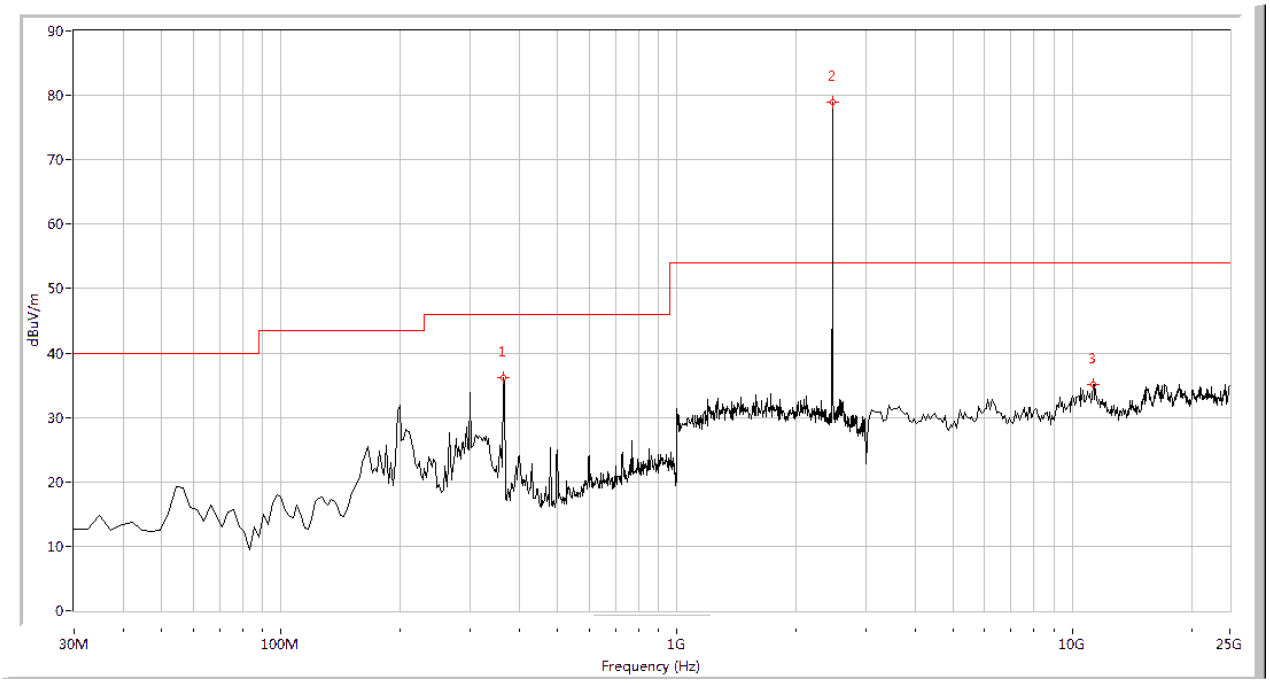
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
42.095	32.11	N.A	N.A	N.A	40.0	N.A	0.0	Vertical	PASS
2436.409	77.82	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
16551.122	35.62	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS



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

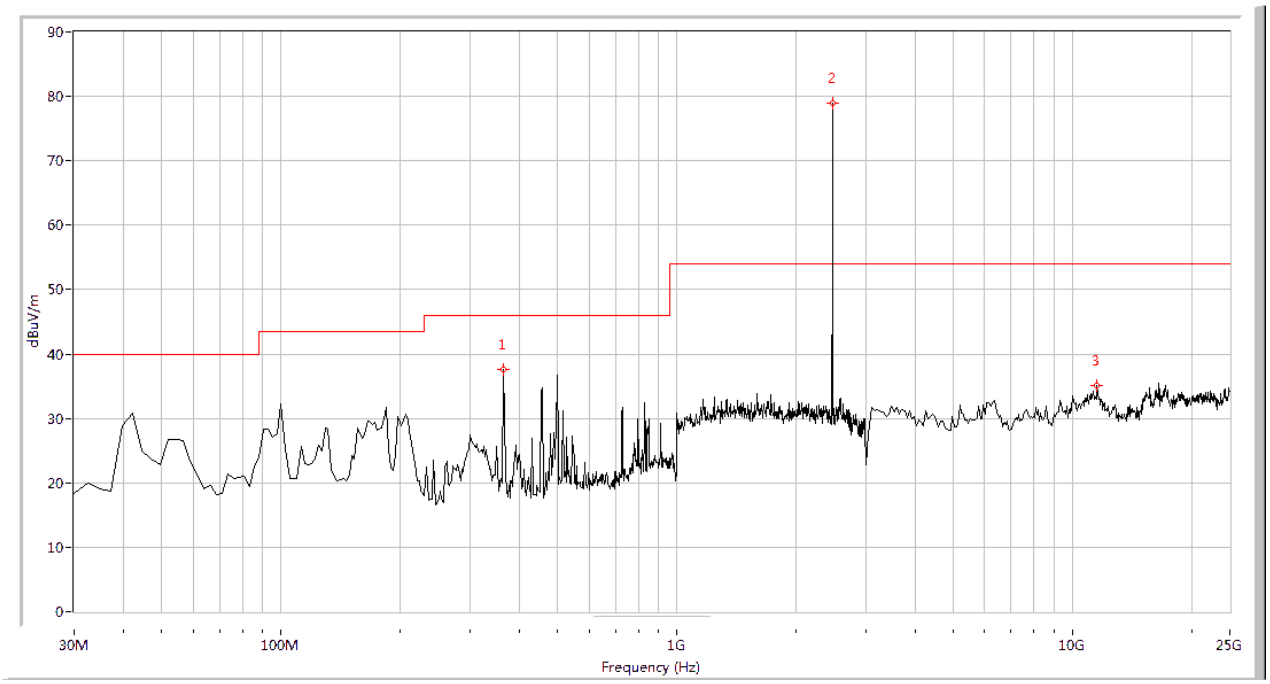
Plot for Channel = 78

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



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	36.13	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2476.309	79.02	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
11284.289	35.08	N.A	N.A	54.0	N.A	54.0	0.0	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
363.815	37.64	N.A	N.A	N.A	46.0	N.A	0.0	Vertical	PASS
2476.309	79.04	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
11558.603	35.19	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

2.9.3.2. π/4-DQPSK Mode:

A. Test Verdict for Harmonics:

<u>The Fundamental Emissions</u>

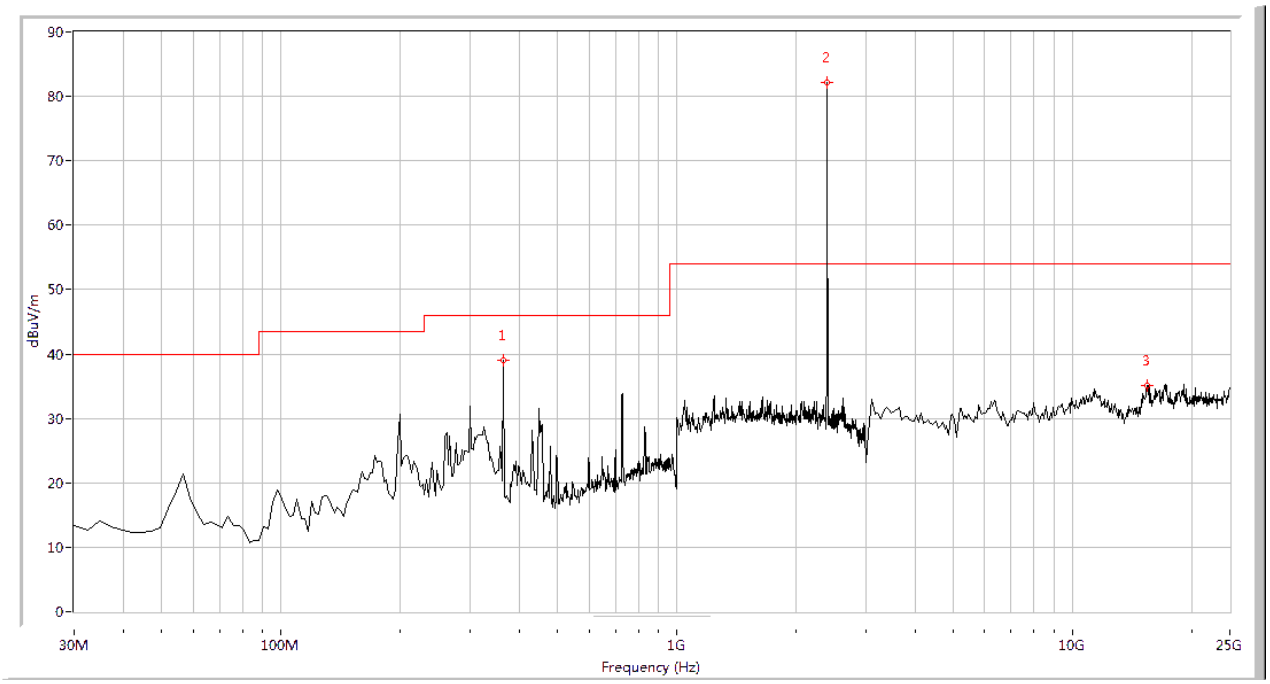
The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	82.15	N/A	Horizontal	Plot A.1
		82.36	N/A	Vertical	Plot A.2
39	2441	78.63	N/A	Horizontal	Plot B.1
		78.06	N/A	Vertical	Plot B.2
78	2480	78.98	N/A	Horizontal	Plot C.1
		79.26	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

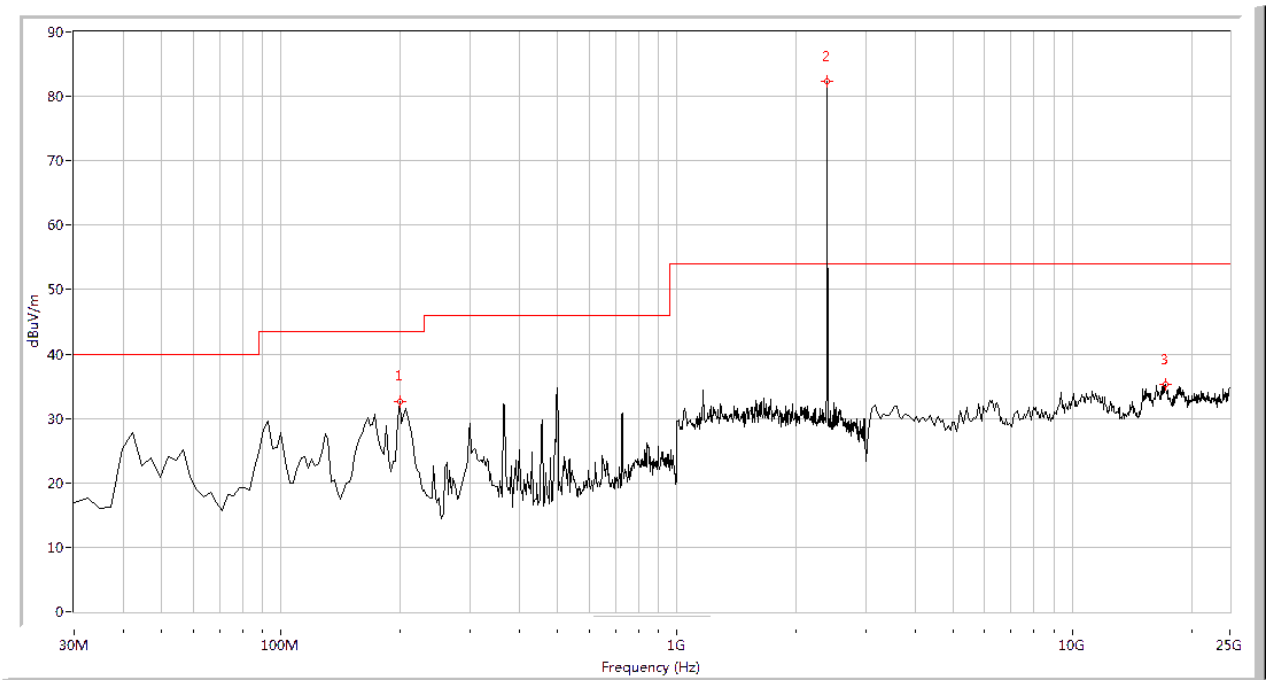
<u>Plots for Channel = 0</u>

(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
363.815	39.03	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2396.509	82.15	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
15453.865	35.18	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	PASS

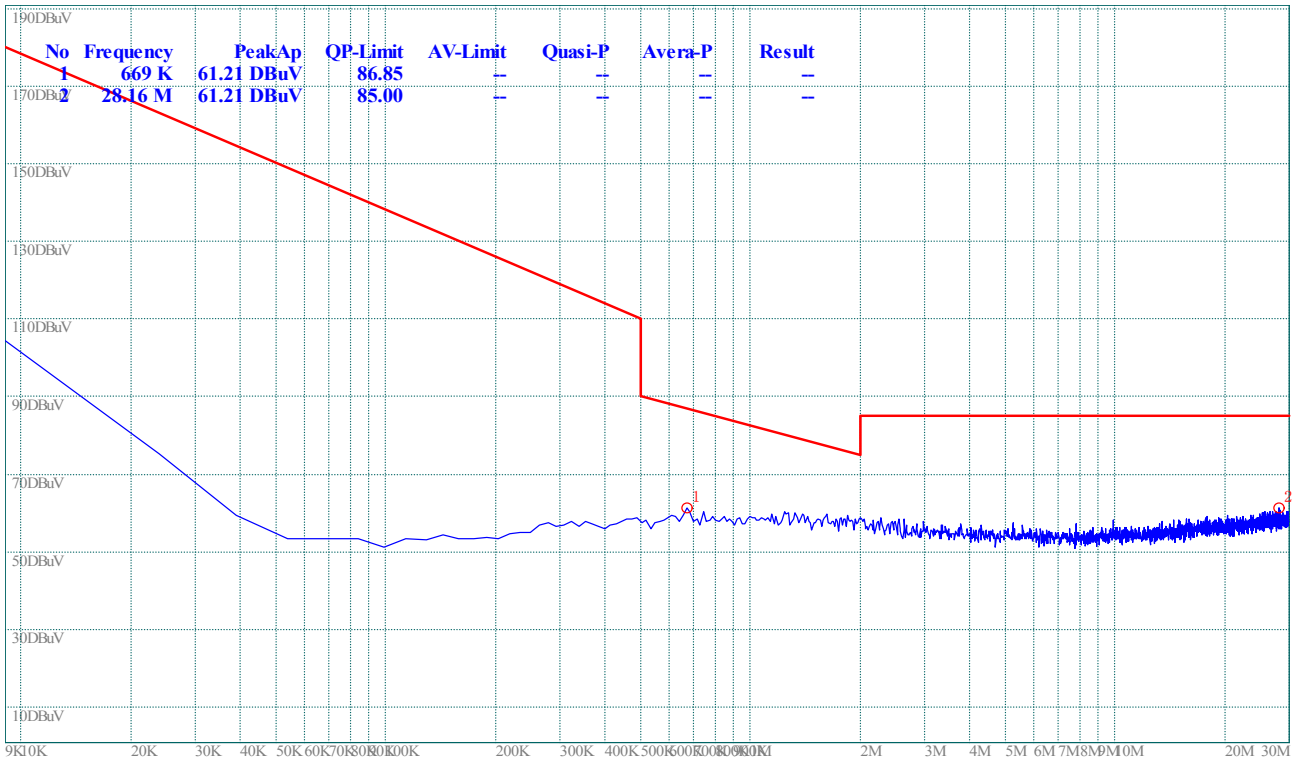
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @ Π/4-DQPSK, channel 0)



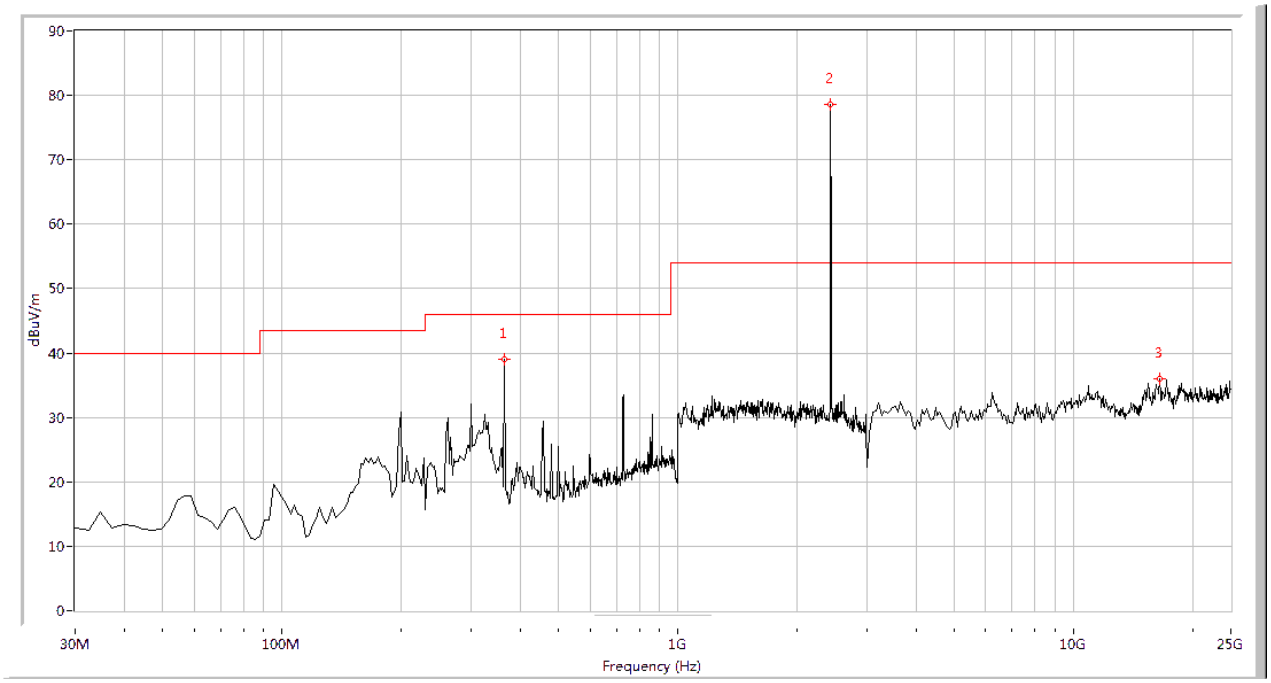
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
199.327	32.61	N.A	N.A	N.A	43.5	N.A	0.0	Vertical	PASS
2396.509	82.36	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
17154.613	35.37	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

Plot for Channel = 39

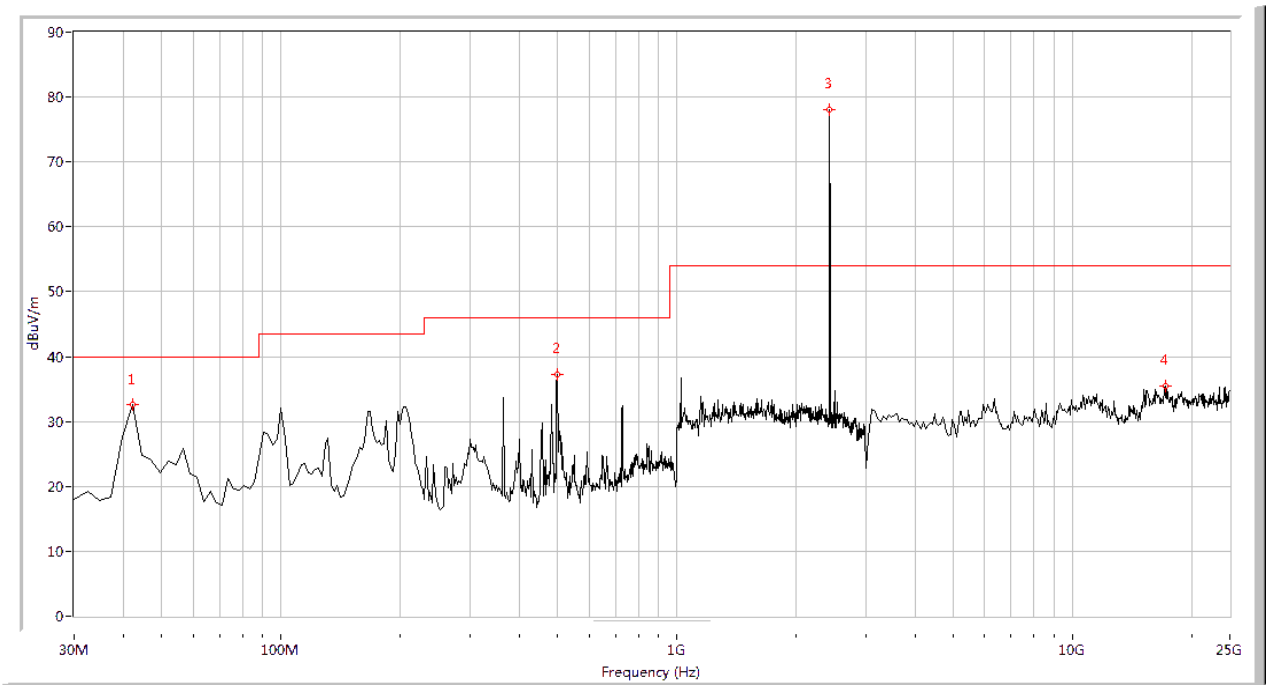


(Plot B.0: 9kHz to 30MHz @ Π/4-DQPSK, channel 39)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	39.02	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2436.409	78.63	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
16551.122	36.07	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	PASS

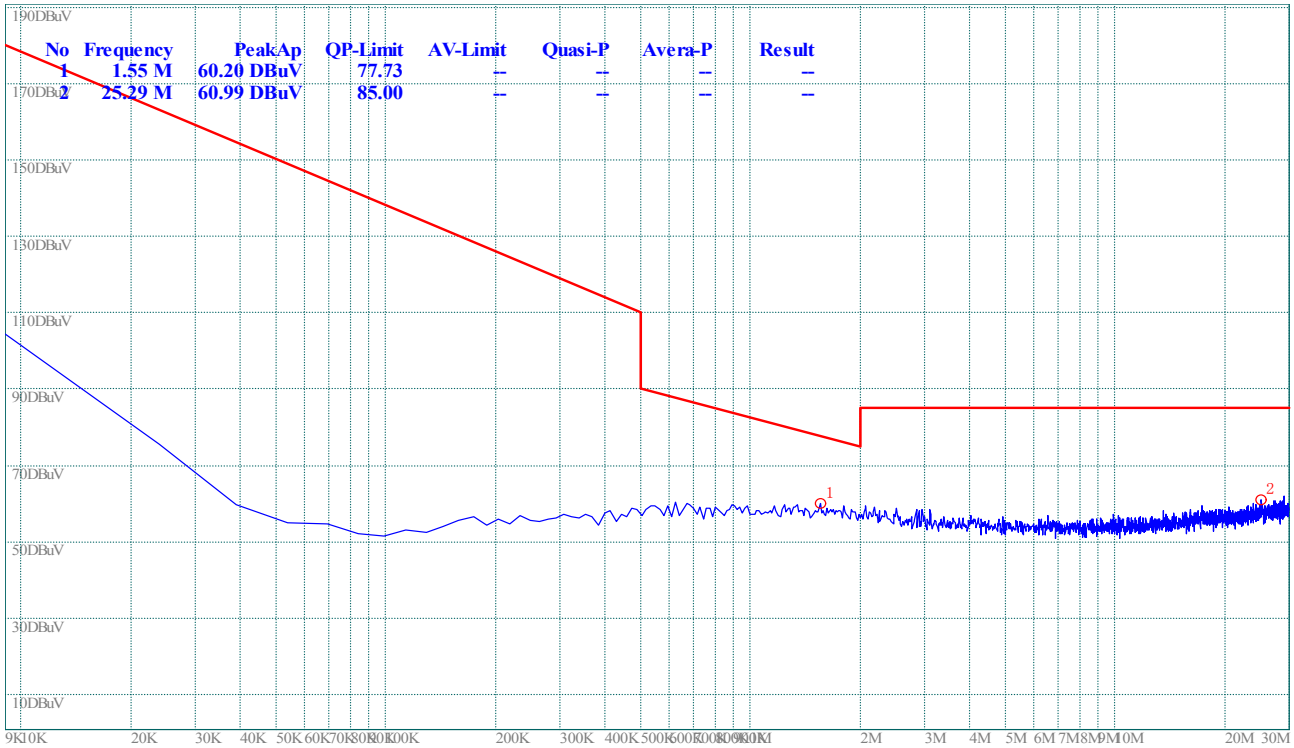
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ Π/4-DQPSK, channel 39)



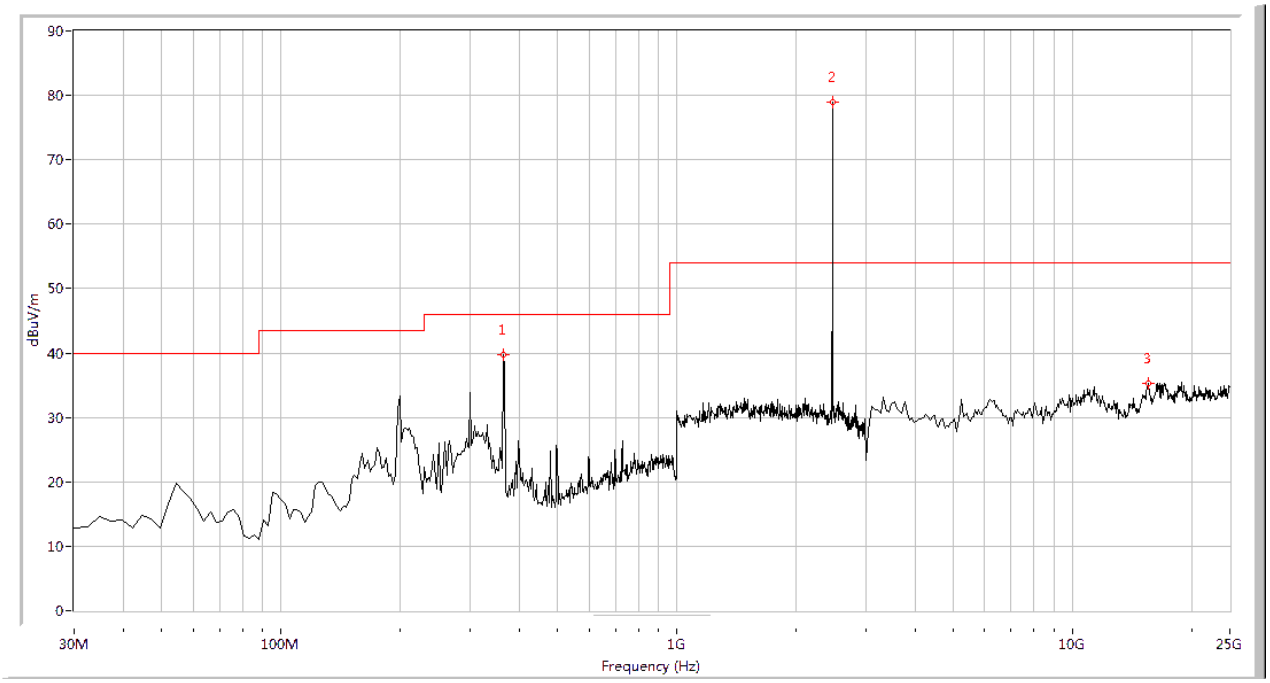
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
42.095	32.70	N.A	N.A	N.A	40.0	N.A	0.0	Vertical	PASS
499.277	37.18	N.A	N.A	N.A	46.0	N.A	0.0	Vertical	PASS
2436.409	78.06	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
17154.613	35.54	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

Plot for Channel = 78

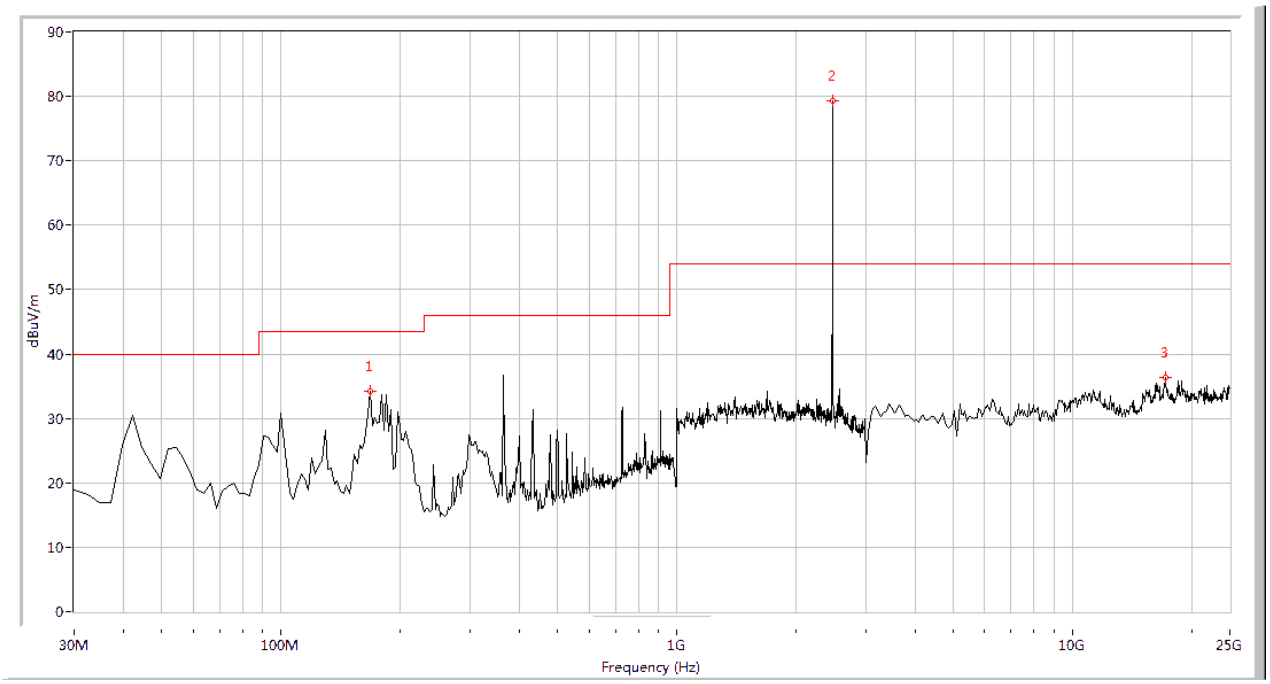


(Plot C.0: 9kHz to 30MHz @ Π/4-DQPSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	39.71	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2476.309	78.98	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
15508.728	35.28	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	PASS

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



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
167.880	34.14	N.A	N.A	N.A	43.5	N.A	0.0	Vertical	PASS
2476.309	79.26	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
17154.613	36.30	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

2.9.3.3. 8-DPSK Mode:

A. Test Verdict for Harmonics:

<u>The Fundamental Emissions</u>

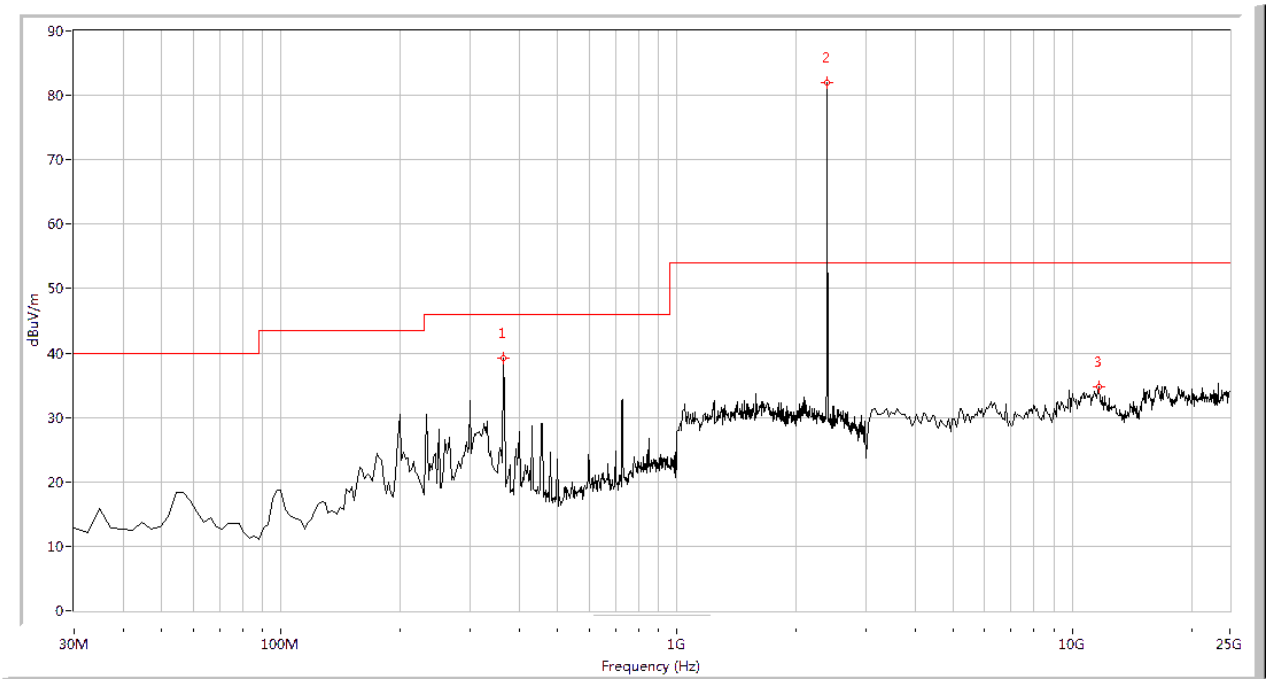
The field strength of {Fundamental Emission} listed below is recorded, and used in the next table.

Channel	Frequency (MHz)	Fundamental Emission (dBμV/m)		Antenna Polarization	Refer to Plot
		PK	AV		
0	2402	82.03	N/A	Horizontal	Plot A.1
		82.59	N/A	Vertical	Plot A.2
39	2441	78.62	N/A	Horizontal	Plot B.1
		77.99	N/A	Vertical	Plot B.2
78	2480	79.01	N/A	Horizontal	Plot C.1
		79.27	N/A	Vertical	Plot C.2

B. Test Plots for the Whole Measurement Frequency Range:

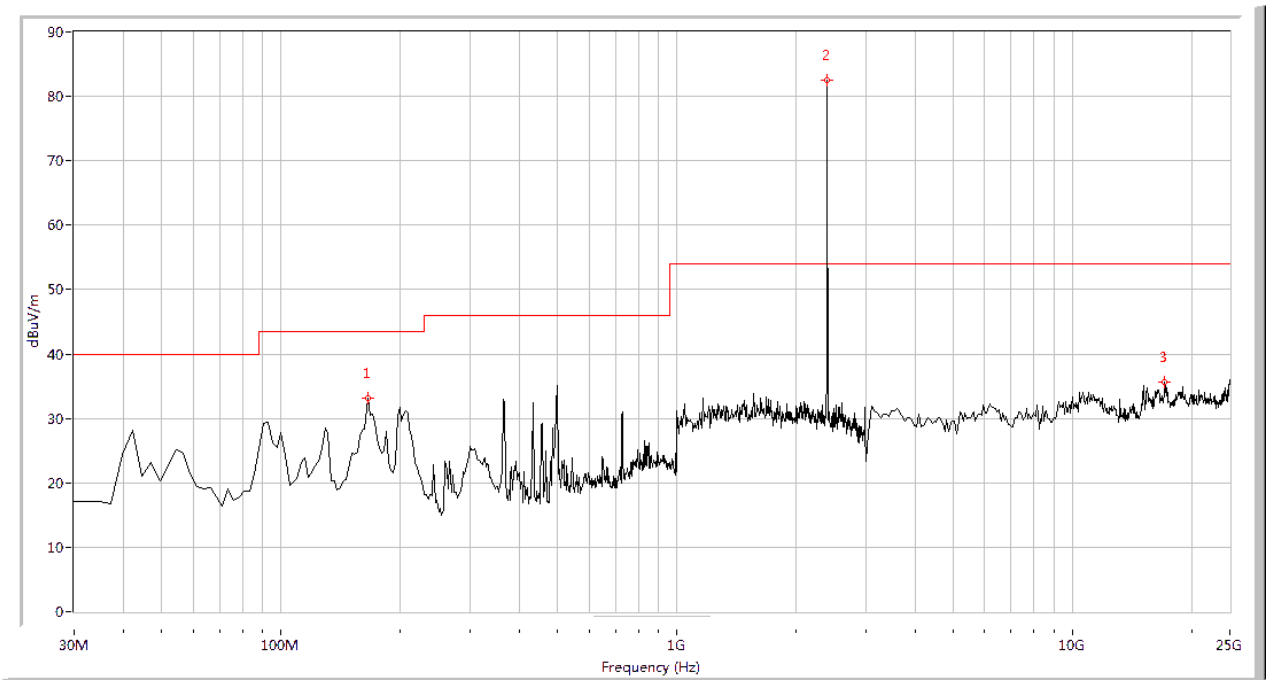
<u>Plots for Channel = 0</u>

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



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	39.29	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2396.509	82.03	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
11668.329	34.68	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	PASS

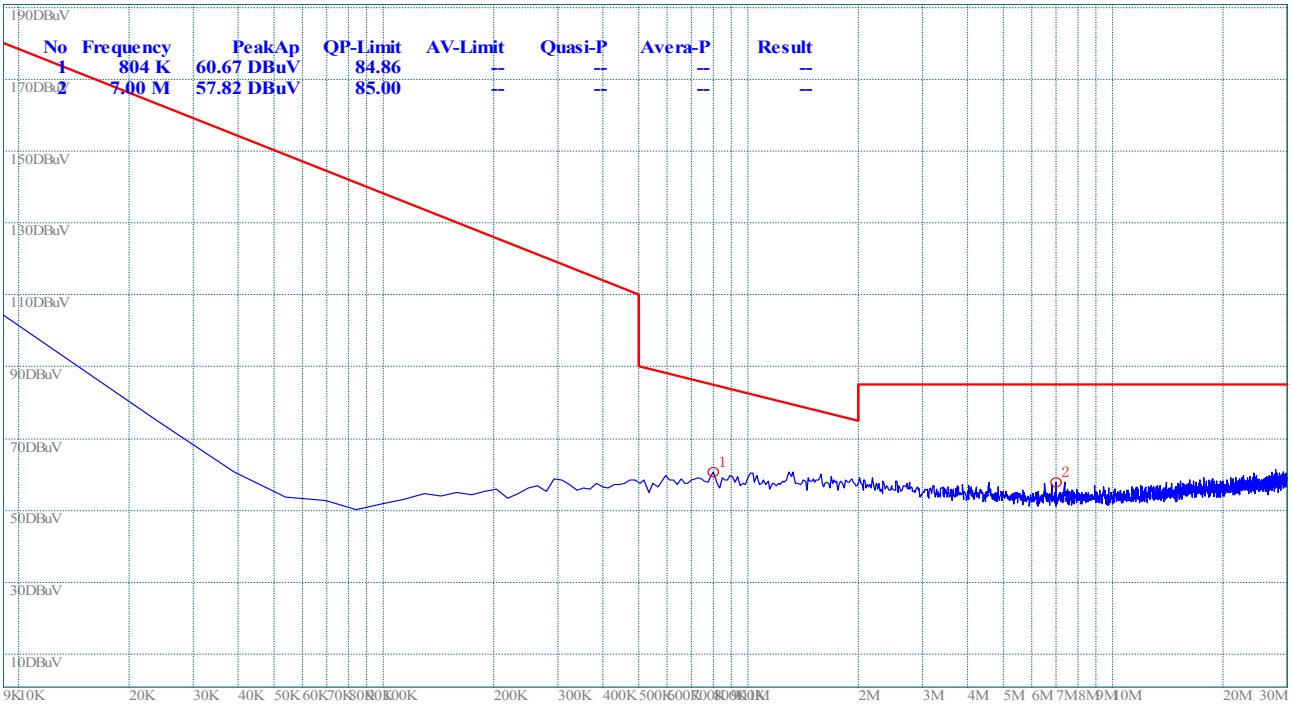
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal @ 8-DPSK, channel 0)



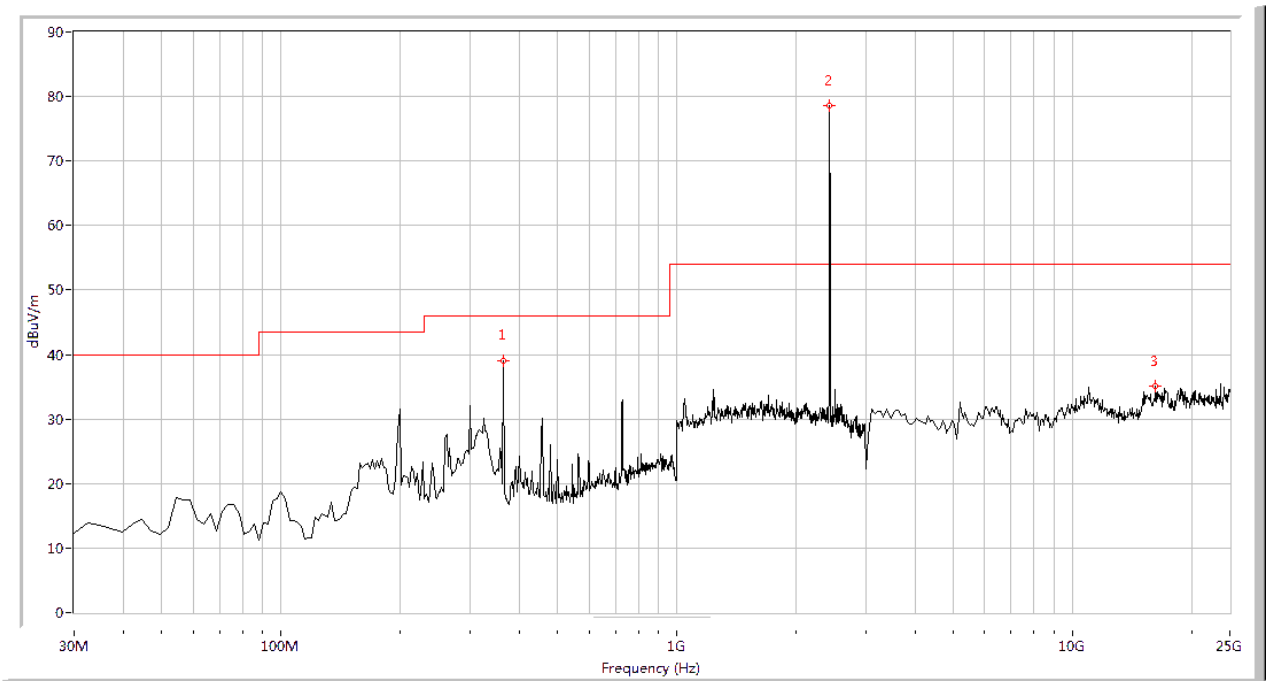
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
165.461	33.20	N.A	N.A	N.A	43.5	N.A	0.0	Vertical	PASS
2396.509	82.59	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
17099.751	35.67	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

Plot for Channel = 39

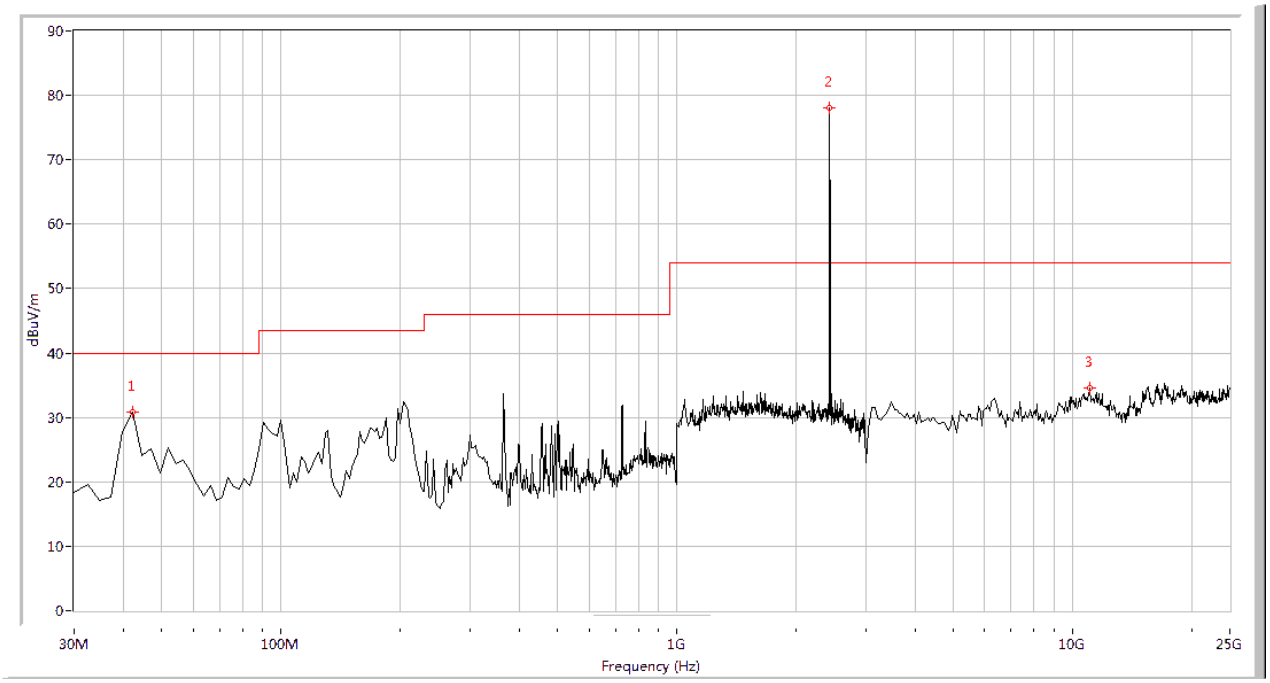


(Plot B.0: 9kHz to 30MHz @ 8-DPSK, channel 39)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	39.02	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2436.409	78.62	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
16221.945	35.09	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	PASS

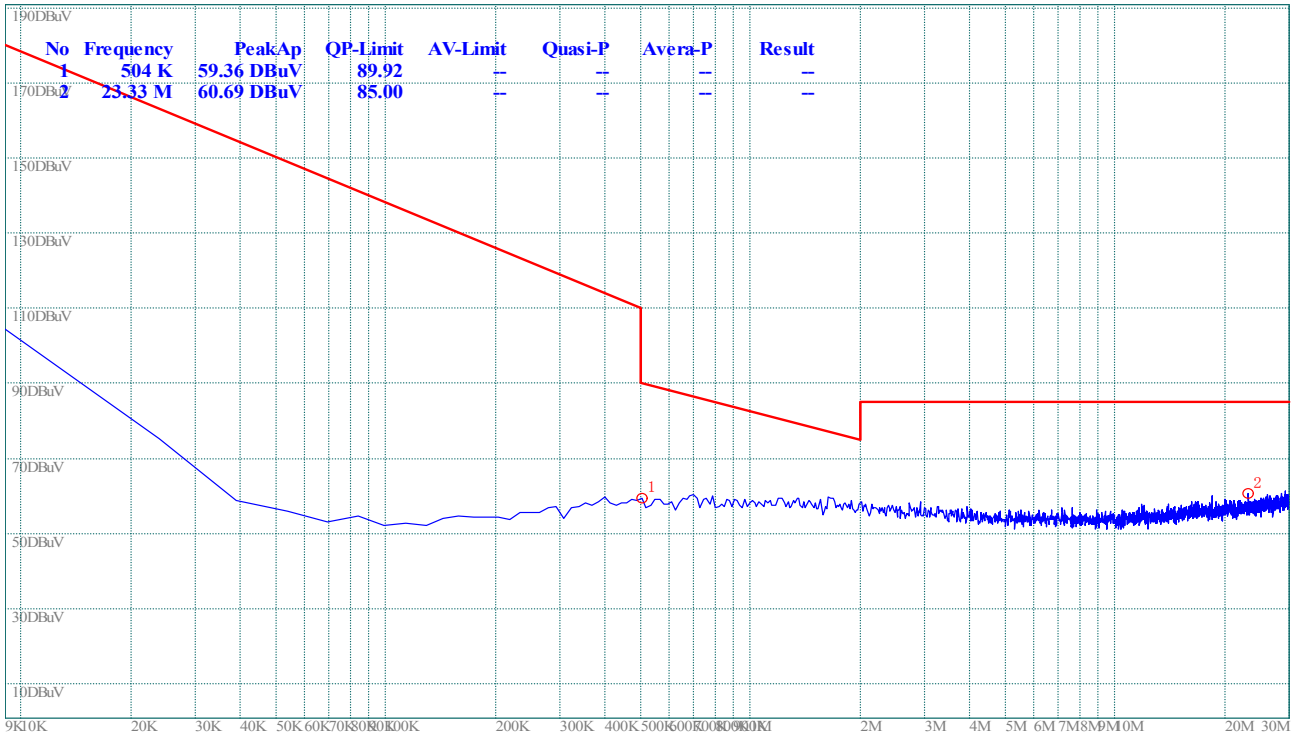
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal @ 8-DPSK, channel 39)



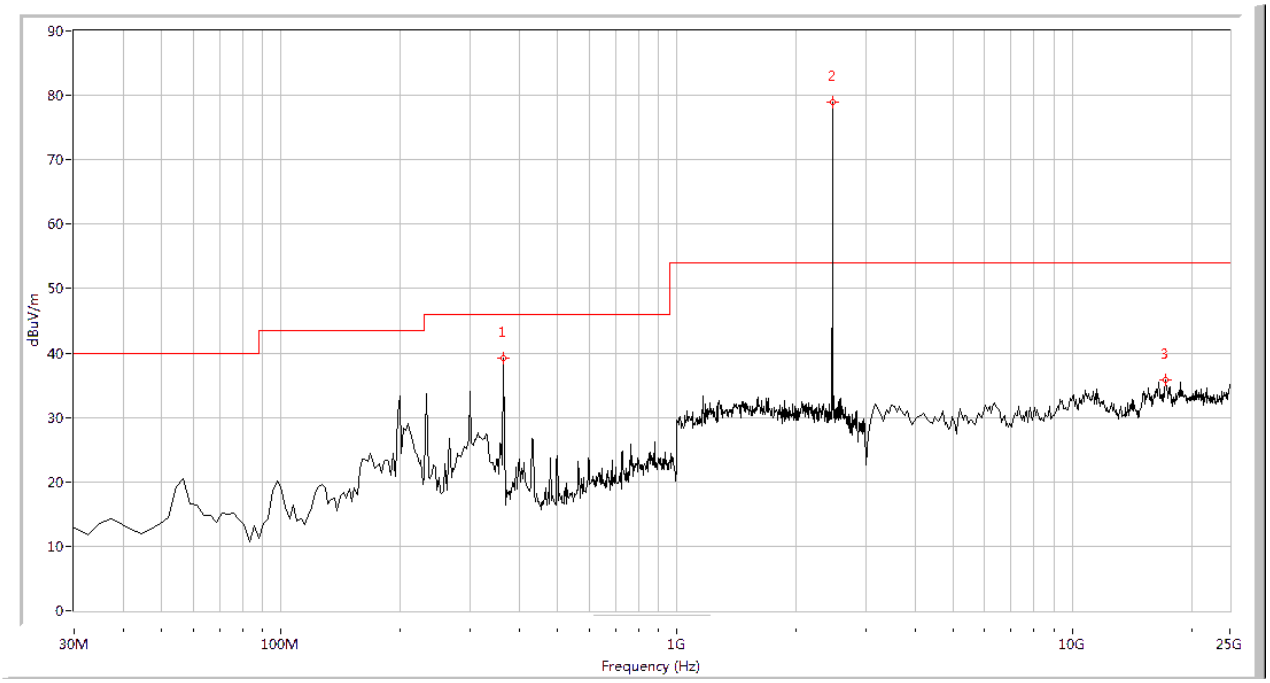
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
42.095	30.77	N.A	N.A	N.A	40.0	N.A	0.0	Vertical	PASS
2436.409	77.99	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
11064.838	34.57	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

Plot for Channel = 78

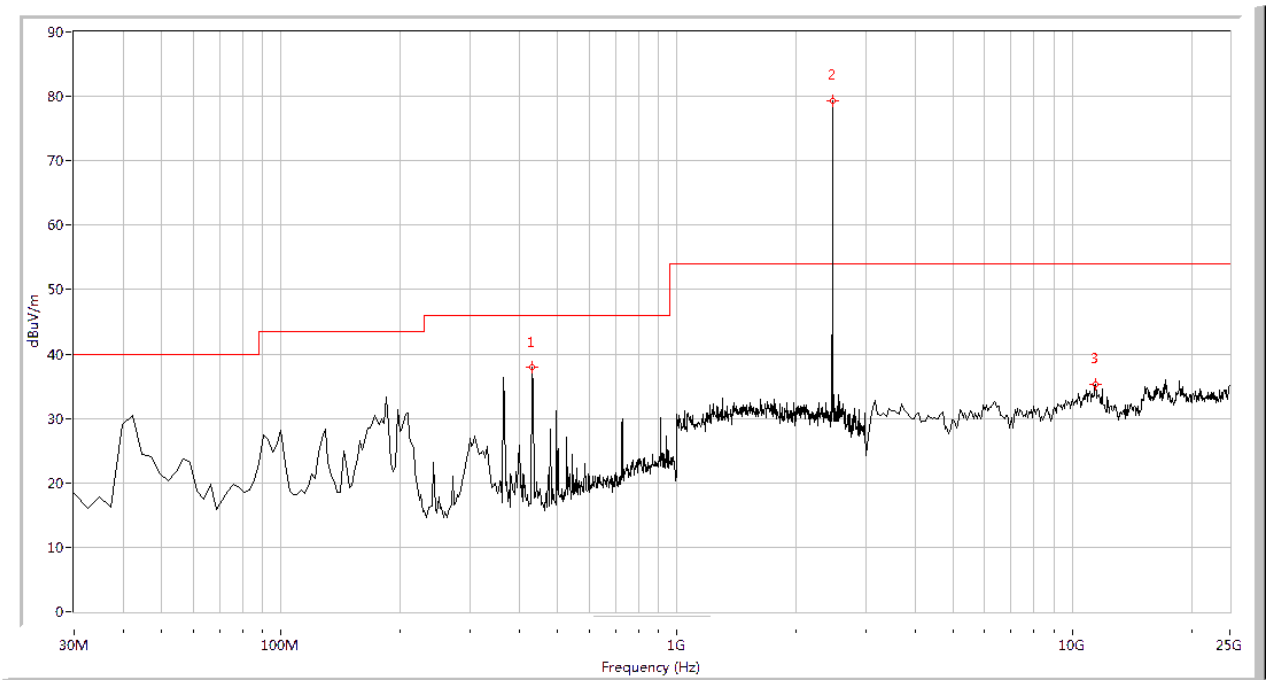


(Plot C.0: 9kHz to 30MHz @ 8-DPSK, channel 78)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Degree	Antenna	Verdict
363.815	39.15	N.A	N.A	N.A	46.0	N.A	0.0	Horizontal	PASS
2476.309	79.01	N.A	N.A	54.0	N.A	54.0	0.0	Horizontal	N/A
17209.476	35.88	N.A	N.A	54.0	N.A	54.0	0.0	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
431.546	38.03	N.A	N.A	N.A	46.0	N.A	0.0	Vertical	PASS
2476.309	79.27	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	N/A
11448.878	35.23	N.A	N.A	54.0	N.A	54.0	0.0	Vertical	PASS

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

2.10. 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 8.013dBm, the maximum gain of antenna is 0dBi, the maximum output power is 8.013dBm (6.3mW). Which is lower than the exclusion threshold 38mW, at frequency 2450MHz, and distance is 20mm.

Since the test result is passed, the detailed file refers to SAR report.

** END OF REPORT **