



Report No.: SZ11030025E02

47 CFR PART 15 C - BLUETOOTH

# TEST REPORT

Issued to

Cellon Communications Technology (ShenZhen)Co., Ltd.

For

C5030

Model Name: C5030, PCD1202, TE1202, CL1202, PCD1202PE,  
PCD1202AL, PCD1202CL, PCD1202PO, PCD1202MV,  
PCD1202OM, PCD1202MX, TE1202PE, AL1202AL,  
CL1202CL, CL1202PO, MV1202MV, TE1202MX  
Brand Name: PCD/ Telefonica  
FCC ID: T38PCD5030  
Test Rule: 47 CFR Part 15 Subpart C  
Test date: March 14, 2011 – March 17, 2011

by

Shenzhen Morlab Communications Technology Co., Ltd.

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Date

2011.3.22

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Date

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Date

2011.3.22

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.  
741109

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| Change History |                |                   |
|----------------|----------------|-------------------|
| Issue          | Date           | Reason for change |
| 1.0            | March 18, 2011 | First edition     |
|                |                |                   |

## 1. GENERAL INFORMATION

### 1.1 EUT Description

EUT Type.....: C5030  
Serial No.....: (n.a, marked #1 by test site)  
Hardware Version .....: P1  
Software Version .....: V1.0  
Applicant .....: Cellon Communications Technology (ShenZhen)Co., Ltd.  
13/F, Skyworth Building C Gaoxin S. Ave. 1st, High-Tech  
industrial Park NanShan, ShenZhen  
Manufacturer .....: Cellon Communications Technology (ShenZhen)Co., Ltd.  
13/F, Skyworth Building C Gaoxin S. Ave. 1st, High-Tech  
industrial Park NanShan, ShenZhen  
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),  $\pi/4$ -DQPSK(EDR 2Mbps),  
8-DPSK(EDR 3Mbps))  
Power Supply.....: Battery  
Model Name: BTR1238  
Brand name: PCD  
Capacitance: 550mAh  
Rated voltage: 3.7V  
Manufacturer: Shenzhen BAK battery Co. Ltd  
Ancillary Equipments.....: AC Adapter (Charger for Battery)  
Model Name: CNR1116  
Brand Name: DVE  
Serial No.: (n.a. marked #1 by test site)  
Rated Input: ~ 100-240V, 50- 60Hz, 0.3A  
Rated Output: = 5.0V, 0.5A  
Manufacturer: DEE VAN ELECTRONICS(LONGCHUAN)  
CO., LTD.

*Note 1:* The EUT is a GSM Mobile Phone, it contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth Module is  $F(\text{MHz})=2402+1*n$  ( $0 \leq n \leq 78$ ). 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.

## 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<br>(10-1-09 Edition) | Radio Frequency Devices |

Test detailed items/section required by FCC/IC 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             | N.A    |
| 9   | 15.209<br>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

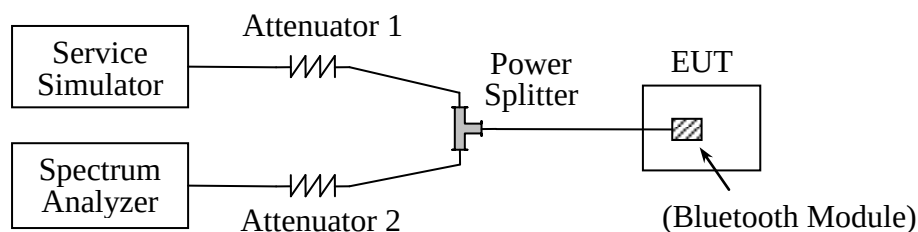
### 2.1 Number of Hopping Frequency

#### 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 75 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 |
|-------------------|--------------|--------|------------|-----------|
| Service Simulator | Agilent      | E5515C | GB43130131 | 2010.09   |
| Spectrum Analyzer | Agilent      | E7405A | US44210471 | 2010.09   |
| Power Splitter    | Weinschel    | 1506A  | NW521      | (n.a.)    |
| Attenuator 1      | Resnet       | 20dB   | (n.a.)     | (n.a.)    |
| Attenuator 2      | Resnet       | 3dB    | (n.a.)     | (n.a.)    |

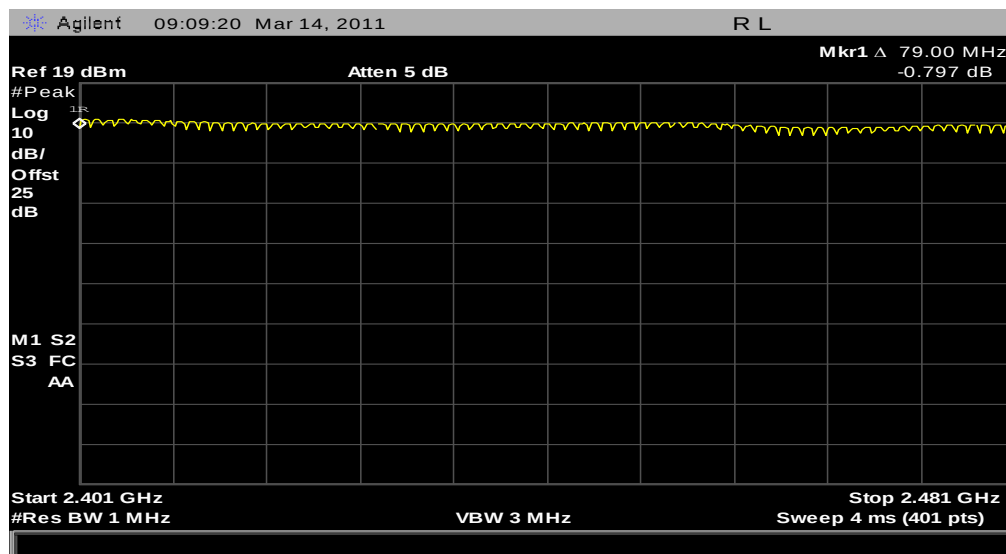
#### 2.1.3 Test Result

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.

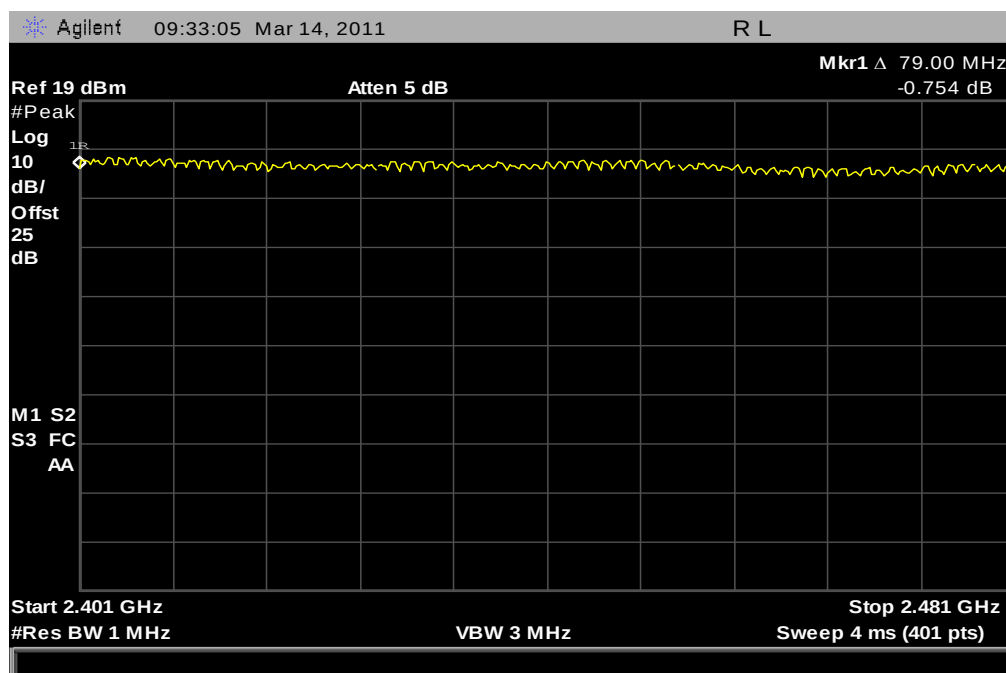
### A. Test Verdict:

| Test Mode      | Frequency Block (MHz) | Measured Channel Numbers | Min. Limit | Refer to Plot | Verdict |
|----------------|-----------------------|--------------------------|------------|---------------|---------|
| GFSK           | 2400 - 2483.5         | 79                       | 75         | Plot A        | PASS    |
| $\pi/4$ -DQPSK | 2400 - 2483.5         | 79                       | 75         | Plot B        | PASS    |
| 8-DPSK         | 2400 - 2483.5         | 79                       | 75         | Plot C        | PASS    |

### B. Test Plot:

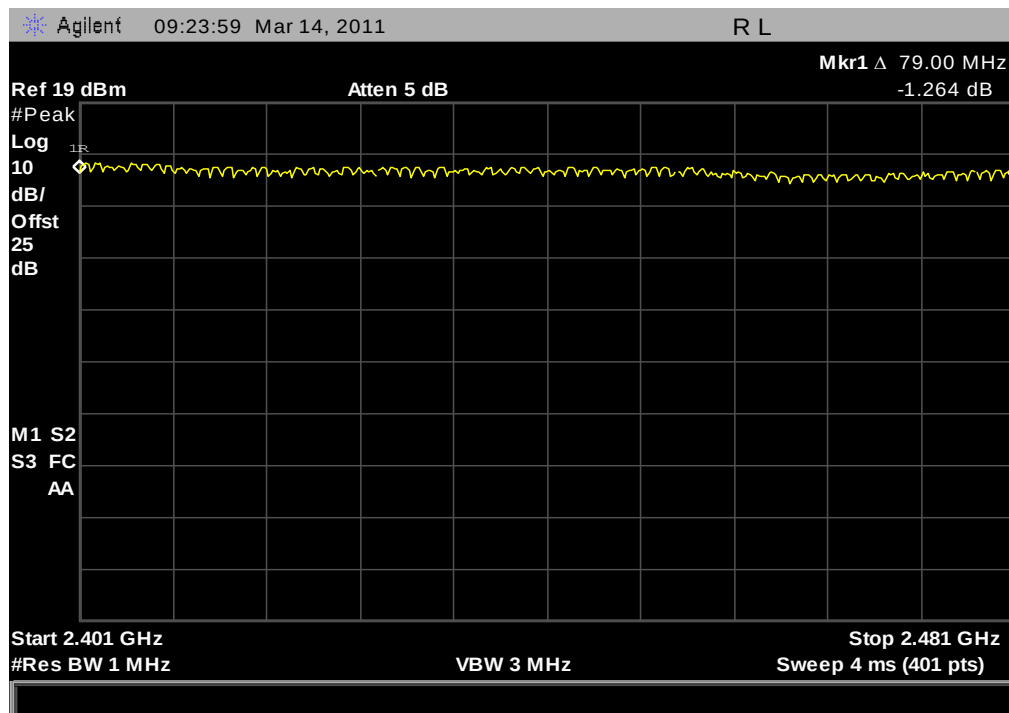


(Plot A: GFSK)



(Plot B:  $\pi/4$ -DQPSK)





(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.

### 2.2.2 Test Description

See section 2.1.2 of this report.

### 2.2.3 Test Result

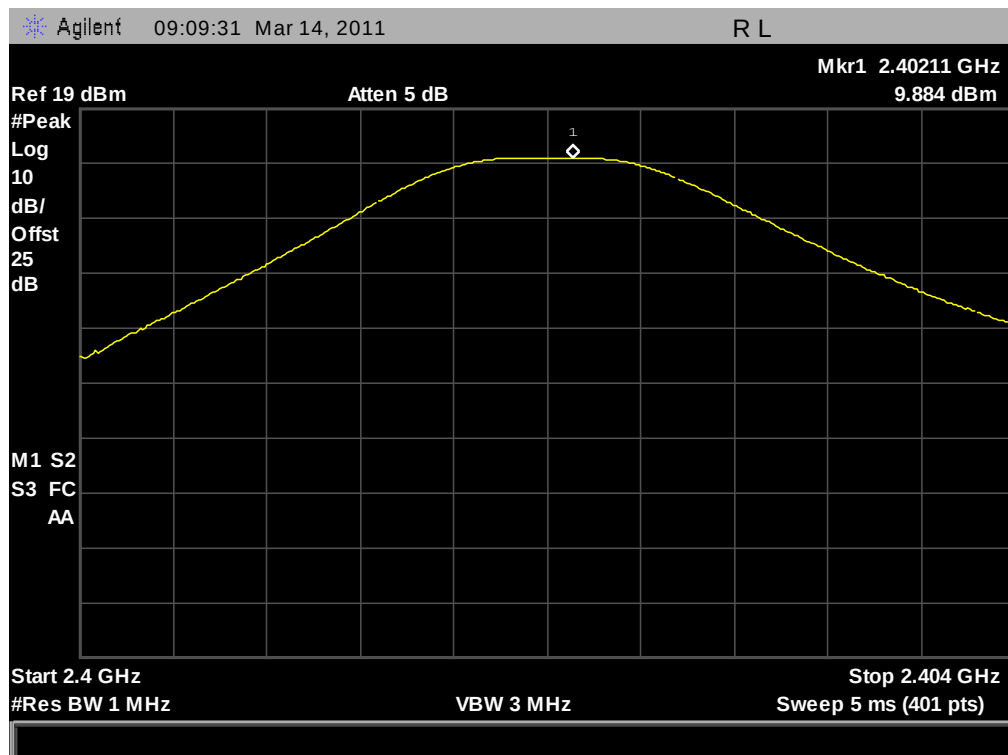
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

#### A. Test Verdict:

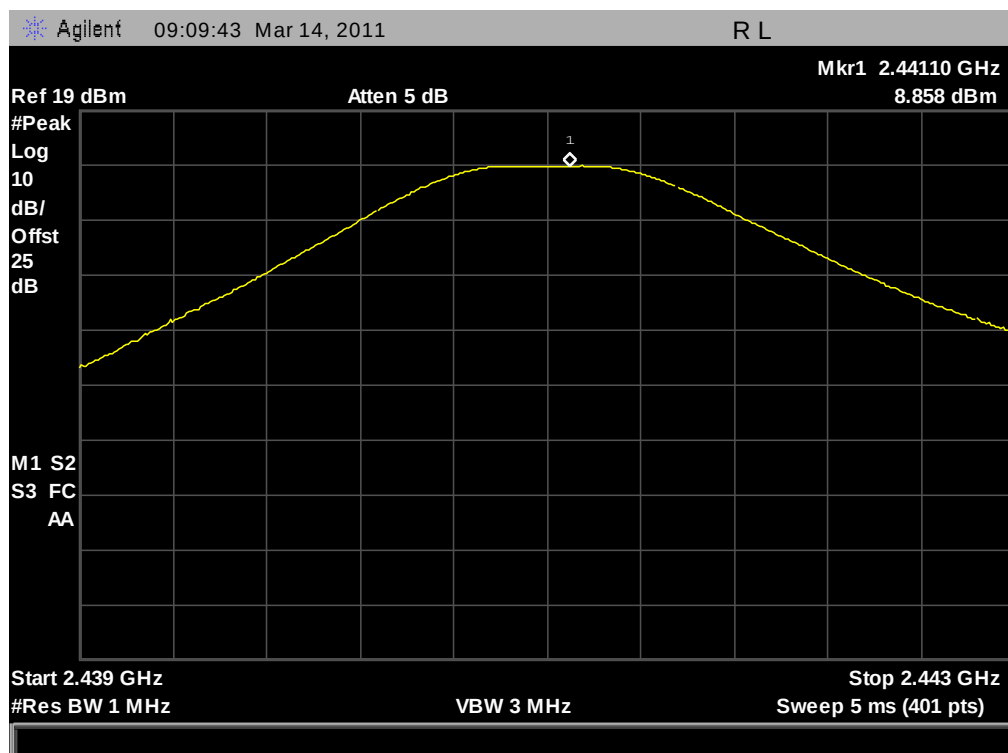
##### GFSK Mode

| Channel | Frequency (MHz) | Measured Output Peak Power |          |               | Limit |   | Verdict |
|---------|-----------------|----------------------------|----------|---------------|-------|---|---------|
|         |                 | dBm                        | W        | Refer to Plot | dBm   | W |         |
| 0       | 2402            | 9.884                      | 0.009736 | Plot A        | 30    | 1 | PASS    |
| 39      | 2441            | 8.858                      | 0.007688 | Plot B        |       |   | PASS    |
| 78      | 2480            | 8.528                      | 0.007125 | Plot C        |       |   | PASS    |

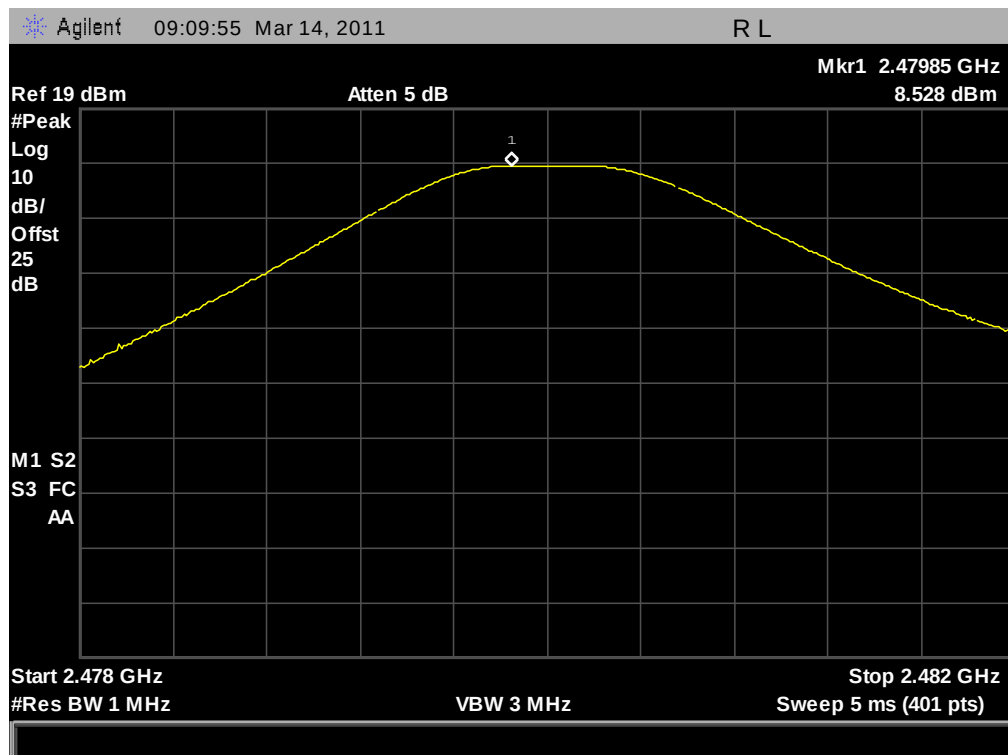
#### B. Test Plot:



(Plot A: Channel = 2402)



(Plot B: Channel = 2441)



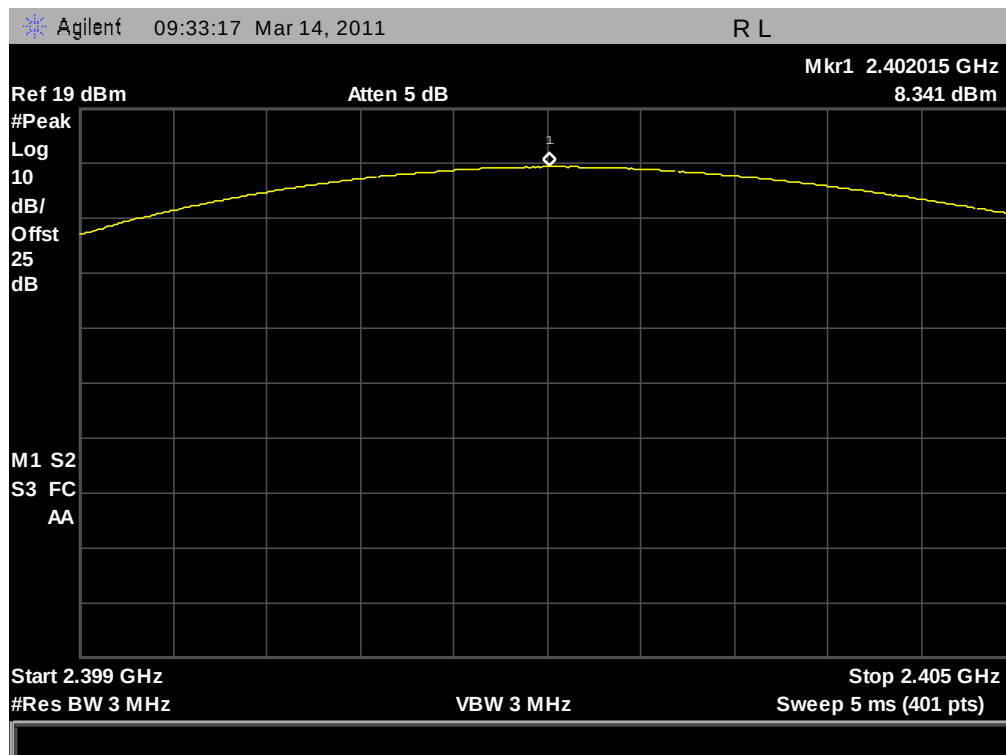
(Plot C: Channel = 2480)

### C. Test Verdict:

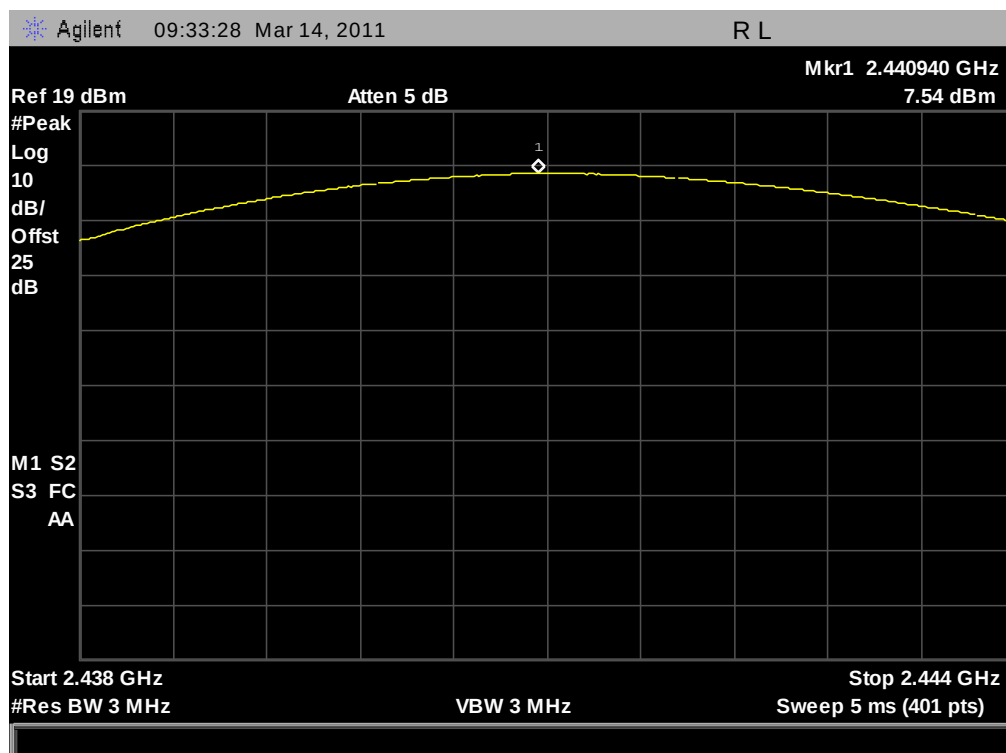
#### $\pi/4$ -DQPSK Mode

| Channel | Frequency (MHz) | Measured Output Peak Power |          |               | Limit |   | Verdict |
|---------|-----------------|----------------------------|----------|---------------|-------|---|---------|
|         |                 | dBm                        | W        | Refer to Plot | dBm   | W |         |
| 0       | 2402            | 8.341                      | 0.006825 | Plot D        | 30    | 1 | PASS    |
| 39      | 2441            | 7.54                       | 0.005675 | Plot E        |       |   | PASS    |
| 78      | 2480            | 7.005                      | 0.005018 | Plot F        |       |   | PASS    |

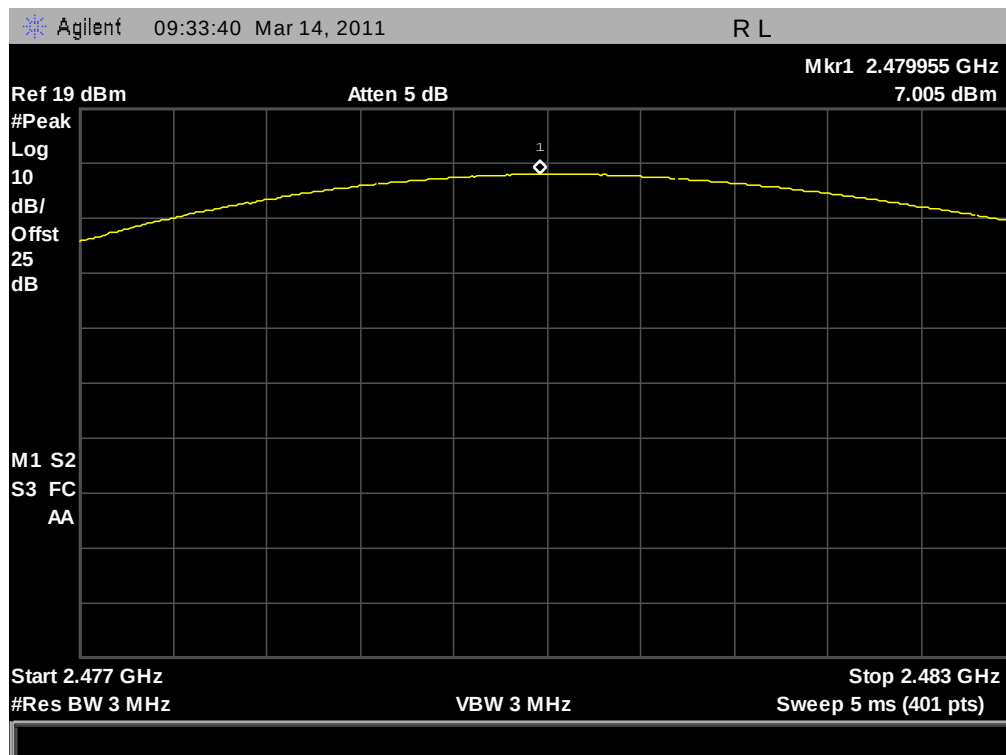
### D. Test Plot:



(Plot D: Channel = 2402)



(Plot E: Channel = 2441)



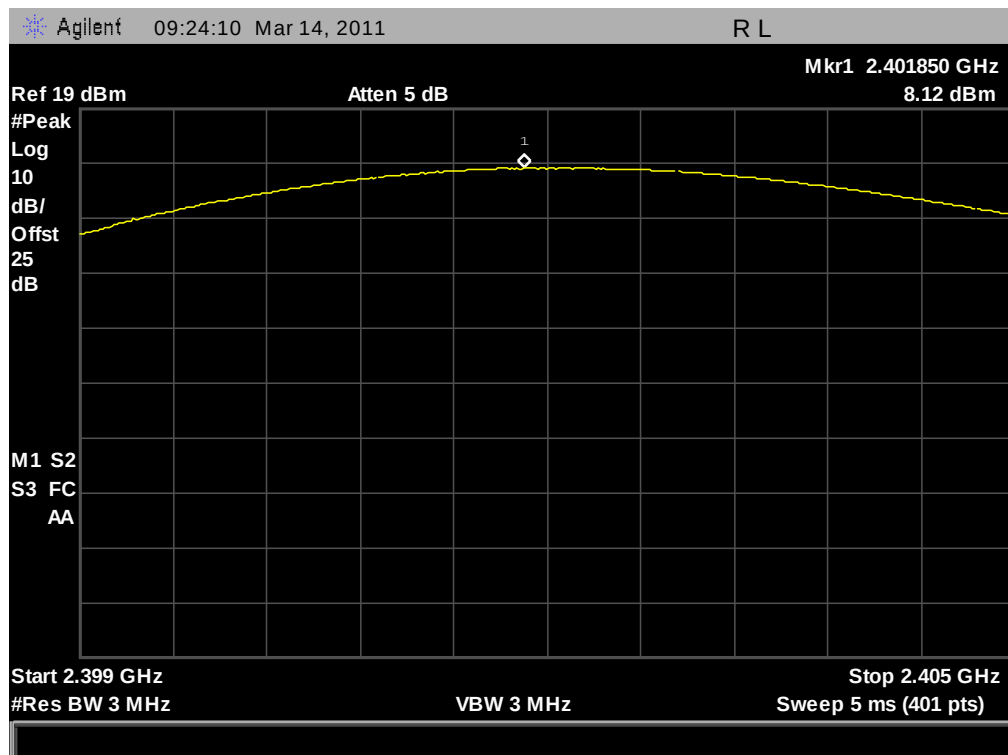
(Plot F: Channel = 2480)

#### E. Test Verdict:

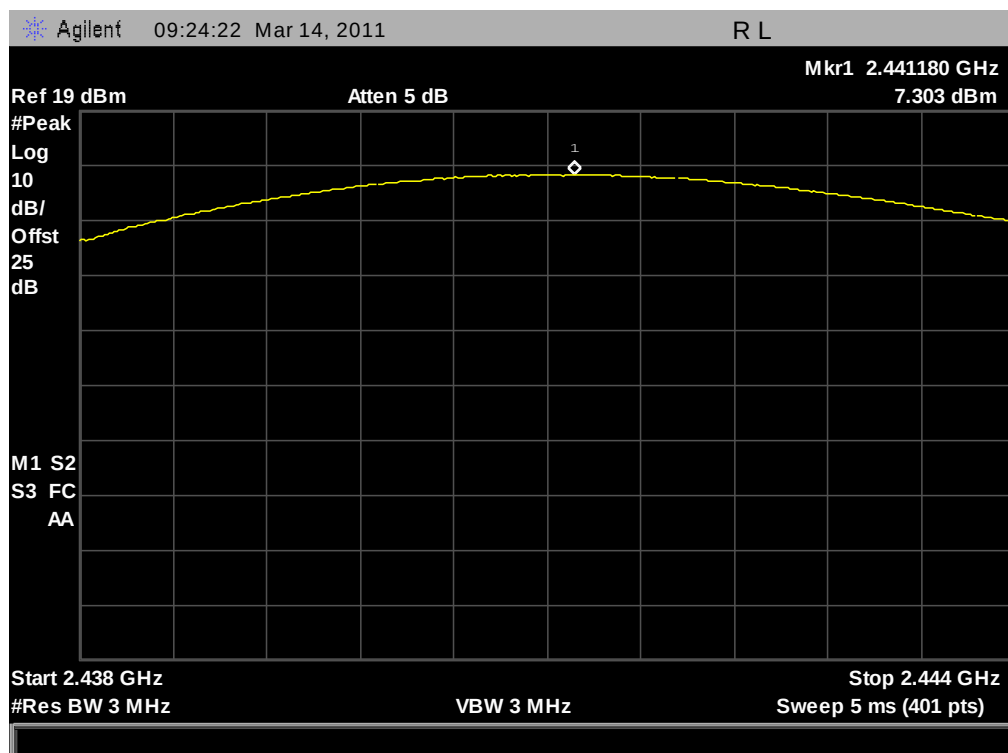
##### 8-DPSK Mode

| Channel | Frequency (MHz) | Measured Output Peak Power |          |               | Limit |   | Verdict |
|---------|-----------------|----------------------------|----------|---------------|-------|---|---------|
|         |                 | dBm                        | W        | Refer to Plot | dBm   | W |         |
| 0       | 2402            | 8.12                       | 0.006486 | Plot G        | 30    | 1 | PASS    |
| 39      | 2441            | 7.303                      | 0.005374 | Plot H        |       |   | PASS    |
| 78      | 2480            | 6.763                      | 0.004746 | Plot I        |       |   | PASS    |

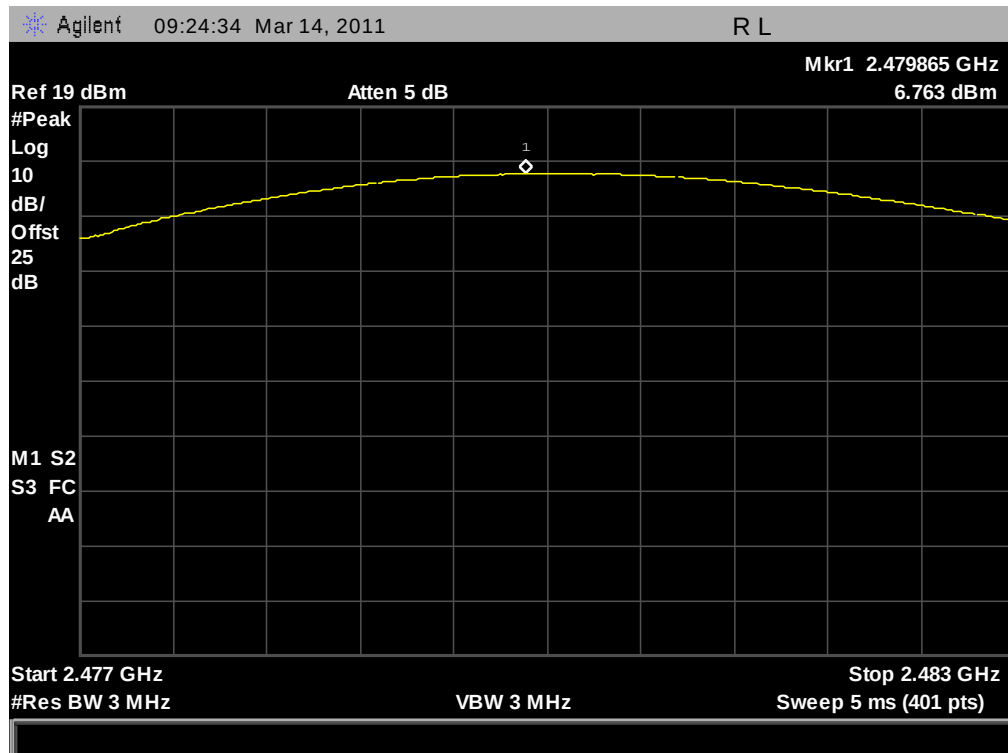
#### F. Test Plot:



(Plot G: Channel = 2402)



(Plot H: Channel = 2441)



(Plot I: Channel = 2480)



## 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 ( $10 \cdot \log 1\% = 20\text{dB}$ ) taking the total RF output power.

### 2.3.2 Test Description

See section 2.1.2 of this report.

### 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.

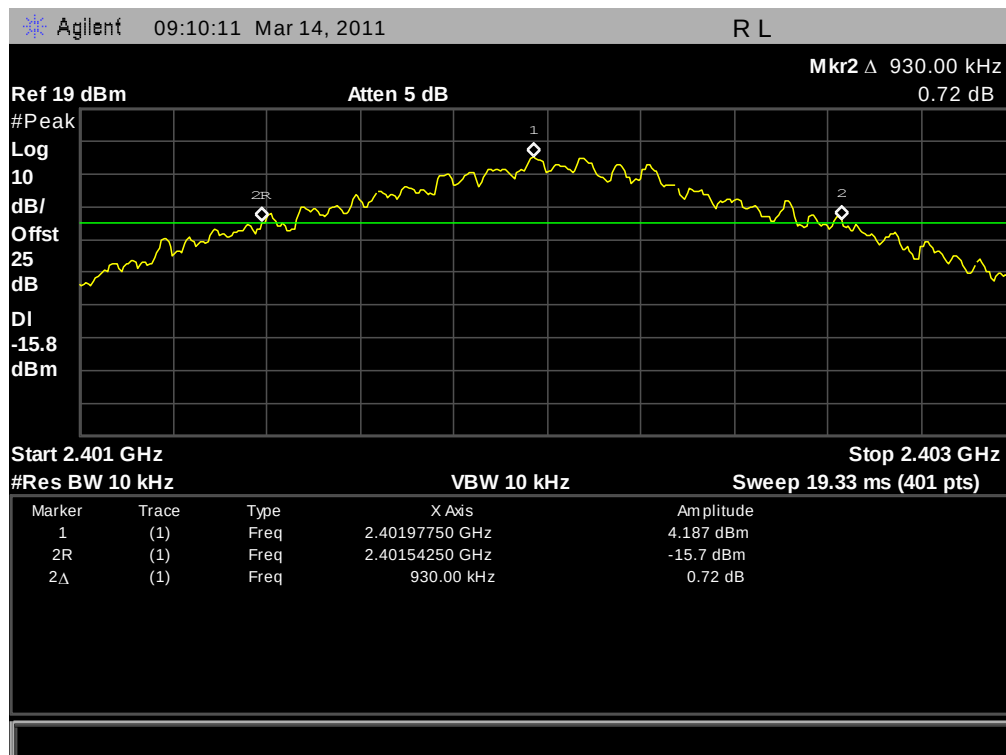
#### A. Test Verdict:

##### GFSK Mode

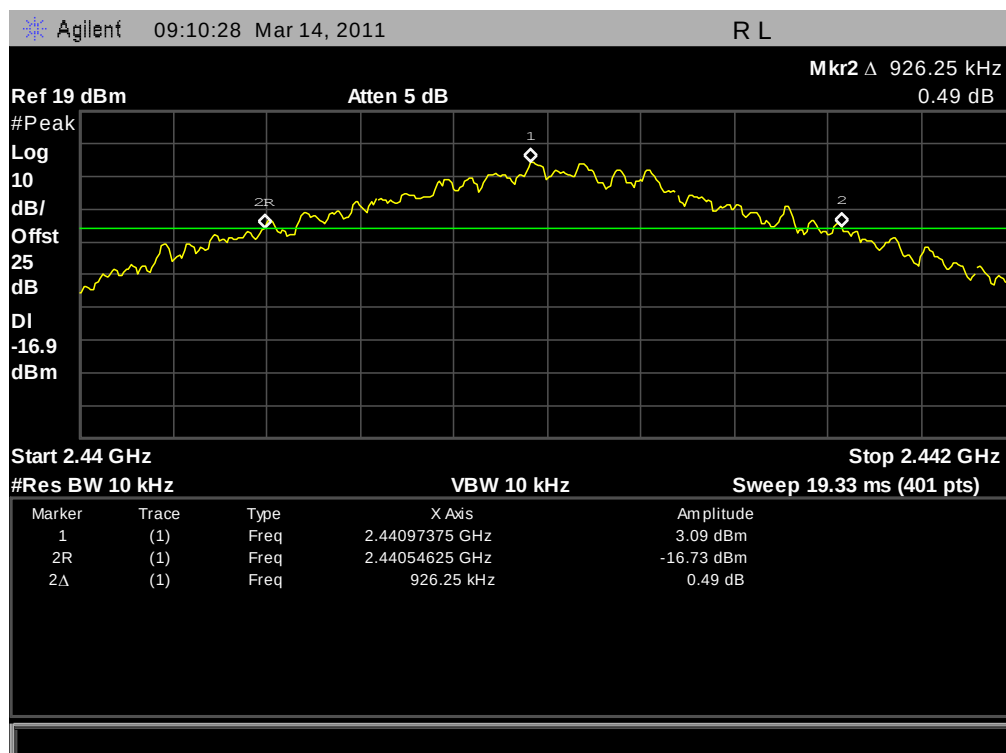
The maximum 20dB bandwidth measured is 930.0KHz according to the table below.

| Channel | Frequency (MHz) | 20dB Bandwidth (KHz) | Refer to Plot |
|---------|-----------------|----------------------|---------------|
| 0       | 2402            | 930.00               | Plot A        |
| 39      | 2441            | 926.25               | Plot B        |
| 78      | 2480            | 926.25               | Plot C        |

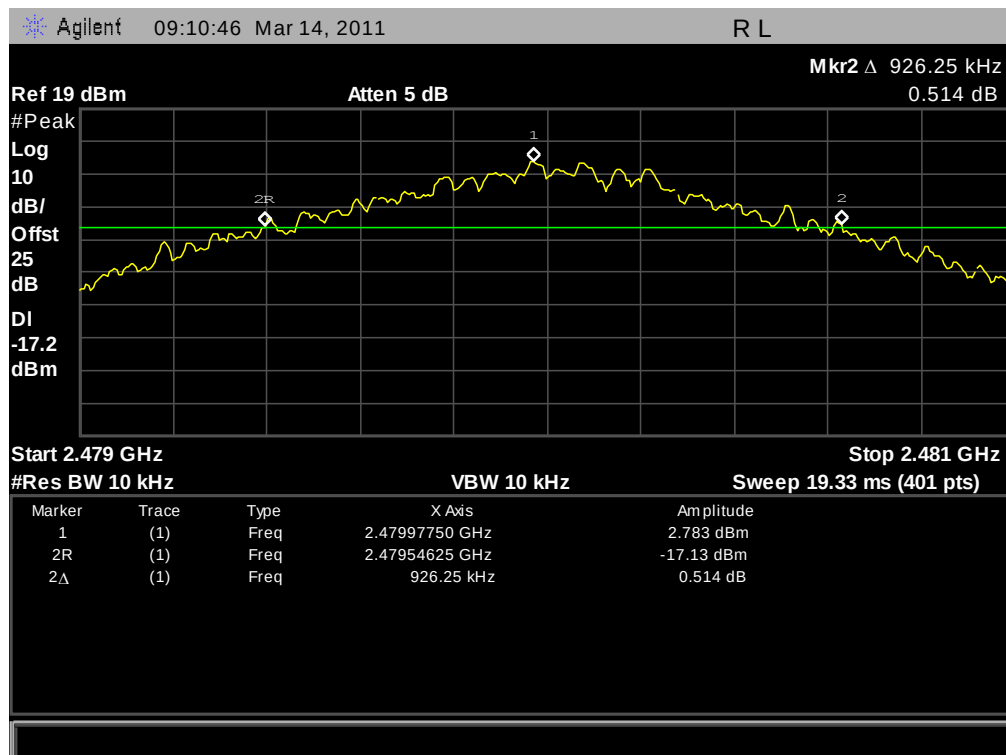
#### B. Test Plot:



(Plot A: Channel = 2402)



(Plot B: Channel = 2441)



(Plot C: Channel = 2480)

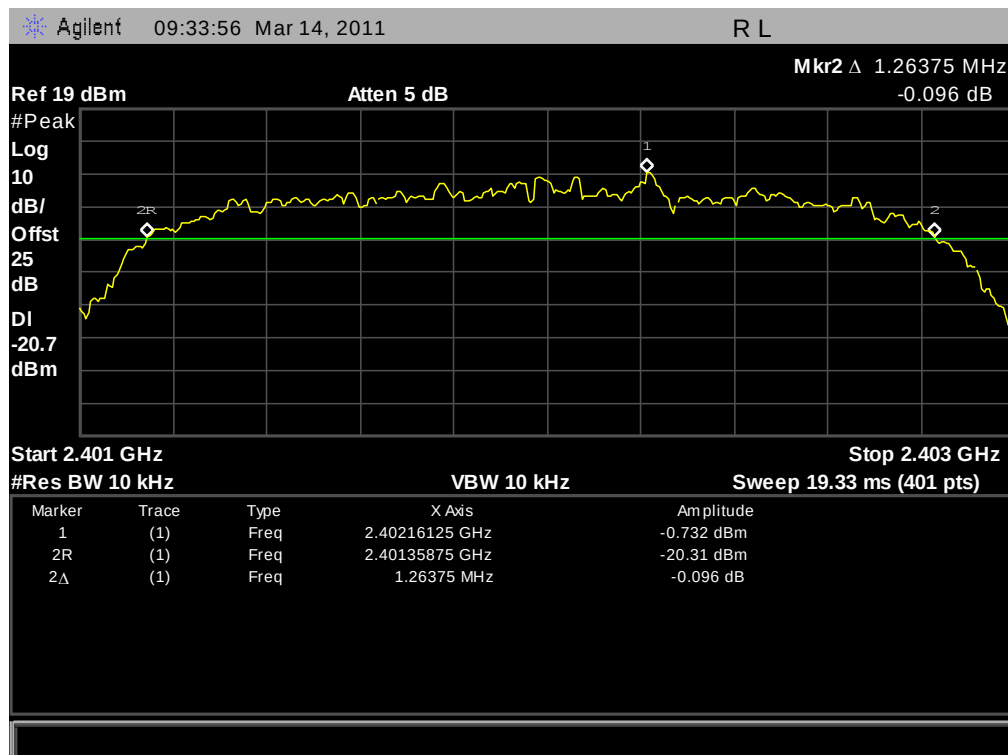
### C. Test Verdict:

#### $\pi/4$ -DQPSK Mode

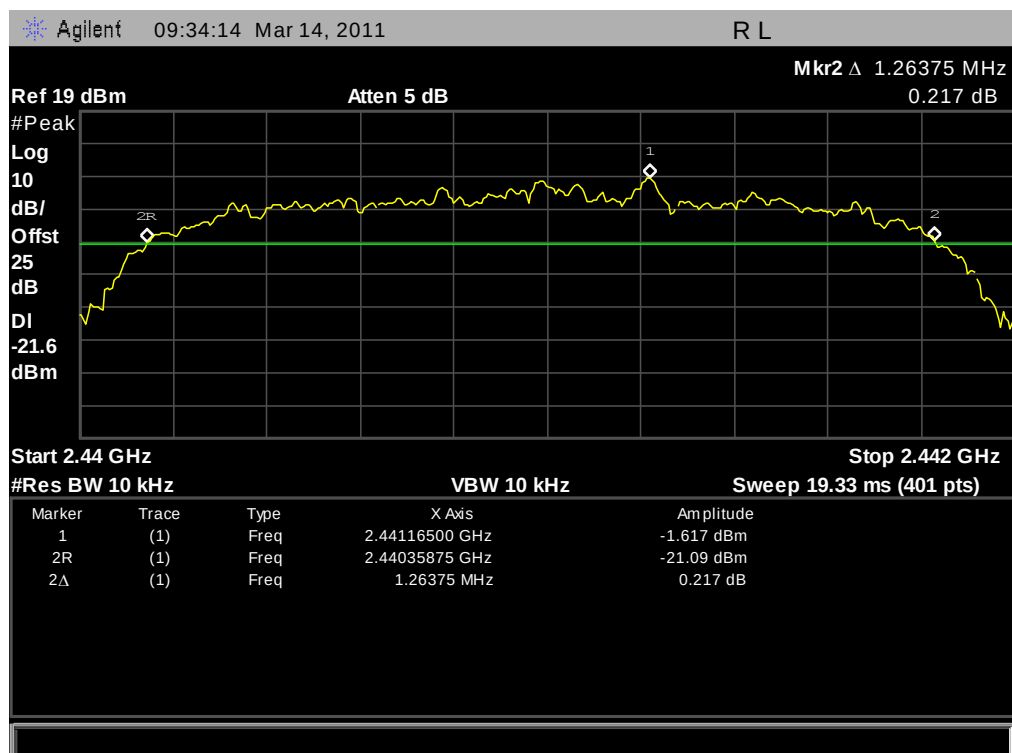
The maximum 20dB bandwidth measured is 1.264MHz according to the table below.

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---------|-----------------|----------------------|---------------|
| 0       | 2402            | 1.264                | Plot D        |
| 39      | 2441            | 1.264                | Plot E        |
| 78      | 2480            | 1.264                | Plot F        |

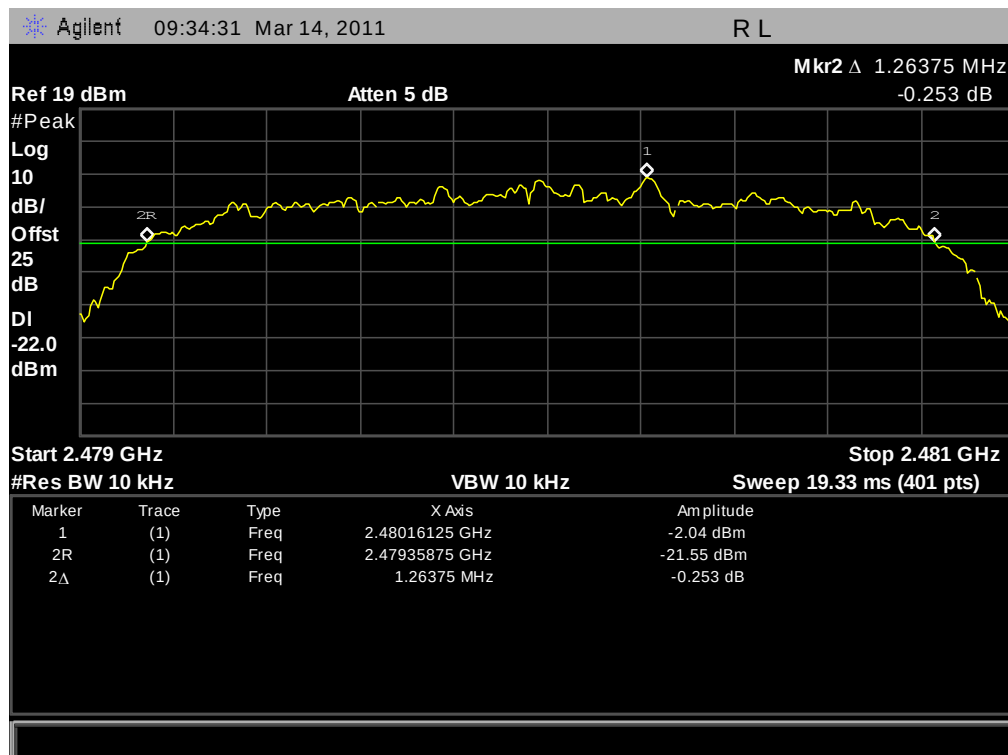
### D. Test Plot:



(Plot D: Channel = 2402)



(Plot E: Channel = 2441)



(Plot F: Channel = 2480)

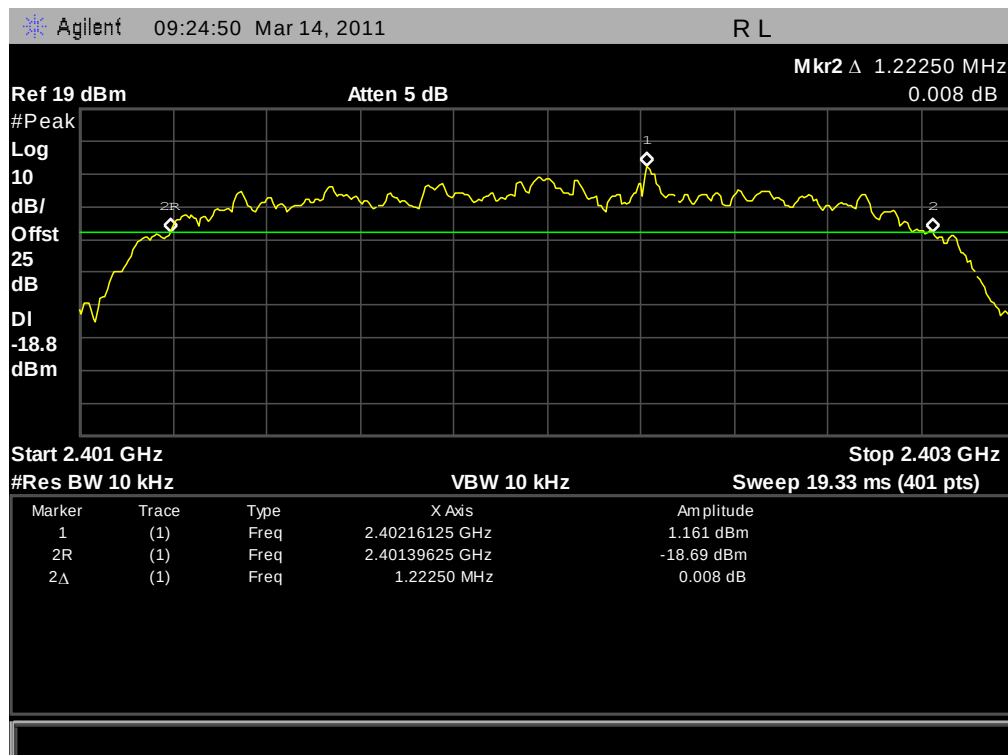
## E. Test Verdict:

### 8-DPSK Mode

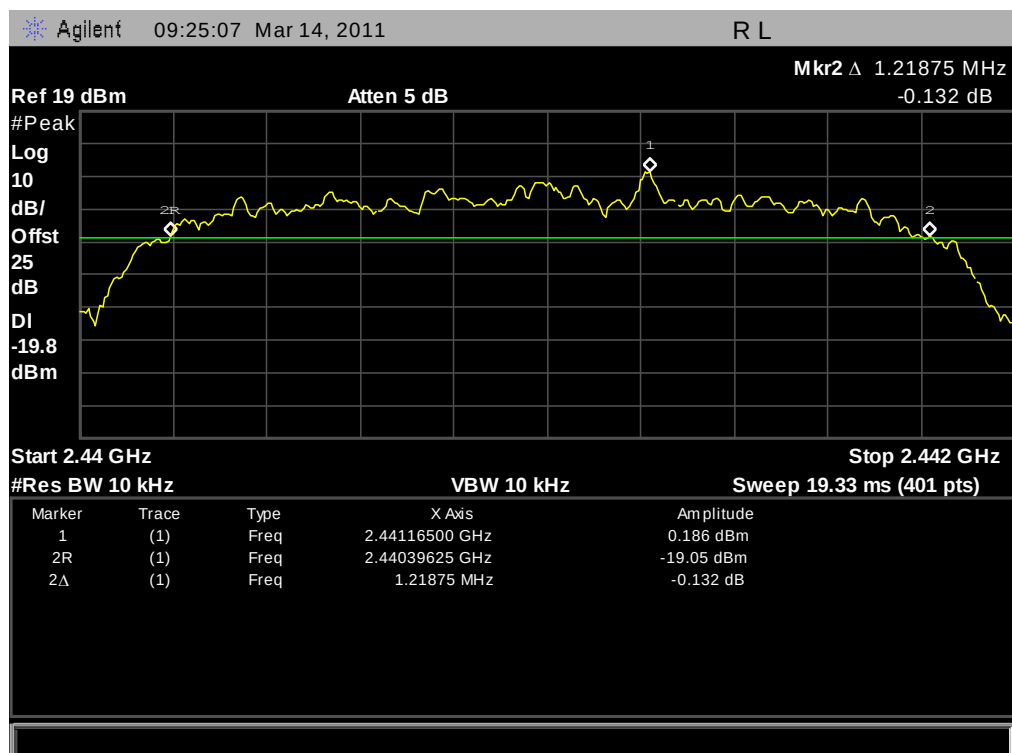
The maximum 20dB bandwidth measured is 1.223MHz according to the table below.

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---------|-----------------|----------------------|---------------|
| 0       | 2402            | 1.223                | Plot G        |
| 39      | 2441            | 1.219                | Plot H        |
| 78      | 2480            | 1.219                | Plot I        |

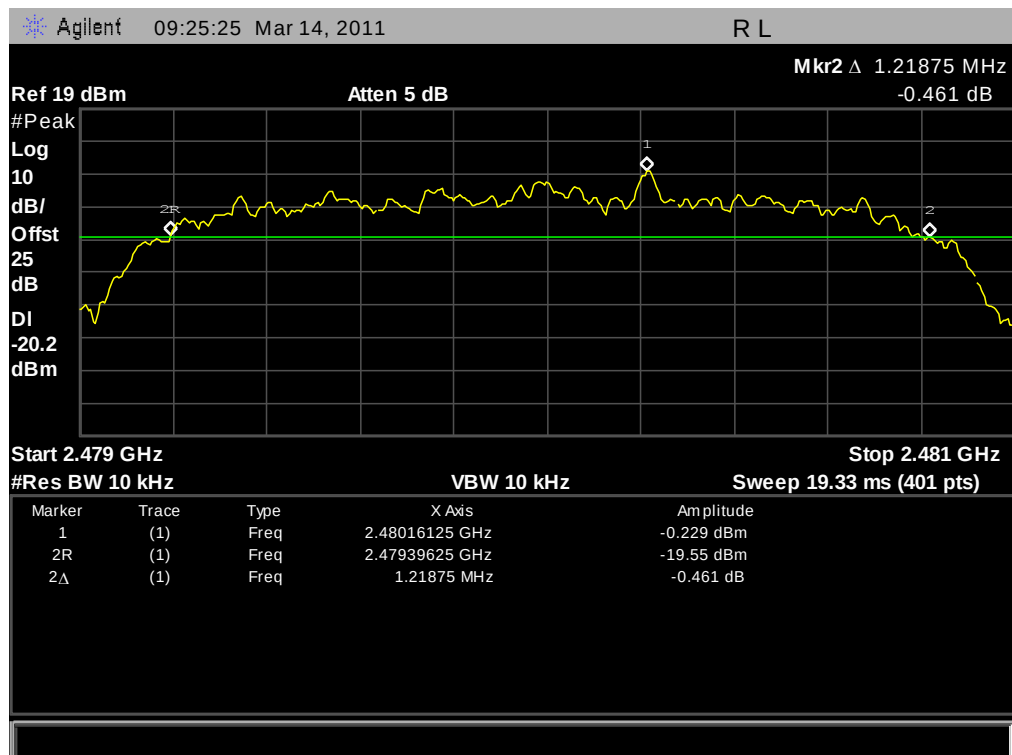
## F. Test Plot:



(Plot G: Channel = 2402)



(Plot H: Channel = 2441)



(Plot I: Channel = 2480)

## 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.

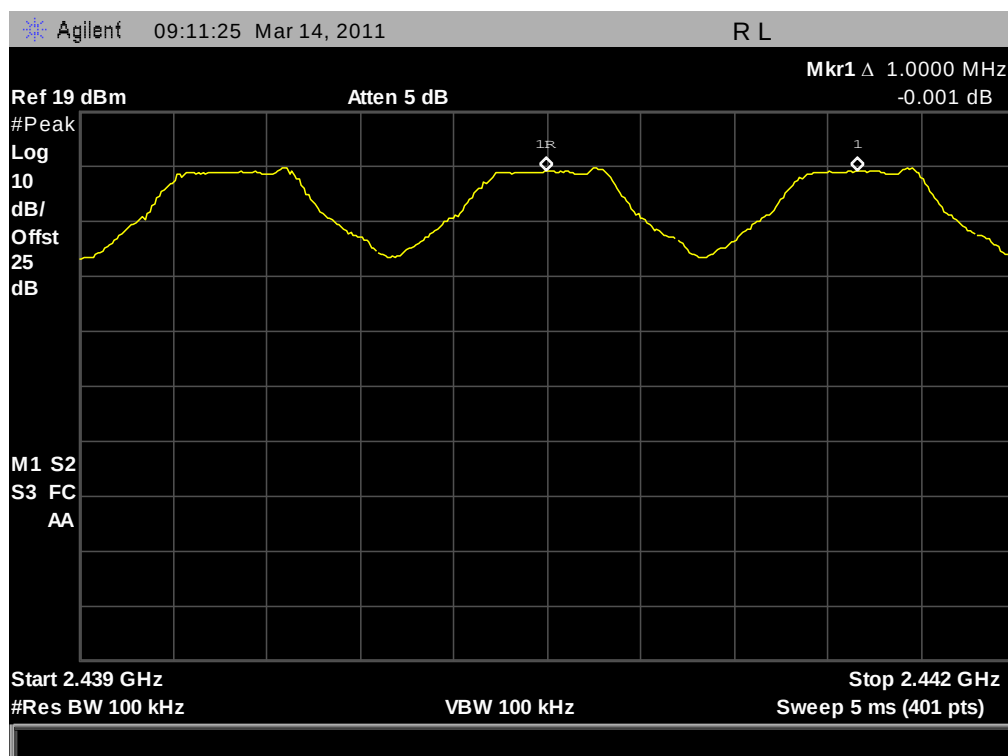
### 2.4.2 Test Description

See section 2.1.2 of this report.

### 2.4.3 Test Result

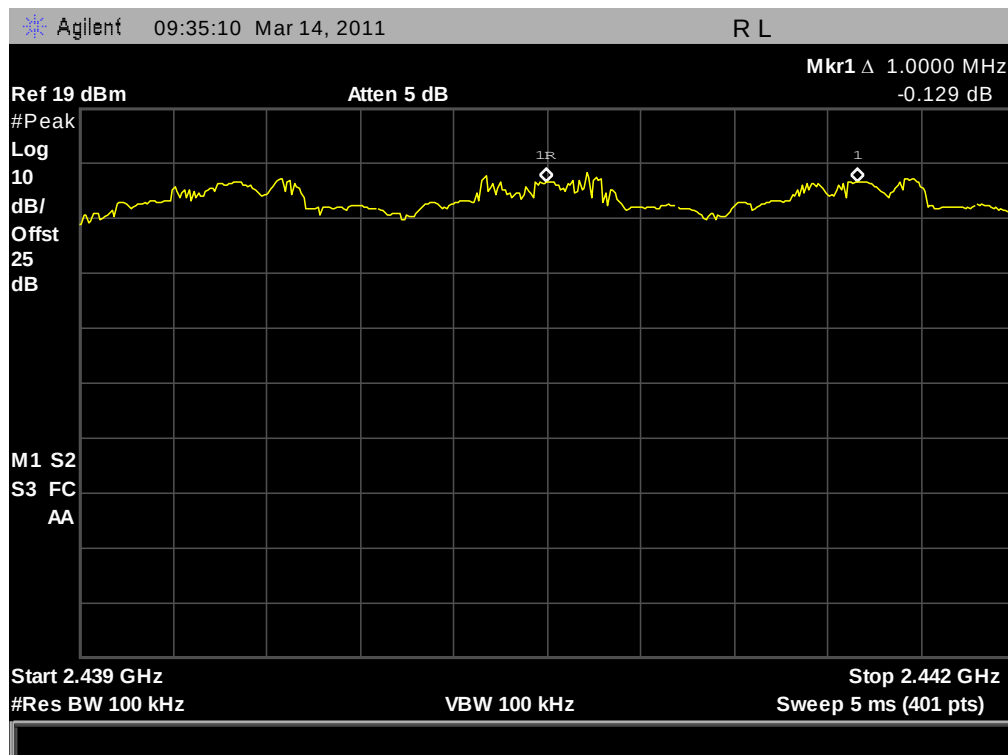
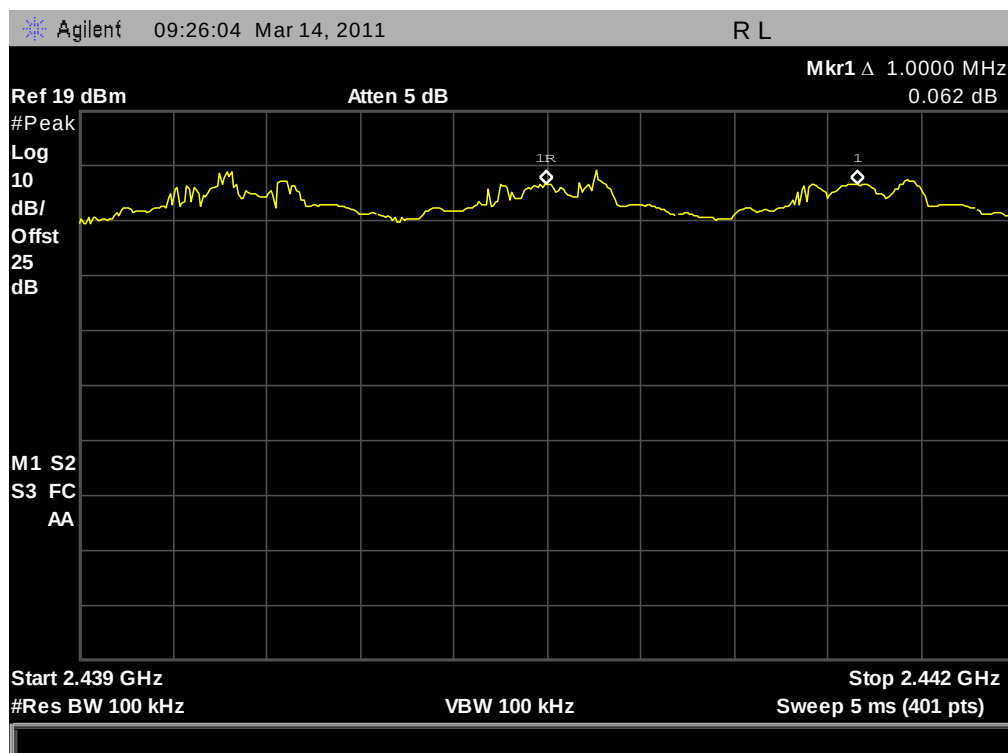
The Bluetooth Module operates at hopping-on test mode.

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 (930.0KHz for GFSK mode, 1.264MHz for  $\pi/4$ -DQPSK mode and 1.223MHz for 8-DPSK mode, refer to section 2.3.3), whichever is greater. So, the verdict is PASS.



(Plot A: GFSK)




(Plot B:  $\pi/4$ -DQPSK)


(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

See section 2.1.2 of this report.

### 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):

$$\begin{aligned}\{\text{Total of Dwell}\} &= \{\text{Pulse Time}\} * (1600 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\} \\ \{\text{Period}\} &= 0.4s * \{\text{Number of Hopping Frequency}\}\end{aligned}$$

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.

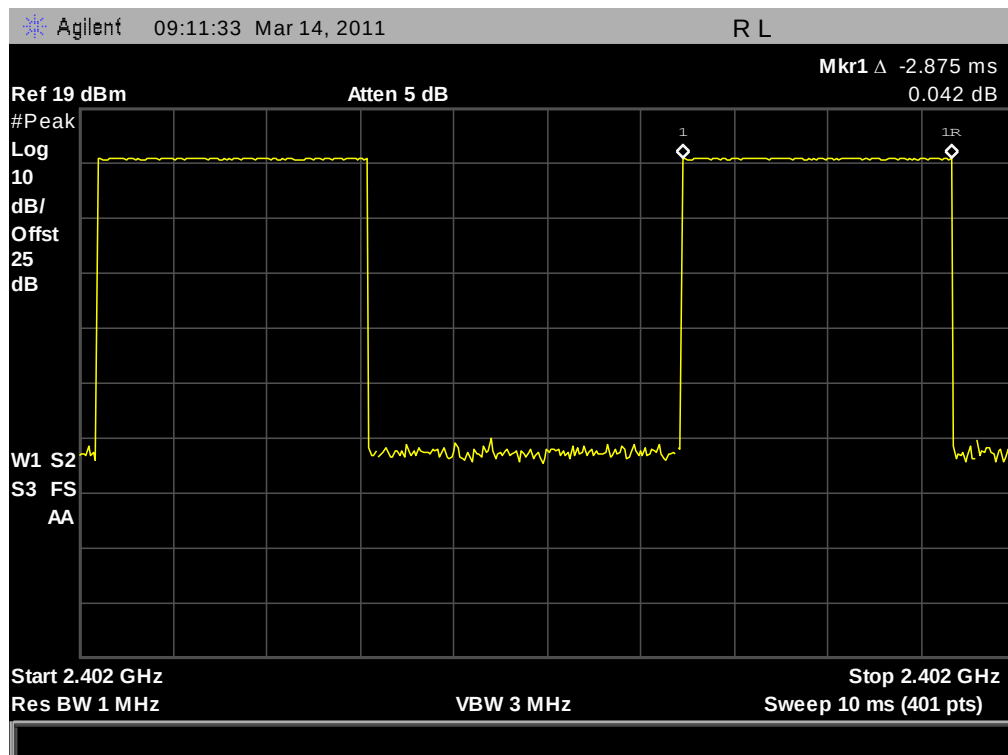
#### A. Test Verdict:

##### GFSK Mode

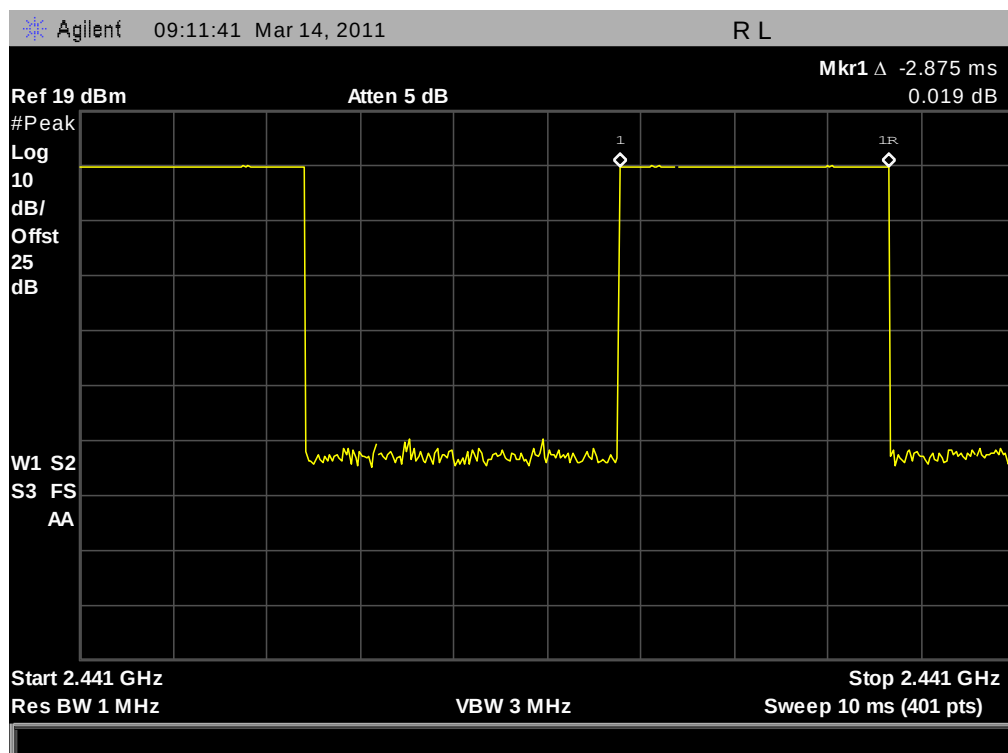
| Channel | Frequency (MHz) | Pulse Time |               | Total of Dwell (ms) | Limit (ms) | Verdict |
|---------|-----------------|------------|---------------|---------------------|------------|---------|
|         |                 | ms         | Refer to Plot |                     |            |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

#### B. Test Plot:

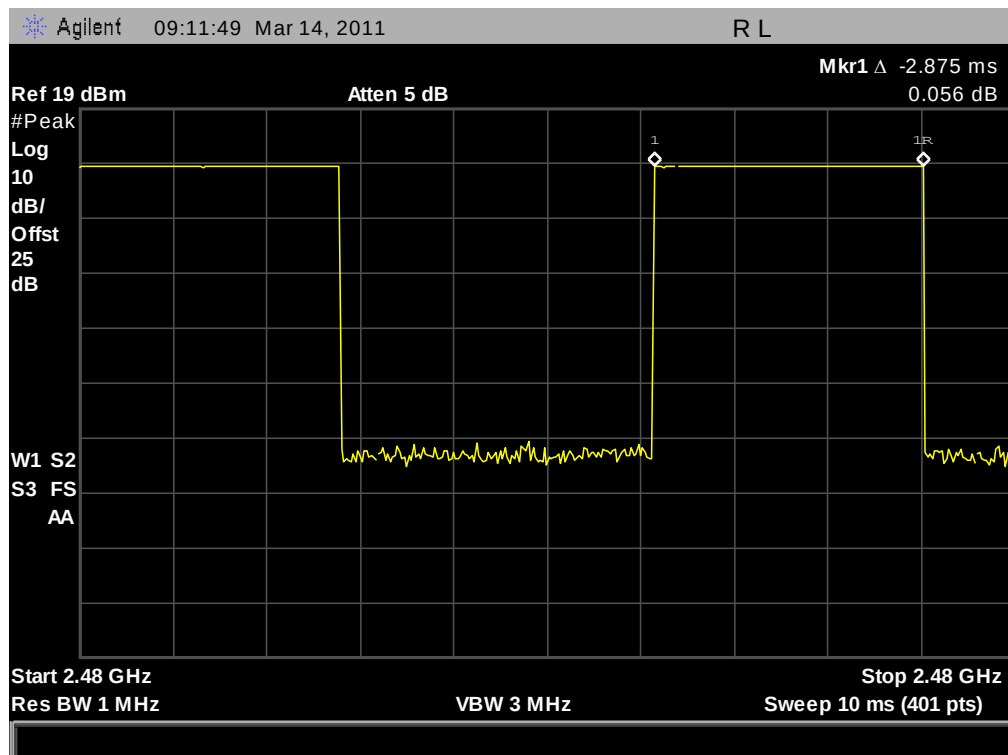
Note: the following plots record the Pulse Time of the Module carrier.



(Plot A: Channel = 2402)



(Plot B: Channel = 2441)



(Plot C: Channel = 2480)

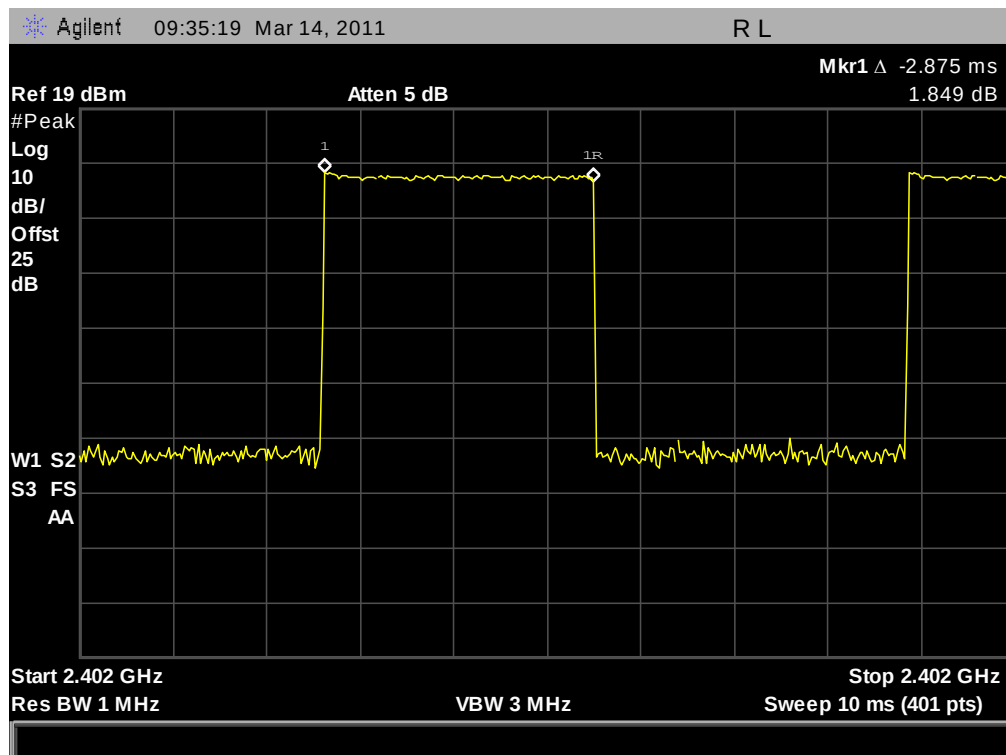
### C. Test Verdict:

#### $\pi/4$ -DQPSK Mode

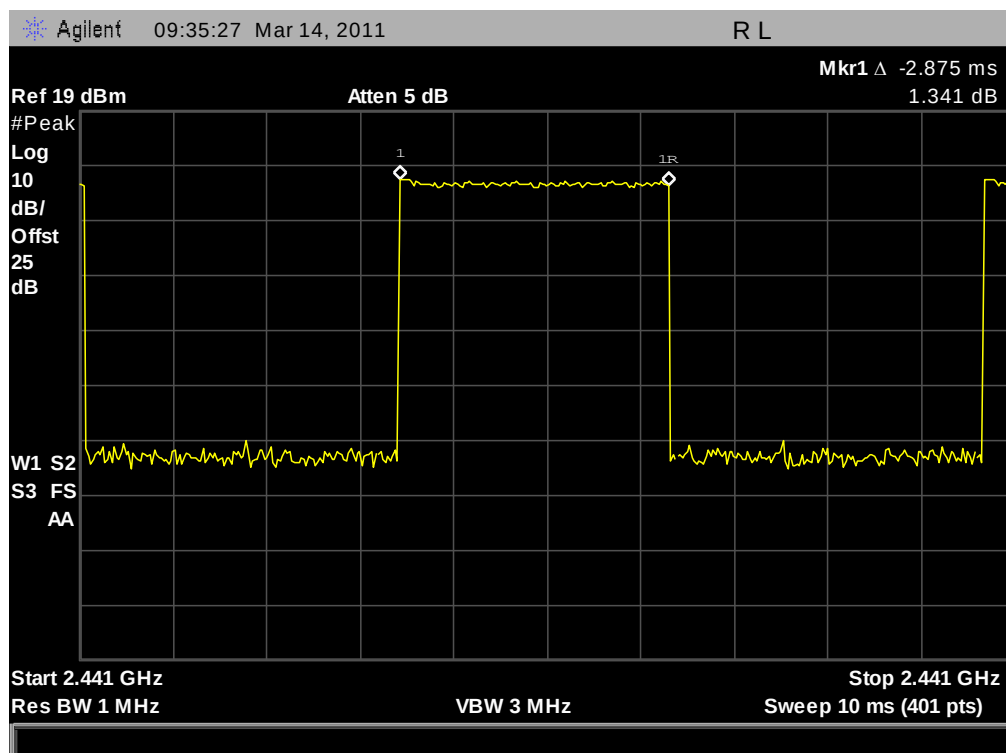
| Channel | Frequency (MHz) | Pulse Time |               | Total of Dwell (ms) | Limit (ms) | Verdict |
|---------|-----------------|------------|---------------|---------------------|------------|---------|
|         |                 | ms         | Refer to Plot |                     |            |         |
| 0       | 2402            | 2.875      | Plot D        | 306.667             | 400        | PASS    |
| 39      | 2441            | 2.875      | Plot E        | 306.667             |            | PASS    |
| 78      | 2480            | 2.900      | Plot F        | 309.333             |            | PASS    |

### D. Test Plot:

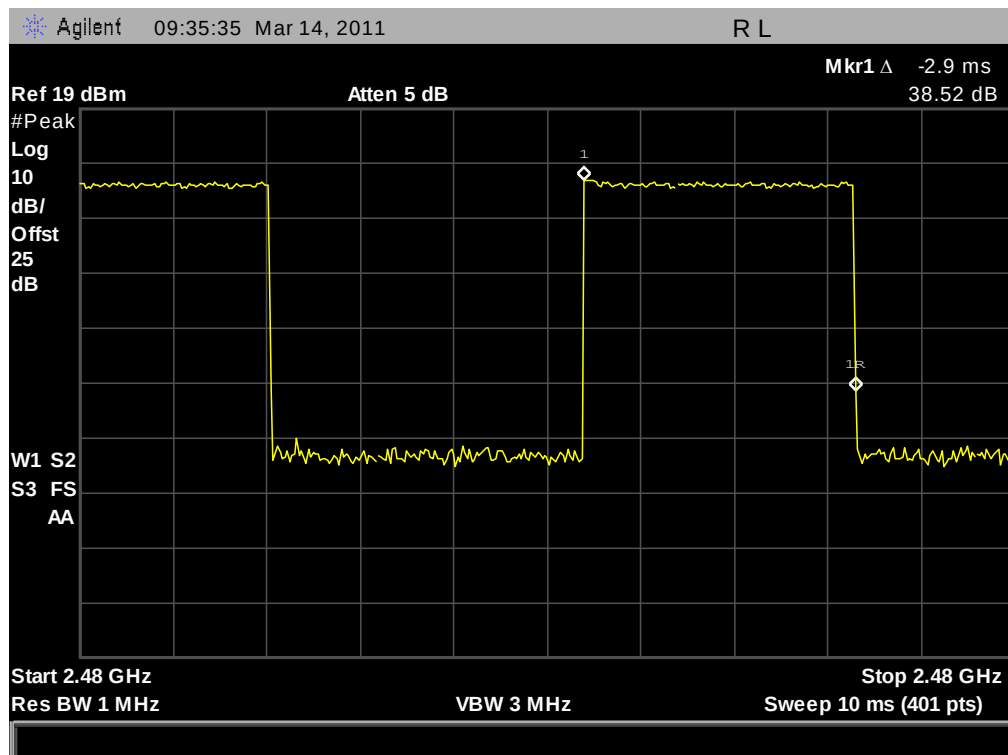
Note: the following plots record the Pulse Time of the Module carrier.



(Plot D: Channel = 2402)



(Plot E: Channel = 2441)



(Plot F: Channel = 2480)

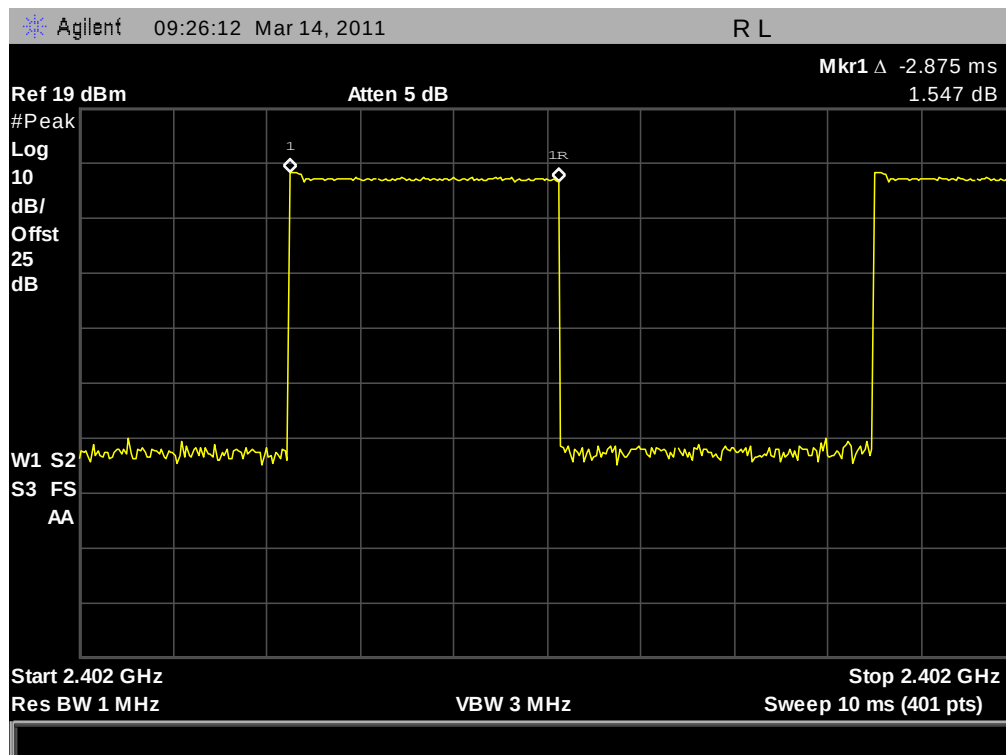
### E. Test Verdict (8-DPSK mode):

#### 8-DPSK Mode

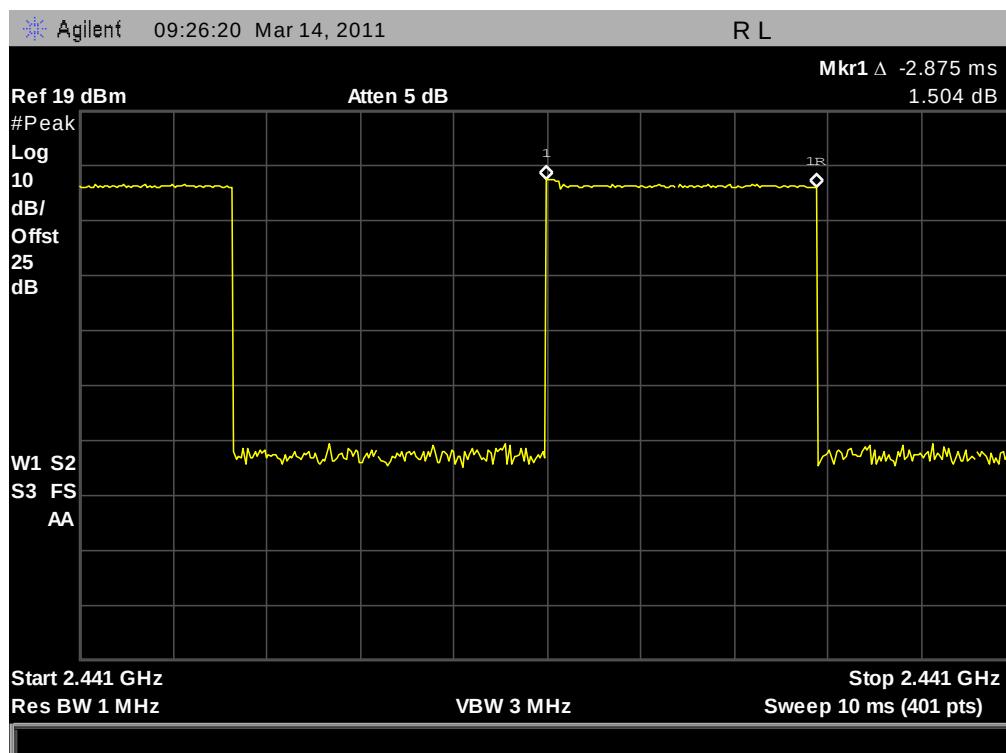
| Channel | Frequency (MHz) | Pulse Time |               | Total of Dwell (ms) | Limit (ms) | Verdict |
|---------|-----------------|------------|---------------|---------------------|------------|---------|
|         |                 | ms         | Refer to Plot |                     |            |         |
| 0       | 2402            | 2.875      | Plot G        | 306.667             | 400        | PASS    |
| 39      | 2441            | 2.875      | Plot H        | 306.667             |            | PASS    |
| 78      | 2480            | 2.875      | Plot I        | 306.667             |            | PASS    |

### F. Test Plot:

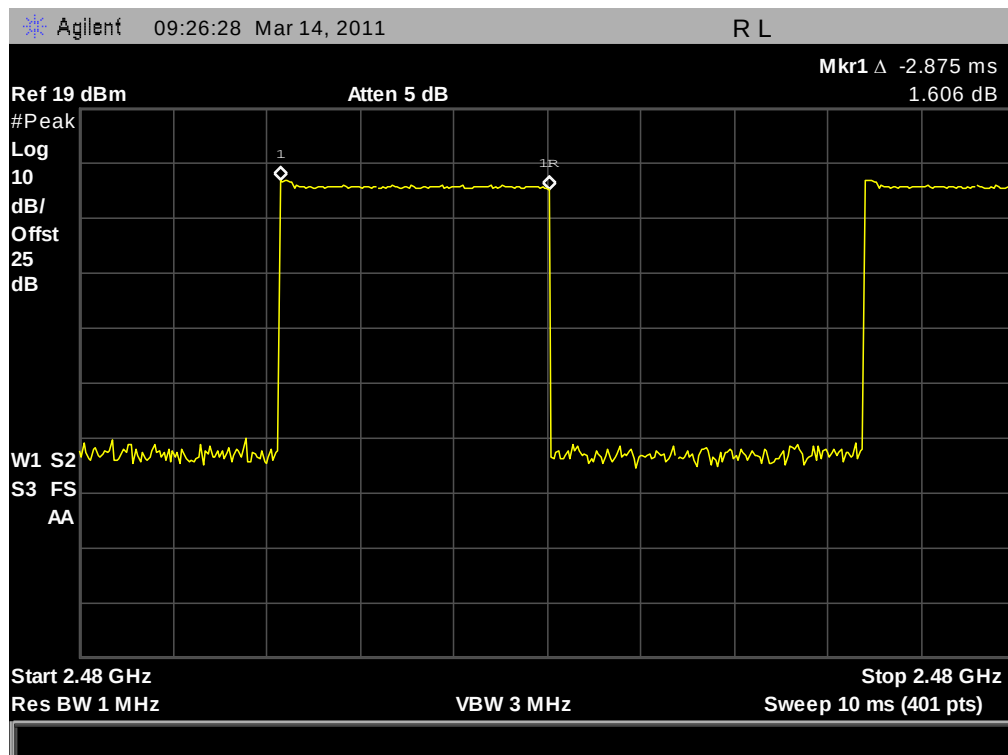
Note: the following plots record the Pulse Time of the Module carrier.



(Plot G: Channel = 2402)



(Plot H: Channel = 2441)



(Plot I: Channel = 2480)



## 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

See section 2.1.2 of this report.

### 2.6.3 Test Result

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

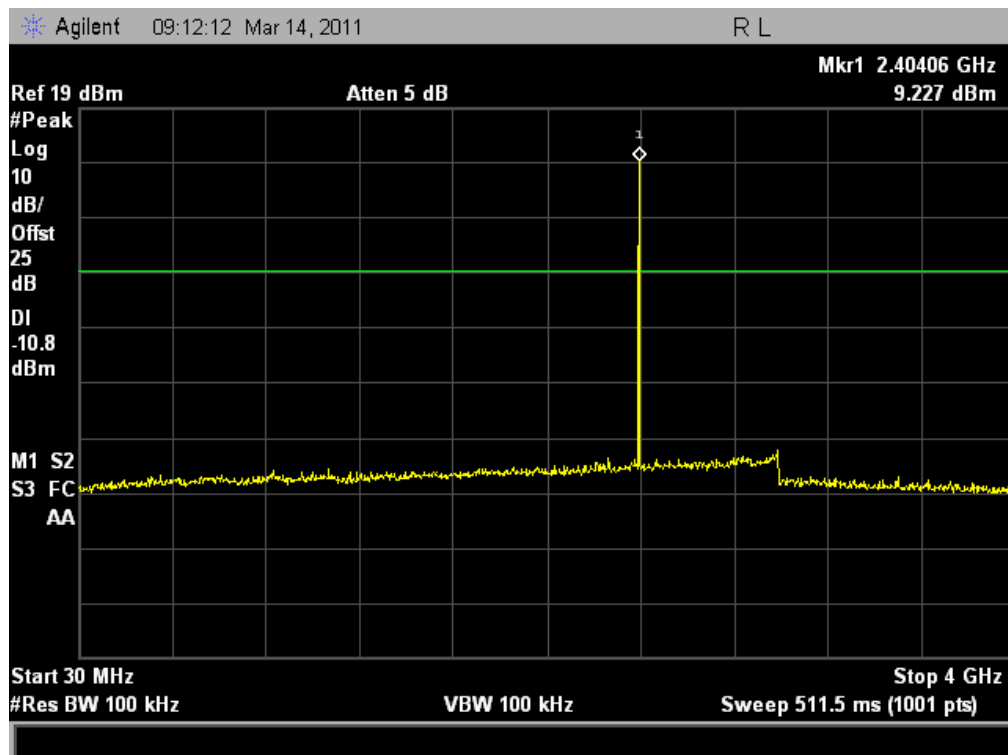
#### A. Test Verdict:

##### GFSK Mode

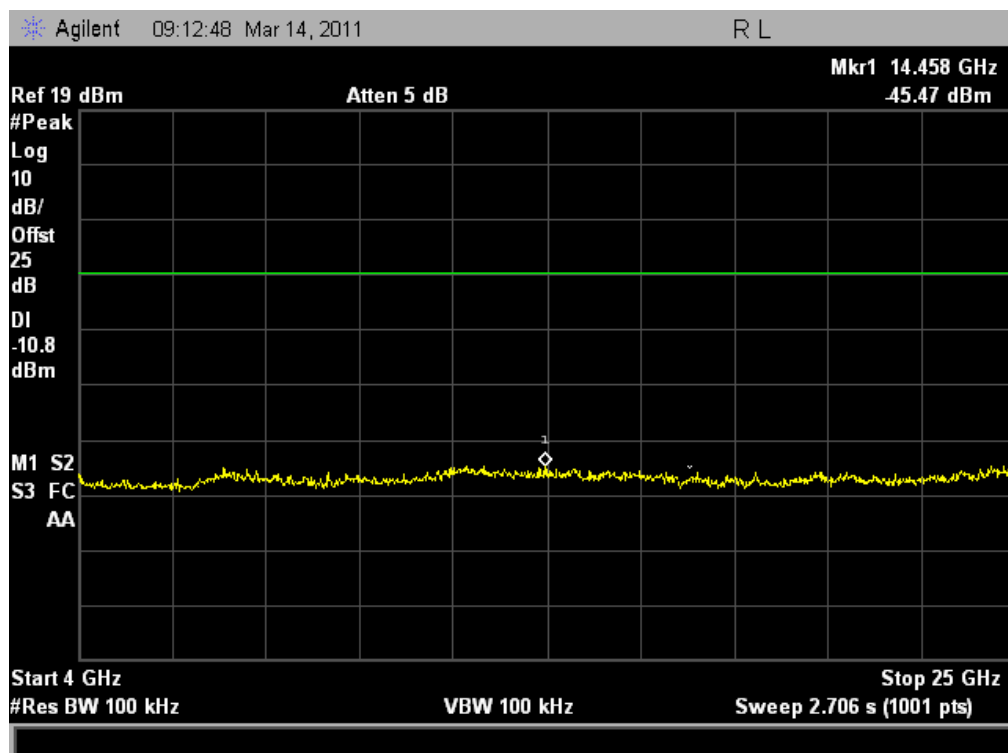
| Channel | Frequency (MHz) | Measured Max. Out of Band Emission (dBm) | Refer to Plot | Limit (dBm)   |                         | Verdict |
|---------|-----------------|------------------------------------------|---------------|---------------|-------------------------|---------|
|         |                 |                                          |               | Carrier Level | Calculated -20dBc Limit |         |
| 0       | 2402            | -45.47                                   | Plot A.1/A.2  | 9.227         | -10.8                   | PASS    |
| 39      | 2441            | -45.2                                    | Plot B.1/B.2  | 8.477         | -11.5                   | PASS    |
| 78      | 2480            | -44.78                                   | Plot C.1/C.2  | 8.192         | -11.8                   | PASS    |

#### B. Test Plot:

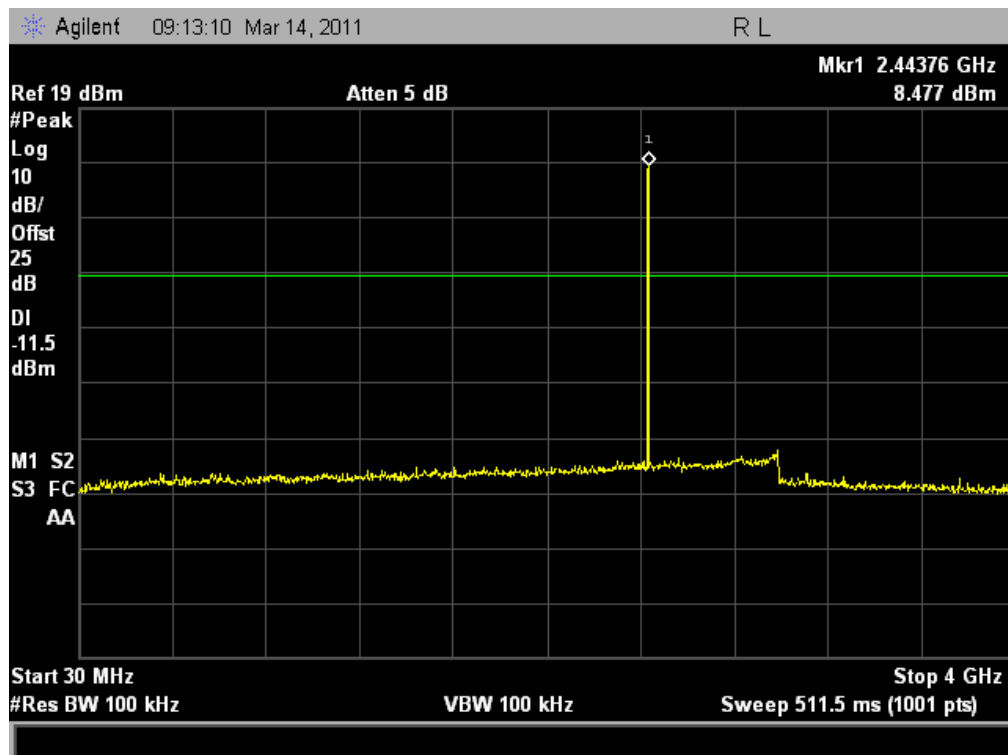
Note: the power of the Module transmitting frequency should be ignored.



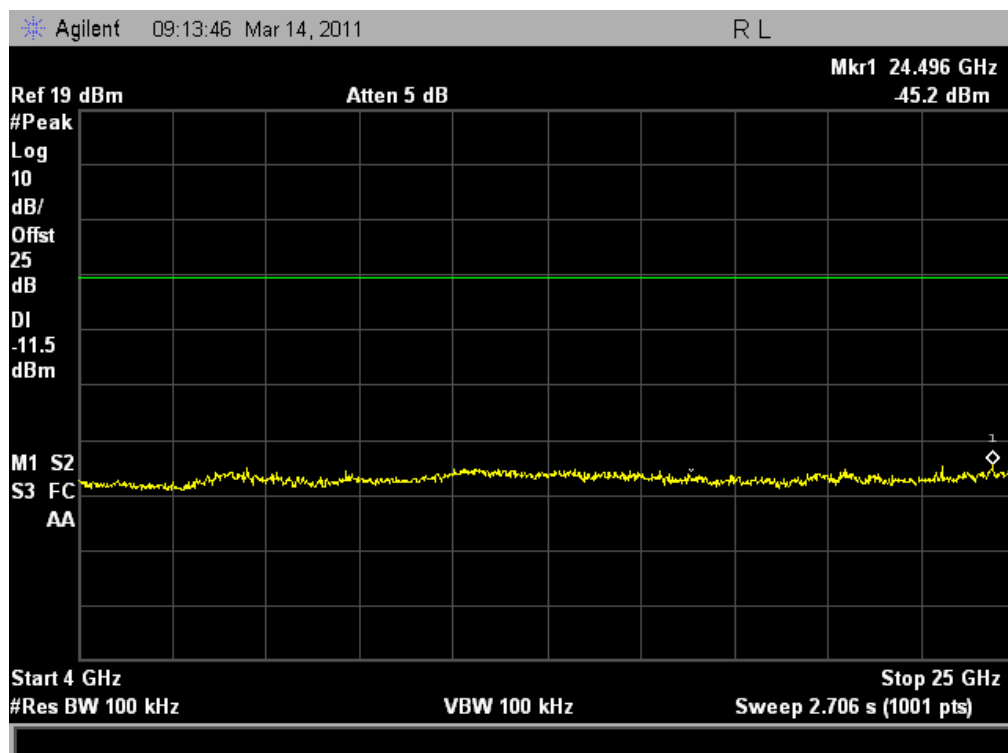
(Plot A.1: Channel = 0, 30MHz to 4GHz)



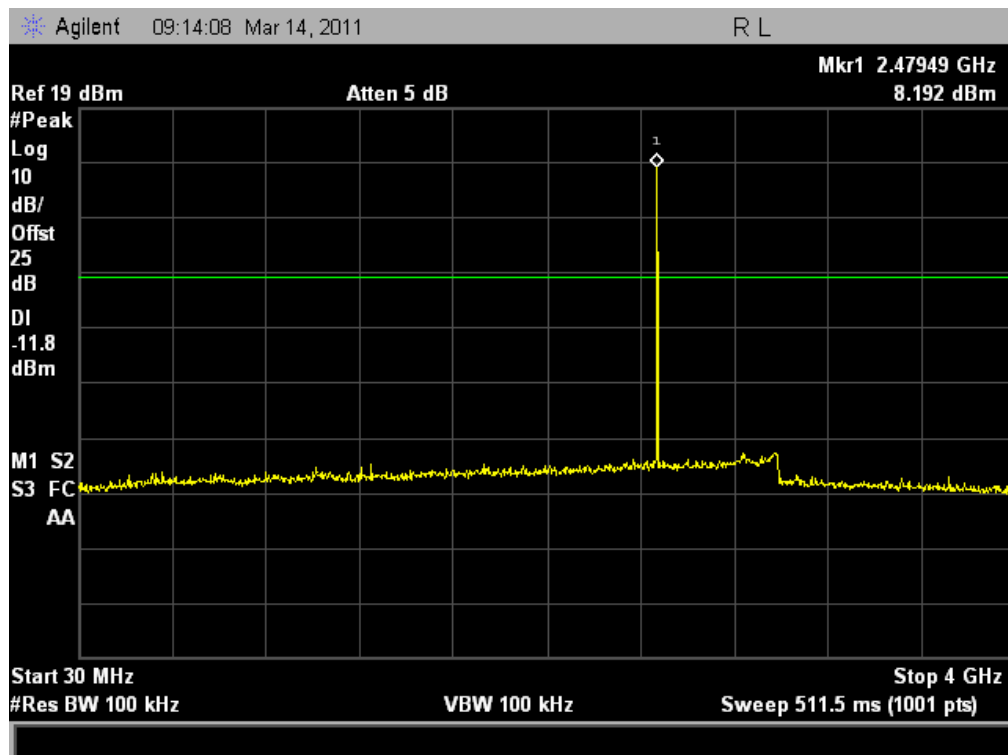
(Plot A.2: Channel = 0, 4GHz to 25GHz)



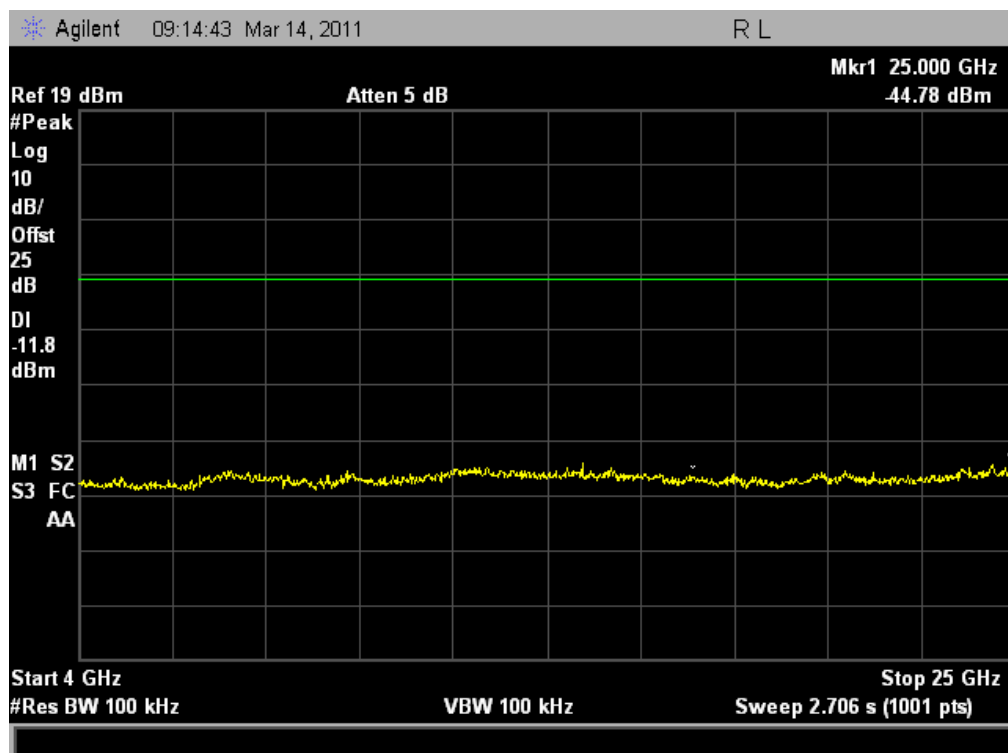
(Plot B.1: Channel = 39, 30MHz to 4GHz)



(Plot B.2: Channel = 39, 4GHz to 25GHz)



(Plot C.1: Channel = 78, 30MHz to 4GHz)



(Plot C.2: Channel = 78, 4GHz to 25GHz)

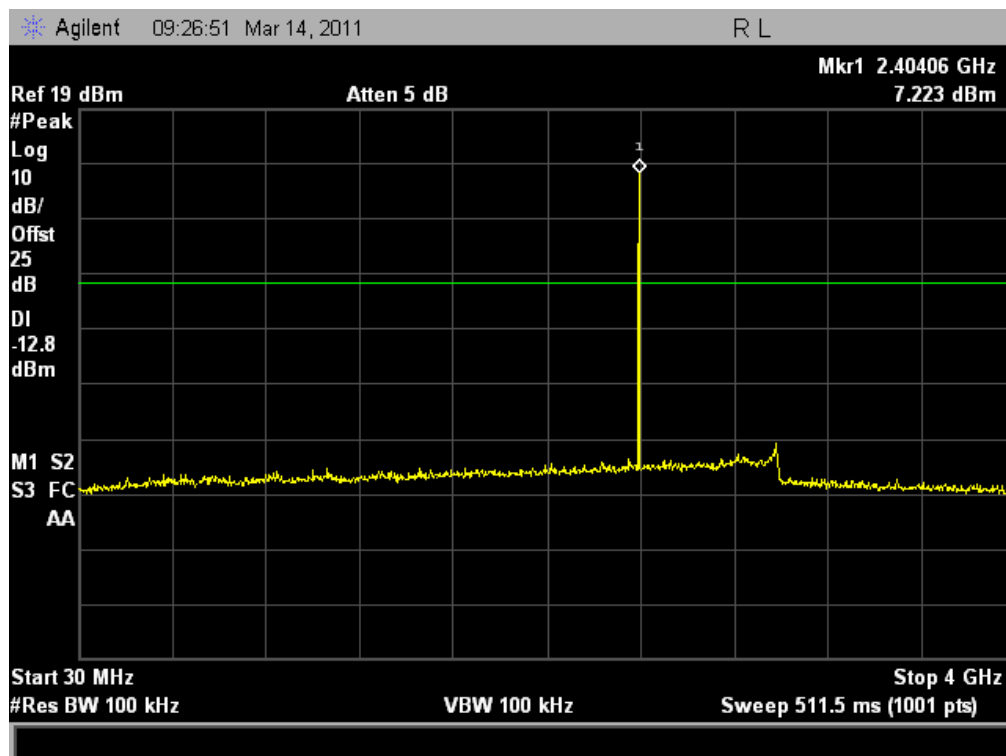
### C. Test Verdict:

#### $\pi/4$ -DQPSK Mode

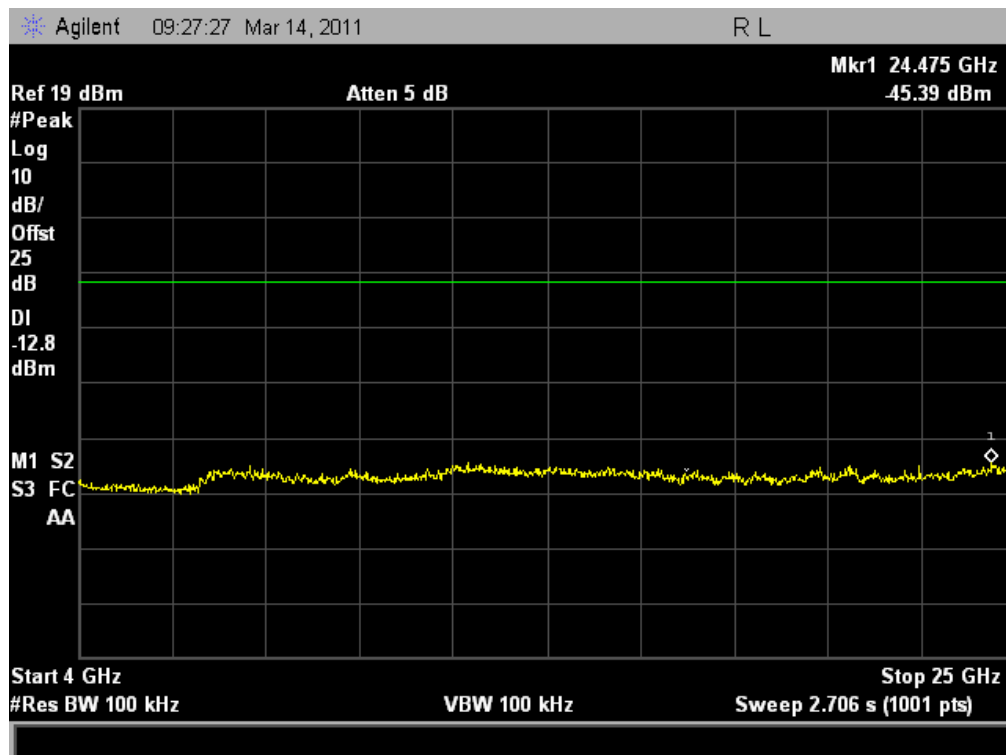
| Channel | Frequency (MHz) | Measured Max. Out of Band Emission (dBm) | Refer to Plot | Limit (dBm)   |                         | Verdict |
|---------|-----------------|------------------------------------------|---------------|---------------|-------------------------|---------|
|         |                 |                                          |               | Carrier Level | Calculated -20dBc Limit |         |
| 0       | 2402            | -45.39                                   | Plot D.1/D.2  | 7.223         | -12.8                   | PASS    |
| 39      | 2441            | -44.81                                   | Plot E.1/E.2  | 2.441         | -17.6                   | PASS    |
| 78      | 2480            | -45.06                                   | Plot F.1/F.2  | 1.912         | -19.1                   | PASS    |

### D. Test Plot:

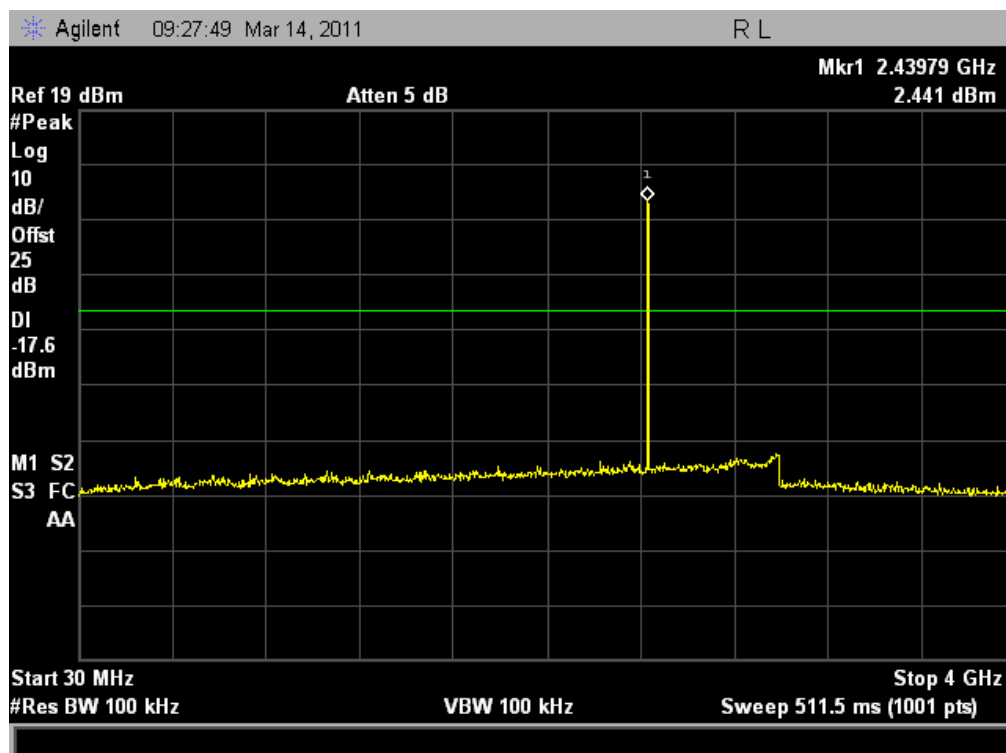
Note: the power of the Module transmitting frequency should be ignored.



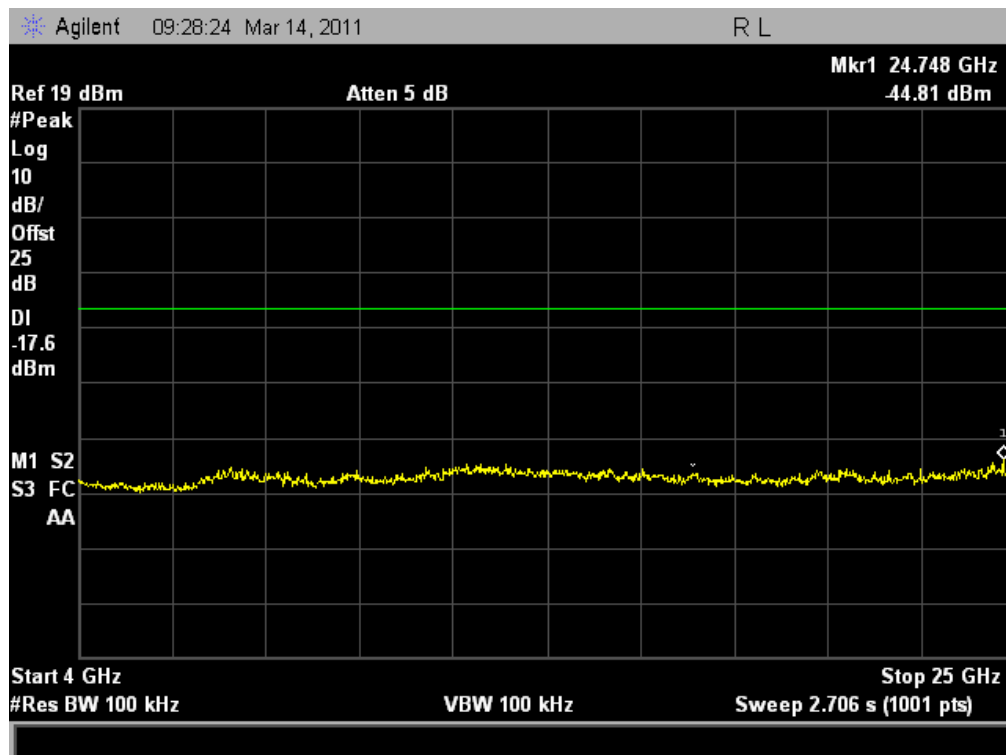
(Plot D.1: Channel = 0, 30MHz to 4GHz)



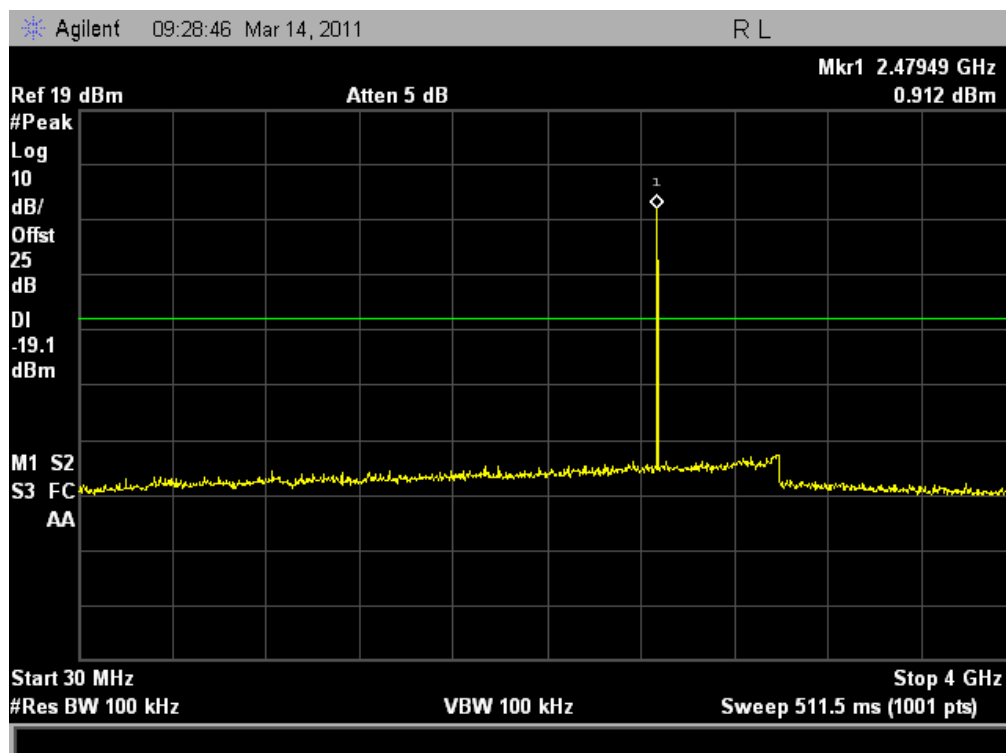
(Plot D.2: Channel = 0, 4GHz to 25GHz)



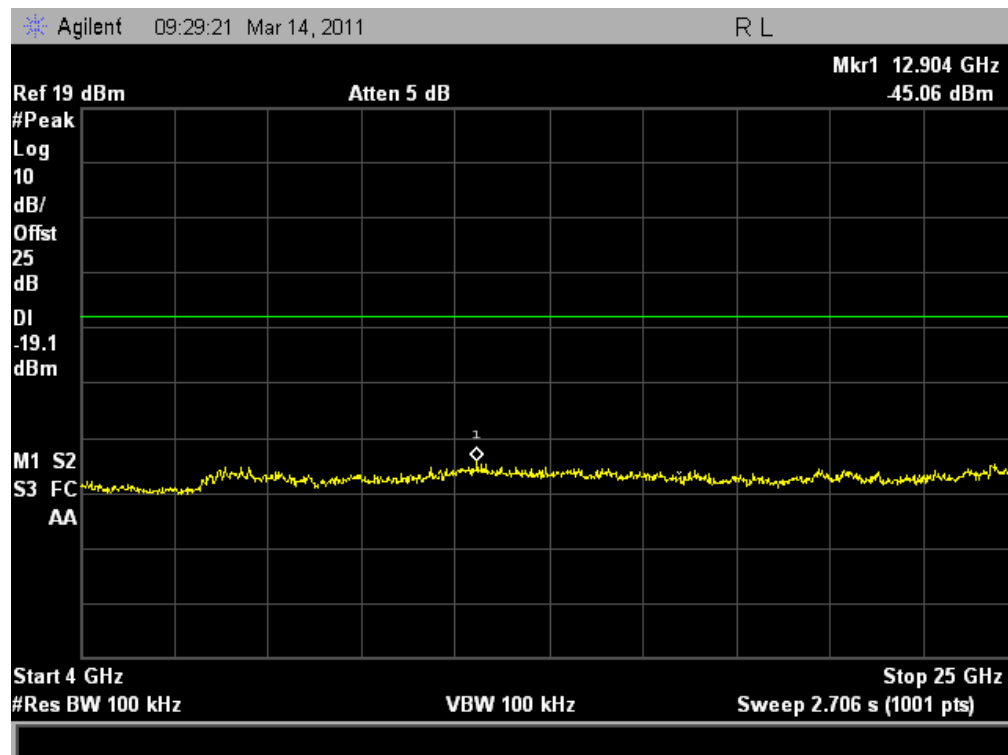
(Plot E.1: Channel = 39, 30MHz to 4GHz)



(Plot E.2: Channel = 39, 4GHz to 25GHz)



(Plot F.1: Channel = 78, 30MHz to 4GHz)



(Plot F.2: Channel = 78, 4GHz to 25GHz)

### E. Test Verdict:

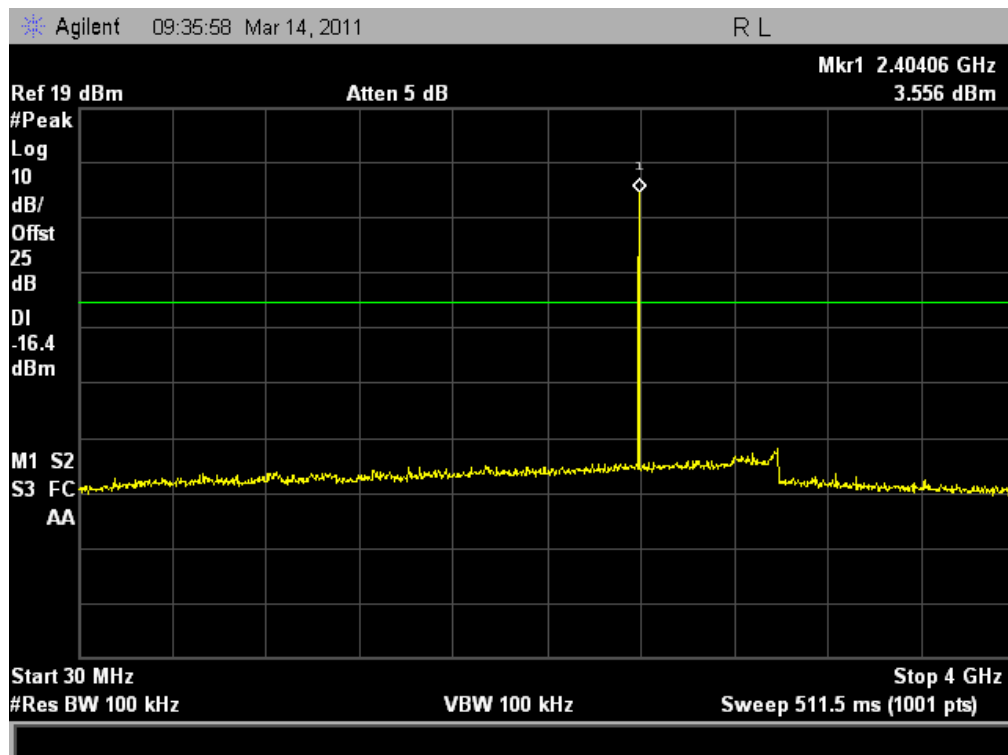
#### 8-DPSK Mode

| Channel | Frequency (MHz) | Measured Max. Out of Band Emission (dBm) | Refer to Plot | Limit (dBm)   |                         | Verdict |
|---------|-----------------|------------------------------------------|---------------|---------------|-------------------------|---------|
|         |                 |                                          |               | Carrier Level | Calculated -20dBc Limit |         |
| 0       | 2402            | -45.39                                   | Plot G.1/G.2  | 3.556         | -16.4                   | PASS    |
| 39      | 2441            | -45.39                                   | Plot H.1/H.2  | 2.69          | -17.3                   | PASS    |
| 78      | 2480            | -44.97                                   | Plot I.1/I.2  | 1.96          | -18                     | PASS    |

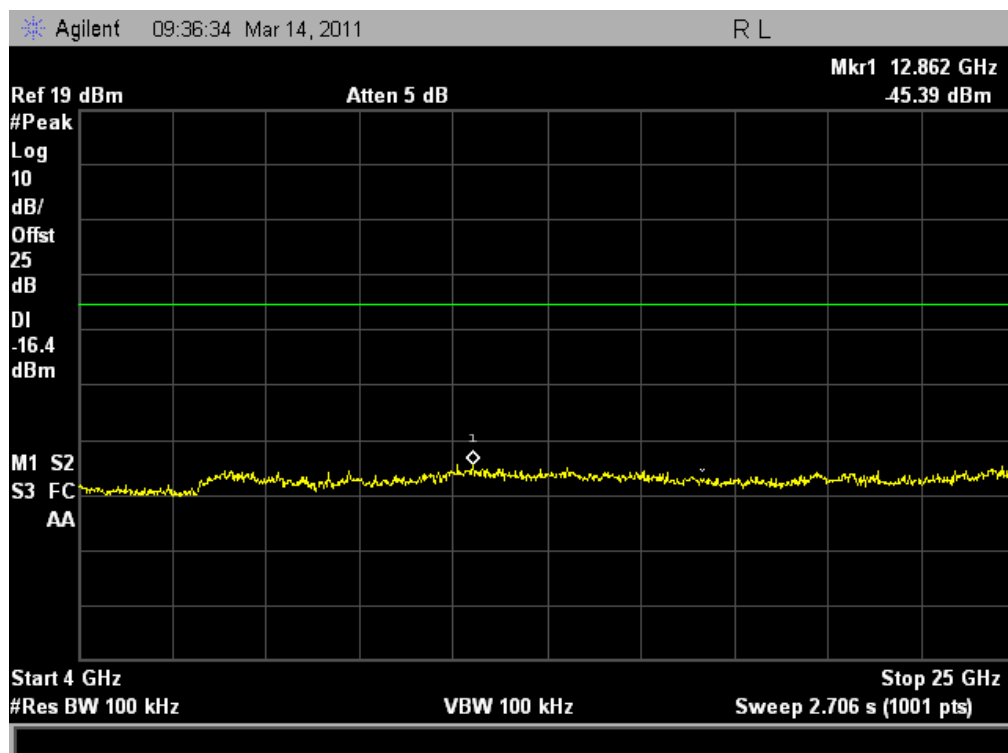
### F. Test Plot:

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

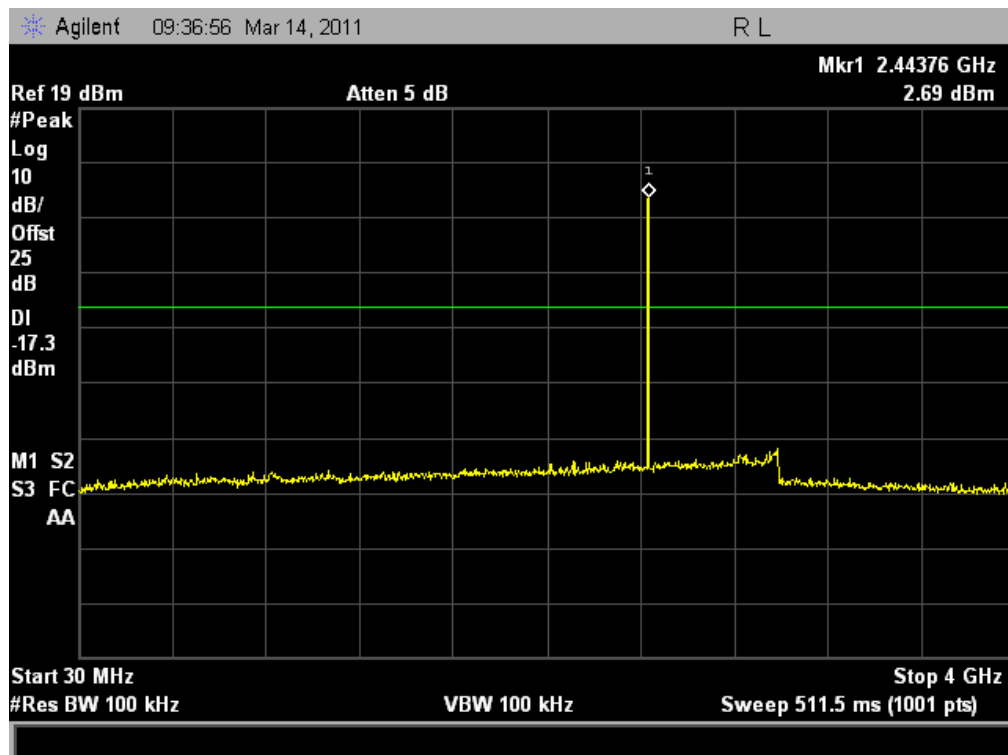




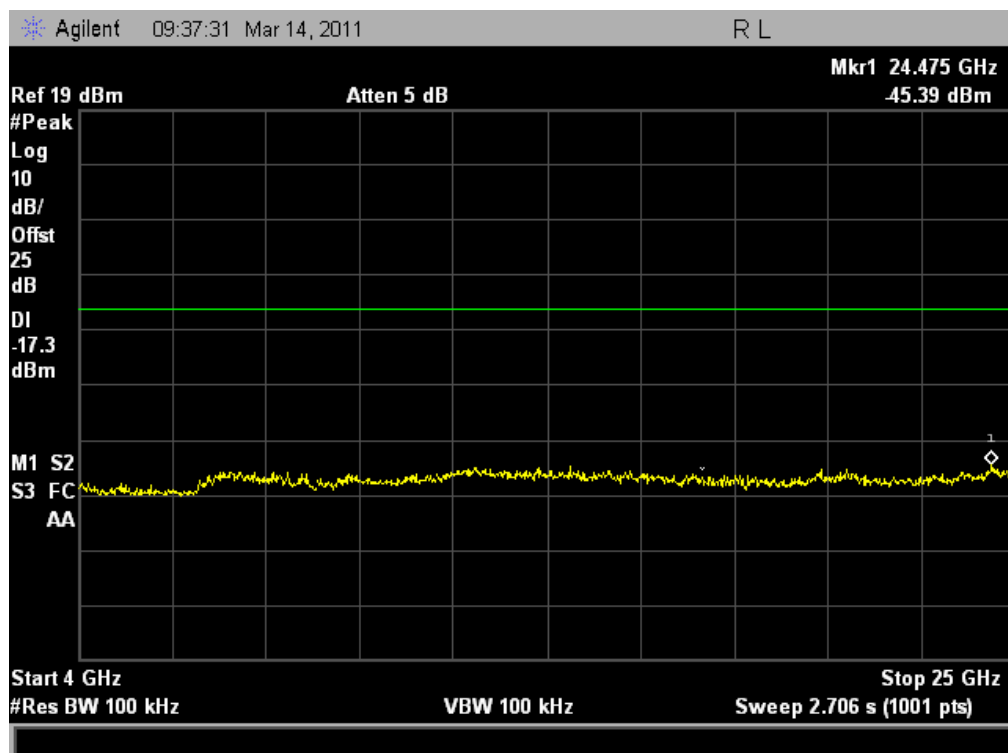
(Plot G.1: Channel = 0, 30MHz to 4GHz)



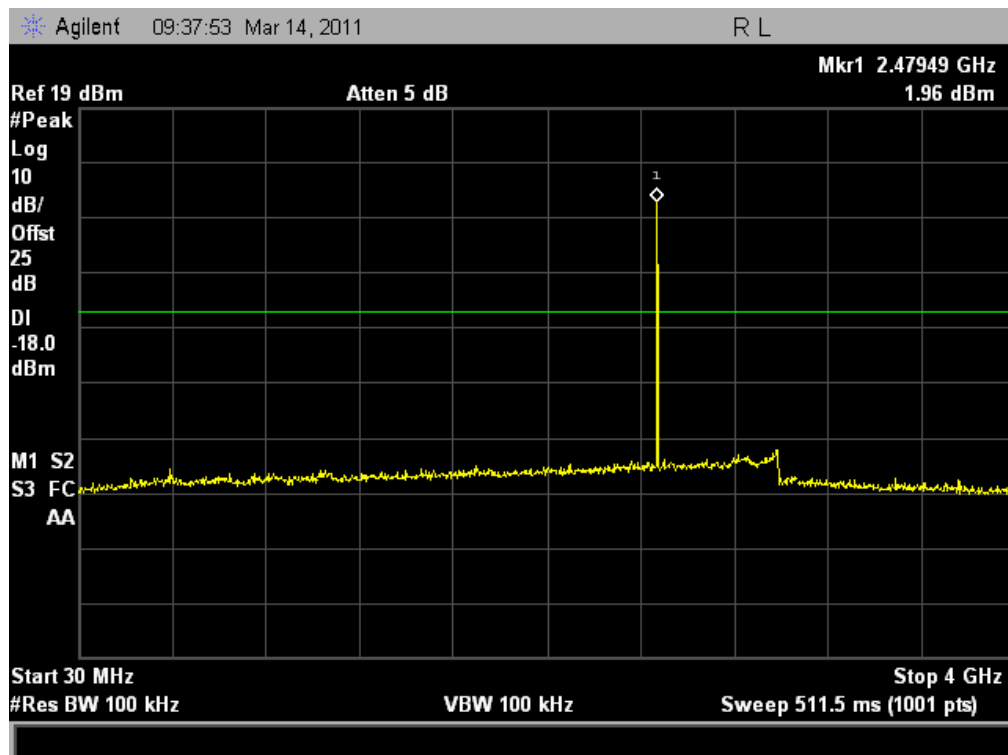
(Plot G.2: Channel = 0, 4GHz to 25GHz)



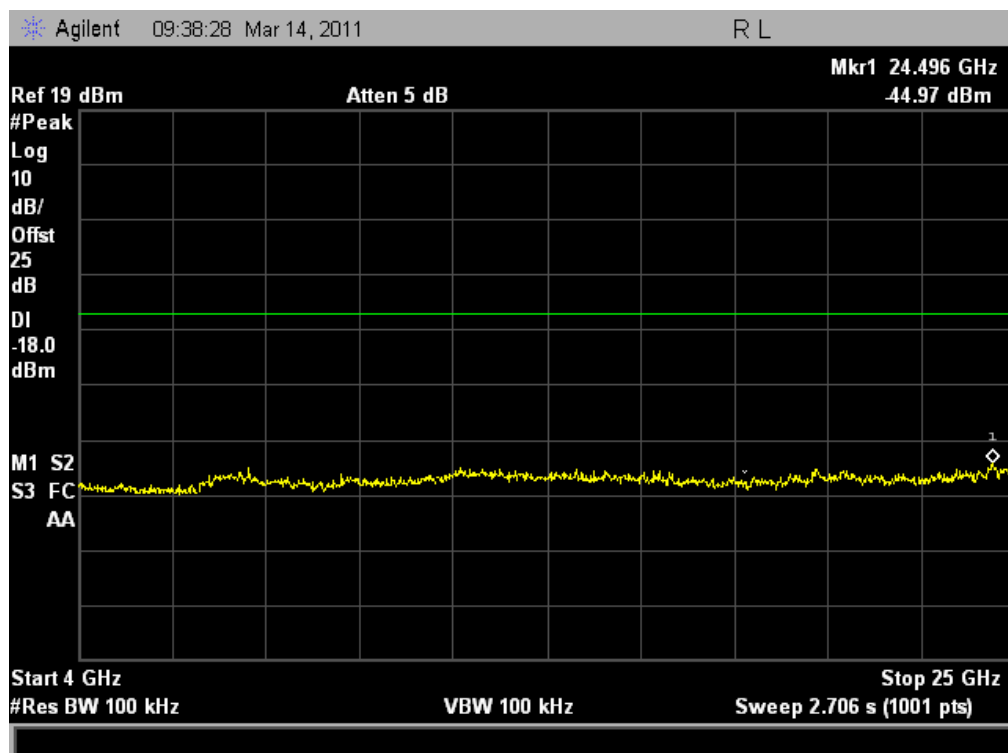
(Plot H.1: Channel = 39, 30MHz to 4GHz)



(Plot H.2: Channel = 39, 4GHz to 25GHz)



(Plot I.1: Channel = 78, 30MHz to 4GHz)



(Plot I.2: Channel = 78, 4GHz to 25GHz)

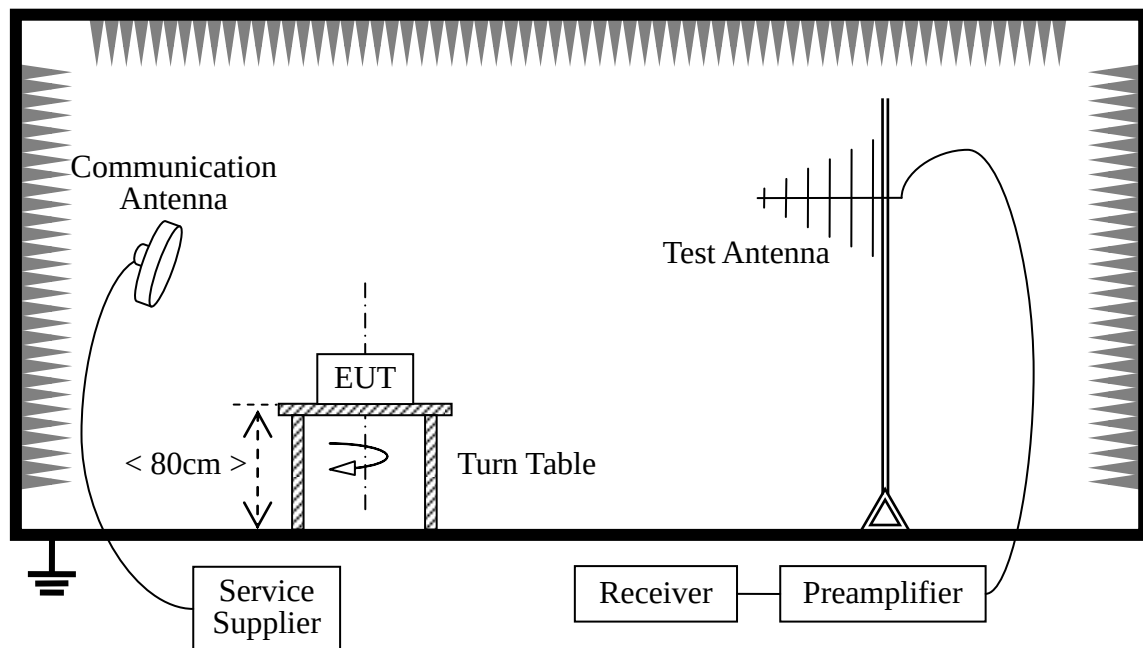
## 2.7 Band Edge

### 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 |
|-----------------------|--------------|------------|------------|-----------|
| System Simulator      | R&S          | CMU200     | 100448     | 2010.9    |
| Receiver              | Agilent      | E7405A     | US44210471 | 2010.9    |
| Full-Anechoic Chamber | Albatross    | 9m*6m*6m   | (n.a.)     | 2010.9    |
| Test Antenna - Horn   | Schwarzbeck  | BBHA 9120C | 9120C-384  | 2010.9    |

### 2.7.3 Test Result

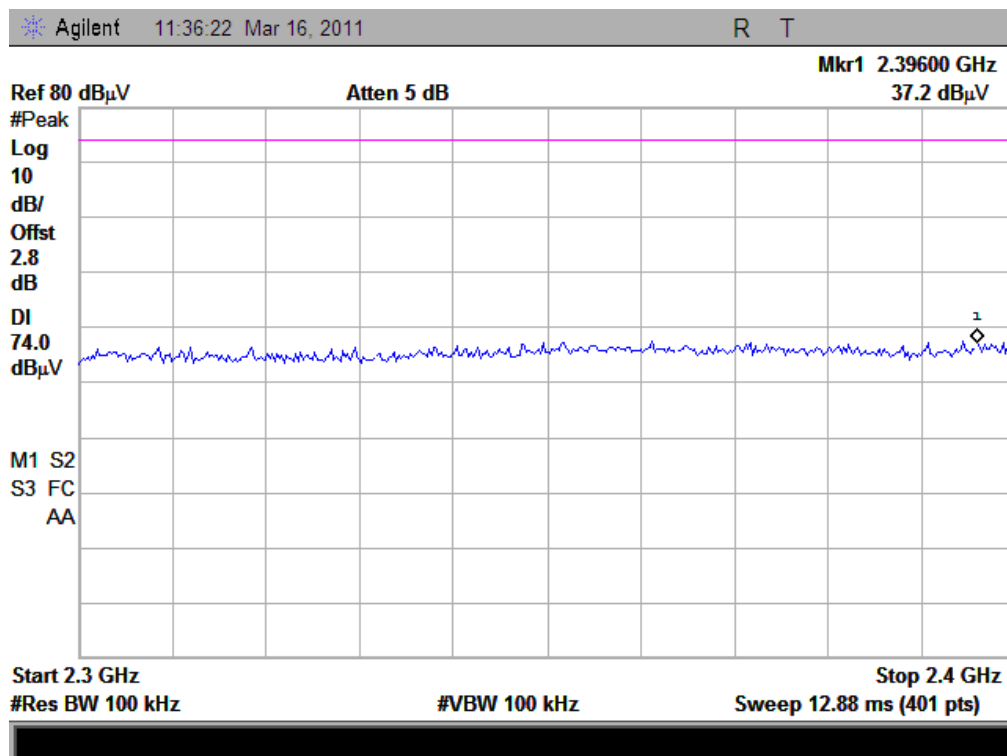
The Bluetooth Module operates at hopping-off test mode. The lowest and highest channels are tested to verify the band edge emissions.

#### A. Test Verdict:

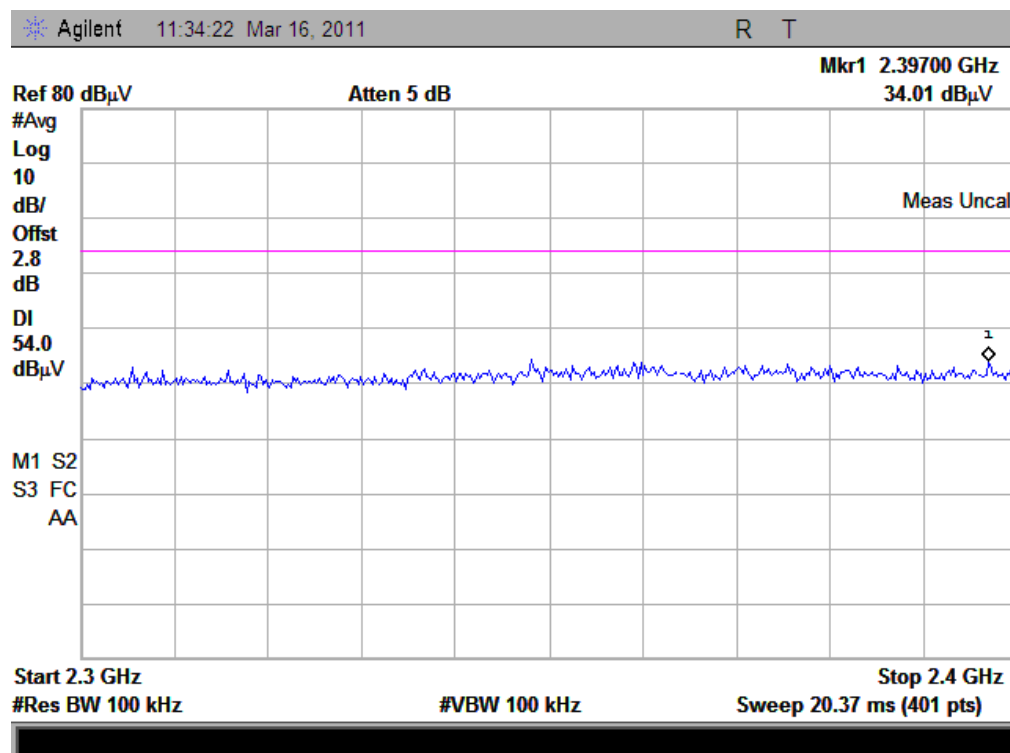
##### GFSK Mode

| Channel | Frequency (MHz) | Max. Emission in the Restricted Bands (dB $\mu$ V/m) |       | Limit (dB $\mu$ V/m) |    | Verdict |
|---------|-----------------|------------------------------------------------------|-------|----------------------|----|---------|
|         |                 | PK                                                   | AV    | PK                   | AV |         |
| 0       | 2402            | 37.2                                                 | 34.01 | 74                   | 54 | PASS    |
| 78      | 2480            | 30.58                                                | 27.74 | 74                   | 54 | PASS    |

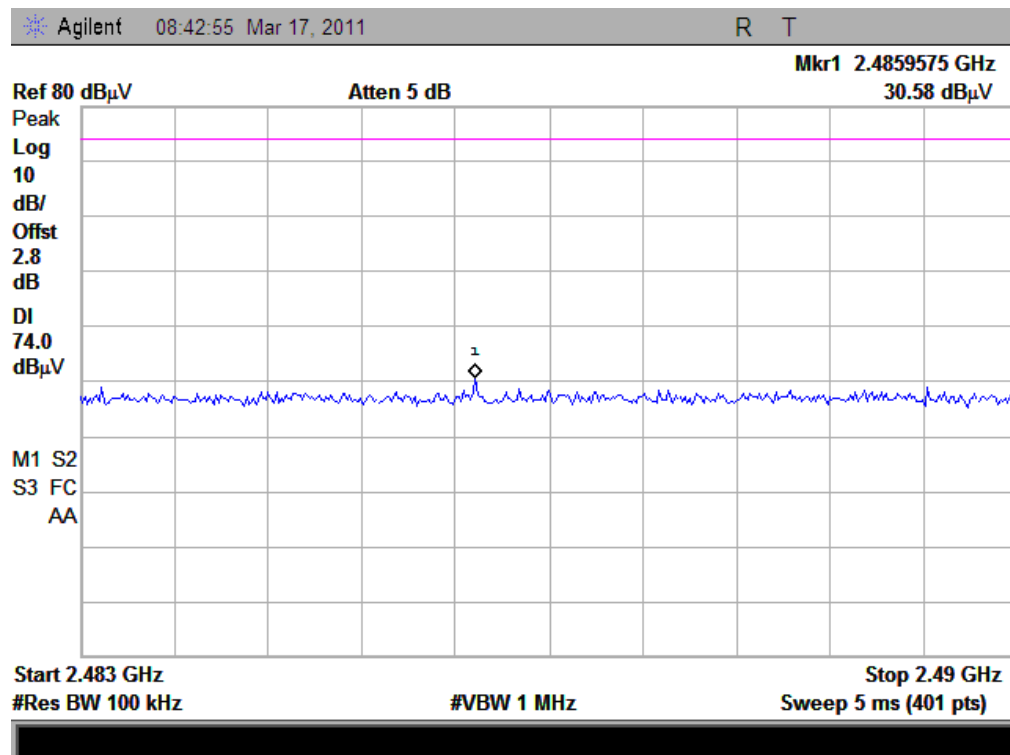
## B. Test Plot:



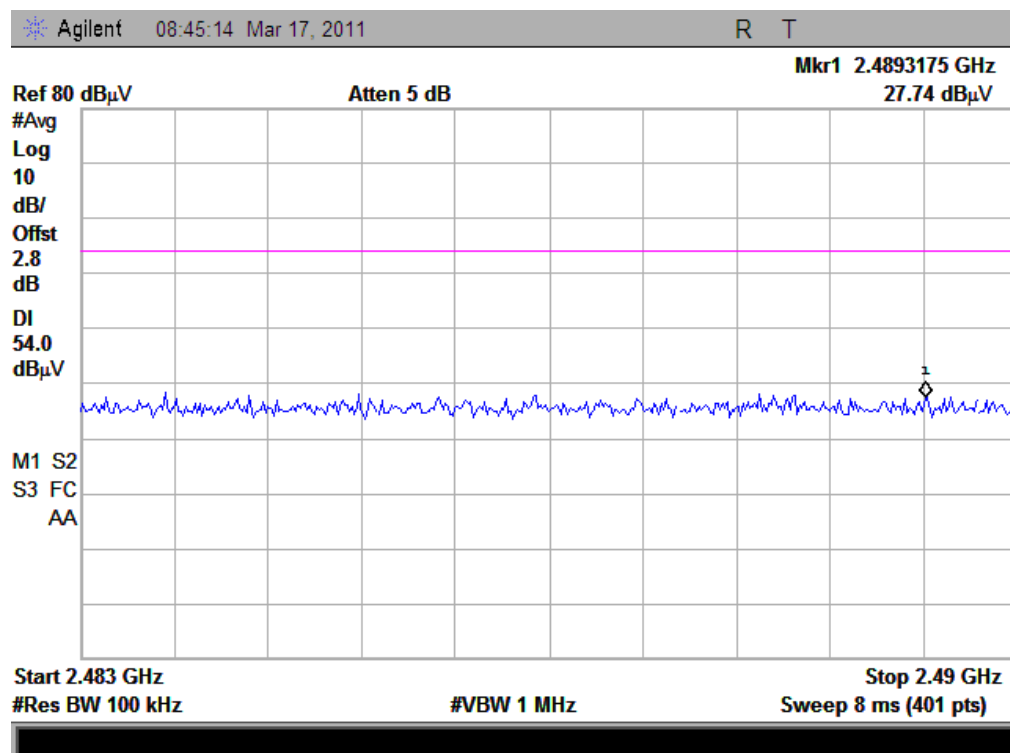
(Plot A1: Channel = 0 PEAK)



(Plot A2: Channel = 0 AVERAGE)



(Plot B1: Channel = 78 PEAK)



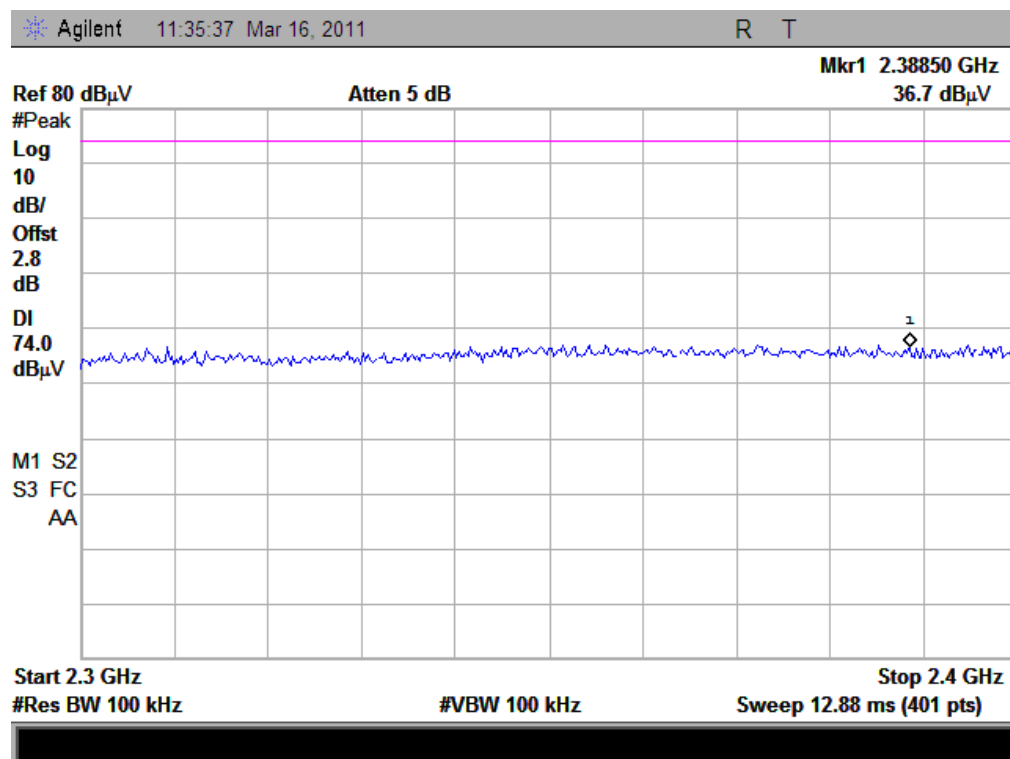
(Plot B2: Channel = 78 AVERAGE)

# A. Test Verdict:

## $\pi/4$ -DQPSK Mode

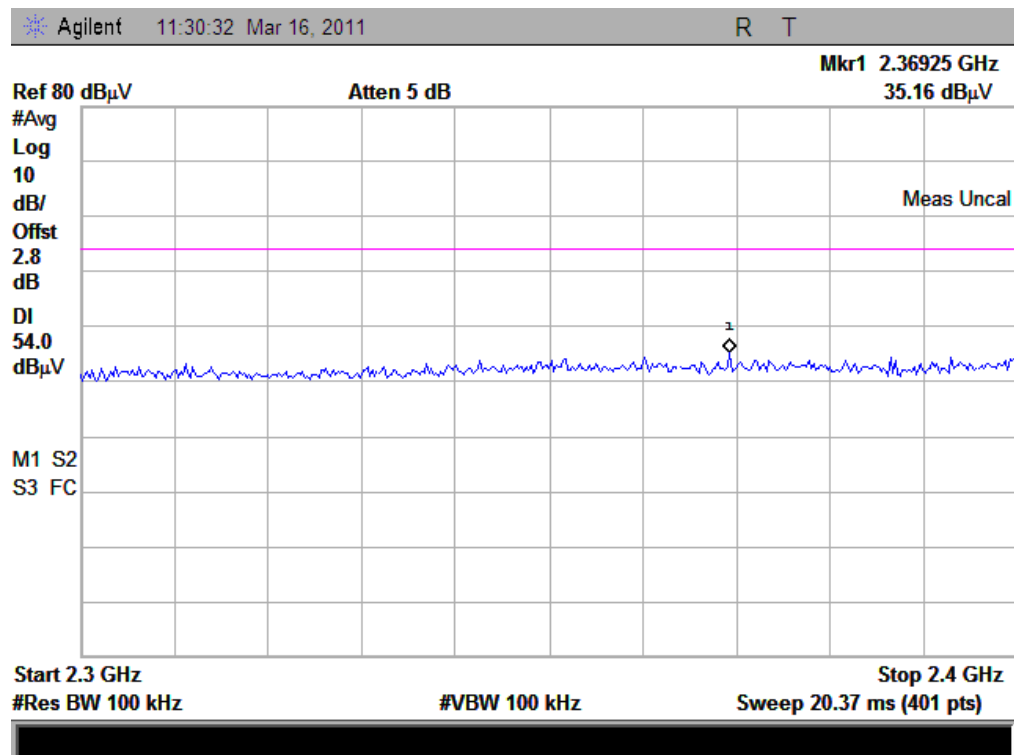
| Channel | Frequency (MHz) | Max. Emission in the Restricted Bands (dB $\mu$ V/m) |       | Limit (dB $\mu$ V/m) |    | Verdict |
|---------|-----------------|------------------------------------------------------|-------|----------------------|----|---------|
|         |                 | PK                                                   | AV    | PK                   | AV |         |
| 0       | 2402            | 36.7                                                 | 35.16 | 74                   | 54 | PASS    |
| 78      | 2480            | 37.7                                                 | 34.95 | 74                   | 54 | PASS    |

# B. Test Plot:

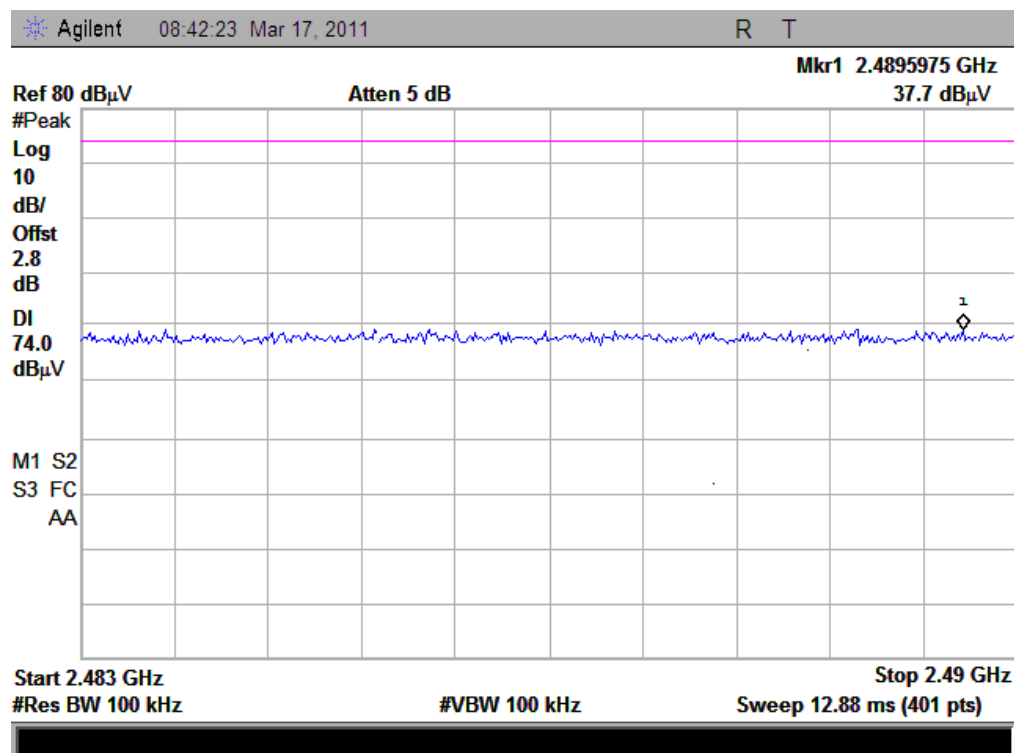


(Plot A1: Channel = 0 PEAK)

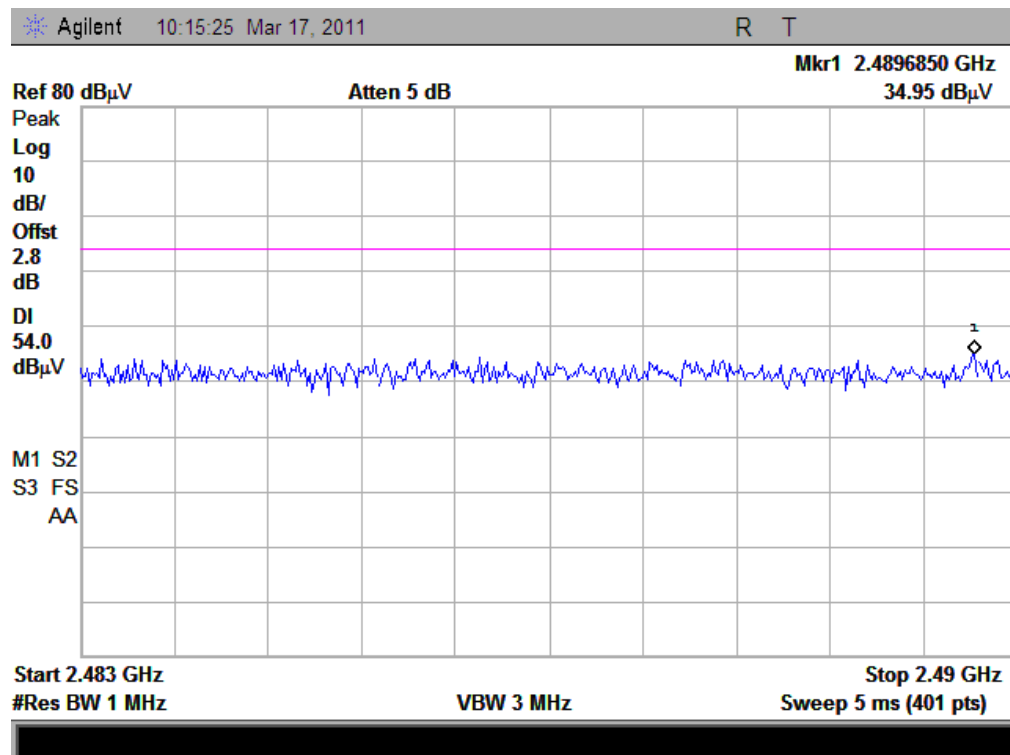




(Plot A2: Channel = 0 AVERAGE)



(Plot B1: Channel = 78 PEAK)



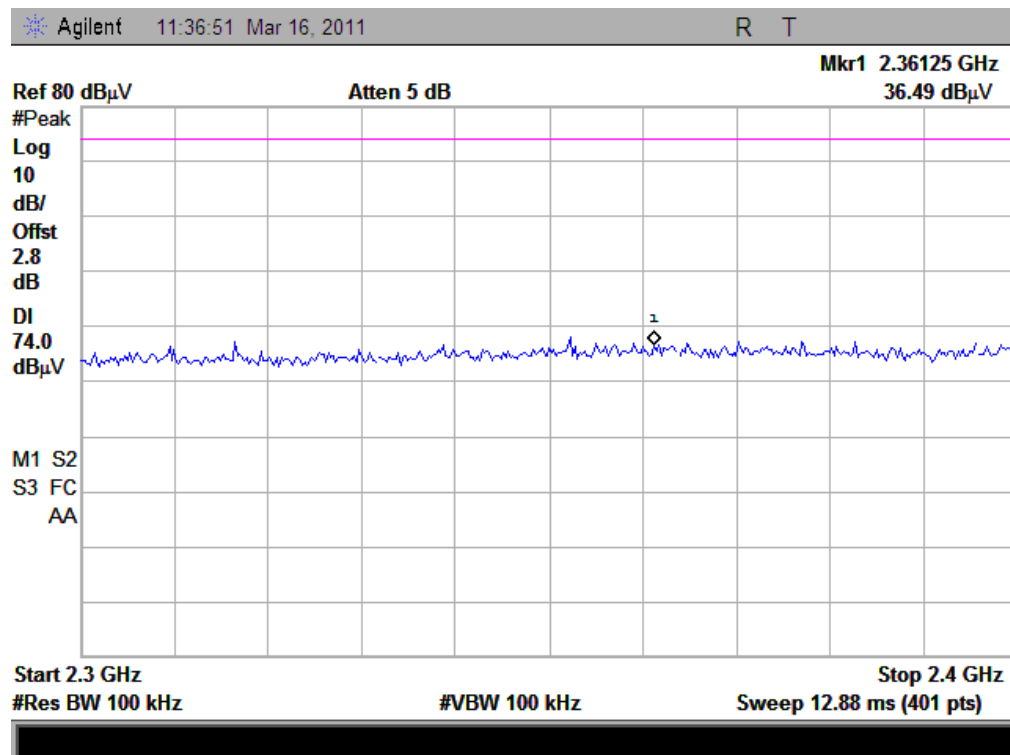
(Plot B2: Channel = 78 AVERAGE)

#### A. Test Verdict:

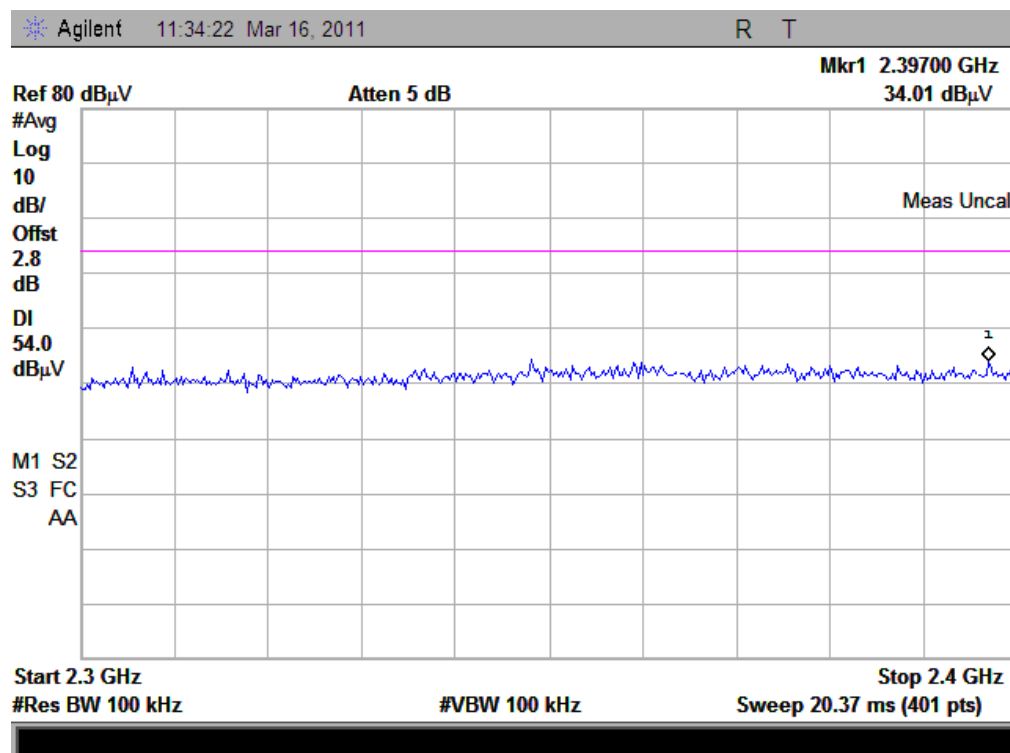
##### 8-DPSK Mode

| Channel | Frequency (MHz) | Max. Emission in the Restricted Bands (dB $\mu$ V/m) |       | Limit (dB $\mu$ V/m) |    | Verdict |
|---------|-----------------|------------------------------------------------------|-------|----------------------|----|---------|
|         |                 | PK                                                   | AV    | PK                   | AV |         |
| 0       | 2402            | 36.49                                                | 34.01 | 74                   | 54 | PASS    |
| 78      | 2480            | 28.94                                                | 27.34 | 74                   | 54 | PASS    |

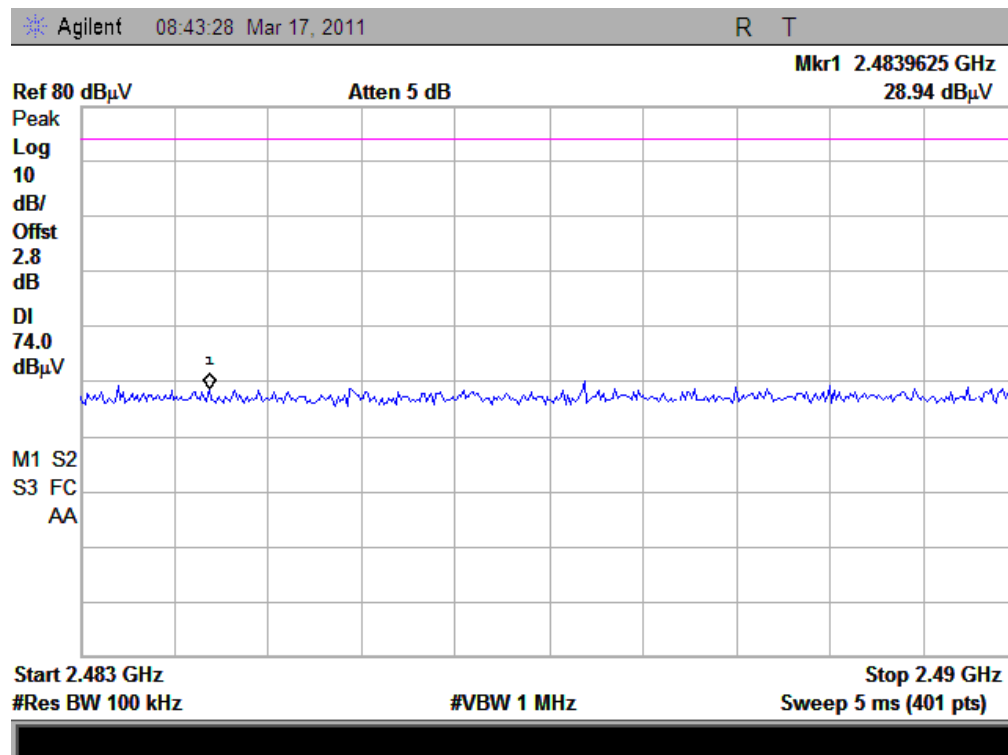
#### B. Test Plot:



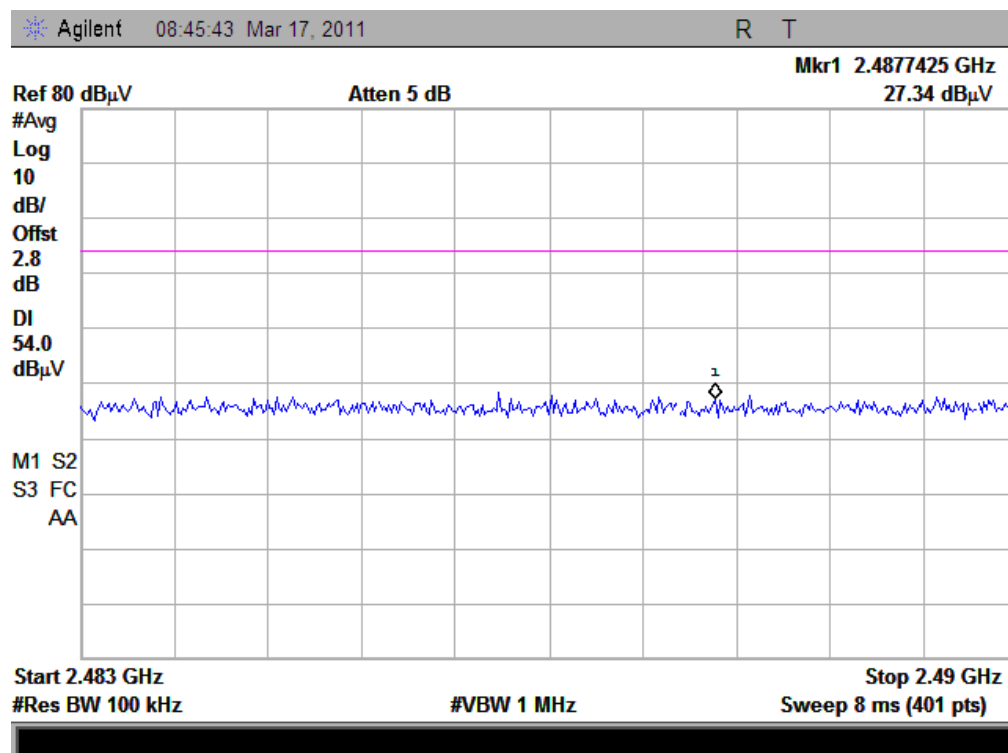
(Plot A1: Channel = 0 PEAK)



(Plot A2: Channel = 0 AVERAGE)



(Plot B1: Channel = 78 PEAK)



(Plot B2: 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 50  $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

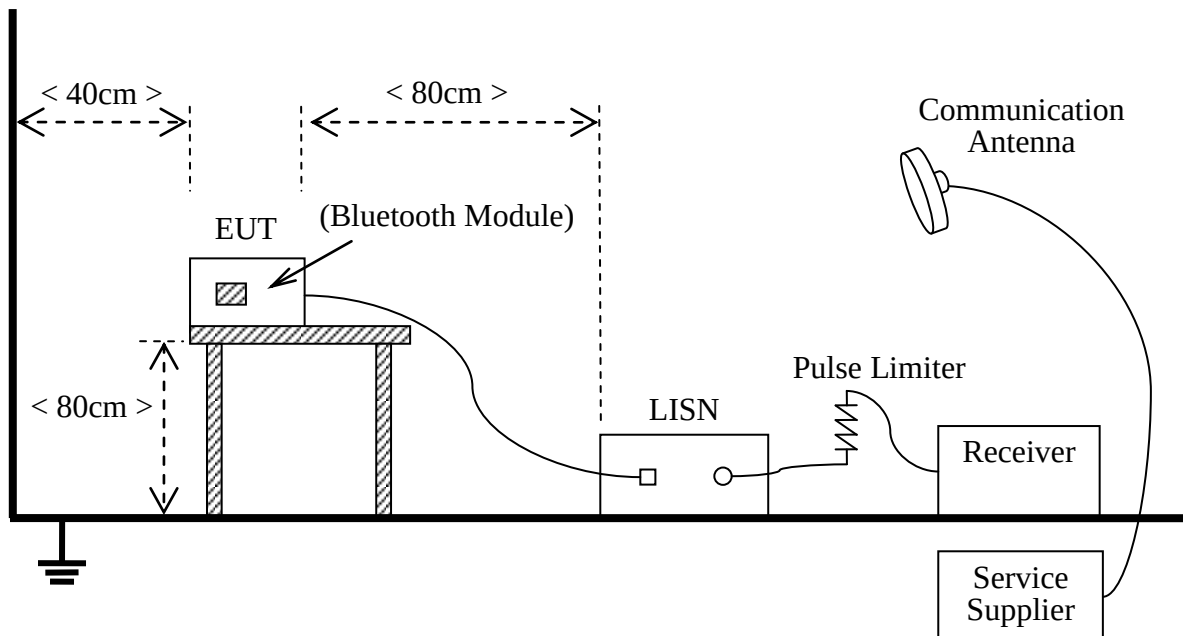
| Frequency range (MHz) | Conducted Limit (dB $\mu$ V) |          |
|-----------------------|------------------------------|----------|
|                       | Quai-peak                    | Average  |
| 0.15 - 0.50           | 66 to 56                     | 56 to 46 |
| 0.50 - 5              | 56                           | 46       |
| 0.50 - 30             | 60                           | 50       |

NOTE:

- The lower limit shall apply at the band edges.
- 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 C63.4:2003

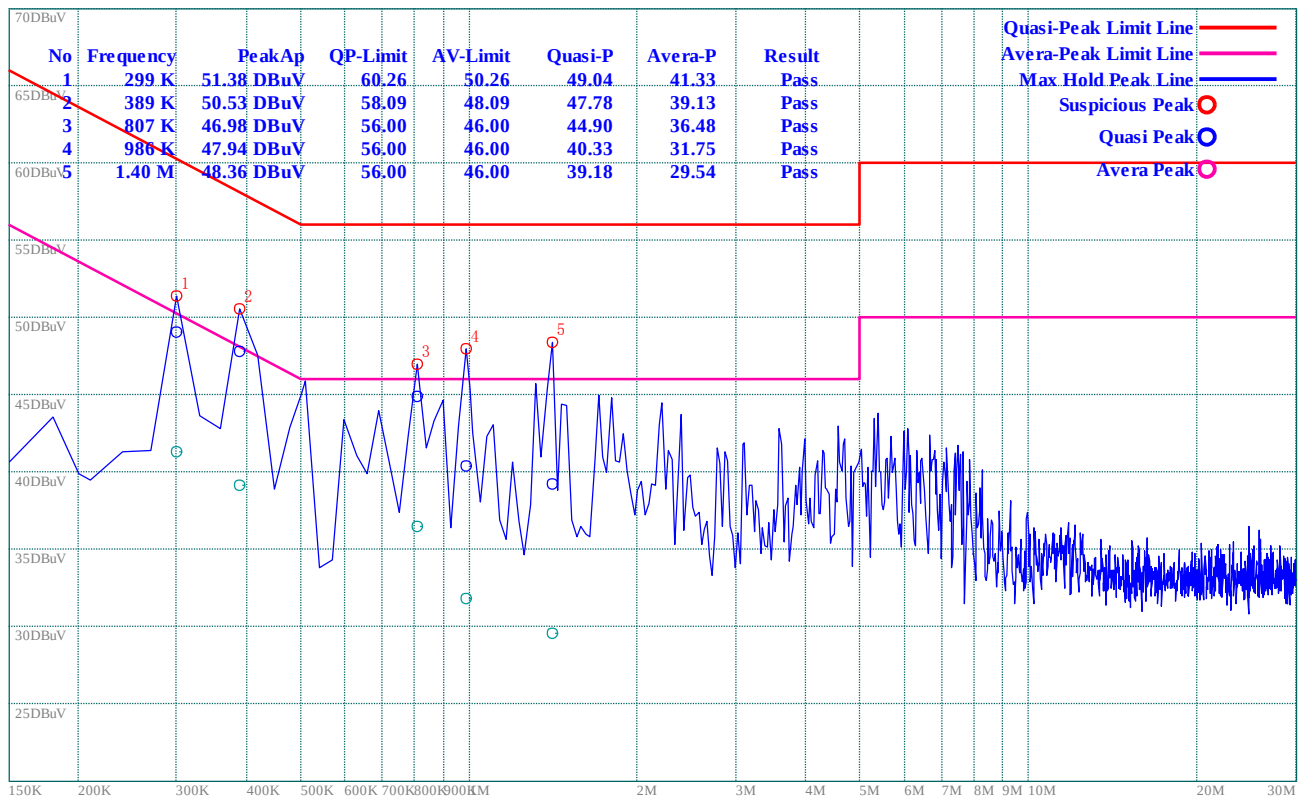
The Bluetooth Module of the EUT is powered by the Battery charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply. The factors of the site are calibrated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (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:

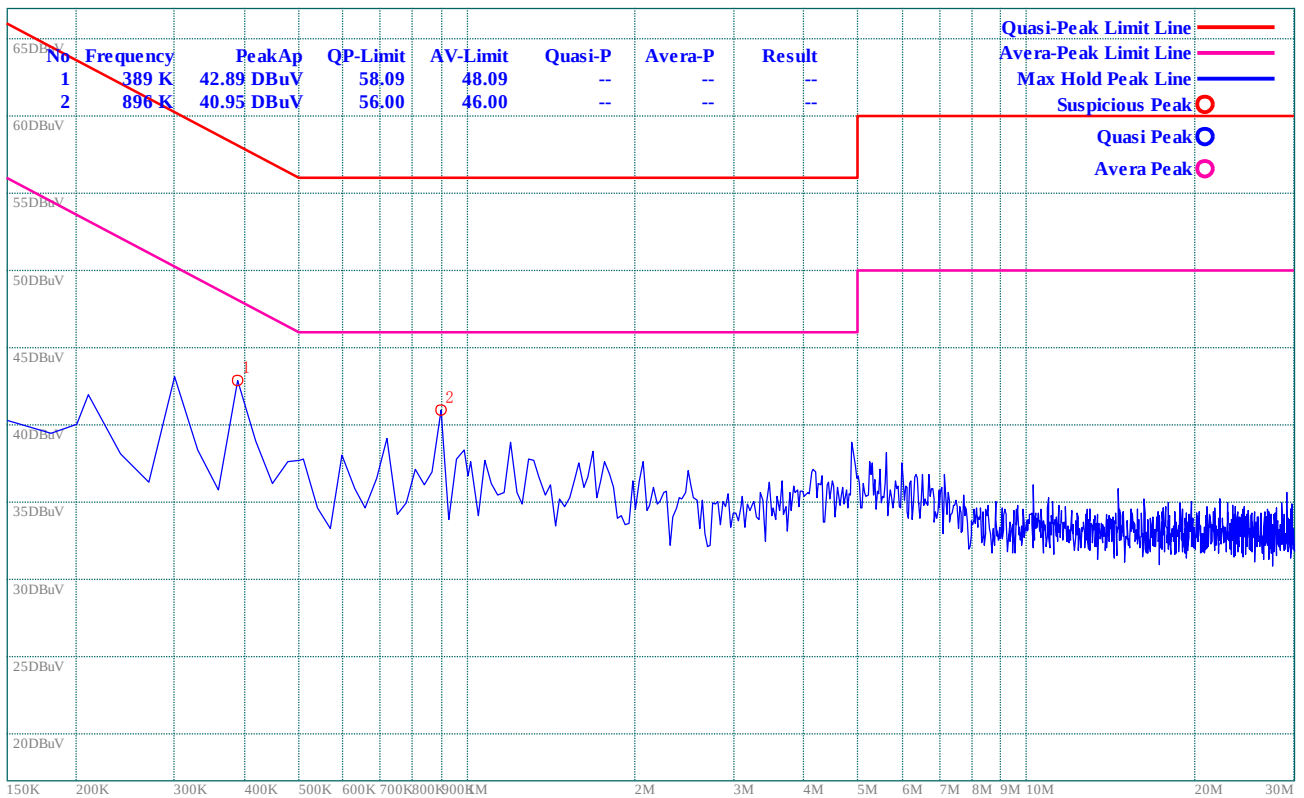
| Description          | Manufacturer | Model       | Serial No. | Cal. Date |
|----------------------|--------------|-------------|------------|-----------|
| Receiver             | Agilent      | E7405A      | US44210471 | 2010.09   |
| LISN                 | Schwarzbeck  | NSLK 8127   | 812744     | 2010.09   |
| Service Supplier     | R&S          | CMU200      | 100448     | 2010.09   |
| Pulse Limiter (20dB) | Schwarzbeck  | VTSD 9561-D | 9391       | (n.a.)    |

## 2.8.3 Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; 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.



(Plot A: L Phase)



(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).

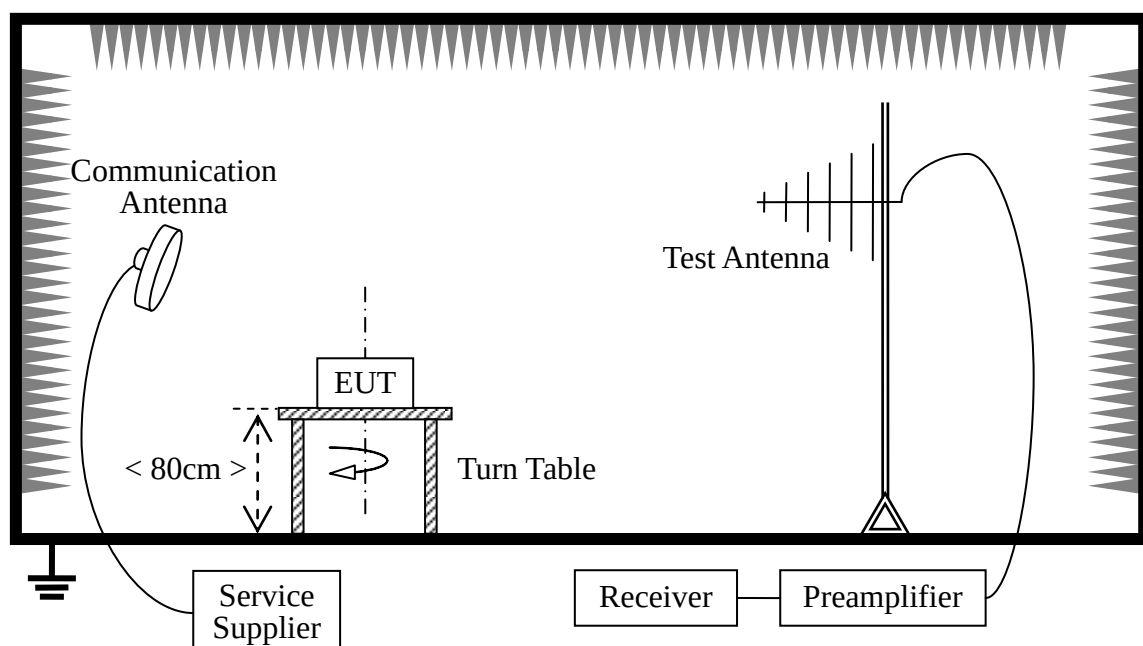
According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength ( $\mu\text{V/m}$ ) | Measurement Distance (m) | Detector |
|-----------------|------------------------------------|--------------------------|----------|
| 30 - 88         | 100                                | 3                        | QP       |
| 88 - 216        | 150                                | 3                        | QP       |
| 216 - 960       | 200                                | 3                        | QP       |
| 960 - 1000      | 500                                | 3                        | QP       |
| Above 1000      | 500                                | 3                        | AV       |

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:





The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2003). 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: In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) 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 azimuth range of turntable was 0° to 360°, the receive antenna has two polarizations horizontal and vertical. When doing measurements above 1GHz, the EUT was placed within the 3dB beam width range of the horn antenna, and the EUT was tested in 3 orthogonal positions as recommended in ANSI C63.4 for Radiated Emissions and the worst-case data was presented.

## B. Equipments List:

| Description             | Manufacturer | Model      | Serial No.   | Cal. Date |
|-------------------------|--------------|------------|--------------|-----------|
| System Simulator        | R&S          | CMU200     | 100448       | 2010.9    |
| Receiver                | Agilent      | E7405A     | US44210471   | 2010.9    |
| Full-Anechoic Chamber   | Albatross    | 9m*6m*6m   | (n.a.)       | 2010.9    |
| Test Antenna - Bi-Log   | Schwarzbeck  | VULB 9163  | 9163-274     | 2010.9    |
| Test Antenna - Horn     | Schwarzbeck  | BBHA 9120C | 9120C-384    | 2010.9    |
| Test Antenna - circular | R&S          | AC004R1    | 0749.3000.03 | 2010.9    |

## 2.9.3 Test Result

### GFSK Mode:

## C. 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 (dB $\mu$ V/m) |       | Antenna Polarization | Refer to Plot |
|---------|-----------------|-------------------------------------|-------|----------------------|---------------|
|         |                 | PK                                  | AV    |                      |               |
| 0       | 2402            | 81.70                               | 77.03 | Horizontal           | Plot A.1      |
|         |                 | 82.50                               | 78.11 | Vertical             | Plot A.2      |
| 39      | 2441            | 86.93                               | 81.35 | Horizontal           | Plot B.1      |
|         |                 | 84.83                               | 80.41 | Vertical             | Plot B.2      |
| 78      | 2480            | 88.44                               | 82.69 | Horizontal           | Plot C.1      |

| Channel | Frequency (MHz) | Fundamental Emission (dB $\mu$ V/m) |       | Antenna Polarization | Refer to Plot |
|---------|-----------------|-------------------------------------|-------|----------------------|---------------|
|         |                 | PK                                  | AV    |                      |               |
|         |                 | 84.54                               | 80.02 | Vertical             | Plot C.2      |

### The un-wanted Emissions:

Test result of channel: 0 (2402MHz)

| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 33.9 M          | 32.34                   | 40                    | -7.66       | 100         | 13            | Horizontal           |
| 912.7 M         | 33.32                   | 46                    | -12.68      | 100         | 37            | Horizontal           |
| 2.928 G         | 48.68                   | 54                    | -5.32       | 100         | 340           | Horizontal           |
| 8.170 G         | 44.65                   | 54                    | -9.35       | 100         | 244           | Horizontal           |
| 33.9 M          | 36.54                   | 40                    | -3.46       | 100         | 355           | Vertical             |
| 132.8 M         | 22.34                   | 43.5                  | -21.16      | 100         | 357           | Vertical             |
| 2.928 G         | 51                      | 54                    | -3          | 100         | 0             | Vertical             |
| 14.043 G        | 44.09                   | 54                    | -9.91       | 100         | 0             | Vertical             |

Test result of channel: 39 (2442MHz)

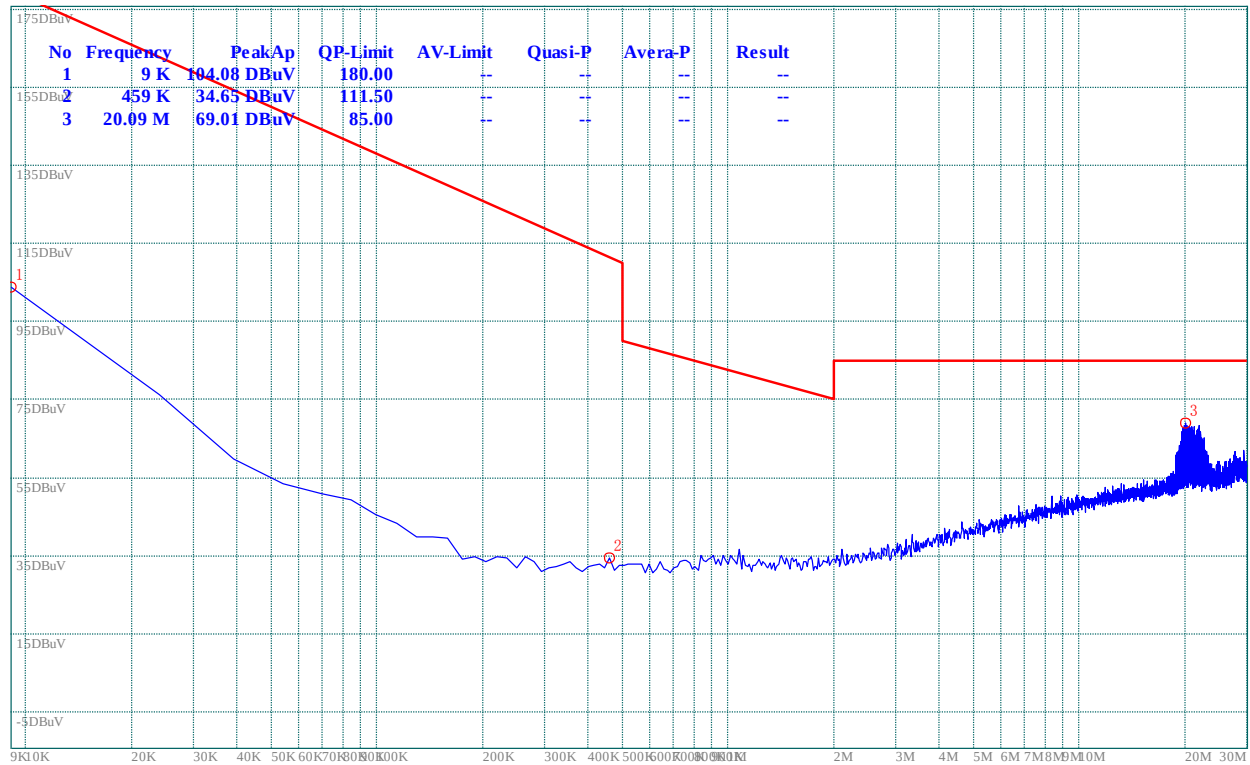
| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 249.2 M         | 30.23                   | 46                    | -15.77      | 100         | 359           | Horizontal           |
| 912.7 M         | 33.93                   | 46                    | -12.07      | 100         | 355           | Horizontal           |
| 8.170 G         | 44.75                   | 54                    | -9.25       | 100         | 359           | Horizontal           |
| 33.9 M          | 36.78                   | 40                    | -3.22       | 100         | 2             | Vertical             |
| 912.7 M         | 30.2                    | 46                    | -15.8       | 100         | 1             | Vertical             |
| 14.088 G        | 43.59                   | 54                    | -10.41      | 100         | 0             | Vertical             |

Test result of channel: 78 (2480MHz)

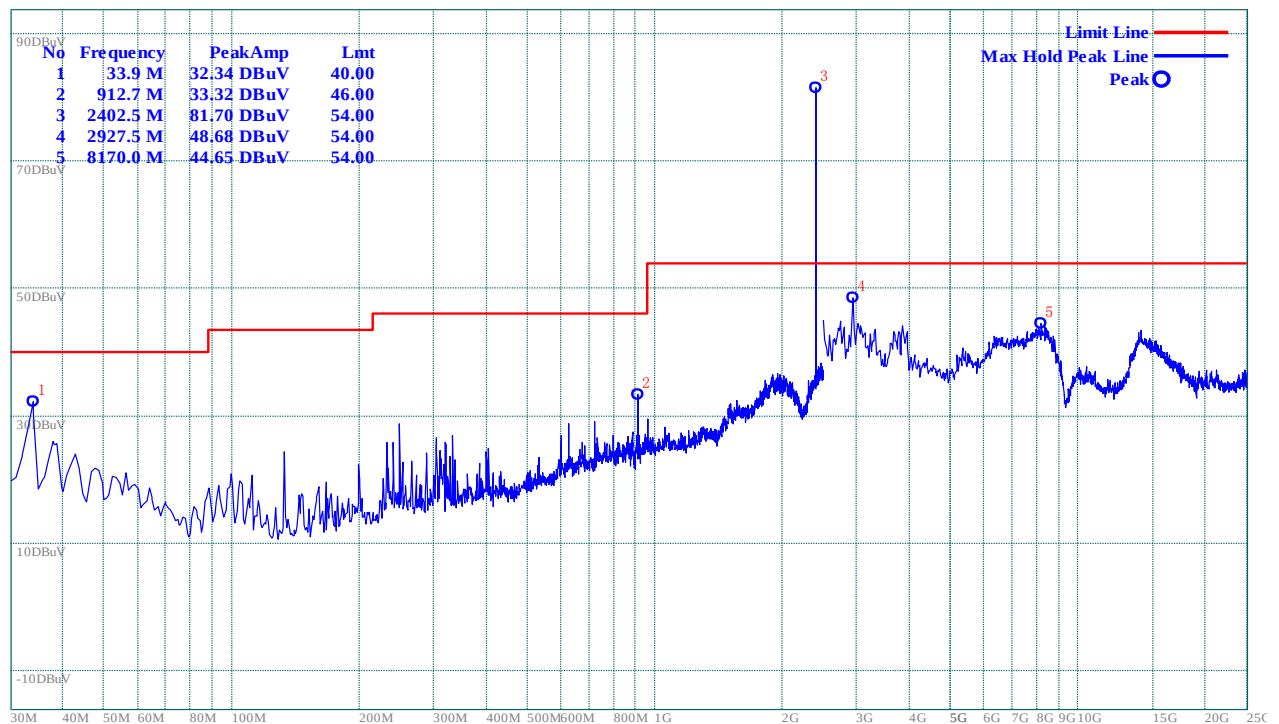
| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 33.9 M          | 31.54                   | 40                    | -8.46       | 100         | 319           | Horizontal           |
| 912.7 M         | 34.3                    | 46                    | -11.7       | 100         | 243           | Horizontal           |
| 8.238 G         | 44.58                   | 54                    | -9.42       | 100         | 0             | Horizontal           |
| 33.9 M          | 34.23                   | 40                    | -5.77       | 100         | 0             | Vertical             |
| 912.7 M         | 34.18                   | 46                    | -11.82      | 100         | 12            | Vertical             |
| 7.855 G         | 44.35                   | 54                    | -9.65       | 100         | 172           | Vertical             |

## D. Test Plots for the Whole Measurement Frequency Range:

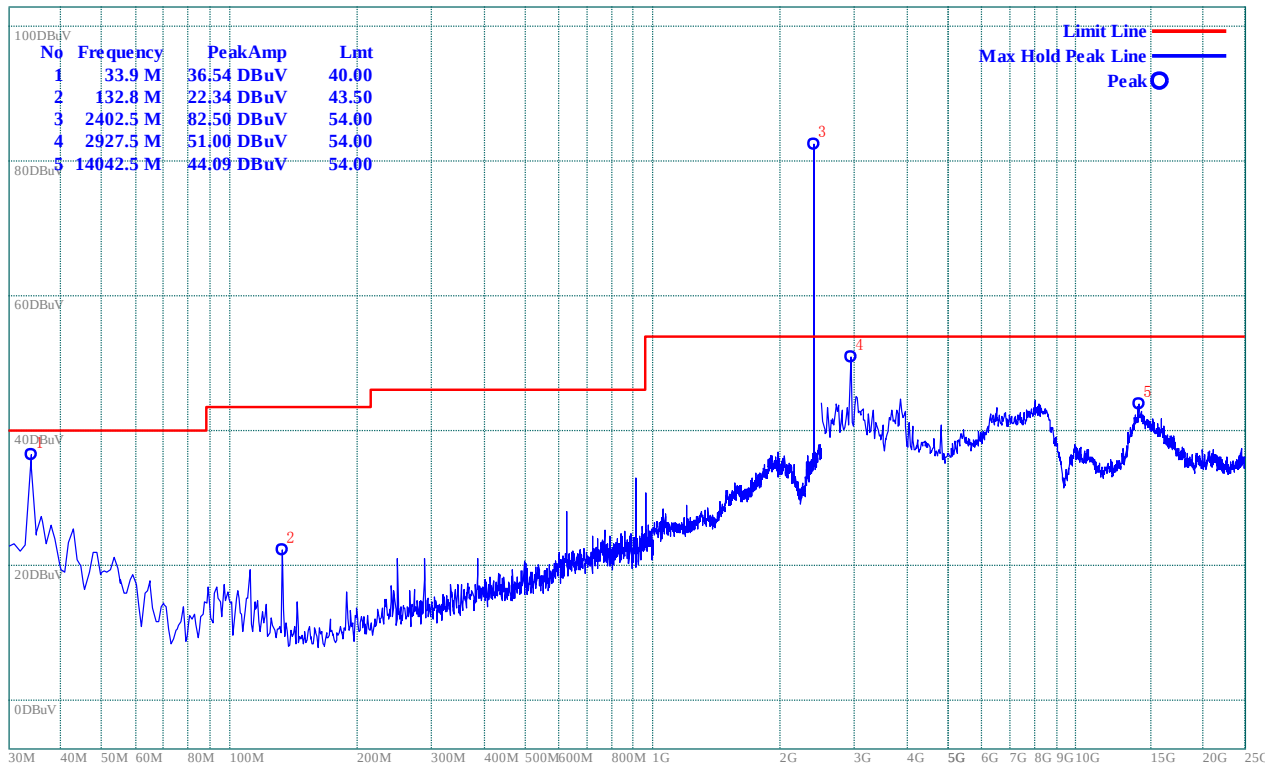
### Plots for Channel = 0



(Plot A.0: 9kHz to 30MHz)

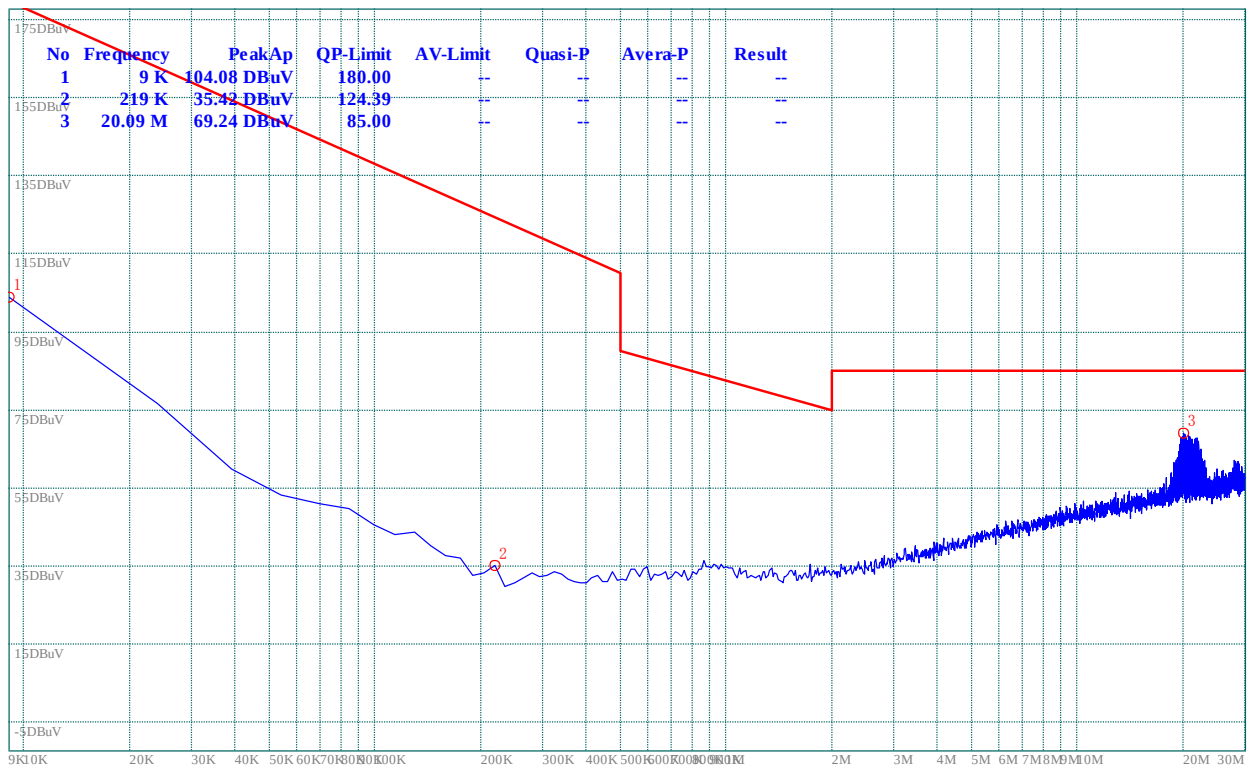


(Plot A.1: Antenna Horizontal)

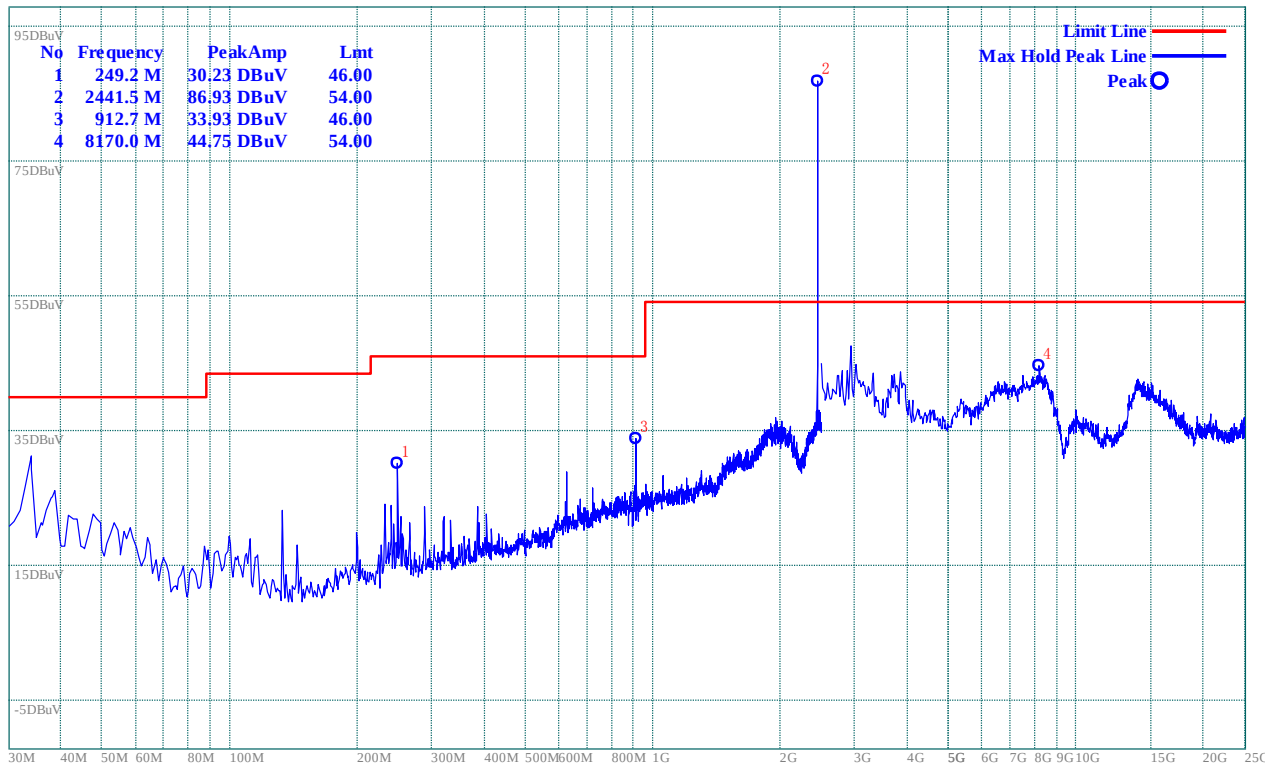


(Plot A.2: Antenna Vertical)

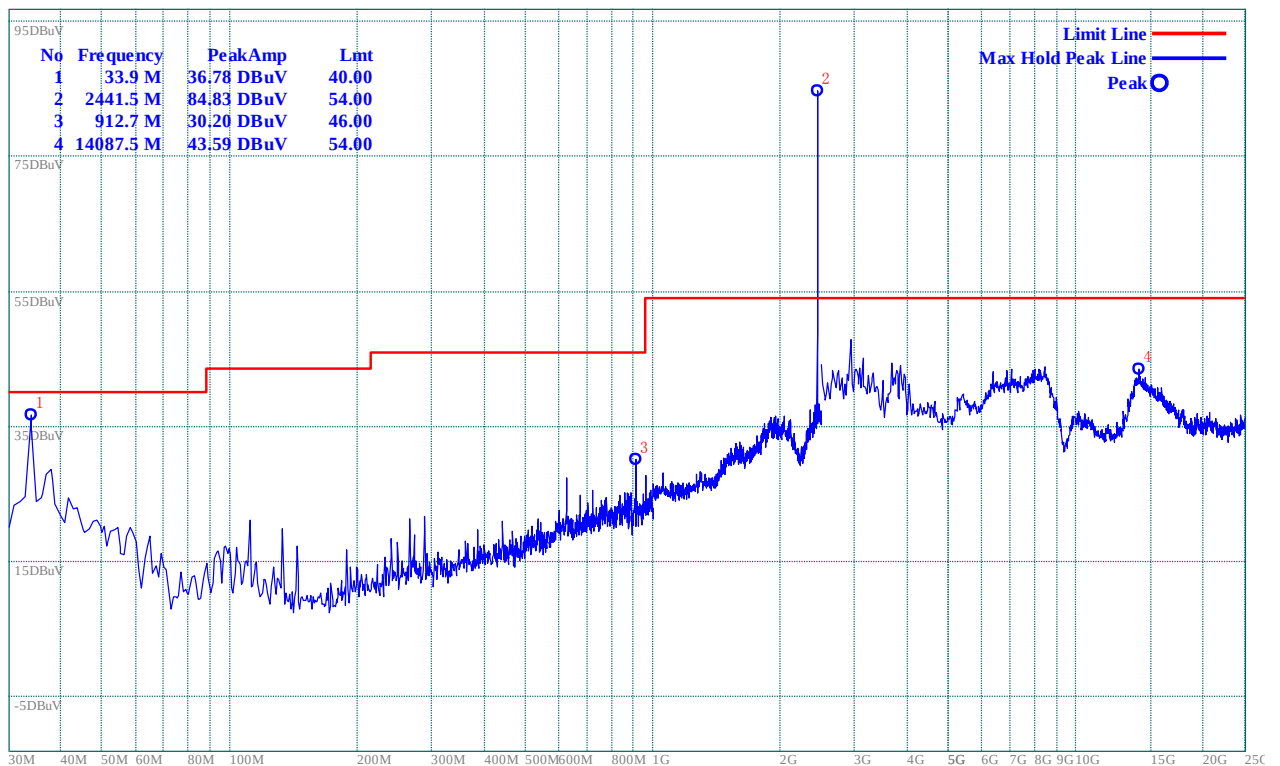
### Plot for Channel = 39



(Plot B.0: 9kHz to 30MHz)

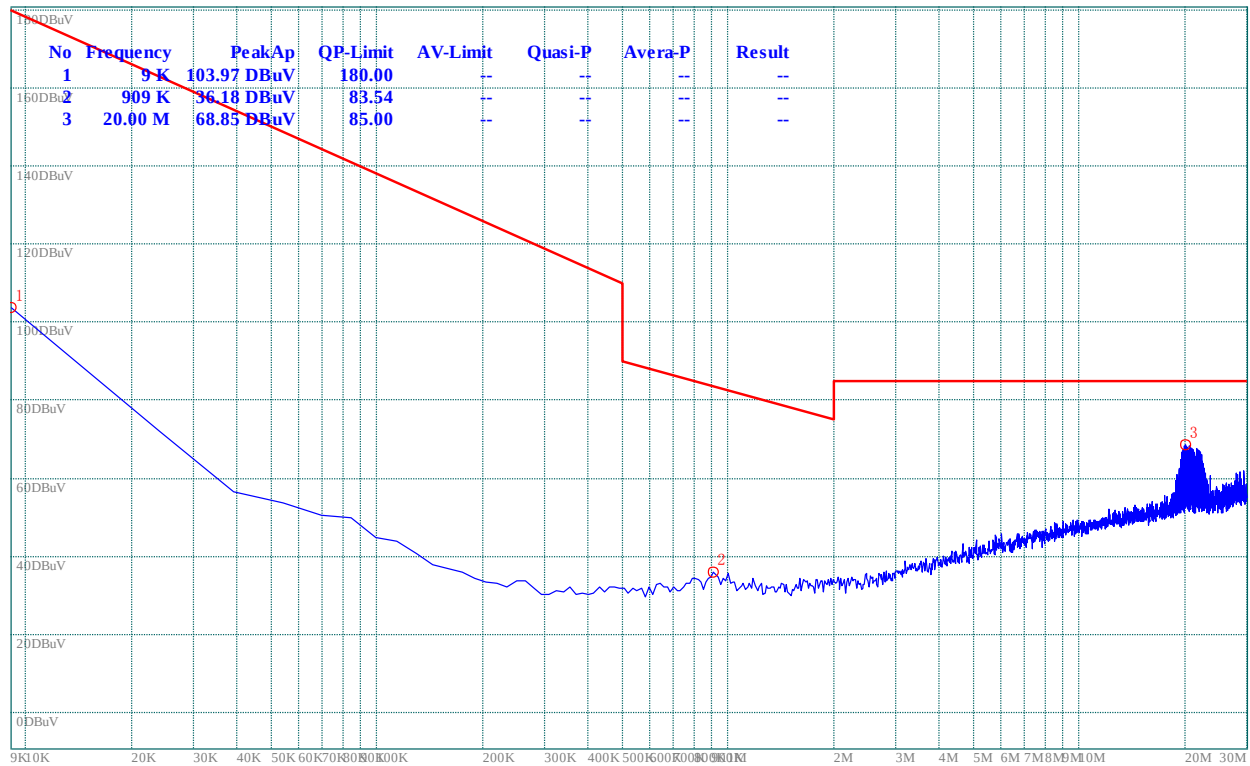


(Plot B.1: Antenna Horizontal)

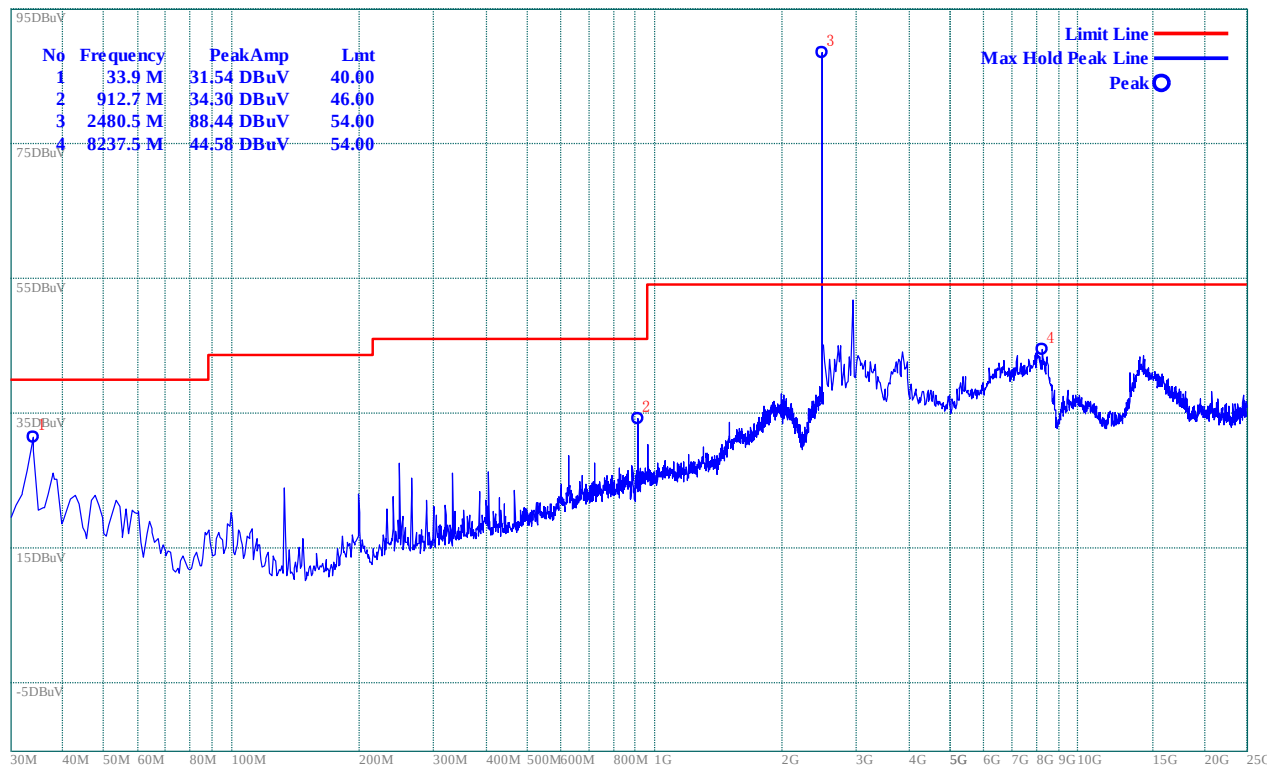


(Plot B.2: Antenna Vertical)

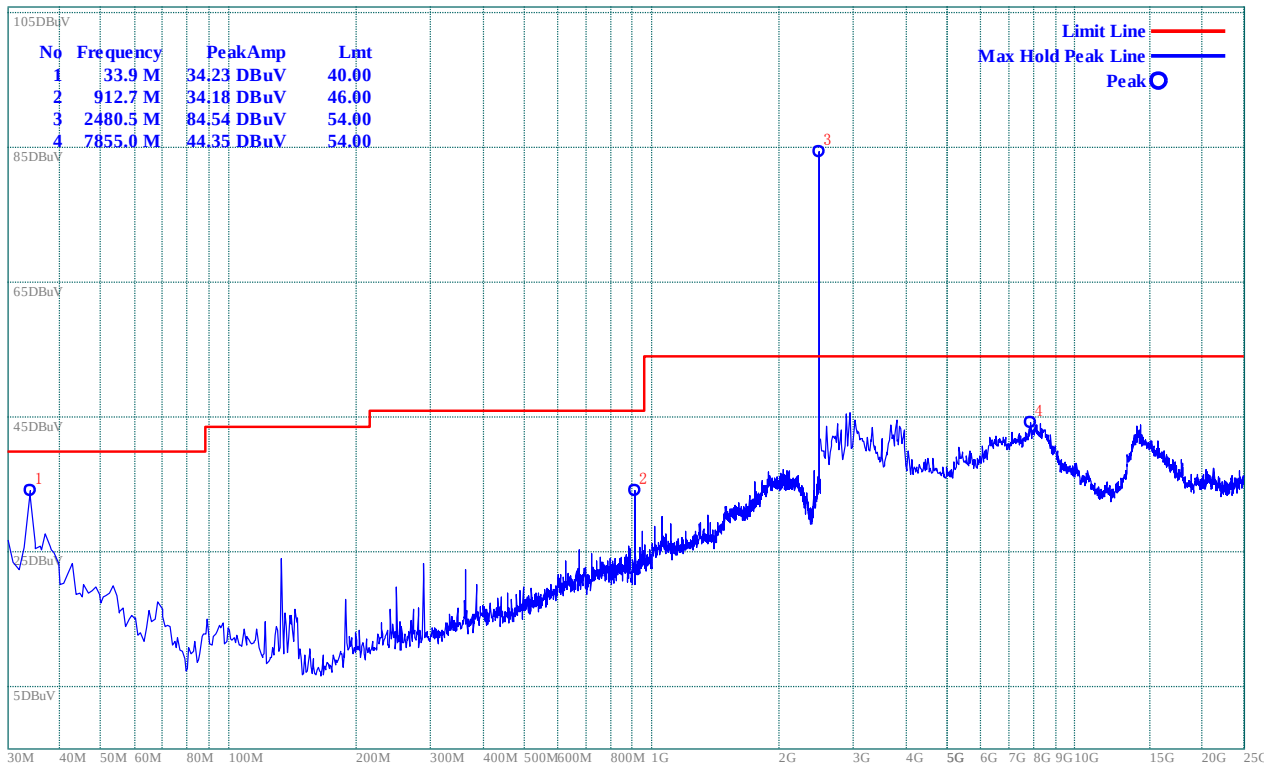
Plot for Channel = 78



(Plot C.0: 9kHz to 30MHz)



(Plot C.1: Antenna Horizontal)



(Plot C.2: Antenna Vertical)

### $\pi/4$ -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 (dB $\mu$ V/m) |       | Antenna Polarization | Refer to Plot |
|---------|-----------------|-------------------------------------|-------|----------------------|---------------|
|         |                 | PK                                  | AV    |                      |               |
| 0       | 2402            | 80.77                               | 74.86 | Horizontal           | Plot A.1      |
|         |                 | 81.70                               | 76.91 | Vertical             | Plot A.2      |
| 39      | 2441            | 89.29                               | 84.21 | Horizontal           | Plot B.1      |
|         |                 | 85.74                               | 81.12 | Vertical             | Plot B.2      |
| 78      | 2480            | 87.79                               | 82.35 | Horizontal           | Plot C.1      |
|         |                 | 84.28                               | 80.02 | Vertical             | Plot C.2      |

##### The un-wanted Emissions:

Test result of channel: 0 (2402MHz)



| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 33.9 M          | 32.17                   | 40                    | -7.83       | 100         | 211           | Horizontal           |
| 912.7 M         | 34.03                   | 46                    | -11.97      | 100         | 161           | Horizontal           |
| 2.928 G         | 48.68                   | 54                    | -5.32       | 100         | 340           | Horizontal           |
| 8.170 G         | 44.65                   | 54                    | -9.35       | 100         | 244           | Horizontal           |
| 33.9 M          | 36.41                   | 40                    | -3.59       | 100         | 23            | Vertical             |
| 912.7 M         | 33.7                    | 46                    | -12.3       | 100         | 4             | Vertical             |
| 2.928 G         | 49.26                   | 54                    | -4.74       | 100         | 212           | Vertical             |
| 8.238 G         | 44.31                   | 54                    | -9.69       | 100         | 163           | Vertical             |

Test result of channel: 39 (2442MHz)

| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 249.2 M         | 31.49                   | 46                    | -14.51      | 100         | 104           | Horizontal           |
| 2.928 G         | 49.48                   | 54                    | -4.52       | 100         | 292           | Horizontal           |
| 33.9 M          | 35.13                   | 40                    | -4.87       | 100         | 12            | Vertical             |
| 132.8 M         | 23.44                   | 43.5                  | -20.06      | 100         | 9             | Vertical             |
| 3.018 G         | 45.38                   | 54                    | -8.62       | 100         | 0             | Vertical             |

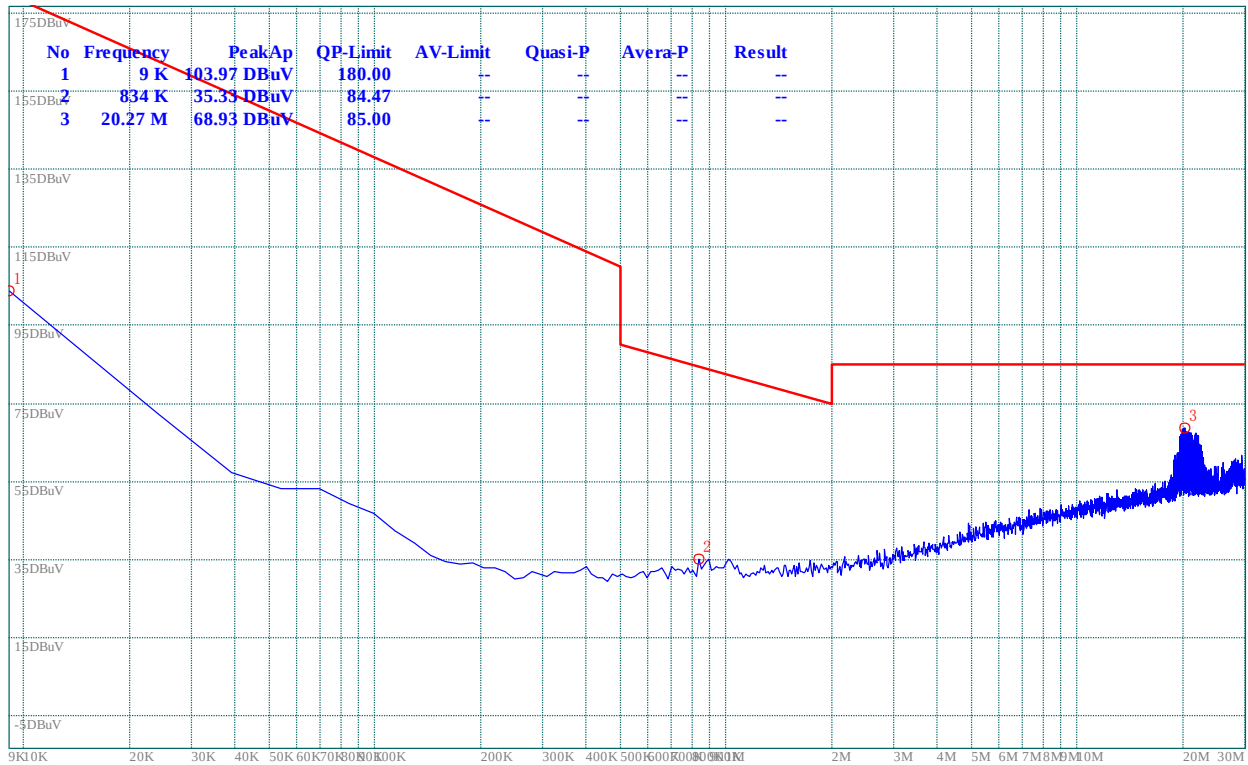
Test result of channel: 78 (2480MHz)

| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 33.9 M          | 32.23                   | 40                    | -7.77       | 100         | 128           | Horizontal           |
| 332.6 M         | 31.23                   | 46                    | -14.77      | 100         | 183           | Horizontal           |
| 2.928 G         | 50.19                   | 54                    | -3.81       | 100         | 1             | Horizontal           |
| 8.080 G         | 43.64                   | 54                    | -10.36      | 100         | 1             | Horizontal           |
| 33.9 M          | 34.15                   | 40                    | -5.85       | 100         | 333           | Vertical             |
| 912.7 M         | 33.05                   | 46                    | -12.95      | 100         | 357           | Vertical             |
| 8.305 G         | 44.59                   | 54                    | -9.41       | 100         | 309           | Vertical             |

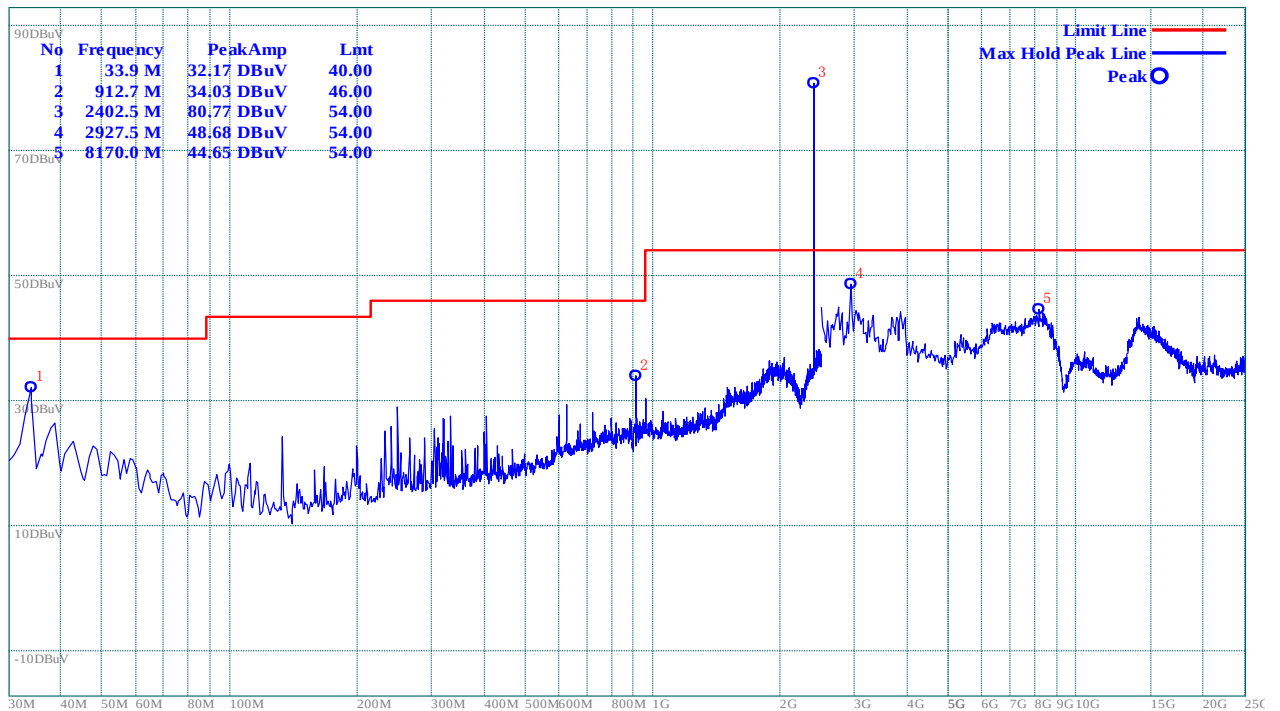


## B. Test Plots for the Whole Measurement Frequency Range:

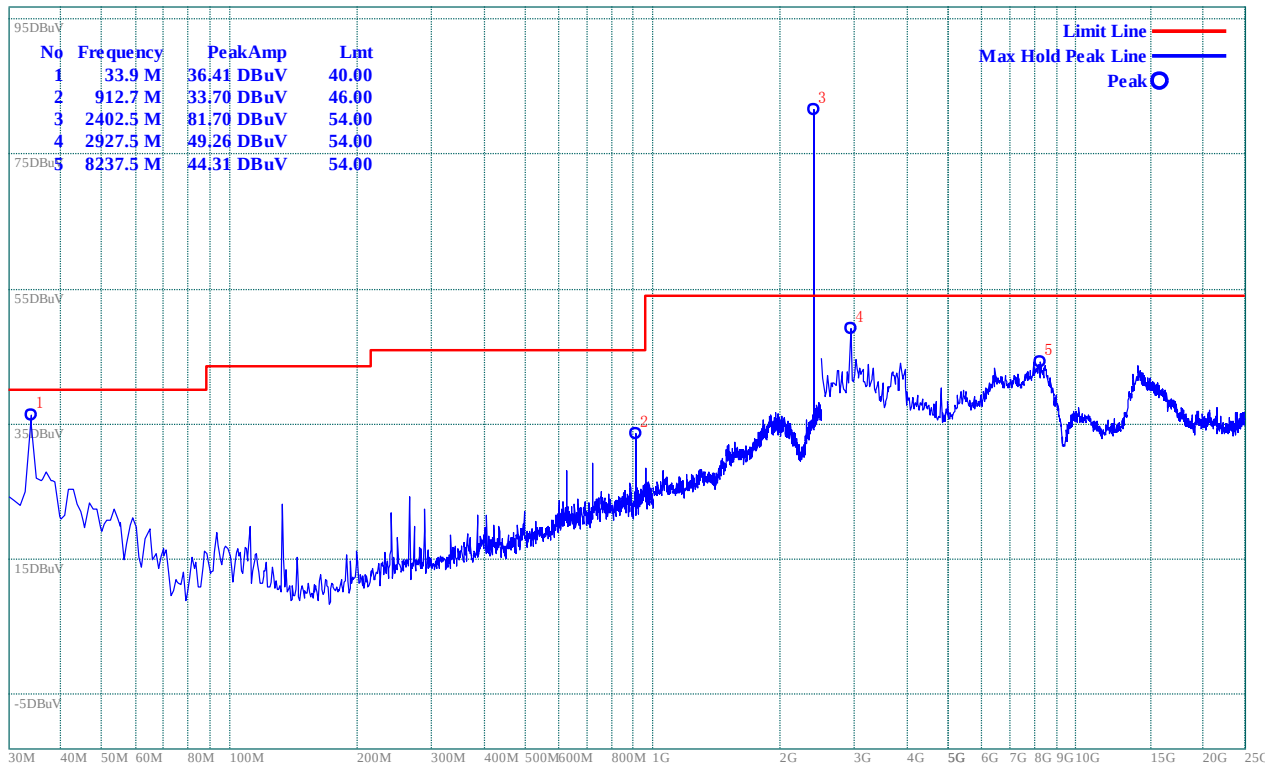
### Plots for Channel = 0



(Plot A.0: 9kHz to 30MHz)



(Plot A.1: Antenna Horizontal)

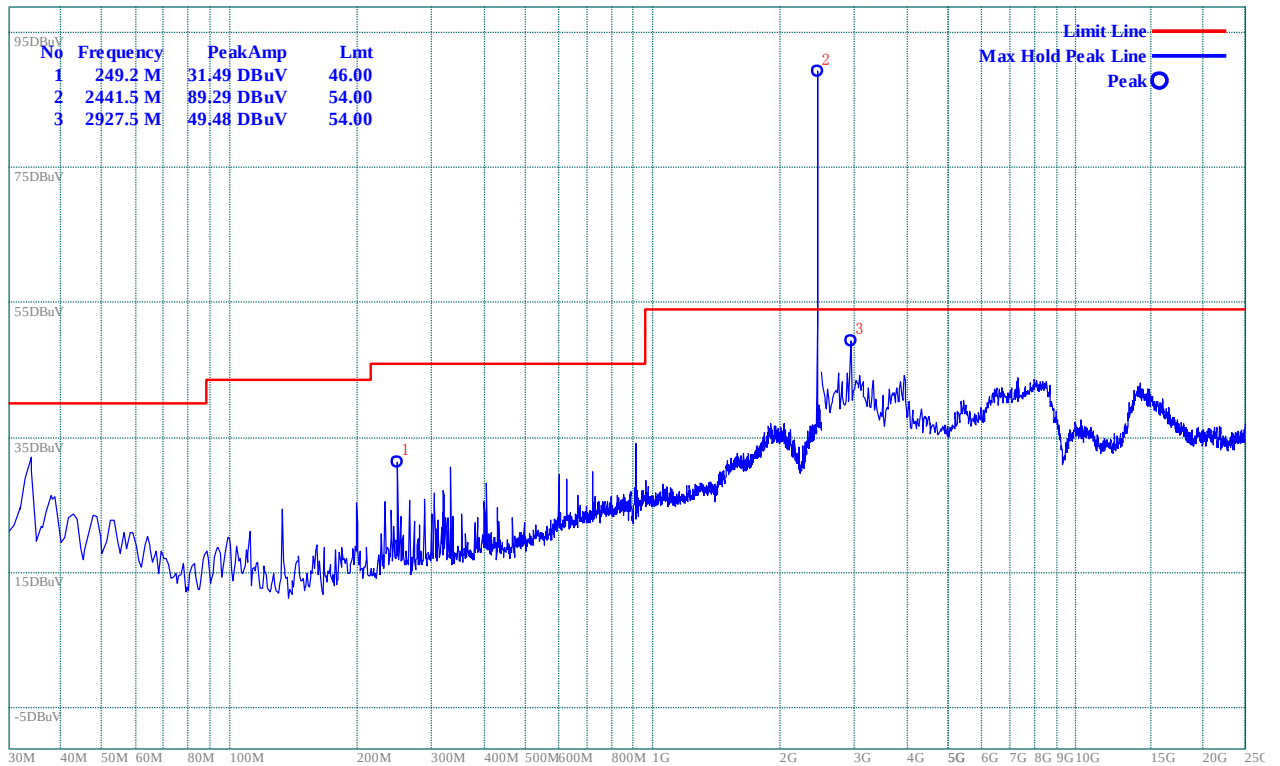


(Plot A.2: Antenna Vertical)

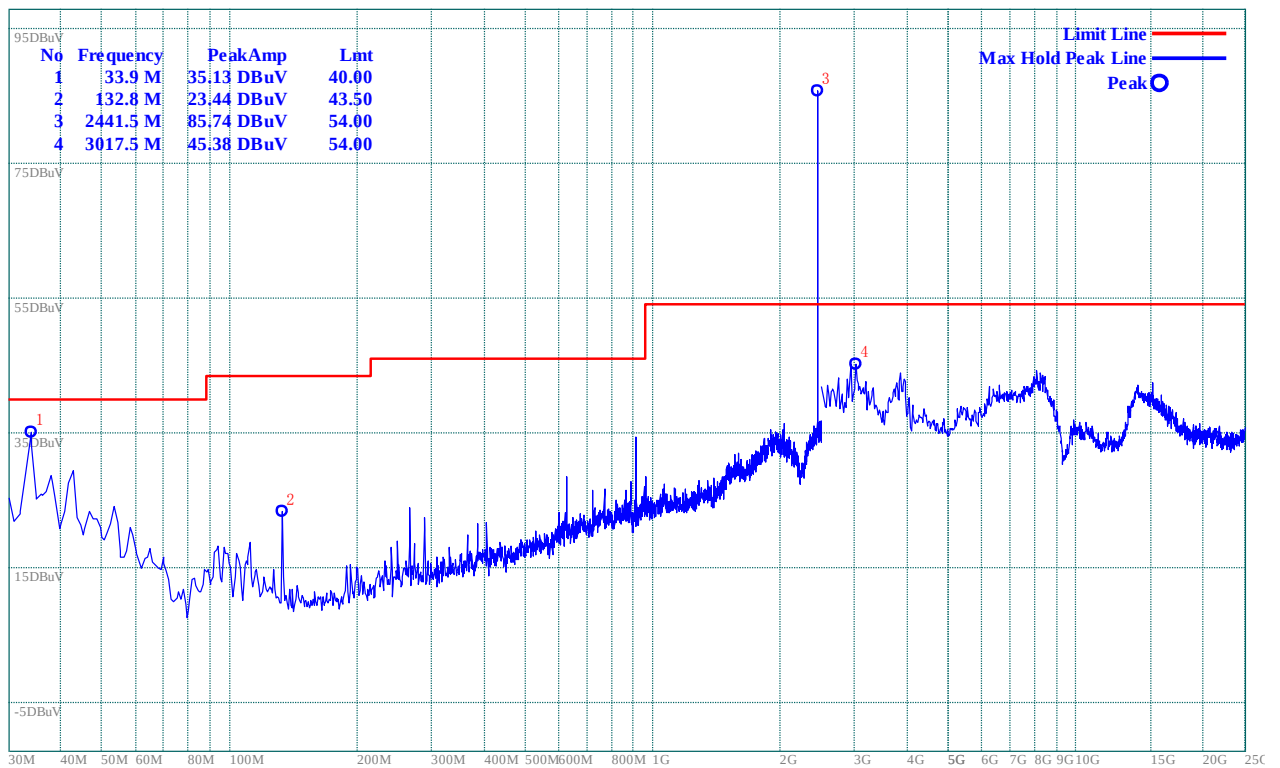
Plot for Channel = 39



(Plot B.0: 9kHz to 30MHz)

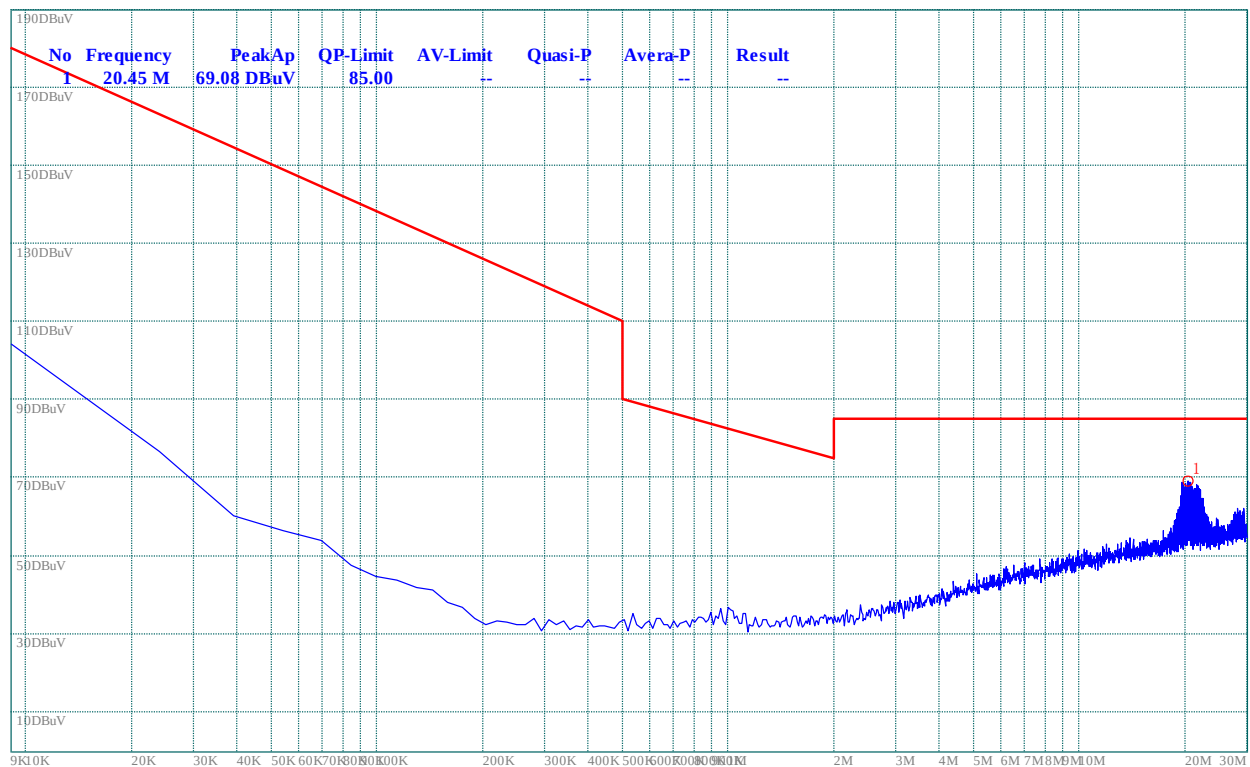


(Plot B.1: Antenna Horizontal)

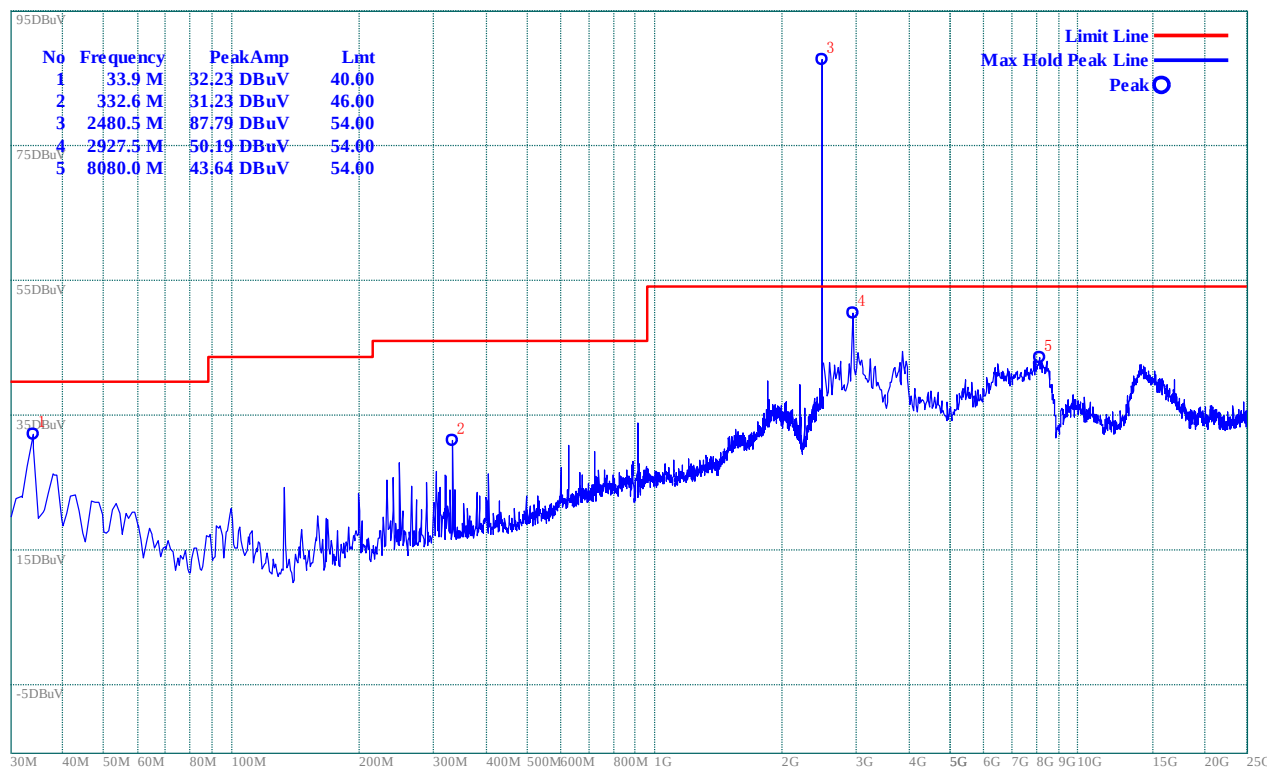


(Plot B.2: Antenna Vertical)

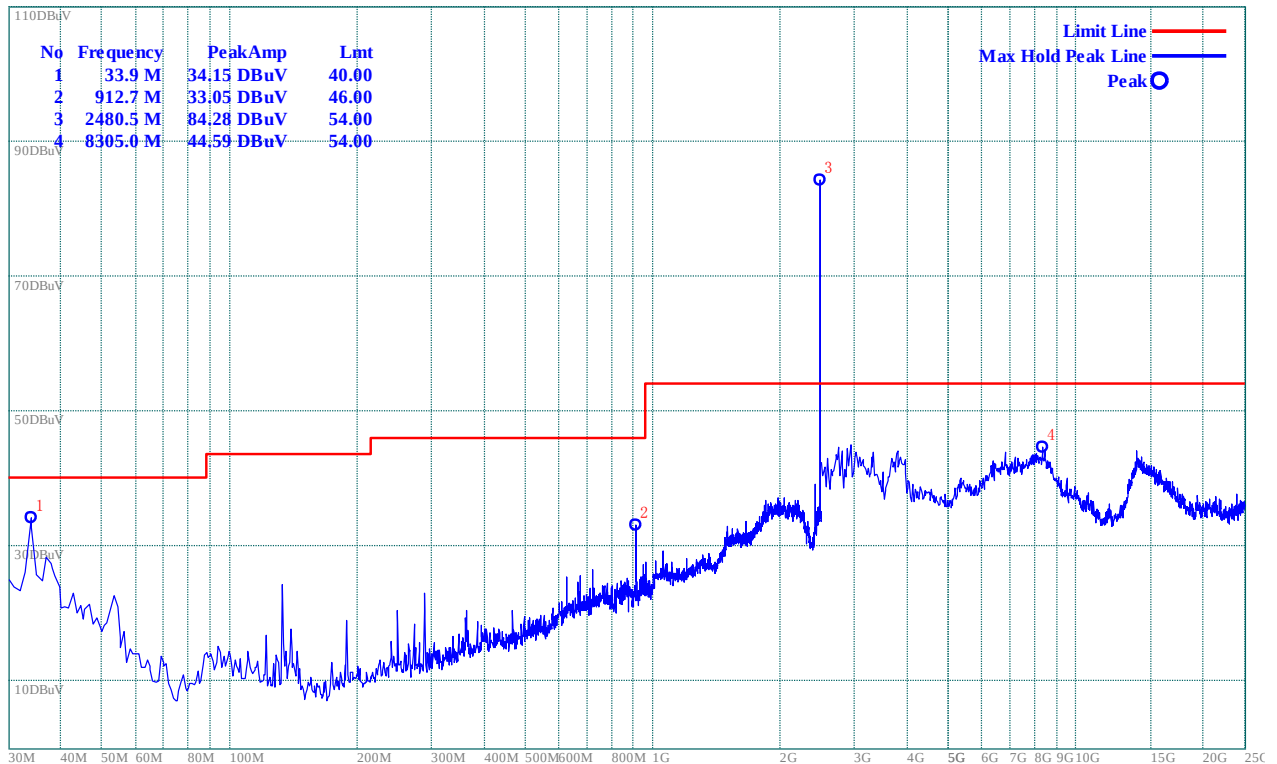
Plot for Channel = 78



(Plot C.0: 9kHz to 30MHz)



(Plot C.1: Antenna Horizontal)



(Plot C.2: Antenna Vertical)

## 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 (dB $\mu$ V/m) |       | Antenna Polarization | Refer to Plot |
|---------|-----------------|-------------------------------------|-------|----------------------|---------------|
|         |                 | PK                                  | AV    |                      |               |
| 0       | 2402            | 81.70                               | 77.14 | Horizontal           | Plot A.1      |
|         |                 | 84.77                               | 78.36 | Vertical             | Plot A.2      |
| 39      | 2441            | 86.93                               | 80.27 | Horizontal           | Plot B.1      |
|         |                 | 87.62                               | 80.98 | Vertical             | Plot B.2      |
| 78      | 2480            | 88.83                               | 81.05 | Horizontal           | Plot C.1      |
|         |                 | 82.84                               | 77.68 | Vertical             | Plot C.2      |

#### The un-wanted Emissions:

Test result of channel: 0 (2402MHz)

| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 33.9 M          | 33.34                   | 40                    | -6.66       | 100         | 29            | Horizontal           |
| 912.7 M         | 34.09                   | 46                    | -11.91      | 100         | 330           | Horizontal           |
| 2.928 G         | 48.68                   | 54                    | -5.32       | 100         | 340           | Horizontal           |
| 33.9 M          | 35.95                   | 40                    | -4.05       | 100         | 6             | Vertical             |
| 912.7 M         | 33.27                   | 46                    | -12.73      | 100         | 12            | Vertical             |
| 2.928 G         | 50.46                   | 54                    | -3.54       | 100         | 244           | Vertical             |
| 14.200 G        | 44.38                   | 54                    | -9.62       | 100         | 316           | Vertical             |

Test result of channel: 39 (2442MHz)

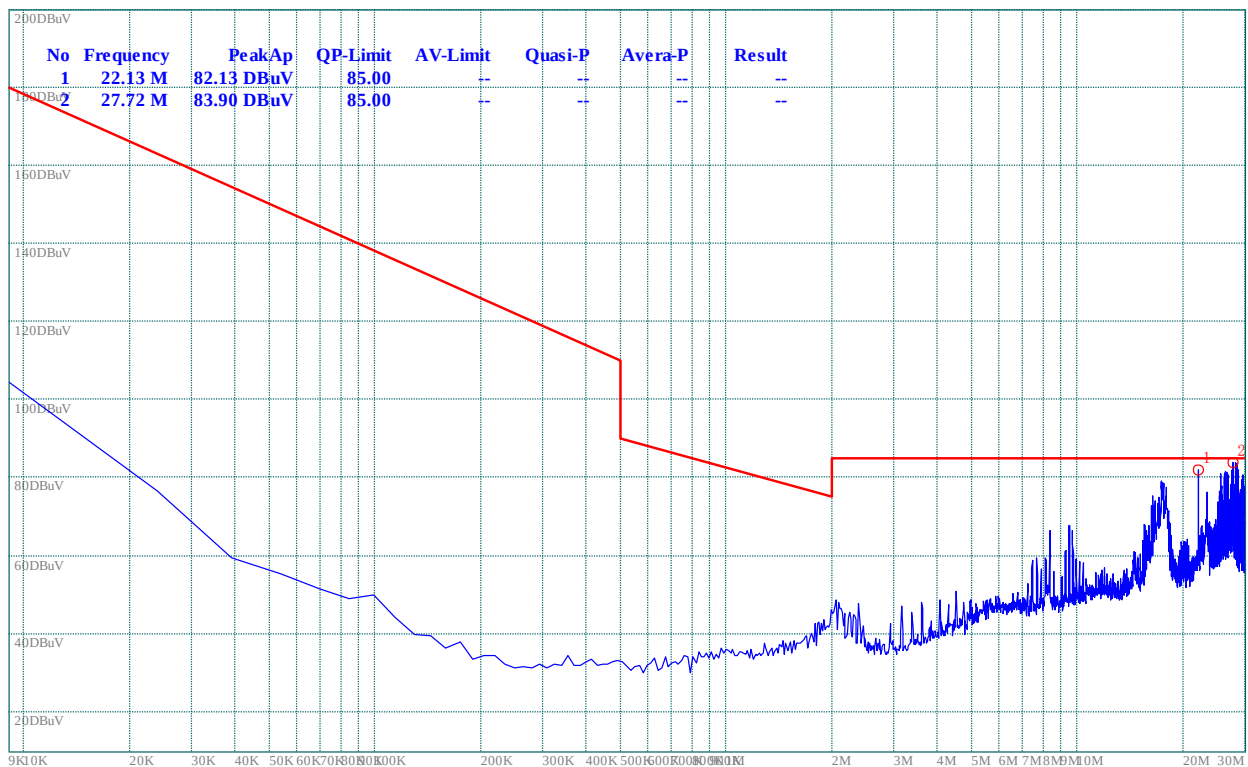
| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 249.2 M         | 30.34                   | 46                    | -15.66      | 100         | 94            | Horizontal           |
| 912.7 M         | 34.58                   | 46                    | -11.42      | 100         | 131           | Horizontal           |
| 2.928 G         | 47.68                   | 54                    | -6.32       | 100         | 315           | Horizontal           |
| 33.9 M          | 36.66                   | 40                    | -3.34       | 100         | 357           | Vertical             |
| 912.7 M         | 32.75                   | 46                    | -13.25      | 100         | 310           | Vertical             |

Test result of channel: 78 (2480MHz)

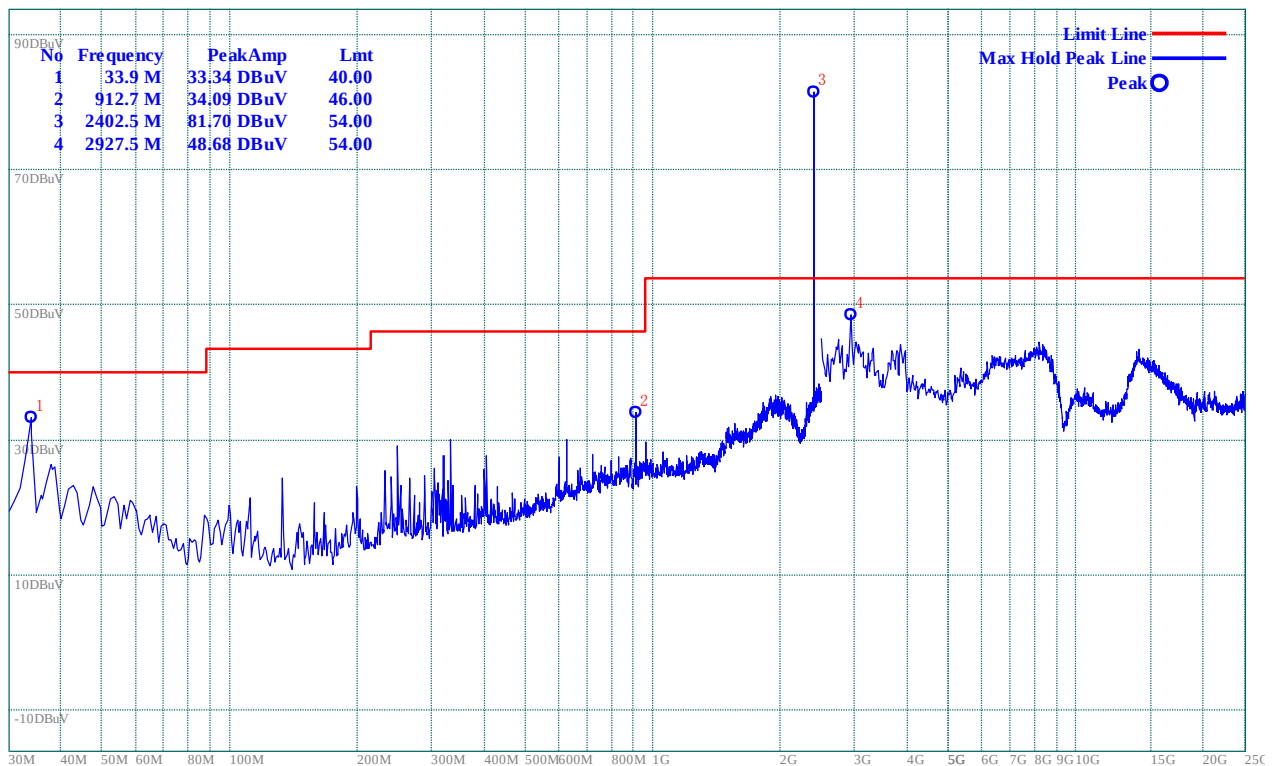
| Frequency (MHz) | PK Level (dB $\mu$ V/m) | Limits (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Azimuth (deg) | Antenna Polarization |
|-----------------|-------------------------|-----------------------|-------------|-------------|---------------|----------------------|
| 33.9 M          | 32.06                   | 40                    | -7.94       | 100         | 3             | Horizontal           |
| 912.7 M         | 33.71                   | 46                    | -12.29      | 100         | 45            | Horizontal           |
| 2.928 G         | 48.68                   | 54                    | -5.32       | 100         | 340           | Horizontal           |
| 8.170 G         | 44.65                   | 54                    | -9.35       | 100         | 244           | Horizontal           |
| 33.9 M          | 36.59                   | 40                    | -3.41       | 100         | 0             | Vertical             |
| 132.8 M         | 24.18                   | 43.5                  | -19.32      | 100         | 2             | Vertical             |
| 14.268 G        | 43.95                   | 54                    | -10.05      | 100         | 268           | Vertical             |

**B. Test Plots for the Whole Measurement Frequency Range:**

Plots for Channel = 0

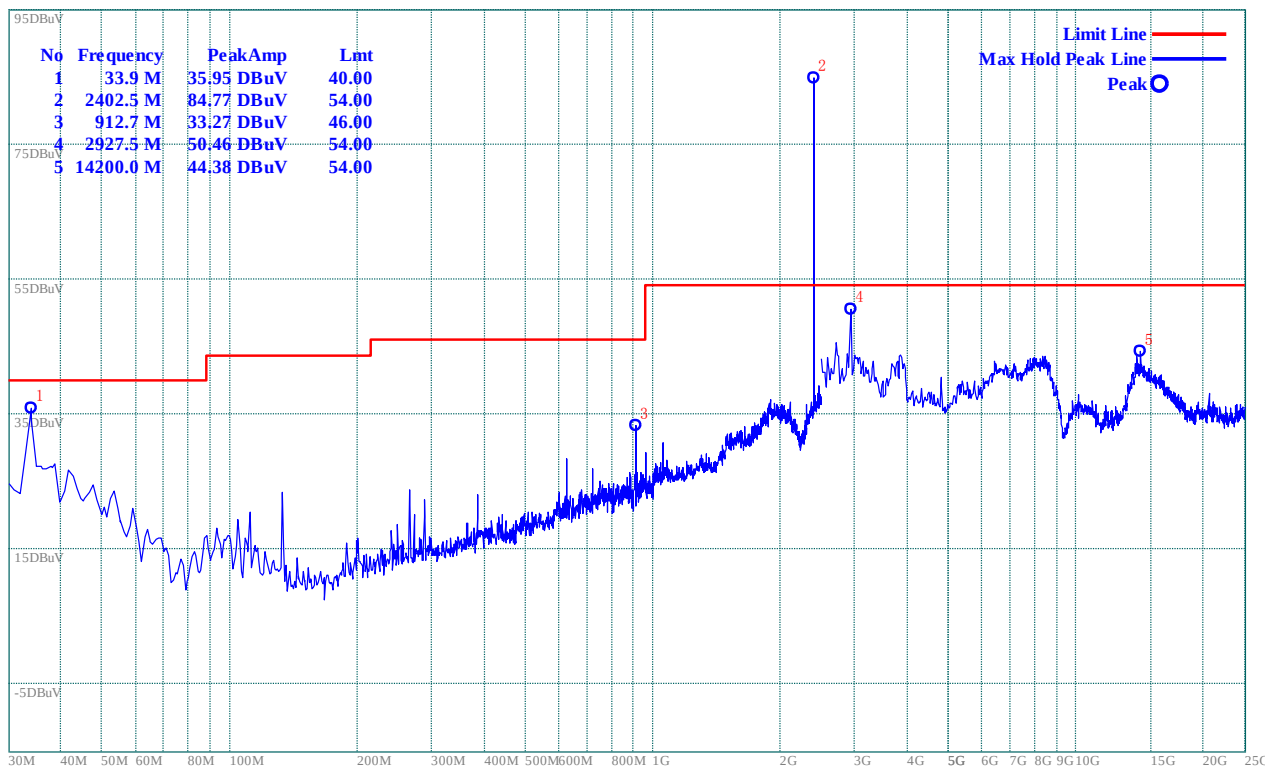


(Plot A.0: 9kHz to 30MHz)



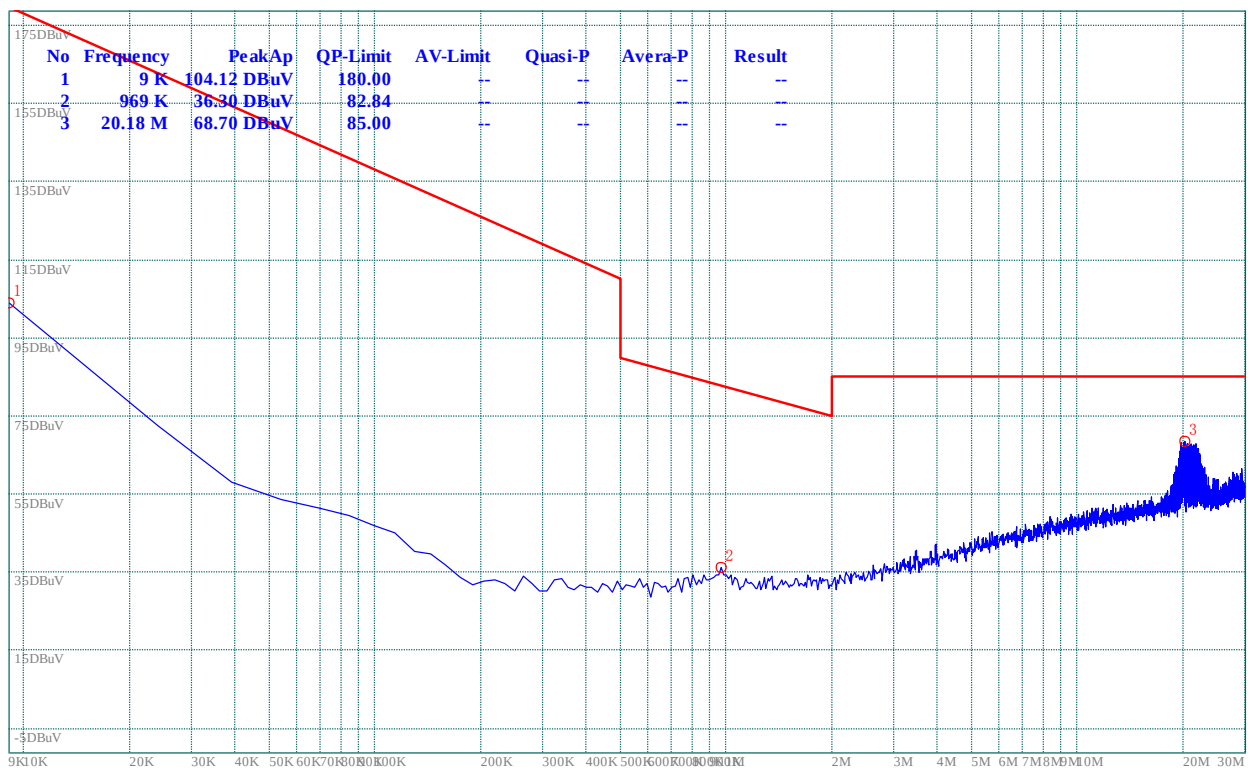
(Plot A.1: Antenna Horizontal)





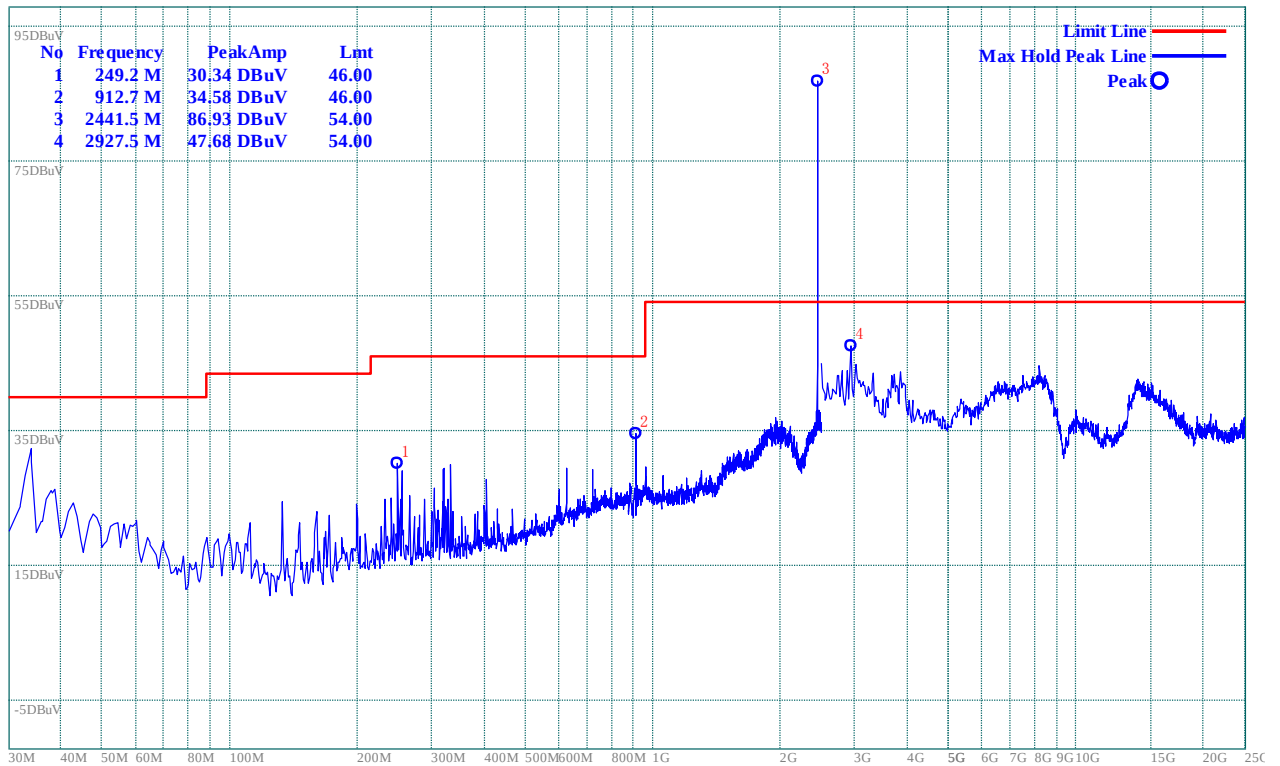
(Plot A.2: Antenna Vertical)

### Plot for Channel = 39

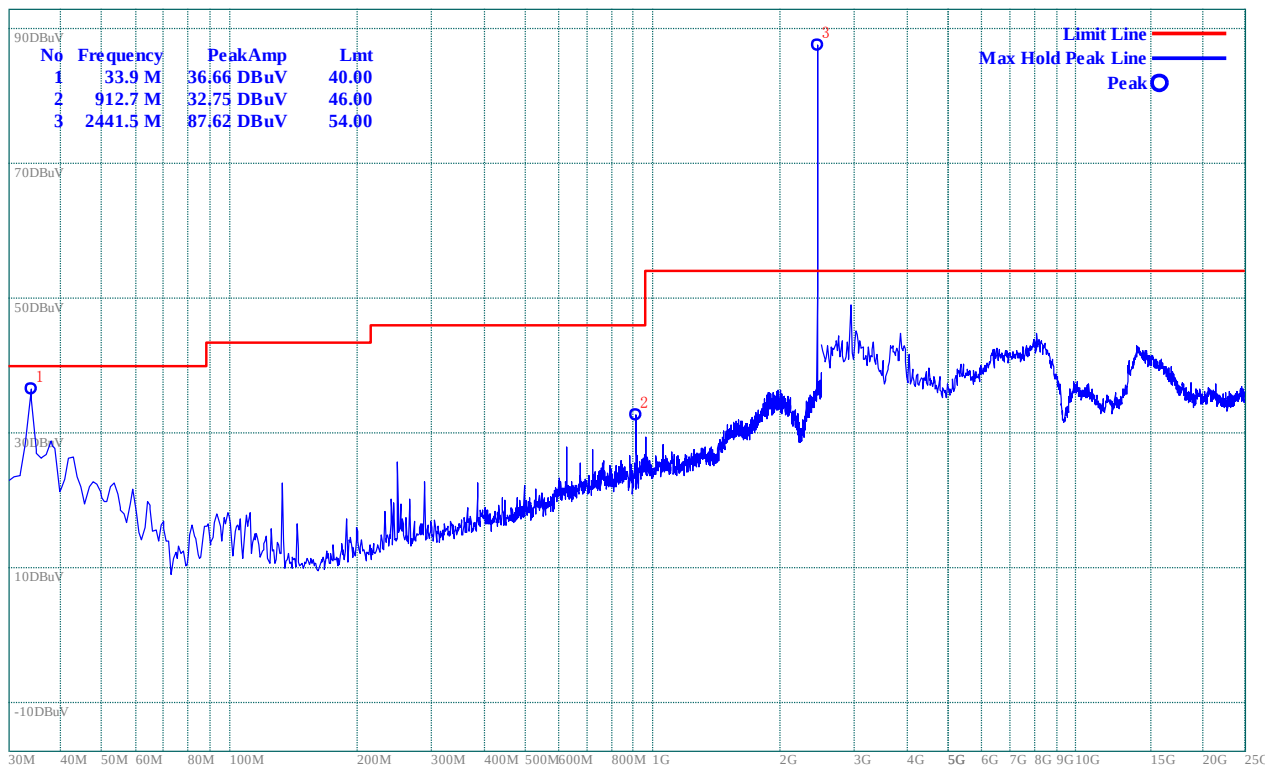


(Plot B.0: 9kHz to 30MHz)



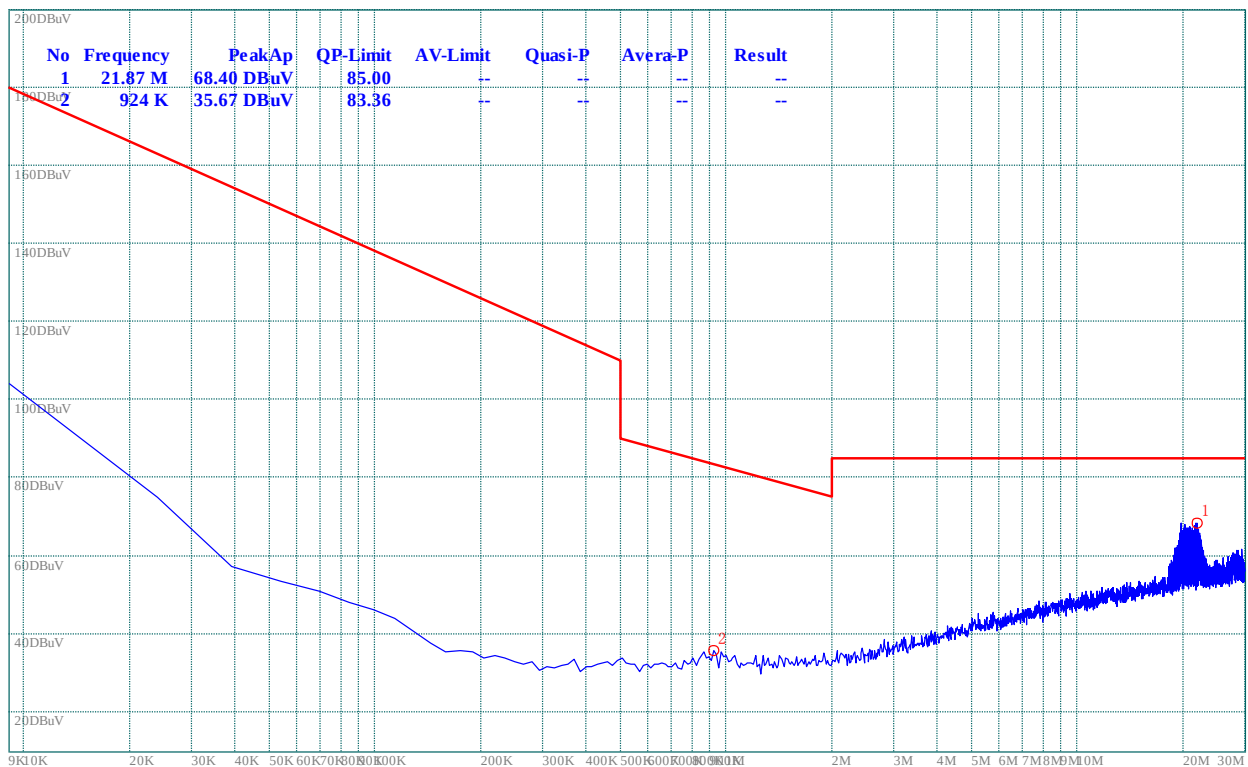


(Plot B.1: Antenna Horizontal)

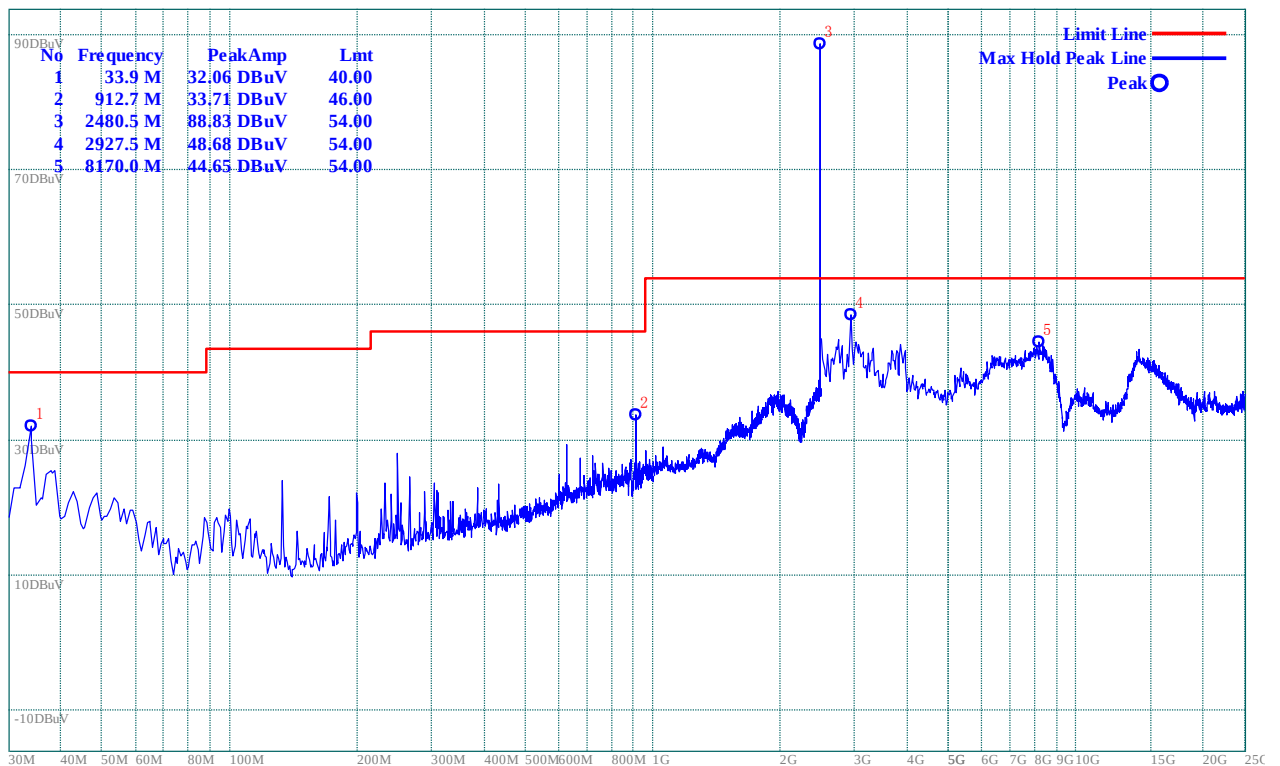


(Plot B.2: Antenna Vertical)

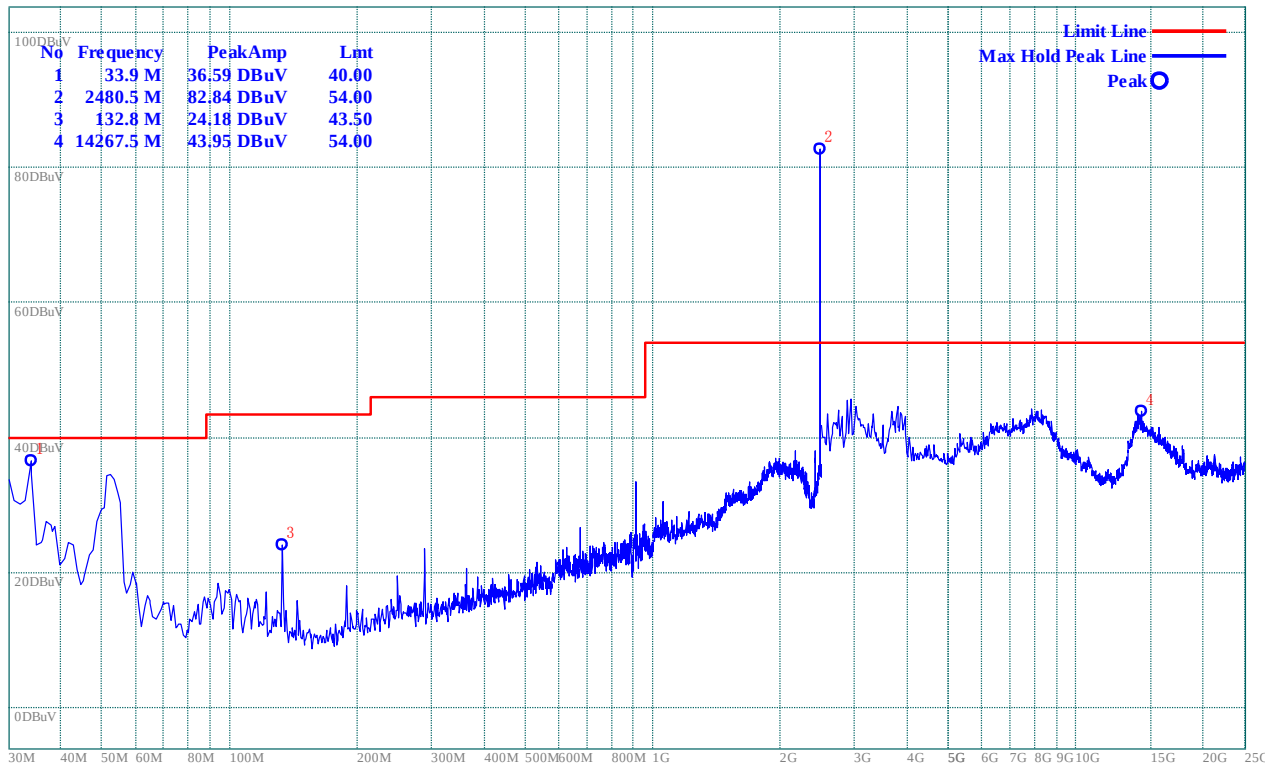
Plot for Channel = 78



(Plot C.0: 9kHz to 30MHz)



(Plot C.1: Antenna Horizontal)



(Plot C.2: Antenna Vertical)

\*\* END OF REPORT \*\*